EXPECTED RETURNS

2022
2026

THE ROASTING TWENTIES

THINGS ARE HEATING UP

Sustainable Investing Expertise by ROBECOSAM

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2022-2026 outlook

This document has been compiled by Laurens Swinkels and Peter van der Welle.
It represents the views of Robeco's Multi-Asset team, which are not necessarily shared by other teams at Robeco.
Please visit www.robeco.com/expectedreturns for more information.
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Contents

Foreword

In this eleventh edition of our annual five-year outlook, we are incorporating climate change for the first time as a medium-term risk affecting our return forecasts for asset classes. We are proud of this innovation. The effect that climate change policies, such as legislation following the European Green Deal, will have on asset prices is one of the key questions for long-term investors. Indeed, it is crucial to carefully analyze the impact of climate change, but perhaps the biggest risk of climate change for investors is not seeing the opportunities.

Coronavirus vaccine development was faster and rolled out more quickly than we envisioned in last year's report, which has set the stage for one of the fastest economic recoveries in history. But while vaccines have weakened the link between infections and hospitalizations, the all-clear sign hasn't been given, especially in emerging markets where vaccines have not been as widely available. Some battles may have been won, but the pandemic war isn't over.

Expected returns are a vital element of any investor's strategic decision making. The approach we take in this report is, as always, based on a five-year outlook, extending to 2026, and our forecasts can be used as input for the investment plans of both institutional and professional investors. We pair our return forecasts for all major asset classes with related content in order to provide readers with a deeper understanding of the markets in which they are investing. Bearing in mind the strong equity market returns over the past year, we remain positive about equity markets thanks to an upgrade of our economic outlook for the next five years. Policy makers will remain stimulative and corporate earnings will flourish due to favorable productivity growth in years to come.

This outlook's theme, the Roasting Twenties, is inspired by the Roaring Twenties of the previous century in which the Western world saw economic, social, and cultural prosperity. However, there are some crucial differences. Productivity boosts are not a luxury, but a necessity to deal with climate risks, ageing societies, and economic inequalities. The urgency of dealing with climate change risks has increased due to the physical risks that have materialized over the past years: severe droughts, increased wildfires, and massive floods. This literal roasting of the planet is leading to the increased development of green energy sources. On top of that, metallurgic roasting of ores and smelting is required to construct new windmill and solar energy parks and replace the existing fossil fuel car fleet with electric vehicles.

We at Robeco have been research driven for over 90 years, and have therefore included many references to academic and non-academic publications for readers wishing to delve deeper into the topics discussed. We hope that you enjoy reading this publication and find it helpful in navigating the investment landscape in the period ahead.

Victor Verberk
Chief Investment Officer

For an assessment of the long-term expected returns, please visit www.robeco.com/expectedreturns.

1

Expected returns 2022-2026

Executive summary

It's easy to understand Elon Musk's fascination with Nikola Tesla, the inventor of the alternating current (AC) technology that serves as the backbone of the company's electric vehicles. Talking to Collier's magazine back in 1926, in the midst of what came to be known as the Roaring Twenties, Tesla essentially predicted the wireless age, stating: "When wireless is perfectly applied the whole earth will be converted into a huge brain, which in fact it is, all things being particles of a real and rhythmic whole. We shall be able to communicate with one another instantly, irrespective of distance."

Thanks to technologies such as Zoom we are clearly now in the era that Tesla envisioned, in which we indeed "see and hear one another as perfectly as though we were face to face, despite intervening distances of thousands of miles". Like many of his peers in the Roaring Twenties, Tesla was a techno optimist, inspired by the breathtaking pace of technological advances in the early part of the 20th century.

Looking ahead to 2026 – the end of our five-year horizon in this publication – it's not difficult to envisage similarities between the Roaring Twenties and what we believe the 2020s may bring. Much like in the 1920s, we have just emerged from a major global crisis during (and thanks to) a period of rapid technological change. US labor productivity growth averaged 2.4% between 1919-29, 60 bps higher than during the war- and pandemic-plagued second decade of the 20th century. We think there could be a similar improvement this time around, and have grown more optimistic about a supply-side boost for the global economy compared with last year. We expect an investment-led pick-up in productivity growth that beats the subdued GDP per capita growth during the 2009-19 Great Expansion – not unlike the jump we saw in the Roaring Twenties.

And we're also excited about the prospects for technological breakthroughs. If Elon Musk is interviewed by Forbes or a similar magazine in 2026, it's likely that he'll have even more reason to exude his optimism about technology than his source of inspiration had exactly a century previously.

Introducing the Roasting Twenties

However, we see some crucial differences between what we now call the Roaring Twenties and the world we live in today. In our view, we are not now in the roaring 2020s, but the Roasting Twenties instead.

First, the reason for optimism linked to technological and economic growth in the coming decade (and so the coming five years as covered by our outlook) rests on a paradox: the optimism is intertwined with that sinking feeling that climate catastrophe is closing in. Back in the 1920s, people could object to the cheap, reliable cars made by Henry Ford by asking what's wrong with the horse? Today it is obvious what's wrong with fossil fuel-powered cars and why they need to be replaced. Therefore, the productivity boost that we expect will be the result of the urgency to extend the existing technological frontier to help us face the increasingly complex demands of an aging society, health and climate risks, and economic polarization.

The world is heating up: a recent Intergovernmental Panel on Climate Change report shows that the average global temperature will increase to 1.5°C above pre-industrial levels in the next two decades, even in the most optimistic emissions-reduction scenario. This

temperature increase will be accompanied by more extreme weather events, such as floods, heatwaves and hurricanes, while sea levels are forecast to rise by up to 50 cm by 2100. Developed economies are now facing increased physical climate risks, as we have seen with the recent wildfires in California, Greece and Italy and the flooding in Germany and Belgium. There is no longer any doubt among scientists whether climate change has been caused by human activity: the changes in recent decades are unprecedented in the last 2,000 years.[1] Although carbon futures prices have been surging lately and 86% of investors believe climate risk will be a key theme in their portfolios by 2023,[2] regional equity valuations do not yet reflect the different climate hazard risks that the various regions are exposed to.

1. For example, between 1800-2006, sea levels rose by around 1.7 mm per year. Since 2006, they have risen by around 3.7 mm per year.

2. Source: 2021 Robeco Global Climate Survey

We expect investors to increasingly incorporate a consideration of climate risk into their asset allocation decisions in the coming five years. To help them do so, this year we have enriched our existing Expected Returns framework by introducing an analysis of how climate factors could affect asset class valuations in addition to valuation and macroeconomic factors. We also discuss the prospective climate-related risks and opportunities for the various asset classes in our new 'Climate' chapter.

Second, we expect the 2020s to see lots of literal roasting in the metallurgic sense: meeting the Paris climate goals requires an acceleration of the green energy transition, which in turn will mean a lot of ore smelting needs to be carried out. That's because, according to the International Energy Agency, constructing an offshore wind plant requires nine times more mineral resources (in weight terms) than a gas-fired plant, while a typical electric car requires six times more mineral inputs than a conventional vehicle. Electrification of transport will require huge amounts of copper and aluminum in particular.

Third, we envisage that there will be a degree of roasting taking place in the post-Covid corporate landscape due to creative destruction and economic scarring. New forms of hybrid working and labor-saving technological innovations resulting from the pandemic could act as a powerful catalyst for productivity gains, while the heat of new competition (there has been a notable rise in the number of start-ups post-Covid) will eliminate industry laggards. Certain sectors will probably experience a structural fall in demand in the post-Covid expansion, while zombie companies are likely to start feeling the heat of structural economic change.

This brings us to our macroeconomic projections. The global economy has been experiencing an atypical stop-start dynamic in 2020-21. The result is that macroeconomic uncertainty has hit its highest level in recent history, exceeding the levels it reached in the Volcker disinflation period in the early 1980s and the 2008 global financial crisis. This means investors should keep an open mind as to how the economic landscape could unfurl over the coming five years.

Today, the market narrative is dominated by the question of whether inflation will be transitory or longer-term in nature. For now, it's too early to tell. However, we believe that four key factors will play an important role in shaping the macroeconomic landscape in the medium term, and they should also shed some light on the inflation debate.

First is the debt legacy of the Covid shock, as there has been no cleansing of corporate balance sheets of the kind we see in a normal recession. Second, the evolution of the policy trilemma between ending the pandemic, keeping the economy functioning and maintaining personal freedoms. Third comes the interplay between central banks and governments. Finally, geopolitics will be important as tensions between the world's superpowers are on the rise.

Let's now consider our three main scenarios

In our base case scenario, the **Roasting Twenties**, the world transitions towards a more durable economic expansion after a very early-cycle peak in growth momentum in 2021. There is still no clear exit from the Covid-19 pandemic, although governments, consumers and producers have adopted an effective way of dealing with what has become a known enemy.

Negative real interest rates drive above-trend consumption and investment growth in developed economies, while the link between corporate and public capex and the productivity growth that ensues remains intact, with positive real returns on capex benefitting real wages and consumption growth. Workers' bargaining power increases due to more early retirements by members of the baby boomer generation after the pandemic – not only in developed economies, but also in China. Central banks want their economies to grow, but not too much, and in this scenario they have luck on their side.

What about the debate about whether inflation is transitory or on a secular uptrend? It remains largely unresolved, reflecting a stalemate between rising cyclical and falling non-cyclical inflation forces. This creates leeway for the Fed and other developed market central banks to gradually tighten monetary conditions, with a first Fed rate hike of 25 bps in 2023 followed by another 175 bps of tightening over the following three years.

We call our bull case the **Silver Twenties** because in it we see a silver lining for the global economy emerging from the pandemic. Shocks like pandemics have the power to change the fabric of society for the better. In this bullish scenario, effective vaccines lead to herd immunity across the globe and Covid-19 gradually falls by the wayside without the need for an active approach to battle it. There is enormous relief and as such 'animal spirits' are released: "the spontaneous urge to action rather than inaction", as Keynes described this emotional mindset in 1936. The USD 2.5 trillion of excess household savings that have been built up during the pandemic flow into the real economy, while elsewhere, stretched savings rates fall below historical averages.

The global economy is able to maintain above-trend productivity growth for longer as the dislocations in goods and labor markets that have forced companies to adapt are resolved more quickly than in our base case. This means non-cyclical inflation pressures fall in 2022, while cyclical inflation remains in check due to more sizable labor productivity gains on the back of greater technology dispersion across sectors. And with the pandemic out of the way, there is a more constructive dialogue between the US and China on a broad range of topics.

But it's not all good news, so we can't refer to this scenario as the Golden Twenties: outcome-oriented central banks start tightening sooner than in our base case due to the earlier-than-expected progress towards their full employment and inflation targets.

Finally we come to our bear case: the **Stag Twenties**. Here, a slowdown in economic growth momentum in 2022 is reinforced by stubbornly high input costs resulting from persistent dislocations in the capital and labor markets. There is no resolution to the policy trilemma as the pandemic spins out of control as vaccines lose their effectiveness against new mutations. As a result, there are renewed strict lockdowns across the globe, followed by a repeat of the supply shock the world experienced in 2020. The subsequent output losses feed through into lower income growth. With inflation in developed economies in the 3-4% range by 2023, fiscal and monetary policy is constrained and stagflation rears its ugly head.

And now the issues that have been the focus of our Expected Returns publication in recent years come to the fore: excess corporate leverage, high income inequality, the sustainability of the euro experiment and zombification. A new, longer, but shallower recession than the first Covid-19 downturn ensues. After the burst of stagflation, disinflation emerges due to lower consumption growth, higher taxes, forced deleveraging, rising corporate and household defaults, and a depleted wealth effect as financial markets were dealt a severe blow in the preceding episode of stagflation.

Frigid bond markets, torrid equity markets

What does this all mean for investors looking to put their money to work in markets that are already back to – and in some cases above – their pre-pandemic levels?

Current asset valuations, especially those of risky assets, appear out of sync with the business cycle, and are more akin to where they should be late in the cycle. The dominant role central banks have taken on in the fixed income markets has forced yields well below the levels warranted by the macroeconomic and inflation outlook. Torrid valuations are suggestive of below-average returns in the medium term across asset classes, and especially for US equities. This is reason enough to keep an eye on downside risk at a time that many investors have a fear-of-missing-out, buy-the-dip mentality.

And yet ex-ante valuations have historically typically only explained around 25% of subsequent variations in returns. The remaining 75% has been generated by other, mainly macro-related, factors. From a macro point of view, the lack of synchronicity between the business cycle and valuations should not be a problem given our expectations for above-trend medium-term growth, which bode well for margins and top-line growth. In our base case, we expect low-double-digit growth in earnings per share for the global equity markets to make up for sizable multiple compression. Previous regimes in which inflation has mildly overshot its target – something else we expect in our base case – have historically seen equities outperform bonds by 4.4 percentage points per year. A world in which inflation is below 3% should also see the bond-equity correlation remain negative.

Negative real interest rates are here to stay for longer, even though we expect real rates to become less negative towards 2026. That implies some parts of the multi-asset universe could heat up further. With 24% of the world's outstanding debt providing a negative yield in nominal terms, investing in the bond markets is a frigid proposition from a return perspective as it is hard to find ways of generating a positive return. Sources of carry within fixed income are becoming scarcer, and are only to be found in the riskier segments of the market, such as high yield credit and emerging market debt.

With excess liquidity still sloshing around and implied equity risk premiums still attractive, the TINA (There is No Alternative) phenomenon persists as alternatives for equities are hard to find. Overall, we expect risk-taking to be rewarded in the next five years, but judge the risk-return distribution to have a diminishing upside skew. The possibility of outsized gains for the equity markets is still there, but the window of opportunity is shrinking.

Nikola Tesla predicted that the world's temperate zones would become "frigid or torrid". We now know the two extremes co-exist.[3] Likewise, asset allocators should ponder how their portfolio could weather a frigid bond market and a torrid equity market at the same time over the next five years. ■

3. In Greece alone temperatures have ranged from -19°C to +48°C in 2021.

Table 1.1: Expected returns 2022-2026

	5-year annualized return	
	EUR	USD
Bonds		
Domestic AAA government bonds	-1.50%	1.00%
Developed global government bonds (hedged)	-0.50%	0.75%
Global investment grade credits (hedged)	0.25%	1.50%
Global corporate high yield (hedged)	1.50%	2.75%
Emerging government debt (local)	2.75%	3.75%
Cash	-0.25%	1.00%
Equity		
Developed market equities	4.25%	5.25%
Emerging market equities	4.00%	5.00%
Listed real estate	3.75%	4.75%
Commodities	5.00%	6.00%
Consumer prices		
Inflation	2.00%	2.25%

Source: Robeco. September 2021. The value of your investments may fluctuate and estimated performance is no guarantee of future results.

2

Expected returns 2022-2026

Valuation

Has value investing made a comeback over the past year? On the one hand, cheap value stocks have outperformed expensive growth stocks, in a reversal of what came before. Cheap high yield corporate bonds and commodities have also performed well, whereas expensive government bonds have performed poorly. But on the other hand, the broad global equity market, which was already expensive, has provided stellar returns overall. All this means we can only say that value has made a partial comeback from a multi-asset perspective.

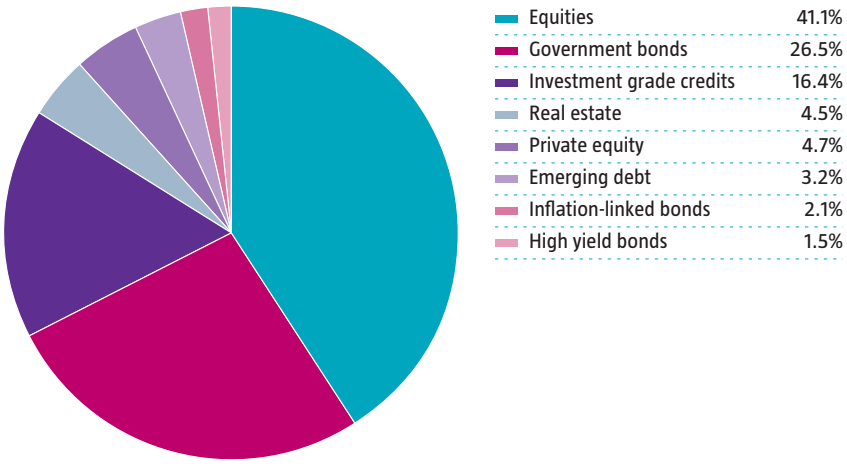
In this chapter, we set out our updated views on the valuations of each asset class. In the following chapters, we examine whether these valuations correspond with our long-term macroeconomic outlook.

The global multi-asset market portfolio is the natural starting point for every investor as it shows how the average invested dollar is allocated across asset classes. Figure 2.1 displays the weight of each asset class in the global market portfolio at the end of 2020.[1] Listed and private equity account for a combined weight of 45.8%, which is substantially lower than the 52.0% average that Doeswijk, Lam and Swinkels (2014) observed over the 1959-2012 period. Government bonds, corporate bonds and real estate account for more of the portfolio now than they have historically.

There is no reason for the weights of the market portfolio to revert to their historical averages, as future weights depend on the prices of existing assets as well as new issuance. Nevertheless, the chart suggests that there is currently more tradable debt than there has been on average since 1959.

1. There is a description of the data sources in Doeswijk, Lam and Swinkels (2014). Annually updated data can be found at: https://doi.org/10.25397/eur.9371741

Figure 2.1: Global multi-asset market portfolio



Source: Doeswijk, Lam, Swinkels (2014) and Erasmus University Data Repository of Laurens Swinkels for annual updates https://doi.org/10.25397/eur.9371741. Figure contains market capitalization weights as of 31 December 2020.

2.1 Government bonds

We assess the valuation of the three major government bond markets – the US, Japan and Germany – according to three metrics: carry, the term premium and mean reversion.

2.1.1 Carry

Instead of trying to predict interest rates to determine the value of government bonds, we can start by determining the return they would provide should the interest rate curve remain unchanged. The return in this case is what we call the carry. Here, we ignore the second-order effect of the roll-down, and compare the yield to maturity of different segments of the global bond market.

Table 2.1 shows the maturity distribution of each of the three bond markets as well as the corresponding durations and yields to maturity as at 31 July 2021. The maturity profiles of Germany and Japan are similar. The US uses more short-dated bonds for financing purposes, as we can see from its 54.4% weight in bonds with maturities under five years. The corresponding figure for Germany is 37.0% and it is 35.1% for Japan.

Table 2.1: Maturity distribution and yields of three major government bond markets

	Germany			United States			Japan		
Maturity	**Weight**	**Duration**	**Yield**	**Weight**	**Duration**	**Yield**	**Weight**	**Duration**	**Yield**
1-3 years	21.4%	1.9	-0.79%	32.1%	2.0	0.20%	19.7%	1.9	-0.13%
3-5 years	15.6%	3.9	-0.81%	22.3%	4.0	0.55%	15.4%	4.0	-0.14%
5-7 years	15.5%	5.8	-0.74%	14.9%	5.9	0.87%	10.3%	5.9	-0.13%
7-10 years	17.4%	8.2	-0.60%	9.8%	8.1	1.14%	15.4%	8.3	-0.06%
10-20 years	15.2%	13.3	-0.30%	5.2%	15.6	1.73%	24.0%	13.8	0.20%
> 20 years	14.8%	22.0	-0.08%	15.6%	20.0	1.87%	15.3%	24.4	0.55%
Index	**100%**	**8.6**	**-0.57%**	**100%**	**7.1**	**0.81%**	**100%**	**9.9**	**0.06%**
Index – Short			0.22%			0.61%			0.2%
Long – Index			0.49%			1.06%			0.48%

Source: Barclays Live, Robeco. We use the Bloomberg Barclays Treasury indices for Germany, the US and Japan. 'Weights' represents the market capitalization weight of the maturity segment. 'Duration' is the option-adjusted modified duration of the maturity segment. 'Yield' is the yield-to-worst of the maturity segment, which is the worst-case yield that can be obtained without default. 'Index – Short' is the yield of the index minus that of the '1-3 years' segment. 'Long – Index' is the yield of the '>20 years' segment minus that of the index. Data is from 31 July 2021.

For a five-year outlook, the yield on a five-year zero-coupon bond would be the nominal risk-free rate. This is the nominal return that can be locked in at the start of the five-year period, assuming there are no defaults over the investment horizon. This yield is typically close to that of the medium-term 5- to 7-year maturity segment, which has a duration of slightly under six years. For Germany, this is -0.74%, only slightly higher than the yield of 1- to 3-year bonds, which is -0.79%. The yield of the German government bond index is -0.57%, while that of long-dated bonds in the over-20-year segment is just -0.08%. These figures show that German government bonds are currently providing limited carry.

What's more, yield curves are flat in Germany and Japan: the index yield is only 22 bps higher than that of short-dated bonds in Germany, while the difference in the yields of long-dated bonds with those of the index is only 49 bps. Although yields are about 60 bps higher in Japan, the yield differences across maturities are similar to those in Germany. In the US, the yield curve is steeper, with a 61 bps yield difference between the index and short-dated bonds, and a 106 bps difference between long-dated bonds and the index.

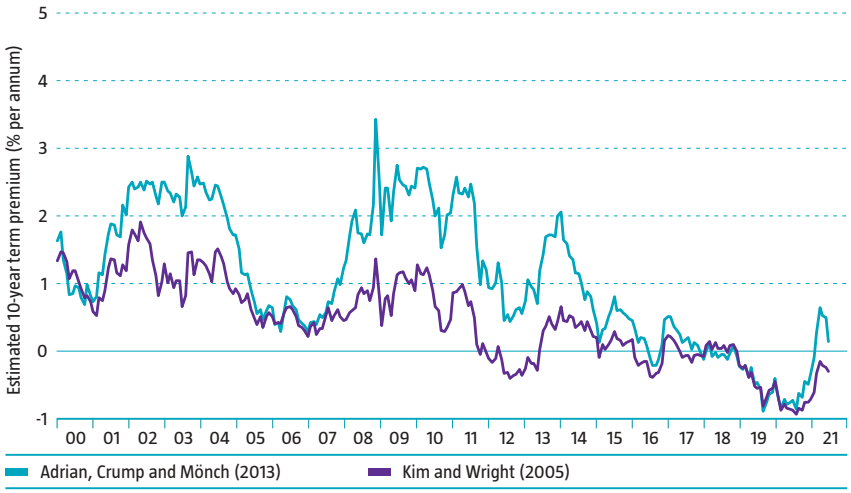
With short-dated bond yields close to cash yields, government bonds are expensive in carry-based terms compared with the 0.75% premium we expect in the steady state for Germany and Japan. However, carry in the US is close to neutral.

2.1.2 Term premium

The term premium refers to the additional return an investor expects to receive from holding a government bond to maturity rather than rolling over bills until the same maturity. Since the expected path of short-term interest rates cannot be observed, the challenge is to come up with a good estimate. For example, if the expected yield earned by rolling over the bills until bond maturity is the current bill yield, the term premium would be equal to the carry we discussed above. Another option would be to use market-implied forward interest rates as the expected future short-term rates. This would by definition lead to a term premium of zero; that is, the expected return of bonds equals the expected return of bills. This would contrast with the term premium that has been observed since 1900.

Researchers have been making considerable efforts to determine the expected path of the short-term interest rate. See, for example, Adrian, Crump and Mönch's (2013) model at the New York Federal Reserve Bank, and Kim and Wright's (2005) model maintained by the Board of Governors of the Federal Reserve System, which are compared in more detail by Adrian, Crump, Mills and Mönch (2014). Figure 2.2 shows the US 10-year term premium resulting from both models, which has been updated to 30 June 2021. Although the general movement in term premium estimates is similar, the level of the term spread can be very different for both models. For example, at the end of December 2009, the Adrian, Crump and Mönch model estimate was 2.70%, while for the Kim and Wright model it was 1.28%. The estimates have been similar overall since 2016, although in recent months there has been some divergence. The latest figures show estimates of 0.13% for the Adrian, Crump and Mönch model and -0.30% for the Kim and Wright model. Both estimates are well below the 0.75% premium that we expect in the long run.

Figure 2.2: US 10-year term premium estimates



Source: Updated data from Adrian, Crump, and Mönch (2013) is maintained online by the Federal Reserve Bank of New York and from Kim and Wright (2005) by the Board of Governors of the Federal Reserve System. Data updated up to 30 June 2021.

In Figure 2.2 we show the 10-year term premium, as this is what most economists look at. For the five-year term premium, which relates to the horizon of our outlook, the estimates of the term premium are slightly lower than the 10-year estimates, at -0.06% for the Adrian, Crump and Mönch model and -0.39% for the Kim and Wright model.

A negative term premium means that investors are willing to pay a premium to invest in bonds rather than bills. There could be several possible reasons for this.

First, the investor base for bonds has changed over time. Central banks are now major players in government bond markets, and unlike typical bond investors, they aim to achieve their monetary goals rather than primarily seek a particular risk-adjusted return for their investment portfolio.

Second, regulation, in which liabilities of pension funds and life insurance companies are marked-to-market, ensures long-dated bonds provide the risk-free rate for these investors. Instead, these investors need to be compensated to take on risk – in other words, buying short-dated bonds.

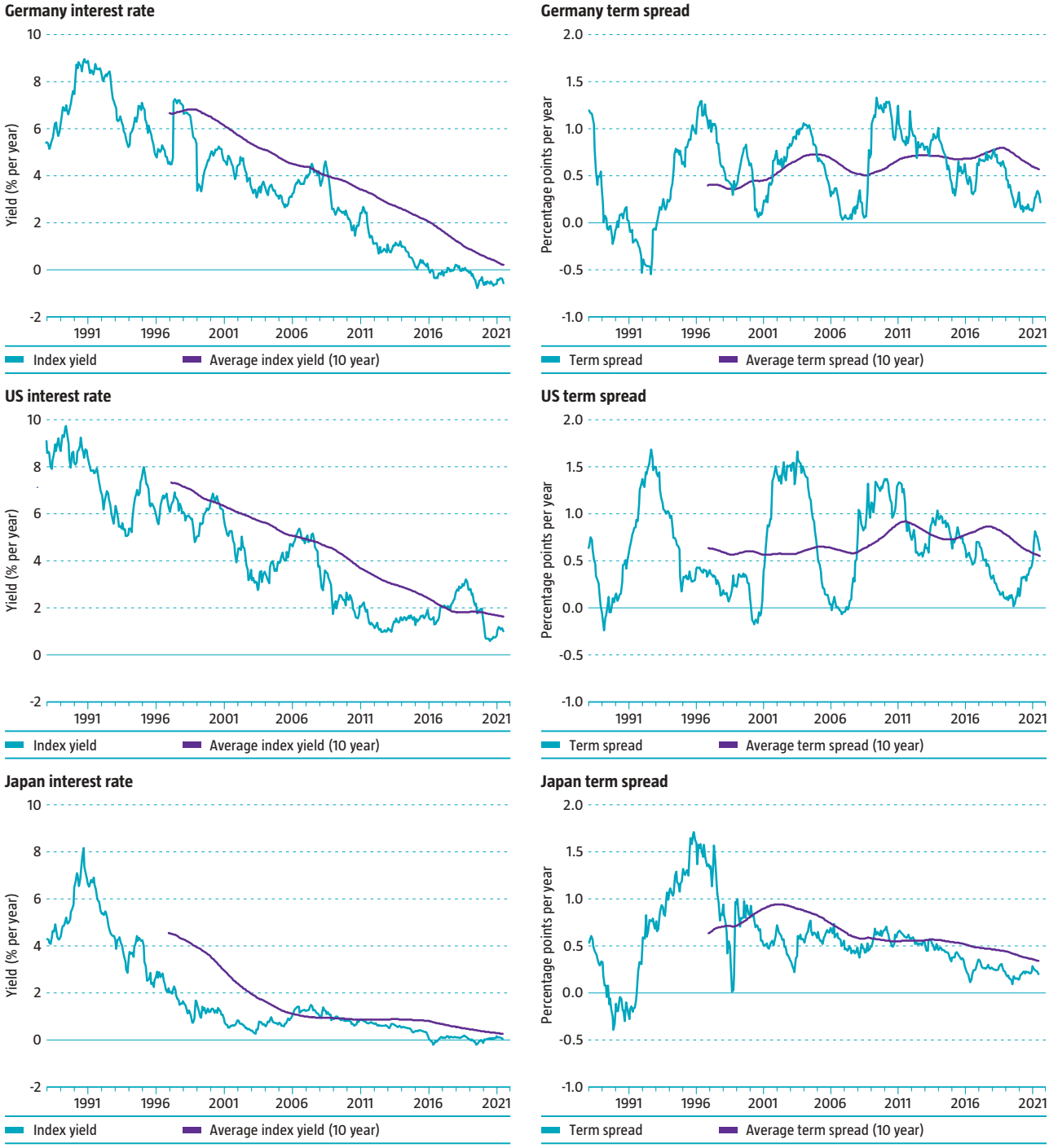
Third, as Campbell, Sunderam, and Viceira (2017) argue, the correlation of bond returns with equity returns determines the existence of a term premium. A negative correlation implies that when equity markets crash, bond markets will generate positive returns. This type of insurance against adverse economic circumstances may be worth paying a premium for by all investors, even those who are price-sensitive. However, this last argument may not be as relevant today as the equity-bond correlation tends to increase in inflationary environments, while with yields at historic lows, they are unlikely to go down much further so they will not be able to protect against a future crash.

We are not aware of any data sources that update these term premium models for other countries. Our own estimates indicate that the 10-year term premium for Germany was -0.83% at the end of July 2021.

2.1.3 Mean reversion

Another popular way to look at valuation is to forecast a reversion to the mean. For example, Asness, Moskowitz and Pedersen (2013) use mean reversion as their main valuation signal. This is inspired by the excess returns documented by DeBondt and Thaler (1985) for equity strategies based on mean reversion signals.

Figure 2.3: Mean reversion of interest rates and term spread



Source: Barclays Live, Robeco. The left side contains the yield to maturity of the Bloomberg Barclays Treasury indices for Germany (top), the US (middle), and Japan (bottom), and its 10-year moving average. The right side contains the yield difference between the Bloomberg Barclays Treasury indices and the 1- to 3-year segment of the same indices, and its 10-year moving average. Data for the period January 1987 to July 2021.

The challenge with mean reversion signals is to determine the level the asset is supposed to revert to. To keep things simple, we compare the interest rate to its 10-year average rate. This is long enough for the average to cover business cycles, but short enough for it to adapt if there are structural changes in the level of interest rates.

Figure 2.3 shows the yield of the bond market since 1987 (left) and the term spread (right); in other words, the difference in the yield of the bond index relative to the short-term interest rate for Germany, the US and Japan. The historical development of the term spread is the carry valuation signal that we discussed above. The interest rate level is currently around 70 bps below its 10-year averages for Germany and the US, and 20 bps below for Japan.

Although it is tempting to consider whether the index's yield will mean-revert, doing so does not take into account the short-term interest rate. The term spread, or carry, looks at the difference between the two, and mean reversion of the term spread suggests that medium-term yields should rise more than short-term rates. The term spread is substantially below its 10-year average for Germany, but the difference from its average is close to zero for the US and Japan. Hence, from a mean-reversion perspective, the German bond market is expensive, but the other two markets are close to fairly priced.

2.1.4 Summary

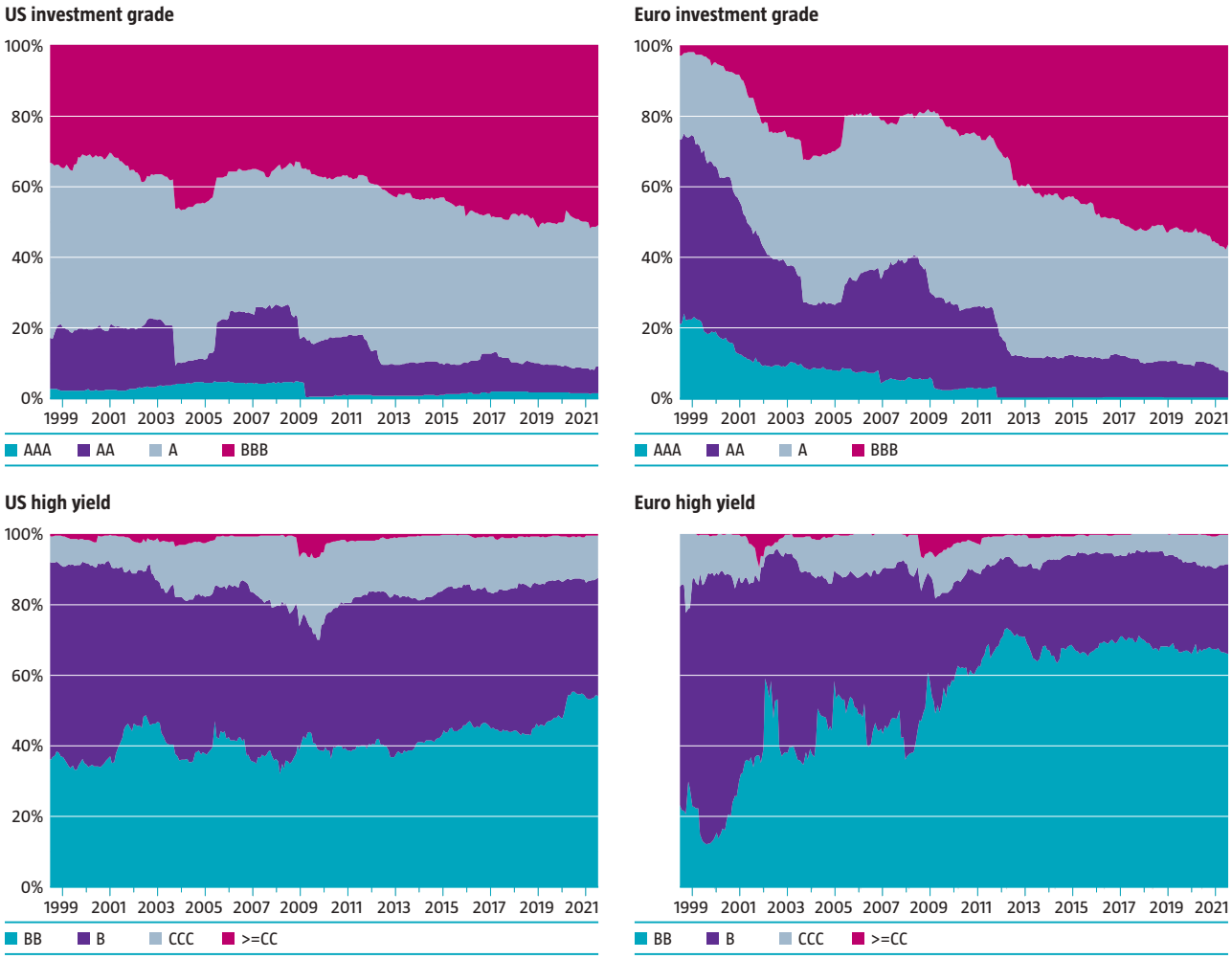
We have looked at three different measures of government bond valuation in the three main markets. Our conclusion is that overall, global government bonds are expensive, mostly due to the German bond market.

2.2 Corporate credit

The quality of bonds in the investment grade index has gradually fallen over time, especially for euro-denominated bonds, as we can see in Figure 2.4. On the other hand, the credit quality of the high yield index has increased. We therefore focus on the yields of BBB (investment grade) and B (high yield) indices in our valuation analysis instead of considering the valuation of the entire indices. This is because choosing one representative rating category for each index means we strip out the effect of yield differences resulting from the changing credit quality of the indices over time.[2]

2. When analyzing the valuation of corporate bonds, we exclude issuers from emerging markets. This is typically a separate asset category and their valuation tends to be affected by the credit rating of the country in which they are domiciled.

Figure 2.4: Credit quality of the investment grade and high yield corporate bond market



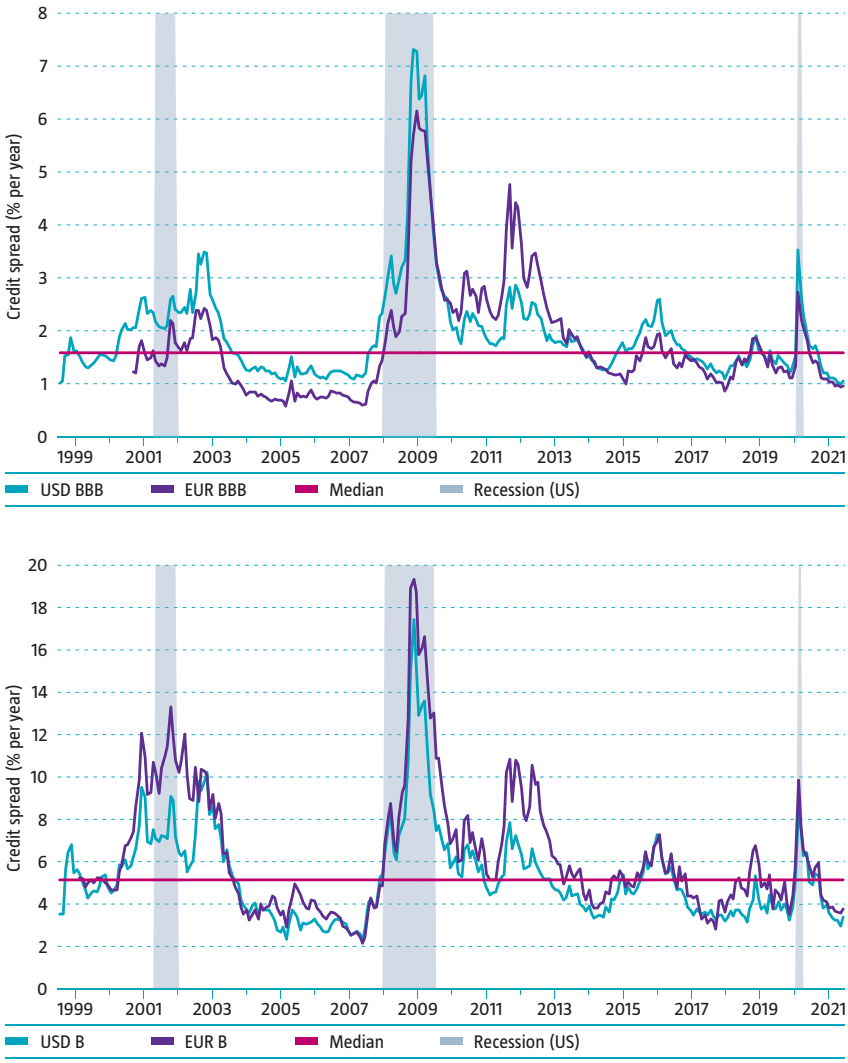
Source: Barclays Live, Robeco. We show the credit quality of the Bloomberg Barclays US Corporate Investment Grade index (top left), the Bloomberg Barclays Euro Corporate Investment Grade index (top right), the Bloomberg Barclays US High Yield index (bottom left) and the Bloomberg Barclays Euro High Yield Index (bottom right) over the period June 1998 to July 2021.

2.2.1 Mean reversion

Figure 2.5 shows a similar situation for investment grade and high yield corporate bonds. Their spreads shot up as a result of the Covid-19 lockdowns across the globe, but after central banks provided liquidity to the market, spreads contracted quickly and are now substantially below the median historical spread levels of 1.6% for investment grade and 5.1% for high yield markets.

The spreads of the investment grade bonds we looked at were close to 1% in both the US and Eurozone at the end of July 2021. From this perspective, investment grade credit is expensive as its spreads are below the median level. High yield credit spreads are 3.4% in the US and 3.7% in the Eurozone, which means high yield bonds are also expensive from this valuation perspective.

Figure 2.5: Credit spreads of BBB- and B-rated corporate bonds

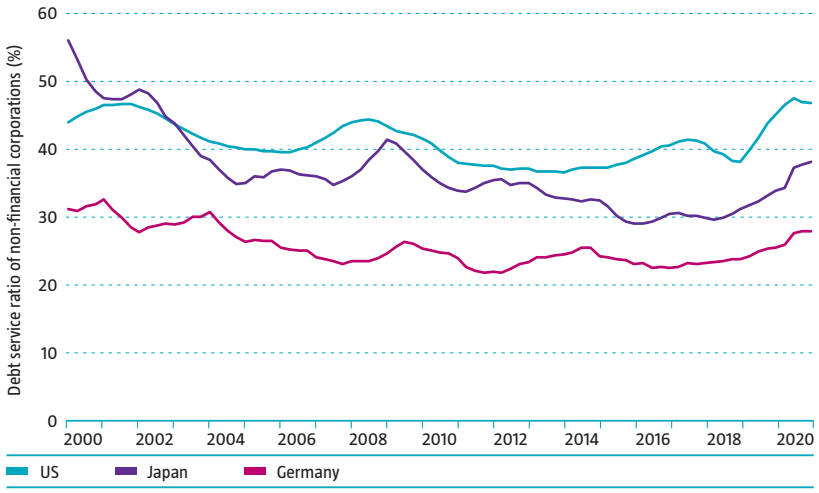


Source: Barclays Live, NBER, Robeco. The top figure shows the option-adjusted credit spread of BBB-rated bonds from the Bloomberg Barclays US Corporate index and the Bloomberg Barclays Euro Corporate index. It also contains median credit spreads over the shown sample period. The bottom figure shows the option-adjusted credit spread of B-rated bonds from the Bloomberg Barclays US High Yield index and the Bloomberg Barclays Euro High Yield index. It also contains median credit spreads over the sample period. Areas indicate NBER contraction periods.

The amount of credit has been on the rise over the past couple of years. This increased indebtedness is a potential risk for corporate bond investors, especially as the quality of covenants has been deteriorating – typically a sign that credit quality is declining. However, due to the substantial fall in interest rates, debt servicing remains manageable.

The debt-service ratio shown in Figure 2.6 represents the ratio of interest payments plus amortizations to income. The slightly increasing ratio for each country can be seen as a negative for future debt servicing. Provided that interest rates remain below companies' income growth, high debt loads are manageable. However, a sharp rise in interest rates or a large fall in corporate earnings could represent a significant challenge for the corporate bond market.

Figure 2.6: Debt-service ratio for non-financial corporations



Source: Bank for International Settlements, Robeco. The debt-service ratio is obtained from the BIS at www.bis.org with data item codes Q:US:N, Q:DE:N, and Q:JP:N. Data is quarterly and from December 1999 to December 2020.

2.2.2 Rule of thumb that accounts for expected default losses

To derive the expected excess return that credit investors earn above government bonds with similar duration, we need to know not just the credit spread that we analyzed in the previous sub-section, but also an estimate of expected default losses. For a buy-and-hold investor, the expected credit return is the credit spread minus expected default losses.

It is a challenge for most models of credit risk to estimate an accurate time-varying expected default loss. Long-run estimates are more readily available as there is a long history of corporate bond defaults. For example, Pedersen (2015) uses Moody's figures from 1920 to 2010 to derive a 0.24% average default loss for investment grade and a 1.80% average default loss for high yield bonds.

Suppose we estimate the default losses on a credit portfolio to be 0.5%, which we subtract from today's credit spread to obtain the expected credit return. If the credit spread is 125 bps, we would be close to the 75 bps credit return that we estimate over the long run.[3] However, if the current spread is 200 bps, this would result in an estimated credit return of 1.5% for the credit return while if the spread is 50 bps the credit return should be 0.00%.

Such an approach, however, does not take into account that high spreads generally imply higher-than-average default losses. This means that a 1.5% return (based on a 200 bps spread) is an overestimation of expected returns, whereas a 0.00% return (based on a 75 bps spread) is an underestimation. Ideally, we would have access to a model that could accurately predict average default losses given current spreads and the macroeconomic outlook.

3. See Robeco's 'Long-term Expected Returns' report. Available upon request.

However, we do not, so we limit ourselves to a rule of thumb that involves assuming the expected return to be half of the credit spread. So, when the credit spread is 200 bps, this rule of thumb says that 100 bps is expected to be lost on defaults, and when the credit spread is 50 bps, 25 bps is expected to be lost on defaults.

While this rule of thumb may be a little crude, it at least recognizes that spread levels are positively correlated with expected default losses.

Table 2.2 shows that the expected excess returns of investment grade corporate bonds calculated according to this method are close to or at 0.45%, substantially below our long-run estimated value of 0.75%. For high yield, the expected excess returns based on this model are also below our long-run estimate of 1.75% per year, at 1.47% for the US and 1.48% for the Eurozone. The spread of the global high yield market is somewhat higher than that of the US and Europe and close to our long-run estimate as the global high yield index also contains corporate and government-related bonds in hard currency from issuers in emerging markets.

Table 2.2: Excess credit returns when they are equal to half the credit spread

	USD		EUR		Global		Long-run estimate
	Spread	Return	Spread	Return	Spread	Return	Return
Investment grade	0.86%	0.43%	0.83%	0.42%	0.89%	0.45%	0.75%
High yield	2.94%	1.47%	2.97%	1.48%	3.77%	1.88%	1.75%

Source: Barclays Live, Robeco. Table contains the option-adjusted spread for the Bloomberg Barclays Corporate Bond and Bloomberg Barclays High Yield indices for the US, Eurozone and global. Data as at 31 July 2021. The return column is half the option-adjusted spread. The long-run estimate is obtained from our Long-Term Expected Returns document.

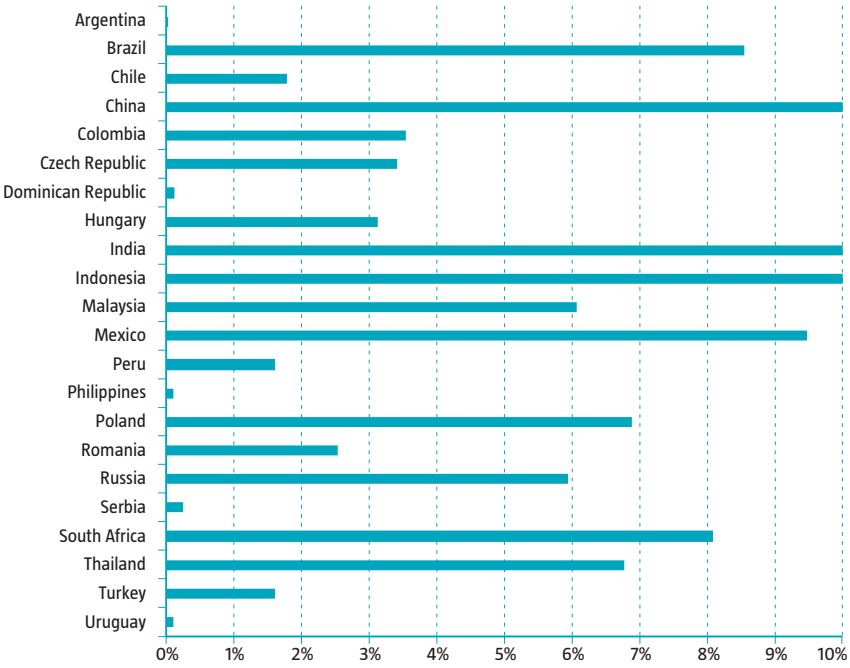
2.2.3 Summary

Having compared two measures of corporate bond valuation, we conclude that investment grade corporate bonds and high yield bonds are expensive both in the US and Europe.

2.3 Emerging market debt

To examine the valuation of local-currency emerging market sovereign debt, we have opted to use the JPMorgan Government Bond Index-Emerging Markets (GBI-EM) Broad Diversified Index. The weights of this index at the end of June 2021 are displayed in Figure 2.7. The main constituents of the index are Brazil, China, India, Indonesia, Mexico and South Africa. Each of these countries accounts for over 8% of the index, which limits individual country weights to 10% for diversification purposes.

Figure 2.7: Country weights in the local-currency bond market index



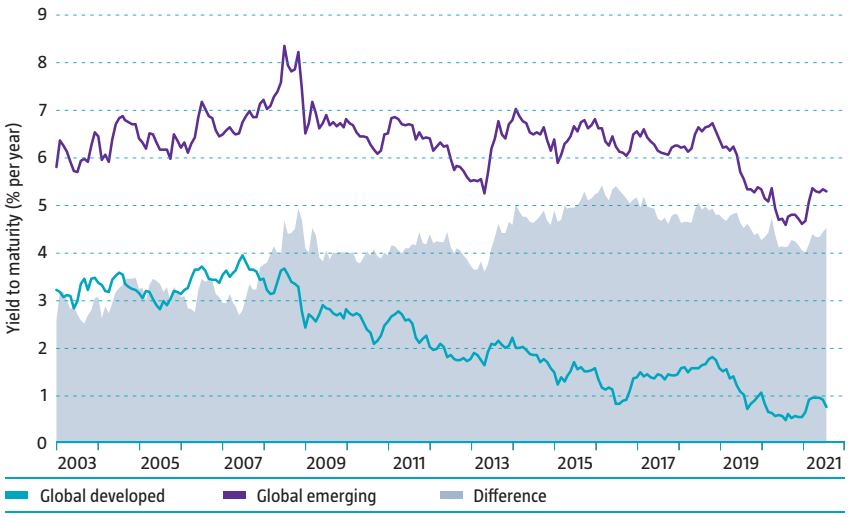
Source: J.P. Morgan, Robeco. Index weights of the J.P. Morgan GBI – Emerging Markets Broad Diversified Index as at 31 July 2021.

2.3.1 Yields

Figure 2.8 shows the yield to maturity of global developed and emerging debt markets, and we can see that the nominal yield for emerging markets has always been higher. Since 2003, emerging debt markets have yielded around 6% per year, with a short-lived spike to 8% during the global financial crisis. Emerging market yields then fell back towards 5%, but the 2013 taper tantrum saw rates jump back up to 7%. Over the past year, emerging market yields have risen above 5% again.

Note that the difference in yield with developed markets has increased since 2003, mainly due to the decrease in developed markets' interest rates. The nominal yield pick-up, or carry, provided by emerging market debt has increased to about 4.5% over the past year.

Figure 2.8: Yield to maturity of global developed and global emerging markets



Source: J.P. Morgan, Robeco. Yield to maturity of the J.P. Morgan GBI – Emerging Markets Broad Diversified Index ('Global emerging') and the J.P. Morgan GBI – Global Index ('Global developed').

Table 2.3 provides an idea of how attractive local-currency emerging market debt is from a yield perspective compared with developed market debt. We subtract inflation from the yields to obtain real yields for both regions. The difference in real yields is 296 bps at the end of June 2021, well above its levels over the past two years.

The difference in real yields may partially be a compensation for credit risk, even though there is virtually no credit risk on nominal debt for sovereigns that can print their own currency to pay off debt. However, such money printing would be expected to lead to inflation and currency devaluations, so credit risk should be viewed as a currency risk from the perspective of a hard-currency investor. Taken together, we think that yields are fairly valued.

Table 2.3: Real yield differences of local-currency emerging debt and developed government bonds

Yield	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	**2021***
Emerging	6.81%	6.55%	6.26%	6.38%	5.33%	4.62%	5.29%
Developed	1.58%	1.38%	1.46%	1.58%	1.06%	0.55%	0.76%
Difference	5.23%	5.17%	4.81%	4.80%	4.27%	4.06%	4.53%
Inflation	**2015**	**2016**	**2017**	**2018**	**2019**	**2020***	**2021***
Emerging	4.21%	3.67%	3.47%	3.25%	3.41%	2.91%	3.19%
Developed	0.29%	0.68%	1.67%	1.97%	1.36%	0.70%	1.62%
Difference	3.92%	2.99%	1.79%	1.29%	2.05%	2.21%	1.57%
Real yield	**2015**	**2016**	**2017**	**2018**	**2019**	**2020***	**2021***
Emerging	2.61%	2.88%	2.80%	3.13%	1.92%	1.70%	2.10%
Developed	1.29%	0.70%	-0.22%	-0.39%	-0.30%	-0.15%	-0.86%
Difference	1.32%	2.19%	3.01%	3.52%	2.22%	1.85%	2.96%

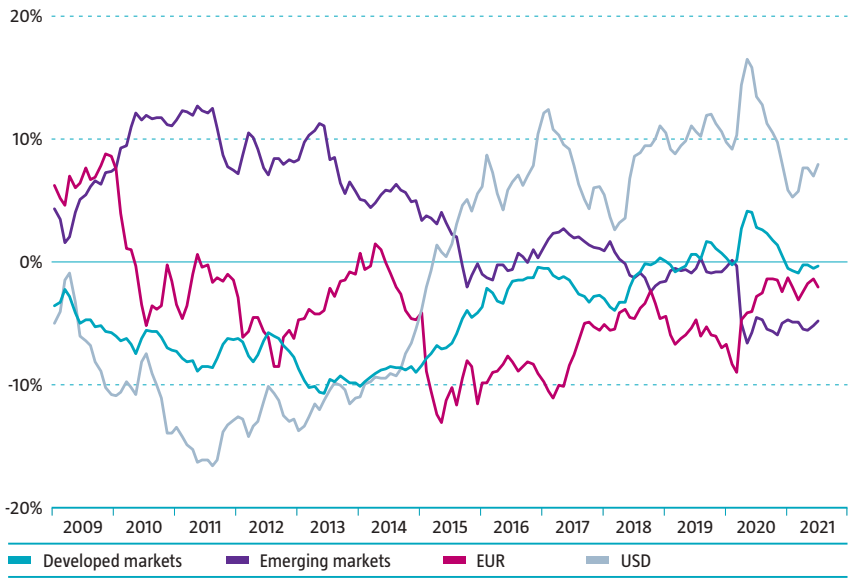
Source: IMF, J.P. Morgan, Robeco. The year 2021* indicates yields from 31 July 2021 and the average of the forecast inflation rates for 2021 and 2022 by the IMF World Economic Outlook (April 2021). For other years the average inflation over the year is used and the yields are as at the end of the year. The country-level variables are combined using index weights at 31 July 2021.

2.3.2 Currencies

To consider the overall valuation of emerging debt, we need to consider currency valuations as well. For this, we use BIS real effective exchange rates (REERs) for the emerging market index based on its weighting at the end of June 2021. We have subtracted the 15-year average of each of the REERs as we assume that such a long-term average is a good representation of its fair value.

In Figure 2.9, we compare the scaled emerging market REERs with those of the basket of developed currencies, the US dollar and the euro. From 2009 to 2014, emerging market currencies were overvalued, while the latest valuation shows that these currencies are about 5% undervalued compared with an index basket of their developed market counterparts. Emerging market currencies are 13% undervalued relative to the US dollar, while against the euro their valuation looks close to neutral, with an undervaluation of only 3%.

Figure 2.9: Currency valuation using real effective exchange rates



Source: BIS. The BIS real (CPI-based) effective exchange rates (data as at 30 June 2021) are compared to their 15-year historical averages. The emerging markets and developed markets lines are combined based on individual currencies using index weights at 30 June 2021. NB: For the Dominican Republic, Serbia and Uruguay the BIS does not report REERs, so we have assumed both are fairly valued. These countries in total have a weight of less than 0.5% in the index.

2.3.3 Summary

We conclude that emerging market bond yields are fairly valued versus a basket of developed market bond yields, but that their currencies are relatively cheap. This leads to a positive valuation signal for local-currency emerging debt. The asset class is also valued attractively versus US and Eurozone debt. For a US dollar investor, the currency component seems attractive and yields fair, while for a German investor, the currency component seems fairly valued and the yield difference attractive. Either way, emerging market bonds look cheap from a valuation perspective.

2.4 Developed market equities

There is evidence that the equity premium can be predicted, even though much of the variation in actual returns typically remains unexplained. One of the predictors that stands out is Campbell and Shiller's (1998) cyclically adjusted price-earnings (CAPE) ratio; see, for example, Ilmanen et al. (2019). This is the main indicator we discuss here in addition to Tobin's Q and the Buffett indicator.

These measures indicate absolute valuation levels of equities and do not necessarily describe how expensive they are relative to bonds. This might be important, because – all else being equal – lower bond yields mechanically increase equity prices due to a lower discount rate for future cash flows.

2.4.1 CAPE ratio

The CAPE ratio is a valuation measure that uses real earnings per share (EPS) over a 10-year period to smooth out fluctuations in corporate profits that occur over different periods of a business cycle. Jivraj and Shiller (2017) show that the CAPE's out-of-sample performance is strong compared with many of its competitor valuation signals.

Table 2.4 contains the CAPEs for the largest developed equity markets. For most countries, the data history for the CAPE starts in December 1981, giving us nearly four decades of international data. As structural differences between countries might lead to different CAPEs, we compare each country to its own valuation history.

Table 2.4: Cyclically adjusted price-earnings ratio for developed countries

Country	Start	Median	Current	Valuation	Weight
Australia	Dec-81	20.1	24.0	↑	2%
Canada	Dec-81	22.4	26.0	↑	3%
France	Feb-99	23.1	27.4	↑	3%
Germany	Dec-81	20.5	22.7	↑	3%
Hong Kong	Dec-81	20.1	19.7	↓	1%
Italy	Apr-93	21.2	24.8	↑	1%
Japan	Dec-81	38.2	23.8	↓	7%
Netherlands	Dec-81	17.0	38.4	↑	1%
Singapore	Dec-81	21.6	16.4	↓	1%
Spain	Jan-89	16.7	17.1	↑	1%
Sweden	Dec-81	22.9	25.3	↑	1%
Switzerland	Dec-81	23.5	31.4	↑	3%
UK	Dec-81	17.1	17.1		4%
USA	Dec-81	23.6	38.5	↑	69%
World		23.9	34.2	↑	
Europe		19.1	23.9	↑	

Source: Barclays Research, MSCI, DataStream, Robeco. The CAPE ratio for each country above has been calculated by Barclays Research using levels of country-specific indices published by MSCI representing the equity markets for the relevant country, adjusted for inflation using data from DataStream. The 'Start' column indicates the start of the sample period, and the 'Median' column the monthly time-series median of the CAPE ratio from the start of the sample to June 2021. The arrows in the 'Valuation' column indicate whether the current CAPE ratio is above (red arrow up, indicating expensive) or below (green arrow down, indicating cheap). The last column, 'Weight', is the weight of the country in the MSCI World index at the end of July 2021. The row for Europe is data from Barclays Research, but the row for World is a weighted average (using the weights in the final column) of each of the individual country figures.

Except for Hong Kong, Japan and Singapore, all countries are expensive according to this measure at the end of June 2021. Due to the large weight it accounts for in the global index and its CAPE of 38.5 at the end of June 2021, the US makes the global index expensive.

Bunn and Shiller (2014) show that when companies buy back shares, the original CAPE might be somewhat biased because the growth rate in EPS is affected, leading Shiller's data page to include a 'total return CAPE' to adjust for this bias. While the traditional CAPE for the US is 38 at the end of June 2021, the total return CAPE stands at 41.6. So both versions of the CAPE signal that equity markets are expensive.

2.4.2 Tobin's Q

Tobin's Q is the market value of equities divided by their net worth measured at replacement cost, which is typically a better fair-value metric than the historical cost, especially in times of high inflation. The natural 'fair value' of Tobin's Q is 1, in which case the stock market pays exactly the same as the replacement rate of assets, and an investor is indifferent to buying the shares or setting up the same company from scratch.

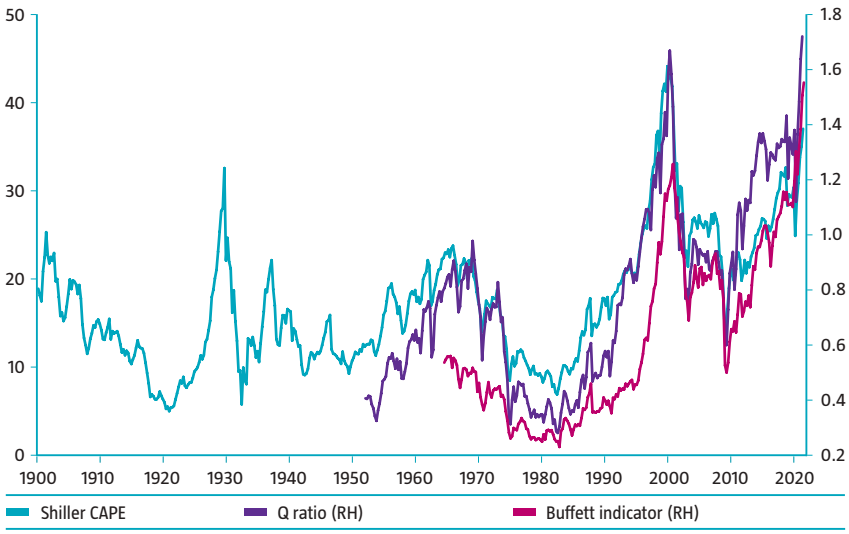
However, it turns out that historically, the average figure is in the range of 0.6-0.7. Estimates of Tobin's Q for the US from 1900 to 2002 are reported in Wright (2004) and available from his website.[4] In Figure 2.10, we show that Tobin's Q is currently[5] 1.7, substantially above both its historical average and its theoretical value of 1.0, indicating that the US stock market is expensive.[6]

4. http://www.bbk.ac.uk/ems/faculty/wright/pdf/Wright2004dataset.xls

5. The last available value is from Q1 2021.

6. This data is from the Federal Reserve's Flow of Funds Accounts of the United States Z1. A disadvantage of using this data series in real time for asset allocation purposes is that it may be revised, and when this happens the historically available series are not the same as point-in-time series.

Figure 2.10: Tobin's Q, Shiller CAPE, and Buffett indicator for the US equity market



Source: Refinitiv, Federal Reserve, Robeco. The Q Ratio is Fed item FL103164103 (Datastream: US10KMKLA) divided by Fed item FL102090005 (Datastream: US10NWMVA). The Buffett indicator is the market value of S&P 500 companies (Datastream: S&PCOMP(MV)) divided by the Gross Domestic Product of the US (Datastream: USGDP...B).

2.4.3 Buffett indicator

Warren Buffett popularized the market value of equities relative to the nominal GDP of a country as a measure of overvaluation or undervaluation. Lleo and Ziemba (2019) find that using this ratio in market timing can generate additional returns, mainly through predicting crashes rather than equity market rallies. Umlauft (2020) and Swinkels and Umlauft (2021) report on the long-term predictive powers of the Buffett indicator for the US and

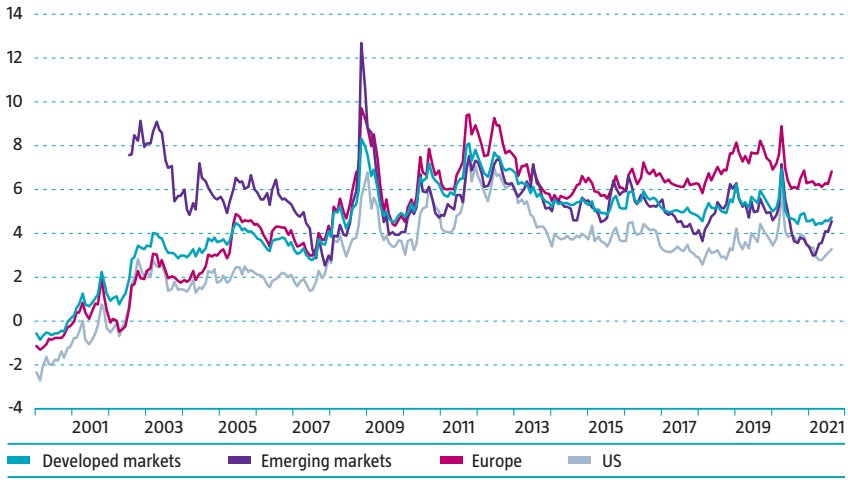
international markets, respectively. Figure 2.10 shows that the Buffett indicator is at an all-time high of 1.6, suggesting that the US market is heavily overvalued.

An international comparison for this figure is challenging as it is affected by the percentage of companies that are publicly traded compared with those that are private, and whether a country is attractive to list in for multinational corporations. The ratio may be more affected by new equity issuance than valuation changes, even for an individual country across time.

2.4.4 Implied equity risk premium

An obvious explanation for increased equity market valuations is low interest rates. One way to put absolute valuations into perspective is to examine the equity risk premiums that are priced in by the market. Damodaran (2020) explains that there are several methods to determine the implied equity risk premium from observable data. Here we obtain the implied equity risk premium by dividing the expected earnings by the price and subtract the bond yield.

Figure 2.11: Implied equity risk premiums



Source: Refinitiv Datastream, I/B/E/S, Robeco. Forward earnings (12 months) to price minus the government bond yield. For emerging markets, Chinese government bond yields are used as a proxy.

Figure 2.11 shows that the implied equity premium around 2000 was negative, indicating that an equity investor at that time had a lower expected return than a bond investor. The high equity valuations we saw at the time co-existed with bond yields above 5%, leading to a negative equity risk premium.[7] After the collapse of the tech bubble, the implied equity premium slowly increased and has been generally been between 3-8% since then.

7. Damodaran (2020) estimates a positive but historically low equity premium of 2.05% for the US equity market in 1999 using another method than ours.

The implied equity premium for the US is currently relatively low at just over 3%, especially compared with the almost 7% in Europe. The implied equity premium for developed and emerging markets is almost the same at 4.5%. This analysis on the implied equity premium shows that even with historically high valuation ratios, the expected return for equity investors can be above that of bond investors at a time when risk-free rates are at historical lows.

2.4.5 Summary

Most developed equity markets are currently expensively valued, and the US is the most expensive according to valuation indicators popularized by three independent experts on the financial markets. Our analysis on the implied equity risk premium suggests that despite these high valuations, expected returns from equities are still higher than those of bonds.

2.5 Emerging market equities

2.5.1 CAPE ratio

As with developed market equities, we can also look at the CAPE for emerging market stocks. Historically, this ratio has contained useful information for emerging market valuations; see Klement (2012).

Although the figures for developed and emerging markets are not entirely comparable because CAPE data for emerging markets starts substantially later than for developed markets, Table 2.5 shows that the average CAPE for emerging equities is typically lower than that of developed markets.

There are several possible explanations for this. First, the higher systematic risk in emerging markets is reflected in higher discount rates, leading to lower prices for the same expected earnings. Second, emerging markets may not be fully financially integrated with the rest of the world, and this market segmentation leads to higher discount rates. Third, emerging equity markets may be tilted towards industries with lower growth potential and therefore lower valuations than developed markets. Therefore, for valuation purposes, it may be more relevant to compare each country to its own historic CAPE levels than comparing CAPEs across countries.

When doing so, we see that the CAPEs of four countries – Mexico, Poland, South Africa and Turkey – are below their historical median levels, and that the CAPE ratio for Turkey is in fact in single digits. The weighted average CAPE across all emerging markets, however, is 22.6, substantially above the historical median of 18.0. So based on this measure, emerging markets overall seem slightly expensive compared with their own history. That said, their average CAPE ratio of 22.6 is substantially lower than developed markets' 34.2.

Table 2.5: Cyclically adjusted price-earnings ratio for developing countries

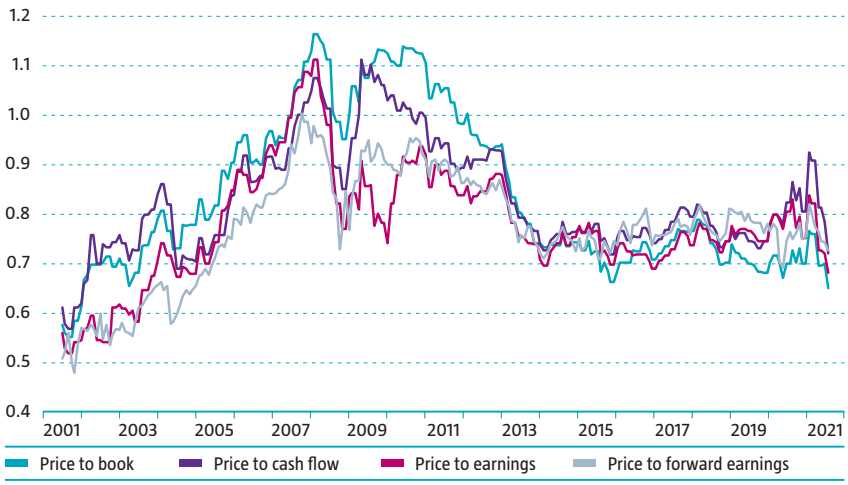
Country	Start	Median	Current	Valuation	Weight
Brazil	May-11	13.3	21.7	↑	6%
China	Oct-04	17.0	19.6	↑	38%
India	Aug-03	22.4	30.9	↑	12%
Israel	Sep-04	17.6	18.3	↑	1%
Korea	Sep-04	15.2	19.4	↑	15%
Mexico	Jan-01	23.6	21.0	↓	2%
Poland	May-04	13.5	12.1	↓	1%
Russia	Nov-05	8.0	10.7	↑	4%
South Africa	Aug-04	20.7	19.2	↓	4%
Taiwan	Jul-04	22.6	32.3	↑	16%
Turkey	Jan-01	12.6	7.7	↓	0%
Emerging		18.0	22.6	↑	

Source: Barclays Research, MSCI, DataStream, Robeco. The CAPE ratio for each country above has been calculated by Barclays Research using levels of country-specific indices published by MSCI representing the equity markets for the relevant country, adjusted for inflation using data from DataStream. The 'Start' column indicates the start of the sample period, and the 'Median' column the monthly time-series median of the CAPE ratio from the start of the sample to June 2021. The arrows in the 'Valuation' column indicate whether the current CAPE ratio is above (red arrow up, indicating expensive) or below (green arrow down, indicating cheap). The last column, 'Weight', is the weight of the country in the MSCI Emerging Markets Index at the end of July 2021. The row for Emerging Markets is a weighted average (using the weights in the final column) of each of the individual country numbers.

2.5.2 Other relative valuation measures

To test the robustness of the CAPE above, we also look at other bottom-up measures of value: price-to-book, price-to-cashflow, price-to-earnings and price-to-forward earnings ratios. Figure 2.12 shows that since 2014, valuations of emerging markets have been consistently below those of developed markets, trading at a discount of 20-30%. Just like with the CAPE, we expect the ratio to be below unity on average. However, the discount of around 30% is high.

Figure 2.12: Emerging equity versus global equity valuation ratios



Source: Refinitiv Datastream, MSCI, Robeco. Each month we divide the bottom-up calculated valuation ratio of the MSCI Emerging Markets Index by the same valuation ratio for the MSCI World Index. The latter only contains developed markets.

2.5.3 Summary

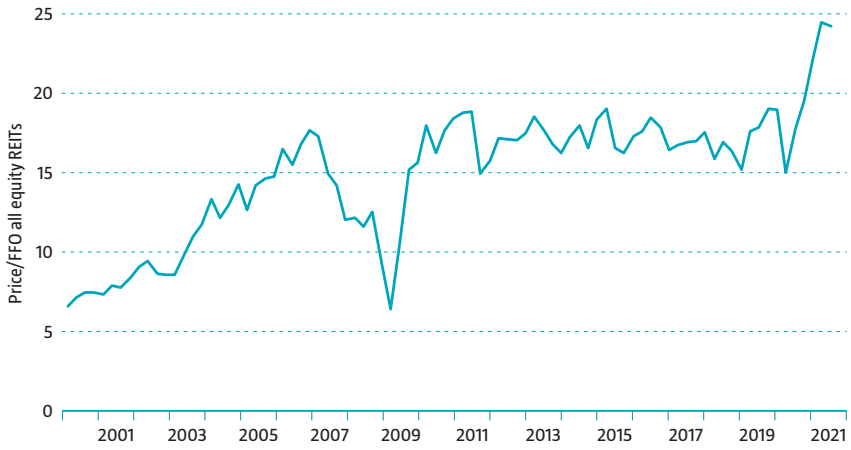
Even though emerging markets seem slightly expensive relative to their own history, their valuation discount relative to developed markets is substantial. This means emerging equities look attractively valued relative to stocks from developed markets.

2.6 Listed real estate

We compare listed real estate valuations with those of global equities. Although a price-earnings ratio is admittedly not the ideal measure for assessing valuations of real estate investment trusts, it is the best measure available.

The CAPE ratio of global real estate valuation stands at 17.9, 2.0 below its average of 19.9 since 2000, but 3.5 higher than last year's value of 14.4. The CAPE of global equities is substantially higher, making real estate look relatively cheap according to this measure right now.

Figure 2.13: REIT-specific valuation ratio for US REITs



Source: S&P Global Market Intelligence, Nareit T-Tracker, Robeco. The valuation ratio specific for Real Estate Investment Trusts is the price (P) divided by the funds from operation (FFO).

A valuation measure commonly applied to real estate investment trusts is to compare their price with their funds from operation (FFO).[8] The FFO is the net income plus depreciation and amortization minus gains on the sale of property. In the US, the price-to-FFO is reported at the market level.

8 See Seok, Cho, and Ryu (2020) for information about FFO relative to net income announcements for US REITs.

Figure 2.13 shows this valuation ratio up to the second quarter of 2021. In the first quarter of 2020 this measure fell from its record high at the end of 2019 of 19.1 to 15.1. It recovered in the second quarter to 17.8, and has carried on increasing, hitting 24.2 at the end of the second quarter of 2021, well above pre-2021 levels.

It is difficult to determine what a 'normal' ratio is given that this measure has only been available for a short time – since 2000. If we consider this limited data series, it would appear that according to this measure, real estate is highly valued compared with its past levels. Combining real estate's relatively low CAPE and elevated price-to-FFO ratio, we deem it fairly valued overall.

2.7 Currencies

We briefly mentioned currency valuation in the section that compared local-currency government bonds from developed and emerging countries. We saw that the US dollar is relatively expensive, while the euro and emerging market currencies are relatively cheap.

Table 2.6: Valuation signals for developed currencies

	BIS			Economist Big Mac index		Gov bond yields
Country	Rel REER	REER	NEER	Raw	GDP-adjusted	(5 year)
Australia	-13.8%	-27.0%	-29.0%	-15.2%	-8.1%	0.39%
Canada	-12.3%	-28.5%	-28.9%	-6.0%	10.2%	0.73%
Euro area	-10.0%	-19.2%	-10.2%	-11.1%	9.2%	-0.53%
Japan	-24.0%	-44.7%	-33.9%	-37.2%	-24.4%	-0.14%
New Zealand	-5.6%	-9.4%	-10.4%	-15.7%	0.6%	1.31%
Norway	-17.3%	-31.9%	-37.8%	11.5%	8.6%	0.89%
Sweden	-15.2%	-24.4%	-19.5%	9.6%	19.8%	-0.28%
Switzerland	-5.6%	-10.3%	11.6%	24.7%	6.5%	-0.71%
United Kingdom	-9.5%	-11.2%	-15.2%	-15.9%	1.0%	0.20%
United States	0.0%	0.0%	0.0%	0.0%	0.0%	0.55%

Source: BIS, The Economist, Barclays, Robeco. The first column, 'Rel REER', contains the Real Effective Exchange Rate (REER) relative to its 15-year history. The second and third columns contain the raw data of the Real and Nominal Effective Exchange Rates (REER and NEER), which are as at 30 June 2021. The next two columns contain the raw difference in the price of a Big Mac and a GDP-adjusted price difference, updated on 21 July 2021. The last column contains the 3- to 5-year government bond yields of each country on 31 July 2021.

The first column in Table 2.6 contains the relative REER that we used in the previous section, but here it has been normalized so that the US dollar is at zero so it can be easily compared with other measures. The absolute REER and the nominal effective exchange rate (NEER), which is not adjusted for inflation differentials, are in the adjacent columns. The US dollar's overvaluation relative to the euro, New Zealand dollar, Swiss franc and sterling is between 5-15%. Its overvaluation relative to other currencies is higher, at between 15-35%.

For comparison purposes, we have also included the Economist's Big Mac Index, which should provide a figure that is comparable to the REER. Since this index shows the relative price of one particular item – a Big Mac – across currencies, it can be interpreted as a relative valuation of currencies based on one specific item rather than a basket of items or standard exchange rates. By contrast, the REER considers a basket of consumption goods and services. The column labeled 'Raw' in Table 2.6 shows price differences of the Big Mac index versus the US dollar, while the GDP-adjusted figure corrects this raw number for GDP per capita. This adjustment is necessary as countries with higher productivity rankings tend to have higher prices (see Balassa 1964 and Samuelson 1964). Based on the Big Mac Index, Australia, Japan and the UK have relatively cheap currencies.

When we consider currencies' relative strength and weakness, we might be tempted to hedge the currency that is predicted to weaken. However, currency hedging comes at a cost, which is equivalent to the difference in interest rates between the foreign country and the investor's home country.[9] Since our investment horizon in this outlook covers five years, we also include five-year bond yields in the last column. A Eurozone investor might choose to hedge their US dollar currency risk because they see that, based on the relative REER (first column), the US dollar is 10% overvalued relative to the euro. They would see that the cost of doing so is just over 1% per year over the next five years, as the US interest rate is 0.55% and

9. A European investor with savings worth USD 100 on their US bank account, on which they earn 1% interest, is exposed to changes in the USD/EUR exchange rate if they want to convert their savings back to the euro after a year. If they want to eradicate this currency risk, they can either buy a currency future or convert the USD 100 to EUR 85 today and receive the 0% European interest rate on their bank account instead. The return on their savings, which was 1% in US dollars, falls to 0% when hedged to the euro – exactly the difference in interest rates between the US and Europe.

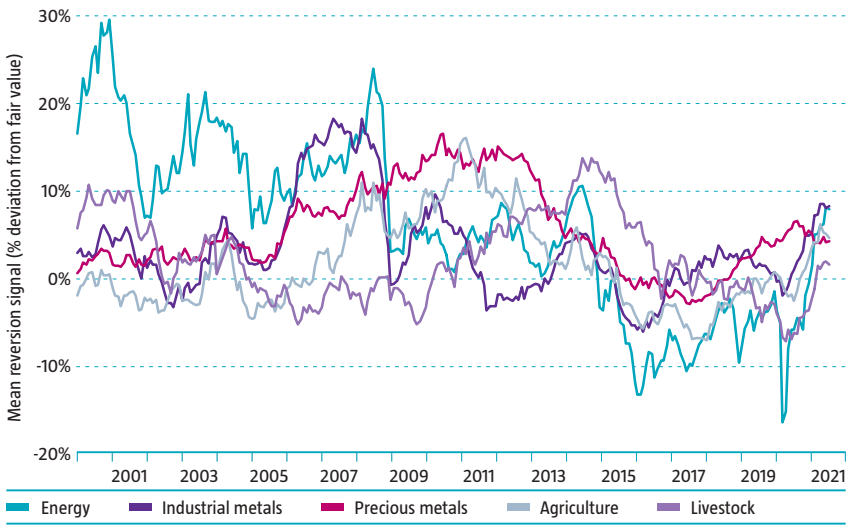
that of the Eurozone -0.53%. If after five years the overvaluation has completely disappeared, the investor would have gained 10% on the US dollar's depreciation, and lost 5% on the interest rate differential, resulting in a 5% total gain. If half the currency overvaluation disappears, the currency hedger breaks even, with a gain of 5% on the currency offset by the loss of 5% on the interest rate. The early literature (Rogoff 1996; Frankel and Rose 1996) found that, on average, half the REER gap closed in about five years for developed currencies. More recent estimates by Rabe and Waddle (2020) find that half of the convergence occurs within three years.

2.8 Commodities

We use the definition of commodity valuation presented by Asness, Moskowitz and Pedersen (2013). That is, we compare the current spot price with the average spot price from four and a half to five and a half years ago.[10] Instead of calculating the valuation for each traded commodity separately, we consider the five main commodity categories: energy, industrial metals, precious metals, agriculture and livestock.

10. The idea is to look at the price five years ago, but this averaging ensures that temporary outliers do not affect the valuation signal too much.

Figure 2.14: Valuation signal for commodities



Source: Refinitiv Datastream, S&P GSCI, Robeco. The figure shows the natural logarithm of the commodity category price index divided by the natural logarithm of the average from 5.5 to 4.5 years ago of the same price index, minus one. Monthly data in USD.

Figure 2.14 shows that energy commodities were in general overvalued from 2000 to 2014. In 2015 and 2020, however, they were 15% undervalued. They have recovered since the Covid-19 crisis, like most other commodity categories, such that they were around 8% overvalued at the end of July 2021. Industrial metals were overvalued by the same amount. Precious metals are the only category whose valuation has decreased over the past year, from 6% overvalued to 4% overvalued. Agricultural commodities are also overvalued by 4%, while livestock is fairly valued.

Typical commodity indices have the highest exposure to energy, followed by agriculture. Therefore, we deem commodities currently slightly expensive overall. ■

3

Expected returns 2022-2026

Climate

It's been the talk of the town in recent years, and is poised to gain even more in prominence. It also heads the agendas of 86% of institutional investors, according to a recent global survey.[1] But will climate change impact the future returns of major asset classes? And by how much?

1. Robeco Global Climate Survey, 2021.

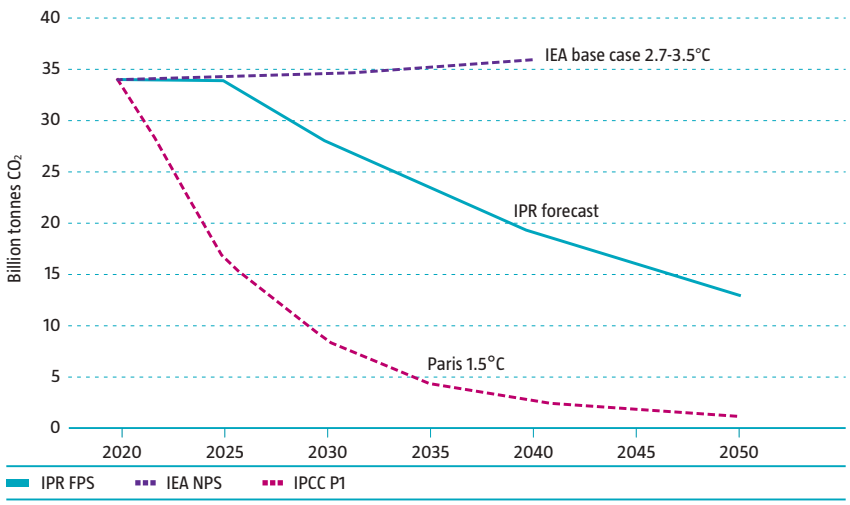
3.1 Introduction

Figure 3.1 shows that in a base case scenario in which the world takes no further action to try to limit climate change, global temperatures are likely to increase to between 2.7-3.5°C above pre-industrial levels by 2050. To limit the increase to just 1.5°C – the goal of the Paris Agreement – would require major reductions in greenhouse gas emissions. However, the Inevitable Policy Response (IPR) project forecasts that a scenario with less ambitious climate action is the most likely outcome.[2] Such a scenario would lead to a temperature overshoot that would need to be reversed by removing greenhouse gases from the atmosphere. However, Figure 3.1 shows that there is a noticeable breakpoint in the IPR forecast around 2025, when greenhouse gas emissions decline markedly due to large policy shifts taking effect. This is the backdrop for our analysis of the impact of climate change risk on our main asset classes.[3]

2. The Inevitable Policy Response is a pioneering project that aims to prepare investors for the associated portfolio risks of climate change. Its forecast of an Inevitable Policy Response provides an alternative to the International Energy Agency as a business planning case for investors, corporates, and regulators. It has been commissioned by the Principles for Responsible Investment.

3. See Robeco's (2021) "Big Book of Climate Investing".

Figure 3.1: Global energy-related CO_2 emissions



Source: Inevitable Policy Response (IPR) Investor Brief (March 2021), Robeco. The base case is sourced from the International Energy Agency's New Policies Scenario 2017. The Paris agreement scenario is by the Intergovernmental Panel on Climate Change. The IPR has forecasted its most likely scenario.

3.2 How could climate change mitigation policies affect cashflows and discount rates?

Investors need to know what the energy transition pathway will look like and how it will affect asset prices. Traditional assets such as stocks and bonds can be valued using discounted cashflow analysis according to the following equation:

$$\text{Price}_{t=0} = \sum_{t=1}^{\infty} \frac{E\{\text{Cashflow}_t\}}{(1 + \text{Discount Rate}_t)^t}$$

where E refers to expectations, and expected cashflows are discounted using the appropriate rate that reflects the (systematic) risk the asset is exposed to. The discount rate is sometimes also referred to as the cost-of-capital of a firm, and equals the expected return on the asset.

The impact of, for example, the introduction of a higher carbon tax or necessary capital expenditures required for the energy transition would affect the cashflows of companies differently. Analysts try to gauge the prospective direct impact of such taxes on company costs, as well as to what extent the effects can be passed on to their customers. In the case of fossil fuel companies, estimates of future cashflows must incorporate the possibility of stranded assets, such as oil reserves that have to remain unused because of the world's efforts to cut greenhouse gas emissions. If such assets do indeed end up being stranded, no positive cashflows come from them so, using discounted cashflow analysis, they have zero value.[4]

The question is whether most investors have recognized this threat and appropriately taken into account the effects of climate mitigation regulation on future cashflows when they value companies. At the same time, companies that may be highly carbon-intensive today may invest heavily in innovations that facilitate the energy transition. For example, fossil fuel companies may earn positive cashflows from innovative activities that partially offset the losses resulting from assets that turn out to be stranded.[5]

At present, there is considerable uncertainty about future climate policies, such as carbon taxes. Therefore, investors may discount expected cashflows that are more sensitive to climate policies at a higher rate than cashflows that are less sensitive. This means that the same expected cashflows in the numerator of the equation above may be worth less today if the discount rate in the denominator is increased to reflect the carbon risk. This increase in the discount rate is called the carbon risk premium, and it is equal to the additional return investors earn from investing in risky companies. Last year, we discussed in this report how empirical studies do not always find a positive premium, but sometimes find a negative carbon risk premium. A negative premium would mean that companies involving higher carbon risk would be worth more today, and would consequently earn lower returns in the future.[6]

Whether climate change mitigation policies affect future cashflows (the numerator in the equation above) or the discount rate (the denominator) is an important consideration for investors. If policies only affect the cashflows, there is no climate risk premium that the average investor can benefit from. It implies that investors who have superior information about the impact of climate change can earn higher returns than the rest of the market. However, the overall expected returns for equity investments obtained by passive investors remain the same. Instead, if uncertainty about climate mitigation policies increases the discount rate, then the cost-of-capital of brown companies is higher, which is the same as saying that their expected returns are higher. Historical differences in realized returns between green and brown companies can be caused by differences in shocks in expected cashflows, in discount rates, or in short-term changes to discount rates. Providing rigorous evidence about these components is essential but at the same time a daunting task.

4. There is empirical evidence that oil companies with more undeveloped reserves have lower stock prices, because undeveloped reserves have a *negative* value, suggesting that investors already incorporate future climate change policies into their valuation; see Atanasova and Schwartz (2020).

5. For example, Cohen, Gurun, and Nguyen (2020) claim that most green patents are produced by oil and gas companies with lower ESG scores.

6. Edmans (2021) explains in more detail the reasons why the cost of capital of sustainable companies may be higher or lower than that of unsustainable companies.

Relatively little is known about how climate risk should affect investors' asset allocation decisions. Cosemans, Hut and Van Dijk (2021) indicate that climate-aware investors invest less in the equity market than investors who do not take the climate into account. On the one hand, the increased climate-related disaster risk increases the equity risk premium, which would imply a higher allocation to equities. But on the other, since climate-related disasters are more likely to be followed by further disasters than by economic upswings, the long-term risk of investing in equities increases. At the same time, the diversification benefits from investing in bonds and equities are reduced because interest rates tend to fall when climate disasters occur. These latter two effects outweigh the benefits of the higher equity risk premium. Therefore, taking into account climate risk should persuade an investor with a long investment horizon to reduce their strategic allocation to equities.

3.3 Supply and demand of brown and green assets

In addition to cashflows and systematic risks, imbalances between the demand and supply of certain types of assets may also temporarily affect prices.

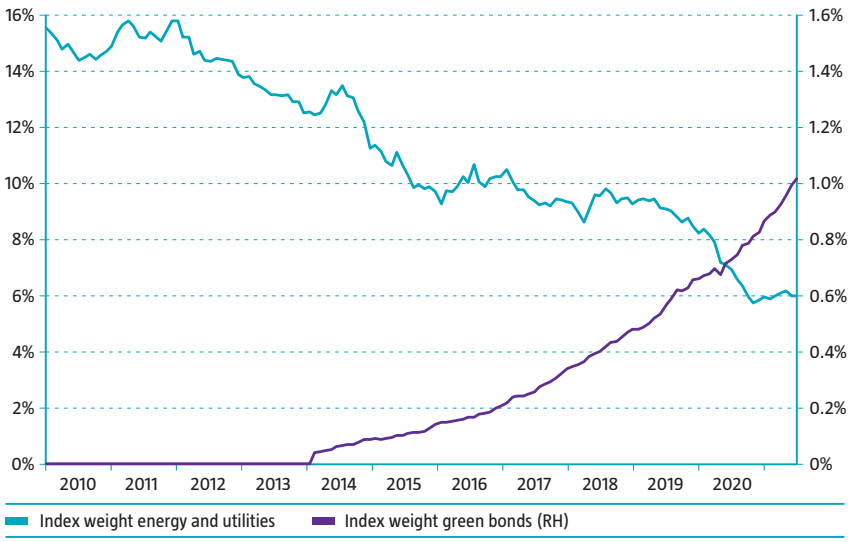
Large groups of investors have already committed to decarbonize their portfolios. These commitments may negatively affect the prices of carbon-intensive assets. Meanwhile, investors who need to reduce their portfolio's carbon footprint may choose to overpay for carbon-light assets because their goal is not solely to produce the portfolio with the best financial risk and return characteristics. If there are enough active investors who do not place considerable importance on their portfolio's footprint, asset prices should stay close to their fair value. However, if there are not enough, the prices of carbon-intensive companies may fall by more than fair value. This means that if the recent returns of carbon-intensive companies have been relatively low, their expected returns going forward would be relatively high.

At the same time, companies that focus on the energy transition may be able to attract relatively cheap capital from investors who are competing with each other to finance their green ambitions.[7] This may increase the share prices of green firms, leading to lower future financial returns. In the medium term, carbon-intense companies are less likely to issue new capital to the financial markets as their cost of capital may have become so high that there are no more profitable brown projects to embark on. Meanwhile, there may be more supply of capital for green projects as many more such projects are feasible when there is a lot of capital available to finance them and the cost of capital is low.

Figure 3.2 shows how the relative proportion of the global developed equity market accounted for by the energy and utilities sectors fell from about 15% in 2011 to only 6% in 2021. This suggests that brown sectors have become substantially less important for global equity investors in recent years. It also shows that the green bond index only has a market capitalization slightly above 1% of the broad global bond index at present, although the proportion it accounts for has increased steeply in recent years.

7. Blitz, Swinkels and Van Zanten (2021) find that over the past decade, brown firms have been able to attract as much fresh capital as green firms.

Figure 3.2: Relative weight of carbon-intensive equities and green bonds



Source: Robeco, Thomson Reuters Datastream, MSCI, Bloomberg Barclays. The blue line is the sum of the index weights of the MSCI Energy and MSCI Utilities sectors as a percentage of the MSCI World Index. The purple line is the market capitalization of the Bloomberg Barclays MSCI Global Green Bond Index divided by the market capitalization of the Bloomberg Barclays Global Aggregate Index.

These two lines show the supply and demand dynamics of energy-related assets. Over the short run, the effects are small and probably dominated by company news. However, the figure shows that supply and demand effects may be important over the medium term. While it may currently be more expensive to buy green bonds than comparable conventional bonds, this premium may disappear when supply catches up with demand.

3.4 Assessing climate change risk

Personal experience of disaster is one of the determinants of household and investor behavior. For instance, Dessaint and Matray (2017) show that corporate managers who witnessed hurricanes in neighboring regions started to overestimate hurricane risk and raised cash levels in their portfolios. Gao, Liu and Shi (2020) show that households confronted by fatal earthquakes increase their level of life insurance. Clearly, personal experiences can affect behavior in asset markets, but do risks like climate change have the same impact?

Climate change may feel estranged from personal experience or only perceived to be a distant risk. As such, Hong, Li and Xu (2019) show that equity markets do not anticipate the effects of predictably worsening droughts until after they materialize. Accordingly, the growing amount of attention being paid to climate change could hit the prices of the asset classes, sectors and regions most exposed to it.

Multi-asset allocators therefore need to consider the question of how various asset classes are likely to be affected by climate change over the next five years. There are several factors to consider, three of which we discuss in this section: (a) climate beta, (b) carbon intensity and (c) Climate Value at Risk. For each of these three measures, we show the potential impact on global equity sectors.

Climate beta

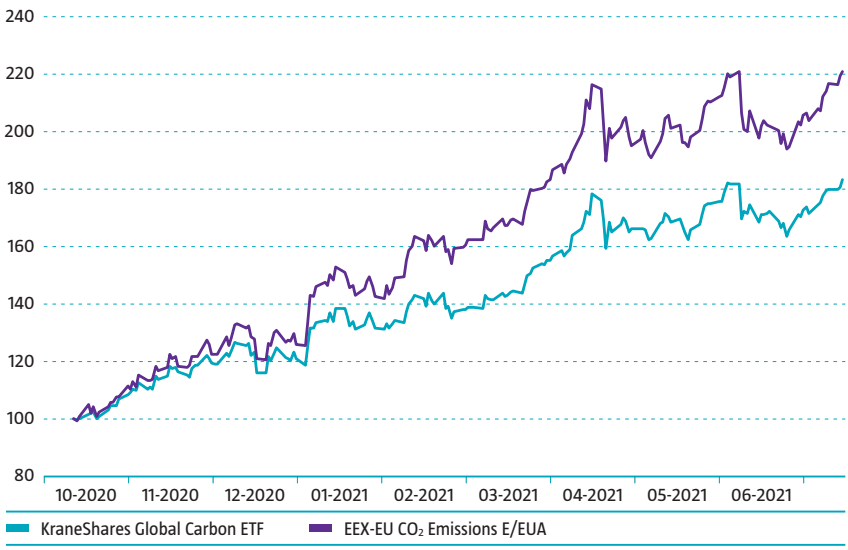
We start out by examining the relationship between changes in prices for carbon emissions and asset returns. By way of background, the price of emitting carbon used to be zero until the introduction of Emissions Trading Systems (ETS).[8] Since then, certain types of carbon emissions have required emitters to possess emission certificates. Once the total amount of these certificates is capped by the government, the market can allocate emissions rights to where they add most value, and the price for one unit of emission may rise or fall depending on the revenue that can be obtained as a result of emission. A polluting industry will pay for carbon emission rights until the marginal costs of doing so exceed the marginal benefit of additional output.

8. Coase (1960) devised a mechanism to mitigate negative externalities by proposing the issuance of property rights that parties can freely trade.

Figure 3.3 shows that global carbon prices have exploded since last October. Since Europe is home to by far the largest and most active carbon futures market, and has the longest price data history, we use it as a proxy for global carbon prices when we calculate climate beta.[9]

9. At 30 June 2021, the IHS Markit Global Carbon Index, which is followed by the KraneShares Global Carbon ETF, assigns a weight of roughly 74% to European carbon futures, 19% to Californian carbon futures and 7% to Regional Greenhouse Gas Initiative futures, covering several US states. The index methodology is described in more detail in IHS Markit (2020).

Figure 3.3: Traded carbon prices since September 2020



Source: Robeco. Refinitiv Datastream. Rebased price of EU ETS CO_2 emissions (code EEXEUAS) and the KraneShares Global Carbon ETF (code U:KRBN), which tracks the IHS Markit Global Carbon Index.

The carbon beta is the sensitivity of stock prices to changes in carbon prices. If governments reduce the number of available carbon certificates as part of their climate policies, and as a consequence the price of carbon emissions increases, this carbon beta can help us understand which parts of the stock market are affected more than others. The left side of Table 3.1 contains the carbon betas for developed markets as a whole and each of the equity sectors. The market index has a positive carbon beta, indicating that the market tends to go up when the price of EU ETS carbon certificates increases. However, the beta is small in economic magnitude: when the price of carbon futures rises by 10%, the equity market on average rises by just 0.48%.

For individual sectors, the carbon betas tend to be smaller and, with the exception of the consumer staples sector, not statistically different from zero, as indicated by t-statistics levels below 2. These empirical results suggest that carbon prices have not been important determinants of stock returns over the past ten years. However, since climate regulations around the world have become more stringent and investors are paying more attention to climate risks than they used to, these carbon sensitivities may increase in the future.

Table 3.1: Carbon exposure measures of equity sectors

	Carbon beta		Carbon intensity				Climate Value at Risk					
	Developed market		Developed markets		Emerging markets		Developed markets			Emerging markets		
	Coeff	T-stat	Index	Sector	Index	Sector	1.5°C	2.0°C	3.0°C	1.5°C	2.0°C	3.0°C
Market index	**0.048**	**2.22**	**49.1**		**160.8**		**-8.0**	**-5.4**	**-3.2**	**-14.5**	**-11.0**	**-5.9**
Materials	0.032	1.90	14.5	328.8	72.1	830.9	-30.6	-18.2	-5.8	-39.2	-28.2	-10.3
Utilities	-0.021	-1.10	13.8	503.4	23.0	1172.8	-26.5	-21.2	-7.5	-48.3	-42.1	-22.9
Energy	0.024	0.95	8.1	257.9	30.9	609.2	-62.9	-33.2	-8.8	-75.1	-58.3	-13.0
Industrials	0.004	0.54	5.4	50.7	11.2	223.5	-2.7	-2.9	-2.9	-21.1	-17.2	-10.8
Consumer discretionary	0.004	0.53	2.2	18.1	8.1	48.3	-4.2	-2.9	-2.6	-5.0	-2.8	-3.0
Consumer staples	-0.039	-2.95	1.9	27.4	2.8	49.3	-13.3	-7.9	-4.3	-13.4	-8.0	-3.8
Information technology	0.008	0.59	1.1	4.8	10.4	49.9	-0.6	-0.8	-1.1	-6.9	-5.4	-4.9
Financials	0.020	1.42	0.9	6.5	0.3	1.8	-4.3	-3.4	-2.7	-6.8	-5.6	-4.8
Health care	-0.027	-1.93	0.6	4.9	0.8	15.9	-5.3	-3.9	-3.1	-5.0	-3.8	-3.1
Communication services	-0.025	-1.76	0.4	4.7	0.8	7.3	-5.8	-4.7	-4.0	-6.5	-5.3	-4.4
Real estate	-0.009	-0.54	0.3	9.7	0.4	18.3	-5.8	-5.0	-4.3	-9.1	-7.6	-6.7

Source: Robeco, Refinitiv Datastream, MSCI, TruCost, MSCI ESG Research. The carbon beta is the slope coefficient of a regression of MSCI World Index returns on the EU-ETS carbon futures returns and an intercept. For the global MSCI sectors, the regression also contains the MSCI World Index returns. The regression is calculated using monthly returns over the past 10 years, ending on 30 June 2021. Carbon intensity is represented by Scope 1 and 2 greenhouse gas emissions divided by the enterprise value including cash. The data was obtained in June 2021. Climate Value at Risk is a forward-looking estimate provided by MSCI ESG Research. The estimates are made at the firm level and aggregated to the market and sector levels using market capitalization weights. The data was obtained in June 2021. Certain information ©2021 MSCI ESG Research LLC. Reproduced by permission.

Carbon intensity

A second way to look at the impact of carbon risk on portfolios is through carbon intensity. In the middle of Table 3.1, we show the carbon intensity of developed and emerging markets and the various sectors, using historic data on Scope 1 and Scope 2 greenhouse gas emissions, which we divide by the enterprise value including cash. This is a standard approach in European regulation and one that institutional investors have adopted to help them set targets for portfolio decarbonization.[10] Note that these numbers may look very different if we consider Scope 3 emissions, which reflect the carbon emissions of the entire value chain of a product or service.

10. See the Final report on EU Climate Benchmarks and Benchmarks' ESG Disclosures and Inaugural 2025 Target Setting Protocol for more details.

Table 3.1 shows that the materials, utilities and energy sectors have the highest carbon intensities in developed markets, ranging from 258 to 503 tonnes of CO_2 per million dollars of enterprise value. By multiplying these intensities by the weight of these sectors in the index, we arrive at the contribution of each sector to the total index. We find that these three sectors are also the largest contributors to the index carbon intensity's 49.1. The carbon intensity of emerging markets is markedly higher at 160.8, and is predominantly attributable to the same three sectors plus industrials.

The carbon intensity data are based on historical figures, and a more forward-looking carbon measure may prove more instructive. This is why we also look at the Climate Value at Risk for the equity market and its various sectors in the columns on the right side of Table 3.1. These columns show the potential losses incurred by the equity markets and sectors in different temperature scenarios.[11]

11. See MSCI ESG Research (2020) for a detailed description of the way the Climate Value at Risk is calculated.

The Climate Value at Risk measure provides a forward-looking, returns-based valuation assessment of climate-related risks and opportunities in an investment portfolio. We consider three scenarios: one with strict measures that limit global warming to 1.5°C, one with somewhat less strict measures consistent with a 2°C scenario, and a scenario in which temperatures rise to 3°C above pre-industrial levels. The Inevitable Policy Response's forecast scenario is closest to the 2°C scenario. In that scenario, the Climate Value at Risk is 5.4% for developed markets and 11.0% for emerging markets. The highest risks are faced by the three sectors with the highest carbon intensities: losses could be above 20% for some sectors in developed markets and as high as 58% for the energy sector in emerging markets.

It's a similar story when we look at corporate bonds. Table 3.2 shows that a developed market investment grade corporate bond index has a carbon intensity of 72.2, while the high yield corporate bond index's intensity is 164.5. The fixed income sectors that contribute most to these scores are electric, energy and basic materials, much like in the equity markets. The carbon intensity measures suggest that three sectors are responsible for most carbon emissions and these are therefore likely to be affected most when carbon prices change.

Table 3.2: Carbon intensities of developed market corporate bond sectors

	Carbon intensity			
	Investment grade		High yield	
	Index	Sector	Index	Sector
Corporate credits	**72.2**		**164.5**	
Electric	24.2	383.1	25.2	983.7
Energy	14.9	228.3	21.2	215.5
Basic industry	9.1	304.0	67.2	1078.4
Capital goods	7.0	144.0	18.9	244.5
Transportation	5.3	168.8	13.7	458.6
Natural gas	3.0	232.8	0.3	224.0
Consumer non-cyclical	2.4	17.8	4.3	37.5
Consumer cyclical	1.9	25.7	9.5	51.8
Utility (other)	1.6	261.0	0.9	418.1
Communications	0.8	10.0	1.5	10.2
Industrial (other)	0.6	80.4	0.9	66.9
Technology	0.5	7.8	0.6	14.3
Insurance	0.4	6.7	0.1	3.2
Real Estate Investment Trusts	0.2	6.5	0.1	10.2
Financial (other)	0.1	8.0	0.2	5.0
Banking	0.1	0.4	0.0	0.8
Finance companies	0.1	6.3	0.0	1.5
Brokerage & exchanges	0.0	2.0	0.0	2.7

Source: Robeco, Barclays, TruCost. Barclays developed markets corporate bonds from its global investment grade and high yield indices. Carbon intensity is represented by Scope 1 and 2 greenhouse gas emissions divided by the enterprise value including cash. The data was obtained in June 2021.

3.5 Consequences for asset class returns

The macroeconomic impacts of climate change are broad-ranging and affect both the demand and supply sides of the economy. The economic cost of climate change will be enormous if no action is taken. Kahn et al. (2019) estimate that global real GDP per capita will be 7.2% lower than at the time of their analysis in 2019 by 2100 in a business-as-usual scenario without mitigation policies. Swiss Re (2021), a leading global insurer that has a lot to lose from climate change, estimates global real GDP could shrink by 18% by 2050 if no action is taken to achieve the Paris Agreement targets. These studies also highlight that there is substantial uncertainty around the economic impact of climate change. As Beirne, Renzhi and Volz (2020) aptly state: *"Models estimating climate change's impacts on economic growth inexorably make a host of assumptions about climatic trends, tipping points, technological innovation, adaptive capacity, and the effects of all these on human well-being and economic activity"*.

Financial markets should reflect the prevailing uncertainty about climate change as a systematic risk factor. Assets that are exposed to climate change risks should have a higher expected return in the long run than assets that are less or not exposed to these risks. The question for investors is to what extent climate risk is already priced in across asset classes. The answer will vary by asset class given differences in market structures, liquidity, investor bases, active versus passive money flows, shares of price-insensitive buyers (such as central banks) and, last but not least, cash flow vulnerability to climate change.

Government bonds

The projected declines in GDP per capita growth should translate into lower real yields for sovereign bonds. Historically, real bond yields are around 80% of real GDP growth. Taking into account this capture rate and Swiss Re's projection of an 18% drop in GDP, our calculations suggest that investors should expect bond returns to be 0.4% lower in geometrically annualized terms between now and 2050. If climate change results in lower GDP growth, this should translate into lower sovereign bond returns.

In the medium term, however, the story for government bonds looks more complex. Econometric work by Beirne, Renzhi and Volz (2020) shows that there is a positive relationship between bond yields and climate vulnerability. Meanwhile, they find that climate vulnerability has a bigger impact on bond yields than climate resilience. This creates a vicious circle: countries that are more vulnerable to climate risk face higher borrowing costs to create the resilience that they wish to achieve, thereby lowering investment activity and leaving them even more vulnerable to climate risk. This dynamic will be especially prevalent in emerging markets, where climate risks seem larger and governments historically experience more problems attracting foreign capital.

The IMF Global Fiscal Sustainability Report does not find a relationship between sovereign bond prices and projected climate risk. However, it observed an increase in sovereign spreads of 11 bps for each one-point increase in the Climate Change Physical Index, which takes into account countries' current climate risk exposures and future vulnerabilities.

So, while the overall impact of climate over the long run could be structural global productivity losses and, as a result, lower sovereign bond yields, the tug of war between building climate resilience on the one hand and the materialization of climate shocks on the other could see higher risk premiums in bonds and therefore higher sovereign bond returns for higher-risk countries. Over the coming five years, we expect global government bond yields to remain low as central banks are likely to keep interest rates low to facilitate government investments in climate change mitigating projects.

We have seen that carbon intensities and Climate Value at Risks are larger for emerging markets than the developed world. Lower potential growth for emerging markets may lead to difficulties in obtaining finance and consequently result in higher risk premiums associated with balance of payment risks, more than offsetting the decline in the real risk-free rate. In addition, the real appreciation of local currencies is a function of the rate at which real GDP per capita is catching up with developed market levels. If this catch-up is delayed due to climate-related output losses being concentrated in emerging markets, the real depreciation of emerging market currencies will dent expected returns in hard-currency terms, with emerging market currencies remaining cheap for a reason. Therefore, we expect below-average investment returns for emerging market debt over the next five years from a climate perspective.

Equities

The key question for equity investors to consider is how climate change will affect the cashflow generation abilities and the discount rate of the typical firm in their assessments of net present value. In the long run, one should expect earnings growth to equal long-run economic output growth. If GDP per capita growth is structurally impaired by climate change, as we discussed in the bond section, there should also be repercussions for the long-term earnings growth potential of companies. Assuming a worst-case scenario of no action being taken (which would result in temperatures rising to 3.2°C above pre-industrial levels, according to Swiss Re's calculations), the 18% decline in global GDP growth would imply global corporate earnings growth falls by around 0.5% per year between now and 2050. Earnings growth in emerging markets is expected to fall by more than this global average.

Concerning the discount rate, we have to account for the secular decline in the risk-free rate and the increase in the implied equity risk premium. Balvers, Du and Zhao (2017) show that uncertainty about temperature shocks increases the cost of equity by 0.22% per year. The IMF Global Fiscal Sustainability Report in April 2020 finds that, using a stylized asset pricing model, in the worst-case scenario of no action being taken to achieve the Paris agreement targets the implied equity risk premium could jump to a whopping 13.4% per year towards the year 2100.[12] Another IMF study in 2020 concludes that markets have not yet fully discounted the potential long-term impact of climate change as it found no correlation between a long-term climate risk metric and 2019 equity valuations, and warned equity investors[13]: "This apparent lack of attention [to climate risks] could be a significant source of market risk looking forward."

12. See Global Financial Stability Report, April 2020 Chapter 5 online Boxes: Climate Change.

13. https://blogs.imf.org/2020/05/29/equity-investors-must-pay-more-attention-to-climate-change-physical-risk/

In the next five years we expect equity investors to start to scrutinize the downside risks that could result from climate change. We think that the IPR's 2°C scenario could become consensus in stylized asset pricing models. If this is the case, it would limit the extent to which equity investors start to demand higher compensation for climate risk than they would without additional policies to mitigate climate change. Dietz et al. (2016) estimate that the 2°C scenario would result in a 0.2% higher net present value of financial assets compared with a business-as-usual scenario, suggesting that climate-mitigating policies are a net positive for investors. We expect a negative, but still limited, impact on overall expected equity returns from the repricing of climate risk over the next five years.

Corporate bonds

For risky fixed income asset classes like high yield and investment grade credit, the impact of climate risk on expected returns can be derived using the risk-weighting method, in which investment grade risk is calculated as a combination of 85% government bond risk and 15% equity risk, and high yield risk as 40% government bond risk and 60% equity risk.

Combined with the higher carbon intensity of high yield relative to investment grade credit that we saw in Table 3.2, we expect no effect on returns for investment grade credit and a below-average expected return for high yield bonds over the next five years.

Commodities

Climate change seems to be a double-edged sword for commodities. On the one hand, demand for commodities might fall as global economic activity slows. On the other, increased physical risk resulting from climate change could see more frequent negative supply shocks hitting commodities, especially agricultural commodities. What's more, any negative supply shocks that occur may take longer to unwind than previously because of a less price-elastic supply response from commodity producers assuming climate risk raises the cost of capital for commodity producers and increases their breakeven prices.

The impact on expected commodity returns under a business-as-usual scenario could be neutral. However, in the scenario of progress towards the Paris climate targets and the green energy transition, the commodity intensity of economic activity could increase, while growth in global economic activity would slow less than in the business-as-usual scenario.

The battle against climate change is resulting in increased demand for certain commodities. For example, an electric vehicle uses on average 83 kg of copper, while a similar vehicle based on the internal combustion engine uses just 23 kg. Meanwhile, the International Energy Agency notes that 90% of new electricity capacity in 2020 stemmed from renewable sources such as wind and solar. Steel is vital in the production of renewable energy, much like copper is for the electric vehicle industry: each new megawatt of solar power produced requires around 40 tons of steel, while each additional megawatt from wind requires 120-180 tons. Renewable energy consumption as a percentage of total global energy consumption is expected to rise to 17% by 2030 in the International Renewable Energy Agency's Planned Energy Scenario. This rise implies that a greener economy could be benign for commodities.

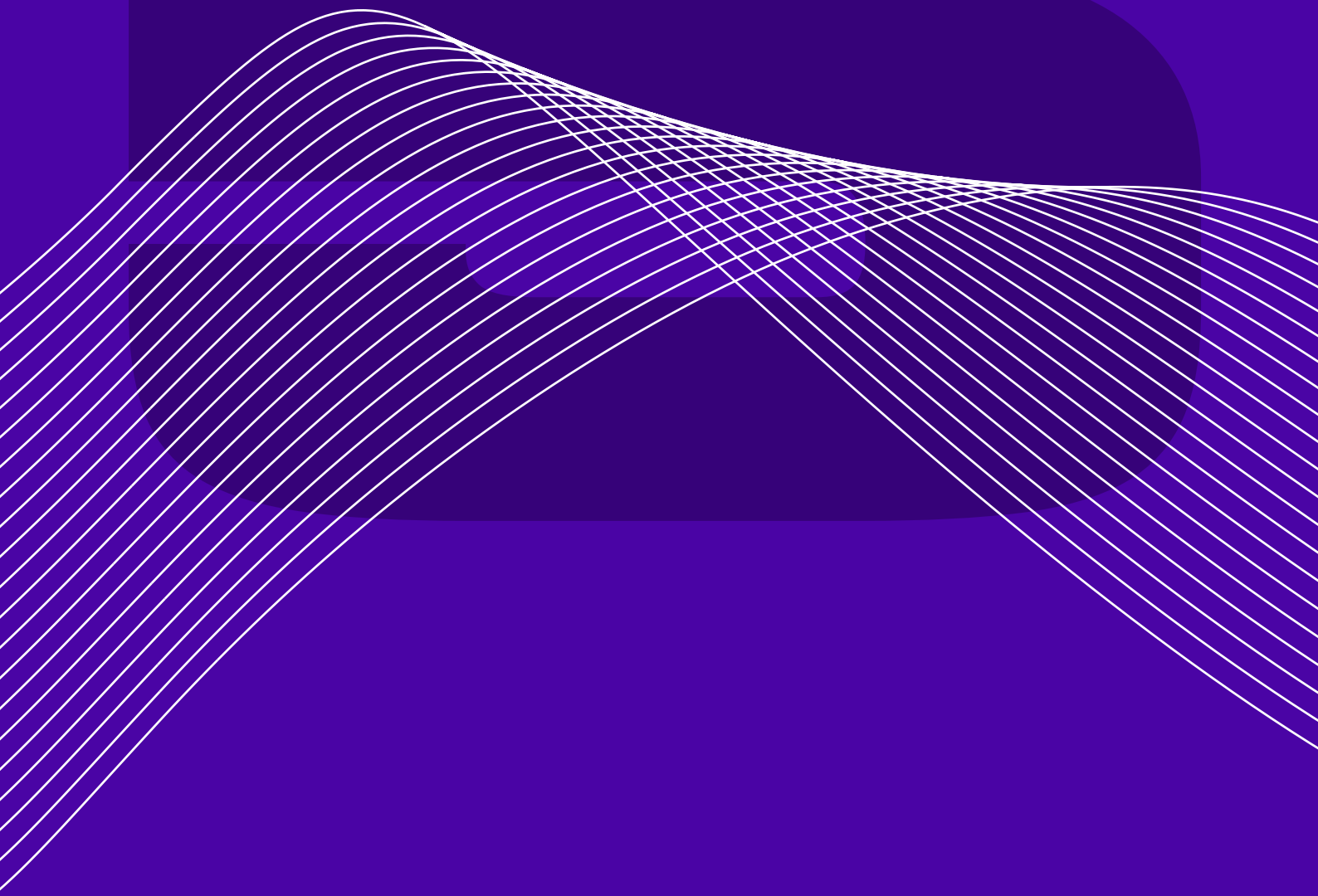
On balance, we expect commodity returns to be higher than average in the coming five years, based on the climate risk perspective.

3.6 Conclusion

The exact magnitude of climate change over the next decade is uncertain, and its impact – and those of the policies and regulations to combat it – on asset prices is even more unclear. However, this does not absolve asset allocators from the task of considering the long-run impact of climate change on asset class returns. The nature of the path from the current situation to the long-run equilibrium is likely to have big implications for most investors' decisions. In this chapter, we hope to have shed some light on the kinds of climate-related issues that investors need to think about when considering their asset allocations over the coming years. ■

Special topics

Long-term investors generally face long-term challenges. In this section, however, we address three topics that institutional investors may very well be facing right now or in the near future.



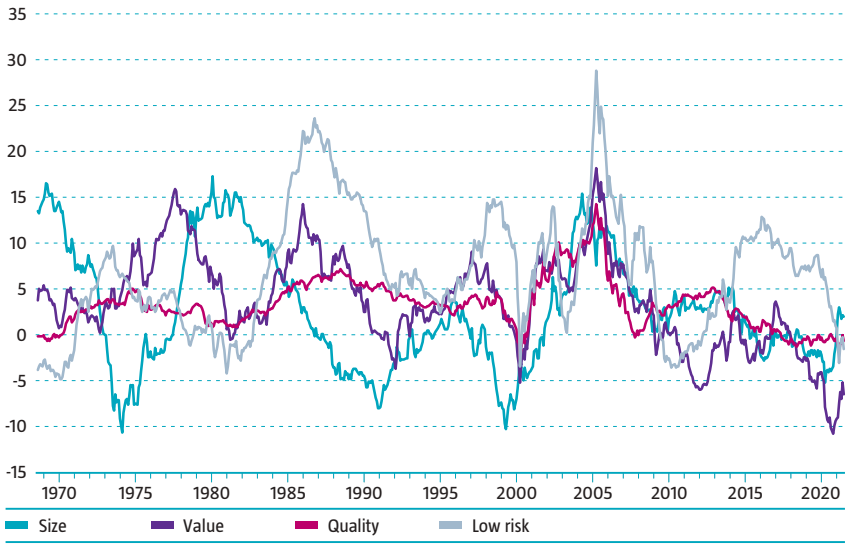
FACTOR INVESTING

SOME FACTORS ARE NOW MORE EQUAL THAN OTHERS

There is no free lunch when it comes to harvesting factor premiums. In fact, there are sustained periods in which one or more factors experience negative returns. Some investors have strong hands during such downturns, enabling them to benefit from the upswings, while others may try to dynamically allocate to factors.[1] This chapter gives an estimate of equity factor returns over a five-year horizon, and concludes that value is currently the most attractive factor.

1. See Van Gelderen, Huij, and Kyosev (2019) for a quantitative analysis showing that, on aggregate, investors earn lower returns because of adverse timing between factors.

Figure 1: Annualized US factor returns over five-year periods



Source: Robeco, Kenneth French data library, Paradox Investing. The factors are size: SMB, value: HML, quality: 50% RMW+50% CMA, and low risk: VOL. Sample period: July 1963 to June 2021. Returns are annualized, simulated and do not include costs and fees.

Figure 1 shows the rolling five-year returns of value, quality, low risk and size for the US equity market in the period from 1963 to 2021. As can be seen, there was considerable variation even between these prolonged periods during this time.[2] For example, the value premium was close to 15% per annum from 1973 to 1977, 1981 to 1985, and 2001 to 2005. Yet it was below -5% per annum from 1987 to 1991, 1996 to 2000, and 2008 to 2012, and even below -10% from 2016 to 2020. Similar cycles have been seen for the other factors, too. While these cycles can be observed in hindsight, the question is whether we can predict them beforehand. For the main asset classes, we have developed a methodology for determining our five-year expected returns. In this special topic, we use a similar approach for the equity factors, consisting of four steps: long term, valuation, macro and climate.[3]

2. See Blitz (2020) for a discussion on the time variation of factor premiums across decades.

Long-term equity factor premiums

The long-term return estimates that underlie our expected returns are published in a separate document.[4] For this, we use the Dimson-Marsh-Staunton equity database, which covers more than 20 countries and contains over 100 years of data. Unfortunately, we do not have such a comprehensive database for equity factor returns. In Table 1, we display the long-term factor premiums, excluding costs and fees, for the US equity market between 1927 and 1963, and for global equity markets from 1990. Note that these factors are based on generic factor definitions and therefore do not include the enhancements we apply in our own factor investing strategies.

3. Even though momentum is a very important factor in a multi-factor portfolio, we do not include it in this medium-term outlook because it changes composition every 12 months. This makes it difficult to apply typical valuation metrics and the macroeconomic environment impact to medium-term momentum returns. Also, a generic momentum factor is prone to crashes, such that it requires risk management with a shorter horizon than five years. For more details on the crash risk and possible risk management strategies, see Hanauer and Windmüller (2020).

4. See for more information Robeco (2020).

Table 1 shows that the long-term outperformance of small-cap stocks relative to their large-cap counterparts (the 'size effect') is positive, at 2.49%, but that the market risk-adjusted return (also known as the alpha) of 0.91% is not statistically different from zero, as its t-statistic is below the threshold of two. This finding has been consistent over more recent subperiods, which may give us a better idea of future returns, and is in line with international evidence on developed and emerging markets. Based on this empirical result, size would not qualify as a factor premium.[5] However, since some investors allocate separately to small caps, we still forecast the time variation in returns on the size factor.

5. See also Blitz and Hanauer (2021b) for a broader discussion on the size factor.

The long-term evidence for the value premium is strong. The raw outperformance of high book-to-market stocks relative to their low counterparts is 4.03% in the US for the period from 1926 to 2021, and its alpha of 2.75% per year is statistically different from zero. The value premium is also strong for the post-1963 period, despite the insignificant alpha of 2.01% since 1990 in the US. According to Blitz (2020), this is down to the poor performance of value in the 1990s and 2010s. In the period following 1990, the value premium was strong outside the US, with excess returns of 3.47% and 7.02% for developed and emerging markets, respectively. For the quality factor, which we define here as the average of the profitability and investment factors, the data we have only starts in 1963. The performance for the US has been 3.10% since 1963, with statistically significant alpha. The performance since 1990 has been similar across the globe, with an excess return of 3.09% for the US, 2.82% for the developed world outside the US, and 2.49% for emerging markets.

The low-risk premium has been one of the strongest in history. Its long-run average return is 5.99%. This is close to its alpha by design, as the factor is made ex-ante neutral to market risk by leveraging up the low-risk portfolio and leveraging down the high-risk portfolio. Its alpha became stronger rather than weaker in the most recent subsample of three decades. The international evidence for this factor is also strong over this period. The alpha for developed markets outside the US is 8.28% and for emerging markets is 5.74%, both of which are statistically significant.

'The low-risk premium has been one of the strongest in history'

Table 1: Long-term global factor performances

		Market	Size	Value	Quality	Low risk
United States 1926-2021	Average	8.22	2.49	4.03	-	5.99
	Volatility	18.53	11.03	12.16	-	10.54
	Alpha	-	0.91	2.75	-	6.04
	T-statistic	-	0.84	2.25	-	5.45
United States 1963-2021	Average	6.89	2.93	3.30	3.10	6.00
	Volatility	15.45	10.51	10.00	5.06	11.71
	Alpha	-	1.57	4.24	3.55	6.00
	T-statistic	-	1.18	3.27	6.52	3.85
United States 1990-2021	Average	8.86	2.03	1.50	3.09	6.45
	Volatility	15.13	10.70	10.78	6.39	14.28
	Alpha	-	0.46	2.14	3.51	6.72
	T-statistic	-	0.24	1.09	4.58	2.56
World ex US 1990-2021	Average	4.54	1.23	3.47	2.82	8.28
	Volatility	16.60	7.05	7.72	3.27	12.87
	Alpha	-	1.68	3.54	2.40	8.28
	T-statistic	-	1.35	2.54	6.12	3.82
Emerging 1992-2021	Average	8.13	1.05	7.02	2.49	5.74
	Volatility	21.24	7.31	7.96	4.06	9.64
	Alpha	-	1.63	6.67	3.18	5.74
	T-statistic	-	1.21	4.49	4.65	3.00

Source: Robeco, Kenneth French data library, Paradox Investing. The factors are size: SMB, value: HML, quality: 50% RMW+50% CMA, and low risk: VOL. The sample period for the low-risk factor for 'world excluding US' starts in 1986 and for 'emerging markets' in 1996 using MSCI index constituents and three-year volatility. For 'emerging markets' we use country-neutral quintile sorts. Alpha is the risk-adjusted return relative to the market factor. Returns are simulated and do not include costs and fees.

Dimson, Marsh and Staunton (2017) find similar premiums in their long UK sample, which dates back to 1900, as well as in their international sample of 23 countries, in which the data for most countries starts in the 1970s. There are very few other systematic historical studies on factor premiums in international equity markets.

An important question is whether these historical premiums will persist in the future. Based on three convincing explanations for their existence, we believe they will. One explanation is that these premiums are the reward for bearing systematic risk. Following this explanation, factor investing is risky, but premiums are persistent. Another explanation is institutional. The way the finance industry is organized, including its regulation and organization, may give rise to incentives that are inconsistent with traditional finance theory and therefore lead to the existence of factor premiums. For example, capital requirements in solvency regulation are not dependent on the risk of the equity portfolio, which may lead to a low-risk premium. Another example is that certain types of news are only slowly incorporated in asset prices due to investors' limited ability to process certain types of information. This explanation posits that factor premiums are persistent as long as the features of the finance industry remain the same. A final explanation relates to behavior, in that investors use signals, heuristics or preferences that are inconsistent with the rational behavior incorporated in most traditional financial models. Based on the assumption that such rationality doesn't really exist and that fear and greed are hardwired in investor behavior, this explanation leads to persistent factor premiums. However, these irrationalities may be arbitraged away or reduced through understanding and awareness. There is empirical evidence consistent with each of the three possible explanations. Therefore, at this point in time, we conclude that the various explanations are strong enough to result in long-term factor premiums. If these explanations no longer hold going forward, we are open to reconsidering the size of these premiums.

The empirical evidence combined with the possible economic explanation leads us to the following long-term assumptions. The additional return of small caps relative to the index for small caps is 0.75%, in line with a beta of 1.2, an equity premium of 4% and an alpha of zero. The long-run value premium is 2.5%, decomposed into a relative outperformance of 1.25% for value stocks, and a relative underperformance of 1.25% for growth stocks. Similarly, we assume a relative outperformance of 1.25% for quality stocks. This is slightly lower than the historical performance of quality, as this factor is a relatively recent phenomenon and the out-of-sample period (1940 to 1963) shows evidence of weaker quality factor performance.[6] For low-risk stocks, we assume that their performance is equal to the market index. Assuming the beta is 0.3 lower than the market, and the equity risk premium is 4%, low-risk stocks have an alpha of 1.2%, which we round to the nearest quarter: 1.25%. These long-run expectations are conservative even for generic factor definitions.

6. See Wahal (2019) for more details.

Valuation ratios of equity factor premiums

The second step in determining our expected returns is to find indicators of an asset class being cheap or expensive. Valuation indicators, for example, have been found to have predictive power for returns.[7] Figure 2 confirms this predictive power for factor premiums as well. The horizontal axis shows the value of a combination of three commonly used equity valuation metrics, where the further to the right the dot, the cheaper the factor.[8] As depicted on the vertical axis, when factor premiums are cheap, returns tend to be high in the five years that follow. This pattern is particularly visible for value and size. The low-risk and quality factors have a narrower spread in valuation ratios over this period, and therefore show a weaker positive relationship with future five-year returns. Nevertheless, Figure 2 clearly shows that cheap factors tend to outperform in the medium term.

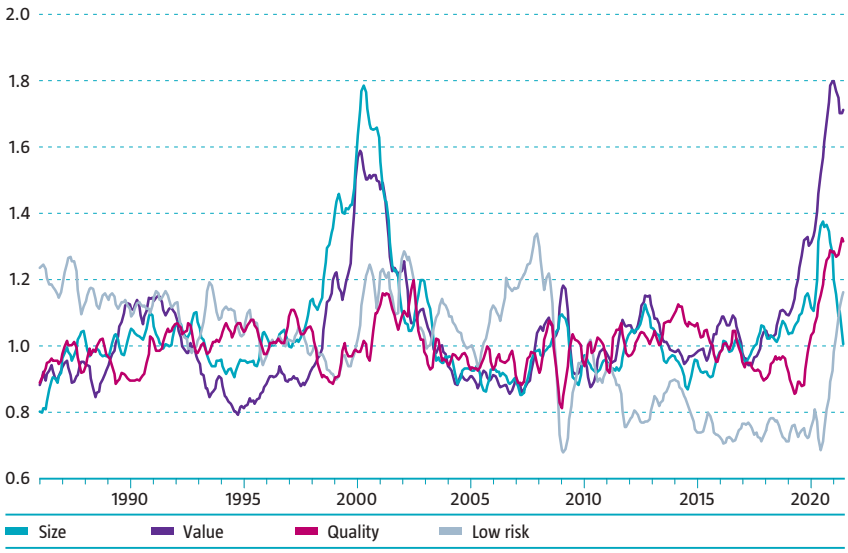
7. See, Cohen, Polk, and Vuolteenaho (2003), Rytchkov (2010), and Yara, Boons, and Tamoni (2021).

8. This is the same procedure to measure factor valuation as in Blitz and Hanauer (2021a).

Figure 2: Relationship between valuation spreads and five-year forward returns, 1986-2021

Source: Robeco. The size factor is based on market capitalization; the value factor is a combination of book-to-market, cash flow-to-price, earnings-to-enterprise value, and the payout yield; the low-risk factor is based on three-year volatility; and the quality factor is based on a combination of gross profits-to-assets, accruals-to-assets, and asset growth. The sample consists of all stocks in the MSCI World Index in the period from 1986 to 2021. The valuation measure contains the first three valuation measures of the value factor. The horizontal axis shows the ratio of the valuation measure of the top quintile portfolio relative to the bottom quintile portfolio, adjusted such that it is one for each factor in the long run, with 0.5 being expensive and 2 being cheap. The returns of the low-risk factor are obtained by leveraging up the low-risk portfolio and leveraging down the high-risk portfolio, and then taking the difference. The vertical axis represents five-year forward returns.

Figure 3: Valuation spreads of global equity factor premiums



Source: Robeco. The size factor is based on market capitalization; the value factor is a combination of book-to-market, cash flow-to-price, earnings-to-enterprise value, and the payout yield; the low-risk factor is based on three-year volatility; and the quality factor is based on a combination of gross profits-to-assets, accruals-to-assets, and asset growth. The sample consists of all stocks in the MSCI World Index in the period from January 1986 to July 2021. The valuation measure contains the first three valuation measures of the value factor. Shown is the three-month moving average of the ratio of the valuation measure of the top quintile portfolio relative to the bottom quintile portfolio, adjusted such that its median is one for each factor in the long run.

Figure 3 shows the time variation of the valuation signal for the four equity factors over time, where again a measure above one indicates that the factor is cheap. Over the past two years, the value factor has been extremely cheap, peaking at even higher levels than previous highs, which were reached just before the dot-com bubble burst. At the end of the 1990s, small-cap stocks were extremely expensive, even more so than in 2020 when their valuation ratio approached 1.4. However, in the first half of 2021, this trend reversed and they are now close to their long-term average. The opposite has occurred with quality and low-risk stocks: they were rather expensive in recent years, but this reversed in 2020 and 2021, and they currently are cheap.

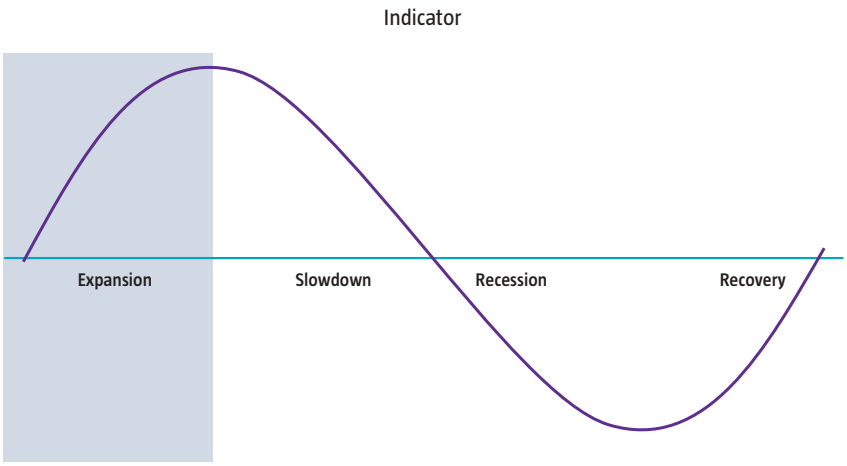
Based on the current readings of the valuation spreads in Figure 3, the relationship between valuation spreads and future returns established in the literature, and the predictive power of high valuations for future returns in Figure 2, we expect higher returns for value, quality, and low risk, and average returns for size.

Macroeconomic environment

The third step in determining our expected returns is to confront the current valuation with the macroeconomic environment. For example, a factor premium could be cheap or expensive for a reason, and therefore not lead to abnormal returns relative to the long-term premium. We start, therefore, with a historical analysis of our business cycle indicator and average factor returns for the US equity market.[9] Figure 4 shows the four phases of the business cycle model: expansion, slowdown, recession and recovery. The reading from July 2021 forecasts an expansion. Our business cycle indicator only uses the information available at the time of the forecast, making it different from the methods used for business cycle dating by the National Bureau of Economic Research. Our macroeconomic view described in Chapter 4 suggests that we will stay in the expansionary and slowdown phase for the next five years.

9. The business cycle indicator is based on (a) credit spreads, (b) earnings yield of the market, (c) the manufacturer's production survey, and (d) unemployment. This indicator is described in more detail by Blitz and Van Vliet (2011). Monthly updates are maintained by the Robeco Multi-Asset team.

Figure 4: Business cycle reading July 2021 – Expansion



Source: Robeco. Van Vliet and Blitz (2011).

Table 2 shows the four factor premiums across the four phases of the business cycle. We see that following expansionary signals, size and quality tend to perform poorly, while the value factor is relatively strong. Low risk has average performance following an expansionary signal.

Although the differences across the business cycle can be large, we must keep in mind that there is significant uncertainty surrounding these estimates. This is highlighted by the t-statistics: many values are below two, suggesting the premiums are not significantly different from zero during these phases. Unfortunately, the uncertainty cannot be avoided in short samples. This also means that the reported differences between two positively estimated premiums are not statistically significant.

Table 2: Annualized factor returns across the business cycle

		Expansion	Slowdown	Recession	Recovery
Periods (months)		**200**	**109**	**206**	**178**
Size	Average	-2.78	6.85	4.15	5.53
	T-statistic	-1.08	1.97	1.64	2.03
Value	Average	3.99	1.78	1.93	5.04
	T-statistic	1.63	0.54	0.80	1.94
Quality	Average	0.86	3.86	4.39	3.64
	T-statistic	0.70	2.30	3.60	2.77
Low risk	Average	4.94	3.78	5.35	9.28
	T-statistic	1.71	0.97	1.89	3.05

Source: Robeco, Kenneth French data library, Paradoxinvesting.com, Van Vliet and Blitz (2011). Period 1963-2021.

A second way to look at the relationship between macroeconomics and equity return factors is to examine their relationship with bond returns. Since we predict five-year bond returns in the main part of this report, we may want to take into account how factor premiums have behaved during interest rate scenarios.

We regress US equity factor returns on US bond returns to find their historical relationship. We do this for several holding periods, ranging from one month to five years. The latter is the most important for our purposes, but investors may be more familiar with the former as this is the period most commonly used by short-term analysts. The results of the bond return sensitivities are displayed in Table 3, where a positive value suggests that the premium is high when bond returns are high (which is when interest rates are decreasing).

Table 3: Bond return sensitivity of equity factor premiums

		1 month	1 quarter	1 year	3 years	5 years
Market	Coefficient	0.12	0.05	0.28	0.45	0.60
	T-statistic	1.31	0.39	1.51	1.75	2.50
Size	Coefficient	-0.20	-0.26	-0.23	-0.59	-0.92
	T-statistic	-3.74	-3.91	-1.81	-2.20	-2.75
Value	Coefficient	-0.09	-0.10	0.01	0.13	0.04
	T-statistic	-1.58	-1.16	0.04	0.55	0.15
Quality	Coefficient	0.03	0.07	0.15	0.37	0.36
	T-statistic	1.06	1.85	2.15	2.83	4.04
Low risk	Coefficient	0.24	0.40	0.70	1.17	1.43
	T-statistic	4.16	4.50	4.45	3.73	3.28

Source: Robeco, Kenneth French data library, Paradoxinvesting.com, Swinkels (2019, 2021). We regress the excess returns of the equity factors on the excess returns of 10-year US Treasuries and a constant. Displayed here are the slope coefficient and its Newey-West t-statistic, which corrects for overlapping monthly observations. Period 1963-2021.

There is a popular belief that value factor returns correlate negatively with bond returns. In other words, when interest rates decrease, long-term cash flows earned by growth firms appreciate more in value than short-term cash flows from value firms. While this may have been the case over the past couple of years, Table 3 shows that the relationship between value and interest rates over the long run is economically and statistically not different from zero. The size factor has an economically and statistically significant negative relationship, and the low-risk factor a positive relationship. For these latter two factors, it is important to take our interest rates predictions into account for our outlook for factor returns.

In Chapter 4, we motivate why we expect long-term interest rates to increase in Europe and the US. In such a scenario, government bond returns will be below average. Historically, these periods have coincided with above-average returns for the size factor and below-average returns for the low-risk factor.

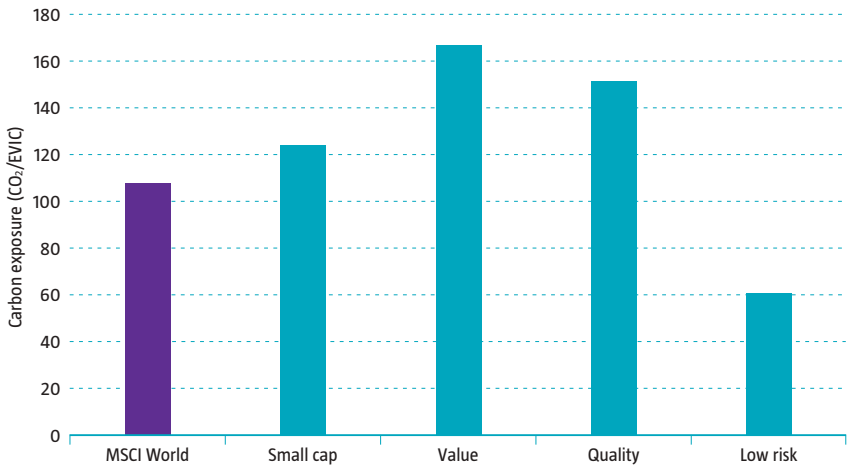
Taken together with the business cycle analysis, we find a negative macro tilt for quality and low risk, no tilt for size, and a positive tilt for value.

Climate risk

The final ingredient of our medium-term outlook for generic factor premiums are the embedded climate risks. In Figure 5, we display the carbon exposure of the generic size, value, quality and low-risk factors alongside that of the market index. We observe that currently, value and quality are the factors most exposed to climate risk, while size is close to the index, and low risk is substantially less exposed to carbon risk. This leads to a negative climate tilt for the generic value and quality factors, and a positive tilt for low risk. Note, however, that the negative climate tilts for generic value and quality can be eliminated through strategy enhancements. At Robeco, we have developed a toolbox that allows investors to harvest factor premiums while reducing the carbon emissions of the portfolio well below benchmark levels.[10]

10. See Swinkels, Ūsaitė, Zhou, and Zwanenburg (2019) for more details on how Robeco decarbonizes the value factor in its quantitative investment strategies.

Figure 5: Carbon exposure of generic global factors



Source: Robeco. Carbon exposure is measured by dividing a company's greenhouse gas emissions by its enterprise value including cash. The portfolio carbon exposure is then the product of a company's weight in the portfolio multiplied by its carbon exposure. Date: 30 April 2021.

Summary

Summarizing the analysis in this chapter, we arrive at our expected returns for the generic equity return factors for the period 2022 to 2026. We expect an outperformance of the size factor that is in line with its higher market risk, resulting in an alpha of 0%. For the value factor, we estimate an above-average factor alpha of 2% per year. For low risk, we expect the same alpha as in the long run, 1.25%, while for quality we forecast a slightly lower alpha of 1%. ■

Table 4: Expected equity factor returns

	Long-term					2022-2026	
	Return	Alpha	Valuation	Macro	Climate	Return	Alpha
Market	7.00%	0.00%	-/-	+/+	-/-	4.25%	0.00%
Size	7.75%	0.00%	=	=	=	5.00%	0.00%
Value	8.25%	1.25%	+/+	+/+	-/-	6.25%	2.00%
Quality	8.25%	1.25%	+/+	-/-	-/-	5.25%	1.00%
Low risk	7.00%	1.25%	+/+	-/-	+/+	4.25%	1.25%

Source: Robeco. September 2021. The value of your investments may fluctuate and estimated performance is no guarantee of future results.

MONETARY POLICY

CENTRAL BANKS' POST-PANDEMIC PLAYBOOK

Easy come, not so easy go

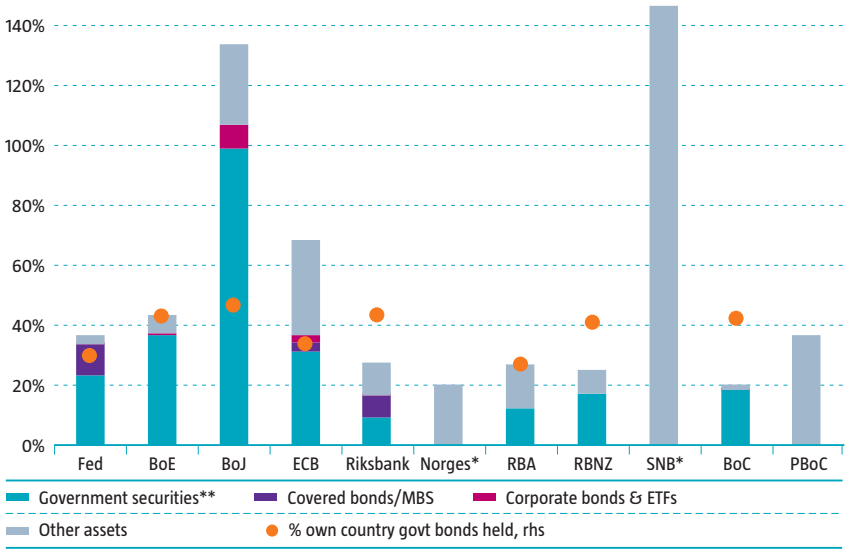
Central banks have thrown the proverbial kitchen sink at it in their fight to mitigate the economic impact of the Covid-19 pandemic. They cut policy rates to (or kept them below) zero, (re-)launched Quantitative Easing (QE) programs to support huge fiscal easing, and set up sizable lending programs for banks and even businesses. The result? The balance sheets of many central banks have ballooned to historic highs. But with vaccinations having brightened the public health outlook, financial markets' attention has now shifted to the process of exiting these stimulus measures.

In this article we set out our take on how this process might evolve, focusing primarily on the Federal Reserve, European Central Bank, Bank of Japan and Bank of England. We highlight key differences between these banks and assess the upside and downside risks to our central expectations. We also explore what central banks might do if a new recession or crisis were to emerge over the next five years. We conclude that it will not be easy for central banks to wind down their balance sheets.

From emergency stimulus back to (ab)normal

While the Bank of England and Bank of Canada have already announced reductions in the pace of their QE purchases and the Reserve Bank of New Zealand stopped buying bonds in July, most developed market central banks have not yet specified how or when they will end their QE-induced balance sheet expansion. Below we outline when we expect this to occur, but first, let's compare the size of selected central banks' balance sheets, including their holdings of government bonds.

Figure 1: Central bank assets as a percentage of GDP



Source: Bloomberg, central bank websites, Robeco. August 2021
* Other assets for Norges and SNB are mainly FX assets
** Includes regional and local government securities; for ECB includes agencies

Figure 1 shows that while the Swiss National Bank and Bank of Japan hold the highest proportion of assets relative to GDP, the composition of their holdings is quite different. The considerable size of the Swiss National Bank's balance sheet is due to its efforts to manage the Swiss franc, while the Bank of Japan's assets are dominated by government bond holdings, reflecting its yield curve control (YCC) policy. The ECB comes in third, with a large share of its assets consisting of loans to the banking sector. Notably, despite having a smaller overall asset base, some central banks, including the Bank of England and Bank of Canada, come close to the Bank of Japan's proportion of ownership of its sovereign bond market of above 40%.

Sequence: from QE tapering, to hiking rates, to balance sheet shrinkage?

The Fed's normalization process after the Global Financial Crisis offers a template for what could soon be in store. In December 2013 it started to taper its USD 85 bln monthly purchases by USD 10 bln following each Fed meeting, concluding the process in October 2014 before starting to raise policy rates in 2015. It did not start reducing the size of its balance sheet – in a tightly controlled manner – until 2018. Currently, the Fed is adding USD 80 bln in Treasuries and USD 40 bln in MBS to its balance sheet every month. If the Fed were to announce an initial reduction in its monthly purchases of USD 15 bln in November and make a similar reduction at each of its subsequent meetings, tapering could be concluded in October 2022.

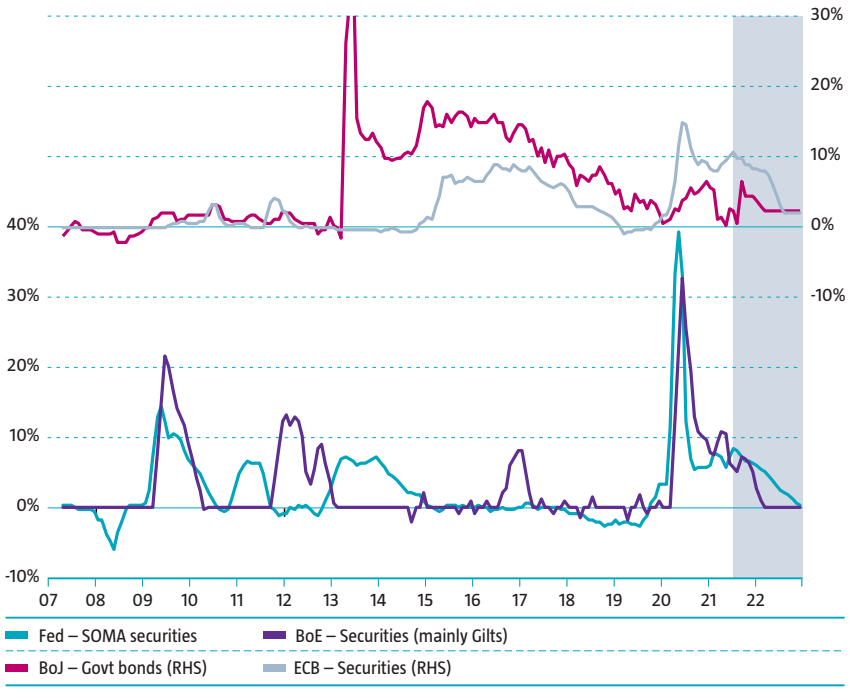
The ECB tapered its monthly net asset purchases, which were part of its 2015 Asset Purchase Program (APP), to zero between 2017-18. But due to the economic outlook worsening, in Q3 2019 it reintroduced net APP purchases, which are supposed to run until "shortly before" the start of rate hikes. Note that its net asset purchases under the pandemic emergency purchase program (PEPP), which was launched in March 2020, are expected to be phased out around the middle of 2022 – pandemic permitting.

The Bank of England's purchase programs target a total amount of QE stock to be held. This is in contrast to the weekly or monthly target amounts without end date at other central banks. The current target for the Bank of England's QE asset portfolio is GBP 895 bln. Our base case is for this total to be reached by the end of this year, which means that net monthly purchases – currently GBP 14 bln a month – would end in December 2021.

The Bank of Japan's QE program started as a reflationary and FX policy tool in 2010 but has since transformed into a supplementary tool to the YCC policy framework. The bonds it has purchased have mainly had maturities of under ten years, making the policy less distortionary for long-end bonds. In our base case we expect the Bank of Japan to continue with its current policy mix of YCC and QE over the coming years.

Figure 2 summarizes our central scenario for selected net asset purchases by the four central banks we discuss above.

Figure 2: Pace of net asset purchases as a percentage of GDP (3-month sum annualized)



Source: Bloomberg, Robeco. August 2021.

Much like the Federal Reserve and Bank of England, most of the remaining G10 central banks that have also engaged in sovereign QE are expected to stop increasing their holdings in the course of 2022. The exception may be the Reserve Bank of Australia given the role of QE in its own YCC policy.

Many central banks have signaled that, after tapering, they will maintain the size of their QE holdings for some time. Indeed, the ECB has said proceeds from maturing securities under PEPP will continue to be reinvested until "at least the end of 2023". Full reinvestment of its maturing APP holdings is intended "for an extended period of time past the date" when it starts raising rates.

The QE program that the Bank of England has implemented since the onset of the pandemic has increased its balance sheet to levels beyond what we believe the Monetary Policy Committee (MPC) sees as desirable. Indeed, the guidance given at the August 2021 MPC meeting was that the bank would consider stopping fully reinvesting maturing holdings when the Bank Rate had risen to at least 0.5%, and that it would consider actively selling Gilts when the Bank Rate reaches 1.0%.

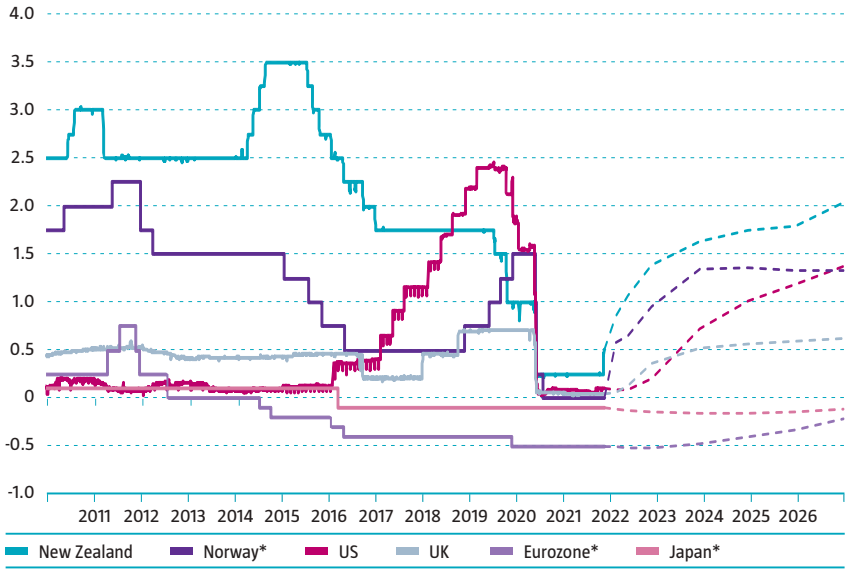
During the reduction of its balance sheet in 2018-19 the Fed managed the process by only reinvesting principal payments in excess of predefined monthly 'cap' levels. Fed comments suggest that its balance sheet was at its desired size at the end of 2019 (when it was 19% of GDP), although research from the St. Louis Fed suggests that the expected trend growth of currency in circulation would require a somewhat larger balance sheet size. If we assume the Fed starts shrinking its balance sheet in 2024, a year after initiating rate hikes, and aims for a size of modestly above 20% GDP, the reduction could be finished by 2028. This would require estimated monthly reductions of USD 35 bln, close to 2018-19 averages.

Notwithstanding the planned winding down of the Fed's corporate bond portfolio by the end of the year, central banks selling off their sovereign QE holdings before they reach maturity seems unlikely in the coming years – except for the Bank of England. But the option of active selling – which central banks would surely like to keep open just in case inflation were to structurally overshoot – is a good reason for them not to give in to calls to write off public debt holdings. Such a move would also be legally challenging, as well as having unintended consequences on public trust in fiat money. To be sure, this does not mean that many central bank balance sheets won't start shrinking before rate hiking cycles are well under way. Lending exposure to the banking sector could become smaller, with, for example, over EUR 1 trillion of the ECB's targeted longer-term refinancing operations repayments due in mid-2023. However, a meaningful reduction in QE holdings on central bank balance sheets is unlikely to occur until after the start of interest rate normalization.

Normalizing policy rates: when and to what levels?

While several emerging market central banks have already started to reverse last year's rate easing, G10 developed-market central banks have remained on hold. In fact, ignoring market expectations for typical early movers, such as Norges Bank and the Reserve Bank of New Zealand, the markets are generally not pricing in a first rate hike until H2 2022 for the Federal Reserve and Bank of England, late 2023 for the ECB, or at all within the next five years for the Bank of Japan (see Figure 3).

Figure 3: Effective policy rates (%) and market-implied path over the next five years



Source: Bloomberg, Robeco calculations. August 2021.
* Actual policy rates (and implied forwards)

Perhaps more importantly for bond yields is where policy rates are going to peak in any upcoming rate normalization cycle. Two things matter in this respect. First, the cyclical inflation outlook, the associated need for policy changes, and whether a central bank would prefer to implement such changes solely via rate hikes or in combination with shrinking its balance sheet. Second, the perceived 'neutral' rate.[1] Table 1 shows nominal neutral policy rate estimates for the Federal Reserve, ECB, Bank of England and Bank of Japan based on inflation expectations and real neutral rate estimates discounted by the markets and calculated by official institutions.

1. We define the 'neutral' (sometimes called 'equilibrium' or 'natural') rate as the policy rate at which monetary (interest rate) policy is considered neither accommodative nor contractionary, i.e. neither stoking nor slowing economic growth.

Table 1: Range of neutral policy rate estimates for selected central banks

	Key policy rate (%)	Market-implied real neutral rate (%)	Official real neutral rate estimate (%)	Long-term inflation expectations (%)	Nominal neutral rate range (%)
Fed	0.10	-0.4	0.50	2.00	1.60 to 2.50
ECB	-0.50	-1.7	-0.50*	1.75	0.05 to 1.25
BoE	0.10	-1.3	0.25	2.00	0.70 to 2.25
BoJ	-0.10	-0.3	-0.50	0.25	-0.25 to -0.05

Note: Market-implied neutral rate estimates derived from yield curve shape and OIS forwards * Midpoint range
Source: Bloomberg, IMF, Fed, ECB, BoJ, BoE. August 2021.

In our central scenario, policy rate peaks in the upcoming normalization cycles are likely to be in the lower half of the range of neutral policy rate estimates for the Federal Reserve and Bank of England and below that estimated for the ECB. In this scenario, consumer price inflation pressures do not spiral out of control, so do not warrant a contractionary policy rate stance (in other words, actual policy rates exceeding the neutral rate). Our cautious stance on neutral rate ranges is related to the high indebtedness throughout economies.

Since the June 2021 FOMC meeting we have known that the Fed has maintained a low tolerance for inflation persistently overshooting its 2% target. What has changed in its new policy regime is its attitude towards conditions that could lead to an inflation overshoot in the future. Rate hikes should be triggered by inflation rising above 2%, not by low unemployment. Lagging employment creation could be a reason to delay rates hikes, though. Updated estimates of Non-Accelerating Inflation Rate of Unemployment – a variable of interest to policy makers as it provides an estimate of the degree of labor market slack in the economy – suggest unemployment should be around 4%, and 6% for minority groups, before rates are hiked. These conditions could be met in early 2023.

'Rate hikes should be triggered by inflation rising above 2%, not by low unemployment'

Fed communication since June suggests that inflation persisting markedly above 2% could lead to faster normalization. Wage growth will probably play a crucial role here. So far wages have remained contained, despite difficulties in filling vacancies flagged by producer surveys. The main risk for a delayed onset of rate hikes would be a delay in reducing unemployment, for example as a consequence of new virus mutations. Could the Fed funds rate overshoot neutral? Yes, but history points to a low probability of it doing so significantly. In both 1995 and 2000 there was an overshoot of 125 bps, falling to 25 bps in 2006. In 2018 there was an undershoot of 50 bps.

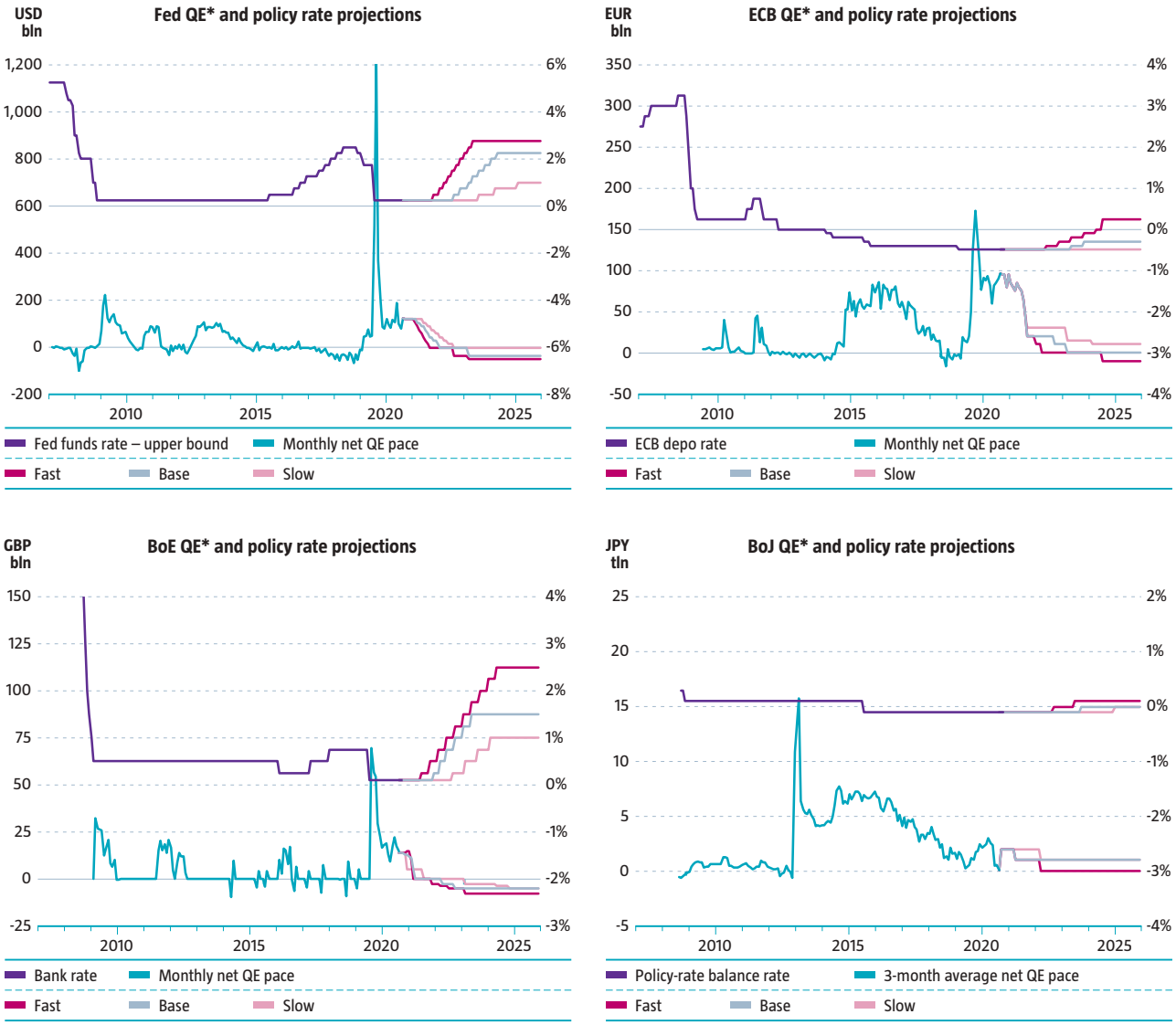
As for the ECB's rate normalization process, the current forward guidance stipulates that the deposit rate of -0.50% is not forecast to be hiked until inflation is expected to be firmly back in line with the new 2% medium-term target. Our base case is that such conditions will not be met before 2024. This implies that net APP purchases are likely to run for most of 2023. However, if underlying inflation rises sooner, the end of net APP purchases could be brought forward to the end 2022 and a first rate hike to early 2023. Under this scenario we still struggle to see the policy rate peak in the upcoming cycle ending up within the 0.05-1.25% range of nominal neutral rate estimates. What's more, we still ascribe a significant probability to a scenario in which expected inflation remains below target for longer, the ECB refrains from rate hikes and, consequently, net APP purchases continue for most, if not all, of the next five years.

We expect the Bank of England to tighten more aggressively. The recent guidance on the balance sheet from the MPC implies, in our view, that the peak bank rate will be lower than the Bank's own official nominal 'neutral' rate forecast. Under current guidance, the MPC would consider tightening policy if there are upside risks to inflation based on clear evidence of spare capacity being reduced beyond the levels projected by the MPC. That said, the pandemic and the subsequent strong, but erratic, recovery makes it difficult to analyze indicators such as spare capacity and wages. Still, in our base case we expect the UK to experience a period of relatively high inflation this year and into H1 2022 driven by commodity-price base effects and supply bottlenecks. We expect it to fall back subsequently to pre-pandemic levels. We believe growth and inflation back at pre-pandemic levels will be more than enough for the MPC to start preparing the markets for a first rate hike in Q4 2022. However, a limited reduction in spare capacity, or a realization of government plans to run tighter fiscal policy, might make the Bank of England more inclined to move more slowly than our base case.

Our base case is that the Bank of Japan will be on auto pilot in terms of YCC supported by QE. The pace of QE and the ultimate size of its balance sheet therefore becomes an outcome of YCC policy changes rather than a target in itself. We envisage the Bank of Japan changing some elements of its YCC policy, like the targeted maturities for purchases and yield ranges, which in turn define its potential QE purchases.

Figure 4 shows our baseline trajectories and scenarios for slower and faster net asset purchases and policy rate normalization in the US, Eurozone, UK and Japan.

Figure 4: Three scenarios for policy rates and net asset purchases of selected central banks



Source: Bloomberg, Fed, ECB, BoE, BoJ, Robeco. August 2021.

What will central banks do in the next recession?

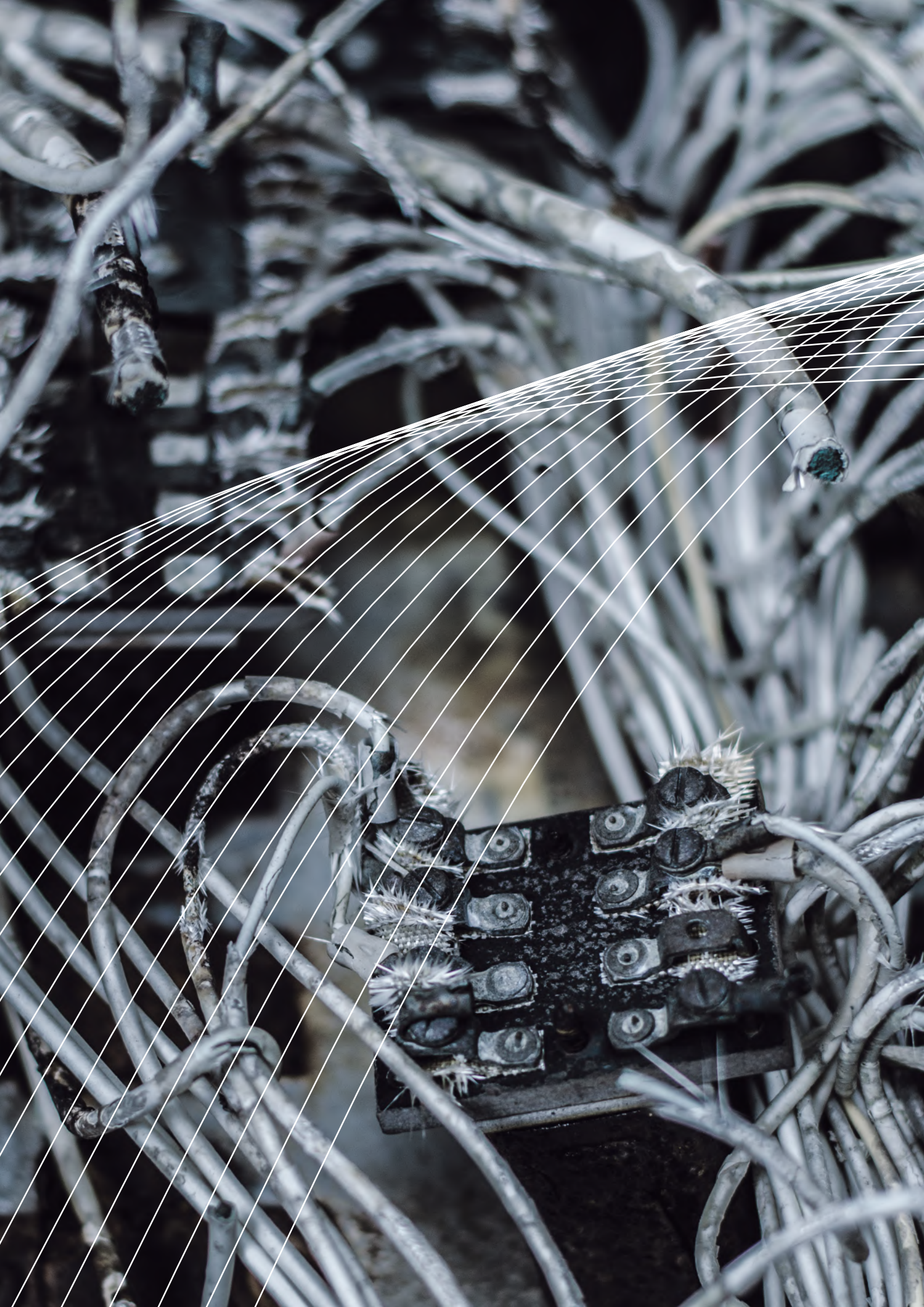
What might central banks do if a new crisis were to emerge over the next five years? From the response to the Covid-19 shock we can draw some conclusions about future central bank action. Forward guidance, large-scale asset purchases, generous lending programs and macroprudential adjustments have all became 'normal' components of the central bank toolbox. It's also become evident that lending criteria have changed – central banks provided liquidity to corporates at the lower end of the rating spectrum, either via the capital markets or lending programs. Some central banks, such as the Reserve Bank of New Zealand and Bank of England, also contemplated implementing negative rates. It was notable, however, that central banks that were already running negative rates opted not to cut them further. The 'reversal' rate at which further rate cuts would become counterproductive is clearly a concern. Another key feature of the monetary support during the pandemic was its close interplay with fiscal policy, marking a regime shift. This regime shift can be explained by the humanitarian and health aspects of the crisis, lessons learnt from austerity after the Global Financial Crisis, and increased economic inequality within countries. Against this backdrop, the risk of *fiscal dominance* – where a central bank's ability to control inflation could be constrained – has increased.

So what might central banks do in a subsequent recession? First, those that have been able to hike rates will quickly cut them back to zero. Second, some, including the Reserve Bank of New Zealand and Bank of England, will probably follow the examples of the ECB, Bank of Japan and Swiss National Bank and cut policy rates to slightly below zero. Third, governments will yet again resort to running large budget deficits, supported by central bank bond purchase programs. Fourth, we would expect renewed and/or bolder private sector debt purchases, perhaps with broader adoption of equity ETF purchases like the Bank of Japan undertook. Finally, we foresee even larger and more generous loan programs to banks and (via banks) to the non-financial private sector. We don't expect banks' intermediary function to be compromised if central bank digital currencies are implemented in the meantime.

Conclusion

So what in fact is the post-pandemic playbook for central banks? Our central scenario is that most will aim to unwind many of the policies they enacted during the pandemic, but that they will struggle to do so in full. Indeed, many developed market central banks will maintain their large balance sheets and low policy rates for years, despite some normalization. Assuming that fears of an inflationary regime change recede, our base case is that QE tapering will end next year (except for the Bank of Japan and ECB), most central banks start hiking rates in early 2023, and meaningful reduction in QE holdings – the Bank of England aside – will not start before late 2023. Moreover, in our central scenario the peaks in upcoming policy rate hike cycles are expected to be in the lower half of the ranges of 'neutral' rate estimates for the Federal Reserve and Bank of England and below that range for the ECB. Factors that could prompt central banks to take action earlier, resulting in higher policy rate peaks, include the emergence of a wage/price spiral or new fiscal policy surprises.

The pandemic has taught us that running a very loose fiscal policy supported by monetary policy is no longer controversial. This means that in the next recession we will move further towards the realm of fiscal dominance – heightening the risk of an eventual inflationary accident. What's more, we predict even larger easy lending programs to banks and the non-financial private sector. While recent experience suggests that moving policy rates deeper into negative territory is not the desired policy path, some central banks, including the Reserve Bank of New Zealand and Bank of England, could go modestly negative. ■



CRYPTOCURRENCIES

WHAT'S SO CRYPTIC ABOUT CRYPTOCURRENCIES?

Bitcoin and its price changes make headlines every day. Enthusiasts applaud the price increases while no-coiners shout victory whenever the price falls. These constant and often opposite news flows make it hard to keep track of what are noteworthy developments and what is just crypto-noise. Our focus here is of a strategic nature and aims to answer several of the bigger, longer-term questions around the cryptocurrency theme: Is bitcoin really digital gold? How sustainable are cryptocurrencies? And will they change the world as we know it?

Is bitcoin digital gold?

Bitcoin was the first cryptocurrency, and still represents half the value of the entire cryptocurrency market. The narrative of bitcoin being a store of value in the form of digital gold is increasingly gaining credence. A growing number of bitcoin proponents and, more importantly, bitcoin investors, see bitcoin as 'superior gold.' Even Fed Chairman Jerome Powell recently called bitcoin "essentially a substitute for gold rather than for the dollar."

Why would bitcoin qualify as digital gold? Just like gold, bitcoin is scarce, durable, portable, and easily transactable. What it lacks relative to gold, of course, is a physical presence and that long history of consensus on it being a reliable store of value. As digital gold, bitcoin has monetary value. The discussion about bitcoin's lack of intrinsic value is therefore less relevant, although this lack of intrinsic value may render it worthless if confidence tanks. As with diamonds, art, stamps, gold and, let's not forget, the US dollar, bitcoin does not provide cash flows. Yet all these asset classes have monetary value and are considered a store of value, even if their prices are not perfectly correlated, and correlation with inflation is low and dependent on the investment horizon.[1]

1. See Martin (2010) for a detailed framework to analyze inflation-hedging properties of a variety of asset classes.

Critics of the store-of-value aspect of bitcoin argue that its volatility is too high and correlation with inflation is far from perfect. How does this measure up against gold? Figure 1 shows that gold's real value has increased substantially since 1971, the end of the gold standard. But, just as with bitcoin, there is no compelling argument why gold should rise in real terms going forward, as there are no cash flows and its industrial use is limited. The gold price fluctuates about as much as a stock market index. Therefore, it's a risky short-term store of value, even though in the long run it has proven to keep its purchasing power.

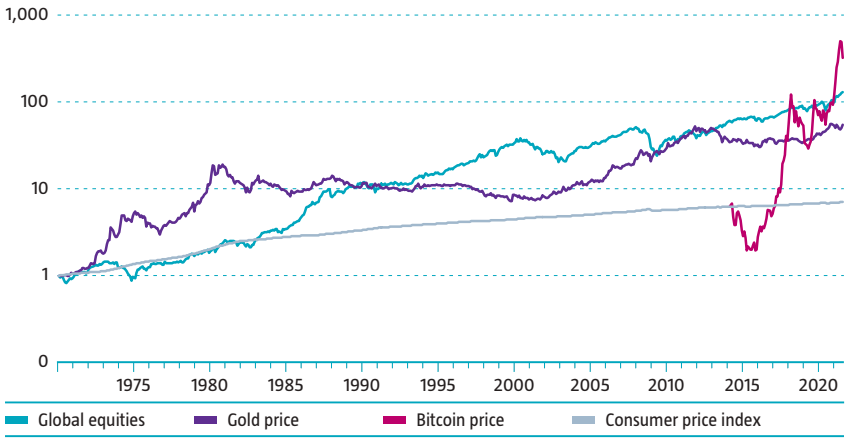
Measured in gold, a Roman soldier 2000 years ago earned about the same wage as a US soldier today.[2] Although bitcoin's volatility is markedly higher, which in itself is undesirable, it is a mistake to think that a store of value ought to be riskless.[3] The gold price went down from over USD 670 in September 1980 and rose back to that level in 2007, losing about 60% of purchasing power in the meantime. And, let's not forget that cash dollars, another popular store of value, lost about 50% of real value between 1969 and 1979. If bitcoin were banned by governments, that would affect it as a store of value. Here too lie parallels with physical gold, which was banned between 1934 and 1964 in the US.

2. See Erb and Harvey (2013).

3. See Nigro (2021).

Given these features, we conclude that bitcoin has the potential to become an established store of value like gold is. But what are its return characteristics?

Figure 1: The price of equities, gold, and bitcoin versus inflation



Source: Robeco, Refinitiv. Global equities is the MSCI World (code: MSWRLD$(RI)), Gold price (code: GOLDBLN), Bitcoin price (code: BTCTOU$), and Consumer Price Index (code: USCONPRCE). Period: December 1969 to 30 June 2021.

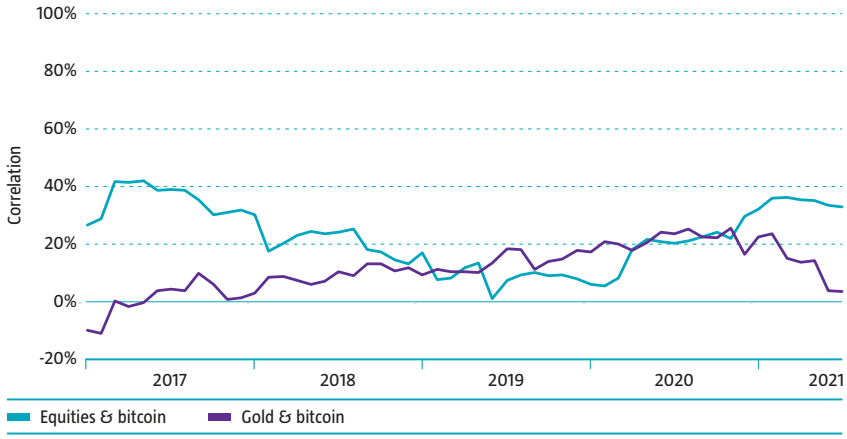
Bitcoin's return characteristics

Bitcoin's realized return since it became a relatively easily tradable asset from 31 December 2013 until 30 June 2021 is an eye-popping 67% per year. This compares to 10.8% for the MSCI World Index. Realized return-wise, bitcoin is in a league of its own. Its average annualized realized volatility is a staggering 84%, more than five times as much as equities and gold. Despite its unparalleled amount of risk, bitcoin's realized return is so extraordinary that its Sharpe ratio of 0.8 has been extremely high. To put this in perspective, an investor in the global market portfolio would have earned a Sharpe ratio of 0.36 since 1960, making that of bitcoin extremely attractive.[4]

4. Source: Doeswijk, Lam, and Swinkels (2020)

A straightforward way to judge whether bitcoin exhibits unique performance behavior relative to other asset classes is by looking at correlation, which since January 2014 has been positive but close to zero (see Figure 2). Hence, adding bitcoin would have offered clear diversification benefits. Over this period, bitcoin shows low correlation to gold as well, reinforcing the narrative that it is a complementary store of value rather than a direct substitute for gold.

Figure 2: Correlation of bitcoin with equities and gold



Source: Robeco, Refinitiv. 36-month rolling correlation between the returns on global equities (code: MSWRLD$(RI)) and bitcoin (code: BTCTOU$) and gold (code: GOLDBLN) and bitcoin. Period: 31 December 2016 to 30 June 2021.

Bitcoin's market cap is roughly USD 1 trillion, about half that of the cryptocurrency market. How does this compare with the market cap of other asset classes? Estimates of physical gold held for investment purposes are about USD 3 trillion, which is comparable to that of the global high yield bond market. The market cap of global equities conversely is roughly USD 66 trillion.

One can switch efficiently between bitcoin and fiat currency, such as the US dollar, which is important because bitcoin is traded to a large extent against crypto assets. CoinMarketCap, a leading price-tracking website for crypto assets, shows bitcoin trading volumes of over USD 50 billion on a wide array of exchanges for almost every day in 2021. In addition, CME, the market leader in bitcoin futures trading, recorded an average daily bitcoin trading value of USD 1 billion in December 2020. This means that bitcoin is reasonably liquid. As with other asset classes such as high yield bonds, however, this liquidity could dry up quickly in periods of stress.

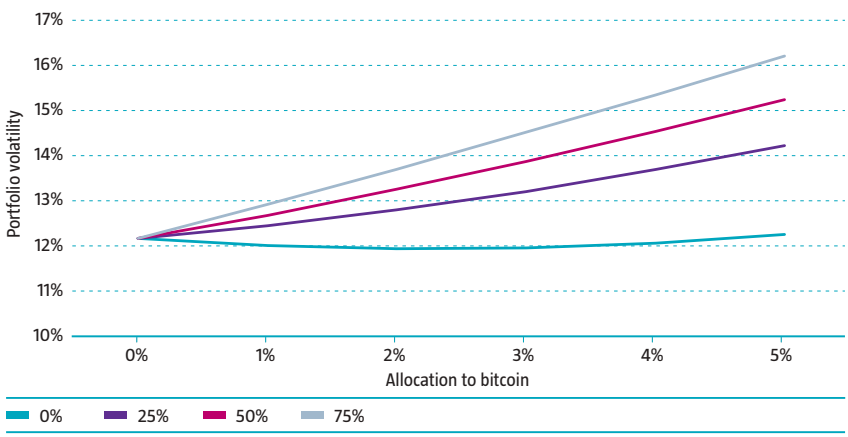
'Bitcoin is reasonably liquid (...), however, this liquidity could dry up quickly in periods of stress'

What strategic asset allocation weight is optimal?

A neutral starting point for any investor's strategic asset allocation may be the weight of the asset class in the global market portfolio. That would mean an allocation of about 0.5%. However, an investor can also decide its optimal asset allocation using mean-variance optimization. This is typically performed using historical return data. Its stellar historical performance would in that case result in an optimal allocation being a portfolio consisting entirely of bitcoin. However, most strategic asset allocators would build in forward-looking assumptions to create a portfolio with better ex-ante characteristics.

To illustrate this, we limit ourselves to the two main conventional asset classes, equities and bonds. Focusing first on the portfolio risk dimension alone, let us assume that the volatility of equities equals 20%, bonds 5%, and bitcoin 100%. The base portfolio has 60% in equities and 40% in bonds. Figure 3 shows the effect on portfolio volatility of replacing 0-5% of the equity portfolio with bitcoin. We consider four scenarios, with correlation of bitcoin with equities of 0%, 25%, 50% and 75%. Remember from Figure 2 that the empirical correlation is in the range 0-40%. With a zero correlation, an allocation of 4% to bitcoin gives a portfolio volatility that is still below that of the 60/40 allocation. With a 25% correlation, a 1% allocation to bitcoin already has a higher volatility than the base portfolio. A 5% allocation to bitcoin increases portfolio risk regardless of the correlation assumptions made. Portfolio risk of a 5% allocation increases from 12.2% to 16.2% with a 75% correlation.

Figure 3: Portfolio volatility for different allocations to bitcoin



Source: Robeco. Simulated portfolio volatility of strategic allocation of 60% equities and 40% bonds, with the bitcoin allocation replacing equities for 0-5% on the horizontal axis. Lines represent four different levels of correlation between bitcoin and equities.

Without a strong conviction on the future return of bitcoin ownership, and disregarding ESG aspects of the asset class for now, a strategic allocation ranging between 0-2% seems optimal from a portfolio risk perspective. In the next section, we discuss the ESG aspects of bitcoin, as well as that of other innovative cryptocurrencies that could change the finance ecosystem entirely.

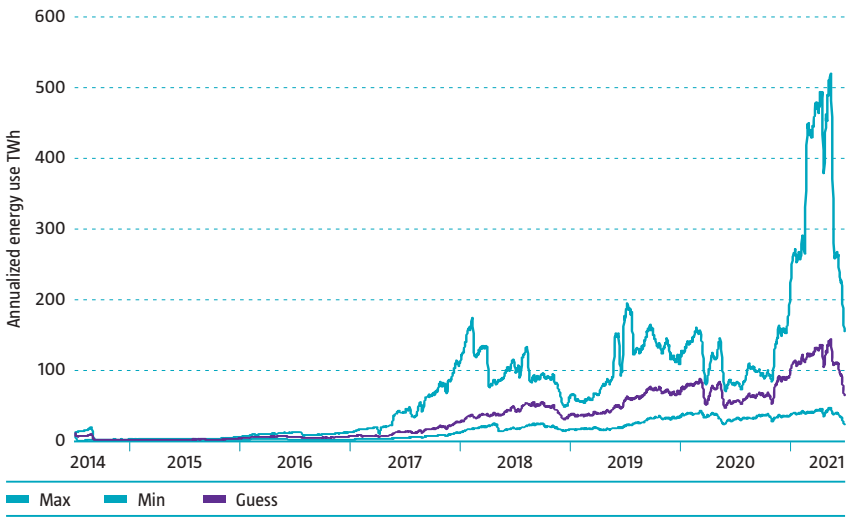
The sustainability controversy

It is good practice for the sustainable investor to carefully examine the ESG aspects of each potential investment, and cryptocurrencies are no exception. Of all the cryptocurrencies, bitcoin grapples with clear sustainability challenges due to its increasing energy consumption, which has led to heated debates between bitcoin evangelists and no-coiners. However, government action, regulations, and further innovation of cryptofinance may improve the sustainability profile of the broader cryptocurrencies space in the future.

Environmental

The computational power required for crypto networks to function consumes a lot of energy, specifically when the so-called proof-of-work (PoW) process is used to verify transactions and as a reward new coins are mined. Figure 4 shows that the estimated annualized consumption of energy used for bitcoin mining surpassed 151 TWh in May 2021, up from 80 TWh a year earlier. This is the same amount of energy that a medium-sized country uses in a year. Higher bitcoin prices attract more so-called 'hash-power' – the combined computational power of a cryptocurrency network or of an individual mining rig on that network – leading to a further increase in electricity consumption. This is a feature of the decentralized network and keeps the system secure. Unfortunately, more efficient processors do not help, as the complexity of the task will increase to ensure that it will take about 10 minutes before a new block is added to the bitcoin blockchain. Figure 4 also shows the uncertainty around the best guess how much energy the bitcoin network consumes. More transparency about its carbon footprint is essential for it to become a sustainable asset.

Figure 4: Estimated bitcoin electricity consumption



Source: Cambridge Bitcoin Electricity Consumption Index, Robeco.

How, then, do we know how much is 'too' much in terms of energy consumption and emissions? It may be useful to compare gold mining's annual carbon emissions, which are actually on a par with those of bitcoin at the moment.[5]

That said, the mining sector is in the process of curbing its carbon emissions, and we count on the crypto mining community to follow this example soon, driven by crypto innovation as well political and regulatory action. Alternative technologies to the PoW process that bitcoin relies on are on the way. For example, Ethereum is expected to switch to proof of stake (PoS), which will substantially reduce the required energy to keep the blockchain safe.

5. Source: https://www.gold.org/goldhub/gold-focus/2021/06/gold-and-crypto-mining-power-and-emissions

Social

Bitcoin and cryptocurrencies have the potential to support the SDG 'No poverty' in the future, depending on how the ecosystem further develops. This may be achieved by democratizing finance and enabling access to finance to the excluded poor.[6] Especially in countries with less developed financial systems, central banks that lack credibility or unstable political situations, cryptocurrencies already partially fulfill the role of the banking system. There is plenty of potential for further innovation, which will reduce the need for trustworthy financial intermediaries by using decentralized finance (DeFi).

6. See Harvey, Ramachandran, and Santoro (2021) for an overview on the social promises of DeFi.

Concerns exist about cryptocurrency's near-anonymity and how it often facilitates criminal behaviors. There are numerous examples of crypto scams.[7] Ransomware attacks often demand payment in cryptocurrencies, illustrating its usefulness to international cybercriminals seeking to extort large sums of money in an efficient and easily concealed manner. However, in the case of the recent Colonial Pipeline, the authorities were able to recover more than half of the ransom, in part because transactions on the main blockchains are by construction transparent and therefore forever traceable.[8]

7. See Zetzsche, Buckley, Arner, and Föhr (2019) and Xia et al. (2020) for analyses of cryptocurrency scams.

8. See the Financial Times article (7 June 2021) "US says it recovered large portion of Colonial Pipeline ransom": https://www.ft.com/content/43dab2dc-a7aa-4102-9779-d1b6ced2985b

It is also difficult to determine the extent to which cryptocurrencies are used for money laundering and illicit activities, although estimates suggest that the percentage of the total trading volume is relatively low.[9] While cryptocurrencies have been associated with criminal activities, we should not forget that cash, especially high-denominated banknotes, is also used frequently by criminals, and that its legitimate users of cash are not held accountable because of that either.

9. Source: https://blog.chainalysis.com/reports/2021-crypto-crime-report-intro-ransomware-scams-darknet-markets

Governance

The decentralized nature of bitcoin and cryptocurrencies is their defining feature. Decentralization means that there is no benevolent or malicious dictator that can force their rules. There needs to be consensus among network participants, otherwise so-called forks appear. This shared-responsibility feature is a strength, though can also lead to nobody taking responsibility. At this moment, transparency and accountability of cryptocurrencies are differently organized than most corporate governance charters that investors use today. Therefore, a separate governance policy may be needed for cryptocurrency investments.

Advocates of cryptocurrencies also voice concerns of distrust in authorities and regulators. While this may occasionally be valid, one can look with similar skepticism at certain cryptocurrencies. For example, Tether, a so-called stablecoin because it is pegged to the US dollar, facilitates a large part of cryptocurrency trading. It claims to be fully backed by USD cash, but since it is unregulated it is difficult to verify whether this is really the case. Improved disclosure and independent audits may be necessary for it to gain wider trust among the finance community. It is also possible that central banks will pick up this role and introduce digital currencies (CBDCs) that compete with stablecoins to facilitate cryptocurrency transactions.

How cryptocurrencies may change the world

While bitcoin is increasingly considered as a store of value, a sort of digital gold, and as a payment method, many players are more enthusiastic about the general, publicly available distributed ledger technology – or blockchain. This is the true underlying innovation that bitcoin brought to the world.[10]

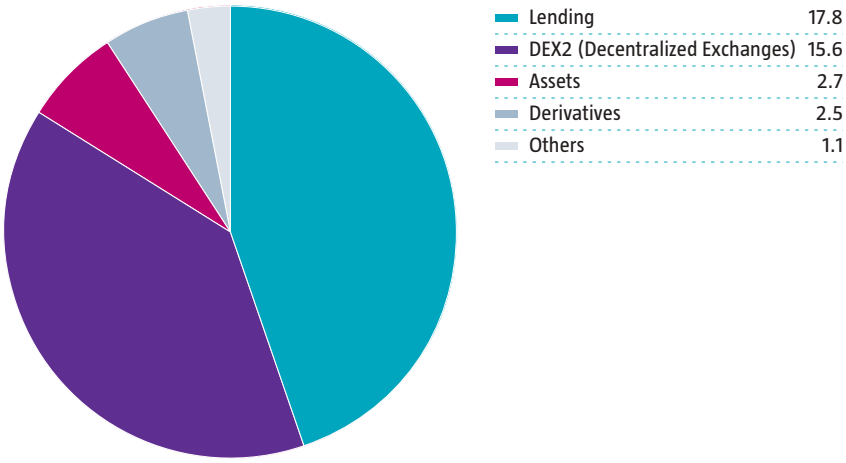
10. See Lemmens, Van Voorst, and Burema (2021a) for a more detailed discussion on the coming wave of blockchain-led disruption.

Put simply, the blockchain technology is a record of transactions that does not require an external authority to validate the authenticity and integrity of data. This blockchain technology is now used to create an ecosystem of mostly decentralized protocols that aim to provide many types of financial services in a decentralized, non-governed way. This trend is typically referred to as 'decentralized finance', or DeFi for short.

DeFi players are trying to recreate existing traditional financial services, like lending, exchanges, and insurance, in a decentralized way using blockchain. Rather than using the bitcoin blockchain, DeFi applications are typically based on the Ethereum blockchain technology. Ethereum is the world's second largest cryptocurrency after bitcoin. However, we are still in the very early stages of DeFi, which currently only represents less than 5% of the total market cap of cryptocurrencies. As Figure 5 shows, the bulk of value locked in DeFi is currently in decentralized lending initiatives and decentralized exchanges. But all financial services could potentially be disrupted by DeFi, including asset management, derivatives, and insurance.[11]

11. See Cong and Xiao (2021) for an overview of cryptofinance.

Figure 5: There is currently USD 40 billion in total value locked in DeFi



Source: DeFi Pulse, Robeco. Data as of March 2021. Locked value in USD billion.

Lending and borrowing is one of the key services provided by the financial industry, and typically requires a trusted intermediary. DeFi aims to disrupt this area by using smart contracts and a decentralized system of processing and validation, so lending without a bank. Compound is currently the largest DeFi lending protocol. Through Compound, lenders create a liquidity pool in which interest rates are determined depending on supply and demand. Both lenders and borrowers can exit the loan at any time.

Most cryptocurrency exchanges, such as Coinbase and Binance, are centralized just like existing stock exchanges. These exchanges ensure and oversee the transfer of assets from one party to the other. Transactions made through decentralized exchanges (DEXes) are administered via a blockchain. This essentially removes third parties, which saves time and costs. Uniswap, SushiSwap and Curve Finance are the most prominent DEXes currently in operation.

On a smart contract platform like Ethereum, anything can be tokenized. For example, one can tokenize company shares or residential properties.[12] But tokenization is not limited to assets, and media content such as digital pictures has also been tokenized. The result is called an NFT, non-fungible token, which are 'one-of-a-kind' digital assets. These digital assets can be traded. NFTs will probably have huge, positive implications for IP protection and royalty collection in the art and media segment. Another potential use of NFTs is for digital identity purposes. In an increasingly digitalized world, it seems inevitable that such digital identification services will become critical. Since NFTs are as unique as one's identity, they can literally represent a person.

12. See Harvey, Ramachandran, and Santoro (2021) for an overview on the social promises of DeFi.

Digital innovation has disrupted major industries from retail commerce, media to hospitality. To disrupt the financial industry, the underlying structures need to be replaced to create business models that can effectively compete with incumbent players, because the challengers can bring easier, cheaper, and faster financial services to more people. Although fintech newcomers have started to eat into the market shares of incumbent financial services providers, the underlying business models have so far not truly been challenged. Big banks still dominate the competitive landscape. They are regulated, have access to deposit insurance systems, and are brands trusted to safeguard money. This pull towards the largest, most trusted entities strengthens big bank moats and helps explain why many fintech firms end up partnering with incumbents instead of trying to displace them.

As DeFi remains in a very nascent stage, we are curious to see how regulators across the world will cope with the challenges it brings to the current financial regulatory environment. With a clearer framework for cryptocurrencies, the adoption of DeFi might accelerate further. A potential game changer would be central banks themselves issuing digital currencies, which could reduce the need for traditional banks as intermediators. However, this is far from certain, as privacy and know-your-customer due diligence activities remain important in today's regulatory environment.[13]

13. See Lemmens, Van Voorst, and Burema (2021b) for a more detailed perspective on central bank digital currencies.

Conclusion

Despite its high volatility, bitcoin's narrative is changing from a digital currency to a store of value. It is referred to as digital gold, and, as we have seen, it shares many important characteristics of physical gold. However, its price pattern shows that it is not a close substitute for gold. Without a strong view on the future direction of bitcoin's price, an allocation of up to 2% would seem reasonable from a portfolio risk perspective, were it not for its sustainability profile.

While all cryptocurrencies face challenges in each of ESG dimension, Bitcoin's significant energy use and the lack of reliable information on the carbon footprint of bitcoin mining in particular currently make it a less viable asset for the sustainable investor. Fortunately, cryptocurrencies are innovating. The second largest cryptocurrency Ethereum, which is the basis for much financial innovation, is in the process of switching to PoS, significantly reducing its carbon footprint.

There are two important implications for investors with regards to cryptocurrencies. First, investors can tilt their conventional portfolios towards the winners of these new financial technologies. For example, there is a growing number of listed companies that enable the trading, managing, and storage of digital assets. Secondly, investing in cryptocurrencies and digital assets requires a new infrastructure to manage these assets. In order not to miss out on the potential benefits of early adapters, investors may want to prepare their asset management operations teams and processes, such that they are ready to invest in tokenized assets when interesting opportunities come to the market.

So in spite of their environmental challenges, we see a bright future for cryptocurrencies. They may well transform the financial industry into a more inclusive and efficient system, particularly for countries with less developed financial systems, unstable political situations, or central banks with low credibility. Democratizing finance with less or no need for financial intermediaries is still at the heart of cryptocurrencies, by employing transparent and verifiable processes thanks to the use of blockchain. ■

4

Expected returns 2022-2026

Macro

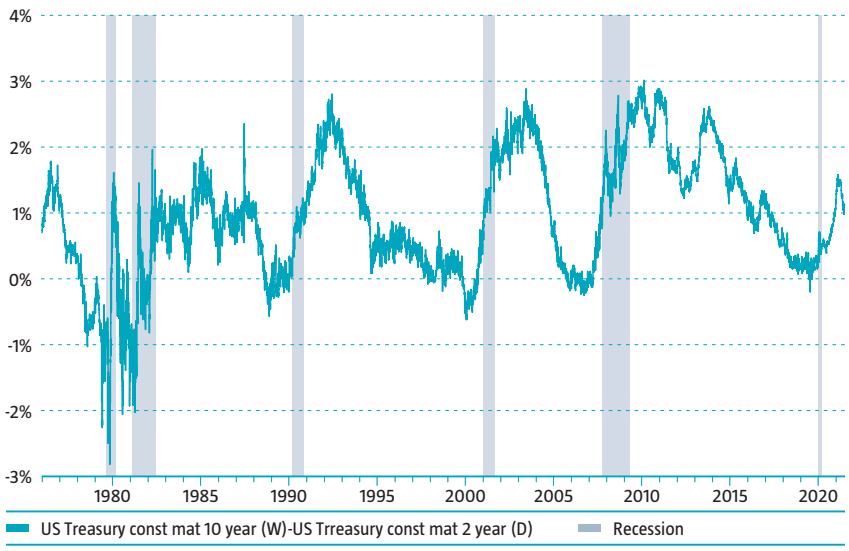
The Covid-19 recession, which according to the National Bureau of Economic Research (NBER) only lasted two months in the US, has been unlike other recessions.[1] It has been atypical not only because of its short duration and considerable depth, but also because of the moderate disinflation we have seen compared with in other recessions recognized by the NBER.

1. As a matter of fact, NBER abandoned the traditional definition of recession as at least two quarters of consecutive contraction in economic activity in response to the Covid crisis.

The absence of a steep cyclical drop in core inflation is because the 2020 recession was not caused by the usual culprit: excess central bank tightening in an effort to cool an overheating economy. This time, the global economy was confronted with exogenous, simultaneous negative supply and demand shocks. The lack of an unwinding of private sector excesses (unlike the large-scale deleveraging in the aftermath of the great financial crisis) and the massive coordinated monetary and fiscal impulses resulted in a stop-start dynamic for the global economy last year.

With the potential excesses built up during the Great Expansion – the record-long US economic expansion from 2009-2019 – still lingering in today's financial economy, some even doubt if a genuine new economic expansion has started or whether the Great Expansion is in fact still going on. Although the excesses of the previous expansion have clearly not been worked off, the US Treasury yield curve inversion in September 2019 and the NBER decreeing that a mini-recession began in Q1 last year are indications that a new business cycle did indeed begin during 2020. In the following chart we can see that historically, inversions of the yield curve have preceded recessions in the US.

Figure 4.1: Yield curve and recessions



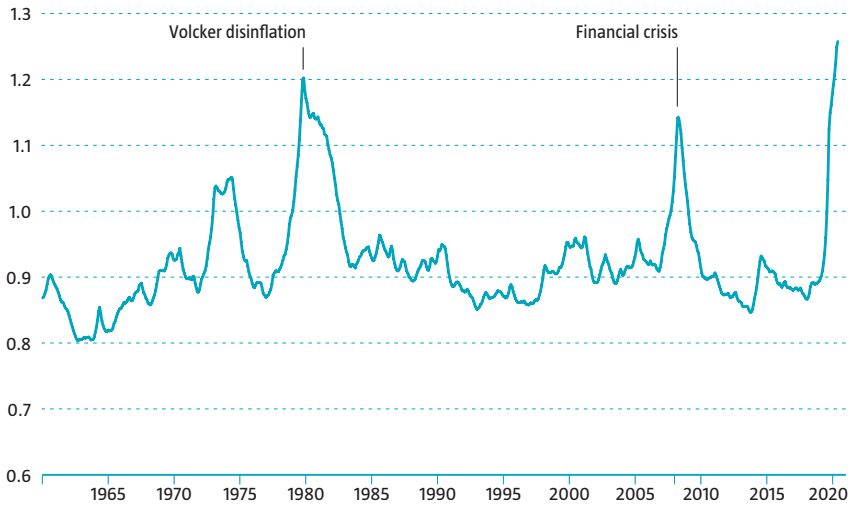
Source: Refinitiv Datastream, Robeco. 8 August 2021.

We may have clarity that a new cycle has begun, but the dust is far from settled on how it will evolve. "Forecasters have a lot to be humble about. It's a highly uncertain business." This remark by Fed Chair Jerome Powell during his July 2021 appearance before the House of Representatives hints at the difficulties inherent in trying to pinpoint the various scenarios that could unfold over the next five years.

Of course, forecasting has always been an uncertain business. However, measures of macroeconomic uncertainty have surged during the pandemic. One such measure developed by Jurado et al. (2015)[2] shows we are in the most uncertain macroeconomic environment since the 1960s, surpassing the start of the Volcker disinflation era and the great financial crisis.

2. They present a better econometric estimate than popular uncertainty measures that typically use, for example, stock market volatility. The metric has a lower frequency than regular volatility and dispersion indices, but once uncertainty episodes do appear they are larger, more persistent and more correlated with real activity.

Figure 4.2: Record-high economic uncertainty



Source: Updated from Jurado, Ludvigson, and Ng (2015) "Measuring Uncertainty".

The lack of predictability stems from the fact that the post-Covid economy is being driven not solely by economic fundamentals, but also by the interplay between the public health backdrop and the economy. This interplay poses a trilemma for policymakers, who are looking to solve the health crisis, create a self-sustaining recovery and maintain personal freedom. Although the distribution of effective vaccines during 2021 has already greatly eased this trilemma by weakening the link between Covid cases and hospitalizations, the all-clear signal has not yet been given, especially for emerging markets. Battles may have been won, but the war on Covid is not over.

And yet looking ahead there is reason for optimism as we know that economic volatility (and in the same vein macroeconomic uncertainty) is mean reverting. Let's also cherish the fact that some elements that contributed to macroeconomic uncertainty around this time last year have already subsided: massive crisis relief measures have proven quite effective in preventing a liquidity vacuum and kickstarting a recovery. The earlier-than-expected arrival of effective vaccines by November represented an astounding scientific success. Broad populations' willingness to be vaccinated has risen dramatically, which has meant that effective vaccines have at least eased the intensity of lockdowns, and as such macroeconomic volatility.

The dust over the global economy from the Covid-19 pandemic will therefore settle; the question is how it will do so. In considering this question, we believe there are four key determinants that will drive potential economic and inflation outcomes over the next five years. The ebb and flow of these factors will create different scenarios depending on their path and interaction with each other.

The four factors are as follows. First, the legacy of the shock of the pandemic in the form of debt levels, economic scarring, risk aversion and (dis)trust. Second, the evolution of the policy trilemma of solving the health crisis, maintaining economic growth and guaranteeing personal freedoms. Third, the effectiveness of the interaction between fiscal and monetary policy during this business cycle. Last, geopolitics.

4.1 Building block 1
The legacy: economies suffering from long Covid

Debt, debt everywhere

No doubt economic historians will fill bookshelves with their reflections on the legacy of the Covid-19 pandemic in the coming years. From an economic perspective, what is already clear is the legacy of sovereign debt that the post-Covid era will have to deal with. According to the International Institute of Finance, the global debt to GDP ratio rose to 356% of GDP in 2020, an increase of 35 percentage points, with total sovereign debt outstanding expected to increase by another USD 10 trillion USD in 2021 to USD 92 trillion.

The large accumulation of debt could create a debt trap: if interest rates are higher than economic growth rates (r>g) a vicious self-reinforcing dynamic could develop, resulting in debt levels in the post-pandemic environment becoming unsustainable, ultimately limiting fiscal space while preventing monetary policy from moving away from the effective lower bound. There is a clear correlation between sovereign credit risk and debt service ratios (r/g). As such, the irony could be that governments that are helping central banks escape a liquidity trap by creating a self-sustaining recovery and inflation will fall into a debt trap further down the road. The risk of the creation of a debt trap that limits fiscal space to tackle future crises seems higher in emerging economies, where market participants are quick to reprice sovereign risk if the fiscal outlook deteriorates.

In contrast, developed economies, as Blanchard (2019) has advised, should be 'relaxed' about the rise in sovereign debt to some extent as long as financial repression – artificially suppressing market interest rates through central bank bond buying (which is less of an option for emerging economies due to the potential for currency crises) helps keep debt service ratios healthy for longer. Indeed, consensus estimates are for real G7 GDP growth rates to outpace interest rates by 2030, with the exception of in Italy. Modern Monetary Theory protagonists even argue that the sovereign debt that has built up is unproblematic as long as inflation does not become rampant. Blanchard's policy advice has clearly been well heeded, looking at the massive crisis response to the pandemic by developed economies' fiscal authorities. Further sustaining developed economies' ability to outgrow their debt burden, a body of literature (e.g. Farhi and Werning 2016) suggests that GDP multipliers from fiscal stimulus are typically higher when monetary policy is at its effective lower bound.

However, other prominent economists, such as Rogoff, have shown concern about the growing debt burden, warning it is no free lunch.[3] Rogoff throws a Wicksellian argument at the problem: "as it seems extremely likely that the rate of return on both public and private investment is comfortably above the growth rate, the world is probably not in an inefficient

3. See https://ec.europa.eu/info/sites/default/files/rogoff_paper_european_fiscal_board_february_26_2021.pdf

equilibrium where higher government debt is a free lunch." According to this line of thinking, convergence of real interest rates with a higher real rate of return on investments will bring along a worsening debt service.[4] Rogoff also points out that even benign r>g economic regimes have not stopped governments getting into trouble in the form of spiraling debt burdens.

4. Wicksell (1898) was a classical economist who based his interest rate theory on the idea that the marginal product of capital should equal the natural rate of interest in equilibrium.

In short, fiscal authorities in developed economies have to walk a tightrope as real interest rates may stay historically low for longer, but not indefinitely so as the economic expansion continues and their central banks try to move away from the effective lower bound to achieve their mandate. Continuing economic expansion (and/or inflation that does not prove transitory) could introduce a trade-off between central bank independence and sovereign debt sustainability (in other words, a challenge to fiscal dominance).

Zombification and economic scarring

Policy intervention is never without cost, and this holds true for the move towards fiscal dominance. Extending overly generous unemployment benefits creates moral hazard risks, encouraging people to stay at home instead of looking for work. Low interest rates to sustain government finances have been shown to increase zombification, hampering the 'survival of the fittest' element that naturally weeds out unproductive zombie companies.

When production resources are locked in low-innovation companies, the long-term productive capacity of an economy suffers. Banerjee and Hofmann (2018) show that a 1% increase in the proportion of zombie firms in the corporate universe reduces productivity growth by 30 bps. Almost any solution to the negative supply-side shock posed by Covid-19 could reinforce problems – supply side-related or otherwise.

This takes us to the theme of economic scarring: has the pandemic impaired the feasible capacity of the economy? The Bank of England's Haskel (2021) sets the scene by stating: "We can define scarring as a situation whereby expected output deviates from some counter-factual output, say the output that would have prevailed had the pandemic never occurred." Economic output can roughly be defined as productivity multiplied by the number of active workers in the economy. Medium-term output will be below pre-pandemic levels if on the productivity side there is damage to skills (lower human capital stock) and/or capital (both tangible and intangible). In addition, declines in population, the labor force participation rate or average hours worked, or a rise in unemployment could impact expected output. Haskel neatly summarizes the various factors, providing GDP impact bandwidths for the UK economy over a three-year horizon.

Table 4.1: Productivity scarring

Component	Contribution by 2024
Human capital (L)	[-0.3,-0.1]
Intangible capital (R)	[-0.2,0.6]
Tangible capital (K)	[-1.4,-0.3]
A: Spillovers from R	[-0.7,2.1]
Potential output (Y)	[-1.5,1.5]

Note: This table sets out the contribution of different channels to the change in potential output by Q2 2024 in %. The exercise conditions on the business investment forecast embedded in the January 2020 and May 2021 Bank of England forecasts.

Source: Haskel (2021)

Interestingly, the overall picture Haskel sketches is agnostic with regard to the impact of scarring on UK economic potential over the next few years as the bandwidth of potential GDP outcomes is symmetrical. Fuentes and Moder (2021) look at scarring in the aftermath of various shocks and find that recessions caused by exogenous shocks (such as epidemics) typically result in no scarring and experience a subsequent overshoot in growth rates, bringing economies back to their long-term trend.

In that respect, 2021's overshoot in economic growth in developed economies echoes the typical post-epidemic pattern of no scarring. However, they state that the jury is still out on whether Covid-19 more closely resembles previous epidemics or financial crises, with the latter more prone to lasting scarring effects. Meanwhile, the IMF (2021) notes that this crisis could result in skills gaps that are not quickly resolved as jobs vulnerable to automation and some roles in areas such as travel and leisure may never come back.

Trust and risk aversion

Another legacy of the pandemic could be an erosion of trust and heightened risk aversion. The Edelman Trust barometer in 2021 refers to an 'epidemic' of mistrust of societal institutions and leaders around the world. In short, the pandemic has put trust to the test.

Zak and Knack (2001) are exponents of an early branch of behavorial macroeconomics showing the effect of trust on economic output levels. They find that low-trust economies such as Venezuela experience reduced rates of investment. By contrast, real-life experiments show that increased face-to-face contact creates trust and increases productivity (Bernard, Moxnes and Saito, 2019); for example, the establishment of a passenger-only railway connection in Japan broadened supplier networks and improved firm performance.

Trust and risk aversion are intertwined. Claude Shannon, the father of information theory, stated that information is reduction of uncertainty. Conversely, an age of misinformation, with more people seeking to distill the signal from the noise from behind their computer screens, could also raise levels of risk- and loss-aversion, reducing the marginal propensity to spend or invest. In the end, this could leave the global savings glut intact due to underinvestment, keeping the natural real rate of interest close to historically low levels.

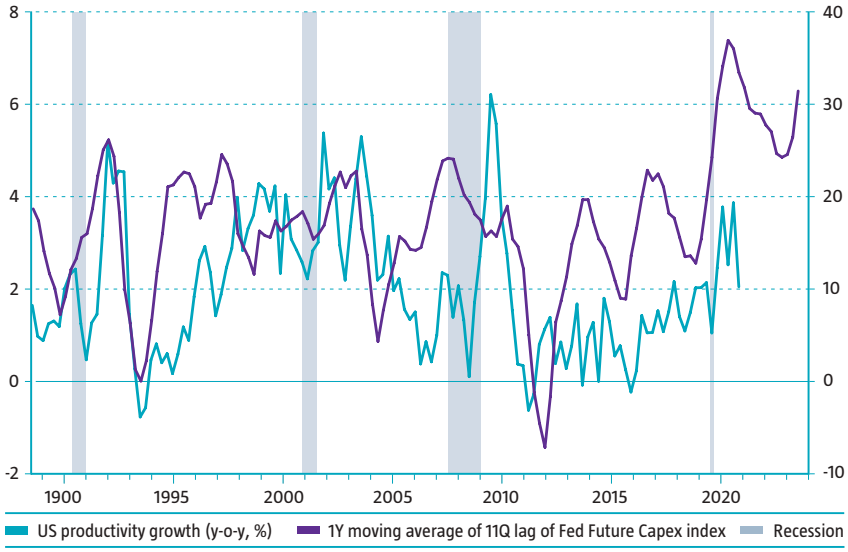
Yet... the Covid legacy could turn out to be a net positive for global productivity

The upside of the pandemic's legacy could outweigh its downside, for two main reasons.

First, the pandemic has accelerated the process of digitalization. Intangible capital expenditure has remained fairly resilient during the pandemic, and this typically boosts productivity growth more than tangible capital expenditure does.[5] In addition, capital intentions have strongly accelerated during the pandemic, boding well for future productivity gains.

5. The IMF (2021) estimate of a 10% increase in intangibles boosting labor productivity growth by 4.5% is broadly consistent (if slightly larger) with contributions of intangible capital to productivity found in the literature (e.g., van Ark et al., 2009; Roth and Thum, 2013).

Figure 4.3: Capex intentions lead productivity gains



Source: Refinitiv Datastream, Robeco

Second, the effect of relocating resources away from in-person services to more digital solutions and the major disruption caused by hybrid working could enhance overall productivity. Legend has it that Sir Isaac Newton developed his laws of gravity after seeing an apple fall from a tree in his garden while forced to study at home when the University of Cambridge was closed due to bubonic plague.[6] Perhaps the rare genius benefits more than others from working from home, but there is a huge debate whether it makes the average office worker more productive.[7]

Thus, the future of hybrid working still hangs in the balance, with a significant gap between employer and employee preferences evident from surveys on the topic. Managers want employees to return to the office to spur 'creative combustion' and boost motivation and company culture. This discrepancy may have played a part in the historically high rate of people quitting their jobs we are currently seeing in the US. Meanwhile, a Working Trend Survey shows that more than 40% of global workers are considering leaving their current employers by the end of 2021.[8] It is far from a given, but such a great migration of workers could have positive effects if they join more productive firms where their human capital is put to better use. The IMF (2021) notes that new business creation is flourishing, and that this "may indicate some reallocation of labor and capital towards firms with higher growth potential." Prettner and Bloom (2020) also notes a recent shift to more digitalized and highly productive firms in the UK.

New ways of working and innovation as a result of the pandemic could act as a powerful catalyst for the kind of creative destruction that boosts productivity. On the other side of the equation, workers such as baristas, bus drivers and those in other services jobs linked to day-to-day urban routines could lose their jobs. If the net balance of this creative destruction process is positive, output gaps may remain large for longer as potential output is increased, creating benign disinflationary pressures.

6. This story is contested; see https://www.newyorker.com/culture/cultural-comment/the-truth-about-isaac-newtons-productive-plague

7. See Barrero, Bloom, and David (2021), who forecast a 2.7% increase in productivity from working from home based on survey data.

8. https://www.microsoft.com/en-us/worklab/work-trend-index/hybrid-work

4.2 Building block 2
The evolution of the policy trilemma

Financial commentator Mohamed El-Erian put the problem succinctly in October 2020: "The problem is that we haven't yet found this balance between three things – public health, normal economic functioning and personal freedoms." The Covid-19 pandemic is still confronting policymakers with the trilemma of finding an acceptable trade-off between public health, the economy and personal freedom. The nature of this trade-off will partly shape the economic, market and social backdrop over the next few years.

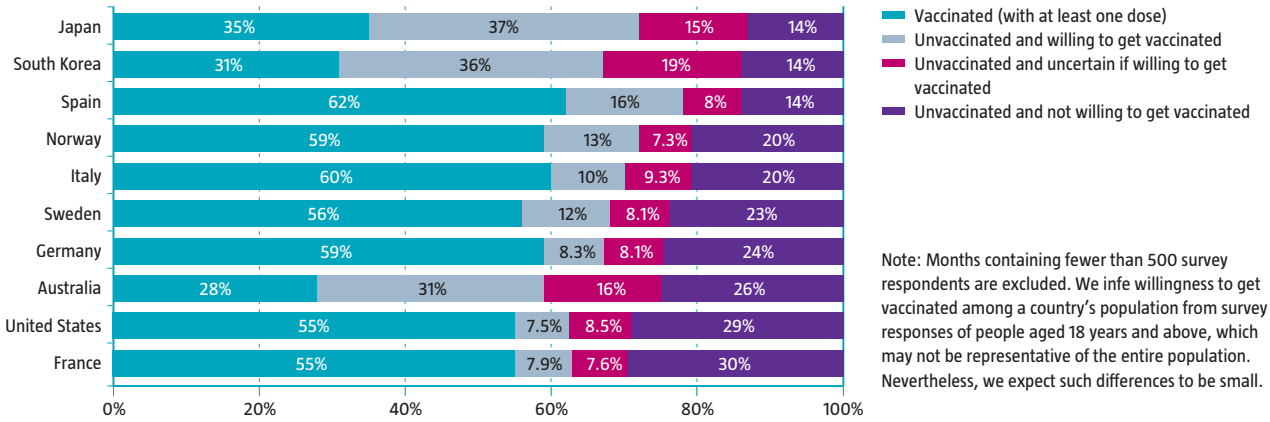
With around 60% of people in developed economies having been vaccinated at the time of writing, the link between Covid-19 cases and hospitalizations has clearly weakened. It has also reduced the severity of lockdown measures and therefore eased the policy trilemma. However, the link is not entirely broken yet as evidence suggests that around 5% of vaccinated people are still susceptible to Covid, while a substantial proportion of people – varying between 10-30%, depending on the population – does not want to be vaccinated. Among these are people who are concerned about being vaccinated but may be persuaded to do so (the doubters), and those who will refuse to be vaccinated no matter what.

Vaccination rates may stall after vaccination programs have finally convinced the doubters (around 10% of populations in Western countries), with the refusers preventing herd immunity being achieved.[9] The question is whether most vaccinated people will be willing to sacrifice their freedoms in renewed lockdowns of the kind we saw in early 2020 to contain the spread of Covid-19 among the unvaccinated and the immune-deficient. This seems increasingly unlikely in the future unless a vaccine-resistant Covid-19 variant emerges. The emergence of a resistant strain is not unthinkable given that vaccines are backwards-looking by design and therefore do not automatically protect against a continually mutating virus. That said, there is no reason to think that any Omega variant that does evolve will be unbeatable.

In the meantime, vaccinated people can still catch symptomatic Covid and may therefore voluntarily limit their activities out of fear of contracting the virus. The road to herd immunity is paved with a number of obstacles – unknown future variants, the possibility that vaccines will not be effective against the new strains, and the lack of willingness among some people to receive Covid vaccinations. It is still too early to call victory against the virus, so a wide range of scenarios remains possible.

9. The level of herd immunity as a proportion of the population, p_c can be defined as $p_c = [1 - 1 / R_0]$ for a vaccine with 100% efficacy that gives life-long protection, where R_0 is the basic reproduction number. However, if the proportional vaccine efficacy,ε, is considered, the simple expression for p_c becomes $[1 - 1 / R_0] / \varepsilon$, see Anderson et al. (2020).

Figure 4.4: Willingness to get vaccinated against Covid



Note: Months containing fewer than 500 survey respondents are excluded. We infe willingness to get vaccinated among a country's population from survey responses of people aged 18 years and above, which may not be representative of the entire population. Nevertheless, we expect such differences to be small.

Source: Our World in data. 18 August 2021

4.3 Building block 3
Credible fiscal financiers for longer?

The effectiveness of the interaction between fiscal and monetary policy during economic expansion is a theme we have been highlighting in this publication since before the onset of the pandemic, and it will continue to be a pivotal factor in determining economic outcomes. As such, will central bank remain credible fiscal financiers for longer?

The global economy is still facing a liquidity trap, with central banks close to the effective lower bound, which is a binding constraint on aggregate demand. This is no longer a problem exclusively facing developed markets as policy rates in some emerging economies, such as Chile and Peru, approached the zero lower bound in 2021. Against such a backdrop, only government spending can boost aggregate demand and push up the economy to a better equilibrium, enabling central banks to rebuild their traditional ammunition against recession by raising policy rates. However, the need for unconventional policy (QE) to circumvent the constraints facing conventional monetary policy from the perspective of standard Taylor rules,[10] which suggest deeply negative nominal policy rates (and thereby additional central bank asset purchases which shadow these Taylor rule-prescribed policy rates) are no longer strictly necessary. This development has already shifted the market's attention to the process of exiting the pandemic stimulus.[11]

However, the process of unwinding QE, hiking interest rates and even winding down central bank balance sheets could also raise the question of whether central banks can still be perceived as credible fiscal financiers. A conflict between a central bank reestablishing its independence (as the Fed did in the Treasury Accord of February 1951 after facilitating an expansionist US Treasury during and after World War II) and governments wishing to pursue further pro-cyclical fiscal expansion on the back of low interest rates is not unthinkable in the next five years. Such a conflict could emerge when substantial progress towards the central bank's policy goals – in other words, persistent inflation around the bank's target – is made.

In the meantime, the ability of fiscal stimulus to induce sustained inflationary pressures is a key factor to watch in the next five years. Episodes of rapid government debt expansion have in the past been inflationary, and the relationship between higher primary deficits and inflation was especially clear in the 1970s. Clarida et al. (2000) and Lubik and Schorfheide (2004) associate this decade with an active fiscal and passive monetary policy regime that hardly responded to inflation through rate hikes.

One important variable that determines fiscal easing's effect on inflation is the degree of Ricardian equivalence – the postponement of consumption today in the anticipation of future tax hikes – and inflation expectations at work. As John Cochrane of the Chicago Business School neatly elucidated in this respect back in 2009: "To inflate, the government also has to make it clear that it will not pay back new debt. If we expect that debt or money will be retired with future taxes, then there is no great incentive to go out and spend to get rid of either. Only if it's clear the debt or money will soon be inflated away does it make sense for people to try to get rid of money or debt now, and go out and buy."

Ultimately, the future of low rates for longer (in other words, financial repression) and central banks acting as fiscal financiers depends on inflation expectations. Higher inflation expectations among households would not only bring consumption forward (in other words, a lower degree of Ricardian equivalence) but also have the potential to steepen the Phillips curve (the inverse relation between wages and unemployment), as Vlekke, Koopman, and Mellen (2020) find.

10. The Taylor rule prescribes economic activity regulation by choosing the federal funds rate based on the inflation gap between the desired (targeted) inflation rate and the actual inflation rate; and the output gap between the actual and natural level.

11. See our central bank special in this publication for the central bank post-pandemic playbook.

4.4 Building block 4
Geopolitics

The well-known "It's the economy, stupid" phrase coined by Bill Clinton's political advisor in his 1992 US presidential election neatly summarizes the interconnection between the economy and politics. Clearly, macroeconomic surprises and political uncertainty are highly correlated, and the causality probably runs in both directions. Politicians get in trouble if growth is disappointing (and vice versa), while if politicians get their economic act together, activity tends to outperform consensus forecasts.

At the macro level, competition between the US, China and Russia for global influence is intensifying. How this pans out will largely depend on the economic and social constraints each of the countries face, and to a lesser extent on their policy goals, such as the China 2025 targets. The Chinese Communist Party went back to the drawing board to revise its political strategy during the Trump presidency. China and the US are increasingly using military terms to describe their economic positioning. Recently, Chinese President Xi Jinping called technology "the main battleground of global power rivalry"[12] and urged Chinese scientists to be ready for increased rivalry. Meanwhile, President Biden has set up a 'strike force' to target what the US sees as unfair practices by competitors like China.

12. Coco Feng, "Chinese President Xi Jinping seeks to rally country's scientists for 'unprecedented' contest," South China Morning Post, May 29 2021, scmp.com.

Taiwan, home to the world's largest semiconductor firm, could be the litmus test for US-Chinese relations as global technology dominance, which both countries aspire to, ultimately hinges upon a safe semiconductor supply chain. Tensions around the island have been on the rise since the election of Taiwanese president Tsai Ing-wen in 2016, with Chinese fighter jets seen nearby. The potential for international isolation, crippling costs and coordinated sanctions could deter China from military intervention against Taiwan, which it sees as a breakaway province. However, according to surveys by Chinese newspaper The Global Times, 70% of mainland Chinese people are in favor of military intervention to reunite China and Taiwan, with 37% stating that war within the next 3-5 years would be optimal.[13]

13. Global Times' "Big Survey on Taiwan Issues," Mainland Officials' Civilian Attitudes Toward Taiwan Getting Tougher - Zhihu (zhihu.com)

More nationalistic politics may also impact globalization and increase fragmentation. As Fuentes and Moder (2021) point out, "reshoring of global value chains in the aftermath of the Covid-19 crisis could hamper innovation and knowledge spillovers across countries." Blanchard and Pisani-Ferry (2021) echo this belief, pointing to declines in economic migrants transferring their wages back home and knowledge spillovers due to travel restrictions, which are having an outsized effect on emerging economies.

Besides China-US tensions and tackling the policy trilemma that we discussed previously, there are a number of structural challenges that will require political attention across the globe. Most of them predate the pandemic and have worsened since its onset; these include climate change, economic inequality and aging populations. They are huge, complex and contentious topics that will consume a lot of political capital. In short, geopolitics will be extremely important over the next five years.

4.5 Base case
Roasting Twenties

In our base case we envisage a move towards a more durable economic expansion after a very early-cycle peak in growth momentum in 2021. We have become more optimistic about the global growth trajectory for the next five years since last year, when we expected US economic growth to take another step down in line with the average 40 bps drop in real

GDP growth observed during each consecutive post World War II NBER expansion. As such, we have upgraded our geometric annualized US real GDP growth forecast by 40 bps from 1.9% to 2.3% for the next five years.

While inflation may prove less transitory than assumed, persistent inflationary pressures will not be broad-based across the core CPI basket and will be less cyclically driven, giving central bankers some leeway to gradually 'take the punchbowl' away from financial markets. What's more, the non-cyclical elements of inflation that prove more persistent in the coming two years will diminish in the second half of our projection period as the impact of the negative supply shock in the aftermath of the pandemic dissipates.

After the initial wave of pent-up demand peters out in early 2022, a transition towards a more durable, less exuberant phase should follow. There is no clear exit from the Covid-19 pandemic, with new variants casting shadows over the expansion. Although history shows post-pandemic recoveries have euphoric characteristics,[14] lingering fear of new Covid mutants, increasing public awareness of the dangers of climate change, ongoing creative destruction and the rivalry between geopolitical superpowers will dampen the mood and make this decade less of the Roaring Twenties and more the Roasting Twenties.

14. This has also been documented in Thompson (1921).

An easing paradox of thrift

We believe that the Covid virus will persist, but that governments, consumers and producers will develop effective ways of dealing with it. This should mean that Covid-19 has less of an impact on consumer confidence going forward.

This resilient backdrop bodes well for stronger consumption and corporate investment in developed economies. In fact, they could overshoot the average trend level for expansions, potentially compensating for the consumption undershoot during the Great Expansion. There is an easing paradox of thrift; there is less excessive saving inhibiting the aggregate demand recovery.

The first driver for an overshoot in the trend growth of consumption is that current real interest rates are historically low. There is a positive relationship between negative real rates and average consumption growth in the subsequent five years. Using Shiller data since 1899 for the US, today's real long-term interest rates of -4% (based on June US CPI figures) would be consistent with consumption per capita growth in excess of 2% over the coming five years. Negative real interest rates will initially contribute to healthy debt servicing and housing affordability levels, although debt servicing is likely to deteriorate in the second half of our projection period as central banks move closer to net tightening.

Second, wealth levels – both financial wealth and wealth from the housing markets – are above historical averages and expected to rise further, albeit more slowly than they have over the past five years. The rising tide in both the financial and housing markets has clearly lifted a lot of boats, and this will underpin consumption growth. Admittedly, the marginal propensity to spend out of wealth from both categories is fairly limited in practice and falls in magnitude as households become richer relative to the rest of the population.[15] Nonetheless, in combination with negative real interest rates on savings accounts and elevated pandemic savings rates, the spending effect could be higher in our base case.

15. The ECB (2015) estimates that for every euro of additional financial wealth, around 11.5 eurocents are consumed for the bottom of the wealth distribution with 1.1 eurocent spent for every euro increase in housing wealth. The marginal propensity to spend from wealth in the UK and US is around 5 cents spent per euro.

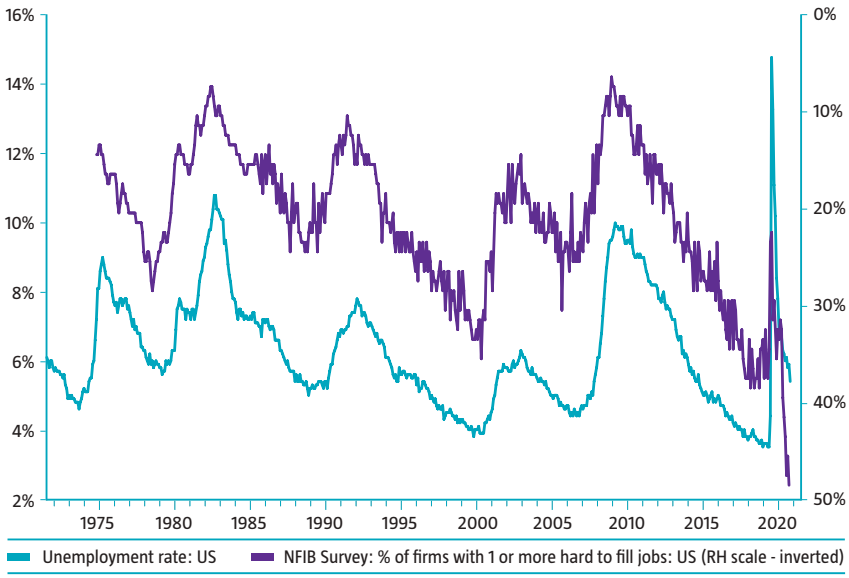
Third, the negative supply shock in the goods and services sector resulting from the pandemic will induce higher investment activity as a percentage of GDP in advanced economies. The link between corporate and public capex and ensuing productivity growth should prove to be intact, with positive real returns on capex benefitting real wages and consumption growth,

thereby moving developed economies like the US and Eurozone away from Japanification. Intangible capital investments should be a key driver of productivity growth. The reallocation effect from the pandemic-related disruption in the labor market should result in a small positive effect on overall labor productivity. The scarring effect in the labor market should remain limited, with the 'lost skills' effect of displaced workers outweighed by the greater efficiency resulting from increased hybrid working and adoption of technology.

The bargaining power of workers should increase due to post-pandemic early retirements by members of the baby boomer generation, not only in developed economies but also in China.[16] In addition, a greater policy focus on addressing economic inequality and only a gradual resolution of the mismatch in the labor market, as shown by the gap between the 2021 surge in job openings and unemployment rates, will create higher wages. As we can see in the following chart, a historically high proportion (almost 50%) of US firms are having difficulty filling vacancies.

16. According to a United Nations estimate, China's working-age population (those aged between 15-64 years) peaked in 2015 and looks set to shrink by 2.5% this decade.

Figure 4.5: High vacancy rate points to a further decline in US unemployment



Source: Refinitiv Datastream, Robeco

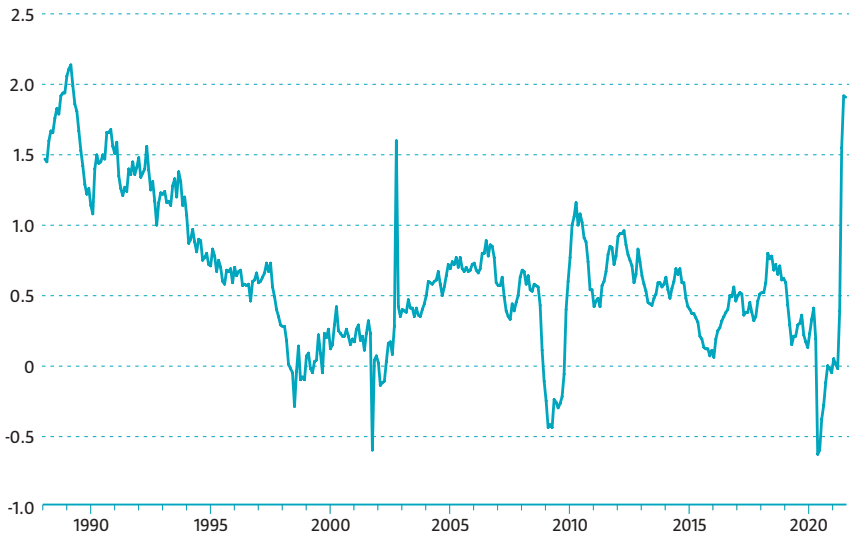
As a result, the divergence between labor productivity growth and wage growth observed in recent decades will stall in our base case, keeping unit labor costs elevated throughout the expansion. Given that companies are determined to optimize the labor-capital ratio to minimize costs in a high-input-cost climate, this focus will facilitate the switch from labor- to capital-intensive production (from man to machine).

The furlough schemes and broader fiscal support for employers we saw during the pandemic have led to a speedy recovery in the labor markets, as shown by the steep drop in unemployment rates from their peak levels in the first half of this year. But after the initial drop, we expect further progress towards full employment to be more gradual, in line with the average in previous expansions, with 0.5% annual falls in U6 unemployment in the US. Solving the skills mismatch by reschooling displaced workers takes time, while the occasional flare-up of Covid variants will also slow down the pace of recovery to normal levels. This all suggests that unemployment will not return to pre-pandemic levels before 2026.

The slower jobs market recovery compared to consensus estimates that we expect in our base case will also leave slack in the global economy, with no apparent wage-price spiral potential: those with the highest marginal propensity to spend in the labor force are not those who benefit the most from the labor scarcity premium. Also, the productivity growth that materializes in the second half of our projection period will only contribute to output gaps closing gradually, leaving a fairly modest cyclical overshoot in core inflation.

In contrast, the non-cyclical inflation pressures that have been present since the start of this expansion will create more input cost inflation in the first two years as a legacy of the negative supply shock and factor dislocation resulting from Covid-19. Rebuilding supply chain resilience (especially in commodity markets, which have suffered from underinvestment) will ease non-cyclical inflation pressures eventually. The divergent paths of cyclical inflation (rising towards 2026) and non-cyclical inflation (declining towards 2026) components will keep markets on edge as to whether inflation is transitory. We expect the US yield curve to steepen until 2023 before flattening towards 2026.

Figure 4.6: Non-cyclical inflation (ex-health care) has surged to levels last seen in 1980s



Source: San Francisco Fed. June 2021.

In this scenario the stalemate between cyclical and non-cyclical inflation forces creates leeway for the Fed and other developed market central banks to engineer a gradual tightening of monetary conditions, with a first Fed rate hike of 25 bps in 2023 followed by another 175 bps of tightening in the three subsequent years. This increase in policy rates will not amount to net tightening: the natural rate of interest will still be above policy rates in 2026, as policy rates are expected to fall well within the estimated range of the natural rate of interest.

The tango between central banks and fiscal authorities is likely to become more complicated in the second half of the projection period as central banks in developed economies start to tighten while fundamentals (such as the change in the global investment-savings balance and the inflation outlook) justify higher Treasury yields. In order to fulfill its dual mandate, the Fed will become less credible as a fiscal financier as it needs to address cyclical inflation forces. Fiscal authorities will realize that debt is no free lunch and will constrain budget deficits, although fiscal expansion's contribution to economic activity will remain above pre-pandemic levels.

China's regulatory crackdown on big companies shows how the government wants to keep education and technology affordable for the majority of its population by improving domestic competition and efficiency while remaining in the tech race with the US. China will continue its balancing act between maintaining debt sustainability and targeted, greener economic growth to prevent worsening economic inequality, which could lead to civil unrest. The more interventionist approach by policymakers leads to better-quality, but lower-trend, growth in China in this scenario. US-China relations will remain tense, characterized by a competitive partnership on topics like climate change. The US is likely to deter China from a military intervention to pursue its reunification with Taiwan. In the meantime, given the US's continuing reliance on Taiwan's semiconductor industry, US industrial policy (and that of other countries) will increasingly be aimed at onshoring semiconductor supply capacity.

4.6 Bull case
Silver Twenties

What if the disruption caused by the pandemic has a silver lining for the global economy? Shocks like pandemics have the power to change the fabric of society. In our bullish scenario, effective vaccines lead to herd immunity across the globe and Covid-19 gradually disappears as the virus is beaten. Whereas in our base case there needs to be an active approach to Covid, in this scenario Covid falls by the wayside.

The restoration of trust in institutions and policymakers, which have proven effective in combating the virus and credited as such, boosts spending in the economy in this scenario. The USD 2.5 trillion of excess US household savings that have been built up due to the pandemic flow into the real economy, while elsewhere stretched savings rates fall below historical averages as household income growth picks up. Consumer sentiment borders on euphoria as Keynesian animal spirits are released: "the spontaneous urge to action rather than inaction, and not as the outcome of a weighted average of quantitative benefits multiplied by quantitative probabilities." In short, it is not rational calculation that drives consumer behavior, but the liberating feeling of being in a new Covid-free era.

The global economy is able to maintain above-trend productivity growth for longer as the dislocations in goods and labor markets that have forced companies to adapt are resolved more quickly compared than in our base case, as higher investment activity in 2021-22 restores supply chain resilience. This reduces non-cyclical inflation pressures in 2022, while cyclical inflation remains in check due to more sizeable labor productivity gains on the back of greater technology dispersion across sectors. The productivity gains made by firms that are able to catch up with the existing technological frontier outweigh the losses incurred by the laggards.

The removal of unproductive companies due to rising real interest rates and creative destruction facilitates a higher trend in GDP per capita growth in developed economies. With the pandemic out of the way, there is a more constructive dialogue between the US and China on a broader range of topics, for their mutual benefit.

But it is not the Golden Twenties as outcome-oriented central banks start tightening sooner than in our base case due to the earlier-than-expected progress towards full employment and inflation targets. This spoils the party to some extent. Capital-intensive sectors that have been lifted by the wave of indiscriminate euphoria see activity levels fall as a modest developed market central bank tightening cycle takes shape in late 2022. The global housing market cools as well.

With a more pronounced corporate shift to disinflationary labor-saving technology than in our base case, central banks observe that the Non-Accelerating-Inflation Rate of Unemployment, the level of unemployment where inflation neither increases nor decreases, has dropped and reduce the pace of rate hikes towards 2026. Given a higher natural real rate of interest, central banks are further away from net policy tightening compared with our base case at the end of the projection period.

4.7 Bear case: Stag Twenties

What if the slowdown in economic growth momentum in 2022 is reinforced by stubbornly high input costs due to persisting dislocations in the capital and labor markets? In this bear case scenario, the Covid crisis remains severe and there is no easing of the policy trilemma. It is difficult to get Covid-19 under control, with vaccines losing their effectiveness due to new mutations of the virus. As a result, lockdown intensities increase across the globe, revisiting 2020's negative supply shock with subsequent output losses feeding through into lower income growth.

US-China relations worsen as further lockdowns incentivize politicians in both countries to blame each other to appease their people. The resultant restrictions on the flow of technology goods and services from China lead to higher inflation in the US and its allies. Tensions surrounding Taiwan approach boiling point. Policymakers remain in crisis mode, with central banks initially providing more quantitative easing, and facilitate a new wave of fiscal spending by suppressing interest rates.

A 'whatever is necessary' stance by policymakers is not without constraints, however. With inflation in developed economies remaining around 3-4% and central banks not signaling a willingness to rein in the inflation overshoot, bond vigilantes start to push back and demand higher compensation for inflation in the sovereign bond markets. In turn, higher yields reduce the available fiscal space, and as a result the fiscal thrust to safeguard the global economy subsides. The economy falls into stagflation. A new, longer, but shallower recession than the first Covid-19 downturn ensues.

The issues that have been the focus of our Expected Returns publication in recent years now come to the fore: excess corporate leverage, high income inequality, the sustainability of the euro experiment and zombification. All of these risk factors, which would typically have ushered in a traditional recession in the absence of the Covid-19 shock, have continued to be very much with us and materialize.

The debt legacy of the initial Covid-19 crisis contributes to a broad balance sheet recession as the sustainability of both private credit and sovereign debt is eroded. A default cycle develops. Consequently, after the stagflation burst, disinflation emerges due to lower consumption growth, forced deleveraging, rising corporate and household defaults and a depleted wealth effect as financial markets have been dealt a severe blow in the stagflation episode.

Next to the disinflation outlook, there is a high degree of Ricardian equivalence inhibiting consumption among higher income classes as there is a significant chance of income redistribution in the balance sheet repair phase due to broad-based civil unrest. With reduced government support for viable companies and more structural output losses due to a prolonged recession, productive capacity in the economy is severely damaged.

Table 4.2: Summary

	Roasting Twenties	Siver Twenties	Stag Twenties
Building block 1. The legacy: economies suffering from long Covid	=	+	- -
Building block 2. The evolution of the policy trilemma	+	++	-
Building block 3. Credible fiscal financiers for longer?	=	=	-
Building block 4. Geopolitics	=	=	-

4.8 Conclusion

Covid-19 has thrust unprecedented macroeconomic uncertainty upon the global economy, and many potential outcomes could unfold from here. Our discussion above, in which we use four main macro drivers that we expect to be critically important in the coming five years to sketch three scenarios, is intended to facilitate discussion about the evolution of the main business cycle drivers, their magnitude and their impact.

Our Roasting Twenties base case sees the Covid-19 virus linger, but its direct economic impact fade. After the strong growth momentum in 2021, we expect a transition towards a more durable, less exuberant phase of economic expansion, with growth rates in developed economies exceeding those observed during the last expansion of 2009-19. Very low real interest rates, elevated household wealth levels and higher investment activity would contribute to this scenario.

This expansion will probably be shorter than the record 2009-2019 Great Expansion, and also more volatile given inflation dynamics (a complex interplay between cyclical and non-cyclical forces) that create challenges for policy coordination. Adding to this volatility are uncleansed (corporate) balance sheets, elevated physical risk from climate change, creative destruction, economic scarring and a geopolitical landscape that will become increasingly difficult to navigate. ■

5

Expected returns 2022-2026

Expected returns

We calculate expected returns for the main asset classes taking into account our assessment of their valuations, the macroeconomic consequences of our three main scenarios, and the forecast effects of climate change. This is the first year in which we have explicitly assessed climate resilience at the asset class level. The climate disasters that we have already seen and expect to see more of in the future are linked to increasing global temperatures – this is one of the reasons we refer to the 'Roasting Twenties' in this year's publication.

Last year, we predicted that the development of an effective vaccine would be the sustainable way out of the pandemic. As it turned out, scientists developed vaccines that appear effective in reducing the number of deaths and hospitalizations faster than we expected, and they have had a major effect – at least in the developed world where access to vaccines is highest. Although new coronavirus variants could alter the picture, successful vaccines have paved the way for economic expansion. The prices of many asset classes already reflect this good news, however, and it is difficult to find attractively valued assets that are not cheap for a reason.

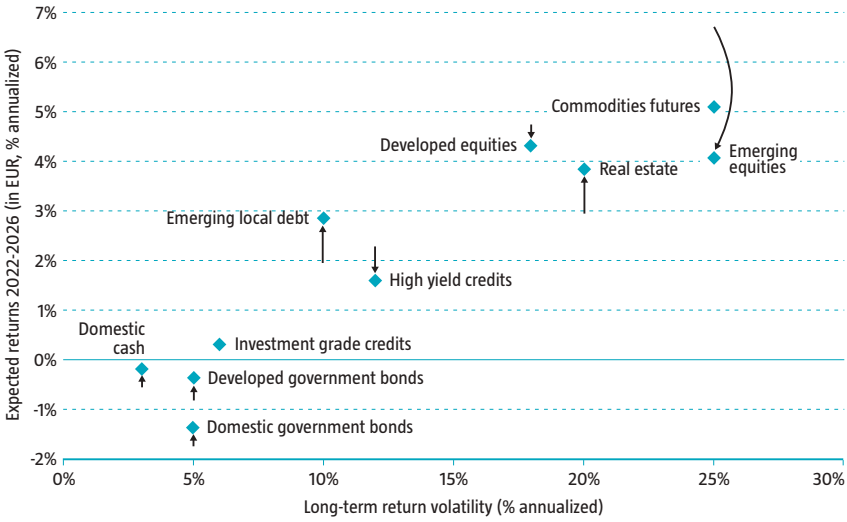
Table 5.1: Five-year return forecast for the main asset classes

	Long-term	Medium-term influences			Forecast in EUR		Forecast in USD	
Bonds	**Returns**	**Valuation**	**Macro**	**Climate**	**2022-2026**	**2021-2025**	**2022-2026**	**2021-2025**
Domestic	4.00%	-/-	-/-	=	↑ -1.50%	-1.75%	↑ 1.00%	-0.25%
Developed	4.25%	-/-	-/-	=	↑ -0.50%	-0.75%	↑ 0.75%	0.00%
Emerging	5.75%	+/+	-/-	-/-	↑ 2.75%	2.00%	↑ 3.75%	3.50%
Investment grade	5.00%	-/-	=	=	= 0.25%	0.25%	↑ 1.50%	1.00%
High yield	6.00%	-/-	+/+	-/-	↓ 1.50%	2.25%	↓ 2.75%	3.00%
Domestic cash	3.50%		+/+		↑ -0.25%	-0.50%	↑ 1.00%	0.25%
Equity								
Developed	7.00%	-/-	+/+	-/-	↓ 4.25%	4.75%	↓ 5.25%	6.25%
Emerging	7.50%	+/+	-/-	-/-	↓ 4.00%	6.75%	↓ 5.00%	8.25%
Real estate	6.00%	=	=	=	↑ 3.75%	3.00%	↑ 4.75%	4.50%
Commodities	4.00%	-/-	+/+	+/+	= 5.00%	5.00%	↓ 6.00%	6.50%
CPI								
Inflation	3.00%				= 2.00%	1.75%	= 2.25%	2.00%

Source: Robeco. September 2021. The medium-term influences correspond with our qualitative assessment of the valuation, climate and macro influences described in Chapters 2, 3 and 4. For equity-like classes, our medium-term influences are assessed relative to developed equities. The expected returns are geometric and annualized. Bond returns are euro-hedged except for emerging market debt (local currency). The value of your investments may fluctuate and estimated performance is no guarantee of future results.

We expect asset returns to remain below their long-term historical averages over the coming five years, mainly due to the low risk-free rate and, in some cases, subdued risk premiums. And yet taking risk in the current environment is likely to be rewarded. Table 5.1 summarizes our expected returns for the major asset classes from the perspective of euro and US dollar investors. The returns for a US dollar investor are higher as the risk-free interest rate is substantially higher in the US, while we expect the dollar to depreciate against the euro. In the remainder of this chapter we explain how we have calculated these expected returns.

Figure 5.1: Five-year return forecast versus long-term volatility



Source: Robeco. September 2021. Vertical axis contains the geometric annualized returns for a euro investor over the period 2022-2026. The horizontal axis is a proxy for the long-term return volatility of each asset class.

Figure 5.1 plots these expected returns against long-term volatility estimates for each asset class. Note that whereas the returns are for the next five years, the volatility figures are long-term estimates and are close to what has been observed in practice over the long term. Although it might be tempting to eyeball a mean-variance efficient frontier through the dots, it would be unwise because we have not considered correlations in our analysis. Assets with low correlations to other asset classes may still form part of a mean-variance efficient portfolio, even when their expected returns are low.

Figure 5.1 shows that government bonds look particularly unattractive from a risk-return perspective. For most risky asset classes, the expected return for the volatility we believe they are likely to involve is substantial, resulting in attractive prospective Sharpe ratios.
The biggest mover from last year is emerging market equities, which now have a slightly negative premium of -0.25% relative to developed markets, whereas we forecast a premium of 2% last year.

Since bond yields in the US are substantially higher than those of Germany, we expect returns to be higher for US dollar investors.

In the following sections, we present our analysis by asset class.

5.1 Cash

Cash is the linchpin of a multi-asset portfolio. It represents the cost of capital for allocations to other assets, provides liquidity and is a safe haven in times of market turmoil and even protects against inflation over the long run. Historically, the return on cash has often been negative in real terms. Yet, as Ang (2014) notes, it has proven to be an underestimated inflation hedge as it has beaten inflation by an average of 70 bps per year since 1900. However, the current era of negative nominal interest rates in some developed economies is unprecedented, and retail savers are anything but compensated for inflation these days.
While the return on cash is determined by central banks' policy rates, it is too simplistic to blame central banks for keeping cash rates this low for so long. Central banks do not operate in a vacuum, especially during a pandemic. The global forces that have driven real cash returns down are separate from monetary causes. The global savings glut (with savings exceeding the subdued demand for capital), rising risk aversion, derisking in financial institutions, weak productivity, demographics and rising income inequality have all played a role in the decline of the natural rate of interest (also called the equilibrium rate, neutral rate or r-star) – the rate consistent with trend GDP growth and price stability. Some economists, such as Holston, Williams and Laubach (2017), have found that as a result of these global forces, the natural rate of interest has fallen substantially in advanced economies.

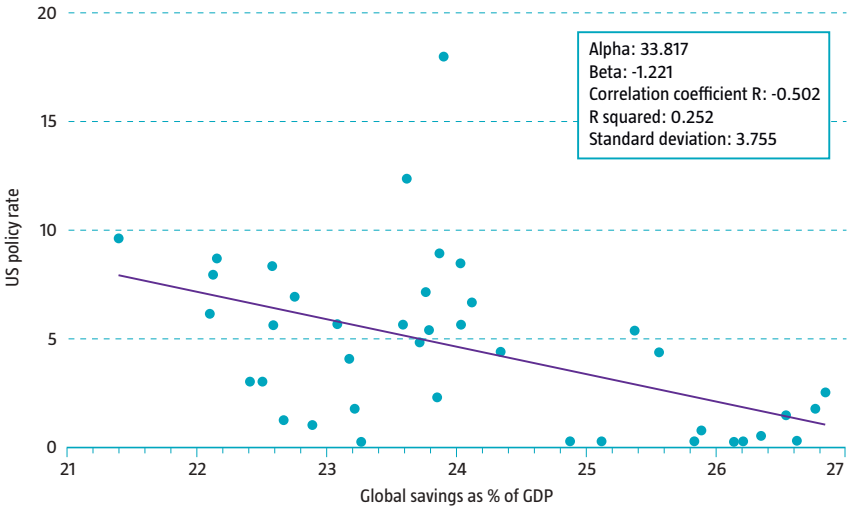
Central banks have responded to this interplay of global economic factors by trying to steer policy and market rates towards the equilibrium rate as they are effectively tasked with setting policy rates consistent with trend GDP growth and price stability. For investors it is therefore crucial to have a handle on the expected neutral rate over the medium term as this is the level that ultimately guides central banks' rate-setting behavior. The difficulty is that the neutral rate is unobservable or, as former FOMC member Kevin Warsh once stated, "r-star is not a beacon in the sky but a chimera in the eye". In short, the neutral rate remains above all a theoretical construct.

Unfortunately, Holston, Williams and Laubach have stopped estimating the neutral rate as the shock caused by the pandemic has created huge uncertainties. In a sense, we are even more in the dark than normal as to where r-star is heading over the next five years. However, a couple of observations can be made. If we assume, as we do in our base case, that investment activity as a percentage of global GDP increases after the pandemic, the pool of savings will shrink further. In other words, we are moving to the left on the regression line in Figure 5.2. The US policy rate consistent with a 1% downward shift from current levels in the global savings ratio as a percentage of GDP is 2.5%. This is towards the upper end of market-implied neutral rate estimates derived from the shape of the yield curve, Overnight Index Swap forwards (see the central bank special for specifics) and just above the June Fed dot plot median estimate of 2.3%. In our base case, we expect that the Fed (and developed market central banks in general) will err on the side of caution, with a low probability of a policy rate overshoot relative to the underlying neutral rate. We see the Fed hiking to 2.00% by 2026, starting in 2023.

As for the ECB's rate normalization process, the current forward guidance stipulates that the deposit facility rate, which is currently -0.50%, is not expected to be hiked until inflation expectations are back in line with their medium-term target. A simple version of the Taylor rule currently makes the case for negative ECB policy rates (Figure 5.3[1]).

1. Our version of the Taylor rule assumes that the ECB should change monetary policy in response to deviations between actual inflation and the ECB's inflation target, and deviations between actual unemployment and the estimated non-accelerating inflation rate of unemployment (NAIRU).

Figure 5.2: Global savings historically high, pushing down policy rates



Source: Refinitiv Datastream, Robeco. Data period 1980-2020.

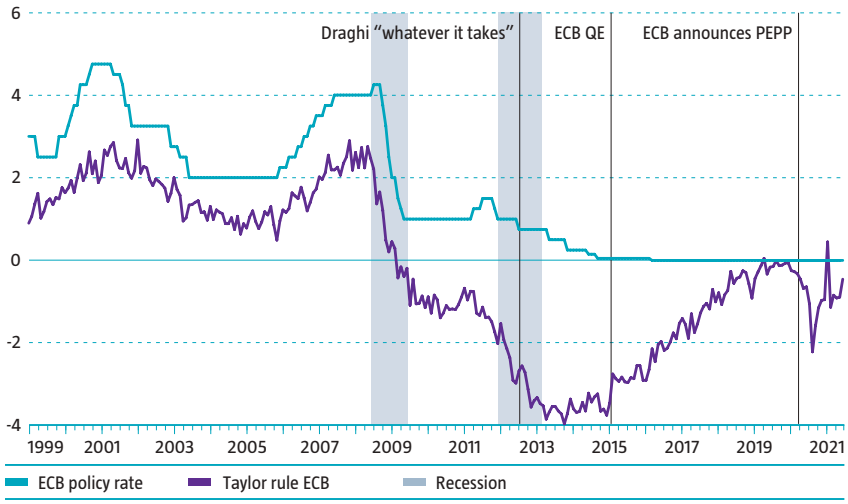
Our base case is that conditions for lift-off when it comes to hiking rates are unlikely to be met before 2024 bearing in mind that the ECB has increased its inflation target from "below but close to 2%" to a "symmetric 2%" following its strategy review. We expect the ECB to implement a first 25 bps rate hike by 2025, followed by another hike such that the deposit facility rate reaches 0% by 2026.

In our bull case scenario, we expect the Taylor rule to give the all-clear signal for hiking policy rates sooner for the Fed (and other developed central banks), with inflation proving sticky and substantial progress towards the policy goal of maximum employment being made earlier than expected. The convergence of the unemployment rate towards the NAIRU is also stronger than in our base case, helped by more job openings. In this scenario we would expect the Fed to start hiking its policy rate in 2022 rather than 2023 as it would be confronted with full employment and non-cyclical inflationary forces that are still lingering by the end of 2022.

Even though the natural rate of interest is likely to be higher than in our base case, we believe the Fed would stick to a gradual outcome-based approach, with policy rates at 2.00% by 2026 as a wage-price spiral would not be developing due to the disinflationary effects of high rates of labor-saving technology adoption.

In our bear case, the stagflation-induced recession would be followed by an episode of disinflation and stagnation. Central banks would carry on expanding their balance sheets to smoothe a debt deleveraging cycle and experiment with the effective lower bound in conventional policy rates, although they would be hesitant to cut rates deeper into negative territory. In this scenario, we believe the ECB would keep its deposit rate at -0.5%-0.6%.

Figure 5.3: ECB monetary policy versus Taylor rule



Source: Refinitiv Datastream, Robeco

5.2 Government bonds

Traditionally, high-rated government bonds have offered investors the guarantee of full capital protection when held to maturity. However, these days, buy-and-hold investors in many countries are guaranteed to incur a loss due to the effect of negative interest rates. The proportion of global government bonds that was trading at negative nominal yields was 31.8% at the end of July 2021, down from 36.5% at the end of 2020.[2]

2. Source: ICE BofA Global Government Bond Index, Robeco. 31 July 2021.

In theory, long-dated nominal government bonds are considered riskier than cash because of their exposure to real productivity growth risk and inflation risk. Investors would therefore typically demand a term premium as a reward for holding these long-term assets instead of cash. We expect that over the long run, the premium for holding long-dated government bonds is 75 bps over cash, slightly below its historical global average of 100 bps since 1900. As we explained in the valuation section, with government bond term premiums in major markets now having turned negative, investors are potentially undercompensated for the macroeconomic risk they are taking on. The term premium seems to be artificially low due to high demand from central banks and solvency-based investors such as insurance companies and pension funds.

In our base case economic scenario, policy rates are kept below zero in the Eurozone and Japan, but will increase to 2% towards the end of the five-year period in the US. As long as growth edges higher and exceeds interest rate levels, the rise in debt ratios will be sustainable. With near-zero policy rates in the Eurozone, government bond yields only have limited room to increase. We believe that 10-year German Treasury bond yields will creep into positive territory over the next five years, but will not increase above 0.75%. US Treasury bond yields also have scope to increase, and we expect them to be higher than 2% for most of the coming five years. Curves in both regions could therefore steepen, although we expect peak steepness to be lower than the average peak level of 2.45% for 10-year/2-year spreads observed in the last five cycles for the US.

This means that investors in Eurozone government bonds will receive negative nominal returns over the next five years, and as low as -1.50% per year for safe-haven German Bunds. The expected return for US bond investors is 1.00% per year, the same level as short-

term rates, leading to a realized term premium of zero over this five-year period. In our base case scenario a global government bond portfolio would be likely to produce a return of -0.50% per year in euro terms. For a US dollar investor, we forecast a return of 0.75% per year for a global government bond portfolio. The difference of 125 bps is due to differences in short-term interest rates. We predict cash will generate -0.25% per year for the Eurozone investor, and 1.00% for the US investor. This difference can also be interpreted as currency hedging costs.

For our 'Silver Twenties' scenario, we expect US inflation to increase substantially above the Fed's target in 2024. Inflation in the Eurozone would also increase, but less so than in the US. While government bond yields increase in the first couple of years to above 3% in the US and above 1% in Germany, they will fall again afterwards. Our forecast implies that a domestic risk-free government bond would yield -2.00% for a Eurozone investor and 0.50% for a US investor. For a global government bond portfolio, average returns are expected to be -0.75% per year in euro terms and 0.25% per year in US dollar terms. The difference is again due to currency hedging costs, which we forecast to be 1.00% per year over this period.

In our 'Stag Twenties' scenario, we would expect inflation in developed markets to exceed most central bank targets, sitting above 3% in the first two years of our horizon before quickly falling below central bank targets to about 1%. Treasury yields would follow the pattern of inflation, which would lead to mark-to-market losses for Treasuries in the first two years, but strong mark-to-market gains in the following year. These gains would outweigh the losses, leading to returns of 1.25% per year for euro investors and 2.00% per year for US dollar investors over the five-year horizon.

5.3 Corporate bonds

Corporate bonds pay investors a premium over government bonds to compensate them for the credit and liquidity risk that the asset class involves. The outlook for investment grade credit in our base case scenario from a macroeconomic perspective is neutral, despite good corporate earnings. Spreads have narrowed since last year and are now substantially below their historical median levels. This suggests that corporate bond markets are already pricing in a lot of good news. We broadly agree with the market's positive view of the economy.

The upside for credit markets is currently limited as about 40% of the global investment grade corporate bond index has a credit spread below 75 bps, our long-run assumption for investment grade credit's excess returns.[3] The current market situation for the asset class is similar to what we saw at the end of 2017.

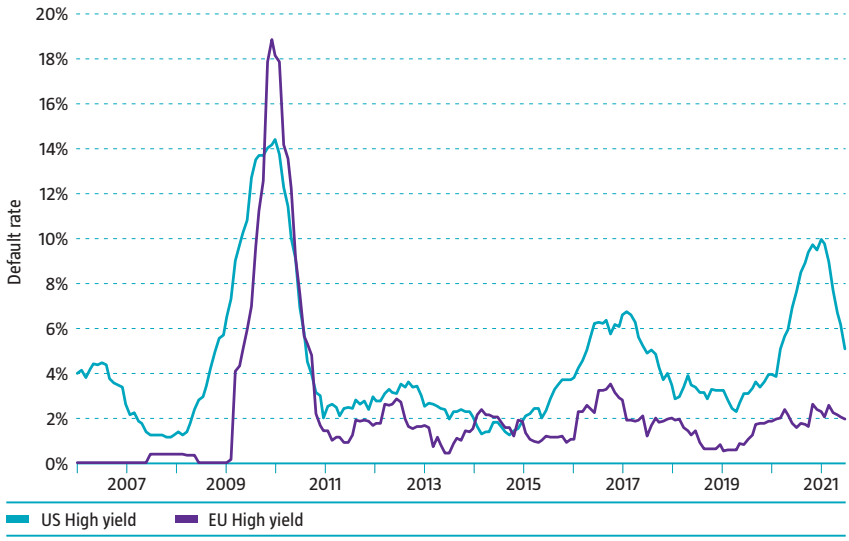
It's a similar picture for the high yield bond market, about 20% of which is made up of bonds with spreads below 200 bps.[4] High yield spreads have only ever been tighter at the end of 2017 and between 2003-07, in the run-up to the global financial crisis.

Central banks are buying corporate bonds, further reducing downside risk for investors. We therefore believe that investors in investment grade credit may still gain a credit premium of 75 bps per year over the next five years, leading to a total return of 0.25% per year from investing in global investment grade corporate bonds for a Eurozone investor. For the US dollar investor, a global government bond portfolio has an expected return of 0.75% per year, so adding the credit premium of 75 bps results in a total expected return of 1.50% per year.

3. Source: ICE BofA Global Corporate Index, Robeco. 31 July 2021.

4. Source: ICE BofA Global Corporate Index, Robeco. 31 July 2021.

Figure 5.4: Default rates of US and Eurozone high yield corporate bonds



Source: BofA, Robeco.

High yield credit is also expensive, but our macro outlook is positive for this asset class. We expect the default rate, which spiked in the US during the Covid crisis (see Figure 5.4), to fall further due to companies benefiting from economic growth. In Europe there was no such spike in defaults, which remained around 2% during the pandemic. Rescue packages may have kept too many unsustainable businesses alive, which will perhaps lead to default rates rising when government support programs are scaled back. Based on this outlook, we expect high yield to earn a premium of 200 bps relative to a global government bond portfolio. Note, however, that this is not a pure credit and liquidity premium. Since high yield bonds involve about half the interest rate sensitivity (or duration) of government bonds, they do not decrease as much in value as government bonds when yields rise. Therefore, some of high yield credit's excess return is because they do not decrease as much in value when government bond yields increase, as we predict will be the case.

In our 'Silver Twenties' scenario, government bond yields increase around the world, which has a negative impact on the total return of investment grade corporate bonds. However, with corporate earnings remaining high in this scenario, spreads should still be able to tighten a little and defaults should be limited. These two contrasting return drivers should offset each other, with the result that we expect a similar return for investment grade credit in our bullish scenario as in our base case: 0.25% per year. We would expect high yield credit to do better in the bullish scenario: further spread compression should boost returns somewhat, but the negative interest rate duration effect is smaller, resulting in expected returns as high as 3.00% per year.

In our 'Stag Twenties' scenario, the positive effect of decreasing interest rates slightly outweighs the effect of wider credit spreads for investment grade credit, which translates into a total return for the asset class of 0.50% per year. High yield corporate bonds would suffer due to higher credit spreads and a spike in defaults. This, combined with the lack of headwinds from falling interest rates, leads us to estimate a return of -0.25% per year for the asset class.

5.4 Equities

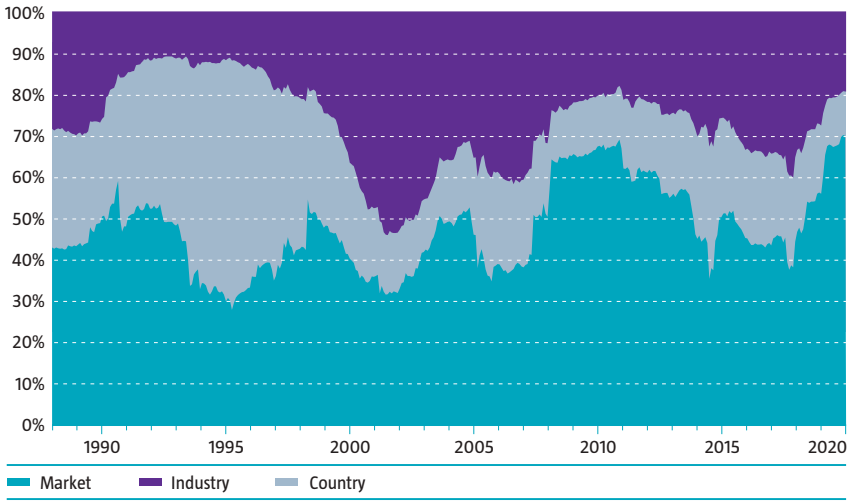
Buy-and-hold equity investors have enjoyed double-digit annualized returns over the past five years. Last year, equity markets enjoyed one of the strongest-ever recovery rallies after a recession. But what about the next five years? Is TINA (There Is No Alternative) going to sing forever? Or is taking risk in the equity markets over this period no longer "simply the best" option?

The view from ex-ante valuations as discussed in our valuation chapter is clearly downbeat. The current ex-ante global CAPE level implies a meagre 1% annualized return for the MSCI AC World index over the next five years. Our simple CAPE-based regression models even suggest US equities could fall in value over the next five years. In addition to this bearish projection there is currently a remarkable asynchronicity between equity market valuations and the current phase of the business cycle. While our global business cycle model shows we are at the early expansion stage, equity valuations are already at levels more consistent with late-cycle expansion.

While valuation levels obviously introduce a negative tilt compared with our steady-state equity returns, it's important to take into account that even prior CAPE levels (one of the best ex-ante stock market predictors available) can only explain around 25% of equities' annualized return variation over the subsequent five years. The bulk of equity price movements are typically the result of changes in the macroeconomic backdrop. Distilling the correct signal from the macro noise, however, is more challenging than ever at present given the historically high degree of macroeconomic uncertainty. As a result, implied equity risk premiums should have been higher given the huge volatility in GDP and consumption due to the unique stop-start dynamic of the pandemic economy in 2020. Very easy financial conditions (thanks to central banks' rapid response) mitigated consumption volatility risk during the pandemic-induced recession.

Which macro factors should investors concentrate on to estimate medium-term stock returns? Easy financial conditions and the reflation theme have been important drivers of equity returns lately. This can be seen in the variance decomposition of developed equity market returns, in which the market was the largest contributor to returns up to February 2021, outweighing industry and country effects. How financial conditions evolve over the medium term remains pivotal for equity returns as overarching market themes (such as the recent reflation theme) are likely to subside given the expected divergence in economic recoveries and subsequent central bank policies in the next five years. Industry and country allocation should start to become more important performance drivers for developed market equities once again, a pattern that also emerged during the Great Expansion.

Figure 5.5: Market, country and industry variance decomposition for developed markets



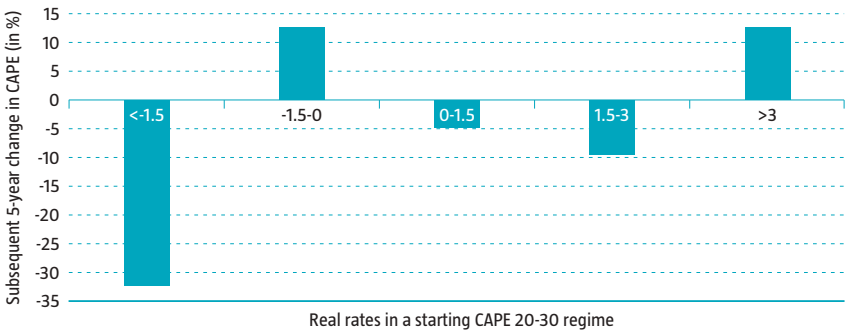
Source: Refinitiv Datastream, Robeco. Variance decomposition (three-year rolling window) of the market, country, and industry effects using the method by Griffin and Karolyi (1998) with country-industry indices for the 12 level two industries and 23 developed market countries. Monthly returns hedged to US dollar. Sample period data January 1985 to January 2021.

As we set out in our base case, we expect a continued economic expansion over the next five years, with real GDP growth in the US and Europe slightly above long-term trend levels. This should result in the convergence of today's stretched valuation levels with the business cycle as earnings growth should outpace price performance. In our view, the bulk of multiple-expansion-led returns is behind us: not only will the denominator (earnings) in the P/E ratio increase, there will also be numerator (price) effects at play.

The hope phase of the current bull market has passed; multiple contraction lies ahead

Even if long-term real interest rates remain in negative territory for most of our projection period, as we expect in our base case, multiples should contract as real interest rates become less negative over time. The current Shiller CAPE is at 38. In the US, there has never been a regime of negative 10-year real interest rates in conjunction with a Shiller CAPE above 30. The regimes in which there have been negative real interest rates combined with a CAPE between 20-30, however, have consistently seen sizable multiple contractions for S&P 500 stocks in the subsequent five years.

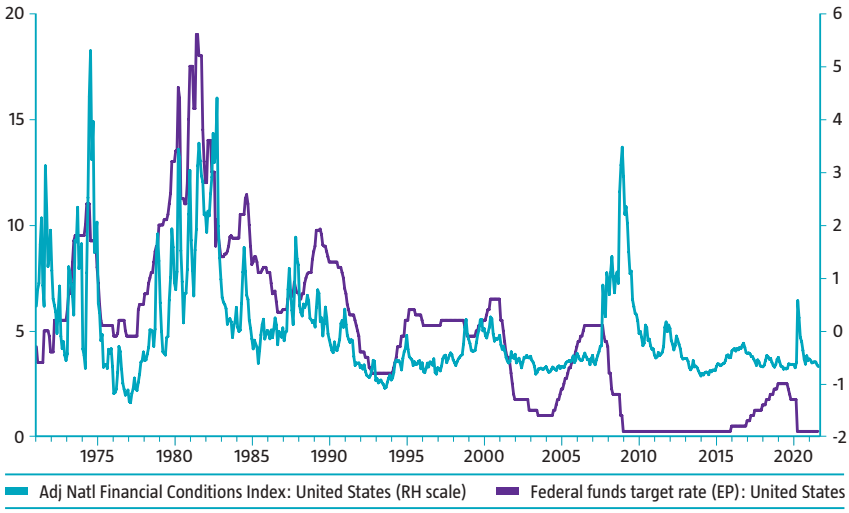
Figure 5.6: High starting valuations combined with significant negative real yields is often followed by multiple compression



Source: Shiller database, Robeco

The onset of central bank rate hiking cycles in developed markets has often led to tightening financial conditions, during which equity multiples typically contract.

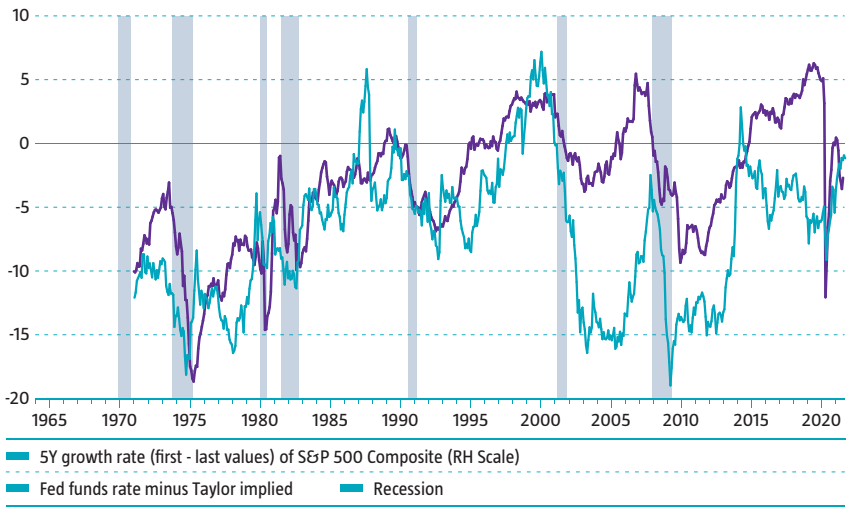
Figure 5.7: Very easy financial conditions have sustained multiple expansion



Source: Refinitiv Datastream, Robeco

Multiple contraction, however, does not mark the end of the bull market. Rather, it is a signal that we have progressed from the hope phase of the bull market to the harvest phase, in which anticipated earnings growth materializes. Bull markets are typically ended by excess tightening by central banks, which eventually hits aggregate demand and, as a consequence, earnings growth. We do not expect excess tightening over the next five years in our base case as developed market policy rates will be somewhat below the neutral rate of interest by 2026. Given their outcome-based policy framework and easing bias, the damage that central bank policy actions inflict on equities over our horizon could therefore be fairly limited. Underpinning this view is the observation that rolling five-year annualized

Figure 5.8: Five-year rolling S&P 500 returns versus Fed policy rate cycle



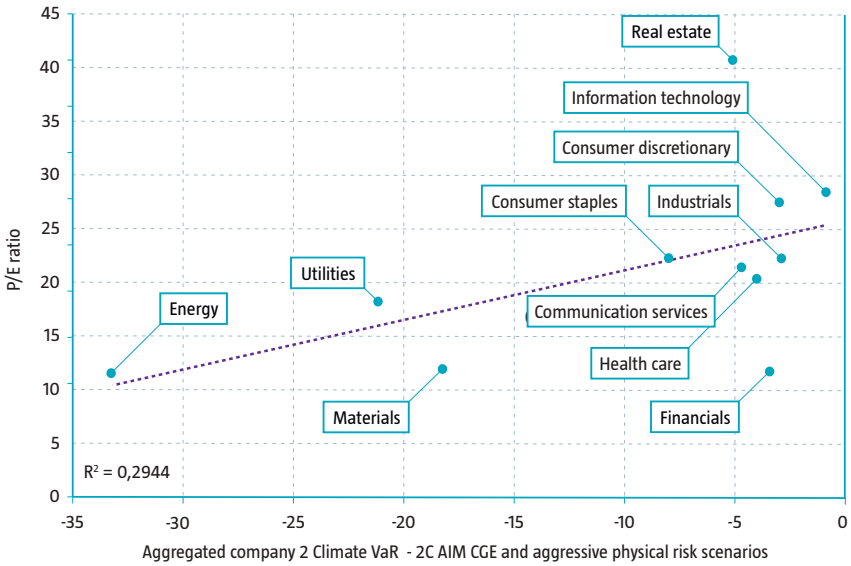
Source: Refinitiv Datastream, Robeco

equity returns typically increase until the cyclical peak in net policy rate tightening is reached (see Figure 5.8). Nonetheless, high ex-ante valuations in combination with high policy rate sensitivity due to increased non-financial leverage mean there is downside risk for equities from (warranted) policy tightening.

Meanwhile, we expect investors to wake up to the impact of climate risk. The IMF (2020) has already warned that equity investors are paying too little attention to physical climate risk. Our analysis suggests that there was still virtually no correlation between equity multiples and climate hazard risk at the country level in 2021. We expect to see more inter-country differentiation over the next five years as well as a broad climate-risk-driven decline in countries' equity valuations in this respect as the sense of urgency about man-made climate change rises. At the same time, we note that due to globalization – 30% of the S&P 500's revenues are generated outside the US, for instance – the cashflow vulnerabilities of large caps are not solely related to domestic climate hazards, so the IMF's country analysis may not be the best way of assessing climate awareness.

By contrast, awareness of climate issues is clearly already being incorporated by investors at the industry level. This is visible in the negative relationship between industry-level climate-related value at risk estimates and industry-level P/E ratios.

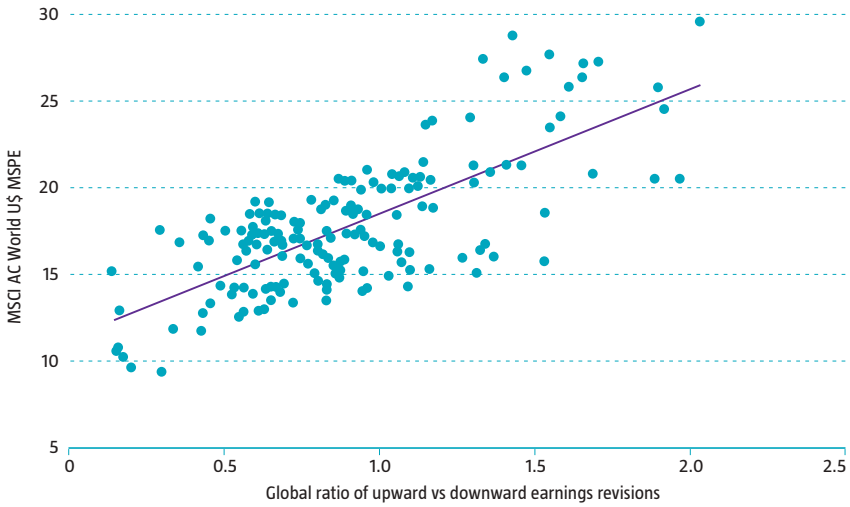
Figure 5.9: MSCI global sector valuation and industry climate risk



Source: MSCI, Refinitiv Datastream, MSCI ESG Research, Robeco. July 2021. Climate Value at Risk is a forward-looking estimate provided by MSCI ESG Research. The estimates are made at the firm level and aggregated to the market and sector levels using market capitalization weights. The data was obtained in June 2021. Certain information c2021 MSCI ESG Research LLC. Reproduced by permission.

Given the multiple compression we envisage, equity returns over the next five years will be predominantly driven by earnings growth. We are less optimistic than current consensus estimates for five-year forward EPS forecasts, which are pricing in 20% annual earnings growth for the MSCI World index. Given our projections that economic growth will be slightly higher than long-term trend levels and taking high operational corporate leverage into account, we think low-double-digit earnings growth is more realistic. This means that at some point, the overly-optimistic long-term EPS projections that are currently baked into valuations will be revised downwards, reducing multiples.

Figure 5.10: Earnings upgrades tend to coincide with higher valuations



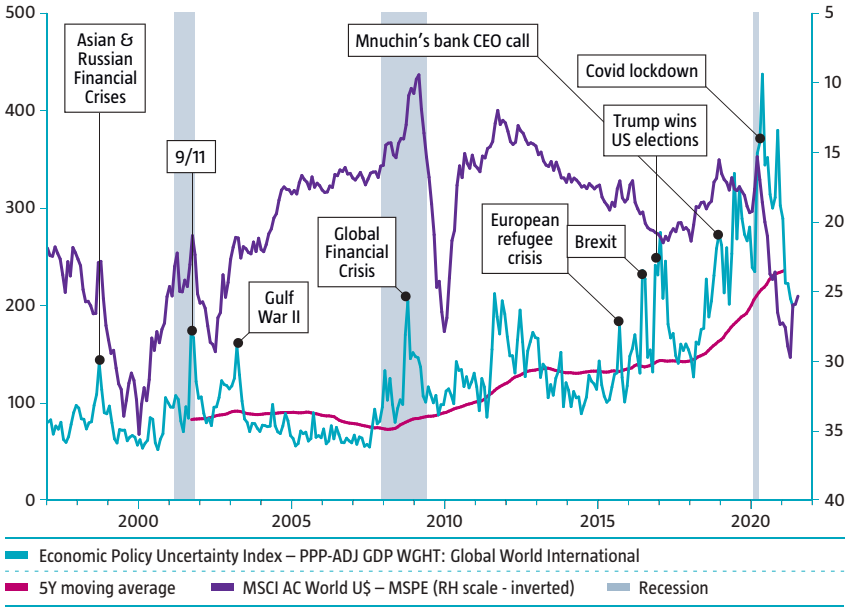
Source: Refinitiv Datastream, Robeco. Data from August 2007 to August 2021.

Lastly, (geo) politics will exert downwards pressure on equity multiples in our base case scenario. Policy uncertainty has dropped from an all-time high since May 2020, as measured by the economic policy uncertainty index,[5] while global equity multiples have expanded.

5. As measured by Baker, Bloom and Davis (2016). See also https://www.policyuncertainty.com/methodology.html

While we envisage a competitive partnership between China and the US in our base case scenario, the emphasis is on the competitive nature of the relationship: disappointing domestic macroeconomic data, the strive for technological hegemony, Covid mutations and increased regulation to tame corporate market power are just some of the factors that could lead to more nationalistic policy agendas and fuel policy uncertainty for international investors.

Figure 5.11: Rising geopolitical uncertainty: lower multiples



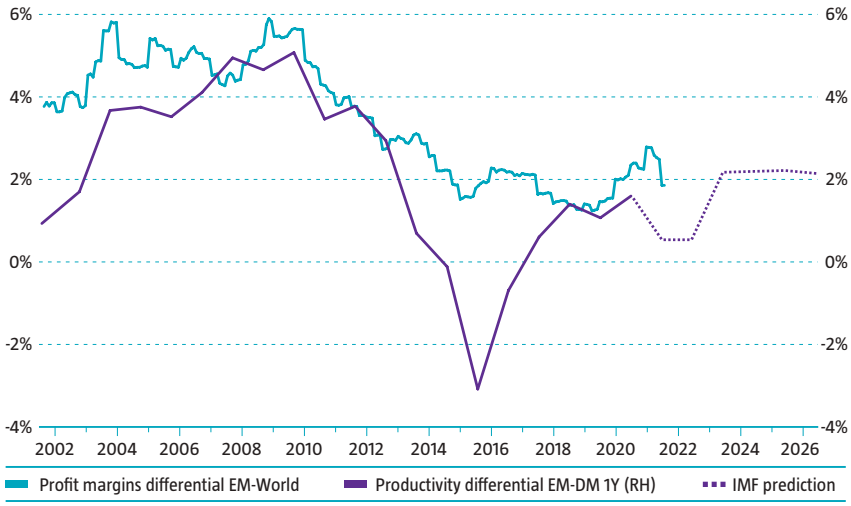
Source: Refinitiv Datastream, Robeco

Earnings growth to be buoyed by productivity gains and consumer strength

Earnings growth will be driven by margin expansion as well as top-line growth over the next five years. Specifically, global profit margins, which have already rebounded above their long-term trend level, will be sustained by solid corporate pricing power. Although non-cyclical factors, like supply chain disruptions and increased regulation, and cyclical factors, like workers' growing bargaining power, capex and higher financing costs, will put pressure on margins, these developments should be offset by productivity gains and consumer demand that are stronger than after the global financial crisis. We expect developed equities to return 4.25% per year in euro terms over the next five years, 25 bps per year less than last year. This leaves us with a return above sovereign bonds of 4.75% which is in line with developed equities' 4.4% excess return in environments in which inflation has overshot mildly and also consistent with their returns during periods of above-trend real GDP growth.

In our base case scenario we have downgraded our forecast for emerging equity returns relative to developed equities. We believe the rate at which emerging markets' GDP per capita catches up with that in developed markets will fall due to lower vaccination rates, lower fiscal and monetary thrust than in developed markets and less productivity-enhancing technology spillovers from developed markets to emerging markets. At the same time, we expect less dollar depreciation than we forecast last year, limiting emerging equities' upside. Lastly, China's recent regulatory changes to improve the quality of its growth seems to be a paradigm shift to balance growth with sustainability and social equality goals. Its efforts to improve the labor share in total GDP are broad-based and will not only keep implied Chinese equity risk premiums elevated due to pervasive policy uncertainty, but could result in a decline in corporate pricing power and profitability.

Figure 5.12: Slowing productivity catch-up, declining margin differential EM-DM



Source: Refinitiv Datastream, Robeco

In our bull case, we envisage a stronger supply side boost and productivity gains resulting in even higher corporate profitability. Earnings growth will be in the high double digits in developed markets in this scenario, with emerging markets benefitting even more from the end of the Covid pandemic. With lower consumer risk aversion, top-line growth would be stronger. In response, multiple contraction should be lower than in our base case as the exuberance reflected in current valuations proves to be justified. As Ang (2014) points

out, productivity shocks and stock returns are highly correlated (the two have shown correlations of almost 50% over five-year horizons). An exuberant consumer and a strong supply side response represent the silver lining of the Covid pandemic in the subsequent expansion, with developed equities returning 10.25% per year in this scenario.

Table 5.2: Different inflation regime, different excess returns

	CPI US	Equity premium vs bonds	Equity premium vs bills	Bond maturity premium
Deflation	<0	2.17%	2.70%	0.84%
Low inflation	1-0	-3.75%	7.25%	11.16%
Subdued inflation	2-1	3.88%	5.23%	1.50%
Mild inflation overshoot	3-2	4.43%	3.34%	-0.23%
Medium inflation overshoot	4-3	5.03%	6.99%	1.81%
Severe inflation overshoot	5-4	8.74%	11.32%	2.99%
High inflation territory	>5	3.49%	-0.28%	-2.97%

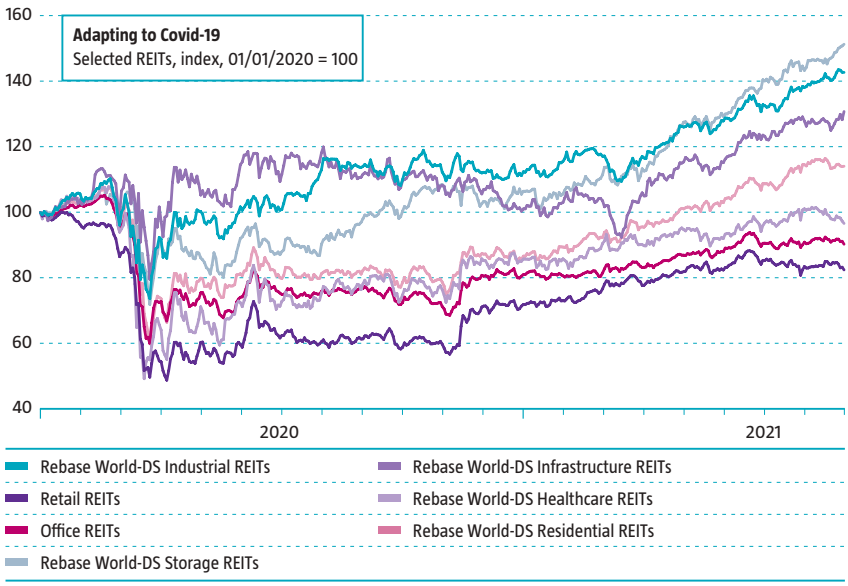
Source: Dimson, March and Staunton database (2017). Global equities ex US 1900-2017.

In our bearish scenario the health crisis intensifies again, worsening the policy trilemma. In this scenario, inflation pressures would remain sticky in the initial years due to non-cyclical forces such as supply bottlenecks and labor shortages, remaining above 3% in the US in 2022 and 2023, while consumer demand cools. Like in the 1970s, policymakers would be unwilling to disinflate the economy due to the social costs of doing so. With central banks unable to effectively address a supply shock to the global economy, this stagflationary scenario would become highly problematic for equities as firms would be losing pricing power at a time that financial conditions are tightening. Equity market participants would start to demand much higher risk premiums. Geopolitical uncertainty would abound, and with producer and consumer confidence plunging again, equities would enter another bear market. Central banks would start to buy equities to sustain the wealth effect but the asset inflation that emerges would not feed through to the real economy. Stagflation transitions towards secular stagnation in the second half of our projection period. A period of low growth and very low inflation would ensue as companies and households cleanse their balance sheets. In such an environment, we forecast a return of -1.5% per year for developed market equities.

5.5 Real estate

We have upgraded our forecast for real estate returns compared with last year, and now expect indirect real estate to only underperform developed equities by 50 bps per year instead of 75 bps. We expect real estate to return 3.75% per year, well below the 6% warranted by our long-term projected equilibrium returns. It is also below the ex-ante five-year return implied by its current CAPE. Whereas storage (which has gained 45% since the start of the pandemic), industrial and logistics REITs have been boosted by the massive shift towards online buying, physical retail REITs have underperformed significantly and are still almost 20% below their pre-pandemic levels. This divergence may persist for longer in our base case.

Figure 5.13: Divergent recoveries in real estate subsectors



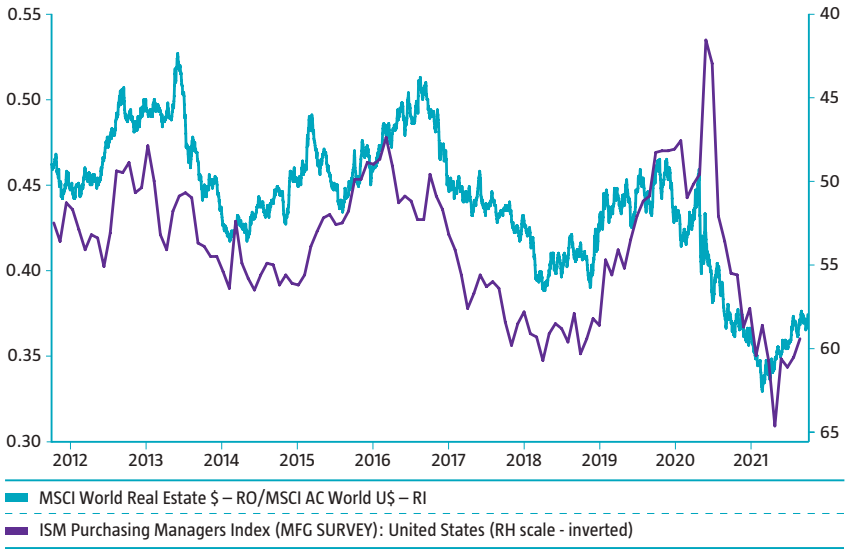
Source: Refinitiv Datastream, Robeco

Our base case scenario of above-trend real activity and inflation hovering around central bank targets is benign for the asset class overall. However, history tells us that Fed rate hikes hurt real estate more than equities in the end given real estate's higher sensitivity to interest rates. In addition, putting leverage to work to generate rental income will not be easy in sub-sectors like retail and office space. Now more than ever, real estate is about healthy spaces to live, work and play, and both the retail and office sub-sectors need to reinvent themselves as the future of hybrid working continues to hang in the balance.

Surveys show a strong divergence in preferences between employers and employees with regard to a return to the office, with workers even willing to forego salary to continue working from home. As the shifts to online shopping and working from home will become second-nature in our base case, the recovery in physical retail and offices will remain incomplete five years from now. Given the substantial investments by real estate owners needed to make the transition to hybrid working, we are highly skeptical about whether REITs' dividend yield, which is currently above its historical average relative to that of equities, will also translate into superior REITS performance. REITs' high dividend yield, while attractive from an income perspective, could be suggestive of lower future capital gains due to one-off sales effects and a lack of capex intentions to undertake maintenance and/or make much-needed adjustments to properties to safeguard future rental income.

Nonetheless, there will be episodes in which real estate outperforms global equities in the next five years, especially in periods of decelerating economic expansion (when the ISM leading indicator is above 50 but falling).

Figure 5.14: Slowing macro momentum tends to benefit real estate



Source: Refinitiv Datastream, Robeco

In our bull case, we expect a return of 8.75% per year for real estate. In this scenario, Covid-19 is decisively beaten, with even vulnerable people feeling comfortable being in close proximity to others once again. In this scenario, demand for retail and office space surges above pre-pandemic levels as the economy expands on the back of strong (urban) investment activity and consumer demand.

The bear case, however, is sobering for real estate investors as it shows that Covid-19 has fundamentally changed economic structures and urban dynamics for good. The virus remains out of control and fear of being in offices and public spaces continues to rise. Real estate tumbles into a secular bear market, returning -1% per year over the next five years, slightly outperforming equities in this scenario.

5.6 Emerging market debt

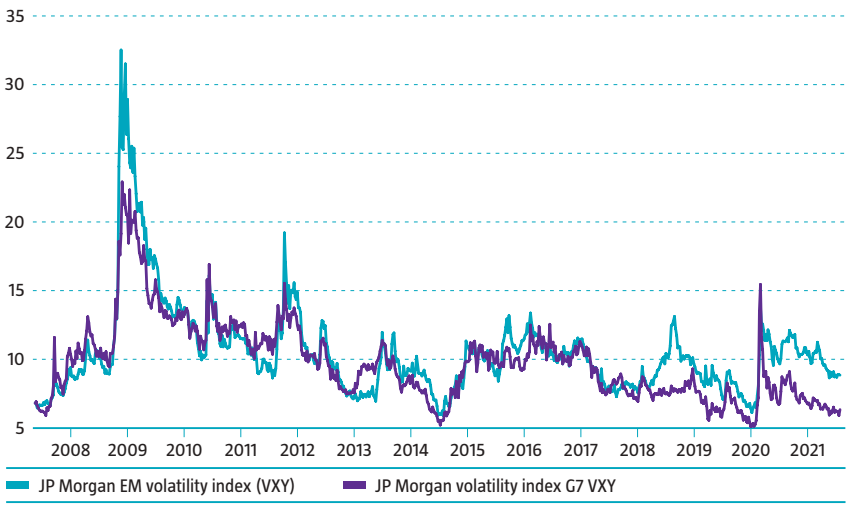
Will local-currency emerging debt issuers benefit from the Roasting Twenties, in which the search for real yield intensifies in our base case? Certainly, local-currency emerging debt has some attractive real yield to offer compared with developed market bonds. However, the yield pick-up reflects the higher sovereign credit risk that it involves, with the credit risk profile of local-currency emerging debt between that of high yield and investment grade credit from developed markets. It has returned 2.1% per year in euro terms (unhedged) over the past five years, below the return of global high yield (3.9% per year, hedged in euro terms) and investment grade (2.5% per year, hedged in euro terms).

In our base case we expect local-currency emerging debt to return 2.75% per year in euro terms over the next five years, outperforming high yield and investment grade. This upgrade relative to our forecast last year is predominantly due to its more favorable starting valuation relative to high yield and investment grade. The macroeconomic backdrop will remain challenging, however, and for this reason buy-and-hold local-currency emerging debt investors look likely to receive lower returns than the current 5% index yield suggests.

Emerging markets' macro resilience has improved in recent years, but they are still susceptible to macroeconomic-related risks. First, currency risk remains pivotal for local-currency emerging debt as its total returns are highly correlated with emerging market

currency volatility. A basket of emerging currencies (as represented by the JP Morgan EM FX Index) has a correlation of 0.93 with monthly unhedged local-currency emerging debt returns. Since the start of the pandemic, a gap has opened up between the volatility of emerging and developed market currencies.

Figure 5.15: A Covid-related gap has opened up between EM and G7 FX volatility



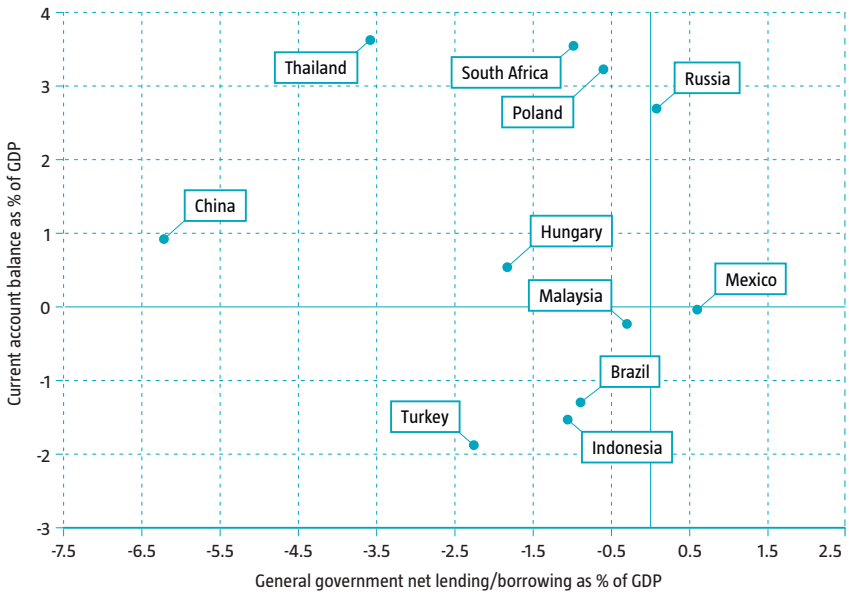
Source: Refinitiv Datastream, Robeco

This volatility gap is largely due to the big difference in vaccination rates between emerging and developed markets, emerging markets' lower fiscal thrust in relative terms and a growth paradigm shift in China, with the result that investors are demanding a higher premium to take exposure to emerging market currencies.

Emerging market currencies are trading at a discount to developed market currencies on a relative purchasing power parity (PPP) basis. Despite their apparent cheapness, real emerging market currency appreciation will in our view be modest due to emerging markets' GDP per capita catching up with that of the US more slowly than expected and rising real rates in the US. The Fed tightening cycle, accompanied by less-negative 10-year US real yields, will create bouts of volatility in emerging markets. The positive aspect this time relative to previous hiking cycles in developed markets is that emerging markets' buffer strength has clearly improved: they now have higher FX reserves as a percentage of GDP than in, for instance, the 2013 taper tantrum.

High savings rates in emerging markets in response to the pandemic have also prevented a widening external financing gap for emerging market issuers as the local savings pool provided a counterbalance to capital outflows. However, with savings rates in emerging markets normalizing and the global savings pool likely to shrink in the next five years in our view, competition for external savings will increase, creating upwards pressure on local-currency emerging debt yields over the medium term. According to IMF projections, some countries, such as Brazil and Turkey, will exhibit twin deficits – fiscal and current account – during the next five years. Given that emerging markets' growth outlook in our base case is less rosy than that suggested by the IMF forecast because of expectations of higher yields, physical climate risk and diminished prospects of technology spillovers from developed markets to the emerging world, such deficits could be significant.

Figure 5.16: Ability to pay: internal versus external balance EMD LC issuers



Source: IMF, Robeco. 5Y averages of 2022-2026 IMF projections.

Yields are also likely to increase as a reflection of the increased climate risk facing emerging markets. Our climate chapter shows that the tug of war between building climate resilience on one hand and the materialization of climate shocks on the other could see higher risk premiums for higher-risk countries, and that this could amount to an additional 100 bps on borrowing costs for emerging market sovereigns. In short, investors' search for real yield should benefit local-currency emerging debt over the next five years, but it has limited upside despite its attractive relative valuation levels.

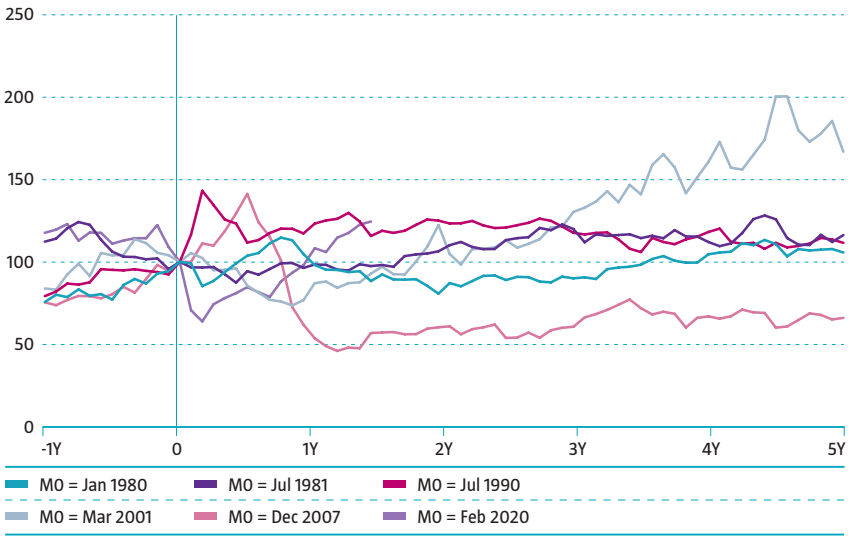
In our bull case, the global expansion becomes more synchronized as there is a swift catch-up in vaccination rates in emerging markets and mortality rates fall. This enables emerging markets to catch up with the developed world more strongly in terms of GDP per capita. Real exchange rates discount future relative productivity differentials, and with emerging markets' growth outlook relative to developed markets brightening on the back of strong global demand for exports from emerging markets, emerging market FX discounts disappear. And yet even in our bull case there is upwards pressure on emerging debt yields due to increased competition for international capital and climate risk. We expect a return of 5.25% per year over the next five years in this scenario.

In our bear case, the emerging and developed worlds diverge further, with emerging markets suffering from a new wave of capital outflows that cannot be mitigated by domestic savings pools. Yields rise significantly in the stagflationary phase in response to sticky inflation, with the subsequent weakening global growth outlook leading to credit spreads widening further into the stagnation phase. In this scenario, we expect returns of a meagre 0.75% per year.

5.7 Commodities

This time last year we suggested that commodities were ready to make a comeback. As it turned out, they have roared back over the past 12 months, with the S&P GSCI commodity index up 53.6% in US dollar terms since 30 July 2020. Although this is already 16.6 percentage points more than the cumulative return that we expected commodities to generate in dollar terms over the entire five-year horizon last year, this year we have only reduced our updated dollar return forecast from 6.5% per year to 5.0% per year, while we have kept our euro-based expectation unchanged at 5%. We think the case for commodities is still compelling despite the strong reopening trade, which has been driven by China's early recovery, the depreciating US dollar and demand for inflation hedges.

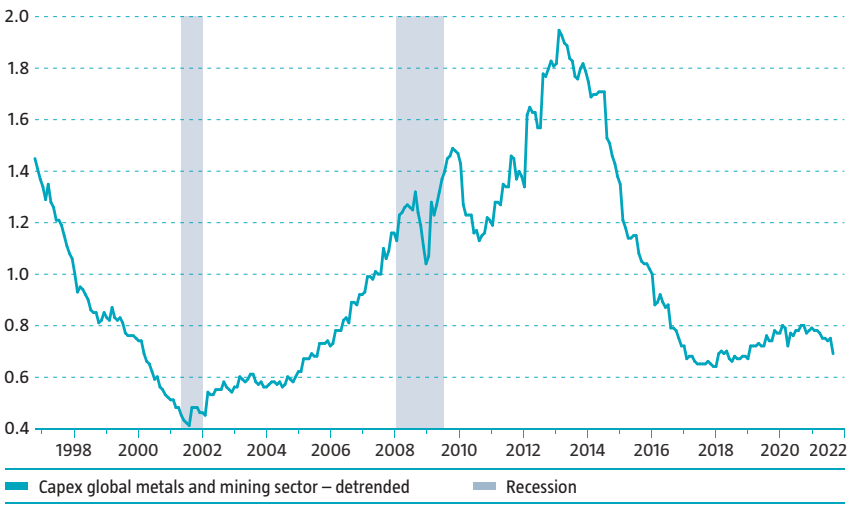
Figure 5.17: GSCI commodity 5Y returns post-recession – rebased to last recession peak



Source: Refinitiv Datastream, Robeco

However, we are not upgrading our commodity forecast as we do not expect this commodity cycle to end up in a supercycle that generates double-digit annualized returns as was the case between 2001-06 for two main reasons. First, the Chinese economy is not growing by double digits every year like it was in the 2001-06 period, and forthcoming US infrastructure expenditure will not fully make up the demand shortfalls resulting from lower Chinese growth than back then. We expect Chinese growth to average around 4.9% per year in our base case. Second, current underinvestment in mining and metal supply is less pronounced than its extremely subdued levels at the start commodity supercycle of the 2000s, so there should be less commodity scarcity further down the road.

Figure 5.18: Looming supply constraints due to underinvestment in metals and mining sector



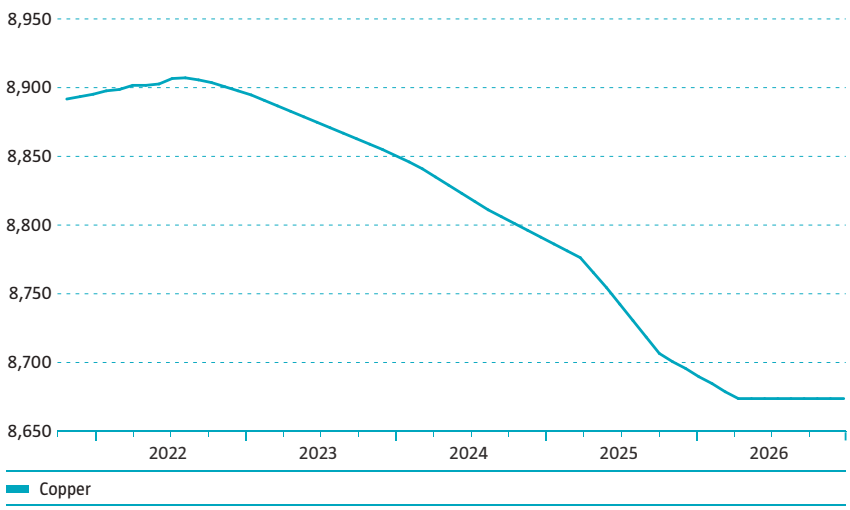
Source: Refinitiv Datastream, Robeco

Improving roll returns

Nonetheless, commodity scarcity will still be a driver of commodity returns over the next five years as current capex in metals and mining is 25% below its long-term average and it will take time for new mining supply to come online.

Commodity returns are determined by spot returns, roll returns and the cost of carry. The roll return is the most important contributor to total returns and is obtained from rolling a shorter-dated position in a futures contract into a longer-dated contract. Research by Gorton, Hayashi, and Rouwenhorst (2013) shows that the highest realized returns for commodities are generated in an environment in which the spot price is above the futures price, which often happens when inventory levels are falling. This enables commodity investors to 'buy low and sell high' as longer-dated futures become more valuable as their prices converge towards the higher spot prices over time.

Figure 5.19: Copper futures (settlement price in USD per tonne)



Source: Refinitiv Datastream, London Metal Exchange. Date: 19 August 2021.

We are currently in an environment in which almost half of the commodity spectrum is in backwardation (when spot prices are higher than longer-dated futures prices), generating positive roll returns. The S&P GSCI index currently has a positive annualized roll return of 7.5%, while the Bloomberg commodity index is showing a positive roll return of 5% per year as of July 2021. As long as the shape of the index constituents' futures curves remains unchanged, this return should be achieved in practice (not taking into account the other drivers of commodity returns, like spot price movements and the cost of carry).

Facilitating the green energy transition

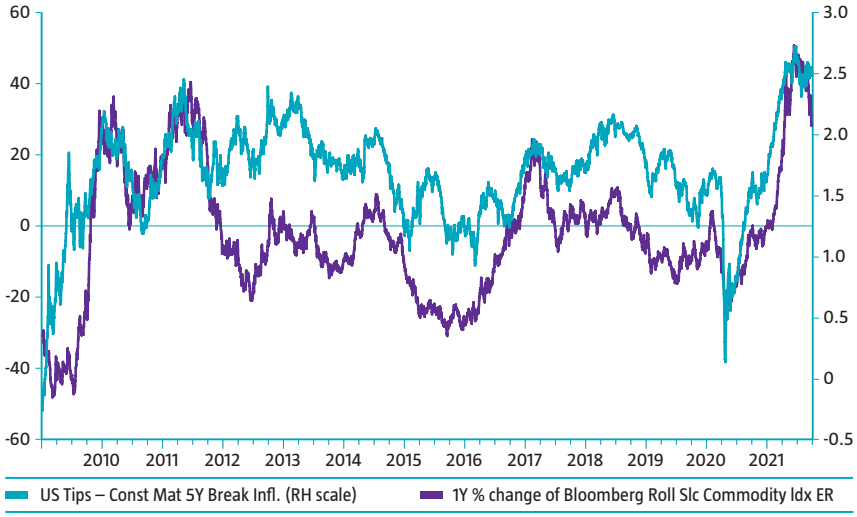
With countries accounting for around two-thirds of global GDP having committed to solve climate change, we expect a policy-driven push to speed up the green energy transition. As a result, demand for copper, iron and aluminum will increase. Steel is the biggest constituent of wind turbines, accounting for around 84% of each turbine by weight. According to the IEA (International Energy Agency), an offshore wind plant requires nine times more mineral resources than a gas-fired plant, while the typical electrical car requires six times the mineral inputs of a conventional car.

Electrification of transport requires huge amounts of copper and aluminum. So to facilitate the renewable energy transition, there will be a lot of roasting – smelting of iron ore, copper ore and alumina – in the coming decades. To meet the net zero carbon emission target by 2050, six times more mineral and metal inputs than today's levels will be needed by 2040 for the production of renewable energy. At the same time, processing these metals (especially aluminum) poses a climate paradox as doing so is highly carbon intensive. To mitigate carbon pollution from roasting activities, production caps for steel producers (of the kind China has recently adopted) could be implemented, driving up metal prices. Alternatively, carbon taxes could be implemented; these would be passed on by producers to the end consumer, with a similar result. In addition, higher prices are needed to incentivize metals and mining companies to expand capacity: the time needed to redevelop existing (brownfield) mining sites varies between 2-4 years, while developing unexploited (greenfield) sites takes 3-8 years. The lag in the supply response from a sector that is underinvested in means metal prices will rise over the next five years in our base case.

Our base case of above-trend economic growth in the developed world is also a benign scenario for oil demand. However, climate change issues, the fall-out from the Covid-19 pandemic and the technological advances made in renewable energy will bring peak oil demand forward. Lower oil prices in the future could create more volatility as OPEC members become more competitive and less cooperative to gain share in a shrinking market. There is still huge uncertainty with regard to when peak oil will occur. On one side, some oil majors like BP believe oil demand will have already peaked before the Covid-19 recession if the net zero emissions scenario materializes. On the other, OPEC believes peak oil will occur around 2040.

Finally, given our view that US inflation will hover around the 2-3% level in the next five years, there will be demand for inflation hedges. While commodity futures are not the best inflation hedge (some commodity currencies do an even better job), roll-enhanced commodity futures indices do show a strong correlation with inflation expectations. Resilient demand for inflation hedges if the secular inflation debate remains unresolved in the next few years (we discussed the ongoing tug of war between non-cyclical and cyclical inflation forces in our macro chapter) should see strong demand for commodities.

Figure 5.20: US breakeven inflation rates (in %)



Source: Refinitiv Datastream, Robeco

In our bull case, consumer demand for commodities is stronger, but at the same time there is also greater willingness to expand supply than in our base case. Returns are below, but fairly close to, those generated during the previous supercycle, with commodities rising by 9% per year in this scenario.

In our bear case, commodities initially benefit from tight inventories, with no expansion of capacity in metals and energy in sight as the economic outlook worsens. In the stagflationary phase, high prices subsequently choke aggregate demand, especially with the pandemic worsening due to new variants. As the global economy moves towards the stagnation phase, roll returns become negative again. We expect commodities to rise by just 0.5% per year in this scenario.

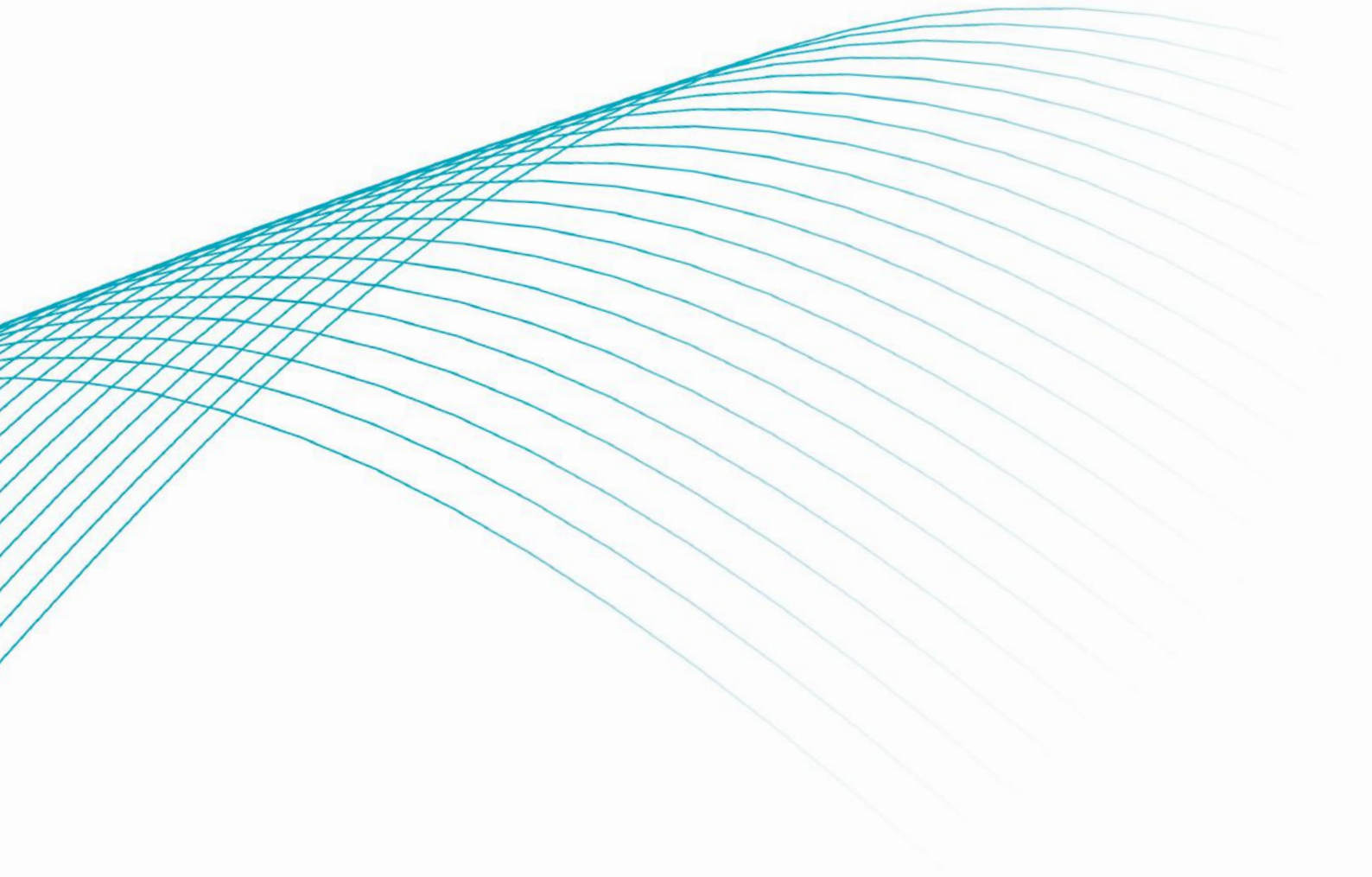
5.8 Summary

We provide a full overview of our expectations for the main asset classes in our base case scenario in the introduction to this chapter. Here, we show these returns and also our expectations for asset class returns in the two other scenarios, both for euro and US dollar investors. We can see that in our 'Silver Twenties' scenario we expect further high returns for risky asset classes, whereas our 'Stag Twenties' scenario would see negative returns for most riskier asset classes, at least for a euro investor. ■

Table 5.3: Five-year return forecast for three macroeconomic scenarios

	Expected returns 2022-2026 (EUR)			Expected returns 2022-2026 (USD)		
Bonds	**Bull**	**Main**	**Bear**	**Bull**	**Main**	**Bear**
Domestic	-2.00%	-1.50%	0.50%	0.75%	1.00%	3.00%
Developed	0.75%	-0.50%	1.25%	0.25%	0.75%	2.00%
Emerging	5.25%	2.75%	0.75%	7.50%	4.75%	2.25%
Investment grade	0.25%	0.25%	0.50%	1.25%	1.50%	1.25%
High yield	3.00%	1.50%	-0.25%	4.00%	2.75%	0.50%
Domestic cash	0.00%	-0.25%	-0.50%	1.00%	1.00%	0.25%
Equity						
Developed	10.25%	4.25%	-1.50%	11.25%	5.25%	-1.00%
Emerging	14.00%	4.00%	-2.75%	15.00%	5.00%	-2.25%
Real estate	8.75%	3.75%	-1.00%	10.75%	4.75%	-0.50%
Commodities	9.00%	5.00%	0.50%	11.00%	7.00%	1.50%
CPI						
Inflation	2.25%	2.00%	1.75%	2.50%	2.25%	2.00%

Source: Robeco, September 2021. Returns are geometric and annualized.



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