Vanguard

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Vanguard economic and market outlook for 2023: Beating back inflation

- Generationally high inflation has led to a marked slowing in global economic activity. Rapid monetary tightening aimed at bringing down inflation will ultimately succeed, but at a cost of a global recession in 2023.
- Current and expected conditions are like those that have signalled past global recessions. Significantly deteriorated financial conditions, increased policy rates, energy concerns and declining trade volumes indicate the global economy will likely enter a recession in the coming year. Job losses should be most concentrated in the technology and real estate sectors, which were among the strongest beneficiaries of the zero-rate environment.
- Inflation continued to trend higher in 2022 across most economies as supply chains had yet to fully recover from pandemic-related distortions and as demand was buoyed by strong household and business balance sheets. Inflation has likely already peaked in most markets, but reducing price pressures tied to labour markets and wage growth will take longer. As such, central banks may reasonably achieve their 2% inflation targets only in 2024 or 2025.
- Consistent with our investment outlook for 2022, which focused on the need for higher short-term interest rates, central banks will continue their aggressive tightening cycle into early 2023 before pausing as inflation falls and job losses mount. Importantly, we see most central banks reluctant to cut rates in 2023 given the need to cool wage growth.
- Although rising interest rates have created near-term pain for investors, higher starting rates have raised our return expectations for both euro area and global ex-euro area bonds, which we now expect to return roughly 2%–3% over the next decade.
- Global equity markets have yet to drop materially below their fair-value range, which they have historically done during recessions. Longer term, however, our global equity outlook is improving because of lower valuations and higher interest rates. Globally, our return expectations are more than 2 percentage points higher than last year. Our expectation for euro area equities is to return between 4.9% and 6.9% over the next decade, while our outlook for global ex-euro area equities increased to 3.7%-5.7%.

Lead authors


Joseph Davis,
PhD


Roger A.
Aliaga-Díaz, PhD


Jumana Saleheen,
PhD


Qian Wang,
PhD


Andrew J.
Patterson, CFA


Kevin DiCiurcio,
CFA


Alexis Gray,
MSc


Asawari Sathe,
MSc


Joshua M. Hirt,
CFA


Shaan Raithatha,
CFA

Vanguard Investment Strategy Group

Global Economics Team

Joseph Davis, PhD, Global Chief Economist

Americas
Roger A. Aliaga-Díaz, PhD, Americas Chief Economist
Joshua M. Hirt, CFA, Senior Economist
Andrew J. Patterson, CFA, Senior Economist
Asawari Sathe, MSc, Senior Economist
Adam J. Schickling, CFA
Maximilian Wieland
David Diwik, MSc
Ariana Abousaeedi

Europe
Jumana Saleheen, PhD, Europe Chief Economist
Shaan Raithatha, CFA, Senior Economist
Roxane Spitznagel, MSc
Lulu Al Ghussein, MSc

Asia-Pacific
Qian Wang, PhD, Asia-Pacific Chief Economist
Alexis Gray, MSc, Senior Economist

Capital Markets Model Research Team
Qian Wang, PhD, Global Head of VCMM
Kevin DiCiurcio, CFA, Senior Investment Strategist
Daniel Wu, PhD, Senior Investment Strategist
Ian Kresnak, CFA
Vytautas Maciulis, CFA
Olga Lepigina, MBA
Ben Vavreck, CFA
Lukas Brandl-Cheng, MSc
Alex Qu

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Notes on asset-return distributions

The asset-return distributions shown here represent Vanguard's view on the potential range of risk premiums that may occur over the next 10 years; such long-term projections are not intended to be extrapolated into a short-term view. These potential outcomes for long-term investment returns are generated by the Vanguard Capital Markets Model® (VCMM) and reflect the collective perspective of our Investment Strategy Group. The expected risk premiums – and the uncertainty surrounding those expectations – are among a number of qualitative and quantitative inputs used in Vanguard's investment methodology and portfolio construction process.

IMPORTANT: The projections and other information generated by the VCMM regarding the likelihood of various investment outcomes are hypothetical in nature, do not reflect actual investment results and are not guarantees of future results. Distribution of return outcomes from the VCMM are derived from 10,000 simulations for each modelled asset class. Simulations are as at 30 September 2022. Results from the model may vary with each use and over time. For more information, see the Appendix section "About the Vanguard Capital Markets Model".

Global outlook summary

The global economy in 2023: Beating back inflation

In our 2022 economic and market outlook, we outlined how we believed the removal of policy accommodation would shape the economic and financial market landscape. Policy has in fact driven conditions globally in 2022, one of the most rapidly evolving economic and financial market environments in history. But one fact has been made abundantly clear: so long as financial markets function as intended, policymakers are willing to accept asset price volatility and a deterioration in macroeconomic fundamentals as a consequence of fighting inflation. The normalisation of consumer behaviour, stabilisation of supply pressures and rapid monetary tightening suggest a more challenging macroeconomic environment in 2023 that, in our view, will help bring down the rate of inflation.

Global inflation: Persistently surprising

Inflation has continued to trend higher across most economies, in many cases setting multidecade highs. The action taken and likely to be taken in the months ahead, by central banks reflects a promising effort to combat elevated inflation that has proven more persistent and broad-based. Supply-demand imbalances linger in many sectors as global supply chains have yet to fully recover from the Covid-19 pandemic and as demand is supported by strong household and business balance sheets buoyed by pandemic-era stimulus. The war in Ukraine continues, threatening another surge in energy and food commodities prices. Effective monetary policy requires good decision-making, good communication and good luck. The current backdrop is missing the good-luck component, posing a challenge for policymakers whose fiscal and monetary tools are less effective at combating supply shocks.

A recession by any other name

Global macro and financial market conditions today and those anticipated in the coming months are similar to those that have signalled global recessions in the past. Energy supply-and-demand concerns, diminishing capital flows, declining trade volumes and falling output per person mean that, in all likelihood, the global economy will enter a recession in the coming year. Central banks generally seek to avoid a recession. Inflation dynamics mean that supply-side price pressures on inflation are likely to reverse in 2023. However, policymakers must tighten financial conditions to stop high inflation from becoming entrenched into the decision-making of households and businesses. That said, households, businesses and financial institutions are arguably in a better position to handle an eventual downturn, to the extent that they have stronger balance sheets. All recessions are painful and we expect the length and depth of the recession in 2023 to vary by region.

Our base case is a global recession in 2023 brought about by the efforts to return inflation to target. Whether history views the 2023 recession as mild or significant matters little for those affected by the downturn. But failing to act aggressively to combat inflation risks harming households and businesses through entrenched inflationary pressures that last longer than the pain associated with any one recession.

As the following table highlights, growth is likely to end 2023 flat or slightly negative in most major economies outside of China. Unemployment is likely to rise over the year but nowhere near as high as during the 2008 and 2020 downturns. Through job losses and slowing consumer demand, a downtrend in inflation is likely to persist throughout 2023. We don't believe that central banks will achieve their targets of 2% inflation in 2023, but they will maintain those targets and look to achieve them throughout 2024 and into 2025 – or reassess them when the time is right. That time isn't now; reassessing inflation targets in a high-inflation environment could have deleterious effects on central bank credibility and inflation expectations.

Vanguard's economic forecasts

Country/ region	GDP growth* 2023 Vanguard	GDP growth* 2023 Consensus	GDP growth* Trend	Unemployment rate 2023 Vanguard	Unemployment rate 2023 Consensus	Unemployment rate NAIRU	Headline inflation† 2023 Vanguard	Headline inflation† 2023 Consensus	Monetary policy Year-end 2022	Monetary policy Year-end 2023	Monetary policy Neutral rate
US	0.25%	0.9%	1.8%	5%	4.4%	3.5%–4%	3%	2.4%	4.25%	5%	2.5%
Euro area	0%	0.2%	1.2%	7.4%	7.1%	6.5%–7%	6.0%	5.8%	2%	2.5%	1.5%
UK	–1.1%	–0.8%	1.7%	4.7%	4.4%	3.5%–4%	6.3%	6.8%	3.5%	4.5%	2.5%
China‡	4.5%	5%	4.3%	4.7%	N/A	5%	2.2%	2.3%	2.65%	2.6%	4.5%

* For the US, GDP growth is defined as the year-over-year change in fourth-quarter gross domestic product. For all other countries/regions, it is defined as the annual change in total GDP in the forecast year compared with the previous year.

† For the US, headline inflation is defined as year-over-year changes in this year's fourth-quarter Personal Consumption Expenditures (PCE) Price Index compared with last year. For all other countries/regions, it is defined as the average annual change in headline Consumer Price Index (CPI) inflation in the forecast year compared with the previous year. Consensus for the US is based on Bloomberg ECFC consensus estimates.

‡ China's policy rate is the one-year medium-term lending facility (MLF) rate.

Notes: Forecasts, which may have been updated from earlier outlooks, are as at 30 November 2022. NAIRU stands for non-accelerating inflation rate of unemployment. The neutral rate is the interest rate that would be neither expansionary or contractionary when the economy is at full employment and stable inflation. This table displays our median neutral rate estimates with an effective range of +/- 1 percentage point.

Source: Vanguard.

Global fixed income: Brighter days ahead

The market, which was initially slow to price higher interest rates to fight elevated and persistent inflation, now believes that most central banks will have to go well past their neutral policy rates – the rate at which policy would be considered neither accommodative nor restrictive – to quell inflation. The eventual peak and persistence of policy rates, which will depend heavily on the path of inflation, will determine how high bond yields rise. Although rising interest rates have created near-term pain for investors, higher starting interest rates have raised our return expectations more than twofold for US and international bonds.

For euro investors, we now expect euro area aggregate bonds to return 2.2%-3.2% per year over the next decade, compared with the –0.5%-0.5% annual returns we forecast a year ago. For global bonds (excluding euro-area bonds, hedged to euros), we expect returns of 2.1%-3.1% per year over the next decade, compared with our year-ago forecast of -0.5%-0.5% per year. This means that for investors with an adequately long investment horizon, we expect their wealth to be higher by the end of the decade than our year-ago forecast would have suggested. In credit, valuations are attractive, but the growing likelihood of recession and declining profit margins skew the near-term risks toward higher spreads. Although credit exposure can add volatility, its higher expected return than government bonds and low correlation with equities validate its inclusion in portfolios.

Global equities: Resetting expectations

Rising interest rates, inflation and geopolitical risks have forced investors to reassess their rosy expectations for the future. The silver lining is that this year's bear market has improved our outlook for global equities, though our Vanguard Capital Markets Model® (VCMM) projections suggest there are greater opportunities outside the US.

For euro investors, the VCMM calculates that euro-area equities are likely to return 4.9%-6.9% per year over the next decade, and global equities (ex-euro areas, unhedged) 3.7%-5.7%. Globally, our equity return expectations are more than two percentage points higher than they were at this time last year. Within the US market, value stocks are fairly valued relative to growth, and small-capitalisation stocks are attractive despite our expectations for weaker near-term growth. Our outlook for the global equity risk premium is still positive at 1 to 3 percentage points, but lower than last year due to a faster increase in expected bond returns.

The VCMM projections are based on a statistical analysis of historical data. Future returns may behave differently from the historical patterns captured in the VCMM. More importantly, the VCMM may be underestimating extreme negative scenarios unobserved in the historical period on which the model estimation is based.

The Vanguard Capital Markets Model® is a proprietary financial simulation tool developed and maintained by Vanguard's primary investment research and advice teams. The model forecasts distributions of future returns for a wide array of broad asset classes. Those asset classes include US and international equity markets, several maturities of the US Treasury and corporate fixed income markets, international fixed income markets, US money markets, commodities, and certain alternative investment strategies. The theoretical and empirical foundation for the Vanguard Capital Markets Model is that the returns of various asset classes reflect the compensation investors require for bearing different types of systematic risk (beta). At the core of the model are estimates of the dynamic statistical relationship between risk factors and asset returns, obtained from statistical analysis based on available monthly financial and economic data from as early as 1960. Using a system of estimated equations, the model then applies a Monte Carlo simulation method to project the estimated interrelationships among risk factors and asset classes as well as uncertainty and randomness over time. The model generates a large set of simulated outcomes for each asset class over several time horizons. Forecasts are obtained by computing measures of central tendency in these simulations. Results produced by the tool will vary with each use and over time.

I. Global economic perspectives

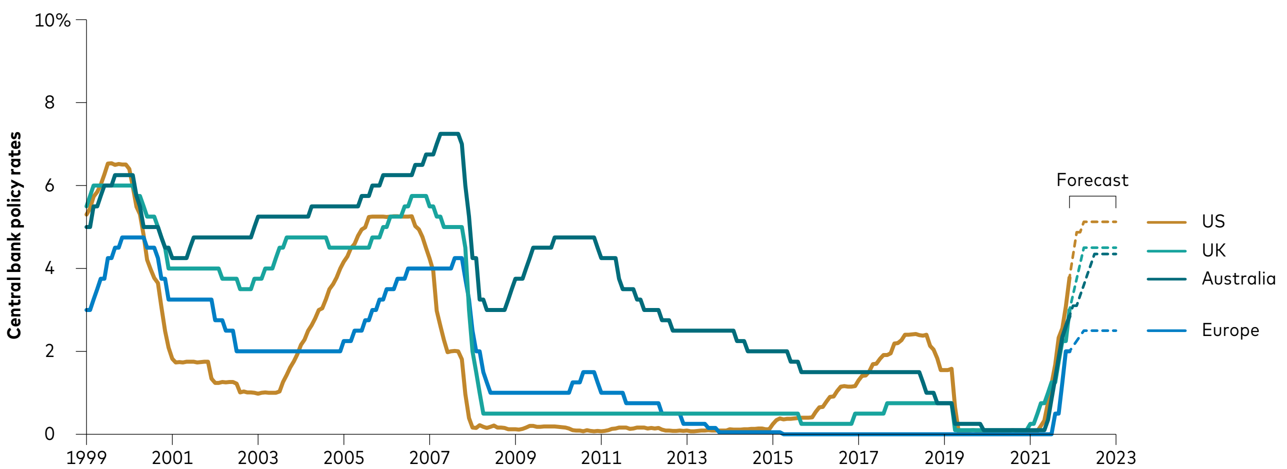
Global economic outlook: Beating back inflation

In our 2022 economic and market outlook, we outlined the reasons why we believed that the removal of policy accommodation would shape the economic and financial market landscape in the year ahead. Policy has in fact been a key driver of conditions globally, as 2022 has proven to be one of the most rapidly evolving economic and financial market environments in recent history. **Figure I-1** shows that the current and expected pace of change in monetary policy is unlike anything we've seen in the last 30 years, particularly on a globally coordinated scale.

The action taken and likely to be taken in the months ahead by central banks reflects an effort to combat multidecade high inflation that has proven more persistent and broad-based. Supply-demand imbalances linger in many sectors as global supply chains have yet to fully recover from the Covid-19 pandemic and as demand is supported by strong household and business balance sheets buoyed by pandemic-era stimulus. The war in Ukraine continues, threatening another surge in energy and food commodities prices. Effective monetary policy requires good decision-making, good communication and good luck. The US Federal Reserve (Fed) has been behind the curve in hiking rates this year, reflecting imprecise decision-making, but more importantly it is missing the good-luck component, posing a challenge for policymakers whose fiscal and monetary tools are less effective at combating supply shocks.

FIGURE I-1

Globally coordinated monetary tightening



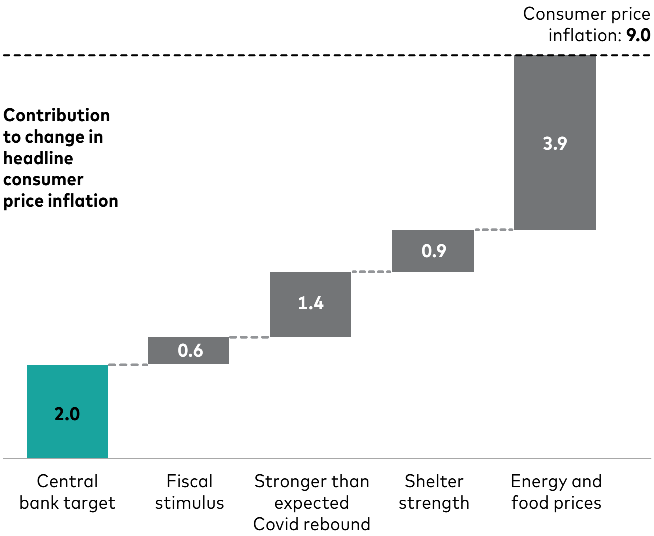
Note: Dotted lines represent Vanguard's forecast for policy rates as at 31 October 2022.

Sources: Vanguard calculations based on data from Thomson Reuters Datastream and Bloomberg.

Because central banks' tools are most effective in bringing down inflation by tamping down demand, the decomposition of the drivers of inflation is crucial. By our estimates (**Figure I-2**), supply and demand factors are evenly contributing to inflationary pressures. If central banks are to rein in inflation, they will probably have to depress demand to the extent that a recession becomes very likely. **Figure I-3** outlines our projected probabilities of recession along with the likely forces that tip the economy into recession.

FIGURE I-2

Global inflation has been driven by a multitude of factors



Notes: This decomposition of inflation into each of the subcategories is based on subjective analysis of our latest inflation forecast for year-end 2022 compared with expectations at the start of 2021. Shelter inflation is the component that captures the effect of shelter costs in the overall CPI. Shelter includes prices for both renters and homeowners. For renters, shelter inflation measures rent, temporary lodging away from home and utility payments. For homeowners, the U.S. Bureau of Labor Statistics calculates what it would cost to rent a similar house. Values in the figure reflect rounding.

Sources: Vanguard calculations based on data from Moody's, Refinitiv and Bloomberg, as at 31 October 2022.

FIGURE I-3

Near-term recession risk is elevated across major developed markets

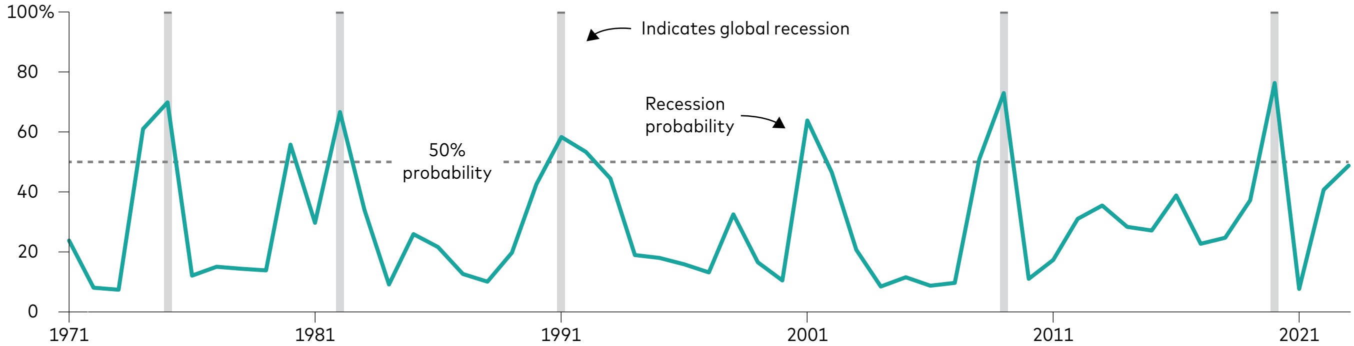
	Probability of recession by end of 2023	Drivers/key risks
US	90%	• Fed tightening path • Inflation eroding consumer purchasing power
Euro area	90%	• Ukraine war impact including energy crisis • Inflation eroding consumer purchasing power • European Central Bank (ECB) tightening path
UK	90%	• Bank of England (BoE) tightening path • Inflation eroding consumer purchasing power

Source: Vanguard, as at 30 September 2022.

Global conditions today and those that are expected to materialise in the coming months are similar to conditions that have signalled global recessions in the past. Energy supply-and-demand concerns, decreasing capital flows, declining trade volumes and falling output per person mean that, in all likelihood, the global economy will enter a recession in the coming year[1]. Borrowing from the World Bank's definition of a global recession, **Figure I-4** assigns a probability that the world is in a state of recession at any given point in time[2]. Only in 2001 was the probability of global recession as high as it is today without an actual recession taking place within the subsequent 12 months[3]. From this we infer that the chances of a global recession in 2023 are very high.

FIGURE I-4

Global recession indicator is at dangerous levels



Note: Probabilities derived from vector similarity matrixes for global unemployment, real per capita GDP, industrial production, foreign direct investment, trade and global energy demand were used to identify similarities between the period under consideration and other recessionary periods.

Sources: World Bank, British Petroleum Statistical Review of World Energy, OECD, Federal Reserve Bank of St. Louis FRED database, OeNB, CPB Netherlands Bureau for Economic Policy Analysis and UNCTAD, as at 31 October 2022. Global unemployment data are from Kose, Sugawara and Terrones (2020).

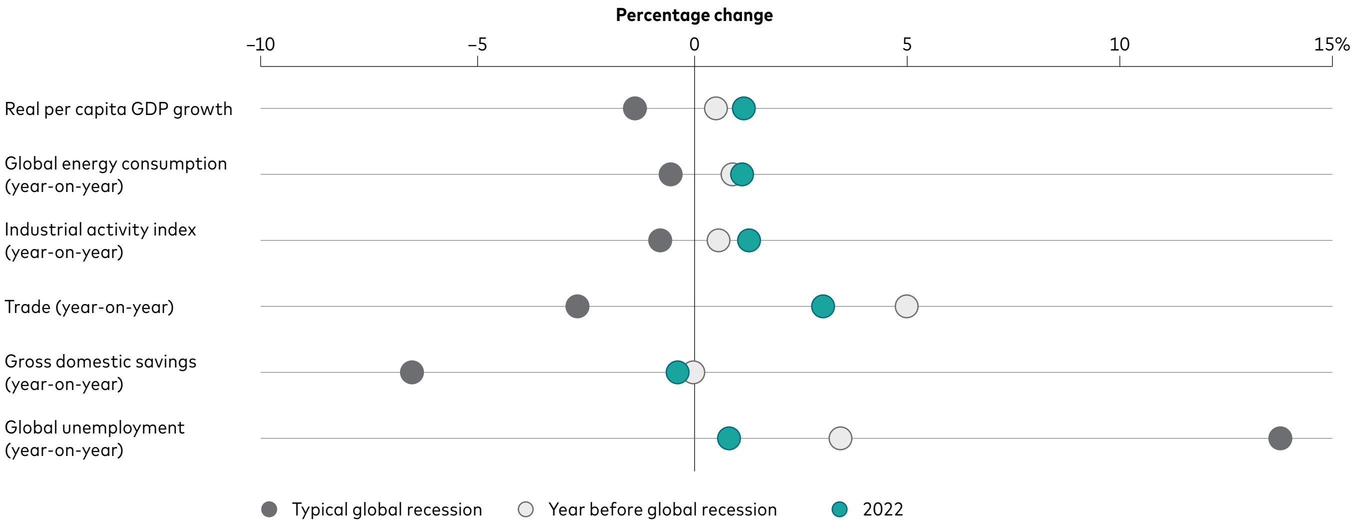
1 While there is no universal definition of a global recession, the World Bank defines a global recession as a period in which (1) annual global real GDP per capita declines and (2) there is strong evidence for a broad-based decline in multiple global economic activity indicators (Kose, Sugawara and Terrones, 2020).

2 See World Bank, 2022, *Risk of Global Recession in 2023 Rises Amid Simultaneous Rate Hikes*, press release issued 15 September 2022, available at www.worldbank.org/en/news/press-release/2022/09/15/risk-of-global-recession-in-2023-rises-amid-simultaneous-rate-hikes.

3 A recession did occur in the US from March to November 2001, though a global recession as defined by the World Bank was avoided.

Periods of global recession tend to be associated with considerable economic and financial market pain (**Figure I-5**). This is in part because, rather than simply a drop in demand or an increase in supply constraints, there is typically broader dislocation in macroeconomic fundamentals or the functioning of financial markets. In 1974 and 1981, global economies were locked in a stagflationary environment brought about by oil supply shocks and an unhinging of inflation expectations; that led to wages and prices moving ever higher in a vicious cycle broken only by substantial monetary policy tightening and ensuing recessions. In 2007, the global financial system nearly came to a halt as liquidity constraints led to solvency concerns at systemically important financial institutions exposed to securities tied to US mortgage debt. And in 2020, large portions of the global economy essentially shut down in efforts to stem the health risks of the Covid-19 pandemic. The starting point for the global economy in 2022 was stronger than in a typical year before a global recession (**Figure I-5**): output and industrial activity were a little stronger and unemployment significantly lower. Taken at face value, a stronger footing into the recession could result in a milder downturn supported by strong balance sheets.

FIGURE I-5
Comparison: global recessions versus now



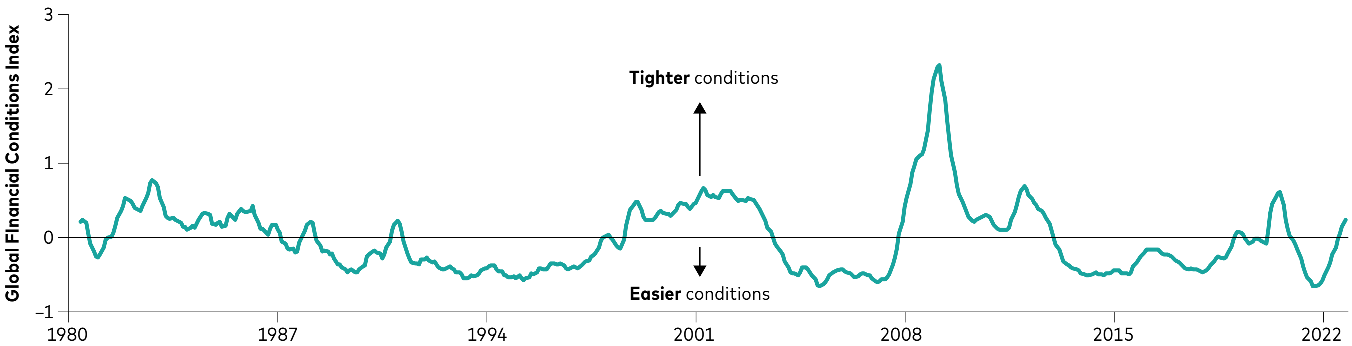
Notes: Global recession years were 1975, 1982, 1991, 2009 and 2020. Year before includes the year before each, excluding 2019. Vanguard calculations are as at 31 October 2022. The typical global recession reflects the median result for each category in the global recession years.

Sources: World Bank, British Petroleum Statistical Review of World Energy, OECD, Federal Reserve Bank of St. Louis FRED database, OeNB, CPB Netherlands Bureau for Economic Policy Analysis, UNCTAD and Our World in Data, as at 31 October 2022. Global unemployment data and years of global recession are from Kose, Sugawara and Terrones (2020).

Today, policymakers face a threat from global inflation brought on by a combination of a strong post-Covid recovery, lingering supply-chain disruptions, the war in Ukraine and overly accommodative fiscal and monetary policy. In response, monetary policy has begun to swing toward restrictive conditions, much as it did during the 1980s (**Figure I-6**), though on a more coordinated scale. There are similarities between the global recessions of the 1970s and what may transpire in coming months, such as relatively tight labour markets (**Figure I-7**) and the presence of supply-side shocks, but there are also key differences. Firstly, rather than double-digit inflation rising ever higher and on the back of rising inflation expectations and wages, inflation expectations have largely stayed contained, particularly those that look out over longer periods (**Figure I-8**). Should that change, central banks will increase the urgency of their tightening processes. Secondly, central banks have built up credibility regarding their resolve and ability to keep inflation at their target rates. This is mainly due to successful efforts to bring inflation down in the 1980s and maintain it at around 2% over the past 30 years. The credibility gained by central banks is what has helped anchor inflation expectations today. This is the key reason why the likelihood of central banks changing their inflation targets amid a high-inflation environment remains low for now, as doing so could hurt their credibility and thus their ability to address inflation in future episodes. That said, a change in the inflation target at some future date cannot be ruled out should it be supported by changes in policy preferences or the structure of the economy (Gagnon and Collins, 2019).

FIGURE I-6

Global financial conditions continue to tighten

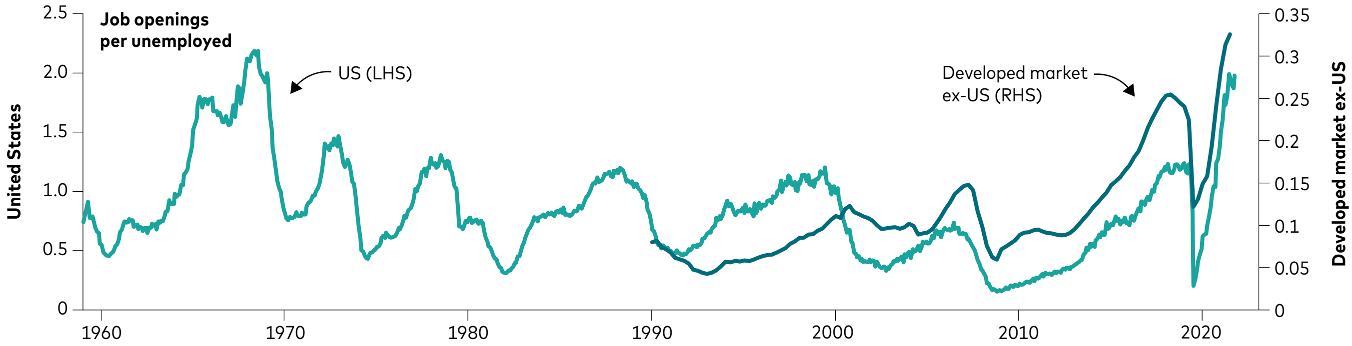


Note: The global index is a GDP-weighted average of the Vanguard US, Bloomberg UK, Vanguard euro zone and Goldman Sachs Japan financial conditions indices.

Sources: Vanguard calculations based on data from Thomson Reuters Datastream, Bloomberg and Goldman Sachs, as at 31 October 2022.

FIGURE I-7

Employers having trouble filling vacant jobs

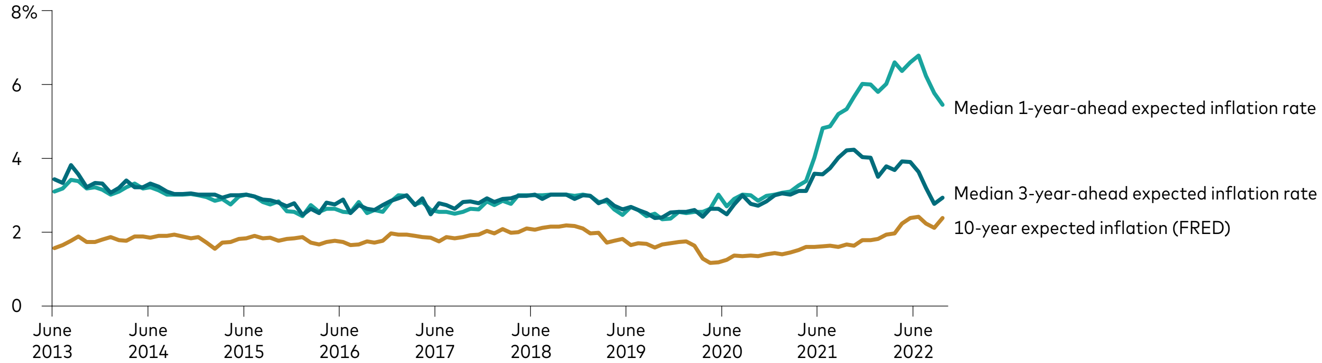


Note: Data include Australia, Austria, Belgium, the Czech Republic, Finland, Germany, Japan, Norway, Portugal, Spain, Sweden, the United Kingdom and the United States.

Sources: Vanguard calculations based on data from Thomson Reuters Datastream, as at 31 October 2022.

FIGURE I-8

Long-term inflation expectations have remained anchored



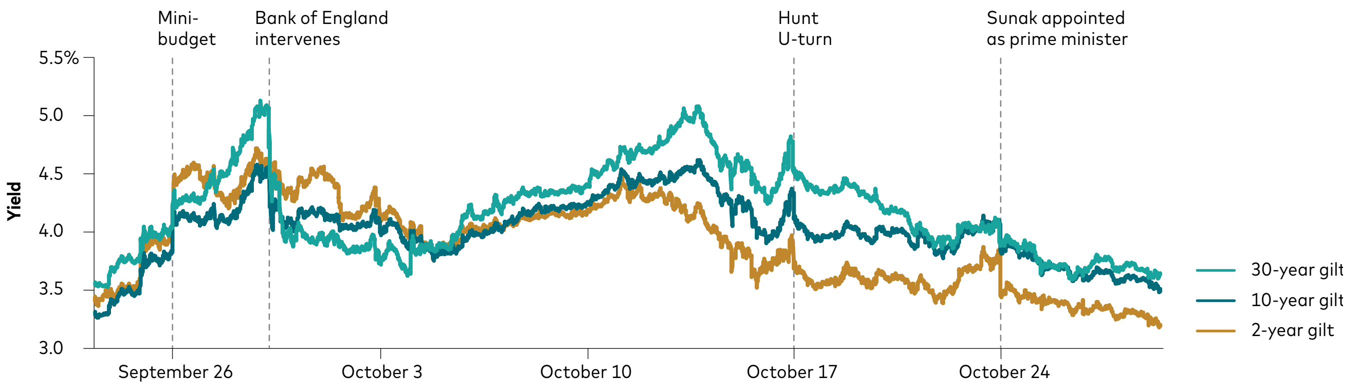
Notes: Global inflation expectations were calculated for G7 countries based on GDP weights. Subcomponent contributions were calculated on a GDP-weighted basis. For CPI subcomponent weights at the country level, 2021 weights were used for the US, the UK, the EU and Canada; 2020 weights were used for Japan. West Texas Intermediate (WTI) spot data were used for oil prices and WTI forward prices were used for forecast estimates.

Sources: Survey of Consumer Expectations, Federal Reserve Bank of New York and Federal Reserve Bank of St. Louis FRED database.

Credibility can affect fiscal policy as well. The market response to the UK's "mini-budget" was swift and harsh (**Figure I-9**), a clear signal that the proposed tax and spending changes negatively affected the perceived willingness and ability of the UK government to service its debts. This should serve as a stark reminder that markets will not tolerate unfunded expenditures (tax cuts or spending increases) beyond a certain level. Following the appointment of Jeremy Hunt as chancellor and Rishi Sunak as prime minister, the UK has seen a return of fiscal orthodoxy. Tax rises and spending cuts worth 2.5% of GDP over the next five years have placated markets. The UK fiscal watchdog – the Office for Budget Responsibility (OBR) – has affirmed that the latest fiscal plans put public sector net debt to GDP on a sustainable path. Gilt yields have returned to levels seen prior to the mini-budget and sterling has recovered against the dollar and euro.

FIGURE I-9

UK gilt yields have declined to pre-mini-budget levels



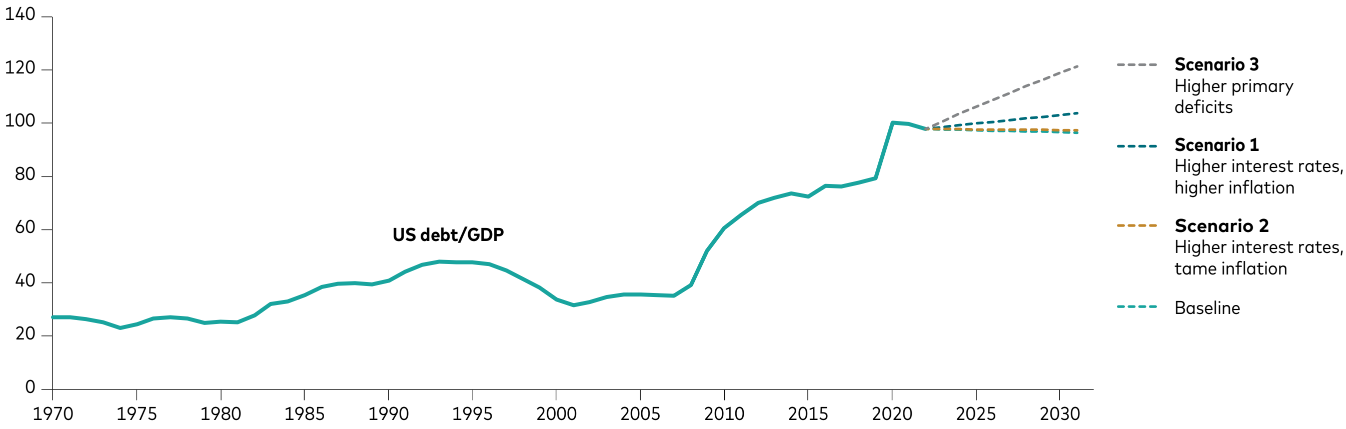
Notes: Intraday data from 22 September 2022 to 27 October 2022, "Mini-budget" refers to the growth plan announced by Chancellor of the Exchequer Kwasi Kwarteng on 23 September 2022. The Bank of England intervened on 28 September to restore financial stability, announcing it would buy an unlimited amount of long-term gilts. On 17 October, new Chancellor of the Exchequer Jeremy Hunt reversed almost all the measures of the mini-budget. On 24 October, Rishi Sunak was announced as the new UK prime minister.

Source: Bloomberg, as at 31 October 2022.

Last year we introduced the theory of fiscal space as one approach to estimating how much debt countries can maintain without risking sustainability and likely interest rate increases (Ostry et al., 2010 and Zandi, Cheng and Packard, 2011). Taking the US situation as an example, **Figure I-10** shows that the current high-inflation, high interest-rate environment does little to affect the sustainability of current debt levels, as the two forces offset each other, but if deficits are to average 5%, as the Congressional Budget Office in the US expects under current US tax and spending policies, the upward trajectory of debt quickly becomes unsustainable. Although the debts taken on during the pandemic were necessary to prevent suffering on a global scale, something needs to be done going forward to start reining in gaps between taxes and spending before financial markets begin to take action themselves. The time is not now, but it is approaching.

FIGURE I-10

US debt ratio is expected to remain flat even in a higher-rate, higher-inflation environment



Notes: Debt-to-GDP ratios were forecasted according to a standard debt accumulation equation. We used real GDP growth taken from July 2022 Congressional Budget Office (CBO) extended baseline projections. The other variables are defined as follows (based on 2022–2032 averages): in the base case, nominal interest rates were assumed to be 1.6%, inflation was assumed to be 2% and the primary deficit was assumed to be 2%. We modifed those assumptions as indicated by the labels in the figure. For Scenario 1, we used 2.5% for the nominal interest rate. For Scenario 2, we used 2.5% for the nominal interest rate and 2.8% for inflation. For Scenario 3, we used 5% for the primary deficit.

Sources: CBO July 2022 extended baseline projections and Vanguard, as at 4 November 2022.

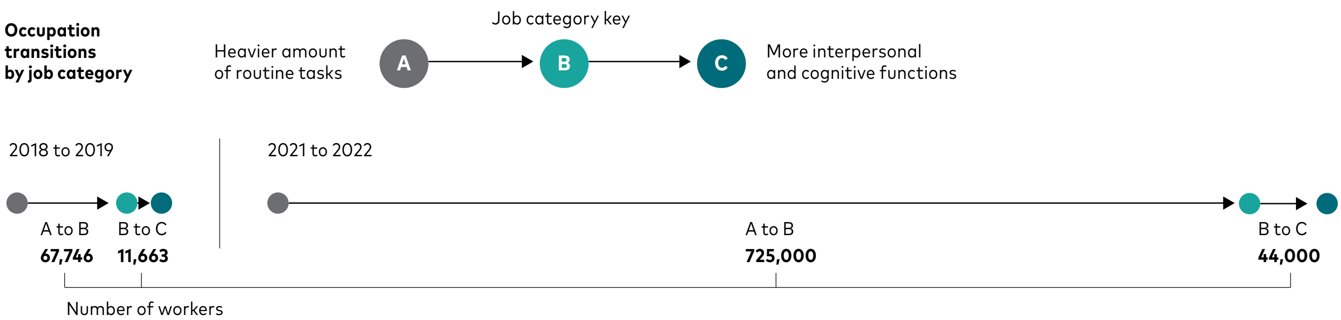
In addition to previously mentioned goods and energy supply shocks and accommodative policy considerations, labour market dislocations have played a role in shaping our current environment. Our research has shown that, as with the other factors, this is in part due to the pandemic and its lingering impacts (Clarke, Tan and Schickling, 2022). That said, the factors driving labour market frictions over the last few years (slowing population growth, increasing retirements and changing skill supply-and-demand dynamics) are likely an acceleration of labour market trends that had been in place well before Covid-19 and the policy responses to it that threw economic and financial markets into turmoil.

In 2018 we presented a more optimistic perspective on automation's impact on labour markets, outlining why automation and broader trends in the skills required of jobs meant that labour demand, rather than declining, was likely to shift to incorporate different skill sets (Tufano et al., 2018). Mirroring what has been the case during most economic downturns (Kopytov, Roussanov and Tashereau-Dumouchel, 2018), increasing numbers of studies and our analysis in **Figure I-11** highlight how people took the time to upskill during the pandemic (Ganguli et al., 2022), because of more time spent at home, concern about the viability or safety of their current industry and/or their increased ability to spend time and money acquiring those additional skills. In **Figure I-11**, the one-third of jobs with the least amount of interpersonal or cognitive capabilities fall into Category A, the middle one-third into Category B and the one-third with the highest requirement of interpersonal and cognitive capabilities into Category C. As individuals move from a Category A role to a Category C role, they typically require increasing amounts of training to allow them to develop the interpersonal and cognitive capabilities required of that type of role. Our work shows that the movement from A to B to C roles from 2021 to 2022 is substantially greater than that which occurred in 2018 to 2019, before the pandemic.

In addition to the movement of workers between types of jobs, this upskilling also implies future productivity increases over time that would in part offset any inflationary pressures associated with higher wages. But the road to that point will be painful. Staffing shortages (**Figure I-12**) are likely in the near term, meaning that wage pressures and the risks they pose to inflation are likely to persist in the absence of intervention from central banks and the impacts outlined earlier.

FIGURE I-11

Job upskilling is a tailwind for potential economic growth



Notes: Occupations categorised as A entail more routine tasks, while B and C occupations entail more cognitive and interpersonal job functions. Average 2021 pay levels for each category in our sample data were $37,200, $51,800 and $60,500.

Sources: Vanguard calculations based on data from the Bureau of Labor Statistics Current Population Survey, as at 30 September 2022.

FIGURE I-12

A global recession will offer only temporary relief from a tight US labour market

Labour supply-demand balance	2022	2025
Supply: Expected civilian labour force	165 million	165.5 million
Demand: Employment + job openings	170 million	174 million
Current shortfall	**5 million**	**8.5 million**

Labour shortfalls likely offset

Labour shortfalls		2025
1	**Non-uniquely human to uniquely human job transitions**	+ 1.5 million
2	**Legal migration returns to pre-Covid 19 rate**	+ 3 million
3	**a. Work-from-anywhere dividend**	+ 600 thousand
	b. Demographic dividend	+ 1.8 million
Implied 2025 shortfall		**1.6 million**

A milder, but still tight labour market

Implied	2022	2025
Vacancy/Unemployment (V/U)	2.0	1.2
Wage growth	6%	4%
Inflation (CPI)	5%–6%	2%–3%

Notes: Non-uniquely human to uniquely human job transitions reduce the labour shortfall since the workers' output per hour increases after the transition. The work-from-anywhere dividend is an estimate of the increase in labour force participation brought on by increased remote work opportunities. The demographic dividend refers to the sizeable percentage of non-working individuals ages 60 to 75 who report a desire to return to the labour force if conditions are right.

Sources: Vanguard calculations based on data from the Bureau of Labour Statistics, as at 30 September 2022.

From an economic, financial market and social perspective, the last few years have left us with no shortage of volatility and pain. That is, unfortunately, likely to persist in the near term as we work through the lasting impacts of the pandemic and subsequent policy reactions. A recession, probably global in nature, seems likely in the next year and, with it, job and output losses that hopefully lead to declines in inflation. That said, households, businesses and financial institutions are in a much better position to handle the eventual downturn, such that drawing parallels with the 1970s, 1980s, 2008 or 2020 seems misplaced.

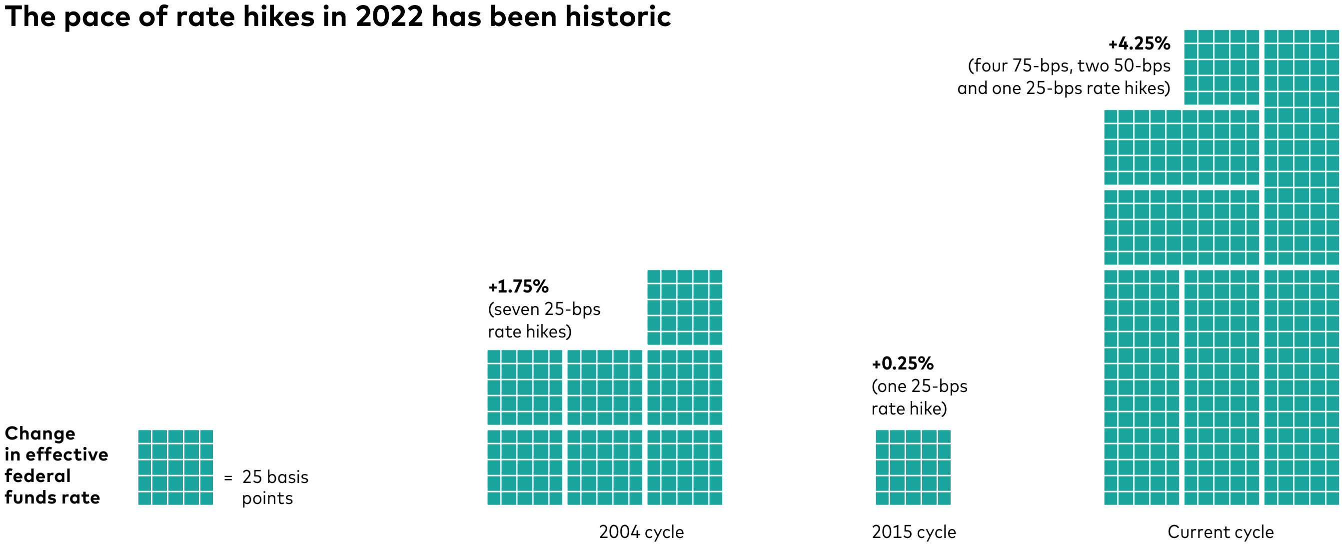
US: A narrow path gets narrower

Economic outcomes in the US for 2023 – much like in the rest of the developed world – will be dominated by monetary policy efforts to accelerate the path of inflation back to target. Growth slowed materially in 2022, but inflation has remained stubbornly elevated and the labour market strong. Further slowdowns in growth and a weakening of the labour market are necessary conditions for disinflation.

Compared with recent history, the current monetary tightening cycle is historic and leaves the narrowest of paths for the economy to escape without a period of recession. **Figure I-13** illustrates the rapid rise in the policy rate over the last four quarters and relative to previous cycles.

FIGURE I-13

The pace of rate hikes in 2022 has been historic



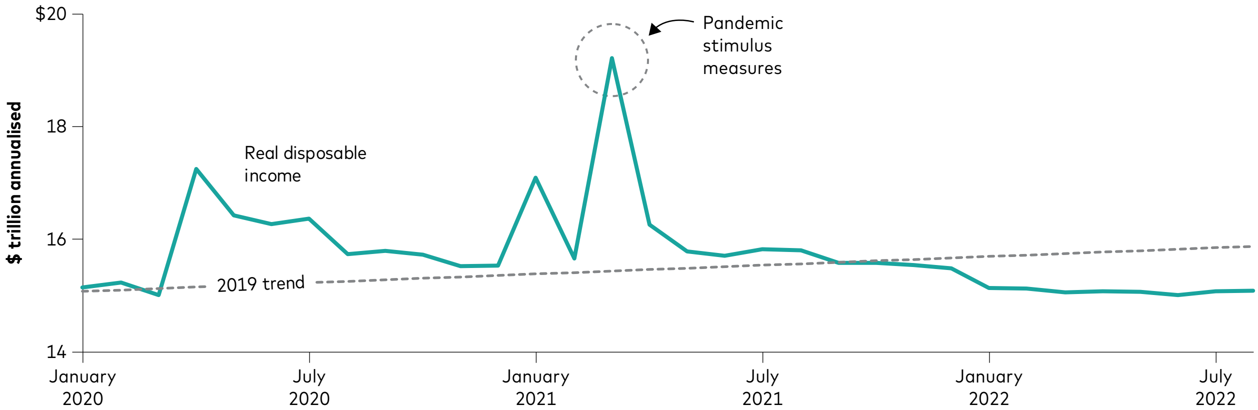
Notes: The figure shows changes in the effective federal funds rate during the first four quarters of each hiking cycle. The current cycle assumes an additional 50 bps of tightening will occur at the December 2022 Federal Open Market Committee meeting. A basis point equals one-hundredth of a percentage point.

Sources: Vanguard and the Federal Reserve Bank of St. Louis, as at 31 October 2022.

Overall, we expect GDP growth of around 0.25% over the course of 2023. Key interest-rate-sensitive sectors of the economy such as housing have already abruptly slowed and consumers are facing wage gains that, while nominally strong, have turned sharply negative in real terms. We estimate that given the pace of inflation relative to wages, the average household experienced a $400 shortfall per month in its standard of living relative to before the pandemic. **Figure I-14** shows the current severity of real income shortfall compared with the pre-Covid income trend. Households in aggregate have thus far absorbed rising prices by relying on a strong labour market and a remaining savings buffer built up during the pandemic, but inflation has depressed sentiment and overall growth activity has slowed below trend as we head into 2023.

FIGURE I-14

Real purchasing power is a key headwind to growth

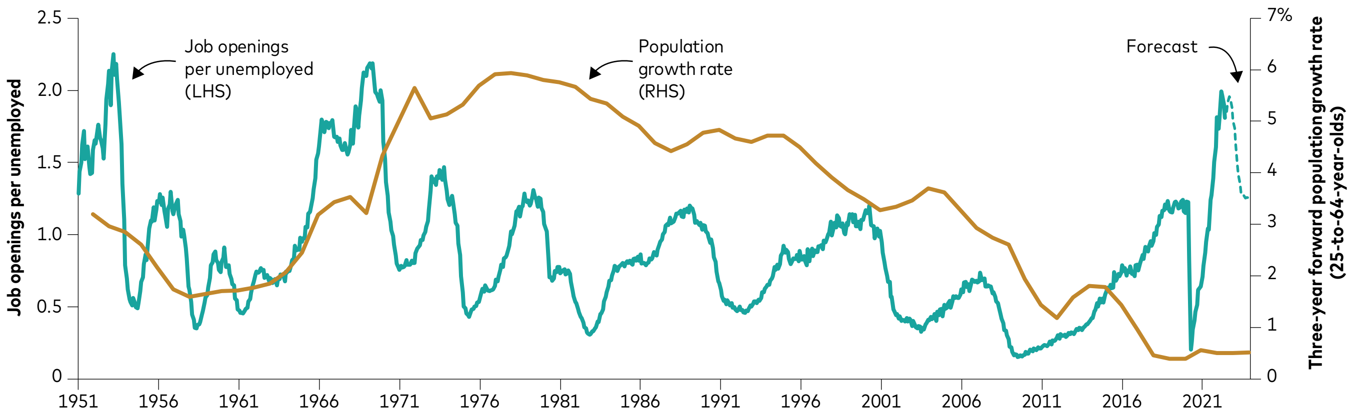


Sources: Vanguard and Refinitiv, as at 31 October 2022.

Although the US labour market has been surprisingly resilient to these mounting economic challenges, aided by structural labour-supply constraints, we expect that demand for labour will moderate as consumers and companies brace for a recession. But considering how tight the labour market is entering this recession – as shown in **Figure I-15** in job openings per unemployed and the slower pace of new entrants into the workforce as a result of slower population growth – unemployment may peak around 5%, a historically low rate for a recession. Furthermore, as a result of the moderation in labour demand and declining consumer confidence, job turnover rates are likely to return to more normal levels, which will help reduce wage inflation to a more sustainable 4% nominal growth rate. We expect a weaker labour market on a number of fronts as outlined above, which will hopefully put downward pressure on inflation.

FIGURE I-15

Tepid working-age population growth limits the downside for the US labour market

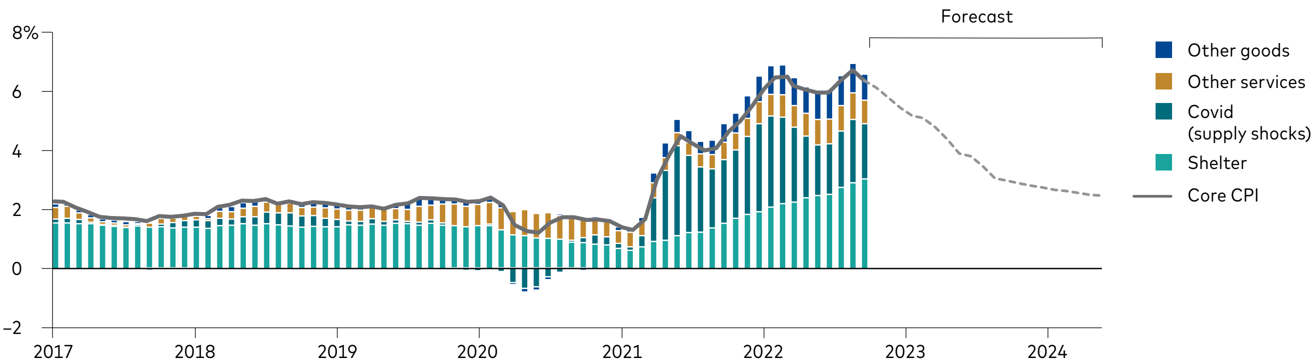


Sources: Vanguard calculations based on data from Datastream, DataBuffet and the Bureau of Labor Statistics, as at 31 October 2022.

Among the drivers of US inflation, in addition to a tight labour market, 2022 saw the lagged impact of supply constraints resulting from pandemic-era dynamics pushing inflation higher (**Figure I-16**). As we step into 2023, early signs of a recovery in goods supply and softening demand could help balance supply and demand for consumption goods and bring prices lower. But expectations of a stronger pickup in services – especially the stickier component of shelter inflation – will keep inflation from falling back quickly. We see inflation by the end of 2023 settling at 3%, which is higher than the Fed's inflation target of 2%. In other words, we do not see inflation returning to target next year.

FIGURE I-16

Inflation has proved more persistent because of Covid-related shocks and the shelter component



Notes: The Covid supply shocks component includes subcomponents that faced extreme supply bottlenecks and demand shocks during peak Covid, namely transportation services and vehicles. Other goods includes apparel, household furnishings and recreational goods. Other services includes health care, education and communication, recreational services and other services. Energy price shocks are not directly included in transportation services but are indirectly included through higher airfares. Shelter inflation is the component that captures the effect of shelter costs in the overall CPI. Shelter includes prices for both renters and homeowners. For renters, shelter inflation measures both rent and utility payments. For homeowners, the BLS calculates what it would cost to rent a similar house.

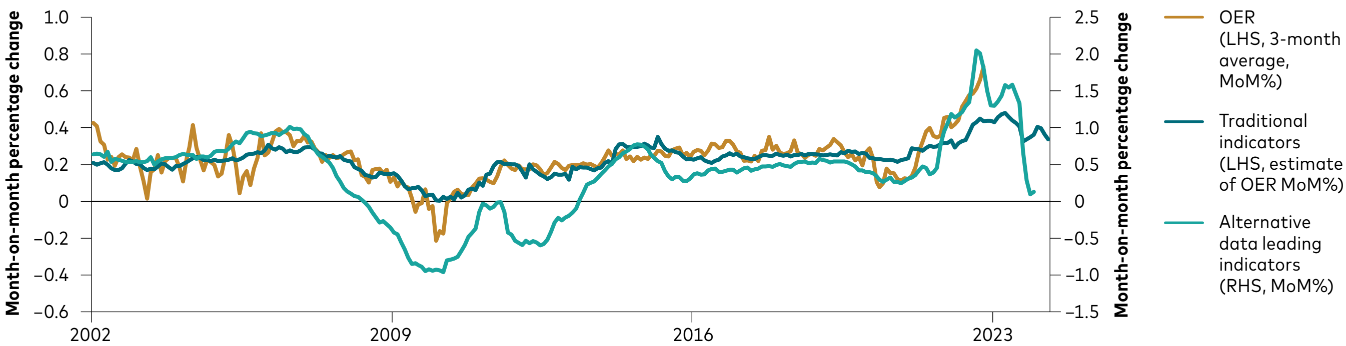
Sources: Vanguard calculations based on data from the Bureau of Labor Statistics, as at 31 October 2022.

As we discussed earlier, monetary policy and the communications from policymakers have squarely focused on inflation and policy rates are currently at levels broadly considered restrictive for economic activity, with more likely in coming quarters. That said, we're starting to see signs of progress in the fight against inflation. Prime among these is housing activity, where signs of slowing momentum are already evident. Given the lag with which housing activity filters into inflation, this will eventually result in a slower pace of shelter inflation sometime in the second half of 2023. In early 2023, shelter inflation will remain strong, reflecting the still-robust housing market momentum of early 2022 (**Figure I-17**). The stronger gains in shelter inflation, in our view, will be offset by a faster deceleration in goods inflation and a slowdown in wages as a tighter policy rate environment begins showing its full effect on the economy in 2023.

Given such price and labour dynamics of late, our monetary policy outlook has become more hawkish and we expect a "higher for longer" policy rate environment ahead. Our baseline outlook envisions the policy rate tightening to reach a peak of 5% by early 2023 and remaining at similar levels throughout the year. Given the uncertainty that the inflation path has posed thus far, we expect the Fed to favour a pace of tightening based strongly on data dependence, with wage and inflation expectations being key watch variables that will influence the Fed's ultimate path.

FIGURE I-17

Both traditional and alternative data suggest a slowdown in shelter inflation only after mid- to late-2023, keeping core inflation elevated at year-end 2023



Notes: Owners' equivalent rent (OER) represents the CPI subcomponent of owner-imputed rent, which holds the highest weight in core CPI. Traditional indicator estimates of OER MoM% are based on a Vanguard proprietary model used to forecast OER MoM gains. Alternative data indicators contain publicly provided data from private rental and housing firms. Weighted average of MoM changes in alternative data has been a relatively good signal of turning points in the monthly pace of shelter inflation.

Sources: Vanguard calculations based on data from Zillow, Apartment List, the Bureau of Labor Statistics, the U.S. Bureau of Economic Analysis, Refinitiv and Moody's, as at 31 October 2022.

Euro area: The European Central Bank (ECB) will continue to tighten despite recession

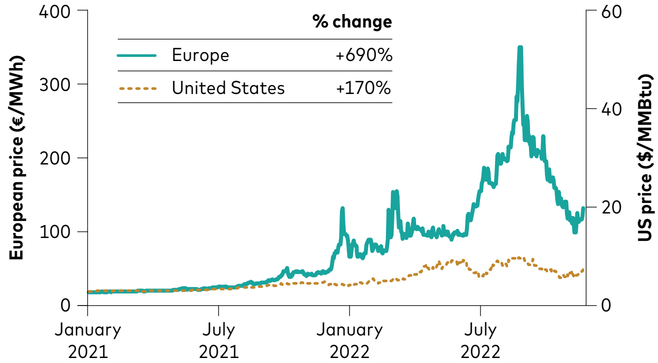
Inflation and the policies enacted to address it have played a large role in shaping the economic conditions in the euro area. The war in Ukraine added another layer of uncertainty, volatility and price pressures in 2022. Activity held up well in the first half of the year, supported by a strong post-pandemic recovery. Growth momentum, though, slowed sharply in the second half as higher energy prices (**Figure I-18a**), tighter financial conditions, depressed sentiment and weakening global growth all weighed on the economy. We expect euro-area GDP growth to slow from around 3% in 2022 to 0% in 2023.

Looking ahead, we are encouraged by Europe's flexibility in adapting to the sharp reduction in Russian gas imports. Over 90% of its gas storage capacity has been filled, helped by additional imports from other pipeline and liquefied natural gas suppliers and efforts have been made to use alternative energy sources in some industries. This should help soften the blow. That said, we still expect gas demand to contract by about 15% this winter relative to last year (**Figure I-18b**) given the war-related supply constraints.

FIGURE I-18

A European energy crisis

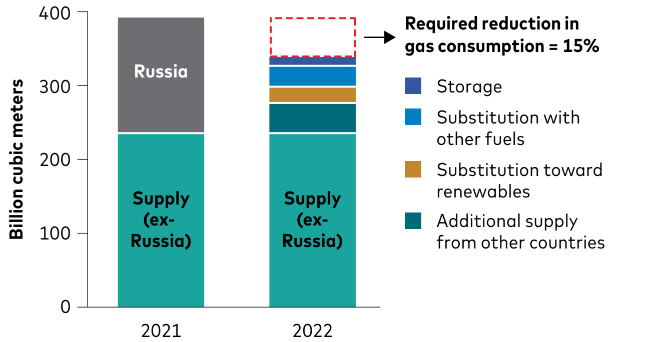
a. European natural gas prices remain elevated



Notes: Increase since 31 December 2020. ICE Dutch TTF natural gas price for Europe and Henry Hub natural gas price for the the US. Daily data from 1 January 2021 to 23 November 2022.

Source: Bloomberg, as at 23 November 2022.

b. European gas imports: how the gap will be plugged

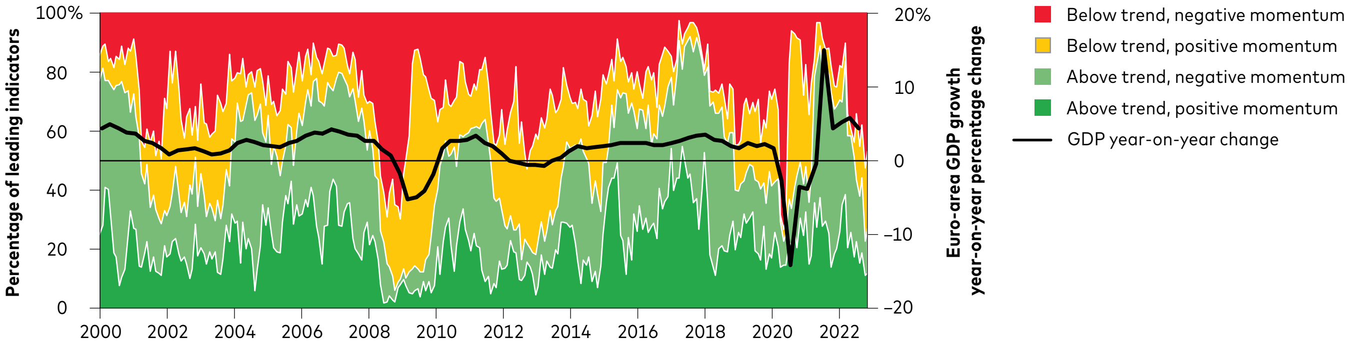


Sources: International Energy Agency, European Commission and Vanguard estimates, as at 31 October 2022.

Forward-looking data, including Vanguard's leading economic indicator, point to continued weakness ahead (**Figure I-19**). In our base case, we expect that the euro-area economy will have entered recession from the fourth quarter of 2022, with growth turning positive only in the second half of 2023. We anticipate that Germany and Italy will underperform, given their relatively large energy-intensive industrial sectors. The risks to this view are skewed to the downside: we do not rule out the prospect of a double-dip recession in the second half of 2023 given that European gas supply will be starting from a much lower base than in 2022 and financial conditions will be tighter. Upside risks include milder-than-expected weather or an earlier-than-expected resolution to the war. As with the US, many of the risks come down to luck.

FIGURE I-19

Vanguard leading economic indicator points to further deterioration in economic growth



Notes: Monthly data from January 2000 to October 2022. The Vanguard leading economic indicator (VLEI) dashboard considers a range of leading indicators, sorted based on current levels relative to trend and underlying momentum. Indicators include consumer confidence, industrial production, retail sales, trade-weighted euro, factory orders and stock market indices.

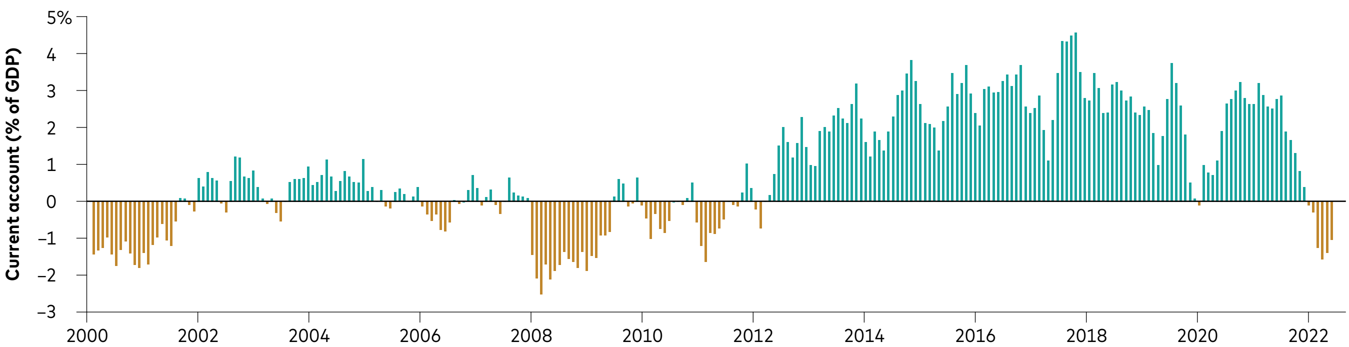
Source: Vanguard, as at 31 October 2022.

Also similar to the US situation is that the central challenge for European policymakers remains rising inflation. To be successful in guiding inflation back down to target, the ECB will need a combination of good decision-making, good communication and good luck. The headline CPI rate doubled, from 5% at the start of 2022 to 10% in November, predominantly because of accelerating energy and food prices. A weakening of the euro, partly driven by the war-induced negative terms-of-trade shock (**Figure I-20**), has amplified this inflationary pressure, as it raised the cost of imports priced in foreign currencies, putting downward pressure on growth[4].

The breadth of inflation has also increased throughout 2022. Some 80% of the CPI is now tracking at an annual rate above 3% and core inflation accelerated from 2.6% at the start of the year to 5% as at November. We expect both headline and core inflation to peak in December 2022 and then fall gradually in 2023 as energy and food price base effects unwind and demand softens. We still, though, expect inflation to average 5.5%–6% in 2023, well above the ECB's target of around 2%, as services inflation persists and core goods pressures dissipate only gradually (**Figure I-21a**).

FIGURE I-20

The current account has switched from surplus to deficit



Note: Monthly data from January 2000 to August 2022.

Sources: Vanguard calculations based on data from Bloomberg, as at 24 October 2022.

4 A country's terms of trade refers to the relative price of exports compared with imports.

The ECB will be concerned about the stickiness of inflation, particularly in the services component, amid a still-tight labour market. Indeed, the unemployment rate is at a record low of 6.5% (as at October 2022), wage growth has increased to 4% year-on-year compared with a pre-pandemic average of 2%[5], and there is tentative evidence that high inflation is now flowing through to longer-term inflation expectations (**Figure I-21b**).

We therefore expect the ECB to build on the 200 basis points' worth of rate increases it has already delivered, with the deposit rate having risen from –0.5% at the start of 2022 to 1.5% at the October 2022 meeting. (A basis point is one-hundredth of a percentage point.) Our base case is for the deposit rate to reach at least 2% by year-end and to peak at 2.5% in early 2023. We expect this restrictive policy stance to be maintained throughout 2023, with risks to our terminal rate view skewed to the upside given the underlying strength of the labour market.

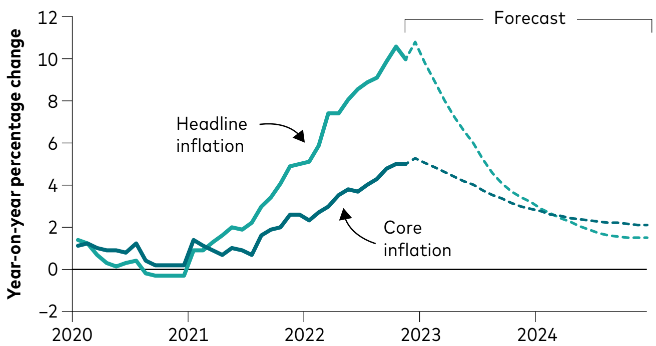
As policymakers continue to raise rates, they will need to be mindful of the risk of euro-area fragmentation, which would impair the proper functioning of monetary policy. The introduction of the Transmission Protection Instrument will help allay concerns here. In our central scenario, the presence of this tool, coupled with a delay of quantitative tightening until the second half of 2023, will limit any material blowout in peripheral spreads.

Finally, given our central scenario of recession, we expect euro-area governments to keep energy-related fiscal measures for at least the first half of 2023 in order to cushion demand, which we estimate will average between 2% and 3% of GDP. This will delay any plans for fiscal consolidation until the latter part of 2023 at the earliest. Given weak growth, continued energy support and rising interest costs, euro-area debt-to-GDP ratios are unlikely to fall meaningfully in the near term. Italy will be under the most scrutiny because of its relatively high debt burden and the election of a new government. Debts will remain sustainable in the near term, but solutions to growing debt burdens must be discussed going forward.

FIGURE I-21

Inflation is a challenge for policymakers

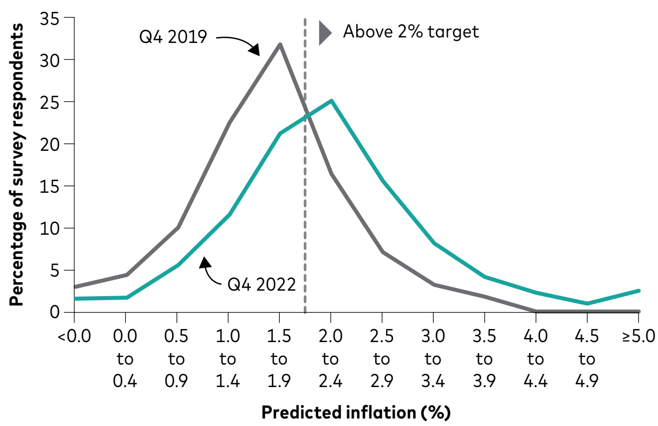
a. Peak in inflation is yet to come



Note: Monthly data from January 2020 to November 2022 and Vanguard forecasts thereafter.

Sources: Vanguard calculations based on data from Bloomberg, as at 22 November 2022.

b. Long-term inflation expectations have become stickier



Note: Longer-term expectations refer to 2027 in Q4 2022 and to 2024 in Q4 2019.

Sources: ECB and Survey of Professional Forecasters, as at 28 October 2022.

5 As measured by the euro-area employment cost index.

UK: Recession looms large as cost-of-living crisis intensifies

The war in Ukraine, the unique structure of the UK energy market and domestic political instability posed challenges to the UK economy in 2022. Activity slowed consistently throughout the year as higher commodity prices, tighter financial conditions, very low confidence and a weak global growth backdrop all dragged on demand. This was before the mini-budget was announced and then renounced weeks later in an effort to appease financial markets. We expect 2022 UK GDP growth of about 4%, coming from a low 2021 base, but – as with other major developed markets – slowing to –1% to –1.5% in 2023.

We expect the economy to have entered recession in the third quarter of 2022. Business surveys are now consistent with a sharp contraction in output and consumer confidence metrics are at historical lows. Forward-looking indicators, including Vanguard's leading economic indicator, suggest further weakness ahead. We expect the recession to last at least six quarters and to be deeper than in the euro area.

The UK's annual rate of CPI inflation doubled in 2022, from 5.4% at the start of the year to 11.1% as at October 2022. The acceleration was primarily driven by higher energy and food prices, though the core goods and services components also rose significantly. The government's Energy Price Guarantee (EPG) policy, which caps unit energy prices, should keep a lid on inflation in the near term.

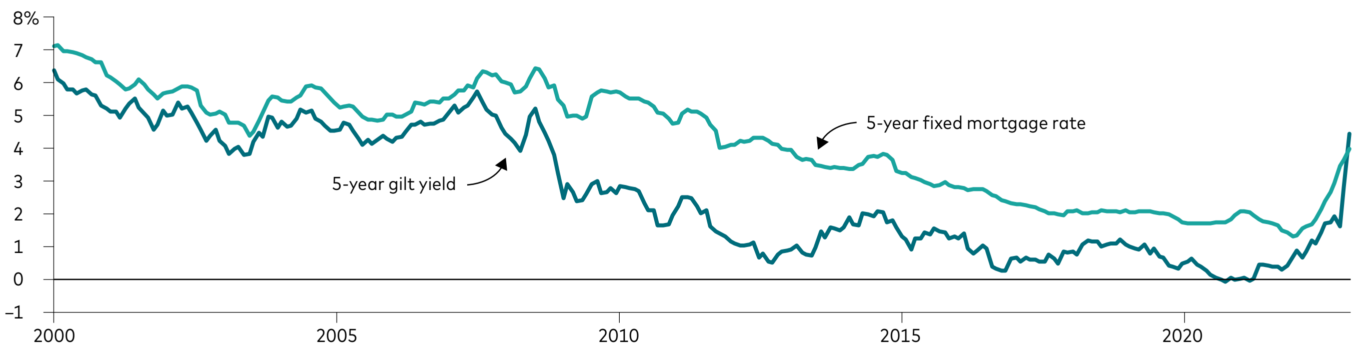
In our base case, we expect inflation to fall gradually from a peak of above 11% in the last quarter of 2022 and to average 6% to 6.5% in 2023, well above the BoE's 2% target.

Aside from energy prices, the BoE will be closely monitoring developments in the labour market to calibrate its appropriate policy response. As in the US, job vacancies in the UK remain close to record highs and wage pressures have intensified, with wages rising roughly 6% year-on-year. The latter issue is of particular concern as strong wage growth will lead to more persistent inflationary pressure, predominantly through the stickier services component. In our central scenario, we expect the BoE to raise interest rates to around 3.5% by the end of 2022 and to a peak rate of 4.5% in early 2023. We expect this restrictive policy stance to persist throughout 2023.

With the implementation of the EPG and higher interest rates, we expect the narrative of the UK's "cost-of-living" crisis to shift away from higher energy prices and towards higher mortgage interest payments. If the Bank Rate does reach 4.5%, this would imply new mortgage rates of at least 5.5% for the average borrower – a near-quadrupling of interest costs (**Figure I-22**). As a large proportion of UK mortgagers are on fixed rates, it will take time for this effect to feed through to the economy. That said, we estimate that 35% to 45% of the total stock of UK mortgages will be repriced to newer rates over the course of 2023. This will further weaken the outlook for the consumer and exert downward pressure on housing valuations.

FIGURE I-22

New mortgage rates have moved in line with higher UK bond yields



Note: Monthly data from 31 January 2000 to 30 September 2022.
Source: Bloomberg, as at 21 October 2022.

The year 2022 was also one of political instability for the UK. Disagreements within the Conservative Party led to three different prime ministers (and four different chancellors). Despite the aggregate fiscal consolidation of the Autumn Statement, policy is actually set to ease in the next two financial years to protect the economy during recession, with the expected tightening occurring thereafter (**Figure I-23**).

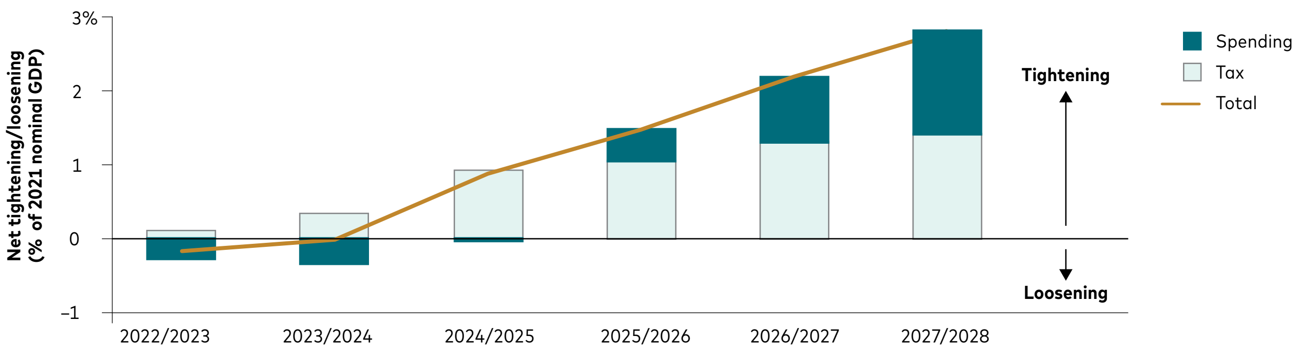
Concerns remain over the sustainability of the UK's debt profile. Although the debt-to-GDP ratio, at below 100%, is lower than in many other developed economies, substantial fiscal consolidation was pencilled in the Autumn Statement to prevent it from rising significantly in the next five years (**Figure I-23**).

The UK is arguably in a more fragile situation than other developed economies. Growth is already weak and global inflation shocks are amplified given that it is a small, open economy. To bring inflation back down to target, the economic sacrifice – ultimately through higher unemployment – could be larger.

Raising interest rates sharply to address this heightened inflation challenge may also unveil hidden risks, particularly given the UK's relatively large financial sector. The stress experienced by some domestic pension funds amid volatility in the gilt market earlier this year is one example of this risk to financial stability.

FIGURE I-23

A modest loosening in fiscal policy until 2024



Sources: Vanguard and the OBR, as at 21 November 2022.

China: A cyclical bounce meets a structural downturn

As in major developed economies, policy has played and will play a large role in economic outcomes in China, but for different reasons. China's economic fortunes are governed by what we have termed an "impossible trilemma", in which policymakers must balance three competing priorities: maintaining a zero-Covid policy (ZCP), ensuring financial stability and sustaining strong levels of economic growth. In 2022, policymakers focused on upholding ZCP and ensuring financial stability at the cost of growth. As a result, we forecast GDP growth to end 2022 at around 3%, well below the historical average and official targets of 5.5%. In 2023, we expect that policymakers' focus is likely to gradually shift away from maintaining a strict ZCP toward achieving slightly stronger economic growth levels.

This will most likely result in a cyclical bounce in 2023 of 4.5% GDP growth with risks skewed to the upside on that view, driven by gradual loosening of Covid controls and a stabilising real estate sector (**Figure I-24**). Nonetheless, we believe that the cyclical bounce will be modest compared with those that followed the global financial crisis in 2009 and the 2020 Wuhan lockdown, given the expected global recession, uncertainty around the exit path from Covid-19, the lack of willingness and capacity to overstimulate the economy and a structural slowdown of growth potential in the long run.

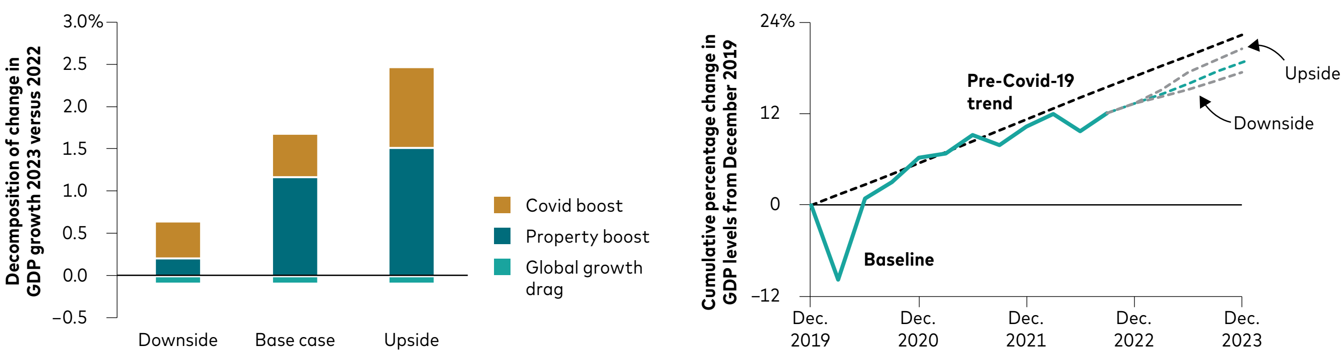
Policymakers have announced that they plan to prepare to reopen the economy by relaxing Covid-19 controls, promoting vaccine and drug development and improving hospital facilities. This could engineer a long-awaited recovery in consumption and service activities. Crucially, however, we think the exit from Covid-19 is unlikely to be smooth, as China's health care system remains vulnerable to large outbreaks. A gradual reopening is more likely, in our view, as booster vaccination rates for the older population improve and an mRNA vaccine and/or effective treatment becomes widely available, which should lead to a more evident rebound in the economy following the National People's Congress (NPC) next March.

FIGURE I-24

Cyclical bounce expected in 2023 as the zero-Covid policy is unwound and the real estate sector stabilises

a. 2023 cyclical GDP bounce decomposed into drivers

b. Chinese GDP unlikely to fully recover to pre-Covid levels



Sources: Vanguard calculations based on data from Bloomberg, as at 31 October 2022.

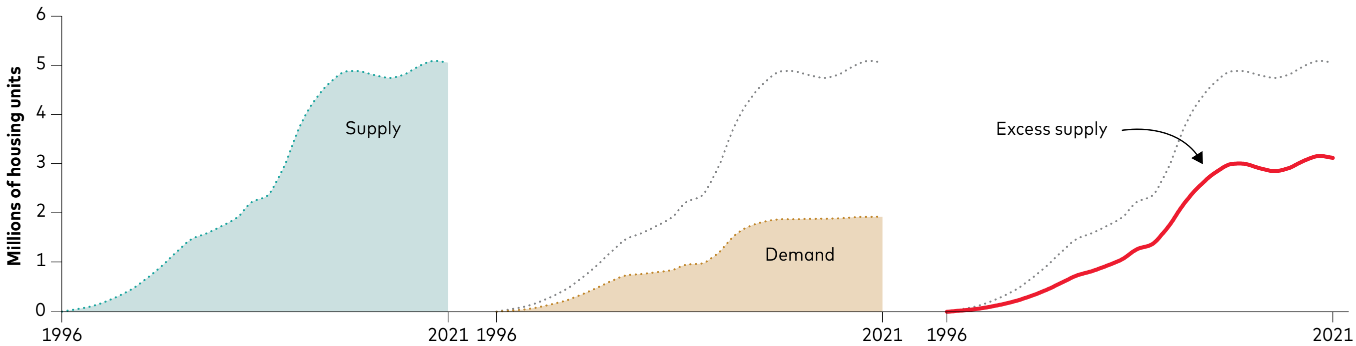
Notes: The baseline assumes a gradual decline in Covid restrictions with the pace accelerating after the March NPC meetings, but no complete abolishment. It also assumes that real estate investment stabilises but does not rebound. The downside scenario assumes Covid restrictions remain at pandemic highs by the March leadership meetings and decline gradually towards year-end, plateauing at a high level. It also assumes real estate investment continues to fall but at a slower pace than in 2022. The upside scenario assumes Covid restrictions are largely abolished after the March NPC meetings while real estate investment has a modest recovery.

Along with ZCP, China's real estate sector was a major drag on headline growth in 2022, subtracting around 2%. In 2023, we expect a cyclical rebound in the sector, which may boost growth by slightly more than 1 percentage point relative to 2022. This rebound is driven by supportive fiscal and monetary policy, stabilising sentiment and real estate investment and reopening the economy, which will help boost demand at a low level following a nearly 10% contraction in 2022. We believe the rebound will be restrained by the significant structural challenges facing China's real estate sector, including oversupply, poor affordability and worsening demographic trends (**Figure I-25**).

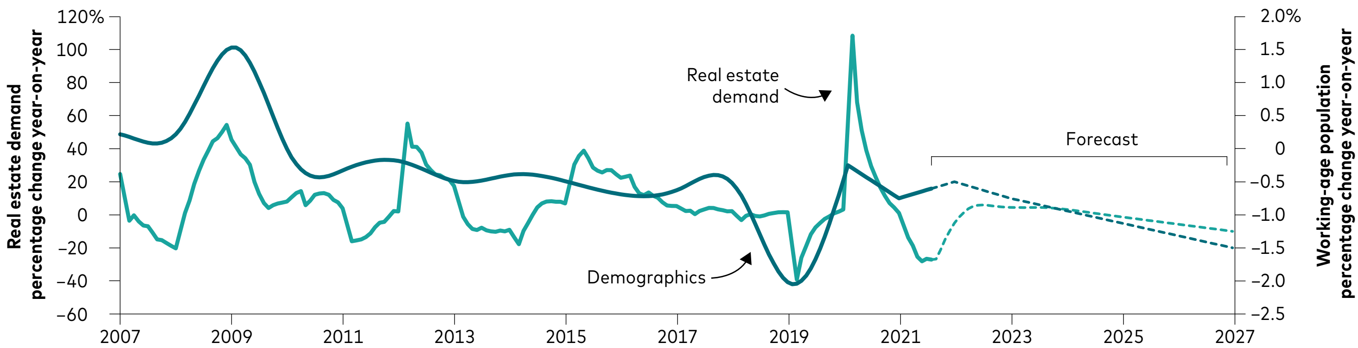
FIGURE I-25

Despite easing regulation, the housing market is unlikely to rebound because of a structural downturn

a. Housing remains oversupplied in China, with increased demand providing only a slight offset to supply growth



b. Cyclical factors will provide near-term support to housing, but structural factors will lower demand over the next five years

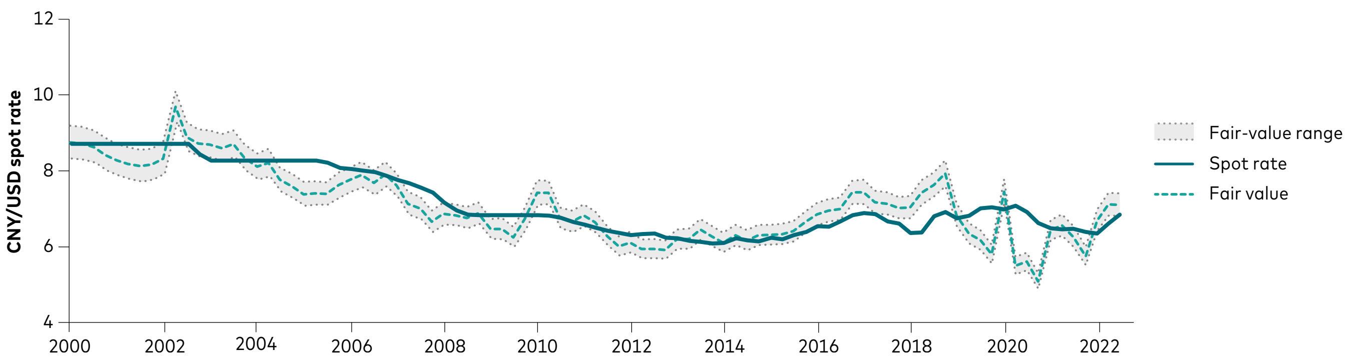


Sources: Vanguard calculations based on data from Bloomberg, as at 31 October 2022.

A modest cyclical bounce, following the deep downturn in 2022, suggests that a negative output gap is likely to persist towards the end of next year even in our upside scenario, with the normalisation in consumption and services continuing to lag behind that of production. Such an incomplete and uneven recovery of the economy would keep consumer inflation subdued. We expect headline CPI to average 2.2% in 2023, with core inflation below 1%. As such, the People's Bank of China (PBoC) is likely to continue with modest liquidity easing and interest rate cuts in the near term, bucking the global trend. Nonetheless, we also believe that policymakers will refrain from overstimulating the housing market and the broader economy in 2023, given concerns about ever-rising leverage and financial stability risks. In fact, once the economy starts to rebound in the second quarter, we expect policy to switch to a more neutral stance. In addition, the depreciation in the renminbi in the second half of 2022 is a reminder that Chinese policymakers have limited space to stimulate, as further and more aggressive easing may lead to capital outflows and higher inflation. The currency is likely to remain under pressure in 2023 as developed-market central banks continue raising interest rates in efforts to curb inflation, though the improved growth outlook in China and the interventions by the PBoC to prevent panic about financial stability could help stabilise the renminbi down the road. Our fair-value model (**Figure I-26**) suggests that the renminbi is now close to fair value based on fundamentals.

FIGURE I-26

Our fair-value model is showing the renminbi fairly valued at current levels

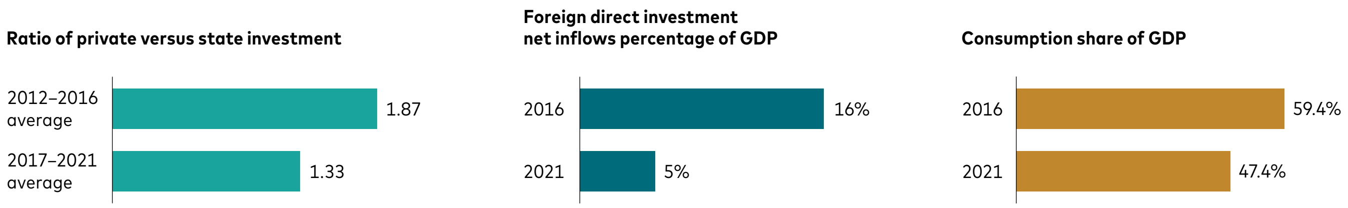


Sources: Vanguard calculations based on data from DataStream, as at 31 October 2022.

In addition to policymakers' reluctance to overstimulate, a worsening structural growth outlook is expected to restrain the recovery in 2023 and the growth outlook in the years ahead. Foreign direct investment flows into China over 2017–2021 were significantly lower than they had been in the prior five years, amid a slowing globalisation trend and rising geopolitical tension, while the pace of private sector investment slowed notably over the same time frame (**Figure I-27**). These developments will weigh on productivity growth, a key determinant of potential growth rates. Also concerning is that progress has reversed during the pandemic on the shift from an investment-led economy to a consumption-led one, exacerbating concerns about growth sustainability in the medium term.

FIGURE I-27

Japanification warning signs, with rising concerns about long-term growth sustainability



Sources: Vanguard calculations based on data from Bloomberg and the CEIC, as at 31 October 2022.

Emerging markets: Headline growth resilience meets underlying economic divergence

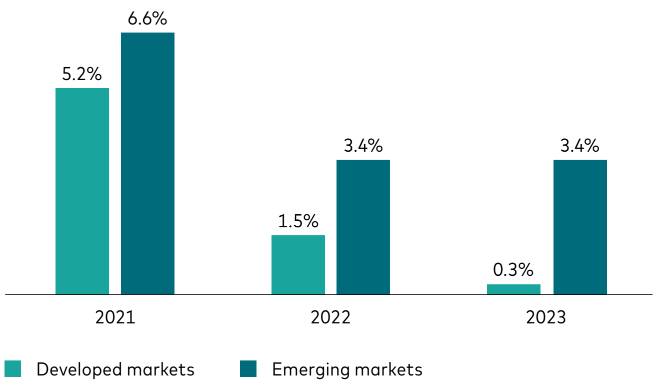
The story of emerging markets (EM) in 2022 has been one of remarkable resilience (**Figure I-28a**) despite myriad macroeconomic shocks. Although food and energy prices rose, financial conditions tightened significantly and Chinese growth disappointed, EM growth, foreign exchange and inflation have not underperformed developed markets. However, the relative headline resilience masks the regional divergence (**Figure I-28b**).

We expect EM growth of 3.4% in 2023 to significantly outperform developed-market growth of 0.3%, but we are likely to see notable divergence once again across regions. While Asia will benefit from a cyclical bounce in China and falling inflation, EM Europe will continue to face inflation pressures from uncertain energy supply and a weak European growth backdrop. In Latin America, growth is likely to disappoint consensus as US growth slows materially in 2023, prompting central banks to adjust policy rates down from very high levels.

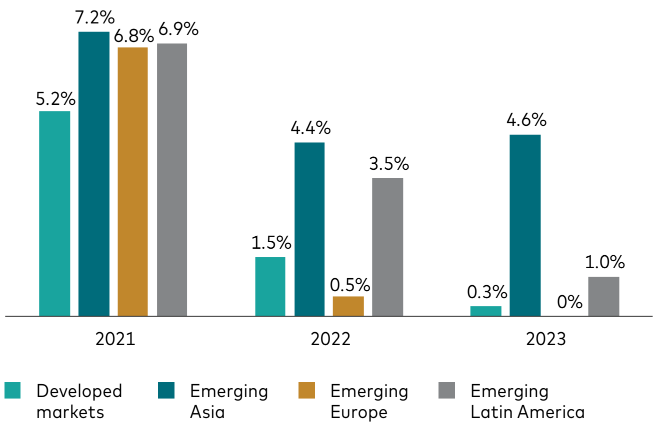
FIGURE I-28

Diverging fortunes for emerging-market economies

a. Emerging market GDP growth will remain resilient relative to developed markets growth in 2023



b. But we expect significant divergence among regions to continue in 2023



Note: Vanguard forecasts for 2022 and 2023.

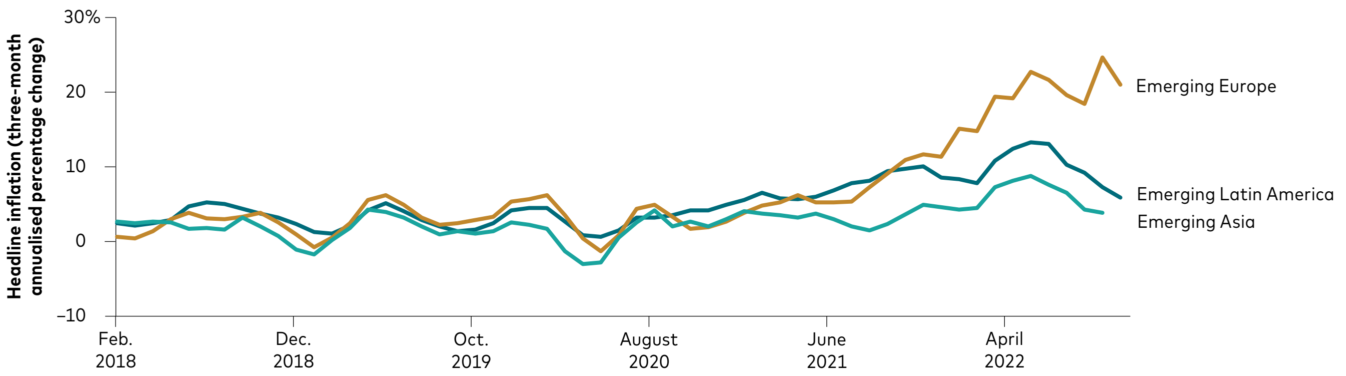
Sources: Vanguard calculations based on data from Thomson Reuters Datastream, as at 31 October 2022.

Our below-consensus outlook for the Latin American region is driven by a few factors. First is our below-consensus US growth outlook. Some 70% of Mexican exports go to the US and Mexican exports are highly correlated with the US inventory cycle (excluding autos). After a strong build over the last year, we expect inventory growth to slow along with the slowing US economy. This will put downside pressure on both Mexican growth and the Mexican current account. Second, Latin America is the only EM region with central bank interest rates above inflation. However, inflation is falling quickly across many Latin American economies (**Figure I-29**). This means interest rates will be even more restrictive at current levels, further slowing economic growth.

In EM Asia, we are expecting 2023 GDP growth of 4.6%, broadly in line with consensus. Our view is driven by two countervailing forces. Our forecast for a cyclical growth rebound in China supports a positive EM Asian growth outlook. Additionally, as inflation in EM Asia falls, we expect central banks to end their hiking cycle, which will support growth. EM Asian export growth has been a major growth support during the recovery from the pandemic. We believe that consensus expectations for a mix of modest rate hikes and cuts and broadly flat inflation are fair.

FIGURE I-29

Inflation in emerging Europe is mainly energy-driven at this point, while inflation in both emerging Latin America and emerging Asia looks more persistent

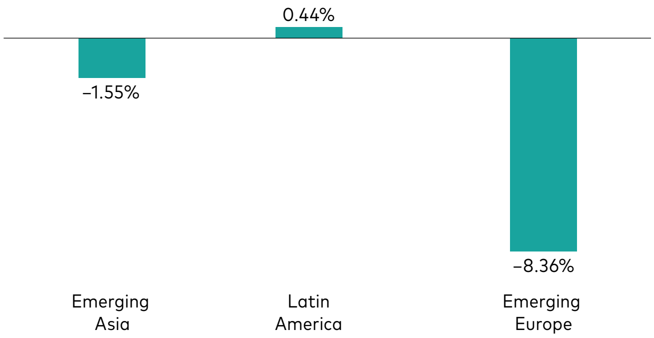


Sources: Vanguard calculations based on data from Refinitiv, as at 31 October 2022.

In EM Europe, we expect 2023 GDP growth to be flat at 0%, below consensus of 0.6%. Our below-consensus view is driven by our below-consensus developed-market European outlook as well as an inflation outlook that we expect to remain precarious throughout 2023. EM European inflation continues to accelerate, though a recent reprieve has come in the form of energy price subsidies. These expensive subsidies can lead to widening fiscal deficits, which lead to tighter financial conditions and lower growth. Should governments try to limit deficit expansion, the energy price subsidy would likely crowd out other government spending priorities, possibly limiting potential growth. The big risk for Europe is that, should inflation remain stubbornly high because of a structural energy shortage, central banks would likely need to continue hiking interest rates to get them to restrictive territory. **Figure I-30** shows that EM European interest rates are a long way from being positive on a real basis, in contrast to their EM peers.

FIGURE I-30

European real spot rates remain deeply negative, while Latin American rates look as though they have room to come down



Sources: Vanguard calculations based on data from Refinitiv, as at 31 October 2022.

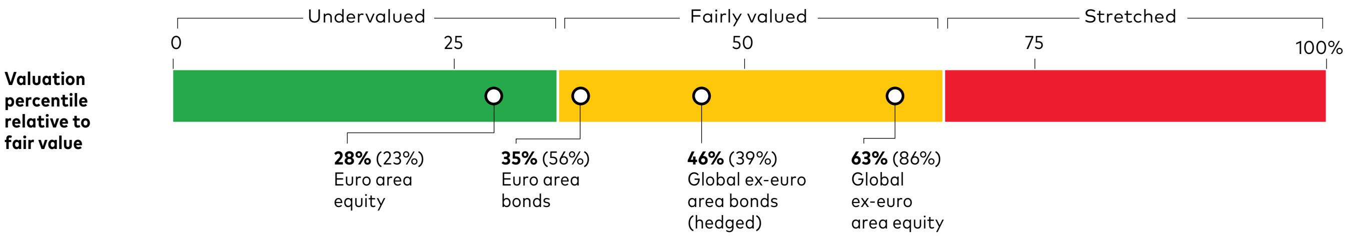
II. Global capital markets outlook

In our economic and market outlook for 2022, we highlighted the risks global capital markets faced from the dual pressures of high equity valuations and interest rates that did not reflect the seriousness of inflation pressures. As 2022 started, markets began to price in this shift and interest rates rose globally. Rising interest rates, coupled with geopolitical shocks and slowing growth, led to a sell-off notable not only for its depth but also its breadth and persistence. While it is impossible to say with confidence when equity and bond markets will reach a bottom, valuations and yields are clearly more attractive than they were a year ago.

Looking ahead, our return outlook—which had been on a steady downward trajectory since 2009—is ticking up. This is especially true in fixed income, where our euro area and global ex-euro area bond return outlooks are 2.2%-3.2% and 2.1%-3.1% a year, respectively, over the next decade, almost three percentage points higher than a year ago. In equities, global ex-euro area valuations are more attractive than they were last year but are still at the upper end of our estimate of fair value. Euro area equities remain slightly undervalued (**Figure II-1**).

FIGURE II-1

The global equity and fixed income opportunity set is now more attractive



Past performance is not a reliable indicator of future results.

Any projections should be regarded as hypothetical in nature and do not reflect or guarantee future results.

Notes: Figure II-1 shows current valuation percentiles relative to fair value, compared to last year's values (in parentheses). The euro area equity valuation measure is the current cyclically adjusted price/earnings ratio (CAPE) percentile relative to the fair-value CAPE for the MSCI Germany total return index. The global ex-euro area equity valuation measure is the market-weighted average of each region's (US, Australia, UK, Japan, Canada and emerging markets) valuation percentile. Fixed income valuation percentiles are current valuations relative to year 30 projections from the VCMM. Bonds are the weighted average between intermediate-term credit and government bond valuation percentiles. The global ex-euro area bond valuation measure is the market-weighted average of each region's (US, Australia, UK, Japan and Canada) valuation percentile. See the Appendix section titled "Indices for VCMM simulations" for further details on asset classes.

Source: Vanguard calculations in EUR, based on data from Robert Shiller's website, at aida.wss.yale.edu/~shiller/data.htm, the US Bureau of Labor Statistics, the Federal Reserve Board and Refinitiv, as at 30 September 2021 and 30 September 2022.

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Vanguard's distinct approach to forecasting

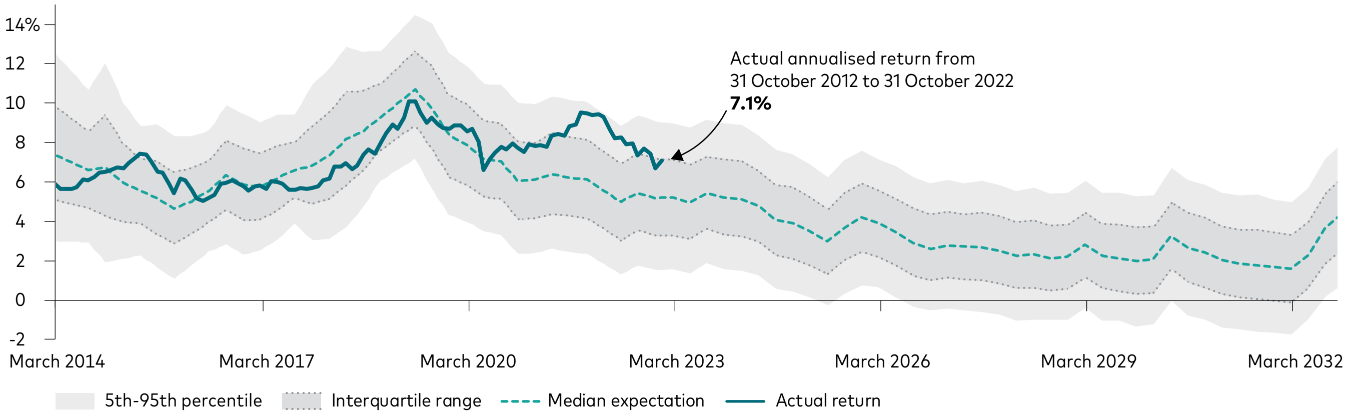
To treat the future with the deference it deserves, Vanguard has long believed that market forecasts are best viewed in a probabilistic framework. This annual publication's primary objectives are to describe the projected long-term return distributions that contribute to strategic asset allocation decisions and to present the rationale for the ranges and probabilities of potential outcomes. This analysis discusses our global outlook from the perspective of an EU investor with a euro-denominated portfolio.

A notable characteristic of the sell-off in global equities and bonds in 2022 was the degree to which both asset classes fell together[6]. **Figure II-2** shows our 10-year outlook and realised returns for a globally diversified, 60% equity/40% bond portfolio since 2004. Rising equity valuations during 2021, particularly in the US, had pushed realised returns above our forecasted interquartile range from 10 years prior. Subsequent losses in both equity and fixed income over the past 12 months have brought realised returns again within the forecast range, offsetting previously higher-than-expected returns. **Figure II-2** also shows that our outlook for global equities and bonds has reversed its downward trend of the past decade. This higher return outlook is in large part due to the higher interest rates that central banks have implemented to fight inflation, causing asset price declines in both equity and bond markets. These forces have also raised return expectations for the next decade, because yields on developed-market sovereign debt are the foundation on which the returns of risk assets are built.

FIGURE II-2

60/40 portfolio returns are now more in line with our view from 10 years ago

10-year annualised returns



Past performance is not a reliable indicator of future results. Any projections should be regarded as hypothetical in nature and do not reflect or guarantee future results.

Notes: Figure II-2 shows the actual 10-year annualised return of a 60/40 portfolio in EUR compared with the VCMM forecast made 10 years earlier. For example, the March 2014 data at the beginning of the chart show the actual return for the 10-year period between 31 March 2004 and 31 March 2014 (solid line) compared with the 10-year return forecast made on 31 March 2004 (dashed line). After September 2022, the dashed line is extended to show how our forecasts made between 31 December 2012 and 30 September 2022 (ending between 31 December 2022 and 30 September 2032) are evolving. The interquartile range (darker grey shaded area) represents the area between the 25th and 75th percentile of the return distribution and the lighter grey shaded area represents the area between the 5th and 95th percentile. See the Appendix section titled 'Indices for VCMM simulations' for further details on asset classes.

Source: Refinitiv as at 31 October 2022 and Vanguard calculations in EUR, as at 30 September 2022.

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6 This breakdown in correlation was disconcerting for many investors and led some to question whether the 60% equity/40% bond portfolio still had merit as an investment tool. Our research finds that correlations can move aggressively over shorter time horizons but that it would take long periods of consistently high inflation for long-term correlation measures – those that more meaningfully affect portfolio outcomes – to turn positive (Wu et al., 2021).

Global fixed income markets: Near-term pain is still possible, but long-term gain is now more likely

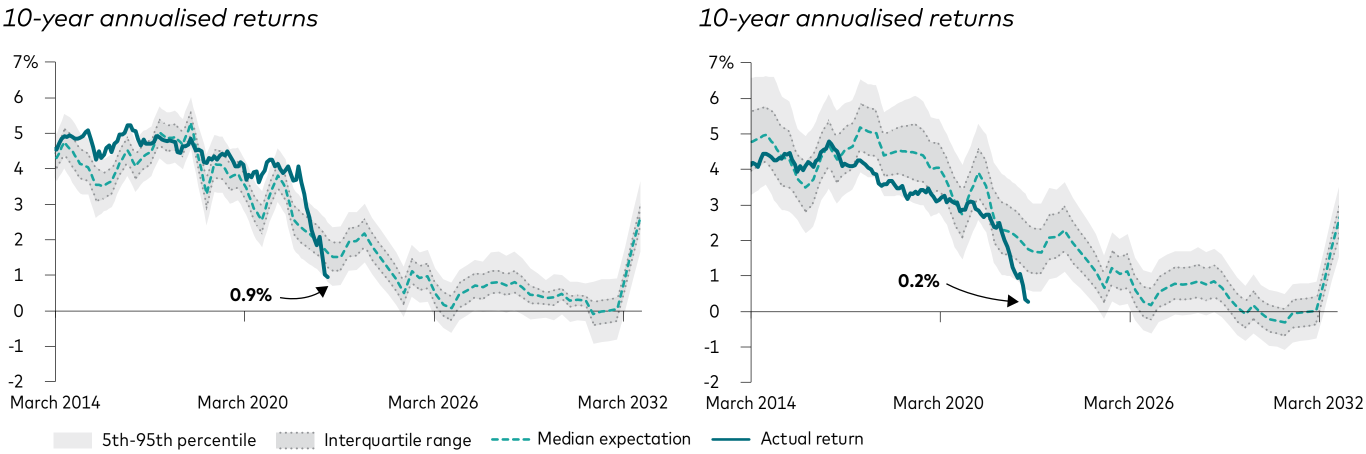
Nowhere has the pain of rising interest rates been felt more acutely than in global fixed income markets. Both the Bloomberg Euro-Aggregate Index and the Bloomberg Global Aggregate Euro Hedged Index have declined by more than in any 12-month period in their respective histories, down 16.7% and 13.9%, respectively[7]. As shown in **Figure II-3a**, the steep decline in euro area bonds in the past year reduced 10-year annualised returns since 2012 to below 1%. **Figure II-3b** tells a similar story for global bonds, with actual results also below our expectations from a decade ago.

FIGURE II-3

Rising interest rates created near-term pain, but have raised our long-term forecast

a. Fastest policy tightening in the ECB's history led to unprecedented losses for euro area bonds

b. Global bonds fell sharply in 2022 as central banks try to keep a lid on inflation



Past performance is not a reliable indicator of future results. Any projections should be regarded as hypothetical in nature and do not reflect or guarantee future results.

Notes: Figures II-3 a and b show the actual 10-year annualised return of euro area bonds and global bonds (hedged) compared with the VCMM forecast made 10 years earlier. For example, the March 2014 data at the beginning of the charts show the actual return for the 10-year period between 31 March 2004 to 31 March 2014 (solid line) compared with the 10-year return forecast made on 31 March 2004 (dashed line). After September 2022, the dashed line is extended to show how our forecasts made between 31 December 2012 and 30 September 2022 (ending between 31 December 2022 and 30 September 2032) are evolving. The interquartile range (darker grey shaded area) represents the area between the 25th and 75th percentile of the return distribution and the lighter grey shaded area represents the area between the 5th and 95th percentile. See the Appendix section titled 'Indices for VCMM simulations' for further details on asset classes.

Source: Refinitiv, as at 31 October 2022 and Vanguard calculations in EUR, as at 30 September 2022.

IMPORTANT: The projections and other information generated by the VCMM regarding the likelihood of various investment outcomes are hypothetical in nature, do not reflect actual investment results and are not guarantees of future results. Distribution of return outcomes from VCMM are derived from 10,000 simulations for each modelled asset class. Simulations are every quarter, between 31 March 2004 and 30 September 2022. Results from the model may vary with each use and over time.

7 Return data from Refinitiv for the Bloomberg Euro-Aggregate Index goes back to July 1998 and data for the Bloomberg Global Aggregate Euro Hedged Index goes back to February 1999. The largest 12-month losses occurred over the periods 30 September 2021 to 30 September 2022 and 31 October 2021 to 31 October 2022, respectively.

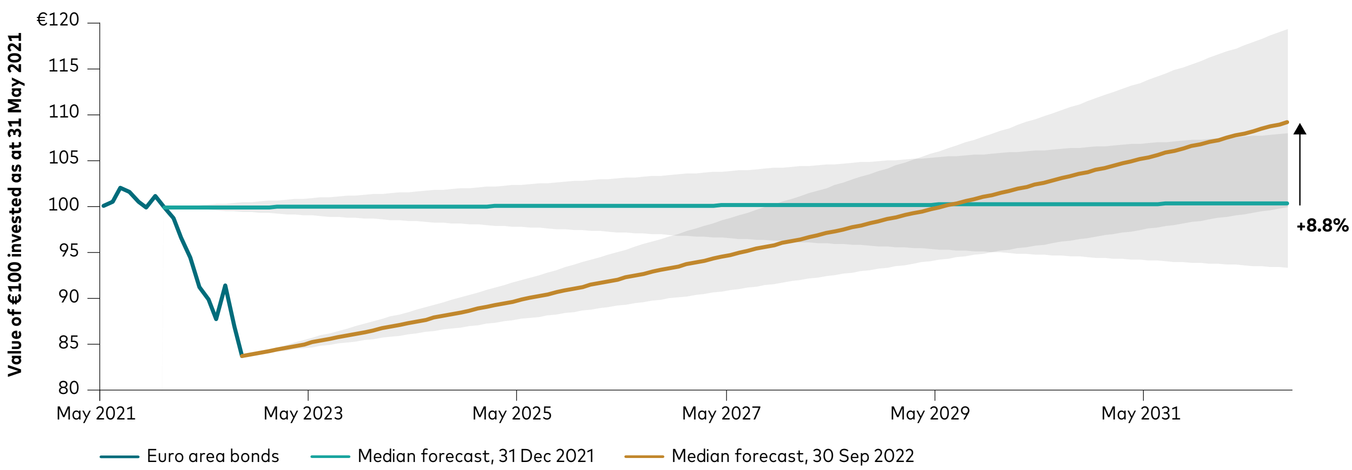
While rising interest rates have created near-term pain for fixed income investors, we expect that those with sufficiently long investment horizons will be better off by the end of the decade than if they had just realised our return forecast from the end of last year (**Figure II-4**). The median projection for the value of a €100 investment in euro area bonds in May 2021 until September 2032 increased by 8.8%. This is due to the effect of duration. When interest rates rise, bonds re-price lower immediately. However, cash flows can then be reinvested at higher rates. Given enough time, the increased income from higher coupon payments will offset the price decline and an investor's total return should increase.

Of course, higher returns are not guaranteed. The median forecast of this analysis is informed by the trajectory of yields implied by the forward yield curve. **Figure II-4** shows that there is a possibility that investors may not have higher wealth at the end of the decade because of further shocks. That said, this analysis should give long-term investors reasons to be optimistic about the return prospects for the fixed income part of their portfolios.

Against a backdrop of rapidly rising interest rates, our fixed income return outlook for the next decade is significantly higher than last year's projection, as shown in **Figure II-5a**, based on more attractive bond market valuations (**Figure II-5b**). Expected returns for global ex-euro area bonds in local currency terms are higher than those of euro area bonds given the relatively higher yields in several developed markets outside the euro area – however, the differences are negligible once we account for currency impacts. Furthermore, diversification through exposure to hedged global ex-euro area bonds should help to offset some risks specific to euro area fixed income markets (Phillips et al., 2014). Importantly, while recent returns for fixed income have prompted some investors to call into question the role of bonds in portfolios, we continue to believe that their inclusion is warranted as a portfolio stabiliser and a long-term diversifier against equity market risk[8].

FIGURE II-4

We expect investors to be better off because of—not in spite of—the sell-off



Past performance is not a reliable indicator of future results. Any projections should be regarded as hypothetical in nature and do not reflect or guarantee future results.

Notes: The chart shows actual returns for the Bloomberg Euro-Aggregate Bond Index along with Vanguard's forecast for cumulative returns over the subsequent 10 years as at 31 December 2021 and 30 September 2022. The shaded areas represent the ranges from the 10th to the 90th percentiles of the forecasted distributions. Data as at 30 September 2022.

Source: Refinitiv and Vanguard calculations in EUR, as at 30 September 2022.

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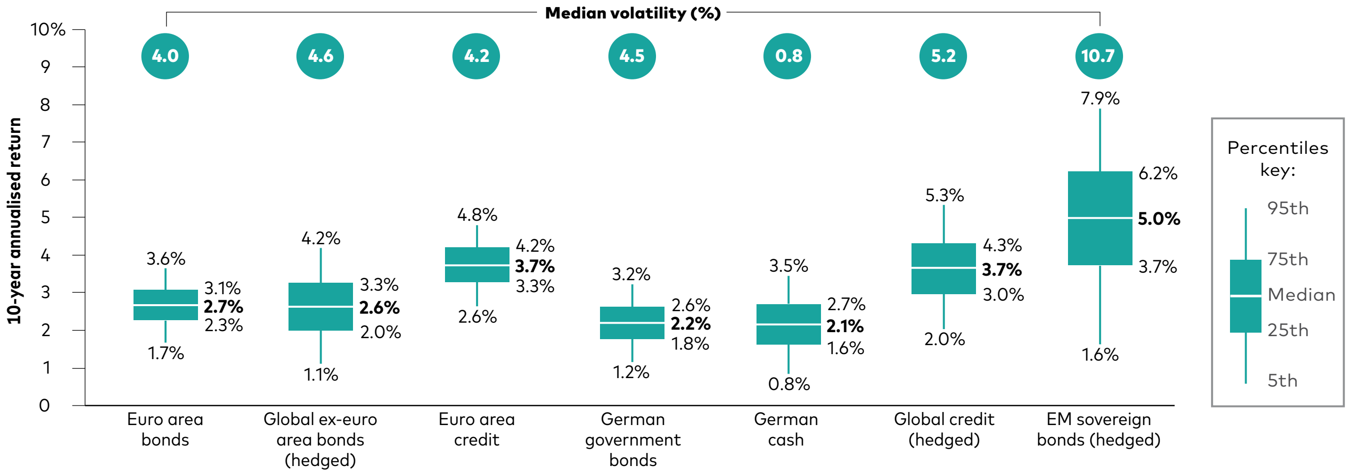
8 Despite their historic sell-off this year, including fixed income in the portfolio still improved results because bonds are a lower-volatility asset. Our research (Wu et al., 2021) finds that asset allocation matters more than correlation regime when estimating outcomes over a long-term horizon.

FIGURE II-5

The green shoots of higher bond returns

a. Higher interest rates have pushed expected bond returns higher



Any projections should be regarded as hypothetical in nature and do not reflect or guarantee future results.

Notes: The forecast corresponds to the distribution of 10,000 VCMM simulations for 10-year annualised nominal returns in EUR for the asset classes highlighted here. Median volatility is the 50th percentile of an asset class's distribution of annualised standard deviation of returns. Asset-class returns do not take into account management fees and expenses, nor do they reflect the effect of taxes. Returns do reflect the reinvestment of income and capital gains. Indices are unmanaged; therefore, direct investment is not possible. See the Appendix section titled "Indices for VCMM simulations" for further details on asset classes.

Source: Vanguard calculations in EUR, as at 30 September 2022.

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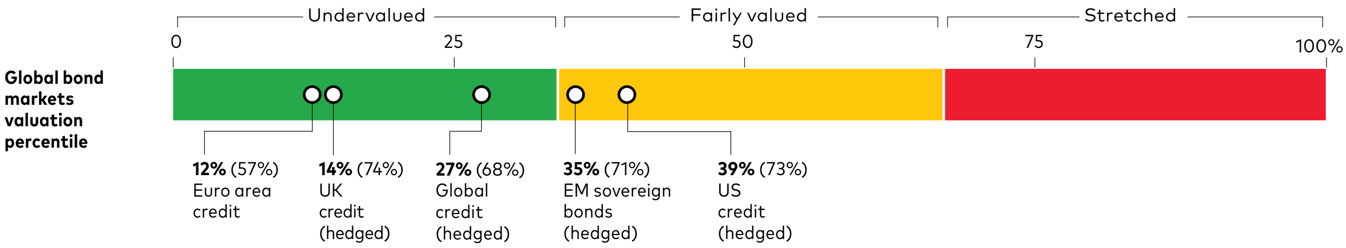
b. Fixed income is fairly valued



Any projections should be regarded as hypothetical in nature and do not reflect or guarantee future results.

Notes: Figure II-5b shows current valuation percentiles that are based on current spreads relative to year 30 VCMM projections, compared to last year's values (in parentheses). See the Appendix section titled "Indices for VCMM simulations" for further details on asset classes.

Source: Vanguard calculations in EUR, based on data from Refinitiv, as at 30 September 2021 and 30 September 2022.

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Government bond yields

After rising by as much as 270 basis points compared with the start of the year, the 10-year yield for euro area bonds has recently traded in a range of between 1.9% and 2.4% as the market has tried to ascertain the direction of central bank policy. Similar moves could be observed in the government bond markets of the US and UK, with increases in the 10-year yield in these markets of up to 350 basis points. This follows the fastest interest rate-hiking cycle in the history of the ECB. However, more important than the size of interest rate increases at any given meeting, we believe that the terminal rate and the amount of time that policy is held at that level will be what ultimately matters for government bond returns.

In the US, based on current economic conditions and Fed policy guidance, our US Treasury fair-value model suggests that the US yield curve is within our fair-value range[9]. The evolution of fair value will depend heavily on the direction of inflation, the policy response of the Fed and the market's expectations for interest rates further in the future. **Figure II-6** shows the expected impact of our economics team's inflation and federal funds rate forecast on the 10-year US Treasury yield over the next three years.

In our baseline scenario—in which inflation falls throughout 2023 but remains above the Fed's 2% target and the federal funds rate rises to 4.5% and stays there for the next 12 months, before gradually falling to 2.5%—we expect the 10-year yield to peak at around its recent highs (4.0%-4.3%). In a more pessimistic scenario—shown by the top of the grey band in **Figure II-6** —the Fed's fight against inflation could force it to raise interest rates as high as 5.7%. In this scenario, the 10-year yield could peak as high as 5.5%. If the fight against inflation requires less action from the Fed, the 10-year yield has likely already peaked, and we would expect lower 10-year yields as policy rates normalise more quickly. No matter the scenario, our view that the Fed will ultimately be successful in bringing inflation down means that it is a high bar for long-term yields to remain above their historical average from the past 35 years.

FIGURE II-6

Higher long-term yields are possible, but any moves above historical averages are likely to be brief

Past performance is not a reliable indicator of future results. Any projections should be regarded as hypothetical in nature and do not reflect or guarantee future results.

Notes: Figure II-6 shows the actual 10-year US Treasury yield quoted on a constant maturity basis since 1 January 1987 and Vanguard's forecast based on a range of economic scenarios. The forecasts are derived from a five-variable vector error correction model, including 10-year Treasury yields, the first three principal components of the covariance matrix of 10-year trailing inflation, 10-year trailing food inflation, 10-year trailing hourly earnings growth, the effective federal funds rate and five-year trailing real GDP estimated over the period 31 January 1979 to 30 September 2022.

Source: Vanguard calculations in USD, based on data from FactSet, the U.S. Bureau of Labor Statistics, the Federal Reserve Board, Refinitiv and Global Financial Data, as at 30 September 2022.

9 For more details on our US Treasury attribution model, see *Vanguard's economic and market outlook for 2022: Striking a better balance* (Davis et al., 2021).

Expected long-term inflation rates implied by Treasury Inflation-Protected Securities (TIPS) also support this view. Breakeven inflation rates in the US peaked in the first half of 2022, as energy prices reached record highs. These expectations have since moderated to 2.15%, as at 30 September 2022. This is below our median VCMM 10-year annualised inflation forecast of 2.5% which leads us to view longer-term inflation protection as cheaper than last year but within our fair-value range. Higher TIPS returns are a result of inflation exceeding market expectations. To that end, only upside inflation surprises will create excess return opportunities.

Global equity markets: Normalising return outlook

The sell-off in equity markets in 2022 has been widespread, and several equity indices posted losses greater than 20% for the first nine months of the year. However, the depreciation of the euro, in particular against the US dollar, meant that euro investors realised lower losses on their unhedged international equity exposures. While these losses are significant from a short-term, realised-return perspective, it means that the global opportunity set is now more attractive than it was a year ago.

FIGURE II-7

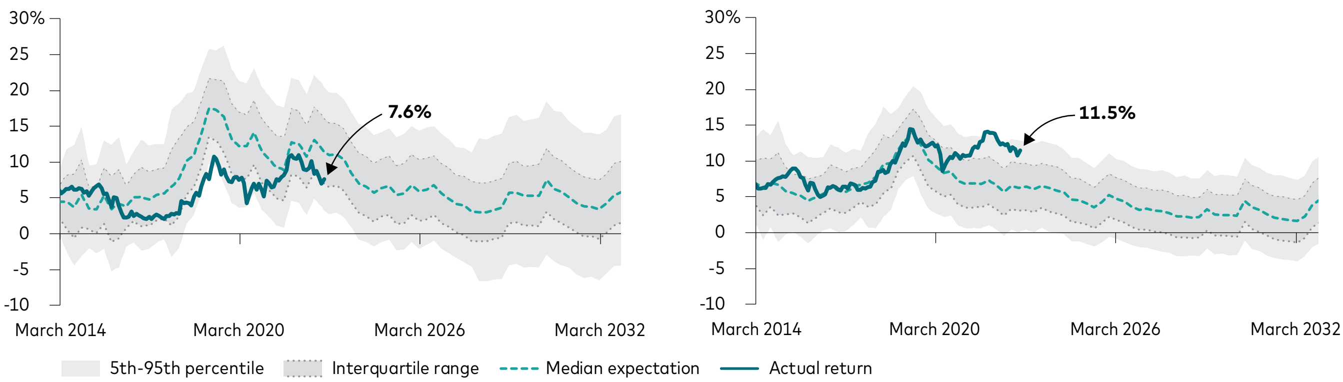
Investors are reassessing their rosy view of equities, pushing our return outlook higher

a. Euro area equities are again below our forecast from a decade ago

10-year annualised returns

b. Global equities are falling back towards our forecast from a decade ago

10-year annualised returns



Past performance is not a reliable indicator of future results. Any projections should be regarded as hypothetical in nature and do not reflect or guarantee future results.

Notes: Figures II-7 a and b show the actual 10-year annualised return of euro area and global equity (in EUR) compared with the VCMM forecast made 10 years earlier. For example, the March 2014 data at the beginning of the charts show the actual return for the 10-year period between 31 March 2004 to 31 March 2014 (solid line) compared with the 10-year return forecast made on 31 March 2004 (dashed line). After September 2022, the dashed line is extended to show how our forecasts made between 31 December 2012 and 30 September 2022 (ending between 31 December 2022 and 30 September 2032) are evolving. The interquartile range (darker grey shaded area) represents the area between the 25th and 75th percentile of the return distribution and the lighter grey shaded area represents the area between the 5th and 95th percentile. See the Appendix section titled 'Indices for VCMM simulations' for further details on asset classes.

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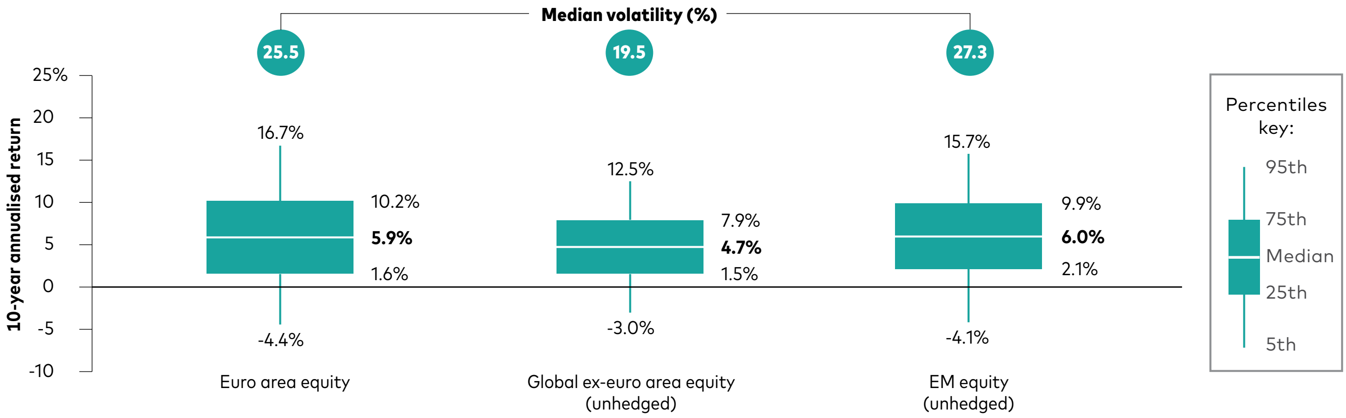
Figure II-7a shows that after a period of returns in line with our expectations, euro area equities have recently underperformed our forecasts from 10 years ago. Globally, the sell-off is bringing equity returns again closer to our prediction, as shown in **Figure II-7b**. Furthermore, after a drop in 10-year expectations following the increase in valuations of US equities in particular in 2021, the reduction of that overvaluation in the current year means that our forward-looking expectations for global equities have again improved. This underscores the challenges facing investors who tilt their portfolios heavily in one direction and highlights the benefits of global diversification.

Figures II-8a and **b** show our expectations for equity returns for euro area-based investors and our view of valuations across developed and emerging markets. Our valuations and forecasting frameworks are intended to set long-term expectations. Therefore, over- or undervaluation should not, in itself, suggest a short-term action on the part of investors. Time-varying portfolio construction should balance risk and return in a utility-based framework and requires acceptance of model and active risk (Aliaga-Díaz et al., 2020).

FIGURE II-8

Improved outlook for global equities

a. Equity market 10-year outlook: setting reasonable expectations



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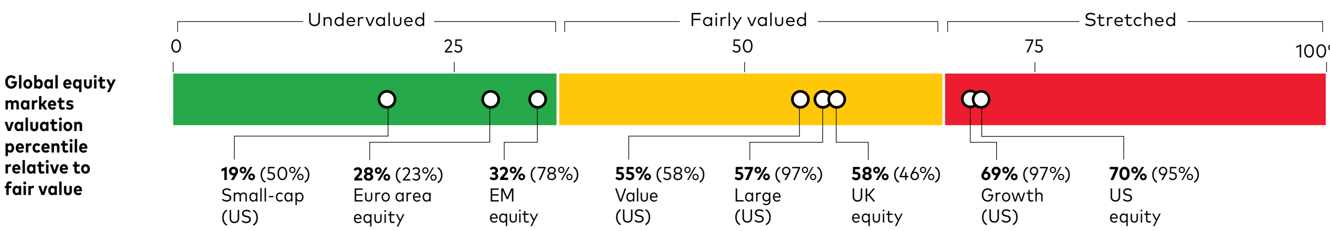
b. Valuations are more attractive than a year ago



Past performance is not a reliable indicator of future results.

Notes: Figure II-8b shows current valuation percentiles relative to fair value, compared to last year's values (in parentheses). Euro area and UK equity valuation measures are the current CAPE percentile relative to the fair-value CAPE for the MSCI Germany and MSCI UK total return indices from 31 January 1970 to 30 September 2021. The US valuation measure is the current CAPE percentile relative to fair-value CAPE for the S&P 500 Index from 31 January 1940 to 30 September 2022. The emerging markets, US growth, US value and US small-cap valuation measures are the percentile relative to fair value as shown in Figures II-13 and II-10 a and b. The US growth valuations are composite valuation measures of the style factor to US relative valuations and the current US CAPE percentile relative to its fair-value CAPE. The relative valuation measure is the current ratio of that style factor to US price/book metrics relative to its historical average from 31 January 1979 through 30 September 2022. For corresponding indices for the four style factor valuation measures, see the Appendix section "Indices for VCMM simulations".

Source: Vanguard calculations in EUR, based on data from Robert Shiller's website, at aida.wss.yale.edu/~shiller/data.htm, the U.S. Bureau of Labor Statistics, the Federal Reserve Board and Refinitiv, as at 30 September 2021 and 30 September 2022.

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More favourable valuations, but some markets remain above our estimate of fair value

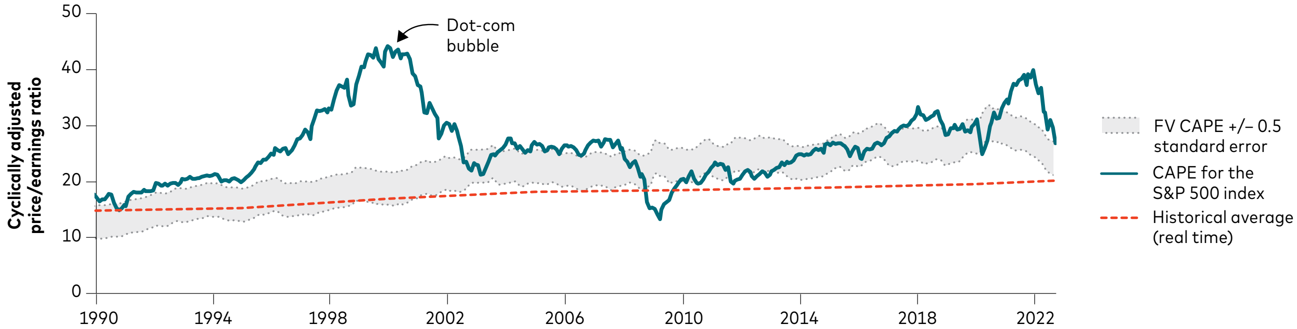
Following the recovery from the pandemic-driven sell-off in 2020, the CAPE of many markets had been rising strongly, before reaching a peak at the end of 2021. This was especially true in the US, where overvaluation reached a level not seen since the dot-com bubble. While equity valuations have improved recently, high inflation and rising real interest rates have simultaneously caused our estimate of fair value to decline. **Figure II-9a** shows our model estimate and suggests that, while the valuation gap has closed dramatically, the US market remains overvalued.

In the euro area, on the other hand, the surge in valuations in 2021 was less pronounced, as shown in **Figure II-9b**. The German CAPE ratio stopped below the mid-point of our fair value range, and both the fair value range and the German CAPE ratio have since been moving downwards, with valuations falling faster and moving below the range again.

FIGURE II-9

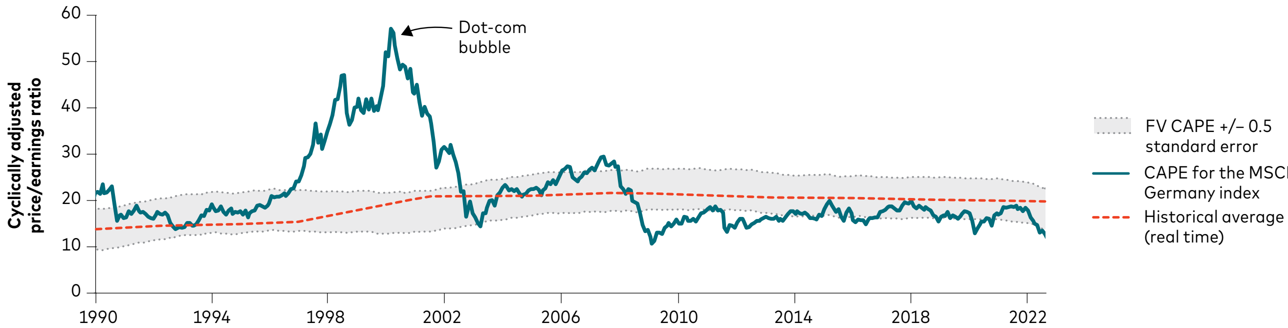
Global equity valuations have improved

a. US equity valuations are more attractive than they were a year ago



Past performance is not a reliable indicator of future results.

b. Euro area equity valuations again below fair value



Past performance is not a reliable indicator of future results.

Notes: Figures II-9 a and b show our fair-value CAPE estimate that is based on a statistical model that corrects CAPE measures for the level of inflation expectations and interest rates. The statistical model specification for the German fair-value CAPE is a three-variable vector error correction model, including MSCI Germany earnings yields, 10-year trailing inflation and 10-year German government bond yields estimated over the period 31 January 1970 to 30 September 2022. The statistical model specification for the US fair-value CAPE is a three-variable vector error correction model, including S&P 500 earnings yields, 10-year trailing inflation and 10-year US Treasury yields estimated over the period 31 January 1940 to 30 September 2022. Details were published in the 2017 Vanguard research paper, Global Macro Matters: As US equity prices rise, the risk-return trade-off gets tricky. A declining fair-value CAPE suggests that a higher equity risk premium (ERP) compensation is required, while a rising fair-value CAPE suggests that the ERP is compressing.

Source: Vanguard calculations in USD and EUR, as at 30 September 2022, based on data from Robert Shiller's website, at aida.wss.yale.edu/~shiller/data.htm, the U.S. Bureau of Labor Statistics, the Federal Reserve Board, Refinitiv and Global Financial Data.

After value's resurrection, the risks are more balanced

Within the US market, the rotation from growth to value investing has been a notable narrative that has continued in 2022. Unlike in the first quarter of 2021, value's outperformance over the past 12 months has had more to do with growth's relative weakness than value's relative strength. Our "fair value of value" framework (**Figure II-10a**) shows how interest rates and inflation have driven value's secular decline over the last 40 years. As we highlighted in our 2021 economic and market outlook, however, by the end of that year the value trade had been oversold (Davis et al., 2020). This led us to believe that even if the macroeconomic conditions that supported growth persisted, value was likely to outperform in the coming years.

Value's outperformance now means the risks are more symmetrical[10]. On the one hand, recession dynamics have historically been beneficial to growth equities. On the other hand, there's reason to believe that this recession might not look exactly like the past and that higher interest rates and inflation could continue to support value.

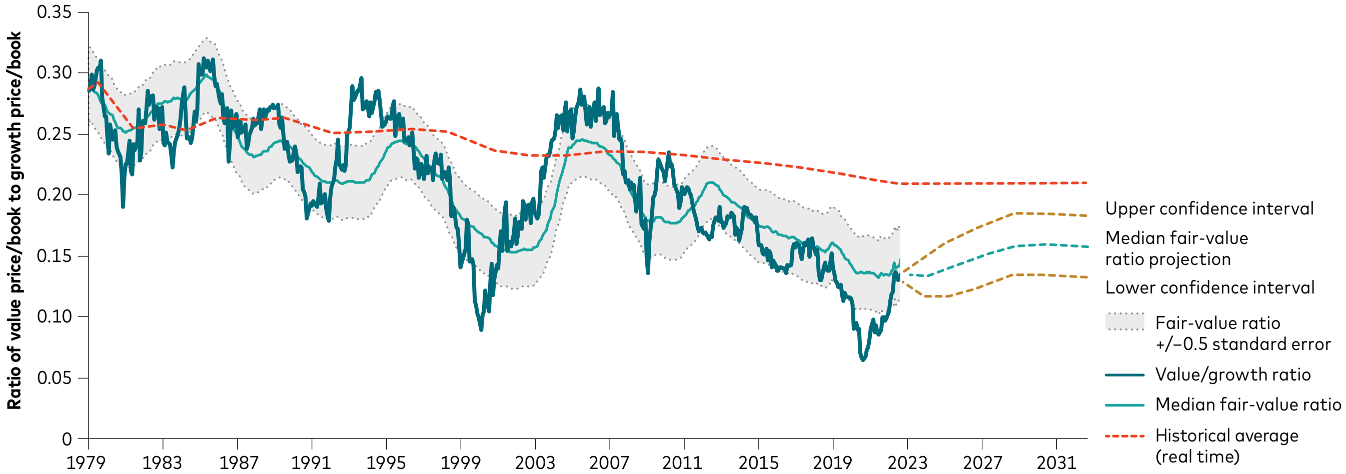
The one part of the US market where our fair-value frameworks see some opportunity is in small-cap equities – albeit to a much lesser degree than we saw in value last year. We find that similar drivers – interest rates, inflation, volatility and corporate profits – explain 72% of the variations in small-cap relative to large-cap price/book ratios (**Figure II-10b**). Currently small-caps sit below our estimate of fair value even when we account for the mounting inflation pressures and rising interest rates experienced over the last year. Our excess return projections for small-caps, however, are de minimis (20 basis points per year over the next decade) – especially when compared with the 160 basis points annualised excess return to value relative to growth.

10 We still expect value to outperform over the next decade, but this outperformance has less to do with relative valuations and more to do with the "value premium" that our research, along with that of academic and other practitioners, finds.

FIGURE II-10

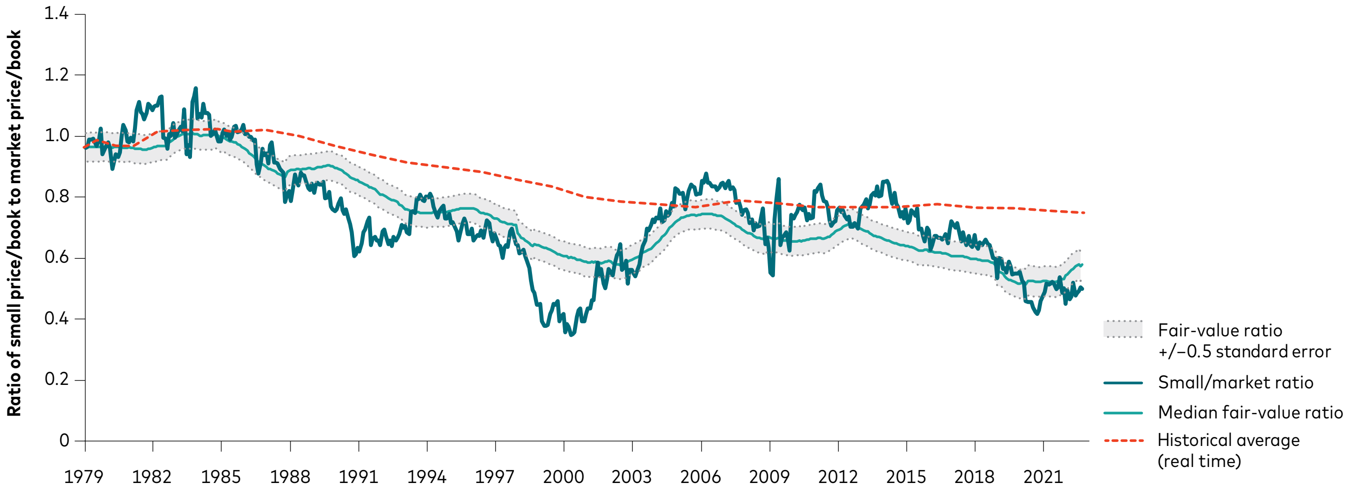
Valuations in parts of the US equity market are attractive

a. With value/growth valuations at fair value, the risk is more symmetrical



Past performance is not a reliable indicator of future results. Any projections should be regarded as hypothetical in nature and do not reflect or guarantee future results.

b. There may still be opportunity in small-caps



Past performance is not a reliable indicator of future results. Any projections should be regarded as hypothetical in nature and do not reflect or guarantee future results.

Notes: Figures II-10 a and b show our fair value estimates for the value/growth and small/market ratios. The value/growth fair-value ratio is estimated with an error correction model, using a five-lag vector autoregression model to project the systematic drivers. The small/market fair-value ratio is estimated with an error correction model, including a respective ratio of price to book, 10-year trailing inflation, 10-year real US Treasury yield, equity volatility and growth of corporate profits. Both models are estimated over the period 31 January 1979 to 30 September 2022.

Source: Vanguard calculations in USD, based on data from FactSet, the U.S. Bureau of Labor Statistics, the Federal Reserve Board, Refinitiv and Global Financial Data, as at 30 September 2022.

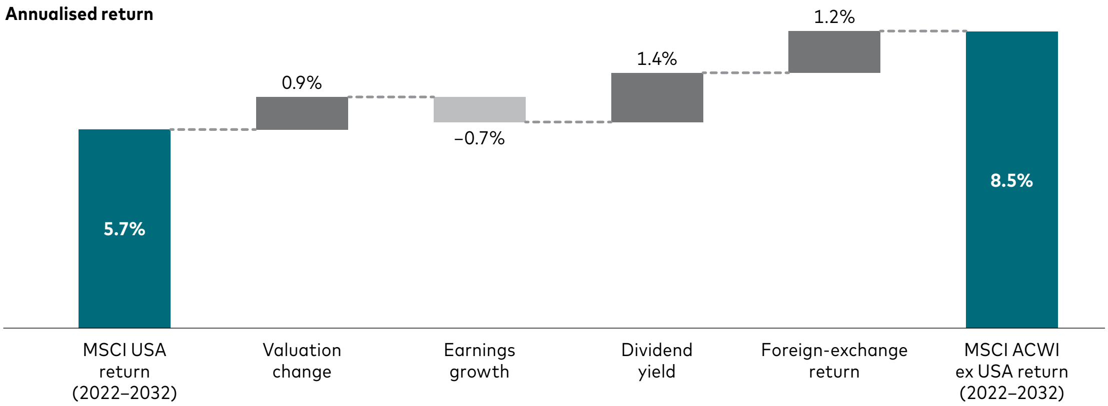
International equities: More value with less growth

US equities have outperformed their global peers by a very wide margin over the past decade. On a cumulative return basis, a portfolio of US equities bought in 2012 is worth twice as much as a portfolio of international equities bought in the same period. Although many reasons have been cited for this outperformance—such as stronger US growth, a less uncertain economic environment and the sector composition of the US equity market—our framework focuses on the durable sources of outperformance. To that end, we believe that the valuation-based expansion in US equities is sowing the seeds for lower returns in the decade ahead. Our outlook is positive for global ex-US equities despite our view that the US will have higher earnings growth, though we may need to see a weakening of the US dollar for international outperformance to be sustained.

Figure II-11 shows our outlook for US and global ex-US equities and a breakdown of the expected total return difference in the decade ahead. While the valuations gap has narrowed since last year, we expect more favourable valuations outside the US, higher dividend payout ratios and a weaker dollar to drive US underperformance.

FIGURE II-11

Expected US dollar depreciation becoming a bigger driver of forecasted global ex-US equity overperformance



	Valuation change	Earnings growth	Dividend yield	Foreign-exchange return	Total return
MSCI USA	–1.18%	5.00%	1.86%	—	5.69%
MSCI ACWI ex USA	–0.46%	4.28%	3.27%	1.20%	8.48%

Any projections should be regarded as hypothetical in nature and do not reflect or guarantee future results.

Notes: The chart decomposes the difference between our median 10-year annualised return forecast for US equities and forecast for global ex-US equities, as at 30 September 2022. US equity returns are represented by the MSCI USA Total Return Index and global ex-US equities by the MSCI ACWI ex USA Total Return Index. Returns do not take into account management fees and expenses, nor do they reflect the effect of taxes. Returns do reflect reinvestment of dividends and capital gains. The two end bars representing US and global ex-US expected returns are median expectations. As a result, this comparison does not account for the correlation between US and global ex-US equities. The sum of the individual bars in the middle may not equal the difference between the two end bars because of rounding.

Source: Vanguard calculations in USD, as at 30 September 2022.

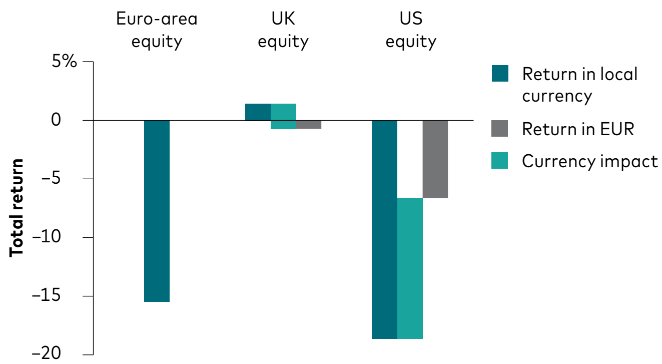
IMPORTANT: The projections and other information generated by the VCMM regarding the likelihood of various investment outcomes are hypothetical in nature, do not reflect actual investment results and are not guarantees of future results. Distribution of return outcomes from VCMM are derived from 10,000 simulations for each modelled asset class. Simulations are as at 30 September 2022. Results from the model may vary with each use and over time.

More favourable valuations outside the US, however, are not a new story. Nevertheless, euro area and other equity markets have been unable to generate any significant outperformance relative to the US. This has been, in parts, due to the strength of the US dollar, which has increased an unhedged euro area-based investor's return on US equities by almost 3% per year over the past decade. As at 30 September 2022, our capital markets model suggests that the US dollar is 13% above what the fundamental, long-term drivers of currency value suggest it should be. This is leading us to project a 1.2% annualised decline in the dollar relative to a basket of international currencies over the next decade.

Figure II-12 shows how a strong US dollar has reduced losses in US equities for unhedged euro area-based investors. In USD terms, US equities have declined by 19% in the first 10 months of 2022. Due to the dollar's strength, this loss declines to 6.6% for a euro area-based investor. Currency returns are notoriously difficult to forecast over short time horizons and many factors can cause them to deviate from their fundamentals. However, over a sufficiently long horizon we expect global inflation and policy convergence to lead to exchange rate normalisation.

FIGURE II-12

US dollar strength cushioned the blow to US equities for euro area-based investors



Past performance is not a reliable indicator of future results.

Notes: The chart breaks down the unhedged equity returns in EUR over the period 31 December 2021 to 30 October 2022 into the equity return in local currency and the exchange rate component. The indices used are the MSCI European Economic and Monetary Union (EMU) Total Return Index, the MSCI UK Total Return Index and the MSCI USA Total Return Index.

Source: Vanguard calculations in EUR, based on data from Refinitiv, as at 31 October 2022.

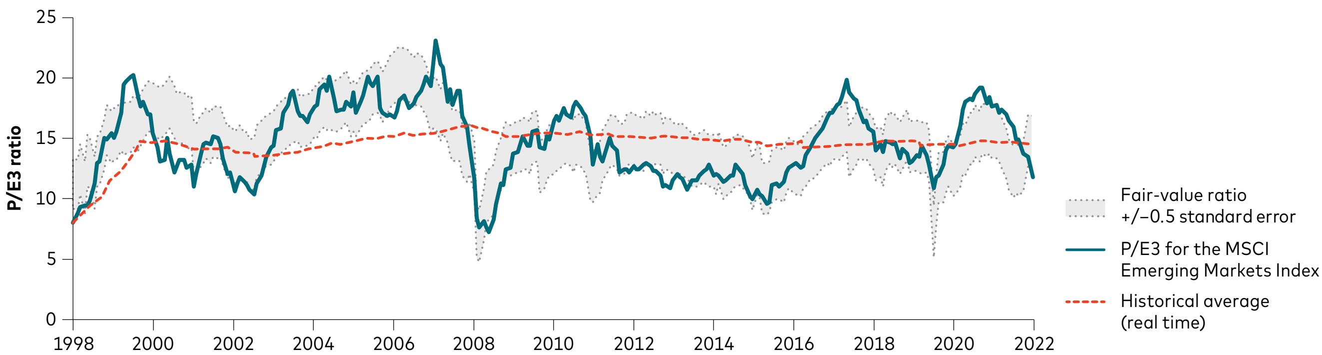
An improved return outlook and consistent diversification benefits from emerging market equities

Within global equity markets, our fair-value framework shown in **Figure II-13** suggests that emerging markets are attractively valued for the first time since the Covid-19 pandemic[11]. Steep sell-offs in 2021 and 2022 due to elevated inflation, aggressive monetary policy tightening, slowing growth and political risks have increased the emerging market risk premium. While near-term headwinds in the form of a strong US dollar, global recession and geopolitical tensions remain, the narrative appears oversold. Faster interest rate normalisation in emerging markets than the US and slowing economic conditions were the main drivers behind the decline in our fair value assessment from September 2021 to June 2022. Interest rate hikes in emerging markets, however, have broadly slowed and US interest rates are rising faster. Higher interest rates in the US relative to emerging markets have raised fair value as this has caused the dollar to trade at a forward discount to emerging market currencies which, according to uncovered interest rate parity, should raise expected returns for a US-based investor.

Our outlook suggests that emerging market equities should return between 5.5%-6.5% on an annualised basis in euro terms (0.1 percentage points higher than euro area equities) over the next decade. Furthermore, emerging market equities still have a relatively low correlation with developed market equities[12], although they tend to have higher risk. For these reasons, we believe that a balanced allocation to emerging market equities can play an important role in investors' portfolios.

FIGURE II-13

Emerging market equity valuations are attractive



Past performance is not a reliable indicator of future results.

Notes: The statistical model specification is a five-variable regression that uses the following variables: inflation for six major emerging market countries (Brazil, China, India, South Korea, Mexico and Taiwan) weighted by MSCI monthly index weights; monthly average of daily real two-year US Treasury yield; the difference between emerging market central bank policy rates weighted by GDP in USD and the federal funds rate; Vanguard's leading economic indicators (VLEI) for China, Brazil and Mexico (weighted average based on country GDP in USD); and the monthly average of daily US equity market volatility, as measured by the CBOE Volatility Index (VIX). P/E3 is the price divided by trailing three-year average earnings.

Source: Vanguard calculations in USD, based on data from the US Federal Reserve Bank of St. Louis FRED database and Bloomberg, as at 30 September 2022.

11 See Davis et al. (2021) for more details on our fair-value model.

12 Correlation of monthly returns in EUR (unhedged) between 31 December 1987 and 31 October 2022 of emerging market equities with US, Australia, UK, euro area, Japan and Canada equities were 0.66, 0.60, 0.61, 0.65, 0.53 and 0.66, respectively.

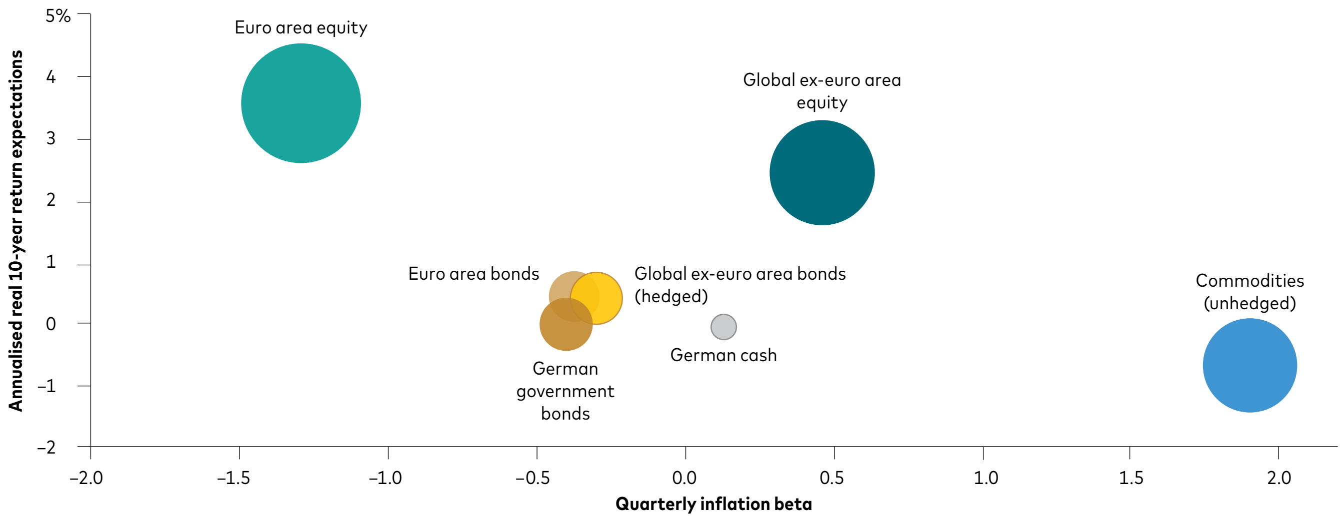
Inflation hedging is a multidimensional problem

There is no one-size-fits-all solution to inflation hedging – it depends on an investor's objectives, investment horizon and risk tolerance. **Figure II-14a** breaks down the inflation hedging properties of major asset classes across these three dimensions. For investors looking to generate a positive real return over a very long horizon, equities—especially if globally diversified—provide the best probability of beating inflation[13]. Investors with a shorter investment horizon may prefer to maintain their purchasing power by matching inflation. To this end, traditional inflation hedges—such as inflation-linked bonds and commodities—are useful. These securities, however, can introduce a real return drag on the portfolio if held for extended periods. Furthermore, commodities also introduce high volatility and, from a euro area investor's perspective, are exposed to exchange rate risk (unless properly hedged), which could be incongruent with a shorter investment horizon.

FIGURE II-14

Commodities are not an investor's only tool to fight inflation

a. There is no one-size-fits-all solution to inflation hedging



Any projections should be regarded as hypothetical in nature and do not reflect or guarantee future results.

Notes: Figure II-14a compares real (inflation-adjusted) return projections over the next 10 years to the inflation beta for various asset classes. Inflation beta is the slope coefficient of a linear regression of the year 30 return forecast on a constant and the year 30 euro area inflation forecast. The size of each bubble represents the forecasted median annualised volatility over the next 10 years. See the Appendix section titled "Indices for VCMM simulations" for further details on asset classes.

Source: Vanguard calculations in EUR, as at 30 September 2022.

IMPORTANT: The projections and other information generated by the VCMM regarding the likelihood of various investment outcomes are hypothetical in nature, do not reflect actual investment results and are not guarantees of future results. Distribution of return outcomes from VCMM are derived from 10,000 simulations for each modelled asset class. Simulations are as at 30 September 2022. Results from the model may vary with each use and over time.

13 As long as domestic and foreign inflation correlation is less than one, foreign equities will serve as an effective inflation hedge. This is because higher local inflation should cause the local currency to depreciate which would raise foreign equity returns, all else equal (Rodel, 2014).

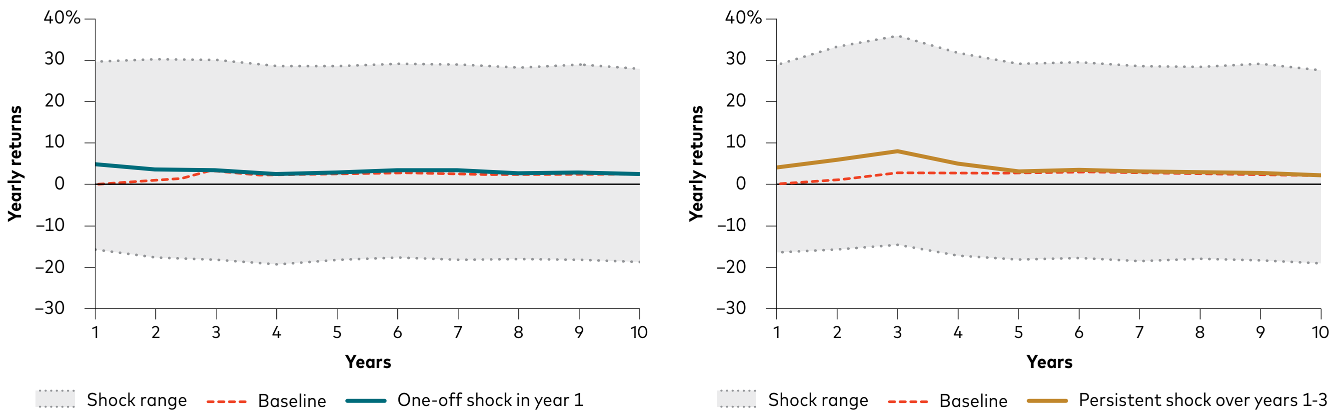
Given the similar energy supply dynamics driving current inflation, it is not hard to draw parallels to the 1970s when oil embargos in the Middle East contributed to inflation pressures in Europe and commodity returns provided a useful hedge. Our research indicates that commodity returns are a function of realised inflation and the economic growth environment. We also find that shocks to these drivers are both quickly reflected in commodity prices and are short-lived.

Figure II-14b shows that a shock to inflation is only reflected in commodity prices for as long as the inflation pressures remain. This means that to realise the full benefit of commodities as an inflation hedge, an investor must be able to correctly time their entry into and exit from the position, or accept a persistent return drag due to a lower Sharpe ratio[14] for commodities than global equities[15].

FIGURE II-14 (CONTINUED)

Commodities are not an investor's only tool to fight inflation

b. Commodity returns are sensitive to inflation but can decay quickly after a shock



Any projections should be regarded as hypothetical in nature and do not reflect or guarantee future results.

Notes: The chart shows the impact of a shock to inflation on nominal commodity returns in EUR (unhedged) over time, based on the distribution of return outcomes from the VCMM derived from 10,000 simulations. The dashed red line shows the baseline VCMM forecast. The green line and shaded area in the left panel show the impact of a temporary shock increasing inflation in year 1 by one standard deviation. The yellow line and shaded area in the right panel show the impact of a persistent shock increasing annualised inflation over years 1-3 by one standard deviation.

Source: Vanguard calculations in EUR, as at 30 September 2022.

IMPORTANT: The projections and other information generated by the VCMM regarding the likelihood of various investment outcomes are hypothetical in nature, do not reflect actual investment results and are not guarantees of future results. Distribution of return outcomes from VCMM are derived from 10,000 simulations for each modelled asset class. Simulations are as at 30 September 2022. Results from the model may vary with each use and over time.

14 The Sharpe ratio is a measure of return above the risk-free rate that adjusts for volatility. A higher Sharpe ratio indicates a higher expected risk-adjusted return.

15 Based on the VCMM median return and volatility forecasts for global equities (in EUR), German cash and commodities (in EUR), global equities have a higher Sharpe ratio than commodities (0.14 vs. -0.04).

A balanced portfolio still offers the best chance of success

As market and economic conditions change dramatically, the chance that an investor won't meet an important goal—perhaps a level of return or income for a medium-term need—may increase.

Vanguard's time-varying asset allocation (TVAA) considers the changing market conditions and returns and constructs optimal portfolios that maximise the best risk-return trade-off for a client's goal. TVAA isn't meant for everyone. It is appropriate for long-term investors who are willing to take on active risk in the form of "model forecast risk" and are willing to put their faith in our disciplined approach to navigating changing market and economic environments. (The Vanguard Portfolio Construction Framework; refer to Aliga-Diaz et al. 2022, for more details).

Figure II-15a shows the optimal portfolio, as at 30 September 2022, for TVAA strategy in Europe versus its benchmark, which is a 60/40 market-cap weighted portfolio with no home bias. The TVAA portfolio targets the same risk profile as the traditional 60/40 portfolio, with the flexibility to deviate from the benchmark based on the Vanguard projected outlook. In September 2022, aided by the Fed, BoE and ECB interest rate-hiking cycles, expected returns for global bonds have risen but, for a European investor bond, return expectations are lower than in other regions, due to the lower level of the euro area yield curve and expected appreciation of the euro.

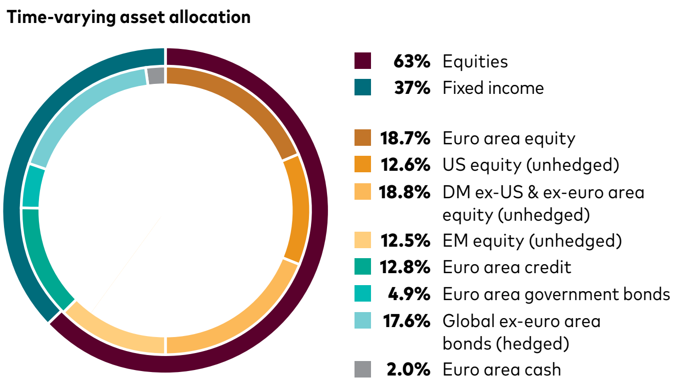
The TVAA strategy breaks down the major asset classes into smaller sub-assets to provide additional portfolio tilt benefits. On the domestic equity front, we see a tilt towards European equities and developed markets ex-US and ex-euro area, primarily driven by more attractive valuation levels. On the domestic fixed-income side, we observe a credit tilt as highlighted by return expectations in **Figure II-5**.

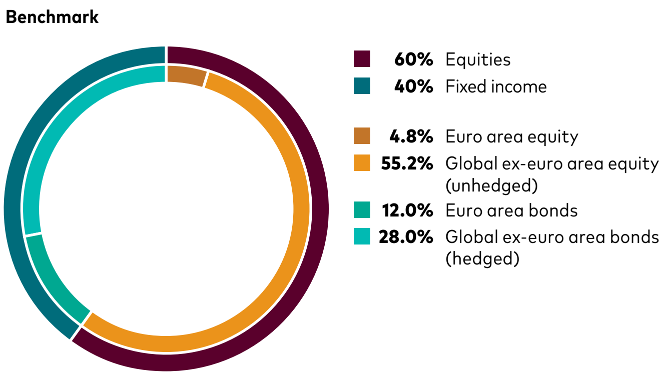
In short, the TVAA portfolio maintains its approximate equity-bond split as our outlook for both bonds and equity have improved since last year. This stands in contrast to other regions where expected returns for bonds have increased more dramatically than for equities, and have led to a tilt towards bonds. There are sub-asset class tilts towards credit and areas within equity that we see as more fairly valued, resulting in a similar volatility for the TVAA portfolio but slightly higher expected returns versus the 60/40 benchmark (see **Figure II-15b**). While the expected maximum drawdown of the time varying portfolio is less negative than the benchmark 60/40 portfolio, the odds of it underperforming the benchmark are around 56%.

FIGURE II-15

A more attractive risk/return trade-off means our time-varying asset allocation framework favours euro area equity and has a credit tilt

a. Asset allocation for a European TVAA portfolio and its benchmark as at 30 September 2022





b. Forward-looking median portfolio metrics as of 30 September 2022

	September 2022	
	TVAA	**Benchmark**
Equity allocation	63%	60%
10-year expected annualised total return	5.9%	5.2%
10-year expected annualised volatility	11.9%	11.6%
10-year expected Sharpe ratio	0.25	0.19
10-year expected maximum drawdown	–12.7%	–13.5%
Excess return to the benchmark	0.7%	—
Tracking error to the benchmark	4.68%	—
Probability of underperformance relative to benchmark (10-yr)	56.3%	—

Any projections should be regarded as hypothetical in nature and do not reflect or guarantee future results.

Notes: Time-varying portfolio allocations were determined by the Vanguard Asset Allocation Model (VAAM). The assets under consideration for the time-varying portfolio are European cash, European equity, US equity, developed markets equity ex-US and ex-euro area, emerging market equity, euro area government bonds, European credit and global bonds ex-euro area. These assets were constrained such that equity must be between 50%-70% of the total portfolio, domestic equity must be less than 30% of total equity, US equity must be between 20% and 80% of total equity, developed market equity ex-US and ex-euro area must be between 10% and 50% of total equity, emerging market equity must be less than 20% of total equity, domestic fixed income less than 50% of total fixed income, domestic credit must be less than 50% of fixed income, domestic euro area government bonds must be between 14% and 50% of fixed income. Euro area cash is constrained to be 2% of the total portfolio. The benchmark portfolio is based on market-cap weights with a 25% home bias on euro area equities and a 35% home bias on euro area bonds. VCMM 10-year projections as at 30 September 2022 were used. See the Appendix section titled "Indices for VCMM simulations" for further details on asset classes.

Source: Vanguard calculations in EUR, as at 30 September 2022.

IMPORTANT: The projections and other information generated by the VCMM regarding the likelihood of various investment outcomes are hypothetical in nature, do not reflect actual investment results and are not guarantees of future results. Simulations are as at 30 September 2022. Results from the model may vary with each use and over time.

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III. Appendix

About the Vanguard Capital Markets Model

IMPORTANT: The projections and other information generated by the Vanguard Capital Markets Model regarding the likelihood of various investment outcomes are hypothetical in nature, do not reflect actual investment results and are not guarantees of future results. VCMM results will vary with each use and over time.

The VCMM projections are based on a statistical analysis of historical data. Future returns may behave differently from the historical patterns captured in the VCMM. More important, the VCMM may be underestimating extreme negative scenarios unobserved in the historical period on which the model estimation is based.

The VCMM is a proprietary financial simulation tool developed and maintained by Vanguard's Investment Strategy Group. The model forecasts distributions of future returns for a wide array of broad asset classes. Those asset classes include US and international equity markets, several maturities of the US Treasury and corporate fixed income markets, international fixed income markets, US money markets, commodities, and certain alternative investment strategies. The theoretical and empirical foundation for the Vanguard Capital Markets Model is that the returns of various asset classes reflect the compensation investors require for bearing different types of systematic risk (beta). At the core of the model are estimates of the dynamic statistical relationship between risk factors and asset returns, obtained from statistical analysis based on available monthly financial and economic data. Using a system of estimated equations, the model then applies a Monte Carlo simulation method to project the estimated interrelationships among risk factors and asset classes as well as uncertainty and randomness over time. The model generates a large set of simulated outcomes for each asset class over several time horizons. Forecasts are obtained by computing measures of central tendency in these simulations. Results produced by the tool will vary with each use and over time.

The primary value of the VCMM is in its application to analysing potential client portfolios. VCMM asset-class forecasts—comprising distributions of expected returns, volatilities, and correlations—are key to the evaluation of potential downside risks, various risk–return trade-offs, and the diversification benefits of various asset classes. Although central tendencies are generated in any return distribution, Vanguard stresses that focusing on the full range of potential outcomes for the assets considered, such as the data presented in this paper, is the most effective way to use VCMM output. We encourage readers interested in more details of the VCMM to read Vanguard's white paper (Davis et al., 2014).

The VCMM seeks to represent the uncertainty in the forecast by generating a wide range of potential outcomes. It is important to recognise that the VCMM does not impose "normality" on the return distributions, but rather is influenced by the so-called fat tails and skewness in the empirical distribution of modelled asset-class returns. Within the range of outcomes, individual experiences can be quite different, underscoring the varied nature of potential future paths. Indeed, this is a key reason why we approach asset-return outlooks in a distributional framework.

Indices for VCMM simulations

The long-term returns of our hypothetical portfolios are based on data for the appropriate market indices through to 30 September 2022. We chose these benchmarks to provide the most complete history possible, and we apportioned the global allocations to align with Vanguard's guidance in constructing diversified portfolios. Asset classes and their representative forecast indices are as follows:

- **German cash:** German 3-month sovereign yield.
- **Euro area inflation:** Harmonised Index of Consumer Prices. Source: Eurostat.
- **Euro area equity:** MSCI European Economic and Monetary Union (EMU) Total Return Index.
- **US equity:** MSCI USA Total Return Index.
- **UK equity:** MSCI UK Total Return Index.
- **Australia equity:** MSCI Australia Total Return Index.
- **Japan equity:** MSCI Japan Total Return Index.
- **Canada equity:** MSCI Canada Total Return Index.
- **EM equity:** MSCI Emerging Markets Total Return Index.
- **Global ex-euro area equity:** MSCI AC World ex EMU Total Return Index Euro.
- **Global equity:** MSCI AC World Total Return Index Euro.
- **DM ex-US & ex-euro area equity:** Market-value-weighted index of Australia equity, UK equity, Japan equity and Canada equity as defined above.
- **Euro area credit:** Bloomberg Euro-Aggregate Credit Bond Index.
- **US credit (hedged):** Bloomberg US Credit Bond Index Euro Hedged.
- **UK credit (hedged):** Bloomberg Sterling Corporate Bond Index Sterling Hedged.
- **Global credit (hedged):** Bloomberg Global Aggregate – Corporates Euro Hedged.
- **Euro area bonds:** Bloomberg Euro-Aggregate Bond Index.
- **Global ex-euro area bonds (hedged):** Bloomberg Global Aggregate ex Euro Index Euro Hedged.
- **Global bonds (hedged):** Bloomberg Global Aggregate Index Euro Hedged.
- **German government bonds:** Bloomberg Germany Treasury Bond Index Euro.
- **US Treasury bonds:** Bloomberg US Treasury Index.
- **EM sovereign bonds (hedged):** Bloomberg Emerging Markets USD Aggregate Sovereign Index Euro Hedged.
- **Commodities:** Bloomberg Commodity Index Euro Total Return.
- **60/40 portfolio:** 60% global equity and 40% global bonds (hedged) as defined above.

All equity indices below are weighted by market capitalisation:

- **Growth (US):** Equities with a price/book ratio in the highest one-third of the Russell 1000 Index.
- **Value (US):** Equities with a price/book ratio in the lowest one-third of the Russell 1000 Index.
- **Large (US):** Equities with a market cap in the highest one-third of the Russell 1000 Index.
- **Small (US):** Equities with a market cap in the lowest two-thirds of the Russell 1000 Index.

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The value of investments, and the income from them, may fall or rise and investors may get back less than they invested.

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Any projections should be regarded as hypothetical in nature and do not reflect or guarantee future results.

Some funds invest in emerging markets which can be more volatile than more established markets. As a result the value of your investment may rise or fall.

Investments in smaller companies may be more volatile than investments in well-established blue chip companies.

Funds investing in fixed interest securities carry the risk of default on repayment and erosion of the capital value of your investment and the level of income may fluctuate. Movements in interest rates are likely to affect the capital value of fixed interest securities. Corporate bonds may provide higher yields but as such may carry greater credit risk increasing the risk of default on repayment and erosion of the capital value of your investment. The level of income may fluctuate and movements in interest rates are likely to affect the capital value of bonds.

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