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Instability: Debt, Inflation and AI's Impact on Investing

Perspectives on Markets, Strategic Allocation and the Investment Industry's Future

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An abrupt shift in the geopolitical environment and change in the global economic paradigm have accelerated a shift to a new investment regime. Forces such as debt and inflation have long been the subject of heated discussion among investors, but their impact has become more immediate. We outline a strategic investment response to this challenge; it includes the redesign of pension systems, the role of alpha and the position of tokens in portfolios.

Contents

Introduction

This book is an attempt to guide investment thinking over the medium to long term. We have divided it into two parts: Part I, "Challenges," and Part II, "Responses." The first part sets out key strategic issues that investors face either directly or indirectly. The strategic challenge is that several forces that have been structural tailwinds driving strong real returns on financial assets in recent decades have either run their course or are likely going into reverse. Examples include deglobalization, high levels of public debt and demographic change. The abrupt shift in US policy under Trump accelerates the switch to a new regime and ushers in a new geopolitical reality that ends the US-led postwar order. An extra level of uncertainty has also been introduced by the unknown impact on long-term growth of climate outcomes. Artificial intelligence (AI) offers hope for offsetting some of these forces, but by how much is uncertain.

The second part focuses on things investors can and should do in response to the above challenges. This amounts to the appropriate ways to partition and allocate to risk. If expected real returns are lower (though still positive) and diversification less plentiful, then this implies that investors who need to deliver real returns must take on more risk. This might sound cavalier in a world where all asset classes are, at the very least, fully valued and the outlook is so uncertain. But we think that action is important to defray a worse outcome—a loss of purchasing power. Overall, this landscape calls for a greater allocation to real assets and a greater role for active versus passive investing.

We offer this view at a time of huge change in the geopolitical order. Markets find it hard to price geopolitical risk, so it would probably be wrong from a forecasting standpoint to let geopolitical risk dominate a view of returns. Nevertheless, geopolitics are an added source of significant uncertainty. Alongside AI and climate, they introduce a need to think about a much broader range of possible future paths. There are different categories of recency bias that beset investors. Most of this book is concerned with the recency bias of the post-1980s era of high levels of real returns. However, there is also the recency bias of the past 80 years of the US-led postwar order; its abrupt unraveling is very hard to price.

The last four decades have probably been the best sustained environment for real returns on financial assets ever. This is not a prelude to some bearish tangent; we think positive real returns are still likely across major asset classes. However, our forecast that those real returns will be much diminished forces a change in asset allocation. During the period of strong real returns in recent decades, a significant change has taken place globally, shifting the locus of pension risk onto individuals. If ensuring pension outcomes is one of the key social roles of the finance industry, then this retreat from a period of strong real returns requires a response in the asset allocation of pension systems in

particular. This issue is all the more accentuated by longer life expectancy and higher inflation. Hence the chapter in this book devoted to pension design.

While we see broad acceptance of the idea that inflation will be higher than the norms of recent decades, we find more hesitancy among investors in responding to this via asset allocation. Thus, the "call to action" as a consequence of the themes in this book is for a shift in portfolio allocation and design. The exact outcome of this will depend on individual investors and their beliefs, time horizons and targets. However, the broad shape of this shift is to:

- Increase exposure to real assets (including public equities, physical real assets and inflation-protected securities).
- Boost private-asset exposure (including private debt, infrastructure and natural resources, but probably not private equity).
- Raise exposure to active returns within all asset classes in a world where passive asset-class betas deliver lower real returns and less mutual diversification.
- Add institutional exposure to non-fiat zero-duration assets such as gold and crypto.
- In a pension glide-path context, stay invested in risky assets far longer, ideally into retirement.

Our last book, *A Preliminary Language for a Post-Global World*, made the case that investors face a new investment regime. This book updates the case for that new regime, focusing on specific areas—notably, public debt, inflation and AI. We also examine the influence that comes from a different source: our view that the energy transition will take far longer than many in the industry seem to be assuming.

This essentially amounts to a change of paradigm. In his book *The Structure of Scientific Revolutions,*[1] Thomas Kuhn teaches us that a paradigm gives people a shared language; an attempt to phrase that shared language is one of the aims of our research. With hindsight, and the elapse of enough time, changes in paradigms might appear obvious. In reality, that is rarely the case as they are unfolding. There is no concrete way to determine when the logical "right" step is to adopt the position of a new paradigm.[2] Calling the start of a new investment regime might, after all, be reckless, with deleterious long-term consequences for investors.

In this book, the focus is on the medium to long term, not the next couple of years. So, we are not devoting a lot of our analysis to near-term policy decisions. Nevertheless, the second Trump administration gives renewed urgency to the idea that there is indeed a new regime. Aspects of this regime, such as an ending of the US-led postwar order, will require a greater passage of time before one can appreciate what net impact that might

1 Thomas Kuhn, *The Structure of Scientific Revolutions* (University of Chicago Press, 1962).
2 See John Worrall, *Scientific Revolutions and Scientific Rationality: The Case of the 'Elderly Holdout'* (1990).

have on aggregate financial markets. However, the "raising the drawbridge" approach of tariffs and stricter immigration does, we think, hasten the onset of a new regime. This is no longer a discussion about slow-moving structural forces and instead has become more immediate. Tariffs by themselves, as is rightly often pointed out by economists, are a one-off increase in prices rather than inflation per se. But the subsequent restitching of supply chains can add longer-term costs. While stricter immigration policy points to a possible cyclical uplift to inflation, it also prefigures the structural demographic shift of fewer workers in many economies that we discuss in this book.

For investors today, this really comes down to a question about inflation and growth. Does one think that the central bank–led orthodoxy of the last 30 years still applies and that we are in a world where, for all the vagaries of short-term variation, inflation in developed markets will continue to lie close to 2%? Alternatively, is there an array of forces that imply that inflation will find a new, and higher, equilibrium? Likewise, does one think that growth over the next decade will continue at a similar healthy pace to the one it has averaged since the 1980s, or was that a special period in a longer-run context, which is unlikely to be repeated? In this book we argue for the latter outcome on both fronts.

It would be myopic, we suggest, to couch this discussion only through the frame of reference of economic and financial variables. Much of this case for a new regime comes down to social and political choices. For example, the future of labor is critical to the discussion of inflation. Does a future smaller working-age population, political limits on immigration, and a need for workers to move into the care sector from other sectors of the economy imply a decisive shift in the bargaining power of labor versus capital? Or does an AI-led evisceration of non-unionized jobs across multiple sectors of the economy secure even more power for capital? What is the future of democracy and geopolitics in an era of AI? How does the stepping back of the US from defense agreements with allies change the security environment?

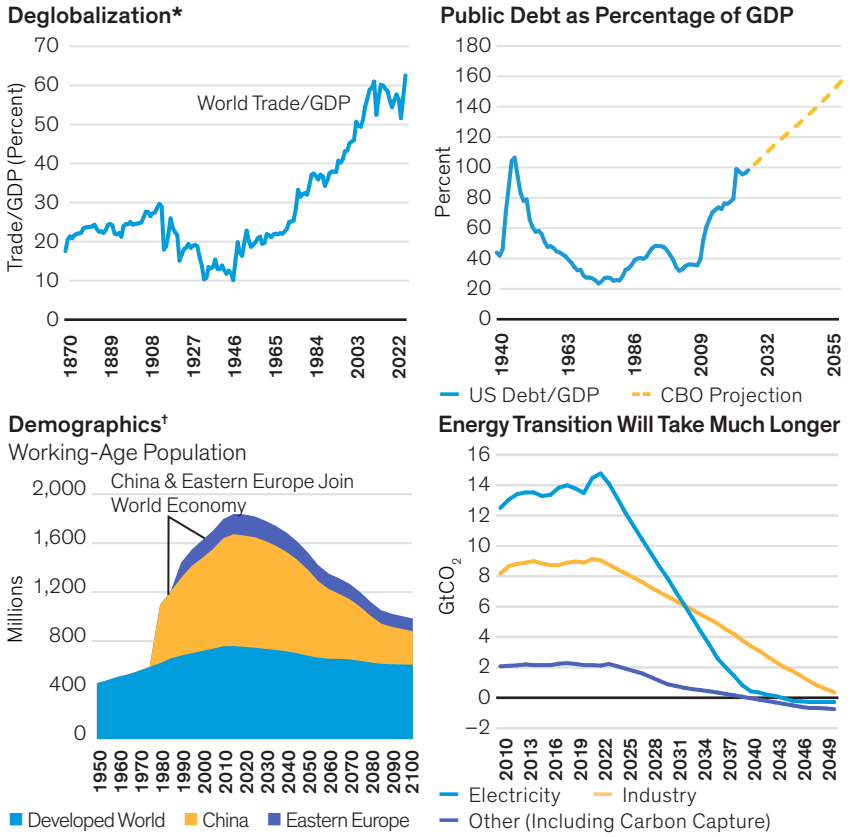
Indeed, one must ask if the nature of capitalism has changed when considering the confluence of mega-cap, semi-monopoly tech platforms; a question mark regarding to what extent economic competition is still as virile; historically high levels of government debt; a shift in how capital is raised away from public markets; challenges to the role of the US dollar; and a challenge to what is meant by money in an age of tokens.

Part I: Challenges

Part I of this book focuses on several of the key macro forces that, in our view, will lead to a higher long-term level of inflation and the risk of lower growth. These forces include deglobalization, which we view as unambiguously inflationary; demographic change, which primarily lowers growth but may also push up inflation; public debt; and the probable outcome that the energy transition takes a lot longer than current expectations (*Display 1*). There is also the open question as to what extent AI can offset some of these challenges, particularly in terms of a broad-based increase in productivity.

We also discuss the role of market structure, in particular the high (though not unprecedented) concentration in markets; the less-liquid nature of portfolios and the consequences of de-equitization; and the structural shrinking of the stock market.

DISPLAY 1: MEGAFORCES IMPLY A NEW INVESTMENT REGIME



Historical analysis and current forecasts do not guarantee future results.

*Trade is the sum of exports and imports of goods and services measured as a share of GDP. †The colored areas represent the size of the population aged 20–65 in the regions shown. The top right display, showing the Congressional Budget Office (CBO) projection, represents data that supplement the CBO's March 2025 report *The Long-Term Budget Outlook: 2025 to 2055*. The bottom right display shows the change in emissions by source required to meet net zero by 2050. Top left and right displays as of December 31, 2021; bottom left and right displays as of December 4, 2024 | **Source:** LSEG Data & Analytics, Our World in Data, UN Population Division, World Bank and AB

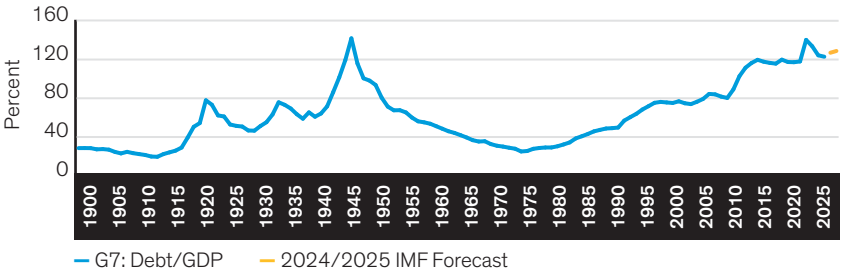
We do not see these as separate, unrelated challenges. Instead, we claim that they act in concert, albeit by different paths, to frame the strategic outlook.

It is arguably a higher level of equilibrium inflation that defines a new regime more than any other, and that is the subject of chapter 1.

Public Debt

Public debt has reached the same share of GDP that it was at the end of WWII. The focus of the conversation on this point in recent meetings has mainly been the US, but this issue also applies across G7 countries overall (*Display 2*). In recent centuries, this level of debt had only previously been reached by developed nations in times of existential conflict. This time, the reason for the extraordinary debt buildup was to keep consumers happy. Public debt has been rising for decades, but its scale, combined with a turn in the long-term path of interest rates, means that debt-service costs are set to consume a growing share of government expenditure for decades. In the US, the servicing cost of debt (which was $882 billion in 2024) now exceeds the defense budget (which was $874 billion in 2024), a ratio that at the very least should raise eyebrows. Historian Niall Ferguson has asserted[3] that "Any great power that spends more on debt. . .than on defense will not stay great for very long," referencing the unhappy examples of the Habsburgs, *ancien régime* France, the Ottoman Empire and the British Empire. This possibly constitutes more of a

DISPLAY 2: G7 GOVERNMENT DEBT TO GDP RATIO (GDP WEIGHTED)



Historical analysis and current forecasts do not guarantee future results.

Display shows government debt/GDP for G7 countries, weighted by nominal GDP denominated in USD. Data from 1900 to 2023 are from Global Financial Data. 2024/2025 forecast is from the International Monetary Fund (IMF).

Through November 18, 2024 | **Source:** Global Financial Data, IMF and AB

3 Niall Ferguson, "Ferguson's Law: Debt Service, Military Spending, and the Fiscal Limits of Power," Hoover Institution, History Working Paper 202502, February 21, 2025.

hard limit than the overall level of debt compared to GDP and might prove to be a useful standpoint from which to view the about-change in US policy.

We make the case in chapter 1, "A Higher-Inflation Future and the Need for Real Assets," that the politically easiest way out might be to let inflation run at a slightly higher level. We return to this point in chapter 6, "Tokens, Power, Non-Jobs and Debasement: The Case for Strategic Allocation to Tokens," exploring what this debt dynamic means for the future of money. Seen through a geopolitical lens, this is bound up with the question of to what degree do US Treasuries still constitute safe-haven assets? The capricious nature of policy formation in 2025 has dealt a significant blow to trust in the US, which gives renewed urgency to questions about fiscal sustainability.

Demographics and Deglobalization

Another huge force that matters in this regard is demographics, particularly the shrinking of the working-age population in developed economies and China. The clearest consequence of having fewer workers in these countries is, *ceteris paribus*, that it implies lower future growth. That assumes constant productivity; the hope for AI is that it could perhaps offset this declining number of workers. We also argue that demographics are inflationary as well, which might sound controversial. After all, hasn't the aging of Japanese society since the 1990s been deflationary? Chapter 1 explores the various angles by which a shift in the relative size of age cohorts could change the inflation outlook. An increase in the cost of care could raise spending by the eldest in society, and because care is particularly hard to automate, it will likely pull workers out of other segments of society into the care sector. This would further increase the competition for labor in those other sectors. In a sense, demographic change and deglobalization are two sides of the same coin: the shrinking working-age populations in China and Europe, and a lower growth rate in that population in the US, undoes a significant part of the increase in the working-age population that globalization brought about. A further fragmenting of the global labor force through changing rules on tariffs and immigration likely amplifies that trend.

A (Much) Slower Energy Transition

A very different force that has the potential to change the inflation and growth outlook is the energy transition, the subject of chapter 2, "Can the Energy Transition Happen? And if Not, What Does that Mean for Asset Allocation?" Our contention is that the transition will take significantly longer than currently assumed by the financial industry. It will simply prove too politically and socially hard to sufficiently change behavior in a way that achieves net zero by 2050. Moreover, it has long been accepted that power demand would have to rise in emerging economies to improve the standard of living for the very poorest people. The hope was that there could at least be an attenuation in power demand in developed countries. Instead, by the end of next year, the extra power demand from AI data centers will add to a demand equivalent to Japan's total power usage. All this makes it highly likely that temperature increases will breach the "Paris limits" of a 1.5°C–2.0°C increase in temperature

relative to preindustrial levels. Such a temperature rise, in turn, increases the probability of irreversible nonlinear effects, such as thawing permafrost or melting ice sheets. This now seems highly likely to be the path we are on.

The consequences of this issue for growth and inflation are hotly debated. We reflect on the results of 27 academic studies that attempt to quantify the impact of temperature on GDP growth. The huge range of the resulting estimates implies that the main impact is not so much a shift in the level of expected growth rates as a radical increase in the degree of uncertainty about those forecasts.

Likewise, the impact of a slower energy transition on the level of inflation is complicated. It depends on whether attempts to change behavior come more from stimulus or taxation. Likewise, there is a plausible case that an energy transition could be near-term inflationary but long-term deflationary. But the higher incidence of extreme weather events, which seems a plausible consequence of breaching a 2°C temperature increase, implies much higher inflation volatility, which investors need to take into account. It is the inflation-volatility aspect of this issue that is the salient point we think investors need to incorporate into their models.

AI

When considering the outlook for aggregate growth, the potential for the adoption of AI to offset other downward forces is the one hope for a more positive path. Our starting position is that AI brings positives and negatives, but they are very unbalanced. The great hope, of course, is that AI unleashes an improvement in productivity akin to the invention of the steam engine, which could change the trajectory of growth. The other positive (from a shareholder perspective, albeit not from a social perspective) is that with corporates firmly in the driver's seat of

DISPLAY 3: HOW DOES AI CHANGE INVESTING?

Positive Forces for Investors	Negative Forces for Investors
Could lead to greater productivity and higher growth	Greater wealth inequality (richest cohort gets richer while destroying jobs?)
Corporations are in the driver's seat—perpetuates high margins	Political impact: Is AI compatible with democracy?
	AI implies greater uncertainty in geopolitics
Markets tend to price these forces quickly	Markets tend to be bad at pricing this—are risks saved up for a future day?

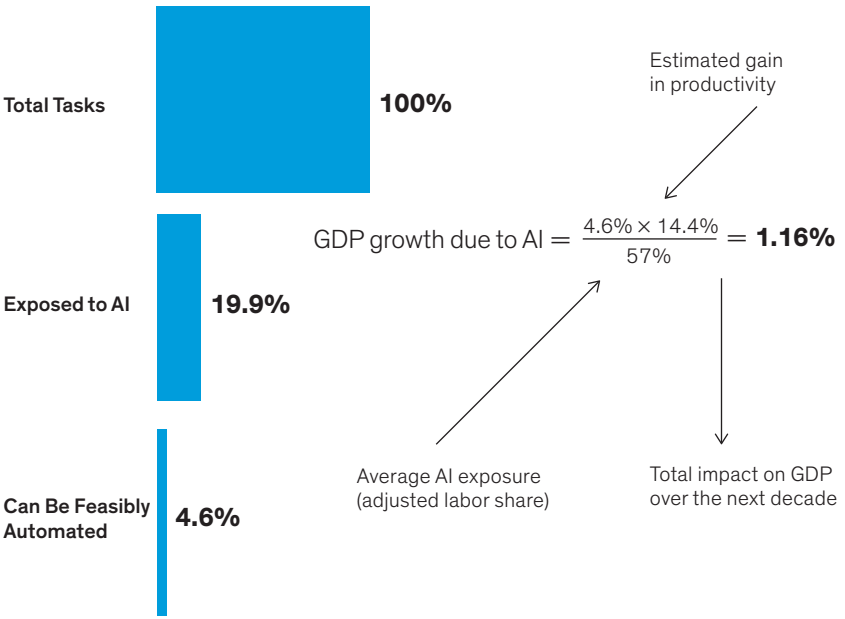
Historical analysis and current forecasts do not guarantee future results.

Source: AB

developing AI, this could prolong a period of a greater corporate profit share of GDP, allowing profit margins to increase even further. The negatives, outlined in *Display 3*, are the risk of greater inequality, a question of what the future of democracy will be in a world where most internet content is not human generated, and greater risk around geopolitical standoffs. The market does not try to price in these types of existential risks, so they don't really show up in return forecasts. Nevertheless, they are strategic risks.

What level of productivity growth is likely? In our research, we attempt to reverse-engineer this question. We estimate that the combined effects of a smaller working-age population, deglobalization and climate change imply that 10 years from now, AI would need to have boosted productivity growth by about 1.5 percentage points per annum to keep aggregate GDP growth constant. Such a shift has happened before,

DISPLAY 4: ESTIMATING AI'S IMPACT ON GDP GROWTH OVER THE NEXT DECADE



Current analysis does not guarantee future results.

As of January 16, 2025 | **Source:** Daron Acemoglu, *The Simple Macroeconomics of AI* (Massachusetts Institute of Technology, 2024); and AB

but it is at the top end of the historical range, so we would struggle to make a forecast this high our central case.

Daron Acemoglu, winner of the 2024 Nobel prize in economics, has suggested that,[4] once one accounts for the proportion of jobs that are readily automated and the speed at which it is economically viable to implement automation, the uplift in GDP growth from AI will be on the order of 1 percentage point over 10 years (i.e., an increase of 1/10th of 1% of GDP growth per annum). This is still a significant change, but is not likely to be sufficient to offset the downward forces on growth (*Display 4*).

Our discussion of AI in chapter 3, "Machines, Democracy, Capitalism and Feudalism: Five Books for a Different Age, and What It Means for Investing," is part of a review of key books that we think touch on important fundamental forces at work in the coming years. We also recorded a podcast based on these books, which is available here. One of the big unknowns is the impact of AI on the workplace and the future of jobs. This is a theme that we also touch on in chapter 6, "Tokens, Power, Non-Jobs and Debasement: The Case for Strategic Allocation to Tokens." In very different ways, AI and tokens could change the dynamic of labor versus capital. They even raise the question of what labor is—and if creating content and posting it on a platform constitutes labor in the Marxist value-theory sense of the word. We suggest that it does, even though such labor is not compensated.

Optimists point to 200 years of technological advances with no signs of structural unemployment. Where jobs have been displaced, in aggregate the uplift in demand has created new ones. Pessimists draw attention to how the benefits of technological advances have not been evenly shared, and how in some cases it has taken multiple generations for real earnings to show improvements from advances in technology. In our chapter on pensions, we suggest that people will have to work significantly longer, and wonder whether the type of work available will be suitable for this expanded working life. What does this mean for the need and desire to work? Robert Skidelsky has suggested (see chapter 3, "Machines, Democracy, Capitalism and Feudalism: Five Books for a Different Age, and What It Means for Investing") that Keynes was wrong for three reasons in his forecast that by 2030 the work week would be just 15 hours. First, one needs to distinguish between wants and needs and the desire for an improving real standard of living. Second, the benefits of productivity improvements are distributed unevenly. And third, labor is not only a cost—it also gives meaning to individuals. These three challenges are very relevant as AI redefines the meaning of labor.

Chapter 3 also touches on another pillar of growth: the functioning of capitalism. To what extent is competitiveness still a driver of the economy? Does the emergence of mega-cap tech platforms presage an attenuation of the competitive dynamic that has been so important for growth? Yanis Varoufakis goes as far as to suggest that the

4 Daron Acemoglu, *The Simple Macroeconomics of AI* (Massachusetts Institute of Technology, 2024).

emergence of tech platforms has brought about an end of capitalism, replacing it with a form of tech-driven feudalism. This is not meant to be a prediction of reaching some AI "singularity," but is a description of the world as it is already. Varoufakis's contention is that, while discussion of profits is ubiquitous in finance, they are not running the show anymore. The only irony in his account is that the downfall of capitalism was not brought about by organized labor but by the power of large corporations.

In the same chapter, we discuss a related point on the functioning of capitalism—its interaction with democracy. Martin Wolf's blunt view is that laissez-faire capitalism is ultimately incompatible with democracy. AI is again key to the narrative here: Does it imply an even wider dispersion between winners and losers in society? If so, what does that mean for the functioning of democracy?

Part II: Responses

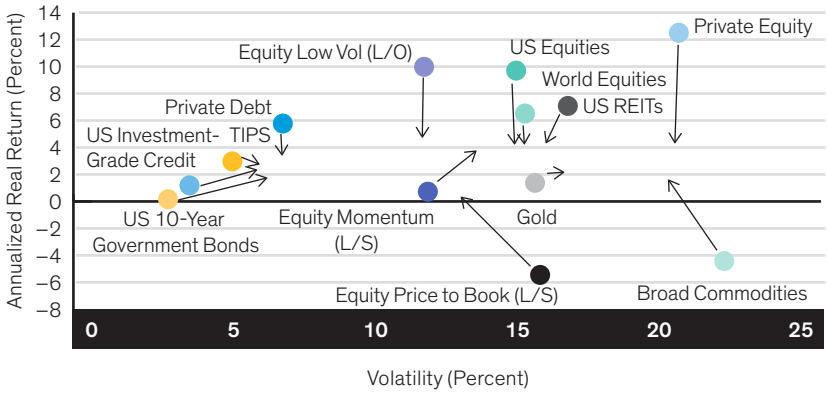
In part II, we pivot to considering how investors should respond to these challenges. The transmission between the ideas in part I to the question of appropriate portfolio design is via assumptions for capital-market returns. We set out our key forecasts for these in *Display 5*. We plot the real return (as that's the only return that counts) of key asset classes against their volatility since the global financial crisis. The arrows indicate the direction we think returns and volatility will evolve over the next decade.

The first thing to point out about this slide is that, while it does suggest a significant shrinkage in the return/risk "space" available to investors, it is not bearish. We are indicating a path to positive real returns on most of the significant allocations that investors make. It is, however, a more challenging outlook, suggesting that many investors need a change in their portfolios.

One way of interpreting this scatter chart is that the shrinkage of the available return/risk space brings the return/risk ratios of asset-class returns closer together. What should investors do in response to this? Well, it depends on what they are trying to achieve; i.e., their target or liability. If an investor has nominal liabilities, this bunching up of return/risk ratios probably implies that they can de-risk their portfolios. Equities might not be worth the risk for a small additional gain over bonds. However, our contention is that nominal liability managers are a shrinking share of total investment. A much more significant pool of investment demands real returns (or at least implicitly requires real returns). In this case, the conclusion is the opposite, and to achieve a given level of real return, investors would likely have to take on more risk.

A key aspect of the task of strategic asset allocation is, therefore, to think about the most efficient and appropriate way to partition and allocate to risk. Choices open to investors include more equity risk, because equities are a real asset if inflation is elevated but not unanchored; illiquidity risk; active as opposed to passive; factor risk; and, for pension design, to stay invested in risk assets longer into retirement. Ideally, investors would take advantage of a number of these avenues, because they are not perfectly correlated.

DISPLAY 5: HISTORICAL VS. EXPECTED RETURN AND RISK FOR DIFFERENT ASSET CLASSES



Historical analysis and current forecasts do not guarantee future results.

L/O: long-only; L/S: long/short. The circles represent real returns and volatility from January 2010 to December 2022 for the major return streams investors can buy. The arrows represent the AB Institutional Solutions team's forecasts for the next five to 10 years. Private equity return data are from the US Private Equity Index from Cambridge Associates, compiled from 1,562 funds, including fully liquidated partnerships, formed between 1986 and 2019. All returns are net of fees, expenses and carried interest. Data are provided at no cost to managers. Private equity volatility is estimated from the MSCI US Small Cap Value Index, with 15% leverage. For private debt, historical and future volatility is expressed as volatility of public US investment-grade credit. The number is between the historical volatility of public US high-yield fixed income and the Preqin Direct Lending return index. Factor future volatility is assumed to be in line with the post-1950 historical average.

As of October 5, 2023 | **Source:** Cambridge Associates, FactSet, Federal Reserve Bank of St. Louis, Kenneth R. French Data Library, LSEG Data & Analytics, MSCI, Preqin and AB

In this book, we focus on the investment implications in several areas in more detail: how pension design can change, the role of alpha versus beta, and the role of non-fiat assets and tokens in general.

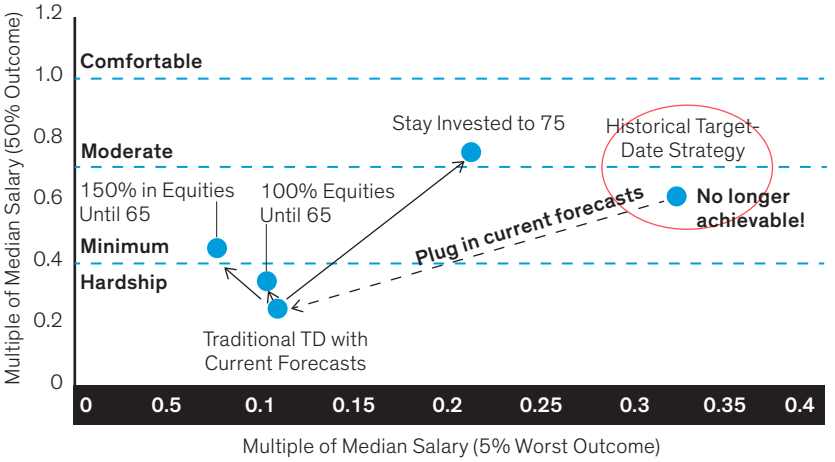
Pensions and Bonds

The implications of this strategic outlook are significant for the asset allocation of pension systems. Aggregate pension holdings have amassed considerable holdings of bonds, and we think this is set to be radically reduced in coming years. Part of this trend reflects a transition, with a growing share of pension assets being housed in defined contribution (DC) plans as opposed to defined benefit (DB) plans. The combination of greater longevity and higher inflation means that a rotation to real assets needs to take place (including equities as a real asset). The role of bonds is further reduced if, as is our contention, bonds are less effective diversifiers of

equity risk in a world of higher inflation, and where the drivers of inflation are not growth-linked.

In chapter 5, "Pensions and Bonds: The End of the Affair?", we make the case that staying invested in risk assets longer is one key step for pension design to take on enough risk to make retirement still possible. In *Display 6*, we plot expected annual income in retirement as a proportion of the national median salary against the likely fifth-percentile worst outcome for an individual who invests 8% of their income into a range of simple DC-like options. The point to the far right shows the outcome if the real return of equities and bonds over recent decades were repeatable. That

DISPLAY 6: EXPECTED PENSION INCOME VS. RISK OF A BAD OUTCOME



Past performance does not guarantee future results.

Display shows the expected median income in retirement (annuity rate) plotted against the likely worst fifth percentile of retirement outcomes. We overlay lines showing how these outcomes relate to different levels of comfort in retirement, using the Pensions and Lifetime Savings Association (PLSA) definitions of retirement needs as a percentage of national median income. The baseline target-date strategy simply invests 100% in equities until the age of 45, then has a linear reallocation over 10 years to become 100% bonds by age 55. The examples shown are as follows: (1) the historical target-date strategy shows the median outcome of returns from such a strategy over complete lifetime-savings cycles since 1970, while the distribution of returns uses a longer look-back period to all outcomes since 1941; (2) the same target-date structure, applying our forecast of lower returns and positive stock-bond correlation; (3) a simple approach to taking more risk of 100% equities through entire career; (4) 150% equities through entire career; (5) 100% equities until 65 and then a linear reallocation to 100% bonds by age 75; retire at 75.

As of May 31, 2024 | **Source:** Global Financial Data, LSEG Data & Analytics, PLSA and AB

point also assumes that equities and bonds have a negative correlation in their returns. However, we suggest that such an outcome is no longer likely. Substituting our own forecasts for equity and bond real returns as well as a higher correlation dramatically reduces the expected income in retirement for an individual who follows a framework that starts shifting the asset allocation into bonds in the middle of the investor's career.

The message here is that rotating into bonds just as the pension pot starts achieving significant size does not lower risk in this context. Even staying invested in equities all the way through to 65 isn't sufficient to achieve historical returns on simple target-date funds. However, staying invested until 75 and starting to rotate into bonds only in the final decade is a significantly better path. Moreover, as we'll discuss in the chapter, the more attractive annuity rates available at that age also raise the expected return.

Tokens and Crypto

The emergence of cryptocurrencies and digital tokens more broadly is intimately linked to some of the key social, economic and political themes outlined in part I. They play a role in the evolving future of jobs—on the one hand possibly increasing the precarity of some forms of labor; on the other hand potentially helping some of the most marginalized people gain access to money. Crypto and tokens also bring a new urgency to the old question, "What is money?" A discussion of digital tokens and crypto necessarily brings us to the question of power—who has it and how do they wield it?

The case for cryptocurrencies in asset allocation is, in our view, very much a function of the level of public debt and the risk this raises of governments using higher inflation as a convenient mechanism for reducing the real value of that debt. In parallel to this is the ongoing attempt by some countries to de-dollarize, which has been given renewed impetus by the rapid geopolitical shifts taking place and the questioning of the safe-haven status of the US dollar. This is primarily an argument for gold before it is an argument for crypto. However, we suggest that ultimately it creates enough demand for non-fiat zero-duration assets that crypto assets deserve a role in portfolios.

For investors, the topic that will absorb more attention in the future is not cryptocurrencies, but the tokenization of real assets. The demand will be driven not by the technology per se, but by the very macro demands of investors needing real assets, and the limits of this allocation when many of these assets are illiquid.

Finding Alpha

By following the logic of needing to find efficient ways to add risk in response to a low-real-return world, one way to achieve this is to increase allocations to active strategies versus passive. The intuition of this is that if the return on passive asset-class beta is set to be lower, then if (we stress the *if*) one can access persistent alpha, it becomes a larger part of the end investor's return.

It is key that the alpha has a good probability of being persistent. However, in recent years the active-management industry has hardly covered itself in glory. Although there have been exceptions in some areas (small-caps and emerging markets, for example), the environment of highly concentrated markets has been tough for active strategies. Our primary suggested response to this is to focus on identifying managers that can deliver idiosyncratic returns; i.e., outperformance above that achieved by a simple set of passive factor strategies. We discussed the methodology for this at length in a previous book. We have shown that a key practical consequence of this is that idiosyncratic alpha is significantly more persistent than traditional alpha measured as excess return.

That is not the whole story, though. There can be a significant mismatch between where alpha is available and the locus of the largest markets that constitute investors' core beta allocations. However, this quandary also hints at the solution, which involves allocating to the richer alpha opportunities "further afield," such as the smaller, less-exploited equity markets and long/short strategies. Thus, our chapter focuses on portable alpha. Simply put, portable alpha is a mechanism that enables investors to combine any independent source of manager skill, or alpha, with any market exposure (beta). It is usually implemented using derivatives: futures, forwards or swaps. The use of derivatives allows the investor to gain synthetic exposure to a beta stream, usually in the passive form of an index. We show that using portable alpha can significantly expand the return/risk trade-off, such as in the case of a 60/40 portfolio, compared with a fully passive implementation.

Certain criteria must be met for this to work, and because portable alpha involves taking on leverage, it adds risk. But again, we think this needs to be seen in a total portfolio sense: investors must take on investment risk to defray the greater risk of a loss of purchasing power. The question is not whether one wants to take on more risk, but what kind of risk is the most appropriate. We show that such approaches need to select sources of alpha that minimize hidden beta, have low correlation among managers and employ managers that genuinely have skill (for us, this implies a need for idiosyncratic alpha). The other drawback is that such an approach adds complexity, and we always want to employ Occam's razor in our approach to investment. But again, this must be seen in the context of overall portfolio needs.

Chapter 7, "Portable Alpha: A Revival," also makes the case for hedge-fund long/short alpha—we highlight multi-manager hedge funds, in particular.

Today's low-return outlook and the challenges faced by active managers in concentrated markets require investors to think more broadly and innovatively about ways to generate return. We argue that investors should not give up on active management but instead look to source it in less-efficient and less-exploited market segments where the alpha opportunity is still rich.

Portable alpha is a powerful technique that gives investors the flexibility to access a wide set of alpha streams in a way that does not impinge on their desired strategic asset allocations. It offers an elegant solution to the issue of a mismatch between the alpha and beta pools, a topic that has increasingly come up in discussions with our clients.

Strategic Asset Allocation

We end this introductory chapter by bringing together these views into an overall strategic asset allocation. The challenges laid out in this book will, we think, bring more investors toward a "total portfolio approach" that considers risks and allocations across all investments rather than within asset-class silos. This is a helpful riposte to the smaller return/risk "space" available to investors. As we highlighted above, we think that investors who have explicit or implicit needs for real returns will likely have to take on greater investment risk. Avenues for this involve higher exposure to equities (as the biggest real asset), greater exposure to illiquid assets, and allocations to alpha and factors. Moreover, from a pension glide-path perspective, one can stay invested in risk assets for longer—ideally past traditional retirement age. All of these can be complementary approaches. The choice of which ones to adopt depends on investors' beliefs, time horizon, liquidity requirements, etc.

What does this mean in practical terms? In *Display 7*, we set out our strategic asset-class views with the allocation that we think is appropriate for the next decade. The principal feature of this allocation is that it has a significant allocation to real assets. This is reflected in the overweight allocation to equities, Treasury Inflation-Protected Securities (TIPS) and other private assets. We make the case that equities are a real asset if inflation is elevated but not unanchored.

Within equities, this allocation accepts a case for US exceptionalism. Yes, other regions are cheaper, but valuation has not been the determinant of regional returns for the past three decades—earnings growth matters more. The case for US exceptionalism has taken a severe knock in 2025, but for equity exposure at least, we think that it still stands given relatively favorable demographics, the higher profitability of US firms, home market scale and energy supply security.

We are underweight nominal-duration assets over strategic horizons for an investor who cares about real returns. This is in part because we don't think nominal bonds can deliver sufficient real returns, but also because we're assuming that bonds will be a less-effective diversifier of equity risk than they have been in recent decades.

We believe that factors deserve a distinct allocation. In part, this is because a low-return world effectively lowers the hurdle that factors must pass to be useful for overall returns. We also note that factors tend to have a relatively stable pairwise correlation, making them additive to portfolio diversification. The case for factors also recognizes that, with asset classes expensive, if one wants to expose at least part of

a portfolio to the mean reversion of valuations, then that rests on intra-asset-class allocations, in which factors play a role.

We advocate a significant allocation to private assets. We reprise that case in this book—a lower-return world forces investors to cast the net more broadly to find both returns and cases where there is plausible illiquidity-premium help. Moreover, there is a diversification point. Crucially, diversification does not rest on the lack of marking to market. We have been very clear that stale prices do not constitute diversification. Instead, the diversification comes from the ability to access return streams not available in public markets. What is sometimes skipped over in the discussion of such assets is that part of the case for private assets has nothing to do with what investors want; instead, it reflects the shift in where capital is raised in the contemporary economy, with the stock of public equity shrinking in absolute terms and the share of credit coming from traditional bank sources also shrinking.

Finally, we also advocate an allocation to non-fiat zero-duration assets. This is primarily aimed at finding diversifiers of an overweight equity position in a world of higher inflation. It also reflects the risks that investors face if questions of public-debt sustainability become even more urgent. We have advocated a positive view on gold for some years. Yes, the price has risen significantly, but we think that the current geopolitical context underpins the continued case for it.

We end by noting that we are in a world where all asset classes are expensive. The allocation questions really hinge on the case for different kinds of risk. In the case of equities, this does not mean that the market must fall over the strategic horizons discussed in this note, but it does indicate that the passive index is riskier, a case amplified by the degree of index concentration. Thus, the strategic allocation also needs to recognize a case for active. Active is not shown in the list of asset classes below; instead, it cuts across them all.

DISPLAY 7: STRATEGIC ASSET-CLASS VIEWS

Asset Class	Recommendation vs. 60/40	Comment
Developed Equities	**Overweight**	
US Large-Cap	+	Real assets; attractive long-term returns; "US exceptionalism"; valuations and market concentration are sources of risk
International Developed	Neutral	Attractive valuations but greater drag on growth from demographics and deglobalization than US
UK	+	Attractive valuations; attractive sector composition offering defensive/stable growth
Japan	+	Positive inflation dynamic; corporate reform boosting corporate earnings and improving long-term fundamentals and shareholder returns; attractive valuations; diversification benefits
EM Equities	**Underweight**	
EM ex China	Neutral	Positive growth premium over DM; better demographics (India, Africa); structural sentiment measures supportive; deglobalization to improve the diversification role of EM; geopolitics and policy are risks in some countries
China	–	Poor demographics; policy and geopolitical risks to outlook (Trump) despite cheap valuations
Style Premia		
US Growth	+*	Expensive but structural tailwinds (greater persistency of ROE; tech and AI theme exposure)
US Value	+*	Potentially higher inflation and rates favor value as long as accompanied by strong growth outlook
EAFE Quality	+*	Attractive valuations; defensive properties and volatility reduction for a less-robust strategic outlook outside the US
EAFE Dividend Yield	+*	Attractive valuations; defensive properties and volatility reduction for a less-robust strategic outlook outside the US; attractive source of income

Asset Class	Recommendation vs. 60/40	Comment
Duration	**Underweight**	
US Government: Long	–	Structural risks; low term premium, inflation volatility; diminishing diversification; prospect of excess issuance relative to demand for bonds
US Government: Intermediate	Neutral/ Overweight	
US Government: Short	+	Better compensation for (lower) risk than long bonds
Euro Government Bonds	Neutral	Yields attractive versus history; stronger fiscal position than US; nearer-term, more favorable policy outlook. Balanced against this are geopolitical and domestic political risk
Real Assets	**Overweight***	
REITs	+*	Real assets, with positive correlation with inflation and positive real returns in all inflation regimes. Structural risks include climate change (higher insurance costs) and policy risk of rent control in residential real estate; case to be selective within the space
Natural Resources Assets	+*	Strategic inflation hedge, provider of real return. Diversifying asset for equity risk even at higher levels of inflation (unlike bonds). Key example of sustainable asset that is also an inflation hedge. Possible risks include climate change (e.g., risk of destruction by fire for timber)
US TIPS	+*	Attractive long-term returns; inflation protection
Private Assets		
Private Equity	–	Expect zero multiple expansion in aggregate, higher cost of debt than most of its history. Many investors are already overweight. High fee and liquidity concerns
Private Debt	+	Attractive current and prospective yield. Floating nature provides inflation protection. Beneficiary of retrenchment by traditional providers of credit
Infrastructure	+	Inflation protection in the form of offering positive long-term real return in both moderate- and high-inflation environments. Beneficiary of energy transition
Non-Fiat		
Gold and Crypto	+	Hedge against debasement risk for G7 currencies

Historical analysis and current forecasts do not guarantee future results.

***Asset has a small or no benchmark allocation.**

Source: AB

Part I: Challenges

Chapter 1—A Higher-Inflation Future and the Need for Real Assets

The risk of higher-equilibrium inflation is a key marker of the notion that investors face a new regime. Recent policy announcements have lent more weight to the idea that the path of inflation might be upward. In this chapter we focus on the disparate forces that imply a higher long-term level of inflation.

Deglobalization is inflationary by fragmenting supply chains and labor markets. Demographic changes are also potentially inflationary, in part by virtue of fewer working-age people but also by the resulting significant increase in the need for (hard-to-automate) care.

The very elevated levels of public debt and the lack of a realistic way to raise real growth imply that inflating away debt would be a politically expedient option across advanced economies. We also think that the energy transition will take much longer than anticipated in the finance industry, leading to greater inflation volatility.

The call to action for investors is to pivot to a higher weight in real assets (which include public equities), and for more focus on inflation hedges, including Treasury Inflation-Protected Securities (TIPS), non-fiat assets and physical assets. The call is also for a change in governance structure that puts more emphasis on preserving purchasing power.

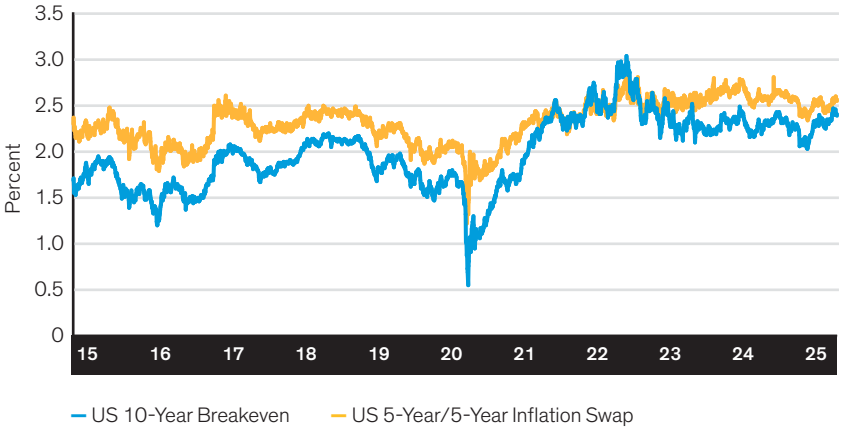
Perhaps the key macroeconomic variable that points to the potential for investors to face a new strategic investment regime is inflation. Certainly, when we have strategic conversations with investors about the medium- to long-term outlook, inflation tends to be a dominant part of that discussion.

There is much debate as to the extent to which the policies of the new US administration might be inflationary and how this might contrast with a more disinflationary trend that had become established in 2024. Yes, these policies have focused more of the debate around inflation risks in the next one to two years, but the message of this chapter is that there is a risk that the long-term equilibrium level of inflation could be higher than markets assume.

When we meet asset allocators around the world, we find that the majority still agree with us that the level and volatility of equilibrium long-term inflation seems set to remain stubbornly higher than before the pandemic. However, there is disagreement as to how much higher long-run forecasts of inflation should be. Also, after a period of cyclical disinflation in the last two years, the case for higher long-run inflation

demands to be revisited. It is these two tasks that we attempt to cover in this chapter. The level of 10-year forward breakeven inflation in the US has been relatively stable, in a 2.3%–2.4% range, for over two years (*Display 8*). In other regions, expected inflation has also risen compared with pre-pandemic levels (*Display 9*). The expectation implied by the breakeven rate in the US is somewhat above the Fed's target, but we argue that there is a risk that inflation ends up being higher than this. If this is the case, it would prompt a need to change asset allocations.

DISPLAY 8: US 10-YEAR INFLATION BREAKEVEN AND 5-YEAR/5-YEAR INFLATION SWAP



Past performance does not guarantee future results.

Through January 30, 2025 | **Source:** Bloomberg and AB

In contrast to the market's assessment of the long-term inflation trajectory, US consumer long-term inflation expectations have remained elevated over the last three years (*Display 10*). In fact, they have actually been edging higher since early 2024. This is important, as it's likely to affect expectations for wage growth, especially if in the longer run it coincides with an increase in labor bargaining power.

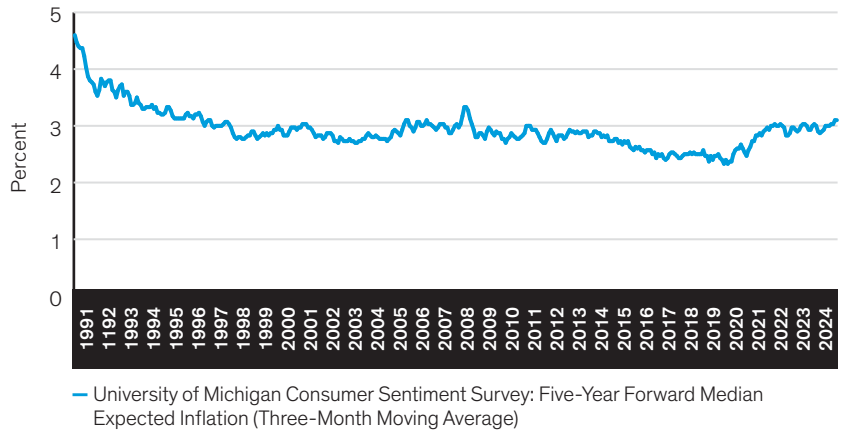
We think that a set of very different forces that are at work will drive inflation higher over strategic horizons. It is this confluence that, we think, makes this long-term pro-inflationary view more likely. It's also important to note, however, that there are potential deflationary forces present too. Thus, we do not think that one faces an unanchored inflationary future; elevated rather than high inflation is the more likely

DISPLAY 9: EUROPEAN 10-YEAR INFLATION BREAKEVEN AND 5-YEAR/5-YEAR INFLATION SWAP

Past performance does not guarantee future results.

Through January 30, 2025 | **Source:** Bloomberg and AB

DISPLAY 10: CONSUMER EXPECTATIONS OF INFLATION HAVE BEEN EDGING HIGHER



Current analysis does not guarantee future results.

Through December 15, 2024 | **Source:** LSEG Data & Analytics, University of Michigan and AB

future. We lay out these forces in *Display 11*. It would be a brave economist who placed coefficients on each of these forces, because we haven't been here before, but in this chapter we try to quantify as much as possible the scale of each of these inflationary forces.

DISPLAY 11: DEFLATIONARY AND INFLATIONARY FORCES ARE AT WORK OVER STRATEGIC HORIZONS

Deflationary Forces	Inflationary Forces
• Lower long-term growth expectations imply lower inflation. • Technology and automation have been deflationary for years. Does AI revolutionize this and undercut the case for inflation? • Consumers' realization, once pent-up spending ebbs, that nominal savings returns are down and inflation is up implies the need to save more, which will lower money's long-term velocity.	Over strategic horizons, inflation is driven by: • Deglobalization (supply/labor cost impact) • Demographics (shrinking labor force and rising care costs) • Energy transition and climate: Is the transition inflationary or deflationary? What's the impact of severe weather on inflation volatility? • Monetization of debt? The debt/GDP ratio is at its highest level since WWII. Is inflation the only way out?

Current analysis does not guarantee future results.

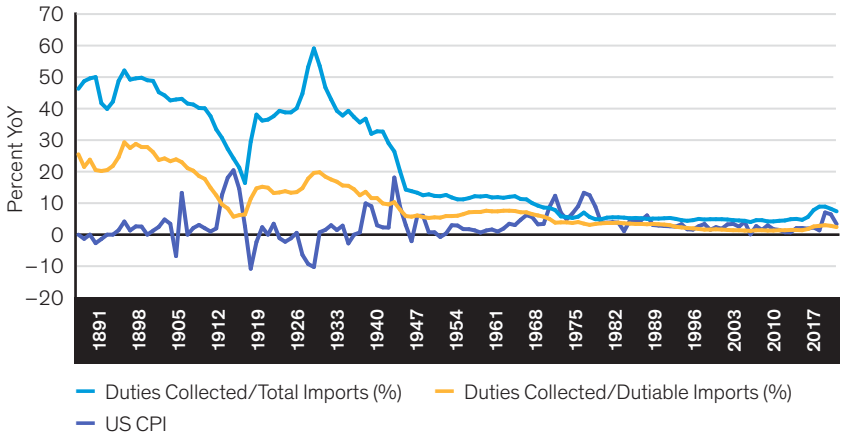
Source: AB

The Emerging Near-Term Narrative on Tariffs and Immigration

Tariffs and immigration were two cornerstone policies of Trump's presidential campaign, and there have already been a flurry of executive actions related to these two areas. While there is still considerable uncertainty around the ultimate size of the tariffs and how the policy on immigrants will evolve, these will have both a short-term impact and potentially long-lasting implications for the level of inflation, most likely pushing it higher.

On tariffs, the key proposals announced so far include a 10% baseline tariff on all US imports that came into effect on April 5, 2025, and a 145% tariff on imports from China. The administration also ended the *de minimis* treatment of all imports from the country. Higher tariffs on imports from 57 countries, ranging from 11% to 50%, were scheduled to take effect on April 9 but were almost immediately suspended for 90 days for all countries except China. The tariffs themselves are not really inflationary as much as a one-off price-level increase. However, it is the restitching of supply chains that has the potential to add costs in a more persistent way. As *Display 12* shows, the structural decline in the US Consumer Price Index (CPI) in the last half century has

DISPLAY 12: US TARIFF DUTIES VS. CPI



Past performance does not guarantee future results.

Through December 31, 2023 | **Source:** LSEG Data & Analytics, US International Trade Commission, World Bank and AB

been closely linked to the structural decline in tariff duties. This suggests that there is at least a possibility that if duties will be on a structurally higher trajectory going forward, they could result in a higher inflation level as well.

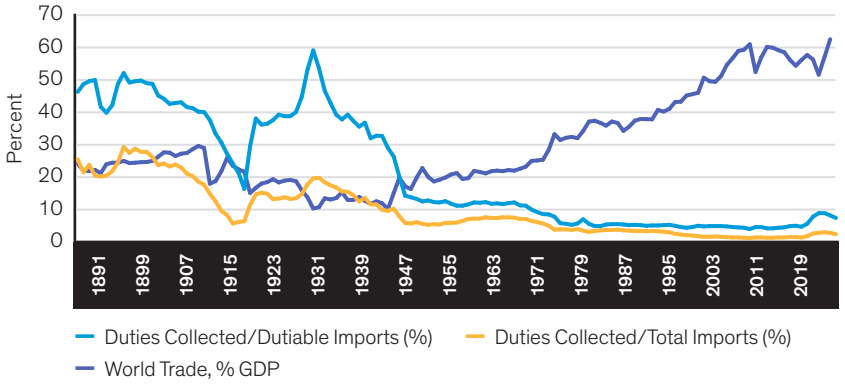
The structural decline in tariff duties has also been a key factor in the ever-rising levels of global trade intensity since the 1950s (*Display 13*). A sharp decline in trade intensity would be a significant drag on global growth, which ultimately would likely hurt US growth as well and offset some inflationary pressures.

A crackdown on immigration is another policy priority of the Trump administration, for which significant actions have already been taken. These include:

- The shutdown of the federal government's CBP One phone app that immigrants and asylum seekers used to schedule appointments to enter the US with legal permission
- Banning asylum at US borders
- Suspending resettlement programs that provided highly vetted refugees with a legal pathway to resettlement

In addition, highly publicized immigration raids across the country have already led to the arrest of thousands of undocumented migrants. While it is extremely hard to estimate the aggregate scale of any deportation program, even a slowdown in the rate of immigration from recent years will likely have far-reaching consequences

DISPLAY 13: US TARIFF DUTIES VS. WORLD TRADE INTENSITY



Past performance does not guarantee future results.

Through December 31, 2023 | **Source:** LSEG Data & Analytics, US International Trade Commission, World Bank and AB

for wage growth and, ultimately, inflation. As we show in *Display 14*, foreign-born workers accounted for all job growth in the US during the post-pandemic economic rebound and helped to fill the record amount of new job openings. Meanwhile, as *Display 15* shows, the rapid increase in new immigrants since 2021 coincided with significant and persistent moderation in wage growth. It was arguably one of the most important factors that created the "Goldilocks" scenario of rapid economic growth and continued disinflation that we have witnessed over the last few years.

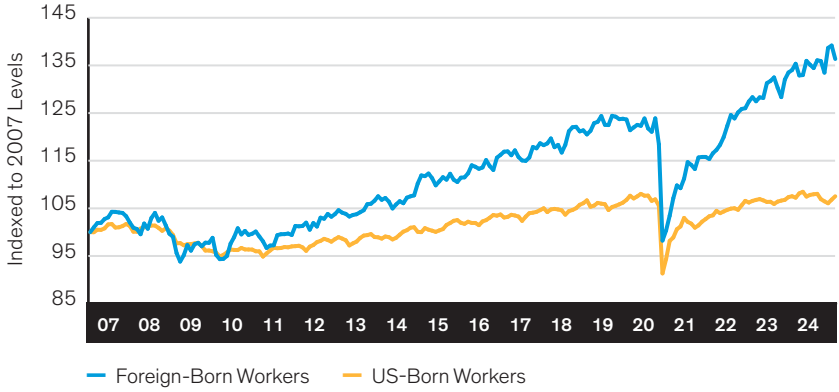
The US labor market remains very tight, with unemployment levels near historical lows at 4%. If companies are forced to compete for a shrinking pool of available labor, it will shift bargaining power to the remaining workers.

Demographics

We think that changing demographics, particularly a shrinking working-age population in developed markets and China, will put upward pressure on inflation over the long run. The following are several distinct aspects of this topic that relate to the supply of labor and the potential for a significant increase in the cost of care:

- A shrinking supply of labor, leading to wage pressures in certain segments of the workforce
- An increase in the dependency ratio and fewer disinflationary working-age people
- A higher cost of care (which is hard to automate)

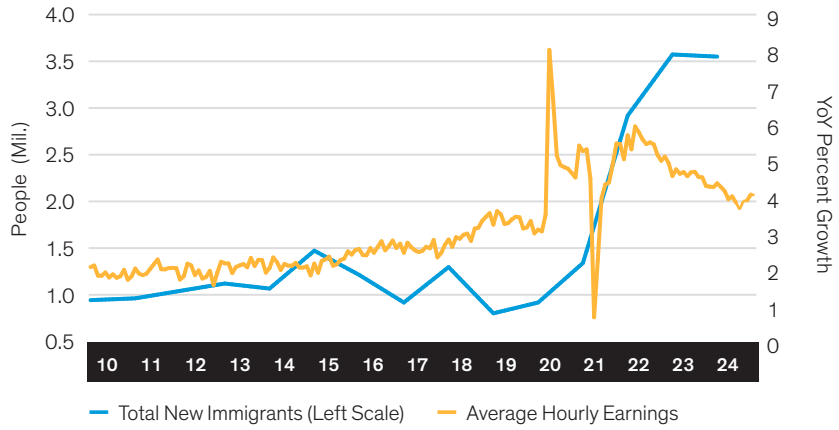
DISPLAY 14: WHAT HAVE NEWLY ARRIVED MIGRANTS MEANT TO THE LABOR MARKET? FOREIGN-BORN WORKERS ACCOUNT FOR ALL POST-COVID JOB GROWTH



Current analysis does not guarantee future results.

Through April 15, 2024 | **Source:** Bloomberg, LSEG Data & Analytics and AB

DISPLAY 15: RISE IN IMMIGRATION COINCIDED WITH SIGNIFICANT MODERATION IN WAGE GROWTH



Current analysis does not guarantee future results.

Through April 15, 2024 | **Source:** Bloomberg, LSEG Data & Analytics and AB

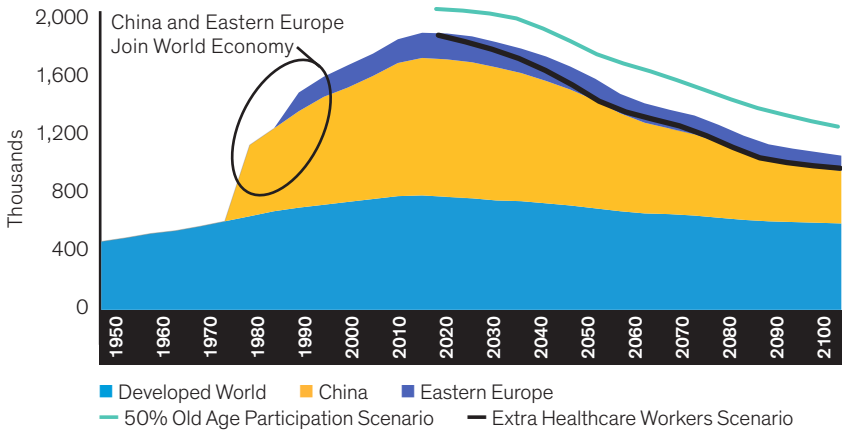
One might ask, "Hang on—wasn't Japan's experience deflationary? If that was the first country to experience significant demographic aging, why is Inigo wheeling out demographics as an inflationary force?

We see significant differences between Japan's experience in the 1990s and today's. Most significantly, in that earlier period there was an asset price bubble that far exceeded the valuations that have been reached today. As just one example, the forward price/earnings (PE) ratio for Japanese equities reached 80× in the early 1990s versus the 20× for global equities today. Moreover, Japan's aging population was happening in isolation, whereas there were deflationary forces in place elsewhere. Today that is not the case.

Several of the forces at work on inflation overlap. Demographics and globalization overlap when it comes to the effective size of the working-age population. In *Display 16*, we show the size of the working-age population for the developed world, China and the Soviet bloc—adding in the latter two as they joined the global economy over the course of the 1980s and 1990s. We show that demographics alone undo

DISPLAY 16: A SHRINKING LABOR FORCE...EVEN BEFORE DEGLOBALIZATION IS TAKEN INTO ACCOUNT

The Decline in Working Population from Demographic Changes Will Remove 30% of the Extra Workers Who Joined the Global Economy in the 1980s



Current analysis does not guarantee future results.

Shaded areas represent population aged 20–65 in regions shown. The green line represents a scenario where 50% of those aged 65 to 79 continue to participate in the labor force. The black line represents a scenario where 0.17 extra nursing and residential care workers are needed for each person aged 75 and older.

As of December 2, 2024 | **Source:** LSEG Data & Analytics, UN Population Division and AB

a significant part of the growth in the effective number of global workers that has occurred in the period of globalization since 1980. That is before one layers on the effect of deglobalization, a topic we return to later in this chapter.

When it comes to the effective working-age population, demographics is not entirely destiny. Policy can change this too. The starting point for this analysis assumes that people retire at 65. Yet no one, surely, believes that this is a realistic aim for the vast majority of people in the future (see chapter 5, "Pensions and Bonds: The End of the Affair?"). Based on this assumption and using United Nations (UN) demographic projections, we can expect an accelerating decline in the labor force in the coming decades. In Display 16 we also consider two additional scenarios denoted by the two lines. The green line illustrates a scenario where 50% of those aged 65 to 79 continue to participate in the labor force. This would delay the date of the peak in the labor force, but from around 2050, the labor force would still start to drop off sharply. One other important consideration: even if 50% of older workers were willing to work way past the current retirement age, it is not certain that they would have the necessary skills or stamina to do so—the labor shortage is likely to be most acute in service-sector jobs that cannot be automated.

The other scenario, represented by the black line, considers the expected increased demand for healthcare workers and residential care staff, because the share of people aged 75 and above is also projected to increase substantially in the coming years. We discuss this issue in more detail later in the chapter; here, we just want to highlight that there is a potential drag on the effective number of workers, driven by the rising need for care.

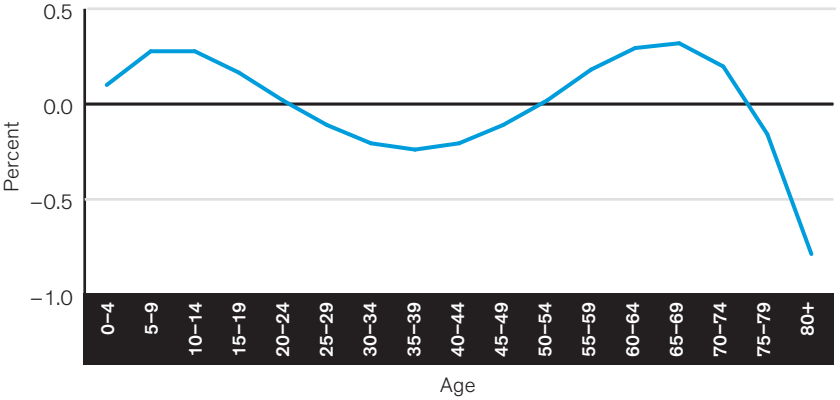
This analysis also excludes India and Africa. UN population forecasts expect India to see growth in its population for some decades, with Africa seeing growth through to the end of the century. However, we exclude them here because we do not think there is a plausible policy path that would see either region effectively join the global economy and repeat what China has done since the 1980s.

This declining number of workers seems set to be a significant force. If the increasing number of workers was at least part of the reason for the erosion of wage bargaining power since the 1980s, it is possible that a decline in the number of workers could create a force in the opposite direction, which we discuss in more detail in a later section.

The ratio of the number of workers to the number of dependents can affect low-frequency inflation; i.e., inflation over time frames longer than a business cycle. The rationale here is that workers produce more than they consume, but the opposite is true for nonworking dependents. A Bank for International Settlements (BIS) paper by Mikael Juselius and Előd Takáts[5] has shown this effect empirically: the age structure leads to slow-moving changes in the natural rate, and monetary policy does not fully internalize

5 Mikael Juselius and Előd Takáts, "The Enduring Link Between Demography and Inflation," BIS Working Paper No. 722, May 2018.

DISPLAY 17: AGE-COHORT EFFECT ON INFLATION (1870–2016)



Past performance does not guarantee future results.

As of May 2018 | **Source:** Mikael Juselius and Előd Takáts, "The Enduring Link Between Demography and Inflation," BIS Working Paper No. 722, May 2018; and AB

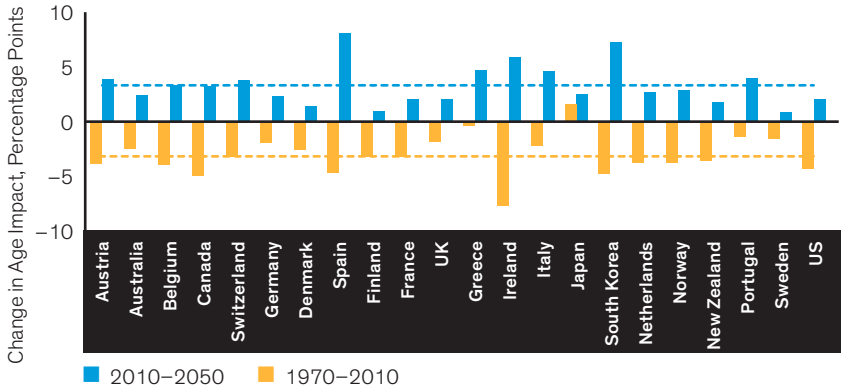
such changes. *Display 17* shows the impact of age cohorts on inflation—the young and retired are inflationary, while people of working age are disinflationary.

One can then apply the expected size of the change in these cohorts and deduce their impact on inflation. Juselius and Takáts conclude that the deflationary effects of age structure on inflation that have been in place for the last 40 years are set to reverse and become inflationary forces. Specifically, they conclude that between now and 2050, the age-cohort effect will put upward pressure on developed-economy inflation at an average of three percentage points (*Display 18*). Over the past half century, by contrast, the increasing share of the working-age population has lowered average inflationary pressures by around three percentage points. The authors stress that this does not constate an inflation forecast in its own right, but instead is an attempt to quantify the age-structure impact on inflation.

This work implies that, historically, there has been a distinction between the old and the very old. While the former are inflationary, the latter have been disinflationary, as they have tended not to spend. Is this set to change? We think that there is a case that the cost of care is likely to form a larger part of consumption. There is a general point here about the cost of healthcare: it has tended to rise faster than broader inflation, and the basket of goods that the elderly buy has a higher weight with regard to healthcare than the population at large. But this also raises a specific point about dementia. *Display 19* shows the average rate of inflation for medical care overall and its subcomponents of

DISPLAY 18: AGE-STRUCTURE EFFECT—FROM DISINFLATIONARY TO INFLATIONARY PRESSURE

The Changing Age Structure Implies That a Low-Frequency Component of Inflation Will Rise by 3 Percentage Points Over the Next 50 Years

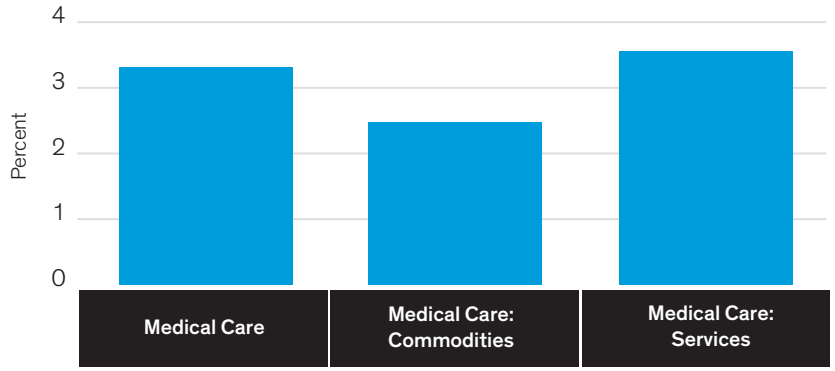


Past performance does not guarantee future results.

The dashed lines show averages.

As of May 2018 | **Source:** Mikael Juselius and Előd Takáts, "The Enduring Link Between Demography and Inflation," BIS Working Paper No. 722, May 2018; and AB

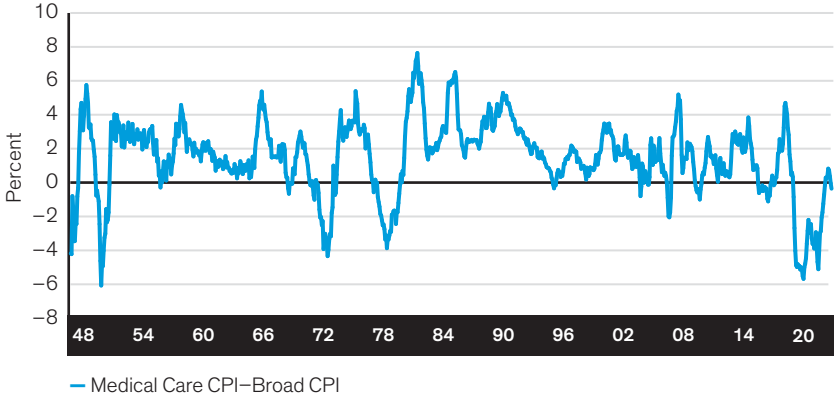
DISPLAY 19: MEDICAL CARE INFLATION AVERAGES



Past performance does not guarantee future results.

As of January 31, 2025 | **Source:** LSEG Data & Analytics and AB

DISPLAY 20: MEDICAL CARE INFLATION IS ALWAYS HIGHER THAN BROAD CPI EXCEPT DURING CYCLICAL HIGH INFLATION SHOCKS (1970s OIL SHOCK, POST-COVID, ETC.)



Past performance does not guarantee future results.

Through January 31, 2025 | **Source:** LSEG Data & Analytics and AB

"medical care—commodities" (e.g., drugs) and "medical care—services" (e.g., care). In the US, inflation in the overall medical-care category has averaged 3.3% annualized since 1998. This has been steadily above the run rate of broader inflation (*Display 20*). The only times when this has not been the case is when there has been a cyclical inflation shock; e.g., in the 1970s and during the pandemic.

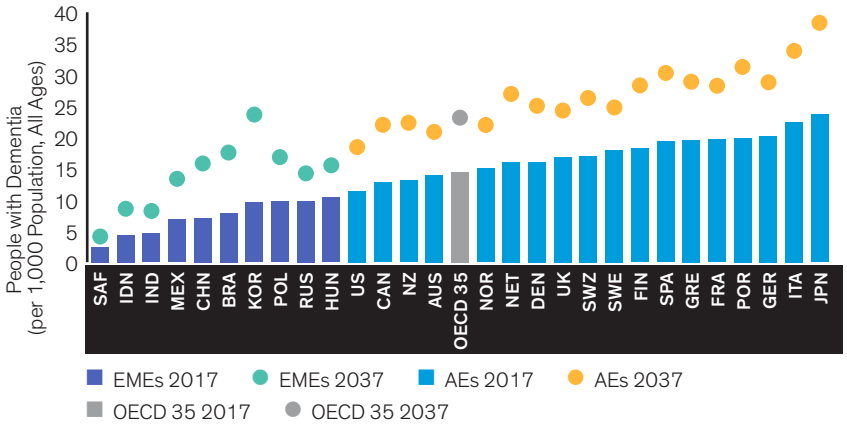
A rapidly aging population will create more demand for medical care and medical services in particular. Over time, this will increase the weight of healthcare expenses in the CPI and exert upward pressure on the overall inflation level.

Aside from an aging population spending more on higher-inflation care services, we can also expect to see a greater incidence of dementia, for which age is a critical risk factor (*Display 21*). Taking the UK as an example, Andrew Kingston et al.[6] assert that this contributes to a particularly large increase in the number of people classified as being in "high dependency," requiring a significant amount of care. Overall, the absolute number of people in the UK aged 65 years or older with high dependency is projected to increase by 36% over the next 20 years (*Display 22*).

6 Andrew Kingston et al., "Forecasting the Care Needs of the Older Population in England over the Next 20 Years: Estimates from the Population Ageing and Care Simulation (PACSim) Modelling Study," *The Lancet* 3, no. 9 (September 2018).

DISPLAY 21: INCIDENCE OF DEMENTIA IS EXPECTED TO RISE MATERIALLY...

People with Dementia (per 1,000 Population)



Current analysis does not guarantee future results.

AEs: advanced economies; EMEs: emerging economies

As of June 25, 2019 | **Source:** Charles Goodhart and Manoj Pradhan, *The Great Demographic Reversal* (Palgrave Macmillan, 2020); OECD Health Statistics, 2017; and AB

DISPLAY 22: ...WHICH WILL INCREASE THE NEED FOR CARE, WITH HIGH-DEPENDENCY RATES SOARING

Expected Dependency in the UK in 2035, and Change from 2015 (Thousands)

Total Population			Dependency					
		% Δ	Low	% Δ	Medium	% Δ	High	% Δ
65–75	6,908	+31	967	–15	98	–49	241	–15
75–84	2,778	+51	1,400	+29	171	+5.7	378	+42
85+	2,815	+114	1,537	+148	293	+73	446	+92

Current analysis does not guarantee future results.

Source: Charles Goodhart and Manoj Pradhan, *The Great Demographic Reversal* (Palgrave Macmillan, 2020); Andrew Kingston et al., "Projections of Multi-Morbidity in the Older Population in England to 2035: Estimates from the Population Ageing and Care Simulation (PACSim) Model," *Age and Ageing* 47, no. 3; and AB

In *Display 23*, we use a variety of sources to try and estimate the expected increase in direct and indirect costs (the latter being care, forgone work by those giving care, etc.) for dementia and cardiovascular conditions. The conclusion is that the total cost of this care is expected to grow at a faster rate than broader inflation.

DISPLAY 23: COST OF CARE FOR SELECT CONDITIONS

USD Billions		Cardiovascular Conditions and Stroke*	Alzheimer and Related Dementias†	
		Conditions (Coronary Heart Disease, Stroke, Heart Failure	US	Global‡
Direct Costs	Today	393	196	488
	2050	1,490	1,400	
Indirect Costs	Today	234	254	330
	2050	361	1,900	
Total (Direct and Indirect)	Today	627	450	818
	2050	1,851	3,300	
Inflation in Total Cost (% p.a.)		**4.3**	**5.7**	

Current analysis does not guarantee future results.

*Drivers: a) greater risk factors; e.g., obesity, b) aging, c) ethnic mix risk factors. Each age/ethnicity cohort is projected out. Source: Dhruv Kazi et al., "Forecasting the Economic Burden of Cardiovascular Disease and Stroke in the United States Through 2050," *Circulation* 150, no. 4 (June 2024)

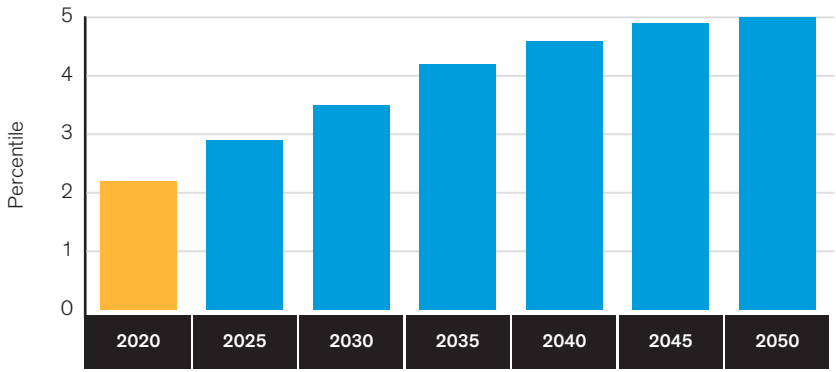
†Drivers: Age is a key factor; also the rise in the cost of care. Assuming care cost inflation of 4%. Estimated cost of informal care (forgone wages or replacement with professional caregiver). Source: Arindam Nandi et al., "Cost of Care for Alzheimer's Disease and Related Dementias in the United States: 2016 to 2060," *NPJ Aging* 10, no. 1 (February 2024)

‡ Source: Martin Prince et al., *World Alzheimer Report 2015*, Alzheimer's Disease International.

Another consequence of an increasing number of very old people is the greater need for nursing and residential-care workers, which has knock-on effects on the broader labor force. We attempt to quantify the extra demand in *Display 24*. In the US since 1990, nursing and residential-care workers (excluding broader health sector workers) as a proportion of the number of people older than 75 has averaged 17%. Assuming this proportion stays constant, and using the UN projections for demographic

composition, we should expect the need for social-assistance workers to rise from less than 3% of the labor force today to over 5% by 2050. This will impact the labor force in two ways. First, it will divert existing workers from other sectors of the economy, reducing labor supply across those sectors at the margin. Second, some of the extra demand for care will likely be met by family members, who will have to reduce their working hours or exit the labor force entirely. Both of these mechanisms will put extra pressure on the labor supply, which will already be constrained by the declining working-age population, and *ceteris paribus*, should further increase the potential bargaining power of labor.

DISPLAY 24: PROJECTED US NURSING AND RESIDENTIAL-CARE WORKERS (% OF TOTAL)



Current analysis does not guarantee future results.

Note: The analysis uses UN demographic projections and assumes that 0.17 nursing and residential-care workers will be needed for each person aged over 75.

As of December 2, 2024 | **Source:** LSEG Data & Analytics, US Bureau of Labor Statistics and AB

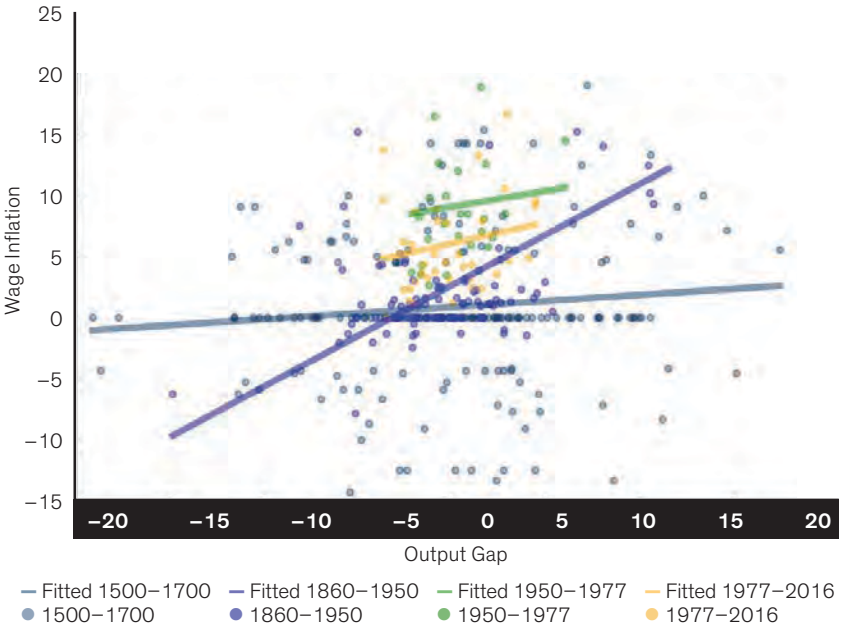
The combination of less immigration, a decline in the working-age population across advanced economies and China, and the extra demand for care workers begs the question of the bargaining power of labor versus capital. If a Phillips curve relationship holds, then this structural increase in the tightness of labor markets implies that wage bargaining power increases, and that this will become a powerful mechanism for structural inflation. Wage inflation has historically been one of the stickiest forms of inflation. One could argue that the decline in the bargaining power of labor since the 1980s, along with the combination of globalization, the post-Reagan-Thatcher tilt in economic policy and the fall in unionization have all contributed very significantly to

benign inflation for decades. If those forces have now run their course, is this a key path for higher inflation?

This outcome depends on the extent to which artificial intelligence (AI), and in particular a form of AI that is very much corporate-led (in the West at least), leads to a level of automation that undercuts labor bargaining power. It is simply too early to scale the relative size of these effects. We would note, though, that long-run data from the Bank of England shows that the existence of a Phillips curve relationship very much depends on the long-run economic regime and the structure of working life. We reproduce this chart here in *Display 25*. The usual Phillips curve relationship, whereby a tighter economy implies wage bargaining power, only really applied from the late 19th century to the mid-20th century. Since then, the relationship has been gradually weakening (in line with a decline in unionization). Interestingly, these data show that there was also no relationship for the 200 years prior to the Industrial Revolution, so it's possible that the period 1860–1950 was really the outlier.

DISPLAY 25: LOSS OF LABOR BARGAINING POWER

500 Years of the Phillips Curve



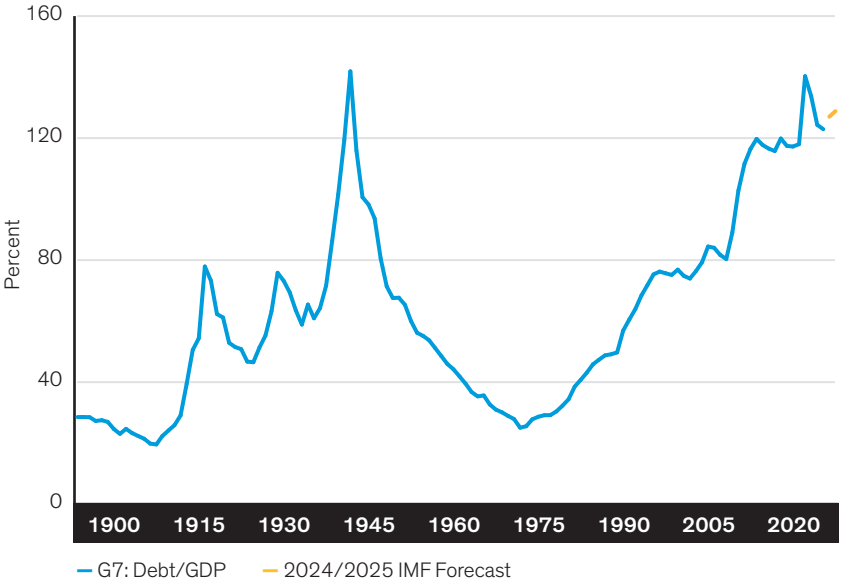
Current analysis does not guarantee future results.

As of June 2017 | **Source:** Bank of England and AB

Debt Monetization

Public levels of debt to GDP in G7 countries are close to the historical highs reached after WWII (*Display 26*). Arguably, the current level understates the true magnitude of the problem, because rapidly aging populations imply significant increases in demand for pension and healthcare spending by governments across the world in the coming decades.

DISPLAY 26: G7 DEBT-TO-GDP RATIO HIGHLIGHTS A GROWING PROBLEM



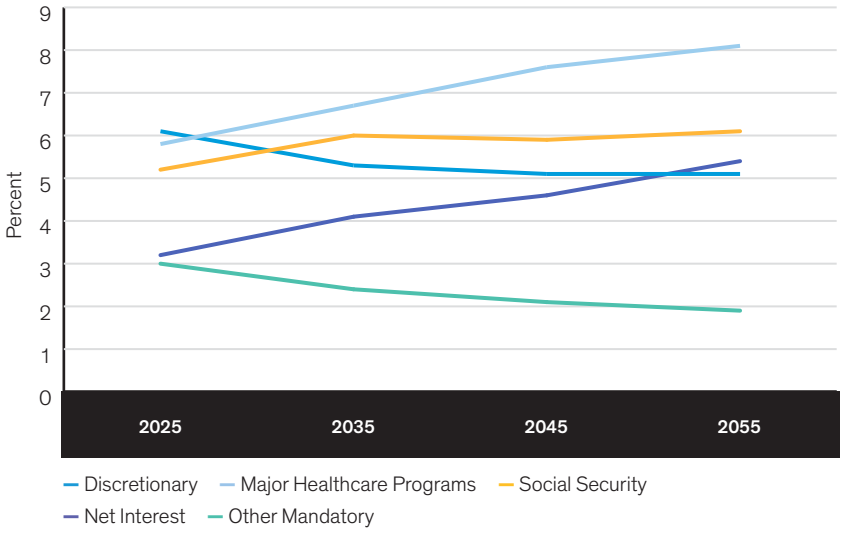
Current analysis does not guarantee future results.

Display shows government debt/GDP for G7 countries weighted by nominal GDP denominated in USD. Data from 1900–2023 is from Global Financial Data. 2024/2025 forecast is from the International Monetary Fund.

As of December 31, 2023 | **Source:** Global Financial Data, International Monetary Fund (IMF) and AB

Rising levels of debt, coupled with a turn in the long-run decline of interest rates, imply that debt service as a share of government expenditure is going to rise significantly in the future (*Display 27*).

DISPLAY 27: CONGRESSIONAL BUDGET OFFICE (CBO) SPENDING PROJECTION BY CATEGORY



Current analysis does not guarantee future results.

Note: The CBO projection presents data that supplement CBO's March 2025 report *The Long-Term Budget Outlook: 2025 to 2055*.

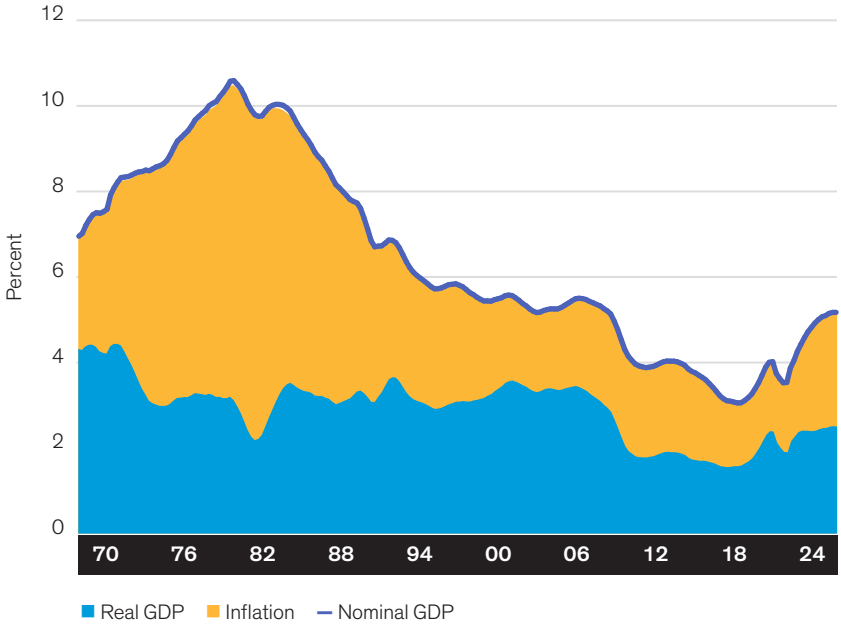
As of April 3, 2025 | **Source:** Congressional Budget Office and AB

Recent investor discussions on this topic have focused on the US. Neither candidate in the last presidential election proposed fiscal discipline, so presumably this trajectory would be unlikely to change even by the next election. But this is not just a US problem. Other G7 countries have top-of-range public debt as well. In other countries, the debt burden might not be increasing at the same pace as it is in the US, but these nations also have inferior growth outlooks and lack a reserve currency. Thus, rising debt burdens are a global problem.

What Are the Possible Ways to Bring Debt Levels Under Control?

The best possible scenario would be a sustained period of significantly higher GDP growth. However, we believe this will be very hard to achieve in a sustained way. As we show in *Display 28*, over the last 50 years US real GDP growth has stayed within a tight range. And given the outlook, which calls for demographics to severely limit the growth of available workers, supply chain pressures, slower immigration and reduced knowledge sharing among countries implied by deglobalization, we expect significant structural headwinds to growth going forward.

DISPLAY 28: US NOMINAL GDP COMPOSITION OVER TIME



Current analysis does not guarantee future results.

As of August 15, 2024 | **Source:** LSEG Data & Analytics and AB

We admit that there is a possibility that advances in AI might drive big gains in productivity that would usher in a growth boom, but at this stage the outlook for AI is too uncertain to make it our base case. Historical experience suggests that large and sustained increases in productivity over a number of years are rare and very hard to achieve. Furthermore, we estimate that the increase in productivity from current levels that is required to offset the headwinds of demographics, deglobalization and the energy transition would have to be on the same order of magnitude as the largest trough-to-peak productivity jump in any decade since the 1940s.

The other possible route for addressing the debt burden is austerity. We are generally skeptical of the idea that a sufficient level of austerity is politically possible in democratic countries with aging populations. The new US administration is experimenting with a more radical form of austerity: is this a route that could provide an alternative way out?

Display 29 shows the breakdown of federal government spending by category, illustrating the challenge of finding significant savings by cutting government spending. The largest expenditure categories are nondiscretionary and related to social and income security, as well as Medicare and Medicaid, which Trump has promised not to cut. Breaking that promise would be very politically contentious. And while there might be some savings in optimizing defense equipment procurement, large cuts to defense spending are unlikely given the current climate of heightened geopolitical risks. Thus, this leaves a very small proportion of overall spending that's discretionary and not defense related.

DISPLAY 29: US FEDERAL GOVERNMENT SPENDING BY CATEGORY

Expenditure	% of Total
Medicare	17
Social Security	16
National Defense	16
Net Interest	12
Health	12
Income Security	8
General Government	5
Veterans Benefits and Services	4
Education, Training, Employment and Social Services	3
Commerce and Housing Credit	2
Transportation	2
Natural Resources and Environment	1
Community and Regional Development	1
Administration of Justice	1
International Affairs	1
Agriculture	1

Current analysis does not guarantee future results.

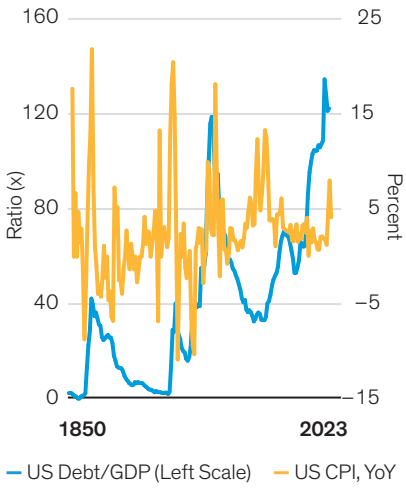
As of January 15, 2025 | **Source:** Committee for a Responsible Federal Budget and AB

Is Inflation the Most Expedient Path Politically to Reduce the Real Value of Debt?

We think that letting inflation run structurally higher will increasingly look like the easiest and most politically expedient option. Looking back to Display 21 (which shows US nominal GDP composition over time), the periods of high nominal growth over the past 50 years were associated with significantly higher inflation. While we don't expect higher inflation to be an official strategy of any government or central bank in the developed world, if inflation settles above the recent average in the range of 2.5% to 3%, it leaves the possibility that monetary policy would not be tightened significantly to force it back to the 2% target. After all, US inflation has already been above the central bank target of 2% for four years.

Looking back over a much longer period, there is evidence that periods of high debt have been associated with periods of higher inflation. All the previous periods of a significant increase in debt levels have been associated with existential national conflict, such as the Napoleonic wars in the case of the UK, the US Civil War and then the WWI–WWII periods (*Displays 30 and 31*).

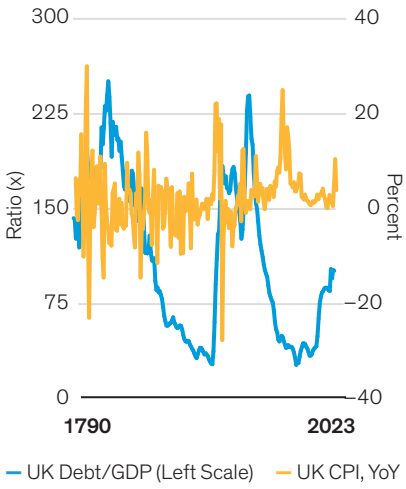
DISPLAY 30: US DEBT/ GDP AND US INFLATION



Past performance does not guarantee future results.

Through December 31, 2023
Source: Global Financial Data and AB

DISPLAY 31: UK DEBT/ GDP AND UK INFLATION

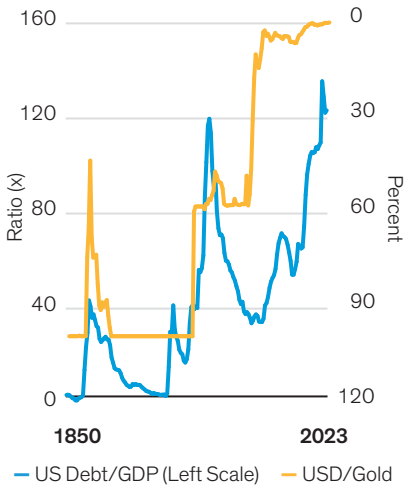


Past performance does not guarantee future results.

Through December 31, 2023
Source: Global Financial Data and AB

This amounts to a depreciation against gold. As this is not just a US problem, the implication, if this pattern is repeated, is to expect a long-term depreciation of all major fiat currencies against gold (*Displays 32 and 33*).

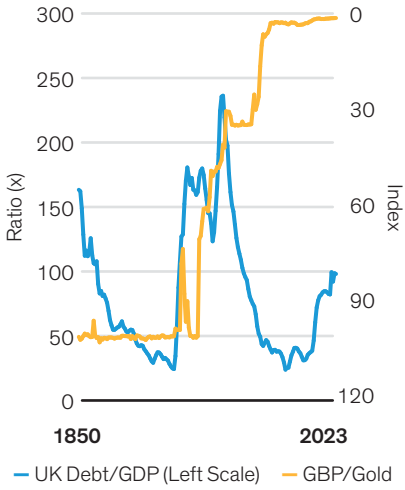
DISPLAY 32: US DEBT/ GDP AND USD/GOLD



Past performance does not guarantee future results.

Through December 31, 2023
Source: Global Financial Data and AB

DISPLAY 33: UK DEBT/ GDP AND GBP/GOLD



Past performance does not guarantee future results.

Through December 31, 2023
Source: Global Financial Data and AB

Some discussions about this high level of public debt raise it as a national security issue. This goes beyond the scope of this discussion of inflation, but we think it is a valid point. The levering up of the economy over the past four decades has made the system more fragile than it otherwise would have been. The large foreign holdings of debt likewise introduce vulnerabilities, under the assumption that default is not an option.

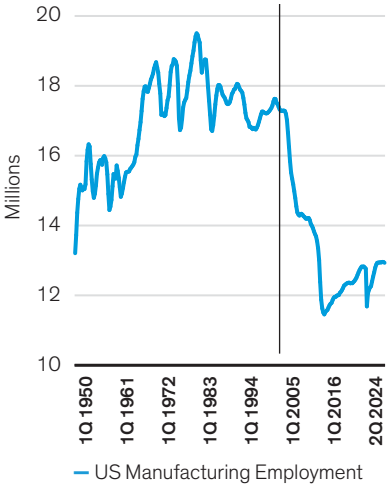
Deglobalization

Deglobalization is set to persist as a theme. Yes, it has been given a near-term acceleration by the announcement of trade tariffs. But beyond that, the forces driving deglobalization are a continued escalation in the US-China rivalry and a rejection of globalization within advanced economies, most clearly illustrated by the rising popularity of far-right anti-immigrant and protectionist parties around the world.

One of the key areas of US-China antagonism is the strong assertion by the new US administration that China has been stealing manufacturing jobs from the US. As *Display 34* shows, there had indeed been a sharp drop in US manufacturing jobs following China's accession to the World Trade Organization (WTO) in 2001. But from a longer perspective, it is also evident that the manufacturing share of total jobs (as opposed to the absolute number) had been declining for a long time before that. While outsourcing manufacturing production to China has contributed to this decline, it would have arguably happened anyway as the US economy shifted toward services.

The result of outsourcing and the potential threat of outsourcing manufacturing jobs to lower-cost areas, along with a structural decline in unionization rates (more on this later), was a significant decline in manufacturing worker bargaining power, resulting in a structural decline in real manufacturing wage growth (*Display 35*). Outside of recessions, growth has shifted from 1.8% per year before 1980 to close to 0% after.

DISPLAY 34: *PRIMA FACIE* EVIDENCE THAT CHINA JOINING WTO IN 2001 WAS DEVASTATING FOR US MANUFACTURING JOBS

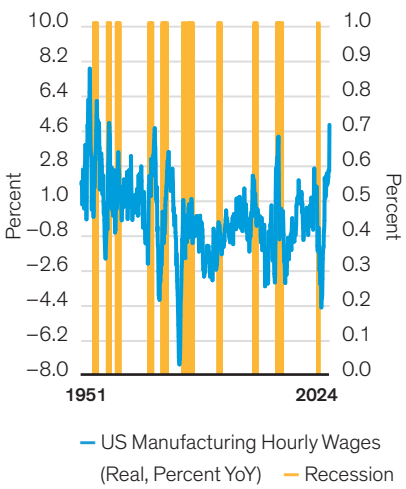


Past performance does not guarantee future results.

Through October 31, 2024
Source: LSEG Data & Analytics and AB

DISPLAY 35: US MANUFACTURING REAL WAGE GROWTH

Outside of Recessions, Growth Has Declined from an Average of 1.8% p.a. to 0% Post-1980



Past performance does not guarantee future results.

Through December 31, 2023
Source: LSEG Data & Analytics and AB

With much lower production costs, China was able to export disinflation, primarily through much lower prices for consumer goods. This had acted as a deflationary impetus since Deng Xiaoping's reforms of the early 1980s—and especially since China gained WTO access. That process is now over, and is now a potential route for inflation in developed markets via both wages and goods. For example, economists Xavier Jaravel and Erick Sager found that a one percentage point increase in import penetration from China caused a 1.9% decline in consumer prices.[7]

It is unlikely that any other country or even region will be able to fill the gap left by China. The two most obvious candidates would be India and Africa, as these are the areas where the working population is projected to continue to grow in the coming decades. However, India's economy is heavily services-oriented and does not have the required manufacturing capacity. Meanwhile, Africa, in addition to lacking manufacturing capacity, is hindered by a lack of necessary infrastructure, and many countries in the region have severe political instability and uncertainty. In both cases, we think it is simply implausible to sketch out a policy path by which those regions become connected to the global economy in a way that China did in the 1980s–1990s.

The result is the continued reshoring of supply chains as well as structurally higher spending on automation. Even assuming higher levels of productivity, the cost of domestically produced goods will be significantly higher than those made in China. Adding the extra capex required to build new factories and other necessary infrastructure on top of that will exert significant upward pressure on the price of consumer goods over time.

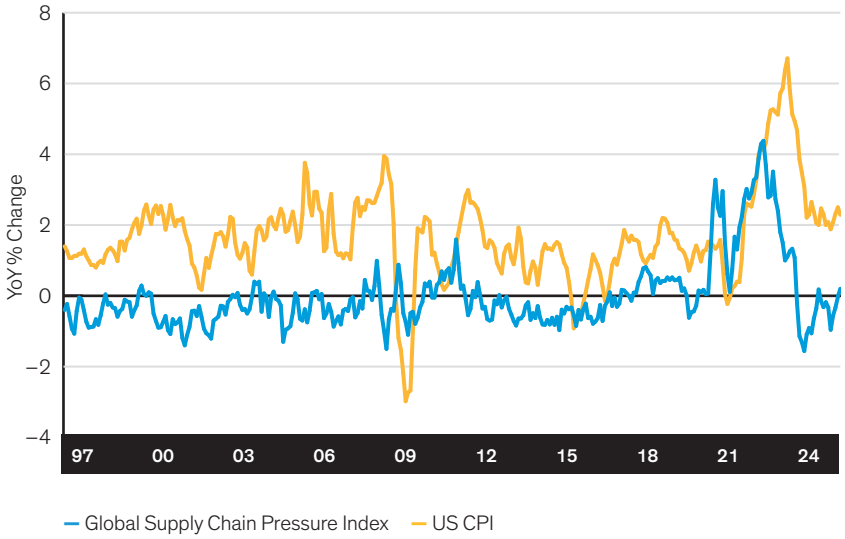
Moreover, the acute goods shortages during the COVID-19 pandemic exposed the flaws of the "just in time" supply chain operating principles that had been favored over the past couple of decades. As the world moves away from this mode of operation and more toward "just in case" precautions, future supply chains will have more redundancies built in, so we expect inventory levels to be permanently higher than pre-pandemic levels. All this is going to come at a cost.

As shown in *Display 36*, supply chain pressures have been a significant driver of inflation volatility over the past five years. As deglobalization leads to trade barriers and more fragmented supply networks, it diminishes the ability of the global economy to absorb any price shocks. Thus, it should not only lead to higher structural inflation but also higher inflation volatility.

7 Xavier Jaravel and Erick Sager, *What Are the Price Effects of Trade? Evidence from the US and Implications for Quantitative Trade Models*, Finance and Economics Discussion Series 2019-068, Board of Governors of the Federal Reserve System, August 2019.

DISPLAY 36: SUPPLY CHAINS AND INFLATION

Concerns Are: (1) The Need to Rebuild Supply Chains that Don't Assume Open Globalization; and (2) More-Fragmented Supply Chains and Less Ability to Cushion Price Shocks



Current analysis does not guarantee future results.

Through August 31, 2024 | **Source:** Bloomberg and AB

Energy Transition and Climate Change

We discuss the potential impact of a slower energy transition and, hence, worse climate outcomes on equilibrium inflation in more detail in chapter 2. Whether the level of inflation is higher or not as a result depends very much on exactly how an energy transition comes about. But we think the clearer conclusion to draw is around the volatility of inflation.

Our view is that the energy transition will take much longer than the time frame generally assumed in the industry. Despite the very rapid price declines for renewable generation, the political and social costs of a transition appear to be very high. Moreover, while it has long been accepted that power demand in emerging economies had to rise to allow the poorest people to be lifted out of poverty, the surprise in recent years has been the significant increase in projected power demand for developed economies linked to AI. The relevance of this for our discussion here is that a significantly slower energy transition implies a worse climate outcome, with

a high likelihood of breaching a 2-degree Celsius (2°C) temperature increase and a greater incidence of extreme weather. It is the impact of extreme weather on the volatility of inflation that is key, with possible mechanisms being the fragility of supply chains, such as food and energy. A number of academic papers have tried to quantify this effect.

A European Central Bank (ECB) working paper by Donata Faccia et al.[8] shows that temperature plays a non-negligible role in driving medium-term price developments, concluding that climate change matters for price stability. In another ECB working paper, Maximilian Kotz et al.[9] suggest that future warming will cause global increases in annual food inflation of between 0.92 and 3.23 percentage points per year and headline inflation of 0.32 to 1.18 percentage points per year. These results suggest that climate change poses risks to price stability through an upward impact on inflation. Looking at the impact of extreme weather in particular, Koyesha Mukherjee and Bazoumana Ouattara suggest that temperature shocks lead to inflationary pressures and find that these effects persist several years after the initial shock.[10]

Bringing It All Together

A diverse number of forces imply a higher-equilibrium level of inflation. Some of these can be quantified to some extent; others are much harder to quantify.

- Demographic change brings an age-cohort effect to inflation. The BIS paper on this estimates this effect to be on the order of three percentage points over the next 50 years.
- There is an extra demographic effect of an increased cost of care for people who are expected to live longer, and where care-heavy conditions like dementia have age as an explicit risk factor. It is simple to observe that the CPI basket for the elderly has a higher weight applied to healthcare than the basket for the overall population (a weight of 11% versus 8% in the US). We have pointed out that overall healthcare inflation has persistently run at a higher rate than general CPI—at an extra 150 basis points (bps) per annum since 1950. Simply adjusting overall inflation for a larger weight of healthcare-heavy elderly spending implies that, by the year 2050, broad CPI would be 30 bps higher. However, we think this is an underestimate: it assumes the current pattern of spending for the elderly stays the same, when in fact there is a good case that it increases, given longevity and the incidence of care-heavy conditions.
- The risk of debt monetization is too uncertain a concept to assign an explicit inflation forecast to; we prefer to characterize it as simply putting an "upside risk" on inflation.

8 Donata Faccia et al., "Feeling the Heat: Extreme Temperatures and Price Stability," European Central Bank Working Paper No. 2626, December 2021.

9 Maximilian Kotz et al., "The Impact of Global Warming on Inflation: Averages, Seasonality and Extremes," European Central Bank Working Paper No. 2821, May 2023.

10 Koyesha Mukherjee and Bazoumana Ouattara, "Climate and Monetary Policy: Do Temperature Shocks Lead to Inflationary Pressures?" *Climatic Change* 167, no. 32 (2021).

- Deglobalization is probably the most unambiguously inflationary force of all those discussed here, but again we would step back from putting a number on it. Tariffs are not, by themselves, really inflation; they are more of a one-off step change in prices. However, the subsequent restitching of supply chains and broader policy changes that undo the globalization process of the last 30 years will likely be inflationary.
- As discussed in this chapter, whether an energy transition (albeit one that we think will be very delayed versus industry expectations) is net inflationary or not is a complex point. However, we do think that the very high likelihood that we pass the 2°C warming point implies more extreme weather as a norm and hence greater inflation uncertainty.

All things considered, our view is that the equilibrium level of US inflation 10 years forward will be in the region of 3%.

What Does This Mean for Asset-Class Returns?

A 3% medium-term inflation target warrants a structurally higher allocation to TIPS, in our view. As we show in *Display 37*, real yields across all maturities in the US have

DISPLAY 37: US TIPS YIELD BY MATURITY

Current analysis does not guarantee future results.

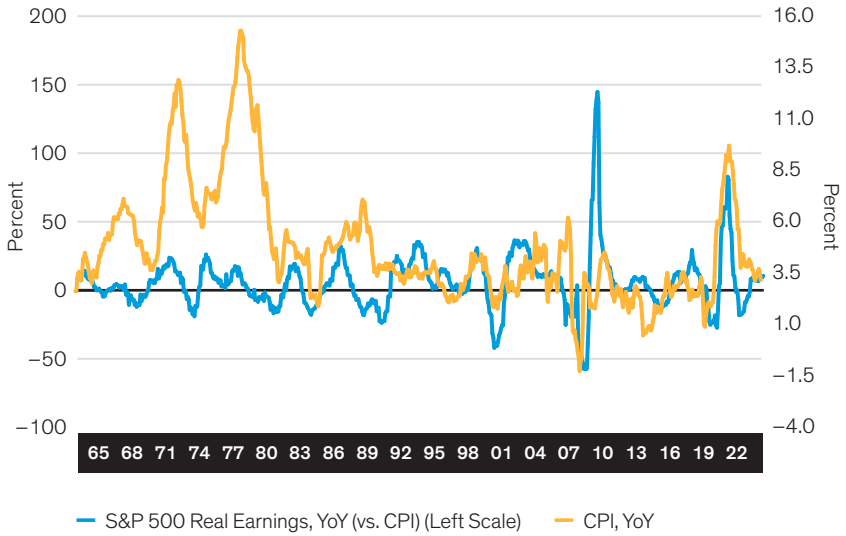
Through October 31, 2024 | **Source:** LSEG Data & Analytics and AB

risen significantly over the last couple of years and are currently at the top of their range since 2010. This creates an attractive entry point for adding a stand-alone TIPS allocation or for switching the allocation from nominal to inflation-linked debt.

One of the likeliest potential risks to a TIPS allocation is that the term premium or sovereign risk is repriced significantly higher. We would favor an allocation to shorter-duration TIPS.

In an environment of moderately higher but not unanchored inflation, we think equities will remain a core building block of long-term asset allocation. When inflation is below 4%, equities have been an effective real asset, because companies are able to pass on higher costs to consumers and grow their earnings in real terms (*Display 38*).

DISPLAY 38: INFLATION AND REAL EARNINGS GROWTH



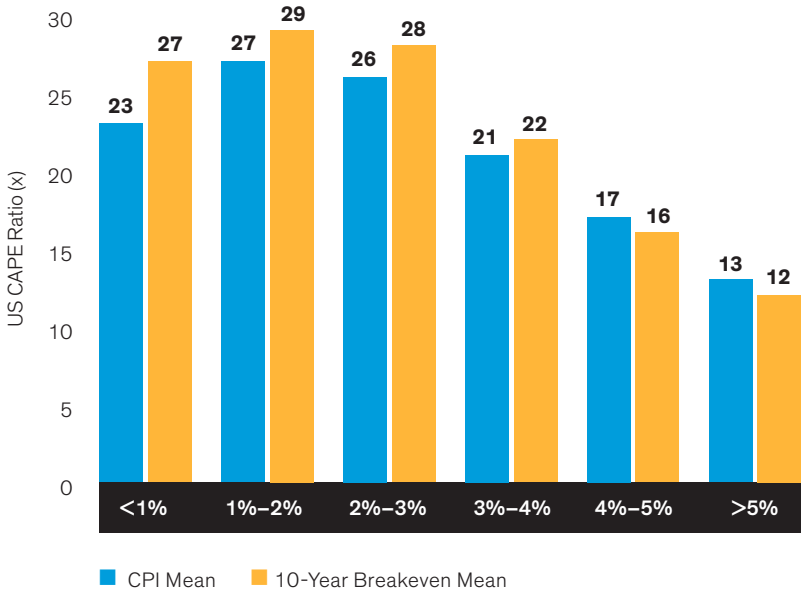
Current analysis does not guarantee future results.

Through January 31, 2025 | **Source:** LSEG Data & Analytics and AB

The other potential constraint to equity returns is the demanded risk premium. This premium has a nonlinear relationship to the level of inflation. If there is a risk of deflation or high inflation, the risk premium rises because it is hard to make long-term forecasts of corporate cash flows. However, if inflation is between these levels, then a smaller risk premium is normal. The biggest headwind to the medium-term equity

outlook is that current valuation multiples are at the top of their historical range. *Display 39* shows that historically, equity multiples were highest when inflation was close to or at the central bank inflation target of 2%. But it also demonstrates that if inflation is contained around or below 3%, valuation multiples can remain elevated.

DISPLAY 39: EQUITY VALUATION MULTIPLES ARE MAXIMIZED AROUND 2% INFLATION



Current analysis does not guarantee future results.

Data from September 30, 1971, to August 31, 2022. Pre-1997, the 10-year breakeven rate is a backcast of implied inflation calculated by the New York Federal Reserve. CAPE ratio: cyclically adjusted price-to-earnings ratio

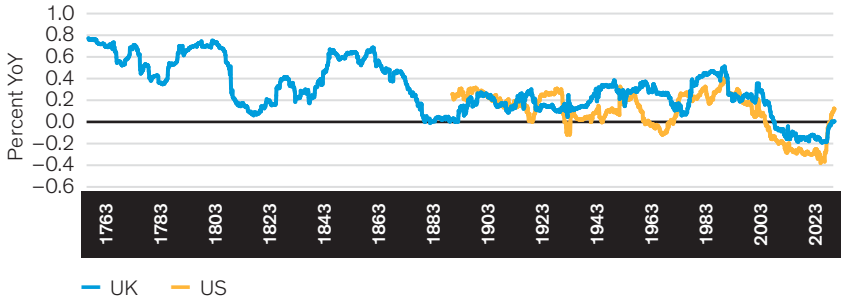
Source: Federal Reserve Bank of New York, LSEG Data & Analytics, Robert Shiller's database and AB

While we acknowledge that this is a headwind and we expect medium-term equity returns to be lower than what we have seen in the past 10 years, we expect them to deliver significantly positive real returns that compare favorably to what could be expected from other asset classes.

Another important consideration of an outlook for higher but also more volatile inflation is that we expect the long-term stock versus bond correlation to remain positive

(*Display 40*). This creates a challenge for portfolio construction and a need to find other assets that can help to diversify equity risk. Unfortunately, as we show in *Display 41*, inflation-linked bonds have also not been an effective diversifier in this case.

DISPLAY 40: THE DIVERSIFYING POWER OF BONDS IS LIKELY TO DECLINE



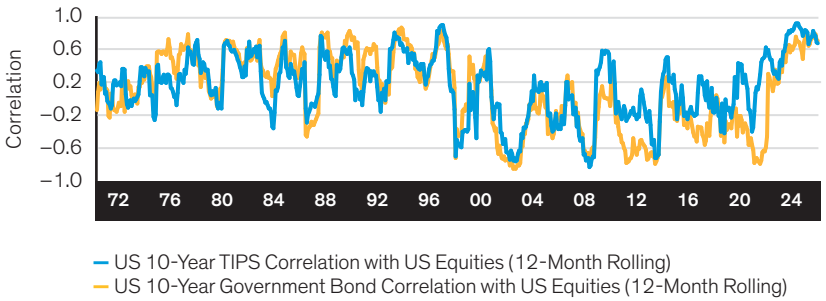
Current analysis does not guarantee future results.

Rolling 10-year correlation between stock and bond returns

Through January 31, 2025 | **Source:** Global Financial Data, LSEG Data & Analytics, Robert Shiller's database and AB

DISPLAY 41: NEITHER TIPS NOR NOMINAL BONDS ARE LIKELY TO DIVERSIFY EQUITY RETURNS

US TIPS and Government Bond Correlation with Equities



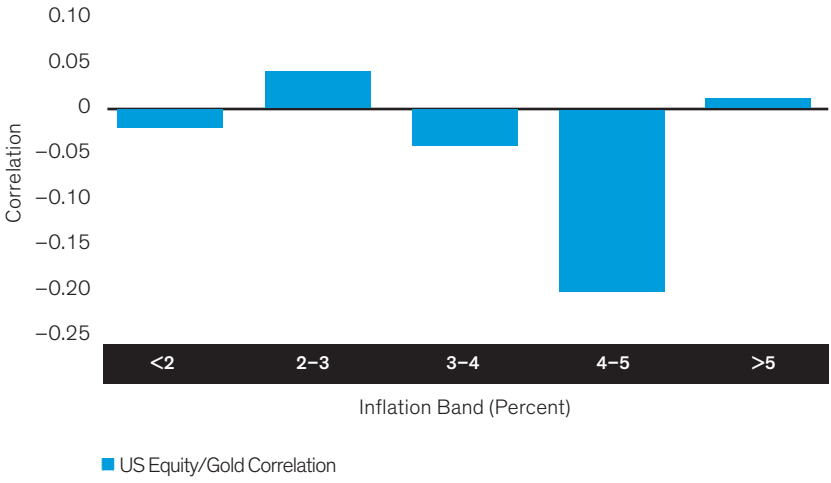
Past performance does not guarantee future results.

Through October 31, 2024 | **Source:** LSEG Data & Analytics and AB

This situation calls for a higher structural allocation to real assets that have a low or imperfect correlation to equities. None of these are quite as effective as the strongly negative correlation that bonds enjoyed in recent decades, but we think that correlation is very hard to achieve at scale for long-only asset classes, given the economic outlook. Low-correlated assets could include real physical assets such as farmland and infrastructure. Also, for diversification purposes in particular, gold has a role to play. A key attraction of gold is that over long horizons its correlation to equities has been close to zero and largely invariant to the inflation level (*Display 42*). And over the last 170 years, gold has successfully delivered a positive (although not very high) real positive return. We view a gold allocation primarily as a diversifying asset as well as a hedge against geopolitical risks and the possibility of an inflation overshoot.

We also note that gold should continue to benefit from the strong demand from central banks that we have seen in the past few years. The main driver for this demand is the attempt at de-dollarization by emerging-market countries that view the weaponization of the US dollar as strategically harmful and wish to diversify their foreign exchange reserves.

DISPLAY 42: GOLD AND EQUITY CORRELATION IN DIFFERENT INFLATION REGIMES



Current analysis does not guarantee future results.

Note: The display shows 12-month rolling correlation from January 1969 through October 2024, bucketed by inflation band.

Source: Global Financial Data, LSEG Data & Analytics and AB

We have shown in earlier research that gold and other commodities historically have been particularly effective in hedging short-term spikes in inflation. However, investors with long-term time horizons seeking to achieve a certain real return objective should also consider higher allocations to other real assets, such as real estate, farmland and timberland, and inflation-linked infrastructure assets.

The bottom line is that a higher-equilibrium level of inflation implies a higher allocation to real assets, including public equities as a real asset. More fundamentally, it calls for a reassessment of governance in the form of a greater focus on the preservation of real purchasing power and the implicit or explicit recognition of inflation as a benchmark, as opposed to benchmarks founded only in financial market indices.

Chapter 2—Can the Energy Transition Happen? And if Not, What Does that Mean for Asset Allocation?

A fast energy transition incurs social and political costs that will probably be deemed unacceptable. It is imperative for investors to consider the ramifications of an energy transition that exceeds a time frame beyond 2050. The power demand of artificial intelligence (AI) in developed markets, coupled with continued growth in emerging markets, limits the speed of adjustment.

Moreover, any agenda of degrowth will be unacceptable to populations in democratic societies and is arguably not even morally justifiable. Thus, the transition will take a lot longer than investors generally anticipate. Consequently, it seems increasingly likely that temperatures will rise above the level assumed by most mainstream investors. The consequence of this is significantly increased "path risk" in the overall investment environment and a greater risk of nonlinear outcomes. We argue that this has profound investment implications, requiring a significantly greater level of diversification than is generally assumed. It also may require a very material reallocation into real assets, although these also come with a host of climate-related issues.

This chapter attempts to be realistic about the political and social limits of a rapid energy transition. This increases the uncertainty for macroeconomic variables—and in a bad climate outcome, implies that investors might need to prepare for higher volatility but still require a given level of real return. Thus, addressing climate change requires a shift in asset allocation.

Our appeal to investors is to think differently about how plausible the case for a quick energy transition is. What is the real meaning of a slower transition for investment praxis? This exercise has nothing to do with deciding whether or not to exclude a given company or whether or not engaging with corporations is in the interests of investors. Instead, the debate is more fundamental—it is about how to protect the long-run purchasing power of investors. This debate raises difficult questions about strategic asset allocation (SAA), how to achieve diversification in the presence of much greater path risk, whether diversification is even possible, and governance. It is still right for investors to be exposed to an energy transition, as there is considerable scope for more capital to be deployed in this area. We also want to draw attention to the cross-asset implications of this topic.

We outline a view that it will likely be socially or politically unacceptable to engineer an energy transition within a time frame compatible with restraining temperature increases to 1.5°C to 2°C versus preindustrial levels. Yes, there has been rapid progress in building capacity in renewable-power generation, and its price has fallen dramatically. However, it is much harder to decarbonize industrial processes and transportation; progress on carbon sequestration has been slow; and enforcing changes in behaviors is difficult. This challenge will ultimately lead to a core debate in contemporary political philosophy. A degrowth agenda would try to tackle this through an outright reduction in growth, but this approach raises difficult moral questions, not to mention that it would be politically impossible in democratic societies. Calls to reform the nature of capitalism are intellectually interesting, but will take time. Impairing standards of living will not be regarded as politically, socially or morally acceptable in advanced economies, nor will preventing an improvement in the standard of living for those in extreme poverty in emerging economies. This is all happening in parallel with other forces such as deglobalization and the declining size of working-age populations in developed markets and China, which plausibly raise equilibrium inflation and reduce growth rates.

We are not taking a normative approach to investment advice in this chapter; instead, we attempt to outline the implications of a slower energy transition for global temperatures and what that would mean for macroeconomic variables of growth and inflation. The scale of uncertainties in the temperature prognosis, not to mention the impact of a given climate outcome, makes this a macro force that is fundamentally different from the other contemporaneous forces of deglobalization and demographics—not least because of the risk of nonlinearities. This situation leads climate to have a different role when it comes to setting forecasts and the resulting asset allocation.

This point does not seem to be reflected in many of the industry approaches to asset allocation. The bottom line is a significant increase in path risk, and hence a much greater need for diversification. However, with government bonds unlikely to be reliable diversifiers, how is this diversification to be achieved? A key response lies in asset allocation. A deeper question is whether diversification, in the traditional meaning of the word, is even possible in the context of a "bad" outcome of climate change. This points to a need to rethink governance and regulation rather than just asset allocation. Another conclusion is that there is a greater need for real assets, but some of these might also be exposed to higher costs, such as insurance. We consider what this means for portfolios.

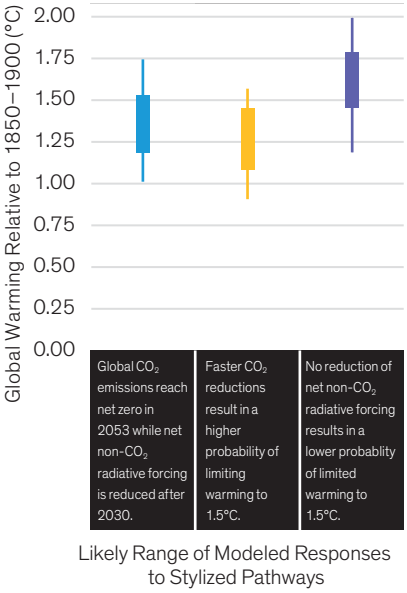
Part I: Can the Energy Transition Happen?

Assessing the Speed of Decarbonization Required

We start this note with the link between an energy-transition process and the likely future path of global temperatures. *Display 43* shows the range of likely temperature pathways associated with different levels of carbon dioxide (CO_2) emissions. The error

bars in these kinds of forecasts are wide, but the Intergovernmental Panel on Climate Change (IPCC) numbers show the current best projection of the range in temperature given a rapid transition away from carbon, versus a future with no net reduction in carbon emissions. The path of decarbonization needed to achieve the 1.5°C outcome via a "strong interpretation" of the Paris Agreement is shown in *Display 44*. This interpretation requires CO_2 emissions to fall to 45% by 2030 and reach net zero by 2050.

DISPLAY 43: OBSERVED GLOBAL TEMPERATURE CHANGE AND MODELED RESPONSES TO STYLIZED ANTHROPOGENIC EMISSIONS AND FORCING PATHWAYS

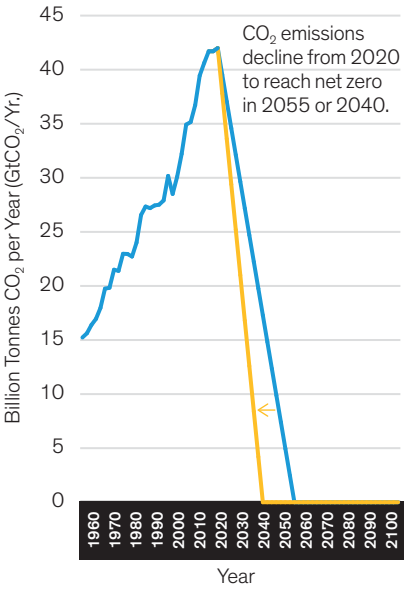


Likely Range of Modeled Responses to Stylized Pathways

Historical analysis does not guarantee future results.

As of May 24, 2022
Source: Intergovernmental Panel on Climate Change, "Summary for Policymakers," in *Global Warming of 1.5°C*, ed. Valérie Masson-Delmotte et al. (Cambridge University Press, 2018): 3–24; and AB

DISPLAY 44: STYLIZED NET GLOBAL CO_2 EMISSIONS PATHWAYS



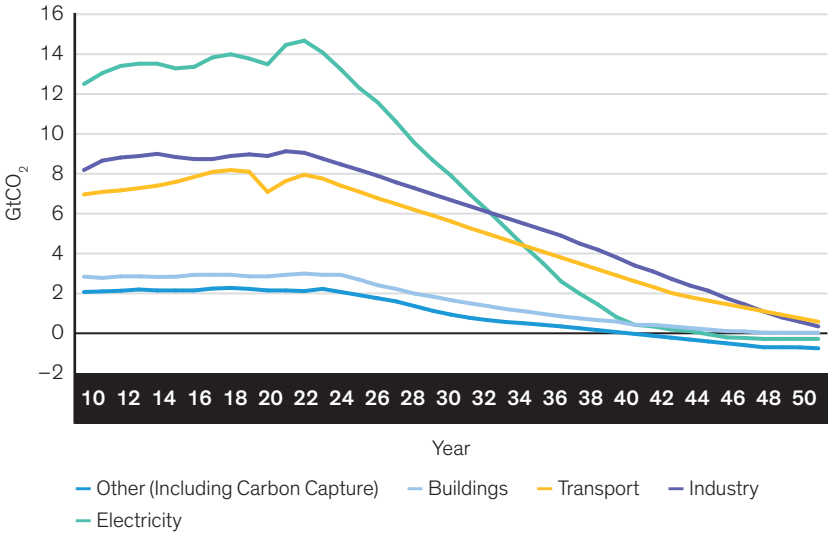
Historical analysis does not guarantee future results.

As of May 24, 2022
Source: Intergovernmental Panel on Climate Change, "Summary for Policymakers," in *Global Warming of 1.5°C*, ed. Valérie Masson-Delmotte et al. (Cambridge University Press, 2018): 3-24; and AB

How could this strong interpretation of the Paris Agreement be achieved? It essentially assumes some combination of decarbonization of electricity, decarbonization of nonelectrical primary energy, efficiency/mitigation and carbon capture. *Display 45* shows one such commonly used breakdown that assumes:

1. A very rapid decarbonization of electricity
2. Decarbonization of other primary sources of power for industry and transportation, such as via electrification
3. Other emissions-reduction efforts; e.g., greener buildings and changes in consumption habits
4. Carbon sequestration

DISPLAY 45: CHANGE IN EMISSIONS BY SOURCE REQUIRED TO MEET NET ZERO BY 2050



Current analysis and forecasts do not guarantee future results.

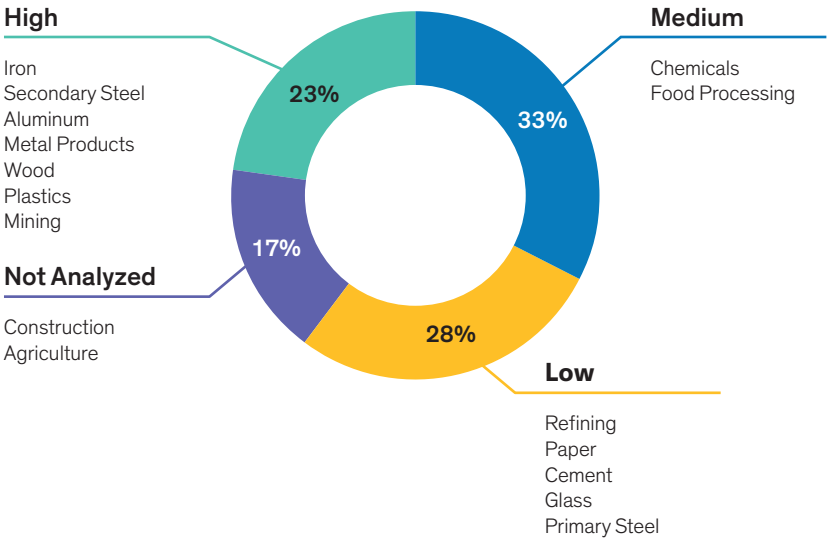
Other includes atmospheric CO_2 removals through direct air capture and storage as well as bioenergy with carbon capture and storage.

As of September 23, 2023 | **Source:** International Energy Agency (IEA), *Net Zero Roadmap: A Global Pathway to Keep the 1.5°C Goal in Reach* (2023 Update); and AB

Why Progress on Decarbonization Is Hard

Some of these aspects are progressing faster than others. The growth of decarbonized electricity generation has been rapid, though the development of grid infrastructure is slow. When other sources of primary emissions that are not primarily electrified are included, the stats are much less encouraging. Areas that stand out as particularly hard to decarbonize are cement production (which constitutes around 8% of global CO_2 emissions) and shipping (3% of global CO_2 emissions). *Display 46* shows energy use in the US broken down by the electrification potential of various industrial sectors, with the pie chart sections corresponding to the proportion of US energy use. Moreover, global coal use is still not declining, with China and India the two largest users (*Display 47*).

DISPLAY 46: US INDUSTRIAL ENERGY USE BY ELECTRIFICATION POTENTIAL

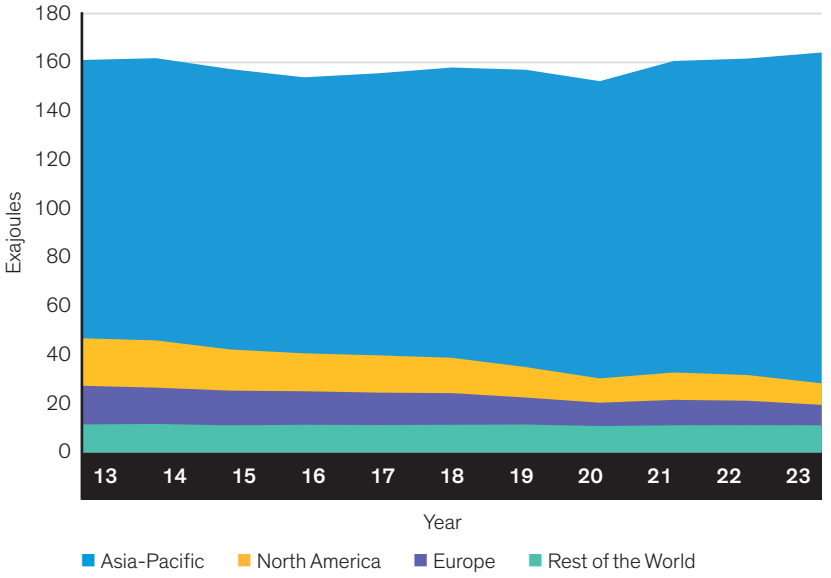


Current analysis and forecasts do not guarantee future results.

Classifying sectors by their potential ease of electrification. Areas correspond to proportion of US energy use.

As of March 26, 2018 | **Source:** Jeffrey Deason et al., *Electrification of Buildings and Industry in the United States: Drivers, Barriers, Prospects, and Policy Approaches* (Lawrence Berkeley National Laboratory, March 2018); and AB

DISPLAY 47: COAL USE HASN'T YET STARTED TO DECLINE, WITH CHINA AND INDIA THE LARGEST TWO USERS



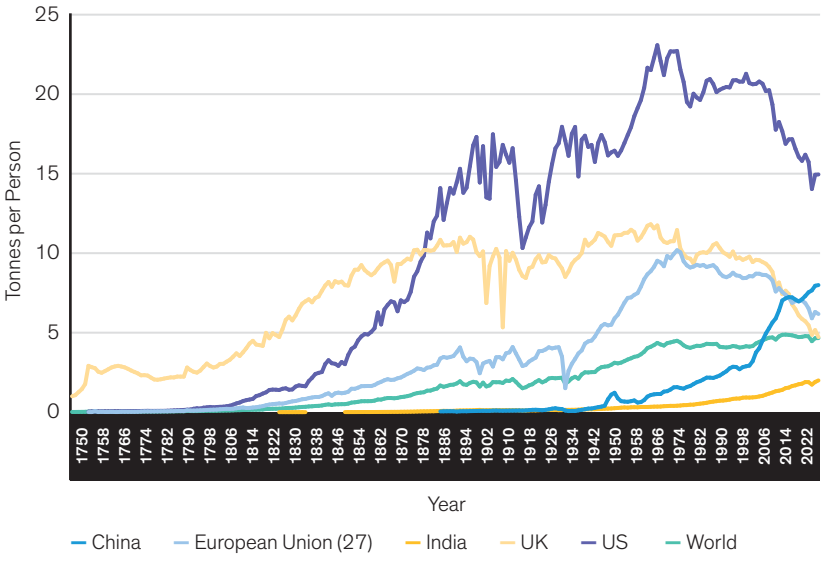
Current analysis and forecasts do not guarantee future results.

As of June 20, 2024 | **Source:** Energy Institute, Visual Capitalist and AB

Another key element for projections of how to reach net zero is a change in behaviors—changing the sources of heat in domestic settings, for example. In Germany, for example, the government has had to backtrack on a proposed plan for an aggressive transition to heat pumps, because the required extra cost to each household ended up making the effort politically impossible.

In *Display 48*, we show that world per-capita CO_2 emissions (the green line) are not yet declining, mainly because of the increasing speed of emissions in China and India and, despite recent drops, the very high level of CO_2 emissions per capita in the US. Advanced economies have seen some declines in energy emissions per capita. However, the fact that these declines started in the 1970s and 1980s point to globalization and deindustrialization in those economies as a likely factor, rather than decarbonization per se. In other words, the carbon emissions were, in part, exported.

DISPLAY 48: PER CAPITA CO_2 EMISSIONS



Current analysis and forecasts do not guarantee future results.

Carbon dioxide (CO_2) emissions from food fuels and industry. Land use charge is not included.

As of June 20, 2024 | **Source:** Our World in Data and AB

Carbon Sequestration Could Face a Shortfall

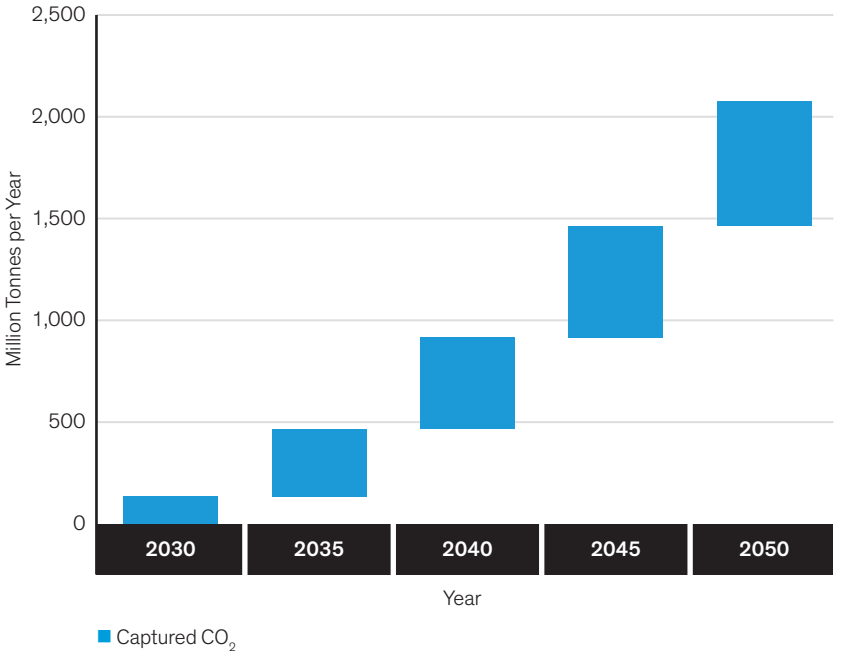
The last leg of the plans to decarbonize involves carbon capture and sequestration. It is unclear at this stage whether the required capacity for capture and sequestration is indeed possible. There could be serious limits to the ability to invest capital and build capacity, and even limits to the viability of the available technology. The scale of the required amount depends on the assumed level of CO_2 emissions that would be allowed to continue. Most assumptions for achieving net zero by 2050 assume that carbon capture occurs at scale by 2030, followed by rapid growth. Some specific forecasts on this front assume a need for 1.7 gigatons (Gt) of CO_2 capture globally by 2035[11] and 250–600 megatons (Mt) of CO_2 for the US by 2035.[12] Achieving this goal would require considerable capital and a build-out of physical infrastructure. For example, it would require 19,000 kilometers (km) of new pipeline by 2030 (and 100,000 km by 2050)

11 International Energy Agency, "Net Zero Roadmap: A Global Pathway to Keep the 1.5°C Goal in Reach" (2023 update), September 2023.

12 Eric Larson et al., *Net-Zero America: Potential Pathways, Infrastructure, and Impacts* (Final Report), Princeton University, October 2021.

to transport carbon (*Display 49*). At that stage, the volume of CO_2 flow in the US would have to be 1.3× current US oil production. This requirement would have to be met by a process that does not exist on any meaningfully large scale today.

DISPLAY 49: IS THE ENERGY TRANSITION ACHIEVABLE? SEQUESTRATION CARBON CAPTURE REQUIRED TO MEET NET ZERO BY 2050 (RANGE OF CARBON CAPTURE REQUIRED, US)



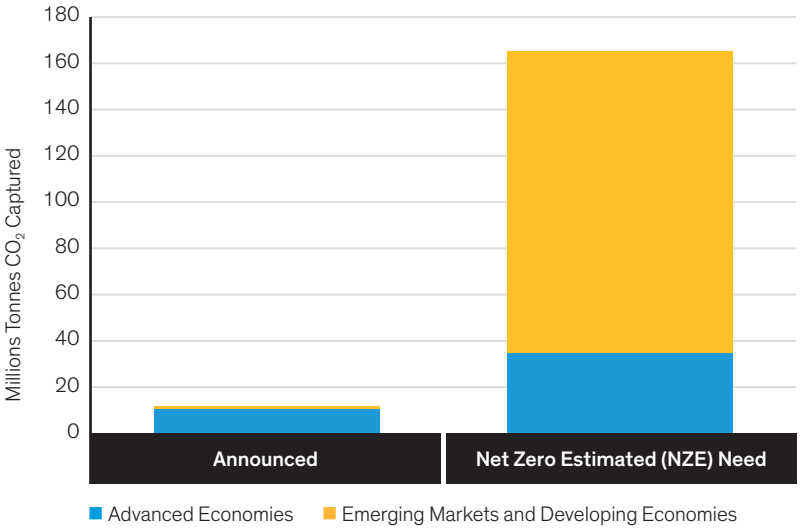
Current analysis and forecasts do not guarantee future results.

Carbon capture has to begin at significant scale by 2030, followed by rapid growth. Lower bound assumes aggressive end-use electrification, but energy-supply options are relatively unconstrained for minimizing total energy-system cost to meet the goal of net zero emissions in 2050. Upper bound also assumes aggressive end-use electrification; on the supply side, wind and solar rate of increase is constrained to 35 GW/y (~30% greater than historical maximum single-year record). More CO_2 storage is allowed to enable the option of more fossil fuel use.

As of October 29, 2021 | **Source:** *Net-Zero America: Potential Pathways, Infrastructure, and Impacts* (Princeton University, October 2021); and AB

Adding up the current announced projects for carbon capture and comparing them to the amount required for achieving net zero by 2050 shows a jarring gap (*Display 50*).

DISPLAY 50: IS THE ENERGY TRANSITION ACHIEVABLE? ANNOUNCED CARBON SEQUESTRATION VS. NZE SCENARIO REQUIREMENTS



Current analysis and forecasts do not guarantee future results.

As of September 23, 2023 | **Source:** IEA, *Net Zero Roadmap: A Global Pathway to Keep the 1.5°C Goal in Reach* (2023 Update); and AB

Alongside this, a major avenue for sequestering carbon is via the world's forests. There are wide error bars around assessments of the degree to which forests can be a carbon sink, but it is worth laying out the numbers so that they can be put into scale alongside other emissions and possible sequestration routes.

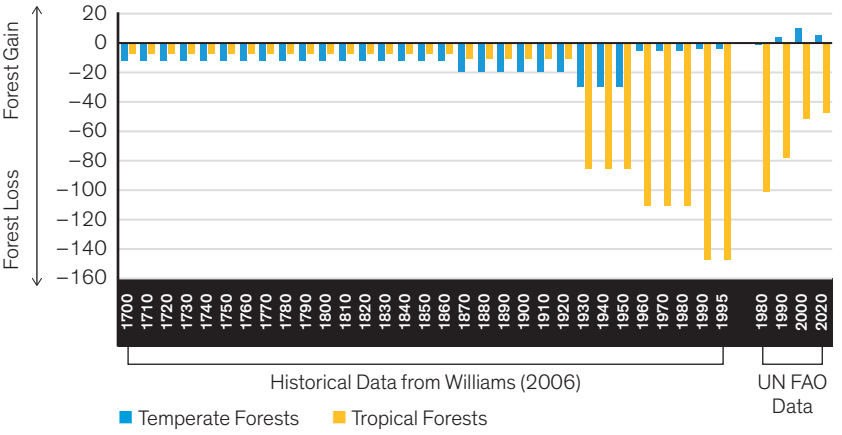
Johnston et al.[13] show that global forests were a net carbon source of approximately 3.6 Gt CO_2/year in 1992; i.e., deforesting activity released carbon. The authors suggest that forests could become a net carbon sink of 1.5 Gt CO_2 by 2030. However, this assumes that net deforestation ends at that point. They go on to suggest that

13 Craig Johnston et al., "From Source to Sink: Past Changes and Model Projections of Carbon Sequestration in the Global Forest Sector," *Journal of Forest Economics* 34, no. 1-2 (August 2019).

forests could become a potential sink of 6.8 Gt CO_2/year by 2065, assuming that forests have expanded to an area greater than their 2010 total by 2050.

Is the world on track to achieve this outcome? The answer seems to be "not even close." In *Display 51*, we show that deforestation reached its peak in the 1980s and 1990s; since then, the rate of forest loss each year has declined. However, since 2001, there has still been a net loss of 12% of tree cover, and the current reforestation efforts continue to be dwarfed by deforestation. There would have to be an enormous level of political energy, both in emerging and developed markets, to achieve a net balance of forestation this decade. It is not clear that this is politically possible.

DISPLAY 51: REFORESTATION ATTEMPTS ARE STILL A DROP IN THE OCEAN COMPARED WITH CONTINUED TREE LOSS



Current analysis and forecasts do not guarantee future results.

As of May 2024

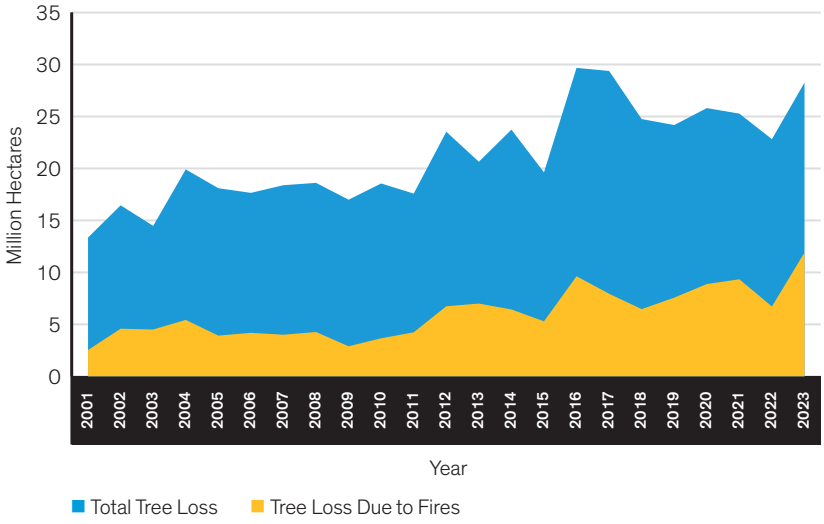
Pre-1995 data from Michael Williams, *Deforesting the Earth: From Prehistory to Global Crisis* (University of Chicago Press, Abridged Edition, 2006). Second series is based on data from UN FAO Global Forest Resources Assessments.

Source: Hannah Ritchie, "Deforestation and Forest Loss," Our World in Data (revised November 2024); Michael Williams; and AB

Moreover, in parallel to anthropogenic deforestation, the rate of forest loss due to fire has increased—presumably due in part to global warming itself. In 2023, fires accounted for 42% of tree loss (*Display 52*). A recognition that the hoped-for role of forests in sequestering carbon will, at the very least, be delayed is starting to be recognized in forecasts. For example, we note that the latest iteration of the Network for Greening the Financial System (NGFS) scenarios has reduced the assumed net-carbon sequestration by 2Gt CO_2 p.a. by 2050 from its previous assumption.[14]

The bottom line is that forests could be a potential net sink of carbon within the next decade, but that would require a huge level of political will that does not seem present today. Therefore, it seems that we should not assume that forests can act as a net carbon sink for this coming decade.

DISPLAY 52: TREE LOSS DUE TO FOREST FIRES HAS BEEN INCREASING, NOW ACCOUNTING FOR 42% OF ALL TREE LOSS



Current analysis and forecasts do not guarantee future results.

As of December 31, 2023 | **Source:** Global Forest Watch and AB

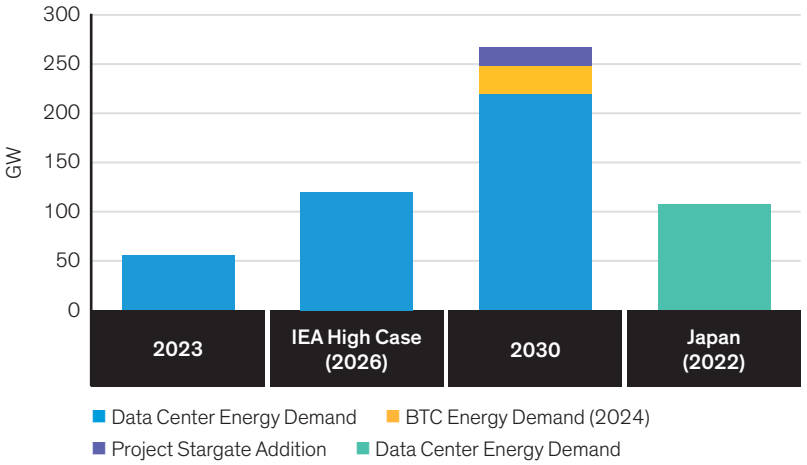
14 Network for Greening the Financial System, *NGFS_Scenarios_for_Central_Banks_and_Supervisors*, November 2023.

AI and Growing Energy Needs

The likely path of CO_2 emissions could be even further from the path required to limit temperatures than the data discussed above suggests. Most approaches to the energy transition have accepted that energy demand for emerging markets will continue to grow strongly if standards of living are to rise, while they might disagree on whether energy demand in developed markets is set to plateau or fall. However, there is an assumption in much of the work on decarbonization that the growth in developed-market energy demand might at least slow.

What if demand accelerates instead? The onset of AI looks set to cause a material increase in power demand, which could lead to a shift in the possible trajectories for emissions. In *Display 53*, we show an estimate of new demand from data centers and cryptocurrency mining in the coming years. By 2030, it could reach nearly 220 gigawatts (GW) from around 55 GW currently. To put this into context, this draw would significantly exceed Japan's total power demand in 2022, which was 107 GW. Adding power demand at the same scale as a G3 economy hardly seems consistent with curtailing energy demand.

DISPLAY 53: GLOBAL ELECTRICITY DEMAND FROM DATA CENTERS, AI AND CRYPTOCURRENCIES



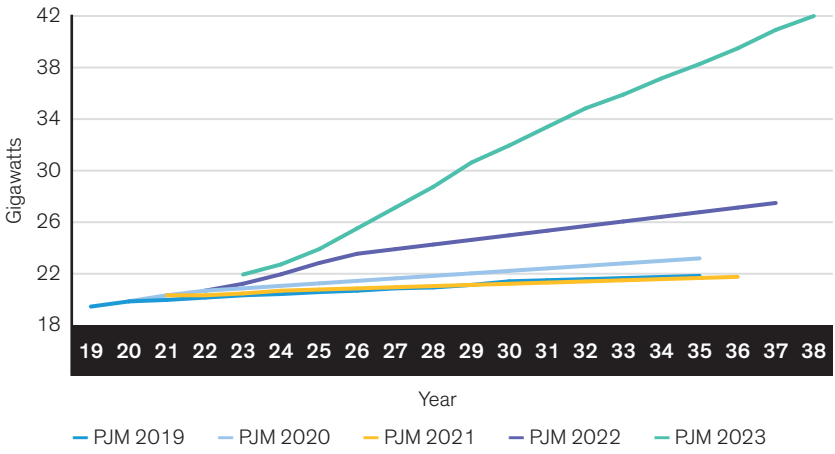
Current analysis and forecasts do not guarantee future results.

Note: 2023 and 2030 data center energy demand is based on McKinsey estimates; IEA forecast and Japan energy consumption estimate is based on IEA, *Electricity 2024*; BTC energy consumption is based on Cambridge Centre for Alternative Finance data; and Project Stargate estimates are from Bernstein US Machinery research team. BTC: Bitcoin

As of January 28, 2025 | **Source:** Bernstein Research, Cambridge Centre for Alternative Finance, IEA, McKinsey and AB

Dramatic macro forecasts such as this are also being borne out on a bottom-up basis by demand projections for individual power distributors. For example, PJM Interconnection, a regional power transmission organization in the US that operates in 14 Eastern states, regularly produces forecasts of power demand for the next decade. In 2020, PJM projected regional demand in 2030 of 22 GW (*Display 54*). By 2023, that 2030 forecast had been revised up to 32 GW, an increase of more than 45%. The vast majority of this increase came from data center power demand. It should be noted that this is a region that has a higher penetration of data center development than usual, so one should not extrapolate this for the whole country. Nevertheless, it is a tangible "bottom up" example of increased power demand.

DISPLAY 54: DATA CENTERS HAVE SIGNIFICANTLY INCREASED EXPECTED POWER DEMAND—PROGRESSION OF PJM POWER-DEMAND FORECASTS FOR DOMINION RESOURCES



Current analysis and forecasts do not guarantee future results.

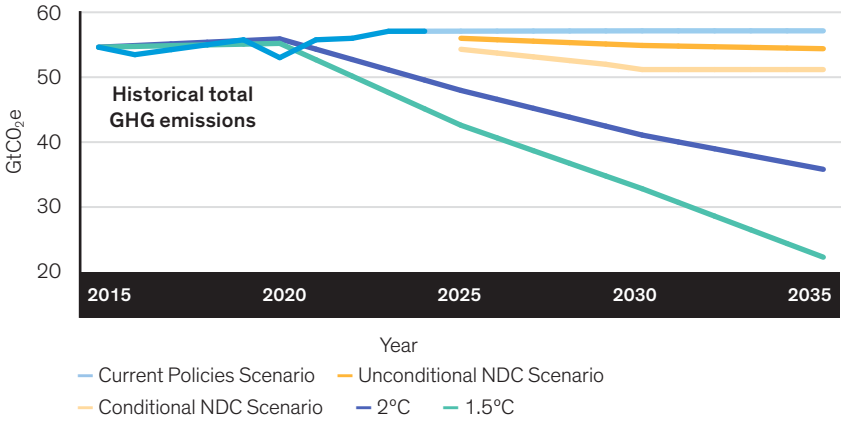
As of January 28, 2024 | **Source:** PJM Interconnection and AB

Social Constraints on Reducing Net Emissions and What They Mean for Political Philosophy

Bringing this section together, there is profound political and social difficulty in trying to achieve an energy transition. That challenge is reflected in the significant gap between the path of CO_2 emissions that seem likely based on current stated policies

and those that are consistent with a 1.5°C or 2°C temperature increase outcome. *Display 55* shows the United Nations estimate of the size of this gap.

DISPLAY 55: CURRENT GOVERNMENT PLANS ARE VERY FAR FROM THE LEVEL IMPLIED BY 1.5°C OR 2°C OUTCOMES



Current analysis and forecasts do not guarantee future results.

NDC refers to nationally determined climate commitment, with conditional NDCs referring to commitments that are contingent on receiving international support. The 1.5 and 2 degree lines indicate the central path likely needed to achieve a temperature increase limited to that level.

As of October 24, 2024 | **Source:** United Nations Environment Programme (2024). Emissions Gap Report 2024: *No More Hot Air...Please! With a Massive Gap Between Rhetoric and Reality, Countries Draft New Climate Commitments*; and AB

At this point in such narratives, an earlier generation of ESG-inspired research tended to digress into a normative discussion of what needs to be done. Here, we take a humbler approach, which is also a more positive one (in the sense of a contradistinction to the normative). The key allocation question is: As the required transition path to limit global warming to 1.5°C looks more and more like a fiction, how should investors adapt?

Forcing through an energy transition would be hard enough anyway—growing demand from data centers in developed economies and rising standards of living in emerging economies have already made that a tall order. The problem is that the following other forces are playing out in parallel:

- A decrease in the working-age population of many developed economies and China implies that, other things being equal, growth rates will fall.

- A tipping of the balance from globalization to deglobalization implies inflationary forces and possibly a further constraint on growth.
- Government indebtedness: There is a high degree of fiscal largesse in the US that is set to continue in the near term, but for G7 countries en masse, the last 40 years have seen a backdrop of growing government debt. There is no hard theoretical limit to the debt burden, but it brings uncertainty to the ability to continually provide a fiscal backstop.
- A period of relative peace is transitioning to one that features both ongoing "hot" wars and an emerging cold war between the US and China.

All these forces imply higher inflation and/or lower real growth as well as constraints on the growth of standards of living. There are possible positive forces, but we don't think they can be relied upon for forecasting. For example, AI could boost aggregate productivity, but it's not clear that it has ever been possible to forecast changes in productivity, not to mention the possible negative implications of AI. Our assumption is that for AI to achieve enough productivity growth to offset these downward forces on growth, it would have to increase aggregate productivity by an amount equal to the historical maximum trough-to-peak change in productivity. That is not something that we would be willing to assume as our base case.[15]

From a blunt economic perspective, increased immigration into advanced economies could generate growth and defuse inflationary pressures, but that path is politically toxic. The bottom line is that, in democracies, it seems hard to imagine a set of circumstances that would allow an energy transition to take place within the time frame required to limit temperatures to a 1.5°C or even 2°C increase above preindustrial levels.

This challenge is reflected in growing evidence that, faced with constraints on standards of living, governments are in fact slowing instead of hastening such commitments. There are numerous examples of countries finding it too hard politically to adhere to such targets, so they have relaxed the targets instead. For example, in 2023, the previous UK administration under Rishi Sunak pushed back the date for banning the sale of new petrol or diesel cars from 2030 to 2035.[16] Earlier in 2024, the Scottish government abandoned a targeted 75% reduction in carbon emissions by 2030. Admittedly, Scotland is a small economy in a global context, but this example is notable because the administration had previously made energy transition a core differentiating aim.[17]

15 Inigo Fraser Jenkins et al., *Productivity, Democracy, Power and Truth: The Influence of AI on Markets and Investing*, AllianceBernstein, October 2023.
16 "Rishi Sunak Pushes Back Ban on New Petrol and Diesel Cars to 2035," *BBC News*, September 20, 2023.
17 Abby Wallace and Andrew McDonald, "Scottish Government Abandons Flagship Climate Goal," *Politico*, April 18, 2024.

In Germany, a law to replace fossil fuel–powered heating systems with more efficient alternatives powered by renewable energy had to be watered down after widespread opposition. Germany also argued for a loophole in the European Union (EU) law that would allow the sale of combustion engine cars beyond the 2035 deadline if they run on synthetic fuels. This was due to fear of the impact on employment in the auto sector, combined with the parallel shock of no longer being able to rely on strong exports to China in a deglobalized world. These countries are already small in terms of their total emissions, in part because they are already fairly energy efficient, and their commitments to the Paris Agreement have not wavered, but it is the specific enactment of energy transition regulation that has proved difficult.

The deployment of renewable energy sources is also progressing very slowly in some Eastern European countries such as the Czech Republic, Poland, Hungary and Bulgaria, and is significantly below the EU average. Meanwhile, despite the pledges of US President Joe Biden's administration to take on climate change, US oil and natural gas production levels hit an all-time high in 2024.

Given the scale of the adjustment needed—specifically the difficulty in electrifying industry and transportation and the slow development of carbon sequestration—some have called for a more radical agenda. The "degrowth" proposal of Jason Hickel[18] amounts to a manifesto, holding that the only way to avoid a profoundly negative impact on the climate and the planet in general is to actually degrow: to set negative targets for GDP growth rates. Aside from asserting that this is the only way to avoid an unacceptable rise in temperature, the degrowth proponents also present it as a way to avoid broader anthropogenic impacts on the planet, such as via biodiversity. This issue is even harder to model and is beset by both irreversible processes and potential nonlinearities; therefore, it is a more difficult process to determine its impact on society and macroeconomic variables. Hickel claims that the energy transition itself requires massive mineral extraction, so a shift to clean energy is not sufficient. He concludes that politicians are not really to blame; capitalism itself is at fault.

In a similar vein, Jonathan Crary delivers an incredibly bleak account of the impact of capitalism on nature in *Scorched Earth*.[19] He echoes Hickel in the view that renewable energy misses the point and that the only way forward is to reduce usage. The conclusion: advanced economies must drastically reduce their energy use. For Crary, this point is inseparable from a broader point about how the intertwined relationship of the internet's evolution and contemporary capitalism has remolded social and interpersonal relations. His contention is that if there is to be a future, it has to be offline and with a very different kind of capitalism.

There has been strong criticism of the degrowth view. Indeed, the strongest rejection holds that it is not just an issue of degrowth being a tough sell to the electorate, but

18 Jason Hickel, *Less Is More: How Degrowth Will Save the World* (Penguin Books, 2023).
19 Jonathan Crary, *Scorched Earth: Beyond the Digital Age to a Post-Capitalist World* (Verso Books, 2022).

also that the degrowth agenda is not morally acceptable. Morality is at stake because degrowth requires imposing a reduction in global standards of living.[20] In practice, degrowth would mean slashing the standard of living in advanced economies and denying an increase in the standard of living to people living in extreme poverty. The other moral strand here is the observation that it is the very poorest people globally who are set to lose the most from unabated climate change, and thus paths to decarbonizing the economy via energy transition rather than degrowth try to (or should try to) address this.

Aside from the moral dilemma, there is a more practical aspect—in democratic systems, it is not possible to introduce a policy that requires voters to accept a lower standard of living. Techno-determinists have asserted that they can provide an answer here. In their view, degrowth is not necessary to achieve an outcome in which standards of living can continue to rise, gross carbon emissions could remain high, and net zero could still be achieved. This path would require huge investments in carbon sequestration, not to mention technical advances. As we discussed earlier, it is not at all obvious either from a scientific or an infrastructure perspective that such an outcome is achievable.

The debate about the nature of capitalism and its morality, or otherwise degrowth, might seem to be overly philosophical for some. However, the reason for bringing it up is that, just as outright degrowth is arguably not compatible with democracy, the evidence is mounting that a rapid energy transition is not compatible either. If the benefits of globalization, unprecedented financialization and modest productivity improvements over the last 30 years had been shared more broadly, it may have been possible to sell such an agenda to voters. But that ship has sailed.

And yet, we see elements of this low-demand and low-growth narrative in the financial literature. To take one example, the latest NGFS scenario[21] proclaims that "limiting the temperature increase to 1.5°C above preindustrial levels in an orderly fashion is within reach." But then, as one of the possible routes to this goal, the NGFS cites that "the new low demand scenario shows that it will require even greater ambition in the future, with significant reduction in energy demand and changes in consumption patterns."

To be completely clear, degrowth is definitively not the only way to achieve an energy transition. As we discussed earlier in this chapter, some combination of decarbonizing, changing behaviors and carbon sequestration can achieve that, and presumably is ultimately the way forward, albeit over an extended time frame. We just think that any assumption of a net lower energy demand is very hard to achieve.

There are, however, planetary boundaries. If a target of more growth (or, more specifically, growth in the real standard of living) is too hard to change, then maybe it is the nature and structure of capitalism that should be the target instead? The more radical manifestos from the contemporary left call for a rejection of capitalism; the

20 See, for example, Martin Wolf, *The Crisis of Democratic Capitalism* (Penguin, 2023).
21 Network for Greening the Financial System, *NGFS Scenarios for Central Banks and Supervisors*, November 2023.

whole capitalist edifice is seen as inevitably injurious to the planet. There are, however, a number of alternative suggestions that work within the current capitalist system and are alive to the moral and electoral constraints of permanent negative economic growth.

Daniel Susskind[22] has suggested that, given planetary constraints, policymakers should not fixate on the quantum of growth; instead, they should more openly discuss the trade-offs and distribution of who benefits. For most of humanity, growth measured by GDP has, along with increased longevity, been one of the huge positive forces of recent decades, and policymakers would reject any idea of wanting less growth. The GDP metric has been useful in helping focus stakeholders on a drive for prosperity, but it does have shortcomings, and its impact on the climate is an important one. Susskind points out that, while many today take GDP as a metric of almost God-given authority, it is in fact a relatively new metric, having been invented in the 1940s. The author makes the case for reconsidering the definition of growth, including which components are included in the calculation of GDP. The conclusion is that we cannot abandon growth but can redirect the pursuit of it.

There have been other attempts to rebalance notions of growth and its broader impact at an aggregate level. Pope Francis, for example, comes at it from a necessarily different angle in his *Encyclical on Climate Change and Inequality*.[23] He makes the case that profit is only ethical if the full social cost is considered. The encyclical takes the position that any impact on the climate is inseparable from the concept of inequality and, hence, a new concept of progress is needed.

Our assumption is that politicians have not done nearly enough to educate populations about the expenditure trade-offs required now versus the benefits to come far in the future. Part of the problem is the scale of the uncertainties about climate forecasts and the impact these uncertainties may or may not have on standards of living. They pose a substantial problem for people making prophecies of doom about the climate. What makes this even harder is that other forces unrelated to the energy transition also challenge the rate of real growth: shrinking working-age populations, deglobalization and already-high public debt. One has to add to this the blunt observation that the median real standard of living in developed economies has stagnated despite a long run of high aggregate growth, and despite (or maybe because of) the financialization of recent decades. Taken together, these factors imply limited openness to any near-term imperilment of standards of living. We show later in this note that a delayed energy transition probably leads to ultimately worse outcomes for the median standard of living, but that point is not likely enough to change behavior now.

We conclude Part I of this chapter by considering what all this means for the likely path of global temperatures, and then we tackle how to think about the implications for macroeconomic variables and, ultimately, asset allocation.

22 Daniel Susskind, *Growth: A History and a Reckoning* (Allen Lane, 2024).
23 Pope Francis, *Encyclical on Climate Change and Inequality : On Care for Our Common Home* (Melville House, 2015).

What Prognosis Does Delayed Decarbonization Imply for Temperature and Climate?

Given the discussion above, and the IPCC's attempt to link carbon emissions with temperature that we outlined at the beginning of this chapter, it seems more likely than not that temperatures will rise by more than 2°C. For example, Jeremy Lawson[24] surveys a broad range of assumed climate outcomes from the IPCC, International Energy Agency (IEA) and NGFS, outlining a case that the transition to a lower-carbon global economy is highly likely to continue, but that the world is unlikely to converge on a Paris-aligned trajectory. The conclusion in the work of Lawson is that the probability-weighted mean scenario points to 2.3°C of warming by 2100 (*Display 56*).

DISPLAY 56: CHANGE IN BEHAVIOR AND CONSUMPTION REQUIRED FOR GIVEN TEMPERATURE OUTCOMES

	Mean Expected Outcome (Lawson et al. 2023)	Baseline Assumed by Market	Required for Paris-Aligned Outcome	If Current Policies Continue
Temperature change 2100, compared to preindustrial levels	2.3C°	2.7	1.8	3.2
Share of nonfossil power generation in 2025	82%	59%	97%	79%
Coal demand (annual growth 2020–2050)	–2.65%	–1.95%	–5.85%	0.82%
Oil demand (annual growth 2020–2050)	–0.97%	–0.08%	–2.03%	–0.98%
Gas demand (annual growth 2020–2050)	0.52%	1.98%	–1.43%	0.77%
Electricity demand (annual growth 2020–2050)	2.66%	2.38%	3%	2%
Electric vehicle share of new vehicle sales in 2050	86%	80%	96%	73%

Paris-aligned outcome requires much more aggressive cuts.

Current analysis and forecasts do not guarantee future results.

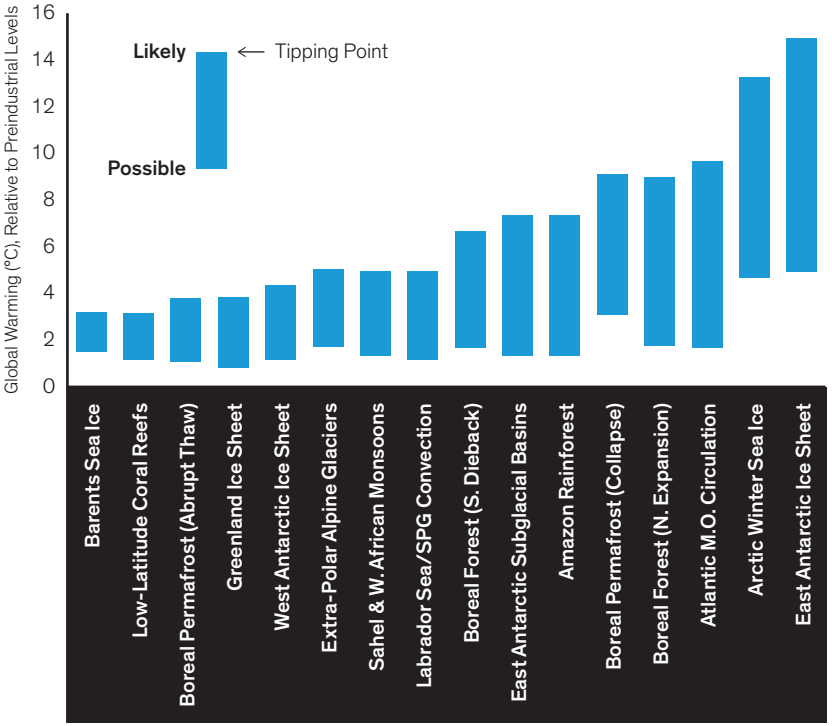
As of February 28, 2023 | **Source:** Jeremy Lawson et al., *A Bespoke, Probabilistic Approach to Climate Scenario Analysis*, CEPR Discussion Paper No. 17944, CEPR Press, February 2023; and AB

24 Jeremy Lawson et al., "A Bespoke, Probabilistic Approach to Climate Scenario Analysis," Centre for Economic Policy Research, Discussion Paper No. 17944, CEPR Press, February 28, 2023.

One specific aspect of the temperature forecast that is relevant when we consider the distribution of future outcomes for macro variables is the risk of nonlinear outcomes. It is hard enough to attempt to link climate to macroeconomic outcomes; it will be even harder if the process is likely to be highly nonlinear.

The problem is that as temperature rises, the risk of passing key tipping points increases. In *Display 57*, we show data from the Institute and Faculty of Actuaries[25]

DISPLAY 57: RISK OF TIPPING POINTS AND NONLINEAR OUTCOMES RISES WITH TEMPERATURE



Current analysis and forecasts do not guarantee future results.

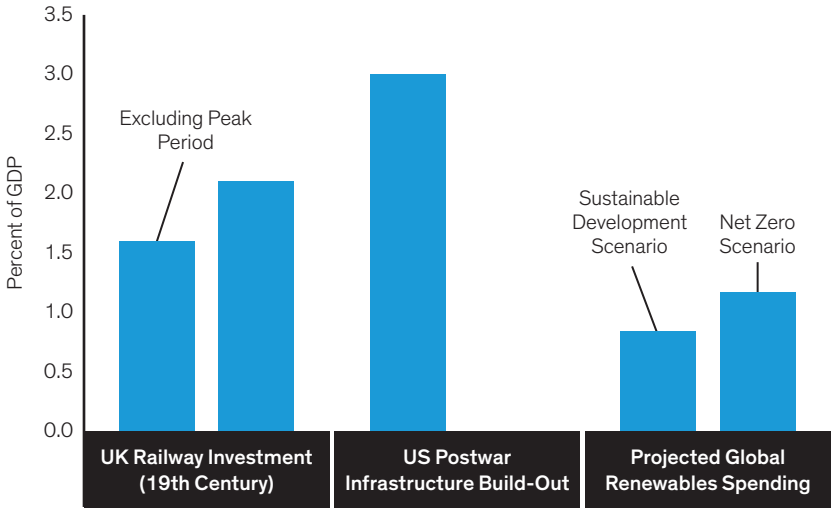
As of July 4, 2023 | **Source:** David McKay et al., "Exceeding 1.5°C Global Warming Could Trigger Multiple Climate Tipping Points," *Science* 377, no. 6611 (September 9, 2022); Sandy Trust et al., *The Emperor's New Climate Scenarios*, Institute and Faculty of Actuaries, July 2023; and AB

25 Sandy Trust et al., "The Emperor's New Climate Scenarios: Limitations and Assumptions of Commonly Used Climate-Change Scenarios in Financial Services," Institute and Faculty of Actuaries, July 2023.

on the risk of various tipping points and how they increase with temperature. The implication is that passing the point of a 2°C increase in temperature could make several of these tipping points much more likely: for example, a thaw in boreal permafrost (increasing methane emissions) and the Greenland ice sheet (raising sea levels). When it comes to the economics of all this, the nonlinear nature of these outcomes significantly increases the uncertainties about potential future paths.

We do not wish to be entirely depressing about the prospects, so we point out a potential expansion in the scale of capital devoted to the technology and infrastructure needs of the energy transition. In *Display 58*, we compare the amount of spending required for global renewables to prior large waves of infrastructure spending—the UK investment in railways in the mid-19th century and the US buildout of the interstate highway network in the 1950s. Those prior episodes consumed a much higher share of GDP, suggesting that the allocation of capital could grow significantly from current numbers.

DISPLAY 58: PROJECTED SPENDING ON THE ENERGY TRANSITION IS STILL LESS THAN SPENDING ON 19TH-CENTURY RAILWAYS AND POST-WWII INFRASTRUCTURE



Current analysis and forecasts do not guarantee future results.

As of April 24, 2024 | **Source:** IEA, World Bank and AB

Part II: What Does Exceeding a 2°C Temperature Rise Mean for Growth and the Economy?

So, our working assumption is that the planet sails through a 2°C increase in temperature. What does it mean if we apply this assumption to the macroeconomic variables that are the basis for forming investment views?

The majority of pension plans assume a minimal impact of climate on GDP. Can this be right? Is it a sign of complacency? It has been suggested that this apparent lack of impact might be because finance papers tend to be peer-reviewed by economists rather than climate scientists. We will discuss this in more detail later in the report.

Our view is that any net impact of climate on growth and inflation needs to be put into context alongside other forces unfolding at the same time. In particular, we point to demographic changes (much more certain than climate forecasts), the likelihood that deglobalization as a force is here to stay and the role of AI. We have already seen that AI usage implies a significant increase in power demand, though it also might raise productivity. That's what the techno-determinists hope for, anyway.

We divide the impact of climate on macro variables into direct and indirect effects. The latter are often ignored but could be larger than the direct effects.

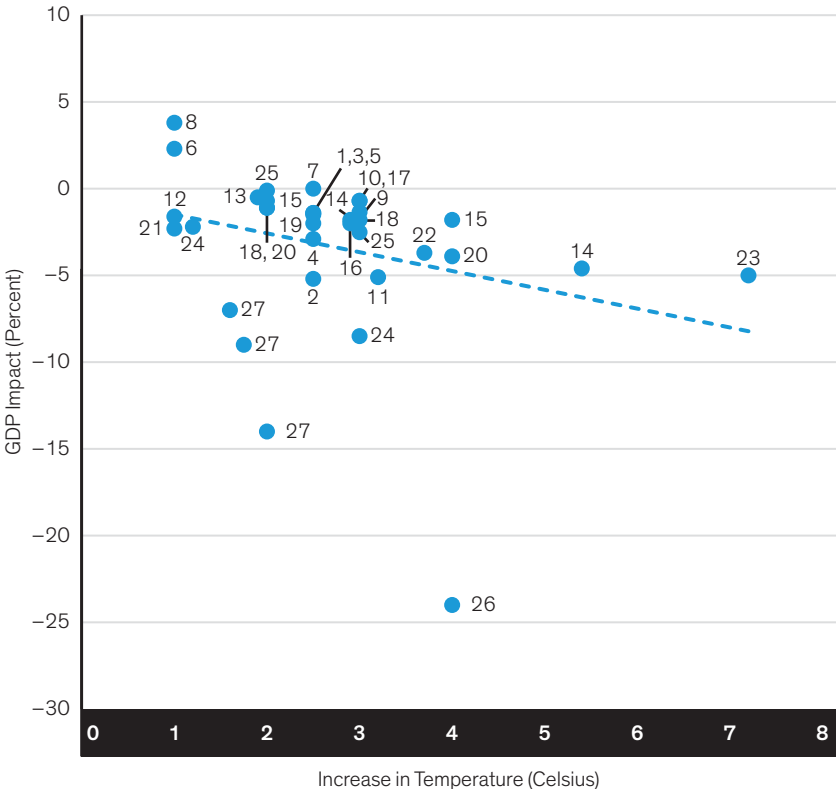
While there are huge error bars around the future path of average temperatures, the error bars around the impact of a given temperature on economic growth are even larger. Thus, one is piling uncertainties upon uncertainties. When we discuss the consequences of all this for asset allocation, we distinguish between the various megaforces defining the investment environment. For example, demographics, while slow, are (more or less) predictable and linear versus climate, which is highly uncertain and nonlinear.

In *Display 59*, we summarize the range of possible impacts on GDP growth of a range of possible temperatures according to some of the most-cited academic papers that have attempted to quantify this link. This illustration shows how different methodologies arrive at a disparate range of estimated growth rates. Part of the reason for the range of assumed impacts is that some studies focus on temperature alone, some assess the impact on a broader range of routes (such as precipitation), and others include indirect effects.

The key point to note about this work is the range of possibilities and what that implies for the needed diversification. One conclusion would be that exceeding a 2°C temperature increase and reaching, say, a 2.2°C increase would imply that global GDP would decline by 2.8%. Assuming that this temperature rise occurs by 2050, the implied decrease in global GDP is 0.11% annualized. We note that the NGFS forecasts (an average of the "current policies" and "delayed transition" scenarios) imply a worse outcome, with a 1.9°C increase in temperature that implies a 0.44% decrease in annualized GDP by 2050.

We have included a line of best fit in this chart. It is not intended to indicate a trend for the progression of growth if temperature rises; instead, it is intended as a way to find the least mean squares average across a broad range of modeled outcomes.

DISPLAY 59: UNCERTAINTIES UPON UNCERTAINTIES—27 ACADEMIC STUDIES OF THE IMPACT OF CLIMATE CHANGE ON GDP GROWTH



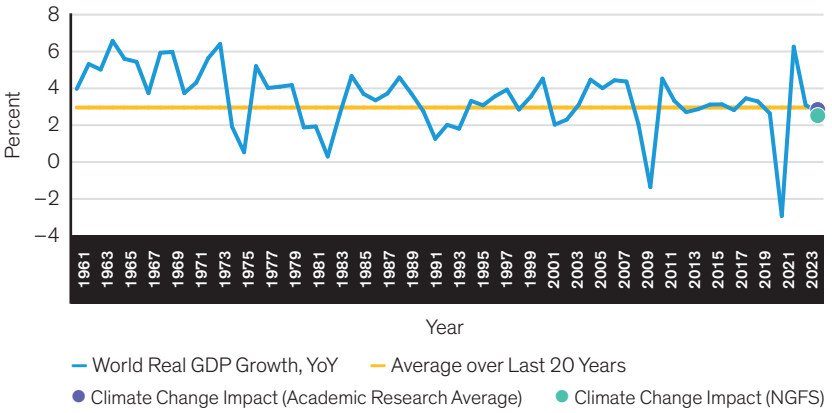
Current analysis and forecasts do not guarantee future results.

1. Fankhauser (1995); 2. Schauer (1995); 3. Nordhaus and Yang (1996); 4. Plambeck and Hope (1996); 5. Nordhaus and Boyer (2000); 6. Tol (2002); 7. Maddison (2003); 8. Horowitz (2009); 9. Eboli et al. (2010); 10. Hope (2011); 11. Maddison and Rehdanz (2011); 12. Ng and Zhao (2011); 13. Bosello et al. (2012); 14. Roson and van der Mensbrugghe (2012); 15. McCallum et al. (2013); 16. Nordhaus (2013); 17. Sartori and Roson (2016); 18. Kompas et al. (2018); 19. Dellink et al. (2019); 20. Takakura et al. (2019); 21. Kalkuhl and Wenz (2020); 22. Conte et al. (2021); 23. Cruz and Rossi-Hansberg (2021); 24. Howard and Sylvan (2021); 25. Kahn et al. (2021)*; 26. Burke et al. (2015); 27. NGFS (2023).* Note: Display shows a summary of academic research conclusions estimating the impact on global GDP of temperature change by 2100 or similar. Asterisk denotes studies where scenarios consider the impact by 2050. GDP impact is cumulative change.

As of November 2023 | **Source:** As referenced above and AB

Display 60 puts the impact of the best-fit estimate, from the academic studies above, and the NGFS scenario impact in the context of global GDP growth. The dots reflect the estimated impact on average global GDP growth over the last 20 years. We provide more context for the impact on annual growth in the following section, which discusses the impact on equity returns. We stress, however, that this growth impact is not happening in isolation, so when we consider its impact on SAA, other factors come into play that depress growth and are, on balance, inflationary.

DISPLAY 60: RANGE OF GDP ESTIMATES IN PERSPECTIVE



Current analysis and forecasts do not guarantee future results.

Note: The average climate change estimate is a summary of academic research conclusions estimating the impact of temperature changes on global GDP by 2100 or similar. It is adapted from Tol (2022), with extra estimates added from Kahn et al. (2021), Burke et al. (2015) and NGFS (2023). For multiple publications by the same author, we selected estimates only from the latest listed publication. For the GDP impact estimate, we assume the forecast temperature change of 2.2°C occurs by 2050. The NGFS scenario is based on *NGFS Scenarios for Central Banks and Supervisors* (November 2023). It is an average of "delayed transition" and "current policies" scenarios.

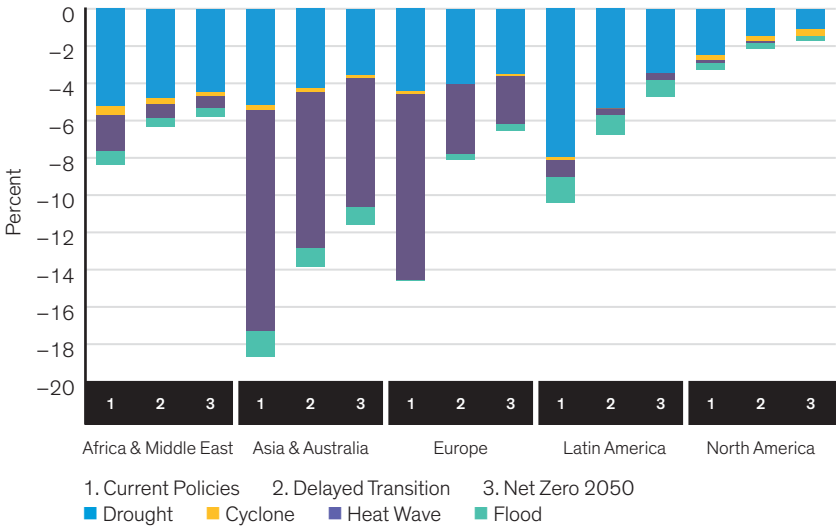
Source: LSEG Data & Analytics, NGFS and AB

A common finding from academic studies is that the impact of climate change on economic growth is highly heterogeneous. The NGFS scenarios imply that North America will be relatively less affected, Asia and Australia face the most deleterious impact, and Europe falls in between (*Display 61*). The NGFS "delayed transition" scenario still assumes that the temperature increase is kept below 2°C; hence, seemingly on the benign side of our central expectation. It suggests that the total

cumulative hit to GDP in North America is 3%, in Europe 8%, and in Asia and Australia 14.5% by 2050. That said, a smaller average impact on GDP for North America should not be conflated with little impact, because the potential impact on insurance costs is high, for example.

In a similar vein, a 2017 International Monetary Fund paper[26] on this studies the contemporaneous effect of temperature on growth, finding that advanced economies face, on average, a negligible contemporaneous impact on activity from a temperature rise. However, for the median emerging economy, a 1°C increase in temperature depresses growth in that year by 0.9 percentage points, with the effect becoming stronger for hotter countries.

DISPLAY 61: REGIONAL ACUTE GDP IMPACT BY HAZARD AND SCENARIO (REGIONAL AVERAGES)



Current analysis and forecasts do not guarantee future results.

All values are differences from baseline (a hypothetical scenario with no transition or physical risk). Simple averages across those countries available for a given region. Latin America is composed of Chile, Mexico and Argentina, except for flood, which is only available for Mexico. North America includes the US and Canada, but only the US for floods. Africa includes Egypt and South Africa, but only South Africa for floods.

As of November 2023 | **Source:** NGFS and AB

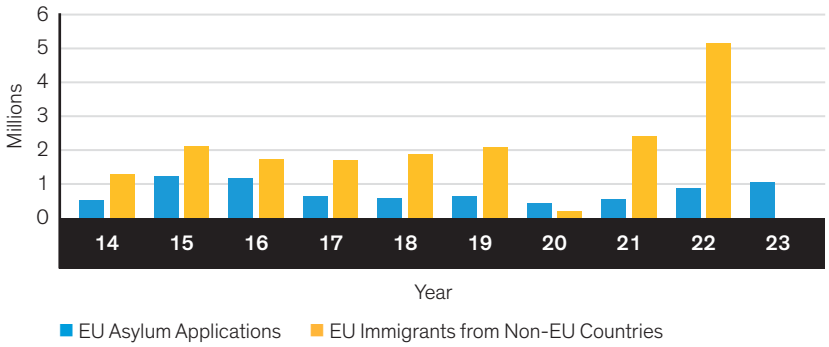
26 *World Economic Outlook: Seeking Sustainable Growth*, International Monetary Fund, October 2017.

Indirect Impact of Climate Change: Migration Pressures Are Only Just Beginning

It is one thing to try and estimate the impact of climate change on economic activity, but quite another to try to model the indirect effects on political systems across multiple election cycles. It is hardly possible to make such a forecast. However, we raise this as an issue because we think the indirect effects of a temperature increase greater than 2°C could, if anything, be larger than the direct effects. There are many possible indirect channels, such as geopolitical clashes over natural resources, but we highlight migration here because it is possible to make some quantitative statements about it.

The case rests on the juxtaposition of projected increases in temperature and projected population growth. Worse growth outcomes in hotter countries and faster population growth imply that migration pressure will remain. For example, we think there will be increased pressure for migration from Latin America to the US and from Africa to Europe (*Displays 63 and 64*). While migration from Latin America to the US is currently an intense political issue, the total population of the US is expected to continue growing slightly, while Latin America's population is expected to begin declining by 2050 (*Display 64*). The imbalance between the US and Latin America would then begin to narrow. However, when comparing Europe to Africa, the outlook is stark and diverging. The bottom line is that migration is set to remain a political issue far into the future.

DISPLAY 62: EU ASYLUM APPLICATIONS AND IMMIGRANTS FROM NON-EU COUNTRIES

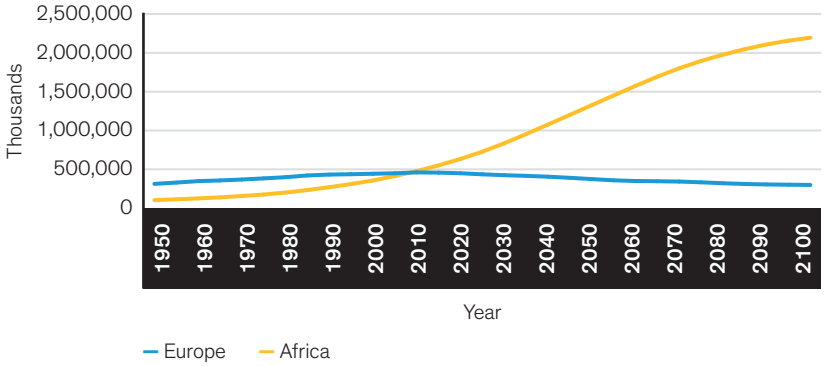


Current analysis does not guarantee future results.

In addition to migration, there is a secondary labor market impact: the OECD finds that the central-transition scenario job destruction is greatest for "blue collar and farm workers."

As of March 10, 2023 | **Source:** OECD, UN and AB

DISPLAY 63: UN POPULATION FORECASTS—EU VS. SUB-SAHARAN AFRICA

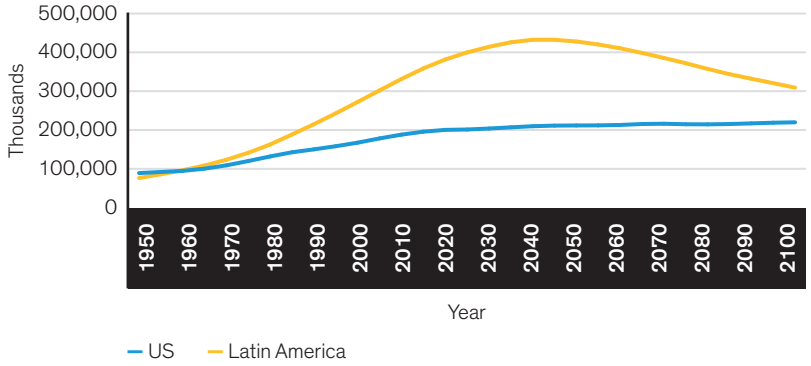


Current analysis does not guarantee future results.

In addition to migration, there is a secondary labor market impact: the OECD finds that the central-transition scenario job destruction is greatest for "blue collar and farm workers."

As of March 10, 2023 | **Source:** OECD, UN and AB

DISPLAY 64: UN POPULATION FORECASTS—US VS. LATIN AMERICA



Current analysis does not guarantee future results.

In addition to migration, there is a secondary labor market impact: the OECD finds that the central-transition scenario job destruction is greatest for "blue collar and farm workers."

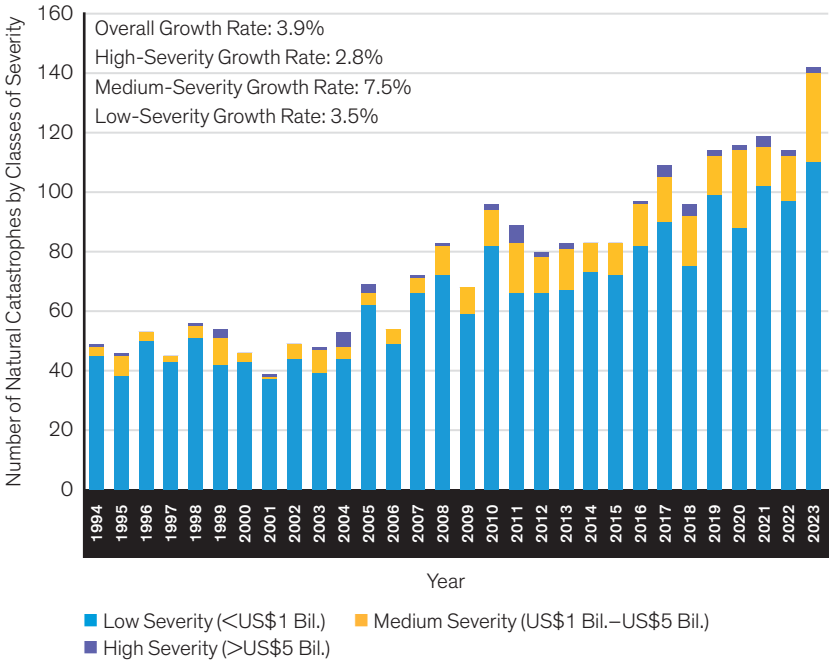
As of March 10, 2023 | **Source:** OECD, UN and AB

Extreme Weather on the Rise

A specific route for a more detrimental version of climate change to impact the real economy and portfolios is through more extreme weather. There are two aspects to this that are of particular interest: the impact of more extreme weather on insurance costs (relevant if the allocation advice from the broader narrative is to own more real assets) and on inflation more generally; for example, via the impact on supply chains, food and energy prices.

Evidence suggests that severe storms have become more frequent. For example, according to the Swiss Re Institute, the total number of natural catastrophes has increased by 3.9% annualized since 1994. In particular, the frequency of midsize storms that cause damage of $1–$5 billion (in constant dollars) has increased by 7.5% annualized since 1994 (*Display 65*).

DISPLAY 65: NUMBER OF NATURAL CATASTROPHES BY CLASS OF SEVERITY (1994–2023)

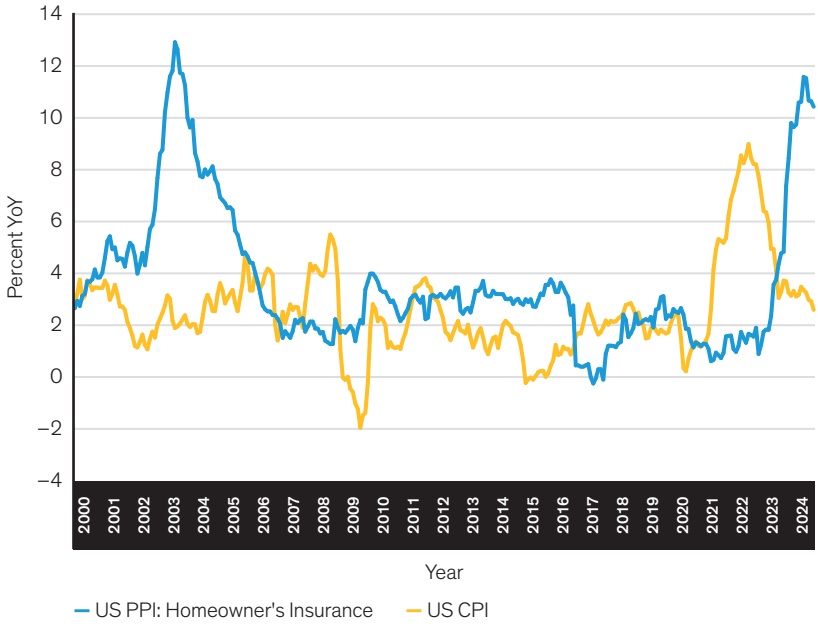


Current analysis and forecasts do not guarantee future results.

As of February 22, 2024 | **Source:** "Natural Catastrophes in 2023: Gearing Up for Today's and Tomorrow's Weather Risks," *Sigma*, no. 1 (2024)

Overall, the number of billion-dollar disasters in the US (on a constant-dollar basis) has increased from an average run rate of below four in the 1980s to over 16 a year by the early 2020s (with 28 events in 2023).[27] This trend is already having a knock-on effect on insurance costs (*Display 66*). Home insurance premium inflation has risen significantly in recent years and shows no signs of abating, even as broader inflation has declined. This cannot give the full picture, because in some cases assets may become uninsurable or terms may be rewritten so that extra insurance is needed (for example, the need for separate flood insurance). A recent study by Deloitte projected that commercial-building insurance costs would double by 2030 in the most high-risk areas.[28]

DISPLAY 66: US PRODUCER PRICE INDEX HOMEOWNERS-INSURANCE COMPONENT AND US CONSUMER PRICE INDEX



Current analysis and forecasts do not guarantee future results.

Through August 15, 2024 | **Source:** LSEG Data & Analytics and AB

27 Swiss Re Institute, "Natural Catastrophes in 2023: Gearing Up for Today's and Tomorrow's Weather Risks," *Sigma*, no. 1 (2024).

28 Renea Burns et al., *Climate Change Impacts Elevate US Commercial Real Estate Insurance Costs*, Deloitte Center for Financial Services, May 29, 2024.

Aggregating this on an economy-wide level, insurance costs as a share of GDP have the potential to grow significantly. Numbers for the EU suggest these costs could double by 2050 (*Display 67*). (Note that these numbers reflect the impact of severe weather, so they differ from the aggregate impact of climate change discussed earlier in the chapter.)

When it comes to asset allocation, this impact is significant. If the forces investors face imply an elevated level and volatility of inflation, then one implication is a need to hold more real assets. For the subset of real assets that are physical, this implies an extra level of insurance costs that will eat into returns and possibly introduce common shocks.

DISPLAY 67: EXPECTED FUTURE ANNUAL DAMAGES FROM CLIMATE-RELATED CATASTROPHES AS A SHARE OF GDP WITHOUT ADAPTATION AND MITIGATION MEASURES

	Baseline	2050			2100	
EU and UK (2015 Values)	**Baseline (1981–2010)**	1.5°C Moderate	2°C Severe	1.5°C	2°C Moderate	3°C Severe
Total (Windstorms, Droughts, River and Coastal Floods)	0.17%	0.21%	0.29%	0.19%	0.41%	0.76%

Current analysis and forecasts do not guarantee future results.

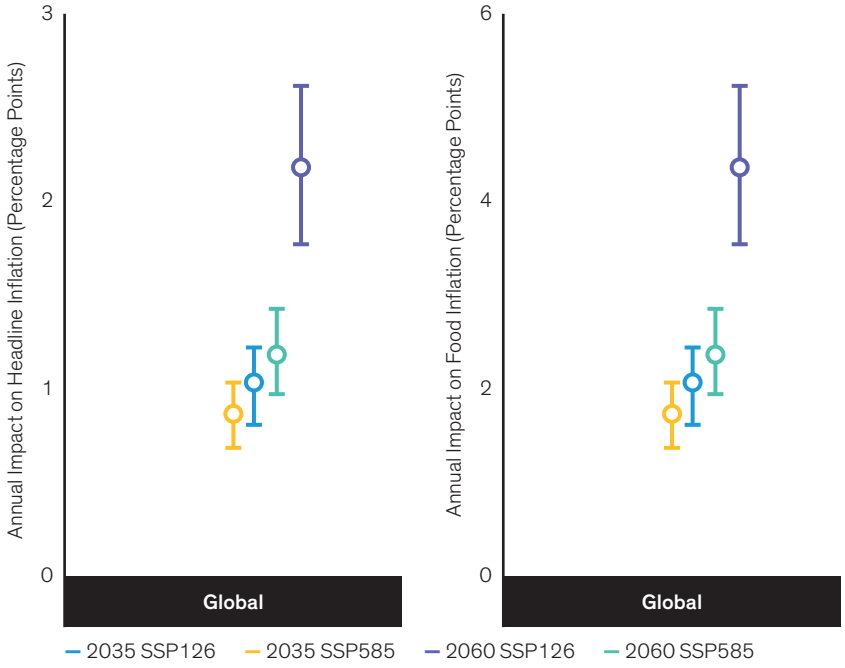
The GDP impact numbers refer to a percentage point per annum impact by the years 2050 and 2100.

As of July 2021 | **Source:** Linda Fache Rousová et al., "Climate Change, Catastrophes and the Macroeconomic Benefits of Insurance," BIS Working Paper No. 394, EIOPA, 2021; and AB

There is a body of academic work on the link between climate change and inflation. For example, Maximilian Kotz et al.[29] show that future warming is estimated to cause, on average, persistent increases in food inflation of 1.49 ± 0.45 or 1.79 ± 0.54 percentage points per year (p.p.p.y.), respectively, in an optimistic or pessimistic emissions scenario. Impacts on headline inflation follow similar patterns and are approximately half as large: 0.76 ± 0.23 or 0.91 ± 0.28 p.p.p.y. under a best- or worst-case emissions scenario (*Display 68*). In this case, "persistent" refers to changes in 30-year average equilibrium inflation.

29 Maximilian Kotz et al., "The Impact of Global Warming on Inflation: Averages, Seasonality and Extremes," European Central Bank, ECB Working Paper No. 2023/2821, May 2023.

DISPLAY 68: IMPACT OF CLIMATE CHANGE ON INFLATION



Current analysis and forecasts do not guarantee future results.

The annual impacts on inflation aggregated across world regions (population weighted), at different time periods (30-year averages centered on the point in question) and under both a low (SSP126) and high (SSP585) emissions scenario for headline (a) and food (b) price aggregates. Point estimates show the average, and error bars the standard deviation, of impacts from the warming projected across the ensemble of 21 CMIP-6 climate models, in the absence of historically unprecedented adaptation.

SSP refers to Shared Socioeconomic Pathway scenarios. They are based on five narratives describing broad socioeconomic trends and are intended to incorporate a range of plausible future scenarios. SSP1 refers to a sustainability-focused growth and equality scenario. SSP2 is a "middle of the road" scenario, where trends are in line with historical patterns. SSP3 is a fragmented world and resurgent nationalism scenario. SSP4 is a world of ever-increasing inequality, and SSP5 is a rapid and unconstrained growth in economic output and energy use scenario. In addition, these baseline SSP scenarios include different mitigation and adaptation targets, which are expressed by the level of radiative forcings with different outcomes of 1.9, 2.6, 3.4, 6 and 8.5 watts per square meter. Thus, a SSP585 scenario, for example, refers to a world of rapid and unconstrained growth with minimal mitigation efforts that results in additional radiative forcing of 8.5 watts per square meter.

As of May 24, 2023 | **Source:** Maximilian Kotz et al., "The Impact of Global Warming on Inflation: Averages, Seasonality and Extremes," European Central Bank, ECB Working Paper No. 2023/2821, May 2023

For SAA decisions, whether these are transient or persistent effects is a critical distinction. Other work points to a more transitory link between temperature and inflation. Koyesha Mukherjee and Bazoumana Ouattara[30] suggest that temperature shocks can lead to an inflation shock; while this might be persistent for several years, the main impact would dissipate within a year. Donata Faccia et al.[31] also show a significant link between temperature and inflation. They demonstrate that the short-term impact is most notable on food prices, but there are also medium-term price developments from temperature shocks with nonlinear effects. A broader worry here is the impact on supply chains, especially in the context of deglobalization already having a potential negative impact by fragmenting supply chains. This leads to a questioning of the ability of supply chains to cushion price shocks in the future.

This literature suggests that two elements of the impact of severe weather on inflation need to be considered in portfolios: the risk of an upward shift in the background mean level of inflation, and also—and probably more importantly—the risk of an increase in inflation volatility.

Part III: What Does All This Mean for Asset Allocation and Portfolios?

The ultimate aim of this chapter is to map this assessment back to actions investors must take in their portfolios. Any change in climate does not happen in isolation; other major forces, such as demographics and deglobalization, happen in parallel. Compared with these other forces, the impact of climate on economic variables is much more uncertain. Thus, while we think it is important to try and quantify the likely impact on expected returns of temperature changes, that is probably not the main mechanism by which climate change impacts portfolios. Instead, many of the implications for investors are related to the likelihood that the range of possible paths is much broader than we have seen before.

If the Transition Is Likely to Be Delayed, Is the Industry Underestimating the Effect on Returns?

A recent study by the Institute and Faculty of Actuaries[32] concluded that there is a disconnect between the current state of climate science and the assumptions underpinning scenario modeling in financial services. The institute noted the risk that as regulatory scenarios for the impact of climate on GDP evolve, they are useful for introducing consistency, but also may engender groupthink. The paper goes on to analyze Task Force on Climate-related Financial Disclosures (TCFD) documents from major UK investors, which show that there is essentially no assumed difference in the expected impact on portfolios between an orderly transition to net zero and a "hot house" world if Paris Agreement targets are missed. It seems odd that there is no

30 Koyesha Mukherjee and Bazoumana Ouattara, "Climate and Monetary Policy: Do Temperature Shocks Lead to Inflationary Pressures?" *Climatic Change* 167, no. 3 (2021).
31 Donata Faccia et al., "Feeling the Heat: Extreme Temperatures and Price Stability," European Central Bank, ECB Working Paper No. 2626, December 2021.
32 Trust et al., *The Emperor's New Climate Scenarios*.

assumed difference between these outcomes in the industry. But as we argue below, even in the case that there is no impact on mean expected returns, the two scenarios do imply a very different distribution of outcomes.

In a similar vein, Steven Keen[33] analyzed disclosures from pension funds, showing that in many cases the funds' investment models predict that global warming in excess of 2°C will have only a minimal impact on portfolios. The implication is that the models used by investment consultants are at odds with the scientific literature in terms of the impact of these levels of warming. Keen concludes that the weakness is that papers on the economics of climate damages tend to be refereed by economists rather than by climate scientists.

Growth

We apply the conclusion that we arrived at in Part I: a rapid energy transition is too painful politically and hence not the most likely path; thus, investors need to incorporate a forecast outcome that temperatures may well rise more than 2°C. We then use the academic work we outlined in Part II that attempts to map temperature increases to the impact on GDP. In *Display 69* we show two interpretations of what this means for growth: (1) the average impact taken from a trend line across all studies (assuming the temperature rise occurs by 2050); and (2) the NGFS outlook average of delayed transition and current policies scenarios. Some of the attempts in the academic literature to link temperature to growth imply an impact to aggregate growth, and hence equity valuations, that is small compared with other forces such as demographic changes and any assumed mean reversion in valuations. The NGFS forecasts imply a large hit to equity returns, though one that is still on the same scale as these other forces.

Part of the reason for the apparent relatively small impact on growth is that the biggest impact is often forecast to be in countries with a lower share of global GDP. Hence, the larger impact may be via indirect channels such as migration and its impact on politics.

The impact of climate on portfolios must be seen in the context of other structural forces that will affect markets and hence portfolios contemporaneously. What sets climate apart from the other forces, with the possible exception of AI, is the degree of uncertainty. We started this chapter by making the case that a quick energy transition is politically and socially very costly, and therefore unlikely. Thus, the uncertainty around the prognosis for climate is very large indeed. The uncertainty around the consequences for a given climate outcome on growth and inflation is also huge. Thus, from the perspective of portfolio design, the principal consequence of a slow energy transition is likely to be much greater path risk when trying to model possible economic scenarios further out. The other contemporaneous forces imply a higher-equilibrium level of inflation (from deglobalization and demographic change).

33 Steven Keen, "Loading the DICE Against Pensions," Carbon Tracker, July 2023.

DISPLAY 69: IMPACT ON CENTRAL-FORECAST EQUITY RETURNS OF MEGAFORCES—CHANGE IN FORECAST ANNUALIZED RETURNS (2024–2050)

US	Central Impact on Equity Returns	Uncertainty in the Impact on Equity Returns
Demographics	0.2	Low and Linear
Deglobalization	0.0	Medium and Linear
Climate Change (Academic Research Average)	–0.1	High and Nonlinear
Climate Change (NGFS)	–0.4	High and Nonlinear
Labor vs. Profit Share	–0.1	Medium and Linear
Valuation Mean Reversion	–0.5	High and Linear
World ex US		
Demographics	–0.8	Low and Linear
Deglobalization	–0.1	Medium and Linear
Climate Change (Academic Research Average)	–0.1	High and Nonlinear
Climate Change (NGFS)	–0.4	High and Nonlinear
Labor vs. Profit Share	0.0	Medium and Linear
Valuation Mean Reversion	0.0	High and Linear

Current analysis and forecasts do not guarantee future results.

Note: Demographic projections are based on United Nations estimates from 2025 to 2050. World ex US uses the Developed World ex US region plus China. The research average climate change estimate is a summary of academic research conclusions estimating the impact on global GDP of temperature changes by 2100 or similar. It is adapted from Tol (2022), with extra estimates added from Kahn et al. (2021), Burke et al. (2015) and NGFS (2023). For multiple publications by the same author, we selected estimates only from the latest listed publication. For the GDP impact estimate, we assume the forecast temperature change of 2.2°C occurs by 2050. The NGFS scenario is based on *NGFS Scenarios for Central Banks and Supervisors* (November 2023). It is an average of "delayed transition" and "current policies" scenarios.

As of November 2023 | **Source:** Marshall Burke et al., "Global Non-Linear Effect of Temperature on Economic Production," *Nature* 527 (2015); Matthew Kahn et al., "Long-Term Macroeconomic Effects of Climate Change: A Cross-Country Analysis," *Energy Economics* 104 (2021); NGFS, *Annual Report 2023*; Richard Tol, "A Meta-Analysis of the Total Impact of Climate Change," CESifo Working Paper No. 9919, 2022; and AB

We believe that an energy transition can ultimately be disinflationary, but the view that we outline here is that completing such a switch will take longer. We have shown, however, a likelihood that climate increases inflation volatility. Likewise, the directional

impact on growth seems likely to be downward, with a central projection that is possibly smaller than the impact of demographics.

Inflation

There are two distinct effects of the interaction of climate and the energy transition on inflation. There is the potential effect of extreme weather on short-term inflation shocks and the separate question of how an energy transition affects inflation. As for extreme weather, as average temperatures increase it seems likely that inflation volatility will also increase. The economic mechanism is mainly via food and energy prices, supply chain disruption and higher insurance costs, which we discussed in the section on extreme weather. Our view is that higher temperatures will lead to higher inflation volatility via extreme weather.

But what about the impact of the energy transition itself on inflation? Our prior starting point on this was that the process of the energy transition raises prices over the course of the transition, but then has the potential to be disinflationary longer term. The upward pressure on inflation of the transition can be thought of as a function of a few elements:

- The pass-through of any taxes or carbon taxes onto consumers that make explicit any negative carbon externalities
- The cost of installing new requisite infrastructure in terms of generating capacity, grid infrastructure and carbon sequestration assets
- The potential for misallocation of resources (which is usual in any large infrastructure/technology change), hence lower economic efficiency during a transition

The promise of disinflationary forces later on comes from the downward adjustment in prices of new "green" energy sources as capital is invested in them. Also, there's the longer-term possibility that economies become delinked from the vagaries of commodity prices. This would be a significant change, specifically compared with the last century, in which oil was the primary source of energy. If this is the case, there is then the huge question of when a shift from net inflationary to disinflationary pressure would take place, and how much it would depend on the form the transition takes (ordered/disordered, late/early, via taxes or subsidies).

There is support from policymakers for this point of view. For example. Isabel Schnabel, a member of the Executive Board of the European Central Bank (ECB), suggested in a recent speech that we face a "prolonged period of upside pressure on inflation."[34] A World Bank report agreed that during the transition, demand for certain energy sources (such as gas) may grow significantly and that an increase in the price of the minerals needed for green technologies would be inflationary.[35]

34 Isabel Schnabel, "A New Age of Energy Inflation: Climateflation, Fossilflation and Greenflation" (panel presentation, The ECB and Its Watchers XXII Conference, Frankfurt, Germany, March 17, 2022).
35 Biagio Bossone et al., "Inflation and the Ecological Transition: A European Perspective," World Bank Blogs, September 15, 2022.

Taking a different approach, Alessandro Ferrari and Valerio Landi[36] show that an energy transition brought about by taxing "dirty" sectors exerts inflationary pressure, but that the expectation of further tax increases in the future depresses demand. The second effect is larger, but the result is that inflation rises at first and is deflationary later.

The pace of the energy transition and the degree to which it is orderly is important. The ECB has suggested that an orderly energy transition poses little threat to the ability of a central bank to maintain price stability. However, a disorderly transition—which we think now looks more likely—would present a much more difficult trade-off between growth and inflation, with headline inflation diverging from target for a prolonged period. Specifically, the ECB research suggests that a disorderly transition results in much higher energy-cost inflation. The central bank could choose to "look through" this effect and focus on core inflation, but overall inflation would still be 0.5 percentage points higher up to 15 years later. The alternative would be to target headline inflation, but that would entail a much greater impact on GDP, again over a period longer than a decade.[37]

Recent work by the Federal Reserve has suggested that energy inflation does not have to be inflationary per se, but may spur the central bank to think more explicitly about the trade-off between its employment and inflation objectives. This balance depends on whether climate policies are enacted as subsidies to "green" sectors or taxes on "dirty" sectors and the flexibility of prices within those sectors. However, the ability to use subsidies as the main mechanism for advancing a transition presumably has limits, given that the level of public debt/GDP across G7 nations has reached the same level it was at the end of WWII. While politicians in the US (of either party) seem unable to propose a way of reducing the current level of fiscal largesse, this debt burden would eventually limit the ability of a subsidy approach.

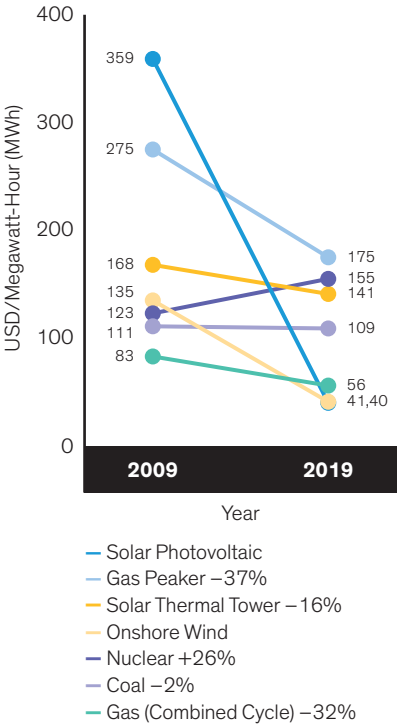
The Fed starts from the observation that policies to price "dirty" and "green" energy differently bring changes in relative prices, not absolute prices. So, if prices for green energy fall quickly, this could be consistent with deflation. The research shows that the price "stickiness" in US sectors correlates with the carbon emissions/value added for the sector. The more carbon-intensive sectors such as air transport, electricity and gas supply see price changes on a more frequent basis than the average economic sector. Thus, for a central bank to achieve lower inflation overall—including in areas with more sticky prices—it has to aim for lower output and employment across the whole economy than it would otherwise target.[38]

We do not have a long data set for price flexibility in the newly emerging sectors related to the transition. However, evidence from the price of renewable-power generation

36 Alessandro Ferrari and Valerio Nispi Landi, "Will the Green Transition Be Inflationary? Expectations Matter," European Central Bank, ECB Working Paper No. 2726, September 2022.
37 Francesco Drudi et al., "Climate Change and Monetary Policy in the Euro Area," European Central Bank, ECB Occasional Paper Series No. 271, September 2021.
38 Marco Del Negro et al., "Is the Green Transition Inflationary?" Federal Reserve Bank of New York, Staff Report No. 1053, February 2023.

and the price of lithium-ion batteries suggests that prices are indeed flexible and decreasing rapidly (*Displays 70 and 71*). Moreover, rapidly evolving battery chemistry points to a range of more flexible options with less supply chain risk.[39]

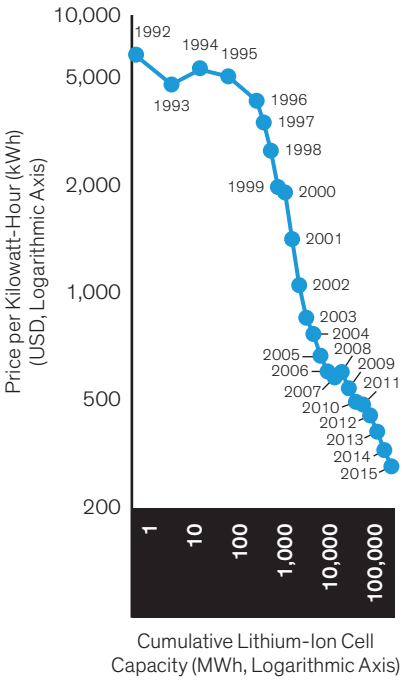
DISPLAY 70: PRICE OF ELECTRICITY FROM NEW POWER PLANTS



Historical analysis does not guarantee future results.

As of June 4, 2021 | **Source:** Hannah Ritchie, "The Price of Batteries Has Declined by 97% in the Last Three Decades," Our World in Data, June 4, 2021; and AB

DISPLAY 71: PRICE DECLINE VS. CAPACITY INCREASE IN LITHIUM-ION BATTERIES



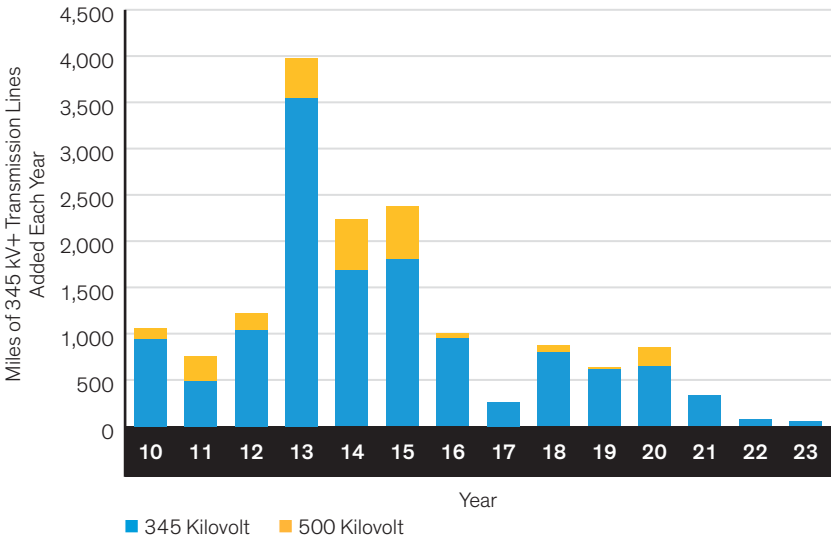
Historical analysis does not guarantee future results.

As of June 4, 2021 | **Source:** Hannah Ritchie, "The Price of Batteries Has Declined by 97% in the Last Three Decades," Our World in Data, June 4, 2021; and AB

39 Xingwen Yu and Arumugam Manthiram, "Sustainable Battery Materials for Next-Generation Electrical Energy Storage," *Advanced Energy and Sustainability Research* 2, no. 5 (May 2021).

The speed of cost reductions is stark. Moreover, there is evidence that forecasters have persistently underestimated both the pace of cost reductions and the speed of the increase in installed capacity in recent years. However, generation and batteries are just two parts of the energy-transition process. Other elements that could still pose considerable costs are the need for a significant improvement in the grid, the buildout of carbon sequestration technology and the shift of the primary energy source for sectors not currently electrified (transportation and industrial processes like cement). We covered carbon sequestration and primary-energy source changes earlier in this chapter; the grid-buildout process is still in its infancy. In the US, for example, the rate at which new transmission lines were being built peaked in 2013, and in recent years this has been growing at a small fraction of the rate of recent decades (*Display 72*). A recent study on national transmission planning[40] suggested that the US transmission system must more than double in size by 2050 if there is a need to decarbonize while not limiting demand.

DISPLAY 72: INVESTMENT IN NEW HIGH-VOLTAGE LINES PEAKED IN 2013 AND HAS STEADILY FALLEN OVER THE LAST 10 YEARS



Current analysis and forecasts do not guarantee future results.

As of July 2024 | **Source:** Nathan Shreve et al., *Fewer New Miles: The US Transmission Grid in the 2020s,* July 2024; and AB

40 US Department of Energy, *National Transmission Planning Study*, 2024.

Our strong conclusion is that inflation volatility is set to be higher, but the impact of the transition on equilibrium inflation is moot. We assume that the transition will be initially inflationary but then disinflationary. The timing of that switch will be a function of how energy policy develops. More generally, this research suggests that the link between the energy transition and inflation, at the very least, likely creates trade-offs for central banks on the inflation versus growth/employment spectrum.

Asset Allocation

The increased uncertainty of outcomes means that diversification becomes even more important across asset classes and regions. The tricky aspect is that new exogenous inflation sources that are not growth-linked imply that bonds will be less effective diversifiers, so diversification requires a broader array of return streams.

A risk of higher inflation volatility implies a greater need for real assets. However, in some cases physical real assets may also face greater costs of insurance and maintenance. Physical real assets are still needed, but their "inflation beta" may be less effective than before.

A challenging aspect of this modeling is determining what happens to the predicted variance and covariance. Our starting view is that these moments tend to be much more stable than those of returns, so setting them equal to long-run averages is a good starting point. However, climate change is potentially unlike historical shifts in economic regimes, so it's not clear if such an approach should hold in this case.

There have been attempts to model the risk characteristics of asset classes in relation to temperature over and above standard macro variables. For example, Jean-Charles Bertrand et al.[41] propose modeling equity variance and covariance as a linear function of variables such as changes in GDP, inflation and temperature, finding that an increase in temperature has a positive link to volatility.

Past changes in temperature have been in a very different range from that indicated by climate models of the future, so we like an approach to modeling future asset-class correlation that depends on macroeconomic variables—not past temperature observations. The key aspect here is that the broader megaforces that we think define the investment environment imply somewhat greater inflationary pressure but lower real growth. This is very different from recent years, when growth and inflation tended to be positively linked. This shift implies a positive stock-bond correlation, not a negative one.[42]

For asset owners' positioning, the conclusion is that the climate impact could be larger than currently assumed, and is not something that can be resolved by buying a

41 Jean-Charles Bertrand et al., "The Impact of Climate Change Risk on Long-Term Asset Allocation," *Journal of Portfolio Management* 50, no. 5 (January 2024): 238-263.

42 Inigo Fraser Jenkins et al., *A Preliminary Language for a Post-Global World*, AllianceBernstein, May 2024.

simple ESG fund that passively excludes sectors. There is a much broader allocation question around whether real assets can help over a period when inflation could be higher and more volatile and when there's a diversification problem. Thus, responding to the likely path of climate change's impact on investment assets poses an asset-allocation problem that requires much more attention in the investment industry.

The need to find sources of return and diversification that may work across a much more broadly distributed set of possible outcomes is probably the key requirement for those tasked with devising SAA. In this light, the ultimate focus is on governance and those tasked with framing investment objectives. Less is said about this aspect than about asset allocation. There are many reasons for this, one being that such decisions are "above the pay grade" of many in the industry. Changes in governance structure should generally happen even more slowly than, and be approached even more humbly than, asset allocation. However, there is a good *prima facie* case to be made that climate change, especially "bad" outcomes, is not really diversifiable in a traditional sense.[43] If that is the case, the response might have to be a different setting for risks and returns and also for the way policymakers set targets and constraints for the investment industry overall.

While a "bad" climate outcome might not really be diversifiable, allocators will need to respond by working within the current framing of investment guidelines. The view that we have outlined—one with much greater uncertainty and path risk in the outlook for growth and inflation, with a bias toward higher inflation and lower growth—has implications for allocations. For most investors, the ultimate need is to protect purchasing power. We assume that need guides allocation decisions.

- An increased focus on diversification implies the need for a greater variety of return streams; therefore, a more widely distributed spread of risk weights across public/private equities; regions; active, long-only and long/short strategies; and asset classes.
- While our working assumption is that the US is relatively less adversely affected than other regions from some aspects of climate risk, analysis of asset-class returns over very long horizons shows the dangers of regional concentration. Of the eight largest equity markets by market cap in 1900, six went to zero within the following 50 years. Regional diversification matters, especially given what are likely to be highly localized differences in climate outcomes. Thus, there is a tricky trade-off to be made with regard to North American exposure versus long-run regional diversification.
- There is a need for greater exposure to real assets, and we include equities as a real asset. The objective of preserving purchasing power when inflation volatility will likely rise, and in the presence of greater inflation path risk, implies that returns

43 For a discussion on this point, see Ellen Quigley, "Universal Ownership in Practice: A Practical Investment Framework for Asset Owners," May 28, 2020.

linked to the real economy matter. This means not only assets with high correlations to inflation, but also assets with a high probability of delivering a positive real return over extended periods of uncertain inflation. The caveat for real assets is the need to incorporate greater insurance costs that might haircut the "inflation beta" of such assets.

- There is ample capacity for capex on the energy transition to increase further, based on a comparison to past infrastructure changes over the last 150 years, so renewable energy is an important investment theme. At the same time, fossil fuels are likely to be present for perhaps longer than currently anticipated. In the presence of attractive free-cash-flow yields and strong net buybacks, we also want exposure to the global energy sector. Commodities also have a role to play in inflation hedging, albeit the weight of specific commodities within that exposure is likely to change over strategic horizons.
- Prefer Treasury Inflation-Protected Securities (TIPS) over nominal bonds. Inflation volatility is set to rise and inflation-path uncertainty will be high, so if governments choose to continue issuing TIPS, then investors should favor them over nominal bonds. Greater inflation volatility is yet another reason to assume that bonds will not fulfill the role of effectively diversifying equity risk.
- Exposure to private assets should increase. Many areas within renewable assets don't find their way into public markets, but they do need considerable capital. This supports a further increase in the weight of private assets. Our view, which we've expressed in other research,[44] is that the illiquidity premium on the overall private equity asset class is currently nil, which suggests favoring other types of private assets such as private debt, infrastructure and natural resources.

44 Inigo Fraser Jenkins et al., *The Role of Private Assets in Strategic Asset Allocation: A Macro Perspective*, AllianceBernstein, May 10, 2023.

Chapter 3—Machines, Democracy, Capitalism and Feudalism: Five Books for a Different Age, and What It Means for Investing

In this chapter, we discuss five recent books that we think are important for contemporary debates about the strategic outlook. These are not traditional book reviews that intend to offer a detailed overview of the whole work in each case. These publications have been chosen as recent books that fit into the debate about what we see as the core fundamental and strategic issues that will change the way investors must think about how they invest, govern their decisions, form views and, ultimately, design portfolios. It is these aspects of the books that we draw out and discuss, offering conclusions for investors.

The books have very different viewpoints, ranging from capitalist to post-capitalist, but share common themes. Where this fits into the broader narrative of this book overall is in analyzing the impact of artificial intelligence (AI). On the one hand AI is the great hope that could point to a path of higher productivity that may be able to offset the downward forces on growth discussed elsewhere in this book. On the other hand these books raise profound questions about the future of work, the position of the individual in society and who benefits from growth.

The path that AI is collectively leading us down is unknown economically, let alone socially and philosophically. It is simply too early to forecast the aggregate impact of AI on the economy. The great hope of AI evangelists, of course, is that it will boost productivity in a way that unleashes a new wave of growth. The more insidious side of AI includes questions of what AI's rise means for jobs, the power of corporations versus labor, and even the possibility of an electoral process in a world where most internet content is not generated by humans.

All this is not to mention any practical limits on AI's productivity boost from the required power consumption of the extra data centers, which may well require power equivalent to the demands of a large country. Some may balk at such statistics, given the desire to reduce the human impact on the planet. Such mundane constraints are not part of this chapter, which is focused on more fundamental ideas. But they constitute planetary constraints, nonetheless.

There is cognitive dissonance here. Markets leap on prospects of higher growth, and that will be a primary focus for many readers of this chapter. The hope of AI has, after all, been the primary reason for very strong equity market returns over the last one to two years. At the same time, running through several of the works discussed here is a

level of anxiety about technological determinism. Jonathan Crary, in *Scorched Earth: Beyond the Digital Age to a Post-Capitalist World*, warns of the suppression of human agency inherent in the development of AI and of the dangers of holding the view that, if something cannot be reduced to data, then it is not ontologically relevant.

Several of these works either directly opine on, or implicitly circle around, the question of the nature of labor and the extent to which it has changed. In *Technofeudalism: What Killed Capitalism*, Yanis Varoufakis addresses this question in his description of "cloud serfs," who unwittingly freely offer their labor by using and uploading content to social media. Martin Wolf, in *The Crisis of Democratic Capitalism*, addresses this question from the angle of how the benefits of capitalism and globalization have been unevenly shared. In *The Machine Age: An Idea, a History, a Warning*, Robert Skidelsky analyzes the interaction of labor and capital, and addresses how work gives meaning to people's lives over and above providing a source of income. Crary highlights how in the internet's early days there were hopes that it would give agency to labor and people's ability to collaborate but contends that the internet's dominant effect instead has been the erosion of any distinction between the work/nonwork and public/private domains.

The interaction of capitalism and liberalism is another theme that cuts across these books. The tension between the two and their mutual interdependence have become a core topic of debate. Wolf addresses this from the perspective of how capitalism has come to endanger liberal democracy. In *The New Leviathans: Thoughts After Liberalism*, John Gray discusses how the role of the state has curtailed liberalism, and Varoufakis suggests that the era of capitalism, faced with a new economic system where winners can extract rent rather than compete for profit, is over. Crary contends that the intertwined forces of capitalism and the internet shatter the norms of social interaction and individual agency.

If these themes come across to capitalists as being defensive or evoke a defensive emotion, that is probably no surprise. We would argue that this reflects the zeitgeist.

Robert Skidelsky, *The Machine Age: An Idea, a History, a Warning*

In his opening sentence, Lord Skidelsky writes that his book "tells three stories about the impact of machines on the human condition: on the way we work, on the way we live and on our possible future." One key thing we don't know about the impact of AI on the workplace is what it will do for jobs. Pessimists argue that it will wipe out jobs for large swaths of the population; optimists point out that all waves of technological innovation since the Industrial Revolution have not, so far, led to a secular displacement of jobs by technology. This theme from the book is probably most on the minds of investors trying to make long-run projections for returns.

Karl Marx and John Maynard Keynes are two constant presences in Skidelsky's book. Keynes famously proposed in his essay "Economic Possibilities for Our Grandchildren" that by 2030 people would have to work only 15 hours per week. Skidelsky suggests that Keynes was wrong for three reasons: (1) the difference between needs and wants (one's needs might be met by a 1930s standard of living today, but that hardly fulfills the wants of most people); (2) work is not only a cost—it also gives meaning to many people (in the book is an interesting and surprising discussion about the definition of work that emerged from medieval monastic life in juxtaposition to ancient classical contempt for work); and (3) gains from productivity improvements have not been equally shared—there is a distribution problem.

There was no net increase in technological unemployment during the Industrial Revolution. However, it took a century for real wage increases from productivity improvements to find their way to the working class. While there was no net increase in structural unemployment, this does prompt the question of what handloom weavers did when their wages fell from 19 shillings per week in 1800 to 6 shillings 3 pence a week by 1830 and then to nothing. Despite the historical lack of structural unemployment in the face of technological change, one wonders, will AI be different in the speed and breadth of the job dislocation it will bring about?

Daron Acemoglu and Simon Johnson also discuss this point in a 2024 paper, exploring classical economist David Ricardo's change of view on the impact of machinery on labor during the early stages of the Industrial Revolution.[45] They conclude that automation can increase wages but only when accompanied by new tasks that raise the marginal productivity of labor and/or when there is sufficient additional hiring in complementary sectors. Moreover, the authors consider working and living conditions and show that automation in the early Industrial Revolution led to a "deskilling" of jobs that disempowered workers and robbed them of control over when and how hard they worked. The authors apply this issue directly to the question of AI adoption in the modern economy. They fear that AI may be directed at automation rather than at raising overall productivity. They also consider working conditions and whether AI could be used for the intrusive assessment and direction of workers. Their conclusion: it is still too early to tell which direction AI might take, and the outcome is an active choice that depends on social and political power structures.

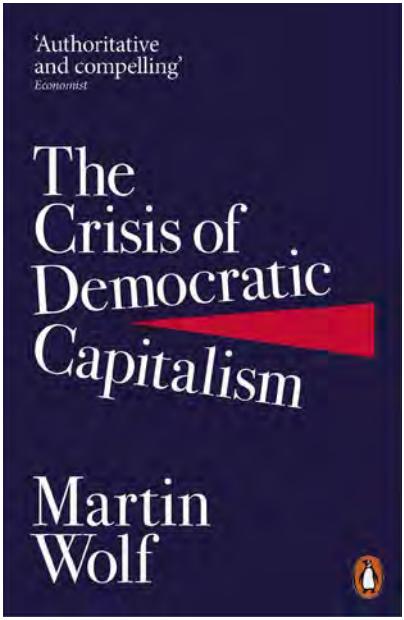
The end of the book is somber. Skidelsky suggests that there is either a technological solution (there is a discussion of transhumanism), which he rejects because it destroys too much that is precious in life, or a solution that involves decreasing our dependence on machines, which he recognizes might not be possible given our social structure. Crary's book *Scorched Earth* (discussed below), coming at this topic from a very different angle, makes a similar point.

In Skidelsky's book there is a discussion of how capitalism has been an enabler of technological development, but at what cost? (In this there is an echo of Jason Hickel and the degrowth movement espoused in his book *Less Is More: How Degrowth Will Save the World*.) We liked the discussion of different sorts of utopias and the role of the devil in Christian thought. He regards the devil as an example of the dialectic, weaving this into a discussion of the social cost of technological advance as part of a rejection of technological determinism.

45 Daron Acemoglu and Simon Johnson, "Learning from Ricardo and Thompson: Machinery and Labor in the Early Industrial Revolution, and in the Age of AI" (working paper, National Bureau of Economic Research, 2024).

Martin Wolf, *The Crisis of Democratic Capitalism*

Long-time *Financial Times* columnist Martin Wolf writes about the intertwined relationship of liberal democracy and capitalism, why the marriage between them is broken, and how to restore it—because the other options are much worse.



The core message of the book is that significant change is needed to defend the ideals of democracy and freedom. Wolf suggests that the combination of a market economy and liberal democracy is unsustainable in its current form. This conclusion is a legacy of the highly unequal sharing of prosperity over recent decades. The symptom of this conclusion is "a loss of trust in the notion of truth," which in turn paves the way for dictators or would-be dictators. Wolf's blunt view is that laissez-faire capitalism is ultimately incompatible with democracy.

Wolf's work includes a discussion of the possible reasons for the stalling of productivity growth, which is rightfully a theme in most discussions of the contemporary economy. The author observes that the financialization of the economy in recent decades did not finance fresh investment. Instead, there has been an emergence of winner-take-all markets, zero marginal cost and platform capitalism. Contemporaneous to this has been a change in attitudes toward antitrust policy. The book suggests that the increase in market concentration is as much a political choice as a fundamental function of technology.[46] The result: a decline in competition. Varoufakis's latest work (which we discuss later) comes at this topic from a very different perspective and offers an utterly different prescription, but both works address this theme.

Wolf is very distrustful of all utopias (here, he is plainly at the opposite end of the spectrum from Varoufakis). He is especially leery of any attempt at revolutionary change. He works through several of these efforts in the book, suggesting that we

46 We made a similar point in the AI chapter in our book *A Preliminary Language for a Post-Global World*, writing that a case can be made that beneficiaries of tech developments are a function of social choices and structures rather than an outcome of the nature of the technology itself.

have relied too much on monetary policy, that modern monetary theory is dangerous, and that universal basic income (UBI) is "delusional." (As an aside, UBI comes up as a frequent topic in more strategic discussions with investors about the economic impact of AI.) Likewise, Wolf strongly rejects Hickel's degrowth stance, suggesting that an attempt to move toward degrowth is "morally unacceptable" given its implications for living standards.

Much of Wolf's book is a suggestion for how to fix the economy and politics. Here, we pick up three of his themes that we think are most relevant: retirement, monopolies and the functioning of democracy.

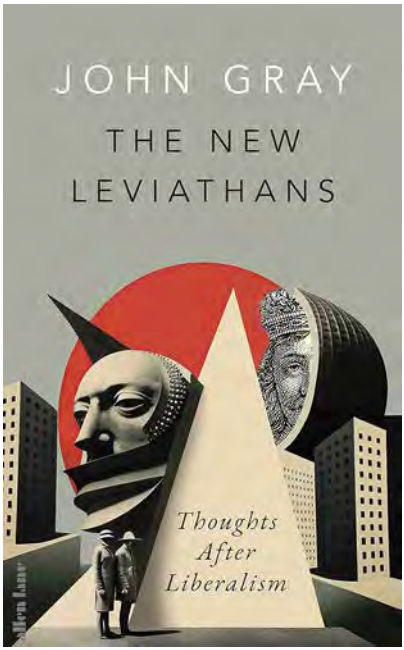
Wolf observes that the collapse of defined benefit (DB) pension arrangements is inevitable, because employers are problematic providers of such promises. We agree, and would add that this inevitability is further fostered by increased longevity and the unwinding of a particular set of macro circumstances that prevailed for much of the post-WWII era. Wolf points out that the decline of the promise of DB is yet another reason for the rise of intergenerational inequality.

The author is very fond of collective defined contribution (DC), using the Netherlands as an example. He suggests that this model leads to better outcomes and, at the same time, fosters deeper capital markets because such funds can have a large allocation to real assets and have no need to shift toward "safe" bonds. We reach the same conclusion in the chapter on pensions and bonds below. Our view is that a core goal must be to preserve the social function of the finance industry in preserving the social compact implicit in the existence of retirement systems. But to do that, there will need to be a much clearer focus on the generation of positive real returns, with a change in asset allocation as a result.

Wolf thinks that society and political systems need to deal with monopolies. He suggests that it would be unthinkable in democracies to essentially nationalize algorithms, as in China. Instead, he asks why large tech companies are not under strict regulatory control, as food and drugs are. There is a discussion on how to tax social media to pay for "real media." This may seem fanciful in the current climate, but in the context of laying out a strategic path, this, to us, at least offers one path to address a key social concern that needs to be addressed.

Concurrently, Wolf offers a list of suggestions for improving the functioning of democracies, the details of which are not relevant to this chapter. The book ends on the notion of citizenship, in the sense of the relationship between the citizen and the state, where responsibilities run both ways between the two and what that relationship means today.

John Gray, *The New Leviathans: Thoughts After Liberalism*



The New Leviathans is a work of political philosophy that applies a Hobbesian lens to the forces driving contemporary society, political movements and geopolitics.

In *Leviathan*, Thomas Hobbes argues that an all-powerful state is necessary to protect people from one another. In *The New Leviathans*, John Gray makes the point that in the latter part of the 20th century, it looked as if Hobbes was wrong. More and more democracies had emerged in which governments could be held to account. Gray's central contention is that today, states have cast off many constraints of the liberal era. This has come about in many ways, perhaps most obviously in China and Russia. But the author suggests that it is also true in Western democracies; he suggests that a growing requirement for a conformity of ideas, which he describes as a kind of neopuritanism that excludes viewpoints condemned as reactionary, endangers cultures of liberal tolerance. In the West, this requirement is imposed not by the state but by civil society. Gray, somewhat depressingly, pronounces that "a liberal civilization based on the practice of tolerance has passed into history."

He suggests that this process began with the apparent triumph of liberalism at the end of the Cold War (marked by Francis Fukuyama in his famous book *The End of History and the Last Man*).[47] This was followed by its retreat—given the recent impetus from the combined forces of the COVID-19 pandemic, accelerating climate change and war in Europe. In Gray's telling, political ideology (be it liberal or Marxist) has a lesser role to play today. Instead, he writes, we are reverting to more "primordial" forces (e.g., nationalist and religious ones). The author points out that Fukuyama himself had departed from the model suggested by Darwin in hypothesizing that evolution can have some natural endpoint.

47 Francis Fukuyama, *The End of History and the Last Man* (Penguin Books, 2012).

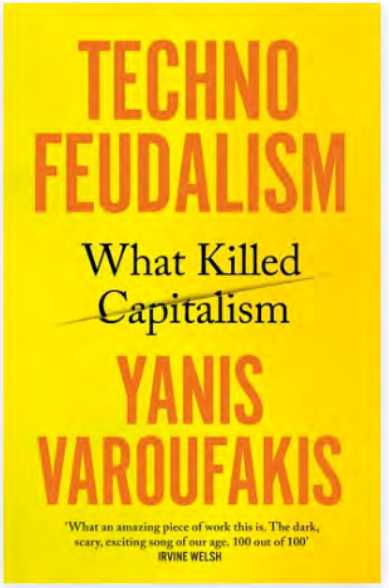
In Gray's description of the clash between systems at the global level, market forces serve the government in China, while in the West, states have ceded power to corporations. His conclusion is that both systems can be described as variants of state capitalism, but with the relationship of capital to the state reversed. Gray describes the concentration of wealth in modern society as feudalism.[48] In fact, Gray contends that this state is actually worse than feudalism because, in the medieval era, lords were expected to protect their serfs. The same is not true today. (We are sympathetic to the reference but would contend that the existence of Social Security does somewhat alter the comparison.) The point, though, is that capitalism had legitimized itself and any resulting wealth dispersion through a myth of unending economic growth, but climate change has since rendered that myth unsustainable.

Gray's book is much more focused on the fundamental underpinnings of society and contemporary thought than on getting down to the nitty-gritty level of economics. Nevertheless, we have long held the view that all economics and finance come down to politics in the end. The dependence of one on the other might sometimes be hard to discern, especially in the case of political systems that have held sway for many decades, such as the liberal order that had existed in many developed economies from WWII until now. There are, of course, many profound implications to be drawn from this, not least for freedom of thought. For investors, the emergence of new leviathans implies that the rule of markets that had come to be seen as normal is in doubt, with states playing a much greater role than previously thought. Although the analogy is not made in the book, for investors a reemergence of the state as leviathan has implications for the independence of central banks, and for the distinction between money and non-money in the context of the role of crypto versus a reserve currency.

48 See Yanis Varoufakis, *Technofeudalism: What Killed Capitalism* (Melville House, 2023), which comes to the same analogy from a Marxist angle.

Yanis Varoufakis, *Technofeudalism: What Killed Capitalism*

The latest book from Yanis Varoufakis sets out a simple hypothesis: capitalism is now dead, in the sense that "its dynamics no longer govern our economies." The author coins the word "technofeudalism" for what has come to replace it. The book's title might lead one to think that this is a warning to us about some future danger that society faces in a dystopian, post-singularity AI takeover, but no! This is about the pre-AI state at which society and the economy have already arrived.



Varoufakis's contention is that while profits are ubiquitous in financial parlance, they are not running the show anymore. Digital platforms may appear to possess elements of markets but are really fiefdoms. Crucially, profit has been replaced by rent—and in this case, rent that has to be paid because of the need to access those platforms.

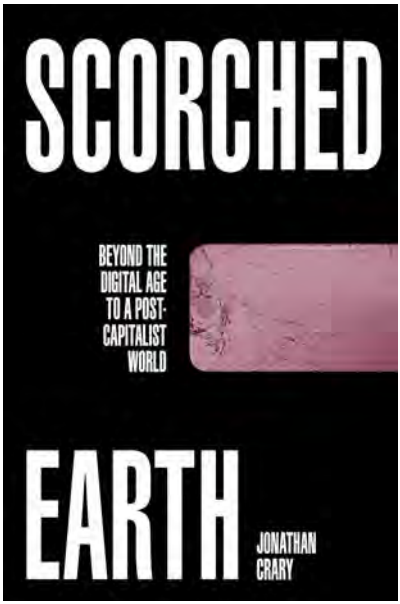
At the core of the new system, he suggests, is cloud capital—the agglomeration of networked computers, software and algorithms. It might seem like another form of traditional capital merely applied to higher-tech examples, but cloud capital differs from traditional capital in crucial ways. Traditional capital requires wage labor to grow and reproduce itself. Cloud capital can grow without paid labor, because individuals seem happy to contribute to it for free—e.g., by participating in social media. We would agree that there are many analogies between individuals' participation in creating content on the internet and a Marxist definition of what constitutes labor.

The historical analogy that Varoufakis cites is the idea that the establishment of a market-based system in the 19th century was preceded by an enclosure of the commons—in that case, land. We have seen a very similar development recently in terms of a plundering of the internet commons, a topic we discussed in our recent note on the societal impact of AI.[49]

49 Inigo Fraser Jenkins and Alla Harmsworth, *Productivity, Democracy, Power and Truth: The Influence of AI on Markets and Investing*, AllianceBernstein, October 10, 2023.

The irony, Varoufakis suggests, is that it was not organized labor that fomented the downfall of capitalism. Instead, it was the confluence of two very different forces: the privatization of the internet by big tech and the policy response to the global financial crisis, which lowered the cost of capital. He suggests that anyone committed to the idea of the market (with Varoufakis himself presumably not being in that group) should profoundly worry about the replacement of profit by rent.

Jonathan Crary, *Scorched Earth: Beyond the Digital Age to a Post-Capitalist World*



Jonathan Crary describes his short book as belonging to the tradition of social pamphleteering, and the book is a stark rejection of what the author sees as an unsustainable trajectory in society. The real target here, as he sees it, is the symbiotic nature of the internet and capitalism as viewed within the context of immediate environmental and planetary limits. The book's opening sentence lays this out: "If there is to be a livable and shared future on our planet, it will be a future offline, uncoupled from the world-destroying systems and operations of 24/7 capitalism."

There is a particular focus in this work on the social and temporal impact of the commercialized internet. Crary expresses a suspicion that social media brings about a neutralizing of "nonfinancializable" forms of social interaction and that, beyond this, young people in particular are being deflected from political agency by a need for technological conformity.

The temporal aspect of this is the author's observation that rhythm at a personal and interpersonal level was endlessly variegated, but that capitalism and especially the internet have eroded that variability. This was a topic he discussed at length in his pre-pandemic work *24/7: Late Capitalism and the Ends of Sleep*.[50] We discussed the implications of this in our black book *Are We Human or Are We Dancer?* in the chapter "The Hiatus of Intimacy and Rhythm: Investing After the Pandemic."

One explicit worry that Crary explores is the way that these forces lead to a loss of capacity for sympathy. He also claims that these forces make any rejection of the status quo hard.

50 Jonathan Crary, *24/7: Late Capitalism and the Ends of Sleep* (Verso Books, 2014).

The Implications of All This for Investors

Ultimately, this chapter is not a book review, but an essay designed to help investors make strategic allocations. Any uplift in productivity from AI is easy enough for investors to incorporate into their models. One can happily dial up the growth term in the numerator of a discounted cash-flow model and determine what higher valuation is justified. However, all the other topics discussed here are fundamentally harder to price. There is too much overlap between the disparate forces that have shaped market returns over decades to unstitch how much recency bias one faces in pricing assets based on models predicated on nearly 80 years of a specific kind of world order.

The role of labor is key to our discussion of many of the books here, which is entirely intentional in our choosing to focus on these works. Of the forces that are easiest to articulate and quantify, the effects of a declining number of workers (for developed economies and China), deglobalization fragmenting the global labor pool, and a greater need for (hard-to-automate) care work for the elderly imply (*ceteris paribus*) that a shift from capital to labor in the balance of bargaining power could be expected. Layered on top of this is the extent to which investors are serious about forcing firms to consider the social consequences of what they do, which could further the narrative of empowering labor. Aside from the social and moral consequences of all this, it implies a sustained animus of inflation from wages to a degree that has not been apparent since the changes set in motion by Reagan, Thatcher and Deng. Set against that, AI holds the potential to radically erode labor bargaining power and redefine what constitutes labor.

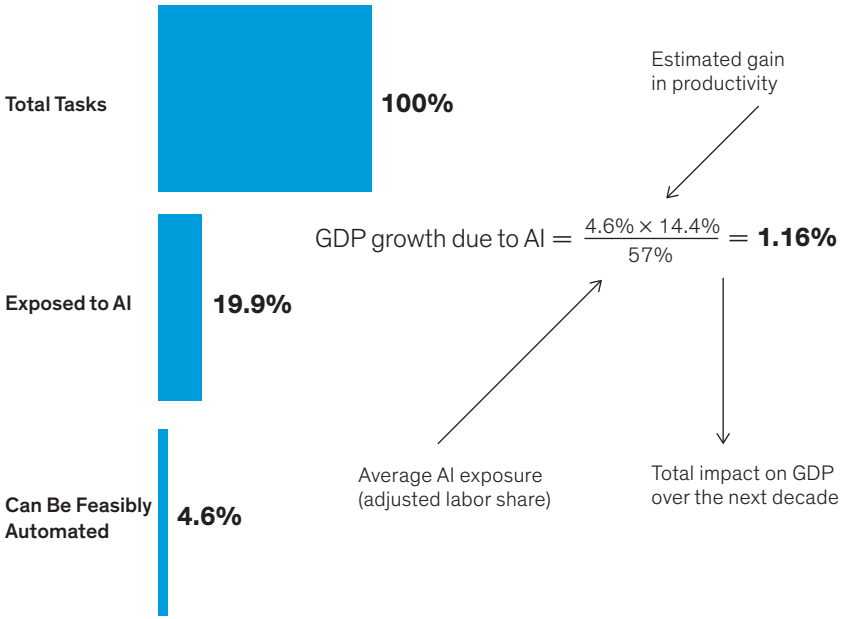
It would take a brave economist to confidently forecast what this balance will look like a decade hence, but it will be central to deciding the investment landscape, let alone the social one. Our view is that these forces, alongside the need to fund an energy transition and the temptation of debt monetization, indeed raise the equilibrium level of inflation. The alternative of mass technological redundancy seems to lead to a need for state support, whether it is outright UBI or not, which also raises inflationary risks.

These books also raise questions about the functioning of capitalism. The degree to which competition is still a driver can not only be viewed through the lens of profits versus rents, but also with regard to the extent that creative destruction is still a generator of productivity growth. If the decline in productivity, even in the face of rapid automation, is indeed a function of a lack of competition, that implies a need to change both antitrust policy (to break up monopolies) and monetary policy (to stop the artificial lengthening of business cycles and to let more companies fail).

Daron Acemoglu recently attempted to quantify the potential productivity gains from AI that one might reasonably expect over the next decade. He suggests that 20% of tasks in the economy are realistically open to being automated over that period (the remainder require either manual dexterity for which current robotics are not sufficient or a level of cognitive ability that AI would struggle with). Based on past

adoption of technology, Acemoglu then suggests that a quarter of these tasks will be economically attractive to automate. Finally, he suggests that the productivity improvement of those tasks that can be automated over the next decade will be 14%. The result, when adjusting for the capital share in the economy, is that US GDP growth can be expected to increase by 1.16% over the next decade (*Display 73*). Such an improvement is not to be sniffed at, but it is far from the level required to offset forces such as fewer available workers and deglobalization.

DISPLAY 73: ESTIMATING THE AI IMPACT ON GDP GROWTH OVER THE NEXT DECADE



Current analysis does not guarantee future results.

As of January 16, 2025 | **Source:** Daron Acemoglu, *The Simple Macroeconomics of AI* (Massachusetts Institute of Technology, 2024); and AB

A topic that these books spend little time on, but that we think is highly important, is the question of how capital is raised in contemporary capitalist economies. For much of the post-WWII period, capital raising has mainly been achieved through a combination of public equities, bank credit and public debt. However, private markets constitute a rapidly increasing share of the capital used to fund growth, both on the

equity and debt sides of the ledger. This trend is intertwined with questions around how widely the benefits of growth are shared in investment portfolios, and the appropriate time horizons for investment. The switch in the sources of capital seems very entrenched, implying a greater share of private assets in strategic allocations. However, when it comes to questions of pension system design in a world dominated by DC investments, where the risk lies with the individual, there is still much work to be done on how to democratize access to such assets.

Lurking in the background of many of these works is the risk of system collapse, be it through revolution, the democratic election of a party that aggressively rejects the electoral norms of recent decades, or through other types of social breakdown related to AI-infused joblessness, inequality or climate disaster. Linked to all these risks is an issue that comes up frequently in our meetings—the importance of geopolitics for market returns. The authors discussed here don't dwell on such apocalyptic scenarios, nor will we. Markets do not do a good job at pricing low-probability-but-massive-impact tail events. Such considerations find their way into asset allocation through the recognition of the possibility that risk premia (equity, credit and sovereign) have all fallen to levels that may not be consistent with long-term equilibrium levels. In our discussions with investors, these issues are crucial to questions of multigenerational planning, for those concerned with such things.

Many of the challenges here lead to questions about the role of government in the economy, be it through regulation from which monopolies may emerge; regulating questions of privacy; responding to fundamental shifts in the job market; or other means. Whether or not governments in developed economies respond to the challenges raised in these books, we think the likely path forward is for greater government involvement in the economy. Yes, the new US administration has focused on cutting costs, but bigger questions have been raised, both for the US and globally. Significant policy changes on global trade and defense show the huge power that governments have to shape the economic stage. We also see greater government involvement in supply chains, including for security reasons. Government spending has become a larger share of many countries' economies for decades, albeit with very different overriding narratives; this will likely become more explicit given the challenges ahead, as raised in these books. Investors therefore need to consider the role of governments in their strategic planning, which we think adds yet another element to the idea that future paths of the economy are inherently riskier, in that one must try to explicitly look across multiple election cycles.

One can always say that the future looks very uncertain. Arguably, this observation could be applied to counter the arguments of bears, who point to current politics and geopolitics as a reason to be fearful. Have we, surely, not been here before? Maybe that is the case for geopolitics. However, the confluence of AI and climate change does seem to be a different kind of risk, which implies that the breadth of paths (or the probability density across possible plausible paths) seems much broader today than has usually been the case. The lesson from this is surely that diversification is

even more important than ever and goes beyond the usual sense of finding assets with low correlations. Diversification also entails thinking seriously about the long-run path risk for the global economy and markets, and searching for assets that can diversify across those paths. This issue has to be part of a broader debate about what risk is (e.g., is it volatility, active risk versus a benchmark or the risk of lost purchasing power?) and what levels of risk are acceptable.

The topics discussed here are not just about long-run investment positioning but also about the role of the industry overall. The social role of the investment industry is an emergent phenomenon, as it is not within the purview of any given fund manager. Nevertheless, it is critical. There is a symbiotic relationship between active investing and capital allocation in an economy. Active investing in this sense is both within and across asset classes; the latter has to be, and is at all times, an active decision. In this sense, the investment industry has a core role in directing capital within the economy and providing return streams that need, somehow, to fund outcomes for broad swaths of society. The questions raised in these books on the future of labor, and on the interaction of capitalism and democracy, will be essential for determining the role of the industry and the nature of investment decisions for years to come.

Chapter 4—Concentration, Illiquidity and De-Equitization

This chapter discusses three investment controversies concerned with market structure. They cover equity market concentration, public versus private assets and de-equitization. These issues are key determinants of the investment opportunity set, the level of volatility investors should expect and, hence, asset allocation.

1. How Concentrated Can the Equity Market Become?

Concentration in Magnificent Seven stocks remains a huge issue for the US market. It raises questions about how risky the "passive" market index is, the opportunity set for investment, the link between the equity market and the real economy, and the outlook for market returns.

There are really two distinct aspects of equity market concentration: (1) stock-level concentration within the market; and (2) the concentration implicit in the weight of the US versus the rest of the world. Most of our discussion deals with the former but discusses the latter to the extent that it is distinct.

Despite all the angst about concentration, we have been here before. The last time the weight of the top 10 US stocks was such a highly concentrated share of the top 500 US stocks was 1969 (*Display 74*). That episode ushered in a prolonged period of decreasing market concentration, most notably in the early 1980s, which hit bottom around 1993.

There have been other episodes if one looks further back in time. While it is hard to get comparable data with which to draw a continuous series, there was another major period of concentration at the end of the 19th century that was succeeded by another prolonged period of deconcentration, from 1903 to 1925.

What drove these prior cycles of deconcentration? The first episode was a result of the trust-busting campaign started by US President Theodore Roosevelt, when the government used antitrust laws to break up monopolies. Notable victories included the 1904 dissolution of Northern Securities Company, which controlled the main railroad lines from Chicago to the Pacific Northwest; the breaking up of Standard Oil in 1911 into 34 separate entities; and the splitting of American Tobacco into four companies in 1911.

AT&T, General Motors, IBM, Standard Oil, General Electric, DuPont and U.S. Steel drove much of the US equity market's growing concentration through the 1930s, 1940s and 1950s. Those seven companies remained among the 10 largest for the

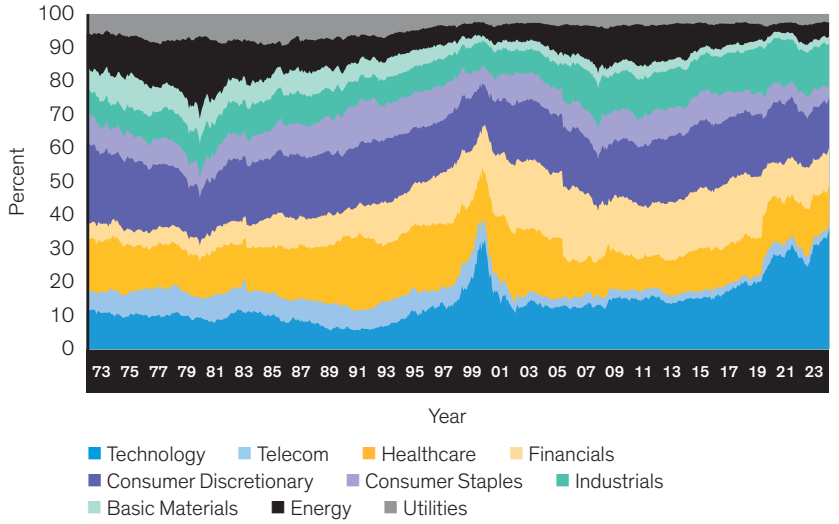
DISPLAY 74: SUMMER OF ’69? WE HAVE BEEN HERE BEFORE

Weight of Top 10 Companies as a Share of the S&P 500

For illustrative purposes only.

Through January 30, 2025 | **Source:** FactSet, S&P and AB

DISPLAY 75: US EQUITY MARKET SECTOR SHARE OVER TIME



For illustrative purposes only.

Through June 28, 2024 | **Source:** LSEG Data & Analytics and AB

majority of that time. From the late 1960s to the mid-1970s, leadership was again concentrated in the "Nifty 50." The ensuing deconcentration was at first led by the demise of this cohort. From a sector perspective, market leadership changed from technology and industrials to energy. Later in the period, an element of regulation also emerged. For example, the breakup of AT&T happened in 1982.

The extent to which concentration has been driven by sector leadership is shown in *Display 75*. The recent period has been more sector-driven than usual, though some of this is due to the specific definitions of sectors.

Because there have been only a small number of deconcentration periods, it may be hard to draw definitive conclusions about what drives them. However, a few salient points stand out. Periods of high concentration are not that unusual, but they tend to be relatively brief. Periods of deconcentration can last a long time (decades, even), so betting against mega-cap stocks from a tactical perspective can be very hard—it's more of a strategic reversion. Trust-busting and regulation have often been an element of the process, but so have shifts in sector leadership. For the purposes of the investment careers of most people in the industry today, and of the majority of datasets used to describe what constitutes a "normal" market, it should be noted that the period from the mid-1980s on saw unusually unconcentrated markets until quantitative easing arrived. This era lowered the cost of capital, and concentration rose to the high level we have become used to in recent years.

Concentration is mainly a feature of markets where value weighting has become the accepted way to determine both the benchmark and opportunity set. However, public equities are rather unique in this respect (*Display 76*). It's true that value weighting is often used to construct bond indices, despite not necessarily being a terribly good idea.

DISPLAY 76: ASSETS WHERE CAP WEIGHTING IS ASSUMED TO BE THE DEFAULT…AND ASSETS WHERE IT IS NOT

Asset Classes That Use Cap Weighting	Assets That Don't Use Cap Weighting
Equities	Private Equity
Bonds	Private Debt
	Commodities
	Currencies
	Real Assets (Farms, Infrastructure)
	Factors

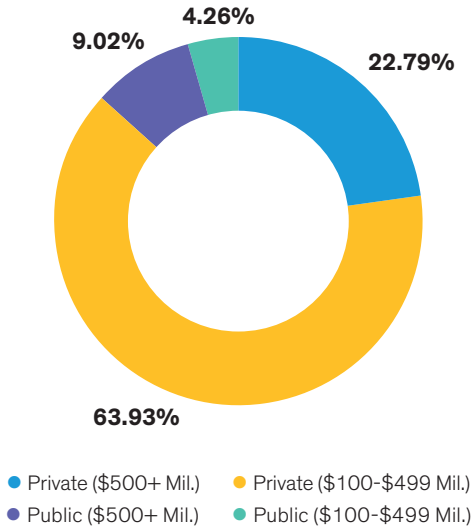
For illustrative purposes only.

As of September 10, 2024 | **Source:** AB

Yes, this approach helps with liquidity, but it also gives prominence to companies or countries with more debt. Most other asset classes are unencumbered by this default assumption of value weighting, so they don't have the same concentration issue.

Arguably, a large part of the case for private assets is that they are not forced to measure themselves relative to a cap-weighted index, giving them more freedom in defining the available opportunity set. For example, the vast majority of companies that have over $100 million in revenues are not listed publicly (*Display 77*). Likewise, commodities, currencies and real assets don't have the same notion of value weighting. We have long argued that investors should view factors as fungible with asset classes.[51] What should the natural default weight across factors be? It is likely to be something similar to equal risk-contribution weighting or simply equal

DISPLAY 77: FEWER THAN 15% OF FIRMS WITH OVER $100 MILLION IN REVENUE ARE PUBLICLY TRADED



For illustrative purposes only.

S&P Capital IQ data as of December 2022; most recent data from US Census Bureau, *Statistics of US Businesses* (2017), used to triangulate S&P Capital IQ estimates for privately held company counts by revenue band

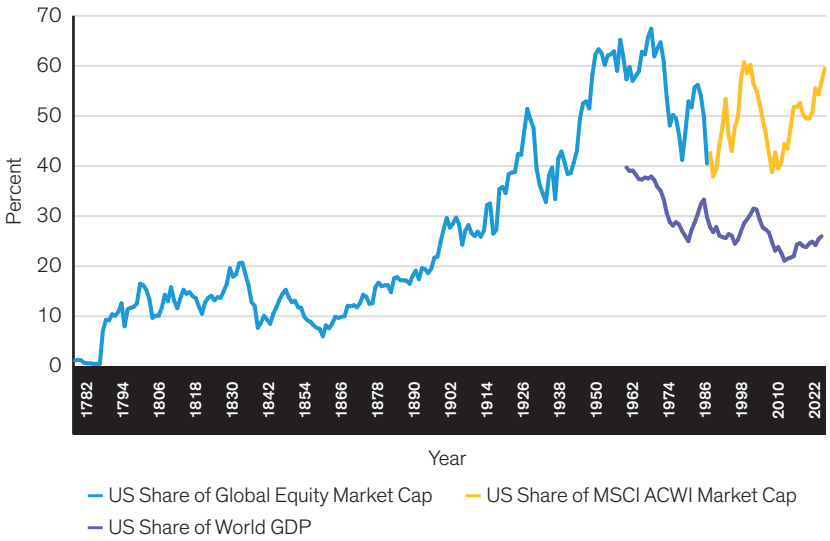
Source: Bain & Company, S&P Capital IQ, US Census Bureau and AB

51 See Inigo Fraser Jenkins and Alla Harmsworth, *Asset Classes and Factors: What's the Difference?* AllianceBernstein, November 2021.

weighting, but market-cap weighting (and hence concentration) is not a feature of that asset class. We should remember that cap weighting is a choice, not a God-given requirement.

Another aspect of concentration is the weight of the US in world indices (*Display 78*). Some of this concentration reflects the success of mega-cap tech names, but much of it reflects the superior growth of the US versus the rest of the world. How does this translate into future expectations? The presence of "expensive" stocks with large weightings in the US market means that some of the US country weight has an element of mean-reversion risk. However, we argue that the influence on the large US weight from superior earnings is much more sustainable. The big downward risks to global growth are shrinking working-age populations, deglobalization and climate change. On all these issues, the US faces less risk than many other countries, so one should not expect a significant shrinkage in US equity market share anytime soon.

DISPLAY 78: WEIGHT OF THE US IN GLOBAL EQUITY MARKETS



For illustrative purposes only.

Through August 31, 2024 | **Source:** Global Financial Data, LSEG Data & Analytics, MSCI and AB

Who is to say what the "correct" weight of the US is, anyway? GDP is as good a reference as any. There is a *prima facie* case that the weight of the US in global equity markets looks odd compared with its global GDP share. The US weight in the MSCI All Country World Index has risen from 43% to nearly 60% since the late 1980s, but its weight in global GDP has fallen from 28% to 26% over the same period. The ratio of market cap to GDP is sometimes referred to as the "Buffett indicator" for valuation, so this might not seem an auspicious position for the US. However, the ratio is of more use for a single country over time than a comparison among countries. The relative size of the Chinese and US equity markets to their economies reflects how capital is raised to fund growth. It is unlikely that China would adopt a US style of public equity capital raising anytime soon, so, again, we think that this element of a relatively concentrated equity market versus GDP will likely remain for a long time.

What does this mean for investors? If most of the market moves are a function of a handful of stocks, it is very hard to have superior knowledge about them and hard to overweight them. Thus, this recent concentration period has not been a good environment for active investing. On the other hand, is it great for passive investments? In the sense that the US market happens to have delivered strong returns, passive investors have had a good experience. The cost of not having full exposure to the US in a global portfolio—or of not having full exposure to US mega-caps—would have been devastating for performance, as many investors have now ruefully learned. But on a forward-looking basis, things are not so rosy. The concentration of returns does make an investment in the passive market riskier.

We will get pushback on this point: "Is the market really riskier? I mean, really?" What is the basis of the claim that ex ante risk of a passive market position has risen? We see three elements:

1. We think recent volatility has been odd and sits oddly with the overall environment. High valuations do not necessarily lead to a market sell-off, but they do point to an increase in volatility. If we layer on the degree of macro, then we think there is a strong case that realized volatility will be higher.
2. Concentration has a role to play in the risk of a drawdown. In *Display 79*, we show the result of a simple regression of the two- or five-year forward drawdown (in the US) on starting levels of the Shiller PE ratio and market concentration. It demonstrates that concentration is a predictor of drawdown risk over and above the level of starting valuation. We can think of the reason for this as the exposure to the "torpedo risk" of a large company underperforming expectations and having an outsize impact on the index.
3. Investors are asking a lot more from the passive index than they have in the past. When one considers the barbell nature of allocations to passive public markets and active private markets, then the passive index is now the largest risk contribution to US pension fund portfolios (*Display 80*).

DISPLAY 79: EQUITY MARKET CONCENTRATION AND DRAWDOWNS

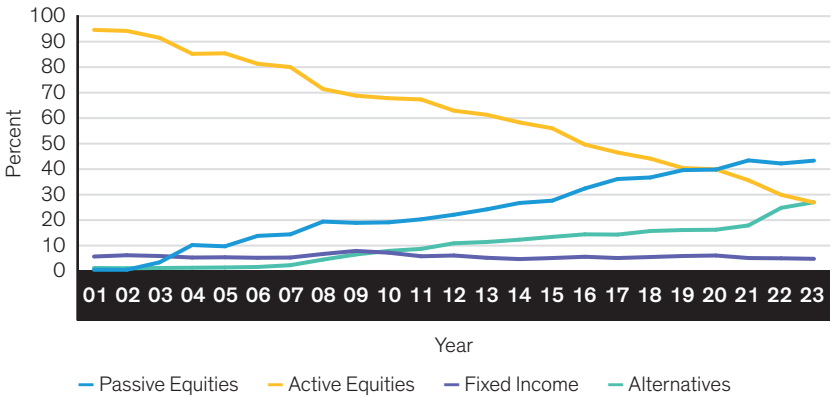
Two-Year Forward S&P 500 Drawdown		Five-Year Forward S&P 500 Drawdown	
Variables	**T-Stat**	**Variables**	**T-Stat**
Starting Weight of US Top 10 Stocks	–5.76	Starting Weight of US Top 10 Stocks	–5.99
Starting Shiller PE Ratio	–9.57	Starting Shiller PE Ratio	–12.83
Adjusted R2	14%	Adjusted R2	22%

Past performance does not guarantee future results.

The regression covers the period from June 1969 to August 2024.

As of September 15, 2024 | **Source:** FactSet, Robert Shiller's database, S&P and AB

DISPLAY 80: RISK CONTRIBUTION FOR US PENSION FUNDS BY ASSET CLASS



Past performance does not guarantee future results.

For this graph we used the capital allocation of US pension plans as the base, and assumed that "alternatives" is a 50/50 combination of private equity and hedge funds. For private equity, we used a public-market-equivalent time series (essentially a smaller-cap, value-tilted index with leverage). For hedge funds, we used the HFRX Aggregate Index. Given the constraints on data availability for alternatives, we used a constant variance/covariance matrix over the full time period, rather than a rolling one. For fixed income, we used the Bloomberg Global Aggregate Total Return Index.

Through December 31, 2023 | **Source:** Bloomberg, Hedge Fund Research, LSEG Data & Analytics, Public Pension Plans Database and AB

The key reason for owning equities is to deliver positive real growth in portfolios, especially in the context of higher equilibrium inflation. This is the core element driving our strategic overweight recommendation. Is there a danger of this goal being imperiled if cap-weighted earnings growth is so divorced from growth in the economy? This is more of an open question: the attribute that equities must deliver to be attractive is a positive real return. Past experience suggests that the link to the real economy will reassert itself (albeit slowly) over time.

In conclusion, periods of concentration have not tended to persist in the past. To answer the question that we posed at the beginning of this section, it seems reasonable to expect that the current concentration will not persist over strategic horizons and that, with time, the market will become less concentrated. Regulation and antitrust-like actions may well be a part of this, though there may also be limits in an age when national tech champions could be seen as an advantage in geopolitical rivalries. Concentration suggests that risk has risen, in contrast with recent low volatility. Investors with a short time horizon concerned about drawdowns may wish to compensate for this risk elsewhere in their allocations, but it does not undo the case for equities overall.

2. How High Can the Allocation to Private Assets Go?

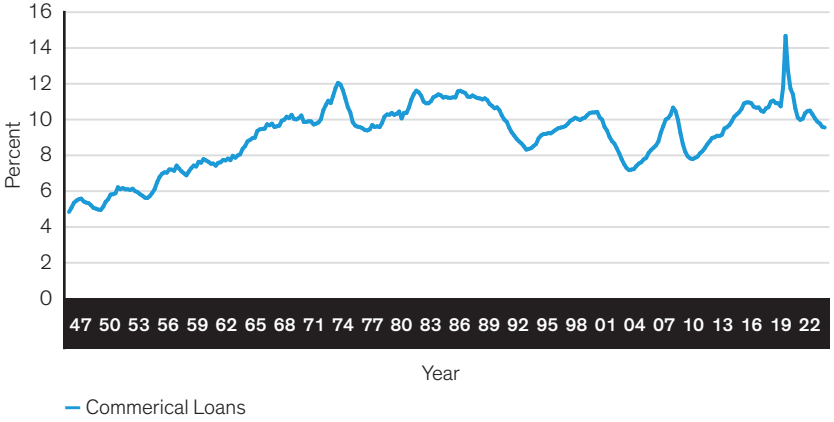
We do not see the migration to private assets as a fad; two types of forces imply that mean private allocations will continue to rise. First, there is demand from investors. We see this as driven by the need for real returns and the hunt for diversification in a world where bonds are likely to be less effective diversifiers of equity risk. To be clear, we see the diversifying power of private assets stemming from the ability to access parts of the economy not listed in public markets, not arising from stale prices. A second force supporting higher private allocations is supply. In this case, "supply" refers to the capital-raising needs of corporations. With progressively smaller shares of capital in the contemporary economy raised in public markets or from bank credit, corporations are inevitably looking to private capital.

The size of the US commercial loan market as a share of GDP has been flat for decades and has shrunk over the last five years (*Display 81*). With banks likely to continue stepping back from credit provision, other sources of funding will have to step further into the market.

The significant inflows to private assets in recent years have pushed institutional allocations up (*Display 82*). For US pension funds, allocations are above 25% today; endowments' allocations are above 45%. For insurance investors, the allocation averages less than 10%.

The main caveat that we have outlined elsewhere is that we no longer see a case for an illiquidity premium being available, on average, for private equity—the category that has received the lion's share of inflows. Thus, we think that the marginal dollar of private capital from here is likely headed into other areas.

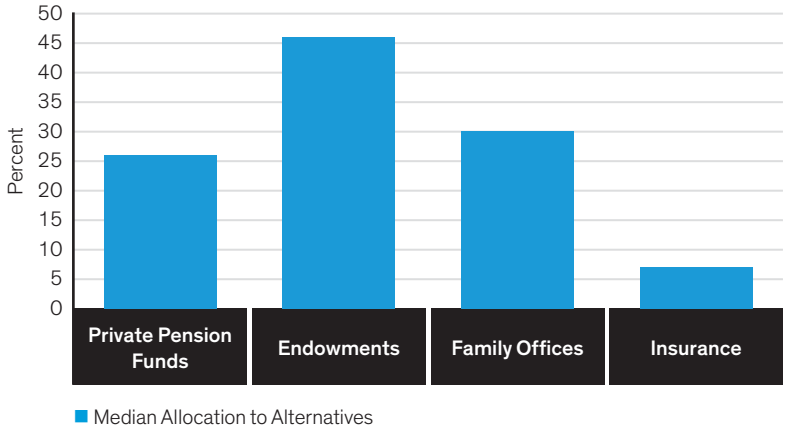
DISPLAY 81: COMMERCIAL LOANS AS A PERCENTAGE OF GDP



For illustrative purposes only.

Through June 30, 2024 | **Source:** Federal Reserve Bank of St. Louis and AB

DISPLAY 82: US INSTITUTIONAL INVESTOR ALLOCATION TO ALTERNATIVES



For illustrative purposes only.

Through June 30, 2024 | **Source:** Preqin and AB

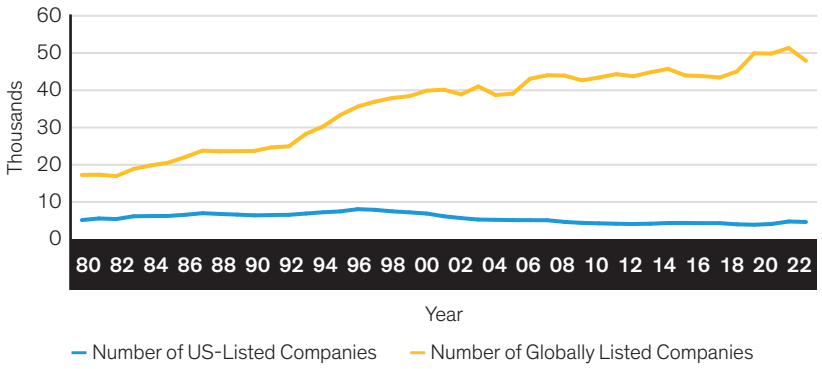
3. De-Equitization: How Far Can the Public Equity Market Shrink?

There have been two great forces levering up the financial system in recent decades. One has been the expansion of public sector debt, as we discuss elsewhere in this book. The other, which is sometimes overlooked, is the multidecade process of de-equitization. Some of this process has been driven by debt-funded buybacks, but a shift in issuer preferences toward private markets has also played a role (in the case of private equity, the exposure is usually levered).

The number of listed equity shares in the world is declining. This is driven both by a reduction in the number of listed companies and also by a reduction in the number of listed shares of those companies. In developed markets such as the US, the number of publicly listed companies has fallen over time. If we include emerging markets, there had been a trend increase in the number of listed companies (as one would expect in growing economies with capitalist systems), but this has slowed markedly over the last decade (*Display 83*). The real de-equitization story, though, is the reduction in the number of listed shares for companies. On this basis, equity markets have become significantly smaller. Yes, the price has gone up, but the number of shares has decreased. For the US, the number of shares has declined by around 2% annualized since peaking in 1996 (*Display 84*).

Even when we include emerging markets, the only meaningful increase in the number of shares for the MSCI All Country World Index in the last decade occurred around the time of a change in the index inclusion factor for Chinese equities. We do not regard

DISPLAY 83: NUMBER OF LISTED COMPANIES—GLOBAL AND US

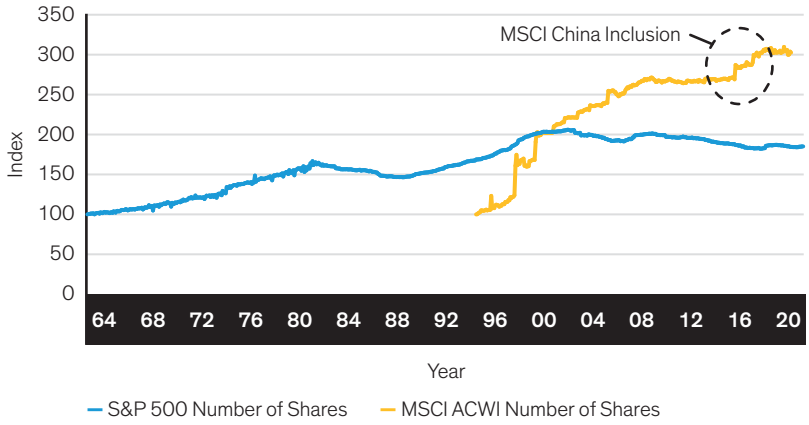


For illustrative purposes only.

Through December 31, 2022 | **Source:** LSEG Data & Analytics, World Bank and AB

that change as economically meaningful, at least not in the sense of the underlying supply of equity capital. This lack of growth in the number of shares for emerging markets is all the more striking because these markets presumably need capital to fund growth.

DISPLAY 84: THE NUMBER OF LISTED SHARES IS DECLINING IN DEVELOPED MARKETS, AND ONLY RISING IN EM BECAUSE OF AD HOC CHANGES IN THE CHINA INDEX INCLUSION FACTOR



For illustrative purposes only.

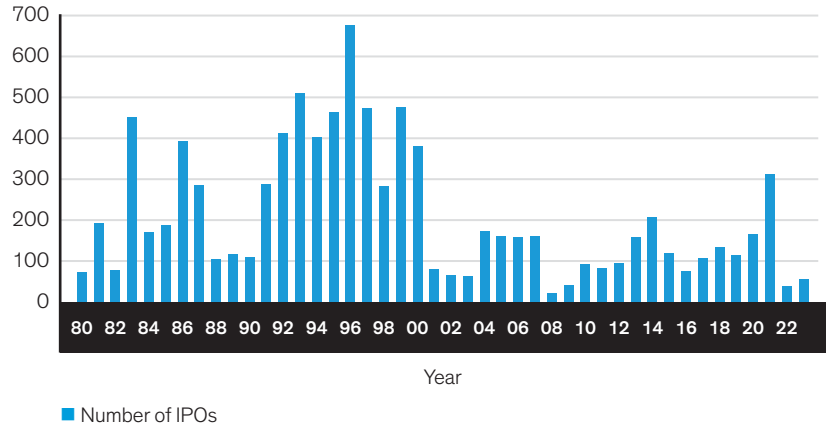
The number of shares is expressed as an index. The circled area shows the impact of the change in the MSCI inclusion factor for China equities.

Through February 28, 2023 | **Source:** LSEG Data & Analytics, MSCI, S&P, World Bank and AB

Two distinct forces are driving this decline—a lack of new issuance and a high level of corporate buybacks. In our view, this makes the pattern more likely to persist.

In *Display 85* and *Display 86* we show the number of initial public offerings (IPOs) each year in the US and their size as a percentage of listed firms. The run rate of issuance is one-10th of its rate in the 1980s and 1990s. Reasons for the decline include firms eschewing the disclosure requirements of public listing and the shift in corporate capex from tangible to intangible assets that require less upfront capital. On this latter point, there are tentative signs of a capex renaissance associated with the grid, renewable energy and the infrastructure needs of AI (*Display 87*).

DISPLAY 85: NUMBER OF NEW IPOs



For illustrative purposes only.

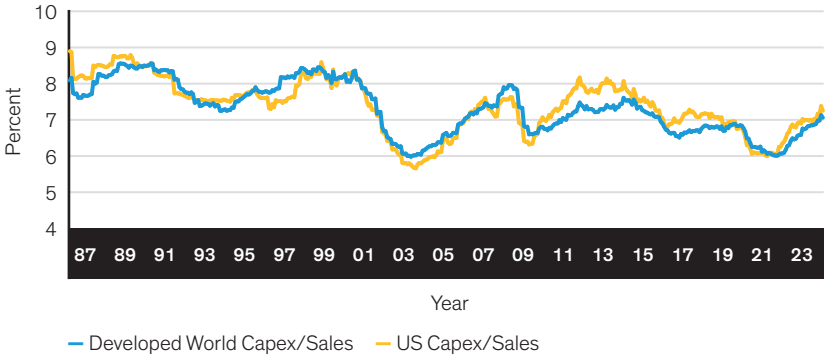
As of December 31, 2023 | **Source:** Jay R. Ritter, *Initial Public Offerings: Updated Statistics*, May 10, 2024; Thomson Reuters; World Bank; and AB

DISPLAY 86: SIZE OF NEW IPOs AS A PERCENTAGE OF MARKET CAP

For illustrative purposes only.

Through December 31, 2022 | **Source:** Jay R. Ritter, *Initial Public Offerings: Updated Statistics*, May 10, 2024; Thomson Reuters; World Bank; and AB

DISPLAY 87: TENTATIVE SIGNS OF A CAPEX RENAISSANCE?



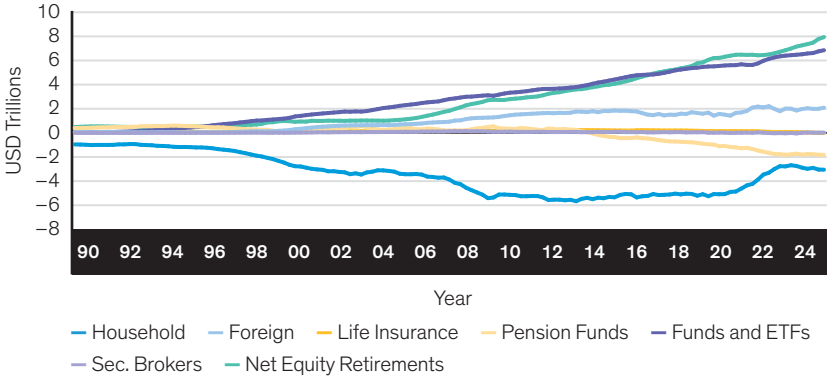
For illustrative purposes only.

Through February 12, 2025 | **Source:** FactSet and AB

The other force at work is, of course, buybacks. Corporations have been the largest source of equity buying for over a decade, outstripping demand from investors (*Display 88*). Although this trend is further advanced in the US, it is now an embedded feature of all developed equity markets. It is a response to the perceived opportunity set versus the cost of capital, but more fundamentally it reflects a corporate system in which many key performance indicators that determine management pay are often couched in per-share terms. This represents a negative externality at the system level—the resilience of the economy is not reflected in incentives at the company level.

Looking across regions, there is a clear pattern of developed markets seeing a shrinking number of shares, but also a slight expansion in the emerging-market share base (at least historically, if not recently). There are two ways to estimate this. One can either calculate the average net buyback yield over time or compute the change in the number of indexed shares over time. On this basis, while the US saw the strongest consistent shrinkage in the number of listed shares, it was a feature of other developed markets too. Japan, for instance, has had an average net-buyback yield over the last decade of 0.6% annualized and a reduction in the number of indexed shares of 0.4% annualized. For the UK, these numbers were 0.5% and 0.3%, respectively. For Asia ex Japan (dominated by China), the average net issuance yield has been –0.6% over the last 10 years, with the number of indexed shares increasing by 1.4% (*Displays 89 and 90*).

DISPLAY 88: CUMULATIVE NET ACQUISITION OF US CORPORATE EQUITIES, 1990–2024



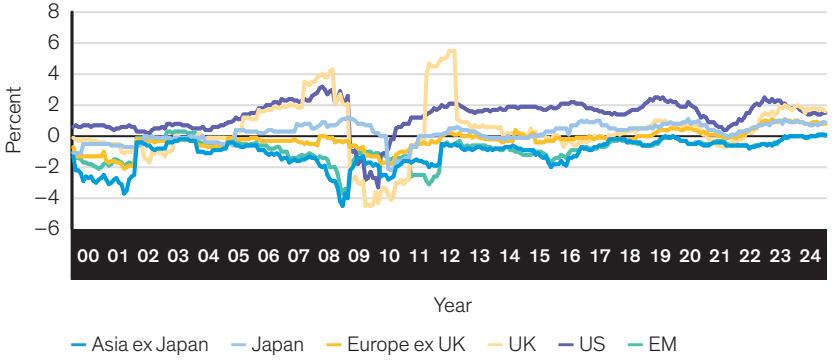
For illustrative purposes only.

Pension funds: government, state and local, and private pension funds

Funds and ETFs: mutual funds, closed-end funds and ETFs

Through March 31, 2024 | **Source:** LSEG Data & Analytics, US Federal Reserve Board and AB

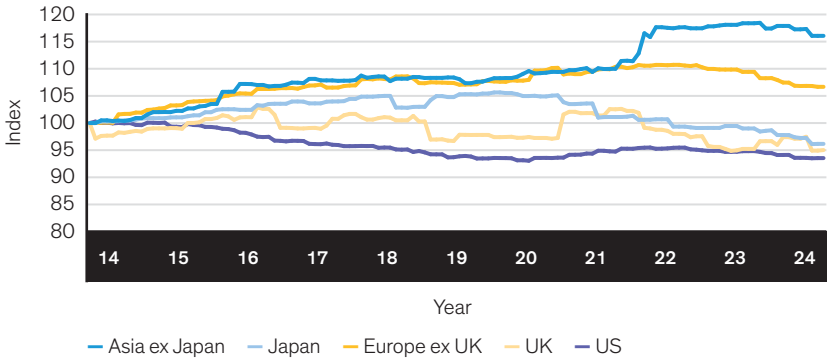
DISPLAY 89: NET BUYBACK YIELD BY REGION



For illustrative purposes only.

Through September 9, 2024 | **Source:** FactSet and AB

DISPLAY 90: QUANTIFYING DE-EQUITIZATION (CHANGE IN NUMBER OF SHARES BY REGION)



For illustrative purposes only.

Through August 31, 2024 | **Source:** LSEG Data & Analytics, MSCI and AB

Is the stock market actually shrinking? One pushback we have received on this point is that market cap has continued to rise because prices have gone up much faster than the number of shares has come down. We think that the number of companies and shares does matter, because their reduced number implies scarcity. But even if one rejects such a view, the increase in total market cap in recent years is really just a happenstance of a recent bullish history. Thus, in forming forecasts of equity returns, we think this reduction in supply is an important pervasive factor.

Public equity (along with bank credit) had been the major source of capital for funding growth since WWII. However, in the contemporary economy, the role of public equity (and bank credit) is shrinking.[52] The net reduction in the supply of equity, buybacks in particular, is an example of levering up the system. This effect is not isolated and must be put in the context of other levering up taking place in parallel. The level of public debt/GDP has climbed in a straight line since the end of the gold standard in the early 1970s. The presence of a cushion of liquid equity capital is, we would argue, a public good, and its removal creates negative externalities. As with the growth of public debt, there is no theoretical level that constitutes a definitive problem. It just makes the system less robust.

52 See Inigo Fraser Jenkins et al., *Fund Management Strategy: What Is the Point of the Stock Market (in a Capital-Light World)?,* Bernstein Research, April 17, 2019.

If governments wanted to curtail this process, they have one blunt option: a tax on buybacks, an approach that occasionally appears on the political radar in different countries. In May 2024, Liberal Democrats in the UK issued a manifesto prior to the general election calling for a 4% tax on buybacks.[53] They did not get elected, but the effort is an example of politicians starting to notice the issue. In February 2025 the French Parliament approved a finance bill that allows for a tax on buybacks. A more subtle approach would be to steer management's key performance indicators away from per-share metrics that companies can manipulate with buybacks. Both of these options seem unlikely at the moment, so public equities will likely continue to benefit from the steady tailwind of a net reduction in supply.

53 Liberal Democrats, "A Share Buyback Tax to Boost Growth and Fund Public Services," May 31, 2024.

Part II: Responses

Chapter 5—Pensions and Bonds: The End of the Affair?

*(**David Hutchins** is a coauthor of this chapter.)*

The role of bonds in pension systems is set to change. The large default allocation to bonds by pension funds has been a function of the large proportion of defined benefit (DB) funds and, until recently, quiescent inflation. We do not think either of these forces still holds. The combination of increased longevity, higher-equilibrium inflation and lower growth rates implies that the strategic asset allocation of pension systems is likely to change.

To be clear, there is still a role for bonds, but via active fixed income or as part of longevity insurance, which is very different from large passive holdings of long-duration government bonds. We explore the options that pension systems have to adapt their strategic asset allocations in the face of a new investment regime.

There's a stark conclusion in applying our forecasts for asset-class real returns to someone earning a median salary and paying 8% of it each year into a simple target-date structure that "de-risked" into bonds in the mid portion of their career before they retired at 65. That person, if they are early in their career and starting that process now, would face a "hardship outcome" below the minimum level deemed necessary for retirement.

We have taken the title of this chapter from Graham Greene. It seems appropriate to reflect the view expressed in his novel that a sense of unhappiness is much easier to convey than one of happiness. When structuring retirement systems, the intent should be, we argue, to minimize the risk of unhappiness for many at the prospect of their life in retirement. At the moment, retirement systems are not set up that way.

Putting aside for the moment the minutiae of optimal asset allocation, our overarching point is that the ability to offer (and indeed any expectation to receive) guaranteed income is going away. This is, *inter alia*, the consequence of 100 years of improved life expectancy, as well as the unwinding of a special set of macro conditions in the second half of the 20th century (mainly quiescent inflation and strong real growth). In addition, the fall in birthrates to below the replacement rate both lowers expected economic growth rates and makes it infeasible to attempt to transfer the cost of retirement to future generations (which would be morally questionable, anyway). The consequence of this shift is that nominal liability managers are in terminal decline. A combination of increased longevity, higher inflation and lower growth implies that a change in asset allocation is needed, including the option of buying longevity insurance.

Lower returns on equities, positive correlations with bonds, higher inflation and greater longevity force defined contribution (DC) plans to make uncomfortable compromises. The options are later retirement, higher contributions, lower retirement income or higher investment risk. There is another potential path for the system overall, albeit not for individual funds: to dump the risk onto later generations. Countries that don't even attempt to fund retirement, such as Italy, do this already. However, this approach raises profound questions of intergenerational fairness and is doubly hard given shrinking working-age populations and the observation that younger cohorts are less well off than older cohorts were at the same age.

We want to be clear at the outset: we are not suggesting that pension funds should not hold any bonds; it's more that their role in pension allocation is changing. There is a role for bonds within longevity insurance/pooling, but as we will show, this may become a limited role that requires a new type of bond. There is also an important role for liquidity (although overall liquidity needs are small). Strategically, earning a default "premium" is a potentially attractive element within a broad array of asset and factor risk premiums, and our view that investors must increase allocations to alpha in a low-return world leaves ample space for active fixed income. But in all of this, the overall pension exposure to passive longer-duration government bonds is going to be significantly attenuated.

If pension funds are set to have fewer government bonds, what asset classes are set to benefit? We think the main shift will be an increase in strategic asset allocation (SAA) toward real assets (we include equities as a real asset). Private assets overall will likely see an increased allocation too (in part reflecting both investor needs and the change in the locus of marginal capital raising in the economy). There will likely also be increased allocations to strategies that seek to address longevity risk.

Many aspects of this issue have more to do with politics than with finance, and a somewhat ugly symbiotic relationship between governments and pension systems. Large pools of pension assets that seek to invest in real assets will be very tempting targets for politicians trying to influence or direct this capital to a long list of pet projects. These might include infrastructure; national champions; and environmental, social and governance (ESG) goals. At the same time, any reduction in pension fund holdings of government bonds raises questions about both the absolute cost of borrowing and bond volatility, as the demand for shorter-term bonds leads to more frequent refinancing. The question is already asked: Who on earth is expected to buy the large amounts of debt set to be issued in the coming years?

There is another political aspect—where the risk sits for funding retirement. There has been a mass transfer of this risk onto individuals in recent decades. Arguably, this was acceptable when it was easy for individuals to buy simple and cheap products (passive 60/40 funds, say) that strongly outperformed inflation, with a low level of risk. We argue that that is no longer the case, which raises the question of whether the "social compact" implicit in the transfer of retirement risk onto individuals is still intact. As we discuss in this chapter, the choices for pension systems in aggregate

are (1) force people to retire later; (2) lower real payouts in retirement; (3) dump the problem onto future generations (which would only work if mass migration were allowed to offset declining populations in developed economies); or (4) allow the pension system to take more risk. Put in these stark terms, the latter option of taking more risk seems far more politically palatable than the other options. Expect Treasury departments to lean on pension regulators accordingly.

We sometimes hear people say that governments are not on the hook in countries like the US, the UK and the Netherlands because these nations have funded systems. This is a fiction. If the investments made to fund retirement end up being insufficient, then governments will end up being on the hook regardless of the small print of the current system. If they don't think they are responsible for these payments, it only takes one election cycle to change that. Expect regulation of the industry to change as a consequence. Because of the nature of the issues at stake—retirement age, potential social transfers, the regulatory structure of pension systems, the capital needs of government spending and intergenerational fairness—only governments have the mandate to chart an overall response.

There are other examples of this interaction of politics, SAA and the ultimate funding of pensions. Japan's Government Pension Investment Fund (GPIF) made a significant change in its SAA a decade ago, significantly increasing its holding of overseas equities. This shift represented an increase in portfolio risk in the sense of volatility, but this is arguably what governments should do, given that they are ultimately on the hook for all retirement costs and are able to bear long-term risk. This shift on the part of the GPIF now looks very fortuitous, as the resulting gain from that extra risk now amounts to 10% of Japan's GDP.[54]

In a somewhat different fashion, the German government announced in early 2024 that it would launch a sovereign wealth fund as an additional pension scheme investing in capital markets. This case is different from that of the GPIF, as it is a new arrangement and funded by government debt. Leaving aside the politics of such a decision, this essentially reflects the need to maintain a given level of real payouts in the face of demographic changes.

Displays 91 and 92 show the asset allocation for the aggregate pension systems of seven countries with major pools of assets to fund pensions. Since 2017, there have been significant changes in these pools of assets.

- In most markets, the mix between DB and DC has shifted decisively in favor of the latter.
- Despite this shift to a larger weight for DC, US and UK allocations to equities have fallen while bond allocations have increased. This change is particularly stark in the UK, with the equity weight in the pension system falling by half. US pension plans

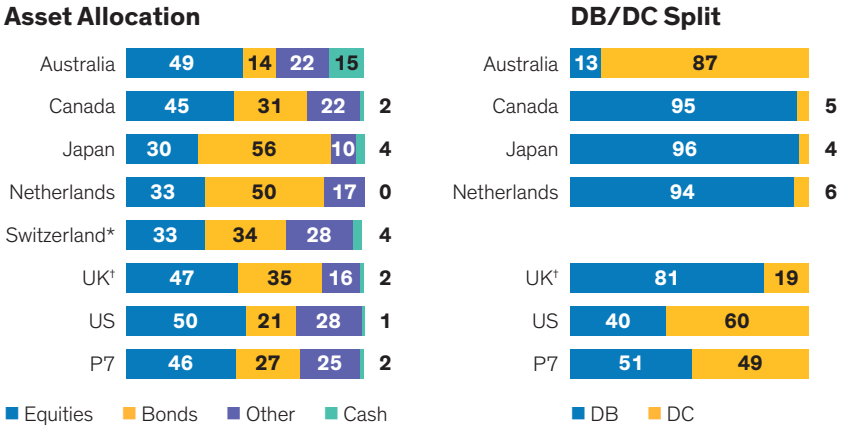
54 Robin Harding, "What Japan's Most Profitable Policy Experiment Can Teach Us," *Financial Times* (May 15, 2024).

have been net sellers of public equities over the last decade.[55] This juxtaposition of a larger DC component with a smaller exposure to equities is, we think, shocking. It ultimately raises serious questions about whether this governance is correct.

- Australia and Canada have undergone a different evolution, with the weight of bonds being more stable while risk assets (either equities or alternatives) have maintained a higher share.

The extreme de-risking of the UK pension system into bonds reflects a regulatory imperative to force matching. In general, the move to a greater bond weight across these systems overall also reflects a history of (until recently) quiescent inflation and low inflation volatility.

DISPLAY 91: ASSET ALLOCATION AND DB/DC SPLIT—2017 (PERCENT)



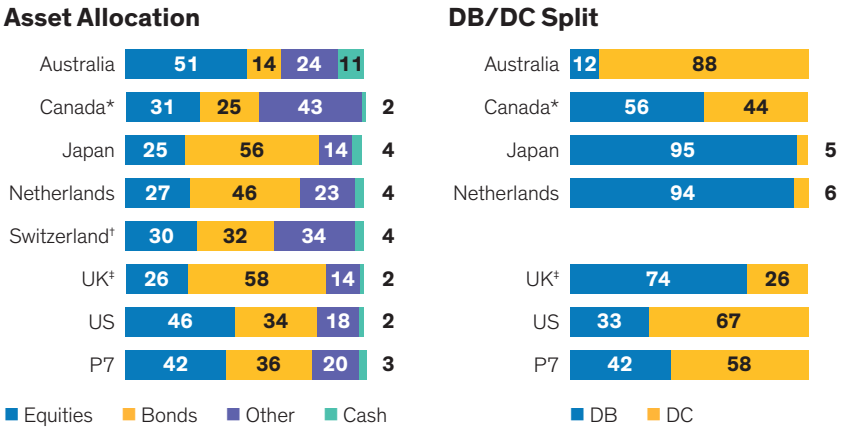
Past performance does not guarantee future results.

P7: combined averages for the seven largest markets listed in the display. | Numbers may not sum due to rounding. | *DC assets in Switzerland are cash balance plans where the plan sponsor shares the investment risk and all assets are pooled. There are no pure DC assets where members make an investment choice and receive market returns on their funds. Therefore, Switzerland is excluded from this analysis. | †In January 2017, the UK's Office for National Statistics stated that the figures previously disclosed for DC entitlements were significantly overestimated. As a result, there is a significant decrease in UK DC pension assets when compared with the previous editions of this study. This change has a very limited impact on the DC assets of the P7 (on the order of a 1% reduction).

As of January 31, 2017 | **Source:** Office for National Statistics, Willis Towers Watson and AB

55 The net buying of US equities by corporations themselves, passive exchange-traded funds and foreigners has been much greater in scale than the sales by US pension plans.

DISPLAY 92: ASSET ALLOCATION AND DB/DC SPLIT—2023 (PERCENT)



Past performance does not guarantee future results.

P7: combined averages for the seven largest markets listed in the display. | The data cover the largest 300 pension funds globally, including public pension plans, sovereign funds, corporate plans and private sector organizations authorized to manage pension plans from different employers. | Numbers may not sum due to rounding. | *Canadian DC assets now include individual accounts. Historical figures have been restated. | †The majority of pension fund assets in Switzerland are DC and take the form of cash balance plans, whereby the plan sponsor shares the investment risk and the assets are pooled. Pure DC assets have only recently been introduced in Switzerland, and although they have seen strong growth, they are not yet large enough to justify inclusion in this analysis. | ‡In January 2017, the UK's Office for National Statistics stated that the figures previously disclosed for DC entitlements were significantly overestimated. As a result, there is a significant decrease in UK DC pension assets when compared to the previous editions of this study. This change has a very limited impact on the DC assets of the P7 (on the order of a 1% reduction).

As of January 31, 2023 | **Source:** Office for National Statistics, Willis Towers Watson and AB

In Displays 91 and 92, the data are backward-looking; this chapter analyzes how the allocation is likely to change in the future. We think the allocation is set to change for two reasons. The first is our case that we are in a new investment regime with a higher-equilibrium level of inflation and lower real growth. For complete details of our assessment of this, please see our May 2024 book, *A Preliminary Language for a Post-Global World*. The second reason is the case for an acceleration in the shifting mix of the pension system between DB and DC. While DB assets are still sizable, their share of total pension assets will continue to fall. Taking the view that the majority of DB assets are "dead money," from the perspective of the dynamics of asset flows, the more interesting intellectual debate and real impact from any reallocation of assets really comes down to DC funds.

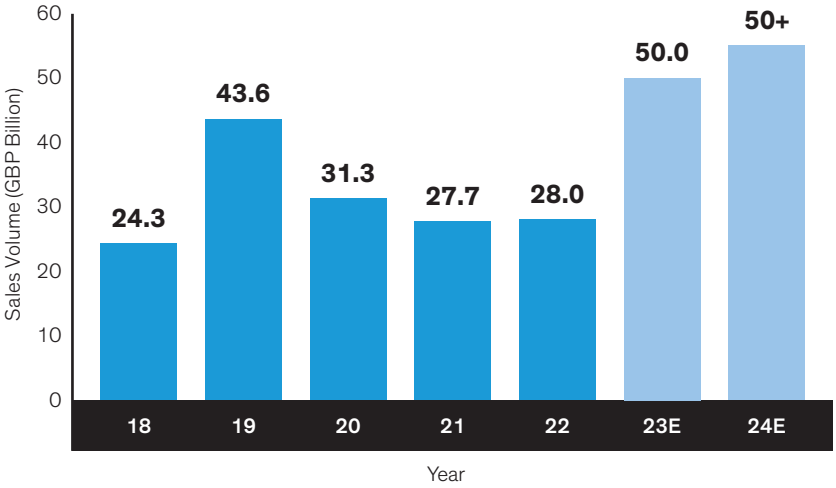
DB: Becoming Less Relevant

DB is largely headed down the path of buyouts, apart from quasi-government plans such as UK local-authority and US state plans. The pace will be much faster now than was thought before, given the way rising rates have improved funding status. While the industry might obsess about the rate of buyouts by insurance companies, this is all pretty boring from the point of view of investing dynamics. Many of these assets are already in government bonds or moving in that direction, so it is really just a question of who owns and manages them. When in a buyout structure, a share of these assets could be in public or private credit allocations as well. However, the main action taking place is in the changing SAA needs of DC funds and the bigger question of what the next iteration of retirement savings will be as we look beyond DB and DC.

The year 2023 saw a record amount of pension assets being bought out in the UK and was one of the largest-ever years for such deals in the US (*Displays 93 and 94*). This surge is a direct consequence of rising bond yields reducing the value of liabilities, thereby improving the funding ratios of plans. At the end of 2023, the average funding status of US corporate DB plans was 104%.

DISPLAY 93: VOLUME OF UK DB PENSION FUND BUYOUTS

Total Volume Across the UK Market



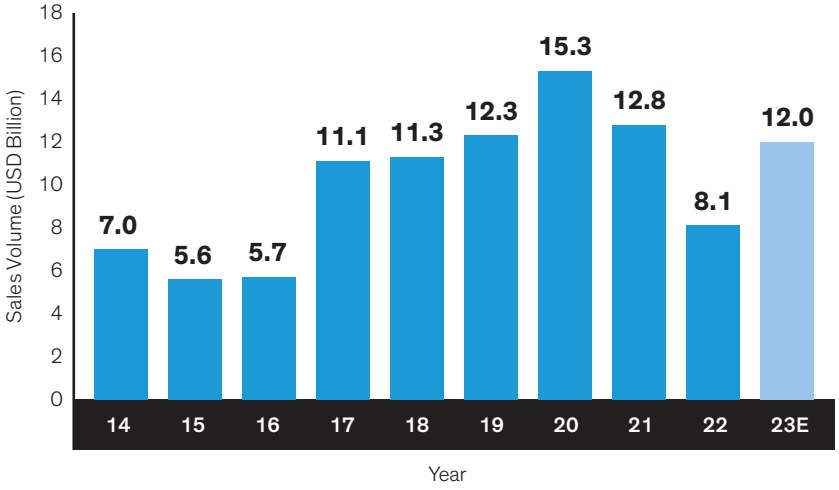
Past performance does not guarantee future results.

Historical volume from Hymans Robertson, *Risk Transfer Report 2024*. Estimated figures for 2023 and 2024 are based on LGRA's analysis.

As of February 2024 | **Source:** Hymans Robertson, LGRA and AB

DISPLAY 94: VOLUME OF US DB PENSION FUND BUYOUTS

4Q 2023 Total Market Volume



Past performance does not guarantee future results.

4Q 2023 projected figure based on estimates from Legal & General Retirement America (LGRA).

As of February 2024 | **Source:** LGRA; LIMRA Secure Retirement Institute, *US Group Annuity Risk Transfer Sales Survey*

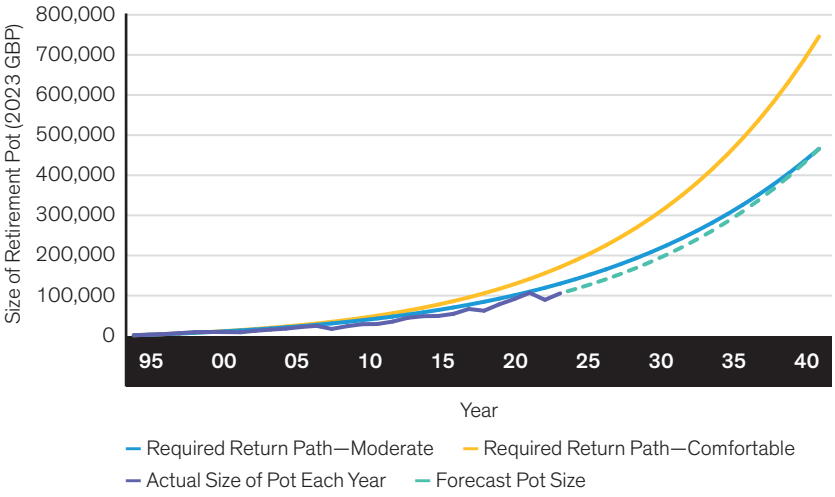
DC: The Problem

DC funds have maintained a large allocation to risk assets overall, but target-date structures tend to reallocate into bonds as people get closer to retirement.

Display 95 shows the size of the total pension pot required to achieve a comfortable or moderate retirement in the UK and how the path to that level should ideally evolve over the course of a working life. We also take 2040 target-date funds as a case in point, plotting the achieved return of an average of 2040 target-date funds from the point when they were first formulated until the present.

The point of this display is to show that this cohort of target-date funds has done well, delivering an average real return of 4.25% annualized since inception. However, there is no cushion to help weather the prospect of lower real returns in the future. From today's level, such funds would have to generate a real return of 7% annualized in order to achieve a moderate level of retirement assets, a level that we regard as unattainable on a mass scale.

DISPLAY 95: UK 2040 TARGET-DATE FUND, REQUIRED AND ACTUAL RETURN



Past performance does not guarantee future results.

This analysis assumes an 8% salary contribution per year and salary growth of CPI +1% per year. "Moderate" and "comfortable" retirement levels are defined by the Pensions and Lifetime Savings Association (PLSA). A "moderate" outcome is defined as earning 67% of the median UK salary and a "comfortable" outcome is defined as earning 107% of the median UK salary. The analysis assumes retirement at age 65 with no government safety net. Actual size of savings pot is calculated using the US 2040 target-date cohort, and the forecast savings pot size assumes a 5% real return.

As of May 30, 2024 | **Source:** PLSA and AB

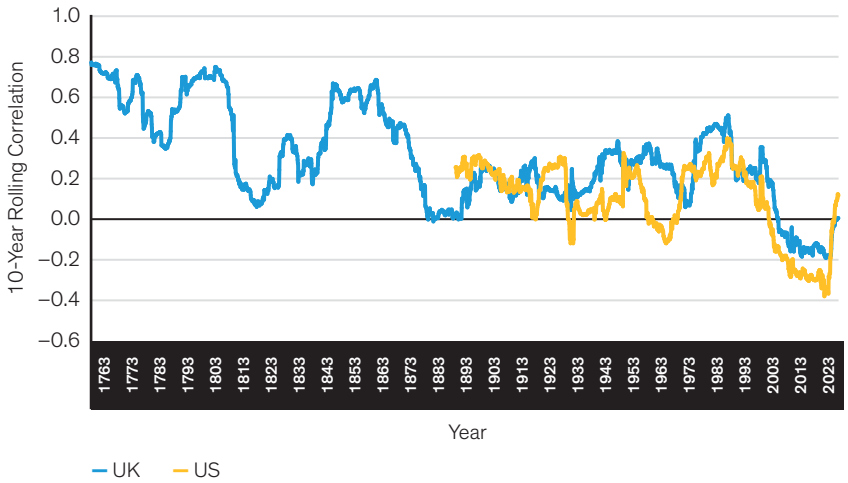
The presence of a UK state safety net makes the "moderate" outcome much easier to achieve, which would imply a need to only track inflation from here on, so that a zero real return would be sufficient. However, (1) a "comfortable" retirement would still require significant real returns; and (2) the generosity of state safety nets in real terms has to be questioned, given that the government debt/GDP ratio is at the top end of its 80-year range. This constraint on governments raises the question of how much people would be willing to rely on that backstop. Falling birthrates and the declining relative wealth of younger cohorts raises yet more questions about the generosity of future state support.

But what return is likely? In the introductory chapter, we discussed that we think the real return versus risk "space" available to investors will likely shrink in the coming decades compared with what has been available over the last four decades. This is

not a bearish expectation, because we think that the returns of major asset classes will be positive in real terms, but it is a more difficult outcome.

Moreover, the task is actually even more difficult: we also think that the negative correlation between stocks and bonds, which has driven so much diversification potential in recent decades, will not persist—it will instead move back to a more normal small positive number (*Display 96*). Aside from a positive correlation in stock and bond returns being the historical norm, the rationale for this relationship applying over the coming decade is that the main forces at work on structural inflation (deglobalization, demographics and the energy transition) are all either growth-agnostic or consistent with lower growth. This inverts the relationship between growth and inflation from its normal positive linkage in recent decades.

DISPLAY 96: LONG-RUN STOCK-BOND CORRELATION



Past performance does not guarantee future results.

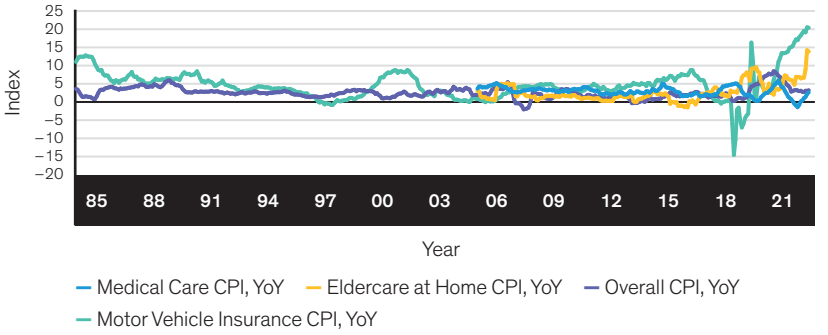
Rolling 10-year correlation between stock and bond returns

Through February 28, 2025 | **Source:** Global Financial Data, LSEG Data & Analytics, Robert Shiller's database and AB

An earlier chapter in this book made the case for higher-equilibrium inflation. However, it is one thing to talk about the aggregate Consumer Price Index (CPI) for a given country, but an individual saving to cover spending needs later in life may face multiple sources of inflation that could be higher. Healthcare costs and insurance costs are examples of

persistent inflation that are well in excess of CPI (*Displays 97 and 98*). For example, the average rate of price increases in the US for elder care has been 3.2% annualized over the last decade. The implication is that achieved returns on savings products may need to be several percentage points above CPI just to preserve purchasing power.

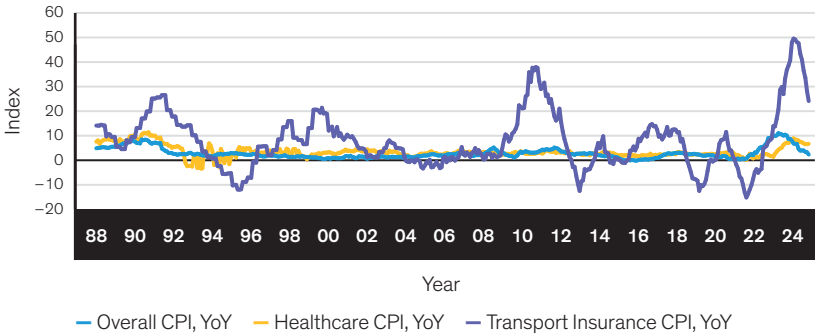
DISPLAY 97: DIFFERENT INFLATION RATES THAT INVESTORS FACE—US



Historical analysis does not guarantee future results.

Through April 30, 2024 | **Source:** LSEG Data & Analytics and AB

DISPLAY 98: DIFFERENT INFLATION RATES THAT INVESTORS FACE—UK



Historical analysis does not guarantee future results.

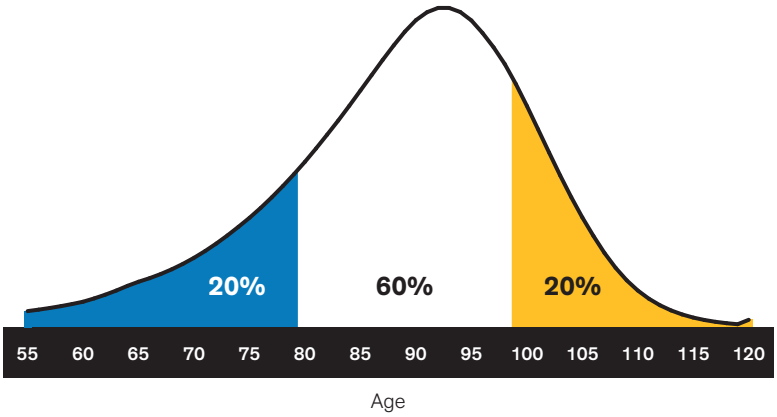
Through April 30, 2024 | **Source:** LSEG Data & Analytics and AB

This higher-equilibrium inflation creates a tension between different definitions of risk. There is risk measured as volatility of returns, or some other metric of investment risk, or perhaps the risk of lost purchasing power. Our view is that declining purchasing power is ultimately more important. If that is so, then mitigating that risk may require a new investment approach.

Will Individuals in DC Plans That Pool Longevity Risk Stoke Future Bond Demand by Liability Managers?

One of the greatest individual risks any retiree faces is longevity. With a 20% probability, you may need your savings only until age 80; in other words, fewer than 15 years after age 65. But with the same 20% probability, you may need those assets to last for more than 35 years. For all but the wealthiest individuals, this level of uncertainty is likely to be unmanageable without some sort of protection.

DISPLAY 99: PROBABILITY OF AGE OF DEATH



For illustrative purposes only.

Source: AB

Traditionally, DB pension plans provided this longevity risk pooling. With their focus on managing short-term funding risk, assessed by reference to a bond yield curve, they have been natural buyers of long-term bonds—some would say forced buyers given short-term-focused solvency regimes.

As bond yields fell and longevity increased, DB plans became ruinously costly and risky for employers; hence they were closed for all but a small minority of private-sector

employees. In the drive to protect against longevity, will DC plans replace DB demand for bonds? And how might this happen? Will the use of insurance-based annuities or non-insurance-based collective pools provide a new source of demand for bonds?

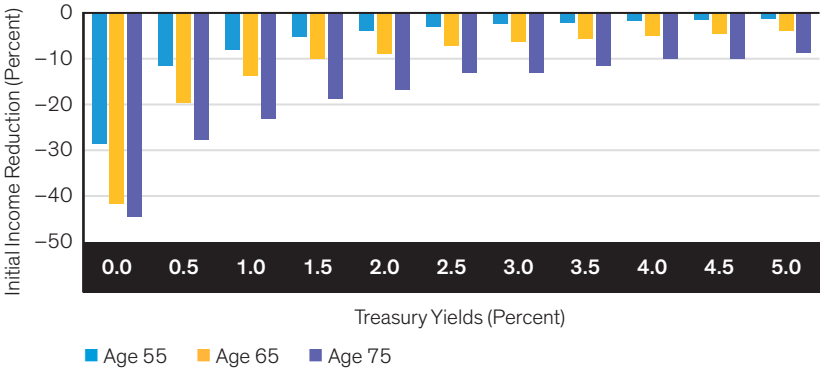
Challenges of Converting to Longevity Pools Limit the Case for Strong Bond Demand

Converting retirement savers' DC savings into longevity pools faces significant challenges, which we believe limits the case that these pools will flourish, in the process creating strong demand for bonds. Mortality risk—the probability that a participant will die early and receive poor value for their money from a DC plan—is very high. Indeed, the distribution illustrated in *Display 99* demonstrates this problem and sets up our first challenge.

Challenge 1: Protection against mortality risk (dying early) comes at a cost that can vary a lot among individuals. How prepared are individuals to give up their hard-earned savings, rather than a pension promise they had in a DB plan if they were to die early, in order to subsidize other pool members? DC plans make this difficult: individuals have an ownership view of their capital; surrendering this on a "gamble" on how long they will live is likely to be emotionally hard. Protections can ease this pain, either by returning capital on death (fewer payments made) or with a contingent pension payable to a dependent. Both are not only costly to provide, but the cost should vary significantly depending on the individual's personal situation and the current yield environment, as demonstrated in *Displays 100 and 101*.

DISPLAY 100: INITIAL INCOME REDUCTION FOR CAPITAL PROTECTION

Increases with Age, Declines with Yields

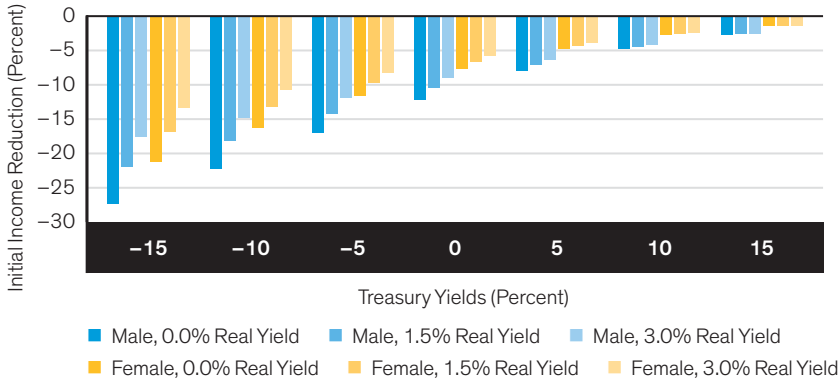


Historical analysis does not guarantee future results.

As of June 30, 2024 | **Source:** Continuous Mortality Investigation (CMI) and AB

DISPLAY 101: INCOME REDUCTION FOR DEPENDENT PENSION AT 65

Age Difference Between Partners and Treasury Yields Matters



Historical analysis does not guarantee future results.

As of June 30, 2024 | **Source:** CMI and AB

This situation is not a surprise, given that someone wanting to participate in a longevity pool only for the upside (not contributing on the downside) will need to pay for this experience. For a 65-year-old annuitant, whether a guarantee or contingent pension is offered, the cost is typically, on average, about a 10% reduction in the initial income provided. However, in the case of contingent pensions, these become ever more problematic to administer in today's world (as traditional marriage becomes less common and cases of divorce in retirement increase). It is also unclear whether single individuals and those with older partners are willing to significantly cross-subsidize other people's lifestyle choices.

The good news is that increasing treasury yields have been reducing the cost of protection.

Indeed, changes in the value of longevity pooling vary not only in terms of the impact on individuals' requirements for protection, but also in terms of their personal circumstances when they retire. This leads to our second challenge.

Challenge 2: The value of longevity protection can vary considerably among individuals based on predictable factors. The distribution of likely longevity outcomes for individual savers, as has already been demonstrated and widely appreciated by many, is highly unpredictable. As a result, a wealth-management process that focuses just on the average expected longevity of, say, age 90, is likely to fail the vast majority of individuals in terms of efficiently managing their retirement needs.

However, it is less well known that average longevity expectations can vary considerably for homogenous groups based on simple and known underwriting factors—those that go beyond sex and age to include wealth, gender, socioeconomic group, ethnicity and preexisting health conditions (such as type 2 diabetes, which is present in just under 25% of US retirees). See *Display 102* for a simple summary of how average life expectancy can vary among individuals, based on analysis undertaken by Club Vita in the UK.

There's a sizable challenge to longevity pooling for DC savers. When the offering terms of longevity pooling don't account for these factors, predictable wealth transfers happen most often on grounds that could be considered extremely unfair socially. This problem is often exacerbated because individuals with the largest pensions in the pool are likely to have the highest longevity expectations, and the pool's principal beneficiaries are a fortunate few—often from a highly elite and socially nondiverse group. To put it another way, the consequence of pooling without underwriting or protection leads to a potential mass transfer of wealth from the poorest members of society to the wealthiest—essentially a highly regressive tax regime.

DISPLAY 102: LONGEVITY RISK IS INDIVIDUALIZED—LONGEVITY INSURANCE SOLUTIONS FOR DC NEED INDIVIDUAL UNDERWRITING

Life expectancy from 65: **12.4 years**		Life expectancy from 65: **22.3 years**	
Unhealthy lifestyle address	→	Healthy lifestyle address	**+Four Years**
Low affluence	→	High affluence	**+Three Years**
Ill health retirement	→	Normal health retirement	**+Two Years**
Manual worker	→	Nonmanual worker	**<One Year**

For illustrative purposes only.

Source: Club Vita and AB

Taking these two challenges together, it is understandable that legislators and the majority of individuals find longevity pooling desirable for an efficient retirement regime, but it will not be cheap to include protections that avoid a key challenge—the depletion of benefits for a large portion of society to cross-subsidize pensions of the lucky few. These considerations of social fairness and equity alone may constrain, and clearly have constrained, the expansion of the use of longevity pooling by individuals in DC plans. This concern has, therefore, constrained the potential for them to become the big bond buyers that such pools are likely to use (in a manner similar to DB').

Delayed Entry to Longevity Pooling Will Reduce Demand for Bonds—and Their Duration

Assuming that the social challenges faced by longevity pooling can be overcome, our research in 2008[56] established that the limited value of pooling for most DC savers made entry before the age of 75 suboptimal. The research showed that the cost of delaying entry into the pool—with annuities as the pooling vehicle—to age 75 was minimal. This point was best represented by what is called the cost of longevity drag—the increase in cost of an annuity purchased one year later, above the risk-free rate, that reflects nonparticipation in the longevity pool for one year.

This incremental cost is well below 1% until a typically healthy individual reaches age 75 (*Display 103*); hence a return that can easily be achieved even in the most conservatively invested portfolio. Add to this the loss of flexibility in how individuals can access their assets as well as the significant information that becomes available in the early years of retirement about financial needs and health, and the case for purchasing an annuity before this age is minimal.

The consequence of this simple piece of advice for bond markets is significant. The average maturity of the bonds needed to back annuities at age 75, rather than 65, falls from close to 15 years down to 11 years. This pulls the average maturity date of the bonds needed down from 30 years to closer to 20 years, so debt issuers will need to refinance 50% more debt a year if pensions were the only source of funding. In addition, individuals typically deplete 30% of their wealth in the first 10 years of retirement, a further argument that demand is not only for shorter-dated bonds but up to 30% lower as well. The best advice on annuitization will result in reduced demand for bonds by pension plans and a focus on shorter-duration issues.

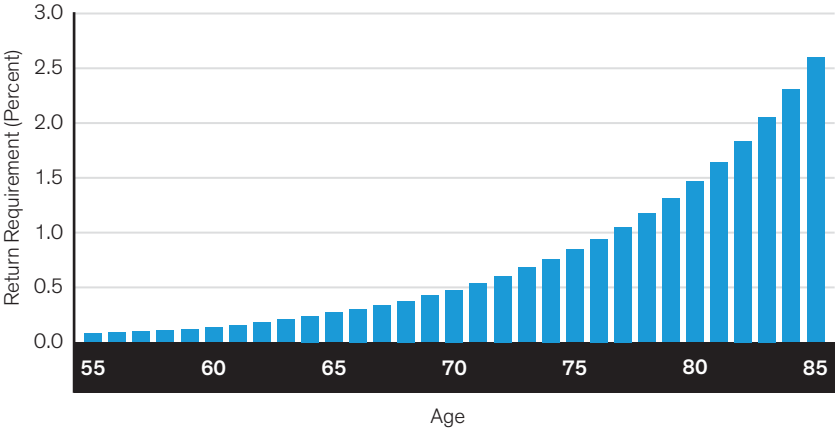
However, there's good news: higher bond yields make longevity pooling more attractive, increasing demand for fixed income.

One way of thinking about the attractiveness of longevity pooling to an individual buyer is the distribution of the internal rate of return they may achieve (in excess of the risk-free rate), allowing for the probability of death at various ages. It is not surprising that

56 David Hutchins, "Avoiding the Next Pensions Crisis," AllianceBernstein, 2008.

DISPLAY 103: THE COST OF DELAYING POOLING—"LONGEVITY DRAG"

Increases Exponentially with Age



Past performance does not guarantee future results.

As of June 30, 2024 | **Source:** CMI and AB

should yields rise on bonds (which are used to back the longevity pool), then the shape of this distribution to the individual becomes more attractive. Indeed, this distribution is a good way of demonstrating why annuities can be extremely unpopular even for risk-averse buyers in a low-interest-rate environment. It also explains the need for annuities to be protected against mortality risk to ensure their value for the money. As shown in *Displays 104 and 105*, we assume a 10-year guarantee is applied to each annuity to rein in the worst extremes of the distribution. The cost ranges from 1% to 7% for a 65-year-old, depending on the interest-rate environment, and it is about 5% at age 75, with less variance in the interest-rate environment.

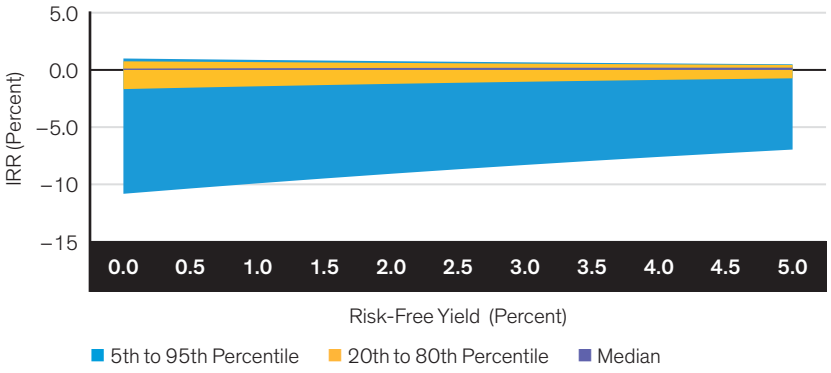
The Need for Inflation Protection Might Require a New Type of Bond for Pensioners

As we have already noted, retirees need a real income that is protected against the impact of inflation. However, inflation-protected annuities are typically expensive, providing initial income that is around 35% lower than that of a level annuity. This puts them out of reach of typical retirees who are unwilling to endure lower initial income.

Added to this, by essentially pushing higher pension payments many years into the future, inflation-protected annuities exaggerate the mortality risk buyers face and the cost of protecting against it (because adding inflation protection essentially reduces

DISPLAY 104: IRR ABOVE THE RISK-FREE RATE OF AN ANNUITY—FOR 65-YEAR-OLD

Probability Distribution At Different Risk-Free Yields

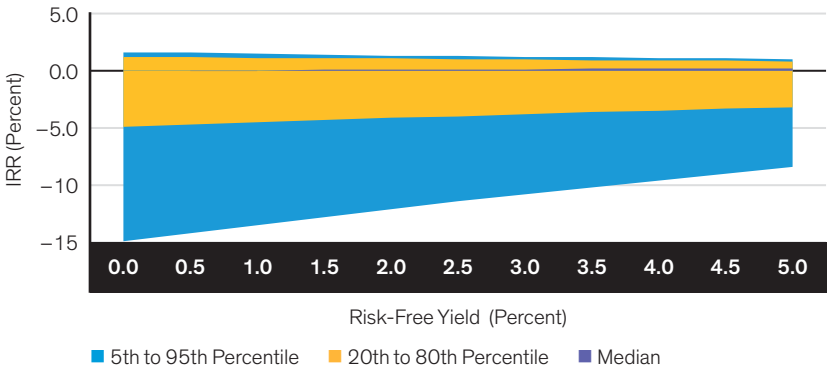


Historical analysis does not guarantee future results.

As of June 30, 2024 | **Source:** CMI and AB

DISPLAY 105: IRR ABOVE THE RISK-FREE RATE OF AN ANNUITY—FOR 75-YEAR-OLD

Probability Distribution At Different Risk-Free Yields



Historical analysis does not guarantee future results.

As of June 30, 2024 | **Source:** CMI and AB

the yield from nominal to real). This increases the cost of providing this protection from a 10% reduction in initial income to closer to a 20% reduction.

Some suggest that annuities could be purchased with some form of constant escalation, or inflation cap, to offset the expected levels of inflation. However, this potentially delivers the worst of both worlds: a lower initial income, higher mortality risk and no protection against unexpected inflation. Indeed, this approach makes little sense with current forecasts calling for inflation to be not only higher but also considerably more uncertain. It is a solution more for insurers and bond issuers than for individuals with a real-income need.

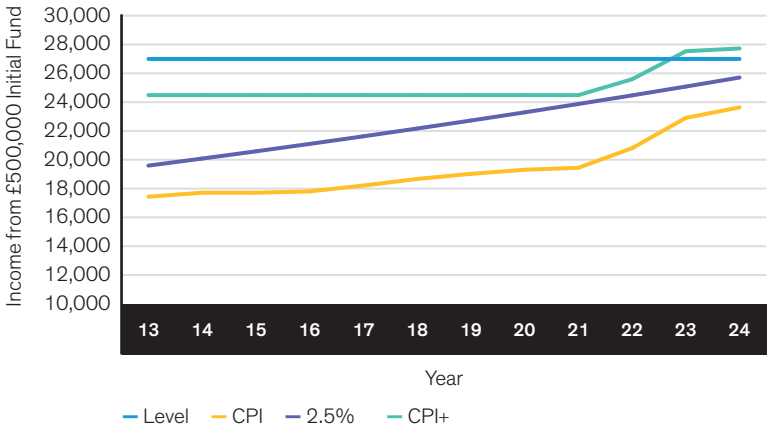
In reality, many investors need to have protection from inflation when it is above a certain threshhold—for example, 3%—with income remaining level in the years when inflation is below the threshold and the payment increasing by an amount equivalent to inflation minus the threshold. This solution fits better with the U-shaped consumption pattern of many individuals, provides the inflation protection necessary over the long term, reduces mortality risk and keeps initial income higher—and hence, the total cost of the retirement provision lower. The challenge here is the availability of the financial instruments to insurers that enable them to provide this protection. It could be an interesting form of national debt management—that a new type of debt that provides this protection would also encourage good inflation management by the government. Not only would it be issued at a yield lower than that of nominal bonds, but it would also cost no more to service if inflation targets were met.

Display 106 illustrates how various forms of annuities would have played out for a retiree who was 65 years old in 2013.

- The level annuity would have provided the highest income, but its spending power would have declined considerably in the last few years. So, while it maximized initial income, it would have continued to decline with inflation in real terms, and would have already seen a considerable amount of its spending power diminished unpredictably over just the first 11 years of retirement.
- The CPI-linked annuity would have maintained real spending power, but at a very high cost in terms of lower initial income—a 35% reduction, which would have been unbearable for all but the wealthiest retirees. In addition, for those who died young, this cost would never have been recovered, because it would not have been fully recovered until well into old age.
- The 2.5% fixed-increase annuity would have arguably not only maintained real income but actually grown it in periods of low inflation—again, however, at a high cost to initial income, with an approximately 25% discount. Also, it is worth noting that the predictability of inflation protection was not great, and the speed at which it was unwound in recent years might have caused some alarm.
- The CPI+ annuity (where increases were only provided when inflation was over 2.5%) would have managed to protect the buyer against the worst effects of the high inflation in recent years at a reasonable cost to initial income of about 10%.

DISPLAY 106: MAKING INFLATION PROTECTION AFFORDABLE

Using Annuities: Initial Income vs. Inflation Protection



Past performance does not guarantee future results.

For a 65-year-old male with 50% contingent pension

Through June 30, 2024 | **Source:** CMI and AB

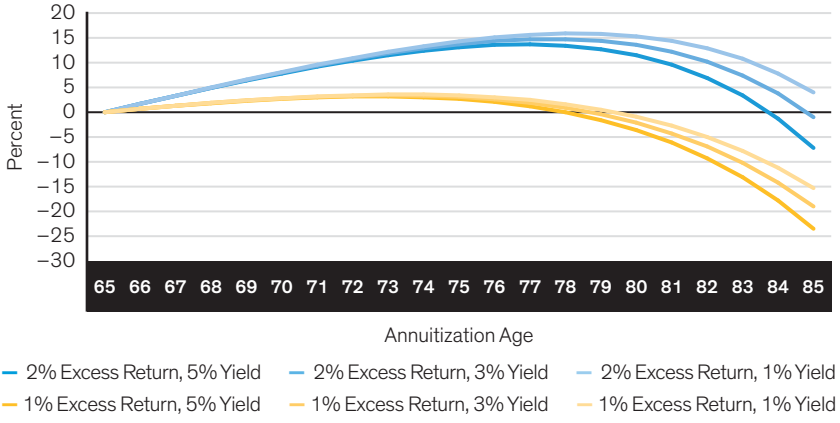
Using Bonds for Long-Term Income Is Economically Costly to Individuals, and Should Be Avoided for All but the Shortest-Term Cash Flows. But Higher Rates Should Increase Demand—Especially if Risk-Asset Returns Are Lower

A final challenge to the increased usage of longevity pooling is that such pools are typically, as a result of solvency requirements, not dissimilar to those faced by DB plans—backed either directly or indirectly by bonds. The economic cost to individual savers of investing in bonds versus equities over the long term is very high. This problem is exacerbated by the use of vehicles such as deferred annuities, which essentially assign the participant capital with the longest time horizon to bonds, and puts only investments with the shortest time horizon into capital markets.

In *Display 107*, we combine the economic cost of a portfolio delivering cash +1% and a portfolio delivering cash + 2% with the cost of delayed entry into a longevity pool. The analysis shows that, in a lower-rate environment, entry should happen later. Also, the higher the return premium you can earn in excess of the risk-free rate, the later you should enter. This neatly demonstrates that we have lived in a golden age for delaying longevity pool entry, with the low rates and high excess returns available in the market very much benefiting those who delayed. With yields now higher and with

DISPLAY 107: WHEN TO ANNUITIZE—INVESTMENT OPPORTUNITY VS. LONGEVITY COST

Increase in Retirement Income for Different Return Assumptions



Past performance does not guarantee future results.

As of June 30, 2024 | **Source:** CMI and AB

risk-adjusted excess-return expectations suppressed, in the future more retirees should be pushed into annuitization sooner. However, that all being said, an optimal age of 75 seems to tie in with this analysis as a good working rule of thumb, no matter what the environment (backing up our conclusion in our original 2009 research).

Alternative Approaches to Longevity Pooling, Collective DC or Investment-Linked Annuities Are Predicated on Reducing Their Reliance on Bonds

The market is proposing two alternative approaches to longevity pooling that aim to reduce reliance on bonds: investment-linked annuities and collective DC plans. In the case of investment-linked annuities, the dominance of the need to hedge market risk leads to a lower use of bonds and the use of derivatives merely to hedge yield declines.

An alternative, which combines the benefits of all these approaches, is the use of guaranteed lifetime withdrawal benefit (GLWB) insurance wrapped around a target-date fund, which is covered in our paper *Leveling the Retirement Income Playing Field*. However, like variable annuities, GLWBs are more sensitive to the cost of hedging equity market risk than long-term interest-rate risk.

In the case of the collective DC plans currently being proposed in the UK, these can be thought of as a DB plan wound back 30 years. In this case, the need to demonstrate short-term solvency based on bond yields is removed; solvency is instead based on long-term best estimates. Ignoring the huge regulatory issues such an approach could present, bonds have a minimal role to play, especially if yields become less attractive. However, it can be argued that the likely scandals such plans would create would eventually lead to them—once again—being subject to a similar solvency regime as DB plans and demands for bonds. Indeed, this is largely what has happened in the Netherlands, the one market that has adopted this model so far.

Retiring Later and Saving More?

Lower returns on equities, positive correlations between stocks and bonds, and higher inflation are forcing DC plans to make uncomfortable compromises. As discussed earlier, the options are later retirement, higher contributions, lower retirement income or higher investment risk. But there is another option for the system overall—albeit not for individual funds—to dump the risk onto later generations, as some countries do that don't even attempt to fund retirement (such as Italy). However, this approach raises profound questions of intergenerational fairness, and is doubly hard given the shrinking working-age populations and the observation that younger cohorts are less well off than older cohorts were at the same age.

Retiring later seems a given in countries where individuals save for their own retirement. In countries where assets are not in place to fund retirement and where the system runs on a pay-as-you go basis, this is the case as well. It's just that politicians haven't worked out a way to explain it to the electorate yet. We note that in nonfunded systems, there is already an elevated risk of people questioning the intergenerational fairness of these systems.

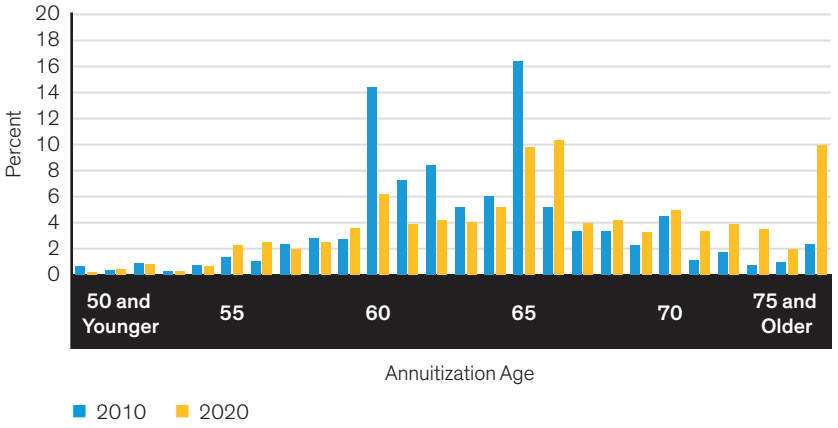
The aggregate average retirement age has risen only slightly (from 62.5 to 63.8 for men across the OECD between 2010 and 2020). But within that average is a shift in the distribution, with an emerging "right-hand tail" of people choosing to (or having no choice but to) retire significantly later. In the UK, the modal age of exiting the workforce has moved from 65 to 75 or older (*Display 108*). In the US, a new AARP survey[57] found that over a quarter (26%) of people who are not yet retired say they expect to never retire. (The same survey also found that 20% of adults aged 50+ have no retirement savings.)

Retiring later also seems a natural response to increasing life expectancy. Indeed, applying the previous expectation of retiring at 65—which was an invention of the 20th century—to current life expectancy implies an almost equal number of years spent working as spent in retirement. If you overlay higher long-term inflation upon that, it becomes plainly unaffordable. Politicians are wary of spelling this out, but that conclusion seems inevitable.

57 AARP, "1 in 5 Americans Ages 50+ Have No Retirement Savings and over Half Worry They Will Not Have Enough to Last in Retirement," press release, April 24, 2024.

DISPLAY 108: THE SHIFT IN DISTRIBUTION TO A LATER RETIREMENT AGE (UK DATA)

Retirement Age in 2010 and 2020



Past performance does not guarantee future results.

April to June 2010 and April to June 2020 | **Source:** Labour Force Survey and AB

This situation prompts a number of questions, of course. How much later should people be expected/forced to work? Although life expectancy has increased, for how long are people expected to stay healthy? Chapter 3, which covers key books that frame the fundamental forces at work in today's economy, also raises the point that while work carries a cost, it can also bring meaning. However, a need or desire to work does not necessarily translate into an ability to work. In the US and other major developed economies, society is often at close to full employment, at least as far as official statistics are concerned. But the nature of labor is changing, and in a world where an increased share of labor could be disintermediated by AI, will an emerging cohort of people willing to work beyond traditional retirement age be accommodated?

The traditional argument that technological advances do not necessarily act as a net destroyer of jobs assumes that the technology in question creates new jobs at a faster rate than it renders jobs obsolete. But the latest wave of automation—which, for example, is seeing a net creation of new jobs in delivering goods to consumers—may add jobs that are not suitable for all job seekers. This is especially relevant in any analysis of the participation rate of individuals aged 65–79 in the context of needing to retire later.

In addition to the nature of labor, there is also the question of how people age. Is the expectation that people will stay healthy longer into old age, and hence be able to work, or will they gradually become more frail? The latter not only implies a diminished ability to work, but also raises the prospect of significant spending on care late in life. This need to spend on care is, we would argue, doubly inflationary, not only because of the direct required expenditure but also because of what it implies about the need for labor to move from other productive sectors of society to the care sector. Our analysis implies that this could significantly offset any increased pool of labor that's derived from requiring people to work longer.[58]

Retiring later, while part of the solution, also directly affects the design of portfolios. It would not make sense to significantly de-risk a portfolio at a point when someone is still working (see below).

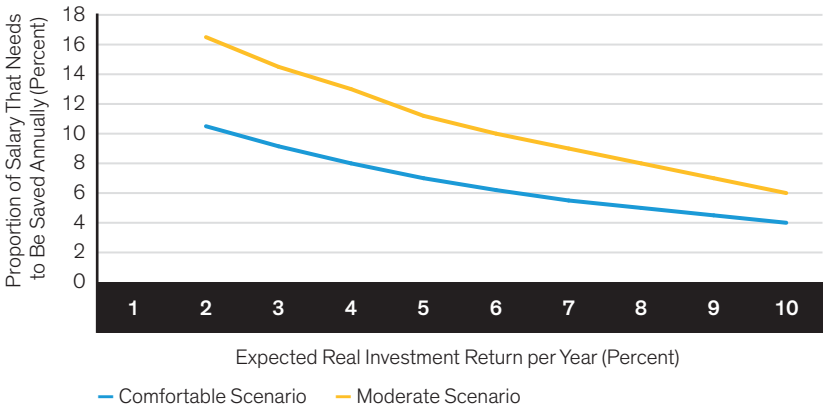
Another possible solution is to contribute more each year in the saving phase. How much more? Well, that depends on achievable real returns, the desired standard of living in retirement and retirement age. Such trade-offs are core parts of retirement planning, but our focus here is on how our view on achievable returns in the current regime impacts these calculations.

Display 109 shows the trade-off between the expected real return of investment assets and the proportion of salary that must be saved each year to fund "moderate" and "comfortable" retirement outcomes in the UK. Here we assume, for the sake of simplicity, a constant rate of return over the entire saving period, but this serves to illustrate the scale of the impact of lower returns. Take a 60/40 allocation as an example. Its average real return in the US from 1980 to 2020 was 8.2% annualized. Our forecast is that the real return of the 60/40 portfolio over the next 10 years will be only 3.8% annualized. If we apply this forecast return reduction to *Display 110*, it implies that compensating for lower expected returns in saving for a moderate retirement would require annual contributions to rise by 3 percentage points, and by 5 percentage points for a comfortable retirement. This is assuming one still retires at the same age, and is a huge increase in contributions. Moreover, as we are very keen to consider the macro effects, such an increase in saving requires a decline in consumer spending, with a knock-on effect on GDP growth.

The temporary accumulation of aggregate excess savings post-pandemic has masked an increase in precarity for younger cohorts that are less wealthy than older cohorts were at the same early stage in their lives. This state of affairs makes it even less likely that increased contribution rates are a viable mass pathway to countering lower real returns and greater longevity.

58 See, for example, Martin Wolf, "Increased Longevity Will Bring Profound Social Change," *Financial Times*, May 13, 2024; Charles Goodhart and Manoj Pradhan, *The Great Demographic Reversal: Ageing Societies, Waning Inequality, and an Inflation Revival* (Palgrave Macmillan, 2020).

DISPLAY 109: IMPACT OF EXPECTED REAL RETURNS ON REQUIRED RATE OF SAVING (UK DATA)



Historical analysis does not guarantee future results.

"Moderate" and "comfortable" retirement levels are defined by the PLSA. A "moderate" outcome is defined as earning 67% of the median UK salary and a "comfortable" outcome is defined as earning 107% of the median UK salary. The analysis assumes retirement at 65 years with no government safety net.

As of January 30, 2024 | **Source:** LSEG Data & Analytics, PLSA and AB

Aside from the core goal of needing to achieve a savings pot size that is sufficient to cover the cost of retirement, the implicit risk that needs to be addressed is that of running out of money. Two forces drive this: inflation and the "risk" of living longer. We will deal with each of these in turn.

"Hedging" higher inflation can mean different things to different investors. We argue that, for an individual seeking to preserve purchasing power far into retirement, the key attribute of an inflation hedge is that it delivers a high probability of positive real return over a period of sustained inflation (or of volatile but high inflation). Having a positive correlation with inflation over, say, a given quarter or year is actually not a necessary attribute. It is only when savers are very close to or in retirement that a short-term correlation with inflation matters. Given our view that retirement ages will be extended anyway, this implies that for the bulk of assets, the definition of hedging retirement that will dominate is the need for assets that generate real returns.

Display 110 shows examples of assets that may be considered different "hedges" of inflation; the level of inflation that one is trying to compensate for matters. The table is divided into "moderate" inflation on the left and "high" inflation on the right, with 4% marking the dividing line. This is approximately the level at which equities stop having

DISPLAY 110: REAL GROWTH AND INFLATION-HEDGING TOOLSETS EVOLVE

Moderate Inflation		High Inflation	
Long-Term Real Return	**High Inflation Beta**	**Long-Term Real Return**	**High Inflation Beta**
Real Estate	Broad Commodity Index	Real Estate	Oil
Equities	Oil	Farmland, Timberland	Gold
Farmland, Timberland	Gold	Equity Income, Free-Cash-Flow Yield	Broad Commodity Index
Equity Value	Commodity Equities	Infrastructure	Commodity Equities
Infrastructure	Equity Momentum		Momentum (Cross-Asset)
	Renewables/Power Delivery		TIPS
	TIPS		

For illustrative purposes only.

Source: AB

the characteristics of real assets. Our view is that moderate-equilibrium inflation, not unanchored high inflation, is what needs to be countered. Within each category, the first column includes assets likely to generate positive real returns over extended periods of inflation, while the second column shows assets that have higher short-term correlations with inflation.

The conclusion is that, all things being equal, DC pensions should be allocating more to real assets, as listed in the first column: equities and real physical assets.

An implication of this conclusion is that it is acceptable, and may even be an outright necessity, to take illiquidity risk as an important aspect of preserving purchasing power. As a broader point, given the growing share of DC assets as a portion of global saving and the growing share of private capital in funding economic growth, it would be perverse if there were not a significant overlap between the two—a point that is often overlooked. The corollary is that there is too much obsession with liquidity. This does presume that the savings assets in question are not potentially being switched over short time frames between different providers. But if rapid switching of long-term savings assets does happen, it implies a design problem in the overall system—see the experience of Australia on this point.

For return forecasts with very long horizons (beyond 15 years), asset valuation today is arguably less of a concern. But it should be an input that guides the path of any changes in allocation. *Display 111* shows current valuations compared with historical valuations for a range of relevant return streams. The main conclusion is that asset classes are fully valued relative to their own histories; valuation opportunities are likely more within asset classes, be that factors or sectors.

DISPLAY 111: CROSS-ASSET VALUATION SUMMARY

Start Date	Asset	Valuation (Z-Score)
Jan 1970	Gold	2.96
Jan 1990	Automation Equity Basket	2.09
Jan 1988	US vs. EAFE	1.54
Jan 1970	Municipal Bonds	1.03
Jan 1970	US Equities	1.00
Jan 1997	US High-Yield Credit	0.83
Jan 1997	US Investment-Grade Credit	0.81
Jan 1970	US 60/40	0.77
Jan 1987	Emerging-Market Equities	0.53
Jan 1970	US 10-Year Government Bonds	0.42
Jan 1995	US Metals & Mining Relative	0.15
Jan 1990	Infrastructure Equity Basket	−0.08
Sep 1971	US TIPS 10-Year	−0.15
Jan 1970	Japan Equities	−0.21
Jan 1973	US REITs	−0.26
Jan 1995	US Banks Relative	−0.78
Jan 1995	US Energy Relative	−1.34
Dec 1977	Small- vs. Large-Cap	−2.26
Dec 2010	US Min. Vol. vs. Market	−2.38

Historical analysis and current forecasts do not guarantee future results.

Data start from January 1970 or the earliest available date (indicated in Start Date column) and run through April 2024. Equity valuations are cyclically adjusted earnings yield (1/CAPE ratio). Bond valuation is based on yield. Relative valuation is measured as the relative 12-month forward earnings yield (1/PE) relative to the broader US market. US PE factor valuation is measured as the 12-month trailing earnings yield. Z score of the 60/40 portfolio is calculated as 0.6 * z score of US equities and 0.4 * z score of US 10-year government bonds. Higher z-score value indicates a higher premium to historical valuation. CAPE ratio: cyclically adjusted price-to-earnings ratio

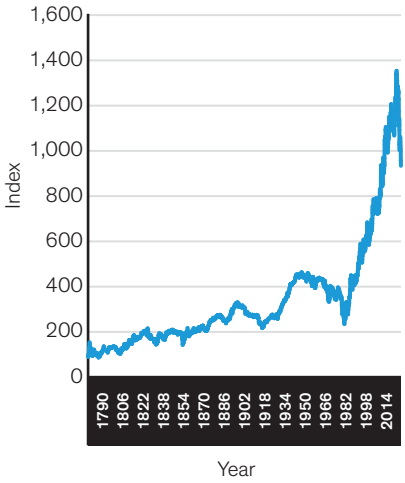
Source: Federal Reserve Bank of St. Louis, Global Financial Data, LSEG Data & Analytics, MSCI and AB

The design of target-date funds and their growth over the last three decades has rested on the idea of de-risking as one approaches retirement. But what *is* risk? This question, perhaps, has seemed uncomplicated for a long time, but a new regime changes it. We think there is an important distinction between risk defined as volatility and risk defined as a loss of purchasing power. In today's context, any de-risking must happen later in life and not have some hard stop at (an already) later retirement age. Also, cast in this light, de-risking should be about reducing the risk of an individual running out of money.

To us, it is no longer obvious that a passive long position in bonds is a low-risk position. The expected real return on duration is low, the volatility of bonds is expected to rise back to a more normal level, and we think that stock and bond returns will remain positively correlated, so bonds will be less-effective diversifiers. In addition, the level of public debt raises questions about fiscal sustainability and what the possible paths to address it mean for real returns on bonds (i.e., the risk of

DISPLAY 112: LONG-RUN RETURN FROM DURATION IS LOWER THAN RECENT DECADES SUGGEST

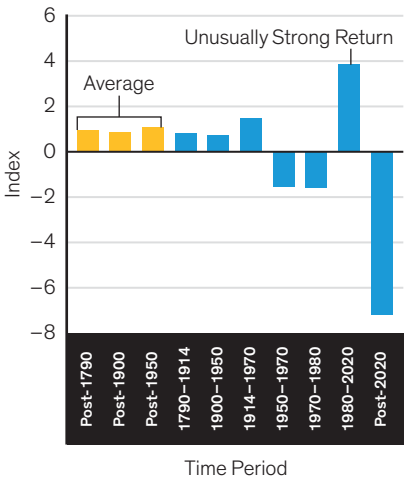
US 10-Year Bonds Minus Cash



Past performance does not guarantee future results.

Through October 30, 2023
Source: Global Financial Data and AB

DISPLAY 113: EXCESS RETURN OF DURATION OVER CASH



Past performance does not guarantee future results.

As of October 30, 2023
Source: Global Financial Data and AB

either an increase in the pricing of sovereign risk or an increase in inflation breakeven rates). The conclusion is that, in the context of a DC portfolio, a bond is not a low-risk investment. In markets where pension assets have significant size compared with the local government bond market (such as in the UK), the view that bonds are not low risk could become a self-fulfilling dynamic.

But wait—aren't bonds a lot more attractive than they were three years ago, given the increase in yields? Tactically, there may be a case for shorter-duration positions, given the level of yields and a flat yield curve. But we would argue that the long-run strategic appeal of longer duration is low. *Displays 112 and 113* show the excess return of 10-year bonds over cash in the US, both as a time series and with the average return in sub-periods. It is evident that the 4% annualized return of 1980–2020 was an unusual outcome, driven by extraordinary starting conditions and profound macro changes over those decades. To the extent that it can be said there is a "normal" return from duration, it is likely closer to 1% annualized. This, however, is based on the US experience in the 20th century; there is no such thing as a risk-free asset over longer horizons, and if sovereign risk needs to be priced in some way, then the return can be lower still (as we've shown in a separate paper).[59]

What This Means for DC Strategic Asset Allocation

Bringing all this together, what does it mean for the strategic allocation of DC funds in this new world?

If we leave aside the politically unpalatable options of contributing more, accepting a lower standard of living in retirement and dumping the retirement problem on the state or future generations, what is left? It is taking more investment risk and working longer. The latter may be politically unattractive, too, but to some extent it is happening already, and it is logical given longer life expectancy. Moreover, there is a linkage between taking more investment risk and working longer, since one of the ways to take more risk at scale is to stay invested for longer. The other options can be summarized as: illiquidity risk, active-management risk, greater equity risk, geopolitical risk, factor risk, leverage or some combination of all of these.

Given the other options, taking more investment risk is a politically expedient and economically attractive route. The key risk this route attempts to offset is a loss of purchasing power, which can be defined as a real return over inflation. An alternative approach is to think of this in terms of the risk of a hardship outcome—an investment outcome that fails to deliver a minimum required level of income in retirement.

Investors have different options open to them for how they choose to partition and express risk in a portfolio. In considering the benefits of a given approach, one has to consider not only the interaction effects among different kinds of risk but also the

59 Inigo Fraser Jenkins and Alla Harmsworth, *Global Quantitative Strategy: The End of Pax Americana and What It Means for the Market*, Bernstein Research, January 23, 2019.

actual amount of potential risk for a given approach. Exposing an investing approach to greater risk is not helpful if there is insufficient capacity to adequately change investment outcomes.

Display 114 explores this topic. We plot the expected income in retirement from a given approach to lifetime saving on the vertical axis, with the horizontal axis showing its bottom-fifth percentile expected return.

The examples shown are the following:

1. A traditional, simple target-date strategy with 30-year historical real returns. It holds 100% equities until age 45, then gradually evolves to 100% government bonds by age 55, with retirement at 65
2. The same as above, but using our predictions of lower real returns and a positive stock-bond correlation
3. The simplest way to take more risk for longer: allocate 100% to equities for the entire glide path, retiring at 65
4. Take even more risk for longer but still retire at 65; a leveraged 150% exposure to equities through the whole glide path until 65
5. Stay invested in risk assets beyond 65 and work longer; hold 100% equities until 65, then shift on a sliding scale to 100% government bonds until retirement at 75

We recognize that these are simplistic approaches to glide paths—one can be more efficient about blending different kinds of risk and also mitigating the sequencing risk of an abrupt conversion of savings into annuities. However, showing it this way makes it easier to lay out the scale of the problem and possible remedies.

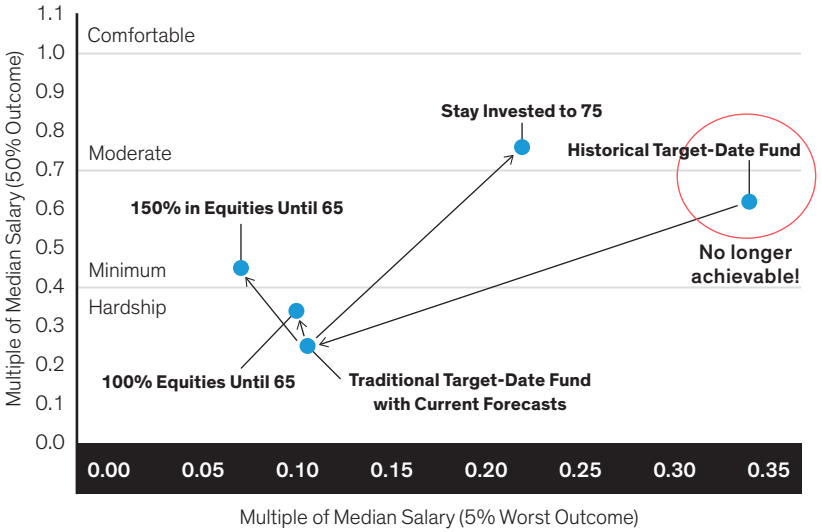
The gap between scenarios one and two shows how lower real returns and less diversification both decrease the expected standard of living in retirement and raise the risk of a hardship outcome. Scenario one is the historical expectation, and scenario two is the base-case prognosis for the future. The remaining scenarios offer three possible paths.

A simple way to dramatically increase risk is to allocate 100% of savings to equities all the way up to retirement. This not only increases overall risk levels but impacts the scale of the risk taken, given that the size of the savings pot is significantly larger in the final decade of saving than at other times—and it is fully allocated to equities. This does have the desired effect of increasing the average expected income in retirement. It also, of course, somewhat increases the risk of the final years of saving being a low-return environment, leading to a hardship outcome. The other problem is that it does not increase risk enough!

Scenario four solves the latter problem by levering equity exposure, which improves the average expected income but also dramatically increases the risk of a hardship outcome. Thus, leverage appears to be an unattractive route to adding risk.

DISPLAY 114: EXPECTED RETIREMENT OUTCOME VS. RISK OF BAD OUTCOME

Median Expected Size of Retirement Pot as Multiple of Salary vs. 5% Worst Outcome of Expected Returns



Past performance does not guarantee future results.

Display shows the expected median income in retirement (annuity rate) plotted against the likely worst fifth percentile of retirement outcomes. We overlay lines showing how these outcomes relate to different levels of comfort in retirement using the PLSA definitions of retirement needs as a percentage of national median income. The baseline TD strategy simply invests 100% in equities until the age of 45, then has a linear reallocation over 10 years to be 100% bonds by age 55. The examples shown are as follows: (1) the historical TD strategy shows the median outcome of returns from such a strategy over complete lifetime savings cycles since 1970, while the distribution of returns uses a longer look-back period to all outcomes since 1941; (2) the same target-date structure applying our forecast of a lower return and positive stock-bond correlation; (3) a simple approach to taking more risk of 100% equities through entire career; (4) 150% equities through entire career; (5) 100% equities until 65 and then a linear reallocation to 100% bonds by age 75, retire at 75.

As of May 31, 2024 | **Source:** Global Financial Data, LSEG Data & Analytics, PLSA and AB

Scenario five assumes an extra decade of working, remaining fully invested in equities until the traditional retirement age of 65, then gradually reallocating from equities to bonds in the final decade from age 65 to 75. It is interesting that this delivers a higher average expected outcome, but with a dramatically lower risk of a hardship outcome. We note that the expected return from the accumulation phase is higher, as there is a significant allocation into equities at a later stage of saving while the pot is larger.

However, the return is then further increased by a more attractive annuity rate being available at an older age.

Interpreting the conclusions from this analysis, the stark reality is that someone who earns a median income over their working life, paying 8% of their salary each year into a traditional simple target-date structure that reallocates from stocks to bonds over the midpoint of their career, would face a hardship outcome in retirement. Here, we assume that the person retires at 65, and we define a hardship outcome as an annual retirement income that is less than one-third of the national median income as defined by the PLSA in the UK.[60]

This scenario excludes state pensions and Social Security, state backing that can make a significant difference at the bottom end of the retirement wealth distribution. However, this difference depends on the country where the retiree lives; it also assumes that states remain sufficiently solvent to honor the real value of such payments far into the future.

Taking higher risk with a 100% equity position or even a levered equity position would increase this median result enough for the savings to pass the threshold required for a "minimum" level of retirement. The approach of staying invested in equities even past the age of 65 and retiring at 75 would get one to the "moderate" retirement outcome. There is no path that yields a "comfortable" retirement. Such are the harsh mathematics of a low real-return world.

Conclusion

The central question in all this is: How should one save the concept of retirement as a viable concept? Increased longevity, higher inflation and the prospect of lower investment returns present a challenge to how retirement is funded. This challenge suggests that a shift in asset allocation is needed in favor of return streams that have attributes closer to those of real assets. At the same time, the mix between DB and DC plans is shifting. DB, with its dominant weight in fixed income, is declining as a share of the overall asset base. Taken in aggregate, this means that bond holdings within pension systems are likely to decline significantly. The more likely role of bonds will be as a component of active strategies, including tactical allocations, and also as an element of longevity pooling. This situation is very different from the central position a passive allocation to government bonds used to play within pension systems.

This chapter lays out the problem as we see it, as well as possible options for the asset allocation and structure of DC pensions. The key risk is the loss of purchasing power—in other words, savers running out of money. Saving more cannot make up the shortfall, given the size of the saving increases needed, the relative lack of wealth of younger cohorts and the implied negative knock-on effects higher savings would

60 "Picture Your Future: Retirement Living Standards," Pensions and Lifetime Savings Association.

have on consumption, economic growth and hence returns. A combination of taking more risk and working longer seems the only route that can solve this problem—this combination implies maintaining a significant exposure to risk assets for much longer than traditionally has been the case. The other aspect of this formulation is the explicit need to counter longevity risk.

DC plan participants' entry into longevity pools should increase with age and real yields. The consequence is that the demand for bonds by an increasingly DC-dominated pension system will fall significantly, as participants choose to lock a lower amount of their savings into lower-duration bonds later in life compared with DB pension schemes. A mitigating factor to the demand decline for bonds will be that, as yields increase (i.e., the cost of long-term debt becomes higher), there will be a natural increase in demand. However, this demand is unlikely to ever reach the current level of DB plans. Finally, in order to help individuals balance the need for inflation protection with the high cost of adding it to an annuity, there may be a case for a new type of debt that provides nominal coupons in low-inflation environments and steps up in high-inflation environments. Such bonds may not only reduce the cost of debt issuance but also provide an added incentive for good inflation management by legislators and regulators.

Finally, the cross-subsidies in the system have to be recognized for an equitable system to evolve: annuities sold without appropriate underwriting risk undermine trust when the unfairness is recognized. Current product design in the US seems to be creating a significant fiduciary risk for plan sponsors who elect to pursue in-plan or out-of-plan annuities without suitable protections for their participants against inequitable wealth redistribution, mortality risk and inflation. These protections will all come at such a high cost that they will make the solution unappealing to all but the most generous DC plans. Given this feature of annuities, we think it is highly unlikely that providers concerned about this inequity and the fiduciary risk would embed annuities in the all-important default strategy (the strategy used by the vast majority of participants in DC plans globally). Without this take-up, positive buying behavior and complex advice from advisors is likely to be limited.

We have encountered a deluge of questions over the last year on the sustainability of public debt, given the observation that the public debt/GDP ratio has risen back to its level at the end of WWII. The US has the advantage of issuing debt in the world's reserve currency, but the degree of fiscal largesse is at best unusual and at worst reckless. European governments have tried to be more fiscally constrained, but required increases in social and defense spending will strain this effort. National pension systems have been ready buyers of government bonds on the basis that such assets are "risk-free," but how does the ability to fund government borrowing change if the pension system adopts other models for strategic asset allocation?

This issue is ultimately political. Questions such as how to keep retirement as a viable option, the age at which people can expect to retire, the transfers between cohorts

with different life expectancies and between generations, how governments are funded, and the setting of investment regulations must all ultimately land in the lap of government, since no other entity has the mandate to enforce a coordinated vision across these subjects. All this needs to be seen in light of a macro regime where the long-term forces are set by demographics, deglobalization, climate change and AI, all of which go beyond the auspices of any single government to control. There is a political need for retirement to remain a credible option, and that is likely to shape the regulation and structure of the investment industry's offerings in a way that is different from the norms of recent decades.

Chapter 6—Tokens, Power, Non-Jobs and Debasement: The Case for Strategic Allocation to Tokens

This chapter considers the role of tokens and crypto assets as investments. However, rather than just address this question within the narrow confines of investment theory, we approach it via the broader social and political role of tokens. Their growing acceptance raises questions on how the nature of money is changing. This in turn has implications for politics, geopolitics and contemporary debates about the nature of work. The specific role of tokens in investment portfolios is linked to two separate features of the strategic investment outlook. First, developed economies find themselves with a level of public debt that, as a proportion of GDP, is unprecedented outside times of existential conflict. Second, significant growth in the need for real assets and greater liquidity will continue. Non-fiat currencies and tokenized assets form a part of the potential response to both these phenomena.

We conclude this chapter with a vision for investment management that ends the false dichotomy between public and private investments and subverts the asset class as a discrete unit for investment allocation. This is an important step in freeing strategic asset allocation from the silos imposed on it by the historical development of the investment industry. A world of lower real returns and less diversification between asset classes needs this tokenization as an engine to free up the methodology of asset allocation.

In this chapter, we cover four key topics at the nexus of the changing role of money and what that change means:

1. What is money and how is it changing?
2. Public debt and the risk of currency debasement
3. Tokens and their role in the changing nature of work
4. The role of tokens in investment portfolios

These topics in turn span very different areas of study: philosophical, political, social and investing viewpoints are all at work. Above all of them are questions about the nature of power; we end this chapter on the relationship between tokens and power's changing nature. Rather than attempting to be comprehensive on each of these topics (which would require a book-length essay), we just focus on the aspects where a change taking place is a key part of contemporary debate, ultimately with a view on what this means for those tasked with making long-run investment decisions.

We start this chapter with the broader political and social issues prompted by tokens and crypto assets, because this larger picture really frames the role of these assets—it would be missed if one started from a more blinkered focus only on investment. We then turn to the role of cryptocurrencies, followed by tokens more broadly in investment portfolios. This is not just a case of a new technology emerging, but of its role being inextricably linked to the economic and political outlook at large.

The investment case for cryptocurrencies that we make is not about the technology per se, but instead the consequences of the levering up of economies via the growth of public debt and other megaforces that imply higher inflation. Likewise, the role of tokenized assets in portfolios is driven by investors' need for real assets and concerns about liquidity. The sociopolitical role of crypto is part of the debate about the future of work and the relative power of the individual versus corporations and the state.

You Know What Money Is, Right? Hobbes vs. Hayek

What is money and what sets it apart from non-money? This question has a long history, but we argue it has new relevance, not only because of the emergence of cryptocurrencies but also because of a host of other forces that have nothing to do with the advent of blockchain technology. These forces are the weaponization of USD access; a growing group of workers with precarious job protections; a more intense debate about the role of the state and how that relates to the freedom of the individual; and the giant levering up of the system by the expansion of government debt over the last 40 years. All these forces challenge accepted notions of money, its status and what it represents. The emergence of crypto against the backdrop of these forces prompts a fundamental questioning of the status of money—questioning that reflects key disagreements about what has constituted money throughout history.

As with so many other topics, there is a good claim to be made that the study of money begins with Aristotle. In *Nicomachean Ethics*,[61] Aristotle teaches us that money exists to make the incommensurable commensurable. He describes the social interaction required between a shoemaker and a builder for the shoemaker to acquire a house from the latter. The ability to effect an exchange between two such assets with different values is aided by the existence of money. On this view, the primary function of money is as a medium of exchange.

David Graeber espoused a somewhat different view in his magisterial history of debt.[62] This account places credit as the source of money, with barter being regarded as more of an origin myth than a historical reality. On this basis, monetary denominations are primarily a unit of account. There is a fascinating discussion on this point of how Charlemagne's coin values were still used for hundreds of years in the Middle Ages after his empire effectively collapsed and the coins were no longer in circulation. People

61 Aristotle, *Nicomachean Ethics*, trans. H. Rackham, Loeb Classical Library, vol. 5 (Harvard University Press, 1926).
62 David Graeber, *Debt: The First 5,000 Years* (Melville House, 2011).

accounted in units of coins that they had never seen. It's a wonderful example of money being used for accounting but with no inherent physical value in the units being used.

Looking up the basis for money in economics textbooks will tell one about the need for money to fulfill functions such as unit of account, medium of exchange and store of value. It's all well and good to consider whether money is needed for exchange or as a unit of account, but we think contemporary issues in the changing nature of money reflect a more fundamental consideration—the nature of power. Specifically, the issue is the relative power of the individual, the nation state and corporations.

Money, even metallic-based currencies, derives its value by virtue of social agreement: gold only has value by virtue of the agreement that it has a value, given its limited industrial use and lack of income. But money is also a key means for the propagation of power. This is true both within countries (e.g., the contrast between the banked and unbanked) and between countries (the weaponization of access to currencies). The move away from currencies that were exchangeable for precious metals gives greater precedence to an alternative basis for the value of money. In contemporary economies, we would argue that one of the most potent arguments for the basis of money having value is that governments demand that taxes be paid in a given currency. Governments, in turn, have a monopoly on the use of force to ensure the collection of taxes, or at least it has long been generally accepted that they have such a monopoly.

This point raises interesting questions on the emergence of potentially competing means of payment. There is a long history of attempts to issue alternative means of payment, from pre–central bank coinage to "local" tokens for shops in the "circular economy." This becomes germane to our discussion here with the attempt to launch such payment systems via digital tokens from nonsovereign entities. Facebook tried to launch Diem (formerly Libra) in 2020, but the strong opposition of US and European governments forced the company to abandon the project. The possibility that corporations might acquire the ability to issue currency was a step too far in terms of the risks to sovereignty. Although Diem didn't work out, we will explore below the ways that tokens can generally be issued by private entities and used in ways that very much look like money.

Another interesting example of an alternative token-as-currency is the QQ coin launched by the Chinese conglomerate Tencent in 2005, predating Bitcoin by three years. The intent was for QQ to be used within the Tencent ecosystem to pay for online services and in-game purchases. However, in 2006 its use spread beyond Tencent and achieved a level of acceptance as an alternative means of payment for small online purchases on other websites and for online gambling. QQ was not based on blockchain technology and was not supposed to be redeemable back to physical currency, so it's not directly comparable to cryptocurrencies. Nevertheless, because of its growing popularity at the time, China's central bank declared multiple crackdowns on its use. This happened notably in 2007 and 2009, when the government declared that virtual currencies could not be used for purchase of

physical goods, outlawing redemptions of QQ coins for more than their purchase price. We see the political economy of this episode as being very similar to the case of Diem.

There is a fundamental divergence of views that one could describe as a tension between the world views of Thomas Hobbes and Friedrich Hayek. The Leviathan as the all-powerful nation-state surely requires a monopoly of money control. This view has been in ascendence for at least a century. For Hayek, however, government control of money is dangerous and gives way to exploitation. Instead, his view would be that it is desirable to have a competition between different forms of money. Hayek's seminal text on this topic, *Denationalisation of Money*, offers an absorbing problem set on this topic in the spirit of any good textbook (*Display 115*). We encourage readers to consider the questions.

DISPLAY 115: HAYEK'S QUESTIONS FOR DISCUSSION

QUESTIONS FOR DISCUSSION

1. Examine the long-held view that there should be only one currency in a country and that it should be controlled by government. Illustrate your discussion with examples from remote and recent history.
2. What are the origins of legal tender? Argue for and against it as the necessary basis of a monetary system.
3. Define money. How is it distinguished from non-money? Argue for and against the concept of a 'quantity' of money. Apply the argument to the 'quantity' theory of money.
4. 'It is desirable for government to control money so that it can vary its supply according to the needs of the economy.' 'People have been losing confidence in money because it has been controlled by government.' Discuss.
5. History shows that there has sometimes been lack of confidence in 'legal tender' paper currencies. How could a régime of competing paper currencies maintain the confidence of the public?
6. 'To be trusted, paper money must be convertible into valuable goods or precious metals.' Do you agree? Discuss the condition in which convertibility is and is not essential.
7. Discuss the view that inflation and deflation would be difficult or impossible if the quantity of money were not controlled by government. Illustrate your answer from the 1929-32 Great Depression and the 1972-75 'Great Inflation'.
8. Boom and slump are associated with 'capitalism'. Are they found in non-capitalist economies? Are they the result of capitalism or other causes?
9. 'It is politically impossible for a monetary authority subject or exposed to severe sectional pressures to avoid increasing the quantity of money to increase employment, thus creating inflation. The gold standard, fixed exchange rates and other restraints in the way of monetary expansion have been found inadequate.' Discuss.
10. How would you remove the power of national government to control the international movement of currency? Would international agreement suffice? How could competition in currency be more effective?

For illustrative purposes only.

Source: F. A. Hayek, *Denationalisation of Money*, Institute of Economic Affairs, 1976

Indeed, Hayek asserts that money is a commodity like any other. Gold and silver are usually the examples that people turn to when they think of commodities as money. More recently, we have heard a client express the view that Bitcoin is in fact a commodity too—just one that we haven't found a use for yet. Must a "thing" have a use to be a commodity? Does the Ethereum blockchain being used as the basis for smart contracts constitute a use case for its native currency?

In his book *Cryptocommunism*, Mark Alizart offers the striking image of Satoshi Nakamoto as Martin Luther.[63] Just as Luther urged the populace in 1517 to reject clerical authority and offered the possibility of convening directly with God, Satoshi's Bitcoin white paper created the possibility of convening directly with money without the intermediation of the banking system, or indeed the state. In the process, Alizart declares that Bitcoin is primarily a political technology before it is an economic one. We strongly agree. After all, what is the process of forming society-wide consensus if not politics? Crypto also becomes political in the way its acceptance alters the power of the state. The particular political angle that Alizart takes is to assert that a Marxist economy really should seek to end the privatization of money rather than abolishing private property. This is in contrast to capitalist systems that require money creation to support growth. This distinction is instructive in the context that central bank digital currencies pose a risk to fractional reserve banking and credit creation. Also, in contrast to fiat currencies, Bitcoin is deflationary given its fixed supply.

We should note a huge distinction here between crypto/tokens overall and Bitcoin, Ethereum and a handful of more accepted tokens. Whereas the supply of Bitcoin is limited, the supply of cryptocurrencies and tokens in general is very clearly not. The CEO of Coinbase recently stated on X that approximately 1 million tokens are currently being created *every week*. The argument that, in theory at least, some cryptocurrencies could be a hedge against debt monetization only applies to a small number of tokens. When we turn to the question of institutional allocation to crypto, this is not too much of a problem—realistically, only a very small number of cryptocurrencies would be potentially considered for such allocations.

What this leads to is a realization that the perception of money is changed by the emergence of cryptocurrencies.[64] Our assumption is that cryptocurrencies do have many of the attributes of money. The caveat is that if their role becomes so large that it interferes with the workings of a sovereign state, then presumably states would seek to suppress them. For example, if Bitcoin ever gained a significant enough share of transactions such that prices were set in Bitcoin, then it could interfere with the ability to implement monetary policy. If cross-border coins were used to try to dislodge the role of the dollar in international payments, the US might choose to respond. Also, if one takes the view that fiat currencies receive their value by virtue of governments

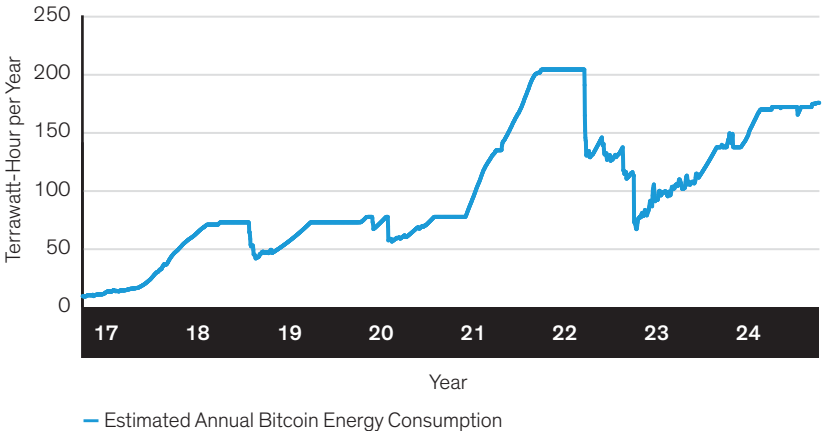
63 Mark Alizart, *Cryptocommunism* (Polity, 2020).
64 See our previous note on this in "A Dialogue Concerning Cryptocurrencies" in *Inflation and the Shape of Portfolios*, AllianceBernstein, May 2021.

demanding that they be used to pay taxes and that governments have a monopoly on the use of force, then crypto might not share equal status with fiat money.

One particular aspect of Bitcoin that discussions of money have not had to previously consider is power consumption and planetary limits. The environmental impact of Bitcoin mining is well known, so there is no need to belabor that point here. According to recent estimates, Bitcoin's annual energy consumption is currently around 175 terawatt hours (TWh) (*Display 116*). To put this into context, this draw is roughly equal to the annual energy consumption of Poland.

The extra "hook" for this point is in the context of the very rapid increase in power demand for data centers serving artificial intelligence (AI). When one tallies up current data center use plus the projected usage for 2025–2026 and the power demand for Bitcoin mining, we get to a level of more than 1,000 TWh in a high-demand scenario, equivalent to the power demand of Japan.[65] We suggest there are various implications of this energy intensity. First, it implies that the combined power demand of crypto mining and AI will receive additional focus when discussing these trends, reminding us of potential limits, although it is unclear where those limits lie given a wave of investment in this area. Second, it implies that a rapid energy transition will be very hard to achieve and that investors need to consider the

DISPLAY 116: ESTIMATED BITCOIN ANNUAL ENERGY CONSUMPTION



Current analysis and forecasts do not guarantee future results.

Through December 11, 2024 | **Source:** Digiconomist.net and AB

65 Inigo Fraser Jenkins et al., *Can the Energy Transition Happen?*, AllianceBernstein, November 2024.

ramifications of a transition that takes far longer, and indeed it raises the question of whether the transition can happen at all. Our view discussed in our recent note on a slower energy transition is that this likely increases the volatility of inflation. Third, investors who have profited from the rise of a US stock market built in no small part on the hope of AI cannot really, with straight faces, complain about the power consumption of Bitcoin.

De-Dollarization and Monetization: The Current State of the Politics and Geopolitics of Money

Any change in the nature of money is necessarily political. There are many strands to this point, but we wish to draw out two particular aspects in this section. First, the level of public debt to gross domestic product (GDP) is at the top end of its range in the modern era. What does this imply for the risk of debasement, and does it create demand for other forms of nonsovereign money? Second, the ongoing attempt by some countries (primarily China and Russia) to de-dollarize introduces a geopolitical impetus to shake up the current accepted status of money, in particular the role of the dollar.

Public debt has risen to its highest level relative to GDP since the end of WWII across developed economies (*Display 117, upper left*). The Congressional Budget Office (CBO) projection for US government spending shows that the country is on a path for government debt to reach 160% of GDP by 2050 (*Display 117, upper right*). The stock of debt alone might not have practical consequences, because it's possible to kick that can down the road for an unspecified amount of time. However, the same CBO projections show that US debt service as a proportion of government expenditure is expected to rise from around 3% currently to nearly 6% by 2055 (*Display 117, lower left*). A global comparison of this trend reveals advantages and disadvantages. The US fiscal balance is rising faster than in other countries, but it has the (huge) advantage of the dollar's reserve-currency status. In Europe, the fiscal balance is not (at the moment, at least) expected to deteriorate as quickly. However, the need to quickly increase defense spending and support a rapidly aging population imply other fiscal constraints, with no reserve currency to fall back on.

The increase in public debt since the 1970s amounts to a levering up of a system that in the past has been associated with not just wars, but periods of existential conflict. Examples include UK debt during the Napoleonic wars, US debt during the Civil War and the debt of many nations in WWI. The disconcerting observation is that a similar debt level has now been reached with no such profound proximate cause. It is hard to avoid the conclusion that the motivation is to keep consumers and investors happy. Investors of a more positive disposition would note that the total economy is not necessarily more levered. For instance, households and corporations are no more levered than they were two decades ago, but the share of the total debt burden accounted for by the state has increased (*Display 118*).

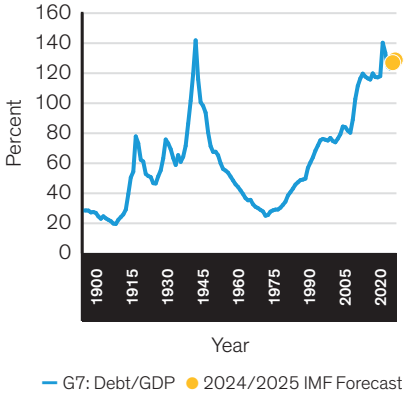
If the financialization of the US economy had driven a trend increase in productivity growth, then this might not be a problem. The unfortunate conclusion is that this has

DISPLAY 117: I STILL OWE MONEY TO THE MONEY TO THE MONEY I OWE...

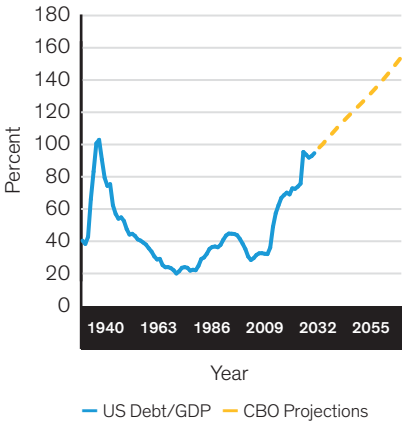
Government Debt Now at Levels Last Seen in WWII

G7 Government Debt to GDP

(GDP Weighted)

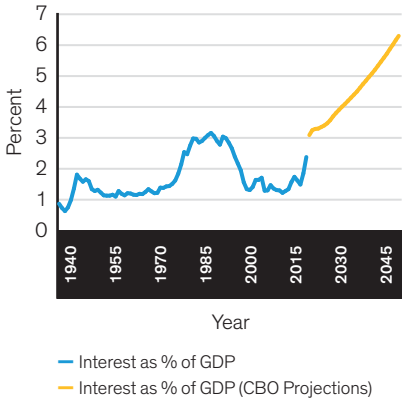


US Government Debt to GDP

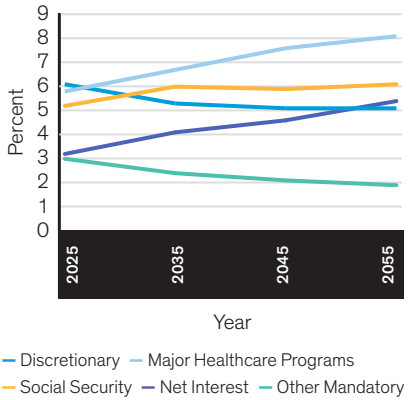


US Interest Expense

(% of GDP Projections)



CBO Spending Projections

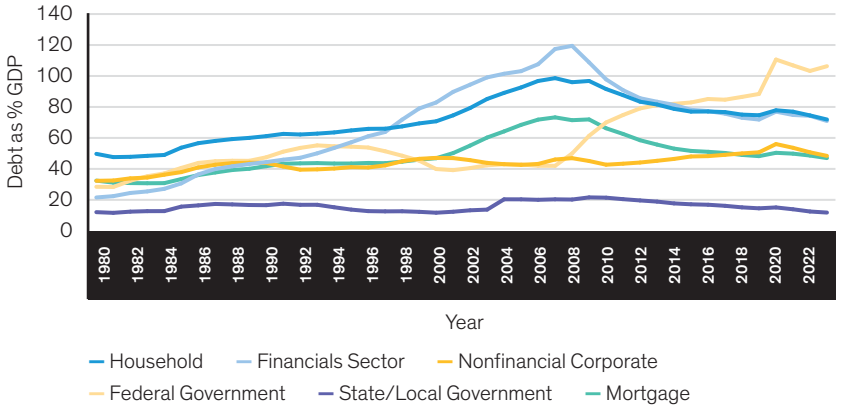


Current analysis and forecasts do not guarantee future results.

Top left display shows government debt/GDP for G7 countries weighted by nominal GDP denominated in USD. Data from 1900–2023 is from Global Financial Data. 2024/2025 forecast is from the International Monetary Fund. Bottom right display: Congressional Budget Office projections present data that supplement the CBO's March 2025 report, *The Long-Term Budget Outlook: 2025 to 2055*.

As of November 18, 2024 | **Source:** Congressional Budget Office (CBO), Federal Reserve Bank of St. Louis, Global Financial Data, International Monetary Fund (IMF), LSEG Data & Analytics and AB

DISPLAY 118: LEVERAGE IN KEY SECTORS OF THE US ECONOMY



Current analysis does not guarantee future results.

Through May 31, 2020 | **Source:** LSEG Data & Analytics and AB

not happened. We have discussed in recent research[66] how there has been very little sign of a trend increase in productivity growth over the last 20 years, despite significant investment in automation. There is an active debate around the extent to which AI can change this, but we think the change is unlikely to be sufficient to offset the quantum of downward pressures on growth from demographic changes, deglobalization and climate risks. The other challenge is that the benefits of this period of financialization have not been shared equally, implying a social and political challenge to letting austerity provide a route out. In the absence of sufficient growth or austerity as likely exit paths, we are left with inflation as the least politically painful strategy for reducing the real value of public debt.

What does this situation imply about future policy options? It raises the risk of "financial repression," keeping the yield on government debt below the level of nominal GDP growth to shrink the value of debt relative to GDP. In pursuing this option, policymakers (Treasury departments, not central bankers) would find it awfully convenient if inflation was on the higher side of neutral. There is indeed historical evidence of bursts of inflation around some previous episodes when government debt rose quickly, such as the case of the UK during the Napoleonic wars, the US during the Civil War and both nations around WWII.

66 See Inigo Fraser Jenkins et al., "Productivity, Democracy, Power and Truth: The Influence of AI on Markets and Investing" in *A Preliminary Language for a Post-Global World*, AllianceBernstein, May 2024.

Therefore, the key question here is whether central banks can retain the same degree of independence that they have had in recent years. We would argue that the gradual buildup of debt in the US and other developed economies makes it more likely that central banks have indeed become somewhat less independent. The likely fractious relationship between the new US administration and the Federal Reserve is a case in point. Public attempts to pressure the Fed during Donald Trump's first administration were arguably not that different from the longer history of presidential attempts to influence the Fed. After all, former Fed Chair Paul Volcker recounted (more than 30 years after the event) that President Ronald Reagan and his chief of staff, James Baker, ordered him not to raise interest rates in 1981.[67] The difference in examining this issue today is that, in recent decades, an assumption has been baked into investors' worldview that the Fed is independent in a way that was not the case in earlier periods.

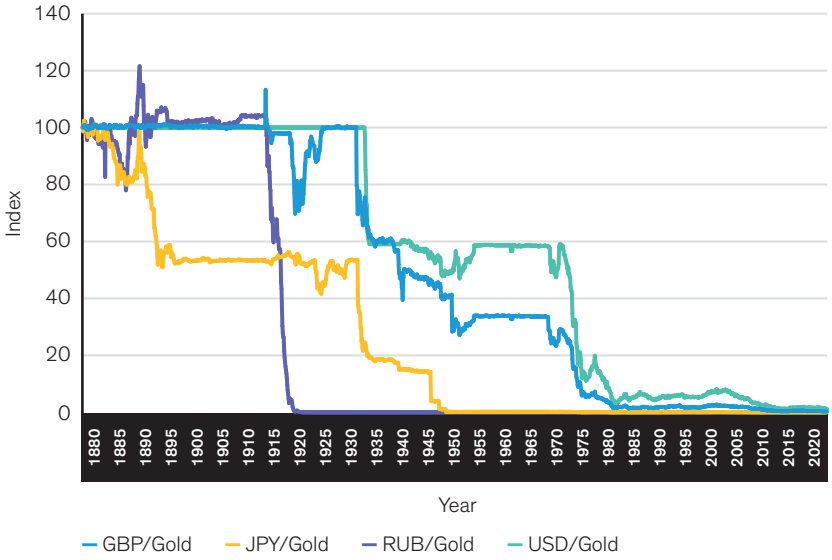
Of course, it is always possible that this can will be kicked down the road, as has been the case so far. There is no theoretical limit to the level of public debt that a country can sustain; Japan passed 200% of GDP back in 2009. However, we think that investors cannot be complacent about debt burdens. Questions about fiscal sustainability and central bank independence have come up in a high proportion of our more strategically oriented meetings with investors over the last year. Also, we can point to specific recent examples when concerns about fiscal sustainability have become acute, with political consequences. One example would be the UK liability-driven investing crisis in 2022. Long-term gilt yields rose by 1.5% in six days and contributed to the resignation of Prime Minister Liz Truss, making her the shortest-serving prime minister in the country's history. Likewise, concerns about French fiscal sustainability led to significant widening of French bond spreads in the run-up to the 2024 election and again later the same year, leading to the collapse of Michel Barnier's government. Clearly, the scale of these incidents is smaller than that in the US, but we see them as canaries in the coal mine for G7 economies at large and for market concerns about sovereign debt.

Hayek, ever-looming over discussions of debasement risks for fiat currencies, helpfully lists[68] those that fell the most in value through the mid-1970s. While the list includes many emerging economies—Argentina and South Korea both saw 99% declines in purchasing power—many developed-market currencies are on the list, such as the UK and Japan (both –78%) as well as the US (–57%).

A longer-term perspective shows that, over time, all currencies decline against gold, either through revolution, war or inflation (*Display 119*). It goes without saying that many assets priced in these currencies manage to deliver returns that more than compensate for their depreciation (US equities being just one example). However, it does beg the question of whether investors might find exposure to assets not impacted by this trend attractive. Bitcoin, in contrast to fiat money, is deflationary

67 See Philipp Carlsson-Szlezak, "US Economics Weekend Blast: How a Dozen Presidents Have Pressured the Fed (or Not) and Why Trump Is Still Different," Bernstein Research.
68 Hayek, *Denationalisation of Money*.

DISPLAY 119: SINKING WITHOUT A TRACE? MAJOR CURRENCIES AGAINST GOLD SINCE 1880



Current analysis does not guarantee future results.

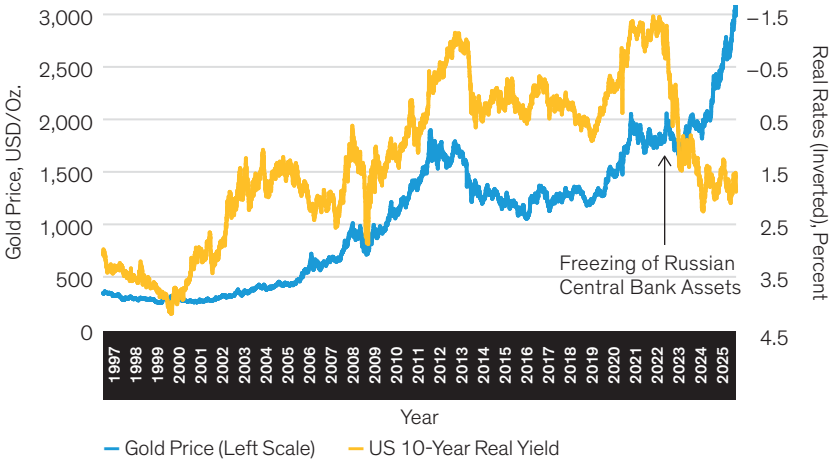
Through May 31, 2020 | **Source:** Global Financial Data and AB

given its fixed supply. Therefore, it could become more attractive to investors who worry about debasement, as long as there is regulatory clarity.

The second theme of this section is geopolitical. The weaponization of access to the dollar in the wake of the Russian invasion of Ukraine has accelerated the desire by some countries to de-dollarize. This urge has manifested itself in the jump in central bank gold buying over the last two years. The consequence of this can also be seen in the observation that gold rallied despite much of this period seeing a rise in real US rates (*Displays 120 and 121*).

Despite the desire of China et al. to de-dollarize, it is not at all obvious that this is possible. China will not be willing to make its currency fully convertible for fear of capital flight, and other attempts to launch dollar alternatives seem remote (e.g., the lackluster interest in the topic at the recent BRICS summit). In fact, despite attempts to de-dollarize, the role of the dollar has continued to grow. The euro's share of global foreign exchange (FX) reserves has declined by 1.5 percentage points over the last 10 years; the share is now under 20% while the renminbi's FX reserve share is

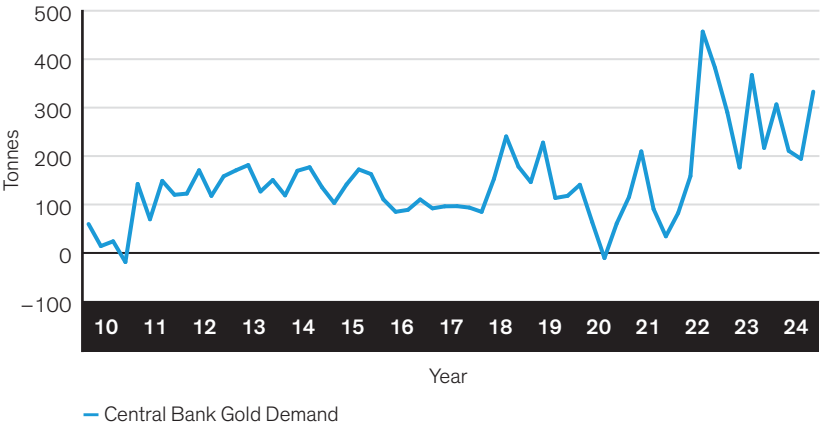
DISPLAY 120: WEAPONIZATION OF USD ACCESS CHANGED THE GOLD/REAL-YIELD RELATIONSHIP



Current analysis and forecasts do not guarantee future results.

Through January 8, 2025 | **Source:** LSEG Data & Analytics and AB

DISPLAY 121: CENTRAL BANK GOLD PURCHASES

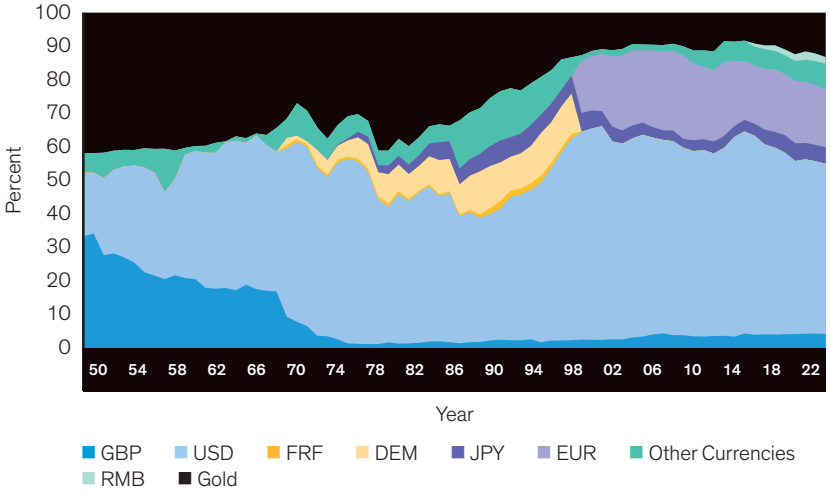


Current analysis does not guarantee future results.

Through September 30, 2024 | **Source:** World Gold Council and AB

stagnant (*Display 122*). When the Bank for International Settlements (BIS) Special Drawing Rights were rebalanced in 2016 to make space for the renminbi (now 12.3%), it was at the expense of non-USD currencies; the weight of the dollar in the BIS basket has increased since 2016.[69]

DISPLAY 122: GLOBAL INTERNATIONAL RESERVE COMPOSITION



Current analysis does not guarantee future results.

Through December 31, 2023 | **Source:** Barry Eichengreen, Arnaud Mehl and Livia Chiţu, *How Global Currencies Work: Past, Present and Future* (Princeton University Press, 2017); IMF, LSEG Data & Analytics and AB

There is an interesting open question on this topic: Does the status of the dollar depend on continued US growth "exceptionalism," and does that still stand? On balance, we think it does. The country has advantages on several of the key megaforces that seem set to shape the investment outlook. On demographics, the US rate of growth in the working-age population is set to be slower than in recent decades, but it will likely continue to grow in absolute terms. This is a far cry from Europe and China, where the working-age population is shrinking. The home-market scale gives the US a degree of cushion against risks that deglobalization is a harsher

69 International Monetary Fund, "IMF Launches New SDR Basket Including Chinese Renminbi, Determines New Currency Amounts," press release, September 30, 2016.

process than currently assumed. The regional risks to growth from climate change are hotly debated, but several forecasts, notably those of the Network for Greening the Financial System,[70] forecast a smaller impact on growth for North America than for other regions. We acknowledge the case for US exceptionalism in our recommendation to overweight US equities, where the key limiting factor is valuation rather than "fundamentals."

Cutting against this is the question of whether the role of the dollar depends on US willingness to enforce the "US-led order." Investors we speak with are split on this topic; it hasn't been tested before, so we can't know the answer. It does mean that any increase in US insularity might bring challenges for the dollar's role. Perhaps a nod to this point is behind Trump's statement about threatening tariffs on countries that tried to move away from the dollar as the basis for cross-border payments.

The conclusion of this section is that there is a case to be made that the political and geopolitical context of money is changing, and that the dynamics of the next five to 10 years look set to differ from the context of the last 40 years. Questions of fiscal sustainability will linger. Likewise, the geopolitics of money are set to become more intense, given the likelihood of a Cold War–like state of affairs between the US and China. Both of these dynamics imply a potentially more positive case for non-fiat assets, primarily gold. As we discuss below, this raises the question as to whether it creates enough demand for non-fiat zero-duration assets that crypto assets can benefit too.

This case must be balanced with potential limits, as well. Despite crypto-positive indications from the new US administration, regulatory risks do remain. So far, a lack of regulatory clarity has been a key limiting factor in institutional adoption of crypto and tokenized assets. There are other potential limits, including the long-running concern about crypto's use for illicit activity. But the real limit, we think, is that if crypto ever gains a significant enough share of transaction volume, then it could attenuate the efficacy of monetary policy. It is the very attraction of such assets not being subject to the constraints of "money" that make them potential targets of regulatory limits.

Money, Tokens and the Future of Work: The Social Role of Money and Crypto

There is already a major debate about the future of work and how it is changing. Probably the most acute concern is the possibility that AI could create mass joblessness through automation. There is currently no consensus on this matter. On the one hand is the observation that two centuries of rapid technological progress and automation since the Industrial Revolution have not created a trend increase in long-term unemployment.[71] Set against this is the observation that many of the jobs most at risk of automation by

70 Network for Greening the Financial System, "NGFS Scenarios for Central Banks and Supervisors," November 2023.

71 David H. Autor, "Why Are There Still So Many Jobs? The History and Future of Workplace Automation," *Journal of Economic Perspectives* 29, no. 3 (Summer 2015): 3–30.

AI are in the least-unionized sectors. There is also the view that, even if past waves of automation have not increased the level of unemployment, a legitimate concern exists about how the benefits of productivity improvements have been shared.[72]

There is a separate debate about the nature of work. For example, does the creation of social media content by individuals without remuneration count as work in the Marxist value theory sense? (Our view is that it definitely does.) What does this say about the bargaining power of labor versus capital in the contemporary economy?

The possible increased role of tokens has a bearing on both of these debates. Rachel O'Dwyer[73] alludes to the ambiguous role of tokens as money by referring to them as "money-ish." This is a handy categorization, because when tokens are used to compensate for work performed, it implies that the work in question is really work-ish. Her work discusses the grey area between a salary and tips or "donations" as pay. There is already a very live debate about the precarity of labor in the face of technological change and platform capitalism, which becomes even more acute if payment is not even in cash. Her work on tokens includes a fascinating discussion of the history of people who are paid in kind, often the marginalized. For example, people who are paid in Amazon vouchers, a token that counts as money-ish and is widely accepted in most countries, but without quite being money.

If individuals are paid in tokens rather than cash, in some cases the issuer of the token can simply create more of them. To the extent that tokens are created by corporations, this again raises questions about the power of corporations as opposed to individuals of government. It recalls the categorization by Yanis Varoufakis[74] of large tech platforms as entities that survive on rent, not profit. Hence the claim that the emergence of platform capitalism has already brought about an end of capitalism as it is traditionally understood, with the role of profit and competition usurped by a mechanism more closely resembling premodern feudalism.

There is another side to the use of tokens in lieu of cash for payment. Just as access to a currency can be weaponized in conflicts between countries, access to traditional cash can sometimes be hard for certain groups, in many cases some of the most marginalized groups. Examples include people living in extreme poverty in parts of the world lacking well-established or easy-to-access banking systems. Other examples are women in Afghanistan, who find it particularly hard to access banking services.[75] Also, sex industry workers in many developed economies are at risk of being debanked, such as OnlyFans workers being denied banking access.[76]

72 Daron Acemoglu and Simon Johnson, *Power and Progress: Our 1,000-Year Struggle over Technology and Prosperity* (PublicAffairs, 2023).
73 Rachel O'Dwyer, *Tokens: The Future of Money in the Age of the Platform* (Verso Books, 2023).
74 Yanis Varoufakis, *Technofeudalism: What Killed Capitalism* (Melville House, 2023).
75 See "A Pathway to Financial Inclusion in Afghanistan," *World Bank Blogs*, February 19, 2020.
76 See Gwyn Easterbrook-Smith, "OnlyFans as Gig-Economy Work: A Nexus of Precarity and Stigma," *Porn Studies* 10, no. 3 (July 28, 2022): 252–267.

De-banking is a way to impose one view of morality on others who don't accept it. There is extra urgency to de-banking if the use of physical cash comes to an end or is more restricted, forcing a reliance on the banking system. Thus, in this case tokens can perform a crucial social function. Of course, this use of tokens also has to be balanced against their ability to enable illegal activity.

Thus, on the one hand, the extension of the use of tokens in a digital world can entrench power structures and is highly relevant when there is already concern about the precarity of work. On the other hand, tokens can also be useful to counter attempts to impose the morality of one group on another via the banking system, a use that on balance can help the marginalized. This points to the role of tokens as an important element in a discussion about power and who wields it, a theme that runs through this chapter. Related to this, it raises questions about freedom and how its definition may shift in a digital world. This point is central to the debate about the distributional effects of any productivity increase from AI.

Tokens as Investments, Part I: Non-Fiat Zero-Duration Assets

The investment angle of this chapter is to discuss the role of digital tokens in portfolios. We have argued for some time that crypto should at some point have such a role, given our view that we are witnessing a change in the investment regime.[77] More recently, we have argued that asset owners should explicitly hold a strategic weight in crypto.[78]

We do not make these recommendations lightly. We are very much alive to the counterarguments. We often hear the views that crypto has no role in institutional portfolios because: (1) it has no inherent value, which makes a return target impossible; (2) there is regulatory uncertainty; (3) it is an asset with a 40% standard deviation of annual returns, thus is too "risky"; and (4) it is simply hard for many investors to understand. There are other potential concerns, but we think that these are the main constraints for institutional allocation.

These objections cannot be lightly dismissed, as they all point to concerns that are very valid. We lay out in this section why we think it is right for institutions to have exposure to non-fiat zero-duration assets that can include crypto. In short, our responses to the above are: (1) gold also has no (or little) inherent value; (2) the regulatory backdrop is changing, so investors might not have the luxury of waiting for full clarity before at least putting plans in place to respond as regulations evolve; (3) investors need to enter any allocation with their eyes wide open to the volatility, but a given level of volatility does not per se preclude an asset from being useful in an overall asset allocation; and (4) this is an investor-specific point—we suspect that familiarity will lead to somewhat greater understanding.

77 Inigo Fraser Jenkins et al., "Portfolio Strategy: Cryptocurrencies in Asset Allocation—I Have Changed My Mind," Bernstein Research, November 30, 2020.

78 Inigo Fraser Jenkins et al., *Five Themes for '25 and Their SAA Implications for US Equities, TIPS and Crypto*, AllianceBernstein, December 2024.

For us, the real basis for the crypto argument lies not with crypto itself, but rather with where a potential allocation fits within an overall approach to strategic asset allocation (SAA). Clearly, this all hinges on the target or liability an investor sets, hence it starts with governance more than anything else. Our view[79] is that the awareness of the risk of higher-equilibrium inflation will lead more investors to ultimately recognize that they need to generate a certain level of real return over inflation. Implicit in this is a tension between risk defined as expected volatility and the risk of a loss of purchasing power. Our view is that purchasing power is a more "hard" limit and that, in general, allocations will hence gravitate more toward real assets, even at the expense of total portfolio volatility.

We think the result of this situation is that many investor types, such as defined contribution plans, sovereign wealth funds and endowments, will need to hold a significant allocation to public equity as the largest and most liquid real asset class available. In a world of lower returns, we think that equity returns—even if lower than they have been historically—become a key source of positive real returns. The question then is what assets to hold around this core allocation to achieve an attractive trade-off of real returns against diversification.

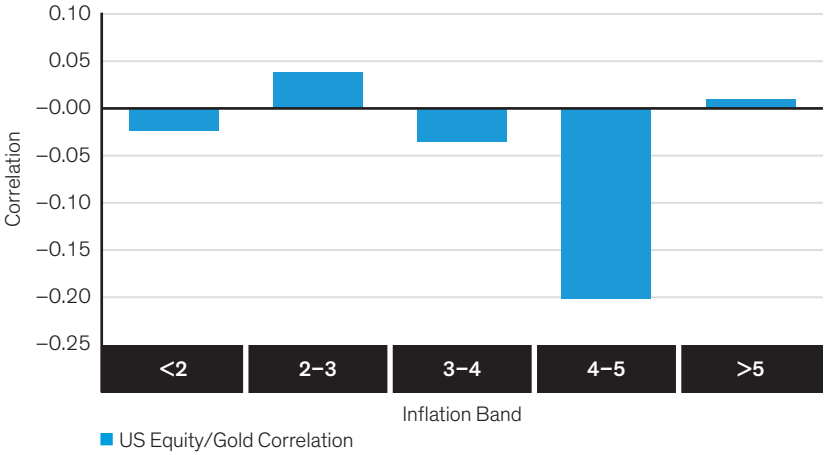
In the past, holding a position in long-duration government bonds was the obvious diversifying asset. However, we think bonds are less likely to be able to fulfill that role, with a correlation to equities that is likely to be positive, higher volatility more in line with the longer-term trend than the global financial crisis/pre-pandemic era, when it was suppressed, and a real return that might not be sufficient. Instead, a range of other return streams are needed. We have discussed the range of options, including private and real assets, factors and active strategies, in detail in other research.

Another of these return streams is that of non-fiat zero-duration assets. With uncertainties about fiscal sustainability and hence risk of debasement and term premia, there is a potential role for such assets. This is primarily a case for gold before any other non-fiat asset. One way to approach this is to consider how the correlation of gold with equities is invariant to the inflation level (*Display 123*), an observation that is most definitely not the case for bonds.

Granted, the long-term return prospects of gold are not high. Over the last 170 years, its real return has been positive but close to zero, at 0.2% annualized. We see its role in a portfolio as a diversifier rather than for return per se. Arguably, the return *should* be close to zero for an asset that is probably the closest thing to a "risk-free asset,"[80] produces no income, is not strictly needed aside from a small number of industrial uses, and has value only by virtue of a social agreement that it does.

79 Inigo Fraser Jenkins et al., *A Preliminary Language for a Post-Global World*, AllianceBernstein, May 2024.
80 We have long held the view that there is actually no such thing as a risk-free asset.

DISPLAY 123: GOLD AND EQUITY CORRELATION IN DIFFERENT INFLATION REGIMES



Past performance does not guarantee future results.

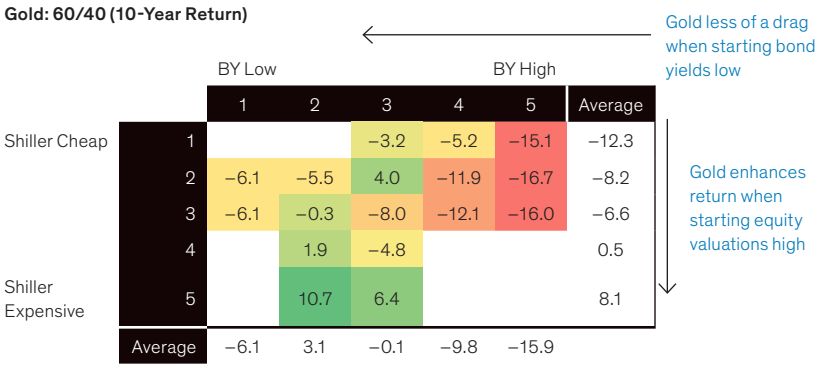
Note: The display shows 12-month rolling correlation from January 1969 through October 2024, bucketed by inflation band.

Source: Global Financial Data, LSEG Data & Analytics and AB

The very strong gold rally over the last year, with the asset outperforming global equities, might put off investors. To that reaction, our main response is that the reason to buy gold is for diversification rather than for near-term returns. Our second response is that gold also has to be seen in the context of an environment where most assets are, we would argue, expensive. One famously can't value gold, but one can value (nearly) everything else. From today's starting level of the Shiller price/earnings (PE) ratio and 10-year bond yield, gold, based on history, would be expected to slightly outperform the 60/40 portfolio 10 years forward (*Display 124*). To be consistent with our equity view, we don't think that a full mean reversion of Shiller PE levels is likely. However, even ignoring equity valuations and conditioning on bond yields alone, we would expect gold to perform in line with the 60/40 (Display 124, bottom row).

The other support for gold is central bank buying in the geopolitical context of attempted de-dollarization, as discussed earlier in this note, which likely adds demand over the medium term. This all begs the question about whether the demand for non-fiat zero-duration assets is sufficient to increase demand for other assets that could plausibly fit into that category. Other precious metals, such as silver, are one option, but we also think that there is space for crypto assets.

DISPLAY 124: GOLD VS. A 60/40 PORTFOLIO—AVERAGE (ANNUALIZED) RETURN CONDITIONED ON EQUITY VALUATION AND BOND YIELD



Past performance does not guarantee future results.

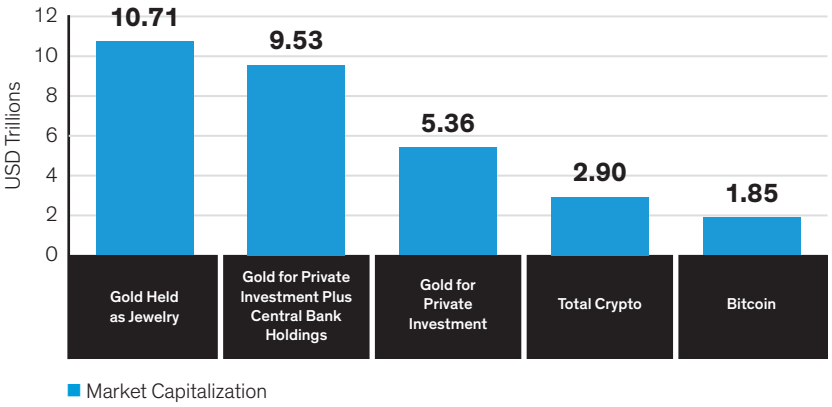
BY: bond yield

Data from January 1972 through April 30, 2020 | **Source:** LSEG Data & Analytics, Robert Shiller's database and AB

We do not believe that it is possible to value crypto, and we remain highly suspicious of any claims to be able to do so as the basis for an investment case. As opposed to valuing crypto, one can instead conduct a scaling exercise. In *Display 125*, we compare the size of gold held for investment and the total size of all crypto. There is no necessary reason why one needs to be larger than the other (a topic that can be debated at length!); we merely make the point that as demand for non-fiat zero-duration assets rises and supply is limited, the value of both should rise in tandem. At current prices, the market cap of all crypto is still more than $2 trillion below the value of gold held for private investment—even before central bank holdings are taken into account.

A problem with adding Bitcoin and Ethereum into portfolios is their high volatility and uncertain correlation with risk assets. We think volatility will continue to decline in step with regulatory clarity and greater institutional involvement. The standard deviation of Bitcoin's annualized daily price move over the last 12 months has been 55% (*Display 126*). By comparison, gold has exhibited an average annualized volatility of daily returns over the last decade of less than 14%. That presents a lower possible floor for the volatility of Bitcoin, but we think volatility will remain well above that level for the medium to long term.

DISPLAY 125: RELATIVE SCALE OF GOLD AND CRYPTO ASSETS

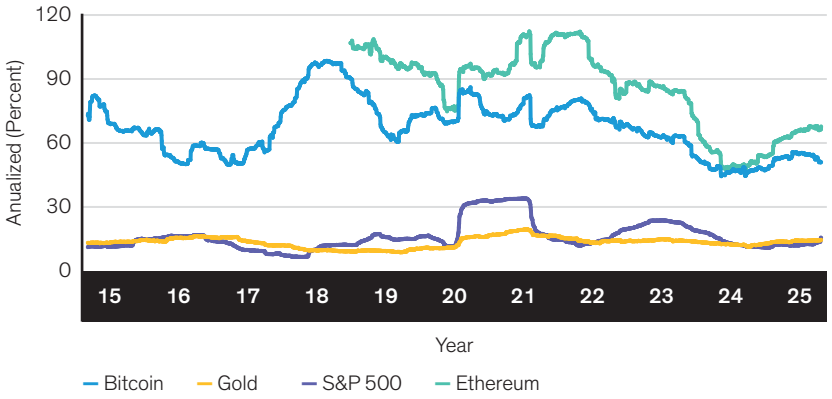


Current analysis does not guarantee future results.

Note: Gold statistics use end of 2024 value for gold stocks and the latest gold price.

As of April 24, 2025 | **Source:** CoinMarketCap, LSEG Data & Analytics, World Gold Council and AB

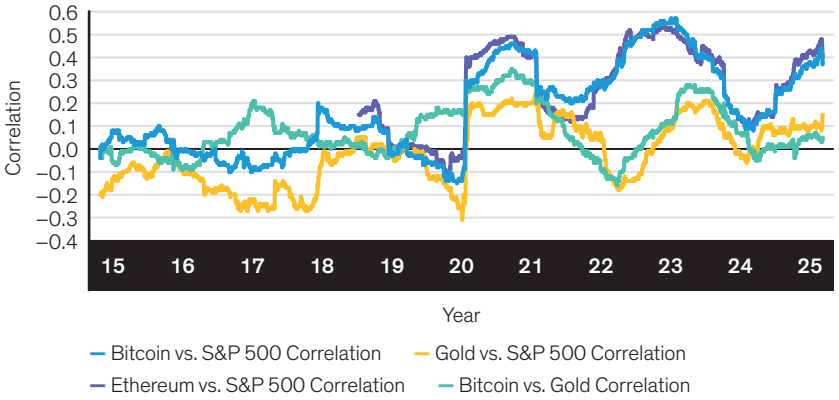
DISPLAY 126: 12-MONTH TRAILING VOLATILITY OF CRYPTO, GOLD AND EQUITIES



Past performance does not guarantee future results.

Through January 7, 2025 | **Source:** LSEG Data & Analytics, S&P and AB

DISPLAY 127: 12-MONTH ROLLING CORRELATION OF CRYPTO, GOLD AND EQUITIES



Past performance does not guarantee future results.

Through January 7, 2025 | **Source:** LSEG Data & Analytics, S&P and AB

The correlation of crypto with other assets is more nuanced. To be clear, it has mainly behaved like a procyclical asset with a significantly positive correlation with equities over the post-pandemic era (*Display 127*). There have been tentative signs that crypto's correlation with equities is falling, and its correlation with gold has been rising more recently.

Our view on the institutional holding of crypto has evolved. Before the COVID-19 pandemic, we did not think crypto had a role to play in asset allocation. The expansion of central bank balance sheets and fiscal policy during the pandemic led us to a very public change of heart,[81] acknowledging that crypto was actually an asset worthy of consideration. More recently, we made the case that crypto could have a specific role as part of a diversification of debasement risk. However, regulatory uncertainty, the high share of retail involvement and volatility meant that its role, while relevant, was only for a future when regulatory clarity was more likely.[82] Trump's election victory prompts a reexamination of that position in two ways. First, it makes the question of fiscal sustainability and possible inflationary consequences more acute. Second, given Trump's crypto-friendly statements on the campaign trail, it brings forward potential regulatory clarity.

81 Fraser Jenkins et al., "Portfolio Strategy: Cryptocurrencies."
82 See Chapter 9, "The Role of Digital Assets in Portfolios" in *A Painful Epiphany*, AllianceBernstein, March 2023.

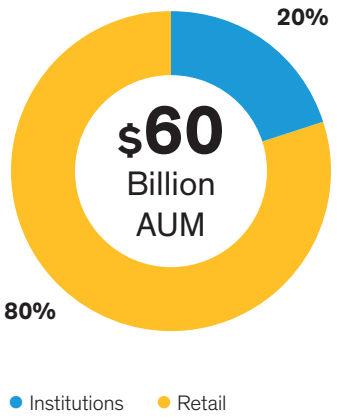
In his campaign Trump implied pro crypto policies would emerge which could give regulatory clarity. At the time of publication we have yet to see firm announcements.

The industry's wish list includes legislation that would carve out a bespoke path to legitimacy among regulators who have, for much of crypto's existence, put a strong emphasis on reining in its potential risks to consumers and the financial system. A key target for the industry would be to change the influence of the Securities and Exchange Commission in this regard.

The bottom line: we think that crypto assets deserve a non-zero weight in institutional strategic asset allocation. Crypto allocations in institutional portfolios

DISPLAY 128: INSTITUTIONAL OWNERSHIP RISING IN BITCOIN, OWNING >20% OF SPOT BITCOIN ETFs

Ownership of Spot BTC ETFs

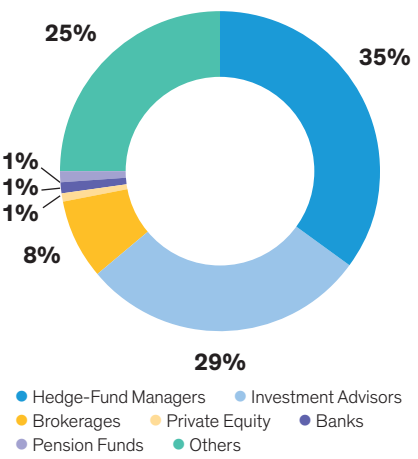


Past performance does not guarantee future results.

As of December 31, 2023 | **Source:** Gautam Chhugani et al., *From Coin to Compute: The Bitcoin Investing Guide*, Bernstein Research, October 22, 2024; and AB

DISPLAY 129: HEDGE FUNDS AND INVESTMENT ADVISORS LEAD INSTITUTIONAL INVESTMENT IN SPOT BITCOIN ETFs

Capital Invested



Past performance does not guarantee future results.

As of December 31, 2023 | **Source:** Gautam Chhugani et al., *From Coin to Compute: The Bitcoin Investing Guide*, Bernstein Research, October 22, 2024; and AB

DISPLAY 130: LEADING INSTITUTIONS INVESTED IN SPOT BITCOIN ETFs

Institutions	Investment in Spot BTC ETFs ($ Mil.)	Number of Spot BTC ETFs Held
Digital Currency Group	1,880	1
Millennium Management	1,245	5
SIG Holdings	937	10
Horizon Kinetics	808	3
Jane Street	773	11
Capula Investment Management	508	2
Goldman Sachs	455	7
Avenir Group	420	2
Schonfeld Strategic Advisors	397	3
Boothbay Fund Management	229	4

Current analysis and forecasts do not guarantee future results.

As of September 30, 2024 | **Source:** Gautam Chhugani et al., *From Coin to Compute: The Bitcoin Investing Guide*, Bernstein Research, October 22, 2024; and AB

have started but are still limited, with ownership of crypto ETFs dominated by retail investors. Even where institutional allocations are in place, they are dominated by hedge-fund positions as opposed to asset owners, implying that the exposure might be more tactical than strategic (*Displays 128–130*).

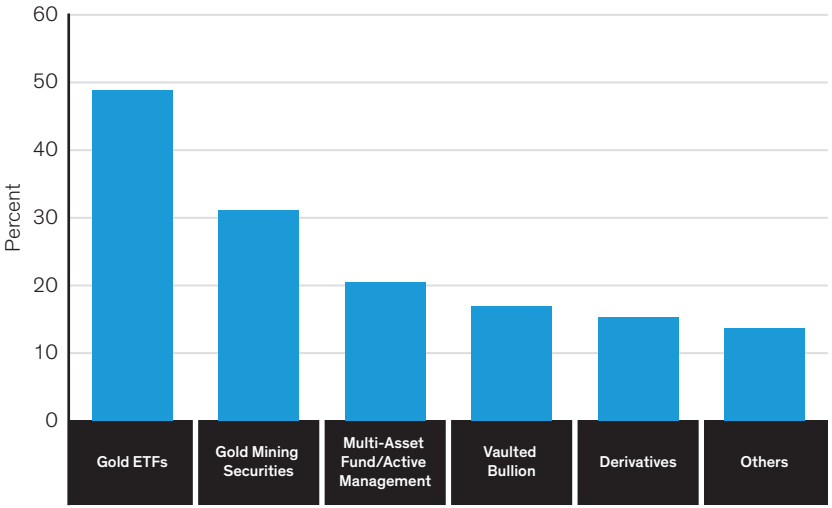
The question arises of the mechanics of adding crypto exposure. Given current fund structures, it is highly unlikely that mainstream institutional assets would take direct access to crypto in their own wallets—at least not for the foreseeable future. Our approach to this issue is to start with our rationale for investing in crypto as really being an offshoot of a case for gold. Thus, the investment process should, we think, be similar, at least initially. The majority of institutional holdings in gold are indirect, via gold ETFs or gold-related equities (*Display 131*).

It should be pointed out that the institutional allocation to gold is small. The majority of investors to whom we speak, particularly pension funds, have zero exposure. We can understand this; historically, gold has not been as attractive as public and private financial assets and it does not pay income, which many investors find valuable.

In aggregate, ownership of gold among institutional investors remains relatively low. According to the World Gold Council's survey, only 15% of institutions had specific

DISPLAY 131: GOLD ETFs ARE THE PRIMARY VEHICLE FOR ALLOCATING TO GOLD

Respondents Selecting Each Instrument



Current analysis and forecasts do not guarantee future results.

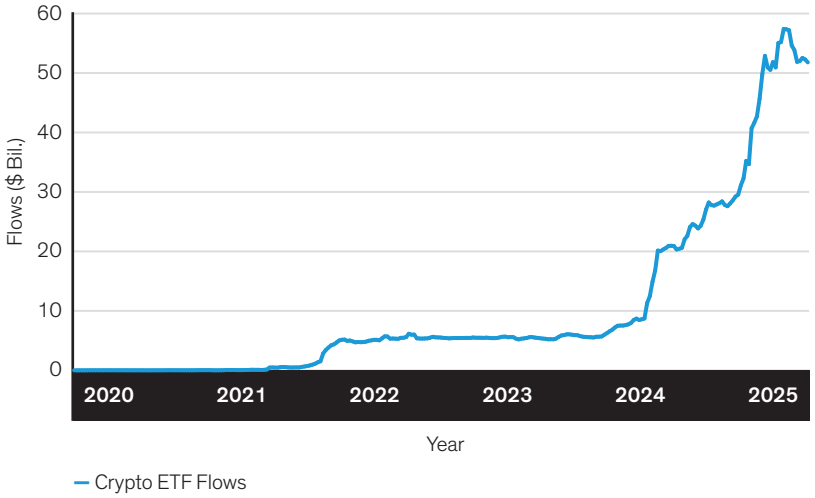
As of October 5, 2022 | **Source:** Coalition Greenwich, World Gold Council and AB

gold positions in their portfolios.[83] Allocations are higher in EMEA and APAC (18% of respondents in each region). But despite modest overall participation by institutional investors, the average allocation to gold is a relatively healthy 4%. We have also noted a marked pickup in questions about gold in our meetings with investors over the last year, compared with the previous five years.

ETFs on cryptocurrencies are now available, and have attracted $50 billion in inflows (*Display 132*). Separately, Coinbase held $220 billion in institutional crypto assets at the end of 4Q 2024,[84] another example of a potential route to crypto exposure. Dedicated crypto hedge funds are a small subset of the overall hedge-fund universe, currently comprising about 2% of total hedge-fund assets under management (AUM), but a rapidly growing one.[85]

83 World Gold Council, *The Use of Gold in Institutional Portfolios*, October 5, 2022.
84 Coinbase, 4Q 2024 Shareholder Letter, February 13, 2025.
85 Coinbase Institutional, 2024 *Allocator's Guide to Digital Asset Hedge Funds*, August 2024.

DISPLAY 132: CRYPTOCURRENCY ETF FLOWS



Current analysis and forecasts do not guarantee future results.

As of December 12, 2024 | **Source:** Emerging Portfolio Fund Research Global and AB

Among big institutional investors, there have been notable early adopters. For example, the Houston Firefighters Relief and Retirement Fund added exposure to Bitcoin and Ethereum through a crypto investment firm as early as October 2021. More recently, the State of Wisconsin Investment Board added Bitcoin ETF exposure from January to April 2024. And in August 2024, the South Korean National Pension Service increased its indirect exposure to Bitcoin through an investment in MicroStrategy equity, which holds the most Bitcoin of any publicly traded company.

Tokens as Investments, Part II: Tokenized Real Assets

Institutional ownership of crypto assets is, however, just the first step in the likely future role of tokens in investment portfolios. In due course, we think that there could be a case for a much more significant allocation to tokenized real assets. At the moment, they are very niche, and it is not possible to implement an allocation at sufficient scale to make it a core part of our investment advice. But if we look forward five years, we think the industry will be spending a lot more time talking about this.

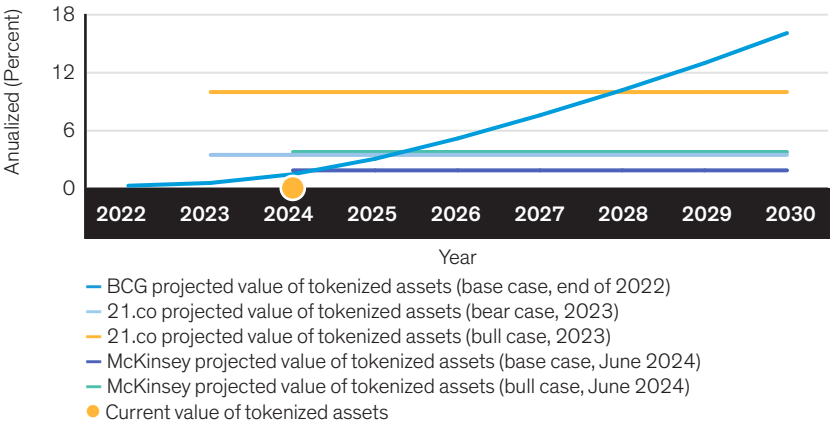
Tokenization of real assets is the process of converting the ownership rights to an asset into a digital token on a blockchain. The issuers choose an underlying blockchain (e.g., Ethereum) and establish a token issuance plan. Usually, tokens are

initially created through a security token offering (STO), which is similar to an initial public offering (IPO) in equity markets but can also involve a private placement. The tokens represent an ownership interest in an asset and can include voting rights relating to matters of the underlying physical asset, such as the sale of tokenized real estate or the decision to renew a lease.

Tokens are then listed on compliant digital asset exchanges, where they can be traded on the secondary market. The process can be performed for assets that have a readily observed price, such as an asset already trading in other markets or for which the price has to be assessed by a verified third party. While the STO process is generally faster and cheaper than an IPO, it still involves costs and needs a large support ecosystem, including legal support to certify asset authenticity, broker-dealers to provide liquidity for secondary trading, and asset custodians.

How large can and will this market be? Various attempts have been made to enumerate this, so far without much success. Boston Consulting Group was one of the earliest and among the most optimistic companies to issue a forecast for the potential size of the market for tokenized assets. At the end of 2022, the company forecast a potential $16 trillion market by 2030 (*Display 133*). Notably, this was considered a conservative estimate; the bull-case projection was significantly

DISPLAY 133: OPTIMISM ABOUT HOW QUICKLY TOKENIZED ASSETS CAN GROW HAS ATTENUATED



Current analysis and forecasts do not guarantee future results.

Note: Current value of tokenized assets as of July 30, 2024

As of July 30, 2024 | **Source:** 21.co, Boston Consulting Group (BCG), Dune Analytics, McKinsey, World Economic Forum and AB

higher. Since then, optimism about the potential addressable market appears to have tempered. Another oft-cited estimate, by the digital asset manager 21.co, projects a range of $3.5–$10 trillion. And a recent McKinsey report arrived at an even lower estimate of around $2 trillion by 2030 as a base case. We show these latter forecasts as horizontal lines in Display 133, starting from when the forecast was made and terminating at the end of the forecast horizon.

However, the actual current value of tokenized assets is nowhere near where it should be, even by the most conservative estimates. Excluding stablecoins, it's just over $2 billion.[86] The biggest share of the total comes from government debt securities, followed by commodities and asset-based finance. Another recent Boston Consulting Group report puts the estimate of real-world tokenized assets at a slightly higher $12 billion.[87] Stablecoins have been the most successful application of asset tokenization so far, but even including stablecoin AUM, the total value of tokenized assets would rise to only about $200 billion.

We think two elements need to fall into place for this market to grow: regulatory clarity and the solidification of investor demand. Regulatory clarity is still absent as of this writing, but the Trump administration could accelerate the process. However, we claim no special insight into the regulatory path.

We think it is easier to sketch out a path for investor demand. For us, this is not about the technology of the blockchain per se. In our view, the key motivation for the structural demand growth of such assets will be the broader investment landscape. Specifically, our take on what will drive demand is the confluence of:

1. Sustained higher demand for real assets
2. A structural shift in how capital is raised in the economy—from public to private markets
3. Elevated concern about liquidity being more fragile
4. An ongoing desire to drive down fees

This list might come as a surprise. Most papers making the case for tokenized assets talk about the technology. We think larger macro forces are even more compelling.

The intersection of real and private assets will likely continue to form a larger part of institutional allocation. If our view that inflation is likely to be more elevated is correct, then investors still have a long way to go in allocating to real assets. Likewise, the way that capital is raised in the contemporary economy has shifted: more of it is in private markets, as private equity has gained share from public equity and private credit has gained share from (listed) banks. At the same time, the stock of public equity is shrinking on absolute terms. All this points to a higher allocation to private assets.

86 "Overview of Tokenization," Dune.com.
87 Boston Consulting Group, *Tokenized Funds, the Third Revolution in Asset Management Decoded*, October 29, 2024.

However, there are constraints on this allocation. In our view, the binding one is not really a limit imposed by an asset-allocation committee or consultant, as such targets are contingent. Instead, we think that a much harder limit is a continued elevated need for liquidity (or, rather, the risk of a liquidity shock) because of three different factors:

1. The ongoing attempt by central banks to pivot from quantitative easing to quantitative tightening
2. The observation that investor portfolios are markedly more illiquid than they have been in the past
3. The liquidity that does exist in public equities and fixed income is more fragile due to changes in market microstructure (e.g., more trading happening at the close, more liquidity being provided by high-frequency traders, and a shift in market participants)

This all means that anything that can create greater liquidity is going to be in high demand.

Secondary markets in fractionalized real assets do not have to require a blockchain, in theory. However, in practice, fractionalizing such assets will likely be easier to achieve on a blockchain. This point provides a powerful incentive for growth in tokenized assets, once the regulatory landscape is clearer. Our view is that the demand for private assets and the parallel uneasiness about liquidity risk will be key features of the asset-allocation discussion over the next five years. Thus, we expect that demand for tokenized real assets will rise. The market for tokenized assets is still small; real estate assets have led the way in terms of private asset exposure.[88] There are also examples of tokenized private credit.[89]

Tokenized access to funds has also started to grow. These are not necessarily real assets at all. For example, there have been recent launches of short-duration fixed-income funds, tokenized on the Ethereum blockchain, with the ability to buy access to the funds with either stablecoin or fiat currencies. We note that funds do not have to be listed on a single blockchain. For example, money-market funds are being initiated on Ethereum and are now expanding their access to other blockchains. So, in a sense, this is analogous to the different share classes of mutual funds.

Yet another emerging example is the tokenization of insurance-linked securities (ILS). There have been a number of separate commercial launches in this area. One such example is the tokenization of catastrophe bonds. To the extent that ILS assets fit under the "alternative" umbrella, they can be seen as an extension to tokenize this growing share of investment portfolios.

These examples are not exploiting the full potential of fractionalized ownership of real assets to make active allocations across the segments, but we see them as building blocks in that direction.

88 Rick Carroll, "In $18 Million Deal, Nearly One-Fifth of St. Regis Aspen Sells Through Digital Tokens," *Aspen Times*, October 9, 2018.
89 rwa.xyz, "Tokenized Private Credit."

Tokenization, Subverting Asset Classes and a Vision

So how should we think about tokenization in SAA models? Tokenized real assets play a potentially very different role than crypto. We see gold and crypto as forming a distinct part of a portfolio allocation, as a non-fiat zero-duration bucket with a specific role in diversifying equity risk in a world of higher and more volatile inflation. They also serve as a hedge against the debasement of fiat currency.

The tokenization of real assets, by contrast, fits in a very different part of the allocation. If one takes a fundamental risk-factor approach to SAA in the spirit of a total portfolio approach, then these would most naturally sit within the inflation-hedging/real-return part of the allocation. If one is taking a more traditional asset-class approach, then they would form part of the allocation to "alternative assets"; i.e., within an allocation to real estate, infrastructure or assets that deliver some form of contractual income.

However, we contend that it would be myopic to think of tokenized assets as fitting into asset-class buckets in this way. Or, at least, such a viewpoint would betray a woeful lack of ambition. The real point about tokenization is that it subverts asset classes. The combined effects of fractionalization, the potential financialization of assets that are otherwise hard to invest in, and increased transparency blur the boundaries of what constitutes an asset class. Fractionalization begets liquidity. It is already apparent that there is a broad spectrum of liquidity under the guise of "illiquid assets." For example, there are private debt vehicles contracted to pay predetermined amounts over a period of two to three years and interval funds with liquidity at predetermined periods; e.g., quarterly. At the opposite end of the scale are private equity investments with the aim of selling the position on a 10- to 12-year horizon. This spectrum of liquidity could evolve further. An encroachment of tokenization into these areas makes a mockery of the term "alternative asset," revealing that they are just "assets."

This vision enables asset owners to target very specific types of asset or return streams and be very specific in how to allocate across them to best meet any given liability or objective. The liquidity created by fractionalization will also likely create some ability to shift exposures to real assets over the course of the business cycle. We stress that this development is not predicated on the technology of the blockchain alone. Instead, it is driven from a viewpoint of investment: the need for a more precise way to allocate to assets and attack the liquid/illiquid dichotomy that stands in the path of efficient allocation.

The real endpoint of this vision is that it removes the distinction between public and private markets and subverts asset classes, an important step in freeing up SAA from the silos that have been imposed on it by the structure of the investment industry. This is crucial in the context of a lower-real-return world where diversification between asset classes is impaired.

Conclusion: Power, Money and Tokens

The growth of cryptocurrencies and other tokens raises political and social questions that are given an extra impetus by other independent aspects of our current situation. Political questions arise from the growth of public debt and geopolitical questions arise from the attempt to challenge the reserve-currency status of the dollar. There are also social questions arising from the ongoing evolution of what is meant by a "job" and from the power of labor versus capital.

The interleaved issues of the nature of money and the nature of work in the contemporary economy point to a three-way pull on where power lies: between the state, the corporation and the individual. In this context, the purest expression of the social power of the individual via work would be the case where individuals are paid for work that they perform in a universally accepted currency that is not debased by the fiscal policy of the state. By contrast, a world where the corporation grabs more of the power in this money/jobs dynamic would see corporations issue tokens to pay workers; these tokens may be acceptable in most countries, but corporate ownership of the means of monetary production implies huge power beyond what is currently meant by the term "gig economy."

The third leg of this power dynamic is an example where the state takes more power in the context of an AI-infused economy that brings the risk of mass job losses. This is most clearly expressed by an implementation of universal basic income (UBI) as a potential response to mass joblessness. In such a society, the individual potentially loses economic agency while the notion of wage inflation and retirement become arbitrary. We would note that some literature on the political left has called for rapid automation and UBI as a means to "liberate" people from work, thereby inverting the causality of automation and loss of jobs.[90] But whatever the driving animus, be it capitalist or Marxist, this third potential strand implies increased power to the state. These are all topics that ultimately address questions of freedom and power; the future of tokens is bound up with these concepts. At face value, a populist tilt would imply a shift in power in favor of individuals, but the twin forces of AI-based automation and growing government debt perhaps suggest that a different path is more likely.

All these are key macro issues that will determine the evolution of the economy, financial markets and the meaning of money in the coming decades. Tokens, in various forms, have a role to play in all of them.

90 Nick Srnicek and Alex Williams, *Inventing the Future: Postcapitalism and a World Without Work* (Verso Books, 2015).

Chapter 7—Portable Alpha: A Revival

One possible response to a low-real-return world is to increase allocations to active strategies. However, market concentration poses a challenge for active managers seeking to enhance returns from some of the largest markets, and in general there may well be a mismatch between desired portfolio beta exposures and the most fruitful alpha sources. Alpha potential is alive and well in less-efficient and less-exploited market segments, such as small-cap and emerging-market (EM) equities, but few investors are willing to budget substantial beta to those areas. Multi-manager hedge funds also seem like effective alpha generators, but how can investors connect their beta and alpha worlds efficiently?

We think one answer lies in a strategy familiar to many investors yet more refined than the version from decades ago: portable alpha. This solution can efficiently tap into a wide range of attractive alpha streams capital while keeping strategic asset allocations on track. If investors implement and govern portable alpha correctly, it may be a powerful tool.

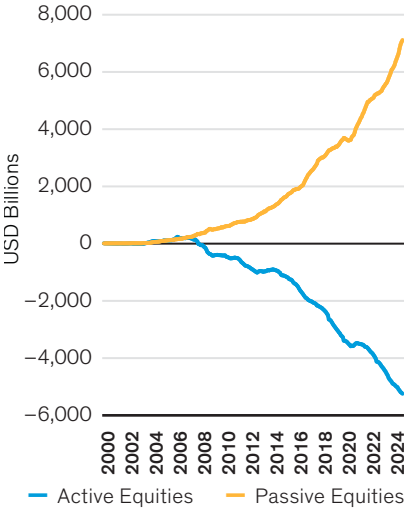
The earlier chapters in this book have outlined the case for a new regime, with the potential for lower future real returns. A difficult beta outlook intensifies the need for alpha (the return from active management above the market), but alpha seems harder to find. The median manager in US large-cap equities—the biggest beta pool and largest allocation in many portfolios—has generated zero alpha before fees and negative alpha after fees for at least a decade. Even top-quartile managers have beaten their benchmarks by only 0.6 % annualized over the past decade, on average. Managers using other large-cap developed equity benchmarks—growth, value and core—have also struggled to add value in recent years, a challenge exacerbated by the market's high concentration in mega-cap tech—the Magnificent Seven problem.

Investors have responded by joining two of the biggest asset-allocation trends of the last two decades: exiting active equity strategies in favor of passive and moving from liquid public markets into private markets, especially private equity (*Displays 134 and 135*). Hedge funds, once a big beneficiary of the move into alternatives, have failed to keep pace, with investors' allocations to these alpha-centric, low-beta portfolios largely stalling.

How can we get a feel for the scope of this shift? With investors directing capital into passive indices on the one hand and into illiquid private equity on the other (less so into other private assets such as debt, real estate, infrastructure and natural resources

DISPLAY 134: INVESTORS ARE EXITING ACTIVE EQUITIES FOR PASSIVE

Global Flows Into Equity Funds

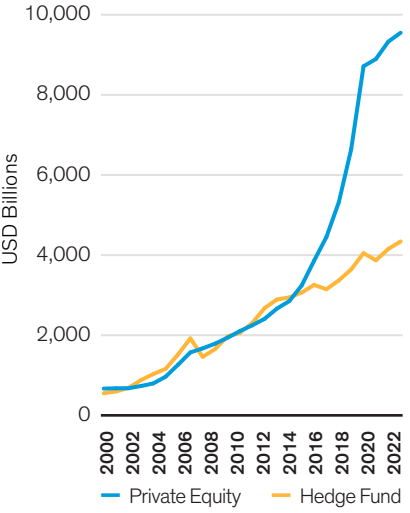


Historical analysis does not guarantee future results.

Through February 28, 2025
Source: Emerging Portfolio Fund Research Global and AB

DISPLAY 135: PRIVATE EQUITY ASSETS HAVE SURGED

Assets Under Management (AUM)



Historical analysis does not guarantee future results.

Through June 31, 2024
Source: Preqin and AB

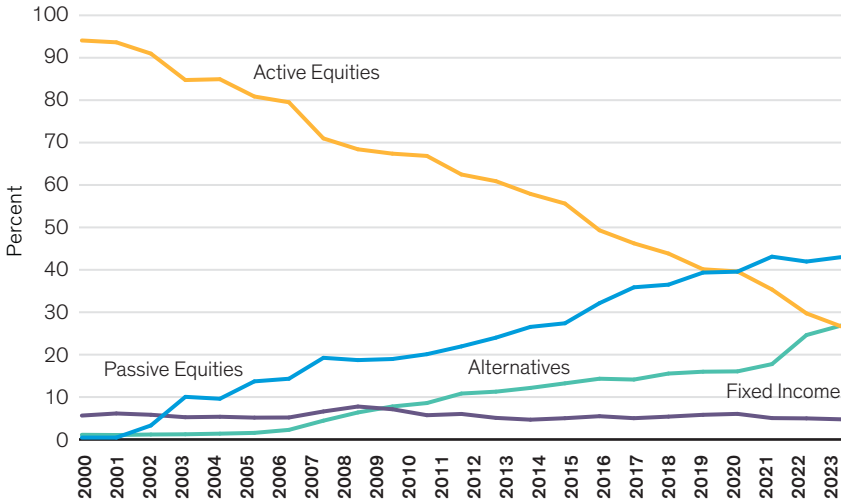
assets), the share of total portfolio risk accounted for by active public equity and private equity (and other alternatives) has crossed over for the first time (*Display 136*).

While the shift to passive and private equity may have been beneficial in a market that has clearly favored US large-cap beta, we question whether this is the correct positioning going forward in a low-return environment. We think investors should be cautious about seeing private equity as a panacea—it poses liquidity risk and is subject to the same valuation risks as public equities. With a record amount of dry powder chasing private equity, returns will likely experience the same (or more) downward pressure as other asset classes.

Yes, private equity (and other private assets) plays an important portfolio role, but the glut of capital inflows may lead returns to fall short of expectations and produce unexpected systemic risks—particularly if these illiquid investments continue to find their way into portfolios that need liquidity in times of market stress.

DISPLAY 136: CHANGING OF THE GUARD IN PORTFOLIO RISK CONTRIBUTIONS

Risk Contribution for US Pension Funds by Asset Class



Current analysis does not guarantee future results.

We use the capital allocation of US pension plans as the base, and assume that "alternatives" is a 50/50 combination of private equity and hedge funds. For private equity, we use a public-market-equivalent time series (essentially a smaller-cap, value-tilted index with leverage). For hedge funds, we use the HFRX Aggregate Index. Given constraints on data availability for alternatives, we use a constant variance/covariance matrix over the full time period, rather than a rolling one. For fixed income, we use the Bloomberg Global Aggregate Total Return Index.

Through December 31, 2023 | **Source:** Bloomberg, Hedge Fund Research (HFR), LSEG Data & Analytics, Public Pension Plan Database and AB

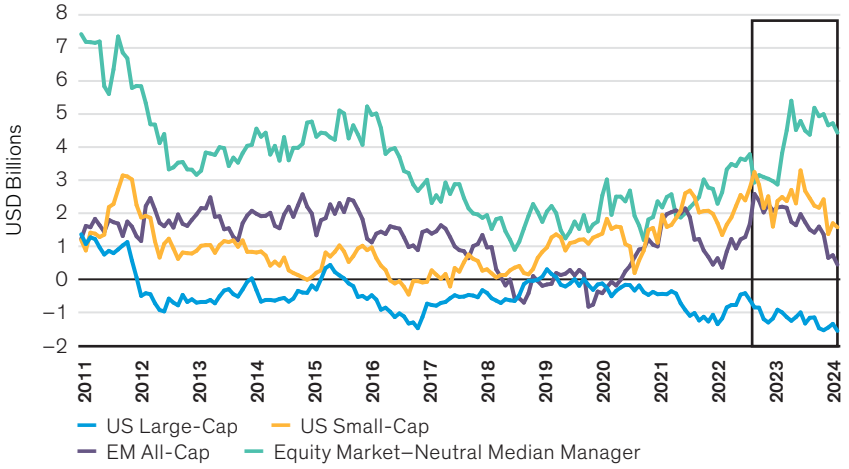
Alpha Is Essential, but Scarce in the Largest Markets

We don't believe that abandoning active management and the pursuit of alpha in public markets is the answer: alpha plays an important role in a low-return world. While it's hard to consistently find positive and lasting alpha, it has by no means gone away. Large-cap active managers have struggled over the past decade and particularly the past few years, but small-cap, emerging-market and equity market–neutral hedge-fund managers have consistently beaten their benchmarks (*Display 137*). In our view, this demonstrates the value of seeking active returns in public markets.

Investors face a beta-alpha mismatch as they pursue alpha. Investors must broaden their view beyond large, efficient market segments to find alpha potential in

DISPLAY 137: ALPHA GENERATORS REMAIN AVAILABLE IN PUBLIC MARKETS

Rolling 36-Month Excess Return of Average Manager (Percent, Net of Fees)



Data do not represent past performance and are not a promise of actual results or a range of future results.

Data based on USD gross returns of a sample of 10,000+ equity funds and 3,000+ fixed-income funds sourced from eVestment and Morningstar. Hedge-fund data are sourced from Hedge Fund Research (HFR). Net-of-fee returns are calculated assuming a 25 bps annual fee for US large-cap equity and a 50 bps annual fee for US small-cap and emerging markets. eVestment and Morningstar geographic focus, style and market focus are used to group funds into subcategories. Funds' individual stated primary benchmarks are used to estimate excess returns. Display shows long-term average excess returns for the median and top-quartile manager in fund categories estimated over rolling 10-year periods from April 1999 to September 2024.

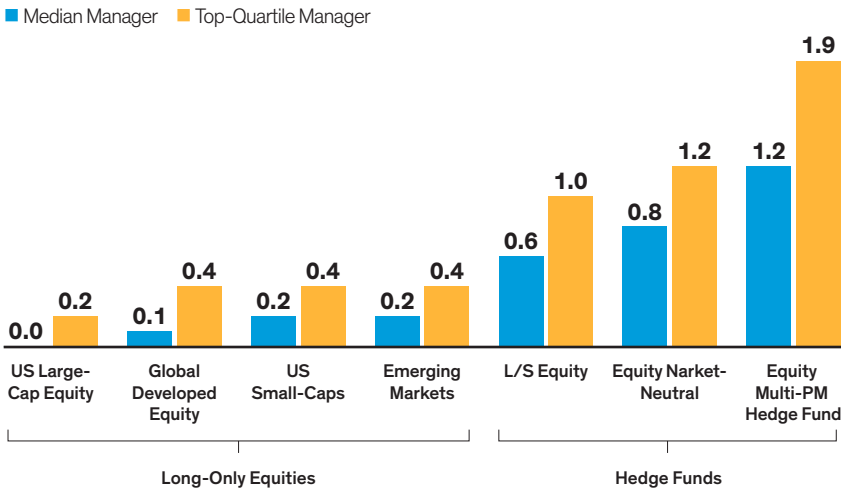
Source: eVestment, HFR, Morningstar and AB

less-explored regions and segments that enable higher information ratios—active return per unit of tracking error (*Display 138*). In small-cap and emerging markets, the rewards (on average, over the long term) are 0.2 units of return per unit of volatility for the median manager. For top-quartile managers in those categories, and in larger, developed global equity benchmarks, return-to-risk ratios are 0.4 or above.

Equity-centric hedge funds have demonstrated impressive alpha-generating capabilities. Their edge in active-return generation makes them fruitful areas

DISPLAY 138: ALPHA IS RICHER IN HEDGE FUNDS AND LESS-EFFICIENT MARKETS

Information Ratios of Median and Top-Quartile Managers (Net of Fees)



Data do not represent past performance and are not a promise of actual results or a range of future results.

Data based on USD gross returns of a sample of 10,000+ long-only equity funds and 3,000+ long-only fixed-income funds sourced from eVestment and Morningstar. Hedge-fund data are sourced from Albourne and HFR. Net-of-fee returns and information ratios are calculated assuming a 25 bps annual fee for US large-cap and global developed equity and a 50 bps annual fee for US small-caps and emerging markets. We use eVestment and Morningstar geographic focus, style and market focus to group funds into subcategories. We use the funds' individual stated primary benchmarks to estimate excess returns. Display shows long-term average excess returns for the median and top-quartile manager in fund categories, estimated over rolling 10-year periods from April 1999 to June 2024.

Source: Albourne, eVestment, HFR, Morningstar and AB

for sourcing alpha, and the more market beta they hedge out, the better their risk-adjusted returns have been. Equity multi-manager hedge funds stand out with the strongest risk-adjusted active returns, as they also benefit from broad alpha diversification: the top-quartile manager produced an information ratio of 1.9.

Unfortunately, most investors have been unwilling or unable to add much underlying benchmark risk to support a meaningful allocation in these richer alpha segments.

Small-cap and emerging-market stocks account for small shares of cap-weighted indices, and hedge funds typically hedge out most, if not all, beta risk explicitly. This forces investors to choose between attractive but uncertain alpha and owning equity or bond risk premia in their asset mixes.

This dilemma highlights the lack of alignment between the asset allocation investors may want and the availability of alpha sources in those markets: alpha is scarce in the largest markets that play the biggest roles in portfolio beta allocations. This issue also hints at a possible solution that endured a shaking-out period during the global financial crisis (GFC) and, with lessons learned, seems poised for a revival: portable alpha.

Portable Alpha: An Approach to Tackling the Beta-Alpha Mismatch

We believe portable alpha offers an avenue to incorporating a broader set of alpha opportunities in a flexible, risk-efficient and capital-efficient way, enhancing returns while preserving strategic asset allocations. It may help address return shortfalls, and it can be tailored to specific risk budgets and illiquidity tolerances for active return sources.

Simply put, portable alpha is a portfolio-construction technique (*Display 139*) that enables investors to combine any independent source of manager alpha with any beta exposure. It's usually implemented through derivatives—futures, forwards or swaps—that create "synthetic" exposure to a beta stream, usually a passive index such as the S&P 500, in our example. In our opinion derivatives are a more capital-efficient way to access beta, because the investor uses cash to fund only a small fraction of the beta exposure—the initial margin needed to secure a futures position.

That approach to beta exposure frees up the rest of the "excess" cash to invest more capital into an alpha source that has the potential to outperform cash and enhance the beta return. Investors end up with a combination of derivatives that provides 100% exposure to the index, reserving some cash collateral for margin variation (50% in our example) and an allocation to one or more alpha streams (50%) funded from the rest of the cash.[91] The total economic exposures exceed the value of the underlying assets, so the position uses leverage—associated financing costs must be included when assessing the portable-alpha strategy's performance.

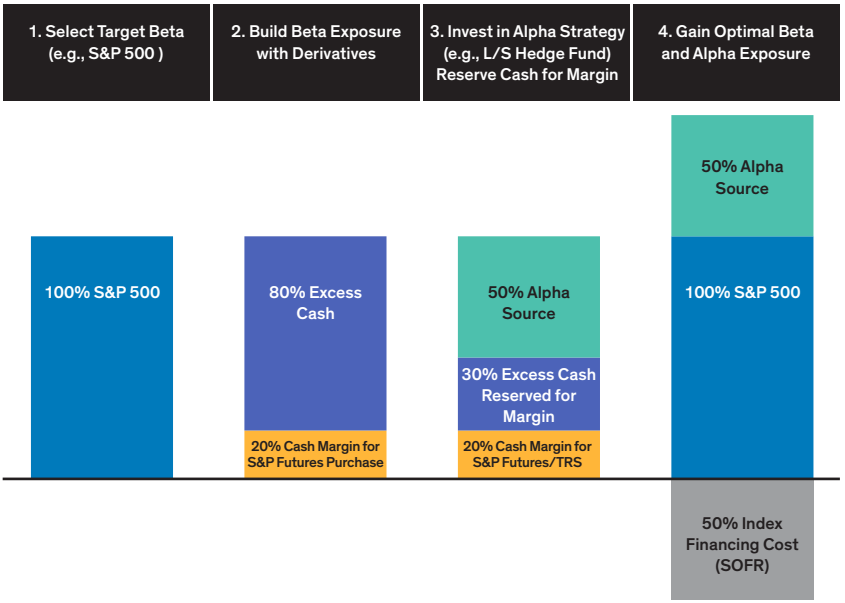
An Example: Portable Alpha in Action

A brief example demonstrates the potential benefits of a portable-alpha program. As a starting point, basic beta combinations of passive global stocks and bonds have generated historical annualized return and risk ranging from a 4.8% return and a 5.9% risk for all bonds to a 6.3% return and a 15.7% risk for all equities (*Display 140, top*).

What if we stick to a 60/40 stock/bond strategic allocation but implement 50% of it actively, using a top-quartile global bond manager and a global portfolio of top-quartile long-only equity managers? We can move beyond the passive frontier

91 This is just one example of an implementation. An investor can also spend cash on beta and source alpha synthetically through a derivative exposure, such as via a total return swap from an investment bank that references the underlying alpha strategy.

DISPLAY 139: PORTABLE ALPHA—THE BASICS



For illustrative purposes only. There can be no assurance that any investment objective will be achieved.

Derivative instruments such as options, futures, forwards or swaps can be riskier than traditional investments, and may be more volatile, especially in a down market. SOFR: Secured Overnight Financing Rate; TRS: total return swap

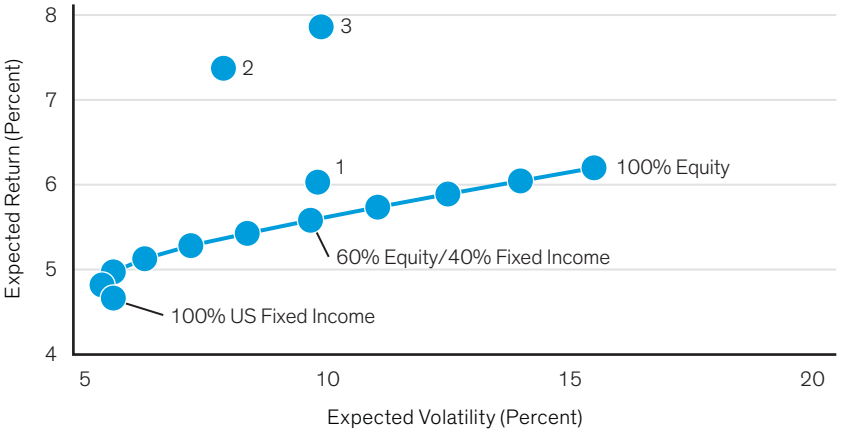
As of October 31, 2024 | **Source:** S&P and AB

to Option 1, with the excess return and tracking error versus the 60/40 passive benchmark shown in *Display 140, bottom*. That's an improvement, but still a relatively modest one, even with the best managers.

In Option 2, we scale down the 60/40 allocation (still 50% passive and 50% active) to 85%, investing 15% in a top-quartile equity market–neutral hedge fund. This approach beats the passive 60/40 benchmark by a much bigger margin of 1.1% annualized, and meaningfully improves the information ratio.

But portable alpha enables a bigger improvement. Option 3 shows the result of allocating 15% to portable alpha using a top-quartile equity market–neutral hedge-fund manager, funded by shifting 15% of the equity position to futures from the cash index. The excess return improves further to 1.5%, with the same volatility as the 60/40 and a much better information ratio of 1.5. The strategic allocation is intact, with the intended underlying beta mix and volatility. Given current market forecasts

DISPLAY 140: PORTABLE ALPHA MAY IMPROVE RISK-ADJUSTED RETURNS



Risk/Return of Portable-Alpha Implementations

	Investment Approaches	Expected Return (%)	Tracking Error	IR
1	60/40 Long-Only 50% Active/50% Passive	0.4	0.8	0.49
2	50% Equity/35% Fixed Income/15% Hedge Funds 50% Active/50% Passive	1.1	1.7	0.64
3	60/40 with 15% Hedge Funds using Portable Alpha 50% Active/50% Passive	1.5	1.0	1.50

Past performance is not necessarily indicative of future results. There can be no assurance that any investment objective will be achieved. Investors should not assume that they will have an investment experience similar to the hypothetical, back-tested or simulated performance shown.

IR: information ratio

As of December 31, 2024 | **Source:** AB

and the flatness of the expected-return curve, our analysis suggests that adding portable alpha improves return more than moving toward an all-equity portfolio does.

How should investors approach the implementation of a portable-alpha strategy to avoid the pitfalls that surfaced in past episodes of market stress? We think thoughtful rules of the road can improve the chances of success—starting with the need to choose managers best suited for an alpha engine.

Getting the Alpha Manager Mix Right Is Critical

Even at the surface level, assembling and maintaining an effective stable of alpha managers seems daunting. It's not possible to simply "earn" alpha the same way investors earn a risk premium through buying and holding a passive stock or bond portfolio. Picking skilled managers is a prerequisite to benefiting from a portable-alpha solution.

To do so, investors should increase their focus on alpha pools that tend to be better. In equities, market-neutral strategies, for example, are fertile ground because they focus on staying beta-neutral and tend to limit persistent factor risks. No matter which pools investors source alpha from, they should zero in on managers that can consistently deliver compelling idiosyncratic alpha—the alpha remaining after adjusting for common, commoditized factor beta exposures. Our research suggests that managers able to deliver high levels of idiosyncratic alpha are more likely to do so persistently.[92] Returns must also be projected to be large enough in absolute terms to exceed the higher cash rates of the post-pandemic period and the significant fees many hedge-fund managers charge.

In the end, this task really comes down to identifying skilled individual managers through a thoughtful, thorough and repeatable process. Investors may have—or may seek to build—such a process in-house, or they can consider tapping the alpha-identification capabilities of an outsourced CIO, fund of hedge funds or multi-manager hedge-fund platform.

Diversifying Across Managers Within an Alpha Engine

Diversification is also a vital component of an alpha engine. Adding diversifying managers has the potential to improve outcomes, which could reduce portfolio volatility and drawdowns while enhancing return. Strategy diversification is also critical: for example, combining fundamental and systematic sources of returns has often led to more consistent results. Beyond equity alpha strategies, macro hedge funds tend to have low correlation to major asset classes and can be attractive in building a more diversified solution.

As shown in *Display 141*, adding managers to a portable-alpha portfolio meaningfully increases the overall Sharpe ratio of the allocation—even if we assume individual managers' Sharpe ratios are a modest 0.3, on average (Display, left).[93] With 10 managers, the expected Sharpe ratio increases by a factor of five, improving to 1.5. But simply hiring more managers doesn't guarantee a high or optimal Sharpe ratio, because correlations among managers (as well as manager skill) play a big role in outcomes.

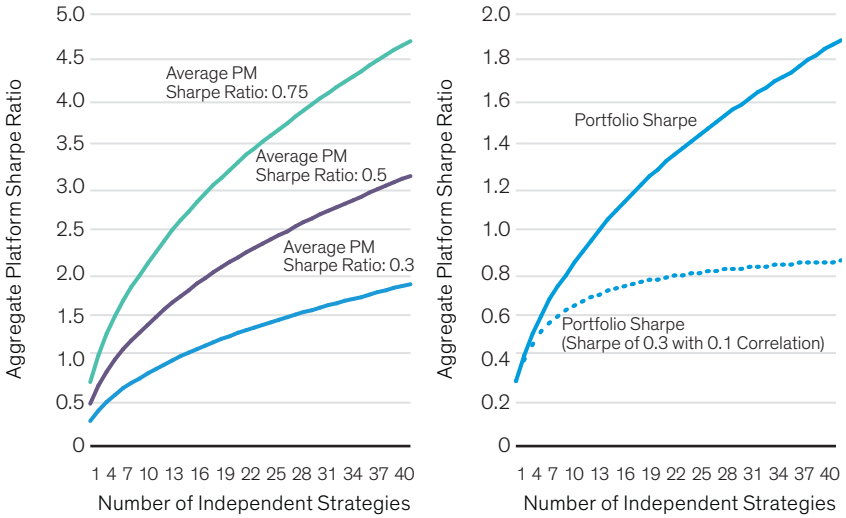
92 Alla Harmsworth and Harjaspreet Mand, *A Cut Above: Why Idiosyncratic Alpha Is Better than Beating the Benchmark*, AllianceBernstein, November 10, 2022.

93 The right display assumes an average Sharpe ratio of 0.3 for the individual portfolio managers—well below the Sharpe ratios achieved by the median manager across our long/short equity (0.47), equity market–neutral (0.55) and multi-manager (0.99) samples.

Even a modest increase in the average pairwise correlation between portfolio managers from 0.0 to 0.1 could materially reduce the improvement in risk-adjusted returns from adding managers (Display, right). And if managers' exposures are correlated to the beta allocation, it could magnify volatility and downside risk, potentially derailing a solution when beta struggles. This point reinforces the critical nature of low-correlation managers, transparency in their portfolios and risk management of the alpha engine.

DISPLAY 141: THE IMPORTANCE OF DIVERSIFICATION

The Importance of Diversification



Current analysis does not guarantee future results.

Diversification does not eliminate the risk of loss.

As of April 3, 2025 | **Source:** AB

Managing Risk—Dynamically

The ongoing effort of managing risk in a portable-alpha solution has many facets. These include monitoring the performance of the alpha engine and its individual managers over time: idiosyncratic alpha, volatility, Sharpe ratio, and the correlations between managers and the portfolio's beta exposure. It's also important to have the capability to adjust unwanted exposures to factors such as beta sources, sectors and industries, and regions. These can accumulate over time when multiple managers wind up pursuing similar opportunities.

The leverage ratio in a portable-alpha strategy also must be optimized to maximize returns while managing risk. It should remain aligned with the investor's risk tolerance and investment objectives, and with the return and volatility characteristics of the portfolio's alpha engine. Investors who seek to combine diversified alpha sources and get the calculus wrong could end up with a far worse risk/return than they intended.

Liquidity management plays a huge role in the success of a portable-alpha strategy, as we'll explore in the following section. Effective liquidity management enables key aspects such as manager rebalancing, alpha and beta rebalancing, and satisfying margin calls when episodes of market dislocation arise. The level of liquidity also affects the scope of alpha exposure in the overall portfolio.

Liquidity: A Vital Dimension with Alpha Managers

Good liquidity is vital for the alpha component of a portable-alpha solution. That's why equity market–neutral and macro managers, who both tend to trade in the most liquid instruments, are the most widely used alpha engines, and why strategies that may include private-market assets or hard-to-value securities should be avoided. Further, liquidity among alpha managers enables investors to adjust or rebalance managers in a timely way based on changes in market conditions, risk exposures or conviction in the alpha engine. The ability to rebalance also allows investors to maintain a consistent proportion of alpha and beta risk in the portable-alpha solution—a proportion consistent with strategic allocation targets.

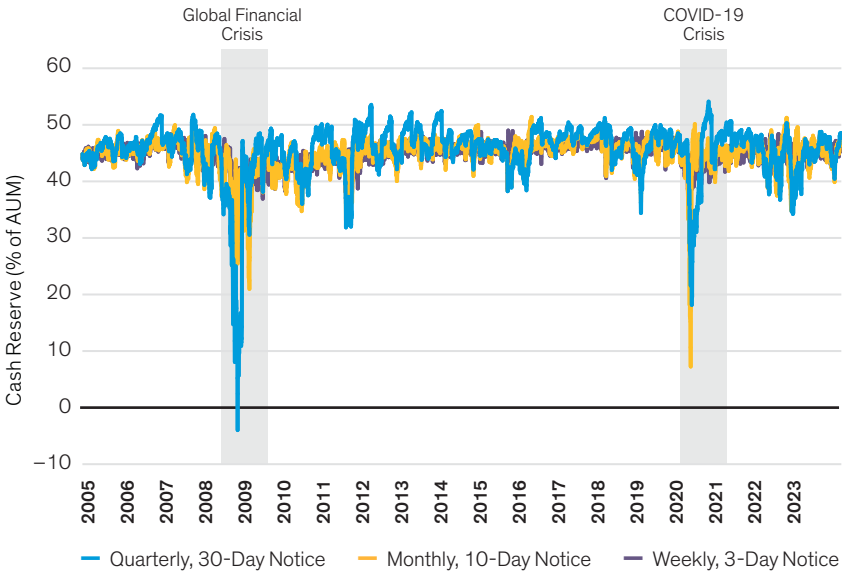
Liquidity also comes into play in meeting margin calls on the beta component in difficult markets. Very sharp stock declines—like those in 2008 and 2020—can drive high demand for cash to meet margin requirements, a crucial function for maintaining the solution's beta exposure. If the alpha strategy is held in a separately managed account or has daily liquidity, a portable-alpha solution can often be run with a significant alpha allocation. But when the alpha strategy is tied up in an illiquid, commingled fund, investors risk either being forced to cut their market exposure or requiring a cash infusion to maintain the beta, if it's not sized appropriately.

In general, the alpha content can be higher the more liquid the alpha source is, the less correlated it is with the beta component, and the lower the beta's volatility. It's important to stress test a portable-alpha solution during extreme bouts of market volatility to ensure that it's sufficiently liquid. *Display 142* shows a historical stress test of various solutions where 50% of the capital is invested in an alpha source with 6% volatility, targeting S&P 500 beta. We use the cash margin rates available at the time and vary the liquidity of the underlying alpha source—from quarterly to weekly—to test if the solution will maintain access to enough reserve cash to meet its obligations over time.

As shown, monthly and weekly liquidity alphas provided enough liquidity to rebalance and maintain margin requirements during stresses. But quarterly-liquidity vehicles didn't—highlighting the challenges during the GFC. Investors seeking to reduce the

DISPLAY 142: MORE-LIQUID ALPHA COMPONENT CASH NEEDS IN STRESS PERIODS

Portable-Alpha Simulation: S&P 500 Beta and 50% Alpha Allocation



Current analysis does not guarantee future results.

Simulated or hypothetical performance results have certain inherent limitations. Simulated or hypothetical trading programs in general are also subject to the fact that they are designed with the benefit of hindsight. No representation is being made that any account will or is likely to achieve returns or a volatility profile similar to those being shown. Portable-alpha solutions invest 50% of capital in a 6% volatility alpha source and target the S&P 500 as beta. Cash margin rates are those available at the specified time.

Through December 31, 2024 | **Source:** S&P and AB

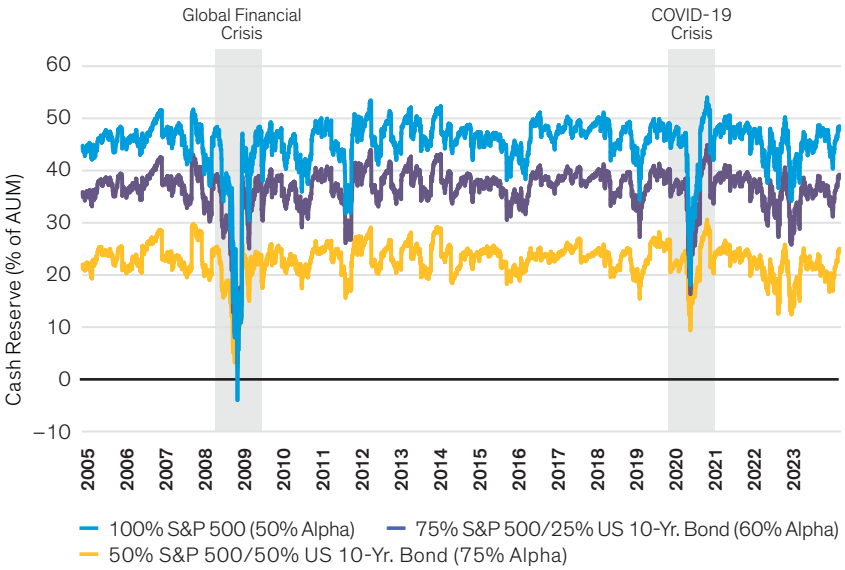
risk of forced beta liquidation during this type of event can either negotiate better liquidity terms, invest less in the alpha source or reduce the volatility of the beta. Cutting the beta's volatility by targeting stock/bond mixes instead of an all-equity allocation (*Display 143*) reduces cash needs during stresses and can support higher alpha allocations. For example, a 50/50 stock/bond mix could support an investment of up to 75% in the alpha engine without depleting cash reserves.

Multi-Manager Hedge Funds: The Most Potent Alpha Engine?

Manager selection, diversification, risk management and liquidity management: a lot goes into running an effective alpha engine. Many investors have upgraded their due

DISPLAY 143: LOWER-VOLATILITY BETA ALLOCATION REDUCES CASH NEEDS IN STRESS AND SUPPORTS MORE ALPHA

Portable-Alpha Simulation: Varying Beta and Alpha Mixes*



Current analysis does not guarantee future results.

***Assumes alpha engine offers quarterly liquidity with 30-day notice period

Simulated or hypothetical performance results have certain inherent limitations. Simulated or hypothetical trading programs in general are also subject to the fact that they are designed with the benefit of hindsight. No representation is being made that any account will or is likely to achieve returns or a volatility profile similar to those being shown. Portable-alpha solutions invest 50% of capital in a 6% volatility alpha source and target the S&P 500 as beta. Cash margins rates are those available at the specified time.

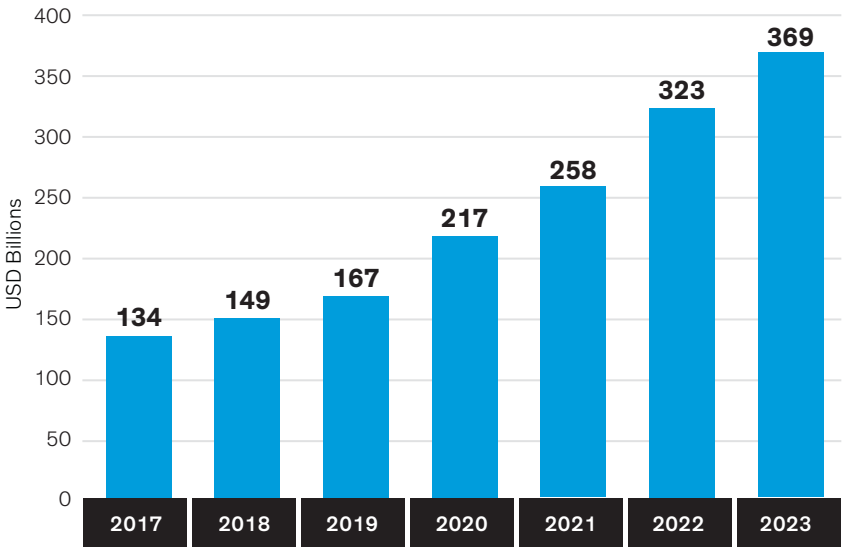
Through December 31, 2024 | **Source:** S&P and AB

diligence and manager-selection processes over the years and have better risk and portfolio-analytics tools today. But rather than taking a "do-it-yourself" approach to running an alpha engine, some investors may prefer strategies that serve as one-stop shops: multi-manager hedge-fund platforms.

The strong growth in these strategies (*Display 144*) likely has a lot to do with their track record of generating the highest and most consistent alpha and risk-adjusted returns. The self-contained approach, in our view, offers advantages over single-manager hedge funds—notably diversification and centralized risk management.

DISPLAY 144: STRONG GROWTH OF DIVERSIFIED ALPHA STRATEGIES

Assets Under Management of Multi-Portfolio-Manager Hedge Funds



Current analysis does not guarantee future results.

As of September 30, 2024 | **Source:** Goldman Sachs and AB

Traditional hedge-fund managers can often own popular trades and carry explicit or "hidden" market betas and systemic risks. Many investment ideas and holdings may be correlated with each other and with those of other managers, both in the same category and across other strategy types. Investors assembling portfolios of hedge funds must handle strategy selection, manager selection, and multifaceted portfolio construction and risk management—including liquidity and leverage risk. This requires much expertise and resourcing.

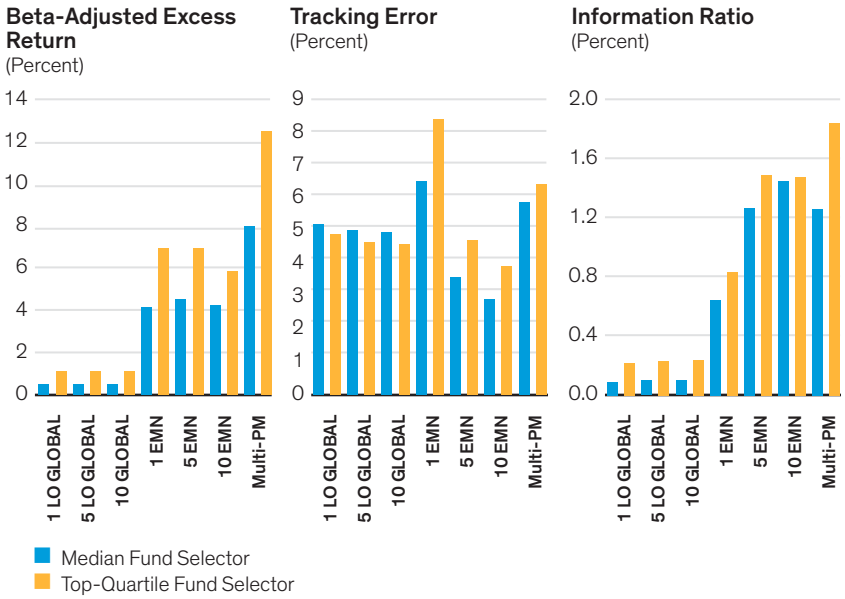
Multi-manager platforms have greater flexibility to address these challenges. The underlying managers focus on pursuing alpha while the platform manager focuses on selecting managers, monitoring them and managing risk. This work includes hedging out unwanted exposures, managing and optimizing leverage and liquidity, and ensuring that managers stick to risk-budget guidelines.

How do multi-manager hedge funds compare with a do-it-yourself approach of selecting and combining portfolios of individual managers?

We compare the performance of the median and top-quartile fund selector (which creates portfolios of one, five and 10 long-only and long-short managers) with that delivered by multi-portfolio-manager platforms. We assume that our do-it-yourself fund selectors rebalance the portfolios annually, and we simulate the results for each manager combination 1,000 times to get an accurate outcome distribution. For long-only manager allocations, we create both US-only portfolios and regionally diversified ones, which we combine into global portfolios with regional weights based on the MSCI ACWI.

On average, multi-manager platforms delivered better outcomes than a do-it-yourself investor allocating to either multiple long-only managers or multiple individual hedge funds (*Display 145*). Alpha returns per dollar invested are much lower for long-only

DISPLAY 145: MULTI-MANAGER HEDGE FUNDS OUTPERFORM "DO-IT-YOURSELF"



Past performance does not guarantee future results.

Simulated or hypothetical performance results have certain inherent limitations. Simulated or hypothetical trading programs in general are also subject to the fact that they are designed with the benefit of hindsight. No representation is being made that any account will or is likely to achieve returns or a volatility profile similar to those being shown. LO: long only; EMN: equity market–neutral; multi-PM: multi-manager hedge fund

As of September 30, 2024 | **Source:** AB

managers than for hedge funds, so investors would need to deploy a lot more capital to generate comparable levels of excess return—making it a far less efficient option.

Because an equity market–neutral hedge-fund manager portfolio is able to use leverage and diversify, its returns become more attractive and its risk reduction increases, but it still falls short of the multi-manager hedge fund. The multi-manager approach enables the highest absolute return as it diversifies, with prudent leverage and effective risk-management techniques extracting the most efficient alpha per unit of capital deployed. We believe that this makes it an effective alpha engine for portable-alpha solutions.

Multi-manager platforms are not without their risks. Some have become very large and complex, and deploy significant leverage across many strategy types. They're not immune from episodic drawdowns that can impact an individual fund or a large portion of the hedge-fund complex. Because they're so focused on minimizing drawdowns, and have the flexibility to quickly fire managers, they may move to quickly unwind large, losing positions, which can actually magnify market volatility. In addition, some may have onerous terms such as high fees and long capital lockups. However, those that provide quarterly or more frequent liquidity along with more transparent, reasonable fees may be attractive components of a portable-alpha solution.

Conclusion

Today's low-return outlook from multiple beta sources and the challenges for active managers in concentrated markets require investors to think more broadly and be innovative in generating returns. We don't believe they should give up on active management, because alpha will be more valuable in a lower-beta world. Instead, they should seek alpha in less-efficient and less-exploited market segments—such as small-cap and EM equities—where the opportunity is richer.

Our research suggests that long/short equity strategies can be a strong alpha source, with many hedge funds outperforming even the best long-only managers. Multi-manager hedge-fund platforms seem particularly skilled at delivering high, persistent alpha and risk-adjusted returns after fees. They can be an attractive addition to the alpha engine. With strong risk management and true diversification among managers, they may be able to deliver more than the sum of their parts.

With effective alpha engines, portable alpha may be an elegant solution for a beta/alpha mismatch. It can access a wide span of alpha streams in a capital-efficient way while enabling investors to maintain their desired strategic asset allocation. It isn't a panacea, with potential drawbacks including complexity, leverage and liquidity risks, as well as the challenge of sourcing reliable, consistent alpha. But its potential is compelling in today's environment: a greater alpha opportunity as well as better capital efficiency and flexibility, fostering more precise, timely management of exposures and potentially more efficient fee allocation.

Portable alpha's past challenges have informed what we see as rules of the road for effective solutions:

- Identify skilled active managers.
- Emphasize manager diversification and low correlations.
- Manage risks effectively and dynamically.
- Ensure liquid alpha streams; manage cash and collateral effectively.

Adhering to these rules, in our view, boosts the chances of success for portable-alpha solutions. Well-designed and well-managed solutions equip investors with what could be a potent tool for enhancing returns in a new investment regime that's likely to be less generous with traditional beta returns than it has been in past decades.

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