

INVESTMENT INSIGHTS

A NEW GOLD RUSH

The search for riches from artificial intelligence has entered a new phase for companies that can harness the opportunities

Eastern promise

Japanese equities are coming into the light

Gilt-edged

Light at the end of the tunnel for UK government bonds

Diversify your diversifiers

An opportunity to put more eggs in the gilts basket

Hope or hyperbole?

Hydrogen's role in the shift to a net-zero economy





FOREWORD



With summer upon us, our lead article on page 4 dives into the seas of artificial intelligence. The launch of ChatGPT has triggered a new artificial intelligence gold rush among investors, with strong gains across the spectrum of technology companies. However, it's far from clear how it will develop, so what might the future hold in this sector for investors?

Our next feature on page 6 looks at the growing attraction of Japanese stocks. The country's Topix stock index has climbed this year to a 33-year high, helped by increasing interest from overseas investors. We look at the many factors behind this recent rise and explore why we still see a lot of potential for Japanese companies.

Is there light at the end of the tunnel for UK government bonds? The past two and a half years have been very tough for gilts – which are usually held in portfolios to provide ballast but suffered bigger losses than most equity markets in 2022. Yet the extent of this weakness has arguably created an opportunity for investors. Read more on page 8.

Building on our look at gilts, our next article on page 10 explores diversification in your portfolio. We believe a whole portfolio approach ensures exposure to several different sub-strategies and thus different types of risk and drivers of returns are needed to maximise the benefits of diversification. We also consider which types of diversifying strategies are more likely to struggle in the current environment.

The final article on page 12 explores the potential role of hydrogen in our transition to becoming a world with net-zero carbon emissions. Hydrogen in theory can be produced almost anywhere, providing a clean source of energy. However, while hydrogen seems likely to have some role in a clean energy future, it may not be the panacea some are hoping.

We hope you and your family are well and looking forward to a summer break. Please visit rathbones.com to find out more about our latest views on issues affecting the global economy and investments.

Handwritten signatures of Liz Savage and Ed Smith in black ink.

Liz Savage and Ed Smith

Co-chief investment officers

InvestmentInsights webinar with Q&A

Join our next webinar on Tuesday 10 October, from 12:00–13:00, to hear our latest thoughts on the investment outlook and opportunities. Visit <https://registration.duuzra.com/form/rathbonesinvestmentsinsights1010> to register.

ARTIFICIAL INTELLIGENCE AND THE SEARCH FOR COMPANY PROFITS

The launch of ChatGPT has triggered a new artificial intelligence (AI) gold rush among investors. This search for riches has driven strong gains this year across the technology sector – from chip makers (the picks and shovels of this new gold rush) to large cloud-computing service providers, software vendors and IT consultants. But it's far from clear how it will all pan out.

Machine learning is not a new phenomenon. At its heart, AI is applying statistical analysis to large data sets. For instance, Uber has been deploying this technology to match drivers and riders since 2015. Amazon uses it for product recommendations, Netflix to make us binge watch its programmes and PayPal for fraud detection. What's new about this craze is that it's generative AI. What makes this subset of machine learning different is that, instead of just trying to spot patterns in data, these algorithms appear to generate original content. This is what has captured the public and investors' imaginations.

Purple cats on the moon

Take pictures of cats, for example. Normal machine learning will be able to identify a cat after scanning millions of cat images. Not so long ago that seemed like a massive technological breakthrough. But it now seems rather quaint when compared with generative AI programmes like DALL-E 2, which can create entirely new images, such as a purple cat on the moon. The humanness of how the computer seems to interact with the data has led to ChatGPT's release being described as an iPhone moment. Some commentators have gone as far as to say it will be as transformational as the Internet in the 2000s.

When we think about which companies will earn the fattest profits from generative AI, and whose lunch it might eat, it is useful to take a step back and look at the whole supply chain. When you look at the basic building blocks of these generative AI models, this machine learning is typically 'trained' on graphics processing (GPU) chips. These are almost all designed by Nvidia – 90% of all generative AI models are trained on its chips. They are mostly manufactured in Taiwan by TSMC, using equipment provided by ASML, a Dutch company. Most of these chips will be

bought by Amazon, Meta, Microsoft and Alphabet and put into their data centres. Those four alone account for roughly half of Nvidia's data-centre chip demand. These large cloud services providers (Microsoft's Azure, Amazon's AWS and Alphabet's Google Cloud Platform) will then rent out that AI computing capacity to software developers and businesses to train and run their own AI programmes and models.

Linguistic versions of generative AI, called large language models (LLMs) are available off the shelf from OpenAI (minority Microsoft owned) and Google. There are also open-source versions (where the software code is made freely available and can be redistributed and modified). Which one you use will depend on your IT resource. Interestingly, Uber has said it would prefer to use the free open-source option, and that LLMs are currently too expensive to deploy at the scale needed.

The value in the industry right now is almost entirely accruing to Nvidia, which is the ultimate provider of picks and shovels for this new AI goldrush. This became apparent when the company reported its blowout first-quarter results. At the time, Nvidia said it couldn't ship its GPU chips fast enough to meet the booming demand for investment in generative AI training, guiding for revenues from this division to almost double quarter on quarter.

Monopolies in the cloud

As its rocketing share price indicates, Nvidia is raking in cash from selling chips to power generative AI (figure 1). The question is whether the firm can maintain this monopoly position given a huge economic incentive for the cloud service providers (their major customers) either to develop an in-house solution or to cultivate an alternative supplier.

There is a basic distinction in AI between training (teaching the AI to build a model) and inference (using that model in the wild). Training as mentioned is largely done on Nvidia chips, but inference can be done on multi-chip solutions including custom silicon designed in-house. The market for inference chips is thought to be significantly greater than training, which

Figure 1: Chips with everything

Nvidia's share price has surged this year as companies everywhere look for ways to adopt new artificial intelligence technologies – and need the company's processing chips.

Source: Refinitiv, Rathbones.



“I FEAR NONE OF THE EXISTING MACHINES; WHAT I FEAR IS THE EXTRAORDINARY RAPIDITY WITH WHICH THEY ARE BECOMING SOMETHING VERY DIFFERENT TO WHAT THEY ARE AT PRESENT.”
EREWON BY SAMUEL BUTLER

may limit Nvidia's growth. When it comes to the rest of the tech sector – at all the layers further up the chain including the cloud services providers and the software applications – it's not clear yet how generative AI will generate profits.

So far the demonstrations of what this technology is capable of have been fairly trivial. So we've seen people use ChatGPT to write poems in cod Shakespearean dialect or DALL-E 2 to make funny images. Perhaps even here one could see a commercial application if it eliminates the need to hire copywriters (see jasper.ai) or graphic designers.

More pragmatic applications are likely to emerge. For example, Microsoft is embedding ChatGPT LLMs into its suite of Office applications for summarising calls or generating PowerPoint presentations. Intuit is using LLMs to help solve complex tax queries. Wendy's to handle drive-through fast food orders and Uber in its call centres. Match Group to help daters initiate conversations with potential dates. Ironclad to rapidly draft and amend legal contracts. We can expect these language versions of generative AI to permeate the user interface of most applications.

Generating better earnings

The crucial point is that it is one thing to deploy generative AI and another to make money from it. It could turn out that generative AI is a feature that businesses need to incorporate in order to avoid obsolescence rather than to make bigger profits. For instance, Adobe has launched Firefly to generate art through natural language processing. If it hadn't done this, a start-up could have offered this service and disrupted its business. Instead of generative AI boosting the earnings outlook for any company right now, it might become a cost of staying in business. Yet Adobe may yet find ways to commercialise this product and it will help tie users into its ecosystem of products.

There will also be losers. Some jobs will be automated, and some companies will get disrupted in this new gold rush. We have already seen one company, the online education assistant Chegg, blame poor results on students using ChatGPT. There

is a live debate about whether ChatGPT could dislodge Google Search's near monopoly. The release of its own AI chatbot Bard is an early sign of Google's ability to respond to this threat.

Identifying the losers isn't straightforward. Unlike with previous technological disruptions, the winners may be today's technology incumbents – they have the resources to develop the most sophisticated models while start-ups struggle to innovate as fast. We also think companies with large, proprietary data sets will also prosper, as they will have the training data to develop the most sophisticated AI models. Entrants lacking this data will struggle to compete. Adobe for instance can draw on its deep image library to train its generative AI tool.

Falling back down to earth

Markets are fickle, and we suspect many stocks that have seen their share prices surge in recent months will fall back down to earth as their earnings reports reveal a lack of boost to their revenue and profits from this technology. For instance, IT consultancy Accenture's recent Q3 results showed that AI would have a negligible impact on revenues in the short term. They reckon only 5–10% of companies have the infrastructure, people or processes to start using generative AI.

Even if much of the hype is unjustified, many technology companies that may benefit in the long term are still trading at reasonable prices. For example, we think the large cloud service providers are likely to be able to drive the next leg of growth through selling AI services, as the backend of most AI applications will be hosted in the cloud. But that's probably three to four years down the line. We also see other opportunities emerging for technology hardware companies like Arm, whose efficient semiconductors should be well suited to power hungry AI calculations in data centres. There are likely to be others.

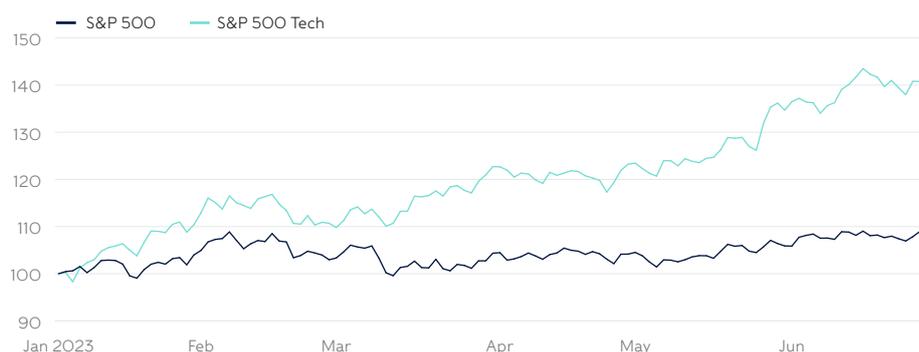
While the potential for this technology is exciting, it's uncertain how it will develop. At this stage we still think it makes sense to evaluate businesses according to their current earnings power rather than future visions of what generative AI might deliver.

Figure 2: Rise of the machines

The technology sector has outperformed the broader S&P 500 Index substantially since the start of 2023.

Rebased to 100 on January 2023

Source: Refinitiv, Rathbones.



JAPANESE EQUITIES ARE COMING INTO THE LIGHT

Foreign investors have long regarded the Japanese stock market as akin to a samurai defeated in battle, sitting in his crumbling castle and ruminating on the bittersweet memory of his glory years. Granted, Japan's Topix stock index has never returned to the stratospheric level of close to 2,900 reached in 1989, shortly before the market bubble burst. However, it has surged this year to a 33-year high, helped by increasing interest from overseas investors. We think this interest is justified for several reasons, and still see a lot of potential for Japanese companies.

One is price. The market is cheap, both by its own past standards and compared with others. By historical standards, our composite measure of stock market valuation is well below its median since 2000. This lumps together numbers such as the forward price-earnings ratio, which divides the price of shares by estimated earnings per share for the year ahead. The price-earnings ratio of 14 is below the global average.

Sometimes stocks – and markets as a whole – are cheap for a reason. However, we see several factors that should boost stock prices. One is the ratcheting up of the pressure on Japanese companies to do better for shareholders.

Recent rule changes at the Tokyo Stock Exchange have added fresh impetus to a long-running trend of improving shareholder value. Companies persistently trading below their book values – and these companies account for roughly half of the Topix – now need to disclose plans to remedy this. In practice, this encourages companies with large piles of idle cash – of which there are many in Japan – either to put the money to work by investing it or to return it to shareholders to reinvest elsewhere. There's already evidence of the latter happening, with companies buying back more of their own shares. You can see a significant rise this year in the price-to-book value of Japanese stocks in the chart below.

Restive shareholders

Pressure does not come just from the Tokyo Stock Exchange. Shareholders are also growing progressively more restive. The number of activist funds in Japan has risen from under

10 in 2014 to nearly 70 this year, according to the Financial Times. These funds corral other shareholders into pressing for corporate change to unlock value for shareholders. The number of shareholder proposals submitted by activists has also surged. It has risen from fewer than the number of fingers on one hand in 2015 to nearly 60 last year, according to local investment bank Mizuho Securities – with a fresh record expected this year.

We also like corporate Japan's pedigree of technological excellence. This puts companies at the forefront of technologies to make the global economy net zero. For instance, a public-private partnership has built the world's largest hydrogen plant powered by renewable energy – the 'green hydrogen' much desired by governments – in Fukushima.

We are also heartened by improvements in the domestic economy. It is recovering strongly, but without the extremely high inflation and need for aggressive monetary tightening seen in the major Western economies. Japan's stock market prospects are not reliant on the domestic economy, because the market is dominated by export-focused companies. But higher domestic demand is still helpful.

Lastly, Japan's market benefits from a useful negative: the 'not China' trade. As a democracy, Japan is not at risk of the sudden crackdowns on companies or entire sectors that have provoked the ire of an autocracy, such as China's 2021 ban on the tutoring industry making a profit from tutoring primary and middle school students. Japan is also gaining from the 'friendshoring' trend, where western countries move supply chains from China to countries with more amicable relations. For example, in May seven large chipmakers set out plans to increase manufacturing and deepen tech partnerships in Japan. China also remains an important market for Japanese exports.

While the Japanese economy faces headwinds from an ageing population and low birth rate, we don't see these factors negating the benefits of its corporate reforms, thriving service industry and potential global leadership in digitalisation. These should continue to support a positive outlook for Japanese equities.

Figure 3: Measuring stock market value

The prices of Japanese equities relative to book value (P/B) is below the global average, which suggests the country's stock market represents good value for investors at the moment.

Source: Refinitiv, Rathbones.





LIGHT AT THE END OF THE TUNNEL FOR UK GOVERNMENT BONDS

In the past, certificates issued by the Treasury (a promise from the government to repay its debts) were printed on paper that featured golden edges, denoting their high quality and ability to hold their value over time. They were called gilt-edged securities – where we get the name gilts for UK government bonds today.

Lately gilts haven't been so golden. To describe the past two and a half years as tough for gilts would be an understatement. Last year was a true *annus horribilis* – the worst in decades for gilts. They're usually held in portfolios to provide ballast, but suffered bigger losses than most equity markets in 2022. The pressure hasn't relented in the first half of this year either. Yet the extent of this weakness has arguably created an opportunity for investors. We've kept our gilt allocation small for some time, but now see three reasons to consider adding to gilts again.

Near the peak in rates

First, central banks in the largest advanced economies – including the UK – are likely to stop raising interest rates in the next few months. This matters because government bonds (particularly those with longer maturities) have historically nearly always performed very well after the final rate increase in a cycle. Can we really be anticipating the peak in UK rates, given recent ugly inflation data?

The last two sets of monthly figures showed price pressures stronger than either the Bank of England (BoE) or markets had expected, with 'core' inflation (which excludes volatile energy and food prices) continuing to rise. We believe there are still strong reasons to expect UK inflation to fall significantly in the second half of this year.

One big factor is energy prices. They were the largest single contributor to the spike in inflation last year, adding nearly four percentage points to the headline rate at their peak, as utility bills surged on the back of Russia's cuts to gas supplies. But western Europe has coped far better than anticipated without Russian supply, making efficiency savings and sourcing gas from elsewhere. Wholesale gas prices have plunged from last year's

peaks in response, and that drop will feed through to lower consumer prices over time. Energy regulator Ofgem's latest price cap announcement means that the typical UK household energy bill will fall by nearly 20% in July, for example.

The shock to food prices which followed the invasion of Ukraine is also now fading. A deal has been agreed to allow Ukraine to resume shipment of grain out of Black Sea ports blockaded by Russia, including wheat, corn and other crops, and markets have adapted to the disruption. In fact, global wheat prices are lower now than they were immediately before the invasion. In the UK specifically, import costs for food producers have fallen for several months now. That points to price growth on supermarket shelves slowing much further in the second half of 2023.

It's a similar story when it comes to the pandemic-induced shock to global goods supply chains too. There's plenty of evidence that this is now all but over, with manufacturers' inventory levels and delivery times back to normal, and delays at major shipping hubs cleared. It's taking a while for UK consumers to feel the full benefits of this return to normality in the prices we pay. But the latest producer-price data suggest that it will come through more clearly in the second half of the year.

Services, which are the most important driver of core inflation, have been the greatest area of concern recently. More than other areas, the prices of services are associated with what's happening to wages. And wage growth has increased again recently. The UK labour market is still structurally tight: there are a lot of job vacancies and available workers are scarce.

This tightness is exacerbated by a couple of UK-specific factors – the continued rise in long-term sickness linked to ongoing problems in the NHS, and the continuing adjustment to post-Brexit changes in immigration policy. The risk of inflationary pressures persisting therefore looks greater in services than elsewhere. However, even here there are some glimmers of hope. The latest wage growth figures were influenced by April's 9.7% increase in the National Living Wage, which won't be repeated.

Figure 4: Up, up and away

UK 10-year gilt yields have been rising steadily this year (meaning prices have fallen) owing largely to Bank of England interest rate hikes against a background of stubbornly high inflation.

Source: Refinitiv, Rathbones.



More generally, there are early indications that the labour market has begun to loosen up. Unemployment has crept up from last year’s multi-decade lows, while the rate of unfilled job vacancies has continued to decline. And surveys of businesses indicate that they’ve reined in plans to increase headcount. In other words, while the jobs market is much tighter than the BoE would like, it is loosening up.

In the wake of the BoE’s bigger-than-expected half a percentage point increase in June, it is likely to raise rates again at its next couple of meetings. Nevertheless, given the more positive outlook for inflation (and how a lot of the impact of its 13 successive hikes to date still need to work through to the real economy), it is probably not far from being finished with its rate increases.

It’s also worth remembering that government bond markets are global in nature so developments outside the UK matter for gilts. In the largest advanced economies – the euro area and the US – there’s been much more progress in driving down inflation. The headline rate has already fallen to 6.1% in the former and 4.0% in the latter, compared with 8.7% in the UK. Against this backdrop, the European Central Bank and US Federal Reserve appear more likely than the BoE to increase rates for the last time in the third quarter, which may provide an indirect fillip to gilts.

A more attractive entry point?

Secondly, gilt valuations are looking much more appealing as gilt yields (which run in the opposite direction to prices) have risen dramatically. As recently as early 2021, the 10-year gilt yield was just 0.2%. It’s now above 4.4% – higher than at any point in the 2010s and within touching distance of the peaks it hit at the time of the mini-budget crisis last autumn.

These much higher yields improve gilts’ prospective balance of risk and reward. Even if gilt prices fall a bit further, that can now be offset by the greater interest income on offer. In other words, buyers of gilts no longer rely solely on price appreciation to deliver returns.

Gilt valuations now also compare much more favourably with other asset classes, including equities. To give just one simple illustration, the 10-year gilt yield has risen by more than four percentage points since the start of 2021, while the UK stock market’s dividend yield has increased by less than one percentage point in this timeframe.

Offsetting equity risk

Finally, the conditions may soon be in place for government bonds to reprise their usual role in our portfolios as an offset to equity risk. This goes back to why we include gilts in our portfolios in the first place. For most of this century, they’ve helped counterbalance the ups and downs of equity markets.

Bonds have typically performed best at the worst moments for stock markets, serving as ballast in portfolios by smoothing out some of the volatility inherent in equity market returns. In technical terms, the returns from bonds and from equities have mostly been negatively correlated. (You can read more about what this means for portfolios in our “Diversifying your diversifiers” article on page 10.)

But over the past couple of years gilts haven’t fulfilled this function as insurance against equity risk. Instead, gilts and stocks weakened together – their returns have been positively correlated – as fears of higher inflation and interest rates have hurt both. But this could soon change.

Historically, the gilt-equity correlation has nearly always been positive when inflation has exceeded 5–6%. But it’s often been negative (which is what we want in this context) when inflation has been lower. Inflation in the US has already fallen below this threshold, and we expect it to follow suit in the UK later this year. Uncertainties remain, but we’re now seeing glimmers of gilt-edged light appear at the end of the tunnel for UK government bonds.

Figure 5: Before and after the cycle

This chart shows the performance of 10-year UK government bonds in the 12 months before and after the final increase in Bank of England rate-rising cycles.

Source: Refinitiv, Rathbones.



AN OPPORTUNITY TO PUT MORE EGGS IN THE GILTS BASKET

Everyone knows the old adage, don't put all your eggs in one basket. This applies to investing too. Fortunately for UK investors with multi-asset portfolios, we believe government bonds are now offering an alternative to equities – one that for the first time in a while is becoming less likely to drop at the same time.

In investment parlance, we would say that government bonds have been providing better diversification benefits than they have done over the past couple of years. You can read more about this in our article on gilts on page 8. In a nutshell, the correlation of gilts to equities is turning negative again. (Think of two baskets moving in opposite directions – when one falls the other is going up, and vice versa).

With yields being at their highest levels in over 10 years, investors are getting paid decently for adding this diversification to their portfolios. For these reasons, we felt it made sense to shift some of our eggs from other diversifying strategies (different 'baskets') into gilts. But what do we mean by diversifying strategies and what is their role in investment portfolios?

Dispelling diversification myths

According to traditional portfolio construction, investments are split across lower-risk investments, such as cash and bonds, and riskier ones that have greater return potential, such as equities. Weightings of each are determined by an investor's appetite for risk and tolerance for losses, as well as the market cycle.

A traditional diversified portfolio would typically have a strategic allocation of 60% in equities and 40% in bonds. The proportions could be adjusted as appropriate at different stages of the market cycle. For example, equities could be increased during recovery phases and reduced in a downturn. The aim was to enhance the risk-adjusted returns of the portfolio.

However, this approach was challenged by Harry Markowitz's Nobel-prize winning work in the 1950s. A key insight was that holding different assets that are not positively correlated (those that don't move in the same direction) can reduce the volatility of the portfolio. Intuitively, this makes sense: if different assets

are correlated, and therefore rise or fall together, they won't provide the benefits of diversification that investors seek in times of market stress. To put it another way, there's no use putting your eggs in different baskets if all the baskets are tied together; if one falls they all fall.

Rathbones' approach is to divide assets into three building blocks, which play different roles – liquidity (mostly safe-haven government bonds and cash), equity-type (such as shares, corporate bonds and emerging market debt) and diversifiers. This third category comprises assets that demonstrate a low or negative correlation to other – liquidity and equity-type – assets in the portfolio, particularly during periods of market stress.

In general, we would take a whole portfolio approach, ensuring exposure to a number of different sub-strategies and thus different types of risk and drivers of returns in order to maximise the benefits of diversification. But tactically it is worth considering which types of diversifying strategies are more likely to struggle in the current environment.

We think event-driven strategies, which seek to exploit pricing inefficiencies that may occur around a corporate event such as an earnings release, bankruptcy or merger, could be vulnerable to heightened economic uncertainty and the recent increase in financing costs. Rising interest rates and yields have also been weighing on commercial property funds this year, particularly the office sector, and this headwind looks set to continue.

Knowing what the various drivers are for the performance of the different strategies can help tilt portfolios towards the current opportunities. But the important thing is that these drivers are different from equity markets, and figure 6 highlights the importance of maintaining diversification at the strategic level. The wide range of fund returns suggests that fund selection is key and can add real value over and above strategic and tactical allocation within diversifying strategies.

Figure 6: Returns and risk over the past five years

This chart shows the returns and risk of typical Rathbones diversified portfolio compared with all-equity of traditional 'balanced' options over the past five years.

Notes: Volatility is a measure of how much returns rise and fall.

Source: BlackRock, Morningstar and Rathbones





HYDROGEN'S ROLE IN THE SHIFT TO A NET-ZERO ECONOMY

Hydrogen is all around us. It is the most abundant element in the universe – and it is therefore fitting, perhaps, that the hype around its potential to be a panacea in the transition to a world of net-zero carbon emissions has been difficult to escape.

Hydrogen has an energy density that is almost three times greater than that of diesel or gasoline. In theory, it can be produced almost anywhere, providing a source of energy that burns cleanly, releasing only water as a byproduct. What's more, it can be transported, or used as a form of energy storage. For these reasons, it's been touted as a silver bullet for the decarbonisation headaches posed by 'hard to abate' sectors such as aviation, shipping, steelmaking and cement production.

In 2017 Japan unveiled the world's first national hydrogen plan, and in 2020 the EU followed suit, launching a hydrogen strategy of its own. The US Inflation Reduction Act (IRA) includes a 10-year tax credit of \$3 per kilogram of green hydrogen produced, which is soon expected to be greater than the cost of production itself. The level of political will behind clean hydrogen is as strong as it has ever been.

Growing demand

Momentum from business, particularly from within the oil and gas industry, has been equally strong. In its recently published scenarios report, Shell forecasts hydrogen could meet up to 12% of final energy demand by 2070. The Hydrogen Council, a lobby group established in 2017 by the oil and gas majors, forecasts that as much as 22% of final demand could be met by hydrogen even earlier, by 2050.

Is there genuine cause for optimism that 30 years from now hydrogen could be an indispensable part of how we heat our homes and get to work, or are these forecasts simply pie in the sky? An assessment of most independent thought leadership on the issue would appear to suggest that the latter is the more likely conclusion.

Hydrogen accounts for a negligible proportion of global energy supply today. It is mostly used in petroleum refining and fertiliser production and is also used at very small scale in transport and utility markets. It can be produced in a number of ways, some far more harmful to the environment than others,

with a spectrum of colours assigned to denote the different ways in which it can be produced (figure 7).

Even within this already tiny contribution to global energy supply from hydrogen, green hydrogen accounts for very little. According to the latest figures from the International Energy Agency, only 0.7% of the 94 million tonnes of hydrogen produced globally in 2021 came from low emission production methods – almost all involving gas, with leaked emissions partially captured using carbon capture technologies (blue hydrogen).

That's not to say this won't change. Vast sums of investment into green hydrogen infrastructure have been promised by policymakers around the world and Goldman Sachs estimates that by 2050 the green hydrogen market in Europe alone could be worth €2.2 trillion per year. In 2022 the cost of grey hydrogen stood at around \$1 per kg, compared to \$2.5–6 per kg of green hydrogen, though BloombergNEF forecasts that this gap could narrow significantly in the coming years.

Still, we feel it would be prudent not to get swept up in the hydrogen hype just yet. A blue-sky scenario, where hydrogen would heat our homes, fuel most modes of transport, help balance electricity grids and decarbonise industry would require safe distribution of the gas in quantities that are unfathomable right now. While hydrogen will no doubt have a place in a clean energy future, many of the solutions to the decarbonisation puzzle we need are already available in the form of renewable electricity, direct electrification and batteries, and that's where we feel attention should be directed.

At the end of 2022, the UK's government's Commons Science and Technology Select Committee concluded that hydrogen would have a "specific but limited" role in decarbonising sectors by 2050. That sounds about right.

You can find out more about how some companies are already using hydrogen to reduce carbon emissions in the production of concrete and steel in our report on *Building a more sustainable future* by visiting <https://insight.rathbones.com/building-a-more-sustainable-future/>

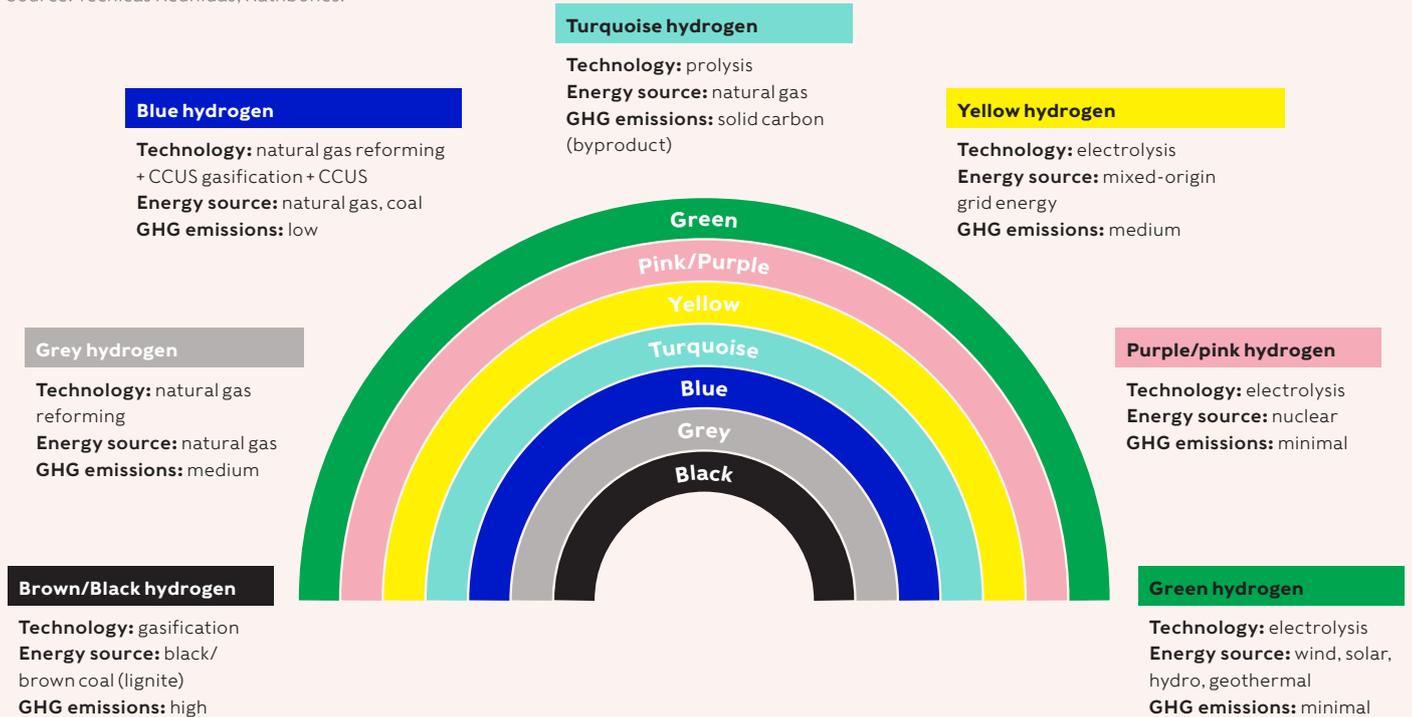


Figure 7: The many different ways to produce hydrogen

This colour scale identifies the different types of hydrogen with details below on production techniques and related greenhouse gas (GHG) emissions.

*CCUS refers to carbon capture and storage.

Source: Tecnicas Reunidas, Rathbones.



FINANCIAL MARKETS

The global economy continues to stutter in the face of high inflation and soaring interest rates. US economic growth slowed sharply in the first quarter and is expected to lose further momentum as the year progresses. US inflation is falling and the US Federal Reserve has paused its rate hikes, but the threat of recession still looms. There was also further turmoil in the US banking sector with the collapse of First Republic Bank. Fortunately, the crisis didn't cause investors to panic and stock markets have calmed.

The UK economy performed better than expected last year and managed to avoid a technical recession. Although GDP rose in the first quarter, the outlook is challenging, with the full drag from interest rate rises yet to be felt. At the same time, jobs growth has continued on both sides of the Atlantic, while unemployment remains near record lows.

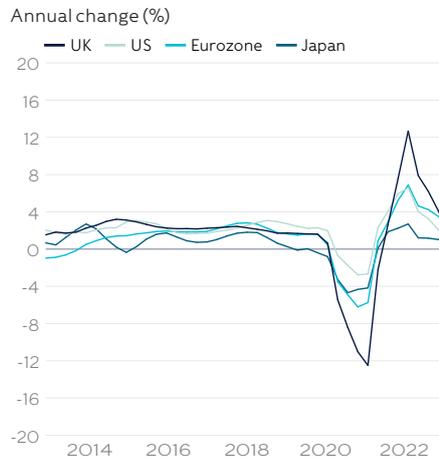
Equities rally

Stock markets rallied in June after a deal was reached between President Joe Biden and House speaker Kevin McCarthy to suspend the US debt limit until January 2025. The standoff over the debt ceiling had raised fears the US could default, which could have sent shockwaves through the markets.

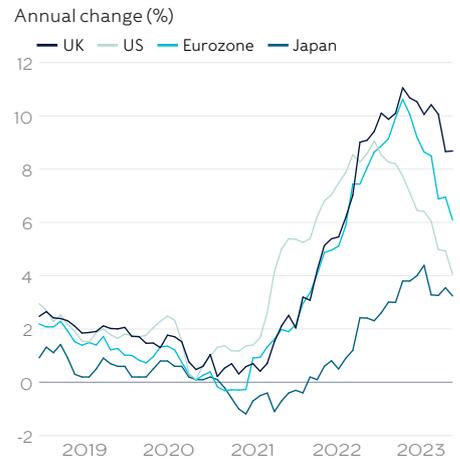
America's tech-heavy Nasdaq index also hit a 14-month high in June, largely driven by some of the index's biggest tech companies. The growing excitement around artificial intelligence (AI) has given US stocks a substantial boost this year, helping the broader S&P 500 index climb higher.

Stronger than expected inflation in May fuelled fears the Bank of England would have to carry on raising interest rates, unsettling bond investors who were hoping for an earlier end to rate rises. Yields on two-year UK government bonds rose to their highest level since 2008 (yields move inversely to prices).

GDP growth



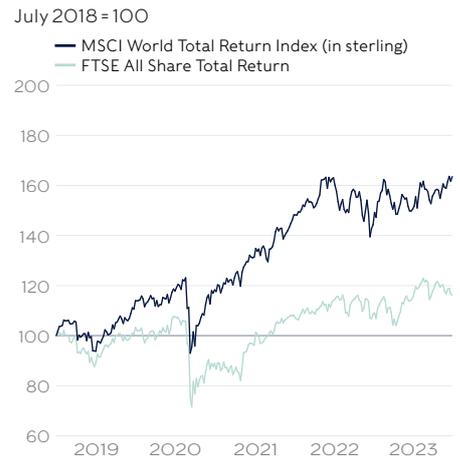
Inflation



Sterling



Equities



Government bonds



Gold



Past performance is not a reliable indicator of future performance.

IMPORTANT INFORMATION

Information valid at 30 June 2023, unless otherwise indicated. This document and the information within it does not constitute investment research or a research recommendation. The value of investments and the income generated by them can go down as well as up.

Rathbones Investment Management International is the Registered Business Name of Rathbones Investment Management International Limited, which is regulated by the Jersey Financial Services Commission. Registered office: 26 Esplanade, St. Helier, Jersey JE1 2RB. Company Registration No. 50503.

Rathbones Investment Management International Limited is not authorised or regulated by the Prudential Regulation Authority or the Financial Conduct Authority in the UK. Rathbones Investment Management International Limited is not subject to the provisions of the UK Financial Services and Markets Act 2000 and the Financial Services Act 2012; and, investors entering into investment agreements with Rathbones Investment Management International Limited will not have the protections afforded by those Acts or the rules and regulations made under them, including the UK Financial Services Compensation Scheme.

This document is not intended as an offer or solicitation for the purchase or sale of any financial instrument by Rathbones Investment Management International Limited. The information and opinions expressed herein are considered valid at publication, but are subject to change without notice and their accuracy and completeness cannot be guaranteed. Not for distribution in the United States. Copyright ©2023 Rathbones Group Plc. All rights reserved. No part of this document may be reproduced in whole or in part without express prior permission.

Rathbones and Rathbone Greenbank Investments are trading names of Rathbones Investment Management Limited, which is authorised by the PRA and regulated by the FCA and the PRA. Registered Office: Port of Liverpool Building, Pier Head, Liverpool L3 1NW. Registered in England No. 01448919. Rathbones Investment Management Limited is a wholly owned subsidiary of Rathbones Group Plc.

If you no longer wish to receive this publication, please call 020 7399 0000 or speak to your regular Rathbones contact.

Call

020 7399 0000

Visit

rathbones.com

Email

enquiries@rathbones.com

For specialist ethical, sustainable and impact investment services

Greenbank

0117 930 3000

greenbankinvestments.com

For offshore investment management services

Rathbones Investment Management International

01534 740 500

rathboneimi.com

 @RathbonesPlc

 @Rathbones1742

 Rathbones Group Plc