Ten more Bristols.” So went the first line of a Financial Times article a few years ago.¹ Hugo Cox, the journalist responsible for the memorable three words, hit on a creative way of unlocking insight. Rather than simply describing the UK’s housing shortfall in straight numerical terms (i.e. five million), he made the figure more relatable so that readers would grasp the problem more readily.

Although most people would not see it this way, Cox was practising a form of data visualisation – it just requires us to imagine the visual. The power of visualising data in innovative ways cannot be understated. Part art, part science, it requires an expert instinct for understanding what matters most; the skill being as much in what you leave out as what you present.

In investing, as data and information expand at an ever-increasing rate, the importance of visualising data accurately and engagingly will only grow. Not only does it help drive efficiency and reduce cognitive load (by helping people understand important trends and concepts more quickly), it can also help create entirely new perspectives.

As with the last three editions of The Little Book of Data, we have curated some of the best and most informative charts over the last 12 months; the ones that, as well as being visually arresting, speak to the most pressing issues of the day. We cover key global trends, COVID’s ongoing influence on our lives, sustainability, macro and market trends and much, much more. It is not exhaustive, but we hope it helps inform your thinking about what lies ahead.

Enjoy.

Mark Versey
CEO, Aviva Investors

¹For any feedback or questions regarding this content, please contact the AIQ Editorial Team at InvestmentWritingContent@avivainvestors.com and visit us online at www.avivainvestors.com/AIQ to see our full range of content.

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The bigger picture
Asia rises (again)
The world’s centre of economic gravity

The geographic centre of global economic power has shifted over time, as calculated by estimating the GDP of different countries through history.

In the first century AD, China and India were the world’s pre-eminent economies. In the nineteenth century, the Industrial Revolution led to rapid development in Europe and the US, pushing the centre of economic gravity north and west. In the mid-twentieth century, Japan’s post-war boom began to pull the centre back again – and the rise of China and other East Asian economies over recent decades has accelerated the eastwards shift.

The map provides much-needed historical context to debate over the rise of China – for much of human history, a prosperous and powerful China has been the normal state of affairs.
Waves of sickness
The global impact of COVID-19

For a global pandemic, the regional effects of COVID-19 have varied significantly over time. In the first and second peaks, the death toll in Europe and the US was disproportionately higher, despite the severity of measures taken by governments to control its spread.

By contrast, other regions – particularly Africa and Asia – recorded relatively few COVID-19 deaths. In the case of the latter, particularly in East Asia, perhaps the experience of dealing with epidemics in the past two decades proved vital in determining a quick and effective response.

Over the course of 2021, the overall picture changed as the rollout of vaccination programmes in Europe and the US led to a sharp decline in deaths – even during periods where case numbers spiked.

In other parts of the world, where the speed of vaccinations has been slower, COVID-19 deaths saw a sharp increase. Notable examples of the hardest hit countries include India and Brazil, whose president Jair Bolsonaro has described the coronavirus as “a little flu” and told people to “stop whining about it” – comments that were eerily similar to another outspoken (former) president before the pandemic took hold.

But what will the picture look like in 2022 and beyond? Will the global race to vaccinate get a grip on the pandemic, or will new variants emerge to pose further challenges for economies and societies?
Uncertainty still surrounds the precise origins of the COVID-19 pandemic, but science suggests it was zoonotic – passed to humans from another species. Coronavirus very similar to COVID-19 occur in bats and pangolins. This graphic shows how zoonotic viruses are transmitted from wildlife to humans, with each interface colour-coded by risk level. The red nodes represent viruses – the larger the node, the more connections it has to different transmission interfaces. Central, highly connected viruses are the most likely to promote the emergence and spread of future diseases.

It’s worth studying closely. As economist Adam Tooze points out in his recent book on the pandemic, Shutdown, we have been living through “an era defined by the blowback from our unbalanced relationship to nature”, and zoonotic diseases are set to become more common.
Economies bounce back
The COVID impact in context

Sometimes you need to zoom out a little to gain perspective. In the case of US economic growth, the steady march upwards since the 1950s is impressive, with the many recessions along the way being reduced to mere wrinkles in the data when viewed in absolute growth terms. The global financial crisis in 2007-09 is clearly evident.

This context makes the recent COVID impact on growth all-the-more eye-watering. But equally impressive is the speed of the global bounce back, both in the US and across the member countries that make up the Organisation for Economic Cooperation and Development (OECD), as seen in the chart below.
# Deep cuts

The growing humanitarian aid crisis

Economic, environmental and health crises have a disproportionate effect on developing countries, which often lack the financial means to address the issues. Historically, humanitarian aid from developed countries, multilateral organisations, NGOs and the private sector has played an important role in meeting the shortfall. However, the gap between the aid provided and the required level of support has widened dramatically over the past decade – a situation exacerbated by COVID-19.

Recent cuts in aid spending by some governments couldn’t have come at a worse time. But this is not a short-term problem – the relative contributions of richer nations have fallen well below their commitments for many years.

Back in 1970, 24 OECD nations (a number that has since swelled to 30) – collectively known as the Development Assistance Committee – committed to providing the equivalent of 0.7 per cent of their national income in foreign aid. By 2020, only six countries were achieving that target, while the average contribution was only 0.4 per cent. With the climate crisis likely to pose acute financial as well as environmental challenges in the years ahead, the prospects of a resolution to the humanitarian funding crisis look bleak.

## The gap between aid provided and funding required (UN-coordinated appeals)

<table>
<thead>
<tr>
<th>Year</th>
<th>Government (OECD DAC)</th>
<th>Government (other)</th>
<th>Private</th>
<th>Public sector</th>
<th>NGOs</th>
<th>Other multilateral organisations</th>
<th>Other unmet requirements</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>2011</td>
<td>5.9</td>
<td>0.1</td>
<td>0.8</td>
<td>8.0</td>
<td>9.3</td>
<td>0.4</td>
<td>0.6</td>
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</tr>
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<td>8.0</td>
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<tr>
<td>2013</td>
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<td>0.1</td>
<td>0.8</td>
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<td>0.4</td>
<td>0.6</td>
<td>19.3</td>
</tr>
<tr>
<td>2014</td>
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<td>0.1</td>
<td>0.8</td>
<td>11.0</td>
<td>11.4</td>
<td>0.4</td>
<td>0.6</td>
<td>26.1</td>
</tr>
<tr>
<td>2015</td>
<td>11.0</td>
<td>0.1</td>
<td>0.8</td>
<td>11.4</td>
<td>13.4</td>
<td>0.4</td>
<td>0.6</td>
<td>27.4</td>
</tr>
<tr>
<td>2016</td>
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<td>0.1</td>
<td>0.8</td>
<td>14.0</td>
<td>16.4</td>
<td>0.4</td>
<td>0.6</td>
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<tr>
<td>2017</td>
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<td>0.8</td>
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<td>19.3</td>
<td>0.4</td>
<td>0.6</td>
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<tr>
<td>2018</td>
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<td>0.8</td>
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<td>19.3</td>
<td>0.4</td>
<td>0.6</td>
<td>37.5</td>
</tr>
<tr>
<td>2019</td>
<td>11.3</td>
<td>0.1</td>
<td>0.8</td>
<td>11.3</td>
<td>13.1</td>
<td>0.4</td>
<td>0.6</td>
<td>30.3</td>
</tr>
<tr>
<td>2020</td>
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<td>0.1</td>
<td>0.8</td>
<td>13.1</td>
<td>13.1</td>
<td>0.4</td>
<td>0.6</td>
<td>30.3</td>
</tr>
</tbody>
</table>

## The main sources of humanitarian aid

![Diagram showing the main sources of humanitarian aid]

- **Governments (OECD DAC)**: \(16.2\) billion
- **Governments (other)**: \(2.5\) billion
- **Private**: \(3.8\) billion
- **Public sector**: \(11.1\) billion
- **NGOs**: \(17.4\) billion
- **Other multilateral organisations**: \(0.2\) billion
- **Other unmet requirements**: \(0.6\) billion

The bigger picture
Ghost towns
How COVID-19 reshaped our cities

Cities have been the lifeblood of commercial and economic activity for millennia. From their origins as trading hubs, often located on the coast or on a river, they have relied on people, ideas and materials interacting with one another.

The global pandemic stifled all this, confining people to their homes. These charts, derived from Google mobility data, show how city districts emptied during lockdowns. As COVID-19 measures ease, and memories and anxieties fade, cities will start to come alive again. Whether their total footfall will ever truly be the same remains to be seen. However, not every meeting, innovation or idea lends itself to a Zoom call.

Footfall in London

![Footfall in London Graph](image-url)

<table>
<thead>
<tr>
<th>City</th>
<th>Feb-20</th>
<th>Apr-20</th>
<th>Jun-20</th>
<th>Aug-20</th>
<th>Oct-20</th>
<th>Dec-20</th>
<th>Feb-21</th>
<th>Apr-21</th>
<th>Jun-21</th>
<th>Aug-21</th>
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<tbody>
<tr>
<td>Paris</td>
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<td>Hong Kong</td>
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<td>0</td>
<td>-30</td>
<td>-60</td>
<td>-90</td>
</tr>
<tr>
<td>Singapore</td>
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<td>-90</td>
<td>+30</td>
<td>0</td>
<td>-30</td>
<td>-60</td>
<td>-90</td>
</tr>
<tr>
<td>New York</td>
<td>+30</td>
<td>0</td>
<td>-30</td>
<td>-60</td>
<td>-90</td>
<td>+30</td>
<td>0</td>
<td>-30</td>
<td>-60</td>
<td>-90</td>
</tr>
</tbody>
</table>
The fight for rights
Freedom around the world

In 1989, political scientist Francis Fukuyama declared “the end of history”, by which he meant the triumph of liberal democracy. But three decades on, much of the world’s population still live under repressive regimes. Over recent months, citizens in authoritarian states such as Belarus have bravely marched for freedom. In the West, the Black Lives Matter protests illustrate that democracies, too, have much work to do to guarantee freedom and human rights for every citizen.

Mobilisation for democracy, 2020

How free are different world regions?
The Party line
Beijing cracks down on tech as Silicon Valley soars

In October 2020, China’s government dramatically intervened at the last minute to nix fintech company Ant Group’s blockbuster $37 billion initial public offering. It was the opening gambit in an epic crackdown on the country’s tech sector.

Over recent months, Beijing has introduced a raft of new tech regulation, wiping billions off the value of major companies. Officials say they want to tackle monopoly power and firm up data protection in the interests of “common prosperity”. Meanwhile, US policymakers have talked tough on reining in Big Tech, but are yet to pass legislation with teeth.

These contrasting regulatory approaches are reflected in the relative market performance of US tech companies (as represented in the Nasdaq-100 Index) and the Hang Seng Tech Index (which includes Chinese tech giants such as Alibaba, Baidu and Tencent).
Shifting sands
Global use of sand soars

It may surprise many that sand, gravel and crushed rock are the most-used natural materials globally. Indeed, the Financial Times reported the construction industry’s use “outstrips total consumption for all fossil fuels and metals” and is expected to double over the next four decades. This increase in demand will create a sustainability headache as the mining of sand depletes rivers and coastlines. Concrete and cement are a big driver of this trend, as sand is a key ingredient in both. Land reclamation is not helping either.

With several of the world’s biggest cities on the coast, one option to expand is by extending into the sea. Singapore, by far the biggest culprit, has increased its land mass by around 25 per cent since 1965. As with any finite resource, trade could become fractured, with sand-rich nations – such as China – restricting exports. And although sand is relatively cheap at present, recycling cement and concrete-based materials would help reduce overall demand.

The illustration below presents the data in abstract form, conveying the urgency of the challenge. Time is running out to put our use of sand and other natural resources onto a more sustainable footing.
Large multinationals have faced mounting criticism in recent years for their efforts to “optimise” the amount of corporation tax they pay—the most popular method involves shifting their profits, and therefore taxable revenues, to low-tax countries. That might not be an option for much longer, however, after the G7 reached an accord in June 2021 that aims to create a global minimum corporate tax rate of 15 per cent.
The heat is on
Humans have shaped the warmest period for more than 100,000 years

It’s time to wake up to the impact that billions of humans walking the planet and burning fuel are having.

The 234 scientists on the Intergovernmental Panel on Climate Change (IPCC), who find evidence for warming, suggest human activities have affected all the major components of the climate system and anticipate catastrophic changes in the natural world if emissions continue to rise (see Appendix for a full explanation of the SSP scenarios).

Annual average change in global surface temperature

The bigger picture

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Annual average change in global surface temperature
Assessing environmental sustainability and social performance at a country level

These charts were devised by a team of academics at the University of Leeds, based on the “safe and just space” framework developed by Johan Rockström of the Stockholm Resilience Centre and popularised by the economist Kate Raworth, author of Doughnut Economics. They show the connections between socioeconomic development and environmental degradation.

The blue areas in the middle of the circles show progress towards social development objectives; green wedges indicate sustainable resource use; and red wedges on the outside of the circles show the extent to which countries have shot through their ecological ceilings. Rich countries such as the US – along with some fast-growing emerging economies – have achieved development through carbon-intensive resource use, while low-income countries like Malawi have kept within their ecological bounds while falling behind on social metrics.

Assessing environmental sustainability and social performance at a country level

Malawi

China

US

Living beyond (and below) our means
Rich countries bear the most responsibility for climate change

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Malawi

China

US

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Assessing environmental sustainability and social performance at a country level

Malawi

China

US
At the beginning of the pandemic, it was believed the main risk of contagion occurred through touching infected surfaces, or via coughing or sneezing. However, science now suggests airborne particle transmission is responsible for most cases – even talking can spread the virus. This graphic from Spanish newspaper El País shows we emit ten times the number of virus-laden particles when we talk in poorly ventilated indoor spaces than when we remain silent, and 50 times more when we shout or sing.

In the worst-case scenario – shouting or singing in a closed room for an hour – a person infected with COVID-19 would release 1,500 infectious particles.
A journal of the plague
How one family spent lockdown

This award-winning graphic, from Spanish design studio Errea Comunicación, shows how a family of five inhabited their apartment in Pamplona, Spain, over the course of a single day at the height of the pandemic.

Mum (42 years old)
Dad (41 years old)
Daughter (9 years old)
Daughter (7 years old)
Daughter (3 years old)
You are not alone
Anxiety levels spike post-COVID

Considering the devastating loss of life, the impact of lockdowns and the ensuing recessions, perhaps it is no surprise that the pandemic led to a significant worsening of mental health across some populations.

Indeed, the pandemic heightened the precise factors that tend to be associated with poor mental health – financial insecurity, unemployment and fear. Meanwhile, positive factors – like social connection, access to physical exercise and health services, and daily routine – fell dramatically.

Percentage of population experiencing anxiety

<table>
<thead>
<tr>
<th>Country</th>
<th>Pre-COVID-19</th>
<th>March to April 2020</th>
</tr>
</thead>
<tbody>
<tr>
<td>Japan</td>
<td>11%</td>
<td>13%</td>
</tr>
<tr>
<td>Czech Republic</td>
<td>12%</td>
<td>15%</td>
</tr>
<tr>
<td>New Zealand</td>
<td>14%</td>
<td>16%</td>
</tr>
<tr>
<td>Austria</td>
<td>17%</td>
<td>20%</td>
</tr>
<tr>
<td>Canada</td>
<td>19%</td>
<td>22%</td>
</tr>
<tr>
<td>Italy</td>
<td>21%</td>
<td>24%</td>
</tr>
<tr>
<td>Australia</td>
<td>22%</td>
<td>25%</td>
</tr>
<tr>
<td>Spain</td>
<td>23%</td>
<td>26%</td>
</tr>
<tr>
<td>Belgium</td>
<td>24%</td>
<td>27%</td>
</tr>
<tr>
<td>Sweden</td>
<td>26%</td>
<td>29%</td>
</tr>
<tr>
<td>France</td>
<td>28%</td>
<td>31%</td>
</tr>
<tr>
<td>Korea</td>
<td>31%</td>
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</tr>
<tr>
<td>US</td>
<td>34%</td>
<td>37%</td>
</tr>
<tr>
<td>UK</td>
<td>35%</td>
<td>38%</td>
</tr>
<tr>
<td>Mexico</td>
<td>37%</td>
<td>40%</td>
</tr>
</tbody>
</table>

You are not alone

"Is there no way out of the mind?"

– Sylvia Plath, ‘Apprehensions'

Federico Babina’s illustration, ‘Archisolation’, is an artistic depiction of what the pandemic felt like to those on the frontlines of the health response and others trapped within four walls at home – a labyrinth with no way out.
Variants versus vaccines
Well-vaccinated countries are more resilient

The spread of the so-called Delta variant of the coronavirus prompted fears of a fresh escalation in the pandemic. But vaccines offer a good defence, even against more virulent strains.

Countries that have vaccinated a large proportion of their populations have managed to reduce the link between a rise in cases and increased COVID-19 deaths, whereas countries where few have been vaccinated are much more vulnerable. Until more people in the global south can access the vaccine, the pandemic will be far from over.

UK: 52.6 per cent of population fully vaccinated

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How protected am I?
Vaccines have made COVID-19 far less lethal

This chart, based on a Financial Times analysis of global infection fatality rates, shows vaccines dramatically reduce the mortality risk associated with COVID-19. However, older people remain at greater risk. Booster jabs to protect older and immunocompromised people could offer further protection through the winter months.

A fully vaccinated 80-year-old now has roughly the same risk of dying from COVID-19 as an unvaccinated 50-year-old.
COVID-19 worsens inequality
Low earners and the young hit disproportionately

COVID-19 created a huge labour-market shock focused on low earners, the young and the self-employed. The youngest (16 to 24) and lowest paid lost the most work due to COVID-19 through a combination of lost jobs, furloughs, and reduced working hours.

Change in the proportion of each age group employed, Q4 2019–Q4 2020

As a result, while many of those in the highest-income brackets kept their jobs and were able to increase savings and pay back debt, a large share of those in the lowest-income groups saw their income drop. They were forced to either dip into their savings or take on more debt.

UK households reporting a change in their savings and debt, February 2020–January 2021

COVID-19 created a huge labour-market shock focused on low earners, the young and the self-employed. The youngest (16 to 24) and lowest paid lost the most work due to COVID-19 through a combination of lost jobs, furloughs, and reduced working hours.
Pathogens, pandemics and permanent taxes

Government spending rises over time

Central government expenditure in Britain

Percentage of GDP

Physics teaches us that what goes up must come down. And yet public debt seems exempt from this law. The funding required to pay for the World Wars in the 20th century resulted in a permanent national debt increase. Some of this reflects the low starting base, as well as the increased role of government. With COVID-19 causing a major disruption to global and domestic economies, and tax rises on the political horizon, it is natural to wonder where the Debt-to-GDP ratio and the ensuing tax rate will plateau.
**Pandemic preparedness**
How pandemic resilience efforts are funded

Flow of funds in global health security, 2014–2021

The social and economic costs of the pandemic have been devastating. It is therefore worth remembering Benjamin Franklin’s advice to fire-threatened Philadelphians in 1736: “An ounce of prevention is worth a pound of cure.”

The Sankey chart presented here tracks the flow of funds in global health security and maps it against the Joint External Evaluation’s (JEE) capacities for prevention, response, detection and other. As learning to live with zoonotic diseases becomes a fact of life, understanding and interrogating where funding goes to help deal with the impact of pandemics will be crucial.
Data and technology
When the chips are down
Semiconductor industry faces increasing concentration risk

The world is becoming ever more connected, and semiconductor chips are in demand for everything from wi-fi-connected fridges to driverless cars. However, the industry has become highly concentrated, partly due to the gargantuan investment required to build chipmaking facilities from scratch.

The tiny, high-end chips needed to run data centres and artificial intelligence servers are made almost exclusively in Taiwan and South Korea. This could be a big problem. The early stages of the pandemic showed how geographical concentration of manufacturing can bring supply-chain snarl-ups – and that’s before we factor in geopolitical risk: Taiwan and South Korea are both located in what political analysts would describe as “hostile regions”.

Global wafer fabrication capacity by location, 2019

Global manufacturing capacity by location
Crypto stokes the chip shortage

GPUs are in demand – and not just from gamers

Demand for video games soared during the pandemic, as gamers sought to meet friends remotely and escape into virtual landscapes. But this wasn’t the only factor that drove up the cost of graphics processing units (GPUs) over the past year.

Crunching data from Keepa, a website that tracks listings on Amazon’s marketplace, The Economist made an interesting discovery. The spike in GPU prices closely correlated with the rise of Ethereum, one of the world’s most popular cryptocurrencies – as well as rendering 3D-graphics, specialised chips such as GPUs are the best tool for mining the currency. Emphasising the connection, central processing units, which are useful for playing video games but not cracking cryptocurrencies, have remained stable in price.

With the crypto-craze showing few signs of slowing down, gamers might have cause to grumble for some time yet.
Mining for Bitcoins requires brute computer power to undertake random numerical searches; it is a laborious and enormously energy-intensive process. Awareness of the environmental cost is growing, and not before time – Bitcoin’s energy consumption now outstrips that of many countries.

Electric car manufacturer Tesla recently announced it will stop accepting payments in Bitcoin, due to concerns about the associated carbon emissions. Meanwhile, Inner Mongolia is among the provinces in China to have banned industrial-scale Bitcoin mining facilities, with officials complaining the associated electricity usage will prevent them from meeting the country’s emissions-reduction targets.
It has been said many times that COVID-19 has simply accelerated existing trends rather than created new ones. This is certainly true of data usage: the amount we use and consume is growing exponentially.

Take Japan. The chart clearly shows a pandemic-driven spike as large swathes of the population started working from home. Zoom out, however, and you can see the rise in data usage was already well underway. The interplay with remote working is not straightforward though. As a leader in technology, electronics and robotics, you might expect Japan to be a leader in flexible working – particularly given the infrastructure challenges its cities’ population densities throw up. Indeed, 15 years ago Japan invested in superfast broadband and the country’s mobile data usage outpaced the US by a factor of ten.

However, a deep-rooted cultural barrier exists. The need for office facetime and an underinvestment in software has stymied any wholesale embrace of hybrid working habits. Maybe the pandemic will finally change that.
Do you need to send that email?
The environmental cost of data

According to energy company OVO, if every adult in the UK sent one fewer email, 16,433 tonnes of carbon would be saved each year. That’s equivalent to the annual emissions of 3,334 diesel cars or 81,000 flights from London to Madrid. One more reason not to hit “Reply All”.

The digital world can seem intangible, ephemeral. But every online activity – from sending an email to streaming a Netflix series or Spotify track – uses a small amount of energy. And multiplied on a global scale, these add up.
Don’t feed the troll
Social media and mental health

In 2011, social media firms were hailed for providing valuable tools to activists battling oppression during the Arab Spring protests. Ten years on, these companies have become more associated with the negative impact of their platforms – especially when it comes to the mental health of younger users facing bullying and abuse.

This graphic shows how major social media platforms ranked in a UK-wide survey conducted by the Royal Society for Public Health. A group of 14-24-year-olds were asked to rate the extent to which social media made certain health-related factors better or worse, from -2 (a lot worse) to +2 (a lot better). Only YouTube received a positive overall score.
The cost of a mobile internet connection varies massively across the world, and for many different reasons. In his book *The Great Reversal*, the academic Thomas Philippon argued a lack of competition is why North American mobile phone plans are so expensive compared with Europe, where the telecoms industry is subject to tougher anti-monopoly rules.

In developing economies, such as those in sub-Saharan Africa, high prices have more to do with a lack of infrastructure, which restricts the amount of data the system can handle and forces up the cost for individual mobile data plans. High prices for internet access in the global south are a major barrier to socioeconomic development and only worsen inequalities of income and opportunity.
Streaming killed the radio star...
...but saves the music business

The music industry is filled with tales of talented artists who struggled to make financial ends meet while sharp-suited record company executives – AKA ‘The Man’ – grew rich at their expense. That was until the turn of the millennium, when the industry began what seemed a terminal decline as CD sales slumped and online downloads (often via illegal file-sharing platforms) decimated the business models of major record labels.

The subsequent surge of streaming through platforms such as Spotify and Apple Music has proved a salvation for ‘The Man’, who still pockets the lion’s share of streaming revenues as ‘recording rightsholders’. By luck rather than design, record labels have also benefited from the recent vinyl comeback, as listeners have reengaged with physical music formats.

The one thing streaming has not addressed is the unequal distribution of revenues between platforms, record labels and artists (not to mention many other interested parties seeking a cut). Artists rich and poor have united in calling for the streaming revenue model to be overhauled, with the #BrokenRecord campaign prompting a damning report on the economics of streaming by the UK government’s Digital, Culture, Music and Sport Committee. But will ‘The Man’ sticking it to ‘The Man’ lead to meaningful reform of the business?
Sustainability
At $172.5 billion, Hurricane Katrina in 2005 remains the most expensive natural disaster in US history. The number of natural disasters in the US has increased over time, with climate change one of the key contributing factors. Extreme weather events leading to billion-dollar disasters are becoming more frequent: 2020 set a new annual record of 22 natural disaster events in the US, shattering the previous record of 16 in 2011 and 2017.
Clean freshwater is an essential ingredient for human life, and water stress – situations where demand for water exceeds the available amount – is a serious issue. In 2020, one in four people around the world lacked safe drinking water in their homes.

Water stress also caused inadequate sanitation at a time when COVID-19 highlighted the importance of good hand hygiene. A report from UNICEF shows that at the onset of the pandemic, three in ten people worldwide could not wash their hands with soap and water in their homes.
This graphic shows events that have forced cross-border migration and displacement of people since 1951, when the United Nations established the Refugee Convention. According to the UN High Commissioner for Refugees, there were around 30 million refugees worldwide at the end of 2020.

There are worrying signs the refugee crisis may get worse. The exit of US troops from Afghanistan in 2021, which allowed the Taliban regime to re-establish control, is likely to spark new waves of migration out of the country. In some regions, the effects of climate change are already combining with political instability to force people from their homes. The World Bank estimates there will be over 140 million climate migrants in Latin America, sub-Saharan Africa and Southeast Asia by 2050.
It’s in the trees
How to capture carbon

Managed woodland can reduce carbon dioxide in the atmosphere, produce in-demand forest products and (in the best regulated schemes) generate certified carbon credits as well. But there are risks, like fire, which cannot be ignored. And how many investors are prepared to take a 40 or 100-year view?

The chart on the left, based on policy scenarios explored by the World Resources Institute, shows how carbon capture through trees could be supplemented using different methods, including enhanced crops and new technologies for direct air capture.

Indicative natural sequestration rates in managed woodland

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Indicative natural sequestration rates in managed woodland
Less than (net) zero
Will we reach elusive climate targets?

In 2015, governments around the world pledged to take action to halt global warming, but it has taken time to get the largest greenhouse gas (GHG) emitters like China on board. Today, pledges to meet net zero (where GHGs produced and removed from the atmosphere are aligned) have been made by nations making up over two-thirds of the global economy. But how will such a complex goal be delivered, and how soon?

Countries with established targets currently emit 28,890 GtCO₂e

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Net-zero targets by coverage

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Law and climate (dis)order
Legal action is growing on the climate frontline

Cases against significant carbon-emitting companies have been growing. A landmark ruling in the Netherlands against Shell, ordering it to move faster with emissions reductions, is part of a trend.

Climate-related litigation: Cases against companies

There are at least 33 cases worldwide being taken against carbon majors – the energy and cement companies identified by Richard Heede as responsible for 63 per cent of carbon dioxide and methane emitted from 1751-2010.

There are also a growing number of financial markets cases, focusing on financial risks, fiduciary duty and corporate due diligence – affecting banks, pension funds and asset managers. Other litigation seeks to have corporate human rights responsibilities recognised or to challenge carbon-intensive projects.

Cases against significant carbon-emitting companies

- Cases against government bodies that could impact corporate actors, e.g. Urgenda Foundation versus Netherlands; Client Earth versus Belgian National Bank
- Financial markets cases, e.g. McVeigh versus REST
- Cases against high-emitting corporations, e.g. Smith versus Fonterra
- Cases against carbon majors, e.g. Milieudefensie versus Shell
- Cases involving high-emitting projects, e.g. Client Earth versus Polska Grupa Energetyczna

Direct and indirect cases involving the private sector
**The ripple effect**

**CSR spending and procurement budgets**

The average FTSE 100 company spends a whopping 400 times more on its procurement budget than it does on corporate social responsibility (CSR) initiatives. Viewed through one lens this is depressing, but it also highlights the latent power within supply chains to tackle environmental and social issues. Each firm can play a part in forcing change among the suppliers it is connected to in the value chain.

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**Don’t trust the numbers**

**Why controversy scores can be misleading**

While many investors use controversy scores as a filter to screen out risky companies, these have serious limitations. Our analysis shows leading controversy scoring systems offered by MSCI and ISS have little in common – only 11 companies show up on both datasets. This suggests investors should start cross-checking the scores and only use them as a starting point for further due diligence.
Carbon pricing is on the rise... but remains woefully inadequate

Carbon pricing schemes have been growing in number and ambition. According to the World Bank, as of 2021 there are 64 initiatives, either emissions trading schemes or carbon taxes, in operation. In 2021, 21.5 per cent of global greenhouse gas emissions are covered by carbon pricing instruments. The chart below shows a breakdown of these schemes; the white area indicates the World Bank’s recommended carbon price corridor.

The fact remains that the world fails to price nearly 80 per cent of emissions, and the levy on the minority of emissions that are taxed is woefully inadequate. Worldwide CO2 emissions totalled around 34 billion tonnes in 2020, while carbon revenues are estimated to be $53 billion. That implies an average carbon tax rate of just $1.60 per tonne, a tiny fraction of the cost many environmental economists are calling for as a matter of urgency to tackle climate change.
More from less
Major economies are slowly decoupling growth from emissions

A common narrative in developed market media and society is that we use too much stuff. While this is undoubtedly true – who couldn’t do without much of their accumulated tat – there are encouraging signs that economic growth and things like energy use and agricultural inputs, as well as metal and other material usage, are decoupling.

Economist and technologist Andrew McAfee, whose book provides this page’s heading, argues a more service-led economy, focused on intangible assets (data and the like), should be one with a lighter environmental footprint – so long as we learn to control data-centre carbon emissions, that is. Think about all those gadgets your smartphone has made redundant.

Sweden

UK

France

Denmark

Germany

US

86 Sustainability

87 Sustainability
How safe is your energy supply?
One more reason to wean ourselves off fossil fuels

Death rates from energy sources, per terawatt-hour produced

While the threats posed by climate change are the most obvious incentive to transition away from fossil fuels, the health risks associated with them offer another. As the chart reveals, mortality rates caused by accidents and air pollution for coal and oil, measured by the number of deaths per terawatt-hour of energy produced, are significantly higher than for other sources. This is particularly troubling given that coal and oil respectively account for 25 per cent and 31 per cent of global energy.

It may surprise some that nuclear energy – long viewed as a pariah, in large part due to health concerns – has historically been one of the safest sources. While it has struggled to escape a complex history, it is increasingly being viewed as an important alternative to renewables in a low-carbon world, including by the French and UK governments.

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Charting a just transition
Can everyone have everything?

Despite the encouraging signs from ‘More from less’ (see pp88-89), we are still consuming too much. This chart from the University of Leeds shows there are currently no countries in the world meeting the needs of their citizens while staying within the planet’s sustainability limits. It plots performance on seven environmental sustainability indicators and 11 minimum social thresholds needed to achieve a “good life”.

In an ideal world, every country would occupy the top left corner of the graphic, matching high living standards with a small environmental footprint. In reality, poorer countries tend to perform badly on social metrics but better on environmental ones; the reverse holds true for richer countries.

So, how can we raise living standards without burning the planet? This is the goal of a just transition: to ensure low-income countries can move up the Y axis of the chart without moving right along the X axis. Financial support from richer nations will be a key part of the solution.
Diversity and inclusion
Race, class and opportunity in America
How inequality compounds over generations

The Black Lives Matter movement has shone a light on the persistence of anti-black racism in Western societies. Research from Raj Chetty of Harvard University suggests how deep rooted the problem is.

Chetty and his colleagues analysed data on children in the US born between 1978 and 1983. Investigating the sources of racial disparities in income, they looked at factors such as parental wealth, educational achievement and incarceration rates, finding black Americans had much lower rates of upwards social mobility than white Americans. They also uncovered a particularly large disparity between the incomes of white and black men.

College attendance rates, males

These charts show how structural racism affected the life chances of a generation of black male children, with those from poorer backgrounds suffering a particular lack of opportunity. The chart on the left shows the relationship between the children’s college attendance rates and their parents’ household income; the chart below shows incarceration rates in later life among the same cohort, indicating an institutionally racist system. Reducing the black-white income gap will require “policies whose effects cross neighbourhood and class lines and increase intergenerational mobility”, the authors argue.

Incarceration, males

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The COVID-19 pandemic hit the hospitality industry hard, as large parts of the sector were shuttered under lockdowns. Research from the Resolution Foundation suggests this will have affected black, Asian and minority ethnic (BAME) hospitality workers disproportionately, as they were already earning less than their white colleagues in the run-up to the crisis.

This chart shows the incomes of white women, BAME women and BAME men relative to white men in UK hospitality between 2015 and 2019, indicating evidence of pay gaps and pay penalties. Pay gaps are the raw pay difference that exists before controlling for compositional factors (individual characteristics such as age, region of residence, level of qualifications and contract type); pay penalties are pay differences that exist even after controlling for compositional factors.
It’s all connected
How intersectionality can help in the fight for equality

“If we aren’t intersectional, some of us, the most vulnerable, are going to fall through the cracks.”

– Kimberlé Crenshaw

In 1976, Emma DeGraffenreid teamed up with a group of other black women to sue General Motors for discrimination – they argued the company segregated its workforce by race and gender, with ‘black’ jobs going to black men and ‘white’ jobs going to white women. The court dismissed their claims on the basis General Motors was not discriminating on the grounds of colour (it was hiring black men) or gender (it was hiring black women). In other words, the specific form of discrimination faced by black women was invisible from a legal point of view.

The academic Kimberlé Crenshaw drew on this case in defining the concept of intersectionality, an approach that highlights how different social categories combine in ways that create new forms of disadvantage. The graphic on the right shows some of the human characteristics captured by an intersectional view. We must ensure power is no longer concentrated among the identities in the middle, and distributed more fairly across the circle.
The diversity deficit
The example of US Fortune 100 and Fortune 500 companies

Composition of new directors at Fortune 100 and Fortune 500 companies, 2020

While there have been some gains in US board diversity, at the current rate, achieving proportional representation could be decades away. Progress has also largely been due to the increase of white women on boards. In contrast, minority men’s representation in the Fortune 500 has been growing at less than 0.5 per cent a year since 2010.

In addition, nearly 36 per cent of diverse board seats are occupied by people on multiple Fortune 500 boards – not accounting for seats they may hold outside the Fortune 500. The opportunities need to be spread more widely among diverse board candidates.

Diversity and inclusion

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What’s in a name?
Men still dominate the investment industry

Most common male fund manager’s name versus total female managers

It’s quite alarming there are more fund managers called Dave in the UK than there are female fund managers. The same situation applies in Italy – just swap Andrea for Dave. While the situation is slightly better in France and Spain, where there are at least more female managers of funds than those run by the most common male name, the overall picture highlights the considerable room for improvement in the investment industry on gender diversity.
One of the problems with neurodiversity is the over-zealous desire to categorise each underlying condition – particularly when they often come with negative connotations and stigma (for example, ‘disorder’ is a consistent feature in many of the label names). It is a double-edged sword though. Many neurodivergent individuals do find solace in a diagnosis and the increased understanding of the cognitive strengths and weaknesses that follows.

A web of neurodiversity

Recognising diversity of thought

This visual, created by Professor Amanda Kirby of DO-IT Solutions, brilliantly depicts the overlapping nature of neurodiversity—by placing character and personality traits at the centre, it reminds us of the individuality of each manifestation. No two people are the same, and labels can only help up to a point.
It’s coming home
Would England win without immigration?

During their progress to the final of the European Championships, the England men’s football team did more than just perform on the pitch. They donated match fees to the NHS, spoke eloquently about the need to tackle racial injustice and celebrated the presence of LGBTQ+ fans in the crowds.

The fans who booed as the players took the knee – not to mention the senior politicians who refused to condemn the abuse – might want to reflect on how the team would have fared without immigration. Harry Kane’s father moved to London from Ireland. Raheem Sterling was born in Jamaica. Bukayo Saka has Nigerian parents.

In this chart, we have crunched the data to show the contribution of England players from migrant backgrounds to the team’s performance during the tournament. It’s a decisive victory for an open, inclusive England.

![Chart showing contribution of England players from migrant backgrounds](chart)

Diversity and inclusion

Diversity and inclusion
Markets and economies
Trading places
Do countries trade more with the US or China?

In 2000, US President Bill Clinton gave a speech at Johns Hopkins University, explaining why he was backing China’s entry into the World Trade Organisation (WTO). He argued the deal was in the US’s economic interests and could lead to change within China, too: “If you believe in a future of greater openness and freedom for the people of China, you ought to be for this agreement.”

Clinton was right that entering the WTO would raise living standards in China, but the country’s authoritarian turn under Xi Jinping shows he was wrong on freedom. Whether the US will continue to benefit economically is also open to debate – these maps show how China has displaced the US as the major trading partner of countries across the world.
Trade bounces back...
...but at what cost?

The chart below shows global trade recovered much quicker post-COVID than after two other recent slowdowns – in 2009, following the financial crisis, and in 2015, when a slump in commodities prices and a downturn in Chinese industrial production hit activity.

Cumulative change in global trade from the start of each recession

But the resumption of trade doesn’t come cheap. The chart below shows how the cost of container shipping from China to the US has spiked amid booming demand. There is also evidence shipping firms may be delaying adding capacity, due to uncertainty over whether new ships will be compliant with future climate regulation.

Shanghai (export) Containerized Freight Composite Index (SCFI)
Could the US be entering a new economic chapter?

US inflation has trended steadily lower for the past four decades. The process began with the appointment in 1979 of Paul Volcker to lead the Federal Reserve. He jacked up interest rates to squeeze inflation out of the economy. While the policy was controversial, it ultimately proved successful and led to the Fed being able to conduct policy free of political interference. Deflationary forces were boosted by several other factors, notably the diminishing influence of unions and globalisation.

However, rising global commodity prices, supply chain bottlenecks, and pent-up demand in the domestic economy have forced US inflation to a 13-year high. While a return to the sky-high rates Volcker was appointed to tackle may be a distant prospect, weighing up how high inflation will rise is arguably the most important call investors need to make at present.
EM inflation catches market off guard
Inflation surprise index highest since 2008

Citigroup’s Inflation Surprise Index for emerging markets, which measures inflation figures relative to market expectations, recently hit its highest level since 2008. Investors have clearly underestimated inflation risk in these countries, and it looks like price pressures are set to rise further.

At the start of 2021, there was a widespread view interest rates in emerging nations, as in the developed world, would remain depressed as monetary authorities allowed their economies to heal from the deep damage wrought by the pandemic.

Just six months later, investors have been caught by surprise. As economies re-open, the notion inflation will prove transitory is being challenged. But whereas some central banks in the developed world are poised to look through price pressures, their emerging market counterparts are less likely to.
The GameStop saga
A brief history of a meme stock

The popularity of GameStop, which sells shrink-wrapped video games, had dwindled in recent years as consumers moved online. However, an army of novice investors flocked to GameStop last winter after Tesla founder Elon Musk tweeted a link to a Reddit page recommending the investment. The company’s shares surged as much as 1,600 per cent in January 2021 as an unprecedented stock market battle developed, pitting amateur investors against hedge funds scrambling to cover losing bets.

Company names mentioned are for informational purposes only and not intended to be investment recommendations. Securities or company names herein do not constitute a solicitation to buy or sell. Past performance is not a reliable indicator of future performance.
Electric dreams
The rise of Tesla

Tesla’s share price has risen sharply since 2020, with investors buying into the growth story told by the company’s founder, Elon Musk. Of course, efforts to decarbonise industries and the potential for electric power to help meet the goals of the Paris Agreement have provided a tailwind too. Tesla’s market capitalisation since 2017 has grown larger than all other major carmakers, including the European giants Volkswagen, BMW, Daimler, Renault and Peugeot.

But while Musk is innovative he is also unpredictable – in November 2021 he took to Twitter to ask his followers whether he should sell a portion of his stock, knocking the company’s share price. How will such stunts affect Tesla’s market performance over the longer term?

Tesla market cap versus combined market cap of European ‘Big Five’

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Speculative SPACs

A new kind of public offering

Special-purpose acquisition companies (SPACs) are an innovation in initial public offerings. They offer a completely different way to take companies public.

Often called “blank cheque companies” – and sometimes, less positively, a “poor man’s private equity” – SPACs are effectively publicly traded companies that have been formed with the sole purpose of merging or acquiring other companies. As the chart shows, usage of SPACs has grown considerably over the last couple of years.

Though the investment vehicles have been around for some time, the renewed interest in them creates relative newness and, when combined with both information asymmetry and moral hazard, makes regulators nervous. Caveat emptor (let the buyer beware).
The ESG investing boom
The markets’ growing interest in climate and social purpose

2020 was a watershed year for ESG investing. The number of ESG investors has sprung up like mushrooms after the rain – the societal impact of the pandemic, climate change and the Black Lives Matter movement all combined to amplify interest.

The sustainable fund market rapidly grew during the year and reached a milestone of €1 trillion in assets under management in Europe alone. This means it grew almost ten-fold in the past decade, up from €112 billion at the end of 2010. However, just looking at the MSCI Global Environment Index, it’s clear that the ESG universe is strongly biased towards certain sectors.

European sustainable fund flows

MSCI Global Environment Index sector weights, per cent

Markets and economies
Paris, mon amour
An attractive office market

Scale is one of Paris’s outstanding attributes. With a population of approximately 12 million in the Greater Paris region, it is one of Western Europe’s two megacities, alongside London. It is the largest regional economy in Europe and also accounts for 30.3 per cent of French GDP, despite representing 18.2 per cent of the population.

The Grand Paris project
Paris has embarked on the most ambitious infrastructure project in Europe, dubbed Grand Paris, which will create a ring network to enable suburb-to-suburb connections without having to travel through the centre of the city. The project envisages four new metro lines encompassing 200 kilometres of new track and 68 new stations, with passenger volumes of two million per day. The project could potentially transform the real estate markets in the Greater Paris region, with the office sector specifically well positioned to benefit.
The economic shockwaves of the COVID-19 pandemic have been most acutely felt in real estate equity. Yet, even though the short-term occupier outlook is negative, the medium-term view is more encouraging. In part, support is provided by the wide spread between ten-year government bond yields and initial property yields in continental Europe and UK real estate.

It seems it will take more than a pathogen to dampen investors’ desire for yield, and the illiquidity premium offered by real assets will continue to play an important role in portfolios.
Appendix
Notes and sources


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Diversity and inclusion

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