#### **RISK**

THE NEXT CRISIS

DIVERSITY

POLICY: CAUGHT IN A TRAP

CONCENTRATION RISK



**ROLL OF THE DICE** 

Risk and resilience in an age of uncertainty



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## Tales of the unexpected

Risk was always destined to be a defining theme of 2020, but the focus of the world's attention was supposed to be on the biggest threat facing the planet: climate change (a subject we covered extensively in the previous edition of AIQ).<sup>1</sup>

The threat of a global pandemic, by contrast, was not prominent in 2020 economic or financial market outlooks, despite media reports late last year of a mysterious pneumonia outbreak in the Chinese city of Wuhan.

Even in February, as the risk of a global health crisis should have been obvious, investors barely blinked: The S&P 500 reached an all-time high on February 19. And though the reaction, when it finally came, was severe – with 34 per cent wiped off the S&P 500 by March 23 – by June 8, the US stock market was only 4.5 per cent off its February peak.

But this is not a comforting rally. Notwithstanding the scale and speed of the monetary and fiscal policy response, things are far from being back to normal; with more than half a million deaths from COVID-19 around the world (as *AIQ* went to press), the health threat remains acute and reviving economies will be a complex task.

The gaping disconnect between market signals and economic reality – seemingly oblivious to one another – should matter to investors. Despite major advances in data capture, analysis and modelling, our ability to identify and manage risks remains far from perfect.

The good news is that we can do something about it, by being open-minded, challenging our biases and looking beyond our usual trusted sources for insights. Something that stood out early in the COVID-19 crisis was that investors who read up on the science and what medical experts were saying – a world outside their own area of expertise – reacted quicker and performed better.

In this Risk edition of *AIQ*, we try to follow that example as we explore some of the biggest threats facing the world and their investment implications. Finding answers to these challenges will be difficult, but hopefully the pages that follow will provide useful, if at times uneasy, food for thought.

We welcome your feedback, so please send any comments to me at the email address below.

I hope you enjoy the issue.

#### Rob Davies,

Head of PR and Thought Leadership, Aviva Investors

#### **AIQ** Editor

rob.davies@avivainvestors.com

<sup>1 &#</sup>x27;AIQ: The climate crisis', Aviva Investors, February 2020.

# ABOUT AIQ

Since its launch in 2016, *AIQ* has covered the big themes influencing financial markets and the global economy. We aim to give our clients in-depth analysis of the issues that affect their investments, from demographics to big data, from climate change to China's growth. We also offer insights on more specialised topics, such as portfolio construction and cashflow-driven investing.

We don't profess to have all the answers. *AIQ* actively seeks the views of independent experts as well as Aviva Investors professionals, and regularly features contributions from world-renowned policymakers, authors and academics.

Too often, the content produced by the asset management industry is bland, jargon-heavy and self-serving. Open to fresh perspectives and committed to strong editorial principles, *AIQ* stands out. After all, it's good to be different



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## **COVER STORY** OLL OF THE DICE

The COVID-19 pandemic starkly illustrates the unpredictable nature of the modern world. We explore how organisations can stay resilient through an era of radical change.

#### **OPINION**

TRIAL AND ERROR Chris Murphy shares the lessons he has learned from an eventful career.



#### **INTERVIEW**

**DEALING WITH** RADICAL UNCERTAINTY Economist and author John Kav talks to AIQ about risk, uncertainty and the longer-term implications of COVID-19.

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#### **INVESTMENT**

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SIZE MATTERS COVID-19 could see large firms cement their dominance over weaker rivals.

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RETIREMENT JOURNEY COVID-19 has created headaches for DC pension schemes. Mapping their risks could help to address them.

#### **INTERVIEW**

#### THE SCIENCE OF PREDICTION

Risk expert Didier Sornette talks to AIQ about how organisations can stay resilient in the face of unexpected crises.



## TRIAL AND ERROR: THE VALUE OF LEARNING FROM MISTAKES



What shapes the behaviour deployed to achieve success depends on how failure is perceived A common characteristic of successful people and organisations is an ability to recognise and quickly learn from their mistakes. UK Equity Income Fund Manager Chris Murphy shares the lessons he has learned from an eventful career.

In their day, John Maynard Keynes and Irving Fisher were celebrated economists and investors. Both lost heavily during the 1929 Wall Street Crash. But whereas Keynes' place in history is firmly established, save a few, avid disciples, little is remembered of Fisher. If he is referenced at all, it is for pronouncing that stock markets had reached "a permanently high plateau" right before the crash.

In part, this may have something to do with how they responded to their mistakes. Keynes learned from his and changed his investment strategy to focus on quality companies rather than trying to predict the ups and down of business cycles. Fisher, by contrast, stubbornly kept to his failing strategy – relying on leverage and economic forecasts – and lost his fortune, dying in poverty.

No-one ever learns from getting it right first time. In his book *Black Box Thinking*, British author and journalist Matthew Syed demonstrated recurrent themes and trends tend to explain success or failure among individuals, teams and companies. What shapes the behaviour deployed to achieve success depends on how failure is perceived. See it as a threat and we deny ourselves of what he calls "the precious learning opportunity" behind every mistake. "In a complex world, one's intelligent capacity is not enough," Syed argued. "One has to be willing to learn, to create a dynamic process of change."

To extract the most value from a mistake, an obvious but difficult step is to take responsibility for that mistake. This isn't always as straightforward as it seems.

Take fund management, where there is a share price reaction. On the surface, it is a blunt way of seeing the evidence in that you buy something and it's worth considerably less the next day. Nevertheless, ego often gets in the way. It is far easier to fall back on what Syed calls "self-justifying behaviours" – primarily blaming someone or something else.

History is littered with examples of this. The pools, for example, used to be the way families bet on football results. Littlewoods, the UK's biggest pools operator, had the opportunity to bid for and run the National Lottery, but felt its brand was so powerful it didn't need to. Its demise from being a household name to irrelevance was rapid, an all too common occurrence for many previously successful brands in the internet age.

The pace of change and disruption has accelerated since the start of this century, a trend that could be amplified by COVID-19. As fund managers, we always

## Asking the right questions is central to extracting the most value from any mistake

ask whether we are set up for things to go wrong. Is the fund inappropriately balanced for difficult periods? Or is it exposed to over-leveraged businesses?

Asking the right questions is central to extracting the most value from any mistake: in the second world war, the Royal Air Force looked at where they were seeing damage in returning planes. They decided to reinforce those areas. However, it made no difference. They asked the wrong question. They missed a crucial bias. They should have asked about the planes that weren't coming back, not just the ones that survived. When they looked more closely and factored this analysis in, more planes returned.

Sharing information is also critical. This only truly happens in an environment where people are rewarded – or at least not punished – for doing so. Rather than seeing mistakes purely in black-and-white terms to assess blame, it may be better to think of how to continuously challenge the investment thesis. Being motivated to investigate what is really happening is especially crucial now because the market environment is changing so fast. It is tough to predict what the world is going to look like on the other side, but we can get closer to being right by having the right framework to challenge ourselves.

Finally, it is important to react when the story changes. To survive, companies need to spot emerging threats. At Tesco, Terry Leahy built up a fantastic business. But it can be all too easy to believe your own press. In meetings, Leahy talked endlessly about the company's successes, but failed to recognise the growth of Aldi and Lidl in the UK following the global financial crisis. Tesco's management lacked humility and objectivity. They failed to cut costs. They treated their suppliers poorly. They simply were not prepared for the competition.

At the time, we didn't sell out of our Tesco position early enough, and this harsh lesson would impact subsequent investment decisions. We didn't ask the right questions. Mistakes can be the result of one of two things, and sometimes both: the stock you buy and how much you buy of it. Not all companies and investments have the same amount of risk over time, and it is important to realise that. If the risk increases, sizing the position appropriately allows for a quicker escape route if anything goes wrong.

Learning from the Tesco experience influenced the team's decision to sell a one per cent holding in a major advertising company. The business had attractive attributes, including a good understanding of the digital changes in its industry and an increasing dividend yield. However, it became increasingly clear company executives were not making enough progress, and we exited the position in February 2018, two months before a company announcement of a board-level investigation caused share prices to fall. We were able to limit the performance cost to our portfolio.

Asking the right questions can also lead to opportunities, even during a crisis. One of the main conversations among colleagues recently is around what happens if we are all at home for longer. For example, how do people spend their money? The obvious answer might be shopping online, but they also might save more. In Asia, as more people have been shocked by the pandemic, maybe they are going to want to buy more life insurance. The discussions about what happens during a lockdown have helped us to increase our exposures to some financial services companies, which have so far proved resilient.

The hardest part of fund management is knowing when to go against the herd and when to fall into line; when to trust your instincts and when to challenge your own perceived wisdom. If I have learned anything in my career, it is that managing these tensions requires keeping an open mind and having endless curiosity.

It is often said in fund management that all you can hope for is being right more often than being wrong. If that is the case, the ability to learn from your mistakes can replace hope with a more resilient and successful approach •

<sup>1</sup> Sylvia Nasar, 'Grand Pursuit: The Story of Economic Genius', Simon & Schuster, September 13, 2011.

<sup>2</sup> Matthew Syed, 'Why you should have your own black box', TEDx Talks, May 31, 2016.

#### **AIQ** INTERVIEW

# JOHN KAY DEALING WITH RADICAL UNCERTAINTY



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Risk arises when something jeopardises your reference narrative; the way you thought you were going to live your life

*AIQ* speaks to economist and author John Kay about risk, uncertainty and the longer-term implications of the coronavirus pandemic.

John Kay is one of Britain's foremost economists. His long and varied career has spanned academia, policy and the corporate world. He has served as director of the Institute for Fiscal Studies and the Saïd Business School at Oxford University. In 2012 he produced an influential report for the UK government that drew attention to the damaging effects of short-termism in the stock market.

Kay has communicated with a wider audience through his long-running column in the *Financial Times* and a series of books, including the prize-winning *Other People's Money* (2015), which examined the relationship between business, finance and the wider economy.

Kay's latest work, co-authored with former Bank of England governor Mervyn King, is *Radical Uncertainty: Decision-making for an unknowable future*. The book was hailed as eerily prescient when it was published in February 2020, just as COVID-19 spread across the globe. The pandemic supports Kay and King's thesis that the world is too unpredictable to model precisely; probabilistic risk management techniques are no match for the topsy-turvy contingencies of real life.

In this Q&A, Kay discusses the thinking behind the book, the longer-term implications of the coronavirus crisis for business and finance, and how companies can adapt to conditions of radical uncertainty.

#### Your book draws a distinction between risk and uncertainty – why is it important to distinguish the two concepts?

In 1921, two large books were published on this subject by John Maynard Keynes and Frank Knight. What they meant by risk were things that could be described probabilistically, whereas uncertainty referred to things that couldn't be defined probabilistically.

What's happened since then – and the financial sector is the extreme example – is that the distinction has effectively been elided, and the historic definition of risk and uncertainty is no longer seen as relevant.

We strongly dispute the contention that all uncertainty can be described probabilistically. We choose to define risk and uncertainty in the way ordinary people do. Risk is when something bad materialises. Uncertainty, on the other hand, can be good or bad; when you go on holiday and try a new restaurant, or meet new people, you don't know what's going to happen. It might be pleasant, or it might not. Risk arises when something jeopardises your reference narrative; the way you thought you were going to live your life. You've had banks and insurers talking about 'surplus capital', as if it's possible for financial businesses to have too much money



Your book focuses on "radical uncertainty... a world of uncertain futures and unpredictable consequences, about which there is necessary speculation and inevitable disagreement". Is COVID-19 an example of this?

COVID-19 is absolutely an example of radical uncertainty. The pandemic is not what Nassim Taleb calls a Black Swan, an event you can't anticipate because you can't imagine the event. You definitely could imagine a pandemic; indeed, we somewhat presciently wrote in the book that a pandemic would happen. But we didn't know when or where, and we certainly couldn't have sensibly responded to the question: "What's the probability a global pandemic will start in Wuhan in December 2019."

#### Are you confident policymakers will be able to deal with the economic fallout from COVID-19, even after the health risks have been addressed?

No. The health and economic risks are bound together. There seems to be a widespread belief that, before long, we will be able to announce the health risk is over and we can get back to normal. It's not going to be like that; the most likely scenario is that this continues in one way or another for the next one to two years. We can't be confident in policymakers' responses, as we simply don't know how this virus will evolve and what the economic consequences are going to be. Our argument is that we should stop pretending to have more knowledge about the world than we actually do.

#### You write that at times of radical uncertainty, decision-makers should ask the question: "What is going on here?" Why is this question so important, and how would we go about answering it under the current circumstances?

In business, politics and finance, you're repeatedly confronted with unique situations. Even if the existence of a pandemic is not a unique situation – and it isn't; it is something that has happened before and will happen again – this pandemic has unique features. You need to recognise that, and by asking "what is going on here" you can address the whole context of what is happening.

To my mind, the big failure so far has been the failure to gather the information we need to make sensible decisions. We haven't had the testing capacity to provide that information. There is now a discussion around random testing, and that is terribly important because we don't know how many people have the virus and how many people who do contract it suffer serious consequences as a result.

#### Would you point to an example of an institution or industry that is managing risk and uncertainty well?

The food retailing sector has responded fairly robustly and effectively to the current crisis, whereas a lot of other business sectors have been shown to have supply chains for which even a slight disruption creates problems.

There is a big set of issues there. To protect yourself against this kind of disruption, you have to find a structure that is robust and resilient, and for that you need to have what engineers would think of as "modularity" – i.e. a system built in such a way that when one part fails it doesn't bring down the whole system. You also need redundancy, which means not trying to run things with the minimum margins of safety you can get away with.

In most of business – particularly in finance – we've tended to regard these kinds of things as signs of inefficiency. The siloing of financial services activities was effectively abolished in the 1980s. Since then you've had banks and insurers talking about "surplus capital", as if it's possible for financial businesses to have too much money. DEALING WITH RADICAL UNCERTAINTY *continued*  You cannot derive a probability about the world from a probability that's developed in a model.

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#### Could the crisis lead to positive change, if companies are motivated to shift from "just in time" supply chains to "just in case" models? Or will we revert to business as usual as the pandemic recedes?

It will be somewhere in-between. People have these sorts of conversations, but the short-term pressures on management will be the same after the crisis. If a chief executive's tenure is five years, they may think, "Is something going to happen on my watch? Probably not."

#### Your book draws attention to bogus probabilities and flawed algorithms. Why are computerbased models ill-suited to conditions of radical uncertainty?

Because the models are constructed by people who assume they have knowledge that they don't have and couldn't possibly have. We talk in the book about the failure of risk management in the financial sector. During the financial crisis, [former Goldman Sachs CFO] David Viniar famously said: "We were seeing things that were 25-standard deviation moves several days in a row." Which of course isn't what happened: what he meant, or should have meant, was that this series of events looked impossible based on the Goldman Sachs model. To derive a probability about the world you would have needed to take a probability based on the Goldman Sachs model, then multiply it by the probability the Goldman Sachs model was in some sense true: you couldn't have known what the latter probability was, and it was clearly very low.

The lesson is that you cannot derive a probability about the world from a probability that's developed in a model. The database with which Goldman Sachs built its model came from a period in which banks didn't go bust.

#### How about the implications for investors today? How can they ensure their portfolios are resilient?

Robustness and resilience are about diversification in large part, particularly in an investment portfolio. In any crisis, there are always some things that do well, as well as some that do badly. If you simply look at the dispersion of individual stock movements over the last few months, as against the average movement of the whole, you can see that: an investment in Amazon has worked out pretty well, for example; an investment in airlines has not. But you couldn't have anticipated the precise nature of this crisis, and a financial crisis would have had very different effects.

#### Investment firms face a dilemma: they have to maximise returns for clients while allowing companies the space to build resilience against uncertain events, perhaps through the kind of investments that won't show up on a quarterly earnings statement. How can they strike the right balance?

Investment intermediaries, asset managers, have the problem of being accountable to financial advisors and investment consultants who are constantly engaging in these kinds of very short-term comparisons, which will not demonstrate the advantages of widespread diversification. And widespread diversification is not something you approach by calculating betas in the way portfolio models typically do, but by asking the "what is going on here" question, and by understanding the underlying determinants of asset price returns.

One lesson is to understand that reducing risk is not the same thing as achieving certainty, and that has huge implications for portfolio management and planning. I sometimes say that someone who knows he is going to be hanged tomorrow has certainty but not security. And that may sound like a joke, but when you look at pension funds that, either collectively or on behalf of individuals, are largely invested in bonds, you see that's more or less precisely what they are doing – offering the certainty of a low standard of living in retirement. That's not risk management.

#### Could any of the painful lessons learned during this crisis be applied to avert other global threats – climate change, for example?

Only if we look at this crisis in a way that generates general lessons rather than specific lessons. If you take the example of climate change, there is quite an exaggerated faith placed in climate models that have all the characteristics of the bad models that I've described. The best approach is to recognise we don't really know what's going to happen, and therefore we need to have strategies that are robust and resilient. We basically need to be doing the equivalent of buying options, which is a matter of looking at fundamental technologies. We shouldn't be paying attention to people who claim without foundation that they know what's going to happen to the climate





# ECONOMICS AND ETHICS: WHY DIVERSITY MATTERS

In business, diversity can be the difference between success and failure. But while progress towards it has been frustratingly slow in many areas, the pressure is mounting on companies to act.

#### WHY DIVERSITY MATTERS *continued*

The first thing is to recognise we have a problem and a collective responsibility to work towards a solution

From Alabama to Amsterdam; from San Jose to Seoul; millions of people from across the world took to the streets in June to take part in Black Lives Matter anti-racism protests. Anger at the recent tragic deaths of three black Americans, George Floyd (46), Breonna Taylor (26) and Ahmaud Arbery (25), may have been the spark that lit the fuse, but the demonstrations reflected deep-rooted and long-held resentment against a societal ill that has festered for too long.

While Donald Trump's opposition to the protests were, even by his standards, a gross misreading of the public mood, leaders of some of the world's biggest companies – including JP Morgan, Amazon and Twitter – were quick to issue statements condemning racism and expressing solidarity with the protesters.

Their comments were greeted with understandable cynicism in some quarters, yet not so long ago the idea of a major CEO wading into a debate on race or other issues of social justice would have been unthinkable. And while their actions will ultimately speak louder than words, perhaps they have to be taken at face value for now with a recognition that progress will depend on the collective endeavours of individuals, companies, investors and governments.

"The first thing is to recognise we have a problem and a collective responsibility to work towards a solution. It must also be acknowledged that the US does not have a monopoly on inequality. The problem is systemic and global," says Mirza Baig, global head of governance at Aviva Investors. "We need to ensure the diversity agenda is expanded to fully reflect the spectrum of marginalised communities, including colour, race, disability and class.

"It is not good enough that companies satisfy themselves with policies that simply prohibit discrimination – this only serves to perpetuate the status quo. If we are going to make a dent in tackling a legacy of institutionalised racism and inequality, it will necessitate proactive action to address the imbalance. Companies can make a difference. We don't have all the answers, none of us do, but we are committed to being part of the movement for change."

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In this article, we explore all forms of diversity, including gender, age, LGBT+, neurodiversity and ethnicity.

#### The risks of getting diversity wrong

Companies are only as good as their people, so goes the business mantra of recent decades. However, organisations that lack diversity can deter talent from joining. Consumers also increasingly choose brands that reflect their values; companies are starting to echo this in their choice of suppliers. Not embracing diversity can therefore lead to a suboptimal workforce and a loss of revenue, something shareholders are increasingly concerned about.<sup>1</sup>

In Billion Dollar Lessons: What You Can Learn from the Most Inexcusable Business Failures of the Last 25 Years, Paul Carroll and Chunka Mui argued the number one cause of business failure was misguided strategy rather than poor execution, incompetent leadership or bad luck. They found that as many as 46 per cent of the failures could have been avoided if companies had been more aware of the potential pitfalls. "A significant percentage of the other failures could have been mitigated if companies had seen warning signs," they wrote.

Annie Duke, World Series of Poker champion and author of the upcoming book, *How To Decide*, identifies two reasons for bad decisions: ill fortune and imperfect information. One way to improve on this imperfect information is to collect different perspectives to gather corrective information.

Norman Marks, author of *Risk Management in Plain English: A Guide*  for Executives: Enabling Success through Intelligent and Informed Risk-Taking, explains this depends on the willingness and ability to find that information, consider it and act on it.

"According to a study, 80 per cent of managers, when making decisions, make them based on their gut. They don't ask other people or the right people. Some don't even know what information is available," he says.

This is important because data does not always equal truth. Two people can look at the same data and come to vastly different conclusions. "You need to recognise the need for information that's different from your views to run a business effectively. If you're not integrating reliable and quality information from all parts of your scattered organisation, how can you make quality decisions?" says Marks.

The problem is that we tend to interact with people who agree with us and look for consensus in teams rather than get a full spectrum of views. "What often happens is that we hire for a diverse group, but then we ask everybody to think the same," says Duke.

Duke and Warren Hatch, CEO of Good Judgment Inc, believe not requiring consensus is crucial, freeing team members to fully express their views. Hatch says being "actively open-minded" is an important factor: "If you have a belief about the world, is it something to be tested, or something to be protected?"

Anonymity can also be a powerful tool in helping to overcome anchoring (typically induced by group members conforming their views to those of the high-status individuals). Hatch explains that his organisation's forecasting projects are run exclusively on an anonymous online platform.

"We will go onto a forecasting platform and have no idea who the other team members are, so we are not thinking about their personal background or their Figure 1: Likelihood of financial performance above national industry median.

by diversity quartile

# Per cent Ethnic diversity Top quartile Bottom quartile Gender diversity Top quartile Bottom quartile Bottom quartile Cender and ethnic diversity combined Top quartile All other quartiles 40

personal beliefs – all I know is the information they are bringing, their comments and that is it," says Hatch.

Source: McKinsey Diversity Database, January 2015.4

## Putting your money where your mouth is

Unsurprisingly, correcting a lack of diversity will take time, money and resources. However, when diversity is seen as an opportunity rather than a cost the investment case becomes harder to ignore.

In terms of gender, research in 2012 by Credit Suisse Research Institute of 2,400 companies globally found that, from 2005 to 2011, companies with at least one woman on the board outperformed those with no women in terms of share price performance, higher returns on equity and valuations and lower leverage.<sup>2</sup>

The study also looked into suggestions successful companies could be more likely to appoint women on the board, rather than women's presence on the board being a success factor. It found that although large-cap companies, which tend to be historical strong performers, are more likely to appoint women to their boards, even in an isolated comparison of these large-cap companies the outperformance of companies with women on the board held up.

Research conducted by McKinsey following hundreds of companies around the world since 2014 also found correlations between ethnic and gender diversity in company leadership and the likelihood of financial outperformance (Figure 1). McKinsey also reported this relationship has strengthened over time.<sup>3</sup>

58

+35

+15

53

+25

54

Furthermore, companies in the fourth quartile for both gender and ethnic diversity in the 2019 study were 27 per cent more likely to underperform on profitability than all other companies in the data set.

While greater gender and ethnic diversity in corporate leadership doesn't automatically translate into more profit, the correlation does indicate that when companies commit themselves to diverse leadership, they are more successful.

## The first steps towards diversity of thought

Once you accept the weight of evidence, the real issue becomes one of ensuring diversity is more than a token section in a recruitment policy and is instead embedded in the organisation.

A key step toward this is to better define it. Within the investment industry, for instance, the Diversity Project aims to accelerate a more inclusive culture across ethnicity, gender, LGBT+, neurodiversity, parental returners, young hires, military veterans, and those who need flexible working.

Neurodiversity is itself a diverse group, referring to the diversity of human brains, and includes conditions such as autism, attention deficit hyperactivity disorder, dyslexia and dyspraxia. Neurodiverse people can make a make a particularly important contribution to overall diversity of thought.  $^{\scriptscriptstyle 5}$ 

The second step is to actively attract and recruit diverse talent, which requires overcoming several hurdles. People from minority groups may not know about career opportunities within a specific industry, or they may assume they will not be hired; and recruitment criteria and processes may be involuntarily biased towards mainstream profiles.

Candidate-matching software or predictive analytics can help to help remove biases.<sup>6</sup> However, promoting diversity also requires rewriting policies, redefining the necessary skills for a particular role, writing clear and concise job descriptions and adapting interview processes.

In a joint report with Uptimize, a provider of training solutions to attract, hire and retain neurodiverse talent, the Chartered Institute of Personnel and Development (CIPD), the UK's professional body for HR and people development, urged companies not to list excellent communication skills in the required skills section of a job description if they are not in fact essential. This could dissuade otherwise talented applicants – particularly those on the autistic spectrum that are more likely to be literal thinkers, or dyslexic people, who may fear the requirements for written communication skills.

The multinational software company SAP, for example, rewrote its interview process to attract non-neurotypical applicants. "Someone with autism would not

#### WHY DIVERSITY MATTERS *continued*

survive the traditional interview process, for example, so we had to be more creative. Applicants are asked to build a robot with Lego Mindstorms and are assessed on how they arrive at solutions and support others, rather than a daunting panel interview," said Stefanie Nennstiel, senior director of diversity and inclusion at SAP, in an interview with the CIPD.<sup>7,8</sup>

## Nobody said diversity was easy

Then comes the truly difficult part: getting inclusion right. According to Boston Consulting Group, although companies are making well-intentioned efforts to recruit and hire a diverse workforce, many individuals from minority groups don't thrive because, for the most part, they don't feel included as valued contributors. The true culture of many companies is cultish and mono, implicitly pressurising employees to change in order to fit in – undermining the diverse hire in the first place.

Progress therefore begins with making diversity part of a company's culture, advocacy from senior management, awareness training (particularly for middle managers who will be the first contact point for employees on a daily basis), developing a support ecosystem, and updating company policies.

Companies also need to adapt their processes at each stage of the employee journey and address them to all employees – as part of an onboarding questionnaire or employee satisfaction survey, for example – as not all neurodiverse staff will be diagnosed, or willing to disclose. The good news is these improvements will benefit the whole workforce.

For example, when onboarding neurodiverse staff, a one-to-one session may work better than a group presentation, providing the opportunity to clarify organisational conventions, ask new employees what they need in terms of their working environment and time flexibility. Tasks should be communicated clearly, and



Source: 'Comic Redesigns the Autism Spectrum to Crush Stereotypes', The Mighty Staff, May 23, 2016

some roles may be reviewed – for example, reassigning non-core aspects of an employee's work.

Many adjustments can be simple, such as providing an employee with an extra screen or a desk by a window, not communicating everything by email, providing assistive technology or not expecting neurodiverse employees to be able to contribute at an unplanned meeting.<sup>9</sup> On an ongoing basis, getting the most out of diverse employees – and simultaneously making them feel heard and valued – can be achieved through a variety of initiatives. Awareness and training for other team members can cover subjects as broad as unconscious biases or as minute as avoiding specific fonts when emailing a dyslexic colleague.

Setting ground rules for communication during meetings (particularly on

#### Figure 2: Redesigning the autism spectrum

Imagine if that was the best compliment you ever received: 'Wow, you are really normal.' Compliments are: 'you are extraordinary' or 'you step outside the box', so if people want to be these things, why are so many people striving to be normal?"

#### Rosie King

Writer, public speaker and autism advocate

interrupting others), and leaders amplifying ideas expressed by diverse team members when they have not been heard are also essential – provided credit is given where credit is due. And with certain non-neurotypical employees, taking a strengths-based approach to assessments may be necessary to help their career development.<sup>10</sup>

Some employees may feel disadvantaged if allowances are made for others, such as a coveted desk by the window for someone who needs a quiet environment. In particular, given the limited number of senior roles in a company, those who benefit from privileged routes to top jobs may resist change that would increase competition. Organisations need to have support in place to defuse these situations before they escalate.<sup>11</sup>

Even when everything seems to work, having diverse perspectives can be difficult. "It is a balance we are seeking to find with so many of these processes. If we have a diversity of perspectives, we can analyse ourselves into paralysis and not get anything done. Finding that balance is something you do through a lot of feedback," says Hatch. To really embed diversity, employees also need advocates who can support them, raise their profile and help them achieve their career goals. Not only will employees feel more valued, it will open previously inaccessible opportunities for promotion, reinforcing diversity within the leadership team itself. It is also important not to make assumptions about an individual's abilities or aspirations, and to implement objective assessment and promotion processes. Finally, like any other business objective, inclusion must be continuously reassessed and measured.<sup>12,13</sup>

Diversity effectively makes everyone work harder, pushing people outside their comfort zone and depriving them of the confidence that comes with conformity.<sup>14</sup> However, companies will not capture the full advantages of diversity until they create a culture that genuinely encourages diverse participation.<sup>15</sup>

#### **Investing and diversity**

Pressure is rightly growing from institutional investors to make diversity strides, particularly pension funds and their consultants. A 2019 survey of 100 asset owners globally with combined assets of more than US\$8 trillion by think tank New Financial found that while pension funds themselves still have progress to make in terms of diversity on trustee boards, the issue is firmly on their agenda.

A considerable gap remains between leaders and the rest, but diversity questions in requests for proposals are increasing in number and frequency. The most engaged asset owners are also asking asset managers questions directly in face-to-face meetings, particularly on the diversity of investment teams.<sup>16</sup>

New Financial found pension schemes' commitments are becoming more explicit, touching not only on diversity, but also culture and inclusion. In addition, the most progressive asset owners are not only stepping up their advocacy and engagement on diversity, they are increasingly bringing diversity criteria into investment mandates and decisionmaking processes.

While diversity may not be a core criterion in selecting an asset manager, it could make the difference between two otherwise similar contenders. In turn,

#### WHY DIVERSITY MATTERS *continued*

asset managers are escalating their engagement on diversity and inclusion with companies they invest in.

They are also focusing on ensuring diversity of thought within their own teams. "When you are deciding on who you want in your team, similar to portfolios, you want to ensure people are contributing in different ways, and that you don't have one investment team all thinking the same," says Emma Halley, head of investment process, multi-asset and macro at Aviva Investors.

This is borne out by research, which has found significant differences between men and women, as well as across age groups and education levels, in terms of attitudes to risk and investing. These differences in perception – and biology – can affect our views, questions we ask, and the data we consider or overlook.

A recent study in Norway set out to capture how situational and individual factors could shape attitudes to risk. The survey of 1000 people aged 15 and above used eight different dimensions of risk and reached some thought-provoking conclusions. "White men tend, in general, to judge risks as smaller and less problematic than women and non-white men," the authors wrote.<sup>17</sup>

Higher-income earners tended to be more comfortable with risk-taking, as did the better educated. "Highly educated people are more positive toward a risky life course, risky physical arenas and competitive arenas in general," the report noted, perhaps because education can help provide solutions for those in challenging situations. Interestingly, the mother's education was perceived to be more significant than the father's when it came to risk appetite. Overall, the implication is that a room filled with diversity could well come to different risk conclusions than one filled with uniformity.

In the investment arena, there is a history of exploring what difference means.





One classic study titled *Boys Will Be Boys* examined brokers' share account data from over 35,000 US households, and analysed trades between 1991 and 1997.<sup>18</sup> It looked at security selection and whether there was a significant difference in gender outcomes.

The study found no difference in the success with which securities were selected, but overall women generated higher returns because they tended to trade less frequently. "Men lower their returns more than women because they trade more, not because their security selections are worse," the authors found. Their thesis is that over-confident male traders tend to undermine returns, as higher trading costs add up.

Research into why this might be the case has been taken forward by John Coates, a former derivatives trader turned Cambridge University neuroscientist. He noticed a difference in the way men and women responded in a high-pressure environment in the dotcom bubble, as some men showed signs of manic, euphoric and delusional behaviour.<sup>19</sup>

He found testosterone levels in the morning would tend to correlate with the profit generated. Though neuroscientists don't fully understand the impact of testosterone, it is thought to stimulate dopamine release, impacting the reward centres of the brain. Coates suggests testosterone might contribute to a 'winners effect' on the trading floor, fuelling irrational exuberance. But at a certain point, performance would peak, and high-risk decisions would fail. Coates also tracked cortisol, theorising about whether it might be relevant in financial markets because high cortisol levels impact memory. He suggested high cortisol levels in market crashes might prompt traders to become radically risk-averse, contributing to pessimism and making it harder to recover from selloffs.

This idea was echoed in a 2014 article on price bubbles in financial markets by Sheen Levine et al.<sup>20</sup> Levine and his team constructed experimental markets in southeast Asia and North America, where participants traded stocks to earn money and randomly assigned participants to either ethnically homogeneous or diverse markets. They analysed 2,022 market transactions by 180 traders in 30 markets, of which 16 were homogeneous and 14 diverse, and found bubbles were affected by ethnic homogeneity but could be thwarted by diversity.

The study found that, in homogenous markets, traders were less likely to scrutinise others' decisions, and therefore more likely to accept pricing errors unquestioningly, leading to overpricing. Similarly, when bubbles burst, homogenous markets crash more severely than diverse ones. The effect was the same across markets and locations, despite marked differences in culture and ethnic composition (Figures 3, 4).

The authors concluded price bubbles arise not only from individual errors or financial conditions, but also from the social context of decision making. Ethnic

Figure 4: Pricing accuracy in diverse versus homogeneous markets, North America

Pricing accuracy, per cent



diversity may be beneficial in providing variety in perspectives and skills, but also because it creates friction and upends consensus.

#### **Uncovering unseen risks**

Sunil Krishnan, head of multi-asset funds at Aviva Investors, argues groupthink increases fragility in the same way as metal corrosion. He believes that resilient teams should constantly work hard to stop the rust from setting in. This ultimately requires a commitment to challenge received wisdom, encourage the voices who are in the minority on an issue, and to keep diversity of mindset and background in mind when putting teams together.

"It doesn't always translate to being right, but if you get it right it means coming up with ideas more quickly, recognising errors earlier and being more ready to change course. That's what resilience looks like for a team," he says.

Annie Duke is equally convinced of the power of a diverse workforce. "We should not think about the world as going only one way. We should try to imagine as many ways as possible it could go or have gone, both in hindsight and looking forward. Examine what all those ways are, then try taking some lessons from that," she says.

Embedding diversity requires a fundamental change and ongoing feedback and adjustments at all levels of an organisation, but it is well worth the effort. As Duke goes on to say: "When you don't access the diversity of opinion that exists in the group, the thing most likely to happen is that you miss risk. Why? Because nobody wants to be the negative person on the team."

Thinking about the downside is uncomfortable, but identifying it is the only way to mitigate its impact or the probability of it happening. In turn, the best way to do that is to access diversity of opinion to the full •

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# RISK AND RESILIENCE IN AN AGE OF UNCERTAINTY

The coronavirus pandemic has highlighted the difficulties of managing risk in an increasingly globalised and interconnected world. We explore how organisations can stay resilient through an era of radical change.



Pavia, located 20 miles south of Milan, looks much like any other small Italian town. Cobbled lanes wind between fashionable boutiques; medieval ruins sit alongside high-rise office blocks. But this unassuming place has an impressive claim to fame.

Pavia is the birthplace of Gerolamo Cardano, one of the brightest minds of the Italian Renaissance. A physician, astrologer and inveterate gambler, Cardano is best known for his treatise *Liber de Ludo Aleae* (Book on Games of Chance), which used mathematical formulae to predict the results of successive dice throws. Written in 1525, it was the first systematic attempt to define the principles of probability.

Though Cardano didn't realise it – he was simply trying to improve his luck at the gambling table – his book laid the groundwork for the study of risk. As probability theory developed, it enabled people to define future possibilities and choose alternative courses of action, taking into account the likelihood of success or failure. This approach revolutionised whole spheres of human activity, from warfare to wealth allocation, from farming to family planning. Cardano's legacy is evident in Pavia's unusual concentration of betting shops and lotto machines. In recent months, his name has cropped up repeatedly in conversations among the town's citizens and officials, as they grapple with the implications of the coronavirus outbreak.<sup>1</sup> Is it safe to visit family during lockdown? When should schools and workplaces reopen? The answers to such questions depend on weighing the odds.

#### **Radical uncertainty**

Pavia's residents are not alone. Around the world, the COVID-19 pandemic has made dodging risk the stuff of everyday life. People have been forced to make tough decisions about how best to protect their health and safeguard their livelihoods. As a recent *Financial Times* op-ed put it: "We are all risk managers now."<sup>2</sup>

But the pandemic also shows some events are simply impossible to predict with any certainty, however sophisticated our understanding of risk. In a highly interconnected world, a viral outbreak at a Chinese wet market can rapidly escalate into a global crisis. Predicting the shape of the future is more difficult than ever. Some experts believe heightened uncertainty may be the new normal. In their book *Radical Uncertainty: Decision-making for an unknowable future*, economists John Kay and Mervyn King argue the modern era is characterised by "uncertain futures and unpredictable events" that confound probabilistic risk models.<sup>3</sup>

COVID-19 is "absolutely an example of radical uncertainty", Kay tells *AIQ*. "We simply don't know how this virus will evolve and what the economic consequences are going to be. Our argument is that we should stop pretending to have more knowledge about the world than we actually do."

This doesn't mean we must simply accept our fate, however. As we'll discover in this article, those who can stay informed, flexible and resilient will find opportunities, even during times of extreme change. In part one, we examine how theories of risk have evolved, from the gambling dens of medieval Italy to the modern trading desk. In part two, we identify some guiding principles for investors hoping to plot a course through an increasingly unpredictable world.

#### RISK AND RESILIENCE IN AN AGE OF UNCERTAINTY *continued*

## PART 1. RISK AND UNCERTAINTY

For most of history, the future was considered to be beyond human knowledge or control. As Peter Bernstein wrote in his classic study *Against the Gods*, "the future was a mirror of the past or the murky domain of oracles and soothsayers".<sup>4</sup>

What changed was the advent of risk. We realised our actions can influence the future; it is therefore not predetermined. The effects of human behaviour can be understood and modelled by drawing inferences from observable data.

Cardano's statistical method, developed by later mathematicians such as Blaise Pascal, Pierre de Fermat and Carl Friedrich Gauss, formed the basis for probabilistic risk calculation. As our understanding of risk became increasingly sophisticated, it enabled massive leaps forward in science, engineering, government and finance, as individuals and organisations began to plan and strategize more effectively.

The early thinkers on risk knew the limitations of their theories. Not every situation can be quantified using statistical methods, which are best suited to scenarios with fixed rules and parameters, like games of cards or dice.

In the 20th century, economists Frank Knight and John Maynard Keynes drew attention to the limits of probabilistic analysis in their writings on finance. They distinguished between risk, which can be measured, and *uncertainty*, which cannot.

As Keynes wrote in an essay summarising his landmark text, *The General Theory of Employment, Interest and Money* (1936): "I do not mean to distinguish what is known for certain from what is merely probable. The game of roulette is not subject, in this sense, to uncertainty. The sense in which I am using the term is that in which a European war is uncertain, or the price of copper and the rate of interest 20 years hence...about these matters there is no scientific basis on which to form any calculable probability whatsoever. We simply do not know."

#### Pangolins and black swans

To better understand the distinction between risk and uncertainty, consider some other examples. Credit investors know there is a risk a company may default on its debt: this can be estimated and priced by looking at the issuer's credit rating, strength of its balance sheet, quality of its governance and the state of the wider economy. This risk is a "known known".

But there are other hazards that can't be measured precisely, or even foreseen. This is the domain of uncertainty: the "unknown unknowns" that complicate more linear risk assessments.

One of the earliest uses of this phrase comes from the aerospace industry. In 1954, two de Havilland Comet passenger jets crashed in mysterious circumstances, stupefying engineers and safety officials. After an exhaustive investigation, the cause of the accidents was found to be metal fatigue originating in the corners of the jets' square-shaped windows. (This is the reason most plane windows are now oval in shape.) Engineers described the square-window problem as an unknown unknown, or "unk unk" for short – a design flaw so tiny it would have been impossible to spot before it cascaded into a crisis.<sup>5</sup>

Derivatives trader-turned author Nassim Nicholas Taleb used his famous metaphor of "the black swan" to describe unknownunknown events. In his definition, black swans are outliers, because nothing in the past can convincingly point to their possibility – even if it is tempting to concoct explanations for them afterwards.

True black swans are rare, however. More often, risks belong to a related category: "known unknowns": hazards we can anticipate in a general sense without being sure exactly when or where they will occur.

COVID-19 is a good example. Experts warned repeatedly of the threat of a

pandemic in recent years. In a TED Talk in 2015, Microsoft founder Bill Gates said global health systems "are not ready" for the outbreak of a novel flu pathogen.<sup>6</sup> As recently as June 2019, Politico magazine modelled the course of a future coronavirus pandemic and analysed its likely effects on public policy.7 But no-one predicted COVID-19 would emerge in late 2019 in the Chinese city of Wuhan, jumping the species barrier from a wild animal – probably a pangolin or a bat - to a human host. Nor did anyone foresee that the spread of the new virus would coincide with the sudden decision by the Saudi government to slash the price of oil, exacerbating the market panic.

"Few people, at least outside of the epidemiological experts, would have countenanced a world where social distancing and the cessation of freedom of movement would become reality in such a short space of time," says Mark Robertson, head of multi-strategy funds at Aviva Investors. "In addition, the decision by Saudi oil producers to enter into a price war was the last thing an already fragile market needed."

#### Here be dragons

The coronavirus outbreak has prompted intense debate about the uses of big data and artificial intelligence in monitoring systemic threats. Could a sophisticated algorithm have anticipated the emergence of a deadly virus, or at least modelled its impact once it emerged?

Didier Sornette, a professor at the Swiss Federal Institute of Technology Zurich, is one of the world's leading experts on risk. By carefully monitoring disturbances in complex systems, he has been able to detect early signs of crisis in various environments, from heavy industry to finance (see *The science of prediction: An interview with Didier Sornette*). Experts in technical fields often cling to a damaging sense of certainty about the future. This can leave their organisations vulnerable to events that lie outside the scope of their models."

Sornette's theory is that extreme events – or "dragon-kings" – often announce themselves through minor shifts that can be discerned by experts who know what to look for. For instance, Sornette was able to predict the failure of a pressure tank in an Ariane space rocket by monitoring the progress of miniature acoustic emissions deep in the tank's matrix of carbon fibres. He has used similar methods to predict seismic aftershocks, landslides and the formation of some financial asset bubbles.

But Sornette appreciates many events are impossible to capture within numerical models. Not even the most advanced data-driven methods could have anticipated the onset of COVID-19, though they might have been helpful in mapping its subsequent transmission across borders. "Predicting the original case – 'patient zero' – would have been impossible," he says.

Sornette's approach acknowledges the difference between risks that can be modelled probabilistically and uncertainties that cannot. Though the distinction is simple enough, it is often overlooked by experts who believe they can perfectly chart the course of the future.

As Sornette puts it: "I like to say that nature is more imaginative than mathematicians, physicists, engineers, specialists of all kinds. We are very often taken by surprise when a catastrophe occurs, as the path to it has not usually been imagined."

#### The trouble with models

Such humility is not always evident in 'expert' forecasters, who are taken by surprise more often than they may like to think. A famous study by the US psychologist Philip Tetlock found the average expert in geopolitics and economics –defined as those with more than 12 years' experience – is about as accurate in predicting the future as a chimpanzee throwing darts at a target.<sup>8</sup>

Tetlock discovered amateurs often perform better than professional futurologists. His government-funded Good Judgement Project unearthed a clutch of so-called "superforecasters", whose predictions consistently beat the average, at least when it came to answering short-term questions – up to about 400 days into the future – with highly constrained parameters.

Superforecasters come from a range of backgrounds, but share a particular character trait: open-mindedness. They are rarely wedded to a single ideology or perspective; they are open to challenge and debate in the interests of learning more; and when the evidence shifts, they are willing to change their minds.

By contrast, experts in technical fields often cling to a damaging sense of certainty about the future. This can leave their organisations vulnerable to events that lie outside the scope of their models. "People in government, people in decision-making positions in corporations, want levels of certainty that models purport to provide," says Margaret Heffernan, author of the new book *Uncharted: How to map the future together.* "The problem is that all of the real risk – the systemic risk – appears to go away, and the possibility of pictureperfect decisions starts to feel available.

"The truth is since every single forecast can only have probabilities attached to it – and those probabilities will always be under 100 per cent – the opportunity to make the perfect decision is always elusive. We have to make trade-offs and try to make the best decisions we can with the information we have, but that information will keep changing, and very few models keep up with that pace of change."

Kay and King make a similar point in *Radical Uncertainty*: "Instead of recognising uncertainty and adopting policies and strategies that will be robust to many alternative futures, banks and businesses are run with reliance on models which claim knowledge of the future that we do not have and could never have."

Finance is a prime example. Over recent decades, hedge funds and investment banks have built complicated models that purport to track all manner of

#### RISK AND RESILIENCE IN AN AGE OF UNCERTAINTY *continued*

Conventional risk management techniques don't work in environments of advanced complexity

commercial and financial risks, including those that are ill-suited to probabilistic analysis. The distinction between risk and uncertainty has been elided.

The industry's reliance on these kinds of models was dramatically illustrated during the global financial crisis. At the height of the turmoil, Goldman Sachs' then-chief financial officer David Viniar famously said the company's risk model indicated markets were undergoing "25-standard deviation moves several days in a row".<sup>9</sup>

The probability of a single 25-standard deviation event is so low it would take up too much space to represent numerically on this page. Suffice to say, it is equivalent to the chances of a single person winning the UK National Lottery 22 times consecutively.<sup>10</sup> Given those odds, the universe has probably not existed long enough for there to have been several days on which 25-standard deviation events could occur. Far more likely is that the model was flawed.

One common reason for the failure of probabilistic risk models is that the past is often an imperfect guide to the future. Banks that fed their models with data drawn from the relatively calm decades of growth and prosperity that followed the end of the Second World War were in for a nasty surprise when the financial crisis hit.

"The lesson is that you cannot derive a probability about the world from a probability that's developed in a model," says Kay. "The database with which Goldman Sachs built its model came from a period in which banks didn't go bust."

Another issue is that risk calculations have become more complicated in the context of a globalised economy, in which a single event can trigger domino effects across multiple countries and markets. New factors enter the equation, feedback loops accumulate, and linear risk events quickly spiral into the domain of uncertainty.

#### The butterfly defect

According to Taleb, financial crises are becoming more damaging because of the physical and technological connections that characterise the modern world. Such connectivity increases the occurrence of "fat tails", named after probability distributions that show unexpected thickness at the extreme end of the bell curve.<sup>11</sup>

Put simply, there are now more situations in which a single variable – a virus, asset bubble, cybersecurity failure, natural disaster, geopolitical spat – can have outsized effects. Under such conditions, quantifiable risks are often shadowed by unknowable uncertainties.

Consider the supply chain for a product such as Apple's iPhone, which links high-end Korean chipmakers, Chinese manufacturing facilities and thousands of small, specialist companies that contribute different components to the finished machine. A single interruption at any point in this highly efficient and finely tuned process can result in delays, supply constraints and price increases further down the line.

A known-unknown event – the coronavirus pandemic - has amplified the risks inherent in this intricate system. Central China, where COVID-19 originated, hosts a cluster of manufacturing firms, including Hon Hai, Apple's main supplier; similarly, Gumi Industrial Complex just outside Daegu, the city at the centre of South Korea's coronavirus outbreak, produces most of the world's memory chips and LED displays. The virus-related cessation in work at these facilities is expected to lead to at least a ten per cent fall in global smartphone shipments this year, and knock-on impacts are already being observed across a range of companies and industries.12

"Supply chains are so integrated and efficient these days, there is less flex when

there is an issue in one part of the world," says Alistair Way, head of emerging market equities at Aviva Investors. "There is no easy way Apple can shift iPhone production away from Hon Hai because it is so efficiently set up with customised facilities."

We are all familiar with the butterfly effect, the metaphor derived from chaos theory that suggests an insect could flap its wings and cause a tornado a thousand miles away. In a 2014 book, University of Oxford economist Ian Goldin coined a new phrase, "The Butterfly Defect", to emphasise the inherent fragility of a deeply interconnected world.<sup>13</sup>

"Everything we have seen since [2014] shows the concerns I expressed then about systemic risk in systems – be they health systems, financial systems, infrastructure systems – have proved themselves to be true. COVID-19 is just the latest example," Goldin says. "Sadly, we are not seeing a full appreciation of the full implications of this. I don't see anything in the direction of travel in health or in infrastructure that is going to make us more resilient."

As new technologies such as Internet of Things introduce still more connections to the global economy, risk management will have to evolve quickly, argues Warren Black, an expert on the dynamics of complex systems and founder of Complexus, a risk consultancy.

"All our risk management standards assume risks happen in a logical, sequential, cause-and-effect way. As our systems and environments get more and more complex, that's no longer true; at the highest level of complexity, you have chaos. Nothing can be predicted or proactively controlled when there is chaos, so conventional risk management techniques don't work in environments of advanced complexity," says Black

## PART 2. STRATEGIES

The challenges of managing risk in this new era of radical uncertainty may be daunting, but they are not impossible to overcome. Organisations that can grasp the unpredictable nature of the modern world – and recognise the limits of their own knowledge – could find opportunities to thrive.

One key lesson to draw from the events of recent months is that attempts to predict the future with certainty are doomed to failure. This is especially the case in finance, where timing the market depends on being right in the specifics, not the generalities.

Imagine that a portfolio manager had listened to Bill Gates's warning of a pandemic in 2015 and repositioned their fund defensively in expectation of imminent market disruption. They would have missed out on five years of outsized returns as equities soared, even if recent events proved Gates was broadly correct. Clients would undoubtedly have questioned such a conservative strategy – particularly given the performance some passive funds were able to deliver over that period thanks to their unmoderated stock-market exposure.

A more sensible response to uncertainty would be to build portfolios that stand to perform well in a range of scenarios, argues Euan Munro, CEO of Aviva Investors.

"It would be a tall ask to say an asset manager should have had a research team that would have known a virus was going to come and spook the markets to this extent. Far less forgivable would be not having a portfolio that had some generic resilience to extremely disruptive events – whether that's a collapse of a banking system, a health crisis or a geopolitical issue," he says.

#### Plan for alternative futures

In *Radical Uncertainty*, Kay and King argue the best way for investors to stay resilient

and flexible in a hyperconnected world is to plan for "alternative futures" through the adoption of "multiple strategies".

Their exemplar is an unconventional oil-company executive named Pierre Wack, a former journalist and student of Indian mysticism who became famous in risk-management circles for his work at Shell in the 1960s.

Wack threw out the centralised planning model the company had previously used and encouraged his teams to think outside the box in planning for a range of potential futures. Long before the creation of OPEC, he speculated about the risk major Middle Eastern energy producers would form a cartel to exert monopoly power. As a result, Shell was able to weather the oil crises of the 1970s much better than its competitors.

Scenario planning has since been applied in a range of other contexts, from business to policymaking. And the approach has a close analogy in modern asset management, where resilience depends on building diversified portfolios that can withstand a range of possible developments.

"In all portfolio construction processes, you need to have a way to stress test alternate scenarios, explicitly for 'shocking' your portfolio through those environments," says Josh Lohmeier, head of North American investment grade credit at Aviva Investors. "That helps you reallocate or rescale those ideas in a way that allows you to capture the inherent alpha while simultaneously acknowledging there will be periods of volatility. There will be exogenous shocks to the market that cannot be predicted; you need to prepare for those every day."

This method of portfolio construction isn't based on predicting low-frequency events, but about building in protection against categories of foreseeable risk. Take the supply-chain example: investors need not have anticipated the outbreak of a new strain of flu to have discerned the vulnerability of the complex smartphone supply chain to a sudden catastrophe. A natural disaster, terrorist attack or geopolitical incident – such as a worsening of the US-China trade war – might have triggered similar disruption.

Preparing for multiple scenarios inevitably means allocating time and resources to model the impact of events that never come to pass. But such portfolios should benefit from the quality known in engineering as "modularity", in that a single failure should only affect discrete parts, not the system as a whole.

"The coronavirus sell-off demonstrates the truth in a statement sometimes attributed to Mark Twain: 'It ain't what you don't know that gets you into trouble, it's what you know for sure but just ain't so,'" says Giles Parkinson, global equities fund manager at Aviva Investors. "Investors have to find ways of dealing with uncertainty. A little more diversification – without diluting into ignorance – can be helpful to protect against unknown unknowns."

#### Prepare for turbulence

As Parkinson points out, a well-diversified portfolio is not just a random collection of assets, but a set of informed ideas about corporate and economic trends, some of which will challenge the prevailing market consensus. The art of portfolio management is about ensuring these cohere, such that the associated risks are not concentrated in a single geography, sector or factor.

The first step in this process is to ensure risks are properly monitored, accounted for and financially compensated. Under conditions of uncertainty, it is especially important to distinguish between risks taken as essential components of an

#### RISK AND RESILIENCE IN AN AGE OF UNCERTAINTY *continued*

intended strategy and those that are unintended consequences of certain market bets, argues Mikhail Zverev, head of global equities at Aviva Investors.

"Consider a hypothetical equity portfolio that is long-US, short-Europe. The fund manager might have structured the portfolio in this way because they prefer the US to Europe from a macroeconomic perspective. But they need to be aware that there are other dynamics involved.

"For example, the US is more tech-heavy than Europe, where the market is more industrials-focused. So, the macroeconomic bet introduces a further lateral risk: the portfolio is not just long-US, but long-tech and short-industrials. That, in turn, brings other interest rate-risk and factor-risk implications," Zverev adds.

As well as tracking these kinds of "knownknown" risks, it is important to closely track and manage correlations – the degree to which asset prices move in relation to each other. Portfolios in which different securities are positively correlated will not be sufficiently diversified, even if those are spread across different asset classes and geographic markets.

"Diversification is a massive cornerstone in investing, but only works when there is a low correlation between ideas, to reduce the total amount of risk," says Wei-Jin Tan, who monitors risk across Aviva Investors' multi-strategy funds. "Correlations are not static, so it is important to continually conduct scenario analysis to get a sense of how they change in different environments."

For instance, bonds and equities have historically been negatively correlated during periods of market calm, but this can change quickly during crises. Tan's team undertakes scenario analysis to determine how correlations alter under different pressures, using historic events as a guide, including the global financial crisis, Russian currency crisis of 1998 and the "taper tantrum" of 2013. This work informs forward-thinking risk management in the context of the portfolio as a whole. One important measure in tracking correlations is their "unusualness". Derived from the work of Indian scientist P.C. Mahalanobis – who developed the concept while studying the distribution of human skull sizes – unusualness is a statistical indication of turbulence that shows how correlations move in extreme situations.

"What we saw going into COVID-19 was that unusualness spiked massively, and that indicated the traditional equity-bond correlation may not hold," says Tan. "Portfolio managers must constantly evaluate and adjust to ensure that the investments they have are the right ones, and that their risks are properly diversified."

#### **Resilience and stock selection**

Risk management in times of uncertainty also requires a more granular analysis of the resilience of individual assets within portfolios, from the creditworthiness of a sovereign-debt issuer to the health of a corporate balance sheet.

The coronavirus crisis has provided a stress test for many business models. Companies with low leverage, comfortable cash buffers and a diversified range of customers and suppliers have generally proven to be more resilient than those that favour lean, cost-cutting efficiencies.<sup>14</sup>

Choosing a good company is about more than reading balance sheets and P&L statements, however. One crucial lesson to be learned from the events of 2020 is that organisations need to play close attention to the wider market and social context in which they operate.

Companies with strong environmental, social and governance (ESG) credentials are proving to be more resilient to the disruption, perhaps because these firms tend to take a more careful and holistic view of their operations and those of their commercial partners. Over the longer term, they should also be better placed to cope with the biggest threat of all: climate change. "Leaders in ESG are focusing on the resilience and sustainability of their business models," says Jaime Ramos Martin, global equities fund manager at Aviva Investors. "Take supply-chain management: in order to be a leader in ESG, companies would have needed to better understand the carbon footprints and labour practices of their suppliers, which will have prepared them for the disruption when COVID-19 hit."

ESG-focused companies also tend to fare better when it comes to public opinion. In *Uncharted*, Heffernan discusses what organisations can learn from the success of "cathedral projects" – long-term collaborative initiatives that depend on continual buy-in from a range of stakeholders.

Consider the European Organization for Nuclear Research (CERN), the multidisciplinary scientific centre that has yielded world-changing discoveries (the confirmation of the Higgs boson theory) and technological innovations (the World Wide Web). Through shrewd governance and public communication strategies, CERN has been able to maintain its funding model for decades. Such projects demonstrate the relationship between long-term resilience and public legitimacy, Heffernan argues.<sup>15</sup>

"No organisation in the world can function without society," she says. "We need educated people; we need roads and energy and light. The rule of law. Health. Clean air. These sorts of things are not optional extras.

"Every corporation exists within an ecosystem, and the corporation can only be as resilient as the society it inhabits. The health of the organisation depends on the health of the ecosystem, and the health of the ecosystem depends on the health of each individual company," adds Heffernan.

In a market context, companies with strong ESG credentials are more likely to earn legitimacy through a sense of corporate purpose, which should help them come Perhaps the most important criterion for resilience in an age of uncertainty is the capacity to adapt when circumstances shift. Organisations that can trim their sails and adjust course when the weather turns are more likely to prosper than those that simply batten down the hatches.<sup>99</sup>

through crises such as COVID-19 and prosper over the longer term.

Aggressive tax avoidance, poor labour standards and community relations and a substandard environmental record will be harder to defend in a world that has suffered the collective hardship of the coronavirus. Companies that have demonstrated they are willing to do the right thing are more likely to retain the loyalty of their staff and customers. Firms that don't do the right thing will also find it more difficult to access government bailouts when required, as Ramos Martin points out.

It is important for investors to keep track of these qualitative measures – and take steps to improve them through engagement with company management teams – as they assess the resilience of their portfolios. Such factors are important determinants of value over the longer term. Whereas quantitative factors can be plugged into a Bloomberg terminal and tend to be quickly arbitraged away, qualitative metrics like corporate behaviour are more difficult to assess, and therefore more rewarding for investors willing to do thorough due diligence.

#### Invest on the side of change

Perhaps the most important criterion for resilience in an age of uncertainty is the capacity to adapt when circumstances shift. Organisations that can trim their sails and adjust course when the weather turns are more likely to prosper than those that simply batten down the hatches. A recent study tracked how 1,000 publicly traded companies fared during successive crises: it found an ability to adapt to new conditions was a hallmark of the bestperforming firms.<sup>16</sup>

Consider the example of Finnish electronics firm Nokia, once the world's leading manufacturer of mobile phones. After the launch of Apple's iPhone in 2007, and the advent of the Android operating system the following year, Nokia's devices looked outmoded and its market share shrank. In 2009, McKinsey placed Nokia in the bottom 25th percentile of its ranking of global companies and predicted it would cease trading within two years.<sup>17</sup> Research shows organisations often become more rigid and inflexible during crises, doubling-down on a single plan of action – but Nokia was different. Its management undertook wide-ranging scenario planning and encouraged teams to collaborate across departmental silos to develop a new vision for the company. As a result of these methods, Nokia successfully reinvented itself as one of world's leading telecommunications infrastructure firms.

Similar principles can be applied in asset management. Teams that work across asset-class silos tend to be better able to spot underlying vulnerabilities and respond in a timely fashion when the market environment shifts. This may be because cross-disciplinary teams are better placed to pick up on informational signals that indicate danger ahead – those early signs of "dragon king"-style events.<sup>18</sup>

"At the beginning of this crisis, many companies were rushing to tap the credit markets to build liquidity; company managements were not speaking to shareholders as much during this 'firefighting' period," says Zverev.

#### RISK AND RESILIENCE IN AN AGE OF UNCERTAINTY *continued*

"By collaborating with our colleagues in the credit team, we were able to get a sense of how COVID-19 was affecting those businesses. This sort of connected thinking is always useful, but particularly so during a crisis."

Collaborating across teams can also provide an indication of how new developments are likely to affect different industries and sectors into the future, and where fresh opportunities might arise. Rather than relying on the misleading certainties offered by algorithms or all-encompassing probabilistic risk models, this approach is based on patiently piecing together a holistic picture of the market using a range of perspectives.

Assessing the impact of new developments is as much art as it is science. As Munro argues, human investors are better placed than quantitative models to make judgements based on informational inputs, not just market outputs, and to spot the inflection points between different regimes.

"Quant models work on the assumption the past is the best predictor we have of the future. But while you can take lessons from something that's worked well over the last 20 years, that might have been because interest rates were going down over that period. How is the situation going to change when interest rates rise? What we're always trying to do is to identify the impact of new trends – that's where humans can offer value over machines," Munro says.

## When the information changes...

So, what changes COVID-19 will bring? A survey of the crisis so far suggests some potential future scenarios.

Technology giants, already among the world's dominant companies, could grow even stronger amid rising demand for networking software. The pressures on global supply chains may prompt a shift from lean, "just-in-time" efficiency to "just-in-case" disaster planning. The car industry, which looked to be challenged by government decarbonisation measures before the crisis, could make a comeback as city dwellers grow wary of using busy public transport.<sup>19</sup>

These kinds of theses about the future can help teams develop what Kay calls "reference narratives", guiding investment decisions. But in unpredictable times, these narratives need to be open to challenge and revision when the picture changes. Flexibility and humility – not unshakeable certainty in the wisdom of one's own decisions – are the hallmarks of longer-term success in asset management and beyond.

No-one knew this better than John Maynard Keynes. In the years after he outlined the distinction between risk and uncertainty, Keynes managed an investment portfolio on behalf of King's College, Cambridge. He grew the value of the fund with a series of accurate market bets based on his forecasts about the business cycle – but he did not anticipate the Wall Street Crash of 1929, which damaged the fund's value (and cost him 80 per cent of his personal net worth).<sup>20</sup>

Other market forecasters of the era were also caught out: Irving Fisher, then the world's most famous economist, claimed stocks had reached "a permanently high plateau" only days before the crash. But unlike Fisher, who doubled down on bad market bets, Keynes was willing to change his mind. This enabled him to adapt to the shifting post-Crash environment and cope with the adverse consequences of his mistakes. As Keynes famously put it in 1940, after he had adjusted his investment strategy and recouped most of his losses: "When my information changes, I alter my conclusions."

At a time of radical uncertainty, investors everywhere would do well to heed his advice •

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Flexibility and humility – not unshakeable certainty in the wisdom of one's own decisions – are the hallmarks of longer-term success



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**AIQ** INTERVIEW

# LORD ADAIR TURNER TIME TO BREAK THE MONETARY FINANCE TABOO

With developed economies stuck in a high-debt and low interest rate trap, the former head of Britain's financial watchdog believes central banks should break a longheld taboo and finance governments directly.

MMT is a bit of a misnomer. It's not 'modern' monetary theory at all

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The Independent called him Britain's technocrat supreme. He held several high-profile roles, including director general of the country's main business lobby group, the Confederation of British Industry, and chaired three government commissions on low pay, pensions and climate change.

But Adair Turner is probably best known as the former chairman of the Financial Services Authority (FSA), the UK's financial regulator between 2001 and 2013 [it was superseded by the Financial Conduct Authority and Prudential Regulation Authority]. He took up the role in September 2008, just five days after Lehman Brothers filed for bankruptcy. During his five-year stint, he played a leading role in the post-crisis redesign of global banking and shadow banking regulation.

At the helm of the FSA, Baron Turner of Ecchinswell risked the ire of commercial banks when he famously described some of their activities as "socially useless". More than a decade on, he is in danger of further censure – this time from central banks. In his 2015 book *Between Debt and the Devil*, Turner attempted to debunk what he claims is the big myth about fiat money – the erroneous notion that printing money will lead to harmful inflation. With the world heading for the deepest recession in nearly a century and fierce debate over the success of the monetary policy experiments of recent years, Lord Turner tells *AIQ* central banks should bite the bullet and finance governments directly to stimulate economies.

#### You have written previously about the benefits of monetary finance. Does this mean you are a convert to the ideas of Modern Monetary Theory?

I think there is a subtle, but important, distinction. At one level, as people have pointed out, MMT is a bit of a misnomer. It's not 'modern' monetary theory at all. It was all laid out by Milton Friedman in his 1948 article *A Monetary and Fiscal Framework for Economic Stability*. If the central bank printed money and either directly distributed it to individuals or gave it to the government to spend, you would stimulate the economy. That is so obvious that I don't think anybody could really deny it.

It is also pretty obvious the impact on aggregate nominal demand depends on how much you do. If Donald Trump suddenly told the Federal Reserve to print ten million one-dollar bills, scatter them from a helicopter and let people —

#### TIME TO BREAK THE MONETARY FINANCE TABOO *continued*

pick them up and spend them, the impact on inflation and nominal GDP would be negligible because \$10 million is such a trivial part of a \$20 trillion economy.

If, on the other hand, he ordered them to print \$100 trillion, the result would be hyperinflation. It is as simple as that. It depends how much you do.

#### Why is there so much resistance to monetary financing from central banks?

If you think we shouldn't be doing monetary finance now because it will cause inflation, then we shouldn't be cutting interest rates and we shouldn't be doing quantitative easing (QE) and we shouldn't be providing liquidity to banks. Those are all ways of stimulating nominal demand.

That is why most orthodox economists engage in obfuscation, pretending monetary finance is in some sense impossible. They are terrified that if we admit it is possible, politicians will do it to excess and we will end up with Weimar Republic or Zimbabwe situations – in other words, you will never be able to do a limited amount.

The interesting questions about monetary finance are therefore not about the technical possibility. Instead, they relate to political controllability. Is this something so dangerous if used in excess that we should create barriers against using it at all? That is the key question.

The European Central Bank, for example, has constitutional limits prohibiting it. Other central banks don't have anything formally written down but have deeprooted resistance; the cultures of the Bank of England and the Federal Reserve are very against it.

The next question becomes: Are you willing to use this tool as a last resort? I would say yes. The negative side effects of running incredibly low and negative interest rates for a long period of time eventually kick in. What I and others propose is that we should ensure monetary finance is only used in extreme circumstances, and in a very tightly disciplined fashion. An independent central bank following an inflation target should determine when it is used.

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This is where I differ from some proponents of MMT. They appear to want it to become an everyday part of how you fund public expenditure, hoping it means you can remove the constraints; not just in a crisis environment, but on a permanent basis. I disagree. It should be used as a tool of demand management in specific deflationary circumstances where your rate of nominal GDP growth is sluggish and where the other tools available to central banks have been exhausted.

#### You have talked about how perversely the actions of central banks have prevented the world weaning itself off a credit boom that had taken place prior to the financial crisis. How do we cure ourselves of this addiction?

If, in 2009, developed nations had agreed to spend the equivalent of three per cent of GDP for three years, financed with money not debt, we would have been in a better place. We would have ended up with less leverage and higher interest rates at an earlier stage. GDP would have grown faster, partly by getting inflation up to target, but also partly by higher economic output. We also would have returned to normal interest rates sooner and had less of a public and private debt overhang.

Disciplined, one-off monetary finance should be thought of as an alternative to credit finance, because money is not credit. Straight monetary finance does not create a debt contract into the future, it is simply money. We have been terrified of increasing high-powered money on a permanent basis to finance public deficits. And, as a result, we have relied on private credit, but that is an unstable way to stimulate the economy as it creates vulnerability in the future – which is, by the way, exactly what Milton Friedman argued back in 1948. If, in the current circumstances, we were to run a deficit equivalent to ten per cent of GDP and finance it with monetary finance, it wouldn't produce excessive inflation. However, if we said, 'why don't we run ten per cent deficits and monetary finance them every year for the next 20 years', this would produce excessive inflation. There is a massive distinction.

Is this something so dangerous if used in

using it at all? That is the key question

excess that we should create barriers against

#### Looking ahead to an economic recovery, is there an argument central banks need to normalise monetary policy faster, regardless of the consequences?

Unless inflation is going above target, I don't think they should. All central bank policy should be contingent on situation and circumstance.

To be clear, I believe in central bank independence and inflation targeting. I just think there are better tools to achieve the end goal. We will end up doing forms of monetary finance anyway, while continuing to deny it. Look at Japan, where despite large fiscal deficits, the central bank buys the debt through QE and continues to pretend these operations are temporary and they will be reversed.

### *Few really believe that in Japan's case do they?*

Very few. Investors and economists know it will never be repaid. But I sometimes worry the only people who do believe it are Japanese consumers, which potentially undermines the whole purpose of the exercise. If Mr and Mrs Watanabe believe this debt has to be repaid, because the government keeps on telling them so, they might think they had better save like mad because there will be future tax increases.

There is a big debate in economics as to whether people act rationally and respond to messages about public debt. My view is that it depends. If you bombard them with public warnings from reasonably authoritative sources, telling them they have got this debt that will have to be repaid, maybe Ricardian Equivalence holds. When the history books are written in 2050, Japan's debt will never have been sold back to the private sector and it will be transparently obvious this was permanent monetary finance. This will be despite the continual insistence of governors of the Bank of Japan along this 60-year path of monetary finance that they are not doing it. But such is central banking: it is a sort of Wizard of Oz game.

#### Does the current crisis provide an opportune moment for governments to provide a muchneeded upgrade to infrastructure?

Governments' first priority should be to support consumption because a lot of people have been involuntarily unemployed or furloughed. It therefore makes sense to support people's incomes. Sadly, it already looks like there will be a lot of people desperately short of money as we come out of lockdown. However, it would also make sense to think about investment. The challenge here is what is known as the 'shovel-ready' problem.

Faced with this crisis, we should be reinforcing investments in renewable energy and, for example, in fibre-optic networks so people who have learnt how to work at home can continue to work in a more effective fashion. The issue is that these kind of projects cannot be started overnight. Windfarms cannot be built immediately; you need to go through a permitting process, have an auction, decide who the supplier is, and so on. Likewise with roads; they need to go through planning permission. Despite investing for the future being the wise thing to do, it takes time to get organised. So, each time we have a cyclical downturn, we tend to say 'wouldn't it be great to stimulate the economy', and yet five years later we find we didn't do it.

Governments should try to overcome this by identifying the projects that are shovel ready. At the local government level there will be a need to refurbish properties, and similarly with overdue improvements to hospitals or schools – these could be accelerated to help get the construction sector going as much as possible.

Pubs, restaurants and hospitality businesses face their own unique challenge. Ideally, we should be finding ways of stimulating the economy by redeploying people from those areas. But the challenge is skills. You can't simply say 'let's go and do some more construction to soak up some unemployed bartenders'.

#### Much of your time at the FSA was spent shoring up the financial system. Do you see any danger the current economic downturn might threaten financial stability once more?

I don't see another financial crisis as an imminent threat. Although some banks have got bigger – JP Morgan's assets are the equivalent of a much bigger share of the US economy than in 2008, for instance – that isn't a fundamental issue. The real question is 'have they got more capital?' The answer is yes, they now have plenty of capital.

As Chair of the International Financial Stability Board's policy committee, I was intimately involved in all the debates about bank capital. We spent a lot of effort between 2009 and 2013 putting in place a new capital regime, Basel III. We did several things: tightened up the definition of what counts as capital, the numerator of the capital ratio; changed the definition of risk-weighted assets, so you couldn't get away with very low risk weights; increased the required ratio: introduced a countercyclical capital buffer and a capital conservation buffer on top of the basic ratio; and implemented a globallysystemic surcharge.

The big global banks at the core of the global banking system now have effective capital ratios that are approximately four or five times higher than they were in 2008. This has put us in a good position and is why, amid this terrible health and economic crisis, I don't see another financial crisis like 2008 as a huge threat •

Such is central banking: it is a sort of Wizard of Oz game.

#### **AIQ** THE NEXT CRISIS: PART 1

# PANDEMIC RISK: WHEN WILL WE LEARN OUR LESSON?

COVID-19 has reminded us that the sources of economic and financial crises can be wildly unpredictable. However, while spotting patient zero in advance was nigh on impossible, pandemic risk was well telegraphed. In the first part of our mini-series, *The source of the next crisis*, we consider whether an infectious disease could wrong-foot us again or whether governments will learn their lesson.

#### Figure 1: History of Pandemics

Throughout history, as humans spread across the world, infectious diseases have been a constant companion. Even in this modern era, outbreaks are commonplace. Here are some of history's most deadly pandemics, from the Antonine Plague to COVID-19.



Source: Visualizing the History of Pandemics, Visual Capitalist, March 14, 2020.

#### WHEN WILL WE LEARN OUR LESSON? *continued*

We do not appreciate fully how the world works and interacts with all the species in it

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The image of Rio de Janeiro's iconic Christ the Redeemer statue wearing a mask packs a powerful punch. Designed to encourage the public to cover up to slow the spread of COVID-19, the mask represents one of life's deep challenges – evaluating and reacting to danger to stay alive. These choices are in sharp focus after a novel infection appeared in a region of China and spread to almost every continent within a few short months.

As any historian will know, it is a pattern on repeat. For centuries, different pathogens have emerged, disrupted society and unsettled their human hosts. In some cases, millions have died, and the details are etched into cultural history.

Despite huge advances in modern medicine, the world is far from free of infectious disease today. The World Health Organisation (WHO) identified 1,483 events of widespread infection in 172 countries between 2011 and 2018.<sup>1</sup>

The data clearly refutes the idea circulating in the 1960s that medical progress would knock pathogens on the head.<sup>2</sup> Instead, at least half the world's population live with no access to essential health services.<sup>3</sup> Elsewhere, widespread use of antibiotics has led to an increase in antimicrobial resistance, and it is widely appreciated that antivirals are not a panacea.

"A new HIV, a new Ebola, a new plague, a new influenza pandemic are not mere probabilities," WHO warned, well before COVID-19.<sup>4</sup>

#### Health risks in complex ecologies

Globalisation is a key contributory factor, according to Ian Goldin, a professor at the University of Oxford and former vice president of the World Bank. As societies have become more open, complex and interwoven, pandemic risk has been amplified. It is just one of the inevitable downsides of the rapid flow of physical and human capital across the world, as Goldin's book *The Butterfly Defect* points out.<sup>5</sup> "It was inevitable a pandemic would arise and spread globally very quickly," Goldin says. "The factors that create pandemics were all in place. The consumption of meat (wild meat in particular), animals living in close proximity to humans, poor sanitary conditions near airports and so on, just increased the probability."

Goldin also has synthetic pandemic risk on his radar – risks that could emerge by design or mistake from experimental laboratories around the world. "The more labs, the more biochemists there are, the cheaper it is for them to engineer and manufacture, the higher the risk of an accident. Just as we had with nuclear, we are past the point at which we can control this risk, because there are so many different equipment manufacturers."

"Pandemic risk has been significantly underappreciated by financial and corporate sectors, but it is near the top of most national risk registers; certainly the UK's National Risk Register, managed by the Civil Contingencies Secretariat in the Cabinet Office," says Rowan Douglas, head of the Climate and Resilience Hub at Willis Towers Watson.

"There was nothing fundamentally surprising about a pandemic hitting. Obviously, the precise attributes of the pathogen, the location and timing of an outbreak – that's unknown beforehand, that's variable. But pandemic risk is absolutely foreseeable, and patterns of frequency, magnitude and impact can be analysed, managed and mitigated," he adds.

So despite numerous warnings, why did COVID-19 seemingly blindside so many governments and companies? Perhaps faith in our medical toolkit and a grounding in western philosophy (which holds that we are separated from nature by our ability to rationalise) have made it easy to ignore that we live in a rich, micro-organic soup bowl.

"We do not appreciate fully how the world works and interacts with all the species in it," says medical device designer Marc Koska, whose new syringe designed for mass immunisation is being fast-tracked by the US government. "If you weigh all the bacteria and viruses on earth, they weigh much more than all other forms of animal life. Because of our lifestyle now, we are detached from the fact that we are just one part of that complex biological system."

He adds on a personal level, "we have checked out of being a co-inhabitor on the planet, and think we are *the* inhabitor of the planet. From a high level, we are not in tune with what we are doing".

Opportunistic micro-organisms seek out new hosts all the time to ensure their survival. Ultimately, only a handful make successful jumps across species, known as zoonoses, but those that do can cause outsize impacts. For example, an infection from a single primate in central Africa by the HIV-1 virus led to the untimely death of 32 million people.<sup>6</sup>

"This is not a small subject at the weird fringe of medicine; this is central," says David Quammen, author of the presciently titled 2012 book *Spillover: Animal Infections and the Next Human Pandemic.*<sup>7</sup> Around one billion cases of disease each year are the result of zoonoses, accounting for most of the troubling new infections.<sup>8</sup> Quammen points out recent outbreaks traced to rats (Hanta), bats (Hendra, Ebola), birds (Bird Flu, West Nile) and pigs (Nipah). Some have alarmingly high fatality rates; for Nipah, it is 40 to 75 per cent.<sup>9</sup>

Quammen believes the spillovers are happening because the human population has outgrown its ecological niche. By moving into virgin or sparsely peopled habitats, there are more opportunities for pathogenic exchange.

"More and more, humans are disrupting the ecosystems harbouring so many different types of creature," he explains. "All our logging, burning, roadbuilding, settlement, killing and eating of bushmeat tend to 'shake loose' the viruses from the reservoir hosts, giving them the opportunity to infect humans instead."

#### Figure 2: The big picture: Micro-organisms far outweigh human life



Source: Yinon M. Bar-On et al, 'The biomass distribution on Earth', PNAS, June 2018, VOX.

Some of the events that enable transfers are niche and culturally specific. A rite of passage for Cameroonian Bakweri pygmies involves eating chimpanzees, creating a potential crossover for Ebola.<sup>10</sup> These details are important; whether the infection burns out or troubles millions depends on the pathogen and the way human societies organise themselves.

As Goldin points out, society's current organisation – highly connected, dense settlements (44,000 people per square kilometre in parts of South Asia)<sup>11</sup>, looking to expand – has helped microorganisms mobilise.

Take COVID-19, potentially spread by tiny droplets in the air just from speaking.<sup>12</sup> Thought to have originated in the city of Wuhan in central China, the virus might have made its way in a single human spreader to the city's international airport, where it could travel onward at over 500 miles an hour. A high-speed exit from one of the city's three train stations would take the virus into new habitats at around 200 miles an hour. If the carrier made Beijing, there were flights leaving worldwide about once every minute. In a hub like London, the pace might accelerate again; pre-COVID, one aircraft took off every 45 seconds.

#### Woefully unprepared

In the face of this risk, where infections can cross borders so rapidly, there is a distinct lack of global health oversight. In 2017, for

example, 60 per cent of countries had no pandemic response planned.<sup>13</sup>

"Governments are not very good at responding to threats when the threat doesn't seem imminent," says Dr. Robert Glasser, former head of the UN Office for Disaster Risk Reduction (UNISDR) and a visiting fellow at the Australian Strategic Policy Institute. "We had so much warning; repeated calls about bird flu, swine flu, SARS, MERS – there were plenty of false alarms. Governments did spend more money when each of those viruses struck, but very quickly the funding went away, rather than devoting consistent, significant funding to address this scale of threat."

Now many are clearly on the back foot. WHO is responsible for pandemic preparedness, but its tiny budget and dependence on voluntary funding have proved a handicap. It has been starved of the skills, technology and resources it needs, according to Professor Goldin. And if the US – WHO's single largest donor – follows through with its threat to withdraw from the organisation completely, its ability to deliver is likely to be further curtailed.

Meanwhile, the delicate geopolitical environment, with US and China tensions escalating again, makes cross-border co-operation difficult. "It feels as if the tone of the relationship has fundamentally changed," says Alistair Way, head of global emerging market equities at Aviva Investors. "The channels of diplomacy between the two countries are worse than they have ever been, which does make things harder. That entire relationship is more sensitive to volatility."

However, international co-operation is desperately needed to manage pandemic risk more effectively. Former CEO of Microsoft Bill Gates believes "billions more" spending should be directed to measures ranging from creating registers of international experts to equipment stockpiling and building public-private partnerships to speed vaccine development.<sup>14,15</sup>

At the time of writing, some progress had been made, with the vaccine alliance Gavi announcing new incentives, including providing volume guarantees for specific vaccine candidates before licensing to encourage companies to invest in productive capacity. The plan is to make it possible to ramp up production of new treatments faster and improve access for lower-income countries.<sup>16</sup>

Addressing all the issues would mean significant changes in the pharmaceutical world, including more cross-collaboration between companies and potential inventory building. Some of the main supply issues, like addressing a surge in demand for protective equipment or glass vials, have been on the radar intermittently for more than ten years. To be most effective, the changes will also need to encompass better early

#### WHEN WILL WE LEARN OUR LESSON? *continued*

warning systems and improving animal welfare in less developed economies – an enormous practical challenge in remote locations.

It is hard to envisage how a comprehensive system can be developed without effective supra-national oversight and collaboration. Issues with transparency (China initially denied human-to-human transmission of COVID-19) and resourcing (the US threat to withdraw funding because it claims WHO is 'too China-centric') highlight the governance void. How can an organisation like WHO protect the health of people around the globe if it is not adequately supported?

"Governments have not generally given supra-nationals the power to see what is happening in their kitchen," Goldin says. "I would like to see a NATO-like equivalent of a rapid-response taskforce, which is able to go to any jurisdiction in the world at short notice, isolate and identify a virus, and seal it off. It would require monitoring capabilities, which requires a global agreement in place to make that workable and be able to report the necessary information. None of that has happened, which is one of the reasons risks have increased."

#### **Chain reactions**

While the crisis is still being played out, work has begun to evaluate the policy measures used for disease control – measures of "extraordinary size and amplitude", according to Professor Didier Sornette from the Swiss Federal Institute of Technology in Zurich. In the first pandemic to hit since the global demographic balance tipped towards the older generation (there are now more people on the planet aged over 65 than under five), stringent lockdowns have taken place. As Sornette points out, "of more than 200 countries, only four have not implemented lockdown measures".

This is a sensitive area; all policy choices have costs, and it is impossible to evaluate the worth of a human life. Not taking action has implications, in vulnerable lives lost or lower productivity. Confining whole populations to their homes, shutting businesses, throwing millions out of work and running up debts will also weigh on societies for years, so it is important to ask whether these actions make sense.

"Have we been collectively blinded by shortsighted medical considerations and been overwhelmed by a pandemic of fear?" Sornette asks.<sup>17</sup>

"The sensible debate regarding lockdown is how can we use what we've learnt about the virus to optimise a set of restrictions, so that we can achieve containment with the least economic pain – and carry through those considerations into the future," says Ian Pizer, investment strategist at Aviva Investors.

"When considering the timing of easing restrictions, there is a danger of starting too early - it risks slowing the ultimate process of easing. In the worst case, restrictions might need to be re-tightened again, causing more economic pain. Starting too late may also cause economic hardship, but if a few weeks longer could achieve a swifter reopening, then it may be worth it. There is no easy answer."

Stringency is another important facet to bear in mind. Pizer gives the example of Sweden, which employed less stringent social distancing measures than many others. Its recent data releases suggest its economy will still be severely impacted, perhaps because of lockdowns elsewhere, or because the threat of infection altered behaviour anyway.

"It's quite possible a stringent lockdown might be economically optimal, if it reduces infection to point at which households and businesses feel risk is low. Ultimately, that could be less painful than experiencing less stringent lockdown measures but higher transmission risk for a longer period," he says.

Comparing responses is a methodological minefield, as lockdowns have been implemented at different levels of infection, at different speeds and combined with alternative strategies to mitigate disease. There are no clear answers and many long-term costs – associated with deteriorating mental health conditions or delayed oncology treatments, for example – are yet to be revealed.

## Mitigating the need for lockdown

One other consideration is that better network analysis, actively using track-andtrace, might mitigate the need for costly lockdowns at all.

South Korea has used surveillance technologies effectively to mitigate the spread of COVID-19, by finding and quarantining patients. At the time of writing, less than 300 people had lost their lives in a country with a population of over 50 million. Compare this with the UK: population 66 million; 40,000 deaths and rising.<sup>18</sup>

Andrew Lever, professor of infectious diseases at the University of Cambridge, attributes South Korea's "outstanding" record to extensive testing and the way phone location data, credit card transactions and CCTV footage have been used to build meticulous logs of people's travels.

So, if someone was positively diagnosed with an infection, all the mobile phone users in their region might be sent a detailed analysis of their movements in the infectious phase. "Patient #8074 – a 21-year-old male and a contact of patient #7923 – went to a 7-Eleven by the entrance to Seoul University from 3:59 to 4:11 a.m. after drinking for two hours at a nearby bar...," one account reads, before adding those locations have been disinfected.<sup>19</sup>

Lever believes this is "the only way forward" with a disease like COVID-19. Automated tracing removes responsibility from the spreader to reveal their own health status, but allows others (public authorities, social contacts) to respond.

"Contact tracing clearly has minimal economic consequences. If you are able to materially reduce the infection rate, the The message from epidemiologists is clear: future pandemics are highly likely

degree to which you require social distancing measures, which are more economically damaging, is materially reduced," says Pizer. "You may need to impose restrictions periodically if you miss a flare-up, but these are likely to be shorter in length and can be targeted at where there are a greater number of infections."

Such an approach inevitably raises privacy questions – something different cultures have varying degrees of sensitivity to. Perhaps one outcome from this crisis, and South Korea's success in using data to manage it, is that the bar for anonymising data has been raised.

#### **Implications for investors**

One important lesson for investors is how swiftly pandemic risk transmitted into a significant market shock, because of the way in which national governments mobilised.

"It may not be the virus itself that determines the scale of the shock, but rather the policy response," says Harriet Ballard, senior multi-asset strategist at Aviva Investors. "If another novel infection were to emerge in the future, we would be looking closely at the requirements for locking down parts of the economy, and the potential mitigation policy, to weigh up the potential impacts."

Meanwhile, post-pandemic, pharmaceutical analysts are expecting governments to prioritise health spending, which may fuel momentum in 2021 and beyond. Health spending was already growing faster than GDP prior to COVID-19 and may increase further still. Better-placed large-cap pharmaceutical producers, life sciences companies and medical equipment makers might all be beneficiaries. (See *Health first: finding resilience in pharmaceuticals* for more details, including the possibility of an upsurge in global efforts to immunise.)

The picture will be nuanced by the fact that some activities are likely to be driven by societal benefit, carried out at low or zero margin, as pharma companies put patients before profit in some fields.

#### Preparing for the next impact

The message from epidemiologists is clear: future pandemics are highly likely. Because of the way micro-organisms reside, because of their immense evolutionary resilience and because of the way we live, they will not go away.

What we can do, however, is be much better prepared. By understanding the nature of disease and how we link to each other, what the outcome of radical policy measures might be, and the constraints on industrial and health capacity, we will have more effective tools at our disposal to make informed decisions.

"Unless we understand more about how people live, how citizens are experiencing their lives and their work, we will not really be able to understand future health challenges," says Carol Brayne, professor of public health medicine at the University of Cambridge. "That's a piece of the jigsaw that has received far less attention in recent years, and that's where we need to turn."

Viruses aren't smarter than us, they are just singularly focused on reproducing. If we put enough of our collective focus and attention towards fighting them, we will have a better chance of returning to some sort of normality

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#### **AIQ** THE NEXT CRISIS: PART 2



# THE INVISIBLE RISK: CYBERSECURITY IN THE FOURTH INDUSTRIAL REVOLUTION

COVID-19 shocked investors into taking pandemic risks more seriously. In an increasingly connected world, where data is the new oil, could cyberattacks be the next big threat?
#### Figure 1: Cross-border data flows

Used cross-border bandwidth



Source: TeleGeography, Global Internet Geography: McKinsey Global Institute analysis, 2016.<sup>5</sup> Note: Lines represent interregional bandwidth (e.g. between Europe and North America) but exclude intraregional cross-border bandwidth (e.g. connecting European nations with one another).

In the spring of 2011, users of Sony's PlayStation Network received a message informing them that "certain functions of PlayStation Network are down". When it was still down the following day, the company issued another statement, saying it would be "a full day or two" before operations would be back to normal.

What PlayStation users didn't know was that, behind the scenes, Sony already had evidence of a cyberattack that would eventually compromise the data of about 100 million customers, including personally identifiable information and financial details. The Sony PlayStation Network – the company's cash cow – was taken offline while engineers addressed the breach, with functions not completely restored for about 40 days.<sup>1</sup>

Lost revenues from the outage, subsequent lawsuits from users who were targeted for credit card fraud, and mitigating efforts such as free offers of PlayStation 3 games to lure customers back would eventually cost the company \$170 million, in one of the most damaging data breaches in history.<sup>2</sup>

"Think about that paradigm shift," says Marc Goodman, author of *Future Crimes: Inside the Digital Underground and the Battle for Our Connected World*, in reference to the case.<sup>3</sup> "Never in the history of humankind would it ever have been possible for one person to rob 100 million people simultaneously."

#### **Fast and furious**

What allows criminal activities to be scaled to previously unimaginable heights is a combination of technological advances, proliferation of data and the connectivity of the global economy, says Louise Piffaut, environmental, social and governance (ESG) analyst at Aviva Investors. As the Internet of Things (IoT), artificial intelligence and cloud computing begin to shape the commercial realities across sectors, cyber threats can only rise – both in number and financial cost. Increasingly, the threats not only come from seasoned hackers but from countries and, more worryingly, employees.

But the same dynamic is also the lifeblood of the global economy, allowing "many companies to find new ways of creating value by monetising data to help their customers, lower costs and improve efficiencies", she adds. This in turn encourages businesses to collect and store more and more data across the globe.

"We're seeing the positive impact across industries, beyond technology, from industrial equipment to health insurance," adds Mikhail Zverev, head of global equities. "Naturally, securing this data is a key concern for businesses and investors – protecting that data advantage, sensitive customer information, and ultimately the functioning of critical business infrastructure."

# **AIQ** THE NEXT CRISIS: PART 2

# CYBERSECURITY IN THE FOURTH INDUSTRIAL REVOLUTION continued

The University of Maryland estimates a data breach occurs once every 39 seconds in the US, affecting nearly one in three Americans. The mean cost of each data breach is about \$3.9 million to businesses, IBM estimates.<sup>4</sup> And worldwide, the growth in the amount of cross-border data transfers (see Figure 1) is creating additional vulnerabilities, with individuals, companies and governments having little knowledge of what data they own and where they are stored, much less attempting to secure that data.

Breaches involving user data remain the most common. Though they mostly impact the individuals targeted, data theft can also leave companies exposed to regulatory and legal liabilities, loss of revenues and severe operational disruptions. In some cases, lives are at risk. Other types of crimes conducted online such as malware and ransomware, while less prevalent, come at a greater cost. According to IBM, they average about \$239 million for each incident – more than 60 times the typical cost of a data breach.

Under the EU's General Data Protection Regulation (GDPR), companies can now be fined up to four per cent of annual revenues. Due to a data breach affecting nine million customers at EasyJet in May, the company may be liable for a maximum fine of about £255 million.<sup>6</sup> Separately, a class action civil lawsuit has been filed in the High Court of London, seeking maximum damages of £18 billion, or £2,000 per customer.<sup>7</sup>

# The intelligent adversary

Four years ago, Klaus Schwab, founder and executive chairman of the World Economic Forum (WEF), coined the phrase 'The Fourth Industrial Revolution' to refer to the coming era, "characterised by a fusion of technologies that is blurring the lines between the physical, digital, and biological spheres".<sup>8</sup> As the world economy edges closer to that reality, WEF has labelled large-scale cyberattacks among the top ten biggest risks over the next decade.<sup>9</sup>



Figure 2: Big Tech's data security patent application activities

Source: cbinsights.com, 2017. Note: The patent filing process involves a significant time lag before the publishing of patent applications. This delay can range from several months to several years, meaning that records prior to 2016 are likely completed at the time of analysis, but there may be applications from 2016 that have yet to be published.

Cyber resilience – the ability to anticipate, adapt and withstand shocks from online incidents – is therefore becoming a key supporting pillar of corporate sustainability, says Richard Butters, ESG analyst and financial sector specialist at Aviva Investors.

Risks are characterised by a distribution, and the concept of a 'fat tail' describes a distribution of returns that exhibit a tail that decays to zero much slower than the Gaussian distribution, says Didier Sornette, professor of entrepreneurial risks in the department of management, technology and economics at the Swiss Federal Institute of Technology in Zurich. Cyber risks have the broadest, wildest swings in the fat tail.

"Imagine, for example, Facebook being hacked: suddenly you have two billion ID thefts, with enormous consequences," he adds.

This may sound far-fetched, given big tech's sizeable budgets to shore up cyber defences. The five biggest tech companies – Facebook, Apple, Amazon, Microsoft and Alphabet, Google's parent company – hold the most data security patents between them (see Figure 2). Nevertheless, Facebook's security wall has been breached before, most notably in 2018 when at least 90 million user accounts were compromised, just as the company was recovering from the Cambridge Analytica data scandal. Inadequate controls around third-party access of user data had been a major issue behind the controversy.

CEO Mark Zuckerberg said at the time: "Security, it's an arms race. We're continuing to improve our defences, and I think this also underscores that there are just constant attacks from people who are trying to take over accounts or steal information from people in our community."<sup>10</sup>

The nature of cybersecurity risk presents particular challenges, requiring a different approach when managing it, argues Sam Savage, author of *The Flaw* of Averages and executive director of ProbabilityManagement.org, a non-profit organisation focused on modelling uncertainty. "You can't treat cybersecurity threats like you would, say, a nuclear meltdown in a power generation plant," Savage adds. "The nuclear reactor is not out to get you. If the core melts down, it's something wrong with the physics. In cybersecurity, we have an intelligent adversary."

## **Unguarded: Castle and moat**

This interplay between offense and defence in cybersecurity is intensifying. The exponential increase in data and data connectivity is combined with the growth of complex data-sharing systems. "Within the next 30 years, we will live on a fully digital Earth," says Warren Black, founder and principal of Complexus, an industry



research collaboration and advisory initiative founded in 2016 to address risk management in highly complex systems. "The whole world is going to be a series of interconnected, complex-intelligent systems – collecting data, storing data, analysing data, sharing data and adapting to the data. That's the way the world is moving."

It currently takes 206 days on average for companies to even detect a data breach and another 73 days to contain it, according to a 2019 IBM analysis. Combine that with new technology such as 5G that can increase download speeds of up to 100 times faster than 4G, and it is likely to be even harder for companies to detect malware, ransomware and other malicious algorithms in time. The digital paradox is that the same advances that enable higher efficiency for individuals, companies and governments also help criminals to wreak more damage and at a much quicker pace.

The velocity of digital advances, therefore, requires ever more sophisticated risk management tools and analysis. Take IoT. In one the most novel cases to date, hackers based in Finland targeted a casino in North America and downloaded valuable data through the company's high-tech fish tank, according to a report by Darktrace, a cybersecurity company that helped detect and remediate the cyberattack.<sup>11</sup>

To be clear, the casino had taken extra precautions to isolate data transfers related to the fish tank from the rest of its commercial network by configuring an individual virtual private network (VPN). Nevertheless, hackers found a loophole to access the tank's smart thermometer, from which they downloaded about 10Gb of data to the cloud pertaining to the accounts of the casino's high rollers.

"By targeting an unconventional device that had recently been introduced into the network, the attack managed to evade the casino's traditional security tools," according to the report.

The number of IoT-connected devices are estimated at about 38 billion,<sup>12</sup> or nearly five devices for each of the (roughly) eight billion people on earth. Securing IoT devices requires a different approach than conventional 'castle-and-moat' or 'perimeter security' methods, which rely on firewalls, proxy servers and other preventative tools to secure the entry and exit points of the network. The traditional approaches assume all entries and exits are guarded, and everything inside the wall is safe – a strategy that is proving increasingly outdated.

Breaches originating internally are also increasing, says Piffaut, who specialises in the technology, media and telecom (TMT) sector. In the US, which experiences more data breaches than any other nation, internal threats were responsible for more than a third of around 40,000 incidents investigated in 2019.<sup>13</sup> The trend could worsen if the COVID-19 crisis spurs more permanent disruptions such as remote working, job changes and cost cutting, which could increase the number of internal threats, she says.

More often, internal sources of cyber risks occur as a result of inadvertent security lapses that leave companies more susceptible to external threats, adds Piffaut. In its 2019 Global Data Risk Report, Varonis Data Lab found that

# CYBERSECURITY IN THE FOURTH INDUSTRIAL REVOLUTION continued

the typical employee had access to an average of about 1.2 million folders.<sup>14</sup> When Varonis analysed the average terabyte of data, it found thousands of sensitive files are not protected (see Figure 3.) To ensure full oversight, data access mapping and labelling are required.

## Nation states take aim

Increasingly, legacy IT networks are no match for the sophisticated tactics deployed by countries, which can use machine learning algorithms to autonomously improve the ability to find system weaknesses.

A major concern is greater digital integration in critical infrastructure, such as nuclear plants, which could be hacked and "pushed towards criticality", says Sornette. "These are big concerns. Stronger and stronger interconnection and 'fragilisation', through optimising and just-in-time production, has made the system more efficient in the short term but left it more vulnerable to unforeseen shocks."

One of the first incidents in which an entire power grid was hacked left more than 200,000 residents across Ukraine powerless when a cyberattack shut down 30 substations and disabled backup power supplies on December 23, 2015.<sup>15</sup> According to a US government report about the incident, the cyberattack was "synchronised and coordinated, probably following extensive reconnaissance of the victim networks".<sup>16</sup> The attacks were implemented with malicious human intent, with the perpetrators likely overwriting existing software at the operating system level or via VPN connections.

Governments have been worried about such attacks to their grid systems for years, and the Ukraine cyberattack brought those fears to life. This led many other countries, including the US, to take extra precautions. Last year, US Congress passed legislation to improve cybersecurity of the country's energy grid by, surprisingly, replacing automated systems with "low-tech redundancies, like manual procedures



Source: IBM X-Force, 2019.

controlled by human operators". The rationale was that it would make cyberattacks more difficult and deter criminals who would have to physically touch the equipment if they wanted to hack it and, therefore, put themselves at risk.<sup>17</sup>

"As our world grows more and more connected, we have before us both new opportunities and new threats," US Senator Angus King, an independent from Maine, said on announcing the Securing Energy Infrastructure Act.<sup>18</sup> "Our connectivity is a strength that, if left unprotected, can be exploited as a weakness. This bill takes vital steps to improve our defences, so the energy grid that powers our lives is not open to devastating attacks launched from across the globe."

## Taking aim at finance

Cybercrime is escalating in nearly all sectors, not just energy. Some industries, though, have been more heavily targeted. Financial services and insurance topped the list of sectors most widely attacked by volume for the fourth year in a row, accounting for 17 per cent of the total among the top ten sectors, according to IBM (see Figure 4). However, the sector also appears to be more prepared. Evidence suggests companies are likely to have "more effective tools and processes in place to detect and contain threats before they turn into major incidents", says IBM.<sup>19</sup> Financial companies are also more likely to test and revise their response plans to improve cyber defences.

One of the industry's most controversial cyber incidents happened in 2017, when credit reporting agency Equifax suffered a data breach affecting 146 million user accounts. "Here, data is an integral part of the company's credibility," says Giles Parkinson, global equity portfolio manager at Aviva Investors. "If Equifax is in the business of data and yet it can't even keep its own records safe, what does that mean? Customers initially recoiled."

Hackers found weaknesses within a customer dispute portal, which allowed access to a variety of other servers storing customer data. This was made possible partly because data was stored in plain text rather than encrypted. To make matters worse, the company had inadvertently failed to renew an encryption certificate, which again made it easier for the breach to occur.<sup>20</sup>

"Breaches have become very common," Piffaut says. "It is less about whether you're a victim of a cyberattack and more about how you've reacted to it that counts."

It has taken time for Equifax to recover. The company brought in new management and spent \$1.4 billion to remediate and

# Since March, there has been a 38 per cent increase in cyberattacks against financial institutions

improve its cybersecurity platform. In 2020, it finally reached a court settlement to pay up to \$125 per consumer claim for a total of \$1.38 billion.<sup>21</sup> Piffaut says there has been a noticeable change in corporate culture, while the board level restructuring has improved the quality of oversight.

"Interestingly, this incident and resulting changes in its IT platform are helping Equifax in the long run – by moving its business to a 'best in class', leading-edge cloud platform and completely revamping its service offerings," Zverev adds. "Equifax not only repaired the trust with its customers, but leapfrogged the competition in terms of its cybersecurity infrastructure."

The high volume of sensitive data often stored on legacy IT platforms leaves large parts of the financial sector exposed. According to Butters, COVID-19 has only amplified these cyber vulnerabilities. The speed at which ecommerce, contactless payments and digital wallets proliferated almost overnight thanks to social distancing measures meant that many businesses simply were not prepared.

He points to India as an example. Many major financial institutions' customer and IT operations are located there: when the government rolled out its lockdown with little notice, staff members had to quickly adapt to working from home with remote access to IT infrastructures that may not be sufficiently secured. Worldwide, an estimated 300 million office workers may be working from home during the pandemic, including up to 90 per cent of banking and insurance workers, according to the Financial Stability Institute. Hackers are taking advantage of this disruption. Since March, there has been a 38 per cent increase in cyberattacks against financial institutions.22

Non-discretionary consumer businesses are also likely to come under pressure, particularly those most disrupted by COVID-19 such as retail, travel and leisure. Even before the pandemic, some of the most notable cyber breaches by volume had occurred at airlines such as British Airways and hotel chains, including Marriott.

"A lot of staff have been furloughed during the pandemic, so there won't be enough people able to maintain IT operations and security systems, at least not to the same extent," Butters says. "It also comes down to the types of data that can fetch a higher price tag. It tends to be customer data, personal details and financial transactions. Both consumer discretionary and banking sectors have that in droves."

#### The network effect

What happens in a company, though, doesn't necessarily stay in the company. Networks are becoming borderless, and the blurring of professional and personal lives only exacerbates matters. According to Piffaut, Google and Apple's concerted efforts to ramp up tracing functions to help fight the spread of the virus, for example, may link sensitive personal details of individuals to other networks belonging to governments, healthcare companies, insurers and TMT service providers. "If you have a virus in the system, it can propagate very quickly and have a devastating impact because you have multiple counterparties involved in that process," adds Butters.

Meanwhile, more organisations are migrating to the cloud, which may concentrate cybersecurity risk, says Zverev. Cloud providers such as Amazon, Google and Microsoft have large budgets and the talent to efficiently scale their cybersecurity platforms. "As more migrate to the cloud, it becomes more accepted to host your enterprise IT there. Security has been a reason to do it rather than a reason not to do it."

"Where would you rather your money be kept, under your mattress or in the vaults of a well-respected bank? It's a bit like that," Zverev says. "Who would you rather look after your data? An IT team in the basement of one of your buildings, or a company that has been doing it best for the last 20 years? I think the decision is easy in a way, but the risk of one incident potentially causing problems for many organisations is high."

The key to addressing the interconnectedness of cybersecurity threats is correctly modelling the nature of the risk. Companies need to invoke game theory and model not one system, but layers upon layers of systems that can attack each other, according to Savage. "We need to optimise the system, then optimise how we would attack that system. Then we're going to optimise how we counter that attack," he says. "So that's very different from modelling other types of risk. You certainly shouldn't throw up your hands with cybersecurity, but you need to always be learning and improving your system."

If Mark Zuckerberg is right and cybersecurity is an arms race, gamers may have an advantage when modelling the risks, according to Savage. "The best [risk] modellers are gamers, because they've learned the game by playing the game," he says. "Games have opponents in them, and the way you beat an opponent is by staying with that opponent and continuously improving your own game."

Savage also believes machine learning and artificial intelligence are important components in advancing cybersecurity infrastructure. For example, they can be used to learn what's 'normal' for a company's security system in order to detect unusual changes in online traffic, user behaviour and other inconsistencies that could help signal potential cyberattacks.

Norman Marks, a global expert on internal auditing and risk management who wrote *Making Business Sense of Technology Risk*, says: "Ultimately, you need good managers who are able to anticipate what might happen and make informed and intelligent decisions. What usually happens – and you've got this in other areas of a company by the way – is a siloed approach to managing cyber risk. You might have a risk committee, an IT department, a strategy team, and a board all having separate discussions." CYBERSECURITY IN THE FOURTH INDUSTRIAL REVOLUTION continued How many professions would come to a complete standstill if the Internet went down?

To strengthen their cyber defences, organisations need a more integrated approach, with a broader view on how cyber risk might affect the overall success of the business, not just its parts.

"Effective managers simply lead to better risk management," adds Marks. "They are better at thinking about all the things that might happen, weighing them, going through and analysing different scenarios and different options, and making a decision. That's risk management."

## Pricing in cyber risk

Like effective managers, however, cybersecurity risk may not always be reflected in share prices. For investors, this presents a dilemma. "While breaches can be costly and cause reputational damage as well as regulatory scrutiny and operational disruption, it's not clear how this should translate into valuations, especially over the long term," Parkinson says. Facebook's share price initially fell by as much as 20 per cent following the Cambridge Analytica scandal and data breach, but subsequently climbed to new highs. Both Equifax and Sony's share prices, while suffering initial wobbles, also recovered.

Zverev sees cybersecurity resilience as a narrative rather than a specific indicator such as the price-to-earnings ratio or carbon footprint. Additionally, the sensitivity of cyber risk to stock performance varies widely, depending on factors such as the nature of the business. Cyberattacks in healthcare, for example, may be more costly and therefore have a bigger impact on share prices.

"It's a bit like quality of management," says Zverev. "How do you measure it? My answer to that, and it will be different for different investors, is to look at management's ability to execute their plans, meet their guidance, allocate capital, deliver good returns, and act in the interests of shareholders and other key stakeholders at difficult points in the company's history. Cyber resilience is part of that holistic analysis."

The market's perception of risk – including cyber risk – is in constant flux, sometimes with devastating speed.

"Today we have COVID-19, but tomorrow it could be a global supply chain disruption; a year or two years from now, somebody could hack the Internet," says Black. "How many professions would come to a complete standstill if the Internet went down? And it is not implausible somebody could hack the Internet given how sophisticated our technology is becoming."

Despite having plenty of warning, many governments, companies and investors didn't see COVID-19 coming – or respond quickly enough when the true scale of the threat was becoming clear. Cyber risk may provide similar lessons in the years to come. Investors should take note

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# INFLATION HAWKS: CRYING WOLF?

Twelve years on from the financial crisis, inflation hawks are back. They were proved wrong then, but could this time be different? In part three of our miniseries on the source of the next crisis, we explore the extent to which inflation poses a risk to the global economy and financial stability.

 $\mathbf{03}$ 

# INFLATION HAWKS: CRYING WOLF? *continued*

"Inflation is always and everywhere a monetary phenomenon in the sense that it is and can be produced only by a more rapid increase in the quantity of money than in output."

#### Nobel Prize-winning economist Milton Friedman<sup>1</sup>

Inflation hawks are widely viewed as a modern-day equivalent of *The Boy Who Cried Wolf.* When the US Federal Reserve (Fed) and other central banks started 'printing' money like it was going out of fashion in early 2009 to fight the financial crisis, warnings of impending inflation were everywhere. After all, one of the oldest ideas in economics is the relationship between the quantity of money and prices. However, the repeated cries of threat have all proved unfounded, discrediting each subsequent warning.

In 2010, a group of economists, fund managers, academics and journalists wrote to the Fed, opposing its policy of buying long-term debt to push down long-term interest rates. The letter warned it risked "currency debasement and inflation" and should be "reconsidered and discontinued". One outspoken investor even went as far as to proclaim he was "100 per cent certain" the US was heading for Zimbabwean levels of hyperinflation.

Those sirens proved to be a false alarm. Despite massive monetary stimulus, inflation has failed to materialise. In the US, for instance, the consumer price index rose by an average of just 1.75 per cent in the decade to the end of 2019. Inflation has been no more evident elsewhere, averaging just two per cent in the UK and 1.34 per cent in the euro zone.<sup>2</sup>

While it is easy to be wise after the event, perhaps the inflation hawks should have known better. After all, by the start of 2009 the Bank of Japan had been experimenting with quantitative easing for nearly eight years,<sup>3</sup> and interest rates had been below one per cent for well over a decade. During that time, prices fell.<sup>4</sup>

# 3.0 2.5 2.0 1.5 1.0 0.5

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## Guess who's back?

However, with central banks dreaming up ever more extreme monetary stimulus and government debt simultaneously soaring as authorities try to limit the damage from what promises to be the deepest recession since the Great Depression, inflation hawks are back. "Get Ready for the Return of Inflation" warned Tim Congdon, a well-known monetarist and former advisor to the British government, in an opinion piece for *The Wall Street Journal.*<sup>5</sup> "Coronavirus will awaken inflationary forces before the year is out" was the headline of another opinion piece, this time in the *Financial Times.*<sup>6</sup>

Financial markets appear sceptical. As Figure 1 shows, US inflation, as implied by the yield differential between government bonds that protect against it and those that do not, is expected to average little more than one per cent over the next decade.

At first glance, 12 years of real-world experiments with previously unimaginable levels of monetary stimulus (in Japan's case significantly longer) trumps the theories of celebrated economist Milton Friedman. However, in reality the situation is more complex. To see why money printing on this scale failed to generate inflation, it is necessary first to understand the difference between the 'monetary base' and the 'money supply'.

The monetary base is the total currency circulating, plus the physical currency held in the vaults of commercial banks,

plus those same banks' reserves held by the central bank. It can only be altered by the central bank via the setting of interest rates and other monetary operations – for example, when it buys assets from commercial banks the monetary base rises and vice versa.

The money supply, by contrast, is outside the direct control of the central bank. In the US, M1 consists of the monetary base, less money held in banks' vaults, plus balances in checking, or current, accounts. M2 adds short-term savings deposits to M1. These measures of the money supply increase each time a bank makes a loan and contract when it receives a principal payment on that loan.

Banks in the US, as in most other countries, are required to hold only a fraction of their deposit liabilities in cash – either in their vaults or in their reserve account at the Fed. As a result, with a fractional reserve rule of say ten per cent, the banking system can add ten dollars to the money supply for every new dollar of reserves added to the banking system by the Fed through its open-market operations. Hence the use of the term 'high-powered money' to describe the monetary base.

As Figure 2 shows, between 1990 and 2008, M2 was between eight and ten times the size of the monetary base, while M1 was between one and a half and three times as big. But when the financial crisis struck in September 2008, both of these monetary multipliers collapsed. And they have remained well below pre-crisis levels ever since.

#### Figure 1: US 10-year breakeven inflation

Figure 2: Decline in US money multipliers



As at the end of 2019, the US monetary base totalled \$3.43 trillion

# Collapse of the money multipliers

So, while measures of the money supply have climbed appreciably, they have risen nowhere near as much as might have been expected given the massive expansion of the monetary base by the Federal Reserve. As at the end of 2019, the US monetary base totalled \$3.43 trillion, up 304 per cent from August 2008. Prior to the financial crisis, a quadrupling of the monetary base would have been expected to lead to a six-fold increase in M1. Instead, it has risen less than 180 per cent. As for M2, a whopping 32-fold surge might have been expected. In fact, it has not even doubled, as seen in Figure 3.<sup>7</sup>

There appear to be two main reasons for this collapse in money multipliers. Firstly, following the financial crisis, regulators tightened capital requirements in an effort to shore up banking systems to reduce the risk of another crisis. Changes included new measures of capital and increased minimum requirements, with special emphasis on requirements for the largest and most systemically important banks.

US banks, for instance, had to increase the ratio of liquid assets to less-liquid ones on their balance sheets. The effect was to make it more costly for banks, particularly smaller ones, to originate higher-return loans, including small-business loans.

As Patrick Minford, professor of applied economics at Cardiff Business School and a former advisor to the UK government, says: "Up to now, quantitative easing has had very little effect on bank credit, or broader money, because there's been such very heavy regulation of bank lending."

At the same time, banks' willingness to accumulate reserves, essentially parking money at central banks, has risen. In the US, for example, prior to the crisis bank reserves earned no interest. That meant banks fully leveraged their reserves by lending as much as they could to maximize profits, with excess bank reserves limited to just a few billion dollars. But in recent years they have held unprecedented levels of reserves, over and above what they are required to, with the central bank, as Figure 4 shows. Since October 2008, the Fed has been paying interest on bank reserves, at rates generally exceeding the yield on Treasury securities. That has given banks a reason to prefer cash reserves over government securities for their liquidity needs. In a July 2009 staff report, the New York Fed said the rise in excess reserves was almost entirely due to Fed policy.<sup>8</sup>

The collapse in money multipliers helps explains why inflation has not taken off, since it is the money supply and not the monetary base that affects inflation in the real economy. With most of the money injected by central banks clogged up in the financial system and not making it out into the real economy, the result has been asset price inflation instead.



# INFLATION HAWKS: CRYING WOLF? *continued*

#### Secular stagnation

A number of economists, including former US Treasury Secretary Lawrence Summers and Nobel Prize-winner Paul Krugman, have for some time argued inflation was never likely to resurface because developed economies are suffering from 'secular stagnation', the effects of which were masked by a credit bubble in the run up to the financial crisis. In their view, a combination of factors, such as a glut of savings, weak investment, globalisation, worsening demographics and rising inequality, have for years exerted downward pressure on growth and inflation.

So, while the amount of money circulating in the real economy has risen, the increase has been insufficient to counteract these deflationary forces. However, other economists, especially disciples of Friedman, argue it would be wrong to assume massive monetary stimulus will not lead to inflation in future just because it failed to do so following the financial crisis, especially since the current circumstances are quite different.

In contrast to the financial crisis, banks are now being encouraged to lend to businesses. "Monetary financing on this scale isn't having much inflationary effect at the moment because everything's in disarray. But we should be on the lookout for quite a big rise in broad money. The time to worry about it is when we get into recovery," says Minford.

Charles Goodhart, former chief economist at the Bank of England, agrees: "What will then happen as the lockdown gets lifted and recovery ensues, following a period of massive fiscal and monetary expansion? The answer, as in the aftermath of wars, will be a surge in inflation."<sup>9</sup> Like Minford, he sees less reason why monetary stimulus will remain jammed in banking systems, while also arguing there is scope for economies to rebound far quicker than in 2009.

For now, it would probably be fair to say views such as these remain in the minority. After all, there is little sign of an early end to the monetary merry-go-round. Since the

#### Figure 3: M2 fails to keep pace with base money

— Monetary base (re-based) — M2 (re-based)



end of last year, the Fed has expanded the US monetary base by \$1.71 trillion, with the majority being parked back at the central bank in the form of excess reserves.

In a recent article, the International Monetary Fund's former chief economist Olivier Blanchard said it is hard to see a strong wage push on the horizon given the increase in unemployment. While it would be wrong to dismiss the threat of inflation entirely, with oil prices having also collapsed and precautionary saving likely to remain elevated for some time to come, the odds were heavily stacked against it. "The challenge for monetary and fiscal policies is likely to be to sustain demand and avoid deflation rather than the reverse," he wrote.<sup>10</sup>

#### The end of globalisation?

Peter Fitzgerald, multi-asset and macro chief investment officer at Aviva Investors, sides with him. "We've got a massive demand shock taking place and it's hard to see where inflation is coming from in the short term."

However, he believes inflation poses a growing threat over the long term. China has had a big deflationary impact on the world since it joined the World Trade Organisation in 2001, but Fitzgerald sees a real risk of this being at least partially reversed. "Given the ongoing trade war with the US, and after the pandemic highlighted to other governments the danger of not being able to get hold of essential goods, de-globalisation could become a real inflationary force," Fitzgerald warns. Sunil Krishnan, Aviva Investors' head of multi-asset funds, agrees. He says there is a trade-off between corporate efficiency and resilience, with the current crisis demonstrating the danger of companies focusing almost exclusively on the former in recent years.

"Rather than having a single supply chain that spans the globe, in future companies might keep two supply relationships going. Instead of just-in-time inventory management, we may see more re-shoring of factories as firms realise they can't afford to have inventory stuck on the other side of the world. This has obvious cost implications," he says.

Although inflation is unlikely to return in the near future, James McAlevey, head of rates at Aviva Investors, believes it could pose a bigger risk looking further ahead, meaning the US yield curve currently looks too flat.

"Whereas much of the world adopted austerity measures following the financial crisis, today the opposite is happening. That means the outcome could be quite different, especially if the Fed decides it is prepared to tolerate inflation overshoots," he says.

All three believe spiralling government deficits could lead to appreciably higher inflation if central banks were to fund governments directly – a policy sometimes known as monetary financing – as a growing band of economists are advocating.

Indeed, in a less well-known section of his speech of 1970, entitled *The Counter-Revolution in Monetary Theory*, Friedman





Central banks have failed to reignite economic activity and, in the eyes of many, have fuelled inequality

warned higher government spending "will clearly be inflationary if it is financed by creating money, that is, by printing currency or creating bank deposits".

Heeding this warning, central banks are adamant they intend to sell the government debt they have acquired as a result of quantitative easing back into the market as and when the time is right. They say monetary financing will lead to runaway inflation, even if the recent experience of Japan suggests otherwise.

## **Political interference**

However, some economists say monetary financing is precisely what central banks should now be doing. Adair Turner, former chairman of the UK's Financial Services Authority, and Mervyn King, former head of the Bank of England, are among them.

"I think it is pretty axiomatically obvious that the impact on inflation of monetary financing all depends on how much you do," argues Lord Turner, pointing out it was the same Milton Friedman who laid out the rationale for monetary financing in 1948 and went on to coin the term 'helicopter money' in a subsequent article of 1969.

Nonetheless, he concedes that if that decision were taken out of central bankers' hands by politicians, there would be a real risk of much higher inflation. For that to happen, a central plank of economic policymaking for the past four decades would have to be abandoned. In the 1980s, governments around the world began handing central banks greater control over monetary policy as they searched for a cure for rampant inflation that had plagued their economies the previous decade. Politicians' failure to maintain monetary discipline was considered a major cause of inflation getting out of control.

But just as high inflation in the 1970s led to central banks being handed independence, could a prolonged period of deflation result in it being taken away? It is no coincidence that recent years have seen growing calls for this. After all, central banks have failed to reignite economic activity and, in the eyes of many, have fuelled inequality. Around the world they have been under attack from politicians, most notably US President Donald Trump, who has been a relentless critic of the Fed.

Fitzgerald says that should economic growth continue to disappoint in the coming years, which is a distinct possibility, populist politicians may find the urge to wrest back control of monetary policy impossible to resist. "There are ultimately only three ways to lower debt. Either you pay it back, you default on it or forgive it, or you inflate it away. Many governments might be tempted to go for the latter option," Fitzgerald says.

He believes investors should continue to look for ways to protect their portfolios against the threat of rising inflation, for example by investing in gold or taking positions in longer-dated inflation swaps, even if – for now – warnings of impending inflation look likely to another case of *The Boy Who Cried Wolf* ●

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# GEOPOLITICS: COULD THE CORONAVIRUS PANDEMIC LEAD TO A NEW COLD WAR?

# This is no longer simply a trade dispute. It's much broader than that

The US-China relationship has deteriorated in the midst of the COVID-19 pandemic. What does this geopolitical rivalry mean for the global economy and markets?

In 1971, US National Security Advisor Henry Kissinger secretly flew to Beijing to meet Chinese Premier Zhou Enlai. It was the beginning of a thaw in US-China relations that culminated in Richard Nixon's historic summit with Chairman Mao the following year.

During the meeting, Kissinger asked Zhou for his views on the French Revolution of 1789. Zhou replied, "It is too soon to tell." Reported later, the comment became famous for revealing the long-term vision of China's leadership – but it was actually the result of a misunderstanding. Zhou thought Kissinger was asking about the more recent civil unrest of 1968, which started in Paris before spreading around the world.<sup>1</sup>

The anecdote is worth pondering today, as US-China relations plunge to their lowest point since the Cold War. As in 1968, a flu pandemic has inflamed existing social and economic tensions. The relationship between the two powers is once again clouded by rancour and misunderstanding. So what are the implications for the global economy and financial markets as the world emerges from the COVID-19 crisis? And what are the chances of a new geopolitical détente?

#### **Geopolitics and COVID-19**

Geopolitical risk in 2020 is not limited to the US-China dispute. Before the coronavirus crisis, headlines were dominated by the threat of war between America and Iran. In early January, the US assassinated a prominent Iranian general, Qasem Soleimani, in retaliation for an attack on its embassy in Iraq. An armed conflict – or at least an acceleration in Iran's nuclear programme – looked possible.<sup>2</sup> The fragile situation in the Middle East was further destabilised by Saudi Arabia's decision to ramp up oil production to win market share from other suppliers in early March, a move that caught global markets by surprise and sent the price of crude tumbling.

The pandemic has diverted attention from these events. Iran is among the countries worst hit by COVID-19 and has had to focus on its domestic health crisis rather than foreign policy. Saudi Arabia agreed a deal with the Organisation of the Petroleum Exporting Countries (OPEC) to cut oil supply once the scale of the virus-related collapse in energy demand became clear.

Meanwhile, the US-China stand-off has taken centre stage. President Donald Trump has blamed the Chinese government for the outbreak, dubbing COVID-19 "the China virus" and disseminating the unproven theory that the pathogen was created in a Chinese lab. For its part, the Chinese government has claimed the coronavirus is the result of an American plot.<sup>3</sup>

With both powers intent on deflecting scrutiny from their handling of the pandemic at home, the war of words threatens to grow to the point where it materially affects their economic relationship, hampering the global recovery from the crisis.

"Trump has fallen in the polls, the economy has been hit and being tough on China is a vote winner in the US: that's a large part of why this has come to the foreground now. This is no longer simply a trade dispute. It's much broader than that," says Harriet Ballard, senior multi-asset strategist at Aviva Investors in London. COULD THE CORONAVIRUS PANDEMIC LEAD TO A NEW COLD WAR? *continued* 

#### **Spheres of influence**

The trade war started in 2017, when the new Trump administration started putting tariffs on Chinese goods; ostensibly to rectify a trade imbalance and to retaliate for the supposed theft of intellectual property from American firms.

After intensive negotiations, the two countries reached a bare bones "phase one" trade deal in January 2020, under which the US cut some tariffs in exchange for a Chinese promise to increase its annual spending on American products by \$200 billion. Beijing also pledged to do more to safeguard the IP of foreign firms operating in China.<sup>4</sup>

Pundits expected the two sides to build on this pact with a more comprehensive deal that Trump could tout to his voter base in the run-up to October's presidential election. But the coronavirus pandemic has put paid to this view: there is now "a near-zero chance" of a phase-two deal this year, argues Ballard.

A major point of contention between the two countries is the planned US investigation into China's handling of COVID-19. On May 12, Republican Senator Lindsey Graham introduced the Chinese Government COVID-19 Accountability Act, legislation that would authorise Trump to slap wide-ranging new sanctions on China if it failed to give a full account of the events leading up to the emergence of the virus in Wuhan in late 2019.<sup>5</sup>

On May 31, Trump provoked China further when he announced his intention to expand the next meeting of the Group of Seven countries (Canada, France, Germany, Italy, Japan, the UK and the US) to include Russia, India, Australia and South Korea – all nations that have sought to resist growing Chinese influence in Asia. The move was seen by many commentators as an attempt to coordinate regional efforts to contain China.<sup>6</sup>

"The main objective is to bring together like-minded countries in a coalition that will handle high technology, pharmaceuticals, defence cooperation and intelligence sharing, to diminish the dependence on China and China's supply chains," says Parag Khanna, managing partner of consultancy FutureMap and author of The *Future is Asian* (2019).

This strategic approach is not new; it builds on previous administrations' efforts to develop the Quadrilateral Security Dialogue (or "Quad"), an informal strategic alliance between the US, India, Australia and Japan. This sort of multilateral approach to containing China would probably continue if Trump's Democratic rival Joe Biden becomes president, but tensions will persist whatever the outcome of the election.

"Should Biden win, his advisers are likely to try to pursue a limited reset in the relationship, but expectations of what could be accomplished are low," says Jeffrey Wright, senior analyst in US foreign affairs at Eurasia Group, a political risk consultancy. "There is simply a structurally higher level of tension between the two [countries] than there was in the Obama years.

"A Biden administration would presumably be more interested in multilateral solutions on issues like climate change, which opens some new avenues for cooperating with Beijing. But on issues like tech competition, geopolitical disputes, and some trade issues, there's not much Biden can do to put the genie back in the bottle," Wright adds.

For its part, China is seeking to build a parallel network of strategic alliances through its ambitious Belt and Road Initiative, a series of infrastructure projects across south and central Asia.

#### A new Cold War?

So where could this manoeuvring lead? Harvard professor Graham Allison has argued the US-China rivalry is an example of the "Thucydides Trap", which occurs when a rising power threatens the established hegemon. The historian Thucydides observed this scenario in ancient Greece, when Sparta challenged Athens, and the dynamic has been repeated throughout the centuries. Allison argues war is often the result, sometimes due to the unpredictable actions of third parties.<sup>7</sup>

In the current situation, there is a risk a flashpoint may occur as a consequence of territorial sabre-rattling between China and a US ally such as Japan, Taiwan or India, especially if certain key resources become scarce due to virus-related supply chain disruptions. In early June, the disputed Himalayan border between China and India was the site of a brutal confrontation that resulted in the deaths of at least 20 Indian soldiers.<sup>8</sup>

Michael Hirson, practice head of China research at Eurasia Group, says a military confrontation between the US and China is a realistic possibility, but probably only as the result of an accident or a miscalculation.

"The US and China have naval forces operating in close proximity in the South China Sea and Taiwan straits, so that risk is ever present," he says. "As the relationship deteriorates, the risk becomes that the channels to deescalate a mistake have broken down, leaving leaders on both sides without an easy way to communicate in a crisis.

"That said, both sides want to avoid war at nearly all costs. The costs of such a war would be tremendous, so neither side would contemplate going to war unless a core interest is at stake," Hirson adds.

China has become more bullish in seeking to expand and defend its territory under President Xi Jinping, building armed fortresses on reclaimed land near major shipping routes in the South China Sea. On the US side, there may be bipartisan support for policies that would escalate the conflict. Indeed, a recent Pew survey found 66 per cent of Americans have an "unfavourable" view of China, with more than 60 per cent seeing rising Chinese power and influence as "a major threat".<sup>9</sup> On the US side, there may be bipartisan support for policies that would escalate the conflict. Indeed, a recent Pew survey found 66 per cent of Americans have an 'unfavourable' view of China, with more than 60 per cent seeing rising Chinese power and influence as 'a major threat'."

Khanna acknowledges the risk of a "localised conflict" between the two powers, if not all-out war. But he argues other countries will have a big say in the outcome, which is likely to be very different from the Cold War between the US and the Soviet Union, when the world was carved into two ideological blocs. Many nations in Asia are much more politically independent and economically powerful now than they were then.

"The world is not going to allow itself to be subsumed by a new US-China Cold War," he says. "That's the difference between the old Cold War and the new Cold War: there has been a learning process. Countries that are [said to be] 'caught in the middle' are not caught in the middle because they are too smart for that. They are going to play both sides. The losers probably wind up being the US and China, or one of the two."

A more indirect risk is that the US-China rivalry undermines international institutions and frameworks that might have helped defuse future crises, making the global system more vulnerable.

"The one thing this pandemic should have taught us is that there is no wall high enough to keep out the great risks we face," says Ian Goldin, professor of globalisation and development at the Oxford Martin School at Oxford University.

"What the US-China tensions are doing is further undermining those global institutions. No global problem can be solved without the collaboration of China and the US; not least pandemics or climate change. There is also the likelihood of lower economic growth, less likely reform of the World Health Organisation, greater poverty and rising inequality in the world."

#### **Colossal economic shock**

What of the risk of an escalation in hostilities on the economic front? The US owes China around \$1.1 trillion in Treasury bonds and could theoretically refuse to pay the debt.<sup>10</sup> Similarly, China could sell its Treasury holdings en masse, which would cause a spike in the US government's borrowing costs and unleash mayhem across financial markets.

Both courses of action would be enormously counterproductive. Cancelling US debt would precipitate a loss of confidence in US assets and destabilise the Treasury market. And China's Treasury holdings are a vital plank of its The US owes China around \$1.1 trillion in Treasury bonds

# COULD THE CORONAVIRUS PANDEMIC LEAD TO A NEW COLD WAR? *continued*

macroeconomic management; it uses its vast US debt portfolio to hold down the value of the yuan against the dollar and keep its exports competitive.

Ballard argues it is "highly unlikely" either side would go down this route, even though Trump has occasionally threatened to default on the debt. "Cancelling China's holdings of Treasuries would be a colossal economic shock that would have a huge impact on the US Treasury market and global financial system," she says.

In fact, the exchange of threats may make the overall economic and financial system more robust if it means both countries are motivated to identify and mitigate the risks of relying on the goodwill of the other side. That process might involve the US seeking to diversify its supply chains away from China, or China seeking to internationalise its currency to curb reliance on a potentially weaponised dollar.

"There should never be one point of failure in the system. Whether its America and the US dollar or China and supply chains, building a more distributed system is always a good idea," says Khanna.

## **Conscious decoupling**

In the short term, a further decoupling of the links between the two countries is likely to bring economic costs. A World Trade Organisation study, published in February 2020, found continued US-China trade uncertainty could hit global GDP growth by 1.7 per cent over the next three years, due to knock-on effects on investment.<sup>11</sup> Total Chinese investment in the US has already fallen sharply from recent peaks: in 2019 it stood at \$5 billion, down from \$45 billion in 2016.<sup>12</sup>

Supply chains are being unwound and key strategic industries brought home. Both the trade war and the pandemic have highlighted the vulnerability of complex supply chains to sudden disruption, which can hamper delivery of essential goods. Anecdotal evidence suggests some production of active pharmaceutical ingredients, or APIs – which are predominantly based in China – is already being re-shored to the US due to political pressure.<sup>13</sup>

As these trends accelerate, global investors will need to constantly monitor the status of political relationships, trade pacts and supply chains to ensure their portfolios will stay resilient. New winners and losers will emerge. Southeast Asian economies such as Vietnam and Indonesia have successfully attracted business from companies seeking to move factories out of China, for example.<sup>14</sup>

On the corporate side, "a diverse set of customers and suppliers can help companies withstand sudden shocks", says Alistair Way, head of emerging market equities at Aviva Investors. He cites China-based Apple supplier Hon Hai as an example of a company that has taken care to ensure its customer base is properly diversified amid rising political and economic uncertainties.

"Hon Hai's core business – assembly of Apple's iPhones – may be vulnerable if demand for consumer gadgets slumps. But the company also makes telecoms infrastructure, servers and medical equipment, thanks to a concerted effort by its management to increase the scope of its business in recent years. This strategy now looks spot on."

## Where there's a will...

Other technology firms may be more vulnerable to an escalation in the US-China stand-off, notably Chinese tech giant Huawei, which is at the centre of a controversy that encapsulates many of the points of contention between the two powers.

The US has accused Huawei of technology theft (or "forced technology transfer") and political surveillance; its critics argue it is effectively a pawn of the Chinese government. For others, the firm symbolises China's emergence as a sophisticated, tech-savvy superpower. Huawei is a global leader in artificial intelligence and 5G technology and files more cutting-edge patents than any other firm.<sup>15</sup>

The US has long sought to curtail Huawei's influence and sees the company's supremacy in 5G telecommunications infrastructure as a security risk to itself and its allies. A new law announced on May 15 imposes stricter export controls on companies doing business with Huawei to limit its access to advanced US semiconductor technology. In response, China announced new restrictions on tech firms operating within its borders, including Apple, Cisco and Qualcomm.<sup>16</sup>

The full implications of the new US law for overseas firms – and American companies that supply chips indirectly to Huawei – are unclear, and enforcement of the new rules could be difficult, opening up some wiggle room for companies that can stay agile.

Some industry giants have already started shifting operations. Taiwanese chipmaker TSMC – which earns 15 per cent of its revenue from Huawei – announced in May that it would build a \$12 billion factory in Arizona, perhaps as a way of circumventing US sanctions.<sup>17</sup>

"Taiwanese companies in particular are being forced into quite a difficult position, given their close relationships with both the US and China. In the shorter term it is probably easier to go along with the American rhetoric, given the unpredictable nature of Trump this year, but over the longer term, countries and companies need to set that against the huge economic importance of China," says Way.

"Does it make sense to pick sides with the US? For the bulk of the world, the benefits of being compliant with the US while alienating China are not clear," he adds. As well as industrial disputes, rising tensions could lead to fractures in the financial networks that have proliferated between the US and China in recent years

#### A better tomorrow?

As well as industrial disputes, rising tensions could lead to fractures in the financial networks that have proliferated between the US and China in recent years, as the Asian power has sought to open its markets to foreign investors.

The picture is complicated by the ongoing civil unrest in Hong Kong, traditionally the gateway to mainland China for overseas institutions. A new security law designed to assert Beijing's control calls into question the territory's autonomous status, and Trump has threatened to revoke Hong Kong's special trade privileges on that basis. In retaliation, Chinese officials accused the US government of hypocrisy, pointing to Washington's crackdown on domestic protests following the killing of George Floyd, an African American man who died in police custody.<sup>18</sup> Ballard argues that while Trump's threat is creating uncertainty among US businesses operating in Hong Kong, and could lead to targeted sanctions on certain individuals or businesses, "it is unlikely to bring about any substantive change in the territory's position, either as an export hub or as a financial access point to mainland markets. It's not clear whose interests that would serve".

In fact, the territory may benefit economically over the longer term from the tensions between the US and China if mainland companies are forced to delist from US exchanges and move their primary listing to Hong Kong. The implications for emerging-market investors could be significant.

"A forced delisting of a large swathe of the Chinese equity market away from Nasdaq to Hong Kong would be massively beneficial for trading volumes on the Hong Kong Exchange," says Way. "It would shift the centre of gravity of emerging market investing much more locally. But given the precarious nature of Hong Kong in the current environment, the picture could change quickly."

With the direction of the future uncertain, Way argues investors in the region would do well to ensure their portfolios are resilient in a range of adverse scenarios, and not simply geared to benefit from a specific geopolitical development.

As for the longer-term consequences of the hazardous US-China rivalry, the smartest response may be to follow the lead of Zhou Enlai and conclude it is too soon to tell

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# **AIQ** THE NEXT CRISIS: PART 5

# NATURE AND NEGLECT: THE ERA OF ECOLOGICAL DISASTERS

As the frequency and ferocity of natural hazards increase, *AIQ* considers the economic and investment implications and what we can learn from past mistakes.



Climate change and environmental degradation are increasing the frequency and severity of natural disasters

While COVID-19 is claiming the headlines, it is by no means an isolated example of our increasingly fragile relationship with the natural world. This year has also seen severe wildfires in Australia, floods in the UK and Uganda, as well as droughts in the American west and New Zealand; hurricane season will add to the final tally.

Climate change and environmental degradation are increasing the frequency and severity of natural disasters. According to the World Economic Forum's (WEF) Global Risk Report 2020, these now average one a week across categories. The top five risks are all environment-related, with three linked to environmental disasters and extreme weather (Figure 1).<sup>1</sup>

Natural hazards are taking a heavy toll on human health and wealth, as some communities barely have time to recover from one disaster before another hits.

"The planet is not in danger – it's we who are in trouble, in that we are endangering the ecosystem that supports us. If we



Figure 1: The global risks landscape 2020

# **AIQ** THE NEXT CRISIS: PART 5

# NATURE AND NEGLECT: THE ERA OF ECOLOGICAL DISASTERS *continued*

disappear, after a period of destruction the planet will thrive again: just look at the area around Chernobyl, which is now a paradise for animals," explains Didier Sornette, professor on the Chair of Entrepreneurial Risks at the Swiss Federal Institute of Technology Zurich (ETH Zurich).

Perhaps we have been too quick to dismiss environmental risks as the stuff of big budget disaster movies. But in light of recent events, when something that started as a localised health issue rapidly morphed into a global health and economic crisis, it seems reasonable to ask whether a natural disaster could be humanity's biggest threat.

## **Ecological threats abound**

According to Dr Robert Glasser, former head of the UN Office for Disaster Risk Reduction and visiting fellow at the Australian Strategic Policy Institute, two main factors are increasing the risk of natural disasters.

First, he argues investments in infrastructure and economic development are being made without due consideration of the disaster risk. "With such poorly riskinformed investments, it is not surprising that more infrastructure is being destroyed and the financial costs of disaster risk are going up," explains Glasser.

The second is climate change, whose impacts are only just becoming visible. "Climate change is increasing the frequency and severity of many hazards. "Infrastructure investments need to take account not only of historical risk of hazards but also of how climate change is altering the risks. In the US, if you look at Hurricane Harvey, something like half of the homes destroyed by that were situated outside the one-in-500-year threat area."

Ed Dixon, head of environmental, social and governance (ESG) for real assets at Aviva Investors, agrees that whereas physical climate risk used to feel like a distant problem, it is now on top of us. On balance, he says the industry is realising the need to assess climate risk for legacy business and assets, as well as new investments.

#### Figure 2: Links between the top global risks in 2020



Source: The Global Risks Report 2020, World Economic Forum.

Biodiversity loss and excessive use of natural resources are further weakening ecosystems' resilience and capacity to recover from shocks. As the UK's Dasgupta Review on the Economics of Biodiversity explained: "Just as diversity within a portfolio of financial assets reduces risk and uncertainty, diversity within a portfolio of natural assets - biodiversity - directly and indirectly increases Nature's resilience to shocks, reducing risks to the services on which we rely. But Nature's resilience is being severely eroded, with biodiversity declining faster than at any time in human history. Current extinction rates are around 100 to 1,000 times higher than the average over the past several million years - and they are accelerating."2

#### Tales of the unexpected

Perhaps the most dangerous dimension of increasing hazards is that, as human interference grows and disasters become more frequent, they begin to compound to cause unpredictable and unmanageable knock-on effects. Rick Stathers, climate change specialist and senior ESG analyst at Aviva Investors, gives the example of chemicals in the environment interacting with each other, creating chemical 'cocktails' that can amplify their effect on plants, animals and humans.

A recent post by Simon Clark of the University of Liverpool's Institute for Risk and Uncertainty also linked the frequency and magnitude of flood events throughout the last century to the impact of human activity on rivers and floodplains. Clark explains that, with only 14 per cent of rivers considered to be in a good ecological state, "the natural functions that regulate flooding have been lost to centuries of human interference".<sup>3</sup>

In the most serious cases, simultaneous and consecutive disasters create a chain reaction with global consequences. Take the food security crisis in 2010-2011. Droughts and fires in Russia, Ukraine and parts of China, as well as floods in Canada and Australia, combined to destroy the wheat crop. That led to countries hoarding wheat and hiking the price of food, which resulted in food riots in parts of North Africa. That was a contributory factor behind the Arab Spring.

#### Figure 3: Extreme precipitation and increasing temperatures, 2020-2050

#### **Extreme precipitation**

Change of likelihood of a 1950-81(50-year) precipitation event



Increasing temperatures\*

Increase of average temperature (°C shift compared with preindustrial climate)



\*Note: based on RCP 8.5 (RCP = representative concentration pathway, a greenhouse gas concentration trajectory). Source: McKinsey Global Institute, as of January 2020.

The European Union's Joint Research Centre is also looking into possible cascade effects; specifically the damage caused by natural disasters to chemical plants or oil and gas pipelines, including the release of hazardous materials into the environment.<sup>4</sup>

Frederique Nakache, equity fund manager at Aviva Investors, thinks it is already part of the higher risk premium for oil and gas companies, as is the political risk stemming from geographic exposure, and risks borne of companies' plans.

"Oil and gas companies are used to working in extreme conditions, including hurricanes and storms in the Gulf of Mexico or the North Sea for example. They have to integrate these harsh environments in their development plans. It also explains why they don't choose oil services companies purely on price, but factor in their reliability in terms of product quality and execution as well," she says.

These risks – of natural disasters, cascading effects and impacts on individuals and communities – are predicted to get worse (Figure 3). In a January 2020 report,

#### Figure 4: The nine tipping points

Amazon rainforest	Arctic sea ice	Atlantic circulation
Boreal forests	Coral reefs	Greenland ice sheet
Permafrost	West Antarctic ice sheet	Part of East Antarctica

Source: Timothy M. Lenton et al., Nature, April 9, 2020.

consultancy McKinsey stated: "According to climate science, further warming will continue to increase the frequency and/or severity of acute climate hazards across the world, such as lethal heat waves, extreme precipitation, and hurricanes, and will further intensify chronic hazards such as drought, heat stress, and rising sea levels."<sup>5</sup>

In addition to rising frequency and severity, the patterns of hazards are changing, presenting risks to areas that have been unaffected previously. "In Australia, in a warming world, recent scientific research suggests that cyclones will begin tracking further south to parts of the country including the Gold Coast, a big tourist area with high-rise buildings that have not been designed for extreme cyclones," says Glasser.

### **Tipping point**

The overuse of resources is not only contributing to the higher frequency of natural disasters, but also the potential for one to turn into a genuine global catastrophe. Moreover, these risks are linked. Pandemics become more likely as humans overshoot their natural boundaries. Rapid deforestation accelerates global warming and degrades wildlife habitats.<sup>6</sup>

# NATURE AND NEGLECT: THE ERA OF ECOLOGICAL DISASTERS continued

Climate change, for example, could bring the planet to several tipping points, each occurring at different levels of warming, where a system goes from one state of equilibrium to another and is permanently changed. According to WEF, passing one of these tipping points may increase the risk of crossing others, and they are all under growing threat of abrupt and irreversible changes.<sup>7</sup>

"Ocean and atmospheric circulation, and feedback between these shifts, could accelerate global warming, triggering a cascade of tipping points or even a global tipping point – and a less habitable, "hothouse" Earth," it warned.

Scientists currently estimate this could happen at three degrees Celsius of warming, at which point humans would no longer be able to stop runaway climate change from occurring, according to Stathers. "If you go to three degrees, you are very likely to go to six degrees or more, hence the urgency to keep warming to within 1.5 degrees," he says.

One example of such a feedback loop causing runaway change is the Amazon. "If we lose 20 per cent of the Amazon – and we are at 17 per cent now – it could change from rainforest to savannah. That would have huge implications because it is a massive carbon sink: it would release that carbon, causing more warming, which would cause other systems to change," says Stathers (Figure 5).

Glasser notes a similar example of a negative feedback loop: at 1.5 degrees of warming most coral reefs - which are fish nurseries for perhaps ten per cent of the world's species - will have died, depleting tropical food supplies. Scientists have also determined that fish species are already moving towards the poles to escape warming waters. At two degrees Celsius of warming, this will result in a decrease of up to 60 per cent in fisheries yield in the tropics. And, as coral reefs disappear, so will the protection they offer coastal areas against storm surges, exposing millions of people to more extreme weather. Combine these factors with the impact warming will

#### Figure 5: The Amazon rainforest tipping point

- High stability, good ecosystem condition
- High stability, poor ecosystem condition
- --> Loss of canopy cover leaving to increased fire frequency and disruption of the water cycle



have on agriculture, and the food security risks become enormous.

"If you put all those things together, it is extremely likely we will see these cascading impacts happening relatively quickly. They will happen in a given year, like bushfires in Australia, but they will also happen in consecutive years, and the individual events will, in effect, become one big event as the interval of time between them shortens," says Glasser.

# The human and economic impact

Natural disasters are leading to increased health spillovers, loss of life and the displacement of populations, though potentially unequally. According to WEF's Global Risks Report 2020, women and children are 14 times more likely than men to die during natural disasters. The elderly and infirm are also at higher risk, and health systems in the poorest countries and communities may not be able to cope as well as those in the rich world. Over 20 million people a year were displaced between 2008 and 2016, and worsening climate change could trigger conflicts in the future. The Cambridge Global Risk Index 2019 identified natural catastrophes as the biggest threat to gross domestic product (GDP), with \$174 billion at risk - 30 per cent of the overall total. Tropical windstorms are the third highest individual risk, at \$66 billion or 11 per cent of total risk (Figure 6).<sup>8</sup>

This is projected to rise significantly, from direct damage – which could reach ten per cent of GDP by the end of the century in the US alone – but also productivity losses, which could be equal to 80 million full-time jobs by 2030 as a result of heat stress.<sup>9</sup>

According to McKinsey, agricultural production could be impacted in similar ways. Though some regions may benefit from a warmer climate, others will see crop yields drop (Figure 7).

Although these estimates do not account for the occurrence of tipping points, the impacts of which are difficult to model, they are enough to underscore the urgent need for action. Unfortunately, the increasing economic cost posed by the disasters themselves, coupled with current geopolitical strains,<sup>10</sup> could compromise efforts to mitigate and adapt to what Glasser calls "the era of disasters".

#### Figure 6: 2019 GDP at risk by city



Source: Source: Cambridge Global Risk Index 2019.

#### **Risks and opportunities**

To adapt to this situation, the first step, says Glasser, is to understand the risks, both from a historical perspective and the current and future impacts of climate change. "That is really tricky because you can get some useful information from climate scientists on, for instance, the risk of extreme weather in a particular part of the country, but we would need much better information to provide climate risk information at levels and with degrees of certainty that are useful for planning in regional and local communities," he says.

The second step is to incorporate this understanding of risks into new investments and also previous investments to make them less exposed and vulnerable to the hazards climate change is amplifying. Policymakers and business leaders will need to take adaptation and mitigation measures to assess climate risk, adapt to risks already locked in, and transition to a low-carbon economy. Pressure is growing on companies, although only a small number seem to be taking decisive action.

"Companies have begun to up their rhetoric, but at the moment only 850

#### Figure 7: Temperature impact on corn crop yields



companies are committed to align their emission pathways with a 1.5 or two-degree future as per the science-based targets initiative," says Stathers. "There aren't enough companies fully analysing the potential ramifications of what a fourdegree environment might imply versus a 1.5-degree environment – through the value chain, in terms of cost of goods sold, suppliers, and how it will impact customers and their disposable income."

Stathers attributes this to the obsession with short-term profitability, which constrains companies' ability to invest in research and development,

# **AIQ** THE NEXT CRISIS: PART 5

NATURE AND NEGLECT: THE ERA OF ECOLOGICAL DISASTERS *continued*  Much remains to be done in terms of incorporating disaster risks into valuations. But progress is critical if capital is to be redeployed

resilience and adaptation – collectively undermining their risk management capability. "In the aviation sector, 90 per cent of the free cash flow in the last decade has gone into share buyback schemes; nothing was spent on building resilience."

The other challenge is an inability to model and value externalities, which remain unaccounted for in company balance sheets and economic forecasts. "They call them externalities because they don't know how to model them – and an externality is climate change, water scarcity, biodiversity loss," says Stathers.

"The way we can measure the ability of companies to face climate change is to use CDP data. CDP provides data on sustainability metrics and scores companies and their climate-change strategies according to the risk they are exposed to through their operations. These are all the actions companies must take, either to decrease their emissions or to offset them by investing elsewhere, for instance in reforestation, and to tackle the physical impact climate change may have on their day-to-day operations," adds Francoise Cespedes, equities portfolio manager at Aviva Investors.

"For example, in the winter of 2018-2019, German chemical companies operating on the Rhine, such as BASF, couldn't use the river to transport and deliver their products to clients because the level of the Rhine was too low. These companies have to adapt and find new ways to transport their goods in order not to be dependent on the level of the Rhine," she says.

She also argues that, as climate change is under way and temperatures will rise for some time to come, some niches or markets should benefit, notably those that help companies and individuals face the impacts of warming. "There are companies like Boskalis, which provides coastal defence equipment to face rising sea levels, but also air-conditioning providers. Segments such as these are a few niches where we expect to see value creation in the next few years."

Much remains to be done in terms of incorporating disaster risks into valuations. But progress is critical if capital is to be redeployed away from companies that are not adapting or are contributing to the risks towards firms that are adopting best practices, including those leading decarbonisation efforts.

"To date, this type of analysis is typically conducted as a qualitative risk overlay related to businesses at the high end of exposure risk. I have not seen it included in a formal way to impact pro-forma models or leverage metrics, thereby directly impacting companies' credit rating. Doing this properly would require analysts to model the related forward probabilities in a precise way, but I don't think we are there yet in terms of market practice," says Paul Lacoursiere, Aviva Investors' global head of ESG research.

In addition to short-termism, Stathers believes one of the issues is that disruption rarely comes from incumbents. It is much harder to entirely redefine an industry from within, particularly for firms with a fiduciary duty to their investors.

"You get a lot of warnings from science, and it takes at least a decade before these signs start moving into policy and investment. But now we recognise that climate change is a fiduciary issue we are taking steps to address that. We are also seeing greater demand from clients and regulators on what investors are doing on climate change, so that is creating changes in how we respond," he says.

Glasser thinks the business community, particularly the financial sector, is moving faster than governments. "I suspect, as these disasters happen more often, and as the impacts become bigger, business regulators will begin requiring corporations to disclose their exposure to climate risks and how they are addressing the risks." he says. "Ultimately this will accelerate the movement of hundreds of billions of dollars towards more resilient infrastructure. It will change the whole system because asset owners will want to make sure they have something to offer investors that is resilient to climate and disaster risk"

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Photograph page 54 courtesy of The World Meteorological Organization (WMO).

# THE EVOLUTION OF ESG: MORE THAN JUST A RISK MITIGATOR

Once dismissed as a virtuous endeavour that compromised investment returns, the ability to gain a more holistic view of risk by considering environmental, social and governance factors is increasingly appreciated by investors. We assess the evolution of ESG across asset classes, as well as its role as a risk mitigator and opportunity spotter.

# MORE THAN JUST A RISK MITIGATOR continued

With money pouring into the responsible investment sector, or funds closely tied to it through environmental, social and governance (ESG) integration, investors are making a clear statement with their money. They either want to do some good with it, think that by doing so they will be rewarded, or both.

Since the term 'ESG' was coined 16 years ago in Who Cares Wins, published by the United Nations Global Compact and the Swiss Federal Department of Foreign Affairs,<sup>1</sup> sustainable investing assets under management now total about US\$14 trillion in Europe and US\$12 trillion in the United States, according to Deloitte.<sup>2</sup>While the US has historically trailed Europe in ESG implementation, the consultancy believes a turning point is around the corner. It estimates ESG-mandated AUM could grow almost three times as fast as non-ESG AUM in the US, accounting for half of all professionally managed investments by 2025.

Despite the rapid progress, there have also been some notable barriers. For many, the focus so far has been on rankings that are often static and uniformly applied for all sectors, based on data that may not be relevant. An ESG score, however comprehensive, is far from a complete picture - within assets, sectors and countries - from which to base investment decisions. Engagement has also traditionally taken a siloed approach, mainly focused on equities, while sidestepping investments elsewhere in the capital structure. And while attempts have been made to consider forward-looking information into the investment process, they have often been applied on an idiosyncratic basis rather than in an integrated way.

In this article, we explore the growing importance of ESG to investors; charting its course from its 'dark green' screening days through to today and the impact of stewardship, engagement and its influence on the drivers of returns. We also consider the progress needed to address some of the shortcomings when translating ESG factors into asset allocation decisions. Investors, too,

#### Figure 1: Performance of ESG strategies vs non-ESG strategies, March 2020



Source: Thomson Reuters, based on Morningstar data, March 2020. Notes: Full sector classifications - EAA Fund Europe Large-Cap Blend Equity; EAA Fund Global Large-Cap Blend Equity; EAA Fund UK Large-Cap Equity; EAA Fund US Large-Cap Blend Equity. Base currencies – global and US in dollars; UK in pounds; Europe in euros. All figures in percentage.

must advance their understanding of how the 'E', the 'S' and the 'G' relate to each other and to financial metrics in a dynamic process that is both suitable to the particular investment as well as being harmonious within the broader portfolio.

#### **Beyond risk mitigation**

Of all the asset classes, ESG has been embedded into equities the longest. Indeed, company engagement started several decades ago, through voting and the rights and responsibilities that come with being a shareholder.

However, investors traditionally saw ESG analysis as part of their risk management process. It still plays that role, but its value is much broader. "In my view, it is more a way of identifying the most meaningful scenarios of how ESG is likely to help meet a corporate strategy. The real lens through which to assess ESG is 'is this company's business model sustainable?'," says Jaime Ramos-Martin, global equity portfolio manager at Aviva Investors.

An increasing amount of data shows that companies adopting sustainable business practices are rewarded by financial markets. In the recent sell-off caused by COVID-19 fears, many strategies with higher ESG

ratings exhibited less volatility to outperform their respective benchmarks, except for active US large-cap equity funds, according to Reuters (see Figure 1). Separate research from Bank of America Merrill Lynch covering the US market between February 19 and March 25 estimates the top 20 per cent of ESGranked stocks outperformed by over five percentage points.<sup>3</sup> This trend persisted on a sector-adjusted basis.

Companies with higher ESG scores are more likely to be found in technology, healthcare or consumer staples, which have fared better than other sectors such as airlines in recent months. "There is an element – by design of ESG funds and the nature of this crisis - that favours certain sectors," says Ramos-Martin. "Then there is true ESG resilience."

Corporate leaders in ESG often focus on longer-term resilience and the sustainability of their business models. These attributes may offer downside protection, he adds. Take supply chain management, which forms a significant part of a company's ESG resilience. Companies with more sustainable supply chains were better able to manage through the early months of the COVID-19 crisis relative to others with efficient, 'just-in-time' systems.

Given the unprecedented public fiscal and monetary support to tackle the economic fallout from the pandemic, there will be a renewed focus on corporate governance. Practices like excessive tax optimisation, poor labour and community relations, and poor environmental compliance will be harder to defend."

Given the unprecedented fiscal and monetary support to tackle the economic fallout from the pandemic, there will be a renewed focus on corporate governance. Practices like excessive tax optimisation, poor labour and community relations, and poor environmental compliance will be harder to defend. In contrast, companies with stronger ESG credentials are more likely to meet the conditions to receive government support through stimulus packages, Ramos-Martin argues.

Diversification benefits are possible too. According to *ESG Performance and Disclosure: A Cross-Country Analysis* published in 2019 by the European Corporate Governance Institute, ESG also has "a small, but statistically significant, impact on reducing volatility, which may mean there are portfolio diversification benefits from high-quality ESG investment in certain situations".

#### A more complete picture

Translating non-financial information into metrics that offer insight into financial performance can be a real challenge – requiring a step change from traditional company analysis which has, historically, been a separate skillset. "I'm expecting to see those skillsets converge," says Paul LaCoursiere, global head of ESG research at Aviva Investors. "Think about ESG from a financial or asset valuation perspective. If it's relevant there, it means that all analysts should be thinking about it and including it in their analysis, whether that's done to identify risk or opportunities. ESG should be joined up with the more traditional financial modelling that analysts have been doing for decades."

Furthermore, although ESG integration has largely focused on equities, LaCoursiere sees this as outdated. "Our view of ESG risk is that it's agnostic to the part of the capital structure you're investing in. In other words, you're analysing the company, and the risk is relevant whether you're investing in senior unsecured debt, subordinated debt or the equity," he says. "There could also be a different level of sensitivity or a different magnitude in terms of the ESG effect on pricing in credit relative to equities, but you'd expect the relationship to be correlated across equities and credit."

Investors' engagement approach should be equally uncompromising regardless of whether you're a bondholder or shareholder, adds Rachel Harris, senior investment director at Aviva Investors. She believes bondholders have as much power to affect changes by working with company management as equity investors, particularly for large-cap, investment-grade companies. "They are every bit as reliant on the debt capital market as they are on the equity capital market," she says.

# ESG: A tactical and strategic input

Outside equities and credit, ESG metrics have typically not been applied to strategic and tactical asset allocation decisions. That is changing, however. At the multi-asset level, ESG factors such as climate change might inform certain portfolio tilts due to concerns over stranded assets. For example, they may be incorporated into decisions on the portfolio exposure of one sector relative to another, or one country versus another.

Climate change also informs strategic asset allocation decisions. Modelling longer-term environmental scenarios may help gauge the potential physical exposures arising from climate risk in various countries – and therefore the impact to ratios such as productivity in different parts of the world, says Peter Fitzgerald, chief investment officer, multi-asset and macro at Aviva Investors.

# MORE THAN JUST A RISK MITIGATOR *continued*

#### Figure 2: US monthly unemployment rate



In India, for example, air pollution from intense crop residue burning led officials in New Delhi and other cities to take extreme measures such as shutting down schools, public buildings and construction work to protect public health. During a public health emergency in 2019, New Delhi's Air Quality Index touched 480 out of 500, which falls into the severe category. The consequences to its economy are significant. Estimates from the International Food Policy Research Institute suggest exposure to the pollution from crop burning causes economic losses of about US\$30 billion annually for the states of Punjab, Harvana and Delhi.4

The solution lies in more sustainable farming management practices, requiring government intervention. This may improve the underlying economy as well as air quality, says Fitzgerald. Having a view on the impact of new legislation to ban intense crop residue on pollution is therefore insightful.

"These kinds of inputs help us complete the investment picture," he says. "We don't just see ESG as a risk, we also see ESG as one more factor that helps us find opportunities, and this is integrated through every step of the investment process."

# Quantifying value and optimising portfolios

Linking non-financial, ESG information to forward-looking financial implications is critical for a more rigorous risk allocation and portfolio construction process. LaCoursiere is leading a collaboration with Aviva Quantum data scientists called ESG Elements, which aims to implement a more dynamic approach to ESG ratings, tailored by sector and linked to financial market performance.

Josh Lohmeier, head of North American investment grade credit at Aviva Investors, sees this playing "an important role in improving allocations to idiosyncratic ideas, as well as assessing risk at the broader portfolio level".



The first step is to better understand ESG drivers under various scenarios from a factor perspective. Water usage, for example, may be more relevant to a utilities company relative to a healthcare company, which may have higher reputational risk. In the future, artificial intelligence, machine learning and alternative uses of data may uncover material ESG information that traditional methods cannot. Raw media processing of news and social media posts, for example, could help investors gauge ESG momentum by tracking the increasing frequency of references classified as either negative or positive sentiment.

Additionally, modelling ESG indicators in a consistent and coherent manner to compare across companies and sectors, and then to conduct more accurate ESG stress tests, can improve ESG risk management and potentially generate alpha at the enterprise and portfolio levels, says Lohmeier.

"Are certain companies and sectors inherently causing climate change problems globally? And are they going to be more volatile?" adds LaCoursiere. "Then you need to consider how will the subtotal of your ESG risk impact performance at the portfolio level?" Sam Savage, author of *The Flaw of Averages: Why We Underestimate Risk in the Face of Uncertainty* and executive director of ProbabilityManagement.org, a nonprofit organisation focused on modelling uncertainty, uses rising sea levels to make a similar point, suggesting it can be analysed to help gauge climate change risk.

To apply to different economic situations, Savage argues probability distribution modelling techniques – developed in financial engineering – may be best suited for ESG stress tests. This technique represents uncertainty as an array of auditable simulated outcomes and metadata called a stochastic information packet (SIP). A global SIP of sea level rise could be accessed by individual regions, which in turn would calculate their own SIPs of economic impact based on local knowledge of factors such as the hydrology, tide basin and storm surges.

"The resulting SIPs would be coherent in that they reflected the same sea level conditions on each trial and could be added together to estimate the global economic impact. The data and the technology are there. It's a matter of getting everyone on board," says Savage, whose work for Shell in 2005 pioneered the field of probability management.

In the case of climate change, positive signs are emerging but much more needs to be done

In asset management, a multi-dimensional approach to risk modelling is perhaps most famously applied in the efficient frontier for portfolio construction. "We need the efficient frontier because you cannot represent utterly orthogonal dimensions as one number that will be meaningful to everyone," adds Savage. "You need a process of optimising the trade-off between the risk and return, which can then be applied to individual circumstances. Risk is in the eye of the beholder."

# A qualitative view

When considering ESG metrics, or any metrics for that matter, it is important not to place too much emphasis on quantitative factors alone. An ESG score is a snapshot in time. If it is not overlaid by qualitative information and judgement, the model will simply be a mirror of the past – a function of the information you have fed into it.

Additional qualitative inputs, such as shifts in the regulatory environment, physical and transition risks, and other material considerations, may indicate whether ESG momentum is improving, stabilising or deteriorating, and help investors evaluate whether "this company will improve in a year or two", says Harris.

"It's not only about the quantitative score, and it's not only about qualitative piece," she adds. "It's also how to engage with companies. After all, the best way of looking to the future of ESG is to try and influence that future. It's all of those elements – quantitative, qualitative and engagement – working together."

As Harris says, trying to influence the future is one way to gain more control of future outcomes. For example, investor engagement is designed to encourage companies to behave in more environmentally and socially responsible ways.

In the case of climate change, positive signs are emerging but much more needs to be done. "There has been a massive shift in the last three or four years, and companies have begun to acknowledge the need for them to take action," says Rick Stathers, senior ESG analyst and climate change specialist at Aviva Investors.

"But there are only 850 companies committed to align their emissions pathways with what is required under the Paris Agreement," he adds. "There just aren't enough companies fully analysing the potential ramifications – and what I mean by that is analysing the impact through the value chain, on cost of goods sold, on the supply chain, and ultimately, the impact to customers and their disposable income."

## **Understanding macro drivers**

ESG factors can also uncover insight at the macro level. Complementing country-level ESG scores with "a timely judgement on ESG momentum" helps investors identify material risks that may be mispriced in the market, says Tom Dillon, macro ESG analyst at Aviva Investors. A crackdown on press freedoms, for example, may indicate a shift in the future business environment.

This has been especially relevant in the spread of the coronavirus. In China, where COVID-19 originated, authorities revoked journalist credentials and silenced or arrested citizens who posted messages they deemed to be contradictory to official statements, according to the Committee to Protect Journalists and Reporters Without Borders.<sup>5</sup> Information suppression has been widespread, not only in China, but throughout the world. Because this is a global health crisis, a lack of transparency affects how other governments respond, how medical centres prepare for the sick and, ultimately, how investors gauge the risk.

The importance of understanding the impact of ESG drivers on macroeconomic dynamics at the portfolio level has never been stronger. "If investors don't understand or don't account for these macro ESG factors, they are frankly missing a major risk factor," adds Dillon. On the flipside, conventional economic indicators such as unemployment may provide a more nuanced understanding of how ESG trends can impact investments. In the US, more than 42 million workers had filed for unemployment benefits by the end of March because of the pandemic.<sup>6</sup> The unemployment rate neared 15 per cent at the end of April and, although it fell slightly in May to 13.3 per cent, it remains higher than at any time since the Great Depression (see Figure 2). Furthermore, income inequality has been rising, as shown in Figure 3.<sup>7</sup>

In their new book Trade Wars Are Class Wars, Matthew Klein and Michael Pettis argue rising inequality directly causes trade conflicts, including the ongoing tensions between the US and China, as government policies have benefitted the elite much more than the average worker. During the past two decades, the labour income share relative to China's national income has hovered around 40 per cent, far below the range of between 60 and 70 per cent for the US and Europe. The country's workers and retirees are earning a disproportionately low share of national income, which diminishes their purchasing power, Klein says.

As China's national income rises but the share going to pay its workers doesn't, deep imbalances are created in the local economy that then get exported to other countries, mainly the US, he adds. In response, the US and other countries face an unpleasant trade-off between rising debt, lower wages and lower employment, hurting workers there too. Trade imbalances are necessarily equal to domestic imbalances. Until such inequality is substantially reversed, global trade tensions are inevitable.

"The fetish for 'competitiveness' among businesses and, to a lesser extent, among governments, is ultimately self-defeating insofar as it mostly means cutting labour costs," says Klein. "What may make sense for an individual company doesn't work when every company behaves in the

# MORE THAN JUST A RISK MITIGATOR *continued*

# *Figure 3:* Top one per cent vs. bottom 50 per cent, share of national income

Share of national income, per cent

- Top 1 per cent ---- Bottom 50 per cent

same way. All that happens at the end of the day is lower disposable income for consumers, which either means lower sales or constant sales financed with higher debt. And while individual countries can try to preserve their manufacturing sectors and boost employment by reducing wages and non-wage costs, the net effect on the global economy if everyone tries to do this is to reduce overall incomes and, eventually, spending."

The result is too much global savings chasing too few investment opportunities. Klein and Pettis, among other economists, argue the result is a perpetually low global interest rate environment with significant implications on asset allocation decisions. Since the pandemic, more central banks are heading towards the zero bound, most notably the US Federal Reserve but also in some developing nations.

"Policy tools that were previously concentrated in developed markets – including ultra-low interest rates and quantitative easing – are increasingly being deployed in emerging markets," says Liam Spillane, head of emerging market debt at Aviva Investors. If you understand ESG factors in their entirety, you start to appreciate exactly why this is.

## **EMD and ESG**

Macro ESG metrics have clear relevance for emerging market debt investors. "We find ourselves in a really unprecedented situation because the COVID-19 crisis is not just an economic crisis. This is also a health crisis and arguably a social crisis in many countries," says Spillane. "As governments will need to issue more debt to support their economies, the scale and efficacy of doing so will come under increasing scrutiny." At the same time, domestic fundamentals may be deteriorating, potentially increasing sovereign bond yields and the costs of servicing that debt.



Set that against the social concerns, and the risk of default for certain emerging market sovereign debt could rise. Divergence between countries is also likely to increase. "The social element within ESG might become louder, more disruptive," Spillane adds. "We haven't seen much of this yet, but the intersection between economic fundamentals and social requirements could become quite disruptive."

The pandemic occurred at the same time as a dramatic drop in commodity prices, particularly oil, which is relevant to many emerging markets. In addition, tourism has been disrupted. "If we consider our investment outlook through the three different lenses, we end up with a situation in which the implications for each country look quite different in terms of its ability to weather this crisis," says Spillane.

Colombia, for example, is hurt by falling oil prices, as are Mexico and Brazil. However, the latter two will likely experience a more severe outbreak and a bigger impact from reduced tourism revenues. Thailand, on the other hand, has reported relatively fewer deaths and is not dependent on oil exports. Yet it will still be harmed by the disruptions in tourism, which directly and indirectly accounts for about 22 per cent of the country's gross domestic product (GDP).<sup>8</sup> In assessing the severity of the pandemic on emerging market sovereign issuers, ESG indicators linked to social unrest may provide information advantages. Take Peru, which is relatively attractive from a governance perspective due to its legislative and fiscal framework. Compared to Brazil or Mexico, it is not as dependent on revenues from oil and tourism for GDP growth.

However, a sharp uptick in social unrest in April and May could indicate trouble ahead as the country grapples with the COVID-19 outbreak, says Dillon. About 70 per cent of the labour force is in the informal economy and therefore may lack workplace protections such as unemployment benefits, healthcare and other social rights. A longstanding underinvestment in healthcare may exacerbate the spread of the virus. Even before the pandemic, socio-political dynamics had become more uncertain.

Many of the incidents of unrest stemmed from these long-term social and political factors, which coronavirus has laid bare. Newly unemployed informal workers, unable to afford city living, battled with police to breach lockdown rules while returning to their hometowns. Meanwhile, healthcare workers demonstrated against inadequate resources, local leadership and late payment of their salaries.

# Investment performance doesn't depend on ESG risk alone, but ESG risk can be a lens to find value

"The fundamentals in Peru are strong, but understanding the risks around social unrest and political fragmentation is going to be critical," Spillane says. "While the framework for how we think about ESG in our investment decisions hasn't changed, the emphasis we place on each of the 'E', 'S' and 'G' factors around how we view value creation will change, but on a case-by-case basis. There is no broad-brush solution."

## Engaging the real world

When it comes to the ability to advance the ESG agenda, perhaps the asset class in the best position to do so is real assets. Compared to listed equities, for example, owning a direct stake in a private infrastructure or real estate asset can give investors more sway, says Mark Versey, chief investment officer of Aviva Investors Real Assets.

"As owners, we have the ability to directly influence corporate activities that improve ESG resilience," he says. "In infrastructure equity, for example, we might own 100 per cent of the company and have people on the management team, or we might be on the board. This means we can directly influence strategy, by being part of the decision process rather than challenging from afar." Therefore, ESG risk assessment is fundamentally different from other asset classes. In equities, if engagement does not work, investors can easily sell out of their position. "However, in real assets, once you're in, you're in," says Ed Dixon, head of ESG for real assets at Aviva Investors.

Typically, the investment is for ten years or longer, while the assets may be designed to last decades more. This increases the need to be aware of the impact of ESG factors.

"The risk of trends manifesting over a longer period is substantially higher," says Dixon. "That forms the way we approach ESG in real assets – in terms of transactions, origination and investment strategy being a lot more front loaded."

Take a pharmaceutical and medical supplier. Although healthcare brings relatively less environmental risk, reputational problems may arise if the tenant is embroiled in a public controversy relating to drug pricing, injuries and fatalities linked to their products. Other social risks may involve business practices such as how it conducts research. In addition, governance considerations may include remuneration, board diversity and M&A strategies. Even if the deal is completed, ESG risk – as with all key investment risks – still needs to be monitored as appropriate to the growth of the business.

For example, employees from one pharmaceutical occupant in Cambridge had to work on premises throughout the COVID-19 crisis because the company is involved with testing kits being rolled out to hospitals globally.

"We worked with them to solve a lot of safety problems to protect employees," says Versey. "This has also helped us to progress on the journey on how to make buildings safer. When economic activities pick up, we can apply what we've learned to help other tenants."

Investment performance doesn't depend on ESG risk alone, but ESG risk can be a lens to find value. It can also help gauge the value at risk from disruptions including climate change, social unrest and, more recently, pandemics. Of all the asset classes, you could say that real assets have an unfair ESG advantage: Their tangible nature has always held appeal with investors.

As Versey puts it: "By being a direct owner, we have control. That's a really important point. This direct ownership gives us this long-term mentality, and a long-term mentality is critical in ESG"

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# POLICY MOVES INTO THE GREAT UNKNOWN, BUT AT WHAT COST?

Policymakers are dreaming up ever more radical experiments to try and pull economies out of what could be the deepest recession in living memory. But until the world can cure its addiction to debt, financial markets will remain on a knife edge.



In 1890, a New Yorker named Eugene Schieffelin took his love of William Shakespeare and ornithology to the next level by releasing 60 starlings, imported from England, into Central Park. He did the same with another 40 birds the following year.

Schieffelin's dream was to introduce all the birds mentioned in Shakespeare's plays to North America. Unfortunately, his plan was too successful for its own good. Scientists estimate US descendants from those two original flocks now number more than 200 million. The rapid spread of a bird that was not native to North America came at the expense of many other birds that compete for nest holes in trees. As well as the damage they have caused to local ecosystems, starlings have had a negative impact on the US economy - destroying agricultural crops, transmitting diseases to humans and other animals, and even causing damage to aircraft.

The story illustrates that even the most well-meaning of actions can have drastic unforeseen consequences. Fast forward to today, and parallels can be drawn with the situation facing policymakers trying to deal with the scale and breadth of the economic fallout from COVID-19. The circumstances dictated they had little option but to respond in dramatic fashion. While the unique nature of the problem means they are unlikely to stop a deep recession, financial market participants hope they will succeed in preventing lasting scars.

However, these responses come with big risks. As with Schieffelin's starlings, they are highly experimental. There are likely to be multiple unintended and unknowable consequences. Exacerbating these concerns is the fact many countries are already stuck in a high-debt, low interest rate trap with no obvious means of escape. Even in the most optimistic scenario, where economies are able to snap back quickly, policymakers are likely to be dealing with the fallout of this crisis for years to come. This could have profound implications for investment markets.

## Central banks act true to form

As the economic impact of COVID-19 became clearer, central banks were quick to flood financial markets with liquidity, slash interest rates where they had room to do so and purchase financial assets in unprecedented quantities. The immediate aim was to restore calm to jittery financial markets. Against that yardstick the measures can be judged a success.







# POLICY MOVES INTO THE GREAT UNKNOWN, BUT AT WHAT COST? *continued*

A large part of the explanation for the rally in risk assets since March is that yields on government bonds have been pinned to the floor. For example, the yield on 30-year US Treasuries sank to a record low of 0.94 per cent on March 9 after the Federal Reserve pledged to buy unlimited amounts of government debt, while vields on 30-year debt offering inflation protection went negative for the first time. Other countries' bond markets reacted in similar fashion with 30-year UK government bond yields falling to a record low of 0.50 per cent, and the yield on 30-year German bunds returning to negative territory.1

Central bankers are trying to limit the depth and duration of the current global recession by preventing credit from contracting too sharply. But the evidence of the past decade suggests the price of their actions could be ever more tepid growth further ahead. As US Federal Reserve chairman Jerome Powell recently conceded: "The path ahead is both highly uncertain and subject to significant downside risks," and the US risked an "extended period of low productivity growth and stagnant incomes".<sup>2</sup>

## The debt disease

Part of the problem is that most of the developed world went on a credit binge in the run up to the financial crisis which it has never had to wean itself off due to central banks' actions. While banks have managed to get leverage down, that has been replaced by record debt issued by non-financial corporations, private equity groups and others. And although household debt has fallen in the US and other countries, that debt has merely been transferred to governments.

According to the Institute of International Finance, global debt totalled \$255 trillion at the end of 2019. That was the equivalent of 322 per cent of GDP, 40 percentage points higher than in 2008 at the onset of the global financial crisis.<sup>3</sup>

#### Figure 2: US credit expansion outpaces economy



Although rising levels of credit can lift spending and economic activity temporarily, there is a limit to how much credit an economy can absorb. Even in a world of zero interest rates, ever higher principal repayments will eventually begin to overwhelm any benefit of low debt servicing costs and start eating into spending. There is no way of knowing for sure, but the danger is most developed countries are now at, or at least close to, that point, and maybe even well beyond it.

In the US, credit creation, as measured by M2 money supply, rose broadly in line with economic output between 1960 and 1982. But since then, the relaxation of banking regulations and availability of ever cheaper money has led to the rate of credit creation far exceeding economic growth. The gap has been especially pronounced over the past two decades. As Figure 2 shows, whereas M2 has risen 210 per cent since the start of the century, nominal economic output has risen by just over half that. Moreover, the divergence has been greatest over the past decade.

One potential route to lowering debt burdens would be strong economic growth. Unfortunately, growth across the developed world has been on a sharp downward trajectory for more than half a century. As Figure 3 shows, trend growth in real GDP in the G7 has plunged from around five per cent in the early 1960s to little more than one per cent today.

#### Adverse side effects

A number of factors could be at play here. Ageing populations, for example, have meant spending on healthcare, social care and pensions has consumed an ever-rising share of scarce resources.

Nevertheless, and even while recognising ultra-low interest rates have suppressed the cost of servicing debt, there are reasons to believe central banks' actions may be doing more harm than good.

Take productivity, the ultimate determinant of an economy's potential growth rate. Across developed nations, productivity growth has been declining for at least three decades. For example, since 1990, US labour productivity grew just 78 per cent. While there are many reasons for this, it appears central banks' policies could be exacerbating the problem. Far from incentivising investment, they seem to be discouraging it.<sup>4</sup>

Public and private companies have taken advantage of low interest rates to issue record amounts of debt over the past decade. But since an immediate financial gain today is worth more than a potential future one through investment, rather than being used to fund new capital projects, companies have often found it more profitable to focus instead on financial engineering. Listed companies have looked to boost shareholder returns via stock repurchases and dividends, while private equity activity has surged.

Figure 3: GDP in long-run decline across G7



According to the Institute of International Finance, global debt totalled

\$255 trillion

at the end of 2019

Source: Federal Reserve Bank of St. Louis.

"To get back to some sort of economic normality we need to get away from the zero lower bound and push up the rate of return on capital," says Patrick Minford, professor of applied economics at Cardiff Business School and a former advisor to the UK government.

Worryingly, when one looks ahead, companies have been reining in capital expenditure to preserve cash. It is not obvious there will be a strong pick-up when economic growth returns. While some have compared the battle against COVID-19 to a war, as former International Monetary Fund chief economist Olivier Blanchard noted: "Uncertainty is likely to lead to low investment; unlike a regular war, there is no capital to rebuild."<sup>5</sup>

# The paradox of age and wealth

Low interest rates are also designed to boost economic activity by encouraging greater household consumption through: the wealth effect via higher asset prices; making saving less attractive; and increasing disposable income by lowering the cost of servicing mortgages and other forms of debt. Once again, however, there are reasons to believe monetary policy is having unintended consequences that are at the very least blunting its effectiveness.

Take wealth effects and savings. Low rates have undoubtedly provided rocket fuel to financial assets, as reflected by the ratio of

household net worth to household income surging to a record high in most countries over the past decade. Yet less of this additional wealth has been spent than might have been expected because of soaring inequality. Assets are disproportionately owned by the wealthiest, who have a much lower marginal propensity to consume.

This helps explain why there is little evidence of falling savings rates.

According to OECD data, while household saving has declined in the UK over the past decade, in Germany, which has one of the oldest populations of any European country, the opposite has happened. As Figure 5 shows, the country's savings rate, after initially falling, has been on the rise.

An even more extreme trend can be seen in the US, where the personal savings rate, having hit a post-war low of 2.2 per cent in July 2005, has since climbed steadily to around eight per cent.<sup>6</sup>

The fact populations have been ageing across the developed world offers a further clue why low interest rates have failed to discourage saving. By depressing prospective investment returns, they could be encouraging people to plough more of their income into their pensions, especially as they approach retirement.

As for the idea falling debt servicing costs have put more money into consumers' hands, while that may be true for younger households, lower rates have simultaneously taken money away from savers. That is why in September last year Japan's central bank governor Haruhiko Kuroda warned excessively low yields could damage consumer sentiment as returns on pensions and other long-term investments dropped.<sup>7</sup>

Research by Princeton economist Arlene Wong shows that as people age, they lift consumption by far less in response to monetary policy shocks. Since they have smaller outstanding mortgage balances, they have less incentive to refinance following an interest rate cut. Indeed, for those reliant on pension income she finds evidence lower rates lead to lower spending.<sup>8</sup>

# Inflation and the law of diminishing returns

In the absence of strong economic growth, a second route to lowering debt and avoiding a painful round of defaults and debt restructurings would be higher inflation. However, recent evidence does not support this idea. When central banks first deployed unconventional monetary policy in the wake of the financial crisis, there were widespread warnings of much higher inflation.

Yet, while asset price inflation may have ensued, this has not been mirrored by rising consumer prices. This is partly because China, Germany and Japan have exported deflation to the rest of the world. All three are large manufacturing exporters, have \_\_\_\_\_

# POLICY MOVES INTO THE GREAT UNKNOWN, BUT AT WHAT COST? *continued*

a massive surplus of saving over investment and huge trade surpluses. Now, with unemployment soaring across the world, and precautionary saving likely to rise sharply, the threat of inflation arguably looks even more remote, at least for now.

Central banks are naturally keen to dispel the idea they have run out of ammunition and are powerless to prevent what looks increasingly likely to be the deepest recession since the Great Depression. However, since it typically takes up to 500 basis points of interest rate cuts to fight recessions, growing doubts over the effectiveness of monetary policy are understandable.

As former Federal Reserve Chairman Ben Bernanke wrote in 2016, since the benefit of low rates may erode over time and the costs are likely to increase, at some point monetary policy faces "diminishing returns".<sup>9</sup>For example, as interest rates approach zero, there is progressively less scope for households to fix mortgages at lower rates.

# The return of big government?

As a result, pressure on governments in advanced countries to get deficits under control has suddenly evaporated and the ideas of John Maynard Keynes, the original advocate of fiscal activism during the Great Depression, have been revived.

Washington has already passed \$3 trillion in fiscal stimulus measures since the crisis began, equivalent to 15 per cent of GDP, and Democrats in Congress are pushing for that to be doubled.<sup>10</sup> Governments elsewhere are promising vast sums as they attempt to play the role of consumer of last resort amid spiralling unemployment and precautionary savings.

Many economists would see big deficits as a price worth paying to combat the crisis. Few would take issue with Powell when he recently said additional fiscal stimulus may be "worth it" if it helps prevent otherwise sound companies going bankrupt and keeps workers in jobs as "deeper and longer

#### Figure 4: US net worth vs. disposable income



recessions" tended to leave "lasting damage to the productive capacity of the economy".<sup>11</sup>

Where there is less agreement is on the longer-term implications of ballooning government deficits for economic growth. While fiscal stimulus can help pull an economy out of a depression, the quid pro quo will almost inevitably be weaker growth further ahead.

#### Alice in Wonderland economics

Charles Goodhart, former chief economist at the Bank of England, says much of the lost demand from recent weeks, especially within the services sector, is permanently lost. "The daily commute to work, or the horrifically executed haircuts at home, will not be demanded twice over whenever normal life resumes."<sup>12</sup>

Minford, meanwhile, says while he is hopeful the recession can end as quickly as it began, "to believe governments can simply pay people to stay at home, borrow money and that there won't be an economic cost to that is to believe in Alice in Wonderland economics".

In 2010, US economists Carmen Reinhart and Kenneth Rogoff published a paper *Growth in a Time of Debt* in which they presented evidence suggesting high levels of public debt had negative consequences for economic growth. The widely cited paper sparked a lively debate among economists, not least because it was seized upon by politicians to justify fiscal austerity.

Following widespread criticism of their methodology and findings, the economists presented new data in 2012 and repeated their claim that where gross public debt exceeds 90 percent of nominal GDP on a sustained basis it has a negative impact on growth, even when markets seem willing to absorb it at low interest rates.<sup>13</sup>

According to the OECD, average general government debt-to-GDP ratios among G7 countries had by 2018 risen to 134 per cent, having a decade earlier been under 100 per cent.<sup>14</sup> Moreover, those numbers do not take into account unfunded liabilities such as pension and healthcare costs. In many cases, these are substantial. This helps explain why UK Chancellor Rishi Sunak is reportedly considering scrapping a guarantee that the basic state pension will rise by a minimum of either 2.5 percent, the rate of inflation or average earnings.<sup>15</sup>

Part of the reason economists cannot agree on what higher government deficits mean for economic growth is they have such different takes on how they should be funded. The orthodox view is deficits eventually need to be reduced to more manageable levels by either growing tax receipts or cutting spending. Failure to do so leads to interest rates climbing and private sector investment being 'crowded out'.
*Figure 5:* Germany personal savings ratio



As we come out of this recession, we need expansionary policy to continue to keep the economy growing

This explains why OECD secretary general Angel Gurría has warned rising debt levels will "come back to haunt us",<sup>16</sup> and the UK's Institute for Fiscal Studies said in March "the tax and spend trade-offs facing policymakers will be made starker for years, and more likely for decades, as they strive to bring debt back down".<sup>17</sup> Sunak is also reportedly contemplating raising taxes to pay for increased spending.<sup>18</sup>

Minford believes it would be an error to lift taxes too soon. "With the benefit of hindsight, the austerity policies many countries adopted after the financial crisis were a mistake. As we come out of this recession, we need expansionary policy to continue to keep the economy growing," he says.

## **Monetary financing**

The idea bigger deficits will ultimately lead to higher taxes or lower spending is deeply ingrained in traditional teaching of economic and financial theory. However, a growing band of economists argue central banks should simply print the money. Followers of modern monetary theory go as far as to propose permanent 'monetary financing', arguing governments need never issue debt to finance spending.

Adair Turner, chairman of the UK's Financial Services Authority during the financial crisis, is among those advocating monetary financing, albeit on a "one-off and disciplined" basis. He believes had authorities chosen this route in 2009, the likely result would have been stronger economic growth, higher inflation, a quicker return to 'normal' levels of interest rates, and less public and private sector debt.

"The beauty of monetary finance is it does not create a debt contract into the future. By refusing to consider that option we were left with very low interest rates as our only tool. What they do is make it easier to create private credit, which is an alternative way of stimulating the economy, but one which creates future vulnerability," he explains.

The suggestion they should break such a long-held and sacred taboo by financing government deficits directly is understandably abhorrent to central banks. In April, Governor Andrew Bailey denied the Bank of England was using monetary financing, sometimes known as 'helicopter money', which he said would damage its credibility to control inflation. He noted permanent expansions of central banks' balance sheets with the aim of funding governments has been linked in other countries to runaway inflation.<sup>19</sup>

Turner believes that is no reason to rule out the option. "If you say we shouldn't be doing monetary finance because it will lead to inflation, then you shouldn't be cutting interest rates or doing QE. It all boils down to how much you do."

He is not alone. Mervyn King, one of Bailey's predecessors, recently said the question was

not whether the central bank should print money to buy government bonds, but rather "how much".<sup>20</sup> Bernanke too has said it would be premature to rule it out.<sup>21</sup>

## A game of illusion

For now, it seems likely that, while central banks will continue buying government debt in record quantities, they will maintain these purchases are temporary and reversible.

As Lord Turner puts it: "We've been terrified of increasing high-powered money, so we'll end up doing it while continuing to deny we're doing it. This is what Japan has done because central banking is a bit like the Wizard of Oz, a game of illusion."

Japan's public debt to GDP ratio has in recent years soared to 225 per cent, with 40 per cent of the debt owned by the Bank of Japan.<sup>22</sup> Few economists or financial market participants expect much, if any, of that debt to ever be sold. The danger is the only people who do believe it are consumers who then restrain consumption in anticipation of higher taxes, negating much of monetary financing's potential stimulatory benefit.

While much of the fiscal stimulus announced recently is intended to shield households from the worst effects of the COVID-19 crisis, companies have also benefitted from massive state support. ~

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Washington for instance in April promised \$25 billion for the crippled airline industry. The previous month, the British government effectively nationalised the country's rail operators on a temporary basis to prevent them entering insolvency. France has said it will use all means to support big companies, including nationalisation if necessary.

# **State intervention**

With central banks simultaneously mopping up record amounts of corporate debt to suppress borrowing costs, some reckon the inevitable consequence will be more state intervention in the coming years. Billionaire US investor Leon Cooperman says the crisis will change capitalism forever.

"When the government is called upon to protect you on the downside, they have every right to regulate you on the upside. So capitalism is changed," the chairman and CEO of Omega Advisors told CNBC.<sup>23</sup>

In March, US Democratic Senator Elizabeth Warren demanded any company being bailed out be permanently barred from share buybacks, be prohibited from paying out dividends or executive bonuses for three years, and offer a minimum of one seat on their board to a workforce representative.<sup>24</sup>

While the proposals went too far for Republican lawmakers, President Donald Trump said in March: "I want money to be used for workers and keeping businesses open, not buybacks."<sup>25</sup>

As many bankers learned in 2008, government bailouts typically come with strings attached. In exchange for their support, it is inevitable politicians will demand restrictions on some companies that have been bailed out to make the rescues more politically palatable. Whether that leads to more widespread intervention in corporate affairs remains to be seen. Minford, a prominent supporter of the free market policies of former UK Prime Minister Margaret Thatcher, believes governments should resist the temptation to intervene too heavily. "I think the state's role is going to be seen as increasingly important given the nature of the current healthcare crisis. But I don't think this necessarily should equate to a bigger or more interventionist state," he says.

# **Economic nationalism**

The crisis looks set to cause lasting changes for companies in other ways. For example, the over-reliance of global supply chains on China, be it in healthcare equipment, pharmaceuticals, or automobiles, has become clear.

Already it looks as if economic nationalism is speeding up. For instance, in April Japan set aside 243.5 billion yen to help pay for manufacturers to shift production out of China, its biggest trading partner.<sup>26</sup>

A number of European politicians have also been using the pandemic to justify a softening of their commitment to competition and the free market. "You should use all options to protect critical European companies from foreign takeovers or influence that could undermine our security and public order," said Ursula von der Leyen, president of the European Commission.<sup>27</sup>

The crisis could trigger increased state involvement in economies in another important way. Infrastructure spending seems likely to rise as governments look to revive their economies. As Minford says: "In the current situation that would be an obvious way to boost economic activity. Moreover, so long as the money is spent sensibly it ought to be good for productivity." Lord Turner agrees that it would make sense for governments to try to lift productivity by rolling out new fibre-optic networks and speeding up progress towards a zero-carbon economy. Unfortunately, projects such as these take time to get off the ground. In the meantime, governments may have to content themselves with accelerating smaller-scale projects such as refurbishing properties, schools and hospitals that were already slated to get improvements "to help get the construction sector going as much as possible", says Lord Turner.

## Investment risks increase

As monetary policy becomes ever more experimental and government deficits balloon, it is increasingly difficult to forecast asset returns. Long-term investors like pension funds and insurance companies are being forced to take more risk to secure ever lower levels of income.

It is possible developed economies will rebound reasonably quickly, especially if a vaccine for COVID-19 can be found, and thereafter respectable levels of growth will return with moderately higher inflation. In that environment interest rates could stay extremely low, encouraging further demand for carry trades and underpinning the price of riskier assets everywhere.

As recent experience proves, financial assets do not need strong economic growth to deliver stellar returns so long as they can rely on a supportive monetary policy environment. But the uncomfortable truth for investors is that policymakers are fast running out of road.

"With 30-year Treasuries yielding little more than one per cent, investors need to lower their return expectations across the board. The kind of returns we've seen over the past ten years are not going to be repeated this decade, no matter what policy response central banks magic up," says Peter Fitzgerald, multi-asset and macro chief investment officer at Aviva Investors.

While central banks could theoretically buy more corporate bonds and even equities, this creates moral hazard. The decision by many corporations to take on so much debt in recent years has reduced their capacity to weather the storm.

## More upheaval ahead?

Moreover, it is important to remember the ultimate goal of monetary policy is to support economic activity and not boost asset prices. If such measures widen inequality even further, the risk will be more social upheaval.

Lord David Willetts, a former member of the British government, says it is already clear monetary policy has played a crucial role in fuelling inequality by boosting wealth far faster than incomes. "This surge in wealth relative to income is at the heart of a lot of what's going wrong. It's changing the character of society," says Lord Willetts. He believes governments will inevitably have to tax wealth more heavily.

It is clear the monetary policy experiment of recent years, as with the release of the hapless Schieffelin's starlings, is having multiple adverse and unintended consequences for economies. By promising ever more extreme measures and layering massive amounts of debt on top of an already huge pile, those adverse consequences could multiply.

For now, it seems unlikely central banks will experiment with pure monetary financing as it would represent an even bigger leap into the unknown. But as Lord Turner says: "If our only way to get out of this trap is via setting interest rates so low as to create strong incentives for private credit growth, we seem condemned to repeat the same mistakes of the past."

Until authorities can find a way to raise interest rates to more normal levels and simultaneously lower debt burdens, financial markets will continue to live on a knife edge. In terms of investing, Fitzgerald says the need for portfolios to be diverse and resilient to a wide range of outcomes, including high levels of both deflation and inflation, has never been greater ●

# The ultimate goal of monetary policy is to support economic activity and not boost asset prices



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# FIVE CHARTS ON INVESTMENT RESILIENCE

In troubled times, the benefits of portfolio diversification can be boosted by taking a fresh look at the drivers of resilience, as the following five charts illustrate. Diversification is the foremost driver of a portfolio's resilience, but there is more to achieving this than random asset selection. All historical relationships can break down, so investors must constantly question and reassess them.

Figures 1a and 1b show correlations between different assets. The first chart shows correlations over the 12 months to January 3, what could be classified as a 'normal' market environment; the second shows correlations for the 12 months to April 15, which includes the period of high market stress linked to COVID-19.

In the first chart, where concerns over a global pandemic were absent, the cooler colours show many assets behaved differently from each other, providing a

#### *Figure 1a:* 52-week correlations as of January 3, 2020

Bloomberg Barclays UK Govt Inf	1.00	-0.24	0.09	-0.37	-0.26	0.20	-0.20	-0.31	-0.23	-0.32	-0.21	-0.36	-0.36	0.23	-0.34	-0.47	-0.33	-0.66	0.41		
WTI Crude Future May 20	-0.24	1.00	-0.16	0.26	0.02	0.12	0.53	0.51	0.37	0.34	0.46	0.52	0.53	0.18	0.49	0.53	0.51	0.26	0.07		0.8
Dollar Index Spot	0.09	-0.16	1.00	-0.55	-0.02	-0.30	-0.23	-0.12	-0.32	-0.31	-0.11	-0.22	-0.20	-0.03	-0.11	-0.37	-0.33	-0.01	-0.49		0.0
FTSE EPRA Nareit Developed Eur	-0.37	0.26	-0.55	1.00	0.03	0.13	0.50	0.43	0.54	0.52	0.37	0.52	0.50	0.25	0.42	0.62	0.66	0.40	0.01		
Germany Govt Bnd 10 Yr DBR	-0.26	0.02	-0.02	0.03	1.00	-0.05	0.15	0.12	-0.03	0.05	0.09	0.07	0.10	-0.00	0.06	0.14	0.03	-0.01	-0.08		
JP Morgan EMBI Global	0.20	0.12	-0.30	0.13	-0.05	1.00	0.38	0.39	0.27	0.34	0.40	0.35	0.35	0.39	0.35	0.25	0.18	-0.39	0.48		0.4
Bloomberg Barclays US Corporate	-0.20	0.53	-0.23	0.50	0.15	0.38	1.00	0.73	0.71	0.65	0.66	0.78	0.78	0.41	0.72	0.65	0.70	0.32	0.02		
MSCI World Quality Net Total R	-0.31	0.51	-0.12	0.43	0.12	0.39	0.73	1.00	0.61	0.62	0.95	0.96	0.97	0.40	0.97	0.80	0.76	0.36	-0.07		
MSCI AC Asia Pacific Index	-0.23	0.37	-0.32	0.54	-0.03	0.27	0.71	0.61	1.00	0.93	0.61	0.72	0.68	0.06	0.61	0.66	0.74	0.46	-0.04		
MSCI Emerging Market Index	-0.32	0.34	-0.31	0.52	0.05	0.34	0.65	0.62	0.93	1.00	0.62	0.69	0.64	0.02	0.59	0.65	0.71	0.41	0.01		0.0
MSCI USA Information Technology	-0.21	0.46	-0.11	0.37	0.09	0.40	0.66	0.95	0.61	0.62	1.00	0.90	0.89	0.33	0.92	0.73	0.68	0.28	-0.02		
MSCI World Index	-0.36	0.52	-0.22	0.52	0.07	0.35	0.78	0.96	0.72	0.69	0.90	1.00	0.99	0.36	0.98	0.86	0.83	0.46	-0.06		
MSCI World ESG Leaders Net Ret	-0.36	0.53	-0.20	0.50	0.10	0.35	0.78	0.97	0.68	0.64	0.89	0.99	1.00	0.38	0.97	0.86	0.81	0.44	-0.07		
MSCI US REIT Index	0.23	0.18	-0.03	0.25	-0.00	0.39	0.41	0.40	0.06	0.02	0.33	0.36	0.38	1.00	0.42	0.13	0.17	-0.19	0.21		-0.4
S&P 500 Index	-0.34	0.49	-0.11	0.42	0.06	0.35	0.72	0.97	0.61	0.59	0.92	0.98	0.97	0.42	1.00	0.78	0.73	0.40	-0.07		
Euro Stoxx 50 Price EUR	-0.47		-0.37	0.62	0.14	0.25	0.65	0.80	0.66	0.65	0.73	0.86	0.86	0.13	0.78	1.00	0.87	0.50	-0.04		
FTSE 100 Index	-0.33		-0.33	0.66	0.03	0.18	0.70	0.76	0.74	0.71	0.68	0.83	0.81	0.17	0.73	0.87	1.00	0.53	-0.08		-0.8
US Generic Govt 10 Yr	-0.66	0.26	-0.01	0.40	-0.01	-0.39	0.32	0.36	0.46	0.41	0.28	0.46	0.44	-0.19	0.40	0.50	0.53	1.00	-0.53		-0.0
Gold	0.41	0.07	-0.49	0.01	-0.08	0.48	0.02	-0.07	-0.04	0.01	-0.02	-0.06	-0.07	0.21	-0.07	-0.04	-0.08	-0.53	1.00		
	Bloomberg Barclays UK Govt Inf	WTI Crude Future May 20	Dollar Index Spot	FTSE EPRA Nareit Developed Eur	Germany Govt Bnd 10 Yr DBR	JP Morgan EMBI Global	Bloomberg Barclays US Corporate	MSCI World Quality Net Total R	MSCI AC Asia Pacific Index	MSCI Emerging Market Index	MSCI USA Information Technology	MSCI World Index	MSCI World ESG Leaders Net Ret	MSCI US REIT Index	S&P 500 Index	Euro Stoxx 50 Price EUR	FTSE 100 Index	US Generic Govt 10 Yr	Gold		

Source: Aviva Investors, Bloomberg, as of April 15, 2020.

good level of diversification. By contrast, the second chart shows a level of market stress. Most assets started behaving in the same way, as evidenced by the prevalence of red, stripping portfolios of their protection. However, a few safe havens could still be found (such as government bonds), and portfolios allocated across such assets would have been more resilient.

#### ESG as a risk mitigator

During the global financial crisis of 2007-2009, when many correlations went to one as asset prices moved in lockstep,

environmental, social and governance (ESG) factors proved among the best sources of resilience. A Bank of America Merrill Lynch study published in September 2019 found that "15 out of 17 bankruptcies in the S&P 500 between 2005 and 2015 afflicted companies with poor environmental and social scores five years prior to the bankruptcies".<sup>1</sup>

In fact, with the world more connected than ever and risks becoming increasingly complex, the power of ESG integration as a risk management tool has grown significantly. The vast majority of key risks listed in the World Economic Forum's Global Risks 2020 report (as shown in Figure 2) are linked to environmental issues, social disruption or governance failures.<sup>2</sup> Even more importantly, many of these are interlinked, and the materialisation of one risk could have unintended and unpredictable knock-on effects elsewhere.

Allocating capital to companies with sound ESG credentials and encouraging the adoption of best practice through shareholder engagement can help make portfolios more resilient, particularly for longer-term investors.

#### Figure 1b: 52-week correlations as of April 15, 2020

Bloomberg Barclays UK Govt Inf	1.00	0.09	-0.55	0.44	0.21	0.67		0.48	0.47	0.34	0.43	0.50	0.51	0.62	0.48	0.43	0.49	-0.52	0.68		
WTI Crude Future May 20	0.09	1.00	-0.09	0.28	-0.03	0.46	0.39	0.36	0.25	0.39	0.29	0.33	0.34	0.15	0.33	0.28	0.35	-0.02	0.16		0.8
Dollar Index Spot	-0.55	-0.09	1.00	-0.62	-0.09	-0.72	-0.67	-0.53	-0.62	-0.51	-0.50	-0.58	-0.58	-0.64	-0.54	-0.54	-0.59	0.29	-0.69		0.0
FTSE EPRA Nareit Developed Eur	0.44	0.28	-0.62	1.00	0.00	0.78	0.82	0.82	0.84	0.81	0.74	0.89	0.89	0.86	0.84	0.88	0.90	0.12	0.64		
Germany Govt Bnd 10 Yr DBR	0.21	-0.03	-0.09	0.00	1.00	0.14	0.09	0.06	0.08	0.07	0.07	0.04	0.05	0.05	0.02	0.07	0.05	-0.25	0.15		
JP Morgan EMBI Global	0.67	0.46	-0.72	0.78	0.14	1.00	0.91	0.79	0.80	0.77	0.72	0.82	0.83	0.78	0.78	0.76	0.80	-0.27	0.74		0.4
Bloomberg Barclays US Corporate	0.58	0.39	-0.67	0.82	0.09	0.91	1.00	0.88	0.86	0.83	0.85	0.90	0.91	0.87	0.90	0.76	0.82	0.03	0.63		
MSCI World Quality Net Total R	0.48	0.36	-0.53	0.82	0.06	0.79	0.88	1.00	0.90	0.88	0.97	0.98	0.98	0.87	0.99	0.85	0.88	0.16	0.60		
MSCI AC Asia Pacific Index	0.47	0.25	-0.62	0.84	0.08	0.80	0.86	0.90	1.00	0.95	0.83	0.93	0.92	0.77	0.87	0.92	0.93	0.07	0.63		
MSCI Emerging Market Index	0.34	0.39	-0.51	0.81	0.07	0.77	0.83	0.88	0.95	1.00	0.83	0.89	0.88	0.71	0.86	0.85	0.87	0.16	0.54		0.0
MSCI USA Information Technology	0.43	0.29	-0.50	0.74	0.07	0.72	0.85	0.97	0.83	0.83	1.00	0.94	0.93	0.84	0.97	0.75	0.78	0.24	0.51		
MSCI World Index	0.50	0.33	-0.58	0.89	0.04	0.82	0.90	0.98	0.93	0.89	0.94	1.00	1.00	0.90	0.98	0.91	0.93	0.15	0.64		
MSCI World ESG Leaders Net Ret	0.51	0.34	-0.58	0.89	0.05	0.83	0.91	0.98	0.92	0.88	0.93	1.00	1.00	0.90	0.98	0.91	0.93	0.13	0.65		
MSCI US REIT Index	0.62	0.15	-0.64	0.86	0.05	0.78	0.87	0.87	0.77	0.71	0.84	0.90	0.90	1.00	0.91	0.74	0.78	0.11	0.63		-0.4
S&P 500 Index	0.48	0.33	-0.54	0.84	0.02	0.78	0.90	0.99	0.87	0.86	0.97	0.98	0.98	0.91	1.00	0.82	0.86	0.22	0.58		
Euro Stoxx 50 Price EUR	0.43	0.28	-0.54	0.88	0.07	0.76	0.76	0.85	0.92	0.85	0.75	0.91	0.91	0.74	0.82	1.00	0.97	0.03	0.68		
FTSE 100 Index	0.49	0.35	-0.50	0.90	0.05	0.80	0.82	0.88	0.93	0.87	0.78	0.93	0.93	0.78	0.86	0.97	1.00	0.03	0.69		0.0
US Generic Govt 10 Yr	-0.52	-0.02	0.29	0.12	-0.25	-0.27	0.03	0.16	0.07	0.16	0.24	0.15	0.13	0.11	0.22	0.03	0.03	1.00	-0.47		-0.8
Gold	0.68	0.16	-0.69	0.64	0.15	0.74	0.63	0.60	0.63			0.64	0.65	0.63	0.58	0.68	0.69	-0.47	1.00	-	
	Bloomberg Barclays UK Govt Inf	WTI Crude Future May 20	Dollar Index Spot	FTSE EPRA Nareit Developed Eur	Germany Govt Bnd 10 Yr DBR	JP Morgan EMBI Global	Bloomberg Barclays US Corporate	MSCI World Quality Net Total R	MSCI AC Asia Pacific Index	MSCI Emerging Market Index	MSCI USA Information Technology	MSCI World Index	MSCI World ESG Leaders Net Ret	MSCI US REIT Index	S&P 500 Index	Euro Stoxx 50 Price EUR	FTSE 100 Index	US Generic Govt 10 Yr	Gold		

Source: Aviva Investors, Bloomberg, as of April 15, 2020.

# FIVE CHARTS ON INVESTMENT RESILIENCE *continued*

## Hubris versus humility

The current crisis has sparked a debate among financial market participants on the wisdom of "just in time" versus "just in case". As the *Financial Times* recently noted: "Adequate preparedness demands wider margins and buffers. It also requires a tolerance for slack that goes against the grain of what, pre-Covid-19, was orthodox management thinking."<sup>3</sup>

Professor John Kay, who recently co-authored *Radical Uncertainty: Decision Making for an Unknowable Future* with former Bank of England governor Mervyn King, explains that investors trying to protect against this kind of disruption need to seek opportunities that are inherently more robust and resilient.

"For that, you need to have what engineers would think of as "modularity"; i.e. a system built in such a way that when one part fails it doesn't bring down the whole system. You also need redundancy, which means not trying to run things with the minimum margins of safety you can get away with. You've had banks and insurers talking about 'surplus capital', as if it's possible for businesses to have too much money."

Figure 3 shows how companies' resilience, expressed as sound balance sheets, is reflected in their performance so far in 2020.

# Consider a range of possible futures

It's not easy, however, to take these ideas on board. Individual investment ideas must collectively amount to an optimal and efficient portfolio to build resilience. This is where portfolio construction makes a difference. Correlation analysis helps ensure risk exposures are diversified, portfolio optimisation techniques can find the most efficient balance of allocations across assets, and scenario analysis can reveal the downside risk of an investment idea.

# Figure 2: The Global Risks Interconnections Map 2020 – World Economic Forum



Source: World Economic Forum, Global Risks 2020 report.

## Figure 3: Strong balance sheets compared to global equities

#### Cumulative performance per cent



Source: Bloomberg, Aviva Investors, as of 30 April 2020.

When it comes to our decision making, we tend to ignore the downside – it's called the illusion of control

Investors should consider all possible outcomes – including the worst-case scenarios – and build portfolios from there, a principle equally applicable in the real world. "We tend to have a more optimistic view of the future, partly because we imagine we have more control over the outcome than we do. In other words, when it comes to our decision making, we tend to ignore the downside – it's called the illusion of control," says Annie Duke, World Series of Poker champion and author of *Thinking in Bets: Making Smarter Decisions When You Don't Have All the Facts.* 

Analysing scenarios, as shown in Figure 4, allows us to see what would happen to our investment returns in our central case (blue line), if things turned out better than we think, and if things turn out worse than we expect. It also clearly shows there is a point where downside risk becomes far too big to take just to make a few extra basis points in returns if things go to plan.

Done properly, such an approach allows portfolio managers to shed the "illusion of control" and build resilience into every investment decision.

## Volatility in perspective

When markets are at their most stressed, it may seem that all asset prices will collapse, and it is extremely difficult to protect portfolios. In such circumstances, often the best thing to do is wait out the downturn and resist the temptation to sell. In other words, do nothing.

As Figure 5 shows, even highly volatile equity markets regain lost ground given enough time.

"I should just make a commitment that, if the market goes down three per cent in a day, my reaction as an investor will be to do nothing," adds Duke. "No matter how much I think, having observed that downside outcome, that I should sell, I know in advance that my reaction will be to do nothing, and I am much more likely to behave in a rational way"

# *Figure 4*: Scenario analysis: targeting the optimal risk level for performance and resilience

Relative performance vs benchmark





# Figure 5: SPX Total Return index over time



Source: Bloomberg, S&P, Aviva Investors, as of April 24, 2020.

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# SIZE MATTERS: WILL COVID-19 LEAD TO A CONCENTRATION OF CORPORATE POWER?

History suggests the economic slowdown will widen existing divisions between companies

99

The fallout from the coronavirus pandemic could see large firms cement their dominance over weaker rivals. We examine the implications for investors.

In 1904, investigative journalist Ida Tarbell published *The History of the Standard Oil Company*, which documented the rise of the US oil giant under its founder, John D. Rockefeller. Exhaustively researched and vividly detailed, Tarbell's book showed how the company wielded its monopoly power to crush smaller rivals.

Tarbell was seen as a troublemaker in some quarters – President Theodore Roosevelt dubbed her style of reformminded journalism "muckraking"– but her book became a bestseller and played a role in turning public opinion against corporate behemoths, which were accused of stifling competition. Standard Oil was broken up by regulators in 1911.

Tarbell might have recognised the structure of US business more than a century later. Even before the coronavirus pandemic hit, bigger companies had seized market share from smaller ones, especially in the technology sector, where digital platforms favour incumbents and first movers. On a range of metrics, markets in advanced economies have become less competitive over the last two decades, most notably in the US.

COVID-19 could see dominant firms gain a further advantage, as they should be better positioned to withstand an economic downturn. So how could these trends reshape the investment landscape? And could public sentiment again turn against the largest companies, as it did in Tarbell's day?

## Zombie apocalypse

Start with the immediate consequences of the pandemic. History suggests the economic slowdown will widen existing divisions between companies. In the last three recessions, the share prices of US firms in the top quartile across ten sectors rose by an average of six per cent; those in the bottom quartile fell by 44 per cent.<sup>1</sup>

A similar divergence in performance was evident in the early stages of the COVID-19 crisis. In the year to May 1, the weighted average total stock return for the top one per cent of global firms by revenue – those that made over \$52 billion in 2019 – was minus nine per cent. For firms in the \$200-500 million revenue bracket, the return was minus 40 per cent.<sup>2</sup> "Some companies will be acquired, and some weaker players won't survive bankruptcy. Consequently, capacity will either decline or simply be concentrated among fewer firms," says Giles Parkinson, global equities fund manager at Aviva Investors. "In part, this is what recessions do – they are the impetus that finally puts 'zombie' firms out of their misery."

Due to COVID-19 containment measures, the worst damage is being inflicted on companies in travel, leisure and retail, as planes are grounded, borders closed, and shops shuttered. Weak companies in these sectors had been sustained by low interest rates and easy access to capital in recent years. A 2019 KMPG report found almost 12 per cent of UK companies in travel and leisure could be categorised as





Source: Census Bureau Business Dynamics Statistics (new firms defined as those less than one year old), 2017.

# WILL COVID-19 LEAD TO A CONCENTRATION OF CORPORATE POWER? *continued*

zombie firms – a higher proportion than any other sector. KPMG defines zombies as those companies with static or falling turnover, low profitability, squeezed margins, limited cash reserves and high leverage, leaving them with little scope to invest in new products or equipment.<sup>3</sup>

"Leverage has gone up in recent years, as companies expected 'lower-for-longer' interest rates to continue," says Colin Purdie, chief investment officer for credit at Aviva Investors. "More-indebted companies and those without fortress-like balance sheets could struggle as cash flows dwindle during the COVID-19 lockdown, especially if the market freezes up and they lose access to capital."

Take the energy sector, which has been hit by the combined impact of the coronavirusrelated demand shock and the glut of new supply from Saudi Arabia that entered the market in early March (although a new deal agreed by the OPEC cartel, Russia and the G20 to cut supplies, announced on April 12, helped stabilise prices).

Some independent oil producers in the US, many of which are highly leveraged, look particularly fragile and could face a wave of defaults and downgrades, says Purdie. Analysis from JP Morgan suggests cumulative high yield energy default rates could reach 24 per cent over the next 12 months, even if the price of crude rises in the second half of the year.<sup>4</sup> Oil majors such as ExxonMobil, Shell and BP are in a stronger position; having retained access to debt markets, they have built formidable cash war chests to manage the COVID-19 fallout.<sup>5</sup>

Elsewhere, lockdown conditions would seem to favour tech giants, already among the world's most profitable companies. More people are shopping online, boosting Amazon's e-commerce business, while the rise in online gaming will benefit its unit Twitch, the dominant player in the e-sports spectatorship market.

Similarly, Apple and Netflix are benefiting from greater demand for streaming services. And companies in telecoms,

#### Figure 2: Markups among the largest firms



data infrastructure and remote-working technology should be well positioned as workforces decamp from office desks to kitchen tables.

## Winners and losers

In *The Myth of Capitalism: Monopolies and the death of competition*, co-authored with Jonathan Tepper, Denise Hearn documented the rising concentration of industries across the US. She believes COVID-19 is likely to accelerate the trends identified in the book.

"Those in the anti-monopoly space are very concerned about [the crisis] providing a competitive advantage for existing incumbents," she says. "Firms like Amazon are hiring 100,000 workers, while nearly ten per cent of the American workforce files for unemployment. Challenger businesses – or even peripheral ones – that will be hampered by COVID-19 will make for attractive acquisition targets on the cheap, and the tech firms in particular are sitting on substantial cash reserves."

As of the end of the first quarter, the big five tech firms (Alphabet, Amazon, Apple, Facebook and Microsoft) held around \$560 billion in cash and marketable securities, according to public filings. And they are starting to put that cash to work: 2020 has seen the fastest rate of deal-making since 2015. In May, Facebook paid \$400 million to acquire Giphy, a search engine for animated GIFs, while Amazon is set to buy autonomous vehicle start-up Zoox for a sum in excess of \$1 billion.<sup>6</sup> The crisis could lead to further concentration in other industries, too. Take airlines. At 40 of the largest US airports, a single airline already controls a majority of the market, and most big airlines have their own "fortress hubs", airports where they face little or no competition.<sup>7</sup> As passenger numbers drop, these larger airlines are poised to grab yet more market share from smaller rivals.

"Airlines have suffered from a sharp drop in demand. As in other industries, it's fairly likely the bigger companies with better balance sheets and access to capital are the ones that are going to survive," says Purdie.

"We will still need airlines after this, but probably not as much; the rise in remote working is likely to lead to less travel for work, for example. The airlines that survive this period could emerge stronger and with a greater market share. They are also likely to benefit from lower oil prices on the other side of the crisis," he adds.

## The death of competition

To an extent, what we are seeing now is capitalism doing what capitalism does – separating the wheat from the chaff, rewarding productive businesses and letting others fall away. But there is a risk COVID-19 could make markets and economies less dynamic if it accelerates the rise to dominance of the largest firms.

Data indicates US markets have steadily become more concentrated over the last two decades. The number of listed

#### Figure 2. Chave of total version accounted for by ton decile firms



In the US, 75 per cent of customers only have access to one high-speed internet provider

companies halved between 1997 and 2013, and the number of new listings has fallen (see Figure 1). Profits are increasingly hoarded by the leading firms among those that remain: ten per cent of public companies are responsible for 80 per cent of total profits globally, according to McKinsey research.<sup>8</sup>

The Chicago school of economics, which was influential in designing modern anti-trust law, argued monopolistic power structures rarely last because high profits attract competitors. But this no longer appears to be the case. As the academic Thomas Philippon observes in his 2019 book *The Great Reversal*, US industries with high profits attracted more new entrants until about 2000; since then, entrants to profitable industries have fallen as the leaders pulled away.<sup>9</sup>

Various explanations have been offered for these trends. One is the changing composition of the economy. Tech firms have grown quickly through network effects, creating digital platforms that improve the more people use them, leaving rivals unable to compete. As other sectors integrate digital technologies, network effects are spreading across economies.

Companies are increasingly investing in intangible assets such as intellectual property, design and branding, which are hugely scalable and conducive to higher output. As research from economists Jonathan Haskel and Stian Westlake shows, this may lead to greater inequality between companies, as large firms are better able to take advantage of synergies between intangibles while protecting their intellectual property. If smaller firms cannot bridge the gap, they tend to cut investment in new ideas and processes, and fall further behind.<sup>10</sup>

Large firms are also increasingly using their political influence to outmuscle rivals. Philippon documents how US corporate giants are squashing competition by lobbying governments and spending lavishly on political campaign contributions to ensure anti-trust enforcement remains weak. This may be one reason why the so-called "buy-and-kill" tactics deployed by big firms against smaller rivals with promising ideas - Microsoft's purchase of the start-up responsible for list-making app Wunderlist, which it scrapped after incorporating elements of its platform, is an example - have faced little regulatory scrutiny up to now.11

Making matters worse, existing business regulations often cement larger firms' competitive advantage because they can easily afford the costs of compliance, while smaller companies face a greater relative burden.

"If you look at banking after the financial crisis, the regulations are stricter but the barriers to entry are higher than ever," says Stephanie Niven, global equities fund manager at Aviva Investors. "And in technology, the introduction of General Data Protection Regulation in Europe has only further entrenched the competitive advantage of the big tech firms."

## Monopoly and monopsony

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Why does all this matter? Leading companies tend to be more profitable not just because they lack competition, but because they are well-run, efficient and innovative. A company's dominance may even bring societal or economic benefits. Take Google: the company's pre-eminence in search is one reason its technology is so effective, because the more users it has, the more powerful its algorithms become.

Similarly, few would argue the world would be better off without Apple's iPhone or Microsoft's Office software – especially as these technologies are enabling the world to stay connected under the coronavirus lockdown. Unlike Standard Oil in the early 20th century, these firms do not appear to be using their dominance to extract excessive prices from customers – the key consideration on which modern anti-trust law rests.

Nevertheless, a lack of competition may be hurting consumers in some industries. Take broadband networks. In the US, 75 per cent of customers only have access to one high-speed internet provider; the others typically only have two to choose from. The average monthly cost of connection is \$68, compared with \$35 for the equivalent connection in most other advanced economies, where there are more providers.<sup>12</sup>

A similar trend is evident in mobile phone plans. The economists Maria Faccio and Luigi Zingales argue US consumers would gain \$65 billion each year if

# WILL COVID-19 LEAD TO A CONCENTRATION OF CORPORATE POWER? *continued*

The lack of competition could be contributing to a deeper economic malaise.

American mobile service prices fell in line with the German equivalent.<sup>13</sup>

A recent study from the International Monetary Fund (IMF) found mark-ups have risen across a range of industries over the last two decades. These price hikes are correlated with rising market concentration, as the largest incumbent firms are responsible for most of the price increases over the period (see Figure 2). The trend is evident across advanced economies and in different sectors, although it is most pronounced in the US.<sup>14</sup>

Philippon estimates that in 2018, the goods and services consumed by a typical household cost five to ten per cent more than would have been the case had competition remained as healthy as it was in 2000. He believes this is a key reason why the American middle classes feel under increasing financial pressure.<sup>15</sup>

Among the forces at play here is "monopsony" – the monopoly power of a buyer in a particular market. As the dominant force in publishing, Amazon can effectively set the price of books, for example. But monopsony is also a problem in labour markets, allowing powerful companies to set wages and restrict the movement of labour.

In depressing overall investment, raising prices and weakening labour at the expense of capital, the lack of competition could be contributing to a deeper economic malaise. Hearn's research indicates it is related to a litany of problems, including "low business dynamism and start-up rates, higher consumer prices, low wages and precarity for many workers, higher inequality, lower productivity growth, low economic growth despite record fiscal and monetary spending, and fragility in economic systems, making them more susceptible to exogenous shocks". She fears the COVID-19 crisis may only worsen these effects.

# **Investment implications**

For investors in the largest firms, their dominance may not seem the most

pressing problem – as Warren Buffett quipped, an unregulated monopoly is in some ways the ideal investment. But the concentration of market power among a few companies could be creating new risks.

As industries become consolidated around a few large companies, markets become more vulnerable to external shocks – or less "anti-fragile", to use the risk theorist Nassim Nicholas Taleb's term.

"One of the most fundamental concepts in investing is diversification. Yet investors have complacently sat idly by – in fact, gleefully welcomed – industry concentration because they thought it was good for returns," says Hearn. "Monopolists and oligopolists inherently become price makers and extract value from every part of the value chain: workers, suppliers, consumers." In the long run, this homogenises the marketplace so that it becomes "incredibly susceptible to shock", she adds.

The pandemic-related disruption has illustrated the vulnerability of some industries to unexpected events. Consider the supply chains for gadgets such as smartphones and televisions, which have become concentrated at various points. Gumi Industrial Complex, located just outside Daegu, the city at the centre of South Korea's coronavirus outbreak, produces most of the world's memory chips and LED displays, including screens for the latest iPhone and other smartphone models. Virus-related cessation in work at this facility is expected to lead to at least a ten per cent fall in global smartphone shipments this year, hurting a clutch of large tech companies, including Apple and Samsung.<sup>16</sup>

"Supply chains are so integrated and efficient these days, there is less flex when there is an issue in one part of the world," says Alistair Way, head of emerging market equities at Aviva Investors.

# The value equation

Over the longer term, there is the risk of a political backlash against larger firms, especially if these companies are seen to have consolidated their power and boosted their profits during a time of general hardship. Calls may grow to rein them in, as in the era of the muckrakers and the robber barons.

Governments that have assumed emergency powers to deal with the pandemic may be emboldened to tackle corporate giants in the wake of the crisis. The policy measures recommended by Hearn and Tepper in *The Myth of Capitalism* include beefed-up anti-trust regulation, tighter merger enforcement and limits to vertical integration.

Companies' freedom to aggressively avoid paying tax or snap up smaller competitors may be constrained. New regulation, similar to the Sherman Antitrust Act that reined in Standard Oil, could be used to classify tech firms as public utilities, like water or energy suppliers, and subject them to more onerous regulation; or perhaps, as Philippon suggests, users will begin demanding compensation for the personal data they currently provide for free.

With these scenarios in mind, Parkinson says it is important for long-term investors to focus on the value a company provides for consumers and wider society, not just the returns it offers shareholders.

"Even if a company looks like it has an unregulated monopoly, there is always a tacit societal contract that constrains how it can act and how much money it can make. Businesses need to stay on the right side of the 'value-for-money' equation," he says.

Parkinson cites Google as a company that continues to offer value for customers, whereas he believes it is more difficult to make the case for Facebook, which has been mired in a series of scandals in recent years. Research led by Erik Brynjolfsson, director of the Initiative on the Digital Economy at the Massachusetts Institute of Technology, backs this up: when asked how much money they would have to be paid to forgo search engines for a year, respondents offered an average figure of \$17,500; to retain access to Facebook, they were willing to pay less than \$600.<sup>17</sup>

## Stakeholders and ecosystems

A similar assessment of value applies when considering a company's wider function and responsibilities in society. Before the COVID-19 pandemic hit, the corporate world had been engaged in a debate about the importance of "stakeholder capitalism". There was growing consensus around the need for companies to do more than simply keep shareholders happy.<sup>18</sup>

The pandemic starkly illustrates that businesses are only as resilient as the environment in which they operate, and market competitiveness is one indication of the health of that environment. Companies that engage in aggressively anti-competitive measures – and use their dominance to exploit consumers and employees – ultimately weaken the system as a whole, according to Mirza Baig, Aviva Investors' global head of governance.

"Companies operate within an ecosystem: that ecosystem includes customers, employees, suppliers; there is no business without those relationships. Companies may be less reliant on employees than they were 50 years ago, but you cannot run a business with an algorithm.

"The demise of market competition can be seen as part of this wider context. Unless companies and governments work together to address this, you will lock in instability in the economy and society. Investors need to accept that regardless of near-term headwinds for profitability, it is necessary to rebase views on the fair distribution of economic value," Baig adds ● The pandemic starkly illustrates that businesses are only as resilient as the environment in which they operate



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# THE RISKS ON THE SAVINGS AND RETIREMENT JOURNEY



What risks should investors consider to build resilience into their portfolios? COVID-19 has caused significant volatility in financial markets, creating headaches for defined contribution pension schemes seeking to deliver robust outcomes. Overcoming this requires a full map of risks along the savings and retirement journey, argues Francois de Bruin.

As part of their fiduciary duty to members, pension schemes must make decisions in a maelstrom of shifting uncertainties and will naturally look to minimise risk in their portfolios. Modern portfolio theory relies on volatility as the primary measure of risk, but there is a serious question mark over whether it adequately captures the biggest risks to investors.

One limitation is that it doesn't distinguish between upside and downside returns, whereas investors are chiefly concerned with loss of capital or shortfall risk. In 2014, research showed equity investors are not compensated for volatility on a riskadjusted basis.<sup>1</sup> Left-tail measures, which deal with value-at-risk and loss of capital. are much better predictors of excess returns. In other words, the fact prices fluctuate does not imply much about inherent riskiness. An investment's ability to deliver sustainable value or productivity, particularly during times of stress, is much more significant and something poorly captured by volatility. But what risks should investors consider to build resilience into their portfolios?

# Mapping out risks along the savings and retirement journey

The risks are multiple, overlapping and complex. Drawing on mental imaging techniques, we can map them out along the accumulation and decumulation phases of a scheme member's journey. This can help inform schemes' decisions in terms of investment guidelines, risk budgets and risk allocations. It can also help schemes communicate to members on key risks to their retirement plans, allowing them to make more informed decisions in terms of contribution levels and time horizons, and to understand how their adviser can help them navigate to and through retirement.

## **Volatility in context**

Managing these risks is largely in the hands of pension managers, who are well aware of the difficult trade-offs they must make to maximise returns while managing exposures. Volatility risk still must play a part and, alongside **inflation risk (5)** and **investment risk (6)**, is of course central to investment decisions and risk-budget allocations (see Figure 1).

Investment risk – the risk of default on bond repayments, share price fluctuation, equity dilution and possible bankruptcy when a company runs into fundamental issues due to strategy errors or external factors – can be easy to overlook in bull markets, particularly when using an index as a reference. As we enter a period of recession and considerable economic uncertainty, it is important to remember that, on average, 32 per cent of stocks that disappeared from the S&P 500 index between 2000 and 2016 were due to corporate failures (Figure 2).

As for bonds, after falling below their historical average in recent years, default rates are now expected to rise – though much will



#### *Figure 1:* Potential pitfalls of the retirement journey – a map for scheme members

Slower growth and demographic trends have given rise to historically low yields

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depend on economic conditions, as well as monetary and fiscal support in response to COVID-19 (Figure 3).<sup>2</sup>

Troubled times like these, when many investors sell at the same time and almost all asset values start falling, are also a stark reminder of the impact **liquidity** (11) and **correlation risks (8)** can have on returns – and of the benefits of being able to hold onto assets until a measure of calm returns (See Figures 4, 5).

Over the longer term, **regulatory risk (12)** and **sustainability risk (10)** have steadily risen in recent years – and both are here to stay.

The latter is also a risk for scheme members, as it can depend on their investment choices as well as those of their pension fund manager. Several other risks are also in their hands, and pension schemes can help members better prepare for their savings and retirement journey through communication and education.

# Helping scheme members prepare for retirement

As the savings and retirement map shows, member engagement and an understanding of the risks are crucial. In addition to sustainability risk, depending on where they are on the retirement journey, members can be exposed to risks of **shortfall**, **longevity**, **volatility**, **drawdown**, **behaviour** and **timing**. **Timing risk (9)** can affect the total wealth an investor accumulates, depending on where markets are when they start saving and when they retire. If they start saving at the beginning of a market downturn, it can take them much longer to accumulate the same amount as an investor who invested the same amount at the beginning of a rally. It is a key risk in the current environment, and savers should think about investing larger sums where they can, to at least partly make up for lower returns.

Shortfall risk (1) is linked to timing risk, and is the risk total savings will fall short of an investor's goal and never return to expected levels; either because they have not set aside enough money periodically, because investments have not performed as well as expected, or a combination of the two.

While the prospect for life expectancy has changed, so too has the prospect for total returns. Slower growth and demographic trends have given rise to historically low yields and, in aggregate, equities and bonds are unlikely to deliver the returns of the past.

Over a five-year horizon, current yields are a good proxy for prospective returns. The Bloomberg Global Aggregate Bond Index today yields less than two per cent, suggesting investors need to balance capital preservation against their multi-decade needs (Figure 6). Agency issues might also arise if retirees, who clearly have a long-time horizon, default to balanced funds with large bond allocations, where managers are reviewed on significantly shorter timespans and can manage near-term outcomes at the potential cost of long-term ones.

These investors may need to add credit risk for additional yield or increase their allocation to equities. It represents a conundrum though, as the long-term historical returns for equities are unlikely to be repeated.

Robert Shiller's cyclically adjusted price-toearnings ratio looks at average inflationadjusted earnings over a ten-year period, and finds the price paid for these earnings to be a reliable predictor of long-term returns. Based on a cyclically adjusted earnings yield of less than four per cent today, equity returns have never delivered double-digit annualised returns over a ten-year holding period (Figure 7).

**Longevity risk (2)** is the risk the retirement pot runs out before the end of the investor's life. While defined benefit schemes are familiar with it, in defined contribution schemes this risk is borne by the end investor, who needs sufficient savings to last several decades in retirement.

To give an example, according to the Office for National Statistics, a British male who turns 65 today (who was only expected to live to 67 years when born) is expected to live for

# THE RISKS ON THE SAVINGS AND RETIREMENT JOURNEY *continued*

another 20 years on average, while the percentage of people expected to live to over 100 is increasing (Figures 8, 9).

While this is cause for celebration, investors need to consider any near-term adjustments against the long-term prospective returns of different asset classes. Asset allocations should therefore reflect appropriate time horizons. Longer life expectancy also means savers must be careful to not draw their

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#### Figure 2: Reasons for removal from the S&P 500 Index, 2000-2016



Source: FactSet, S&P Dow Jones Indices, Credit Suisse, as of February 7, 2017.

#### *Figure 4*: 52-week correlations as of January 3, 2020

Bloomberg Barclays UK Govt Inf	1.00	-0.24	0.09	-0.37	-0.26	0.20	-0.20	-0.31	-0.23	-0.32	-0.21	-0.36	-0.36	0.23	-0.34	-0.47	-0.33	-0.66	0.41		
WTI Crude Future May 20	-0.24	1.00	-0.16	0.26	0.02	0.12	0.53	0.51	0.37	0.34	0.46	0.52	0.53	0.18	0.49	0.53	0.51	0.26	0.07		0.8
Dollar Index Spot	0.09	-0.16	1.00	-0.55	-0.02	-0.30	-0.23	-0.12	-0.32	-0.31	-0.11	-0.22	-0.20	-0.03	-0.11	-0.37	-0.33	-0.01	-0.49		0.0
FTSE EPRA Nareit Developed Eur	-0.37	0.26	-0.55	1.00	0.03	0.13	0.50	0.43	0.54	0.52	0.37	0.52	0.50	0.25	0.42	0.62	0.66	0.40	0.01		
Germany Govt Bnd 10 Yr DBR	-0.26	0.02	-0.02	0.03	1.00	-0.05	0.15	0.12	-0.03	0.05	0.09	0.07	0.10	-0.00	0.06	0.14	0.03	-0.01	-0.08		
JP Morgan EMBI Global	0.20	0.12	-0.30	0.13	-0.05	1.00	0.38	0.39	0.27	0.34	0.40	0.35	0.35	0.39	0.35	0.25	0.18	-0.39	0.48		0.4
Bloomberg Barclays US Corporate	-0.20	0.53	-0.23	0.50	0.15	0.38	1.00	0.73	0.71	0.65	0.66	0.78	0.78	0.41	0.72	0.65	0.70	0.32	0.02		
MSCI World Quality Net Total R	-0.31	0.51	-0.12	0.43	0.12	0.39	0.73	1.00	0.61	0.62	0.95	0.96	0.97	0.40	0.97	0.80	0.76	0.36	-0.07		
MSCI AC Asia Pacific Index	-0.23	0.37	-0.32	0.54	-0.03	0.27	0.71	0.61	1.00	0.93	0.61	0.72	0.68	0.06	0.61	0.66	0.74	0.46	-0.04		
MSCI Emerging Market Index	-0.32	0.34	-0.31	0.52	0.05	0.34	0.65	0.62	0.93	1.00	0.62	0.69	0.64	0.02	0.59	0.65	0.71	0.41	0.01		0.0
MSCI USA Information Technology	-0.21	0.46	-0.11	0.37	0.09	0.40	0.66	0.95	0.61	0.62	1.00	0.90	0.89	0.33	0.92	0.73	0.68	0.28	-0.02		
MSCI World Index	-0.36	0.52	-0.22	0.52	0.07	0.35	0.78	0.96	0.72	0.69	0.90	1.00	0.99	0.36	0.98	0.86	0.83	0.46	-0.06		
MSCI World ESG Leaders Net Ret	-0.36	0.53	-0.20	0.50	0.10	0.35	0.78	0.97	0.68	0.64	0.89	0.99	1.00	0.38	0.97	0.86	0.81	0.44	-0.07		
MSCI US REIT Index	0.23	0.18	-0.03	0.25	-0.00	0.39	0.41	0.40	0.06	0.02	0.33	0.36	0.38	1.00	0.42	0.13	0.17	-0.19	0.21		-0.4
S&P 500 Index	-0.34	0.49	-0.11	0.42	0.06	0.35	0.72	0.97	0.61	0.59	0.92	0.98	0.97	0.42	1.00	0.78	0.73	0.40	-0.07		
Euro Stoxx 50 Price EUR	-0.47		-0.37	0.62	0.14	0.25	0.65	0.80	0.66	0.65	0.73	0.86	0.86	0.13	0.78	1.00	0.87	0.50	-0.04		
FTSE 100 Index	-0.33		-0.33	0.66	0.03	0.18	0.70	0.76	0.74	0.71	0.68	0.83	0.81	0.17	0.73	0.87	1.00	0.53	-0.08		-0.8
US Generic Govt 10 Yr	-0.66	0.26	-0.01	0.40	-0.01	-0.39	0.32	0.36	0.46	0.41	0.28	0.46	0.44	-0.19	0.40	0.50	0.53	1.00	-0.53		-0.0
Gold	0.41	0.07	-0.49	0.01	-0.08	0.48	0.02	-0.07	-0.04	0.01	-0.02	-0.06	-0.07	0.21	-0.07	-0.04	-0.08	-0.53	1.00		
	Bloomberg Barclays UK Govt Inf	WTI Crude Future May 20	Dollar Index Spot	FTSE EPRA Nareit Developed Eur	Germany Govt Bnd 10 Yr DBR	JP Morgan EMBI Global	Bloomberg Barclays US Corporate	MSCI World Quality Net Total R	MSCI AC Asia Pacific Index	MSCI Emerging Market Index	MSCI USA Information Technology	MSCI World Index	MSCI World ESG Leaders Net Ret	MSCI US REIT Index	S&P 500 Index	Euro Stoxx 50 Price EUR	FTSE 100 Index	US Generic Govt 10 Yr	Gold		

Source: Aviva Investors, Bloomberg, as of April 15, 2020.

#### Figure 3: Credit spreads suggest defaults are coming

Per cent - Speculative-grade corporates HY Spread — Moody's Jan 2020 Forecast 18 16 14 12 10 8 6 4 2 2002 2004 2006 2008 2010 2012 2014 2016 2018 2020 Source: Moody's Investor Services, forecasts as at January 30, 2020, Bloomberg data as at April 30, 2020.

capital down too quickly, particularly when market conditions are affecting returns.

# The difficulty of keeping emotions at bay

**Drawdown risk (4)** – the risk retirees will shrink their savings pot too quickly – tends to be poorly captured by traditional risk measures. This is because it is only prevalent for a certain cohort of

#### *Figure 5:* **52-week correlations as of April 15, 2020**

Bloomberg Barclays UK Govt Inf	1.00	0.09	-0.55	0.44	0.21	0.67		0.48	0.47	0.34	0.43	0.50	0.51	0.62	0.48	0.43	0.49	-0.52	0.68	-	
WTI Crude Future May 20	0.09	1.00	-0.09	0.28	-0.03	0.46	0.39	0.36	0.25	0.39	0.29	0.33	0.34	0.15	0.33	0.28	0.35	-0.02	0.16		0.0
Dollar Index Spot	-0.55	-0.09	1.00	-0.62	-0.09	-0.72	-0.67	-0.53	-0.62	-0.51	-0.50	-0.58	-0.58	-0.64	-0.54	-0.54	-0.59	0.29	-0.69		0.0
FTSE EPRA Nareit Developed Eur	0.44	0.28	-0.62	1.00	0.00	0.78	0.82	0.82	0.84	0.81	0.74	0.89	0.89	0.86	0.84	0.88	0.90	0.12	0.64		
Germany Govt Bnd 10 Yr DBR	0.21	-0.03	-0.09	0.00	1.00	0.14	0.09	0.06	0.08	0.07	0.07	0.04	0.05	0.05	0.02	0.07	0.05	-0.25	0.15		
JP Morgan EMBI Global	0.67	0.46	-0.72	0.78	0.14	1.00	0.91	0.79	0.80	0.77	0.72	0.82	0.83	0.78	0.78	0.76	0.80	-0.27	0.74		0.4
Bloomberg Barclays US Corporate	0.58	0.39	-0.67	0.82	0.09	0.91	1.00	0.88	0.86	0.83	0.85	0.90	0.91	0.87	0.90	0.76	0.82	0.03	0.63		
MSCI World Quality Net Total R	0.48	0.36	-0.53	0.82	0.06	0.79	0.88	1.00	0.90	0.88	0.97	0.98	0.98	0.87	0.99	0.85	0.88	0.16	0.60		
MSCI AC Asia Pacific Index	0.47	0.25	-0.62	0.84	0.08	0.80	0.86	0.90	1.00	0.95	0.83	0.93	0.92	0.77	0.87	0.92	0.93	0.07	0.63		
MSCI Emerging Market Index	0.34	0.39	-0.51	0.81	0.07	0.77	0.83	0.88	0.95	1.00	0.83	0.89	0.88	0.71	0.86	0.85	0.87	0.16	0.54		0.0
MSCI USA Information Technology	0.43	0.29	-0.50	0.74	0.07	0.72	0.85	0.97	0.83	0.83	1.00	0.94	0.93	0.84	0.97	0.75	0.78	0.24			
MSCI World Index	0.50	0.33	-0.58	0.89	0.04	0.82	0.90	0.98	0.93	0.89	0.94	1.00	1.00	0.90	0.98	0.91	0.93	0.15	0.64		
MSCI World ESG Leaders Net Ret	0.51	0.34	-0.58	0.89	0.05	0.83	0.91	0.98	0.92	0.88	0.93	1.00	1.00	0.90	0.98	0.91	0.93	0.13	0.65		
MSCI US REIT Index	0.62	0.15	-0.64	0.86	0.05	0.78	0.87	0.87	0.77	0.71	0.84	0.90	0.90	1.00	0.91	0.74	0.78	0.11	0.63		-0.4
S&P 500 Index	0.48	0.33	-0.54	0.84	0.02	0.78	0.90	0.99	0.87	0.86	0.97	0.98	0.98	0.91	1.00	0.82	0.86	0.22	0.58		
Euro Stoxx 50 Price EUR	0.43	0.28	-0.54	0.88	0.07	0.76	0.76	0.85	0.92	0.85	0.75	0.91	0.91	0.74	0.82	1.00	0.97	0.03	0.68		
FTSE 100 Index	0.49	0.35	-0.50	0.90	0.05	0.80	0.82	0.88	0.93	0.87	0.78	0.93	0.93	0.78	0.86	0.97	1.00	0.03	0.69		0.0
US Generic Govt 10 Yr	-0.52	-0.02	0.29	0.12	-0.25	-0.27	0.03	0.16	0.07	0.16	0.24	0.15	0.13	0.11	0.22	0.03	0.03	1.00	-0.47		-0.0
Gold	0.68	0.16	-0.69	0.64	0.15	0.74	0.63	0.60	0.63			0.64	0.65	0.63	0.58	0.68	0.69	-0.47	1.00	—	
	Bloomberg Barclays UK Govt Inf	WTI Crude Future May 20	Dollar Index Spot	FTSE EPRA Nareit Developed Eur	Germany Govt Bnd 10 Yr DBR	JP Morgan EMBI Global	Bloomberg Barclays US Corporate	MSCI World Quality Net Total R	MSCI AC Asia Pacific Index	MSCI Emerging Market Index	MSCI USA Information Technology	MSCI World Index	MSCI World ESG Leaders Net Ret	MSCI US REIT Index	S&P 500 Index	Euro Stoxx 50 Price EUR	FTSE 100 Index	US Generic Govt 10 Yr	Gold		

Source: Aviva Investors, Bloomberg, as of April 15, 2020.

THE RISKS ON THE SAVINGS AND RETIREMENT JOURNEY *continued* 

investors – those in decumulation – and doesn't feature on factsheets. Those forced to sell shares or units to meet their near-term needs run the risk of not having enough assets remaining to recover over the long term.

To illustrate drawdown risk, we can take the example of savers retiring anywhere between 1970 and 2000. Figures 10 and 11 show a wide range of global equity returns over the 20-year periods, from 16 per cent per annum for the 1980 retiree to 6.7 per cent per annum for someone retiring in 2000.

Assuming these investors decided to draw down over 20 years, at an annual rate equal to the market's average annual return; starting with \$100,000, the average expected end value is \$10,000. Significantly, in 11 of the scenarios the retirees run out of money. That is a 35 per cent chance of ruin over a 20-year period, knowing an increasing number of savers will live longer than 20 years in retirement.

Going back to our initial thoughts, volatility (3), although not the only risk, can exacerbate drawdown risk by causing widely divergent outcomes for investors in the same plan but who enter drawdown only months apart. Most investors aim to reduce volatility by increasing their allocation to bonds, but this creates a difficulty because, as we have seen with longevity and shortfall risks, this type of reallocation can come at the cost of long-term outcomes.

This can be compounded by **behavioural risk (7)**, when emotionally charged decisions lead savers to draw down just as volatility pushes asset prices down, forcing them to sell even more assets.

Some of this is down to luck, but investors who are aware of the risks will be better prepared – for instance, they might discuss their options with an adviser, increase their contributions or change the timings of their drawdowns.

#### Figure 6: Bond return expectations



#### *Figure 7:* Equity return expectations are lower



#### Figure 8: Life expectancy at birth



#### Figure 9: Life expectancy at 65







# *Figure 11:* The decumulation journey: Investor outcomes in drawdown are highly path-dependent despite strong returns



### **Embracing uncertainty**

As the map of the savings and retirement journey shows, each risk may affect scheme members' paths to varying degrees at different points in time and combine with others to multiply or offset the impacts.

The outcome is that market returns do not equate to investor returns. All investors look at long-term time series to decide how and where to allocate, but this often masks the reality of savers' experience, which is magnified once they start drawing down income.

Pension schemes and advisors can help scheme members understand where they are on the map, keep the different risks in mind and consider how they can best manage them to reach their desired retirement destination.

Ultimately, we can make better decisions if we identify as many risks as possible, even if they are difficult to quantify. As Annie Duke, World Series of Poker champion and author of *Thinking in Bets: Making Smarter Decisions When You Don't Have All the Facts*, puts it: "Ignoring the risk and uncertainty might make us feel better in the short run, but the cost to the quality of our decision-making can be immense. If we can find ways to become more comfortable with uncertainty, we can see the world more accurately and be better for it"

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- James X. Xiong, Thomas M. Idzorek and Roger G. Ibbotson, 'Volatility versus Tail Risk: Which One Is Compensated in Equity Funds?', The Journal of Portfolio Management Winter 2014, 40 (2) 112-121.
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# DIDIER SORNETTE THE SCIENCE OF PREDICTION

*AIQ* speaks to the world-renowned risk expert Didier Sornette about the coronavirus pandemic and how organisations can stay resilient in the face of unexpected crises.



Rocket-fuel explosions, natural disasters, financial crises, pandemics. These are just some of the dangers risk expert Didier Sornette has studied during his distinguished career.

Currently professor on the Chair of Entrepreneurial Risks at the Swiss Federal Institute of Technology in Zurich, Sornette leads teams that track a range of global hazards, from bubbles in the real estate market to failures at nuclear energy facilities. He brings a scientific rigour to his predictive work: he was previously a professor of geophysics at the University of California, Los Angeles, where he specialised in monitoring earthquakes.

Sornette is perhaps best known for his theory of the "dragon-king": a sudden, catastrophic risk cascade. Unlike Nassim Taleb's black swan – which describes a fundamentally unpredictable event – dragon-kings announce themselves early through small changes in the workings of complex systems. Experts able to pick up on these tell-tale signs can ensure they are prepared when the disruption hits.

Sornette thinks it unlikely that COVID-19 could have been predicted in this way – but that doesn't mean we shouldn't have been better prepared. He recently undertook research to better understand the dynamics of the crisis and the efficacy of the various policy responses. His tentative conclusion is that the world has entered a new historical regime – "a phase of fear" – with implications for finance, economics and geopolitics.

In this Q&A, Sornette discusses his research on COVID-19 and the principles of good risk management in an increasingly complex and interconnected world.

# Could COVID-19 have been predicted, in the manner of a dragon-king event?

COVID-19 was predictable in the sense that – as has been much commented upon – pandemics were at the top, or close to the top, of the list of concerns among risk managers across the world over recent decades. It was predictable in the same way an earthquake is predictable: we know another one is coming, but the timing is unclear.

My concept of the dragon-king refers to processes in which we see progressive damage, or collective behaviour or processes, that can be diagnosed, and which can be identified by those with the relevant skills. Once the pandemic began to spread, it followed a contagion process with a tree-like structure, which was to some degree predictable thanks to epidemiological models. But predicting the original case – "patient zero" – would have been impossible.

# How do lockdowns compare with policy responses to sudden risk events in the past?

The extraordinary size and amplitude of the response is unprecedented in historical terms. Out of more than 200 countries, only four have not implemented lockdown measures. These measures cost between ten and 20 per cent of GDP in each case, according to some estimates. You can produce a list of epidemics in the 20th century that were probably much more severe than this one but didn't receive anything like the same response. Take the Asian flu of 1957, which killed more than one million people. In France alone, 100,000 people died. Our best estimate for COVID-19 is that the total number of French deaths would be between 20,000 and 30,000. COVID-19 is not minor – it is horrific – but it is far from the end of the world and it should be considered in context and in comparison with other fatalities, and the global costs and consequences.

# Why has COVID-19 brought such a massive response compared with previous pandemics?

My tentative hypothesis is that the interaction of people through the internet and social media, and access to instantaneous news, has resulted in a global synchronisation of response. To use the language of physics, as in the phase transition between a liquid and solid, we have entered a new regime, a "phase of fear". My premise is that the origin of this new phase can be identified around the time of 9/11. The terrorist acts revealed the changes in the way we see politics and were used to justify the Iraq intervention. It was the first time a single shock (of relatively minor amplitude, when put in the global context) synchronised large parts of the world in an extraordinary reaction with extraordinary consequences.

### How can we ensure economies and societies are more resilient against these kinds of crises?

The universal emphasis so far has been on measures such as lockdowns, confinement, protective masks, tracing. What's missing is an emphasis on the resilience of the individual. It is good we are defending ourselves against exogenous shocks by

Nature is more imaginative than mathematicians, physicists, engineers, specialists of all kinds. We are very often taken by surprise when a catastrophe occurs

erecting protective barriers, but I would argue the first barrier should be about building a society populated by healthy individuals with healthy immune systems. The correlation between the severity of the illness and other comorbidity factors, such as obesity, diabetes and cardiovascular disease, has been well documented. We tend to be fatalistic about this, but can do something about it.

#### What kind of economic damage is the lockdown causing, and could it be creating new risks within the system?

COVID-19 is revealing the many – often submerged – issues societies have. It has catalysed the emergence of unspoken problems and unsolved issues, and it may exacerbate them. Take the European Union. The response to COVID-19 has illustrated the dysfunction and the lack of reality in the talk of "solidarity" within the EU. It has also drawn attention to problems with globalisation and the competition between China and the US.

#### With geopolitical friction increasing during the crisis – Trump pinning the blame on China, for example – could an escalating geopolitical crisis be a concern coming out of the pandemic?

COVID-19 might have triggered cooperation, collaboration and brotherhood: unfortunately, we have seen quite the opposite. Take the US, which bought a plane delivering a shipment of facemasks to France while it was on the tarmac. And even Europe has not shown unity. There has been some cooperation, but much less than we could have hoped for.

I see an 80-90 per cent probability that the confrontation between the US and China will continue and worsen. You have two superpowers, we could say two "empires", and the world is going to develop more and more in this "bipolar" mode. My concern is that this competition will occur in a domain that is existential: imagine if there was a scarcity of some important commodity that, for example, China needed and the US blocked by using its navy. What is considered existential or threatening to a country's way of life or identity varies between countries. In the West we tend to think too much as "Westerners"; we don't put ourselves into the minds of our friends or competitors often enough. Look at what happened when the West backed Ukraine against Russia. We didn't appreciate sufficiently that Ukraine was hugely important for Russia; historically it has been one of the last lines of defence that kept it from being invaded.

# Does cybersecurity concern you, given the rise in remote working?

Cybersecurity is one of the biggest risks we face. Risks are characterised by a distribution, and the concept of a "fat tail" describes a distribution of returns that exhibit a tail that decays to zero much slower than the Gaussian distribution. Cyber risks have the broadest, wildest swings in the fat tail. Imagine, for example, Facebook being hacked: suddenly you have two billion ID thefts, with enormous consequences. Another concern is greater digital integration in critical infrastructure, such as nuclear plants, which could be hacked and pushed towards criticality. These are big concerns. Stronger and stronger interconnection and "fragilization", through optimising and just-in-time production, has made the system more efficient in the short term but left it more vulnerable to unforeseen shocks. I like to say that nature is more imaginative than mathematicians, physicists, engineers, specialists of all kinds. We are very often taken by surprise when a catastrophe occurs, as the path to it has usually not been imagined.

# How does climate change compare with other global threats?

I am one of the leaders of a project supported by ETH Zurich and a consortium of organisations called Tellus, named after the Roman goddess of the Earth, and it's all about trying to understand the sustainability of human-Earth systems. "Global warming" is too narrow a way of thinking about the problem. The planet is not in danger – it's we who are in trouble, in that we are endangering the ecosystem that supports us. If we disappear, after a period of destruction the planet will thrive again: just look at the area around Chernobyl, which is now a paradise for animals.

We need to steer the planet towards a more sustainable and harmonious future. There are many components to this. We don't speak enough about water stress, which is a huge problem. We need to speak about the pollution caused by synthetic chemicals that have entered the endocrine system of the human body and disturb the hormones that allow our

# THE SCIENCE OF PREDICTION *continued*

organs to synchronise and coordinate. We need to transform our industry, our way of life, our ecological footprint so that we transition to sustainability. We need to focus not on risks in silos, but on the whole human-Earth system.

#### You have written that even the most complex systems have "pockets of predictability" that enable us to anticipate future developments. How can we go about spotting these early warning signals?

My hypothesis, and we are continuously testing this with new systems, is that most crises, or transitions more generally, do not happen out of the blue but proceed through what I summarise as a "maturation" towards a tipping point – a catastrophe, using the language of mathematics, or a phase transition, using the language of physics.

Think of this analogy: you are a climber and you use a rope. The rope is made of many filaments. Suppose that due to stresses - your weight, the rubbing of the rope against the rockface – some filaments are damaged; one by one they break. Your weight is still held by the rope, until enough filaments are damaged that the rope breaks and you fall. Your fall would have been predictable if you monitored the progressive damage and if you understood the underlying mechanics through which the load is shared by the remaining filaments. If you can model this and monitor the damage, you can diagnose the progressive maturation of this instability.

# What are the applications of this kind of work?

I first started working on this subject at the beginning of the 1990s, in collaboration with the company that later became the European Aeronautic Defence and Space Company [now Airbus]. We were interested in understanding the predictability of the failure of pressure tanks in the European Ariane rocket. And we did what I've just described with the rope and the climber: we subjected the pressure tanks to increasing pressure. Using acoustic gauges, we recorded the acoustic emissions that revealed tiny earthquakes in the matrix of the carbon fibres. These cracking sounds revealed delamination in the matrix, and the breaking of the little fibres. By monitoring the evolution of the cracking, as revealed by the acoustic emissions, we were able to develop a model that reliably predicted the failure of the pressure tanks.

In a sense, this same procedure can be applied to develop a sufficiently predictive diagnostic in a range of fields, even illnesses. People don't develop a cancer out of the blue; they first have a recurrent inflammation induced by little stressors, which then evolves to chronic disease. Then, after 20-30 years, depending on the subject, it progresses to another severe phase, like cancer. A similar effect occurs in a financial bubble. The first stage is the development of a new technology, a nucleation phase, and then the first wave of investors arrives. More and more investors come to the market, attracted by the cumulative gain they have seen, and the market progresses as the positive feedback becomes more and more decoupled from the fundamental value. So common conceptualisations can be developed for predictions in each of these fields.

#### Your institute monitors the status of financial bubbles. Where could the next financial crisis come from, and how can investors ensure their portfolios are resilient to it?

Since the great financial crisis of 2007-'09, the markets have become dysfunctional. They are no longer the voting machines that encapsulate the collective intelligence of investors; they have become completely skewed by central bank and government intervention.

Do I see a big crisis coming? Yes, potentially, but of a very different type than the financial crisis. That was a "normal" crisis, with leverage and excess in the financial markets. Now the excesses are at the policy level, the debt level; the big issue is the level of public debt and the "whatever it takes" mantra policymakers are doubling-down on. There are still some localised bubbles, but they tend to be isolated in certain niches, in certain currencies or countries.

You have to look at the consequences of the policy and economic responses to COVID-19 and the geographical regions that have become more fragile as a result - think of southern Europe, perhaps even Europe as a whole. The long-term viability of the euro is being called into question. There are lots of unknowns as to political decisionmaking among the 27 countries. It's quite obvious countries that are emerging as the big winners are in Asia; I'm quite bullish on Asia, in particular China. In a portfolio with a long-term view, I would also include resilient or "anti-fragile" assets: commodities such as palladium, gold and so on.

#### Should investors be aiming to model the precise nature of the next risk event, or is it more sensible to build portfolios that are resilient in a range of future scenarios?

Investors should look at a range of scenarios. The level of uncertainty has multiplied. We still know little, from an epidemiological perspective, about COVID-19. It is likely a second wave will come. Many experts are suggesting it will evolve over the next two to three years. But it will be with us forever, and that's important to keep in mind.

Much depends on the lessons governments learn from the initial lockdown response, and the implications of this for Europe and for globalisation. There is a lot of uncertainty about how new supply chains will develop as many people call for re-onshoring of industries, construction and so on. Then there is the global geopolitical situation, with the US becoming more adamant against China in their global superpower confrontation. Amid these huge uncertainties, investors will need portfolios that are resilient against a wide range of scenarios



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