BANK OF ENGLAND

Speech

Avoiding Economic Anxiety

Speech given by
Andy Haldane
Chief Economist and Member of the Monetary Policy Committee (MPC)

Cheshire and Warrington LEP Economic Summit Webinar
30 September 2020

The views expressed here are not necessarily those of the Bank of England or the Monetary Policy Committee. I would like to thank Jack Meaning and Andre Moreira for their help in preparing the text. I would like to thank Andrew Bailey, Frances Cassidy, Alan Castle, Shiv Chowla, Liam Crowley-Reidy, Jon Cunliffe, Harvey Daniell, Pavandeep Dhami, Simon Hayes, Saurav Kamath, Zaar Khan, Simon Kirby, Nick Mclaren, Becky Maule, Shahid Nazir, Mette Nielsen, Douglas Rendle, Michael Saunders, Michal Stelmach and Jan Vlieghe for their comments.

Thank you for the invitation to speak at this Cheshire and Warrington Local Enterprise Partnership (LEP) Economic Summit. Through my colleague on the Industrial Strategy Council and former Chair of the LEP, Christine Gaskell, I know the excellent work the LEP does in supporting the local economy and community. That support has never been more important given the risks facing individuals, businesses and communities.

Given those risks, I thought I would focus today on the economic outlook in the UK, updated in the light of events since the publication of the Bank's *Monetary Policy Report* in August. Plenty has since happened. But one factor has remained the same: the extra-ordinary degree of uncertainty about the economic outlook. That makes monitoring the economy closely, and setting policy to support it, more important than ever.

At present, the largest clouds on the economic horizon in the UK come from: the effects of rising numbers of Covid cases across the UK and the accompanying policy measures taken to contain them; risks to business activity and jobs in the light of these public health developments; and the effects of moving to new trading arrangements with the EU at year-end. This unholy trinity of risks give good grounds for caution.

Some degree of caution is desirable - in how we socialise, shop and work - to prevent the spread of this awful disease. But we need at the same time to prevent healthy caution morphing into fear and fatalism. Pessimism can be as contagious as the disease - and as damaging to our economic fortunes. Avoiding economic anxiety is crucial to support the on-going recovery. This has important implications for how businesses and policymakers act and communicate.

The Fall and Rise of the UK Economy

Let me start by running through the fortunes of the economy so far this year. The early months saw a collapse in UK economic activity unprecedented in its speed and scale – a fall in GDP of around a quarter in a matter of weeks. This recession was unique in its source as well as its speed and scale. An extreme shock to public health required extreme public health measures, restricting the flow of goods, services and people. Large parts of the economy were, in effect, put into a policy-induced coma.

The resulting collapse in aggregate demand would ordinarily have resulted in huge numbers of job losses. Economists call the relationship between demand and jobs *Okun's Law*.[1] Historically, the Okun coefficient is found to lie around 0.5-0.6. On that basis, the 25% fall in output would have been expected to lower employment by perhaps 12-15% and to raise the unemployment rate by maybe 10 percentage points, taking the pool of unemployed workers to around 5 million.

The Government's job support packages, notably the Coronavirus Job Retention Scheme (CJRS), avoided this catastrophic outcome. The CJRS provided support to around 9 million workers at its peak, in addition to which income support was provided to around 2 ½ million self-employed workers. Currently, it is estimated

[1] See Okun (1962)

that around 2.75 million workers remain on furlough. The CJRS will end next month, to be replaced with the Job Support Scheme (JSS) announced by the Chancellor last week.

Of course, not all jobs have or could have been protected. Data from the ONS's Labour Force Survey (LFS) is, at present, difficult to interpret when gauging employment trends. But based on HMRC data on paid employees, around 700,000 workers may have been laid-off, in addition to around 280,000 self-employed workers. That means around 1 million workers in total may so far have lost their jobs. This figure, more than any other, underlines the gravity of the shock the UK economy has faced this year.

The better news is that the economy began its recovery from this dramatic fall earlier, and has since recovered far-faster, than anyone expected. The speed and scale of the UK's recovery has surprised to the upside, persistently and significantly, for at least the past four months. Back in May, the Bank expected GDP to be around 18% below its pre-Covid level on average during the third quarter. Consensus forecasts by professional economists were, at the time, weaker still.

Four months on, we now expect GDP to be around 3-4% below its pre-Covid level by the end of the third quarter. In other words, the economy has already recovered just under 90% of its earlier losses. Having fallen precipitously by 20% in the second quarter, we expect UK GDP to have risen by a vertiginous 20% in the third quarter – by some margin its largest-ever rise. Put differently, since May UK GDP has been rising, on average, by around 1.5% per *week*.

The pace of recovery has varied, starting slowly in May, picking up pace rapidly during June and July and is then expected to have slowed a little during August and September. Even if our GDP nowcasts for August and September come to pass, there remains an average recession-sized gap between output and its pre-Covid level. Nonetheless, had this economic outcome been offered as a forward contract in the early summer months, absolutely everyone would have been a buyer.

So what explains this faster-than-expected recovery? And, crucially, will it persist in the face of the unholy trinity of risks from Covid, unemployment and Brexit that potentially lie in store? These are related questions because behaviours exhibited by households and businesses so far are likely to be revealing about what impact future risks might have. Habits tend to persist. That means, for all the uncertainty about the outlook, the UK's recent economic performance does offer some signal about the future outlook.

The simplest explanation for the upside surprises to UK activity over recent months would be that lockdown measures have been released sooner and faster than expected. But the pace of release from lockdown in the UK has in fact been broadly in line with what the Bank had expected in May. The biggest surprise has been the robustness of peoples' spending behaviour in the face of lockdown constraints and other risks, not the evolution of these constraints and risks *per se*.

The behaviour of UK consumers has been most surprising. Based on our suite of fast indicators, UK consumption has been rising by, on average, around 2% per week since May.[2] As best we can tell, consumer spending now stands at around pre-Covid levels. In other words, consumption has fully recovered more than a year earlier than the Bank expected as recently as August. Large-ticket purchases, such as cars and houses, are also back to around pre-Covid levels.

Against a backdrop of more than 40,000 Covid-related deaths, an extra 1 million people unemployed and perhaps a quarter of the workforce having faced a cut in their incomes, the speed and scale of this recovery in consumption is, I think, fairly remarkable. It suggests considerable resilience on the part of consumers in the face of adversity. It also indicates considerable flexibility in both *how* and on *what* they spend.

On the *how*, UK consumers have (perhaps unsurprisingly) switched from the High Street online to meet their spending needs. Online spending has jumped from 20% to almost 27% of overall spending during the course of this year, peaking at a third of all spending in May. It seems probable some of this switch online will endure into the future. Online habits tend to persist.

On the *what*, there have been notable switches in expenditure patterns in the face of new working and socialising patterns (Table 1). According to data from Visa, on average this year spending on hotels and accommodation is down by over 40% and on travel by over 35%. By contrast, spending on households goods is up 8% and food spending is up by over 25%. Home production and home consumption has surged to counterbalance the effects of reduced time and money spent away from the home.

Table 1: Average year-on-year changes in Visa Consumer Spending Index since March 2020

	Food etc	**Clothing & Foot**	**Household Goods**	**Hea. & Edu.**	**Trans. & Comms**	**Rec. & Cult**	**Hot. & Rest.**	**Misc. Goods**
%	25.7	-18.2	8.0	-30.9	-35.4	-11.2	-41.8	-9.0

Source: Visa

Some of these spending habits are likely to persist. If more people work from home, travel spending is likely to be permanently lower and office equipment spending permanently higher. Other spending switches are likely to reflect pent-up demand and prove temporary – for example, on household goods, cars and houses. Nonetheless, with cumulative spending this year still running significantly below last year's levels – for houses and cars, 20-40% below – considerable pent-up demand remains.

An interesting case study in consumer resilience comes from restaurant spending. Peak to trough, this fell over 90% as restaurants closed. As they re-opened in July, restaurant spending picked-up, if initially slowly.

[2] See Haldane and Chowla (2020).

In surveys at the start of August, almost half of consumers said they felt very or quite uncomfortable about visiting a restaurant. That suggested considerable caution about eating-out, with many consumers seemingly putting a high price on personal safety.

The Government's Eat Out to Help Out scheme provided a £10-capped subsidy to eating-out during August. By the end of the month, it had supported 100 million meals across the UK. The scheme also provided an interesting test-bed for answering the question: what price do people put on overcoming their caution about visiting a restaurant? At £5.22, the answer was strikingly low.

The economic news has not all been positive. Job losses have continued to mount (though the Bank revised down its estimate of job losses by around 720,000 between May and August). And the recovery in consumer spending has not been matched among businesses. Business surveys suggest investment is still 20-30% below its pre-Covid level and online job vacancies are around 45% lower. For the worst-affected sectors, such as retail, hospitality and culture, the situation is weaker-still.

Where Next for the Economy?

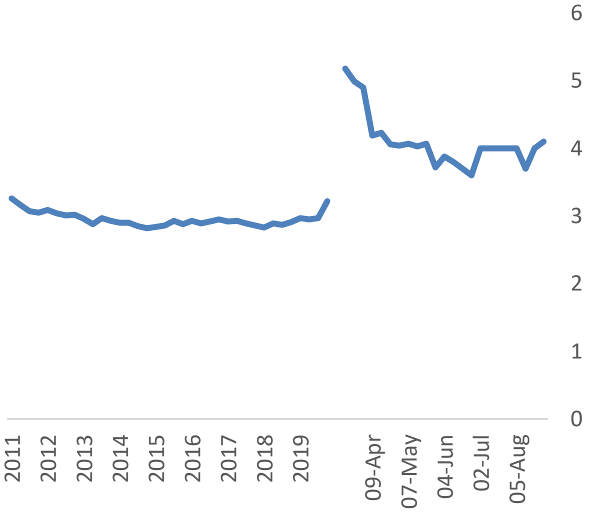
The key question, at this juncture, is what happens next? Will the positive momentum of the past few months continue or was this a false dawn? Will the resilience of the consumer, or the reticence of companies, win out? Is the economic glass nine-tenths full or one tenth empty? Such is the uncertainty, it would be imprudent to make confident predictions about the shape of the recovery from here - which is one reason why, contrary to some commentary, I have not done so.

Recovering the final few percentage points of lost output was always certain to be the hardest. Adding to that difficulty, storm clouds have recently begun re-gathering over the recovery. The three darkest of these clouds come from the rising number of Covid infections and the accompanying re-tightening of some lockdown restrictions across the UK; the threat from further job losses, including from the closure of the CJRS; and the risks from the transition to the UK's new trading arrangements with the EU at year-end.

All three of these risks - the unholy trinity - are clear and present dangers to the UK's recovery. They are the reason why, in its August projections, the MPC included a significant downside skew to demand. At the same time, these risks need to be put in proportion and in context. While recognising their gravity, my concern is that perceptions of these risks among household and businesses are, at present, exaggerated. By creating excess caution, this has the potential to restrain unnecessarily the recovery.

Levels of anxiety among the general public ratcheted-up dramatically in March and April, by a factor of two-thirds. Despite falling gradually, anxiety has remained at elevated levels, a third above pre-Covid levels (Chart 1). Measures of confidence among businesses and households have followed a similar pattern, spiking sharply downwards and largely remaining at those low levels, despite the sharp economic recovery (Chart 2). This suggests a persistent, and perhaps puzzling, degree of pessimism.

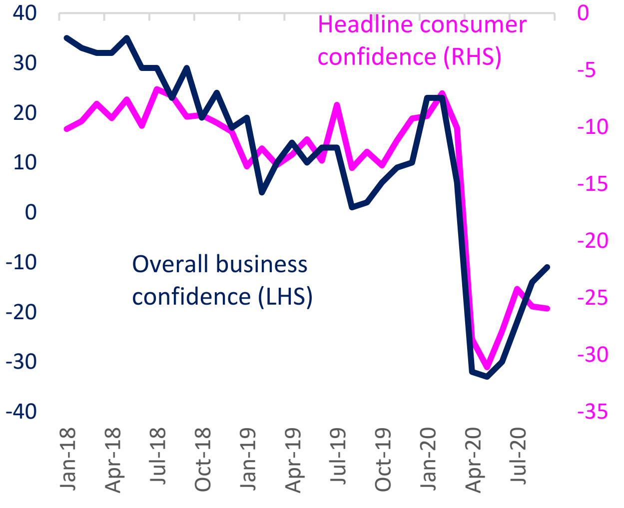
Chart 1: Anxiety score (mean response)



Source: ONS

Note: Quarterly data to March 2020 and weekly data thereafter

Chart 2: HH and business consumer confidence



Sources: GfK/EC Consumer Confidence Survey, Lloyds Business Barometer

Note: Headline consumer confidence is based on the average of five survey balances: general macroeconomic situation over the past 12 months and expectations for the next 12

The failure of consumer confidence to recover is particularly striking, given the complete recovery in consumption by households over the same period. Put differently, the historical correlation between consumer confidence and spending appears to have broken down (Chart 3). A wedge has emerged between peoples' expectations and their spending, between their risk perceptions and economic reality. The same is true, to a somewhat lesser extent, among businesses.

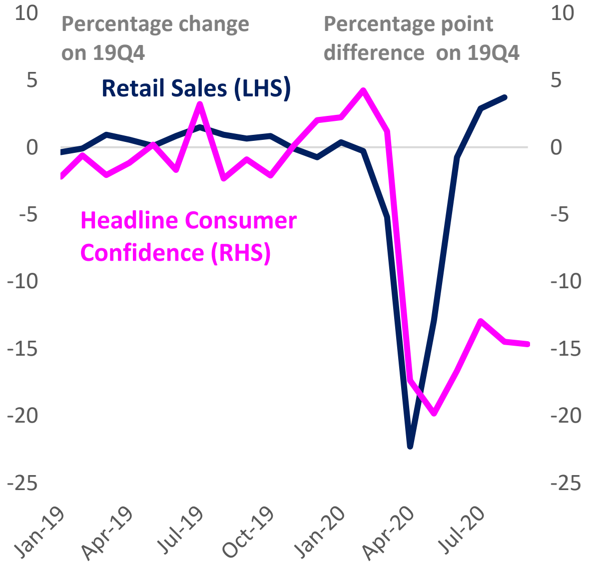
For households, that wedge might have arisen because of fears about *future* unemployment or inflation. Past experience suggests peoples' perceptions are sensitive to these macro-economic factors which is why economists sometimes combine the two in a so-called "misery index".[3] (Economics is not called the dismal science for nothing.) If you plot this index over time, and project it into the future using the Bank's most recent forecasts, two features stand out (Chart 4).

First, by the end of this year the misery index will have risen to around 8%, over two percentage points higher than at the start of the year. Economically, this is a significant rise. But, second, in the historical scheme of things this move is nonetheless fairly modest and the level of misery, comparatively-speaking,

[3] See Nessen (2008)

remains fairly low. The misery index also suggests some wedge has opened up between public perceptions and policymaker expectations for the economy.

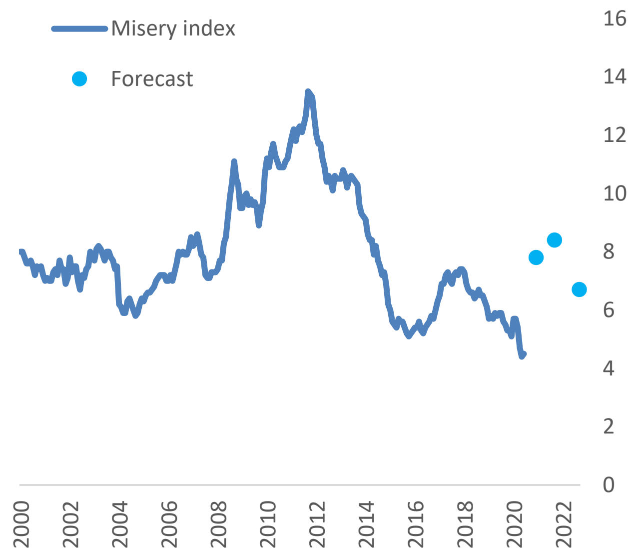
Chart 3: Consumer confidence and spending



Sources: GfK/EC, ONS.

Notes: Headline consumer confidence is based on the average of five survey balances: general macroeconomic situation over the past 12 months and expectations for the next 12

Chart 4: UK Misery Index



Sources: ONS and Bank calculations

Notes: Index is summation of the unemployment rate and inflation rate. Forecast is based on projections in Aug 2020 Monetary Policy Report.

If the public do have an exaggerated sense of the risks they face, what might be its source? Psychological studies suggest it may reflect behavioural biases inherited from our hunter-gatherer past. Humans tend to over-estimate systematically risks that are systemic or existential to lives and livelihoods.[4] This "dread risk" causes excessively cautious behaviour, sometimes with harmful side-effects – as when the exaggerated fear of flying after 9/11 caused more people to drive.[5]

These exaggerated risk perceptions are often amplified by others' words and actions. Caution is contagious. What often then emerges is a "popular narrative". These narratives have been found to be an important driver of collective behaviour in financial markets and the economy.[6] Behavioural biases at times of existential risk, spreading contagiously, can result in pessimistic popular narratives detached from reality. At times of stress, a global game of Chinese Whispers can generate unduly negative expectations.

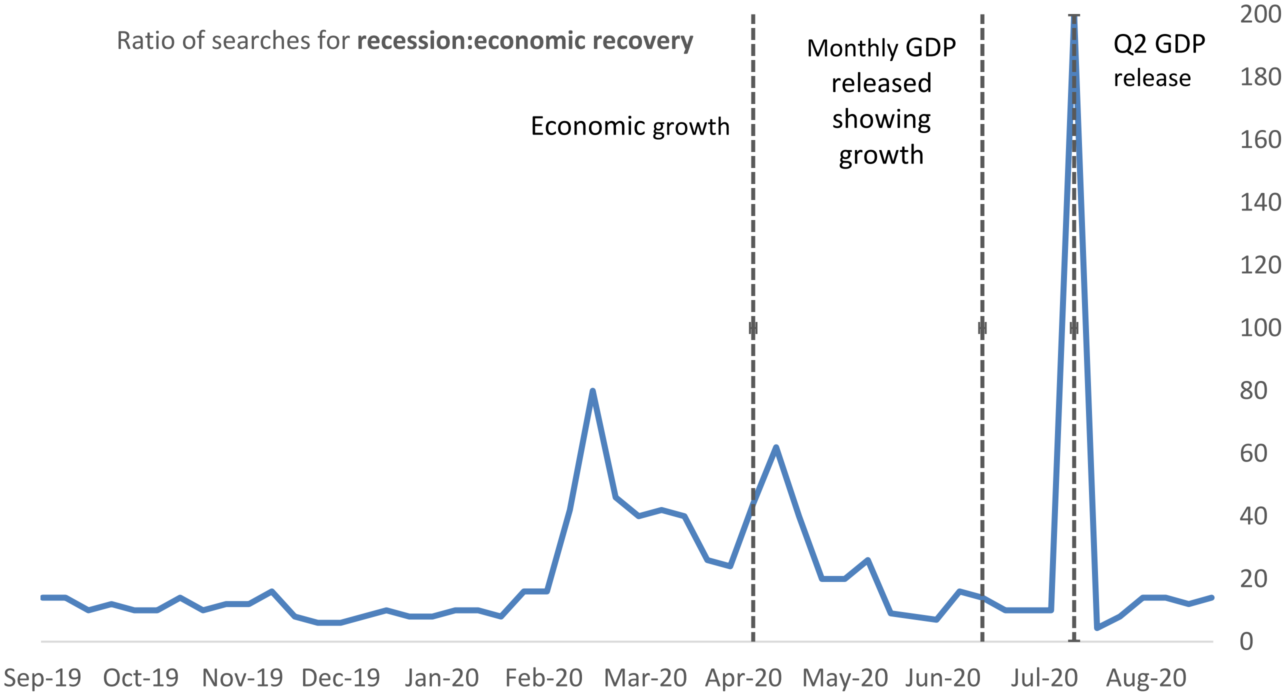
[4] See Haldane (2015)
[5] See Gigerenzer (2004)
[6] See Akerlof and Shiller (2009)

I think the prevailing popular economic narrative, among businesses and households currently, is unduly negative. It has emphasized recession and risk over recovery and resilience. It has resulted in good economic news (of which there has been plenty) being discounted too readily, and fearfulness about the future being accentuated. Let me give a few simple examples.

Chart 5 plots a simple Google search of the relative incidence of two words – "recession" and "recovery"; it is an economic pessimism ratio. Before the Covid crisis, the pessimism ratio was steady. As the crisis struck there was a predictable and sizable spike upwards, by a factor of roughly 8. Since then the ratio has fallen somewhat, as we might expect as the economy has moved from recession to recovery.

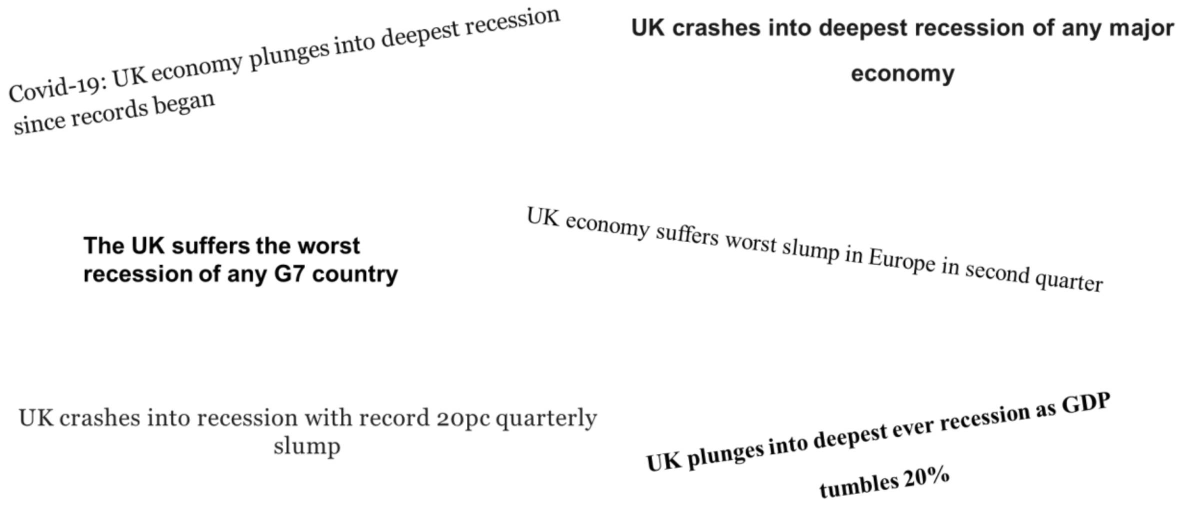
The dynamics of this sentiment indicator are nonetheless revealing. The drift down in the ratio has been very gradual. It remained elevated well after economic recovery had commenced and recession ceased. Even now, four or five months into recovery, recession is out-Googling recovery by a factor of 15 to one, above its pre-Covid level. The prevailing popular narrative on the economy has remained recessionary.

Chart 5: Ratio of Google Trends topic searches for the term recession vs economic recovery



Source: Google Trends

A particularly revealing episode is associated with the notable spike in the pessimism ratio on the 12 August. This was when the Office for National Statistics published second quarter GDP figures for the UK. These showed a huge fall of over 20% in GDP, the largest quarterly fall on record by far. This, understandably, was one of the top three new stories on the day. Here are some of the headlines that accompanied it:



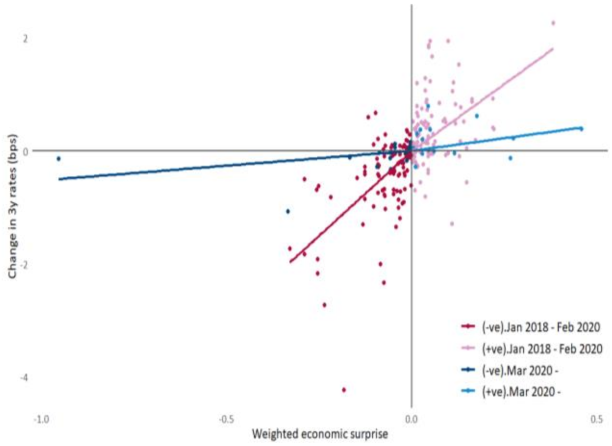
Yet the irony is that the *only* news in this release was GDP growth for the month of June, the final month of the quarter. This saw an almost 9% rise in activity, by far the largest rise in any month ever and above market expectations. Yet negative media headlines outnumbered positives by many multiples. Positive economic news was media-filtered into an extreme negative event.

This filtering of good news, and accentuation of the bad, is a familiar pattern of human behaviour at times of stress and uncertainty. Psychologists call it “catastrophizing” – discounting the best and fixating on the worst, whatever the balance of risks. It is a well-known problem among people suffering anxiety or depression. Economy-wide, the result has been collective dread risk, fanned by contagious pessimism.

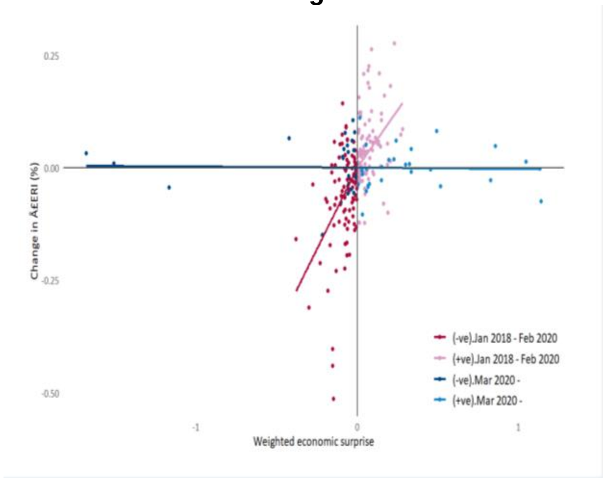
There is some evidence of a detachment from fundamentals in the behaviour of financial markets too. Chart 6 plot the responsiveness of various financial prices (interest rates, equities and the exchange rate) to macro-economic news in the two years period to the Covid crisis and during this year. Pre-Covid, all three market prices were sensitive to macro news. Since Covid, this relationship has disappeared. Financial markets, recently, have detached from economic fundamentals.

Charts 6 Financial market sensitivity to economic news

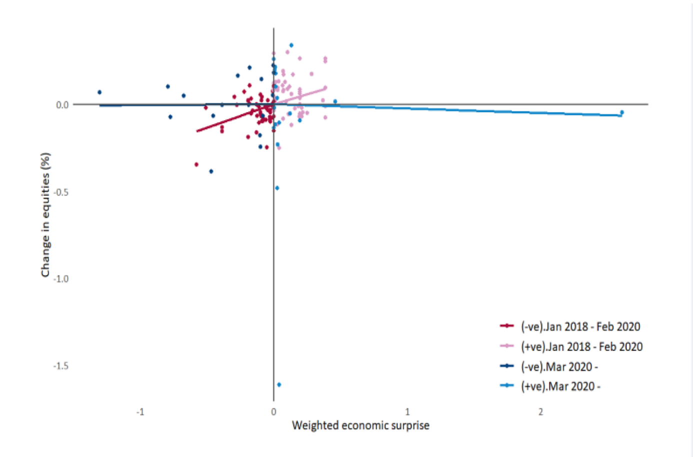
3 year sterling interest rates



Sterling ERI



FTSE All-Share



Source: Bloomberg Finance L.P., Reuters Tick data from Refinitiv and Bank calculations.

The Role of Policy

There is another reason why people may, at present, have an exaggerated sense of anxiety. The risks they face (to health, jobs and Brexit) are perceived to be beyond their control. It is well-known that events perceived to be uncontrollable add to anxiety. Indeed, anxiety can itself generate perceptions that events are beyond your control, contributing to fatalism about the future and excess levels of caution.[7]

Yet the risks facing individuals, businesses and the economy at present *are*, at least to some degree, within our control, collectively if not individually. All of these risks can be mitigated, if not eliminated entirely, by the actions of individuals, businesses and policymakers.

[7] See Grupe and Nitschke (2013).

One safeguard against these risks comes from our individual actions when we socialise, shop and work. A further, collective, source of insurance comes from public policy – public health policy, fiscal policy and monetary policy. Extra-ordinary action has been taken on all three fronts during the Covid crisis to contain risks to the public, businesses and the economy. As importantly, it has been made clear that further action would be taken on all three fronts where risks to re-escalate.

Taking the three largest risks in turn, on public health there has been a worrying rise in Covid cases across the UK recently. In response, a sequence of local lockdown measures have been put in place and last week these were accompanied by some tightening of national restrictions. While it is too early to judge what economic impact these measures will have, they are likely to restrain economic activity and slow growth.

At the same time, it is important to put the likely impact of these measures in proportion. While the impact on individual businesses may be large, their *direct* impact on aggregate activity is likely to be modest. The measures affect only a sub-set of spending, notably hospitality (7% of total consumption) and work-related travel (also 7%). If both categories were to fall to their levels at the start of summer, as lockdown began to be eased, this would take a little over 3% off levels of consumption in the fourth quarter and 2% off GDP.

But there are good reasons to think this is likely to be a significant over-estimate. Measures announced so far are nothing like as severe as earlier in the year. Even during that earlier period, we saw significant substitution between spending categories, partially insulating aggregate spending. In this respect, it is notable how quickly spending in the worst Covid-affected US States bounced back recently following their second wave.

Of course, it is possible the *indirect* effects of lockdown measures hit spending harder. The most important of those effects would arise if they caused a further significant dip in consumer and/or business confidence. But that rather underscores my central point – the importance of avoiding over-pessimistic commentary on the economic outlook which fuels anxiety, heightens caution and risks becoming self-fulfilling.

On the risks to jobs, this is clearly real and it is very likely further losses lie ahead. In its August projections, the MPC expected unemployment to rise to around 7.5% (or 2 ½ million people) by the end of the year. On that assumption, around two-thirds of the net job losses from the Covid crisis have already occurred, with a further 500,000 losses expected in the remainder of the year.

That unemployment projection, while necessarily very uncertain, flowed from an assumption that UK output would be around 5.4% below pre-Covid levels by year-end.[8] With an Okun coefficient of around 0.6, that translated into a rise of unemployment of 3-3.5 percentage points. In the August projections, this took unemployment from its pre-Covid level of 4% to around 7-7.5% at its year-end peak.

[8] Corrected 1 October 2020 from 7% in the initial publication.

Since then, there have been three significant pieces of news about the jobs outlook. First, output has continued to recover faster than expected. By the end of Q3, output is now expected to be only around 3-4% below its pre-Covid level. Other things equal, this lowers risks to the MPC's unemployment projections. Second, acting in the opposite direction, there are downside risks to this output projection as we move into the fourth quarter due to the new lockdown measures and any future measures.

The third piece of significant news is the announcement of the Government's new JSS last week, which provides wage subsidies to workers returning on reduced hours for a six month period. With details still to be finalised, it is too early to reach quantitative conclusions on the impact of the JSS. The direction of its impact is clear, however, reducing risks to unemployment relative to the Bank's August projections which assumed no successor scheme.

The balance of these effects on jobs is unclear. Surveys of employment expectations among households and businesses are at low levels. For example, households' expectations are consistent with a rise in unemployment to around 8 or 9%, at least a percentage point higher than the MPC's August projections. This is another example of the wedge between public and policymaker expectations. It also means households and businesses would be positively surprised if the MPC's projections were to materialise.

The third of the unholy trinity of risks – Brexit – is in some ways the hardest of all to judge. It too, though, is a controllable risk, at least to some degree, by businesses and policymakers. Whatever the final outcome of the trade negotiations, it is clear the UK will be leaving the customs union with the EU at the end of the year. Doing so in a way that reduces operational frictions in trade, and hence costs for the economy, will require intensive preparatory work by the Government and businesses.

Existing surveys suggest many firms still have a distance to travel before they are fully prepared for leaving the customs union with the EU, understandably so given the disruption caused by Covid. But there is still time for this operational work to be done and it will be important businesses prioritise that in the weeks ahead to minimise disruption to their businesses and the economy. I am confident UK companies will rise to this challenge, as they have to the challenge of Covid.

Let me say a final word on monetary policy. The MPC has already taken extraordinary monetary policy action in the face of the Covid crisis, reducing Bank Rate by 65 basis points and expanding QE by a further £300 billion. Through its forward guidance, the MPC has made clear that it will not tighten monetary policy until there is clear evidence of progress being made towards reducing unemployment and returning inflation to target on a sustainable basis.

The MPC has also made clear that it stands ready to take whatever further action is needed to support the economy and return inflation sustainably to target, should that prove necessary. Alongside public health and fiscal measures, this forms part of the on-going economy-wide insurance policy put in place during the Covid crisis. That insurance policy should be a source of confidence and comfort for companies and households with understandable concerns about their businesses and jobs.

At its meeting earlier this month, MPC decided no further monetary policy action was needed to achieve its statutory objectives. The MPC's minutes also explained that the Bank would be taking forward operational work to assess the feasibility of implementing negative interest rates, should this be required in future. Commencing that operational work underlines the MPC's commitment to having negative rates as a potential tool in the monetary policy toolbox.

Some commentators have interpreted the start of this work as conveying a signal about the likelihood of the MPC introducing negative rates in the near-term. The minutes contained no such signal. The operational work necessary to assess the feasibility of negative rates is likely to take a number of months. After that work is complete, judgements on negative rates will depend on the economic outlook at the time and in particular on whether that necessitates further monetary stimulus. If that condition was satisfied, any decision on negative rates would then depend on whether the balance of costs and benefits from using this tool was positive and whether this cost/benefit balance favoured negative rates over other monetary tools.

All three of these conditions would need to be satisfied before negative rates became a reality. At present, none of those conditions is in my view satisfied.

Conclusions

The economy faces uncertainties that are extraordinarily large and risks that are skewed to the downside. In this environment, caution is natural and understandable. It is important policymakers are vigilant to these risks and uncertainties and responsive to them with their policy actions. It is important they provide, as they have so far, economy-wide insurance to support businesses and households during these troubled times. That has been the approach of the MPC so far and it will continue to be its approach if new risks arise.

At the same time, it is important the unexpectedly positive progress the economy has made so far this year is not overlooked. The economy has recovered further and faster, and has shown far-greater robustness and resilience, than anyone expected. This positive news has received less attention than it deserves, both on its own terms and because of what it may tell us about the economy's resilience to future shocks.

My concern at present is that good news on the economy is being crowded-out by fears about the future. This is human nature at times of stress. But it can also make for an overly-pessimistic popular narrative, which fosters fear, fatalism and excess caution. This is unhealthy in itself but, if left unaddressed, also risks becoming self-fulfilling. I have a Rooseveltian fear of fear itself.

If the economy were sat on a psychiatrist's sofa, the diagnosis would not be especially difficult. A propensity to dismiss good news and dwell on bad? To catastrophize about the future? The sense of events being beyond our control? These are the psychological symptoms of anxiety. And collective anxiety is as contagious, and could be as damaging to our well-being, as this terrible disease.

Averting an economic anxiety attack calls for a balanced and flexible approach to the words and actions of businesses and policymakers. Planning for the worst is important, but needs to be accompanied by hope for the best. Encouraging news about the present needs not to be drowned out by fears for the future. Now is not the time for the economics of Chicken Licken.[9]

That means balance in how the economic outlook is described, acknowledging good news as well as bad, contemplating upside as well as downside scenarios, taking positive signals (as well as some comfort) from the resilience shown so far. This is not boosterism; it is balance, at a time when behavioural biases and pessimistic popular narratives offer an unbalanced lens on the economy. The policy authorities, including the Bank, have a public responsibility to avoid economic catastrophizing.

Policymakers, including the MPC, have already demonstrated a willingness to act at speed and scale to mitigate economic risks. They have put in place the UK's largest-ever economic insurance policy. It is important this insurance policy continues to flex as new risks arise, to build damaged confidence among households and businesses. For its part, the MPC has committed to keeping borrowing costs at current extraordinarily low levels to support jobs and incomes for as long as necessary to return inflation to target.

[9] The fictional fowl who, having been hit on the head by an acorn, declared the sky was falling in.

References

Akerlof, G and Shiller, R. 2009. *Animal Spirits: How Human Psychology Drives the Economy, and Why It Matters for Global Capitalism*. Princeton.

Gigerenzer, G. 2004. 'Dread Risk, September 11, and Fatal Traffic Accidents', Psychological Science, Vol 15, Issue 4.

Grupe, D and Nitschke, J. 2013. 'Uncertainty and Anticipation in Anxiety: An integrated neurobiological and psychological perspective'. *National Review of Neuroscience. 2013 Jul; 14(7): 488–501.*

Haldane, A. 2015 'Stuck'. *Speech to the Open University*.

Haldane, A., Chowla, S. 2020. 'Fast economic indicators'*. Nature Reviews Physics.*

Nessen, R. 2008. 'The Brookings Institution's Arthur Okun – Father of the "Misery Index"'. *Brookings Op-Ed.*

Okun, Arthur M. 1962. 'Potential GNP: Its Measurement and Significance'. *American Statistical Association, Proceedings of the Business and Economics Statistics Section, pp. 98–104.*