Under pressure?

What drives inflation and where it’s heading
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About Rathbones research
Rathbones has an experienced and well-resourced research team that supports our investment process. To generate investment ideas we start by exploring the main forces driving the global economy and their implications for the future. They include global geopolitics and central bank policy, as well as other themes such as demographic trends and the continuously shifting dynamics between developed and developing countries.

Find out more
We publish a wide range of in-depth analysis into the most pressing issues affecting the investment environment. Recent publications include:
– How soon is now? The investment impact of disruptive technologies
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– US vs Europe: The American Dream is alive and kicking

For more details about the key issues affecting the global economy and financial markets, please read the latest edition of our quarterly publication Investment Insights. Ask your investment manager if you would like a copy or visit rathbones.com
Foreword

Prices have gone up a lot over the years. Mr Darcy, in Jane Austen’s *Pride and Prejudice*, earned his status as one of the most famously flush men in English literature with an income of just £10,000 a year at the turn of the 19th century. Fast-forward a hundred years or so and Charles Foster Kane’s $60 million fortune in *Citizen Kane* established him at the top of the rich list.

You would need a thousand times that today. When *Citizen Kane* came out in cinemas in 1941 a ticket cost a shilling (5p in decimalised money). Today the average ticket costs around £7.50, although anyone who lives in London will be wondering where on earth that average cinema is. Even the cost of an appointment with the dentist has risen by 30% over the past 10 years alone.

One of the most complicated and fiercely debated economic experiences of everyday life is why and how prices keep rising. We call this phenomenon inflation. In this report, we examine some of the forces that influence inflation over the longer term, not what might cause prices to rise over the next six months. We’ve got plenty to say on the short-term outlook, but we hope to use this report to provide some thought leadership on a long-term theme for our long-term investors.

Understanding inflation

Even if economics is not your specialist subject, we hope you find this paper conceptually simple because the vast majority of us experience inflation and its consequences every day. Everyone buys goods and services; most of us earn a wage or an income from our savings and investments; everyone ages; everyone lives in a globalised world, which is changing all the time with technology and innovation. Yet understanding how all these forces interact and the effect they have on the prices we pay every time we part with our money is not easy.

Moreover, many of our clients have inflation-adjusted return targets (in economics we call that a real return target). They want to generate an investment return over and above the rate at which consumer prices rise, preserving the purchasing power of their wealth and growing it or drawing an income from it.

This is a vast subject, with an expansive literature. We focus most of our discussions on demography and ageing, on globalisation and technology, and on the interaction between wages and prices. Why these subjects? Because they are likely to be some of the major determinants of the rate at which prices rise over the next 20 years, and the way in which they affect inflation may be changing. We hope this piques your interest. It certainly does ours.

Edward Smith
Head of Asset Allocation Research
A very short history of inflation

It’s helpful to think of inflation in terms of the old adage, too much money chasing too few goods. But don’t let the simplicity of that statement fool you: the factors that influence the flow of money and the amount of goods (and services) produced are vast, and we have limited our discussion to three broad topics.

In the first section, we delve into demography and ask how patterns of ageing and saving might influence inflation. In the second section, we explore globalisation – its net effect may not be what you think. In the third, we ask how patterns of employment impact prices and whether changing patterns of work – more self- and part-time employment, for example – might alter the relationship. We then offer a range of inflation scenarios and give you our thoughts on their likelihood.

We also want to set out what we’ve omitted. We haven’t picked apart the inflationary or deflationary forces that Brexit might impart. In the worst-case scenario, Brexit would represent a shock to the productive capacity of the country. In advanced economies, such shocks tend to have a transitory effect on inflation and are unlikely to influence the long-term trend. Brexit would be more likely to have a lasting impact on interest rates and the exchange rate.

Please refer to our report If you leave me now for a comprehensive overview of how we think leaving the European Union may impact the UK economy. Second, we have not discussed the effect of quantitative easing. We’re discussing what drives inflation over the long run. The tightening or loosening of monetary policy in the name of meeting central banks’ inflation targets – by ordinary or extraordinary means – is only likely to impact inflation temporarily.

But first, how did prices get to where they are today?

A personal experience

Inflation in the UK has averaged 2.1% a year over the past 25 years, but during the 25 years before that it averaged 8.4%, breaching 25% in the 1970s. We’re all susceptible to assuming our past experiences are the rule rather than the exception. Older readers may be tempted to think the recent quiescence is unusual. If that’s you, you are in good company. A fascinating (if rather unnerving) paper by three economists at Berkeley has revealed how personal experiences of inflation have strongly influenced the voting tendencies of Federal Reserve (Fed) policymakers over the past 60 years.

In other words, rather than setting interest rates based solely on prevailing economic fundamentals, those highly intelligent men and women tasked with steering the US economy have been swayed strongly by the rate of inflation they have experienced during their lifetimes (Malmendier et al, 2017). In figure 1 we plot the rate of inflation over the past 250 years, which shows that low inflation is not unusual. High rates of inflation in the 1970s and 1980s were rather unique: outside periods of war, inflation has rarely strayed too far away from low single digits. In the 19th century, it averaged 0%.

What drove prices higher in the 1970s and 1980s in the UK was a combination of the unfortunate and the unadvised. The deregulation of mortgage lending and the mass adoption of credit cards fuelled an almighty consumer boom, while the government slashed taxes and made a dash for growth as policymakers assumed the economy had more spare capacity than existed. Wages rose and rose, in no small part due to monopolistic labour unions who called
Introduction

strikes whenever pay caps were mooted, crippling productivity. The 1973 oil crisis doubled the price of petrol. When it all came crashing down, the situation was made far worse by appalling monetary policy decisions that left firms’ and households’ expectations of what prices would be next year — or the year after that — dangerously unanchored.

This perfect storm is unlikely to be repeated. Lessons have been learned the hard way. Since then inflation — and wage inflation — has been characterised by a slow-moving, stable trend (Yellen, 2015). In this paper, we’re interested in what might influence that slow-moving trend over the next 20 years or so. (Few of our non-endowment clients have an investment horizon longer than that).

Box 1: Defining inflation

Inflation is a general rise in prices, not just a few items becoming more expensive here and there. Disinflation tends to mean a slowing rate of price rises, as distinct from deflation, which means outright falling prices. But there is plenty of confusion here and we try to avoid using disinflation.

Inflation is usually defined as the average rise in prices paid by the average consumer. It is calculated by how much money was spent on thousands of different goods and services in the previous year. In the UK, the Office for National Statistics (ONS) captures a data series called the consumer price index (CPI), and the annual rate of change of the CPI is the most commonly used measure of inflation.

What does it mean for me?

You might ask how applicable the rate of inflation experienced by the average consumer is to you. In figures 2 and 3 we’ve calculated rates of inflation based on the expenditures of different age groups and income brackets. There is surprising consistency between them. Over the past 15 years, the CPI for the highest-earning households has averaged 2.1%, the same as the headline index. During this time, prices have risen the most for the lowest earners because they spend more on energy and utility bills (27% on average).

This feature has also made their rate of inflation the least predictable from year to year. Similarly, the difference between the average rate of inflation experienced by different age groups over the past 15 years has been negligible (less than 0.1%), apart from the under 30s, who have faced an extra 0.3% of inflation a year, again due to the higher weighting to utilities.

What about housing costs?

Consumer price indices do not tend to include the costs of purchasing a home. This is a matter of contention if the index is used to measure the cost of living. However, as a measure of inflation — a general rise in prices — it is no bad thing. Housing markets are often highly localised and influenced by factors not applicable to other prices (such as tax rates offered to foreign investors). Meanwhile, mortgage costs depend on personal circumstances in a way that most other prices do not.

The link between mortgage costs and monetary policy is also very different. Central bankers raise interest rates to stop prices rising too quickly. But mortgage costs are directly tied to central bank interest rates, so in the short term higher interest rates would exacerbate, not curb, inflation. In short, if you want to understand what drives prices in general, it’s best to leave houses out of the equation.
Demographics at a tipping point

How patterns of ageing and saving affect prices

A permanent change in the age structure of a population — its demography — can alter patterns of consumption, saving and investment. It can also affect the size of the workforce and its skillset, the rate of productivity growth, and the way in which income is distributed between labour and the owners of land and capital. All these transitions can impact inflation, but in ways that can push in opposite directions. Despite economists’ best efforts, the implications are not always clear, either in theory or upon rigorous empirical study.

The popular consensus seems to have coalesced around the view that an ageing demographic profile is deflationary. The Japanese experience is often the first evidence cited. From the mid-1990s, Japan was the first wealthy nation to suffer a shrinking workforce. Since then its rate of inflation — and the expected rate of inflation in particular — has struggled to stay in positive territory. But, as we posit in the boxed text on page 13, there are many moving parts and we are not so sure that its lesson is relevant to the rest of the world. Moreover, there is a significant body of research setting out well-reasoned and well-evidenced arguments for the inflationary consequences of ageing.

We believe that ageing creates both inflationary and deflationary forces. Which way the balance tips may be determined by which age cohorts are growing or shrinking most rapidly. In this regard, ageing has just entered a new era. Our reading of the literature, confirmed by some modelling exercises of our own, suggests the next phase of ageing is likely to start to exert net upward pressure on inflation, but not to any alarming extent.

**Saving less and spending more**

A recent project called the National Transfer Accounts has confirmed what some economists have always suspected: that consumption does not fall with age. Indeed, as figure 4 shows, spending continues to increase through the average lifetime, while incomes fall (unfortunately the project is yet to publish data for the UK). The composition of an individual’s spending tends to change with age — the very old spend very large sums on healthcare, either privately or via government programmes — but the fact remains that the total amount of goods and services demanded does not decrease.

Intuitively, an inflationary impulse occurs when the proportion of the population willing and able to work starts to shrink relative to those who are no longer ‘productive’ — in other words, when more and more non-workers compete for the goods and services produced by relatively fewer workers. The UK has only just reached that stage today.

Since the 1960s, the number of non-workers — the old and the young — has shrunk relative to the number of workers. We call this the ‘dependency ratio’ because these two groups depend on the goods and services produced by those of working age. The number of producers has grown more quickly than the number of consumers. In other words, while the world has been ageing, this crucial demographic pattern has sent a profoundly deflationary impulse. But since the 1960s, the number of non-workers — the old and the young — has shrunk relative to the number of workers. But this deflationary impulse is now reversing.

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**Figure 4: Spending patterns**

Income and consumption by age, expressed as a percentage of average income for 30- to 49-year-olds.

Source: National Transfer Accounts and Rathbones.
that impulse is reversing — and in some countries quite sharply. The dependency ratio troughed in the UK around 10 years ago (according to United Nations data) — from now on the proportion of pensioners is set to grow more quickly than those of working age (figure 5).

A global dependency

For sure, the UK’s dependency ratio is not set to rise quite so steeply as other global regions. The absolute number of 15- to 64-year-olds is not set to peak until around 2072, while it has likely already peaked in Western Europe and China. That said, our economic modelling work (see appendix) confirms that the global dependency ratio better explains changes in UK inflation than the UK’s.

Globalisation has integrated global workforces: when previously isolated countries enter global supply chains and start to consume (now globalised) goods and services, the effect on richer countries is analogous to a boom in the working-age population (Goodhart & Pradhan, 2017). The decline of advanced economy dependency ratios was amplified by the integration of China and Eastern Europe into the global workforce from the early 1990s. China started that decade with just a 2% share of global manufacturing, by 2016 it had taken a 19% share. However, many of the most globally integrated emerging economies are ageing more rapidly than the UK or the US. Even with the favourable demographics of African and southern Asian economies, the global dependency ratio reached its nadir in 2012.

Now, fewer workers catering to a relatively greater demand for their wares could improve their ability to bargain for a pay rise. In theory, that will push up wages beyond what could be justified previously by their productivity, which is inflationary. The effect is magnified as older people’s spending habits shift towards services that use labour more intensively, such as healthcare and holidays. (Remember the idea of too much money chasing too few goods.)

Labour scarcity would also shift income away from capital (profits) and towards workers. The owners of capital tend to be wealthy, and the wealthy tend to save a large amount of their income. So a process that redistributes income away from the wealthy also reduces savings and increases consumption, which is likely to be inflationary too.

In his book, The Age of Aging, the economist George Magnus points out with arresting lucidity how ill-prepared governments are for the expense of serving an aged population. And an ageing population can become a very expensive one. In California, the elderly receive three times more government spending than the young. If we assume that social safety nets and welfare states are kept in place, a considerable amount of income will need to transfer from workers to the old. Taxes will rise. If the transfer is progressive, funded by the wealthiest members of society, it may also be inflationary, providing the government spends the proceeds domestically. Higher taxes will reduce wealthy households’ disposable incomes and they may respond by reducing savings more than consumption.

Figure 5: Demographic patterns

The dependency ratio for 15- to 64-year-olds suggests the proportion of pensioners is set to grow more quickly than those of working age.
This issue raises the question of whether government debt matters for inflation. The data suggests it has not had a significant impact since World War II (Giannitsarou & Scott, 2006). Theoretically, government debt doesn’t matter providing monetary policy remains unconstrained. Imagine an economy closed off from the rest of the world. When the government issues debt the private sector has to buy it. The government then spends (or distributes) the money it has borrowed back into the private sector. But because this transaction has changed the balance between desired savings and desired investment, interest rates will rise and that creates a new non-inflationary equilibrium. The situation becomes more complicated when we introduce open, interconnected economies and banking systems, of course. But the basic intuition should still hold — that interest rates (together with exchange rates) balance things out.

**The middle-age savings spread**

Ageing in the UK has thus far been deflationary because dependency ratios have been falling. Middle-aged cohorts have increased particularly quickly, which has increased savings relative to consumption. This group saves the most as retirement looms (Magnus, 2009). As more people move out of middle age, savings decrease and consumption increases. An important academic study found that people’s consumption habits start to ‘turn’ deflationary in their early 30s (Juselius & Takats, 2015), which is when rates of saving start to shoot up (figure 6).

In the UK, the proportion of 30- to 64-year-olds in the population peaked in 2005, although globally it is not set to peak until 2025. Over the next decade then, this trend is likely to exert downward pressure on prices of tradeable goods and services but place upward pressure on the price of services in the UK and other advanced economies that are wholly domestically supplied.

If life expectancy continues to increase, middle-aged cohorts are likely to save more (cf. Bloom et al, 2009 for the strong link between life expectancy and saving). However, a recent report by the Institute of Health Equity at University College London found that life expectancy has slowed or even stopped rising altogether in the UK (Independent, 2017).

**Ageing and efficiency**

Inflationary pressures could be amplified if a shrinking workforce places upward pressure on wages, while ageing slows the rate at which companies improve their productivity — how many goods and services a given level of workers can provide. A study by ZEW, a leading economic research institute in Germany, found that industries with a higher proportion of older workers are less likely to adopt new technologies. You may remember that the NHS’s failed multi-billion pound patient record-keeping system was blamed on the inability of less-IT savvy older workers to input data (although we suspect a lack of incentives and poor implementation may also be to blame).

The economist James Feyrer has shown that the median age of those responsible for innovation in the US has been remarkably stable at around 48, whereas the median age of managers who adopt their ideas is lower at around 40. Most patent applications are also filed by the under 60s (Aksoy et al, 2016). Other studies have found evidence of a decline in labour quality in the over 50s when speed and problem solving were required, but not when verbal ability or experience matters (Skirbekk, 2003).

Taken together, these studies are worrying: ageing causes an aggregate decline in the agility of human capital, but also prohibits the adoption of new technologies that could make up for the loss. However, as ageing societies naturally demand more services that require people skills and experience, this effect may not be so significant. It also seems that the number of people in their 40s is the key for innovation and change, so we should breathe a sigh of relief that this cohort is not set to peak in the UK until 2033 and globally not until 2096.

In contrast, the number of 40-year-olds in Western Europe peaked in 2009. If this link between demography and productivity growth holds then a fall in relative productivity is likely to put downward pressure on the euro relative to the exchange rates of economies ageing less rapidly, and that could have an inflationary impact in the eurozone through rising import prices.

Two Japanese economists have found another way in which ageing can lower aggregate human capital. Older workers have a significant amount of specialised, even firm-specific, knowledge that they find difficult to transfer to new roles or new companies. When good, incumbent workers are left unemployed as a result of the natural processes of competition and creative destruction or a downturn in the business cycle, the older among them undergo a permanent loss of human capital and the economy a permanent loss of productivity (Fujita & Fujiwara, 2014).

**Which way will the wind blow?**

There are counterarguments to what we have just set out. The main one was first proposed in the 1930s by an economist called Alvin Hansen. As populations age, population growth also slows. Hansen said that economies only need a given stock of capital (buildings, equipment, infrastructure and land) per worker. If population growth slows, demand also falls for new houses, new offices, new machines and so on. At its most extreme, Hansen hypothesised a ‘secular
stagnation’ – an enduring decline in investment spending and a chronic oversupply of savings, which pushes an economy into a semi-permanent slump and unleashes fiercely deflationary pressures.

We are not so sure that ageing will cause investment spending to slow quite so dramatically from here. More importantly, we are not so sure it will cause future investment spending to fall by more than future savings. Consider residential investment. Inertia is well documented and older people tend to keep their large family homes, necessitating more houses for a given population as that population ages. Even if older people did vacate their homes, younger generations can’t afford them today anyway so more affordable housing needs to be built. From a global perspective, as emerging markets continue to get richer, existing housing stock requires replacing as high incomes increase the demand for more floor space and second homes. This puts upward pressure on the cost of building materials (Goodhart & Erfurth, 2014).

If a scarcity of labour places upward pressure on wages, firms have an incentive to invest in labour-augmenting technology in order to mitigate some of that extra cost. Business investment has been lower than expected in most countries over the past 20 years, but this was also driven by the relative availability of labour and its relative cheapness as globalisation brought new low-cost workers into the workforce. As we have seen, the relative availability of labour has come to an end, although relative cheapness could persist if – and it may be a big if – governance, infrastructure and education can improve in Africa and the Indian subcontinent. Lastly, the impetus to limit global warming should also mandate large investment spending in clean energy production and distribution, transportation and farming.

An oft cited study by three International Monetary Fund (IMF) economists confirms that unanticipated ageing causes inflation to deviate below the prevailing trend, but it does not analyse the impact of ageing on the trend itself, which is what this report is really interested in (Yoon et al, 2014).

Adding it all up
Our conclusion that ageing is on the cusp of becoming inflationary is supported by an increasing number of robust academic studies (cf. Goodhart & Pradhan, 2017; Aksoy et al, 2016). One of the most rigorous concluded that demographic change has caused on average a five percentage point fall in the rate of inflation across 22 advanced economies from the late 1970s, a process that was largely completed by the early 2000s (Juselius & Takats, 2015). This was attributed to the growing proportion of 35- to 64-year-olds (figure 6). The proportion of that cohort has peaked; from the age of 65, the average person carries inflationary pressures.

As a base case, we estimate that the ageing process over the next two decades will increase the annual rate of inflation in the UK by between 0.15% and 0.23% by 2037, all other things being equal (see figure 7 and appendix). We see three downside risks to this view.

First, younger workers are saving less than their predecessors (Magnus, 2009) and may not be saving enough for retirement. If this continues all the way to pensionable age, consumption spending is likely to start falling with age, potentially quite dramatically.

Second, robots. In our essay on the economic impact of automation, If the machines aren’t coming for your jobs, are they coming for your investment returns?, we argued against the ‘mass
Demographics at a tipping point

**Box 2: Will the old vote their way to deflation?**

“Demographics is not destiny”, to paraphrase George Magnus. Lawmakers can change retirement ages or incentivise and facilitate greater participation in the workforce from those of working age. That said, it is unlikely — and in some cases impossible — to legislate ageing workforces away. The IMF has estimated that to offset the impact of a declining proportion of 20- to 64-year-olds in the population to 2050, participation rates would have to rise by an average 10 percentage points across advanced economies (20 in Spain, Italy and South Korea).

In other words, if around six people in every 10 in this age group work today, seven in 10 would need to work by 2050 to offset their shrinking numbers. To put that in context, the participation rate only increased by six percentage points between 1960 and 2000, when economic and social conditions were arguably much more favourable (Magnus, 2009).

Mathematically at least, raising the retirement age could provide a more feasible offset. It would need to rise by around seven years across advanced economies to offset the decline in the proportion of 20- to 64-year-olds (and by only three years in the UK). But average retirement ages have been falling over the past two decades, and attempts to raise them in a number of European countries since the financial crisis have shown just how unpopular the policy is with voters. James Bullard, President of the Federal Reserve Bank of St Louis, believes older people vote for policies that engineer low inflation, benefiting those with savings but no wage income (Bullard et al, 2012). Although the central bank committees responsible for setting monetary policy are independent, they are appointed by elected politicians. Voter preference can more directly influence fiscal policies and we wonder whether this is why austerity — an indisputably disinflationary policy, even if you believe it necessary — has found more favour with conservative (traditionally older) voters.

Analysts at Morgan Stanley have argued that Japan failed to escape inflation in the mid-2000s because of an entrenched preference for deflation in a legislature that is biased towards the elderly — the seats with the highest proportion of elderly voters relative to youth voters require fewer votes to win. Such gerontocracies are entrenched by the habitualness of older voters, regularly turning out and voting for the same party. Our own analysis suggests that there is the foundation for a similar bias in the UK. As the downward sloping trend line in figure 8 shows, constituencies with an older demographic contain fewer voters and therefore require fewer votes to win. They also tend to be in the regions that the ONS estimates will age the most over the next 20 years. The correlation weakens when we look at those registered to vote, however.

<table>
<thead>
<tr>
<th>Proportion of elderly residents minus young residents (%)</th>
<th>Total number of residents</th>
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<tr>
<td>-30</td>
<td>20,000</td>
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<tr>
<td>-25</td>
<td>40,000</td>
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<td>10</td>
<td>160,000</td>
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<td>15</td>
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**Figure 8: UK constituencies by size and demographic**

The elderly tend to prefer things to stay the same and analysis of voter behaviours suggests this behaviour can have a deflationary effect on an economy.

unemployment’ thesis because of the likelihood that artificial intelligence is likely to be more of a human’s complement than a substitute (‘co-bots’ rather than robots) for the foreseeable future. But if ageing limits our ability to work alongside machines, developers may redouble their efforts to produce a rival to human labour with general (non-task specific) intelligence. Initially, the increase in investment spending would be inflationary, but if they were successful, the wholesale displacement of workers would have profoundly deflationary consequences.

The third, politics. This represents perhaps the greatest downside risk to our view that ageing populations will turn inflationary. (See box ‘Will the old vote their way to deflation?’)

**Ageing past the tipping point**

Over the past five decades, ageing has had a profoundly deflationary effect. But what may be the crucial factor, the dependency ratio, acting on patterns of saving, investment and productivity, has reached a tipping point. From now on, a rising proportion of older people and a declining proportion of those of working age is likely to create a net inflationary impulse.
The UK’s dependency ratio troughed in 2007 but its working-age population isn’t projected to shrink until 2072 and its total population isn’t set to shrink this century.

**Box 3: Is Japan a special case?**

The speed at which Japan’s population is ageing is infamous. So too is its inflation problem: it’s been stuck around zero since the mid-1990s, when the 15- to 64-year-old population peaked. Many people assume that Japan’s demography led to its deflation, and that this manner of causation must be universal. We are far from convinced. Japan’s situation is unique in various ways:

**The dependency ratio.** Japan’s dependency ratio (non-workers relative to the working-age population) started to increase after 1992, when this ratio for the rest of the world still had much further to fall. While labour was becoming scarcer in Japan, it was becoming more abundant abroad. In a new era of globalisation, Japanese firms ‘offshored’ production, making use of this abundant labour to keep wages from rising. Japan was also next door to the epicentre of the offshoring revolution — China. Japan aged alone, the rest of the world is doing so more or less in synchrony. That’s a very important difference.

**A shrinking population.** Furthermore, Japan had to deal not only with a rising dependency ratio, but also a shrinking working-age population and a soon-to-be-shrinking total population all at the same time. Again, this is unique. The UK’s dependency ratio troughed in 2007 but its working-age population isn’t projected to shrink until 2072 and its total population isn’t set to shrink this century. Of course, these projections are conditioned on a reasonable degree of immigration (and Brexit may change that in the UK). Japan had legislative and cultural barriers that kept immigration extremely low, and prevented younger immigrant workers from offsetting the ageing, native workforce. Not only was Japan’s ageing exceedingly rapid, it was also poorly understood. The academic literature was nowhere near as rich, and firms and governments had little knowledge of the consequences. This situation led to an unanticipated decrease in demand — a shock that once realised contributed to a collapse in investment and spending that was already under way after a severe financial crisis (Koo, 2011; Yoon et al, 2014).

**Losing market share.** While household savings declined to support pensioners’ spending habits, corporate savings ballooned, which was probably a key factor (Gruber, 2015). Japanese firms also started to lose market share around the world. It’s worth considering a counterfactual: if Japanese firms had been better at exporting, would gross investment have declined by so much and would the deflationary force have been nearly so great?

**Ageing and deflation.** In 2014 three IMF economists released a paper entitled, *Is Japan’s Population Aging Deflationary?* It concluded it was, and is very frequently cited as evidence that all ageing must be deflationary. But the paper actually supports the idea that it is unlikely to be for the rest of the world. The study confirmed that aggregate demand has been well-supported by retirees spending from savings. However, Japanese savers held a large quantity of financial assets overseas, so dissaving by the elderly resulted in a repatriation of foreign savings, which in turn led to the appreciation of the yen.

Remember that Japan had offshored much of its production so its rate of inflation was much more dependent on import prices, which fall as the yen rises. The deflationary impact from currency appreciation more than offset the inflationary effects from higher demand relative to supply (Anderson et al, 2014). Clearly, if many advanced economies are repatriating foreign savings at the same time, the exchange rate effect is not going to be so great.  

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4. We include the dependency ratio in our estimation of behavioural equilibrium exchange rates, which attempt to compute the exchange rate justified by long-term economic fundamentals. The pound, which is already extremely undervalued relative to equilibrium, is unlikely to be driven lower by the UK’s relative demographic profile (Rathbones, 2016).
Exploring globalisation’s net effect on inflation

Globalisation has come a long way fast, but the process has slowed. On the basis of the Fraser Institute’s Economic Freedom Index, more than 98% of the world’s population has lived in a capitalist society since 2005, up from just 30% in 1985 (figure 9). The average tariff charged on imported goods in advanced economies has more than halved since 1980 and tumbled by more than two-thirds in developing ones, but again the process was largely over by the mid-2000s (IMF, 2016).

Global exports measured as a percentage of global gross domestic product (GDP) are no higher today than they were 10 years ago; the World Trade Organization’s quantification of global supply chain integration also seems to have peaked. The incentive for developed economies to offshore production has also eroded. In 1990, the average hourly manufacturing wage in the UK or Germany was 18 times the average hourly wage in China; today it is just four times. Whatever effect globalisation has had on inflation to date, its impact seems likely to be much smaller in the future.

But what effect has globalisation had on inflation? In the previous section, we touched on the impact globalisation has had on labour markets. As new workers have been brought into global supply chains, the effect on richer countries is analogous to a boom in the working-age population, decreasing workers’ ability to negotiate higher wages and increasing the slice of the pie going to capital, which has increased savings at the expense of spending (IMF, 2017).

A global market
Capital markets have also been globalised, which has also pushed down prices. Since a company in Germany has been able to raise investment from a company in Hong Kong, themselves backed by investors in the UK, the cost of capital has decreased as the available supply has effectively increased. In particular, globalisation has lowered the cost of capital in capital-scarce emerging markets, facilitating more investment and expanding the network of lower-cost operations in emerging economies producing goods for export. Investment here from advanced economies may pass on knowledge, improving efficiency and thereby lowering prices further.

Most recognisably, global integration has combined to lower production costs and this pushes down prices both through imported goods and through the lower cost of imported components and parts and ancillary services (such as help desks in Bangalore).

There are also indirect effects. Globalisation increases competition, which has the potential to spur productivity growth and possibly reduce inflation. There is some evidence of this in the US in the 1990s (Chen et al, 2009). Productivity growth makes it easier for central banks to allow inflation to fall because output growth will continue to be rapid nevertheless. Again this may have been the case in the US in the 1990s, but the surge in productivity did not seem to spill over into other advanced economies. This casts doubt on whether globalisation really did accelerate innovation across borders and indicates that maybe the US was just doing its own thing (Mishkin, 2008).

The increased purchasing power of wages induced by lower import prices might also dampen demand for wage increases. At the same time, however, lower import prices free purchasing power for other goods and services, which exert upward pressures on inflation elsewhere.

Lower prices here, more demand there
Let’s stick with the idea that lower prices here may mean more demand over there. As globalisation brought hundreds of millions of citizens in emerging markets into the middle classes, their incomes compete for many of the same goods and services that fill advanced economies’ inflation baskets. In particular, China’s rapid development led to a soaring demand for commodities and agricultural products. During 2004 to 2006 the region accounted for 40% of the growth in the global demand for oil and more than 70% of the global growth in copper and zinc. Toys and gadgets may be cheaper, but that has been at least partially offset by the rising cost of food, fuel and building materials.

Indeed, if utility bills account for such a large share of the under 30s’ annual...

Figure 9: The Fraser Institute Economic Freedom Index
The proportion of the global population living in a capitalist society has increased from 30% in 1985 to 98% in 2005.

Source: Fraser Institute, Datastream and Rathbones.
expenditures, globalisation may have actually increased the rate of inflation experienced by younger age groups. Analysis by the Federal Reserve Board of Governors has weighed the downward effects on US inflation from cheaper manufactures against the upward effect from higher commodity prices and found that the net effect is close to zero (Mishkin, 2008). Research by the Organisation for Economic Co-operation and Development has reached a similar conclusion, finding a net effect of 0 to -0.25% on annual inflation in both the US and the eurozone.

This may come as something of a surprise – it certainly goes against the popular narrative – but when we step back to consider the bigger picture, the logic is rather obvious. If the next phase of globalisation becomes about emerging markets capturing larger shares of the global trade in services, the deflationary impulse may be a little stronger. While the global trade in services has grown more strongly than the trade in manufacturing, emerging markets have captured very little of that growth. China has just a 4% share of global services exports, and that share hasn’t grown at all since 2000. So there’s plenty up for grabs. Tradeable services (such as computer programming, design, accountancy and call centres) are far less capital intensive than manufactures. They do not require such large investments in structures, equipment and supporting infrastructure to get them up and running. They do not need kilometre-long factories, expensive precision instruments or transport to get their goods to market. All that’s required are basic offices, computers and fast broadband. As such, the offshoring of services to emerging markets would be unlikely to exert the same upward pressure on commodity prices. An interesting hedge against one of the possible drivers of lower inflation over the next decade might be a basket of Indian companies exporting services.

Globalisation has undoubtedly globalised the forces that act on inflation, even if they may act in opposing ways and the net effect is up for debate. Consequently, central banks have less control of the forces that drive the domestic rates of inflation under their respective wards. As we shall see in the next section, this has altered the relationship between unemployment, wages and prices. We know that central banks take this lack of control into account.

Between 1998 and 2006, goods inflation (excluding energy and food) averaged around -1.5% a year in the UK, while the monetary policy stance supported +3.7% annual inflation of services prices, which are largely determined by the evolution of domestic costs, in order to meet the Bank of England’s (BoE’s) 2.0% inflation target (Carney, 2015). But it is perhaps no surprise that central banks are turning their attention increasingly towards financial stability. In other words, if price shocks are now global in nature and they can’t prevent them, they can make sure that the buttresses are as sturdy as possible. Expect the regulation of financial services to become even more severe.

Falling prices of toys and gadgets

Rising cost of food, fuel and building materials
The elusive relationship between jobs, wages and prices

If falling dependency ratios and globalisation have eroded workers’ bargaining power in advanced economies, is there still a link between a country’s employment conditions and its rate of inflation?

In economics, we call the relationship between domestic conditions and inflation the Phillips curve (after a pioneering, mid-20th century economist — a very smart but Heath Robinson-esque figure who built one of the first economic ‘models’ not out of 1s and 0s but out of plastic tubing and water). Phillips’ original work established an inverse relationship between a country’s rate of unemployment and its wage growth (the lower the rate of unemployment, the more wages increase), and his peers quickly extrapolated the relationship to unemployment and inflation (today we often differentiate between the ‘wage’ Phillips curve and the ‘price’ Phillips curve (see box “The Phillips curve”).

The relationship works much better if we make the equation a little more complex and add inflation expectations. In other words, economic conditions only cause actual inflation to deviate around expected inflation; when demand and supply are in balance inflation is anchored by what is expected to be normal.

These days, the relationship between unemployment and price inflation appears less robust than the original conception linking unemployment and wages. The empirical research, especially in the UK and the US, has shown that the nature of the relationship between domestic conditions and inflation – referred to as the ‘slope of the Phillips Curve’ – has varied considerably over time, but with a tendency for inflation to become less responsive – or the slope to ‘flatten’ – over the past few decades (Constancio, 2015; Haldane, 2017). There are several possible explanations: – globalisation has increased the importance of the global cycle – inflation has become better ‘anchored’ – the changing nature of work – the Phillips curve is difficult to specify. Let’s address each in turn.

i. Globalisation

While the evidence for a strong relationship between domestic conditions and prices is decidedly mixed, there is much more evidence that the relationship between domestic employment and domestic wages has stayed strong over the past 30 years (Broadbent, 2014) – at least until very recently. One possibility could be that global competition between firms has reduced their ‘pricing power’ – their ability to pass on wage increases into the prices of final products, settling instead for lower mark-ups. At the same time, increasing competition could make firms more willing to cut prices in response to falling demand. This is supported by evidence that inflation is more sensitive to a fall in employment than it is to an increase (Fabiani et al, 2006; Ciccarelli & Ospat, 2017).

Financial globalisation has increased the correlation of borrowing costs and contributed to more synchronous economic cycles between countries. When one region sneezes, another is now more likely to catch a cold. A number of studies have found that the inclusion of a global inflation factor improves inflation forecasting for the majority of advanced economies (cf. Constancio, 2015 for a good bibliography).

Our own analysis confirms that the traditional, domestic measures used in the Phillips curve (unemployment, unemployment relative to trend, or the output gap) no longer explain variation in UK inflation since the mid-1980s – in the language of economics, we say that they have lost statistical significance. The globalisation of production has increased the importance of international prices relative to domestic factors. While financial globalisation has increased domestic inflation sensitivities to global shocks, the global business cycle has some influence (statistically significant) over inflation, but it is not particularly strong. A fall from the very top of the average business cycle to the very bottom may cause inflation to fall (temporarily) by just 0.6%, all other things being equal (see appendix).

ii. Inflation has become better ‘anchored’

Better, more credible monetary policy in advanced economies is a highly plausible explanation of the decreasing sensitivity of prices to both domestic and global conditions. If inflation expectations act as an anchor around which the ebb and flow of the economy may cause actual inflation to deviate, a strong anchor means less deviation.

This is also more consistent with the timing of the flattening of the Phillips curve (changes in employment conditions having less impact on inflation), which was largely over before the collapse of the Berlin Wall and the rise of China as the world’s manufacturer (Berganza et al, 2016; Mishkin, 2008). Central banks, with their explicit inflation targets, have successfully established a strong nominal anchor for inflation expectations. Think of it like this: the business cycle will not cause firms and households to push for/accept permanent higher/lower mark-ups or wages because they expect central banks to ensure that the economy will not overheat or deflate for any prolonged period.

Numerous studies confirm that the importance of long-term inflation
expectations, which have converged around central bank targets over the past three decades, has steadily increased (Berganza et al, 2016; Yellen, 2015). Many conclude that this was why we did not observe a deflation spiral after the financial crisis despite very large increases in unemployment (Blanchard et al, 2015). The corollary is that the importance of domestic or international economic conditions has decreased and this is manifest in a flatter Phillips curve. There is also evidence that when inflation is low and everyone expects it to stay anchored, it becomes irrelevant for wage negotiations and other price-setting decisions (Akerlof et al, 2000), again resulting in a flat Phillips curve.

Patterns of correlation across national inflation rates — how one country’s rate of inflation moves in relation to another’s — provide further evidence of the diminished role of the business cycle and the predominant role of central bank anchors. In a speech entitled Inflation in a globalised world, BoE Governor Mark Carney demonstrated how, “by the early 2000s, inflation resembled random variations around countries’ targets, and cross-country inflation correlations fell”. While the deflationary shock of the financial crisis and the rise and fall of the commodity super-cycle have increased correlations of headline CPIs, core inflation rates — inflation excluding food and energy prices — have become less synchronous, albeit around a common, stable anchor (Carney, 2015).

Ben Broadbent, a Deputy Governor of the BoE, has observed that the flatter slope of the wage Phillips curve over the past 25 years looks similar to the slope between 1870 and 1913 — the period that Phillips originally identified himself. This evidence revives the theory that a Phillips curve-type relationship is only stable and significant during periods when there is a clear nominal anchor for prices. Between 1870 and 1913 it was the gold standard; today it is a central bank’s inflation target (Broadbent, 2014).

### Box 4: The Phillips curve

The Phillips curve is a single-equation empirical model, named after William Phillips, describing a historical inverse relationship between rates of unemployment and corresponding rates of inflation that result within an economy. The curve slopes from left to right, highlighting the trade-off policymakers face between controlling inflation or unemployment.

#### iii. A change in the nature of work

For the past five years, wage growth itself has been persistently weaker than could be explained by under-employment and productivity — the two factors that tend to drive the variation of wage growth around the long-run trend. Even when we account for ‘hidden’ unemployment — workers who are employed but wish to work more hours — wage growth has fallen short. This has led us to wonder if the structural level of wage growth has been driven lower by a new, emerging phenomenon. This might have caused the wage Phillips curve to flatten as well as the price Phillips curve. We can’t rule out that it is still a lingering hangover from the financial crisis, but another idea is that low wage growth is due to changing patterns of work.

There are almost 1 million more self-employed workers in the UK than there were 10 years ago (according to data from the ONS). The total number of people in work has increased by 3 million over the same period. Self-employment didn’t fall during the recession, so it is tempting to say that it was a response to getting laid off during the crisis, but survey evidence suggests that most of the self-employed are perfectly happy with their current status.

Similarly, there are almost 700,000 more workers employed part-time who do not want a part-time job. There are more than 400,000 more part-time workers who do, and the widely reported growth of controversial ‘zero hours’ contracts plays to that (from 150,000 in 2007 to 900,000 in 2017, although the media storm may mean that some of the increase is due to workers realising — and therefore reporting for the first time — that they are employed on such terms).

Flexible forms of employment can bring many benefits and there is some evidence that its growth has enticed previously inactive people back into work. Inactivity rates — the proportion of the population neither in work nor looking for it — have fallen considerably for 25- to 49-year-olds over the past 15 years. More people entering the workforce may dampen wage growth even as demand for workers picks up. Further, employment is arguably
more precarious when you are paid by the task or the hour. Without obvious peers and colleagues against which to benchmark, without human resources departments and structured career progression programmes, and without the value of human capital that comes with knowing one company inside out, the rise of flexible employment (whether voluntary or involuntary) may have reduced workers’ ability to bargain for higher wages.

It has certainly reduced workers’ ability to bargain in groups. Data collected from job listings websites tell us that there is a far greater dispersion of wages around similar self-employed jobs than there is around full-time pay (Haldane, 2017). To put that another way, there is no ‘going rate’ for the ‘flexibly’ employed. As Andy Haldane, the BoE’s Chief Economist, puts it (with what is becoming trademark poetic flourish), “a workforce that is more easily divided than in the past may find itself more easily conquered”.

The UK government is concerned about what these developments may be doing to the economy (and its tax receipts): it has just commissioned an independent review of the situation. Haldane doubts that changes in working patterns are the main culprit in suppressing wage growth, “But they have probably been a contributor in the past and, more significantly, are likely to continue to [be] in the future if these trends, as seems likely, perpetuate.”

If this assessment is correct, inflation may become a little less sensitive to the ebb and flow of employment – the Phillips curve may flatten a little more. The BoE’s database tells us that before the industrial revolution, when cottage industry and farming was the norm and workers had next to no bargaining power, the Phillips curve was as flat as a pancake.

iv. The Phillips curve isn’t stable and it’s difficult to specify
Specifying the Phillips curve is tough. Recently, some statistical relationships appear to have shifted that had remained stable for decades. In some countries, the inactivity rate – the proportion of the population neither in work nor looking for it – has shifted higher; in others the proportion of long-term unemployed has risen. In others still, particularly Europe, the relationship between vacancy rates and unemployment has changed: there has been a pronounced shift in the number of jobs available for every unemployed person, possibly indicating that the unemployed no longer possess the right skills. Something called Okun’s law has broken down across the West. This handy rule of thumb stipulated that for every 1% fall in unemployment you would get a 0.5% increase in GDP (both relative to trend). It started to break down in the late 1980s and has fallen apart since the mid-2000s.

All these changes could materially shift the slope of the Phillips curve. As such, it is very difficult to know what measure of domestic conditions is best. The two standards, unemployment or the deviation of actual output from the economy’s potential (known as the output gap), may just be too simplistic.
Inflation expectations and scenarios for the next 20 years

As we’ve seen, some of the structural forces that shape inflation are shifting in interesting ways. But the balance of evidence does not suggest a significant likelihood of either a profoundly inflationary or profoundly deflationary scenario. We’re sorry if this makes the report a bit of a let-down.

In other words, inflation expectations are likely to remain well anchored and under control. Although monetary policy is abused constantly in the media, it is to its credit that long-term inflation expectations have remained so well anchored throughout the roller-coaster ride of the past 10 years.

Table 1 shows a range of scenarios that might play out over the next 20 years or so. It is possible to imagine innumerable nuances to the scenarios set out here, but we believe too many scenarios confuse more than they guide. Unsurprisingly, given what we have just said, we assign the highest probability to a benign scenario in which inflation expectations remain well anchored and any inflationary effects from ageing or deflationary effects from technological change are offset with monetary policy.

We assign the second-highest probability to the prospect of technologically induced low inflation. Ordinarily, technological change improves productivity, which ultimately drives wage growth over the long run (Krugman, 1994). Further, higher productivity lowers the production costs of goods and services, which stimulates demand. For example, if a TV now costs a third of what it did last year, most people will buy a TV and a new coat. Although there may be a lag, there is no lasting impact on inflation. Remember, as we set out in our introduction, inflation or deflation is a general rise or fall in prices — the net effect on all prices is key.5

Table 1 shows a few scenarios where we believe that might not happen — in other words, where new technologies increase supply but also lower aggregate demand. For more information on some of the technological change touched upon, we’d encourage you to read our recent report, How soon is now? The investment impact of disruptive technologies.

We assign the lowest probabilities to secular stagnation and ‘stagflation’ scenarios. We have set out why we think the secular stagnation thesis is unlikely to play out on page 11, but it is far from an impossibility. Stagflation — low economic growth and frequent recessions combined with very high inflation (such as the 1970s) — is also unlikely but the risk has increased under President Trump. Although Trump is unlikely to oversee all the policies set out in table 1, he may topple a protectionist domino that leads to populist/nationalist responses down the line. Protectionism and a global trade war are likely to cause higher inflation initially before segueing into something more akin to secular stagnation (read our report, Trade of the century: Popular politics and the hidden costs of protectionism, if you’d like a fuller explanation).

In the final column of table 1, we set out our thoughts on what the inflation scenario might mean for long-term investment strategies. As you can see from figures 10 and 11, equities (since 1980) only tend to struggle when inflation falls below 0.5% or rises above 3.5%. Unanticipated changes in inflation, however, as measured by Citib’s inflation surprise index, do seem to have an adverse effect on valuations (figure 14).

Financial assets are forward-looking. They are the present value of future cash flows. In figures 12 and 13 we show how they respond to changes in inflation expectations, but note that the response is highly conditioned on the accompanying change in growth expectations. We proxy growth expectations with the change in real yields on the 10-year government bond. The bars in figures 12 and 13 show the average monthly performance of a variety of assets as inflation and growth expectations rise or fall. Equities do very well when inflation and growth expectations both move higher — and the riskier the better. The worst scenario for all assets other than gold is when both inflation and growth expectations fall together. We must point out, however, that this analysis is based on the past 25 years (as far back as the data on inflation expectations allows), and as such reflects performance during rather benign inflationary conditions.

Recognising the opportunities

Lastly, as long-term investors, we are constantly on the lookout for investment themes that may provide a source of return irrespective of the vicissitudes of the economic cycle. We have touched on a number of such themes in this report — ageing, personalised medicine and automation, for example. If you would like more information on these themes, please contact your portfolio manager.

We’ll leave you with an interesting observation about how ageing might directly influence stock market valuations. Two professors of finance in the US hypothesised that if ageing affects the rate at which savings are accumulated and decumulated, ageing therefore directly affects the supply and demand of equity markets. If there are more people in saving mode accumulating financial assets than there are people dissaving and cashing in their portfolios, this will impact equity market valuations.

As such, the professors observed a clear correlation between the number of 40- to 49-year-olds relative to the number of 60- to 69-year-olds (or savers...
versus dissavers) and the price-to-earnings ratio of the US stock market – a simple measure of valuation (Liu & Siegel, 2011). Projecting the trend forward doesn’t make for happy reading (figure 15). We suspect lower investment returns, lower rates of saving and later retirement means the number of 40- to 54-year-olds versus the number of 65- to 74-year-olds is the more appropriate ratio today. And that makes a big difference. We also can’t establish nearly such a strong correlation outside of the US. Still, it’s an interesting theory, and certainly a reminder of how so many themes, all too often discussed in isolation, are inextricably connected.

### Table 1: Inflationary scenarios for the next 20 years

<table>
<thead>
<tr>
<th>Scenario</th>
<th>Description</th>
<th>Inflation</th>
<th>Likelihood</th>
<th>Long-term investment strategy</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Base case</strong></td>
<td>Inflation remains anchored to central bank targets. The moderate inflationary/deflationary effects of ageing, technological disruption and other phenomena are controlled with monetary policy.</td>
<td>1.5–2.5%</td>
<td>65%</td>
<td>A balanced, multi-asset portfolio with equities at its core could be the key to superior risk-adjusted returns. Bonds are likely to struggle as interest rates rise, pressured by policy normalisation and demographics, so favour diversifying assets instead.</td>
</tr>
</tbody>
</table>
| **Technological disruption** | Here we detail a selection of technological events that could push down on inflation to the extent that central banks struggle to fully offset:  
(i) Technology improves connectivity, while reforms in Anglophone emerging markets such as India pave the way to substantial outsourcing of services away from advanced economies. The deflationary impact of lower cost services is not fully offset by emerging market demand  
(ii) Personalised medicine revolutionises healthcare permitting more people to remain in work — increasing, saving — for longer. The oldest age groups do not spend savings from the plunging cost of healthcare elsewhere  
(iii) Automation and artificial intelligence start to become substitutes for — rather than complements to — human workers, reducing workers’ bargaining power while increasing productivity. | 0.5–1.5%  | 20%        | Similarly, a balanced, multi-asset portfolio with equities at its core is most likely to work well. Extra performance could come from investing in technological change itself, but it is important to scrutinise whether investing in the architects, early-adopters or the beneficiaries of change is the way to go. Interest rates are likely to remain low and government bonds and credit are likely to act as good diversifying assets over the business cycle. Land prices are likely to deflate in advanced economies. |
| **Secular stagnation**    | The world prefers to save rather than invest. Workers struggle to save enough for retirement and consumption now falls with age. A low-growth world deters new investments, and new technologies are hard to come by. Nominal interest rates can’t be set low enough and inflation falls to very low levels. Prolonged deflationary episodes following recessions are more likely, particularly if private-sector debt remains high. | <1%        | 7.5%       | Structurally low interest rates mean bond yields are likely to move lower. Low interest rates lend some valuation support to equities, but very low rates of economic growth will hurt valuations too and equity returns are likely to be very low. Income generating equities would be highly likely to command a premium, especially companies that are able to increase their dividend as investment declines. In a world of low growth, capturing market share is going to be more important than ever, so innovation is likely to command a premium too. |
| **Policy induced stagflation** | Populist turns in advanced economy democracies dramatically increase government spending, potentially funded by taking away central bank independence and the creation of ‘helicopter money’, which would un-anchor inflation expectations. At the same time, supply is constrained by protectionism, globalisation goes into reverse and manufactures get a whole lot more expensive. Anti-immigration policies accelerate societal ageing and increase labour bargaining power for the lower paid cohorts. Minimum wages also increase. | >3%        | 7.5%       | Equities in general are likely to underperform. Index-linked bonds are likely to work initially but then cash may be better once interest rates have risen to a plateau. Real assets with inflation-linked rents might do well, such as property and infrastructure, particularly if they are also leveraged as inflation would eat away at the real value of their debt obligations. Gold possibly works, but it depends on how real yields respond. If interest rates increase by more than inflation, commodities may struggle. |

Probability-weighted average rate of inflation: 1.8%
**Figure 10: Equity valuations in different inflation environments**

- Average trailing price/Earnings ratio

Source: Datastream and Rathbones.

**Figure 11: Real returns and real earnings growth by inflation**

- Average real earnings per share growth (year-on-year)
- Average real return (year-on-year)

Source: Datastream and Rathbones.

**Figure 12: Equity valuations in different inflation environments**

- Inflation expectations are rising and real yields are rising
- Inflation expectations are rising but real yields are falling

Source: Datastream and Rathbones.

**Figure 13: Real returns and real earnings growth by inflation**

- Inflation expectations are falling but real yields are rising
- Inflation expectations are falling and real yields are falling

Source: Datastream and Rathbones.

**Figure 14: Valuations and surprise inflation**

Source: Datastream and Rathbones.

**Figure 15: Valuations and a saving versus dissaving demographic profile**

Source: United Nations, Datastream and Rathbones.
Setting the scene on current inflation

£10,000 1790 Mr Darcy
£45.5m 1941 Citizen Kane
£64.5bn 2017 Bill Gates

OVER THE YEARS, FORTUNES HAVE RISEN EXPONENTIALLY

Everyday prices have seen lots of action

<table>
<thead>
<tr>
<th>AVERAGE CINEMA TICKET</th>
</tr>
</thead>
<tbody>
<tr>
<td>5p 1941</td>
</tr>
</tbody>
</table>

Today’s low inflation has been the norm over the last

300 YEARS

Oil crises were a major cause of high inflation during 70s and 80s

WORKERS INFLATIONAL

OWNERS OF CAPITAL DISINFLATIONAL

POWER IS NOW SHIFTING

Services like education and healthcare account for the bulk of inflation today
Is ageing now inflationary?

Big shift towards spending on services such as healthcare in retirement

After this age, workers tend to become less innovative and productive 48

DEPENDING RATIO

has reached the tipping point

Saving turns people disinflationary in their thirties

Ageing has been disinflationary over the past 50 YEARS

The globalisation of inflation

98% Amount of the world’s population that has lived in a capitalist society since 2005

INCREASED SHARE OF INCOME

is going to capital owners from workers and robots may increase the share further

A RISE IN SUPPLY OF CAPITAL

PUSHES DOWN COST OF CAPITAL

THE WAY TARIFFS HAVE PLUNGED SINCE 1980

50% DEVELOPED WORLD

66% DEVELOPING WORLD

Falling prices of toys and gadgets

Rising cost of food, fuel and building materials
Econometric methodology

In order to estimate the effect of ageing and the slope of the Phillips curve, we have constructed a model of UK CPI inflation over the past 35 years.

Using ordinary least squares, we regress the annual rate of inflation against four independent variables and four dummy variables that represent changes in the rate of VAT.

1. Inflation expectations are defined as the four-quarter moving average of the breakeven rate of the 10-year index-linked gilt. Before 1992 we use the eight-quarter moving average of actual inflation, lagged by one quarter.

2. After Juselius & Takats (2015), we express population ageing by way of dependency, using the number of 30-to-64-year-olds as the denominator. We get the best results by combining the UK ratio with a global ratio by weighting them according to imports relative to GDP.

3. Import prices are the annual rate of change of imported goods and services expressed in sterling terms in order to capture the exchange rate effect.

4. We get the best results when using the Rathbones global business cycle indicator (which is based on unemployment and industrial production gaps in G7 economies plus South Korea) to define the Phillips curve. The variable loses statistical significance if we use any UK-based measures.

We introduce an autoregressive term AR(1) to address the serial correlation of the residuals so that we can be assured of non-spurious coefficient values.

Table 2: Calculating inflation

<table>
<thead>
<tr>
<th>Variable</th>
<th>Coefficient</th>
<th>Std. error</th>
<th>Statistic</th>
<th>Probability</th>
</tr>
</thead>
<tbody>
<tr>
<td>EXPECTATIONS_fwd</td>
<td>0.469</td>
<td>0.105</td>
<td>4.477</td>
<td>0.000</td>
</tr>
<tr>
<td>30G4_DEPENDENCY*100</td>
<td>0.011</td>
<td>0.004</td>
<td>2.657</td>
<td>0.009</td>
</tr>
<tr>
<td>IMPORT_PRICES(-1)</td>
<td>0.031</td>
<td>0.015</td>
<td>1.978</td>
<td>0.050</td>
</tr>
<tr>
<td>BUSINESS_CYCLE(-5)</td>
<td>0.318</td>
<td>0.135</td>
<td>2.359</td>
<td>0.020</td>
</tr>
<tr>
<td>DUMMY_1</td>
<td>2.015</td>
<td>0.335</td>
<td>6.016</td>
<td>0.000</td>
</tr>
<tr>
<td>DUMMY_2</td>
<td>-0.486</td>
<td>1.558</td>
<td>-0.312</td>
<td>0.756</td>
</tr>
<tr>
<td>DUMMY_3</td>
<td>0.647</td>
<td>1.446</td>
<td>0.447</td>
<td>0.655</td>
</tr>
<tr>
<td>DUMMY_4</td>
<td>1.078</td>
<td>0.936</td>
<td>1.151</td>
<td>0.252</td>
</tr>
<tr>
<td>AR(1)</td>
<td>0.880</td>
<td>0.043</td>
<td>20.270</td>
<td>0.000</td>
</tr>
<tr>
<td>SIGMASQ</td>
<td>0.225</td>
<td>0.025</td>
<td>9.187</td>
<td>0.000</td>
</tr>
</tbody>
</table>

R-squared 0.938  Mean dependent variable 2.957
Adjusted R-squared 0.934  S.D. dependent variable 1.909
S.E. of regression 0.492  Akaike info criterion 1.458
Sum squared resid 31.975  Schwarz criterion 1.706
Log likelihood -96.381  Hannan-Quinn criterion 1.583
Durbin-Watson stat 1.938

Inverted AR Roots 0.88

Figure 16: Modelling inflation

Source: Datastream and Rathbones.
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