# ECN320 SRP for session 8. Domestic Macroeconomic Concerns

#### DOMESTIC MACROECONOMIC RELATIONSHIPS

#### Interest rates and inflation

The most straightforward theoretical relationship between the rates of interest and inflation is the Fisher effect. The Fisher effect states that the real interest rate is equal to the nominal interest rate minus the expected inflation rate, i.e.:

 $i_{Real} = i_{Nominal} - \pi$ .

What this suggests is that a change in the rate of growth in money supply proportionately affects the nominal interest rate and the inflation rate as well.

Ever since central bankers adopted inflation targeting the monetary rule has been guided by their "preference" to minimize the deviations in the actual rate of inflation,  $\pi_t$ , from the targeted rate of inflation,  $\pi^T$  (typically 2%), and the actual output level,  $Y_t$ , from the potential rate of output (i.e., the natural rate of output),  $Y_n$ . Consider the following loss function:

$$L = (Y_t - Y_n)^2 + \beta (\pi_t - \pi^T)^2$$

This suggests that the choice confronting a central banker is a trade-off between minimizing deviation in inflation from its target and output levels from the natural rate. The Taylor rule, devised by a US economist in the 1990s, is a rule of thumb on changing interest rates according to having to minimize deviations (above or below the targeted inflation and the natural rate of output. Graphically, these preferences might be illustrated as in the graph below.



The point a represents the central bank's "bliss point" where inflation is at the target rate and output is at the natural rate (so there is no tendency for a change in the rate of inflation). For levels of output, Y' (Y'') below (above) Y<sub>n</sub>, there would be an expectation of decreasing (increasing) inflation, below (above) the inflation target, and the central bank would have to cut (raise) interest rates to return the inflation rate and output level towards its bliss point. Of course, a central bank's preference could be such that it tolerates bigger deviations in, say, inflation from the target, in which case the circle would appear elliptical instead.

#### **Trends in inflation**

Inflation used to be a regular macroeconomic concern the world over. The rich world tamed the worst of runaway prices by the late 1990s. Having demonstrated their ability to control inflation, governments made central banks independent giving

them discretion to use monetary policy to meet inflation targets set by government, typically a 2% rate (see World Bank chart, OECD annual inflation, %). In the 2000s and early 2010s commodity price booms sent prices above the target, but as the world oil price crashed in 2014 the inflation rates rarely exceeded the target. There were concerns with deflation following the global financial crisis (GFC) and the pandemic. Even as economies began to pick up, accelerating inflation was not a serious issue with which to contend. It was not until the post-covid lockdowns ended that central bankers were surprised by the inflation rates that began emerging in 2021.

Unaccustomed to high inflation, central bankers' seemed surprised that their forecasts of inflation were so wrong and that their estimates repeatedly undershot inflation. Why was inflation so persistent in 2022? It should have seemed straightforward given that spending remained high and because monetary policy had been so loose. However, it was only as late as Dec 2020 that the Fed thought that US interest rates would remain at near zero in 2023 [1]. Thus, the need to tighten was not wholly clear-cut, so some banks did not raise interest rates fast enough. (Some countries including Brazil, Chile, and Norway did lift rates sooner.)

In 2021, as the covid-19 pandemic interfered with the production of goods and services, governments unleashed large stimulus packages to households, firms and workers alike. Meanwhile, there were dramatic shifts in consumption, which swung sharply towards goods and then back towards services. The barrage of shocks continued with Russia's invasion of Ukraine in Feb 2022, raising the value of the US dollar and causing concerns for energy markets and agricultural commodity supply chains [1].

While supply chains were strained, it was hard to be sure that that was truly a sign of broad overheating rather than of isolated stress. In some countries the labour market looked slack as fiscal stimulus programs and work-protection schemes were only just ending. But when these programs ended, unemployment kept falling [2]. Strong wage growth was another source of inflation. In normal times, wage growth is mostly determined by labour productivity, inflation expectations and the presence or absence of labour-market slack. Faster productivity growth and higher expected inflation translate into more wage growth; higher unemployment translates into less. In the early stages of the pandemic, these relationships broke down. According to the IMF's analysis, fundamentals mattered less than the intense constraints on labour supply associated with lockdowns and social distancing. As the recovery kicked in, normal patters began to assert themselves, but it had not helped with wages. The supply of labour had become less of a problem, but pay packets kept growing thanks to robust hiring and low unemployment [1].



Worse still was that some central banks continued quantitative easing (the policy of buying bonds when rates were at rock bottom) until late 2021. The fiscal stimulus measures in response to the pandemic reached 10% of GDP in some countries in 2020-21 (and continued above 6% in some cases). A second surprise was that inflation had stayed high. By 2022 post-pandemic inflation had been amplified by Russia's invasion of Ukraine. Natural gas prices hit levels that were ten times those of the 2010s. Some central banks consistently predicted that inflation would soon fall. Instead, it spread from energy, food and other goods to services, wages and housing, from which it is harder to root out [2].

Macroeconomic forecasting is notoriously tricky. Data are sparse and inexact; the structure of economies shifts over time. A key variable in forecasting inflation is the size of "secondround" effects: how far will price rises be self-perpetuating? Such effects fed a decade of brutal inflation after the oil shocks of the 1970s. But in the 1990s they faded. Workers did not chase inflation-reinforcing pay increases Weaker trade unions, migration and globalisation probably played a part; so did credible, independent central banks. Thus, central banks were wrong-footed when the post-1990s pattern did not persist, and second-round effects were back [2].

**Macroeconomic policy responses to inflation's return** In Feb 2022, when the Fed published the winter edition of its semi-annual report to Congress, it dropped a normal section outlining the appropriate level of interest rates as determined by "monetary-policy rules". Its inclusion might have been awkward, because it would have suggested that rates should be as high as 9%, when the Fed still had them near to 0% [3].

The omission was important. It shone light on a decades-old question that was being asked with more insistence amid soaring inflation: should central banks limit their discretion and set interest rates according to black-and-white rules? The search for rules to guide and constrain central banks has a long pedigree. It dates back to the 1930s when Henry Simons, a US economist, argued that authorities should aim to maintain "the constancy" of a predetermined price index—a novel idea in his era. In the 1960s Milton Friedman called for central banks to increase the money supply by a set amount every year. That monetarist rule was influential until the 1980s, when the relationship between money supply and GDP broke down [3].

Any discussion of rules conjures up a seminal paper written in 1993 by John Taylor, an economist at Stanford University. In it he presented a straightforward equation which came to be known as the "Taylor rule". The only variables were the pace of inflation and the deviation of GDP growth from its trend path. Plugging these in produced a recommended policy-rate path which, over the late 1980s and early 1990s, was almost identical to the actual federal-funds rate, the overnight lending rate targeted by the Fed. So it seemed to have great explanatory power. Mr Taylor argued that his rule might help to steer central banks on the right path for rates in the future [3].

However, just as the Taylor rule started to get attention from economists and investors alike, its explanatory power grew weaker. In the late 1990s the recommended Taylor rate was consistently lower than the fed-funds rate. That sparked a cottage industry of academic research into alternative rules, mostly grounded by Mr Taylor's original insights. Some put more weight on the GDP gap. Others added inertia, since central banks take time to adjust rates. Another group shifted from current inflation to forecasts, trying to account for the lag between policy actions and economic outcomes. In its reports the Fed usually mentions five separate rules [3].

The appeal of rules lies in their cold neutrality: they are swayed only by numbers, not by fallible judgment about the economy. Central bankers love saying that their policy decisions are dependent on data. In practice they sometimes struggle to listen to the data when their message is unpalatable, as it was with inflation during 2021-22. Central bankers found numerous reasons, from the supposedly transitory nature of inflation to the limited recovery in the labour market, to delay raising rates. But throughout that time, the suite of rules cited by the Fed was unambiguous in its verdict: tightening was needed [3]. The rules are, however, not perfectly neutral. Someone first has to construct them, deciding which elements to include and what weights to ascribe to them. Nor are they as tidy as implied by the convention of calling them "simple monetary-policy rules". They are simple in the sense that they contain relatively few inputs. But just as a bunch of simple threads can make for one messy knot, so a proliferation of simple rules has made for a baffling array of possibilities. Moreover, each rule is built on top of a foundation of assumptions. These typically include estimates of the long-term unemployment rate and of the natural interest rate (the theoretical rate that supports maximum output for an economy without stoking inflation). Modellers must also settle on which of a range of inflation gauges to use [3].

At the close of 2022 the rate of inflation caused concern in the rich world, especially in the US. Central banks had to correct the error by raising interest rates sharply and swiftly. The rule tells central bankers to raise interest rates by more than inflation has gone up. To disregard the rule is to allow inflation-adjusted borrowing costs to fall, administering a stimulus that makes the problem worse. To follow the principle, policymakers must raise real rates every time prices accelerate. If they do, sooner or later the economy will slow and order will be restored. The Taylor principle is necessary to stabilise inflation in state-of-the-art economic models. It is also common sense [4].

Yet at the end of 2022, no major central bank followed the principle. Since the start of 2021 inflation had risen by five percentage points in the US, eight points in the UK and ten points in the euro zone. Central banks' interest-rate rises were rapid by historical standards, but they were nowhere close to keeping pace with the price growth. Alarm bells rang. "The Fed had not yet hit the brakes," declared Jonathan Parker of MIT after a bumper 0.75-percentage-point increase in Nov [4].

The trouble is that although the Taylor principle makes sense in theory, there is disagreement about how to apply it in practice. A true measure of real interest rates is forward-looking. New borrowers and lenders need to know what inflation will be in the future, not what it was in the past. According to a survey by the New York Fed, consumers expected inflation of 5.4% in 2023. Mr Parker subtracted this from the Fed's target interest-rate range of 3.75-4% to get a negative real interest rate of about -1.5%. That was below the prevailing rate before the covid-19 pandemic and "very, very not contractionary", he said [4].

But why only look forward one year? Many loans are provided over a longer time frame. And here lies the doveish calculation. Greg Mankiw of Harvard University worried that the Fed may have been overdoing things because the five-year real interest rate priced into financial markets had risen sharply since the start of 2001, by 3.4 percentage points at the time of writing. The textbook version of the Taylor rule, a more expansive cousin of the Taylor principle, says that real interest rates should go up by half the increase in inflation. Look five years ahead in financial markets, and take a measure of underlying inflation—Mr Mankiw points to a three-point rise in annual wage growth—and real rates roughly kept pace with inflation. In other words, the Fed's tightening looked like too much, rather than too little [4].

The argument relies on what economists call "rational expectations". The public's view about what a central bank might do tomorrow is in theory just as important as today's short-term interest rates. As a result, in modern economic models it does not matter much if policymakers fail to raise interest rates above inflation at a given point in time, notes Michael Woodford of Columbia University. Only the expectation of a systematic disregard for the Taylor principle "indefinitely into the future" would cause monetary mayhem. And the Fed's policymakers hardly showed that sort of disregard. The central bank was not done raising interest rates: markets expected them to rise above 5% in 2023. That could be enough to satisfy the Taylor principle by then [4]. A belief that expectations are rational is usually associated with a conservative, hawkish view of the world, in which people belong to the species *Homo economicus*. These arguments helped doves argue that central banks should calm down. The Fed boasted that it turned the real interest rates that were priced into financial markets positive at almost all horizons. The worst case of a yield curve having slipped away from a central bank's control was in the UK—but, ironically, the problem is that markets seemed to expect more interest-rate increases than the Bank of England (BoE) would have liked. The central bank forecast that the path for rates envisaged by markets would result in a deep recession and bring inflation well below target. It is almost as if the BoE had too much inflation-fighting credibility [4].

Even if the Taylor principle was being met on a forwardlooking basis, that was not the end of the story. The principle prescribes only the minimum tightening that is needed to bring inflation to heel. Were central banks only narrowly to clear the hurdle then inflation could take a long time to return to target. Another issue is that interest rates are supposed to rise still higher when an economy is overheating. In the US, where there were almost two job openings for every unemployed worker, clearly this was a problem. Failing to respond to it could prolong the inflationary episode [4].

Despite inflation rates slowing down in 2024, Fed chairman Powell warned that it was likely to "take longer than expected" for inflation to return to the 2% target and to justify cuts to interest rates. While there have clearly been some common factors in the inflationary processes across the Atlantic, the US and eurozone economies have been different too - the former being more dynamic. The labour market tightness was more significant in driving inflation in the US than in the eurozone. At the same time, "pass-through" effects from higher world prices, notably of energy, were far greater in the eurozone. This made eurozone inflation more credibly "temporary" than that of the US. Two more pieces of data helped elucidate what had happened. In both the US and EU, aggregate nominal demand sank far below 2000-23 trend levels of growth during the pandemic. In the second quarter of 2020, nominal demand was as much as 12% below trend in the eurozone. By the fourth quarter of 2023, in contrast, it was 8% above trend in the US and 9% above tend in the eurozone (where the trend growth was also weaker). The explosive growth in demand in these two crucial economies must have caused supply shocks as well as merely accommodating them [5].

The strength in domestic demand in the US in 2023-24 was surprising everyone. That could keep inflation running high, preventing the Fed from lowering rates. This was exacerbated by low unemployment levels that lingered near historic lows. The labour market trends proved difficult to assess on both sides of the Atlantic [6].

A second relevant piece of data was on money. The pandemic saw not just huge increases in fiscal deficits, but also explosive growth in broad money. The US ratio of M2 to GDP was 28% above the 1995-2019 linear trend. By the fourth quarter of 2023, it was back to just 1% higher. For the eurozone, these ratios were 19% and minus 7%, respectively. These were huge monetary boom and bust numbers [5] (see chart, money supply growth [7]).

But another complication for both the US and Europe is that the economies moved from a relatively tight fiscal and loose money regime to one of loose fiscal policy and tight money. For the Fed, the challenge is to deal with the unwillingness of US politics to show any restraint over its budget. While Europe faced similarities, the demographic and climate challenges could make the shift more pronounced [6].



Finally, economic analysis must encompass the extreme supply shifts, including geopolitical tensions and global fragmentation. The 1990s brought a series of positive global supply shocks. The 2020s could usher in negative supply shocks (e.g., a second Trump administration where tariffs are hiked across the board; tit-for-tat industrial policies, subsidies, and countervailing measures to derisk or decouple supply chains from China, etc.). On a positive note is the rise of a new, large country, India. China's fortunes alongside high-income countries have been dominant in the global economy because it produces more goods and services than any other country and its economy grew at 8% per year. Those days are ending. China's economy is more than twice the size of India's, measured with purchasing power parity exchange rates, but its growth is slowing rapidly. India will soon rival its neighbour, not only in population, but in its contribution to global growth [6].

However, how to decide when to loosen? Central bankers have to keep in mind four crucial points. First is that ending up with inflation well below target is pretty bad because this risks making monetary policy ineffective. The consequences of being too tight could be almost as bad as those being too loose. Second, it is evidently true that demand and so inflation might prove to be too great, especially in the US, but it could also turn out to be too weak. Whie the aim is rightly to get inflation to target, it makes no sense to pay any price to achieve this objective [5].

A third point is that there are problems created by being determined to eliminate the very possibility of having to change course. If one starts from the assumption that the first interest rate cut must be followed by many more in the same direction, the degree of certainty needed before starting will be too great. The price of waiting until certain is likely to be that of waiting too long. Lastly, being data-dependent indeed makes sense, but data matter only if they materially affect forecasts of the future. What matters is not what is happening right now, but what will happen in the months or even years ahead, as past policy works through the system. There is reason to suppose that the recent inflation news in the US in not very significant. Two years ago, it was clear that monetary policy had to be tightened: the risk of moving into a high-inflation world were too high. By mid-2024, it was becoming clear that the ECB should start loosening. For the US, the underlying situation was more evenly balanced, but the Fed too cannot wait forever [5].

## Inflation, unemployment, and wages

The relationship between inflation and unemployment was first studied by Irving Fisher in 1926 before Phillips' work that set out a formal relationship [8]. The Phillips curve, the result of a 1958 study documenting a striking near century-long (1861-1957) stable, negative relationship between lower unemployment rates and faster UK wage inflation, became described as "probably the single most important macroeconomic relationship" [9][8]. This was remarkable, given the changes over that period in workers' rights. In 1861 most workers could not vote; by 1957 the post-war Labour government had nationalised much of the economy [8]. However, even as the relationship was questioned often since the 1960s, the logic of the curve, the trade-off between inflation and unemployment, still guides and preoccupies central bankers in the 2020s [9][8].

When business is brisk and unemployment low, central bankers worry that workers will demand pay raises over and above inflation and any improvement in their productivity. If firms pass higher wages on to customers by increasing prices, inflation will rise. If central bankers wish to prevent this, they will raise the interest rate they charge for the money they lend, slowing the economy and curbing the wage pressure [9].

The opposite happens at the other end of the curve. High unemployment flattens wages and spending, putting downward pressure on inflation. To counteract this, policymakers typically cut interest rates. Central bankers hope to find themselves somewhere in the middle: with inflation where they want it to be and unemployment neither high nor low enough to affect it. They aim to set a "neutral" interest rate that leaves inflation stable where it is [9].

A fundamental macroeconomic question then is why does unemployment even exist? There are few bigger wastes than the loss to idleness of hours, days and years by people who would rather be working. Unemployment can ruin lives, sink budgets and topple governments. Yet policymakers do not wage all-out war on joblessness. The Fed, uniquely among major central banks, is required to pursue "maximum employment" (defined as making sure that anyone who wants a job can get one) only really targets what is known as unemployment's "natural" rate, at which inflation is stable [8].

The importance of this concept is hard to overstate. The Fed's argument for interest-rate rises in 2017, for example, hinged on stopping unemployment from falling too far beneath the natural rate. Yet the natural rate is in many respects an article of faith, always sought but never seen. Where does it come from [8]?

There are several reasons why unemployment cannot simply be eradicated fully. It takes time for people to move from one job to another: this is said to cause "frictional" unemployment. If people cannot find jobs because they have outdated skills—think hand weavers after the invention of the loom—they might become "structurally" unemployed [8].

John Maynard Keynes, the great British economist, took a first step towards the natural-rate hypothesis when he focused minds on "involuntary" unemployment. In *The General Theory*, published in 1936 in the aftermath of the Depression, Keynes noted that many people could not find jobs at the going wage, even if they had comparable skills to those in work. Classical economics blamed artificially high wages, perhaps caused by trade unions. But Keynes pointed to lacklustre economy-wide spending. Even if wages fell, he reasoned, workers would have less to spend, making the demand deficiency worse. The answer, he thought, was for governments to manage aggregate demand to keep employment "full" [8].

Keynes was not the father of all that is now thought of as "Keynesian". Inflation, for instance, barely entered his analysis of unemployment. But by the late 1960s Keynesianism had become associated with the idea that when managing aggregate demand, policymakers are not just choosing a rate of unemployment. They are simultaneously choosing how fast prices rise [8].

Paul Samuelson and Robert Solow, two other economic luminaries, investigated the relationship in the US, and reported that there was no such stability there. The Phillips curve shifted around. In any given era, Samuelson and Solow wrote, "wage rates do tend to rise when the labour market is tight, and the tighter the faster." They described the relationship as a "menu", encouraging the idea that the job of Keynesian policymakers was to pick a point on the curve that best aligned with their preferences. How low unemployment could fall, in other words, depended only on what level of inflation was tolerable (for rising wages would surely end up lifting prices, too) [8].

It is unclear whether policymakers actually thought of the relationship between inflation and unemployment as a menu. But the idea was prominent enough by the late 1960s to attract withering criticism. Its two main detractors, Edmund Phelps and Milton Friedman, would each go on to win a Nobel prize. Mr Phelps began writing groundbreaking models of the labour market in 1966. A year later, Friedman gave what became the canonical criticism of the old way of thinking in an address to the American Economics Association. He argued that, far from there being a menu of options for policymakers to pick from, one rate of unemployment—a natural rate—would eventually prevail [8].

Suppose, Friedman reasoned, that a central bank prints money to push unemployment lower than the natural rate. A larger money supply would lead to more spending. Firms would respond to increased demand for their products by expanding production and raising prices, say by 5%. This inflation would catch workers by surprise. Their wages would be worth less than they bargained for when they had negotiated their contracts. Labour would, for a while, be artificially cheap, encouraging hiring. Unemployment would fall below the natural rate. The central bank would achieve its goal [8].

However, the next time pay was negotiated, workers would demand a 5% raise to restore their standard of living. If neither firm nor worker gained or lost negotiating power since the last time real wages were set, the natural rate of unemployment would reassert itself as firms shed staff to pay for the raise. To get unemployment back down again, the central bank could embark on another round of easing. But workers can be fooled only for so long. They would come to expect 5% inflation, and would insist on commensurately higher wages in advance, rather than playing catch-up with the central bank. Without an inflation surprise, there would be no period of unexpectedly cheap labour. So unemployment would not fall [8].

The implication? For a central bank to keep unemployment below the natural rate, it must keep outdoing itself, delivering inflation surprise after inflation surprise. Enter the second driver, the public's expectations. Friedman reasoned, Keynesians were wrong to pin a low rate of unemployment to a given, high rate of inflation. To sustain unemployment even a little below the natural rate, inflation would need to accelerate year in, year out. Friedman's and Phelps's natural rate became known as the "non-accelerating inflation rate of unemployment" (NAIRU) [8].

No society could tolerate endlessly rising, or falling, inflation. Phillips had observed a correlation in the data, but it was not one that policymakers could exploit in the long run. "There is always a temporary trade-off between inflation and unemployment," Friedman said. "There is no permanent tradeoff." That remains the premise on which rich-world central banks operate. When officials talk about the Phillips curve, they mean Friedman's temporary trade-off. In the long run, they believe, unemployment will come to rest at the natural rate [8].

The idea has such influence partly because Friedman's and Phelps's contributions were so well timed. Before 1968, the US had had two years with unemployment below 4% and inflation below 3%. When Friedman spoke, prices were indeed accelerating; inflation rose to 4.2% in 1968. The next year it hit 5.4% even as unemployment changed little. The "stagflation" of the 1970s killed off the idea of a stable Phillips curve. Successive shocks to oil prices, in 1973 and 1979, sent both inflation and unemployment surging. In 1975 both were above 8%; in 1980 inflation hit 13.5% even as unemployment exceeded 7% [8].

The idea of the NAIRU looked a little shaky, too; inflation was meant to fall so long as unemployment was too high. Friedman's followers could argue that bad supply-side policies, in conjunction with the oil-price shocks, had pushed the NAIRU up, but the concept of the NAIRU also came under attack from theorists. It was built, in part, on the idea that inflation expectations are "adaptive": to predict inflation, firms and workers look at its current value. But the doctrine of "rational expectations" decreed that firms and consumers would, to the greatest extent possible, anticipate policymakers' actions. Whenever the public suspected that central bankers would try to push unemployment below the natural rate, inflation would rise immediately. On the other hand a credible promise not to seek any

hand, a credible promise not to seek any unsustainable jobs booms should keep inflation under control, simply by "anchoring" expectations [8].

That proposition was put to the test after Paul Volcker became Fed chairman in 1979. Mr Volcker was set on getting inflation down. As it turned out, he would need to prove his mettle. His tight monetary policies brought the federal funds rate to almost 20% in 1981, contributing to a double-dip recession with a rate of unemployment above 10%. It got the job done; inflation tumbled. Since Mr Volcker's time at the Fed, it has rarely exceeded 5% [8].

Some economists still point to the Volcker recessions as proof that inflation expectations are adaptive. The public did not believe inflation would fall just because the Fed said it would. The US had to suffer high unemployment to bring inflation down. Policymakers had to grapple with a short-term Phillips curve after all, as Friedman and Phelps argued. Yet the experience of the 1980s would not be repeated. In the decades that followed, central banks committed to inflation targets. As they gained credibility, the trade-off between inflation and unemployment weakened. Economists wrote "New Keynesian" models incorporating rational expectations. By the mid-2000s some of these models showed a "divine coincidence": targeting the best possible path for inflation, after an economic shock, would also result in the best possible path for unemployment. [8].

The only way economists can estimate the natural rate is by watching how inflation and unemployment move in reality, they assumed that the natural rate had risen (a US estimate in 2013 by Robert Gordon, of Northwestern University, put it at 6.5%). Yet as labour markets tightened—US unemployment was 4.3% in 2017—inflation remained quiescent. Estimates of the natural rate were revised back down [8].

The recent experience has again led some to doubt the very existence of the natural rate of unemployment. But to reject the natural rate entirely, you would need to believe one of two

things. Either central banks cannot influence the rate of unemployment even in the short term, or they can peg unemployment as low as they like—zero, even—without sparking inflation. Neither claim is credible. The natural rate of unemployment surely exists. Whether it is knowable is another matter [8].

That wages did not rise faster in the mid-2010s, given the low level of unemployment owes much to the public's expectations. Firms feel freer to push up prices, and employees to bargain for bigger wage rises, if they expect higher inflation [11]. Inflation and wage rates remained low since the GFC even as employment was historically high and unemployment falling (see chart, unemployment rate and wage growth) [12].



With the return of inflation in the 2020s, old macroeconomic concerns returned. In 2021 consumer prices surged. Policy measures taken to address inflation were implemented slowly initially. Accelerating rates were met with tighter monetary policy and by mid-2022 inflation trekked down to the target. However, in 2024 prices began to creep up again (see chart, consumer prices). Was the rich world about to repeat the mistakes of the 1970s? Back then policymakers attacked inflation but did not kill it off. Inflation in the US hit 12%, fell to 5% in 1976 before climbing up to 15% in 1980. Central banks failed to adjust policy fast enough to prevent an oil-price shock in 1979 from spreading across the economy. Only with an enormous recession in the early 1980s, which policymakers engineered, was inflation brought under control [10].

In the rich-world labour markets remained tight (see chart, OECD unemployment rate). The OECD's unemployment rate was below 5% during 2022-24. With companies competing hard for staff, nominal wages rose by more than 4% year on year, 2023-24 see chart, G10 nominal wages). With productivity growth weak (see chart, US total factor productivity growth) and capital spending remaining low, employers were unable to spread higher wage cost over more output. Thus, these costs have to be passed on to consumers in the form of higher prices. This was happening in the services sector, which covers everything from financial advice to physical therapy. Services



prices increased by 4% year on year in the biggest economies, about twice the rate from before the pandemic [10].



Consider the three big drivers of general price changes for a macroeconomy: capacity pressures in the domestic economy, the price of imports, and the public's expectations [11][13]. The first big influence on inflation is the amount of slack (or United States of States of United States of States of States of States of United States of States of

spare capacity) in the domestic economy. The unemployment rate, measuring labour-market slack, is convenient and the most-used gauge [11]. As the economy approaches full employment, the scarcity of workers ought to put upward pressure on wages, which companies pass on in higher prices [13].

The second big influence on inflation is the transient effects of import prices, i.e., imported inflation, which is determined by the balance of supply and demand in globally traded goods, such as commodities, as well as shifts in exchange rates [11][13]. The Trump administration's threats of tariffs and other disruptions to trade raise concern for import prices but also raise uncertainties for producers and households alike.

How expectations are formed is not well understood [13]. In theory, expectations are in the gift of central banks. If they can convince the public that they have the tools to regulate aggregate demand, and thus the level of slack, expectations should converge on the central bank's inflation target, usually 2% in rich countries. But expectations are also influenced by what inflation has been recently [11]. Consumer expectations reflect two main factors: current inflation and energy prices. In normal times, about 80% of the variation in quarterly one-yearahead inflation expectations is explained by these two variables [10]. In rich countries, during the mid-2010s inflation fell short of the targets. Rates in the euro area were well shy of the target. Japan was something of an outlier. Almost three decades of deflation seem to have taught firms and wage-earners to expect a rate of inflation a lot less than 2%. Japan, to kick-start inflation, called for companies to raise wages by 3% in the 2018 wage round [11].

The inclusion of expectations as a determinant of inflation was an effort to "augment" the Phillips curve mode. The tug-of-war trade-off between the amount slack in the economy and the public's expectations that is the Phillips curve had become less steep (see chart, US Phillips curve [14]). Blanchard (2016) of the Peterson Institute for International Economics found that a drop in the unemployment rate in the US had less than a third as much power to raise inflation as it did in the mid-1970s [13].<sup>1</sup>

Expectations can also explain only part of the puzzle. Inflation expectations in the US had not exceeded 3% for 20 years and were low for decades. The subdued expectations should have shifted the Phillips curve downward, so that a given rate of unemployment is associated with a lower rate of inflation (see

chart, changes to the Phillips curve). But what happened to the curve since the GFC (and before its return) was more like a
rotation, rather than a shift up or down. Inflation was seemingly insensitive to joblessness, yielding a curve that had become strangely flat. This may be because the unemployment rate mistook the amount of spare capacity or "slack" in the economy. By 2019 unemployment in the US, Europe and Japan had fallen to surprisingly low levels, which tempted some people on the periphery of the labour force back into work. Japan's firms found room to grow by hiring many women and old folk who had not been counted as unemployed [9].

Inflation may also be slow to rise in a jobs boom for the same reason it is slow to fall in a bust. In downturns, firms are reluctant to lower wages, because of the harm to staff morale. But because they refrain from cutting wages in bad times, they may delay raising them in good. According to

this view, wages will eventually pick up. It just takes time. And many other things, like a pandemic, can intervene before they do [9].



Although the flat Phillips curve puzzled central banks as much as anyone, they may be partly responsible for it. The curve is supposed to slope downwards (when inflation or unemployment is high, the other is low). But central banks' policies tilt the other way. When inflation looks set to rise, they typically tighten their stance, generating a little more unemployment. When inflation is poised to fall, they do the opposite. The result is that unemployment edges up before inflation can, and goes down before inflation falls. Unemployment moves so that inflation will not [9].

The relationship between labour-market buoyancy and inflation still exists, according to this view. And central banks can still make some use of it. But precisely because they do, it does not appear in the data. "Who killed the Phillips curve?" asked Jim Bullard, a US central banker, at a conference of his peers in 2018. "The suspects are in this room" [9].



But what happens when the killers run out of ammunition? To keep the Phillips curve flat, central banks must be able to cut

Jan. 2016, accessed at https://www.piie.com/publications/pb/pb16-1.pdf.

<sup>&</sup>lt;sup>1</sup> Blanchard, Olivier, "The US Phillips Curve: Back to the 1960s?", Policy brief, Peterson Institute of International Economics, No. PB16-1,

interest rates whenever inflation threatens to fall. Yet they can run out of room to do so. They cannot lower interest rates much below zero, because people will take their money out of banks and hold onto cash instead [9].

When Mr Bullard spoke, the Fed expected the economy to continue strengthening, allowing it to keep raising interest rates. But that proved impossible. The Fed was able to raise interest rates no higher than 2.5% before it had to pause (in January 2019) then reverse course during the pandemic. The neutral interest rate proved to be lower than it thought. That left it little room to cut interest rates further when covid-19 struck [9].

The neutral interest rate had fallen, according to some observers, because of global capital flows. Heavy saving by the world's ageing populations has resulted in too much money chasing too few investments. By lowering the neutral rate, this "global savings glut" has left interest rates closer to the floor than central bankers would like. That makes it harder for them to offset any additional downward pressures on prices [9].

Friedman thought central banks could prevent inflation if sufficiently determined to do so. "There is no technical problem about how to end inflation," he wrote in 1974. "The real obstacles are political." Is reviving inflation any different? Central banks face two technical limits. First, they cannot lower interest rates much below zero. And they can only purchase financial assets, not consumer goods. Central banks can create unlimited amounts of money. But they cannot force anyone to spend it [9].

A solution is to work in tandem with the government, which can spend any money the central bank creates. Before covid-19, such dalliances were rare. But an increasing number of central banks, in both the rich and emerging world, were changing course. These partnerships tried to stop pandemic-related unemployment turning low inflation into outright deflation. If they failed it could have been an economic disaster: mass joblessness coupled with negative inflation [9].

But prior to the pandemic, some central banks saw a need for tighter monetary policy because they worried about diminishing slack [15]. There were signs of stronger pay pressures in the UK and the US, and firm evidence of them in the Czech Republic, where wage growth was above 7% [13]. If money was kept too loose, inflation would rise as the economy over heated [15].

Overall wages and salaries did not reflect the apparent strength of the labour market. Blue-collar and service workers saw higher pay rises, with wages of production workers growing at more than a 3% annualised pace in the 3<sup>rd</sup> quarter of 2017. Professionals saw their pay growth slow (see chart, US wages and salaries by occupation[18]]). Overall, average hourly earnings rose by 2.5% and exceeded core inflation (see chart, bottom panel, hourly earnings vs inflation) [15].



As noted, it takes time for low unemployment to translate into inflation. Perhaps the labour market might not have been as hot as the Fed thought. Estimates of the "natural" rate of unemployment are notoriously unreliable. Rate-setters gradually revised theirs down, from over 5% at the end of 2013 to 4.6% at the end of 2017 [15].



With the return of inflation in the 2020s, the Phillips curve relationship again changed appearing vertical as the inflation rate rose and the labor market remained tight (see chart, US core inflation)[16].



#### Wage-price spiral: would wage deals prolong inflation?

With the return of sustained high rates of inflation came concerns about workers demanding higher wages that, in turn, could contribute to more inflation, i.e., a wage-inflation spiral. In 2022, the purchasing power of wages, once the cost-of-living was taken into account, actually fell to negative 0.9% in the first half of the year. That was the first time since 2008 that the real global wage growth had been negative, according to a report by the International Labour Organization (ILO). Among the advanced G20 countries, the real wage growth declined to minus 2.2%, while in the emerging G20 countries it slowed but remained positive at 0.8%.

In the past, productivity gains made by workers have justified wage rises. But according to the ILO, 2022 recorded the largest gap between productivity growth and real wage growth in high-income countries since 1999.

In 2023, on both sides of the Atlantic there was pressure for wage increases through raising the minimum wage rates, industrial actions through collective negotiation, and calls for strikes by public sector unions. In Japan, a shake-up of seniority-based salary structures was considered to raise the pay of younger workers. For central bankers, the concern was whether the demands by the world's workers for better pay would affect their fight to curb the rate of inflation. As the shocks to the energy market and effect of the pandemic faded, the concern was whether wage inflation would become the main driver of inflation. The related worry was after a year of very high inflation that it may have triggered a lasting change in the expectations and behaviour of workers, employers and consumers. This could lead to something better described as "wage-price persistence" – where a strong jobs market allows service sector workers to demand bigger pay rises, and companies to pass on the costs to households bolstered by high employment rates and government support.

The inflation problems facing the Fed and ECB were different. In the US, inflation was driven chiefly by a stimulus-fuelled surge in demand after the end of lockdowns. The question for policymakers is whether higher wages could be justified by improved productivity. In the eurozone and UK, the dominant issue was the energy price shock caused by the geopolitical fallout of Russia's invasion of Ukraine. For Europe the question was how that cost would be shared between companies, workers and taxpayers. Even if wage increases lag inflation, the wage increases could still be too high for companies to bear without raising prices further. With workers having suffered a bit hit to their living standards, the pay settlements that might have looked generous in normal times were still well short of inflations. Such wage gains could prove futile if they simply perpetuated further wage demands that, in turn, pushed up prices.

That in many countries unemployment was at near record lows, labour shortages were widespread, and employers were intent on retaining staff even in a downturn only seemed to strengthen labour's bargaining position. Given tight labour markets, central bankers needed convincing signs that the economy was not overheating and that unemployment might increase (to lower the pressure on wages). If a tight labour market was the source of the inflation problem, then central banks were not equipped with a policy response other than a recession-inducing interest rate rise.

*Financial Times*, "Wage inflation is a mirage for most workers", by R. Foroohar, 5 Dec 2022, p. 19; and "Will wage deals prolong inflation?", by D. Strauss, 2 Mar 2023, p. 15.

#### Trends in labour and wages

Before 2000, the average labour compensation trended downward until the recovery from the GFC, supporting the notion of increasing inequality across the rich world. The trend across the OECD countries matches that of what has happened in the US economy (see charts, OECD labour compensation [17]).



If there was a defining economic problem for the US as it recovered from the GFC, it was stagnant wages. In the five years following the end of the recession in June 2009 wages and salaries rose by only 8.7%, while prices increased by 9.5%. In 2014 the median worker's inflation-adjusted earnings, by one measure, were no higher than they were in 2000. It is commonly said that wage stagnation contributed to an economic anxiety in middle America that lifted Mr. Trump to the White House [18].

After years of imbalance, a shift in economic power towards workers was to be welcomed, so long as inflation remained low. Mr Trump's first administration coincided with a turnaround in fortunes for the middle class. In 2015, median household income, adjusted for inflation, rose by 5.2%; in 2016 it was up by another 3.2%. During those two years, poorer households gained more, on average, than richer ones. Then blue-collar wages began to rocket. Wage and salary growth for factory workers, builders and drivers outstripped that for professionals and managers. Blue-collar pay growth exceeded 4% [18].

As unemployment fell, from over 6% in mid-2014 to 4.1% by the end of 2017, wage growth picked up. In 2016, service workers enjoyed the biggest pay rises in the economy—3.4%, on average. A year later, growth in service wages decelerated slightly, but blue-collar wage growth surged ahead [18].

Strong demand, rather than a productivity boom, drove the scramble for workers. In the manufacturing sector, for example, output per hour worked was just 0.1% higher in 2017 than in 2016, and had not grown at all in the previous five years. Production and wages picked up anyway. One reason was a weaker dollar in 2017. On a trade-weighted basis, the dollar fell by almost 9% through mid-Sep. The weaker dollar and a strengthening world economy spurred demand for US goods which were up by 4% on 2016 [18].

In a tight labour market, strikers have more leverage than before. In Oct 2021, there was a wave of industrial action in the US known as "Striketober". Partly it was the resumption of trends visible before covid-19. Nearly half a million workers were involved in work stoppages in both 2018 and 2019, the most in more than three decades. That reflected both dissatisfaction with pay and working conditions and the unions' confidence that, in a tight labour market, they had leverage. The pandemic only reinforced these dynamics. Having been lauded as essential workers during covid, everyone from nurses to food-packers expected better treatment. And with companies struggling to find staff, workers were emboldened [19].

*Economist*, "Wages in Germany: Hard bargains", 16 Oct 2021, p. 62.

A highly skilled workforce, harmonious labour relations and restrained wage growth: all have long underpinned Germany's economic success. But, as the covid recovery continued, the three pillars looked wobbly. A shortage of skilled workers became more acute. Pay rose against the backdrop of higher inflation.

Disgruntled unions even threatened to strike.

Average wages in Germany rose by 5.5% in the second quarter of 2021, compared with 2020. That may in part reflect a base effect: pay fell by 4% in the same period in 2020, when the economic shock from the pandemic hit. Still, workers in 2021 were in their strongest position in 30 years, says Gabriel Felbermayr of the Kiel Institute for the World Economy, a think-tank. Bosses chased skilled staff in particular. Automation and migration could not make up the shortfall, says Carsten Brzeski of ING, a bank.

Trade unions were not shy about using their increased power. Unions used to prefer preserving jobs to securing pay rises, and so tended to come to an agreement with bosses who were unable to afford higher wages. Things were more fractious in 2021. Some workers went on strike demanding a fairer share of a surge in profits in sectors benefiting from covid-19. The boss of IG Bau, a union representing construction workers warned of a first nationwide strike in 20 years if employers did not meet demand for a wage increase of 5.3%. [In the end it agreed to a pay increase of 3.3% in 2022 and 2% in 2023].

## Productivity

Productivity is the magic elixir of economic growth. Increases in the size of the labour force or the stock of capital can raise output, but the effect of such contributions diminishes unless better ways are found to make use of those resources. Productivity growth – wringing more output from available resources – is the ultimate source of long-run increases in income. It is not everything, as Paul Krugman, a Nobel economics laureate, once note, but in the long run it is almost everything [20].

Economists know less about how to boost productivity than they would like, however. Increases in labour productivity (i.e., more output per worker per hour) seem to follow improvements in education levels, increases in investment (which raise the level of capital per worker), and adoption of new innovations. A rise in total factor productivity – or the efficiency with which an economy uses is productive inputs – may require the discovery of new ways of producing goods and services or the reallocation of scarce resources from low-productivity firms and place to high-productivity ones [20].

Over the long run, nothing affects average workers' pay-packets

more than labour productivity. The principle is simple: divide the total output of goods and services in different sectors by the number of hours worked that it took to produce them. Rising productivity is a sign that workers churn out more per hour than in the past. This implies that their total hourly compensation (wages plus other benefits such as health care and pensions) should rise.

Investment – whether in physical capital or in skills – tends to increase labour productivity, by making workers more efficient, but productivity levels have slowed since the 2000s. In manufacturing output is relatively easy to gauge and US productivity performance has been impressive, but by the mid-1990s the sector only accounted for 17% of GDP, a lower share than in other developed countries. Much of the rest of the US economy was devoted to providing services, where output and hence productivity is trickier to measure. The CPI fails to take into account quality improvements, or the possibility that goods can be purchased more cheaply from discount stores. US output measures fail to capture productivity gains, so the argument goes<sup>2</sup> [21].

In the service sector, Mr. Gordon, economist at Northwestern University, argues that that much of the US's poor performance stemmed from the structure of its labour market. Weak unions and low minimum wages allowed real wages at the bottom to fall. A US firm could hire relatively more (cheaper) workers than a European counterpart. (US restaurants hire more waiters and table-clearers than the European equivalent.) Slow overall growth in productivity in these US sectors was, in part, the mirror image of high unemployment in Europe [21].

Mr. Gordon highlights a crucial point: that it makes no sense to look for one general explanation of declining productivity growth. The shift to services, with its measurement problems, may explain much. But so may the fact that the US has a more efficient labour market, that it saves less than other economies, and that as a technology leader, it is likely to improve less fast than countries catching it up [21].

After the mid-1990s, information technology, as measured through research and devlopment, was expected to be a driver of growth. Productivy questions began to heat up again in the

#### 2010s. Why is productivity growth low if information

technology is advancing rapidly? Its salience has grown as techies have become convinced that machine learning and artificial intelligence will soon put hordes of workers out of work (among tech-moguls, Bill Gates has called for a robot tax to deter automation, and Elon Musk for a universal basic income). A lot of economists think that a surge in productivity that would leave millions on the scrapheap is unlikely soon, if at all. The 2018 meeting of the American Economic Association showed they were taking the tech believers seriously. A session on weak productivity growth was busy; many covering the implications of automation were packed out [22].

Productivity pessimism returned. From 1995 to 2004 US output per hour worked grew at an annual average pace of 2.5%; from 2004 to 2016 the pace was just 1%. Elsewhere in the G7 group of rich countries, the pace was slower still. An obvious explanation is that the GFC led firms to defer productivityboosting investment. Not so, say John Fernald, of the Fed Bank of San Francisco, and co-authors, who estimate that the US slowdown began in 2006. Its cause was decelerating "total factor productivity"—the residual that determines GDP after labour and capital are accounted for. Productivity stagnated despite swelling research spending. This supports the popular idea that fewer transformative technologies are left to be discovered [22].

Others take almost the diametrically opposed view. Erik Brynjolfsson of MIT pointed to sharp gains in machines' ability to recognise patterns. They can, for instance, outperform humans at recognising most images—crucial to the technology behind driverless cars—and match dermatologists' accuracy in diagnosing skin cancer. Mr Brynjolfsson and his co-authors forecast that such advances would eventually lead to a widespread reorganisation of jobs, affecting high- and lowskilled workers alike [22].

Productivity pessimism remains the norm among official forecasters, but more academics are trying to understand how automation may affect the economy. In a series of papers, Daron Acemoglu of MIT and Pascual Restrepo of Boston University present new theoretical models of innovation. They propose that technological progress be divided into two categories: the sort that replaces labour with machines; and that which creates new, more complex tasks for humans. The first, automation, pushes down wages and employment. The second, the creation of new tasks, can restore workers' fortunes Historically, the authors argue, the two types of innovation seem to have been in balance, encouraged by market forces. If automation leads to a labour glut, wages fall, reducing the returns to further automation, so firms find new, more productive ways to put people to work instead. As a result, previous predictions of technology-induced joblessness have proved mostly wrong [22].

However, the two forces can, in theory, fall out of sync. For example, if capital is cheap relative to wages, the incentive to automate could prevail permanently, leading the economy to robotise completely. The authors speculate that, for now, biases towards capital in the tax code, or simply an "almost singular focus" on artificial intelligence, might be tilting firms towards automation, and away from thinking up new tasks for people. Another risk is that much of the workforce lacks the right skills to complete the new-economy tasks that innovators might dream up [22].

These ideas shed light on the productivity paradox. Mr Brynjolfsson and his co-authors argue that it can take years for the transformative effects of general-purpose technologies such as artificial intelligence to be fully felt.<sup>3</sup> If firms are consumed

<sup>&</sup>lt;sup>2</sup> Gordon, R., "Problems in Measurement and Performance of Service-Sector Productivity in the US", NBER Working Paper, No. 5519, Mar 1996, access at https://www.nber.org/papers/w5519.

<sup>&</sup>lt;sup>3</sup> Brynjolfsson, E., D. Rock and C. Syverson, "Artificial Intelligence and the Modern Productivity Paradox: A Clash of Expectations and

by efforts to automate, and such investments take time to pay off, it makes sense that productivity growth would stall. Investment has not been unusually low relative to GDP in recent years, but it shifted to research and development spending away from structures and equipment [22] [23].

If research in automation does start yielding big payoffs, the question is what will happen to the displaced workers. Recent trends suggest the economy can create unskilled jobs in sectors such as health care or food services where automation is relatively difficult. And if robots and algorithms become far cheaper than workers, their owners should become rich enough to consume much more of everything, creating more jobs for people [22]. It took time before powered machinery was able to improve labour productivity in the US economy, when levels increased more quickly after 1920 and again after 1930. The same tendency in labour productivity from IT adoption appears to be playing out (see chart, US labour productivity) [23].



The risk is that without sufficient investment in training, technology will relegate many more workers to the ranks of the low-skilled. To employ them all, pay or working conditions might have to deteriorate. If productivity optimists are right, the eventual problem may not be the quantity of available work, but its quality [22].

## UNORTHODOX MONETARY POLICY AND ITS AFTERMATH

#### INTRODUCTION

In 2001, after the dot.com bubble led to recession, the Fed cut rates from 6.5% to 1% in response. The rate rose again to 5% before the buildups leading to the GFC. The collapsing housing market in 2007 forced a return to cuts. In late 2008, as the full extent of the recession was becoming clear, rates dropped to near zero, leaving the Fed to combat the worst downturn in generations that damaged the financial system and caused deep recession (a credit crunch that delivered a massive blow to demand), without its main weapon. The central bank of the UK was also forced to push the official rates to close to zero in 2009 [24][25]. In July 2012 the ECB joined them, slashing its deposit rate to 0% and its main policy rate below 1% (see chart, central bank-policy rates [25]). The BoJ had set rates near zero in the 1990s when it fought deflation after an asset-price crash [26] [23].

Central banks in developed economies faced a frightening collapse in output and soaring unemployment without recourse to a policy rate, the mainstay of monetary policymaking [27]. Monetary policymakers became reliant on "unconventional"

Statistics", NBER, working paper No. 24001, Nov 2017, access at https://www.nber.org/papers/w24001.

measures. The International Monetary Fund (IMF) noted that "central banks in advanced economies responded with unconventional tools to address two broad objectives: first, to restore the proper functioning of financial markets and intermediation, and second to provide further monetary policy accommodation . . . The two objectives, while conceptually distinct, are closely related" [28] [26].



From the GFC until the pandemic's return to inflation, central banks almost exclusively relied the much more contentious and less certain instrument of quantitative easing (QE) [25]. Unconventional monetary policy covers everything from negative interest rates to a change in inflation targets, but QE, the creation of (central bank) money on a large scale to buy assets, was most popular tool since the GFC [29]. Printing money to buy assets under a QE programme was first attempted in 2001 by the BoJ when it announced purchase plans in terms of a desired increase in the quantity of bank reserves. It promised to buy ¥400 billion-worth of government bonds a month to raise the level of reserves to ¥5 trn [27].

#### Quantitative easing

First, some definitions. In normal times central banks move short-term interest rates via "open-market operations": by buying or selling securities, they supply or subtract reserves from the banking system. The quantity of reserves that banks hold is a secondary consideration; the real target is the interest rate. A lower rate encourages spending and investment to boost the economy. However, in times of severe economic distress, rates may fall to zero rendering this standard tool useless [29].

#### QE has come to refer to several flavours of asset-purchase

programmes designed to reinforce monetary policy [29][25]. Outright asset purchases held by central banks increased substantially as a % of GDP (see chart, bank assets) [25]. The US Fed had to be particularly imaginative because the US financial system was more complex and more dependent on "shadow banking" – intermediation outside the banking system – than were those of other advanced economies. Liquidity provision was extended to non-bank entities, for example, such as securities firms [29].



The Fed's purchase of private assets was aimed at supporting markets and improving the impaired balance sheets of banks and other financial intermediaries. The purchase of government bonds was expected to persuade the holders to shift their portfolios towards riskier assets [30].

In one version of QE, "credit easing", the aim was to support the economy by restoring a degree of normality to financial markets and institutions by boosting liquidity and reducing interest rates when credit channels were clogged. The Fed's purchases of mortgage-backed securities, the demand for which weakened sharply, fell into this category [29]. From Nov 2008 to Nov 2009, the Fed purchased Treasuries worth \$300bn, as well as debt of government-sponsored mortgage agencies valued ta \$175bn and mortgage-backed securities worth \$1.25trn. This came to be known as QE1 (see chart, US bond yield) and was more about facilitating credit than QE proper [30]



In the UK, the BoE launched its first QE programme, worth £200bn, in January 2009. The expansion of the BoE's balance sheet, relative to the size of the economy, was almost identical to that of the Fed (see chart, UK bond yield). The UK added QE2 worth £175bn, in October 2011. Under these programmes, the BoE bought only government bonds, or gilts. These QEs were monetary. Credit easing in the UK began in July 2012 under a program called Funding for Lending, organised with the Treasury [30].



A second type of asset purchase aimed to boost the economy without creating new money. An example is the Fed's "Operation Twist", QE2 in the US, where the Fed sold shortterm debt and used the proceeds to buy long-term debt. Giving investors cash for long-term debt was intended to prompt them to invest more money in other assets [29]. The Maturity Extension Programme, as it was formally called, was worth \$667bn and ran from 2010 to 2011 [30]. QE proper is a third type, the large-scale asset purchases, QE3 in the US. Initially, it focused on the mortgage-backed securities of government-sponsored enterprises and followed it up with purchases of Treasuries. The purpose was mostly monetary rather than financial; it was aimed at preventing deflation [30]. The most straightforward way this was meant to help the economy was through "portfolio rebalancing". The investors who sold securities to the central bank then took the proceeds and bought other assets, raising their prices. Lower bond yields encouraged borrowing; higher equity prices raised consumption; both helped investment and boosted demand. To the extent that investors added foreign assets, portfolio rebalancing also weakened the domestic currency, and fueled exports [29].

If a central bank is expected to hold on to the government debt it buys, then QE can also support the economy by cutting government-borrowing costs and reducing the future burden of taxation. It can work by changing expectations, too. A promise to keep short-term interest rates low for a long time may be more credible if it is accompanied by QE, since the central bank is exposing itself through its holdings to the risk of a rise in interest rates [29].

QE affects monetary conditions via a "scarcity channel", a "duration channel" and a "signalling channel". By reducing the availability of assets, QE causes investors to shift towards assets deemed close substitutes. This should raise prices and lower yields. By limiting access to long-maturity financial assets, QE lowers the riskiness of investors' portfolios. That should increase prices and lower yields for all maturities, not just those of the assets the central bank purchases. Finally, QE puts the central bank's money where its mouth is, thereby reinforcing credibility. For this reason, it is a complement to another unconventional policy, namely "forward guidance<sup>4</sup> on future short-term interest rates [30].

"Forward guidance" requires two policy tools working together: asset purchases and a credible commitment to keep future rates down. The idea behind this tactic, adopted by both the BoE and the European Central Bank (ECB), is that anyone considering a loan needs to take into account both the rate of interest today and the likely rates in the future. If central banks can make a credible commitment to keep rates in the future down, the expected payment on floating-rate mortgages and car loans will drop. Even those borrowing at fixed rates would be able to save money by refinancing at lower costs. Consumption and investment would be more attractive as a result [24].

To illustrate, between 2009 and 2013 the Fed had made largescale asset purchases by buying financial assets including government and corporate debt and pools of household mortgages. Over the same period the BoE purchased £375 billion (\$585 billion) of government bonds. The asset purchases pushed up bond prices, pushing down the yields, or interest rates, on these assets. This cut the costs of finance across the economy. If asset purchases target the cost of borrowing now, the second tool targets the rates that people expect to pay and receive in the future. In 2008 the Fed indicated that its policy rate, then below 0.2%, would be low "for some time". In 2011 it was more explicit, saying that low rates would be "warranted" until mid-2013. In 2012 it went further still, committing to keep rates low until unemployment, then at 7.6%, fell below 6.5% [24].

Perhaps the best example of this combination of strong words and deeds comes from the ECB. In July 2012 Mario Draghi, its president, announced it would do "whatever it takes" to ensure

<sup>&</sup>lt;sup>4</sup> A central bank's "forward guidance" is more than just a prediction, and more a promise or commitment of some kind. The aim is to change public expectations about what the bank will do tomorrow to improve the economy today. Central banks prefer to change interest rates in small increments. Forward guidance allows them to move gradually, while signalling that the first small step will not be the only one. If

investors heed the guidance, the future steps will be priced into longerterm interest rates straight away [*Economist*, "Free exchange: Forward misguidance", 22 Jul 2022, p. 63].

that the euro area survived. His pledge was backed by a new scheme to buy up debt issued by troubled governments. The promise was enough: interest rates in Spain fell by 250 basis points in 2013. The commitment worked, despite the fact that debt had yet to be bought. Central bankers may inhabit a new world, but they can still be as influential [24].

Thus, the effectiveness of asset purchases depended on whether markets believed the purchases would continue and how quickly they would be unwound. If the central bank's balance sheet were to be reduced, without recycling the cash when bonds matured, it would signal tightening and that purchases were temporary.

That's the theory. Efforts to divine the actual results of these interventions are messy. Unconventional monetary tools were only rarely used before the crisis, which means the sample size of case studies is small. And events stubbornly refused to pause in the immediate wake of new QE, making it hard for economists to isolate its impact [29].

The BoJ pioneered QE's use as a tool of monetary policy in 2001, but it used it in a relatively limited way. Its goal was to buy enough securities to create a desired quantity of reserves hoping to raise asset prices and end deflation. The BoJ introduced its "comprehensive monetary easing" in Oct 2010, intended to be worth ¥76tn by the end of 2013. But the BOJ used it extremely aggressively in Apr 2013 when it launched its "quantitative and qualitative easing" (QQE). This aimed to increase the monetary base by between ¥60tn and ¥70tn annually [30].

With QE increasingly pivotal to monetary policy, how much bang for the buck (or yen or euro) did it deliver? Credit easing played a role in restoring US financial markets to health, but how well did QE work? This question is hard to answer. QE is far from the only reason long-term interest rates remained low. In the UK, for example, long-term rates stayed low after it ended. The explanation is the belief that the economy would stay weak and so accommodative policies would prove longlasting [29].

Empirical studies<sup>5</sup> generally turn up positive results from central-bank asset purchases. They appeared to move interest rates, for example. The BoJ's QE in 2001 quickly cut short-term rates to zero and is generally thought to have had a small but meaningful downward impact on medium- and long-run interest rates. Early reviews of crisis-era asset purchases were likewise modestly positive. The trillion-dollar question is whether QE boosted the broader economy. Before leaving the Fed in 2014, Chairman Bernanke was asked if he was confident that QE



<sup>5</sup> F. Kydland and E. Prescott (1977). "Rules rather than discretion: The inconsistency of optimal plans", *Journal of Political Economy*. M. Woodford (2012), "Methods of Policy Accommodation at the Interest-Rate Lower Bound", Columbia University. Chen, H., V. Cúrdia and A. Ferrero (2012). "The Macroeconomic Effects of Large-Scale Asset Purchase Programs", *Economic Journal*. Cúrdia, V. and A. Ferrero (2013). "How Stimulatory Are Large-Scale Asset Purchases?", Fed Reserve Bank of San Francis., *Economic Letter*. would do the job. He replied: "The problem with QE is it works in practice but does not work in theory." The chart (US employment and inflation expectations) shows a boost in nonfarm payrolls (a proxy for job growth) and an uptick in inflation (end of deflation) [29].

Estimates from the San Francisco concluded that \$600bn of asset purchases took 1.5 percentage points off of the US jobless rate (payroll employment could have been as much as 3m workers higher than would otherwise have been) and tended to lower the yield long-term (10-year Treasury) rates by 15-25 basis points. Real output by late 2012 may have been 3% higher than it would have been in the absence of QE1 and QE2. Research by some BoE economists on the impact of its first £200 billion in QE purchases suggested that it may have raised the UK's real GDP by as much as 2% and inflation by 1.5%, an impact equivalent to a 3-percentage-point cut in the main interest rate. Although a different BoE study found a more modest impact, the data suggested that QE helped the real economy [26] [23].

Causation was harder to discern for equity prices. Some of the expected impact may have been priced in before QE was announced, as happened when Chairman Bernanke, hinted at QE2 in the summer of 2010. Yet QE programmes in Japan, the UK and the US appear to have been associated with rising equity prices [30].

The IMF argued that the signalling channel was most important, at least in the US, although the portfolio balance channel seemed to be important in the UK, perhaps because markets are more segmented from one another. What effect did this have on economies? Economists largely agree that QE raised asset prices, including equity prices, and affected economies positively. For this reason, the IMF recommended aggressive QE, including purchases of government bonds, by the ECB. Moreover, there was some evidence that these effects, too, were strongest via the signalling channel, probably because QE was seen to cut off the tail risks of a still deeper slump. Thus, QE proved itself to be a useful instrument under slump conditions, the view of most policy makers and academics [30].

To critics, even the gains suggested by the studies did not justify the risks, great and small, of large-scale asset purchases. Three dangers stand out. The first threat is to the function of some financial markets. The Bank for International Settlements (BIS) argued in an annual report that huge growth in bank reserves drove overnight-lending rates to zero, causing the market for unsecured overnight lending to atrophy. Since the unsecured overnight rate was the principal policy lever for central banks, this development could, the BIS warned, make it hard for them

to rein in inflation in the future [30].

A second risk from QE is of distortions in the market for government debt. The borrowing costs of some governments were extraordinarily low—an auction of ten-year Treasuries in 2012 produced record-low yields. A flight to safety was a contributing factor, but it seems that markets either anticipate decades of abysmal economic growth, or the risk premium for holding long-dated bonds was unsustainably low, thanks in part to central-bank purchases. Any adjustment may be sudden and have unpredictable consequences [30].

Beltran, D., M. Kretchmer, J. Marquez and C. Thomas (2012). "Foreign Holdings of U.S. Treasuries and U.S. Treasury Yields". Warnock, F. and V. Warnock (2009). "International Capital Flows and U.S. Interest Rates", *Journal of International Money and Finance*. Kaminska, I., D. Vayanos and G. Zinna (2011). "Preferred-habitat investors and the US term structure of real rates", Bank of England Working Papers, 2011. QE works mainly by distorting asset prices, particularly those of long-lived assets, such as equities. As the distortions unwind, a new round of difficulties would be created. The argument against this is that it is an objection to active monetary policies, not QE alone. Another criticism is that buying bonds has adverse distributional consequences, benefiting rich owners but damaging subsequent returns on long-term savings. Yet, again, this effect is largely due to ultra-low interest rates. QE is just the icing on that cake. Moreover, if interest rates had been substantially higher, economies would have been far weaker, resulting in far more bankruptcies. That, too, would have created large losses, including for many savers [30].

A related concern is that QE can reduce market pressure on sovereigns that would otherwise face higher interest rates and a corresponding need to deal responsibly with their public finances. This is not a concern to take lightly. A central bank can lose control over inflation if the market loses confidence in the sovereign and the bank is forced into buying government debt. On the other hand, a central bank that neglected its duties to play fiscal watchdog could risk its independence [30].

Another related criticism was that QE was preventing the deleveraging of the private sector and keeping "zombies" (both corporate and governmental) out of bankruptcy or default. More broadly, these policies reduced the pressure for radical restructuring and reform necessitated by the unsustainable precrisis trends and post-crisis legacy. These are legitimate concerns, but they are not about QE per se but rather about ultra-easy monetary policy [30].

Yet another line of criticism is that QE, particularly by the Fed, guardian of the world's principal reserve currency, have disruptive global spillover effects. Emerging economies, notably Brazil and China, made these complaints strongly. Again this is

more a criticism of the entire stance of monetary policy rather than of QE in itself. But the most important point by far is that another great depression or even a far weaker recovery would have been much worse. The early interventions were unquestionably of benefit to everybody. Moreover, in a world of floating exchange rates, countries have to prepare themselves for changing monetary policies and fluctuating exchange rates elsewhere. The hope was whether emerging economies were now properly prepared for the ending of QE [30].

According to the IMF, QE did weaken the dollar and an adjustment in its external balance was strong. But it does not make any sense to expect the US or other crisis-hit countries to stick in recession for the (often imaginary) sake of other countries [30].

Part of what lies behind this set of criticisms is a

struggle over the balance of financial power. Creditor countries believe they are morally entitled to dictate to deficit countries. But they cannot dictate to the country that issues the global reserve currency. So the US was able to force adjustment upon others, including China, by pursuing policies that were in its own interests. Inside the eurozone, the creditors have far more power: this has not gone well [30].

A far wilder, albeit popular, criticism is that QE must lead to hyperinflation or at least very high inflation. Central banks could leave reserves permanently higher. This would turn QE into a form of "helicopter money", retrospectively. By this is meant scattering money across the population, suggested by Milton Friedman. That option was not employed. Yet, done on a suitably large scale, helicopter money would, as Willem Buiter, chief economist of Citi, argued, end deficient demand. In irresponsible hands it could also cause hyperinflation. But it need not do so [30]. Deflation and negative interest rates

Economists widely thought that, in practice, the lowest possible interest rate was the "zero lower bound". The alternative to keeping money in banks is holding it as cash. Below a zero interest rate, banks and their depositors have an incentive to switch to cash, which pays no interest but does not charge any either [27][28][29]. Depositors might tolerate small fees, to avoid the cost and hassle of making other arrangements—but most had assumed their tolerance would be limited [31].

The "natural" interest rate is the level that would, in theory, cause inflation to neither rise nor fall. If rates are much lower (higher) than this, then a central bank tries to expand (contract) the economy. When an economy is struggling, the central bank usually cuts interest rates. The idea is to reduce the "real" (ie, inflation-adjusted) rate. As real rates fall, it becomes less attractive to save and more alluring to borrow. When real rates go negative, there is an extra potency: savers lose more money each year to inflation than they gain from interest. If saving is a losing proposition, investment and consumption should rise, buoying the economy [32].

Negative interest rates arrived in several countries, in response to the growing threat of deflation. To get negative real rates, the nominal interest rate must be lower than the rate of inflation; if inflation is negative, the nominal interest rate must also fall below zero [32]. The whiff of deflation was everywhere in 2014 (see charts, comparing CPI and inflation targets). The central banks of the US, UK and the euro zone had a 2% target for inflation, but inflation was below that target. The US, UK and Canada were all growing at more than 2% and still inflation was below the target. Japan, which escaped from deflation in 2013 after more than a decade of struggle, had a rate of 2.4% battled not to slip back into deflation. In China inflation was below 1%, compared with a 4% central government target [33] [34].



Oil explains a lot. The perversity of the low-inflation world was shown by the fact that the catalyst for the latest deflation scare was in itself a largely positive development. The price of a barrel of oil fell from \$115 at the end of Jun 2014 to about \$85 in Oct and to \$60 in Feb 2015, prompting a sharp drop in headline inflation (core inflation, which excludes energy, was not quite as low) as it trickled through economies. In the US, the price of gasoline fell 35% over the six months from Feb 2015, and the cost of diesel and heating oil was down, too. Across the board lower commodity prices were knocking down another 0.4 percentage points off global inflation, according to J.P. Morgan [26] [23].

The drop in oil prices was in part due to higher supply, but it also the product of slowing growth around the world. Higher supply —in itself—was not a bad thing. A fall in the oil price is a gigantic tax cut for oil importers. An IMF rule of thumb has it that a \$20 drop in the oil price adds about 0.4 percentage points to global growth [33]. Energy use is a necessity, and consumers and firms are better off with cut-price fuel. As well as lower energy bills, the cost of inputs, from plastic bottles to detergent, edge down. Some of the savings are passed on: food, which is costly to transport and requires a lot of packaging, is cheaper. These are the hallmarks of a positive supply shock: cheap oil means economies can provide more goods at lower prices. In the services sector, which relies much less on energy, transport and oil-based inputs, prices were still rising (see right-hand-side of chart, "euro-area consumer prices") [34].



A short spell of deflation driven by cheaper oil would be tolerable in some situations. There are times when deflation can be a symptom of encouraging underlying developments, e.g., when brought about by advancing productivity it enables the economy to produce more goods and services at lower cost, raising consumers' real incomes. However, deflation when accompanied by falling real wages can hurt workers in many sectors and cause a contraction in demand and further deflation [33]. Such was the seriousness of the situation that existed in 2014 that some central bankers were willing to give negative rates a shot at fighting deflation [32].

By 2016, almost a quarter of the world's GDP came from countries (in Europe and Japan) with negative rates [35]. For a central bank cautious about unconventional measures, setting a negative interest rate was a bold move for the ECB. In June 2014, the ECB reduced its benchmark interest rate, at which it lends to commercial banks, to 0.15% and its deposit rate, which it pays to banks on their reserves, to -0.1%. By September, the ECB cut the deposit rate again, to -0.2% (see chart, deposit rates) [31] [36]. Sweden and Switzerland also had negative rates and Denmark since 2012. Central banks in effect began charging commercial banks to hold their excess deposits at the central bank, in the hope that it would drive down borrowing costs more generally. The intention was to spur banks to use "idle" cash balances, boosting lending, as well as weakening the local currency by making it unattractive to hold. Both effects, they hoped, would raise growth and inflation [32].



In a speech, Mr Draghi claimed that the ECB's unconventional policies, including more QE, since 2014 had been a 'dominant force' in spurring the euro-zone economy and staving off deflation. Lending by banks was slowly reviving. Even so, he

suggested, deficient inflation and lingering concerns about the strength of recovery justified the further action [31].

Though they defy convention, they have proved a useful addition to the central-banking toolkit. The lowest deposit rate set by the central bank acts as a floor for short-term interest rates in money markets (e.g., the cost of overnight loans) and for borrowing rates generally. This is why short-term moneymarket rates turned negative. Borrowing costs across Europe tumbled, helping the fight against deflation and driving down

exchange rates [35]. Negative policy rates and money creation through central-bank purchases of bonds or foreign currencies dragged the yields on sovereign bonds into the red all over Europe (see chart, government bond yields). That in turn pulled down the interest rates charged by banks for new loans [31].



Advocates of negative returns pointed out that banks had huge sums stashed with central banks. These "excess" reserves those above the minimum regulatory requirement—were the result of QE schemes (in which central banks print money to buy bonds, largely from banks). The Fed's enthusiastic bond buying helped swell excess reserves in the US from \$1.9 billion in August 2008 to \$2.6 trillion in January 2015. In the euro zone they climbed from €1.8 billion (\$2.7 billion) in 2008 to €158 billion in 2013. Paying a negative rate on that pile would impose a nasty cost on banks. To avoid it, the theory runs, banks would lend more, thereby reducing their reserves [32].

Yet deposits in Europe, where rates went negative in 2014, were. For commercial banks, a small interest charge on electronic deposits proved to be bearable compared with the costs of safely storing stacks of cash—and were not onerous enough in 2015 to try to pass on to individual depositors [35].

As in Switzerland and Denmark, Japan's central bank shielded banks from the full effect by setting up a system of tiered interest rates, in which the negative rate applied only to new

> reserves. As interest rates went deeper into negative territory, profit margins would be squeezed harder—even in places where central banks tried to protect banks [35].

> That would put pressure on banks to charge their own customers for deposits. Such pressure had already started to tell. Banks in Europe started to pass on some of the cost of negative rates to big corporate depositors. Their only ready alternative to stashing large pots of cash was safe and liquid government bonds, whose yields had also turned negative, for terms of up to ten years in Switzerland. Rich personal-

account holders were next. The boss of Julius Baer, a Swiss private bank, said in Feby 2016 that if interest rates in Europe went further into the red, it might have to charge depositors [35]. Danske Bank, Denmark's biggest, only charged negative rates to a small fraction of its biggest business clients. For the most part Danish banks decided to absorb the cost. Denmark's negative rates cost banks just 0.005% of their assets [32].

Retail customers are more resistant to charges, because small stashes can easily be stored in a mattress or a home safe. Small savers could use any available form of prepayment—gift vouchers, long-term subscriptions, urban-transport cards or mobile-phone SIM cards—to avoid the cost of having money in the bank [35]. Depositors, to safeguard their savings, could switch to foreign currency or precious metals [31].

In aggregate, the quest to diminish reserves is hopeless. As soon as one bank gets rid of some, by extending a loan to buy a car, say, the car dealer deposits the proceeds in another bank, boosting its reserves. However, as banks tried to palm these reserves off on one another, they increased lending, stimulating the economy. This whole picture, however, is dependent on finding lots of willing borrowers—something that was hard to come by when optimism about the prospects of new ventures was in short supply [32].

#### Sub-zero interest rates are neither unfair nor unnatural

Interest, in many people's minds, is a reward for deferring gratification. That is one reason why low interest rates are widely perceived as unjust. Suppose shipwrecked sailors had washed ashore with perishable figs. Any one of them who was willing to save figs for later consumption would have had less to consume in future – the rate of interest would have been steeply negative. "There is no absolutely necessary reason inherent in the nature of man or things why the rate of interest in terms of any commodity standard should be positive rather than negative," Fisher concluded in *The Theory of Interest* in 1930 [36].

In 2016, the Bank of Japan (BoJ) began charging financial institutions for adding to their reserves at the central bank. Its negative-rate policy was harshly criticised for unsettling thrifty households, jeopardising bank profitability and killing growth with "monetary voodoo". Behind this fear and criticism was perhaps a gut conviction that negative rates upended the natural order of things. Why should people pay to save money they had already earned? Earlier cuts below zero in Switzerland, Denmark, Sweden and the euro area were scarcely more popular [36].

But these monetary innovations would have struck some earlier economic thinkers as entirely natural. Indeed, in 1916 Silvio Gesell, in *The Natural Economic Order* favoured negative interest rates on money. In it, he span his own shipwreck parable, in which a lone Robinson Crusoe tries to save three years' worth of provisions to tide him over while he devotes his energies to digging a canal. In Gesell's story, unlike Fisher's, storing wealth requires considerable effort and ingenuity. Meat must be cured. Wheat must be covered and buried. The buckskin that will clothe him in the future must be protected from moths with the stink-glands of a skunk. Saving the fruits of Crusoe's labour entails considerable labour in its own right [36].

Even after this care and attention, Crusoe is doomed to earn a negative return on his saving. Mildew contaminates his wheat. Mice gnaw at his buckskin. "Rust, decay, breakage...dry-rot, ants, keep up a never-ending attack" on his other assets [36].

Salvation for Crusoe arrives in the form of a similarly shipwrecked "stranger". The newcomer asks to borrow Crusoe's food, leather and equipment while he cultivates a farm of his own. Once he is up and running, the stranger promises to repay Crusoe with freshly harvested grain and newly stitched clothing [36]. Crusoe realises that such a loan would serve as an unusually perfect preservative. By lending his belongings, he can, in effect, transport them "without expense, labour, loss or vexation" into the future, thereby eluding "the thousand destructive forces of nature". He is, ultimately, happy to pay the stranger for this valuable service, lending him ten sacks of grain now in return for eight at the end of the year. That is a negative interest rate of -20% [36].

If the island had been full of such strangers, perhaps Crusoe could have driven a harder bargain, demanding a positive interest rate on his loan. But in the parable, Crusoe is as dependent on the lone stranger, and his willingness to borrow and invest, as the stranger is on him [36].

In Japan, too, borrowers are scarce. Private non-financial companies, which ought to play the role, have instead been lending to the rest of the economy (see chart, previous page Central-bank deposit rates), acquiring more financial claims each quarter than they incur. At the end of Sep 2017, they held ¥259trn (\$2.4trn) in currency and deposits [36].

Gesell worried that hoarding money in this way perverted the natural economic order. It let savers preserve their purchasing power without any of the care required to prevent resources eroding or any of the ingenuity and entrepreneurialism required to make them grow. "Our goods rot, decay, break, rust," he wrote, and workers lose a portion of their principal asset—the hours of labour they could sell— "with every beat of the pendulum". Only if money depreciated at a similar pace would people be as anxious to spend it as suppliers were to sell their perishable commodities. To keep the economy moving, he wanted a money that "rots like potatoes" and "rusts like iron" [36].

The BoJ shuns such language (and, in the past, has at times seemed determined to keep up the yen's value). But in imposing a negative interest rate in 2016 and setting an inflation target three years before, it was in effect pursuing Gesell's dream of a currency that rots and rusts, albeit by only 2% a year [36].

The BoE expressed concerns about the effect of low interest rates on building societies, a type of mutually owned bank that is especially dependent on deposits. That makes it hard to reduce deposit rates below zero. But they have assets, like mortgages, with interest payments contractually linked to the central bank's policy rate. Money-market funds, which invest in short-term debt, faced similar problems, since they operated under rules that made it difficult to pay negative returns to investors. Weakened financial institutions, in turn, are not good at stoking economic growth [32].

Commercial banks did not swap their reserves at the central bank for cash, as theory would suggest. The outstanding stock of loans to non-financial companies in the euro zone fell by 0.5% in the six months after the ECB imposed negative rates [31].

The biggest effect of negative interest rates may have been on currencies. Low interest rates help to pull down yields on all manner of local investments, encouraging both natives and foreigners to put their money elsewhere. As capital takes flight, the currency should fall. When the ECB introduced negative deposit rates, the euro fell against the dollar by nearly 20%. After Sweden adopted negative rates, the krona fell to a six-year low against the dollar. It is no coincidence that the central bank with the greatest enthusiasm for negative rates was Denmark's: its sole objective is maintaining a fixed exchange rate with the euro [32]. Denmark's central bank set its main policy rate below zero for most of 2012-15 to repel capital inflows that had threatened its exchange-rate peg with the euro. In Jan 2015 the SNB abandoned its attempts to stop the franc from appreciating against the euro by printing and selling francs in vast quantities; instead it resorted to negative interest rates to deter investors from buying francs. Sweden's central bank, the Riksbank, took its main policy rate negative in Feb 2015, to weaken the krona, making imports more expensive and thus pushing inflation closer to its 2% target [31].

For all these countries, it is the exchange rate against the euro that matters most. To suppress their currencies, their central banks had to offer interest rates that were further below zero than the ECB's. In Nov 2015, the deposit rate in Denmark and in Switzerland was -0.75%; in Sweden it was -1.1% [31].

Some will object that the decline in real interest rates was solely the result of monetary policy, not real forces. This is wrong. Monetary policy does indeed determine short-term nominal rates and influences longer-term ones. However, the objective of price stability means that policy was aimed at balancing aggregate demand with potential supply. The central banks merely discovered that ultra-low rates were needed to achieve this objective [37].

In brief, one must regard ultra-low interest rates as symptoms of the disease, not its cause. Yet it is right to question whether the monetary treatment employed was the best one. Here, three points can be made. One is that, given the nature of banking institutions, negative rates were unlikely to be passed on to depositors and, if so, would likely damage the banks. A second is that there is a limit to how negative rates can go without limiting the convertibility of deposits into cash. Finally, for these reasons, this policy might do more damage than good. Even supporters agreed there were limits [37].

It is possible to answer such criticisms. Nevertheless, such an exceptional policy could undermine confidence more than strengthen it. Would this mean monetary policy is exhausted? Not at all. Monetary policy's ability to raise inflation is essentially unlimited. The danger is rather that calibrating monetary policy is more difficult the more extreme it becomes. For this reason, fiscal policy should have come into play more aggressively. Indeed, it is hard to understand the obsession with limiting public debt when it was as cheap as it was [37].

The best policies would be a combination of raising potential supply and sustaining aggregate demand. Important elements would have been structural reforms and aggressive monetary and fiscal expansion. The IMF argues that structural reforms work best in such an expansionary context. The US was more successful in delivering a more balanced set of policies than the eurozone [37].

Germany always had the option of abandoning the euro, but the outcome would be a huge appreciation of the recreated D-mark, losses on foreign assets, in domestic terms, a damaged financial sector, accelerated outward investment, deflation and hollowed-out manufacturing. Alternatively, Germany could stay inside the eurozone, understanding that its monetary policy cannot be for the benefit of creditors alone. A policy that stablises the eurozone must help debtors, too. Furthermore, the overreliance on monetary policy is a result of choices, particularly over fiscal policy, on which Germany strongly insisted. It is also the result of excess savings, to which Germany substantially contributed. It complained about the ECB's attempts to fix problems that Germany helped create [37].

Japan was the first country to reduce rates to zero (hitting the "zero lower bound" in the jargon). In August 2000 the BoJ raised rates from zero even though prices were still falling; a recession started two months later. A second attempt at raising rates, in 2006, also had to be reversed two years later [38].

Similar problems bedevilled other central banks that attempted to raise rates in the wake of the financial crisis of 2007-08. The ECB pushed up interest rates in 2008 and again, twice, in 2011, as the euro-zone debt crisis was unfolding. Sweden's Riksbank



went even further, pushing rates from 0.25% to 2% in 2010-11 in response to a surge in inflation; by late 2011 the bank had to change course and Sweden had negative interest rates [38].

The sluggish nature of the recovery in the rich world since the crisis, and the high levels of debt that remained, explained why it was so difficult for central banks to return to a "normal" level of interest rates. In the past, many central banks were usually raising rates at the same time. But any country that tightened policy in the 2010s would stand out from the crowd. Foreign capital would drive its currency higher, as investors took advantage of more attractive yields. That would act as a further tightening of policy, since a higher exchange rate reduces the price of imports, and so adds to deflationary pressures [38].

**Unconventional monetary policy affecting currency markets** Emerging economies, led by Brazil's finance minister, Guido Mantega, first accused the US of instigating a currency war in Sep 2010 when the Fed created new money through QE. QE led investors toward emerging markets in search of better returns, lifting their exchange rates in the process. The implication was that QE was a form of protectionism, aimed at stealing market share from the developing world. Mr. Mantega, claimed that this was not just happening, but that it was deliberate and unwelcome: a currency war had begun between North and South. The Brazilians followed up his statement with taxes on currency inflows [39].

Those charges were also levelled at Japan in 2012 when Shinzo Abe, the prime minister, promised bold stimulus to restart growth and vanquish deflation. In 2013, the BoJ began QE, weakening the yen to bolster exports (falling 16% and 19%, respectively, against the dollar and euro) while boosting corporate profits and share prices. The complaints, however, were overdone. Rather than condemning the actions of the US and Japan, the rest of the world should have praised them—and the euro zone would follow suit [39].

The evidence for Mr Mantega's case was pretty shaky. The Brazilian real was lower than it was when he made his remarks (see chart, currencies against the dollar). The Chinese yuan gained value against the dollar since 2010 while the Korean won rallied once risk appetites recovered in early 2009. On a trade-weighted basis (which includes many developing currencies in the calculation), the dollar was almost exactly where it was when Lehman Brothers, an investment bank, collapsed in September 2008 (triggering the US' QE programs) [39].



QE1 was in late 2008 at the time the dollar rose sharply (see chart, Fed \$ exchange rate index). The dollar is regarded as the "safe haven" currency; investors flock to it when they are worried about the outlook for the global economy. Fears were at their greatest in late 2008 and early 2009 after the collapse of Lehman Brothers. The dollar then fell again once the worst of the crisis had passed [39].

QE2, launched in Nov 2010, had more straightforward effects. The dollar fell by the time the programme finished in June 2011. However, that fall might have been down to investor confidence that the central bank's actions would revive the economy and that it was safe to buy riskier assets; over the same period, the Dow Jones Industrial Average rose while Treasury bond prices fell. After all this, though, the dollar remained higher against both the euro and the pound than it was when Lehman collapsed [39].

Nevertheless, QE did affect emerging economies. Many developing countries had export-based economic policies. So that their currencies did not rise too quickly against the dollar, thus pricing their exports out of the market, these countries managed their dollar exchange rates, formally or informally. The result was that loose US monetary policy ended up being transmitted to the developing world, often in the form of lower US interest rates. By boosting demand, the effect showed up in higher commodity prices. Gold more than doubled in price since Lehman collapsed and reached a record high against the euro in 2012. Some investors feared that QE's general tendency was the debasement of rich-world currencies that would eventually stoke inflation [39].

Thus, QE's effect on other currencies might not have been what traders at first expected. However, with the advent of all this unconventional monetary policy, foreign-exchange markets have changed the way they think and operate. Currency trading is, by its nature, a zero-sum game. For some to fall, others must rise. The unorthodox policies of developed nations have not caused their currencies to fall relative to one another in the way people might have expected. This could be because all rich-country governments have adopted such policies, at least to some extent. But it would not be surprising if rich-world currencies were to fall against those of developing countries [39].

In economic textbooks the old rule is that high inflation leads to weak exchange rates (to keep exports competitive) is much less reliable than it used to be. Currency movements counter the differences in nominal interest rates between countries so that investors get the same returns on similarly safe assets whatever the currency. Experience over the past 30 years has shown that this is not reliably the case. Instead short-term nominal interestrate differentials have persistently reinforced currency movements; traders borrow money in a currency with low interest rates, and invest the proceeds in a currency with high rates, earning a spread (the carry) in the process. Countries with higher-than-average inflation rates tend to have higher-thanaverage nominal interest rates. Between 1979 and 2009 this "carry trade" delivered a positive return in every year bar three. With nominal interest rates in most developed markets close to zero in the 2010s, there was less scope for the carry trade. [39].

So instead of looking at short-term interest rates that are almost identical, investors paid more attention to yield differentials in the bond markets. D. Woo, a currency strategist at Bank of America Merrill Lynch, said that markets were moving on real (after inflation) interest rate differentials rather than the nominal gaps they used to heed. Real rates in the US and UK were negative, but deflation in Japan and Switzerland meant their real rates were positive—hence the recurring enthusiasm for their currencies [39].

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