PIMCO

ECB Monetary Policy Confronts Aging Demographics and Elusive Inflation

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Two decades ago, economist Paul Krugman described how Japan's economy had fallen into a liquidity trap: With the Bank of Japan's (BOJ) policy rate constrained by the zero lower bound, insufficient inflation was keeping the real interest rate too high to stimulate aggregate demand. Despite extensive monetary policy easing by the BOJ and large government budget deficits since then, inflation in Japan has proved elusive, and expectations have disconnected from the BOJ's 2% inflation target.

Europe today displays at least three similarities to Japan back then: The European Central Bank (ECB) policy rate is at the zero lower bound, debt and nonperforming loan levels are high and the population is transitioning from an aging to an aged society. It's true Europe's more diverse economy, culture and institutions differ from Japan in many ways, but as the ECB embarks upon normalising its unconventional monetary policy, it is pertinent to consider whether Europe risks sliding into a liquidity trap as Japan did 20 years ago.

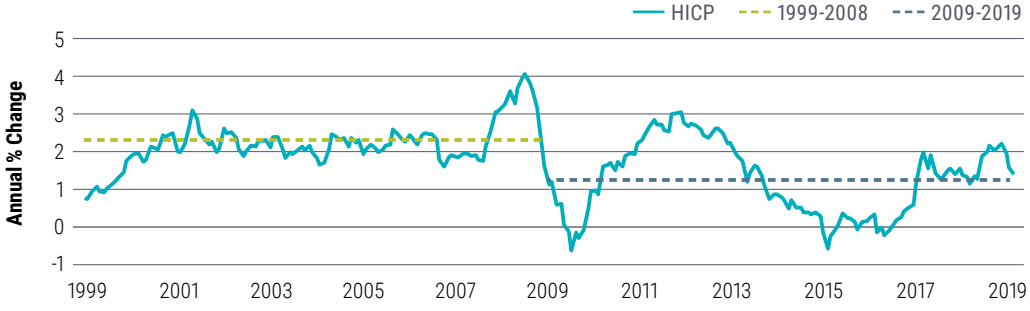
To assess this risk and its implications, we examine the evolution of inflation expectations in the eurozone and the linkages between demography and inflation. We review the policy instruments the ECB has at its disposal, whether they are likely to be effective in boosting inflation and what the investment implications are.

Our tentative conclusion is that demographic trends will continue to exert secular, downward pressure on eurozone inflation. We see a non-trivial risk inflation expectations gradually dislodge to levels below 2% over the coming decade and that the ECB enters the next recession without ever having normalised its policy stance.

EUROZONE INFLATION AND INFLATION EXPECTATIONS

Since the euro's inception in 1999, consumer price inflation in the eurozone has averaged 1.7%, in line with its *"below, but close to, 2%"* definition of price stability. This 20-year average masks two distinct halves, however: 2.2% during the first decade and 1.2% during the second (see Figure 1). The distinction is important because past inflation outcomes shape future inflation expectations.

Figure 1: Eurozone Harmonised Index of Consumer Prices (HICP): Two distinct decades

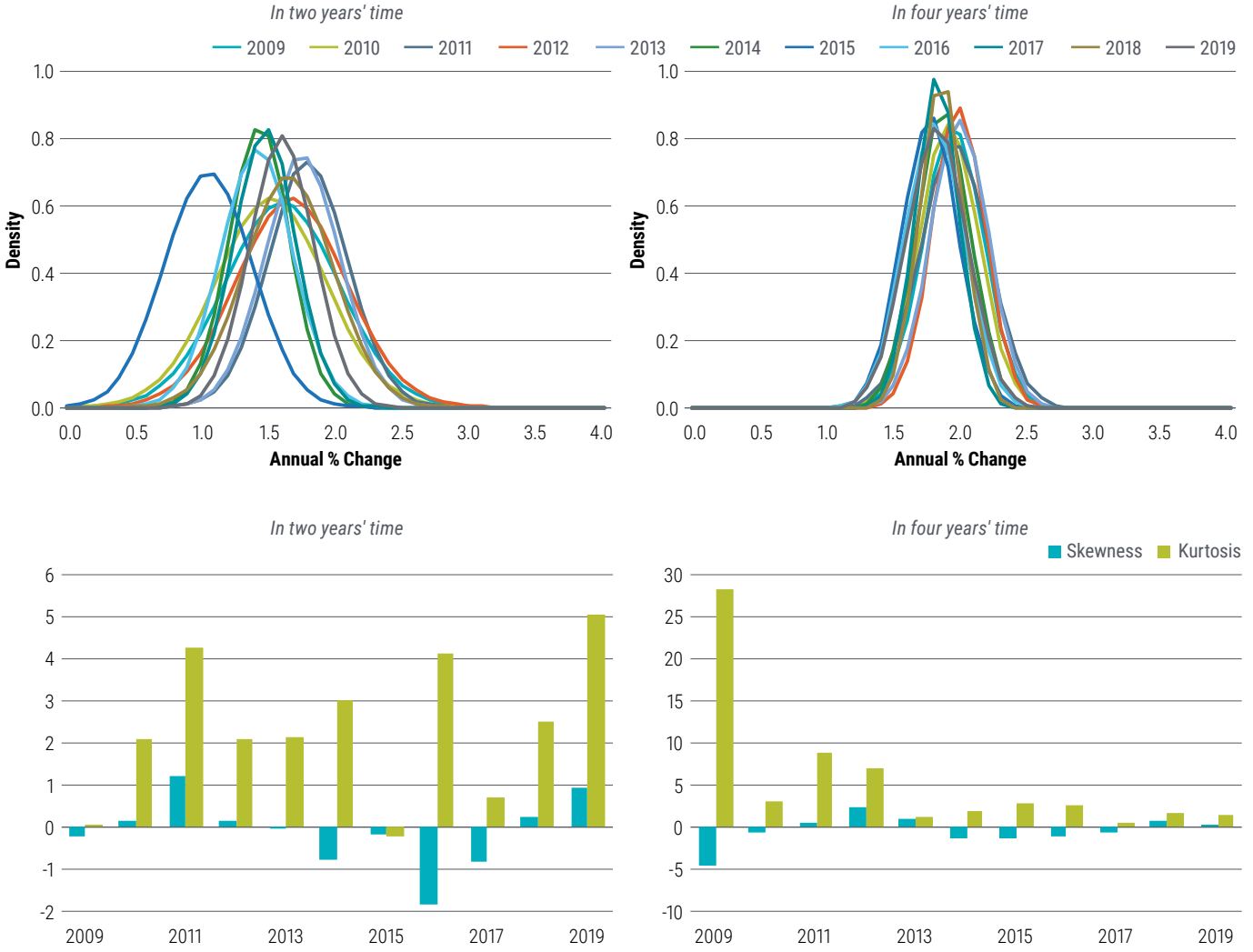


Source: Eurostat, PIMCO as of February 2019

The ECB's quarterly Survey of Professional Forecasters (SPF) provides one source of inflation expectations data. The SPF has inflation expectations firmly anchored between 1.6% and 2%, depending on the forecast horizon. Figure 2 shows the SPF's mean two- and four-year inflation projections as of the first quarter of each calendar year, fitted with a normal probability distribution derived from the first two moments of the point forecast.

Figure 2: Two- and four-year eurozone inflation expectations: survey-implied probability density function

Density, skewness and kurtosis



Source: ECB, PIMCO as of February 2019

The latest four-year projection shows a mean forecast as of 2019 (for 2023) of 1.8%. The mean for each four-year projection sample has remained fairly stable between 1.8% and 2.0% since 2009. The distribution of the four-year projection has gradually drifted leftward (lower) over time, however, signalling forecasters in 2019 assign a marginally higher probability to a slightly lower inflation outcome relative to a decade ago. The latest two-year projection shows a mean forecast as of 2019 (for 2021) of 1.6%, and the distribution of forecasts has shifted back to the right (higher), from a mean as low as 1.1% in 2015, in response to the ECB easing monetary policy since then.

Skewness and kurtosis of the forecasts have also improved, signalling slightly higher (and more stable) inflation expectations. Negative values of skewness indicate a statistical data distribution tilted to the left; positive values a distribution tilted to the right. High kurtosis values indicate a data distribution has heavy ("fat") tails, or outliers; low kurtosis light tails, or a lack of outliers. Skewness and kurtosis of the latest two-year projections indicate a larger tail skewed to the right, i.e., a bias toward inflation expectations higher than the 1.6% mean. This is a significant improvement over the 2014 to 2017 period, when the skewness was negative and

kurtosis positive, reflecting a fatter, left-tail bias toward lower inflation during this period.

We force the distributions of the point forecasts in Figure 2 to be normal. As such, they underrepresent the variation of probability distributions reported by individual forecasters. The cross-section of individual forecasters' probability distributions corroborates the gradual leftward drift of four-year inflation forecasts. Whereas in 2009, 49% of the cumulative distribution of individual forecasts foresaw inflation rates greater than or equal to 2% and 51% foresaw inflation less than or equal to 1.9%, by 2019 these ratios were 35% and 66%, respectively.

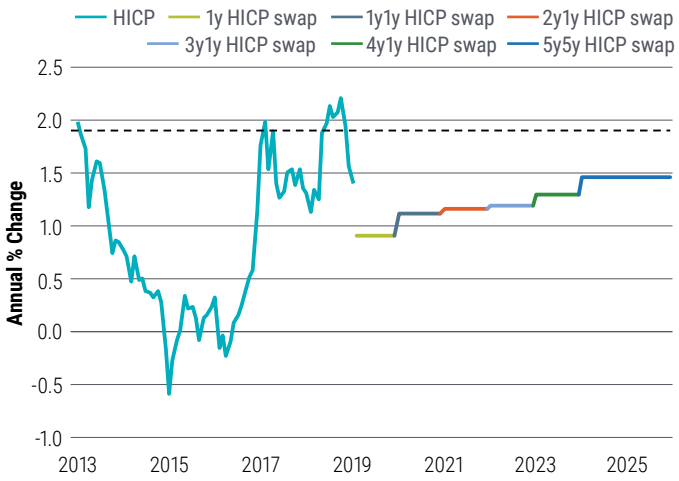
Forecasts have shifted gradually leftward toward lower expected inflations. The risk we see evolving, however, is that the longer inflation outcomes undershoot the ECB's price stability definition, the greater the likelihood inflation expectations – forecast measures of expectations, in this case – adjust downward to the new reality as people learn from past forecasting mistakes. A central bank's inflation target loses credibility when this occurs. This is the problem that has befallen the BOJ. Japan's average annual consumer price inflation has remained below 2% in 19 out of the past 20 years, rendering the BOJ's 2% inflation target, which it introduced in 2013, incredible.

Darvas (2018) documents the undershooting of eurozone inflation outcomes relative to the ECB staff macroeconomic projections since 2014. The longer such undershooting persists, in our opinion, the more likely that either inflation expectations drift lower, or the ECB's price stability definition loses credibility.

Whereas the ECB's SPF represents the projections of approximately 50 forecasters, inflation-linked bonds and swaps represent the market clearing price of the many market participants transacting in inflation and its derivatives. Although financial markets are prone to over- and undershooting, market-based prices might be considered a more representative measure of inflation expectations. In the eurozone, they convey a sobering outlook for inflation.

Ten-year maturity bonds linked to eurozone consumer price inflation issued by the governments of Germany, France, Spain and Italy embed expectations for inflation between 0.7% and 1.1% on average over the next decade. Swaps referencing the rate of inflation of the harmonised index of consumer prices (HICP) with one-year tenors covering the years 2019 to 2023 – the period spanning the ECB's policy-relevant horizon – are below 1.3%. The five-year tenor HICP inflation swap starting in five years is 1.5%, below the level prevailing in January 2015 when the ECB announced its expanded asset purchases programme (see Figure 3).

Figure 3: HICP inflation and forward inflation swap rates



Source: ECB, Bloomberg, PIMCO as of February 2019

While financial market prices of future inflation may be overreacting to current uncertainties concerning global trade, they corroborate the leftward shift in the distribution of SPF projections. As such, they signal an increased risk inflation expectations are gradually drifting away from the ECB's price stability definition.

LINKAGES BETWEEN DEMOGRAPHY AND INFLATION

The aging of a population is a crucial factor influencing economic activity. Economic theory, however, is divided on the linkages and causality between aging and inflation. The *life cycle hypothesis* posits aging is inflationary, whereas the *secular stagnation hypothesis* posits aging is deflationary:

- **Life cycle hypothesis: Aging is inflationary.** In this theory, economic agents (people) generally adapt consumption and savings behaviour over their life cycle in order to smooth consumption over time. Household income is typically low among young adults, rising during working age and falling in retirement. Working-age people save more of their income than the young and old. Different savings-consumption patterns across these three age cohorts lead to shifts in aggregate demand and supply that affect inflation. When the working-age cohort is large relative to the young and old, its higher savings, coupled with the output it produces, creates more aggregate supply relative to demand. At the same time, the rising labour supply puts downward pressure on wages and inflation. The reverse occurs as society ages. Juselius and Takáts (2015, 2018) find a positive relationship between the dependency ratio (young plus old cohorts relative to working-age cohort) and inflation, in support of the life cycle hypothesis.

- **Secular stagnation hypothesis: Aging is disinflationary.** Secular stagnation describes a state of weak actual and potential aggregate demand in which savings exceeds the long-term investment needed to support growth. Economies operating above capacity typically generate inflation in wages and products; however, an economy experiencing secular stagnation behaves as if it were operating below capacity. Even when growth accelerates, inflation does not appear. Demographic change is seen as a key driver of secular stagnation: An aging population saves for retirement and spends less per capita, and a slowdown in productivity may also reduce investment. Bobeica et al. (2017) find a positive relationship between the growth rate of the working-age population and core inflation, in support of the secular stagnation hypothesis.

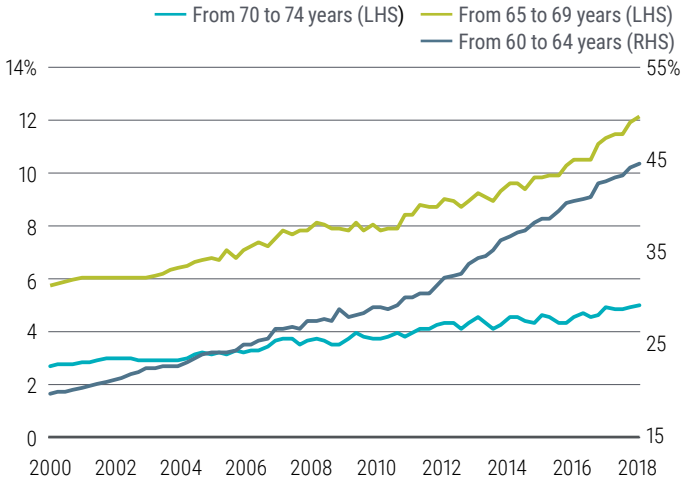
PIMCO's analysis into the linkages among longevity, the labour market and savings lends support to the secular stagnation hypothesis. The transition of Europe's population from an aging to an aged society looks set to impart a secular, downward drag on inflation in the decades ahead. While this downward drag may be offset by a rising participation rate of older cohorts in the workforce, this new source of labour supply could also damp wage pressure and inflation.

Our analysis looks deeper at the role of longevity in the relationship between demography and inflation. It begins with the observation that older people are working longer, many of them beyond the conventional retirement age of 64 (used to test relationships between demography and inflation). Over the past two decades, the employment rate of 60- to 64-year-olds in the eurozone rose from 20% to 45%, of 65- to 69-year-olds from 6% to 12% and even 5% of 70- to 74-year-olds are employed today (see Figure 4). Increasing numbers of active older persons constitute a marginal increase in the workforce population, i.e., people in or seeking employment.

The eurozone's workforce increased by 5.5 million people over the past decade. Of this increase, approximately three quarters came from persons aged 15 to 64, while one quarter came from persons 65 or older, the cohort typically associated with retirement. This latter cohort is the fastest-growing segment of the active population, averaging 5% annual growth over the past decade (versus just 0.2% annual growth for the 15- to 64-year-old cohort – all data is from Eurostat). Increasing participation of older people in the workforce arguably owes to rising longevity, including public policy incentives in response to longevity, such as higher statutory retirement ages and pressure on governments to control expenditure on public pensions.

Figure 4: More people are working later in life

Employment rate by age cohort



Source: Eurostat as of February 2019

Older persons also tend to save their income. In 2010, Eurostat conducted a one-time survey of households' saving rates as a percentage of disposable income. Of the 16 eurozone countries covered in the survey, 13 countries saw the savings rate of the 60 years and older cohort exceed the total household savings rate. Only in Slovakia, Germany and Belgium was the savings rate of older persons below that of all households, and even then it was positive. So not only are people saving as they approach retirement, they are also saving in retirement (see Figure 5).

Figure 5: Median household savings rate by age cohort: older persons save more than spend

Median savings rate by age cohort (% of disposable income)

Country	Total	less than 30 years	30 to 44 years	45 to 59 years	60 years and over
Estonia	35.2	27.5	36.2	32.1	37.0
France	29.1	4.2	24.2	29.8	36.2
Luxembourg	29.8	15.4	26.3	29.7	35.7
Italy	26.1	-31.5	15.7	25.3	33.5
Finland	23.1	7.2	22.2	23.6	28.0
Spain	17.7	-4.5	13.4	15.4	25.1
Ireland	19.0	0.3	17.6	21.1	21.9
Austria	18.7	-9.0	16.1	22.2	21.7
Portugal	14.0	8.1	6.8	13.0	21.7
Cyprus	11.3	-13.2	0.6	13.1	21.3
Slovenia	18.0	-7.9	14.9	20.2	20.4
Slovakia	24.5	21.1	25.8	28.7	19.8
Latvia	12.2	12.4	15.9	7.8	12.7
Germany	13.6	2.9	18.9	17.0	8.0
Belgium	9.9	4.2	12.8	15.2	3.1
Greece	-9.5	-48.2	-20.4	-9.7	2.4

Source: Eurostat as of May 2017

That older people are working longer and saving more potentially has implications for inflation. According to the life cycle hypothesis, it could damp upward pressure on inflation, because the dependency ratio adjusted for a larger working-age cohort rises more slowly than the baseline measure excluding persons older than 64. According to the secular stagnation hypothesis, it could have the opposite effect, owing to the more gradual decline in the working-age population supporting aggregate demand. The marginal supply of additional labour and savings from active, older cohorts, however, could also weaken the link between unemployment and inflation as well as support the excess of savings over investment.

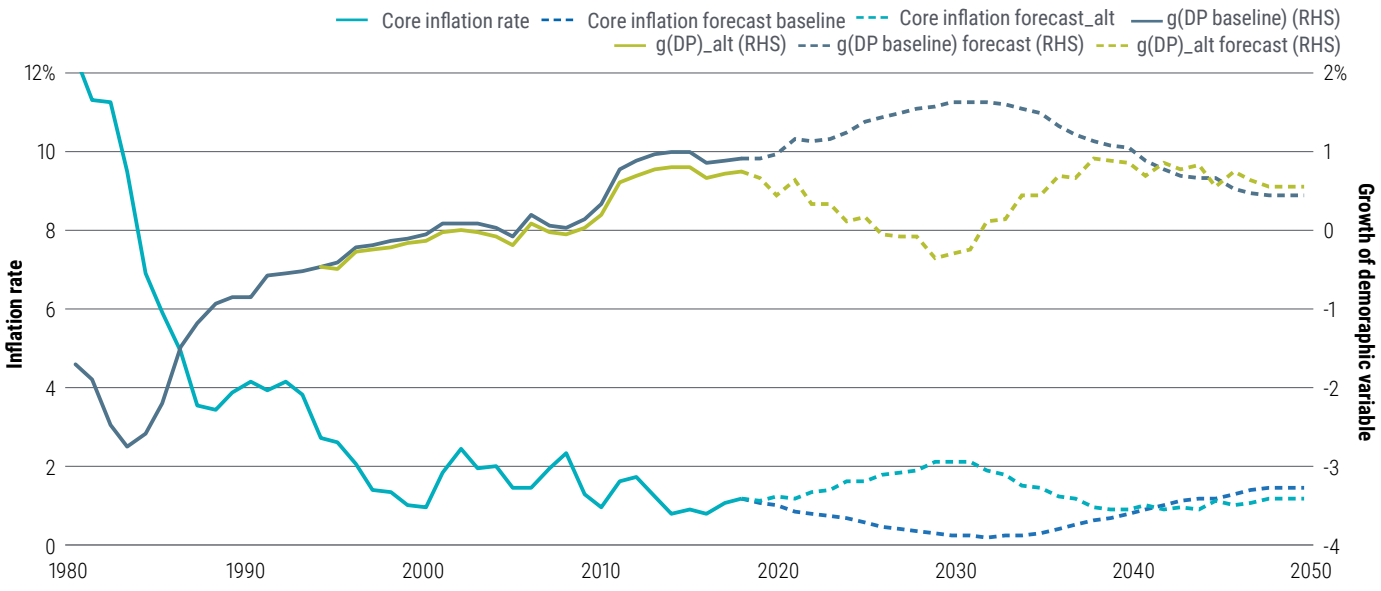
To test how older, more active cohorts might be affecting inflation, we adapt the work of Juselius and Takáts (life cycle hypothesis) and Bobeica et al. (secular stagnation hypothesis) by expanding the traditional definition of the working-age cohort to include persons between 65 and 69 years of age. Each year we transition a fraction of this cohort into an expanded working-age group beginning in 1995 over a period of 50 years. We set the initial rate of transition into the expanded (20- to 69-year-old) workforce in line with growth of the employment rate observed in this cohort. Completion of the transition implicitly assumes the statutory retirement age rises to 70 by 2045, compared to 65 in most eurozone countries currently and scheduled to rise to 67 by the next decade.

We use a vector autoregression (VAR) model to simulate the relationship between core inflation and a demographic variable starting in the early 1980s after the cost-push inflation of the second oil shock ebbed (see Appendix). For the life cycle hypothesis, we model core inflation as a function of the growth rate of the dependency ratio, defined as the young cohort (0–19) plus old age cohort (65+ initially, rising to 70+ by 2045) relative to the working-age cohort (20–64 initially, rising to 20–69 by 2045). For the secular stagnation hypothesis, we model core inflation as a function of the growth rate of the ratio of working-age population (20–64 initially, rising to 20–69 by 2045) to total population. For both hypotheses, we use a working-age baseline model capturing the 20 to 64 cohort and an alternative model capturing the expanded 20 to 69 cohort. We use the United Nations' population database to derive the demographic variables and employ the constant fertility projections for future population levels. The simulations provide two results.

First, for the life cycle hypothesis, the growth rate of the dependency ratio shows a negative relationship to core inflation. Negative growth dynamics in the dependency ratio bottomed in the early 1980s and reaccelerated since then, coinciding with the fall in core inflation. Under the baseline scenario, in which we hold the working-age cohort constant between 20 and 64, growth in the dependency ratio continues increasing, peaking in the early 2030s and exerting downward pressure on core inflation until then. Core inflation continues declining in the baseline scenario, reaching rates close to zero by 2030 (see Figure 6).

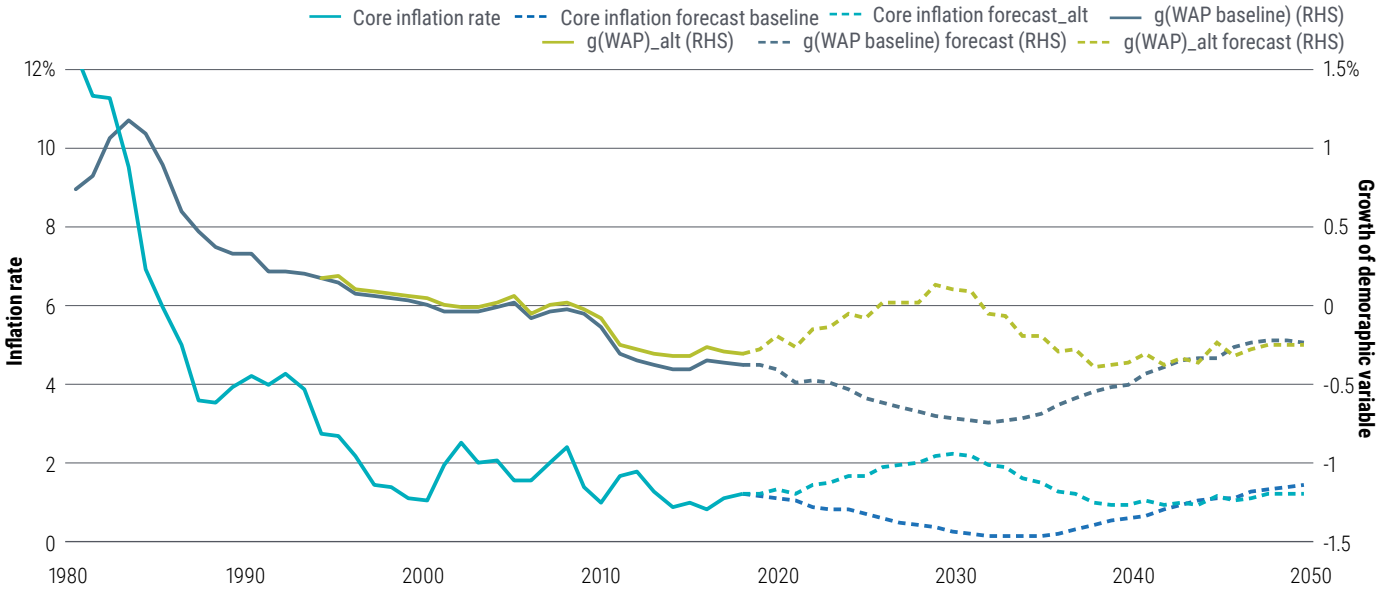
Under the alternate definition of the working-age population, growth in the dependency ratio begins slowing down early next decade and even turns slightly negative by 2030 as more 65- to 69-year-olds are assumed to enter the working-age population. The corresponding impact is to raise the rate of core inflation toward 2% by 2030.

Figure 6: Core inflation as a function of growth in dependency ratio
Inflation projection - life cycle hypothesis



Source: United Nations, Eurostat, Haver, PIMCO as of February 2019. Legend: alt = alternative assumption, g = year-on-year growth rate, DP = dependency ratio

Figure 7: Core inflation as a function of growth in working-age population
Inflation projection - secular stagnation hypothesis



Source: United Nations, Eurostat, Haver, PIMCO as of February 2019. Legend: alt = alternative assumption, g = year-on-year growth rate, WAP = working age population relative to total population.

Second, for the secular stagnation hypothesis, the growth rate of the working-age population relative to total population shows a positive relationship to core inflation. Growth in the working-age population declined since the 1980s, reaching zero in the late 1990s and turning negative last decade, while core inflation kept falling. Under the baseline scenario of a constant 20- to 64-year-old working-age cohort, growth in the working-age population continues to slow until the early 2030s, exerting downward pressure on core inflation until then, with core inflation falling close to zero by this time (see Figure 7).

Under the alternate definition of the working-age population, growth in the working-age population reaccelerates from slightly negative rates currently to a slightly positive growth rate up until 2030 as more 65- to 69-year-olds are assumed to enter the working-age population. As with the life cycle hypothesis, the corresponding impact is to raise the core inflation rate toward 2% by 2030.

Overall, both scenarios and both simulations suggest that without policies to actively encourage older persons to continue participating in the labour force, the secular trends of aging and longevity look set to exert downward pressure on eurozone inflation throughout the next decade. And even under the alternate definition of the working-age population that implicitly assumes the retirement age of 70 by 2045, core inflation only creeps up to 2%, unlike the higher aging-induced inflation rates suggested by Juselius and Takáts.

CAN MONETARY POLICY COUNTERACT SECULAR DOWNWARD PRESSURE ON INFLATION?

When we consider the eurozone's higher-frequency business cycle against this secular demographic backdrop, we conclude the window of opportunity for the ECB to normalise policy in this cycle is rapidly closing. The ECB's policy flexibility is limited by the recent pause signalled by the U.S. Federal Reserve Open Market Committee (FOMC) in raising interest rates, the eurozone's high reliance on exports, persistent uncertainty about global trade and the asymmetry of monetary policy at the zero lower bound.

We define a pause as the FOMC leaving the target federal funds rate unchanged over a six-month period. Historically during these periods, the ECB (and the Bundesbank before it) cut its policy rate in 50% of occasions, left rates unchanged in 32% of occasions and hiked rates in the remaining 18% (see Figure 8). The current cyclical economic outlook for the eurozone and ECB policy is challenging. Without global growth reaccelerating, which may facilitate further policy tightening by the FOMC, it appears plausible the ECB will remain on hold for the foreseeable future. It is not inconceivable, therefore, that the ECB enters the next cyclical downturn – whenever it happens – without ever having normalised its policy stance.

Given the policy stance's initial conditions – a policy rate of –0.4%, €1.8 trillion in excess liquidity, ownership of approximately 25% of the total outstanding stock of eurozone sovereign bonds – a legitimate question surrounds the ECB's willingness and ability to counteract the next recession.

Figure 8: What did the ECB do when the FOMC paused?

Action	Hike	Pause	Cut
Count	24	43	67
Frequency	18%	32%	50%
Mean (%)	0.56	0.00	-0.57
Median (%)	0.50	0.00	-0.25

Source: Bloomberg, PIMCO as of February 2019
Note: Pause is defined as the FOMC leaving the target federal funds rate unchanged on balance during a six-month period. From June 1979 through February 2019 there were 134 such occasions. Table shows what policy rate actions the Bundesbank/ECB took during these pauses

We are concerned with neither the will nor the instruments left in the ECB's monetary toolkit. Rather, in light of the BOJ's experience, our concern is about the efficacy of the actions the ECB might undertake in light of the demographic drag on inflation. The ECB has been in easing mode for a decade. The next decade could prove to be similar. What then could it do?

ECB FORWARD GUIDANCE AND POLICY RATES

While the ECB can guide markets toward keeping interest rates low for longer, the room to lower policy rates from current levels is limited. When the ECB cut the deposit facility rate to −0.4% in March 2016, ECB President Mario Draghi asked, *"How low can we go?"* to which he replied, *"From today's perspective, and taking into account the support of our measures to growth and inflation, we don't anticipate that it will be necessary to reduce rates further … Does it mean that we can go as negative as we want without having any consequences on the banking system? The answer is no."*

The experiences with negative interest rates at the central banks of Denmark, Sweden and Switzerland suggest limited scope for further rate cuts by the ECB. Further rate cuts would probably require consideration of a tiering system for the remuneration of excess reserves. Tiering is not a free lunch that eliminates the zero lower bound. Uncertainty about the level of the reversal rate – the rate at which accommodative monetary policy reverses its intended effect and becomes contractionary (Brunnermeier, Koby 2019) – lead us to conclude the ECB is already close to the effective lower bound. That the ECB cut rates by several hundred basis points during previous easing cycles and is unlikely to be able to raise policy rates by much this cycle suggests forward guidance on rates will play a more important role than reductions to policy rates during the next recession.

LIQUIDITY OPERATIONS

Collateralised liquidity-providing open market operations are arguably the simplest, most effective and least controversial tool at the ECB's disposal. The ECB has not rationed liquidity since October 2008, when it introduced a fixed rate full allotment tender procedure for all refinancing operations. Under this procedure, the theoretical limit to liquidity operations is the amount of eligible collateral banks can mobilise. At the end of 2018, the ECB reported that nominal eligible collateral amounted to €14 trillion, of which banks were using just over €1.5 trillion – including valuation and haircuts – to borrow €734 billion from the ECB's refinancing facilities.

These voluntary lending operations constitute a significant portion of the €1.8 trillion in excess liquidity currently in the eurozone, the other large contribution being reserves created involuntarily via the asset purchase programme. Excess liquidity – reserves over and above minimum required reserves – keeps financial conditions accommodative and establishes the deposit facility rate as the relevant monetary policy rate. Prior to the introduction of fixed rate full allotment tender procedures, the main refinancing operations rate was the key policy rate under the so-called benchmark allotment framework in which the ECB conducted open market operations to steer excess liquidity close to zero in the system.

While there is ample eligible collateral available for banks to post in future refinancing operations, their demand for liquidity is ultimately endogenous to the terms of the refinancing operations and the subsequent rate of return on the assets those funds would finance. In one extreme, banks might choose to replace existing market funding with central bank funding without creating new credit. Or, banks might simply use the liquidity for carry trades – for example, buying government bonds with the borrowed funds.

To incentivise banks to lend to the real economy, the ECB in 2014 introduced targeted longer-term refinancing operations (TLTRO) with maturities up to four years, at a fixed borrowing cost as low as the −0.4% deposit facility rate upon fulfilment of certain lending criteria. The rate on the new two-year maturity TLTRO-III operations announced by the ECB this month is floating and will be indexed to the main refinancing operation rate. When the ECB next needs to ease monetary policy, we expect it to launch additional TLTROs with longer maturities at fixed rates under the full allotment procedure.

PUBLIC SECTOR ASSET PURCHASES

The ECB ended net asset purchases under its first comprehensive quantitative easing programme in December 2018. The ECB imposed a 33% issue and issuer limit on government bonds, resulting in it purchasing approximately 25% of the eligible eurozone government debt stock. These limits would have to be raised for the ECB to credibly embark on another round of large-scale sovereign bond purchases. Article

123 of the Treaty on the Functioning of the European Union (TFEU) prohibits the ECB directly funding the public sector. The European Court of Justice's (ECJ) 2018 ruling on the ECB's asset purchase programme affirms the ECB has to abide by a limit when purchasing government bonds. But this limit could well be different (i.e., higher) than the current 33% restriction.

The legal bar for the ECB to pursue further asset purchases is surmountable. According to the ECJ, a government bond purchase programme is supposed to offer sufficient guarantees to prevent the purchase of securities on secondary markets from having an effect equivalent to that of direct purchases of such bonds on the primary market. To fulfil this requirement, the ECB had already built four safeguards into its purchase programme: 1) the Eurosystem (ECB and national central banks) does not buy securities around the date of a new issuance, 2) portfolio weights are guided by the capital key, 3) limited risk sharing of hypothetical losses on assets purchased under the programme and 4) issue and issuer limits.

An increase of the issue and issuer limits to 50% (as used for supranational bond purchases) therefore does not strike us as implausible. This would enable the Eurosystem to double the amount of eurozone government bonds on its balance sheet from €2.1 trillion currently.

PRIVATE SECTOR ASSET PURCHASES

There are no impediments to the ECB restarting previous private sector purchase programmes of covered bonds, asset-backed securities and corporate bonds. Article 18 of the Eurosystem Statute sheds light on whether the ECB could buy other asset classes. It states that in order to achieve its objectives, the ECB and national central banks may *"operate in the financial markets by buying and selling outright (spot and forward) or under repurchase agreement and by lending or borrowing claims and marketable instruments, whether in euro or other currencies, as well as precious metals."* Here it is important to note the definition of *"marketable instruments"* is maintained by the Governing Council, so there is scope for it to amend the General Documentation to, for example, include equities in the definition of marketable instruments. Currently, the General Documentation essentially references only debt instruments that fulfil certain criteria. Similarly on *"claims,"* which represent *"non-marketable assets,"* the definition is maintained by the Governing Council and currently encompasses claims for the repayment of money which constitutes a debt obligation of a debtor vis-à-vis a counterparty. The Governing Council could also decide to change this definition to include a wide variety of assets.

In all its private and public sector purchase programmes, the ECB so far only bought assets that are eligible as collateral in open market refinancing operations per the General Documentation.

But the important point remains that the Governing Council can change these definitions with a simple majority vote, and as such the ECB potentially has relatively broad discretion over the assets it could buy. This differs from the FOMC, for example, where Congress would need to approve assets other than U.S. Treasuries and agency mortgages.

We think bank bonds are unlikely to feature in future private sector purchase programmes, owing to the conflict of interest between the ECB's monetary policy and supervisory roles. The ECB discourages banks from using unsecured financial bonds as collateral. Bank bonds attract by far the highest haircuts within the marketable asset complex, and Article 64 of the General Documentation calls for *"non-subordination with respect to marketable assets."* We would argue that equities and plain vanilla credit claims (whole sale loans) constitute potential private sector purchase instruments. If this were to be the case for equities, we would expect purchases to occur through passive, market-weighted exchange-traded funds.

'HELICOPTER MONEY'

Assuming another large-scale asset purchase programme fails to revive inflation, the ECB might at some stage evaluate ways to cooperate more closely with the fiscal authorities, such as via "helicopter money," i.e., creating and distributing money directly into the economy via a number of possible methods. ECB president Mario Draghi in March 2016 called helicopter money *"a very interesting concept."* Article 123 of the TFEU prohibits the ECB from funding national governments, which rules out some forms of helicopter money, but in our view does not rule out three others.

First, quantitative easing combined with a large expansion of the budget deficit by national fiscal authorities constitutes the least unconventional form of helicopter money. Article 123 rules out direct cash transfers to governments and poses a high hurdle for governments to haircut sovereign debt held by the Eurosystem. This form of helicopter money is arguably also the least effective, owing to the government's implicit promise to repay the debt and therefore the perception the liquidity injection is temporary. It probably would induce the private sector to save more, or at least not spend their cash balances.

Second, helicopter money could theoretically take the form of direct cash transfers to households. Besides Article 123 of the TFEU, the ECB must adhere to Article 5.4, which essentially states that measures need to be suitable, necessary and proportionate in a strict sense, and adhere to Article 127.1, which contains the requirement to act according to the principle of an open market economy favouring an efficient allocation of resources. Cash transfers to households, which remove the role of the fiscal authorities, are potentially compatible with these

articles. Note Article 20 of the ECB Statute gives wide-ranging leeway for the Governing Council to decide on *"such other operational methods of monetary control as it sees fit."* In a March 2016 interview, when asked whether the central bank could send cheques directly to people, ECB executive board member Peter Praet answered, "*Yes, all central banks can do it. You can issue currency and distribute it to people,"* without commenting further on the legality.

Third, helicopter money could be state investments funded by quantitative easing. Article 123's prohibition of monetary financing does not apply to publicly owned credit institutions. Conceptually, the ECB could buy ultra-long maturity bonds issued by the European Investment Bank (EIB), for example. The EIB could use the proceeds to finance public infrastructure spending and, contrary to standard EIB procedures, the European Council could decide to waive the 50% co-financing requirement. The liquidity created by such spending would be made permanent were the EIB not to redeem the bonds purchased by the ECB.

It is unquestionable that helicopter money is an extreme policy, raising political, legal, operational and accounting challenges. The ECB nonetheless appears to have relatively more leeway regarding this instrument relative to other large central banks.

INFLATION TARGETS AND CENTRAL BANK INDEPENDENCE

In the wake of the financial and sovereign debt crises, a number of observers proposed central banks should increase the target for inflation they aim to achieve (Blanchard et al., 2010), or target a price level rather than a rate of inflation (Bernanke, 2017). Proponents argue this would help achieve price stability in the long run, particularly when monetary policy is more frequently constrained by the zero lower bound.

Here we think it important to clarify the inflation-target aspect of the ECB's monetary policy framework. In contrast to many other central banks, the ECB does not practice direct inflation targeting. While the ECB is mandated by the TFEU to maintain price stability over the medium term, the mandate does not specify a definition of what price stability entails in practice. The Governing Council, therefore, decided to quantify the definition of price stability as *"inflation rates below, but close to, 2% over the medium term."*

While it is unlikely the European Council will change the TFEU to specify an inflation target for the ECB – and even less likely to remove its independence – the Governing Council is free to formulate a definition of inflation consistent with conditions of price stability. It is not inconceivable, therefore, that the Governing Council revisits its quantitative definition of price stability to better reflect technological and demographic realities, and in order to remove the perceived asymmetry in the current price stability definition.

Currently, *"below"* and *"2%"* give rise to the impression that rates of inflation between 2% and 3%, say, are undesirable relative to inflation rates between 1% and 2%. This asymmetry could be removed by adopting a price stability definition that specifies both an upper and a lower band around a central target. Taking this as well as the secular drag on inflation from demographics, globalisation and technology into consideration, a definition of price stability that appears more realistic to us is 1.5% plus or minus 1%.

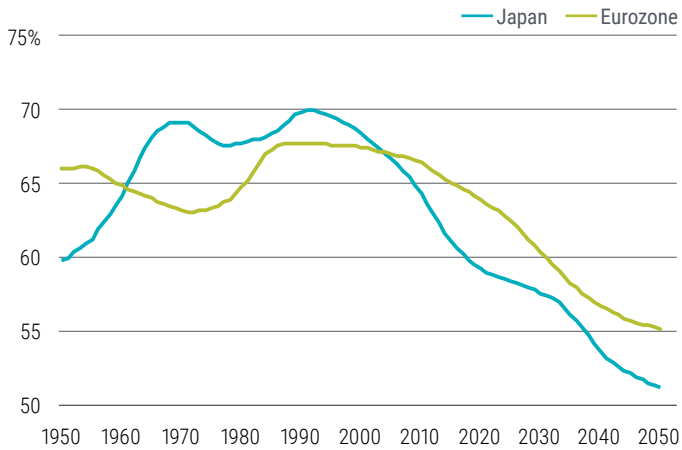
To an extent, this is already happening. Paloviita et al. (2017) argue that ECB policy responses to past inflation gaps can be considered symmetric with respect to a target of 1.6% to 1.7% inflation. At PIMCO, we use a 1.6% inflation target for the ECB when modelling fair value estimates for real yields, and think even this number may be too high.

EFFICACY AND INVESTMENT IMPLICATIONS

This year, 2019, marks the twentieth anniversary of the introduction of zero policy interest rates in Japan. The BOJ has little inflation to show for it. Inflation expectations are primarily adaptive. Japan has an entire generation that has experienced only low inflation throughout their lifetimes. At the same time, an increasingly older-age cohort (with substantial political clout) has little interest in the BOJ achieving its inflation target.

In comparison, Europe's demographic profile, measured by the share of working-age persons in society relative to total population, is evolving just as Japan's did, only with a decade's delay (see Figure 9).

Figure 9: 20- to 64-year-old persons relative to total population



Source: United Nations as of February 2019

The ECB's policy flexibility is arguably lower today than the BOJ's two decades ago. Unless the ECB were to embark upon more potent forms of helicopter money, we see an increasing risk future nominal economic activity and interest rates in the eurozone evolve as they did during Japan's past two decades. Further attempts by the ECB to revive inflation may instead simply lead to a rise in the share of zombie firms (Banerjee and Hofmann, 2018). While a persistent state of ultra-low interest rates, excess liquidity and high asset prices risks engraining a deflationary mindset, for investors it poses new challenges and opportunities.

BOJ policies contributed to declining Japanese sovereign bond yields, to a weakening of the yen and to Japanese investors' portfolio allocations shifting toward riskier, more global assets. Low interest rates look set to become a permanent feature of eurozone financial markets given limited room for the ECB to normalise monetary policy. As a result, investors in Europe may have to rethink traditional asset allocations and processes, including

- harvesting what remains of the term premium;
- pursuing liquid and illiquid alternative investments across sectors and the capital structure;
- devoting resources for what potentially will be a larger market for special situation and distressed credit opportunities; and
- investing globally by taking duration risk in markets where yields have scope to fall and increasing open foreign currency exposure.

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Appendix

Vector autoregressive model based on inflation and age dynamics for the eurozone between 1983–2018

Model	Coefficients	Value	Standard error	T-Statistic	P-Value
MODEL 1	α (π)	0.008	0.003	3.024	0.002
	α (AGE)	-0.001	0.000	-2.335	0.020
	β (π,π)	0.598	0.106	5.617	0.000
	β (AGE,π)	0.017	0.013	1.304	0.192
	β (π,AGE)	0.827	0.527	1.571	0.116
	β (AGE,AGE)	0.809	0.063	12.745	0.000
	π: Eurozone core inflation, year-over-year **AGE:** Growth of (working age population / total population), year-over-year				
MODEL 2	α (π)	0.007	0.002	2.920	0.004
	α (AGE)	-0.001	0.000	-2.421	0.015
	β (π,π)	0.612	0.109	5.590	0.000
	β (AGE,π)	0.020	0.013	1.585	0.113
	β (π,AGE)	0.797	0.575	1.386	0.166
	β (AGE,AGE)	0.775	0.067	11.544	0.000
	π: Eurozone core inflation, year-over-year **AGE:** Growth of (working age population / total population)_alternative, year-over-year				
MODEL 3	α (π)	0.008	0.002	3.149	0.002
	α (AGE)	0.002	0.001	2.380	0.017
	β (π,π)	0.596	0.102	5.842	0.000
	β (AGE,π)	-0.041	0.031	-1.344	0.179
	β (π,AGE)	-0.349	0.209	-1.672	0.094
	β (AGE,AGE)	0.819	0.063	13.074	0.000
	π: Eurozone core inflation, year-over-year **AGE:** Growth of (dependency ratio), year-over-year				
MODEL 4	α (π)	0.007	0.002	3.060	0.002
	α (AGE)	0.002	0.001	2.421	0.015
	β (π,π)	0.607	0.105	5.794	0.000
	β (AGE,π)	-0.048	0.031	-1.568	0.117
	β (π,AGE)	-0.343	0.228	-1.504	0.133
	β (AGE,AGE)	0.789	0.067	11.792	0.000
	π: Eurozone core inflation, year-over-year **AGE:** Growth of (dependency ratio)_alternative, year-over-year				

Notes: The estimation sample covers annual data from 1983 to 2018. We estimate a vector autoregressive model as we can reject cointegration (all variables are stationary based on the Augmented Dickey-Fuller Test and the Johansen cointegration test indicating full rank). Based on the Akaike criterion, we choose a model specification with 1 lag which corresponds to 1 year (we tested for 4 lags). The alternative formulation of both models reflects a gradual phasing in of the 65- to 69-year age cohort into the working age population beginning in 1995 over a period of 50 years. The starting date of our data sample coincides with the end of the inflationary period of the 1970s. To account for the structural break in inflation dynamics in the early 1980s, we start under the new paradigm rather than utilising a dummy variable during the late 1970s – early 1980s to explain the overshoot of inflation. The later 1982 start date preserves parsimony and avoids overspecifying the model.

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