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EDITORIAL

Continued accommodative monetary policy supports the return of the inflation rate towards the price stability objective

27 MAR 2018 11:00 AM • BANK OF FINLAND BULLETIN 1/2018 • EDITORIAL

Recent developments in the euro area and global economy have been favourable. In the euro area, economic growth is strong and broad-based, which is also reflected in decreasing unemployment. The output gap has closed in most euro area countries on the back of economic growth. Inflation remains still subdued, but confidence in inflation converging towards the ECB's objective has strengthened. Despite current favourable developments, the lessons learned from the financial and euro crises must not be forgotten.

Financial crises leave a deep imprint. For the euro area, the moment of truth came in 2010–2011: after recovering from the collapse in global trade, a return to the earlier growth path seemed possible. The depth of the euro area sovereign debt crisis could not be anticipated at that time, but shortcomings in the Monetary Union gradually began to surface.

Indeed, the feedback loop between banks and their sovereigns caused the financial crisis to escalate into a sovereign debt crisis within the euro area. In several countries, the problems arose out of large-scale growth in banks' lending, as well as from poor risk management. Substantial public financial assistance was necessary in order to prevent a

collapse of the banking sector which would have shaken the entire financial system. In other countries, the root cause of the problems was excessive government indebtedness, and domestic banks ultimately ensured their sovereign's access to financing.

Reforming the euro area is a necessary, gradual process. Banking Union already includes single supervisory and crisis resolution mechanisms. From the monetary policy perspective, complementing this with a common deposit guarantee scheme, as well as developing a Capital Markets Union, are key to ensuring the transmission of the single monetary policy across the whole euro area.

The period of the financial crisis has also coincided with other major shifts in the global economy. Productivity growth has decelerated. The population is ageing. Taken together, these trends have slowed economic growth and lowered the long-term real equilibrium interest rate in the advanced economies. In addition, a strong increase in saving in emerging economies has contributed to a decrease in real interest rates.

During the financial crisis, monetary policy hit the so-called zero lower bound. This meant that there was no more room for significant interest rate cuts, although the economic situation and inflation outlook deteriorated further. On a global scale, the liquidity trap turned out to pose an even more severe and persistent problem from the monetary policy perspective than what had been feared. In the euro area, interest rates have been close to or even below zero since the end of 2011.

Central banks have not remained passive in the face of these novel challenges. Especially in the euro area, where the room for manoeuvre is structurally more limited than in other currency areas, monetary policy emerged as the central element accelerating the recovery from the financial crisis. In July 2012, the ECB's President Mario Draghi held his – epochal, as it turned out – speech in which he said that the ECB would do within its mandate whatever it takes to preserve the euro. The non-standard monetary policy measures, including forward guidance and quantitative easing, were incorporated in central banks' monetary policy toolkit. These tools proved to be efficient in preventing deflationary threats in the euro area. Inflation remains subdued, but confidence in attaining the objective has strengthened.

Three factors may, however, cause inflation and in particular underlying inflation to remain lower than expected. Firstly, the link between inflation and the degree of economic slack has weakened. It seems that a reduction in economic slack no longer leads to an increase in inflation in the same way as in the past. This phenomenon may, however, be linked to increasing productivity and the difficulty of estimating the magnitude of available capacity within the labour force. It may also relate to the early stages of an upswing and therefore be transitory.

Secondly, inflation expectations have remained low – especially those derived from market data. This might arise from persistently low inflation. If inflation expectations cease to be forward-looking, the attainment of price stability is delayed.

Thirdly, owing to the financial crisis and persistently sluggish growth, it is more difficult than in the past to estimate the potential growth rate of the economy and the amplitude

of unused capacity. If the assessments regarding the closing of the output gap turn out to be excessively optimistic, the increase in prices will be slower than expected.

Owing to these uncertainties, the conduct of monetary policy in the euro area rests on patience, persistence and prudence. Monetary policy must be forward-looking, and the lessons learned from the financial crisis must be kept in mind. Olivier Blanchard, former chief economist of the International Monetary Fund (IMF), has said that unemployment in the euro area could decrease more than we believe without causing inflation to rise. This would be positive from the perspective of longer-term economic growth. A gradual tightening of monetary policy will rest on a more solid basis when indications of inflation rates to potentially temporarily exceed two per cent become more prominent in inflation expectations. This way can we ensure that the Eurosystem's price stability objective of below, but close to, 2% is symmetrical and can be attained in a sustainable manner even without additional support from monetary policy.

Helsinki, 26 March 2018

Erkki Liikanen
Governor of the Bank of Finland

Tags

monetary policy, inflation, financial crisis

Expansionary economic policy boosts growth

TODAY 1:00 PM • BANK OF FINLAND BULLETIN 1/2018 •
MONETARY POLICY, ECONOMIC OUTLOOK

The growth outlook for the global economy is strong. Growth is supported by a synchronized expansion in several key economic regions, accommodative monetary policy, and fiscal stimulus in the United States. China continues to pursue rapid growth, while the accumulation of debt continues. Growth is reducing economic slack in several countries simultaneously, leading to a gradual increase in inflationary pressures. If favourable developments continue, monetary policy in key countries is expected to tighten gradually.

The outlook for the global economy is overshadowed by serious threats, such as rising protectionism and geopolitical tensions. Downward risks are further intensified by potential global adjustments in asset prices as well as the waning reform momentum in China and the euro area alike, while indebtedness remains high.

Euro area GDP is already some 5% higher than its level before the financial crisis. Output will exceed potential output in the next few years, after having remained below it for nine years in a row. Growth accelerated to 2.7% at the end of last year, and confidence in the economy remains exceptionally strong despite a small dip. All key forecasters expect strong GDP growth in the immediate years ahead. The ECB's monetary policy remains accommodative, and financial conditions in the euro area remain favourable in spite of a slight tightening. The condition of the euro area banking sector is slowly improving, but loan growth is still sluggish, particularly in countries that experienced the debt crisis.

Despite the ongoing cyclical upswing and the decrease in unemployment, core inflation has thus far not risen. Moreover, inflation expectations have remained rather subdued.

Although the likelihood of negative inflation rates has been practically eliminated, financial market measures suggest that the probability of inflation reaching levels close to 2% has increased only slightly. Strong growth prospects and improved inflation expectations nevertheless pave the way for an increase in inflation towards the ECB's price stability objective.

Based on the improvement in cyclical conditions, the question has emerged whether the acceleration of euro area economic growth is to be considered cyclical and temporary or structural and long-lasting? In the next few years, the euro area economy is projected to grow substantially faster than its growth potential. At the same time, however, estimates of potential growth rates have also increased slightly, suggesting that part of the pickup in growth may be sustainable. Nonetheless, the expected longer-term growth rate of the euro area remains below pre-crisis levels, as the population is not expected to grow and potential output growth is supported only by a persistently sluggish productivity growth.

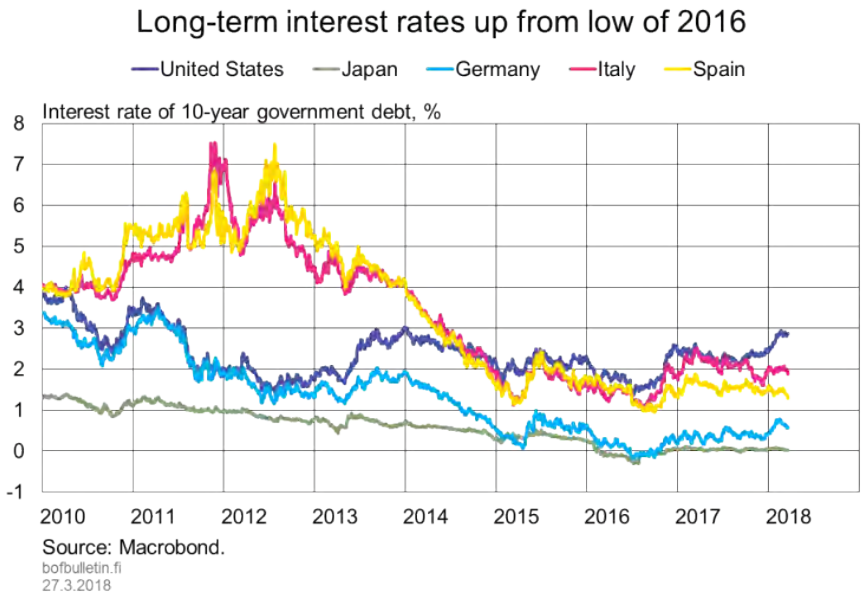
The cyclical upswing is therefore expected to moderate somewhat and growth will gradually decelerate to levels below 2%, thereby approaching the rate of potential growth. Given the favourable cyclical conditions, this would be an opportune moment to implement structural reforms and to gradually adjust the public finances.

Global economy growing strongly, financial markets volatile

The global economy and world trade grew across a broad front and at a good pace in 2017. Confidence in economic growth is strong, although early in the year purchasing managers' indices, in particular, dipped in certain countries. Global growth is expected to reach about 4% this year.[1] Growth is supported by approximately similar rates of recovery in many key economic regions, by accommodative monetary policy and by fiscal stimulation in the United States.

1. This corresponds to estimates by the IMF, OECD and the ECB (excluding the euro area). The global economy grew by 3.7% in 2017.

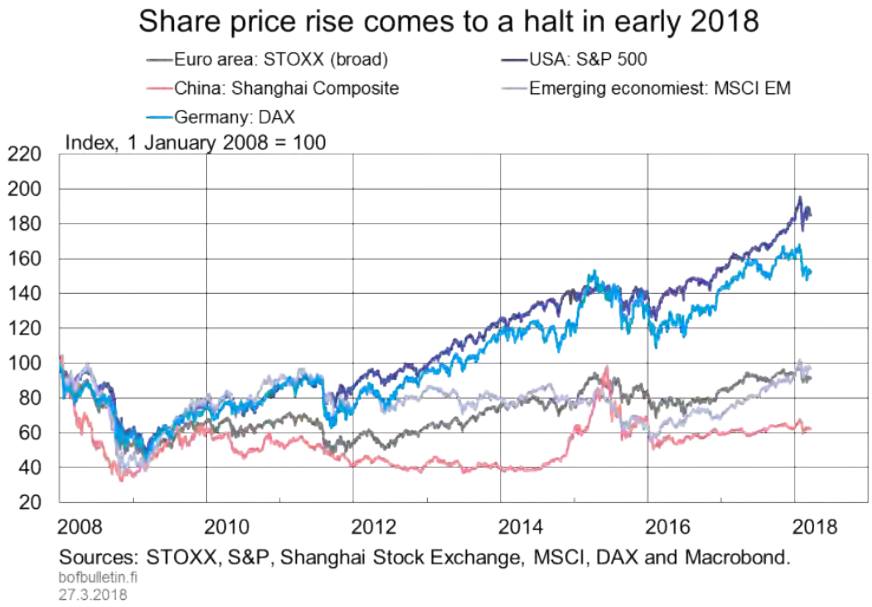
Chart 1.



Despite solid economic growth, inflation has grown only slightly on a global scale. Inflation in OECD countries was a little over 2% in 2017. The good growth has nevertheless strengthened expectations of higher inflation and an interest rate hike especially in the United States, where the fiscal stimulus is expected to increase inflationary pressures (see Chart 1). Expectations of tighter monetary policy and uncertainty about US economic policy and developments have nevertheless been reflected on the share markets.

An abrupt turn took place in share prices in early February, when the upswing that had been ongoing for over a year came to an end (see Chart 2) and at the same time the VIX index measuring share market volatility increased significantly. Interest rates are still rising, dampening share market developments, and the financial markets may become even more volatile than they are at present.

Chart 2.



ECB monetary policy still supportive of growth

The ECB's policy rates have been exceptionally low for a long time. The interest rate is 0% for main refinancing operations, 0.25% for the marginal lending facility, and -0.4% for the deposit facility. The Governing Council announced in October 2017 that it will continue the net purchase of securities until at least September 2018, but reduced the monthly net purchases from EUR 60 billion to EUR 30 billion. Net purchases can be continued if the Governing Council does not consider the rate of inflation is returning sustainably in line with the objective. The Governing Council also expects policy rates to remain at their current level for a prolonged period, and in any case beyond the end of the net asset purchases under the programme.

The Eurosystem will continue to reinvest any capital maturing from previously purchased securities well after the net purchases have ended. A monthly average of EUR 10 billion will mature of securities purchased between January and September 2018 (see Reinvestment of securities in ECB's expanded asset purchase programme), meaning that monthly gross purchases will average EUR 40 billion.

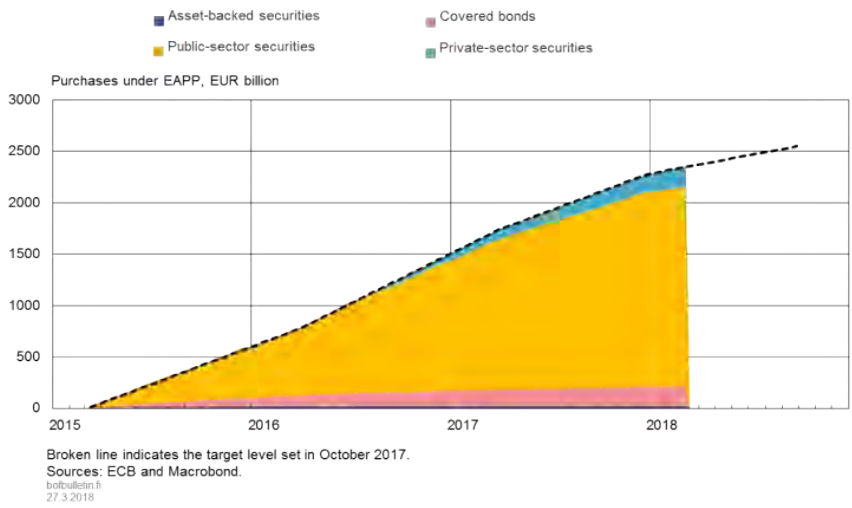
The ECB's monetary policy stance currently consists of net purchase of securities, a large balance sheet and reinvestment of maturing securities coupled with low key policy rates and forward guidance on these. Forward guidance regarding the policy rates enables the ECB to influence long-term interest rates and expectations regarding the timing of any eventual rate hike.

The effect based on the purchase programme's size derives from the fact that securities held by the Eurosystem reduce their availability to investors. Low availability with respect to demand increases the price of securities, which in turn results in lower interest rates on the bond markets. In particular, the compensation demanded by investors for holding on to bonds with a long rather than a short maturity will decrease as demand for

bonds with a long maturity recedes. This will bring long-term interest rates down. Even after net purchases have ended, earlier purchases by the ECB will substantially slow down the rise of long-term interest rates.

Chart 3.

Net programme purchases will expand Eurosystem balance sheet at least until September



Broken line indicates the target level set in October 2017.
Sources: ECB and Macrobond.
bofbulletin.fi
27.3.2018

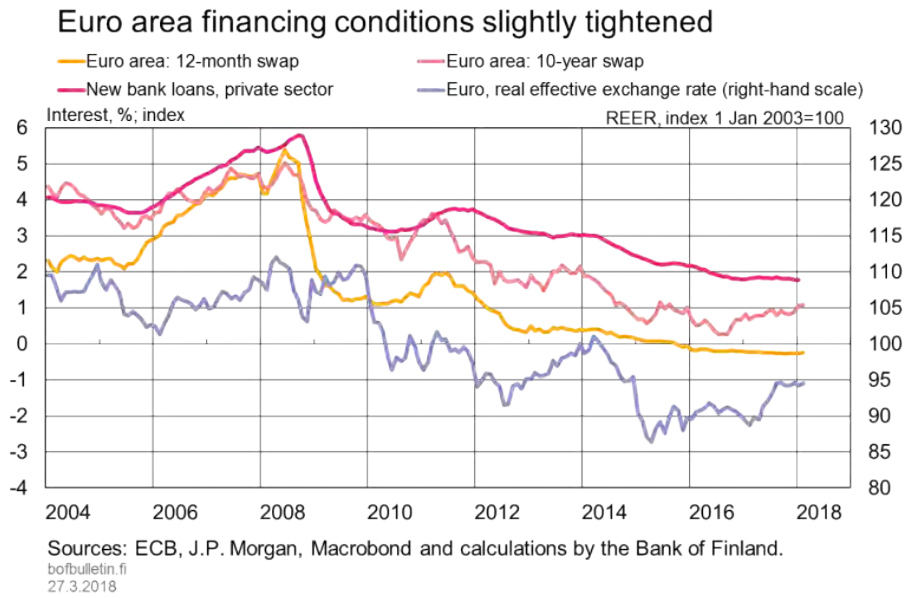
Euro area financing conditions favourable despite slight pinch

The Governing Council's aim is to keep euro area financing conditions relaxed until the price stability objective has been sustainably achieved. Financing conditions are affected, among other factors, by market interest rates, access to finance, asset price development and exchange rates.

Rising long-term interest rates and appreciation of the euro have tightened financial conditions somewhat (see Chart 4). Long-term interest rates have risen since summer 2016. This growth has continued in early 2018 thanks to the positive outlook in the euro area and the global economy.

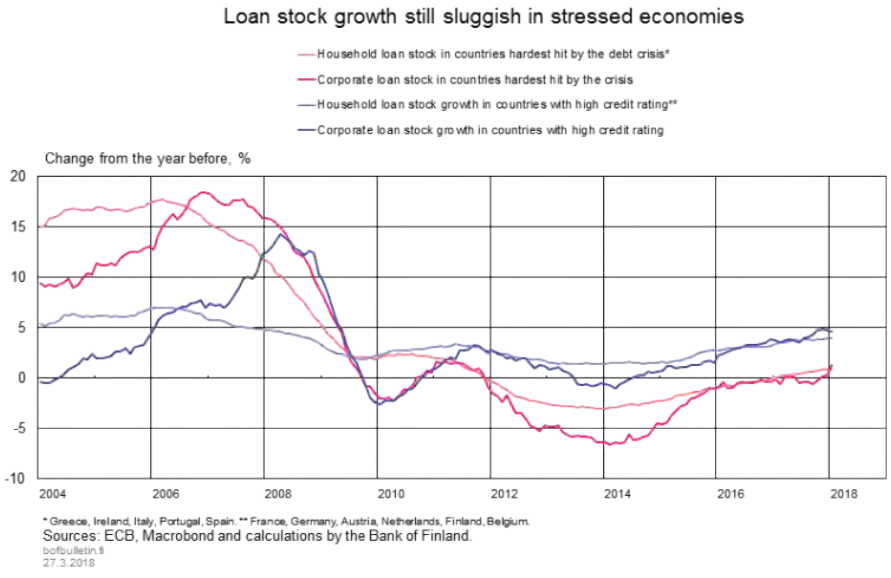
A good growth outlook and current account surplus will strengthen the euro despite the accommodative monetary policy. The euro became significantly stronger during 2017 against the dollar and also in terms of the nominal trade-weighted index. However, the real exchange rate is still not historically high (see Chart 4).

Chart 4.



An accommodative monetary policy has kept short-term interest rates and interest rates paid by the private sector for their bank loans exceptionally low (see Chart 5). The interest rates on new bank loans to non-financial corporations and households in the euro area have remained below 2% since mid-2016. Although interest rates are low and the private sector's balance sheet adjustment has for the large part already been applied, lending has not accelerated significantly in the euro area. The loan stock has, nevertheless, grown significantly in countries with a high credit rating, while growth has been moderate in countries that were hardest hit by the crisis (see Chart 5). The rise in house prices in the euro area has accelerated to around 4%.

Chart 5.



Euro area banking sector slowly recovering

The profitability of banks in the euro area continued to recover in 2017. According to the single supervisory mechanism (SSM), the return on equity of euro area banks in the third quarter of 2017 was 7.0%, as against 5.4% year on year. Banks' operating profit increased by about 30% year on year. Banks' profitability has been maintained especially by lower recognition of credit losses or impairments, and a good increase in trading profits.

Core banking operations in the euro area, on the other hand, have remained weak. The low interest rate environment weakens especially net interest income. This is very important to banks, and net interest income contracted in the third quarter of 2017 by 2% year on year. At the same time, balance sheet adjustment by banks, changes in business models and increasing investments in digitalisation have kept costs high.

Investors' confidence in the banking sector has nevertheless been improved by a moderate rise in inflation expectations and a steeper interest curve. Combined with the good economic outlook and increasing lending, these factors foreshadow a better outlook also for banks in the medium term. In addition, the ECB's accommodative monetary policy has kept banks' funding costs historically low.

Investor confidence in euro area banks has also been improved by the banks' lower balance sheet risk and higher capital adequacy. According to the single supervisory mechanism (SSM), euro area banks' Tier 1 capital adequacy ratio in the third quarter of 2017 was 15.3% (14.6% a year earlier). Banks' non-performing loans have also shrunk (see Chart 6). Large banks in the euro area had EUR 759 billion of non-performing loans in the third quarter of 2017, which is almost 18% less than a year earlier. The non-performing loan total has been reduced to about 5.2% of all loans by banks.

Despite the positive developments, the large volume of non-performing loans is still weakening the profitability of some banks and contributing to lending differentials across euro area countries. Measures taken to reduce balance sheet risks should therefore be continued.[2] The reduction of balance sheet risks is also important as we move towards the European Deposit Insurance Scheme (see 'Construction of a risk-based European Deposit Insurance Scheme'). The absence of a common deposit protection scheme intertwines the fates of banks and their home sovereigns. Banking Union aims to loosen the bank-sovereign feedback loop in the euro area (see 'How has the feedback loop between banks and sovereigns changed since the crisis years?').

Banks' risk-bearing capacity will be tested again this year. The European Banking Authority carries out EU-wide stress tests every other year with the ECB, the European Systemic Risk Board and national regulators.

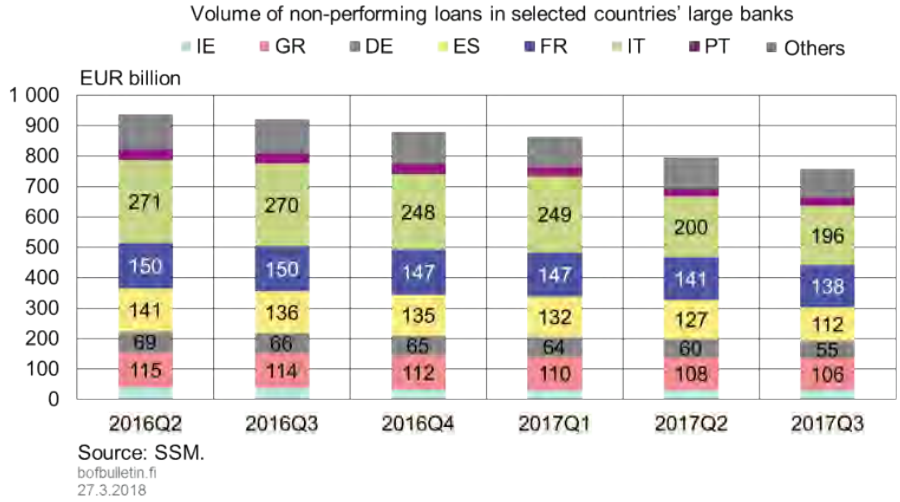
A total of 48 banks will take part in the 2018 stress tests, covering about 70% of the banking sector in the euro area, other EU countries and Norway. The purpose of the

2. At the moment the Single Supervisory Mechanism is drawing up instructions for a new practice for the reservation of non-performing loans in order to increase banks' loan loss reserves and crisis resilience. What is more, the new accounting standard IFRS 9 entered into force at the beginning of 2018, according to which anticipated impairments are recorded already when granting loans.

stress tests is to evaluate banks' loss absorbing capacity in some hypothetical situation in which the condition of the banks' operating environment weakens significantly as a result of extensive real economy and financial market disturbance. The stress test results will be published in early November 2018.

Chart 6.

Volume of non-performing loans of large euro area banks well down on previous year

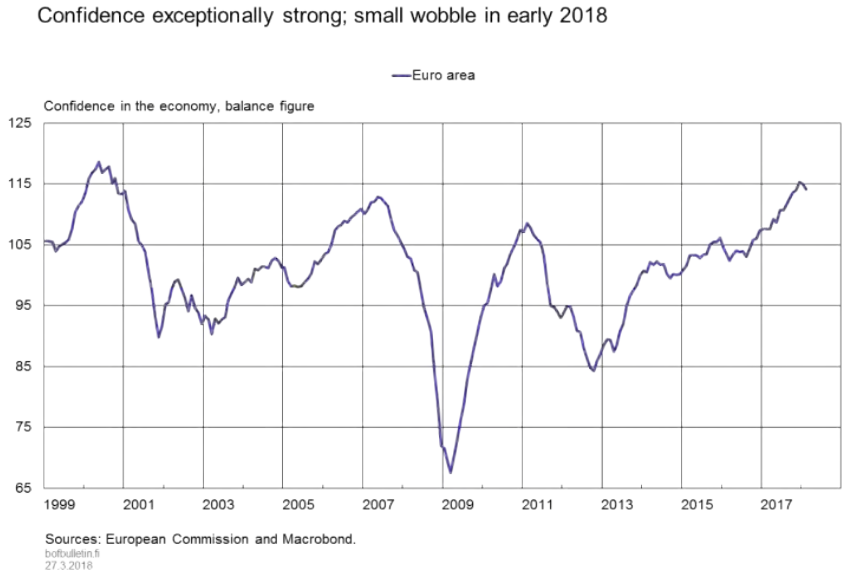


Strong economic upturn in the euro area

Euro area GDP has finally recovered from the financial crisis, and production figures exceed the level before the crisis by 5%. Real economy growth in the euro area has been good in recent years. GDP grew by about 2.5% in 2017. Confidence indicators forecast GDP growth to continue well during the next few quarters (Chart 7). As confidence is growing and growth has been better than expected, growth forecasts for 2018 have been rising for almost the whole past year. The strong economic growth in the euro area is also reflected in the exchange rate.

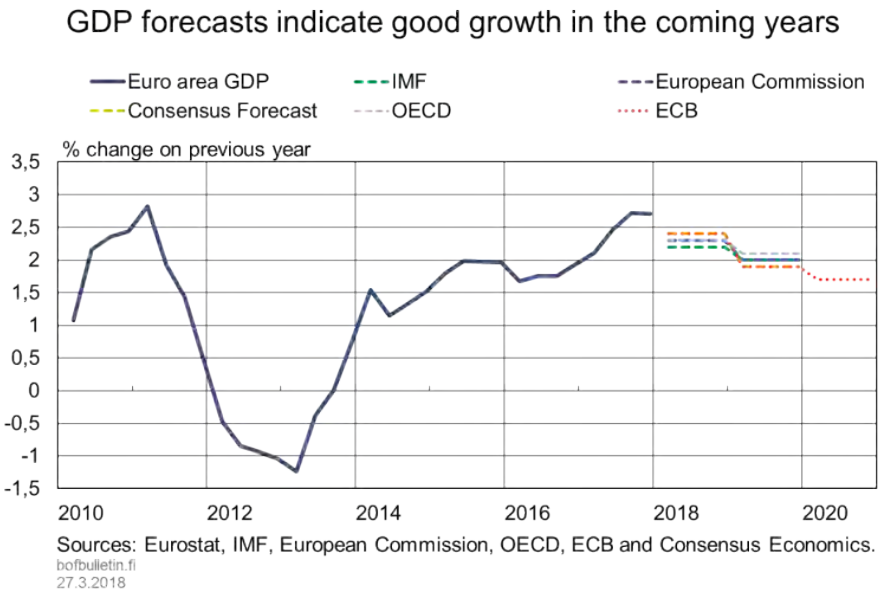
Economic forecasts could become even more optimistic despite the higher exchange rate, especially if the change in the rate continues to be caused by internal economic factors. During the past year, the role of internal factors is estimated to have been significant. If the stronger exchange rate was not in any way connected with the euro area's own development (that is, if it were exogenous), this would slow economic growth. It is clear that the stronger euro is affected by factors both within the euro area and outside.

Chart 7.



Economic growth in the euro area accelerated to 2.7% in the latter half of 2017. In 2018, growth will probably still be a good 2%, but the economic upswing is expected to flatten out, with growth gradually dipping below 2%, i.e. closer to the rate of potential growth (Chart 8). According to the ECB forecast, the euro area economy will grow by 2.4% in 2018, 1.9% in 2019 and 1.7% in 2020. Of the components of aggregate demand, private consumption and private investment are the factors that have had the greatest influence on boosting economic growth in the euro area between 2014 and 2017. Net exports and public consumption have also supported growth, but their effect on GDP growth has been considerably lower than that of private consumption and investment. Private consumption will continue to grow well in the next few years. Investment and exports are also expected to support growth somewhat better than in recent years.

Chart 8.



Private consumption will be bolstered in the next few years by an increase in households' disposable income amid a steadily improving employment situation and higher labour income. On the other hand, the slightly accelerating inflation will also dampen growth real disposable income, and the financing conditions are forecast to gradually tighten just a little.

The growth of investment in the euro area has been broadly based since 2015. Private productive investment and residential investments have increased both in all the big countries within the euro area and in euro area countries outside this group.[3] Investment growth in the next few years will be buttressed by the very low interest rate environment, the need to renew the capital base and the lower level of the capital ratio for corporate sector debt.

Exports from the euro area have grown in recent years at a higher rate than the export markets have. According to the OECD, the order books of export companies in the euro area at the beginning of 2018 were fuller than at almost any time between 1985 and 2017. Exports are forecast to grow steadily in the next few years, maintaining the high current account surplus in the euro area.

The euro area current account surplus grew in the third quarter of 2017 to 4.4% of GDP. The surplus is partly the result of high export volumes. Germany's current account surplus is as high as 8%, and even the countries that were worst hit by the crisis have a current account surplus of about 2.8%.

A current account surplus stabilises the economy in the event of unfavourable shocks. The major current account surplus in the euro area nevertheless means that savings exceed investment; in other words, investment in the euro area is still relatively low.

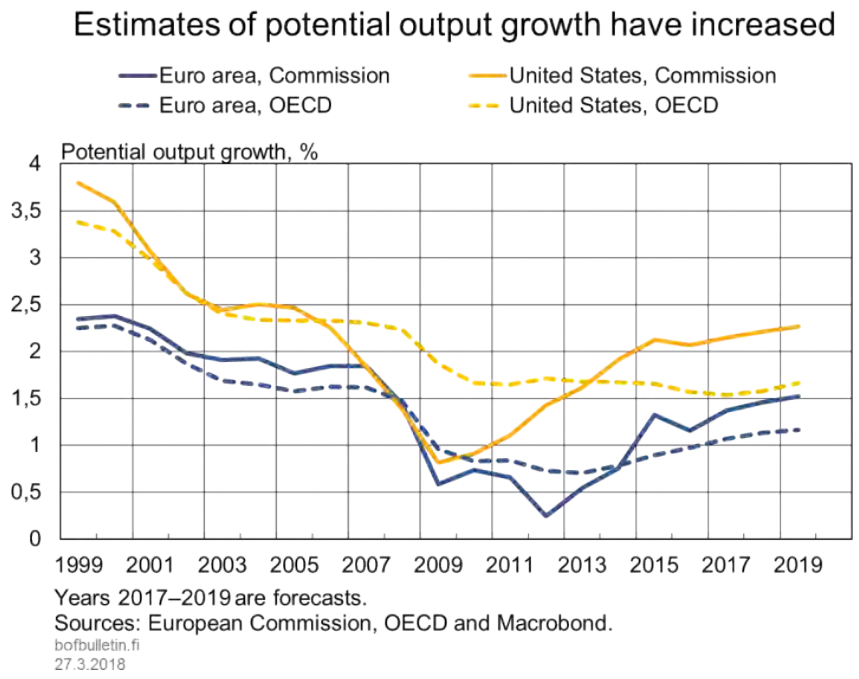
3. Euro area excl. Germany, France, Spain and Italy.

What is the euro area's long-term growth outlook?

The improved cyclical condition has raised the question whether the higher rate of growth in the euro area is really cyclical and short-term or structural and long-term. The euro area economy is forecast to grow in the next few years faster than its potential growth rate. At the same time, however, estimates of the rate of potential growth have increased.

Potential output, which depicts long-term growth prospects in the euro area, developed weakly after the financial crisis peaked. Its growth rate slowed then to as low as under 1%, against almost 2% before the financial crisis (Chart 9). The slow development of potential output is a global phenomenon, the prime reason being the extended trend of relatively sluggish productivity development. The reasons for this have been proposed as, among other things, lower benefits from ICT investments, less input in research and product development and the long shadow of the financial crisis.[4]

Chart 9.



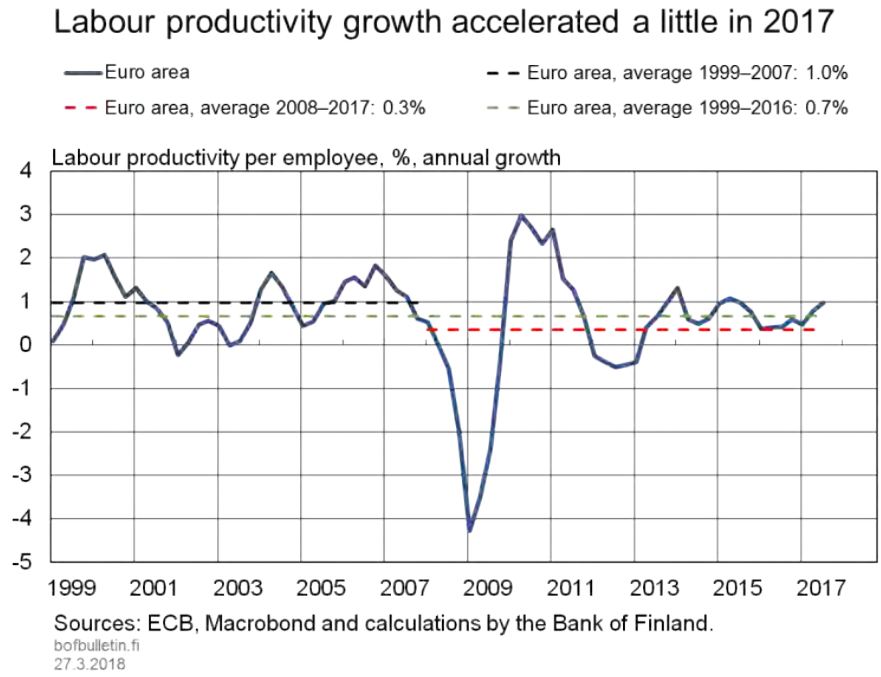
In recent years, the growth rate of potential output has been estimated to have increased, although it is still slower than before the crisis. The European Commission estimated in autumn 2017 that potential growth in 2018 would be 1.5%, while the spring 2017 estimate was for 1.2%. Any estimate on the potential growth rate comes with considerable uncertainty attached.

Growth potential is affected by labour input and productivity development. Productivity in the euro area per employee grew in the third quarter of 2017 by 1% year on year, which is roughly the equivalent to the average before the financial crisis (Chart 10).

4. See 'Weak productivity a drag on global economy', Bank of Finland Bulletin 4/2017.

The higher rate of productivity growth from 0.4% in 2016 is probably to a large extent cyclical. At times it may, however, reflect the positive effects of the structural changes that took place in many households after the crisis. Several reforms were carried out on both the product and labour markets in 2010–2015, especially in countries that were hardest hit by the crisis. These reforms are often reflected in stronger indicators measuring the financial structures of these countries.[5]

Chart 10.



Regardless of any reforms, cross-country differences within the euro area's economic structures are still considerable (see 'Euro countries recovered from crisis at different paces'). In addition to this, the rate of reforms in euro area countries has slowed, with a few exceptions. This is also shown in indices measuring structural reforms.[6] Indeed, all euro-area countries have some catching up to do in terms of indicators measuring economic structures, compared with the strongest economies. In the USA and Singapore, for example, economic structures, measured both with the Doing Business and the Word Economic Forum indicators, function better than in any euro area country. However, France especially is in the process of implementing numerous economic reforms. Changes affecting the labour market are already in the implementation phase, and both tax and pension reforms are being prepared. If successful, they can balance the country's public economy, reduce unemployment and give a boost to potential growth.

Growth potential is not affected only by labour productivity, but also by the size of the labour force available. Percentage growth in the working-age population (aged 15–64) in

5. For example, the World Bank's Doing Business index improved significantly after 2010 in Spain, Italy, Greece and Portugal.

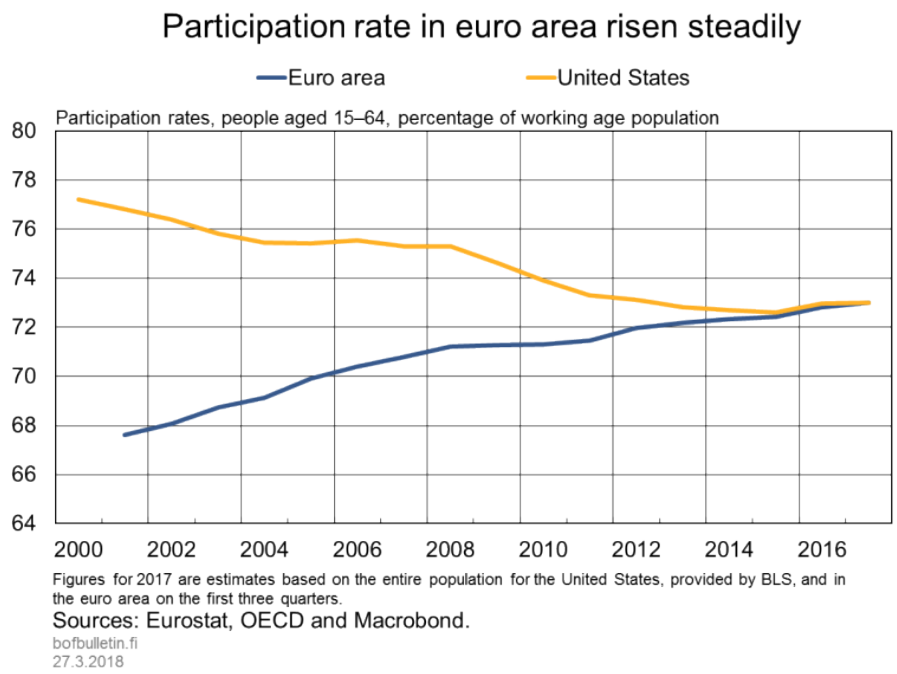
6. For example, the World Economic Forum's Global Competitiveness Report 2018 does not indicate any considerable improvement on 2017 in the euro area countries.

the euro area has almost stopped in recent years, while early in the new millennium it was about 0.5%.

In the current decade the effects of slow population development have been alleviated by a higher participation rate. As the population as a whole ages, the working-age population is forecast to contract in the next decade, especially in many of the newer euro area countries, and among the larger countries, in Germany and Spain. In order for the working age population to continue to grow, the participation rate would also have to keep growing. However, the participation rate in the euro area is already level with that of the United States (Chart 11). In order to raise the participation rate even further, major labour market structural changes would be required, and without these, the growth of potential output relies more and more on higher productivity.

Long-term growth in the euro area economy is forecast to be low, because the population is not really growing and the growth of potential output relies on higher productivity. Potential output growth in the United States is forecast to be faster than in the euro area, as population development is more favourable there than in the euro area, and labour productivity growth is faster.

Chart 11.



Do we have full employment in the euro area?

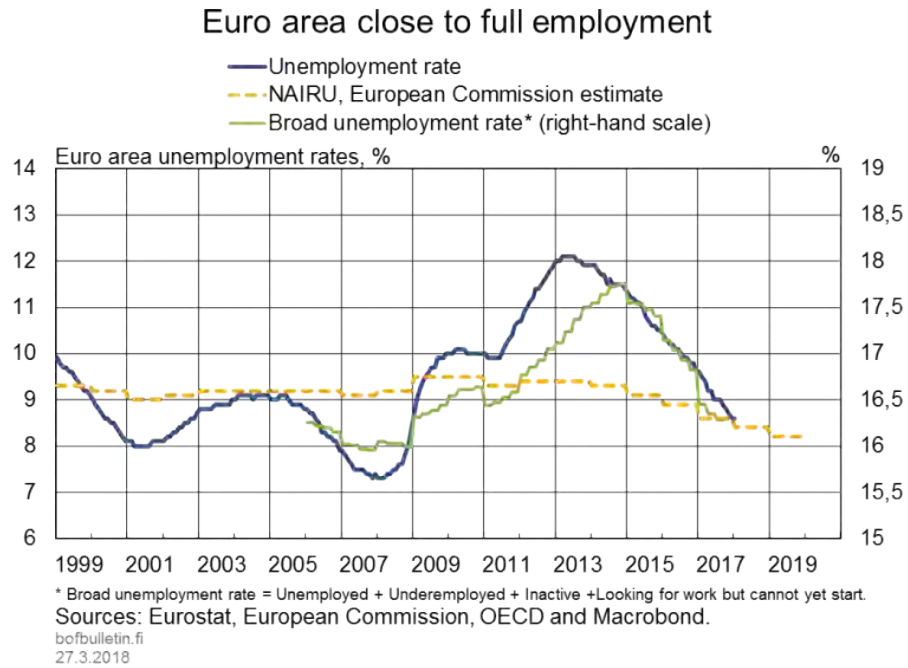
As a result of recent economic growth – which has been much faster than the potential growth – there is less unutilised economic capacity. According to the latest estimates by the IMF, European Commission and the OECD, the euro area's output gap is about to close up.

However, real-time assessment of the output gap comes with a considerable amount of uncertainty. According to many estimates, production was lower than the potential

output in 2009–2017, that is, for about 9 years. This shows that the financial crisis and sovereign debt crisis have exceptionally long-term after-effects. Now, however, we have caught up with the effects of the crisis on production, and production is forecast to exceed potential output in a few years. Once production exceeds the level of estimated potential output (that is, making the output gap positive), the economy will begin to boom.

The higher rate of economic growth in the euro area has brought unemployment down. At the beginning of 2018, the unemployment rate was about 8.5%. This is close to the European Commission's autumn forecast (8.4%) about non-accelerating-inflation rate of unemployment, or NAIRU,[7] which describes the level of full employment in 2018 (Chart 12). Although the upswing may still bring the unemployment rate down, current NAIRU estimates indicate that reducing unemployment in the future would require labour market reform. On the other hand, NAIRU levels are difficult to estimate. The free available labour force may be greater than if it is calculated using the traditional unemployment rate, because working hours have increased less after the crisis than the employment rate has, and some fall under the heading of marginally attached or underemployed workers and are not included in ordinary unemployment rate figures.

Chart 12.

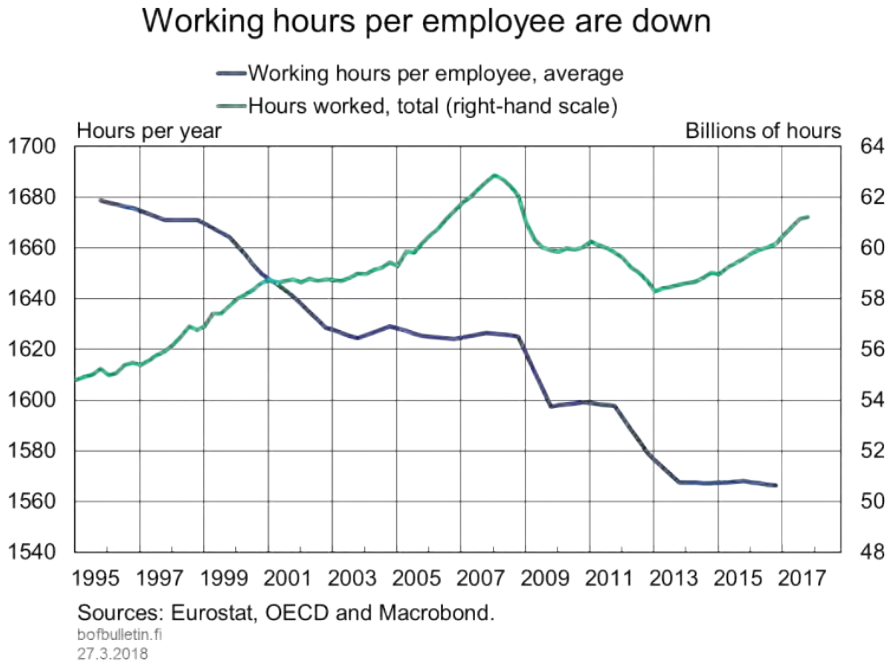


Employment rates in the euro area have risen as the economic situation has improved, and the number of people employed has reached the level of before the financial crisis. Cross-country differences in employment rates are, however, still significant. Germany's employment rate is in a league of its own, at about 75%, while in Italy it is only 58%. The number of hours worked has nevertheless increased more slowly than the employment

7. NAIRU refers to an unemployment rate that has a neutral effect on inflation. Any unemployment rate lower than this will accelerate inflation. If the unemployment rate is the same as NAIRU, it is a common interpretation that the economy has full employment.

rate has, meaning that the number of hours worked per person has fallen (Chart 13). The fact that the number of hours worked has remained lower than in 2000–2010 may indicate that there is more available labour force in the euro area than can be deduced on the basis of the employment rate. On the other hand, a lower number of working hours may also be a permanent phenomenon. This reduction has been going on since the 1990s and may reflect a growing appreciation of leisure time, for example. Moreover, the recent increase in the participation and employment rates can be mostly contributed to the older generation's (aged 55–64) more active participation in the labour market. These age groups may well want to work shorter hours than younger people.

Chart 13.



During the recession, people working part-time in the euro area against their will increased, as did the number of people not actually looking for work but nevertheless prepared to work. the broader measure of labour underutilisation, which takes into account marginally attached and underemployed workers, was a little over 16% in the third quarter of 2017 (Chart 12).[8] All marginally attached and underemployed workers accounted for an average of 7.7% of the labour force in 2017, which is almost one percentage point more than at the height of the economic upswing before the financial crisis. Taking them into account will somewhat increase the estimate of the free labour force, but does not seem to significantly change the picture about the development of available economic capacity.

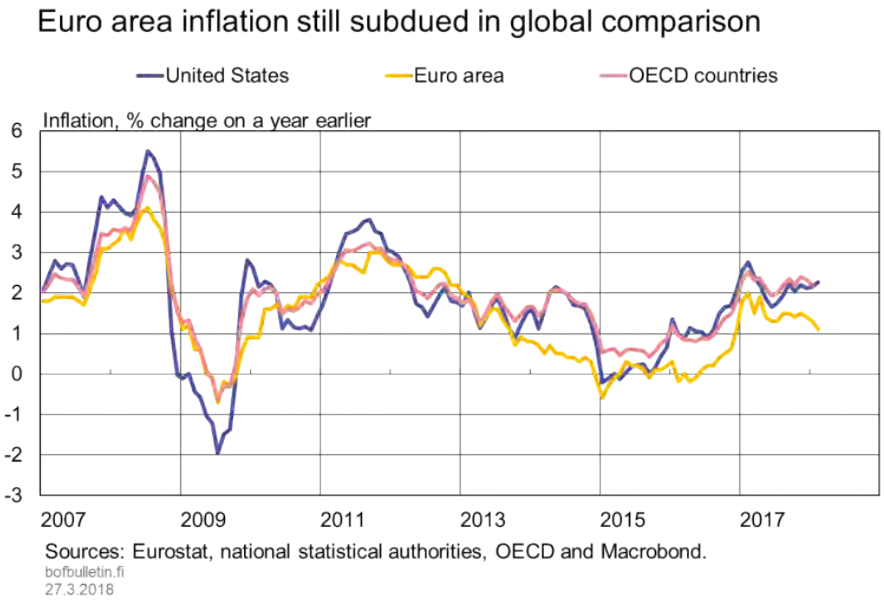
Euro area inflation gradually gathering pace

Growth in inflation last year, both globally and within the euro area, can largely be attributed to the recovery in the price of oil. Inflation has remained consistently near 2%

8. See ECB (2017), 'Assessing labour market slack', ECB Economic Bulletin 3/2017, Box 3.

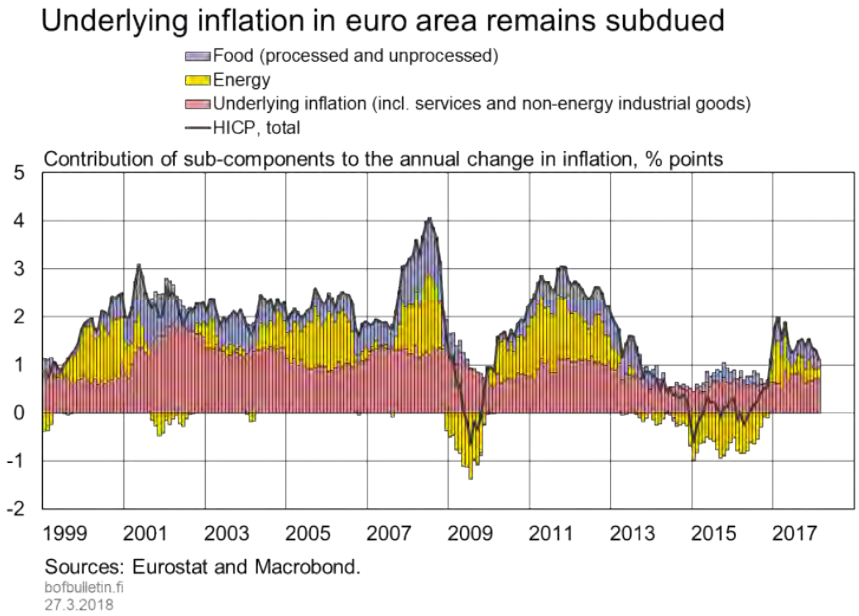
across the OECD area and the United States for over a year now; however, in spite of modest improvement, the pace of inflation in the euro area continues to underperform the OECD average, and has done so for several years (Chart 14). Consumer price inflation rose by 1.5% in the euro area last year, representing a marked increase over the 2014–2016 average of 0.2%.

Chart 14.



Underlying inflation, which omits the more volatile categories of food and energy prices and serves as a better measure of the euro area's internal price pressures and longer term inflationary outlook, remains rather low, at approximately 1%, where it has largely remained since 2014 (Chart 15). Nevertheless, underlying inflation is expected to gather strength in the forthcoming years, as the cyclical upswing eventually results in real GDP surpassing the economy's level of potential output. The cyclical upswing and a recovery in inflation expectations should together create the conditions for euro area inflation to gradually accelerate.

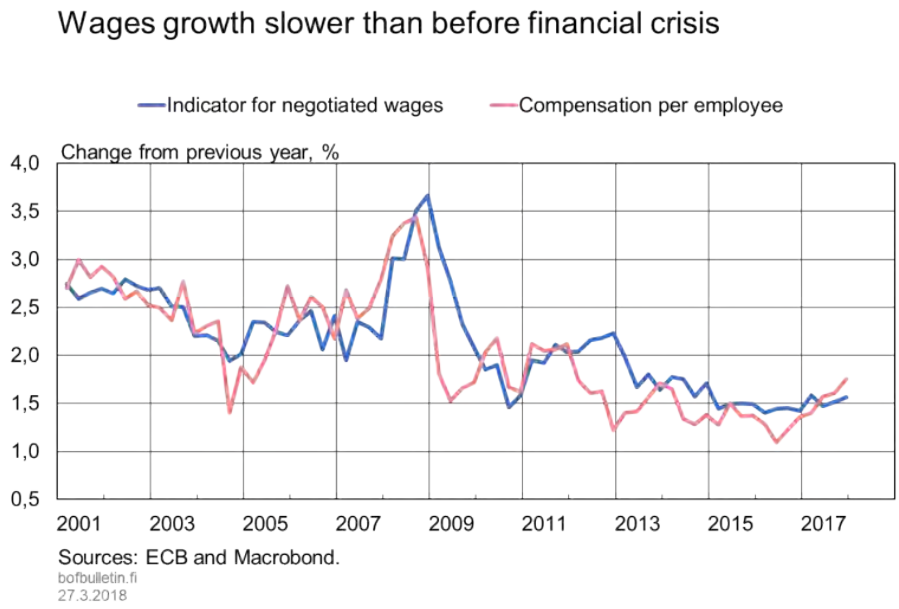
Chart 15.



Wages growth is expected to pick up on the back of increased labour demand, as the cyclical upswing spurs output and reduces the amount of slack in the economy. Wages growth has remained as of yet comparatively modest, despite reductions in unemployment across the euro area.

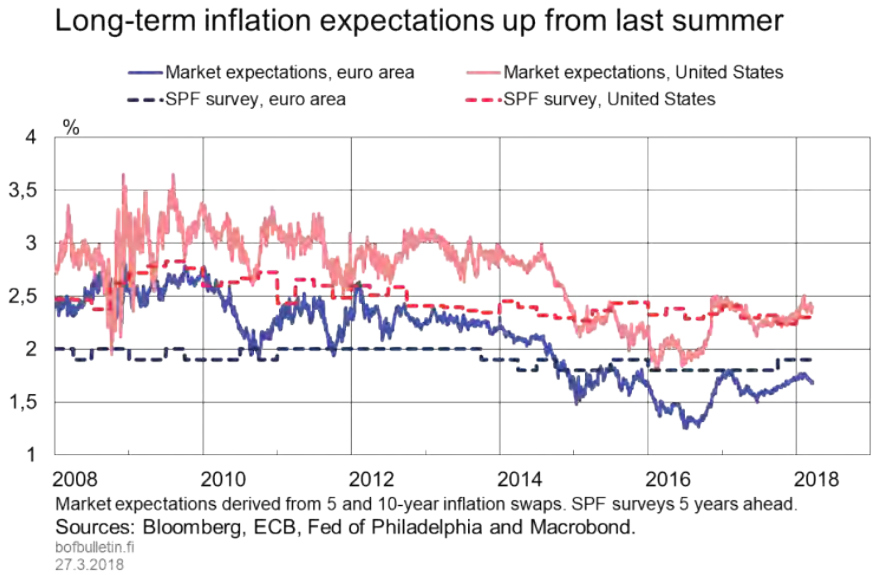
Growth in compensation per employee currently stands at 1.8%, slightly up from the low of 2016, but remains significantly lower than its rate of around 2.5% before the onset of the crisis (Chart 16). Lacklustre wage inflation might be explained by a variety of causes, including low productivity growth, subdued inflation expectations and a reduction in workers' leverage in wage negotiations caused by factors such as globalisation. It is worth bearing in mind, however, that wages are often slow to respond to improvements in economic conditions.

Chart 16.



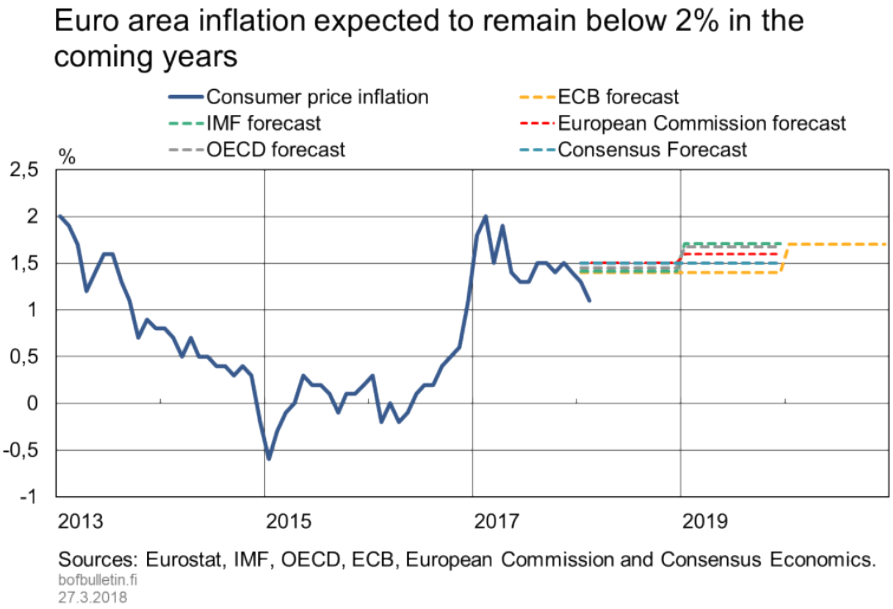
Inflation expectations have broadly firmed up since last summer, whether measured by survey or obtained from market data. Short-term inflation expectations have largely increased on the back of the cyclical upswing, but other factors, such as the recovery in the price of oil, have also bolstered sentiment. However, short-term expectations are secondary to the performance of long-term inflation expectations from the perspective of the monetary policy objective. As such, the euro area's long-term inflation expectations are just under 2%, which is still considerably lower than during the onset of the financial crisis (Chart 17). Although the immediate risk of negative inflation has all but disappeared, the probability, derived from financial market information, of inflation reaching the monetary policy objective has increased only little. The likelihood of inflation reaching a level clearly surpassing the policy objective still remain slim.

Chart 17.



In the current year, inflation will be supported by a slightly higher oil price as compared with the reference period in 2017, but these effects will be somewhat offset by the recent appreciation of the euro. Euro area inflation is expected to gradually accelerate towards the policy objective in the coming years (Chart 18). Although robust economic growth is foreseen to continue, all major forecasts predict that inflation will remain shy of 2% in the immediate years ahead. According to the ECB's forecast, euro area inflation will reach 1.4% in 2018 and remain at that level in 2019, before accelerating to 1.7% in 2020. It is certainly possible that the strong cyclical upswing and a sudden rise in inflation expectations might spur inflation to accelerate beyond these figures. Overall, the euro area's inflation outlook is characterised by a measure of uncertainty, as underlying inflation has shown little sign of growth despite improvements in unemployment and the expected closure of the output gap. Finally, inflation expectations have remained relatively subdued in spite of favourable economic conditions.

Chart 18.



Euro area's large economies growing, but regional unemployment imbalances remain

German economic growth accelerated to 2.9% towards the end of 2017, on the back of strong domestic demand and export growth. Germany's strong growth is widely expected to continue. The country's public finances are in surplus and the debt-to-GDP ratio has shrunk to approximately 65%. A new government was formed in March, which announced plans to spend its accumulated surplus on a variety of programmes, but especially on social welfare. Consequently, increased government spending will slightly boost growth in the years ahead. Germany's unemployment rate of 3.8% (youth unemployment at 6.6%) has sunk below the natural rate of unemployment and is beginning to be reflected in wages growth. Early signs of this were visible in February, when Germany's largest labour union, IG Metall negotiated a deal with the metals industry's employer representatives in the south-western state of Baden-Württemberg. Accordingly, employees affected by the deal will see their wages increase by 3.5% over the course of 12 months, and this is widely believed to serve as a weather vane for the rest of the German economy. German labour costs have grown at an annual average rate of around 2.5% in recent years.

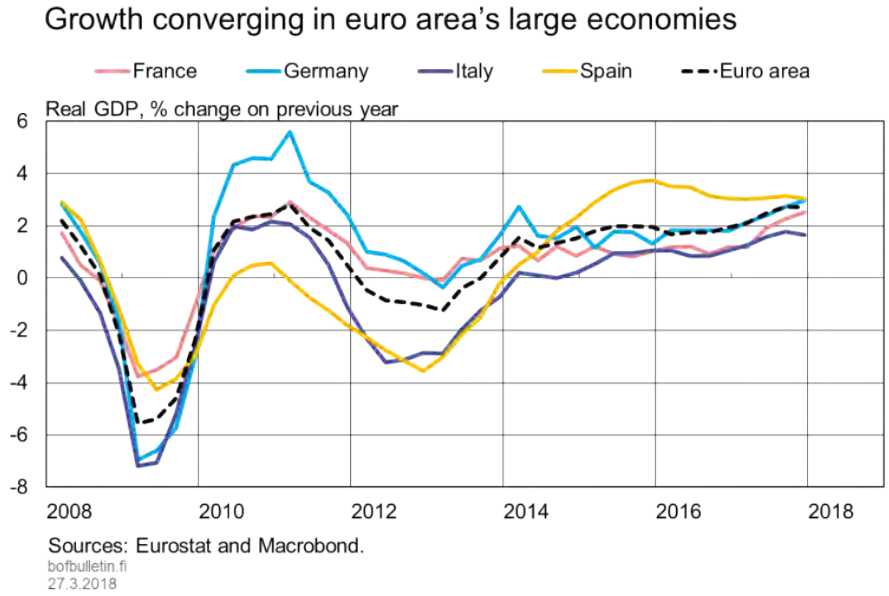
In France, economic growth picked up last year and is expected to continue at just below 2% in the current year and in 2019. Growth is mainly being driven by domestic demand. The French economy has not benefited from the global economic upswing to the degree that Germany has. A series of economic reforms proposed by President Macron are aimed at improving competitiveness. At the same time, measures will also be taken to address labour market efficiency, in an attempt to tackle unemployment as well as youth unemployment, currently close to 10% and 25%, respectively. The reforms will also seek to balance the public finances and reduce the country's debt-to-GDP ratio, which has reached almost 100%.

In Italy, GDP increased by approximately 1.5% last year, largely on the back of private consumption and investment; however; growth is expected to gradually slow. The contribution of net exports to GDP growth will remain slight, as both imports as well as exports have seen brisk growth. Italy's labour force participation rate has firmed up, leading to an increase in employment; however, labour participation is still low compared with the euro area's other large economies. Unemployment remains high at over 10%, with youth unemployment exceeding 35%. This, together with a large estimated level of hidden unemployment, has resulted in weak wages growth. This is only compounded by a labour productivity rate that is significantly below the euro area average. The implementation of much-needed structural reforms is being frustrated by shortcomings in the country's political system. As such, Italy's potential growth is forecast to remain low. Overall, the subdued growth outlook and high public debt-to-GDP ratio (over 130%) increase the Italian economy's exposure to risk.

Spain has been able to maintain growth above the euro area average for several years now in its efforts to make up for time lost during the crises. In 2017, the Spanish economy grew by 3.1%. The prevailing economic upswing has increased demand for Spanish exports, both within the euro area and globally, and the economy has benefited accordingly. Unemployment has improved rapidly but is still over 16% (youth unemployment over 40%). A large share of Spanish unemployment is structural by nature, meaning that it will be more resistant to the effects of the cyclical recovery.

Nevertheless, the country's labour force participation rate is fairly strong, and employment has grown steadily since 2013. The Spanish economy continues to benefit from the familiar elements of structural reforms, improvements in cost-competitiveness, slowly recovering house prices and accommodative financing conditions. Yet, despite its brisk growth, the country's public finances remain in deficit and the debt-to-GDP ratio has only decreased marginally. Overall, Spain's growth conditions have firmed up and potential growth has steadily improved, almost matching that of France.

Chart 19.



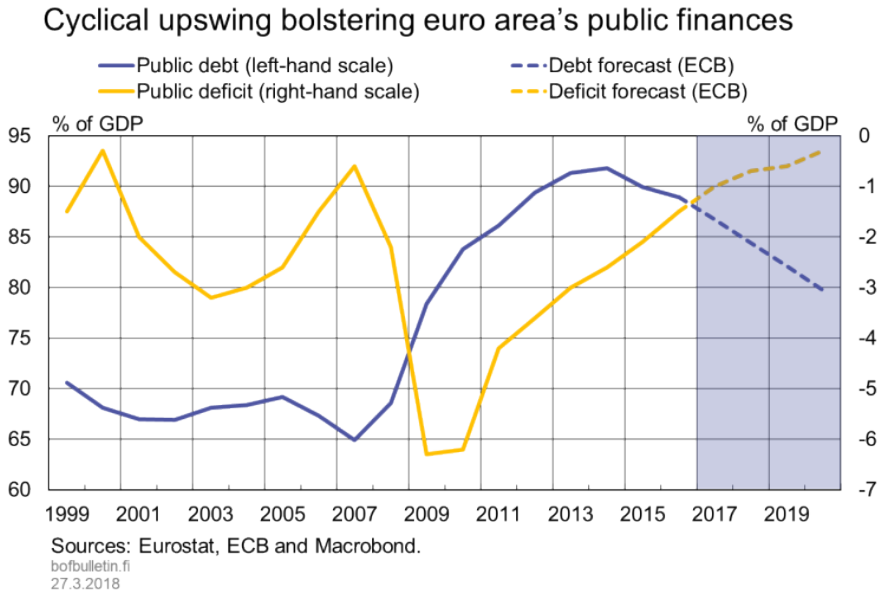
Cyclical upswing would be an opportune time to rebalance public finances

The euro area's debt-to-GDP ratio shrunk to somewhat under 90% in 2017, and the debt ratio is expected to continue its gradual improvement (Chart 20). At its peak, debt-to-GDP reached 92% in 2014. But while the euro area aggregate has improved, wide regional imbalances remain. Of the large economies, France, Italy and Spain are expected to maintain large debt-to-GDP ratios in the near future. The euro area's overall fiscal deficit contracted to approximately 1% of GDP in 2017. Historically, this figure is small.

Recently, the euro area's public finances have mainly improved on the back of the strong cyclical recovery. Not only does brisk growth bring additional tax revenue; it also reduces pressure on a variety of public expenditures, such as unemployment benefits. This in turn reduces the deficit. The debt ratio also sees additional improvement from the simple fact that when the ratio's denominator, or GDP, grows, the overall figure of debt-to-GDP becomes smaller. Additionally, reduced interest expenditure firms up the public finances. The overall impact of fiscal policy on the euro area's public finances has remained slight in recent years, and the conduct of fiscal policy is likewise expected to remain neutral in the immediate years ahead.

Although the euro area's public finances will be backed by strong cyclical conditions and low interest rates in the upcoming years, many countries will continue to grapple with high debt-to-GDP ratios. The current growth cycle would be an opportune time to make adjustments to the public finances, especially in countries burdened by excessive debt. According to countercyclical fiscal policy, public spending should be limited during cyclical upswings. This would provide governments with additional headroom for the conduct of fiscal policy and bolster market confidence, even in the midst of less favourable cyclical or financing conditions.

Chart 20.

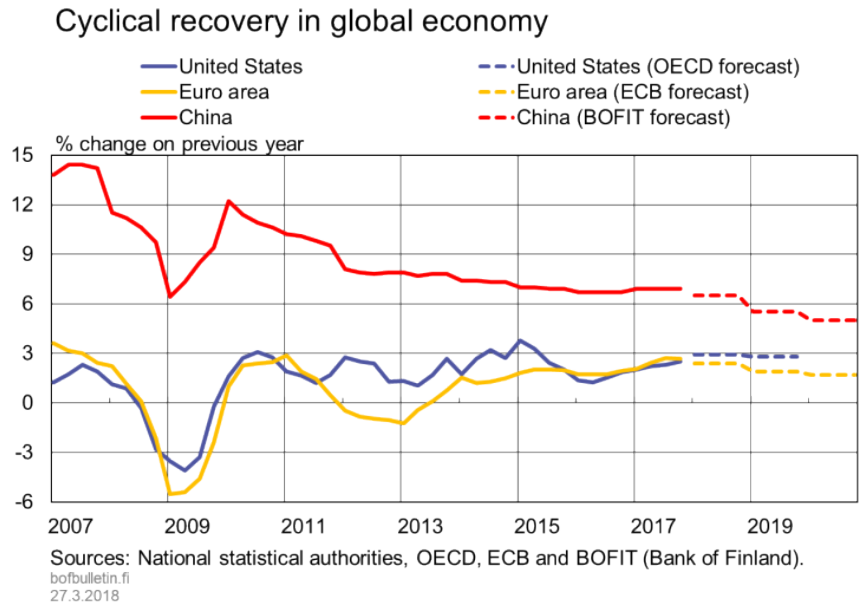


Global economic growth broadly based

The outlook for the global economy remains strong, but growth risks are tilted on the downside. The US economy grew by 2.3% in 2017, while the Chinese economy's growth rate accelerated to 6.9%, according to the country's official data. In the same period, the euro area grew by 2.5%, with the growth rate reaching approximately 2.7% in the latter half of the year. Widespread accommodative economic policy will continue to support growth in the upcoming years. In the United States, fiscal policy will remain exceptionally light in spite of the strong cyclical conditions. The Chinese government remains committed to its target of doubling 2010's real GDP by 2020; to accomplish this it will need to continue its economic stimulus. In the euro area, growth is still being supported by the ECB's non-standard monetary policy measures.

The global economy is gaining from a period of simultaneous upturn among many major economies. Should growth exceed its potential level, the remaining slack in the global economy will diminish and result in increased inflationary pressures. Barring any significant changes in prevailing conditions, monetary policy is expected to be tightened at a gradual pace while the ratios of debt-to-GDP remain largely unchanged. Similarly, growth is expected to gradually return to its potential rate, following the cyclical upswing's peak phase.

Chart 21.



Revival of US oil production to balance oil supply

The price of oil recovered sharply towards of the end of last year, on the back of increased demand as well as supply-side factors. OPEC's agreement to curb oil production, signed in December 2016, was extended a year later and is poised to last until the end of 2018; however, the subsequent increase in the oil price has prompted US shale producers to increase their output. In addition, Iran's return to the oil market, following the lifting of sanctions, has helped balance the supply of oil. Turning to the demand side, favourable

cyclical conditions have reinvigorated the global economy's appetite for oil and other commodities. Indeed, many commodities saw even larger price hikes than oil, largely driven by strong demand in China. Oil approached USD 70 a barrel at the beginning of the current year, but oil futures predict this to drop to under USD 60 by 2020.

US short-term outlook bolstered by expansionary fiscal policy

The US economy grew by 2.3% in 2017, and strong consumer and industrial confidence suggest that brisk growth is set to continue. Fiscal stimulus has played a major role in boosting the country's short-term growth outlook. US legislators passed a tax reform bill towards the end of last year, and its effects will already start to be felt in the economy this year. The bill introduces reductions to corporate and personal tax rates and adjusts the taxation of multinational corporations. The corporate tax rate will be slashed from 35% to 21%, but at the same time tax deductibles will be reined in. The average and marginal tax rates on wage income will drop by around 1 percentage point and 2.5 percentage points, respectively. In addition, public spending will be increased over the next two years.

The tax reform bill and increase in public spending will encourage growth in private sector consumption and investment and stimulate the economy, especially in 2018–2019. According to the OECD's forecast, annual growth will improve by 0.5–0.75 percentage points over 2018–2019.[9] More specifically, the forecast puts growth at 2.9% this year and 2.8% in 2019 (Chart 21).

The country's overall general government deficit remained near 4.5% in 2017, and the debt-to-GDP ratio reached approximately 108%, a slight increase over the year before. The fiscal stimulus is expected to contribute significantly to the deficit and debt ratio in the near future, despite strong GDP growth. In 2020, the deficit and public debt are expected to be approximately 1.5 and 3 percentage points higher than they would have been without the additional fiscal stimulus.[10]

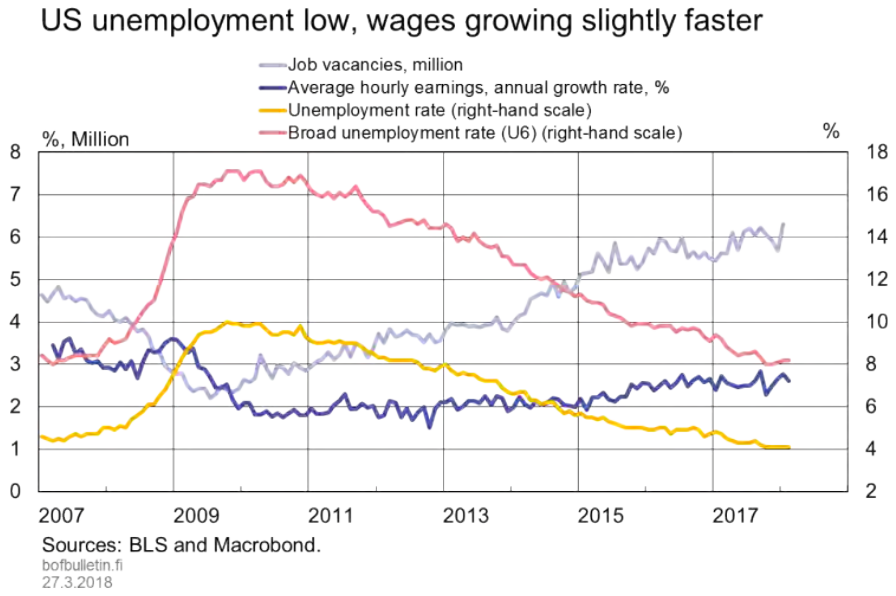
If full employment has been reached and the economy is already experiencing brisk growth, a fiscal stimulus will add to inflationary pressures. US unemployment currently stands at around 4% (Chart 22). The gap between unemployment aggregates (i.e. those that are narrower and broader in scope) has decreased, especially in 2017, which would indicate that less workers are forced to settle for part-time positions against their will. Annual wage growth, as measured by average hourly compensation, has picked up and is expected to accelerate due to the labour market conditions. The inflation rate has remained just over 2% since late 2017 and is expected to exceed 2 % in the immediate years ahead. Underlying inflation, which excludes the more volatile price categories of energy and food, has accelerated, although it is still slower than headline inflation. The reduction in economic slack will inevitably lead to increased inflationary pressures. In consequence, the Federal Reserve is expected to continue its gradual normalisation of

9. OECD (2018), Interim Economic Outlook, March.
10. See CBO (2017), An Analysis of the President's 2018 Budget, July and CRFB (2018), Updating the U.S. Budget Outlook, March.

monetary policy, implying further interest rate hikes and balance sheet adjustments, measures which it began in December 2015 and October 2017, respectively.

Fiscal policy will sustain the growth rate well above potential in the immediate years ahead, but growth will eventually adjust towards its potential. It has been suggested that the tax bill might increase the level of potential output, but this proposition is still uncertain. The US current account deficit stands at approximately 2.5% of GDP and is expected to remain large. The government's proposed tariffs on steel and aluminium are not expected to decrease the trade deficit, nor will other similar restrictions on trade. The announced fiscal stimulus will also contribute to the trade deficit. Increased protectionism in the United States will only add to the country's downside risks to growth.

Chart 22.



China committed to policy of high growth

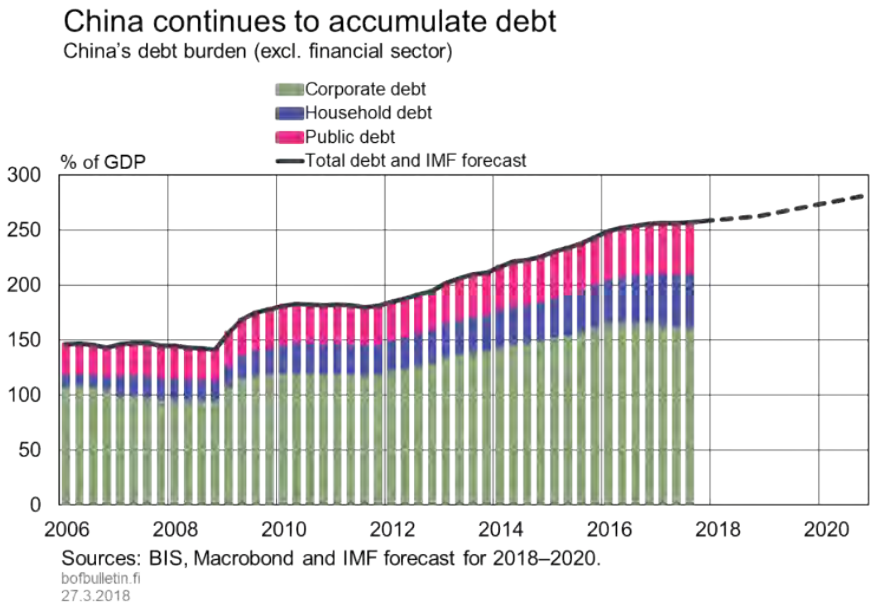
According to the country's official statistics, growth in China accelerated slightly last year, reaching 6.9%. While it is difficult to evaluate cyclical conditions from GDP data, the economic situation is estimated to have improved from 2015–2016, as external demand has recovered and domestic consumption remains strong. Consumption accounted for 60% of growth last year; however, additional headroom remains, as private consumption only accounted for 40% of GDP, while public consumption stood at 15%. Investment growth has slowed, but its share of GDP remains significant, at 44%.

The current account surplus has shrunk to just over 1% of GDP. China has maintained its restrictions on capital outflow, which has raised the country's currency reserves and supported its exchange rate. Last year, the yuan appreciated 7% against the USD and depreciated 6% against the euro, but the trade-weighted exchange rate remained relatively stable.

The Chinese government's expansionary fiscal policy (e.g. public investment and support of state-controlled enterprises) has also contributed to the brisk pace of growth. China's economic policy stance is seen to have changed. In a departure from a market-based policy, it has recently emphasised the role of the Party, illustrated by a decision at March's National People's Congress, where legislators lifted constitutional restrictions on presidential term limits. The pace of reforms has also slowed. Instead, all efforts will be placed on meeting the government's target of doubling 2010's real GDP by 2020 – a target which cannot be met without additional deficit spending. To this end, the government set its GDP growth target at 6.5% for the current year, a figure which China is expected to reach. In the near future, however, China will be forced to address risks associated with its financial markets as well as tackle its considerable environmental problems.

These issues, along with structural factors, will see the growth rate decline to approximately 5% by 2020, according to calculations by the Bank of Finland (see BOFIT Forecast for China). The official growth statistics should be viewed as approximations, as China feels a need to meet its growth targets and has certain difficulties in statistical reporting.

Chart 23.



Japanese growth burdened by population ageing and debt

Japan's economy has enjoyed sustained growth during the past eight quarters, and growth in 2017 amounted to 1.7%. This growth is mainly backed by an increase in exports, as domestic demand has been modest. Corporate investment has recovered slightly, but Japanese businesses are reluctant to invest domestically due to an ageing and contracting population.

Household consumption has suffered from relatively subdued wages growth. Businesses are beginning to face labour shortages, however, and will soon be forced to compete for workers by increasing wages. Measures aimed at increasing the labour supply, such as encouraging women into the workforce or raising the retirement age, will have little effect at this point.

Negligible wage inflation has a direct impact on the prices faced by consumers. As such, the meagre gains in consumer price inflation have primarily been the result of increased costs in importing energy. Underlying inflation remains near zero, and the central bank has signalled that its accommodative monetary policy is set to continue.

In the longer term, Japanese growth will slow to approximately 1%. However, because the population is contracting, slower growth does not mean that living conditions will deteriorate. Indeed, GDP per capita has actually increased in recent years. The main issue posed by slower growth lies in Japan's ability to remain solvent amid its massive sovereign debt, where the country has struggled to reduce its considerable debt-to-GDP ratio.

UK economy preparing for life after Brexit

The United Kingdom’s economy grew by 1.8% last year, but growth is expected to slow in the immediate years ahead due to uncertainties related to Brexit. Private consumption is growth being subdued by the effects of faster inflation on real income. Inflation accelerated to approximately 3% towards the end of 2017. Although the UK’s growth rate is expected to slow, unemployment has remained under 4.5%. The outcome of the Brexit negotiations continue to remain important for the UK’s economic outlook.

Price correction in Sweden’s housing market

In Sweden, GDP grew by 2.7% and HICP inflation stood at approximately 1.9% in 2017. Confidence in the economy has remained strong amid low unemployment (approximately 6.5%) and a high employment rate (approximately 78%). The country has a strong current account surplus and its volume of public debt remains small. These favourable conditions were also backed by a sustained boom in the housing market, which seems to have ended in a minor correction (see ‘The impact of the housing market on the Swedish economy’).

Continued slow growth outlook for Russian economy

Russia’s economy showed signs of recovery last year with GDP growth at 1.5% (see BOFIT forecast for Russia). Imports began to pick up after a deep recession and grew by 17%, as the rouble’s real exchange rate strengthened and domestic demand increased. In 2018, growth will be backed by the recovery in the oil price. GDP growth is expected to accelerate to just under 2%, resulting in a slightly larger GDP than in 2014. If the price of oil does not firm up and if, following March's presidential election, no efforts are made to diversify the economy, then Russia’s growth rate is expected to slow to its potential of 1.5% in the immediate years ahead.

Global growth risks tilted on the downside

The global economic outlook is weighed down by growing protectionist sentiment in the United States, as exemplified by the country's planned imposition of tariffs on steel and aluminium and its new-found ambitions of negotiating better terms of trade for itself. Potential tit-for-tat retaliation and similar restrictions would have a negative impact on global trade. Even the risk of heightened protectionism may reduce confidence and weaken the global economy's growth outlook significantly. The effects of global protectionism would be both profound and long-lasting.

There are growing fears that China is pursuing its growth targets at the expense of implementing important structural reforms. Moreover, the apparent shift towards the Party's and state's role in managing the economy (e.g. the removal of presidential term limits) has created cause for concern. Indebtedness has also continued to grow, albeit at a slighter slower rate. China's total debt (excluding the financial sector) already stands at approximately 260% of GDP, and the lack of reforms means that the marginal productivity of new debt will only decrease. As the country continues to accumulate more debt, it faces growing risks to its financial markets and growth rate.

Political uncertainty currently abounds, relating to e.g. Russia, the United States and North Korea. These geopolitical tensions and political uncertainties could lead to severe and unpredictable consequences.

Fiscal stimulus amidst full employment will add to inflationary pressures in the United States. This might force the country's central bank to normalise its monetary policy at a faster pace than currently predicted. Rapid successive interest rate hikes as well as other uncertainties related to the US economy could create volatility on global financial markets and increase the risk of an asset price correction, which could even surpass the worst estimates.

The United Kingdom's EU membership will expire in March 2019, and an agreement is finally being reached on the 'transition period' which will last until the end of 2020. Outlining transitional arrangements will help ease the uncertainty overshadowing the United Kingdom's economic outlook, but it will not shed light on the country's long-term trade relationship with the European Union. The Treasury estimates that a Brexit resulting in a free-trade deal with the EU will lead to a 4.6–7.8% contraction in output over 15 years, as compared with remaining within the EU. In the worst-case scenario, where no deal is reached and trade is based on WTO rules, the reduction in output would be 5.4–9.5%.[11] The effects of Brexit on other EU members and the euro area's growth outlook are expected to be significantly smaller, but its unprecedented nature might lead to unforeseen consequences.

The euro area's growth risks are predominantly on the upside in the short term, but remain tilted on the downside in the long term. The strength and duration of the euro area's cyclical upswing may still be underestimated, and so growth could still exceed short-term forecasts. External downside risks stem from the growth risks related to the

11. HM Treasury analysis: the long-term economic impact of EU membership and the alternatives. Presented to Parliament by the Chancellor of the Exchequer by Command of Her Majesty. April 2016.

global economy. Internal risks, on the other hand, relate to uncertainties surrounding the implementation of structural reforms in the euro area as well as risks to the public finances and banking sectors in certain countries. Despite recent improvements, non-performing loans continue to strain the balance sheets of several banks and play a part in creating yield spreads across the euro area. In recent years, the pace of reform has slowed in the majority of euro area countries. The continued implementation of structural reforms remains crucial for increasing growth potential and the ability to withstand crises. Raising the growth potential also improves a national economy's ability to service its sovereign debt. In particular, deepening the integration of European Monetary Union by completing Banking Union would substantially improve the euro area's crisis resilience and thereby reduce the threats posed by downside risks.

Tags

ECB, employment, euro area, global economy, inflation, monetary policy, productivity, risks to growth

Reinvestments in ECB's expanded asset purchase programme

TODAY 1:00 PM • BANK OF FINLAND BULLETIN 1/2018 • MONETARY POLICY

Under the ongoing purchase programme, the Eurosystem's securities holdings had already grown by about EUR 2,300 billion by the end of 2017. The ECB Governing Council has announced that it will continue net asset purchases at a monthly pace of EUR 30 billion until September 2018, at the least. Gross purchases of securities consist of net purchases that increase the Eurosystem balance sheet and of reinvestments to replace maturing securities. Gross purchases will average about EUR 40 billion a month during the period January–September 2018, during which securities will mature by an average of about EUR 10 billion per month. The reinvestment of maturing holdings is gradually becoming an increasingly important part of an appropriate monetary policy stance.

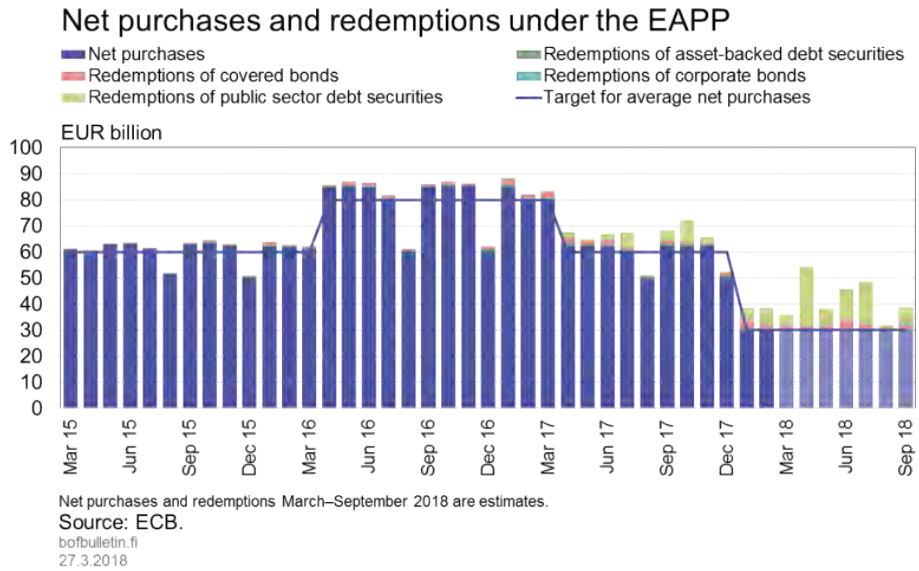
The Eurosystem began its purchases under the expanded asset purchase programme (EAPP)[1] in March 2015 to help achievement of the price stability objective and to address the risks of a prolonged period of low inflation. The Eurosystem holdings increased to EUR 2,286 billion by the end of 2017. At its meeting in October 2017, the Governing Council decided to reduce the pace of net monthly purchases from EUR 60 billion to EUR 30 million as of January 2018. The Governing Council confirmed that net purchases will be continued until the end of September 2018, or beyond, until the Governing Council sees a sustained adjustment in the path of inflation consistent with its inflation target.

1. The expanded asset purchase programme consists of the public sector purchase programme (PSPP), the asset-backed securities purchase programme (ABSPP), the covered bond purchase programme (CBPP3) and the corporate sector purchase programme (CSPP).

The Eurosystem's gross asset purchases equal net purchases plus reinvestments of principal payments from maturing securities[2]. The net purchases increase the Eurosystem's balance sheet on average by the pace of the monthly purchase target set by the Governing Council. Since the purchase programme has been in place already since 2015 and the stock of acquired assets has increased to a significant level, the reinvestment of redemptions is gradually becoming an increasingly important part of the monetary policy stance.

The Governing Council decided in October 2017 that the Eurosystem will publish monthly redemption amounts for each component of the asset purchase programme.[3] The redemption amounts are published every month for the following 12-month period, which gives a better idea of the amount and timing of reinvestments to be made. The published data shows that amounts of maturing holdings vary considerably depending on the month and the purchase programme (Chart 1).

Chart 1.



During January–September 2018, securities owned by the Eurosystem will according to the current estimate mature to a total of EUR 101 billion, i.e. an average of more than EUR 10 billion per month.[4] When reinvestments are taken into account, the actual monthly gross purchases are significantly higher than the net purchase pace, equivalent to about EUR 40 billion per month on average until September 2018.

The Governing Council has announced the Eurosystem would reinvest the principal payments from maturing securities purchased under the programme for an extended period of time after the end of its net asset purchases, and in any case as long as is

2. The Governing Council decided in December 2015 on the reinvestment of maturing assets.

3. For the latest information about the redemptions of Eurosystem holdings, please see the ECB website.

4. According to estimates published by the ECB, the total maturities in 2018 will be about EUR 146 billion. This figure may grow further as the Eurosystem buys securities maturing in 2018.

necessary.[5] This will promote both favourable liquidity conditions and an appropriate monetary policy stance. After the end of net purchases, the reinvestment of redemptions ensures that the size of the expanded asset purchase programme remains at a level in line with the Governing Council's target.

Public sector debt securities account for most of the assets purchased under the expanded asset purchase programme and the coming reinvestments. Of the total redemptions in 2018, the public sector purchase programme will account for EUR 116 billion (about 80%) and the private sector purchase programmes for EUR 30 billion (about 20%). In the public sector purchase programme, the national central banks within the Eurosystem buy their domestic public sector debt securities in accordance with the capital key, that is, in accordance with the proportionate size of the member country's economy. The ECB has clarified that during the period of net asset purchases, principal redemptions of public sector securities will be reinvested in the jurisdiction in which the maturing bond was issued.[6] When securities mature in the public sector purchase programme, the redemptions are reinvested preferably during the same month or at least within the next two months, depending on the liquidity conditions of the secondary market. As a result, purchase volumes by individual countries may fluctuate considerably from month to month.

In the private sector programmes, there are no strict country allocations for the purchase volumes. However, the Eurosystem's purchases are broadly oriented towards market weightings of eligible bonds, taking into account the market conditions. New bond issues and secondary market liquidity may vary considerably from month to month and country to country. Therefore, in private sector programmes the monthly redemptions in certain countries may not directly reflect the purchase volumes in that jurisdiction.

Tags

central bank's balance sheet, net purchases, purchase programmes, reinvestments

5. See ECB (2017) The recalibration of the ECB's asset purchase programme. Economic Bulletin No.7.
6. Under the public sector purchase programme the Eurosystem purchases bonds issued by euro area countries, their regional and local governments, recognised agencies and international and supranational institutions located in the euro area.

How has the feedback loop between banks and sovereigns changed since the crisis years?

TODAY 1:00 PM • BANK OF FINLAND BULLETIN 1/2018 • MONETARY POLICY

One aim of Banking Union is to weaken the feedback loop between banks and their sovereigns so that increases in banks' credit risk would no longer be reflected in sovereign credit risk and, conversely, banks' financing costs would no longer be driven by their sovereign's creditworthiness. Currently, for banks and sovereigns alike, credit risk insurance costs much less than during the crisis. Although the bank-sovereign nexus has weakened, the feedback loop cannot be considered to be broken.

The bank-sovereign nexus cannot be broken by monetary policy

The feedback loop between banks and their sovereigns caused the financial crisis to escalate into a sovereign debt crisis in the euro area. In some countries, the problems arose from a major growth in bank lending, as well as from poor risk management. In these countries, the central government had to provide substantial financial assistance in order to prevent a collapse of the banking sector that would have shaken the whole financial system. In countries where the root cause of the problems was excessive government indebtedness, domestic banks ultimately ensured their sovereign's access to financing. In both cases the outcome was identical: both banks and the sovereign ended up in significant distress, and external financial assistance was required to solve the problem.

As the global financial crisis escalated following the collapse of Lehman Brothers, euro area banks also saw their cost of hedging credit risk increase significantly. Soon

thereafter, the price of credit risk insurance began to increase tangibly also for the respective sovereigns (Charts 1 and 2).

Chart 1.

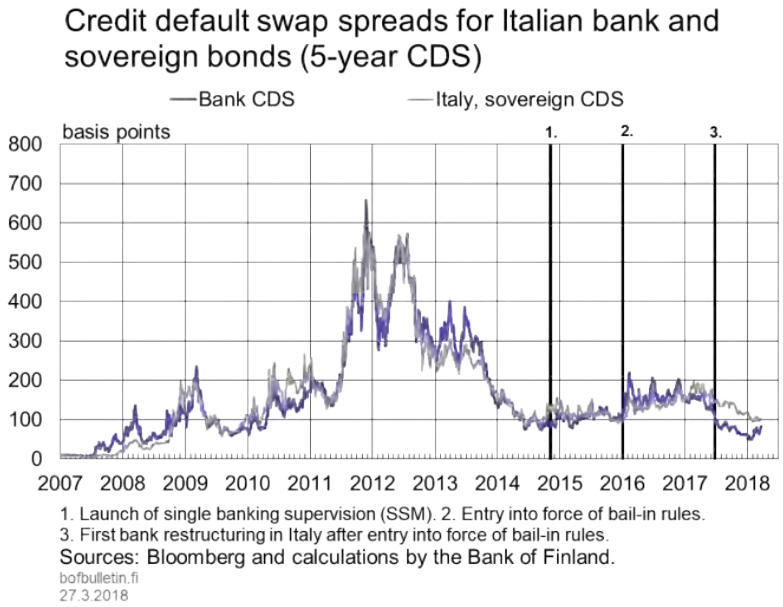
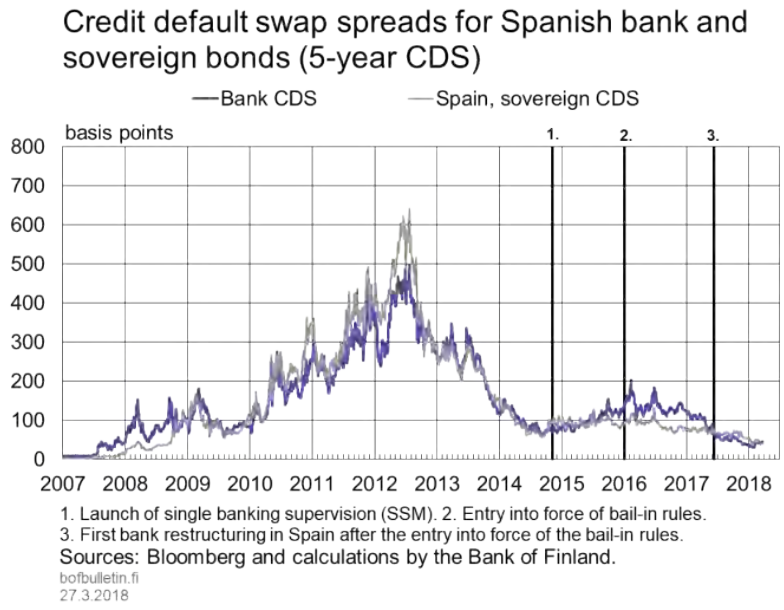


Chart 2.



For stressed economies, such as Spain and Italy, the pricing of credit risk embarked on a markedly downward path at the end of July 2012, following the – epochal, as it later turned out – speech by the ECB's President Mario Draghi, in which he said that the ECB would do within its mandate whatever it took to preserve the euro. The message was further reinforced in September 2012 when the ECB announced the Outright Monetary Transactions (OMT) programme which created the possibility for the Eurosystem to purchase, if necessary, debt securities issued by countries hit by market turbulence.[1]

Thus far it has not been necessary for the ECB to conduct purchases under this monetary policy programme. However, the Eurosystem's intervention was crucial in helping decrease the price of credit risk both for sovereigns hit by the crisis and for banks located in these countries. Despite this, the OMT programme as such does not address the fateful feedback loop between banks and their sovereigns.

Banking Union aimed at weakening feedback loop

It was decided in summer 2012 that Banking Union would be established in the euro area. Over the short term, its creation was aimed at stabilising the financial markets, whereas the longer-term objective was to facilitate efficient financial intermediation and help loosen the bank-sovereign nexus in the euro area.

Back then, the euro area countries agreed upon single banking supervision and crisis resolution mechanisms, but the third pillar of Banking Union, a shared deposit guarantee scheme, was still left outside the scope of joint decision-making.[2] The Single Supervisory Mechanism is responsible for the direct supervision of the largest and most significant banks in the euro area, while the Single Resolution Mechanism is tasked with the restructuring or, if necessary, the orderly liquidation at minimum cost of banks which are no longer financially sound.

In 2014, the ECB conducted a comprehensive assessment of the condition of euro area banks in cooperation with national supervisory authorities. Following the assessment, banks for which a capital shortfall had been observed had to raise additional capital. A precondition for any bank to enter the Banking Union was that it had ensured its viability. The results of the comprehensive assessment were disclosed in October 2014, and the Single Supervisory Mechanism began operating at the beginning of November.

The Bank Recovery and Resolution Directive (BRRD), which has been implemented at EU level, plays a central role in breaking the feedback loop between banks and their sovereigns by defining the shared tools available for handling distressed banks, as well as the related powers. Since the beginning of 2016, the bail-in rules embedded in the resolution mechanism limit the costs caused to taxpayers in the event of a bank collapse. Under these rules, the bail-in tool (debt write-down) is activated in situations of bank distress. In this way, the escalation of a bank's problems should be less heavily reflected in sovereign credit risk than before.

The third pillar of Banking Union, a European deposit guarantee scheme, is currently under discussion. The lack of common deposit guarantee is one element maintaining the feedback loop between banks and their sovereigns. This feedback loop is further reinforced by the fact that banks in many countries still have large holdings of bonds issued by their sovereigns.

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1. The conduct of purchases for monetary policy reasons under the OMT programme requires conditionality which aims at ensuring the debt sustainability of the targeted sovereigns.
2. For more information on the shared deposit guarantee scheme, see Construction of a risk-based European Deposit Insurance Scheme.

Crisis tools had their first real test

In the course of 2015 and especially at the beginning of 2016, the price of hedging credit risk associated with subordinated debt increased on the back of investors anticipating the entry into force of the bail-in rules (Charts 3 and 4). At the beginning of 2016, interbank differences in the cost of hedging credit risk also increased. At the same time, the price of credit risk associated with Spanish, Italian and French sovereign debt remained relatively stable, which seems to point to a weakening of the feedback loop.

Chart 3.

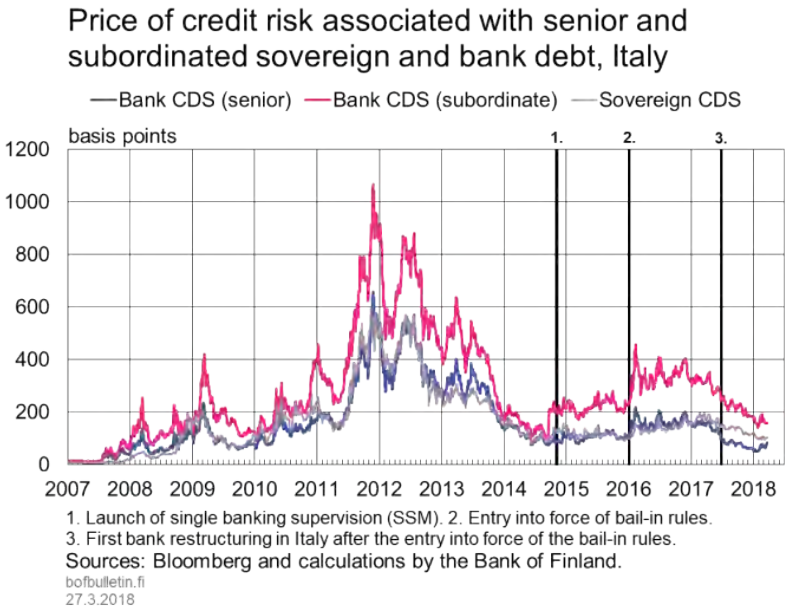
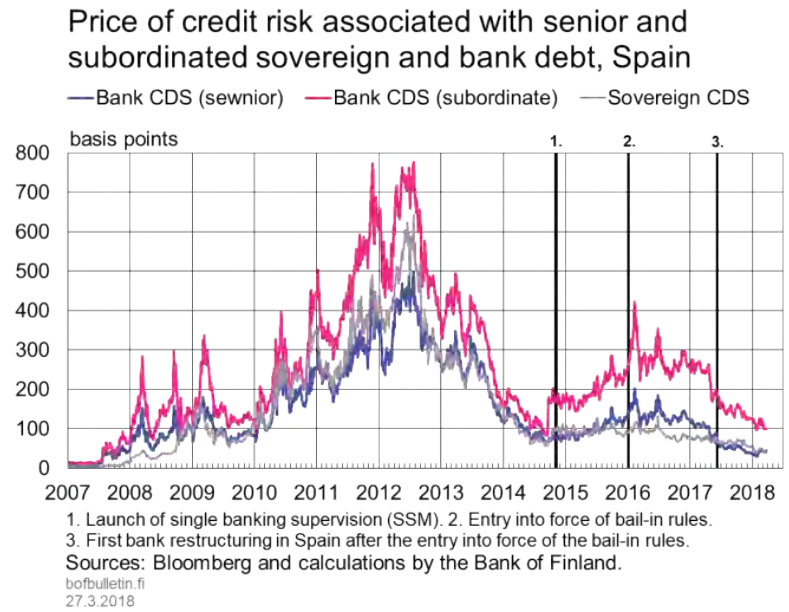


Chart 4.



The new crisis tools underwent their first real test in June 2017 as some Spanish and Italian banks began to encounter problems. In Spain, the control over Banco Popular was transferred by an ECB decision to the Single Resolution Board (SRB). In June, the ECB announced that two Italian banks, Veneto Banca and Banca Popolare di Vicenza, were failing or likely to fail. The SRB considered that these banks were not large enough to cause systemic risk in the financial system. If the conditions of the resolution procedure are not met, the resolution is conducted under national law.

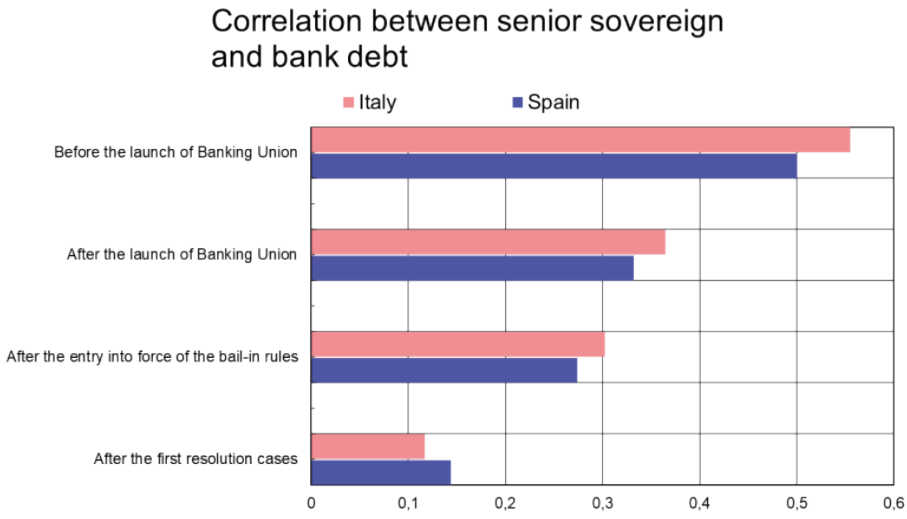
Although in Spain the financial responsibility associated with the resolution is borne by investors and in Italy still in part by taxpayers, in both countries the new resolution procedure led to a decrease in CDS spreads for senior and subordinated debt alike.

Has the feedback loop weakened?

The feedback loop between banks and their sovereigns can be examined by analysing how changes in the price of sovereign credit risk correlate with changes in the price of bank credit risk over different periods of time. The evolution of prices is affected by several factors, and the correlation between different elements does not reflect a causality between them. In addition to a simple correlation, the link between changes in the prices of sovereign and bank credit risk can be examined by means of a principal component analysis in which the price path is adjusted for the impact of common components.

The outcome of the analysis was that, adjusted for common components, the correlation between banks and their sovereigns (for instance Italy and Spain) seemed to have decreased tangibly after the launch of Banking Union in November 2014 (Chart 5). Following the entry into force of the bail-in rules on 1 January 2016, the direct impact on the correlation seems to have been moderate, but the impact may have materialised with a delay in the aftermath of the first resolution cases in which the new model was applied.

Chart 5.



Sources: Bloomberg and calculations by the Bank of Finland.
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27.3.2018

Examining correlations between the prices of hedging sovereign and bank credit risk is only one, highly simplified, way of analysing the evolution of the feedback loop. The correlation analysis presented here does not imply any causality between the observations discussed. Moreover, the weakening of correlations does not necessarily mean that the feedback loop cannot strengthen again in the future. Reforms undertaken in the euro area have loosened the feedback loop in the banks-to-sovereigns direction, but only marginally in the opposite direction. A more complete breaking of the feedback loop remains conditional on the completion of Banking Union and cross-border banking in the euro area.

Tags

banking union, crisis resolution, debt crisis

Construction of a risk-based European Deposit Insurance Scheme

TODAY 1:00 PM • BANK OF FINLAND BULLETIN 1/2018 • FINANCIAL STABILITY

The completion of Banking Union is an important objective from the perspective of financial stability. Reaching an agreement on a common deposit insurance scheme is a key component in achieving that objective. The purpose of a deposit insurance scheme is to strengthen confidence in uninterrupted access to bank deposits. The size of the Deposit Insurance Fund must be sufficient to credibly withstand possible problem situations. Banks' deposit insurance contributions should be calibrated based on risks. This would reign in individual banks' incentives to benefit from a common deposit insurance scheme to which all banks have contributed. Studies show that a common deposit insurance scheme would be quite resilient.

The further development of EMU and the completion of Banking Union necessitates the creation of a common European Deposit Insurance Scheme (EDIS). Currently, covered deposits are within the scope of the national deposit guarantee schemes of the bank's country of location. The common deposit insurance scheme would have more resources than national deposit guarantee schemes, which would increase the stability of the euro area banking system significantly compared with the current situation. The aim is to achieve an equally strong level of confidence in the liquidity of bank deposits across the euro area.

According to the European Commission proposal, the size of the joint Deposit Insurance Fund would be 0.8% of the amount of covered deposits.[1] The ECB has examined the

1. A European Deposit Insurance Scheme (EDIS) – Frequently Asked Questions.

sufficiency of the European Deposit Insurance Scheme proposed by the Commission, based on a quantitative analysis which takes into account the realisation of different risk scenarios.[2] The study considers a fully fledged deposit insurance system, based on end-2015 data from 1,675 euro area banks.[3] The results of the ECB analysis indicate that a deposit insurance scheme in line with the Commission's proposal would be sufficient to cover the risks even in the more conservative scenarios[4]. The sufficiency of the deposit insurance scheme would be threatened only in the event that banks' losses were to rise to very high levels. Other safety net tools are necessary for dealing with such extensive systemic crises.

The Commission proposes that the deposit insurance contributions be calibrated based on the banks' risk profiles. A detailed calibration of banks' deposit insurance contributions ensures that banks with the highest likelihood of having to use deposit insurance pay the highest share of the contributions. In other words, the banks most likely to cause risks would pay a higher share of the contributions to compensate for the risks caused. This will also ensure that individual banks will not benefit from contributions paid by other banks, by taking higher risks and, if their plans are unsuccessful, leaving the losses to be borne by the other banks.

The European Banking Authority's Guidelines on the creation of national deposit guarantee schemes can be considered a starting point, but the Guidelines must be applied on the level of the Banking Union. A bank's deposit insurance contribution would be calibrated based on its risk profile relative to its peers in the Banking Union.[5]

The ECB has analysed the calibration of risk-based contributions to the deposit insurance scheme in different alternatives. When assessing banks' balance sheet risks and calibrating deposit insurance contributions the volume of non-performing loans could also be utilised. The amount of MREL[6]-eligible liabilities, which strengthen banks' risk resilience, could in turn decrease the amount of contributions. MREL-eligible liabilities are used in bank resolution when a bank's creditors are bailed in. The purpose of these liabilities, which are within the scope of bail-in, is to ensure that the costs of future problems in the banking sector will not be borne by taxpayers. The larger the amount of a bank's MREL-eligible liabilities, the smaller the likelihood of the bank having to resort to the deposit insurance scheme.

The size of a risk-based deposit insurance fund would thus, as a rule, be sufficient to cover the risks in a non-systemic crisis, but not in a systemic crisis. By combining the risk

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2. ECB Macroprudential Bulletin, Issue 3, June 2017.
3. The covered deposits of the banks analysed in the sample totalled some EUR 4,700 billion, corresponding to approximately 83% of covered deposits in the euro area.
4. For the scenario, the probability of default (PD) is calculated for each bank. The analysis assumes that banks fail in the order of their probability of default. The analysis considers crises of a different magnitude, where the riskiest 1% or 3% of banks fail simultaneously. The most conservative estimates assume bank losses to be larger than in the 2007–2010 financial crisis.
5. The ECB analysed also alternatives in which national specificities – e.g. effectiveness of bankruptcy legislation – would be reflected in deposit insurance contributions. The impact of country-level differences on deposit insurance fees is highlighted also in a working paper published by German and French economists.
6. Minimum requirement for own funds and eligible liabilities (MREL).

scenarios and risk-based contributions, one can investigate the possible existence of cross-subsidisation[7] between banking sectors in different Member States. The results of the ECB analysis show that the risk of unwarranted cross-subsidisation appears to be low. This follows from the bank resolution process, in which bank losses are covered in accordance with the principle of bail-in. Calculations show that only a small amount of losses would have to be covered by deposit insurance scheme. In the most conservative scenarios, in which the assumed losses may be considerable, there is a possibility of cross-subsidisation. In these scenarios, banks in some countries could benefit from the deposit insurance scheme more than they have originally contributed.

Assessments of the usefulness of a common deposit insurance scheme should also take into account that the situation and capital position of banks vary across countries and over time. A banking system or banks that are solid today may over time turn out to be quite weak if the situation deteriorates. Banks that are weak today may, in turn, prove to be solid and profitable if the time horizon is sufficiently long. An example of this is the comparison of the current condition of the Finnish banking system to the situation in the mid-1990s.

Tags

banking union, deposit insurance scheme

7. Here subsidisation refers to a situation in which banks in a certain country use, in a loss scenario, more of the Insurance Deposit Fund's resources than they have contributed.

Euro countries recovered from crisis at different paces

TODAY 1:00 PM • BANK OF FINLAND BULLETIN 1/2018 • ECONOMIC OUTLOOK

Following the steep contraction caused by the financial crisis, there have been substantial differences in economic performance across the different countries in the euro area. Some countries experienced a double recession from which recovery has been slow. In others, the economy picked up at a steady pace, and in some cases actually rather quickly. The stressed economies in the euro area have also recovered at varying speeds. Healthy economic structures seemed to have facilitated a speedier recovery. At the moment, the four largest euro area economies are growing at a rate above their potential output. Nevertheless, their long-term growth prospects differ from each other.

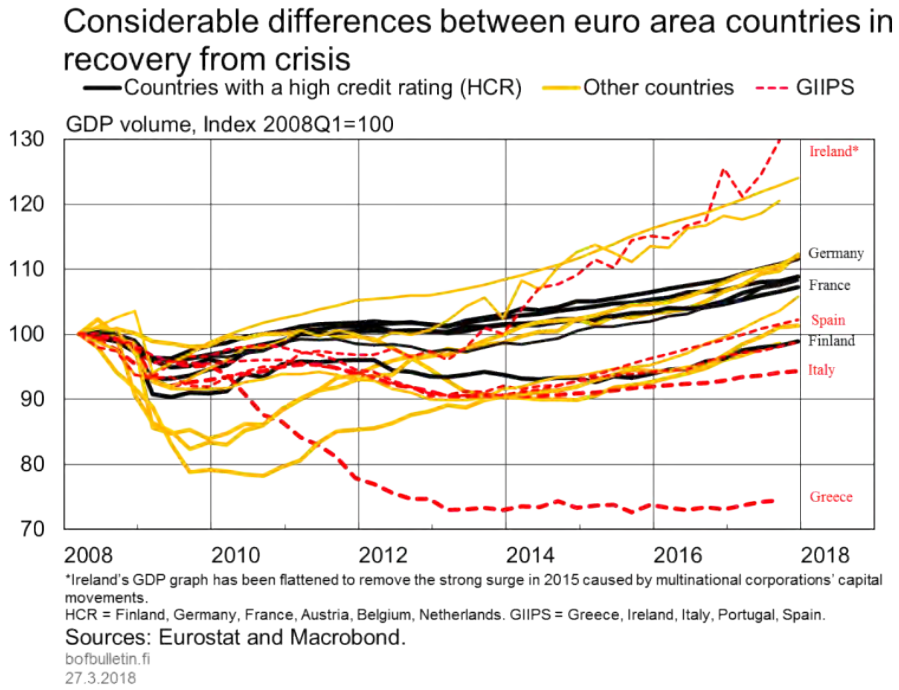
Rate of recovery in euro countries varies

In the early stages of the financial crisis in 2008–2009, all current euro area countries fell into a deep recession when, as a result of the global recession, both exports and investments contracted significantly. Since then, euro area countries have performed in varying ways (Chart 1).

Recovery from the financial crisis has ranged from rapid (e.g. Ireland), steady (e.g. Germany and France), slow (e.g. Italy and Portugal) to almost non-existent (Greece). However, countries cannot be rated in such a straightforward way, and even if GDP development for any two countries was similar, the reasons for their performance may vary significantly. To better understand future developments, it is important to understand which factors reduced the effects of the crisis in some countries and helped them to recover quickly.

It is also important to realise that the countries that bore the brunt of the crisis have recovered at very different rates. Greece, Ireland, Portugal, Spain and Cyprus received external financial support through an EU/IMF programme once they got into serious difficulties in 2010–2013. Of these countries, recovery was rapid particularly in Ireland, and partly also in Spain, while the GDP of Greece has scarcely moved from the rock-bottom figures it plunged to during the crisis.

Chart 1.



Some euro countries suffered a double recession in 2011–2012 as a result of the sovereign debt crisis and problems in the banking sector.[1] It was not until 2017 that countries such as Spain that were hit by the double recession managed to recover to the pre-crisis level of 2008. Italy's GDP is still below its pre-crisis level. Countries with a double recession also still have unemployment rates that are higher than in 2008, although the situation has notably improved in recent years. The investment rates in these countries are still well below pre-crisis levels. There are several reasons for the poor investment development, such as deleveraging of debt by the private sector.

On the other hand, some countries managed to avoid a double recession and, having first experienced a big drop, have since enjoyed steady or even strong growth. Such economies include, for example, the euro area's biggest countries, Germany and France. These reached their pre-crisis GDP levels by 2013. Although the investment rate has been subdued there, too, investments did nevertheless exceed the pre-crisis level in 2015 and have since been very close to the levels before the crisis.

The financial crisis resulted in Ireland and the Baltic countries in a severe GDP contraction, but since then these countries have recovered quickly. Production rates

1. Finland's GDP also declined again at this time, but this was due primarily to the poor performance of exports.

reached pre-crisis levels on average during 2014. The economic performance of Greece, in contrast, has been poor, and GDP growth is seriously lagging behind the other euro area economies. The Greek investment rate has also been exceptionally low and is currently the lowest in the euro area.

A flexible corporate-sector operating environment supports growth

Economic structures have a major impact on crisis recovery.[2] One way to gauge the operation and flexibility of economic structures is the World Bank's Doing Business indicator which compares business environments in 190 countries.[3] Chart 2 shows the current euro countries' Doing Business indicator values in 2009 and economic recovery since 2009. According to the chart, countries with healthy corporate operating environments when the global financial crisis started (high indicator value) do indeed seem to have been enjoying good growth by 2016.[4]

In countries where the operating environment is poor, such as Greece, Cyprus and Italy, economic growth has been modest since the financial crisis hit. In Portugal, Greece and Cyprus, the precondition for financial support within the stability support programme was that economic structures be improved, which is reflected in the Doing Business indicator by the improved figures since 2009.

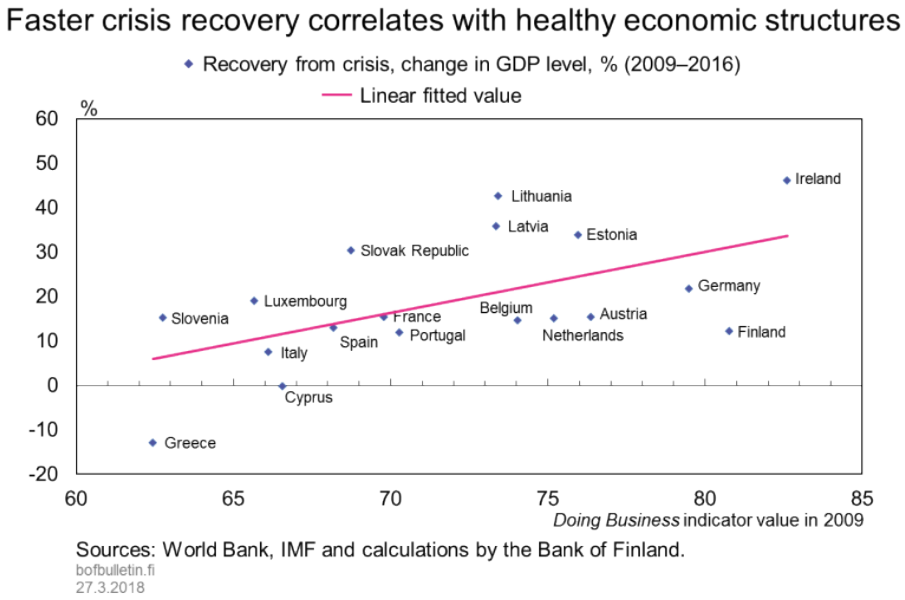
In Ireland, on the other hand, where recovery has been rapid, and in Germany, which has grown well, the economic operating environment was already healthy in 2009. The Baltic States have also recovered apace from the financial crisis, supported according to the indicators by a good corporate operating environment in 2009, which has also shown considerable additional improvements since then. Finland is an exception, because Finnish economic recovery has been tardy despite a healthy operating environment. This is partly due to the exceptionally serious problems experienced by the export sector.

2. Praet (2015), for example, explains in his speech how economic structures have an effect on both long-term growth and economies' ability to bounce back from crises. See Praet (2015): 'Long-run growth, monetary policy and financing of the economy', presented at 43rd Economics Conference of Oesterreichische Nationalbank, Vienna, 15 June 2015.

3. The indicator compares private-sector operating environment structures in different countries. These structures include the duration and costs of setting up a business, taxation and the relative incentive of being an entrepreneur in terms of various factors.

4. This observation is valid even if we take into account the depth of the financial crisis a country is in.

Chart 2.



Sources: World Bank, IMF and calculations by the Bank of Finland.
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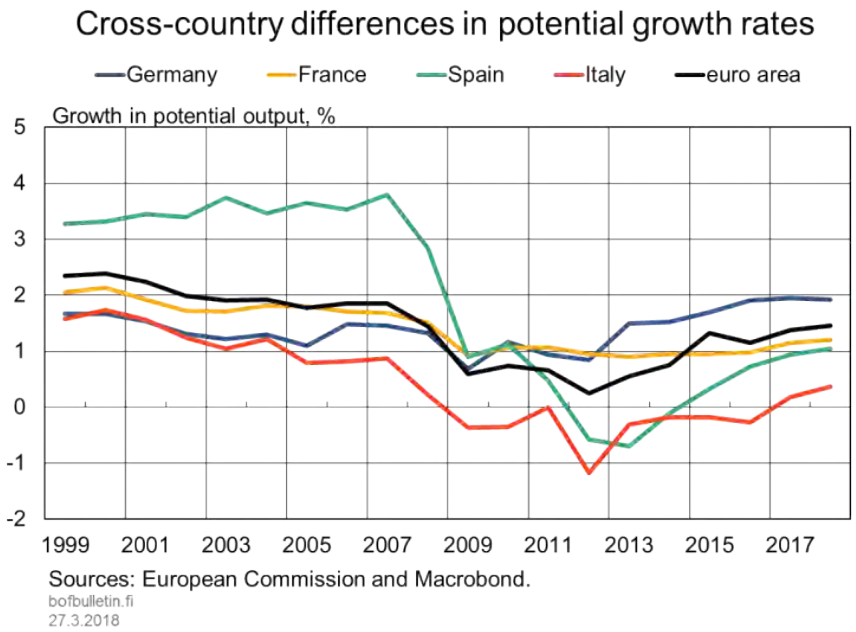
Long-term developments depend on growth potential

Despite the variety of development paths since the crisis, cyclical conditions have improved in all euro area countries in 2017. For example, the good performance of the four largest euro area countries is manifest in lower output gaps, meaning that their production is close to their potential levels. According to a European Commission estimate,[5] the output gap has turned positive (that is, production levels exceeded potential) or will do so at the latest in 2018 in Germany, Italy and Spain (Chart 3). Output gap estimates, however, vary somewhat, with the IMF,[6] for example, claiming that Germany's output gap turned positive already in 2016. On the other hand, they also project that the output gap will still be negative in France and Italy in 2020.

5. European Commission's autumn 2017 forecast.
6. IMF WEO, October 2017.

Chart 3.



Although growth has been strong recently, this is an upswing that is expected to weaken gradually. In the longer term, economic performance relies on potential output growth. The potential growth rate refers to how much an economy can grow without accelerating inflation due to resources being fully utilised. For example, according to the latest European Commission[7] estimate, the potential output increase of the German economy is the highest among the biggest euro countries, at an annual rate of close to 2%. The growth in potential output is estimated at about 1.2% in France, about 0.9% in Spain and about 0.2% in Italy. The longer-term growth prospects of the largest four euro area countries differ from each other because of differences in changes in the proportionate size the of working-age population and in labour productivity. At the moment, the four largest euro area countries are growing faster than their potential output growth.

Tags

economic development, economic growth, euro area, financial crisis, indicators

7. European Commission's autumn 2017 forecast.

The impact of the housing market on the Swedish economy

TODAY 1:00 PM • BANK OF FINLAND BULLETIN 1/2018 • ECONOMIC OUTLOOK

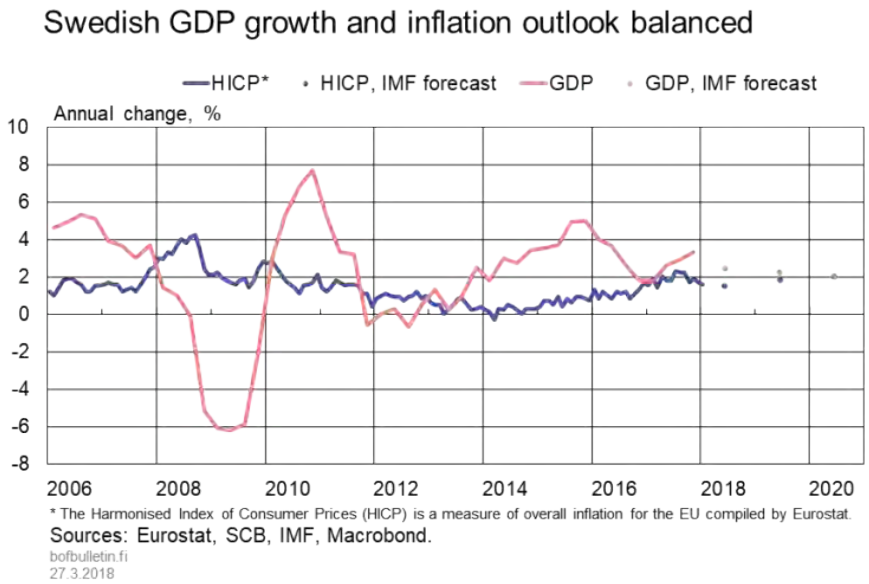
Sweden's economy is performing well. Economic growth is robust and inflation is close to the target level, despite the accommodative stance of monetary policy. Sweden's general government finances are slightly in surplus and government debt is small. In addition, Sweden's current account posts a considerable surplus. Housing prices have been on an upward trend for several years, particularly in Stockholm, Gothenburg and Malmö. Since autumn 2017, housing prices have, however, declined by some 10%. The near-term economic policy challenges include the resolving of structural problems on the housing market.

Continued favourable developments in the economy

Swedish GDP grew by approximately 3% year-on-year in 2017. According to the International Monetary Fund (IMF, 2017) Sweden's annual GDP growth is expected to moderate gradually, to about 2% in 2020 (Chart 1). Growth is sustained by robust domestic demand, which is bolstered by a strong increase in investment, particularly in residential construction (Chart 2).

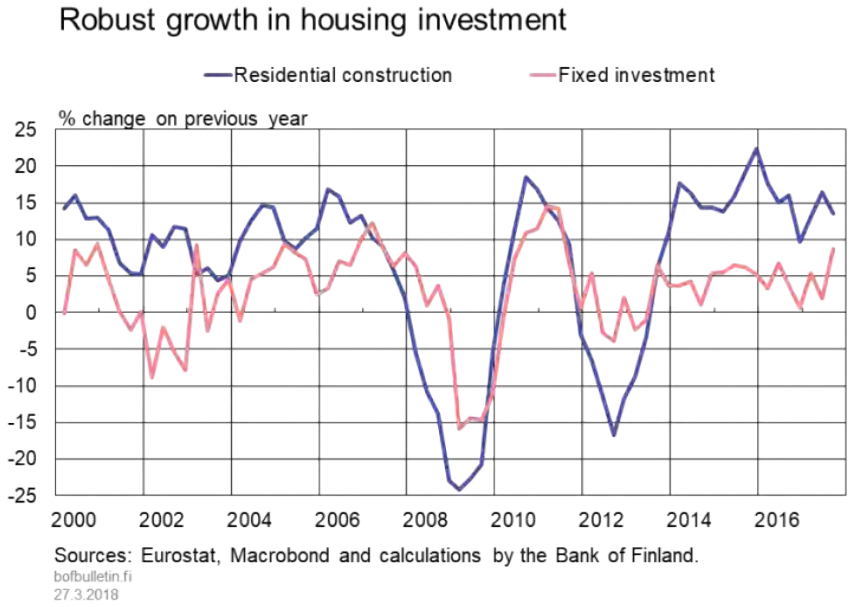
Sweden's foreign trade is in surplus. The current account posted a surplus of some 4% of GDP in 2017. In other words, domestic savings clearly exceed investments.

Chart 1.



Sweden's general government surplus is slightly under 1% of GDP. The general government debt ratio is low, at 45% of GDP (2016). As a result, Sweden has more room for fiscal stimulus than most other European countries in the event of a possible future recession.

Chart 2.



Measured by the HICP, inflation in Sweden was 1.6% in January 2018. The rate was thus slightly lower than the Riksbank's target of 2%[1]. According to IMF staff projections,

1. The Riksbank has defined the inflation target as a 2% annual increase in the consumer price index compiled by Statistics Sweden, at a fixed interest rate.

inflation will return close to target in the immediate years ahead and inflation expectations are projected to gradually increase.

Structural problems on the housing market

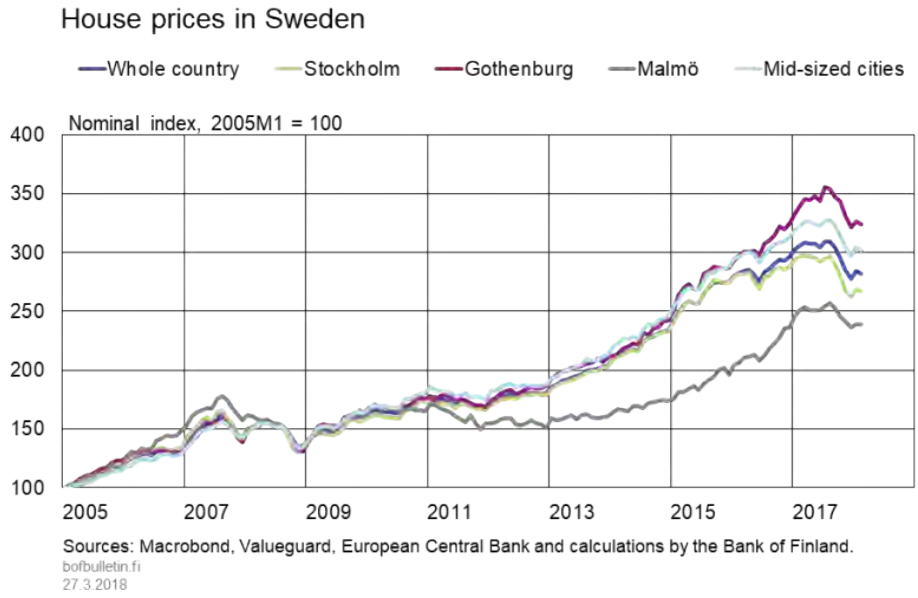
According to the IMF assessment, the Swedish housing market has deep structural problems. Construction costs have risen, reflecting in particular complex building regulations and limited competition in the sector. These, in turn, are mainly due to cumbersome municipal land sale and planning and approval procedures and have resulted in housing supply constraints in 255 out of 290 municipalities. This applies particularly to the three major metropolitan areas: Stockholm, Gothenburg and Malmö.

Another significant structural bottleneck on the housing market are the strict rent controls, which have resulted in a decline in the supply of rental housing. The shortage of rental apartments has left many households with no option but to purchase housing. This development is incentivised by the partial tax deductibility of mortgage interest payments.

In addition to structural factors, the overheating of the housing market reflects cyclical factors, for example the decline in interest rates and favourable developments in household income. The general assessment is that the Swedish housing market is characterised by overpricing, but the assessments vary considerably as to the size of the overpricing.

According to statistics by real estate agents, housing prices began to decline in September 2017 (Chart 3). Recent robust activity in residential construction, a gradual tightening of macroprudential policy – for example, a mandatory amortisation requirement for new housing loans (if the loan-to-value ratio is higher than 50%) – and expectations on monetary policy tightening have all served to cool the housing market.

Chart 3.



Housing market and debt pose risk to positive developments

Sweden's economic growth is robust and inflation is close to the target level (see Sveriges Riksbank, 2018). The positive trend is expected to continue. The positive spiral in the economy has been reinforced by the prolonged upward trend in house prices.

The housing market, and particularly developments in house prices, does, however pose the largest risks to the Swedish economy. The economic impact of a decline in house prices can be assessed with model calculations. The IMF (2016) has conducted a stress test on the Swedish economy (Table 1). In the stress test scenario, domestic and external factors trigger a decline in house prices of approximately 20% in the first year and over 10% in the second year. This scenario is thus 3–4 times more severe than the actual 10% decline in house prices observed in Sweden.

Table. IMF:n stressiskenaario, prosenttia

	1st year	2nd year	3rd year
GDP growth	–0,7	–3,4	–2,9
Investment growth	–0,4	–10,7	–6,7
Inflation (HICP)	–3,9	–0,3	–0,6
Nominal house prices	–19,2	–12,7	–3,5
Equity prices	–24,5	3,9	17
Exchange rate (+ = depreciation)	2,7	9,1	–1,6

Source: IMF (2016), Financial System Stability Assesment, Sweden.

The real effects of the IMF stress scenario would be very significant, and for example GDP growth would slow from the projected rate of close to 2% to clearly negative rates. However, the latest Monetary Policy Report by the Riksbank does not foresee this type of development. Even though the premise of the IMF stress scenario differs in many respects from the already materialised 10% decline in the housing market, the outcome of the stress test scenario does indicate that, in future, investment growth, GDP growth and inflation will slow, the unemployment rate will rise and the external value of the krona will depreciate.

A deepening of the downturn in the housing market could bring the positive trend in the economy to a halt and possibly even lead to a negative spiral. Stefan Ingves (2018), Governor of the Riksbank, has emphasised that '*high indebtedness makes the economy vulnerable and it is important that we slow down this development.*'

The moderate downward trend in house prices since September 2017 will dampen Sweden's economic growth in the short term while creating conditions for more stable growth in the longer term. The Swedish economy also has flexibilities in the event of more severe risks. These include, in particular, the current account surplus and the small public sector debt.

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Tags

economy, housing price developments, Sweden, indebtedness

Post-crisis monetary policy modelling

TODAY 1:00 PM • BANK OF FINLAND BULLETIN 1/2018 • MONETARY POLICY


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In the aftermath of the global financial crisis many central banks cut their policy rates close to zero or even below and introduced non-standard monetary policy measures. The financial crisis and the European debt crisis that followed demonstrated the importance of the linkages between financial markets and the real economy. In this article we survey the open issues in economic research posed by limits on how low central banks are able to cut policy rates, and the unconventional measures, especially forward guidance and large scale asset purchase programmes.

New policies call for new models

Before the global financial crisis in 2008–2009, central banks in advanced countries implemented monetary policy mainly by steering the short-term nominal interest rate.[1] With inflation hovering around central bank targets, around 2% in most countries, and real interest rates above 2 %, monetary policy had ample space within which to operate.

The crisis that originated on the financial markets took professional economists by surprise. Although some economists understood the possibly disruptive implications of finance for the real economy, the financial markets were insufficiently integrated in macroeconomic models before the crisis. In addition, the likelihood of nominal interest rates falling to zero was considered negligible, and analytical tools for such an environment[2] were lacking.[3] But as inflation and output plummeted during the crisis, policy rates were quickly reduced to the ZLB, making it difficult to provide further stimulus with the conventional policy tool.

With the ZLB binding, central banks had to look for new measures to stimulate demand and bring inflation back to the target. For instance, many central banks adopted quantitative easing and forward guidance.[4] Yet, formal frameworks for analysing these measures were largely missing at the time. The view after the crisis is that *"the problem with quantitative easing is it works in practice, but it doesn't work in theory"* (Bernanke (2014)). Actually, one could claim that the problem with forward guidance is that it works perhaps too well in theory, compared with the effects found in empirical studies. These puzzles have spurred substantial effort for developing more realistic models about the new policy environment.

This paper surveys the recent monetary policy models that have been developed since the crisis. For instance, several models now deal with financial constraints and frictions. Similarly, models that take into account non-linearities stemming from an asymmetry in that there is a limit to interest rate cuts, thus an inability to cut rates further, are readily available and increasingly used by policymakers. The development has also partly been driven by the experience with unconventional policy measures. Forward guidance, for example, has turned out to be somewhat less potent as a policy tool than pre-crisis models predicted. This, in turn, has highlighted the importance of incorporating deviations from rational expectations to generate more realistic predictions.[5] In contrast, quantitative easing turned out to be more effective than expected, which suggests that heterogeneity among market participants may be important for aggregate outcomes.

In this article we review the key recent developments in monetary policy frameworks following the crisis. In the next section we look more closely at the challenges that the ZLB presents to the monetary policy transmission mechanism. "Monetary policy and

1. The central bank sets nominal interest rates by managing the supply of liquidity to private banks. If firms adjust their prices sluggishly, this also allows the central bank to exert temporary influence over the real interest rate. The goal is to maintain price stability and possibly to reduce output fluctuations as well.
2. Henceforth, we shall use the term 'ZLB' (zero lower bound) to denote the lowest level central banks are willing to adjust their rates to, even if in some instances (including the Eurosystem) rates have been reduced into negative territory. The terms 'ZLB', 'effective zero lower bound' and the 'liquidity trap' are used as synonyms.
3. Long-term secular trends, such as societal aging, may have increased savings and lowered real interest rates more generally, and thereby also increased the likelihood of reaching the ZLB. For a review of the relevant literature, and critical evidence on this hypothesis, see Borio et al. (2017).
4. Quantitative easing refers to a policy whereby the central bank buys financial assets, such as government bonds, from private banks with the intent of easing longer term financing conditions. In forward guidance, the central bank seeks to influence private expectations by communicating its commitment to a future policy path.
5. Rational expectations imply that agents form mathematical expectations based on the full model structure. This requires very strong informational assumptions that are unlikely to be met in practice.

financial frictions" section concerns how financial frictions will change the monetary policy transmission channel outside the liquidity trap. In sections "Forward guidance" and "Quantitative easing" we analyse unconventional monetary policy measures, forward guidance and quantitative easing. In section "Conclusions" we draw some conclusions.

Modelling monetary policy at the zero lower bound

The crisis uncovered an important asymmetry in the transmission of monetary policy stemming from the fact that a central bank has limits below which it cannot cut its policy rates.

Before the crisis the probability of hitting the ZLB was considered small. According to Orphanides and Wieland (1998) and Reifschneider and Williams (1999) the probability could be reduced further by setting a positive inflation target. As a result, the workings of pre-crisis monetary policy could be described relatively well by an interest rate rule, such as the Taylor rule.[6]

The crisis changed this view. Firstly, it would seem that the probability of hitting the ZLB is much higher than previously thought (Kiley and Roberts, 2017). This may stem from the fall in the level of the natural rate, implying a rising incidence of the effective ZLB in the future. Further, the earlier estimates on the likelihood of the ZLB were based on data from the Great Moderation, from the mid-1980s until the crisis. Finally, it takes longer than previously expected to recover from ZLB episodes.

The existence of the ZLB limits the degree of monetary stimulus from the negative real interest rate, a monetary stimulus that might be required to avert an economic downturn. Under such circumstances the real interest rate is not low enough: people want to save more than firms are willing to invest. Then to equate savings and investments, output and aggregate income have to fall. With the lower level of income, the amount of savings (the aggregate amount of euros or dollars saved in the economy) is also lower, and investments can absorb savings. However, while the economy reaches an equilibrium, the outcome is rather unpleasant: output is lower and unemployment is higher.

Expectations of reaching the ZLB in the future may affect the current behaviour of households, firms and the central bank. In particular, if households and firms expect a binding ZLB and a recession, they may reduce their spending, and the resulting fall in aggregate demand may render the recession a self-fulfilling expectation. Crucially, the actions of households and firms depend on their expectations about the central bank's policies. The optimal policy requires the central bank to lower policy rates aggressively in response to adverse shocks, in order to reduce the probability of a binding ZLB in the future (Nakov 2008).

Because of the monetary policy constraints induced by the ZLB, non-linearities should be incorporated explicitly in the solutions, simulations and estimations of macroeconomic models. In the past, dynamic stochastic general equilibrium (DSGE) models have been

6. The Taylor rule ties the nominal interest rate to the deviations of inflation from target inflation and the output gap.

typically solved by using a first or second order local approximation. More recently, researchers have started to use solution algorithms that maintain the nonlinearity in the interest rate rule, but log-linearize the remaining equilibrium conditions (Eggertsson and Woodford (2003); Bodenstein, Guerrieri and Gust (2013); Guerrieri and Iacoviello (2015)). Alternative solution methods include non-linear projection techniques, as in Gust, López-Salido and Smith (2012) and Gust, Herbst, López-Salido and Smith (2017).

Finally, we should note that at the ZLB the interest rate does not guarantee a unique equilibrium of the model. The Taylor principle, i.e. a sufficiently strong reaction of nominal interest rate to inflation, is needed to provide a unique equilibrium. At the liquidity trap, the nominal interest rate is fixed to the ZLB for a possibly unknown time period and hence the interest rate cannot provide equilibrium selection. In other words, there may exist a multitude of different equilibria where self-fulfilling expectations give rise to different economic outcomes – i.e. different time paths of output, unemployment, inflation etc.

Monetary policy and financial frictions

The recent crisis has demonstrated that financial markets can greatly amplify shocks originating in other economic segments. This has led to renewed interest in investigating the interaction between macroeconomic and financial variables.

From a central bank perspective it is important to understand the channels through which monetary policy transmits to financial variables, in particular to credit costs. Pre-crisis macroeconomic models typically predicted that the response of lending rates to monetary policy interventions is determined exclusively by the expected path of the target policy rate – the interest rate channel. A change in the policy rate is then expected to be extended to the longer rates via the expectations hypothesis of the yield curve.

Recent empirical papers find evidence of alternative transmission channels. Gertler and Karadi (2015) show that movements in US medium and long-term rates after an unexpected tightening of monetary policy reflect an increase in the term premium. Caldara and Herbst (2018) find that unexpected monetary policy changes in the federal funds rate are key drivers of credit spreads. Miranda-Agrippino and Ricco (2017) document a significant and persistent rise in corporate bond spreads and premia after a contractionary monetary policy shock, consistent with an increase in the external finance premium, i.e. the wedge between external (e.g. bonds, loans equity) and internal (e.g. earnings) financing costs.

These empirical findings point to a credit channel of monetary policy embedded in many post-crisis macro models. This channel posits that the effects of monetary policy interventions on lending rates are amplified by endogenous changes in the external finance premium. In turn, the existence of an external, positive finance premium is generally attributed to some financial market imperfections or frictions such as imperfect information or costly contract enforcement on financial markets (Bernanke et al. 1999, Kiyotaki and Moore 1997). Recent papers (Linde et al. 2016; Del Negro and Schorfheide 2013) show that including financial frictions in macro models is essential to describe the evolution of macroeconomic variables since the Great Recession. Moreover, these papers

point to time variation in the relevance of financial frictions, which can occasionally become more severe, as demonstrated by the latest crisis.

The existence of a credit channel is even more relevant at the ZLB when the interest rate cannot be moved and the expectations hypothesis channel cannot be used to affect long-term rates. This will be discussed in more details in the following sections.

Forward guidance

As the conventional policies turned out to be redundant at the liquidity trap, central banks have started to employ, among other unconventional measures, forward guidance, thus providing information about, or commitment to, their future monetary policy actions. The key idea in forward guidance is that the central bank can alleviate the recession (today) by promising to keep nominal interest rates low (at zero) in the future.

Empirical evidence on forward guidance

Several empirical studies have attempted to quantify the effects of forward guidance on measures of real activity or expectations thereof. Forward guidance itself is typically measured from data on futures contracts, as a revision in the expected path of the policy rate following a monetary policy announcement. The majority of studies find that forward guidance has substantial impact on the yields on long-dated securities, in line with conventional monetary policy transmission.

The real effects of forward guidance are, however, less clear cut. Campbell et al. (2012), for instance, find that an expansionary forward guidance shock leads to negative effects on the real economy. To explain this puzzle, they conjecture that forward guidance has two opposing informational effects. To the extent that it signals a commitment to a pre-specified expansionary monetary policy path (Odyssean forward guidance), for example, the effects should resemble the conventional ones. However, if market participants interpret the guidance as a signal that the central bank sees a deterioration in the future outlook (Delphic forward guidance), and subsequently revise their own expectations downward, it can have the opposite effect.

Recent empirical studies attempt to distinguish between Odyssean and Delphic forward guidance. They find that the latter can almost fully explain the puzzling effects (e.g. Campbell et al. (2018)). Focusing on Odyssean forward guidance, a number of studies find real responses that are well in line with those reported for conventional monetary policy (e.g. Gertler and Karadi (2015); Bundick and Smith (2017); Hubert and Labondance (2017)). Nevertheless, unexpected Odyssean forward guidance shocks are typically rather small in magnitude. Moreover, its estimates may be exaggerated as it is difficult to separate them from the effects of quantitative easing programmes that are announced at the same dates. Hence, while most studies find that forward guidance can occasionally serve as a useful tool, if implemented with care, its overall effects are difficult to estimate.

Forward guidance puzzle and proposed remedies

While forward guidance seems to work in practice, it works much better in theory. Indeed, in standard New Keynesian macro models, Odyssean forward guidance is an implausibly strong policy tool. Moreover, in these models forward guidance is the more effective the further in the future the promised policy action will take place (McKay et al (2016); Del Negro et al (2015)).[7]

Why is forward guidance so powerful in standard New Keynesian macro models? If the central bank can engineer a boom in the future, the expected good times will create a boom – or at least alleviate a recession – already today.[8] Moreover, in the standard New Keynesian model (current) inflation depends on expected cumulative future output. An interest rate drop today will then create a transitory boom, lasting for one period – the current quarter – and raises current inflation only modestly. However, a promise to lower interest rates in 10 years' time creates a boom lasting for 40 quarters and gives rise to hyperinflation today (see e.g. McKay et al (2016)).

The main reason behind the forward guidance puzzle is that the standard New Keynesian macro models are highly forward-looking. How can we weaken the grip of the future over the present? Recently proposed remedies, or modifications to the standard New Keynesian framework include i) heterogeneous agent New Keynesian models (HANK) and ii) deviations from rational expectations: behavioural New Keynesian models, k-level rationality, lack of common knowledge/higher-order beliefs. These proposed remedies are discussed in more detail in sections "Heterogeneous agent New Keynesian models and forward guidance" and "Departures from the assumptions of rational expectations and forward guidance".

The proposed remedies to the forward guidance puzzle are closely linked to the monetary policy transmission mechanism in New Keynesian macro models. Roughly speaking, the transmission mechanism can be decomposed into two parts: a) direct/partial equilibrium effects: intertemporal substitution; b) indirect/general equilibrium effects: income effects, Keynesian multipliers.

The *direct effect* of monetary policy is the portion of monetary policy transmission that would take place if consumers only took into consideration the announced change in monetary policy, while assuming that the rest of the economic environment, for example aggregate economic activity, would remain unchanged. The direct effect essentially boils down to intertemporal substitution. For example, after a (promised) drop in the (current or future) interest rate, households frontload their consumption, i.e. they move it from the future towards the present.

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7. Early papers addressing the forward guidance puzzle include Laséen and Svensson (2011) and Verona et al. (2013).

8. Assume that (in period t, or today) the central bank promises to lower interest rates at some future date T. This triggers consumers to increase their consumption in period T, and since output is demand driven (in the short run), also period T output goes up. But higher period T consumption and output encourages people to consume more in period T-1, and also period T-1 output goes up. Following the same logic backwards in time, one can conclude that output rises in every period between today (when the interest rate drop is promised) and period T (when the promised interest rate drop is implemented).

The *indirect effects* of monetary policy result from consumers, or economic agents, reacting to changes in the macro economy. Due to the direct effect, discussed above, more accommodative monetary policy boosts aggregate demand and aggregate output. But higher aggregate output results in higher income, which boosts aggregate demand, which boosts aggregate output, and so on. These *general equilibrium* effects essentially resemble a Keynesian multiplier.[9]

To summarize the proposed remedies, in heterogeneous agent New Keynesian models, the direct/partial equilibrium effect of monetary policy is weakened, while the indirect/general equilibrium effects are typically reinforced. When the assumption of rational expectations – or more generally the assumption of perfect rationality – is relaxed, the general equilibrium effects of monetary policy are typically muted. Therefore, the effectiveness of forward guidance is diminished to perhaps more plausible and realistic levels.

Heterogeneous agent New Keynesian models and forward guidance

The key starting point in heterogeneous agent New Keynesian (HANK) models is that people are different, and they face different idiosyncratic (or individual specific) shocks: for example, a person may find or lose a job, fall ill, or be more or less fortunate in their personal investments. Furthermore, these idiosyncratic shocks are uninsurable (whereas in the standard New Keynesian model all consumers belong to a large representative household, which provides insurance against all idiosyncratic shocks). In particular, after a sequence of adverse shocks, the household may become borrowing constrained (Kaplan and Violante (2018); Kaplan et al. (2017); Ravn and Sterk (2017)).

In the HANK models, the *direct, partial equilibrium, effect* of forward guidance is weakened. An individual consumer is less inclined to increase his consumption today in response to promised laxer monetary policy in the future. In order to take advantage of the announced future interest rate drop, the consumer should run down his assets, or incur debt, and then pay back in the future when interest rates are lower. But in the meantime, before the drop in interest rates takes place, the consumer may become unemployed or face other adverse (idiosyncratic) shocks, so that the asset cushion would be needed (McKay et al. (2016)).

Indirect effect of monetary policy (income effects, Keynesian multipliers) in HANK models. When people (may) face borrowing constraints, current income becomes a more important determinant of current consumption, as opposed to some measure of permanent income, or life cycle income. In other words, the marginal propensity to consume from current income increases, at the individual level, as well as at the aggregate level. This then strengthens the Keynesian multiplier, and the indirect income effects of forward guidance are more powerful in heterogeneous agent New Keynesian models than in the standard representative household model (Werning (2015)).[10]

9. In standard representative household New Keynesian models the direct effect of monetary policy tends to be much stronger than the indirect effects. This is basically because in these frameworks consumption depends on (some version of) permanent income, and while monetary policy affects current income streams, it tends to have very limited impact on permanent income. However, the indirect/general equilibrium effects become relatively more important at longer horizons of forward guidance.

To sum up, HANK models change our view of the monetary policy transmission mechanism, compared with the pre-crisis New Keynesian paradigm, which relied on the representative household assumption. However, it is still unclear whether heterogeneous agents, by themselves, can resolve the forward guidance puzzle. The key issue seems to be whether the weakening of the partial equilibrium effect of monetary policy announcements outweighs the stronger general equilibrium effect: McKay et al. (2016) and Kaplan et al. (2016) obtain this result, implying that HANK models help to resolve the forward guidance puzzle. On the other hand, Werning (2015) and Fahri and Werning (2017) show the opposite case is also possible.

Departures from the assumptions of rational expectations and forward guidance

Many of the departures from the rational expectations assumption aim to weaken the indirect general equilibrium effects of promised future monetary policy: boundedly rational economic agents do not take all the general equilibrium effects into account. Since the importance of general equilibrium effects, vis-à-vis partial equilibrium effects, is significant for promised future policies, the power of forward guidance is weakened.

Garcia-Schmidt and Woodford (2015) and Fahri and Werning (2017) drop the assumption of rational expectations and replace it with k-level rationality. The implications of k-level rationality, or k-level thinking, can be understood by considering the Keynesian multiplier process imbedded in the indirect effects of monetary policy: laxer monetary policy boosts aggregate demand, which boosts aggregate output, which boosts aggregate demand, which boosts aggregate output, and so on. In the rational expectations equilibrium, it is implicitly assumed that consumers follow this train of thought for an infinite number of rounds. Under k-level rationality, it is instead assumed that people stop this thought process after k rounds. Under k-level rationality, the multiplier is weaker than under rational expectations, and the indirect effects of monetary policy, in particular forward guidance, are muted.

Broadly similar themes are explored by Angeletos and Liam (2017), who relax the assumption of common knowledge: people do not know for sure what others think about the future. This is important, since the indirect, general equilibrium effects of monetary policy depend on these higher order beliefs. Essentially, one should feel optimistic about the future only if other people are optimistic: if others are pessimistic, aggregate demand will be weak, and output and income will be lower. Then, if a person does not know for sure what others think, he will react less strongly to a monetary policy announcement.

Gabaix (2017) proposes a behavioural model where the power of forward guidance is weakened by economic agents' limited attention, or myopia. The agents do not pay

10. More generally, in HANK models monetary policy can affect aggregate output and inflation through income and wealth redistribution. For example, lower interest rates redistribute income from lenders to borrowers. On the other hand, monetary policy may affect equilibrium wages – possibly differently for low and high earners – and the rate of return on capital. Since the marginal propensity to consume varies between different groups (for example borrowers and low income earners typically consume a larger share of their current income than lenders and high income earners), these distributional changes translate into changes in aggregate demand and aggregate output. See Auclert (2017) and Kaplan and al. (2017) for a more comprehensive account of different income-redistribution-related transmission mechanisms of monetary policy.

attention to all the myriad aspects of the economy, instead building a simplified model of the world they live in, and use this as a basis for action. The more distant the events in the future, the less clearly the behavioural agents see them. While in the k-level rationality approach (Garcia-Schmidt and Woodford (2015); Fahri and Werning (2017)) and the higher order beliefs approach (Angeletos and Liam (2017)) the general equilibrium effects of forward guidance are muted, in Gabaix (2017) not only the general equilibrium effects, but also the partial equilibrium effects of forward guidance are weakened by agents' limited attention and myopia.

Quantitative easing

Since the onset of the financial crisis, several central banks have resorted to QE measures by purchasing a variety of assets, ranging from safe and liquid government debt to risky and less-liquid private or government debt. While QE programs differ in their implementation with respect to timing and assets purchased, they share a common objective: to stimulate the economy when conventional monetary policy cannot be used, i.e. when the policy rate reaches its nominal lower bound.

Empirical evidence on quantitative easing

QE operates primarily by affecting the yield curve, in particular by reducing longer-term interest rates. Indeed, it has been documented that central bank asset purchases led to economically meaningful declines in interest rates on a range of securities, including government bonds, agency mortgage-backed securities and corporate bonds (D'Amico and King (2013) and Gagnon, Raskin, Remach and Sack (2011) provide evidence for the US; Joyce et al. (2011) for the UK; Andrade et al. (2016) for the euro area). These declines in yields have translated into a reduction of key housing interest rates (Gabriel and Lutz (2014); Hancock and Passmore (2011)) and an increase in stock prices (Krishnamurthy, Nagel and Vissing-Jørgensen (2014)).

Quantifying the wider macroeconomic effects of QE is particularly challenging for two reasons: firstly, there is little historical precedent for these programmes; secondly, a number of other measures were adopted at the same time in response to the crisis: e.g. fiscal policy, forward guidance. Nevertheless, a number of studies seek to isolate the contribution of QE to the economic developments of the past few years by conducting a counterfactual analysis, i.e. estimating the evolution of output, unemployment and inflation in the absence of QE. The general finding is that QE policies have significantly affected the broader economy by averting significant risks both of deflation and of further decline in output or employment. The effects are generally stronger on real activity than on inflation. Increases of up to 3% are reported for US output, and up to 1% for inflation (Liu et al. (2017)). Results for the euro area point to a positive effect of QE: inflation would have been lower and output losses higher without the ECB purchase programme (Andrade et al. (2016)). Peak effects on the level of real GDP and annual inflation in the UK amount to 1.5% and 1.25%, respectively (Kapetanios et al. (2012)). In Japan, the gains from QE policies are estimated to be more modest, with a rise in industrial production by 0.4% in response to a 7% rise in the bank reserves held by the Bank of Japan (Schenkelberg and Watzka 2013).

Quantitative easing in macro models

Perhaps somewhat surprisingly, the standard view emerging from pre-crisis macro models was that quantitative easing measures are irrelevant. This property dates back to the seminal work by Wallace (1981). Wallace's irrelevance result states that alternative sizes and compositions of the central bank balance sheet have no real or nominal effect on the economy: in particular output, unemployment and inflation should not be affected by quantitative easing.[11] More recently, Eggertsson and Woodford (2003) have shown that the irrelevance holds in standard New Keynesian models, when monetary policy is constrained by the zero lower bound.

The gist of the irrelevance result is that any changes in the central bank's (or more generally the public sector's) balance sheet are crowded out by the reactions of the private sector. Essentially, any losses or gains incurred by the public sector are eventually covered by the consumers, or households, populating the economy. Thus, moving assets to the public sector balance sheet is just as irrelevant as moving them from the right pocket of a consumer to the left pocket. (The basic logic is similar to the Ricardian equivalence property that holds in many simple macro models.)

The view after the crisis is that *"the problem with QE is it works in practice, but it doesn't work in theory"* (Bernanke (2014)). Breaking the irrelevance property involves the introduction of various forms of frictions and market incompleteness into the pre-crisis macro models. In particular, financial frictions have played a key role in recent modelling. The theoretical efforts of explaining the effectiveness of QE have fallen under the *credit/liquidity channel* by Araújo et al. (2015), Del Negro et al. (2017), Driffill and Miller (2013), Gertler and Karadi (2011), Williamson (2014) etc., the *portfolio rebalancing channel* by Chen et al. (2012), Ellison and Tischbirek (2014) and the *signalling channel* by Eggertsson and Woodford (2003).

The *signalling channel* is tightly linked with forward guidance, discussed in Section "Forward guidance" above. When buying securities, whose (future) value depends on future monetary policy, the central bank puts its money where its mouth is. Hence the central bank signals that it is serious about the announcements concerning future policies. (If the central bank reneges on its promises, it will suffer losses when asset prices fall.)

In models that incorporate the *credit/liquidity channel*, financial frictions break the Wallace irrelevance result. Del Negro et al. (2017) look at the swapping of illiquid assets for liquid assets. In particular, they include some liquidity frictions in an otherwise standard DSGE model featuring nominal and real rigidities. These frictions include a standard financing constraint that allows firms to borrow only up to a fraction of the value of their current investment. The second important friction is that a firm with an investment opportunity can sell only up to a certain fraction of its illiquid (equity of other firms, commercial papers, bank loans, mortgages etc.) assets in each period. In their model, the central bank can do open market operations whereby it swaps liquid (money

11. This is close to the Modigliani-Miller and Ricardian Equivalence theorems. The Modigliani-Miller theorem states that it does not make any difference if the firm finances its new investment with equity or debt.

and government bonds) assets for these less liquid assets. This reduces the liquidity premium[12] and therefore lowers interest rates.

The financial frictions in the Del Negro et al. model could be interpreted as a proxy for the collapse of certain asset markets and collateral values of assets. The central bank can, however, at least partially help to circumvent these frictions by providing much-needed liquidity. Hence QE matters, and the irrelevance result does not hold.

In models that address the *portfolio balance channel*, market segmentation breaks the irrelevance property. Chen et al. (2012) assume that there are two types of households. The unrestricted households can save via both short and long-term bonds, but they have to pay a premium for the extra possibility that they can transform along the maturity. The restricted households can save only through long-term bonds. This heterogeneity creates separated short and long-term bond markets i.e. market segmentation. The central bank can change the maturity on the bond markets by, for example, buying at the long end and selling at the short end (Operation Twist). Swanson (2011) found that, in practice, Operation Twist yielded significant negative effects on long-term rates.

Conclusions

The financial crisis challenged the prevailing paradigm of New Keynesian macro modelling. Firstly, pre-crisis models were ill suited to handle nonlinearities imposed by the ZLB. Secondly, standard pre-crisis macro models did not include interaction between financial markets and the real economy. Thirdly, pre-crisis models were ill-equipped to analyse the effects of unconventional monetary policies like quantitative easing and forward guidance.

The new unconventional monetary policies are challenging to model. Quantitative easing seems to work in practice but not necessarily in theory. The commitment type of forward guidance seems to have huge effects in theory, whereas the softer forms of guidance applied in practice come with significantly smaller effects. Including heterogeneity, financial frictions and other forms of market incompleteness, as well as possibly non-rational behaviour, in our models appears to help to solve these puzzles. Nevertheless, these are still highly uncharted waters for research. When implementing changes in the macro models, we may also have to reconsider the transmission mechanism of conventional monetary policy.

There remain many unanswered policy and modelling questions which we did not cover in this short article, such as the policy space and cooperation between different policies. As a result of the prevailing ZLB, monetary policy space has turned out to be highly persistent. This is challenging, since the current business cycle might turn down at some point, and under such circumstances the monetary policy space is relatively limited. A related question is whether central banks should alter their inflation target or accept a more flexible price level or nominal GDP target to increase the policy space. The other interesting policy issue, not covered in this survey, is how policy coordination between

12. A liquidity premium is a premium demanded by investors when any given security cannot be easily converted into cash for its fair market value.

monetary, fiscal and financial (macro prudential and regulatory) policies should be arranged.

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Reports of the Phillips curve's death are greatly exaggerated

TODAY 1:00 PM • BANK OF FINLAND BULLETIN 1/2018 • MONETARY POLICY


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Inflation has remained low in the euro area in recent years. This has raised doubts over the traditional view of inflation dynamics held before the financial crisis, where inflation is understood to be a function of inflation expectations and production costs. Alternative factors have been proposed to explain the low inflation rate, including the various effects of globalisation and digitisation. In our analysis, we demonstrate that the Phillips curve remains an effective tool for understanding inflation dynamics in the euro area. The recent period of low inflation can be attributed to sharp falls in the price of oil, subdued inflation expectations and a negative output gap. The development of inflation expectations remains central to predicting the path of inflation.

Understanding inflation dynamics is key for conducting monetary policy

The objective of the ECB's monetary policy in the euro area is to maintain price stability, defined by the Governing Council as keeping inflation below but close to 2% over the medium term. Managing inflation through monetary policy is not entirely straightforward, as inflation is sensitive to a wide array of economic factors and monetary policy itself has a delayed effect on pricing.

Identifying the factors that determine inflation and understanding their effects is fundamental for the conduct of monetary policy. To illustrate this, certain factors – such as discrete changes in the tax code or individual movements in the price of oil – generally have a temporary, one-off impact on inflation and do not necessarily call for a monetary policy response. Shifts in inflation expectations, on the other hand, can lead to sustained volatility in the inflation rate and must be met with appropriate policy measures. To reiterate, monetary policy's effects on inflation are delayed, so the conduct of policy must also be forward-looking with respect to the inflation forecast. Well-timed policy has the ability to maintain price stability and moderate the effects of business cycles on the economy.

This article explores inflation dynamics through the lens of the New Keynesian Phillips curve[1], where inflation is viewed as a function of inflation expectations and marginal production costs. Marginal production costs can be thought to comprise commodity prices as well as cost-push pressures related to the business cycle. Additionally, the New Keynesian Phillips curve can be used as a framework for predicting the path of inflation, when projected values of the function's variables are used as its input.

It has recently been argued that inflation might be subject to a variety of factors that lie outside the parameters of the Phillips curve.[2] One frequent argument is that the increasingly competitive conditions ushered in by globalisation and digitalisation might have a mitigating impact on inflation.[3] The global output gap has also been suggested as an influencing factor together with the degree of domestic economic slack. Others have proposed that inflation and the output gap share a nonlinear relationship.[4] Finally, it is argued that globalisation has weakened employees' bargaining power, lowering wage inflation and, subsequently, consumer price inflation.

Despite these hypotheses, our analysis suggests that the New Keynesian Phillips curve does well in approximating inflation dynamics in the euro area. The low rate of inflation in recent years is largely explained by significant falls in the price of oil, subdued inflation expectations and a negative output gap. As such, the Phillips curve appears to retain its effectiveness in forecasting inflation for the conduct of monetary policy.

Inflation as depicted by the New Keynesian Phillips curve

According to the New Keynesian Phillips curve, current inflation is a function of inflation expectations and production costs. The importance of inflation expectations is explained

1. Several variants of the Phillips curve exist. The eponymous curve was proposed by William Phillips, who in 1958 published a paper demonstrating an inverse relationship between unemployment and wage inflation in Great Britain over 1861–1957. The New Keynesian Phillips curve was first empirically tested by Galí and Gertler (1999). For an extensive overview of recent empirical findings concerning the New Keynesian Phillips curve, refer to Mavroeidis, Plagborg-Møller and Stock (2014).
2. For example Carney (2017), Constâncio (2017), Draghi (2017) and Yellen (2017) evaluate possible causes for low inflation outside of the Phillips curve.
3. Auer, et al. (2017) and Gross & Semmler (2017).
4. Dhyne et al. (2005) calculate that the price of a product or service in the euro area changes on average once over an approximately 12-month period.

by price stickiness; since the nominal values of wages and prices are updated infrequently, expected price movements must be taken into account when setting present-day wages and prices.[5] Therefore, inflation expectations, whether low or high, have an immediate effect on current inflation. This has the risk of becoming self-perpetuating, creating a scenario where low inflation is by and large the result of low inflation expectations.

Another key factor when considering price changes is the overall development of cost pressures associated with output, i.e. the level of marginal costs.[6] Both domestic and international factors influence the formation of marginal costs. In the New Keynesian Phillips curve, domestic cost pressures are often measured by the output gap,[7] which estimates the degree of capacity utilisation within the economy. During cyclical downswings, firms are faced with unused capacity in production but enjoy relatively unrestricted access to labour, while during upswings, this situation is reversed. Production costs are particularly sensitive to developments in unemployment. The very fact that production costs are influenced by cyclical conditions forms the relationship between inflation and business cycles.

Exchange rates and the development of commodity prices, particularly oil, are the most significant international factors that contribute to output costs. Oil is ubiquitous to most production chains and at the very least determines transportation costs. Currency depreciation contributes to inflation by raising the prices of imported goods.

The economic factors that serve as the Phillips curve's inputs can be approximated by a number of alternative methodologies. As a result, the model does not produce an entirely unambiguous estimate of inflation. Inflation expectations can be survey-based (e.g. the ECB's Survey of Professional Forecasters, or SPF) or market-based (e.g. the prices of inflation swaps on financial markets).[8] In our analysis, inflation expectations are based on the mean of SPF results and swap values.[9] Data on the output gap are obtained from ECB estimates. External cost pressures are represented by the euro–dollar exchange rate and the dollar price of Brent Crude. Based on these data, the Phillips curve can be applied to explain month-on-month changes in the Harmonised Index of Consumer Prices (HICP) in the euro area.[10]

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5. A hybrid variant of the New Keynesian Phillips curve does exist, where lagged (i.e. realised) inflation also serves as a variable determining the level of inflation. Price indexation could serve as justification for this. The backward-looking variable (i.e. lagged inflation), however, risks overweighting the effects of recent years' large but transient shocks to the economy, such as the previously mentioned volatility in the price of oil. For this reason, a strictly forward-looking variant of the Phillips curve has been adopted for the purpose of this analysis. Galı´, Gertler and López-Salido (2001) explore the differences between the variants of the model but conclude that a strictly forward-looking model is effective in depicting euro area inflation.

6. Marginal costs are defined as the increase in costs when production is increased.

7. See e.g. Galí (2008).

8. Inflation swaps are financial instruments used to hedge against future inflation. Inflation expectations extracted from inflation swaps are often used as a measure of the market's inflation expectations. For further detail, see Bank of Finland Bulletin (2016).

9. Inflation expectations covering a one-year time horizon are sourced from SPF results. Data extracted from the price of inflation swaps are also used to represent inflation expectations over a one-year period but with an inspection horizon beginning one year into the future.

In our analysis, the equation[11] for the Phillips curve is:

$$Inf_{MoM,t} = 0{,}96Inf_{Exp,t} + 0{,}12y_t - 0{,}010fx_t - 0{,}012fx_{t-1} + 0{,}017oil_t + 0{,}005oil_{t-1} + e_t,$$

where $Inf_{MoM,t}$ is the monthly, seasonally adjusted annual rate of the total index, $Inf_{Exp,t}$ inflation expectations one-year-ahead and y_t the output gap. The variables fx_t and oil_t are external cost pressures, i.e. monthly changes in the exchange rate and oil price, where one-month lagged values are also factored in. The share of inflation left unaccounted for by the model's input variables is represented by the residual e_t. The variables are accompanied by multipliers based on appropriate estimates.[12]

By inputting these data into the Phillips curve, it is possible to assess the impact each of the variables has on the inflation rate. Our results show that a single percentage point shift in inflation expectations produces a similar shift in the inflation rate. The effects of the output gap are much less, at approximately one tenth of a percentage point, whereas a 10% depreciation in the exchange rate or a 10% hike in the price of oil both raise inflation by approximately 0.2 of percentage point over the course of a few months. These results are consistent with the conventional understanding of inflation formation.

Why might the Phillips curve fail to capture inflation?

Recently the Phillips curve has been criticised for having lost its ability to approximate the dynamics of inflation. This critique is based on observations where economic growth, and the accompanying closing of the output gap, has not led to expected gains in the inflation rate, effectively implying that inflation has become less sensitive to the business cycle. Evidence of this arose during the financial crisis when the United States' deeply negative output gap did not result in a negative rate of inflation.

One theory holds that inflation dynamics have been altered by the increased global integration of the goods and labour markets: global economic conditions (i.e. the global output gap) may weigh more heavily on domestic price formation. Others point towards the disruptive effects of technology and digitisation on the formation of wage-push inflation. It has also been suggested that the output gap and inflation do not actually share the linear relationship widely assumed in economic models.

The expansion of global trade has had obvious impacts on commodity prices and imports, but it might have also influenced inflation dynamics through other channels. In a speech, Yellen (2017) touched upon the potential for global value chains and the threat

10. Consumer prices are based on the seasonally adjusted index released by the ECB. These adjustments control for price volatility caused by seasonal disturbances such as discount shopping days and holidays.
11. The estimate's inspection horizon is 1999M1–2017M12.
12. These multipliers are obtained by applying the ordinary least squares (OLS) method and are all statistically significant.

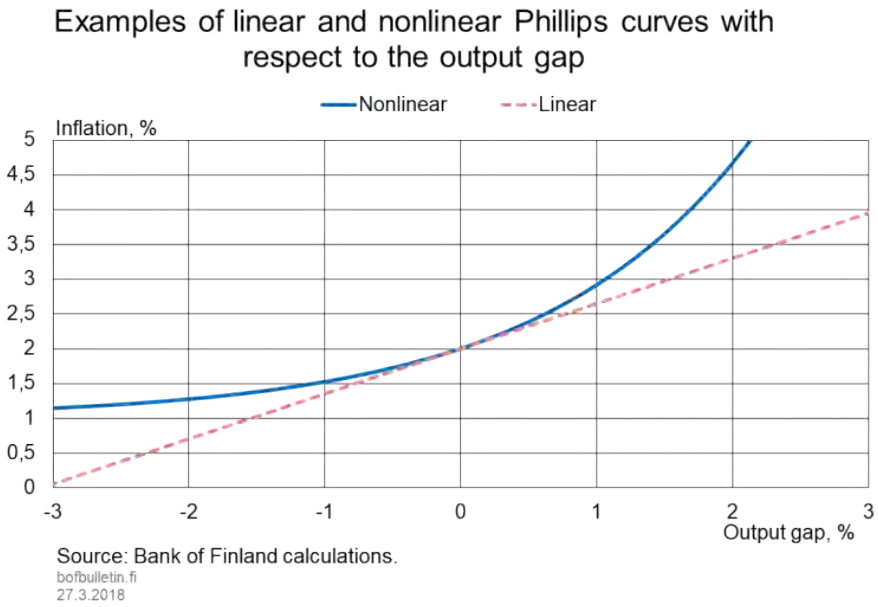
of outsourcing to reduce workers' leverage in wage negotiations. Autor et al. (2016) observe that in the United States unemployment has increased and wages declined particularly in the regions whose industries are under the most pressure from Chinese imports.

In the advanced economies, the rise of global value chains may have reduced the domestic output gap's role in price formation, causing inflation dynamics to become more dependent on global economic conditions (Auer et al., 2017). Domestic cost factors would then have less of an influence on price formation and the development of marginal costs.

This disruptive potential of technological innovation and digitalisation is well evident in the increased adoption of automation. Concerns have been raised about automation's ability to restrict wages growth, especially for middle-income earners in professions undergoing rapid technological change (IMF, 2017). In addition, structural changes on labour markets have reduced uniformity in the labour supply, reducing the bargaining power of workers in wage negotiations. For example, the prominence of zero-hour contracts, fixed-term positions and part-time work have all increased (Haldane 2017). Digitisation has also increased competitive pressures on the goods markets, owing to what has been termed 'Amazonisation', where online commerce has caused traditional retailers to see their pricing power diminished, effectively reducing their profit margins and lowering prices (see discussion, Curran & Jamrisko 2017).

Finally, according to traditional theory, the output gap has a linear relationship with the inflation rate; however, it is plausible that inflation might become more sensitive to output in economic upswings and less so when cyclical conditions deteriorate (Chart 1). This could explain inflation's seemingly obtuse behaviour during the financial crisis as well as the post-crisis recovery. According to Gross & Semmler (2017), the Phillips curve would suggest these sorts of nonlinearities in the euro area.

Chart 1.



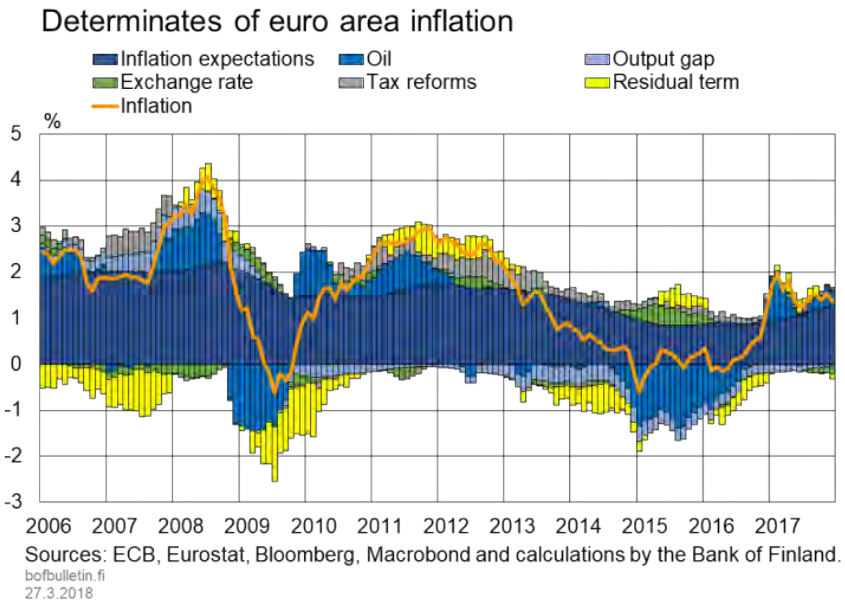
Using the Phillips curve to approximate euro area inflation dynamics

In our analysis, we apply the New Keynesian Phillips curve to approximate inflation dynamics based on inflation expectations, the output gap, the oil price and the exchange rate. Should these endogenous factors fail to capture the dynamics of inflation, then our model's residual term ought to grow over time.[13] In such an event, alternative factors (such as those outlined in the previous section) would be greater determinants of euro area inflation.

However, the Phillips curve does relatively well in capturing the recent path of inflation (Chart 2). The inflation rate fell from just over 2% in 2012 to almost zero for the duration of 2015 and 2016. This is explained by three factors. First, the fall in the price of oil dragged down inflation by over 1 percentage point. Second, the cyclical downswing created a sustained negative output gap, which further subdued inflation. According to current estimates, the negative shift in the output gap caused by the financial crisis lasted for approximately 8 years, beginning in 2009. Third, inflation expectations weakened drastically after 2013.

13. The effects of tax reforms have been factored into our analysis, complementing the Phillips curve's internal parameters. Inflation is particularly sensitive to consumption tax, as it directly affects the prices of goods and services. This can be controlled for by referencing a price index series at constant tax.

Chart 2.



Our model also explains the inflation rate's acceleration to approximately 1.5% in 2017. The uptick in inflation was backed by trends anticipating inflation growth as well as the lifting of factors that temporarily inhibited inflation. Inflation was spurred on by increases in the prices of food and oil in early 2017 as well as the dissipation of base effects caused by fluctuations in the oil price a year earlier. Most significant for sustained inflation growth was the recovery of inflation expectations from 2015's subpar levels. In addition, the gradual narrowing of the output gap and increase in domestic cost-push pressures has also supported the acceleration in inflation.[14]

Our model based on the Phillips curve appears to capture the euro area's inflation dynamics reasonably well, although its ability to do so was considerably weaker during the crisis years. The financial crisis was, however, a period of exceptionally turbulent economic conditions. It is not surprising that models designed to approximate the dynamics of the economy in normal conditions fail to do so during crises. It is also significant that our model's residual term, as discussed earlier in this section, did not exhibit growth over time. As our model appears to approximate recent inflation dynamics relatively well, it should be safe to conclude that the reports of the Phillips curve's death are greatly exaggerated.

Inflation expectations key for the long-term inflation outlook

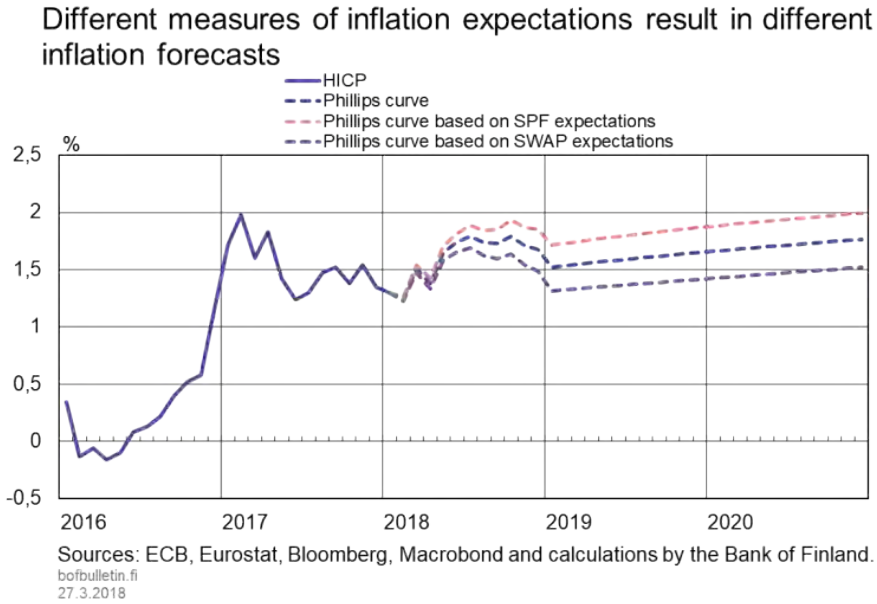
The Phillips curve presented in this article can be used to forecast the path of inflation by supplementing variables with their projected values. In Chart 3, the centre dotted line represents the projected path of inflation for the immediate years ahead when inflation expectations are based on the mean value of the SPF and expectations held by financial

14. According to their most recent estimates, the IMF, European Commission and OECD all expect the output gap to turn positive no later than some time in 2018.

markets (i.e. the prices of inflation swaps). Should inflation expectations prove to be higher than this (e.g. closer to the estimates given in the SPF), inflation would be considerably stronger. Similarly, inflation would be lower if expectations leaned towards the more modest estimates held by market participants. Chart 3 illustrates how inflation expectations guide inflation over the medium-term. Our example shows that estimates on where inflation will fall in three years range between 1.5% and 2%, depending on the course of inflation expectations.

The model's inflation forecast is not, however, solely determined by inflation expectations, but also its other variables. In other words, changes in the output gap, oil price and exchange rate will also alter the forecast path of inflation. The inflation paths depicted in Chart 3 are based on the assumption that the price of oil and the exchange rate remain constant at early 2018 levels. The output gap is assumed to develop along the path as predicted in the Eurosystem's macroeconomic projections published in December 2017.

Chart 3.



Calculations reveal that even if the oil price were to remain unchanged with respect to its levels in early 2018, its price increases in 2017 will continue to contribute to inflationary pressures throughout the year. This base effect, caused by atypical price volatility during the index reference period, will have vanished by 2019–2020. In a similar vein, the effects of previous shifts in the exchange rate will continue to be felt in 2018's inflation path. These factors, however, will have a one-off impact on the inflation rate and disappear over the longer term. Should the oil price and exchange rate remain unchanged, inflation forecasts for 2019–2020 will largely be determined by the performance of inflation expectations and the output gap. Under these circumstances, the inflation rate is expected to steadily accelerate. The output gap's transition from negative to positive, caused by the recovery in the real economy, will raise inflation by a mean of approximately 0.1–0.2 of a percentage point by the end of the forecast horizon.

Over the longer term, inflation expectations are the most important factor that determine the inflation rate.

Inflation dynamics can still be approximated by the Phillips curve

In this article, we have demonstrated that the New Keynesian Phillips curve can effectively approximate inflation dynamics within the euro area. The shortfall in inflation during 2015–2016 is largely explained by the effects of the negative output gap as well as significant drops in the oil price and inflation expectations. The base effect caused by the earlier fall in the oil price has since dissipated and the oil price itself has firmed up. These factors have contributed to inflation growth. Furthermore, the output gap has closed on the back of strong economic growth. Yet with inflation expectations only improving slightly, the rate of inflation remains subdued on the whole.

It has been argued that the recent period of low inflation might be caused by changes in inflation dynamics that are unaccounted for in the Phillips curve. Evidence of this, however, remains weak. According to the ECB (2017b) and Mikolaju & Lodge (2016), the influence of global factors on euro area inflation dynamics has remained slight, commodity prices notwithstanding. Neither Yellen (2017) nor Draghi (2017) attribute much weight to the global output gap's effects on inflation dynamics. Globalisation may have reduced workers' leverage in wage negotiations, lowering wage-push inflation, but the IMF (2017) notes that slow wage growth can at least partially be attributed to weak productivity growth. It remains unclear what effects digitalisation might have on inflation. According to the ECB (2015), electronic commerce's impact on inflation has remained slight, at approximately 0.1 of a percentage point on annual inflation. Finally, there is still insufficient evidence to conclude that the relationship between the output gap and inflation is nonlinear (Yellen, 2017).

According to our analysis, the Phillips curve's residual term does not display growth over time, suggesting that 'traditional' factors still play a central role in determining inflation. Despite this, our model does not reveal why inflation expectations have remained low. Indeed, low expectations appear to be the primary cause for inflation's subdued performance. It is plausible that the disruptive potential of globalisation and digitalisation on the goods and labour markets is manifested in inflation expectations. However, while it is important not to underestimate the impact of prevailing megatrends, the Phillips curve remains a formidable tool for understanding the dynamics of inflation.

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