Inflation, unemployment and monetary policy – new research findings

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On 15 February 2013 the Riksbank organised a full-day seminar on the theme "Inflation, unemployment and monetary policy". The seminar brought together academics and central bank economists from Sweden and abroad. The purpose was to discuss some new studies of the relationship between inflation and unemployment, and the role unemployment and employment should play in the monetary policy framework. This article summarises the papers presented and the discussions held at the seminar.

Introduction

It's now been 20 years since the inflation target was introduced in Sweden.[1] As a monetary policy regime, inflation targeting has worked well. Its greatest merit is that it has provided the Swedish economy with a nominal anchor – it has been successful in anchoring inflation expectations to the inflation target. Following the introduction of the inflation target, inflation in Sweden fell from the two-digit figures observed in the 1970s and 1980s to slight fluctuations close to the 2 per cent target (see Figure 1). In addition, contrary to what many feared, GDP growth did not turn out to be lower because of this; rather slightly higher (Figure 2). During this period, Sweden has also become an EU member, the fiscal policy framework has been strengthened, new rules and regulations have led to wage formation that functions better and product markets have been deregulated. Together with these reforms, inflation targeting has helped to create better fundamentals for growth, although it is difficult to determine the exact significance of the monetary policy conducted. Indeed, various studies about the development in countries with and without inflation targets have not led to any clear conclusions about the way in which the introduction of an inflation target affects growth. Yet, there nevertheless appears to be a consensus view that a transition to an inflation target does not affect growth negatively.[2]

1   The inflation target was announced in January 1993, but started to apply officially to the annual CPI increase as of 1995. See also the article "The development of inflation in a longer perspective" in Account of Monetary Policy 2012, Sveriges Riksbank.
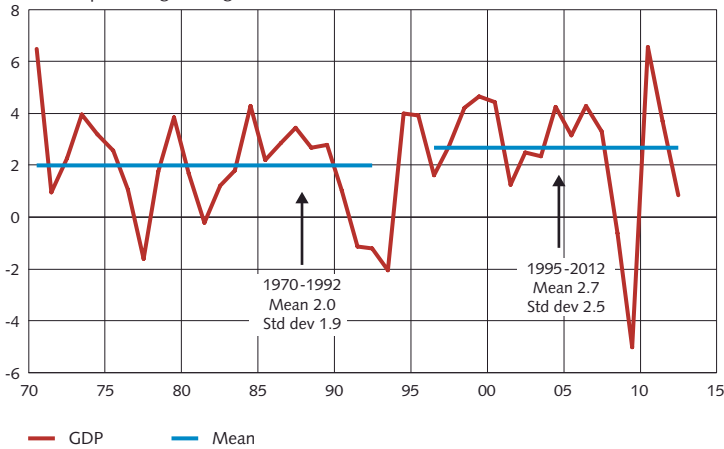2   See Ball (2010) and Svensson (2010).

Figure 1. CPI in Sweden
Annual percentage change, monthly data

1971-1992
Mean 8.3
Std dev 3.0

1995-2012
Mean 1.3
Std dev 1.2

— CPI inflation   — Mean
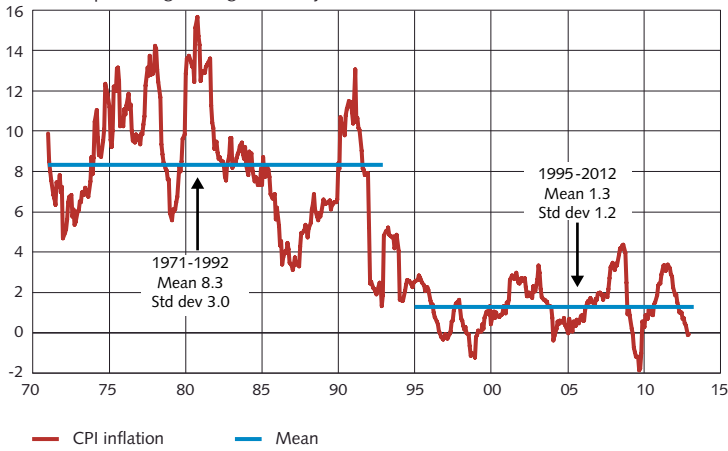
Source: Statistics Sweden

Figure 2. GDP in Sweden
Annual percentage change, annual data

1970-1992
Mean 2.0
Std dev 1.9

1995-2012
Mean 2.7
Std dev 2.5

— GDP   — Mean

Source: Statistics Sweden

Developments on the Swedish labour market have, however, been much less favourable. Unemployment rose to over 10 per cent after the banking crisis at the outset of the 1990s, and although it decreased during the latter part of the 1990s, it never came back down to the pre-crisis levels (see Figure 3). And, after the latest global financial crisis, unemployment increased again in both Sweden and other countries.

Figure 3. Unemployment in Sweden
Per cent of the labour force, aged 16-64
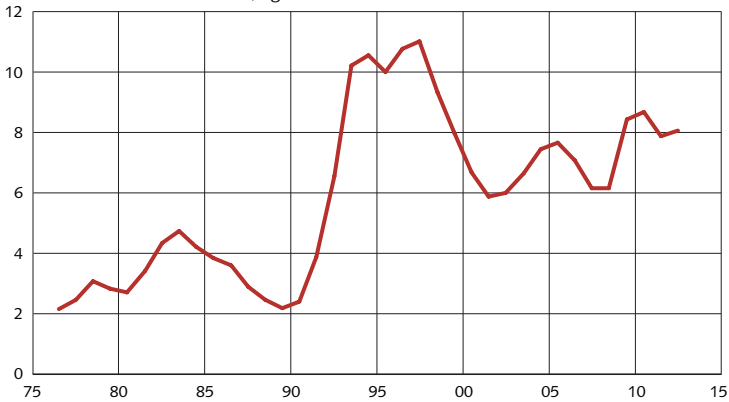
Source: Statistics Sweden

In light of the deep global recession which followed in the wake of the financial crisis, it is not surprising that unemployment has risen. There are, however – at least in Sweden – clear signs that much of the rise in unemployment is structural in nature; that is, it has more to do with the functioning of the labour market than the state of the economy. For example, there are indications that matching between job seekers and vacant positions does not function as well as it did before, among other things because of changes in the composition of the working-age population. Unemployment is also higher for certain groups that are weakly linked to the labour market. In addition, geographic mobility has decreased and the average period in unemployment has increased. At the same time, company recruitment periods have lengthened, suggesting that it is now more difficult for companies to find the competence they seek.[3]

What can monetary policy do to counteract unemployment?

The prevailing view in economic theory is that monetary policy can counteract cyclical unemployment by influencing demand in the economy. In the long term, however, monetary policy cannot influence any real variables, and hence not unemployment either. A way to express this is to say that the Phillips curve (the relationship between inflation and unemployment) is vertical in the long term, so there is no long-term trade-off between unemployment and inflation. However, rising unemployment in recent years has nevertheless evoked a debate about the role monetary policy should play in counteracting more long-term labour market trends.[4]

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3   See for instance the article "Has the functioning of the labour market changed?" in the Monetary Policy Report published in October 2012, Sveriges Riksbank.

4   This debate is also being conducted in other countries, such as in the USA, where unemployment has declined relatively slowly in the recovery of the past few years.

How does this debate tally with the customary view that monetary policy cannot influence unemployment in the long term? Is there nevertheless a long-term trade-off between inflation and unemployment? And, if so, what are the implications for monetary policy? In order to gather knowledge about what current research has to say about these and other closely related matters, the Riksbank arranged a full-day seminar on the theme "Inflation, unemployment and monetary policy" for academics and central bank economists from Sweden and abroad. During the seminar, the significance of various economic relationships and explanations were discussed which led to diverging conclusions about the role of monetary policy in reducing unemployment. Table 1 shows the papers presented at the seminar.

Table 1. Papers presented at the seminar

"Inflation Dynamics and the Great Recession: An Update"
Authors: Indra Astrayuda, Johns Hopkins University, Laurence Ball, Johns Hopkins University, och Sandeep Mazumder, Wake Forest University
Discussant: Henrik Jensen, University of Copenhagen

"The Case for Temporary Inflation in the Eurozone"
Authors: Stephanie Schmitt-Grohé, Columbia University, och Martín Uribe, Columbia University
Discussant: Nils Gottfries, Uppsala University

"Forecasting Inflation"
Authors: Jon Faust, Board of Governors of the Federal Reserve System, och Jonathan H. Wright, Johns Hopkins University
Discussant: Ragnar Nymoen, University of Oslo

"The Possible Unemployment Cost of Average Inflation Below a Credible Target"
Author: Lars E.O. Svensson, Sveriges Riksbank
Discussant: Lars Ljungqvist, Stockholm School of Economics and New York University

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"Notes for a New Guide to Keynes (I): Wages, Aggregate Demand, and Employment"
Author: Jordi Galí, Centro de Recerca en Economia Internacional, Universitat Pompeu Fabra
Discussant: Per Krusell, Institute for International Economic Studies, Stockholms University

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A matter discussed was how unemployment and inflation are affected by inflation expectations being well-anchored to the inflation target. The stable inflation expectations are a sign that inflation targeting has been successful. If monetary policy is credible and inflation expectations are well-anchored, the short-term trade-off between inflation and resource utilisation (unemployment, for example) will be more favourable. In other words, inflation will be more stable and less affected when resource utilisation fluctuates. This can be part of the reason why inflation in many countries has not fallen as expected when unemployment has risen, since wage claims, for example, are based on inflation expectations that are stable around the inflation target.

Stable inflation expectations can also lead to the emergence of a long-term trade-off between inflation and unemployment. If over a long period the actual average rate of inflation is below the inflation target while, for example, wage demands are based on

expectations of inflation being close to the target, real wages and hence unemployment might be higher, even in the long term. It is therefore particularly important that inflation does not fall below the inflation target if inflation expectations are well-anchored to the target.

Another matter that relates to the labour market is how rigidity in wage formation affects unemployment and inflation. If wages are sluggish and do not decline despite the economy being in a deep recession, unemployment will be unnecessarily high. Many countries in the euro area exemplify this, with unemployment having risen in recent years, but without any great extent of wage adjustment. A potential resort could then be, by means of more expansive monetary policy, to temporarily increase the rate of inflation in the entire euro area in order to reduce real wages and boost employment in these countries.

Wage rigidity can thus affect economic welfare through unnecessarily large fluctuations in employment over time. This rationale is based on Classical economic theory, which focuses on how wages affect companies' costs and hence production and employment. The Keynesian theory finds instead that employment is determined by aggregate demand, so wage levels are of no direct consequence to employment. The more contemporary New Keynesian theory combines insights from Classical and Keynesian theory. In such models, wage changes can affect employment and aggregate demand directly, but exactly how depends to a great extent on how monetary policy is designed. A result discussed at the seminar was that, according to New Keynesian models – unlike Classical models – it is not certain that welfare improves with more flexible wages.

Monetary policy works with a lag and must therefore be based on projections about inflation and other economic development variables. Good forecasts are thus key to well-balanced monetary policy. At the seminar, different inflation forecasting methods were therefore also discussed. Central banks use different models and methods to capture the current state of the economy and establish forecasts of economic development ahead. Structural economic models are based on economic theory and attempt to capture the functioning of the economy. Statistical models are instead less strictly related to economic theory and are used to identify usable statistical relationships between different variables. Also, judgements are used to interpret the development according to various surveys, and draw overall conclusions from the results of various models.

However, according to the evaluation of various forecasting methods described at the seminar, attempts to capture more complicated cyclical patterns do not generally lead to better inflation forecasts. More advanced models cannot improve a relatively simple forecast which starts with a good nowcast of inflation and then gradually glides towards the long-term mean value of the inflation rate. Yet, such methods and models can nevertheless contribute to improving the monetary policy decisions and communication of central banks. For instance, an inflation forecast that deviates from the inflation target in the medium term indicates a need to adapt monetary policy.

Well-anchored inflation expectations can help resolve the "deflation puzzle"

In connection with the financial crisis and "the great recession", a phenomenon emerged in the USA (and several other countries) known as "the deflation puzzle"; inflation fell surprisingly little in relation to the sharp rise in unemployment during 2008-2010.

One way of illustrating this is to assume that inflation is determined by inflation expectations and the deviation of unemployment from trend according to a traditional Phillips curve:

$$\pi_t = \pi_t^e - \alpha\,(u_t - u_t^*) + e_t$$

where π_t^e is expected inflation, $(u_t - u_t^*)$ the unemployment gap and e_t a random term. Estimates of such a Phillips curve, with expected inflation being given by inflation in the previous period – that is $\pi_t^e = \pi_{t-1}$ – worked relatively well for explaining inflation in the USA until 2007. When unemployment rose sharply during the financial crisis, inflation in the USA ought, according to those estimates, have fallen sharply and turned into deflation. However, in reality inflation fell much less, irrespective of whether inflation is measured using CPI or CPI ex energy and food prices as a measure of underlying inflation.[5]

In a paper published in 2011, Ball and Mazumder suggest two empirical specifications of the Phillips curve that enable it to better explain the development of the actual inflation rate. Their specification involves the weighted median of CPI inflation across different sectors being used as a measure of underlying inflation, and the effect of unemployment on inflation, the parameter α, being allowed to vary over time.[6] With this new specification, the modest drop in inflation during 2008-2010 could be predicted relatively well.

However, in their contributions to the Riksbank's seminar, Indra Astrayuda, Laurence Ball and Sandeep Mazumder noted that the recent development cannot be captured by this specification either.[7] While the new specification predicts that inflation will continue to fall, the actual inflation rate bottomed out in mid-2010 and has since risen slightly. The model cannot explain this development, and a "deflation puzzle" has hence emerged again.

The authors are thus proceeding and attempting to find further explanations. One explanation could be that inflation expectations have gradually become better anchored to what is perceived to be the Federal Reserve's target for inflation. Estimates suggest that this is the case, but it only seems to be part of the reason (see Figure 4).

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5   It has also been observed that inflation has been unexpectedly stable since 2008 in other countries too, see for example IMF (2013, chapter 3).

6   See Ball and Mazumder (2011). A reason for using the weighted median inflation across different sectors is to reduce the effects of changes in relative prices, and hence temporary supply shocks, between sectors. Ball and Mazumder (2011) believe that median inflation is a better measure of underlying inflation than the CPI ex energy and food prices, because it better eliminates the effects from the supply shocks that occurred during the studied period.

7   See Astrayuda, Ball and Mazumder (2013).

Figure 4. Dynamic forecasts of median inflation in the USA, 2008-2012, based on a Phillips curve with inflation expectations anchored at 2.5 per cent
Per cent
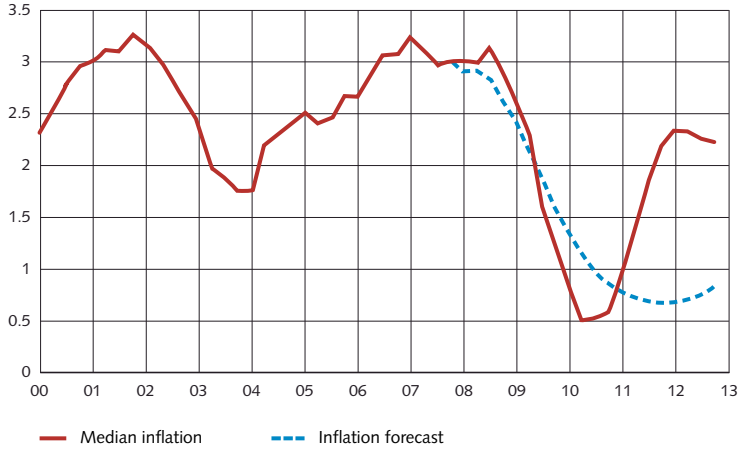
Source: Astrayuda, Ball and Mazumder (2013, Figure 7)

Another reason could be that not all unemployment affects inflation. People who have been unemployed for relatively long periods may be more weakly linked to the labour market and be less attractive to employ. They may then have less of a restraining effect on wage formation. When unemployment is defined based on people who have been unemployed for less than 15 weeks, the explanatory degree increases in the Phillips curve estimate. This is because unemployment, according to this definition, is largely back at the pre-crisis level (and thus therefore no longer has a restraining effect on inflation).

The subsequent discussion focused a lot on how inflation expectations should be measured and modelled. In the empirical analysis, the authors assume that the expectations are backward-looking and are determined by an average of the inflation rate in previous years. However, exactly how the expectations are specified is of great consequence. If it is instead assumed that the expectations are forward-looking, the estimated slope of the Phillips curve is flatter and no longer statistically significant. Unemployment then has less of an effect on inflation, which helps explain the "deflation puzzle". Another possibility is to use different measures of inflation expectations (such as from surveys) for estimating the Phillips curve.

Some participants also found that the theory behind the relationship between inflation and unemployment is unclear. In contemporary New Keynesian theory, inflation is driven by the marginal costs of companies, which are largely determined by the wage trend. The link with unemployment is more complicated. In order to understand the development in inflation according to that theory, wage data could therefore be used to estimate the Phillips curve.

Do well-anchored inflation expectations and sub-target inflation bring about higher unemployment?

During the period 1997-2011, CPI inflation in Sweden was 1.4 per cent on average, and hence 0.6 percentage points below the inflation target.[8] An important question is whether this has had any consequences in real terms. According to the mainstream of economic theory, there is a short-term trade-off between inflation and unemployment, such as in the Phillips curve above, but there is no such trade-off in the long term. In his contribution to the seminar, Lars E.O. Svensson notes, however, that inflation expectations have been very stable around the inflation target and have been on average close to 2 per cent despite actual inflation having fluctuated and having been lower than the inflation target on average.[9] This can lead to a long-term relationship between inflation and unemployment. Svensson argues that inflation falling below the inflation target has therefore had real consequences in terms of unemployment being higher than necessary on average.[10]

If households and companies have rational expectations, inflation expectations over a long period of time should on average coincide with actual inflation. A potential explanation for inflation expectations being higher on average than actual inflation is based on the theory of "near-rational" expectations.[11] In this context, such expectations can be interpreted such that when the actual inflation does not deviate too much from the 2 per cent inflation target, many households and companies disregard this deviation and behave as though inflation were on target. For example, wage negotiations can be based on CPI inflation being 2 per cent ahead, despite inflation having been slightly lower than 2 per cent on average.

The consequence is real wages being higher than expected, and unemployment therefore being higher than its long-term sustainable level. The long-term Phillips curve is then no longer vertical (as in the case of rational expectations), but slopes downwards. In this case, there is thus a trade-off between inflation and unemployment, with unemployment being higher in the long run when inflation is lower.

Svensson estimates the Phillips curve for Sweden over the period from 1997 to 2011. According to the estimates, the long-term Phillips curve has a negative slope of around -0.75, see Figure 5.[12] Because actual CPI inflation has fallen below the target by 0.6 percentage points on average, this estimate means that unemployment was on average 0.6/0.75=0.8 percentage points higher than it would have been had inflation been on target. However, there is a certain degree of uncertainty in this estimate. With a 95 per

8   The average pertains to the inflation series to which the Executive Board had access when the monetary policy decisions were made. The calculation method for CPI was changed in 2005. The average of the now official (revised) inflation rate is slightly lower. See Andersson, Palmqvist and Österholm (2012).
9   See also IMF (2013, chapter 3) for a discussion about how inflation expectations have stabilised around inflation targets in a number of OECD countries, and the implications of this for the relationship between unemployment and inflation and for monetary policy.
10   See Svensson (2013).
11   See Akerlof, Dickens and Perry (2000).
12   Svensson estimates the long-term Phillips curve in several ways, and selects a slope of -0.75 as a benchmark.

cent confidence interval, the cost in terms of higher unemployment could have been between 0.6 and 1.5 percentage points.[13]

Figure 5. Unemployment and CPI inflation, 1976Q1-2012Q3, and the benchmark long-term Phillips curve in Sweden
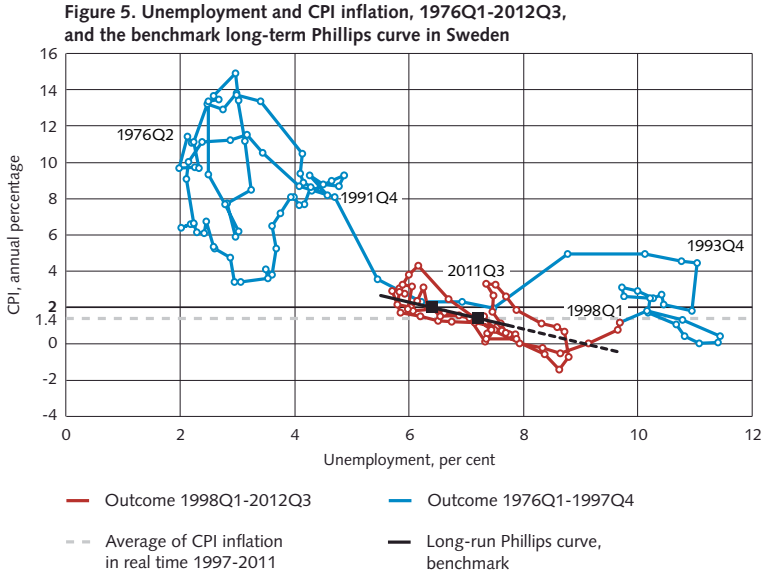
Source: Svensson (2013, Figure 10)

In an international comparison, Svensson notes that in certain other countries with inflation targets, inflation has on average been very close to the target during the same period. In the UK, however, inflation exceeded the target by 1.4 percentage points on average during 2008-2011.

According to Svensson, the downward-sloping long-term Phillips curve should not, however, be used to reduce unemployment by means of the central bank secretly aiming at higher inflation. This would be incompatible with transparent monetary policy and participants in the economy would eventually realise this were the case, which would undermine the credibility of the inflation target. Svensson's conclusion regarding inflation targeting is that the central bank should ensure that the average inflation over a long period be kept close to the target. This could be achieved with a price level target, whereby monetary policy, instead of attempting to stabilise inflation year by year, endeavours to stabilise the price level around a rising trend, so that inflation is close to the target on average.

The subsequent discussion then primarily focused on how the regression results ought to be interpreted given the theoretical model. Some participants pointed out that the relationship in the Phillips curve will only be valid in the long term if it is assumed that inflation expectations are constant. However, this assumption is never explicitly tested in the paper. Others noted that different measures of inflation expectations behave differently

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13 See also Söderström and Vredin (2013) for a discussion of Svensson's results.

over time. While measures from Prospera (used by Svensson in his paper) are stable around the inflation target, inflation expectations for the corporate sector as measured by the National Institute of Economic Research's survey are more variable over time, and lower than 2 per cent on average.[14]

In the discussion, it was also noted that a further implication of Svensson's results is that real wages have become higher than expected, which ought to have led to company profits being lower than expected. It would then be interesting to investigate whether support for this can be found.

Should wage rigidity in the euro area be counteracted by expansive monetary policy?

Two papers at the seminar discussed how wage formation rigidity affects the economy and unemployment in particular. In their contribution, Stephanie Schmitt-Grohé and Martín Uribe argue that a temporary increase in the inflation rate in the euro area could restore full employment in "peripheral" euro countries.[15] Their analytical framework is a stylised model of a small, open economy with a fixed exchange rate, in which nominal wages are flexible when rising, but sluggish downwards.

Despite major increases in unemployment in a number of euro countries since 2008, nominal wage levels in these countries have not decreased to any great extent (hence a sort of equivalent to the "deflation puzzle" in the paper by Astrayuda, Ball and Mazumder).[16] In the authors' model, the crisis is interpreted as an external shock which increases the real interest rate which the country must pay on its loans (the country is assumed to be a net borrower). The higher interest on loans leads to a decline in demand for nontradables.[17] Because nominal wages are sluggish downwards, no adjustment occurs through wage formation; instead, employment in the nontradables sector falls.

Schmitt-Grohé and Uribe believe it is not probable that the peripheral euro countries will take any domestic political measures to reduce unemployment. As a solution, they propose instead that the European Central Bank (ECB) temporarily increases inflation in the entire euro area. Higher inflation would stimulate the nontradables sectors in the peripheral countries by means of a reduction in real wage increases and a rise in employment. According to the analysis, employment in the so-called core countries (which do not appear to have equivalent labour market problems) is not affected because nominal wages in these countries will rise in line with the price level. The price level will then increase more in the core countries than in the peripheral euro countries, which increases demand for the goods of the peripheral countries.

14 See Flodén (2012).
15 See Schmitt-Grohé and Uribe (2012).
16 The countries discussed in the paper are Cyprus, Greece, Ireland, Portugal and Spain.
17 Goods and services included in foreign trade are referred to as tradables, while goods and services that are not exposed to international competition in the same way are referred to as nontradables.

Schmitt-Grohé and Uribe calculate that a temporary increase in inflation to 4 per cent in the entire euro area in the next five years would suffice to restore full employment in the peripheral euro countries.

The discussion then focused partly on the theoretical framework in the paper, and partly on the empirical estimates. A common theory is based on overly high salaries in the tradables-producing sector leading to poorer competitiveness and hence reduced exports. The theoretical model used by the authors focuses instead on the effects in the nontradables-producing sector, but the effects on the tradables-producing sector ought to be at least equally important. It was then discussed whether the estimates in the paper exaggerate the problem. At the outset of the financial crisis, wages were around 20-30 per cent too high in certain countries, but since then wages have been adjusted somewhat and productivity has increased. The labour cost per produced unit has therefore fallen sharply in certain countries compared to, for instance, Germany. So, the problem has perhaps become less serious. Others pointed out that labour costs had fallen mainly because production and employment have decreased, which is a sign of weakness rather than a step in the right direction.

Wage rigidity can have positive effects on the economy

The contribution of Schmitt-Grohé and Uribe focused on a specific case in which wage rigidity leads to poorer economic developments. In his contribution to the seminar, Jordi Galí broadened the perspective and discussed the consequences of wage rigidity on efficiency and economic welfare. In Classical economic theory, equilibrium of real wages and employment is determined by labour supply and demand. Unemployment can only occur if there are restrictions that involve the prevailing real wage being over the equilibrium level. The natural way to reduce unemployment is by means of a downward adjustment in the real wage, for instance by means of the unemployed undercutting the prevailing wage. Then, demand for labour increases, and hence employment too. More flexible wages will then lead to more stable employment, a more efficient distribution of resources in the economy and better welfare.

John Maynard Keynes' fundamental criticism of the Classical theory was that the real wage appeared to determine employment without any real regard for the state of demand in the product market. The Keynesian theory turned the rationale around by regarding employment as a function of aggregate demand. The real wage was determined in turn by employment, and not vice versa.

Using the so-called New Keynesian theory, Jordi Galí analyses the discussion in Keynes "General Theory" about the role of wages in determining employment.[18] The New Keynesian theory is based on insights from both Classical economic theory and Keynesian theory. A similarity between the New Keynesian model and "General Theory" is that wage adjustments do not play a direct role in determining employment. In the New Keynesian

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18 See Galí (2012).

model, the effect of wages on employment is indirect only. This means that salaries affect inflation, while aggregate demand and employment are mainly affected by the central bank adjusting monetary policy. The extent to which better wage flexibility can stabilise employment is then highly dependent on how monetary policy reacts to inflation.

According to Keynes, variations in aggregate demand should result in countercyclical fluctuations in real wages. Because it is assumed that the real wage is set in relation to the marginal product of labour (how much production increases when one more person is appointed), and because the marginal product of labour is assumed to decrease when more workers are appointed, the real wage declines when demand increases and companies increase their production and appoint more workers. According to Keynes, lower real wages are thus connected to demand and production increasing. In reality, however, the real wage seems to move in a pro-cyclical manner, so the real wage increases when production rises. In a New Keynesian model, the real wage will also be pro-cyclical if prices are sufficiently rigid in relation to wages. In this case, the New Keynesian theory appears to fit in better with reality than the traditional Keynesian theory.

According to the Classical theory, increased productivity leads to increased labour demand, higher employment and higher real wages.[19] Production increases both due to increasing employment and also due to higher productivity. According to this theory, productivity-enhancing shocks will thus give rise to a positive correlation between production and employment.

In Keynesian models, however, the effect of an exogenous productivity increase depends on the reaction of aggregate demand. If aggregate demand does not increase at all or not much, employment will decrease because the same production level can be achieved with fewer employees.

In New Keynesian models, the reaction patterns of monetary policy play, as noted above, a key role in the development of aggregate demand and hence employment. A common way of describing monetary policy is the so-called Taylor rule. This involves the policy rate being set with reference to how much inflation deviates from an inflation target, and how much resource utilisation deviates from a normal level. In a New Keynesian model with the policy rate determined by a Taylor rule, higher productivity can lead to increased production and a higher real wage with lower employment and lower inflation.[20] Galí believes that this description of the effects of shocks to productivity has significant empirical support.

In the debate about the functioning of the labour market, it is often claimed, with support from the Classical theory, that flexible wages reduce fluctuations in employment and enhance efficiency in the economy and hence welfare. According to New Keynesian models, however, the effects of a change in wages depend on how the change affects demand, and Galí demonstrates that welfare need not generally be higher when wages are

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19 This is under the assumption that income effects on labour supply are not too great.
20 This result is obtained in the simple model used by Galí, but is also valid in empirically estimated dynamic stochastic general equilibrium models with a richer structure.

more flexible.[21] When the central bank follows a Taylor rule that reacts relatively little to the deviation of inflation from the target, the opposite can apply for reasonable parameter values. Galí therefore believes that it cannot be taken for granted that increased wage flexibility is always desirable, or that wage cuts are efficient in combating unemployment.

In the subsequent discussion, it was ascertained that a lesson was that even the simple New Keynesian model can have surprising implications and be complicated to understand. However, certain participants expressed doubts about the model as such. For example, the model includes shocks to demand which diverge greatly from what Keynes had in mind. Also, the model does not have any explicit role for unemployment: employment can be inefficiently low if real wages are too high, but why this is the case is not explicitly modelled. Also, it is assumed that everybody is perfectly insured against unemployment, so the consumption level of an individual is not affected by him or her becoming unemployed. It is therefore difficult to take the welfare analysis seriously in such a model. It would be desirable to base the model to a greater extent on different microeconomic relationships, for instance with different types of households, workers and companies. This could provide a more convincing analysis of the labour market and the role of monetary policy for unemployment.

The recipe for a good inflation forecast: Start with a solid assessment of the current situation and draw a smooth line to the long-term level

According to the New Keynesian analysis, good forecasts are key to well-balanced monetary policy, and monetary policy is more effective when it is well understood by the general public. Central banks have also started to attach greater importance to policy transparency, and forecasts for inflation and other key variables are being published by an increasing number. In inflation targeting regimes, the accuracy and credibility of inflation forecasts are thus of great importance. But which forecasting methods give good inflation forecasts?

Jon Faust and Jonathan H. Wright use real-time databases to evaluate inflation forecasts in the USA.[22] They compare the forecasts from a large number of models with judgemental forecasts published by the Federal Reserve, and with two surveys conducted among forecasters in the private sector. The forecast models evaluated include naive forecasts (which use the latest outcome as the forecast), time series models, models based on various Phillips curves, dynamic stochastic general equilibrium (DSGE) models and forecasting methods that use large quantities of information and combine different forecast models. The forecasting ability of the models is evaluated over different horizons, from nowcasts (for the current quarter) up to eight quarters.

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21 In the New Keynesian model used by Galí, the loss of welfare of the representative household is approximated by a loss function that depends on the variance in employment, price inflation and wage inflation.
22 See Faust and Wright (2012).

The results show that a good nowcast is crucial to establishing good forecasts in the long term too. And, judgemental forecasts are much more successful than pure model-based forecasts.

Good forecasting methods must also take account of a slowly fluctuating inflation trend to capture the fact that the normal state can vary over time. The forecasting methods that fared best use models that measure inflation as a deviation from trend (the inflation gap), and use information from long-term inflation expectations.

Faust and Wright draw the conclusion that attempts to capture complicated cyclical patterns do not generally lead to better inflation forecasts. More advanced models which use more information cannot significantly improve a simple forecast which starts with a good nowcast of inflation and then gradually glides towards the trend value for inflation (see Figure 6).

Figure 6. Recipe for a good inflation forecast
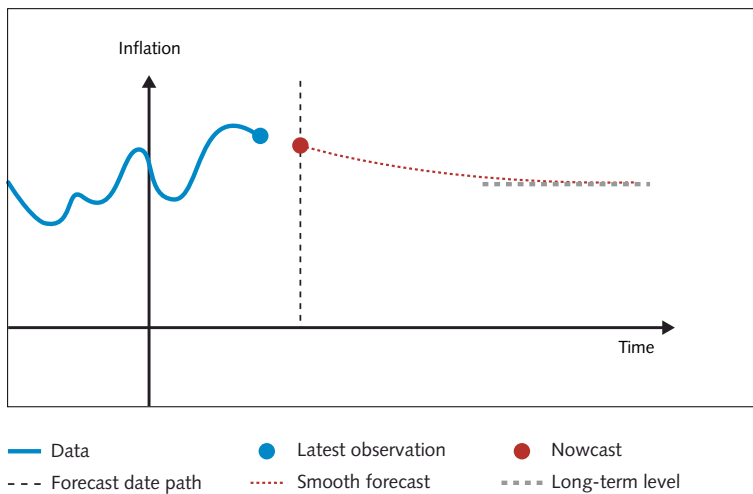
Source: Faust's presentation at the seminar

According to this study, models which attempt to capture cyclical dynamics thus do not contribute to central banks doing better forecasts. Yet, according to Faust, such models can nevertheless help improve policy decisions if they deliver relevant alternative scenarios which describe how the inflation forecast reacts to monetary policy.

In the subsequent discussion, it was pointed out that structural breaks in the economy are important but very hard to forecast. A structural break can lead to enduring forecasting errors, and the model that best adjusts to such breaks will be the most efficient in forecasting. A naive forecast which predicts that inflation will be the same in the future as it is today may contain major forecasting errors on average, but be very efficient in capturing structural changes. Other participants stressed that although the paper was of great interest, it is unclear how usable the results are for central banks with inflation targets. The

long-term level of inflation is then given by the inflation target, and the task of the central bank is to get inflation to reach the target at a reasonable pace. It is then important to perform conditional forecasts, that is forecasts established under various monetary policy assumptions, in order to then determine suitable monetary policy. Faust found, however, that central banks also need unconditional forecasts, and that even for conditional forecasts, the use of smooth forecasting paths is more efficient.

Concluding discussion

The seminar was rounded off with a general discussion about some different questions of importance to monetary policy. Is there a long-term trade-off between inflation and unemployment? What role should employment and unemployment play in monetary policy? Should they be used as targets for monetary policy alongside the inflation target, or just as indicators of inflationary pressures? If monetary policy is to have an explicit target for employment or unemployment, what importance should be attributed to this target compared with the inflation target?

Some participants pointed out that there is probably a long-term relationship between inflation and unemployment, which conflicts with traditional economic theory. One reason could be that expectations are not entirely rational and are hence on average inaccurate even over longer periods of time. Another reason could be the presence of persistence effects (sometimes referred to as "hysteresis") in unemployment, whereby short-lasting fluctuations in unemployment can have long-lasting effects. If there is a long-term relationship, it will be important for monetary policy to focus on unemployment and employment to a greater extent than merely to the degree they can be used as indicators of future inflation.

Other participants believed that there is no satisfactory model of unemployment, which makes it hard to determine the degree of significance unemployment should bear in devising monetary policy. Also, it would be of use to have better models for studying how central banks' credibility is affected by having targets that are broader than pure inflation targets. Overly ambitious monetary policy may involve risks. Monetary policy with too many targets risks being ambiguous, which could lead to higher unemployment over time.

The papers presented at the seminar and the discussions conducted show that labour market issues are important to both inflation and monetary policy. However, the relationship between inflation, unemployment and monetary policy is complex and can vary over time. These matters will therefore remain high on the agenda in the monetary policy discussion ahead.

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