Economic Commentaries

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Inflation, unemployment and monetary policy

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Since the inflation target was introduced, the average rate of inflation has been low and stable, but also somewhat lower than the inflation target of 2 per cent. This has led to a debate about whether monetary policy has been too tight and about the consequences for unemployment. In this Commentary, the authors point out that inflation and unemployment are affected by many different factors, not just by monetary policy. The simple link between inflation and unemployment reflected in the Phillips curve in itself says nothing about the effects of monetary policy. Simulations using a macro model indicate that monetary policy has less of an impact on unemployment than suggested in the debate.

Since 1993, the objective of the Riksbank's monetary policy has been to stabilise inflation around the target of 2 per cent. Apart from stabilising inflation around the inflation target, monetary policy also strives to stabilise production and employment around long-term sustainable paths.[2] Since the inflation target was introduced, inflation has been both lower and more stable than it was previously, see Figure 1. At the same time, GDP growth has been higher than it was prior to 1993. Inflation targeting has thus been a successful strategy. However, the average inflation rate has been somewhat lower than the Riksbank's inflation target. And the average rate of unemployment has been high since the economic crisis in the early 1990s, see Figure 2.

The low rate of inflation and the high rate of unemployment have led to criticism of the Riksbank: the critics have claimed that monetary policy has been too tight and that unemployment has therefore been unnecessarily high, see for example Assarsson (2011) and Svensson (2013b).[3] Svensson, for example, calculates that unemployment has on average been 0.8 percentage points higher since 1997 as a consequence of inflation being lower than the target. This corresponds to approximately 38 000 jobs.[4] The mechanism that is assumed to provide this link between inflation and unemployment is that wage agreements have been based on expectations that inflation will be 2 per cent. The fact that inflation has subsequently been lower has led to higher real wages, and lower employment, than intended.

It is a generally accepted view that a more expansionary monetary policy (that is a lower repo rate) leads to higher inflation and temporarily lower unemployment. This view is not controversial but is supported by macroeconomic models based on sound theoretical and empirical grounds. One can therefore always state that a more expansionary monetary policy will – all else being equal – lead to higher inflation and lower unemployment for a certain period of time. However, it is also generally accepted that the ability of monetary policy to affect the average rate of unemployment over a longer period of time is more limited.

However, even if it is thus possible with hindsight to say that a more expansionary monetary policy could have led to higher average inflation and lower unemployment during certain periods, the actual monetary policy decisions may nevertheless have been well balanced when they were made, given the information that was available at the time. If, in addition to this, one wants to estimate to what extent monetary policy has been responsible for the high rate of unemployment, one must take into account that there are many other factors that also affect inflation and unemployment.

The aim of this Commentary is to contribute to the discussion of monetary policy's impact on inflation and unemployment over the last 20 years. We do this by

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2. See Sveriges Riksbank (2010).

3. See Bergström and Boije (2005) and Boije and Holmberg (2007) for previous discussions of similar criticism.

4. The labour force consisted on average of approximately 4.7 million individuals in the period 1997-2012. Svensson (2013a) uses the same calculations to estimate that if CPI inflation had been one percentage point higher at present then unemployment would have been 1.3 percentage points lower, which corresponds to approximately 65 000 jobs.

presenting relevant data and discussing how different methods can be used to draw different conclusions on the basis of these data. Our main message is that simple calculations and messages that suggest monetary policy is the cause of the high rate of unemployment risk presenting a misleading picture of what monetary policy can achieve and of the causes of unemployment. All calculations of the effects of monetary policy on unemployment are based on specific assumptions which in themselves are difficult to test. Such calculations are therefore uncertain and should be taken with a pinch of salt. The calculations that we present (which should also be taken with a pinch of salt) indicate that monetary policy has not had such substantial effects on unemployment as Svensson (2013b) claims.

The low rate of inflation has many causes

Since 1995, inflation in Sweden measured in terms of the CPI (Consumer Price Index) has averaged between 1.3 and 1.5 per cent, see Table 1 and Figure 3. The definition of the CPI has changed over time, so the exact figure depends on which definition you choose.[5]

An important reason why CPI inflation has been low is that there has been a general decrease in interest rates, not just in Sweden but abroad too. Lower interest rates lead to lower costs for housing and housing costs are included in the CPI. How housing costs should be calculated in the CPI is a difficult methodological question and different countries have chosen different solutions. In Sweden, we have chosen to measure housing costs in terms of the mortgage costs households have for their homes. The effect of this is that a more expansionary monetary policy (a lower repo rate) that aims to raise the rate of inflation leads to lower CPI inflation in the short term when mortgage rates fall. As interest rates have fallen in general for some time now, this effect has not just been temporary. The Riksbank has therefore long been studying inflation measures in which these direct effects of interest-rate changes on CPI inflation are discounted.[6]

If we discount the direct effects of falling interest rates on the CPI via housing costs and instead look at the rate of inflation measured using the CPIF (the CPI with a fixed interest rate), the rate of inflation has been 1.7-1.8 per cent.[7] Considering how high inflation was and how severely it fluctuated before the inflation target was introduced (see Figure 1), one may think that the deviations from the inflation target have not been particularly substantial. Measured in terms of both the CPI and the CPIF, inflation has on average been within the tolerance interval of 1 to 3 per cent that the Riksbank used until 2010. Monetary policy has thus been successful in the sense that inflation has been low and highly stable, even though it has not averaged exactly 2 per cent.

An important mechanism behind the fact that monetary policy has reduced inflation is that the Riksbank's inflation target has influenced companies' and households' inflation expectations, and consequently wages and prices. In addition, the Riksbank has systematically tightened monetary policy when there has been a risk that inflation would overshoot the target, and has eased monetary policy when it has appeared that inflation would be too low. However, other factors have also contributed to the low rate of inflation. Figure 3 shows that inflation was particularly low in the years 1998-2000, 2004-2007, 2009 and 2012. The Riksbank has previously explained the low inflation rate by pointing out that productivity growth was stronger than expected (so that cost pressures were low) and that the prices of imported goods increased slowly (or even fell).[8] This picture is also supported by the Riksbank's macroeconomic model, Ramses. Figure 4 shows how Ramses explains CPIF inflation since 1995.[9] According

5. The decision taken in 1993 was that the inflation target would apply from 1 January 1995. We have therefore chosen 1995 as the starting point for our calculations. See Andersson, Palmqvist and Österholm (2012) for a detailed discussion of various measures of the development of inflation.
6. See, for example, Heikensten (1999).
7. The CPIF is in many respects similar to the consumer price index used in other countries where the housing costs in the CPI are calculated in a different way than in Sweden. For example, CPIF inflation is very closely correlated to inflation in Sweden measured using the EU's harmonised consumer price index, the HICP.
8. See, for example, Sveriges Riksbank (2006).
9. The figure presents an historical decomposition of CPIF inflation, that is how Ramses interprets inflation's deviation from 2 per cent in terms of exogenous factors (shocks). See Christiano et al. (2011) for a description of the model.

to Ramses, the low rate of inflation can mainly be explained in terms of unexpectedly strong productivity (the red bars in Figure 4), but also to a certain extent by international factors (the blue bars). According to the model, monetary policy has at the same time helped to keep inflation up by being more expansionary than normal (the yellow bars).

One of the most important explanations of the low rate of inflation since 1995 is thus that productivity has been unexpectedly strong. A more rapid increase in productivity than expected can give rise to higher unemployment and lower employment in the short term as it means that companies can produce the same amount of goods and services with less labour. In the longer term, however, it is rather the case that higher productivity will lead to increased employment as companies will be able to pay higher wages and this in turn will lead to higher incomes, increased demand and so on.[10] According to Ramses, the unexpectedly strong development of productivity has helped to keep the unemployment rate below its long-term trend, see Figure 5. Developments abroad have, on the other hand, led to higher unemployment, for example due to weaker demand for Swedish exports. According to the model, the factors that have led to low inflation may thus have had counteracting effects on unemployment. This means that the relationship between inflation and unemployment in a certain period depends on what shocks the economy has been exposed to. However, irrespective of the factors that have caused the low level of inflation, an even more expansionary monetary policy would probably have led to higher inflation and lower unemployment, at least in the short term. An important question that then arises is whether monetary policy could have been conducted in a better way.

As it takes time for monetary policy decisions to have an impact on the economy, repo-rate decisions are based on forecasts of, for example, inflation. However, the Riksbank cannot predict all of the changes that will take place around the world, or in productivity and so on, and is therefore unable to keep inflation on target all the time.[11] Inflation could perhaps have been somewhat closer to the target if monetary policy had reacted more quickly or more strongly (or more effectively) to various shocks. One way of assessing whether monetary policy could have been conducted in a better way is to study the inflation forecasts published by the Riksbank and compare them with the forecasts of other forecasters. If the Riksbank's forecasts have systematically been higher than the inflation forecasts of other forecasters in periods when inflation has been low then it is also probable that monetary policy has been too tight. Such a comparison of various forecasts is shown in Figure 6. This comparison indicates that the Riksbank was better than other forecasters at predicting the low rate of inflation in 2004-2005, but that the situation was the opposite in 2009 and 2012. The results of the comparison are therefore not clear-cut.[12] It cannot be said that the forecasts have generally been poor and that monetary policy was therefore poorly balanced at the time the decisions were actually made. This does not mean that there is no point in investigating what the effects of different monetary-policy decisions from those that were actually made might have been.

The Phillips curve shows a link between low inflation and high unemployment

There are many different methods for estimating how monetary policy affects inflation and unemployment. Svensson (2013b) presents estimates of a long-term relationship between inflation and unemployment, a downward-sloping Phillips curve. Ideas about such a relationship affected economic policy in the 1960s and 1970s, but when inflation rose to ever increasing heights at the same time as unemployment refused to fall, this theory was abandoned; at least the idea that there was a stable, long-term relationship.

10. Christiano (2012) reviews some of the research literature on the link between productivity and employment.
11. The Riksbank conducts flexible inflation targeting, which means that it strives to stabilise inflation around the target a couple of years ahead (see Sveriges Riksbank 2010). Negative shocks to inflation will thus lead to inflation being lower than the target for a certain period of time. If such shocks dominate for a longer period of time, then average inflation will also be lower than the target.
12. If we make the same comparison as in Figure 6 for CPIF inflation instead of for CPI inflation, we can see that the differences between the Riksbank's forecasts and those of other forecasters are smaller for 2009 and 2012 than in the case of CPI inflation.

Over the last 15 years, however, it appears that the negative relationship between inflation and unemployment has arisen once again. It is not exactly clear what this is due to. A possibility discussed by Svensson (2013b) is that inflation expectations have been stable around 2 per cent despite the fact that the actual rate of inflation has varied. If wages have been governed by a largely constant expected inflation rate then this has led to higher real wages and lower employment when the actual rate of inflation has fallen. Conversely, the same mechanisms have led to lower real wages and higher employment when inflation has risen. Wage formation in combination with stable inflation expectations could thus explain why there appears to be a negative link between inflation and unemployment even in the long term.[13] At the same time, the observed link could be a result of unexpected shocks, for example to productivity, which in the short term have led to lower inflation and higher unemployment in line with our reasoning above.

However, it is doubtful whether the Phillips curve relationship between inflation and unemployment really is stable. If we look at longer periods of 20 years then there does not appear to be any clear relationship. Figure 7 presents unemployment and inflation since 1976. The relationship has obviously changed over time. In the 1970s and 1980s, unemployment was relatively stable, while inflation fluctuated widely. In recent decades, the situation has been reversed: inflation has been relatively stable while unemployment has fluctuated widely. It is reasonable to assume that there are many different explanations of why the relationship between inflation and unemployment has changed. In the 1970s and 1980s, economic policy was generally more focused on keeping down unemployment rather than inflation. At the same time, the economy was subjected to a number of negative supply shocks, for example the oil-price shocks.

Since the 1990s and onwards, more importance has been attached to price stability in economic policy. Globalisation and increased competition have led to positive supply shocks, but at the same time the functioning of the labour market has clearly deteriorated so that average unemployment has been higher. There are many indications that the long-term development of inflation and the long-term development of unemployment are driven by entirely different factors. An important explanation of why a negative relationship between inflation and unemployment can nevertheless be observed in recent years is probably, as Svensson points out, that inflation expectations have been more stable since the inflation target was introduced. However, this does not mean that there is now a stable long-term relationship that can be exploited by economic policy.[14]

Svensson uses the negative relationship between CPI inflation and unemployment over the last 15 years (the slope of the Phillips curve) and calculates that a 0.6 percentage points lower rate of inflation is associated with a 0.8 percentage points higher rate of unemployment. This figure is of course only an estimated correlation, but it corresponds to approximately 38 000 jobs. The figure of 0.6 percentage points corresponds to approximately how much CPI inflation has been below the target since 1997. In order to translate the deviation from the inflation target into unemployment figures, one needs to make a number of assumptions. Svensson assumes that inflation expectations have been constant at 2 per cent despite the fact that inflation has varied over time. This leads to real wages being systematically too high and thus to a long-term relationship between inflation and unemployment. Svensson also assumes that the deviation of CPI inflation from the target is more relevant than any other measure of inflation (for example the CPIF, for which the rate of increase has been much closer to 2 per cent).

The reasoning based on the Phillips curve is in turn based on a correlation between CPI inflation and unemployment, but it is not obvious how the correlation should be interpreted, for example whether there is any causal link from unemployment to inflation or vice versa. Svensson's conclusion is that monetary policy has been too tight and that this has led to low inflation and high unemployment. Our point is that

13. Svensson's reasoning is compatible with a theoretical model by Akerlof et al. (2000) with "near-rational" households and companies whose inflation expectations are close to zero as long as inflation is low and stable. In their model, this leads to a long-term relationship between inflation and unemployment when inflation is low. Fuhrer (2011) finds that inflation expectations in the United States have been well-anchored over the last 15 years.
14. Sargent (1999) warns of the consequences of interpreting the correlation between inflation and unemployment as a structural relationship that can be exploited by monetary policy. See also Sargent and Söderström (2000).

a relationship between CPI inflation and unemployment may have many different causes and therefore in itself does not provide any clear guidance to economic policy. One interesting point is that the relationship between unemployment and CPI inflation since 1995 is much stronger than the relationship between unemployment and CPIF inflation, see Figures 7 and 8. This can be explained by the fact that the Riksbank has tended to cut the repo rate when unemployment has been high and these cuts have led to CPI inflation (via the impact of the repo rate on housing costs) being low, at least in the short term. This mechanism is thus completely different to the structural relationship between inflation and unemployment that Svensson bases his calculations on.[15]

A macro model indicates a weaker relationship between monetary policy and unemployment

Another way to calculate the effects of monetary policy on inflation and unemployment is to use the Riksbank's macro models. Such estimates are of course also uncertain, partly because the models do not capture all the factors and relationships that are relevant in reality and partly because it is not obvious how to design an experiment in which "monetary policy changes". Should it be a certain change in the repo rate that has no relationship to anything else taking place in the economy (that is a temporary deviation from the normal monetary policy)? Or should it be a fundamental change in the way the Riksbank conducts monetary policy involving a transition from one systematic way of reacting to various shocks to another? The effects depend on which policy experiment one conducts and on what one assumes about how it affects households' and companies' expectations regarding the way monetary policy is conducted. This is a well-known methodological problem that has engaged the minds of several of the winners of the Sveriges Riksbank Prize in Economic Sciences in Memory of Alfred Nobel.[16]

An experiment that can be conducted is to use the Riksbank's model, Ramses, to calculate the effects of tightening monetary policy for 15 years so that inflation is 0.2 percentage points lower than it would otherwise have been. (Only CPIF inflation is modelled in Ramses and since 1995 CPIF inflation has on average been 0.2 to 0.3 percentage points lower than the inflation target). If one assumes that the tighter monetary policy is not foreseen by households and companies (so that inflation expectations two years ahead remain close to the inflation target) then the average unemployment rate rises by approximately 0.25 percentage points. This corresponds to approximately 12 000 jobs. Like Svensson's results, these results are based on inflation expectations being stable around the target despite the fact that the actual inflation rate has been lower than the target.

However, it is hardly realistic to believe that the Riksbank would be able to deviate from its normal behaviour for so long without this affecting expectations about the conduct of monetary policy. Given this, it may be the case that the properties of the model used for the experiment should also be changed. This in turn means that the original model's estimates of the effects of monetary policy are not valid. If the new interest-rate policy affects expectations of future monetary policy, and thus price and wage formation, then the calculated effect of monetary policy on employment could very well be weaker.[17] Monetary policy works, among other things, through its impact on real wages and if inflation expectations are not affected the impact on real wages (and employment) will be greater than if expectations adjust.

It is thus possible to perform illustrative calculations – with a certain amount of empirical support - that indicate that the conduct of a certain form of monetary policy

15. Svensson (2013b) also estimates a Phillips curve based on inflation measured using the CPIX and the CPIF (the CPIX was used until 2008 and excludes mortgage costs and the direct effects of changed indirect taxes and subsidies from the CPI). Svensson finds a weaker relationship between unemployment and the CPIX/F, but argues that the costs of low inflation in terms of unemployment are thereby even higher, although estimated with less precision.
16. The criticism of how policy experiments used to be analysed in the Keynesian model tradition is referred to as the Lucas criticism, after the prize-winner Robert Lucas. The Riksbank's analyses have been highly influenced by methods proposed by two other prize-winners, Thomas Sargent and Christopher Sims, but these arguments are also the subject of keen debate in the scientific literature. See Christiano (2012).
17. This is precisely an example of the Lucas criticism mentioned above.

since 1995, aimed at achieving higher inflation, could have entailed 38 000 more jobs. However, other calculations indicate much smaller effects of monetary policy on employment, and even these calculations may very well overestimate the effects. All such calculations are based on a number of assumptions and are highly uncertain. The impact of monetary policy may have been much weaker – or stronger, for that matter. The honest answer is that we simply do not know, not even when we use the best scientific methods available. And even if we accept one of these calculations, it does not necessarily mean that monetary policy could have been conducted in a better way when the decisions were actually made.

Both unemployment and financial risks are taken into account in the repo-rate decisions

Another perspective on this discussion is gained if one looks at the development of unemployment over a longer period of time. Since 1995, unemployment has averaged just under 8 per cent, that is approximately in line with the level it is at today. Today, this corresponds to around 400 000 individuals. When the economic cycle peaked just before the financial crisis began, unemployment was just under 6 per cent. During the trough in 2009, unemployment was approximately 9 per cent. The cyclical component of unemployment is thus much smaller than the long-term, structural component. Although monetary policy has probably had some impact on unemployment, the effects are not large in relation to the overall problem of unemployment.

The fact that economic activity has weakened and unemployment has increased, first in connection with the acute crisis in 2008-2009 and then again in 2012, is one of the reasons why the Riksbank has cut the repo rate. The low level of inflationary pressures is another. An even lower repo rate may of course have led to somewhat higher inflation and lower unemployment. However, risks relating to developments on the financial markets, for example the risk of an excessive level of indebtedness and the risk of new financial crises like the ones we have seen in other countries, are also taken into account in monetary policy.[18] An intensive discussion is now underway at central banks and in academia on what conclusions should be drawn from the financial crisis as far as monetary policy is concerned, but our current state of knowledge does not as yet provide much guidance to the practical implementation of monetary policy.[19]

Detailed studies are required to determine why inflation has been so low, the nature of inflationary pressures in the future and how monetary policy can reduce the risks associated with high unemployment and high indebtedness. It is important to confidence in the Riksbank and in monetary policy that the Riksbank can shed light on these issues in its analyses and communication. Strict evaluations of monetary policy, conducted both within and outside the Riksbank, are also needed in order to be able to continue conducting an effective monetary policy. However, our main message in this Commentary has been that simple calculations and messages that suggest monetary policy is the cause of the high rate of unemployment risk presenting a misleading picture of what monetary policy can achieve and of the causes of unemployment.

18. In principle, this can be justified in two different ways. The first is that financial instability can affect the possibilities to stabilise inflation and employment. In addition to this, however, one of the tasks of the Riksbank is to promote a safe and efficient payment system and it may be necessary to use monetary policy for this purpose too. See, for example, Sveriges Riksbank (2010).
19. See Eichengreen et al. (2011) for a contribution to this debate. Norges Bank and the Reserve Bank of New Zealand have modified their inflation targeting regimes and declared that they now attach greater importance than previously to the risks of financial instability.

Table 1. Average inflation in various periods
Average of monthly outcomes measured as annual percentage change.

	1995-2012		1997-2012		2000-2012	
	Real time	Revised	Real time	Revised	Real time	Revised
CPI	1.44	1.31	1.40	1.29	1.60	1.52
CPIF	1.80	1.67	1.74	1.63	1.77	1.70
CPIX	1.65	1.53	1.56	1.45	1.63	1.53

Figure 1. CPI inflation since 1970
Annual percentage change, revised data.

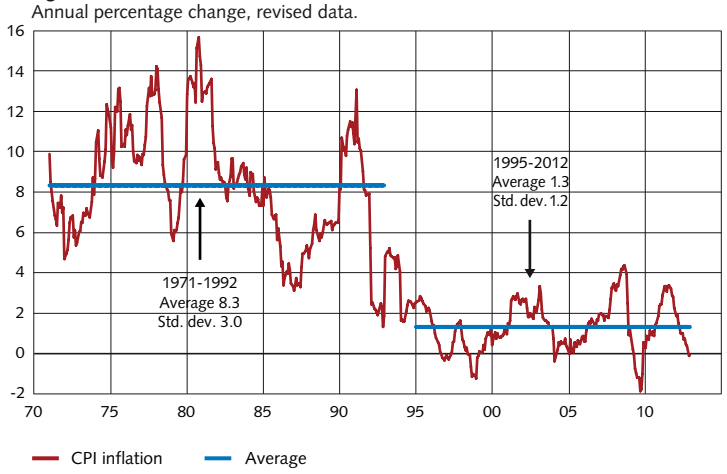


Figure 2. Unemployment since 1976
Percentage of labour force, 16-64 years, seasonally-adjusted data.

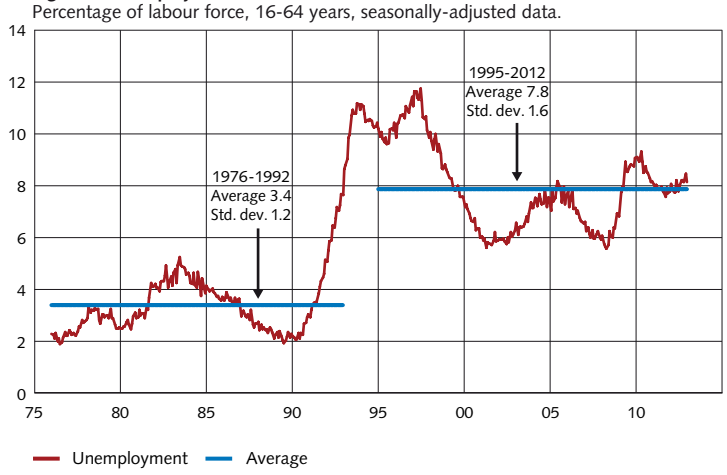


Figure 3. CPI inflation and CPIF inflation since 1995
Annual percentage change, revised data. The CPIF is the CPI with a fixed interest rate.

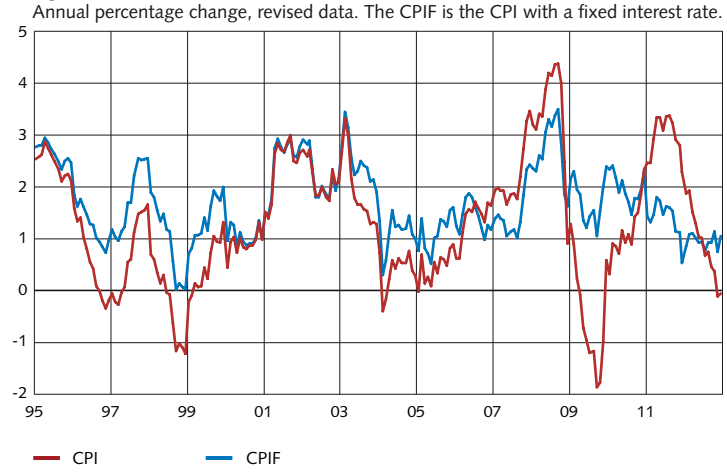


Figure 4. Historical explanation of CPIF inflation's deviation from two per cent since 1995 according to the Riksbank's macro model Ramses
Annual percentage change, revised data, quarterly averages.

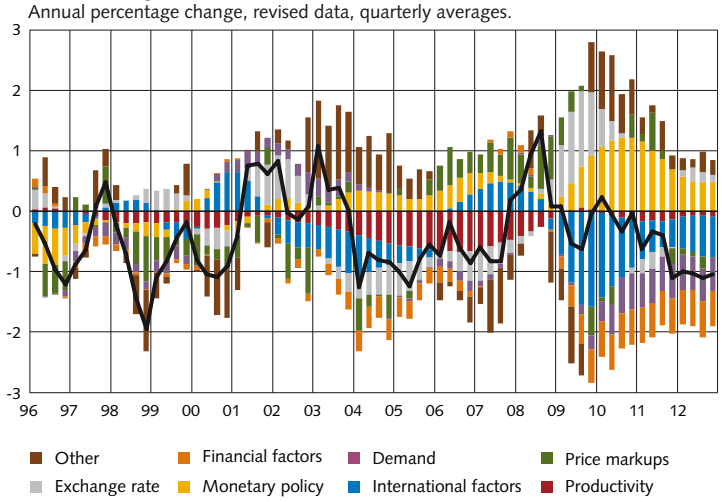


Figure 5. Historical explanation of unemployment's deviation from trend since 1995 according to the Riksbank's macro model Ramses
Quarterly averages.

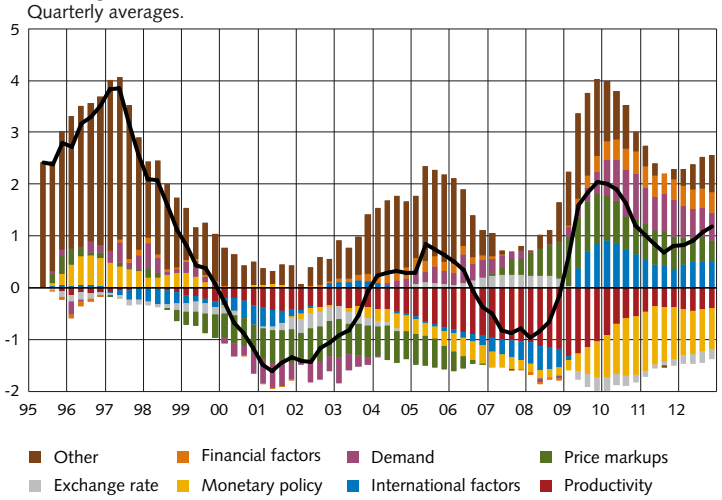


Figure 6. Forecasts of CPI inflation since 1999: The Riksbank and other forecasters
Annual percentage change, revised data. Forecasts of annual CPI inflation made one year before outcomes.

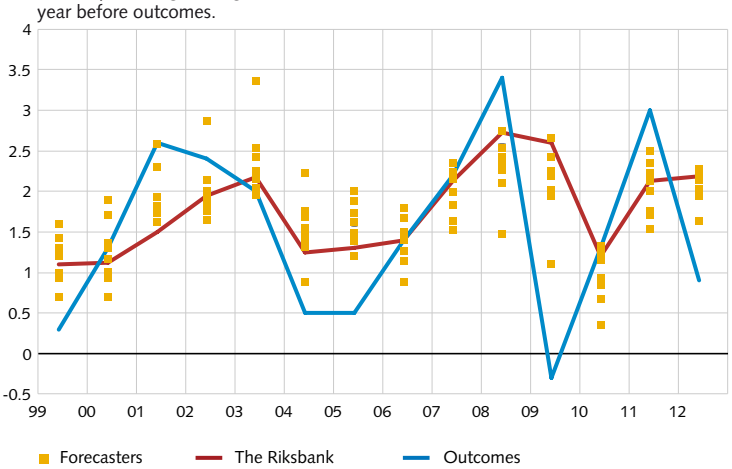


Figure 7. CPI inflation and unemployment since 1976
CPI: annual percentage change, revised data.
Unemployment: percentage of labour force, 16-64 years, seasonally-adjusted data.

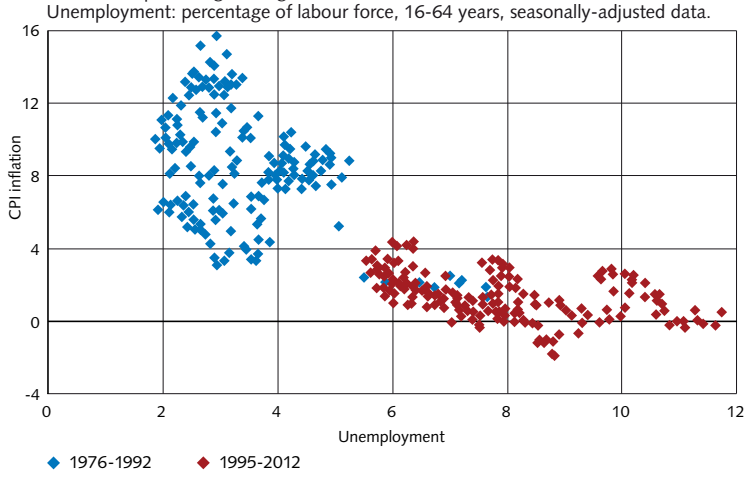
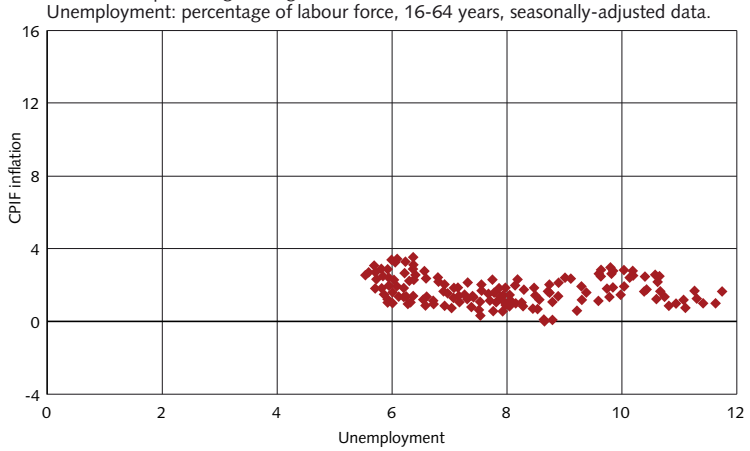


Figure 8. CPIF inflation and unemployment since 1995
CPIF: annual percentage change, revised data.
Unemployment: percentage of labour force, 16-64 years, seasonally-adjusted data.



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