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The Real Interest Rate Gap: Measurement and Application

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Resumé

Til empiriske formål foreslås det at fastlægge realrentegabet som en simpel transformation af forskellen på to nominelle rentesatser, nemlig centralbankens pengepolitiske rente og renten på lange statsobligationer. Sidstnævnte rummer information om inflationsforventninger og realafkastet på andre aktiver. Den foreslåede beregningsmetode benyttes til en empirisk analyse af de senere års pengepolitik i nogle få lande. Der fremkommer nogle nye, men foreløbige fortolkninger, specielt vedrørende USA og Sverige. Der fremføres desuden argumenter for at inkludere beregningsmetoden, hvis resultater er umiddelbart tilgængelige i realtid, i analyserne inden for ECBs første søjle.

Abstract

For empirical purposes it is suggested to approximate the real interest rate gap by a simple transformation of the difference between two nominal interest rates, the central bank's policy rate and the long-term interest rate. The latter contains information on inflationary expectations and expected real returns from other assets. The suggested measure is used for an empirical analysis of recent monetary policy in a few countries and some new, although preliminary interpretations are obtained, in particular concerning the US and Sweden. In addition, arguments are put forward to include the measure in the analyses under the first pillar of the ECB. The measure is readily available in real time.

The Real Interest Rate Gap: Measurement and Application

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Abstract *For empirical purposes it is suggested to approximate the real interest rate gap by a simple transformation of the difference between two nominal interest rates, the central bank's policy rate and the long-term interest rate. The latter contains information on inflationary expectations and expected real returns from other assets. The suggested measure is used for an empirical analysis of recent monetary policy in a few countries and some new, although preliminary interpretations are obtained, in particular concerning the US and Sweden. In addition, arguments are put forward to include the measure in the analyses under the first pillar of the ECB. The measure is readily available in real time.*

Problem

The concept of a neutral or natural interest rate has been given new life in recent monetary theory. As a consequence, the concept of the real interest rate gap has been introduced in the theoretical models. If the central bank's (real) rate of interest exceeds the natural rate of interest, the real interest rate gap is positive and monetary policy is contractive. The natural interest rate is the short-term real interest rate that is consistent with output in the medium term converging towards the potential output, which again is the level of output compatible with stable inflation.

The natural interest rate and its accompaniment, the real interest rate gap, have so far not been introduced in practical monetary policy in any systematic way, although some first attempts can be seen, cf. BIS (2002). In the following it is argued that taking these concepts into greater account can give monetary policy a firmer anchor, and thereby reduce the risk of the central bank either conducting a purely discretionary monetary policy or a monetary policy which for extended periods is inappropriately tight or expansionary as a consequence of an unclear guiding point in the real world.

The focus will be on a simple method to determine the real interest rate gap in real time by considering two nominal interest rates: the central bank's

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[1] *Constructive comments from Niels Thygesen, Claus Vastrup, participants at the EPRU Network Conference in May 2002 at the University of Copenhagen and from colleagues at the Nationalbank on previous versions are gratefully acknowledged. Remaining errors and shortcomings are the responsibility of the author.*
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interest rate and the long-term interest rate which in free markets is forward-looking in terms of inflation and alternative real returns. Historical real interest rate gaps are calculated for a few countries and for the euro area, and the time series are used to analyse monetary policy in recent years. The analysis shows that the real interest rate gap can give a better understanding of the monetary policy conducted in the USA, and that taking account of the consequences of a real interest rate gap could probably have led to a more appropriate Swedish monetary policy in a recent period. It is also argued that analysis of the real interest rate gap can enhance the ECB's first pillar.

The real interest rate gap gives an indication of the degree of tightness of monetary policy, but further analysis is required to assess whether this is appropriate or not. Deviations from neutral are the core aspect of policy-making and a purely technical answer is not available.

The model frame

Recent years' analyses of monetary policy have focused on various topics related to inflation-targeting and policy rules. There has been an approximately shared framework consisting of a simple macro model for a closed economy with an aggregate supply curve and an aggregate demand curve. In this paper most nuances of the different variants in terms of formation of expectations, lags and parameter restrictions will be omitted, and in contrast to tradition there will be no calibration and evaluation of optimality properties, mainly because the objective is to demonstrate the strength of a simple analysis that can take part of the assessment of monetary policy in real time, irrespective of the central bank's concrete monetary-policy strategy.

(1) $p = p(p^e, p_{-k}, u-u^n, \mathbf{z}, e_p)$

(2) $u - u^n = u(E[u-u^n], (u-u^n)_{-k}, r-r^n, \mathbf{z}, e_u)$

(3) $r \bullet i - p^e$

In (1) p designates current inflation, p^e current inflation expectations, p_{-k} lagged inflation, $u-u^n$ unemployment's deviation from natural employment (or the output gap), and $\mathbf{z}$ other significant economic factors, while e_p is an independent, identically-distributed residual term. The dating is not stated explicitly. Subject to appropriate restrictions on the parameters there will be a vertical supply curve in the long term.

In (2) $E[u-u^n]$ designates the expected output gap, $(u-u^n)_{-k}$ the lagged output gap, $r-r^n$ the deviation of the real interest rate from the natural real interest rate, and e_u an independent, identically distributed, residual term.

Finally, (3) defines the real interest rate as the nominal short-term interest rate, i, less inflation expectations. The nominal short-term interest rate is subject to the central bank's control.

With appropriate dynamics, the model is identical to the model of Svensson (2001a), but several authors have provided similar models. The central bank determines its interest rate, the interest rate affects aggregate demand, and thereby the short-term gap between actual and natural unemployment, which again determines the deviation of actual inflation from expected inflation. The literature focuses especially on the short-term trade off between inflation and unemployment in the central bank's loss function and on the assumptions concerning the model's parameters, dynamics and formation of expectations. A second main theme is robustness, since it in general is preferable that the optimum interest rate is not strongly sensitive to small model changes of a technical nature.

General statistical issues

From an empirical viewpoint it is obvious that several key variables are not immediately observable. Additional analyses are required before the central bank can achieve estimates of the empirical counterparts to the model's variables. These estimates will be open to discussion, subject to considerable uncertainty and often subject to major subsequent revisions. This relates especially to the natural unemployment (the output gap) and the natural real-interest rate, but determining inflation expectations is not a trivial matter either.

Therefore it is also important to involve the issue of the robustness of the applied data or statistics in the analysis, cf. Orphanides (2001). By applying historical statistics Orphanides arrives at a different assessment of historical monetary policy to that revealed by applying recent statistics. The monetary policy of our time would not have given protection from the policy errors of previous times, because the statistics of previous times gave a different picture of the monetary-policy issues.

Natural unemployment and the output gap

The Orphanides critique concerns distinctly concepts such as natural unemployment or the output gap. These concepts can at the same time be relevant from a theoretical viewpoint and problematic from a practical economic-policy viewpoint. There is no easy solution to the problem, which ever way it is considered. This demonstrates the advantage of being able to limit the use of indirect statistics as much as possible. By this is meant statistics which are not reflecting something directly observable, which are strongly dependent on a particular model, and which furthermore is subject to significant revisions as time passes. It should be noted that this problem is not significantly affected by redefinitions to e.g. potential growth rate. In real time, there is a need to assess whether the economy currently and in the immediate future operates below, at or above capacity, and the actual consequences of this.

The natural (real) rate of interest

The history of the natural rate of interest in contemporary monetary theory is relatively short.

Blinder (1998) introduces the neutral real rate of interest as the real-interest rate that ensures that the long-term IS curve is equivalent to the potential output. The neutral real rate of interest is thus consistent with unchanged inflation in the medium term. At a lower real-interest rate monetary policy is expansive and will at some point in time lead to higher inflation if it is maintained. The opposite will apply in the case of a higher real-interest rate than the neutral rate. Blinder emphasises that the neutral interest rate is not constant, but depends on e.g. the fiscal stance and the exchange rate, as well as permanent shocks to the IS curve. To get an idea of its magnitude, Blinder recommends calculating the average ex-post real-interest rate over a very long period of 30 to 50 years. Alternatively, an empirical macromodel can be solved backwards, which Blinder finds to lend considerable volatility to the neutral real-interest rate since it takes care of the adjustment.

Woodford (2000) uses the name "natural interest rate" for by and large the same concept. The natural interest rate is defined as the real-interest rate that ensures that aggregate demand is equivalent to natural output, i.e. output at natural unemployment. Woodford draws lines back to Wicksell's analyses of 100 years ago, and points out that Friedman's use of "natural unemployment" originates from an analogy with Wicksell's natural interest rate, which was better known in the 1960s than in a number of recent years. Wicksell (1898) analyses a world without capital markets where marginal capital formation is financed via bank lending. If the lending rate is low compared to the prospective yield on real capital an investment boom will occur and the price level will increase. The natural lending rate can be interpreted as the short-term (real) rate that will be consistent with a stable price level. “It is not a high or low rate of interest in the absolute sense which must be regarded as influencing the demand for raw materials, labour, and land or other productive resources, and so indirectly determining the movement of prices. The causative factor is the current rate of interest on loans as compared with what I shall be calling the natural rate of interest on capital. This natural rate is roughly the same thing as the real interest of actual business” (Wicksell (1898,1936) p. xxv). In the formulation of our times it seems legitimate to speak of comparisons between the (real) central bank rate and the risk-adjusted prospective (real) yield of real capital.

By its own it is not of major significance whether the real-interest rate-term in the demand curve (2) is formulated as the real-interest rate, or the real-interest rate's deviation from the natural interest rate, although the latter formulation is richer from a theoretical viewpoint. In the original formulations of inflation targeting, the real-interest rate was thus included directly,

cf. e.g. Svensson (1997). The substance is that the real-interest rate must be determined so that the aggregate demand contributes in the best possible way to fulfilling the monetary-policy goals within the relevant horizon. The natural interest rate, although not constant but a function of e.g. productivity trends, can be seen as an anchor, so that the issue of whether monetary policy is expansive or contractive has an immediate response, cf. also Blinder (1998).

The formulation of the demand curve (2) does, however, entail risks if the central bank seeks to adhere closely to the model.

First of all, it must have data on current inflation expectations in order to determine to which real-interest rate the central bank's instrument, the nominal interest rate, corresponds. The inflation expectations are not immediately observable, but information can be extracted by asking, just as it is the case for other types of expectation. However, this is complicated by the fact that inflation expectations, at least in the slightly longer term, will be a function of how the central bank employs its instrument. The use of the current inflation equivalent to static expectations will normally violate an assumption that households and enterprises seek to optimise. In contrast, expectations can deviate from the subsequent result for long periods, so that an assumption of rational expectations becomes of normative rather than descriptive character. Far more can be said on this subject, cf. Pedersen (2001) and Knudsen (2002) for some Danish experiences in that respect. The aspect central to this presentation is that the real-interest data in one way or the other are a model-dependent structure, and not actual statistics.

Secondly, the central bank has to estimate the natural interest rate. Calculating the average ex-post real-interest rate over a very long period, which is the preferred method of Blinder, it will not be immediately possible to involve relevant factors such as the current fiscal stance and exchange rate, or other shifts in demand. In many countries, moreover, it will be relevant to take into consideration the changes in taxation during the period, which in practice can be a serious complication. Laubach & Williams (2001) determine the natural interest rate together with potential output and trend growth using a Kalman filter and a restricted VAR model. This gives a relatively fluctuating series for the natural interest rate, since the most stable of the series considered in the period 1960-2000 varies between 1 and 4.5 per cent. Parallel to the above mentioned research by Laubach & Williams, BIS (2002) uses a ten-year moving average of productivity growth plus an estimate of households' rate of time preference set equal to 2 per cent per annum resulting in quite stable values for the natural rate, presently around 4 per cent.

The real interest rate gap: Neiss and Nelson

The difference between the current real-interest rate and the natural interest rate can be termed the real interest rate gap.

Neiss & Nelson (2001) determine the real interest rate gap by applying a stochastic general equilibrium model. For the UK they find that the real interest rate gap has varied between –5 and +2 per cent in the period 1980-1999 after smoothing out over eight quarters, and this has been negative, equivalent to an expansionary monetary policy since 1996; and – which appears strange to someone who can remember the first half of the 1990s – that monetary policy was more contractive in the late 1980s and in 1993-94 than in 1992, when Britain gave up defending the pound's participation in ERM because the authorities found the costs to be excessive.

The real interest rate gap: General statistical viewpoints

Model-based determinations of the natural interest rate or the real interest rate gap are by definition a function of the model and therefore in principle very different to traditional statistics. If decision-makers are not extremely aware that the fluctuations in the natural interest rate can just as well be attributable to technical factors as to a change of environment, there is a risk that reality and the model are confused inappropriately. This is a reflected image of how it is normally considered desirable for statistics to be produced independently of the use of statistics.

The above considerations show that it is desirable for the real interest rate gap to be calculated independently of the theoretical models for expected inflation, the natural interest rate or the real interest rate gap directly. Non-model dependent real interest rate gap statistics can show information that by definition is ruled out in strongly model-dependent structures.

The following describes a nearby alternative. It requires first of all the consideration of the word "real". In practical statistical terms, all information known with great certainty is nominal. For example, a company's nominal turnover, audited by a certified public accountant, is known, while the real turnover most often is a theoretical design. There is a statistical paradox, since the nominal statistics are actual (not real), while the real compilations are fully or partly fictional. However, the words easily catch on. Users of statistics are led to believe that something called "real" entails a special degree of certainty, while something called "nominal" is less reliable. In the real world, just the opposite is the case, however. If it is possible to make do with nominal statistics we are on more certain ground than if we need to apply real numbers.

Determining figures for the theory's real interest rate gap suffers from being fictional twice over if the natural interest rate and the current real-interest rate are determined independently. It is well known from elementary

mathematical statistics that the variance of the difference between two stochastic variables, *X* and *Y*, will exceed the variance of both variables unless *X* and *Y* correlate enough. Formally

(4) $\text{var}(X-Y) = \text{var}(X) + \text{var}(Y) - 2\text{cov}(X,Y)$

This implies that the uncertainty concerning the difference can become quite big, unless there is reason to believe that the two variables correlate enough to outweigh the two variance terms when the difference is taken. The previously discussed methods for the determination of the natural interest rate are primarily backward looking, while the determination of the present real-interest rate is forward-looking.

For practical as well as mathematical statistical reasons it is thus worthwhile to consider alternative methods of determining the real interest rate gap. A nearby alternative, seemingly not mentioned in the literature so far, is to determine the real interest rate gap as a transformation of the difference between two nominal entities without measurement errors, namely the central bank's interest rate and the interest rate on long-term government bonds. A transformation is needed to take into account that the interest rate for long-term assets is normally higher than for short-term assets.

The real interest rate gap and the term structure

Applying such a measure for the real interest rate gap demands acceptance of a likely impact from the yield on real capital to the long-term interest rates without inclusion of the central banks interest rate. Having recent years developments in stockprices and interest rates in mind this seems obvious, but the possibility of a link is rarely mentioned in theory.

In his overview of theories of the term structure of interest rates Schiller (1990) does not mention the possibility of an influence from stockprices, neither does Walsh (1998). From a theoretical viewpoint the most elegant theory of the term structure is the expectation theory, which can give rise to interesting interpretations of the relation between the monetary-policy interest rates and the market interest rates depending on circumstances, cf. Ellingsen & Söderström (2001). However, if a more complex model including real capital is valid, the conclusions no longer carry over to monetary policy in real time.

It is of interest that Ohlin (1936, p. viii) in his foreword to the English translation of Wicksell (1898) speaks of a link between the return on real capital and the return in the capital market. "Must not the "natural" rate of interest, governed by the marginal productivity of capital, i.e. of the roundabout methods of production which would exist if money were not used, have some connection with the rate of interest as it actually appears on the capital market?" Although the use of the words "capital market" and "money market" is somewhat unclear in the foreword, it seems obvious that Ohlin is not

thinking of the central bank's interest rate, but of some market-determined rate.

To the extent that the long-term bond-rate is not only influenced by expected future short-rates, but also by developments in the markets for real capital (primarily shares, houses, and real estate), the empirical relevance of the expectation theory declines and needs to be supplemented with developments in other markets.

The long-term interest rate is forward-looking. Market participants' expectations of future inflation, activity and long-term yields on other assets, with shares and real estate at one extreme and notes and coin at the other, are included in the determination of the interest rate. This is not a non-binding response to opinion pollsters' compilations of expectations of various factors, but a response where future real income is at stake. Subsequently, expectations will often prove to have been incorrect, but in principle, this is of little interest if the main issue is what participants actually expect to happen, or what they previously expected.

The real interest rate gap: An empirically oriented measure

To make the above more tangible, it is proposed to determine an empirical counterpart to the theoretical real interest rate gap as the central bank's interest rate, $i_{cb,}$ less the yield on 10-year government bonds, i_{10y}, after deduction of the average slope of the yield curve over an extended period.

(5) $r - r^n = i_{cb} - i_{10y} - \text{avg}(i_{cb} - i_{10y})$

It needs to be underlined that the proposed measure should not be considered *the* real interest rate gap but a transformation of the gap, hopefully monotonic and with an interpretable zero. Much more research has to be carried out to determine the precise character of the transformation. The formulation thus has the somewhat arbitrary consequence that the average of the real interest rate gap for the estimation period is equal to zero. With these reservations in mind the factors entering the formula are precisely determined from a statistical viewpoint and available in real time without any subsequent revisions. These are strongly wanted properties for supplementary information when interest rates are set.

Neutral, expansive or contractive monetary policy

The idea behind the above is that if the real interest rate gap is zero, the monetary-policy interest rate will be neutral in the sense that inflation remains by and large at the same level if unemployment is close to its natural rate. If the monetary-policy interest rate is higher, monetary policy will contribute to dampening activity and inflation, while the opposite is the case with a lower monetary-policy interest rate. This is thus a highly empiri-

cally-oriented answer to the question of whether monetary policy is expansive or contractive in absolute terms.

There is a vital difference from using the Monetary Conditions Index, cf. e.g. Ball (1999), as this index measures changes from some starting point, but not its level as such. Based on one of the elements in MCI, the effective exchange rate, the importance of distinguishing between level and change becomes clear. The effective exchange rate can go up equivalent to a deterioration of competitiveness, but this is not necessarily a problem if competitiveness is favourable in absolute terms as the starting point, as is e.g. the case if a country at the same time has a high employment level and a current-account surplus. If solely the effective exchange rate is applied, it is not possible to assess whether the levels are in place. In the same way, movement in MCI does not say whether monetary policy has changed sign, but only whether it is tighter or more expansionary than before. However, it must be considered possible to anchor the level of MCI by calculating the equilibrium exchange rate and the real interest rate gap, but this is not pursued further in this paper.

There is a clear parallel to the assessment of fiscal policy. Even though parliament may have reduced public expenditure or raised taxes, fiscal policy can still be expansionary, but to a lesser degree than before. Slightly simplified, recent years' economic literature on fiscal policy has defined a neutral fiscal policy as the fiscal policy that, with a closed output gap, ensures approximate balance in public finances, so that government debt is under control. If the cyclically adjusted budget shows a deficit, there is a need to tighten fiscal policy at some future point in time. In this case, fiscal policy will be expansionary in absolute terms, notwithstanding the tightening. In the same way, a negative real interest rate gap will indicate that monetary policy is expansionary in absolute terms.

The real interest rate gap and monetary-policy strategies

The further significance of whether monetary policy is expansionary or contractive naturally also depends on the monetary-policy strategy pursued by the central bank.

If the central bank conducts a fixed-exchange-rate policy or is placed in a country that is member of a monetary union, a negative real interest rate gap, i.e. a monetary-policy interest rate significantly lower than the long-term interest rate, may imply a possible need for a tightening of fiscal policy. In the terms of the above model this will depend on whether the output gap is closed or not. Fiscal policy is not directly represented in the model (1)-(3), but concealed in the $\boldsymbol{z}$ vector.

From a purely technical viewpoint, however, it is noteworthy, that this model does not relate especially to the monetary conditions. This is a conse-

quence of the fact that money does not play any independent role. The real interest rate gap can be replaced with the cyclically adjusted budget balance without any technical difficulty. Nonetheless, it is still considered a model for monetary analysis, primarily because the authorities of many countries have abandoned the use of fiscal policy in their economic stabilisation policy as a consequence of e.g. the long reaction time that normally applies to getting a change of fiscal policy through parliament.

If the central bank applies a relatively mechanical decision-making rule such as the Taylor rule, the real interest rate gap is included in the rule on an underlying basis. Based on Taylor's original attempt to describe FOMC's approach, cf. Taylor (1993), the monetary-policy interest rate must be raised by 1.5 per cent on a rise in inflation by 1 per cent, with no change in the output gap. If the output gap increases by 1 per cent, the central bank must lower the interest rate by 0.5 per cent based on the original formulation. The Taylor rule implies that the real interest rate gap moves in the right direction on a change in inflation or output gap. As there are no examples of central banks that relatively mechanically adhere to a Taylor rule, it is especially interesting that the Taylor principle implies that the real-interest rate must increase on an increase in observed inflation, so that extended periods with an inappropriate real interest rate gap are ruled out.

The Taylor rule's certainty against an inappropriate real interest rate gap is not part of an in some respects unspecified strategy such as that of the Federal Reserve, a mixed strategy like the ECB's, or an inflation target as applied by e.g. the central banks of New Zealand, Canada, the UK and Sweden, to name some model countries. However, there is a relation. The Taylor rule can be seen as a simple special instance of inflation forecast targeting.

Irrespective of the differences, the stated monetary-policy strategies have a common feature that in practice approximately the same set of variables are considered, so that the difference between the strategies to a large extent is a question of weighting and communication.

Anchoring the monetary policy

The question posed in this paper is whether the central bank can benefit from applying a statistically simple expression of the real interest rate gap that is independent of the model apparatus otherwise applied, so that it does not place all its eggs in one basket.

The optimal reliance on rules in the design of monetary policy will e.g. depend on preceding history and competence, cf. Jensen (2002). The monetary policy pursued by the USA in recent years has generally been considered to be both discretionary and successful in that rules such as the Taylor rule have collapsed, while in many respects the economic development has been

favourable. On the other hand, other countries have successfully pursued a rule based policy, e.g. Sweden where the repo interest rate has been fixed as in a Taylor rule, if current inflation is replaced by the Riksbank's estimate of inflation two years ahead at an unchanged interest rate, cf. Berg, Jansson & Vredin (2002).

Rules ensure an anchoring of monetary policy so as to prevent the worst accidents, provided that the rule is both sound and robust. In the short term, however, it will often be tempting to deviate from the rule, since the combination of output gap and inflation can immediately come closer to the desired situation than by mechanically adhering to the rule.

Literature on inflation forecast targeting, cf. Svensson (2001a), can be viewed as a means of building bridges between the short term and the medium term, so as to prevent short-term optimisation from leading to greater medium-term costs than under a rule-based policy. Svensson describes a targeting rule. The central bank is empowered by legislation or treaty to ensure well-defined, low inflation, but at the same time, perhaps subordinate to the inflation target, to take into account the short-term real-economic development. Svensson recommends that inflation forecast targeting leads to the fixing of interest rates whereby the interest rate is determined as the solution to an optimal control problem. In concrete terms this will imply that the central bank prepares (and publishes) its prognoses for inflation, output gap and interest rate that correspond to minimisation of the (published) loss function. This avoids the conflict described in the literature whereby private agents are assumed to optimise, while the central bank does not, but adheres to a mechanical rule.

In terms of current practice in central banks that apply inflation targets a particularly controversial aspect is the publication of the future interest-rate path. Naturally, this is not a question of the central bank being bound to follow this path, but whether it will follow it if no unforeseen events occur. One quarter or six months later a new optimum path is drawn up.

The procedure outlined is adhered to in New Zealand, cf. Svensson (2001b). In practice, however, it must be considered uncertain whether optimum control theory is applied, but paths for the future development in inflation and interest rate are published in the inflation reports, cf. also Hampton (2002).

From a decision-making viewpoint it is interesting to note that the governor takes the interest-rate decisions in New Zealand. In other central banks it is normal to have a committee responsible for interest-rate decisions. A natural issue for the committee is what will happen if the interest rate remains constant to ensure a certain separation of technicians and decision makers. The inflation reports from the Bank of England and Sveriges Riksbank are thus prepared subject to the assumption that the repo rate is unchanged throughout the forecast horizon. If the forecasted rate of inflation two years ahead is

moving out of the target zone, this will be an important element at the coming monetary-policy meetings.

The above shows that in many countries monetary policy is anchored in a forecast most often prepared subject to the assumption of an unchanged central-bank interest rate, which can sometimes be clearly unrealistic. Goodhart (2001) expresses concern at this potential inconsistency, but finds that in a committee structure technicians cannot anticipate the committee's decisions. The assumption of an unchanged interest rate is thus necessary, and as a former MPC member Goodhart argues for this assumption not having prevented MPC from reacting quickly with pre-emptive action.

Can a forecast be an anchor?

A key issue in this respect is whether a forecast can be an anchor. A necessary precondition is that it is sound in professional terms. The main risk is that the forecast proves to be pure wishful thinking, or even worse, that the forecast is designed to support a particular policy without taking the realities of the situation into account.

In his review of the Bank of England's monetary policy under inflation targeting, Kohn (2000) notes a tendency for MPC members to request analyses which support the policy preferred by the member in the actual situation (interest-rate dove or hawk). There will probably be a tendency for dove and hawk to hold each other checkmate, so that the priors show up primarily in the distribution of the inflation forecast, called the fan chart. In principle, however, this is a serious concern, since the procedure from assumptions via a well-defined analysis to a forecast as a direct consequence of assumptions and tools, is reversed. One starts with the preferred policy, in this case a higher or lower interest rate, and works back to some model specifications or assumptions that give the required result. In such a case the fan chart expresses pseudo-science, cf. the criticism of the use of add-factors in structural models in the 1970s. Brunner (1973) pointed out the risk of wishful thinking whereby an unclear, implicit model in the heads of forecasters or decision makers determines the assumptions in the forecast by retroactive calculation. The formal presentation of the assumptions, including the model, and the related forecast will in such a case be a shallow exercise designed to convince the rest of the world, and with the risk of self-deception.

It must therefore be considered of great importance that the forecast in inflation forecast targeting is professionally sound, which e.g. entails that it must subsequently be subject to systematic analysis of forecast errors. In this respect Norges Bank sets an example via published systematic analyses of forecast errors, cf. e.g. Sturød (2002). Other central banks are clearly less systematic in this respect.

This does not change the fact, however, that even Norges Bank makes errors in its forecasts. The forecast is therefore an insufficient anchor, even if it has not been politically manipulated. It is therefore desirable to supplement the forecast with information derived independently of the preferred framework for monetary analysis, here the simple model (1)-(3). Irrespective of whether the slope of the yield curve is included in the forecast, the nominally calculated real interest rate gap can serve as a simple framework for discussion of a central monetary-policy issue: is monetary policy contractive, neutral or expansive? The real interest rate gap naturally cannot show what is most appropriate, but it can function as an anchor or guide if it is included in the analysis as a routine.

Empirical aspects of the real interest rate gap

The charts below present for some of the model countries the long-term interest rates, short-term interest rates and real interest rate gaps using (5). Moreover, inflation, unemployment, and the OECD's latest time series of the output gap are included. Such a brief going through of recent periods with a small number of variables does of course not do justice to the analyses carried out in the respective central banks. The purpose is to see whether it is likely that calculation of the real interest rate gap as a supplement to present procedures can contribute to the understanding of monetary policy, and whether the signals can help to anchor it.

The **USA** is of interest, cf. Chart 1. The proposed measure of the real interest rate gap adheres to the output gap in a strikingly accurate way that has not been discussed so far, but is obvious from the lower panel of the Chart.

In general, US monetary policy seems to adhere to a very simple rule that the real interest rate gap changes in step with the output gap. As long as the output gap is negative the real interest rate gap has in general been negative by roughly the same magnitude and the real interest rate gap is closed in step with the closing of the output gap.

Some deviations from the general rule can be observed. In 1994/95 actual monetary policy was tighter than suggested by the rule while it was more expansionary in 1998/99. The first episode, however, was not a deviation in real time. In 1994 the output gap was closed according to the calculations of the time and underlines that the output gap is a deceitful statistic. In 1998/99 monetary policy was made more expansionary as a consequence of concerns about financial stability in connection with the crisis in Russia and the losses associated with the development in LTCM, cf. Lowenstein (2000).

Whatever the reason, it is clear from looking at the Chart that monetary policy has been conducted in such a way that the response to an increase in the output gap has been a by and large equivalent increase in the real interest rate gap. The simple, superficially nominal, measure of the real interest rate

gap appears to tell a different story about recent American monetary policy than told by most other researchers.

Taylor (1999) does not discuss the real interest rate gap at all. Orphanides & Williams (2002) discuss the uncertainty in compiling both the output and real interest rate gaps and on this basis recommend a differencing rule: the nominal interest rate shall be changed in step with the changes in inflation and unemployment/activity.

Looking at Chart 1, it is surprisingly difficult to see the role of inflation. However, it should be borne in mind that market participants' expectations of future inflation are part of the long-term interest rate. Inflation has been by and large constant during the period considered, so there is little reason to reduce the role of inflation in American monetary policy to the introductory parts of dinner speeches. It may also be interesting to note that it is hard to spot a role for forecasts in American monetary policy. Fed takes its hat off promptly when it sees the man, but not before.

In the **UK**, traces of the pattern in the USA can be found, cf. Chart 2. The real interest rate gap varies by and large as in the USA, while the output gap varies considerably less, so there is not the same obvious correlation. When the output gap is closed as in 1998 and 2000 the Bank of England pursues a contractive monetary policy, measured by the real interest rate gap, and the policy is eased when the output gap re-appears. In the context of the period since 1997, when the Bank of England became independent of the Treasury in determining the short-term interest-rate, it is not until 2002, however, that monetary policy can be said to be expansive. In the Treasury period the background to monetary policy was always output levels below potential, and the real interest rate gap also indicates that monetary policy was consistently expansive.

The Chart also serves to emphasise one of the problems in applying the output gap to economic policy. Unemployment in Britain has been halved since 1994, while the output gap at most has been closed. Taking the trends in unemployment into consideration instead, make the monetary policy of Bank of England easier to follow. The increase in the base rate during 1997 was against a background of rapidly declining unemployment. A fear of overheating if speed limits were not respected seems quite obvious from the development in the unemployment rate even if the output gap not closed until 1998.

Sweden is a quite interesting case, cf. Chart 3. For a year since the spring of 2001 Swedish inflation exceeded the inflation target of 2 per cent +/- 1 per cent measured by Sveriges Riksbank's preferred inflation measure, UND1X, which is consumer prices less indirect taxes and direct influence from interest-rate changes.

Sveriges Riksbank has pointed out repeatedly that monetary policy does not react to the current inflation, but to the inflationary prospects 1-2 years ahead as prescribed in the literature on inflation forecast targeting. The analysis by Berg, Jansson & Vredin (2002) shows that the forecasted inflation 2 years ahead has in fact played a significant role in the decisions on interest rates.

The prognoses for inflation 2 years ahead prepared in 1999 and 2000 were close to 2 per cent. Retroactively, this seems surprising, since the output gap had closed and unemployment had fallen significantly. However, this demonstrates the trivial, yet important message, namely that even the best makes forecast errors, sometimes by a significant margin. Involving the real interest rate gap in the analysis would naturally have raised the question of whether monetary policy in a situation with a closed output gap should be obviously expansionary as the simple measure of the real interest rate gap indicates was the case in 1999 and 2000.

The consequence of an expansionary monetary policy and a closed output gap appeared in 2001 and 2002 as inflation exceeding the target zone. Including the real interest rate gap in the Riksbank’s analysis could have contributed to a firmer anchoring of monetary policy.

In contrast, interest-rate increases took place in 1995, while there was still idle capacity, but inflation at the top level of the inflation target in current and forward-oriented terms. However, inflation in 1997/98 ended back down at a level of 1 per cent, indicating that a slightly less restrictive policy two years before might have brought realised inflation closer to the target.

The real interest rate gap is a type of background radiation to economic policy in **Denmark**, cf. Chart 4. As a consequence of Denmark's fixed-exchange-rate policy the real interest rate gap has generally adhered to that of the euro area/Germany since autumn 1993. Accordingly, monetary policy became expansive from 1994 onwards when the output gap had closed.

However, other forms for economic policy were relied upon. Despite the lack of an independent Danish monetary policy, unemployment has fallen significantly, and inflation has been stable, in the region of 2 per cent since 1990. It is hard to see how a monetary policy based on the local Danish conditions could have led to a more favourable economic development. Beyond any doubt one reason is that the fiscal and structural policy has been applied more actively to the stabilisation policy than in countries where stabilisation is left to the central bank. Overall, the Ministry of Finance, and ultimately the government and the Folketing (Parliament) were aware of the demands from the fixed-exchange-rate policy on the fiscal and structural policy. This does not imply a very activist fiscal policy, but some infrequent adjustments in the course of the steady hand, e.g. in 1998 with the so-called

Whitsun-package, and structural initiatives to make in particular the labour-market function better.

That fiscal and structural policies are not included explicitly demonstrates an inherent inadequacy of the model (1)-(3) for monetary analysis and puts the discussion of the optimality of various monetary-policy rules into perspective. A combination with fiscal and structural policy will probably always be better. In terms of the model the more interesting questions are how natural unemployment can be reduced, when initiatives should be taken and, slightly more hidden, how potential growth is increased.

The real interest rate gap and the ECB's first pillar

The ECB's monetary-policy strategy contains 3 central elements, cf. Issing et al. (2001). Firstly, it defines the Treaty's provision on price stability as price increases not exceeding 2 per cent in the medium term. The strategy furthermore comprises two pillars, i.e. a key role for money, as well as a broadly-based assessment of future inflation. The first pillar, the analysis of money supply, concerns the longer term, while the second pillar concerns the short to medium term.

Based on the model (1)-(3) the first pillar appears difficult to understand. Money supply is not included in the model in any respect. The first pillar reflects the understanding that in the end inflation is a purely monetary phenomenon, i.e. inflation in the long term is due to growth in money supply beyond the level that is contingent on growth in potential output and trend adjustments to the velocity.

The ECB's monetary policy is based on the principles for a free market economy, expressed specifically by how the banking system is not subject to special taxation via a requirement to place non-interest-bearing reserves with the ECB. There is a reserve requirement that the banks place 2 per cent of the deposits on their reserve accounts with the ECB, but these funds accrue interest at the market rate. On this basis the money supply is a completely endogenous variable determined late in the causal structure. The growth in the money supply will e.g. reflect the development in activity and the yields on various assets, including the ECB's interest rate, and will show the result of the private agents' optimising behaviour. In this sense, the trend of the money supply might provide a lot of information, e.g. on the likely appearance of asset-bubbles, and the usefulness of the information will increase in step with the errors and revisions related to other economic statistics, cf. e.g. Coenen, Levin & Wieland (2001).

Since the analyses in the first pillar concern an endogenous variable not directly under the central bank's control, this is fundamentally a question of comparing the outcome of the market with a reference value. Growth exceeding the reference value may indicate that future excess demand is being

built up, resulting in rising inflation at some future stage, and thus indicating a more expansive policy than appears from the broad assessment of inflation.

Analysis of the real interest rate gap defined by the simple empirically oriented method described above can be seen as a natural supplement under the first pillar, as it is a question of comparing the outcome of the market, now the long-term interest rate, with a prior, the central bank's interest rate. Does this comparison give any sign that monetary policy is more or less expansionary than indicated by the broadly based assessment of inflation? Is it desirable? As a principle it is adequate that the central bank's inflation analysis is held up against checkpoints in order to assess whether monetary policy is expansionary, neutral or contractive.

Due to the short history of the ECB only limited material is available to exemplify the analysis. In April 1999, the ECB lowered its interest rates by 0.5 per cent on the grounds that there was no prospect of inflation exceeding the definition of price stability in a weak economic environment, and that the growth in money supply was close to the reference value of 4½ per cent. During autumn 1999 long-term yields began to rise, so that the real interest rate gap became clearly negative, and thereby increasingly signalled an expansionary monetary policy. In November 1999 the ECB so to speak cancelled the interest-rate reduction of the spring, and raised the interest rate by 0.5 per cent. In the press communiqué reference is made to the medium-term economic development and the stronger growth in the money supply.

It is interesting to note that Issing et al. (2001) refer to the long-term interest rate in the opening section of their analysis of this increase in the rates of the ECB. However, the exposition gives the impression that by raising the interest rate the Council believed that they had cancelled out the expansion from the spring, and there are no indications that raising the interest rate by more than 0.50 per cent was ever considered, while it is discussed what problems raising the rate by 0.25 per cent could create. An analysis of the real interest rate gap, cf. Chart 5, could perhaps have ensured a more resolute increase in interest rates when the output gap was closed and inflation on its way up. However, when inflation reached 2 per cent in the spring of 2000 the ECB increased its interest rates further and the real interest rate gap became positive with a decline in long-term rates as a supporting factor.

A final observation is that the ECB seems to keep its monetary policy closer to neutral than did the Bundesbank. Before 1999 the real interest rate gap of the Bundesbank varied between more than plus 2 per cent in 1992 and early 1993 and minus 2 per cent in 1996, while the real interest rate gap since the beginning of 1999 in general has varied between plus and minus 1 per cent corresponding to a more neutral monetary policy since ECB started its op-

erations. The difference can of course also be due to a less volatile environment than in the years of German reunification.

Who catches mice while the dog is chasing the cat?

An inherent problem in applying market expectations to monetary policy is that the market expectations will include expectations of the central bank's future decisions. If the central bank simultaneously utilises market expectations in its assessment of the need for interest-rate adjustments there is naturally a risk that the private market participants and the central bank spend time on analysing each other, instead of analysing the economy. Keynes (1936) demonstrated the problem with great clarity in his analysis of a beauty contest where prizes are awarded among those voting for the winner. This makes it more important what you think the person next to you thinks, rather than what you think yourself. Or what you think your neighbour thinks you think. Irrespective of the degree of gearing of expectations, the outcome is the same: nobody is there to catch the mice. There is a latent risk related to deriving expectations that can reflect counterparties' expectations of one's own acting.

This type of risk also relates to the measure set up for the real interest rate gap. If the long-term yield changes, and the central bank holds its interest rate unchanged, the real interest rate gap will be changed. Therefore, it is important to underline that involving the real interest rate gap in monetary policy should never be normative and that mechanical reactions to changes in the gap are not recommendable. Instead, the real interest rate gap can tell a more humble tale of what market forces believe, and the central bank can compare the outcome of its interpretation with other analyses on determining the short-term nominal interest rate.

Conclusion

It is proposed to supplement the analyses of monetary policy with a simple measure of the real interest rate gap. As a theoretical concept the real interest rate gap is the difference between the monetary-policy real-interest rate and the natural (real) interest rate. In the literature so far this approach has been followed when quantifying the real interest rate gap. It is argued that it is better to use nominal entities and to compile the real interest rate gap as a simple transformation of the difference between the nominal monetary-policy interest rate and the nominal long-term interest rate.

The real interest rate gap proves to be of interest on assessment of especially American and Swedish monetary policy, but also fits into the ECB's monetary-policy strategy. The ECB's first pillar can be perceived as an independent role for factors reflecting the interplay between monetary policy, economic trends and the market's reactions.

The real interest rate gap in the USA apparently follows the output gap closely, but with deviations, e.g. in connection with the crisis following the developments in Russia in 1998. It is hard to find a role for forecasting in US monetary policy.

The opposite applies to Sweden, where involving a real interest rate gap in this simple form could have set a clear question mark against the retroactively too expansionary Swedish monetary policy in 1999 and 2000, with data compiled on a daily basis in real time without subsequent revisions.

The real interest rate gap indicates that the monetary policy of the ECB stays closer to neutral than the policy of Deutsche Bundesbank did.

The right role for the real interest rate gap is to be a guide, not a straitjacket, for monetary policy. It is an unconditional advantage that this information is easily available in real time without direct relation to the other parts of the analyses of the central bank. It is important that the real interest gap is presented as it is, i.e. independent information for the monetary-policy decision makers, regardless of whether it is incorporated in the inflation forecast or not. The forecast must be concentrated on being as professional as possible, i.e. with as small deviations as possible between forecast and result, but it should never monopolise the monetary-policy analysis, not even in inflation forecast targeting central banks.

The suggested measure of the real interest rate gap is therefore a sound supplement to the analyses carried out in any central bank.

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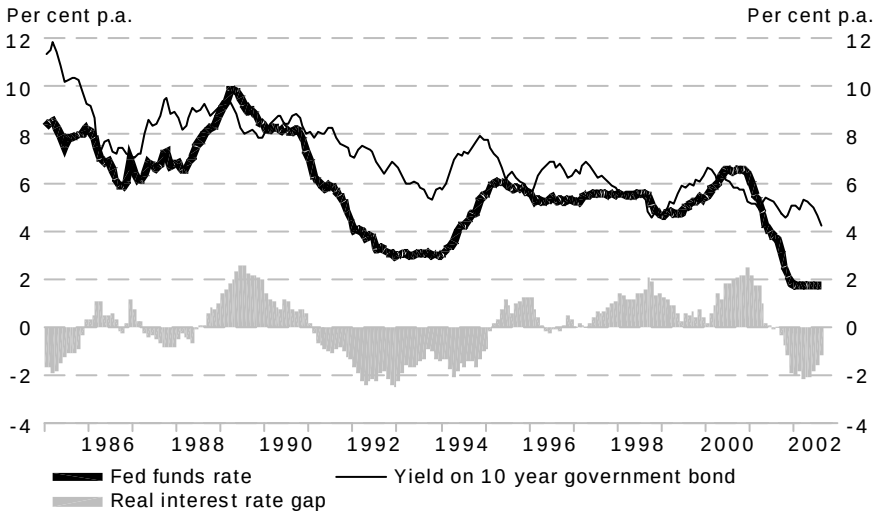
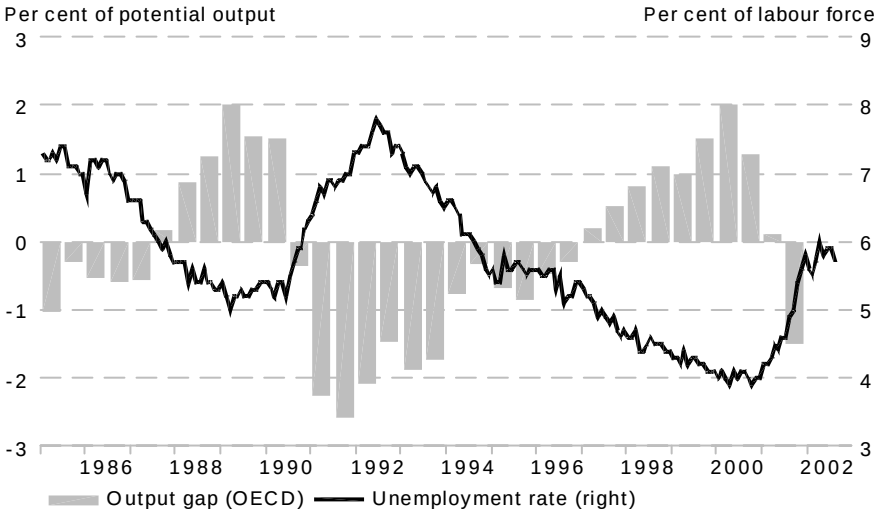
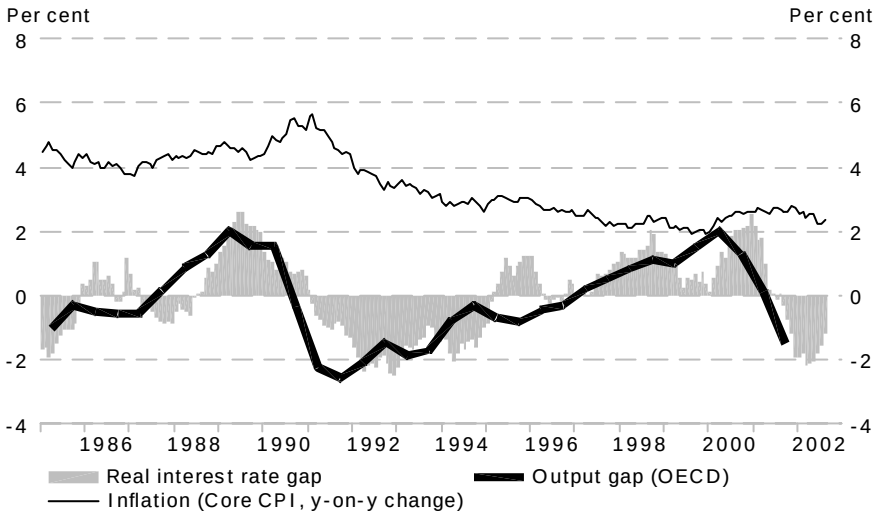
Chart 1. USA

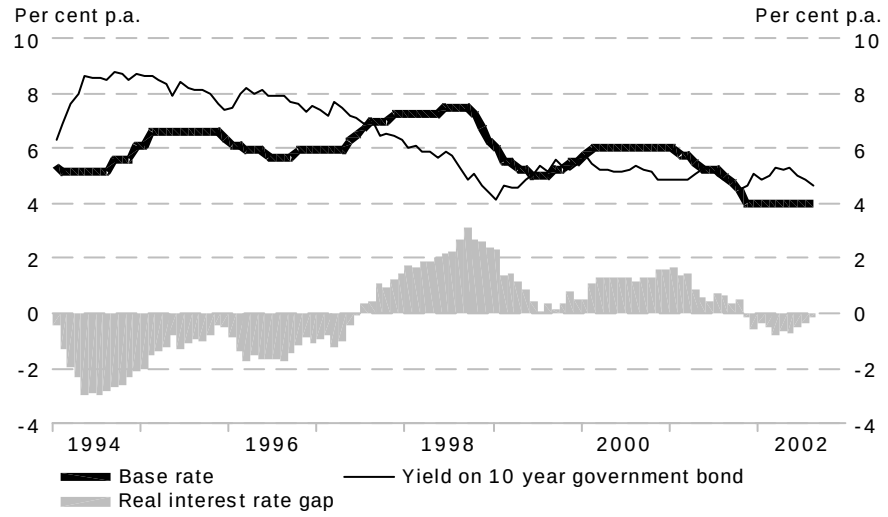


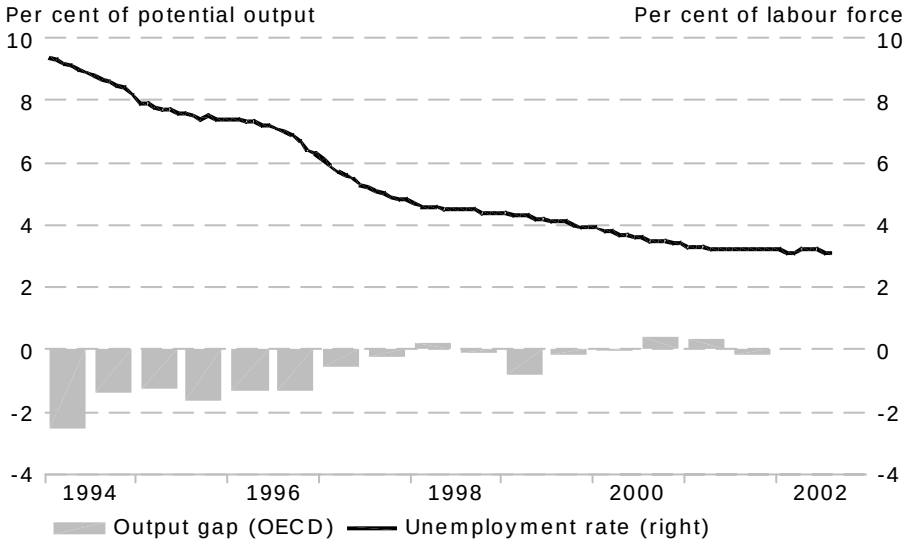


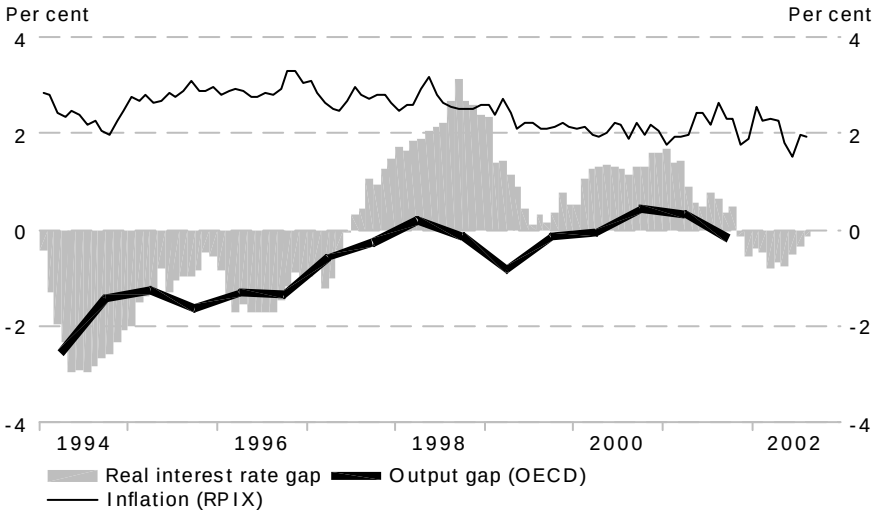


Source: Danmarks Nationalbank, EcoWin and OECD, *Economic Outlook*, May 2002.

Chart 2. UK

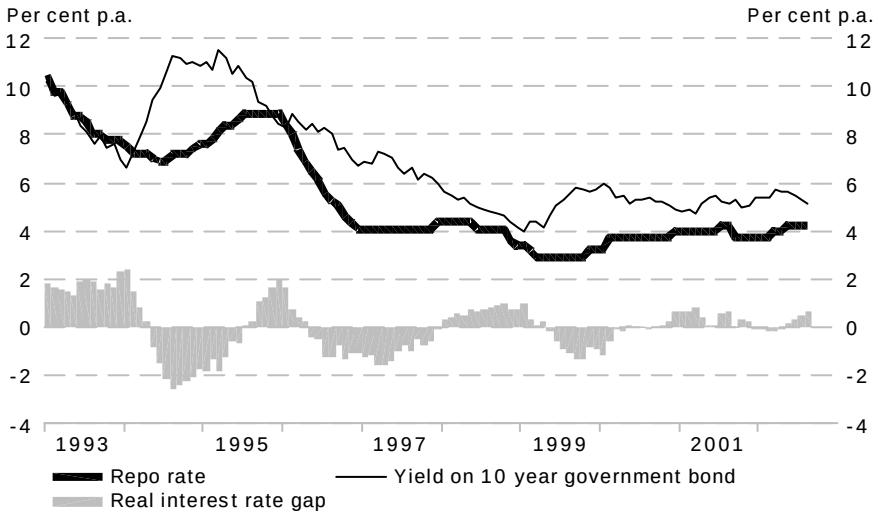


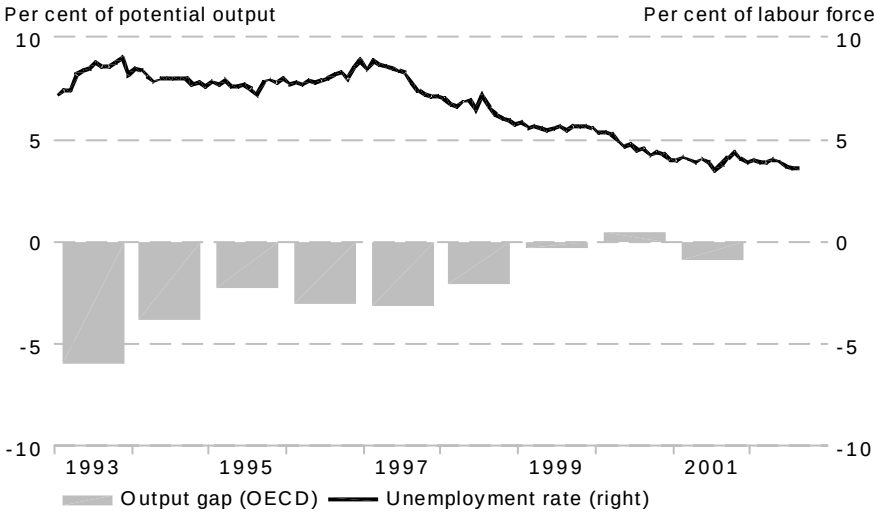


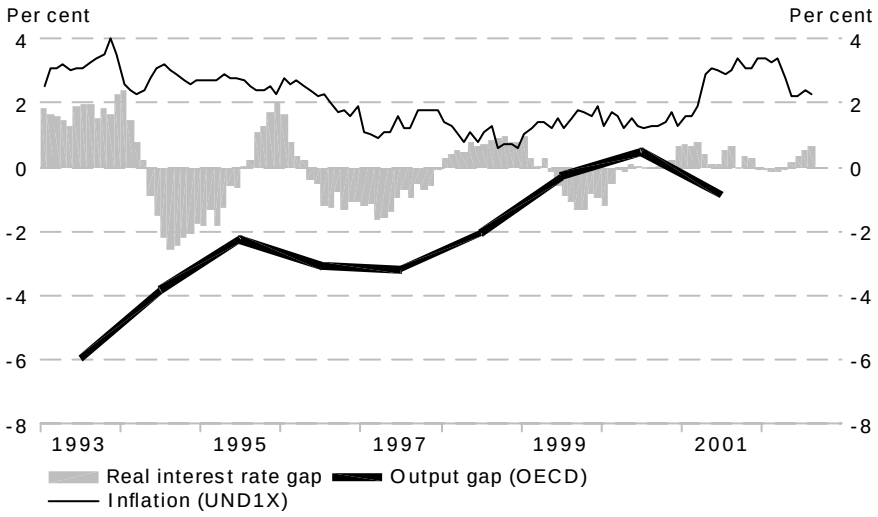


Source: Danmarks Nationalbank, EcoWin and OECD, *Economic Outlook*, May 2002.

Chart 3. Sweden

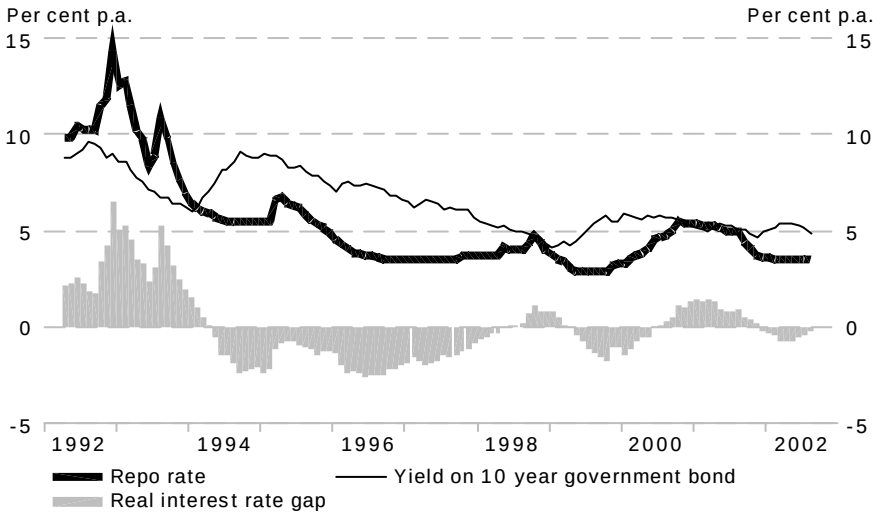


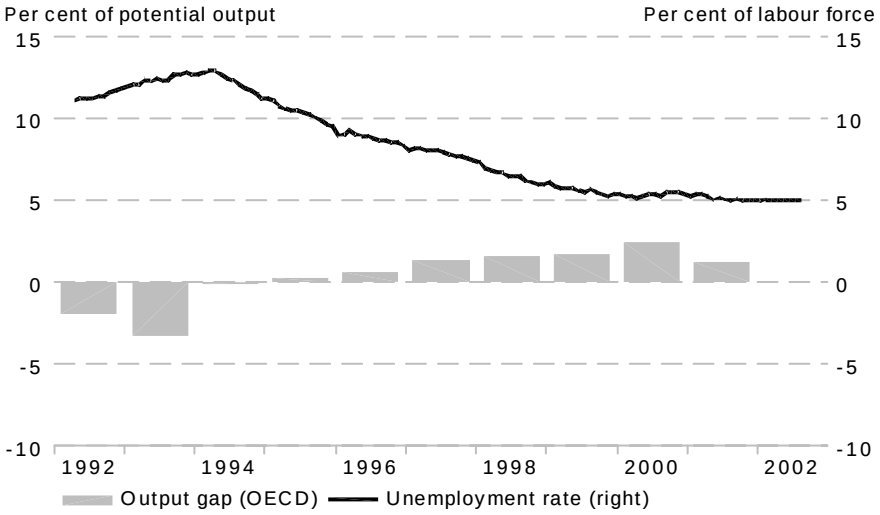


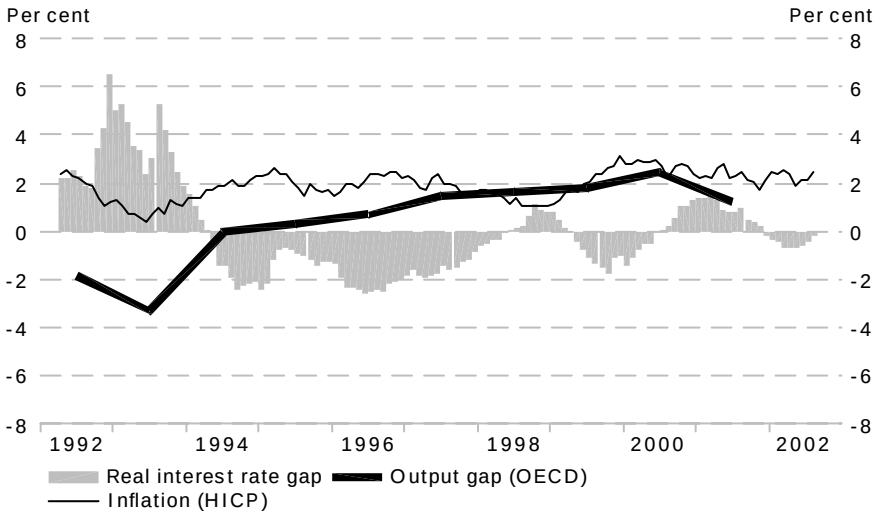


Source: Danmarks Nationalbank, EcoWin and OECD, *Economic Outlook*, May 2002.

Chart 4. Denmark

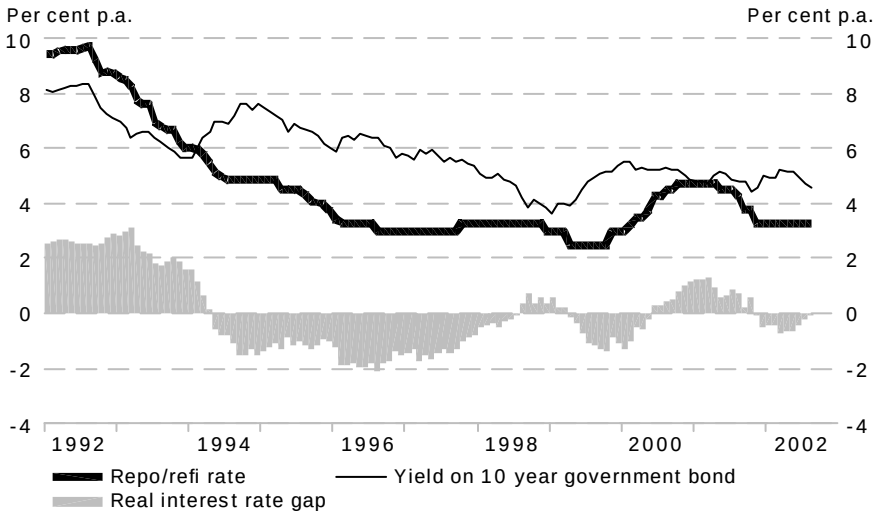


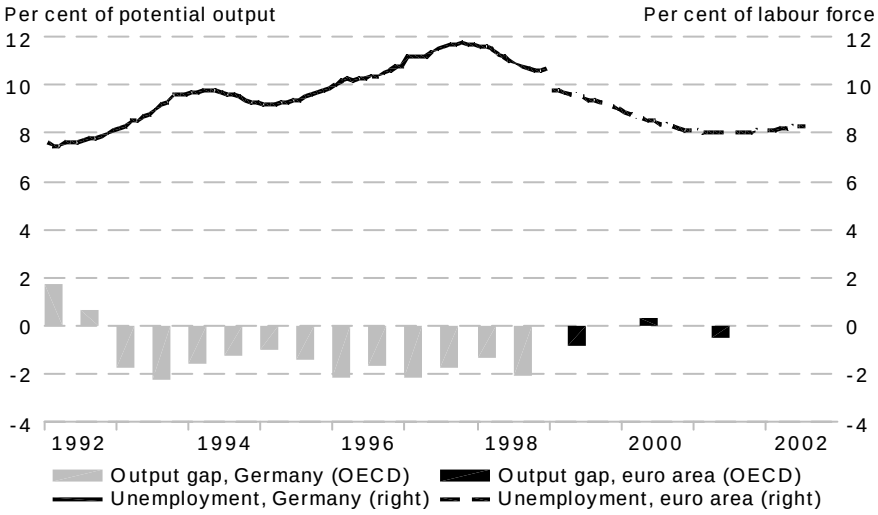


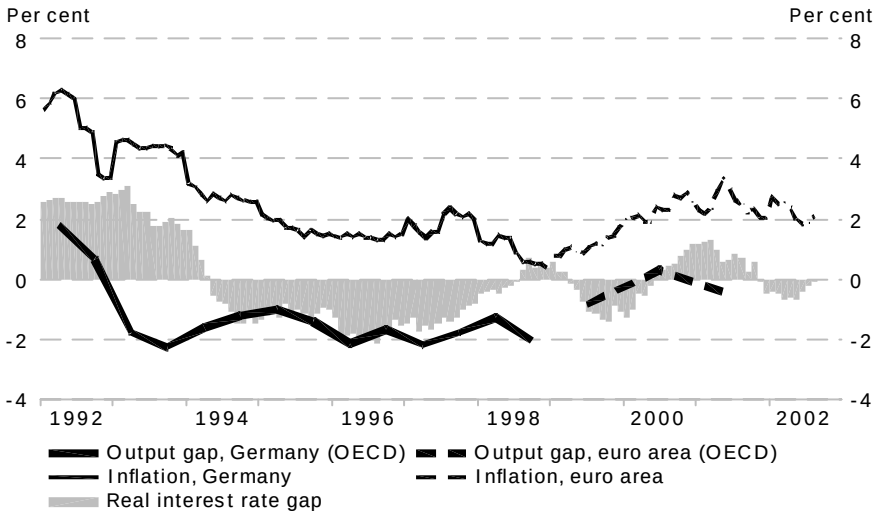


Source: Danmarks Nationalbank, EcoWin and OECD, *Economic Outlook*, May 2002.

Chart 5. Germany / euro area







Source: Danmarks Nationalbank, EcoWin and OECD, *Economic Outlook*, May 2002.