

# The basis for inflation targeting

Speech by Deputy Governor Jarle Berge at a Seminar held by the Association of Norwegian Economists at Sanderstølen on 21 January 2005

*Please note that the text below may differ slightly from the actual presentation. The speech does not contain new assessments of the economic situation or of current interest rate setting.*

In 2004, the Norwegian Finn Kydland and the American Edward Prescott were awarded the Nobel Prize in economic sciences. They received the prize for their theoretical studies in the 1970s on economic policy rules and the importance of anchoring economic agents' expectations. Norway's current economic policy, with an inflation target for monetary policy and a fiscal policy rule, is partly based on the insights of Kydland and Prescott. But it is not just theory that has brought us here. Practice and experience over the last 30 to 40 years have perhaps been just as important. In his book "Doctrines and economic management in retrospect", Hermod Skånland, former Governor of Norges Bank, points out that until the 1980s, the perception that government had to assume responsibility for employment and that borrowing should be inexpensive contributed to both the currency crisis and the banking crisis.<sup>1</sup> Today's economic policy can be seen as a result of a long learning process where academicians and the authorities have contributed.

First, I will discuss the historical and theoretical basis for the current monetary policy. I will then move on to discuss monetary policy in practice and will also look more closely at the requirements inflation targeting imply for our analytical tools.

## **Historical and theoretical basis for inflation targeting - lessons and experiences**

In particular, two fundamental lessons from the last 30-40 years have taken on considerable importance for economic policy in general and monetary policy in particular. We can, perhaps, say that these lessons have led to a paradigm shift in economic policy.

One lesson is that if the authorities do not take into account that economic agents are forward-looking when they make decisions about consumption and investment, wages and prices, this may have adverse consequences. Agents take into account their expectations concerning future economic policy, not only today's economic policy. It is thus important that the authorities do not sow doubt about their objectives. They must act in a predictable and credible manner within a long-term framework. There must be consistency between the stated objectives of economic policy and what is actually done to achieve these objectives.

This is exactly what Kydland and Prescott pointed out in their pioneering work from 1977.<sup>2</sup> Their work was based on insights from the theory of rational expectations, an area where Robert Lucas, who received the Nobel Prize in 1995, made a significant contribution.<sup>3</sup> Economic agents will not systematically misjudge what the authorities plan to do in the future. Kydland and Prescott showed that room for manoeuvre in economic policy may have a price. The insight they provided was that economic policy can achieve better results if the authorities can commit themselves to a pre-established set of credible policy rules, rather

than give themselves the possibility of changing policy at any given time in the future. This was a fundamentally new insight compared with the belief that the authorities had unlimited possibilities for managing the economy, a view that had dominated economic policy in previous decades.

One example used by Kydland and Prescott is what can happen when the authorities impose heavy taxes on capital today at the same time as they promise to lower taxes in the future. If firms believe this, they will increase investment now. However, when the increased real capital stock becomes a fact, the authorities may be tempted to disregard their promise of lower taxes. The purpose of reducing taxes has already been achieved. A breach of promise may be accepted once. Having learned by experience, however, economic agents will not believe this kind of promise unless the authorities commit themselves to delivering what they promise. In order to function, policy must therefore be time-consistent and credible.

In Norway, the devaluation decade from 1976 to 1986 may be an example of economic policy that did not fully recognise the role of expectations and the significance of credible policy rules. During this period, the krone was devalued ten times if we also include "technical adjustments", which also implied devaluation. The many exchange rate adjustments in this period were in part aimed at remedying the deterioration of Norway's relative cost level, which in turn was related to the government's attempt to take responsibility for employment also when the social partners failed to do so. Gradually, expectations of a continued exchange rate policy that would maintain manufacturing's cost competitiveness became widespread. This weakened the incentives for the social partners to keep wage and cost inflation at a reasonable level. The devaluations contributed to high inflation. When it finally became clear that this could not continue, it took many years before inflation was brought under control and interest rates in Norway could be reduced to the level of interest rates in other countries.

The other lesson drawn from economic theory and economic policy in the 1960s, 1970s and 1980s was that in the medium and long term it is not possible to reduce employment by accepting somewhat higher inflation. An attempt to increase output beyond the level that is consistent with stable inflation will over time lead to steadily rising inflation. Economic agents will eventually incorporate higher inflation into their inflation expectations. In the long run, the result will only be higher inflation, not higher employment. Output and employment will return to their supply-determined level. In the long term, output is determined by the supply of labour, capital, technology and adaptability. Monetary policy has little effect on these factors. In other words, there is no permanent trade-off between inflation and output.

Very high inflation is a wartime phenomenon and a phenomenon of the 1970s and 1980s. Substantial real economic losses have followed in the wake of high inflation. High and variable inflation impairs the function of prices as an information vehicle. Over time, monetary policy can determine the inflation rate. Low inflation is monetary policy's contribution to stable, high economic growth over time.

The responsibility for interest rate decisions was delegated to Norges Bank pursuant to the amendment to the 1985 Norges Bank Act and through the change in its application in 1986. The interest rate would no longer be an instrument of industrial or social policy. The last

devaluation took place in 1986 after a fall in oil prices. We then shifted to a fixed exchange rate regime. The Norwegian economy had to go through an extensive turnaround operation. The objective of monetary policy was to provide the economy with a nominal anchor. Confidence in the Norwegian krone had to be restored in order to avoid persistently high inflation. This required very high interest rates. The fixed exchange rate regime resulted in a gradual reduction in inflation and succeeded in providing the economy with a nominal anchor.

However, fine-tuning the exchange rate proved to be an extremely demanding task. We had to abandon the fixed exchange rate regime in December 1992. Important reasons were freer capital flows, deeper financial markets and hence a surge in cross-border capital movements. Initially, however, the krone exchange rate showed little change and quickly found a new range.

The exchange rate remained stable until autumn 1996, but gradually began to show wider fluctuations. Developments in international financial markets led to more pronounced fluctuations. And more fundamentally, exchange rate developments no longer provided signals to wage formation and fiscal policy when labour market pressures mounted and incomes policy failed. High petroleum revenues, fiscal slippage and expectations of increased use of petroleum revenues contributed to this. The exchange rate was no longer appropriate as a nominal anchor. Norges Bank therefore placed increasing emphasis on low and stable inflation in its conduct of monetary policy.

Petroleum revenues posed particular challenges to stabilisation policy. It became increasingly challenging to smooth cyclical fluctuations by means of fiscal policy. The pressure on fiscal policy made it appropriate to tie oneself to the mast to a further extent to protect petroleum revenues from special interest groups. But this meant that monetary policy had to be given greater responsibility for stabilising inflation, output and employment.

The response to this challenge was the revision of economic policy in spring 2001. The most important policy change was the plan for phasing in petroleum revenues - the so-called fiscal rule. An inflation target for monetary policy was introduced at the same time. We can now say that inflation targeting is normal in small and medium-sized economies with financial markets that function relatively smoothly. The fiscal rule and the inflation target can be seen as an answer to the problems raised by Kydland and Prescott.

### **Inflation targeting in practice**

Norges Bank operates a flexible inflation targeting regime, so that weight is given to both variability in inflation and variability in output and employment in setting interest rates. Thus, we take into account that monetary policy affects output and employment in the short term and that it is appropriate to take this into account when setting the interest rate to reach the inflation target over time. Flexible inflation targeting builds a bridge between the long-term objective of monetary policy, which is to keep inflation at bay, and the task of real economic stability. The inflation target is a vehicle for, not an obstacle to, monetary policy's contribution to smoothing fluctuations in the real economy.

The effect of monetary policy depends on market participants' *expectations* concerning future policy as much as the central bank's interest rate decisions. It is primarily economic agents' interest rate expectations that influence consumption and investment decisions - and consequently inflation. To be successful, monetary policy must be capable of influencing expectations. Michael Woodford, a leading academician in modern monetary theory, states the following in his book "Interest and Prices": *"For successful monetary policy is not so much a matter of effective control of overnight interest rates as it is of shaping market expectations of the way in which interest rates, inflation, and income are likely to evolve over the coming year and later. (2) It follows that, insofar as it is possible for the central bank to affect expectations, this should be an important tool of stabilization policy."*<sup>4</sup>

As long as the central bank's behaviour is credible and predictable, an inflation target for monetary policy can contribute to anchoring expectations of future inflation. This also contributes to providing a basis for economic agents' interest rate expectations.

In the *Inflation Report*, Norges Bank provides its assessments of the outlook for economic developments. The chart shows Norges Bank's projections from *Inflation Report 3/04*, which was published in November. The projections are conditional on the market's interest rate expectations. This interest rate path is then assessed by the Executive Board on the basis of the derived projections for inflation and the output gap. Since summer 2004, the *Inflation Report* has presented the Executive Board's assessments of monetary policy in the next four-month period.

In the last *Inflation Report*, it was the Executive Board's assessment that the projections conditional on the market's interest rate expectations seemed to provide a reasonable balance between the objective of bringing up inflation, while avoiding excessive growth in output and employment. The previous *Inflation Report*, from July 2004, stated that *"the most appropriate alternative now seems to be that the interest rate should be kept unchanged for a longer period than indicated by market expectations."* After this, we saw that interest rate expectations fell.

By communicating our view concerning interest rate expectations, Norges Bank seeks to influence interest rate expectations. The objective is for interest rate expectations to be consistent with economic developments where inflation is on target over time and output is stable around its potential level. Most often, however, there will be a number of ways to achieve this. We need some references that provide some indication of whether a given interest rate path is reasonable. It is natural to turn first to monetary policy theory.

In the theoretical literature, the trade-off between price stability and stability in the real economy is often described as a problem of minimisation, where the central bank wants to minimise a loss function, which includes variations in output and variations in inflation. The central bank shall then choose the path for the interest rate ahead that minimises the expected discounted "losses" in all future periods. In practice, no inflation-targeting central bank uses a loss function of this kind directly. However, what they do contains elements of theoretical thinking. We try to set the interest rate so that it provides a "reasonable balance" between the objective of stabilising inflation around the target and the objective of stable developments in the real economy.

The theoretical framework provides limited concrete and easily communicable guidance. In practice, it may be useful to have some simple points of reference that can help us to evaluate whether an interest rate path seems reasonable in relation to the monetary policy objective.

The most important task of monetary policy is to provide an anchor for inflation expectations. Norges Bank sets the interest rate with a view to stabilising inflation at the target within a reasonable time horizon, normally 1-3 years. Therefore, when evaluating the interest rate path, the most important criterion is whether inflation reaches the target within this time horizon and remains there. If we do not reach the target within this time horizon, there may be a risk that inflation expectations will gradually move away from the target. This could weaken confidence in monetary policy and the inflation target as a nominal anchor. For the same reason, inflation should also be moving towards the target well before the end of the three-year period.

The inflation gap and the output gap should be in reasonable proportion to each other until closure. This assessment must also take account of the substantial uncertainty surrounding the calculation of the output gap, and of Norges Bank's mandate which specifies that inflation shall be 2.5 per cent over time.

The inflation gap and the output gap shall normally not be positive or negative at the same time further ahead. If, for example, both gaps are positive, a higher interest rate path would be preferable as this would bring inflation closer to the target and contribute to stabilising output.

Depending on the initial situation for inflation and production, it may be difficult to meet these criteria simultaneously. How easy it is to meet these criteria will depend on the disturbances to which the economy has been exposed.

There are also other important considerations when assessing the interest rate path. We must assess whether the interest rate path, at least in the next few months, results in acceptable developments also under alternative, but realistic assumptions concerning economic developments and the functioning of the economy. In other words, is the strategy robust? We must also evaluate the consequences for financial stability.

Last, but not least, a successful monetary policy requires a reasonably good understanding of the state of the economy and its functioning. I will now discuss this in more detail.

## **Analyses and models at Norges Bank**

The Executive Board's assessments of various interest rate paths are based on projections of economic developments, supplemented by other information and discretion. To provide you with some insight into how we work when we make projections for the Norwegian economy, it may be practical to use a tripartite approach: the short-term or current situation, the medium-term or projection period and finally what we call the long-term. The dividing lines are not clearly defined, but are to some extent overlapping as indicated in the chart.

Knowledge about the current economic situation is absolutely essential to making projections of economic developments that are useful for monetary policy. We must form a picture of capacity utilisation in the economy and whether it is increasing or decreasing. We must also try to identify the driving forces or disturbances that influence developments. A macroeconomic model will be a useful tool in this connection. Nevertheless, thorough analyses of available economic statistics are the most important source when we are assessing the current situation.

To obtain a good picture of the current situation, it is important to consider developments in context and to distinguish between genuinely new information and noise. There is always uncertainty associated with statistics and the quality can vary depending on the source. Frequency and the time from measurement to publication also vary considerably. Economic data are published with a time lag and are often revised. A very useful cross-reference and alternative information channel to official statistics is therefore our own regional network which consists of enterprises, organisations and local authorities throughout the country. We engage in five rounds of talks each year with business and community leaders concerning economic developments in their industries. All of this information provides a basis for our analysis of the current situation. A large share of the overall resources used for analyses and projections of the Norwegian economy is devoted to this work.

Based on experience and economic theory, we can assume that certain relationships will hold in the long term. There is fairly broad agreement that monetary policy cannot affect the level of output and employment over time. Therefore, it is reasonable to assume that output and employment over time are determined by supply-side factors. At the same time, inflation is determined over time by monetary policy. Both theory and experience indicate that in the long term, the real interest rate must be positive and consistent with the growth potential of the Norwegian and international economy. Experience shows that the real interest rate has generally ranged somewhere between 2 and 4 per cent. In keeping with experience, we can assume that wage income, consumption and investment as a share of production are fairly stable over time. Hence, we have some fairly robust reference points for the economy in the long term.

In the work on medium-term forecasting, short-term developments are linked to our assessments of long-term developments. In this context, a macroeconomic model can function as a bridge. Moreover, a macro model can ensure consistency between important economic variables. As an alternative and a cross-reference, we also make medium-term projections using a more detailed analysis of a number of economic variables. Simple equations where the parameters are econometrically determined and smaller systems of equations are used in this work. The baseline scenario that is published in the *Inflation Report* is based on a discretionary overall assessment of the projections derived from the model and the projections from the more detailed analysis. Thus, we do not use a macro model mechanically. But a macro model can function as a reference and a guide while ensuring consistency in the projections over time.

The value of a macro model depends on how useful it is for monetary policy assessments. Under an inflation targeting regime, the focus is largely on risks, on understanding what type of disturbances to which the economy may be exposed and on analysing the monetary

policy response to various disturbances. The recurrent question that we seek to answer is at what level the interest rate should be set to bring inflation back to target and stabilise economic developments around trend. In the policy analysis and the risk analysis, we look at the consequences for economic developments of alternative assumptions about the interest rate, the current economic situation and the functioning of the economy. Such analyses of alternative scenarios must be based on a macro model.

What are the requirements we set for a macro model? First, it is of particular importance that the mechanisms in the model can be interpreted and communicated so that the model is perceived as a sound tool, both in the internal process and in the Bank's external communication. In the policy analysis, we also need a framework where the various disturbances can be interpreted and described. The importance of analysing risks also means that we must be able to change the various model mechanisms in a straightforward way. Moreover, the model must reflect the lessons that led to a paradigm shift in economic policy. Expectations must therefore play an explicit role in the model. The model must reflect that inflation is a monetary phenomenon in the long term and that monetary policy provides the economy with a nominal anchor.

Norges Bank's macro models have played a key role in forecasting work over many years. The models satisfy many of the requirements for a sound model, but the introduction of inflation targeting revealed new needs that these models were not designed to meet. Developments in economics and computational technology have also provided new possibilities for constructing and solving macroeconomic models. Norges Bank has therefore started work on developing a new macro model. An important purpose of constructing a new model is to expand our tool kit so that we are better equipped to conduct policy analyses. I would therefore like to devote some attention to this model here, also because it may help explain our thinking as to the functioning of the economy.

We have called the new macro model "Norwegian Economy Model", or abbreviated "NEMO". In the work on developing the model, we have benefited greatly from our close cooperation with the IMF and the Federal Reserve Bank of New York. We have also been inspired by and learned from the work of a number of other central banks, for example in the UK, Sweden and Canada. In addition, we have the benefit of a long history of model-building in Norway.

NEMO belongs to a class of macroeconomic models that tends to be referred to as DSGE models, which stands for "Dynamic Stochastic General Equilibrium". The term dynamic means that the entire path from the short term to the long term is modelled. The model is stochastic in the sense that the economy is exposed to random disturbances. Such disturbances can, for example, stem from a change in preferences, technology and market structure. General equilibrium implies that supply equals demand at all times in all markets, but there may be considerable temporary deviations from the long-term growth path.

A prominent feature of this type of model is that the behaviour of different economic agents is modelled explicitly. Each model parameter therefore has its own economic interpretation. Households maximise utility and choose the optimal distribution between work and leisure and between consumption and saving. Firms maximise profit. The authorities have defined specific economic policy objectives.

The first DSGE models were developed in the early 1980s, and were closely linked to real business cycle theory which Kydland and Prescott pioneered. These models included elements of classical theory such as perfect competition, flexible prices and market clearing. A main thesis of real business cycle theory is that not only is long-term economic growth, but also the business cycle, driven from the supply side, specifically by an uneven development in technology. Lags in the economy were linked to real variables in these models, for example that it takes time to install new capital. A result of this theory was that stabilisation policy is superfluous. The one-sided focus on technology shocks as a driving force of the business cycle drew criticism from many economists.

The DSGE models have been further developed over the past decade and they have gained a more prominent role. Important additions are Keynesian elements such as monopolistic competition and nominal rigidities. Monopolistic competition means that firms have market power and set prices as a mark-up on their marginal costs. In the more recent DSGE models, prices and wages are also rigid in the short term, partly reflecting contracts and costs associated with price adjustments. These two assumptions imply that production is determined by demand in the short term and that monetary policy affects the real economy. Therefore, more recent DSGE models have features that combine elements of both Neoclassical and Keynesian models. This body of theory is often referred to as the "New Neoclassical Synthesis", but these types of models are also frequently called "New Keynesian". The long-term properties of the models can be qualified as classical: Monetary policy can only influence nominal variables, while production is determined by technology, preferences and the supply of factor inputs. In the short term, the model has Keynesian features: Production is determined by demand. Monetary policy can influence production and employment because it takes time to change prices and wages.

NEMO will be quantified so that it reflects our perception of the central mechanisms that apply to today's economy. In this process, we must combine our overall theoretical and empirical insight. Econometrics and other empirical methods are used as an aid in providing us with insight into the functioning of the economy. The strategy and methods that we use in this work are broad-based and include traditional econometrics, insight gained from many years of work on the RIMINI model and other Norwegian macro models, structural VAR models, Bayesian estimation techniques, analyses of stylised facts and micro observations. Different approaches can yield different results. Discretion must therefore always be exercised in quantifying the model.

We have not completed the work on quantifying the model parameters. I would nevertheless like to illustrate how NEMO can already be qualitatively used as input in analysing the Norwegian economy.

During most of the 1990s and until 2002, inflation was close to the current inflation target. Consumer price inflation in Norway declined sharply, however, through 2003 and into 2004. It is important to understand the background for these developments. The most appropriate - or optimal - monetary policy response will depend on underlying shocks or disturbances.

A number of factors seem to have contributed to pushing down inflation to such a low level. The appreciation of the krone through 2002 contributed to a sharp fall in prices for imported consumer goods. A shift in trade patterns and the cyclical downturn in the world economy



may also have contributed. Since mid-2003, however, a more subdued rise in prices for domestically produced goods and services was primarily responsible for reducing overall price inflation. In our *Inflation Report*, we have pointed out that intensified competition in retail trade and other service sectors in recent years may have contributed. In the first round, increased competition affects companies' profit margins because prices are pushed down. Many companies have probably responded by rationalising operations in order to cut costs.

Although there is probably no model that would a priori have captured the considerable disturbances to which the Norwegian economy has been exposed, it is useful to be able to analyse the effects of the disturbances after they have occurred. Therefore, let us use the model to look at the qualitative effects of a fairly long-lasting increase in competition in product markets. The magnitude and duration of the shock has been adjusted so that inflation in the model illustration falls by around 1 percentage point. In the charts, all the variables are shown as deviations from a baseline scenario, i.e. a path for economic developments without such a disturbance. The figures on the X-axis indicate the number of quarters.

Increased competition reduces companies' possibilities for setting prices higher than marginal production costs. This contributes to a reduction in prices. Owing to nominal rigidities, however, it takes time for prices to adapt to increased competition. Therefore, inflation falls gradually.

The interest rate is reduced to counter the fall in inflation and to bring inflation back to the target. Lower real interest rates combined with lower price inflation contribute to higher consumer demand. Output increases to meet higher demand. Higher output increases demand for factor inputs such as labour and capital. Therefore, the number of man-hours increases. Investment also rises as a result of lower real interest rates. Increased demand for labour results in a tighter labour market and upward pressure on nominal wages. Lower price inflation has the opposite effect. Therefore, nominal wages may remain relatively stable, while real wages increase sharply. Thus, real marginal costs increase. This will gradually contribute to pushing up price inflation. The prospect of higher inflation leads to a gradual increase in the interest rate. An increase in real interest rates curbs demand. Since increased competition is assumed to be only temporary in this illustration, there will be no permanent effects on output. Therefore, the economy will gradually return to the baseline scenario.

Of course, we do not believe that increased competition alone can explain developments in the Norwegian economy in the last couple of years. There have been many driving forces behind low inflation and developments in output. Nevertheless, the developments resulting from the model analysis are fairly consistent in qualitative terms with the picture we seem to be observing for the Norwegian economy. Inflation and the interest rate are low. Real wages have risen and consumption growth is high. Mainland investment and in particular housing investment have gradually increased substantially. The number of man-hours worked has also picked up markedly, although employment growth measured by the number of persons has been more subdued.

The model can thus support an assumption that increased competition in the Norwegian economy is one of several driving forces behind low inflation. The model may also provide an indication of the appropriate monetary policy response to such disturbances. However, let me again emphasise that this model is still in the development process and that in addition to this model, we are also working on other empirically-based analyses to understand relationships in the Norwegian economy. It is important to have an abundance of tools so that we can combine different models and theories in our economic analyses.

## Conclusion

The lesson from Kydland and Prescott was that economic policy can achieve better results if the authorities can commit themselves to a pre-established set of credible policy rules. The conduct of monetary policy in Norway, as in many other countries, is delegated to the central bank with an objective of low and stable inflation. The inflation target can be seen as an answer to the problems raised by Kydland and Prescott.

However, inflation targeting probably places greater demands on our understanding of the way the economy functions than earlier. Macroeconomic models are useful tools that can combine our empirical and theoretical insights. But models cannot provide definitive answers to all the questions that we as decision-makers face on a daily basis. Nor can they reduce the uncertainty surrounding economic developments. Therefore, it is necessary to analyse the economy from different angles. We must also look out the window, we must be pragmatic and we must exercise discretion.

## Footnotes

<sup>1</sup>Skånland, Hermod (2004): "Doktriner og økonomisk styring. Et tilbakeblikk", *Norges Banks skriftserie* nr. 36("Doctrines and economic management in retrospect", *Norges Bank's Occasional Papers*, no. 36) (In Norwegian only).

<sup>2</sup>See Kydland, F. E. and E. C. Prescott (1977): "Rules rather than discretion: The inconsistency of optimal plans", *Journal of Political Economy* 85, 473-490.

<sup>3</sup>Lucas, R. E. (1976): "Econometric Policy Evaluation: A Critique" *Carnegie-Rochester Conference Series on Public Policy* 1, 19-46.

<sup>4</sup>Woodford, Michael (2003): "*Interest and Prices*", Princeton University Press, page 15.