Stefan Ingves: Flexible inflation targeting in theory and practice

Speech by Mr Stefan Ingves, Governor of the Sveriges Riksbank, to the Swedish Economics, at the Swedish Economics Association, Stockholm, 12 May.

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Mikael Apel, Carl Andreas Claussen and Niklas Frykström have contributed to this speech.

It is enjoyable, inspiring and a privilege to come here and speak at the Swedish Economics Association. It is one of the few occasions when I can take a break from current practical monetary policy and discuss issues of a more academic nature. I intend to take up some issues that I have been considering "on the side" for some time now. If I were to try to coin a title that summaries what I am going to talk about, it would probably be "the link between theory and practice in monetary policy", and more specifically where I believe the boundaries are as to how close the links can be. I would like to point out that these are my personal reflections and not official Riksbank views.

Monetary policy's tasks in general terms…

According to the Sveriges Riksbank Act, the objective of monetary policy is to maintain price stability. The Riksbank has specified this as a target for inflation – where the annual change in the consumer price index (CPI) is to be 2 per cent. At the same time as monetary policy is aimed at attaining the inflation target, it is also supposed to "support the objectives of general economic policy for the purpose of attaining sustainable growth and a high level of employment". The Riksbank does this by not merely striving to stabilise inflation around the inflation target, but also striving to stabilise the real economy, that is, production and employment. The Riksbank thus conducts what is known as flexible inflation targeting. Flexible here means that the Riksbank does not focus solely on inflation.

To be rather more concrete, one might say that every time we make a decision we try to find a forecast path for the repo rate that means monetary will be, as we say, well-balanced. This means that we try to find an appropriate balance between stabilising inflation around the inflation target and stabilising the real economy. One way of illustrating this balance is to say that the deviations arising during the forecast period between, on one hand, inflation and the inflation target, and, on the other, the real economy and a trend, may not become too great.

…and in theory

It is common in the literature to describe flexible inflation targeting as the central bank minimising a loss function that is a weighted sum of a measure of the variation in inflation and the variation in the real economy. The loss function can be written as

$$L = \sum (\pi - \pi^*)^2 + \lambda \sum (y - y^*)^2$$,

where π is the forecast for inflation, π^* is the inflation target and $y - y^*$ is the forecast deviation between actual resource utilisation in the economy and the long-run sustainable, or

"normal" level of resource utilisation.[1] The first term represents the central bank's target of stabilising inflation and the second its ambition to stabilise the real economy.

The parameter λ represents the importance the central bank gives to stabilising the economy in relation to stabilising inflation. If λ were zero, this would mean that the central bank does not care at all about developments in the real economy, but merely tries to bring inflation as close to the target as possible. If λ is large, this means that the central bank places great emphasis on stabilising the real economy in relation to stabilising inflation. The term loss function comes from the fact that the larger the deviation, or "gap", the further away we are from where we want to be, and thereby the greater the "loss".

In this theoretical description the central bank's task is described in slightly more detail than the general wording of "finding a suitable balance between stabilising inflation and stabilising the real economy". More specifically, it is a question of finding the interest rate that will minimise the squared forecast deviations during the forecast period between actual inflation and the inflation target and between actual and normal resource utilisation, where the latter deviation is weighted by λ – a bit of a tongue-twister to put into words.

But it can be illustrated relatively conveniently with the aid of a figure. The figure measures the variation in inflation along the horizontal axel and the variation in the real economy along the vertical axel. The variations are measured using the mean squared gap, that is, the average squared deviation across the forecast horizon. Such mean squared gaps can be calculated for various possible interest rate paths and one can then compare different interest rate paths by marking the mean squared gap in the figure. The closer to origo, or the further south-west in the figure, the smaller the two mean squared gaps are, and the better success the accompanying interest rate path has in stabilising inflation and the real economy.[2]

We say that inflation targeting, or the interest rate path, is effective if it is not possible to reduce one of the mean squared gaps without the other gap increasing in size at the same time. Theoretically, we could imagine there is a very large number of effective points. These points form a "front" as illustrated in the figure. Where the central bank chooses to position itself on this front depends on how important it considers stabilising the real economy to be in relation to stabilising inflation, that is, which λ the central bank has.

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[1] I have simplified somewhat. Without simplification, the loss is often written as

$$L_t = \sum_{j=0}^{T} \left(\pi_{t+j} - \pi^* \right)^2 + \lambda \sum_{j=0}^{T} \left(y_{t+j} - y_{t+j}^* \right)^2$$

where t, is the time when we make the forecasts, and T is the "horizon", that is, the period our forecasts cover.

[2] The method with a mean squared gap is presented in the article "Evaluation of different monetary policy alternatives" in the Monetary Policy Report, October 2009. A presentation and an analysis using this method were also included in Material for assessing monetary policy 2009 and Material for assessing monetary policy 2010. For a more detailed description and references to relevant literature, see Lars E.O. Svensson's speech "Assessing monetary policy". The speech was held at Uppsala University on 13 March 2009.

Figure 1. Mean squared gap for resource utilisation and inflation, and the effective front.
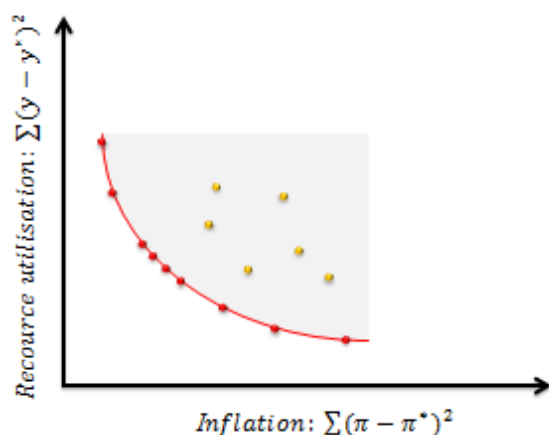
The step from theory to practice is not uncomplicated

This theoretical approach, where the central bank minimises a squared loss function with inflation and resource utilisation has been in the monetary policy toolbox for a long time, and it has been useful in developing flexible inflation targeting. It captures in an illustrative and relatively simple way the essence of inflation targeting and it has helped to structure our thinking. The mean squared gap analysis makes it easier for the central bank to explain why it chooses a particular monetary policy – what it means more specifically by a "well-balanced" policy. It can also provide support when assessing monetary policy.

But however good the tool is, the step from theory to practice is not without complications. I intend to discuss some circumstances that in various ways complicate things when taking this step.

Arguments in loss function less clear in practice than in theory

One such circumstance is that although the variables included in the loss function – inflation and resource utilisation – are in theory unambiguous and well-specified, in practice it is far from evident how they should be measured. Resource utilisation can be regarded as a summary of developments in the real economy and shows to what extent labour and real capital are being used at a particular time. It normally states use in relation to the level sustainable in the long run, which is often regarded as a "normal" level. One complication is that it is not possible to directly observe how high the level of resource utilisation in the economy is, and nor is there any generally-accepted view of this should be calculated. Different measures can give fairly different results and it is therefore difficult to determine to any great degree of precision the level of resource utilisation at any given time.

The Riksbank uses a broad approach in its analysis of resource utilisation and describes a number of indicators in its reports, such as measures based on surveys of companies and on "gaps", for instance the GDP gap and the number of hours worked gap, where the trend or normal level is calculated according to some method.[3] The Riksbank weighs together these

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[3]   See, for instance, the article "The stabilisation of the real economy and measures of resource utilisation", Material for Assessing Monetary Policy 2010, Sveriges Riksbank.

indicators and makes an overall assessment of the current level of resource utilisation. The assessment is qualitative and can be expressed as resource utilisation being "higher than normal", "normal" or "lower than normal". A qualitative assessment regarding how resource utilisation will develop during the forecast period is also provided. This can be expressed, for instance, as "resource utilisation will rise and be close to normal at the end of the forecast period". Although we publish forecasts for different gaps in our reports, we do not make a quantitative forecast that reflects the overall assessment of how resource utilisation will develop.

One alternative would be for the Riksbank to simply decide to use one particular measure of resource utilisation as a starting point when setting the interest rate. But we have chosen not to do this. For instance, the difficulties in estimating what is a "normal level" for resource utilisation indicate it may be risky to commit oneself to any specific method. Another reason is that the Executive Board of the Riksbank is what is usually known as an individualistic committee.[4] Put simply, this means that the members of the Executive Board act as individuals, both in the communication of monetary policy and when deciding on the interest rate. They can thus make their own assessments of which measure or measures of developments in the real economy they consider should be the focus of monetary policy. I will return shortly to the consequences of our being a group that makes such decisions.

The second variable in the loss function, inflation, is not as problematic as it can be measured in a much better way than resource utilisation. But it is not entirely clear which measure of inflation should be used. Although the inflation target is worded in terms of the CPI, when the repo rate changes a lot, as it did during the crisis, it will have a large direct impact on the CPI through households' mortgage expenditure. It may then be more appropriate to focus on an inflation measure that excludes these direct effects of interest rate changes. This is what the Riksbank has done recently, focussing primarily on CPIF inflation. However, it is largely a question of judgement which measure of inflation one should focus on. For instance, it is possible that one might sometimes want to disregard other components of the CPI, for instance, the direct effects of oil price increases.


An illustration

One can illustrate the complications that may arise in the actual work with the aid of the type of figure I showed earlier, where one marks the average squared deviations, the mean squared gaps, during the forecast period. For a concrete example of a time when the differences were particularly visible, we can study the forecast from September 2008.

In addition to the repo rate path in the main scenario, the Riksbank usually also analyses two alternative repo rate paths; one that is higher than the one in the main scenario and one that is lower. The mean squared gaps for different measures of inflation and resource utilisation generated by these three interest rate paths in September 2008 are shown in Figure 2.

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[4] See, for instance, Blinder, A. S. (2007), "Central Banking by Committee: Why and How?" *European Journal of Political Economy* vol. 23, pp. 106–123.

Figure 2. Mean squared gaps September 2008
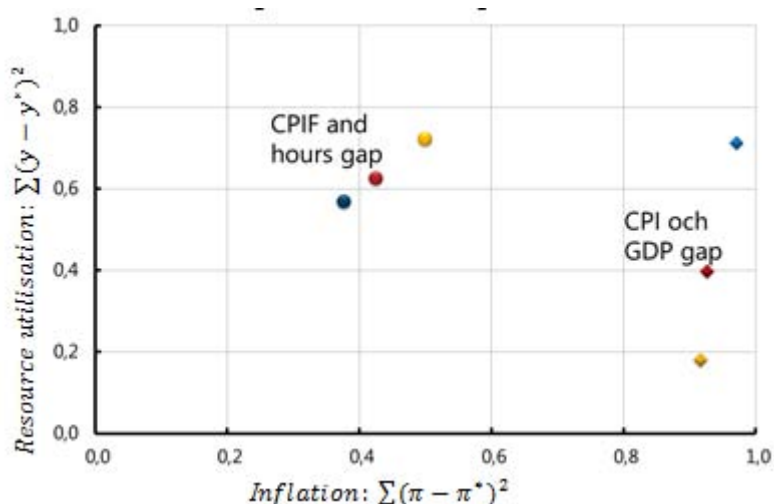
Source: The Riksbank

Note: Red dots show the main scenario, blue dots show the alternative with a higher repo rate path and yellow dots show the alternative with a lower repo rate path.

If inflation is measured in terms of the CPIF, that is, the CPI excluding direct effects of interest rates, and if resource utilisation is measured with a gap calculated on the number of hours worked in the economy, one obtains the three dots up on the left-hand side of the figure. It is clear that in this case it is the higher repo rate path that gives the least overall squared deviations during the forecast period – its dots are furthest to the south west, closest to origo. The lower repo rate path gives the largest deviations. But if inflation is instead measured in terms of the CPI and resource utilisation is measured in terms of the GDP gap, the result is the opposite. Here, it is the lower repo rate that gives the overall smallest square deviations. Thus, the variables used to measure inflation and resource utilisation can play an important role regarding which repo rate path one prefers.

It is also worth noting that the repo rate path in the main scenario does not give the smallest overall mean square gap in any of these cases.[5] This has been the case also on other occasions. At first sight, this may seem rather strange. But let me explain why it is not necessarily so – and also point out some other circumstances that can complicate the step from simple theories to practical policy.

Interest rate scenarios produced in different ways

A slightly technical explanation as to why an alternative interest rate path may give an apparently better outcome than the repo rate path in the main scenario concerns how the various scenarios were made. When we at the Riksbank make forecasts we use various macroeconomic models. For instance, the Riksbank uses what is known as a general equilibrium model of the Swedish economy named RAMSES (the Riksbank's Aggregate Macromodel for Studying the Economy in Sweden). But the models always need to be supplemented with personal judgements. These judgements become particularly important when unusual events and structural changes occur that alter the functioning of the economy. This was the case during the financial crisis, for instance. Figure 3 shows the RAMSES forecast for the GDP gap and the Riksbank's forecast in the Monetary Policy Report

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[5]   However, at the time this decision was made, no alternative scenario was unambiguously better than the main scenario if one calculates the mean squared gap for the combination of GDP gap and CPIF.

published in February 2009. As you can see, there is a fairly large difference between the forecast generated solely from a model and the published forecast supplemented with personal judgements.

Figure 3. Forecasts for the GDP gap Monetary Policy Report 1/2009
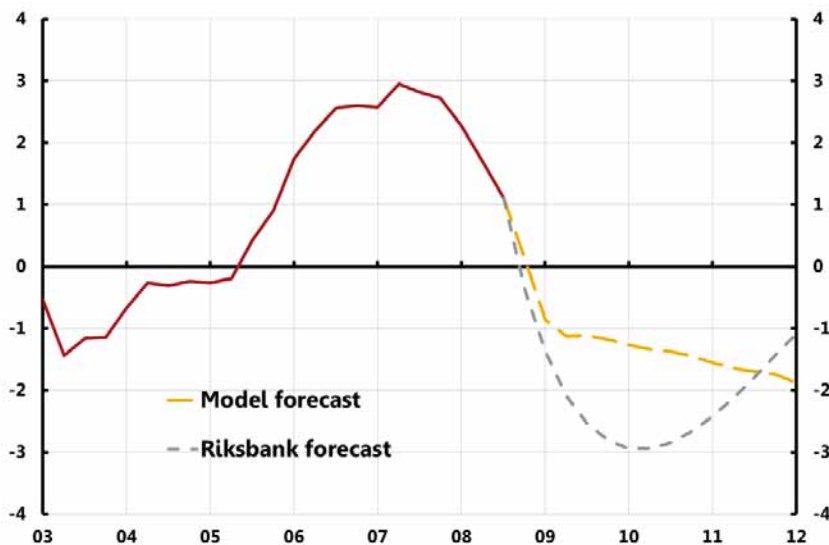
Source: The Riksbank

The significance of the personal judgements becomes even clearer when we see the forecasts for the repo rate (Figure 4). According to our forecast, a much more expansionary monetary policy was needed during the crisis than was suggested by RAMSES.

Figure 4. Forecasts for the repo rate Monetary Policy Report 1/2009
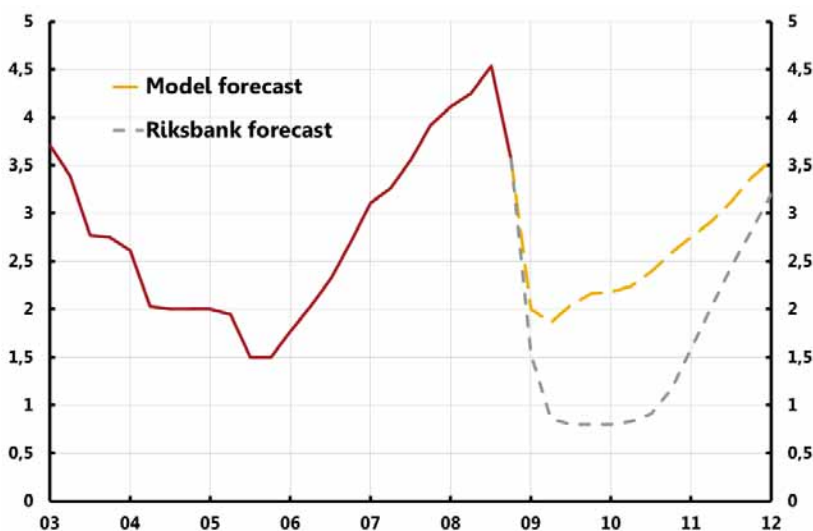
Source: The Riksbank

Personal judgements are also necessary in normal situations; and the forecasts in the main scenario published by the Riksbank in the Monetary Policy Reports and Updates are produced in this way – with support from models but with the addition of considerable personal judgements. The forecasts gradually emerge during a rather long and labour-intensive process that spans several weeks.

The forecasts in the alternative repo rate scenarios, on the other hand, are produced in a different manner. Here we use the main scenario as a starting point and then make a purely model-based adjustment using RAMSES. No personal judgement over and above that in the main scenario has been made. The forecasts in the alternative repo rate scenarios are thus less thoroughly analysed than those in the main scenario. If the alternative repo rate scenarios were supplemented with personal judgements, the forecasts and mean squared gaps would probably look different.

The main reason for this simplified approach is that it would require too many resources to produce complete, detailed forecasts for several different repo rate paths. Of course, it is not written in stone how main forecasts and alternative scenarios should be produced, and the Riksbank is currently reviewing the decision-making process to see how it could be improved. But this is the way we have worked until now. One can thus imagine that part of the explanation as to why an alternative repo rate scenario may give a smaller mean squared gap than the main scenario could be that it is only a purely model-based adjustment of the main scenario.

This raises another question: If one were also to supplement the alternative repo rate paths with personal judgements, would one always conclude that the main scenario would give the lowest loss? The answer to this question should reasonably be "yes, at least most of the time" – there are some reservations, which I will discuss in a moment. We try to conduct the policy we judge to be the best or "best balanced" and if we judged that another repo rate path than that in the main scenario would give a better outcome, we would of course choose that one instead. This should be visible in the mean squared gap analysis, that is, there should not be alternative repo rate paths that give a dot that lies south-west of the main scenario.

Consideration to developments beyond the forecast horizon and risks

There may also be other reasons why the main scenario does not necessarily provide smaller mean squared deviations than an alternative repo rate scenario. One is that the calculations are based on forecasts that extend no further than three years ahead. But there may sometimes be reason to consider what might happen beyond this time horizon, even if this is difficult to capture in a normal quantitative forecast. This could mean that the central bank chooses a repo rate path that, while it does not give the lowest squared deviations over the three-year forecast period, is nevertheless judged preferable from a longer-term perspective. For instance, the bank may hold the policy rate higher to try to prevent a credit boom that is feared would cause problems – with large squared deviations – beyond the forecast horizon.

A closely-related reason is that the central bank under certain circumstances gives consideration to specific risks when setting interest rates. This is something I personally find to be one of the most important factors missing in the simple analytical framework. This could also be expressed as the central bank holding the policy rate at a higher level to reduce the risk – within or beyond the forecast horizon – that, for instance, a credit boom would continue too long and cause problems. The central bank might also wish to hold the policy rate at a higher level to reduce the risk of inflation expectations rising too high, which could also be problematic. The higher policy rate could give larger deviations during the forecast period, but may nevertheless be preferable as it reduces the risk of a really poor outcome.

Framework more difficult to apply with an Executive Board

Another circumstance that I perceive as complicating matters with regard to putting the theoretical approach into practice is the fact that there are six of us making the monetary policy decisions. The theory usually assumes that one single person determines the policy rate – despite the fact that it is now fairly rare for this to be the case in practice. The loss

function I mentioned earlier then reflects this single policymaker's view of how monetary policy should be conducted.

In the cases where the theory acknowledges that there may be several different monetary policymakers, it is often also assumed that the only thing that distinguishes them from one another is that they have different preferences as to how much they want to stabilise inflation in relation to stabilising the real economy – that they have different λ.[6] Otherwise the policymakers are assumed to see things in the same way: They have the same view of the loss function, what it should include, and they make their forecasts of inflation and resource utilisation in the same way, in the same "model". If this were the case in practice, the monetary policymakers could quite simply vote on the various effective dots presented in the figure with the mean squared gaps.

But the reality is quite different. The complications I have mentioned so far, such as how the variables in the loss function should be measured or how to take risk into account, would cause problems even for a single monetary policymaker. But of course things become even more complicated with several different policymakers who may have differing views on these issues.

Scepticism towards far-reaching parallels between theory and practice

So how do the monetary policymakers view the relationship between monetary policy theories and the practical implementation of monetary policy? We can gain one indication from a survey carried out a while back. In this, a questionnaire was sent to all of those who are or have been members of the Executive Board of the Riksbank since it was first created in 1999.[7] The questions concerned, for instance, how the members view different hypotheses within the research into monetary policy decision-making by a committee. As far as I know, this is the only such survey carried out on a monetary policy committee. An equivalent study is now under way in Norway.

Some of the questions concern the link between the way monetary policy is often described in academic research and how monetary policymakers view it with the eyes of a practitioner. For instance, the following question was included: "Would you consider – using your own judgement or, for instance, the Riksbank's analysis resources – stating in terms of a figure how much importance you would normally place on stabilising resource utilisation in the economy in relation to stabilising inflation (that is, stating your λ)?"

A total of nine persons out of the twelve who responded to the survey replied that they would not consider this. These members were given a number of alternatives to select as the reason for their response. The explanation the members themselves considered to apply the best was that the idea that one can use a figure to explain the relative weight of stabilising inflation against that of stabilising resource utilisation in the economy is overly simple. Many also considered that it was meaningless to try to quantify the relative weight given to inflation and resource utilisation, partly because this could depend on the situation in the economy and thus vary over time, and partly because the measures of resource utilisation are so uncertain.

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[6] In the academic literature one usually calls a policymaker who gives a relatively high priority to stabilising inflation, a small λ, conservative. A well-known theoretical result reached in the mid-1980s by Kenneth Rogoff, nowadays adviser to the Riksbank, was that under certain circumstances it might be optimal to appoint a governor who was more "conservative" than society in general (Rogoff, K., (1985), "The Optimal Degree of Commitment to an Intermediate Monetary Target", *Quarterly Journal of Economics*, vol. 100, pp. 1169–1189).

[7] Apel, M., C. A. Claussen and P. Lennartsdotter, (2010), "Picking the Brains of MPC Members", Sveriges Riksbank Working Paper Series No. 237.

It thus appears that there is fairly broad scepticism among the members towards drawing far-reaching parallels between how monetary policy is described in theory and how they view it as practitioners. All of those who are or have been members of the Executive Board agree, I am sure, with the general wording that the Riksbank is to stabilise inflation around 2 per cent and, in addition, to stabilise the real economy. But after that I believe that the views differ quite substantially as to how far one can go in using theory when conducting practical monetary policy. The reaction many people probably have is that if one were to reduce monetary policy to a choice between dots on the figure I showed you, it would make it appear as though monetary policy had an exactness that does not actually exist. My guess is that this scepticism is not unique to the Executive Board of the Riksbank, but is shared by other countries' monetary policy committees.

Differences are good

Essentially, it is positive that the members of the Executive Board have fairly different views on things. When the Executive Board was established in 1999 there was a more or less explicit aim that it would consist of people with different backgrounds, experience and knowledge. This type of diversification appears to be something that most countries with monetary policy committees strive to attain. One reason for this is that there is a widespread belief that committees tend to make better decisions than individual policymakers, as a committee can "pool" its experiences and knowledge.[8] The decision can thus be made on a broader and better basis. As the saying goes: "two – or rather more – heads are better than one". And in order to have something to "pool", the people on the committee should not be too alike. If they all are cast in the same mould and think in the same way, one might just as well have one single policymaker.

If there are so many different wills and ways of thinking, how can we actually manage to agree on a detailed, quantified forecast and an exactly determined repo rate path? Also here we can receive guidance from the survey I mentioned earlier. One question in the survey was whether the members had refrained from entering a reservation against one or more monetary policy decisions, despite considering that another decision than the majority view would have been better. Seven of the members, that is, more than half of them, replied that they had. The most important motivation given for this was that they said there was some "bargaining margin" in the repo rate decisions and that the decision reached was sufficiently close to what they would have advocated. In terms of the mean squared gap analysis, one could express this as the members actually preferring different dots, but given that the main scenario dot was sufficiently close to their own, they accepted the main scenario. I believe that this is a fairly important insight: The forecasts we present are often a compromise and an approximation. They point to the probable and desired direction, but the exact figures should probably be taken with a pinch of salt.

An important balancing act

At the same time, it is important to realise that the problem that constantly lies below the surface is how to find an appropriate balance between what one could call diversification and clarity: On the one hand the central bank wants to benefit from the fact that the decisions are made by a committee. We are not supposed to be cast in the same mould. There should thus be a sufficient degree of freedom and scope for individual members to make their own analyses, draw their own conclusions and make decisions as they see fit.

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[8] For arguments in favour of this hypothesis in research, see for instance Blinder, A. S., and J. Morgan, (2005), "Are Two Heads Better Than One? Monetary Policy by Committee", Journal of Money, Credit, and Banking, vol. 37, pp. 789–812.

On the other hand, this should not mean that monetary policy becomes unclear, that it is characterised by more or less loose opinions – and that it thus becomes more difficult to understand and thus to assess. Ultimately, it is the confidence of the general public that is at risk here; the legitimacy of monetary policy. This was strongly emphasised when the inflation-targeting regime was introduced. The Riksbank then put considerable energy into explaining what inflation targeting was all about and this probably contributed to the relatively quick acceptance of this policy. Now the inflation-targeting policy is much more established, but there is of course still a need for clarity and structure.

So although I have highlighted some of the problems regarding drawing parallels between theoretical analysis and practical monetary policy, this should not be interpreted to mean that I do not think that theory has a role to play. I am convinced that, used wisely, it can provide good support when explaining and assessing monetary policy.

But exactly how theory can be used in the practical work, and exactly where the optimum balance lies between diversification and clarity, or between the degree of freedom and structure in an uncertain world is something that every central bank must try to ascertain. I can assure you that this is something we have considered at great length at the Riksbank. It is also an important part of the work on reviewing the decision-making process that I mentioned earlier. I do not believe it is possible to capture everything with the aid of two aggregates. Now and then something is likely to disappear on route.

New challenges – the importance of managing systemic risk

I have so far only discussed "traditional" complications in the step from theory to practice. I have given examples of challenges we have faced more or less continuously since inflation targeting was introduced. But if we look ahead, it is likely that the picture will be further complicated by the changes that will follow in the wake of the financial crisis. What I am mainly thinking about here is the increased focus on macroprudential policies.

After the financial crisis we have learnt two main lessons. The first is that the central banks' interest rate-setting must take into account financial stability to a greater degree. The second is that we need new regulation in the financial market that focuses on systemic risk. But the macroprudential policies may have effects that are in many ways similar to the effects of monetary policy – particularly if the tools are varied over time. This increased interaction between monetary policy and macroprudential policies is another circumstance that means that the connections between the simple theoretical framework and practical monetary policy become twisted.

Of course, it is not the case that monetary policy and regulation were two entirely independent policy areas prior to the crisis and that after the crisis they will be fully integrated. But I nevertheless believe that monetary policy and regulation will come closer to one another in the future.

When I was here a year ago, I spoke at length on how monetary policy can contribute to maintaining financial stability and how different types of regulations can affect monetary policy and its transmission mechanism. I will not go into this again today. Instead, I would like to focus on something I did not say so much about then, namely the institutional solutions and division of responsibility with regard to monetary policy and macroprudential policy.

There are a number of interesting questions here: Should the responsibility be centralised to one authority or spread across two or more authorities? If the responsibility is spread out, what mandates should the different authorities have, or, to express it in simple theoretical terms, how should their loss functions look? Should they act independently of one another or should they coordinate their measures?

At present, considerable effort is being put into finding answers to these questions, both in the academic world and on the political plane. There are no clear answers as yet, and I will

not be able to give any here. But I would nevertheless like to think aloud on a specific question that I find particularly interesting, namely what might happen if the responsibility for monetary policy and for macroprudential policies are split between two authorities that do not coordinate their measures.

Risk of poorer policy mix if responsibility is split?

I shall use an example to illustrate the potential problems. Let us assume that the macroprudential policy is a time-varying capital requirement.[9] A financial supervisory authority controls the capital requirement, while the central bank controls the interest rate. There is an upper and a lower limit for the capital requirement, k^{max} and k^{min}. This is illustrated by the two horizontal lines in Figure 5. Changes in the capital requirement affect developments in the economy. For example, we can imagine that a tightening will reduce the banks' credit granting and thus slow down demand in the economy.

The green line shows the level of the capital requirement the financial supervisory authority considers to be best for each level of the interest rate. The red line correspondingly indicates the combinations of interest rate and level of capital requirement preferred by the central bank. The two authorities' views of what can be considered an appropriate policy mix in a given situation thus differ. The financial supervisory authority is more concerned over systemic risk than the central bank. This is expressed in that for each level of the interest rate the financial supervisory authority wants a higher capital requirement than the central bank would have set if it had control over both tools. It is likely that the differences in the views of what constitutes a good policy mix are greatest when the interest rate is low, so let the curves in the figure apply to a situation with a low interest rate. I will return to this in a moment.

Figure 5. Illustration of the interplay between the central bank and the financial supervisory authority
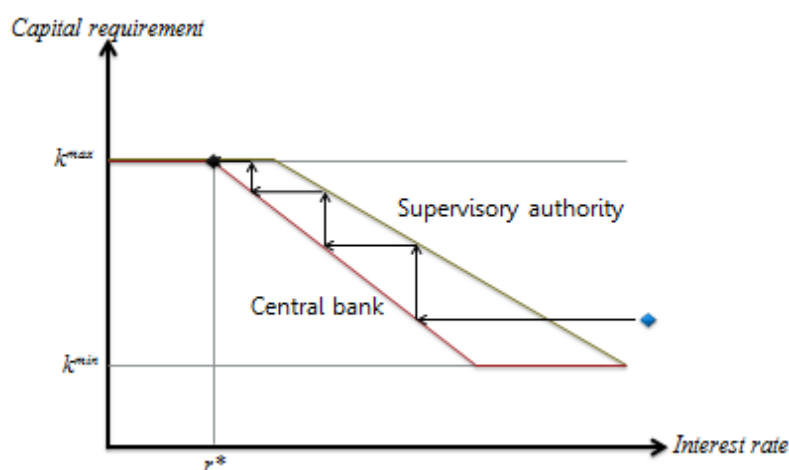
Let us assume that the interest rate and the capital requirement started off at the blue dot in the figure. Let us assume that demand in the economy has fallen, and that a need for more expansionary policy has therefore arisen to stabilise the real economy and inflation. The central bank then wants to cut the policy rate so that it is on the red curve.

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[9]   Capital requirement here refers to the statutory capital adequacy requirement.

But at this low interest rate the financial supervisory authority may worry that risks are beginning to build up and it will therefore raise the capital requirement. However, the higher capital requirement not only means that the risks decline, it also has some negative effect on demand in the economy. This has the consequence that the central bank wishes to cut the policy rate further, which in turn makes the financial supervisory authority want to raise the capital requirement, and so on, and so on. This leads to a "race", which ultimately leads to the capital requirement reaching its upper limit at the same time as the interest rate is extremely low.

It is easy to imagine that this final mix of the two policy instruments is not optimal from the perspective of the economy as a whole. The means of control for monetary policy and risk have been used much more aggressively than is beneficial for the economy and also more aggressively than either the central bank or the financial supervisory authority would wish. Of course, one can discuss how realistic this particular example is. But I nevertheless believe that it illustrates the importance of formulating the authorities' mandate and powers of authority wisely. It also shows that monetary policy and regulation are connected. Each regulation creates a form of "shadow interest rate".

So how can we avoid policy "drifting away" in this unfortunate manner? One possibility is to try to formulate the tasks of the central bank and the financial supervisory authority so that they make a unanimous assessment of what needs to be done. In the figure this would correspond to the green and red curves coinciding. If the curves lie exactly on top of one another, there will not be any interaction that leads to the two means of control being used too aggressively.

Another possibility might be to give the central bank the responsibility for both tools – it is not possible to give the financial supervisory authority responsibility for monetary policy. In the figure, the adjustment would then come to a halt after the first interest rate cut. How close this is to the socially optimal point depends on how well the central bank's loss function agrees with the socially optimal one. But it is almost certainly closer than the policy mix that results from the policies drifting away.

A third possibility is that the central bank and the financial supervisory authority coordinate, or negotiate on the policy. It is not clear what this would result in, but it would in any case avoid the inferior policy mix in the alternative without any coordination.

I need hardly say that the step between this simple theoretical example and a practical solution is fairly large. But this is actually just a further example of the complications that form the main theme of my speech. Perhaps I should add that the question of how to divide responsibility for the means of control is currently being examined by the financial crisis committee appointed by the government a while ago. It will of course be interesting to see the committee's conclusions.

Conclusion

Let me round off. I would guess that many of you here today are used to seeing monetary policy through an academic's eyes. When you hear the term monetary policy you may first and foremost associate it with the theoretical framework – the way that monetary policy is often portrayed in textbooks and scientific articles. Others of you may think instead of the more conventional, day-to-day image of monetary policy given in the media, with a focus on the Riksbank's interest rate changes and possible disagreement among the Executive Board.

One might say that these two images in some way represent the start and finish of the monetary policy process. When an interest rate decision is to be made, the process starts in one way or another with the simple theoretical framework. As I noted earlier, this captures fairly well the intuition behind flexible inflation targeting – that a well-balanced monetary policy concerns finding a suitable balance between stabilising inflation and stabilising the real economy. Each of us involved in making the policy rate decision has some version of the

theoretical framework in our head, even if it is probably often fairly implicit. At the other end of the process is the media image, with concrete repo rate decisions.

The basic question is how we can best go from the simple theoretical analysis into actual policy. There is a balancing act to achieve here: On the one hand, one wants to retain sufficient clarity and structure in the process as given by the theoretical framework. But on the other hand, one does not want to provide an overly simple and thereby perhaps misleading picture of monetary policy and the deliberations that we have to make in practice.

What I have talked about here today concerns the link between theory and practice, and more specifically why the connections between them are not so simple. The interesting but difficult challenges faced when going from theoretical analysis to practical policy are something the Riksbank – and presumably also other central banks – spends a lot of time and energy managing. These challenges may not be so well-known outside of the central bank world and I hope that I have now been able to provide some insight into them.