



# SPEECH

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## Inflation targeting and financial stability\*

Today, I would like to begin by briefly presenting my view of the causes of the financial crisis. Then, I will discuss the lessons for monetary policy from the financial crisis. Finally, I will discuss some aspects of practical inflation targeting, using Swedish monetary policy as an example.<sup>1</sup>

Let me first summarize my conclusions.

The financial crisis was caused by other factors than monetary policy. Easy monetary policy in the United States had very little to do with the crisis.

Price stability is not enough to achieve financial stability. Interest-rate policy is not enough to achieve financial stability. A separate financial-stability policy is needed. It is important to distinguish between monetary policy and financial-stability policy. They are distinct and different. They have different objectives, and different suitable instruments. The responsibility for monetary policy and the control of the monetary-policy instruments rests with the central bank, but the responsibility for financial-stability policy and the control of the financial-stability instruments rests with different authorities in different countries. Importantly, it was financial-stability policy that failed and caused the crisis, not monetary policy.

Financial stability as an objective of *monetary policy* makes little sense, whereas financial stability as an objective for the *central bank* makes sense, *if* the central bank controls the financial-stability instruments.

Flexible inflation targeting – applied in the right way and using all the information that is relevant for the forecast of inflation and resource utilisation, including financial conditions when appropriate – remains in my view the best-practice monetary policy before, during, and after the financial crisis.

In some situations, financial stability may imply restrictions on monetary policy and then imply a higher or lower policy rate than otherwise, but that will be a rare event. Normally, financial stability will be handled with financial-stability policy, not monetary policy.

Monetary policy should not be used to target housing prices or household debt. The policy rate is too blunt an instrument, and such targeting with the use of the policy rate will have

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<sup>1</sup> Some of these issues are further discussed in Svensson (2010a, b).

high real costs in terms of output and unemployment. If housing prices and/or household debt are considered a problem, there are much better instruments available.

Flexible inflation targeting aims at stabilizing both inflation around the inflation target and resource utilization around a normal level. Using mean squared gaps as quantitative measures of the stability of inflation and resource utilization is another step towards a more systematic and consistent monetary policy and increased transparency.

### **The financial crisis had little to do with monetary policy**

As I see it, the financial crisis was caused by factors that had very little to do with monetary policy. These factors were the macro conditions; distorted incentives in financial markets; regulatory and supervisory failures; information problems; and some very specific circumstances, such as the US housing policy to support home ownership for low-income households.<sup>2</sup>

Regarding the *macro conditions*, global imbalances with a high level of saving relative to investment in many emerging-market economies, and a corresponding low level of saving relative to investment in industrialised countries – the so-called global saving glut and investment shortage – led to low real interest rates and high asset prices.<sup>3</sup> Low world real interest rates in combination with the Great Moderation, the long period of very stable growth and stable low inflation, led to a systematic underestimation of risk, very low risk premiums in financial markets and a substantial expansion of credit.

*Distorted incentives* for commercial and investment banks to increase leverage to excessive levels, together with lax regulation and supervision and the lack of an appropriate bank resolution regime, led to a very fragile financial sector. Securitisation reduced the incentives to exercise due diligence in loan origination. It also led to regulatory arbitrage by setting up off-balance-sheet entities, which for various reasons nevertheless remained in effect on the balance sheet. Traders and fund managers also had distorted incentives to take excessive risks because of short-sighted and asymmetric remuneration contracts.

There were eventually enormous *information problems* in assessing the risks of extremely complex asset-backed securities, and the potential for correlated systemic risks was grossly underestimated. None of these causes had anything to do with monetary policy, except indirectly in that monetary policy may have contributed to the Great Moderation.

Regarding the role of the Federal Reserve's expansionary monetary policy in the period preceding the crisis, opinion is divided as to whether or not it contributed to the build-up of the crisis. In my view, during the period in question there was a genuine and well-motivated fear of the United States falling into a Japanese-style deflationary liquidity trap, and the optimal policy in such a situation is a very expansionary monetary policy.<sup>4</sup> Given the empirically limited effect of policy rates on house prices, a very tight US monetary policy would have been required to prevent the house price boom, with a deep recession and the risk of the United States falling into deflation and a liquidity trap.<sup>5</sup> And a tighter monetary policy would have had no impact on the global imbalances, regulatory problems, distorted incentives and information problems mentioned above (although it could have ended the Great Moderation with a deep recession and deflation).

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<sup>2</sup> See Bean (2009) for more discussion.

<sup>3</sup> See Bernanke (2007).

<sup>4</sup> See Svensson (2003) for a discussion of policy options before and in a liquidity trap.

<sup>5</sup> See Assenmacher-Wesche and Gerlach (2010), Bean (2009), Bean, Paustian, Penalver and Taylor (2010), Bernanke (2010), Dokko, Doyle, Kiley, Kim, Sherlund, Sim and Van den Heuvel (2009), International Monetary Fund (2009).

## Lessons for monetary policy

■ What conclusions can we draw so far from the financial crisis about the conduct of monetary policy and any need to modify the framework of flexible inflation targeting? One obvious conclusion is that price stability is not enough to achieve financial stability (Carney 2009, White 2006). Good flexible inflation targeting by itself does not achieve financial stability, if anyone ever thought it did.

Another conclusion is that interest-rate policy is not enough to achieve financial stability. The policy rate is an ineffective instrument for influencing financial stability, and policy rates high enough to have a noticeable effect on credit growth and house prices will have a strong negative effect on inflation and resource utilisation, even in sectors that are not experiencing any speculative activity. The use of the policy rate to prevent an unsustainable boom in house prices and credit growth poses major problems for the timely identification of such an unsustainable development, as well as for the assessment of whether policy-rate adjustment would have any noticeable impact on the development, and of whether, in the longer run, the development of inflation and resource utilisation would be better (Bean, Paustian, Penalver and Taylor 2010, Kohn 2008, 2009).

Instead, a separate financial-stability policy is needed, with financial stability as the objective and appropriate instruments to achieve the objective. Instruments like supervision and regulation, including appropriate bank resolution processes, should be the first choice for financial stability. Preventing a financial crisis requires not only improvements in the supervision of financial institutions, but also a greater emphasis on the supervision of the financial system as a whole. As regards the regulatory framework, generally, to the extent that financial instability depends on specific distortions, good regulation should aim to attack these distortions as close to the source as possible. Macro-prudential regulation that is contingent on the business cycle and financial indicators may need to be introduced to induce better financial stability. Possible macro-prudential regulation includes variable capital and margin requirements.

### The relation between monetary policy and financial-stability policy

It is helpful to conceptually distinguish financial-stability policy from monetary policy. Different economic policies, such as fiscal policy, monetary policy and labour market policy, can be distinguished according to their objectives, the policy instruments that are suitable for achieving the objectives and the authority or authorities that control the instruments and are responsible for achieving the objectives. From this point of view, it is clear that monetary policy and financial-stability policy are distinct and different, and understanding this is important.

Monetary policy, in the form of flexible inflation targeting, has the objective of stabilising both inflation around the inflation target and resource utilisation around a normal level. Under normal circumstances, the suitable instruments are the policy rate and communication, including the publication of forecasts of inflation, the real economy and (by some central banks) the policy rate. In times of crisis, as we have seen during the current crisis, other more unconventional methods can be used, such as fixed-rate lending at longer maturities and asset purchases (quantitative easing) to affect longer interest rates and expectations of future short rates, and foreign-exchange intervention to prevent currency appreciation or even to induce currency depreciation. The authority responsible for monetary policy is typically the central bank.

Financial-stability policy has the objective of maintaining and promoting financial stability. Financial stability can be defined as a situation where the financial system can fulfil its main functions of submitting payments, transforming saving into financing and providing risk management with sufficient resilience to disruptions that threaten these functions. The

available instruments are, under normal circumstances, supervision, regulation, and financial-stability reports with analyses and leading indicators that may provide early warnings of stability threats. In times of crisis, authorities may use instruments such as lending of last resort, variable-rate lending at longer maturities (credit policy, credit easing), special resolution regimes for insolvent financial firms, government lending guarantees, government capital injections, and so forth. The responsible authority or authorities vary across countries. In some countries it is the central bank, in other countries there is a separate financial supervisory authority, and sometimes the authority is shared between different institutions.

So, financial-stability policy and monetary policy are conceptually distinct, with distinct objectives and distinct suitable instruments. My point here is that this has to be taken into account when considering the lessons of the financial crisis for monetary policy. The interest rate is a blunt and unsuitable instrument for achieving financial stability and it thus makes little sense to assign the objective of financial stability to *monetary policy*. However, it may make sense to assign the objective of financial stability to the *central bank*, if the central bank is given control of the appropriate supervisory and regulatory instruments.

The fact that financial-stability policy and monetary policy are distinct and different does not mean that there is no interaction between them. This interaction needs to be considered. Monetary policy affects asset prices and balance sheets and can thereby affect financial stability. Financial-stability policy directly affects financial conditions, which affect the transmission mechanism of monetary policy. This means that monetary policy should normally be conducted taking financial-stability policy into account, and financial-stability policy should be conducted taking monetary policy into account. This is similar to how fiscal policy is conducted taking monetary policy into account, and monetary policy is conducted taking fiscal policy into account. Importantly, under normal conditions, financial stability is handled by financial-stability policy, not by monetary policy.

### **Modifying monetary policy?**

What conclusions can we draw so far from the financial crisis about the conduct of monetary policy and any need to modify the framework of flexible inflation targeting?

One important lesson from the financial crisis is that in crisis times financial conditions may have a very strong and deteriorating effect on the transmission mechanism, making standard interest-rate policy much less effective. However, in normal times, financial conditions are likely to matter less or not at all. Nevertheless, this motivates more research on how to incorporate financial conditions and financial intermediation into the standard models of the transmission mechanism used by central banks. Much progress has already been made in understanding these effects (see Adrian and Shin 2010a, Gertler and Kiyotaki 2010 and Woodford 2010a). However, even with much better analytical foundations concerning the role of financial conditions in the transmission mechanism, there will of course, as always, be considerable scope for the application of good judgment in monetary policy.

Flexible inflation targeting aims at stabilising inflation around the inflation target and resource utilisation around a normal level. Monetary policy then boils down to “forecast targeting”, choosing a policy-rate path such that the corresponding forecasts of inflation and resource utilisation best stabilise inflation around the target and the resource utilisation around a normal level. If the central bank uses all relevant information in constructing these forecasts, including the impact of changes in financial conditions on inflation and resource utilisation at any horizon, monetary policy will automatically respond in the best possible way to changing financial conditions (Woodford 2007, 2010a). Taking financial conditions into account becomes a special case of the general rule of “filtering all information through the forecast”. Only information that affects the forecast should be responded to, whereas information that does not affect the forecast can be disregarded. Inflation and resource utilization are target

variables, that is, variables that the central bank tries to stabilize. Financial conditions are not target variables. Instead, they are only indicators, and relevant only to the extent they provide information useful for the forecast of the target variables.

However, let us suppose a situation where the appropriate and effective instruments for ensuring financial stability are not available, for instance because of serious problems with the regulatory and supervisory framework that cannot be remedied in the short run. In such a second-best situation, if there is a threat to financial stability, one may argue that, to the extent that the policy rates does have an impact on financial stability, this impact should be taken into consideration when choosing the policy-rate path to best stabilise inflation and resource utilisation. Such considerations could result in a lower or higher policy-rate path than otherwise, in order to trade off less effective stabilisation of inflation and resource utilisation for more financial stability. To the best of my knowledge, the evidence so far indicates that in normal times such a trade-off is very unfavourable, in the sense that the impact of policy rates on financial stability is quite small and the impact on inflation and resource utilisation is significantly greater. Then, in normal times an optimal trade-off would still result in policy rates directed towards stabilizing inflation and resource utilization with little impact on financial stability. A good financial-stability policy framework is necessary to ensure financial stability. Monetary policy cannot serve as a substitute.

### **The “risk taking” channel?**

In discussions of monetary policy and financial stability, there have been many references to the “risk-taking channel” (Borio and Zhu 2008), according to which leverage and risk in the financial sector depend on and is decreasing in the policy rate. Adrian and Shin (2010a, b) argue, in a model with such a risk-taking channel, that short interest-rate movements may have considerable effects on the leverage of securities broker-dealers in the market-based financial sector outside the commercial-banking sector.

Even if leverage and risk depend on the policy rate, it is not obvious that their levels or their variation are necessarily a threat to financial stability. Furthermore, in order to correctly assess the effect of monetary policy on leverage and risk, it is importantly to distinguish the effect of monetary policy from the effect of the general level of interest rates. Monetary policy can only make the actual short real interest rate deviate for some time from the state-dependent neutral real interest rate. It is the impact of that deviation, not the impact of generally low real interest rates, that is the correct measure of the impact of monetary policy.

As far as I can see, the empirical evidence for the risk-taking channel is pretty weak.<sup>6</sup> Furthermore, it is claimed mainly for the shadow-banking sector, not for commercial banks. As far as I know, the leverage of commercial banks seems independent of the policy rate (Adrian and Shin 2010b). The size of the market-based financial sector may end up being smaller after the crisis. In Europe, Canada and the Nordic countries, the risk-taking channel already seems less relevant as commercial banks dominate the financial sector.

The “search for yields” is often mentioned as an example of how lower interest rates lead to more risk taking. By this is meant, for instance, that a portfolio manager has promised to deliver a particular level of expected rates of return on his or her portfolio. If the overall rates of return fall, fulfilling the promise to maintain a particular level of expected rates of return requires taking on higher risk, as in standard models of portfolio choice. However, it is obvious that such a promise or contract of a particular expected rate of return without consideration of the risk involved is a very strange and distortive promise or contract. Good regulation should prohibit such promises or contracts. Any reasonable contract or promise

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<sup>6</sup> See, for instance Altunbas, Gambacorta and Marques-Ibanez (2010), Bank for International Settlements (2010), and Maddaloni and Peydró (2010) and references in these papers.

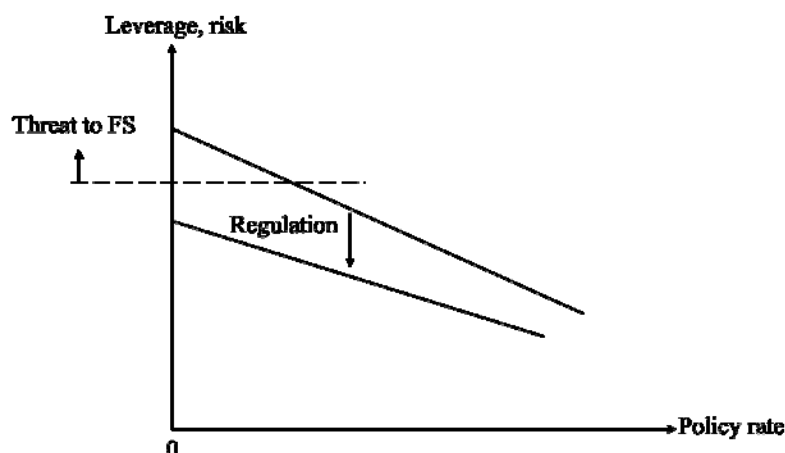
consistent with standard models of portfolio choice should obviously involve both expected *excess* rates of return as well as risk.

If we assume that the risk of a financial crisis increases as this leverage increases, and that increased policy rates reduce leverage, then policy rates would affect the risk of a financial crisis (Woodford 2010b). However, new regulation is likely to limit excess leverage and limit the magnitude of these affects.

Consider figure 1, where the upper downward-sloping line indicates that leverage and risk are decreasing in the policy rate. Furthermore, suppose that leverage and risk above the level corresponding to the horizontal dashed line imply a threat to financial stability that increases with increased leverage and risk. In such a situation, too low policy rates would imply a threat to financial stability.

However, better regulation may reduce the leverage and risk for any given policy rate, and also reduce the sensitivity of leverage and risk to the policy rate. Thus, regulation might shift the line summarizing the dependence of leverage and risk down to the lower flatter line in figure 1. If that is possible, policy rates even down to zero no longer pose a threat to financial stability.

**Figure 1. Leverage, risk and the policy rate**



### Leaning against the wind?

What about “leaning against the wind”, the idea that central banks should raise the interest rate more than appears to be warranted by inflation and resource utilisation to counter rapid credit growth and rising asset prices?

It has sometimes not been entirely clear to me whether advocates of the leaning against the wind policy mean that credit growth and asset prices should be considered targets and entered into the explicit or implicit loss functions alongside inflation and resource utilisation, or whether they mean that credit growth and asset prices should still be considered just indicators, and that they emphasise them merely because credit growth and asset prices may have negative effects on inflation and resource utilisation at a longer horizon. In the latter case, leaning against the wind is a way to improve the stability of inflation and resource utilisation in the longer run. Then it is completely consistent with my interpretation of flexible inflation targeting.

However, in line with the previous discussion, instruments other than interest rates are likely to be much more effective in avoiding excessive credit growth and asset-price booms, and should thus be used as a first best alternative. Interest rates that are high enough to have a noticeable effect on credit growth and asset prices may have strong negative effects on

inflation and resource utilization, and a central bank will probably rarely have sufficient information about the likely beneficial longer-horizon effects on inflation and resource utilization for the trade-off to be worthwhile and motivated.

Kohn (2006) specifies three conditions that should be fulfilled for central banks to take “extra action” to deal with a possible asset-price bubble: “First, policymakers must be able to identify bubbles in a timely fashion with reasonable confidence. Second, a somewhat tighter monetary policy must have a high probability that it will help to check at least some of the speculative activity. And third, the expected improvement in future economic performance that would result from the curtailment of the bubble must be sufficiently great.” He concludes, also in Kohn (2008) and after thorough considerations, that those conditions would rarely be met. See also Kohn (2009).

### **Housing prices and household debt in Sweden**

In Sweden, there is now a lively debate about whether rising housing prices and household indebtedness constitute a problem or not, and on whether the policy rate or other instruments should be used if housing prices and household debt are considered a problem. Several of my colleagues on the Executive Board have referred to rising house prices, increasing household debt and the possible build-up of financial imbalances as reasons for increasing the policy rate. My view is that there is no evidence that current housing prices and household indebtedness in Sweden are a problem. If they were to be considered a problem, there are much better instruments to affect them than the policy rate.

First, household indebtedness is not a threat to financial stability in Sweden. Household debt consists mostly of mortgages. But, unlike in the United States, mortgages are personal (what is known as full recourse loans). They do not lead to any significant credit losses for the mortgage issuers. Mortgages did not lead to any large credit losses even in the severe crisis in the 1990s – the banks’ credit losses were primarily caused by loans for commercial property.

Second, I cannot see any indications that a housing price bubble is building up or that current housing prices levels are unsustainable. The house price indicator published by *The Economist* points to Swedish housing being overvalued by some 40 percent relative to rent levels. However, this indicator disregards the fact that Swedish rent control means that rents are much lower than the corresponding market rents. Current housing prices seem perfectly consistent with a high demand and modest supply. Construction of new housing has been very low in Sweden.

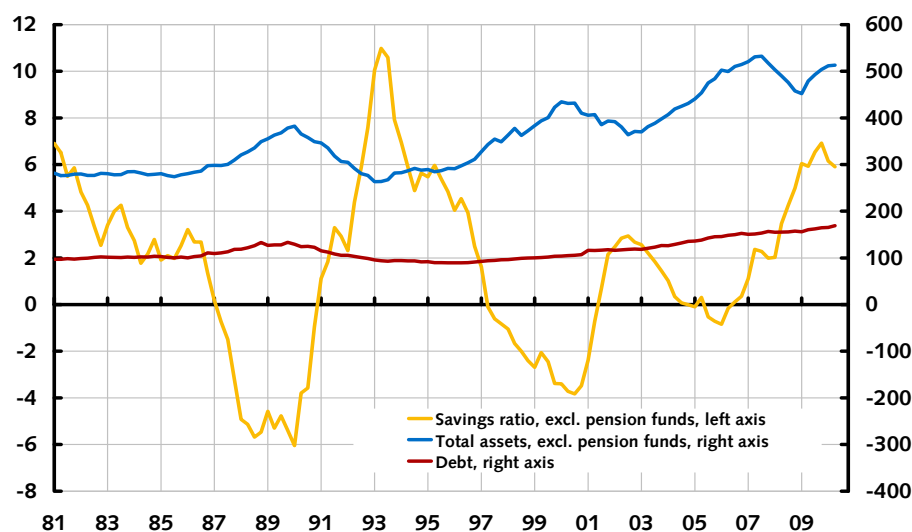
Third, in Sweden, there is no “buy to let”, only “buy to live”. The rules of condominium associations put severe restrictions on subletting. Homes are primarily bought to live in, rather than as objects for investment or speculation.

Fourth, households have strong balance sheets. When it comes to assessing possible vulnerabilities, the levels of the balance sheets are arguably more important than the flows. A lot of fuss is made about household debt now being around 165 percent of household disposable income and increasing, as is shown in figure 2. But at the same time, as seen in the figure, household wealth is about 500 percent of their disposable income. Moreover, the debt share of the assets remains stable over time. The average household thus has debts equivalent to only one-third of its assets, while its equity is equivalent to two-thirds of its assets. This low leverage and high equity implies a large buffer against a fall in house prices.

Fifth, the debt and wealth data shown in figure 2 refer to the aggregate of all households and hence to the average household. One may of course argue that a sizeable fraction of the marginal households with the highest debt might be more vulnerable. But a detailed study by Finansinspektionen (2010) (the Swedish Financial Supervisory Authority) shows that this is not the case. Households with new mortgages are the ones with the largest mortgages. But they are not particularly vulnerable and can manage extreme stress tests with very high

unemployment and large falls in house prices. In general, the debt-servicing ability of these borrowers is very good, even with mortgage rates much higher than today. The banks' credit assessments and housing cost calculations are actually conservative; based on high mortgage rates, from 6.5 percent and up to 10 percent. With an interest rate of 7.5 percent, 92 percent of households will have a surplus in a "left-to-live-on" calculation that includes generous standard deductions for the cost of living. Most households have very large surpluses, because it is the households with very high incomes that have the largest debts. If unemployment increases by a full 10 percentage points, that is from almost 9 percent to almost 19 percent, and house prices fall by 20 percent, according to the report only 4.5 percent of these households will experience both a deficit in their "left-to-live-on" calculation and a loan-to-value ratio of more than 100 percent (Finansinspektionen 2010, table 6).

**Figure 2. Households' assets, debt, and saving (Sweden)**  
Percent of disposable income



Sixth, the fact that the household savings ratio is high (see figure 2) indicates that mortgages are not being used to finance consumption to any great extent. There is hence no evidence of substantial housing equity withdrawal to finance consumption. Things were different prior to the 1990s crisis. At the end of the 1980s, increased mortgages were used to finance household consumption to a large degree. This is a dangerous situation, as continued price increases then become a condition for continued mortgage increases to uphold consumption. But it shows up in a low savings ratio. The savings ratio at the end of the 1980s was strongly negative (see figure 2). This indicates that households were living above their means, which is an unsustainable situation. This was also the case in the United States before the recent crisis, when the savings ratio was very low and consumption was financed by higher mortgages. The situation in Sweden now is quite different. Mortgages are not being used to finance consumption to any great extent.

Finally, the consequences of a fall in house prices for monetary policy need not be so problematic. If this leads to a fall in consumption, it would be a demand shock, which would cause lower inflation and resource utilisation. However, this could to a large degree be counteracted by more expansionary monetary policy, particularly if a relatively high percentage of borrowers with variable-rate mortgages implies that monetary policy has a greater impact.<sup>7</sup>

<sup>7</sup> See the discussion at the monetary policy meeting in July (Sveriges Riksbank 2010c) with my criticism of the article on house prices in Riksbank (2010a).



If the level or growth of household prices and/or household debt is considered a problem, there are better instruments to deal with this problem than the policy rate. As household debt mostly consists of mortgages and these are used to buy housing, house prices and household debt are really two sides of the same coin. If house prices increase, then household debt increases. If we want household debt to increase more slowly, then house prices must increase more slowly.

Thus, slowing down the increase in house prices and the increase in household debt is essentially the same thing. Regardless of whether or not these factors are a problem, the policy rate would appear to be an unsuitable instrument for influencing house prices and debts. Widespread theoretical and empirical research shows that changes in policy rates have a modest effect on house prices, but a substantial effect on production, jobs and unemployment. A typical conclusion is that, all else being equal, an increase in the policy rate of 1 percentage point reduces house prices by around 1.5 percent, but at the same time reduces GDP by around one third, that is, about 0.5 percent. So to reduce house prices by 15 percent may require raising the policy rate by as much as 10 percentage points. But this would cause GDP to fall by around 5 percent. These estimates are of course uncertain, but nevertheless imply very high real costs in terms of GDP.<sup>8</sup>

If house prices and household indebtedness are regarded as a problem, there are more effective instruments than the policy rate – instruments that also have less negative effects. Some examples are the mortgage ceiling introduced by Finansinspektionen, a mortgage tax or limited tax deductions for mortgages, a property tax, a reserve requirement for mortgages and so on. As a comparison, a higher policy rate functions not only as a tax on mortgages, but also as a tax on loans for production, investment and trade. This in turn leads to the large costs to the real economy that I mentioned earlier.

More generally, if house prices and household indebtedness are regarded as a problem, then this problem needs to be analysed and specified in greater detail to assess which means can be used to deal with it. Is the problem some form of market failure? Does it involve an externality? Is it due to a lack of information to borrowers, and is it thus a consumer protection issue? It is only when we have specified the problem that we can determine suitable measures to deal with it.

## Practical inflation targeting

As I have already explained, flexible inflation targeting can be described as “forecast targeting”. The central bank chooses a policy-rate path so that the forecast of inflation and resource utilization best stabilizes inflation around the inflation target and resource utilization around its normal level. We can formalize and specify this somewhat by expressing this as a case of selecting a policy-rate path that minimizes an inter-temporal forecast loss function, written as the following standard quadratic form,<sup>9</sup>

$$L_t = \sum_{\tau=0}^{\infty} \delta^{\tau} \left( \pi_{t+\tau,t} - \pi^* \right)^2 + \lambda_y \sum_{\tau=0}^{\infty} \delta^{\tau} \left( y_{t+\tau,t} - y_{t+\tau,t}^* \right)^2. \quad (1)$$

Here,  $\delta$  is a discount factor satisfying  $0 < \delta \leq 1$ ,  $\pi_{t+\tau,t}$  denotes the mean forecast in quarter  $t$  of inflation in quarter  $t+\tau$ , and  $\pi^*$  denotes the inflation target. Furthermore,  $y_{t+\tau,t}$  denotes the mean forecast of (the logarithm of) output,  $y_{t+\tau,t}^*$  denotes the mean forecast of (the logarithm of) potential output, so  $y_{t+\tau,t} - y_{t+\tau,t}^*$  denotes the mean forecast of the output gap, where thus the output gap is used as a measure of resource utilization. We allow  $\delta = 1$ , since sum of

<sup>8</sup>See, for instance, Assenmacher-Wesche and Gerlach (2010), Bean, Paustian, Penalver and Taylor (2010), Del Negro and Otrok (2007), Dokko, Doyle, Kiley, Kim, Sherlund, Sim and Van den Heuvel (2009), Edge, Kiley and Laforte (2008), Iacoviello and Neri (2008), Jarocinski and Smets (2008) and Walentin and Sellin (2010).

<sup>9</sup> See Svensson (2010a) for more details.

squares of mean forecasts normally converge also for  $\delta = 1$ . Finally,  $\lambda_y$  is the weight on output-gap stabilization relative to that of inflation stabilization.

If the unemployment gap is used as the measure of resource utilization, the forecast loss function is written as

$$L_t = \sum_{\tau=0}^{\infty} \delta^{\tau} \left( \pi_{t+\tau,t} - \pi^* \right)^2 + \lambda_u \sum_{\tau=0}^{\infty} \delta^{\tau} \left( u_{t+\tau,t} - u^*_{t+\tau,t} \right)^2, \quad (2)$$

where  $u_{t+\tau,t}$  denotes the mean forecast of the rate of unemployment,  $u^*_{t+\tau,t}$  denotes the mean forecast of the equilibrium rate of unemployment, and  $\lambda_u$  denotes the weight on unemployment-gap stabilization relative to that on inflation stabilization.<sup>10</sup>

### Mean squared gaps

We can see the discounted sum of squares in the first term in (1) and (2) as a measure of the degree of stabilization of the inflation forecast around the inflation target. Let us refer to the gap between inflation and the inflation target as the inflation gap. The closer to zero, the better the inflation forecast is stabilized around the inflation target or, equivalently, the better the inflation-gap forecast is stabilized around zero. Let us for simplicity assume that the discount factor is equal to one, so the discounted sum of squares is just the undiscounted sum of squares. Furthermore, let us truncate the sum of squares at the finite forecast horizon  $T$  (normally 12 quarters for the Riksbank). Finally, let us divide the sum of squares with the number of periods up to and including the forecast horizon,  $T + 1$ . Then, we can define the mean squared gaps for (the) inflation (forecast) as

$$\text{MSG}_t^{\pi} \equiv \sum_{\tau=0}^T \left( \pi_{t+\tau,t} - \pi^* \right)^2 / (T + 1) \quad (3)$$

and use the mean squared gap for inflation as a measure of the degree of stabilization of the inflation forecast. Similarly, we can define the mean squared gaps for output and unemployment as

$$\text{MSG}_t^y \equiv \sum_{\tau=0}^T \left( y_{t+\tau,t} - y^*_{t+\tau,t} \right)^2 / (T + 1) \text{ and } \text{MSG}_t^u \equiv \sum_{\tau=0}^T \left( u_{t+\tau,t} - u^*_{t+\tau,t} \right)^2 / (T + 1), \quad (4)$$

and then use the mean squared gaps for output and unemployment as measures of the degree of stabilization of the output-gap and unemployment-gap forecast, respectively.

It follows that we can approximate the forecast loss function in terms of the output gap (1) as

$$\text{MSG}_t^{\pi} + \lambda_y \text{MSG}_t^y \quad (5)$$

and in terms of the unemployment gap (2) as

$$\text{MSG}_t^{\pi} + \lambda_u \text{MSG}_t^u. \quad (6)$$

The scaling by  $1/(T+1)$  does not affect the ranking of policy alternatives, but the truncation at the forecast horizon  $T$  of course means that differences between policy alternatives beyond the forecast horizon are ignored.

The mean squared gaps for inflation, output, and unemployment thus provide quantitative measures of the stability of inflation around the inflation target and the stability of resource utilization around a normal level. With these quantitative measures of stability, we may be able to verify whether policy is *efficient*. By a policy being efficient, we mean that it is not possible to find a different policy-rate path such that the corresponding forecast of inflation

<sup>10</sup> If there is a linear relation,  $y_{t+t,t} - y^*_{t+t,t} = -c (u_{t+t,t} - u^*_{t+t,t})$ , between the output gap and the unemployment gap as in the “gap version” of Okun’s Law, where the constant  $c > 0$  is the Okun coefficient, the relative weights on unemployment-gap and output-gap stabilization are related according to  $\lambda_u = c^2 \lambda_y$ .

and resource utilization stabilizes inflation better without stabilizing resource utilization worse (or stabilizes resource utilization better without stabilizing inflation worse).

We may also be able to judge whether policy is a *reasonable compromise* between stabilizing inflation and stabilizing resource utilization, that is, whether policy is consistent with a reasonable relative weight on resource-utilization stabilization. We may also verify whether policy is *consistent over time*, that is, whether policy is consistent with a constant relative weight on resource-utilization over time.

That policy is efficient is obviously a necessary (but not sufficient) condition for policy being optimal (optimal in the sense of minimizing the forecast loss function for a given relative weight on the stabilization of resource utilization). If policy is not efficient, it is possible to find a policy-rate path that leads to a lower loss of the forecast loss function.

Another necessary condition for optimal policy is one of the Qvigstad (2005) criteria, namely that the inflation gap and the output gap (unemployment gap) should have opposite (same) signs. Normally, the inflation forecast is not precisely on the target and the forecast of resource utilisation is not precisely at a normal level. For monetary policy to be optimal in such a situation the inflation forecast should be above the target and the forecast of resource utilisation should be below a normal level, or vice versa. If the forecasts for inflation and resource utilisation are both too low, target attainment for both can be improved if monetary policy becomes more expansionary, in which case achieving the right balance is not a problem. Similarly, if the forecasts for inflation and resource utilisation are both too high, target attainment for both can be improved if monetary policy becomes tighter. In this case too, achieving the right balance is not a problem. One can say that a necessary condition for a well-balanced monetary policy is that the inflation gap (between inflation and the inflation target) and the resource utilisation gap (between resource utilisation and normal resource utilisation) should have different signs. If they have the same sign, monetary policy is not optimal.<sup>11</sup>

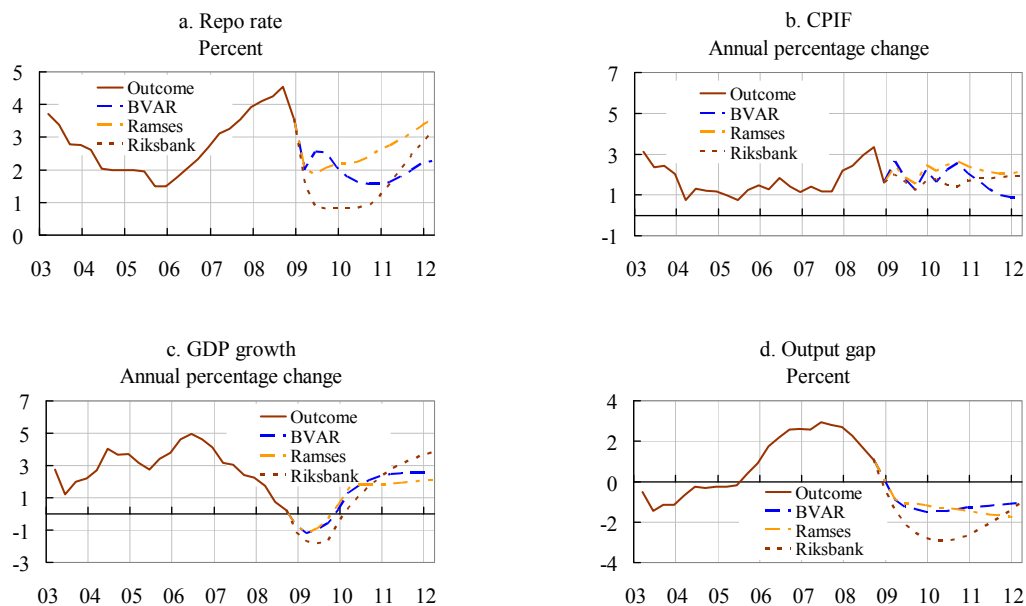
### **Always use good judgment**

Throughout the monetary-policy decision process in central banks, a considerable amount of judgment is applied to assumptions and projections. Figure 4 shows an example of how judgment is applied to results in a different forecast than the model forecasts. The four panels a-d show the forecast of the repo rate (the Riksbank's policy rate), CPIF, GDP growth and the output gap at the policy meeting in February 2009. The dash-dotted curves show the forecast from the Riksbank's DSGE model Ramses when an estimated policy function is applied. The dashed curve shows the forecast from the Riksbank's Bayesian VAR model BVAR. The dotted curves, finally, show the Riksbank's forecast of the four variables as presented in the Monetary Policy Report of February 2009. Taking into the account the severe financial crisis and the rapidly deteriorating economic situation, the Riksbank lowered the repo rate by 100 basis points to 1 percent, much lower than the repo rate paths suggested by the models, and still had a more pessimistic view of GDP growth and the output gap than the models. The use of judgment in monetary policy is further discussed in Svensson (2005, 2010a).

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<sup>11</sup> The discussion of optimal policy and necessary conditions here disregards issues of commitment and discretion. These are further discussed in Svensson (2010a) and Woodford (2010c).

**Figure 3. Riksbank forecasts, February 10, 2009**



### Monetary policy alternatives

As an example of the analysis of policy alternatives with the help of mean squared gaps, figure 4 shows the Riksbank's policy options at the meeting on 3 September 2008, a few days before the Lehman collapse. Panel a shows three alternative repo-rate paths, labelled Main, Low, and High. Panel c shows the corresponding forecasts for CPIF inflation (the CPI less direct effects of changes in interest rates on housing costs) for the three repo-rate paths. The inflation target is 2 percent. Panel d shows corresponding output-gap forecasts for the three repo-rate paths.

We see that in this case there is a trade-off between stabilizing the inflation gap and the output gap. In panel c we see that the low (high) policy-rate path stabilizes the inflation forecast worse (better) around the inflation target, but in panel d we see that the low (high) policy-rate path stabilizes the output-gap forecast better (worse) around zero.

Panel b shows the corresponding mean squared gaps for the inflation and output forecasts for the three policy-rate paths, with the mean squared gap for inflation along the horizontal axis and for output along the vertical axis. That there is a trade-off between stabilizing inflation and the output gap is apparent since the mean squared gaps for the low (high) policy-rate path is southeast (northwest) of the point corresponding to the main policy-rate. The low (high) policy-rate path implies a higher (lower) mean squared gap for inflation and higher (lower) mean squared gap for output.

Since there is a trade-off between stabilizing inflation and the output gap, the preferred policy-rate path depends on the relative weight placed on output-gap versus inflation-gap stabilization. The downward-sloping straight line shows an iso-loss line corresponding to an equal weight being placed on inflation and output-gap stabilization ( $\lambda_y = 1$ ). For that weight, we see that the main policy-rate path is marginally better than the low policy-rate path, since the line through the Main point is marginally closer to the origin than a line through the Low point. The main policy-rate path is significantly better than the high policy-rate path. For a sufficiently low  $\lambda_y$  (a sufficiently steep line), the high policy-rate path would be better. The majority of the Executive Board voted in favour of the main policy-rate path.

After the collapse of Lehman Brothers, the repo rate and the repo-rate path were shifted down in large steps.

**Figure 4. Monetary policy alternatives for the Riksbank, September 3, 2008 (before Lehman)**

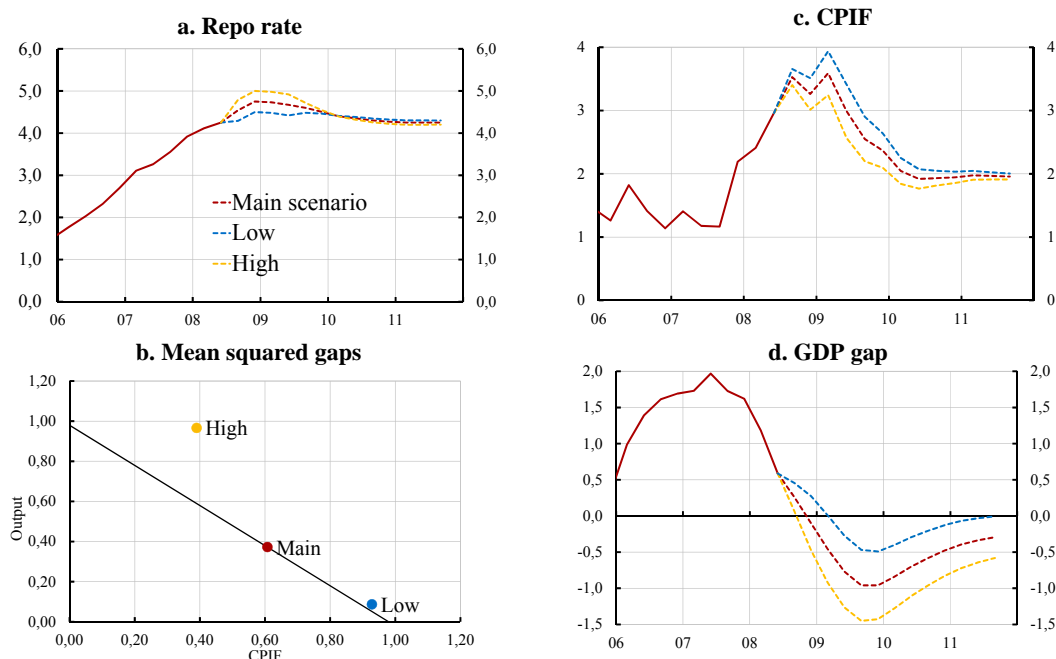
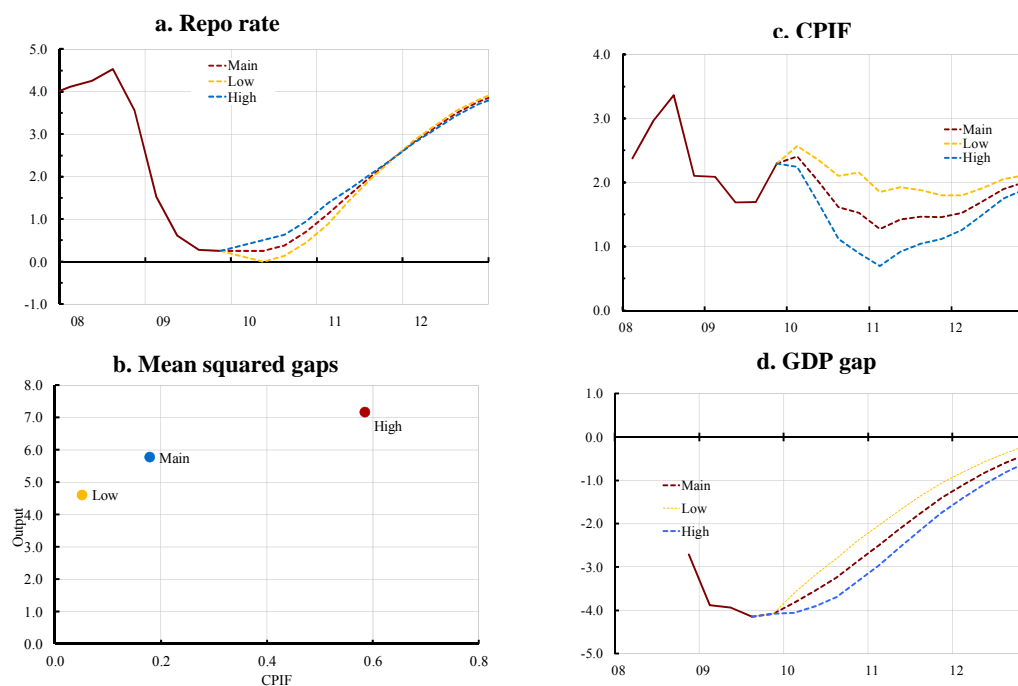


Figure 5 shows the policy alternatives at the monetary policy meeting on 10 February 2010. Panels c and d show that the lower policy-rate path results in a CPIF-forecast closer to the target and an output-gap forecast closer to zero. Panel b shows that it corresponds to smaller mean squared gaps for both inflation and output. Thus, the main policy-rate path is not efficient, since an alternative policy-rate path exists that stabilizes both inflation and the output gap better. Nevertheless, the majority of the Executive Board voted in favour of the main policy-rate path. I dissented in favour of the low policy-rate path.

Thanks to the high level of transparency of the Riksbank, the attributed minutes from the meeting (Sveriges Riksbank 2010b) reveal a lively debate about the decision at this meeting and allow any reader to assess the validity of the arguments presented.

**Figure 5. Monetary policy alternatives for the Riksbank, February 10, 2010**



### The unemployment gap versus the output gap as a measure of resource utilization

The above examples use the output gap as a measure of resource utilization. More recently, I have started to attach greater importance to the unemployment gap as a measure of resource utilization. There are several reasons for this. Unemployment is measured frequently and with relatively great precision. Unemployment figures are not revised other than as a consequence of amended definitions. This can be compared with GDP, where precision is poor and large revisions common. The difficulty with the unemployment gap is of course to estimate the equilibrium unemployment rate. However, this can be estimated in and outside the central bank using various methods and approaches. It is possible to conduct a transparent discussion and debate on the level of the equilibrium unemployment rate in and outside the central bank. This is a great advantage, for the same reason that it is considered a great advantage with an inflation target that the relevant price indices are constructed by another authority than the central bank (in the Swedish case by Statistics Sweden and not the Riksbank). It would not be appropriate for the central bank itself to calculate the price index against which target fulfilment is measured.

As regards output and hours worked gaps, a complicated and difficult estimate of potential GDP and hours worked is required, with many assumptions that may seem arbitrary. It may at times be tempting to manipulate the measure so as to support the prevailing policy. I have heard the opinion expressed that there is always some measure of resource utilisation that can be used to justify the present policy-rate path. In this context, the unemployment gap appears as a more robust, transparent and less easily manipulated indicator of resource utilisation than the alternatives. It is also easy to perform sensitivity analyses with different assumptions about the equilibrium unemployment rate.

### Conclusions

Let me repeat my main conclusions. The financial crisis was caused by other factors than monetary policy. Easy monetary policy in the United States had very little to do with the

crisis. Price stability is not enough to achieve financial stability. Interest-rate policy is not enough to achieve financial stability. A separate financial-stability policy is needed. It is important to distinguish between monetary policy and financial-stability policy. They are distinct and different. They have different objectives, and different suitable instruments. The responsibility for monetary policy and the control of the monetary-policy instruments rests with the central bank, but the responsibility for financial-stability policy and the control of the financial-stability instruments rests with different authorities in different countries. Importantly, it was financial-stability policy that failed and caused the crisis, not monetary policy. Financial stability as an objective of *monetary policy* makes little sense, whereas financial stability as an objective for the *central bank* makes sense, if the central bank has control of the financial-stability instruments.

Flexible inflation targeting – applied in the right way and using all the information that is relevant for the forecast of inflation and resource utilisation, including financial conditions when appropriate – remains in my view the best-practice monetary policy before, during, and after the financial crisis. In some situations, financial stability may imply restrictions on monetary policy and then imply a higher or lower policy rate than otherwise, but that will be a rare event. Normally, financial stability will be handled with financial-stability policy, not monetary policy.

Monetary policy should not be used to target housing prices or household debt. The policy rate is too blunt an instrument, and such targeting with the use of the policy rate will have high real costs in terms of output and unemployment. If housing prices and/or household debt are considered a problem, there are much better instruments available.

Flexible inflation targeting aims at stabilizing both inflation around the inflation target and resource utilization around a normal level. Using mean squared gaps as quantitative measures of the stability of inflation and resource utilization is another step towards a more systematic and consistent monetary policy and increased transparency.

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