

# The Role of Science in Best-Practice Monetary Policy: In Honor of Otmar Issing\*

Lars E.O. Svensson  
Princeton University, CEPR, and NBER

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## Abstract

There is a considerable amount of science in current best-practice monetary policy. But a considerable amount of judgment is needed, too. There is no way best-practice monetary policy can rely on models alone. The current monetary-policy setup by Norges Bank, the central bank of Norway, provides an example of best-practice monetary policy. The bank decides on an optimal instrument-rate plan that results in inflation and output-gap forecasts that are deemed to best achieve the bank's objective. The instrument-rate, inflation, and output-gap forecasts are published and extensively motivated and discussed. The framework, which can be described as "forecast targeting," implies that judgment is used in a systematic and disciplined way.

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# 1 Best-practice monetary policy

Otmar Issing and I have not always agreed on everything. However, we agree completely on the most important things, for instance, that price stability should be the primary objective for monetary policy.

Almost eight years ago, Europe was full of rumors about who the Euro-area governments might nominate for the ECB's Executive Board. There was considerable uncertainty about who those people might be, and I remember being nervous about whether the nominees would be sufficiently competent and independent. I remember vividly how very relieved I was when I received the news that the German government was nominating Otmar Issing. I was convinced that, with Otmar in the Executive Board, the common monetary policy in the Euro areas was in the safest possible hands.

Whereas Otmar and I agree on the most important things, we have not always agreed on the details, for instance, what degree of transparency is best, or what weight should be given to monetary aggregates as monetary-policy indicators. Over the years, I have had the great privilege of having had regular and most interesting and rewarding discussions with Otmar on various issues in monetary policy, in his office, at various conferences, at various dinners, and in his car. I am extremely grateful for all these occasions. I have learned so much from our discussions, and I hope very much that we can continue to have them in the future.

Today I will talk briefly about the role of science in best-practice monetary policy. By best-practice monetary policy, I mean flexible inflation targeting, where the central bank aims at stabilizing inflation around a low inflation target, but also gives some weight to stabilizing real activity, measured by the output gap between actual output and potential output, for instance.

Because of the lags between monetary-policy actions and the effects on inflation and output, best-practice monetary policy has to rely on forecasts, using a procedure that can be called "forecast targeting." Forecast targeting involves both a policy decision and the implementation of the policy decision.

The policy decision under forecast targeting involves using all relevant information about the state of the economy and transmission mechanism to select an instrument-rate path, indeed an instrument-rate plan, such that the resulting forecasts of inflation and the output gap "look good." Using all relevant information about the transmission mechanism means using all relevant results from simulations of different models, but also using judgment. By judgment, I mean information,

views, and knowledge beyond the scope of a particular model.<sup>1</sup> Because the inflation and output-gap forecast depend on the entire path of the instrument rate, it is not sufficient to decide on just the current instrument rate. Implicitly or explicitly, a path and not just the current level needs to be chosen.

What do I mean by the inflation and output-gap forecasts “looking good?” I mean that the inflation and output-gap forecasts provide a good compromise between the inflation forecast approaching the inflation target and the output-gap forecast approaching zero (that is, the output forecast approaching the potential-output forecast). More precisely, the inflation and output-gap forecasts minimize an explicit or implicit intertemporal loss function, for instance of the form

$$E_t \sum_{s=t}^{\infty} \delta^{\tau} [(\pi_s - \pi^*)^2 + \lambda(y_s - \bar{y}_s)^2],$$

the expected sum of discounted future squared inflation gaps between inflation ( $\pi_s$ ) and the inflation target ( $\pi^*$ ) and output gaps between output ( $y_s$ ) and potential output ( $\bar{y}_s$ ), where  $\delta$  ( $0 < \delta < 1$ ) is a discount factor and  $\lambda > 0$  is the weight on output-gap stabilization relative to inflation stabilization.

The implementation of best-practice monetary policy takes into account that monetary policy is actually the management of private-sector expectations (Woodford [21]). The impact of monetary policy on inflation and output depends on the private-sector decisions about prices and output that it induces. These decisions depend on the expectations about future inflation, output, and interest rates that monetary policy induces. The current instrument rate matters hardly at all; what matters for private-sector decisions are the private sector’s expectations about future interest rates. Therefore, the implementation of best-practice monetary policy consists of announcing and motivating the bank’s forecasts of inflation, the output gap, and, importantly, the instrument rate. This is the most effective way of managing private-sector expectations.

There has been much recent debate about the pros and cons of alternative assumptions about the instrument-rate path in the central bank’s decision process (see, for instance, Archer [1] and [2], Bean [3], Goodhart [4], Heikensten [5], Honkapohja and Mitra [6], Leitemo [8], Lomax [9], Svensson [14], [17], and [18], and Woodford [21]). Four alternatives have been discussed for the instrument-rate path: (1) A constant instrument rate, (2) market expectations of future interest rates, (3) an instrument rate following an instrument rule, such as the Taylor rule, (4) an optimal instrument-rate path, that is, the path the central bank believes best achieves the bank’s objectives, which will also be the central bank’s own best forecast of future instrument rates.

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<sup>1</sup> Svensson [16] and Svensson and Tetlow [20] provide a detailed treatment of how to use judgment in optimal monetary policy.

I am convinced that best-practice monetary policy involves alternative (4), the optimal instrument-rate forecast, that is, the central bank’s best forecast of its own future policy. By definition, this is the path the central bank deems to be optimal. Furthermore, since it is the best forecast of future interest rates, it provides the best information for private-sector decisions. Therefore, this is the most effective implementation of monetary policy, that is, the most effective way to manage private-sector expectations. Finally, it provides the most accountability for the central bank. Since the resulting inflation and output-gap forecast rely on the central bank’s best instrument-rate forecasts, they are the central bank’s best inflation and output-gap forecast. Therefore, these forecasts are the most relevant ones to compare with other forecasters’ forecasts and with the actual outcomes.

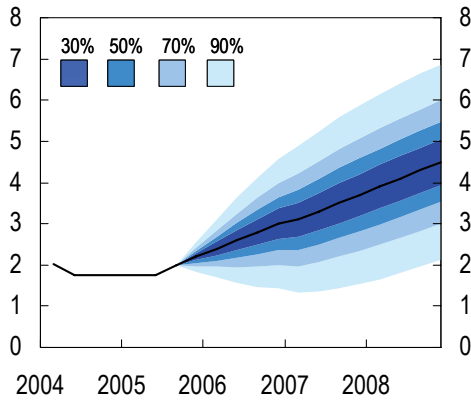
## 2 The Norwegian example

The Reserve Bank of New Zealand is the pioneer in inflation targeting. It is also the pioneer in introducing and publishing not only inflation and output-gap forecasts but also explicit instrument-rate paths. It has done so since 1998 (Archer [1] and [2], Svensson [13]). Norges Bank is an enthusiastic and competent newcomer to the inflation-targeting camp. An evaluation of monetary policy in Norway by Svensson, Houg, Solheim, and Steigum [19] gave the bank excellent marks. With its *Inflation Report* of November 2005 (Norges Bank [10]), the bank has made monetary-policy history by starting to publish an explicitly optimal instrument-rate path with uncertainty bands together with criteria for optimal inflation and output-gap forecasts and other innovations in transparent monetary policy. This section briefly discusses the Norwegian example. Qvigstad [12] provides a more analytic background to this development; Norges Bank [10] and [11] provide more details.

In each *Inflation Report*, Norges Bank states (Norges Bank [10, p. 4]): “The operational target of monetary policy is low and stable inflation, with annual consumer price inflation of approximately 2.5% over time. In general, direct effects on consumer prices resulting from changes in interest rates, taxes, excise duties and extraordinary temporary disturbances are not taken into account.” In line with this, Norges Bank focuses on changes in the CPI-ATE, the consumer price index adjusted for taxes and excluding energy products. Furthermore, the bank is explicit about being a *flexible* inflation targeter and in explaining what that means: “Norges Bank operates a flexible inflation targeting regime, so that weight is given to both variability in inflation and variability in output and employment.” Thus, Norges Bank can be seen as attempting to stabilize both the inflation gap

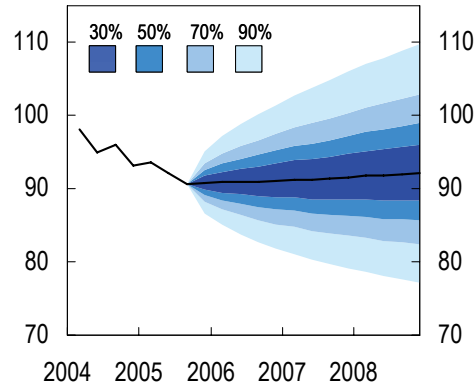
(the gap between inflation and the inflation target) and the output gap, which is consistent with minimizing a conventional intertemporal quadratic loss function (Qvigstad [12]).

**Chart 1.5a** The sight deposit rate in the baseline scenario with fan chart. Per cent. Quarterly figures. 04 Q1 – 08 Q4



Source: Norges Bank

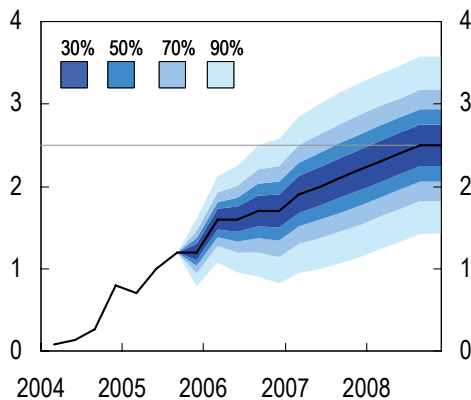
**Chart 1.5b** Import-weighted exchange rate (I-44)<sup>1)</sup> in the baseline scenario with fan chart. Quarterly figures. 04 Q1 – 08 Q4



<sup>1)</sup> A rising curve denotes a weaker krone exchange rate. It is assumed that strengthening by a certain percentage is just as likely as weakening by the same percentage.

Source: Norges Bank

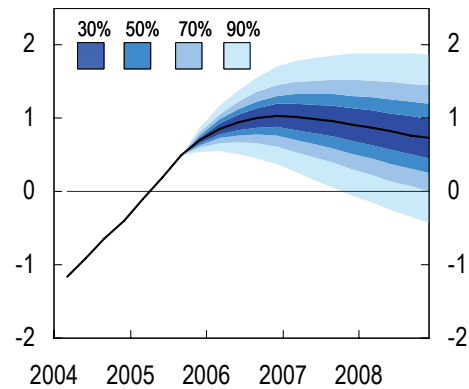
**Chart 1.5c** Projected CPI-ATE in the baseline scenario<sup>1)</sup> with fan chart. 4-quarter change. Per cent. 04 Q1 – 08 Q4



<sup>1)</sup> Other measures of underlying inflation are shown in a separate box in Section 2.

Sources: Statistics Norway and Norges Bank

**Chart 1.5d** Estimated output gap in the baseline scenario<sup>1)</sup> with fan chart. Per cent. Quarterly figures. 04 Q1 – 08 Q4



<sup>1)</sup> Uncertainty concerning the current situation is not taken into account in the calculation.

Source: Norges Bank

Charts 1.5a-d in the *Inflation Report* [10] show the optimal forecasts with fan charts in the report's baseline scenario of, respectively, the instrument rate (the so-called sight deposit rate), the exchange-rate (import-weighted), inflation (CPI-ATE), and the output gap.<sup>2</sup>

<sup>2</sup> These graphs are from the Inflation Report [10] of November 2005. On the first day of the Issing Colloquium, March 16, Norges Bank published a new Inflation Report, [11].

That the bank is a flexible inflation targeter and puts weight on stabilizing both the inflation gap and the output gap is emphasized in chart 1.7, where the inflation and output-gap forecasts are displayed in the same graph with the same scale. As seen in chart 1.7, inflation is currently below the 2.5% target in Norway, and the bank projects that inflation will gradually rise towards the target and reach that at the end of 2008. The projected rise in inflation is brought about by a projected positive output gap. These forecasts of the bank's target variables require an instrument-rate forecast as displayed in chart 1.5a. The editorial of the report states that "the interest rate path presented provides a reasonable balance between the objectives of monetary policy," which can be interpreted as the inflation, output-gap, and instrument-rate forecasts in charts 1.5a-d being optimal forecasts of these variables.

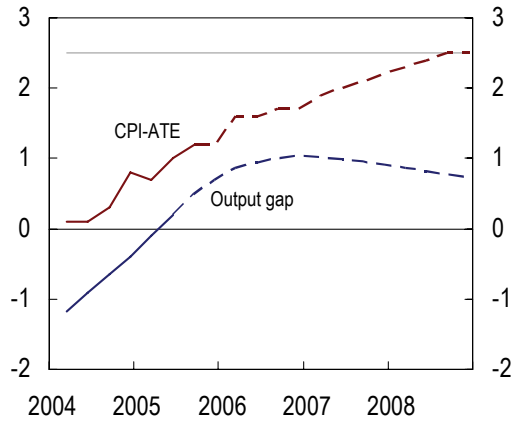
The bank also provides six criteria for an "appropriate" instrument-rate path, that is, and optimal instrument-rate path. These criteria are discussed and justified in detail in Qvigstad [12]. They can be understood as verbal forms of optimality conditions, that is, the optimal *targeting rules* that Svensson [15] advocates rather than instrument rules such as Taylor rules. Norges Bank's criteria are reproduced in the appendix.

The bank also provides optimal forecasts of the instrument rate, inflation, and the output gap for alternative scenarios. Charts 1.9a-c show such forecasts for two alternative scenarios, one with stronger trade shifts (leading to lower import prices) and lower wage growth, and one with inflation rising more rapidly than predicted.

As explained in Qvigstad [12] and Norges Bank [10] and [11], the bank cross-checks its optimal instrument-rate path against various simple instrument rules and indicators that are less dependent on a specific analytical framework and specific forecasts for the Norwegian economy. Chart 1.10 provides a comparison with market expectations of future instrument rates as represented by forward interest rates. Chart 1.11 compares the instrument rate with alternative simple instrument rules. Chart 1.12 provides a comparison with an empirical reaction function estimated from previous instrument-rate responses.

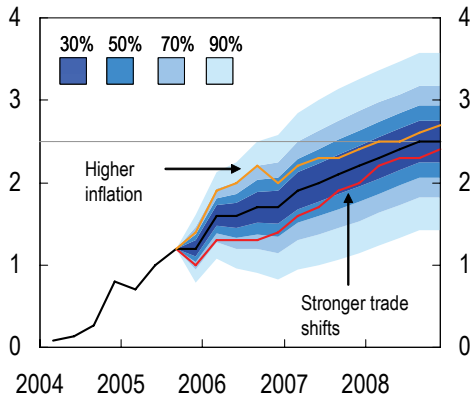
Finally, implicitly paying tribute to Otmar's and the ECB's emphasis on monetary aggregates as monetary-policy indicators, chart 1.14 displays money growth, both actual and estimated trend growth of M2.

**Chart 1.7** Projections for the CPI-ATE and output gap in the baseline scenario. Quarterly figures. Per cent. 04 Q1 – 08 Q4



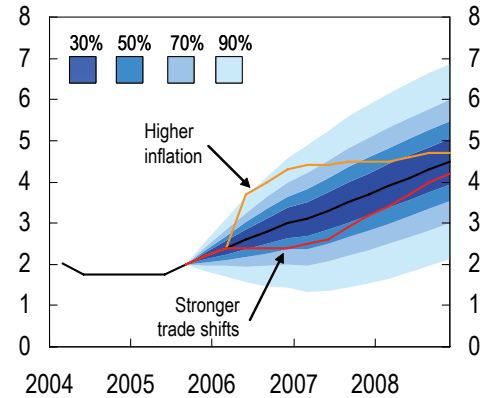
Sources: Statistics Norway and Norges Bank

**Chart 1.9b** Projected CPI-ATE in the baseline scenario and in the alternatives with stronger trade shifts and lower wage growth (red line) and higher inflation (yellow line). 4-quarter change. Per cent. 04 Q1 – 08 Q4



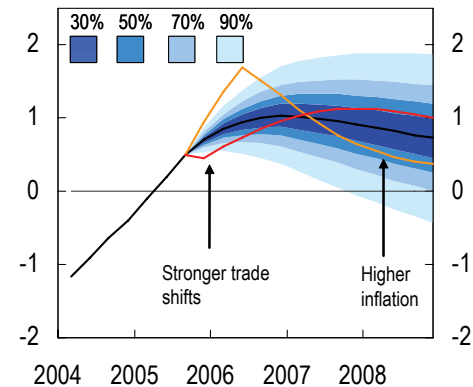
Sources: Statistics Norway and Norges Bank

**Chart 1.9a** Sight deposit rate in the baseline scenario and in the alternatives with stronger trade shifts and lower wage growth (red line) and higher inflation (yellow line). Per cent. Quarterly figures. 04 Q1 – 08 Q4



Source: Norges Bank

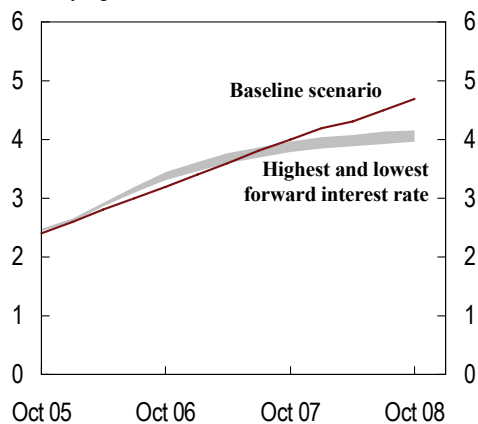
**Chart 1.9c** Estimated output gap in the baseline scenario<sup>1)</sup> and in the alternatives with stronger trade shifts and lower wage growth (red line) and higher inflation (yellow line). Per cent. Quarterly figures. 04 Q1 – 08 Q4



<sup>1)</sup> Uncertainty concerning the current situation is not taken into account in the calculation.

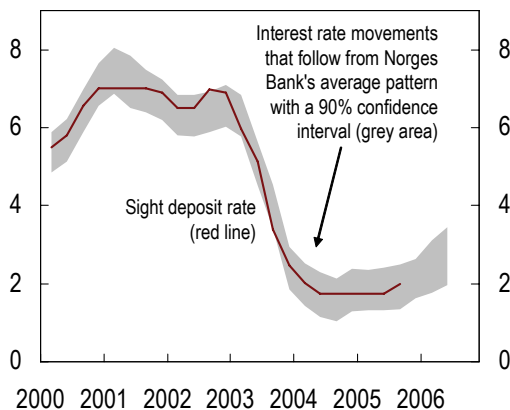
Source: Norges Bank

**Chart 1.10** 3-month money market rate in the baseline scenario<sup>1)</sup> and band with highest and lowest forward interest rate last 10 days.<sup>2)</sup> Per cent. Quarterly figures. 05 Q4 - 08 Q4



<sup>1)</sup> The money market rate is normally about ¼ percentage point higher than the sight deposit rate.  
<sup>2)</sup> Highest and lowest forward interest rate in the period 14 – 27 Oct 2005.  
 Source: Norges Bank

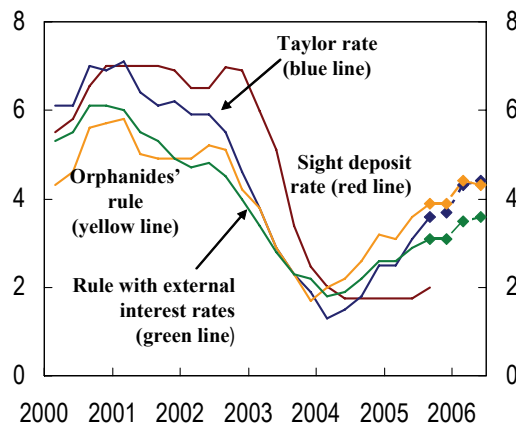
**Chart 1.12** Sight deposit rate and interest rate developments that follow from Norges Bank's average pattern for the setting of interest rates.<sup>1)</sup> Per cent. Quarterly figures. 00 Q1 – 06 Q2



<sup>1)</sup> The interest rate movements are explained by developments in inflation, mainland GDP growth, wage growth and 3-month interest rates among trading partners. See Inflation Report 3/04 for further discussion.

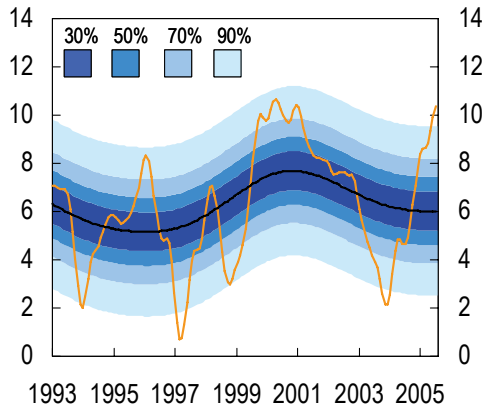
Source: Norges Bank

**Chart 1.11** Sight deposit rate, Taylor rule, Orphanides rule and rule with external interest rates. Inflation as in the baseline scenario. Quarterly figures. Per cent. 00 Q1 - 06 Q2



Source: Norges Bank

**Chart 1.14** Money supply (M2). 12-month growth, estimated trend growth and intervals.<sup>1)</sup> Per cent. Monthly figures. Jan 93 - Aug 05



<sup>1)</sup> Actual M2 growth is smoothed. Trend growth is estimated using a Hodrick-Prescott filter (lambda = 100 000). The confidence intervals are based on the standard deviation calculated using the deviation between actual M2 growth and trend growth.

Source: Norges Bank

### 3 Conclusions

There is much science in current best-practice monetary policy. But there is also considerable use of judgment, where by judgment I mean information, views, and knowledge beyond the scope of



a particular model. The use of judgment is both unavoidable and desirable. I believe that best-practice monetary policy will never be able to rely on models alone. As Otmar states in his Stone Lectures with Gaspar, Tristani, and Vestin [7, p. 9], “the judgmental elements are necessary to bridge the gap between the simplifications of monetary theory and the complexities of real-world decision making.” Therefore, monetary-policy with the right use of judgment will be better than monetary policy that relies only on models. Importantly, the process of forecast targeting that is part of best-practice monetary policy implies that judgment is used in a more systematic and disciplined way. For instance, new information is “filtered through the forecast.” That is, if new information has no impact on the forecasts of inflation and/or the output gap at the existing instrument-rate path, it should normally warrant any change of the instrument-rate path. Only if new information has an impact on future inflation and the output gap should it normally affect the instrument-rate plan. Svensson [16] and Svensson and Tetlow [20] provide more details on how judgment can be used in a systematic and disciplined way.

Norges Bank has set a model for other central banks in publishing optimal inflation, output-gap, and instrument-rate forecasts, with fan charts indicating the degree of uncertainty and with ample discussion and justification of the forecasts, including alternative scenarios, cross-checking with alternative policy rules, and the application of a list of criteria for optimal instrument-rate forecasts.

That Otmar is retiring at this juncture is very unfortunate and a big loss to world central banking from several points of view. For instance, I would think that, if Otmar would have stayed a few more years at the ECB, he would have enthusiastically worked on implementing the great improvements in best-practice monetary-policy that Norges Bank has demonstrated to us.

## Appendix

From Norges Bank [10, p. 8, box]:

### **Criteria for an appropriate future interest rate path**

The following criteria may be useful in assessing whether a future interest rate path appears reasonable compared with the monetary policy objective.

1. If monetary policy is to anchor inflation expectations around the target, the interest rate must be set so that inflation moves towards the target. Inflation should be stabilised near the target within a reasonable time horizon, normally 1-3 years. For the same reason, inflation should also be moving towards the target well before the end of the three-year period.

2. Assuming that inflation expectations are anchored around the target, the inflation gap and the output gap should be in reasonable proportion to each other until they close.<sup>1</sup> The inflation gap and the output gap should normally not be positive or negative at the same time further ahead.

3. Interest rate developments, particularly in the next few months, should result in acceptable developments in inflation and output also under alternative, albeit not unrealistic assumptions concerning the economic situation and the functioning of the economy.

4. The interest rate should normally be changed gradually so that we can assess the effects of interest rate changes and other new information about economic developments.

5. Interest rate setting must also be assessed in the light of developments in property prices and credit. Wide fluctuations in these variables may in turn constitute a source of instability in demand and output in the somewhat longer run.

6. It may also be useful to cross-check by assessing interest rate setting in the light of some simple monetary policy rules. If the interest rate deviates systematically and substantially from simple rules, it should be possible to explain the reasons for this.

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<sup>1</sup> The inflation gap is the difference between actual inflation and the inflation target of 2.5%. The output gap measures the percentage difference between actual and projected potential mainland GDP.

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