

Monetary-Policy Challenges: Monetary-Policy Responses to Oil-Price Changes*

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Central banks should take past, present, and predicted future oil-price movements into account in their monetary policy depending on how these movements affect the inflation and output-gap forecasts that should guide monetary policy. Oil price movements have complex effects on these forecasts, so the impact of oil price movements on policy is complex. This note discusses the main principles in determining the appropriate monetary-policy response to oil-price changes.

Oil prices have moved dramatically in the last few years. The price of Brent crude oil rose to more than USD 65 in the beginning of September 2005 and has since fallen somewhat and is now fluctuating in the USD 55-60 range (European Central Bank, 2005). Rising oil prices may both increase inflation and reduce output and growth. How should central banks adjust monetary policy to oil-price movements?

The answer to this question follows from the general principles for good monetary policy, as explained, for instance, in Svensson (2003). However, whereas the principles for good monetary policy are simple, the practice of good monetary policy is difficult. The same is the case for the question of how to adjust monetary policy to oil-price changes: the principles are simple, but the practice is difficult. In particular, there is no simple relation between the appropriate instrument-rate adjustment and a given change in oil prices.¹

So, the principles of good monetary policy are simple: Perform *flexible inflation targeting*, which means aiming to stabilize inflation around an explicit low positive numerical inflation target with some weight also on stabilizing the real economy. Stabilizing the real economy can be expressed more precisely as stabilizing the output gap, that is, stabilizing output around an estimate of potential output. Because of the lags between monetary-policy actions and the effect on inflation and output, the best way to do this is to look forward and perform *forecast targeting*. This means setting the central

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¹ The issues raised by monetary policy and oil-price movements are similar to those raised by monetary policy and central-bank judgment; see Svensson (2005) on the latter.

bank's instrument rate (more precisely, to choose an instrument-rate *plan*, a planned path for the current and future instrument rate) such that the corresponding inflation and output-gap forecasts “look good.” Looking good means either achieving stable inflation at the inflation target and a stable output gap at zero or, more realistically, a good compromise between the two. In practice, looking good normally means that the inflation and output-gap forecasts approach the inflation target and zero, respectively, often one to three years ahead (but, more precisely, the whole future forecast paths should look good, not just the forecast at some fixed horizon).

Although these principles are simple, as explained in Svensson (2005), the *practice* of constructing forecasts, deciding on the appropriate instrument rate (plan), and communicating these to the general public and the market is quite complicated and difficult.

How do these principles apply to oil-price movements? How should central banks find the optimal instrument-rate plan? The *first* step is to make a forecast of future oil prices. More precisely, past, current, and predicted future oil prices are one set of inputs in the construction of inflation and output-gap forecasts. Thus, any unanticipated change in current oil prices and any revision of the outlook for future oil prices call for a shift in the oil-price forecast.

The *second* step is to assess what impact the shift in the oil-price forecast has on the inflation and output-gap forecasts. In particular, estimating the impact on the forecast of the output gap, the gap between output and potential output, requires that the impact on *both* the output and potential-output forecasts is assessed. Potential output is a complex concept. The most appropriate concept for monetary-policy purposes is the hypothetical output level that would arise in the hypothetical situation where there is complete nominal price and wage flexibility but any real distortions such as taxes, imperfect competition, and information imperfections remain in place. This is not the same as the standard trend measures of potential output.

Whereas potential output normally is independent of monetary policy, it does depend on the shocks hitting the economy, including oil-price changes. Oil is one of the intermediate inputs in production. For an oil-importing economy, an increase in the price of imported oil relative to the price of the economy's output implies an increase in production costs and is similar to a fall in productivity. A fall in productivity reduces potential output. Furthermore, an increase in the relative price of an imported commodity implies a terms-of-trade deterioration for the economy as a whole. A terms-of-trade deterioration has a negative income and wealth effect on consumption, which reduces aggregate demand for output. Aggregate demand is also affected by expectations of changes in future incomes. Hence, a rise in oil prices is likely to have negative effects on both output and potential output. The relative sizes and the time profile of those effects are not obvious, though. To the extent that aggregate demand and output is sluggish, the negative effect on potential output may dominate and lead to a positive output gap (output less potential output) in the short and medium run, but generally the time profile of the shift in the output-gap forecast is complex.

The shift in the oil-price forecast will also have an impact on the inflation forecast. Oil prices enter directly into consumer prices as fuel for heating and for personal transportation. An increase in production costs because of higher costs of intermediate oil inputs in production will also increase the CPI. Finally, any shift in the output-gap forecast will have an impact on the inflation forecast via the standard output-gap channel in the Phillips curve. Expectations of future price changes will also have an impact on inflation, via various expectations channels. Although most effects on the inflation forecasts from an upward shift in the oil-price forecast would be positive, the time profile of the shift in the inflation forecast is not obvious.

An important part of the analysis concerns the effects of the oil-price changes on private-sector inflation expectations. Since private-sector inflation expectations have an independent effect on inflation, an increase in private-sector inflation expectations shifts the central bank's inflation forecast up. If the central bank's credibility is high, meaning that the private-sector inflation expectations are stable and close to the inflation target, the expectations channel helps to stabilize the inflation forecast. If the central bank's credibility is low, meaning that private-sector inflation expectations are volatile and shift substantially with oil-prices increase, the shift in inflation expectations are larger. In particular, low credibility deteriorates the tradeoff between inflation stability and output gap stability. With low credibility, when private-sector inflation expectations and the inflation forecast shifts up, the appropriate monetary-policy response and the best compromise between stabilizing the inflation forecast and the output-gap forecast will normal involve tighter monetary policy and a more negative output-gap forecast than with good credibility.

We can think of the above shifts in the inflation and output-gap forecasts, resulting from the shift in the oil-price forecast, as being constructed for a given interest-rate plan. To isolate the effect of the shift in the oil-price forecast, we may assume that the interest-rate plan and the corresponding inflation and output-gap forecasts look good before the shift in the oil-price forecast. The shift in the oil-price forecast then results in shifts in the inflation and output-gap forecasts such that these forecasts may no longer look good. The *third* step is then to decide, given the shift in inflation and output-gap forecasts, what revision, if any, of the interest-rate plan is required in order to make the inflation and output-gap forecasts look good again. The new current instrument setting is then the first element in the new instrument-rate plan.

It follows from the above that the new instrument setting is a very complex function of the initial movement of oil prices. It is too complex to be summarized as a simple formula. Therefore, there is no point in trying to determine a simple policy function for the appropriate instrument-rate response to a movement in oil prices. It all depends on the whole shift in the oil-price forecast, how that shift affects the inflation and output-gap forecast, and what shift this requires in the instrument-rate plan for the inflation and output-gap forecasts to look good. The policy function is best left implicit, defined by the three steps I have outlined above.

The *fourth* and last step is to announce and implement the new instrument rate, and to explain the analysis and the outcome of the three steps above to observers and the general public. The latter is what is done in the monetary-policy reports by the best flexible inflation targeters. In particular, good analysis and high transparency may convince the private sector that the central bank has the situation under control, which may increase the central bank's credibility and make the tradeoff between stabilizing the inflation forecast and the output-gap forecast more favorable.

It follows that determining the appropriate monetary-policy response to past oil-price movements is a demanding exercise. Similarly, evaluating whether central banks have responded appropriately is a demanding exercise. Ideally, it requires a detailed report by the central banks of how they have done the first three steps outlined above. Norges Bank's *Inflation Report* of November 2005 (Norges Bank, 2005) provides an excellent practical example of such a report, from the point of view of an oil exporter. In particular, the report includes a detailed discussion of what it means by the inflation and output-gap forecasts looking good (Norges Bank, 2005, box on p. 8, "Criteria For an Appropriate Future Interest Rate Path"; Qvigstad, 2005, provides a more detailed discussion). Norges Bank's criteria for an appropriate future interest-rate path are reproduced in an appendix.

Appendix: Criteria for an appropriate future interest rate path (Norges Bank, 2005, p. 8, box)

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.¹ 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.

¹ 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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