Comments on:

Optimal Monetary Policy
in an Operational Medium-Sized DSGE Model

by Malin Adolfson, Stefan Laséen, Jesper Lindé and Lars Svensson

Günter Coenen
European Central Bank

The 2nd Oslo Workshop on Monetary Policy, Oslo, 8-9 June, 2007.
The paper is to be commended for extending the analysis of optimal monetary policy to an “operational” medium-sized DSGE model: RAMSES

- examines optimal policy (under commitment in a timeless perspective and under discretion) relative to a policy benchmark based on an estimated Taylor-Type interest-rate rule
- constructs “optimal policy projections” (by conducting policy simulations that minimise an intertemporal loss function)

The paper provides an interesting academic perspective on practical policy-making at Sveriges Riksbank:

- RAMSES is the main model used at the Riksbank for forecasting and policy simulations (besides, e.g., BVARs).
- The Riksbank has recently adopted its “own interest rate path” as forecast assumption.
The Riksbank’s Interest Rate Assumptions

• The Riksbank’s framework for forecasting has evolved over time:
  – Initially, the Riksbank used to condition its forecasts on constant interest rate assumptions.
  – Since October 2005, the Riksbank gave more prominence to projections based on market interest rates relative to those based on constant interest rates.
  – On 17 January 2007, it was announced that the Riksbank will use an own path of the repo rate as an assumption in the future projections.

• A primary reason for the change in assumption is that “[i]t will be easier to explain to the general public and the financial markets how we reason when making policy decisions and how we see future interest rate developments.” (Governor Stefan Ingves, 19 January 2007)
What Defines a Good Interest Rate Path?

• The Riksbank identified several characteristics of a “good” interest rate path:
  – The interest rate should be set so that inflation normally is close to the 2-percent target over a two-year horizon.
  – The interest rate should also be set to achieve, as far as possible, a stable, sustainable development in the real economy.
  – Changes in the repo rate should therefore normally be made gradually and not in large steps.
  – A desirable interest rate path should also be determined with a view to assessing different types of risks to inflation and the real economy.

( Monetary Policy in Sweden, Riksbank, February 2007)
What Defines a Good Interest Rate Path?

• The Riksbank identified several characteristics of a “good” interest rate path:
  – The interest rate should be set so that inflation normally is close to the 2-percent target over a two-year horizon.
  – The interest rate should also be set to achieve, as far as possible, a stable, sustainable development in the real economy.
  – Changes in the repo rate should therefore normally be made gradually and not in large steps.
  – A desirable interest rate path should also be determined with a view to assessing different types of risks to inflation and the real economy.

(\emph{Monetary Policy in Sweden}, Riksbank, February 2007)

• Do optimal policy projections based on RAMSES succeed in delivering a good interest rate path?
What Defines a Good Interest Rate Path?

- The Riksbank identified several characteristics of a “good” interest rate path:
  - The interest rate should be set so that inflation normally is close to the 2-percent target over a two-year horizon. **No, but the outcome potentially improves on the estimated interest-rate rule.**
  - The interest rate should also be set to achieve, as far as possible, a stable, sustainable development in the real economy.
  - Changes in the repo rate should therefore normally be made gradually and not in large steps.
  - A desirable interest rate path should also be determined with a view to assessing different types of risks to inflation and the real economy.

*(Monetary Policy in Sweden, Riksbank, February 2007)*
What Defines a Good Interest Rate Path?

- The Riksbank identified several characteristics of a “good” interest rate path:
  - The interest rate should be set so that inflation normally is close to the 2-percent target over a two-year horizon. No, but the outcome potentially improves on the estimated interest-rate rule.
  - The interest rate should also be set to achieve, as far as possible, a stable, sustainable development in the real economy. Only if high weight on output stabilisation.
  - Changes in the repo rate should therefore normally be made gradually and not in large steps. Only if high weight on interest smoothing.
  - A desirable interest rate path should also be determined with a view to assessing different types of risks to inflation and the real economy.

(Monetary Policy in Sweden, Riksbank, February 2007)
What Defines a Good Interest Rate Path?

• The Riksbank identified several characteristics of a “good” interest rate path:

  – The interest rate should be set so that inflation normally is close to the 2-percent target over a two-year horizon. **No, but the outcome potentially improves on the estimated interest-rate rule.**

  – The interest rate should also be set to achieve, as far as possible, a stable, sustainable development in the real economy. **Only if high weight on output stabilisation.**

  – Changes in the repo rate should therefore normally be made gradually and not in large steps. **Only if high weight on interest smoothing.**

  – A desirable interest rate path should also be determined with a view to assessing different types of risks to inflation and the real economy. **Not addressed, but forecast risks could in principle be assessed.**

*(Monetary Policy in Sweden, Riksbank, February 2007)*
Some Preliminaries

• The paper develops techniques that may be of interest to researchers interested in optimal monetary policy analysis more widely:
  – summarising the algebra of optimal policy projections for the generic linear expectations model in state space form (cf. Svensson and Woodford, 2005)
  – working out the relation between the generic state space form and the AIM representation of linear rational expectations models (cf. Anderson and Moore, 1985)

• Still, the implementation of the technique requires to distinguish predetermined and non-predetermined variables that may constitute a challenge for medium-sized models like RAMSES.

• Direct application of the AIM algorithm without such distinction should be feasible (cf. Tetlow and Finan, 2001).
Optimal Policy Projections

• The optimal policy projection in a timeless perspective is the path that minimises the intertemporal loss function

\[
\sum_{\tau=0}^{\infty} L(Y_{t+\tau}; \lambda_Y) + \Xi_{t-1,t} H(x_{t,t} - x_{t,t-1})
\]

where \( \Xi_{t-1,t} H \) is the marginal loss of a change in the one-period ahead projection of \( x_t \) (cf. Svensson and Woodford, 2005)

• The properties of the resulting optimal policy projection depend in possibly important ways on:
  
  – the choice of the loss function \( L(Y_{t+\tau}; \lambda_Y) \)
  
  – the choice of the information set available in period \( t \)
  
  – the choice of the Lagrange multiplier \( \Xi_{t-1,t} \)
The Choice of the Loss Function

• The analysis is based on a “more or less standard” loss function:

\[ L(Y_t; \lambda_Y) = (p_t^C - p_{t-4}^C)^2 + \lambda_y(y_t - \bar{y}_t)^2 + \lambda_{\Delta i}(i_t - i_{t-i})^2 \]

that is motivated by pragmatic considerations.

• In principle, the derivation of the 2nd-order approximation to the household’s utility function should be readily available, but such welfare-based criterion is known to be very much dependent on the model structure.

• Disregarding the welfare-based approach, the literature still provides a rationale for including alternative arguments such as:

  – wage inflation (Levin et al., 2005)
  – terms of trade (Corsetti and Pesenti, 2004)

as these variables affect relevant policy margins.
Sources of Uncertainty and Information Set(s)

- RAMSES features four different sources of uncertainty:
  - parameters
  - partially unobservable states
  - shocks (current and future)
  - measurement errors

  with parameter uncertainty being disregarded in the current application so that “certainty equivalence” can be invoked.

- The remaining sources of uncertainty raise potentially important issues regarding the choice of the information set.

- In particular, there is a need to clarify the respective information sets available to the “econometrician” and the “policy-maker”.
Sources of Uncertainty and Information Set(s)

• In the estimation of RAMSES, it is assumed that agents, including the policy-maker, have full information.

• In the projection exercise, the policy-maker’s information set is restricted to the variables observed by the econometrician.

• Moreover, the observations pertaining to the current period are excluded from the information set, albeit without providing a rationale.

• In principle, the policy-maker ought to use the Kalman filter to form optimal estimates of the unobserved states, the current shocks and measurement errors (cf. Svensson and Woodford, 2003).

• Optimal filtering would introduce another element of history-dependence, making interest rate responses smoother.
Implementing Optimal Policy in a Timeless Perspective

- Optimal monetary policy in a timeless perspective is history dependent due to its dependence on the initial value of the Lagrange multiplier $\Xi_{t-1}$ associated with the model’s non-predetermined variables.

- In the current application, the optimal policy projection is implemented from 2006Q2 onwards using the sequence of “filtered states” inherited from model simulations under the estimated interest rate rule:

$$\Xi_{t-1,t} = \sum_{\tau=0}^{T} (M_{\Xi\Xi})^{\tau} M_{\Xi X} X_{t-1-\tau|t-1-\tau}$$

which introduces an inconsistency.

- What are the outcomes if optimal policy were to be implemented from the introduction of inflation targeting in 1995 onwards?

- How would the outcomes differ if “re-optimisation from scratch” (with $\Xi_{t-1,t} = 0$) were to be considered?
Potential Sources of Misspecification

• Estimation of RAMSES under optimal monetary policy in a timeless perspective results in a sizeable deterioration of the marginal likelihood.

• Part of the deterioration may be caused by the fact that the interest rate shock has been dropped. Does the forecasting performance of the model deteriorate with respect to the interest rate?

• More generally, the incidence and the pattern of individual shocks may have changed, distorting the covariance structure of the observed variables. Do the forecast-error-variance decompositions differ?

• The propagation of shocks (e.g., transitory technology shocks) under optimal monetary policy is noticeably affected, even though the estimated structural parameters are not. Are the loss-function parameters reliably identified?
Conclusion

• Optimal policy projections can potentially provide an interesting input into practical policy-making at Sveriges Riksbank.

• Yet, the available results on the performance of optimal policy projections relative to an estimated simple interest rate rule are preliminary and their drivers seem not fully understood.

• And thus, the question of whether optimal policy projections succeed in delivering a “good” interest rate path is still open.