Comment on Chung, Herbst, and Kiley, "Effective Monetary Policy Strategies in New Keynesian Models: A Re-examination"*

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The paper by Chung, Herbst and Kiley (2014) (CHK) is a paper on a potentially important issue, namely whether the set of central bank models used for monetary policy is too restrictive, dominated by sticky-price models rather than also including sticky-information models. The paper compares a sticky-price model and a sticky-information model with regard to the empirical support, the response to current and anticipated shocks, including persistent episodes of a binding zero lower bound for policy rates. It also considers the performance in the two models of different monetary policies, such as alternative instrument and targeting rules, under different shocks, with and without a binding lower bound for the policy rate.

Among the lessons for policy and future research are that, in many situations, aspects of different monetary policies are similar across the two models. However, with a binding lower bound for the policy rate, the performances of some policies differ quite a lot. All in all, CHK paper indicates that central banks may benefit from more diversity in their models.

In my comments, I will, first, emphasize that it is not new that it matters to what extent models – like the sticky-price and sticky-information models – are forward- or backward-looking. Anticipated shocks and preemptive policy have much larger effects in forward-looking models. Second, sticky-information models are hardly robust to dramatic new events and policies. In line with the Lucas critique, the amount of information collection and the degree of forward-lookingness may vary over time and depend on new situations and policies. Third, central-bank observation and learning over time may reveal whether the economy behaves more like a sticky-price or a sticky-information model. Fourth, I have will have some comments on the conceptual framework and policy classification used in the paper. Finally, I will argue that the paper's emphasis on policies represented by simple policy rules rules makes it somewhat less relevant for actual policy, since it seems that real-world monetary policy is better described as "forecast targeting" rather than by mechanically following simple policy rules. In particular, forecast targeting is arguably the most robust policy of all, in that it uses all relevant information, including judgment, model and other uncertainty, and consequences of a lower bound for the policy rate.

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It is well known that it matters to what extent models are forward- or backward-looking

CHK notes that sticky-price and sticky-information models differ in that the aggregate-supply relation, the Phillips curve, is forward-looking in the sticky-price model but backward-looking in the sticky-information model. It is well known that the response of forward- and backward-looking models to anticipated shocks differ very much.

Figure 1 (Svensson (2005, figure 1), shows the response of a backward-looking model (the Rudebusch and Svensson (1999) model, where the private sector is backward-looking) from an anticipated inflation shock (z_π) in quarter 6.[1] Panel (b) shows the response of inflation (π), the output gap (y), and the nominal (i) and real (r) policy rate, when the central bank does not adjust the policy optimally until when the shock occurs in quarter 6.[2] Panel (a) shows the same response, but when the central bank anticipates the shock and responds optimally to it already in quarter 0. We see that anticipating the shock and raising the policy rate early results in a better outcome.

Figure 1. Monetary Policy with and without Judgment: Backward-Looking Model

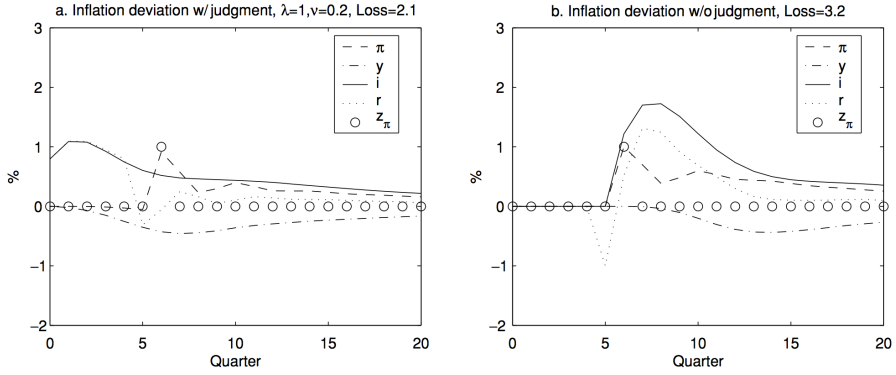


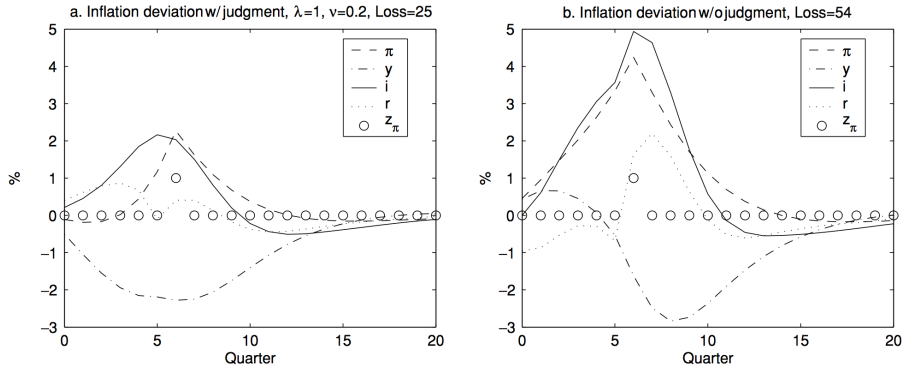
Figure 2 (Svensson (2005, figure 2)) shows the same two cases for a forward-looking model (the Lindé (2005) "hybrid" New Keynesian model). Panel (b) shows the outcome, if the central bank follows the optimal policy rule in the model but disregards the inflation shock until it occurs in quarter 6. Since forward-looking private agents anticipate the future shock in

[1] Svensson (2005) deals with the role of central-bank judgment in monetary policy, where judgment refers to information, knowledge, and views outside the scope of a particular model. Judgment is modeled as the central bank's conditional mean estimate of arbitrary multidimensional stochastic "deviations" – "add factors" – to the model's equations.

[2] The loss function is quadratic with the weight 1 on the squared inflation gap and the squared output gap, and with the weight 0.2 on the squared first-difference of the policy rate.

quarter 0, inflation and the output gap responds strongly before the shock actually occurs. Panel (a) shows the outcome when the central bank responds optimally to the future shock when it becomes known in quarter 0. The outcome is much better and the loss is much smaller in the latter case.

Figure 2. Monetary Policy with and without Judgment: Forward-Looking Model



Thus, the economy's response to anticipated future shocks depends strongly on whether its agents are backward- or forward-looking. Furthermore, optimal policy is preemptive and responds to anticipated future shocks. If policy does not respond to anticipated future shocks but only responds mechanically to current variables, even if that response is optimal, the outcome is much inferior to the preemptive policy.

This also applies to anticipated future shocks that may cause the lower bound for policy rates to bind in the future. In such a case, policy should preemptively be more expansionary once the information about future shocks has arrived, so as to moderate the consequences of a future binding lower bound.

In the CHK paper, the sticky-price and sticky-information distinction is only applied to the aggregate supply, the Phillips curve, of the economy. The authors are of course aware that it may also apply to the aggregate-demand side. In general, it of course matter a lot to what extent agents are forward-looking and influenced by expectations regarding aggregate demand, interest rates, other asset prices, and so on.

Sticky information is hardly robust to dramatic new events and policies

It makes sense that the amount of information collection and degree of forward-lookingness of agents are endogenous and vary over time, depending on circumstances and the benefits of information collection. In crises, with big shocks and new and unconventional communication and policies by central banks, it seems likely that agents' information collection and incentives to anticipate developments would increase. With much talk about

and use of forward guidance, it seems that more agents would see increased benefits from collecting information and looking forward. Therefore, the parameters of the sticky-information model are hardly robust to dramatic events such as the recent crisis, the binding lower bound, and so forth. Of course, for the same reason, the degree of stickiness in the sticky-price model is also likely to be endogenous and be influenced by dramatic events.

Central-bank learning may reveal which model applies

Real-world central banks try to learn from the economy's response and often re-estimate and update their models. Since the sticky-information and sticky-price models behave very differently with a binding lower bound, it is possible that the data in a prolonged such episode might reveal and allow the central bank to learn about which model fits the best. Since actual economies may be a mixture of these two clear-cut cases, it will probably be a matter of varying weights on the two cases. But the possibility to distinguish the two cases should be better in such a prolonged situation.

The conceptual framework and policy classification

I find the authors conceptual framework and policy classification a bit confusing, and I would prefer a more clear distinction between loss functions, targeting rules, and instrument rules. I find it practical to by *inflation targeting* mean a policy regime where the central bank's objective is to stabilize inflation around an inflation target and resource utilization around a long-run sustainable rate. This can be represented by a standard quadratic loss function, such as

$$L_t = (\pi_t - \pi^*)^2 + \lambda(y_t - y_t^*)^2, \tag{1}$$

where π_t, π^*, y_t, and y_t^* denote inflation, the inflation target, output, and potential output, respectively, in period *t*, and where λ denotes the relative weight on output-gap stabilization relative to inflation-gap stabilization. Here, resource utilization is for concreteness measured by the output gap, but it could also be measured by the employment gap or the unemployment gap, especially since it may be easier to estimate employment and unemployment gaps than output gaps.

Furthermore, I find it practical to let "strict" inflation targeting refer to a regime where $\lambda = 0$, and to let "flexible" inflation targeting refer to a regime where $\lambda > 0$. That is, with strict

inflation targeting, the only objective is to stabilize inflation at the inflation target.[3] In practice, as far as I can see, all real-world inflation-targeting regimes are flexible ones, in that there is always some weight on stabilizing the real economy.

Similarly, I find it practical to by *price-level targeting* mean a policy regime with a period loss function such as

$$L_t = (p_t - p_t^*)^2 + \lambda_p (y_t - y_t^*)^2, \tag{2}$$

where p_t and p_t^* denote the (log) price level and a price level target, respectively, and λ_p is the relative weight on stabilization of the output gap relative to stabilization of the price-level gap.

In the standard New Keynesian model, the first-order condition for optimal policy under discretion with the loss function (1) can be written

$$(\pi_t - \pi^*) + \frac{\lambda}{\kappa}(y_t - y_t^*) = 0, \tag{3}$$

where κ is the slope of the New Keynesian Phillips curve. The first-order condition for optimal policy under commitment can be written

$$(\pi_t - \pi^*) + \frac{\lambda}{\kappa}[(y_t - y_t^*) - (y_{t-1} - y_{t-1}^*)] = 0, \tag{4}$$

which can be rewritten as

$$(p_t - p_t^*) + \frac{\lambda}{\kappa}(y_t - y_t^*) = 0, \tag{5}$$

where p_t^* is a price-level target. Here, conditions (3)-(5) can be seen as alternative "targeting rules" for inflation targeting, where by a targeting rule is meant a condition on the central bank's target variables. Condition (3), when referring to forecasts, is consistent with the "Qvigstad rule", of former Norges Bank Deputy Governor Jan Qvigstad (2005), namely that under flexible inflation targeting normally forecasts of the inflation and output gaps shall have opposite signs. Condition (5) implies that the price-level gap should be proportional to the negative of the output gap, and can therefore called a price-level targeting rule.

[3] This terminology was to my knowledge first introduced in a paper presented at a Bank of Portugal conference in Lisbon in 1996 and later published in Svensson (1999).

Furthermore, as shown by Vestin (2006), condition (5) can be satisfied under optimal policy under discretion for the price-level targeting loss function (2), if for any given weight λ in (1) an appropriate choice of the relative weight λ_p in (2) is made.

What about nominal-income targeting? I think it is natural to associate nominal-income (level) targeting with a loss function such as

$$L_t = [(p_t + y_t) - (p_t^* + y_t^*)]^2, \tag{6}$$

where $p_t + y_t$ denotes (log) nominal income and $p_t^* + y_t^*$ denotes a corresponding nominal-income (level) target.

In the CHK paper, their equation (17) is condition (3) for the case $\lambda = \kappa$. It is called "strict inflation targeting" (p. 32), even though it refers to a situation where λ is positive. Furthermore, $\lambda = \kappa$ is clearly a special case. Their equation (18) is condition (5) with $\lambda = \kappa$, and is called both "price-level targeting" and "strict nominal-income targeting." It corresponds to nominal income equal to the nominal income target and a zero loss in the loss function (6), so it seems appropriate to refer to it as nominal income targeting. However, as mentioned, it is the first-order condition for optimal policy with the price-level loss function (2) only under special circumstances.

Actual policy is closer to "forecast targeting"

The paper examines the performance of some simple instrument and targeting rules in the sticky-price and sticky-information models, summarized in the paper's table 8. This corresponds to the central bank committing to these simple rules, regardless of what happens. As discussed in Svensson 2003, committing to a simple instrument rule, where the policy instrument only responds to a few variables, such as inflation and the output gap, disregards a lot of relevant information and is not optimal. Furthermore, given realistic lags of the response of the economy to monetary policy actions, it is not possible to fulfill simple targeting rules that involving equality between current target variables. They have at a minimum to be formulated in terms of forecasts of the target variables. Even so, optimal targeting rules with a more realistic transmission mechanism become quite complicated.

In the real world, central banks do not follow simple instrument rules, such as the Taylor rule (Kohn 2012, Svensson 2003, Woodford 2007). Instead, inflation-targeting central banks' behavior is arguably better described as "forecast targeting," that is, choosing a policy-rate path such that corresponding forecasts of the target variables "look good." Here, the forecasts look good if, for instance, the inflation and unemployment forecasts appropriately stabilize

inflation around the inflation target and unemployment around a long-run sustainable rate. This means that the policy takes into account all relevant information, including agents' inflation expectations, a binding lower bound, uncertainty, judgment, etc. It means that policy does not respond to a few variables, such as current inflation and output, but responds to all information that affects the forecasts of the target variables. It also means taking into account model uncertainty and the fact that different models result in different forecasts and that a considerable amount of judgment need to be applied. As argued in Svensson (2011), such a policy of forecast targeting is probably the most robust policy of all.

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