

# The new Keynesian Phillips curve tested on OECD panel data

Roger Bjørnstad and Ragnar Nymoen

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## Response to referee reports

We refer to the report which has “Comments for authors” in the title as The first report, and the report with “Referee report on” in the title as The second report.

### The first report

#### General comments

Hopefully the revised version makes the way we have applied the encompassing approach, section 3 has been revised and extended, and the same is true for section 5 with the econometric results.

#### Detailed comments

1 The paper by Imbs et al. (2007) is valuable since it reminds us that aggregation bias applies also for estimation of NPCs. However the relevance of their theoretical points for our paper is reduced by the fact that our starting point is the empirical regularities obtained for the NPCs that have been estimated on aggregated data, see GGL (2005), listed as point 1-4 in section 2 of our paper. Hence, the property that the coefficient of the lead-term is larger than the coefficient of lagged inflation, seems to result in spite of the possible bias due to aggregation and homogeneity restrictions pointed out by Imbs et al. (2007), and e.g. Dees et al. (2008). In Table 3 in our paper the coefficient of the forward term is estimated to 0.6 and the backward coefficient estimated to 0.5. Interestingly, the sectorial NPCs of Imbs et al. (2007) do not differer qualitatively from this result, or from the other estimations based on even more aggregated data sets (euro area, for example): The mean of the estimated lead-coefficients in Table 3 in Imbs et al. (2007) is 0.7 and the mean of the coefficients of lagged inflation is 0.3. However, there is no formal econometric assessment of the validity of the NPC in Imbs et al. (2007), or consideration of alternative models. As it stands, the empirical results on micro data may alternatively be interpreted as another confirmation of our hypothesis, namely that the dominance of the forward term

and the near perfect dynamic homogeneity will be found for any dataset (micro or country or region, to which there are well known references) where the NPC does not happen to contain a good approximation of the underlying forcing variables.

Of course, the dominance of the forward term found with data from a number of heterogenous countries, is a main point in GGL (2005), and suggest that this regularity will prevail accross different representations of heterogeneity in the statistical model. Interestingly the mulyty-country study of Dees et al. (2008) first presents results which support the dominance of the forward-term in the standard NPC (and the dynamic homogeneity), when heterogeneity is accounted for, but then show that the dominance of the forward-term vanishes once variables representing foreign inflation is included in the NPC. We consider this finding to be consistent with our results, and we include a note about that in the revised version.

**2** Following this comment we have revised section 5, in particular Table 3 and the associated text, with the aim of checking whether the use of the simplified identity (4), (which is equation (1) in the referee report) introduces a bias that damages the NPC, cf the column labeled NPC 3 in Table 3. It does not.

**3.** Conversely, one interpretation of the significant  $\chi_{ival}^2$  in NPC1- NPC3 is that the “expectations interpretation” does not explain the significance of  $(ulc_{i,t-1} - p_{i,t-1})$  and  $(ulc_{i,t-1} - pi_{i,t-1})$ , thus NPC class of models does not account for the properties of the rival model. which we denote the ICM. Conversely the ICM can explain why a model with a lead-term included, but which omits  $(ulc_{i,t-1} - p_{i,t-1})$  and  $(ulc_{i,t-1} - pi_{i,t-1})$ , will typically be estimated with a huge coefficient for the lead-term, see the last part section 3 in the revised version. We are not claiming that this is the oinly explanation, only that the ICM encompass the finding of a dominating lead-term. This is a main point in our paper, and it extends the results in Bårdsen and Nymoer (2004) from the euro area data to the panel of OECD countries.

**4** We do not claim or assume that  $p_t - pd_t$  is  $I(1)$ . So  $ulc_t - p_t$  and  $ws_t$  can both be  $I(0)$ , indeed this is the interpretation that we make.

## The second report

### Major Comments

i) We do not rule out that  $(ulc - p)$  and  $(ulc - pi)$  both are non-stationary variables, even when ICM is the true model. It is sufficient that they cointegrate since that theory applies to steady state situations, consistent with both  $I(1)$ -ness of the three nominal varaibles and the two real variables. Cointegration implies equilibrium correction dynamics (which can be rationalized by adjustment costs as well), which is a balanced equation.

ii) Yes, for certain parameter values (9) is a reparameterization of the NPC through the identity (3) and the assumption (4), and the observation that this can be motivated by the fact that NPC already incorporates mark-up pricing is a good point, but this is not the motivation for introducing (7). Formally, we show that (6) is a reparameterization of (2). With the equations (7)-(9) we set up the ICM and show that (6) also is a special case of (9). Hence, under certain conditions, NPC is a special case of an existing model of inflation. The role of (7) is to introduce this existing model.

Our aim in this paper has not been to specify the best model of inflation, but to test whether the NPC can parsimoniously encompass an existing model of inflation given the NPC favourable assumption that the leads and lags of inflation, as well as the exogenous components, are the same in both models. We agree with the referee that there may be another model that can potentially encompass both the ICM and the NPC and that the best route to discover such a model is to model inflation using a general to specific specification strategy. That said, we note again that the minimal nesting model show no sign of residual misspecification, and therefore appears to be a valid model for testing hypotheses about model reduction, which in effect is what we do.

iii) In brief this is because we refer to parsimonious encompassing, for which the choice of completing model is much less of an issue, also for dynamic models see Hendry (1995). Regarding whether encompassing approach is relevant for this paper we think so because the NPC is an example of the proliferation of competing models and explanations for the same empirical phenomenon. Although some element of model pluralism is inevitable, and perhaps also a virtue since no test is definitive, in particular, in the social sciences, proliferation as a result of lack of mindfulness of alternatives and absence of evaluation of new models against the evidence represented by existing models not likely to further progress in a discipline. Encompassing arose as an intuitive idea of trying to explain the results obtained by rival models as seen from the viewpoint of a given model, and it is that aspect of encompassing which is main concern in our paper, since it represents a framework for reducing the proliferation of “inflation models” in economics. Section 3 in the paper has been extended to rationalize our approach more clearly.

iv) See response to the first referee report, point 1 in particular.

### Minor Comments

p.3, l.3: We have replaced ‘stringent theoretical’ with ‘microeconomic foundation’.

p.3, l.15: We have replaced ‘scientific inference requires ’ with ‘model evaluation entails’.

p.3, l. -18: OK.

p.5, l. 15: OK.

p.7, (4). Yes, in this context it is, and we have changed the sentence above (4) to make that clear. It is obviously stylized, and in the empirical testing we

take care to not to let the ‘restrictions’ imposed by (4) bias the evaluation of the NPC as a potentially parsimonious encompassing model.

p.8,l.-6: OK.

p.8,l.-6: We have rewritten this sentence.

p.9,l-18: We have deleted the sentence, as it seems redundant.

p.9, (19). OK, this was a typo.

p.13, Table 3: We have kept the country subscribts, since it reminds the reader of the country specific nature of the explanatory variables, and we have kept the standard errors.

p.13, l -2: OK

## References

- Bårdsen, E. S. J., G. and R. Nymoen (2004). Econometric Evaluation of the New Keynesian Phillips Curve. *Oxford Bulletin of Economics and Statistics*, 66—SUPPLEMENT, 671—686.
- Dees, S., M. H. Pesaran, V. Smith and R. Smith (2008). Identification of New Keynesian Phillips Curves from a Global Perspective. April 2008.
- Gali, J., M. Gertler and J. Lopez-Salido (2005). Robustness of the Estimates of the Hybrid New Keynesian Phillips Curve. *Journal of Monetary Economics*, 52, 1107—1118.
- Hendry, D. F. (1995). *Dynamic Econometrics*. Oxford University Press, Oxford.
- Imbs, J., J. Jondeau and E. Pelgrin (2007). Aggregating Phillips Curves.