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*Macroeconomic Models
and
Forecasts for Austria*

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Editorial

On November 11 and 12, 2004, the Oesterreichische Nationalbank (OeNB) held a workshop on “Macroeconomic Models and Forecasts for Austria” (in German language). As *Josef Christl* (OeNB) emphasized in his introductory remarks, forecasts are of utmost importance for economic policymaking. Due to their important role, transparency on the forecasting tools and methods used by policy makers and policy advisors is highly desirable. Accordingly, the first aim of the workshop was to enhance such transparency. Indeed, the workshop – the first of its kind held in Austria – covered the bulk of the econometric models used regularly in Austria. Its nearly 100 participants bear witness of the strong interest in such information.

A second goal of the workshop was to encourage an exchange of expertise and experiences between the main institutions that work on macroeconomic modeling in Austria, namely WIFO (the Austrian Institute of Economic Research), IHS (the Institute for Advanced Studies), the OeNB and Joanneum Research. The OeNB warmly thanks all the participating institutions for their readiness to embark upon, and contribute to such an active and open exchange. The purpose of this volume is to document the proceedings and to make them available to a wider national and international public.

The workshop was organized into four sessions. Topic of **session 1** was a comparison of the **structural macroeconomic models** of the OeNB, IHS and WIFO. *Gerhard Fenz* (OeNB) presented the OeNB's macromodel (AQM – Austrian Quarterly Model). This model follows the neoclassical synthesis tradition. Equilibrium is neoclassical in the long run, where output is supply-determined, but Keynesian in the short run, where output is demand-determined. The rationale is that frictions on the goods and labor markets slow the adjustment of the economy to its equilibrium level. The OeNB uses this model to prepare its semiannual macroeconomic forecast and to perform simulations. In the Multi-Country Model, the model used by the Eurosystem and coordinated by the European Central Bank (ECB), AQM represents the country block for Austria and it is linked to the other. As the only quarterly model for Austria, AQM captures intra-year trends.

Next, *Helmut Hofer* (IHS) and *Robert Kunst* (IHS and University of Vienna) elucidated the IHS's econometric model. This model, the LIMA (Link Model Austria) model, is Keynesian, meaning that output is demand-determined. The model is used primarily for economic forecasting purposes; in addition, it serves to

perform simulations. LIMA is the Austrian contribution to the United Nations' LINK project, an international research activity which integrates independently developed national econometric models into a global econometric model.

The first session concluded with a presentation by *Josef Baumgartner* (WIFO), of WIFO's macroeconomic model, WIFO-Macromod, which is also a typical demand-determined model. Supply factors are taken into account in price and wage determination. WIFO utilizes its Macromod model for its annual medium-term forecast (with a five-year forecast horizon) and for simulations. However, WIFO does not use the model for its quarterly economic forecast.

The discussants (*Rudolf Zwiener*, German Institute for Economic Research – DIW; *Thomas Warmedinger*, ECB) concurred in emphasizing that while the details differed, the models nevertheless had many features in common. All three models are error correction models that capture both long-term equilibrium effects and short-term adjustment effects. Simulations comparing the reactions of the models to specified shocks produced comparable and broadly plausible results according to the discussants. The reactions of the three models are characterized by a rather strong wage-price spiral in Austria, a small, open market economy. Conversely, the reactions to changes in price competitiveness in foreign trade are fairly weak.

Session 2 dealt, first of all, with **short-term forecasts using statistical models**. *Martin Schneider* (OeNB) presented the OeNB's short-term economic indicator, which is based on the results of two econometric models: a state space model and a dynamic factor model. The state space model uses six selected indicators (ifo business climate index, credit volume, number of vacancies, real exchange rate, employment, new car registrations) to estimate GDP. The dynamic factor model employs a set of 143 indicators, from which it extracts the major driving forces behind the business cycle by means of dynamic time series techniques. To adjust the models for discretionary economic policy measures, institutional issues or structural breaks, expert judgement is incorporated into the result. In his comment, *Robert Kunst* (University of Vienna) provided some fundamental thoughts on business indicators and on the standard tests used in the empirical part to assess the quality of forecasts.

Sylvia Kaufmann (OeNB) discussed her work on the identification of cyclical turning points for Austria. To this end, information about cyclical conditions is extracted from a large number of Austrian and other countries' economic time series. The method groups those time series together which display similar dynamics over the business cycle. The classification is not specified a priori; rather, it is estimated together with the model parameters. The model identifies a group of series that leads another one, while a third group of series moves independently from two former series. To determine turning points, the economic cycle is modeled using a Markov process which identifies periods of below- and above-average growth. The turning points determined by this process are compared with those identified by the Economic Cycle Research Institute. It turns out that in the

first half of the 1990s, the turning points are nearly identical whereas minor deviations occur subsequently. *Robert Kunst* (University of Vienna) emphasized the innovative character of this approach. He pointed out that describing an economy by means of just two states was an extreme simplification.

The first day of the workshop concluded with a presentation by *Thomas Url* (WIFO) of a **long-run economic model (A-LMM)** for Austria. A-LMM was developed jointly by WIFO and IHS. This model is suited to simulating the long-term effects of aging on employment, output growth and the solvency of the social security system. The long-run equilibrium solution of the model is determined by supply-side factors and is derived from neoclassical theory. Demand components are modeled by means of dynamic optimization, which takes into account the forward-looking behavior of economic agents and allows for a smooth transition to the long-term growth path. By disaggregating the population into six age cohorts, the model is able to account for future demographic trends. Alternative scenarios were developed to highlight the effect on the economy of aging from different perspectives. In his comment, *Heinz Glück* (OeNB) underlined that on a scale from theoretical to empirical coherence, the long-run nature of the model clearly placed the main focus on its theoretical foundation.

Session 3 on the second day of the workshop was devoted to **inflation and exchange-rate forecasts**. To start with, *Gabriel Moser* and *Fabio Rumler* (both OeNB) presented model-based inflation forecasts. These forecasts use various models to project changes in the Harmonised Index of Consumer Prices and its five sub-indices. Factor models as well as VAR (vector autoregressive) and ARIMA (auto-regressive integrated moving average) models are employed. The factor models are identified as exhibiting the highest forecasting accuracy for five out of six indices; in two cases, forecasting accuracy may be improved further by combining factor model forecasts with forecasts made using VAR models. All ARIMA models produce less accurate forecasts. Moreover, the aggregation of the forecasts for the sub-indices produce a marginally better result than the forecast of the overall index itself. In his comment, *Gerhard Rünstler* (ECB) identified the problems inflation forecasting faces. Using empirical evidence for the euro area, Rünstler showed that non-stationarity or near-non-stationarity of inflation generally limit predictability.

Ines Fortin (IHS) presented the model used by the IHS for exchange rate forecasting. In general, exchange rate developments are hard to forecast. More complex models do not succeed in producing significantly better exchange rate forecasts than simpler models, such as extrapolating the last available value (random walk forecasting). This applies particularly to short-term forecasts. However, experience with the IHS exchange rate model also shows that the longer the forecasting horizon is, the better the model's forecasting quality is compared to that of random walk forecasting. In his comment, *Harald Grech* (OeNB) clearly established that even though the IHS's monetary exchange rate model is frequently

used in the literature, it rarely delivers significantly better results over short-term horizons of up to 12 months. Harald Grech briefly sketched some of the weak points of the monetary model, touched upon empirical estimation methods (VARs), and then made two proposals which could possibly improve forecasting quality (use of real-time data or panel estimates).

Finally, **session 4** of the workshop covered **input-output models**. *Kurt Kratena* (WIFO) described the most recent version of WIFO's MULTIMAC IV input-output-based macroeconomic model. The model integrates econometrically estimated behavioral equations for goods and factor demand, prices, wages and employment using input-output relations for 36 sectors. WIFO regularly uses the MULTIMAC IV model to simulate the sectoral impact of shocks and economic policy measures Kurt Kratena applied the model to two simulations (the expansion of investment in information and communication technology including counterfinancing, the impact of road pricing) to demonstrate its possible uses.

Oliver Fritz (WIFO) and *Gerhard Streicher* (Joanneum Research) reported on work in progress on developing MULTIREG, the first multiregional input-output model for Austria. The model consists of three main parts: first, the regional input-output tables of all nine Austrian federal provinces with time-variant coefficients (based on the make-use approach); second, a trade matrix that captures the delivery linkages between the provinces; third, econometrically estimated behavioral equations. The two discussants (*Karin Wagner*, OeNB, and *Josef Richter*, University of Innsbruck) drew attention to the contradictory context in which such models are built. The demands on an ideal input-output model cannot be fulfilled in practice. Hence, all models invariably represent a compromise in terms of coherence, data timelines, the degree of detail etc. Josef Richter concluded his contribution with a discussion of the demands on the statistical system in Austria from the perspective of input-output modeling.

In conclusion, the workshop succeeded in giving a snapshot of the current state of macroeconomic modeling in Austria. The range of models presented is directly related to the variety of requirements which guided their development. Different forecasting horizons (short versus medium versus long-term), different aggregation levels (sectoral and regional), different numbers of variables to be forecast require different model types. But it is also interesting to see that models designed in different institutions for the same or very similar purposes, such as the macroeconomic models of WIFO, IHS and OeNB, are also shaped by the institutional context in which they were developed. They reflect the views and preferences of their designers, the resources available in designing them, and the various pragmatic adjustments made over time in view of problems encountered, changing demands, and, last but not least, changing data. It is likely that the landscape of economic models used in Austria will undergo major changes over the next decade. Progress in economic theory, more sophisticated econometric methods as well as rapidly increasing computing power have prepared the ground

for a new generation of macroeconomic models. For instance, dynamic stochastic general equilibrium models are now becoming a standard tool for forecasting and policy simulations.

All in all, the workshop showed that both economists in the academic and research profession and in policy work, are keenly interested in the design and use of macroeconomic models for forecasting purposes. Thus, the call by many participants for a follow-up event seems to be more than warranted and will hopefully be taken up not too far away in the future.

Gerhard Fenz
Ernest Gnan
Walpurga Köhler-Töglhofer
Martin Schneider