Macroeconomic Models and Forecasts for Austria

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On November 11 and 12, 2004, the Oesterreichische Nationalbank (OeNB) held a workshop entitled "Makroökonomische Modelle und Prognosen für Österreich" (Macroeconomic Models and Forecasts for Austria). The purpose of the workshop was to provide an overview of the econometric models developed and used in Austria, and to promote exchanges between the main institutions that work on modeling in Austria, namely WIFO (Austrian Institute of Economic Research), IHS (Institute for Advanced Studies), Joanneum Research and the OeNB. This workshop – the first of its kind held in Austria – covered the bulk of the econometric models used regularly in Austria and attracted nearly 100 participants. The papers presented at the workshop are scheduled to appear in an issue of the OeNB Workshop Series in the first quarter of 2005.

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In his introductory statement, *Josef Christl* (OeNB) emphasized the importance of forecasts for economic policymaking. Moreover, he drew attention to the specific role of this workshop in boosting the transparency of research relevant to economic policymaking. In light of this aim, *Peter Mooslechner* (OeNB) then warmly thanked the participating institutions for their active contributions to this workshop. The event was organized by theme and divided into four sessions. The topic of the first session was a comparison of the structural macroeconomic models applied by 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 in 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 is linked to the other country blocks through foreign trade equations. As the only quarterly model for Austria, the AQM captures intra-year trends.

Next, *Helmut Hofer* (IHS) and *Robert Kunst* (IHS and University of Vienna) elucidated the IHS's econometric model, the LIMA (Link Model Austria) model, which is Keynesian, meaning that output is demand-determined. This 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). WIFO's macroeconomic model, WIFO-Macromod, 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. A comparison of the models based exclusively on structures or equations, however, provides an incomplete picture. Hence, the discussion centered on comparing the models' reactions to specified shocks. In general, the discussants shared the view that the simulations produced comparable and broadly plausible results. The reactions of the three models are characterized by a wage-price spiral that is rather strong for a small, open market economy such as Austria. Conversely, their reactions to changes in price competitiveness in foreign trade are fairly weak.

The second session dealt 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. However, econometric models cannot capture all factors determining short-term economic developments, such as discretionary economic policy measures, institutional issues or structural breaks. To adjust the models for such factors, expert judgment is incorporated into the result. In his comment, *Robert Kunst* (University of Vienna) provided some basic thoughts on business indicators and on the standard tests used in the empirical part to assess a model's predictive quality.

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. This 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 com-

pared 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 subsequently, minor deviations occur. *Robert Kunst* (University of Vienna) emphasized the innovative character of this approach. He pointed out, however, 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 for Austria, A-LMM, which was developed jointly by WIFO and IHS. This model is suited to simulating the long-term effects of demographic developments such as aging on employment, output growth and the solvency of the social security system. The model's long-run equilibrium solution 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 of aging on the economy 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.

The second day of the workshop was opened by *Gabriel Moser* and *Fabio Rumler* (both OeNB), who presented model-based inflation forecasts. These forecasts use various models – ranging from a factor model as well as VAR (vector autoregressive) and ARIMA (auto-regressive moving average) models – to project the rise in the Harmonised Index of Consumer Prices and its five subindices. The factor models are identified as exhibiting the highest predictive quality 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 forecasts for the subindices 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, he showed that the nonstationarity or near-nonstationarity of inflation generally limit predictability.

In the second presentation during this session, *Ines Fortin* (IHS) introduced the model IHS uses 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 extrapolations from 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 predictive quality is compared to that of random walk forecasting. In his comment, *Harald Grech* (OeNB) clearly established that even though 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. He briefly sketched some of the weak points of the monetary model, touched upon empirical estimation methods (VARs), and then suggested using real-time data or panel estimates to possibly improving forecasting quality.

The last session 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. Kratena applied the model to two simulations (to the expansion of investment in information and communication technology including counterfinancing and to 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. This model consists of three main parts: first, the regional input-output tables for all nine Austrian 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. In practice, the demands on an ideal input-output model cannot be fulfilled. Hence, all existing 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.