New quarterly macroeconomic model

The macroeconomic forecast presented in this edition of *Monetary Bulletin* is prepared using a new macroeconomic model developed by the Central Bank of Iceland's Economics Department. It differs in many respects from the model used by the Central Bank in its evaluations of the economic outlook since 2002, but resembles those used by a number of other central banks. The following is a short comparison between the properties of the new and earlier models.

The old annual model was unsuitable in various respects
Since the Central Bank of Iceland began publishing macroeconomic forecasts in 2002 it has used a macroeconomic model originally developed by the National Economic Institute in cooperation with the Central Bank and Ministry of Finance. Although the model served its purpose, it has a number of shortcomings. For example, it is not particularly suited for the type of analytical and forecasting tasks most needed by the Central Bank. As the model is an annual model, it proved inadequate for analysing short-term economic developments. This is a drawback for central banks that need to utilise recent data to the full in their estimates of the economic outlook, which are a cornerstone of their interest rate decisions. The annual model is also customised for analysing fiscal policy, with a detailed breakdown of different tax bases and their impacts. It focuses less on the role of monetary policy and its transmission mechanism through the economy, especially given the current framework of a floating exchange rate and inflation targeting. In such an environment, household and market expectations have a substantial effect on variables such as inflation, the exchange rate and asset prices. The annual model is very large and detailed, containing more than one thousand economic variables. Maintenance and updating of the underlying databases is therefore extremely costly. It is difficult to keep an overview of the mechanism of such an extensive model and interpret its different results. Interpretation is complicated even further by the radical changes that have taken place in the structure of the economy since the model was originally estimated.[1] It is some time since the model has been reviewed in its entirety and no in-depth analysis of its long-term properties has ever been made.

New quarterly model
For the above reasons, the Central Bank launched preparations for the design of a quarterly macroeconomic model, called QMM, in 2001. Building a new database to support the model proved to be a time-consuming task, because quarterly national accounts for Iceland only went back to 1997 and many important variables were not available

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1. As an annual model, it needs to be estimated over a relatively long sample period. Thus the equations are estimated over a period when, for example, interest rates were not market-determined, cross-border capital movements were restricted and the inflation rate was high and volatile.

at a quarterly frequency. Development of QMM is nearing completion and the forecast in this edition of *Monetary Bulletin* is solely based on it. In the Bank's last two forecasts, the QMM was tested alongside the older model. Design work is not finished, however – macroeconomic modelling is an ongoing task because models are continually being upgraded to incorporate new information and knowledge. In the near future it is planned to finalise the detailing of its long-term properties. Subsequently, the model will be made available and the handbook for it, which has been compiled simultaneously, will be published. The idea is to have the most recent version of the model, its underlying database and the handbook available on the Central Bank's website.

QMM is much simpler than the annual model it replaces. It is a single-sector model with around 150 variables. The quarterly frequency allows evaluation over more recent periods which are more likely to reflect the current economic structure better. In most instances, it is therefore evaluated using data that extend only to the first half of the 1990s.

Being smaller and less detailed, QMM does not provide as much information as its predecessor on the interaction of economic sectors or development of relative prices. However, this is more than outweighed by easier interpretation of the interaction of main economic variables. From a central banking viewpoint, there are two essential features: describing the main determinants of aggregate demand and its interaction with the production capacity of the economy, and presenting a realistic description of monetary policy transmission and its impact on aggregate demand, and thereby on inflation. In central banks' core forecasting and analytical work, the advantages of a relatively small model easily outweigh its disadvantages. Indeed, there has been a widespread trend towards smaller and more manageable macroeconomic models among central banks around the world.[2]

Properties of the new model

The structure of QMM is standard. In the long run, economic activity is determined on the supply side, which is described by a Cobb-Douglas production function with constant returns to scale. The production function determines the long-term share of labour and capital in output, which in turn imposes long-run restrictions on the behaviour of investment and labour demand.

The demand side of the economy represents the allocation of production at any given time. Thus private consumption is determined by disposable income, wealth and interest rates; business investment by overall demand and the real cost of capital; residential housing investment by overall demand and the ratio of house prices to construction cost; exports of goods and services by global demand and the real exchange rate; and imports of goods and services by domestic demand and the real exchange rate.

2. In addition, the Central Bank has a number of small models which are suitable for addressing specific questions which QMM is not suitable to answer.

The price level is determined by a Phillips curve for the CPI. In other words, inflation is determined by inflation expectations, historical inflation, the output gap and temporary real exchange-rate shocks.[3] Wage growth is determined by the deviation of unemployment from the natural rate of unemployment and the long-run restriction imposed by the production function and profit maximisation on the labour share. Other prices are broadly determined as a mark-up on the relevant factor costs.

In the long run, there is complete dichotomy of the nominal and real sectors of QMM, i.e. the Phillips curve is vertical and nominal neutrality ensured. Real and nominal inertia, however, ensures that monetary policy can affect the real economy over the short- to medium-term horizon, in line with standard modern economic theory. In the long term, however, monetary policy affects only nominal variables, while the real side of the economy is determined by the production capacity of the economy along its balanced growth path.

What difference does QMM make?

It is hoped that the new model will enhance the Central Bank's macroeconomic and inflation forecasting. These forecasts, however, are not only regarded as simple projections of future economic developments on the basis of specific assumptions. They serve equally – or possibly more – as tools for analysing underlying developments and interpreting their causes. The new model should enhance the Central Bank's analysis of economic developments and the reliability of its assessments of the macroeconomic effects that different economic policies and shocks have. Its relative simplicity and transparency should also facilitate the Bank in presenting its economic analysis and the assumptions on which its decisions are based to the public and market agents. In this way, it could contribute to a more credible and effective monetary policy.

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3.   See also Box VIII-1 on p. 48 of this edition of *Monetary Bulletin*.