This publication is published autonomously by the Deutsche Bundesbank, Frankfurt am Main, by virtue of section 18 of the Bundesbank Act of July 26, 1957. It is available free of charge to interested parties.

Deutsche Bundesbank, Wilhelm-Epstein-Strasse 14, 60431 Frankfurt am Main
P.O.B. 10 06 02, 60006 Frankfurt am Main
Federal Republic of Germany

Telephone (0 69) 95 66 - 1
or (0 69) 95 66 ... plus extension number
Telex 41 227 within Germany, 4 14 431 from abroad,
Fax (0 69) 5 60 10 71

Internet: http://www.bundesbank.de

Reproduction permitted only if source is stated
ISBN 3-933747-46-5
## Contents

### Introduction

I. The challenge of international economic integration and globalisation  8
II. A reconsideration of the spectrum of modelling approaches  11
III. Modelling international economic integration using a structural multi-country model  13

### Structure of the country models

I. Countries of the model  16
   1. Country coverage  16
   2. General structure of the country models  18
II. Behavioural equations  27
   1. Theoretical basis of specification  27
   2. Aggregate demand  29
      2.1. Private consumption  29
      2.2. Labour supply  34
   3. Aggregate supply  34
      3.1. Fixed and inventory investment  34
      3.2. Employment  39
      3.3. Imports  43
      3.4. Potential gross domestic product and rate of capacity utilisation  46
   4. Factor costs and prices  50
      4.1. Wages  50
      4.2. Production costs  51
      4.3. Price inflation  51
      4.4. Other prices  55
   5. Government  57
   6. Money, interest rates and exchange rates  62
      6.1. Money demand and P-star  63
      6.2. Monetary policy rules  68
      6.3. Government bond yields  70
      6.4. Exchanges rates  72
<table>
<thead>
<tr>
<th>Section</th>
<th>Pages</th>
</tr>
</thead>
<tbody>
<tr>
<td>Foreign trade block</td>
<td>76</td>
</tr>
<tr>
<td>I. Coverage of the trade block</td>
<td></td>
</tr>
<tr>
<td>II. Price deflator of imports</td>
<td>79</td>
</tr>
<tr>
<td>III. Nominal exports</td>
<td>81</td>
</tr>
<tr>
<td>IV. Foreign competitors’ price deflators and oil price</td>
<td>81</td>
</tr>
<tr>
<td>Data compilation and equation estimation</td>
<td>84</td>
</tr>
<tr>
<td>I. Data compilation</td>
<td></td>
</tr>
<tr>
<td>II. Specification</td>
<td>87</td>
</tr>
<tr>
<td>III. Estimation</td>
<td>88</td>
</tr>
<tr>
<td>Baseline and simulation properties</td>
<td>92</td>
</tr>
<tr>
<td>I. Baseline</td>
<td></td>
</tr>
<tr>
<td>1. Short-run dynamics and long-run properties</td>
<td>92</td>
</tr>
<tr>
<td>2. Terminal conditions</td>
<td>93</td>
</tr>
<tr>
<td>3. Equilibrium and equilibrium mechanism</td>
<td>94</td>
</tr>
<tr>
<td>II. Simulation properties</td>
<td>97</td>
</tr>
<tr>
<td>1. Monetary and fiscal policy shocks</td>
<td>97</td>
</tr>
<tr>
<td>2. Supply side effects</td>
<td>107</td>
</tr>
<tr>
<td>3. Summary</td>
<td>107</td>
</tr>
<tr>
<td>References</td>
<td>110</td>
</tr>
<tr>
<td>Model bibliography</td>
<td>130</td>
</tr>
<tr>
<td>Model documentation</td>
<td></td>
</tr>
<tr>
<td>I. Model equations</td>
<td>136</td>
</tr>
<tr>
<td>1. USA</td>
<td></td>
</tr>
<tr>
<td>2. Japan</td>
<td>146</td>
</tr>
<tr>
<td>3. Germany</td>
<td>156</td>
</tr>
<tr>
<td>4. United Kingdom</td>
<td>179</td>
</tr>
<tr>
<td>5. France</td>
<td>189</td>
</tr>
<tr>
<td>6. Italy</td>
<td>200</td>
</tr>
<tr>
<td>7. Canada</td>
<td>211</td>
</tr>
<tr>
<td>8. Netherlands</td>
<td>221</td>
</tr>
<tr>
<td>9. Belgium</td>
<td>232</td>
</tr>
<tr>
<td>10. Euro area</td>
<td>243</td>
</tr>
<tr>
<td>11. Foreign trade block</td>
<td>248</td>
</tr>
<tr>
<td>II. Model variables</td>
<td>264</td>
</tr>
</tbody>
</table>
### Tables

<table>
<thead>
<tr>
<th>No.</th>
<th>Title</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Country coverage and size of macro-econometric multi-country models</td>
<td>10</td>
</tr>
<tr>
<td>2.</td>
<td>World trade and German foreign trade in 1997</td>
<td>17</td>
</tr>
<tr>
<td>3.</td>
<td>Sector accounts in the country models</td>
<td>19</td>
</tr>
<tr>
<td>4.</td>
<td>Simplified version of a country model</td>
<td>22</td>
</tr>
<tr>
<td>5.</td>
<td>Size and block structure of the model</td>
<td>26</td>
</tr>
<tr>
<td>6.</td>
<td>Consumption equation</td>
<td>31</td>
</tr>
<tr>
<td>7.</td>
<td>Investment equation: Real private fixed investment</td>
<td>36</td>
</tr>
<tr>
<td>8.</td>
<td>Investment equation: Real inventory investment</td>
<td>37</td>
</tr>
<tr>
<td>9.</td>
<td>Labour demand equation</td>
<td>42</td>
</tr>
<tr>
<td>10.</td>
<td>Import equation</td>
<td>45</td>
</tr>
<tr>
<td>11.</td>
<td>Production function</td>
<td>47</td>
</tr>
<tr>
<td>12.</td>
<td>Wage equation</td>
<td>52</td>
</tr>
<tr>
<td>13.</td>
<td>Inflation equation: Price deflator of domestic demand</td>
<td>54</td>
</tr>
<tr>
<td>14.</td>
<td>Other price equations: Price deflator of private consumption, fixed investment, government demand, and price deflator of exports</td>
<td>56</td>
</tr>
<tr>
<td>15.</td>
<td>Government expenditure and transfer equations</td>
<td>61</td>
</tr>
<tr>
<td>16.</td>
<td>Money demand equation</td>
<td>67</td>
</tr>
<tr>
<td>17.</td>
<td>Exchange rate equation</td>
<td>73</td>
</tr>
<tr>
<td>18.</td>
<td>Import structure in 1997</td>
<td>77</td>
</tr>
<tr>
<td>19.</td>
<td>Export structure in 1997</td>
<td>78</td>
</tr>
<tr>
<td>20.</td>
<td>Foreign trade equations</td>
<td>80</td>
</tr>
<tr>
<td>21.</td>
<td>Effects of simultaneous temporary changes of monetary or fiscal policy in all countries on output gap and price level</td>
<td>102</td>
</tr>
</tbody>
</table>
Charts

1. Consumption ratio from 1981 to 1998  30
2. Labour participation rate from 1981 to 1998  33
4. "Wage share" from 1981 to 1998  41
5. "Import ratio" from 1981 to 1998  44
6. Unemployment rate from 1981 to 1998  48
7. Output gap from 1981 to 1998  49
8. Deficit ratio from 1981 to 1998  58
10. Transfer ratio from 1981 to 1998  60
11. Income velocity of money from 1981 to 1998  65
12. Short-term and long-term interest rates from 1981 to 1998  71
13. Effects of simultaneous temporary changes of monetary or fiscal policy in all countries on interest rates  98
14. Effects of simultaneous temporary changes of monetary or fiscal policy in all countries on output and price level  99
15. Effects of simultaneous temporary changes of monetary or fiscal policy in all countries on output gap and inflation rate  101
16. Effects of simultaneous temporary changes of monetary policy in all countries on output and price level  104
17. Effects of simultaneous temporary changes of fiscal policy in all countries on output and price level  105
18. Effects of simultaneous temporary changes of monetary or fiscal policy in all countries on output and price level  106
Introduction
I. The challenge of international economic integration and globalisation

With the further removal of foreign trade barriers, the growing liberalisation of international capital transactions and the tremendous progress in information technology, the global integration of the markets for goods, labour and financial assets has intensified considerably in recent years. This process has made particularly great progress in the European Economic Union through the accession of further countries, the creation of a common market and the establishment of the European Monetary System as well as the European Monetary Union. The effects of monetary and fiscal policy measures are therefore transmitted far more strongly from one country to another than before. For that reason the analysis of economic developments can no longer be restricted to a single country. Likewise, the feedback effects of higher interest rates or higher government deficits from other countries have to be considered more than hitherto in monetary and fiscal policy. In addition the creation of the euro in the European Monetary Union and the problems of international cooperation in monetary, fiscal and exchange policy, particularly in Europe and among the G-7 countries, have made it more necessary to take mutual economic dependencies into consideration than in the past.

For many years, the World Economic Outlook of the International Monetary Fund\(^1\) as well as the Economic Outlook of the OECD\(^2\) have therefore contained macro-

---


economic forecasts and economic policy scenario analyses using the econometric multi-country models of those institutions. The Commission of the European Union\(^3\) has also used this instrument of analysis intensively. Several central banks\(^4\), the Economic Planning Agency of the Japanese government\(^5\) and economic research institutes and academics have likewise applied econometric multi-country models in their analyses\(^6\). The European System of Central Banks is also working on an econometric multi-country model.\(^7\)

Econometric models for the economy of a single country, such as the former econometric model of the Bundesbank for the German economy,\(^8\) can only be applied to the analysis of economic developments in that particular country. As the economic developments abroad have been assumed to be exogenous in such cases, these models show an open foreign economic flank. Effects of domestic developments on other countries as well as feedback effects from abroad are not taken into consideration. The consistency of economic forecasts is therefore not guaranteed. That means that neglecting the international economic linkages in large open economies like Germany can result in considerable forecast errors.

Because the feedback effects from abroad are neglected, international economic problems can be analysed with a national econometric model only to a very

---


\(^7\) Henry, J., Euro area-Wide and Country Modelling at the Start of EMU, Economic and Financial Modelling, 1999.

\(^8\) Deutsche Bundesbank, Macro-econometric model of the German economy, Frankfurt am Main, April 1994.
## Country coverage and size of macro-econometric multi-country models

<table>
<thead>
<tr>
<th>Country</th>
<th>Multi-mod(^1)</th>
<th>Inter-link(^2)</th>
<th>Quest(^3)</th>
<th>FRB Global(^4)</th>
<th>EPA(^5)</th>
<th>NIGEM(^6)</th>
<th>Oxford Model(^7)</th>
<th>MEM MOD(^8)</th>
</tr>
</thead>
<tbody>
<tr>
<td>USA</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>Japan</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>Germany</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>United Kingdom</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>France</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>Italy</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>Canada</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>Netherlands</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>Belgium</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>Denmark</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>Finland</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td></td>
<td></td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>Greece</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td></td>
<td></td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>Ireland</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>Austria</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td></td>
<td></td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>Portugal</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td></td>
<td></td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>Sweden</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td></td>
<td></td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>Spain</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td></td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>Iceland</td>
<td>x</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Norway</td>
<td>x</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Switzerland</td>
<td>x</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Turkey</td>
<td>x</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Australia</td>
<td>x</td>
<td></td>
<td></td>
<td></td>
<td>x</td>
<td>x</td>
<td>x</td>
<td></td>
</tr>
<tr>
<td>New Zealand</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mexico</td>
<td></td>
<td>x</td>
<td></td>
<td></td>
<td>x</td>
<td>x</td>
<td>x</td>
<td></td>
</tr>
<tr>
<td>Korea</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>x</td>
<td>x</td>
<td></td>
<td></td>
</tr>
<tr>
<td>China</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>x</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hong Kong</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>x</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Taiwan</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>x</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Number of countries: 7  23  16  8  9  18  24  9
Number of equations: 7  460  23  4200  16  1400  8  1230  9  1500  18  4500  24  690


Deutsche Bundesbank
limited extent. As the credit and capital markets have become increasingly integrated over the years, interest rate changes, for example, cannot be analysed in isolation. A change in monetary policy instruments triggers international transmission processes, which in turn react to developments in various money markets.

Unlike in national econometric models, in multi-country models, the international economic linkages are of fundamental importance. International economic interdependencies have to be considered in the analysis of economic policy measures. The explicit modelling of other important countries helps enhance the consistency of forecasts in the model context. A macro-econometric multi-country model therefore possesses a considerable comparative advantage over national econometric models in the analysis of international economic policy problems.

Given the obvious limitations of single-country models, the Deutsche Bundesbank has developed its macro-econometric multi-country model MEMMOD, which serves to maintain the international consistency of forecasts and to analyse international cooperation in monetary and fiscal policy, particularly since the establishment of the European Monetary Union. The current version of the model consists of compact country models for Germany’s most important trade partners. These models have been connected by international linkages. The multi-country model of the Deutsche Bundesbank covers European Union member states Belgium, France, Germany, Italy, the Netherlands and the United Kingdom. In addition, country models for the USA, Canada and Japan have been included, which means the model contains all G-7 countries. The remaining countries have been aggregated into three regions which contain other EU countries, other OECD countries and the rest of the world.

II. A reconsideration of the spectrum of modelling approaches

MEMMOD is a macro-econometric model with relatively solid theoretical foundations. The spectrum of alternative modelling strategies ranges from more data based models to strict theoretical models. The two extremes thus reflect strategies where either the model has to fit the data, or vice versa. Vector
Autoregressive models (VAR) represent, in their basic form, the strictly data based models. They do not require any theoretical assumptions. VARs are free of any restrictions, and can therefore be used to explain the dynamic interactions between endogenous variables. However, since they are purely data based, their key field of application is limited to short-term forecasts and analyses. Structural VARs (SVARs) deviate from the purely data based foundation of VARs and impose some restrictions on the model, which are derived from economic theory. This already enables them to be used in a wider range of applications. Both VARs and SVARs can be used to analyse economic shocks in the form of impulse response functions. The advantage of SVARs is that, as opposed to basic VARs, the economic shock can be associated with a specific economic interpretation.

Computable general equilibrium models are located at the other end of the spectrum, the theory based models. Optimising behaviour of agents and equilibrium are the foundation of such models. Since these conditions are not generally found in the data, such models need to be calibrated in order for the data to fit the model. With their rather loose link to underlying data, such models have very limited power in terms of short-term forecasts and analyses. Although theoretically appealing, the relevance of such models for longer term policy analyses seems equally questionable, given the apparent disequilibria observed in the “real world”.

It is evident from the above considerations that any modelling strategy represents a compromise. For the Bundesbank’s purposes it is important to have a universal tool that can be used for both short-term and long-term analyses. It is also important that the model incorporates institutional arrangements and that, especially the German part of the model, incorporates in detail the interdependencies of a broad range of variables. Moreover, as outlined in the first part of this chapter, the international interdependencies need to be reflected in the model. Information obtained from VARs in that respect is not sufficient because their small size implies that not all variables of interest can be explained, let alone the international framework. Strictly theoretical models, on the other hand, lack short-term explanatory power, and this probably holds for long-term explanations, too. The model of the euro area monetary sector, however, has been influenced more by theoretical considerations, since there is an obvious lack of aggregated euro area data.

An alternative approach would be to produce a range of models where each one is tailor-made for a particular set of applications. For one thing, the group of
models would be intended to cover the spectrum from data based models to theory based models outlined above. Different models can also be used to encompass a range of different levels of aggregation and coverage. Developing and maintaining models that cover these two dimensions would be very costly. Another problem associated with such a strategy is that a range of models would obviously produce a range of solutions, unless their respective fields of applications are strictly separated. The resulting policy recommendations would therefore be largely discretionary, similar to ad hoc or model-free analyses. However, the limitations of an one-model strategy cannot be ignored, and the appropriate analysis tool would have to be considered on a case-by-case basis.

III. Modelling international economic integration using a structural multi-country model

The long-run properties of the country models in MEMMOD can be described as neo-classical. Potential GDP has been estimated on the basis of a Cobb-Douglas production function with constant returns to scale in the long run, and decreasing returns to scale in the short run. Potential GDP is in the long run equivalent to actual production, which implies full capacity utilisation. This is achieved by optimising the behaviour of economic agents in the central behavioural equations of the model. The expectation formation process of economic agents is partly assumed to be backward-looking, i.e. adaptive, and partly forward-looking, i.e. model-consistent or rational. Wage and price formations offset actual and trend unemployment and thus lead to labour market equilibrium; the Phillips curve is vertical in the long run. Inflation is therefore seen as a nominal phenomenon. Economic growth in the long run is determined by population growth and productivity progress. Price rigidities affect the short-run properties of the model. The rather slow adjustment of prices and wages to their equilibrium levels causes market disequilibria and cyclical fluctuations around the path of potential gross domestic product.

The development of the macro-econometric multi-country model MEMMOD has been based on many years of experience with the Bundesbank model for the German economy. The micro-economic foundation of the behavioural equations as well as the macro-economic disaggregation of sectors and markets are formed in a manner similar to this model. This enables real developments and monetary
and financial processes, in which the Bundesbank is particularly interested, to be taken into consideration. Regarding the linkage of the separate country models by foreign current transactions and exchange markets, to some extent it has been possible to build on the experiences of other central banks and international institutions with econometric multi-country models. But the concepts applied there could not be adapted directly to the multi-country model of the Deutsche Bundesbank in every respect. Especially the enlargement of the area covered due to German unification in 1990 necessitated the inclusion of various special factors in the German block of the model.

The introduction of the D-Mark in East Germany in 1990 rendered a separate recording of financial variables for the new and the old federal states, Länder, ultimately impossible. In this area, new equations applying to Germany as a whole had to be estimated. In line with the large differences in behaviour and supply side conditions between eastern and western Germany, the data for real variables have been recorded separately for some time, however. This has made it possible to temporarily specify a small real block for eastern Germany (alongside the existing western German model), for which the coefficients have been calibrated under the assumption of convergence in economic conditions and behaviour to western German structures.\(^9\) Starting at the beginning of 1995 this separate recording of data has been largely discontinued, however, making a further respecification of the model necessary. Since it can be assumed that the process of adjustment in eastern Germany has made visible progress ten years after German unification, the German block of the model has now been based almost entirely on data belonging to Germany as a whole. Unification-induced jumps in the data or changes in behaviour are dealt with in the respective equations by unification dummies.

After the start of the European Monetary Union in 1999 the model was respecified again. The financial markets of the countries participating in the euro area have been integrated into a common European financial market. Once the euro banknotes and coins have been introduced, it will no longer be possible to record national contributions to the single monetary aggregate. The single monetary policy of the European System of Central Banks already influences financial markets. These changes have therefore been taken into consideration in the specification of an euro area financial sector in the model.

---

Structure of the country models
I. Countries of the model

1. Country coverage

In order to be able to easily keep the model in perspective and to keep the data requirements in manageable dimensions, the Bundesbank’s econometric multi-country model has been built as compactly as possible. From this it follows that only a selection of countries or regions can be included in the model. From a world-wide economic standpoint the USA, Japan, Germany, United Kingdom, France, Italy and Canada, which are represented at world economic summits as G-7, have demonstrably been the most important industrial countries in recent years. With respect to Germany’s foreign transactions the two EU countries of Belgium and the Netherlands are additionally of special importance. All other countries have been aggregated into one of three regions: “other EU countries”, “other OECD countries” and “rest of world”.

The G-7 countries together account for more than half of world GDP. The “other EU countries” and “other OECD countries” together make up only 10 % of world GDP. In addition, the G-7 countries have a share of nearly 50 % in world trade. The share of the “other OECD countries” together with “other EU countries”, on the other hand, likewise amounts only to just over 10 %. The G-7 countries are Germany’s most important trade partners. Along with Belgium and the Netherlands, Germany exported more than 50 % of its goods to those countries in 1997. On the other hand, nearly 50 % of German imports were delivered from those countries.

The multi-country model specifies the most significant macro-economic interdependencies within important industrial countries as well as their international trade linkages in a consistent manner. From the Bundesbank’s perspective, the modelling of monetary developments, interest rates and exchange rates deserves special attention, particularly with regard to the European integration process. This helps to explain the development of the most relevant economic policy variables. Despite the highly aggregated nature of the single country models, the whole multi-country model contains around 690 equations.
<table>
<thead>
<tr>
<th>Country Or region</th>
<th>World trade¹</th>
<th>German exports</th>
<th>German imports</th>
</tr>
</thead>
<tbody>
<tr>
<td>USA</td>
<td>14.3</td>
<td>8.4</td>
<td>7.8</td>
</tr>
<tr>
<td>Japan</td>
<td>6.9</td>
<td>2.4</td>
<td>4.9</td>
</tr>
<tr>
<td>Germany</td>
<td>8.6</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>United Kingdom</td>
<td>5.3</td>
<td>8.2</td>
<td>7.0</td>
</tr>
<tr>
<td>France</td>
<td>5.0</td>
<td>8.8</td>
<td>10.5</td>
</tr>
<tr>
<td>Italy</td>
<td>4.0</td>
<td>7.2</td>
<td>7.8</td>
</tr>
<tr>
<td>Canada</td>
<td>3.7</td>
<td>0.8</td>
<td>0.7</td>
</tr>
<tr>
<td>G-7 countries</td>
<td>47.9</td>
<td>35.8</td>
<td>38.7</td>
</tr>
<tr>
<td>Netherlands</td>
<td>3.4</td>
<td>8.0</td>
<td>8.5</td>
</tr>
<tr>
<td>Belgium³</td>
<td>3.0</td>
<td>5.5</td>
<td>6.2</td>
</tr>
<tr>
<td>Total</td>
<td>54.3</td>
<td>49.3</td>
<td>53.4</td>
</tr>
<tr>
<td>Other EU countries³</td>
<td>7.6</td>
<td>16.8</td>
<td>14.4</td>
</tr>
<tr>
<td>Other OECD countries⁴</td>
<td>4.2</td>
<td>12.2</td>
<td>14.0</td>
</tr>
<tr>
<td>Rest of world</td>
<td>33.9</td>
<td>21.7</td>
<td>18.2</td>
</tr>
<tr>
<td>World</td>
<td>100</td>
<td>100</td>
<td>100</td>
</tr>
</tbody>
</table>

Memo items:
- Euro area
  - 29.2
  - 40.5
  - 43.2
- EU countries
  - 37.0
  - 54.5
  - 54.4
- OECD countries
  - 66.1
  - 78.3
  - 81.8


¹ World trade defined as average of world imports and world exports. — ² Including Luxembourg. — ³ Austria, Denmark, Finland, Greece, Ireland, Portugal, Spain and Sweden. — ⁴ Australia, Iceland, New Zealand, Norway, Switzerland and Turkey.
2. General structure of the country models

At nearly 120 equations for Germany and around 60 equations for the other countries, the model has deliberately been built in a compact way. Nonetheless, the present version of the model covers all essential aspects of a country’s macro-economic development and contains important monetary and fiscal policy instruments. The model comprises markets for goods, labour and financial assets, i.e. money and foreign exchange assets. Economic agents have been aggregated into the sectors of households, firms, government and foreign countries. Total demand has been disaggregated into private consumption, government demand, private investment (fixed investment and inventory investment), exports and imports. For these components of gross domestic product, the nominal and real development as well as the development of the price deflators belonging to them are each explained in the country models.

The demand side is faced by the supply side with labour force, employment and potential output. The disequilibrium between supply and demand is indicated on the labour market by the unemployment rate and on the goods market by the output gap (capacity utilisation). These disequilibria on the labour and goods markets are seen by themselves as important factors determining the development of wages and prices. The development of wage rates together with the changes in employment are used to derive gross wage income. After deducting direct taxes and social security contributions, what remains is net wage income, which, together with government transfers, forms the most important part of households’ disposable income.

Beyond that, indirect taxes and depreciation allowances are considered in the distribution of gross domestic product, which means that the financial balances of households (savings), of government (budget balance), of firms (net lending) and of foreign countries (current account balance) can be derived in the country models. In the financial sector, the country models contain a money demand function and the setting of long-term interest rates and exchange rates of the respective local currency against the US-Dollar, with the exchange rates and interest rates of the currencies which have participated in the exchange rate mechanism of the European Monetary System having been taken into account in a special manner. The monetary sector of the euro area has been specified separately following the launch of the euro in 1999. It replaces the monetary sectors of the individual participating countries. The development of endogenous variables is affected by several economic policy variables, to which the monetary
## Sector accounts in the country models

*The model abbreviation is listed alongside the variable for which it stands.*

<table>
<thead>
<tr>
<th>Households</th>
<th>Firms</th>
</tr>
</thead>
<tbody>
<tr>
<td>Priv. consumption: CP</td>
<td>Wage income: L</td>
</tr>
<tr>
<td>Profit income</td>
<td></td>
</tr>
<tr>
<td>National income: VE</td>
<td>- Direct taxes and social sec. contributions: TDB</td>
</tr>
<tr>
<td>Financial balance: FH</td>
<td>Transfers from government: SB</td>
</tr>
<tr>
<td>Disposable income</td>
<td>Disposable income</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Government</th>
<th>Foreign countries</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gov. demand: G</td>
<td>Direct taxes and social security contributions: TDB</td>
</tr>
<tr>
<td>Transfers to households: SB</td>
<td>Indirect taxes: TIS</td>
</tr>
<tr>
<td>Financial balance: FS</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Income and expenditure</th>
<th>Financial balances</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wage income: L</td>
<td>Priv. consumption: CP</td>
</tr>
<tr>
<td>Profit income</td>
<td>Gov. demand: G</td>
</tr>
<tr>
<td>National income: VE</td>
<td>Fixed investment: IAN</td>
</tr>
<tr>
<td>Depreciation allowances: D</td>
<td>Inventory investment: V</td>
</tr>
<tr>
<td>Indirect taxes: TIS</td>
<td>Exports: EX</td>
</tr>
<tr>
<td></td>
<td>Final demand: END</td>
</tr>
<tr>
<td>Gross domestic product: BIP</td>
<td></td>
</tr>
</tbody>
</table>

Deutsche Bundesbank
and fiscal policy instruments belong: real government demand, direct and indirect tax rates and the short-term interest rates which are determined by monetary policy rules. The linkage of the country models takes place through current and capital transactions with foreign countries, meaning that exports and import prices are both exogenous in the single country models but endogenous in the complete model.

It turned out to be extraordinary difficult to obtain the necessary quarterly data. Apart from national statistics, the "Quarterly National Accounts", the "Main Economic Indicators", the "Economic Outlook" and the "Quarterly Labour Force Statistics" of the OECD are the most important sources of data, nevertheless, they had to be checked for internal consistency. They have been supplemented by data from the Bank for International Settlements, the International Monetary Fund and the European Central Bank. The German block of the model is based on data for Germany as a whole from various statistical sources such as national accounts, banking statistics, financial accounts, balance of payments and foreign trade statistics for example. The application of various statistical sources sometimes made it necessary to introduce dummy variables and residual items. Generally the data are seasonally adjusted. But in some cases only annual data are available, they then have to be converted into quarterly data. Moreover, the base year of price deflators is different from one country to the next. Special problems arise from the up-dating at the actual end of the series, which in some cases is only possible with delays. In those cases the data are extrapolated using simple approaches. The time series are analysed by means of several tests on their trend, seasonal and stationarity properties, the idea being to find suitable statistical specifications for the behavioural equations.

The most important behavioural equations on the goods market are the consumption equation, the investment equations, the import equation, the production function (which determines potential output) and the price equations for domestic and export prices. On the labour market the supply of labour force provided by households, the demand of firms and government for employment and the development of wages are explained by behavioural equations. The centre of financial markets is built by the money demand equation, an interest rate equation and the determination of exchange rates on foreign exchange markets.

The economic transactions between the different sectors of the economy have been condensed into a highly aggregated system of income accounts, from which
the most important definition equations building the backbone of the country models can be derived. They include, for example, the definition of final demand, gross domestic product, national income and households’ disposable income. The distribution and expenditure of gross domestic product are two sides of one and the same coin. The financial balances of households and government, aggregated into total domestic savings, can be derived from the income accounts. They are offset by net investment of firms and the current account balance against foreign countries.

The economic activities of the different sectors are performed in the model on three highly aggregated macro-economic markets: the goods market, the labour market and the financial markets. On each of these markets demand meets supply. The theoretical foundation of the behavioural equations in the country models takes into consideration neo-classical elements as well as Keynesian elements. The time dimension plays an important role in this. In the short run prices and wages are regarded as relatively inflexible and rigid, because they are fixed by contracts or cannot be adjusted without considerable transaction costs either. Volume reactions are therefore of high importance in shorter time horizons and market disequilibria can arise. On goods markets these disequilibria are expressed in an overutilisation or underutilisation of production capacities and on labour markets in unemployment or overemployment.

Generally private agents try to maximise their profits or their utility. This utility or profit maximising behaviour on the part of households and firms causes market forces to be set in motion with corresponding price and wage reactions. In the long run those forces help remove the existing disequilibria. Because it is sometimes assumed in the model that economic agents form their expectations adaptively and react with time lags, it is nevertheless possible for imbalances on the goods and labour markets to continue for longer periods. For the money market as well as for other financial markets, however, it is assumed that arising disequilibria are removed very quickly by the utilisation of arbitrage possibilities or that agents react in a forward-looking manner. Due to the assumed homogeneity of the traded financial products and to the relatively low information and transaction costs, price rigidities on financial markets are neglected and price or interest rate reactions will promptly cause the market to return to a state of equilibrium.

Supply and demand of the economic sectors of the economy meet each other on the different markets. Economic activities of households are extended to goods,
## I. Aggregate demand

1. **Private consumption:**
   \[
   \Delta \ln \left( \frac{C}{W_O} \right) = \alpha_{C0} + \alpha_{C1} \Delta \ln \left( \frac{YV}{p + W_O} \right) + \alpha_{C2} \left( r - \pi^e \right) \\
   + \alpha_{C3} \Delta \ln \left( \frac{C-I}{W_O-1} \right) + \alpha_{C4} \ln \left( \frac{C-4}{Y-4 - IM-4} \right)
   \]

2. **Labour supply:**
   \[
   \ln \left( \frac{E}{W_O} \right) = \alpha_{E0} + \alpha_{E1} \ln \left( \frac{E-I}{W_O-1} \right)
   \]

3. **Real final demand:**
   \[Y = C + I + G + X\]

4. **National income:**
   \[VE = Y * p - d * K * p - TI - IM * m\]

5. **Disposable income:**
   \[YV = VE + SB - TD\]

## II. Aggregate supply

6. **Private investment:**
   \[\ln (I) = \alpha_{I0} + \alpha_{I1} \ln (Y) + \alpha_{I2} \left( r - \pi^e \right)\]

7. **Labour demand:**
   \[\ln (L) = \alpha_{L0} + \alpha_{L1} \ln (Y) + \alpha_{L2} \ln \left( \frac{p * (I - t)}{w} \right)\]

8. **Imports:**
   \[\ln (M) = \alpha_{M0} + \alpha_{M1} \ln (Y) + \alpha_{M2} \ln \left( \frac{p * (I - t)}{m} \right)\]

9. **Potential output:**
   \[\ln \left( Y^* \right) = \pi_{V-1} + \pi_{V-2} T + \pi_{V-3} \ln (E) + \left( 1 - \alpha_{V-3} \right) \ln (K_{-1})\]

10. **Real capital stock:**
    \[K = (1-d) * K_{-1} + l\]

## III. Factor costs and price deflators

11. **Wage rate:**
    \[\Delta \ln (w) = \alpha_{W0} + \alpha_{W1} \Delta \ln (w-1) + (1 - \alpha_{W1}) \Delta \ln (p) + (1 - \alpha_{W1}) \Delta \ln (p-1) \]
    \[+ \alpha_{W2} \Delta \ln \left( \frac{E^*}{E} \right) + \alpha_{W3} \Delta \left( \frac{E-4}{E} \right) + \alpha_{W4} \left( \frac{E-4}{E-4} \right)\]

12. **Inflation rate:**
    \[\pi = \alpha_{I1} \Delta^2 \ln \left( \frac{co}{1 - \xi} \right) + \alpha_{I2} \left[ (1 - \phi) \pi_{-1} + \phi \left( 1 - \mu \right) \pi_{-1} + \mu \pi_{-1} \right]
    + \alpha_{I3} \ln \left( \frac{Y - IM}{Y^*} \right) + (1 - \alpha_{I2}) \Delta \ln \left( \frac{p^*}{p} \right) + \alpha_{I4} \ln \left( \frac{p^*_4}{p^*_4} \right)\]

13. **Adaptive inflation expectations:**
    \[\pi^e = \beta \pi^e_{-1} + (1 - \beta) \pi_{-1}\]
### Simplified version of a country model (cont'd)

<table>
<thead>
<tr>
<th>Equation</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>(14)</td>
<td>Production costs: $\ln (C_0) = \gamma_1 \ln (w) + (1 - \gamma_1) \ln (m)$</td>
</tr>
<tr>
<td>(15)</td>
<td>Price deflator: $\ln (p) = \ln (p_{-1}) + 0.01 \cdot \pi$</td>
</tr>
</tbody>
</table>

#### IV. Government

<table>
<thead>
<tr>
<th>Equation</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>(16)</td>
<td>Direct taxes: $TD = td \cdot VE$</td>
</tr>
<tr>
<td>(17)</td>
<td>Indirect taxes: $TI = ti \cdot Y \cdot p$</td>
</tr>
<tr>
<td>(18)</td>
<td>Government expenditure: $\Delta \ln (G) = \alpha_{G1} \Delta \ln (G_{-1}) + (1 - \alpha_{G1}) \Delta \ln (Y - IM) + \alpha_{G2} \ln \left(\frac{Y - IM}{Y^*}\right)$</td>
</tr>
<tr>
<td>(19)</td>
<td>Transfer payments: $\ln \left(\frac{SB}{(Y - IM) \cdot p}\right) = \alpha_{SB0} + \alpha_{SB1} \ln \left(\frac{SB_{-1}}{(Y_{-1} - IM_{-1}) \cdot p_{-1}}\right) + \alpha_{SB2} \frac{\Delta}{E}$</td>
</tr>
</tbody>
</table>

#### V. Money, interest rates and the exchange rate

<table>
<thead>
<tr>
<th>Equation</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>(20)</td>
<td>Money stock: $\ln \left(\frac{M}{p}\right) = \alpha_{M0} + \alpha_{M1} \ln (Y - IM) + \alpha_{M2} r$</td>
</tr>
<tr>
<td>(21)</td>
<td>Long-term price level: $\ln (\pi^<em>) = \ln (M) - \left[\alpha_{M0} + \alpha_{M1} \ln \left(\frac{\pi^</em>}{\pi}\right) + \alpha_{M2} \left(\Delta \ln \left(\frac{\pi^*}{\pi}\right) + \tilde{\pi}\right)\right]$</td>
</tr>
<tr>
<td>(22)</td>
<td>Short–term interest rate: $rs = \alpha_{r1} \ln (\pi_{-1}) + (1 - \alpha_{r1}) \frac{\left[\Delta \ln \left(\frac{\pi^*}{\pi}\right) + \tilde{\pi}\right]}{4} + \alpha_{r2} \frac{1}{4} \left(\pi_{-1} - \tilde{\pi}<em>{-1}\right) + \alpha</em>{r3} \left(\frac{3}{4} \ln \left(\frac{Y_{-1} - IM_{-1}}{Y_{-1}}\right)\right)$</td>
</tr>
<tr>
<td>(23)</td>
<td>Long–term interest rate: $(1 + 0.01r) = (1 + 0.01r_{-1})^{(1 - \alpha_3)} (1 + 0.01r_{-1})^{\alpha_3} \left(\frac{1 + 0.01rs}{1 + 0.01} \left(\Delta \ln \left(\frac{\pi^*}{\pi}\right) + \tilde{\pi}\right)\right)$</td>
</tr>
<tr>
<td>(24)</td>
<td>Exchange rate: $\ln (e) = \alpha_{eo} + \alpha_{e1} \ln (e_{-1}) + (1 - \alpha_{e1}) \ln \left(\frac{p+1}{p_{-1}}\right) - (rs - rsf) + \alpha_{es} (rs_{-1} - rsf_{-1})$</td>
</tr>
</tbody>
</table>

Deutsche Bundesbank
Simplified version of a country model (cont’d)

Table 4

Variables

The abbreviation of variables in the simplified version is different from that in the complete model.

A  Labour demand (employment)
C  Real private consumption
c0  Production costs
d  Depreciation rate (exogenous)
E  Labour supply (labour force)
e  Exchange rate against US-Dollar
G  Real government demand (consumption and investment)
I  Real private investment
IM  Real imports
K  Real private capital stock
M  Money stock
m  Price deflator of imports (exogenous in country model)
p  Price deflator of domestic demand
p*  Long-term price level
pf  Foreign price deflator of domestic demand (exogenous in country model)
π  Inflation rate
πe  Adaptive inflation expectations
κ  Inflation target (exogenous)
r  Long-term interest rate (government bond yield for ten years)
rs  Short-term interest rate (for three-month funds)
rsf  Foreign short-term interest rate (exogenous in country model)
SB  Transfer payments to households (social benefits)
T  Time (exogenous)
TD  Direct taxes
td  Direct tax rate (explained by autoregression)
TI  Indirect taxes
ti  Indirect tax rate (explained by autoregression)
VE  National income
w  Wage rate
WO  Population (explained by time trend)
X  Real exports (exogenous in country model)
Y  Real final demand
Y*  Potential output
YV  Disposable income of households

Deutsche Bundesbank
labour and financial markets. With given preferences, they fix their demand for consumption goods and decide on their labour supply as well as the distribution of their wealth into the different categories of assets, among them the liquid means which are necessary to carry out transactions in goods and services (money demand). Private firms optimise their demand for factors of production and their supply of goods in view of similar aspects. The demand for factors of production consists of capital services, labour demand and the demand for imported inputs. The internal inputs are balanced out by aggregation. Investments are of special importance in macro-economic developments because they form part of aggregate demand and thus determine changes in the real capital stock and aggregate supply possibilities.

The single country models are divided into different blocks by relevant criteria. Although a variety of criteria can be used to justify a given breakdown, and arbitrariness can sometimes result, a certain uniformity has been developed in this respect. First of all, a distinction is made between the real block and the financial block. The real block of the model has been divided into aggregate demand, aggregate supply, the determination of factor costs and prices and the redistribution of income by government. Money and credit demand of households and firms as well as the development of interest rates and exchange rates are included in the financial block. A simplified version of a country model (Table 4) gives a brief overview of the most important relationships covered in the model. This simplified version contains only 24 equations which form the "nucleus" as it were, to which the single country models can be reduced. Table 5 contains an overview of all behavioural and definitional equations in the single blocks of the model. Many of those equations follow from the larger disaggregation of the complete model.

Unlike the behaviour of private economic agents the economic activities of government are not based on optimising assumptions in the model but on other considerations. Government demand (i.e. government consumption and government investment), the demand for labour and the demand of government for financial assets are based more on national and social considerations and are described in the model by simple (reaction) functions. Accordingly, government demand and tax rates are important economic policy instrument variables.

The demand for exported goods plays an important role in the strongly linked, labour-divided economies of the industrial countries. The exports of each country are determined by the weighted sum of all other countries’ imports. The weights
## Size and block structure of the model

<table>
<thead>
<tr>
<th>Block model</th>
<th>US</th>
<th>JP</th>
<th>GY</th>
<th>UK</th>
<th>FR</th>
<th>IT</th>
<th>CA</th>
<th>NL</th>
<th>BE</th>
<th>EMU</th>
<th>FT</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>I. Aggregate demand</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Behav. equations</td>
<td>4</td>
<td>4</td>
<td>7</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>9</td>
<td>48</td>
</tr>
<tr>
<td>Def. equations</td>
<td>11</td>
<td>11</td>
<td>22</td>
<td>11</td>
<td>13</td>
<td>13</td>
<td>11</td>
<td>13</td>
<td>13</td>
<td>3</td>
<td>29</td>
<td>150</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>15</td>
<td>15</td>
<td>29</td>
<td>15</td>
<td>17</td>
<td>17</td>
<td>15</td>
<td>17</td>
<td>17</td>
<td>3</td>
<td>38</td>
<td>198</td>
</tr>
<tr>
<td><strong>II. Aggregate supply</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Behav. equations</td>
<td>9</td>
<td>9</td>
<td>16</td>
<td>8</td>
<td>8</td>
<td>9</td>
<td>9</td>
<td>9</td>
<td>8</td>
<td>8</td>
<td>85</td>
<td></td>
</tr>
<tr>
<td>Def. equations</td>
<td>7</td>
<td>7</td>
<td>21</td>
<td>7</td>
<td>7</td>
<td>7</td>
<td>7</td>
<td>7</td>
<td>7</td>
<td>2</td>
<td>79</td>
<td></td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>16</td>
<td>16</td>
<td>37</td>
<td>15</td>
<td>15</td>
<td>16</td>
<td>16</td>
<td>16</td>
<td>15</td>
<td>2</td>
<td>164</td>
<td></td>
</tr>
<tr>
<td><strong>III. Factor costs and price deflators</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Behav. equations</td>
<td>6</td>
<td>6</td>
<td>12</td>
<td>6</td>
<td>6</td>
<td>6</td>
<td>6</td>
<td>6</td>
<td>5</td>
<td>6</td>
<td>10</td>
<td>69</td>
</tr>
<tr>
<td>Def. equations</td>
<td>6</td>
<td>8</td>
<td>8</td>
<td>6</td>
<td>6</td>
<td>8</td>
<td>6</td>
<td>7</td>
<td>6</td>
<td>2</td>
<td>20</td>
<td>83</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>12</td>
<td>14</td>
<td>20</td>
<td>12</td>
<td>12</td>
<td>14</td>
<td>12</td>
<td>12</td>
<td>12</td>
<td>2</td>
<td>30</td>
<td>152</td>
</tr>
<tr>
<td><strong>IV. Government</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Behav. equations</td>
<td>4</td>
<td>4</td>
<td>10</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>42</td>
<td></td>
</tr>
<tr>
<td>Def. equations</td>
<td>4</td>
<td>4</td>
<td>11</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>43</td>
<td></td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>8</td>
<td>8</td>
<td>21</td>
<td>8</td>
<td>8</td>
<td>8</td>
<td>8</td>
<td>8</td>
<td>8</td>
<td>8</td>
<td>85</td>
<td></td>
</tr>
<tr>
<td><strong>V. Money, interest rates, exchange rates</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Behav. equations</td>
<td>3</td>
<td>3</td>
<td>4</td>
<td>3</td>
<td>5</td>
<td>5</td>
<td>4</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>46</td>
<td></td>
</tr>
<tr>
<td>Def. equations</td>
<td>3</td>
<td>3</td>
<td>4</td>
<td>3</td>
<td>5</td>
<td>5</td>
<td>4</td>
<td>5</td>
<td>5</td>
<td>6</td>
<td>43</td>
<td></td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>6</td>
<td>7</td>
<td>11</td>
<td>6</td>
<td>10</td>
<td>10</td>
<td>8</td>
<td>10</td>
<td>10</td>
<td>11</td>
<td>89</td>
<td></td>
</tr>
<tr>
<td><strong>Complete model</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Behav. equations</td>
<td>26</td>
<td>27</td>
<td>52</td>
<td>25</td>
<td>27</td>
<td>28</td>
<td>27</td>
<td>27</td>
<td>27</td>
<td>5</td>
<td>19</td>
<td>290</td>
</tr>
<tr>
<td>Def. equations</td>
<td>31</td>
<td>33</td>
<td>66</td>
<td>31</td>
<td>35</td>
<td>37</td>
<td>32</td>
<td>36</td>
<td>35</td>
<td>13</td>
<td>49</td>
<td>398</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>57</td>
<td>60</td>
<td>118</td>
<td>56</td>
<td>62</td>
<td>65</td>
<td>59</td>
<td>63</td>
<td>62</td>
<td>18</td>
<td>68</td>
<td>688</td>
</tr>
<tr>
<td><strong>Exogenous variables</strong></td>
<td>5</td>
<td>5</td>
<td>22</td>
<td>5</td>
<td>5</td>
<td>7</td>
<td>6</td>
<td>5</td>
<td>1</td>
<td>4</td>
<td>72</td>
<td></td>
</tr>
</tbody>
</table>


Deutsche Bundesbank
are taken from a trade share matrix. By aggregating the demand components private consumption, private investment, government demand and the foreign trade balance, i.e. exports minus imports, gross domestic product can be calculated, which is met on the supply side by potential output. The difference between the supply and demand of goods yields the output gap, which is a measure of disequilibrium. An overutilisation or an underutilisation of production capacities leads to an acceleration or a deceleration, respectively, of the increase of goods prices in the model. The reaction of prices itself contributes to creating a goods market equilibrium in the long run.

The macro-economic labour market shows a structure similar to that of the goods market. The labour supply of households is met by the labour demand of firms and government. The difference of the two variables yields the unemployment rate, which is a measure of the macro-economic disequilibrium on the labour market. Along with other variables, the unemployment rate helps determine the development of wages. Contrary to real economic markets, an equilibrium concept with fast market clearance is assumed for financial markets. For the money market, this implies that money demand and the short-term interest rate are determined in the model, whereas money supply is implicitly given by the equilibrium condition.

Labour, capital and the rate of technological progress determine the real growth and real wealth of a country in the long run. The cyclical fluctuations of macro-economic demand exert a considerable impact on production in the short and medium run, however.

II. Behavioural equations

1. Theoretical basis of specification

The long-run equilibrium relationships which have been developed in economic theory serve as a basis for the specification of the behavioural equations in all countries. Yet empirical estimations then result in clear differences of long-run structural coefficients and dynamic adjustment parameters from one country to the next. In this way homogeneous structural models can be developed which still
take into account the country-specific differences in the behaviour and reactions of economic agents.

In the specification of the behavioural equations, dynamic adjustment processes have been frequently assumed to follow an error-correction model. Specifications have been based in this case on long-run economic relationships between different macro-economic variables such as the relationship between the disposable income of households and private consumption, the relationship between production of firms and labour demand, or the relationship between transactions volume and money demand. Temporary deviations from these long-run equilibrium relationships trigger dynamic adjustment processes by which such "errors" are corrected. This method of equation specification ensures that both short-run and long-run aspects of the behaviour of economic agents are taken into consideration. In this manner, the equations show long-run properties which essentially correspond to the propositions of neo-classical economic theory. The development of a variable depends in the long run on the level, but in the short run also on the changes of its factors of determination.

To estimate the coefficients, seasonally adjusted quarterly data are used for the most part. The statistical properties of the variables are in each case analysed by different unit root and cointegration tests. If the dependent variable is characterised by Y and, furthermore, the independent variable by X and if these variables are integrated and cointegrated, then in many cases the estimation is based on the following error-correction model:10

\[ \ln Y = \alpha_0 + \alpha_1 \ln X + Y_{EC} \]

\[ \Delta \ln Y = \sum_{i=1}^{m} \beta_1 \Delta \ln Y_{-i} + \sum_{j=0}^{n} \beta_{2j} \Delta \ln X_{-j} + \beta_3 Y_{EC_{-4}}. \]

In this equation the difference operator is defined as \( \Delta Y = Y - Y_{-4} \) and the natural logarithm is represented by \( \ln \). The expression \( \Delta \ln Y \) is therefore the relative change in the variable Y against the corresponding quarter of the previous year. The long-run equilibrium is described by the error-correction term EC. The adjustment process is stable if the coefficient \( \beta_3 \) is negative. This coefficient measures to which extent deviations from equilibrium ("errors"), which have

---

arisen in the previous quarter, will be corrected in the current quarter. Beyond that, the velocity of adjustment is influenced by the coefficients $\beta_i$ and $\beta_j$.

Cointegration exists, if the adjustment coefficient $\beta_3$ with the "right" sign is significantly different from zero.

2. Aggregate demand

2.1. Private consumption

Real private consumption expenditure is generally assumed to be proportional to households' real disposable income, thus implying a constant consumption or savings ratio. In the past, however, the development of the consumption ratio has varied from one country to the next. In some countries, such as the USA, the United Kingdom, Italy and Canada, the consumption ratio has increased in recent years. By contrast, in other countries the consumption ratio has remained constant over the long run.

Apart from the indeterminate development of the consumption ratio in the past, tying real consumption expenditures in the long run to real disposable income is not compatible with the steady-state solution of the model, either. In the steady-state, the growth rate of nominal disposable income is equal to nominal GDP growth. The deflator for private consumption is tied to the central price equation of the model. This does not apply to the GDP deflator\(^\text{11}\), which implies that real disposable income is not proportional to real GDP. With real consumption as the main component of GDP, this would lead to an unstable steady-state solution. This necessitated an error-correction mechanism which ensures that real private consumption is proportional to real GDP in the long run.

It is questionable to which extent effects of interest rate changes and the resulting influences of the valuation of assets on consumption behaviour can be estimated empirically. In the long run, real interest rates will be stationary and therefore will have no impact on changes in consumption. The short-run influence of interest rates on consumption behaviour is difficult to determine because the real interest

\(^\text{11}\) The GDP deflator is calculated as the ratio of nominal to real GDP. The deflators of all domestic GDP components are proportional to the overall price deflator of domestic demand, which is the central price in the model. But since import and export price inflation do not coincide with overall inflation, the GDP deflator is not proportional to the price deflator of domestic demand, either.
Consumption ratio from 1981 to 1998

Chart 1

Real private consumption in per cent of real GDP

USA

Japan

Germany

United Kingdom

France

Italy

Canada

Netherlands

Belgium


Deutsche Bundesbank
Consumption equation

Real private consumption per capita

\[ \Delta \ln \left( \frac{\text{CPR}}{\text{WOBE}} \right) = \alpha_0 + \alpha_1 \Delta \ln \left( \frac{100 + \text{YV}}{\text{PCP} + \text{WOBE}} \right) + \alpha_2 + 0.01(\text{RL} - \text{PCPD}) + \alpha_3 \Delta \ln \left( \frac{\text{CPR}_{-1}}{\text{WOBE}_{-1}} \right) + \alpha_4 \Delta \left( \frac{\text{CPR}_{-4}}{\text{BIPR}_{-4}} \right) \]

Estimation period: 1975 / 1 - 1997 / 4
Data base: March 1999

<table>
<thead>
<tr>
<th>Country</th>
<th>( \alpha_0 )</th>
<th>( \alpha_1 )</th>
<th>( \alpha_2 )</th>
<th>( \alpha_3 )</th>
<th>( \alpha_4 )</th>
<th>( R^2 )</th>
<th>DW</th>
</tr>
</thead>
<tbody>
<tr>
<td>USA</td>
<td>-0.01</td>
<td>0.27</td>
<td>-0.14</td>
<td>0.67</td>
<td>-0.03</td>
<td>0.78</td>
<td>1.67</td>
</tr>
<tr>
<td></td>
<td>(0.21)</td>
<td>(3.86)</td>
<td>(2.32)</td>
<td>(9.74)</td>
<td>(0.55)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Japan</td>
<td>-0.06</td>
<td>0.36</td>
<td>-0.13</td>
<td>0.55</td>
<td>-0.12</td>
<td>0.47</td>
<td>1.86</td>
</tr>
<tr>
<td></td>
<td>(1.15)</td>
<td>(4.58)</td>
<td>(1.97)</td>
<td>(7.35)</td>
<td>(1.27)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>United Kingdom(^1)</td>
<td>-0.04</td>
<td>0.31</td>
<td>-0.34</td>
<td>0.48</td>
<td>-0.17</td>
<td>0.70</td>
<td>2.14</td>
</tr>
<tr>
<td></td>
<td>(2.31)</td>
<td>(4.20)</td>
<td>(3.35)</td>
<td>(6.66)</td>
<td>(3.31)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>France</td>
<td>-0.16</td>
<td>0.46</td>
<td>-0.12</td>
<td>0.35</td>
<td>-0.31</td>
<td>0.71</td>
<td>1.53</td>
</tr>
<tr>
<td></td>
<td>(5.91)</td>
<td>(6.47)</td>
<td>(2.03)</td>
<td>(4.70)</td>
<td>(6.08)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Italy</td>
<td>-0.02</td>
<td>0.15</td>
<td>-0.07</td>
<td>0.73</td>
<td>-0.05</td>
<td>0.86</td>
<td>0.53</td>
</tr>
<tr>
<td></td>
<td>(12.17)</td>
<td>(3.53)</td>
<td>(2.33)</td>
<td>(13.06)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Canada</td>
<td>-0.11</td>
<td>0.07</td>
<td>-0.24</td>
<td>0.73</td>
<td>-0.23</td>
<td>0.70</td>
<td>1.90</td>
</tr>
<tr>
<td></td>
<td>(2.39)</td>
<td>(1.20)</td>
<td>(3.19)</td>
<td>(10.83)</td>
<td>(2.63)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Netherlands(^2)</td>
<td>-0.08</td>
<td>0.15</td>
<td>-0.08</td>
<td>0.54</td>
<td>-0.18</td>
<td>0.69</td>
<td>2.34</td>
</tr>
<tr>
<td></td>
<td>(3.18)</td>
<td>(2.82)</td>
<td>(0.90)</td>
<td>(6.64)</td>
<td>(3.43)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Belgium</td>
<td>-0.06</td>
<td>0.04</td>
<td>-0.05</td>
<td>0.84</td>
<td>-0.14</td>
<td>0.84</td>
<td>0.42</td>
</tr>
<tr>
<td></td>
<td>(2.01)</td>
<td>(1.39)</td>
<td>(1.54)</td>
<td>(16.99)</td>
<td>(2.18)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

1 Weighted average of nominal short- and long-term interest rates used.
2 Estimation period: 1979 / 1 - 1997 / 4

BIPR: Real gross domestic product
CPR: Real private consumption
PCP: Price deflator of private consumption
PCPD: Expected inflation rate of private consumption
RL: Yield on government bonds
WOBE: Population
YV: Disposable income of households
\( \Delta \): Difference operator: \( \Delta x = x - x_{-4} \)
\( R^2 \): Adjusted coefficient of determination
DW: Durbin Watson Statistic
t-values below coefficients

Deutsche Bundesbank
rates and the expected inflation rates cannot be observed directly. However, the long-term real interest rate is included into all estimated consumption equations. If real private consumption is expressed as CPR, disposable income as YV, the price deflator and private consumption as PCP, total population as WOBE, the yield on ten-year government bonds as RL and the expected inflation rate as PCPD, then the consumption behaviour of households per capita, taking into account dynamic adjustment to long-run equilibrium, can be described as follows:

$$\Delta \ln \left( \frac{CPR}{WOBE} \right) = \alpha_0 + \alpha_1 \Delta \ln \left( \frac{100 + YV}{PCP + WOBE} \right) + \alpha_2 + 0.01 (RL - PCPD)$$

$$+ \alpha_3 \Delta \ln \left( \frac{CPR_{-1}}{WOBE_{-1}} \right) + \alpha_4 \ln \left( \frac{CPR_{-4}}{BIPR_{-4}} \right)$$

In the long run this is equivalent to

$$\ln (CPR) = -\frac{\alpha_0}{\alpha_4} + \ln (BIPR) - \frac{\alpha_2}{\alpha_4} + 0.01 (RL - PCPD).$$

This implies a constant consumption ratio in the steady-state. The velocity of adjustment is estimated to be low in the USA and Italy and high in France and Canada. The estimates of the long-run semi-interest elasticity of private consumption range from –0.4 in France, Belgium and the Netherlands to more than –4 in the USA, where private financial wealth plays an important role.

The consumption equation for Germany follows a two-step error-correction specification. On top of the influences which were accounted for in the other countries, consumption in Germany is also dependent on net financial wealth of households (NGVH) and transfers from households to foreign countries (VERR). With LN being the net wage income and TRN the transfer payments to households, the consumption equation in Germany is specified as

$$\ln \left( \frac{CPR}{WOBE} \right) = \alpha_0 + \alpha_1 \ln \left( \frac{LN + TRN}{PCP + WOBE} \right) + \left(1 - \alpha_1\right) \ln \left( \frac{GNEH - VERR - 0.25 + 0.4 \times PCPD + NGVH_{-1}}{PCP + WOBE} \right)$$

$$+ \beta_3 (0.01 RL - PCPD) + \beta_4 \Delta \ln \left( \frac{CPR_{-1}}{WOBE_{-1}} \right) + \beta_5 \Delta CPR_{-4}.$$
Labour participation rate from 1981 to 1998

Chart 2

Labour force in per cent of total population

USA

Japan

Germany

United Kingdom

France

Italy

Canada

Netherlands

Belgium

Deutsche Bundesbank
2.2. Labour supply

The consumption expenditure of households is financed in large part by wage income, which makes up more than half of disposable income in all countries. In order to earn wage income households offer their labour services. Labour supply of households, i.e. the total labour force, is proportional to population in the long run, which implies constant participation rates in the long run. In the estimation period they changed considerably, partly for statistical reasons. The adjustment of labour supply to changes in the employable population, by migration for example, is considerably slow, which means participation rates can change over the short to medium term.

In the German block of the model a utility-maximising approach has been specified, where households endeavour to realise the optimal combination of labour and leisure. Apart from the population (and its age structure), real net income per employed person is a determinant for labour supply of households in this country model.

3. Aggregate supply

3.1. Fixed and inventory investment

Real investment expenditure is based on profit-maximising behaviour on the part of firms. It is conveniently assumed that the macro-economic production function can be represented by a Cobb-Douglas production technology. Investment expenditure serves to adjust the real capital stock to its optimal long-run level. Given existing technologies and endowments and a constant real capital stock in the short run, firms determine the profit-maximising allocation of their factors of production.

If the production of goods, i.e. real final demand, is abbreviated as ENDR, the real capital stock as KRP, employment as E1, imported inputs as IMR and a time trend as T, then this leads to the following Cobb-Douglas production function:

\[
ENDR = a_0 e^{\alpha T} \left( KRP^\alpha E1^\beta IMR^\gamma \right) \quad \text{with} \quad \alpha + \beta + \gamma = 1
\]
“Investment ratio” from 1981 to 1998

Chart 3

Real gross private fixed investment in per cent of real final demand

Deutsche Bundesbank
Investment equation

Real private fixed investment

Long-term co-integrated equation

\[ \ln (\text{IANR}) = \alpha_0 + \alpha_1 \ln (\text{ENDR}) + \alpha_2 + 0.01 (\text{RL} - \text{PEVD}) + \text{IANR} \_ \text{EC} \]

Short-term error-correction equation

\[ \Delta \ln (\text{IANR}) = \beta_1 \Delta \ln (\text{ENDR}) + \beta_2 + 0.01 \alpha (\text{RL} - \text{PEVD}) + \beta_3 \Delta \ln (\text{IANR} \_ - 1) + \beta_4 \text{IANR} \_ \text{EC} \_ - 4 \]


Data base: March 1999

<table>
<thead>
<tr>
<th>Country</th>
<th>( \alpha_0 )</th>
<th>( \alpha_1 )</th>
<th>( \alpha_2 )</th>
<th>( \beta_1 )</th>
<th>( \beta_2 )</th>
<th>( \beta_3 )</th>
<th>( \beta_4 )</th>
<th>( R^2 )</th>
<th>( R^2 _ \text{GL} )</th>
<th>DW _ \text{lt}</th>
<th>DW _ \text{st}</th>
</tr>
</thead>
<tbody>
<tr>
<td>USA (^1)</td>
<td>-1.95</td>
<td>0.98</td>
<td>0.66</td>
<td>-0.28</td>
<td>0.66</td>
<td>-0.20</td>
<td>0.90</td>
<td>0.92</td>
<td>0.08</td>
<td>1.02</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(8.14)</td>
<td>(29.96)</td>
<td>(6.51)</td>
<td>(1.63)</td>
<td>(13.86)</td>
<td>(4.89)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Japan (^1)</td>
<td>-1.53</td>
<td>1.00</td>
<td>-1.97</td>
<td>0.56</td>
<td>-0.10</td>
<td>0.67</td>
<td>-0.11</td>
<td>0.18</td>
<td>0.90</td>
<td>0.07</td>
<td>1.57</td>
</tr>
<tr>
<td></td>
<td>(55.41)</td>
<td>(4.71)</td>
<td>(5.85)</td>
<td>(1.08)</td>
<td>(13.07)</td>
<td>(3.54)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Germany</td>
<td>-4.71</td>
<td>1.30</td>
<td>1.21</td>
<td>-0.41</td>
<td>0.49</td>
<td>-0.10</td>
<td>0.88</td>
<td>0.84</td>
<td>2.01</td>
<td>1.80</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(14.68)</td>
<td>(26.58)</td>
<td>(6.97)</td>
<td>(3.05)</td>
<td>(7.47)</td>
<td>(2.70)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>United Kingdom (^1)</td>
<td>-2.31</td>
<td>1.04</td>
<td>-0.30</td>
<td>0.73</td>
<td>-0.15</td>
<td>0.51</td>
<td>-0.29</td>
<td>0.92</td>
<td>0.80</td>
<td>0.27</td>
<td>1.82</td>
</tr>
<tr>
<td></td>
<td>(13.45)</td>
<td>(31.49)</td>
<td>(5.42)</td>
<td>(0.57)</td>
<td>(7.55)</td>
<td>(4.44)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>France (^1)</td>
<td>-1.63</td>
<td>1.00</td>
<td>-0.02</td>
<td>0.49</td>
<td>-0.20</td>
<td>0.67</td>
<td>-0.09</td>
<td>0.16</td>
<td>0.87</td>
<td>0.06</td>
<td>1.60</td>
</tr>
<tr>
<td></td>
<td>(89.66)</td>
<td>(4.41)</td>
<td>(5.57)</td>
<td>(3.61)</td>
<td>(13.26)</td>
<td>(3.96)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Italy (^1)</td>
<td>1.37</td>
<td>0.44</td>
<td>-0.55</td>
<td>0.34</td>
<td>-0.07</td>
<td>0.68</td>
<td>-0.23</td>
<td>0.73</td>
<td>0.88</td>
<td>0.11</td>
<td>0.87</td>
</tr>
<tr>
<td></td>
<td>(7.09)</td>
<td>(14.00)</td>
<td>(3.05)</td>
<td>(4.88)</td>
<td>(0.65)</td>
<td>(14.56)</td>
<td>(4.44)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Canada</td>
<td>-2.93</td>
<td>1.17</td>
<td>-1.00</td>
<td>0.45</td>
<td>-0.83</td>
<td>0.73</td>
<td>-0.15</td>
<td>0.91</td>
<td>0.83</td>
<td>0.09</td>
<td>1.26</td>
</tr>
<tr>
<td></td>
<td>(14.54)</td>
<td>(30.22)</td>
<td>(3.53)</td>
<td>(2.52)</td>
<td>(10.20)</td>
<td>(3.29)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nether-Lands (^2)</td>
<td>-1.80</td>
<td>1.00</td>
<td>1.00</td>
<td>0.50</td>
<td>-0.71</td>
<td>0.00</td>
<td>2.42</td>
<td>0.00</td>
<td>0.29</td>
<td>1.09</td>
<td>2.42</td>
</tr>
<tr>
<td></td>
<td>(246.30)</td>
<td>(5.55)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Belgium</td>
<td>-2.09</td>
<td>0.97</td>
<td>0.44</td>
<td>-0.09</td>
<td>0.80</td>
<td>-0.09</td>
<td>0.67</td>
<td>0.89</td>
<td>0.02</td>
<td>0.43</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(3.84)</td>
<td>(13.80)</td>
<td>(4.47)</td>
<td>(0.41)</td>
<td>(19.41)</td>
<td>(3.88)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

1 Exact specification varies. Please refer to model documentation.

\( \Delta \) Difference operator: \( \Delta x = x - x_{-4} \)

\( R^2 \) Adjusted coefficient of determination

\( DW \) Durbin Watson Statistic

t-values below coefficients

Deutsche Bundesbank
**Investment equation**

Real inventory investment

\[ VR = \alpha_0 + \alpha_1 VR_{-1} + \alpha_2 \Delta ENDR \]

Estimation period: 1975/1 – 1997/4

Data base: March 1999

<table>
<thead>
<tr>
<th>Country</th>
<th>( \alpha_0 )</th>
<th>( \alpha_1 )</th>
<th>( \alpha_2 )</th>
<th>( R^2 )</th>
<th>DW</th>
</tr>
</thead>
<tbody>
<tr>
<td>USA(^1)</td>
<td>0.002</td>
<td>0.60</td>
<td></td>
<td>0.36</td>
<td>1.71</td>
</tr>
<tr>
<td></td>
<td>(2.88)</td>
<td>(7.18)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Japan</td>
<td>0.06</td>
<td>0.49</td>
<td>0.04</td>
<td>0.45</td>
<td>2.30</td>
</tr>
<tr>
<td></td>
<td>(1.35)</td>
<td>(5.82)</td>
<td>(3.84)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Germany</td>
<td>-24.75</td>
<td>0.30</td>
<td>0.05</td>
<td>0.92</td>
<td>2.10</td>
</tr>
<tr>
<td></td>
<td>(16.09)</td>
<td>(2.91)</td>
<td>(2.61)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>United Kingdom</td>
<td>-0.38</td>
<td>0.26</td>
<td>0.12</td>
<td>0.47</td>
<td>2.13</td>
</tr>
<tr>
<td></td>
<td>(3.04)</td>
<td>(2.72)</td>
<td>(5.48)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>France</td>
<td>-1.85</td>
<td>0.55</td>
<td>0.14</td>
<td>0.62</td>
<td>2.23</td>
</tr>
<tr>
<td></td>
<td>(2.83)</td>
<td>(8.20)</td>
<td>(6.30)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Italy</td>
<td>0.46</td>
<td>0.22</td>
<td>0.16</td>
<td>0.50</td>
<td>1.85</td>
</tr>
<tr>
<td></td>
<td>(1.81)</td>
<td>(2.52)</td>
<td>(6.80)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Canada(^1)</td>
<td>0.00</td>
<td>0.70</td>
<td></td>
<td>0.51</td>
<td>2.01</td>
</tr>
<tr>
<td></td>
<td>(0.81)</td>
<td>(9.82)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Netherlands(^2)</td>
<td>0.31</td>
<td>0.24</td>
<td>0.04</td>
<td>0.06</td>
<td>2.06</td>
</tr>
<tr>
<td></td>
<td>(1.36)</td>
<td>(2.26)</td>
<td>(1.16)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Belgium</td>
<td>-0.91</td>
<td>0.81</td>
<td>0.02</td>
<td>0.77</td>
<td>0.44</td>
</tr>
<tr>
<td></td>
<td>(2.26)</td>
<td>(15.22)</td>
<td>(1.46)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

1 Equation: \[ \frac{VR}{ENDR_{-1}} = \alpha_0 + \alpha_1 \frac{VR_{-1}}{ENDR_{-2}} \]

2 Estimation period: 1978/1 – 1997/4

\( VR \) Real inventory investment

\( ENDR \) Real final demand

\( \Delta \) Difference operator: \( \Delta x = x - x_{-4} \)

\( R^2 \) Adjusted coefficient of determination

\( DW \) Durbin Watson Statistic
t-values below coefficients

Deutsche Bundesbank
In this equation $\alpha$ denotes the production elasticity of capital, $\beta$ the production elasticity of labour, $\lambda$ the production elasticity of imported inputs and $\alpha_1$ the autonomous rate of technical growth. Enterprises’ profits ($Q$) result in the model from sales less the usage costs for the factors of production, i.e. labour, capital and imported inputs. With sales prices being abbreviated as $PEV$, the wage rate as $LA$, the number of employed persons as $E1$, the user costs of capital as $CC$ and import prices as $PIM$, profits can be defined as:

$$Q = ENDR \times PEV \times (1 - 0.01 \times TISS) - E1 \times LA - KRP \times CC - IMR \times PIM.$$

This takes into account the fact that the average indirect tax rate $TISS$ is levied on sales. From the profit-maximising behaviour of firms it follows that the marginal return of capital has to be equal to its marginal costs:

$$\frac{\partial ENDR}{\partial KRP} = \alpha \frac{ENDR}{KRP} \frac{CC}{PEV(1 - 0.01 \times TISS)}.$$

The long-run optimal stock of real capital then follows from:

$$KRP = \alpha \frac{ENDR}{PEV(1 - 0.01 \times TISS)} \frac{CC}{CC}.$$

The user costs of capital comprise the expected long-term real interest rate after taxes, the depreciation rate, the investment prices and a risk premium. The optimal stock of capital increases with higher production or sales, and it decreases with higher user costs of capital.

In the theoretical framework set out above, there is a problem regarding statistical underpinning. The available data provides no evidence of a long-run effect of the user costs of capital on the capital stock. It follows from above that the change in the capital stock is linearly dependent on final demand. The long-term investment function is thus estimated as:

$$\ln(IANR) = \alpha_0 + \alpha_1 \ln(ENDR) + \alpha_2 \times 0.01 (RL - PEVD) + IANR \_EC,$$

12 The inclusion of all imports in the profit function implies that only firms are importing goods and services. Although there is a small amount of imports by households, most imports are likely to be carried out through dealers who belong to the business sector.
with the user costs of capital approximated by real long-term interest rates. In some cases the coefficient $\alpha_1$ has been restricted to 1. The estimated values range from 0.44 for Italy to 1.30 for Germany.

The short-run adjustment to equilibrium values takes the influence of long-term real interest rates into account, too. This leads to the following error-correction equation:

$$\Delta \ln (\ln (\ln (\text{PEVD})) - \beta_0 + \beta_1 \Delta \ln (\ln (\text{IANR}))) + \beta_2 \Delta \ln (\ln (\ln (\text{IANR}))) + \beta_3 \Delta \ln (\ln (\text{IANR}))) + \beta_4 \Delta \ln (\ln (\text{IANR})).$$

Real inventory investments depend dynamically on the quarter-on-quarter changes in real final demand:

$$VR = \alpha_0 + \alpha_1 \Delta \text{ENDR} + \alpha_2 \Delta \text{ENDR}.$$  

It was not possible to estimate empirically any effect of the user costs of capital or of the interest rate development.

Firms react to economic fluctuations through pro-cyclical changes in their stock of inventories. If real final demand rises, they increase their inventories in order to react flexibly to variations in sales when the demand increases. Theoretically, anti-cyclical reactions are also conceivable, where the stock of inventories is initially be reduced with production unchanged, because it is uncertain whether a sudden increase in demand is temporary or permanent.

3.2. Employment

From the assumptions regarding production technology and behaviour of firms it follows that the relationship between labour income and sales proceeds, which can be interpreted as "wage share" with respect to final demand\footnote{The wage share used here is different from the usual definition which is the ratio of gross wage income to national income.}, is constant in the long run. The "wage share" calculated in this manner is relatively stable over shorter time periods in most countries.\footnote{Data for Germany are not seasonally adjusted and therefore vary considerably over the short term.} In accordance with the profit-maximising behaviour of firms, the optimal demand for labour results from the marginal productivity condition, implying that the marginal return from labour input has to
be equal to its marginal cost. If the number of employed persons is $E_1$, the production of goods, i.e. real final demand, $ENDR$, sales prices $PEV$ and gross wage income per employed person $LA$, it holds under these assumptions that

$$\frac{\partial ENDR}{\partial E_1} = \frac{LA}{PEV(1 - 0.01 \times TISS)} = \beta \frac{ENDR}{E_1}.$$

The production elasticity of labour, or the long-run "wage share" $\beta$, is assumed to be constant in this equation. The labour demand equation then is

$$E_1 = \beta \frac{ENDR}{PEV(1 - 0.01 \times TISS)} \times LA.$$

An indirect tax rate $TISS$ is levied on production revenues. An increase in indirect taxes leads, ceteris paribus, to a reduction in employment. The estimation is based on the following long-run labour demand equation

$$\ln (E_1) = \alpha_0 + \alpha_1 \ln (ENDR) + \alpha_2 \ln \left( \frac{PEV(1 - 0.01 \times TISS)}{LA} \right) + E_{1,EC}.$$

The restriction $\alpha_1 = \alpha_2$ which is derived from production theory can only partly be assumed to hold. The estimated values for $\alpha_1$ lie between 0.2 for France and Italy and 0.8 for the USA. The estimated long-run real wage elasticity of labour demand is slightly lower in most cases. The dynamic adjustment to long-run optimal labour demand follows an error-correction equation

$$\Delta \ln (E_1) = \beta_1 \Delta \ln (ENDR) + \beta_2 \Delta \ln \left( \frac{PEV(1 - 0.01 \times TISS)}{LA} \right) + \beta_3 \Delta \ln \left( E_1 \right) + \beta_4 E_{1,EC,-4}.$$

The interdependence between labour supply and demand in this form is merely given through wages. But wages will only eliminate any discrepancy between supply and demand if labour markets work properly. In some industrial countries unemployment has risen considerably over the past two decades. It is widely argued that wages are only a small factor in that development. It would therefore be inappropriate to model wages as a function of the unemployment rate itself. For that reason the model uses the deviations from an exponentially smoothed unemployment rate as the determining factor of wages. In order to avoid an
"Wage share" from 1981 to 1998

Gross wage income in per cent of nominal final demand

USA

Japan

Germany

United Kingdom

France

Italy

Canada

Netherlands

Belgium

Deutsche Bundesbank
Labour demand equation

Table 9

Number of employed persons

Long-term co-integrated equation
\[ \ln (EI) = \alpha_0 + \alpha_1 \ln (ENDR) + \alpha_2 \ln (PEVLA) + \varepsilon_{\text{EC}_{1E}} \]

Short-term error-correction equation
\[ \Delta \ln (EI) = \beta_1 \Delta \ln (ENDR) + \beta_2 \Delta \ln (PEVLA) + \beta_3 \Delta \ln \left( \text{PEV}_{t-1} \right) + \beta_4 \Delta \varepsilon_{\text{EC}_{1E-4}} \]

Data base: March 1999

<table>
<thead>
<tr>
<th>Country</th>
<th>( \alpha_0 )</th>
<th>( \alpha_1 )</th>
<th>( \alpha_2 )</th>
<th>( \beta_1 )</th>
<th>( \beta_2 )</th>
<th>( \beta_3 )</th>
<th>( \beta_4 )</th>
<th>( R^2_{\text{lt}} )</th>
<th>( R^2_{\text{st}} )</th>
<th>DW_{\text{lt}}</th>
<th>DW_{\text{st}}</th>
</tr>
</thead>
<tbody>
<tr>
<td>USA</td>
<td>-1.27</td>
<td>0.82</td>
<td>0.72</td>
<td>0.39</td>
<td>0.24</td>
<td>0.45</td>
<td>-0.21</td>
<td>0.99</td>
<td>0.98</td>
<td>0.32</td>
<td>1.14</td>
</tr>
<tr>
<td>Japan</td>
<td>2.70</td>
<td>0.30</td>
<td>0.09</td>
<td>0.64</td>
<td>-0.22</td>
<td></td>
<td></td>
<td>0.99</td>
<td>0.92</td>
<td>0.25</td>
<td>2.12</td>
</tr>
<tr>
<td>Germany</td>
<td>-0.99</td>
<td>0.52</td>
<td>0.72</td>
<td>0.17</td>
<td>0.24</td>
<td>0.55</td>
<td>-0.29</td>
<td>0.98</td>
<td>0.97</td>
<td>0.41</td>
<td>1.50</td>
</tr>
<tr>
<td>United</td>
<td>1.13</td>
<td>0.40</td>
<td>0.40</td>
<td>0.11</td>
<td>0.08</td>
<td>0.80</td>
<td>-0.10</td>
<td>0.67</td>
<td>0.96</td>
<td>0.10</td>
<td>1.09</td>
</tr>
<tr>
<td>Kingdom</td>
<td>(7.51)</td>
<td>(13.85)</td>
<td>(7.43)</td>
<td>(5.74)</td>
<td>(27.70)</td>
<td>(3.79)</td>
<td></td>
<td>0.85</td>
<td>0.75</td>
<td>0.08</td>
<td>0.35</td>
</tr>
<tr>
<td>France</td>
<td>1.79</td>
<td>0.19</td>
<td>0.13</td>
<td>0.19</td>
<td>0.13</td>
<td>0.39</td>
<td>-0.35</td>
<td>0.85</td>
<td>0.75</td>
<td>0.08</td>
<td>0.35</td>
</tr>
<tr>
<td>Italy</td>
<td>1.80</td>
<td>0.21</td>
<td>0.18</td>
<td>0.20</td>
<td>0.13</td>
<td>0.44</td>
<td>-0.24</td>
<td>0.29</td>
<td>0.34</td>
<td>0.08</td>
<td>0.71</td>
</tr>
<tr>
<td>Canada</td>
<td>-0.72</td>
<td>0.61</td>
<td>0.23</td>
<td>0.26</td>
<td>0.09</td>
<td>0.59</td>
<td>-0.07</td>
<td>0.96</td>
<td>0.94</td>
<td>0.05</td>
<td>1.43</td>
</tr>
<tr>
<td>Nether</td>
<td>-0.78</td>
<td>0.47</td>
<td>0.12</td>
<td>0.28</td>
<td>0.12</td>
<td>-0.83</td>
<td></td>
<td>0.99</td>
<td>0.93</td>
<td>0.46</td>
<td>0.69</td>
</tr>
<tr>
<td>lands</td>
<td>(8.80)</td>
<td>(26.41)</td>
<td>(5.01)</td>
<td>(7.62)</td>
<td>(2.72)</td>
<td>(7.39)</td>
<td></td>
<td>0.99</td>
<td>0.93</td>
<td>0.46</td>
<td>0.69</td>
</tr>
<tr>
<td>Belgium</td>
<td>-0.16</td>
<td>-0.003</td>
<td>0.98</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0.99</td>
<td>0.99</td>
<td>0.10</td>
<td></td>
</tr>
</tbody>
</table>

1 Total hours worked
3 Equation: \( \ln (E_t) = \beta_1 + \beta_2 T + \beta_3 \ln (E_{t-1}) + \left( 1 - \beta_3 \right) \ln (ENDR + PEVLA) \)

\[ E_{t-1} \] Number of employed persons
\[ \Delta \] Difference operator: \( \Delta x = x_t - x_{t-4} \)
\[ R^2 \] Adjusted coefficient of determination
\[ DW \] Durbin Watson Statistic
\[ t \] t-values below coefficients

Deutsche Bundesbank
excess demand situation with negative unemployment there is an additional term in the above equation, which reduces labour demand in such a situation.\textsuperscript{15}

The adjustment of actual employment to long-run optimal labour demand, which is determined by the level of production, real wages and indirect taxation, is relatively sluggish in many cases. This may be due to the fact that firms react to changes in production or demand initially by adjusting average working hours, such as overtime hours, before adjusting the number of employed persons. However, statistical data on working hours are not available for all countries. In the model for Germany the distribution of labour demand on the number of employed persons and the average working time has been specified separately. Considerable rigidities on the labour market are caused by institutional regulations, such as those governing protection against dismissal, and by considerable adjustment costs with respect to the recruitment, training and dismissal of employees.

3.3. Imports

The import equation has been specified as a factor demand equation similar to the investment equation and the employment equation described in the previous sections. It results from the assumed production technology and the optimisation behaviour of firms, which implies that the marginal product of imported inputs has to be equal to its marginal costs. If real imports are denoted by $IMR$, real final demand by $ENDR$, import prices by $PIM$ and the price deflator of final demand by $PEV$, then

$$\frac{\partial ENDR}{\partial IMR} = \gamma ENDR IMR \frac{PIM ENDR}{PEV(t - 0.01 \times TISS)}$$

Under these conditions the long-run optimal value of imports is given by

$$IMR = \gamma ENDR \frac{PEV(t - 0.01 \times TISS)}{PIM}.$$  

\textsuperscript{15} The exact term is $\min(0, \lambda \cdot \ln(\frac{0.97 EW}{E1})), where EW is labour supply and $\lambda$ is an adjustment factor which in most countries equals unity.
"Import ratio" from 1981 to 1998

Real imports of goods and services in per cent of real final demand

Chart 5

Deutsche Bundesbank
### Import equation

Table 10
Real imports of goods and services

**Long-term co-integrated equation**
\[
\ln(\text{IMR}) = \alpha_0 + \alpha_1 \ln(\text{ENDR}) + \alpha_2 \ln(\text{PEVPIM}) + \text{IMR}_{-EC}
\]

**Short-term error-correction equation**
\[
\Delta \ln(\text{IMR}) = \beta_1 \Delta \ln(\text{ENDR}) + \beta_2 \Delta \ln(\text{PEVPIM}) + \beta_4 \Delta \ln(\text{IMR}_{-1}) + \beta_4 \ln(\text{IMR}_{-EC-4})
\]


Data base: March 1999

<table>
<thead>
<tr>
<th>Country</th>
<th>$\alpha_0$</th>
<th>$\alpha_1$</th>
<th>$\alpha_2$</th>
<th>$\beta_1$</th>
<th>$\beta_2$</th>
<th>$\beta_3$</th>
<th>$\beta_4$</th>
<th>$R^2_{lt}$</th>
<th>$R^2_{st}$</th>
<th>$DW_{lt}$</th>
<th>$DW_{st}$</th>
</tr>
</thead>
<tbody>
<tr>
<td>USA</td>
<td>-2.20</td>
<td>1.00</td>
<td>1.58</td>
<td>1.13</td>
<td>0.30</td>
<td>0.47</td>
<td>-0.09</td>
<td>0.85</td>
<td>0.91</td>
<td>0.19</td>
<td>1.35</td>
</tr>
<tr>
<td></td>
<td>(143.73)</td>
<td>(23.30)</td>
<td>(7.59)</td>
<td>(4.20)</td>
<td>(8.36)</td>
<td>(2.19)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Japan</td>
<td>-2.46</td>
<td>1.00</td>
<td>0.30</td>
<td>0.38</td>
<td>0.06</td>
<td>0.70</td>
<td>-0.20</td>
<td>0.40</td>
<td>0.86</td>
<td>0.08</td>
<td>1.55</td>
</tr>
<tr>
<td></td>
<td>(197.59)</td>
<td>(8.07)</td>
<td>(2.87)</td>
<td>(1.78)</td>
<td>(11.12)</td>
<td>(4.13)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Germany</td>
<td>-1.84</td>
<td>1.04</td>
<td>1.04</td>
<td>0.33</td>
<td>0.33</td>
<td>0.59</td>
<td>-0.21</td>
<td>0.95</td>
<td>0.78</td>
<td>0.16</td>
<td>1.95</td>
</tr>
<tr>
<td></td>
<td>(5.31)</td>
<td>(18.96)</td>
<td>(5.03)</td>
<td>(9.53)</td>
<td>(4.19)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>United Kingdom</td>
<td>$\beta_0$: -0.35</td>
<td>$\beta_5$: -0.07</td>
<td>0.29</td>
<td>0.27</td>
<td>1.58</td>
<td>0.27</td>
<td>1.58</td>
<td>0.82</td>
<td>1.54</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(3.59)</td>
<td>(1.16)</td>
<td>(4.79)</td>
<td>(5.08)</td>
<td>(10.04)</td>
<td>(5.08)</td>
<td>(10.04)</td>
<td>(10.04)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>France</td>
<td>0.15</td>
<td>0.003</td>
<td>0.71</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0.60</td>
<td>1.47</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(2.06)</td>
<td>(0.09)</td>
<td>(11.36)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Italy</td>
<td>-5.23</td>
<td>1.57</td>
<td>0.22</td>
<td>1.73</td>
<td>0.05</td>
<td>0.07</td>
<td>-0.52</td>
<td>0.98</td>
<td>0.86</td>
<td>0.44</td>
<td>1.00</td>
</tr>
<tr>
<td></td>
<td>(14.31)</td>
<td>(25.97)</td>
<td>(3.82)</td>
<td>(11.23)</td>
<td>(0.84)</td>
<td>(1.06)</td>
<td>(5.59)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Canada</td>
<td>-1.52</td>
<td>1.00</td>
<td>0.48</td>
<td>0.68</td>
<td>0.60</td>
<td>-0.37</td>
<td></td>
<td>0.72</td>
<td>0.85</td>
<td>0.29</td>
<td>1.21</td>
</tr>
<tr>
<td></td>
<td>(209.22)</td>
<td>(2.12)</td>
<td>(5.87)</td>
<td>(6.00)</td>
<td>(4.90)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nether-Lands</td>
<td>-1.11</td>
<td>1.00</td>
<td>0.67</td>
<td>1.31</td>
<td>0.20</td>
<td>0.09</td>
<td>-0.39</td>
<td>0.78</td>
<td>0.94</td>
<td>0.26</td>
<td>1.23</td>
</tr>
<tr>
<td></td>
<td>(135.90)</td>
<td>(16.71)</td>
<td>(14.83)</td>
<td>(4.28)</td>
<td>(1.63)</td>
<td>(6.11)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Belgium</td>
<td>-0.94</td>
<td>1.00</td>
<td>0.66</td>
<td>0.91</td>
<td>0.14</td>
<td>0.45</td>
<td>-0.04</td>
<td>0.35</td>
<td>0.94</td>
<td>0.02</td>
<td>0.31</td>
</tr>
<tr>
<td></td>
<td>(97.59)</td>
<td>(7.16)</td>
<td>(9.26)</td>
<td>(2.97)</td>
<td>(7.63)</td>
<td>(1.53)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

1 Equation: $\Delta \ln(\text{IMR}) = \beta_0 + \beta_1 \Delta \ln(\text{IMR}_{-1}) + \beta_2 \Delta \ln(\text{PEVPIM}) + \beta_3 \Delta \ln(\text{IMR}_{-EC})$

2 Equation: $\Delta \ln(\text{IMR}) = \beta_1 \Delta \ln(\text{PEVPIM}) + \beta_2 \Delta \ln(\text{IMR}_{-1}) + \beta_3 \ln(\text{PEVPIM}_{-4}) + \beta_4 \ln(\text{IMR}_{-EC-4})$


<table>
<thead>
<tr>
<th>ENDR</th>
<th>Real final demand</th>
<th>TISS</th>
<th>Indirect tax rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>EXR</td>
<td>Real exports</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
| IMR  | Real imports      | $\Delta$ | $
| PEV  | Price deflator of final demand | $\Delta$ | Adjusted coefficient of determination |
| PEVPIM | Price ratio between domestic demand deflator and import price deflator, defined as: | $\Delta$ | Durbin Watson Statistic |
| PIM  | Price deflator of imports | $\Delta$ | t-values below coefficients |

Deutsche Bundesbank
The parameter $\gamma$ represents the production elasticity of imported inputs. It is equal to the average "import ratio", with respect to real final demand, which has, however, increased in most countries. The import ratio in the past has been between around 10% for the USA and Japan and more than 40% for Belgium.

The estimation of the long-run import equation is based on the following specification:

$$\ln(\text{IMR}) = \alpha_0 + \alpha_1 \ln(\text{ENDR}) + \alpha_2 \ln\left(\frac{\text{PEV} \ast (1 - 0.01 \ast \text{TISS})}{\text{PIM}}\right) + \text{IMR}_{-\text{EC}}$$

Nevertheless, in most countries a unit elasticity of imports with respect to final demand, i.e. $\alpha_1 = 1$, is required for feasible long-run solutions. The estimated relative import price elasticities range from 0.2 in Italy to 1.6 in the United States.

The development of actual real imports adjusts in an error-correction process to the long-run optimal import level as follows:

$$\Delta \ln(\text{IMR}) = \beta_1 \Delta \ln(\text{ENDR}) + \beta_2 \Delta \ln\left(\frac{\text{PEV} \ast (1 - 0.01 \ast \text{TISS})}{\text{PIM}}\right) + \beta_3 \Delta \ln(\text{IMR}_{-\text{EC}}) + \beta_4 \text{IMR}_{-4}$$

The adjustment process has been estimated to be relatively slow in the USA and Belgium and relatively rapid in Italy, the Netherlands and Canada.

3.4. Potential gross domestic product and rate of capacity utilisation

Aggregate supply in the economy is represented by potential gross domestic product. Potential GDP is determined through labour supply, the capital stock and the level of technical progress. In MEMMOD this is modelled with a Cobb-Douglas production function, containing labour and capital as well as an autonomous rate of technical growth.

The following equation is used to determine potential GDP (BIPQ), where EW stands for the labour force, KRP for the capital stock and T for a time trend:

$$\text{BIPQ} = \alpha_0 \left[ e^{(\alpha_1 + \alpha_2 \ast T)} \left(1 + (\text{ARLQ} - \text{ARLQN}) \ast \text{EW}^{\alpha_3} \ast \text{KRP}^{(1 - \alpha_4)}\right)\right]$$
Production function

Real GDP and potential real GDP

\[ \text{BIPQ} = \alpha_0 \cdot \exp \left[ \alpha_1 + \alpha_2 0.01T + \alpha_3 \ln \left( \text{E1} + 0.01(\text{ARLQ} - \text{ARLQN}) + \text{EW} \right) + (1-\alpha_3) \ln (\text{KRP}_{-1}) \right] \]

Estimation period: 1974 / 1 – 1998 / 4
Data base: March 1999

<table>
<thead>
<tr>
<th>Country</th>
<th>(\alpha_0)</th>
<th>(\alpha_1)</th>
<th>(\alpha_2)</th>
<th>(\alpha_3)</th>
<th>(R^2)</th>
<th>DW</th>
</tr>
</thead>
<tbody>
<tr>
<td>USA</td>
<td>0.92</td>
<td>0.99</td>
<td>0.14</td>
<td>0.63</td>
<td>0.91</td>
<td>0.26</td>
</tr>
<tr>
<td></td>
<td>(211.03)</td>
<td>(32.55)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Japan</td>
<td>1.00</td>
<td>-0.72</td>
<td>0.12</td>
<td>0.59</td>
<td>0.72</td>
<td>0.14</td>
</tr>
<tr>
<td></td>
<td>(85.17)</td>
<td>(16.14)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Germany</td>
<td>1.00</td>
<td>-2.94</td>
<td>0.23</td>
<td>0.49</td>
<td>0.83</td>
<td>0.27</td>
</tr>
<tr>
<td></td>
<td>(163.32)</td>
<td>(12.24)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>United Kingdom</td>
<td>1.00</td>
<td>0.05</td>
<td>0.32</td>
<td>0.66</td>
<td>0.94</td>
<td>0.18</td>
</tr>
<tr>
<td></td>
<td>(5.42)</td>
<td>(39.96)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>France</td>
<td>0.93</td>
<td>1.23</td>
<td>0.23</td>
<td>0.62</td>
<td>0.98</td>
<td>0.39</td>
</tr>
<tr>
<td></td>
<td>(335.33)</td>
<td>(69.72)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Italy</td>
<td>0.86</td>
<td>0.17</td>
<td>0.16</td>
<td>0.50</td>
<td>0.90</td>
<td>0.37</td>
</tr>
<tr>
<td></td>
<td>(24.09)</td>
<td>(22.84)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Canada</td>
<td>0.92</td>
<td>0.99</td>
<td>0.05</td>
<td>0.61</td>
<td>0.00</td>
<td>0.05</td>
</tr>
<tr>
<td></td>
<td>(334.84)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Netherlands(^1)</td>
<td>0.93</td>
<td>1.05</td>
<td>0.14</td>
<td>0.60</td>
<td>0.41</td>
<td>0.26</td>
</tr>
<tr>
<td></td>
<td>(60.62)</td>
<td>(7.73)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Belgium(^1)</td>
<td>0.90</td>
<td>2.74</td>
<td>0.11</td>
<td>0.60</td>
<td>0.87</td>
<td>0.33</td>
</tr>
<tr>
<td></td>
<td>(540.78)</td>
<td>(25.32)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

1 Estimation period: 1978 / 1 – 1998 / 4
2 Estimation period: 1975 / 1 – 1998 / 4

<table>
<thead>
<tr>
<th>ARLQ</th>
<th>Unemployment rate</th>
<th>(\alpha_0)</th>
<th>Scale parameter</th>
</tr>
</thead>
<tbody>
<tr>
<td>ARLQN</td>
<td>&quot;Smoothed&quot; unemployment rate</td>
<td>(\alpha_1)</td>
<td>Level parameter</td>
</tr>
<tr>
<td>BIPQ</td>
<td>Potential real GDP</td>
<td>(\alpha_2)</td>
<td>Technical progress per quarter</td>
</tr>
<tr>
<td>E1</td>
<td>Employment</td>
<td>(\alpha_3)</td>
<td>Average wage ratio</td>
</tr>
<tr>
<td>EW</td>
<td>Labour force</td>
<td>(R^2)</td>
<td>Adjusted coefficient of determination</td>
</tr>
<tr>
<td>KRP</td>
<td>Real capital stock</td>
<td>DW</td>
<td>Durbin Watson Statistic</td>
</tr>
<tr>
<td>T</td>
<td>Time trend</td>
<td>t-values below coefficients</td>
<td></td>
</tr>
</tbody>
</table>

Deutsche Bundesbank
Unemployment rate from 1981 to 1998

Chart 6

- - - - Actual unemployment rate
- - - - Smoothed unemployment rate
- - - - Difference between actual and smoothed unemployment rate

USA

Japan

Germany

United Kingdom

France

Italy

Canada

Netherlands

Belgium

Deutsche Bundesbank
Output gap from 1981 to 1998

Chart 7

USA

Japan

Germany

United Kingdom

France

Italy

Canada

Netherlands

Belgium

Deutsche Bundesbank
As a consequence of hysteresis effects, it is assumed that only the part of the unemployed which exceeds the long-term trend may be counted as part of the potential labour force. The estimated rate of technical progress ranges between 0.2 % p.a. in Canada and 1.3 % p.a. in the United Kingdom. The elasticity of substitution between the factors of production is equal to one. The distribution parameter $\alpha$, has been calibrated on the basis of the labour income shares ranging from 0.5 for Italy to 0.66 for the United Kingdom.

The discrepancy between aggregate supply and demand is expressed through the rate of capacity utilisation, defined as

$$\text{GAP}_Q = 100 \times \frac{\text{BIP}_R}{\text{BIP}_Q}.$$  

From this the output gap can easily be calculated.

In its role as the key indicator of equilibrium, the rate of capacity utilisation enters the Phillips curve relationship in the inflation equation. It is furthermore used for the counter-cyclical specification of fiscal expenditures.

4. Factor costs and prices

4.1. Wages

Over the long term, the theoretical wage development takes full account of price inflation and also productivity gains, which can be attributed to labour. In the short term labour market discrepancies exert an additional influence. Classical theory suggests that the wage rate effectively clears the labour market and thus ensures a long-run equilibrium with unemployment equal to the "natural rate". The idea of a natural rate is being increasingly disputed, though, since unemployment has risen considerably in the last two decades in some countries. It is certainly questionable whether this rise in unemployment can be fully attributed to adverse wage developments. Of course, wages are still a key determinant of labour market developments, and vice versa. The particular influence of labour market discrepancies on wage developments, however, are more likely to occur in the form of trend deviations. The trend, or "smoothed" unemployment $\text{ARLQN}$ takes the form
where $\theta$ is the smoothing parameter, which is set equal to 0.9. The wage equation can then be formulated as

$$
\Delta \ln (LA) = \alpha_0 + \alpha_1 \Delta \ln (LA_{-1}) + (1 - \alpha_1) \Delta \ln (PCP) + \alpha_2 \lambda \Delta \ln (BIPQ) \\
+ \alpha_3 \Delta 0.01 (ARLQ - ARLQN) + \alpha_4 0.01 (ARLQ - ARLQN).
$$

BIPQ is potential output, which is multiplied by the share of labour in total production costs, in order to approximate the productivity gains attributable to labour in its role as a factor of production.

4.2. Production costs

The index of production costs, COSI, is determined by a weighted average of labour and import costs, reflected by wages (LA) and import prices (PIM), respectively. The weights $\lambda_1$ and $\lambda_2$ therefore represent the share of the two factors in the production process. The index of production costs can then be calculated as

$$
\text{COSI} = \frac{\text{LA}^{\lambda_1} \text{PIM}^{\lambda_2} - 100}{\text{COSI}_{\text{base}}}.
$$

4.3. Price inflation

The central price equation in the model refers to the price deflator of domestic demand (PINV). In the short run, prices are influenced by changes in production costs and the level of capacity utilisation. The rate of inflation is anchored to an explicit target rate of inflation (INFT). But the impact of this target rate on current inflation is realised through expectation formation. In the euro area countries, the inflation target is also incorporated in the area-wide equilibrium price level P-star (PSM3).

16 Since capital costs are difficult to capture, labour and imports are assumed to be the only factors of production. Let $\mu_1$, $\mu_2$, and $\mu_3$ be the “true” shares of labour, imports and capital, respectively, in the production process. In order to represent the total production costs as a function of two factors, the ratios for labour and imports, $\lambda_1$ and $\lambda_2$, have to be defined as

$$
\lambda_1 = \frac{\mu_1}{\mu_1 + \mu_2}, \quad \lambda_2 = \frac{\mu_2}{\mu_1 + \mu_2}.
$$

17 The last factor represents an adjustment to the base year of the production cost index.

18 The equilibrium price level PSM3 is derived from the European demand for the monetary aggregate M3 (see section 6 for more detail).
Wage equation

Gross wage income per employee

\[ \Delta \ln (LA) = \alpha_0 + \alpha_1 \Delta \ln (LA_{-1}) + (1 - \alpha_2) \Delta \ln PCP + \alpha_2 \lambda \Delta \ln \left( BIPQ \right) + \alpha_3 0.01 \Delta \left( ARLQ - ARLQN \right) + \alpha_4 0.01 \left( ARLQ_{-4} - ARLQN_{-4} \right) \]

Estimation period: 1975 / 1 – 1997 / 4
Data base: March 1999

<table>
<thead>
<tr>
<th>Country</th>
<th>( \alpha_0 )</th>
<th>( \alpha_1 )</th>
<th>( \alpha_2 )</th>
<th>( \alpha_3 )</th>
<th>( \alpha_4 )</th>
<th>( \lambda )</th>
<th>( \beta )</th>
<th>( R^2 )</th>
<th>DW</th>
</tr>
</thead>
<tbody>
<tr>
<td>USA</td>
<td>0.001</td>
<td>0.83</td>
<td>-0.15</td>
<td>-0.15</td>
<td></td>
<td></td>
<td>0.74</td>
<td>1.64</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(1.0)</td>
<td>(15.56)</td>
<td>(3.08)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Japan</td>
<td>0.31</td>
<td>0.64</td>
<td>0.52</td>
<td>0.80</td>
<td></td>
<td></td>
<td>0.98</td>
<td>1.67</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(5.36)</td>
<td>(10.29)</td>
<td>(7.41)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Germany</td>
<td>0.91</td>
<td>-0.31</td>
<td>-0.17</td>
<td></td>
<td></td>
<td></td>
<td>0.89</td>
<td>1.74</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(25.48)</td>
<td>(3.51)</td>
<td>(3.33)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>United Kingdom</td>
<td>0.002</td>
<td>0.80</td>
<td>-0.41</td>
<td>-0.20</td>
<td></td>
<td></td>
<td>0.56</td>
<td>1.22</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.95)</td>
<td>(2.55)</td>
<td>(1.86)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>France</td>
<td>0.75</td>
<td>0.25</td>
<td>-0.01</td>
<td>0.71</td>
<td></td>
<td></td>
<td>0.77</td>
<td>1.68</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(16.33)</td>
<td>(0.63)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Italy</td>
<td>0.77</td>
<td>0.21</td>
<td>0.05</td>
<td>0.84</td>
<td></td>
<td></td>
<td>0.99</td>
<td>1.55</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(11.74)</td>
<td>(3.20)</td>
<td>(1.26)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Canada</td>
<td>0.001</td>
<td>0.74</td>
<td>-0.33</td>
<td>-0.33</td>
<td></td>
<td></td>
<td>0.65</td>
<td>2.40</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.75)</td>
<td>(12.13)</td>
<td>(3.65)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Netherlands</td>
<td>0.44</td>
<td>-0.41</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0.81</td>
<td>0.93</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(7.13)</td>
<td>(4.53)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Belgium</td>
<td>0.001</td>
<td>0.87</td>
<td>0.13</td>
<td>-0.16</td>
<td>0.47</td>
<td></td>
<td>0.88</td>
<td>0.42</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(1.05)</td>
<td>(25.44)</td>
<td>(2.67)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

1 Equation: \( \Delta \ln (LA) = \alpha_1 \Delta \ln (LA_{-1}) + \alpha_2 \Delta \ln \left( LAS \right) + \alpha_4 \ln \left( \frac{LAS_{-4}}{LA_{-4}} \right) \)

2 Estimation period: 1978 / 2 – 1997 / 4

<table>
<thead>
<tr>
<th>ARLQ</th>
<th>Unemployment rate</th>
<th>PCP</th>
<th>Deflator of private consumption</th>
</tr>
</thead>
<tbody>
<tr>
<td>ARLQN &quot;Smoothed&quot; unemployment rate</td>
<td>( \beta )</td>
<td>Long-term elasticity of real wages with respect to labour productivity</td>
<td></td>
</tr>
<tr>
<td>E1</td>
<td>Employment</td>
<td></td>
<td>Average labour share in output</td>
</tr>
<tr>
<td>ENDR</td>
<td>Real final demand</td>
<td>( \lambda )</td>
<td>Difference operator: ( \Delta x = x - x_{-4} )</td>
</tr>
<tr>
<td>LA</td>
<td>Gross wage income per employee</td>
<td>( \Delta )</td>
<td>Adjusted coefficient of determination</td>
</tr>
<tr>
<td>LAS</td>
<td>Long-term income: ( LAS = PCP \left( \frac{ENDR}{ET} \right)^{\beta \lambda} )</td>
<td>( R^2 )</td>
<td>Durbin Watson Statistic</td>
</tr>
<tr>
<td></td>
<td></td>
<td>DW</td>
<td>t-values below coefficients</td>
</tr>
</tbody>
</table>

Deutsche Bundesbank
Modelling price inflation in the euro area countries follows the idea that real influences are the source of inflation at the national level only. Simply speaking, there is no apparent reason why, for instance, wage developments in Belgium should have any direct impact on prices in Italy. Monetary inflation, on the other hand, can only be formulated at the euro area aggregate level, because after the introduction of the euro it will be impossible to formulate a meaningful national money demand equation. This dualism therefore serves not only to draw a distinction between real and monetary factors of inflation. It also provides the synthesis between national and area-wide influences on inflation.

The key requirement for using the P-star concept to model monetary inflation is a stable money demand equation. Section 6 (and indeed a number of recent studies) will show that this is the case in the euro area. There is relatively scant evidence of the impact of P-star on domestic prices. Germany was the only country where P-star exerts a significant effect on inflation. For that reason, the influence of P-star has not been incorporated in the inflation equations of the countries outside the euro area. The lack of evidence in the euro area countries other than Germany is based on national price gaps\(^{19}\), based on national money demand equations. However, there is evidence of the impact of P-star on prices at the aggregate level\(^{20}\), which is still difficult to quantify at this early stage of monetary union.

Let \(\text{INF}\) be the rate of national inflation, \(\text{COSI}\) the index of production costs, \(\text{TISS}\) the indirect tax rate, \(\text{GAPQ}\) the rate of capacity utilisation, i.e. the output gap, \(\text{PINV}\) the national price level, \(\text{INFT}\) the target rate of inflation and \(\text{PSM3}\) the equilibrium price level.\(^{21}\) The equation for inflation is then given as follows:

\[
\text{INF} = \alpha_1 \cdot x^2 \cdot \ln \left( \frac{\text{COSI}}{1 - 0.01 \cdot \text{TISS}} \right) + \alpha_2 \left( 1 - \phi \right) \cdot \text{INF}_{-1} + \phi \left( 1 - \mu \right) \cdot \text{INF}_{+1} + \mu \cdot \text{INFT} + \alpha_3 \cdot \ln \left( 0.01 \cdot \text{GAPQ} \right) \\
+ (1 - \alpha_2) \cdot \Delta \ln \left( \frac{\text{PSM3}}{\text{PINV}_{-1}} \right) + \alpha_4 \cdot \ln \left( \frac{\text{PSM3}}{\text{PINV}_{-1}} \right)
\]

The inflation equation is only consistent in the long run if the coefficients of the inflation terms on the right-hand side add up to one. These inflation terms are in particular the lag and lead of actual inflation, the inflation target, and for the euro area countries also the change in P-star, i.e. equilibrium inflation. For the Euro

\(^{19}\) See equation V.5 in the model documentation below.
\(^{20}\) See Gerlach, S., Svensson, L.E.O.: "Money and Inflation in the euro area: A Case for Monetary Indicators?". The authors construct a measure of the euro wide consumer price index, which is used in their analysis.
\(^{21}\) In the euro area countries, \(\text{PSM3}\) refers to the aggregate euro level.
**Inflation equation**

Table 13

Price deflator of domestic demand

\[
0.01 \cdot \text{INF} = \alpha_1 \Delta^2 \ln \left( \frac{\text{COSI}}{1 - 0.01 \cdot \text{TISS}} \right) + \alpha_2 \cdot 0.01 \left( (1 - \phi) \text{INF}_{-1} + \phi \left( (1 - \mu) \text{INF}_{-1} + \mu \text{INFT} \right) \right) \\
+ \alpha_3 \ln \left( 0.01 \text{GAPQ} \right) + (1 - \alpha_2) \Delta \ln \left( \frac{\text{PSM3}_{-1}}{\text{PINV}_{-1}} \right)
\]

Estimation period: 1976 / 1 – 1997 / 4

Data base: March 1999

<table>
<thead>
<tr>
<th>Country</th>
<th>( \alpha_1 )</th>
<th>( \alpha_2 )</th>
<th>( \alpha_3 )</th>
<th>( \alpha_4 )</th>
<th>( \phi )</th>
<th>( \mu )</th>
<th>( R^2 )</th>
<th>DW</th>
</tr>
</thead>
<tbody>
<tr>
<td>USA</td>
<td>0.03</td>
<td>1.00</td>
<td>0.10</td>
<td></td>
<td>0.31</td>
<td>0.4</td>
<td>0.38</td>
<td>1.71</td>
</tr>
<tr>
<td>Japan</td>
<td>0.03</td>
<td>1.00</td>
<td>0.05</td>
<td></td>
<td>0.22</td>
<td>0.4</td>
<td>0.30</td>
<td>1.24</td>
</tr>
<tr>
<td>Germany</td>
<td>0.03</td>
<td>0.95</td>
<td>0.03</td>
<td>0.10</td>
<td>0.25</td>
<td>0.4</td>
<td>0.96</td>
<td>1.88</td>
</tr>
<tr>
<td>United Kingdom</td>
<td>0.02</td>
<td>1.00</td>
<td>0.10</td>
<td></td>
<td>0.40</td>
<td>0.4</td>
<td>0.99</td>
<td>2.53</td>
</tr>
<tr>
<td>France</td>
<td>0.03</td>
<td>0.97</td>
<td>0.03</td>
<td>0.10</td>
<td>0.36</td>
<td>0.4</td>
<td>0.99</td>
<td>0.71</td>
</tr>
<tr>
<td>Italy</td>
<td>0.04</td>
<td>0.92</td>
<td>0.03</td>
<td>0.10</td>
<td>0.46</td>
<td>0.4</td>
<td>0.99</td>
<td>0.18</td>
</tr>
<tr>
<td>Canada</td>
<td>0.05</td>
<td>1.00</td>
<td>0.10</td>
<td></td>
<td>0.40</td>
<td>0.4</td>
<td>0.55</td>
<td>2.00</td>
</tr>
<tr>
<td>Netherlands</td>
<td>0.02</td>
<td>0.89</td>
<td>0.03</td>
<td>0.10</td>
<td>0.37</td>
<td>0.4</td>
<td>0.55</td>
<td>2.00</td>
</tr>
<tr>
<td>Belgium</td>
<td>0.03</td>
<td>0.95</td>
<td>0.03</td>
<td>0.10</td>
<td>0.40</td>
<td>0.4</td>
<td>0.96</td>
<td>0.03</td>
</tr>
</tbody>
</table>

1 Inflation adjusted for indirect taxation.
2 Estimation period: 1977 / 1 – 1997 / 4
3 Estimation period: 1978 / 1 – 1997 / 4
4 Estimation period: 1979 / 1 – 1997 / 4
5 Estimation period: 1983 / 4 – 1997 / 4

<table>
<thead>
<tr>
<th>COSI</th>
<th>Index of production costs</th>
</tr>
</thead>
<tbody>
<tr>
<td>GAPQ</td>
<td>Rate of capacity utilisation: ( \ln (\text{GAPQ}) = \ln (\text{BIPR}) - \ln (\text{BIPQ}) )</td>
</tr>
<tr>
<td>INF</td>
<td>Inflation rate of domestic demand deflator</td>
</tr>
<tr>
<td>INFT</td>
<td>Target rate of inflation</td>
</tr>
<tr>
<td>PINV</td>
<td>Deflator of domestic demand</td>
</tr>
<tr>
<td>PSM3</td>
<td>Long-term price level, Euro-aggregate</td>
</tr>
<tr>
<td>TISS</td>
<td>Indirect tax rate</td>
</tr>
<tr>
<td>Δ</td>
<td>Difference operator: ( \Delta x = x - x_{-4} )</td>
</tr>
<tr>
<td>R²</td>
<td>Adjusted coefficient of determination</td>
</tr>
<tr>
<td>DW</td>
<td>Durbin Watson Statistic</td>
</tr>
<tr>
<td>t-values below coefficients</td>
<td></td>
</tr>
</tbody>
</table>

Deutsche Bundesbank
Area countries the restriction is already incorporated in the above equation through the restriction on the coefficient of equilibrium inflation. The other countries require the restriction $\alpha_2 = 1$.

The rational expectations coefficient $\phi$ was estimated wherever possible. The target rate of inflation is an integral part of expectation formation. The exact influence of the target rate on expectation formation is reflected in the parameter $\mu$. This parameter cannot be estimated because there was no ex-post inflation target.

Because the inflation equation contains its own lead as an explanatory variable, a terminal value is required, which is simply the target rate. The need for a terminal condition is also the reason why there is a separate variable for inflation ($\text{INF}$), rather than simply the rate of change in the price level. The latter would specify the terminal condition in level form as well, which would not make sense. The price level is thus derived from inflation as:

$$\ln(PINV) = \ln(PINV_{-4}) + 0.01 \text{INF}.$$  

4.4. Other prices

The price inflation rates for other GDP components are adjusted to the central inflation equation. The adjustment process for the price deflators for private consumption ($\text{PCP}$), fixed investment ($\text{PIAN}$), government demand ($\text{PG}$) and exports ($\text{PEX}$) is specified as follows:

$$\Delta \ln(\text{PCP}) = \alpha \Delta \ln(\text{PCP}_{-1}) + (1 - \alpha) \Delta \ln(PINV)$$
$$\Delta \ln(\text{PIAN}) = \alpha \Delta \ln(\text{PIAN}_{-1}) + (1 - \alpha) \Delta \ln(PINV)$$
$$\Delta \ln(\text{PG}) = \alpha \Delta \ln(\text{PG}_{-1}) + (1 - \alpha) \Delta \ln(PINV)$$
$$\Delta \ln(\text{PEX}) = \alpha \Delta \ln(\text{PEX}_{-1}) + (1 - \alpha) \Delta \left[ (1 - \lambda) \ln(PINV_{-1}) + \lambda \text{LPAC}_{-1} \right].$$

The equation for export prices takes the price deflator of foreign competitors ($\text{LPAC}$) into account, which is explained in more detail in the chapter about the foreign trade block.
## Other price equations

### Price deflator of private consumption, fixed investment and government demand

\[
\Delta \ln (\tilde{P}) = \alpha_1 \Delta \ln (\tilde{P}_{-1}) + (1 - \alpha_1) \Delta \ln (\tilde{PINV})
\]

### Price deflator of exports

\[
\Delta \ln (\tilde{PEX}) = \alpha_1 \Delta \ln (\tilde{PEX}_{-1}) + (1 - \alpha_1) \Delta \left[ (1 - \lambda) \ln (\tilde{PINV}_{-1}) + \lambda \tilde{LPAC}_{-1} \right]
\]


Data base: March 1999

### Table

<table>
<thead>
<tr>
<th>Country</th>
<th>PCP</th>
<th>PIAN</th>
<th>PG</th>
<th>PEX</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(\alpha_1)</td>
<td>(R^2)</td>
<td>(\alpha_1)</td>
<td>(R^2)</td>
</tr>
<tr>
<td>USA</td>
<td>0.48</td>
<td>0.42</td>
<td>0.88</td>
<td>0.86</td>
</tr>
<tr>
<td>Japan</td>
<td>0.54</td>
<td>0.78</td>
<td>0.67</td>
<td>0.49</td>
</tr>
<tr>
<td>Germany (^1)</td>
<td>0.38</td>
<td>0.36</td>
<td>0.78</td>
<td>0.61</td>
</tr>
<tr>
<td>United Kingdom</td>
<td>0.41</td>
<td>0.30</td>
<td>0.58</td>
<td>0.54</td>
</tr>
<tr>
<td>France</td>
<td>0.53</td>
<td>0.78</td>
<td>0.44</td>
<td>0.42</td>
</tr>
<tr>
<td>Italy</td>
<td>0.66</td>
<td>0.64</td>
<td>0.93</td>
<td>0.84</td>
</tr>
<tr>
<td>Canada</td>
<td>0.82</td>
<td>0.69</td>
<td>0.91</td>
<td>0.68</td>
</tr>
<tr>
<td>Netherlands (^2)</td>
<td>0.71</td>
<td>0.75</td>
<td>0.85</td>
<td>0.76</td>
</tr>
</tbody>
</table>

1 Equation: \(\Delta \ln (\tilde{P}) = \alpha_1 \Delta \ln (\tilde{P}_{-1}) + \alpha_2 \Delta \ln (\tilde{PINV}) + \alpha_3 \Delta \ln (\tilde{PINV}_{-1}) + \lambda \tilde{LPAC}_{-1}\)

2 Estimation period: 1978 / 2 – 1997 / 4

PCP: Price deflator of private consumption
PIAN: Price deflator of fixed investment
PG: Price deflator of government demand
PINV: Price deflator of domestic demand
PEX: Price deflator of exports
LPAC: Price deflator of foreign competitors (logarithm)
\(\lambda\): Average share of exports in final demand

Deutsche Bundesbank
5. Government

Governments, on the one hand, levy direct (TDB) and indirect taxes (TIS), and on the other demand consumer and investment goods as well as services (G) and transfer social benefits to households (SB). Indirect taxes are net of subsidies to private firms. The government balances are further disaggregated in the case of Germany in order to fulfil additional simulation requirements.

A general pattern of fiscal policy within the set of countries included in the model seems to be that within the last twenty years government consumption and investment relative to GDP have either remained constant or decreased, whereas social benefits relative to GDP have increased instead (see Charts 9 and 10). Deficit ratios have improved significantly over the last five years, with the exception of Japan (Chart 8). This is especially true of those countries committed to meet the Maastricht criteria. Tax revenues are calculated as average tax rates (TDBS for direct taxes and TISS for indirect taxes) multiplied by the tax base, which is approximated by national income for direct taxes and social security contributions and by nominal final demand for indirect taxes, respectively. Out of sample, tax rates are determined by autoregressive processes.

Despite the fact that there has been a decrease in government demand relative to GDP at constant prices, it is assumed in the model that this ratio will be constant in the very long run. In the short term, however, adjustments and countercyclical reactions to the output gap, known as built-in stabilisers, are accounted for. This leads to the following equation for real government demand:

\[ \Delta \ln(G) = \alpha_1 \Delta \ln(G_{-1}) + (1 - \alpha_1) \Delta \ln(BPR) + \alpha_2 \Delta \ln(GAPQ) \].

The elasticity of government expenditure with respect to the output gap has been estimated to be low for the USA, the Netherlands and Belgium and relatively high for France and Canada. The German fiscal policy reaction function incorporates the deficit quota, too. This ensures that the deficit will return to zero in the long run, a restriction which is not contained in the other country models.

Government transfers to private households (SB) are determined by the number of children, unemployed persons and senior citizens in the population and are often linked to the level of wages. The different determinants have been approximated in the model by the development of nominal GDP. Despite the trend in the observed data, it has been assumed that the ratio between transfer payments and
Deficit ratio from 1981 to 1998

Chart 8

Government deficit in per cent of nominal GDP

USA  Japan  Germany

United Kingdom  France  Italy

Canada  Netherlands  Belgium

Deutsche Bundesbank
"Government demand ratio" from 1981 to 1998

Real government demand in per cent of real GDP

Deutsche Bundesbank
Transfer ratio from 1981 to 1998

Chart 10

Government transfers to private households in per cent of nominal GDP

Deutsche Bundesbank
Government expenditure and transfer equations  

**Government expenditure**

\[ \Delta \ln (GR) = \alpha_1 \Delta \ln (GR_{-1}) + (1 - \alpha_2) \Delta \ln (BIP) + \alpha_2 \Delta \ln (0.01 \text{ GAPQ}) \]

**Transfer payments**

\[ \ln \left( \frac{SB}{BIP} \right) = \alpha_0 + \alpha_1 \ln \left( \frac{SB_{-1}}{BIP_{-1}} \right) + \alpha_2 \times 0.01 \times (ARLQ - ARLQN) \]

Estimation period: 1975/1 – 1997/4  
Data base: March 1999

<table>
<thead>
<tr>
<th>Country</th>
<th>( \alpha_1 )</th>
<th>( \alpha_2 )</th>
<th>( \bar{R}^2 )</th>
<th>DW</th>
<th>Expenditure</th>
<th>( \alpha_0 )</th>
<th>( \alpha_1 )</th>
<th>( \alpha_2 )</th>
<th>( \bar{R}^2 )</th>
<th>DW</th>
<th>Transfer payments</th>
</tr>
</thead>
<tbody>
<tr>
<td>USA</td>
<td>0.86</td>
<td>-0.04</td>
<td>0.85</td>
<td>2.20</td>
<td>-0.04</td>
<td>0.98</td>
<td>0.57</td>
<td>0.97</td>
<td>0.68</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(19.68)</td>
<td>(0.71)</td>
<td>(1.01)</td>
<td>(3.94)</td>
<td>(58.16)</td>
<td>(3.94)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Japan(^1)</td>
<td>0.81</td>
<td>-0.11</td>
<td>0.65</td>
<td>1.58</td>
<td>0.07</td>
<td>0.98</td>
<td>1.92</td>
<td>0.997</td>
<td>0.30</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(12.28)</td>
<td>(0.85)</td>
<td>(18.91)</td>
<td>(3.95)</td>
<td>(556.34)</td>
<td>(3.95)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>United Kingdom</td>
<td>-0.41</td>
<td></td>
<td>0.12</td>
<td>0.40</td>
<td>-0.07</td>
<td>0.97</td>
<td>0.44</td>
<td>0.98</td>
<td>1.41</td>
<td></td>
<td></td>
</tr>
<tr>
<td>France</td>
<td>0.94</td>
<td>-0.05</td>
<td>0.85</td>
<td>1.29</td>
<td>0.04</td>
<td>0.97</td>
<td>0.15</td>
<td>0.99</td>
<td>0.93</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(20.62)</td>
<td>(0.83)</td>
<td>(2.74)</td>
<td>(0.87)</td>
<td>(92.88)</td>
<td>(0.87)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Italy</td>
<td>0.61</td>
<td></td>
<td>0.26</td>
<td>0.24</td>
<td>-0.06</td>
<td>0.96</td>
<td>0.24</td>
<td>0.97</td>
<td>0.58</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(5.62)</td>
<td>(0.62)</td>
<td>(2.02)</td>
<td>(0.67)</td>
<td>(58.16)</td>
<td>(0.67)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Canada</td>
<td>0.89</td>
<td>-0.10</td>
<td>0.85</td>
<td>1.80</td>
<td>-0.02</td>
<td>0.99</td>
<td>0.60</td>
<td>0.99</td>
<td>0.46</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(22.77)</td>
<td>(0.71)</td>
<td>(1.09)</td>
<td>(3.95)</td>
<td>(100.18)</td>
<td>(3.95)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Netherlands(^1)</td>
<td>0.59</td>
<td>-0.09</td>
<td>0.51</td>
<td>2.30</td>
<td>-0.14</td>
<td>0.92</td>
<td>0.29</td>
<td>0.89</td>
<td>1.26</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(7.62)</td>
<td>(1.48)</td>
<td>(2.04)</td>
<td>(2.01)</td>
<td>(21.84)</td>
<td>(2.01)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Belgium</td>
<td>0.98</td>
<td>-0.01</td>
<td>0.95</td>
<td>0.30</td>
<td>-0.18</td>
<td>0.88</td>
<td>0.75</td>
<td>0.98</td>
<td>0.34</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(31.12)</td>
<td>(0.14)</td>
<td>(6.11)</td>
<td>(6.49)</td>
<td>(44.80)</td>
<td>(6.49)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

1 Transfer payments: \( \ln \left( \frac{SB}{BIP} \right) = \alpha_0 + \alpha_1 \ln \left( \frac{SB_{-1}}{BIP_{-1}} \right) + \alpha_2 \times 0.01 \times (ARLQ - ARLQN) \)

2 Estimation period: 1978/1 – 1997/4

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Description</th>
<th>( \Delta )</th>
<th>( \bar{R}^2 )</th>
<th>DW</th>
<th>t-values below coefficients</th>
</tr>
</thead>
<tbody>
<tr>
<td>ARLQ</td>
<td>Unemployment rate</td>
<td>Difference operator: ( \Delta x = x - x_{-4} )</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ARLQN</td>
<td>&quot;Smoothed&quot; unemployment rate</td>
<td>Adjusted coefficient of determination</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>BIP</td>
<td>Nominal gross domestic product</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>BIPR</td>
<td>Real gross domestic product</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>GAPQ</td>
<td>Capacity utilisation</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>GR</td>
<td>Real government demand</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SB</td>
<td>Government transfers to households</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Deutsche Bundesbank
GDP is constant in the long run. Built-in stabilisers have been incorporated into the respective equation by the disequilibrium measure in the labour market. The transfer equation therefore reads as

$$
\ln \left( \frac{SB}{BIP} \right) = \alpha_0 + \alpha_1 \ln \left( \frac{SB_{-1}}{BIP_{-1}} \right) - \alpha_2 + 0.01 \times (ARLQ - ARLQN).
$$

The dynamic adjustment to the long-run ratio has been estimated to be very slow in all countries. This is true also of the adjustment in government demand.

6. Money, interest rates and the exchange rate

Within the financial sector important nominal variables are determined. The sector mainly comprises explanatory equations for the money stock, interest rates and the exchange rate. Money demand serves as the theoretical basis for modelling the money stock. Its characteristics and especially its stability are fundamental for the transmission of monetary policy since it relates the "real" sector of the economy to the financial sector. The central bank's reaction function determines the short-term interest rate. The yield on government bonds depends on these by means of the expectations hypothesis of the term structure. Finally, the exchange rate, i.e. the price of one US-Dollar in local currency, rests on the uncovered interest rate parity combined with the purchasing power parity.

On the one hand, empirical analyses of the past behaviour of the variables have been a guide in selecting a suitable specification. But on the other hand, the simulation characteristics, i.e. the stability, of the model have had a great impact. Therefore, additional knowledge of a changing policy framework has been incorporated where needed in order to achieve more realistic ex-ante simulation results.

Currently two issues have had, and will have, a significant impact on the financial variables in the model: First, the launch of the European Economic and Monetary Union (EMU) invalidated the previous specification of money, interest rates and exchange rates at the national level of the participating countries. Second, rational (i.e. model-consistent) expectations are applied to financial variables. This task is far from being completed, but specifications for interest rates and the exchange rate will be reported. Terminal conditions are consistently and endogenously reached by means of an analogous set of steady-state equations. In the following,
therefore, both versions are given where necessary. It needs to be stressed that the steady-state model is not in itself an adequate, richly specified macroeconometric model. It only becomes a useful model when run together with the so-called dynamic model, i.e. the model version that includes equations with forward-looking expectations. The econometric software package TROLL offers different algorithms for solving forward-looking models, Fair-Taylor and Stacked Time. Here, the latter is employed.

6.1. Money demand and P-star

Standard theories of money demand state that money may be held for basically two reasons, i.e. for transaction and speculation purposes. Thus, in the first stage money is regressed on real gross domestic product (GDP) and the yield on government bonds apart from seasonal dummies, a dummy which takes account of the German currency union and a constant. Real GDP serves as a scale variable, whereas the long-term interest rate is a measure for the opportunity costs of holding money. However, when a broad monetary aggregate is used, neither the short-term interest rate nor the inflation rate is included. The former would represent the rate of return of money itself, whereas the latter is supposed to measure the opportunity costs of holding money instead of real assets.

The steady-state growth rate of real money balances equals the target money growth rate minus the target inflation rate. The latter is decided upon by the monetary policy authorities and is assumed to be fully credible in the long run. According to the quantity theory of money the following holds:

$$\frac{M - BIPR}{PINV} = \frac{V}{\cdot}$$

where $M$ denotes the money stock, $PINV$ the price deflator of domestic demand, $BIPR$ the transaction volume approximated by real GDP and $V$ the velocity of money. Assuming velocity to be constant over time, the above equation says that real money balances are proportional to real GDP. Accordingly, the nominal money stock grows at the same rate as nominal GDP, and the income elasticity of money demand is equal to one. However, this assumption does not hold with regard to countries included in the model, as Chart 11 reveals. Especially in Japan, Germany, the UK, Canada, Belgium and the Netherlands, velocity does show a declining trend over time. This may be due to the fact that money is increasingly held more as a store of value than for transaction purposes. In this case money
stocks rise by a higher amount than GDP, and consequently the elasticity of money demand exceeds unity.

Relaxing the assumption of $V$ being constant over time, the above equation may be written as

$$\Delta \ln (M) = \alpha_1 \Delta \ln (BIPR) + \Delta \ln (PINV),$$

where $\alpha_1$ denotes the income elasticity of money demand and $\Delta$ the difference operator. Finally, the money growth target rate $MTR$ is endogenously determined:

$$MTR = \alpha_1 \Delta \ln (BIPQ) + \text{INFT},$$

where $\Delta \ln (BIPQ)$ denotes the growth rate of potential output and INFT the target rate of inflation.

As mentioned before, the steady-state growth rate of real money balances is defined as:

$$\Delta \ln \left( \frac{M}{PINV} \right) = MTR - \text{INFT} = \alpha_1 \Delta \ln (BIPQ).$$

However, within the dynamic model (i.e. the model version that includes forward-looking expectations), a two stage estimator is employed. At the first stage, a long-run money demand equation is estimated:

$$\ln \left( \frac{M}{PINV} \right) = \alpha_0 + \alpha_1 \ln (BIPR) + \alpha_2 \text{RL} + M_{EC},$$

where RL is the yield on government bonds and EC denotes the error-correction term. The second stage is devoted to estimating an error correction-model:

$$\Delta \ln \left( \frac{M}{PINV} \right) = \beta_1 \Delta \ln \left( \frac{M_{-1}}{PINV_{-1}} \right) + \beta_2 \Delta \ln (BIPR) + \beta_3 \Delta \text{RL} + \beta_4 M_{EC_{-1}}.$$

In some cases money illusion is allowed for in the short run and the inflation rate is added in order to explain short-run dynamics. In the long run the price elasticity of money demand is restricted to be equal to unity.
Income velocity of money from 1981 to 1998

Chart 11

Ratio of nominal GDP to money balances

USA

Japan

Germany

United Kingdom

France

Italy

Canada

Netherlands

Belgium

Deutsche Bundesbank
Table 16 shows the estimated parameter values of the long-run money demand function. The income elasticity of money demand $\alpha_1$ takes on values ranging from 0.7 in the USA to 2.3 in the United Kingdom. The semi interest rate elasticity is the lowest in the USA (-0.3) and the highest in Japan (-1.10) and the UK (-4.2). According to the critical values, the loading coefficients are statistically significant at the five per cent level with the exception of Canada.

Modelling European Economic and Monetary Union (EMU) is a formidable task. Since the ESCB has quantified a reference value for the growth rate of the monetary aggregate M3, the P-star approach appears to be a natural starting point. National price levels are assumed to converge to the EMU equilibrium price level (PSM3) in the long term. Traditionally, P-star follows from the quantity theory of money. It measures the long-term price level given by

$$\ln(P_{SM3}) = \ln(MB) + \ln(V^*) - \ln(BIPQ),$$

where $M3$ denotes the broad monetary aggregate as is used by the ESCB, and $V^*$ is equal to long-run velocity. The difference between long-run and actual prices, i. e. the price gap, is decomposed into two components:

$$\ln(P_{SM3}) - \ln(P_{INV}) = [\ln(V^*) - \ln(V)] + [\ln(BIPR) - \ln(BIPQ)].$$

Accordingly a ‘velocity gap’ or ‘liquidity gap’ and the ‘output gap’ constitute the ‘price gap’, which in turn explains future price movements. This concept is especially useful in modelling euro area prices by estimating a long-term euro area-wide price level to which member country’s price levels converge. Moreover, in a recent paper Gerlach and Svensson find convincing evidence of the existence of the P-star model in the euro area.

Introducing the stable money demand function given above together with the quantity theory of money

---

### Money demand equation

**Long-term co-integrated equation**

\[
\ln \left( \frac{M}{PINV} \right) = \alpha_0 + \alpha_1 \ln (BIPR) + \alpha_2 0.01RL + M_{-EC} \]

**Short-term error-correction equation**

\[
\Delta \ln \left( \frac{M}{PINV} \right) = \beta_1 \Delta \ln \left( \frac{M_{-1}}{PINV_{-1}} \right) + \beta_2 \Delta \ln (BIPR) + \beta_3 0.01\Delta RL + \beta_4 M_{-EC_{-4}} \]


Data base: March 1999

<table>
<thead>
<tr>
<th>Country</th>
<th>( \alpha_0 )</th>
<th>( \alpha_1 )</th>
<th>( \alpha_2 )</th>
<th>( \beta_1 )</th>
<th>( \beta_2 )</th>
<th>( \beta_3 )</th>
<th>( \beta_4 )</th>
<th>( R^2_{it} )</th>
<th>( R^2_{st} )</th>
<th>DW_{it}</th>
<th>DW_{st}</th>
</tr>
</thead>
<tbody>
<tr>
<td>USA</td>
<td>-1.72</td>
<td>0.72</td>
<td>-0.29</td>
<td>0.81</td>
<td>0.09</td>
<td>-0.43</td>
<td>-0.12</td>
<td>0.90</td>
<td>0.90</td>
<td>0.05</td>
<td>1.37</td>
</tr>
<tr>
<td></td>
<td>(8.30)</td>
<td>(25.95)</td>
<td>(1.27)</td>
<td>(15.70)</td>
<td>(1.97)</td>
<td>(4.70)</td>
<td>(4.54)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Japan</td>
<td>-5.76</td>
<td>1.68</td>
<td>-1.10</td>
<td>0.71</td>
<td>0.49</td>
<td>-0.36</td>
<td>-0.29</td>
<td>1.00</td>
<td>0.96</td>
<td>0.47</td>
<td>0.83</td>
</tr>
<tr>
<td></td>
<td>(67.77)</td>
<td>(101.50)</td>
<td>(5.28)</td>
<td>(12.22)</td>
<td>(4.80)</td>
<td>(2.78)</td>
<td>(4.11)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Euro area¹</td>
<td>-5.54</td>
<td>1.32</td>
<td>-0.68</td>
<td>0.77</td>
<td>0.25</td>
<td>-0.24</td>
<td>-0.28</td>
<td>0.99</td>
<td>0.97</td>
<td>0.45</td>
<td>1.64</td>
</tr>
<tr>
<td></td>
<td>(33.32)</td>
<td>(57.03)</td>
<td>(5.54)</td>
<td>(13.18)</td>
<td>(3.23)</td>
<td>(3.26)</td>
<td>(3.92)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>United</td>
<td>-9.39</td>
<td>2.27</td>
<td>-4.21</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1.00</td>
<td>1.10</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Kingdom²</td>
<td>2.66</td>
<td>3.00</td>
<td>2.19</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Canada</td>
<td>-8.23</td>
<td>1.90</td>
<td>-0.09</td>
<td>0.92</td>
<td>0.11</td>
<td>-0.05</td>
<td></td>
<td>0.97</td>
<td>0.97</td>
<td>0.09</td>
<td>1.49</td>
</tr>
<tr>
<td></td>
<td>(46.86)</td>
<td>(55.43)</td>
<td>(0.22)</td>
<td>(34.64)</td>
<td>(2.67)</td>
<td>(2.50)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>


² Long-run parameter values of the equation:

\[
\ln \left( \frac{M}{PINV} \right) = \alpha_0 + \alpha_1 \ln (BIPR) + \alpha_2 0.01RL + \alpha_3 \ln \left( \frac{M_{-1}}{PINV_{-1}} \right) \]

BIPR: Real gross domestic product
M: Money stock
PINV: Price deflator of domestic demand
RL: Yield on government bonds
\( \Delta \): Difference operator: \( \Delta x = x - x_{-4} \)
\( R^2 \): Adjusted coefficient of determination
DW: Durbin Watson Statistic

t-values below coefficients

Deutsche Bundesbank
\[
\ln(V) = \ln(PINV) - \ln(M_B) + \ln(BIPR)
\]
yields
\[
\ln(V) = -\alpha_0 + (1-\alpha_1)\ln(BIPR) - \alpha_2 RL.
\]

Ultimately this suggests that long-term velocity is determined by
\[
\ln\left(V^*\right) = -\alpha_0 + (1 - \alpha_1)\ln(BIPQ) - \alpha_2 RLST
\]
leading to
\[
\ln(PSM3) = \ln(M_B) - \alpha_0 - \alpha_1 \ln(BIPQ) - \alpha_2 RLST,
\]
where \(RLST\) denotes the steady-state yield on government bonds. It is assumed to be equal to the steady-state values of the real short-term interest rate plus the target inflation rate and the term premium. \(P\text{-star}\) is a function of nominal money and of the growth rate of potential output. Consequently it is endogenous and by itself cannot serve as the nominal anchor of the model. According to this concept, a stable and controllable long-run euro Area-wide money demand function and a national inflation-driving price gap between the euro area-wide \(P\text{-star}\) and national price levels (not the output gap alone) suffice to ensure that the ESCB will achieve both its monetary and the underlying inflation target over the medium or long term.

6.2. Monetary policy rules

With exchange rates being flexible in all countries and in the euro area, the three-month money market rate (\(RS\)) is the instrumental variable of monetary policy. A forward-looking central bank reaction function determines the three-month interest rate:

\[
RS = 0.75 \times RS_{-1} + (1 - 0.75) RSST + 0.5 \times \left(\frac{1}{4} \sum_{i=1}^{4} (\ln(INF_i) - \ln(INFT_i)) \right)
\]

\[+ 0.5 \times \left(\frac{1}{4} \sum_{i=0}^{3} (\ln(BIPR_{-i}) - \ln(BIPQ_{-i})) \right)\]
where \( RSST \) denotes the steady-state three-month rate, \( INF \) the current inflation rate and \( INFT \) its target. The variable \( RSST \) is assumed to be equal to the yearly average growth rate of potential output plus the target inflation rate for simulation purposes. The specification for \( RS \), which includes a large amount of interest rate smoothening, is similar to what is commonly known as the Taylor rule supplemented by a long-term solution where the Fisher proposition holds:

\[
RS = RSST_{\text{real}} + INFT.
\]

For the European System of Central Banks a different specification was chosen in order to incorporate the two-pillar strategy of the ESCB to maintain price stability. The first of the two pillars gives money a prominent role with a quantitative reference value for the growth rate of the broad monetary aggregate M3. The second follows what is commonly known as inflation forecast targeting where price stability is maintained by keeping the inflation rate below two per cent. To make the two-pillar monetary policy strategy of the ESCB operational, it has been translated into a monetary growth target (the reference value) based on an inflation target. A monetary policy rule based on these targets essentially seems to correspond with the declared monetary policy strategy of the ESCB. However, it is instructive to sum up the P-star concept by noting that the money growth target is

\[
\Delta \ln (M3) = \alpha \Delta \ln (BPQ) - \alpha \Delta \ln (M3) - \ln (M3) + MTR = \Delta \ln (PSM3) - \Delta \ln (M3).
\]

Accordingly, the P-star concept, together with monetary targeting, provides a special case of inflation forecast targeting, with P-star as the leading indicator for future inflation. Monetary targeting is thus the optimal monetary policy option of the central bank given the information of a stable money demand and the explanatory power of P-star. This is far less than the information set usually assumed for inflation forecast targeting. Finally, the following central bank reaction function for the euro area is used in the model:
The reaction function ensures that the monetary growth reference value $\text{MTR}$ will serve as the nominal anchor of the model for the euro area. Apart from adjustments within the real sector of the model, a difference between expected actual and targeted money growth leads to a reaction in the short-term interest rate due to policy measures taken by the ESCB. This in turn affects the yield on long-term bonds $\text{RL}$. Since the yield on government bonds is used as a measure of the opportunity costs of holding money, actual money growth starts to converge towards its target value $\text{MTR}$.

As the euro only came into existence on January 1, 1999 and the monetary policy of the ESCB is likely to be different from a quasi-average of its member countries, the parameter values of the reaction function which determines the money market rate have been calibrated. The real short-term interest rate of the euro area is approximated by the growth rate of potential output.

### 6.3. Government bond yields

The yield on ten-year government bonds represents the long end of the yield curve and plays a prominent role in the transmission mechanism of monetary policy. This is due to the fact that money market rates are strongly influenced, if not wholly determined, by central banks; these rates are in turn exogenous to the bond market rates. But at the same time other variables have an effect, inter alia inflation expectations or international interest rate interdependencies. However, the expectations hypothesis has been taken as the starting point for modelling yields. Accordingly, the ten-year yield equals the geometric average of forty future three-month rates plus a time-invariant term premium $\text{TERM}$:

$$1 + \text{RL} = \prod_{i=0}^{39} \left(1 + \text{RS}_i\right)^{\frac{1}{40}} \times (1 + \text{TERM}).$$

For the period $t+1$ the equation holds accordingly; thus, simple algebra yields

$$1 + \text{RL} = (1 + \text{RL}_{t+1}) \left(\frac{(1 + \text{RS})}{(1 + \text{RS}_{t+40})}\right)^{\frac{1}{40}}.$$
Short-term and long-term interest rates
from 1981 to 1998

% p. a.

--- Short-term interest rate

_____ Yield on ten-year government bonds

USA

Japan

Germany

United Kingdom

France

Italy

Canada

Netherlands

Belgium

Deutsche Bundesbank
Moreover, the short-term interest rate ten years ahead is set equal to its steady-
state value \( RSST \) with:

\[
\ln \left( \sum_{i=0}^{3} BIPQ_i \right) + NFT.
\]

Finally, it is assumed that expectations are a mixture of forward-looking and backward-looking:

\[
1 + RL = (1 + RL_{t-1})(1 - \alpha)(1 + RL_{t+1})^{\alpha} \left\{ \frac{1 + RSST}{1 + RL} \right\}^{\alpha}.
\]

The parameter \( \alpha \) is estimated by non-linear least squares and takes on values in
the range of 0.476 (Canada) to 0.535 (euro area).

### 6.4. Exchange rates

A natural starting point for specifying the exchange rate within a macro-
econometric model is the uncovered interest rate parity, complemented by the
purchasing power parity, serving as a long-term anchor of exchange rate
expectations. Furthermore, it is assumed that investors exhibit a home bias and
consequently define a risk premium (RISP) for investing abroad as

\[
RISP = (RS - US\_RS) - \ln \left( \frac{ER_{t+1}}{ER} \right) - \ln \left( \frac{ER_{t+1}}{ER} \right)
\]

with \( ER \) denoting the exchange rate of the home currency against the US-Dollar at
period \( t \) and \( ER^e_{t+1} \) its expected value given the information in period \( t - 1 \). This is
equivalent to

\[
\ln (ER) = \ln \left( \frac{ER^e_{t+1}}{ER} \right) - (RS - US\_RS) + RISP.
\]

For the sake of simplicity it is assumed that the risk premium is constant over time.
The expected exchange rate in period \( t + 1 \) given the information in period \( t \)
equals the expected relative price difference (purchasing power parity):

\[
\ln \left( \frac{ER^e_{t+1}}{PCP^e_{t+1}} \right) = \ln \left( \frac{PCP^e_{t+1}}{US\_PCP^e_{t+1}} \right).
\]

Taking the random walk property of exchange rate movements into account, the
exchange rate equation reads as follows.
**Exchange rate equation**

Exchange rate against US-Dollar

\[
\ln(ER) = \alpha_0 + \alpha_1 \ln(ER_{-1}) + (1 - \alpha_1) \ln\left(\frac{PCP_{t+1}}{US\_PCP_{t+1}}\right) - 1.0 \times 0.01 \times (RS - US\_RS) \\
+ \alpha_1 \times 0.01 \times (RS_{-1} - US\_RS_{-1})
\]

Estimation period: 1975 / 1 - 1997 / 4

Data base: March 1999

<table>
<thead>
<tr>
<th>Country</th>
<th>$\alpha_0$</th>
<th>$\alpha_1$</th>
<th>$R^2$</th>
<th>DW</th>
</tr>
</thead>
<tbody>
<tr>
<td>Japan</td>
<td>0.16</td>
<td>0.97</td>
<td>0.94</td>
<td>1.24</td>
</tr>
<tr>
<td></td>
<td>(1.28)</td>
<td>(37.99)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Euro area</td>
<td>-0.01</td>
<td>0.96</td>
<td>0.95</td>
<td>1.34</td>
</tr>
<tr>
<td></td>
<td>(1.57)</td>
<td>(34.51)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>United Kingdom</td>
<td>0.30</td>
<td>0.93</td>
<td>0.85</td>
<td>1.59</td>
</tr>
<tr>
<td></td>
<td>(1.71)</td>
<td>(22.57)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Canada</td>
<td>0.02</td>
<td>0.95</td>
<td>0.92</td>
<td>1.82</td>
</tr>
<tr>
<td></td>
<td>(2.37)</td>
<td>(33.24)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

ER
- Exchange rate against US-Dollar

PCP
- Price deflator of private consumption

RS
- Short-term interest rate

$R^2$
- Adjusted coefficient of determination

DW
- Durbin Watson Statistic

t-values below coefficients

Deutsche Bundesbank

\[
\ln(ER) = \alpha_0 + \alpha_1 \ln(ER_{-1}) + (1 - \alpha_1) \ln\left(\frac{PCP_{t+1}}{US\_PCP_{t+1}}\right) - (RS - US\_RS) + \alpha_1 (RS_{-1} - US\_RS_{-1}),
\]

where the risk premium is absorbed by the constant term. Estimation results reveal a high persistence of shocks in the mean. Purchasing power differences only slowly affect the exchange rate, whereas changes in interest rate differentials influence the exchange rate immediately.
Foreign trade block
I. Coverage of the trade block

The trade block, together with the exchange rate equations and the euro area block, constitutes the main link connecting the individual country blocks of the model. The trade block links the import and export relationships between the individual countries in a consistent manner. The relationships between import and export prices and the price deflator of foreign competitors are also determined in the trade block. The trade block contains, in addition to the countries included in the model, a block for the rest of the EU, a block for the rest of the OECD and a block for the rest of the world. The formation of these blocks is based on the corresponding data grouping of the OECD.\(^{25}\)

The key structure of the trade relationships is derived from a static trade matrix. This matrix contains, in the first place, the trade flows between the countries and blocks considered. The bilateral trade relations can be based on either exports or imports. The US-Dollar-denominated exports from one country to another do not equal the imports of the second country from the first. The discrepancy is to some extent due to differences in definitions, such as for instance the incorporation of customs duties and insurance costs. There are also substantial statistical discrepancies which are widely believed to affect the export figures more than the import figures; hence, the latter are used for the calculation of the trade matrix. The shares of each individual country or block in each country’s total exports and imports can be calculated from the import matrix below. The result is given in Tables 17 and 18. Table 17 shows the import shares of each country (h-matrix) and Table 18 shows the export shares of each country (k-matrix).

The general idea of the trade specification is to determine the import volume and the export prices domestically, i.e. in the respective country models. The export volume and the import prices are then determined as a function of foreign imports and export prices, respectively.

---

25 OECD, Monthly Statistics of Foreign Trade.
## Import structure in the year 1997

**Table 18**

<table>
<thead>
<tr>
<th>Exporting country</th>
<th>US</th>
<th>JP</th>
<th>GY</th>
<th>UK</th>
<th>FR</th>
<th>IT</th>
<th>CA</th>
<th>NL</th>
<th>BE²</th>
</tr>
</thead>
<tbody>
<tr>
<td>USA</td>
<td>22.44</td>
<td>7.75</td>
<td>13.40</td>
<td>8.57</td>
<td>4.98</td>
<td>67.59</td>
<td>8.31</td>
<td>7.71</td>
<td></td>
</tr>
<tr>
<td>Japan</td>
<td>13.95</td>
<td>4.87</td>
<td>5.02</td>
<td>3.32</td>
<td>2.03</td>
<td>4.60</td>
<td>3.62</td>
<td>2.39</td>
<td></td>
</tr>
<tr>
<td>Germany</td>
<td>4.95</td>
<td>3.67</td>
<td>13.68</td>
<td>16.60</td>
<td>17.97</td>
<td>1.98</td>
<td>22.14</td>
<td>18.56</td>
<td></td>
</tr>
<tr>
<td>United Kingdom</td>
<td>3.76</td>
<td>2.12</td>
<td>6.96</td>
<td>8.47</td>
<td>6.70</td>
<td>2.37</td>
<td>9.75</td>
<td>9.10</td>
<td></td>
</tr>
<tr>
<td>France</td>
<td>2.38</td>
<td>1.70</td>
<td>10.50</td>
<td>9.46</td>
<td>13.19</td>
<td>1.89</td>
<td>7.10</td>
<td>14.13</td>
<td></td>
</tr>
<tr>
<td>Italy</td>
<td>2.23</td>
<td>1.75</td>
<td>7.80</td>
<td>5.03</td>
<td>9.80</td>
<td>1.12</td>
<td>3.85</td>
<td>3.90</td>
<td></td>
</tr>
<tr>
<td>Canada</td>
<td>19.32</td>
<td>2.90</td>
<td>0.68</td>
<td>1.36</td>
<td>0.64</td>
<td>0.83</td>
<td>0.51</td>
<td>0.64</td>
<td></td>
</tr>
<tr>
<td>Netherlands</td>
<td>0.84</td>
<td>0.58</td>
<td>8.48</td>
<td>6.54</td>
<td>5.05</td>
<td>6.15</td>
<td>0.39</td>
<td>17.90</td>
<td></td>
</tr>
<tr>
<td>Belgium¹</td>
<td>0.94</td>
<td>0.55</td>
<td>6.15</td>
<td>4.85</td>
<td>8.05</td>
<td>4.67</td>
<td>0.33</td>
<td>11.16</td>
<td></td>
</tr>
<tr>
<td>Other EU³</td>
<td>3.02</td>
<td>2.93</td>
<td>14.38</td>
<td>13.52</td>
<td>13.38</td>
<td>11.95</td>
<td>1.77</td>
<td>9.39</td>
<td>8.55</td>
</tr>
<tr>
<td>Other OECD⁴</td>
<td>15.19</td>
<td>11.41</td>
<td>14.01</td>
<td>9.20</td>
<td>7.11</td>
<td>8.25</td>
<td>5.96</td>
<td>5.63</td>
<td>4.23</td>
</tr>
<tr>
<td>Rest of world</td>
<td>33.43</td>
<td>49.95</td>
<td>18.43</td>
<td>17.94</td>
<td>19.02</td>
<td>23.29</td>
<td>12.00</td>
<td>18.54</td>
<td>12.88</td>
</tr>
<tr>
<td>Total</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td></td>
</tr>
</tbody>
</table>

**Memo items:**

<table>
<thead>
<tr>
<th>EU</th>
<th>18.12</th>
<th>13.30</th>
<th>54.27</th>
<th>53.08</th>
<th>61.35</th>
<th>60.63</th>
<th>9.85</th>
<th>63.39</th>
<th>72.15</th>
</tr>
</thead>
<tbody>
<tr>
<td>OECD</td>
<td>66.58</td>
<td>50.05</td>
<td>81.57</td>
<td>82.06</td>
<td>80.98</td>
<td>76.72</td>
<td>88.00</td>
<td>81.46</td>
<td>87.12</td>
</tr>
</tbody>
</table>


1 Share of imports of country j (column) from country i (row) in total imports of country j.  — 2 Including Luxembourg.  — 3 Austria, Denmark, Finland, Greece, Ireland, Portugal, Spain and Sweden.  — 4 Australia, Iceland, New Zealand, Norway, Switzerland and Turkey.


Deutsche Bundesbank
Export structure in the year 1997

Table 19

Share in per cent (k-matrix)

<table>
<thead>
<tr>
<th>Importing country</th>
<th>US</th>
<th>JP</th>
<th>GY</th>
<th>UK</th>
<th>FR</th>
<th>IT</th>
<th>CA</th>
<th>NL</th>
<th>BE1</th>
</tr>
</thead>
<tbody>
<tr>
<td>USA</td>
<td>28.83</td>
<td>8.42</td>
<td>11.63</td>
<td>7.26</td>
<td>8.32</td>
<td>77.84</td>
<td>3.57</td>
<td>4.94</td>
<td></td>
</tr>
<tr>
<td>Japan</td>
<td>11.06</td>
<td>2.43</td>
<td>2.56</td>
<td>2.02</td>
<td>2.55</td>
<td>4.55</td>
<td>0.96</td>
<td>1.12</td>
<td></td>
</tr>
<tr>
<td>Germany</td>
<td>4.91</td>
<td>5.05</td>
<td>10.80</td>
<td>16.03</td>
<td>14.61</td>
<td>1.37</td>
<td>18.14</td>
<td>16.26</td>
<td></td>
</tr>
<tr>
<td>United Kingdom</td>
<td>5.99</td>
<td>3.66</td>
<td>8.23</td>
<td>10.17</td>
<td>6.65</td>
<td>1.94</td>
<td>9.86</td>
<td>9.03</td>
<td></td>
</tr>
<tr>
<td>France</td>
<td>3.36</td>
<td>2.13</td>
<td>8.76</td>
<td>8.13</td>
<td>11.35</td>
<td>0.79</td>
<td>6.67</td>
<td>13.14</td>
<td></td>
</tr>
<tr>
<td>Italy</td>
<td>1.47</td>
<td>0.98</td>
<td>7.15</td>
<td>4.85</td>
<td>9.39</td>
<td>0.78</td>
<td>6.14</td>
<td>5.75</td>
<td></td>
</tr>
<tr>
<td>Canada</td>
<td>19.30</td>
<td>2.15</td>
<td>0.76</td>
<td>1.66</td>
<td>1.30</td>
<td>0.95</td>
<td>0.37</td>
<td>0.39</td>
<td></td>
</tr>
<tr>
<td>Netherlands</td>
<td>2.23</td>
<td>1.59</td>
<td>7.98</td>
<td>6.40</td>
<td>4.58</td>
<td>3.05</td>
<td>0.43</td>
<td>12.46</td>
<td></td>
</tr>
<tr>
<td>Belgium2</td>
<td>1.69</td>
<td>0.86</td>
<td>5.47</td>
<td>4.88</td>
<td>7.46</td>
<td>2.53</td>
<td>0.45</td>
<td>13.24</td>
<td></td>
</tr>
<tr>
<td>Other EU3</td>
<td>1.22</td>
<td>4.05</td>
<td>16.79</td>
<td>11.08</td>
<td>13.71</td>
<td>13.83</td>
<td>1.36</td>
<td>10.53</td>
<td>7.51</td>
</tr>
<tr>
<td>Other OECD4</td>
<td>13.11</td>
<td>13.17</td>
<td>12.21</td>
<td>4.62</td>
<td>5.65</td>
<td>8.73</td>
<td>-6.96</td>
<td>4.90</td>
<td>3.96</td>
</tr>
<tr>
<td>Rest of world</td>
<td>35.66</td>
<td>37.54</td>
<td>21.80</td>
<td>33.38</td>
<td>22.42</td>
<td>27.45</td>
<td>17.44</td>
<td>25.62</td>
<td>25.45</td>
</tr>
<tr>
<td>Total</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
</tr>
</tbody>
</table>

Memo items:

<table>
<thead>
<tr>
<th></th>
<th>EU</th>
<th>OECD</th>
</tr>
</thead>
<tbody>
<tr>
<td>EU</td>
<td>20.87</td>
<td>64.34</td>
</tr>
<tr>
<td>OECD</td>
<td>18.31</td>
<td>62.46</td>
</tr>
<tr>
<td></td>
<td>54.38</td>
<td>78.20</td>
</tr>
<tr>
<td></td>
<td>46.15</td>
<td>66.62</td>
</tr>
<tr>
<td></td>
<td>61.35</td>
<td>77.58</td>
</tr>
<tr>
<td></td>
<td>52.00</td>
<td>72.55</td>
</tr>
<tr>
<td></td>
<td>7.13</td>
<td>82.56</td>
</tr>
<tr>
<td></td>
<td>64.58</td>
<td>74.38</td>
</tr>
<tr>
<td></td>
<td>64.14</td>
<td>74.55</td>
</tr>
</tbody>
</table>


1 Share of exports of country j (column) from country i (row) in total exports of country j. — 2 Including Luxembourg. — 3 Austria, Denmark, Finland, Greece, Ireland, Portugal, Spain and Sweden. — 4 Australia, Iceland, New Zealand, Norway, Switzerland and Turkey.


Deutsche Bundesbank
II. Price deflator of imports

The import price for each country is determined through the weighted average of its trading partners’ export prices. For clarity, this weighted average is first calculated as an index variable before being used in a second step to determine the price deflators of imports. The weights are taken from the trade matrix of import shares (h-matrix). The export price index of the rest of the world $PEX_{ROW}$ is represented by the oil price $POIL$. Prices in the remaining regions (REG, ROE, ROW) are determined in US-Dollars. The equation for the index of foreign export prices is thus given as follows:

$$\ln(PEX_i) = \ln(ER_i) + \sum \sum h_{ij} \ln\left(\frac{PEX_j}{ER_j}\right)$$

$i = \{US, JP, GY, UK, FR, IT, CA, NL, BE\}$

$j = \{US, JP, GY, UK, FR, IT, CA, NL, BE, REG, ROE, ROW\}$

$i \neq j$

$PEX_{ROW} = POIL$

$ER_{REG} = ER_{ROE} = ER_{ROW} = ER_{US} = 1.$

The variable $PEXA$ is the only determinant of each country’s price deflator of imports. Movements in the exchange rate are fully transmitted into the index variable $PEXA$. One can observe, however, that relatively large movements in the exchange rate do not have an immediate impact on import prices in the same order of magnitude. The full adjustment will only be completed in the medium to long term. In order to capture such an adjustment process, the import price equations are modelled dynamically as follows:

$$\Delta_4 \ln(PIM) = (1-\alpha_1) \Delta_4 \ln(PEXA) + \alpha_1 \Delta_4 (PIM_{-1}).$$

Table 20 shows the estimation results.
### Foreign trade equations

**Equation for the price deflator of imports**

\[ \Delta \ln (PIM) = (1 - \alpha_1) \Delta \ln (PEXA) + \alpha_1 \Delta \ln (PIM, t) \]

**Equation for nominal exports**

\[ \Delta \ln (EX) = (1 - \alpha_1) \Delta \ln (IMAK) + \alpha_1 \Delta \ln (EX, t) \]

Estimation period: 1978 / 1 – 1997 / 4  
Data base: March 1999

<table>
<thead>
<tr>
<th>Country</th>
<th>Price deflator of imports</th>
<th>Nominal exports</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>( \alpha_1 )</td>
<td>( \bar{R}^2 )</td>
</tr>
<tr>
<td>USA</td>
<td>0.82</td>
<td>0.96</td>
</tr>
<tr>
<td></td>
<td>(40.80)</td>
<td></td>
</tr>
<tr>
<td>Japan</td>
<td>0.64</td>
<td>0.89</td>
</tr>
<tr>
<td></td>
<td>(25.50)</td>
<td></td>
</tr>
<tr>
<td>Germany ¹</td>
<td>0.84</td>
<td>0.95</td>
</tr>
<tr>
<td></td>
<td>(36.75)</td>
<td></td>
</tr>
<tr>
<td>United Kingdom</td>
<td>0.72</td>
<td>0.81</td>
</tr>
<tr>
<td></td>
<td>(18.16)</td>
<td></td>
</tr>
<tr>
<td>France</td>
<td>0.74</td>
<td>0.87</td>
</tr>
<tr>
<td></td>
<td>(23.00)</td>
<td></td>
</tr>
<tr>
<td>Italy</td>
<td>0.63</td>
<td>0.86</td>
</tr>
<tr>
<td></td>
<td>(22.10)</td>
<td></td>
</tr>
<tr>
<td>Canada</td>
<td>0.81</td>
<td>0.82</td>
</tr>
<tr>
<td></td>
<td>(18.80)</td>
<td></td>
</tr>
<tr>
<td>Netherlands ²</td>
<td>0.65</td>
<td>0.80</td>
</tr>
<tr>
<td></td>
<td>(17.24)</td>
<td></td>
</tr>
<tr>
<td>Belgium</td>
<td>0.83</td>
<td>0.92</td>
</tr>
<tr>
<td></td>
<td>(29.52)</td>
<td></td>
</tr>
</tbody>
</table>

¹ The equations contain seasonal dummy variables  
² Estimation period: 1979/1 – 1997/4

---

**Deutsche Bundesbank**
III. Nominal exports

The concept for the nominal export equation is similar to the one used for the import price deflators above. The first step is again to calculate an index variable, which in this case is determined by the weighted average of all other countries’ nominal import volumes. The weights here are given by the export shares ($k$-matrix). The specification thus approximates a world trade adding-up. The import volume of the rest of the world block is substituted out due to a shortage of data, i.e. the sum of the shares of all other countries $j$ in country $i$’s exports is normalised to unity. The index of foreign activity is thus given as

$$\sum_{k_i} \ln \left( \frac{\text{IM}_i}{\text{ER}_i} \right)$$

$$i = \{\text{US, JP, GY, UK, FR, IT, CA, NL, BE}\}$$

$$j = \{\text{US, JP, GY, UK, FR, IT, CA, NL, BE, REG, ROE}\}$$

$$i \neq j.$$

Analogously to the import price equations, nominal exports are also determined dynamically by the following equation:

$$\Delta \ln (\text{EX}) = (1-\alpha) \Delta \ln (\text{IMAK}) + \alpha_1 \Delta_1 \ln (\text{EX}_{-1}).$$

The estimation results are also shown in Table 20. The adjustment is estimated to take place somewhat more swiftly than in the import price equations.

IV. Foreign competitors’ price deflators and oil price

In order to incorporate competition effects, the determination of the export prices in each country takes the price developments of other countries into account. Specifically, an index variable is specified which is calculated as the weighted average of all other countries’ domestic prices ($\text{PINV}$), converted into the local
currency. The weights are taken from the $k$-matrix of export shares. Substituting the rest of the world's price index in the same way as this was done for the import price deflator equations above, the index variable $LPAC$ is then defined as:

$$LPAC_i = \ln(ER_i) + \sum_{j} \frac{\ln(PINV_j)}{1-k_{ij}}$$

$$i = \{US, JP, GY, UK, FR, IT, CA, NL, BE\}$$

$$j = \{US, JP, GY, UK, FR, IT, CA, NL, BE, REG, ROE\}$$

$$i \neq j$$

$$PINV_{REG/ROE} = PEX_{REG/ROE}.$$

The foreign competitors' price deflator is then used in the estimated equations for the countries' export prices.

The oil price in the multi-country model is exogenous. The following estimated autoregressive equation is used to determine future values of the oil price:

$$\ln(POIL) = \alpha_0 + \alpha_1 \ln(POIL_{-1}) + \alpha_2 \Delta_4 \ln(POIL_{-1}) + \alpha_3 \Delta_4 \ln(POIL_{-2}).$$
Data compilation and equation estimation
I. Data compilation

The size of MEMMOD and particularly its considerable country coverage requires a comprehensive data base. The time series data base of the Bundesbank meets these requirements, giving primary data for 577 time series. However, the time series may originate from various sources, most prominently the German Federal Statistical Office (Statistisches Bundesamt) for German data and the OECD for other countries. The frequency of all primary data is quarterly, with the exception of Belgium\(^\text{26}\). However, the loss of information when adjusting all countries but Belgium to a yearly frequency outweighs the cost of employing cubic splines to obtain quarterly data for Belgium. For monthly data either end-of-quarter values (stock variables) or quarterly averages (interest rates) are taken to obtain a quarterly frequency. All data are seasonally adjusted with the exception of Germany.

Occasional re-definitions of variables require appropriate dummy variables in order to capture structural breaks. In addition, non-seasonally adjusted data are assumed to be seasonally co-integrated, and thus quarterly dummies are introduced into the equations.

Another obstacle may be that some series are only available with a considerable time lag. These series need to be deterministically extrapolated up to the current end of the data sample. Moreover, values for exogenous variables must be determined up to the end of the simulation horizon. The population, for instance, is assumed to grow at a constant rate. Dummies are set according to their definition. Usually the time series are re-loaded several times a year, with a re-estimation of the model taking place only once in a year.

The trade matrix of the trade block, as documented in the previous chapter, determines import and export shares of all countries. Exports and imports alike are based on imports reported in OECD publications. In the trade share matrices, imports of country i originating from country j approximate country j’s exports to country i. Import shares are used to derive the weighted average of foreign export prices (PEXA), which in turn is exogenous in the individual country’s import price equation. Export shares are the weights when calculating the price index of foreign suppliers (LPAC) and the average of foreign imports (IMAK). Imperfectly

\(^{26}\) For simplicity the term "Belgium" is used to comprise both Belgium and Luxembourg due to data availability.
competitive world markets where exporters are not price takers are assumed. Instead, their prices are dependent on those of potential competitors. The weighted average of foreign imports explains exports.

Apart from dummies, the remaining time series (so-called secondary data) are derived at a further stage. Aggregates, price deflators, and ratios are calculated. In addition, potential output, P-star, and the production cost index of wages and imports are estimated. Parameters are stored for further use. Price deflators are equal to aggregates at current prices multiplied by 100 and divided by the aggregate at constant prices. There are only a few cases where this identity is solved for the aggregate at constant prices. Base years vary from 1980 (France) to 1995 (UK and the Netherlands).

With respect to ratios, the labour share of income plays an important role in estimating potential output. It is defined as gross wage income divided by final demand less indirect taxes. The import share of income is defined accordingly, and finally gross capital income is equal to one minus the labour share of income and minus the import share of income.

The model includes stochastic equations for gross wage income per employee (LA), and its definition, in turn, is solved for gross wage income (L). However, when generating the data, primary data for L is loaded and LA is defined:

\[ LA = \frac{100 \times L}{\alpha E1} \]

where \( \alpha \) denotes the base-year mean of gross wage income. The variable E1 stands for employment. Apart from gross wage income per employee, an index of production costs (COSI) is calculated which determines the short-term dynamics of inflation. Two factors, labour and imports, enter the index, which is defined as:

\[ COSI = LA^{\alpha_3} PIM^{(1-\alpha_3)} \frac{100}{COSI_{base}} \]

where \( \alpha_3 \) denotes the labour share of income re-based to suit the two-factor approach taken in the equation. The production cost index is subsequently adjusted in order to equal 100 in the individual country’s base year.
Potential output is measured in units of GDP at constant prices. A Cobb-Douglas production function is assumed with a constant labour share of income as calculated above and again re-based because of the two factors of production, labour and capital, such that

$$BIPQ = \exp\left(a_1 + a_2 T + \alpha_2 \ln (1 + 0.01 (ARLQ - ARLQN) + EW) + \left(1 - \alpha_3\right) \ln (KRP)\right),$$

where $T$ denotes a time trend, $ARLQN$ denotes a smoothed unemployment rate with $ARLQN = 0.9 \times ARLQN_{-1} + 0.1 \times ARLQ$, and $KRP$ is the capital stock. Finally, the rate of capacity utilisation is defined as

$$GAPQ = 100 \times \frac{BIPR}{BIPQ}.$$
The euro / US-Dollar exchange rate cannot be appropriately calculated as an average of its constituent members' exchange rate. The D-Mark / US-Dollar exchange rate has therefore been used in the following way:

\[ EMU_{ER} = \frac{1}{GY_{ER}} \times \alpha_{ECU} \]

The notation refers to the official quotation, in which the value of one euro is measured in units of US-Dollar, whereas the D-Mark exchange rate gives the price of one US-Dollar in D-Mark.

The price deflator of domestic demand in the euro area (EMU_PINV) equals domestic demand at current prices multiplied by 100 and divided by domestic demand at constant prices. The weighted average of the constituent member country's interest rates yields the short- and long-term interest rate, respectively, of the euro area. The weights equal the share in euro area-wide GDP at constant prices. Finally, for the broad money aggregate M3, ECB data are used.

The data compilation faces some important changes now that the European System of National Accounts 1995 (ESA 95) has been introduced. In due course the primary data bases will be adapted to the new system, which will not only lead to major data revisions but also necessitate some re-definitions. Moreover, historical data for Germany will only be available from 1991 onwards. A dummy variable is already used in order to capture the change from West German figures to figures for a united Germany. This might additionally suffice to take into account the change in accounting standards.

II. Specification

Individual country models are independently generated, estimated, and simulated at the next modelling stage. This involves redundant equations for variables determined in other parts of the whole model. Therefore, a meaningful forward-looking multi-country model is created at a further stage only when all necessary equations from the various country models and the trade block are combined.
Models that are used in forecasting and economic policy analysis should meet two requirements simultaneously. On the one hand, they should reflect and explain economic developments in the past from the observed data. Under the assumption of constant economic structures, conclusions regarding future developments can be drawn. On the other hand, models should be in line with economic theory, and should thus exhibit neo-classical long-run equilibrium properties. A further constraint imposed on the model is that simulations should reach a steady-state by the end of the simulation horizon. The steady-state of the model is formulated consistently with neo-classical economic theory. However, dynamic adjustments to these long-run steady-states are in many cases relatively slow. The relatively short observation periods that were available are often not sufficient to estimate the long-run equilibrium structure of an economy. At this point calibration comes into play to impose some long-run restrictions on the model. Too much estimation sometimes contradicts theoretical long-run properties of the models. Too much calibration, however, often stands in stark contrast to observed economic developments. Long-run policy analysis, such as a study on the pension problem, requires a model with reasonable long-term properties. Short-term analyses, and in particular economic forecasts, require a more data based formation of the model. An all-purpose model like MEMMOD has to reach a compromise between the two.

III. Estimation

The use of error-correction equations in many cases allows the short-term dynamics to be reconciled with long-run neo-classical theory. Error-correction models have been used for investment, labour demand, imports and money demand. For private consumption a one-step procedure has been applied. The error-correction coefficients reflect rather slow adjustments in some cases and relatively fast adjustments in other cases. In some cases no long-run co-integration has been found. To guarantee reasonable long-run properties and the dynamic stability of the model, it was necessary to calibrate a lot of coefficients, especially to impose a long-run unit income elasticity in consumption, investment and import equations.

Estimation is based on quarterly data, which normally range from 1975 to 1997. Most data come from different OECD sources such as the “Main Economic
Indicators”, “Quarterly National Accounts” and “Economic Outlook”. For German data national sources have been used. With the exception of Germany, all data have been seasonally adjusted. Implicitly explained data such as price deflators or ratios – for example, unemployment rates, output gaps, or deficit ratios – have been computed. Other data like potential output, production costs, P-star, or euro area aggregates, have been constructed.

Wherever possible, the estimation method is ordinary least squares. There are a small number of equations which are non-linear in the coefficients and thus require the method of non-linear least squares. The estimation results in the following model documentation show the estimated coefficients of the equations. Additional information includes the t-values of the coefficients, the adjusted coefficient of determination\(^{27}\), the Durbin-Watson statistic and the standard error of regression.

\(^{27}\) The degree of determination (“R-square”) statistic is calculated as a centred R-square if there is a constant term, otherwise it is an uncentred R-square. Non-linear least squares always provide the uncentred R-square statistic. The difference between the two is that the uncentred R-square includes the explanatory power of the constant, whereas the centred R-square does not.
Baseline and simulation properties
I. Baseline

1. Short-run dynamics and long-run properties

As outlined in the previous chapter, specification and estimation in MEMMOD seek to embrace both short-term dynamics and long-term theoretical foundations. This is also reflected in the baseline and simulation properties of the model. The exact distinction between the short term and the long term, and possibly even the medium term, is largely discretionary. The baseline gives an idea of the time horizon required for most adjustments to be accomplished.

Modelling the long run is essential for a variety of reasons. Most importantly, it is a diagnostic device, in order to detect potential instabilities or inconsistencies in the model. In other words, without well-specified long-term properties the model is likely to face significant convergence difficulties during simulations. It is at the modeller’s discretion how well-specified the long run ought to be. The perfect (i.e. sustainable) steady-state is only achieved when it is suitably defined for all variables in a model. Too much emphasis on long-term properties, however, often leads to costs in terms of short-term dynamics. Models with greater emphasis on short-term dynamics are likely to tend to compromise the long-term properties, and vice versa. Any compromise in the long-term properties implies eventually a numerical instability or indeterminacy of the model. Minor inconsistencies only cause a breakdown of the model well beyond the time horizon of interest, whereas others may result in instabilities beforehand. The compromise found for MEMMOD allows simulations to be conducted until at least 2050.

Suitable long-run properties are not just a technical necessity. In policy simulation analyses it is often important to elucidate the long-term consequences of scenarios in order to derive valuable policy recommendations. As a consequence of an expansive fiscal policy shock, for example, simulations should not result in an explosive trajectory of fiscal balances. Finally, suitable long-run modelling facilitates the setting of terminal conditions, which are the values of lead variables beyond the simulation horizon.

---


29 The baseline in MEMMOD is usually only run until 2030, because longer simulation periods are very costly in terms of computing time.
A full model out-of-sample simulation, without any shocks being imposed on the system, generates the baseline scenario. The simulation horizon is set sufficiently long to bring the model into equilibrium and to rule out a perceptible influence of the terminal conditions in the short run. The baseline is the scenario against which any alternative simulations are set. Since results of such simulations are commonly reported as deviations from the baseline, the exact pattern of the baseline is of lesser importance, unless the model is highly non-linear.

2. Terminal conditions

A steady-state analogue of the full dynamic model is used to generate the terminal conditions of MEMMOD. The forward-looking equations of the dynamic model are replaced by either a backward-looking analogue or a theoretical steady-state formulation. The overview below shows the variables with forward-looking specifications, their terminal conditions, and the equation(s) in which they occur.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Terminal Condition</th>
<th>Equation(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>INF</td>
<td>INFT</td>
<td>INF, RS¹</td>
</tr>
<tr>
<td>MGR</td>
<td>MTR_{ss}</td>
<td>RS¹</td>
</tr>
<tr>
<td>MTR</td>
<td>MTR_{ss}</td>
<td>RS¹</td>
</tr>
<tr>
<td>RS</td>
<td>RSST</td>
<td>RL</td>
</tr>
<tr>
<td>PINV</td>
<td>PINV_{ss}</td>
<td>ER</td>
</tr>
</tbody>
</table>

1 Non-euro area countries’ monetary policy rule.
2 Euro area monetary policy rule.

The terminal conditions for the short-term interest rate, the inflation rate and the monetary growth rate are set according to their theoretical steady-state values. That means for the short-term interest rate in its steady-state that there are no deviations in the target variables from their target values; thus, the steady-state value of the short-term interest rate is given by the Fisher equation. Steady-state
inflation and the monetary growth rate are given by their target rates. Because terminal conditions for these two variables are specified as growth rates, the corresponding variables in the equations of the model refer to growth rates as well. The terminal conditions for the exchange rate are generated by the use of lags instead of leads in the respective equation.

3. Equilibrium and equilibrium mechanism

Having a well-defined equilibrium is in itself not necessarily sufficient for the model to reach this equilibrium. This section therefore highlights the equilibrium mechanisms in MEMMOD. Equilibrium can be defined in various parts of the model, such as government debt, external position, etc. The two key equilibria, however, boil down to the following:

a) Real GDP equals potential output (real equilibrium)

b) Inflation rate equals inflation target (nominal equilibrium).

The real side of the model thus reaches equilibrium when real GDP equals potential output, or simply when aggregate demand equals aggregate supply. Aggregate supply is, according to neo-classical theory, the anchor; in other words, the equilibrium mechanism works through demand adjustments. Although not essential, all components of GDP are expected to constitute a more or less fixed proportion of GDP, and their growth rate is therefore approximately equal to the GDP growth rate. This, however, does not apply to the foreign trade variables. The import demand elasticity with respect to national income is restricted to unity in most countries. Export growth is thus the weighted average of foreign growth. The growth path of potential GDP, however, is not harmonised across countries due to different rates of population growth and technological progress. Export growth therefore does not normally coincide with either domestic GDP growth or import growth.

Using aggregate supply as a real anchor does not imply that it is exogenously determined, as in very simple neo-classical models. The production function used in MEMMOD incorporates some endogenous influences on aggregate supply by

---

30 The inflation equation, for example, cannot be specified in terms of a growth rate of price levels, because that would imply steady-state price levels rather than a steady-state inflation rate. 31 A “perfect” steady-state solution would be more binding in that respect and force all components to converge to a constant proportion of GDP. However, this would interfere with the plausibility of the short-term dynamics of the model and is thus not binding in MEMMOD.
means of investment and therefore the capital stock. Labour supply is a fixed proportion of the exogenous population\textsuperscript{32}. The German part of the model also allows for an endogenous participation rate, which endogenises labour supply in Germany.

Consumption and investment depend on the interest rate, which can thus be used as a policy variable to resolve disequilibrium on the demand side\textsuperscript{33}. Interest rate adjustments are not necessarily sufficient to reach equilibrium in each country model. The model therefore uses anti-cyclical fiscal expenditures as an additional equilibrating mechanism\textsuperscript{34}. This is also necessary to balance any foreign trade imbalances that come about through reasons explained above.

An explicit inflation target provides the nominal anchor in MEMMOD. The inflation target, in its role as nominal anchor, influences inflation expectations directly. The main instrument used to achieve nominal equilibrium is in all countries the short-term interest rate, which is set by the monetary authorities. The monetary policy equilibrium mechanism in the euro area countries differs from the mechanisms in the other countries. The first difference lies in the formulation of monetary policy itself. The ESCB pursues a strategy of monetary targeting\textsuperscript{35}, whereas other central banks are assumed\textsuperscript{36} to pursue a combination of inflation and output targeting. The transmission mechanism differs as well, insofar as the equilibrium price level has a direct impact on inflation in the euro area countries.

The reaction function of the non-euro area countries is set to react to deviations of output and inflation from their respective equilibrium levels. In the case of an output gap the adjustment of the interest rate leads to an adjustment of consumption and investment and thus to a movement towards equilibrium which continues until equilibrium is reached. The exchange rate effect further amplifies

\textsuperscript{32}Here the term “exogenous” is also used for purely autoregressive variables.

\textsuperscript{33}The interest rate also has a direct impact on aggregate supply, which is relatively small, as the diagnostic monetary policy shock simulation below shows.

\textsuperscript{34}This of course reflects a key aspect of the stability and growth pact (Amsterdam, June 1997), namely fiscal consolidation in the participating countries. The idea is for a sound budgetary position to leave room for fiscal policy manoeuvre to counter asymmetric real developments, without breaching the limit of 3\% of GDP.

\textsuperscript{35}Strictly speaking, the ESCB pursues a two-pillar strategy of monetary targeting and price stability. However, since the monetary target in MEMMOD already takes account of an explicit inflation target, including an inflation target in the reaction function would only put more weight on inflation.

\textsuperscript{36}The UK and Canada are the only non-euro area countries in MEMMOD which have an explicitly declared inflation target. Even though output stabilisation is not a declared target, its inclusion in the reaction function is an essential element of the equilibrium mechanism.
the movement towards equilibrium. Deviations of inflation from its target rate also cause an adjustment in the interest rate. With the output gap as one of the determinants of inflation, equilibrating forces are only given through output. Both output and inflation are also anchored independently of monetary policy. Movements in the nominal interest rate thus function as an additional equilibrium force.

The equilibrating mechanism of the ESCB’s monetary targeting policy is modelled using what is termed the P-star concept. The general idea is that prices adjust to their long-term equilibrium level, which takes account of the output gap and the liquidity gap. P-star reinforces the stabilising mechanism for price and output equilibrium.

The equilibrium mechanism of P-star and the reaction function of the European System of Central Banks can only be defined at the aggregate level of the euro area. National prices and the aggregate euro area price level are interdependent. The dependency of the euro area aggregate on national prices exists by definition, i.e. the euro area aggregate is calculated as a weighted average of national prices. The European equilibrium price level, on the other hand, factors in the national inflation equations and thus produces price equilibrium at the national level.

There is no comparable mechanism for the output levels. Aggregate European demand might well be in equilibrium whilst national output gaps persist. Neither the nominal exchange rate nor an independent monetary policy can be used as an equilibrium mechanism. MEMMOD incorporates two mechanisms that are designed to bring national output levels into equilibrium. One is the anti-cyclical fiscal policy mentioned above. The other channel is given through the impact of national output gaps on national inflation. National inflation will then affect the real exchange rate, which thus functions as an equilibrating mechanism.

The baseline simulation shows that the non-euro area countries generally follow a rather stable output path such as can be found for the aggregate euro area output level. However, inflation in the non-euro area countries requires a longer adjustment time because the equilibrium price level is not used as the anchor for inflation.

37 After the introduction of euro coins and notes it will be virtually impossible to determine each individual member country’s money demand, which would be necessary to calculate national P-star values.
II. Simulation properties

1. Monetary and fiscal policy shocks

The simulation properties of MEMMOD will be illustrated using a shock on monetary policy as well as a fiscal policy shock. In the monetary shock, a temporary tightening of the monetary policy stance is assumed, with the interest rate being raised for 2000 and 2001 by 100 basis points above the baseline. The fiscal policy shock is also formulated as a contractive shock, with real government expenditure being lowered by 1% of real GDP\(^38\). It also lasts for the same two years, before the shock variables are endogenised again. Neither shock has any impact on the terminal conditions of MEMMOD.

Chart 13 shows the effects of the two shocks on the nominal short-term interest rate\(^39\). The monetary shock, shown on the left-hand side, shifts the level of the interest rate up, as specified in the shock. After the shock, the interest rate moves rapidly back towards the baseline level. In order to bring inflation and output back to the baseline, the interest rate has to undercut its baseline value temporarily. This implies that the negative impact on output is somewhat larger than the favourable effect on inflation. One can see that the movement of the short-term interest rate below baseline is less pronounced in the euro area. This is because of the stronger impact of the interest rate given the influence of P-star. The return of the short-term interest rate to its baseline level is rationally expected. The effect on the long-term interest rate is therefore smaller and the return to the baseline faster.

The effect of the fiscal policy shock is shown on the right-hand side of Charts 13 to 15. The shock causes a monetary policy response to counter the negative impact on output. The interest rate is thus lowered by about two percentage

---

\(^{38}\) Government expenditure in MEMMOD is determined primarily in real terms; nominal government expenditure is thus derived from real expenditure and a price deflator. This necessitates the shock to be imposed on the real component. In the case of Germany, however, government expenditure is primarily determined in nominal terms, meaning the shock was imposed on nominal government expenditure as 1% of nominal GDP.

\(^{39}\) Simulation results for Japan have only reproduced partly here. This is due to the special economic situation in 1999 where the simulations start: Given a low level of capacity utilisation and a low inflation rate, the interest rate response function hits the lower bound (0.15 % p.a.) almost instantly in the simulations. Simulation experiments built on top of such an extreme baseline are thus not representative of the general simulation properties. Earlier experiments conducted before the severe Japanese recession showed Japan to be roughly in line with the other non-euro area countries.
Effects of simultaneous temporary changes of monetary or fiscal policy in all countries on interest rates

Chart 13

Deviation from baseline in percentage points

- Short-term interest rate
- Ten-year government bond yield

**Monetary policy***  
**Fiscal policy***

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Euro Area</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>United Kingdom</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>USA</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Canada</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* Increase in short-term interest rates by 100 basis points in 2000 and 2001
** Decrease in government expenditure by 1 % of real GDP in 2000 and 2001

Deutsche Bundesbank

98
Effects of simultaneous temporary changes of monetary or fiscal policy in all countries on output and price level

Deviation from baseline in percent

---

Monetary policy

Fiscal policy

Euro Area

United Kingdom

USA

Canada


* Increase in short-term interest rates by 100 basis points in 2000 and 2001

** Decrease in government expenditure by 1% of real GDP in 2000 and 2001

Deutsche Bundesbank
points compared to the baseline in all countries. The cyclical swings during the adjustment process are larger than those in response to the monetary shock. Especially in the USA, there appears to be a rather strong initial reaction from the monetary authorities, which subsequently requires a contractive monetary stance.

Chart 14 shows the effects of the two shocks on the levels of real GDP and prices. It shows that there is a permanent negative level effect in prices, whereas the level of GDP returns almost to the baseline. Permanent effects exist because the equilibrium conditions are defined in terms of capacity utilisation and inflation, which are shown in Chart 15.

The effects of the shocks are approximately of the same order of magnitude in the euro area and in the non-euro area countries, in terms of output and inflation alike. The effect of the monetary shock on capacity utilisation ranges between about –0.25 and –0.65 percentage points. The impact of this shock on inflation amounts in all countries to a maximum of about one-quarter percentage point. The lowest point is reached within two to three years.

Most variables return fully to or close to their respective baseline values or to their new equilibrium within the horizon shown in the graphs. This suggests a stable long-term equilibrium that is not too dominant in the short term. The adjustment time depends predominantly on the implicit dynamics in the model.

A key factor in the adjustment dynamics is the monetary policy reaction function. The nominal interest rate reacts to changes in output and inflation but also exerts a substantial influence on these two variables. It is therefore a key variable in the equilibrium mechanism. Monetary policy rules are discussed at great length in the academic literature. The main focus of that discussion is on the past performance of such rules, i.e. the best fit to the data. There are two key reasons why a rule based on past performances is not necessarily suitable for use in macro-econometric models. First, due to the prominent role of the interest rate in the equilibrium mechanism, it is more important to focus on the future performance of such rules in order to bring about stability in the model. Second, since some central banks have a declared monetary strategy, the rule has to be

---

Effects of simultaneous temporary changes of monetary or fiscal policy in all countries on output gap and inflation rate

Deviation from baseline in percentage points

---

**Monetary policy***

**Fiscal policy**

---

* Increase in short-term interest rates by 100 basis points in 2000 and 2001

** Decrease in government expenditure by 1 % of real GDP in 2000 and 2001

Deutsche Bundesbank
Effects of simultaneous temporary changes of monetary or fiscal policy in all countries on output gap and price level

Table 21

Deviation from baseline in percentage points or in per cent

<table>
<thead>
<tr>
<th>Variable/country</th>
<th>Year</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>10</th>
<th>15</th>
</tr>
</thead>
<tbody>
<tr>
<td>I. Monetary policy*</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. Output gap</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Euro area</td>
<td>-0.14</td>
<td>-0.34</td>
<td>-0.27</td>
<td>-0.05</td>
<td>0.17</td>
<td>-0.00</td>
<td>-0.02</td>
<td></td>
</tr>
<tr>
<td>UK</td>
<td>-0.18</td>
<td>-0.39</td>
<td>-0.29</td>
<td>-0.05</td>
<td>0.08</td>
<td>0.01</td>
<td>-0.01</td>
<td></td>
</tr>
<tr>
<td>USA</td>
<td>-0.12</td>
<td>-0.42</td>
<td>-0.50</td>
<td>-0.16</td>
<td>0.23</td>
<td>0.03</td>
<td>-0.05</td>
<td></td>
</tr>
<tr>
<td>Canada</td>
<td>-0.21</td>
<td>-0.64</td>
<td>-0.50</td>
<td>0.01</td>
<td>0.20</td>
<td>0.01</td>
<td>-0.03</td>
<td></td>
</tr>
<tr>
<td>Japan</td>
<td>-0.10</td>
<td>-0.43</td>
<td>-0.63</td>
<td>-0.31</td>
<td>0.27</td>
<td>-0.05</td>
<td>-0.16</td>
<td></td>
</tr>
<tr>
<td>2. Price level†</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Euro area</td>
<td>-0.07</td>
<td>-0.38</td>
<td>-0.98</td>
<td>-1.66</td>
<td>-2.11</td>
<td>-1.69</td>
<td>-1.58</td>
<td></td>
</tr>
<tr>
<td>UK</td>
<td>-0.06</td>
<td>-0.24</td>
<td>-0.45</td>
<td>-0.54</td>
<td>-0.53</td>
<td>-0.46</td>
<td>-0.38</td>
<td></td>
</tr>
<tr>
<td>USA</td>
<td>-0.04</td>
<td>-0.22</td>
<td>-0.55</td>
<td>-0.83</td>
<td>-0.88</td>
<td>-0.79</td>
<td>-0.71</td>
<td></td>
</tr>
<tr>
<td>Canada</td>
<td>-0.04</td>
<td>-0.26</td>
<td>-0.64</td>
<td>-0.88</td>
<td>-0.87</td>
<td>-0.68</td>
<td>-0.57</td>
<td></td>
</tr>
<tr>
<td>Japan</td>
<td>-0.02</td>
<td>-0.11</td>
<td>-0.32</td>
<td>-0.55</td>
<td>-0.64</td>
<td>-0.54</td>
<td>-0.42</td>
<td></td>
</tr>
<tr>
<td>II. Fiscal policy**</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. Output gap</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Euro area</td>
<td>-1.43</td>
<td>-1.31</td>
<td>-0.41</td>
<td>0.21</td>
<td>0.24</td>
<td>0.18</td>
<td>-0.02</td>
<td></td>
</tr>
<tr>
<td>UK</td>
<td>-0.75</td>
<td>-0.33</td>
<td>-0.01</td>
<td>0.13</td>
<td>0.03</td>
<td>-0.00</td>
<td>-0.05</td>
<td></td>
</tr>
<tr>
<td>USA</td>
<td>-1.05</td>
<td>-0.49</td>
<td>0.38</td>
<td>0.68</td>
<td>0.25</td>
<td>0.27</td>
<td>0.12</td>
<td></td>
</tr>
<tr>
<td>Canada</td>
<td>-1.24</td>
<td>-0.52</td>
<td>0.17</td>
<td>0.24</td>
<td>0.01</td>
<td>0.04</td>
<td>-0.05</td>
<td></td>
</tr>
<tr>
<td>Japan</td>
<td>-1.85</td>
<td>-1.58</td>
<td>0.09</td>
<td>1.15</td>
<td>0.60</td>
<td>0.54</td>
<td>0.24</td>
<td></td>
</tr>
<tr>
<td>2. Price level†</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Euro area</td>
<td>-0.16</td>
<td>-0.62</td>
<td>-1.20</td>
<td>-1.67</td>
<td>-1.92</td>
<td>-2.00</td>
<td>-2.07</td>
<td></td>
</tr>
<tr>
<td>UK</td>
<td>-0.25</td>
<td>-0.52</td>
<td>-0.63</td>
<td>-0.58</td>
<td>-0.52</td>
<td>-0.82</td>
<td>-1.08</td>
<td></td>
</tr>
<tr>
<td>USA</td>
<td>-0.34</td>
<td>-0.83</td>
<td>-0.99</td>
<td>-0.72</td>
<td>-0.37</td>
<td>-0.52</td>
<td>-0.57</td>
<td></td>
</tr>
<tr>
<td>Canada</td>
<td>-0.28</td>
<td>-0.83</td>
<td>-1.07</td>
<td>-0.97</td>
<td>-0.80</td>
<td>-1.31</td>
<td>-1.73</td>
<td></td>
</tr>
<tr>
<td>Japan</td>
<td>-0.31</td>
<td>-0.96</td>
<td>-1.41</td>
<td>-1.39</td>
<td>-1.15</td>
<td>-1.86</td>
<td>-2.36</td>
<td></td>
</tr>
</tbody>
</table>

* Increase in short-term interest rates by 100 basis points in 2000 and 2001
** Decrease in government expenditure by 1 % of real GDP in 2000 and 2001
† Price deflator of domestic demand

Deutsche Bundesbank
modelled consistently with that strategy, and such a strategy may be inconsistent with a conventional policy rule such as a Taylor monetary rule.

Charts 16 and 17 show the effects of the two shocks on output and prices in a Phillips curve-type representation. The adjustment path describes a semi-circle with fast output losses and slow price reactions in the early stages. In this phase of the transmission process of monetary or fiscal policy shocks, the Phillips curve appears relatively flat. But in later periods output returns to its baseline, whereas the price level distinctly decreases. The charts also highlight the differences in simulation results for the individual euro area countries. One can see that differences in the size of the effect and also the adjustment patterns do indeed exist\(^{41}\). However, such differences within the euro area only partly reflect the true structural differences between the euro area economies. Asymmetric specifications in the country models, in particular the German block, are another explanatory factor of the asymmetric response to the two shocks. Although the models for all individual countries but Germany started off with a homogeneous framework, they have all been adjusted to fit each country individually. This implies, for instance, that restrictions have not been imposed equally. The ‘true’ structural asymmetries should probably result from differences in the estimated coefficients, derived from otherwise homogeneous models.

The charts show that all long-run Phillips curves are approximately vertical between the origin and the end points. Chart 18 further illustrates the Phillips curve effects, here in a comparison between the two shocks for each individual country. The response pattern in the countries outside the euro area is, with the exception of Japan, very similar between the two shocks. The euro area countries show a noticeably higher price effect in the monetary shock. The key results of the simulation analyses are also summarised in Table 21.

Effects of simultaneous temporary changes of monetary policy in all countries on output and price level*

Deviation from baseline in percent

Euro area
Single country

* Increase in short-term interest rates by 100 basis points in 2000 and 2001

Deutsche Bundesbank
Effects of simultaneous temporary changes of fiscal policy in all countries on output and price level*

Deviation from baseline in percent

--- Euro area

----- Single country

* Decrease in government expenditure by 1 % of real GDP in 2000 and 2001

Deutsche Bundesbank
Effects of simultaneous temporary changes of monetary or fiscal policy in all countries on output and price level

Deviation from baseline in percent

- Monetary policy* (long-run 0)
- Fiscal policy ** (long-run Δ)

Deutsche Bundesbank
2. **Supply side effects**

The shocks affect the investment behaviour and labour demand, and therefore, through various channels, aggregate supply. Neither of the factors of production capital or labour is anchored to a steady-state level. The assumption of a natural rate of unemployment would provide an anchor for labour, given an exogenous population and participation rate.

However, the NAIRU concept is running into increasing criticism in the literature, and alternative concepts along the line of hysteresis and time-varying NAIRUs have taken over. The whole point of the hysteresis idea is precisely the fact that there is no anchor for the rate of unemployment. This idea has been approximated in MEMMOD by using a smoothed unemployment rate.

Although the initial effect on investment and labour demand will normally be reversed, there is no mechanism in place that ensures that the initial effect will be offset exactly. The monetary shock, for instance, has a negative impact on investment. One has seen above that the interest rate eventually returns to its baseline value. This also applies to investment behaviour, but there is no mechanism that brings the capital stock back to its baseline level.

This does not contradict, or interfere with, the role of aggregate supply as the real anchor to the model. As the current discussion of equilibrium concepts such as NAIRU demonstrates, equilibrium concepts are often considered to be too stringent. An implication of a flexible supply side is, for example, that policy mistakes, which cause higher unemployment in the short run, will also have a potential impact over the long run.

3. **Summary**

The nominal anchor in MEMMOD is given by the inflation target, and the real anchor by potential output. There is a difference between the euro area and the other countries regarding the price mechanism. The P-star concept used for the euro area makes the interest rate a more powerful instrument in controlling inflation. There is no difference between the euro area and the other countries in the long term, where a state of equilibrium is reached in inflation and the output

---

43 The exponential smoothing of the unemployment rate is a simple moving average process.
gap. MEMMOD also takes account of potential supply-side effects, which are small, but potentially long-lasting or even permanent.


Carlberg, M., Open Economy Dynamics, Heidelberg 1993.


Church, K. B., Mitchell, P. R., Smith, P. N. Wallis, K. F., Targeting inflation: Comparative control exercises on models of the UK economy, Economic Modelling, 13, 1996.


Clark, Peter B. and Rose, D., Asymmetry in the U.S. Output-Inflation Nexus, International Monetary Fund Staff Papers, 43, 1996.


Douven, R. C. and Plasmans, J. E. J., SLIM, a small linear interdependent model of eight EU-member states, the USA and Japan, Economic Modelling, 13, 1996.


European Commission, One market, one money. An evaluation of the potential benefits and costs of forming an economic and monetary union, European Economy, No. 44, October 1990.


Fisher, P., Rational Expectations in Macroeconomic Models, Dordrecht 1992


Haas, R. D. and Masson, P. R., MINIMOD: Specification and Simulation Results, International Monetary Fund Staff Papers, 33, 1986.


International Monetary Fund, World Economic Outlook, May 1996.

Issing, O., Monetary targeting in Germany: The stability of monetary policy and of the monetary system, Journal of Monetary Economics, 39, 1997


Model bibliography


Deutsche Bundesbank, Macro-econometric Model of the German Economy, Frankfurt am Main, April 1994.

Deutsche Bundesbank, Makro-ökonometrisches Mehr-Länder-Modell, Frankfurt am Main, November 1996.

Herrmann, H. and Jahnke, W., The interest rate policy transmission process in Germany, in Bank for International Settlements, National Differences in Interest Rate Transmission, Basle 1994, pp. 107 - 133.


Jahnke, W., Arbeitsmarkt und Lohnentwicklung in der deutschen Wirtschaft (The Labour Market and Wages in the German Economy), Jahrbücher für Nationalökonomie und Statistik, Bd. 203, Heft 2, 1987, pp. 152 - 166.

Jahnke, W., Gesamtwirtschaftliche Wirkungen der Bevölkerungsentwicklung bis zum Jahre 2000 — Simulationsergebnisse mit einem makroökonomischen Modell für die Bundesrepublik Deutschland, in Felderer, B. (Hrsgb.), Bevölkerung und Wirtschaft, Berlin 1990, pp. 211 - 229.

Jahnke, W., Geldpolitik und monetärer Transmissionsprozeß im ökonometrischen Modell der Deutschen Bundesbank, Geld und Währung Working Papers, Nr. 21, Frankfurt am Main 1991.


Klimesch, H., Möglichkeiten einer computergestützten Strukturanalyse ökonometrischer Modelle – dargestellt am Beispiel des ökonometrischen Modells der


Model documentation
I. Model equations

1. USA

1. Aggregate demand

1. Real private per capita consumption

\[ \Delta_d \ln \left( \frac{\text{US\_CPR}}{\text{US\_WOBE}} \right) = -0.005 + 0.267 \Delta_d \ln \left( \frac{100 \times \text{US\_YV}}{\text{US\_PCP} + \text{US\_WOBE}} \right) \]
\[ - 0.140 \times 0.01 \times (\text{US\_RL} - \text{US\_PCPD}) \]
\[ + 0.673 \Delta_d \ln \left( \frac{\text{US\_CPR} - 1}{\text{US\_WOBE}} \right) \]
\[ - 0.031 \ln \left( \frac{\text{US\_CPR}}{\text{US\_BIPR} - 4} \right) \]

\[ R^2 = 0.775 \quad DW = 1.671 \quad SER = 0.008 \]

2. Participation rate (labour supply)

\[ \ln \left( \frac{\text{US\_EW}}{\text{US\_WOBE}} \right) = -0.016 + 0.975 \ln \left( \frac{\text{US\_EW} - 1}{\text{US\_WOBE} - 1} \right) \]

\[ R^2 = 0.997 \quad DW = 1.986 \quad SER = 0.003 \]

3. Population

\[ \ln (\text{US\_WOBE}) = 5.224 + 0.244 \times 0.01 \times T \]

\[ R^2 = 0.999 \quad DW = 0.039 \quad SER = 0.002 \]
4. **Transfers to foreign countries**

\[
\text{US}_U = 1.143 - 2.568 \text{Q1} - 0.082 \text{Q2} - 0.017 \text{Q3} \\
\quad + 0.883 \text{US}_U{}^{-1} \\
\quad (1.619) \quad (2.648) \quad (0.084) \quad (0.017) \\
\quad (14.715)
\]

\[
R^2 = 0.708 \quad DW = 2.319 \quad SER = 3.289
\]

5. **Nominal private consumption**

\[
\text{US}_\text{CP} = 0.01 \times \text{US}_\text{CPR} + \text{US}_\text{PCP}
\]

6. **Nominal gross private fixed capital investment**

\[
\text{US}_\text{IAN} = 0.01 \times \text{US}_\text{IANR} \times \text{US}_\text{PIAN}
\]

7. **Nominal final demand**

\[
\text{US}_\text{END} = 0.01 \times \text{US}_\text{ENDR} \times \text{US}_\text{PEV}
\]

8. **Real final demand**

\[
\text{US}_\text{ENDR} = \text{US}_\text{CPR} + \text{US}_\text{IANR} + \text{US}_\text{GR} + \text{US}_\text{VR} + \text{US}_\text{EXR}
\]

9. **Nominal gross domestic product**

\[
\begin{align*}
\text{US}_\text{BIP} &= 0.01 \times \left[ \text{US}_\text{ENDR} - \text{US}_\text{EXR} \right] \times \text{US}_\text{PINV} \\
&\quad + 0.01 \times \text{US}_\text{EXR} \times \text{US}_\text{PEX} \\
&\quad - 0.01 \times \text{US}_\text{IMR} \times \text{US}_\text{PIM} \\
&\quad + \text{US}_\text{SDN}
\end{align*}
\]

10. **Real gross domestic product**

\[
\text{US}_\text{BIPR} = \text{US}_\text{ENDR} - \text{US}_\text{IMR} + \text{US}_\text{SDR}
\]

11. **National income**

\[
\text{US}_\text{VE} = \text{US}_\text{BIP} - \text{US}_\text{TIS} - \text{US}_\text{D}
\]

12. **Disposable income of households**

\[
\text{US}_\text{YV} = \text{US}_\text{VE} - \text{US}_\text{TDB} + \text{US}_\text{SB}
\]

13. **Gross wage income**

\[
\text{US}_\text{L} = 0.01 \times 7.690 \times \text{US}_\text{LA} \times \text{US}_\text{E1}
\]

14. **Net lending of households**

\[
\text{US}_\text{FH} = \text{US}_\text{YV} - \text{US}_\text{CP}
\]

15. **Current account balance**

\[
\text{US}_\text{LBS} = 0.01 \times \left[ \text{US}_\text{EXR} + \text{US}_\text{PEX} - \text{US}_\text{IMR} + \text{US}_\text{PIM} \right] - \text{US}_\text{U}
\]
II. Aggregate supply

1. Real gross private fixed capital investment

   a) \[ \ln (US\_IANR) = -1948 + 0.984 \ln (US\_ENDR) + US\_IANR\_EC \]
   
   \( R^2 = 0.904 \quad DW = 0.083 \quad SER = 0.067 \)

   b) \[ \Delta_4 \ln (US\_IANR) = 0.655 \Delta_4 \ln (US\_ENDR) \]
   
   \[ = -0.283 + 0.01 \Delta_4 US\_RL_{-1} \]
   
   \[ + 0.656 \Delta_4 \ln (US\_IANR_{-1}) \]
   
   \[ - 0.195 US\_IANR\_EC_{-4} \]
   
   \( R^2 = 0.917 \quad DW = 1.023 \quad SER = 0.024 \)

2. Real inventory investment

   \[ \frac{US\_VR}{US\_ENDR_{-1}} = 0.002 + 0.603 \frac{US\_VR_{-1}}{US\_ENDR_{-2}} \]

   \( R^2 = 0.357 \quad DW = 1.707 \quad SER = 0.004 \)

3. Employment (labour demand)

   a) \[ \ln (US\_Et) = -1.268 + 0.816 \ln (US\_ENDR) \]
   
   \[ + 0.716 \ln \left( \frac{US\_FEV + (100 - US\_TISS)}{100 + US\_LA} \right) + US\_Et\_EC \]
   
   \( R^2 = 0.996 \quad DW = 0.316 \quad SER = 0.008 \)
b) \[ \Delta_4 \ln (US_{EI}) = 0.389 \Delta_4 \ln (US_{ENDR}) \]
\[ + 0.241 \Delta_4 \ln \left( \frac{US_{PEV} \ast (100 - US_{TISS})}{100 + US_{LA}} \right) \]
\[ + 0.446 \Delta_4 \ln (US_{EI_{-1}}) \]
\[ - 0.211 \Delta_4 \ln (US_{EI_{-4}}) \]
\[ + \min \left[ 0, 5 \ast \ln \left( \frac{0.97 US_{EW}}{US_{EI}} \right) \right] \]

\[ R^2 = 0.978 \quad DW = 1.141 \quad SER = 0.003 \]

4. **Real imports of goods and services**

a) \[ \ln (US_{IMR}) = -2.201 + 1.0 \ln (US_{ENDR}) \]
\[ + 1.579 \ln \left( \frac{US_{PEV} \ast (1 - 0.01 \ast US_{TISS})}{US_{PIM}} \right) \]
\[ + US_{IMR_{EC}} \]

\[ R^2 = 0.851 \quad DW = 0.193 \quad SER = 0.089 \]

b) \[ \Delta_4 \ln (US_{IMR}) = 1.131 \Delta_4 \ln (US_{ENDR}) \]
\[ + 0.298 \Delta_4 \ln \left( \frac{US_{PEV} \ast (1 - 0.01 \ast US_{TISS})}{US_{PIM}} \right) \]
\[ + 0.474 \Delta_4 \ln (US_{IMR_{-1}}) \]
\[ - 0.088 \Delta_4 \ln (US_{IMR_{-4}}) \]

\[ R^2 = 0.910 \quad DW = 1.352 \quad SER = 0.030 \]

5. **Depreciation allowances**

\[ US_D = 1.813 + (1 - 0.01 \ast US_{KAB}) \ast US_{D_{-1}} \]
\[ + 0.01 \ast US_{KAB} \ast 0.01 \ast US_{IANR_{-1}} \ast US_{PINV_{-1}} \]

\[ R^2 = 0.000 \quad DW = 2.655 \quad SER = 7.203 \]
6. Potential gross domestic product

\[
\text{US\_BIPQ} = 0.922 \left[ 0.986 + 0.138 + 0.01\times T \right. \\
\left. -211.033 \right) (32.952) \\
+ \exp \left[ + 0.630 \ln \left[ \text{US\_E1} + 0.01 \times (\text{US\_ARLQ} - \text{US\_ARLQ}_0) + \text{US\_EW} \right] \\
+ (1 - 0.630) \ln \left[ \text{US\_KRP}_0 \right] \right]
\]

\( R^2 = 0.914 \quad DW = 0.261 \quad SE = 0.012 \)

7. Nominal inventory investment

\[
\text{US\_V} = 0.01 \times \text{US\_PINV} \times (\text{US\_VR} + \text{US\_CPR} + \text{US\_IANR} + \text{US\_GR}) \\
- \text{US\_CP} - \text{US\_IAN} - \text{US\_G}
\]

8. Private real stock of capital

\[
\text{US\_KRP} = (1 - 0.01 \times \text{US\_KAB}) \text{US\_KRP}_0 + \text{US\_IANR}
\]

9. Capacity utilisation

\[
\text{US\_GAPQ} = 100 \times \frac{\text{US\_BIPR}}{\text{US\_BIPQ}}
\]

10. Unemployment

\[
\text{US\_ARL} = \text{US\_EW} - \text{US\_E1}
\]

11. Unemployment rate

\[
\text{US\_ARLQ} = 100 \times \frac{\text{US\_ARL}}{\text{US\_EW}}
\]

12. "Smoothed" unemployment rate

\[
\text{US\_ARLQN} = 0.9 \times \text{US\_ARLQN}_0 + 0.1 \times \text{US\_ARLQ}
\]

13. Net lending of firms

\[
\text{US\_FU} = \text{US\_D} - \text{US\_IAN} - \text{US\_V} - \text{US\_U} - \text{US\_SDN}
\]
III. Factor costs and deflators

1. Gross wage income per employee

\[
\Delta_4 \ln (\text{US\_LA}) = 0.001 + (1 - 0.830) \Delta_4 \ln (\text{US\_PCP}) \\
(1.296)
\]
\[
- 0.154 \Delta_4 (\text{US\_ARLQ} - \text{US\_ARLQN}) * 0.01 \\
(3.076)
\]
\[
- 0.154 (\text{US\_ARLQ}_{-4} - \text{US\_ARLQN}_{-4}) * 0.01 \\
+ 0.830 \Delta_4 \ln (\text{US\_LA}_{-1}) \\
(15.577)
\]

\[R^2 = 0.743 \quad DW = 1.635 \quad SER = 0.005\]

2. Deflator of domestic demand

a) \[0.01 * \text{US\_INF} = 0.03 \Delta_4^2 \ln \left( \frac{\text{US\_COSI}_{-1}}{1 - 0.001 * \text{US\_TISS}_{-1}} \right) \\
+ 0.01 * \left( (1 - 0.307) * \text{US\_INF}_{-1} + 0.307 * \left( (1 - 0.4) * \text{US\_INF}_{-1} \right) \right) \\
+ 0.01* \ln (0.01* \text{US\_GAPQ}) \]

\[R^2 = 0.379 \quad DW = 1.713 \quad SER = 0.003\]

b) \[\ln (\text{US\_PINV}) = \ln (\text{US\_PINV}_{-4}) + 0.01 * \text{US\_INF}\]

3. Deflator of private consumption

\[\Delta_4 \ln (\text{US\_PCP}) = (1 - 0.479) 0.01 * \text{US\_INF} \\
+ 0.479 \Delta_4 \ln (\text{US\_PCP}_{-1}) \\
(8.119)\]

\[R^2 = 0.420 \quad DW = 0.526 \quad SER = 0.003\]
4. **Deflator of government demand**

\[ \Delta_4 \ln(US_{.PG}) = (1 - 0.611) 0.01 \ast US_{.INF} \\
+ 0.611 \Delta_4 \ln(US_{.PG-1}) \]

\[ R^2 = 0.687 \quad DW = 1.483 \quad SER = 0.004 \]

5. **Deflator of private fixed capital investment**

\[ \Delta_4 \ln(US_{.PIAN}) = (1 - 0.880) 0.01 \ast US_{.INF} \\
+ 0.880 \Delta_4 \ln(US_{.PIAN-1}) \]

\[ R^2 = 0.857 \quad DW = 0.533 \quad SER = 0.007 \]

6. **Deflator of exports**

\[ \Delta_4 \ln(US_{.PEX}) = (1 - 0.945) \Delta_4 \left[ (1 - 0.116) \ast \ln(US_{.PINV-1}) \right] \\
+ 0.945 \Delta_4 \ln(US_{.PEX-1}) \]

\[ R^2 = 0.866 \quad DW = 0.815 \quad SER = 0.012 \]

7. **Production costs**

\[ US_{.COSI} = \frac{100}{99.999} \ast US_{.LA}^{0.847} \ast US_{.PIM}^{1-0.847} \]

8. **Deflator of final demand**

\[ US_{.PEV} = \left( US_{.ENDR} - US_{.EXR} \right) \ast US_{.PINV} + US_{.EXR} \ast US_{.PEX} \]

9. **Deflator of gross domestic product**

\[ US_{.PBIP} = 100 \ast \frac{US_{.BIP}}{US_{.BIPR}} \]

10. **Adaptive expectation on consumer price inflation**

\[ US_{.PCPD} = 0.9 \ast US_{.PCPD-1} + 0.1 \Delta_4 \ln(PCP_{-1}) \ast 100 \]

142
11. Adaptive expectation on inflation rate of final demand
   \[ \text{US}_{\text{PEVD}} = 0.9 \times \text{US}_{\text{PEVD}_{\text{-1}}} + 0.1 \Delta_4 \ln \{\text{PEV}_{\text{-1}}\} + 100 \]

IV. Government

1. Direct tax rate
   \[ \text{US}_{\text{TDBS}} = 0.510 + 0.983 \text{US}_{\text{TDBS}_{\text{-1}}} \]
   \[ (0.440) \quad (23.847) \]
   \[ \hat{R}^2 = 0.862 \quad \text{DW} = 2.016 \quad \text{SER} = 0.336 \]

2. Indirect tax rate
   \[ \text{US}_{\text{TISS}} = 0.448 + 0.007 \text{Q1} + 0.015 \text{Q2} + 0.014 \text{Q3} + 0.930 \text{US}_{\text{TISS}_{\text{-1}}} \]
   \[ (2.299) \quad (0.262) \quad (0.538) \quad (0.488) \quad (32293) \]
   \[ \hat{R}^2 = 0.920 \quad \text{DW} = 1.835 \quad \text{SER} = 0.095 \]

3. Real government demand
   \[ \Delta_4 \ln \{\text{US}_{\text{GR}}\} = 0.860 \Delta_4 \ln \{\text{US}_{\text{GR}_{\text{-1}}}\} \]
   \[ + (1 - 0.860) \Delta_4 \ln \{\text{US}_{\text{BIPR}}\} \]
   \[ - 0.041 \ln \{0.01 \times \text{US}_{\text{GAPQ}}\} \]
   \[ (19.675) \quad (0.708) \]
   \[ \hat{R}^2 = 0.849 \quad \text{DW} = 2.195 \quad \text{SER} = 0.011 \]

4. Government transfers to households
   \[ \ln \frac{\text{US}_{\text{SB}}}{\text{US}_{\text{BIP}}} = -0.036 + 0.569 \times 0.01 \times \{\text{US}_{\text{ARLQ}} - \text{US}_{\text{ARLQN}}\} + 0.982 \ln \frac{\text{US}_{\text{SB}_{\text{-1}}}}{\text{US}_{\text{BIP}_{\text{-1}}}} \]
   \[ (1.006) \quad (3.940) \quad (58.155) \]
   \[ \hat{R}^2 = 0.974 \quad \text{DW} = 0.677 \quad \text{SER} = 0.015 \]

5. Direct taxes and social contributions
   \[ \text{US}_{\text{TDB}} = 0.01 \times \text{US}_{\text{TDBS}} \times \text{US}_{\text{VE}} \]
6. **Indirect taxes (excluding subsidies)**  
\[ \text{US\_TIS} = 0.01 \times \text{US\_TISS} + \text{US\_ENDR} + 0.01 \times \text{US\_PEV} \]

7. **Nominal government demand**  
\[ \text{US\_G} = 0.01 \times \text{US\_GR} + \text{US\_PG} \]

8. **Net lending of government**  
\[ \text{US\_FS} = \text{US\_TDB} + \text{US\_TIS} - \text{US\_G} - \text{US\_SB} \]

V. **Money and interest rates**

1. **Real stock of money**
   
a) \[ \ln \left( \frac{\text{US\_M2}}{\text{US\_PINV}} \right) = -1.720 + 0.715 \ln (\text{US\_BIPR}) \\
    \quad (8.298) \quad (25.952) \\
    - 0.292 \times 0.01 \times \text{US\_RL} + \text{US\_M2\_EC} \\
    \quad (1.267) \]
   
   \[ R^2 = 0.898 \quad DW = 0.053 \quad SER = 0.046 \]

   b) \[ \Delta_4 \ln \left( \frac{\text{US\_M2}}{\text{US\_PINV}} \right) = 0.094 \Delta_4 \ln (\text{US\_BIPR}) \\
    \quad (1.971) \]
   
   \[ - 0.426 \Delta_4 \times 0.01 \times \text{US\_RL} \\
    \quad (4.698) \]
   
   \[ + 0.809 \Delta_4 \ln \left( \frac{\text{US\_M2\_4}}{\text{US\_PINV\_4}} \right) \\
    \quad (15.700) \]
   
   \[ - 0.120 \text{US\_M2\_EC\_4} \\
    \quad (4.544) \]
   
   \[ R^2 = 0.899 \quad DW = 1.366 \quad SER = 0.011 \]

2. **Monetary policy rule:**
   **Money market interest rate for three-month funds**
   
   \[ \text{US\_RS} = 0.75 \times \text{US\_RS\_4} + (1 - 0.75) \text{US\_RSST} \\
    + 0.50 \times \left( \frac{1}{4} \sum_{i=3}^{4} \text{US\_INF\_i} - \text{US\_INFT\_i} \right) \\
    + 0.50 \times 100 \times \ln \left( 0.01 \times \frac{1}{4} \sum_{i=0}^{3} \text{US\_GAPQ\_i} \right) \]
3. Yield on government bonds

\[
1 + 0.01 \text{US}_\text{RL} = \left(1 + 0.01 \text{US}_\text{RL}_{-1}\right)^{1-0.492} \\
\times \left(1 + 0.01 \text{US}_\text{RL}_{+1}\right)^{0.492} \\
\times \left(1 + 0.01 \text{US}_\text{RS} \frac{1}{1 + 0.01 \text{US}_\text{RSST}}\right)
\]

\( R^2 = 1.000 \) \quad \text{DW} = 2.645 \quad \text{SER} = 0.004

4. Short-term interest rate (long-run)

\[
\text{US}_\text{RSST} = 100 \times \Delta_4 \ln \left(\sum_{i=0}^{3} \text{US}_\text{BIPQ}_{-i}\right) + \text{US}_\text{INFT}
\]

5. Long-term interest rate (long-run)

\[
\text{US}_\text{RLST} = \text{US}_\text{RSST} + \text{US}_\text{TERM}
\]
2. Japan

I. Aggregate demand

1. Real private per capita consumption

\[
\Delta_4 \ln \left( \frac{\text{JP\_CPR}}{\text{JP\_WOBE}} \right) = -0.058 \quad (1.152)
\]
\[
+ 0.357 \Delta_4 \ln \left( \frac{\text{JP\_YV}}{0.01 \times \text{JP\_PCP} + \text{JP\_WOBE}} \right) \quad (4.583)
\]
\[
- 0.131 \times 0.01 \times (\text{JP\_RL} - \text{JP\_PCPD}) \quad (1.970)
\]
\[
+ 0.551 \times \Delta_4 \ln \left( \frac{\text{JP\_CPR} - 1}{\text{JP\_WOBE} - 1} \right) \quad (7.353)
\]
\[
- 0.124 \times \ln \left( \frac{\text{JP\_CPR} - 4}{\text{JP\_BIPR} - 4} \right) \quad (1.273)
\]

\[ R^2 = 0.467 \quad \text{DW} = 1.862 \quad \text{SER} = 0.012 \]

2. Participation rate (labour supply)

\[
\ln \left( \frac{\text{JP\_EW}}{\text{JP\_WOBE}} \right) = -0.066 + 0.923 \ln \left( \frac{\text{JP\_EW} + 1}{\text{JP\_WOBE} - 1} \right) + 0.0001 \times T \quad (2.657)
\]

\[ R^2 = 0.995 \quad \text{DW} = 2.189 \quad \text{SER} = 0.003 \]

3. Population

\[
\ln (\text{JP\_WOBE}) = 4.648 + 0.134 + 0.01 \times T \quad (1360.425) \quad (42.991)
\]

\[ R^2 = 0.953 \quad \text{DW} = 0.007 \quad \text{SER} = 0.008 \]

4. Transfers to foreign countries

\[
\text{JP\_U} = -0.052 + 0.027 \text{Q1} - 0.014 \text{Q2} - 0.054 \text{Q3} + 0.887 \text{JP\_U\_1} \quad (0.943) \quad (0.376) \quad (0.198) \quad (0.748) \quad (17598)
\]

\[ R^2 = 0.772 \quad \text{DW} = 2.354 \quad \text{SER} = 0.244 \]
5. **Nominal private consumption**
   \[ \text{JP\_CP} = 0.01 \times \text{JP\_CPR} \times \text{JP\_PCP} \]

6. **Nominal gross private fixed capital investment**
   \[ \text{JP\_IAN} = 0.01 \times \text{JP\_IANR} \times \text{JP\_PIAN} \]

7. **Nominal final demand**
   \[ \text{JP\_END} = 0.01 \times \text{JP\_ENDR} \times \text{JP\_PEV} \]

8. **Real final demand**
   \[ \text{JP\_ENDR} = \text{JP\_CPR} + \text{JP\_IANR} + \text{JP\_GR} + \text{JP\_VR} + \text{JP\_EXR} \]

9. **Nominal gross domestic product**
   \[ \text{JP\_BIP} = 0.01 \times [\text{JP\_ENDR} - \text{JP\_EXR}] \times \text{JP\_PINV} \\
   + 0.01 \times \text{JP\_EXR} \times \text{JP\_PEX} \\
   - 0.01 \times \text{JP\_IMR} \times \text{JP\_PIM} \\
   + \text{JP\_SDN} \]

10. **Real gross domestic product**
    \[ \text{JP\_BIPR} = \text{JP\_ENDR} - \text{JP\_IMR} + \text{JP\_SDR} \]

11. **National income**
    \[ \text{JP\_VE} = \text{JP\_BIP} - \text{JP\_TIS} - \text{JP\_D} \]

12. **Disposable income of households**
    \[ \text{JP\_YV} = \text{JP\_VE} - \text{JP\_TDB} + \text{JP\_SB} \]

13. **Gross wage income**
    \[ \text{JP\_L} = 0.01 \times 0.919 \times \text{JP\_LA} + \text{JP\_E1} \]

14. **Net lending of households**
    \[ \text{JP\_FH} = \text{JP\_YV} - \text{JP\_CP} \]

15. **Current account balance**
    \[ \text{JP\_LBS} = 0.01 \times [\text{JP\_EXR} \times \text{JP\_PEX} - \text{JP\_IMR} \times \text{JP\_PIM}] - \text{JP\_U} \]
II. Aggregate supply

1. Real gross private fixed capital investment

a) \( \ln(\text{JP\_IANR}) = -1.525 + 1.0 \ln(\text{JP\_ENDR}) \) 
\( (55.413) \) 
\(-1.969 + 0.01 \times \text{JP\_RL} + \text{JP\_IANR\_EC} \) 
\( (4.707) \)

\( R^2 = 0.182 \) \( DW = 0.073 \) \( SER = 0.080 \)

b) \( \Delta_4 \ln(\text{JP\_IANR}) = 0.555 \Delta_4 \ln(\text{JP\_ENDR}) \) 
\( (5.852) \) 
\(-0.101 \Delta_4 + 0.01 \times (\text{JP\_RL\_1 - JP\_PEVD\_1}) \) 
\( (1.082) \) 
\(+ 0.674 \Delta_4 \ln(\text{JP\_IANR\_1}) \) 
\( (1.307) \) 
\(-0.111 \text{JP\_IANR\_EC\_4} \) 
\( (3.536) \)

\( R^2 = 0.895 \) \( DW = 1.565 \) \( SER = 0.023 \)

2. Real inventory investment

\( \text{JP\_VR} = 0.059 + 0.491 \text{JP\_VR\_1} + 0.042 \Delta_4 \text{JP\_ENDR} \) 
\( (1.349) \) \( (5.820) \) \( (3.841) \)

\( R^2 = 0.449 \) \( DW = 2.303 \) \( SER = 0.204 \)

3. Employment (labour demand)

a) \( \ln(\text{JP\_EI}) = 2.702 + 0.301 \ln(\text{JP\_ENDR}) + \text{JP\_EI\_EC} \) 
\( (192.770) \) \( (97.963) \)

\( R^2 = 0.990 \) \( DW = 0.254 \) \( SER = 0.008 \)
b) \( \Delta_4 \ln (\text{JP}_E) = 0.090 \Delta_4 \ln (\text{JP}_\text{EN DR}) \) 
\[ (5.648) \]
\( + 0.639 \Delta_4 \ln (\text{JP}_E_1) \) 
\[ (11.133) \]
\( - 0.218 \text{ JP}_E_1 \text{ EC - 4} \) 
\[ (3.944) \]
\[ + \min \left[ 0, \ln \left( \frac{0.97 \text{ JP}_E \text{EW}}{\text{JP}_E} \right) \right] \]

\( R^2 = 0.915 \quad DW = 2.120 \quad SER = 0.003 \)

4. **Real imports of goods and services**

a) \( \ln (\text{JP}_\text{IMR}) = -2.458 + 1.00 \ln (\text{JP}_\text{EN DR}) \) 
\[ (197.586) \]
\[ + 0.300 \ln \left( \frac{\text{JP}_\text{PEV} \times (1 - 0.01 + \text{JP}_\text{TISS})}{\text{JP}_\text{PIM}} \right) \] 
\[ (8.067) \]
\[ + \text{ JP}_\text{IMR - EC} \]

\( R^2 = 0.403 \quad DW = 0.083 \quad SER = 0.102 \)

b) \( \Delta_4 \ln (\text{JP}_\text{IMR}) = 0.383 \Delta_4 \ln (\text{JP}_\text{EN DR}) \) 
\[ (2.865) \]
\[ + 0.055 \Delta_4 \ln \left( \frac{\text{JP}_\text{PEV} \times (1 - 0.01 + \text{JP}_\text{TISS})}{\text{JP}_\text{PIM}} \right) \] 
\[ (1.781) \]
\[ + 0.702 \Delta_4 \ln (\text{JP}_\text{IMR - 1}) \] 
\[ (1.1115) \]
\[ - 0.197 \text{ JP}_\text{IMR - EC - 4} \] 
\[ (4.126) \]

\( R^2 = 0.855 \quad DW = 1.550 \quad SER = 0.036 \)

5. **Depreciation allowances**

\( \text{JP}_D = 0.171 - 0.135 \text{ Q1} - 0.055 \text{ Q2} - 0.128 \text{ Q3} + (1 - 0.01 \times \text{JP}_\text{KAB}) \times \text{JP}_D - 1 \) 
\[ (0.723) \quad (0.404) \quad (0.164) \quad (0.383) \]
\[ + 0.01 \times \text{JP}_\text{KAB} + 0.01 \times \text{JP}_\text{LANR - 1} \times \text{JP}_\text{PINV - 1} \]

\( R^2 = -0.032 \quad DW = 3.377 \quad SER = 1.135 \)
6. Potential gross domestic product

\[ JP\_BIPQ = 0.999 \]
\[ \quad \left[ -0.715 + 0.123 \times 0.01 + T \right. \]
\[ \quad \left. (85.165) (16.138) \times \exp^{+0.588 \ln (\left[JP\_E1 + 0.01 \times (JP\_ARLQ - JP\_ARLQ\_N) + JP\_EW\right]} \right] \]
\[ + (1-0.588) \ln (\left[JP\_KRP\_1\right]} \]

\( R^2 = 0.724 \quad DW = 0.136 \quad SER = 0.022 \)

7. Nominal inventory investment

\[ JP\_V = 0.01 \times JP\_PINV \times (JP\_VR + JP\_CPR + JP\_IANR + JP\_GR) \]

8. Private real stock of capital

\[ JP\_KRP = (1 - 0.01 \times JP\_KAB) \times JP\_KRP\_1 + JP\_IANR \]

9. Capacity utilisation

\[ JP\_GAPO = 100 \times \frac{JP\_BIPR}{JP\_BIPQ} \]

10. Unemployment

\[ JP\_ARL = JP\_EW - JP\_E1 \]

11. Unemployment rate

\[ JP\_ARLQ = 100 \times \frac{JP\_ARL}{JP\_EW} \]

12. "Smoothed" unemployment rate

\[ JP\_ARLQN = 0.9 \times JP\_ARLQ\_N + 0.1 \times JP\_ARLQ \]

13. Net lending of firms

III. Factor costs and price deflators

1. Gross wage income per employee

\[
\Delta_4 \ln (JL_{LA}) = 0.637 \Delta_4 \ln (JL_{LAS}) \\
(10.285) + 0.305 \Delta_4 \ln (JL_{LA,-1}) \\
(5.364) + 0.519 \ln \left( \frac{JL_{LAS,-4}}{JL_{LA,-4}} \right) \\
(7.413)
\]

\[R^2 = 0.975 \quad DW = 1.666 \quad SER = 0.010\]

2. Deflator of domestic demand

a) \[0.01 \times JL_{INF} - 0.033 \Delta_4 \ln \left( \frac{JL_{COSI}}{1 - 0.01 \times JL_{TISS}} \right) \]

\[+ 0.01 \left( (1 - 0.22) \times JL_{INF,-1} + 0.221 \times (1 - 0.4) \times JL_{INF_{-1}} + 0.4 \times JL_{INF} \right) \]

\[+ 0.05 \ln (0.01 \times JL_{GAPQ})\]

\[R^2 = 0.295 \quad DW = 1.236 \quad SER = 0.006\]

b) \[\ln (JP_{PINV}) = \ln (JP_{PINV_{-4}}) + 0.01 \times JL_{INF}\]

3. Deflator of private consumption

\[
\Delta_4 \ln (JL_{PCP}) = (1 - 0.542) 0.01 \times JL_{INF} \\
+ 0.542 \Delta_4 \ln (JL_{PCP_{-1}}) \\
(18.167)
\]

\[R^2 = 0.784 \quad DW = 1.389 \quad SER = 0.005\]

4. Deflator of government demand

\[
\Delta_4 \ln (JL_{PG}) = (1 - 0.276) 0.01 \times JL_{INF} \\
+ 0.276 \Delta_4 \ln (JL_{PG_{-1}}) \\
(5.066)
\]

\[R^2 = 0.220 \quad DW = 1.526 \quad SER = 0.011\]
5. Deflator of private fixed capital investment
\[ \Delta_4 \ln (\text{JP\_PIAN}) = (1 - 0.669) 0.01 \times \text{JP\_INF} \\
+ 0.669 \Delta_4 \ln (\text{JP\_PIAN}_{-1}) \]
\[ (9.340) \]
\[ R^2 = 0.489 \quad DW = 0.502 \quad SER = 0.013 \]

6. Deflator of exports
\[ \Delta_4 \ln (\text{JP\_PEX}) = (1 - 0.888) \Delta_4 \left[ (1 - 0.122) \ln (\text{JP\_PINV}_{-1}) \right] \\
+ 0.122 \text{JP\_LPAC}_{-1} \]
\[ + 0.888 \Delta_4 \ln (\text{JP\_PEX}_{-1}) \]
\[ (12174) \]
\[ R^2 = 0.655 \quad DW = 1.337 \quad SER = 0.034 \]

7. Production costs
\[ \text{JP\_COSI} = \frac{100}{99.966} \times \text{JP\_LA}^{0.844} \times \text{JP\_PIM} - 0.844 \]

8. Deflator of final demand
\[ \text{JP\_PEV} = \frac{(\text{JP\_ENDR} - \text{JP\_EXR}) \times \text{JP\_PINV} + \text{JP\_EXR} \times \text{JP\_PEX}}{\text{JP\_ENDR}} \]

9. Deflator of gross domestic product
\[ \text{JP\_PBIP} = 100 \times \frac{\text{JP\_BIP}}{\text{JP\_BIPR}} \]

10. Adaptive expectation on consumer price inflation
\[ \text{JP\_PCPD} = 0.9 \times \text{JP\_PCPD}_{-1} + 0.1 \Delta_4 \ln (\text{PCP}_{-1}) \times 100 \]

11. Adaptive expectation on inflation rate of final demand
\[ \text{JP\_PEVD} = 0.9 \times \text{JP\_PEVD}_{-1} + 0.1 \Delta_4 \ln (\text{PEV}_{-1}) \times 100 \]

12. Long-term gross wage income per employee
\[ \text{JP\_LAS} = \frac{1}{1.54} \times \text{JP\_PCP} \times \text{JP\_BPR}^{0.8} \times (1 - 0.01 \times \text{JP\_ARLQ})^{0.8} \]

13. Labour productivity
\[ \text{JP\_BPR} = 0.9 \times \text{JP\_BPR}_{-1} + 0.1 \frac{\text{JP\_ENDR}}{\text{JP\_ET}} \]
IV. Government

1. Direct tax rate

\[\text{JP\_TDBS} = 0.984 + 0.963 \times \text{JP\_TDBS\_1}\]
\[\begin{array}{c c}
(1.412) & (35.634) \\
\end{array}\]

\[R^2 = 0.933 \quad DW = 2.629 \quad SER = 0.606\]

2. Indirect tax rate

\[\text{JP\_TISS} = 0.427 + 0.444 \times \text{JP\_TISS\_1} + 0.494 \times \text{JP\_TISS\_4}\]
\[\begin{array}{c c c c}
(1.554) & (5.445) & (6.114) \\
\end{array}\]

\[R^2 = 0.819 \quad DW = 2.469 \quad SER = 0.356\]

3. Real government demand

\[\Delta_4 \ln (\text{JP\_GR}) = 0.813 \Delta_4 \ln (\text{JP\_GR\_1})\]
\[\begin{array}{c c}
(12.284) \\
\end{array}\]

\[+ (1 - 0.813) \Delta_4 \ln (\text{JP\_BIPR})\]
\[\begin{array}{c c}
(0.845) \\
\end{array}\]

\[− 0.114 \ln (0.01 \times \text{JP\_GAPQ})\]

\[\begin{array}{c c c c}
(0.01) & (0.001) \\
\end{array}\]

\[R^2 = 0.650 \quad DW = 1.584 \quad SER = 0.026\]

4. Government transfers to households

\[\ln (\text{JP\_SB}) = 0.073 + 1918 \Delta_4 0.01 \times (\text{JP\_ARLQ} - \text{JP\_ARLQN})\]
\[\begin{array}{c c c c}
(18.908) & (3.952) \\
\end{array}\]

\[+ 0.976 \ln (\text{JP\_SB\_1})\]
\[\begin{array}{c c}
(556.335) \\
\end{array}\]

\[R^2 = 0.997 \quad DW = 0.303 \quad SER = 0.009\]

5. Direct taxes and social contributions

\[\text{JP\_TDB = 0.01 \times JP\_TDBS \times JP\_VE}\]

6. Indirect taxes (excluding subsidies)

\[\text{JP\_TIS = 0.01 \times JP\_TISS \times 0.01 \times JP\_ENDR \times JP\_PEV}\]
7. Nominal government demand
\[ J_{P_G} = 0.01 \times J_{P_GR} \times J_{P_PG} \]

8. Net lending of government
\[ J_{P_FS} = J_{P_TDB} + J_{P_TIS} - J_{P_G} - J_{P_SB} \]

V. Money, interest rates and exchange rate

1. Real stock of money
\[
\ln\left( \frac{J_{P_M}}{J_{P_PINV}} \right) = -5.755 + 1.678 \ln(J_{P_BIPR}) \\
(67.767) \quad (101.498) \\
- 1.096 \times 0.01 \times J_{P_RL} + J_{P_M} \times J_{P_EC} \\
(5.283)
\]
\[ R^2 = 0.997 \quad DW = 0.468 \quad SER = 0.022 \]

\[ \Delta \ln\left( \frac{J_{P_M}}{J_{P_PINV}} \right) = 0.493 \Delta \ln(J_{P_BIPR}) \\
(4.797) \\
- 0.355 \Delta \ln J_{P_RL} \\
(2.778) \\
+ 0.710 \Delta \ln\left( \frac{J_{P_M-1}}{J_{P_PINV-1}} \right) \\
(12.218) \\
- 0.287 J_{P_M-1 EC-4} \\
(4.110)
\]
\[ R^2 = 0.964 \quad DW = 0.832 \quad SER = 0.012 \]

2. Monetary policy rule:
Money market interest rate for three-month funds
\[
J_{P_RS} = 0.75 J_{P_RS-1} + (1 - 0.75) J_{P_RSST} \\
+ 0.50 \times \frac{1}{4} \sum_{i=1}^{4} (J_{P-INF_{it}} - J_{P_INFT_{it}}) \\
+ 0.50 \times \frac{1}{4} \sum_{i=0}^{3} 100 \times \ln (0.01 J_{P_GAPQ_{it}})
\]
3. Yield on government bonds

\[ 1 + 0.01 \cdot \text{JP}_\text{RL} = (1 + 0.01 \cdot \text{JP}_\text{RL,1})^{(1 - 0.492)} \]
\[ = (1 + 0.01 \cdot \text{JP}_\text{RL,1})^{0.492} \]
\[ = \left( \frac{1 + 0.01 \cdot \text{JP}_\text{RS}_0}{1 + 0.01 \cdot \text{JP}_\text{RS}_1} \right)^{-0.02} \]
\[ = \left( \frac{1 + 0.01 \cdot \text{JP}_\text{RL}_0}{1 + 0.01 \cdot \text{JP}_\text{RL}_1} \right)^{-0.02} \]

\[ R^2 = 1.000 \quad DW = 2.909 \quad SER = 0.004 \]

4. Short-term interest rate (long-run)

\[ \text{JP}_\text{RSST} = 100 \cdot \Delta q \ln \left( \sum_{i=0}^{3} \text{JP}_\text{BIPQ}_{i-1} \right) + \text{JP}_\text{INFT} \]

5. Long-term interest rate (long-run)

\[ \text{JP}_\text{RLST} = \text{JP}_\text{RSST} + \text{JP}_\text{TERM} \]

6. Exchange rate of the Yen against the US-Dollar

\[ \ln (\text{JP}_\text{ER}) = 0.161 + (1 - 0.965) \ln \left( \frac{\text{JP}_\text{PCP}_{t+1}}{\text{US}_\text{PCP}_{t+1}} \right) \]
\[ - 1.0 \cdot 0.01 \cdot (\text{JP}_\text{RS} - \text{US}_\text{RS}) \]
\[ + 0.965 \cdot 0.01 \cdot (\text{JP}_\text{RS}_{t-1} - \text{US}_\text{RS}_{t-1}) \]
\[ + 0.965 \cdot \ln (\text{JP}_\text{ER}_{t-1}) \]
\[ (37.988) \]

\[ R^2 = 0.941 \quad DW = 1.239 \quad SER = 0.057 \]
3. Germany

I. Aggregate demand

1. Real private per capita consumption

\[
\begin{align*}
\ln \left( \frac{GY_{\text{CPR}}}{GY_{\text{WOBE}}} \right) &= 5.044 - 0.002 Q1 + 0.044 Q2 + 0.047 Q3 \\
&+ 0.732 \ln \left( \frac{GY_{\text{LN}} + GY_{\text{TRN}}}{GY_{\text{PCP}} + GY_{\text{WOBE}}} \right) \\
&+ (1 - 0.732) \ln \left( \frac{GY_{\text{GNEH}} - GY_{\text{VERR}} - 0.25 \times GY_{\text{PCPD}} \times GY_{\text{NGVH-1}}}{GY_{\text{PCP}} + GY_{\text{WOBE}}} \right) \\
&+ GY_{\text{CPR, EC}} \\
\end{align*}
\]

\[R^2 = 0.992 \quad DW = 0.605 \quad SER = 0.015\]

\[
\Delta_4 \ln \left( \frac{GY_{\text{CPR}}}{GY_{\text{WOBE}}} \right) = 0.027 \\
&+ 0.491 \Delta_4 \ln \left( \frac{GY_{\text{LN}} + GY_{\text{TRN}}}{GY_{\text{PCP}} + GY_{\text{WOBE}}} \right) \\
&+ 0.225 \Delta_4 \ln \left( \frac{GY_{\text{GNEH}} - GY_{\text{VERR}} - 0.25 \times GY_{\text{PCPD}} \times GY_{\text{NGVH-1}}}{GY_{\text{PCP}} + GY_{\text{WOBE}}} \right) \\
&- 0.588 (0.01 \times GY_{\text{RL}} - GY_{\text{PCPD}}) \\
&+ 0.041 \Delta_4 \ln \left( \frac{GY_{\text{CPR,-1}}}{GY_{\text{WOBE,-1}}} \right) \\
&- 0.507 GY_{\text{CPR, EC,-4}} \\
\end{align*}
\]

\[R^2 = 0.893 \quad DW = 1.634 \quad SER = 0.008\]
2. Participation rate of employees (labour supply)

\[
\ln (\text{GY}_\text{EQU}) = -0.005 \ Q1 - 0.005 \ Q2 - 0.0001 \ Q3 + 0.049 \ \Delta_1 \text{GY}_\text{DWU} \\
+ 0.101 \ln (\text{GY}_\text{WOBA} - \text{GY}_\text{WOBE}) \\
+ 0.015 \ln (\text{GY}_\text{LN} - \text{GY}_\text{BT} + \text{GY}_\text{PCP}) \\
+ 0.032 \ln (\text{GY}_\text{EQU}_{-4}) \\
- 0.032 \ln (\text{GY}_\text{EQU}_{-4})
\]

\[
R^2 = 1.000 \quad DW = 2005 \quad SER = 0.002
\]

3. Withdrawn profits and property income

\[
\ln (\text{GY}_\text{GNEH}) = 0.115 - 0.067 \ Q1 - 0.094 \ Q2 - 0.102 \ Q3 \\
+ 0.092 \ln (\text{GY}_\text{GU} - \text{GY}_\text{TDSO}_{-1}) \\
+ 0.276 \ln (\text{GY}_\text{GNEH}_{-1}) \\
+ 0.633 \ln (\text{GY}_\text{GNEH}_{-4})
\]

\[
R^2 = 0.993 \quad DW = 1449 \quad SER = 0.041
\]

4. Transfers of households to foreign countries

\[
\text{GY}_\text{VERR} = 1.097 - 0.120 \ Q1 + 0.179 \ Q2 + 0.445 \ Q3 \\
- 3.312 \ \Delta_1 \text{GY}_\text{DWU} + 1.394 \ \Delta_1 \text{GY}_\text{DWU}_{-1} + 0.276 \ \text{GY}_\text{DWU} \\
+ 0.191 \times 0.01 \times \text{GY}_\text{YV} \\
+ 0.356 \ \text{GY}_\text{VERR}_{-1}
\]

\[
R^2 = 0.872 \quad DW = 1903 \quad SER = 0.266
\]
5. Balance of capital transfer payments of households

\[ GY_{SVPH} = -0.002 + 0.170 \times Q1 - 0.188 \times Q2 + 0.668 \times Q3 - 1120 \times GY_{DWU} \]

\[ + 1158 + 0.01 \times GY_{YV_{-1}} \]

\[ + 0.613 \times GY_{SVPH_{-1}} \]

\[ R^2 = 0.945 \quad DW = 2.563 \quad SER = 0.714 \]

6. Transfers of firms to foreign countries

\[ GY_{ARSF} = -0.953 + 0.923 \times Q1 - 0.002 \times Q2 - 1.414 \times Q3 + 11940 \times \Delta_{1} \times GY_{DWU_{-2}} \]

\[ (0.975) \quad (1.131) \quad (0.003) \quad (1.763) \quad (4.282) \]

\[ + 1110 \times 0.01 \times GY_{END} \]

\[ (9.964) \]

\[ R^2 = 0.589 \quad DW = 2.339 \quad SER = 2.717 \]

7. Nominal private consumption

\[ GY_{CP} = 0.01 \times GY_{CPR} \times GY_{PCP} \]

8. Nominal domestic demand

\[ GY_{INLV} = 0.01 \times GY_{INVR} \times GY_{PNV} \]

9. Real domestic demand

\[ GY_{INVR} = GY_{CPR} + GY_{CSR} + GY_{IAUR} + GY_{IASR} + GY_{IBUR} + GY_{IBSR} + GY_{IWR} + GY_{VR} \]

10. Nominal final demand

\[ GY_{END} = GY_{INLV} + GY_{EX} \]

11. Real final demand

\[ GY_{ENDR} = GY_{INVR} + GY_{EXR} \]

12. Nominal gross domestic product

\[ GY_{BIP} = GY_{END} - GY_{IM} \]

13. Real gross domestic product

\[ GY_{BIPR} = GY_{ENDR} - GY_{IMR} \]

14. Nominal gross national product

\[ GY_{BSP} = GY_{BIP} + GY_{SEVE} \]
15. Average relation of nominal final demand to nominal gross domestic product
\[ GY_{EBQQ} = 0.7 GY_{EBQQ,-1} + 0.3 \left( \frac{GY_{END} - GY_{TBSP} + GY_{SUBV}}{GY_{BIP} - GY_{TBSP} + GY_{SUBV}} \right) \]

16. Gross wage income
\[ GY_{L} = GY_{LAST} * GY_{AVBI} * \frac{GY_{BI}}{GY_{BI} + 1} \]

17. Gross wage income, excluding employers' social contributions
\[ GY_{LG} = GY_{L} - GY_{SZAF} \]

18. Net wage income
\[ GY_{LN} = GY_{LG} - GY_{LOST} - GY_{SOZN} \]

19. Gross profit income
\[ GY_{GW} = GY_{BSP} - GY_{L} - GY_{TBSP} + GY_{SUBV} - GY_{D} \]

20. Gross profit income of firms
\[ GY_{GU} = GY_{GW} - GY_{GST} + GY_{ZINS} \]

21. Disposable income of households
\[ GY_{YV} = GY_{LN} + GY_{GNEH} + GY_{TRN} - GY_{VERR} \]

22. Net lending of households
\[ GY_{FH} = GY_{YV} - GY_{CP} - GY_{SVPH} \]

23. Net financial wealth of households
\[ GY_{NGVH} = GY_{NGVH,-1} + GY_{FH} + 31635 \]

24. Total labour force
\[ GY_{EW} = GY_{EQU} * GY_{WOBE} + GY_{SELB} \]

25. Population between 15 and 65 years
\[ GY_{WOBA} = GY_{WOBE} - GY_{WOBS} \]

26. Net lending of foreign countries
\[ GY_{FA} = - (GY_{EX} - GY_{IM}) + GY_{ARSF} + GY_{VERR} - GY_{SEVE} \]

27. Net financial wealth of foreign countries
\[ GY_{NGVA} = GY_{NGVA,-1} + GY_{FA} + 7143 \]

28. Current account balance
\[ GY_{LBS} = - GY_{FA} + GY_{DLBS} \]
II. Aggregate supply

1. Real machinery and equipment investment of firms

\[ \ln(\text{GY}_{\text{IAUR}}) = -4.706 + 1299 \ln(\text{GY}_{\text{ENDR}}) + \text{GY}_{\text{IAUR}, EC} \]

\[ R^2 = 0.881 \quad \text{DW} = 2014 \quad \text{SER} = 0.102 \]

2. Real construction investment of firms

\[ \ln(\text{GY}_{\text{IBUR}}) = 0.417 - 0.053 Q1 + 0.202 Q2 + 0.131 Q3 \]

\[ R^2 = 0.959 \quad \text{DW} = 2.148 \quad \text{SER} = 0.053 \]

3. Real residential construction investment

\[ \ln \left( \frac{\text{GY}_{\text{IWR}}}{\text{GY}_{\text{WOBE}}} \right) = -0.931 - 0.147 Q1 + 0.087 Q2 + 0.070 Q3 \]

\[ R^2 = 0.741 \quad \text{DW} = 0.788 \quad \text{SER} = 0.071 \]
b) \[ \Delta_4 \ln \left( \frac{GY_{IWR}}{GY_{WOBE}} \right) = 0.517 \Delta_4 \ln \left( \frac{GY_{CPR}}{GY_{WOBE}} \right) \\
+ 0.497 \Delta_4 \ln \left( \frac{GY_{IWR,-1}}{GY_{WOBE,-1}} \right) \\
- 0.343 \left( \frac{GY_{IWR,EC,-4}}{GY_{IWR,EC,-4}} \right) \]

\[ R^2 = 0.586 \quad DW = 1.869 \quad SER = 0.045 \]

4. Real inventory investment

\[ GY_{VR} = -24.749 + 47.341 Q1 + 17.417 Q2 + 37.003 Q3 \]
\[ - (16.086) \quad (13.125) \quad (12.985) \quad (19.392) \]
\[ + 0.048 \Delta_4 GY_{ENDR} \]
\[ (2.613) \]
\[ + 0.300 GY_{VR,-1} \]
\[ (2.914) \]

\[ R^2 = 0.923 \quad DW = 2.095 \quad SER = 4.254 \]

5. Firms capital consumption in machinery and equipment

\[ GY_{KBAU} = 0.034 GY_{IAUR,-1} + (1 - 0.034) GY_{KBAU,-1} \]
\[ (7.686) \]

\[ R^2 = 0.394 \quad DW = 2.201 \quad SER = 0.671 \]

6. Firms capital consumption in construction

\[ GY_{KBBU} = 0.007 GY_{IBUR,-1} + (1 - 0.007) GY_{KBBU,-1} \]
\[ (1334) \]

\[ R^2 = 0.019 \quad DW = 2.020 \quad SER = 1.014 \]
7. Employment (total hours)

a) \[ \ln(\text{GY}_{\text{AVBI}}) = -0.991 - 0.091 \text{Q1} - 0.083 \text{Q2} - 0.110 \text{Q3} \]
   \[ (3.163) \quad (9.906) \quad (13.079) \quad (13.864) \]
   \[ - 0.007 \text{Q1} \times \text{GY}_{\text{DWU}^{-2}} - 0.014 \text{Q2} \times \text{GY}_{\text{DWU}^{-2}} \]
   \[ (0.669) \quad (12.78) \]
   \[ + 0.041 \text{Q3} \times \text{GY}_{\text{DWU}^{-2}} \]
   \[ (3.007) \]
   \[ + 0.122 \text{GY}_{\text{DWU}} \]
   \[ (9.937) \]
   \[ + 0.523 \ln(\text{GY}_{\text{ENDR}}) \]
   \[ (10.777) \]
   \[ + 0.716 \ln \left( \frac{\text{GY}_{\text{PEV}} + \text{GY}_{\text{TIPS}}}{\text{GY}_{\text{LAST}}} \right) \]
   \[ (13.395) \]
   \[ + \text{GY}_{\text{AVBI EC}} \]

\[ R^2 = 0.978 \quad DW = 0.408 \quad SER = 0.018 \]

b) \[ \Delta_4 \ln(\text{GY}_{\text{AVBI}}) = 0.075 \Delta_4 \text{GY}_{\text{DWU}} \]
   \[ (7.030) \]
   \[ + 0.408 \Delta_4 \ln(\text{GY}_{\text{ENDR}}) \]
   \[ (5.582) \]
   \[ - 0.153 \Delta_4 \ln(\text{GY}_{\text{ENDR}^{-1}}) \]
   \[ (15.01) \]
   \[ - 0.081 \Delta_4 \ln(\text{GY}_{\text{ENDR}^{-2}}) \]
   \[ (0.921) \]
   \[ + 0.843 \Delta_4 \ln \left( \frac{\text{GY}_{\text{PEV}} \times \text{GY}_{\text{TIPS}}}{\text{GY}_{\text{LAST}}} \right) \]
   \[ (22.252) \]
   \[ - 0.470 \Delta_4 \ln \left( \frac{\text{GY}_{\text{PEV}^{-1}} \times \text{GY}_{\text{TIPS}^{-1}}}{\text{GY}_{\text{LAST}^{-1}}} \right) \]
   \[ (5.044) \]
   \[ - 0.131 \Delta_4 \ln \left( \frac{\text{GY}_{\text{PEV}^{-2}} \times \text{GY}_{\text{TIPS}^{-2}}}{\text{GY}_{\text{LAST}^{-2}}} \right) \]
   \[ (1.443) \]
   \[ + 0.435 \Delta_4 \ln(\text{GY}_{\text{AVBI}^{-1}}) \]
   \[ (4.448) \]
   \[ + 0.118 \Delta_4 \ln(\text{GY}_{\text{AVBI}^{-2}}) \]
   \[ (13.35) \]
   \[ - 0.288 \text{GY}_{\text{AVBI EC}^{-4}} \]
   \[ (3.854) \]

\[ R^2 = 0.970 \quad DW = 1504 \quad SER = 0.010 \]
8. Effective average hours worked per employee

a) \[ \ln(\text{GY}_\text{ARST}) = 0.042 + 0.014 \ Q1 - 0.086 \ Q2 - 0.185 \ Q3 \\
\quad (10.136) (2.373) (14.714) (31673) \\
- 0.003 \ Q1 \times \text{GY}_\text{DWU}_2 + 0.027 \ Q2 \times \text{GY}_\text{DWU}_2 \\
\quad (0.290) (2588) \\
+ 0.188 \ Q3 \times \text{GY}_\text{DWU}_2 \\
\quad (17.733) \\
- 0.074 \ \text{GY}_\text{DWU}_2 \\
\quad (9.917) \\
+ 1.00 \ln(\text{GY}_\text{TA}) \\
+ \text{GY}_\text{ARST}_\text{EC} \]

\[ R^2 = 0.946 \quad DW = 1.723 \quad SER = 0.017 \]

b) \[ \Delta_4 \ln \left( \frac{\text{GY}_\text{ARST}}{\text{GY}_\text{TA}} \right) = -0.031 \Delta_4 \ \text{GY}_\text{DWU}_2 \\
\quad (5.078) \\
- 0.114 \Delta_1 \ \text{GY}_\text{DWU} \\
\quad (9.692) \\
+ 0.180 \ \Delta_1 \ \text{GY}_\text{DWU} \\
\quad (18.864) \\
+ 0.173 \Delta_4 \ln(\text{GY}_\text{GAPQ}) \\
\quad (3.949) \\
+ 0.553 \Delta_4 \ln \left( \frac{\text{GY}_\text{LTGW}}{\text{GY}_\text{TA} + \text{GY}_\text{LAST}} \right) \\
\quad (10.487) \\
- 0.477 \Delta_4 \ln \left( \frac{\text{GY}_\text{LTGW},1}{\text{GY}_\text{TA},1 + \text{GY}_\text{LAST},1} \right) \\
\quad (9.762) \\
+ 0.328 \Delta_4 \ln \left( \frac{\text{GY}_\text{ARST},1}{\text{GY}_\text{TA},1} \right) \\
\quad (5.203) \\
- 0.348 \ \text{GY}_\text{ARST}_\text{EC},4 \\
\quad (4.896) \]

\[ R^2 = 0.910 \quad DW = 2.276 \quad SER = 0.008 \]

9. Commuters

\[ \text{GY}_\text{PEND} = -0.016 + 0.001 \ Q1 + 0.016 \ Q2 + 0.010 \ Q3 + 0.014 \ \text{GY}_\text{DWU} \\
\quad (3.465) (0.152) (4.571) (2.903) (2.775) \\
+ 0.893 \ \text{GY}_\text{PEND},1 \\
\quad (20.012) \]

\[ R^2 = 0.955 \quad DW = 2.239 \quad SER = 0.012 \]
10. Real imports of goods and services

\[ \ln (\text{GY}_\text{IMR}) = -1.835 + 0.047 \text{ Q1} + 0.056 \text{ Q2} + 0.055 \text{ Q3} - 0.074 \text{ GY}_\text{DWU} \]
\[ + 1.044 \ln \left( \frac{\text{GY}_\text{ENDR} \times \text{GY}_\text{PEV} \times \text{GY}_\text{TIPS}}{\text{GY}_\text{PIM}} \right) \]
\[ + \text{GY}_\text{IMR}_\text{EC} \]
\[ \bar{R}^2 = 0.946 \quad DW = 0.163 \quad SER = 0.070 \]

b) \[ \Delta_4 \ln (\text{GY}_\text{IMR}) = 0.020 \Delta_4 \text{GY}_\text{DWU} \]
\[ + 0.326 \Delta_4 \ln \left( \frac{\text{GY}_\text{ENDR} \times \text{GY}_\text{PEV} \times \text{GY}_\text{TIPS}}{\text{GY}_\text{PIM}} \right) \]
\[ + 0.587 \Delta_4 \ln (\text{GY}_\text{IMR,-1}) \]
\[ - 0.209 \text{GY}_\text{IMR}_\text{EC,-4} \]
\[ \bar{R}^2 = 0.783 \quad DW = 1.952 \quad SER = 0.031 \]

11. Potential gross domestic product

\[ \ln (\text{GY}_\text{BIPQ}) = -2.944 - 0.058 \text{ Q1} - 0.031 \text{ Q2} - 0.024 \text{ Q3} - 0.170 \text{ GY}_\text{DWU} \]
\[ + 0.911 \times 0.0025 + T + 0.405 \times 0.0025 + T \times \text{GY}_\text{DWU} \]
\[ + 0.491 \times \text{GY}_\text{EBQQ,-1} \times \ln \left( \frac{\text{GY}_\text{BI} + \text{GY}_\text{SELB} + \text{GY}_\text{EW} \times 0.01 (\text{GY}_\text{ARLQ} - \text{GY}_\text{ARLQN})}{\text{GY}_\text{TA}} \right) \]
\[ + (1 - 0.491 \times \text{GY}_\text{EBQQ,-1}) \ln (\text{GY}_\text{KRAD} + \text{GY}_\text{KRBQ}) \]
\[ \bar{R}^2 = 0.833 \quad DW = 0.273 \quad SER = 0.026 \]

12. Capacity utilisation

\[ \text{GY}_\text{GAPQ} = 100 \times \frac{\text{GY}_\text{BIPR}}{\text{GY}_\text{BIPQ}} \]

13. Nominal machinery and equipment investment

\[ \text{GY}_\text{IAU} = 0.01 \times \text{GY}_\text{IAUR} \times \text{GY}_\text{PIAU} \]
14. Real machinery and equipment investment of government
\[ G_{Y, IAS}^{SR} = 100 + \frac{G_{Y, IAS}}{G_{Y, IAS}} \]

15. Nominal construction investment of firms
\[ G_{Y, IBU} = 0.01 \cdot G_{Y, IBUR} \cdot G_{Y, PBU} \]

16. Real construction investment of government
\[ G_{Y, IBS}^{SR} = 100 + \frac{G_{Y, IBS}}{G_{Y, IBS}} \]

17. Nominal residential construction investment
\[ G_{Y, IW} = 0.01 \cdot G_{Y, IWR} \cdot G_{Y, PIW} \]

18. Nominal inventory investment
\[ G_{Y, V} = G_{Y, INLV} - G_{Y, CP} - G_{Y, CS} - G_{Y, IAU} - G_{Y, IAS} - G_{Y, IBU} - G_{Y, IW} - G_{Y, IBS} \]

19. Real capital stock of firms’ machinery and equipment
\[ G_{Y, KRAU}^{SR} = G_{Y, KRAU} + G_{Y, IAU} - G_{Y, KBAU} + 144.96 \]

20. Average real capital stock of firms’ machinery and equipment
\[ G_{Y, KRAU}^{SR} = 0.5 \cdot (G_{Y, KRAU} + G_{Y, KRAU}^{R-1}) \]

21. Real capital stock of firms’ construction
\[ G_{Y, KRBU}^{SR} = G_{Y, KRBU} + G_{Y, IBUR} - G_{Y, KBBU} + \Delta_t G_{Y, DWU} + 432.11 \]

22. Average real capital stock of firms’ construction
\[ G_{Y, KRBU}^{SR} = 0.5 \cdot (G_{Y, KRBU} + G_{Y, KRBU}^{R-1}) \]

23. Depreciation allowances
\[ G_{Y, D} = 0.01 \cdot \left( 0.25 \cdot 0.075 \cdot G_{Y, KRAU} + G_{Y, PIAU} + 0.25 \cdot 0.015 \cdot G_{Y, KRBU} + G_{Y, PIBU} \right) + G_{Y, DSW} \]

24. Net lending of firms
\[ G_{Y, FU} = -G_{Y, FH} - G_{Y, FS} - G_{Y, FA} \]

25. Net financial wealth of firms
\[ G_{Y, NGVU}^{SR} = G_{Y, NGVU}^{SR} + G_{Y, FU} - \Delta_t G_{Y, DWU} + 429.23 \]

26. Employment (domestic concept)
\[ G_{Y, BI} = 1000 \cdot \frac{G_{Y, AVBI}}{G_{Y, ARST}} \]

27. Employment (residence concept)
\[ G_{Y, BI} = G_{Y, BI} - G_{Y, PEND} \]
28. **Unemployment**
   \[ GY_{ARL} = GY_{EW} - GY_{B1} - GY_{SELB} \]

29. **Unemployment rate**
   \[ GY_{ARLQ} = 100 \times \frac{GY_{ARL}}{GY_{EW}} \]

30. "**Smoothed**" unemployment rate
   \[ GY_{ARLQN} = 0.9 \times GY_{ARLQN_{-1}} + 0.1 \times GY_{ARLQ} \]

31. **Negotiated working time per employee**
   \[ GY_{TA} = (GY_{KATA} - GY_{TIU}) \times \frac{GY_{WOST}}{5} \]

### III. Factor costs and deflators

1. **Negotiated wage and salary level in Western Germany**
   \[
   \Delta_4 \ln (GY\_LTGW) = -0.314 + 0.01 \times \Delta_4 (GY\_ARLQ - GY\_ARLQN) \\
   + (1 - 0.911) GY\_PCPD \\
   + 0.911 \Delta_4 \ln (GY\_LTGW_{-1}) \\
   - 0.171 + \frac{1}{4} \times 0.01 \times \sum_{i=1}^{4} (GY\_ARLQ_{-i} - GY\_ARLQN_{-i})
   \]

   \[ R^2 = 0.886 \quad DW = 1.743 \quad SER = 0.006 \]

2. **Gross wage and salary income per hour worked (wage rate)**
   \[
   \ln (GY\_LAST) = 6.257 + 0.017 Q1 + 0.163 Q2 + 0.143 Q3 \\
   \quad (3.286) \quad (2.525) \quad (23.825) \quad (21.987) \\
   + 0.022 Q1 \times GY\_DWU_{-2} - 0.023 Q2 \times GY\_DWU_{-2} \\
   \times (1985) \\
   - 0.156 Q3 \times GY\_DWU_{-2} \\
   - 0.124 GY\_DWU \\
   - 0.047 \ln (1.980) \\
   \quad (13.956) \\
   \quad (13.078) \\
   + 1.099 \ln \left( \frac{0.95 \times GY\_LTGW + 0.05 \times GY\_LTGO}{GY_{TA}} \right) \\
   + GY\_LAST\_EC
   \]

   \[ R^2 = 0.997 \quad DW = 1.854 \quad SER = 0.019 \]
b) \( \Delta_4 \ln (\text{GY\_LAST}) = -0.184 \Delta_4 \text{GY\_DWU} \) 
\( (28.225) \)
\( + 1.006 \Delta_4 \ln \left( \frac{0.95 \times \text{GY\_LTGW} + 0.05 \times \text{GY\_LTGO}}{\text{GY\_ARST}} \right) \) 
\( (47.314) \)
\( - 0.194 \Delta_4 \text{GY\_LAST\_EC\_4} \) 
\( (2.713) \)

\( R^2 = 0.965 \quad DW = 1.504 \quad SER = 0.012 \)

3. **Deflator of domestic demand**

a) \( 0.01 \times \text{GY\_INF} + \Delta_4 \ln (\text{GY\_TIPS}) = 0.03 \Delta_4^2 \ln (\text{GY\_PIM}) \)
\( + 0.03 \Delta_4^2 \ln (\text{GY\_LAST}) \)
\( + \frac{0.01 \text{GY\_INF}_{-1} + \Delta_4 \ln (\text{GY\_TIPS}_{-1})}{(1 - 0.245)} \) 
\( + \frac{0.01 \text{GY\_INF}_{-1} + \Delta_4 \ln (\text{GY\_TIPS}_{-1})}{(1 - 0.4)} \)
\( + \frac{0.945}{(43.225)} + \frac{0.245}{(2.314)} + \frac{0.01 \text{GY\_INF}_{+1} + \Delta_4 \ln (\text{GY\_TIPS}_{+1})}{0.4 + \text{GY\_INF}} \)

\( R^2 = 0.963 \quad DW = 1.880 \quad SER = 0.007 \)

b) \( \ln (\text{GY\_PINV}) = \ln (\text{GY\_PINV}_{-4}) + 0.01 \times \text{GY\_INF} \)

4. **Deflator of private consumption**

\( \Delta_4 \ln (\text{GY\_PCP}) = 0.444 \Delta_4 \ln (\text{GY\_PINV}) \)
\( (8.841) \)
\( + 0.575 \Delta_4 \ln (\text{GY\_PCP}_{-1}) \)
\( (12.049) \)
\( + 0.061 \ln \left( \frac{\text{GY\_PINV}_{-4}}{\text{GY\_PCP}_{-4}} \right) \) 
\( (2.657) \)

\( R^2 = 0.987 \quad DW = 1.667 \quad SER = 0.004 \)
5. **Deflator of government consumption**

\[
\Delta_4 \ln (GY_{PCS}) = -0.010 \Delta_4 \ln (GY_{DWU}) \\
+ 0.800 \Delta_4 \ln (GY_{PINV}) \\
+ 0.218 \Delta_4 \ln (GY_{PCS_{-1}}) \\
+ 0.030 \ln \left( \frac{GY_{PINV_{-4}}}{GY_{PCS_{-4}}} \right)
\]

\( R^2 = 0.919 \quad DW = 1.578 \quad SER = 0.011 \)

6. **Deflator of firms’ machinery and equipment investment**

\[
\Delta_4 \ln (GY_{PIAU}) = 0.015 \Delta_4 \ln (GY_{CCRA_{-2}}) \\
+ (1 - 0.900) \Delta_4 \ln (GY_{PINV}) \\
+ 0.900 \Delta_4 \ln (GY_{PIAU_{-1}})
\]

\( R^2 = 0.855 \quad DW = 2.146 \quad SER = 0.006 \)

7. **Deflator of government’s machinery and equipment investment**

\[
\Delta_4 \ln (GY_{PIAS}) = -0.013 \Delta_4 \ln (GY_{DWU}) \\
+ 0.042 \Delta_4 \ln (GY_{CCRA_{-2}}) \\
+ 0.515 \Delta_4 \ln (GY_{PINV}) \\
+ 0.472 \Delta_4 \ln (GY_{PIAS_{-1}}) \\
+ 0.079 \ln \left( \frac{GY_{PINV_{-4}}}{GY_{PIAS_{-4}}} \right)
\]

\( R^2 = 0.895 \quad DW = 2.214 \quad SER = 0.011 \)
8. **Deflator of firms’ construction investment**

\[
\Delta_4 \ln (GY_{PBU}) = 0.061 \Delta_4 \ln (GY_{COSI}) \\
\quad + 0.886 \Delta_4 \ln (GY_{PBU_{-1}}) \\
\quad + 0.066 \ln \left( \frac{GY_{PINV_{-4}}}{GY_{PBU_{-4}}} \right) \\
\]

\[R^2 = 0.968 \quad DW = 1.196 \quad SER = 0.008\]

9. **Deflator of government’s construction investment**

\[
\Delta_4 \ln (GY_{PBS}) = -0.004 \\
\quad + 0.056 \Delta_4 \ln (GY_{COSI}) \\
\quad + 0.942 \Delta_4 \ln (GY_{PBS_{-1}}) \\
\quad + 0.106 \ln \left( \frac{GY_{PINV_{-4}}}{GY_{PBS_{-4}}} \right) \\
\]

\[R^2 = 0.936 \quad DW = 1.759 \quad SER = 0.008\]

10. **Deflator of residential construction**

\[
\Delta_4 \ln (GY_{PW}) = 0.003 \quad \ln (GY_{DWU}) \\
\quad + 0.066 \Delta_4 \ln (GY_{COSI}) \\
\quad + 0.064 \Delta_4 \ln (GY_{PINV}) \\
\quad + 0.808 \Delta_4 \ln (GY_{PW_{-1}}) \\
\quad + 0.049 \ln \left( \frac{GY_{PINV_{-4}}}{GY_{PW_{-4}}} \right) \\
\]

\[R^2 = 0.975 \quad DW = 1.284 \quad SER = 0.007\]
11. **Deflator of exports of goods and services**

\[
\Delta_4 \ln (GY_{PEX}) = (1 - 0.958) \Delta_4 \left[ (1 - 0.203) \ln (GY_{PINV} - 1) + 0.203 \, GY_{LPAC} - 1 \right] \\
+ 0.958 \Delta_4 \ln (GY_{PEX} - 1) \\
(26.101)
\]

\[R^2 = 0.897 \quad DW = 0.776 \quad SER = 0.007\]

12. **Deflator of final demand**

\[GY_{PEV} = 100 \times \frac{GY_{END}}{GY_{ENDR}}\]

13. **Deflator of gross domestic product**

\[GY_{PBIP} = 100 \times \frac{GY_{BIP}}{GY_{BIPR}}\]

14. **Adaptive expectation on consumer price inflation**

\[GY_{PCPD} = 0.9 \times GY_{PCPD} - 1 + 0.1 \times \Delta_4 \ln (GY_{PCPD} - 1) + 100\]

15. **Adaptive expectation on inflation rate of final demand**

\[GY_{PEVD} = 0.9 \times GY_{PEVD} - 1 + 0.1 \times \Delta_4 \ln (GY_{PEVD} - 1) + 100\]

16. **Present value of depreciation of machinery and equipment**

\[GY_{ZAU} = \frac{0.2}{0.01 \times GY_{RL} + 0.026} \times (1 - GY_{TSUD}) + 0.2\]

17. **User costs of machinery and equipment**

\[GY_{CCRA} = \left[ 0.01 \times GY_{RL} + 0.026 \right] \times (1 - GY_{TSUD}) - GY_{PEVD} + 0.075 + \frac{1 - GY_{TSUD} \times GY_{ZAU}}{1 - GY_{TSUD}} \times 0.01 \times GY_{RIA} + 662.652\]

18. **Index of production costs**

\[GY_{COSI} = GY_{LAST}^{0.491} \times GY_{PIM}^{0.217} \times GY_{CCRA}^{0.710} \times (1 - 0.491 - 0.217)\]
IV. Government

1. Average wage tax rate

\[
\text{GY\_LST} = 19.528 + 0.004 \times 100 \times 0.85 \frac{\text{GY\_LG}}{\text{GY\_BI}} \\
+ \left[ -0.082 - 0.186 \text{Q1} - 0.087 \text{Q2} - 0.119 \text{Q3} \right] \\
(0.086) \quad (9.971) \quad (4.616) \quad (6.327) \\
- 0.117 \Delta_4 \text{GY\_DWU}_{t-2} - 0.069 \Delta_4 \text{GY\_DWU} \\
(2.936) \quad (1.801) \\
\right] \times 100 \frac{\text{GY\_BI}}{0.85 \text{GY\_LG}}
\]

\( R^2 = 0.829 \quad DW = 1.409 \quad SER = 0.832 \)

2. Other direct taxes

\[
\ln(\text{GY\_TDSO}) = -0.066 - 0.014 \text{Q1} - 0.123 \text{Q2} + 0.012 \text{Q3} \\
(0.132) \quad (0.388) \quad (4.779) \quad (0.410) \\
+ 0.352 \left[ 0.067 \ln(\text{GY\_GU}) \\
(3.307) \\
+ 0.116 \ln(\text{GY\_GU}_2) \\
+ 0.150 \ln(\text{GY\_GU}_3) \\
+ 0.167 \ln(\text{GY\_GU}_4) \\
+ 0.150 \ln(\text{GY\_GU}_5) \\
+ 0.116 \ln(\text{GY\_GU}_6) \\
+ 0.067 \ln(\text{GY\_GU}_7) \right] \\
- 0.252 \left[ 0.107 \ln(\text{GY\_LOST}_2) \\
(2.442) \\
+ 0.179 \ln(\text{GY\_LOST}_3) \\
+ 0.214 \ln(\text{GY\_LOST}_4) \\
+ 0.214 \ln(\text{GY\_LOST}_5) \\
+ 0.179 \ln(\text{GY\_LOST}_6) \\
+ 0.107 \ln(\text{GY\_LOST}_7) \right] \\
+ 0.286 \ln(\text{GY\_TSUD}) \\
(2.130) \\
+ 0.319 \ln(\text{GY\_LST}) \\
(2.071) \\
+ 0.616 \ln(\text{GY\_TDSO}_{-1}) \\
(7.715)
\]

\( R^2 = 0.875 \quad DW = 1.823 \quad SER = 0.073 \)
3. **Value-added taxes**

\[
\ln (GY_{UST}) = -0.039 - 0.052 Q1 - 0.066 Q2 - 0.083 Q3 \\
(0.635) (2.307) (4.757) (6.848) \\
+ 0.499 \left(1 + 0.019 \cdot GY_{DWU}\right) \\
(6.449) (3.250) \\
* \ln \left(GY_{MWST} \cdot (GY_{CP} + GY_{CS} + GY_{IAS} + GY_{IBS} + GY_{IW})\right) \\
+ 0.433 \ln (GY_{UST,-1}) \\
(5.277)
\]

\[R^2 = 0.996 \quad DW = 1567 \quad SER = 0.028\]

4. **Other indirect taxes**

\[
\ln (GY_{TBSO}) = -2.471 - 0.112 Q1 - 0.079 Q2 - 0.056 Q3 \\
(7.173) (6.508) (5.329) (3.701) \\
+ 0.417 \ln (GY_{GU}) \\
(9.678) \\
\quad + 0.30 \ln (GY_{GU,-1}) \\
\quad + 0.16 \ln (GY_{GU,-2}) \\
\quad + 0.06 \ln (GY_{GU,-3}) \\
\quad + 0.704 \ln (GY_{CPR}) \\
(7.659)
\]

\[R^2 = 0.983 \quad DW = 1619 \quad SER = 0.044\]

5. **Social contributions of employees**

\[
\Delta_4 \ln \left(\frac{GY_{SOZN}}{GY_{BI}}\right) = 0.552 \Delta_4 \ln \left(\frac{GY_{LG}}{GY_{BI}}\right) \\
(8.112) \\
+ 0.852 \Delta_4 \ln (GY_{SOZB}) \\
(7.813) \\
+ 0.393 \Delta_4 \ln \left(\frac{GY_{SOZN,-1}}{GY_{BI,-1}}\right) \\
(7.189)
\]

\[R^2 = 0.930 \quad DW = 1.433 \quad SER = 0.021\]
6. Social contributions of employers

\[ \Delta_4 \ln \left( \frac{\text{GY\_SZAF}}{\text{GY\_BL}} \right) = 0.857 \Delta_4 \ln \left( \frac{\text{GY\_LG}}{\text{GY\_BL}} \right) \]

\[ + 0.443 \Delta_4 \ln (\text{GY\_SOZB}) \]

\[ + 0.204 \Delta_4 \ln \left( \frac{\text{GY\_SZAF}_{-1}}{\text{GY\_BL}_{-1}} \right) \]

\[ R^2 = 0.951 \quad DW = 1.366 \quad SER = 0.015 \]

7. Nominal government consumption

\[ \Delta_4 \ln (\text{GY\_CS}) = 0.006 + 0.110 \Delta_4 \text{GY\_DWU} - 0.095 \Delta_1 \text{GY\_DWU}_{-2} \]

\[ + 0.914 \Delta_4 \ln (\text{GY\_LTGW}_{-1}) \]

\[ + 0.544 \times \frac{1}{4} \sum_{i=1}^{4} \frac{\text{GY\_FS}_{-i} + \Delta_1 \text{GY\_DWU}_{-18-i} + 204}{\text{GY\_BSP}_{-i}} \]

\[ + 0.401 \Delta_4 \ln (\text{GY\_CS}_{-1}) \]

\[ R^2 = 0.836 \quad DW = 2.069 \quad SER = 0.017 \]

8. Transfers to households

\[ \text{GY\_TRN} = -3.346 + 3.654 \text{Q1} - 1.369 \text{Q2} + 2.389 \text{Q3} \]

\[ (2.502) \quad (3.528) \quad (1.484) \quad (3.242) \]

\[ + 0.099 \frac{\text{GY\_LG}}{\text{GY\_BL}} + \frac{\text{GY\_WOBS}}{\text{GY\_BL}} \]

\[ + 0.792 \frac{\text{GY\_TRN}_{-1}}{16.917} \]

\[ R^2 = 0.997 \quad DW = 1.737 \quad SER = 1.845 \]
9. **Subsidies to firms**

\[
\ln (GY_{SUBV}) = -2.630 - 0.367 Q1 - 0.258 Q2 - 0.217 Q3 \\
(5.612) (7.018) (7.149) (6.047) \\
+ 0.744 \ln (GY_{BSP}) \\
(6.698) \\
+ 0.233 \ln (GY_{SUBV-1}) \\
(2.170)
\]

\[R^2 = 0.921 \quad DW = 1991 \quad SER = 0.121\]

10. **Total gross debt liabilities of government**

\[
GY_{BVS} = 42.886 + 0.882 \cdot GY_{BVS-1} \\
(3.642) (18.740) \\
- 0.142 \cdot GY_{NGVS} + 48.542 \cdot GY_{DWU} \\
(2.362) (5.279) \\
+ 146.714 \cdot GY_{DUM951} \\
(8.890)
\]

\[R^2 = 0.999 \quad DW = 1.788 \quad SER = 14.457\]

11. **Wage taxes**

\[GY_{LOST} = 0.01 \cdot GY_{LST} \cdot 0.85 \cdot GY_{LG}\]

12. **Real government consumption**

\[GY_{CSR} = 100 \cdot \frac{GY_{CS}}{GY_{PCS}}\]

13. **Interest payments**

\[GY_{ZINS} = GY_{BVS} \cdot 0.01 \cdot \left( \frac{GY_{RZIN} - 100 \sum_{i=1}^{3} \frac{GY_{ZINS_i}}{GY_{BVS_i}}}{100} \right)\]

14. **Direct taxes**

\[GY_{TDIR} = GY_{LOST} + GY_{TDSO}\]

15. **Indirect taxes**

\[GY_{TBSP} = GY_{UST} + GY_{TBSO}\]

16. **Social contributions**

\[GY_{SOZ} = GY_{SOZN} + GY_{SZAF}\]
17. **Average corporate income tax rate**
\[ GY_{TSUD} = 0.5 \times (0.4 \times GY_{KSTA} + 0.6 \times GY_{KSTN}) \]

18. **Average indirect tax rate**
\[ GY_{TIPS} = 1 - 0.333 \times \frac{GY_{MWST} - GY_{SUBV}}{GY_{END}} \]

19. **Total revenue of government**
\[ GY_{SEIN} = GY_{TDIR} + GY_{TBSP} + GY_{SOZ} + GY_{GST} \]

20. **Net lending of government**
\[ GY_{FS} = GY_{SEIN} - (GY_{CS} + GY_{IAS} + GY_{IBS} + GY_{TRN} + GY_{SUBV} + GY_{ZINS} + GY_{SRSS}) \]

21. **Net financial wealth of government**
\[ GY_{NGVS} = GY_{NGVS_{-1}} + GY_{FS} + \Delta_1 GY_{DWU} + 41.45 \]

V. **Money, interest rates and exchange rate**

1. **Nominal money growth target rate**
\[ GY_{MTR} = 1.394 \times 100 + \Delta_4 \ln (GY_{BIPQ}) + GY_{INFT} \]

2. **Money stock M3**

   a) \[
   \ln \left( \frac{GY_{MB}}{GY_{PINV}} \right) = -6.271 + 0.077 \text{ Q1} + 0.043 \text{ Q2} + 0.019 \text{ Q3}
   \]
   \[ (52.770) \quad (9.000) \quad (5.051) \quad (2.292) \]
   \[ + 0.151 \Delta_1 GY_{DWU_{-1}} \]
   \[ (5.028) \]
   \[ + 1.394 \ln (GY_{BIPR}) \]
   \[ (81.773) \]
   \[ - 2.081 + 0.01 GY_{RL} \]
   \[ (7.958) \]
   \[ + GY_{MB_{EC}} \]

\[ R^2 = 0.982 \quad DW = 0.608 \quad SER = 0.029 \]
b) \[ \Delta_4 \ln \left( \frac{\text{GY}_{-\text{MB}}}{\text{GY}_{-\text{PINV}}} \right) = 0.017 + 0.159 \Delta_4 \text{GY}_{-\text{DWU}+1} - 0.113 \Delta_4 \text{GY}_{-\text{DWU}} \] 
\[ (3.532) \quad (15.799) \quad (8.132) \]
\[ + 0.125 \Delta_4 \ln (\text{GY}_{-\text{BPR}}) \] 
\[ (1.351) \]
\[ - 0.289 \Delta_4 \ln (\text{GY}_{-\text{PINV}}) \] 
\[ (2.780) \]
\[ - 0.761 \Delta_4 \text{0.01} \text{GY}_{-\text{RL}} \] 
\[ (5.026) \]
\[ + 0.633 \Delta_4 \ln \left( \frac{\text{GY}_{-\text{MS}-1}}{\text{GY}_{-\text{PINV}+1}} \right) \] 
\[ (9.392) \]
\[ - 0.223 \text{GY}_{-\text{MS}-1} \text{EC}_{-4} \] 
\[ (3.837) \]

\[ R^2 = 0.889 \quad DW = 1.538 \quad SER = 0.013 \]

c) \[ 0.01 \ast \text{GY}_{-\text{MGR}} = \Delta_4 \ln (\text{GY}_{-\text{MB}}) \]

3. **Long-term price level (P-Star)**

\[ \text{GY}_{-\text{PSM}3} = \left( 1 - \text{GY}_{-\text{EMU}} \right) \ast \frac{1}{0.979} \ast \exp \left( \ln \text{GY}_{-\text{M3}} + 6.271 - 0.077 \text{Q1} - 0.043 \text{Q2} - 0.019 \text{Q3} - 0.0151 \Delta_1 \text{GY}_{-\text{DWU}+1} - 1.394 \ln \text{GY}_{-\text{BIPQ}} + 2.081 \ast 0.01 \ast \text{GY}_{-\text{RL}} \right) \]

\[ + \text{GY}_{-\text{EMU}} \ast \text{EMU}_{-\text{PSM3}} \]

4. **Money market interest rate for three-month funds**

\[ \Delta_1 \text{GY}_{-\text{RS}} = \left( 1 - \text{GY}_{-\text{EMU}} \right) \ast \left[ 0.957 \Delta_1 \text{GY}_{-\text{RPEN}} + 0.175 \Delta_1 \text{US}_{-\text{RS}} + 0.040 \ast 100 \Delta_4 \ln (\text{GY}_{-\text{PEV}}) + 0.325 (\text{GY}_{-\text{RPEN}-1} - \text{GY}_{-\text{RS}-1}) \right] \]

\[ + \text{GY}_{-\text{EMU}} \ast [\text{EMU}_{-\text{RS}} - \text{GY}_{-\text{RS}-1}] \]

\[ R^2 = 0.779 \quad DW = 1.983 \quad SER = 0.343 \]
5. **Yield on government bonds**

\[
1 + 0.01 \text{GY}_\text{RL} = (1 - \text{GY}_{\text{EMU}}) \times \left(1 + (1 + 0.01 \text{GY}_{\text{RL}})^{0.499}\right)
\]

\[
\times \left(1 + 0.01 \text{GY}_{\text{RS}}\right) \times \left(1 + 0.01 \text{GY}_{\text{RSST}}\right)
\]

\[
+ \text{GY}_{\text{EMU}} + \left(1 + 0.01 \text{EMU}_\text{RL}\right)
\]

\[
R^2 = 1.000 \quad DW = 2.089 \quad SER = 0.002
\]

6. **Short-term interest rate (long-run)**

\[
\text{GY}_{\text{RSST}} = 100 \times \Delta_4 \ln \left(\sum_{i=0}^{3} \text{GY}_{\text{BIPQ}_{-i}}\right) + \text{EMU}_{\text{INFT}}
\]

7. **Long-term interest rate (long-run)**

\[
\text{GY}_{\text{RLST}} = \text{GY}_{\text{RSST}} + \text{EMU}_{\text{TERM}}
\]

8. **Average interest rate on government debt**

\[
\text{GY}_{\text{RZIN}} = -0.043 + 0.308 \Delta_4 \text{GY}_{\text{DWU}_5}
\]

\[
(2.353) \quad (4.103)
\]

\[
+ \left(1 - 0.970\right) \times \frac{1}{5} \times \sum_{i=3}^{7} \text{GY}_{\text{RL}_{-i}}
\]

\[
+ 0.970 \text{GY}_{\text{RZIN}_1}
\]

\[
(72.800)
\]

\[
R^2 = 0.983 \quad DW = 1.914 \quad SER = 0.146
\]
9. Exchange rate of the D-Mark against the US-Dollar

\[
\ln (GY_{ER}) = (1 - GY_{EMU}) \times \left[ 0.022 + (1 - 0.948) \ln \left( \frac{GY_{PCP_{t+1}}}{US_{PCP_{t+1}}} \right) \right. \\
\left. + 1.0 \times 0.01 \times (GY_{RS} - US_{RS}) \right. \\
\left. + 0.948 \times 0.01 \times (GY_{RS_{t-1}} - US_{RS_{t-1}}) \right. \\
\left. + 0.948 \times \ln (GY_{ER_{t-1}}) \right] \\
+ GY_{EMU} \times \ln \left( \frac{1 \, 95583}{EMU \_ER} \right)
\]

\[ R^2 = 0.992 \quad DW = 1.298 \quad SER = 0.051 \]

10. Monetary policy rule: repurchase rate

\[
GY_{RPEN} = (1 - GY_{EMU}) + \left[ 0.75 \times GY_{RPEN_{t-1}} \right. \\
+ (1 - 0.75) \times GY_{RSST} \\
+ 0.35 \times (GY_{MGR_{t+4}} - GY_{MTR_{t+4}}) \\
+ 3 \times \Delta_1 GY_{DWU_{t-4}} \\
+ 4 \times \Delta_1 GY_{DWU_{t-3}} \\
+ 4 \times \Delta_1 GY_{DWU_{t-2}} \\
+ 8 \times \Delta_1 GY_{DWU_{t-1}} \\
+ GY_{EMU} \times EMU \_RS
\]
4. United Kingdom

I. Aggregate demand

1. Real private per capita consumption

\[
\Delta_4 \ln \left( \frac{UK\_CPR}{UK\_WOBE} \right) = -0.043 + 0.313 \Delta_4 \ln \left( \frac{100 + UK\_YV}{UK\_PCP + UK\_WOBE} \right) \\
- 0.343 + 0.01 \ast (0.8 \ast UK\_RL + 0.2 \ast UK\_RS) \\
+ 0.483 \Delta_4 \ln \left( \frac{UK\_CPR-1}{UK\_WOBE-1} \right) \\
- 0.176 \ln \left( \frac{UK\_CPR-4}{UK\_BIPR-4} \right)
\]

\[R^2 = 0.700 \quad DW = 2.135 \quad SER = 0.014\]

2. Participation rate (labour supply)

\[
\ln \left( \frac{UK\_EW}{UK\_WOBE} \right) = -0.019 + 0.973 \ln \left( \frac{UK\_EW-1}{UK\_WOBE-1} \right)
\]

\[R^2 = 0.984 \quad DW = 1.380 \quad SER = 0.003\]

3. Population

\[
\ln (UK\_WOBE) = 3.983 + 0.059 \ast 0.01 \ast T \\
(1967.682) \quad (31.868)
\]

\[R^2 = 0.918 \quad DW = 0.007 \quad SER = 0.005\]

4. Transfers to foreign countries

\[
UK\_U = -0.118 + 0.069 Q1 + 0.324 Q2 + 0.154 Q3 + 0.625 \ast UK\_U\_1 \\
(0.982) \quad (0.411) \quad (1.915) \quad (0.917) \quad (7.200)
\]

\[R^2 = 0.357 \quad DW = 2.265 \quad SER = 0.571\]
5. Nominal private consumption
   \[\text{UK}\_\text{CP} = 0.01 \times \text{UK}\_\text{CPR} + \text{UK}\_\text{PCP}\]

6. Nominal gross private fixed capital investment
   \[\text{UK}\_\text{IAN} = 0.01 \times \text{UK}\_\text{IANR} + \text{UK}\_\text{PIAN}\]

7. Nominal final demand
   \[\text{UK}\_\text{END} = 0.01 \times \text{UK}\_\text{ENDR} + \text{UK}\_\text{PEV}\]

8. Real final demand
   \[\text{UK}\_\text{ENDR} = \text{UK}\_\text{CPR} + \text{UK}\_\text{IANR} + \text{UK}\_\text{GR} + \text{UK}\_\text{VR} + \text{UK}\_\text{EXR}\]

9. Nominal gross domestic product
   \[\text{UK}\_\text{BIP} = 0.01 \times (\text{UK}\_\text{ENDR} - \text{UK}\_\text{EXR}) + \text{UK}\_\text{PINV} + 0.01 \times \text{UK}\_\text{EXR} + \text{UK}\_\text{PEX} - 0.01 \times \text{UK}\_\text{IMR} + \text{UK}\_\text{PIM} + \text{UK}\_\text{SDN}\]

10. Real gross domestic product
    \[\text{UK}\_\text{BIPR} = \text{UK}\_\text{ENDR} - \text{UK}\_\text{IMR} + \text{UK}\_\text{SDR}\]

11. National income
    \[\text{UK}\_\text{VE} = \text{UK}\_\text{BIP} - \text{UK}\_\text{TIS} - \text{UK}\_\text{D}\]

12. Disposable income of households
    \[\text{UK}\_\text{YV} = \text{UK}\_\text{VE} - \text{UK}\_\text{TDB} + \text{UK}\_\text{SB}\]

13. Gross wage income
    \[\text{UK}\_\text{L} = 0.01 \times 3.688 \times \text{UK}\_\text{LA} \times \text{UK}\_\text{E1}\]

14. Net lending of households
    \[\text{UK}\_\text{FH} = \text{UK}\_\text{YV} - \text{UK}\_\text{CP}\]

15. Current account balance
    \[\text{UK}\_\text{LBS} = 0.01 \times (\text{UK}\_\text{EXR} \times \text{UK}\_\text{PEX} - \text{UK}\_\text{IMR} \times \text{UK}\_\text{PIM}) - \text{UK}\_\text{U}\]
II. Aggregate supply

1. Real gross private fixed capital investment

   a) \( \ln(\text{UK\_IANR}) = -2.312 + 1.041 \ln(\text{UK\_ENDR}) \)
      \( \times (13.446) \times (3.149) \)
      \( - 0.3 \times 0.01 \times (0.8 \text{UK\_RL} + 0.2 \text{UK\_RS}) + \text{UK\_IANR\_EC} \)

      \( R^2 = 0.916 \quad DW = 0.267 \quad SER = 0.057 \)

   b) \( \Delta_4 \ln(\text{UK\_IANR}) = 0.731 \Delta_4 \ln(\text{UK\_ENDR}) \)
      \( \times (5.422) \)
      \( - 0.150 \times 0.01 \times \Delta_4 \text{UK\_RL} \)
      \( \times (0.567) \)
      \( + 0.513 \Delta_4 \ln(\text{UK\_IANR\_E}) \)
      \( \times (7.549) \)
      \( - 0.286 \text{UK\_IANR\_EC\_4} \)

      \( R^2 = 0.795 \quad DW = 1.824 \quad SER = 0.033 \)

2. Real inventory investment

   \( \text{UK\_VR} = -0.384 + 0.256 \text{UK\_VR\_E} + 0.119 \Delta_4 \text{UK\_ENDR} \)
      \( \times (3.039) \times (2.720) \times (5.476) \)

      \( R^2 = 0.469 \quad DW = 2.128 \quad SER = 0.824 \)

3. Employment (labour demand)

   a) \( \ln(\text{UK\_EI}) = 1.131 + 0.400 \ln(\text{UK\_ENDR}) \)
      \( \times (7.506) \times (13.849) \)
      \( + 0.400 \ln \left( \frac{\text{UK\_PEV} + (1 - 0.01 \times \text{UK\_TISS})}{\text{UK\_LA}} \right) \)
      \( \times \text{UK\_EI\_EC} \)

      \( R^2 = 0.668 \quad DW = 0.095 \quad SER = 0.020 \)
b) $\Delta_4 \ln (\text{UK}_E) = 0.107 \Delta_4 \ln (\text{UK}_\text{ENDR})$
\[\text{(7.434)}\]
+ 0.079 $\Delta_4 \ln \left( \frac{\text{UK}_\text{PEV} \ast (1 - 0.01 \ast \text{UK}_\text{TISS})}{\text{UK}_\text{LA}} \right)$
\[\text{ (5.740)}\]
+ 0.800 $\Delta_4 \ln (\text{UK}_E\text{I}_\text{I})$
\[\text{ (27.696)}\]
− 0.098 $\text{UK}_E\text{I}_\text{EC}_\text{I}_\text{I}$
\[\text{ (3.791)}\]
+ $\min \left[ 0, \ln \left( 0.97 \text{UK}_E\text{W} \right) \right]$

$R^2 = 0.957 \quad DW = 1.089 \quad SER = 0.004$

4. Real imports of goods and services

$\Delta_4 \ln (\text{UK}_\text{IMR}) = -0.350 + 1.581 \Delta_4 \ln (\text{UK}_\text{ENDR})$
\[\text{(3.592)} \quad \text{ (10.043)}\]
+ 0.288 $\Delta_4 \ln (\text{UK}_\text{IMR}_\text{I})$
\[\text{ (4.787)}\]
+ 0.242 $\ln (\text{UK}_\text{ENDR}_\text{I} - \text{UK}_\text{IMR}_\text{I})$
\[\text{ (3.820)}\]
+ 0.272 $\ln \left( \frac{\text{UK}_\text{PEV}_\text{I} \ast (1 - 0.01 \ast \text{UK}_\text{TISS}_\text{I})}{\text{UK}_\text{PIM}_\text{I}} \right)$
\[\text{ (5.080)}\]
− 0.074 $\ln \left( \frac{\text{UK}_\text{IMR}_\text{I}}{\text{UK}_\text{EXR}_\text{I}} \right)$
\[\text{ (1.162)}\]

$R^2 = 0.816 \quad DW = 1.545 \quad SER = 0.029$

5. Depreciation allowances

$\text{UK}_\text{D} = 0.170 + (1 - 0.01 \ast \text{UK}_\text{KAB}) \ast \text{UK}_\text{D}_\text{I}$
\[\text{ (1.039)}\]
+ 0.01 $\text{UK}_\text{KAB} \ast \text{UK}_{\text{I}ANR}_\text{I} \ast 0.01 \ast \text{UK}_{\text{PINV}}\text{I}$

$R^2 = 0.000 \quad DW = 2.788 \quad SER = 1.569$
6. **Potential gross domestic product**

\[
\text{UK\_BIPQ} = 0.998 + 0.048 \text{T} + 0.322 + 0.01 \times \exp \left[ 0.655 \ln \left( \text{UK\_E1} + 0.01 \times (\text{UK\_ARLQ} - \text{UK\_ARLQ}_N) + \text{UK\_EW} \right) + (1 - 0.655) \ln \left[ \text{UK\_KRP\_1} \right] \right]
\]

\( R^2 = 0.942 \)   \( \text{DW} = 0.181 \)   \( \text{SER} = 0.023 \)

7. **Nominal inventory investment**

\[
\text{UK\_V} = 0.01 \times \text{UK\_PINV} + (\text{UK\_CPR} + \text{UK\_IANR} + \text{UK\_GR} + \text{UK\_VR}) - \text{UK\_CP} - \text{UK\_IAN} - \text{UK\_G}
\]

8. **Private real stock of capital**

\[
\text{UK\_KRP} = (1 - 0.01 \times \text{UK\_KAB}) \times \text{UK\_KRP\_1} + \text{UK\_IANR}
\]

9. **Capacity utilisation**

\[
\text{UK\_GAPQ} = 100 \times \frac{\text{UK\_BIPR}}{\text{UK\_BIPQ}}
\]

10. **Unemployment**

\[
\text{UK\_ARL} = \text{UK\_EW} - \text{UK\_E1}
\]

11. **Unemployment rate**

\[
\text{UK\_ARLQ} = 100 \times \frac{\text{UK\_ARL}}{\text{UK\_EW}}
\]

12. **“Smoothed” unemployment rate**

\[
\text{UK\_ARLQ}_N = 0.9 \times \text{UK\_ARLQ}_{N-1} + 0.1 \times \text{UK\_ARLQ}
\]

13. **Net lending of firms**

\[
\text{UK\_FU} = \text{UK\_D} - \text{UK\_I}:\text{UK\_V} - \text{UK\_U} - \text{UK\_SDN}
\]
III. Factor costs and deflators

1. Gross wage income per employee

\[
\Delta_4 \ln (UK_{LA}) = 0.002 + (1 - 0.795) \Delta_4 \ln (UK_{PCP}) \\
\quad + 0.795 \Delta_4 \ln (UK_{LA_{-1}}) \\
\quad - 0.414 \Delta_4 0.01(UK_{ARLQ} - UK_{ARLQN}) \\
\quad - 0.204 \Delta_4 0.01(UK_{ARLQ_{-4}} - UK_{ARLQN_{-4}}) \\
\]

\[R^2 = 0.559 \quad DW = 1224 \quad SER = 0.015\]

2. Deflator of domestic demand

\(a) \quad 0.01 \times \text{UK}_\text{INF} = \frac{0.022 \Delta^2 \ln \left(\frac{\text{UK}_\text{COSI}}{1 - 0.01 \times \text{UK}_\text{TISS}}\right)}{(0.869)} + 0.01 \times \left[(1 - 0.398) \times \text{UK}_\text{INF}_{-1} + 0.398 \times \left((1 - 0.4) \times \text{UK}_\text{INF}_{-4} + 0.4 \times \text{UK}_\text{INF}_{-1} + 0.007\right)\right] + 0.01 \times \ln (UK_{GAPQ})\)

\[R^2 = 0.452 \quad DW = 2532 \quad SER = 0.007\]

\(b) \quad \ln (UK_{PINV}) = \ln (UK_{PINV}_{-4}) + 0.01 \times \text{UK}_\text{INF}\)

3. Deflator of private consumption

\[
\Delta_4 \ln (UK_{PCP}) = [1 - 0.384] \times 0.01 \times \text{UK}_\text{INF} \\
\quad + 0.384 \Delta_4 \ln (UK_{PCP_{-1}}) \\
\]

\[R^2 = 0.364 \quad DW = 1040 \quad SER = 0.007\]

184
4. Deflator of government demand

\[ \Delta_4 \ln (UK_{PG}) = (1 - 0.511) + 0.01 \times \ln (UK_{INF}) + 0.511 \Delta_4 \ln (UK_{PG}_{-1}) \]  
(7.405)

\[ R^2 = 0.376 \quad DW = 1.542 \quad SER = 0.016 \]

5. Deflator of private fixed capital investment

\[ \Delta_4 \ln (UK_{PIAN}) = (1 - 0.783) + 0.01 \times \ln (UK_{INF}) + 0.783 \Delta_4 \ln (UK_{PIAN}_{-1}) \]  
(11.896)

\[ R^2 = 0.609 \quad DW = 1.801 \quad SER = 0.016 \]

6. Deflator of exports

\[ \Delta_4 \ln (UK_{PEX}) = (1 - 0.773) \Delta_4 \left[ (1 - 0.236) \ln (UK_{PINV}_{-1}) + 0.236 \ln (UK_{LPAC}_{-1}) \right] + 0.773 \Delta_4 \ln (UK_{PEX}_{-1}) \]  
(10.408)

\[ R^2 = 0.581 \quad DW = 10.15 \quad SER = 0.024 \]

7. Production costs

\[ UK_{COSI} = \frac{100}{99.987} \times UK_{LA}^{0.678} \times UK_{PIM}^{1 - 0.678} \]

8. Deflator of final demand

\[ UK_{PEV} = \frac{(UK_{ENDR} - UK_{EXR}) \times UK_{PINV} + UK_{EXR} + UK_{PEX}}{UK_{ENDR}} \]

9. Deflator of gross domestic product

\[ UK_{PBIP} = 100 \times \frac{UK_{BIP}}{UK_{BIFR}} \]

10. Adaptive expectation on consumer price inflation

\[ UK_{PCPD} = 0.9 \times UK_{PCPD}_{-1} + 0.1 \Delta_4 \ln (PCP_{-1}) \times 100 \]
11. Adaptive expectation on inflation rate of final demand

\[ \text{UK\_PEVD} = 0.9 \times \text{UK\_PEVD}_{-1} + 0.1 \Delta_4 \ln (\text{PEV}_{-1}) \times 100 \]

IV. Government

1. Direct tax rate

\[ \text{UK\_TDBS} = 1.947 + 0.516 \times \text{UK\_TDBS}_{-1} + 0.406 \times \text{UK\_TDBS}_{-4} \]

\[ (1.064) \quad (6.966) \quad (5.385) \]

\[ R^2 = 0.650 \quad DW = 1.726 \quad SER = 0.966 \]

2. Indirect tax rate

\[ \text{UK\_TISS} = 0.877 + 0.920 \times \text{UK\_TISS}_{-1} \]

\[ (2.973) \quad (32.726) \]

\[ R^2 = 0.922 \quad DW = 2.233 \quad SER = 0.343 \]

3. Real government demand

\[ \Delta_4 \ln (\text{UK\_GR}) = \Delta_4 \ln (\text{UK\_BIPR}) - 0.407 \ln (0.01 \times \text{UK\_GAPQ}) \]

\[ (3.575) \]

\[ R^2 = 0.123 \quad DW = 0.398 \quad SER = 0.033 \]

4. Government transfers to households

\[ \ln \left( \frac{\text{UK\_SB}}{\text{UK\_BIP}} \right) = -0.066 + 0.441 \times (\text{UK\_ARLQ} - \text{UK\_ARLQN}) \]

\[ (2.105) \quad (3.254) \]

\[ + 0.967 \ln \left( \frac{\text{UK\_SB}_{-1}}{\text{UK\_BIP}_{-1}} \right) \]

\[ (62.859) \]

\[ R^2 = 0.978 \quad DW = 1.406 \quad SER = 0.021 \]
5. **Direct taxes and social contributions**
   \[ \text{UK}_\text{TDB} = 0.01 \times \text{UK}_\text{TDBS} \times \text{UK}_\text{VE} \]

6. **Indirect taxes (excluding subsidies)**
   \[ \text{UK}_\text{TIS} = 0.01 \times \text{UK}_\text{TISS} \times \text{UK}_\text{END} \]

7. **Nominal government demand**
   \[ \text{UK}_\text{G} = 0.01 \times \text{UK}_\text{GR} \times \text{UK}_\text{PG} \]

8. **Net lending of government**
   \[ \text{UK}_\text{FS} = \text{UK}_\text{TDB} + \text{UK}_\text{TIS} - \text{UK}_\text{G} - \text{UK}_\text{SB} \]

V. **Money, interest rates and exchange rate**

1. **Real stock of money**
   \[
   \ln \left(\frac{\text{UK}_\text{M}_4}{\text{UK}_\text{PNV}}\right) = -0.723 + 0.175 \ln(\text{UK}_\text{BIPR}) \\
   \quad - 0.324 + 0.01 \times \text{UK}_\text{RL} \\
   \quad + 0.923 \ln \left(\frac{\text{UK}_\text{M}_{4-1}}{\text{UK}_\text{PNV}_{-1}}\right) \\
   \quad (2.663) \quad (2.998) \quad (2.188) \quad (43.283)
   \]
   \[ R^2 = 0.998 \quad DW = 1.099 \quad SER = 0.015 \]

2. **Monetary policy rule:**
   **Money market interest rate for three-month funds**
   \[
   \text{UK}_\text{RS} = 0.75 \text{UK}_\text{RS}_{-1} + (1 - 0.75) \text{UK}_\text{RSST} \\
   + 0.80 \times \sum_{i=1}^{4} (\text{UK}_\text{INF}_{i-1} - \text{UK}_\text{INFT}_{i}) \\
   + 0.80 \times \sum_{i=0}^{3} 100 \times \ln (0.01 \text{UK}_\text{GAPQ}_{i})
   \]
3. Yield on government bonds

\[ 1 + 0.01 \cdot \text{UK\_RL} = (1 + 0.01 \cdot \text{UK\_RL\_1})^{(1-0.518)} \]
\[ \times (1 + 0.01 \cdot \text{UK\_RL\_2})^{0.518} \]
\[ \times \left( \frac{1 + 0.01 \cdot \text{UK\_RS\_1}}{1 + 0.01 \cdot \text{UK\_RS\_4}} \right)^{1.04} \]
\[ \times \left( \frac{1 + 0.01 \cdot \text{UK\_RL\_4}}{1 + 0.01 \cdot \text{UK\_RL\_7}} \right)^{-0.02} \]

\[ R^2 = 1.000 \quad DW = 2.565 \quad SER = 0.004 \]

4. Short-term interest rate (long-run)

\[ \text{UK\_RSST} = 100 \times \Delta_4 \ln \left( \sum_{i=0}^{3} \text{UK\_BIPO\_i} \right) + \text{UK\_INFT} \]

5. Long-term interest rate (long-run)

\[ \text{UK\_RLST} = \text{UK\_RSST} + \text{UK\_TERM} \]

6. Exchange rate of the Pound against the US-Dollar

\[ \ln(\text{UK\_ER}) = 0.302 + (1-0.930) \ln \left( \frac{\text{UK\_PCP}}{\text{US\_PCP}} \right) \]
\[ -1.0 \times 0.01 \times (\text{UK\_RS} - \text{US\_RS}) \]
\[ + 0.930 \times 0.01 \times (\text{UK\_RS\_1} - \text{US\_RS\_1}) \]
\[ + 0.930 \ln(\text{UK\_ER\_1}) \]
\[ (22.572) \]

\[ R^2 = 0.848 \quad DW = 1.585 \quad SER = 0.055 \]
5. France

I. Aggregate demand

1. Real private per capita consumption

\[
\Delta_4 \ln \left( \frac{FR\_CPR\_WOBE}{FR\_WOBE} \right) = -0.155 + 0.463 \Delta_4 \ln \left( \frac{FR\_BIPR\_WOBE}{FR\_WOBE} \right) \\
- 0.116 + 0.01 \ast (FR\_RL\_1 - FR\_PCPD\_1) \\
+ 0.353 \Delta_4 \ln \left( \frac{FR\_CPR\_1}{FR\_WOBE\_1} \right) \\
- 0.312 \ln \left( \frac{FR\_CPR\_4}{FR\_BIPR\_4} \right)
\]

\( R^2 = 0.710 \quad DW = 1.528 \quad SER = 0.007 \)

2. Participation rate (labour supply)

\[
\ln \left( \frac{FR\_EW\_WOBE}{FR\_WOBE} \right) = -0.039 + 0.953 \ln \left( \frac{FR\_EW\_1}{FR\_WOBE\_1} \right)
\]

\( R^2 = 0.988 \quad DW = 0.955 \quad SER = 0.001 \)

3. Population

\[
\Delta_4 \ln (FR\_WOBE) = 0.0004 + 0.894 \Delta_4 \ln (FR\_WOBE\_1) \\
(2.292) \quad (20.810)
\]

\( R^2 = 0.826 \quad DW = 0.371 \quad SER = 0.0006 \)

4. Transfers to foreign countries

\[
FR\_U = 1.649 + 0.854 \ast FR\_U\_1 \\
(2.051) \quad (15.729)
\]

\( R^2 = 0.730 \quad DW = 2.816 \quad SER = 5.573 \)
5. Nominal private consumption
   \[ FR_{CP} = 0.01 \times FR_{CPR} + FR_{PCP} \]

6. Nominal gross private fixed capital investment
   \[ FR_{IAN} = 0.01 \times FR_{IANR} + FR_{PIAN} \]

7. Nominal final demand
   \[ FR_{END} = 0.01 \times FR_{ENDR} + FR_{PEV} \]

8. Real final demand
   \[ FR_{ENDR} = FR_{CPR} + FR_{IANR} + FR_{GR} + FR_{VR} + FR_{EXR} \]

9. Nominal gross domestic product
   \[ FR_{BIP} = 0.01 \times [FR_{ENDR} - FR_{EXR}] \times FR_{PINV} \\
   + 0.01 \times FR_{EXR} + FR_{PEX} \\
   - 0.01 \times FR_{IMR} + FR_{PIM} \\
   + FR_{SDN} \]

10. Real gross domestic product
    \[ FR_{BIPR} = FR_{ENDR} - FR_{IMR} + FR_{SDR} \]

11. National income
    \[ FR_{VE} = FR_{BIP} - FR_{TIS} - FR_{D} \]

12. Disposable income of households
    \[ FR_{YV} = FR_{VE} - FR_{TDB} + FR_{SB} \]

13. Gross wage income
    \[ FR_{L} = 0.01 \times 18.372 \times FR_{LA} + FR_{EI} \]

14. Net lending of households
    \[ FR_{FH} = FR_{YV} - FR_{CP} \]

15. Current account balance
    \[ FR_{LBS} = 0.01 \times [FR_{EXR} + FR_{PEX} - FR_{IMR} + FR_{PIM}] - FR_{U} \]

16. Nominal domestic demand
    \[ FR_{INLV} = FR_{CP} + FR_{G} + FR_{IAN} + FR_{V} \]

17. Real domestic demand
    \[ FR_{INVR} = FR_{CPR} + FR_{GR} + FR_{IANR} + FR_{VR} \]
II. Aggregate supply

1. Real gross private fixed capital investment

   a) \[ \ln(\text{FR\_IANR}) = -1.626 + 10 \ln(\text{FR\_BIPR}) \]
   \[ (89.660) \]
   \[ -0.018 \times 0.01 \times (\text{FR\_RL} - \text{FR\_PEVD}) \]
   \[ (4.406) \]
   \[ + \text{FR\_IANR\_EC} \]

   \[ R^2 = 0.162 \quad DW = 0.061 \quad SER = 0.083 \]

   b) \[ \Delta_4 \ln(\text{FR\_IANR}) = 0.494 \Delta_4 \ln(\text{FR\_ENDR}) \]
   \[ (5.566) \]
   \[ -0.196 (0.01 \times \text{FR\_RL} - \text{FR\_PEVD}) \]
   \[ (3.605) \]
   \[ + 0.668 \Delta_4 \ln(\text{FR\_IANR}^{-1}) \]
   \[ (13.261) \]
   \[ -0.094 \text{FR\_IANR\_EC}^{-4} \]

   \[ R^2 = 0.873 \quad DW = 1.597 \quad SER = 0.017 \]

2. Real inventory investment

   \[ \text{FR\_VR} = -1852 + 0.552 \text{FR\_VR}^{-1} + 0.136 \Delta_4 \text{FR\_ENDR} \]
   \[ (2.829) \quad (8.204) \]

   \[ R^2 = 0.623 \quad DW = 2.231 \quad SER = 4.178 \]

3. Employment (labour demand)

   a) \[ \ln(\text{FR\_EI}) = 1.792 + 0.189 \ln(\text{FR\_ENDR}) \]
   \[ (12.382) \quad (8.681) \]
   \[ + 0.129 \ln \left( \frac{\text{FR\_PEV} \times (1 - 0.01 \times \text{FR\_TISS})}{\text{FR\_LA}} \right) \]
   \[ (4.630) \]
   \[ + \text{FR\_EI\_EC} \]

   \[ R^2 = 0.851 \quad DW = 0.077 \quad SER = 0.007 \]
b) \[ \Delta_4 \ln (FR_{EI}) = 0.390 \Delta_4 \ln (FR_{EL-4}) \\
(7.247) \\
+ 0.188 \Delta_4 \ln (FR_{ENDR}) \\
(12.640) \\
+ 0.126 \Delta_4 \ln \left( \frac{FR_{PEV} + (1 - 0.001 \times FR_{TISS})}{FR_{LA}} \right) \\
(6.817) \\
- 0.352 FR_{EI_{EC-4}} \\
(5.913) \\
+ \min \left[ 0, \ln \left( \frac{0.97 FR_{EW}}{FR_{EI}} \right) \right] \]

\[ R^2 = 0.747 \quad DW = 0.346 \quad SER = 0.004 \]

4. **Real imports of goods and services**

\[ \Delta_4 \ln (FR_{IMR}) = 0.149 \Delta_4 \ln \left( \frac{FR_{PEV} + (1 - 0.001 \times FR_{TISS})}{FR_{PIM}} \right) \\
(2.059) \\
+ 0.713 \Delta_4 \ln (FR_{IMR-1}) \\
(11.364) \\
+ 0.003 \ln \left( \frac{FR_{PEV_{-4}} + (1 - 0.001 \times FR_{TISS_{-4}})}{FR_{PIM_{-4}}} \right) \\
(0.090) \\
+ (1 - 0.713) \times \Delta_4 \ln (FR_{EXR}) \]

\[ R^2 = 0.599 \quad DW = 1.468 \quad SER = 0.035 \]

5. **Depreciation allowances**

\[ FR_{D} = 0.899 + (1 - 0.01 \times FR_{KAB}) \times FR_{D_{-1}} \\
(1080) \\
+ 0.01 \times FR_{KAB} + FR_{IANR_{-1}} + 0.01 \times FR_{PINV_{-1}} \]

\[ R^2 = 0.000 \quad DW = 2.280 \quad SER = 7.985 \]
6. Potential gross domestic product

\[
\text{FR\_BIPQ} = 0.929 \\
\begin{align*}
1226 & \; + \; 0.228 \; \times \; 0.01 \; \times \; T \\
(355.325) & \; (69.721)
\end{align*}
\]

\[
\ast \; \exp \left( + \; 0.615 \; \ln \left( \text{FR\_E1} + 0.01 \times (\text{FR\_ARLQ} - \text{FR\_ARLQN}) \times \text{FR\_EW} \right) \\
+ (1 - 0.615) \; \ln \left( \text{FR\_KRP}_{-1} \right) \right)
\]

\[R^2 = 0.978 \quad DW = 0.389 \quad SER = 0.011\]

7. Nominal inventory investment

\[
\text{FR\_V} = 0.01 \; \ast \; \text{FR\_PINV} \; \ast \left( \text{FR\_CPR} + \text{FR\_IANR} + \text{FR\_GR} + \text{FR\_VR} \right) \\
- \text{FR\_CP} - \text{FR\_IAN} - \text{FR\_G}
\]

8. Private real stock of capital

\[
\text{FR\_KRP} = (1 - 0.01 \; \ast \; \text{FR\_KAB}) \; \text{FR\_KRP}_{-1} + \text{FR\_IANR}
\]

9. Capacity utilisation

\[
\text{FR\_GAPQ} = 100 \; \ast \frac{\text{FR\_BIPR}}{\text{FR\_BIPQ}}
\]

10. Unemployment

\[
\text{FR\_ARL} = \text{FR\_EW} - \text{FR\_E1}
\]

11. Unemployment rate

\[
\text{FR\_ARLQ} = 100 \; \ast \frac{\text{FR\_ARL}}{\text{FR\_EW}}
\]

12. "Smoothed" unemployment rate

\[
\text{FR\_ARLQN} = 0.9 \; \ast \text{FR\_ARLQN}_{-1} + 0.1 \; \ast \text{FR\_ARLQ}
\]

13. Net lending of firms

\[
\text{FR\_FU} = \text{FR\_D} - \text{FR\_IAN} - \text{FR\_V} - \text{FR\_U} - \text{FR\_SDN}
\]
III. Factor costs and deflators

1. Gross wage income per employee

\[
\Delta_4 \ln (FR_{LA}) = 0.749 \Delta_4 \ln (FR_{LA_{-1}}) \\
\quad + (1 - 0.749) \Delta_4 \ln (FR_{PCP}) \\
\quad + (1 - 0.749) \times 0.713 \times \Delta_4 \ln (FR_{BIPO}) \\
\quad - 0.013 \times 0.01 \times \sum_{i=1}^{4} (FR_{ARLQN_{-1}} - FR_{ARLQN_{-}})
\]

\( R^2 = 0.765 \quad DW = 1683 \quad SER = 0.007 \)

2. Deflator of domestic demand

a) \( 0.01 \times FR_{INF} = 0.03 \Delta_4 \ln \left[ \frac{FR_{COSI}}{1 - 0.01 \times FR_{TISS}} \right] \\
\quad + 0.965 \times 0.01 \times \left( \frac{1 - 0.359 \times FR_{INF_{-1}}}{41.939} \right) \\
\quad + 0.359 \times 0.4 \times \left( \frac{1 - 0.4 \times FR_{INF_{+1}}}{4.591} \right) \\
\quad + 0.03 \ln (0.01 \times FR_{GAPQ}) \\
\quad + (1 - 0.965) \Delta_4 \ln (FR_{PSM3}) \\
\quad + 0.10 \ln \left( \frac{FR_{PSM3_{-4}}}{FR_{PINV_{-4}}} \right) \)

\( R^2 = 0.990 \quad DW = 0.710 \quad SER=0.006 \)

b) \( \ln (FR_{PINV}) = \ln (FR_{PINV_{-4}}) + 0.01 \times FR_{INF} \)

3. Deflator of private consumption

\[
\Delta_4 \ln (FR_{PCP}) = (1 - 0.409) \times 0.01 \times FR_{INF} \\
\quad + 0.409 \Delta_4 \ln (FR_{PCP_{-1}})
\]

\( R^2 = 0.302 \quad DW = 0.961 \quad SER = 0.004 \)
4. **Deflator of government demand**

\[
\Delta_4 \ln \left( \text{FR\_PG} \right) = (1 - 0.447) \times 0.01 \times \text{FR\_INF} \\
+ 0.447 \Delta_4 \ln \left( \text{FR\_PG}_{-1} \right) \\
(7.694)
\]

\[R^2 = 0.394 \quad DW = 1.880 \quad SER = 0.009\]

5. **Deflator of private fixed capital investment**

\[
\Delta_4 \ln \left( \text{FR\_PIAN} \right) = (1 - 0.577) \times 0.01 \times \text{FR\_INF} \\
+ 0.577 \Delta_4 \ln \left( \text{FR\_PIAN}_{-1} \right) \\
(10.390)
\]

\[R^2 = 0.543 \quad DW = 0.834 \quad SER = 0.008\]

6. **Deflator of exports**

\[
\Delta_4 \ln \left( \text{FR\_PEX} \right) = (1 - 0.834) \Delta_4 \left[ (1 - 0.253) \ln \left( \text{FR\_PINV}_{-1} \right) \right] \\
+ 0.253 \Delta_4 \ln \left( \text{FR\_LPAC}_{-1} \right) \\
+ 0.834 \Delta_4 \ln \left( \text{FR\_PEX}_{-1} \right) \\
(11.896)
\]

\[R^2 = 0.645 \quad DW = 1.214 \quad SER = 0.013\]

7. **Production costs**

\[
\text{FR\_COSI} = \frac{100}{100.01} \times \text{FR\_LA}^{0.713} \times \text{FR\_PIM}^{1 - 0.713}
\]

8. **Deflator of final demand**

\[
\text{FR\_PEV} = \frac{\left( \text{FR\_ENDR} - \text{FR\_EXR} \right) \times \text{FR\_PINV} + \text{FR\_EXR} + \text{FR\_PEX}}{\text{FR\_ENDR}}
\]

9. **Deflator of gross domestic product**

\[
\text{FR\_PBIP} = 100 \times \frac{\text{FR\_BIP}}{\text{FR\_BIPR}}
\]

10. **Adaptive expectation on consumer price inflation**

\[
\text{FR\_PCPD} = 0.9 \times \text{FR\_PCPD}_{-1} + 0.1 \Delta_4 \ln (\text{PCP}_{-1})
\]
11. Adaptive expectation on inflation rate of final demand
\[ FR_{PEVD} = 0.9 \times FR_{PEVD_{-1}} + 0.1 \Delta_4 \ln(PEV_{-1}) \]

IV. Government

1. Direct tax rate
\[ FR_{TDBS} = 1502 - 0.116 Q1 - 0.271 Q2 - 0.090 Q3 + 0.964 FR_{TDBS_{-1}} \]
\[ (2.97) \quad (1.077) \quad (2.524) \quad (0.835) \quad (69.102) \]
\[ R^2 = 0.981 \quad DW = 1.875 \quad SER = 0.365 \]

2. Indirect tax rate
\[ FR_{TISS} = 4.393 - 0.106 Q1 + 0.024 Q2 - 0.052 Q3 + 0.579 FR_{TISS_{-1}} \]
\[ (5.266) \quad (1696) \quad (0.386) \quad (0.825) \quad (7.185) \]
\[ R^2 = 0.361 \quad DW = 1.846 \quad SER = 0.213 \]

3. Real government demand
\[ \Delta_4 \ln(FR_{GR}) = 0.943 \Delta_4 \ln(FR_{GR_{-1}}) + (1 - 0.943) \Delta_4 \ln(FR_{BIPR}) \]
\[ (20.617) \]
\[ = -0.051 \ln\left(\frac{FR_{GAPQ_{-1}}}{(0.833)}\right) \]
\[ \frac{1}{4} \sum_{i=1}^{4} FR_{GR_{-1}} \]
\[ R^2 = 0.851 \quad DW = 1.291 \quad SER = 0.008 \]

4. Government transfers to households
\[ \ln\left(\frac{FR_{SB}}{FR_{BIP}}\right) = -0.043 + 0.151 + 0.01 (FR_{ARLQ} - FR_{ARLQN}) \]
\[ (2.736) \quad (0.865) \]
\[ + 0.971 \ln\left(\frac{FR_{SB_{-1}}}{FR_{BIP_{-1}}}\right) \]
\[ (92.884) \]
\[ R^2 = 0.991 \quad DW = 0.931 \quad SER = 0.009 \]
5. Direct taxes and social contributions
\[ FR\_TDB = 0.01 \times FR\_TDBS + FR\_VE \]

6. Indirect taxes (excluding subsidies)
\[ FR\_TIS = 0.01 \times FR\_TISS + FR\_END \]

7. Nominal government demand
\[ FR\_G = 0.01 \times FR\_GR + FR\_PG \]

8. Net lending of government
\[ FR\_FS = FR\_TDB + FR\_TIS - FR\_G - FR\_SB \]

V. Money, interest rates and exchange rate

1. Real stock of money
\[
a) \ln\left( \frac{FR\_M3}{FR\_PINV} \right) = -4.674 + 1.166 \ln(FR\_BIPR) + 0.534 \times 0.01 + FR\_RL + FR\_M3\_EC \\
(8.970) (15.738) (1.860) \\
R^2 = 0.915 \quad DW = 0.168 \quad SER = 0.048
\]

\[
b) \Delta_1 \ln\left( \frac{FR\_M3}{FR\_PINV} \right) = 0.445 \Delta_1 \ln(FR\_BIPR) - 0.208 \times 0.01 + FR\_RL \\
(1483) (0.561) \\
-0.109 \times 0.01 \ln\left( \frac{FR\_M3\_t}{FR\_PINV\_t} \right) - 0.072 \times FR\_M3\_EC \_t \\
(8.78) (1428) \\
R^2 = 0.030 \quad DW = 1942 \quad SER = 0.019
\]

2. Money market interest rate for three-month funds
\[
FR\_RS = (1 - FR\_EMU) \times \left[ (1 - FR\_EWS) \times FR\_RS\_t + \frac{FR\_EWS}{GY\_RS + 100} \ln\left( \frac{FR\_ERDM\_4}{FR\_ERDM\_4} \right) + FR\_RRS \right] + FR\_EMU \times EMU\_RS
\]
3. Yield on government bonds

\[
1 + 0.01 \text{FR.}_{\text{RL}} = (1 - \text{FR.}_{\text{EMU}}) \times (1 + 0.01 \text{FR.}_{\text{RL}})^{1 - 0.524} \times (1 + 0.01 \text{FR.}_{\text{RL}})^{10.524} \times \left( \frac{1}{1 + 0.01 \text{FR.}_{\text{RS}} + 0.01 \text{FR.}_{\text{RSST}}} \right) + \text{FR.}_{\text{EMU}} \times (1 + 0.01 \text{EMU.}_{\text{RL}})
\]

\[R^2 = 1.000 \quad DW = 1860 \quad SER = 0.003\]

4. Short-term interest rate (long-run)

\[\text{FR.}_{\text{RSST}} = 100 \times \Delta_4 \ln \left( \sum_{i=0}^{3} \text{FR.}_{\text{BIPQ}} \right) + \text{EMU.}_{\text{INFT}}\]

5. Long-term interest rate (long-run)

\[\text{FR.}_{\text{RLST}} = \text{FR.}_{\text{RSST}} + \text{EMU.}_{\text{TERM}}\]

6. Exchange rate of the Franc against the US-Dollar

\[
\ln (\text{FR.}_{\text{ER}}) = (1 - \text{FR.}_{\text{EMU}}) \times \left[ \frac{\text{FR.}_{\text{EWS}} \times \ln (\text{FR.}_{\text{ERDM}} + \text{GY.}_{\text{ER}})}{0.062 + (1 - 0.946) \ln (1.546)} - 1.0 \times 0.01 \times (\text{FR.}_{\text{RS}} - \text{US.}_{\text{RS}}) + 0.946 \times 0.01 \times (\text{FR.}_{\text{RS}} - \text{US.}_{\text{RS}}) + 0.946 \times \ln (\text{FR.}_{\text{ER}}) + \text{FR.}_{\text{EMU}} \times \ln \left( \frac{\text{PCP.}_{\text{FD}}}{{\text{PCP.}_{\text{FU}}}} \right) + 655957 \times \ln (\text{EMU.}_{\text{ER}}) \right] \]

\[R^2 = 0.998 \quad DW = 1.104 \quad SER = 0.054\]
7. Long-term price level (P-Star)

\[
FR_{PSM3} = (1 - FR_{EMU}) \times \frac{1}{0.996} \times \exp \left\{ \ln(FR_{M3}) + 4.674 \right\} \\
+ FR_{EMU} \times \frac{1}{0.574} \\
+ 1.166 \ln(FR_{BIPQ}) + 0.534 + 0.01 + FR_{RL}
\]

8. Risk premium

\[
FR_{RRS} = 0.655 \times FR_{RRS_{-1}}
\]

\[
R^2 = 0.435 \quad DW = 2.053 \quad SER = 3.246
\]

9. Exchange rate of the Franc against the D-Mark

\[
FR_{ERDM} = (1 - FR_{EMU}) \times \left\{ \frac{FR_{EWS} + FR_{ERDM_{-1}}}{1 - FR_{EWS}} \times \left( \frac{FR_{ER}}{GY_{ER}} \right) \right\} + FR_{EMU} = 335386
\]
6. Italy

I. Aggregate demand

1. Real private consumption

\[
\Delta_4 \ln \left( \frac{\text{IT\_CPR}}{\text{IT\_WOBE}} \right) = -0.019 \quad (12.174)
\]

\[
+ 0.154 \quad \Delta_4 \ln \left( \frac{\text{IT\_YV}_{-1}}{0.01 \times \text{IT\_PCP}_{-1} + \text{IT\_WOBE}_{-1}} \right) \quad (3.532)
\]

\[
- 0.070 \times 0.01 \times (\text{IT\_RL} - \text{IT\_PCP}) \quad (2.325)
\]

\[
+ 0.728 \quad \Delta_4 \ln \left( \frac{\text{IT\_CPR}_{-1}}{\text{IT\_WOBE}_{-1}} \right) \quad (13.059)
\]

\[
- 0.05 \ln \left( \frac{\text{IT\_CPR}_{-4}}{\text{IT\_BIPR}_{-4}} \right)
\]

\[R^2 = 0.857 \quad DW = 0.534 \quad SER = 0.008\]

2. Participation rate (labour supply)

\[
\ln \left( \frac{\text{IT\_EW}}{\text{IT\_WOBE}} \right) = -0.043 + 0.953 \ln \left( \frac{\text{IT\_EW}_{-1}}{\text{IT\_WOBE}_{-1}} \right) \quad (1.857) \quad (38.034)
\]

\[R^2 = 0.941 \quad DW = 2.120 \quad SER = 0.008\]

3. Population

\[
\ln (\text{IT\_WOBE}) = 3.980 + 0.063 + 0.01 \times T - 0.021 \times \text{IT\_Di11} \quad (3552.404) \quad (52.734) \quad (30.422)
\]

\[R^2 = 0.972 \quad DW = 0.954 \quad SER = 0.002\]
4. Transfers to foreign countries

\[
IT\_U = -0.297 + 0.647 \text{Q1} + 0.452 \text{Q2} + 0.393 \text{Q3} + 0.869 \text{IT\_U}_{-1}
\]

\[
(0.906) \quad (1.412) \quad (0.988) \quad (0.858) \quad (15.915)
\]

\[R^2 = 0.734 \quad DW = 2.558 \quad SER = 1.552\]

5. Nominal private consumption

\[
IT\_CP = 0.01 \times IT\_CPR + IT\_PCP
\]

6. Nominal gross private fixed capital investment

\[
IT\_IAN = 0.01 \times IT\_IANR + IT\_PIAN
\]

7. Nominal final demand

\[
IT\_END = 0.01 \times IT\_ENDR + IT\_PEV
\]

8. Real final demand

\[
IT\_ENDR = IT\_CPR + IT\_IANR + IT\_GR + IT\_VR + IT\_EXR
\]

9. Nominal gross domestic product

\[
IT\_BIP = 0.01 \times [IT\_ENDR - IT\_EXR] + IT\_PINV
+ 0.01 \times IT\_EXR \times IT\_PEX
- 0.01 \times IT\_IMR + IT\_PIM
+ IT\_SDN
\]

10. Real gross domestic product

\[
IT\_BIPR = IT\_ENDR - IT\_IMR + IT\_SDR
\]

11. National income

\[
IT\_VE = IT\_BIP - IT\_TIS - IT\_D
\]

12. Disposable income of households

\[
IT\_YV = IT\_VE - IT\_TDB + IT\_SB
\]

13. Gross wage income

\[
IT\_L = 0.01 \times 6.951 + IT\_LA \times IT\_E1
\]

14. Net lending of households

\[
IT\_FH = IT\_YV - IT\_CP
\]

15. Current account balance

\[
IT\_LBS = 0.01 \times [IT\_EXR \times IT\_PEX - IT\_IMR \times IT\_PIM] - IT\_U
\]
16. **Nominal domestic demand**
   \[ IT_{\text{INLV}} = IT_{\text{CP}} + IT_{\text{G}} + IT_{\text{IAN}} + IT_{\text{V}} \]

17. **Real domestic demand**
   \[ IT_{\text{INVR}} = IT_{\text{CPR}} + IT_{\text{GR}} + IT_{\text{IANR}} + IT_{\text{VR}} \]

II. **Aggregate supply**

1. **Real gross private fixed capital investment**
   a) \[ \ln \left( IT_{\text{IANR}} \right) = 1.365 + 0.443 \ln \left( IT_{\text{ENDR}} \right) \]
      \[ (7.094) \] \[ (13.995) \]
      \[ - 0.545 \] \[ 0.01 \ast IT_{\text{RL}_{-1}} + IT_{\text{IANR}_{-1}}EC \]
      \[ (3.045) \]
      \[ R^2 = 0.730 \]
      \[ DW = 0.113 \]
      \[ SER = 0.053 \]

   b) \[ \Delta_4 \ln \left( IT_{\text{IANR}} \right) = 0.337 \Delta_4 \ln \left( IT_{\text{ENDR}} \right) \]
      \[ (4.880) \]
      \[ - 0.067 \Delta_4 \ast IT_{\text{RL}_{-1}} \]
      \[ (0.647) \]
      \[ + 0.682 \Delta_4 \ln \left( IT_{\text{IANR}_{-1}} \right) \]
      \[ (14.563) \]
      \[ - 0.231 IT_{\text{IANR}_{-1}}EC_{-4} \]
      \[ (4.437) \]
      \[ R^2 = 0.876 \]
      \[ DW = 0.869 \]
      \[ SER = 0.021 \]

2. **Real inventory investment**
   \[ IT_{\text{VR}} = 0.458 + 0.219 IT_{\text{VR}_{-1}} + 0.156 \Delta_4 IT_{\text{ENDR}} \]
   \[ (1.813) \] \[ (2.520) \] \[ (6.800) \]
   \[ R^2 = 0.500 \]
   \[ DW = 1.848 \]
   \[ SER = 1.637 \]
3. Employment (labour demand)

a) $\ln (\text{IT}_E) = 1.802 + 0.208 \ln (\text{IT}_{ENDR})$
\[ (4.636) \quad (3.145) \]
\[ + 0.175 \ln \left( \frac{\text{IT}_{PEV} \ast (1 - \text{IT}_{TISS})}{\text{IT}_{LA}} \right) \]
\[ (2.015) \]
\[ + \text{IT}_{E1\_EC} \]

$R^2 = 0.285 \quad DW = 0.076 \quad SER = 0.023$

b) $\Delta_4 \ln (\text{IT}_E) = 0.435 \Delta_4 \ln (\text{IT}_{E1\_4})$
\[ (4.580) \]
\[ + 0.195 \Delta_4 \ln (\text{IT}_{ENDR}) \]
\[ (4.735) \]
\[ + 0.127 \Delta_4 \ln \left( \frac{\text{IT}_{PEV} \ast (1 - \text{IT}_{TISS})}{\text{IT}_{LA}} \right) \]
\[ (2.095) \]
\[ - 0.240 \text{ IT}_{E1\_EC}\_4 \]
\[ (4.135) \]
\[ + \min \left[ 0, \ln \left( \frac{0.97 \text{ IT}_{EW}}{\text{IT}_E} \right) \right] \]

$R^2 = 0.335 \quad DW = 0.714 \quad SER = 0.012$

4. Real imports of goods and services

a) $\ln (\text{IT}\_IMR) = -5.234$
\[ (14.306) \]
\[ + 1.573 \ast \ln (\text{IT}_{ENDR}) \]
\[ (25.969) \]
\[ + 0.220 \ast \ln \left( \frac{\text{IT}_{PEV} \ast (1 - 0.01 \ast \text{IT}_{TISS})}{\text{IT}_{PIM}} \right) \]
\[ (3.820) \]
\[ + \text{IT}\_IMR\_EC \]

$R^2 = 0.981 \quad DW = 0.438 \quad SER = 0.046$
b) \[ \Delta_4 \ln \left( \frac{\text{IT}_\text{IMR}}{\text{IT}_\text{ENDR}} \right) + 0.070 \Delta_4 \ln \left( \frac{\text{IT}_\text{IMR} - 1}{\text{IT}_\text{IMR} - 1} \right) + 0.047 \Delta_4 \ln \left( \frac{\text{IT}_\text{PEV} - 1 \times (1 - 0.01 \times \text{IT}_\text{TISS} - 1)}{\text{IT}_\text{PI} - 1} \right) - 0.522 \text{IT}_\text{IMR} \times \text{EC} - 4 \]

\[ \overline{R}^2 = 0.864 \quad DW = 0.996 \quad SER = 0.032 \]

5. **Depreciation allowances**

\[ \text{IT}_D = 0.688 + (1 - 0.01 \times \text{IT}_\text{KAB}) \times \text{IT}_D - 1 \]

\[ \overline{R}^2 = 0.000 \quad DW = 1283 \quad SER = 2.236 \]

6. **Potential gross domestic product**

\[ \text{IT}_\text{BIPQ} = 0.864 \]

\[ \left\{ \begin{array}{l}
0.168 + 0.164 + 0.01 \times T - 0.016 \text{IT}_D 09 \\
(24085) \quad (22835) \quad (3380)
\end{array} \right. 
+ 0.495 \ln \left[ \text{IT}_E 1 + 0.01 \times (\text{IT}_\text{AR}LQ - \text{IT}_\text{AR}LQN) \times \text{IT}_E W \right] 
+ (1 - 0.495) \ln (\text{IT}_\text{KRP} - 1) \]

\[ \overline{R}^2 = 0.903 \quad DW = 0.371 \quad SER = 0.014 \]

7. **Nominal inventory investment**

\[ \text{IT}_V = 0.01 \times \text{IT}_\text{PIN} \times (\text{IT}_\text{CPR} + \text{IT}_\text{IANR} + \text{IT}_\text{GR} + \text{IT}_\text{VR}) - \text{IT}_C - \text{IT}_\text{IAN} - \text{IT}_G \]

8. **Private real stock of capital**

\[ \text{IT}_\text{KRP} = (1 - 0.01 \times \text{IT}_\text{KAB}) \text{IT}_\text{KRP} - 1 + \text{IT}_\text{IANR} \]

9. **Capacity utilisation**

\[ \text{IT}_\text{GAPQ} = 100 \times \frac{\text{IT}_\text{BIPR}}{\text{IT}_\text{BIPQ}} \]

204
10. **Unemployment**
   \[ IT_{ARL} = IT_{EW} - IT_{E1} \]

11. **Unemployment rate**
   \[ IT_{ARLQ} = 100 \times \frac{IT_{ARL}}{IT_{EW}} \]

12. **"Smoothed" unemployment rate**
   \[ IT_{ARLQN} = 0.9 \times IT_{ARLQN_{-1}} + 0.1 \times IT_{ARLQ} \]

13. **Net lending of firms**
   \[ IT_{FU} = IT_{D} - IT_{IAN} - IT_{V} - IT_{U} - IT_{SDN} \]

### III. Factor costs and deflators

1. **Gross wage income per employee**
   \[
   \Delta_4 \ln \left( IT_{LA} \right) = 0.214 \ \Delta_4 \ln \left( IT_{LAS} \right) \\
   + 0.767 \ \Delta_4 \ln \left( IT_{LA-1} \right) \\
   + 0.049 \ \ln \left( \frac{IT_{LAS-4}}{IT_{LA-4}} \right)
   \]
   \[ R^2 = 0.987 \quad DW = 1.554 \quad SER = 0.014 \]

2. **Deflator of domestic demand**
   \[
   a) \quad 0.01 \times IT_{INF} = 0.039 \ \Delta_2 \ln \left( \frac{IT_{COSI}}{1 - 0.01 \times IT_{TISS}} \right) \\
   + 0.919 \times 0.01 \times 0.919 \times \Delta_2 \ln \left( \frac{IT_{PSM3}}{IT_{PINV-4}} \right)
   \]
   \[ R^2 = 0.988 \quad DW = 0.181 \quad SER = 0.016 \]
   \[ b) \quad \ln \left( IT_{PINV} \right) = \ln \left( IT_{PINV-4} \right) + 0.01 \times IT_{INF} \]
3. Deflator of private consumption

\[
\Delta_4 \ln (IT_{PCP}) = (1 - 0.531) \cdot 0.01 \cdot IT_{INF} \\
+ 0.531 \Delta_4 \ln (IT_{PCP,-1}) \\
\text{ (18.178)}
\]

\[R^2 = 0.784 \quad DW = 0.655 \quad \text{SER} = 0.005\]

4. Deflator of government demand

\[
\Delta_4 \ln (IT_{PG}) = (1 - 0.760) \cdot 0.01 \cdot IT_{INF} \\
+ 0.760 \Delta_4 \ln (IT_{PG,-1}) \\
\text{ (13.187)}
\]

\[R^2 = 0.656 \quad DW = 1.478 \quad \text{SER} = 0.016\]

5. Deflator of private fixed capital investment

\[
\Delta_4 \ln (IT_{PIAN}) = (1 - 0.440) \cdot 0.01 \cdot IT_{INF} \\
+ 0.440 \Delta_4 \ln (IT_{PIAN,-1}) \\
\text{ (8.097)}
\]

\[R^2 = 0.419 \quad DW = 0.792 \quad \text{SER} = 0.013\]

6. Deflator of exports

\[
\Delta_4 \ln (IT_{PEX}) = (1 - 0.806) \text{\LARGE \begin{bmatrix} \Delta_4 (1 - 0.21) \ln (IT_{PINV,-1}) \\ + 0.21 IT_{LAPAC,-1} \end{bmatrix}} + 0.806 \Delta_4 \ln (IT_{PEX,-1}) \\
\text{ (9.872)}
\]

\[R^2 = 0.555 \quad DW = 0.942 \quad \text{SER} = 0.026\]

7. Production costs

\[IT_{COSI} = \frac{100}{99.989} \cdot IT_{LA}^{0.687} \cdot IT_{PIM}^{1-0.687}\]
8. **Deflator of final demand**

\[
IT_{\text{PEV}} = \frac{(IT_{\text{ENDR}} - IT_{\text{EXR}}) + IT_{\text{PINV}} + IT_{\text{EXR}} + IT_{\text{PEX}}}{IT_{\text{ENDR}}}
\]

9. **Deflator of gross domestic product**

\[IT_{\text{PBIP}} = 100 \times \frac{IT_{\text{BIP}}}{IT_{\text{BIPR}}}
\]

10. **Adaptive expectation on consumer price inflation**

\[IT_{\text{PCPD}} = 0.9 \times IT_{\text{PCPD}_{-1}} + 0.1 \Delta_{0914} \ln (PCP_{-1})
\]

11. **Adaptive expectation on inflation rate of final demand**

\[IT_{\text{PEVD}} = 0.9 \times IT_{\text{PEVD}_{-1}} + 0.1 \Delta_{0914} \ln (PEV_{-1})
\]

12. **Long-term gross wage income per employee**

\[IT_{\text{LAS}} = \frac{1}{9.891} \times IT_{\text{PCP}} \times IT_{\text{BPR}^{0.84}} \times (1 - 0.01 \times IT_{\text{ARLQ}})^{0.84}
\]

13. **Labour productivity**

\[IT_{\text{BPR}} = 0.9 \times IT_{\text{BPR}_{-1}} + 0.1 \frac{IT_{\text{ENDR}}}{IT_{\text{ET}}}
\]

**IV. Government**

1. **Direct tax rate**

\[IT_{\text{TDBS}} = 0.076 + 0.161 \times Q1 + 0.060 \times Q2 + 0.181 \times Q3 + 1.0 \times IT_{\text{TDBS}_{-1}}
\]

\[
R^2 = 0.005 \quad DW = 0.744 \quad SER = 0.380
\]

2. **Indirect tax rate**

\[IT_{\text{TISS}} = 0.065 - 0.032 \times Q1 - 0.028 \times Q2 - 0.004 \times Q3 + 1.0 \times IT_{\text{TISS}_{-1}}
\]

\[
R^2 = -0.026 \quad DW = 0.572 \quad SER = 0.162
\]
3. Real government demand

\[ \Delta_4 \ln (IT_{GR}) = \Delta_4 \ln (IT_{BIPR}) - 0.608 \ln (0.01 \times IT_{GAPQ}) \]  
(5.623)

\[ R^2 = 0.258 \quad DW = 0.235 \quad SER = 0.023 \]

4. Government transfers to households

\[ \ln \left( \frac{IT_{SB}}{IT_{BIP}} \right) = -0.059 + 0.239 \Delta_4 \times 0.01 (IT_{ARLQ} - IT_{ARLNQ}) \]  
(2.022)

\[ + 0.964 \ln \left( \frac{IT_{SB-1}}{IT_{BIP-2}} \right) \]  
(58.159)

\[ R^2 = 0.974 \quad DW = 0.580 \quad SER = 0.017 \]

5. Direct taxes and social contributions

\[ IT_{TDB} = 0.01 \times IT_{TDBS} \times IT_{VE} \]

6. Indirect taxes (excluding subsidies)

\[ IT_{TIS} = 0.01 \times IT_{TISS} \times IT_{END} \]

7. Nominal government demand

\[ IT_{G} = 0.01 \times IT_{GR} \times IT_{PG} \]

8. Net lending of government

\[ IT_{FS} = IT_{TDB} + IT_{TIS} - IT_{G} - IT_{SB} \]

V. Money, interest rates and exchange rate

1. Real stock of money

a) \[ \ln \left( \frac{IT_{MB}}{IT_{PINV}} \right) = -3.78 + 1.0 \times \ln (IT_{BIPR}) + IT_{MB \_ EC} \]
b) \[ \Delta_4 \ln \left( \frac{\text{IT\_MB}}{\text{IT\_PINV}} \right) = -0.169 + 0.01 \times \Delta_4 \text{IT\_RL} \]
\[
+ 0.938 \times \Delta_4 \ln (\text{IT\_MB_{-1}})
\]
\[
+ 0.918 \times \Delta_4 \ln (\text{IT\_PINV})
\]
\[
- 0.05 \times \text{IT\_MB\_EC}_{-4}
\]

\[ R^2 = 0.875 \quad DW = 1.405 \quad SER = 0.016 \]

2. **Money market interest rate for three-month funds**

\[
\text{IT\_RS} = (1 - \text{IT\_EMU}) \times \left( (1 - \text{IT\_EWS}) \times \text{IT\_RS}_{-1}
\right.
\]
\[
+ \text{IT\_EWS} \times \left( \text{GY\_RS} + 100 \times \ln \left( \frac{\text{IT\_ERDM}}{\text{IT\_ERDM}_{-1}} \right) + \text{IT\_RS} \right)
\]
\[
+ \text{IT\_EMU} \times \text{EMU\_RS}
\]

3. **Yield on government bonds**

\[ 1 + 0.01 \times \text{IT\_RL} = (1 - \text{IT\_EMU})
\]
\[
\times \left( (1 + 0.01 \times \text{IT\_RL}_{-1})^{1-0.519}
\right.
\]
\[
\times \left( (1 + 0.01 \times \text{IT\_RL}_{+1})^{0.519}
\right)
\]
\[
\times \left( \frac{1+0.01 \times \text{IT\_RS}}{1+0.01 \times \text{IT\_RSST}} \right)
\]
\[
+ \text{IT\_EMU} \times (1 + 0.01 \times \text{EMU\_RL})
\]

\[ R^2 = 1.000 \quad DW = 1.781 \quad SER = 0.005 \]

4. **Short-term interest rate (long-run)**

\[
\text{IT\_RSST} = 100 \times \Delta_4 \ln \left( \sum_{i=0}^{3} \frac{\text{IT\_BIPQ}_{-i}}{} \right) + \text{EMU\_INFT}
\]

5. **Long-term interest rate (long-run)**

\[
\text{IT\_RLST} = \text{IT\_RSST} + \text{EMU\_TERM}
\]
6. **Exchange rate of the Lira against the US-Dollar**

\[
\ln(\text{IT}_\text{ER}) = (1 - \text{IT}_\text{EMU}) \times \left[ \text{IT}_\text{EWS} \times \ln(\text{IT}_\text{ERDM} + \text{GY}_\text{ER}) \right]
\]

\[
= (1 - \text{IT}_\text{WDS}) \times \left[ 0.116 \times (1 - 0.978) \ln(\frac{\text{IT}_\text{PCP}_1}{\text{US}_\text{PCP}_1}) \right]
\]

\[
= -1.0 \times 0.01 \times (\text{IT}_\text{RS} - \text{US}_\text{RS})
\]

\[
+ 0.978 \times 0.01 \times (\text{IT}_{\text{RS}-1} - \text{US}_{\text{RS}-1})
\]

\[
+ 0.978 \ln(\text{IT}_{\text{ER}-1})
\]

\[
+ (1 - \text{IT}_\text{EWS}) \times \left[ 199627 \times \ln(\frac{\text{EMU}_\text{ER}}{\text{EMU}_\text{ER}}) \right]
\]

\[
R^2 = 1.000 \quad DW = 1.142 \quad SER = 0.051
\]

7. **Long-term price level (P-Star)**

\[
\text{IT}_\text{PSM3} = (1 - \text{IT}_\text{EMU}) \times \frac{1}{0.952} \times \exp\left[ \ln(\text{IT}_\text{PSM2}) + 378 - 10 \times \ln(\text{IT}_\text{BIPQ}) \right]
\]

\[
+ \text{IT}_\text{EMU} \times \text{EMU}_\text{PSM3} \times \frac{1}{0.990}
\]

8. **Risk premium**

\[
\text{IT}_\text{RRS} = 0.845 \quad \text{IT}_{\text{RRS}-1}
\]

\[
R^2 = 0.714 \quad DW = 1.447 \quad SER = 3.845
\]

9. **Exchange rate of the Lira against the D-Mark**

\[
\text{IT}_\text{ERDM} = (1 - \text{IT}_\text{EMU}) \times \left[ \text{IT}_\text{EWS} + \text{IT}_\text{ERDM}_{-1} \right]
\]

\[
= (1 - \text{IT}_\text{WDS}) \times \left[ \text{IT}_\text{EWS} + \text{IT}_\text{ERDM}_{-1} \right]
\]

\[
+ \text{IT}_\text{EMU} \times \frac{1}{990.002}
\]

\[
210
\]
7. Canada

I. Aggregate demand

1. Real private per capita consumption

\[
\Delta_4 \ln \left( \frac{\text{CA\_CPR}}{\text{CA\_WOBE}} \right) = -0.112 + 0.069 \times \Delta_4 \ln \left( \frac{100 + \text{CA\_YV}}{\text{CA\_PCP} \times \text{CA\_WOBE}} \right) \\
- 0.235 + 0.01 \times (\text{CA\_RL} - \text{CA\_PCPD}) \\
+ 0.732 + \frac{\Delta_4 \ln \left( \frac{\text{CA\_CPR}_{-1}}{\text{CA\_WOBE}_{-1}} \right)}{10.829} \\
- \frac{0.230 \ln \left( \frac{\text{CA\_CPR}_{-4}}{\text{CA\_BIPR}_{-4}} \right)}{2.631}
\]

\[R^2 = 0.699 \quad DW = 1.899 \quad SER = 0.011\]

2. Participation rate (labour supply)

\[
\ln \left( \frac{\text{CA\_EW}}{\text{CA\_WOBE}} \right) = -0.032 + 0.951 \ln \left( \frac{\text{CA\_EW}_{-1}}{\text{CA\_WOBE}_{-1}} \right)
\]

\[R^2 = 0.993 \quad DW = 2.131 \quad SER = 0.004\]

3. Population

\[
\ln (\text{CA\_WOBE}) = 2.953 + 0.298 + 0.01 \times T \\
(1837.137) \quad (203.491)
\]

\[R^2 = 0.998 \quad DW = 0.023 \quad SER = 0.004\]

4. Transfers to foreign countries

\[
\begin{align*}
\text{CA\_U} &= 0.162 + 3.010 \times Q1 - 0.446 \times Q2 - 0.264 \times Q3 \\
& \quad + 0.856 \times \text{CA\_U}_{-1} - 0.128 \times \text{CA\_D881} \\
& \quad + 0.806 \times \text{Q1} - 0.446 \times \text{Q2} - 0.264 \times \text{Q3} \\
& \quad + 0.856 \times \text{CA\_U}_{-1} - 0.128 \times \text{CA\_D881} \\
\end{align*}
\]

\[R^2 = 0.771 \quad DW = 2.553 \quad SER = 1.076\]
<table>
<thead>
<tr>
<th></th>
<th>Equation</th>
</tr>
</thead>
<tbody>
<tr>
<td>5.</td>
<td>Nominal private consumption</td>
</tr>
<tr>
<td></td>
<td>( CA_{CP} = 0.01 \cdot CA_{CPR} + CA_{PCP} )</td>
</tr>
<tr>
<td>6.</td>
<td>Nominal gross private fixed capital investment</td>
</tr>
<tr>
<td></td>
<td>( CA_IAN = 0.01 \cdot CA_IANR + CA_PIAN )</td>
</tr>
<tr>
<td>7.</td>
<td>Nominal final demand</td>
</tr>
<tr>
<td></td>
<td>( CA_END = 0.01 \cdot CA_ENDR + CA_PEV )</td>
</tr>
<tr>
<td>8.</td>
<td>Real final demand</td>
</tr>
<tr>
<td></td>
<td>( CA_ENDR = CA_CPR + CA_IANR + CA_GR + CA_VR + CA_EXR )</td>
</tr>
<tr>
<td>9.</td>
<td>Nominal gross domestic product</td>
</tr>
<tr>
<td></td>
<td>( CA_BIP = 0.01 \cdot (CA_ENDR - CA_EXR) \cdot CA_PINV + 0.01 \cdot CA_EXR \cdot CA_PEX - 0.01 \cdot CA_IMR \cdot CA_PIM + CA_SDN )</td>
</tr>
<tr>
<td>10.</td>
<td>Real gross domestic product</td>
</tr>
<tr>
<td></td>
<td>( CA_BIPR = CA_ENDR - CA_IMR + CA_SDR )</td>
</tr>
<tr>
<td>11.</td>
<td>National income</td>
</tr>
<tr>
<td></td>
<td>( CA_VE = CA_BIP - CA_TIS - CA_D )</td>
</tr>
<tr>
<td>12.</td>
<td>Disposable income of households</td>
</tr>
<tr>
<td></td>
<td>( CA_YV = CA_VE - CA_TDB + CA_SB )</td>
</tr>
<tr>
<td>13.</td>
<td>Gross wage income</td>
</tr>
<tr>
<td></td>
<td>( CA_L = 0.01 \cdot 7.550 \cdot CA_LA + CA_EI )</td>
</tr>
<tr>
<td>14.</td>
<td>Net lending of households</td>
</tr>
<tr>
<td></td>
<td>( CA_FH = CA_YV - CA_CP )</td>
</tr>
<tr>
<td>15.</td>
<td>Current account balance</td>
</tr>
<tr>
<td></td>
<td>( CA_LBS = 0.01 \cdot (CA_EXR \cdot CA_PEX - CA_IMR \cdot CA_PIM) - CA_U )</td>
</tr>
</tbody>
</table>
II. Aggregate supply

1. Real gross private fixed capital investment
   
a) $\ln(\text{CA}_{\text{IANR}}) = -2.932 + 1.166 \times \ln(\text{CA}_{\text{ENDR}}) + \text{CA}_{\text{IANR}} \_EC$
   
   \[
   (14.537) \quad (30.218)
   \]
   
   \[-1.00 \times 0.01(\text{CA}_{RL} - \text{CA}_{PEVD})
   \]

   \[R^2 = 0.906 \quad DW = 0.085 \quad SER = 0.086\]

   
b) $\Delta_4 \ln(\text{CA}_{\text{IANR}}) = 0.451 \Delta_4 \ln(\text{CA}_{\text{ENDR}})$
   
   \[
   (3529)
   \]
   
   \[-0.827 \Delta_4 0.01(\text{CA}_{RL} - \text{CA}_{PEVD})
   \]

   \[
   (2.520)
   \]
   
   \[+ 0.730 \Delta_4 \ln(\text{CA}_{\text{IANR}} - 1)
   \]

   \[
   (10.196)
   \]
   
   \[-0.154 \text{CA}_{\text{IANR}} \_EC - 4
   \]

   \[(3.293)\]

   \[R^2 = 0.833 \quad DW = 1.261 \quad SER = 0.036\]

2. Real inventory investment
   
   \[
   \frac{\text{CA}_{VR}}{\text{CA}_{ENDR} - 1} = 0.0001 + 0.696 \frac{\text{CA}_{VR} - 1}{(0.809)} \frac{\text{CA}_{VR} - 2}{(9.820)}
   \]

   \[R^2 = 0.512 \quad DW = 2.010 \quad SER = 0.005\]

3. Employment (labour demand)
   
a) $\ln(\text{CA}_{EL}) = -0.723 + 0.609 \ln(\text{CA}_{ENDR})$
   
   \[
   (5.820) \quad (25.879)
   \]
   
   \[+ 0.231 \ln \left(\frac{\text{CA}_{PEV} + (1 - 0.01 \times \text{CA}_{TIS})}{\text{CA}_{LA}}\right)
   \]

   \[
   (3.552)
   \]
   
   \[+ \text{CA}_{EL} \_EC
   \]

   \[R^2 = 0.962 \quad DW = 0.052 \quad SER = 0.024\]
b) \[ \Delta_4 \ln (\text{CA}_{-} \text{EI}) = 0.259 \ \Delta_4 \ln (\text{CA}_{-} \text{ENDR}) \\
(8.655) + 0.090 \ \Delta_4 \ln \left( \frac{\text{CA}_{-} \text{PEV} \ast (1 - 0.01 \ast \text{CA}_{-} \text{TISS})}{\text{CA}_{-} \text{LA}} \right) \\
(3.001) + 0.587 \ \Delta_4 \ln (\text{CA}_{-} \text{EI}_{-} \text{L}) \\
(11.648) - 0.071 \ \text{CA}_{-} \text{EI}_{-} \text{EC}_{-} \text{E} \\
(1.992) + \min \left[ 0 , \ln \left( \frac{0.97 \ \text{CA}_{-} \text{EW}}{\text{CA}_{-} \text{EI}} \right) \right] \]

\[ R^2 = 0.937 \ \ DW = 1.431 \ \ SER = 0.007 \]

4. **Real imports of goods and services**

a) \[ \ln (\text{CA}_{-} \text{IMR}) = -1520 \\
(209.216) + 100 \ \ln (\text{CA}_{-} \text{ENDR}) \\
+ 100 \ \ln \left( \frac{\text{CA}_{-} \text{PEV} \ast (1 - 0.01 \ast \text{CA}_{-} \text{TISS})}{\text{CA}_{-} \text{PIM}} \right) \\
+ 0.225 \ \text{CA}_{-} \text{D} \text{921} \\
(15.475) + \text{CA}_{-} \text{IMR}_{-} \text{EC} \]

\[ R^2 = 0.715 \ \ DW = 0.287 \ \ SER = 0.062 \]

b) \[ \Delta_4 \ln (\text{CA}_{-} \text{IMR}) = 0.480 \ \Delta_4 \ln (\text{CA}_{-} \text{ENDR}_{-} \text{L}) \\
(2.115) + 0.679 \ \Delta_4 \ln \left( \frac{\text{CA}_{-} \text{PEV} \ast (1 - 0.01 \ast \text{CA}_{-} \text{TISS})}{\text{CA}_{-} \text{PIM}} \right) \\
(5.866) + 0.602 \ \Delta_4 \ln (\text{CA}_{-} \text{IMR}_{-} \text{L}) \\
(5.999) - 0.365 \ \text{CA}_{-} \text{IMR}_{-} \text{EC}_{-} \text{E} \\
(4.895) \]

\[ R^2 = 0.850 \ \ DW = 1.206 \ \ SER = 0.038 \]
5. Depreciation allowances

\[
CA_{-D} = 0.394 + \left( 1 - 0.01 \times CA_{-KAB} \right) \times CA_{-D,-1} \\
\text{(3.588)} \\
+ 0.01 \times CA_{-KAB} \times CA_{-IANR,-1} + 0.01 \times CA_{-PINV,-1}
\]

\[
R^2 = 0.000 \quad DW = 2.007 \quad SER = 1.053
\]

6. Potential gross domestic product

\[
CA_{-BIPQ} = 0.917 \\
\left[ 0.986 + 0.05 \times 0.01 \times T \\
\text{(334.841)} \\
\times \exp \left( + 0.61 \ln \left( \frac{CA_{-E1} + 0.01 \times (CA_{-ARLQ} - CA_{-ARLQN}) \times CA_{-EW}}{+ (1 - 0.61) \ln \left[ CA_{-KRP,-1} \right]} \right) \right) \right]
\]

\[
R^2 = 0.000 \quad DW = 0.052 \quad SER = 0.029
\]

7. Nominal inventory investment

\[
CA_{-V} = 0.01 \times CA_{-PINV} \times \left( CA_{-VR} + CA_{-CPR} + CA_{-IANR} + CA_{-GR} \right) \\
- CA_{-CP} \times CA_{-IAN} \times CA_{-G}
\]

8. Private real stock of capital

\[
CA_{-KRP} = \left( 1 - 0.01 \times CA_{-KAB} \right) \times CA_{-KRP,-1} + CA_{-IANR}
\]

9. Capacity utilisation

\[
CA_{-GAPQ} = 100 \times \frac{CA_{-BIPR}}{CA_{-BIPQ}}
\]

10. Unemployment

\[
CA_{-ARL} = CA_{-EW} - CA_{-E1}
\]

11. Unemployment rate

\[
CA_{-ARLQ} = 100 \times \frac{CA_{-ARL}}{CA_{-EW}}
\]

12. "Smoothed" unemployment rate

\[
CA_{-ARLQN} = 0.9 \times CA_{-ARLQN,-1} + 0.1 \times CA_{-ARLQ}
\]

13. Net lending of firms

\[
CA_{-FU} = CA_{-D} - CA_{-IAN} - CA_{-V} - CA_{-U} - CA_{-SDN}
\]
III. Factor costs and deflators

1. Gross wage income per employee

\[ \Delta_4 \ln (CA_{LA}) = 0.001 + (1 - 0.739) \Delta_4 \ln (CA_{PCP}) \]
\[ + 0.739 \Delta_4 \ln (CA_{LA-1}) \]
\[ - 0.326 \Delta_4 0.01 \cdot (CA_{ARLQ} - CA_{ARLQN}) \]
\[ - 0.326 \cdot 0.01 \cdot (CA_{ARLQ-4} - CA_{ARLQN-4}) \]

\[ R^2 = 0.647 \quad DW = 2.396 \quad SER = 0.010 \]

2. Deflator of domestic demand

a) \[ 0.01 \cdot CA_{INF} = 0.05 \Delta_4 \ln \left( \frac{CA_{COSI}}{1 - 0.01 \cdot CA_{TISS}} \right) \]
\[ + 0.01 \cdot \left[ (1 - 0.4) \cdot CA_{INF-1} + 0.4 \cdot \frac{(1 - 0.4) \cdot CA_{INF} + 0.4 \cdot CA_{INFT} + 0.4 \cdot CA_{INF}}{} \right] \]
\[ + 0.1 \cdot \ln \left( 0.01 \times \frac{1}{4} \sum_{i=0}^{3} CA_{GAPQ-1} \right) \]

b) \[ \ln (CA_{PINV}) = \ln (CA_{PINV-4}) + 0.01 + CA_{INF} \]

3. Deflator of private consumption

\[ \Delta_4 \ln (CA_{PCP}) = (1 - 0.655) 0.01 \cdot CA_{INF} \]
\[ + 0.655 \Delta_4 \ln (CA_{PCP-1}) \]

\[ R^2 = 0.644 \quad DW = 1237 \quad SER = 0.005 \]

4. Deflator of government demand

\[ \Delta_4 \ln (CA_{PG}) = (1 - 0.432) 0.01 \cdot CA_{INF} \]
\[ + 0.432 \Delta_4 \ln (CA_{PG-1}) \]

\[ R^2 = 0.307 \quad DW = 2.326 \quad SER = 0.011 \]
5. **Deflator of private fixed capital investment**

\[
\Delta_4 \ln (C\text{AP}_{\text{IAN}}) = (1 - 0.931) 0.01 \times \Delta_4 \ln (C\text{AP}_{\text{IAN}}) \\
+ 0.931 \Delta_4 \ln (C\text{AP}_{\text{IAN},-1}) \\
(21615)
\]

\[R^2 = 0.837 \quad DW = 1.348 \quad SER = 0.012\]

6. **Deflator of exports**

\[
\Delta_4 \ln (C\text{AP}_{\text{EX}}) = (1 - 0.927) \Delta_4 \left[(1 - 0.272) \ln (C\text{AP}_{\text{INV},-1}) + 0.272 C\text{AP}_{\text{AC},-1}\right] \\
+ 0.927 \Delta_4 \ln (C\text{AP}_{\text{EX},-1}) \\
(18.231)
\]

\[R^2 = 0.810 \quad DW = 1.167 \quad SER = 0.020\]

7. **Production costs**

\[
C\text{AP}_{\text{COI}} = \frac{100}{99.994} \times C\text{AP}_{\text{LA}}^{0.662} + C\text{AP}_{\text{PMI}}^{1 - 0.662}
\]

8. **Deflator of final demand**

\[
C\text{AP}_{\text{PEV}} = \frac{(C\text{AP}_{\text{ENDR}} - C\text{AP}_{\text{EXR}}) \times C\text{AP}_{\text{INV}} + C\text{AP}_{\text{EXR}} \times C\text{AP}_{\text{PEX}}}{C\text{AP}_{\text{ENDR}}}
\]

9. **Deflator of gross domestic product**

\[
C\text{AP}_{\text{PBIP}} = 100 \times \frac{C\text{AP}_{\text{BIP}}}{C\text{AP}_{\text{BIPR}}}
\]

10. **Adaptive expectation on consumer price inflation**

\[
C\text{AP}_{\text{PCPD}} = 0.9 \times C\text{AP}_{\text{PCPD},-1} + 0.1 \Delta_4 \ln (CP_{\text{F},-1})
\]

11. **Adaptive expectation on inflation rate of final demand**

\[
C\text{AP}_{\text{PEVD}} = 0.9 \times C\text{AP}_{\text{PEVD},-1} + 0.1 \Delta_4 \ln (PEV_{\text{F},-1})
\]
IV. Government

1. Direct tax rate

\[ CA_{_TDBS} = 0.356 + 0.890 \, CA_{_TDBS_{-1}} + 0.098 \, CA_{_TDBS_{-2}} \]
\[ (0.303) \quad (8.431) \quad (0.881) \]

\[ R^2 = 0.864 \quad DW = 1.921 \quad SER = 0.545 \]

2. Indirect tax rate

\[ CA_{_TISS} = 0.528 + 0.943 \, CA_{_TISS_{-1}} \]
\[ (1.647) \quad (27.039) \]

\[ R^2 = 0.889 \quad DW = 2.173 \quad SER = 0.310 \]

3. Real government demand

\[ \Delta_4 \ln \left( CA_{_GR} \right) = 0.885 \, \Delta_4 \ln \left( CA_{_GR_{-1}} \right) \]
\[ (22.768) \]
\[ + \left( 1 - 0.885 \right) \Delta_4 \ln \left( CA_{_BIPR} \right) \]
\[ - 0.1 \ln \left( 0.01 \times CA_{_GAPQ} \right) \]

\[ R^2 = 0.851 \quad DW = 1.804 \quad SER=0.013 \]

4. Government transfers to households

\[ \ln \left( \frac{CA_{_SB}}{CA_{_BIP}} \right) = -0.024 + 0.597 + 0.01 \left( CA_{_ARLQ} - CA_{_ARLQN} \right) \]
\[ (1.088) \quad (3.951) \]
\[ + 0.988 \ln \left( \frac{CA_{_SB_{-1}}}{CA_{_BIP_{-1}}} \right) \]
\[ (100.176) \]

\[ R^2 = 0.991 \quad DW = 0.457 \quad SER = 0.017 \]

5. Direct taxes and social contributions

\[ CA_{_TDB} = 0.01 \times CA_{_TDBS} \times CA_{_VE} \]

6. Indirect taxes (excluding subsidies)

\[ CA_{_TIS} = 0.01 \times CA_{_TISS} \times CA_{_END} \]
7. **Nominal government demand**
\[ CA_{_G} = 0.01 \times CA_{_GR} \times CA_{_PG} \]

8. **Net lending of government**
\[ CA_{_FS} = CA_{_TDB} + CA_{_TIS} - CA_{_G} - CA_{_SB} \]

V. **Money, interest rates and exchange rate**

1. **Real stock of money**
   a) \[ \ln \left( \frac{CA_{_M}}{CA_{_PINV}} \right) = -8.230 + 1.901 \ln (CA_{_BIPR}) \]
   \[ (46.862) \quad (55.434) \]
   \[ -0.092 + 0.01 \times CA_{_RLD} \]
   \[ (0.223) \]
   \[ + CA_{_M}EC \]
   \[ R^2 = 0.970 \quad DW = 0.092 \quad SER = 0.061 \]

   b) \[ \Delta 4 \ln \left( \frac{CA_{_M}}{CA_{_PINV}} \right) = 0.106 \Delta 4 \ln (CA_{_BIPR}) \]
   \[ (2.674) \]
   \[ + 0.923 \Delta 4 \ln \left( \frac{CA_{_M-1}}{CA_{_PINV-1}} \right) \]
   \[ (34.637) \]
   \[ - 0.047 \times CA_{_M}EC_{-4} \]
   \[ (2.498) \]
   \[ R^2 = 0.970 \quad DW = 1.490 \quad SER = 0.010 \]

2. **Monetary policy rule:**
   **Money market interest rate for three-month funds**
   \[ CA_{_RS} = 0.75 CA_{_RS-1} + (1 - 0.75) \times CA_{_RSST} \]
   \[ + 0.50 \times \sum_{i=1}^{4} (CA_{ INF_i} - CA_{ INF_{i-1}}) \]
   \[ + 0.50 \times \sum_{i=0}^{3} 100 \times \ln (0.01 \times CA_{ GAP_{i+1}}) \]
3. **Yield on government bonds**

\[
1 + 0.01 \text{CA}_\text{RL} = (1 + 0.01 \text{CA}_\text{RL} - 1)(1 - 0.476) \\
\times (1 + 0.01 \text{CA}_\text{RL}) \cdot (0.476) \\
\times \left\{ \frac{1 + 0.01 \text{CA}_\text{RS}}{1 + 0.01 \text{CA}_\text{RSST}} \right\}^{\frac{1}{0.02}} \\
\times \left\{ \frac{1 + 0.01 \text{CA}_\text{RL} - 1}{1 + 0.01 \text{CA}_\text{RLST}} \right\}
\]

\[
R^2 = 1.000 \hspace{1em} DW = 2.816 \hspace{1em} SER = 0.004
\]

4. **Short-term interest rate (long-run)**

\[
\text{CA}_\text{RSST} = 100 * \Delta_4 \ln \left( \sum_{i=0}^{3} \text{CA}_\text{BIPQ}_{-i} \right) + \text{CA}_\text{INFT}
\]

5. **Long-term interest rate (long-run)**

\[
\text{CA}_\text{RLST} = \text{CA}_\text{RSST} + \text{CA}_\text{TERM}
\]

6. **Exchange rate of the Can. Dollar against the US-Dollar**

\[
\ln(\text{CA}_\text{ER}) = 0.017 + (1 - 0.945) \ln \left( \frac{\text{CA}_\text{PCP}_{-1}}{\text{US}_\text{PCP}_{-1}} \right) \\
- 1.0 * 0.01 \times (\text{CA}_\text{RS} - \text{US}_\text{RS}) \\
+ 0.945 * 0.01 \times (\text{CA}_\text{RS}_{-1} - \text{US}_\text{RS}_{-1}) \\
+ 0.945 \ln (\text{CA}_\text{ER}_{-1})
\]

\[
R^2 = 0.924 \hspace{1em} DW = 1.824 \hspace{1em} SER = 0.020
\]

7. **"Smoothed" long-term interest rate**

\[
\text{CA}_\text{RLD} = 0.9 \times \text{CA}_\text{RLD}_{-1} + 0.1 \times 0.01 \times \text{CA}_\text{RL}
\]
8. Netherlands

I. Aggregate demand

1. Real private per capita consumption

\[ \Delta_4 \ln \left( \frac{\text{NL CPR}}{\text{NL WOBE}} \right) = -0.081 + 0.151 \Delta_4 \ln \left( \frac{100 \times \text{NL YV}}{\text{NL PCP} + \text{NL WOBE}} \right) \\
\quad - 0.081 \times 0.01 \times (\text{NL RL} - \text{NL PCPD}) \\
\quad + 0.540 \Delta_4 \ln \left( \frac{\text{NL CPR}_{-1}}{\text{NL WOBE}_{-1}} \right) \\
\quad - 0.179 \ln \left( \frac{\text{NL CPR}_{-4}}{\text{NL BIPR}_{-4}} \right) \]

\[ R^2 = 0.692 \quad DW = 2.343 \quad SER = 0.010 \]

2. Participation rate (labour supply)

\[ \ln \left( \frac{\text{NL EW}}{\text{NL WOBE}} \right) = -0.096 + 0.898 \ln \left( \frac{\text{NL EW}_{-1}}{\text{NL WOBE}_{-1}} \right) + 0.014 \text{ NL D09} \]

\[ R^2 = 0.980 \quad DW = 1.865 \quad SER = 0.011 \]

3. Population

\[ \Delta_4 \ln (\text{NL WOBE}) = 2.523 + 0.149 + 0.01 \times T \\
\quad (1868.624) \quad (127.065) \]

\[ R^2 = 0.995 \quad DW = 0.024 \quad SER = 0.002 \]

4. Transfers to foreign countries

\[ \text{NL U} = 0.267 + 0.578 \text{ NL U}_{-1} \\
\quad (0.959) \quad (5.904) \]

\[ + 0.400 \text{ Q1} + 0.188 \text{ Q2} + 0.448 \text{ Q3} \\
\quad (1.136) \quad (0.544) \quad (1.297) \]

\[ R^2 = 0.289 \quad DW = 2.378 \quad SER = 1109 \]
5. **Nominal private consumption**
   \[ NL_{CP} = 0.01 \times NL_{CPR} \times NL_{PCP} \]

6. **Nominal gross private fixed capital investment**
   \[ NL_{IAN} = 0.01 \times NL_{IANR} \times NL_{PIAN} \]

7. **Nominal final demand**
   \[ NL_{END} = 0.01 \times NL_{ENDR} \times NL_{PEV} \]

8. **Real final demand**
   \[ NL_{ENDR} = NL_{CPR} + NL_{IANR} + NL_{GR} + NL_{VR} + NL_{EXR} \]

9. **Nominal gross domestic product**
   \[
   NL_{BIP} = 0.01 \times (NL_{ENDR} - NL_{EXR}) \times NL_{PINV} \\
   + 0.01 \times NL_{EXR} \times NL_{PEX} \\
   - 0.01 \times NL_{IMR} \times NL_{PIM} \\
   + NL_{SDN}
   \]

10. **Real gross domestic product**
    \[ NL_{BIPR} = NL_{ENDR} - NL_{IMR} + NL_{SDR} \]

11. **National income**
    \[ NL_{VE} = NL_{BIP} - NL_{TIS} - NL_{D} \]

12. **Disposable income of households**
    \[ NL_{YV} = NL_{VE} - NL_{TDB} + NL_{SB} \]

13. **Gross wage income**
    \[ NL_{L} = 0.01 \times 10.946 \times NL_{LA} - NL_{E1} \]

14. **Net lending of households**
    \[ NL_{FH} = NL_{YV} - NL_{CP} \]

15. **Current account balance**
    \[ NL_{LBS} = 0.01 \times [NL_{EXR} \times NL_{PEX} - NL_{IMR} \times NL_{PIM}] - NL_{U} \]

16. **Nominal domestic demand**
    \[ NL_{INLV} = NL_{CP} + NL_{G} + NL_{IAN} + NL_{V} \]

17. **Real domestic demand**
    \[ NL_{INVR} = NL_{CPR} + NL_{GR} + NL_{IANR} + NL_{VR} \]
II. Aggregate supply

1. Real gross private fixed capital investment

   a) \[ \ln (\text{NL\_IANR}) = -1.798 + 1.00 \ln (\text{NL\_BIPR}) \]
   \[ (2.463) \]
   \[ + \text{NL\_IANR\_EC} \]

   \[ R^2 = 0.000 \quad DW = 1.087 \quad SE = 0.067 \]

   b) \[ \Delta_4 \ln (\text{NL\_IANR}) = 1.00 \Delta_4 \ln (\text{NL\_ENDR}) \]
   \[ + 0.5 \Delta_4 \ln (\text{NL\_IANR}\_t) \]
   \[ - 0.711 \text{NL\_IANR\_EC}\_t \]
   \[ (5.554) \]

   \[ R^2 = 0.291 \quad DW = 2.419 \quad SE = 0.076 \]

2. Real inventory investment

   \[ \text{NL\_VR} = 0.308 + 0.244 \text{NL\_VR}_{t-1} + 0.037 \Delta_4 \text{NL\_ENDR} \]
   \[ (1.359) \quad (2.258) \quad (1.156) \]

   \[ R^2 = 0.055 \quad DW = 2.055 \quad SE = 1.237 \]

3. Employment (labour demand)

   a) \[ \ln (\text{NL\_EI}) = -0.784 + 0.470 \ln (\text{NL\_ENDR}) \]
   \[ (8.800) \quad (26.413) \]
   \[ + 0.120 \ln \left( \frac{\text{NL\_PEV} \times (1 - 0.01 \times \text{NL\_TISS})}{\text{NL\_LA}} \right) \]
   \[ (5.009) \]
   \[ + 0.116 \times \text{NL\_D09} \]
   \[ (19.556) \]
   \[ + \text{NL\_EI\_EC} \]

   \[ R^2 = 0.993 \quad DW = 0.461 \quad SE = 0.011 \]
b) \[ \Delta_4 \ln (\text{NL\_EI}) = 0.279 \Delta_4 \ln (\text{NL\_ENDR}) \]
\[ + 0.123 \Delta_4 \ln (\text{NL\_EI}_{-1}) \]
\[ + 0.135 \Delta_4 \text{NL\_DO9} \]
\[ - 0.831 \times \text{NL\_EI\_EC}_{-4} \]
\[ (7.622) \]
\[ (2.719) \]
\[ (19.015) \]
\[ (7.389) \]

\[ R^2 = 0.932 \quad DW = 0.688 \quad SER = 0.010 \]

4. Real imports of goods and services

a) \[ \ln (\text{NL\_IMR}) = - 1.110 + 1.00 \times \ln (\text{NL\_ENDR}) \]
\[ + 0.665 \times \ln \left( \frac{\text{NL\_PEV} \times (1 - 0.01 \times \text{NL\_TISS})}{\text{NL\_PIM}} \right) \]
\[ + \text{NL\_IMR\_EC} \]
\[ (135.900) \]
\[ (16.711) \]

\[ R^2 = 0.779 \quad DW = 0.263 \quad SER = 0.030 \]

b) \[ \Delta_4 \ln (\text{NL\_IMR}) = 1.310 \Delta_4 \ln (\text{NL\_ENDR}) \]
\[ + 0.093 \Delta_4 \ln (\text{NL\_IMR}_{-1}) \]
\[ + 0.199 \Delta_4 \ln \left( \frac{\text{NL\_PEV} \times (1 - 0.01 \times \text{NL\_TISS})}{\text{NL\_PIM}} \right) \]
\[ - 0.392 \times \text{NL\_IMR\_EC}_{-4} \]
\[ (14.832) \]
\[ (1632) \]
\[ (4.275) \]
\[ (6.111) \]

\[ R^2 = 0.935 \quad DW = 1.228 \quad SER = 0.014 \]

5. Depreciation allowances

\[ \text{NL\_D} = 0.595 + (1 - 0.01 \times \text{NL\_KAB}) \times \text{NL\_D}_{-1} \]
\[ + 0.01 \times \text{NL\_KAB} \times \text{NL\_IANR}_{-1} + 0.01 \times \text{NL\_PINV}_{-1} \]
\[ (5.016) \]

\[ R^2 = 0.000 \quad DW = 1973 \quad SER = 1.080 \]
6. Potential gross domestic product

\[ NL\_BIPQ = 0.927 \]
\[ \frac{1.050 + 0.142 \times 0.01 \times T - 0.058 \times NL\_D09}{(60.623)(7.733)(6.460)} + \exp\left(0.595 \ln(NL\_E1) + 0.01 \times (NL\_ARLQ - NL\_ARLQN) + NL\_EW\right) \]
\[ + (1 - 0.595) \ln(NL\_KRP\_1) \]

\[ R^2 = 0.411 \quad DW = 0.257 \quad SER = 0.020 \]

7. Nominal inventory investment

\[ NL\_V = 0.01 \times NL\_PINV + NL\_CPR + NL\_IANR + NL\_GR + NL\_VR \]
\[ - NL\_CP - NL\_IAN - NL\_G \]

8. Private real stock of capital

\[ NL\_KRP = \{1 - 0.01 \times NL\_KAB\} \times NL\_KRP\_1 + NL\_IANR \]

9. Capacity utilisation

\[ NL\_GAPQ = 100 \times \frac{NL\_BIPR}{NL\_BIPQ} \]

10. Unemployment

\[ NL\_ARL = NL\_EW - NL\_E1 \]

11. Unemployment rate

\[ NL\_ARLQ = 100 \times \frac{NL\_ARL}{NL\_EW} \]

12. "Smoothed" unemployment rate

\[ NL\_ARLQN = 0.9 \times NL\_ARLQN\_1 + 0.1 \times NL\_ARLQ \]

13. Net lending of firms

\[ NL\_FU = NL\_D - NL\_IAN - NL\_V - NL\_U - NL\_SDN \]
III. Factor costs and deflators

1. Gross wage income per employee

\[
\Delta_4 \ln (NL_{LA}) = (1 - 0.442) \Delta_4 \ln (NL_{PCP}) + 0.442 \Delta_4 \ln (NL_{LA_1}) \\
+ 0.407 \times 0.01 (NL_{ARLQ_4} - NL_{ARLQN_4}) \\
- 0.089 \Delta_4 \ln (NL_{D09})
\]

\[
\frac{(7.125)}{} \quad \frac{(4.534)}{} \quad \frac{(8.907)}{}
\]

\[R^2 = 0.810 \quad DW = 0.926 \quad SER = 0.016\]

2. Deflator of domestic demand

a) \[0.01 \times NL_{INF} = 0.022 \times \Delta_4 \ln \left(\frac{NL_{COSI}}{1 - 0.01 \times NL_{TISS}}\right)\]

\[+ 0.885 \times 0.01 \times \Delta_4 \ln \left(\frac{1 - 0.372 \times NL_{INF_4} + 0.372}{2.607}\right)\]

\[+ 0.03 \ln (0.01 \times NL_{GAPQ})\]

\[+ (1 - 0.885) \Delta_4 \ln (NL_{PSMB})\]

\[+ 0.1 \ln \left(\frac{NL_{PSMB_4}}{NL_{PINV_4}}\right)\]

\[R^2 = 0.550 \quad DW = 2.004 \quad SER = 0.016\]

b) \[\ln (NL_{PINV}) = \ln (NL_{PINV_4}) + 0.01 \times NL_{INF}\]

3. Deflator of private consumption

\[
\Delta_4 \ln (NL_{PCP}) = (1 - 0.823) 0.01 NL_{INF} + 0.823 \Delta_4 \ln (NL_{PCP_{-1}})
\]

\[R^2 = 0.693 \quad DW = 2.383 \quad SER = 0.006\]
4. **Deflator of government demand**

\[
\Delta_4 \ln (\text{NL\_PG}) = (1 - 0.906) 0.01 \text{NL\_INF} \\
+ 0.906 \Delta_4 \ln (\text{NL\_PG}^{-1}) \\
(12.858)
\]

\[
R^2 = 0.679 \quad DW = 2.369 \quad SER = 0.010
\]

5. **Deflator of private fixed capital investment**

\[
\Delta_4 \ln (\text{NL\_PIAN}) = 0.01 \times \text{NL\_INF}
\]

6. **Deflator of exports**

\[
\Delta_4 \ln (\text{NL\_PEX}) = (1 - 0.771) \Delta_4 \left[ (1 - 0.374) \ln (\text{NL\_PINV}^{-1}) \right] \\
+ 0.374 \text{NL\_LPAC}^{-1} \\
+ 0.771 \Delta_4 \ln (\text{NL\_PEX}^{-1}) \\
(10.988)
\]

\[
R^2 = 0.608 \quad DW = 1.211 \quad SER = 0.031
\]

7. **Production costs**

\[
\text{NL\_COSI} = \frac{100}{101.36} \times \text{NL\_LA}^{0.524} \times \text{NL\_PIM}^{1-0.524}
\]

8. **Deflator of final demand**

\[
\text{NL\_PEV} = \left( \frac{\text{NL\_ENDR} - \text{NL\_EXR} \times \text{NL\_PINV} + \text{NL\_EXR} \times \text{NL\_PEX}}{\text{NL\_ENDR}} \right)
\]

9. **Deflator of gross domestic product**

\[
\text{NL\_PBIP} = 100 \times \frac{\text{NL\_BIP}}{\text{NL\_BIPR}}
\]

10. **Adaptive expectation on consumer price inflation**

\[
\text{NL\_PCPD} = 0.9 \times \text{NL\_PCPD}^{-1} + 0.1 \Delta_4 \ln (\text{PCP}^{-1})
\]

11. **Adaptive expectation on inflation rate of final demand**

\[
\text{NL\_PEVD} = 0.9 \times \text{NL\_PEVD}^{-1} + 0.1 \Delta_4 \ln (\text{PEV}^{-1})
\]
IV. Government

1. Direct tax rate

\[ \text{NL\_TDBS} = 1.964 + 0.947 \times \text{NL\_TDBS}_{-1} \]

\[
R^2 = 0.891 \quad DW = 1.537 \quad SER = 0.793
\]

2. Indirect tax rate

\[ \text{NL\_TISS} = 0.771 + 0.880 \times \text{NL\_TISS}_{-1} \]

\[
R^2 = 0.734 \quad DW = 2.784 \quad SER = 0.354
\]

3. Real government demand

\[ \Delta_4 \ln (\text{NL\_GR}) = 0.591 \times \Delta_4 \ln (\text{NL\_GR}_{-1}) \]

\[
+ [1 - 0.591] \Delta_4 \ln (\text{NL\_BIPR})
- 0.088 \ln (0.01 \times \text{NL\_GAPQ}) \]

\[
R^2 = 0.505 \quad DW = 2.298 \quad SER = 0.014
\]

4. Government transfers to households

\[ \ln \left( \frac{\text{NL\_SB}}{\text{NL\_BIP}} \right) = -0.138 + 0.915 \ln \left( \frac{\text{NL\_SB}_{-1}}{\text{NL\_BIP}_{-1}} \right) \]

\[
+ 0.289 \times \Delta_4 \times 0.01 \times (\text{NL\_ARLQ} - \text{NL\_ARLQN}) \]

\[
R^2 = 0.885 \quad DW = 1.260 \quad SER = 0.015
\]

5. Direct taxes and social contributions

\[ \text{NL\_TDB} = 0.01 \times \text{NL\_TDBS} \times \text{NL\_VE} \]

6. Indirect taxes (excluding subsidies)

\[ \text{NL\_TISS} = 0.01 \times \text{NL\_TISS} \times \text{NL\_END} \]
7. Nominal government demand
\[ NL\_G = 0.01 \times NL\_GR + NL\_PG \]

8. Net lending of government
\[ NL\_FS = NL\_TDB + NL\_TIS - NL\_G - NL\_S8 \]

V. Money, interest rates and exchange rate

1. Real stock of money

   a) \[ \ln \left( \frac{NL\_MB}{NL\_PINV} \right) = -6.878 + 1.667 \ln (NL\_BIPR) + NL\_MB\_EC \\
       (40.561) \hspace{1cm} (48.778) \]

   \[ R^2 = 0.974 \hspace{0.5cm} DW = 0.378 \hspace{0.5cm} SER = 0.035 \]

   b) \[ \Delta_4 \ln \left( \frac{NL\_MB}{NL\_PINV} \right) = 0.468 \Delta_4 \ln (NL\_BIPR) \]
       \[ (3.098) \]
       \[ - 0.308 \Delta_4 (0.01 \times NL\_RL) \]
       \[ (1.221) \]
       \[ + 0.716 \Delta_4 \ln \left( \frac{NL\_MB\_t}{NL\_PINV\_t} \right) \]
       \[ (8.567) \]
       \[ - 0.229 NL\_MB\_EC\_\Delta_4 \]
       \[ (2.987) \]

   \[ R^2 = 0.893 \hspace{0.5cm} DW = 2.233 \hspace{0.5cm} SER = 0.018 \]

2. Money market interest rate for three-month funds

\[ NL\_RS = (1 - NL\_EMU) \times \left[ (1 - NL\_EWS) \times NL\_RS\_t \right. \]
\[ + NL\_EWS \times GY\_RS + 100 \times \ln \left( \frac{NL\_ERDM}{NL\_ERDM\_t} \right) + NL\_RRS \]
\[ + NL\_EMU \times EMU\_RS \]
3. Yield on government bonds

\[ 1 + 0.01 \text{NL}_\text{RL} = (1 - \text{NL}_\text{EMU}) \times \left(1 + 0.01 \text{NL}_\text{RL}_{-1}\right)^{0.51} \times (1 + 0.01 \text{NL}_\text{RL}_{+1})^{0.51} \times \left(1 + 0.01 \text{NL}_\text{RS} \right) \left(1 + 0.01 \text{NL}_\text{RSST} \right) + \text{NL}_\text{EMU} \times (1 + 0.01 \text{EMU}_\text{RL}) \]

\[ R^2 = 1.000 \quad DW = 2.433 \quad SER = 0.002 \]

4. Short-term interest rate (long-run)

\[ \text{NL}_\text{RSST} = 100 \times \Delta_\Delta \ln \left( \sum_{i=0}^{3} \text{NL}_\text{BIPQ}_{-i} \right) + \text{NL}_\text{INFT} \]

5. Long-term interest rate (long-run)

\[ \text{NL}_\text{RLST} = \text{NL}_\text{RSST} + \text{NL}_\text{TERM} \]

6. Exchange rate of the Guilder against the US-Dollar

\[ \ln (\text{NL}_{\text{ER}}) = (1 - \text{NL}_\text{EMU}) \times \left[ \text{NL}_{\text{EWS}} \times \ln (\text{NL}_{\text{ERDM}} \times \text{GY}_{\text{ER}}) \right] + (1 - \text{NL}_{\text{EWS}}) \times \left[ 0.033 + (1 - 0.949) \ln \left( \frac{\text{NL}_{\text{PCP}}_{+1}}{\text{US}_{\text{PCP}}_{+1}} \right) - 1.0 \times 0.01 \times (\text{NL}_{\text{RS}} - \text{US}_{\text{RS}}) + 0.949 \times 0.01 \times (\text{NL}_{\text{RS}}_{-1} - \text{US}_{\text{RS}}_{-1}) + 0.949 \times \ln (\text{NL}_{\text{ER}}_{-1}) \right] + \text{NL}_\text{EMU} \times \ln \left( \frac{220371}{\text{EMU}_{\text{ER}}} \right) \]

\[ R^2 = 0.995 \quad DW = 1.326 \quad SER = 0.052 \]
7. Long-term price level (P-Star)

\[
NL_{PSM} = (1 - NL_{EMU}) \times \left( \frac{1}{0.981} \times \exp \left( \ln \left( NL_{M3} \right) + 6.878 - 1667 \ln (NL_{BIPQ}) \right) \right) + NL_{EMU} \times EMU_{PSM} \times \frac{1}{1.158}
\]

8. Risk premium

\[
NL_{RRS} = 0.627 \times NL_{RRS_{-1}}
\]

\[
R^2 = 0.395 \quad DW = 1.625 \quad SER = 0.906
\]

9. Exchange rate of the Guilder against the D-Mark

\[
NL_{ERDM} = (1 - NL_{EMU}) \times \left( \frac{NL_{EWS} + NL_{ERDM_{-1}}}{(1 - NL_{EWS}) + \frac{NL_{ER}}{GY_{ER}}} \right) + NL_{EMU} \times 1.12674
\]
9. Belgium

I. Aggregate demand

1. Real private per capita consumption

\[ \Delta_4 \ln\left( \frac{\text{BE CPR}}{\text{BE WOBE}} \right) = -0.059 + 0.042 \Delta_4 \ln\left( \frac{100 \times \text{BE YV}}{\text{BE PCP} \times \text{BE WOBE}} \right) 
- 0.052 \times 0.01 (\text{BE RL} - \text{BE PCPD}) 
+ 0.840 \Delta_4 \ln\left( \frac{\text{BE CPR}_{-1}}{\text{BE WOBE}_{-1}} \right) 
- 0.144 \ln\left( \frac{\text{BE CPR}_{-4}}{\text{BE BIPR}_{-4}} \right) \]

\[ R^2 = 0.842 \quad DW = 0.424 \quad SER = 0.006 \]

2. Participation rate (labour supply)

\[ \Delta_1 \ln(\text{BE EW}) = 0.939 \times \Delta_1 \ln(\text{BE EW}_{-1}) 
+ (1 - 0.939) \Delta_1 \ln(\text{BE WOBE}) \]

\[ R^2 = 0.901 \quad DW = 0.536 \quad SER = 0.000 \]

3. Population

\[ \ln(\text{BE WOBE}) = 2.083 + 0.2 \times 0.01 \times T \]

\[ R^2 = 0.000 \quad DW = 0.001 \quad SER = 0.042 \]

4. Transfers to foreign countries

\[ \text{BE U} = -1.103 + 0.409 \times \text{BE U}_{-1} 
+ 1.991 \times Q1 + 1.059 \times Q2 + 0.936 \times Q3 \]

\[ R^2 = 0.126 \quad DW = 2.067 \quad SER = 15.712 \]

232
5. Nominal private consumption
   BE\_CP = 0.01 * BE\_CPR + BE\_PCP

6. Nominal gross private fixed capital investment
   BE\_IAN = 0.01 * BE\_IANR + BE\_PIAN

7. Nominal final demand
   BE\_END = 0.01 * BE\_ENDR + BE\_PEV

8. Real final demand
   BE\_ENDR = BE\_CPR + BE\_IANR + BE\_GR + BE\_VR + BE\_EXR

9. Nominal gross domestic product
   BE\_BIP = 0.01 * [BE\_ENDR - BE\_EXR] * BE\_PINV
   + 0.01 * BE\_EXR * BE\_PEX
   - 0.01 * BE\_IMR + BE\_PIM
   + BE\_SDN

10. Real gross domestic product
    BE\_BIPR = BE\_ENDR - BE\_IMR + BE\_SDR

11. National income
    BE\_VE = BE\_BIP - BE\_TIS - BE\_D

12. Disposable income of households
    BE\_YV = BE\_VE - BE\_TDB + BE\_SB

13. Gross wage income
    BE\_L = 0.01 * 225.978 * BE\_LA + BE\_E1

14. Net lending of households
    BE\_FH = BE\_YV - BE\_CP

15. Current account balance
    BE\_LBS = 0.01 * [BE\_EXR + BE\_PEX - BE\_IMR + BE\_PIM] - BE\_U

16. Nominal domestic demand
    BE\_INLV = BE\_CP + BE\_G + BE\_IAN + BE\_V

17. Real domestic demand
    BE\_INVR = BE\_CPR + BE\_GR + BE\_IANR + BE\_VR
II. Aggregate supply

1. Real gross private fixed capital investment

a) \[
\ln(\text{BE\_IANR}) = -2.090 + 0.969 \ln(\text{BE\_ENDR}) + 0.003 \ln(\text{BE\_IANR}\_EC) \\
(3.836) (13.800)
\]
\[R^2 = 0.666\]
\[\text{DW} = 0.021\]
\[\text{SER} = 0.128\]

b) \[
\Delta_4 \ln(\text{BE\_IANR}) = 0.443 \Delta_4 \ln(\text{BE\_ENDR}) + 0.801 \Delta_4 \ln(\text{BE\_IANR}\_EC) \\
- 0.088 \times 0.01 \Delta_4 \ln(\text{BE\_RL} - \text{BE\_PEVD}) - 0.085 \times 0.1 \Delta_4 \ln(\text{BE\_IANR}\_EC) \\
(4.467) (19.405) (0.409) (3.882)
\]
\[R^2 = 0.892\]
\[\text{DW} = 0.428\]
\[\text{SER} = 0.026\]

2. Real inventory investment

\[
\text{BE\_VR} = -0.905 + 0.806 \text{BE\_VR}_{-1} + 0.017 \Delta_4 \text{BE\_ENDR} \\
(2.262) (15.223) (3.461)
\]
\[R^2 = 0.769\]
\[\text{DW} = 0.441\]
\[\text{SER} = 2.592\]

3. Employment (labour demand)

\[
\ln(\text{BE\_E1}) = -0.160 - 0.003 \times 0.01 \times T + 0.975 \ln(\text{BE\_E1}_{-1}) \\
(5.339) (2.053) (202.160)
\]
\[
+ (1 - 0.975) \ln \left( \frac{\text{BE\_ENDR} + \frac{\text{BE\_PEV} \times (1 - 0.01 \times \text{BE\_TISS})}{\text{BE\_LA}}}{\text{BE\_E1}} \right) \\
+ \min \left[ 0, \ln \left( \frac{0.97 \times \text{BE\_EW}}{\text{BE\_E1}} \right) \right]
\]
\[R^2 = 0.999\]
\[\text{DW} = 0.101\]
\[\text{SER} = 0.002\]
4. Real imports of goods and services

\[
\begin{align*}
\ln (BE_{IMR}) &= -0.940 + 100 \ln (BE_{ENDR}) \\
&\quad + 0.657 \ln \left( \frac{BE_{PEV} \times (1 - 0.01 \times BE_{TISS})}{BE_{PIM}} \right) \\
&\quad + BE_{IMR\_EC} \\
R^2 &= 0.346 \quad DW = 0.022 \quad SER = 0.070
\end{align*}
\]

\[
\begin{align*}
\Delta_4 \ln (BE_{IMR}) &= 0.905 \Delta_4 \ln (BE_{ENDR\_1}) \\
&\quad + 0.447 \Delta_4 \ln (BE_{IMR\_1}) \\
&\quad + 0.139 \Delta_4 \ln \left( \frac{BE_{PEV} \times (1 - 0.01 \times BE_{TISS})}{BE_{PIM}} \right) \\
&\quad - 0.037 \times BE_{IMR\_EC\_4} \\
R^2 &= 0.939 \quad DW = 0.312 \quad SER = 0.015
\end{align*}
\]

5. Depreciation allowances

\[
\begin{align*}
BE_{D} &= 1464 + (1 - 0.01 \times BE_{KAB}) \times BE_{D\_1} \\
&\quad + 0.01 \times BE_{KAB} \times BE_{IANR\_1} + 0.01 \times BE_{PINV\_1} \\
R^2 &= 0.000 \quad DW = 0.372 \quad SER = 5.361
\end{align*}
\]

6. Potential gross domestic product

\[
\begin{align*}
BE_{BIPQ} &= 0.896 \\
&\quad \left\{ \begin{array}{c}
2738 + 0.114 + 0.01 \times T \\
(540.789) (25.318)
\end{array} \right. \\
&\quad \times \exp \left( + 0.597 \ln \left( BE_{E1} + 0.01 \times (BE_{ARLQ} - BE_{ARLQN}) \times BE_{EW} \right) \\
&\quad + (1 - 0.597) \ln (BE_{KRP\_1}) \right) \\
R^2 &= 0.871 \quad DW = 0.330 \quad SER = 0.012
\end{align*}
\]
7. **Nominal inventory investment**
   \[ BE\_V = 0.01 \times BE\_PINV \times (BE\_CPR + BE\_IANR + BE\_GR + BE\_VR) \]
   \[ - (BE\_CP + BE\_IAN + BE\_G) \]

8. **Private real stock of capital**
   \[ BE\_KRP = (1 - 0.01 \times BE\_KAB) \times BE\_KRP_{-1} + BE\_IANR \]

9. **Capacity utilisation**
   \[ BE\_GAPQ = 100 \times \frac{BE\_BIPR}{BE\_BIPQ} \]

10. **Unemployment**
    \[ BE\_ARL = BE\_EW - BE\_E1 \]

11. **Unemployment rate**
    \[ BE\_ARLQ = 100 \times \frac{BE\_ARL}{BE\_EW} \]

12. **"Smoothed" unemployment rate**
    \[ BE\_ARLQN = 0.9 \times BE\_ARLQN_{-1} + 0.1 \times BE\_ARLQ \]

13. **Net lending of firms**
    \[ BE\_FU = BE\_D - BE\_IAN - BE\_V - BE\_U - BE\_SDN \]

III. **Factor costs and deflators**

1. **Gross wage income per employee**
   \[ \Delta_4 \ln (BE\_LA) = 0.001 + 0.872 \Delta_4 \ln (BE\_LA_{-1}) \]
   \[ (1045) \quad (25.438) \]
   \[ + (1 - 0.872) \Delta_4 \ln (BE\_PCP) \]
   \[ + (1 - 0.872) \times 0.47 \Delta_4 \ln (BE\_BIPQ) \]
   \[ - 0.161 \times 0.01 \times (BE\_ARLQ_{-1} - BE\_ARLQN_{-1}) \]
   \[ (2674) \]

   \[ R^2 = 0.884 \quad DW = 0.415 \quad SER=0.007 \]
2. Deflator of domestic demand

\[ 0.01 \times \text{BE}_\text{INF} = 0.03 \Delta_4 \ln \left( \frac{\text{BE}_\text{COSI}}{1 - 0.01 \times \text{BE}_\text{TISS}} \right) \]

\[ + 0.949 \times 0.01 \times \left( \frac{(1 - 0.4) \times \text{BE}_\text{INF} - 0.4}{33.468} \right) \]

\[ + 0.03 \times \ln \left( 0.01 \times \text{BE}_\text{GAPQ} \right) \]

\[ + (1 - 0.949) \Delta_4 \ln \left( \frac{\text{BE}_\text{PSMB}}{\text{BE}_\text{INFT}_\text{EMU}} \right) \]

\[ + 0.1 \ln \left( \frac{\text{BE}_\text{PSMB} - 4}{\text{BE}_\text{INV} - 4} \right) \]

\[ R^2 = 0.961 \quad DW = 0.031 \quad SER = 0.011 \]

b) \( \ln \left( \text{BE}_\text{INV} \right) = \ln \left( \text{PINV}_t - 4 \right) + 0.01 \times \text{BE}_\text{INF} \)

3. Deflator of private consumption

\[ \Delta_4 \ln \left( \text{BE}_\text{PCP} \right) = (1 - 0.713) 0.01 \times \text{BE}_\text{INF} \]

\[ + 0.713 \Delta_4 \ln \left( \text{BE}_\text{PCP}_t - 1 \right) \]

\[ R^2 = 0.750 \quad DW = 0.255 \quad SER = 0.004 \]

4. Deflator of government demand

\[ \Delta_4 \ln \left( \text{BE}_\text{PG} \right) = (1 - 0.809) 0.01 \times \text{BE}_\text{INF} \]

\[ + 0.809 \Delta_4 \ln \left( \text{BE}_\text{PG}_t - 1 \right) \]

\[ R^2 = 0.824 \quad DW = 0.366 \quad SER = 0.007 \]

5. Deflator of private fixed capital investment

\[ \Delta_4 \ln \left( \text{BE}_\text{PIAN} \right) = (1 - 0.848) 0.01 \times \text{BE}_\text{INF} \]

\[ + 0.848 \Delta_4 \ln \left( \text{BE}_\text{PIAN}_t - 1 \right) \]

\[ R^2 = 0.764 \quad DW = 0.111 \quad SER = 0.005 \]
6. **Deflator of exports**

\[
\Delta_4 \ln (\text{BE}_{\text{PEX}}) = (1 - 0.919) \Delta_4 \left[ (1 - 0.460) \ln (\text{BE}_{\text{PINV}}) \right] + 0.460 \text{BE}_{\text{LPAC}} - 0.919 \Delta_4 \ln (\text{BE}_{\text{PEX}}) \\
(14.966)
\]

\[R^2 = 0.742 \quad DW = 0.339 \quad SER = 0.014\]

7. **Production costs**

\[
\text{BE}_{\text{COSI}} = \frac{100}{99.995} \times \text{BE}_{\text{LA}}^{0.469} + \text{BE}_{\text{PM}}^{1 - 0.469}
\]

8. **Deflator of final demand**

\[
\text{BE}_{\text{PEV}} = \frac{(\text{BE}_{\text{ENDR}} - \text{BE}_{\text{EXR}}) \times \text{BE}_{\text{PINV}} + \text{BE}_{\text{EXR}} \times \text{BE}_{\text{PEX}}}{\text{BE}_{\text{ENDR}}}
\]

9. **Deflator of gross domestic product**

\[
\text{BE}_{\text{PBIP}} = 100 \times \frac{\text{BE}_{\text{BIP}}}{\text{BE}_{\text{BIPR}}}
\]

10. **Adaptive expectation on consumer price inflation**

\[
\text{BE}_{\text{PCPD}} = 0.9 \times \text{BE}_{\text{PCPD}} - 1 + 0.1 \Delta_4 \ln (\text{PCP})
\]

11. **Adaptive expectation on inflation rate of final demand**

\[
\text{BE}_{\text{PEVD}} = 0.9 \times \text{BE}_{\text{PEVD}} - 1 + 0.1 \Delta_4 \ln (\text{PEV})
\]

IV. **Government**

1. **Direct tax rate**

\[
\text{BE}_{\text{TDBS}} = 0.407 + 0.987 \times \text{BE}_{\text{TDBS}} - 1 \\
(0.779) \quad (59.358)
\]

\[R^2 = 0.975 \quad DW = 0.247 \quad SER = 0.491\]
2. **Indirect tax rate**

\[
\text{BE\_TISS} = 0.148 + 1.834 \times \text{BE\_TISS}_{-1} - 0.860 \times \text{BE\_TISS}_{-2}
\]

\[
(2.654) \quad (32.069) \quad (14.748)
\]

\[
R^2 = 0.992 \quad DW = 0.571 \quad SER = 0.039
\]

3. **Real government demand**

\[
\Delta_4 \ln(\text{BE\_GR}) = 0.979 \times \Delta_4 \ln(\text{BE\_GR}_{-1})
\]

\[
+ (1 - 0.979) \times \Delta_4 \ln(\text{BE\_BIPR})
\]

\[
- 0.006 \times \ln(0.01 \times \text{BE\_GAPQ})
\]

\[
(31117) \quad (0.141)
\]

\[
R^2 = 0.946 \quad DW = 0.298 \quad SER = 0.007
\]

4. **Government transfers to households**

\[
\ln \left( \frac{\text{BE\_SB}}{\text{BE\_BIP}} \right) = -0.184 + 0.881 \ln \left( \frac{\text{BE\_SB}_{-1}}{\text{BE\_BIP}_{-1}} \right)
\]

\[
+ 0.752 + 0.01 (\text{BE\_ARLQ} - \text{ARLQN})
\]

\[
(6.114) \quad (44.796) \quad (6.485)
\]

\[
R^2 = 0.977 \quad DW = 0.342 \quad SER = 0.011
\]

5. **Direct taxes and social contributions**

\[
\text{BE\_TDB} = 0.01 \times \text{BE\_TDBS} + \text{BE\_VE}
\]

6. **Indirect taxes (excluding subsidies)**

\[
\text{BE\_TIS} = 0.01 \times \text{BE\_TISS} + \text{BE\_END}
\]

7. **Nominal government demand**

\[
\text{BE\_G} = 0.01 \times \text{BE\_GR} + \text{BE\_PG}
\]

8. **Net lending of government**

\[
\text{BE\_FS} = \text{BE\_TDB} + \text{BE\_TIS} - \text{BE\_G} - \text{BE\_SB}
\]
V. Money, interest rates and exchange rate

1. Real stock of money

\[
\ln \left( \frac{\text{BE\_M3}}{\text{BE\_PINV}} \right) = -6.966 + 1.497 \ln (\text{BE\_BIPR}) \\
(15.735) (25.875) \]

- 1981 * 0.01 BE\_RL + BE\_M3\_EC \\
(6.605)

\( R^2 = 0.952 \quad DW = 0.202 \quad SER = 0.050 \)

b) \( \Delta_4 \ln \left( \frac{\text{BE\_M3}}{\text{BE\_PINV}} \right) = 0.113 \Delta_4 \ln (\text{BE\_BIPR}) \)
\( (1.154) \)

- 0.765 \( \Delta_4 (0.01 \times \text{BE\_RL}) \) \\
(4.525)

+ 0.831 \( \Delta_4 \ln \left( \frac{\text{BE\_M3\_1}}{\text{BE\_PINV\_1}} \right) \)
\( (18.030) \)

- 0.161 BE\_M3\_EC\_4 \\
(3.297)

\( R^2 = 0.900 \quad DW = 1.047 \quad SER = 0.018 \)

2. Money market interest rate for three-month funds

\[
\text{BE\_RS} = (1 - \text{BE\_EMU}) \times \left( (1 - \text{BE\_EWS}) \times \text{BE\_RS\_1} + \text{BE\_EWS} \times \left( \text{GY\_RS} + 100 \times \ln \left( \frac{\text{BE\_ERDM}}{\text{BE\_ERDM\_4}} \right) + \text{BE\_RRS} \right) \right) + \text{BE\_EMU} \times \text{EMU\_RS} \\
\]

3. Yield on government bonds

\[
1 + 0.01 \text{BE\_RL} = (1 - \text{BE\_EMU}) \times (1 + 0.01 \text{BE\_RL\_1})^{(1 - 0.499)} \times (1 + 0.01 \text{BE\_RL\_1})^{(0.499)} \\
\times \left( \frac{1 + 0.01 \text{BE\_RS}}{1 + 0.01 \text{BE\_RSST}} \right)^{1.40} + \text{BE\_EMU} \times (1 + 0.01 \text{EMU\_RL}) \\
\]

\( R^2 = 1.000 \quad DW = 1.668 \quad SER = 0.003 \)

4. Short-term interest rate (long-run)
5. Long-term interest rate (long-run)

\[ \text{BE}_{-\text{RLST}} = \text{BE}_{-\text{RSST}} + \text{BE}_{-\text{TERM}} \]

6. Exchange rate of the Belgian Franc against the US-Dollar

\[
\ln(\text{BE}_{\text{ER}}) = (1 - \text{BE}_{\text{EMU}}) \times \left( 0.100 + (1 - 0.972) \ln \left( \frac{\text{BE}_{\text{PCP}_{+1}}}{\text{US}_{\text{PCP}_{+1}}} \right) - 1.0 \times 0.01 \times (\text{BE}_{\text{RS}} - \text{US}_{\text{RS}}) + 0.972 \times 0.01 \times (\text{BE}_{\text{RS}_{-1}} - \text{US}_{\text{RS}_{-1}}) + 0.972 \ln(\text{BE}_{\text{ER}_{-1}}) \right) + \text{BE}_{\text{EMU}} \times \ln \left( \frac{40.3399}{\text{EMU}_{\text{ER}}} \right)
\]

\[ R^2 = 1.000 \quad \text{DW} = 1.201 \quad \text{SER} = 0.052 \]

7. Long-term price level (P-Star)

\[
\text{BE}_{\text{PSM3}} = (1 - \text{BE}_{\text{EMU}}) \times \left( \frac{1}{1112} \ln(\text{BE}_{\text{M3}} - 1497 \ln(\text{BE}_{\text{BIPQ}})) \times \exp \left[ + 6.966 + 1981 \times 0.01 \times \text{BE}_{\text{RL}} + \text{BE}_{\text{EMU}} \times \text{EMU}_{\text{PSM3}} \times \frac{1}{0.990} \right] \right)
\]

8. Risk premium

\[
\text{BE}_{\text{RRS}} = 0.874 \quad \text{BE}_{\text{RRS}_{-1}}
\]

\[ R^2 = 0.766 \quad \text{DW} = 1.462 \quad \text{SER} = 1.467 \]

9. Exchange rate of the Belgian Franc against the D-Mark
\[
BE_{ERDM} = (1 - BE_{EMU}) \cdot \left\{ \begin{array}{l}
BE_{EWS} + BE_{ERDM_{-1}} \\
+ (1 - BE_{EWS}) \cdot \frac{BE_{ER}}{GY_{ER}}
\end{array} \right\} + BE_{EMU} \cdot 20.6255
\]
10. Euro area

I. Output and Prices

1. Nominal domestic demand

\[
\begin{align*}
\text{EMU} \text{INLV} &= \frac{1}{2.05586} \\
&= \left[ \begin{array}{l}
\text{GY} \text{INLV} + \text{FR} \text{INLV} \times \frac{1}{3.4005} \\
+ \text{IT} \text{INLV} \times \frac{1}{0.7476} \\
+ \text{NL} \text{INLV} \times \frac{1}{1.1269} \\
+ \text{BE} \text{INLV} \times \frac{1}{20.5881}
\end{array} \right]
\end{align*}
\]

2. Real domestic demand

\[
\begin{align*}
\text{EMU} \text{INVR} &= \frac{1}{2.05586} \\
&= \left[ \begin{array}{l}
\text{GY} \text{INVR} + \text{FR} \text{INVR} \times \frac{1.8965}{3.4005} \\
+ \text{IT} \text{INVR} \times \frac{1.0768}{0.7476} \\
+ \text{NL} \text{INVR} \times \frac{0.9204}{1.1269} \\
+ \text{BE} \text{INVR} \times \frac{1.0334}{20.5881}
\end{array} \right]
\end{align*}
\]

3. Real gross domestic product

\[
\begin{align*}
\text{EMU} \text{BIPR} &= \frac{1}{2.05586} \\
&= \left[ \begin{array}{l}
\text{GY} \text{BIPR} + \text{FR} \text{BIPR} \times \frac{1.8965}{3.4005} \\
+ \text{IT} \text{BIPR} \times \frac{1.0768}{0.7476} \\
+ \text{NL} \text{BIPR} \times \frac{0.9204}{1.1269} \\
+ \text{BE} \text{BIPR} \times \frac{1.0334}{20.5881}
\end{array} \right]
\end{align*}
\]
4. Potential gross domestic product

\[
EMU_{BIPQ} = \left\{ \frac{GY_{BIPQ}}{2.05586} + \frac{FR_{BIPQ} \times 1.8965}{3.4005} + \frac{IT_{BIPQ} \times 1.0768}{0.7476} + \frac{NL_{BIPQ} \times 0.9204}{1.1269} + \frac{BE_{BIPQ} \times 1.0334}{20.5881} \right\}
\]

5. Capacity utilisation

\[
EMU_{GAPQ} = 100 \times \frac{EMU_{BIPR}}{EMU_{BIPQ}}
\]

6. Deflator of domestic demand

\[
EMU_{PINV} = 100 \times \frac{EMU_{INLV}}{EMU_{INVR}}
\]

7. Inflation rate

\[
EMU_{INF} = 100 \times \Delta \ln (EMU_{PINV})
\]

II. Money, interest rates and exchange rate

1. Money growth target rate

\[
EMU_{MTR} = 1.324 \times 100 \times \Delta \ln (EMU_{BIPQ}) + EMU_{INFT}
\]
2. Real stock of money

\[ \ln \left( \frac{\text{EMU\_MB}}{\text{EMU\_PINV}} \right) = -5.537 + 0.020 \times Q1 + 0.013 \times Q2 - 0.006 \times Q3 (33.319) (3.973) (2.432) (1.107) \\
+ 0.017 \times \Delta \text{G}_\text{DWU}_{t-1} (1.025) \\
+ 1.324 \ln (\text{EMU\_BIPR}) (57.032) \\
- 0.684 \times 0.01 \times \text{EMU\_RL} (5.544) \\
+ \text{EMU\_M2\_EC} \]

\[ R^2 = 0.993 \quad DW = 0.447 \quad SER = 0.016 \]

b) \( \Delta_4 \ln (\text{EMU\_M3}) - 0.01 \times \text{EMU\_INF} = 0.006 \times \Delta_4 \text{G}_\text{DWU}_{t-1} \)

\[ (1097) \\
- 0.008 \times \Delta_4 \text{G}_\text{DWU} (1512) \\
+ 0.249 \times \Delta_4 \ln (\text{EMU\_BIPR}) (3.230) \\
+ 0.043 \times 0.01 \times \text{EMU\_INF} (1.612) \\
- 0.242 \times \Delta_4 (0.01 \times \text{EMU\_RL}) (3.262) \\
+ 0.767 \times \left( \Delta_4 \ln (\text{EMU\_M3}_{t-1}) \right) (13.176) \\
- 0.01 \times \text{EMU\_INF}_{t-1} \\
- 0.275 \times \text{EMU\_M3\_EC}_{t-4} (3.920) \]

\[ R^2 = 0.966 \quad DW = 1.637 \quad SER = 0.006 \]

c) \( 0.01 \times \text{EMU\_MGR} = \Delta_4 \ln (\text{EMU\_MB}) \)

3. Long-term price level (P-Star)

\[ 0.0960 \times \text{EMU\_PSM3} = \exp \left\{ \ln (\text{EMU\_M3}) + 5.32 - 0.020 \times Q1 - 0.013 \times Q2 + 0.006 \times Q3 \right\} \\
+ 0.017 \times \Delta_1 \text{G}_\text{DWU}_{t-1} - 1.324 \ln (\text{EMU\_BIPQ}) \\
+ 0.0684 \times 0.01 \times \text{EMU\_RLST} \]
4. Yield on government bonds

\[
1 + 0.01 \text{EMU}_\text{RL} = (1 + 0.01 \text{EMU}_\text{RL}_{-1}) (1 - 0.498)
\]
\[
= (1 + 0.01 \text{EMU}_\text{RL}_{-1}) 0.498
\]
\[
= \left( \frac{1 + 0.01 \text{EMU}_\text{RS}}{1 + 0.01 \text{EMU}_\text{RSST}} \right) \frac{1}{40}
\]
\[
= \left( \frac{1 + 0.01 \text{EMU}_\text{RL}_{-4}}{1 + 0.01 \text{EMU}_\text{RLST}_{-4}} \right) - 0.02
\]

\[R^2 = 1.000\quad DW = 1.541\quad SER = 0.002\]

5. Short-term interest rate (long-run)

\[
\text{EMU}_\text{RSST} = 100 \Delta_4 \ln \left( \sum_{i=0}^{3} \text{EMU}_\text{BIPQ}_{-i} \right) + \text{EMU}_\text{INFT}
\]

6. Long-term interest rate (long-run)

\[
\text{EMU}_\text{RLST} = \text{EMU}_\text{RSST} + \text{EMU}_\text{TERM}
\]

7. Monetary policy rule:
Money market interest rate for three-month funds

\[
\text{EMU}_\text{RS} = 0.75 \ast \text{EMU}_\text{RS}_{-1} + (1 - 0.75) \text{EMU}_\text{RSST}
\]
\[
+ 0.80 \left( \text{EMU}_\text{MGR}_{-4} - \text{EMU}_\text{MTR}_{-4} \right)
\]

8. Exchange rate of the euro against the US-Dollar

\[
\ln \left( \frac{1}{\text{EMU}_\text{ER}} \right) = -0.011 + (1 - 0.960) \ln \left( \frac{\text{EMU}_\text{PINV}_{+1}}{\text{US}_\text{PINV}_{+1}} \right)
\]
\[
-1.0 \ast 0.01 \ast (\text{EMU}_\text{RS} - \text{US}_\text{RS})
\]
\[
+ 0.960 \ast 0.01 \ast (\text{EMU}_\text{RS}_{-1} - \text{US}_\text{RS}_{-1})
\]
\[
+ 0.960 \ast \ln \left( \frac{1}{\text{EMU}_\text{ER}_{-1}} \right)
\]

\[R^2 = 0.953\quad DW = 1.337\quad SER = 0.049\]
9. **Term premium on interest rates**

\[
\text{EMU\_TERM} = 0.95 \times \text{EMU\_TERM}_{-1} \\
+ (1 - 0.95) \times (\text{EMU\_RL}_{-1} - \text{EMU\_RS}_{-1})
\]
11. Foreign trade block

I. Exports and imports

1. Nominal world import demand for exports from the USA

\[
\ln(US_{IMAK}) = \frac{1}{1 - 0.3566} \left[ 0.0169 \ln \left( \frac{BE_{IM}}{BE_{ER}} \right) + 0.1930 \ln \left( \frac{CA_{IM}}{CA_{ER}} \right) + 0.0336 \ln \left( \frac{FR_{IM}}{FR_{ER}} \right) \\
+ 0.0491 \ln \left( \frac{GY_{IM}}{GY_{ER}} \right) + 0.0147 \ln \left( \frac{IT_{IM}}{IT_{ER}} \right) + 0.1106 \ln \left( \frac{JP_{IM}}{JP_{ER}} \right) \\
+ 0.0223 \ln \left( \frac{NL_{IM}}{NL_{ER}} \right) + 0.0599 \ln \left( \frac{UK_{IM}}{UK_{ER}} \right) \\
+ 0.0122 \ln (REG_{IM}) + 0.1311 \ln (ROE_{IM}) \right]
\]

2. Nominal exports of the USA

\[
\Delta_4 \ln(US_{EX}) = (1 - 0.675) \Delta_4 \ln(US_{IMAK}) \\
= 0.675 \Delta_4 \ln(US_{EX-1})
\]

\[
R^2 = 0.654 \quad DW = 1.509 \quad SER = 0.030
\]

3. Real exports of the USA

\[
US_{EXR} = 100 \cdot \frac{US_{EX}}{US_{PEX}}
\]
4. Nominal world import demand for exports from Japan

\[ \ln(\text{JPcelona}) = \ln(\text{JPcelona}) + \frac{1}{1 - 0.3754} \times \left[ 0.0086 \ln \left( \frac{\text{BEcelona}}{\text{BEcon}a} \right) + 0.0215 \ln \left( \frac{\text{CAcon}a}{\text{CAcon}a} \right) + 0.0213 \ln \left( \frac{\text{FRcelona}}{\text{FRcon}a} \right) + 0.0505 \ln \left( \frac{\text{GYcelona}}{\text{GYcon}a} \right) + 0.0098 \ln \left( \frac{\text{ITcon}a}{\text{ITcon}a} \right) + 0.0159 \ln \left( \frac{\text{NLcon}a}{\text{NLcon}a} \right) + 0.0366 \ln \left( \frac{\text{UKcon}a}{\text{UKcon}a} \right) + 0.2883 \ln (\text{UScon}a) \right. \]

5. Nominal exports of Japan

\[ \Delta_4 \ln(\text{JPcon}a) = (1 - 0.641) \Delta_4 \ln(\text{JPcelona}) \]

\[ (13398) \]

\[ + 0.641 \Delta_4 \ln(\text{JPcon}a-1) \]

\[ R^2 = 0.694 \quad DW = 1.098 \quad SER = 0.041 \]

6. Real exports of Japan

\[ \text{JPcon}a = 100 \times \frac{\text{JPcon}a}{\text{JPcon}a} \]

7. Nominal world import demand for exports from Germany

\[ \ln(\text{GYcelona}) = \ln(\text{GYcon}a) + \frac{1}{1 - 0.2180} \times \left[ 0.0547 \ln \left( \frac{\text{BEcelona}}{\text{BEcon}a} \right) + 0.0076 \ln \left( \frac{\text{CAcon}a}{\text{CAcon}a} \right) + 0.0876 \ln \left( \frac{\text{FRcelona}}{\text{FRcon}a} \right) + 0.0715 \ln \left( \frac{\text{ITcon}a}{\text{ITcon}a} \right) + 0.0243 \ln \left( \frac{\text{JPcon}a}{\text{JPcon}a} \right) + 0.0798 \ln \left( \frac{\text{NLcon}a}{\text{NLcon}a} \right) + 0.0823 \ln \left( \frac{\text{UKcon}a}{\text{UKcon}a} \right) + 0.0842 \ln (\text{UScon}a) + 0.1679 \ln (\text{REGcon}a) + 0.1221 \ln (\text{ROEcon}a) \right. \]
8. Nominal exports of Germany

\[ \Delta_4 \ln (GY_{EX}) = (1 - 0.0783) \Delta_4 \ln (GY_{IMAK}) 
\quad (21796) 
\quad + 0.0783 \Delta_4 \ln (GY_{EX_{-1}}) \]

\[ R^2 = 0.857 \quad DW = 1.887 \quad SER = 0.033 \]

9. Real exports of Germany

\[ GY_{EXR} = 100 \times \frac{GY_{EX}}{GY_{PEX}} \]

10. Nominal world import demand for exports from the United Kingdom

\[ \ln (UK_{IMAK}) = \ln (UK_{ER}) + \frac{1}{1 - 0.3338} \]

\[ + \begin{bmatrix} 
0.0488 \ln \left( \frac{BE_{IM}}{BE_{ER}} \right) 
+ 0.0166 \ln \left( \frac{CA_{IM}}{CA_{ER}} \right) 
+ 0.0813 \ln \left( \frac{FR_{IM}}{FR_{ER}} \right) \\
+ 0.1080 \ln \left( \frac{GY_{IM}}{GY_{ER}} \right) 
+ 0.0485 \ln \left( \frac{IT_{IM}}{IT_{ER}} \right) 
+ 0.0256 \ln \left( \frac{JP_{IM}}{JP_{ER}} \right) \\
+ 0.0640 \ln \left( \frac{NL_{IM}}{NL_{ER}} \right) 
+ 0.1163 \ln (US_{IM}) \\
+ 0.1108 \ln (REG_{IM}) 
+ 0.0462 \ln (ROE_{IM}) 
\end{bmatrix} \]

11. Nominal exports of the United Kingdom

\[ \Delta_4 \ln (UK_{EX}) = (1 - 0.533) \Delta_4 \ln (UK_{IMAK}) 
\quad (10.137) 
\quad + 0.533 \Delta_4 \ln (UK_{EX_{-1}}) \]

\[ R^2 = 0.565 \quad DW = 2.374 \quad SER = 0.036 \]

12. Real exports of the United Kingdom

\[ UK_{EXR} = 100 \times \frac{UK_{EX}}{UK_{PEX}} \]

250
13. Nominal world import demand for exports from France

\[
\ln (\text{FR\textunderscore IMAK}) = \ln (\text{FR\textunderscore ER}) + \frac{1}{1 - 0.2242} \\
\left[ 0.0746 \ln \left( \frac{\text{BE\textunderscore IM}}{\text{BE\textunderscore ER}} \right) + 0.0130 \ln \left( \frac{\text{CA\textunderscore IM}}{\text{CA\textunderscore ER}} \right) \\
+ 0.1603 \ln \left( \frac{\text{GY\textunderscore IM}}{\text{GY\textunderscore ER}} \right) + 0.0939 \ln \left( \frac{\text{IT\textunderscore IM}}{\text{IT\textunderscore ER}} \right) + 0.0202 \ln \left( \frac{\text{JP\textunderscore IM}}{\text{JP\textunderscore ER}} \right) \\
+ 0.0458 \ln \left( \frac{\text{NL\textunderscore IM}}{\text{NL\textunderscore ER}} \right) + 0.1017 \ln \left( \frac{\text{UK\textunderscore IM}}{\text{UK\textunderscore ER}} \right) + 0.0726 \ln (\text{US\textunderscore IM}) \\
+ 0.1371 \ln (\text{REG\textunderscore IM}) + 0.0565 \ln (\text{ROE\textunderscore IM}) \right]
\]

14. Nominal exports of France

\[
\Delta_4 \ln (\text{FR\textunderscore EX}) = (1 - 0.643) \Delta_4 \ln (\text{FR\textunderscore IMAK}) \\
(1.3532) \\
+ 0.643 \Delta_4 \ln (\text{FR\textunderscore EX}_{-1})
\]

\[R^2 = 0.699 \quad DW = 1.463 \quad SER = 0.028\]

15. Real exports of France

\[
\text{FR\textunderscore EXR} = 100 \times \frac{\text{FR\textunderscore EX}}{\text{FR\textunderscore PEX}}
\]

16. Nominal world import demand for exports from Italy

\[
\ln (\text{IT\textunderscore IMAK}) = \ln (\text{IT\textunderscore ER}) + \frac{1}{1 - 0.2745} \\
\left[ 0.0253 \ln \left( \frac{\text{BE\textunderscore IM}}{\text{BE\textunderscore ER}} \right) + 0.0095 \ln \left( \frac{\text{CA\textunderscore IM}}{\text{CA\textunderscore ER}} \right) + 0.1135 \ln \left( \frac{\text{FR\textunderscore IM}}{\text{FR\textunderscore ER}} \right) \\
+ 0.1461 \ln \left( \frac{\text{GY\textunderscore IM}}{\text{GY\textunderscore ER}} \right) + 0.0255 \ln \left( \frac{\text{JP\textunderscore IM}}{\text{JP\textunderscore ER}} \right) \\
+ 0.0305 \ln \left( \frac{\text{NL\textunderscore IM}}{\text{NL\textunderscore ER}} \right) + 0.0665 \ln \left( \frac{\text{UK\textunderscore IM}}{\text{UK\textunderscore ER}} \right) + 0.0832 \ln (\text{US\textunderscore IM}) \\
+ 0.1383 \ln (\text{REG\textunderscore IM}) + 0.0873 \ln (\text{ROE\textunderscore IM}) \right]
\]
17. **Nominal exports of Italy**

\[ \Delta_4 \ln(\text{IT}_{\text{EX}}) = (1 - 0.619) \Delta_4 \ln(\text{IT}_{\text{IMAK}}) + 0.0619 \Delta_4 \ln(\text{IT}_{\text{EX}_1}) \]

\( R^2 = 0.553 \quad \text{DW} = 1.932 \quad \text{SER} = 0.049 \)

18. **Real exports of Italy**

\[ \text{IT}_{\text{EXR}} = 100 \cdot \frac{\text{IT}_{\text{EX}}}{\text{IT}_{\text{PEX}}} \]

19. **Nominal world import demand for exports from Canada**

\[
\ln(\text{CA}_{\text{IMAK}}) = \ln(\text{CA}_{\text{ER}}) + \frac{1}{1 - 0.1744} \left[ 0.0045 \ln\left(\frac{\text{BE}_{\text{IM}}}{\text{BE}_{\text{ER}}}\right) + 0.0079 \ln\left(\frac{\text{FR}_{\text{IM}}}{\text{FR}_{\text{ER}}}\right) \right. \\
+ 0.0137 \ln\left(\frac{\text{GY}_{\text{IM}}}{\text{GY}_{\text{ER}}}\right) + 0.0078 \ln\left(\frac{\text{IT}_{\text{IM}}}{\text{IT}_{\text{ER}}}\right) + 0.0455 \ln\left(\frac{\text{JP}_{\text{IM}}}{\text{JP}_{\text{ER}}}\right) \\
+ 0.0043 \ln\left(\frac{\text{NL}_{\text{IM}}}{\text{NL}_{\text{ER}}}\right) + 0.0194 \ln\left(\frac{\text{UK}_{\text{IM}}}{\text{UK}_{\text{ER}}}\right) + 0.7784 \ln(\text{US}_{\text{IM}}) \\
\left. + 0.0136 \ln(\text{REG}_{\text{IM}}) - 0.0696 \ln(\text{ROE}_{\text{IM}}) \right] 
\]

20. **Nominal exports of Canada**

\[ \Delta_4 \ln(\text{CA}_{\text{EX}}) = (1 - 0.514) \Delta_4 \ln(\text{CA}_{\text{IMAK}}) + 0.514 \Delta_4 \ln(\text{CA}_{\text{EX}_1}) \]

\( R^2 = 0.472 \quad \text{DW} = 2.084 \quad \text{SER} = 0.032 \)

21. **Real exports of Canada**

\[ \text{CA}_{\text{EXR}} = 100 \cdot \frac{\text{CA}_{\text{EX}}}{\text{CA}_{\text{PEX}}} \]
22. Nominal world import demand for exports from the Netherlands

\[
\ln (NL_{\text{IMAK}}) = \ln (NL_{\text{ER}}) + \frac{1}{1 - 0.2562} \left[ 0.1324 \ln \left( \frac{BE_{\text{IM}}}{BE_{\text{ER}}} \right) + 0.0037 \ln \left( \frac{CA_{\text{IM}}}{CA_{\text{ER}}} \right) + 0.0667 \ln \left( \frac{FR_{\text{IM}}}{FR_{\text{ER}}} \right) \right. \\
\left. + 0.1814 \ln \left( \frac{GY_{\text{IM}}}{GY_{\text{ER}}} \right) + 0.0614 \ln \left( \frac{IT_{\text{IM}}}{IT_{\text{ER}}} \right) + 0.0096 \ln \left( \frac{JP_{\text{IM}}}{JP_{\text{ER}}} \right) \right] \\
\left. + 0.0986 \ln \left( \frac{UK_{\text{IM}}}{UK_{\text{ER}}} \right) + 0.0357 \ln (US_{\text{IM}}) \right] \\
+ 0.1053 \ln (\text{REG}_{\text{IM}}) + 0.0490 \ln (\text{ROE}_{\text{IM}})
\]

23. Nominal exports of the Netherlands

\[
\Delta_4 \ln (NL_{\text{EX}}) = (1 - 0.435) \Delta_4 \ln (NL_{\text{IMAK}}) \\
(6373) \\
+ 0.435 \Delta_4 \ln (NL_{\text{EX}}_{-1})
\]

\[R^2 = 0.351 \quad DW = 1.587 \quad SER = 0.035\]

24. Real exports of the Netherlands

\[NL_{\text{EXR}} = 100 \times \frac{NL_{\text{EX}}}{NL_{\text{PEX}}}\]

25. Nominal world import demand for exports from Belgium

\[
\ln (BE_{\text{IMAK}}) = \ln (BE_{\text{ER}}) + \frac{1}{1 - 0.2545} \left[ 0.0039 \ln \left( \frac{CA_{\text{IM}}}{CA_{\text{ER}}} \right) + 0.1314 \ln \left( \frac{FR_{\text{IM}}}{FR_{\text{ER}}} \right) \right. \\
\left. + 0.1626 \ln \left( \frac{GY_{\text{IM}}}{GY_{\text{ER}}} \right) + 0.0575 \ln \left( \frac{IT_{\text{IM}}}{IT_{\text{ER}}} \right) + 0.0112 \ln \left( \frac{JP_{\text{IM}}}{JP_{\text{ER}}} \right) \right] \\
\left. + 0.1246 \ln \left( \frac{NL_{\text{IM}}}{NL_{\text{ER}}} \right) + 0.0903 \ln \left( \frac{UK_{\text{IM}}}{UK_{\text{ER}}} \right) + 0.0494 \ln (US_{\text{IM}}) \right] \\
+ 0.0751 \ln (\text{REG}_{\text{IM}}) + 0.0396 \ln (\text{ROE}_{\text{IM}})
\]
26. Nominal exports of Belgium

\[ \Delta_4 \ln(\text{BE}_{\text{EX}}) = (1 - 0.830) \Delta_4 \ln(\text{BE}_{\text{IMAK}}) \]
\[ + 0.830 \Delta_4 \ln(\text{BE}_{\text{EX} - 1}) \]

\[ R^2 = 0.833 \quad DW = 0.934 \quad SER = 0.021 \]

27. Real exports of Belgium

\[ \text{BE}_{\text{EXPR}} = 100 \times \frac{\text{BE}_{\text{EX}}}{\text{BE}_{\text{PEX}}} \]

28. Nominal imports of the USA

\[ \text{US}_{\text{IM}} = 0.01 \times \text{US}_{\text{IMR}} \times \text{US}_{\text{PIM}} \]

29. Nominal imports of Japan

\[ \text{JP}_{\text{IM}} = 0.01 \times \text{JP}_{\text{IMR}} \times \text{JP}_{\text{PIM}} \]

30. Nominal imports of Germany

\[ \text{GY}_{\text{IM}} = 0.01 \times \text{GY}_{\text{IMR}} \times \text{GY}_{\text{PIM}} \]

31. Nominal imports of the United Kingdom

\[ \text{UK}_{\text{IM}} = 0.01 \times \text{UK}_{\text{IMR}} \times \text{UK}_{\text{PIM}} \]

32. Nominal imports of France

\[ \text{FR}_{\text{IM}} = 0.01 \times \text{FR}_{\text{IMR}} \times \text{FR}_{\text{PIM}} \]

33. Nominal imports of Italy

\[ \text{IT}_{\text{IM}} = 0.01 \times \text{IT}_{\text{IMR}} \times \text{IT}_{\text{PIM}} \]

34. Nominal imports of Canada

\[ \text{CA}_{\text{IM}} = 0.01 \times \text{CA}_{\text{IMR}} \times \text{CA}_{\text{PIM}} \]

35. Nominal imports of the Netherlands

\[ \text{NL}_{\text{IM}} = 0.01 \times \text{NL}_{\text{IMR}} \times \text{NL}_{\text{PIM}} \]

36. Nominal imports of Belgium

\[ \text{BE}_{\text{IM}} = 0.01 \times \text{BE}_{\text{IMR}} \times \text{BE}_{\text{PIM}} \]
37. **Nominal imports of other EU countries**
   \[ \text{REG\_IM} = 1.02 \times \text{REG\_IM}_{-1} \]

38. **Nominal imports of other OECD countries**
   \[ \text{ROE\_IM} = 1.02 \times \text{ROE\_IM}_{-1} \]

II. **Price deflator of exports and imports**

1. **Price deflator of exports of other EU countries**
   \[ \text{REG\_PEX} = 1.005 + \text{REG\_PEX}_{-1} \]

2. **Price deflator of exports of other OECD countries**
   \[ \text{ROE\_PEX} = 1.005 + \text{ROE\_PEX}_{-4} \]

3. **World export price deflator for imports of the USA**
   \[
   \ln (\text{US\_PEXA}) = 0.0094 \ln \left( \frac{\text{BE\_PEX}}{\text{BE\_ER}} \right) + 0.1932 \ln \left( \frac{\text{CA\_PEX}}{\text{CA\_ER}} \right) + 0.0238 \ln \left( \frac{\text{FR\_PEX}}{\text{FR\_ER}} \right) \\
   + 0.0495 \ln \left( \frac{\text{GY\_PEX}}{\text{GY\_ER}} \right) + 0.0223 \ln \left( \frac{\text{IT\_PEX}}{\text{IT\_ER}} \right) + 0.1395 \ln \left( \frac{\text{JP\_PEX}}{\text{JP\_ER}} \right) \\
   + 0.0084 \ln \left( \frac{\text{NL\_PEX}}{\text{NL\_ER}} \right) + 0.0376 \ln \left( \frac{\text{UK\_PEX}}{\text{UK\_ER}} \right) \\
   + 0.0302 \ln (\text{REG\_PEX}) + 0.1519 \ln (\text{ROE\_PEX}) + 0.3343 \ln (\text{WE\_POIL})
   \]

4. **Price deflator of imports of the USA**
   \[
   \Delta_4 \ln (\text{US\_PIM}) = (1 - 0.820) \Delta_4 \ln (\text{US\_PEXA}) \\
   + 0.820 \Delta_4 \ln (\text{US\_PIM}_{-1})
   \]
   \[ R^2 = 0.955 \quad DW = 1.042 \quad SER = 0.018 \]
5. World export price deflator for imports of Japan

\[
\ln (\text{JP\_PEXA}) = \ln (\text{JP\_ER}) \\
+ 0.0055 \ln (\text{BE\_PEX} / \text{BE\_ER}) + 0.0290 \ln (\text{CA\_PEX} / \text{CA\_ER}) + 0.0170 \ln (\text{FR\_PEX} / \text{FR\_ER}) \\
+ 0.0367 \ln (\text{GY\_PEX} / \text{GY\_ER}) + 0.0175 \ln (\text{IT\_PEX} / \text{IT\_ER}) \\
+ 0.0058 \ln (\text{NL\_PEX} / \text{NL\_ER}) + 0.0212 \ln (\text{UK\_PEX} / \text{UK\_ER}) + 0.2244 \ln (\text{US\_PEX}) \\
+ 0.0293 \ln (\text{REG\_PEX}) + 0.1141 \ln (\text{ROE\_PEX}) + 0.4995 \ln (\text{WE\_POIL})
\]

6. Price deflator of imports of Japan

\[
\Delta_4 \ln (\text{PIM\_JP}) = (1 - 0.638) \Delta_4 \ln (\text{JP\_PEXA}) \\
+ 0.638 \Delta_4 \ln (\text{PIM\_JP}_t-1)
\]

\[\overline{R^2} = 0.892 \quad \text{DW}=1.282 \quad \text{SER}=0.040\]

7. World export price deflator for imports of Germany

\[
\ln (\text{GY\_PEXA}) = \ln (\text{GY\_ER}) \\
+ 0.0615 \ln (\text{BE\_PEX} / \text{BE\_ER}) + 0.0068 \ln (\text{CA\_PEX} / \text{CA\_ER}) + 0.1050 \ln (\text{FR\_PEX} / \text{FR\_ER}) \\
+ 0.0780 \ln (\text{IT\_PEX} / \text{IT\_ER}) + 0.0487 \ln (\text{JP\_PEX} / \text{JP\_ER}) \\
+ 0.0848 \ln (\text{NL\_PEX} / \text{NL\_ER}) + 0.0696 \ln (\text{UK\_PEX} / \text{UK\_ER}) + 0.0775 \ln (\text{US\_PEX}) \\
+ 0.1438 \ln (\text{REG\_PEX}) + 0.1401 \ln (\text{ROE\_PEX}) + 0.1843 \ln (\text{WE\_POIL})
\]

8. Price deflator of imports of Germany

\[
\Delta_4 \ln (\text{PIM\_GY}) = (1 - 0.837) \Delta_4 \ln (\text{GY\_PEXA}) \\
+ 0.837 \Delta_4 \ln (\text{PIM\_GY}_t-1)
\]

\[\overline{R^2} = 0.945 \quad \text{DW} = 1.069 \quad \text{SER} = 0.019\]
9. **World export price deflator for imports of the United Kingdom**

\[
\ln (\text{UK}_\text{PEXA}) = \ln (\text{UK}_\text{ER}) \\
+ 0.0485 \ln (\text{BE}_\text{PEX}) + 0.0136 \ln (\text{CA}_\text{PEX}) + 0.0946 \ln (\text{FR}_\text{PEX}) \\
+ 0.1368 \ln (\text{GY}_\text{PEX}) + 0.0503 \ln (\text{IT}_\text{PEX}) + 0.0502 \ln (\text{JP}_\text{PEX}) \\
+ 0.0654 \ln (\text{NL}_\text{PEX}) + 0.1340 \ln (\text{US}_\text{PEX}) \\
+ 0.1352 \ln (\text{REG}_\text{PEX}) + 0.0920 \ln (\text{ROE}_\text{PEX}) + 0.1794 \ln (\text{WE}_\text{POIL})
\]

10. **Price deflator of imports of the United Kingdom**

\[
\Delta_4 \ln (\text{UK}_\text{PIM}) = (1 - 0.716) \Delta_4 \ln (\text{UK}_\text{PEXA}) \\
\quad (18157) \\
\quad + 0.716 \Delta_4 \ln (\text{UK}_\text{PIM}_1)
\]

\[R^2 = 0.807 \quad DW = 1.328 \quad SER = 0.026\]

11. **World export price deflator for imports of France**

\[
\ln (\text{FR}_\text{PEXA}) = \ln (\text{FR}_\text{ER}) \\
+ 0.0805 \ln (\text{BE}_\text{PEX}) + 0.0064 \ln (\text{CA}_\text{PEX}) \\
+ 0.1660 \ln (\text{GY}_\text{PEX}) + 0.0980 \ln (\text{IT}_\text{PEX}) + 0.0332 \ln (\text{JP}_\text{PEX}) \\
+ 0.0505 \ln (\text{NL}_\text{PEX}) + 0.0847 \ln (\text{UK}_\text{PEX}) + 0.0857 \ln (\text{US}_\text{PEX}) \\
+ 0.1338 \ln (\text{REG}_\text{PEX}) + 0.0711 \ln (\text{ROE}_\text{PEX}) + 0.1902 \ln (\text{WE}_\text{POIL})
\]

12. **Price deflator of imports of France**

\[
\Delta_4 \ln (\text{FR}_\text{PIM}) = (1 - 0.738) \Delta_4 \ln (\text{FR}_\text{PEXA}) \\
\quad (22998) \\
\quad + 0.738 \Delta_4 \ln (\text{FR}_\text{PIM}_1)
\]

\[R^2 = 0.870 \quad DW = 1.082 \quad SER = 0.021\]
13. World export price deflator for imports of Italy

\[
\ln(\text{IT\_PEXA}) = \ln(\text{IT\_ER}) + 0.0467 \ln\left(\frac{\text{BE\_PEX}}{\text{BE\_ER}}\right) + 0.0083 \ln\left(\frac{\text{CA\_PEX}}{\text{CA\_ER}}\right) + 0.1319 \ln\left(\frac{\text{FR\_PEX}}{\text{FR\_ER}}\right) + 0.1797 \ln\left(\frac{\text{GY\_PEX}}{\text{GY\_ER}}\right) + 0.0203 \ln\left(\frac{\text{JP\_PEX}}{\text{JP\_ER}}\right) + 0.0615 \ln\left(\frac{\text{NL\_PEX}}{\text{NL\_ER}}\right) + 0.0670 \ln\left(\frac{\text{UK\_PEX}}{\text{UK\_ER}}\right) + 0.0498 \ln(\text{US\_PEX}) + 0.1195 \ln(\text{REG\_PEX}) + 0.0825 \ln(\text{ROE\_PEX}) + 0.2329 \ln(\text{WE\_POIL})
\]

14. Price deflator of imports of Italy

\[
\Delta_4 \ln(\text{IT\_PIM}) = (1 - 0.628) \Delta_4 \ln(\text{IT\_PEXA}) + 0.632 \Delta_4 \ln(\text{IT\_PIM}_{-1})
\]

\(R^2 = 0.861\) \(\text{DW} = 0.867\) \(\text{SER} = 0.021\)

15. World export price deflator for imports of Canada

\[
\ln(\text{CA\_PEXA}) = \ln(\text{CA\_ER}) + 0.0033 \ln\left(\frac{\text{BE\_PEX}}{\text{BE\_ER}}\right) + 0.0121 \ln\left(\frac{\text{FR\_PEX}}{\text{FR\_ER}}\right) + 0.0198 \ln\left(\frac{\text{GY\_PEX}}{\text{GY\_ER}}\right) + 0.0460 \ln\left(\frac{\text{JP\_PEX}}{\text{JP\_ER}}\right) + 0.0039 \ln\left(\frac{\text{NL\_PEX}}{\text{NL\_ER}}\right) + 0.237 \ln\left(\frac{\text{UK\_PEX}}{\text{UK\_ER}}\right) + 0.6759 \ln(\text{US\_PEX}) + 0.0177 \ln(\text{REG\_PEX}) + 0.0596 \ln(\text{ROE\_PEX}) + 0.1200 \ln(\text{WE\_POIL})
\]

16. Price deflator of imports of Canada

\[
\Delta_4 \ln(\text{CA\_PIM}) = (1 - 0.809) \Delta_4 \ln(\text{CA\_PEXA}) + 0.809 \Delta_4 \ln(\text{CA\_PIM}_{-1})
\]

\(R^2 = 0.817\) \(\text{DW} = 1.420\) \(\text{SER} = 0.020\)
17. World export price deflator for imports of the Netherlands

\[
\ln (NL_{PEXA}) = \ln (NL_{ER}) \\
+ 0.1116 \ln \left( \frac{BE_{PEX}}{BE_{ER}} \right) + 0.0051 \ln \left( \frac{CA_{PEX}}{CA_{ER}} \right) + 0.0710 \ln \left( \frac{FR_{PEX}}{FR_{ER}} \right) \\
+ 0.2214 \ln \left( \frac{GY_{PEX}}{GY_{ER}} \right) + 0.0385 \ln \left( \frac{IT_{PEX}}{IT_{ER}} \right) + 0.0362 \ln \left( \frac{JP_{PEX}}{JP_{ER}} \right) \\
+ 0.0975 \ln \left( \frac{UK_{PEX}}{UK_{ER}} \right) + 0.0831 \ln (US_{PEX}) \\
+ 0.0939 \ln (REG_{PEX}) + 0.0563 \ln (ROE_{PEX}) + 0.1854 \ln (WE_{POIL})
\]

18. Price deflator of imports of the Netherlands

\[
\Delta_4 \ln (NL_{PIM}) = (1 - 0.651) \Delta_4 \ln (NL_{PEXA}) \\
(17.242) \\
+ 0.651 \Delta_4 \ln (NL_{PIM,-1})
\]

\[^2 R = 0.799 \quad DW = 0.947 \quad SER=0.022\]

19. World export price deflator for imports of Belgium

\[
\ln (BE_{PEXA}) = \ln (BE_{ER}) \\
+ 0.064 \ln \left( \frac{CA_{PEX}}{CA_{ER}} \right) + 0.1413 \ln \left( \frac{FR_{PEX}}{FR_{ER}} \right) \\
+ 0.1856 \ln \left( \frac{GY_{PEX}}{GY_{ER}} \right) + 0.0390 \ln \left( \frac{IT_{PEX}}{IT_{ER}} \right) + 0.0239 \ln \left( \frac{JP_{PEX}}{JP_{ER}} \right) \\
+ 0.1790 \ln \left( \frac{NL_{PEX}}{NL_{ER}} \right) + 0.0910 \ln \left( \frac{UK_{PEX}}{UK_{ER}} \right) + 0.0771 \ln (US_{PEX}) \\
+ 0.0855 \ln (REG_{PEX}) + 0.0423 \ln (ROE_{PEX}) + 0.0128 \ln (WE_{POIL})
\]

20. Price deflator of imports of Belgium

\[
\Delta_4 \ln (BE_{PIM}) = (1 - 0.829) \Delta_4 \ln (BE_{PEXA}) \\
(29515) \\
+ 0.829 \Delta_4 \ln (BE_{PIM,-1})
\]

\[^2 R = 0.917 \quad DW = 0.414 \quad SER=0.015\]
21. Foreign competitors’ price deflator of the USA

\[
\text{US\_LPAC} = \frac{1}{1 - 0.3566} \\
\left[ 0.0169 \ln \left( \frac{\text{BE\_PINV}}{\text{BE\_ER}} \right) + 0.1930 \ln \left( \frac{\text{CA\_PINV}}{\text{CA\_ER}} \right) + 0.0336 \ln \left( \frac{\text{FR\_PINV}}{\text{FR\_ER}} \right) \right] \times \left[ + 0.0491 \ln \left( \frac{\text{GY\_PINV}}{\text{GY\_ER}} \right) + 0.0147 \ln \left( \frac{\text{IT\_PINV}}{\text{IT\_ER}} \right) + 0.1106 \ln \left( \frac{\text{JP\_PINV}}{\text{JP\_ER}} \right) \right] \\
+ 0.0223 \ln \left( \frac{\text{NL\_PINV}}{\text{NL\_ER}} \right) + 0.0599 \ln \left( \frac{\text{UK\_PINV}}{\text{UK\_ER}} \right) \\
+ 0.0122 \ln (\text{REG\_PEX}) + 0.1311 \ln (\text{ROE\_PEX})
\]

22. Foreign competitors’ price deflator of Japan

\[
\text{JP\_LPAC} = \frac{1}{1 - 0.3754} \\
\left[ 0.0086 \ln \left( \frac{\text{BE\_PINV}}{\text{BE\_ER}} \right) + 0.0215 \ln \left( \frac{\text{CA\_PINV}}{\text{CA\_ER}} \right) + 0.0213 \ln \left( \frac{\text{FR\_PINV}}{\text{FR\_ER}} \right) \right] \times \left[ + 0.0505 \ln \left( \frac{\text{GY\_PINV}}{\text{GY\_ER}} \right) + 0.0098 \ln \left( \frac{\text{IT\_PINV}}{\text{IT\_ER}} \right) \right] \\
+ 0.0159 \ln \left( \frac{\text{NL\_PINV}}{\text{NL\_ER}} \right) + 0.0366 \ln \left( \frac{\text{UK\_PINV}}{\text{UK\_ER}} \right) + 0.2883 \ln (\text{US\_PINV}) \\
+ 0.0405 \ln (\text{REG\_PEX}) + 0.1317 \ln (\text{ROE\_PEX}) + \ln (\text{JP\_ER})
\]

23. Foreign competitors’ price deflator of Germany

\[
\text{GY\_LPAC} = \frac{1}{1 - 0.2180} \\
\left[ 0.0547 \ln \left( \frac{\text{BE\_PINV}}{\text{BE\_ER}} \right) + 0.0076 \ln \left( \frac{\text{CA\_PINV}}{\text{CA\_ER}} \right) + 0.0876 \ln \left( \frac{\text{FR\_PINV}}{\text{FR\_ER}} \right) \right] \times \left[ + 0.0715 \ln \left( \frac{\text{IT\_PINV}}{\text{IT\_ER}} \right) + 0.0243 \ln \left( \frac{\text{JP\_PINV}}{\text{JP\_ER}} \right) \right] \\
+ 0.0798 \ln \left( \frac{\text{NL\_PINV}}{\text{NL\_ER}} \right) + 0.0823 \ln \left( \frac{\text{UK\_PINV}}{\text{UK\_ER}} \right) + 0.0842 \ln (\text{US\_PINV}) \\
+ 0.1679 \ln (\text{REG\_PEX}) + 0.1221 \ln (\text{ROE\_PEX}) + \ln (\text{GY\_ER})
\]
24. Foreign competitors' price deflator of the United Kingdom

\[
\text{UK\_LPAC} = \frac{1}{1 - 0.3338} \left[ 0.0488 \ln \left( \frac{\text{BE\_PINV}}{\text{BE\_ER}} \right) + 0.0166 \ln \left( \frac{\text{CA\_PINV}}{\text{CA\_ER}} \right) + 0.0813 \ln \left( \frac{\text{FR\_PINV}}{\text{FR\_ER}} \right) \\
+ 0.1080 \ln \left( \frac{\text{GY\_PINV}}{\text{GY\_ER}} \right) + 0.0485 \ln \left( \frac{\text{IT\_PINV}}{\text{IT\_ER}} \right) + 0.0256 \ln \left( \frac{\text{JP\_PINV}}{\text{JP\_ER}} \right) \\
+ 0.0640 \ln \left( \frac{\text{NL\_PINV}}{\text{NL\_ER}} \right) + 0.1163 \ln (\text{US\_PINV}) \\
+ 0.1108 \ln (\text{REG\_PEX}) + 0.0462 \ln (\text{ROE\_PEX}) \right] + \ln (\text{UK\_ER})
\]

25. Foreign competitors' price deflator of France

\[
\text{FR\_LPAC} = \frac{1}{1 - 0.2242} \left[ 0.0746 \ln \left( \frac{\text{BE\_PINV}}{\text{BE\_ER}} \right) + 0.0130 \ln \left( \frac{\text{CA\_PINV}}{\text{CA\_ER}} \right) \\
+ 0.1603 \ln \left( \frac{\text{GY\_PINV}}{\text{GY\_ER}} \right) + 0.0939 \ln \left( \frac{\text{IT\_PINV}}{\text{IT\_ER}} \right) + 0.0202 \ln \left( \frac{\text{JP\_PINV}}{\text{JP\_ER}} \right) \\
+ 0.0458 \ln \left( \frac{\text{NL\_PINV}}{\text{NL\_ER}} \right) + 0.1017 \ln \left( \frac{\text{UK\_PINV}}{\text{UK\_ER}} \right) + 0.0726 \ln (\text{US\_PINV}) \\
+ 0.1371 \ln (\text{REG\_PEX}) + 0.0565 \ln (\text{ROE\_PEX}) \right] + \ln (\text{FR\_ER})
\]

26. Foreign competitors' price deflator of Italy

\[
\text{IT\_LPAC} = \frac{1}{1 - 0.2745} \left[ 0.0253 \ln \left( \frac{\text{BE\_PINV}}{\text{BE\_ER}} \right) + 0.0095 \ln \left( \frac{\text{CA\_PINV}}{\text{CA\_ER}} \right) + 0.1135 \ln \left( \frac{\text{FR\_PINV}}{\text{FR\_ER}} \right) \\
+ 0.1461 \ln \left( \frac{\text{GY\_PINV}}{\text{GY\_ER}} \right) + 0.0255 \ln \left( \frac{\text{JP\_PINV}}{\text{JP\_ER}} \right) \\
+ 0.0305 \ln \left( \frac{\text{NL\_PINV}}{\text{NL\_ER}} \right) + 0.0665 \ln \left( \frac{\text{UK\_PINV}}{\text{UK\_ER}} \right) + 0.0832 \ln (\text{US\_PINV}) \\
+ 0.1383 \ln (\text{REG\_PEX}) + 0.0873 \ln (\text{ROE\_PEX}) \right] + \ln (\text{IT\_ER})
\]
27. Foreign competitors’ price deflator of Canada

\[
CA_{LPAC} = \frac{1}{1 - 0.1744} \left[ 0.0045 \ln \left( \frac{BE\_PINV}{BE\_ER} \right) + 0.0137 \ln \left( \frac{GY\_PINV}{GY\_ER} \right) + 0.0079 \ln \left( \frac{FR\_PINV}{FR\_ER} \right) \right. \\
\left. + 0.0043 \ln \left( \frac{NL\_PINV}{NL\_ER} \right) + 0.0194 \ln \left( \frac{IT\_PINV}{IT\_ER} \right) + 0.0455 \ln \left( \frac{JP\_PINV}{JP\_ER} \right) \right. \\
\left. + 0.0136 \ln \left( \text{REG\_PEX} \right) - 0.0696 \ln \left( \text{ROE\_PEX} \right) \right]
\]

\[+ \ln (CA\_ER)\]

28. Foreign competitors’ price deflator of the Netherlands

\[
NL_{LPAC} = \frac{1}{1 - 0.2562} \left[ 0.1324 \ln \left( \frac{BE\_PINV}{BE\_ER} \right) + 0.0037 \ln \left( \frac{CA\_PINV}{CA\_ER} \right) + 0.0667 \ln \left( \frac{FR\_PINV}{FR\_ER} \right) \right. \\
\left. + 0.1814 \ln \left( \frac{GY\_PINV}{GY\_ER} \right) + 0.0614 \ln \left( \frac{IT\_PINV}{IT\_ER} \right) + 0.0096 \ln \left( \frac{JP\_PINV}{JP\_ER} \right) \right. \\
\left. + 0.0986 \ln \left( \frac{UK\_PINV}{UK\_ER} \right) + 0.0357 \ln \left( \text{US\_PINV} \right) \right. \\
\left. + 0.1053 \ln \left( \text{REG\_PEX} \right) + 0.0490 \ln \left( \text{ROE\_PEX} \right) \right] \\
\left[ + \ln (NL\_ER) \right]
\]

29. Foreign competitors’ price deflator of Belgium

\[
BE_{LPAC} = \frac{1}{1 - 0.2545} \left[ 0.0039 \ln \left( \frac{CA\_PINV}{CA\_ER} \right) + 0.1314 \ln \left( \frac{FR\_PINV}{FR\_ER} \right) \right. \\
\left. + 0.1626 \ln \left( \frac{GY\_PINV}{GY\_ER} \right) + 0.0575 \ln \left( \frac{IT\_PINV}{IT\_ER} \right) + 0.0112 \ln \left( \frac{JP\_PINV}{JP\_ER} \right) \right. \\
\left. + 0.1246 \ln \left( \frac{NL\_PINV}{NL\_ER} \right) + 0.0903 \ln \left( \frac{UK\_PINV}{UK\_ER} \right) + 0.0494 \ln \left( \text{US\_PINV} \right) \right. \\
\left. + 0.0751 \ln \left( \text{REG\_PEX} \right) + 0.0396 \ln \left( \text{ROE\_PEX} \right) \right] \\
\left[ + \ln (BE\_ER) \right]
\]
30. World price of oil

\[
\ln(\text{WE\_POIL}) = 0.801 + 0.830 \ln(\text{WE\_POIL}_{-4})
\]
\[
+ 1001 \Delta_4 \ln(\text{WE\_POIL}_{-1})
\]
\[
- 0.359 \Delta_4 \ln(\text{WE\_POIL}_{-2})
\]

\( R^2 = 0.789 \quad DW = 1.820 \quad SER = 0.146 \)
II. Model variables

The series identifications refer to the time series data base of the Deutsche Bundesbank. The exogenous variables are marked by an X. The second column shows the number of the equation which is associated with the variable. The Roman numeral refers to the group within the corresponding country block. The trade block equations (block 11) are marked with "t.b." Most variables except those for Germany are seasonally adjusted.

**USA**

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
<th>Equation</th>
<th>Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>US_ARL</td>
<td>Unemployment, million, Series YSU300</td>
<td></td>
<td></td>
</tr>
<tr>
<td>US_ARLQ</td>
<td>Unemployment rate as a percentage of total labour force, per cent, defined:</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(US_ARLQ = 100 \times \frac{US_ARL}{US_EI + US_ARL})</td>
<td></td>
<td></td>
</tr>
<tr>
<td>US_ARLQN</td>
<td>&quot;Smoothed&quot; unemployment rate as a percentage of total labour force, per cent, defined: (US_ARLQN = 0.9 \times US_ARLQN_t + 0.1 \times US_ARLQ)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>US_BIP</td>
<td>Gross domestic product, at current prices, US$ billion, Series YAU003</td>
<td></td>
<td></td>
</tr>
<tr>
<td>US_COSI</td>
<td>Index of production costs, 1992 = 100, defined: (US_COSI = \frac{100}{99.999} \times US_LA^{0.847} \times US_RM^{1-0.847})</td>
<td></td>
<td></td>
</tr>
<tr>
<td>US_CP</td>
<td>Private consumption, at current prices, US$ billion, Series YAU008</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
US_D II.5 Depreciation allowances, US$ billion, defined:

US_E1 II.3 Employment, million, Series YUU330

US_END I.7 Final demand, at current prices, US$ billion, defined:

US ENDR I.8 Final demand, at 1992 prices, US$ billion, defined:

US_EW I.2 Total labour force, million, defined:
US_EW = US_E1 + US_ARL

US_EX 11.I.2 Exports of goods and services, at current prices, US$ (t.b.) billion, Series YAU005


US_FH I.14 Net lending of households, US$ billion, Series LQ1778

US_FS IV.8 Net lending of government, US$ billion, Series LJ9996

US FU II.13 Net lending of firms, US$ billion, defined:

US_G IV.7 Government demand, at current prices, US$ billion, Series YAU009

US_GAPQ II.9 Capacity utilisation, per cent, defined:
US_GAPQ = 100 * US_BIPQ / US_BIPR


US_IANR II.1 Gross private fixed capital investment, at 1992 prices, US$ billion, Series YAU111

US_IM 11.I.28 Imports of goods and services, at current prices, US$ (t.b.) billion, Series YAU006
US_IMAK 11.I.1 World import demand for exports from the USA, at current prices, US$ billion, definition
US_INF III.2a Domestic price inflation, per cent p. a., defined:
\[ US_{\text{INF}} = 100 \Delta_4 \ln \left(US_{\text{PINV}}\right) \]
US_INFT'X Target inflation rate, per cent p.a., defined:
\[ US_{\text{INFT}} = 2.5 \]
US_KAB'X Depreciation rate, per cent, defined:
\[ US_{\text{KAB}} = 100 \times \left(1 - \frac{US_{\text{KRP}} - US_{\text{LANR}}}{US_{\text{KRP}-1}}\right) \]
US_L I.13 Gross wage income, US$ billion, Series LQ1771
US_LA III.1 Gross wage income per employee, 1992 = 100, defined:
\[ US_{\text{LA}} = \frac{100 \times \frac{US_{\text{L}}}{US_{\text{EI}}}}{7,690} \]
US_LBS I.15 Current account balance, US$ billion, Series LA1859
US_LPAC 11.II.21 Foreign competitors' deflator, definition
(t.b.)
US_M2 V.1 Money stock M2, US$ billion, Series AS3439
US_PBIP III.9 Deflator of gross domestic product, 1992 = 100, defined:
\[ US_{\text{PBIP}} = 100 \times \frac{US_{\text{BIP}}}{US_{\text{BIPR}}} \]
US_PCP III.3 Deflator of private consumption, 1992 = 100, defined:
\[ US_{\text{PCP}} = 100 \times \frac{US_{\text{CP}}}{US_{\text{CPR}}} \]
US_PCPD III.10 Adaptive expectation on consumer price inflation, per cent p.a., defined:
\[ US_{\text{PCPD}} = 0.9 \times US_{\text{PCPD}-1} + 0.1 \times \Delta_4 \ln \left(US_{\text{PCP}-1}\right) \times 100 \]
US_PEV III.8 Deflator of final demand, 1992 = 100, defined:
US_PEV = 100 * US_END
US_ENDR

US_PEVD III.11 Adaptive expectation on inflation rate of final demand, per cent p.a., defined:
US_PEVD = 0.9 * US_PEX - 1 + 0.1 * ∆ln (US_PEV - 1) * 100

US_PEX III.6 Deflator of exports of goods and services, 1992 = 100, defined: US_PEX = 100 * US_EX
US_EXR

US_PEXA 11.II.3 World export deflator for imports of the USA, (t.b.) definition

US_PG III.4 Deflator of government demand, 1992 = 100, defined:
US_PG = 100 * US_G
US_GR

US_PIAN III.5 Deflator of private fixed capital investment, 1992 = 100, defined: US_PIAN = 100 * US_IAN
US_IANR

US_PIM 11.II.4 Deflator of imports of goods and services, 1992 = 100, (t.b.) defined: US_PIM = 100 * US_IM
US_IMR

US_PINV III.2b Deflator of domestic demand, 1992 = 100, defined:
US_CPR + US_IANR + US_GR + US_VR

US_RL V.3 Yield on government bonds with residual maturities of ten years, per cent p. a., Series AU3317

US_RLST V.5 Long-term interest rate (long-run), per cent p.a., definition

US_RS V.2 Money market interest rate for three-month funds, per cent p. a., Series AU3211

US_RSST V.4 Short-term interest rate (long-run), per cent p.a., definition

US_SB IV.4 Government transfers to households, US$ billion, Series LJ1647
US_SDN'X  Statistical discrepancy of gross domestic product, at current prices, US$ billion, defined:
\[
US_{\text{SDN}} = US_{\text{BIP}} - \left( US_{\text{CP}} + US_{\text{G}} + US_{\text{IAN}} \right) + US_{\text{V}} + US_{\text{EX}} - US_{\text{IM}}
\]

US_SDR'X  Statistical discrepancy of gross domestic product, at 1992 prices, US$ billion, defined:
\[
US_{\text{SDR}} = US_{\text{BIPR}} - \left( US_{\text{CPR}} + US_{\text{GR}} + US_{\text{IANR}} \right) + US_{\text{VR}} + US_{\text{EXR}} - US_{\text{IMR}}
\]

US_TDB  IV.5  Direct taxes, US$ billion, defined:
\[
US_{\text{TDB}} = US_{\text{G}} + US_{\text{SB}} + US_{\text{FS}} - US_{\text{TIS}}
\]

US_TDBS  IV.1  Direct tax rate, per cent, defined:
\[
US_{\text{TDBS}} = \frac{US_{\text{TDB}}}{US_{\text{VE}}} \times 100
\]

US_TERM'X  Term premium on interest rates, per cent p. a., defined: \( US_{\text{TERM}} = \text{mean} (US_{\text{RL}} - US_{\text{RS}}) \)

US_TIS  IV.6  Indirect taxes excluding subsidies, US$ billion, Series LQ1777

US_TISS  IV.2  Indirect tax rate, per cent, defined:
\[
US_{\text{TISS}} = \frac{US_{\text{TIS}}}{US_{\text{END}}} \times 100
\]

US_U  I.4  Transfers to foreign countries, US$ billion, defined:
\[
US_{\text{U}} = US_{\text{EX}} - US_{\text{IM}} - US_{\text{LBS}}
\]

US_V  II.7  Inventory investment, at current prices, US$ billion, Series YAU010

US_VE  I.11  National income, US$ billion, defined:
\[
US_{\text{VE}} = US_{\text{BIP}} - US_{\text{TIS}} - US_{\text{D}}
\]

US_VR  II.2  Inventory investment, at 1992 prices, US$ billion, Series YAU110

US_WOBE  I.3  Population, million, Series YJU350

US_YV  I.12  Disposable income of households, US$ billion, defined:
\[
US_{\text{YV}} = US_{\text{CP}} + US_{\text{FH}}
\]
## Japan

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
<th>Series</th>
</tr>
</thead>
<tbody>
<tr>
<td>JP_ARL</td>
<td>Unemployment, million, Series YSJ300</td>
<td></td>
</tr>
<tr>
<td>JP_ARLQ</td>
<td>Unemployment rate as a percentage of total labour force, per cent, defined:</td>
<td></td>
</tr>
<tr>
<td></td>
<td>( \frac{\text{JP}<em>\text{ARL}}{\text{JP}</em>\text{ET} + \text{JP}_\text{ARL}} \times 100 )</td>
<td></td>
</tr>
<tr>
<td>JP_ARLQN</td>
<td>&quot;Smoothed&quot; unemployment rate as a percentage of total labour force, per cent, defined:</td>
<td></td>
</tr>
<tr>
<td></td>
<td>( 0.9 \times \text{JP}_\text{ARLQN}_{-1} + 0.1 \times \text{JP}_\text{ARLQ} )</td>
<td></td>
</tr>
<tr>
<td>JP_BIP</td>
<td>Gross domestic product, at current prices, ¥ trillion, Series YAJ003</td>
<td></td>
</tr>
<tr>
<td>JP_BIPQ</td>
<td>Potential gross domestic product, at 1990 prices, ¥ trillion, definition</td>
<td></td>
</tr>
<tr>
<td>JP_BIPR</td>
<td>Gross domestic product, at 1990 prices, ¥ trillion, Series YAJ103</td>
<td></td>
</tr>
<tr>
<td>JP_BPR</td>
<td>&quot;Smoothed&quot; labour productivity, 1990 = 100, defined:</td>
<td></td>
</tr>
<tr>
<td></td>
<td>( 0.9 \frac{\text{JP}_\text{BPR} - 1}{\text{JP}<em>\text{ET}} + 0.1 \frac{\text{JP}_\text{ENDR}}{\text{JP}</em>\text{ET}} )</td>
<td></td>
</tr>
<tr>
<td>JP_COSI</td>
<td>Index of production costs, 1990 = 100, defined:</td>
<td></td>
</tr>
<tr>
<td></td>
<td>( \frac{100}{99.966} \times \left( \text{JP}_\text{LA}^{0.844} \right) \times \left( \text{JP}_\text{PIM}^{1-0.844} \right) )</td>
<td></td>
</tr>
<tr>
<td>JP_CP</td>
<td>Private consumption, at current prices, ¥ trillion, Series YAJ008</td>
<td></td>
</tr>
<tr>
<td>JP_CPR</td>
<td>Private consumption, at 1990 prices, ¥ trillion, Series YAJ108</td>
<td></td>
</tr>
<tr>
<td>JP_D</td>
<td>Depreciation allowances, ¥ trillion, defined:</td>
<td></td>
</tr>
<tr>
<td></td>
<td>( \text{JP}_\text{D} = \text{JP}_\text{BIP} - \text{JP}_\text{TDB} - \text{JP}_\text{TIS} - \text{JP}_\text{YV} + \text{JP}_\text{SB} )</td>
<td></td>
</tr>
<tr>
<td>JP_E1</td>
<td>Employment, million, Series YUJ330</td>
<td></td>
</tr>
<tr>
<td>JP_END</td>
<td>Final demand, at current prices, ¥ trillion, defined:</td>
<td></td>
</tr>
<tr>
<td></td>
<td>( \text{JP}_\text{END} = \text{JP}_\text{CP} + \text{JP}_\text{IAN} + \text{JP}_\text{G} + \text{JP}_\text{V} + \text{JP}_\text{EX} )</td>
<td></td>
</tr>
</tbody>
</table>
Final demand, at 1990 prices, ¥ trillion, defined:

\[ \text{JP}_\text{ENDR} = \text{JP}_\text{CPR} + \text{JP}_\text{IANR} + \text{JP}_\text{GR} + \text{JP}_\text{VR} + \text{JP}_\text{EXR} \]

Exchange rate of yen against US$, yen per US $, defined:

\[ \text{JP}_\text{ER} = \text{GY}_\text{ER} \times \text{WUS014} \]

Total labour force, million, defined:

\[ \text{JP}_\text{EW} = \text{JP}_\text{E1} + \text{JP}_\text{ARL} \]

Exports of goods and services, at current prices, ¥ trillion, Series YAJ005

\[ \text{JP}_\text{EX} = 11.1.5 \]

Exports of goods and services, at 1990 prices, ¥ trillion, Series YAJ105

\[ \text{JP}_\text{EXR} = 11.1.6 \]

Net lending of households, ¥ trillion, Series LQ1029

\[ \text{JP}_\text{FH} = 11.1.4 \]

Net lending of government, ¥ trillion, Series LJ9997

\[ \text{JP}_\text{FS} = IV.8 \]

Net lending of firms, ¥ trillion, defined:

\[ \text{JP}_\text{FU} = \text{JP}_\text{FH} + \text{JP}_\text{FS} + \text{JP}_\text{LBS} \]

\[ \text{JP}_\text{FU} = II.13 \]

Government demand, at current prices, ¥ trillion, Series (YAJ009 + LQ1017)

\[ \text{JP}_\text{G} = IV.7 \]

Capacity utilisation, per cent, defined:

\[ \text{JP}_\text{GAPQ} = 100 \times \frac{\text{JP}_\text{BIPR}}{\text{JP}_\text{BIPQ}} \]

\[ \text{JP}_\text{GAPQ} = II.9 \]

Government demand, at 1990 prices, ¥ trillion, Series (YAJ109 + LQ1018)

\[ \text{JP}_\text{GR} = IV.3 \]

Gross private fixed capital investment, at current prices, ¥ trillion, Series (YAJ011 - LQ1017)

\[ \text{JP}_\text{IAN} = I.6 \]

Gross private fixed capital investment, at 1990 prices, ¥ trillion, Series (YAJ111 - LQ1018)

\[ \text{JP}_\text{IANR} = II.1 \]

Imports of goods and services, at current prices, ¥ trillion, Series YAJ006

\[ \text{JP}_\text{IM} = 11.1.29 \]

(t.b.)

World import demand for exports from Japan, definition

\[ \text{JP}_\text{IMAK} = 11.1.4 \]

(t.b.)

Exports of goods and services, at 1990 prices, ¥ trillion, Series YAJ106

\[ \text{JP}_\text{IMR} = II.4 \]
JP_INF  III.2a  Domestic price inflation, per cent p. a., defined:
JP_INF = 100 Δ₄ \ln (JP_PINV)

JP_INFT’X  Target inflation rate, per cent p.a., defined:
JP_INFT = 2.5

JP_KAB’X  Depreciation rate, per cent, defined:
JP_KAB = 100 \left( 1 - \frac{JP_KRP - JP_LANR}{JP_KRP_{-1}} \right)

JP_KRP  II.8  Private capital stock, at 1990 prices, ¥ trillion, Series PJ03HG

JP_L  I.13  Gross wage income, ¥ trillion, Series LQ1001

JP_LA  III.1  Gross wage income per employee, 1990 = 100, defined:
JP_LA = \frac{100}{0.919} \frac{JP_L}{JP_E}

JP_LAS  III.12  Long-term gross wage income per employee, 1990 = 100, defined:
JP_LAS = \frac{1}{15399} \frac{JP_PCP \times JP_BPR^{0.8}}{(1 - 0.01JP_ARLO)^{0.8}}

JP_LBS  I.15  Current account balance, ¥ trillion, Series LA1111

JP_LPAC  11.II.22  Foreign competitors’ deflator, definition (t.b.)

JP_M  V.1  Broad money stock, ¥ trillion, Series AS3491

JP_PBIP  III.9  Deflator of gross domestic product, 1990 = 100, defined:
JP_PBIP = 100 \frac{JP_BIP}{JP_BIPR}

JP_PCP  III.3  Deflator of private consumption, 1990 = 100, defined:
JP_PCP = 100 \frac{JP_CP}{JP_CPR}

JP_PCPD  III.10  Adaptive expectation on consumer price inflation, per cent p.a., defined:
JP_PCPD = 0.9 \times JP_PCPD_{-1} + 0.1 \times Δ₄ \ln (JP_PCP_{-1}) \times 100
<table>
<thead>
<tr>
<th>Code</th>
<th>Page</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>JP_PEV</td>
<td>III.8</td>
<td>Deflator of final demand, 1990 = 100, defined:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>$JP_{PEV} = 100 \times \frac{JP_{END}}{JP_{ENDR}}$</td>
</tr>
<tr>
<td>JP_PEVD</td>
<td>III.11</td>
<td>Adaptive expectation on inflation rate of final demand, per cent p.a., defined:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>$JP_{PEVD} = 0.9 \times JP_{PEV, t-1} + 0.1 \times \Delta_4 \ln(JP_{PEV, t-1}) \times 100$</td>
</tr>
<tr>
<td>JP_PEX</td>
<td>III.6</td>
<td>Deflator of exports of goods and services, 1990 = 100, defined:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>$JP_{PEX} = 100 \times \frac{JP_{EX}}{JP_{EXR}}$</td>
</tr>
<tr>
<td>JP_PEXA</td>
<td>11.II.5</td>
<td>World export deflator for imports of Japan, definition (t.b.)</td>
</tr>
<tr>
<td>JP_PG</td>
<td>III.4</td>
<td>Deflator of government demand, 1990 = 100, defined:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>$JP_{PG} = 100 \times \frac{JP_{G}}{JP_{GR}}$</td>
</tr>
<tr>
<td>JP_PIAN</td>
<td>III.5</td>
<td>Deflator of private fixed capital investment, 1990 = 100, defined:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>$JP_{PIAN} = 100 \times \frac{JP_{IAN}}{JP_{IANR}}$</td>
</tr>
<tr>
<td>JP_PIM</td>
<td></td>
<td>Deflator of imports of goods and services, 1990 = 100, defined:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>$JP_{PIM} = 100 \times \frac{JP_{IM}}{JP_{IMR}}$</td>
</tr>
<tr>
<td>JP_PINV</td>
<td>III.2b</td>
<td>Deflator of domestic demand, 1990 = 100, defined:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>$JP_{PINV} = 100 \times \frac{JP_{CP} + JP_{IAN} + JP_{G} + JP_{V}}{JP_{CPR} + JP_{IANR} + JP_{GR} + JP_{VR}}$</td>
</tr>
<tr>
<td>JP_RL</td>
<td>V.3</td>
<td>Yield on government bonds with residual maturities of ten years, per cent p. a., Series AU3311</td>
</tr>
<tr>
<td>JP_RLST</td>
<td>V.5</td>
<td>Long-term interest rate (long-run), per cent p.a., definition</td>
</tr>
<tr>
<td>JP_RS</td>
<td>V.2</td>
<td>Money market interest rate for three-month funds, per cent p. a., Series AU3221</td>
</tr>
<tr>
<td>JP_RSST</td>
<td>V.4</td>
<td>Short-term interest rate (long-run), per cent p.a., definition</td>
</tr>
<tr>
<td>JP_SB</td>
<td>IV.4</td>
<td>Government transfers to households, ¥ trillion, Series LJ1644</td>
</tr>
</tbody>
</table>
Statistical discrepancy of gross domestic product, at current prices, ¥ trillion, defined:
\[
\text{JP\_SDN} = \text{JP\_BIP} - \left( \text{JP\_CP} + \text{JP\_G} + \text{JP\_IAN} + \text{JP\_V} + \text{JP\_EX} - \text{JP\_IM} \right)
\]

Statistical discrepancy of gross domestic product, at 1990 prices, ¥ trillion, defined:
\[
\text{JP\_SDR} = \text{JP\_BIPR} - \left( \text{JP\_CPR} + \text{JP\_GR} + \text{JP\_IANR} + \text{JP\_VR} + \text{JP\_EXR} - \text{JP\_IMR} \right)
\]

Direct taxes, ¥ trillion, defined:
\[
\text{JP\_TDB} = \text{JP\_G} + \text{JP\_SB} + \text{JP\_FS} - \text{JP\_TIS}
\]

Direct tax rate, per cent, defined:
\[
\text{JP\_TDBS} = \frac{\text{JP\_TDB}}{\text{JP\_VE}} \times 100
\]

Term premium on interest rates, per cent p. a., defined:
\[
\text{JP\_TERM} = \text{mean} \left( \text{JP\_RL} - \text{JP\_RS} \right)
\]

Indirect taxes excluding subsidies, ¥ trillion, Series LQ1003

Indirect tax rate, per cent, defined:
\[
\text{JP\_TISS} = \frac{\text{JP\_TIS}}{\text{JP\_END}} \times 100
\]

Transfers to foreign countries, ¥ trillion, defined:
\[
\text{JP\_U} = \text{JP\_EX} - \text{JP\_IM} - \text{JP\_LBS}
\]

Inventory investment, at current prices, ¥ trillion, Series YAJ010

National income, ¥ trillion, defined:
\[
\text{JP\_VE} = \text{JP\_BIP} - \text{JP\_TIS} - \text{JP\_D}
\]

Inventory investment, at 1990 prices, ¥ trillion, Series YAJ110

Population, million, Series YJJ350

Disposable income of households, ¥ trillion, defined:
\[
\text{JP\_YV} = \text{JP\_CP} + \text{JP\_FH}
\]
Germany

GY_ARL II.28 Unemployment, million, Deutsche Bundesbank, Monthly Report, Table IX.6, Series UX1100

GY_ARLQ II.29 Unemployment rate, as a percentage of total labour force, per cent, defined: \[ \text{GY}_\text{ARLQ} = 100 \times \frac{\text{GY}_\text{ARL}}{\text{GY}_\text{EW}} \]

GY_ARLQN II.30 *Smoothed* unemployment rate, as a percentage of total labour force, per cent, defined: \[ \text{GY}_\text{ARLQN} = 0.9 \times \text{GY}_\text{ARLQN}_{-1} + 0.1 \times \text{GY}_\text{ARLQ} \]

GY_ARSF I.6 Transfers of firms to foreign countries, DM billion, defined: \[ \text{GY}_\text{ARSF} = \text{GY}_\text{EX} - \text{GY}_\text{IM} + \text{GY}_\text{FA} - \text{GY}_\text{VERR} + \text{GY}_\text{SEVE} \]

GY_ARST II.8 Hours worked per employee, hours, Series DQ9436

GY_AVBI II.7 Total hours worked by employees, billion hours, defined: \[ \text{GY}_\text{AVBI} = 0.001 \times \text{GY}_\text{BI} \times \text{GY}_\text{ARST} \]

GY_B1 II.27 Employment (residence concept), million, Series DQ0004 and DQ9004

GY_BI II.26 Employment (internal-market concept), million, Deutsche Bundesbank, Monthly Report, Table IX.6., Series DQ0146 and DQ9146

GY_BIP I.12 Gross domestic product, at current prices, DM billion, defined:
\[ \text{GY}_\text{BIP} = \text{GY}_\text{CP} + \text{GY}_\text{CS} + \text{GY}_\text{IAU} + \text{GY}_\text{IAS} + \text{GY}_\text{IBU} + \text{GY}_\text{IW} + \text{GY}_\text{IBS} + \text{GY}_\text{V} + \text{GY}_\text{EX} - \text{GY}_\text{IM} \]

GY_BIPQ II.11 Potential gross domestic product, at 1991 prices, DM billion, definition

GY_BIPR I.13 Gross domestic product, at 1991 prices, DM billion, defined:
\[ \text{GY}_\text{BIPR} = \text{GY}_\text{CPR} + \text{GY}_\text{CSR} + \text{GY}_\text{IAPR} + \text{GY}_\text{IASR} + \text{GY}_\text{IBUR} + \text{GY}_\text{IWR} + \text{GY}_\text{IBSR} + \text{GY}_\text{VR} + \text{GY}_\text{EXR} - \text{GY}_\text{IMR} \]
GY_BSP I.14 Gross national product, at current prices, DM billion, Deutsche Bundesbank, Monthly Report, Table IX.1., Series DQ0007 and DQ9007

GY_BVS IV.10 Gross indebtedness of government, DM billion, Deutsche Bundesbank, Monthly Report, Table VIII.8., Series BQ1710

GY_CCRA III.17 User costs of machinery and equipment investment, 1991 = 100, defined:
\[
GY\_CCRA = \frac{652.662PIAU\_GY01.0TSUD\_GY1 - ZAU\_GY*TSUD\_GY1*075.0PEVD\_GY}{1-GY\_TSUD} + 0.01*GY\_PRAU + 662652
\]

GY_COSI III.18 Index of production costs, 1991 = 100, defined:
\[
GY\_COSI = GY\_LAST^{0.491} * GY\_PIM^{0.921} + GY\_CCRA^{(1-0.491-0.217)}
\]

GY_CP I.7 Private consumption, at current prices, DM billion, Deutsche Bundesbank, Monthly Report, Table IX.1., Series DQ0011 and DQ9011

GY_CPR I.1 Private consumption, at 1991 prices, DM billion, Deutsche Bundesbank, Monthly Report, Table IX.1., Series DQ0012 and DQ9012

GY_CS IV.7 Government consumption, at current prices, DM billion, Deutsche Bundesbank, Monthly Report, Table IX.1., Series DQ0013 and DQ9013

GY_CSR IV.12 Government consumption, at 1991 prices, DM billion, Deutsche Bundesbank, Monthly Report, Table IX.1., Series DQ0014 and DQ9014

GY_D II.23 Depreciation allowances, DM billion, Series DQ0411 and DQ9411

GY_DLBS\'X Residual item in the current account and capital transfers to foreign countries, DM billion, defined:
\[
GY\_DLBS = GY\_LBS + GY\_FA
\]
GY_DSW'X  Depreciation allowances for residential construction and government, DM billion, defined:
\[
GY_{DSW} = GY_{D} - 0.01 \times 0.25 \times (0.075 \times GY_{RAU} \times GY_{KRAU}) = -0.01 \times 0.25 \times (0.015 \times GY_{PIU} \times GY_{KBU})
\]

GY_DUM951'X  Dummy variable for break in data in 1995 quarter 1

GY_DWU'X  Dummy variable for German unification, from 3rd quarter 1990 = 1, before = 0

GY_EBQQ  I.15  "Smoothed" ratio of nominal final demand to nominal gross domestic product, defined:
\[
GY_{EBQQ} = 0.7 \left( GY_{END} - GY_{TBSP} + GY_{SUBV} \right) + 0.3 \left( GY_{BIP} - GY_{TBSP} + GY_{SUBV} \right)
\]

GY_EMU'X  Dummy variable for participation of Germany in European Monetary Union, from 1999 Q1 = 1, before = 0

GY_END  I.10  Final demand, at current prices, DM billion, defined:
\[
GY_{END} = GY_{CP} + GY_{CS} + GY_{IAU} + GY_{IAS} + GY_{IBU} + GY_{IBS} + GY_{IW} + GY_{V} + GY_{EX}
\]

GY_ENDR  I.11  Final demand, at 1991 prices, DM billion, defined:
\[
GY_{ENDR} = GY_{CPR} + GY_{CSR} + GY_{IAUR} + GY_{IASR} + GY_{IBUR} + GY_{IWR} + GY_{IBSR} + GY_{VR} + GY_{EXR}
\]

GY_EQU  I.2  Labour force participation rate of employees (residents), defined: \[
GY_{EQU} = \frac{GY_{EW} - GY_{SELB}}{GY_{WOB}}
\]

GY_ER  V.9  Exchange rate of the D-Mark against the US$, DM per US$, Series WU5009

GY_EW  I.24  Total labour force (residents), million, defined: \[
GY_{EW} = GY_{B1} + GY_{SELB} + GY_{ARL}
\]

GY_EX  11.1.8  Exports of goods and services, at current prices, DM billion, Deutsche Bundesbank, Monthly Report, Table IX.1., Series DQ0252 and DQ9252

GY_EXR  11.1.9  Exports of goods and services, at 1991 prices, DM billion, Deutsche Bundesbank, Monthly Report, Table IX.1., Series DQ0253 and DQ9253
GY_FA  I.26 Net lending of foreign countries, DM billion, Series DQ0491 and DQ9491

GY_FH  I.22 Net lending of households, DM billion, Series DQ0478 and DQ9478

GY_FS  IV.20 Net lending of government, DM billion, Series DQ0472 and DQ9472

GY_FU  II.24 Net lending of firms, DM billion, defined:
GY_FU = - GY_FA - GY_FH - GY_FS

GY_GAPQ II.12 Capacity utilisation, per cent, defined:
GY_GAPQ = 100 * GY_BIPR / GY_BIPQ

GY_GNEH I.3 Withdrawn profits and property income of households (after deduction of interest paid on consumer loans), DM billion, Series DQ0408 and DQ9408

GY_GST'X Gross profit income of government, DM billion, Series DQ4555 and DQ9455

GY_GU  I.20 Gross profit income of firms, DM billion, defined:
GY_GU = GY_GW - GY_GST + GY_ZINS

GY_GW  I.19 Gross profit income, DM billion, defined:
GY_GW = GY_BSP - GY_L - GY_TBSP + GY_SUBV - GY_D

GY_IAS'X Government gross machinery and equipment investment, at current prices, DM billion, Series DQ0043 and DQ9043

GY_IASR II.14 Government gross machinery and equipment investment, at 1991 prices, DM billion, Series DQ0051 and DQ9051

GY_IAU II.13 Firms’ gross machinery and equipment investment, at current prices, DM billion, Series DQ0091 and DQ9091 minus Series DQ0043 and DQ9043

GY_IAUR II.1 Firms’ gross machinery and equipment investment, at 1991 prices, DM billion, Series DQ0092 and DQ9092 minus Series DQ0593 and DQ9593
<table>
<thead>
<tr>
<th>Code</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>GY_IBS'X</td>
<td>Government gross investment in construction, including purchases and sales of land and used equipment, at current prices, DM billion, Series DQ0037 and DQ9037</td>
</tr>
<tr>
<td>GY_IBSR</td>
<td>Government gross investment in construction, at 1991 prices, DM billion, Series DQ0038 and DQ9038</td>
</tr>
</tbody>
</table>
| GY_IBU   | Firms’ gross investment in construction, at current prices, DM billion, defined:  
  $GY_{IBU} = DQ0093 \text{ and } DQ9093 - GY_{IBS} - GY_{IW}$ |
| GY_IBUR  | Firms’ gross investment in construction, at 1991 prices, DM billion, defined:  
  $GY_{IBUR} = DQ0094 \text{ and } DQ9094 - GY_{IBSR} - GY_{IWR}$ |
| GY_IM    | Imports of goods and services, at current prices, DM billion, Deutsche Bundesbank, Monthly Report, Table IX.1., Series DQ0254 and DQ9254 |
| GY_IMAK  | World import demand for exports from Germany, definition |
| GY_IMR   | Imports of goods and services, at 1991 prices, DM billion, Deutsche Bundesbank, Monthly Report, Table IX.1., Series DQ0255 and DQ9255 |
| GY_INF   | Domestic price inflation, per cent p. a., defined:  
  $GY_{INF} = 100 \frac{\Delta \ln (GY_{PINV})}{\Delta t}$ |
| GY_INFT'X| Target inflation rate, per cent p. a., defined:  
  $GY_{INFT} = 2.0$ |
| GY_INLV  | Domestic demand, at current prices, DM billion, defined:  
  $GY_{INLV} = GY_{CP} + GY_{CS} + GY_{IAU} + GY_{IAS} + GY_{IBU} + GY_{IBS} + GY_{IW} + GY_{V}$ |
| GY_INVR  | Domestic demand, at 1991 prices, DM billion, defined:  
  $GY_{INVR} = GY_{CPR} + GY_{CSR} + GY_{IAR} + GY_{IASR} + GY_{IBUR} + GY_{IBSR} + GY_{IWR} + GY_{V}$ |
| GY_IW    | Gross investment in residential construction, at current prices, DM billion, Series DQ0033 and DQ9033 |
GY_IWR II.3 Gross investment in residential construction, at 1991 prices, DM billion, Series DQ0034 and DQ9034

GY_KATA'X Potential working days, Series VJ7027

GY_KBAU II.5 Firms’ capital consumption in machinery and equipment, at 1991 prices, DM billion, Series VQ7101

GY_KBBU II.6 Firms’ capital consumption in construction, at 1991 prices, DM billion, Series VQ7100 minus VQ7101

GY_KRAD II.20 “Smoothed” private capital stock in machinery and equipment, at 1991 prices, DM billion, defined:

\[ GY_{KRAU} = 0.5 \times (GY_{KBAU} + GY_{KBAU-1}) \]

GY_KRAU II.19 Private capital stock in machinery and equipment, at 1991 prices, DM billion, defined:

\[
GY_{KRAU} = 606.12 + \sum_{1960/1}^{1990/2} (GY_{IAUR} - GY_{KBAU}) + 144.96 + \sum_{1990/3}^{1990/2} (GY_{IAUR} - GY_{KBAU})
\]

GY_KRBD II.22 “Smoothed” private capital stock in construction, at 1991 prices, DM billion, defined:

\[ GY_{KRBU} = 0.5 \times (GY_{KBBU} + GY_{KBBU-1}) \]

GY_KRBU II.21 Private capital stock in construction, at 1991 prices, DM billion, defined:

\[
GY_{KRBU} = 842.28 + \sum_{1960/1}^{1990/2} (GY_{IBUR} - GY_{KBBU}) + 432.11 + \sum_{1990/3}^{1990/2} (GY_{IBUR} - GY_{KBBU})
\]

GY_KSTA'X Corporate tax rate for withdrawn profits, Series VQ7193

GY_KSTN'X Corporate tax rate for retained profits, Series VQ7194

GY_L I.16 Gross wage income, DM billion, Deutsche Bundesbank, Monthly Report, Table IX.1., Series DQ0048 and DQ9048
GY_LAST III.2 Gross wage income per hour worked, 1991 = 100, defined:
\[ G_Y_{\text{LAST}} = 3.232 \times \frac{G_Y_{\text{L}}}{0.001 \times G_Y_{\text{B}} \times G_Y_{\text{ARST}}} \]

GY_LBS I.28 Current account balance, DM billion, Deutsche Bundesbank, Monthly Report, Table X.1., Series EU4710

GY_LG I.17 Gross wage income (excluding employers’ social contributions), DM billion, Series DQ0426 and DQ9426

GY_LN I.18 Net wage income, DM billion, Deutsche Bundesbank, Monthly Report, Table IX.8., Series DQ0403 and DQ9403

GY_LOST IV.11 Tax on wage income, DM billion, Series DQ0734 and DQ9734

GY_LPAC 11.II.23 Foreign competitors’ deflator, definition (t.b.)

GY_LST IV.1 Wage tax rate, per cent, defined:
\[ G_Y_{\text{LST}} = 100 \times \frac{G_Y_{\text{LOST}}}{0.85 \times G_Y_{\text{LG}}} \]

GY_LTGO’X Negotiated monthly wage and salary level (eastern Germany), 1991 = 100, Deutsche Bundesbank, Monthly Report, Table IX.9., Series DC7504

GY_LTGW III.1 Negotiated monthly wage and salary level (western Germany), 1991 = 100, Deutsche Bundesbank, Monthly Report, Table IX.9., Series DC5504

GY_M3 V.2a Money stock M3, DM billion, end-of-quarter values, Series TU0800

GY_MGR V.2c Monetary growth rate, per cent p.a., defined:
\[ 0.01 G_Y_{\text{MGR}} = \Delta_4 \ln (G_Y_{\text{MB}}) \]

GY_MTR V.1 Monetary target rate, per cent p.a., definition

GY_MWST’X “Normal” value-added tax rate, Series VQ7015
GY_NGVA  I.27  Net financial wealth of foreign countries, DM billion, defined:

\[ GY_{\text{NGVA}} = -23.10 + \sum_{1960/1}^{1990/2} GY_{\text{FA}} + 71.43 + \sum_{1990/3}^{1990/3} GY_{\text{FA}} \]

GY_NGVS  IV.21  Net financial wealth of government, DM billion, defined:

\[ GY_{\text{NGVS}} = 41.00 + \sum_{1960/1}^{1990/2} GY_{\text{FS}} + 41.45 + \sum_{1990/3}^{1990/3} GY_{\text{FS}} \]

GY_NGVU  II.25  Net financial wealth of firms, DM billion, defined:

\[ GY_{\text{NGVU}} = -126.10 + \sum_{1960/1}^{1990/2} GY_{\text{FU}} - 429.23 + \sum_{1990/3}^{1990/3} GY_{\text{FU}} \]

GY_PBIP  III.13  Deflator of gross domestic product, 1991 = 100, defined:

\[ GY_{\text{PBIP}} = \frac{G_{\text{BIP}}}{G_{\text{BIPR}}} \]

GY_PCP  III.4  Deflator of private consumption, 1991 = 100, defined:

\[ GY_{\text{PCP}} = 100 * \frac{G_{\text{CP}}}{G_{\text{CPR}}} \]

GY_PCPD  III.14  Adaptive expectation on consumer price inflation, per cent p.a., defined:

\[ GY_{\text{PCPD}} = 0.9 * GY_{\text{PCPD}_{-1}} + 0.1 * \Delta_q \ln(GY_{\text{PCP}}_{-1}) + 100 \]

GY_PCS  III.5  Deflator of government consumption, 1991 = 100, defined:

\[ GY_{\text{PCS}} = 100 * \frac{G_{\text{CS}}}{G_{\text{CSR}}} \]

GY_PEND  II.9  Commuters, million, defined: \( GY_{\text{PEND}} = GY_{\text{BI}} - GY_{\text{B1}} \)

GY_PEV  III.12  Deflator of final demand, 1991 = 100, defined:

\[ GY_{\text{PEV}} = 100 * \frac{G_{\text{END}}}{G_{\text{ENDR}}} \]

GY_PEV  III.15  Adaptive expectation on inflation rate of final demand, per cent p.a., defined:

\[ GY_{\text{PEVD}} = 0.9 * GY_{\text{PEVD}_{-1}} + 0.1 * \Delta_q \ln(GY_{\text{PEV}}_{-1}) + 100 \]
<table>
<thead>
<tr>
<th>Code</th>
<th>Section</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>GY_PEX</td>
<td>III.11</td>
<td>Deflator of exports of goods and services, 1991 = 100, defined: $\frac{GY_{EX}}{GY_{EXR}} \times 100$</td>
</tr>
<tr>
<td>GY_PEXA</td>
<td>11.II.7</td>
<td>World export deflator for imports of Germany, definition</td>
</tr>
<tr>
<td>GY_PIAS</td>
<td>III.7</td>
<td>Deflator of government gross machinery and equipment investment, 1991 = 100, defined: $\frac{GY_{IAS}}{GY_{IASR}} \times 100$</td>
</tr>
<tr>
<td>GY_PIAU</td>
<td>III.6</td>
<td>Deflator of firms’ gross machinery and equipment investment, 1991 = 100, defined: $\frac{GY_{IAU}}{GY_{IAUR}} \times 100$</td>
</tr>
<tr>
<td>GY_PIBS</td>
<td>III.9</td>
<td>Deflator of government gross investment in construction, 1991 = 100, defined: $\frac{GY_{IBS}}{GY_{IBSR}} \times 100$</td>
</tr>
<tr>
<td>GY_PIBU</td>
<td>III.8</td>
<td>Deflator of firms’ gross investment in construction, 1991 = 100, defined: $\frac{GY_{IBU}}{GY_{IBUR}} \times 100$</td>
</tr>
<tr>
<td>GY_PIM</td>
<td>11.II.8</td>
<td>Deflator of imports of goods and services, 1991 = 100, defined: $\frac{GY_{IM}}{GY_{IMR}} \times 100$</td>
</tr>
<tr>
<td>GY_PINV</td>
<td>III.3b</td>
<td>Deflator of domestic demand, 1991 = 100, defined: $\frac{GY_{INLV}}{GY_{INVR}} \times 100$</td>
</tr>
<tr>
<td>GY_PIW</td>
<td>III.10</td>
<td>Deflator of investment in residential construction, 1991 = 100, defined: $\frac{GY_{IW}}{GY_{IWR}} \times 100$</td>
</tr>
<tr>
<td>GY_PSM3</td>
<td>V.3</td>
<td>Long-term price level (P-Star), 1991 = 100, definition</td>
</tr>
<tr>
<td>GY_RL</td>
<td>V.5</td>
<td>Yield on government bonds with residual maturities of nine to ten years, per cent p. a., Deutsche Bundesbank, Monthly Report, Table VII.5, Series WX3950 and WU8612</td>
</tr>
</tbody>
</table>
GY_RLST V.7 Long-term interest rate (long-run), per cent p.a., definition

GY_RPEN V.10 Interest rate for Bundesbank’s open market transactions in securities under repurchase agreements, per cent p. a., Deutsche Bundesbank, Monthly Report, Table VI.3., Series VQ7225

GY_RS V.4 Interest rate for three-month money market funds, per cent p. a., Deutsche Bundesbank, Monthly Report, Table VI.5., Series SU0107

GY_RSST V.6 Short-term interest rate (long-run), per cent p.a., definition

GY_RZIN V.8 Interest rate on government debt, per cent p. a., defined:

\[ GY_{RZIN} = GY_{ZINS} - \sum_{i=0}^{3} GY_{BVS_i} \]

GY_SEIN IV.19 Government revenue, DM billion, defined:

\[ GY_{SEIN} = GY_{TDIR} + GY_{TBSP} + GY_{SOZ} + GY_{GST} \]

GY_SELBX Number of self-employed and unpaid family workers, million, Series DQ9143

GY_SEVEX Net current transfers from the rest of the world, DM billion, defined: \( GY_{SEVE} = GY_{BSP} - GY_{BIP} \)

GY_SOZ IV.16 Employers’ and employees’ social contributions, DM billion, defined: \( GY_{SOZ} = GY_{L} - GY_{LN} - GY_{LOST} \)

GY_SOZBX Rate of contributions to pension insurance, unemployment insurance, and health insurance, per cent, Series VQ7230

GY_SOZNX Employees’ social contributions, DM billion, defined:

\[ GY_{SOZN} = GY_{SOZ} - GY_{SZAF} \]

GY_SRSSX Residual item in the financial account of government, DM billion, defined:

\[ GY_{SRSS} = GY_{SEIN} - GY_{CS} - GY_{IAS} - GY_{IBS} - GY_{SUBV} - GY_{TRN} - GY_{ZINS} - GY_{FS} \]
GY_SUBV IV.9 Government subsidies to private firms (including subsidies of foreign countries), DM billion, Series DQ0413 and DQ9413

GY_SVPH I.5 Net capital transfer payments of households, DM billion, defined: GY_SVPH = GY_YV - GY_CP - GY_FH

GY_SZAF IV.6 Employers' social contributions, including voluntary contributions, DM billion, defined: GY_SZAF = GY_L - GY_LG

GY_TA II.31 Negotiated working time per employee, hours, defined: GY_TA = (GY_KATA - GY_TJU + GY_WOST) * 5

GY_TBSO IV.4 Other indirect taxes, DM billion, defined: GY_TBSO = GY_TBSP - GY_UST

GY_TBSP IV.15 Indirect taxes, DM billion, Series DQ0412 and DQ9412

GY_TDIR IV.14 Direct taxes, DM billion, Series DQ0450 and DQ9450

GY_TDSO IV.2 Other direct taxes, DM billion, defined: GY_TDSO = GY_TDIR - GY_LOST

GY_TIPS IV.18 Indirect tax rate, defined: GY_TIPS = 1 - 0.333 * GY_MWST - (GY_TBSP - GY_SUBV) / GY_END

GY_TJU'X Negotiated vacation time, days, Series VQ7110

GY_TRN IV.8 Government current transfer payments to households (after deduction of tax on pensions), Deutsche Bundesbank, Monthly Report, Table IX.8., Series DQ0082 and DQ9082

GY_TSUD IV.17 Corporate tax rate, defined: GY_TSUD = 0.5 * (0.4 * GY_KSTA + 0.6 * GY_KSTN)

GY_UST IV.3 Value-added taxes (including turnover tax on imports), DM billion, Deutsche Bundesbank, Monthly Report, Table VIII.5., Series BU2001 and BU2002

GY_V II.18 Inventory investment, at current prices, DM billion, Deutsche Bundesbank, Monthly Report, Table IX.1., Series DQ0084 and DQ9084
GY_VERR I.4 Transfers of households to foreign countries, DM billion, defined:

\[ GY_{\text{VERR}} = GY_{\text{LN}} + GY_{\text{GNEH}} + GY_{\text{TRN}} - GY_{\text{YV}} \]

GY_VR II.4 Inventory investment, at 1991 prices, DM billion, Deutsche Bundesbank, Monthly Report, Table IX.1., Series DQ0085 and DQ9085

GY_WOBA I.25 Population between 15 and 65 years of age, million, defined: \( GY_{\text{WOBA}} = GY_{\text{WOBE}} - GY_{\text{WOBS}} \)

GY_WOBE X Population, million, Series UQBA28

GY_WOBS'X Population under 15 and over 65 years of age, million, Series VJ7009

GY_WOST'X Negotiated working time per week, hours, Series VQ7109

GY_YV I.21 Disposable income of households, DM billion, Deutsche Bundesbank, Monthly Report, Table IX.8., Series DQ0405 and DQ9405

GY_ZAU III.16 Present value of depreciation allowances for machinery and equipment investment, defined:

\[ GY_{\text{ZAU}} = \frac{0.2}{(0.1 \times GY_{\text{RL}} + 0.026) \times (1 - GY_{\text{TSUD}}) + 0.2} \]

GY_ZINS IV.13 Interest payments by government, DM billion, Series DQ0460 and DQ9460

United Kingdom

UK_ARL II.10 Unemployment, million, Series YSG300

UK_ARLQ II.11 Unemployment rate as a percentage of total labour force, per cent, defined:

\[ UK_{\text{ARLQ}} = 100 \times \frac{UK_{\text{ARL}}}{UK_{\text{ET}} + UK_{\text{ARL}}} \]

UK_ARLQN II.12 "Smoothed" unemployment rate as a percentage of total labour force, per cent, defined:

\[ UK_{\text{ARLQN}} = 0.9 \times UK_{\text{ARLQN}_{-1}} + 0.1 \times UK_{\text{ARLQ}} \]
<table>
<thead>
<tr>
<th>Code</th>
<th>Section</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>UK_BIP</td>
<td>I.9</td>
<td>Gross domestic product, at current prices, £ billion, Series YAG003</td>
</tr>
<tr>
<td>UK_BIPQ</td>
<td>II.6</td>
<td>Potential gross domestic product, at 1995 prices, £ billion, definition</td>
</tr>
<tr>
<td>UK_BIPR</td>
<td>I.10</td>
<td>Gross domestic product, at 1995 prices, £ billion, Series YAG103</td>
</tr>
<tr>
<td>UK_COSI</td>
<td>III.7</td>
<td>Index of production costs, 1995 = 100, defined:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>[ \text{UK_COSI} = \frac{100}{99.987} \times \text{UK_LA}^{0.678} + \text{UK_PIM}^{1-0.678} ]</td>
</tr>
<tr>
<td>UK_CP</td>
<td>I.5</td>
<td>Private consumption, at current prices, £ billion, Series YAG008</td>
</tr>
<tr>
<td>UK_CPR</td>
<td>I.1</td>
<td>Private consumption, at 1995 prices, £ billion, Series YAG108</td>
</tr>
<tr>
<td>UK_D</td>
<td>II.5</td>
<td>Depreciation allowances, £ billion, defined:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>[ \text{UK_D} = \text{UK_BIP} - \text{UK_TDB} - \text{UK_TIS} - \text{UK_YV} + \text{UK_S8} ]</td>
</tr>
<tr>
<td>UK_E1</td>
<td>II.3</td>
<td>Employment, million, Series YQG330</td>
</tr>
<tr>
<td>UK_END</td>
<td>I.7</td>
<td>Final demand, at current prices, £ billion, defined:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>[ \text{UK_END} = \text{UK_CP} + \text{UK_IAN} + \text{UK_G} + \text{UK_V} + \text{UK_EX} ]</td>
</tr>
<tr>
<td>UK_ENDR</td>
<td>I.8</td>
<td>Final demand, at 1995 prices, £ billion, defined:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>[ \text{UK_ENDR} = \text{UK_CPR} + \text{UK_IANR} + \text{UK_GR} + \text{UK_VR} + \text{UK_EXR} ]</td>
</tr>
<tr>
<td>UK_ER</td>
<td>V.6</td>
<td>Exchange rate of pound against US$, pounds per US$ 100, defined:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>[ \text{UK_ER} = \text{GY_ER} + \text{WLV5005} ]</td>
</tr>
<tr>
<td>UK_EW</td>
<td>I.2</td>
<td>Total labour force, million, defined:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>[ \text{UK_EW} = \text{UK_ET} + \text{UK_ARL} ]</td>
</tr>
<tr>
<td>UK_EX</td>
<td>11.1.11</td>
<td>Exports of goods and services, at current prices, £ billion, Series YAG005</td>
</tr>
<tr>
<td></td>
<td>(t.b.)</td>
<td></td>
</tr>
<tr>
<td>UK_EXR</td>
<td>11.1.12</td>
<td>Exports of goods and services, at 1995 prices, £ billion, Series YAG105</td>
</tr>
<tr>
<td></td>
<td>(t.b.)</td>
<td></td>
</tr>
<tr>
<td>UK_FH</td>
<td>I.14</td>
<td>Net lending of households, £ billion, Series LQ0783</td>
</tr>
<tr>
<td>UK_FS</td>
<td>IV.8</td>
<td>Net lending of government, £ billion, Series LJ9995</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>286</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Variable</td>
<td>Code</td>
<td>Description</td>
</tr>
<tr>
<td>----------</td>
<td>------</td>
<td>-------------</td>
</tr>
<tr>
<td>Net lending of firms, £ billion, defined:</td>
<td>UK_FU</td>
<td></td>
</tr>
<tr>
<td>Government demand, at current prices, £ billion, Series (YAG009 + LQ0773)</td>
<td>UK_G</td>
<td>IV.7</td>
</tr>
<tr>
<td>Capacity utilisation, per cent, defined:</td>
<td>UK_GAPQ</td>
<td>II.9</td>
</tr>
<tr>
<td>Government demand, at 1995 prices, £ billion, Series (YAG109 + LQ0799)</td>
<td>UK_GR</td>
<td>IV.3</td>
</tr>
<tr>
<td>Gross private fixed capital investment, at current prices, £ billion, Series (YAG011 - LQ0773)</td>
<td>UK_IAN</td>
<td>I.6</td>
</tr>
<tr>
<td>Gross private fixed capital investment, at 1995 prices, £ billion, Series (YAG111 - LQ0799)</td>
<td>UK_IANR</td>
<td>II.1</td>
</tr>
<tr>
<td>Imports of goods and services, at current prices, £ billion, Series YAG006</td>
<td>UK_IM</td>
<td>11.I.31</td>
</tr>
<tr>
<td>World import demand for exports from the United Kingdom, definition</td>
<td>UK_IMAK</td>
<td>11.I.10</td>
</tr>
<tr>
<td>Imports of goods and services, at 1995 prices, £ billion, Series YAG106</td>
<td>UK_IMR</td>
<td>II.4</td>
</tr>
<tr>
<td>Domestic price inflation, per cent p. a., defined:</td>
<td>UK_INF</td>
<td>III.2a</td>
</tr>
<tr>
<td>Target inflation rate, per cent p.a., defined:</td>
<td>UK_INFT'X</td>
<td></td>
</tr>
<tr>
<td>Depreciation rate, per cent, defined:</td>
<td>UK_KAB'X</td>
<td></td>
</tr>
<tr>
<td>Private capital stock, at 1995 prices, £ billion, Series PJ02TY</td>
<td>UK_KRP</td>
<td>II.8</td>
</tr>
<tr>
<td>Gross wage income, £ billion, Series LQ0767</td>
<td>UK_L</td>
<td>I.13</td>
</tr>
</tbody>
</table>
UK_LA III.1 Gross wage income per employee, 1995 = 100, defined: $\text{UK\_LA} = \frac{\text{UK\_L}}{\text{UK\_EI} \times 3.688}$

UK_LBS I.15 Current account balance, £ billion, Series LA0859

UK_LPAC 11.II.24 Foreign competitors' deflator, definition (t.b.)

UK_M4 V.1 Money stock, £ billion, Series AS3478

UK_pbip III.9 Deflator of gross domestic product, 1995 = 100, defined: $\text{UK\_PBIP} = 100 + \frac{\text{UK\_BIP}}{\text{UK\_BIPR}}$

UK_PCp III.3 Deflator of private consumption, 1995 = 100, defined: $\text{UK\_PCP} = 100 \times \frac{\text{UK\_CP}}{\text{UK\_CPR}}$

UK_PCpD III.10 Adaptive expectation on consumer price inflation, per cent p.a., defined: $\text{UK\_PCPD} = 0.9 \times \text{UK\_PCPD}_{-1} + 0.1 \times \Delta \ln(\text{UK\_PCP}_{-1}) \times 100$

UK_PEV III.8 Deflator of final demand, 1995 = 100, defined: $\text{UK\_PEV} = 100 \times \frac{\text{UK\_END}}{\text{UK\_ENDR}}$

UK_PEvD III.11 Adaptive expectation on inflation rate of final demand, per cent p.a., defined: $\text{UK\_PEVD} = 0.9 \times \text{UK\_PEVD}_{-1} + 0.1 \times \Delta \ln(\text{UK\_PEV}_{-1}) \times 100$

UK_PEx III.6 Deflator of exports of goods and services, 1995 = 100, defined: $\text{UK\_PEx} = 100 \times \frac{\text{UK\_EX}}{\text{UK\_EXR}}$

UK_PeXA 11.II.9 World export deflator for imports of the United Kingdom, definition (t.b.)

UK_PG III.4 Deflator of government demand, 1995 = 100, defined: $\text{UK\_PG} = 100 \times \frac{\text{UK\_G}}{\text{UK\_GR}}$

UK_PIAN III.5 Deflator of private fixed capital investment, 1995 = 100, defined: $\text{UK\_PIAN} = 100 \times \frac{\text{UK\_IAN}}{\text{UK\_IANR}}$

288
<table>
<thead>
<tr>
<th>UK_PIM</th>
<th>11.II.10</th>
<th>Deflator of imports of goods and services, 1995 = 100, defined: $IMR_{UK} = 100 \times \frac{UK_{IM}}{UK_{IMR}}$</th>
</tr>
</thead>
<tbody>
<tr>
<td>UK_PINV</td>
<td>III.2b</td>
<td>Deflator of domestic demand, 1995 = 100, defined: $INVR_{UK} = 100 \times \frac{UK_{INLV}}{UK_{INVR}}$</td>
</tr>
<tr>
<td>UK_RL</td>
<td>V.3</td>
<td>Yield on government bonds with residual maturities of ten years, per cent p. a., Series AU3325</td>
</tr>
<tr>
<td>UK_RLST</td>
<td>V.5</td>
<td>Long-term interest rate (long-run), per cent p.a., definition</td>
</tr>
<tr>
<td>UK_RS</td>
<td>V.2</td>
<td>Money market interest rate for three-month funds (Treasury bill rate), per cent p. a., Series AU3210</td>
</tr>
<tr>
<td>UK_RSST</td>
<td>V.4</td>
<td>Short-term interest rate (long-run), per cent p.a., definition</td>
</tr>
<tr>
<td>UK_SB</td>
<td>IV.4</td>
<td>Government transfers to households, £ billion, Series LJ1646</td>
</tr>
<tr>
<td>UK_SDN'X</td>
<td></td>
<td>Statistical discrepancy of gross domestic product, at current prices, £ billion, defined: $SDN_{UK} = BIP_{UK} - \left( CP_{UK} + G_{UK} + I_{UK} - \text{IM}<em>{UK} + V</em>{UK} - \text{EX}<em>{UK} - \text{IMR}</em>{UK} \right)$</td>
</tr>
<tr>
<td>UK_SDR'X</td>
<td></td>
<td>Statistical discrepancy of gross domestic product, at 1995 prices, £ billion, defined: $SDR_{UK} = BIPR_{UK} - \left( CPR_{UK} + GR_{UK} + IANR_{UK} + VR_{UK} + EXR_{UK} - IMR_{UK} \right)$</td>
</tr>
<tr>
<td>UK_TDB</td>
<td>IV.5</td>
<td>Direct taxes, £ billion, defined: $TDB_{UK} = G_{UK} + SB_{UK} + FS_{UK} - TIS_{UK}$</td>
</tr>
<tr>
<td>UK_TDBS</td>
<td>IV.1</td>
<td>Direct tax rate, per cent, defined: $TDBS_{UK} = \frac{TDB_{UK}}{VE_{UK}} \times 100$</td>
</tr>
<tr>
<td>UK_TERM'X</td>
<td></td>
<td>Term premium on interest rates, per cent p. a., defined: $\text{TERM}<em>{UK} = \text{mean} (\text{RL}</em>{UK} - \text{RS}_{UK})$</td>
</tr>
<tr>
<td>UK_TIS</td>
<td>IV.6</td>
<td>Indirect taxes excluding subsidies, £ billion, Series LQ0766</td>
</tr>
</tbody>
</table>

289
UK\_TISS \text{IV.2} \quad \text{Indirect tax rate, per cent, defined:} \\
\quad \text{UK\_TISS} = \frac{\text{UK\_TIS}}{\text{UK\_END}} + 100

UK\_U \text{I.4} \quad \text{Transfers to foreign countries, £ billion, defined:} \\
\quad \text{UK\_U} = \text{UK\_EX} - \text{UK\_IM} - \text{UK\_LBS}

UK\_V \text{II.7} \quad \text{Inventory investment, at current prices, £ billion, Series} \\
\quad \text{YAG010}

UK\_VE \text{I.11} \quad \text{National income, £ billion, defined:} \\
\quad \text{UK\_VE} = \text{UK\_BIP} - \text{UK\_TIS} - \text{UK\_D}

UK\_VR \text{II.2} \quad \text{Inventory investment, at 1995 prices, £ billion, Series} \\
\quad \text{YAG110}

UK\_WOBE \text{I.3} \quad \text{Population, million, Series YJG350}

UK\_YV \text{I.12} \quad \text{Disposable income of households, £ billion, defined:} \\
\quad \text{UK\_YV} = \text{UK\_CP} + \text{UK\_FH}

\text{France}

FR\_ARL \text{II.10} \quad \text{Unemployment, million, Series YSF300}

FR\_ARLQ \text{II.11} \quad \text{Unemployment rate as a percentage of total labour force, per cent, defined:} \\
\quad \text{FR\_ARLQ} = 100 \cdot \frac{\text{FR\_ARL}}{\text{FR\_ET} + \text{FR\_ARL}}

FR\_ARLQN \text{II.12} \quad \text{“Smoothed” unemployment rate as a percentage of} \\
\quad \text{total labour force, per cent, defined:} \\
\quad \text{FR\_ARLQN} = 0.9 \cdot \text{FR\_ARLQ}_{-1} + 0.1 \cdot \text{FR\_ARLQ}

FR\_BIP \text{I.9} \quad \text{Gross domestic product, at current prices, FF billion,} \\
\quad \text{Series YAF003}

FR\_BIPQ \text{II.6} \quad \text{Potential gross domestic product, at 1980 prices, FF} \\
\quad \text{billion, definition}

FR\_BIPR \text{I.10} \quad \text{Gross domestic product, at 1980 prices, FF billion,} \\
\quad \text{Series YAF103}
FR_COSI  III.7  Index of production costs, 1980 = 100, defined:
\[ FR\_COSI = \frac{100}{100.01} \times FR\_LA^{0.713} \times FR\_PM^{1-0.713} \]

FR_CP  I.5  Private consumption, at current prices, FF billion, Series YAF008

FR_CPR  I.1  Private consumption, at 1980 prices, FF billion, Series YAF108

FR_D  II.5  Depreciation allowances, FF billion, defined:
\[ FR\_D = FR\_BIP - FR\_TDB - FR\_TIS - FR\_YV + FR\_SB \]

FR_E1  II.3  Employment, million, Series YJF330

FR_EMU'X  Dummy variable for participation in European Monetary Union, until 1998 Q4 = 0, from 1999 Q1 = 1

FR_END  I.7  Final demand, at current prices, FF billion, defined:
\[ FR\_END = FR\_CP + FR\_IAN + FR\_G + FR\_V + FR\_EX \]

FR_ENDR  I.8  Final demand, at 1980 prices, FF billion, defined:
\[ FR\_ENDR = FR\_CPR + FR\_IANR + FR\_GR + FR\_VR + FR\_EXR \]

FR_ER  V.6  Exchange rate of the franc against the US$, French francs per US$, defined: \[ FR\_ER = GY\_ER \times FR\_ERDM \]

FR_ERDM  V.9  Exchange rate of the franc against the D-Mark, French francs per D-Mark, Series WU5012

FR_EW  I.2  Total labour force, million, defined:
\[ FR\_EW = FR\_E1 + FR\_ARL \]

FR_EWS'X  Dummy variable for the exchange rate mechanism of the European Monetary System, full participation = 1, non-participation = 0, otherwise in-between

FR_EX  11.I.14  Exports of goods and services, at current prices, FF billion, Series YAF005

FR_EXR  11.I.15  Exports of goods and services, at 1980 prices, FF billion, Series YAF105

FR_FH  I.14  Net lending of households, FF billion, Series LQ0530

FR_FS  IV.8  Net lending of government, FF billion, Series LJ9993
FR_FU II.13 Net lending of firms, FF billion, defined:
\[ FR_{FU} = -FR_{FH} - FR_{FS} + FR_{LBS} \]

FR_G IV.7 Government demand, at current prices, FF billion, Series (YAF009 + LQ0502)

FR_GAPQ II.9 Capacity utilisation, per cent, defined:
\[ FR_{GAPQ} = 100 \times \frac{FR_{BIPR}}{FR_{BIPQ}} \]

FR_GR IV.3 Government demand, at 1980 prices, FF billion, Series (YAF109 + LQ0503)

FR_IAN I.6 Gross private fixed capital investment, at current prices, FF billion, Series (YAF011 - LQ0502)

FR_IANR II.1 Gross private fixed capital investment, at 1980 prices, FF billion, Series (YAF111 - LQ0503)

FR_IM 11.I.32 Imports of goods and services, at current prices, (t.b.) FF billion, Series YAF006

FR_IMAK 11.I.13 World import demand for exports from France, definition

FR_IMR II.4 Imports of goods and services, at 1980 prices, FF billion, Series YAF106

FR_INF III.2a Domestic price inflation, per cent p. a., defined:
\[ FR_{INF} = 100 \times \Delta \ln (FR_{PINV}) \]

FR_INLV I.16 Domestic demand, at current prices, FF billion, defined:
\[ FR_{INLV} = FR_{CP} + FR_{G} + FR_{IAN} + FR_{V} \]

FR_INVR I.17 Domestic demand, at 1980 prices, FF billion, defined:
\[ FR_{INVR} = FR_{CPR} + FR_{GR} + FR_{IANR} + FR_{VR} \]

FR_KAB'X Depreciation rate, per cent, defined:
\[ FR_{KAB} = 100 \times \left( 1 - \frac{FR_{KRP} - FR_{IANR}}{FR_{KRP} - 1} \right) \]

FR_KRP II.8 Private capital stock, at 1980 prices, FF billion, Series PJ02P1

FR_L I.13 Gross wage income, FF billion, Series LQ0524
FR_LA III.1 Gross wage income per employee, 1980 = 100, defined: \( FR_{LA} = \frac{FR_{L}}{FR_{EI}} \times 18.372 \)

FR_LBS I.15 Current account balance, FF billion, Series LQ0616

FR_LPAC 11.II.25 Foreign competitors’ price deflator, definition (t.b.)

FR_M3 V.1 Money stock, FF billion, Series VX8902

FR_PBIP III.9 Price deflator of gross domestic product, 1980 = 100, defined: \( FR_{PBIP} = 100 \times \frac{FR_{BIP}}{FR_{BIPR}} \)

FR_PCP III.3 Price deflator of private consumption, 1980 = 100, defined: \( FR_{PCP} = 100 \times \frac{FR_{CP}}{FR_{CPR}} \)

FR_PCPD III.10 Adaptive expectation on consumer price inflation, per cent p.a., defined:
\( FR_{PCPD} = 0.9 \times FR_{PCPD_{-1}} + 0.1 \times \Delta_{4} \ln (FR_{PCP_{-1}}) \times 100 \)

FR_PEV III.8 Price deflator of final demand, 1980 = 100, defined:
\( FR_{PEV} = 100 \times \frac{FR_{END}}{FR_{ENDR}} \)

FR_PEVD III.11 Adaptive expectation on inflation rate of final demand, per cent p.a., defined:
\( FR_{PEVD} = 0.9 \times FR_{PEVD_{-1}} + 0.1 \times \Delta_{4} \ln (FR_{PEV_{-1}}) \times 100 \)

FR_PEX III.6 Price deflator of exports of goods and services, 1980 = 100, defined: \( FR_{PEX} = 100 \times \frac{FR_{EX}}{FR_{EXR}} \)

FR_PEXA 11.II.11 World export price deflator for imports of France, definition (t.b.)

FR_PG III.4 Price deflator of government demand, 1980 = 100, defined: \( FR_{PG} = 100 \times \frac{FR_{G}}{FR_{GR}} \)

FR_PIAN III.5 Price deflator of private fixed capital investment, 1980 = 100, defined: \( FR_{PIAN} = 100 \times \frac{FR_{IAN}}{FR_{IANR}} \)
**FR_PIM** 11.II.12 Price deflator of imports of goods and services, (t.b.) 1980 = 100, defined: \( FR\_PIM = 100 \times \frac{FR\_IM}{FR\_IMR} \)

**FR_PINV** III.2b Price deflator of domestic demand, 1980 = 100, defined: \( FR\_PINV = 100 \times \frac{FR\_INLV}{FR\_INVR} \)

**FR_PSM3** V.7 Long-term price level (P-Star), 1980 = 100, definition

**FR_RL** V.3 Yield on government bonds with residual maturities of ten years, per cent p. a., Series LQ9983

**FR_RLST** V.5 Long-term interest rate (long-run), per cent p.a., definition

**FR_RRS** V.8 Risk premium, per cent p. a., defined:
\[
FR\_RRS = FR\_RS - GY\_RS - 100 \times \ln \left( \frac{FR\_ERDM}{FR\_ERDM_{-1}} \right)
\]

**FR_RS** V.2 Money market interest rate for three-month funds, per cent p. a., Series AU3504

**FR_RSST** V.4 Short-term interest rate (long-run), per cent p.a., definition

**FR_SB** IV.4 Government transfers to households, FF billion, Series LJ1642

**FR_SDN’X** Statistical discrepancy of gross domestic product, at current prices, FF billion, defined:
\[
FR\_SDN = FR\_BIP - (FR\_CP + FR\_G + FR\_IAN) + FR\_V + FR\_EX - FR\_IM
\]

**FR_SDR’X** Statistical discrepancy of gross domestic product, at 1980 prices, FF billion, defined:
\[
FR\_SDR = FR\_BIPR - (FR\_CPR + FR\_GR + FR\_IANR) + FR\_VR + FR\_EXR - FR\_IMR
\]

**FR_TDB** IV.5 Direct taxes, FF billion, defined:
\[
FR\_TDB = FR\_G + FR\_SB + FR\_FS - FR\_TIS
\]

**FR_TDBS** IV.1 Direct tax rate, per cent, defined:
\[
FR\_TDBS = \frac{FR\_TDB}{FR\_VE} \times 100
\]
<table>
<thead>
<tr>
<th>Code</th>
<th>Series</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>FR_TIS</td>
<td>IV.6</td>
<td>Indirect taxes excluding subsidies, FF billion, Series LQ0525</td>
</tr>
<tr>
<td>FR_TISS</td>
<td>IV.2</td>
<td>Indirect tax rate, per cent, defined:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>$\text{FR}<em>{-\text{TISS}} = \frac{\text{FR}</em>{-\text{TIS}}}{\text{FR}_{-\text{END}}} \times 100$</td>
</tr>
<tr>
<td>FR_U</td>
<td>I.4</td>
<td>Transfers to foreign countries, FF billion, defined:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>$\text{FR}<em>{-\text{U}} = \text{FR}</em>{-\text{EX}} - \text{FR}<em>{-\text{IM}} - \text{FR}</em>{-\text{LBS}}$</td>
</tr>
<tr>
<td>FR_V</td>
<td>II.7</td>
<td>Inventory investment, at current prices, FF billion, Series YAF010</td>
</tr>
<tr>
<td>FR_VE</td>
<td>I.11</td>
<td>National income, FF billion, defined:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>$\text{FR}<em>{-\text{VE}} = \text{FR}</em>{-\text{BIP}} - \text{FR}<em>{-\text{TIS}} - \text{FR}</em>{-\text{D}}$</td>
</tr>
<tr>
<td>FR_VR</td>
<td>II.2</td>
<td>Inventory investment, at 1980 prices, FF billion, Series YAF110</td>
</tr>
<tr>
<td>FR_WOBE</td>
<td>I.3</td>
<td>Population, million, Series YJF350</td>
</tr>
<tr>
<td>FR_YV</td>
<td>I.12</td>
<td>Disposable income of households, FF billion, defined:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>$\text{FR}<em>{-\text{YV}} = \text{FR}</em>{-\text{CP}} + \text{FR}_{-\text{FH}}$</td>
</tr>
</tbody>
</table>

**Italy**

<table>
<thead>
<tr>
<th>Code</th>
<th>Series</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>IT_ARL</td>
<td>II.10</td>
<td>Unemployment, million, Series YAI300</td>
</tr>
<tr>
<td>IT_ARLQ</td>
<td>II.11</td>
<td>Unemployment rate as a percentage of total labour force, per cent, defined:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>$\text{IT}<em>{-\text{ARLQ}} = \frac{100 \times \text{IT}</em>{-\text{ARL}}}{\text{IT}<em>{-\text{E1}} + \text{IT}</em>{-\text{ARL}}}$</td>
</tr>
<tr>
<td>IT_ARLQN</td>
<td>II.12</td>
<td>“Smoothed” unemployment rate as a percentage of total labour force, per cent, defined:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>$\text{IT}<em>{-\text{ARLQN}} = 0.9 \times \text{IT}</em>{-\text{ARLQN}<em>{-1}} + 0.1 \times \text{IT}</em>{-\text{ARLQ}}$</td>
</tr>
<tr>
<td>IT_BIP</td>
<td>I.9</td>
<td>Gross domestic product, at current prices, trillion lira, Series YAI003</td>
</tr>
<tr>
<td>IT_BIPQ</td>
<td>II.6</td>
<td>Potential gross domestic product, at 1990 prices, trillion lira, definition</td>
</tr>
<tr>
<td>Code</td>
<td>Description</td>
<td>Definition</td>
</tr>
<tr>
<td>-------</td>
<td>------------------------------------------------------------------------------</td>
<td>---------------------------------------------------------------------------</td>
</tr>
<tr>
<td>IT_BIPR I.10</td>
<td>Gross domestic product, at 1990 prices, trillion lira, Series YAI103</td>
<td></td>
</tr>
<tr>
<td>IT_BPR III.13</td>
<td>“Smoothed” labour productivity, 1990 = 100, defined:</td>
<td>[ IT_BPR = 0.9 \frac{IT_BPR_1 + 0.1 IT_ENDR}{IT_E1} ]</td>
</tr>
<tr>
<td>IT_COSI III.7</td>
<td>Index of production costs, 1990 = 100, defined:</td>
<td>[ IT_COSI = \frac{100}{99.989} \left( IT_LA^{0.687} + IT_PIM^{1 - 0.687} \right) ]</td>
</tr>
<tr>
<td>IT_CP I.5</td>
<td>Private consumption, at current prices, trillion lira, Series YAI008</td>
<td></td>
</tr>
<tr>
<td>IT_CPR I.1</td>
<td>Private consumption, at 1990 prices, trillion lira, Series YAI108</td>
<td></td>
</tr>
<tr>
<td>IT_D II.5</td>
<td>Depreciation allowances, trillion lira, defined:</td>
<td>[ IT_D = IT_BIP - IT_TD - IT_TIS - IT_YV + IT_SB ]</td>
</tr>
<tr>
<td>IT_D09’X</td>
<td>Dummy variable for structural break in labour market statistics, until 1992 Q4 = 0, from 1993 Q1 = 1</td>
<td></td>
</tr>
<tr>
<td>IT_D11’X</td>
<td>Dummy variable for structural break in population statistics, until 1990 Q4 = 0, from 1991 Q1 = 1</td>
<td></td>
</tr>
<tr>
<td>IT_E1 II.3</td>
<td>Employment, million, Series YQI330</td>
<td></td>
</tr>
<tr>
<td>IT_EMU’X</td>
<td>Dummy variable for participation in European Monetary Union, until 1998 Q4 = 0, from 1999 Q1 = 1</td>
<td></td>
</tr>
<tr>
<td>IT_END I.7</td>
<td>Final demand, at current prices, trillion lira, defined:</td>
<td>[ IT_END = IT_CP + IT_IAN + IT_G + IT_V + IT_EX ]</td>
</tr>
<tr>
<td>IT_ENDR I.8</td>
<td>Final demand, at 1990 prices, trillion lira, defined:</td>
<td>[ IT_ENDR = IT_CPR + IT_IANR + IT_GR + IT_VR + IT_EXR ]</td>
</tr>
<tr>
<td>IT_ER V.6</td>
<td>Exchange rate of the lira against the US$, lira per US$, defined:</td>
<td>[ IT_ER = GY_ER \cdot IT_ERDM ]</td>
</tr>
<tr>
<td>IT_ERDM V.9</td>
<td>Exchange rate of the lira against the D-Mark, lira per D-Mark, Series WU5007</td>
<td></td>
</tr>
<tr>
<td>IT_EW I.2</td>
<td>Total labour force, million, defined:</td>
<td>[ IT_EW = IT_E1 + IT_ARL ]</td>
</tr>
</tbody>
</table>
IT_EWS'X  Dummy variable for the exchange rate mechanism of the European Monetary System, full participation = 1, non-participation = 0, otherwise in-between

IT_EX  11.I.17  Exports of goods and services, at current prices, trillion lira, Series YAI005
(t.b.)

IT_EXR  11.I.18  Exports of goods and services, at 1990 prices, trillion lira, Series YAI105
(t.b.)

IT_FH  I.14  Net lending of households, trillion lira, defined:
\[ \text{IT}_{-\text{FH}} = \text{IT}_{-\text{YV}} - \text{IT}_{-\text{CP}} \]

IT_FS  IV.8  Net lending of government, trillion lira, Series LJ9990

IT_FU  II.13  Net lending of firms, trillion lira, defined:
\[ \text{IT}_{-\text{FU}} = -\text{IT}_{-\text{FH}} - \text{IT}_{-\text{FS}} + \text{IT}_{-\text{LBS}} \]

IT_G  IV.7  Government demand, at current prices, trillion lira, Series (YAI009 + LJ2109)

IT_GAPQ  II.9  Capacity utilisation, per cent, defined:
\[ \text{IT}_{-\text{GAPQ}} = 100 \times \frac{\text{IT}_{-\text{BIPR}}}{\text{IT}_{-\text{BIPQ}}} \]

IT_GR  IV.3  Government demand, at 1990 prices, trillion lira, Series (YAI109 + LJ2110)

IT_IAN  I.6  Gross private fixed capital investment, at current prices, trillion lira, Series (YAI011 - LJ2109)

IT_IANR  II.1  Gross private fixed capital investment, at 1990 prices, trillion lira, Series (YAI111 - LJ2110)

IT_IM  11.I.33  Imports of goods and services, at current prices, trillion lira, Series YAI006
(t.b.)

IT_IMAK  11.I.16  World import demand for exports from Italy, definition
(t.b.)

IT_IMR  II.4  Imports of goods and services, at 1990 prices, trillion lira, Series YAI106

IT_INF  III.2a  Domestic price inflation, per cent p. a., defined:
\[ \text{IT}_{-\text{INF}} = 100 \Delta_4 \ln (\text{IT}_{-\text{PINV}}) \]
IT_INLV I.16 Domestic demand, at current prices, trillion lira, defined: IT_INLV = IT_CP + IT_G + IT_IAN + IT_V

IT_INVRI I.17 Domestic demand, at 1990 prices, trillion lira, defined: IT_INVRI = IT_CPR + IT_GR + IT_IANR + IT_VR

IT_KAB’X Depreciation rate, per cent, defined:
IT_KAB = 100 * \left(1 - \frac{IT_KRP - IT_IANR}{IT_KRP_{-1}}\right)

IT_KRP II.8 Private capital stock, at 1990 prices, trillion lira, Series PJ03DJ

IT_L I.13 Gross wage income, trillion lira, Series LQ1282

IT_LA III.1 Gross wage income per employee, 1990 = 100, defined: IT_LA = \frac{IT_L * 100}{IT_EI * 6.951}

IT_LAS III.12 Long-term gross wage income per employee, 1990 = 100, defined:
IT_LAS = \frac{1}{9.8915} * IT_CP * IT_BPR^{0.84} * (1 - 0.01 IT_ARLQ)^{0.84}

IT_LBS I.15 Current account balance, trillion lira, Series LQ1372

IT_LPAC 11.II.26 Foreign competitors’ price deflator, definition (t.b.)

IT_M3 V.1 Money stock, trillion lira, Series VX8903

IT_PBIP III.9 Price deflator of gross domestic product, 1990 = 100, defined: IT_PBIP = 100 * \frac{IT_BIP}{IT_BIPR}

IT_PCP III.3 Price deflator of private consumption, 1990 = 100, defined: IT_PCP = 100 * \frac{IT_CP}{IT_CPR}

IT_PCPD III.10 Adaptive expectation on consumer price inflation, per cent p.a., defined:
IT_PCPD = 0.9 * IT_PCPD_{-1} + 0.1 * \Delta_4 \ln \{IT_PCP_{-1}\} * 100
<table>
<thead>
<tr>
<th>Code</th>
<th>Section</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>IT_PEV</td>
<td>III.8</td>
<td>Price deflator of final demand, 1990 = 100, defined: $\frac{IT_{-PEV}}{IT_{-ENDR}} = 100$</td>
</tr>
<tr>
<td>IT_PEV_D</td>
<td>III.11</td>
<td>Adaptive expectation on inflation rate of final demand, per cent p.a., defined: $IT_{-PEVD} = 0.9 \times IT_{-PEVD_{-1}} + 0.1 \times \Delta t \ln (IT_{-PEV_{-1}}) \times 100$</td>
</tr>
<tr>
<td>IT_PEX</td>
<td>III.6</td>
<td>Price deflator of exports of goods and services, 1990 = 100, defined: $IT_{-PEX} = 100 \times \frac{IT_{-EX}}{IT_{-EXR}}$</td>
</tr>
<tr>
<td>IT_PEX_A</td>
<td>III.13</td>
<td>World export price deflator for imports of Italy, definition</td>
</tr>
<tr>
<td>IT_PG</td>
<td>III.4</td>
<td>Price deflator of government demand, 1990 = 100, defined: $IT_{-PG} = 100 \times \frac{IT_{-G}}{IT_{-GR}}$</td>
</tr>
<tr>
<td>IT_PIAN</td>
<td>III.5</td>
<td>Price deflator of private fixed capital investment, 1990 = 100, defined: $IT_{-PIAN} = 100 \times \frac{IT_{-IAN}}{IT_{-INVR}}$</td>
</tr>
<tr>
<td>IT_PIM</td>
<td>III.14</td>
<td>Price deflator of imports of goods and services, (t.b.) 1990 = 100, defined: $IT_{-PIM} = 100 \times \frac{IT_{-IM}}{IT_{-IMR}}$</td>
</tr>
<tr>
<td>IT_PINV</td>
<td>III.2b</td>
<td>Price deflator of domestic demand, 1990 = 100, defined: $IT_{-PINV} = 100 \times \frac{IT_{-INLV}}{IT_{-INVR}}$</td>
</tr>
<tr>
<td>IT_PSM3</td>
<td>V.7</td>
<td>Long-term price level (P-Star), 1990 = 100, definition</td>
</tr>
<tr>
<td>IT_RL</td>
<td>V.3</td>
<td>Yield on government bonds with residual maturities of ten years, per cent p.a., Series LQ9980 and AU3305</td>
</tr>
<tr>
<td>IT_RLST</td>
<td>V.5</td>
<td>Long-term interest rate (long-run), per cent p.a., definition</td>
</tr>
<tr>
<td>IT_RRS</td>
<td>V.8</td>
<td>Risk premium, per cent p.a., defined: $IT_{-RRS} = IT_{-RS} - GY_{-RS} - 100 \times \left[ IT_{-ERDM} \right] $</td>
</tr>
<tr>
<td>IT_RS</td>
<td>V.2</td>
<td>Money market interest rate for three-month funds, per cent p.a., Series LU1371</td>
</tr>
</tbody>
</table>
Short-term interest rate (long-run), per cent p.a., definition

**Government transfers to households, trillion lira, Series LJ1643**

**Statistical discrepancy of gross domestic product, at current prices, trillion lira, defined:**
\[ \text{IT}_\text{SDN} = \text{IT}_\text{BIP} - (\text{IT}_\text{CP} + \text{IT}_\text{G} + \text{IT}_\text{IAN} + \text{IT}_\text{V} + \text{IT}_\text{EX} - \text{IT}_\text{IM}) \]

**Statistical discrepancy of gross domestic product, at 1990 prices, trillion lira, defined:**
\[ \text{IT}_\text{SDR} = \text{IT}_\text{BIPR} - (\text{IT}_\text{CPR} + \text{IT}_\text{GR} + \text{IT}_\text{IANR} + \text{IT}_\text{VR} + \text{IT}_\text{EXR} - \text{IT}_\text{IMR}) \]

**Direct taxes, trillion lira, defined:**
\[ \text{IT}_\text{TDB} = \text{IT}_\text{G} + \text{IT}_\text{SB} + \text{IT}_\text{FS} - \text{IT}_\text{TIS} \]

**Direct tax rate, per cent, defined:**
\[ \text{IT}_\text{TDBS} = \frac{\text{IT}_\text{TDB}}{\text{IT}_\text{VE}} \times 100 \]

**Indirect taxes excluding subsidies, trillion lira, Series (LJ1284 - LJ1285)**

**Indirect tax rate, per cent, defined:**
\[ \text{IT}_\text{TISS} = \frac{\text{IT}_\text{TIS}}{\text{IT}_\text{END}} \times 100 \]

**Transfers to foreign countries, trillion lira, defined:**
\[ \text{IT}_\text{U} = \text{IT}_\text{EX} - \text{IT}_\text{IM} - \text{IT}_\text{LBS} \]

**Inventory investment, at current prices, trillion lira, Series YAI010**

**Inventory investment, at 1990 prices, trillion lira, Series YAI110**

**Population, million, Series YJI350**

**Disposable income of households, trillion lira, Series LJ1282**

300
### Canada

<table>
<thead>
<tr>
<th>Code</th>
<th>Definition</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>CA_ARL</td>
<td>Unemployment, million, Series YSK300</td>
<td>II.10</td>
</tr>
<tr>
<td>CA_ARLQ</td>
<td>Unemployment rate as a percentage of total labour force, per cent, defined: ( \frac{CA_{ARL}}{CA_{ARL} + CA_{ARLQ}} \times 100 )</td>
<td>II.11</td>
</tr>
<tr>
<td>CA_ARLQN</td>
<td>“Smoothed” unemployment rate as a percentage of total labour force, per cent, defined: ( 0.9 \times CA_{ARLQN-1} + 0.1 \times CA_{ARLQ} )</td>
<td>II.12</td>
</tr>
<tr>
<td>CA_BIP</td>
<td>Gross domestic product, at current prices, Can. $ billion, Series YAK003</td>
<td>I.9</td>
</tr>
<tr>
<td>CA_BIPQ</td>
<td>Potential gross domestic product, at 1992 prices, Can. $ billion, definition</td>
<td>II.6</td>
</tr>
<tr>
<td>CA_BIPR</td>
<td>Gross domestic product, at 1992 prices, Can. $ billion, Series YAK103</td>
<td>I.10</td>
</tr>
<tr>
<td>CA_COSI</td>
<td>Index of production costs, 1992 = 100, defined: ( \frac{100}{99.994} \times CA_{PM}^{0.662} \times CA_{IM}^{1-0.662} )</td>
<td>III.7</td>
</tr>
<tr>
<td>CA_CP</td>
<td>Private consumption, at current prices, Can. $ billion, Series YAK008</td>
<td>I.5</td>
</tr>
<tr>
<td>CA_CPR</td>
<td>Private consumption, at 1992 prices, Can. $ billion, Series YAK108</td>
<td>I.1</td>
</tr>
<tr>
<td>CA_D</td>
<td>Depreciation allowances, Can. $ billion, defined: ( CA_{D} = CA_{BIP} - CA_{TDB} - CA_{TIS} - CA_{YV} + CA_{SB} )</td>
<td>II.5</td>
</tr>
<tr>
<td>CA_D881'X</td>
<td>Dummy variable, 1988 Q1 = 1, otherwise = 0</td>
<td></td>
</tr>
<tr>
<td>CA_D921'X</td>
<td>Dummy variable, until 1991 Q4 = 0, since 1992 Q1 = 1</td>
<td></td>
</tr>
<tr>
<td>CA_E1</td>
<td>Employment, million, Series YUK330</td>
<td>II.3</td>
</tr>
<tr>
<td>CA_END</td>
<td>Final demand, at current prices, Can. $ billion, defined: ( CA_{END} = CA_{CP} + CA_{IAN} + CA_{G} + CA_{V} + CA_{EX} )</td>
<td>I.7</td>
</tr>
<tr>
<td>Code</td>
<td>Description</td>
<td>Definition</td>
</tr>
<tr>
<td>--------</td>
<td>-----------------------------------------------------------------------------</td>
<td>---------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>CA_ENDR</td>
<td>Final demand, at 1992 prices, Can. $ billion, defined:</td>
<td>$CA_ENDR = CA_CPR + CA_IANR + CA_GR + CA_VR + CA_EXR$</td>
</tr>
<tr>
<td>CA_ER</td>
<td>Exchange rate of the Can. $ against the US$, Can. dollars per US$, defined:</td>
<td>$CA_ER = GY_ER \times WU008$</td>
</tr>
<tr>
<td>CA_EW</td>
<td>Total labour force, million, defined:</td>
<td>$CA_EW = CA_E1 + CA_ARL$</td>
</tr>
<tr>
<td>CA_EX</td>
<td>Exports of goods and services, at current prices, Can. $</td>
<td>Series YAK005</td>
</tr>
<tr>
<td>CA_EXR</td>
<td>Exports of goods and services, at 1992 prices, Can. $</td>
<td>Series YAK105</td>
</tr>
<tr>
<td>CA_FH</td>
<td>Net lending of households, Can. $ billion</td>
<td>Series LQ0288</td>
</tr>
<tr>
<td>CA_FS</td>
<td>Net lending of government, Can. $ billion</td>
<td>Series LJ9992</td>
</tr>
<tr>
<td>CA_FU</td>
<td>Net lending of firms, Can. $ billion, defined:</td>
<td>$CA_FU = - CA_FH - CA_FS + CA_LBS$</td>
</tr>
<tr>
<td>CA_G</td>
<td>Government demand, at current prices, Can. $ billion, defined:</td>
<td>Series (YAK009 + LQ0259)</td>
</tr>
<tr>
<td>CA_GAPQ</td>
<td>Capacity utilisation, per cent, defined:</td>
<td>$CA_GAPQ = 100 \times \frac{CA_BIPR}{CA_BIPQ}$</td>
</tr>
<tr>
<td>CA_IAN</td>
<td>Gross private fixed capital investment, at current prices, Can. $ billion,</td>
<td>Series (YAK011 - LQ0259)</td>
</tr>
<tr>
<td>CA_IANR</td>
<td>Gross private fixed capital investment, at 1992 prices, Can. $ billion,</td>
<td>Series (YAK111 - LQ0262)</td>
</tr>
<tr>
<td>CA_IM</td>
<td>Imports of goods and services, at current prices, Can. $</td>
<td>Series YAK006</td>
</tr>
<tr>
<td>CA_IMAK</td>
<td>World import demand for exports from Canada, definition</td>
<td></td>
</tr>
</tbody>
</table>
CA_IMR II.4 Imports of goods and services, at 1992 prices, Can. $ billion, Series YAK106

CA_INF III.2a Domestic price inflation, per cent p.a., defined:
CA-INF = 100 ∆ln(CA_PINV)

CA_INFT'X Target inflation rate, per cent p.a., defined:
CA_INFT = 2.5

CA_KAB'X Depreciation rate, per cent, defined:
CA_KAB = 100 \times \left( 1 - \frac{CA_KRP - CA_IANR}{CA_KRP_{-1}} \right)

CA_KRP II.8 Private capital stock, at 1992 prices, Can. $ billion, Series PJ011S

CA_L I.13 Gross wage income, Can. $ billion, Series LQ0279

CA_LA III.1 Gross wage income per employee, 1992 = 100, defined:
CA_LA = \frac{100 \times CA_L}{7.550 \times CA_EI}

CA_LBS I.15 Current account balance, Can. $ billion, Series KA0009

CA_LPAC 11.II.27 Foreign competitors’ price deflator, definition (t.b.)

CA_M V.1 Money stock, Can. $ billion, Series LA3437

CA_PBIP III.9 Price deflator of gross domestic product, 1992 = 100, defined:
CA_PBIP = 100 \times \frac{CA_BIP}{CA_BIPR}

CA_PCP III.3 Price deflator of private consumption, 1992 = 100, defined:
CA_PCP = 100 \times \frac{CA_CP}{CA_CPR}

CA_PCPD III.10 Adaptive expectation on consumer price inflation, per cent p.a., defined:
CA_PCPD = 0.9 \times CA_PCPD_{-1} + 0.1 \times ∆ln(CA_PCPD_{-1}) + 100

CA_PEV III.8 Price deflator of final demand, 1992 = 100, defined:
CA_PEV = 100 \times \frac{CA_END}{CA_ENDR}
CA_PEVD  III.11  Adaptive expectation on inflation rate of final demand, per cent p.a., defined:
CA_PEVD = 0.9 * CA_PEVD_{-1} + 0.1 * \Delta \ln (CA_{PEV-1}) + 100

CA_PEX  III.6  Price deflator of exports of goods and services, 1992 = 100, defined: CA_PEX = 100 * \frac{CA_EX}{CA_EXR}

CA_PEXA  11.II.15 World export price deflator for imports of Canada, definition
(t.b.)

CA_PG  III.4  Price deflator of government demand, 1992 = 100, defined: CA_PG = 100 * \frac{CA_G}{CA_GR}

CA_PIAN  III.5  Price deflator of private fixed capital investment, 1992 = 100, defined: CA_PIAN = 100 * \frac{CA_IAN}{CA_IANR}

CA_PIM  11.II.16 Price deflator of imports of goods and services, (t.b.) 1992 = 100, defined: CA_PIM = 100 * \frac{CA(IM)}{CA(IMR)}

CA_PINV  III.2b Price deflator of domestic demand, 1992 = 100, defined:
CA_PINV = 100 * \frac{CA_CP + CA_IAN + CA_G + CA_V}{CA_CPR + CA_IANR + CA_GR + CA_VR}

CA_RL  V.3  Yield on government bonds with residual maturities of ten years, per cent p. a., Series LQ9982

CA_RLD  V.7  "Smoothed" long-term interest rate, per cent p. a., defined:
CA_RLD = 0.9 CA_RLD_{-1} + 0.1 CA_RL

CA_RLST  V.5  Long-term interest rate (long-run), per cent p.a., definition

CA_RS  V.2  Money market interest rate for three-month funds, per cent p. a., Series AU3234

CA_RSST  V.4  Short-term interest rate (long-run), per cent p.a., definition

CA_SB  IV.4  Government transfers to households, Can. $ billion, Series LJ1641
CA_SDN'X  Statistical discrepancy of gross domestic product, at current prices, Can. $ billion, defined:

\[
CA_{SDN} = CA_{BIP} - \left( \frac{CA_{CP} + CA_{G} + CA_{IAN}}{CA_{V} + CA_{EX} - CA_{IM}} \right)
\]

CA_SDR'X  Statistical discrepancy of gross domestic product, at 1992 prices, Can. $ billion, defined:

\[
CA_{SDR} = CA_{BIPR} - \left( \frac{CA_{CPR} + CA_{GR} + CA_{IANR}}{CA_{VR} + CA_{EXR} - CA_{IMR}} \right)
\]

CA_TDB  IV.5  Direct taxes, Can. $ billion, defined:

\[
CA_{TDB} = CA_{G} + CA_{SB} + CA_{FS} - CA_{TIS}
\]

CA_TDBS IV.1  Direct tax rate, per cent, defined:

\[
CA_{TDBS} = \frac{CA_{TDB}}{CA_{VE}} \times 100
\]

CA_TERM'X  Term premium on interest rates, per cent p. a., defined: \( CA_{TERM} = \text{mean} (CA_{RL} - CA_{RS}) \)

CA_TIS  IV.6  Indirect taxes excluding subsidies, Can. $ billion, Series LQ0280

CA_TISS IV.2  Indirect tax rate, per cent, defined:

\[
CA_{TISS} = \frac{CA_{TIS}}{CA_{END}} \times 100
\]

CA_U  I.4  Transfers to foreign countries, Can. $ billion, defined:

\[
CA_{U} = CA_{EX} - CA_{IM} - CA_{LBS}
\]

CA_V  II.7  Inventory investment, at current prices, Can. $ billion, Series YAK010

CA_VE I.11  National income, Can. $ billion, defined:

\[
CA_{VE} = CA_{BIP} - CA_{TIS} - CA_{D}
\]

CA_VR II.2  Inventory investment, at 1992 prices, Can. $ billion, Series YAK110

CA_WOBE I.3  Population, million, Series YJK350

CA_YV I.12  Disposable income of households, Can. $ billion, defined:

\[
CA_{YV} = CA_{CP} + CA_{FH}
\]

305
Netherlands

<table>
<thead>
<tr>
<th>Code</th>
<th>Series</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>NL_ARL</td>
<td>II.10</td>
<td>Unemployment, million, Series YSH300</td>
</tr>
<tr>
<td>NL_ARLQ</td>
<td>II.11</td>
<td>Unemployment rate as a percentage of total labour force, per cent, defined:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>( NL_{\text{ARLQ}} = 100 \frac{NL_{\text{ARL}}}{NL_{\text{E1}} + NL_{\text{ARL}}} )</td>
</tr>
<tr>
<td>NL_ARLQN</td>
<td>II.12</td>
<td>“Smoothened” unemployment rate as a percentage of total labour force, per cent, defined:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>( NL_{\text{ARLQN}} = 0.9 \cdot NL_{\text{ARLQN}<em>1} + 0.1 \cdot NL</em>{\text{ARLQ}} )</td>
</tr>
<tr>
<td>NL_BIP</td>
<td>I.9</td>
<td>Gross domestic product, at current prices, billion guilders, Series YAH003</td>
</tr>
<tr>
<td>NL_BIPQ</td>
<td>II.6</td>
<td>Potential gross domestic product, at 1995 prices, billion guilders, definition</td>
</tr>
<tr>
<td>NL_BIPR</td>
<td>I.10</td>
<td>Gross domestic product, at 1995 prices, billion guilders, Series YAH103</td>
</tr>
<tr>
<td>NL_COSI</td>
<td>III.7</td>
<td>Index of production costs, 1995 = 100, defined:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>( NL_{\text{COSI}} = 100 \left( \frac{NL_{\text{LA}}}{101.36} \right)^{0.524} \cdot NL_{\text{PEM}}^{0.524} )</td>
</tr>
<tr>
<td>NL_CP</td>
<td>I.5</td>
<td>Private consumption, at current prices, billion guilders, Series YAH008</td>
</tr>
<tr>
<td>NL_CPR</td>
<td>I.1</td>
<td>Private consumption, at 1995 prices, billion guilders, Series YAH108</td>
</tr>
<tr>
<td>NL_D</td>
<td>II.5</td>
<td>Depreciation allowances, billion guilders, defined:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>( NL_{\text{D}} = NL_{\text{BIP}} - NL_{\text{TDB}} - NL_{\text{TIS}} - NL_{\text{YV}} + NL_{\text{SB}} )</td>
</tr>
<tr>
<td>NL_D09'X</td>
<td></td>
<td>Dummy variable for structural break in labour market statistics, until 1987 Q4 = 0, since 1988 Q1 = 1</td>
</tr>
<tr>
<td>NL_E1</td>
<td>II.3</td>
<td>Employment, million, defined: ( NL_{\text{E1}} = NL_{\text{EW}} - NL_{\text{ARL}} )</td>
</tr>
<tr>
<td>NL_EMU'X</td>
<td></td>
<td>Dummy variable for participation in European Monetary Union, until 1998 Q4 = 0, from 1999 Q1 = 1</td>
</tr>
<tr>
<td>NL_END</td>
<td>I.7</td>
<td>Final demand, at current prices, billion guilders, defined: ( NL_{\text{END}} = NL_{\text{CP}} + NL_{\text{IAN}} + NL_{\text{G}} + NL_{\text{V}} + NL_{\text{EX}} )</td>
</tr>
</tbody>
</table>
Final demand, at 1995 prices, billion guilders, defined:
\[ \text{NL}_{\text{ENDR}} = \text{NL}_{\text{CPR}} + \text{NL}_{\text{IANR}} + \text{NL}_{\text{GR}} + \text{NL}_{\text{VR}} + \text{NL}_{\text{EXR}} \]

Exchange rate of the guilder against the US$, guilders per US$, defined:
\[ \text{NL}_{\text{ER}} = \text{GY}_{\text{ER}} \times \text{NL}_{\text{ERDM}} \]

Exchange rate of the guilder against the D-Mark, guilders per D-Mark, Series WU5000

Total labour force, million, Series YUH351

Dummy variable for the exchange rate mechanism of the European Monetary System, full participation = 1, non-participation = 0, otherwise in-between

Exports of goods and services, at current prices, billion guilders, Series YAH005

Exports of goods and services, at 1995 prices, billion guilders, Series YAH105

Net lending of households, billion guilders, defined:
\[ \text{NL}_{\text{FH}} = \text{NL}_{\text{YV}} - \text{NL}_{\text{CP}} \]

Net lending of government, billion guilders, Series LJ9998

Net lending of firms, billion guilders, defined:
\[ \text{NL}_{\text{FU}} = - \text{NL}_{\text{FH}} - \text{NL}_{\text{FS}} + \text{NL}_{\text{LBS}} \]

Government demand, at current prices, billion guilders, Series (YAH009 + LQ1508)

Capacity utilisation, per cent, defined:
\[ \text{NL}_{\text{GAPQ}} = 100 \times \frac{\text{NL}_{\text{BIPR}}}{\text{NL}_{\text{BIPQ}}} \]

Government demand, at 1995 prices, billion guilders, Series (YAH109 + LQ1509)

Gross private fixed capital investment, at current prices, billion guilders, Series (YAH011 - LQ1509)

Gross private fixed capital investment, at 1995 prices, billion guilders, Series (YAH111 - LQ1509)
NL_IM 11.I.35 Imports of goods and services, at current prices, billion guilders, Series YAH006

(t.b.)

NL<IMAK> 11.I.22 World import demand for exports from the Netherlands, definition

(t.b.)

NL_IMR II.4 Imports of goods and services, at 1995 prices, billion guilders, Series YAH106

NL_INF III.2a Domestic price inflation, per cent p. a., defined:

\[
NL_{\text{INF}} = 100 \Delta \ln[NL_{\text{PINV}}]
\]

NL_INLV I.16 Domestic demand, at current prices, billion guilders, defined:

\[
NL_{\text{INLV}} = NL_{\text{CP}} + NL_{G} + NL_{IAN} + NL_{V}
\]

NL_INVN I.17 Domestic demand, at 1995 prices, billion guilders, defined:

\[
NL_{\text{INVR}} = NL_{\text{CPR}} + NL_{GR} + NL_{IANR} + NL_{VR}
\]

NL_KAB’X Depreciation rate, per cent, defined:

\[
NL_{\text{KAB}} = 100 \ast \left( 1 - \frac{NL_{\text{KRP}} - NL_{\text{IANR}}}{NL_{\text{KRP}} - 1} \right)
\]

NL_KRP II.8 Private capital stock, at 1995 prices, billion guilders, Series PJ03ZU

NL_L I.13 Gross wage income, billion guilders, Series LQ1606

NL_LA III.1 Gross wage income per employee, 1995 = 100, defined:

\[
NL_{\text{LA}} = \frac{100}{10.946} \ast \frac{NL_{\text{L}}}{NL_{\text{EI}}}
\]

NL_LBS I.15 Current account balance, billion guilders, Series KA9100

NL_LPAC 11.II.28 Foreign competitors’ price deflator, definition

(t.b.)

NL_M3 V.1 Money stock, billion guilders, Series AU5053

NL_PBIP III.9 Price deflator of gross domestic product, 1995 = 100, defined:

\[
NL_{\text{PBIP}} = 100 \ast \frac{NL_{\text{BIP}}}{NL_{\text{BIPR}}}
\]
<table>
<thead>
<tr>
<th>Code</th>
<th>Section</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>NL_PCP</td>
<td>III.3</td>
<td>Price deflator of private consumption, 1995 = 100, defined: ( NL_{PCP} = 100 \times \frac{NL_{CP}}{NL_{CPR}} )</td>
</tr>
<tr>
<td>NL_PCPD</td>
<td>III.10</td>
<td>Adaptive expectation on consumer price inflation, per cent p.a., defined: ( NL_{PCPD} = 0.9 \times NL_{PCPD, -1} + 0.1 \times \Delta \ln (NL_{PCP, -1}) \times 100 )</td>
</tr>
<tr>
<td>NL_PEV</td>
<td>III.8</td>
<td>Price deflator of final demand, 1995 = 100, defined: ( NL_{PEV} = 100 \times \frac{NL_{END}}{NL_{ENDR}} )</td>
</tr>
<tr>
<td>NL_PEVD</td>
<td>III.11</td>
<td>Adaptive expectation on inflation rate of final demand, per cent p.a., defined: ( NL_{PEVD} = 0.9 \times NL_{PEVD, -1} + 0.1 \times \Delta \ln (NL_{PEV, -1}) \times 100 )</td>
</tr>
<tr>
<td>NL_PEX</td>
<td>III.6</td>
<td>Price deflator of exports of goods and services, 1995 = 100, defined: ( NL_{PEX} = 100 \times \frac{NL_{EX}}{NL_{EXR}} )</td>
</tr>
<tr>
<td>NL_PEXA</td>
<td>11.II.17(t.b.)</td>
<td>World export price deflator for imports of the Netherlands, definition</td>
</tr>
<tr>
<td>NL_PG</td>
<td>III.4</td>
<td>Price deflator of government demand, 1995 = 100, defined: ( NL_{PG} = 100 \times \frac{NL_{G}}{NL_{GR}} )</td>
</tr>
<tr>
<td>NL_PIAN</td>
<td>III.5</td>
<td>Price deflator of private fixed capital investment, 1995 = 100, defined: ( NL_{PIAN} = 100 \times \frac{NL_{IAN}}{NL_{IANR}} )</td>
</tr>
<tr>
<td>NL_PIM</td>
<td>11.II.18(t.b.)</td>
<td>Price deflator of imports of goods and services, ( 1995 = 100 ), defined: ( NL_{PIM} = 100 \times \frac{NL_{IM}}{NL_{IMR}} )</td>
</tr>
<tr>
<td>NL_PINV</td>
<td>III.2b</td>
<td>Price deflator of domestic demand, 1995 = 100, defined: ( NL_{PINV} = 100 \times \frac{NL_{CP} + NL_{IAN} + NL_{G} + NL_{V}}{NL_{CPR} + NL_{IANR} + NL_{GR} + NL_{VR}} )</td>
</tr>
<tr>
<td>NL_PSM3</td>
<td>V.7</td>
<td>Long-term price level (P-Star), 1995 = 100, definition</td>
</tr>
<tr>
<td>NL_RL</td>
<td>V.3</td>
<td>Yield on government bonds with residual maturities of ten years, per cent p.a., Series AU3320</td>
</tr>
<tr>
<td>NL_RLST</td>
<td>V.5</td>
<td>Long-term interest rate (long-run), per cent p.a., definition</td>
</tr>
</tbody>
</table>
Risk premium, per cent p.a., defined:
\[ NL_{RRS} = NL_{RS} - GY_{RS} - 100 \cdot \ln \left( \frac{NL_{ERDM}}{NL_{ERDM,4}} \right) \]

Money market interest rate for three-month funds, per cent p.a., Series AU3249

Short-term interest rate (long-run), per cent p.a., definition

Government transfers to households, billion guilders, Series LJ1645

Statistical discrepancy of gross domestic product, at current prices, billion guilders, defined:
\[ NL_{SDN} = NL_{BIP} - \left( NL_{CP} + NL_{G} + NL_{IAN} + NL_{V} \right) + NL_{EX} - NL_{IM} \]

Statistical discrepancy of gross domestic product, at 1995 prices, billion guilders, defined:
\[ NL_{SDR} = NL_{BIPR} - \left( NL_{CPR} + NL_{GR} + NL_{IANR} \right) + NL_{VR} + NL_{EXR} - NL_{IMR} \]

Direct taxes, billion guilders, defined:
\[ NL_{TDB} = NL_{G} + NL_{SB} + NL_{FS} - NL_{TIS} \]

Direct tax rate, per cent, defined:
\[ NL_{TDBS} = \frac{NL_{TDB}}{NL_{VE}} \cdot 100 \]

Indirect taxes excluding subsidies, billion guilders, Series LQ1522

Indirect tax rate, per cent, defined:
\[ NL_{TISS} = \frac{NL_{TIS}}{NL_{END}} \cdot 100 \]

Transfers to foreign countries, billion guilders, defined:
\[ NL_{U} = NL_{EX} - NL_{IM} - NL_{LBS} \]

Inventory investment, at current prices, billion guilders, Series YAH010

National income, billion guilders, defined:
\[ NL_{VE} = NL_{BIP} - NL_{TIS} - NL_{D} \]
<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
<th>Series</th>
</tr>
</thead>
<tbody>
<tr>
<td>NL_VR</td>
<td>Inventory investment, at 1995 prices, billion guilders</td>
<td>YAH110</td>
</tr>
<tr>
<td>NL_WOBE</td>
<td>Population, million</td>
<td>YJH350</td>
</tr>
<tr>
<td>NL_YV</td>
<td>Disposable income of households, billion guilders</td>
<td>LJ1680</td>
</tr>
</tbody>
</table>

Belgium

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
<th>Series</th>
</tr>
</thead>
<tbody>
<tr>
<td>BE_ARL</td>
<td>Unemployment, million</td>
<td>YJB300</td>
</tr>
<tr>
<td>BE_ARLQ</td>
<td>Unemployment rate as a percentage of total labour force, per cent</td>
<td>YJB100</td>
</tr>
<tr>
<td>BE_ARLQN</td>
<td>“Smoothed” unemployment rate as a percentage of total labour force, per cent</td>
<td>YJB110</td>
</tr>
<tr>
<td>BE_BIP</td>
<td>Gross domestic product, at current prices</td>
<td>YJB003</td>
</tr>
<tr>
<td>BE_BIPQ</td>
<td>Potential gross domestic product, at 1990 prices</td>
<td>YJB006</td>
</tr>
<tr>
<td>BE_BIPR</td>
<td>Gross domestic product, at 1990 prices</td>
<td>YJB103</td>
</tr>
<tr>
<td>BE_COSI</td>
<td>Index of production costs, 1990 = 100</td>
<td>YJB004</td>
</tr>
<tr>
<td>BE_CP</td>
<td>Private consumption, at current prices</td>
<td>YJB008</td>
</tr>
<tr>
<td>BE_CPR</td>
<td>Private consumption, at 1990 prices</td>
<td>YJB108</td>
</tr>
<tr>
<td>BE_D</td>
<td>Depreciation allowances, billion Belgian francs</td>
<td>YJB009</td>
</tr>
</tbody>
</table>

\[
BE_{D} = BE_{BIP} - BE\_TDB - BE\_TIS - BE\_YV + BE\_SB
\]
BE_E1 II.3 Employment, million, Series YJB330

BE_EMU'X Dummy variable for participation in European Monetary Union, until 1998 Q4 = 0, from 1999 Q1 = 1

BE_END I.7 Final demand, at current prices, billion Belgian francs, defined: BE_END = BE_CP + BE_IAN + BE_G + BE_V + BE_EX

BE_ENDR I.8 Final demand, at 1990 prices, billion Belgian francs, defined:
BE_ENDR = BE_CPR + BE_IANR + BE_GR + BE_VR + BE_EXR

BE_ER V.6 Exchange rate of the Belgian franc against the US$, Belgian francs per US$, defined:
BE_ER = GY_ER * BE_ERDM

BE_ERDM V.9 Exchange rate of the Belgian franc against the D-Mark, Belgian francs per D-Mark, Series WU5001

BE_EW I.2 Total labour force, million, defined:
BE_EW = BE_E1 + BE_ARL

BE_EWS'X Dummy variable for the exchange rate mechanism of the European Monetary System, full participation = 1, non-participation = 0, otherwise in-between

BE_EX 11.I.26 Exports of goods and services, at current prices, billion Belgian francs, Series YJB005

BE_EXR 11.I.27 Exports of goods and services, at 1990 prices, billion Belgian francs, Series YJB105

BE_FH I.14 Net lending of households, billion Belgian francs, defined: BE_FH = BE_YV - BE_CP

BE_FS IV.8 Net lending of government, billion Belgian francs, Series LJ9991

BE_FU II.13 Net lending of firms, billion Belgian francs, defined:
BE_FU = - BE_FH - BE_FS + BE_LBS

BE_G IV.7 Government demand, at current prices, billion Belgian francs, Series (YJB009 + LJ2009)
<table>
<thead>
<tr>
<th>Code</th>
<th>Section</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>BE_GAPQ</td>
<td>II.9</td>
<td>Capacity utilisation, per cent, defined:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>( BE_\text{GAPQ} = 100 \times \frac{BE_\text{BIPR}}{BE_\text{BIPQ}} )</td>
</tr>
<tr>
<td>BE_IANR</td>
<td>II.1</td>
<td>Gross private fixed capital investment, at 1990 prices, billion Belgian francs, defined: ( BE_\text{IANR} = 100 \times \left( \frac{BE_\text{IAN}}{BE_\text{PIAN}} \right) )</td>
</tr>
<tr>
<td>BE_IM</td>
<td>11.1.36</td>
<td>Imports of goods and services, at current prices, billion Belgian francs, Series YJB006 (t.b.)</td>
</tr>
<tr>
<td>BE_IMAK</td>
<td>11.1.25</td>
<td>World import demand for exports of Belgium, definition (t.b.)</td>
</tr>
<tr>
<td>BE_IMR</td>
<td>II.4</td>
<td>Imports of goods and services, at 1990 prices, billion Belgian francs, Series YJB106</td>
</tr>
<tr>
<td>BE_INF</td>
<td>III.2a</td>
<td>Domestic price inflation, per cent p. a., defined: ( BE_\text{INF} = 100 \Delta_4 \ln(\text{BE}_\text{PINV}) )</td>
</tr>
<tr>
<td>BE_INLV</td>
<td>I.16</td>
<td>Domestic demand, at current prices, billion Belgian francs, defined: ( BE_\text{INLV} = BE_\text{CP} + BE_\text{G} + BE_\text{IAN} + BE_\text{V} )</td>
</tr>
<tr>
<td>BE_INVR</td>
<td>I.17</td>
<td>Domestic demand, at 1990 prices, billion Belgian francs, defined: ( BE_\text{INVR} = BE_\text{CPR} + BE_\text{GR} + BE_\text{IANR} + BE_\text{VR} )</td>
</tr>
<tr>
<td>BE_KAB'X</td>
<td></td>
<td>Depreciation rate, per cent, defined: ( BE_\text{KAB} = 100 \times \left( 1 - \frac{BE_\text{KRPR} - BE_\text{IANR}}{BE_\text{KRPR}_1} \right) )</td>
</tr>
<tr>
<td>BE_KRP</td>
<td>II.8</td>
<td>Private capital stock, at 1990 prices, billion Belgian francs, Series PJ01DQ</td>
</tr>
<tr>
<td>BE_L</td>
<td>I.13</td>
<td>Gross wage income, billion Belgian francs, Series LJ2018</td>
</tr>
<tr>
<td>Code</td>
<td>Section</td>
<td>Description</td>
</tr>
<tr>
<td>--------</td>
<td>---------</td>
<td>---------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>BE_LA</td>
<td>III.1</td>
<td>Gross wage income per employee, 1990 = 100, defined: ( BE_{LA} = \frac{100 \cdot BE_L}{225.978 \cdot BE_{EI}} )</td>
</tr>
<tr>
<td>BE_LBS</td>
<td>I.15</td>
<td>Current account balance, billion Belgian francs, Series LQ2124</td>
</tr>
<tr>
<td>BE_LPAC</td>
<td>11.II.29</td>
<td>Foreign competitors’ price deflator, definition</td>
</tr>
<tr>
<td>BE_M3</td>
<td>V.1</td>
<td>Money stock, billion Belgian francs, Series VX8900</td>
</tr>
<tr>
<td>BE_PBIP</td>
<td>III.9</td>
<td>Price deflator of gross domestic product, 1990 = 100, defined: ( BE_{PBIP} = 100 \cdot \frac{BE_{BIP}}{BE_{BIPR}} )</td>
</tr>
<tr>
<td>BE_PCP</td>
<td>III.3</td>
<td>Price deflator of private consumption, 1990 = 100, defined: ( BE_{PCP} = 100 \cdot \frac{BE_{CP}}{BE_{CPR}} )</td>
</tr>
<tr>
<td>BE_PCPD</td>
<td>III.10</td>
<td>Adaptive expectation on consumer price inflation, per cent p.a., defined: ( BE_{PCPD} = 0.9 \cdot BE_{PCPD_{-1}} + 0.1 \cdot \Delta_4 \ln (BE_{PCP_{-1}}) \times 100 )</td>
</tr>
<tr>
<td>BE_PEV</td>
<td>III.8</td>
<td>Price deflator of final demand, 1990 = 100, defined: ( BE_{PEV} = 100 \cdot \frac{BE_{END}}{BE_{ENDR}} )</td>
</tr>
<tr>
<td>BE_PEVD</td>
<td>III.11</td>
<td>Adaptive expectation on inflation rate of final demand, per cent p.a., defined: ( BE_{PEVD} = 0.9 \cdot BE_{PEVD_{-1}} + 0.1 \cdot \Delta_4 \ln (BE_{PEV_{-1}}) \times 100 )</td>
</tr>
<tr>
<td>BE_PEX</td>
<td>III.6</td>
<td>Price deflator of exports of goods and services, 1990 = 100, defined: ( BE_{PEX} = 100 \cdot \frac{BE_{EX}}{BE_{EXR}} )</td>
</tr>
<tr>
<td>BE_PEXA</td>
<td>11.II.19</td>
<td>World export price deflator for imports of Belgium, definition</td>
</tr>
<tr>
<td>BE_PG</td>
<td>III.4</td>
<td>Price deflator of government demand, 1990 = 100, defined: ( BE_{PG} = 100 \cdot \frac{BE_{G}}{BE_{GR}} )</td>
</tr>
<tr>
<td>BE_PIAN</td>
<td>III.5</td>
<td>Price deflator of private fixed capital investment, 1990 = 100, Series LJ2117</td>
</tr>
</tbody>
</table>
BE_PIM 11.II.20 Price deflator of imports of goods and services, 1990 = 100, defined: \( \text{BE}_{\text{PIM}} = 100 \times \frac{\text{BE}_{\text{IM}}}{\text{BE}_{\text{IMR}}} \)

BE_PINV III.2b Price deflator of domestic demand, 1990 = 100, defined: \( \text{BE}_{\text{PINV}} = 100 \times \frac{\text{BE}_{\text{INLV}}}{\text{BE}_{\text{INVR}}} \)

BE_PSM3 V.7 Long-term price level (P-Star), 1990 = 100, definition

BE_RL V.3 Yield on government bonds with residual maturities of ten years, per cent p. a., Series AU3300

BE_RLST V.5 Long-term interest rate (long-run), per cent p.a., definition

BE_RRS V.6 Risk premium, per cent p. a., defined:
\[
\text{BE}_{\text{RRS}} = \text{BE}_{\text{RS}} - \text{GY}_{\text{RS}} - 100 \times \ln \left( \frac{\text{BE}_{\text{ERDM}}}{\text{BE}_{\text{ERDM}}} \right) 
\]

BE_RS V.2 Money market interest rate for three-month funds, per cent p. a., Series AU3215

BE_RSST V.4 Short-term interest rate (long-run), per cent p.a., definition

BE_SB IV.4 Government transfers to households, billion Belgian francs, Series LJ1640

BE_SDN'X Statistical discrepancy of gross domestic product, at current prices, billion Belgian francs, defined:
\[
\text{BE}_{\text{SDN}} = \text{BE}_{\text{BIP}} - \left( \text{BE}_{\text{CP}} + \text{BE}_{\text{G}} + \text{BE}_{\text{IAN}} + \text{BE}_{\text{V}} \right) + \text{BE}_{\text{EX}} - \text{BE}_{\text{IM}}
\]

BE_SDR'X Statistical discrepancy of gross domestic product, at 1990 prices, billion Belgian francs, defined:
\[
\text{BE}_{\text{SDR}} = \text{BE}_{\text{BIPR}} - \left( \text{BE}_{\text{CP}} + \text{BE}_{\text{GR}} + \text{BE}_{\text{IANR}} \right) + \text{BE}_{\text{VR}} + \text{BE}_{\text{EXR}} - \text{BE}_{\text{IMR}}
\]

BE_TDB IV.5 Direct taxes, billion Belgian francs, defined:
\[
\text{BE}_{\text{TDB}} = \text{BE}_{\text{G}} + \text{BE}_{\text{SB}} + \text{BE}_{\text{FS}} - \text{BE}_{\text{TIS}}
\]

BE_TDBS IV.1 Direct tax rate, per cent, defined:
\[
\text{BE}_{\text{TDBS}} = \frac{\text{BE}_{\text{TDB}}}{\text{BE}_{\text{VE}}} \times 100
\]
<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Definition and Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>BE_TIS</td>
<td>IV.6 Indirect taxes excluding subsidies, billion Belgian francs,</td>
<td>Series (LJ2016 - LJ2017)</td>
</tr>
<tr>
<td></td>
<td>Series (LJ2016 - LJ2017)</td>
<td></td>
</tr>
<tr>
<td>BE_T ISS</td>
<td>IV.2 Indirect tax rate, per cent, defined:</td>
<td>( BE_ISS = \frac{BE_TIS}{BE_END} \times 100 )</td>
</tr>
<tr>
<td></td>
<td>BE_U Transfers to foreign countries, billion Belgian francs,</td>
<td>defined: ( BE_U = BE_EX - BE_IM - BE_LBS )</td>
</tr>
<tr>
<td></td>
<td>defined: ( BE_U = BE_EX - BE_IM - BE_LBS )</td>
<td></td>
</tr>
<tr>
<td>BE_V</td>
<td>II.7 Inventory investment, at current prices, billion Belgian</td>
<td>francs, Series YJB010</td>
</tr>
<tr>
<td></td>
<td>francs, Series YJB010</td>
<td></td>
</tr>
<tr>
<td>BE_VE</td>
<td>I.11 National income, billion Belgian francs, defined:</td>
<td>( BE_VE = BE_BIP - BE_TIS - BE_D )</td>
</tr>
<tr>
<td></td>
<td>BE_VR Inventory investment, at 1990 prices, billion Belgian</td>
<td>francs, Series YJB110</td>
</tr>
<tr>
<td></td>
<td>francs, Series YJB110</td>
<td></td>
</tr>
<tr>
<td>BE_W OB E</td>
<td>I.3 Population, million, Series YJB350</td>
<td></td>
</tr>
<tr>
<td>BE_Y V</td>
<td>I.12 Disposable income of households, billion Belgian francs,</td>
<td>defined: ( BE_YV = BE_BIP - BE_TIS )</td>
</tr>
<tr>
<td></td>
<td>defined: ( BE_YV = BE_BIP - BE_TIS )</td>
<td>Series LJ2019</td>
</tr>
<tr>
<td></td>
<td>Series LJ2019</td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>Euro area</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>EMU_BIPQ</strong> I.4 Potential gross domestic product, at 1991 prices,</td>
<td>( \text{€ (ECU)} ) billion, definition</td>
</tr>
<tr>
<td></td>
<td>( \text{€ (ECU)} ) billion, definition</td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>EMU_BIPR</strong> I.3 Gross domestic product, at 1991 prices, ( \text{€ (ECU)} )</td>
<td>billion, definition</td>
</tr>
<tr>
<td></td>
<td>( \text{€ (ECU)} ) billion, definition</td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>EMU_ER</strong> II.8 Exchange rate of the euro (ECU) against the US$, US$</td>
<td>per euro (ECU), defined: ( \text{EMU_ER} = \frac{2.05586}{\text{GY_ER}} )</td>
</tr>
<tr>
<td></td>
<td><strong>EMU_GAPQ</strong> I.5 Capacity utilisation, 1991 = 100, defined:</td>
<td>( \text{EMU_GAPQ} = \frac{100 \text{EMU_BIPR}}{\text{EMU_BIPQ}} )</td>
</tr>
<tr>
<td></td>
<td><strong>EMU_INF</strong> I.7 Domestic price inflation, per cent p. a., defined:</td>
<td>( \text{EMU_INF} = 100 \Delta_4 \ln \text{EMU_PINV} )</td>
</tr>
<tr>
<td></td>
<td><strong>EMU_INF</strong> I.7 Domestic price inflation, per cent p. a., defined:</td>
<td>( \text{EMU_INF} = 100 \Delta_4 \ln \text{EMU_PINV} )</td>
</tr>
<tr>
<td></td>
<td><strong>EMU_INF</strong> I.7 Domestic price inflation, per cent p. a., defined:</td>
<td>( \text{EMU_INF} = 100 \Delta_4 \ln \text{EMU_PINV} )</td>
</tr>
<tr>
<td></td>
<td><strong>EMU_INF</strong> I.7 Domestic price inflation, per cent p. a., defined:</td>
<td>( \text{EMU_INF} = 100 \Delta_4 \ln \text{EMU_PINV} )</td>
</tr>
</tbody>
</table>
**EMU_INFT'X**  
Target inflation rate, per cent p. a., defined:  
\( \text{EMU_INFT} = 2.0 \)

**EMU_INLV**  
I.1 Domestic demand, at current prices, € (ECU) billion, definition

**EMU_INVR**  
I.2 Domestic demand, at 1991 prices, € (ECU) billion, definition

**EMU_M3**  
II.2a Money stock M3, € billion, end-of-quarter values, Series TUP986

**EMU_MGR**  
II.2c Money growth rate, per cent p.a., defined:  
\( \text{EMU_MGR} = 100 \times \Delta \ln(\text{EMU_M3}) \)

**EMU_MTR**  
II.1 Money growth target rate, per cent p.a., definition

**EMU_PINV**  
I.6 Price deflator of domestic demand, 1991 = 100, defined:  
\( \text{EMU_PINV} = 100 \cdot \frac{\text{EMU_INLV}}{\text{EMU_INVR}} \)

**EMU_PSM3**  
II.3 Long-term price level (P-Star), 1991 = 100, definition

**EMU_RL**  
II.4 Yield on government bonds with residual maturities of nine to ten years, per cent p. a., defined:  
\( \text{EMU_RL} = 0.3767 \text{GY}_RL + 0.2633 \text{FR}_RL + 0.2523 \text{IT}_RL + 0.0636 \text{NL}_RL + 0.0441 \text{BE}_RL \)

**EMU_RLST**  
II.6 Long-term interest rate (long-run), per cent p.a., definition

**EMU_RS**  
II.7 Interest rate for three-month funds, per cent p. a., defined:  
\( \text{EMU_RS} = 0.3767 \text{GY}_RS + 0.2633 \text{FR}_RS + 0.2523 \text{IT}_RS + 0.0636 \text{NL}_RS + 0.0441 \text{BE}_RS \)

**EMU_RSST**  
II.5 Short-term interest rate (long-run), per cent p.a., definition

**EMU_TERM**  
II.9 Term premium on interest rates, per cent p. a., defined:  
\( \text{EMU_TERM} = \text{mean} (\text{EMU_RL} - \text{EMU_RS}) \)
Foreign trade and total model

Q1'X  Seasonal dummy for the first quarter
Q2'X  Seasonal dummy for the second quarter
Q3'X  Seasonal dummy for the third quarter

REG_IM 11.I.37 Imports of goods and services of other EU countries, at current prices, US$ billion
        (t.b.)

REG_PEX 11.II.1 Price deflator of exports of other EU countries, 1990 = 100
         (t.b.)

ROE_IM  11.I.38 Imports of goods and services of other OECD countries, at current prices, US$ billion
         (t.b.)

ROE_PEX 11.II.2 Price deflator of exports of other OECD countries, 1990 = 100
         (t.b.)

T'X  Time trend, 1st quarter 1960 = 1

WE_POIL 11.II.30 World oil price, 1991 = 100, Series YU0510
        (t.b.)