The BOF5 Macroeconomic Model of Finland,
Structure and Equations
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The BOF5 Macroeconomic Model of Finland, Structure and Equations

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Abstract

This report is the basic documentation of the present (fifth) version of the Bank of Finland macroeconomic model, BOF5, built for policy simulation and forecasting. In constructing the model, consistent treatment of expectations is emphasized. Following current theoretical literature, intertemporal optimization with rational expectations is taken as the starting point, and Euler equations are applied in the estimation of the key behavioural equations. Consistent treatment of technology on the supply side has been another important aim. We illustrate the properties of the model with some simulation experiments. A complete list of equations and an outline of the derivation of the key equations are presented. We also show how forward-looking equations have been transformed to facilitate simulation under alternative assumptions concerning the formation of expectations.

Keywords: macroeconomic models, Finland, econometric modelling, policy simulations, expectations, Euler equations
Suomen makrotaloudellinen malli BOF5, rakenne ja yhtälöt

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Tiivistelmä


Asiasanat: makromallit, Suomen kansantalous, ekonometria, talouspolitiikan simulointi, odotukset, Euler-yhtälöt
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Notation

Standard errors of the parameter estimates are in parenthesis below the coefficients.

When standard error is not shown, the parameter in question is fixed a priori.

Variables with a negative (positive) subscript are lagged (shifted forward). Subscripts refer to number of lags (leads) in quarters.

• \( n \) is the difference operator.
• \( n \) denotes difference over \( n \) quarters.
• \( \log \) denotes natural logarithms.

Units:
- Values are in millions of FIM.
- Volumes are in millions of FIM at 1990 prices.
- Price indices take the value of 100 in 1990.
- Interest rates are in per cent.
- Labour force figures are in 1000 persons.

The estimation method and period is given before the summary statistics

\( R^2 \) is the adjusted coefficient of determination.
\( DW \) denotes the Durbin-Watson statistic. This statistic is redundant when the lag of the endogeneous variable is used as an explaining variable.
\( SE \) denotes the standard error of regression.

P-value is the significance level of the validity of overidentifying restrictions in Hansen’s J-test.
1 Foreword

This paper discusses the fifth version of the Bank of Finland macroeconomic model, BOF5. The report is outlined as follows. After an introduction to the model, a complete list of equations is presented. We aim at listing the equations in a tractable way to facilitate the reader to get insight of the economics of the model. This set of equations was also used in the simulations included in the introduction.

In appendix 1 we introduce the applied Euler approach. First, we present sketches for derivation of key behavioural equations, based on intertemporal optimisation by households and firms. Second, we show how backward looking counterparts, included in the model as alternative equations, are derived as transformations of the estimated equations. In simulating the model, either alternative can be chosen, as illustrated in the introduction. In policy analysis, we assume model consistent expectations and use the genuinely forward looking equations. Third, the estimation strategy and method is briefly commented.

Appendix 2 presents a list of the backward looking alternative equations. Appendix 3 gives a list of variables of this model version in an alphabetical order.

The next effort in documenting the BOF5 model will be a series of discussion papers, which describe the economics in the model – both the theoretical framework and the operational modelling solutions – more in detail. In those reports, more references are also given to literature both for the theoretical framework and for the exact specifications we may have followed in deriving the model equations.

The model was built by Alpo Willman during his research leave at the Research department in 1994–1995. Testing and fine tuning of the model, as well as regular use of the model for policy and forecasting applications, has since taken place at the Economics department. The model team economists include Head of forecasting office Alpo Willman, presently at the EMI, Hanna-Leena Männistö, and from 1997 onwards, Mika Kortelainen and Mika Tujula.

Of other colleagues directly involved in this project we would like to thank Head of Research department Juha Tarkka for sharing views on research strategy and guiding the ongoing work of testing and reporting. Maritta Paloviita worked as an economist in the team till 1996. Aila Koivunmaa has been responsible for the model data bank and assistance throughout the project, and in 1996 Ulla Sjöblom joined the team.

Needless to say, the model project has benefited from comments by numerous colleagues inside and outside the Bank of Finland. Of those outside the bank we would like to thank Dr. John Whitley (then in the LBS) for sharing expertise in the early stages of the project. Of those inside the bank special thanks are due to Head of Economics department Antti Suvanto and Advisor to the board David Mayes for encouragement. Thanks are also due to Päivi Lindqvist for taking care of the demanding text processing of this Discussion Paper. The aim of this publication is to encourage further feedback from the readers.
Introduction to the BOF5 macroeconomic model of Finland

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The Bank of Finland’s BOF model is designed to simulate the Finnish economy in an aggregative way and to produce quantitative information on responses of the economy to various types of impulses originating eg in the world economy or in economic policy measures. The BOF model is a medium-sized quarterly macroeconometric model, used for forecasting and policy analysis. This article describes the structure of the latest version of the model and provides some examples of its behaviour in simulation experiments. Expectations for a very large set of variables can now be treated as genuinely forward-looking, which extends the model’s applicability for several types of policy simulation.

Evolution of the BOF model

In retrospect, there have been several jumps in the development of the theoretical foundations of the BOF model in its more than 25 years of existence. These jumps fairly well reflect overall developments in the art of building macroeconometric models. In the 1970s the BOF model was a typical Keynesian demand-oriented model. In the 1980s it was modified so as to be more consistent with the "neoclassical synthesis", which stressed the importance of long-run supply constraints.

The 1980s also saw the development of a theoretical framework for modelling the functioning of financial markets. In the BOF3 version of 1985, disequilibrium economic theory was applied to the Finnish financial markets. This reflected the fact that until the mid-1980s Finnish monetary policy was based on credit rationing. Soon afterwards, the Finnish financial markets were deregulated and the focus of attention shifted from excess demand for bank loans to the demand and supply of broad money, the determination of money market interest rates and the term structure of interest rates. Hence, the BOF4's (1990) financial block was modelled within a conventional framework in which the interest rate clears the money market.

New version: forward looking

The latest version of the model, BOF5, was recently put into operation. One aim of recent work on the model has been to further develop the theoretical foundations and reduce the gap between macroeconometric models and mainstream macroeconomic theory. This gap is largely associated with difficulties...
in modelling and solving large-scale macroeconomic models with rational, model consistent expectations, even though in the theoretical literature rational expectations has been the main working hypothesis for expectations formation for some 20 years.

With the development of solution algorithms, estimation software, and more powerful PC hardware, the treatment of expectations as being forward looking is no longer out of reach of model builders. Hence, in building the BOF5 the main hypothesis has been that expectations are model consistent. This makes the model behave in an essentially forward looking way.

In connection with forecasting applications, however, the hypothesis of model consistent expectations is still computationally burdensome and considered to reflect a rather extreme view. For this reason the BOF5 also contains a backward-looking alternative for each forward-looking equation, with exactly the same long-run properties.

In preparing the medium-term macro forecast, a part of which is the inflation forecast, inflation expectations can be treated as forward looking. The inflation forecast indicates whether the inflation target is likely to be achieved with no change in the stance of monetary policy. On the other hand, in analysing policy, rational expectations entail indisputable advantages, and the whole spectrum of forward-lookingness can be utilized.

Other improvements over the BOF4 concern the wealth and credit channels, of which the wealth channel is described below. Because the credit channel is not yet included in the version normally used, we do not discuss it here. Without the credit channel, the financial block of the BOF5 reflects a straightforward application of the monetary tradition of financial modelling.

**Main features of the BOF5 model**

**An aggregative description**

We first sketch a broad picture of the model before describing more precisely the workings of the core of the model, i.e. the private sector.

In the goods and production factor markets, the model contains three domestic behavioural sectors: household sector, corporate sector and government sector. The corporate sector is disaggregated into two production sectors: the manufacturing sector, assumed to be exposed to foreign competition, and the rest of the private sector, assumed to be sheltered from direct foreign competition.

Mainly because of the need to determine incomes and outlays, the general government sector is disaggregated into central government, local government sector and social security funds. The local government sector is treated as a single independent decisionmaking unit, which is assumed to maximize the utility of municipality residents under a tight budget constraint. The central government guides the behaviour of the local government sector mainly through transfer payments to municipalities.

In the financial block of the BOF5 model the agents (decisionmakers) are households, firms, banks, other financial institutions, the government sector, the central bank, and the foreign investors.

A fixed exchange rate regime is normally incorporated, but the central bank decision variable can be varied in the simulations. This means that the model can also be solved assuming a floating exchange rate regime. Perfect capital mobility,
implying uncovered interest parity, is the benchmark case. Here again, the possibility of using the model in the model consistent expectations mode is very important.

In the context of wage formation, labour unions and centralized bargaining play an important role in Finland. This is reflected in the structure of the model in that wage developments are decomposed into ‘negotiated’ wage rate increases and ‘wage drift’ occurring outside the contractual wage formation mechanism. Inflation expectations, tax wedges and unemployment are the main determinants of negotiated wages. The wage drift component in turn is determined by disequilibrium factors in the labour market, i.e. the unemployment rate and the real-wage gap. The latter is determined by the difference between lagged real product wage and the warranted wage, given by the marginal product of labour.

Theoretical foundations

The theoretical starting point adopted in constructing the BOF5 is that it represents the neoclassical synthesis. By this, we mean that in the short run, owing to the relative rigidity of wages and prices, production, income and employment are determined by aggregate demand. The short-run properties of the model are thus Keynesian. In the course of time, however, wages and prices respond to possible discrepancies between demand and supply, and consequently the product and labour markets tend to converge to full employment and purchasing power parity between domestic and foreign currency prices.

In specifying the equations of the BOF5 model, expectation variables appear as explanatory variables in many of the estimated equations: private consumption, housing investment, private fixed investment, inventory investment, demand for labour, price of housing, price of exports, producer prices and the demand for money. Systematic use of the Euler approach makes the model forward looking. In addition, the negotiated wages equation entails rational inflation expectations and the long-term interest rate is determined as a weighted average of expected short-term interest rates.

Unlike in traditional models, where only the past values of fundamental explanatory variables affect dependent variables, it is now the entire expected future time paths of fundamental variables which affect dependent variables. However, although it is forward looking, the BOF5 also contains a substantial amount of friction and rigidities, mainly resulting from adjustment costs, both in quantities and some prices. Thus it is not only the future that matters for the solution of the model; the past performance of the economy also has a strong impact.

A common way of taking into account adjustment costs is to apply two-stage optimization. The first stage, which is carried out as if there were no adjustment costs, determines the desired levels of the variables. In the second stage, adjustment costs – which increase with deviations of actual levels from desired levels and with changes in actual values – are minimized. This procedure results in equations which although forward-looking also have a strong backward-looking character.

In the following, we focus on the household and corporate sectors, because both households and firms are modelled to make intertemporal decisions for which expectations formation plays an important role.
Household sector behaviour

Both past and future matter

Households gain utility from consumption and services associated with holding money. Via the budget constraint, consumption and investment decisions affect net borrowing and further accumulation of wealth in the household sector. As owner-occupied housing is part of household sector wealth, the housing market should be modelled in order to have wealth formation fully determined.

The behaviour of the household sector is based on intertemporal maximization of utility under a flow budget constraint, with wealth composed of housing wealth, money balances and debt. In addition, the possibility that the ability of households to foresee future flows of income is imperfect has been taken into account.

These assumptions imply that private consumption depends on current-period real disposable income, real wealth and the present value of the expected stream of future real income. Hence, consumption is forward looking.

As a result of utility maximization, the demand for real money balances is determined by private consumption and nominal interest rate. Because of adjustment costs associated with money balances, we end up with a forward-looking equation for the demand for money, which also contains backward-looking elements, ie the demand for actual real money balances depends on the weighted averages of past and future consumption streams and on nominal interest rates.

The wealth channel

The interaction of the demand and supply of housing services plays an important role in the wealth channel mechanism and hence in the transmission of monetary policy to the household sector. The equilibrium condition for the demand and supply of housing services, which determines the rental price of housing, depends positively on permanent income and negatively on the existing housing stock. The market price of housing is the discounted present value of the determinants of the rental price of housing and is therefore forward looking. However, as it is assumed that the demand for housing services reacts slowly to changes in permanent income, this relationship also includes a strong backward-looking element. In this equation, monetary policy affects the market price of housing directly through the interest rate used in discounting.

The market price of housing affects the household sector wealth via the value of the housing stock and the accumulation of the housing stock. The construction of new dwellings is a function of the market price of housing relative to production costs (Tobin’s q). In addition, changes in the interest rate also have a direct effect on housing investment. This direct link is associated with the cost of financing during the construction period.

The household sector flow budget constraint defines the net borrowing requirement, ie the accumulated changes in outstanding debt of the household sector.
Anticipated change in future income

Charts 1 and 2, which give the results of partial simulations, illustrate the working of the household sector and the implications of forward-lookingness. These simulations are based on endogenous equations for consumption, market price of housing, housing investment, housing stock, market value of housing stock, accumulation of net financial wealth and total nominal wealth. Disposable income of households is increased permanently by one per cent in the experiments.

In the first case it is assumed that households know with certainty the permanent increase in future income long before it occurs. In the second case the increase in income comes as a surprise, but after its occurrence it is known to be permanent. In Chart 1, we see that consumption starts to react to an anticipated future increase in income immediately when households become informed of it, i.e., households try to smooth their life-cycle consumption paths.

Chart 2 shows how consumption, the real price of dwellings, the stock of housing and real wealth move toward their new long-run equilibrium levels in the case of an anticipated increase in income. The housing price reacts quite strongly to future income increases and is transmitted to the wealth variable. As the estimated income elasticity of the demand for housing services is greater than unity, the percentage increase in the housing stock is in the long run greater than the percentage increase in consumption. The real price of housing remains permanently above the baseline. This is necessary in order to keep investment in dwellings at the level required by the greater depreciation associated with a larger housing stock.
Chart 1. Reaction of private consumption to anticipated and unanticipated permanent increase in real disposable income

Percentage difference from base

1 Consumption, anticipated
2 Consumption, unanticipated
3 Real disposable income

Chart 2. Reaction of private consumption to anticipated permanent increase in real disposable income

Percentage difference from base

1 Private consumption
2 Housing stock
3 Real price of housing
4 Wealth
Corporate sector behaviour

Firms maximize future profits ...

The behaviour of firms is based on profit maximization. Again, the two-stage optimization approach is used. Desired levels are first determined and then the adjustment costs are minimized.

In the first stage, firms maximize the value of their expected future profit streams subject to their respective production functions,\(^2\) product demand functions and adjustment costs associated with investment. The manufacturing sector meets two demand functions: the foreign demand for exportables, i.e., the goods exports equation; and domestic demand for import-competing products. In line with the small open economy hypothesis, the price elasticity of exportables is high and approaches infinity in the long run.

Demand in the rest of the private sector is solely domestic demand. Demand for domestically produced goods and services is obtained indirectly as the difference between total domestic demand and imports. As the price elasticity of imports is low, there is low substitutability between domestically produced and imported goods.

As a result of profit maximization we obtain forward-looking fixed investment functions for each sector so that investment depends on both future and past differences between the marginal product and the rental price of capital. The main determinant of the rental price of the capital is the real interest rate. Marginal products of capital are calculated from estimated production functions and depend positively on the output-capital ratio. Hence, accumulation of the capital stock decreases the marginal product of capital and the incentive for additional investment, unless the demand for output grows at the same time.

The desired demand for labour input can be solved from the inverted production function. The first stage maximization also defines the desired price levels for exportables and for commodities sold in domestic markets as a markup over short-run marginal costs of production. Marginal costs include raw material costs and the ratio of nominal labour costs to the marginal product of labour (measured in terms of the capital-labour ratio). Hence, a positive demand shock causes upward price pressure via the decreasing marginal product of labour.

It is worth noting that although the main determinant of export prices is the short-run marginal cost of production, in the long run purchasing power parity must hold between export prices and competing world market prices. For instance, if relative export prices are too high, the volume of exports and hence production decreases. This process continues until costs are restored to a level consistent with competing world market prices, mainly through wage responses to lower demand for labour.

... And minimize adjustment costs

The second stage of the minimization of adjustment cost functions produces equations for actual export prices, producer prices and actual labour demand, with

\(^2\) In manufacturing, the value-added production function is a Cobb-Douglas function and for the rest of the private sector the functional form is CES. In both sectors the input share of raw materials is assumed constant in volume terms.
both forward- and backward-looking elements. A similar type of equation is also
derived for inventory investment by assuming increasing costs associated with
deviations of inventories and production from desired levels.

The input-output identity for production with the assumption of fixed input
shares is used in solving for value-added deflators. Likewise, prices for demand
components are obtained as weighted averages of sectoral producer prices, import
prices and indirect taxes. The consumer price index is modelled to include the
imputed housing cost term.

**Simulation properties of the model**

We now illustrate some of the main features of the model with the aid of
simulation experiments. Two different types of shocks are discussed: a
government consumption shock and a real interest rate shock. 3 To demonstrate the
importance of expectations modelling, both shocks are introduced under two
extreme assumptions regarding expectations.

The first assumption is that of forward-looking (model consistent)
expectations. Here, rational expectations are incorporated into a wide set of
behavioural equations as described above. The second assumption is that of
backward- looking expectations. In this case economic agents look only at past
developments in making intertemporal choices. Expectations in the private sector
are formed solely on the basis of past observations. For modelling purposes, we
use extrapolative expectations in fundamentals combined with exogenous
inflation expectations.

In the forward-looking simulations, the nominal interest rate reacts to changes
in inflation, with the real interest rate remaining constant. Fixed nominal
exchange rates are assumed in all the experiments.

**Government expenditure shock**

In the expenditure shock, central government consumption is permanently
decreased by an amount roughly equal to one per cent of real GDP in 1997. Chart
3 shows that the model behaves according to the principles of the "neoclassical
synthesis". In the short run, the decrease in government expenditure has a
contractionary effect on output. In the longer run, the adjustment of prices and
wages works to adjust the economy toward an equilibrium level of output, which
is determined by supply considerations such as the available labour force and
exogenously determined technical progress.

In the simulation, the resultant shift of resources from the government sector
to the private sector increases average productivity, so that the long-run level of
output is slightly higher than without the cut in the government spending. Increase
in productivity leads to a change in relative prices as domestic price level
decreases. However, neither the unemployment rate nor inflation are permanently
affected.

---

3 The shocks and assumptions are the same as in the preliminary simulations published in the
Bulletin, May 1997, but the model is a bit different due to model testing since then. The present
simulations have been run using the model version reported in this publication, with all the
forward looking equations included in the model.
Chart 3. **BOF5 model simulations**
Key variables, differences from base

**Central government consumption decreased by one per cent of GDP**

**Real interest rate increased by one percentage point**

GDP, per cent

Private consumption prices, per cent

Real wage rate, per cent

Unemployment rate, %-pts

Unemployment rate, %-pts

1 Forward looking
2 Backward looking
Real interest rate shock

In the interest rate simulation, the real ex post short-term money market rate is permanently raised by one percentage point. The simulation is not intended to be a realistic monetary policy simulation. Rather, it serves merely to clarify the role of the real interest rate as such in the model. In a more realistic monetary policy simulation, the accompanying exchange rate effects would of course have to be included as well. It is also questionable whether monetary policy is at all capable of permanently influencing the real interest rate. The most appropriate interpretation of the present shock would be a permanent increase in the marginal product of capital abroad, transmitted to the Finnish economy through a higher world real interest rate.

This rise in the real interest rate results in a permanent decrease in production in Finland. This comes mainly through adjustment of the capital stock to a lower level in response to an increase in the rental price of capital. Likewise, we see that the real wage rate must decrease in order to maintain full employment in the new long-run equilibrium.

Both shocks show, that the adjustment to a shock follows a different time path, depending on how expectations formation is modelled. With forward-looking expectations, the adjustment toward a new equilibrium is faster. The difference here as seen in chart 3 is not that big, however, which validates also the use of the model in backward looking mode in forecasting applications. However, due to simulation design, the shown dynamic adjustment paths are as close as they can be, as we have chosen unanticipated and permanent shocks. The expectation formation mechanism would make a much bigger difference if shocks were assumed anticipated and transitory. The possibility to distinguish these aspects of a shock in forward looking mode is important in actual policy simulations.

Ongoing work aims at further improvements

The BOF5 model is currently under thorough testing in the Bank of Finland’s Economics Department. This testing will probably lead to continued refinements in model structure details. Future work on the BOF5 model will focus not only on practical forecasting applications but also on reporting of the structure and full properties of the model.

A particularly important area for further research relates to means of handling credibility issues in practical macroeconomic modelling. Progress in this area is obviously vital to the usefulness of econometric models in analysing economic policy in general and monetary policy in particular.

A selected bibliography on BOF models

- Alpo Willman, If the markka floated: simulating the BOF4 model with fixed and floating exchange rates, Finnish Economic Papers vol 2 No 1 Spring 1989.


Key words: macroeconomic models, econometric modelling, simulation, expectations
3 List of equations

3.1 Production functions and marginal productivities (T)

T.1 Technical development, the manufacturing sector

\[ \text{TECH1} = 3.68632 \times \text{DSHIFT1} \times e^{3.1563 \times \text{TREND}/100} \]

T.2 The normal level of production with existing inputs, the manufacturing sector, CD-production function

\[ \text{GDP1T} = \text{TECH1} \times \left( \text{KF1}_{-1} \right)^{0.372303} \times \left( \text{LH1} \right)^{0.627697} \]

T.3 The marginal product of capital, manufacturing

\[ \text{FK1} = 0.372303 \times \frac{\text{GDP1}}{\text{KF1}_{-1}} \]

T.4 The marginal productivity of labour, manufacturing, 1990=100

\[ \text{MPL1} = \frac{\text{TECH1}}{1.3009} \times \left( \frac{\text{KF1}_{-1}}{\text{LH1}} \right)^{0.372303} \]

Multivariate regression estimation of the production functions and marginal productivities of the manufacturing sector:

Equation 1,

\[
\begin{align*}
\log \text{GDP} - \log (3.86632) - 0.031563 \times \text{TREND} \\
- 0.627697 \times \log \text{LH1} - (1 - 0.627697) \times \log \text{KF1} = 0
\end{align*}
\]

Method of estimation = Multivariate least squares method.

Estimation period = 1962Q1–1993Q4
Sum of squared residuals = .210652
Variance of residuals = .00164572
SE = .040567
DW = .284725

| DSHIFT1 | Dummy, shift in technical development, manufacturing (91.1–94.4) |
| FK1     | The marginal product of capital, manufacturing |
| GDP     | GDP in purchasers' values, millions of 1996 FIM |
| GDP1    | Production at factor cost, manufacturing, millions of 1990 FIM |
| GDP1T   | The normal level of production with existing inputs, manufacturing |
| KF1     | Net stock of fixed capital, manufacturing, millions of 1990 FIM |
| LH1     | Performed working hours, manufacturing, millions of hours |
| MPL1    | Marginal productivity of labour, manufacturing, 1990=100 |
| TECH1   | Technical development, manufacturing |
| TREND   | Linear trend, 1960Q1 onwards 0.25+TREND_{-1} |
Equation 2,

\[
\log\left(\frac{GDPV1}{YW1 + SOC1} - 1\right) - \log\left(\frac{1 - 0.627697}{(GDPV1 - 1) - 0.00339465} \cdot 0.627697 \cdot (0.00339465)\right) = 0
\]

Method of estimation = Multivariate least squares method.
Estimation period = 1962Q1–1993Q4
Sum of squared residuals = 3.47666
Variance of residuals = .027161
SE = .164807
DW = .225456

T.5 Technical development, the non-manufacturing private sector

\[
TECH2 = 0.471930 \cdot e^{1.7845 \cdot TREND/100}
\]

T.6 The normal level of production with existing inputs, the non-manufacturing private sector (excluding the ownership and renting of houses), CES-production function

\[
GDP2T = TECH2 \cdot (0.920194 \cdot KF2^{0.444604} + [1 - 0.92094] \cdot LH2^{-0.444604})^{-1/0.444604}
\]

T.7 The marginal productivity of capital, the non-manufacturing private sector

\[
FK2 = 0.920194 \cdot TECH2^{-0.444604} \cdot ((GDP2 - GDP21) / KF2^{-1})^{1.444604}
\]

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>FK2</td>
<td>The marginal product of capital, non-manufacturing private sector</td>
</tr>
<tr>
<td>GDP2</td>
<td>Production at factor cost, non-manufacturing private sector, mills of 1990 FIM</td>
</tr>
<tr>
<td>GDP21</td>
<td>Production at factor cost, letting of own property, mills of 1990 FIM</td>
</tr>
<tr>
<td>GDP2T</td>
<td>The normal level of prod. with existing inputs, non-manuf. priv. sector (excl. letting of own property)</td>
</tr>
<tr>
<td>GDPV1</td>
<td>Production at factor cost, manufacturing, FIM million</td>
</tr>
<tr>
<td>KF2</td>
<td>Net stock of fixed capital, non-manufacturing private sector, millions of 1990 FIM</td>
</tr>
<tr>
<td>LH2</td>
<td>Performed working hours, non-manufacturing private sector, millions of hours</td>
</tr>
<tr>
<td>SOC1</td>
<td>Entrepreneurs' social security contribution rate, manufacturing</td>
</tr>
<tr>
<td>TECH2</td>
<td>Technical development, non-manufacturing private sector</td>
</tr>
<tr>
<td>TREND</td>
<td>Linear trend, 1960Q1 onwards 0.25+TREND_{-1}</td>
</tr>
<tr>
<td>YW1</td>
<td>Wages and salaries, manufacturing, FIM million</td>
</tr>
</tbody>
</table>
The marginal productivity of labour, the non-manufacturing private sector, 1990=100

\[ \text{MPL}_2 = \left( \frac{\text{TECH}_2}{6.8955} \right) \left( 0.920194 \left( \frac{\text{KF}_2}{\text{LH}_2} \right) - 0.444604 \right) + \left( 1 - 0.920194 \right) \]

Multivariate regression estimation of the production functions and marginal productivities of the non-manufacturing private sector:

**Equation 1,**

\[
\log (\text{GDP}_2 - \text{GDP}_{21}) - \log (0.471930) - 0.017845 \times \text{TREND} + 0.034640 \times \left( 1 - 0.920194 \right) \left( \text{KF}_2 / \text{LH}_2 \right) = 0
\]

Method of estimation = Multivariate least squares method
Estimation period = 1962Q1–1993Q4
Sum of squared residuals = 0.173555
Variance of residuals = 0.00135590
SE = 0.036823
DW = 0.408761

**Equation 2,**

\[
\log \left( \frac{\text{GDPV}_2 - \text{GDPV}_{21} - 1}{\text{YW}_2 + \text{SOC}_2} \right) - \log \left( 0.920194 \right) \left( \frac{\text{KF}_2}{\text{LH}_2} \right) = 0
\]

Method of estimation = Multivariate least squares method
Estimation period = 1962Q1–1993Q4
Sum of squared residuals = 2.02249
Variance of residuals = 0.015801
SE = 0.125701
DW = 1.36844

<table>
<thead>
<tr>
<th>GDP2</th>
<th>Production at factor cost, non-manufacturing private sector, mills of 1990 FIM</th>
</tr>
</thead>
<tbody>
<tr>
<td>GDP21</td>
<td>Production at factor cost, letting of own property, mills of 1990 FIM</td>
</tr>
<tr>
<td>GDPV2</td>
<td>Production at factor cost, non-manufacturing private sector, FIM million</td>
</tr>
<tr>
<td>GDPV21</td>
<td>Production at factor cost, letting of own property, FIM million</td>
</tr>
<tr>
<td>KF2</td>
<td>Net stock of fixed capital, non-manufacturing private sector, millions of 1990 FIM</td>
</tr>
<tr>
<td>LH2</td>
<td>Performed working hours, non-manufacturing private sector, millions of hours</td>
</tr>
<tr>
<td>MPL2</td>
<td>Marginal productivity of labour, non-manufacturing private sector, 1990=100</td>
</tr>
<tr>
<td>SOC2</td>
<td>Entrepreneurs’ social security contribution rate, non-manufacturing private sector</td>
</tr>
<tr>
<td>TECH2</td>
<td>Technical development, non-manufacturing private sector</td>
</tr>
<tr>
<td>YW2</td>
<td>Wages and salaries, non-manufacturing private sector, FIM million</td>
</tr>
</tbody>
</table>
3.2 Consumption (C)

C.1 Expectation of private consumption, volume

\[ CEX = C_{t+1} \]

C.2 Yearly change in the private consumption prices

\[ \text{INFPCP} = 0.25 \times \left( \frac{\text{PCP}}{\text{PCP}_{t-4}} - 1 \right) \]

C.3 Expectations of the yearly change in the private consumption prices

\[ \text{INFPCPEX} = \text{INFPCP}_{t+1} \]

C.4 Net wealth of households

\[ \text{WEALTH} = \text{PHM} \times \text{KH} / 100 + 0.83895 \times \text{MON2} - \text{LBH} - \text{LCGH} \]

C.5 Private consumption

\[
C = 0.300798 \times \text{YD} \times 100 / \text{PCP} \\
+ (1 - 0.300798) \times \left[ 0.853317 \times \frac{\text{CEX}}{1 + \text{RLBN} / 400 - \text{INFPCPEX}} \\
+ 0.047707 \times 0.25 \times \frac{\text{WEALTH}_{t+1}}{\text{PCP}} + \text{YD} \right]
\]

Method of estimation = Generalized Method of Moments
Estimation period = 1977Q1—1994Q2
P-value = 0.1042
SE = 0.00923270

<table>
<thead>
<tr>
<th>Variable</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>C</td>
<td>Private consumption, millions of 1990 FIM</td>
</tr>
<tr>
<td>CEX</td>
<td>C(t+1)</td>
</tr>
<tr>
<td>INFPCP</td>
<td>0.25*(PCP/PCP(t-4) - 1)</td>
</tr>
<tr>
<td>INFPCPEX</td>
<td>INFPCP(t+1)</td>
</tr>
<tr>
<td>KH</td>
<td>Net stock of priv. residential capital, net, millions of 1990 FIM</td>
</tr>
<tr>
<td>LBH</td>
<td>Bank loans to the households, FIM million</td>
</tr>
<tr>
<td>LCGH</td>
<td>Stock of central government housing loans, FIM million</td>
</tr>
<tr>
<td>MON2</td>
<td>Monetary aggregate M2, FIM million</td>
</tr>
<tr>
<td>PCP</td>
<td>Private consumption prices, 1990=100</td>
</tr>
<tr>
<td>PHM</td>
<td>House price index, all dwellings, entire country, 1990=100</td>
</tr>
<tr>
<td>RLBN</td>
<td>Average rate on deposit banks' new lending, per cent</td>
</tr>
<tr>
<td>WEALTH</td>
<td>Net wealth of households, FIM million</td>
</tr>
<tr>
<td>YD</td>
<td>Household disposable income, FIM million</td>
</tr>
</tbody>
</table>
C.6 Private consumption, value
\[ CV = PCP \times C / 100 \]

C.7 Public consumption, volume
\[ CG = CCG + CLG + CSOS \]

C.8 Total consumption
\[ CTOT = C + CG \]

C.9 Central government consumption, value
\[ CCGV = CCG \times PCCG / 100 \]

C.10 Local government consumption, value
\[ CLGV = CLG \times PCLG / 100 \]

C.11 Consumption of social security funds, value
\[ CSOSV = CSOS \times PCSOS / 100 \]

C.12 Total public sector consumption, value
\[ CGV = CCGV + CLGV + CSOSV \]

<table>
<thead>
<tr>
<th>C</th>
<th>Private consumption, millions of 1990 FIM</th>
</tr>
</thead>
<tbody>
<tr>
<td>CCG</td>
<td>Central government consumption, millions of 1990 FIM</td>
</tr>
<tr>
<td>CCGV</td>
<td>Central government consumption, FIM million</td>
</tr>
<tr>
<td>CG</td>
<td>Public consumption, millions of 1990 FIM</td>
</tr>
<tr>
<td>CGV</td>
<td>Public consumption, FIM million</td>
</tr>
<tr>
<td>CLG</td>
<td>Local government consumption, millions of 1990 FIM</td>
</tr>
<tr>
<td>CLGV</td>
<td>Local government consumption, FIM million CPI Consumer price index, 1990=100</td>
</tr>
<tr>
<td>CSOS</td>
<td>Social security funds consumption, mills of 1990 FIM</td>
</tr>
<tr>
<td>CSOSV</td>
<td>Social security funds consumption, FIM million</td>
</tr>
<tr>
<td>CTOT</td>
<td>Total consumption, millions of 1990 FIM</td>
</tr>
<tr>
<td>CV</td>
<td>Private consumption, FIM million</td>
</tr>
<tr>
<td>PCCG</td>
<td>Central government consumption prices, 1990=100</td>
</tr>
<tr>
<td>PCLG</td>
<td>Local government consumption prices, 1990=100</td>
</tr>
<tr>
<td>PCP</td>
<td>Private consumption prices, 1990=100</td>
</tr>
<tr>
<td>PCSOS</td>
<td>Social insurance institutions consumption prices, 1990=100</td>
</tr>
</tbody>
</table>
Total consumption, Value

\[ \text{CTOTV} = \text{CV} + \text{CGV} \]

<table>
<thead>
<tr>
<th>CGV</th>
<th>Public consumption, FIM million</th>
</tr>
</thead>
<tbody>
<tr>
<td>CTOTV</td>
<td>Total consumption, FIM million</td>
</tr>
<tr>
<td>CV</td>
<td>Private consumption, FIM million</td>
</tr>
</tbody>
</table>
3.3 Investment (I)

I.1 Yearly change in fixed investment prices, manufacturing

\[ \text{INFPIF1} = 0.25 \times (\text{PIF1}/\text{PIF1}_{-4} - 1) \]

I.2 Expectations of the yearly change in fixed investment prices, manufacturing

\[ \text{INFPIF1E} = \text{INFPIF1}_{+1} \]

I.3 Expectations of the growth of net stock of private fixed capital, manufacturing, 1-quarter lead

\[ \text{DLKF1EX} = \text{DLKF1}_{+1} \]

I.4 Expectations of the growth of net stock of private fixed capital, manufacturing, 2-quarter lead

\[ \text{DLKF1E2} = \text{DLKF1}_{+2} \]

I.5 The growth of net stock of private fixed capital, manufacturing

\[ \text{DLKF1} = -0.11702 \times \text{DLKF1E2} + 0.61035 \times \text{DLKF1EX} \\
+ 0.49310 \times \text{DLKF1}_{-1} \\
+ 0.010793 \times (\text{PGDP1} \times \text{FK1}/\text{PIF1} \\
- (\text{CCR1} + \text{RS}/400 - \text{INFPIF1E})/(1 + \text{RS}/400 - \text{INFPIF1E})) \\
- 0.00012418/1000 \]

---

<table>
<thead>
<tr>
<th>Variable</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>CCR1</td>
<td>Capital consumption rate, manufacturing</td>
</tr>
<tr>
<td>DLKF1</td>
<td>The growth of net stock of private fixed capital, manufacturing</td>
</tr>
<tr>
<td>DLKF1E2</td>
<td>DLKF1EX((t+1))</td>
</tr>
<tr>
<td>DLKF1EX</td>
<td>DLKF2((t+1))</td>
</tr>
<tr>
<td>FK1</td>
<td>The marginal product of capital, manufacturing</td>
</tr>
<tr>
<td>INFPIF1</td>
<td>(0.25 \times (\text{PIF1}/\text{PIF1}_{(t-4)} - 1))</td>
</tr>
<tr>
<td>INFPIF1E</td>
<td>INFPIF1((t+1))</td>
</tr>
<tr>
<td>PGDP1</td>
<td>Value-added deflator for manufacturing, 1990=100</td>
</tr>
<tr>
<td>PIF1</td>
<td>Fixed investment prices, manufacturing, 1990=100</td>
</tr>
<tr>
<td>RS</td>
<td>Money market rate, 3-month HELIBOR (1987 onwards), per cent</td>
</tr>
</tbody>
</table>
Estimated form:

\[(G^2) * B * DLKFIEX2 - ((G * B)^2 + G * B + G) * DLKFIEX \]
\[+ (G * (B^2) + G * B + 1) * DLKFI - B * DLKFI_{-1} \]
\[- abs(A3) * FI + abs(A3) * UC/(1 + REALR) - A2 * constant = 0; \]

\[FI = PGDP1*FK1/PIF1\]
\[UC = RS/400–INFPIF1E+CCR1\]
\[REALR = RS/400–INFPIF1E\]

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Estimate</th>
<th>Standard Error</th>
</tr>
</thead>
<tbody>
<tr>
<td>G</td>
<td>.487157</td>
<td>.049246</td>
</tr>
<tr>
<td>B</td>
<td>.911926</td>
<td>.035235</td>
</tr>
<tr>
<td>A3</td>
<td>.019960</td>
<td>.00494443</td>
</tr>
<tr>
<td>A2</td>
<td>-.000229648</td>
<td>.0000713842</td>
</tr>
</tbody>
</table>

Method of estimation = Generalized Method of Moments
Estimation period = 1974Q1–1993Q2
P-value = 0.6023
SE = .000910820

I.6 Private fixed investment, manufacturing, volume

\[IF1 = (DLKF1 + CCR1)*KF1_{-1} \]

I.7 Private net stock of fixed capital, manufacturing, millions of 1990 FIM

\[KF1 = (1–CCR1)*KF1_{-1} + IF1 \]

I.8 Yearly change in fixed investment prices, non-manufacturing private sector

\[INFPIF2 = 0.25*(PIF2/PIF2_{-4} – 1) \]

**Parameter Estimate Standard Error**

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</table>

Method of estimation = Generalized Method of Moments
Estimation period = 1974Q1–1993Q2
P-value = 0.6023
SE = .000910820

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I.7 Private net stock of fixed capital, manufacturing, millions of 1990 FIM

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**Parameter Estimate Standard Error**

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<td>A3</td>
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</tr>
<tr>
<td>A2</td>
<td>-.000229648</td>
<td>.0000713842</td>
</tr>
</tbody>
</table>
I.9 Expectations of the yearly change in fixed investment prices, non-manufacturing private sector

\[ \text{INFPIF2E} = \text{INFPIF2}_{+1} \]

I.10 Expectations of the growth of net stock of private fixed capital, non-manufacturing private sector, 1-quarter lead

\[ \text{DLKF2EX} = \text{DLKF2}_{+1} \]

I.11 Expectations of the growth of net stock of private fixed capital, non-manufacturing private sector, 2-quarter lead

\[ \text{DLKF2E2} = \text{DLKF2}_{+2} \]

I.12 The growth of net stock of private fixed capital, non-manufacturing private sector

\[
\begin{align*}
\text{DLKF2} &= -0.10881 \times \text{DLKF2E2} + 0.58932 \times \text{DLKF2EX} \\
&\quad + 0.50705 \times \text{DLKF2}_{-1} \\
&\quad + 0.023270 \times (\text{PREL2} \times \text{FK2}) \\
&\quad - (\text{CCR2} + \text{RS} / 400 - \text{INFPIF2E}) / \\
&\quad (1 + \text{RS} / 400 - \text{INFPIF2E}) \\
&\quad - 0.29585 / 10000
\end{align*}
\]

Estimated form:

\[
(G^2) \times B \times \text{DLKF2E2} - ((G \times B)^2 + G \times B + G) \times \text{DLKF2EX} \\
+ (G \times (B^2) + G \times B + 1) \times \text{DLKF2} - B \times \text{DLKF2}_{-1} \\
- \text{abs}(A3) \times \text{FCUC3} - A1 \times \text{constant} = 0
\]

---

| CCR2 | Capital consumption rate, non-manufacturing private sector |
| DLKF2 | The growth of net stock of private fixed capital, non-manufacturing private sector |
| DLKF2E2 | DLKF2EX\((t+1)\) |
| DLKF2EX | DLKF2\((t+1)\) |
| FK2 | The marginal product of capital, non-manufacturing private sector |
| INFPIF2 | \(0.25*(\text{PIF2}/\text{PIF2}(t-4) - 1)\) |
| INFPIF2E | INFPIF2\((t+1)\) |
| RS | Money market rate, 3-month HELIBOR (1987 onwards), per cent |
FC2 = PREL2 * FK2  
UC3 = (CCR2 + RS/400 – INFPIF2E)/(1 + RS/400 – INFPIF2E))  
FCUC3 = FC2 – UC3  
PREL2 = 100*((GDPPV2 – GDPPV21)/(GDPP2 – GDPP21))/PIF2

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Estimate</th>
<th>Standard Error</th>
</tr>
</thead>
<tbody>
<tr>
<td>G</td>
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</tr>
<tr>
<td>A1</td>
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<td>.000135423</td>
</tr>
</tbody>
</table>

Method of estimation = Generalized Method of Moments  
Estimation period = 1974Q1–1993Q2  
P-value = 0.6573  
SE = .000912762

1.13 Private fixed investment, non-manufacturing private sector  
IF2 = (DLKF2 + CCR2)*KF2 – 1 + DKFCG

1.14 Net stock of fixed capital, non-manufacturing private sector  
KF2 = (1 – CCR2)*KF2 – 1 + IF2 – DKFCG

1.15 Yearly change in the house price index  
INFPHM = 0.25*(PHM/PHM_(t-4) – 1)

1.16 Yearly change in the residential construction prices  
INFPIH = 0.25*(PIH/PIH_(t-4) – 1)

| CCR2 | Capital consumption rate, non-manufacturing private sector |
| DLKF2 | The growth of net stock of private fixed capital, non-manufacturing private sector |
| FK2 | The marginal product of capital, non-manufacturing private sector |
| GDP2 | Production at factor cost, non-manufacturing private sector, mills of 1990 FIM |
| GDP21 | Production at factor cost, letting of own property, mills of 1990 FIM |
| GDPV2 | Production at factor cost, non-manufacturing private sector, FIM million |
| GDPV21 | Production at factor cost, letting of own property, FIM million |
| IF2 | Private fixed investment, non-manufacturing private sector, mills of 1990 FIM |
| INFPHM | 0.25*(PHM/PHM(t-4) – 1) |
| INFPIF2E | INFPIF2(t+1) |
| INFPIH | 0.25*(PIH/PIH(t-4) – 1) |
| KF2 | Net stock of fixed capital, non-manufacturing private sector, millions of 1990 FIM |
| PHM | House price index, all dwellings, entire country, 1990=100 |
| PIF2 | Fixed investment prices, non-manufacturing private sector, 1990=100 |
| PIH | Residential construction prices, 1990=100 |
| RS | Money market rate, 3-month HELIBOR (1987 onwards), per cent |

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I.17 Expectations of residential construction
\[ I_{\text{HEX}} = I_{\text{H}_{t+1}} \]

I.18 Expectations of the yearly change in the residential construction prices
\[ I_{\text{NFPIHEX}} = I_{\text{NFPIH}_{t+1}} \]

I.19 Expectations of the yearly change in the house price index
\[ I_{\text{NFPHMEX}} = I_{\text{NFPHM}_{t+1}} \]

I.20 Change in the volume of private fixed investment, residential construction
\[
I_H = (0.35596 \times (1 - RLBN / 400 + I_{\text{NFPIHEX}}) \times I_{\text{HEX}} + 0.35596 \times I_{\text{H}_{t-1}} + 3381.76 \times \frac{PHM_{t-2}}{PIH_{t-2}} + 0.59683 \times D1090Q4 \times (FCHG / (0.01 \times PIH) - 1143) - 6700.92 \times (RLBN / 400 - I_{\text{NFPHMEX}}) - 492.1152) / (1 - 0.35596 \times (RLBN / 400 - I_{\text{NFPIHEX}}))
\]

Estimated form:
\[
(\text{ALFA} + A0 + A0 \times (1 - \text{REALRLBN})) \times I_H
- A0 \times (I_{\text{H}_{t-1}} + (1 - \text{REALRLBN}) \times I_{\text{HEX}} - \text{PHM}_{t-2} / \text{PIH}_{t-2}
- A1 \times \text{DUM90} \times (FCHG / (0.01 \times PIH) - 1143) - A3 \times RLBN - A5 = 0
\]

\[
\text{REALRLBN} = 0.25 \times (RLBN / 100 - \Delta_{t} \log PIHEX)
\]
\[
\text{RRLBN} = 0.25 \times (RLBN / 100 - \Delta_{t} \log PHMEX)
\]

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Estimate</th>
<th>Standard Error</th>
</tr>
</thead>
<tbody>
<tr>
<td>ALFA</td>
<td>0.0000851889</td>
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<tr>
<td>A0</td>
<td>0.000105257</td>
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</tr>
<tr>
<td>A1</td>
<td>0.000176483</td>
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<tr>
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<td>-1.98149</td>
<td>0.338374</td>
</tr>
<tr>
<td>A5</td>
<td>-145520</td>
<td>0.114189</td>
</tr>
</tbody>
</table>

- **FCGH**: Central government housing loans, drawings, FIM million
- **IH**: Residential construction, millions of 1990 FIM
- **IHEX**: IH(t+1)
- **INFPHM**: 0.25*(PHM/PHM(t-4) - 1)
- **INFPHMEX**: INFPHM(t+1)
- **INFPIH**: 0.25*(PIH/PIH(t-4) - 1)
- **INFPIHEX**: INFPIH(t+1)
- **PHM**: House price index, all dwellings, entire country, 1990=100
- **PIH**: Residential construction prices, 1990=100
- **RLBN**: Average rate on deposit banks' new lending, per cent
Method of estimation = Generalized Method of Moments  
Estimation period = 1974Q2–1993Q3  
P-value = 0.1077  
SE = .124315

I.21 Expectations of the real house price index

\[ \text{PHMREX} = \text{PHMR}_{+1} \]

I.22 Real house price index

\[
\begin{align*}
\text{PHMR} &= (.723834 \times \text{PHMR}_{-1} + (.731117 - \text{RLBN} / 400) \\
&+ \text{INFPCPEX} \times \text{PHMREX} + (.01 \times .109936) \\
&\times ((16.6 \times (C - \text{KH}_{-1})) / 1000 \\
&- .723834 \times (16.6 \times (C - \text{KH}_{-2})) / 1000) \\
&- 0.052053) / (1 + (.723834 \times (.731117 - \text{RLBN}_{-1} / 400) \\
&+ \text{INFPCPEX}_{-1}))
\end{align*}
\]

Method of estimation = Generalized Method of Moments  
Estimation period = 1978Q1–1993Q3  
P-value = .1825  
SE = .18003

I.23 House price index

\[ \text{PHM} = \text{PHMR} \times \text{PCP} \]

<table>
<thead>
<tr>
<th>INFPCPEX</th>
<th>INFPCP(t+1)</th>
</tr>
</thead>
<tbody>
<tr>
<td>KH</td>
<td>Net stock of priv. residential capital, net, millions of 1990 FIM</td>
</tr>
<tr>
<td>PCP</td>
<td>Private consumption prices, 1990=100</td>
</tr>
<tr>
<td>PHM</td>
<td>House price index, all dwellings, entire country, 1990=100</td>
</tr>
<tr>
<td>PHMR</td>
<td>Real house price index, all dwellings, entire country, 1990=100</td>
</tr>
<tr>
<td>PHMREX</td>
<td>PHMR(t+1)</td>
</tr>
<tr>
<td>RLBN</td>
<td>Average rate on deposit banks' new lending, per cent</td>
</tr>
</tbody>
</table>
I.24 Target level of inventories

\[ \text{KIIT} = -10891.0 + 1.42271 \times (\text{GDPIT}_{t-1} + \text{GDP2T}_{t-1}) \]
\[ -1.02015 \times (\frac{\text{RS}_{t-2}}{100} - \Delta_4 \log \text{PCP}_{t-1}) \times (\text{GDPIT}_{t-1} + \text{GDP2T}_{t-1}) \]

Method of estimation = Ordinary Least Squares
Estimation period = 1969Q1–1993Q4
\[ R^2 = .829202 \]
\[ \text{DW} = .202364 \]
\[ \text{SE} = 7343.47 \]

I.25 Level of sales

\[ \text{SALEA} = \text{CTOT} + \text{ITOT} + \text{XGN} - \text{MGN} + \text{STD} - \text{TIN} - \text{GDPG} \]

I.26 Expectations of the change in inventories

\[ \text{IIEX} = \text{II}_{t+1} \]

I.27 Expectations of the level of sales

\[ \text{SALEAEX} = \text{SALEA}_{t+1} \]

I.28 Expectations of the normal level of production with existing inputs, manufacturing

\[ \text{GDP1TEX} = \text{GDP1T}_{t+1} \]

| CTOT | Total consumption, millions of 1990 FIM |
| GDP1T | The normal level of production with existing inputs, manufacturing, millions of 1990 FIM |
| GDP1TEX | GDP1T_{t+1} |
| GDP2T | The normal level of prod. with existing inputs, non-manuf. priv. sector (excl. letting of own property), millions of 1990 FIM |
| GDPG | Production at factor cost, general govt, millions of 1990 FIM |
| II | Change in inventories, millions of 1990 FIM |
| IIEX | II_{t+1} |
| ITOT | Total fixed investment, millions of 1990 FIM |
| KIIT | The target level of inventories, millions of 1990 FIM |
| MGN | Imports of goods, millions of 1990 FIM (SNA) |
| PCP | Private consumption prices, 1990=100 |
| RS | Money market rate, 3-month HELIBOR (1987 onwards), per cent |
| SALEA | Sales, millions of 1990 FIM |
| SALEAEX | Salea (t+1) |
| STD | Statistical discrepancy, millions of 1990 FIM |
| TIN | Indirect taxes less subsidies, millions of 1990 FIM |
| XGN | Exports of goods, millions of 1990 FIM (SNA) |
I.29 Expectations of the normal level of production with existing inputs, non-manufacturing excl. letting

\[ \text{GDP2TEX} = \text{GDP2T}_{t+1} \]

I.30 Change in inventories

\[ \text{II} = (0.461364^* (1 - \text{RLBN} / 400 + \text{INFPCPEX}) \]
\[ * ([\text{IIEX} + (\text{SALEAEX} - \text{SALEA}) - (\Delta \text{GDP1T} + \Delta \text{GDP2T})) \]
\[ + 0.461364^* (\text{II}_{t-1} - (\Delta \text{SALEA}) + (\Delta \text{GDP1T}_{t-1} + \Delta \text{GDP2T}_{t-1})) \]
\[ + (1 - 2^* 0.461364^* (\Delta \text{KIIT})) \]
\[ - 92.4189^* (1 - D0186Q1)^* (\Delta \text{RS} - \Delta \text{RLBN})) / \]
\[ (49.1462) \]
\[ (1 - 0.461364^* (\text{RLBN} / 400 + \text{INFPCPEX})) \]

Method of estimation = Generalized Method of Moments
Estimation period = 1975Q1–1993Q3
P-value = 0.4795
SE = 1245.25

I.31 Private non-residential investment, volume

\[ \text{IF} = \text{IF1} + \text{IF2} \]

I.32 Private fixed investment, volume

\[ \text{I} = \text{IF} + \text{IH} \]

\text{GDP1T} \quad \text{The normal level of production with existing inputs, manufacturing, mills of 1990 FIM}
\text{GDP2T} \quad \text{The normal level of prod. with existing inputs, non-manuf. priv. sector (excl. letting of own property), millions of 1990 FIM}
\text{GDP2TEX} \quad \text{GDP2T}(t+1)
\text{IF} \quad \text{Private non-residential investment, mills of 1990 FIM}
\text{IF1} \quad \text{Private fixed investment, manufacturing, mills of 1990 FIM}
\text{IF2} \quad \text{Private fixed investment, non-manufacturing private sector, mills of 1990 FIM}
\text{IH} \quad \text{Residential construction, millions of 1990 FIM}
\text{II} \quad \text{Change in inventories, millions of 1990 FIM}
\text{IIEX} \quad \text{II}(t+1)
\text{INFPCPEX} \quad \text{INFPCP}(t+1)
\text{KIIT} \quad \text{The target level of inventories, millions of 1990 FIM}
\text{RLBN} \quad \text{Average rate on deposit banks' new lending, per cent}
\text{RS} \quad \text{Money market rate, 3-month HELIBOR (1987 onwards), per cent}
\text{SALEA} \quad \text{Sales, millions of 1990 FIM}
\text{SALEAEX} \quad \text{Salea (t+1)
1.33 Total public investment, volume
   \[ IG = ICG + ILG + ISOS \]

1.34 Total investment, volume
   \[ ITOT = I + IG \]

1.35 Private non-residential fixed investment, manufacturing, value
   \[ IFV1 = IF1 \cdot PIF1/100 \]

1.36 Private non-residential fixed investment, non-manufacturing, value
   \[ IFV2 = IF2 \cdot PIF2/100 \]

1.37 Residential construction, value
   \[ IHV = IH \cdot PIH/100 \]

1.38 Private non-residential investment, value
   \[ IFV = IFV1 + IFV2 \]

1.39 Private fixed investment, value
   \[ IV = IFV + IHV \]

---

I  Private fixed investment, millions of 1990 FIM
ICG  Central govt investment (excl. enterprises), millions of 1990 FIM
IF1  Private fixed investment, manufacturing, millions of 1990 FIM
IF2  Private fixed investment, non-manufacturing private sector, millions of 1990 FIM
IFV  Private non-residential investment, FIM million
IFV1  Private fixed investment, manufacturing, FIM million
IFV2  Private fixed investment, non-manufacturing private sector, FIM million
IG  Public investment, millions of 1990 FIM
IH  Residential construction, millions of 1990 FIM
IHV  Residential construction, FIM million
ILG  Local government investment, millions of 1990 FIM
ISOS  Social security funds investment, millions of 1990 FIM
ITOT  Total fixed investment, millions of 1990 FIM
IV  Private fixed investment, FIM million
PIF1  Fixed investment prices, manufacturing, 1990=100
PIF2  Fixed investment prices, non-manufacturing private sector, 1990=100
PIH  Residential construction prices, 1990=100
1.40 Central government investment, value
\[ ICGV = ICG \times PICG / 100 \]

1.41 Local government investment, value
\[ ILGV = ILG \times PILG / 100 \]

1.42 Social security funds investment, value
\[ ISOSV = ISOS \times PISOS / 100 \]

1.43 Total public investment, value
\[ IGV = ICGV + ILGV + ISOSV \]

1.44 Total fixed investment, value
\[ ITOTV = IV + IGV \]

1.45 Net stock of fixed capital, central government, volume
\[ KFCG = ICG + (1 - CCRCG) \times KFCG_{-1} + DKFCG \]

1.46 Net stock of fixed capital, local government, volume
\[ KFLG = ILG + (1 - CCRLG) \times KFLG_{-1} \]

---

CCRCG  Capital consumption rate, central government  
CCRLG  Capital consumption rate, local government  
ICG  Central govt investment (excl. enterprises), millions of 1990 FIM  
ICGV  Central govt investment (excl. enterprises), FIM million  
IGV  Public investment, FIM million  
ILG  Local government investment, millions of 1990 FIM  
ILGV  Local government investment, FIM million  
ISOS  Social security funds investment, millions of 1990 FIM  
ISOSV  Social security funds investment, FIM million  
ITOTV  Total fixed investment, FIM million  
IV  Private fixed investment, FIM million  
KFCG  Net stock of fixed capital, central govt, millions of 1990 FIM  
KFLG  Net stock of fixed capital, local government, millions of 1990 FIM  
PICG  Central government investment prices, 1990=100  
PILG  Local government investment prices, 1990=100  
PISOS  Social security funds investment prices, 1990=100
I.47 Net stock of fixed capital; social security funds, volume
KFS = ISOS + (1 - CCRS)\*KFS\(_{-1}\)

I.48 Net stock of fixed capital, general government, volume
KFG = KFCG + KFLG + KFS

I.49 Net stock of private residential capital, volume
KH = IH + (1 - CCRH)\*KH\(_{-1}\)

I.50 Stock of inventories, volume
KII = KIL\(_{-1}\) + II

I.51 Inventory investment and statistical discrepancy, volume
IIS = II + STD

I.52 Inventory investment and statistical discrepancy, value
IISV = GDPV + MV - ITOTV - XV - CTOTV

---

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>CCRH</td>
<td>Capital consumption rate, residential buildings</td>
</tr>
<tr>
<td>CCRS</td>
<td>Capital consumption rate, social security funds</td>
</tr>
<tr>
<td>CTOTV</td>
<td>Total consumption, FIM million</td>
</tr>
<tr>
<td>GDPV</td>
<td>GDP in purchasers' values, FIM million</td>
</tr>
<tr>
<td>IH</td>
<td>Residential construction, millions of 1990 FIM</td>
</tr>
<tr>
<td>II</td>
<td>Change in inventories, millions of 1990 FIM</td>
</tr>
<tr>
<td>IIS</td>
<td>Inventory investment and statistical discrepancy, mills of 1990 FIM</td>
</tr>
<tr>
<td>IISV</td>
<td>Inventory investment and statistical discrepancy, FIM million</td>
</tr>
<tr>
<td>ISOS</td>
<td>Social security funds investment, millions of 1990 FIM</td>
</tr>
<tr>
<td>ITOTV</td>
<td>Total fixed investment, FIM million</td>
</tr>
<tr>
<td>KFCG</td>
<td>Net stock of fixed capital, central govt, millions of 1990 FIM</td>
</tr>
<tr>
<td>KFG</td>
<td>Net stock of fixed capital, general govt, millions of 1990 FIM</td>
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<td>Net stock of fixed capital, local government, millions of 1990 FIM</td>
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<td>KFS</td>
<td>Net stock of fixed capital, social security funds, millions of 1990 FIM</td>
</tr>
<tr>
<td>KH</td>
<td>Net stock of priv. residential capital, net, millions of 1990 FIM</td>
</tr>
<tr>
<td>KII</td>
<td>Stock of inventories, millions of 1990 FIM</td>
</tr>
<tr>
<td>MV</td>
<td>Imports of goods and services, FIM million</td>
</tr>
<tr>
<td>STD</td>
<td>Statistical discrepancy, millions of 1990 FIM</td>
</tr>
<tr>
<td>XV</td>
<td>Exports of goods and services, FIM million</td>
</tr>
</tbody>
</table>
3.4 Exports (X)

X.1 Exports of goods, volume

\[ X_{GN} = X_{GNWE} - DXGE \]

X.2 Exports of goods, multilateral, finite LR-price elasticity

(LR-price elasticity = 4.61)

\[
\Delta \log(X_{GNWE}) = -0.729555\,\Delta \log(X_{GNWE \_1}) \\
- 0.344091\,\Delta \log(X_{GNWE \_2}) \\
+ 0.364816\,\Delta \log(MNIG \_1) \\
+ 0.436928\,\Delta \log(MNIG \_2) \\
- 0.148877\,(\log(X_{GNWE \_1}) - 0.85\,\log(MNIG \_1)) \\
- 0.685874\,\log(RPX_{GN}) + 0.903024
\]

Method of estimation = Instrumental Variable NL2SLSQ
Estimation period = 1978Q1-1995Q4
\[ R^2 = 0.544019 \]
\[ DW = 1.98912 \]
\[ SE = 0.044436 \]

X.3 Expectation of the export price of goods

\[ PX_{GNEX} = PX_{GN \_1} \]

X.4 Expectation of the effect of the bilateral trade on the export price of goods

\[ DPX_{GEEX} = DPX_{GE \_1} \]

<table>
<thead>
<tr>
<th>DPXGE</th>
<th>Dummy to correct PXGN for bilateral trade</th>
</tr>
</thead>
<tbody>
<tr>
<td>DPXGEEX</td>
<td>DPXGE(t+1)</td>
</tr>
<tr>
<td>DXGE</td>
<td>Dummy to correct XGN for bilateral trade</td>
</tr>
<tr>
<td>MNIG</td>
<td>Export markets, imports of Finland’s major export countries, 1990=100</td>
</tr>
<tr>
<td>PXGN</td>
<td>Export prices of goods, 1990=100 (SNA)</td>
</tr>
<tr>
<td>PXGNEX</td>
<td>PXGN(t+1)</td>
</tr>
<tr>
<td>RPXGN</td>
<td>Relative export price of goods, estimate, 1990=1</td>
</tr>
<tr>
<td>XGN</td>
<td>Exports of goods, millions of 1990 FIM (SNA)</td>
</tr>
<tr>
<td>XGNWE</td>
<td>Exports of goods, multilateral, volume, auxiliary variable</td>
</tr>
</tbody>
</table>
X.5 Marginal costs in production, exports of goods

\[
SMCXG = \left(\frac{1}{(1 - 0.2384 \times (1 + TIRXG)/0.9602))} \times \left(\frac{1}{(1 + TIRXG)/0.9602} \times (0.2442 \times P20 + 0.1274 \times PMRN + 0.0348 \times PMSN) + 0.3552 \times 100 \times (1 + SOCR1)/1.26719 \times \left(\frac{WAR1}{0.676016}/MPL1\right)\right)\]

X.6 Indirect tax rate on exports of goods

\[
TIRXG = DVAT12 \times TSR/17 - DSUB12 \times SUBR
\]

X.7 Export price of goods

\[
\log(DPXGE \times PXGN) = 0.298429 \times \left[0.9925 \times \log(DPXGEEX \times PXGNEX) + \log(DPXGE_{t-1} \times PXGN_{t-1})\right] + (1 - 0.298429 \times (1 + 0.9925)) \times \log(ZPXGN)
\]

Method of estimation = Generalized Method of Moments
Estimation period = 1974Q3–1994Q3
P-value = 0.6154
SE = 0.063715

where:

\[
ZPXGN = 1.22 \times (0.449991 \times \log PCOMP + (1 - 0.449991) \times \log SMCXG)
\]

<table>
<thead>
<tr>
<th>DPXGE</th>
<th>Dummy to correct PXGN for bilateral trade</th>
</tr>
</thead>
<tbody>
<tr>
<td>DPXGEEX</td>
<td>DPXGE(t+1)</td>
</tr>
<tr>
<td>DSUB12</td>
<td>Dummy, share of subsidies of exports of goods, ((-94.2 = 0.0380))</td>
</tr>
<tr>
<td>DVAT12</td>
<td>Dummy, share of value-added tax of exports of goods, ((-94.2 = 0.0018))</td>
</tr>
<tr>
<td>MPL1</td>
<td>Marginal productivity of labour, manufacturing, 1990=100</td>
</tr>
<tr>
<td>PCOMP</td>
<td>Competitors' prices on export markets, 1990=100</td>
</tr>
<tr>
<td>PMRN</td>
<td>Import prices of raw materials, 1990 = 100 (weighting = 0.531)</td>
</tr>
<tr>
<td>PMSN</td>
<td>Import prices of services, 1990=100 (SNA)</td>
</tr>
<tr>
<td>PXGN</td>
<td>Export prices of goods, 1990=100 (SNA)</td>
</tr>
<tr>
<td>PXGNEX</td>
<td>PXGN(t+1)</td>
</tr>
<tr>
<td>SMCXG</td>
<td>Marginal costs in exports, 1990=100</td>
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<tr>
<td>SOCR1</td>
<td>Entrepreneurs' social security contrib.rate, manufacturing</td>
</tr>
<tr>
<td>SUBR</td>
<td>Effective tax rate, commodity subsidies, 1990=1</td>
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<tr>
<td>TIRXG</td>
<td>Indirect tax rate on exports of goods</td>
</tr>
<tr>
<td>TSR</td>
<td>Sales tax rate, %</td>
</tr>
<tr>
<td>WAR1</td>
<td>Average wage, manufacturing, FIM/h</td>
</tr>
</tbody>
</table>
Estimated form for ZPXGN:

\[
ZPXGN = .449991 \log \text{PCOMP} + (1 - .449991) \log \text{SMCXG} + .279597 \log \text{MNIG} - .021724 \times \text{TREND} - .490333
\]

Method of estimation = Non-Linear Least Squares
Estimation period = 1976Q1–1994Q4
DW = 1.00576
SE = .026193

X.8 Relative export price of goods

\[
\text{RPXGN} = (\text{DPXGE} \times \text{PXGN}) / \text{PCOMP}
\]

X.9 Relative export price of services

\[
\log \text{RPXSN} = \log \text{PXSN} - .33 \times \log \text{PMCN} - .67 \times \log \text{PMIN}
\]

X.10 Exports of services, volume

\[
\Delta \log \text{XSN} = - .14886 \times \Delta \log \text{XSN}_{-1} - .99218 \times \Delta \log \text{RPXSN} - .21325 \times \log(XSN_{-1} / ZXSN_{-1}) + .01395
\]

Method of estimation = Ordinary Least Squares
Estimation period = 1972Q2–1994Q4
\(R^2 = .698\)
DW = 2.180
SE = .05659

<table>
<thead>
<tr>
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<tr>
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<td>PCOMP</td>
<td>Competitors' prices on export markets, 1990=100</td>
</tr>
<tr>
<td>PMCN</td>
<td>Import prices of consumer goods, 1990=100 (weighting = .2778)</td>
</tr>
<tr>
<td>PMIN</td>
<td>Import prices of investment goods, 1990=100 (weighting = .1912)</td>
</tr>
<tr>
<td>PXGN</td>
<td>Export prices of goods, 1990=100 (SNA)</td>
</tr>
<tr>
<td>PXSN</td>
<td>Export prices of services, 1990=100 (SNA)</td>
</tr>
<tr>
<td>RPXGN</td>
<td>Relative export price of goods, estimate, 1990=1</td>
</tr>
<tr>
<td>RPXSN</td>
<td>Relative export price of services, estimate, 1990=1</td>
</tr>
<tr>
<td>SMCXG</td>
<td>Marginal costs in exports, 1990=100</td>
</tr>
<tr>
<td>TREND</td>
<td>Linear trend, 1960Q1 onwards 0.25+TREND_{-1}</td>
</tr>
<tr>
<td>XSN</td>
<td>Exports of services, millions of 1990 FIM (SNA)</td>
</tr>
</tbody>
</table>
where

\[
\log ZXSN = .84293* \log XGN \\
(0.0315) \\
-1.19937* \log RPXSN \\
(0.0614) \\
-.08664 \\
(0.3133)
\]

Method of estimation = Ordinary Least Squares
Estimation period = 1972Q1–1994Q4
\[R^2 = .901\]
\[DW = .773\]
\[SE = .08286\]

X.11 Export prices of services

\[
\Delta \log PXSN = .55777* \Delta \log PMSN \\
(0.1203) \\
+.18607* \Delta \log P2 \\
(0.0983) \\
-.17958* \log (PXSN_{-1} / ZPXSN_{-1}) \\
(0.0623) \\
+.00538 \\
(0.0029)
\]

Method of estimation = Ordinary Least Squares
Estimation period = 1976Q1–1994Q4
\[R^2 = .344\]
\[DW = 1.792\]
\[SE = .01585\]

where

\[
\log ZPXSN = .29434* \log P2 + (1 - .29434) * \log PMSN \\
(0.0900) (0.0900) \\
+.00360* TREND - .07083 \\
(0.0007) (0.0155)
\]

Method of estimation = Instrumental Variable NL2SLSQ
Estimation period = 1975Q1–1994Q4
\[R^2 = .266\]
\[DW = .330\]
\[SE = .0301\]

\(P2\)  Producer prices in non-manufacturing private sector, 1990=100
\(PMSN\)  Import prices of services, 1990=100 (SNA)
\(PXSN\)  Export prices of services, 1990=100 (SNA)
\(RPXSN\)  Relative export price of services, estimate, 1990=1
\(TREND\)  Linear trend, 1960Q1 onwards 0.25+\(TREND\)_{-1}
\(XGN\)  Export of goods, millions of 1990 FIM (SNA)
X.12 Exports of goods, value
\[ X_{GNV} = PX_{GN} \times X_{GN}/100 \]

X.13 Exports of services, value
\[ X_{SNV} = PX_{SN} \times X_{SN}/100 \]

X.14 Exports of goods and services, volume
\[ X = X_{GN} + X_{SN} \]

X.15 Exports of goods and services, value
\[ X_{V} = X_{GNV} + X_{SNV} \]
3.5 Imports (M)

M.1 Demand for imports of goods, input-output estimate

\[ MDD = 0.3575 \times GDP1 + 0.0417 \times GDP2 + 0.1295 \times C + 0.0406 \times CG \]
\[ + 1658 \times (IF + IG) + 0.0073 \times XGN \]

M.2 Imports of goods, volume

\[ \Delta \log MGN = -0.52207 \times \Delta \log MGN_{-1} \]
\[ -0.20931 \times \Delta \log MGN_{-2} - 0.23355 \times \log(MGN_{-1} / MDD) \]
\[ + 0.67564 \times \Delta_3 \log MDD \]
\[ + 0.29720 \times (\Delta \log XGN - \Delta \log(GDP1 + GDP2)) \]
\[ + 0.06225 \times \log(XGN / (GDP1 + GDP2)) \]
\[ + 0.12301 \times \log((0.67 \times PD1 + 0.33 \times P20) / PMGN) \]
\[ + 0.07869 \]

Method of estimation = Ordinary Least Squares

Estimation period = 1972Q1–1993Q4

\[ R^2 = 0.542 \]
\[ DW = 1.912 \]
\[ SE = 0.05457 \]

C Private consumption, millions of 1990 FIM
CG Public consumption, millions of 1990 FIM
GDP1 Production at factor cost, manufacturing, millions of 1990 FIM
GDP2 Production at factor cost, non-manufacturing private sector, millions of 1990 FIM
IF Private non-residential investment, millions of 1990 FIM
IG Public investment, millions of 1990 FIM
MDD mdd, demand variable in imports equation
MGN Imports of goods, millions of 1990 FIM (SNA)
P20 Producer prices in non-manufacturing private sector excl. letting of own property, 1990=100
PD1 Prices of manufactures sold on the domestic market, manufacturing, 1990=100
PMGN Import prices of goods, 1990=100 (SNA)
XGN Export of goods, millions of 1990 FIM (SNA)
M.3 Imports of services, volume

\[ \Delta \log MSN = -1.13300 - 0.29932 \Delta \log MSN_{-1} \]
\[ -0.20631 \log(MSN_{-1} \times PMSN / PCP) \]
\[ + 0.34987 \log(0.0416 \times C + 0.0977 \times GDP1 + 0.0114 \times GDP2) \]
\[ + 0.08822 \log(XGN / (GDP1 + GDP2)) \]
\[ - 0.93033 \Delta \log(PMSN / PCP) \]

Method of estimation = Ordinary Least Squares
Estimation period = 1971Q1–1994Q4
\( R^2 = 0.296 \)
\( DW = 1.962 \)
\( SE = 0.05277 \)

M.4 Imports of goods, value

\[ MGNV = PMGN \times MGN / 100 \]

M.5 Imports of services, value

\[ MSNV = PMSN \times MSN / 100 \]

M.6 Imports of goods and services, volume

\[ M = MGN + MSN \]

M.7 Imports of goods and services, value

\[ MV = MGNV + MSNV \]

C  Private consumption, millions of 1990 FIM
GDP1  Production at factor cost, manufacturing, millions of 1990 FIM
GDP2  Production at factor cost, non-manufacturing private sector, millions of 1990 FIM
M  Imports of goods and services, millions of 1990 FIM
MGN  Imports of goods, millions of 1990 FIM (SNA)
MGNV  Imports of goods, FIM million (SNA)
MSN  Imports of services, millions of 1990 FIM (SNA)
MSNV  Imports of services, FIM million (SNA)
MV  Imports of goods and services, FIM million
PCP  Private consumption prices, 1990=100
PMGN  Import prices of goods, 1990=100 (SNA)
PMSN  Import prices of services, 1990=100 (SNA)
XGN  Exports of goods, millions of 1990 FIM (SNA)
3.6 Production (Q)

Q.1 Production at factor cost, central government, volume
GDPCG/GDPCG_{1} = CCG/CCG_{1}

Q.2 Production at factor cost, local government, volume
GDPLG/GDPLG_{1} = CLG/CLG_{1}

Q.3 Production at factor cost, social security funds
GDPS/GDPS_{1} = CSOS/CSOS_{1}

Q.4 Production at factor cost, general government, volume
GDPG = GDPCG + GDPLG + GDPS

Q.5 Production at factor cost, manufacturing, volume

\[ \Delta GDP_1 = .24108 \times \Delta C + .26981 \times \Delta (CG - GDPG) + .24987 \times \Delta (IF + IG) \]
\[ + .13146 \times \Delta IH + .62661 \times \Delta XGN \]
\[ + .17382 \times \Delta XSN - .35133 \times \Delta MGN \]
\[ - .13341 \times \Delta MSN + .28023 \times \Delta IIS \]

(0.042)
Method of estimation = Ordinary Least Squares
Estimation period = 1975Q2–1994Q4
$R^2 = .362$
$DW = 2.820$
$SE = 537.85$

Q.6 Indirect taxes less subsidies, volume

$\Delta TIN = .17648 \Delta C + .11017 \Delta (CG - GDPG) + .08557 \Delta (IF + IG)$
$+ .05669 \Delta IH - .01639 \Delta XGN$
$+ .05379 \Delta XSN + .05018 \Delta MGN$
$- .09741 \Delta MSN + .04122 \Delta IIS$

Method of estimation = Ordinary Least Squares
Estimation period = 1975Q2–1994Q4
$R^2 = .067$
$DW = 2.810$
$SE = 223.09$

Q.7 Gross domestic product in purchases value, volume

$GDP = C + CG + ITOT + IIS + X - M$

Q.8 Gross domestic production at factor cost, volume

$GDPF = GDP - TIN$

<table>
<thead>
<tr>
<th>Variable</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>C</td>
<td>Private consumption, millions of 1990 FIM</td>
</tr>
<tr>
<td>CG</td>
<td>Public consumption, millions of 1990 FIM</td>
</tr>
<tr>
<td>GDP</td>
<td>GDP in purchasers' values, millions of 1990 FIM</td>
</tr>
<tr>
<td>GDPF</td>
<td>GDP at factor cost, millions of 1990 FIM</td>
</tr>
<tr>
<td>IF</td>
<td>Private non-residential investment, millions of 1990 FIM</td>
</tr>
<tr>
<td>IG</td>
<td>Public investment, millions of 1990 FIM</td>
</tr>
<tr>
<td>IH</td>
<td>Residential construction, millions of 1990 FIM</td>
</tr>
<tr>
<td>IIS</td>
<td>Inventory investment and statistical discrepancy, millions of 1990 FIM</td>
</tr>
<tr>
<td>ITOT</td>
<td>Total fixed investment, millions of 1990 FIM</td>
</tr>
<tr>
<td>M</td>
<td>Imports of goods and services, millions of 1990 FIM</td>
</tr>
<tr>
<td>MGN</td>
<td>Imports of goods, millions of 1990 FIM (SNA)</td>
</tr>
<tr>
<td>MSN</td>
<td>Imports of services, millions of 1990 FIM (SNA)</td>
</tr>
<tr>
<td>TIN</td>
<td>Indirect taxes less subsidies, millions of 1990 FIM</td>
</tr>
<tr>
<td>X</td>
<td>Exports of goods and services, millions of 1990 FIM</td>
</tr>
<tr>
<td>XGN</td>
<td>Exports of goods, millions of 1990 FIM (SNA)</td>
</tr>
<tr>
<td>XSN</td>
<td>Exports of services, millions of 1990 FIM (SNA)</td>
</tr>
</tbody>
</table>
Q.9 Production at factor cost, private non-manufacturing sector, volume

\[ GDP2 = GDPF - GDP1 - GDG \]

Q.10 Production at factor cost, housing, volume

\[ \log GDPV2 = -5.26039 + 1.05389 \log KH_{-1} \]

Method of estimation = Ordinary Least Squares
Estimation period = 1970Q1–1994Q4
\[ R^2 = .982 \]
\[ DW = .470 \]
\[ SE = .0396 \]

Q.11 Production at factor cost, manufacturing sector, value

\[ GDPV1 = PGDP1 * GDP1 / 100 \]

Q.12 Production at factor cost, private non-manufacturing sector, value

\[ GDPV2 = PGDP2 * GDP2 / 100 \]

Q.13 Production at factor cost, housing, value

\[ GDPV21 = PGDP21 * GDP21 / 100 \]

Q.14 Production at factor cost, central government, value

\[ GDPVCG = PGDPCG * GDPCG / 100 \]
Q.15 Production at factor cost, local government, value

\[ \text{GDPVLG} = \text{PGDPLG} \times \text{GDPLG}/100 \]

Q.16 Production at factor cost, social security funds, value

\[ \text{GDPVS} = \text{PGDPS} \times \text{GDPS}/100 \]

Q.17 Production at factor cost, general government, value

\[ \text{GDPVG} = \text{GDPVCG} + \text{GDPVLG} + \text{GDPVS} \]

Q.18 Production at factor cost, private sector, value

\[ \text{GDPV8} = \text{GDPV1} + \text{GDPV2} \]

Q.19 Gross domestic production at factor cost, value

\[ \text{GDPFV} = \text{GDPV1} + \text{GDPV2} + \text{GDPVG} \]

Q.20 Gross domestic production at factor cost, value

\[ \text{GDPV} = \text{GDPFV} + \text{TIV} - \text{SUB} \]

\begin{tabular}{|l|l|}
\hline
\text{GDPFV} & GDP at factor cost, FIM million \\
\text{GDPLG} & Production at factor cost, local govt, mills of 1990 FIM \\
\text{GDPS} & Production at factor cost, social security funds, millions of 1990 FIM \\
\text{GDPV} & GDP in purchasers' values, FIM million \\
\text{GDPV1} & Production at factor cost, manufacturing, FIM million \\
\text{GDPV2} & Production at factor cost, non-manufacturing private sector, FIM million \\
\text{GDPV8} & Production at factor cost, private sector, FIM million \\
\text{GDPVCG} & Production at factor cost, central govt, FIM million \\
\text{GDPVG} & Production at factor cost, general govt, FIM million \\
\text{GDPVLG} & Production at factor cost, local govt, FIM million \\
\text{GDPVS} & Production at factor cost, social security funds, FIM million \\
\text{PGDPLG} & Value-added deflator for local government, 1990=100 \\
\text{PGDPS} & Value-added deflator for social security funds, 1990=100 \\
\text{SUB} & Commodity subsidies, FIM million \\
\text{TIV} & Central government revenue from commodity taxes, FIM million \\
\hline
\end{tabular}
3.7 Employment (L)

L.1 Desired labour demand, manufacturing

\[ LH1T = \frac{(GDP1/TECH1)^{(1/0.627697)} \cdot (KF1_{-1})^{-0.627697}}{(1-KF1)} \]

L.2 Desired labour demand, non-manufacturing

\[ LH2T = \left\{ \left( \frac{1}{1-0.920194} \right)^{0.444604} \cdot \left( \frac{GDP2 - GDP21}{TECH2} \right)^{-0.444604} \right\} \]

\[ - \left( \frac{0.920194}{1-0.920194} \right)^{0.444604} \cdot KF2_{-1}^{0.444604} \]

L.3 The average productivity of labour, manufacturing

\[ Q1 = \frac{(GDP1/LH1)}{1.342979} \]

L.4 Expectations of performed working hours, manufacturing

\[ LH1EX = LH1_{+1} \]

---

GDP1 \quad \text{Production at factor cost, manufacturing, millions of 1990 FIM}
GDP2 \quad \text{Production at factor cost, non-manufacturing private sector, mills of 1990 FIM}
GDP21 \quad \text{Production at factor cost, letting of own property, mills of 1990 FIM}
KF1 \quad \text{Net stock of fixed capital, manufacturing, millions of 1990 FIM}
KF2 \quad \text{Net stock of fixed capital, non-manufacturing private sector, millions of 1990 FIM}
LH1 \quad \text{Performed working hours, manufacturing, millions of hours}
LH1T \quad \text{Desired demand for labour, manufacturing, millions of hours (from inverted production function)}
LH2T \quad \text{Desired demand for labour, non-manufacturing private sector, millions of hours}
Q1 \quad \text{Labour productivity, manufacturing, 1990=100}
TECH1 \quad \text{Technical development, manufacturing}
TECH2 \quad \text{Technical development, non-manufacturing private sector}
L.5 Performed working hours, manufacturing

$$\log LH_1 = 0.44160 \times (\log LH_{1,EX} + \log LH_{-1}) + 0.11681 \times \log LH_{IT}$$

Estimated from:

$$(1.50050 + 0.63^2) \times \Delta \log LH_1 - 1.50050 \times \Delta \log LH_{EX}$$

$$- 0.63 \times \left( \log \left( \frac{GDP_1}{GDP_{1,T-1}} \right) - (1 - 0.63) \times DLKF_{-2} - 0.031563 / 4 \right) = 0$$

Method of estimation = Generalized Method of Moments

Estimation period = 1980Q1–1995Q3

P-value = 0.0403

SE = 0.030333

L.6 The average productivity of labour, the non-manufacturing private sector

$$Q_2 = (GDP_2/LH_2)/1.015688$$

L.7 Expectations of performed working hours, the private non-manufacturing sector

$$LH_{2,EX} = LH_{2+1}$$
L.8 Performed working hours, the private non-manufacturing sector

\[ \log LH2 = 0.47089 \times (\log LH2EX + \log LH2_{-1}) + 0.058211 \times \log LH2T \]

Estimated form:

\[
(3.10961 + .62^2) \times \Delta \log LH2 - 3.10961 \times \Delta \log LH2EX \\
- .62 \times \left( \log \frac{GDP2 - GDP21}{GDP2T_{-1}} \right) - (1 -.62) \times DLKF2_{-2} - .021135 / 4 = 0
\]

Method of estimation = Generalized Method of Moments
Estimation period = 1980Q1–1995Q3
P-value = 0.1124
SE = .037799

L.9 Performed working hours, entrepreneurs, manufacturing

\[ \frac{LHE1}{LH1} = .00125 + .96959 \times \frac{LHE1_{-1}}{LH1_{-1}} \]

Method of estimation = Ordinary Least Squares
Estimation period = 1977Q1–1994Q4
\[ R^2 = .958 \]
\[ DW = .229 \]
SE = .00134

L.10 Performed working hours, entrepreneurs; the private non-manufacturing sector

\[ \frac{LHE2}{LH2} = .00166 + .99305 \times \frac{LHE2_{-1}}{LH2_{-1}} \]

Method of estimation = Ordinary Least Squares
Estimation period = 1975Q2–1994Q4
\[ R^2 = .99 \]
\[ DW = .551 \]
SE = .0031

<table>
<thead>
<tr>
<th>DLKF2</th>
<th>The growth of net stock of private fixed capital, non-manufacturing private sector</th>
</tr>
</thead>
<tbody>
<tr>
<td>GDP2</td>
<td>Production at factor cost, non-manufacturing private sector, mills of 1990 FIM</td>
</tr>
<tr>
<td>GDP21</td>
<td>Production at factor cost, letting of own property, mills of 1990 FIM</td>
</tr>
<tr>
<td>GDP2T</td>
<td>The normal level of prod. with existing inputs, non-manuf. priv. sector (excl.</td>
</tr>
<tr>
<td></td>
<td>letting of own property), millions of 1990 FIM</td>
</tr>
<tr>
<td>LH1</td>
<td>Performed working hours, manufacturing, millions of hours</td>
</tr>
<tr>
<td>LH2</td>
<td>Performed working hours, non-manufacturing private sector, millions of hours</td>
</tr>
<tr>
<td>LH2T</td>
<td>Desired demand for labour, non-manufacturing private sector, millions of hours</td>
</tr>
<tr>
<td>LH2EX</td>
<td>LH2(t+1)</td>
</tr>
<tr>
<td>LHE1</td>
<td>Performed working hours, entrepreneurs, manufacturing, mills of hours</td>
</tr>
<tr>
<td>LHE2</td>
<td>Performed working hours, entrepreneurs, non-manuf. priv sector, mills of hours</td>
</tr>
</tbody>
</table>
L.11 Performed working hours, employees, manufacturing

\[ \text{LHW1} = \text{LH1} - \text{LHE1} \]

L.12 Performed working hours, employees, the private non-manufacturing sector

\[ \text{LHW2} = \text{LH2} - \text{LHE2} \]

L.13 Performed working hours, employees, the private sector

\[ \text{LHW8} = \text{LHW1} + \text{LHW2} \]

L.14 Performed working hours, entrepreneurs, the private sector

\[ \text{LHE} = \text{LHE1} + \text{LHE2} \]

L.15 Performed working hours, the private sector

\[ \text{LH8} = \text{LHW8} + \text{LHE} \]

\begin{tabular}{ll}
LH1 & Performed working hours, manufacturing, millions of hours \\
LH2 & Performed working hours, non-manufacturing private sector, millions of hours \\
LH8 & Performed working hours, private sector, millions of hours \\
LHE & Performed working hours, entrepreneurs, million of hours \\
LHE1 & Performed working hours, entrepreneurs, manufacturing, mills of hours \\
LHE2 & Performed working hours, entrepreneurs, non-manuf. priv sector, mills of hours \\
LHW1 & Performed working hours, manufacturing, employees, mills of hours \\
LHW2 & Performed working hours, non-manufacturing private sector, employees, mills of hours \\
LHW8 & Performed working hours, private sector, employees, mills of hours \\
\end{tabular}
L.16 Performed working hours, general government sector

\[ \text{LHG} = 0.01115 \times (\text{GDPG} - \text{CCRCG} \times KFCG_{-1} - \text{CCRLG} \times KFLG_{-1} - \text{CCRS} \times KFS_{-1}) \]

Method of estimation = Ordinary Least Squares
Estimation period = 1980Q1–1994Q4
\( R^2 = 0.978 \)
\( DW = 0.823 \)
SE = 2.43825

L.17 Performed working hours, total

\[ \text{LH} = \text{LH8} + \text{LHG} \]

L.18 Employment (Labour force survey)

\[ \Delta \log(\text{LES} - 2.53327 \times \text{LHG}) = 0.25025 \]
\[ + 0.28147 \times \Delta \log(\text{LES}_{-1} - 2.53327 \times \text{LHG}_{-1}) \]
\[ - 0.40087 \times \log((\text{LES}_{-1} - 2.53327 \times \text{LHG}_{-1}) / \text{LH8}_{-1}) \]
\[ + 0.41221 \times \Delta \log \text{LH8} - 0.09069 \times \Delta \log \text{LH8}_{-1} \]
\[ + 0.24069 \times \Delta \log \text{LH8}_{-3} + 0.00284 \times \text{TREND} \]

Method of estimation = Ordinary Least Squares
Estimation period = 1972Q1–1994Q4
\( R^2 = 0.551 \)
\( DW = 1.964 \)
SE = 0.00953

| CCRCG | Capital consumption rate, central government |
| CCRLG | Capital consumption rate, local government |
| CCRS  | Capital consumption rate, social security funds |
| GDPG  | Production at factor cost, general govt, millions of 1990 FIM |
| KFCG  | Net stock of fixed capital, central govt, millions of 1990 FIM |
| KFLG  | Net stock of fixed capital, local government, millions of 1990 FIM |
| KFS   | Net stock of fixed capital, social security funds, millions of 1990 FIM |
| LES   | Employment (Labour force survey), 1000 persons |
| LH    | Performed working hours total, millions of hours |
| LH8   | Performed working hours, private sector, millions of hours |
| LHG   | Performed working hours, general govt, millions of hours |
| TREND | Linear trend, 1960Q1 onwards 0.25 + TREND_{-1} |
L.19 Employment (SNA)

\[ \frac{LE}{LE_{-1}} = \frac{LES}{LES_{-1}} \]

L.20 Labour force (Labour force survey)

\[ \Delta \log(\frac{LFS}{N}) = -.02036 \]

\[ -.26323 \times \Delta \log(\frac{LFS_{-1}}{N_{-1}}) \]

\[ +.34666 \times \Delta \log(\frac{LES}{N}) \]

\[ -.08074 \times \log(\frac{LFS_{-1}}{N_{-1}}) \]

\[ +.02332 \times \log(\frac{LES_{-1}}{N_{-1}}) \]

Method of estimation = Ordinary Least Squares
Estimation period = 1977Q1–1995Q4
\[ R^2 = .545 \]
\[ SE = .00268 \]
\[ DW = 1.809 \]

L.21 Unemployment (Labour force survey)

\[ LUS = LFS - LES \]

L.22 Unemployment rate (Labour force survey)

\[ UR = \max(100 \times \frac{LUS}{LFS}, 1.0) \]

LE Employment (SNA), 1000 persons
LES Employment (labour force survey), 1000 persons
LFS Labour force (labour force survey), 1000 persons
LUS Unemployment (labour force survey), 1000 persons
N Population of working age (15–74 years), 1000 persons
UR Unemployment rate, %
L.23 Long term unemployment rate

\[
\Delta ULR = .59293 \Delta ULR_{-1} + .33485 \Delta ULR_{-2} \\
- .45028 \Delta ULR_{-3} + .63504 \Delta ULR_{-4} \\
+ .06048 \Delta UR_{-2} + .11633 \Delta UR_{-3} \\
- .35692 ULR_{-4} + .11861 UR_{-6} - .40721
\]

Method of estimation = Ordinary Least Squares
Estimation period = 1983Q1–1995Q2
\( R^2 = .944 \)
\( SE = .05437 \)
\( DW = 2.004 \)

ULR Long term unemployment rate, %
UR Unemployment rate, %
3.8 Wages (W)

W.1 Average wage rate, manufacturing, log-linear Phillips relation

\[ \Delta \log(\text{WAR1}/\text{WNR1}) = -0.438966 \]
\[ - 0.418821 \Delta \log(\text{WAR1}_{-1}/\text{WNR1}_{-1}) \]
\[ + 0.294392 \Delta \log(\text{MPL1}) \]
\[ - 0.101830 \log\left( \frac{1 - \text{ATAX}_{-1} * \text{WAR1}_{-1} * (1 + \text{SOCR1}_{-1})}{1 - \text{MTAX}_{-1} * \text{PGDP1}_{-1} * \text{MPL1}_{-1}} \right) \]
\[ - 0.011270 \cdot (0.25 \cdot \text{logUR} + 0.75 \cdot \text{logUR}_{-4}) \]

Method of estimation = Ordinary Least Squares
Estimation period = 1975Q4–1994Q4
R² = 0.383977
Durbin’s h = 0.804528
SE = 0.00679038

W.2 Average wage rate, private non-manufacturing sector

\[ \Delta \log(\text{WAR2}/\text{WNR2}) = 0.00181 \]
\[ + 0.64657 \Delta \log(\text{WAR1}/\text{WNR1}) \]
\[ - 0.74147 \log(\text{WAR2}_{-1}/\text{WAR1}_{-1}) - 0.00467 \cdot \text{UR} \]

Method of estimation = Ordinary Least Squares
Estimation period = 1970Q1–1994Q4
R² = 0.532
DW = 2.080
SE = 0.02130

ATAX Average income tax rate of wage and salary earners, estimate
MPL1 Marginal productivity of labour, manufacturing, 1990=100
MTAX Average marginal income tax rate of wage and salary earners, estimate
PGDP1 Value-added deflator for manufacturing, 1990=100
SOCR1 Entrepreneurs’ social security contrib. rate, manufacturing
UR Unemployment rate, %
WAR1 Average wage, manufacturing, FIM/h
WAR2 Average wage, non-manufacturing private sector, FIM/h
WNR1 Negotiated wage rate, manufacturing, 1990=100
WNR2 Negotiated wage rate, non-manufacturing private sector, 1990=100

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W.3 Wage rate, manufacturing

$$\Delta_4 \log(\frac{WR1}{WAR1}) = .00382 \quad (0.0040)$$

$$+ .26485 \Delta_4 \log(\frac{WR1_{-1}}{WAR1_{-1}}) \quad (0.0965)$$

$$- .07200 \Delta_4 \log PGDPI_{-1} \quad (0.0202)$$

$$- .16256 \Delta_4 \log MPL1 \quad (0.0757)$$

Method of estimation = Ordinary Least Squares
Estimation period = 1970Q1–1994Q4
R² = 0.254
DW = 2.023
SE = .01147

W.4 Wage rate, the private non-manufacturing sector

$$\Delta_4 \log(\frac{WR2}{WAR2}) = -.00596 \quad (0.0029)$$

$$+.07618 \Delta_4 \log UR_{-5} \quad (0.0344)$$

Method of estimation = Ordinary Least Squares
Estimation period = 1979Q1–1994Q4
R² = 0.058
DW = 1.746
SE = 0.02256

MPL1 Marginal productivity of labour, manufacturing, 1990=100
PGDP1 Value-added deflator for manufacturing, 1990=100
UR Unemployment rate, %
WAR1 Average wage, manufacturing, FIM/h
WAR2 Average wage, non-manufacturing private sector, FIM/h
WR1 Wage rate, manufacturing, 1990=100
WR2 Wage rate, non-manufacturing private sector, 1990=100
W.5  Wage rate, general government

\[
\Delta \log \text{WRG} = -0.09144\Delta \log \text{WRG}_{-1} \\
- 0.15728\Delta \log \text{WRG}_{-2} \\
+ 0.89245\Delta \log (0.3 \times \text{WR1} + 0.7 \times \text{WR2}) \\
+ 0.50749\Delta \log ((1 - \text{MTAX})/(1 - \text{ATAX})) \\
+ 0.35019\log((1 - \text{MTAX}_{-1})/(1 - \text{ATAX}_{-1})) \\
- 0.00334\log(\text{UR} + \log(\text{UR}_{-4})) \\
- 0.16296\log(\text{WRG}_{-1}/(0.3 \times \text{WR1}_{-1} + 0.7 \times \text{WR2}_{-1})) \\
+ 0.08370
\]

Method of estimation = Ordinary Least Squares
Estimation period = 1976Q1-1994Q4
\( R^2 = 0.769 \)
\( \text{DW} = 2.202 \)
\( \text{SE} = 0.00798 \)

W.6  Average wage rate, government sector

\[ \text{WARG}/\text{WARG}_{-1} = \text{WRG}/\text{WRG}_{-1} \]

W.7  Inflation expectations, (T+2)

\[ \text{INFPCPE2} = \text{INFPCP}_{t+2} \]

ATAX  Average income tax rate of wage and salary earners, estimate
INFPCP  0.25*(PCP/PCP(t-4)-1)
INFPCPE2  INFPCP(t+2)
MTAX  Average marginal income tax rate of wage and salary earners, estimate
UR  Unemployment rate, %
WARG  Average wage, public sector, FIM/h
WR1  Wage rate, manufacturing, 1990=100
WR2  Wage rate, non-manufacturing private sector, 1990=100
WRG  Wage rate, general government, 1990=100
W.8 Negotiated wage rate, manufacturing

\[ \Delta \log WNR_1 = \text{INFPCPE}_2 \]
\[ + \left[ \frac{1}{4 (1 - 0.594274)} \right] \times \left( -0.061309 \times \Delta \log UR_{-4} - 0.173282 \times \Delta \log (1 - ATAX_{-1}) \right. \]
\[ + 0.124896 \times [\Delta \log (\text{GDPV}_1/(1 + \text{SOCR}_1) \times \text{PCP} \times \text{LH}_1)] \]
\[ - 0.00474229 \]
\[ (0.010240) (0.063914) (0.047703) (0.00133484) \]

Method of estimation = Generalized Method of Moments
Estimation period = 1975Q1–1993Q4
P-value = 0.1526
SE = 0.012037

W.9 Negotiated wage rate, the private non-manufacturing sector

\[ \Delta \log WNR_2 = \text{INFPCPE}_2 \]
\[ + \left[ \frac{1}{4 (1 - 0.592605)} \right] \times \left( -0.052809 \times \Delta \log UR_{-4} - 0.230975 \times \Delta \log (1 - ATAX_{-1}) \right. \]
\[ + 0.137763 \times [\Delta \log (\text{GDPV}_8/(1 + \text{SOCR}_8) \times \text{PCP} \times \text{LH}_8)] \]
\[ - 0.00271615 \]
\[ (0.014234) (1.16551) (0.047209) (0.00148963) \]

Method of estimation = Generalized Method of Moments
Estimation period = 1975Q1–1993Q4
P-value = 0.9030
SE = 0.012894

ATAX Average income tax rate of wage and salary earners, estimate
GDPV1 Production at factor cost, manufacturing, FIM million
GDPV8 Production at factor cost, private sector, FIM million
INFPCPE2 INFPCE2(+2)
LH1 Performed working hours, manufacturing, millions of hours
LH8 Performed working hours, private sector, millions of hours
PCP Private consumption prices, 1990=100
SOCR1 Entrepreneurs' social security contrib. rate, manufacturing
SOCR8 Entrepreneurs' social security contrib. rate, private sector
UR Unemployment rate, %
WNR1 Negotiated wage rate, manufacturing, 1990=100
WNR2 Negotiated wage rate, non-manufacturing private sector, 1990=100
W.10  Negotiated wage rate, the private sector
\[ WNRP = 0.30 \times WNR1 + 0.70 \times WNR2 \]

W.11  Wage rate
\[ WR = 0.22 \times WR1 + 0.52 \times WR2 + 0.26 \times WRG \]

WNR1  Negotiated wage rate, manufacturing, 1990=100
WNR2  Negotiated wage rate, non-manufacturing private sector, 1990=100
WNRP  Negotiated wage rate, private sector, 1990=100
WR    Wage rate, total, 1990=100
WR1   Wage rate, manufacturing, 1990=100
WR2   Wage rate, non-manufacturing private sector, 1990=100
WRG   Wage rate, general government, 1990=100
3.9 Prices and costs (P)

P.1 Expectations of the prices of manufacturing goods sold on domestic market

\[ PD1EX = PD1_{t-1} \]

P.2 Prices of manufacturing goods sold on domestic market

\[
\log PD1 = 1.94447 \times (0.9925 \times \log PD1EX + \log PD1) \\
+ (1 - 1.94447 \times (1 + 0.9925)) \times \log SMCI
\]

Method of estimation = Generalized Method of Moments
Estimation period = 1987Q1–1994Q3
P-value = 0.0855
SE = 0.015526

P.3 Marginal costs in manufacturing

\[
SMCI = \left( \frac{1}{(1 - 0.2384 \times (1 + TIR1)/0.9983)) \times ((1 + TIR1)/0.9983) \times (0.2442 \times P20 + 0.1274 \times PMRN + 0.0348 \times PMSN) + 0.3552 \times 100 \right) \times (1 + SOCR1) / 1.26719 \times (WAR1/1.67601) / MPL1
\]

P.4 Indirect tax rate on manufacturing production

\[
TIR1 = DVAT1 \times TSR/17 + DTIOV1 \times TIOVR - DSUB1 \times SUBR
\]

| DSUB1 | Dummy, share of commodity subsidies of production, manufacturing, (–94.2 = .0085) |
| DTIOV1 | Dummy, share of other commodity taxes of production, manufacturing, (–94.2 = .0133) |
| DVAT1 | Dummy, share of value-added tax of production, manufacturing, (–94.2 = –.0065) |
| MPL1 | Marginal productivity of labour, manufacturing, 1990=100 |
| P20 | Producer prices in non-manufacturing private sector excl. letting of own property, 1990=100 |
| PD1 | Prices of manufactures sold on the domestic market, manufacturing, 1990=100 |
| PD1EX | PD1(t+1) |
| PMRN | Import prices of raw materials, 1990=100 (weighting = .531) |
| PMSN | Import prices of services, 1990=100 (SNA) |
| SMCI | Marginal costs in manufacturing, 1990=100 |
| SOCR1 | Entrepreneurs’ social security contrib. rate, manufacturing |
| SUBR | Effective tax rate, commodity subsidies, 1990=1 |
| TIOVR | Effective tax rate, other commodity taxes, 1990=1 |
| TIR1 | Indirect tax (excl. subsidies) rate on production, manufacturing |
| TSR | Sales tax rate, % |
| WAR1 | Average wage, manufacturing, FIM/h |
P.5 Prices in manufacturing

\[
\log P_l = 0.29567 \log PXGN + (1 - 0.29567) \log PD1 \\
(0.0076)
\]

Method of estimation = Ordinary Least Squares
Estimation period = 1978Q1–1994Q4
\( R^2 = 0.900 \)
\( DW = -953 \)
\( SE = 0.00484 \)

P.6 Expectations of prices in the private non-manufacturing sector (excl. housing)

\( P_{20EX} = P_{20}^{+1} \)

P.7 Prices in the private non-manufacturing sector (excl. housing)

\[
\log P_{20} = 3.26249 \times (0.9925 \times \log P_{20EX} + \log P_{20}^{-1}) \\
+ (1 - 3.26249 \times (1 + 0.9925)) \times \log SMC2 \\
(0.069051)
\]

Method of estimation = Generalized Method of Moments
Estimation period = 1978Q1–1994Q3
\( P\text{-value} = 0.2689 \)
\( SE = 0.043956 \)

P.8 Marginal costs in private non-manufacturing sector (excl. housing)

\[
SMC2 = \frac{1}{1 - 0.2977 \times (1 + TIR2) / 1.0812} \times ((1 + TIR2) / 1.0812 \times (0.1166 \times PD1 + 0.0221 \times PMRN + 0.0283 \times PMSN) \\
+ 0.5353 \times 100 \times (1 + SOCR2) / 1.25535 \\
\times \frac{(WAR2 / 0.64795)}{MPL2})
\]

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>MPL2</td>
<td>Marginal productivity of labour, non-manufacturing private sector, 1990=100</td>
</tr>
<tr>
<td>P1</td>
<td>Producer prices in manufacturing, 1990=100</td>
</tr>
<tr>
<td>P20</td>
<td>Producer prices in non-manufacturing private sector excl. letting of own property, 1990=100</td>
</tr>
<tr>
<td>P20EX</td>
<td>( P_{20}^{+1} )</td>
</tr>
<tr>
<td>PD1</td>
<td>Prices of manufactures sold on the domestic market, manufacturing, 1990=100</td>
</tr>
<tr>
<td>PMRN</td>
<td>Import prices of raw materials, 1990=100 (weighting = .531)</td>
</tr>
<tr>
<td>PMSN</td>
<td>Import prices of services, 1990=100 (SNA)</td>
</tr>
<tr>
<td>PXGN</td>
<td>Export prices of goods, 1990=100 (SNA)</td>
</tr>
<tr>
<td>SMC2</td>
<td>Marginal costs in non-manufacturing private sector, 1990=100</td>
</tr>
<tr>
<td>SOCR2</td>
<td>Entrepreneurs' social security contrib. rate, non-manufacturing private sector</td>
</tr>
<tr>
<td>TIR2</td>
<td>Indirect tax (excl. subsidies) rate on production, non-manufacturing private sector</td>
</tr>
<tr>
<td>WAR2</td>
<td>Average wage, non-manufacturing private sector, FIM/h</td>
</tr>
</tbody>
</table>
P.9 Indirect tax rate in private non-manufacturing production

\[
TIR2 = DVAT2 \times TSR/17 + DTIOV2 \times TIOVR - DSUB2 \times SUBR
\]

P.10 Value-added deflator in housing sector

\[
\Delta \log PGDP21 = \Delta \log P20
\]

P.11 Prices in private non-manufacturing sector

\[
P2 = (P20 + 0.062 \times PGDP21)/1.062
\]

P.12 Prices in private sector

\[
P8 = 0.3794 \times P1 + 0.6206 \times P2
\]

P.13 Prices in private domestic sector

\[
\log PD8 = 1.2765 \times \log P8 - 0.2765 \times \log PXGN
\]

P.14 Input-output estimate for PGDP1

\[
PGDPIIO = (1/1.3552) \times (P1 - (1 + TIR1) \times (0.2384 \times P1 + 0.2442 \times P20 + 0.1274 \times PMRN + 0.0348 \times PMSN)/0.9983)
\]

<table>
<thead>
<tr>
<th>DSUB2</th>
<th>Dummy, share of commodity subsidies of production, private non-manufacturing sector, ((-94.2 = 0.033))</th>
</tr>
</thead>
<tbody>
<tr>
<td>DTIOV2</td>
<td>Dummy, share of other commodity taxes of production, private non-manufacturing sector, ((-94.2 = 100))</td>
</tr>
<tr>
<td>DVAT2</td>
<td>Dummy, share of value-added tax of production, private non-manufacturing sector, ((-94.2 = 0.581))</td>
</tr>
<tr>
<td>P1</td>
<td>Producer prices in manufacturing, 1990=100</td>
</tr>
<tr>
<td>P2</td>
<td>Producer prices in non-manufacturing private sector, 1990=100</td>
</tr>
<tr>
<td>P8</td>
<td>Producer prices in private sector, 1990=100</td>
</tr>
<tr>
<td>P20</td>
<td>Producer prices in non-manufacturing private sector excl. letting of own property, 1990=100</td>
</tr>
<tr>
<td>PD8</td>
<td>Prices of manufactures sold on the domestic market, private sector, 1990=100</td>
</tr>
<tr>
<td>PGDPIIO</td>
<td>Input-output estimate for deflator PGDP1, 1990=100</td>
</tr>
<tr>
<td>PGDP21</td>
<td>Value-added deflator for letting of own property, 1990=100</td>
</tr>
<tr>
<td>PMRN</td>
<td>Import prices of raw materials, 1990=100 (weighting = 0.531)</td>
</tr>
<tr>
<td>PMSN</td>
<td>Import prices of services, 1990=100 (SNA)</td>
</tr>
<tr>
<td>PXGN</td>
<td>Export prices of goods, 1990=100 (SNA)</td>
</tr>
<tr>
<td>SUBR</td>
<td>Effective tax rate, commodity subsidies, 1990=1</td>
</tr>
<tr>
<td>TIOVR</td>
<td>Effective tax rate, other commodity taxes, 1990=1</td>
</tr>
<tr>
<td>TIR1</td>
<td>Indirect tax (excl. subsidies) rate on production, manufacturing</td>
</tr>
<tr>
<td>TIR2</td>
<td>Indirect tax (excl. subsidies) rate on production, non-manufacturing private sector</td>
</tr>
<tr>
<td>TSR</td>
<td>Sales tax rate, %</td>
</tr>
</tbody>
</table>
P.15 Value added deflator in manufacturing
\[ \Delta \log \text{PGDP}_1 = \Delta \log \text{PGDP}_1\text{IO} \]

P.16 Input-output estimate for PGDP2
\[ \text{PGDP}_2\text{IO} = (1/0.5353) \times (\text{P}_2 - (1 + \text{TIR}_2) \times (0.1166 \times \text{PD}_1 + 0.2977 \times \text{P}_2 + 0.0221 \times \text{PMRN} + 0.0283 \times \text{PMSN}) / 1.0812) \]

P.17 Value added deflator in private non-manufacturing sector
\[ \Delta \log \text{PGDP}_2 = \Delta \log \text{PGDP}_2\text{IO} \]

P.18 Value added deflator, central government
\[ \text{PGDPCG} = 100 \times ((1 + \text{SOCRCG}) \times \text{YWCG} + \text{CCVT} - \text{CCV}_1 - \text{CCV}_2 - 0.90 \times \text{CCVLG} - \text{CCVS}) / \text{GDPCG} \]

P.19 Value added deflator, local government
\[ \text{PGDPLG} = 100 \times ((1 + \text{SOCRLG}) \times \text{YWLG} + 0.90 \times \text{CCVLG}) / \text{GDPLG} \]

<table>
<thead>
<tr>
<th>Variable</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>CCV1</td>
<td>Consumption of fixed capital, manufacturing, FIM million</td>
</tr>
<tr>
<td>CCV2</td>
<td>Consumption of fixed capital, non-manufacturing private sector, FIM million</td>
</tr>
<tr>
<td>CCVLG</td>
<td>Consumption of fixed capital, local government, FIM million</td>
</tr>
<tr>
<td>CCVS</td>
<td>Consumption of fixed capital, social security funds, FIM million</td>
</tr>
<tr>
<td>CCVT</td>
<td>Consumption of fixed capital, FIM million</td>
</tr>
<tr>
<td>GDPCG</td>
<td>Production at factor cost, central government, millions of 1990 FIM</td>
</tr>
<tr>
<td>GDPLG</td>
<td>Production at factor cost, local govt, mills of 1990 FIM</td>
</tr>
<tr>
<td>P2</td>
<td>Producer prices in non-manufacturing private sector, 1990=100</td>
</tr>
<tr>
<td>PD1</td>
<td>Prices of manufactures sold on the domestic market, manufacturing, 1990=100</td>
</tr>
<tr>
<td>PGDP1</td>
<td>Value-added deflator for manufacturing, 1990=100</td>
</tr>
<tr>
<td>PGDP1IO</td>
<td>Input-output estimate for deflator PGDP1, 1990=100</td>
</tr>
<tr>
<td>PGDP2</td>
<td>Value-added deflator for non-manufacturing private sector, 1990=100</td>
</tr>
<tr>
<td>PGDP2IO</td>
<td>Input-output estimate for deflator PGDP2, 1990=100</td>
</tr>
<tr>
<td>PGDPCG</td>
<td>Value-added deflator for central government, 1990=100</td>
</tr>
<tr>
<td>PGDPLG</td>
<td>Value-added deflator for local government, 1990=100</td>
</tr>
<tr>
<td>PMRN</td>
<td>Import prices of raw materials, 1990=100 (weighting = .531)</td>
</tr>
<tr>
<td>PMSN</td>
<td>Import prices of services, 1990=100 (SNA)</td>
</tr>
<tr>
<td>SOCRCG</td>
<td>Entrepreneurs' social security contrib. rate, central government</td>
</tr>
<tr>
<td>SOCRLG</td>
<td>Entrepreneurs' social security contrib. rate, local government</td>
</tr>
<tr>
<td>TIR2</td>
<td>Indirect tax (excl. subsidies) rate on production, non-manufacturing private sector</td>
</tr>
<tr>
<td>YWCG</td>
<td>Wages and salaries, central government, FIM million</td>
</tr>
<tr>
<td>YWLG</td>
<td>Wages and salaries, local government, FIM million</td>
</tr>
</tbody>
</table>
P.20 Value added deflator, social security funds

\[ PGDPS = 100 \times (1 + SOCRS) \times YWS + CCVS)/GDPS \]

P.21 Input-output estimate for PCP

\[ \log PCPIO = 0.2049 \times \log PD1 + 0.5137 \times \log P20 + 0.1258 \times \log PGDP21 + 0.1556 \times \log PMCN \]

P.22 Input-output estimate for PCCG

\[ \log PCCGIO = 0.0636 \times \log PD1 + 0.1377 \times \log P20 + 0.7404 \times \log PGDPCG + 0.0580 \times \log PMCN \]

P.23 Input-output estimate for PCLG

\[ \log PCLGIO = 0.0565 \times \log PD1 + 0.1150 \times \log P20 + 0.7924 \times \log PGDPLG + 0.0361 \times \log PMCN \]

P.24 Input-output estimate for PCSOS

\[ \log PCSOSIO = 0.0148 \times \log PD1 + 0.3394 \times \log P20 + 0.6458 \times \log PGDPS \]
P.25 Input-output estimate for PIF

\[
\log \text{PIFIO} = 0.2098 \log \text{PD1} + 0.6147 \log \text{P20} + 0.1755 \log \text{PMIN}
\]

P.26 Private consumption prices

\[
\Delta \log \text{PCP} = \Delta \log \text{PCPIO} - (1 - 0.1251) \Delta \log (1 - \text{TIRC})
\]

P.27 Indirect tax rate on private consumption

\[
\text{TIRC} = \text{DVAT345} \times \frac{\text{TSR}}{17} + \text{DTIOV345} \times \text{TIOVR} - \text{DSUB345} \times \text{SUBR}
\]

P.28 Central government consumption prices

\[
\Delta \log \text{PCCG} = \Delta \log \text{PCCGIO} - (1 - 0.7407) \Delta \log (1 - \text{TIRCCG})
\]

P.29 Indirect tax rate on consumption, central government

\[
\text{TIRCCG} = \text{DVAT6} \times \frac{\text{TSR}}{17} + \text{DTIOV6} \times \text{TIOVR} - \text{DSUB6} \times \text{SUBR}
\]

| DSUB345 | Dummy, share of commodity subsidies of private consumption |
| DSUB6  | Dummy, share of commodity subsidies of central government consumption, \((-94.2 = 0.0027)\) |
| DTIOV345 | Dummy, share of other commodity taxes of private consumption |
| DTIOV6  | Dummy, share of other commodity taxes, central government consumption, \((-94.2 = 0.0163)\) |
| DVAT345 | Dummy, share of value-added tax of private consumption |
| DVAT6  | Dummy, share of value-added tax of central government consumption, \((-94.2 = 0.0712)\) |
| P20    | Producer prices in non-manufacturing private sector excl. letting of own property, 1990=100 |
| PCCG   | Central government consumption prices, 1990=100 |
| PCCGIO | Input-output estimate for deflator PCCG, 1990=100 |
| PCP    | Private consumption prices, 1990=100 |
| PCPIO  | Input-output estimate for deflator PCP, 1990=100 |
| PD1    | Prices of manufactures sold on the domestic market, manufacturing, 1990=100 |
| PIF    | Private non-residential investment prices, 1990=100 |
| PIPIO  | Input-output estimate for deflator PIF, 1990=100 |
| PMIN   | Import prices of investment goods, 1990=100 (weighting = 0.1912) |
| SUBR   | Effective tax rate, commodity subsidies, 1990=1 |
| TIOVR  | Effective tax rate, other commodity taxes, 1990=1 |
| TIRC   | Indirect tax & subsidies rate on private consumption |
| TIRCCG | Indirect tax rate on consumption, central government |
| TSR    | Sales tax rate, % |
P.30 Local government consumption prices
\[ \Delta \log PCLG = \Delta \log PCLGIO - (1 - 0.7924) \times \Delta \log (1 - TIRCLG) \]

P.31 Indirect tax rate on consumption, local government
\[ TIRCLG = DVAT7 \times TSR / 17 + DTIOV7 \times TIOVR - DSUB7 \times SUBR \]

P.32 Consumption prices, social security funds
\[ \Delta \log PCSOS = \Delta \log PCSOSIO - (1 - 0.6458) \times \Delta \log (1 - TIRCSOS) \]

P.33 Indirect tax rate on consumption, social security funds
\[ TIRCSOS = DVAT8 \times TSR / 17 + DTIOV8 \times TIOVR - DSUB8 \times SUBR \]

<table>
<thead>
<tr>
<th>Variable</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>DSUB7</td>
<td>Dummy, share of commodity subsidies of local government consumption, (-94.2 = .0057)</td>
</tr>
<tr>
<td>DTIOV7</td>
<td>Dummy, share of other commodity taxes, local government consumption, (-94.2 = .0210)</td>
</tr>
<tr>
<td>DTIOV8</td>
<td>Dummy, share of other commodity taxes, social security funds' consumption, (-94.2 = .0579)</td>
</tr>
<tr>
<td>DVAT7</td>
<td>Dummy, share of value-added tax of local government consumption, (-94.2 = .0782)</td>
</tr>
<tr>
<td>DVAT8</td>
<td>Dummy, share of value-added tax of consumption, social security funds, (-94.2 = .0103)</td>
</tr>
<tr>
<td>PCLG</td>
<td>Local government consumption prices, 1990=100</td>
</tr>
<tr>
<td>PCLGIO</td>
<td>Input-output estimate for deflator PCLG, 1990=100</td>
</tr>
<tr>
<td>PCSOS</td>
<td>Social insurance institutions consumption prices, 1990=100</td>
</tr>
<tr>
<td>PCSOSIO</td>
<td>Input-output estimate for deflator PCSOS, 1990=100</td>
</tr>
<tr>
<td>SUBR</td>
<td>Effective tax rate, commodity subsidies, 1990=1</td>
</tr>
<tr>
<td>TIOVR</td>
<td>Effective tax rate, other commodity taxes, 1990=1</td>
</tr>
<tr>
<td>TIRCLG</td>
<td>Indirect tax rate on consumption, local government</td>
</tr>
<tr>
<td>TIRCSOS</td>
<td>Indirect tax rate on consumption, social security funds</td>
</tr>
<tr>
<td>TSR</td>
<td>Sales tax rate, %</td>
</tr>
</tbody>
</table>
P.34  Fixed investment prices, manufacturing

\[
\log(PIF_1^* (1 - TIRIF_1)) / PIFIO = \\
0.94144 \log(PIF_{-1}^* (1 - TIRIF_{-1})) / PIFIO_{-1}) \\
+ 0.02781 \log(PIH / P20) \\
+ 0.11251 \Delta \log(PIH / P20) \\
- 0.0013
\]

Method of estimation = Ordinary Least Squares
Estimation period = 1975Q1–1995Q4
R² = .883
DW = 1.938
SE = .01697

P.35  Indirect tax rate on fixed investment, manufacturing

\[
TIRIF_1 = (.17 * (.75 * TSR7 + .25 * TSR8) / TSR + DVAT9) * TSR / 17 \\
+ DTIOV9 * TIOVR
\]

DVAT9  Dummy, share of value-added tax of fixed non-residential investment, manufacturing, (−94.2 = 0)
P20  Producer prices in non-manufacturing private sector excl. letting of own property, 1990=100
PIF1  Fixed investment prices, manufacturing, 1990=100
PIFIO  Input-output estimate for deflator PIF, 1990=100
PIH  Residential construction prices, 1990=100
TIRIF1  Indirect tax rate on fixed investment, manufacturing
TSR  Sales tax rate, %
TSR7  Sales tax rate, industrial machinery and equipment, %
TSR8  Sales tax rate, industrial buildings, %
P.36  Fixed investment prices, private non-manufacturing sector

\[
\log(PIF2^*(1 - TIRIFO) / PIFIO) = \\
0.87538 \log(PIF2_{-1}^*(1 - TIRIFO_{-1}) / PIFIO_{-1}) \\
+ 0.04796 \log(PIH / P20) \\
+ 0.13388 \Delta \log(PIH / P20) \\
- 0.00654 \\
\]

Method of estimation = Ordinary Least Squares
Estimation period = 1975Q1–1995Q4
\( R^2 = 0.932 \)
\( DW = 1.733 \)
\( SE = 0.01001 \)

P.37  Indirect tax rate on fixed investment, non-manufacturing

\[ TIRIFO = DVAT10^*TSR/17 + DTIOV9^*TIOVR \]

<table>
<thead>
<tr>
<th>DTIOV9</th>
<th>Dummy, share of other consumption taxes, fixed non-residential investment, ( (-94.2 = 0.0075) )</th>
</tr>
</thead>
<tbody>
<tr>
<td>DVAT10</td>
<td>Dummy, share of value-added tax of fixed non-residential investment, private non-manufacturing and general government sector, ( (-94.2 = 0.0581) )</td>
</tr>
<tr>
<td>P20</td>
<td>Producer prices in non-manufacturing private sector excl. letting of own property, 1990=100</td>
</tr>
<tr>
<td>PIF2</td>
<td>Fixed investment prices, non-manufacturing private sector, 1990=100</td>
</tr>
<tr>
<td>PIFIO</td>
<td>Input-output estimate for deflator PIF, 1990=100</td>
</tr>
<tr>
<td>PIH</td>
<td>Residential construction prices, 1990=100</td>
</tr>
<tr>
<td>TIOVR</td>
<td>Effective tax rate, other commodity taxes, 1990=1</td>
</tr>
<tr>
<td>TIRIFO</td>
<td>Indirect tax rate on fixed investment, other private investment</td>
</tr>
<tr>
<td>TSR</td>
<td>Sales tax rate, %</td>
</tr>
</tbody>
</table>
P.38 Residential construction prices, static specification

\[ \log PIH = 0.0029 \times \log PD1 + 0.9971 \times \log P20 \]
\[ + 0.34339 \times \log (IH + IH_{-1} + IH_{-2}) \]
\[ + 0.01191 \times \text{TREND} \]
\[ - 3.92097 \]

Method of estimation = Ordinary Least Squares
Estimation period = 1975Q1–1995Q4
\( R^2 = 0.666 \)
\( DW = 0.335 \)
\( SE = 0.04910 \)

P.39 Central government investment prices

\[ \Delta \log PICG = \Delta \log PIF2 \]

P.40 Local government investment prices

\[ \Delta \log PILG = \Delta \log PIF2 \]

P.41 Fixed investment prices, social security funds

\[ \Delta \log PISOS = \Delta \log PIF2 \]

P.42 Value added deflator at factor cost

\[ \text{PGDPF} = 100 \times \text{GDPFV} / \text{GDPF} \]

<table>
<thead>
<tr>
<th>GDPF</th>
<th>GDP at factor cost, millions of 1990 FIM</th>
</tr>
</thead>
<tbody>
<tr>
<td>GDPFV</td>
<td>GDP at factor cost, FIM million</td>
</tr>
<tr>
<td>IH</td>
<td>Residential construction, millions of 1990 FIM</td>
</tr>
<tr>
<td>P20</td>
<td>Producer prices in non-manufacturing private sector excl. letting of own property, 1990=100</td>
</tr>
<tr>
<td>PD1</td>
<td>Prices of manufactures sold on the domestic market, manufacturing, 1990=100</td>
</tr>
<tr>
<td>PGDPF</td>
<td>Value-added deflator at factor cost, 1990=100</td>
</tr>
<tr>
<td>PICG</td>
<td>Central government investment prices, 1990=100</td>
</tr>
<tr>
<td>PIF2</td>
<td>Fixed investment prices, non-manufacturing private sector, 1990=100</td>
</tr>
<tr>
<td>PIH</td>
<td>Residential construction prices, 1990=100</td>
</tr>
<tr>
<td>PILG</td>
<td>Local government investment prices, 1990=100</td>
</tr>
<tr>
<td>PISOS</td>
<td>Social security funds investment prices, 1990=100</td>
</tr>
<tr>
<td>TREND</td>
<td>Linear trend, 1960Q1 onwards ( 0.25 + \text{TREND} _i )</td>
</tr>
</tbody>
</table>
P.43 Private investment prices

\[ PI = 100 \times \frac{IV}{I} \]

P.44 Private fixed non-residential investment prices

\[ PIF = 100 \times \frac{IFV}{IF} \]

P.45 General government investment prices

\[ PIG = 100 \times \frac{IGV}{IG} \]

P.46 Fixed investment prices

\[ PITOT = 100 \times \frac{ITOTV}{ITOT} \]

P.47 General government consumption prices

\[ PCG = 100 \times \frac{CGV}{CG} \]

P.48 Value added deflator in general government

\[ PGDPG = 100 \times \frac{GDPVG}{GDPG} \]

---

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>CG</td>
<td>Public consumption, millions of 1990 FIM</td>
</tr>
<tr>
<td>CGV</td>
<td>Public consumption, FIM million</td>
</tr>
<tr>
<td>GDPG</td>
<td>Production at factor cost, general govt, millions of 1990 FIM</td>
</tr>
<tr>
<td>GDPVG</td>
<td>Production at factor cost, general govt, FIM million</td>
</tr>
<tr>
<td>I</td>
<td>Private fixed investment, millions of 1990 FIM</td>
</tr>
<tr>
<td>IF</td>
<td>Private non-residential investment, mills of 1990 FIM</td>
</tr>
<tr>
<td>IFV</td>
<td>Private non-residential investment, FIM million</td>
</tr>
<tr>
<td>IGV</td>
<td>Public investment, millions of 1990 FIM</td>
</tr>
<tr>
<td>IGV</td>
<td>Public investment, FIM million</td>
</tr>
<tr>
<td>ITOT</td>
<td>Total fixed investment, millions of 1990 FIM</td>
</tr>
<tr>
<td>ITOTV</td>
<td>Total fixed investment, FIM million</td>
</tr>
<tr>
<td>IV</td>
<td>Private fixed investment, FIM million</td>
</tr>
<tr>
<td>PCG</td>
<td>Public consumption prices, 1990=100</td>
</tr>
<tr>
<td>PGDPG</td>
<td>Value-added deflator for general government, 1990=100</td>
</tr>
<tr>
<td>PI</td>
<td>Private investment prices, 1990=100</td>
</tr>
<tr>
<td>PIF</td>
<td>Private non-residential investment prices, 1990=100</td>
</tr>
<tr>
<td>PIG</td>
<td>General government investment prices, 1990=100</td>
</tr>
<tr>
<td>PITOT</td>
<td>Investment prices, 1990=100</td>
</tr>
</tbody>
</table>
Post Recursive Inflation Indices:

P.49  Indicator of underlying inflation, input output estimate

\[ \text{PUIIO} = 0.2049 \times \text{PD1} + 0.5137 \times \text{P20} + 0.1258 \times \text{PGDP21} + 0.155 \times \text{PMCN} \]

P.50  Indicator of underlying inflation

\[ \Delta \text{PUI} = \Delta \text{PUIIO} \]

P.51  Index of housing costs in private consumption

\[
\text{PHCOST} = 0.85103 \times \left( (1/3) \times \text{RLB} + (2/3) \times \text{RLB}_{-1} \right) \times \text{LBH}_{-1} / C \\
+ 0.66226 \times \text{PHM}_{-2} \] \quad \text{(0.0202)}
\[
+ (1 - 0.109501) \times 0.66226 \times \text{PHM}_{-1} \] \quad \text{(0.0202)}

Method of estimation = Ordinary Least Squares
Estimation period = 1988Q1–1994Q4
\[ R^2 = 0.987 \]
\[ DW = 0.515 \]
\[ SE = 2.06569 \]

P.52  Net price index

\[ \text{PNET} = 0.904 \times \text{PUI} + 0.096 \times \text{PHCOST} \]

---

LBH  Bank loans to the households, FIM million
P20  Producer prices in non-manufacturing private sector excl. letting of own property, 1990=100
PD1  Prices of manufactures sold on the domestic market, manufacturing, 1990=100
PGDP21 Value-added deflator for letting of own property, 1990=100
PHCOST Index of housing costs in private consumption, 1990=100
PHM  House price index, all dwellings, entire country, 1990=100
PMCN  Import prices of consumer goods, 1990=100 (weighting = .2778)
PNET  Net price index, 1990=100
PUI  Underlying inflation, 1990=100
PUIIO  Indicator of underlying inflation, input output estimate, 1990=100
RLB  Bank lending rate, per cent
P.53 Sales taxes in private consumption

\[ \text{TIVC} = (\text{TSR} / 17) \times [\text{DVAT345} \times (\text{CV} - \text{GDPV21}) + 0.01 \times \text{DVAT1} \times (0.2384 \times \text{PD1} + 0.2442 \times \text{P20} + 0.1622 \times \text{PMRN}) \times \text{GDPl} / 0.3552 \]
\[ + 0.01 \times \text{DVAT2} \times (0.1166 \times \text{PD1} + 0.2977 \times \text{P20} + 0.0504 \times \text{PMRN}) \times \text{GDP2} / 0.5353] \]
\[ - (1 - D1095Q1) \times 840 + \text{DTIOV345} \times (\text{CV} - \text{GDPV21}) \]

P.54 Subsidies in private consumption

\[ \text{SUBC} = \text{DSUB345} \times (\text{CV} - \text{GDPV21}) + 1870 + D1095Q1 \times 840 \]

P.55 Tax tariff index, indirect taxes

\[ \text{PTAX} = (100 / 24467) \times \text{TIVC} / \text{C} \]

P.56 Tax tariff index, subsidies

\[ \text{PSUB} = (100 / 0.03930) \times \text{SUBC} / \text{C} \]

P.57 Tax tariff index, net

\[ \text{PTARIF} = (0.2743 \times \text{PTAX} - 0.0440 \times \text{PSUB}) / 0.2303 \]

| C | Private consumption, millions of 1990 FIM |
| CV | Private consumption, FIM million |
| D1095Q1 | Dummy for joining the EU |
| DSUB345 | Dummy, share of commodity subsidies of private consumption |
| DTIOV345 | Dummy, share of other commodity taxes of private consumption |
| DVAT1 | Dummy, share of value-added tax of production, manufacturing, \((-94.2 = -0.065)\) |
| DVAT2 | Dummy, share of value-added tax of production, private non-manufacturing sector, \((-94.2 = 0.0581)\) |
| DVAT345 | Dummy, share of value-added tax of private consumption |
| GDP1 | Production at factor cost, manufacturing, millions of 1990 FIM |
| GDPV21 | Production at factor cost, letting of own property, FIM million |
| P20 | Producer prices in non-manufacturing private sector excl. letting of own property, 1990=100 |
| PD1 | Prices of manufactures sold on the domestic market, manufacturing, 1990=100 |
| PMRN | Import prices of raw materials, 1990=100 (weighting = 0.531) |
| PSUB | Tax tariff index, subsidies, 1990=100 |
| PTARIF | Tax tariff index, net, 1990=100 |
| PTAX | Tax tariff index, indirect taxes, 1990=100 |
| SUBC | Subsidies in private consumption, FIM million |
| TIVC | Sales taxes in private consumption, FIM million |
| TSR | Sales tax rate, % |

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P.58  Consumer price index

\[ \text{CPI} = .7696 \times \text{PNET} + .2303 \times \text{PTARIF} \]

P.59  Harmonized consumer price index

\[ \text{CPIH} = 100 \times \left( \frac{\text{CPI} - .08 \times \text{PHCOST} - .09 \times \text{PCG}}{97.63066} \right) \]
3.10 Incomes (Y)

Y.1 Consumption of fixed capital, manufacturing

\[ CCV_1 = 0.91764 \times CCR_1 \times KF_{1t} \times PIF_{1t} / 100 \]

Y.2 Consumption of fixed capital, non-manufacturing private sector

\[ CCV_2 = 1.38259 \times CCR_2 \times KF_{2t} \times PIF_{2t} / 100 \]

Y.3 Consumption of fixed capital, housing sector

\[ CCV_{21} = 1.05124 \times CCRH \times KH_{t} \times PIH_{t} / 100 \]

Y.4 Consumption of fixed capital, central government sector

\[ \log CCV_{CG} = -1.04264 + 1.07273 \times \log (CCRCG \times KFCG_{-1} \times PICG / 100) \]

Method of estimation = Ordinary Least Squares
Estimation period = 1976Q1–1993Q4
\[ R^2 = .993 \]
\[ DW = .235 \]
\[ SE = .04777 \]

<table>
<thead>
<tr>
<th>Variable</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>CCR1</td>
<td>Capital consumption rate, manufacturing</td>
</tr>
<tr>
<td>CCR2</td>
<td>Capital consumption rate, non-manufacturing private sector</td>
</tr>
<tr>
<td>CCRCG</td>
<td>Capital consumption rate, central government</td>
</tr>
<tr>
<td>CCRH</td>
<td>Capital consumption rate, residential buildings</td>
</tr>
<tr>
<td>CCV1</td>
<td>Consumption of fixed capital, manufacturing, FIM million</td>
</tr>
<tr>
<td>CCV2</td>
<td>Consumption of fixed capital, non-manufacturing private sector, FIM million</td>
</tr>
<tr>
<td>CCV21</td>
<td>Consumption of fixed capital, letting of own property, FIM million</td>
</tr>
<tr>
<td>CCVCG</td>
<td>Consumption of fixed capital, central government, FIM million</td>
</tr>
<tr>
<td>KF1</td>
<td>Net stock of fixed capital, manufacturing, millions of 1990 FIM</td>
</tr>
<tr>
<td>KF2</td>
<td>Net stock of fixed capital, non-manufacturing private sector, millions of 1990 FIM</td>
</tr>
<tr>
<td>KFCG</td>
<td>Net stock of fixed capital, central govt, millions of 1990 FIM</td>
</tr>
<tr>
<td>KH</td>
<td>Net stock of priv. residential capital, net, millions of 1990 FIM</td>
</tr>
<tr>
<td>PICG</td>
<td>Central government investment prices, 1990=100</td>
</tr>
<tr>
<td>PIF1</td>
<td>Fixed investment prices, manufacturing, 1990=100</td>
</tr>
<tr>
<td>PIF2</td>
<td>Fixed investment prices, non-manufacturing private sector, 1990=100</td>
</tr>
<tr>
<td>PIH</td>
<td>Residential construction prices, 1990=100</td>
</tr>
</tbody>
</table>

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Y.5  Consumption of fixed capital, local government sector

\[ \log CCVLG = -0.31515 + 1.03354 \times \log (CCRLG \times KFLG^{-1} \times PILG / 100) \]

Method of estimation = Ordinary Least Squares
Estimation period = 1976Q1–1993Q4
\[ R^2 = .999 \]
\[ DW = .194 \]
\[ SE = .01980 \]

Y.6  Consumption of fixed capital, social security funds

\[ CCVS = CCRS \times KFS^{-1} \times PISOS / 100 \]

Y.7  Consumption of fixed capital, general government sector

\[ CCVG = CCVCG + CCVLG + CCVS \]

Y.8  Consumption of fixed capital, household sector

\[ \log (CCVH \times 100 / (PIH \times CCRH \times KH^{-1})) = -.66781 \]
\[ + .92054 \times \log (CCR2 \times KF2^{-1} \times PIF2 / 100) \]

Method of estimation = Ordinary Least Squares
Estimation period = 1975Q1–1994Q4
\[ R^2 = .992 \]
\[ DW = .236 \]
\[ SE = .04389 \]

<table>
<thead>
<tr>
<th>CCR2</th>
<th>Capital consumption rate, non-manufacturing private sector</th>
</tr>
</thead>
<tbody>
<tr>
<td>CCRH</td>
<td>Capital consumption rate, residential buildings</td>
</tr>
<tr>
<td>CCRLG</td>
<td>Capital consumption rate, local government</td>
</tr>
<tr>
<td>CCRS</td>
<td>Capital consumption rate, social security funds</td>
</tr>
<tr>
<td>CCVCG</td>
<td>Consumption of fixed capital, central government, FIM million</td>
</tr>
<tr>
<td>CCVG</td>
<td>Consumption of fixed capital, public sector, FIM million</td>
</tr>
<tr>
<td>CCVH</td>
<td>Consumption of fixed capital, households, FIM million</td>
</tr>
<tr>
<td>CCVLG</td>
<td>Consumption of fixed capital, local government, FIM million</td>
</tr>
<tr>
<td>CCVS</td>
<td>Consumption of fixed capital, social security funds, FIM million</td>
</tr>
<tr>
<td>KF2</td>
<td>Net stock of fixed capital, non-manufacturing, private sector, millions of 1990 FIM</td>
</tr>
<tr>
<td>KFLG</td>
<td>Net stock of fixed capital, local government, millions of 1990 FIM</td>
</tr>
<tr>
<td>KFS</td>
<td>Net stock of fixed capital, social security funds, millions of 1990 FIM</td>
</tr>
<tr>
<td>KH</td>
<td>Net stock of priv. residential capital, net, millions of 1990 FIM</td>
</tr>
<tr>
<td>PIF2</td>
<td>Fixed investment prices, non-manufacturing private sector, 1990=100</td>
</tr>
<tr>
<td>PIH</td>
<td>Residential construction prices, 1990=100</td>
</tr>
<tr>
<td>PILG</td>
<td>Local government investment prices, 1990=100</td>
</tr>
<tr>
<td>PISOS</td>
<td>Social security funds investment prices, 1990=100</td>
</tr>
</tbody>
</table>
Y.9  Consumption of fixed capital, private sector

\[ CCV8 = CCV1 + CCV2 \]

Y.10  Consumption of fixed capital, total

\[ CCVT = CCV1 + CCV2 + CCVG \]

Y.11  Wages and salaries, manufacturing sector

\[ YW1 = WAR1 \times LHW1 \]

Y.12  Wages and salaries, non-manufacturing private sector

\[ YW2 = WAR2 \times LHW2 \]

Y.13  Wages and salaries, central government sector

\[ YWCG = WARG \times 0.0115 \times (GDPCG - CCRCG \times KFCG) \]

Y.14  Wages and salaries, social security funds

\[ YWS = WARG \times 0.0115 \times (GDPS - CCRS \times KFS) \]

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>CCRCG</td>
<td>Capital consumption rate, central government</td>
</tr>
<tr>
<td>CCRS</td>
<td>Capital consumption rate, social security funds</td>
</tr>
<tr>
<td>CCV1</td>
<td>Consumption of fixed capital, manufacturing, FIM million</td>
</tr>
<tr>
<td>CCV2</td>
<td>Consumption of fixed capital, non-manufacturing private sector, FIM million</td>
</tr>
<tr>
<td>CCV8</td>
<td>Consumption of fixed capital, private sector, FIM million</td>
</tr>
<tr>
<td>CCVG</td>
<td>Consumption of fixed capital, public sector, FIM million</td>
</tr>
<tr>
<td>CCVT</td>
<td>Consumption of fixed capital, FIM million</td>
</tr>
<tr>
<td>GDPCG</td>
<td>Production at factor cost, central government, millions of 1990 FIM</td>
</tr>
<tr>
<td>GDPS</td>
<td>Production at factor cost, social security funds, millions of 1990 FIM</td>
</tr>
<tr>
<td>KFCG</td>
<td>Net stock of fixed capital, central govt, millions of 1990 FIM</td>
</tr>
<tr>
<td>KFS</td>
<td>Net stock of fixed capital, social security funds, millions of 1990 FIM</td>
</tr>
<tr>
<td>LHW1</td>
<td>Performed working hours, manufacturing, employees, mills of hours</td>
</tr>
<tr>
<td>LHW2</td>
<td>Performed working hours, non-manufacturing private sector, employees, mills of hours</td>
</tr>
<tr>
<td>WAR1</td>
<td>Average wage, manufacturing, FIM/h</td>
</tr>
<tr>
<td>WAR2</td>
<td>Average wage, non-manufacturing private sector, FIM/h</td>
</tr>
<tr>
<td>WARG</td>
<td>Average wage, public sector, FIM/h</td>
</tr>
<tr>
<td>YW1</td>
<td>Wages and salaries, manufacturing, FIM million</td>
</tr>
<tr>
<td>YW2</td>
<td>Wages and salaries, non-manufacturing private sector, FIM million</td>
</tr>
<tr>
<td>YWCG</td>
<td>Wages and salaries, central government, FIM million</td>
</tr>
<tr>
<td>YWS</td>
<td>Wages and salaries, social security funds, FIM million</td>
</tr>
</tbody>
</table>
Y.15 Wages and salaries, local government sector
YWLG = WARG*0.0115*(GDPLG-CCRLG*KFLG_1)

Y.16 Wages and salaries, general government sector
YWG = YWCG + YWLG + YWS

Y.17 Wages and salaries, total
YW = YW1 + YW2 + YWG

Y.18 Employers' social security contribution rate, manufacturing sector
SOCR1 = SOCSPR + SOCUR + SOCTELR + SOCOR1

Y.19 Employers' social security contribution rate, non-manufacturing private sector
SOCR2 = SOCSPR + SOCUR + 0.72*SOCTELR + 0.28*SOCLELR
 + SOCOR2.

Y.20 Employers' social security contribution rate, private sector
SOCR8 = (SOC1 + SOC2)/(YW1 + YW2)
Y.21 Employers’ social security contribution rate, central government

\[
SOCRCG = SOCSGR + SOCORCG
\]

Y.22 Employers’ social security contribution rate, local government

\[
SOCRLG = SOCSGR + SOCUR + SOCORLG
\]

Y.23 Employers’ social security contribution rate, social security funds

\[
SOCRS = SOCSGR + SOCUR + SOCORS
\]

Y.24 Employers’ social security contributions, manufacturing

\[
SOC1 = SOCRI * YW1
\]

Y.25 Employers’ social security contributions, non-manufacturing private sector

\[
SOC2 = SOCR2 * YW2
\]

Y.26 Employers’ social security contributions, general government

\[
SOCG = SOCRCG * YWCG + SOCRLG * YWLG + SOCRS * YWS
\]
| Y.27  | Employers’ social security contributions, total |
|       | \( SOC = SOC1 + SOC2 + SOCG \) |

| Y.28  | Gross operating surplus, manufacturing |
|       | \( YNW1 = GDPV1 - YW1 - SOC1 \) |

| Y.29  | Gross operating surplus, non-manufacturing private sector |
|       | \( YNW2 = GDPV2 - YW2 - SOC2 \) |

| Y.30  | Gross operating surplus, general government |
|       | \( YNWG = GDPVG - YWG - SOCG \) |

| Y.31  | Gross operating surplus, total |
|       | \( YNW = YNW1 + YNW2 + YNWG \) |

| GDPV1  | Production at factor cost, manufacturing, FIM million |
| GDPV2  | Production at factor cost, non-manufacturing private sector, FIM million |
| GDPVG  | Production at factor cost, general govt., FIM million |
| SOC    | Entrepreneurs’ social security contributions, total, FIM million |
| SOC1   | Entrepreneurs’ social security contributions, manufacturing, FIM million |
| SOC2   | Entrepreneurs’ social security contrib., non-manufact. priv. sector, FIM million |
| SOCG   | Entrepreneurs’ social security contributions, general government, FIM million |
| SOCR1  | Entrepreneurs’ social security contribution rate, manufacturing |
| SOCR2  | Entrepreneurs’ social security contrib. rate, non-manufacturing private sector |
| YNW    | Gross operating surplus, total, FIM million |
| YNW1   | Gross operating surplus, manufacturing, FIM million |
| YNW2   | Gross operating surplus, non-manufacturing private sector, FIM million |
| YNWG   | Gross operating surplus, public sector, FIM million |
| YW1    | Wages and salaries, manufacturing, FIM million |
| YW2    | Wages and salaries, non-manufacturing private sector, FIM million |
| YWG    | Wages and salaries, general government, FIM million |
Y.32 Net operating surplus, manufacturing

\[
YNOI_{III} = YNW1 - CCV1 - .30137 \times TIOCG + .2118 \times SUBOCG
\]

Method of estimation = Ordinary Least Squares
Estimation period = 1975Q1–1994Q4
\( R^2 = .906 \)
\( DW = 1.849 \)
\( SE = 134.4 \)

Y.33 Net operating surplus, non-manufacturing private sector

\[ YNOI2 = YNOI - YNOI_{III} \]

Y.34 Net operating surplus, housing sector

\[
\log YNOI_{21} = -.13012 + 1.02348 \times \log (GDPV21 - CCRH \times KH_{-1} \times PIH/100)
\]

Method of estimation = Ordinary Least Squares
Estimation period = 1975Q1–1993Q4
\( R^2 = .936 \)
\( DW = .321 \)
\( SE = .1402 \)

Y.35 Net operating surplus, total (domestic)

\[ YNOI = YNW - CCVT - TIOCG + SUBOCG \]

---

CCRH Capital consumption rate, residential buildings
CCV1 Consumption of fixed capital, manufacturing, FIM million
GDPV21 Production at factor cost, letting of own property, FIM million
KH Net stock of priv. residential capital, net, millions of 1990 FIM
PIH Residential construction prices, 1990=100
SUBOCG Central government other subsidies, FIM million
TIOCG Central government revenue from other indirect taxes, FIM million
YNOI Net operating surplus, total (domestic), FIM million
YNOI\(_{III}\) Net operating surplus, manufacturing, FIM million
YNOI2 Net operating surplus, non-manufacturing private sector, FIM million
YNOI\(_{21}\) Net operating surplus, housing sector, FIM million
YNW Gross operating surplus, total, FIM million
YNW1 Gross operating surplus, manufacturing, FIM million
Y.36 Net operating surplus, households

Default: Long-run relationship

\[ Y_{NOIH} = Y_{NOI21} + (Y_{NOIH_{-1}} - Y_{NOI21_{-1}}) \times \left( 0.60382 \times \left( \frac{Y_{NOI} - Y_{NOI21}}{Y_{NOI_{-1}} - Y_{NOI21_{-1}}} \right) \right) + (1 - 0.60382) \]

Estimated form:

\[ \Delta \log \left( \frac{Y_{NOIH} - Y_{NOI21}}{Y_{NOI} - Y_{NOI21}} \right) = 0.7895 \times (0.2623) - 0.24678 \times \log(Y_{NOIH_{-1}} - Y_{NOI21_{-1}}) \times (0.0770) + 0.14901 \times \log(Y_{NOI_{-1}} - Y_{NOI21_{-1}}) \times (0.0556) + 0.48902 \times \Delta \log \left( \frac{G_{DP2_{-1}} - G_{DP21_{-1}} + G_{DI_{-1}}}{G_{DPT_{-1}} + G_{DPT2_{-1}}} \right) \times (2.723) \]

Method of estimation = Ordinary Least Squares
Estimation period = 1975Q1–1995Q4
\( R^2 = 0.100 \)
\( DW = 1.930 \)
\( SE = 0.07608 \)

Y.37 Net operating surplus, corporate sector, (institutional; incl. government enterprises)

\[ Y_{NOIC} = Y_{NOI} - Y_{NOIH} \]

Y.38 Net investment income from abroad (SNA)

\[ \Delta Y_{FINNA} = \Delta Y_{FIN} \]

<table>
<thead>
<tr>
<th>GDP1</th>
<th>Production at factor cost, manufacturing, millions of 1990 FIM</th>
</tr>
</thead>
<tbody>
<tr>
<td>GDP1T</td>
<td>The normal level of production with existing inputs, manufacturing, mills of 1990 FIM</td>
</tr>
<tr>
<td>GDP2</td>
<td>Production at factor cost, non-manufacturing private sector, mills of 1990 FIM</td>
</tr>
<tr>
<td>GDP21</td>
<td>Production at factor cost, letting of own property, mills of 1990 FIM</td>
</tr>
<tr>
<td>GDP2T</td>
<td>The normal level of production with existing inputs, non-manufacturing private sector (excl. letting of own property), millions of 1990 FIM</td>
</tr>
<tr>
<td>YFIN</td>
<td>Investment income from abroad, net, FIM million</td>
</tr>
<tr>
<td>YFINNA</td>
<td>Net investment income from abroad (SNA), FIM million</td>
</tr>
<tr>
<td>YNOI</td>
<td>Net operating surplus, total (domestic), FIM million</td>
</tr>
<tr>
<td>YNOI21</td>
<td>Net operating surplus, housing sector, FIM million</td>
</tr>
<tr>
<td>YNOIC</td>
<td>Net operating surplus, corporate sector, FIM million</td>
</tr>
<tr>
<td>YNOIH</td>
<td>Net operating surplus, households, FIM million</td>
</tr>
</tbody>
</table>
Y.39 National Income

\[ Y = \text{GDPV} + \text{YFINNA} - \text{CCVT} + \text{SUBEU} \]

Y.40 Income transfers from abroad, net (SNA)

\[ \text{YFTRNA} = \text{YFTR} + \text{YFIN} - \text{YFINNA} - \text{SUBEU} \]

Y.41 Disposable income of the national economy

\[ \text{YDTOT} = Y + \text{YFTRNA} \]

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<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>CCVT</td>
<td>Consumption of fixed capital, FIM million</td>
</tr>
<tr>
<td>GDPV</td>
<td>GDP in purchasers' values, FIM million</td>
</tr>
<tr>
<td>SUBEU</td>
<td>Indirect taxes from the rest of the world, net, FIM million</td>
</tr>
<tr>
<td>Y</td>
<td>National income, FIM million</td>
</tr>
<tr>
<td>YDTOT</td>
<td>Disposable income, total, FIM million</td>
</tr>
<tr>
<td>YFIN</td>
<td>Investment income from abroad, net, FIM million</td>
</tr>
<tr>
<td>YFINNA</td>
<td>Net investment income from abroad (SNA), FIM million</td>
</tr>
<tr>
<td>YFTR</td>
<td>Income transfers from abroad, net, FIM million</td>
</tr>
<tr>
<td>YFTRNA</td>
<td>Income transfers from abroad, net (SNA), FIM million</td>
</tr>
</tbody>
</table>
3.11 Incomes and outlays of corporates (CO)

CO.1 Interest income, firms

\[ YIC = 0.68857 \times YIH + 0.72995 \times 0.0025 \times RS \times (M_3 - M_2) \]

Method of estimation = Ordinary Least Squares
Estimation period = 1975Q1–1995Q4
\[ R^2 = 0.962 \]
\[ DW = 0.112 \]
\[ SE = 314.79 \]

CO.2 Interest income, manufacturing

\[ \frac{YIC1}{YIC_{1-4}} = \frac{YIC}{YIC_{-4}} \]

CO.3 Interest income, non-manufacturing firms (excl. banks)

\[ YIC2 = YIC - YIC1 \]

---

MON2 Monetary aggregate M2, FIM million
MON3 Monetary aggregate M3, FIM million
RS Money market rate, 3-month HELIBOR (1987 onwards), per cent
YIC Interest income of enterprises, FIM million
YIC1 Interest income of manufacturing, FIM million
YIC2 Interest income of non-manufacturing private sector, FIM million
YIH Interest income of households, FIM million
CO.4  Interest outlays, manufacturing

\[
\Delta \text{EIC}_1 = 0.21255 \Delta \text{EIC}_{1-1} \\
+ 0.75565 \times 0.0025 \left[ \Delta (RLB \times LCD_{1-1}) \right] \\
+ \Delta (RFOR \times LCF_{1-1}) \\
- 0.41605 \times 0.0025 \left[ \Delta (RLB_{-1} \times LCD_{1-2}) \right] \\
+ \Delta (RFOR_{-1} \times LCF_{1-2}) \\
- 0.33647 \times 0.0025 \left[ \Delta (RLB_{-1} \times LCD_{1-2}) \right] \\
+ 16.72197
\]

Method of estimation = Ordinary Least Squares
Estimation period = 1977Q1–1994Q4
\[ R^2 = 0.811 \]
\[ DW = 2.221 \]
\[ SE = 81.34 \]

CO.5  Interest outlays, non-manufacturing firms (excl. banks)

\[
\Delta \text{EIC}_2 = 0.37864 \Delta \text{EIC}_{2-1} \\
+ 1.00010 \times 0.0025 \left[ \Delta (RLB \times LCD_{2-1}) + \Delta (RFOR \times LCF_{2-1}) \right] \\
- 0.55422 \times 0.0025 \left[ \Delta (RLB_{-1} \times LCD_{2-2}) \right] \\
+ \Delta (RFOR_{-1} \times LCF_{2-2}) \\
- 0.6311 \times 0.0025 \left[ \Delta (RLB_{-1} \times LCD_{2-2}) \right] \\
+ 35.41593
\]

Method of estimation = Ordinary Least Squares
Estimation period = 1977Q1–1994Q4
\[ R^2 = 0.861 \]
\[ DW = 1.913 \]
\[ SE = 86.30 \]
CO.6 Interest outlays, firms (excl. banks)

\[ EIC = EIC1 + EIC2 \]

CO.7 Disposable income, corporates (excl. banks)

\[ \Delta YDC = \Delta YNOIC + \Delta YIC - \Delta EIC - \Delta TYC \]

CO.8 Net lending, corporate sector (excl. banks)

\[ \Delta FCN = \Delta YDC + \Delta CCV8 - \Delta IFV - \Delta (0.01 \times PIF \times II) \]

CO.9 Cash flow, manufacturing

\[ CFB1 = YNOII - TYCIR \times TYC - EIC1 + YIC1 + CCV1 \]

CO.10 Cash flow, non-manufacturing corporate sector (excl. banks)

\[ CFB2 = YNOIC - YNOII - EIC2 + YIC2 - (1 - TYCIR) \times TYC \]
\[ + CCV2 - CCV21 \]

<table>
<thead>
<tr>
<th>CCV1</th>
<th>Consumption of fixed capital, manufacturing, FIM million</th>
</tr>
</thead>
<tbody>
<tr>
<td>CCV2</td>
<td>Consumption of fixed capital, non-manufacturing private sector, FIM million</td>
</tr>
<tr>
<td>CCV21</td>
<td>Consumption of fixed capital, letting of own property, FIM million</td>
</tr>
<tr>
<td>CCV8</td>
<td>Consumption of fixed capital, private sector, FIM million</td>
</tr>
<tr>
<td>CFB1</td>
<td>Cash flow, manufacturing, FIM million</td>
</tr>
<tr>
<td>CFB2</td>
<td>Cash flow, non-manufacturing private sector, FIM million</td>
</tr>
<tr>
<td>EIC</td>
<td>Interest expenditure, corporate sector, FIM million</td>
</tr>
<tr>
<td>EIC1</td>
<td>Interest expenditure, manufacturing, FIM million</td>
</tr>
<tr>
<td>EIC2</td>
<td>Interest expenditure, non-manufacturing private sector, FIM million</td>
</tr>
<tr>
<td>FCN</td>
<td>Net lending by corporate sector, FIM million</td>
</tr>
<tr>
<td>IFV</td>
<td>Private non-residential investment, FIM million</td>
</tr>
<tr>
<td>II</td>
<td>Change in inventories, millions of 1990 FIM</td>
</tr>
<tr>
<td>PIF</td>
<td>Private non-residential investment prices, 1990=100</td>
</tr>
<tr>
<td>TYC</td>
<td>Corporate tax revenue, FIM million</td>
</tr>
<tr>
<td>TYCIR</td>
<td>Corporate tax rate in central government taxation, manufacturing</td>
</tr>
<tr>
<td>YDC</td>
<td>Disposable income of corporate sector, FIM million</td>
</tr>
<tr>
<td>YIC</td>
<td>Interest income of enterprises, FIM million</td>
</tr>
<tr>
<td>YIC1</td>
<td>Interest income of manufacturing, FIM million</td>
</tr>
<tr>
<td>YIC2</td>
<td>Interest income of non-manufacturing private sector, FIM million</td>
</tr>
<tr>
<td>YNOII</td>
<td>Net operating surplus, manufacturing, FIM million</td>
</tr>
<tr>
<td>YNOIC</td>
<td>Net operating surplus, corporate sector, FIM million</td>
</tr>
</tbody>
</table>

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CO.11 Private foreign currency denominated loan stock, manufacturing

\[ LCF1 = LCF_{1-1} \times FXTW/FXTW_{-1} + 0.7 \times (FMPN - FEXP) \]

CO.12 Private foreign currency denominated loan stock, services

\[ LCF2 = LCF_{2-1} \times FXTW/FXTW_{-1} + 0.3 \times (FMPN - FEXP) \]

CO.13 Foreign currency denominated stock of loans of the non-banking private corporate sector

\[ LCF = LCF1 + LCF2 \]

CO.14 Domestic currency denominated stock of loans, manufacturing

\[ LCD1 = LCD_{-1} - LCD2 - 0.1 \times LCF - FCN \]

CO.15 Domestic currency denominated stock of loans, non-manufacturing firm (excl. banks)

\[ \Delta LCD2 = - \Delta LCF2 + IFV2 - CFB2 + 0.81436 \times PIF \times II/100 - 3608.641 \\
\quad (4393) \quad (828.48) \]

Method of estimation = Ordinary Least Squares
Estimation period = 1985Q1–1994Q4
\[ R^2 = 0.059 \]
\[ DW = 1.856 \]
\[ SE = 5235.8 \]

- CFB2: Cash flow, non-manufacturing private sector, FIM million
- FCN: Net lending by corporate sector, FIM million
- FEXP: Investments abroad, corporate sector, FIM million
- FMPN: Foreign borrowing by private sector, FIM million
- FXTW: Bank of Finland currency index, 1982=100
- IFV2: Private fixed investment, non-manufacturing private sector, FIM million
- II: Change in inventories, millions of 1990 FIM
- LCD: Domestic currency denominated stock of loans of the non-banking private corporate sector, FIM million
- LCD1: Domestic currency denominated stock of loans, manufacturing, FIM million
- LCD2: Domestic currency denominated stock of loans, non-manufacturing firms (excl. banks), FIM million
- LCF: Foreign currency denominated stock of loans of the non-banking corporate sector, FIM million
- LCF1: Private foreign currency denominated loan stock, manufacturing, FIM million
- LCF2: Private foreign currency denominated loan stock, non-manufacturing private sector, FIM million
- PIF: Private non-residential investment prices, 1990=100
CO.16  Domestic currency denominated stock of loans of the non-banking private corporate sector

\[ \text{LCD} = \text{LCD}1 + \text{LCD}2 \]

<table>
<thead>
<tr>
<th>LCD</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>LCD</td>
<td>Domestic currency denominated stock of loans of the non-banking private corporate sector, FIM million</td>
</tr>
<tr>
<td>LCD1</td>
<td>Domestic currency denominated stock of loans, manufacturing, FIM million</td>
</tr>
<tr>
<td>LCD2</td>
<td>Domestic currency denominated stock of loans, non-manufacturing firms (excl. banks), FIM million</td>
</tr>
</tbody>
</table>
3.12 Incomes and outlays of households (H)

H.1 Factor income by households

\[ YFIH = YW + SOC + YWF + YNOIH \]

H.2 Entrepreneurial income of households

\[ \frac{YSE}{YSE_{-1}} = 1.2974 \times \frac{YNOIH}{YNOIH_{-1}} \]

Estimated from:

\[
\log YSE = -5.97925 + 1.2974 \times \log YNOIH \\
\text{(4354)} \quad \text{(0.476)}
\]

Method of estimation = Ordinary Least Squares
Estimation period = 1976Q1–1994Q4
\[ R^2 = .908 \]
\[ DW = 1.126 \]
\[ SE = .141 \]

H.3 Interest income, households

\[ YIH = .77231 \times .0025 \times RLB \times (MON2_{-1} - CURNB_{-1}) - 161.7762 \]

\[
\text{(0.0136)} \quad \text{(61.7702)}
\]

Method of estimation = Ordinary Least Squares
Estimation period = 1975Q1–1995Q4
\[ R^2 = .975 \]
\[ DW = .235 \]
\[ SE = 304.15 \]

---

\begin{tabular}{ll}
CURNB & Currency in circulation, public, FIM million \\
MON2 & Monetary aggregate M2, FIM million \\
RLB & Bank lending rate, per cent \\
SOC & Entrepreneurs’ social security contributions, total, FIM million \\
YFIH & Factor incomes by households, FIM million \\
YIH & Interest income of households, FIM million \\
YNOIH & Net operating surplus, households, FIM million \\
YSE & Entrepreneurial income of households, FIM million \\
YW & Wages and salaries, total, FIM million \\
YWF & Wages, salaries and social security contributions from abroad, FIM million \\
\end{tabular}
H.4 Interest outlays, households

\[ \text{EIH} = 1.10003 \times 0.0025 \times \text{RLB} \times \text{LBH}_{-1} + 0.59589 \times 0.0025 \times \text{RLB} \times \text{LCGH}_{-1} \]

Method of estimation = Ordinary Least Squares
Estimation period = 1971Q1–1994Q4
\( R^2 = 0.997 \)
\( \text{DW} = 0.810 \)
\( \text{SE} = 146.53 \)

H.5 Dividend and rest of property income of the household sector

\[ \Delta \log \left( \frac{\text{YOHN}}{\text{GDPV}} \right) = +0.80508 \times \Delta \log \left( \frac{\text{YOHN}_{-1}}{\text{GDPV}_{-1}} \right) \]
\[ -0.14742 \times \Delta \log \left( \frac{\text{YOHN}_{-2}}{\text{GDPV}_{-2}} \right) \]
\[ -0.11626 \times (\text{ZYOHN}_{-1} - \text{ZYOHN}_{-2}) \]
\[ -0.07659 \times (\log(\text{YOHN}_{-1} / \text{GDPV}_{-1}) - \text{ZYOHN}) \]

Method of estimation = Ordinary Least Squares
Estimation period = 1971Q1–1994Q4
\( R^2 = 0.523 \)
\( \text{DW} = 2.059 \)
\( \text{SE} = 0.03608 \)

where

\[ \text{ZYOHN} = -7.77129 - 1.29346 \times \log(\text{IFV} / \text{GDPV}) \]
\[ + 1.37503 \times \log(\text{PHMR}) \]

Method of estimation = Ordinary Least Squares
Estimation period = 1970Q1–1994Q4
\( R^2 = 0.780 \)
\( \text{DW} = 0.285 \)
\( \text{SE} = 0.1722 \)

---

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>EIH</td>
<td>Interest expenditure, households, FIM million</td>
</tr>
<tr>
<td>GDPV</td>
<td>GDP in purchasers' values, FIM million</td>
</tr>
<tr>
<td>IFV</td>
<td>Private non-residential investment, FIM million</td>
</tr>
<tr>
<td>LBH</td>
<td>Bank loans to the households, FIM million</td>
</tr>
<tr>
<td>LCGH</td>
<td>Stock of central government housing loans, FIM million</td>
</tr>
<tr>
<td>PHMR</td>
<td>Real house price index, all dwellings, entire country, 1990=100</td>
</tr>
<tr>
<td>RLB</td>
<td>Bank lending rate, per cent</td>
</tr>
<tr>
<td>YOHN</td>
<td>Dividend and rest of property income of the household sector, FIM million</td>
</tr>
</tbody>
</table>
H.6 Entrepreneurial and property income of the household sector

\[ \text{YINH} = \text{YSE} + \text{YIH} - \text{EIH} + \text{YOHN} \]

H.7 Other transfers received by households

\[ \text{YTRHO} = \text{TRHGOV} + (\text{YTRHO}_{-1} - \text{TRHGOV},_{-1} + \text{YTRHO}_{-2} - \text{TRHGOV}_{-2} + \text{YTRHO}_{-3} - \text{TRHGOV}_{-3} + \text{YTRHO}_{-4} - \text{TRHGOV}_{-4}) / 4 \]

H.8 Transfer income of households received from other sectors

\[ \text{YTRH} = \text{TRCGH} + \text{TRLGH} + \text{TRSHV} + \text{YTRHO} \]

H.9 Transfers of households to other sectors

\[ \text{TRHGTOT} = \text{TYP} + \text{SOC} + \text{SOL} + \text{TOCG} + \text{TOLG} + \text{TRHGOV} \]

H.10 Household disposable income

\[ \text{YD} = \text{YFIH} + \text{YINH} + \text{YTRH} - \text{TRHGTOT} \]

---

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>EIH</td>
<td>Interest expenditure, households, FIM million</td>
</tr>
<tr>
<td>SOC</td>
<td>Entrepreneurs’ social security contributions, total, FIM million</td>
</tr>
<tr>
<td>SOL</td>
<td>Social security payments by employees and pensioners, total, FIM million</td>
</tr>
<tr>
<td>TOCG</td>
<td>Central government compulsory fees, fines and penalties, FIM million</td>
</tr>
<tr>
<td>TOLG</td>
<td>Local government compulsory fees, fines and penalties, FIM million</td>
</tr>
<tr>
<td>TRCGH</td>
<td>Central government transfers to households, FIM million</td>
</tr>
<tr>
<td>TRHGOV</td>
<td>Households other required current transfers, FIM million</td>
</tr>
<tr>
<td>TRHGTOT</td>
<td>Households expenditure on unrequired current transfers, FIM million</td>
</tr>
<tr>
<td>TRLGH</td>
<td>Local government transfers to households, FIM million</td>
</tr>
<tr>
<td>TRSHV</td>
<td>Social security funds current transfers to households, FIM million</td>
</tr>
<tr>
<td>TYP</td>
<td>Central and local government revenue direct taxes on households, FIM million</td>
</tr>
<tr>
<td>YD</td>
<td>Household disposable income, FIM million</td>
</tr>
<tr>
<td>YFIH</td>
<td>Factor incomes by households, FIM million</td>
</tr>
<tr>
<td>YIH</td>
<td>Interest income of households, FIM million</td>
</tr>
<tr>
<td>YINH</td>
<td>Entrepreneurial and property income of the household sector, FIM million</td>
</tr>
<tr>
<td>YOHN</td>
<td>Dividend and rest of property income of the household sector, FIM million</td>
</tr>
<tr>
<td>YSE</td>
<td>Entrepreneurial income of households, FIM million</td>
</tr>
<tr>
<td>YTRH</td>
<td>Transfer income of households received from other sectors, FIM million</td>
</tr>
<tr>
<td>YTRHO</td>
<td>Other transfers received by households, FIM million</td>
</tr>
</tbody>
</table>
H.11 Fixed investment of the household sector, value

\[ IHTV = IHV + (0.942201 \times (IHTV_{-1} - IHV_{-1}) / IFV_{-1}) \]
\[ + 0.00912 \times IFV \]

Method of estimation = Ordinary Least Squares
Estimation period = 1970Q1–1994Q4
\( R^2 = 0.878 \)
\( DW = 1.968 \)
\( SE = 0.0098 \)

H.12 Net lending of the household sector (SNA)

\[ FHN = YD + CCVH + CAPH - CV - IHTV \]

H.13 Net borrowing of the household sector (flow of funds)

\[ FHNB = -FHN \]

H.14 Bank loans to households

\[ \Delta LBH = -FCGHN + FHNB + 0.83895 \times \Delta MON2 + 1328.9/4 \]

Method of estimation = Ordinary Least Squares
Estimation period = 1971–1994
\( R^2 = 0.780 \)
\( DW = 1.202 \)
\( SE = 4058.7 \)

<table>
<thead>
<tr>
<th>CAPH</th>
<th>Capital consumption, households, FIM million</th>
</tr>
</thead>
<tbody>
<tr>
<td>CCVH</td>
<td>Consumption of fixed capital, households, FIM million</td>
</tr>
<tr>
<td>CV</td>
<td>Private consumption, FIM million</td>
</tr>
<tr>
<td>FCGHN</td>
<td>Central government housing loans, net change, FIM million</td>
</tr>
<tr>
<td>FHN</td>
<td>Net lending by households, FIM million</td>
</tr>
<tr>
<td>FHNB</td>
<td>Net lending by households, flow of funds, FIM million</td>
</tr>
<tr>
<td>IFV</td>
<td>Private non-residential investment, FIM million</td>
</tr>
<tr>
<td>IHTV</td>
<td>Gross fixed capital formation, households, FIM million</td>
</tr>
<tr>
<td>IHV</td>
<td>Residential construction, FIM million</td>
</tr>
<tr>
<td>LBH</td>
<td>Bank loans to the households, FIM million</td>
</tr>
<tr>
<td>MON2</td>
<td>Monetary aggregate M2, FIM million</td>
</tr>
<tr>
<td>YD</td>
<td>Household disposable income, FIM million</td>
</tr>
</tbody>
</table>
3.13 Incomes and outlays of public sector (G)

G.1 Taxable earned income of households

\[
\text{YTAXABLE/ YTAXABLE}_{-1} = (YW + TRPPV + TRCGPV + TRLGPV + D0183Q1*TRNHV + TRCGU + TRSU) \\
/ (YW_{-1} + TRPPV_{-1} + TRCGPV_{-1} + TRLGPV_{-1} + D0183Q1*TRNHV_{-1} + TRCGU_{-1} + TRSU_{-1})
\]

G.2 Tax base of households’ earned income (taxable less tax deductions) in central government taxation

\[
\text{YTAXCG} = \text{TDEDTCG*YTAXABLE} - \text{SOLTEL}
\]

G.3 Average income tax-rate of households in central government taxation

\[
\text{ATAXCG} = 1.03339*\text{TYU} + 9.08646*\text{TYS} \\
+ .82758*\text{TYS}\times \log(\text{YTAXCG}/\text{LFS})
\]

Method of estimation = Ordinary Least Squares
Estimation period = 1975Q1-1993Q4
\(R^2 = .956\)
\(DW = .894\)
\(SE = .00513\)

<table>
<thead>
<tr>
<th>ATAXCG</th>
<th>Average income tax-rate of households in central government taxation, estimate</th>
</tr>
</thead>
<tbody>
<tr>
<td>D0183Q1</td>
<td>Dummy for widening the tax base</td>
</tr>
<tr>
<td>LFS</td>
<td>Labour force (labour force survey), 1000 persons</td>
</tr>
<tr>
<td>SOLTEL</td>
<td>Employees’ TEL-pension and unemployment insurance contributions, FIM million</td>
</tr>
<tr>
<td>TDEDTCG</td>
<td>Share of taxable income minus deductions of tax base in central government taxes of households</td>
</tr>
<tr>
<td>TRCGPV</td>
<td>Central government pension insurance, FIM million</td>
</tr>
<tr>
<td>TRCGU</td>
<td>Central government basic unemployment allowances, FIM million</td>
</tr>
<tr>
<td>TRLGPV</td>
<td>Local government pension insurance, FIM million</td>
</tr>
<tr>
<td>TRNHV</td>
<td>Social insurance instit. expenditure on nat. pension and sickness insurance, FIM million</td>
</tr>
<tr>
<td>TRPPV</td>
<td>Private sector pension insurance, FIM million</td>
</tr>
<tr>
<td>TRSU</td>
<td>Unemployment compensations tied to the level of earned income, FIM million</td>
</tr>
<tr>
<td>TYS</td>
<td>Slope of the progressive income tax schedule</td>
</tr>
<tr>
<td>TYU</td>
<td>Intercept of the progressive income tax schedule</td>
</tr>
<tr>
<td>YTAXABLE</td>
<td>Taxable earned income of households, FIM million</td>
</tr>
<tr>
<td>YTAXCG</td>
<td>Tax base of households’ earned income (taxable less tax deductions) in central government taxation, FIM million</td>
</tr>
<tr>
<td>YW</td>
<td>Wages and salaries, total, FIM million</td>
</tr>
</tbody>
</table>
G.4 Average income tax-rate of wage and salary earners, total

\[ \text{ATAX} = \text{ATAXCG} + \text{TLGR} + \text{SOLNR} + (1 - \text{ATAXCG}) \times (\text{SOLTELr} + \text{SOLUR}) \]

G.5 Marginal income tax rate of wage and salary earners in central government taxation, estimate

\[ \text{MTAXCG} = \text{ATAXCG} + 0.82758 \times \text{TYS} \]

G.6 Marginal income tax rate of wage and salary earners, estimate

\[ \text{MTAX} = \text{MTAXCG} + \text{TLGR} + \text{SOLNR} + (1 - \text{ATAXCG}) \times (\text{SOLTELr} + \text{SOLUR}) \]

G.7 Assessed income tax liability of households

\[ \text{TYPL} = \text{ATAXCG} \times \text{YTAXCG} + \text{TLGR} \times \text{YTAXLG} \]

G.9 Central government tax revenue from capital income of households

\[ \text{TYPCAP} = 0.8513 \times \text{TYCR} \times \text{YCAPTX} \]

where

\[ \text{YCAPTX} = \text{YNOI} + \text{YSE} + \text{YOHN} - \text{YNOI21} - \text{EIH} \]

---

<table>
<thead>
<tr>
<th>ATAX</th>
<th>Average income tax rate of wage and salary earners, estimate</th>
</tr>
</thead>
<tbody>
<tr>
<td>ATAXCG</td>
<td>Average income tax-rate of households in central government taxation, estimate</td>
</tr>
<tr>
<td>EIH</td>
<td>Interest expenditure, households, FIM million</td>
</tr>
<tr>
<td>MTAX</td>
<td>Average marginal income tax rate of wage and salary earners, estimate</td>
</tr>
<tr>
<td>MTAXCG</td>
<td>Average marginal income tax rate of wage and salary earners in central government taxation, estimate</td>
</tr>
<tr>
<td>SOLNR</td>
<td>Insured persons' nat. pension &amp; sickness ins. contribution rate</td>
</tr>
<tr>
<td>SOLTELr</td>
<td>Insured persons' employee pension schemes contribution rate</td>
</tr>
<tr>
<td>SOLUR</td>
<td>Insured persons' unemployment security contribution rate</td>
</tr>
<tr>
<td>TLGR</td>
<td>Average local government tax rate</td>
</tr>
<tr>
<td>TYCR</td>
<td>Corporate tax rate in central government taxation</td>
</tr>
<tr>
<td>TYPCAP</td>
<td>Taxes on capital income collected from households, FIM million</td>
</tr>
<tr>
<td>TYPL</td>
<td>Assessed income tax liability of households, FIM million</td>
</tr>
<tr>
<td>TYS</td>
<td>Slope of the progressive income tax schedule</td>
</tr>
<tr>
<td>YNOI21</td>
<td>Net operating surplus, housing sector, FIM million</td>
</tr>
<tr>
<td>YNOI</td>
<td>Net operating surplus, households, FIM million</td>
</tr>
<tr>
<td>YOHN</td>
<td>Dividend and rest of property income of the household sector, FIM million</td>
</tr>
<tr>
<td>YSE</td>
<td>Entrepreneurial income of households, FIM million</td>
</tr>
<tr>
<td>YTAXCG</td>
<td>Tax base of households' earned income (taxable less tax deductions) in central government taxation, FIM million</td>
</tr>
<tr>
<td>YTAXLG</td>
<td>Tax base of households (taxable income less deductions) in local government taxation, FIM million</td>
</tr>
</tbody>
</table>
G.10 Tax payments at source on interest income

\[ TYPI = DTYPI \times TYCR \times RDT \times (MON2_{-1} - CURNB_{-1})/400 \]

G.11 Advance income tax payments of households

\[ TYPW = TYPL + TYPRE - TYPS \]

G.12 Central and local government revenue from direct taxes on households

\[ TYP = TYPW + TYPSA - TYPREA + TYPCAP + TYPI + DTYPLOAN + TYPRES \]

G.13 Insured persons national pension and sickness insurance contributions

\[ ASOLN = 1.24192 \times [SOLNR \times YW + SOLNPR \times (TRCGPV + TRLGPV + TRPPV + TRNHV)] \]

Method of estimation = Ordinary Least Squares
Estimation period = 1979Q1–1994Q4
\[ R^2 = .722 \]
\[ DW = 2.082 \]
\[ SE = 109.09 \]

<table>
<thead>
<tr>
<th>Term</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>CURNB</td>
<td>Currency in circulation, public, FIM million</td>
</tr>
<tr>
<td>DTYPI</td>
<td>Dummy for tax payments at source on interest income (share of taxable deposits 94.1%)</td>
</tr>
<tr>
<td>MON2</td>
<td>Monetary aggregate M2, FIM million</td>
</tr>
<tr>
<td>RDT</td>
<td>Interest rate, time deposits, per cent</td>
</tr>
<tr>
<td>SOLN</td>
<td>Insured persons national pension and sickness insurance contributions, FIM million</td>
</tr>
<tr>
<td>SOLNPR</td>
<td>Old age, invalidity and unemployment pensioners social security contrib. rate</td>
</tr>
<tr>
<td>SOLNR</td>
<td>Insured persons' nat. pension &amp; sickness ins. contribution rate</td>
</tr>
<tr>
<td>TRCGPV</td>
<td>Central government pension insurance, FIM million</td>
</tr>
<tr>
<td>TRLGPV</td>
<td>Local government pension insurance, FIM million</td>
</tr>
<tr>
<td>TRNHV</td>
<td>Social insurance instit. expenditure on nat. pension and sickness insurance, FIM million</td>
</tr>
<tr>
<td>TRPPV</td>
<td>Private sector pension insurance, FIM million</td>
</tr>
<tr>
<td>TYCR</td>
<td>Corporate tax rate in central government taxation</td>
</tr>
<tr>
<td>TYP</td>
<td>Central and local government revenue direct taxes on households, FIM million</td>
</tr>
<tr>
<td>TYPCAP</td>
<td>Taxes on capital income collected from households, FIM million</td>
</tr>
<tr>
<td>TYPI</td>
<td>Tax payments at source on interest income, FIM million</td>
</tr>
<tr>
<td>TYPL</td>
<td>Assessed income tax liability of households, FIM million</td>
</tr>
<tr>
<td>TYPRE</td>
<td>Excess taxes collected from households, FIM million</td>
</tr>
<tr>
<td>TYPREA</td>
<td>Tax refunds to households, FIM million</td>
</tr>
<tr>
<td>TYPRES</td>
<td>Other direct taxes collected from households, net, FIM million</td>
</tr>
<tr>
<td>TYP</td>
<td>Central and local govtn revenue from subsequently collected direct taxes on households, FIM million</td>
</tr>
<tr>
<td>TYPSA</td>
<td>Central and local govt revenue from subsequently collected direct taxes (arrears) on households, FIM millions</td>
</tr>
<tr>
<td>TYPW</td>
<td>Advance income tax payments of households, FIM million</td>
</tr>
<tr>
<td>YW</td>
<td>Wages and salaries, total, FIM million</td>
</tr>
</tbody>
</table>
G.14 Employees' TEL-pension and unemployment insurance contributions

\[ \Delta \text{SOLTEL} = 0.79708 \times [\text{SOLTELr} + \text{SOLUR}] \times \text{YW} \]  

Method of estimation = Ordinary Least Squares  
Estimation period = 1993Q1–1994Q4  
\( R^2 = 0.957 \)  
\( \text{DW} = 1.889 \)  
\( \text{SE} = 38.77 \)

G.15 The non-obligatory social security payments of employees

\[ \text{SOLVS}/\text{SOLVS}_{-1} = \text{YW}/\text{YW}_{-1} \]

G.16 Social security payments by employees to the social security fund

\[ \text{SOLS} = \text{SOLVS} + \text{SOLTEL} + \text{SOLN} \]

G.17 Central government employees' pension insurance contributions

\[ \text{SOLCG} = 1.78 \times \text{SOLTELr} \times \text{YWCG} \]

G.18 Social security payments by employees and pensioners, total

\[ \text{SOL} = \text{SOLS} + \text{SOLCG} \]

G.19 Tax base of corporate taxation

\[ \text{YTYC} = \text{TDEDTYC} \times (\text{YNW} - \text{YNWG} - \text{CCV1} - \text{CCV2} - \text{EIC} + \text{YIC}) \]

<table>
<thead>
<tr>
<th>Variable</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>CCV1</td>
<td>Consumption of fixed capital, manufacturing, FIM million</td>
</tr>
<tr>
<td>CCV2</td>
<td>Consumption of fixed capital, non-manufacturing private sector, FIM million</td>
</tr>
<tr>
<td>EIC</td>
<td>Interest expenditure, corporate sector, FIM million</td>
</tr>
<tr>
<td>SOL</td>
<td>Social security payments by employees and pensioners, total, FIM million</td>
</tr>
<tr>
<td>SOLCG</td>
<td>Central government employees' pension insurance contribution, FIM million</td>
</tr>
<tr>
<td>SOLN</td>
<td>Insured persons national pension and sickness insurance contributions, FIM million</td>
</tr>
<tr>
<td>SOLS</td>
<td>Social security payments by employees to social security funds, FIM million</td>
</tr>
<tr>
<td>SOLTEL</td>
<td>Employees' TEL-pension and unemployment insurance contrib., FIM million</td>
</tr>
<tr>
<td>SOLTELr</td>
<td>Insured persons' employee pension schemes contribution rate</td>
</tr>
<tr>
<td>SOLUR</td>
<td>Insured persons' unemployment security contribution rate</td>
</tr>
<tr>
<td>SOLVS</td>
<td>Non-obligatory social security payments of employees, FIM million</td>
</tr>
<tr>
<td>TDEDTYC</td>
<td>Deductions in corporate taxation, per cent</td>
</tr>
<tr>
<td>YIC</td>
<td>Interest income of enterprises, FIM million</td>
</tr>
<tr>
<td>YNW</td>
<td>Gross operating surplus, total, FIM million</td>
</tr>
<tr>
<td>YNWG</td>
<td>Gross operating surplus, public sector, FIM million</td>
</tr>
<tr>
<td>YTYC</td>
<td>Tax base of corporate taxation, FIM million</td>
</tr>
<tr>
<td>YW</td>
<td>Wages and salaries, total, FIM million</td>
</tr>
<tr>
<td>YWCG</td>
<td>Wages and salaries, central government, FIM million</td>
</tr>
</tbody>
</table>
G.20 General government revenue from direct taxes on corporate entities

TYC = 0.80564* (Δ_6 ZET + ZMT_5) + 0.17656* Δ_5 ZMT_4

+ 0.42132* Δ_4 ZMT_3 + 0.18327* Δ_3 ZMT_3

+ 0.13107* ΔZMT_5 - 0.31608* Δ_6 ZET

- 0.13870* Δ_2 ZET_4 - 0.28798* ΔZET_5

where:

ZET = (TYCR + D1093Q1*TLGR)*YTYC

ZMT = (TYCR + D1093Q1*TLGR)*YTYC

Method of estimation = Ordinary Least Squares

Estimation period = 1970Q1-1993Q4

R^2 = .971

DW = .597

SE = 128.37

<table>
<thead>
<tr>
<th>D1093Q1</th>
<th>Dummy for a change in corporate taxation</th>
</tr>
</thead>
<tbody>
<tr>
<td>TLGR</td>
<td>Average local government tax rate</td>
</tr>
<tr>
<td>TYC</td>
<td>Corporate tax revenue, FIM million</td>
</tr>
<tr>
<td>TYCR</td>
<td>Corporate tax rate in central government taxation</td>
</tr>
<tr>
<td>YTYC</td>
<td>Tax base of corporate taxation, FIM million</td>
</tr>
</tbody>
</table>
G.21 Tax base of value-added tax

$$\text{TBVAT} = 0.01 \times \text{DVAT1} \times (0.2384 \times P20 + 0.2442 \times PD1 + 0.1622 \times \text{PMRN}) \times \text{GDP1}/0.3552$$

$$+ 0.01 \times \text{DVAT2} \times (0.1166 \times PD1 + 0.2977 \times P20 + 0.0504 \times \text{PMRN}) \times \text{GDP2}/0.5353$$

$$+ \text{DVAT345} \times (\text{CV} - \text{GDPV21})$$

$$+ \text{DVAT6} \times (\text{CCGV} - 0.28 \times \text{GDPVG})$$

$$+ \text{DVAT7} \times (\text{CLGV} - 0.7 \times \text{GDPVG})$$

$$+ \text{DVAT8} \times (\text{CSOSV} - 0.02 \times \text{GDPVG})$$

$$+ (17 \times (0.75 \times \text{TSR7} + 0.25 \times \text{TSR8}) / \text{TSR} + \text{DVAT9}) \times \text{IFV1}$$

$$+ \text{DVAT10} \times (\text{IFV} + \text{IGV})$$

$$+ \text{DVAT12} \times \text{XGNV}$$

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>CCGV</td>
<td>Central government consumption, FIM million</td>
</tr>
<tr>
<td>CLGV</td>
<td>Local government consumption, FIM million</td>
</tr>
<tr>
<td>CSOSV</td>
<td>Social security funds consumption, FIM million</td>
</tr>
<tr>
<td>CV</td>
<td>Private consumption, FIM million</td>
</tr>
<tr>
<td>DVAT1</td>
<td>Dummy, share of value-added tax of prod., manufacturing, (-94.2 = -0.0065)</td>
</tr>
<tr>
<td>DVAT10</td>
<td>Dummy, share of value-added tax of fixed non-residential investment, private non-manufacturing and general government sector, (-94.2 = 0.0581)</td>
</tr>
<tr>
<td>DVAT12</td>
<td>Dummy, share of value-added tax of exports of goods, (-94.2 = 0.0018)</td>
</tr>
<tr>
<td>DVAT2</td>
<td>Dummy, share of value-added tax of prod., private non-manufacturing sector, (-94.2 = 0.0581)</td>
</tr>
<tr>
<td>DVAT345</td>
<td>Dummy, share of value-added tax of private consumption</td>
</tr>
<tr>
<td>DVAT6</td>
<td>Dummy, share of value-added tax of central government consumption, (-94.2 = 0.0712)</td>
</tr>
<tr>
<td>DVAT7</td>
<td>Dummy, share of value-added tax of local government consumption, (-94.2 = 0.0782)</td>
</tr>
<tr>
<td>DVAT8</td>
<td>Dummy, share of value-added tax of consumption, social security funds, (-94.2 = 0.0103)</td>
</tr>
<tr>
<td>DVAT9</td>
<td>Dummy, share of value-added tax of fixed non-residential investment, manufacturing, (-94.2 = 0.0)</td>
</tr>
<tr>
<td>GDP1</td>
<td>Production at factor cost, manufacturing, millions of 1990 FIM</td>
</tr>
<tr>
<td>GDP2</td>
<td>Production at factor cost, non-manufacturing private sector, millions of 1990 FIM</td>
</tr>
<tr>
<td>GDPV21</td>
<td>Production at factor cost, letting of own property, FIM million</td>
</tr>
<tr>
<td>GDPVG</td>
<td>Production at factor cost, general govt., FIM million</td>
</tr>
<tr>
<td>IFV</td>
<td>Private non-residential investment, FIM million</td>
</tr>
<tr>
<td>IFV1</td>
<td>Private fixed investment, manufacturing, FIM million</td>
</tr>
<tr>
<td>IGV</td>
<td>Public investment, FIM million</td>
</tr>
<tr>
<td>P20</td>
<td>Producer prices in non-manufacturing private sector excl. letting of own property, 1990=100</td>
</tr>
<tr>
<td>PD1</td>
<td>Prices of manufactures sold on the domestic market, manufacturing, 1990=100</td>
</tr>
<tr>
<td>PMRN</td>
<td>Import prices of raw materials, 1990-100 (weighting = 0.531)</td>
</tr>
<tr>
<td>TBVAT</td>
<td>Tax base of value-added tax, FIM million</td>
</tr>
<tr>
<td>TSR</td>
<td>Sales tax rate, %</td>
</tr>
<tr>
<td>TSR7</td>
<td>Sales tax rate, industrial machinery and equipment, %</td>
</tr>
<tr>
<td>TSR8</td>
<td>Sales tax rate, industrial buildings, %</td>
</tr>
<tr>
<td>XGNV</td>
<td>Exports of goods, FIM million (SNA)</td>
</tr>
</tbody>
</table>
Central government revenue from value-added tax

\[ \Delta \log(\frac{TSCG}{TSR}) = -1.34757 \]
\[ + 0.80288 \Delta \log TBVAT \]
\[ + 0.36341 \log TBVAT_{-1} \]
\[ - 0.31776 \log(\frac{TSCG_{-1}}{TSR_{-1}}) \]
\[ - 0.38542 \Delta \log(\frac{TSCG_{-1}}{TSR_{-1}}) \]

Method of estimation = Ordinary Least Squares
Estimation period = 1975Q1–1994Q4
R\(^2\) = 0.366
DW = 2.146
SE = 0.06878

<table>
<thead>
<tr>
<th>TBVAT</th>
<th>Tax base of value-added tax, FIM million</th>
</tr>
</thead>
<tbody>
<tr>
<td>TSCG</td>
<td>Central government revenue from value-added tax, FIM million</td>
</tr>
<tr>
<td>TSR</td>
<td>Sales tax rate, %</td>
</tr>
</tbody>
</table>
G.23 Tax base of other commodity taxes

\[ TBTIOV = 0.01 \times DTIOV1 \times (0.2384 \times PD1 + 0.2442 \times P20 \\
+ 0.1622 \times PMRN) \times GDP1 / 0.3552 \\
+ 0.01 \times DTIOV2 \times (0.1166 \times PD1 + 0.2977 \times P20 + 0.0504 \times PMRN) \\
\times GDP2 / 0.5353 \\
+ DTIOV345 \times (CV - GDPV21) \\
+ DTIOV6 \times (CCGV - 0.28 \times GDPVG) \\
+ DTIOV7 \times (CLGV - 0.7 \times GDPVG) \\
+ DTIOV8 \times (CSOSV - 0.02 \times GDPVG) \\
+ DTIOV9 \times (IFV + IGV) \]

G.24 General government revenue from other commodity taxes

\[ TIOV = 1.01728 \times TIOVR \times TBTIOV \]

<table>
<thead>
<tr>
<th>CCGV</th>
<th>Central government consumption, FIM million</th>
</tr>
</thead>
<tbody>
<tr>
<td>CLGV</td>
<td>Local government consumption, FIM million CPI consumer price index, 1990=100</td>
</tr>
<tr>
<td>CSOSV</td>
<td>Social security funds consumption, FIM million</td>
</tr>
<tr>
<td>CV</td>
<td>Private consumption, FIM million</td>
</tr>
<tr>
<td>DTIOV1</td>
<td>Dummy, share of other commodity taxes of production, manufacturing, (-94.2 = .0133)</td>
</tr>
<tr>
<td>DTIOV2</td>
<td>Dummy, share of other commodity taxes of production, private non-manufacturing sector, (-94.2 = .0264)</td>
</tr>
<tr>
<td>DTIOV345</td>
<td>Dummy, share of other commodity taxes of private consumption</td>
</tr>
<tr>
<td>DTIOV6</td>
<td>Dummy, share of other commodity taxes, central government consumption, (-94.2 = .0163)</td>
</tr>
<tr>
<td>DTIOV7</td>
<td>Dummy, share of other commodity taxes, local government consumption, (-94.2 = .0210)</td>
</tr>
<tr>
<td>DTIOV8</td>
<td>Dummy, share of other commodity taxes, social security funds' consumption, (-94.2 = .0579)</td>
</tr>
<tr>
<td>DTIOV9</td>
<td>Dummy, share of other consumption taxes, fixed non-residential investment, (-94.2 = .0075)</td>
</tr>
<tr>
<td>GDP1</td>
<td>Production at factor cost, manufacturing, millions of 1990 FIM</td>
</tr>
<tr>
<td>GDP2</td>
<td>Production at factor cost, non-manufacturing private sector, mills of 1990 FIM</td>
</tr>
<tr>
<td>GDPV21</td>
<td>Production at factor cost, letting of own property, FIM million</td>
</tr>
<tr>
<td>GDPVG</td>
<td>Production at factor cost, general govt., FIM million</td>
</tr>
<tr>
<td>IFV</td>
<td>Private non-residential investment, FIM million</td>
</tr>
<tr>
<td>IGV</td>
<td>Public investment, FIM million</td>
</tr>
<tr>
<td>P20</td>
<td>Producer prices in non-manufacturing private sector excl. letting of own property, 1990=100</td>
</tr>
<tr>
<td>PD1</td>
<td>Prices of manufactures sold on the domestic market, manufacturing, 1990=100</td>
</tr>
<tr>
<td>PMRN</td>
<td>Import prices of raw materials, 1990=100 (weighting = .531)</td>
</tr>
<tr>
<td>TBTIOV</td>
<td>Tax base of other commodity taxes, FIM million</td>
</tr>
<tr>
<td>TIOV</td>
<td>Other commodity taxes, FIM million</td>
</tr>
<tr>
<td>TIOVR</td>
<td>Effective tax rate, other commodity taxes, 1990=1</td>
</tr>
</tbody>
</table>
G.25 Central government revenue from other indirect taxes

\[ \frac{TIOCG}{TIOCG_{-1}} = \frac{(GDPV1 + GDPV2)}{(GDPV1_{-1} + GDPV2_{-1})} \]

G.26 Central government revenue from commodity taxes

\[ TIV = TSCG + TIOV - SUBEU \]

G.27 Central government revenue from indirect taxes

\[ TICG = TIV + TIOCG + SUBEU \]

G.28 Central government revenue from direct taxes

\[ TYCG = TYP + TYC - TYLG \]

G.29 Central government income from employers’ social security payments

\[ \frac{YSOCG}{YSOCG_{-1}} = \frac{SOC}{SOC_{-1}} \]

G.30 Central government transfer-income from other sectors, total

\[ YTRCG = TICG + TYCG + TOCG + YSO CG + SOLCG + YTRCGO \]

---

**GDPV1**  Production at factor cost, manufacturing, FIM million

**GDPV2**  Production at factor cost, non-manufacturing private sector, FIM million

**SOC**  Entrepreneurs’ social security contributions, total, FIM million

**SOLCG**  Central government employees’ pensions insurance contribution, FIM million

**SUBEU**  Indirect taxes from the rest of the world, net, FIM million

**TICG**  Central government revenue from indirect taxes, FIM million

**TIOCG**  Central government revenue from other indirect taxes, FIM million

**TIOV**  Other commodity taxes, FIM million

**TIV**  Central government revenue from commodity taxes, FIM million

**TOCG**  Central government compulsory fees, fines and penalties, FIM million

**TSCG**  Central government revenue from value-added tax, FIM million

**TYC**  Corporate tax revenue, FIM million

**TYCG**  Central government revenue from direct taxes, FIM million

**TYLG**  Local government revenue from direct taxes, FIM million

**TYP**  Central and local government revenue direct taxes on households, FIM million

**YSOCG**  Central government income from entrepreneurs’ social security payments, FIM million

**YTRCG**  Central government transfer-income from other sectors, total, FIM million

**YTRCGO**  Central government other transfer-income, FIM million
G.31 Central government’s property and entrepreneurial income

\[
YICG = 1.38409 \times (RLB_{-2} \times LCGH_{-3} + RDT \times CASHCG_{-1}) / 400 - 115.2916
\]

Method of estimation = Ordinary Least Squares
Estimation period = 1975Q2–1994Q4
\( R^2 = .973 \)
\( DW = .416 \)
\( SE = 103.49 \)

G.32 Central government revenues, total

\[
YCGTOT = YICG + YTRCG
\]

G.33 Interest outlays and insurance payments of central government

\[
\Delta_4 GCGI = .16733 \times (.0025 \times RBTX \times \Delta_4 LDCG_{-1} \\
+ .0025 \times RFOR \times \Delta_4 LFCG_{-1}) \\
+ .45615 \times (.0025 \times RBTX_{-1} \times \Delta_4 LDCG_{-2} \\
+ .0025 \times RFOR_{-1} \times \Delta_4 LFCG_{-2}) \\
+ (1 - .16733 - .45615) \times (.0025 \times RBTX_{-2} \times \Delta_4 LDCG_{-3} \\
+ .0025 \times RFOR_{-2} \times \Delta_4 LFCG_{-3})
\]

Method of estimation = Ordinary Least Squares
Estimation period = 1976Q1–1995Q4
\( R^2 = .338 \)
\( DW = .354 \)
\( SE = 178.0106 \)

<table>
<thead>
<tr>
<th>Variable</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>CASHCG</td>
<td>Central government cash position, FIM million</td>
</tr>
<tr>
<td>GCGI</td>
<td>Central government interest expenditure, FIM million</td>
</tr>
<tr>
<td>LCGH</td>
<td>Stock of central government housing loans, FIM millions</td>
</tr>
<tr>
<td>LDCG</td>
<td>Central government sector’s domestic currency denominated debt, FIM million</td>
</tr>
<tr>
<td>LFCG</td>
<td>Foreign currency denominated central government debt, FIM million</td>
</tr>
<tr>
<td>RBTX</td>
<td>Taxable government bond yield, approx. 5 years, per cent</td>
</tr>
<tr>
<td>RDT</td>
<td>Interest rate, time deposits, per cent</td>
</tr>
<tr>
<td>RFOR</td>
<td>Foreign interest rate, 3 month commercial ECU (1991Q3 onwards), per cent</td>
</tr>
<tr>
<td>RLB</td>
<td>Bank lending rate, per cent</td>
</tr>
<tr>
<td>YCGTOT</td>
<td>Central government revenue, total, FIM million</td>
</tr>
<tr>
<td>YICG</td>
<td>Central government’s property and entrepreneurial income, FIM million</td>
</tr>
<tr>
<td>YTRCG</td>
<td>Central government transfer-income from other sectors, total, FIM million</td>
</tr>
</tbody>
</table>
G.34 Pensions paid by the central government sector

\[
TRCGPV = D1001Q1 \times TRCGPV + (1 - D1001Q1) \times [TRCGPVDI + ((0.8 \times CPI_{-4}/CPI_{-8} + 0.2 \times WR_{-4}/WR_{-8}) - 1)]
\]

G.35 Central government transfers to households

\[
TRCGH = TRCGPV + TRCGHO
\]

G.36 Unemployment compensations (basic daily allowances)

\[
TRCGU = DTRURIND \times \left(0.52805 \times TRCGU_{-1} \times (0.1242) + 0.01242 \times (WR + PCP) \times LUS \times (0.0021) + 0.00956 \times (WR_{-3} + PCP_{-3}) \times LUS_{-3} \times (0.0034) + 0.00695 \times (WR_{-1} + PCP_{-1}) \times LUS_{-1} \times (0.0019) + (1 - DTRURIND) \times LUS \times ((TRCGU_{-1} + TRCGU_{-2})/(LUS_{-1} + LUS_{-2}))\right)
\]

Method of estimation = Ordinary Least Squares
Estimation period = 1986Q1–1994Q4
\[R^2 = 0.997\]
\[DW = 1.630\]
\[SE = 33.36\]

<table>
<thead>
<tr>
<th>CPI</th>
<th>Consumer price index, 1990=100</th>
</tr>
</thead>
<tbody>
<tr>
<td>D1001Q1</td>
<td>Dummy for pension expenditures</td>
</tr>
<tr>
<td>DTRURIND</td>
<td>Dummy, indexation of unemployment compensation, 1 = on, 0 = off</td>
</tr>
<tr>
<td>LUS</td>
<td>Unemployment (labour force survey), 1000 persons</td>
</tr>
<tr>
<td>PCP</td>
<td>Private consumption prices, 1990=100</td>
</tr>
<tr>
<td>TRCGH</td>
<td>Central government transfers to households, FIM million</td>
</tr>
<tr>
<td>TRCGHO</td>
<td>Central government other current transfers to households, FIM million</td>
</tr>
<tr>
<td>TRCGPV</td>
<td>Central government pension insurance, FIM million</td>
</tr>
<tr>
<td>TRCGPVDI</td>
<td>Central government pension insurance vol. index (C,R4), demography</td>
</tr>
<tr>
<td>TRCGU</td>
<td>Central government basic unemployment allowances, FIM million</td>
</tr>
<tr>
<td>WR</td>
<td>Wage rate, total, 1990=100</td>
</tr>
</tbody>
</table>
G.37 Central government outlays in financing unemployment compensations tied to the level of earnings

\[ \text{TRCGSU} = \text{TRCGUR} \times \text{TRSU} \]

G.38 Central government transfer outlays to social security funds, total

\[ \text{TRCGS} = \text{TRCGU} + \text{TRCGSU} + \text{TRCGSO} \]

G.39 Base for commodity subsidies

\[ \text{TBSUB} = 0.01 \times \text{DSUB1} \times (0.2384 \times \text{PD1} + 0.2442 \times \text{P20} + 0.1622 \times \text{PMRN}) \times \text{GDP1} / 0.3552 \\
+ 0.01 \times \text{DSUB2} \times (0.1166 \times \text{PD1} + 0.2977 \times \text{P20} + 0.0504 \times \text{PMRN}) \times \text{GDP2} / 0.5353 \\
+ \text{DSUB345} \times (\text{CV} - \text{GDPV21}) \\
+ \text{DSUB6} \times (\text{CCGV} - 0.28 \times \text{GDPVG}) \\
+ \text{DSUB7} \times (\text{CLGV} - 0.7 \times \text{GDPVG}) \\
+ \text{DSUB8} \times (\text{CSOSV} - 0.02 \times \text{GDPVG}) \\
+ \text{DSUB12} \times \text{XGNV} \]

<table>
<thead>
<tr>
<th>Variable</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>CCGV</td>
<td>Central government consumption, FIM million</td>
</tr>
<tr>
<td>CLGV</td>
<td>Local govt. consumption, FIM million CPI consumer price index, 1990=100</td>
</tr>
<tr>
<td>CSOSV</td>
<td>Social security funds consumption, FIM million</td>
</tr>
<tr>
<td>CV</td>
<td>Private consumption, FIM million</td>
</tr>
<tr>
<td>DSUB1</td>
<td>Dummy, share of commodity subsidies of production, manufacturing, ((-94.2 = 0.0085))</td>
</tr>
<tr>
<td>DSUB12</td>
<td>Dummy, share of subsidies of exports of goods, ((-94.2 = 0.0380))</td>
</tr>
<tr>
<td>DSUB2</td>
<td>Dummy, share of commodity subsidies of production, private non-manufacturing sector, ((-94.2 = 0.0033))</td>
</tr>
<tr>
<td>DSUB345</td>
<td>Dummy, share of commodity subsidies of private consumption</td>
</tr>
<tr>
<td>DSUB6</td>
<td>Dummy, share of commodity subs. of central gov. consumption, ((-94.2 = 0.0027))</td>
</tr>
<tr>
<td>DSUB7</td>
<td>Dummy, share of commodity subs. of local gov. consumption ((-94.2 = 0.0057))</td>
</tr>
<tr>
<td>DSUB8</td>
<td>Dummy, share of commodity subsidies of consumption, social security funds, ((-94.2 = 0.0009))</td>
</tr>
<tr>
<td>GDP1</td>
<td>Production at factor cost, manufacturing, millions of 1990 FIM</td>
</tr>
<tr>
<td>GDP2</td>
<td>Production at factor cost, non-manufacturing private sector, mills of 1990 FIM</td>
</tr>
<tr>
<td>GDPV21</td>
<td>Production at factor cost, letting of own property, mills of 1990 FIM</td>
</tr>
<tr>
<td>GDPVG</td>
<td>Production at factor cost, general govt, FIM million</td>
</tr>
<tr>
<td>P20</td>
<td>Production prices in non-manufacturing private sector excl. lett. of own property, 1990=100</td>
</tr>
<tr>
<td>PD1</td>
<td>Prices of manufactures sold on the domestic market, manufacturing, 1990=100</td>
</tr>
<tr>
<td>PMRN</td>
<td>Import prices of raw materials, 1990=100 (weighting = 0.531)</td>
</tr>
<tr>
<td>TBSUB</td>
<td>Commodity subsidies, FIM million</td>
</tr>
<tr>
<td>TRCGU</td>
<td>Central government basic unemployment allowances, FIM million</td>
</tr>
<tr>
<td>TRCGS</td>
<td>Central government transfers to the social security funds, FIM million</td>
</tr>
<tr>
<td>TRCGSO</td>
<td>Central government other current transfers to social sec. funds, FIM million</td>
</tr>
<tr>
<td>TRCGSU</td>
<td>Central govt. unemployment allowances based on previous earnings, FIM mill.</td>
</tr>
<tr>
<td>TRCGUR</td>
<td>Central government contribution rate in unemployment benefits, FIM million</td>
</tr>
<tr>
<td>TRSU</td>
<td>Unemployment compensations tied to the level of earned income, FIM million</td>
</tr>
<tr>
<td>XGNV</td>
<td>Exports of goods, FIM million (SNA)</td>
</tr>
</tbody>
</table>
G.40 Commodity subsidy rate

$$\text{SUBR} = \frac{\text{SUB}}{(1.06797 \times \text{TBSUB})}$$

G.41 Commodity subsidies of the central government

$$\text{SUBCG} = \text{SUB} - \text{SUBLG}$$

G.42 Central government transfer outlays to other sectors, total

$$\text{TRCGTOT} = \text{SUBCG} + \text{SUBOCG} + \text{TRCGH} + \text{TRCGL} + \text{TRCGS} + \text{TRCGF}$$

G.43 Disposable income of the central government

$$\text{YDCG} = \text{YCGTOT} - \text{GCGI} - \text{TRCGTOT}$$

G.44 Net lending of the central government

$$\text{FCGN} = \text{YDCG} + \text{CCVCG} + \text{CAPCG} - \text{CCGV} - \text{ICGV}$$

G.45 Central government outlays (SNA), total

$$\text{GCGTOTV} = \text{YCGTOT} - \text{FCGN}$$

---

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>CAPCG</td>
<td>Capital consumption, central government, FIM million</td>
</tr>
<tr>
<td>CCGV</td>
<td>Central government consumption, FIM million</td>
</tr>
<tr>
<td>CCVCG</td>
<td>Consumption of fixed capital, central government, FIM million</td>
</tr>
<tr>
<td>FCGN</td>
<td>Central government net lending, FIM million</td>
</tr>
<tr>
<td>GCGI</td>
<td>Central government interest expenditure, FIM million</td>
</tr>
<tr>
<td>GCGTOTV</td>
<td>Central government expenditure (SNA), FIM million</td>
</tr>
<tr>
<td>ICGV</td>
<td>Central government investment (excl. enterprises), FIM million</td>
</tr>
<tr>
<td>SUB</td>
<td>Commodity subsidies, FIM million</td>
</tr>
<tr>
<td>SUBCG</td>
<td>Central government subsidies, FIM million</td>
</tr>
<tr>
<td>SUBLG</td>
<td>Local government subsidies, FIM million</td>
</tr>
<tr>
<td>SUBOCG</td>
<td>Central government other subsidies, FIM million</td>
</tr>
<tr>
<td>SUBR</td>
<td>Effective tax rate, commodity subsidies, 1990=1</td>
</tr>
<tr>
<td>TBSUB</td>
<td>Commodity subsidies, FIM million</td>
</tr>
<tr>
<td>TRCGH</td>
<td>Central government transfers to households, FIM million</td>
</tr>
<tr>
<td>TRCGL</td>
<td>Central government transfers to local government, FIM million</td>
</tr>
<tr>
<td>TRCGS</td>
<td>Central government transfers to the social security funds, FIM million</td>
</tr>
<tr>
<td>TRCGTOT</td>
<td>Central government transfer outlays to other sectors, total, FIM million</td>
</tr>
<tr>
<td>YCGTOT</td>
<td>Central government revenue, total, FIM million</td>
</tr>
<tr>
<td>YDCG</td>
<td>Central government disposable income, FIM million</td>
</tr>
</tbody>
</table>
G.46 Central government revenue surplus
\[ \text{FCGCASH} = \text{FCGN} + \text{FCGCASHO} \]

G.47 Central government housing loans, redemptions
\[ \text{FCGHB} = 0.01231 \times \text{LCGH}_{-1} \]

Method of estimation = Ordinary Least Squares
Estimation period = 1961Q1–1993Q4
\[ R^2 = 0.811 \]
\[ DW = 1.366 \]
\[ SE = 73.26 \]

G.48 Central government housing loans, net change
\[ \text{FCGHN} = \text{FCGH} - \text{FCGHB} \]

G.49 Stock of central government housing loans
\[ \Delta \text{LCGH} = \text{FCGHN} \]

G.50 Central government financial investment, net
\[ \text{FCGFIN} = (-1) \times (\text{FCGHN} + \text{FCGSUP} + \text{FCGFION}) \]

G.51 Central government net financing requirement (–)
\[ \text{FCGNBR} = \text{FCGCASH} + \text{FCGFIN} \]

<table>
<thead>
<tr>
<th>Variable</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>FCGCASH</td>
<td>Central government deficit before financial transactions (cash basis)</td>
</tr>
<tr>
<td>FCGCASHO</td>
<td>Central government deficit before financial transactions (SNA-CASH-discrepancy), FIM million</td>
</tr>
<tr>
<td>FCGFIN</td>
<td>Central government financial investment, net (cash basis), FIM million</td>
</tr>
<tr>
<td>FCGFION</td>
<td>Central government other financial investment, net (cash basis), FIM million</td>
</tr>
<tr>
<td>FCGH</td>
<td>Central government housing loans, drawings, FIM million</td>
</tr>
<tr>
<td>FCGHB</td>
<td>Central government housing loans, redemptions, FIM million</td>
</tr>
<tr>
<td>FCGHN</td>
<td>Central government housing loans, net change, FIM million</td>
</tr>
<tr>
<td>FCGN</td>
<td>Central government net lending, FIM million</td>
</tr>
<tr>
<td>FCGNBR</td>
<td>Central government net financial requirement (–), FIM million</td>
</tr>
<tr>
<td>FCGSUP</td>
<td>Central government capital support to banks, FIM million</td>
</tr>
<tr>
<td>LCGH</td>
<td>Stock of central government housing loans, FIM million</td>
</tr>
</tbody>
</table>
G.52 Central government’s domestic currency denominated debt

\[ \Delta LDCG = -FCGNBR + \Delta CASHCG - FFCG - FOCGN \]

G.53 Foreign currency denominated debt of the central government, in FIM

\[ LFCG = (FXTW/FXTW_{-1}) \times LFCG_{-1} + FFCG \]

G.54 Central government gross debt

\[ LCGB = LFCG + LDCG \]

G.55 Central government debt excl. debt to govt pension funds

\[ LCGC = LCGB - LCGPF \]

G.56 Tax base of households (taxable income less deductions) in local government taxation

\[ Y TAXLG = TDEDLG \times YTAXABLE \]

| **CASHCG** | Central government cash position, FIM million |
| **FCGNBR** | Central government net financial requirement (−), FIM million |
| **FFCG** | Foreign currency denominated debt of the central government, balance of payments, increase (−), FIM million |
| **FOCGN** | Central government other markka loans, FIM million |
| **FXTW** | Bank of Finland currency index, 1982=100 |
| **LCGB** | Central government gross debt, FIM million |
| **LCGC** | Central government debt excl. debt to central government pension fund, FIM million |
| **LCGPF** | Central government debt to pension funds, FIM million |
| **LDCG** | Central government sector’s domestic currency denominated debt, FIM million |
| **LFCG** | Foreign currency denominated central government debt, FIM million |
| **TDEDLG** | Share of taxable minus deductions of tax base in local government taxes on households |
| **YTAXABLE** | Taxable earned income of households, FIM million |
| **YTAXLG** | Tax base of households (taxable income less deductions) in local government taxation, FIM million |
G.57 Local government revenue from direct taxes

\[ TYLG = .98910 \times (TLGR \times YTAXLG) + .42778 \times D0190Q1 \times TYC + .63555 \times (1 - D0190Q1) \times TYC \]

Method of estimation = Ordinary Least Squares
Estimation period = 1975–1993
\[ R^2 = .991 \]
\[ DW = 2.161 \]
\[ SE = 1363.59 \]

G.58 Transfer income, total, local government

\[ YTRLG = TYLG + TOLG + TRCGL + YOLG \]

G.59 Interest (etc.) income of the local government sector

\[ YILG = RLB / 400 \times (1.79400 \times CLGV - 1.21701) \]

Method of estimation = Ordinary Least Squares
Estimation period = 1975Q1–1994Q4
\[ R^2 = .680 \]
\[ DW = .047 \]
\[ SE = 18.14 \]

G.60 Local government revenue, total

\[ YLGTOT = YILG + YTRLG \]
G.61 Commodity subsidies, local government

\[ \frac{\text{SUBLG}}{\text{SUBLG}_{-1}} = \frac{\text{TBSUB}}{\text{TBSUB}_{-1}} \]

G.62 Local government outlays, total

\[ \text{TRLGTOT} = \text{SUBLG} + \text{TRLGH} + \text{TRLGS} + \text{TRLGO} \]

G.63 Interest outlays and insurance payments of local government

\[ \text{GILG} = 0.28570 \times 0.0025 \times 0.64 \left( \text{RLB} \times \text{LLGN}_{-1} \right) \]

\[ + 1.20193 \times 0.0025 \times \text{RLB}_{-4} \times \text{LLGN}_{-5} + 53.59838 \]

Method of estimation = Ordinary Least Squares

Estimation period = 1977Q1–1994Q4

\[ R^2 = 0.987 \]

\[ \text{DW} = 0.323 \]

\[ \text{SE} = 31.91 \]

G.64 Disposable income of local government

\[ \text{YDLG} = \text{YLGTOT} - \text{GILG} - \text{TRLGTOT} \]
G.65 Local government consumption, volume

\[ \Delta CLG = 0.3814 \times \Delta CLG_{-1} - 0.06126 \times ZCLG_{-1} \]

Method of estimation = Ordinary Least Squares
Estimation period = 1980Q1–1994Q4
\[ R^2 = 0.305 \]
\[ DW = 2.112 \]
\[ SE = 146.32 \]

where

\[ ZCLG = CLG - 100 \times \left[ 0.7537 \times (TYLG - SUBLG) + 1.03004 \times TRCGL \right] / PCLG \]

Method of estimation = Ordinary Least Squares
\[ R^2 = 0.903 \]
\[ DW = 0.250 \]
\[ SE = 0.593 \]

G.66 Net lending of the local government sector

\[ FLGN = YDLG + CCVLG + CAPLG - CLGV - ILGV \]

G.67 Local government debt (consolidated; ESA defin.)

\[ \Delta LLGN = -FLGN \]

---

**CAPLG**  Capital consumption, local governments, FIM million
**CCVLG**  Consumption of fixed capital, local government, FIM million
**CLG**  Local government consumption, millions of 1990 FIM
**CLGV**  Local government consumption, FIM million CPI consumer price index, 1990=100
**FLGN**  Net lending by local government, FIM million
**ILGV**  Local government investment, FIM million
**LLGN**  Local government debt (consolidated; ESA defin.), FIM million
**PCLG**  Local government consumption prices, 1990=100
**SUBLG**  Local government subsidies, FIM million
**TRCGL**  Central government transfers to local government, FIM million
**TYLG**  Local government revenue from direct taxes, FIM million
**YDLG**  Disposable income of local government, FIM million
G.68 Employers' social security payments to social security funds

$$\text{SOCS}/\text{SOCS}_{-1} = (\text{SOC} - \text{YSOCG})/(\text{SOC}_{-1} - \text{YSOCG}_{-1})$$

G.69 Transfer incomes of social security funds

$$\text{YTRS} = \text{SOCS} + \text{SOLS} + \text{TRCGS} + \text{TRLGS} + \text{YTRSO}$$

G.70 Unemployment compensation tied to the level of earned income by social security funds

$$\text{TRSU} = \text{DTRURIND} \times ((\text{WR}_{-1}/\text{WR}_{-2}) \times (\text{LUS}/\text{LUS}_{-1}) \times \text{TRSU}_{-1})$$
$$+ (1 - \text{DTRURIND}) \times (\text{LUS}/\text{LUS}_{-1}) \times \text{TRSU}_{-1}$$

G.71 Pensions paid to the private sector pensioners by social security funds

$$\text{TRPPV} = \text{D1001Q1} \times \text{TRPPV} + (1 - \text{D1001Q1}) \times \left[ (\text{TRPPVDI} + ((0.8 \times \text{CPI}_{-4}/\text{CPI}_{-8} + 0.2 \times \text{WR}_{-4}/\text{WR}_{-8}) - 1)) \times \text{TRPPV}_{-4} \right]$$

G.72 Pensions paid to the local government sector pensioners by social security funds

$$\text{TRLGPV} = \text{D1001Q1} \times \text{TRLGPV} + (1 - \text{D1001Q1}) \times \left[ (\text{TRLGPVDI} + ((0.8 \times \text{CPI}_{-4}/\text{CPI}_{-8} + 0.2 \times \text{WR}_{-4}/\text{WR}_{-8}) - 1)) \times \text{TRLGPV}_{-4} \right]$$

\[
\begin{align*}
\text{CPI} & \quad \text{Consumer price index, 1990=100} \\
\text{D1001Q1} & \quad \text{Dummy for pension expenditures} \\
\text{DTRURIND} & \quad \text{Dummy, indexation of unemployment compensation, 1=on, 0=off} \\
\text{LUS} & \quad \text{Unemployment (labour force survey) 1000 persons} \\
\text{SOC} & \quad \text{Entrepreneurs' social security contributions, total, FIM million} \\
\text{SOCS} & \quad \text{Entrepreneurs' security payments to social security funds, FIM million} \\
\text{SOLS} & \quad \text{Social security payments by employees to social security funds, FIM million} \\
\text{TRCGS} & \quad \text{Central government transfers to the social security funds, FIM million} \\
\text{TRLGPV} & \quad \text{Local government pension insurance, FIM million} \\
\text{TRLGPVDI} & \quad \text{Local government pension insurance vol. index, demography} \\
\text{TRLGS} & \quad \text{Local government current transfers to social security funds, FIM million} \\
\text{TRPPV} & \quad \text{Private sector pension insurance, FIM million} \\
\text{TRPPVDI} & \quad \text{Private sector pension insurance vol. index, demography} \\
\text{TRSU} & \quad \text{Unemployment compensations tied to the level of earned income, FIM million} \\
\text{WR} & \quad \text{Wage rate, total, 1990=100} \\
\text{YSOCG} & \quad \text{Central government income from entrepreneurs' social security payments, FIM million} \\
\text{YTRS} & \quad \text{Transfer income of social security funds, FIM million} \\
\text{YTRSO} & \quad \text{Other transfer income of social security funds, FIM million}
\end{align*}
\]
G.73 Transfers to households by social security funds, total

\[ TRSHV = TRPPV + TRLGPV + TRNHV + TRNHOV + TRSU + TRCGU + TRSHOV \]

G.74 Total transfers to other sectors by social security funds

\[ TRSTOT = TRSHV + TRSOV \]

G.75 Interest income of social security funds

\[
\Delta YIS = \Delta YIS_{-1} - 0.20597 \Delta YIS_{-2} \\
+ 0.13993 \times (0.0025 \times RLB \times FSN) \\
+ 0.05194 \times YIS_{-1} \times \Delta RLB / RLB_{-1}
\]

Method of estimation = Ordinary Least Squares
Estimation period = 1975Q1–1994Q4
\[ R^2 = 0.142 \]
\[ DW = 1.920 \]
\[ SE = 16.36 \]

G.76 Interest outlays of social security funds

\[ GIS = 0.0025 \times RLB \times LSOSN_{-1} \]

G.77 Net interest income of social security funds

\[ YINS = YIS - GIS \]
G.78 Disposable income of social security funds

\[ YDS = YIS - GIS + YTRS - TRSTOT \]

G.79 Net lending of social security funds

\[ FSN = YDS + CCVS - CSOSV - ISOSV + OSV \]

G.80 Disposable income of general government

\[ YDG = YDCG + YDLG + YDS \]

G.81 Consolidated general government debt (ESA defin.)

\[ \Delta LGN = \Delta LCGB - FLGN - \Delta LGINT \]

G.82 Net lending of the general government sector, total

\[ FGN = FCGN + FLGN + FSN \]

G.83 Financial institutions disposable income

\[ YDBANK = YDTOT - YD - YDC - YDG \]

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>CCVS</td>
<td>Consumption of fixed capital, social security funds, FIM million</td>
</tr>
<tr>
<td>CSOSV</td>
<td>Social security funds consumption, FIM million</td>
</tr>
<tr>
<td>FCGN</td>
<td>Central government net lending, FIM million</td>
</tr>
<tr>
<td>FGN</td>
<td>Net lending by public sector, FIM million</td>
</tr>
<tr>
<td>FLGN</td>
<td>Net lending by local government, FIM million</td>
</tr>
<tr>
<td>FSN</td>
<td>Net lending by social security funds, FIM million</td>
</tr>
<tr>
<td>GIS</td>
<td>Required current transfers, social security funds, FIM million</td>
</tr>
<tr>
<td>ISOSV</td>
<td>Social security funds investment, FIM million</td>
</tr>
<tr>
<td>LCGB</td>
<td>Central government gross debt, FIM million</td>
</tr>
<tr>
<td>LGINT</td>
<td>General government internal debt (correction for consolidated debt), FIM million</td>
</tr>
<tr>
<td>LGN</td>
<td>General government consolidated gross debt, (EMU-criterion), FIM million</td>
</tr>
<tr>
<td>OSV</td>
<td>Gross accumulation, other items, social insurance instit., FIM mills</td>
</tr>
<tr>
<td>TRSTOT</td>
<td>Total transfers to other sectors by social security funds, FIM million</td>
</tr>
<tr>
<td>YD</td>
<td>Household disposable income, FIM million</td>
</tr>
<tr>
<td>YDBANK</td>
<td>Financial institutions disposable income, FIM million</td>
</tr>
<tr>
<td>YDC</td>
<td>Disposable income of corporate sector, FIM million</td>
</tr>
<tr>
<td>YDCG</td>
<td>Central government disposable income, FIM million</td>
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<tr>
<td>YDG</td>
<td>Disposable income of general government, FIM million</td>
</tr>
<tr>
<td>YDLG</td>
<td>Disposable income of local government, FIM million</td>
</tr>
<tr>
<td>YDS</td>
<td>Disposable income of social security funds, FIM million</td>
</tr>
<tr>
<td>YDTOT</td>
<td>Disposable income, total, FIM million</td>
</tr>
<tr>
<td>YIS</td>
<td>Interest income of social security funds, FIM million</td>
</tr>
</tbody>
</table>
3.14 Balance of payments (B)

B.1 Trade balance

BPTNV = XGNV − MGNV

B.2 Services Balance

BPSNV = XSNV − MSNV

B.3 Balance of goods and services

BPTSNV = BPTNV + XSNV − MSNV

B.4 Investment income from abroad, net

\[ \text{YFIN} / \text{KLMN}_{-1} = 0.5 \times (\text{YFIN}_{-1} / \text{KLMN}_{-2} + \text{YFIN}_{-2} / \text{KLMN}_{-3}) \]

B.5 Income transfers from abroad, net

\[ \text{YFTR} = -\text{TRCGF} - 4.11322 \times \text{GDPV} / 1000 + 120.88479 \]

Method of estimation = Ordinary Least Squares

Estimation period = 1970Q1–1994Q4

\[ R^2 = 0.750 \]

\[ DW = 1.1011 \]

\[ SE = 98.157 \]

B.6 Current account

BPCV = BPTSNV + YFIN + YFTR

<table>
<thead>
<tr>
<th>BPCV</th>
<th>Current account, FIM million</th>
</tr>
</thead>
<tbody>
<tr>
<td>BPSNV</td>
<td>Balance of services (SNA), FIM million</td>
</tr>
<tr>
<td>BPTNV</td>
<td>Trade balance, FIM million</td>
</tr>
<tr>
<td>BPTSNV</td>
<td>Balance of goods and services, FIM million</td>
</tr>
<tr>
<td>GDPV</td>
<td>GDP in purchasers' values, FIM million</td>
</tr>
<tr>
<td>KLMN</td>
<td>Foreign debt net, FIM million</td>
</tr>
<tr>
<td>MGNV</td>
<td>Imports of goods, FIM billions (SNA)</td>
</tr>
<tr>
<td>MSNV</td>
<td>Imports of services, FIM million (SNA)</td>
</tr>
<tr>
<td>TRCGF</td>
<td>Central government transfers abroad, FIM million</td>
</tr>
<tr>
<td>XGNV</td>
<td>Exports of goods, FIM million (SNA)</td>
</tr>
<tr>
<td>XSNV</td>
<td>Exports of services, FIM million (SNA)</td>
</tr>
<tr>
<td>YFIN</td>
<td>Investment income from abroad, net, FIM million</td>
</tr>
<tr>
<td>YFTR</td>
<td>Income transfers from abroad, net, FIM million</td>
</tr>
</tbody>
</table>
B.7 Net lending of the banking sector

\[ FBANK = BPCV - FHN - FGN - FCN \]

B.8 Private sector capital imports, net

Default: Balance of payments identity, exogenous GFXN

\[ FMPN = (-1) \cdot (BPCV + FMCGN) + GFXN - (1 + FDFX) \cdot GFXN_{-1} \]

Alternative 1: Portfolio equation.

\[ FMPN = DFMPN1 \cdot (\Delta RS - \Delta RFOR + DFMPN2) \cdot GDPV_{-1} \]

B.9 Change of the Bank of Finland's net foreign claims

\[ FGFXN = (-1) \cdot (BPCV + FMCGN + FMPN) \]

B.10 Bank of Finland's net foreign claims

Default: GFXN exogenous

\[ GFXN = GFXN_{-1} \]

Alternative 1: GFXN from the balance of payments-identity

\[ GFXN = (1 + FDFX) \cdot GFXN_{-1} - FGFXN. \]

<table>
<thead>
<tr>
<th>Variable</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>BPCV</td>
<td>Current account, FIM million</td>
</tr>
<tr>
<td>DFMPN1</td>
<td>Dummy for FMPN equation, interest sensitivity</td>
</tr>
<tr>
<td>DFMPN2</td>
<td>Dummy for FMPN equation</td>
</tr>
<tr>
<td>FBANK</td>
<td>Net lending by financial institutions, FIM million</td>
</tr>
<tr>
<td>FCN</td>
<td>Net lending by corporate sector, FIM million</td>
</tr>
<tr>
<td>FDFX</td>
<td>Change of the exchange rate index for the net foreign claims, %</td>
</tr>
<tr>
<td>FGFXN</td>
<td>Change of the Bank of Finland's net foreign claims, FIM million</td>
</tr>
<tr>
<td>FGN</td>
<td>Net lending by public sector, FIM million</td>
</tr>
<tr>
<td>FHN</td>
<td>Net lending by households, FIM million</td>
</tr>
<tr>
<td>FMCGN</td>
<td>Foreign borrowing by the central government, net, FIM million</td>
</tr>
<tr>
<td>FMPN</td>
<td>Foreign borrowing by private sector, FIM million</td>
</tr>
<tr>
<td>GDPV</td>
<td>GDP in purchasers' values, FIM million</td>
</tr>
<tr>
<td>GFXN</td>
<td>Foreign claims of the central bank, net, FIM million</td>
</tr>
<tr>
<td>RFOR</td>
<td>Foreign interest rate, 3-month commercial ECU (1991Q3 onwards), per cent</td>
</tr>
<tr>
<td>RS</td>
<td>Money market rate, 3-month HELIBOR (1987 onwards), per cent</td>
</tr>
</tbody>
</table>
3.15 Financial markets (R)

R.1 Expectations of the government bond rate, 4–5 years

\[ R_{BTXEX} = R_{BTX+1} \]

R.2 Government bond rate (4–5 years)

Default: Rational expectations

\[ R_{BTX} = .933201 \times R_{BTXEX} + (1 - .933201) \times RS \]

Method of estimation = Generalized Method of Moments
Estimation period = 1985Q1–1995Q3
P-value = 0.0406
SE = .754055

Alternative 1: Rational expectations, risk premium

\[ R_{BTX} = .76639 \times R_{BTXEX} + (1 - .76639) \times RS - .05455 \times (100 \times FCGN / GDPV) \]

Method of estimation = Ordinary Least Squares
Estimation period = 1985Q1–1995Q4
\[ R^2 = .833 \]
\[ DW = 1.024 \]
SE = .64375

| FCGN | Central government net lending, FIM million |
| GDPV | GDP in purchasers' values, FIM million |
| RBTX | Taxable government bond yield, approx. 5 years, per cent |
| RBTXEX | RBTX (t+1) |
| RS | Money market rate, 3-month HELIBOR (1987 onwards), per cent |
R.3 Long term market rate of interest (5 years)

\[
RDEB = \max \{ [RBTX - .32214 + .56947 \times (RDEB_{-1} - RBTX_{-1})] \\
+ .88466 \times \frac{(LCD_{-1} + LCF_{-1})}{(PHM \times (KFL_{-1} + KF2_{-1})/100)} - RBTX \}
\]

Method of estimation = Ordinary Least Squares
Estimation period = 1988Q1–1994Q4
\[R^2 = .773\]
\[DW = 1.735\]
\[SE = .19518\]

R.4 Average rate on banks’ new lending

\[
\Delta RLBN = .14298 \times \Delta RLBN_{-1} + .37014 \times ARS_{-1} \\
+ .18353 \times \Delta RBTX - .06867 \times (RLBN_{-1} - RBTX_{-1})
\]

Method of estimation = Ordinary Least Squares
Estimation period = 1988Q1–1995Q4
\[R^2 = .755\]
\[DW = 2.201\]
\[SE = .38115\]

<table>
<thead>
<tr>
<th>KF1</th>
<th>Net stock of fixed capital, manufacturing, millions of 1990 FIM</th>
</tr>
</thead>
<tbody>
<tr>
<td>KF2</td>
<td>Net stock of fixed capital, non-manufacturing private sector, millions of 1990 FIM</td>
</tr>
<tr>
<td>LCD</td>
<td>Domestic currency denominated stock of loans of the non-banking private corporate sector, FIM million</td>
</tr>
<tr>
<td>LCF</td>
<td>Foreign currency denominated stock of loans of the non-banking corporate sector, FIM million</td>
</tr>
<tr>
<td>PHM</td>
<td>House price index, all dwellings, entire country, 1990=100</td>
</tr>
<tr>
<td>RBTX</td>
<td>Taxable government bond yield, approx. 5 years, per cent</td>
</tr>
<tr>
<td>RDEB</td>
<td>Market yield on depotures, per cent</td>
</tr>
<tr>
<td>RLBN</td>
<td>Average rate on deposit banks’ new lending, per cent</td>
</tr>
<tr>
<td>RS</td>
<td>Money market rate, 3-month HELIBOR (1987 onwards), per cent</td>
</tr>
</tbody>
</table>
R.5  Banks’ average interest rate on outstanding loans

$$\Delta RLB = -0.17373^{*} \Delta RLB_{-1} + 0.34533^{*} \Delta RLB_N + 0.17276^{*} \Delta RD - 0.05503^{*}(RLB_{-1} - RLBN_{-1})$$

Method of estimation = Ordinary Least Squares
Estimation period = 1986Q1–1995Q4
$R^2 = .915$
$DW = 2.018$
$SE = .14863$

R.6  Average interest rate, bank deposits

$$RDT = \max\left[(RDT_{-1} + 0.16124^{*} \Delta RDT_{-1} + 0.51413^{*} \Delta RD + 0.17661^{*} \Delta RLB - 0.18439^{*} RDT_{-1} + 0.11740^{*} RLBN_{-1} - 0.31975), 0]\right]$$

Method of estimation = Ordinary Least Squares
Estimation period = 1985Q1–1995Q4
$R^2 = .841$
$DW = 2.252$
$SE = .16514$

R.7  Expectations of the demand for money, M2

$$MON2EX = MON2_{t+1}$$
R.8 Demand for money, M2

\[
\log \text{MON2} = 0.37556 \times (\log \text{MON2}_{t+1} + 0.95596 \times \log \text{MON2EX}) \\
+ (1 - 0.37556 \times (1 + 0.955996)) \times \log Z\text{MON2}
\]

Method of estimation = Generalized Method of Moments
Estimation period = 1972Q1–1995Q2
P-value = 0.3434
SE = 0.035634

where

\[
\log \left( \frac{Z\text{MON2}}{\text{PCP}} \right) = -4.95829 + 1.14098 \times \log C \\
- 0.0485680 \times (\text{RS} - \text{RDT}) \\
- 0.010208 \times (\text{RBTX} - \text{RDT}) \\
+ 0.072819 \times \text{DLIB} + 0.102401 \times D0188Q4
\]

Method of estimation = Ordinary Least Squares
Estimation period = 1971Q3–1995Q4
R² = 0.994138
DW = 0.749049
SE = 0.024557

C Private consumption, millions of 1990 FIM
D0188Q4 Dummy for a change in capital income taxation
DLIB Dummy for financial market liberalisation (−85Q4=0, 85Q1=.25, 85Q2=.50, ..., 86Q4=2)
MON2 Monetary aggregate M2, FIM million
MON2EX MON2(t+1)
PCP Private consumption prices, 1990=100
RBTX Taxable government bond yield, approx. 5 year, per cent
RDT Interest rate, time deposits, per cent
RS Money market rate, 3-month HELIBOR (1987 onwards), per cent
Demand for money, M1

\[
\Delta \log((\text{MON}_1 - \text{DMON}_1)/\text{PCP}) = 0.31969 \times \Delta \log \text{ZMON}_1 \\
+ 0.14405 \times \Delta \text{D1091Q1} \\
- 0.24313 \times \log((\text{MON}_{1-1} - \text{DMON}_{1-1})/\text{ZMON}_{1-1}) \\
+ 0.00563
\]

Method of estimation = Ordinary Least Squares
Estimation period = 1973Q1–1995Q4
\( R^2 = 0.541 \)
\( \text{DW} = 1.836 \)
\( \text{SE} = 0.01805 \)

where

\[
\log(\text{ZMON}_1/\text{PCP}) = -1.05670 + 0.75405 \times \log \text{C} - 0.00272 \times \text{RS} \\
- 0.01961 \times \text{RDT} - 0.02189 \times \text{D1091Q1}
\]

Method of estimation = Ordinary Least Squares
Estimation period = 1972Q1–1995Q4
\( R^2 = 0.961 \)
\( \text{DW} = 0.888 \)
\( \text{SE} = 0.02878 \)

C Private consumption, millions of 1990 FIM
D1091Q1 Dummy for a new tax, tax at source of interest income
DMON1 Dummy for shift from MON2 into MON1 (36 and 24 month deposits, 96Q1–98Q1)
MON1 Monetary aggregate M1, FIM million
PCP Private consumption prices, 1990=100
RDT Interest rate, time deposits, per cent
RS Money market rate, 3-month HELIBOR (1987 onwards), per cent
R.10 Demand for money, M3

\[
\log(\text{MON3} / \text{MON2}) = -0.07063 \times \log(\text{IFV} / \text{GDPV8}) + 0.00257 \times \text{RS} - 0.04556
\]

Method of estimation = Ordinary Least Squares
Estimation period = 1988Q1–1996Q4
\[R^2 = 0.496\]
\[DW = 0.948\]
\[SE = 0.01379\]

R.11 Bank certificates of deposits held by the public

\[\text{KCDP} = \text{MON3} - \text{MON2}\]

---

**GDPV8**  Production at factor cost, private sector, FIM million
**IFV**  Private non-residential investment, FIM million
**KCDP**  Bank certificates of deposits held by the public, FIM million
**MON2**  Monetary aggregate M2, FIM million
**MON3**  Monetary aggregate M3, FIM million
**RS**  Money market rate, 3-month HELIBOR (1987 onwards), per cent
R.12 Currency in circulation, public

\[ \Delta \log \text{CURNB} = 0.74256 \cdot \Delta \log \text{CV} \\
- 0.00239 \cdot \Delta \text{RBTX} \\
- 0.07168 \cdot \text{ZCURNB}_{-1} \]

Method of estimation = Ordinary Least Squares
Estimation period = 1975Q3–1996Q2
R² = 0.003
DW = 2.622
SE = 0.03336

where

\[ \text{ZCURNB} = \log \text{CURNB} - 0.84669 \cdot \log \text{CV} + 0.02499 \cdot \text{RBTX} \]

Method of estimation = Ordinary Least Squares
Estimation period = 1975Q2–1996Q2
R² = 0.984
DW = 0.366
SE = 0.06098

R.13 Currency in circulation, banks

\[ \Delta \log \text{CURB} = 0.486938 \cdot \Delta \log (\text{MON2} - \text{CURNB}) \]

R.14 Currency in circulation

\[ \text{CUR} = \text{CURNB} + \text{CURB} \]

<table>
<thead>
<tr>
<th>CUR</th>
<th>Currency in circulation, FIM million</th>
</tr>
</thead>
<tbody>
<tr>
<td>CURB</td>
<td>Currency in circulation, banks, FIM million</td>
</tr>
<tr>
<td>CURNB</td>
<td>Currency in circulation, public, FIM million</td>
</tr>
<tr>
<td>CV</td>
<td>Private consumption, FIM million</td>
</tr>
<tr>
<td>MON2</td>
<td>Monetary aggregate M2, FIM million</td>
</tr>
<tr>
<td>RBTX</td>
<td>Taxable government bond yield, approx. 5 years, per cent</td>
</tr>
</tbody>
</table>
R.15 Required reserves

\[ CR = (1 - D0193Q3) \cdot CRR \cdot (MON2 - CUR) / 100 \\
+ D0193Q3 \cdot 1.242 \cdot [CRR_1 \cdot (MON1 - CUR) \\
+ CRR_2 \cdot (MON2 - MON1) + CRR_3 \cdot (MON3 - MON2)] / 100 \]

R.16 Bank loans to the corporate sector

\[ LBC = [(LBC_{-1} + LBC_{-2}) / (LCD_{-1} + LCD_{-2})) \cdot LCD \]

R.17 Bank foreign currency denominated loans to the corporate sector

\[ LBCF = [(LBCF_{-1} + LBCF_{-2}) / (LCF_{-1} + LCF_{-2})) \cdot LCF \]

R.18 Bank markka loans to the corporate sector

\[ LBCD = LBC - LBCF \]

R.19 Bank loans to the public, total

\[ LBTOT = LBC + LBH \]

R.20 Bank markka deposits by the public

\[ KDP = MON2 - CURNB \]

<table>
<thead>
<tr>
<th>CR</th>
<th>Cash reserve deposits by banks, FIM million</th>
</tr>
</thead>
<tbody>
<tr>
<td>CRR</td>
<td>Cash reserve requirement, %</td>
</tr>
<tr>
<td>CRR1</td>
<td>Reserve requirement on deposits payable on demand, %</td>
</tr>
<tr>
<td>CRR2</td>
<td>Reserve requirement on other deposits, %</td>
</tr>
<tr>
<td>CRR3</td>
<td>Reserve requirement on other items, %</td>
</tr>
<tr>
<td>CUR</td>
<td>Currency in circulation, FIM million</td>
</tr>
<tr>
<td>CURNB</td>
<td>Currency in circulation, public, FIM million</td>
</tr>
<tr>
<td>D0193Q3</td>
<td>Dummy for a revision of the reserve deposits system</td>
</tr>
<tr>
<td>KDP</td>
<td>Bank deposits by the public, FIM million</td>
</tr>
<tr>
<td>LBC</td>
<td>Bank loans to the enterprises, FIM million</td>
</tr>
<tr>
<td>LBCD</td>
<td>Bank FIM denominated loans to the enterprises, FIM million</td>
</tr>
<tr>
<td>LBCF</td>
<td>Bank foreign currency denominated loans to the enterprises, FIM million</td>
</tr>
<tr>
<td>LBH</td>
<td>Bank loans to the households, FIM million</td>
</tr>
<tr>
<td>LBTOT</td>
<td>Bank loans to the public, FIM million</td>
</tr>
<tr>
<td>LCD</td>
<td>Domestic currency denominated stock of loans of the non-banking private corporate sector, FIM million</td>
</tr>
<tr>
<td>LCF</td>
<td>Foreign currency denominated stock of loans of the non-banking corporate sector, FIM million</td>
</tr>
<tr>
<td>MON1</td>
<td>Monetary aggregate M1, FIM million</td>
</tr>
<tr>
<td>MON2</td>
<td>Monetary aggregate M2, FIM million</td>
</tr>
<tr>
<td>MON3</td>
<td>Monetary aggregate M3, FIM million</td>
</tr>
</tbody>
</table>
R.21 Banks’ balance sheet, other items, net

\[ \text{KOBN} = \text{LBH} + \text{LBCD} + \text{LBCF} - (\text{MON3} - \text{CURNB}) + \text{CURB} + \text{LBCG} - \text{CASHCG} - \text{LBFBN} - \text{KOWNB} \]

R.22 Banks’ net liabilities to the Bank of Finland

\[ \text{LBFBN} = \text{LBFBON} - \text{CR} - \text{FREE} \]

R.23 Bank of Finland other balance sheet items, net

\[ \text{KOBFN} = \text{GFXN} + \text{CDBF} + \text{LBFBN} + \text{LBFGN} + \text{LBFCN} - \text{CUR} - \text{CR} - \text{FREE} \]

R.24 Bank of Finland, foreign exchange reserves

\[ \text{GFX} = \text{GFXN} - \text{KFBFO} \]

---

CASHCG: Central government cash position, FIM million
CDBF: Outstanding certificates of deposits issued by the Bank of Finland, (−), FIM million
CR: Cash reserve deposits by banks, FIM million
CUR: Currency in circulation, FIM million
CURB: Currency in circulation, banks, FIM million
CURNB: Currency in circulation, public, FIM million
FREE: Banks’ free reserves, FIM million
GFX: Foreign exchange reserves of the central bank, FIM million
GFXN: Foreign claims of the central bank, net, FIM million
KFBFO: Bank of Finland other foreign liabilities, net, FIM million
KOBFN: Bank of Finland other balance sheet items, net, FIM million
KOB: Balance sheet of the banks, other items, net, FIM million
KOWNB: Banks’ own capital, FIM million
LB: Bank FIM denominated loans to the enterprises, FIM million
LBCD: Bank foreign currency denominated loans to the enterprises, FIM million
LBCG: Central government bonds and debentures to the banks, FIM million
LBFBN: Banks’ net debt to the Bank of Finland, FIM million
LBFBON: Banks’ other net liabilities to the Bank of Finland, FIM million
LBFCN: Bank of Finland lending to the public, FIM million
LBFGN: Central government debt to the Bank of Finland, FIM million
LBH: Bank loans to the households, FIM million
MON3: Monetary aggregate M3, FIM million
3.16 Policy rules and pre-recursive block of exogenous variables

Model closure is often achieved by policy rules. We present here only some examples of such rules. Different formulations of policy rules serve different types of simulations. The simple rules presented here should not be interpreted to describe actual behaviour of the authorities.

Variables that are typically treated as exogenous are denoted by * in the list of variables in appendix 3. In long simulations or when indexation is desired we use simple generating equations for these variables. Only the most interesting generating equations are presented in this chapter. In addition, we classify the blocks of exogenous variables by economic content.

1) WORLD ECONOMY, IMPORT PRICES

Foreign prices

PNIG Export prices of the competitors, FIM, 1990=100
PWE HWWA, prices of energy raw materials, in USD, 1990=100
PWM HWWA, prices of raw materials for manufacturing excl. energy, 1990=100

PCOMP Competitors' prices on export markets, 1990=100

\[ \log(\text{PCOMP}) = .7 \log(\text{PNIG}/.99) + .3 \log(\text{PWM}) \]

Import prices in FIM

PMRN Import prices of raw materials, 1990=100 (weighting=.531)

\[ \Delta \log(\text{PMRN}) = 1.3458 \Delta \log(\text{PMRN} - 1) \\
+ .30057 \Delta \log(\text{PNIG}) + .09613 \Delta \log(\text{PWM} - 1) \\
+ .18645 (\Delta \log(\text{FXSUSD}) + \Delta \log(\text{PWE})) \\
+ .07777 \Delta \log(\text{FXSUSD}) \\
- .11756 \Delta \log(\text{FXSUSD} - 1) \\
- .18666 \times \text{ZPMRN} + .00389 \]

Method of estimation: Ordinary Least Squares
Estimation period: 1974Q3–1996Q3
\[ R^2 = .726 \]
\[ DW = 2.158 \]
\[ SE = .01629 \]
where

\[
Z_{PMRN} = \log(\text{PMRN}_{-1}) - 0.18416 \log(\text{PWM}_{-1})
\]
\[\quad - 0.25843 \log(\text{FXSUSD}_{-1} \cdot \text{PWE}_{-1})
\]
\[\quad - (1 - 0.18416 - 0.25843) \log(\text{PNIG}_{-1})
\]
\[\quad + 0.33787
\]

Method of estimation: OLS
Estimation period: 1974Q1–1996Q3
\[R^2 = 0.898\]
\[DW = 0.489\]
\[SE = 0.03682\]

**PMCN** Import prices of consumer goods, 1990=100 (weighting=.2778)

\[
\Delta \log \left( \frac{\text{PMCN} \cdot \text{FXTW}}{\text{PNIG}} \right) = 0.4 \Delta \log \text{FXTW} - 0.17 \log \left( \frac{\text{PMCN}_{-1}}{\text{PNIG}_{-1}} \right)
\]

Estimation: Ketelsen and Kortelainen, Bank of Finland DP 26/1996

**PMIN** Import prices of investment goods, 1990=100 (weighting=.1912)

\[
\Delta \log \left( \frac{\text{PMIN} \cdot \text{FXTW}}{\text{PNIG}} \right) = 0.4 \Delta \log \text{FXTW} - 0.17 \log \left( \frac{\text{PMIN}_{-1}}{\text{PNIG}_{-1}} \right)
\]

Estimation: Ketelsen and Kortelainen, Bank of Finland DP 26/1996

**PMGN** Import prices of goods, 1990=100 (SNA)

\[
\log(\text{PMGN}) = 0.5310 \log(\text{PMRN}) + 0.2778 \log(\text{PMCN})
\]
\[\quad + 0.1912 \log(\text{PMIN})
\]

**PMSN** Import prices of services, 1990=100 (SNA)

\[
\frac{\text{PMSN}}{\text{PMSN}_{-1}} = \frac{\text{PNIG}}{\text{PNIG}_{-1}}
\]

Other foreign variables

**RFOR** Foreign interest rate, 3-month commercial ECU rate (1991Q3 onwards), per cent

**MNIG** Export markets, imports of Finland’s major export countries, 1990=100
2) MONETARY POLICY

The monetary policy rule which is labelled Default was used in the simulations of Chapter 1. In effect, the short term interest rate of the shock was changed by the amount inflation differed from that of the control, as the foreign rate RFOR and the inflation target INFSTAR were kept unchanged, and the dummy DMP was set equal to one.

Interest rates

Default: RS reacts to changes in inflation

$$RS = \max\{((\text{RFOR} + DMP*400*(\text{INFPCP} - \text{INFSTAR})), 0.5\}$$

Alternative: RS reacts to changes in expected inflation

$$RS = \max\{((\text{RFOR} + DMP*400*(\text{INFPCPE2} - \text{INFSTAR})), 0.5\}$$

RS INFSTAR RD
Money market rate, 3-month HELIBOR (1987 onwards), per cent
Target rate of inflation in a monetary policy rule for RS
Bank of Finland base rate, per cent

Exchange rates

FXTW FXSUSD FDFX
Bank of Finland currency index, 1982=100
Exchange rate, FIM/USD
Change of the exchange rate index for the net foreign claims, per cent

Minimum reserve requirements

CRR CRR1 CRR2 CRR3
Cash reserve requirement (prior to 1993Q2), per cent
Reserve requirement on deposits payable on demand, per cent
Reserve requirement on other deposits, per cent
Reserve requirement on other items, per cent

Banks and the central bank

CDBF FREE KFBFO KOWNB LBCG
Outstanding certificates of deposits issued by the Bank of Finland, (~), FIM million
Banks' free reserves, FIM million
Bank of Finland other foreign liabilities, net, FIM million
Central government bonds and debentures to the banks, FIM million
3) **FISCAL POLICY, PUBLIC FINANCE**

Example of a fiscal policy rule: tax rates can be endogenised to guarantee sustainability of public finances. One practical application is to tie income taxes to central government net interest outlays. In medium term forecasting, however, tax rates are exogenous.

Example of indexation:

Bracket creep due to inflation is avoided with the following equation for the intercept of the progressive income tax schedule

\[ \Delta_4 T_Y U = - T_Y S \Delta_4 \log PCP_{-1} \]

Tax rates (indirect and direct)

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>TSR</td>
<td>Sales tax rate, per cent</td>
</tr>
<tr>
<td>TSR7</td>
<td>Sales tax rate, industrial machinery and equipment, per cent (prior to 1990Q4)</td>
</tr>
<tr>
<td>TSR8</td>
<td>Sales tax rate, industrial buildings, per cent (prior to 1977Q2)</td>
</tr>
<tr>
<td>TIOVR</td>
<td>Effective tax rate, other commodity taxes, 1990 = 1</td>
</tr>
<tr>
<td>TLGR</td>
<td>Average local government tax rate, per cent</td>
</tr>
<tr>
<td>TYS</td>
<td>Slope of the progressive income tax schedule</td>
</tr>
<tr>
<td>TYU</td>
<td>Intercept of the progressive income tax schedule</td>
</tr>
<tr>
<td>TYC1R</td>
<td>Corporate tax rate in central government taxation, manufacturing</td>
</tr>
<tr>
<td>TYCR</td>
<td>Corporate tax rate in central government taxation</td>
</tr>
<tr>
<td>TDEDCG</td>
<td>Share of taxable income minus deductions of tax base in central gvt taxes on households</td>
</tr>
<tr>
<td>TDEDLG</td>
<td>Share of taxable minus deductions of tax base in local gvt taxes on households</td>
</tr>
<tr>
<td>TDEDTYC</td>
<td>Deductions in corporate taxation, per cent</td>
</tr>
<tr>
<td>TYPRE</td>
<td>Excess taxes collected from households, FIM million</td>
</tr>
<tr>
<td>TYPREA</td>
<td>Tax refunds to households, FIM million</td>
</tr>
<tr>
<td>TYPRES</td>
<td>Other direct taxes collected from households, net, FIM million</td>
</tr>
<tr>
<td>TYPSS</td>
<td>Central and local govt revenue from subsequently collected direct taxes on households, FIM million</td>
</tr>
<tr>
<td>TYPSPA</td>
<td>Central and local government revenue from subsequently collected direct taxes (arrears) on households, FIM million</td>
</tr>
<tr>
<td>TOCG</td>
<td>Central government compulsory fees, fines and penalties, FIM million</td>
</tr>
<tr>
<td>TOLG</td>
<td>Local government compulsory fees, fines and penalties, FIM million</td>
</tr>
</tbody>
</table>
Social security contribution rates

SOCTELR  Employers' contribution rate for employee pension schemes
SOCLELR  Employers' contribution rate for temp. employee pension scheme
SOCSGR   Employers' national pension and sickness ins. contribution rate, general government.
SOCSPR   Employers' national pension and sickness ins. contribution rate, private sector
SOCSR    Employers' national pension and sickness insurance contribution rate
SOCUR    Employers' unemployment insurance rate
SOCOR1   Employers' other social security contribution rate, manufacturing
SOCOR2   Employers' other social security contribution rate, non-manufacturing private sector
SOCORCG  Employers' other social security contribution rate, central government
SOCORLG  Employers' other social security contribution rate, local government
SOCORS   Employers' other social security contribution rate, social security funds
SOLNPR   Old age, invalidity and unemployment pensioners' social security contribution rate
SOLNR    Insured persons' national pension and sickness insurance contribution rate
SOLUR    Insured persons' unemployment security contribution rate

Public expenditure

CCG       Central government consumption, millions of 1990 FIM
CSOS      Social security funds consumption, millions of 1990 FIM
ICG       Central govt investment (excl. enterprises), millions of 1990 FIM
ILG       Local government investment, millions of 1990 FIM
ISOS      Social security funds investment, millions of 1990 FIM

Transfers to households

TRCGPV    Central government pension insurance, FIM million
TRCGHO    Central government other current transfers to households, FIM million
TRLGH     Local government transfers to households, FIM million
TRLGPV    Local government pension insurance, FIM million
TRNHV     Social insurance instit. expenditure on nat. pension and sickness insurance, FIM mill.
TRNHOV    Households other compensation from the social insurance instit., FIM mill.
TRPPV     Private sector pension insurance, FIM million
<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>TRSHOV</td>
<td>Social security funds other current transfers to households, FIM million</td>
</tr>
<tr>
<td>TRCGUR</td>
<td>Central government contribution rate in unemployment benefits</td>
</tr>
<tr>
<td>TRCGPVDI</td>
<td>Central government pension insurance vol. index (C, R4), demography</td>
</tr>
<tr>
<td>TRLGPVDI</td>
<td>Local government pension insurance vol. index, demography</td>
</tr>
<tr>
<td>TRPPVDI</td>
<td>Private sector pension insurance vol. index, demography</td>
</tr>
</tbody>
</table>

Other transfers

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>TRCGF</td>
<td>Central government transfers abroad, FIM million</td>
</tr>
<tr>
<td>TRCGL</td>
<td>Central government transfers to local government, FIM million</td>
</tr>
<tr>
<td>TRCGSO</td>
<td>Central govt other current transfers to social sec. funds, FIM mill.</td>
</tr>
<tr>
<td>TRLGS</td>
<td>Local government current transfers to social security funds, FIM mill.</td>
</tr>
<tr>
<td>TRLGO</td>
<td>Local government other current transfers, FIM million</td>
</tr>
<tr>
<td>YTRCGO</td>
<td>Other current transfers to central government, FIM million</td>
</tr>
<tr>
<td>YOLG</td>
<td>Local government other requited current transfers, FIM million</td>
</tr>
<tr>
<td>TRSOV</td>
<td>Social security funds other current transfers, FIM million</td>
</tr>
<tr>
<td>YTRSO</td>
<td>Other current transfers to social security funds, FIM million</td>
</tr>
</tbody>
</table>

Subsidies

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>SUB</td>
<td>Commodity subsidies, FIM million</td>
</tr>
<tr>
<td>SUBEU</td>
<td>Indirect taxes from the rest of the world, net, FIM million</td>
</tr>
<tr>
<td>SUBOCG</td>
<td>Central government other subsidies, FIM million</td>
</tr>
</tbody>
</table>

Central government finances

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>CASHCG</td>
<td>Central government cash position, FIM million</td>
</tr>
<tr>
<td>FCGCASHO</td>
<td>Central govt deficit before financial transactions, discrepancy of SNA and cash basis concepts, FIM million</td>
</tr>
<tr>
<td>FCGFION</td>
<td>Central govt other fin. investment, net (cash basis), FIM mill.</td>
</tr>
<tr>
<td>FCGH</td>
<td>Central government housing loans, drawings, FIM million</td>
</tr>
<tr>
<td>FCGSUP</td>
<td>Central govt capital support to banks, FIM million</td>
</tr>
</tbody>
</table>

Other

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>FOCGN</td>
<td>Central government long-term debt, FIM million</td>
</tr>
<tr>
<td>LCGPF</td>
<td>Central government debt to pension funds, FIM million</td>
</tr>
<tr>
<td>LGINT</td>
<td>General government internal debt (correction for consolidated debt), FIM million</td>
</tr>
<tr>
<td>LSOSN</td>
<td>Social security funds debt, FIM million</td>
</tr>
</tbody>
</table>
4) CAPITAL IMPORTS, PRIVATE AND PUBLIC SECTOR

FEXP Investments abroad, corporate sector, FIM million
If GFXN Foreign claims of the central bank, net, FIM million, is exogenous
then FMPN Foreign borrowing by private sector, FIM million, is solved from
FMCGN the balance of payments identity, and vice versa
FFCG Foreign currency denominated debt of the central government,
balance of payments, increase (−), FIM million

5) TECHNICAL & SUPPLY SIDE VARIABLES:

N Population of working age (15–74 years), 1000 persons
CCR1 Capital consumption rate, manufacturing
CCR2 Capital consumption rate, non-manufacturing private sector
CCRCG Capital consumption rate, central government
CCRH Capital consumption rate, residential buildings
CRLG Capital consumption rate, local government
CRS Capital consumption rate, social security funds
TREND Linear trend, 1960Q1 onwards 0.25+ TREND_{-1}

6) MISCELLANEOUS VARIABLES (FEED-BACKS ONLY THROUGH BALANCE-SHEETS)

CAPCG Capital consumption, central government, FIM million
CAPH Capital consumption, households, FIM million
CAPLG Capital consumption, local governments, FIM million
OSV Gross accumulation, other items, social insurance instit., FIM
STD million
YWF Statistical discrepancy, millions of 1990 FIM
Wages; salaries and social security contributions from abroad,
FIM mill.

7) DUMMIES

See Appendix 3.
Appendix 1

Forward looking equations of the model

1.1 Euler equation approach

Below we describe briefly how the forward looking equations are derived in the model. There exist five cases of optimisation schemes from which the Euler equations (first order conditions) are derived. The necessary conditions for the local maxima (second order conditions) are not reported below.

In the first case, the Euler equation is obtained through the consumption behaviour of a utility maximising consumer. In the second case, the Euler equation is obtained through the investment behaviour of a profit-maximising firm. In the third case, the Euler equation is obtained via an intertemporal optimising agent problem assuming adjustment costs both in changes of levels and in deviations from the desired level. Thereby the forward looking equations for eg prices, demand for labour, and demand for money are defined. In the fourth case, the Euler equation for inventory investment is obtained via an intertemporal optimising agent problem assuming adjustment costs both in deviations from the normal level of production and in deviations from the desired stock of inventories. In the fifth case, the Euler equation for housing investment is derived. Finally, we provide the derivation of the forward-looking equation for the real price of housing.

In addition, model consistent inflation expectations make wage formation forward looking. The labour unions are assumed to maximise expected real after-tax wages over the contract period. Thus, inflation expectations enter the negotiated wage rate equation with coefficient one. Wage drift over the negotiated wage is a function of the real wage gap and the unemployment rate.

Case 1: Consumption

This is a discrete time version of the basic overlapping generations model of consumption by Blanchard, 1985, *Journal of Political Economy* 93 (2). In deriving the aggregate counterpart of the Euler equation we follow the forward differencing approach by Sefton and in't Veld, 1997, *NIESR mimeo*. In the aggregate level the behaviour of forward looking optimising consumers with a finite planning horizon and free access to capital markets is determined by the following system of equations (see below for a sketch of derivation):

\[
(1) \quad C = \alpha W \\
(2) \quad W = V_{-1} + H \\
(3) \quad H = \sum_{i=0}^{\infty} \left( \frac{1-p}{1+r} \right)^i Y_{+i}
\]
\( V = (1 + r)[V_{t-1} + Y - C] \)

where \( C \) is consumption, \( W \) is total real wealth, \( V \) is real asset wealth, \( H \) is human real wealth (discounted value of future income), and \( Y \) refers to real labour income and \( r \) to the real interest rate (constant) and \( p \) is probability of death. The propensity to consume out of wealth, \( \alpha \), is also a function of deeper structural parameters, the degree of relative risk aversion, the rate of time preference, the probability of death and the real interest rate. The parameters we are mostly interested in are the propensity to consume out of wealth, \( \alpha \), and the parameter \( \gamma \) measuring the length of planning horizon of consumers, to be introduced shortly.

**An individual in cohort** \( k \). Denote by \( c(k,i), y(k,i), v(k,i) \) and \( h(k,i) \) consumption, income, (non-human) asset wealth and human wealth of an individual in the \( k^{th} \) cohort in period \( i \), or in the case of the wealth variables, at the end of the period \( i \).

Individuals in cohort \( k \) maximise the utility they derive from consumption over their lifetime,

\[
\max U_t = E \left( \sum_{i=t}^{\infty} \log c(k,i)(1-\theta)^{i-t} \right) = \sum_{i=t}^{\infty} \log c(k,i)(1-p)^{i-t}(1-\theta)^{i-t}
\]

where \( \theta \) is the individuals discount factor. The only source of uncertainty is here the constant probability of death, \( p \). A logarithmic utility function implying constant risk aversion is assumed. Optimisation is subject to the sequence of one-period flow budget constraints . . .

\[
v(k,i) = \frac{(1 + r_i)}{(1 - p)} (v(k,i-1) + y(k,i) - c(k,i)).
\]

In addition, total present value of expenditure must equal total present value of income over the expected horizon.

The Euler equation, ie the first order condition to the intertemporal optimisation problem, of an individual in the \( k^{th} \) cohort (\( c^e \) denotes expected consumption) is

\[
c^e(k, t + i + 1) = (1 - \theta)(1 + r_{t+i})c^e(k, t + i).
\]

Substituting the Euler equation into the individual's lifetime budget constraint gives the consumption function

\[
c(k, t) = (1 - (1 - p)(1 - \theta))(h(k, t) + v(k, t - 1))
\]

where, under perfect foresight concerning the future income stream,

\[
h(k, t) = \sum_{i=0}^{\infty} \left( \frac{1 + r_0}{\prod_{j=0}^{i} (1 + r_j)} \right)(1 - p)^{i} y(k, t + i)
\]
is the discounted value of future earnings (ie human wealth). Perfect foresight is, however, a very restrictive assumption. It is more realistic to assume that economic agents have much more information concerning their income in the near future than income further in the future. Hence, it is quite probable, that in forming income expectations over the life-cycle, information concerning income prospects in the foreseeable future is used in extrapolating expectations concerning future income at further horizon. To take into account of the imperfect ability of individuals to foresee future flows of income over their life-cycles we redefine the human wealth as follows:

\[ h(k, t) = \frac{r + p + \gamma(1-p)}{r + p} \sum_{i=0}^{\infty} \left( \frac{1 + r_0}{\prod_{j=0}^{i} (1 + r_j)} \right) [(1-p)(1-\gamma)]^i y(k, t + i) \]

where \( r \) is the level of interest which, if sustained infinitely, fulfils the identity

\[ \sum_{i=0}^{\infty} \left( \frac{1}{1+r} \right)^i - \frac{1 + r_0}{\prod_{j=0}^{i} (1 + r_j)} \] 

\[ [(1-p)(1-\gamma)]^i y(k, t + i) = 0. \]

\( r \) can be interpreted as a weighted average of the interest rate over the planning horizon.

Parameter \( \gamma \) is the measure of myopia. If it is zero, then the definition of human wealth reduces to that of perfect foresight and, by contrast, when \( \gamma \) converges towards unity, then all information concerning future income is contained by current period income. This is compatible with the assumption that the income generating process is a random walk. The scaling factor \( \frac{r + p + \gamma(1-p)}{r + p} \) is needed to keep the level of human wealth intact from the size of \( \gamma \). Without the scaling factor, human wealth \( h(k, t) \) would decrease towards the level \( y(k, t) \) when \( \gamma \) converges towards unity.

We see that propensity to consume out of wealth of an individual in the kth cohort is constant and will be denoted \( \alpha \), where \( \alpha = (1 - (1 - p)(1 - \theta)). \)

**Aggregation.** Summing up the cohorts, the size of which is normalised to \( p \), we get aggregate wealth \( V_t = (1 + r_t)(V_{t-1} + Y_t - C_t) \) and the aggregate consumption function

\[ C_t = \alpha(V_{t-1} + H_t) \]

where

\[ H_t = \frac{r + p + \gamma(1-p)}{r + p} \sum_{i=0}^{\infty} \left( \frac{1 + r_0}{\prod_{j=0}^{i} (1 + r_j)} \right) [(1-p)(1-\gamma)]^i y_{t+i} \]

\(^1\) If, more generally, constant risk aversion with parameter \( \delta \) is assumed, \( \alpha = 1 - (1 - p)(1 - \theta)^{\delta}(1 + r)^{\delta-1}. \)
and \( Y \) is aggregate income. After substituting the definition of aggregate human wealth into the aggregate consumption function, applying conventional Koyck-lag technique forward and using the aggregate wealth definition defined above, we end up with equation

\[
C_t = \frac{(1-p)(1-\gamma)}{1-\alpha(1-p)(1-\gamma)} C_{t-1} + \frac{\alpha[p-\gamma(1-p)]}{1-\alpha(1-p)(1-\gamma)} [V_{t-1} + Y_t] + \frac{\alpha \gamma(1-p)}{r+p} Y_t
\]

Thus, consumption is a function of previous period asset wealth, current period income and the expected consumption next period, which represents the unobservable discounted stream of expected future income. We see that the impact of current period income increases and the impact of expected consumption next period decreases the greater \( \gamma \) becomes.

**Case 2: Fixed investment**

Following Hubbard, Kashyap and Whited, 1993, *NBER WP* No. 4392, we shall assume that the firm is maximizing its value \( V_t \), i.e. the expected discounted profit at time \( t \). In addition, we shall assume no taxes in order to simplify the notation.

\[
\max V_t = E_t \sum_{t=0}^{\infty} \left[ \prod_{j=0}^{t-1} \beta_j \right] (d_t - s_t)
\]

\[
= E_t \left\{ (\beta_0 * \beta_1 * \ldots * \beta_{t-1}) * (d_t - s_t) + (\beta_0 * \beta_1 * \ldots * \beta_{t-1} * \beta_t) * (d_{t+1} - s_{t+1}) + (\beta_0 * \beta_1 * \ldots * \beta_{t-1} * \beta_t * \beta_{t+1}) * (d_{t+2} - s_{t+2}) + \ldots \right\},
\]

where \( E_t \) is expectations conditional on information at time \( t \), \( \beta \) is the discount factor, \( d_t = D_t / P_t \) is the real dividends, \( P_t \) is the price of investment, and \( s_t = S_t / P_t \) is the real value of new shares issued at time \( t \).

The real dividend of the firm is defined as:

\[
d_t = \left\{ p_t F(K_{t-1}, N_t) - w_t N_t - A(K_t, K_{t-1}, K_{t-2}) - i_t b_{t-1} \right\} + s_t + b_t - b_{t-1} - I_t,
\]

where \( p_t = p_t^Y / P_t \), \( p_t^Y \) is the price of output, \( F(K_{t-1}, N_t) \) is the production function, \( K_t \) is the capital stock, \( N_t \) is the labour hours, \( w_t = W_t / P_t \) is the real wage rate, \( A(K_t, K_{t-1}, K_{t-2}) \) is an adjustment cost function which arises when the capital stock is changed, \( i_t \) is the nominal interest rate, \( b_t = B_t / P_t \) is the real net debt, \( W_t \) is the nominal wage, \( B_t \) is the net debt, \( I_t \) is the investment.

Capital stock accounting identity: \( K_t = I_t + (1-\delta)K_{t-1} \), where \( \delta \) is the rate of depreciation.
Define \( H_t = \frac{V_t}{(\beta_0 \cdot \beta_1 \cdot \ldots \cdot \beta_{t-1})} \) and make an simplifying assumption that the discount factor is constant i.e. \( \beta_t = \beta_{t+1} = \ldots = \beta = \frac{1}{1+r} \), where \( r \) is the real interest rate, hence, we may write the problem of the firm as:

\[
\max_{t \in \mathcal{K}} H_t = (d_t - s_t) + \beta E_t (d_{t+1} - s_{t+1}) + \beta^2 E_t (d_{t+2} - s_{t+2}) + \ldots
\]

\[
= p_t F(K_{t-1}, N_t) - w_t N_t - A(K_t, K_{t-1}, K_{t-2}) - (1 + i_{t-1}) b_{t-1} + b_t
\]

\[
- (K_t - (1 - \delta) K_{t-1}) + \beta E_t \left\{ p_{t+1} F(K_t, N_{t+1}) - w_{t+1} N_{t+1}ight.
\]

\[
- A(K_{t+1}, K_t, K_{t-1}) - (1 + i_t) b_t + b_{t+1} - (K_{t+1} - (1 - \delta) K_t) \}
\]

\[
+ \beta^2 E_t \left\{ p_{t+2} F(K_{t+1}, N_{t+2}) - w_{t+2} N_{t+2} - A(K_{t+2}, K_{t+1}, K_t)ight.
\]

\[
- (1 + i_{t+1}) b_{t+1} + b_{t+2} - (K_{t+2} - (1 - \delta) K_{t+1}) \}
\]

\[
+ \ldots
\]

The first order condition of \( H_t \) with respect to \( K_t \) gives:

\[
- \frac{\partial A(K_t, K_{t-1}, K_{t-2})}{\partial K_t} - 1
\]

\[
+ \beta E_t \left\{ p_{t+1} (1 + \frac{1}{\epsilon} \frac{\partial F(K_t, N_{t+1})}{\partial K_t} - \frac{\partial A(K_{t+1}, K_t, K_{t-1})}{\partial K_t} + (1 - \delta) \}
\]

\[
- \beta^2 E_t \left\{ \frac{\partial A(K_{t+2}, K_{t+1}, K_{t})}{\partial K_t} \right\} = 0,
\]

where \( \epsilon \) is the elasticity of demand. Let us further assume that the adjustment cost function can be specified as (see The BOF4 Quarterly Model of Finnish Economy, Bank of Finland, 1990, p. 136 for a close formulation):

\[
A(K_t, K_{t-1}, K_{t-2}) = \frac{a}{2} \frac{(\Delta K_t - b \Delta K_{t-1})^2}{K_{t-1}}
\]

\[
= \frac{a}{2} \Delta K_t \Delta \log K_t + \frac{ab}{2} \Delta K_{t-1} \Delta \log K_{t-1} - ab \Delta K_t \Delta \log K_{t-1}
\]

where \( 0 < b < 1 \) and \( \Delta \log K_t = \log K_t - \log K_{t-1} \).

Taking the partial derivates of this adjustment cost function yields:

\[
\frac{\partial A(K_t, K_{t-1}, K_{t-2})}{\partial K_t} = \frac{a}{2} \Delta \log K_t + \frac{a}{2} \Delta K_t - ab \Delta \log K_{t-1}
\]

\[
= a \Delta \log K_t - ab \Delta \log K_{t-1},
\]

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\[
\frac{\partial A(K_{t+1}, K_t, K_{t-1})}{\partial K_t} = -\frac{a}{2} \Delta \log K_{t+1} - \frac{a}{2} \Delta K_{t+1}^{t+1} + ab \Delta \log K_t - ab \frac{\Delta K_{t+1}}{K_t}
\]

\[
+ \frac{ab^2}{2} \Delta \log K_t + \frac{ab^2}{2} \Delta K_t
\]

\[
= -a(1+b)\Delta \log K_{t+1} + ab(1+b)\Delta \log K_t,
\]

\[
\frac{\partial A(K_{t+2}, K_{t+1}, K_t)}{\partial K_t} = ab \frac{\Delta K_{t+2}}{K_t} - \frac{ab^2}{2} \Delta \log K_{t+1} + \frac{ab^2}{2} \Delta K_{t+1}
\]

\[
= ab \Delta \log K_{t+2} - ab^2 \Delta \log K_{t+1}.
\]

Let us insert these in the first order condition. Define \( \Delta k_t \equiv \Delta \log K_t \) and divide by \(-a\). Thus, we may write the first order condition:

\[
\beta^2 b \Delta E_t k_{t+2} = [\beta^2 b^2 + \beta(1+b)] \Delta E_t k_{t+1} + (\beta b(1+b)+1) \Delta k_t - b \Delta k_{t-1}
\]

\[
= \frac{\beta}{a} E_t \left( p_{t+1} (1+\frac{1}{\varepsilon}) \frac{\partial F(K_t, N_{t+1})}{\partial K_t} + (1-\delta) - \frac{1}{\beta} \right)
\]

where \( \varepsilon \) is the elasticity of demand and \((r+\delta)\) is the user cost of capital. This third-order linear difference equation is the Euler equation for the fixed investment.

**Case 3: Price, money demand and labour demand equations**

Here we shall assume an intertemporal optimizing agent problem under adjustment costs, see eg Rotemberg (1982), *Review of Economic Studies*, October, 49, pp. 517–531. Adjustment costs arise from the change in the decision variable \( x \) as well from the deviation of \( x \) from its long-run value \( x^* \). \( E_t \) is the expectations held at \( t \). \( \delta \) is the discount factor.

Optimizing agents minimize their loss function:

\[
\min L = \min_{\{u_t\}, \{x_t\}} \frac{1}{2} E_t \sum_{i=0}^{\infty} \delta^i \left[ (x_{t+i} - x^*)^2 + \alpha (x_{t+i} - x_{t+i-1})^2 \right]
\]

\[
<=>
\]
First Order Condition:

\[
\frac{\partial L}{\partial x_t} = E_t \left( -(x_t - x_t^*) - \alpha(x_t - x_{t-1}) + \alpha \delta(x_{t+1} - x_t) \right) = 0
\]

\[
\iff
\]

\[
E_t \left( x_t - \frac{\alpha}{1 + \alpha + \alpha \delta} x_{t-1} - \frac{\alpha \delta}{1 + \alpha + \alpha \delta} x_{t+1} + \frac{1}{1 + \alpha + \alpha \delta} x_t^* \right) = 0
\]

This second-order linear difference equation is the Euler equation.

**Case 4: Inventory investment**

The firm minimises the loss function at time 0:

\[
\min V_0 = \frac{1}{2} E_0 \sum_{i=0}^{\infty} \delta^i \left[ \omega_1 (K_{I_t} - K_{I_t}^*)^2 + \omega_2 (Q_t - Q_t^*)^2 \right]
\]

\[
= \frac{1}{2} E_0 \delta^0 \left[ \omega_1 (K_{I_0} - K_{I_0}^*)^2 + \omega_2 (Q_0 - Q_0^*)^2 \right]
\]

\[
+ \frac{1}{2} E_0 \delta^1 \left[ \omega_1 (K_{I_1} - K_{I_1}^*)^2 + \omega_2 (Q_1 - Q_1^*)^2 \right] + \ldots,
\]

where \( V_0 \) is the loss function at time 0, \( E_0 \) is the expectations conditional on the information held at time 0, \( \delta \) is the discount factor, \( \omega_1 \) and \( \omega_2 \) are constants of the loss function, \( K_I \) is the stock of inventories, \( K_I^* \) is the desired stock of inventories, \( Q \) is the level of production and \( Q^* \) is the level of production with existing inputs (the normal level of production), \( K_I^* \) is assumed to be determined by \( Q^* \) and the real interest rate.

At time \( t \) the firm minimises:
where $Q_t = \text{SALE}_t + K_{t} - K_{t-1}$ and $\text{SALE}$ is the sales of the storable goods.

Let us define $H_t = V_t \frac{\delta}{\delta t}$.

The first order condition of $H_t$ with respect to $K_{It}$:

\[
\frac{\partial H_t}{\partial K_{It}} = \omega_1 (K_{It} - K_{It}^*) + \omega_2 (\text{SALE}_t + K_{t} - K_{t-1} - Q_t^*) - E_t \delta (\omega_2 (\text{SALE}_t + K_{t} - K_{t-1} - Q_t^*)) = 0.
\]

We may write the first order condition as:

\[
(\omega_1 + (1 + \delta)\omega_2)K_{It} = \omega_1 K_{It}^* - \omega_2 (\text{SALE}_t - K_{t-1} - Q_t^*)
+ \delta \omega_2 E_t (\text{SALE}_t + K_{t} - Q_t^*).
\]

Let $\delta = 1 - \gamma$, where $\gamma$ is the real interest rate:

\[
(\omega_1 + 2\omega_2 - \gamma\omega_2)K_{It} = \omega_1 K_{It}^* - \omega_2 (\text{SALE}_t - K_{t-1} - Q_t^*)
+ (1 - \gamma)\omega_2 E_t (\text{SALE}_t + K_{t} - Q_t^*).
\]

In order to have stationary variables we difference the first order condition:

\[
(\omega_1 + 2\omega_2 - \gamma\omega_2)\Delta K_{It} = \omega_1 \Delta K_{It}^* - \omega_2 (\Delta \text{SALE}_t - \Delta K_{t-1} - \Delta Q_t^*)
+ (1 - \gamma)\omega_2 E_t (\Delta \text{SALE}_t + \Delta K_{t} - \Delta Q_t^*),
\]

where $\Pi_t$ is the inventory investment. Divide the first order condition by $\omega_1 + 2\omega_2$:

\[
\frac{1 - \frac{\omega_2}{\omega_1 + 2\omega_2}}{\omega_1 + 2\omega_2} \Pi_t = \frac{\omega_1}{\omega_1 + 2\omega_2} \Delta K_{It}^* - \frac{\omega_2}{\omega_1 + 2\omega_2} (\Delta \text{SALE}_t - \Pi_{t-1} - \Delta Q_t^*)
+ (1 - \gamma) \frac{\omega_2}{\omega_1 + 2\omega_2} E_t (\Delta \text{SALE}_t + \Pi_{t} - \Delta Q_{t-1}^*).
\]
Define $\frac{\omega_2}{\omega_1 + 2\omega_2} = A$. Thus $\frac{\omega_1 + 2\omega_2}{\omega_1 + 2\omega_2} = 1 \Rightarrow \frac{\omega_1}{\omega_1 + 2\omega_2} = 1 = \frac{\omega_1}{\omega_1 + 2\omega_2}$.

\[
\frac{\omega_1}{\omega_1 + 2\omega_2} = 1 - \frac{2\omega_2}{\omega_1 + 2\omega_2} = 1 - 2A.
\]

Hence, we may write the first order condition as:

\[
(1 - rA)\Pi_t = (1 - 2A)\Delta K_t^* + A(\Pi_{t-1} - \Delta \text{SALE}_t + \Delta Q_t^*)
\]

\[
+ (1 - r)E_t(\Delta \text{SALE}_{t+1} + \Pi_{t+1} - \Delta Q_{t+1}^*)
\]

This second-order linear difference equation is the Euler equation for inventory investment.

**Case 5: Housing investment**

Assume that the construction company is maximising expected discounted profits at time 0:

\[
\max V_0 = E_0 \sum_{t=0}^{\infty} \left( \prod_{i=0}^{t-1} \delta^i \right) [\text{PHM}_t(I_{t-n}^m + I_{t-n}^A) - \text{PIH}_t[C(I_t^m, I_t^A) + A(I_t^m, I_t^A)]]
\]

where $E_0$ is the expectations held at time 0, $\delta$ is the discount factor, PHM is the price of the dwellings, PIH is the residential construction prices, $I_{t-n}^m$ is the portion of housing investment that is financed by the market, $I_t^A$ is the portion of housing investment that is financed by the government, $C(I_t^m, I_t^A)$ is the production cost function, $A(I_t^m, I_t^A)$ is the adjustment cost function which arises as the construction company is adjusting its production to housing investment. Notice, that the income from past housing investment in the revenue side comes in period lag.

Assume further that

\[
C(I_t^m, I_t^A) = I_0 + \mu(I_t^m + I_t^A - I_0) + \frac{\alpha}{2} (I_t^m - I_0^m)^2 + \frac{\beta}{2} (I_t^A - I_0^A)^2
\]

\[
+ \gamma (I_t^m - I_t^A)(I_t^A - I_0^A)
\]

Production is homogenous if $\alpha = \beta = \gamma$ and

\[
A(I_t^m, I_t^A) = \frac{a}{2} (I_t^m - I_{t-1}^m)^2 + \frac{b}{2} (I_t^A - I_{t-1}^A)^2 + c(I_t^m - I_{t-1}^m)(I_t^A - I_{t-1}^A).
\]

Adjustment cost is homogenous if $a=b=c$. 

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Define further $H_t = \frac{V_t}{(\delta^0 * \delta^1 * ... \delta^{t-1})}$. Thus we may write the maximization problem of the construction company at time $t$:

$$\text{max } H_t = \left(\text{PHM}_t(I_{t-n}^m + I_{t-n}^A) - \text{PIH}_t\left[\text{C}(I_{t-n}^m, I_{t-n}^A) + A(I_{t-n}^m, I_{t-n}^A)\right]\right)$$

$$+ E_t \delta(\text{PHM}_{t+1}(I_{t+1-n}^m + I_{t+1-n}^A)$$
$$- \text{PIH}_{t+1}\left[\text{C}(I_{t+1-n}^m, I_{t+1-n}^A) + A(I_{t+1-n}^m, I_{t+1-n}^A)\right]) + ...$$

$$= \text{PHM}_t(I_{t-n}^m + I_{t-n}^A) - \text{PIH}_t(I_0 + \mu(I_{t-n}^m + I_{t-n}^A - I_0)$$
$$+ \frac{\alpha}{2}(I_{t-n}^m - I_0^m)^2 + \frac{\beta}{2}(I_{t-n}^A - I_0^A)^2$$
$$+ \gamma(I_{t-n}^m - I_0^m)(I_{t-n}^A - I_0^A) + \frac{\alpha}{2}(I_{t-n}^m - I_{t-n}^m)^2 + \frac{\beta}{2}(I_{t-n}^A - I_{t-n}^A)^2$$
$$+ c(I_{t-n}^m - I_0^m)(I_{t-n}^A - I_0^A)$$
$$+ E_t \delta(\text{PHM}_{t+1}(I_{t+1-n}^m + I_{t+1-n}^A) - \text{PIH}_{t+1}\left[\text{C}(I_{t+1-n}^m, I_{t+1-n}^A) + A(I_{t+1-n}^m, I_{t+1-n}^A - I_0)$$
$$+ \frac{\alpha}{2}(I_{t+1-n}^m - I_0^m)^2 + \frac{\beta}{2}(I_{t+1-n}^A - I_0^A)^2 + \gamma(I_{t+1-n}^m - I_0^m)(I_{t+1-n}^A - I_0^A)$$
$$+ c(I_{t+1-n}^m - I_0^m)(I_{t+1-n}^A - I_0^A)) + ...$$

Assume that $n$ is one. Then the first order condition of $H_t$ with respect to $I_{t-n}^m$:

$$\frac{\partial H_t}{\partial I_{t-n}^m} = -\text{PIH}_t \mu - \text{PIH}_t \alpha(I_{t-n}^m - I_0^m) - \text{PIH}_t \gamma(I_{t-n}^A - I_0^A) - \text{PIH}_t a(I_{t-n}^m - I_{t-n}^m)$$

$$- \text{PIH}_t c(I_{t-n}^A - I_{t-n}^A) + E_t \delta(\text{PHM}_{t+1} + \text{PIH}_{t+1}a(I_{t+1-n}^m - I_{t-n}^m)$$
$$+ \text{PIH}_{t+1} c(I_{t+1-n}^A - I_{t-n}^A)) = 0$$

Notice that $I_{t-n}^m = I_t - I_{t-n}^A$ and $I_0^m = I_0 - I_0^A$. Divide the first order condition by $\text{PIH}_t$.

$$-\mu - \alpha(I_t - I_{t}^A - (I_0 - I_0^A)) - \gamma(I_t^A - I_{t}^A) - a(I_t - I_{t-n}^A - (I_{t-n} - I_{t-n}^A)) - c(I_t - I_{t-n})$$

$$+ E_t \delta \left(\frac{\text{PHM}_{t+1}}{\text{PIH}_t} + \frac{\text{PIH}_{t+1}}{\text{PIH}_t}\left[a(I_{t+1-n} - I_{t-n}^A - (I_t - I_{t-n})) + c(I_{t+1-n} - I_{t-n}^A)\right]\right) = 0$$

Let

$$E_t \delta \frac{\text{PIH}_{t+1}}{\text{PIH}_t} = E_t \frac{1}{1 + i_t}\left(\frac{\text{PIH}_{t+1} - \text{PIH}_t}{\text{PIH}_t} - 1\right) = \frac{1 + \pi_{PH}^e}{1 + i_t} = 1 - (i_t - \pi_{PH}^e) = 1 - t_i^e$$
and let

\[ E_t \delta \frac{PHM_{t+1}}{PHM_t} = \frac{1}{1 + i_t} \frac{PHM_t}{PHM_t} \]

Hence, the first order condition may be written as:

\[ (\alpha + 2a - r_t^e a)I_t = (1 - r_t^e) a E_t I_{t+1} + a I_{t-1} \]

\[ q_t (1 - r_t^e) - \mu + \alpha I_0 + (\alpha - \gamma)(I_t^A - I_0^A) + (a - c)(I_t^A - I_{t-1}^A) - (1 - r_t^e) E_t (I_t^A - I_t^A) \]

Notice that if the homogeneity assumption for the adjustment cost function is satisfied i.e \( a = b = c \) then the last term in the right hand side vanishes. This second-order linear difference equation is the Euler equation for the housing investment.

**Case 6: The market price of Housing**

Assume that the demand for and the supply of housing services can be described as follows.

**Demand for housing services:**

\[ D_t(p) = \alpha \sum_{i=0}^{\infty} \lambda^i y_{t-1} - \frac{1}{\beta} p_t + \rho, \]

where \( D_t \) is the demand for the housing services at time \( t \), \( y \) is expected permanent income and \( p \) is the rental price of housing services.

The demand for housing services depends positively on permanent income and negatively on the rental price of housing services. It is worth of noting that if \( \lambda > 0 \) in the above equation, then the demand for housing services depend on the distributed lag of expected permanent income. The rationale behind this is that households do not necessarily go to housing markets at the moment their expected permanent income increases. At that moment they may start to consider the possibility to increase the housing level and perhaps start a searching process. It may take time before these plans materialize. Anyway the hypothesis that \( \lambda \) differs from null is a testable hypothesis.

The stock of existing housing stock defines the supply of housing services. At each moment it is given and it can be changed only through net investment in housing.

\[ S_t = \delta KH_{t-1}, \]
where $S_t$ is the supply of housing services at time $t$, $\delta$ is the rate of depreciation, $KH$ is the net stock of residential capital.

The rental price of housing can be solved from the equilibrium condition $D(p)=S$:

$$p_t = a \sum_{i=0}^{\infty} \lambda^i y_{t-i} - b KH_{t-i} + e,$$

where $a = \alpha \beta$, $b = \beta \delta$ and $e = \beta \rho$.

The real market price of housing is the discounted value of all future real rents of a unit of housing:

$$PHMR_t = \sum_{j=0}^{\infty} P_{t+j} \left( \prod_{i=0}^{j} E_t R_{t+i} \right)$$

$$= p_t + E_t R_{t+1} P_{t+1} + E_t R_{t+1} E_t R_{t+2} P_{t+2} + ...$$

where $R$ is the discount factor and $E_t R_t = 1$. On the basis of above equation the following relation holds for the next periods real price of housing:

$$E_t R_{t+1} PHMR_{t+1} = E_t R_{t+1} P_{t+1} + E_t R_{t+1} R_{t+2} P_{t+2} + ...$$

Subtracting this from the above yields:

$$PHMR_t - E_t R_{t+1} PHMR_{t+1} = p_t = a \sum_{i=0}^{\infty} \lambda^i y_{t-i} - b KH_{t-i} + e$$

Lag with one period and multiply by $\lambda$:

$$\lambda (PHMR_{t-1} - E_{t-1} R_t PHMR_t) = \lambda p_{t-1} = \lambda a \sum_{i=0}^{\infty} \lambda^i y_{t-i} - \lambda b KH_{t-2} + \lambda e$$

$$= a \sum_{i=1}^{\infty} \lambda^i y_{t-i} - \lambda b KH_{t-2} + \lambda e$$

Subtracting this from the above yields:

$$(1 - \lambda E_{t-1} R_t) PHMR_t - E_t R_{t+1} PHMR_{t+1} - \lambda PHMR_{t-1}$$

$$= a y_t - b (KH_{t-1} - \lambda KH_{t-2}) + (1 - \lambda) e.$$

Notice that, if $\lambda = 0$, then $PHMR_{t-1}$ drops out and the equation is completely forward looking.
1.2 The backward looking version of the model

For forecasting practice, forward looking equations are transformed into alternative (optional) backward looking versions as follows.

Assume that we have estimated the following forward looking equation. For simplicity of exposition, the discount factor $\delta$ is here assumed to be one in the above Case 3 of the Euler equation.

\[ x_t = a x_{t+1} + a x_{t-1} + (1 - 2a) x_t^*, \]

where $x_t^*$ is fundamentals forcing $x_t$ and $a = \alpha / (1 + 2\alpha)$.

Calculate the roots of equation (1) ($\lambda_1$ and $\lambda_2$) and express (1) as a weighted sum of all future values of $x_{t+i}^*$ and assume static expectations of future values of $x^*$.

We end up with equation:

\[ x_t = \lambda_1 x_{t-1} + (1 - \lambda_1) x_t^*, \]

Equation (1) can be written as

\[(L^{-1} - \frac{1}{a} + L) x_t = \frac{2a - 1}{a} x_t^* \]

where $L$ is a lag operator.

Lagging with one period and factorizing to roots gives

\[(1 - \lambda_1 L)(1 - \lambda_2 L) x_t = \frac{2a - 1}{a} x_{t-1}^* \]

where $\lambda_1$ and $\lambda_2$ are the roots of the lag polynomial. Properties of characteristic roots satisfy $\lambda_1 + \lambda_2 = 1/a$ and $\lambda_1 \lambda_2 = 1$.

Notice, that the general solution to this second order difference equation is:

\[ x_t = \frac{1}{(1 - \lambda_1 L)(1 - \lambda_2 L)} \left[ \frac{2a - 1}{a} x_{t-1}^* + c_1 \lambda_1^t + c_2 \lambda_2^t \right] \]

we shall assume that $c_1 = c_2 = 0$.

Therefore, we can write

\[(1 - \lambda_1 L) x_t = \frac{(\lambda_2 L)^{-1}}{1 - (\lambda_2 L)^{-1}} \left( \frac{2a - 1}{a} \right) x_{t-1}^*, \]

or

\[ x_t = \lambda_1 x_{t-1} + \sum_{i=1}^{\infty} (1/\lambda_2)^i \left( \frac{1 - 2a}{a} \right) x_{t-1+i}^*. \]
Under the assumption of static expectations we have\(^2\)

\[ x_t = \lambda_1 x_{t-1} + \left( \frac{1 - 2a}{a} \right) \left( \frac{1}{\lambda_2 - 1} \right) x_t^* \]

Using the properties of the characteristic roots the coefficient of \( x_t^* \) can be written as:

\[
\left( \frac{1 - 2a}{a} \right) \left( \frac{1}{\lambda_2 - 1} \right) = \left( \frac{1}{a} - 2 \right) \left( \frac{1}{(1/\lambda_1) - 1} \right) = (\lambda_1 + \lambda_2 - 2) \left( \frac{1}{(1/\lambda_1) / \lambda_1} \right) \\
= \left( \frac{\lambda_1 + 1}{\lambda_1 - 1} \right) \left( \frac{\lambda_1}{1 - \lambda_1} \right) \\
= \left( \frac{\lambda_1^2 - 2\lambda_1 + 1}{\lambda_1} \right) \left( \frac{\lambda_1}{1 - \lambda_1} \right) = (\lambda_1 - 1)^2 = 1 - \lambda_1
\]

Thus,

\[ x_t = \lambda_1 x_{t-1} + (1 - \lambda_1) x_t^*. \]

**Backward looking transformation for investment equation**

Assume that the Euler equation is a third order linear difference equation (as is the case for the investment equation):

\[ x_t = \frac{-1}{b} x_{t+2} - \frac{a}{b} x_{t+1} - \frac{c}{b} x_{t-1} + \frac{1}{b} x_t^*, \]

where \( x_t^* \) is fundamentals defining \( x_t \).

This may be written as:

\[ x_{t+2} + ax_{t+1} + bx_t + cx_{t-1} = x_t^* \]

\[ \Leftrightarrow \]

\[ (1 + aL + bL^2 + cL^3) x_{t+2} = x_t^* \]

Factorizing to roots gives

---

\(^2\) This can be seen as an error-correction or partial-adjustment type of dynamic behavioural equation. The backward-looking versions such as above can be analytically derived from the original Euler equations without need of further estimation. In the BOP5 model, to improve the forecasting properties of such backward looking behavioural equations, the variables such as \( x \) and \( x^* \) have been transformed so as to remove trends where necessary. In certain cases, however, the dynamic equation has been directly estimated and only the fundamental \( x^* \) is taken from the Euler equation. This applies to the backward-looking equations for private consumption, residential construction, price index for housing, and inventory investment.
(1 - \lambda_1 L)(1 - \lambda_2 L)(1 - \lambda_3 L)x_{t+2} = x_t^*,

where \lambda_1, \lambda_2 and \lambda_3 are the roots of the lag polynomial. Properties of the characteristic roots satisfy 
\[-(\lambda_1 + \lambda_2 + \lambda_3) = a, \lambda_1 \lambda_2 + \lambda_2 \lambda_3 + \lambda_1 \lambda_3 = b \text{ and } -(\lambda_1 \lambda_2 \lambda_3) = c.\]

Notice, that the general solution to this third order linear difference equation is:

\[
x_t = \frac{1}{(1 - \lambda_1 L)(1 - \lambda_2 L)(1 - \lambda_3 L)} x_t^* + d_1 \lambda_1^t + d_2 \lambda_2^t + d_3 \lambda_3^t,
\]

Assuming \(d_1 = d_2 = d_3 = 0\), we may write

\[
(1 - \lambda_1 L)x_{t+2} = \frac{1}{(1 - \lambda_2 L)(1 - \lambda_3 L)} x_t^*.
\]

\[
(1 - \lambda_1 L)x_{t+2} = \frac{1}{(\lambda_2 - \lambda_3)} \left( \frac{\lambda_2 (\lambda_2 L)^{-1}}{1 - (\lambda_2 L)^{-1}} + \frac{\lambda_3 (\lambda_3 L)^{-1}}{1 - (\lambda_3 L)^{-1}} \right) x_t^*.
\]

Lagging with two periods and assuming static expectation formation ie \(x_t^* = E_t(x_{t+1}^*) = E_t(x_{t+2}^*) = ...\)

\[
(1 - \lambda_1 L)x_t = \frac{1}{(\lambda_2 - \lambda_3)} \left( - \sum_{i=0}^{\infty} \left( \frac{1}{\lambda_2} \right)^i x_{t+i}^* + \sum_{i=0}^{\infty} \left( \frac{1}{\lambda_3} \right)^i x_{t+i}^* \right).
\]
This is the backward looking equation for investment.

1.3 GMM estimation of Euler equations

Nonlinear rational expectations models as Euler equations can be estimated by using Maximum Likelihood (ML) estimation or Generalized Method of Moments (GMM) estimation. GMM estimation has an clear advantage over the ML estimation method, because in the ML estimation the stochastic process of forcing variables has to be characterized while with GMM estimation no such assumption is needed. In GMM estimation only certain moment restrictions has to be specified instead of the whole density of the model. The generality of GMM method is also a weakness as GMM does not use all possible information.

Assume that a model (possibly a non-linear model) can be described by the function:

\[ f(\beta_0, X_t) \]

where \( X_t \) is strictly stationary and ergodic vector of variables at time \( t \), \( \beta_0 \) is the true value of unknown \( r \)-dimensional parameter vector, and \( f(*) \) is differentiable \( k \)-dimensional vector valued function. In the above Euler equation (3. Case), the unknown vector of parameters is \( \beta = (\alpha) \) and the strictly stationary and ergodic vector of variables is \( X_t = (x_t, x_t^*, \delta) \). Thus,

\[ f(\beta, X_t) = x_t - \frac{\alpha}{1 + \alpha + \alpha \delta} x_{t-1} - \frac{\alpha \delta}{1 + \alpha + \alpha \delta} x_{t+1} - \frac{1}{1 + \alpha + \alpha \delta} x_t^* \]

The conditional moment restriction of this model can written as:

\[ E[v_t | I_t] = 0 \]

---

where \( v_t \) is the disturbance vector \( (v_t = f(\beta_0, X_t)) \), \( I_t \) is the information set at time \( t \), \( E[\cdot | I_t] (\equiv E_t) \) is the conditional expectation operator conditioned with the information set \( I_t \).

Applying the law of iterated expectations to the Euler equation yields unconditional moment condition (population moment condition):

\[
E(f(\beta_0, X_t)) = E(E_t \{f(\beta_0, X_t)\}) = 0
\]

In order to obtain other moment conditions, the Euler equation can be combined with the rational expectation hypothesis, namely, all information contained in the agents' information set \( I_t \) at time \( t \) are used when agents form their expectations. Thus if information \( Z_t \in I_t \) and \( X_{t+1} \not\in I_t \) then \( E_t [Z_t, X_{t+1}] = Z_t E_t [X_{t+1}] \). If \( E_t [X_{t+1}] = 0 \) then \( Z_t E_t [X_{t+1}] = 0 \).

Hence, the Euler equation together with the rational expectations hypothesis implies \( q \) orthogonal conditions (population moment conditions):

\[
E(Z_t \cdot f(\beta_0, X_t)) = 0
\]

where \( Z_t \) is \((q \times k)\) variable matrix contained in the information set \( I_t \) which agents use when they form their expectations at time \( t \) and \( \beta_0 \) is the true value of the unknown vector of parameters \( \beta \).

Suppose that \( T \) is large, \( X_t \) is strictly stationary and ergodic and \( f(\cdot) \) is continuous then the law of large numbers implies that the sample moment

\[
g(\beta; X_T) = \frac{1}{T} \sum_{t=1}^{T} Z_t f(\beta, X_t)
\]

converges with probability one to the population moment condition:

\[
\frac{1}{T} \sum_{t=1}^{T} Z_t f(\beta, X_t) \rightarrow P E(\{Z_t \cdot f(\beta_0, X_t)\})
\]

This implies further that,

\[
\lim_{T \to \infty} \frac{1}{T} \sum_{t=1}^{T} Z_t f(\beta_0, X_t) = 0
\]

Let \( \hat{\beta}_T \) be the value that minimizes the quadratic form of the sample moments:

\[
J_T(\beta) = [g(\beta; X_T)]' \hat{D}_T^{-1} [g(\beta; X_T)],
\]

where \( ' \) denotes transposition, \( g(\beta; X_T) \) is defined as above and \( \hat{D}_T^{-1} \) is a \((q \times q)\) positive semidefinite symmetric matrix which satisfies almost surely that:

\[
\lim_{T \to \infty} \hat{D}_T^{-1} = D_0,
\]
where $D_0$ is a positive definite symmetric matrix. Both $\hat{D}_T^{-1}$ and $D_0$ are also referred to as distance matrices.

Assume that an interior optimum is achieved by setting the derivative with respect to $\hat{\beta}$ to zero. Hence, the GMM estimate $\hat{\beta}_T$ is a solution to:

$$
\left\{ \frac{\partial g(\beta; X_T)}{\partial \beta^T} \right\}_{(\infty)} \hat{D}_T^{-1} \left[ g(\beta; X_T) \right] = 0,
$$

where $r$ is the number of parameters to be estimated.

Notice that since $g(\beta_0; X_T)$ is a sample mean of a process whose population mean equals zero, $g(\beta_0; X_T)$ satisfies the central limit theorem under certain conditions (see Hamilton 1994, *Time Series Analysis*, p. 414). Thus, we may treat the GMM estimate $\hat{\beta}_T$ approximately as asymptotically Gaussian:

$$
\hat{\beta}_T = N(\beta_0, \tilde{\nu}_T / T),
$$

where $\tilde{\nu}_T = (\tilde{G}_T \hat{D}_T^{-1} \tilde{G}_T^T)^{-1}$ and \( \tilde{G}_T = \frac{\partial g(\beta; X_T)}{\partial \beta^T} \bigg|_{\beta = \hat{\beta}_T} \).

Furthermore, there exists an optimal distance matrix for the GMM estimator. Suppose, that when evaluating at the true value $\beta_0$, the process $f(\beta_0, X_t)$ is strictly stationary with zero mean and the $i$th autocovariance matrix:

$$
\Gamma_i = E\{f(\beta_0, X_t)f(\beta_0, X_{t-i})\}.
$$

Assume that these autocovariances are absolutely summable:

$$
S = \sum_{i=-\infty}^{\infty} \Gamma_i
$$

The asymptotic variance of the sample mean of $f(\beta_0, X_t)$:

$$
S = \lim_{T \to \infty} T \cdot E\{f(\beta_0, X_T)f(\beta_0, X_T)\}.
$$

The optimal value of the distance matrix $\hat{D}_T^{-1}$ is given by the inverse of the asymptotic variance matrix $S^{-1}$. Thus, the minimum asymptotic variance matrix is achieved when $\hat{\beta}_T$ is chosen to minimise:

$$
J_T(\beta) = [g(\beta; X_T)]^T S^{-1} [g(\beta; X_T)].
$$
The model is overidentified when the number of orthogonality conditions exceeds the number of parameters to be estimated i.e. \( q > r \). In this case Hansen's J-test for the overidentifying restrictions is:

\[
\lim_{T \to \infty} \frac{\sqrt{T}g(\hat{\beta}_T; X_T)}{\hat{S}_T^{-1}[\sqrt{T}g(\hat{\beta}_T; X_T)]} \xrightarrow{L} \chi^2(q - r)
\]
Appendix 2

Alternative equations without leads

C.3  Expectations of the yearly change in the private consumption prices

Alternative 1: Balassa–Samuelson effect

\[
\text{INFPCPEX} = (1 - 0.13778) \times (\text{INFPCP} + \text{INFPCP}_{-4}) / 2
+ 0.25 \times [0.13778 \times \text{log PMGN}_{-4}
+ 0.08770 \times \text{log}(\text{PD8})_{-4}
+ 0.07855 \times \text{log}(\text{PXGN})_{-4}] + 0.25 \times \text{log PMGN} + 0.08770 \times \text{log}(\text{PD8})_{-4}
+ 0.07855 \times \text{log}(\text{PXGN})_{-4}
\]

Method of estimation = Ordinary Least Squares
Estimation period = 1978Q1–1995Q4
\( R^2 = 0.364 \)
\( DW = 0.425 \)
\( SE = 0.01007 \)

C.5  Private consumption

Alternative 1: Error-correction with static expectations model as fundamentals

\[
\Delta \log C = 0.578246 \times \Delta \log ZC
- 0.056966 \times \text{log}(\frac{C_{-1}}{ZC_{-1}}) + 0.00243696
\]

Method of estimation = Ordinary Least Squares
Estimation period = 1977Q2–1994Q2
\( R^2 = 0.308 \)
\( DW = 2.057 \)
\( SE = 0.010281 \)

where

\[
ZC = \{(1 - 0.300798) \times 0.047707 \times (0.25 \times \text{WEALTH}_{-1} + \text{YD})
+ 0.300798 \times \text{YD} / (0.01 \times \text{PCP})
}/(1 - 0.853317 \times (1 - 0.300798) / (1 + \text{RLBN} / 400 - \text{INFPCPEX})]$$
Note, ZC is derived from the estimated forward-looking equation assuming CEX = C (static expectations).

I.5 The growth of net stock of private fixed capital, manufacturing

Alternative: Static expectations

\[ DLKFl = .91193 \times DLKFl_{-1} + 0.070034 \times [\text{PGDPi} \times FK1 / \text{PIFl} \]
\[ - (\text{CCR1} + \text{RS}/400 - \text{INFP1IE})/(1 + \text{RS}/400 - \text{INFP1IE})] \]
\[ - 0.80575/1000 \]

I.12 The growth of net stock of private fixed capital, non-manufacturing private sector

Alternative: Static expectations

\[ DLKF2 = .92591 \times DLKF2_{-1} + 0.045732 \times [\text{PREL2} \times FK2 \]
\[ - (\text{CCR2} + \text{RS}/400 - \text{INFP2F2E})/(1 + \text{RS}/400 - \text{INFP2F2E})] \]
\[ - 0.17624/1000 \]

where

\[ \text{PREL2} = 100 \times [(\text{GDPV2} - \text{GDPV21})/\text{GDP2} - \text{GDP21}]/\text{PIF2} \]

I.20 Change in the volume of private fixed investment, residential construction

Alternative: Static expectations

\[ \Delta \text{IH} = .504040 \times \Delta \text{ZIH} - .319893 \times (\text{IH}_{-1} - \text{ZIH}_{-1}) \]

where

\[ \text{ZIH} = 0.41945 \times \text{IH}_{-1} + (1 - 0.41945) \times [\text{PHM}_{-2} / \text{PIH}_{-2} \]
\[ + (.176483/1000) \times \text{D1090Q4} \times (\text{FCGH} / (.01 \times \text{PIH}) - 1143) \]
\[ - 1.98149 \times (\text{RLBN}/400 - \text{INFPHM}) \]
\[ - .145520]/(.851889/10000) \]

Method of estimation = Ordinary Least Squares
Estimation period = 1974Q2–1993Q3
\[ R^2 = .197122 \]
\[ DW = 2.17783 \]
\[ SE = 434.088 \]
1.22 Real house price index

Alternative: Static expectations

\[ \Delta \log \text{PHMR} = .440499 \times \Delta \log \text{PHMR}_{-1} + .226435 \times \Delta \log \text{PHMR}_{-2} \\
- .408159 \times \log (\text{PHMR}_{-1}/Z\text{PHMRSTA}) + .029097 \]

Method of estimation = Ordinary Least Squares
Estimation period = 1976Q1–1993Q3
\[ R^2 = .586121 \]
\[ DW = 1.98619 \]
\[ SE = .023745 \]

where

\[ Z\text{PHMRSTA} = .723834 \times \text{PHM}_{-1}/\text{PCP}_{-1} + [731117 - (\text{RLBN}_{-1}/400 - \text{INFPCPEX}_{-1})] \\
\times \{.01 \times .109936 \times [16.6 \times (50812.66 \times \log C - 498832.60) \\
- (471956.9 \times \log KH_{-1} - 5675668.0)/1000 \\
- .723834 \times (16.6 \times (50812.66 \times \log C - 498832.60) \\
- (471956.9 \times \log KH_{-2} - 5675668.0))/1000] \\
- .052353 /(1 - .731117 + \text{RLBN}/400 - \text{INFPCPEX}) \]

I.30 Change in inventories

Alternative: Static expectations

\[ \Pi = 0.66867 \times \Pi_{-1} + (1 - 0.66867) \times (\Delta \text{KIIT}) \\
- .711263 \times (\Delta \text{SALEA} - (\Delta \text{GDPIT}_{-1} + \Delta \text{GDP2T}_{-1})) \]

Method of estimation = Ordinary Least Squares
Estimation period = 1975Q1–1993Q3
\[ R^2 = .538689 \]
\[ DW = 1.90476 \]
\[ SE = 1578.31 \]

X.7 Export price of goods

Alternative 1: Static expectations

\[ \log (\text{DPXGE} \times \text{PXGN}) = 0.33085 \times \log (\text{DPXGE}_{-1} \times \text{PXGN}_{-1}) \\
+ (1 - 0.33085) \times \log Z\text{PXGN} \]
where

\[ \log ZPXGN = 1.22 \times (0.449991 \times \log PCOMP + (1 - 0.449991) \times \log SMCXG) \]

L.5 Performed working hours, manufacturing
Alternative: Static expectations
\[ \log LH1 = 0.60122 \times \log LH1_{-1} + (1 - 0.60122) \times \log LH1_T \]

L.8 Performed working hours, the private non-manufacturing sector
Alternative: Static expectations
\[ \log LH2 = 0.70482 \times \log LH2_{-1} + (1 - 0.70482) \times \log LH2_T \]

W.7 Inflation expectations, \((T + 2)\)
Alternative 1: Balassa-Samuelson effect
\[ \text{INFPCPE}2 = (1 - 0.17686) \times \left( \frac{\text{INFPCP} + \text{INFPCP}_{-4}}{2} \right) \]
\[ + 0.25 \times \left[ 0.17686 \times \Delta \log PMGN \right] \]
\[ + 0.08037 \times \Delta \log \left( \frac{PD8}{PXGN} \right) \]
\[ + 0.14181 \times \log \left( \frac{\text{GDP1 + GDP2}}{\text{GDP1T + GDP2T + GDP21}} \right) \]

Method of estimation = Ordinary Least Squares
Estimation period = 1978Q1–1995Q4
\[ R^2 = 0.398 \]
\[ DW = 0.425 \]
\[ SE = 0.01242 \]

P.2 Prices of manufacturing goods sold on domestic market
Alternative: Static expectations
\[ \log PD1 = 0.20235 \times \log PD1_{-1} + (1 - 0.20235) \times \log SMC1 \]
P.7 Prices in the private non-manufacturing sector (excl. housing)

Alternative: Static expectations

\[ \log P20 = 0.37076 \log P20_{-1} + (1 - 0.37076) \log SMC2 \]

R.2 Government bond rate (4–5 years)

Alternative: Static expectations, risk premium

\[ RBTX = RS - \left( \frac{0.05455}{1 - 0.76639} \right) \times (100 \times FCGN/GDPV) \]

R.8 Demand for money, M2

Alternative 1: Static expectations

\[ \log (MON2 + DMON2) = 0.44744 \log (MON2_{-1} + DMON2_{-1}) + (1 - 0.44744) \log ZMON2 \]

Alternative 2: Error correction

\[ \Delta \log MON2 = 0.010278 + 0.228990 \Delta \log MON2_{-1} + 0.381553 \Delta \log ZMON2 - 0.204501 \log (MON2_{-1} / ZMON2_{-1}) \]

Method of estimation = Ordinary Least Squares
Estimation period = 1972Q1–1995Q4
\[ R^2 = 0.453031 \]
\[ DW = 2.21141 \]
\[ SE = 0.012421 \]
Appendix 3

List of variables

<table>
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<tr>
<th>SUFFIXS</th>
<th>Description</th>
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<tbody>
<tr>
<td>EX</td>
<td>expected</td>
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<tr>
<td>*</td>
<td>exogenous</td>
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</table>

<table>
<thead>
<tr>
<th>Variable</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>ATAX</td>
<td>Average income tax rate of wage and salary earners, estimate</td>
</tr>
<tr>
<td>BPCV</td>
<td>Current account, FIM million</td>
</tr>
<tr>
<td>BPSNV</td>
<td>Balance of services (SNA), FIM million</td>
</tr>
<tr>
<td>BPTNV</td>
<td>Trade balance, FIM million</td>
</tr>
<tr>
<td>BPTSNV</td>
<td>Balance of goods and services, FIM million</td>
</tr>
<tr>
<td>C</td>
<td>Private consumption, millions of 1990 FIM</td>
</tr>
<tr>
<td>CAPCG</td>
<td>Capital consumption, central government, FIM million</td>
</tr>
<tr>
<td>CAPH</td>
<td>Capital consumption, households, FIM million</td>
</tr>
<tr>
<td>CAPLG</td>
<td>Capital consumption, local governments, FIM million</td>
</tr>
<tr>
<td>CASHCG</td>
<td>Central government cash position, FIM million</td>
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<tr>
<td>CCG</td>
<td>Central government consumption, millions of 1990 FIM</td>
</tr>
<tr>
<td>CCGV</td>
<td>Central government consumption, FIM million</td>
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<tr>
<td>CCR1</td>
<td>Capital consumption rate, manufacturing</td>
</tr>
<tr>
<td>CCR2</td>
<td>Capital consumption rate, non-manufacturing private sector</td>
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<tr>
<td>CCRCG</td>
<td>Capital consumption rate, central government</td>
</tr>
<tr>
<td>CCRH</td>
<td>Capital consumption rate, residential buildings</td>
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<tr>
<td>CCRLG</td>
<td>Capital consumption rate, local government</td>
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<tr>
<td>CCRS</td>
<td>Capital consumption rate, social security funds</td>
</tr>
<tr>
<td>CCV1</td>
<td>Consumption of fixed capital, manufacturing, FIM million</td>
</tr>
<tr>
<td>CCV2</td>
<td>Consumption of fixed capital, non-manufacturing private sector, FIM mill.</td>
</tr>
<tr>
<td>CCV21</td>
<td>Consumption of fixed capital, letting of own property, FIM million</td>
</tr>
<tr>
<td>CCV8</td>
<td>Consumption of fixed capital, private sector, FIM million</td>
</tr>
<tr>
<td>CCVCGR</td>
<td>Consumption of fixed capital, central government, FIM mill.</td>
</tr>
<tr>
<td>CCVG</td>
<td>Consumption of fixed capital, public sector, FIM million</td>
</tr>
<tr>
<td>CCVH</td>
<td>Consumption of fixed capital, households, FIM million</td>
</tr>
<tr>
<td>CCVLG</td>
<td>Consumption of fixed capital, local government, FIM mill.</td>
</tr>
<tr>
<td>CCVS</td>
<td>Consumption of fixed capital, social security funds, FIM mill.</td>
</tr>
<tr>
<td>CCVT</td>
<td>Consumption of fixed capital, FIM million</td>
</tr>
<tr>
<td>*CDBF</td>
<td>Outstanding certificates of deposits issued by the Bank of Finland, (−), FIM million</td>
</tr>
<tr>
<td>CEX</td>
<td>C(t+1)</td>
</tr>
<tr>
<td>CFB1</td>
<td>Cash flow, manufacturing, FIM million</td>
</tr>
<tr>
<td>CFB2</td>
<td>Cash flow, non-manufacturing private sector, FIM million</td>
</tr>
<tr>
<td>CG</td>
<td>Public consumption, millions of 1990 FIM</td>
</tr>
<tr>
<td>CGV</td>
<td>Public consumption, FIM million</td>
</tr>
<tr>
<td>CLG</td>
<td>Local government consumption, millions of 1990 FIM</td>
</tr>
<tr>
<td>CLGV</td>
<td>Local government consumption, FIM million</td>
</tr>
<tr>
<td>CPI</td>
<td>Consumer price index, 1990=100</td>
</tr>
<tr>
<td>COPH</td>
<td>EU Harmonised consumer price index, 1996=100, Finland</td>
</tr>
</tbody>
</table>
CR  Cash reserve deposits by banks, FIM million
*CRR  Cash reserve requirement, %
*CRR1 Reserve requirement on deposits payable on demand, %
*CRR2 Reserve requirement on other deposits, %
*CRR3 Reserve requirement on other items, %
*CSOS Social security funds consumption, mills of 1990 FIM
CSOSV Social security funds consumption, FIM million
CTOT Total consumption, millions of 1990 FIM
CTOTV Total consumption, FIM million
CUR Currency in circulation, FIM million
CURB Currency in circulation, banks, FIM million
CURNB Currency in circulation, public, FIM million
CV Private consumption, FIM million
DLKF1 The growth of net stock of private fixed capital, manufacturing
DLKF1E2 DLKF1EX(t+1)
DLKF1EX DLKF1(t+1)
DLKF2 The growth of net stock of private fixed capital, non-manufacturing private sector
DLKF2E2 DLKF2EX(t+1)
DLKF2EX DLKF2(t+1)
EIC Interest expenditure, corporate sector, FIM million
EIC1 Interest expenditure, manufacturing, FIM million
EIC2 Interest expenditure, non-manufacturing private sector, FIM million
EIH Interest expenditure, households, FIM million
FBANK Net lending by financial institutions, FIM million
FCGCASH Central govt deficit before fin.transact. (cash basis), FIM mill.
*FCGCASHO Central govt deficit before fin.transact. (SNA-CASH -discrepancy), FIM mill.
FCGFIN Central govt financial investment, net (cash basis), FIM mill.
*FCGFION Central govt other fin. investment, net (cash basis), FIM mill.
*FCGH Central government housing loans, drawings, FIM million
FCGHB Central government housing loans, redemptions, FIM million
FCGHN Central government housing loans, net change, FIM million
FCGN Central government net lending, FIM million
FCGNBR Central government net financial requirement (−), FIM million
*FCGSUP Central govt capital support to banks, FIM million
FCN Net lending by corporate sector, FIM million
*FDFX Change of the exchange rate index for the net foreign claims, %
*FEXP Investments abroad, corporate sector, FIM million
*FFCG Foreign currency denominated debt of the central government, balance of payments, increase (−), FIM million
FGFXN Change of the Bank of Finland's net foreign claims, FIM million
FGN Net lending by public sector, FIM million
FHN Net lending by households, FIM million
FHNBR Net lending by households, flow of funds, FIM million
FK1 The marginal product of capital, manufacturing
FK2 The marginal product of capital, non-manufacturing private sector
FLGN Net lending by local government, FIM million
*FMCIGN Foreign borrowing by the central government, net, FIM mill.
(*)FMPN Foreign borrowing by private sector, FIM million
Central government other markka loans, FIM million
Banks' free reserves, FIM million
Net lending by social security funds, FIM million
Exchange rate, FIM/USD
Bank of Finland currency index, 1982=100
Central government interest expenditure, FIM million
Central government expenditure (SNA), FIM million
GDP in purchasers' values, millions of 1990 FIM
Production at factor cost, manufacturing, millions of 1990 FIM
The normal level of production with existing inputs, manufacturing, mills of 1990 FIM
Production at factor cost, non-manufacturing private sector, mills of 1990 FIM
Production at factor cost, letting of own property, mills of 1990 FIM
The normal level of prod. with existing inputs, non-manuf. priv. sector (excl. letting of own property), millions of 1990 FIM
Production at factor cost, central government, millions of 1990 FIM
GDP at factor cost, millions of 1990 FIM
Production at factor cost, general govt, millions of 1990 FIM
Production at factor cost, local govt, mills of 1990 FIM
Production at factor cost, social security funds, millions of 1990 FIM
GDP in purchasers' values, FIM million
Production at factor cost, manufacturing, FIM million
Production at factor cost, non-manufacturing private sector, FIM million
Production at factor cost, letting of own property, FIM million
Production at factor cost, private sector, FIM million
Production at factor cost, central govt, FIM million
Production at factor cost, general govt, FIM million
Production at factor cost, local govt, FIM million
Production at factor cost, social security funds, FIM million
Foreign exchange reserves of the central bank, FIM million
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Required current transfers, local government, FIM million
Required current transfers, social security funds, FIM mill.
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Central govt investment (excl. enterprises), millions of 1990 FIM
Central govt investment (excl. enterprises), FIM million
Private non-residential investment, mills of 1990 FIM
Private fixed investment, manufacturing, mills of 1990 FIM
Private fixed investment, non-manufacturing private sector, mills of 1990 FIM
Private non-residential investment, FIM million
Private fixed investment, manufacturing, FIM million
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<th>Code</th>
<th>Description</th>
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<td>IFV2</td>
<td>Private fixed investment, non-manufacturing private sector, FIM million</td>
</tr>
<tr>
<td>IG</td>
<td>Public investment, millions of 1990 FIM</td>
</tr>
<tr>
<td>IGV</td>
<td>Public investment, FIM million</td>
</tr>
<tr>
<td>IH</td>
<td>Residential construction, millions of 1990 FIM</td>
</tr>
<tr>
<td>IHEX</td>
<td>IH(t+1)</td>
</tr>
<tr>
<td>IHTV</td>
<td>Gross fixed capital formation, households, FIM million</td>
</tr>
<tr>
<td>IHV</td>
<td>Residential construction, FIM million</td>
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<td>II</td>
<td>Change in inventories, millions of 1990 FIM</td>
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<tr>
<td>IIXEX</td>
<td>II(t+1)</td>
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<tr>
<td>IISV</td>
<td>Inventory investment and statistical discrepancy, FIM million</td>
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<tr>
<td>IIS</td>
<td>Inventory investment and statistical discrepancy, mills of 1990 FIM</td>
</tr>
<tr>
<td>*ILG</td>
<td>Local government investment, millions of 1990 FIM</td>
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<tr>
<td>ILGV</td>
<td>Local government investment, FIM million</td>
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<tr>
<td>INFPCP</td>
<td>0.25*(PCP/PCP(t-4) − 1)</td>
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<td>INFPCPE2</td>
<td>INFPCP(t+2)</td>
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<td>INFPCPEX</td>
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<td>INFPHM</td>
<td>0.25*(PHM/PHM(t-4) − 1)</td>
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<td>INFPIF1</td>
<td>0.25*(PIF1/PIF1(t-4) − 1)</td>
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<td>INFPIF1E</td>
<td>INFPIF1(t+1)</td>
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<td>0.25*(PIF2/PIF2(t-4) − 1)</td>
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<td>INFPIF2E</td>
<td>INFPIF2(t+1)</td>
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<td>INFPIH</td>
<td>0.25*(PIH/PIH(t-4) − 1)</td>
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<td>INFPIHEX</td>
<td>INFPIH(t+1)</td>
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<td>*INSTAR</td>
<td>Inflation target</td>
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<td>*ISOS</td>
<td>Social security funds investment, millions of 1990 FIM</td>
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<td>ISOSV</td>
<td>Social security funds investment, FIM million</td>
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<td>ITOT</td>
<td>Total fixed investment, millions of 1990 FIM</td>
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<td>ITOTV</td>
<td>Total fixed investment, FIM million</td>
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<td>IV</td>
<td>Private fixed investment, FIM million</td>
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<td>KCDP</td>
<td>Bank certificates of deposits held by the public, FIM million</td>
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<tr>
<td>KDP</td>
<td>Bank deposits by the public, FIM million</td>
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<tr>
<td>KF1</td>
<td>Net stock of fixed capital, manufacturing, millions of 1990 FIM</td>
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<td>KF2</td>
<td>Net stock of fixed capital, non-manufacturing private sector, millions of 1990 FIM</td>
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<tr>
<td>*KFBFO</td>
<td>Bank of Finland other foreign liabilities, net, FIM million</td>
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<td>KFCG</td>
<td>Net stock of fixed capital, central govt, millions of 1990 FIM</td>
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<tr>
<td>KFG</td>
<td>Net stock of fixed capital, general govt, millions of 1990 FIM</td>
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<td>KFLG</td>
<td>Net stock of fixed capital, local government, millions of 1990 FIM</td>
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<td>KFS</td>
<td>Net stock of fixed capital, social security funds, millions of 1990 FIM</td>
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<td>KII</td>
<td>Stock of inventories, millions of 1990 FIM</td>
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<td>KLMN</td>
<td>Foreign debt net, FIM million</td>
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<td>KIIT</td>
<td>The target level of inventories, millions of 1990 FIM</td>
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<td>KOBFN</td>
<td>Bank of Finland other balance sheet items, net, FIM million</td>
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<td>KOBN</td>
<td>Balance sheet of the banks, other items, net, FIM million</td>
</tr>
<tr>
<td>*KOWNB</td>
<td>Banks' own capital, FIM million</td>
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<tr>
<td>LBC</td>
<td>Bank loans to the enterprises, FIM million</td>
</tr>
<tr>
<td>LBCD</td>
<td>Bank FIM denominated loans to the enterprises, FIM million</td>
</tr>
<tr>
<td>Code</td>
<td>Description</td>
</tr>
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<td>-----------------------------------------------------------------------------</td>
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<td>LBCF</td>
<td>Bank foreign currency denominated loans to the enterprises, FIM million</td>
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<td>*LBCG</td>
<td>Central government bonds and debentures to the banks, FIM million</td>
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<td>LBFBN</td>
<td>Banks' net debt to the Bank of Finland, FIM million</td>
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<td>*LBFBON</td>
<td>Banks' other net liabilities to the Bank of Finland, FIM million</td>
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<td>*LBFCN</td>
<td>Bank of Finland lending to the public, FIM million</td>
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<td>*LBFGN</td>
<td>Central government debt to the Bank of Finland, FIM million</td>
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<td>Bank loans to the households, FIM million</td>
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<td>LB</td>
<td>Bank loans to the public, FIM million</td>
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<td>LCD</td>
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PD1(t+1)

Prices of manufactures sold on the domestic market, private sector, 1990=100

PD8

Value added deflator, market prices, 1990=100

PGDP

Value-added deflator for manufacturing, 1990=100

PGDP1

Input-output estimate for deflator PGDP1, 1990=100

PGDP1IO

Value-added deflator for non-manufacturing private sector, 1990=100

PGDP2

Value-added deflator for letting of own property, 1990=100

PGDP21

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Value-added deflator for central government, 1990=100

PGDPCG

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PGDPF

Value-added deflator for general government, 1990=100

PGDPLG

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PGDPS

Value-added deflator for social security funds, 1990=100

PHCOST

Index of housing costs in private consumption, 1990=100

PHM

House price index, all dwellings, entire country, 1990=100

PHMR

Real house price index, all dwellings, entire country, 1990=100

PHMREX

PiMR(t+1)

PI

Private investment prices, 1990=100

PICG

Central government investment prices, 1990=100

PIF

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General government investment prices, 1990=100

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Residential construction prices, 1990=100

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Investment prices, 1990=100

(*) PMCN

Import prices of consumer goods, 1990=100 (weighting=.2778)

PMGN

Import prices of goods, 1990=100 (SNA)

(*) PMIN

Import prices of investment goods, 1990=100 (weighting=.1912)

(*) PMRN

Import prices of raw materials, 1990=100 (weighting=.531)

(*) PMSN

Import prices of services, 1990=100 (SNA)

PNET

Net price index, 1990=100

*PNIG

Export prices of the competitors, FIM,1990=100

PSUB

Tax tariff index, subsidies, 1990=100

PTARIF

Tax tariff index, net, 1990=100

PTAX

Tax tariff index, indirect taxes, 1990=100

PUI

Underlying inflation, 1990=100

PUIIIO

Indicator of underlying inflation, input output estimate, 1990=100

*PWE

HWWA, prices of energy raw materials, in USD, 1990=100

*PWM

HWWA, prices of raw materials for manufacturing exl. energy, 1990=100

PXGN

Export prices of goods, 1990=100 (SNA)

PXGNEX

PXGN (t+1)

PXSN

Export prices of services, 1990=100 (SNA)
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<td>Entrepreneurs' nat. pension &amp; sickness ins. contribution rate, private sector, FIM mill.</td>
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<td>*SOCSPR</td>
<td>Entrepreneurs' nat. pension &amp; sickness ins. contribution rate, general government, FIM mill.</td>
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<td>Entrepreneurs' contribution rate for employee pension schemes</td>
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*TSR  Sales tax rate, %
*TSR7  Sales tax rate, industrial machinery and equipment, %
*TSR8  Sales tax rate, industrial buildings, %
TYC  Corporate tax revenue, FIM million
*TYC1R  Corporate tax rate in central government taxation, manufacturing
TYCG  Central government revenue from direct taxes, FIM million
*TYCR  Corporate tax rate in central government taxation
TYLG  Local government revenue from direct taxes, FIM million
TYP  Central and local government revenue direct taxes on households, FIM million.
TYPCAP  Taxes on capital income collected from households, FIM million
TYPI  Tax payments at source on interest income, FIM million
TYPL  Assessed income tax liability of households, FIM million
*TYPRE  Excess taxes collected from households, FIM million
*TYPREA  Tax refunds to households, FIM million
*TYPRES  Other direct taxes collected from households, net, FIM million
*TYP  Central and local government revenue from subsequently collected direct taxes on households, FIM million
*TYPAS  Central and local government revenue from subsequently collected direct taxes (arrears) on households, FIM million
TYPW  Advance income tax payments of households, FIM million
*TYS  Slope of the progressive income tax schedule
*TYU  Intercept of the progressive income tax schedule
ULR  Long term unemployment rate, %
UR  Unemployment rate, %
WAR1  Average wage, manufacturing, FIM/h
WAR2  Average wage, non-manufacturing private sector, FIM/h
WARG  Average wage, public sector, FIM/h
WEALTH  Net wealth of households, FIM million
WNR1  Negotiated wage rate, manufacturing, 1990=100
WNR2  Negotiated wage rate, non-manufacturing private sector, 1990=100
WNRP  Negotiated wage rate, private sector, 1990=100
WR  Wage rate, total, 1990=100
WR1  Wage rate, manufacturing, 1990=100
WR2  Wage rate, non-manufacturing private sector, 1990=100
WRG  Wage rate, general government, 1990=100
X  Exports of goods and services, millions of 1990 FIM
XGN  Exports of goods, millions of 1990 FIM (SNA)
XGNV  Exports of goods, FIM million (SNA)
XGNWE  Exports of goods, multilateral, volume, auxiliary variable
XSN  Exports of services, millions of 1990 FIM (SNA)
XSNV  Exports of services, FIM million (SNA)
XV  Exports of goods and services, FIM million
Y  National income, FIM million
YCGTOT  Central govt revenue, total, FIM million
YD  Household disposable income, FIM million
YDBANK  Financial institutions disposable income, FIM million
YDC  Disposable income of corporate sector, FIM million
YDCG  Central govt disposable income, FIM million
YDG  Disposable income of general government, FIM million
YDILG  Disposable income of local government, FIM million
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<td>Interest income of non-manufacturing private sector, FIM million</td>
</tr>
<tr>
<td>YICG</td>
<td>Central government's property and entrepreneurial income, FIM million</td>
</tr>
<tr>
<td>YIH</td>
<td>Interest income of households, FIM million</td>
</tr>
<tr>
<td>YILG</td>
<td>Interest (etc.) income of the local government sector, FIM million</td>
</tr>
<tr>
<td>YINH</td>
<td>Entrepreneurial and property income of the household sector, FIM million</td>
</tr>
<tr>
<td>YINS</td>
<td>Net interest income of social security funds, FIM million</td>
</tr>
<tr>
<td>YIS</td>
<td>Interest income of social security funds, FIM million</td>
</tr>
<tr>
<td>YLGTO</td>
<td>Local government revenue, FIM million</td>
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<tr>
<td>YNOI</td>
<td>Net operating surplus, total (domestic), FIM million</td>
</tr>
<tr>
<td>YNOI1</td>
<td>Net operating surplus, manufacturing, FIM million</td>
</tr>
<tr>
<td>YNOI2</td>
<td>Net operating surplus, non-manufacturing private sector, FIM million</td>
</tr>
<tr>
<td>YNOI21</td>
<td>Net operating surplus, housing sector, FIM million</td>
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<tr>
<td>YNOIC</td>
<td>Net operating surplus, corporate sector, FIM million</td>
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<tr>
<td>YNOIH</td>
<td>Net operating surplus, households, FIM million</td>
</tr>
<tr>
<td>YNW</td>
<td>Gross operating surplus, total, FIM million</td>
</tr>
<tr>
<td>YNW1</td>
<td>Gross operating surplus, manufacturing, FIM million</td>
</tr>
<tr>
<td>YNW2</td>
<td>Gross operating surplus, non-manufacturing private sector, FIM million</td>
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<tr>
<td>YNWG</td>
<td>Gross operating surplus, public sector, FIM million</td>
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<tr>
<td>YOHN</td>
<td>Dividend and rest of property income of the household sector, FIM million</td>
</tr>
<tr>
<td>*YOLG</td>
<td>Local government other required current transfers, FIM million</td>
</tr>
<tr>
<td>YSE</td>
<td>Entrepreneurial income of households, FIM million</td>
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<tr>
<td>YSOCG</td>
<td>Central government income from entrepreneurs' social security payments, FIM mill.</td>
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<tr>
<td>YTAXABLE</td>
<td>Taxable earned income of households, FIM million</td>
</tr>
<tr>
<td>YTAXCG</td>
<td>Tax base of households’ earned income (taxable less tax deductions) in central government taxation, FIM million</td>
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<tr>
<td>YTAXLG</td>
<td>Tax base of households (taxable income less deductions) in local government taxation, FIM million</td>
</tr>
<tr>
<td>YTCRG</td>
<td>Central government transfer-income from other sectors, total, FIM million</td>
</tr>
<tr>
<td>*YTCRGO</td>
<td>Central government other transfer-income, FIM million</td>
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<tr>
<td>YTRH</td>
<td>Transfer income of households received from other sectors, FIM mill.</td>
</tr>
<tr>
<td>YTRHO</td>
<td>Other transfers received by households, FIM mill.</td>
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<tr>
<td>YTRLG</td>
<td>Transfer income, total, local government, FIM million</td>
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<tr>
<td>YTRS</td>
<td>Transfer incomes of social security funds, FIM million</td>
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<tr>
<td>*YTRS0</td>
<td>Other transfer incomes of social security funds, FIM million</td>
</tr>
<tr>
<td>Code</td>
<td>Description</td>
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<td>-------</td>
<td>-----------------------------------------------------------------------------</td>
</tr>
<tr>
<td>YTYC</td>
<td>Tax base of corporate taxation, FIM million</td>
</tr>
<tr>
<td>YW</td>
<td>Wages and salaries, total, FIM million</td>
</tr>
<tr>
<td>YW1</td>
<td>Wages and salaries, manufacturing, FIM million</td>
</tr>
<tr>
<td>YW2</td>
<td>Wages and salaries, non-manufacturing private sector, FIM million</td>
</tr>
<tr>
<td>YWCG</td>
<td>Wages and salaries, central government, FIM million</td>
</tr>
<tr>
<td>*YWF</td>
<td>Wages, salaries and social security contributions from abroad, FIM million.</td>
</tr>
<tr>
<td>YWG</td>
<td>Wages and salaries, general government, FIM million</td>
</tr>
<tr>
<td>YWLG</td>
<td>Wages and salaries, local government, FIM million</td>
</tr>
<tr>
<td>YWS</td>
<td>Wages and salaries, social security funds, FIM million</td>
</tr>
</tbody>
</table>

**DUMMIES:**

- **D1001Q1**: Dummy for pension expenditures
- **D0183Q1**: Dummy for widening the tax base
- **D0186Q1**: Dummy for relevant interest rates in investment eq.
- **D0188Q4**: Dummy for a change in capital income taxation
- **D0190Q1**: Dummy for local government revenue from corporate taxes
- **D1090Q4**: Dummy for central government housing loans
- **D1091Q1**: Dummy for a new tax, tax at source of interest income
- **D1093Q1**: Dummy for a change in corporate taxation
- **D1093Q3**: Dummy for a revision of the reserve deposits system
- **D1095Q1**: Dummy for joining the EU
- **DFMPN1**: Dummy for FMPN equation, interest sensitivity
- **DFMPN2**: Dummy for relevant interest rates in investment eq.
- **DKFCG**: Dummy for capital stock shifts between central government sector and private sector (privatisation of the rails etc.)
- **DMON1**: Dummy for shift from MON2 into MON1 (36 and 24 month deposits, 96Q1 98Q1)
- **DMON2**: Dummy for shift from MON2 into yield bonds (96Q1 98Q1)
- **DMP**: Dummy for monetary policy rule
- **DLIB**: Dummy for financial market liberalisation
- **DPXGE**: Dummy to correct PXGN for bilateral trade
- **DPXGEEX**: Dummy to correct PXGN for bilateral trade
- **DSEAS**: Seasonal dummy, Q1=1, Q2=Q3=Q4=0
- **DSHIFT1**: Dummy, shift in technical development, manufacturing (91.1–94.4)
- **DSUB1**: Dummy, share of commodity subsidies of production, manufacturing, (–94.2 = .0085)
- **DSUB12**: Dummy, share of subsidies of exports of goods, (–94.2 = .0380)
- **DSUB2**: Dummy, share of commodity subsidies of production, private non-manufacturing sector, (–94.2 = .0033)
- **DSUB345**: Dummy, share of commodity subsidies of private consumption
- **DSUB6**: Dummy, share of commodity subsidies of central government consumption, (–94.2 = .0027)
- **DSUB7**: Dummy, share of commodity subsidies of local government consumption, (–94.2 = .0057)
- **DSUB8**: Dummy, share of commodity subsidies of consumption, social
| DTIOV1 | Dummy, share of other commodity taxes of production, manufacturing, \(-94.2 = .0133\) |
| DTIOV2 | Dummy, share of other commodity taxes of production, private non-manufacturing sector, \(-94.2 = .0264\) |
| DTIOV345 | Dummy, share of other commodity taxes of private consumption |
| DTIOV6 | Dummy, share of other commodity taxes, central government consumption, \(-94.2 = .0163\) |
| DTIOV7 | Dummy, share of other commodity taxes, local government consumption, \(-94.2 = .0210\) |
| DTIOV8 | Dummy, share of other commodity taxes, social security funds' consumption, \(-94.2 = .0579\) |
| DTIOV9 | Dummy, share of other consumption taxes, fixed non-residential investment, \(-94.2 = .0075\) |
| DTRURIND | Dummy, indexation of unemployment compensation, 1=on, 0=off |
| DTYPI | Dummy for tax payments at source on interest income (share of taxable deposits 94.1 --) |
| DTYPRE1 | Dummy for timing of tax rebate; 1st year's Q4 proportion |
| DTYPRE2 | Dummy for timing of tax rebate; 2nd year's Q4 proportion |
| DTYPS1 | Dummy for timing of subseq. tax collect.; 1st year's Q4 proportion |
| DTYPS2 | Dummy for timing of subseq. tax collect.; 2nd year's Q1 proportion |
| DVAT1 | Dummy, share of value-added tax of production, manufacturing, \(-94.2 = -.0065\) |
| DVAT10 | Dummy, share of value-added tax of fixed non-residential investment, private non-manufacturing and general government sector, \(-94.2 = .0581\) |
| DVAT12 | Dummy, share of value-added tax of exports of goods, \(-94.2 = .0018\) |
| DVAT2 | Dummy, share of value-added tax of production, private non-manufacturing sector, \(-94.2 = .0581\) |
| DVAT345 | Dummy, share of value-added tax of private consumption |
| DVAT6 | Dummy, share of value-added tax of central government consumption, \(-94.2 = .0712\) |
| DVAT7 | Dummy, share of value-added tax of local government consumption, \(-94.2 = .0782\) |
| DVAT8 | Dummy, share of value-added tax of consumption, social security funds, \(-94.2 = .0103\) |
| DVAT9 | Dummy, share of value-added tax of fixed non-residential investment, manufacturing, \(-94.2 = .0\) |
| DXGE | Dummy to correct XGN for bilateral trade |