BANK OF FINLAND DISCUSSION PAPERS

10/98

Alpo Willman – Mika Kortelainen – Hanna-Leena Männistö – Mika Tujula

Economics Department
Research Department
3.6.1998

The BOF5 Macroeconomic Model of Finland, Structure and Equations

SUOMEN PANKIN KESKUSTELUALOITTEITA • FINLANDS BANKS DISKUSSIONUNDERLAG

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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

Suomen Pankin keskustelualoitteita 10/98

Alpo Willman – Mika Kortelainen – Hanna-Leena Männistö – Mika Tujula
Kansantalouden osasto ja tutkimusosasto

Tiivistelmä

Tässä julkaisussa dokumentoidaan Suomen Pankin kokonaistaloudellisen simulointimallin nykyinen versio BOF5. Malli on tarkoitettu politiikkalaskelmiin ja ennustamiseen. Mallia rakennettaessa on korostettu odotustekijöiden johdonmukaista käsittelyä. Nykyistä teoreettista tutkimusta seuraten mallinnuksen lähtökohdaksi on otettu ajassa tapahtuva optimointi rationaalisten odotusten vallitessa, ja siksi tärkeimmät käyttäytymisyhtälöt on estimoitu Euler-yhtälöinä. Myös toisenlaisia odotusten muodostumismekanismeja voidaan soveltaa simuloinneissa, sillä yhtälöistä on käytettävissä muunnokset, joissa muuttujien tulevat arvot eivät ole mukana. Odotusten mallintamisen ohella myös teknologian johdonmukainen käsittely talouden tarjontapuolella on ollut toinen tärkeä tavoite. Raportissa kuvataan muutamien simulointikokeiden avulla mallin perusominaisuuksia. Julkaisu sisältää myös täydellisen yhtälöluettelon sekä keskeisten yhtälöiden johdon pääpiirteissään.

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

Contents

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.

$\bullet$	is the difference operator.
$\bullet_n$	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.

2 Introduction to the BOF5 macroeconomic model of Finland

by **Alpo Willman**, Head of Office
and **Hanna-Leena Männistö**, Economist
Economics Department
Bank of Finland

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,[1] 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

[1] The number of key behavioural equations in the model is currently about 60. In addition, there are more than 300 identities, input-output equations and definitional equations.

in modelling and solving large-scale macroeconometric 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, ie 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 mondel 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, ie 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

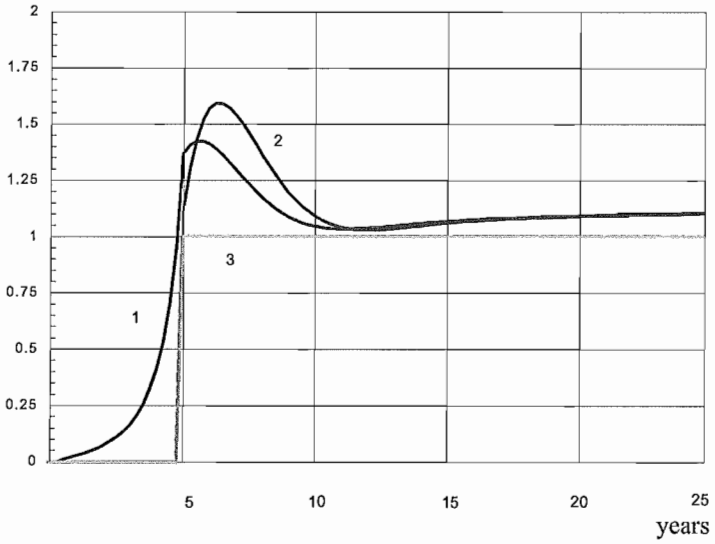
Charts 1 and 2, which give the results of partial simulations, illustrate the working of the household sector and the implications of forward-lookingness. These simulations are based on endogenous equations for consumption, market price of housing, housing investment, housing stock, market value of housing 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, ie 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**

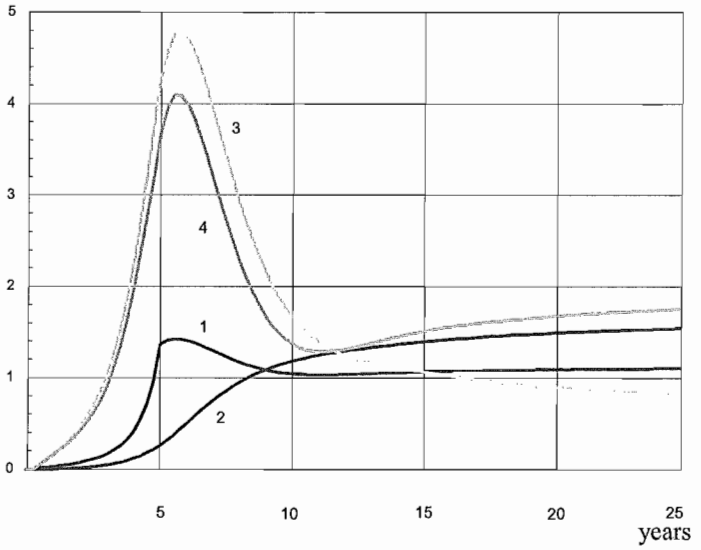
Percentage difference from base



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 fist 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, ie 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 addording 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.

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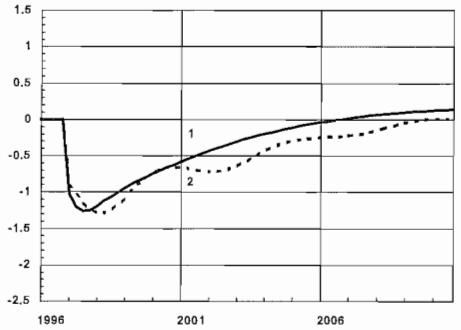
3 The shocks and assumptions are the same as in the preliminary simulations published in the Bulletin, May 1997, but the model is a bit different due to model testing since then. The present simulations have been run using the model version reported in this publication, with all the forward looking equations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

Chart 3. **BOF5 model simulations**
Key variables, differences from base

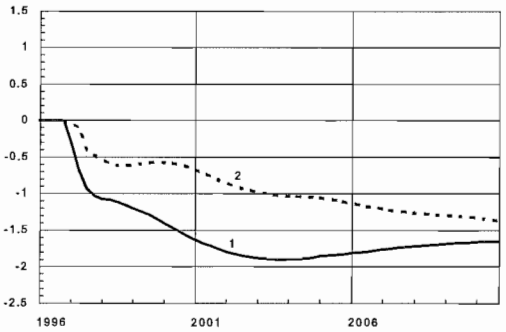
Central government consumption decreased by one per cent of GDP

GDP, per cent

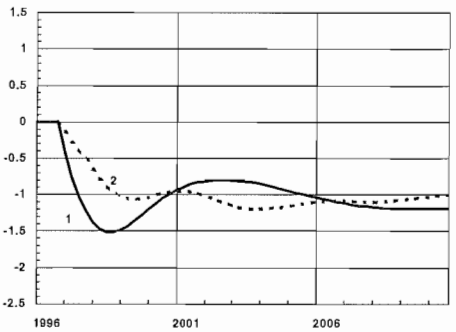


Real interest rate increased by one percentage point

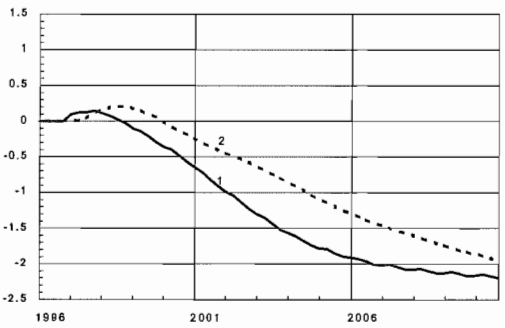
GDP, per cent



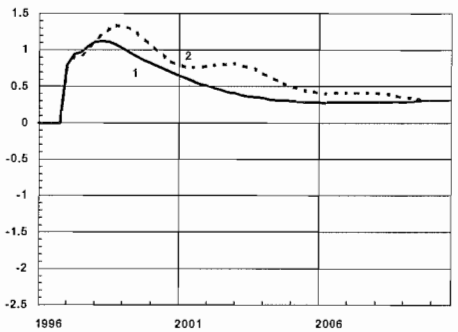
Private consumption prices, per cent



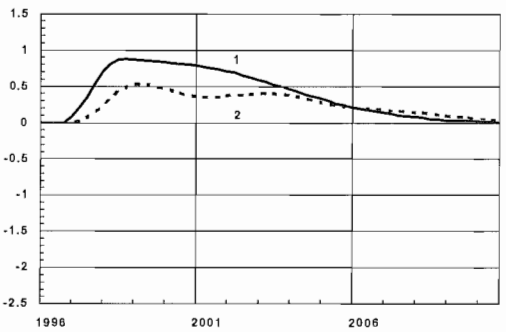
Real wage rate, per cent



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 schocks. The expectation formation mechanism would make a much bigger difference if schocks were assumed anticipated and transitory. The possibility to distinct these aspects of a schock 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.

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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

$$TECH1 = 3.68632*DSHIFT1*e^{3.1563*TREND/100}$$

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

$$GDP1T = TECH1*KF1_{-1}^{0.372303}*LH1^{0.627697}$$

T.3 The marginal product of capital, manufacturing

$$FK1 = 0.372303*GDP1/KF1_{-1}$$

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

$$MPL1 = TECH1/1.3009*(KF1_{-1}/LH1)^{0.372303}$$

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

Equation 1,

$$\log GDP - \underset{(.065808)}{\log(3.86632)} - \underset{(.000302657)}{.031563} * TREND$$
$$- \underset{(.00339465)}{.627697} * \log LH1 - (1 - \underset{(.00339465)}{.627697}) * \log KF1 = 0$$

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 1990 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,

$$\log\left(\frac{GDPV1}{YW1+SOC1}-1\right)-\log\left(\frac{1-\underset{(.00339465)}{.627697}}{\underset{(.00339465)}{.627697}}\right)=0$$

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

$$TECH2 = 0.471930*e^{1.7845*TREND/100}$$

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

$$GDP2T = TECH2*(0.920194*KF2_{-1}^{-0.444604} + [1-0.92094]*LH2^{-0.444604})^{-1/0.444604}$$

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

$$FK2 = 0.920194*TECH2^{-0.444604}*((GDP2-GDP21)/KF2_{-1})^{1.444604}$$

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
GDP2T	The normal level of prod. with existing inputs, non-manuf. priv. sector (excl. letting of own property)
GDPV1	Production at factor cost, manufacturing, FIM million
KF2	Net stock of fixed capital, non-manufacturing private sector, millions of 1990 FIM
LH2	Performed working hours, non-manufacturing private sector, millions of hours
SOC1	Entrepreneurs' social security contribution rate, manufacturing
TECH2	Technical development, non-manufacturing private sector
TREND	Linear trend, 1960Q1 onwards 0.25+$TREND_{-1}$
YW1	Wages and salaries, manufacturing, FIM million

T.8 The marginal productivity of labour, the non-manufacturing private sector, 1990=100

$$MPL2 = (TECH2/6.8955) * (0.920194 * (KF2_{-1}/LH2)^{-0.444604} + (1-0.920194))^{-1.444604/0.444604}$$

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

Equation 1,

$$\log(GDP2 - GDP21) - \underset{(.034640)}{\log(.471930)} - \underset{(.000375139)}{.017845} * TREND + \underset{(.025818)}{(1/.444604)} * \log(\underset{(.011911)}{.920194} * KF2^{\underset{(.025818)}{-.444604}} + \underset{(.011911)}{(1-.920194)} * LH2^{\underset{(.025818)}{-.444604}}) = 0$$

Method of estimation = Multivariate least squares method
Estimation period = 1962Q1–1993Q4
Sum of squared residuals = .173555
Variance of residuals = .00135590
SE = .036823
DW = .408761

Equation 2,

$$\log\left(\frac{GDPV2 - GDPV21}{YW2 + SOC2} - 1\right) - \log\left(\frac{\underset{(.011911)}{.920194}}{1 - \underset{(.011911)}{.920194}}\right) + \underset{(.025818)}{.444604} * \log\left(\frac{KF2}{LH2}\right) = 0$$

Method of estimation = Multivariate least squares method
Estimation period = 1962Q1–1993Q4
Sum of squared residuals = 2.02249
Variance of residuals = .015801
SE = .125701
DW = 1.36844

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
KF2	Net stock of fixed capital, non-manufacturing private sector, millions of 1990 FIM
LH2	Performed working hours, non-manufacturing private sector, millions of hours
MPL2	Marginal productivity of labour, non-manufacturing private sector, 1990=100
SOC2	Entrepreneurs' social security contribution rate, non-manufacturing private sector
TECH2	Technical development, non-manufacturing private sector
YW2	Wages and salaries, non-manufacturing private sector, FIM million

3.2 Consumption (C)

C.1 Expectation of private consumption, volume

$$CEX = C_{+1}$$

C.2 Yearly change in the private consumption prices

$$INFPCP=.25*(PCP/PCP_{-4}-1)$$

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

$$INFPCPEX = INFPCP_{+1}$$

C.4 Net wealth of households

$$WEALTH = PHM*KH/100 + .83895*MON2 - LBH - LCGH$$

C.5 Private consumption

$$C = \underset{(.040039)}{.300798} * YD * 100/PCP$$

$$+ \underset{(.040039)}{(1 - .300798)} * \left[\underset{(.016822)}{.853317} * \frac{CEX}{1 + RLBN/400 - INFPCPEX} \right.$$

$$\left. + \underset{(.00509330)}{0.047707} * 100 * \frac{.25 * WEALTH_{-1} + YD}{PCP} \right]$$

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

C	Private consumption, millions of 1990 FIM
CEX	C(t+1)
INFPCP	0.25*(PCP/PCP(t–4) – 1)
INFPCPEX	INFPCP(t+1)
KH	Net stock of priv. residential capital, net, millions of 1990 FIM
LBH	Bank loans to the households, FIM million
LCGH	Stock of central government housing loans, FIM million
MON2	Monetary aggregate M2, FIM million
PCP	Private consumption prices, 1990=100
PHM	House price index, all dwellings, entire country, 1990=100
RLBN	Average rate on deposit banks' new lending, per cent
WEALTH	Net wealth of households, FIM million
YD	Household disposable income, FIM million

C.6 Private consumption, value

CV = PCP*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*PCCG/100

C.10 Local government consumption, value

CLGV = CLG*PCLG/100

C.11 Consumption of social security funds, value

CSOSV = CSOS*PCSOS/100

C.12 Total public sector consumption, value

CGV = CCGV + CLGV + CSOSV

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

C.13 Total consumption, Value

CTOTV = CV + CGV

CGV	Public consumption, FIM million
CTOTV	Total consumption, FIM million
CV	Private consumption, FIM million

3.3 Investment (I)

I.1 Yearly change in fixed investment prices, manufacturing

$$INFPIF1 = 0.25*(PIF1/PIF1_{-4} - 1)$$

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

$$INFPIF1E = INFPIF1_{+1}$$

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

$$DLKF1EX = DLKF1_{+1}$$

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

$$DLKF1E2 = DLKF1_{+2}$$

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

$$\begin{aligned} DLKF1 = & -0.11702 * DLKF1E2 + 0.61035 * DLKF1EX \\ & + 0.49310 * DLKF1_{-1} \\ & + 0.010793 * (PGDP1 * FK1 / PIF1 \\ & - (CCR1 + RS/400 - INFPIF1E)/(1 + RS/400 - INFPIF1E)) \\ & - 0.00012418/1000 \end{aligned}$$

CCR1	Capital consumption rate, manufacturing
DLKF1	The growth of net stock of private fixed capital, manufacturing
DLKF1E2	DLKF1EX(t+1)
DLKF1EX	DLKF2(t+1)
FK1	The marginal product of capital, manufacturing
INFPIF1	0.25*(PIF1/PIF1(t–4) – 1)
INFPIF1E	INFPIF1(t+1)
PGDP1	Value-added deflator for manufacturing, 1990=100
PIF1	Fixed investment prices, manufacturing, 1990=100
RS	Money market rate, 3-month HELIBOR (1987 onwards), per cent

Estimated form:

$$(G^2)*B*DLKF1E2-((G*B)^2+G*B+G)*DLKF1EX$$
$$+(G*(B^2)+G*B+1)*DLKF1-B*DLKF1_{-1}$$
$$-abs(A3)*F1+abs(A3)*UC/(1+REALR)-A2*constant=0;$$

F1 = PGDP1*FK1/PIF1
UC = RS/400–INFPIF1E+CCR1
REALR = RS/400–INFPIF1E

Parameter	Estimate	Standard Error
G	.487157	.049246
B	.911926	.035235
A3	.019960	.00494443
A2	–.000229648	.0000713842

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

$INFPIF2 = 0.25*(PIF2/PIF2_{-4} - 1)$

CCR1	Capital consumption rate, manufacturing
DLKF1	The growth of net stock of private fixed capital, manufacturing
DLKF1E2	DLKF1EX(t+1)
DLKF1EX	DLKF2(t+1)
FK1	The marginal product of capital, manufacturing
IF1	Private fixed investment, manufacturing, mill of 1990 FIM
INFPIF1E	INFPIF1(t+1)
INFPIF2	0.25*(PIF2/PIF2(t–4) – 1
KF1	Net stock of fixed capital, manufacturing, millions of 1990 FIM
PGDP1	Value-added deflator for manufacturing, 1990=100
PIF1	Fixed investment prices, manufacturing, 1990=100
PIF2	Fixed investment prices, non-manufacturing private sector, 1990=100
RS	Money market rate, 3-month HELIBOR (1987 onwards), per cent

I.9 Expectations of the yearly change in fixed investment prices, non-manufacturing private sector

$$INFPIF2E = INFPIF2_{+1}$$

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

$$DLKF2EX = DLKF2_{+1}$$

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

$$DLKF2E2 = DLKF2_{+2}$$

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

$$\begin{aligned} DLKF2 = & -0.10881 * DLKF2E2 + 0.58932 * DLKF2EX \\ & + 0.50705 * DLKF2_{-1} \\ & + 0.023270 * (PREL2 * FK2 \\ & - (CCR2 + RS/400 - INFPIF2E)/ \\ & \quad (1 + RS/400 - INFPIF2E)) \\ & - 0.29585/10000 \end{aligned}$$

Estimated form:

$$\begin{aligned} & (G^2) * B * DLKF2E2 - ((G * B)^2 + G * B + G) * DLKF2EX \\ & + (G * (B^2) + G * B + 1) * DLKF2 - B * DLKF2_{-1} \\ & - abs(A3) * FCUC3 - A1 * constant = 0 \end{aligned}$$

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*(PIF2/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*((GDPV2–GDPV21)/(GDP2–GDP21))/PIF2

Parameter	Estimate	Standard Error
G	.463246	.057507
B	.925907	.054252
A3	.014018	.00492832
A1	–.0000540232	.000135423

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

I.13 Private fixed investment, non-manufacturing private sector

$$IF2 = (DLKF2 + CCR2)*KF2_{-1} + DKFCG$$

I.14 Net stock of fixed capital, non-manufacturing private sector

$$KF2 = (1–CCR2)*KF2_{-1} + IF2 – DKFCG$$

I.15 Yearly change in the house price index

$$INFPHM = 0.25*(PHM/PHM_{-4}–1)$$

I.16 Yearly change in the residential construction prices

$$INFPIH = 0.25*(PIH/PIH_{-4}–1)$$

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

I.17 Expectations of residential construction

$$IHEX = IH_{+1}$$

I.18 Expectations of the yearly change in the residential construction prices

$$INFPIHEX = INFPIH_{+1}$$

I.19 Expectations of the yearly change in the house price index

$$INFPHMEX = INFPHM_{+1}$$

I.20 Change in the volume of private fixed investment, residential construction

$$\begin{aligned} IH = {} & (.35596 * (1 - RLBN/400 + INFPIHEX) * IHEX + 0.35596 * IH_{-1} \\ & + 3381.76 * PHM_{-2} / PIH_{-2} \\ & + 0.59683 * D1090Q4 * (FCGH/(.01 * PIH) - 1143) \\ & - 6700.92 * (RLBN/400 - INFPHMEX) \\ & - 492.1152)/(1 - 0.35596 * (RLBN/400 - INFPIHEX)) \end{aligned}$$

Estimated form:

$$\begin{aligned} & (ALFA + A0 + A0 * (1 - REALRLBN)) * IH \\ & - A0 * (IH_{-1} + (1 - REALRLBN) * IHEX) - PHM_{-2} / PIH_{-2} \\ & - A1 * DUM90 * (FCGH/(.01 * PIH) - 1143) - A3 * RRLBN - A5 = 0 \end{aligned}$$

$$REALRLBN=.25*(RLBN/100-\Delta_4 logPIHEX)$$
$$RRLBN=.25*(RLBN/100-\Delta_4 logPHMEX)$$

Parameter	Estimate	Standard Error
ALFA	.0000851889	.0000137378
A0	.000105257	.0000445073
A1	.000176483	.0000514822
A3	−1.98149	.338374
A5	−.145520	.114189

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

$$PHMREX = PHMR_{+1}$$

I.22 Real house price index

$$\begin{aligned} PHMR = {} & (\underset{(.108236)}{.723834} * PHMR_{-1} + (\underset{(.128152)}{.731117} - RLBN/400 \\ & + INFPCPEX) * PHMREX + (.01 * \underset{(.0002702004)}{.109936}) \\ & * ((16.6 * C - KH_{-1})/1000 \\ & - \underset{(.108236)}{.723834} * (16.6 * C - KH_{-2})/1000) \\ & - \underset{(.020207)}{.052053}) / (1 + \underset{(.108236)}{.723834} * (\underset{(.128152)}{.731117} - RLBN_{-1}/400 \\ & + INFPCPEX_{-1})) \end{aligned}$$

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

I.23 House price index

$$PHM = PHMR * PCP$$

INFPCPEX	INFPCP(t+1)
KH	Net stock of priv. residential capital, net, millions of 1990 FIM
PCP	Private consumption prices, 1990=100
PHM	House price index, all dwellings, entire country, 1990=100
PHMR	Real house price index, all dwellings, entire country, 1990=100
PHMREX	PHMR(t+1)
RLBN	Average rate on deposit banks' new lending, per cent

I.24 Target level of inventories

$$KIIT = \underset{(4351.53)}{-10891.0} + \underset{(.069459)}{1.42271} * (GDP1T_{-1} + GDP2T_{-1})$$
$$- \underset{(.350796)}{1.02015} * (RS_{-2}/100 - \Delta_4 \log PCP_{-1}) * (GDP1T_{-1} + GDP2T_{-1})$$

Method of estimation = Ordinary Least Squares
Estimation period = 1969Q1–1993Q4
R^2 = .829202
DW = .202364
SE = 7343.47

I.25 Level of sales

SALEA = CTOT+ITOT+XGN–MGN+STD–TIN–GDPG

I.26 Expectations of the change in inventories

$IIEX = II_{+1}$

I.27 Expectations of the level of sales

$SALEAEX = SALEA_{+1}$

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

$GDP1TEX = GDP1T_{+1}$

CTOT	Total consumption, millions of 1990 FIM
GDP1T	The normal level of production with existing inputs, manufacturing, mills 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

$$GDP2TEX = GDP2T_{+1}$$

I.30 Change in inventories

$$\begin{aligned} II = {} & \underset{(.0280)}{(.461364} * (1 - RLBN/400 + INFPCPEX) \\ & * (IIEX + (SALEAEX - SALEA) - (\Delta GDP1T + \Delta GDP2T)) \\ & + \underset{(.0280)}{.461364} * (II_{-1} - (\Delta SALEA) + (\Delta GDP1T_{-1} + \Delta GDP2T_{-1})) \\ & + (1 - 2 * \underset{(.0280)}{.461364} * (\Delta KIIT) \\ & - \underset{(49.1462)}{92.4189} * (1 - D0186Q1) * (\Delta RS - \Delta RLBN)) / \\ & (1 - \underset{(.0280)}{.461364} * (RLBN/400 + INFPCPEX)) \end{aligned}$$

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

$$IF = IF1 + IF2$$

I.32 Private fixed investment, volume

$$I = IF + IH$$

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

I.33 Total public investment, volume

IG = ICG + ILG + ISOS

I.34 Total investment, volume

ITOT = I + IG

I.35 Private non-residential fixed investment, manufacturing, value

IFV1 = IF1*PIF1/100

I.36 Private non-residential fixed investment, non-manufacturing, value

IFV2 = IF2*PIF2/100

I.37 Residential construction, value

IHV = IH*PIH/100

I.38 Private non-residential investment, value

IFV = IFV1 + IFV2

I.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, mills of 1990 FIM
IF2	Private fixed investment, non-manufacturing private sector, mills 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

I.40 Central government investment, value

$$ICGV = ICG*PICG/100$$

I.41 Local government investment, value

$$ILGV = ILG*PILG/100$$

I.42 Social security funds investment, value

$$ISOSV = ISOS*PISOS/100$$

I.43 Total public investment, value

$$IGV = ICGV + ILGV + ISOSV$$

I.44 Total fixed investment, value

$$ITOTV = IV + IGV$$

I.45 Net stock of fixed capital, central government, volume

$$KFCG = ICG + (1 - CCRCG)*KFCG_{-1} + DKFCG$$

I.46 Net stock of fixed capital, local government, volume

$$KFLG = ILG + (1 - CCRLG)*KFLG_{-1}$$

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

$$IISV = GDPV + MV - ITOTV - XV - CTOTV$$

CCRH	Capital consumption rate, residential buildings
CCRS	Capital consumption rate, social security funds
CTOTV	Total consumption, FIM million
GDPV	GDP in purchasers' values, FIM million
IH	Residential construction, millions of 1990 FIM
II	Change in inventories, millions of 1990 FIM
IIS	Inventory investment and statistical discrepancy, mills of 1990 FIM
IISV	Inventory investment and statistical discrepancy, FIM million
ISOS	Social security funds investment, millions of 1990 FIM
ITOTV	Total fixed investment, FIM million
KFCG	Net stock of fixed capital, central govt, millions of 1990 FIM
KFG	Net stock of fixed capital, general 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
KH	Net stock of priv. residential capital, net, millions of 1990 FIM
KII	Stock of inventories, millions of 1990 FIM
MV	Imports of goods and services, FIM million
STD	Statistical discrepancy, millions of 1990 FIM
XV	Exports of goods and services, FIM million

3.4 Exports (X)

X.1 Exports of goods, volume

$$XGN = XGNWE - DXGE$$

X.2 Exports of goods, multilateral, finite LR-price elasticity (LR-price elasticity = 4.61)

$$\begin{aligned}\Delta\log(XGNWE) = &-\underset{(.110043)}{.729555}*\Delta\log(XGNWE_{-1})\\ &-\underset{(.101885)}{.344091}*\Delta\log(XGNWE_{-2})\\ &+\underset{(.203716)}{.364816}*\Delta\log(MNIG_{-1})\\ &+\underset{(.199167)}{.436928}*\Delta\log(MNIG_{-2})\\ &-\underset{(.077211)}{.148877}*(\log(XGNWE_{-1})-.85*\log(MNIG_{-1}))\\ &-\underset{(.132053)}{.685874}*\log(RPXGN)+\underset{(.477581)}{.903024}\end{aligned}$$

Method of estimation = Instrumental Variable NL2SLSQ
Estimation period = 1978Q1–1995Q4
R^2 = .544019
DW = 1.98912
SE = .044436

X.3 Expectation of the export price of goods

$$PXGNEX = PXGN_{+1}$$

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

$$DPXGEEX = DPXGE_{+1}$$

DPXGE	Dummy to correct PXGN for bilateral trade
DPXGEEX	DPXGE(t+1)
DXGE	Dummy to correct XGN for bilateral trade
MNIG	Export markets, imports of Finland's major export countries, 1990=100
PXGN	Export prices of goods, 1990=100 (SNA)
PXGNEX	PXGN(t+1)
RPXGN	Relative export price of goods, estimate, 1990=1
XGN	Exports of goods, millions of 1990 FIM (SNA)
XGNWE	Exports of goods, multilateral, volume, auxiliary variable

X.5 Marginal costs in production, exports of goods

$$\begin{aligned} SMCXG = {} & (1/(1-.2384*(1+TIRXG)/.9602)) \\ & *((1+TIRXG)/.9602*(0.2442*P20 \\ & +.1274*PMRN+.0348*PMSN) \\ & +.3552*100*(1+SOCR1)/1.26719 \\ & *(WAR1/.676016)/MPL1 \end{aligned}$$

X.6 Indirect tax rate on exports of goods

$$TIRXG = DVAT12*TSR/17 - DSUB12*SUBR$$

X.7 Export price of goods

$$\begin{aligned} \log(DPXGE*PXGN) = {} & \underset{(.051661)}{.298429}*[(.9925*\log(DPXGEEX*PXGNEX) \\ & +\log(DPXGE_{-1}*PXGN_{-1})] \\ & +(1-\underset{(.051661)}{.298429}*(1+.9925))*\log ZPXGN \end{aligned}$$

Method of estimation = Generalized Method of Moments
Estimation period = 1974Q3–1994Q3
P-value = 0.6154
SE = .063715

where:

$$ZPXGN = 1.22*(.449991*\log PCOMP + (1-.449991)*\log SMCXG)$$

DPXGE	Dummy to correct PXGN for bilateral trade
DPXGEEX	DPXGE(t+1)
DSUB12	Dummy, share of subsidies of exports of goods, (–94.2 = .0380)
DVAT12	Dummy, share of value-added tax of exports of goods, (–94.2 = .0018)
MPL1	Marginal productivity of labour, manufacturing, 1990=100
PCOMP	Competitors' prices on export markets, 1990=100
PMRN	Import prices of raw materials, 1990 = 100 (weighting = .531)
PMSN	Import prices of services, 1990=100 (SNA)
PXGN	Export prices of goods, 1990=100 (SNA)
PXGNEX	PXGN(t+1)
SMCXG	Marginal costs in exports, 1990=100
SOCR1	Entrepreneurs' social security contrib.rate, manufacturing
SUBR	Effective tax rate, commodity subsidies, 1990=1
TIRXG	Indirect tax rate on exports of goods
TSR	Sales tax rate, %
WAR1	Average wage, manufacturing, FIM/h

Estimated form for ZPXGN:

$$ZPXGN = \underset{(.055053)}{.449991} * \log PCOMP + (1 - \underset{(.055043)}{.449991}) * \log SMCXG$$
$$+ \underset{(.051532)}{.279597} * \log MNIG - \underset{(.00290296)}{.021724} * TREND - \underset{(.150128)}{.490333}$$

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

X.8 Relative export price of goods

RPXGN = (DPXGE*PXGN)/PCOMP

X.9 Relative export price of services

log RPXSN = log PXSN –.33*log PMCN –.67*log PMIN

X.10 Exports of services, volume

$$\Delta \log XSN = \underset{(.0593)}{-.14886} * \Delta \log XSN_{-1}$$
$$- \underset{(.0743)}{.99218} * \Delta \log RPXSN$$
$$- \underset{(.0735)}{.21325} * \log(XSN_{-1} / ZXSN_{-1})$$
$$+ \underset{(.0060)}{.01395}$$

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

DPXGE	Dummy to correct PXGN for bilateral trade
MNIG	Export markets, imports of Finland's major export countries, 1990=100
PCOMP	Competitors' prices on export markets, 1990=100
PMCN	Import prices of consumer goods, 1990=100 (weighting = .2778)
PMIN	Import prices of investment goods, 1990=100 (weighting = .1912)
PXGN	Export prices of goods, 1990=100 (SNA)
PXSN	Export prices of services, 1990=100 (SNA)
RPXGN	Relative export price of goods, estimate, 1990=1
RPXSN	Relative export price of services, estimate, 1990=1
SMCXG	Marginal costs in exports, 1990=100
TREND	Linear trend, 1960Q1 onwards 0.25+$TREND_{-1}$
XSN	Exports of services, millions of 1990 FIM (SNA)

where

$$\log ZXSN = \underset{(.0315)}{.84293} * \log XGN - \underset{(.0614)}{1.19937} * \log RPXSN - \underset{(.3133)}{.08664}$$

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

X.11 Export prices of services

$$\Delta \log PXSN = \underset{(.1203)}{.55777} * \Delta \log PMSN + \underset{(.0983)}{.18607} * \Delta \log P2 - \underset{(.0623)}{.17958} * \log(PXSN_{-1} / ZPXSN_{-1}) + \underset{(.0029)}{.00538}$$

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

where

$$\log ZPXSN = \underset{(.0900)}{.29434} * \log P2 + (1 - \underset{(.0900)}{.29434}) * \log PMSN + \underset{(.0007)}{.00360} * TREND - \underset{(.0155)}{.07083}$$

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

XGNV= PXGN*XGN/100

X.13 Exports of services, value

XSNV= PXSN*XSN/100

X.14 Exports of goods and services, volume

X = XGN + XSN

X.15 Exports of goods and services, value

XV = XGNV + XSNV

PXGN	Export prices of goods, 1990=100 (SNA)
PXSN	Export prices of services, 1990=100 (SNA)
X	Exports of goods and services, millions of 1990 FIM
XGN	Export of goods, millions of 1990 FIM (SNA)
XGNV	Exports of goods, FIM million (SNA)
XSN	Exports of services, millions of 1990 FIM (SNA)
XSNV	Exports of services, FIM million (SNA)
XV	Exports of goods and services, FIM million

3.5 Imports (M)

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

$$MDD = .3575 * GDP1 + .0417 * GDP2 + .1295 * C + .0406 * CG + 1658 * (IF + IG) + .0073 * XGN$$

M.2 Imports of goods, volume

$$\begin{aligned}\Delta \log MGN = & \underset{(.1277)}{-.52207} * \Delta \log MGN_{-1} \\ & \underset{(.1006)}{-.20931} * \Delta \log MGN_{-2} \underset{(.1133)}{-.23355} * \log(MGN_{-1} / MDD) \\ & \underset{(.1935)}{+.67564} * \Delta_3 \log MDD \\ & \underset{(.1011)}{+.29720} * (\Delta \log XGN - \Delta \log(GDP1 + GDP2)) \\ & \underset{(.0419)}{+.06225} * \log(XGN / (GDP1 + GDP2)) \\ & \underset{(.0784)}{+.12301} * \log((.67 * PD1 + .33 * P20) / PMGN) \\ & \underset{(.0585)}{+.07869}\end{aligned}$$

Method of estimation = Ordinary Least Squares
Estimation period = 1972Q1–1993Q4
$R^2 = .542$
DW = 1.912
SE = .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, mills of 1990 FIM
IF	Private non-residential investment, mills 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

$$\Delta \log MSN = \underset{(.5429)}{-1.13300} \underset{(.0894)}{-.29932} * \Delta \log MSN_{-1}$$
$$\underset{(.0660)}{-.20631} * \log(MSN_{-1} * PMSN / PCP)$$
$$\underset{(.1212)}{+.34987} * \log(.0416 * C + .0977 * GDP1 + .0114 * GDP2)$$
$$\underset{(.0540)}{+.08822} * \log(XGN / (GDP1 + GDP2))$$
$$\underset{(.5429)}{-0.93033} * \Delta \log(PMSN / PCP)$$

Method of estimation = Ordinary Least Squares
Estimation period = 1971Q1–1994Q4
R^2 = .296
DW = 1.962
SE = .05277

M.4 Imports of goods, value

MGNV = PMGN*MGN/100

M.5 Imports of services, value

MSNV = PMSN*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, mills 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 millions (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

$$\begin{aligned}\Delta GDP1 = {} & .24108 * \Delta C + .26981 * \Delta(CG - GDPG) + .24987 * \Delta(IF + IG) \\ & + .13146 * \Delta IH + .62661 * \Delta XGN \\ & + .17382 * \Delta XSN - .35133 * \Delta MGN \\ & - .13341 * \Delta MSN + \underset{(.0423)}{.28023} * \Delta IIS\end{aligned}$$

C	Private consumption, millions of 1990 FIM
CCG	Central government consumption, millions of 1990 FIM
CG	Public consumption, millions of 1990 FIM
CLG	Local government consumption, millions of 1990 FIM
CSOS	Social security funds consumption, mills of 1990 FIM
GDP1	Production at factor cost, manufacturing, millions of 1990 FIM
GDPCG	Production at factor cost, central government, millions of 1990 FIM
GDPG	Production at factor cost, general govt, millions of 1990 FIM
GDPLG	Production at factor cost, local govt, mills of 1990 FIM
GDPS	Production at factor cost, social security funds, millions of 1990 FIM
IF	Private non-residential investment, mills of 1990 FIM
IG	Public investment, millions of 1990 FIM
IH	Residential construction, millions of 1990 FIM
IIS	Inventory investment and statistical discrepancy, mills of 1990 FIM
MGN	Imports of goods, millions of 1990 FIM (SNA)
MSN	Imports of services, millions of 1990 FIM (SNA)
XGN	Exports of goods, millions of 1990 FIM (SNA)
XSN	Exports of services, millions of 1990 FIM (SNA)

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

$$\Delta TIN = .17648 * \Delta C + .11017 * \Delta(CG - GDPG) + .08557 * \Delta(IF + IG) + .05669 * \Delta IH - .01639 * \Delta XGN + .05379 * \Delta XSN + .05018 * \Delta MGN - .09741 * \Delta MSN + \underset{(.0175)}{.04122} * \Delta IIS$$

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

$$GDPF = GDP - TIN$$

C	Private consumption, millions of 1990 FIM
CG	Public consumption, millions of 1990 FIM
GDP	GDP in purchasers' values, millions of 1990 FIM
GDPF	GDP at factor cost, millions of 1990 FIM
IF	Private non-residential investment, mills of 1990 FIM
IG	Public investment, millions of 1990 FIM
IH	Residential construction, millions of 1990 FIM
IIS	Inventory investment and statistical discrepancy, mills of 1990 FIM
ITOT	Total fixed investment, millions of 1990 FIM
M	Imports of goods and services, millions of 1990 FIM
MGN	Imports of goods, millions of 1990 FIM (SNA)
MSN	Imports of services, millions of 1990 FIM (SNA)
TIN	Indirect taxes less subsidies, millions of 1990 FIM
X	Exports of goods and services, millions of 1990 FIM
XGN	Exports of goods, millions of 1990 FIM (SNA)
XSN	Exports of services, millions of 1990 FIM (SNA)

Q.9 Production at factor cost, private non-manufacturing sector, volume

$$GDP2 = GDPF - GDP1 - GDPG$$

Q.10 Production at factor cost, housing, volume

$$\log GDP21 = \underset{(.1896)}{-5.26039} + \underset{(.0145)}{1.05389} * \log KH_{-1}$$

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

$$GDPVCG = PGDPCG * GDPCG/100$$

GDP1	Production at factor cost, manufacturing, millions of 1990 FIM
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
GDPCG	Production at factor cost, central government, millions of 1990 FIM
GDPF	GDP at factor cost, millions of 1990 FIM
GDPG	Production at factor cost, general govt, millions of 1990 FIM
GDPV1	Production at factor cost, manufacturing, FIM million
GDPV2	Production at factor cost, non-manufacturing private sector, FIM million
GDPV21	Production at factor cost, letting of own property, FIM million
GDPVCG	Production at factor cost, central govt, FIM million
KH	Net stock of priv. residential capital, net, millions of 1990 FIM
PGDP1	Value-added deflator for manufacturing, 1990=100
PGDP2	Value-added deflator for non-manufacturing private sector, 1990=100
PGDP21	Value-added deflator for letting of own property, 1990=100
PGDPCG	Value-added deflator for central government, 1990=100

Q.15 Production at factor cost, local government, value

GDPVLG = PGDPLG*GDPLG/100

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

GDPVS = PGDPS*GDPS/100

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

GDPVG = GDPVCG + GDPVLG + GDPVS

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

GDPV8 = GDPV1 + GDPV2

Q.19 Gross domestic production at factor cost, value

GDPFV = GDPV1 + GDPV2 + GDPVG

Q.20 Gross domestic production at factor cost, value

GDPV = GDPFV + TIV – SUB

GDPFV	GDP at factor cost, FIM million
GDPLG	Production at factor cost, local govt, mills of 1990 FIM
GDPS	Production at factor cost, social security funds, millions of 1990 FIM
GDPV	GDP in purchasers' values, FIM million
GDPV1	Production at factor cost, manufacturing, FIM million
GDPV2	Production at factor cost, non-manufacturing private sector, FIM million
GDPV8	Production at factor cost, private sector, FIM million
GDPVCG	Production at factor cost, central govt, FIM million
GDPVG	Production at factor cost, general govt, FIM million
GDPVLG	Production at factor cost, local govt, FIM million
GDPVS	Production at factor cost, social security funds, FIM million
PGDPLG	Value-added deflator for local government, 1990=100
PGDPS	Value-added deflator for social security funds, 1990=100
SUB	Commodity subsidies, FIM million
TIV	Central government gevenue from commodity taxes, FIM million

3.7 Employment (L)

L.1 Desired labour demand, manufacturing

$$LH1T = (GDP1/TECH1)^{(1/.627697)} * (KF1_{-1})^{-(1-.627697)/.627697}$$

L.2 Desired labour demand, non-manufacturing

$$LH2T = \left\{ \left(\frac{1}{1-.920194} \right) * \left(\left(\frac{GDP2 - GDP21}{TECH2} \right)^{-.444604} \right) - \left(\frac{.920194}{1-.920194} \right) * KF2_{-1}^{-.444604} \right\}^{-1/.444604}$$

L.3 The average productivity of labour, manufacturing

$$Q1 = (GDP1/LH1)/1.342979$$

L.4 Expectations of performed working hours, manufacturing

$$LH1EX = LH1_{+1}$$

GDP1	Production at factor cost, manufacturing, millions of 1990 FIM
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
KF1	Net stock of fixed capital, manufacturing, millions of 1990 FIM
KF2	Net stock of fixed capital, non-manufacturing private sector, millions of 1990 FIM
LH1	Performed working hours, manufacturing, millions of hours
LH1T	Desired demand for labour, manufacturing, millions of hours (from inverted production function)
LH2T	Desired demand for labour, non-manufacturing private sector, millions of hours
Q1	Labour productivity, manufacturing, 1990=100
TECH1	Technical development, manufacturing
TECH2	Technical development, non-manufacturing private sector

L.5 Performed working hours, manufacturing

$$\log LH1 = .44160 * (\log LH1EX + \log LH_{-1}) + .11681 * \log LH1T$$

Estimated from:

$$\underset{(.469725)}{(1.50050 + .63^2)} * \Delta \log LH1 - \underset{(.469725)}{1.50050} * \Delta \log LH1EX$$

$$-.63 * \left(\log \left(\frac{GDP1}{GDP1T_{-1}} \right) - (1 - .63) * DLKF1_{-2} - .031563/4 \right) = 0$$

Method of estimation = Generalized Method of Moments
Estimation period = 1980Q1–1995Q3
P-value = 0.0403
SE = .030333

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

Q2 = (GDP2/LH2)/1.015688

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

$LH2EX = LH2_{+1}$

DLKF1	The growth of net stock of private fixed capital, manufacturing
GDP1	Production at factor cost, manufacturing, millions of 1990 FIM
GDP1T	The normal level of production with existing inputs, manufacturing, mills of 1990 FIM
GDP2	Production at factor cost, non-manufacturing private sector, mills of 1990 FIM
LH	Performed working hours total, millions of hous
LH1	Performed working hours, manufacturing, millions of hours
LH1EX	LH1(t+1)
LH1T	Desired demand for labour, manufacturing, millions of hours (from inverted production function)
LH2	Performed working hours, non-manufacturing private sector, millions of hours
LH2EX	LH2(t+1)
Q2	Labour productivity, non-manufacturing private sector, 1990=100

L.8 Performed working hours, the private non-manufacturing sector

$$\log LH2 = 0.47089*(\log LH2EX + \log LH2_{-1}) + 0.058211*\log LH2T$$

Estimated form:

$$\underset{(1.45600)}{(3.10961+.62^2)} * \Delta \log LH2 - \underset{(1.45600)}{3.10961} * \Delta \log LH2EX$$

$$-.62 * \left(\log \left(\frac{GDP2 - GDP21}{GDP2T_{-1}} \right) - (1-.62) * DLKF2_{-2} - .021135/4 \right) = 0$$

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

L.9 Performed working hours, entrepreneurs, manufacturing

$$LHE1/LH1 = \underset{(.0009)}{.00125} + \underset{(.0240)}{.96959} * LHE1_{-1}/LH1_{-1}$$

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

$$LHE2/LH2 = \underset{(.0038)}{.00166} + \underset{(.0133)}{.99305} * LHE2_{-1}/LH2_{-1}$$

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

DLKF2	The growth of net stock of private fixed 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
GDP2T	The normal level of prod. with existing inputs, non-manuf. priv. sector (excl. letting of own property), millions of 1990 FIM
LH1	Performed working hours, manufacturing, millions of hours
LH2	Performed working hours, non-manufacturing private sector, millions of hours
LH2T	Desired demand for labour, non-manufacturing private sector, millions of hours
LH2EX	LH2(t+1)
LHE1	Performed working hours, entrepreneurs, manufacturing, mills of hours
LHE2	Performed working hours, entrepreneurs, non-manuf. priv sector, mills of hours

L.11 Performed working hours, employees, manufacturing

$$LHW1 = LH1 - LHE1$$

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

$$LHW2 = LH2 - LHE2$$

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

$$LHW8 = LHW1 + LHW2$$

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

$$LHE = LHE1 + LHE2$$

L.15 Performed working hours, the private sector

$$LH8 = LHW8 + LHE$$

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

L.16 Performed working hours, general government sector

$$LHG = \underset{(.0000)}{.01115}*(GDPG - CCRCG * KFCG_{-1} - CCRLG * KFLG_{-1} - CCRS * KFS_{-1})$$

Method of estimation = Ordinary Least Squares
Estimation period = 1980Q1–1994Q4
$R^2 = .978$
DW = .823
SE = 2.43825

L.17 Performed working hours, total

$$LH = LH8 + LHG$$

L.18 Employment (Labour force survey)

$$\Delta \log(LES - 2.53327 * LHG) = \underset{(.0476)}{.25025} + \underset{(.0887)}{.28147}*\Delta \log(LES_{-1} - 2.53327 * LHG_{-1}) - \underset{(.0769)}{.40087}*\log((LES_{-1} - 2.53327 * LHG_{-1})/LH8_{-1}) + \underset{(.0619)}{.41221}*\Delta \log LH8 - \underset{(.0593)}{.09069}*\Delta_2 \log LH8_{-1} + \underset{(.0594)}{.24069}*\Delta \log LH8_{-3} + \underset{(.0006)}{.00284}*TREND$$

Method of estimation = Ordinary Leat Squares
Estimation period = 1972Q1–1994Q4
$R^2 = .551$
DW = 1.964
SE = .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)

$$LE/LE_{-1} = LES/LES_{-1}$$

L.20 Labour force (Labour force survey)

$$\begin{aligned}\Delta\log(LFS/N) = &-.02036 \\ &(.0102) \\ &-.26323*\Delta\log(LFS_{-1}/N_{-1}) \\ &(.0811) \\ &+.34666*\Delta\log(LES/N) \\ &(.0384) \\ &-.08074*\log(LFS_{-1}/N_{-1}) \\ &(.0370) \\ &+.02332*\log(LES_{-1}/N_{-1}) \\ &(.0106)\end{aligned}$$

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)

$$UR = \max(100*LUS/LFS, 1.0)$$

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

$$\Delta ULR = \underset{(.0930)}{.59293^{*}}\,\Delta ULR_{-1} + \underset{(.1229)}{.33485^{*}}\,\Delta ULR_{-2}$$
$$- \underset{(.1301)}{.45028^{*}}\,\Delta ULR_{-3} + \underset{(.1119)}{.63504^{*}}\,\Delta ULR_{-4}$$
$$+ \underset{(.0276)}{.06048^{*}}\,\Delta UR_{-2} + \underset{(.0295)}{.11633^{*}}\,\Delta UR_{-3}$$
$$- \underset{(.0522)}{.35692^{*}}\,ULR_{-1} + \underset{(.0188)}{.11861^{*}}\,UR_{-6} - \underset{(.0691)}{.40721}$$

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

$$\Delta \log(WAR1 / WNR1) = \underset{(.150762)}{-.438966}$$
$$\underset{(.099094)}{-.418821} * \Delta \log(WAR1_{-1} / WNR1_{-1})$$
$$\underset{(.170260)}{+.294392} * \Delta \log MPL1$$
$$\underset{(.032654)}{-.101830} * \log\left(\frac{1-ATAX_{-1}}{1-MTAX_{-1}} * \frac{WAR1_{-1} * (1+SOCR1_{-1})}{PGDP1_{-1} * MPL1_{-1}}\right)$$
$$\underset{(.00215027)}{-.011270} * (.25 * \log UR + .75 * \log UR_{-4})$$

Method of estimation = Ordinary Least Squares
Estimation period = 1975Q4–1994Q4
$R^2 = 0.383977$
Durbin's h = 0.804528
SE = 0.00679038

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

$$\Delta \log(WAR2 / WNR2) = \underset{(.0045)}{.00181}$$
$$\underset{(.1502)}{+.64657} * \Delta \log(WAR1 / WNR1)$$
$$\underset{(.0757)}{-.74147} * \log(WAR2_{-1} / WAR1_{-1}) \underset{(.0007)}{-.00467} * UR$$

Method of estimation = Ordinary Least Squares
Estimation period = 1970Q1–1994Q4
$R^2 = 0.532$
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

W.3 Wage rate, manufacturing

$$\Delta_4 \log(WR1/WAR1) = \underset{(.0040)}{.00382}$$
$$+ \underset{(.0965)}{.26485}^{*} \Delta_4 \log(WR1_{-1}/WAR1_{-1})$$
$$- \underset{(.0202)}{.07200}^{*} \Delta_4 \log PGDP1_{-1}$$
$$- \underset{(.0757)}{.16256} \Delta_4 \log MPL1$$

Method of estimation = Ordinary Least Squares
Estimation period = 1970Q1–1994Q4
$R^2 = 0.254$
DW = 2.023
SE = .01147

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

$$\Delta_4 \log(WR2/WAR2) = \underset{(.0029)}{-.00596}$$
$$\underset{(.0344)}{.07618}^{*} \Delta \log UR_{-5}$$

Method of estimation = Ordinary Least Squares
Estimation period = 1979Q1–1994Q4
$R^2 = 0.058$
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

$$\Delta \log WRG = \underset{(.0600)}{-.09144} * \Delta \log WRG_{-1}$$
$$\underset{(.0590)}{-.15728} * \Delta \log WRG_{-2}$$
$$\underset{(.0617)}{+.89245} * \Delta \log(.3 * WR1 + .7 * WR2)$$
$$\underset{(.1733)}{+.50749} * \Delta \log((1 - MTAX)/(1 - ATAX))$$
$$\underset{(.1721)}{+.35019} * \log((1 - MTAX_{-1})/(1 - ATAX_{-1}))$$
$$\underset{(.0013)}{-.00334} * (\log(UR) + \log(UR_{-4}))$$
$$\underset{(.0499)}{-.16296} * \log(WRG_{-1}/(.3 * WR1_{-1} + .7 * WR2_{-1}))$$
$$\underset{(.0331)}{+.08370}$$

Method of estimation = Ordinary Least Squares
Estimation period = 1976Q1–1994Q4
$R^2 = 0.769$
DW = 2.202
SE = 0.00798

W.6 Average wage rate, government sector

$$WARG / WARG_{-1} = WRG / WRG_{-1}$$

W.7 Inflation expectations, (T+2)

$$INFPCPE2 = INFPCP_{+2}$$

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

$$\Delta \log WNR1 = INFPCPE2$$
$$+[1/(4*(1-\underset{(.061309)}{.594274}))]*\{\underset{(.010240)}{-.061532}*\Delta \log UR_{-4}$$
$$\underset{(.063914)}{-.173282}*\Delta \log(1-ATAX_{-1})$$
$$\underset{(.047703)}{+.124896}*[\Delta \log(GDPV1/((1+SOCR1)*PCP*LH1))]$$
$$\underset{(.00133484)}{-.00474229}\}$$

Method of estimation = Generalized Method of Moments
Estimation period = 1975Q1–1993Q4
P-value = 0.1526
SE = .012037

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

$$\Delta \log WNR2 = INFPCPE2$$
$$+[1/(4*(1-\underset{(.073498)}{.592605}))]*\{\underset{(.014234)}{-.052809}*\Delta \log UR_{-4}$$
$$\underset{(.116551)}{-.230975}*\Delta \log(1-ATAX_{-1})$$
$$\underset{(.047209)}{+.137763}*[\Delta_2 \log(GDPV8/((1+SOCR8)*PCP*LH8))]$$
$$\underset{(.00148963)}{-.00271615}\}$$

Method of estimation = Generalized Method of Moments
Estimation period = 1975Q1–1993Q4
P-value = 0.9030
SE = .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	INFPCP(t+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 = .30*WNR1 + .70*WNR2

W.11 Wage rate

WR = .22*WR1 + .52*WR2 + .26*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

$$PD1EX = PD1_{+1}$$

P.2 Prices of manufacturing goods sold on domestic market

$$\log PD1 = \underset{(.054215)}{.194447} * (.9925 * \log PD1EX + \log PD1_{-1}) + (1 - \underset{(.054215)}{.194447} * (1 + .9925)) * \log SMC1$$

Method of estimation = Generalized Method of Moments
Estimation period = 1987Q1–1994Q3
P-value = 0.0855
SE = .015526

P.3 Marginal costs in manufacturing

$$SMC1 = (1/(1 - .2384 * (1 + TIR1)/.9983)) * ((1 + TIR1)/.9983 * (.2442 * P20 + .1274 * PMRN + .0348 * PMSN) + .3552 * 100 * (1 + SOCR1)/1.26719 * (WAR1/.67601)/MPL1)$$

P.4 Indirect tax rate on manufacturing production

$$TIR1 = DVAT1*TSR/17 + DTIOV1*TIOVR - DSUB1*SUBR$$

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)
SMC1	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

$$\log PI = \underset{(.0076)}{.29567} * \log PXGN + (1 - \underset{(.0076)}{.29567}) * \log PD1$$

Method of estimation = Ordinary Least Squares
Estimation period = 1978Q1–1994Q4
R^2 = .900
DW = -953
SE = .00484

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

$$P20EX = P20_{+1}$$

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

$$\log P20 = \underset{(.069051)}{.326249} * (.9925 * \log P20EX + \log P20_{-1}) + (1 - \underset{(.069051)}{.326249} * (1 + .9925)) * \log SMC2$$

Method of estimation = Generalized Method of Moments
Estimation period = 1978Q1–1994Q3
P-value = 0.2689
SE = .043956

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

$$SMC2 = (1/(1 - .2977 * (1 + TIR2)/1.0812)) * ((1 + TIR2)/1.0812 * (.1166 * PD1 + 0.0221 * PMRN + .0283 * PMSN) + .5353 * 100 * (1 + SOCR2)/1.25535 * (WAR2/.64795)/MPL2)$$

MPL2	Marginal productivity of labour, non-manufacturing private sector, 1990=100
P1	Producer prices in manufacturing, 1990=100
P20	Producer prices in non-manufacturing private sector excl. letting of own property, 1990=100
P20EX	P20(t+1)
PD1	Prices of manufactures sold on the domestic market, manufacturing, 1990=100
PMRN	Import prices of raw materials, 1990=100 (weighting = .531)
PMSN	Import prices of services, 1990=100 (SNA)
PXGN	Export prices of goods, 1990=100 (SNA)
SMC2	Marginal costs in non-manufacturing private sector, 1990=100
SOCR2	Entrepreneurs' social security contrib. rate, non-manufacturing private sector
TIR2	Indirect tax (excl. subsidies) rate on production, non-manufacturing private sector
WAR2	Average wage, non-manufacturing private sector, FIM/h

P.9 Indirect tax rate in private non-manufacturing production

$$TIR2 = DVAT2*TSR/17 + DTIOV2*TIOVR - DSUB2*SUBR$$

P.10 Value-added deflator in housing sector

$$\Delta \log PGDP21 = \Delta \log P20$$

P.11 Prices in private non-manufacturing sector

$$P2 = (P20 + .062*PGDP21)/1.062$$

P.12 Prices in private sector

$$P8 = .3794*P1 + .6206*P2$$

P.13 Prices in private domestic sector

$$logPD8 = 1.2765*logP8 - .2765*logPXGN$$

P.14 Input-output estimate for PGDP1

$$PGDP1IO = (1/.3552) * (P1 - (1 + TIR1) * (.2384 * P1 + .2442 * P20 + .1274 * PMRN + .0348 * PMSN) / .9983)$$

DSUB2	Dummy, share of commodity subsidies of production, private non-manufacturing sector, (–94.2 = .0033)
DTIOV2	Dummy, share of other commodity taxes of production, private non-manufacturing sector, (–94.2 = 100)
DVAT2	Dummy, share of value-added tax of production, private non-manufacturing sector, (–94,2 = .0581)
P1	Producer prices in manufacturing, 1990=100
P2	Producer prices in non-manufacturing private sector, 1990=100
P8	Producer prices in private sector, 1990=100
P20	Producer prices in non-manufacturing private sector excl. letting of own property, 1990=100
PD8	Prices of manufactures sold on the domestic market, private sector, 1990=100
PGDP1IO	Input-output estimate for deflator PGDP1, 1990=100
PGDP21	Value-added deflator for letting of own property, 1990=100
PMRN	Import prices of raw materials, 1990=100 (weighting = .531)
PMSN	Import prices of services, 1990=100 (SNA)
PXGN	Export prices of goods, 1990=100 (SNA)
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
TIR2	Indirect tax (excl. subsidies) rate on production, non-manufacturing private sector
TSR	Sales tax rate, %

P.15 Value added deflator in manufacturing

$$\Delta \log PGDP1 = \Delta \log PGDP1IO$$

P.16 Input-output estimate for PGDP2

$$PGDP2IO = (1/.5353) * (P2 - (1 + TIR2) * (.1166 * PD1 + .2977 * P2 + .0221 * PMRN + .0283 * PMSN) / 1.0812)$$

P.17 Value added deflator in private non-manufacturing sector

$$\Delta \log PGDP2 = \Delta \log PGDP2IO$$

P.18 Value added deflator, central government

$$PGDPCG = 100 * ((1 + SOCRCG) * YWCG + CCVT - CCV1 - CCV2 - .90 * CCVLG - CCVS) / GDPCG$$

P.19 Value added deflator, local government

$$PGDPLG = 100 * ((1 + SOCRLG) * YWLG + .90 * CCVLG) / GDPLG$$

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

P.20 Value added deflator, social security funds

$$PGDPS = 100*((1+SOCRS)*YWS + CCVS)/GDPS$$

P.21 Input-output estimate for PCP

$$\log PCPIO = .2049 * \log PD1 + .5137 * \log P20 + .1258 * \log PGDP21 + .1556 * \log PMCN$$

P.22 Input-output estimate for PCCG

$$\log PCCGIO = .0636 * \log PD1 + .1377 * \log P20 + .7404 * \log PGDPCG + .0580 * \log PMCN$$

P.23 Input-output estimate for PCLG

$$\log PCLGIO = .0565 * \log PD1 + .1150 * \log P20 + .7924 * \log PGDPLG + .0361 * \log PMCN$$

P.24 Input-output estimate for PCSOS

$$\log PCSOSIO = .0148 * \log PD1 + .3394 * \log P20 + .6458 * \log PGDPS$$

CCVS	Consumption of fixed capital, social security funds, FIM million
GDPS	Production at factor cost, social security funds, millions of 1990 FIM
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
PCLG	Local government consumption prices, 1990=100
PCLGIO	Input-output estimate for deflator PCLG, 1990=100
PCP	Private consumption prices, 1990=100
PCPIO	Input-output estimate for deflator PCP, 1990=100
PCSOS	Social insurance institutions consumption prices, 1990=100
PCSOSIO	Input-output estimate for deflator PCSOS, 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
PGDPCG	Value-added deflator for central government, 1990=100
PGDPLG	Value-added deflator for local government, 1990=100
PGDPS	Value-added deflator for social security funds, 1990=100
PMCN	Import prices of consumer goods, 1990=100 (weighting = .2778)
SOCRS	Entrepreneurs' social security contrib. rate, social security funds
YWS	Wages and salaries, social security funds, FIM million

P.25 Input-output estimate for PIF

$$\log PIFIO = .2098 * \log PD1 + .6147 * \log P20 + .1755 * \log PMIN$$

P.26 Private consumption prices

$$\Delta \log PCP = \Delta \log PCPIO - (1 - .1251) * \Delta \log(1 - TIRC)$$

P.27 Indirect tax rate on private consumption

$$TIRC = DVAT345 * TSR / 17 + DTIOV345 * TIOVR - DSUB345 * SUBR$$

P.28 Central government consumption prices

$$\Delta \log PCCG = \Delta \log PCCGIO - (1 - .7407) * \Delta \log(1 - TIRCCG)$$

P.29 Indirect tax rate on consumption, central government

$$TIRCCG = DVAT6 * TSR / 17 + DTIOV6 * TIOVR - DSUB6 * SUBR$$

DSUB345	Dummy, share of commodity subsidies of private consumption
DSUB6	Dummy, share of commodity subsidies of central government consumption, (–94.2 = .0027)
DTIOV345	Dummy, share of other commodity taxes of private consumption
DTIOV6	Dummy, share of other commodity taxes, central government consumption, (–94.2 = .0163)
DVAT345	Dummy, share of value-added tax of private consumption
DVAT6	Dummy, share of value-added tax of central government consumption, (–94.2 = .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
PIFIO	Input-output estimate for deflator PIF, 1990=100
PMIN	Import prices of investment goods, 1990=100 (weighting = .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

$$\Delta \log PCLG = \Delta \log PCLGIO - (1 - .7924) * \Delta \log(1 - TIRCLG)$$

P.31 Indirect tax rate on consumption, local government

$$TIRCLG = DVAT7 * TSR / 17 + DTIOV7 * TIOVR - DSUB7 * SUBR$$

P.32 Consumption prices, social security funds

$$\Delta \log PCSOS = \Delta \log PCSOSIO - (1 - .6458) * \Delta \log(1 - TIRCSOS)$$

P.33 Indirect tax rate on consumption, social security funds

$$TIRCSOS = DVAT8 * TSR / 17 + DTIOV8 * TIOVR - DSUB8 * SUBR$$

DSUB7	Dummy, share of commodity subsidies of local government consumption, (–94.2 = .0057)
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)
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)
PCLG	Local government consumption prices, 1990=100
PCLGIO	Input-output estimate for deflator PCLG, 1990=100
PCSOS	Social insurance institutions consumption prices, 1990=100
PCSOSIO	Input-output estimtae for deflator PCSOS, 1990=100
SUBR	Effective tax rate, commodity subsidies, 1990=1
TIOVR	Effective tax rate, other commodity taxes, 1990=1
TIRCLG	Indirect tax rate on consumption, local government
TIRCSOS	Indirect tax rate on consumption, social security funds
TSR	Sales tax rate, %

P.34 Fixed investment prices, manufacturing

$$\log(PIF1*(1-TIRIF1)/PIFIO) =$$
$$.94144*\log(PIF1_{-1}*(1-TIRIF1_{-1})/PIFIO_{-1})$$
$$\underset{(.0377)}{}$$
$$+.02781*\log(PIH/P20)$$
$$\underset{(.0223)}{}$$
$$+.11251*\Delta\log(PIH/P20)$$
$$\underset{(.0635)}{}$$
$$-.00013$$
$$\underset{(.0051)}{}$$

Method of estimation = Ordinary Least Squares
Estimation period = 1975Q1–1995Q4
R^2 =.883
DW = 1.938
SE = .01697

P.35 Indirect tax rate on fixed investment, manufacturing

$$TIRIF1 = (.17*(.75*TSR7+.25*TSR8)/TSR+DVAT9)*TSR/17$$
$$+DTIOV9*TIOVR$$

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, industiral buildings, %

P.36 Fixed investment prices, private non-manufacturing sector

$$\log(PIF2*(1-TIRIFO)/PIFIO) =$$
$$\underset{(.0469)}{.87538}*\log(PIF2_{-1}*(1-TIRIFO_{-1})/PIFIO_{-1})$$
$$+\underset{(.0217)}{.04796}*\log(PIH/P20)$$
$$+\underset{(.0393)}{.13388}*\Delta\log(PIH/P20)$$
$$-\underset{(.0038)}{.00654}$$

Method of estimation = Ordinary Least Squares
Estimation period = 1975Q1–1995Q4
R^2 = .932
DW = 1.733
SE = .01001

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

TIRIFO = DVAT10*TSR/17 + DTIOV9*TIOVR

DTIOV9	Dummy, share of other consumption taxes, fixed non-residential investment, (–94.2 = .0075)
DVAT10	Dummy, share of value-added tax of fixed non-residential investment, private non-manufacturing and general government sector, (–94.2 = .0581)
P20	Producer prices in non-manufacturing private sector excl. letting of own property, 1990=100
PIF2	Fixed investment prices, non-manufacturing private sector, 1990=100
PIFIO	Input-output estimate for deflator PIF, 1990=100
PIH	Residential construction prices, 1990=100
TIOVR	Effective tax rate, other commodity taxes, 1990=1
TIRIFO	Indirect tax rate on fixed investment, other private investment
TSR	Sales tax rate, %

P.38 Residential construction prices, static specification

$$\log PIH = .0029 * \log PD1 + .9971 * \log P20$$
$$+ \underset{(.0356)}{.34339} * \log(IH + IH_{-1} + IH_{-2})$$
$$+ \underset{(.0010)}{.01191} * TREND$$
$$- \underset{(.3697)}{3.92097}$$

Method of estimation = Ordinary Least Squares
Estimation period = 1975Q1–1995Q4
$R^2 = .666$
DW = .335
SE = .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

PGDPF = 100*GDPFV/GDPF

GDPF	GDP at factor cost, millions of 1990 FIM
GDPFV	GDP at factor cost, FIM million
IH	Residential construction, millions of 1990 FIM
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
PGDPF	Value-added deflator at factor cost, 1990=100
PICG	Central government investment prices, 1990=100
PIF2	Fixed investment prices, non-manufacturing private sector, 1990=100
PIH	Residential construction prices, 1990=100
PILG	Local government investment prices, 1990=100
PISOS	Social security funds investment prices, 1990=100
TREND	Linear trend, 1960Q1 onwards 0.25 + $TREND_{-1}$

P.43 Private investment prices

PI = 100*IV/I

P.44 Private fixed non-residential investment prices

PIF = 100*IFV/IF

P.45 General government investment prices

PIG = 100*IGV/IG

P.46 Fixed investment prices

PITOT = 100*ITOTV/ITOT

P.47 General government consumption prices

PCG = 100*CGV/CG

P.48 Value added deflator in general government

PGDPG = 100*GDPVG/GDPG

CG	Public consumption, millions of 1990 FIM
CGV	Public consumption, FIM million
GDPG	Production at factor cost, general govt, millions of 1990 FIM
GDPVG	Production at factor cost, general govt, FIM million
I	Private fixed investment, millions of 1990 FIM
IF	Private non-residential investment, mills of 1990 FIM
IFV	Private non-residential investment, FIM million
IG	Public investment, millions of 1990 FIM
IGV	Public investment, FIM million
ITOT	Total fixed investment, millions of 1990 FIM
ITOTV	Total fixed investment, FIM million
IV	Private fixed investment, FIM million
PCG	Public consumption prices, 1990=100
PGDPG	Value-added deflator for general government, 1990=100
PI	Private investment prices, 1990=100
PIF	Private non-residential investment prices, 1990=100
PIG	General government investment prices, 1990=100
PITOT	Investment prices, 1990=100

Post Recursive Inflation Indecies:

P.49 Indicator of underlying inflation, input output estimate

$$PUIIO = .2049*PD1 + .5137*P20 + .1258*PGDP21 + .1556*PMCN$$

P.50 Indicator of underlying inflation

$$\Delta PUI = \Delta PUIIO$$

P.51 Index of housing costs in private consumption

$$PHCOST = \underset{(.0522)}{.85103}*((1/3)*RLB + (2/3)*RLB_{-1})*LBH_{-1}/C$$
$$+ D109501*\underset{(.0202)}{.66226}*PHM_{-2}$$
$$+ (1 - D109501)*\underset{(.0202)}{.66226}*PHM_{-1}$$

Method of estimation = Ordinary Least Squares
Estimation period = 1988Q1–1994Q4
$R^2 = .987$
DW = .515
SE = 2.06569

P.52 Net price index

$$PNET = .904*PUI + .096*PHCOST$$

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

$$
\begin{aligned}
TIVC = {} & (TSR/17) * [DVAT345 * (CV - GDPV21) \\
& + .01 * DVAT1 * (.2384 * PD1 + .2442 * P20 + .1622 * PMRN) \\
& \quad * GDP1/.3552 \\
& + .01 * DVAT2 * (.1166 * PD1 + .2977 * P20 + .0504 * PMRN) \\
& \quad * GDP2/.5353] \\
& - (1 - D1095Q1) * 840 + DTIOV345 * (CV - GDPV21)
\end{aligned}
$$

P.54 Subsidies in private consumption

$$SUBC = DSUB345*(CV-GDPV21) + 1870 + D1095Q1*840$$

P.55 Tax tarif index, indirect taxes

$$PTAX = (100/.24467)*TIVC/C$$

P.56 Tax tarif index, subsidies

$$PSUB = (100/.03930)*SUBC/C$$

P.57 Tax tarif index, net

$$PTARIF = (.2743*PTAX - .0440*PSUB)/.2303$$

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 = –.0065)
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
GDP1	Production at factor cost, manufacturin, 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 = .531)
PSUB	Tax tarif index, subsidies, 1990=100
PTARIF	Tax tarif index, net, 1990=100
PTAX	Tax tarif index, indirect taxes, 1990=100
SUBC	Subsidies in private consumption, FIM million
TIVC	Sales taxes in private consumption, FIM million
TSR	Sales tax rate, %

P.58 Consumer price index

CPI = .7696*PNET + .2303*PTARIF

P.59 Harmonized consumer price index

CPIH = 100*(CPI – .08*PHCOST – .09*PCG)/97.63066

CPI	Consumer price index, 1990=100
CPIH	EU harmonised consumer price index, 1996=100, Finland
PCG	Public consumption prices, 1990=100
PHCOST	Index of housing costs in private consumption, 1990=100
PNET	Net price index, 1990=100
PTARIF	Tax tarif index, net, 1990=100

3.10 Incomes (Y)

Y.1 Consumption of fixed capital, manufacturing

$$CCV1 = 0.91764*CCR1*KF1_{-1}*PIF1/100$$

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

$$CCV2 = 1.38259*CCR2*KF2_{-1}*PIF2/100$$

Y.3 Consumption of fixed capital, housing sector

$$CCV21 = 1.05124*CCRH*KH_{-1}*PIH/100$$

Y.4 Consumption of fixed capital, central government sector

$$\log CCVCG = \underset{(.0678)}{-1.04264} + \underset{(.0107)}{1.07273}* \log(CCRCG * KFCG_{-1} * PICG/100)$$

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

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
CCV1	Consumption of fixed capital, manufacturing, FIM million
CCV2	Consumption of fixed capital, non-manufacturing private sector, FIM million
CCV21	Consumption of fixed capital, letting of own property, FIM million
CCVCG	Consumption of fixed capital, central government, FIM million
KF1	Net stock of fixed capital, manufacturing, millions of 1990 FIM
KF2	Net stock of fixed capital, non-manufacturing private sector, millions of 1990 FIM
KFCG	Net stock of fixed capital, central govt, millions of 1990 FIM
KH	Net stock of priv. residential capital, net, millions of 1990 FIM
PICG	Central government investment prices, 1990=100
PIF1	Fixed investment prices, manufacturing, 1990=100
PIF2	Fixed investment prices, non-manufacturing private sector, 1990=100
PIH	Residential construction prices, 1990=100

Y.5 Consumption of fixed capital, local government sector

$$\log CCVLG = \underset{(.0247)}{-.31515} + \underset{(.0038)}{1.03354} * \log(CCRLG * KFLG_{-1} * PILG/100)$$

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

$$CCVS = CCRS * KFS_{-1} * PISOS/100$$

Y.7 Consumption of fixed capital, general government sector

$$CCVG = CCVCG + CCVLG + CCVS$$

Y.8 Consumption of fixed capital, household sector

$$\log(CCVH * 100/(PIH * CCRH * KH_{-1})) = \underset{(.0791)}{-.66781} + \underset{(.0092)}{.92054} * \log(CCR2 * KF2_{-1} * PIF2/100)$$

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

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

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

$$YW1 = WAR1*LHW1$$

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

$$YW2 = WAR2*LHW2$$

Y.13 Wages and salaries, central government sector

$$YWCG = WARG*.0115*(GDPCG-CCRCG*KFCG_{-1})$$

Y.14 Wages and salaries, social security funds

$$YWS = WARG*.0115*(GDPS-CCRS*KFS_{-1})$$

CCRCG	Capital consumption rate, central government
CCRS	Capital consumption rate, social security funds
CCV1	Consumption of fixed capital, manufacturing, FIM million
CCV2	Consumption of fixed capital, non-manufacturing private sector, FIM million
CCV8	Consumption of fixed capital, private sector, FIM million
CCVG	Consumption of fixed capital, public sector, FIM million
CCVT	Consumption of fixed capital, FIM million
GDPCG	Production at factor cost, central government, millions of 1990 FIM
GDPS	Production at factor cost, social security funds, millions of 1990 FIM
KFCG	Net stock of fixed capital, central govt, millions of 1990 FIM
KFS	Net stock of fixed capital, social security funds, millions of 1990 FIM
LHW1	Performed working hours, manufacturing, employees, mills of hours
LHW2	Performed working hours, non-manufacturing private sector, employees, mills of hours
WAR1	Average wage, manufacturing, FIM/h
WAR2	Average wage, non-manufacturing private sector, FIM/h
WARG	Average wage, public sector, FIM/h
YW1	Wages and salaries, manufacturing, FIM million
YW2	Wages and salaries, non-manufacturing private sector, FIM million
YWCG	Wages and salaries, central government, FIM million
YWS	Wages and salaries, social security funds, FIM million

Y.15 Wages and salaries, local government sector

$$YWLG = WARG^{*}.0115^{*}(GDPLG - CCRLG^{*}KFLG_{-1})$$

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

$$SOCR2 = SOCSPR + SOCUR + .72^{*}SOCTELR + .28^{*}SOCLELR + SOCOR2$$

Y.20 Employers' social security contribution rate, private sector

$$SOCR8 = (SOC1 + SOC2)/(YW1 + YW2)$$

CCRLG	Capital consumption rate, local government
GDPLG	Production at factor cost, local govt, mills of 1990 FIM
KFLG	Net stock of fixed capital, local government, millions of 1990 FIM
SOC1	Entrepreneurs' social security contributions, manufacturing, FIM million
SOC2	Entrepreneurs' social security contrib., non-manufact. priv. sector, FIM million
SOCLELR	Entrepreneurs' contribution rate for temp. employee pension scheme
SOCOR1	Entrepreneurs' other social security contribution rate, manufacturing
SOCOR2	Entrepreneurs' other social security contrib. rate, non-manufact. private sector
SOCR1	Entrepreneurs' social security contribution rate, manufacturing
SOCR2	Entrepreneurs' social security contrib. rate, non-manufacturing private sector
SOCR8	Entrepreneurs' social security contribution rate, private sector
SOCSPR	Entrepreneurs' nat. pension & sickness ins. contrib. rate, priv. sector, FIM mill.
SOCTELR	Entrepreneurs' contribution rate for employee pension schemes
SOCUR	Entrepreneurs' unemployment insurance rate
WARG	Average wage, public sector, FIM/h
YW	Wages and salaries, total, FIM million
YW1	Wages and salaries, manufacturing, FIM million
YW2	Wages and salaries, non-manufacturing private sector, FIM million
YWCG	Wages and salaries, central government, FIM million
YWG	Wages and salaries, general government, FIM million
YWLG	Wages and salaries, local government, FIM million
YWS	Wages and salaries, social security funds, FIM million

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 = SOCR1*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

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
SOCORCG	Entrepreneurs' other social security contribution rate, central government
SOCORLG	Entrepreneurs' other social security contribution rate, local government
SOCORS	Entrepreneurs' other social security contribution rate, social security funds
SOCR1	Entrepreneurs' social security contribution rate, manufacturing
SOCR2	Entrepreneurs' social security contrib. rate, non-manufacturing private sector
SOCRCG	Entrepreneurs' social security contribution rate, central government
SOCRLG	Entrepreneurs' social security contribution rate, local government
SOCRS	Entrepreneurs' social security contribution rate, social security funds
SOCSGR	Entrepreneurs' nat. pension & sickness ins. contribution rate, general government, FIM million
SOCUR	Entrepreneurs' unemployment insurance rate
YW1	Wages and salaries, manufacturing, FIM million
YW2	Wages and salaries, non-manufacturing private sector, FIM million
YWCG	Wages and salaries, central government, FIM million
YWLG	Wages and salaries, local government, FIM million
YWS	Wages and salaries, social security funds, FIM million

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

$$YNOI1 = YNW1 - CCV1 - \underset{(.0378)}{.30137} * TIOCG + \underset{(.0163)}{.2118} * SUBOCG$$

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

$$YNOI2 = YNOI - YNOI1$$

Y.34 Net operating surplus, housing sector

$$\log YNOI21 = \underset{(.2326)}{-.13012} + \underset{(.0308)}{1.02348} * \log(GDPV21 - CCRH * KH_{-1} * PIH/100)$$

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
YNOI1	Net operating surplus, manufacturing, FIM million
YNOI2	Net operating surplus, non-manufacturing private sector, FIM million
YNOI21	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

$$YNOIH = YNOI21 + (YNOIH_{-1} - YNOI21_{-1}) * (.60382 * ((YNOI - YNOI21)/(YNOI_{-1} - YNOI21_{-1})) + (1 - .60382))$$

Estimated form:

$$\Delta \log\left(\frac{YNOIH - YNOI21}{YNOI - YNOI21}\right) = \underset{(.2623)}{.7895} - \underset{(.0770)}{.24678} * \log(YNOIH_{-1} - YNOI21_{-1}) + \underset{(.0556)}{.14901} * \log(YNOI_{-1} - YNOI21_{-1}) + \underset{(.2723)}{.48902} * \Delta_5 \log\left(\frac{GDP2_{-1} - GDP21_{-1} + GDP1_{-1}}{GDP1T_{-1} + GDP2T_{-1}}\right)$$

Method of estimation = Ordinary Least Squares
Estimation period = 1975Q1–1995Q4
R^2 = .100
DW = 1.930
SE = .07608

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

$$YNOIC = YNOI - YNOIH$$

Y.38 Net investment income from abroad (SNA)

$$\Delta YFINNA = \Delta YFIN$$

GDP1	Production at factor cost, manufacturing, millions of 1990 FIM
GDP1T	The normal level of production with existing inputs, manufacturing, mills of 1990 FIM
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
GDP2T	The normal level of production with existing inputs, non-manufacturing private sector (excl. letting of own property), millions of 1990 FIM
YFIN	Investment income from abroad, net, FIM million
YFINNA	Net investment income from abroad (SNA), FIM million
YNOI	Net operating surplus, total (domestic), FIM million
YNOI21	Net operating surplus, housing sector, FIM million
YNOIC	Net operating surplus, corporate sector, FIM million
YNOIH	Net operating surplus, households, FIM million

Y.39 National Income

$$Y = GDPV + YFINNA - CCVT + SUBEU$$

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

$$YFTRNA = YFTR + YFIN - YFINNA - SUBEU$$

Y.41 Disposable income of the national economy

$$YDTOT = Y + YFTRNA$$

CCVT	Consumption of fixed capital, FIM million
GDPV	GDP in purchasers' values, FIM million
SUBEU	Indirect taxes from the rest of the world, net, FIM million
Y	National income, FIM million
YDTOT	Disposable income, total, FIM million
YFIN	Investment income from abroad, net, FIM million
YFINNA	Net investment income from abroad (SNA), FIM million
YFTR	Income transfers from abroad, net, FIM million
YFTRNA	Income transfers from abroad, net (SNA), FIM million

3.11 Incomes and outlays of corporates (CO)

CO.1 Interest income, firms

$$YIC = \underset{(.0252)}{.68857} * YIH + \underset{(.1767)}{.72995} * .0025 * RS * (MON3_{-1} - MON2_{-1})$$

Method of estimation = Ordinary Least Squares
Estimation period = 1975Q1–1995Q4
R^2 = .962
DW = .112
SE = 314.79

CO.2 Interest income, manufacturing

$$YIC1/YIC1_{-4} = YIC/YIC_{-4}$$

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

$$\begin{aligned}\Delta EIC1 = {} & .21255^{*}\,\Delta EIC1_{-1} \\ & \underset{(.0971)}{} \\ & +.75565^{*}(.0025^{*}[\Delta(RLB^{*}LCD1_{-1}) \\ & \underset{(.0768)}{} \\ & +\Delta(RFOR^{*}LCF1_{-1})]) \\ & -.41605^{*}(.0025^{*}[\Delta(RLB_{-1}^{*}LCD1_{-2}) \\ & \underset{(.1278)}{} \\ & +\Delta(RFOR_{-1}^{*}LCF1_{-2})]) \\ & -.33647^{*}(EIC1_{-1}-1.23032^{*}[.0025^{*}(RLB_{-1}^{*}LCD1_{-2} \\ & \underset{(.0552)}{} \\ & +RFOR_{-1}^{*}LCF1_{-2})]) \\ & +16.72197 \\ & \underset{(10.00)}{}\end{aligned}$$

Method of estimation = Ordinary Least Squares
Estimation period = 1977Q1–1994Q4
$R^2 = .811$
DW = 2.221
SE = 81.34

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

$$\begin{aligned}\Delta EIC2 = {} & .37864^{*}\,\Delta EIC2_{-1} \\ & \underset{(.1194)}{} \\ & +1.00010^{*}(.0025^{*}[\Delta(RLB^{*}LCD2_{-1})+\Delta(RFOR^{*}LCF2_{-1})]) \\ & \underset{(.0599)}{} \\ & -.55422^{*}(.0025^{*}[\Delta(RLB_{-1}^{*}LCD2_{-2}) \\ & \underset{(.1286)}{} \\ & +\Delta(RFOR_{-1}^{*}LCF2_{-2})]) \\ & -06311^{*}(EIC2_{-1}-1.16208^{*}[.0025^{*}(RLB_{-1}^{*}LCD2_{-2} \\ & \underset{(.0230)}{} \\ & +RFOR_{-1}^{*}LCF2_{-2})]) \\ & +35.41593 \\ & \underset{(12.00)}{}\end{aligned}$$

Method of estimation = Ordinary Least Squares
Estimation period = 1977Q1–1994Q4
$R^2 = .861$
DW = 1.913
SE = 86.30

EIC1	Interest expenditure, manufacturing, FIM million
EIC2	Interest expenditure, non-manufacturing private 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
LCF1	Private foreign currency denominated loan stock, manufacturing, FIM million
LCF2	Private foreign currency denominated loan stock, non-manufacturing private sector, FIM million
RFOR	Foreign interest rate, 3 month commercial ECU (1991Q3 onwards) per cent
RLB	Bank lending rate, per cent

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)

$$\Delta FCN = \Delta YDC + \Delta CCV8 - \Delta IFV - \Delta(0.01*PIF*II)$$

CO.9 Cash flow, manufacturing

$$CFB1 = YNOI1 - TYC1R*TYC - EIC1 + YIC1 + CCV1$$

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

$$CFB2 = YNOIC - YNOI1 - EIC2 + YIC2 - (1 - TYC1R) * TYC + CCV2 - CCV21$$

CCV1	Consumption of fixed capital, manufacturing, FIM million
CCV2	Consumption of fixed capital, non-manufacturing private sector, FIM million
CCV21	Consumption of fixed capital, letting of own property, FIM million
CCV8	Consumption of fixed capital, private sector, FIM million
CFB1	Cash flow, manufacturing, FIM million
CFB2	Cash flow, non-manufacturing private sector, FIM million
EIC	Interest expenditure, corporate sector, FIM million
EIC1	Interest expenditure, manufacturing, FIM million
EIC2	Interest expenditure, non-manufacturing private sector, FIM million
FCN	Net lending by corporate sector, FIM million
IFV	Private non-residential investment, FIM million
II	Change in inventories, millions of 1990 FIM
PIF	Private non-residential investment prices, 1990=100
TYC	Corporate tax revenue, FIM million
TYC1R	Corporate tax rate in central government taxation, manufacturing
YDC	Disposable income of corporate sector, FIM million
YIC	Interest income of enterprises, FIM million
YIC1	Interest income of manufacturing, FIM million
YIC2	Interest income of non-manufacturing private sector, FIM million
YNOI1	Net operating surplus, manufacturing, FIM million
YNOIC	Net operating surplus, corporate sector, FIM million

CO.11 Private foreign currency denominated loan stock, manufacturing

$$LCF1 = LCF1_{-1} * FXTW/FXTW_{-1} + .7*(FMPN - FEXP)$$

CO.12 Private foreign currency denominated loan stock, services

$$LCF2 = LCF2_{-1} * FXTW/FXTW_{-1} + .3*(FMPN - FEXP)$$

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

$$LCD1 = LCD_{-1} - LCD2 - \Delta LCF - FCN$$

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

$$\Delta LCD2 = -\Delta LCF2 + IFV2 - CFB2 + \underset{(.4393)}{.81436} * PIF * II/100 - \underset{(828.48)}{3608.641}$$

Method of estimation = Ordinary Least Squares
Estimation period = 1985Q1–1994Q4
$R^2 = .059$
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 priv. 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

$$LCD = LCD1 + LCD2$$

LCD	Domestic currency denominated stock of loans of the non-banking priv. 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

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

$$YSE/YSE_{-1} = 1.2974*YNOIH/YNOIH_{-1}$$

Estimated from:

$$\log YSE = \underset{(.4354)}{-5.97925} + \underset{(.0476)}{1.2974}* \log YNOIH$$

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

H.3 Interest income, households

$$YIH = \underset{(.0136)}{.77231}*.0025 * RLB * (MON2_{-1} - CURNB_{-1}) - \underset{(61.7702)}{161.7762}$$

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

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

H.4 Interest outlays, households

$$EIH = \underset{(.0213)}{1.10003} * .0025 * RLB * LBH_{-1} + \underset{(.1109)}{.59589} * .0025 * RLB * LCGH_{-1}$$

Method of estimation = Ordinary Least Squares
Estimation period = 1971Q1–1994Q4
$R^2 = .997$
DW = .810
SE = 146.53

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

$$\Delta \log\left(\frac{YOHN}{GDPV}\right) = \underset{(.0949)}{+.80508} * \Delta \log(YOHN_{-1} / GDPV_{-1}) - \underset{(.0967)}{.14742} * \Delta \log(YOHN_{-2} / GDPV_{-2}) - \underset{(.0456)}{.11626} * (ZYOHN_{-1} - ZYOHN_{-2}) - \underset{(.0220)}{.07659} * (\log(YOHN_{-1} / GDPV_{-1}) - ZYOHN))$$

Method of estimation = Ordinary Least Squares
Estimation period = 1971Q1–1994Q4
$R^2 = .523$
DW = 2.059
SE = .03608

where

$$ZYOHN = \underset{(.1561)}{-7.77129} - \underset{(.0840)}{1.29346} * \log(IFV / GDPV) + \underset{(.0935)}{1.37503} * \log(PHMR)$$

Method of estimation = Ordinary Least Squares
Estimation period = 1970Q1–1994Q4
$R^2 = .780$
DW = .285
SE = .1722

EIH	Interest expenditure, households, FIM million
GDPV	GDP in purchasers' values, FIM million
IFV	Private non-residential investment, FIM million
LBH	Bank loans to the households, FIM million
LCGH	Stock of central government housing loans, FIM million
PHMR	Real house price index, all dwellings, entire country, 1990=100
RLB	Bank lending rate, per cent
YOHN	Dividend and rest of property income of the household sector, FIM million

H.6 Entrepreneurial and property income of the household sector

$$YINH = YSE + YIH - EIH + YOHN$$

H.7 Other transfers received by households

$$YTRHO = TRHGOV + (YTRHO_{-1} - TRHGOV_{-1} + YTRHO_{-2} - TRHGOV_{-2} + YTRHO_{-3} - TRHGOV_{-3} + YTRHO_{-4} - TRHGOV_{-4})/4$$

H.8 Transfer income of households received from other sectors

$$YTRH = TRCGH + TRLGH + TRSHV + YTRHO$$

H.9 Transfers of households to other sectors

$$TRHGTOT = TYP + SOC + SOL + TOCG + TOLG + TRHGOV$$

H.10 Household disposable income

$$YD = YFIH + YINH + YTRH - TRHGTOT$$

EIH	Interest expenditure, households, FIM million
SOC	Entrepreneurs' social security contributions, total, FIM million
SOL	Social security payments by employees and pensioners, total, FIM million
TOCG	Central government compulsory fees, fines and penalties, FIM million
TOLG	Local government compulsory fees, fines and penalties, FIM million
TRCGH	Central government transfers to households, FIM million
TRHGOV	Households other requited current transfers, FIM million
TRHGTOT	Households expenditure on unrequited current transfers, FIM million
TRLGH	Local government transfers to households, FIM million
TRSHV	Social security funds current transfers to households, FIM million
TYP	Central and local government revenue direct taxes on households, FIM million
YD	Household disposable income, FIM million
YFIH	Factor incomes by households, FIM million
YIH	Interest income of households, FIM million
YINH	Entrepreneurial and property income of the household sector, FIM million
YOHN	Dividend and rest of property income of the household sector, FIM million
YSE	Entrepreneurial income of households, FIM million
YTRH	Transfer income of households received from other sectors, FIM million
YTRHO	Other transfers received by households, FIM million

H.11 Fixed investment of the household sector, value

$$IHTV = IHV + \underset{(.0353)}{(.942201} * (IHTV_{-1} - IHV_{-1}) / IFV_{-1}) + \underset{(.0059)}{.00912)} * IFV$$

Method of estimation = Ordinary Least Squares
Estimation period = 1970Q1–1994Q4
R^2 = .878
DW = 1.968
SE = .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

$$\Delta LBH = -FCGHN + FHNB + \underset{(.0922)}{.83895} * \Delta MON2 + \underset{(1320)}{1328.9/4}$$

Method of estimation = Ordinary Least Squares
Estimation period = 1971–1994
R^2 = .780
DW = 1.202
SE = 4058.7

CAPH	Capital consumption, households, FIM million
CCVH	Consumption of fixed capital, households, FIM million
CV	Private consumption, FIM million
FCGHN	Central government housing loans, net change, FIM million
FHN	Net lending by households, FIM million
FHNB	Net lending by households, flow of funds, FIM million
IFV	Private non-residential investment, FIM million
IHTV	Gross fixed capital formation, households, FIM million
IHV	Residential contruction, FIM million
LBH	Bank loans to the households, FIM million
MON2	Monetary aggregate M2, FIM million
YD	Household disposable income, FIM million

3.13 Incomes and outlays of public sector (G)

G.1 Taxable earned income of households

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

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

$$YTAXCG = TDEDCG * YTAXABLE - SOLTEL$$

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

$$ATAXCG = \underset{(.0325)}{1.03339} * TYU + \underset{(.2270)}{9.08646} * TYS + \underset{(.0358)}{.82758} * TYS * \log(YTAXCG/LFS)$$

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

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

G.4 Average income tax-rate of wage and salary earners, total

$$ATAX = ATAXCG + TLGR + SOLNR + (1 - ATAXCG) * (SOLTELR + SOLUR)$$

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

$$MTAXCG = ATAXCG + .82758*TYS$$

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

$$MTAX = MTAXCG + TLGR + SOLNR + (1 - ATAXCG) * (SOLTELR + SOLUR)$$

G.7 Assessed income tax liability of households

$$TYPL = ATAXCG*YTAXCG + TLGR*YTAXLG$$

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

$$TYPCAP = .8513*TYCR*YCAPTX$$

where

$$YCAPTX = YNOIH + YSE + YOHN - YNOI21 - EIH$$

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

G.10 Tax payments at source on interest income

$$TYPI = DTYPI*TYCR*RDT*(MON2_{-1} - CURNB_{-1})/400$$

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

$$\Delta SOLN = \underset{(.0933)}{1.24192}* \Delta[SOLNR * YW + SOLNPR * (TRCGPV + TRLGPV + TRPPV + TRNHV)]$$

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

CURNB	Currency in circulation, public, FIM million
DTYPI	Dummy for tax payments at source on interest income (share of taxable deposits 94.1–)
DTYPLOAN	Dummy for obligatory central government loan from taxpayers (1993–1995)
MON2	Monetary aggregate M2, FIM million
RDT	Interest rate, time deposits, per cent
SOLN	Insured persons national pension and sickness insurance contributions, FIM mill.
SOLNPR	Old age, invalidity and unemployment pensioners social security contrib. rate
SOLNR	Insured persons' nat. pension & sickness ins. contribution rate
TRCGPV	Central government pension insurance, FIM million
TRLGPV	Local government pension insurance, FIM million
TRNHV	Social insurance instit. expenditure on nat. pension and sickness insurance, FIM million
TRPPV	Private sector pension insurance, FIM million
TYCR	Corporate tax rate in central government taxation
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
TYPS	Central and local govt revenue from subsequently collected direct taxes on households, FIM million
TYPSA	Central and local govt revenue from subsequently collected direct taxes (arrears) on households, FIM millions
TYPW	Advance income tax payments of households, FIM million
YW	Wages and salaries, total, FIM million

G.14 Employees' TEL-pension and unemployment insurance contributions

$$\Delta SOLTEL = \underset{(.0211)}{.79708} * \Delta[(SOLTELR + SOLUR) * YW]$$

Method of estimation = Ordinary Least Squares
Estimation period = 1993Q1–1994Q4
R^2 = .957
DW = 1.889
SE = 38.77

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

$$SOLVS/SOLVS_{-1} = YW/YW_{-1}$$

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

$$SOLS = SOLVS + SOLTEL + SOLN$$

G.17 Central government employees' pension insurance contributions

$$SOLCG = 1.78*SOLTELR*YWCG$$

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

$$SOL = SOLS + SOLCG$$

G.19 Tax base of corporate taxation

$$YTYC = TDEDTYC*(YNW - YNWG - CCV1 - CCV2 - EIC + YIC)$$

CCV1	Consumption of fixed capital, manufacturing, FIM million
CCV2	Consumption of fixed capital, non-manufacturing private sector, FIM million
EIC	Interest expenditure, corporate sector, FIM million
SOL	Social security payments by employees and pensioners, total, FIM million
SOLCG	Central government employees' pensions insurance contribution, FIM million
SOLN	Insured persons national pension and sickness insurance contributions, FIM mill.
SOLS	Social security payments by employees to social security funds, FIM million
SOLTEL	Employees' TEL-pension and unemployment insurance contrib., FIM million
SOLTELR	Insured persons' employee pension schemes contribution rate
SOLUR	Insured persons' unemployment security contribution rate
SOLVS	Non-obligatory social security payments of employees, FIM million
TDEDTYC	Deductions in corporate taxation, per cent
YIC	Interest income of enterprises, FIM million
YNW	Gross operating surplus, total, FIM million
YNWG	Gross operating surplus, public sector, FIM million
YTYC	Tax base of corporate taxation, FIM million
YW	Wages and salaries, total, FIM million
YWCG	Wages and salaries, central government, FIM million

G.20 General government revenue from difect taxes on corporate entities

$$\begin{aligned} TYC = & \underset{(.0108)}{.80564}*(\Delta_6 ZET + ZMT_{-6}) + \underset{(.0567)}{.17656}*\Delta_5 ZMT_{-1} \\ & + \underset{(.0721)}{.42132}*\Delta_4 ZMT_{-2} + \underset{(.0653)}{.18327}*\Delta_3 ZMT_{-3} \\ & + \underset{(.0710)}{.13107}*\Delta ZMT_{-5} - \underset{(.0397)}{.31608}*\Delta_6 ZET \\ & - \underset{(.0831)}{.13870}*\Delta_2 ZET_{-4} - \underset{(.1089)}{.28798}*\Delta ZET_{-5} \end{aligned}$$

where:

$ZET = (TYCR + D1093Q1*TLGR)*YTYC_{-8}$
$ZMT = (TYCR + D1093Q1*TLGR)*YTYC$

Method of estimation = Ordinary Least Squares
Estimation period = 1970Q1–1993Q4
$R^2 = .971$
DW = .597
SE = 128.37

D1093Q1	Dummy for a change in corporate taxation
TLGR	Average local government tax rate
TYC	Corporate tax revenue, FIM million
TYCR	Corporate tax rate in central government taxation
YTYC	Tax base of corporate taxation, FIM million

G.21 Tax base of value-added tax

$$
\begin{aligned}
TBVAT = {} & .01 * DVAT1 * (.2384 * PD1 + .2442 * P20 + .1622 * PMRN) \\
& * GDP1 / .3552 \\
& + .01 * DVAT2 * (.1166 * PD1 + .2977 * P20 + .0504 * PMRN) \\
& * GDP2 / .5353 \\
& + DVAT345 * (CV - GDPV21) \\
& + DVAT6 * (CCGV - .28 * GDPVG) \\
& + DVAT7 * (CLGV - .7 * GDPVG) \\
& + DVAT8 * (CSOSV - .02 * GDPVG) \\
& + (.17 * (.75 * TSR7 + .25 * TSR8) / TSR + DVAT9) * IFV1 \\
& + DVAT10 * (IFV + IGV) \\
& + DVAT12 * XGNV
\end{aligned}
$$

CCGV	Central government consumption, FIM million
CLGV	Local government consumption, FIM million CPI consumer price index, 1990=100
CSOSV	Social security funds consumption, FIM million
CV	Private consumption, FIM million
DVAT1	Dummy, share of value-added tax of prod., 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 prod., 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)
GDP1	Production at factor cost, manufacturing, millions of 1990 FIM
GDP2	Production at factor cost, non-manufacturing private sector, mills of 1990 FIM
GDPV21	Production at factor cost, letting of own property, FIM million
GDPVG	Production at factor cost, general govt., FIM million
IFV	Private non-residential investment, FIM million
IFV1	Private fixed investment, manufacturing, FIM million
IGV	Public investment, 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 = .531)
TBVAT	Tax base of value-added tax, FIM million
TSR	Sales tax rate, %
TSR7	Sales tax rate, industrial machinery and equipment, %
TSR8	Sales tax rate, industrial buildings, %
XGNV	Exports of goods, FIM million (SNA)

G.22 Central government revenue from value-added tax

$$\Delta \log(TSCG / TSR) = \underset{(.5002)}{-1.34757}$$
$$\underset{(.2515)}{+.80288^{*}\Delta_2 \log TBVAT}$$
$$\underset{(.1285)}{+.36341^{*}\log TBVAT_{-1}}$$
$$\underset{(.1112)}{-.31776^{*}\log(TSCG_{-1} / TSR_{-1})}$$
$$\underset{(.1064)}{-.38542^{*}\Delta\log(TSCG_{-1} / TSR_{-1})}$$

Method of estimation = Ordinary Least Squares
Estimation period = 1975Q1–1994Q4
R^2 = .366
DW = 2.146
SE = .06878

TBVAT	Tax base of value-added tax, FIM million
TSCG	Central government revenue from value-added tax, FIM million
TSR	Sales tax rate, %

G.23 Tax base of other commodity taxes

$$
\begin{aligned}
TBTIOV = {} & .01*DTIOV1*(.2384*PD1+.2442*P20 \\
& +.1622*PMRN)*GDP1/.3552 \\
& +.01*DTIOV2*(.1166*PD1+.2977*P20+.0504*PMRN) \\
& *GDP2/.5353 \\
& +DTIOV345*(CV-GDPV21) \\
& +DTIOV6*(CCGV-.28*GDPVG) \\
& +DTIOV7*(CLGV-.7*GDPVG) \\
& +DTIOV8*(CSOSV-.02*GDPVG) \\
& +DTIOV9*(IFV+IGV)
\end{aligned}
$$

G.24 General government revenue from other commodity taxes

$$TIOV = 1.01728*TIOVR*TBTIOV$$

CCGV	Central government consumption, FIM million
CLGV	Local government consumption, FIM million CPI consumer price index, 1990=100
CSOSV	Social security funds consumption, FIM million
CV	Private consumption, FIM million
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)
GDP1	Production at factor cost, manufacturing, millions of 1990 FIM
GDP2	Production at factor cost, non-manufacturing private sector, mills of 1990 FIM
GDPV21	Production at factor cost, letting of own property, FIM million
GDPVG	Production at factor cost, general govt., FIM million
IFV	Private non-residential investment, FIM million
IGV	Public investment, 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 = .531)
TBTIOV	Tax base of other commodity taxes, FIM million
TIOV	Other commodity taxes, FIM million
TIOVR	Effective tax rate, other commodity taxes, 1990=1

G.25 Central government revenue from other indirect taxes

$$TIOCG/TIOCG_{-1} = (GDPV1 + GDPV2)/(GDPV1_{-1} + GDPV2_{-1})$$

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

$$YSOCG/YSOCG_{-1} = SOC/SOC_{-1}$$

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

$$YTRCG = TICG + TYCG + TOCG + YSOCG + SOLCG + YTRCGO$$

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

$$YICG = \underset{(.0259)}{1.38409} * (RLB_{-2} * LCGH_{-3} + RDT * CASHCG_{-1}) / 400$$
$$\underset{(21.0217)}{-115.2916}$$

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

$$\begin{aligned}\Delta_4 GCGI = {} & \underset{(.1195)}{.16733} * (.0025 * RBTX * \Delta_4 LDCG_{-1} \\ & + .0025 * RFOR * \Delta_4 LFCG_{-1}) \\ & + \underset{(.1944)}{.45615} * (.0025 * RBTX_{-1} * \Delta_4 LDCG_{-2} \\ & + .0025 * RFOR_{-1} * \Delta_4 LFCG_{-2}) \\ & + (1 - \underset{(.1195)}{.16733} - \underset{(.1944)}{.45615}) * (.0025 * RBTX_{-2} * \Delta_4 LDCG_{-3} \\ & + .0025 * RFOR_{-2} * \Delta_4 LFCG_{-3})\end{aligned}$$

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

CASHCG	Central government cash position, FIM million
GCGI	Central government interest expenditure, FIM million
LCGH	Stock of central government housing loans, FIM millions
LDCG	Central government sector's domestic currency denominated debt, FIM million
LFCG	Foreign currency denominated central government debt, FIM million
RBTX	Taxable government bond yield, approx. 5 years, per cent
RDT	Interest rate, time deposits, per cent
RFOR	Foreign interest rate, 3 month commercial ECU (1991Q3 onwards), per cent
RLB	Bank lending rate, per cent
YCGTOT	Central government revenue, total, FIM million
YICG	Central government's property and entrepreneurial income, FIM million
YTRCG	Central government transfer-income from other sectors, total, FIM million

G.34 Pensions paid by the central government sector

$$TRCGPV = D1001Q1 * TRCGPV + (1 - D1001Q1) * [(TRCGPVDI + ((.8 * CPI_{-4} / CPI_{-8} + .2 * WR_{-4} / WR_{-8}) - 1)) * TRCGPV_{-4}]$$

G.35 Central government transfers to households

$$TRCGH = TRCGPV + TRCGHO$$

G.36 Unemployment compensations (basic daily allowances)

$$TRCGU = DTRURIND * \underset{(.1242)}{(.52805 * TRCGU_{-1}} + \underset{(.0021)}{.01242} * \Delta((WR + PCP) * LUS) + \underset{(.0034)}{.00956} * \Delta((WR_{-3} + PCP_{-3}) * LUS_{-3}) + \underset{(.0019)}{.00695} * ((WR_{-1} + PCP_{-1}) * LUS_{-1}) + (1 - DTRURIND) * LUS * ((TRCGU_{-1} + TRCGU_{-2}) / (LUS_{-1} + LUS_{-2}))$$

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

CPI	Consumer price index, 1990=100
D1001Q1	Dummy for pension expenditures
DTRURIND	Dummy, indexation of unemployment compensation, 1 = on, 0 = off
LUS	Unemployment (labour force survey), 1000 persons
PCP	Private consumption prices, 1990=100
TRCGH	Central government transfers to households, FIM million
TRCGHO	Central government other current transfers to households, FIM million
TRCGPV	Central government pension insurance, FIM million
TRCGPVDI	Central government pension insurance vol. index (C,R4), demography
TRCGU	Central government basic unemployment allowances, FIM million
WR	Wage rate, total, 1990=100

G.37 Central government outlays in financing unemployment compensations tied to the level of earnings

$$TRCGSU = TRCGUR * TRSU$$

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

$$TRCGS = TRCGU + TRCGSU + TRCGSO$$

G.39 Base for commodity subsidies

$$\begin{aligned} TBSUB = {} & .01 * DSUB1 * (.2384 * PD1 + .2442 * P20 + .1622 * PMRN) \\ & * GDP1 / .3552 \\ & + .01 * DSUB2 * (.1166 * PD1 + .2977 * P20 + .0504 * PMRN) \\ & * GDP2 / .5353 \\ & + DSUB345 * (CV - GDPV21) \\ & + DSUB6 * (CCGV - .28 * GDPVG) \\ & + DSUB7 * (CLGV - .7 * GDPVG) \\ & + DSUB8 * (CSOSV - .02 * GDPVG) \\ & + DSUB12 * XGNV \end{aligned}$$

CCGV	Central government consumption, FIM million
CLGV	Local gov. consumption, FIM million CPI consumer price index, 1990=100
CSOSV	Social security funds consumption, FIM million
CV	Private consumption, FIM million
DSUB1	Dummy, share of commodity subsidies of prod., 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 subs. of central gov. consumption, (–94.2 = .0027)
DSUB7	Dummy, share of commodity subs. of local gov. consumption (–94.2 = .0057)
DSUB8	Dummy, share of commodity subsidies of consumption, social security funds, (–94.2 = .0009)
GDP1	Production at factor cost, manufacturing, millions of 1990 FIM
GDP2	Production at factor cost, non-manufacturing private sector, mills of 1990 FIM
GDPV21	Production at factor cost, letting of own property, mills of 1990 FIM
GDPVG	Production at factor cost, general govt, FIM million
P20	Production prices in non-manufacturing private sector excl. lettin 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 = .531)
TBSUB	Commodity subsidies, FIM million
TRCGU	Central government basic unemployment allowances, FIM million
TRCGS	Central government transfers to the social security funds, FIM million
TRCGSO	Central government other current transfers to social sec. funds, FIM million
TRCGSU	Central govt. unemployment allowances based on previous earnings, FIM mill.
TRCGUR	Central government contribution rate in unemployment benefits, FIM million
TRSU	Unemployment compensations tied to the level of earnerd income, FIM million
XGNV	Exports of goods, FIM million (SNA)

G.40 Commodity subsidity rate

$$SUBR = SUB/(1.06797*TBSUB)$$

G.41 Commodity subsidies of the central government

$$SUBCG = SUB - SUBLG$$

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

$$TRCGTOT = SUBCG + SUBOCG + TRCGH + TRCGL + TRCGS + TRCGF$$

G.43 Disposable income of the central government

$$YDCG = YCGTOT - GCGI - TRCGTOT$$

G.44 Net lending of the central government

$$FCGN = YDCG + CCVCG + CAPCG - CCGV - ICGV$$

G.45 Central government outlays (SNA), total

$$GCGTOTV = YCGTOT - FCGN$$

CAPCG	Capital consumption, central government, FIM million
CCGV	Central government consumption, FIM million
CCVCG	Consumption of fixed capital, central government, FIM million
FCGN	Central government net lending, FIM million
GCGI	Central government interest expenditure, FIM million
GCGTOTV	Central government expenditure (SNA), FIM million
ICGV	Central government investment (excl. enterprises), FIM million
SUB	Commodity subsidies, FIM million
SUBCG	Central government subsidies, FIM million
SUBLG	Local government subsidies, FIM million
SUBOCG	Central government other subsidies, FIM million
SUBR	Effective tax rate, commodity subsidies, 1990=1
TBSUB	Commodity subsidies, FIM million
TRCGH	Central government transfers to households, FIM million
TRCGL	Central government transfers to local government, FIM million
TRCGS	Central government transfers to the social security funds, FIM million
TRCGTOT	Central government transfer outlays to other sectors, total, FIM million
YCGTOT	Central government revenue, total, FIM million
YDCG	Central government disposable income, FIM million

G.46 Central government revenue surplus

$$FCGCASH = FCGN + FCGCASHO$$

G.47 Central government housing loans, redemptions

$$FCGHB = \underset{(.0004)}{.01231} * LCGH_{-1}$$

Method of estimation = Ordinary Least Squares
Estimation period = 1961Q1–1993Q4
$R^2 = .811$
DW = 1.366
SE = 73.26

G.48 Central government housing loans, net change

$$FCGHN = FCGH - FCGHB$$

G.49 Stock of central government housing loans

$$\Delta LCGH = FCGHN$$

G.50 Central government financial investment, net

$$FCGFIN = (-1)*(FCGHN + FCGSUP + FCGFION)$$

G.51 Central government net financing requirement (–)

$$FCGNBR = FCGCASH + FCGFIN$$

FCGCASH	Central government deficit before financial transactions (cash basis) FIM million
FCGCASHO	Central government deficit before financial transactions (SNA-CASH-discrepancy), FIM million
FCGFIN	Central government financial investment, net (cash basis), FIM million
FCGFION	Central government other financial investment, net (cash basis), FIM million
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 government capital support to banks, FIM million
LCGH	Stock of central government housing loans, FIM million

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

$$LFCG = (FXTW/FXTW_{-1})*LFCG_{-1} + FFCG$$

G.54 Central government gorss 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

$$YTAXLG = TDEDLG*YTAXABLE$$

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

$$TYLG = \underset{(.0364)}{.98910} * (TLGR * YTAXLG) + \underset{(.2027)}{.42778} * D0190Q1 * TYC + \underset{(.2255)}{.63555} * (1 - D0190Q1) * TYC$$

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

$$YILG = RLB / 400 * (\underset{(.1379)}{1.79400} * CLGV - \underset{(4.2974)}{1.21701})$$

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

G.60 Local government revenue, total

$$YLGTOT = YILG + YTRLG$$

CLGV	Local government consumption, FIM million CPI Consumer price index, 1990=100
D0190Q1	Dummy for local government revenue from corporate taxes
RLB	Bank lending rate, per cent
TLGR	Average local government tax rate
TOLG	Local government compulsory fees, fines and penalties, FIM million
TRCGL	Central government transfers to local government, FIM million
TYC	Corporate tax revenue, FIM million
TYLG	Local government revenue from direct taxes, FIM million
YILG	Interest (etc.) income of the local government sector, FIM million
YLGTOT	Local government revenue, FIM million
YOLG	Local government other requited current transfers, FIM million
YTAXLG	Tax base of households (taxable income less deductions) in local government taxation, FIM million
YTRLG	Transfer income, total, local government, FIM million

G.61 Commodity subsidies, local government

$$SUBLG/SUBLG_{-1} = TBSUB/TBSUB_{-1}$$

G.62 Local government outlays, total

$$TRLGTOT = SUBLG + TRLGH + TRLGS + TRLGO$$

G.63 Interest outlays and insurance payments of local government

$$GILG = \underset{(0.0437)}{0.28570} * .0025 * \Delta_4 (RLB * LLGN_{-1}) + \underset{(0.0168)}{1.20193} * (.0025 * RLB_{-4} * LLGN_{-5}) + \underset{(6.7304)}{53.59838}$$

Method of estimation = Ordinary Least Squares
Estimation period = 1977Q1–1994Q4
R^2 = .987
DW = .323
SE = 31.91

G.64 Disposable income of local government

$$YDLG = YLGTOT - GILG - TRLGTOT$$

GILG	Requited current transfers, local government, FIM million
LLGN	Local government debt (consolidated; ESA defin.), FIM million
RLB	Bank lending rate, per cent
SUBLG	Local government subsidies, FIM million
TBSUB	Commodity subsidies, FIM million
TRLGH	Local government transfers to households, FIM million
TRLGO	Local government other current transfers, FIM million
TRLGS	Local government current transfers to social security funds, FIM million
TRLGTOT	Local government expenditure on unrequited current transfers, FIM million
YDLG	Disposable income of local government, FIM million
YLGTOT	Local government revenue, FIM million

G.65 Local government consumption, volume

$$\Delta CLG = \underset{(.0623)}{.3814} * \Delta CLG_{-1} - \underset{(.0359)}{.06126} * ZCLG_{-1}$$

Method of estimation = Ordinary Least Squares
Estimation period = 1980Q1–1994Q4
$R^2 = .305$
DW = 2.112
SE = 146.32

where

$$ZCLG = CLG - 100 * \left[\underset{(.0735)}{.7537} * (TYLG - SUBLG) + \underset{(.0985)}{1.03004} * TRCGL \right] / PCLG$$

Method of estimation = Ordinary Least Squares
$R^2 = .903$
DW = .250
SE = .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

$$SOCS/SOCS_{-1} = (SOC - YSOCG)/(SOC_{-1} - YSOCG_{-1})$$

G.69 Transfer incomes of social security funds

$$YTRS = SOCS + SOLS + TRCGS + TRLGS + YTRSO$$

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

$$TRSU = DTRURIND * ((WR_{-1} / WR_{-2}) * (LUS/LUS_{-1}) * TRSU_{-1}) + (1 - DTRURIND) * (LUS/LUS_{-1}) * TRSU_{-1}$$

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

$$TRPPV = D1001Q1 * TRPPV + (1 - D1001Q1) * [(TRPPVDI + ((.8 * CPI_{-4} / CPI_{-8} + .2 * WR_{-4} / WR_{-8}) - 1)) * TRPPV_{-4}]$$

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

$$TRLGPV = D1001Q1 * TRLGPV + (1 - D1001Q1) * [(TRLGPVDI + ((.8 * CPI_{-4} / CPI_{-8} + .2 * WR_{-4} / WR_{-8}) - 1)) * TRLGPV_{-4}]$$

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

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

$$\Delta YIS = \Delta YIS_{-1} \underset{(.0542)}{-.20597} * \Delta YIS_{-2} \underset{(.0447)}{+.13993} * (.0025 * RLB * FSN) \underset{(.0207)}{+.05194} * YIS_{-1} * \Delta RLB / RLB_{-1}$$

Method of estimation = Ordinary Least Squares
Estimation period = 1975Q1–1994Q4
$R^2 = .142$
DW = 1.920
SE = 16.36

G.76 Interest outlays of social security funds

$$GIS = .0025*RLB*LSOSN_{-1}$$

G.77 Net interest income of social security funds

$$YINS = YIS - GIS$$

FSN	Net lending by social security funds, FIM million
GIS	Requited current transfers, social security funds, FIM million
LSOSN	Social security funds debt, FIM million
RLB	Bank lending rate, per cent
TRCGU	Central government basic unemployment allowances, FIM million
TRLGPV	Local government pension insurance, FIM million
TRNHOV	Households other compensation from the social insurance instit., FIM million
TRNHV	Social insurance instit. expenditure on nat. pension and sickness ins., FIM mill.
TRPPV	Private sector pension insurance, FIM million
TRSHOV	Social security funds other current transfers to households, FIM million
TRSHV	Social security funds current transfers to households, FIM million
TRSOV	Social security funds other current transfers, FIM million
TRSTOT	Total transfers to other sectors by social security funds, FIM million
TRSU	Unemployment compensations tied to the level of earned income, FIM million
YINS	Net interest income of social security funds, FIM million
YIS	Interest income of social security funds, FIM million

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

$$YDBANK = YDTOT - YD - YDC - YDG$$

CCVS	Consumption of fixed capital, social security funds, FIM million
CSOSV	Social security funds consumption, FIM million
FCGN	Central government net lending, FIM million
FGN	Net lending by public sector, FIM million
FLGN	Net lending by local government, FIM million
FSN	Net lending by social security funds, FIM million
GIS	Requited current transfers, social security funds, FIM million
ISOSV	Social security funds investment, FIM million
LCGB	Central government gross debt, FIM million
LGINT	General government internal debt (correction for consolidated debt), FIM million
LGN	General government consolidated gross debt, (EMU-criterion), FIM million
OSV	Gross accumulation, other items, social insurance instit., FIM mills
TRSTOT	Total transfers to other sectors by social security funds, 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 government disposable income, FIM million
YDG	Disposable income of general government, FIM million
YDLG	Disposable income of local government, FIM million
YDS	Disposable income of social security funds, FIM million
YDTOT	Disposable income, total, FIM million
YIS	Interest income of social security funds, FIM million

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

$$YFIN/KLMN_{-1} = .5 * (YFIN_{-1}/KLMN_{-2} + YFIN_{-2}/KLMN_{-3})$$

B.5 Income transfers from abroad, net

$$YFTR = -TRCGF - \underset{(.2359)}{4.11322} * GDPV/1000 + \underset{(18.4983)}{120.88479}$$

Method of estimation = Ordinary Least Squares
Estimation period = 1970Q1–1994Q4
R^2 = .750
DW = 1.1011
SE = 98.157

B.6 Current account

$$BPCV = BPTSNV + YFIN + YFTR$$

BPCV	Current account, FIM million
BPSNV	Balance of services (SNA), FIM million
BPTNV	Trade balance, FIM million
BPTSNV	Balance of goods and services, FIM million
GDPV	GDP in purchasers' values, FIM million
KLMN	Foreign debt net, FIM million
MGNV	Imports of goods, FIM millions (SNA)
MSNV	Imports of services, FIM million (SNA)
TRCGF	Central government transfers abroad, FIM million
XGNV	Exports of goods, FIM million (SNA)
XSNV	Exports of services, FIM million (SNA)
YFIN	Investment income from abroad, net, FIM million
YFTR	Income transfers from abroad, net, FIM million

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, eksogenous GFXN

$$FMPN = (-1)*(BPCV + FMCGN) + GFXN - (1 + FDFX)*GFXN_{-1}$$

Alternative 1: Portfolio equation

$$FMPN = DFMPN1*(\Delta RS - \Delta RFOR + DFMPN2)*GDPV_{-1}$$

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

$$FGFXN = (-1)*(BPCV + FMCGN + FMPN)$$

B.10 Bank of Finland's net foreign claims

Default: GFXN exogenous

$$GFXN = GFXN_{-1}$$

Alternative 1: GFXN from the balance of payments-identity

$$GFXN = (1 + FDFX)*GFXN_{-1} - FGFXN$$

BPCV	Current account, FIM million
DFMPN1	Dummy for FMPN equation, interest sensitivity
DFMPN2	Dummy for FMPN equation
FBANK	Net lending by financial institutions, FIM million
FCN	Net lending by corporate sector, FIM million
FDFX	Change of the exchange rate index for the net foreign claims, %
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
FMCGN	Foreign borrowing by the central government, net, FIM million
FMPN	Foreign borrowing by private sector, FIM million
GDPV	GDP in purchasers' values, FIM million
GFXN	Foreign claims of the central bank, net, FIM million
RFOR	Foreign interest rate, 3-month commercial ECU (1991Q3 onwards), per cent
RS	Money market rate, 3-month HELIBOR (1987 onwards), per cent

3.15 Financial markets (R)

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

$$RBTXEX = RBTX_{+1}$$

R.2 Government bond rate (4–5 years)

Default: Rational expectations

$$RBTX = \underset{(.065699)}{.933201} * RBTXEX + (1 - \underset{(.065699)}{.933201}) * RS$$

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

Alternative 1: Rational expectations, risk premium

$$RBTX = \underset{(.0594)}{.76639} * RBTXEX + (1 - \underset{(.0594)}{.76639}) * RS - \underset{(.0152)}{.05455} * (100 * FCGN / GDPV)$$

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)

$$\Delta RDEB = \max\{[RBTX - \underset{(.1906)}{.32214} + \underset{(.1766)}{.56947} * (RDEB_{-1} - RBTX_{-1}) + \underset{(.4047)}{.88466} * (LCD_{-1} + LCF_{-1})/(PHM * (KF1_{-1} + KF2_{-1})/100)], RBTX\}$$

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

$$\Delta RLBN = \underset{(.0959)}{.14298} * \Delta RLBN_{-1} + \underset{(.0594)}{.37014} * \Delta RS + \underset{(.0977)}{.18353} * \Delta RBTX - \underset{(.0562)}{.06867} * (RLBN_{-1} - RBTX_{-1})$$

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

KF1	Net stock of fixed capital, manufacturing, millions of 1990 FIM
KF2	Net stock of fixed capital, non-manufacturing private sector, millions of 1990 FIM
LCD	Domestic currency denominated stock of loans of the non-banking private corporate sector, FIM million
LCF	Foreign currency denominated stock of loans of the non-banking corporate sector, FIM million
PHM	House price index, all dwellings, entire country, 1990=100
RBTX	Taxable government bond yield, approx. 5 years, per cent
RDEB	Market yield on depentures, per cent
RLBN	Average rate on deposit banks' new lending, per cent
RS	Money market rate, 3-month HELIBOR (1987 onwards), per cent

R.5 Banks' average interest rate on outstanding loans

$$\Delta RLB = \underset{(.0610)}{-.17373}*\Delta RLB_{-1} + \underset{(.0457)}{.34533}*\Delta RLBN + \underset{(.0811)}{.74276}*\Delta RD - \underset{(.0187)}{.05503}*(RLB_{-1} - RLBN_{-1})$$

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

$$RDT = \max[(RDT_{-1} + \underset{(.0749)}{.16124}*\Delta RDT_{-1} + \underset{(.0927)}{.51413}*\Delta RD + \underset{(.0483)}{.17661}*\Delta RLBN - \underset{(.0634)}{.18439}*RDT_{-1} + \underset{(.0424)}{.11740}*RLBN_{-1} - \underset{(.1835)}{.31975}),0]$$

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

$$MON2EX = MON2_{+1}$$

MON2	Monetary aggregate M2, FIM million
MON2EX	MON2(t+1)
RD	Bank of Finland base rate, per cent
RDT	Interest rate, time deposits, per cent
RLB	Bank lending rate, per cent
RLBN	Average rate on deposit banks' new lending, per cent

R.8 Demand for money, M2

$$\log MON2 = \underset{(.067296)}{.37556} * (\log MON2_{-1} + \underset{(.092447)}{.95596} * \log MON2EX + (1 - \underset{(.067296)}{.37556} * (1 + \underset{(.092447)}{.955996})) * \log ZMON2$$

Method of estimation = Generalized Method of Moments
Estimation period = 1972Q1–1995Q2
P-value = 0.3434
SE = .035634

where

$$\log(ZMON2/PCP) = \underset{(.325335)}{-4.95829} + \underset{(.030236)}{1.14098} * \log C - \underset{(.000954335)}{.00485680} * (RS - RDT) - \underset{(.00228104)}{.010208} * (RBTX - RDT) + \underset{(.00657849)}{.072819} * DLIB + \underset{(.00916716)}{.102401} * D0188Q4$$

Method of estimation = Ordinary Least Squares
Estimation period = 1971Q3–1995Q4
R^2 = .994138
DW = .749049
SE = .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

R.9 Demand for money, M1

$$\Delta\log((MON1 - DMON1)/PCP) = \underset{(.1232)}{.31969}*\Delta\log ZMON1$$
$$+\underset{(.0199)}{.14405}*\Delta D1091Q1$$
$$-\underset{(.0772)}{.24313}*\log((MON1_{-1} - DMON1_{-1})/ZMON1_{-1})$$
$$+\underset{(.0020)}{.00563}$$

Method of estimation = Ordinary Least Squares
Estimation period = 1973Q1–1995Q4
$R^2 = .541$
DW = 1.836
SE = .01805

where

$$\log(ZMON1/PCP) = \underset{(.2242)}{-1.05670} + \underset{(.0203)}{.75405}*\log C - \underset{(.0010)}{.00272}*RS$$
$$-\underset{(.0033)}{.01961}*RDT - \underset{(.0087)}{.02189}*D1091Q1$$

Method of estimation = Ordinary Least Squares
Estimation period = 1972Q1–1995Q4
$R^2 = .961$
DW = .888
SE = .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

$$\log(MON3/MON2) = \underset{(.0123)}{-.07063}*\log(IFV/GDPV8) + \underset{(.0009)}{.00257}*RS - \underset{(.0292)}{.04556}$$

Method of estimation = Ordinary Least Squares
Estimation period = 1988Q1–1996Q4
R^2 = .496
DW = 0.948
SE = .01379

R.11 Bank certificates of deposits held by the public

KCDP = MON3 – 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

$$\Delta \log CURNB = \underset{(.1606)}{.74256} * \Delta \log CV - \underset{(.0053)}{.00239} * \Delta RBTX - \underset{(.0601)}{.07168} * ZCURNB_{-1}$$

Method of estimation = Ordinary Least Squares
Estimation period = 1975Q3–1996Q2
$R^2 = .003$
DW = 2.622
SE = .03336

where

$$ZCURNB = \log CURNB - \underset{(.0028)}{.84669} * \log CV + \underset{(.0025)}{.02499} * RBTX$$

Method of estimation = Ordinary Least Squares
Estimation period = 1975Q2–1996Q2
$R^2 = .984$
DW = .366
SE = .06098

R.13 Currency in circulation, banks

$$\Delta \log CURB = .486938 * \Delta \log(MON2 - CURNB)$$

R.14 Currency in circulation

$$CUR = CURNB + CURB$$

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
MON2	Monetary aggregate M2, FIM million
RBTX	Taxable government bond yield, approx. 5 years, per cent

R.15 Required reserves

$$CR = (1 - D0193Q3) * CRR * (MON2 - CUR)/100 + D0193Q3 * 1.242 * [CRR1 * (MON1 - CUR) + CRR2 * (MON2 - MON1) + CRR3 * (MON3 - MON2)]/100$$

R.16 Bank loans to the corporate sector

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

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

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

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

$$KDP = MON2 - CURNB$$

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, %
CUR	Currency in circulation, FIM million
CURNB	Currency in circulation, public, FIM million
D0193Q3	Dummy for a revision of the reserve deposits system
KDP	Bank deposits by the public, FIM million
LBC	Bank loans to the enterprises, FIM million
LBCD	Bank FIM denominated loans to the enterprises, FIM million
LBCF	Bank foreign currency denominated loans to the enterprises, FIM million
LBH	Bank loans to the households, FIM million
LBTOT	Bank loans to the public, FIM million
LCD	Domestic currency denominated stock of loans of the non-banking private corporate sector, FIM million
LCF	Foreign currency denominated stock of loans of the non-banking corporate sector, FIM million
MON1	Monetary aggregate M1, FIM million
MON2	Monetary aggregate M2, FIM million
MON3	Monetary aggregate M3, FIM million

R.21 Banks' balance sheet, other items, net

$$KOBN = LBH + LBCD + LBCF - (MON3 - CURNB) + CURB + LBCG - CASHCG - LBFBN - KOWNB$$

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

$$LBFBN = LBFBON - CR - FREE$$

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

$$KOBFN = GFXN + CDBF + LBFBN + LBFGN + LBFCN - CUR - CR - FREE$$

R.24 Bank of Finland, foreign exchange reserves

$$GFX = GFXN - KFBFO$$

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
KOBN	Balance sheet of the banks, other items, net, FIM million
KOWNB	Banks' own capital, FIM million
LBCD	Bank FIM denominated loans to the enterprises, FIM million
LBCF	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(PCOMP) = .7*log(PNIG/.99)+.3*log(PWM)

Import prices in FIM

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

$$\begin{aligned}\Delta \log PMRN = {} & \underset{(.0605)}{.13458^*}\,\Delta \log PMRN_{-1} \\ & + \underset{(.0992)}{.30057^*}\,\Delta \log PNIG + \underset{(.0480)}{.09613}\,\Delta \log PWM_{-1} \\ & + \underset{(.0190)}{.18645^*}\,(\Delta \log FXSUSD + \Delta \log PWE) \\ & + \underset{(.0536)}{.07777^*}\,\Delta \log FXSUSD \\ & - \underset{(.0434)}{.11756^*}\,\Delta \log FXSUSD_{-1} \\ & - \underset{(.0576)}{.18666^*}\,ZPMRN + \underset{(.0021)}{.00389}\end{aligned}$$

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

where

$$ZPMRN = \log(PMRN_{-1}) - \underset{(.0282)}{.18416} * \log(PWM_{-1}) - \underset{(.0111)}{.25843} * \log(FXSUSD_{-1} * PWE_{-1}) - (1 - \underset{(.0282)}{.18416} - \underset{(.0111)}{.25843}) * \log(PNIG_{-1}) + \underset{(.0167)}{.33787}$$

Method of estimation: OLS
Estimation period: 1974Q1–1996Q3
$R^2 = .898$
DW = .489
SE = .03682

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

$$\Delta \log\left(\frac{PMCN * FXTW}{PNIG}\right) = .4 * \Delta \log FXTW - .17 * \log\left(\frac{PMCN_{-1}}{PNIG_{-1}}\right)$$

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

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

$$\Delta \log\left(\frac{PMIN * FXTW}{PNIG}\right) = .4 * \Delta \log FXTW - .17 * \log\left(\frac{PMIN_{-1}}{PNIG_{-1}}\right)$$

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

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

$$\log(PMGN) = .5310 * \log(PMRN) + .2778 * \log(PMCN) + .1912 * \log(PMIN)$$

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

$$PMSN/PMSN_{-1} = PNIG/PNIG_{-1}$$

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{((RFOR + DMP*400*(INFPCP – INFSTAR)),0.5}

Alternative: RS reacts to changes in expected inflation

RS = max{(RFOR + DMP*400*(INFPCPE2 – INFSTAR)),0.5}

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

Exchange rates

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

Minimum reserve requirements

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

Banks and the central bank

CDBF	Outstanding certificates of deposits issued by the Bank of Finland, (–), FIM million
FREE	Banks' free reserves, FIM million
KFBFO	Bank of Finland other foreign liabilities, net, FIM million
KOWNB	Banks' own capital, FIM million
LBCG	Central government bonds and debentures to the banks, 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

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

$$\Delta_4 TYU = - TYS * \Delta_4 \log PCP_{-1}$$

Tax rates (indirect and direct)

TSR	Sales tax rate, per cent
TSR7	Sales tax rate, industrial machinery and equipment, per cent (prior to 1990Q4)
TSR8	Sales tax rate, industrial buildings, per cent (prior to 1977Q2)
TIOVR	Effective tax rate, other commodity taxes, 1990=1
TLGR	Average local government tax rate, per cent
TYS	Slope of the progressive income tax schedule
TYU	Intercept of the progressive income tax schedule
TYC1R	Corporate tax rate in central government taxation, manufacturing
TYCR	Corporate tax rate in central government taxation
TDEDCG	Share of taxable income minus deductions of tax base in central gvt taxes on households
TDEDLG	Share of taxable minus deductions of tax base in local gvt taxes on households
TDEDTYC	Deductions in corporate taxation, per cent
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
TYPS	Central and local govt revenue from subsequently collected direct taxes on households, FIM million
TYPSA	Central and local government revenue from subsequently collected direct taxes (arrears) on households, FIM million
TOCG	Central government compulsory fees, fines and penalties, FIM million
TOLG	Local government compulsory fees, fines and penalties, FIM million

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

TRSHOV	Social security funds other current transfers to households, FIM million
TRCGUR	Central government contribution rate in unemployment benefits
TRCGPVDI	Central government pension insurance vol. index (C, R4), demography
TRLGPVDI	Local government pension insurance vol. index, demography
TRPPVDI	Private sector pension insurance vol. index, demography

Other transfers

TRCGF	Central government transfers abroad, FIM million
TRCGL	Central government transfers to local government, FIM million
TRCGSO	Central govt other current transfers to social sec. funds, FIM mill.
TRLGS	Local government current transfers to social security funds, FIM mill.
TRLGO	Local government other current transfers, FIM million
YTRCGO	Other current transfers to central government, FIM million
YOLG	Local government other requited current transfers, FIM million
TRSOV	Social security funds other current transfers, FIM million
YTRSO	Other current transfers to social security funds, FIM million

Subsidies

SUB	Commodity subsidies, FIM million
SUBEU	Indirect taxes from the rest of the world, net, FIM million
SUBOCG	Central government other subsidies, FIM million

Central government finances

CASHCG	Central government cash position, FIM million
FCGCASHO	Central govt deficit before financial transactions, discrepancy of SNA and cash basis concepts, FIM million
FCGFION	Central govt other fin. investment, net (cash basis), FIM mill.
FCGH	Central government housing loans, drawings, FIM million
FCGSUP	Central govt capital support to banks, FIM million

Other

FOCGN	Central government long-term debt, FIM million
LCGPF	Central government debt to pension funds, FIM million
LGINT	General government internal debt (correction for consolidated debt), FIM million
LSOSN	Social security funds debt, FIM million

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 the balance of payments identity, and vice versa
FMCGN	Foreign borrowing by the central government, net, FIM mill.
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
CCRLG	Capital consumption rate, local government
CCRS	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 million
STD	Statistical discrepancy, millions of 1990 FIM
YWF	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) $C = \alpha W$

(2) $W = V_{-1} + H$

(3) $H = \sum_{i=0}^{\infty} \left(\frac{1-p}{1+r} \right)^{i} Y_{t+i}$

(4) $$V = (1+r)[V_{-1} + Y - C]$$

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, α, 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, α, and the parameter γ measuring the length of planing 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 θ 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

$$\sum_{i=0}^{\infty} \left[\left(\frac{1}{1+r} \right)^i - \frac{1+r_0}{\prod_{j=0}^{i}(1+r_j)} \right] [(1-p)(1-\gamma)]^i \, y(k,t+i) = 0.$$

r can be interpreted as a weighted average of the interest rate over the planing horizon.

Parameter γ 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 γ 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 γ. Without the scaling factor, human wealth h(k,t) would decrease towards the level y(k,t) when γ converges towards unity.

We see that propensity to consume out of wealth of an individual in the k^{th} cohort is constant and will be denoted α, where $\alpha = (1 - (1 - p)(1 - \theta))$.[1]

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 δ 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

$$C_t = \frac{(1-p)(1-\gamma)}{1-\alpha(1-p)(1-\gamma)} \frac{C_{t+1}}{(1+r_t)} + \frac{\alpha[p-\gamma(1-p)]}{1-\alpha(1-p)(1-\gamma)}[V_{t-1}+Y_t] + \frac{\alpha\gamma(1-p)}{r+p}Y_t$$

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 γ 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, ie the expected discounted profit at time t. In addition, we shall assume no taxes in order to simplify the notation.

$$\begin{aligned}
\max V_t &= E_t \sum_{t=t}^{\infty} \left[\prod_{j=0}^{t-1} \beta_j \right] (d_t - s_t) \\
&= E_t \{ (\beta_0 * \beta_1 * \ldots * \beta_{t-1}) * (d_t - s_t) \\
&\quad + (\beta_0 * \beta_1 * \ldots * \beta_{t-1} * \beta_t) * (d_{t+1} - s_{t+1}) \\
&\quad + (\beta_0 * \beta_1 * \ldots * \beta_{t-1} * \beta_t * \beta_{t+1}) * (d_{t+2} - s_{t+2}) + \ldots, \},
\end{aligned}$$

where E_t is expectations conditional on information at time t, β is the discount factor, $d_t = D_t / P_t^I$ is the real dividends, P_t^I is the price of investment and $s_t = S_t / P_t^I$ is the real value of new shares issued at time t.

The real dividend of the firm is defined as:

$$d_t = \{ p_t F(K_{t-1}, N_t) - w_t N_t - A(K_t, K_{t-1}, K_{t-2}) - i_{t-1} b_{t-1} \} + s_t + b_t - b_{t-1} - I_t,$$

where $p_t = P_t^Y / P_t^I$, 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, $w_t = W_t / P_t^I$ 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, $b_t = B_t / P_t^I$ 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 δ is the rate of depreciation.

Define $H_t = \frac{V_t}{(\beta_0 * \beta_1 * ... * \beta_{t-1})}$ and make an simplifying assumption that the discount factor is constant i.e. $\beta_t = \beta_{t+1} = ... = \beta = \frac{1}{1+r}$, where r is the real interest rate, hence, we may write the problem of the firm as:

$$\begin{aligned}
\max_{\{K_t\}} H_t &= (d_t - s_t) + \beta E_t(d_{t+1} - s_{t+1}) + \beta^2 E_t(d_{t+2} - s_{t+2}) + ... \\
&= p_t F(K_{t-1}, N_t) - w_t N_t - A(K_t, K_{t-1}, K_{t-2}) - (1+i_{t-1})b_{t-1} + b_t \\
&\quad - (K_t - (1-\delta)K_{t-1}) + \beta E_t\{p_{t+1}F(K_t, N_{t+1}) - w_{t+1}N_{t+1} \\
&\quad - A(K_{t+1}, K_t, K_{t-1}) - (1+i_t)b_t + b_{t+1} - (K_{t+1} - (1-\delta)K_t)\} \\
&\quad + \beta^2 E_t\{p_{t+2}F(K_{t+1}, N_{t+2}) - w_{t+2}N_{t+2} - A(K_{t+2}, K_{t+1}, K_t) \\
&\quad - (1+i_{t+1})b_{t+1} + b_{t+2} - (K_{t+2} - (1-\delta)K_{t+1})\} \\
&\quad + ...
\end{aligned}$$

The first order condition of H_t with respect to K_t gives:

$$\begin{aligned}
&-\frac{\partial A(K_t, K_{t-1}, K_{t-2})}{\partial K_t} - 1 \\
&\quad + \beta E_t\left\{p_{t+1}(1+\frac{1}{\varepsilon})\frac{\partial F(K_t, N_{t+1})}{\partial K_t} - \frac{\partial A(K_{t+1}, K_t, K_{t-1})}{\partial K_t} + (1-\delta)\right\} \\
&\quad - \beta^2 E_t\left\{\frac{\partial A(K_{t+2}, K_{t+1}, K_t)}{\partial K_t}\right\} = 0,
\end{aligned}$$

where ε 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):

$$\begin{aligned}
A(K_t, K_{t-1}, K_{t-2}) &= \frac{a}{2}\frac{(\Delta K_t - b\Delta K_{t-1})^2}{K_{t-1}} \\
&\approx \frac{a}{2}\Delta K_t \Delta \log K_t + \frac{ab^2}{2}\Delta K_{t-1}\Delta \log K_{t-1} - ab\Delta K_t \Delta \log K_{t-1}
\end{aligned}$$

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:

$$\begin{aligned}
\frac{\partial A(K_t, K_{t-1}, K_{t-2})}{\partial K_t} &= \frac{a}{2}\Delta \log K_t + \frac{a}{2}\frac{\Delta K_t}{K_t} - ab\Delta \log K_{t-1} \\
&\approx a\Delta \log K_t - ab\Delta \log K_{t-1},
\end{aligned}$$

$$\frac{\partial A(K_{t+1},K_t,K_{t-1})}{\partial K_t} = -\frac{a}{2}\Delta\log K_{t+1} - \frac{a}{2}\frac{\Delta K_{t+1}}{K_{t+1}} + ab\Delta\log K_t - ab\frac{\Delta K_{t+1}}{K_t}$$
$$+\frac{ab^2}{2}\Delta\log K_t + \frac{ab^2}{2}\frac{\Delta K_t}{K_t}$$
$$\approx -a(1+b)\Delta\log K_{t+1} + ab(1+b)\Delta\log K_t,$$

$$\frac{\partial A(K_{t+2},K_{t+1},K_t)}{\partial K_t} = ab\frac{\Delta K_{t+2}}{K_t} - \frac{ab^2}{2}\Delta\log K_{t+1} - \frac{ab^2}{2}\frac{\Delta K_{t+1}}{K_t}$$
$$\approx ab\Delta\log K_{t+2} - ab^2\Delta\log K_{t+1}.$$

Let us insert these in the first order condition. Define $\Delta k_t = \Delta\log K_t$ and divide by $-a$. Thus, we may write the first order condition:

$$\beta^2 b\Delta E_t k_{t+2} - [\beta^2 b^2 + \beta(1+b)]\Delta E_t k_{t+1} + (\beta b(1+b)+1)\Delta k_t - b\Delta k_{t-1}$$
$$= \frac{\beta}{a}E_t\left(p_{t+1}(1+\frac{1}{\varepsilon})\frac{\partial F(K_t,N_{t+1})}{\partial K_t} + \underbrace{(1-\delta)-\frac{1}{\beta}}_{-(r+\delta)}\right)$$

where ε 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. δ is the discount factor.

Optimizing agents minimize their loss function:

$$\min_{(x_t)} L = \min_{(x_t)} \frac{1}{2}E_t\sum_{i=0}^{\infty}\delta^i\left[(x_{t+i} - x^*_{t+i})^2 + \alpha(x_{t+i} - x_{t+i-1})^2\right]$$

<=>

$$\max_{(x_t)} -L = \max_{(x_t)} -\frac{1}{2} E_t \sum_{i=0}^{\infty} \delta^i \left[(x_{t+i} - x^*_{t+i})^2 + \alpha (x_{t+i} - x_{t+i-1})^2 \right] =$$

$$\max_{(x_t)} -\frac{1}{2} E_t \Big[(x_t - x^*_t)^2 + \alpha (x_t - x_{t-1})^2 + \delta ((x_{t+1} - x^*_{t+1})^2$$

$$+ \alpha (x_{t+1} - x_t)^2) + \ldots \Big]$$

First Order Condition:

$$\frac{\partial L}{\partial x_t} = E_t \Big(-(x_t - x^*_t) - \alpha (x_t - x_{t-1}) + \alpha\delta (x_{t+1} - x_t) \Big) = 0$$

<=>

$$E_t \left(x_t - \frac{\alpha}{1+\alpha+\alpha\delta} x_{t-1} - \frac{\alpha\delta}{1+\alpha+\alpha\delta} x_{t+1} - \frac{1}{1+\alpha+\alpha\delta} x^*_t \right) = 0$$

This second-order linear difference equation is the Euler equation.

Case 4: Inventory investment

The firm minimises the loss function at time 0:

$$\min V_0 = \frac{1}{2} E_0 \sum_{i=0}^{\infty} \delta^i \left[\omega_1 (KI_i - KI^*_i)^2 + \omega_2 (Q_i - Q^*_i)^2 \right]$$

$$= \frac{1}{2} E_0 \delta^0 \left[\omega_1 (KI_0 - KI^*_0)^2 + \omega_2 (Q_0 - Q^*_0)^2 \right]$$

$$+ \frac{1}{2} E_0 \delta^1 \left[\omega_1 (KI_1 - KI^*_1)^2 + \omega_2 (Q_1 - Q^*_1)^2 \right] + \ldots,$$

where V_0 is the loss function at time 0, E_0 is the expectations conditional on the information held at time 0, δ is the discount factor, ω_1 and ω_2 are constants of the loss function, KI is the stock of inventories, KI* 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), KI* is assumed to be determined by Q* and the real interest rate.

At time t the firm minimises:

$$\min V_t = \frac{1}{2}E_t\sum_{i=t}^{\infty}\delta^i\left[\omega_1(KI_i - KI_i^*)^2 + \omega_2(Q_i - Q_i^*)^2\right]$$

$$= \frac{1}{2}E_t\delta^t\left[\omega_1(KI_t - KI_t^*)^2 + \omega_2(Q_t - Q_t^*)^2\right]$$

$$+ \frac{1}{2}E_t\delta^{t+1}\left[\omega_1(KI_{t+1} - KI_{t+1}^*)^2 + \omega_2(Q_{t+1} - Q_{t+1}^*)^2\right] + \ldots$$

$$= \frac{1}{2}E_t\delta^t\left[\omega_1(KI_t - KI_t^*)^2 + \omega_2(SALE_t + KI_t - KI_{t-1} - Q_t^*)^2\right]$$

$$+ \frac{1}{2}E_t\delta^{t+1}\left[\omega_1(KI_{t+1} - KI_{t+1}^*)^2 + \omega_2(SALE_{t+1} + KI_{t+1} - KI_t - Q_{t+1}^*)^2\right] + \ldots,$$

where $Q_t = SALE_t + KI_t - KI_{t-1}$ and SALE is the sales of the storable goods.

Let us define $H_t = \frac{V_t}{\delta^t}$.

The first order condition of H_t with respect to KI_t:

$$\frac{\partial H_t}{\partial K_t} = \left[\omega_1(KI_t - KI_t^*) + \omega_2(SALE_t + KI_t - KI_{t-1} - Q_t^*)\right]$$

$$- E_t\delta\left[\omega_2(SALE_{t+1} + KI_{t+1} - KI_t - Q_{t+1}^*)\right] = 0.$$

We may write the first order condition as:

$$(\omega_1 + (1+\delta)\omega_2)KI_t = \omega_1 KI_t^* - \omega_2(SALE_t - KI_{t-1} - Q_t^*)$$

$$+ \delta\omega_2 E_t(SALE_{t+1} + KI_{t+1} - Q_{t+1}^*)$$

Let $\delta = 1 - r$, where r is the real interest rate:

$$(\omega_1 + 2\omega_2 - r\omega_2)KI_t = \omega_1 KI_t^* - \omega_2(SALE_t - KI_{t-1} - Q_t^*)$$

$$+ (1-r)\omega_2 E_t(SALE_{t+1} + KI_{t+1} - Q_{t+1}^*).$$

In order to have stationary variables we difference the first order condition:

$$(\omega_1 + 2\omega_2 - r\omega_2)\underbrace{\Delta KI_t}_{II_t} = \omega_1\Delta KI_t^* - \omega_2(\Delta SALE_t - \underbrace{\Delta KI_{t-1}}_{II_{t-1}} - \Delta Q_t^*)$$

$$+ (1-r)\omega_2 E_t(\Delta SALE_{t+1} + \underbrace{\Delta KI_{t+1}}_{II_{t+1}} - \Delta Q_{t+1}^*),$$

where II_t is the inventory investment. Divide the first order condition by $\omega_1 + 2\omega_2$:

$$\left(1 - \frac{r\omega_2}{\omega_1 + 2\omega_2}\right)II_t = \frac{\omega_1}{\omega_1 + 2\omega_2}\Delta KI_t^* - \frac{\omega_2}{\omega_1 + 2\omega_2}(\Delta SALE_t - II_{t-1} - \Delta Q_t^*)$$

$$+ (1-r)\frac{\omega_2}{\omega_1 + 2\omega_2}E_t(\Delta SALE_{t+1} + II_{t+1} - \Delta Q_{t+1}^*).$$

Define $\frac{\omega_2}{\omega_1+2\omega_2}=A$. Thus $\frac{\omega_1+2\omega_2}{\omega_1+2\omega_2}=1 \Rightarrow \frac{\omega_1}{\omega_1+2\omega_2}+\frac{2\omega_2}{\omega_1+2\omega_2}=1 \Rightarrow$

$\frac{\omega_1}{\omega_1+2\omega_2}=1-\frac{2\omega_2}{\omega_1+2\omega_2}=1-2A$.

Hence, we may write the first order condition as:

$$(1-rA)\Pi_t = (1-2A)\Delta KI_t^* + A(\Pi_{t-1} - \Delta SALE_t + \Delta Q_t^*) + (1-r)AE_t(\Delta SALE_{t+1} + \Pi_{t+1} - \Delta Q_{t+1}^*)$$

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:

$$\max V_0 = E_0 \sum_{t=0}^{\infty} \left(\prod_{i=0}^{t-1} \delta^i \right) \left(PHM_t(I_{t-n}^m + I_{t-n}^A) - PIH_t\left[C(I_t^m, I_t^A) + A(I_t^m, I_t^A)\right] \right)$$

where E_0 is the expectations held at time 0, δ is the discount factor, PHM is the price of the dwellings, PIH is the residential construction prices, I_t^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 n period lag.

Assume further that

$$C(I_t^m, I_t^A) = I_0 + \mu(I_t^m + I_t^A - I_0) + \frac{\alpha}{2}(I_t^m - I_0^m)^2 + \frac{\beta}{2}(I_t^A - I_0^A)^2 + \gamma(I_t^m - I_0^m)(I_t^A - I_0^A)$$

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.

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:

$$\begin{aligned}
\max H_t &= \left(PHM_t(I^m_{t-n} + I^A_{t-n}) - PIH_t\left[C(I^m_t, I^A_t) + A(I^m_t, I^A_t)\right]\right) \\
&\quad + E_t\delta\left(PHM_{t+1}(I^m_{t+1-n} + I^A_{t+1-n})\right. \\
&\quad \left. - PIH_{t+1}\left[C(I^m_{t+1}, I^A_{t+1}) + A(I^m_{t+1}, I^A_{t+1})\right]\right) + ... \\
&= PHM_t(I^m_{t-n} + I^A_{t-n}) - PIH_t[I_0 + \mu(I^m_t + I^A_t - I_0) \\
&\quad + \frac{\alpha}{2}(I^m_t - I^m_0)^2 + \frac{\beta}{2}(I^A_t - I^A_0)^2 \\
&\quad + \gamma(I^m_t - I^m_0)(I^A_t - I^A_0) + \frac{a}{2}(I^m_t - I^m_{t-1})^2 + \frac{b}{2}(I^A_t - I^A_{t-1})^2 \\
&\quad + c(I^m_t - I^m_{t-1})(I^A_t - I^A_{t-1})] \\
&\quad + E_t\delta\{PHM_{t+1}(I^m_{t+1-n} + I^A_{t+1-n}) - PIH_{t+1}[I_0 + \mu(I^m_{t+1} + I^A_{t+1} - I_0) \\
&\quad + \frac{\alpha}{2}(I^m_{t+1} - I^m_0)^2 + \frac{\beta}{2}(I^A_{t+1} - I^A_0)^2 + \gamma(I^m_{t+1} - I^m_0)(I^A_{t+1} - I^A_0) \\
&\quad + \frac{a}{2}(I^m_{t+1} - I^m_t)^2 + \frac{b}{2}(I^A_{t+1} - I^A_t)^2 + c(I^m_{t+1} - I^m_t)(I^A_{t+1} - I^A_t)]\} + ...
\end{aligned}$$

Assume that n is one. Then the first order condition of H_t with respect to I^m_t:

$$\begin{aligned}
\frac{\partial H_t}{\partial I^m_t} &= -PIH_t\mu - PIH_t\alpha(I^m_t - I^m_0) - PIH_t\gamma(I^A_t - I^A_0) - PIH_t a(I^m_t - I^m_{t-1}) \\
&\quad - PIH_t c(I^A_t - I^A_{t-1}) + E_t\delta[PHM_{t+1} + PIH_{t+1}a(I^m_{t+1} - I^m_t) \\
&\quad + PIH_{t+1}c(I^A_{t+1} - I^A_t)] = 0
\end{aligned}$$

Notice that $I^m_t = I_t - I^A_t$ and $I^m_0 = I_0 - I^A_0$. Divide the first order condition by PIH_t.

$$\begin{aligned}
&-\mu - \alpha(I_t - I^A_t - (I_0 - I^A_0)) - \gamma(I^A_t - I^A_0) - a(I_t - I^A_t - (I_{t-1} - I^A_{t-1})) - c(I^A_t - I^A_{t-1}) \\
&\quad + E_t\delta\frac{PHM_{t+1}}{PIH_t} + E_t\delta\frac{PIH_{t+1}}{PIH_t}[a(I_{t+1} - I^A_{t+1} - (I_t - I^A_t)) + c(I^A_{t+1} - I^A_t)] = 0
\end{aligned}$$

$$\begin{aligned}
&-\mu - \alpha(I_t - I_0 - (I^A_t - I^A_0)) - \gamma(I^A_t - I^A_0) - a(I_t - I_{t-1}) + (a-c)(I^A_t - I^A_{t-1}) \\
&\quad + E_t\delta\frac{PHM_{t+1}}{PIH_t} + E_t\delta\frac{PIH_{t+1}}{PIH_t}[a(I_{t+1} - I_t) + (c-a)(I^A_{t+1} - I^A_t)] = 0
\end{aligned}$$

Let

$$E_t\delta\frac{PIH_{t+1}}{PIH_t} = E_t\frac{1}{1+i_t}\left(\frac{PIH_{t+1} - PIH_t}{PIH_t} - 1\right) = \frac{1+\pi^e_{PIH}}{1+i_t} \approx 1 - (i_t - \pi^e_{PIH}) = 1 - r^e_t$$

and let

$$E_t\delta\frac{PHM_{t+1}}{PIH_t}=\frac{1}{1+i_t}\frac{PHM_t}{PIH_t}\underbrace{E_t\frac{PHM_{t+1}}{PHM_t}}_{E_t(\frac{PHM_{t+1}-PHM_t}{PHM_t}-1)=(1+\pi^e_{PHM})}$$

$$=\underbrace{\frac{PHM_t}{PIH_t}}_{q_t}\frac{(1+\pi^e_{PHM})}{1+i_t}\approx q_t(1-r^e_t).$$

where q_t is the market price of housing relative to production costs (Tobin's q)

Hence, the first order condition may be written as:

$$(\alpha+2a-r^e_t a)I_t=(1-r^e_t)aE_tI_{t+1}+aI_{t-1}$$

$$q_t(1-r^e_t)-\mu+\alpha I_0+(\alpha-\gamma)(I^A_t-I^A_0)+(a-c)(I^A_t-I^A_{t-1}-(1-r^e_t)E_t(I^A_{t+1}-I^A_t))$$

Notice that if the homogeneity assumption for the adjustment cost function is satisfied ie 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:

$$D_t(p)=\alpha\sum_{i=0}^{\infty}\lambda^i y_{t-i}-\frac{1}{\beta}p_t+\rho,$$

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 λ 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, δ 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:

$$p_t = a\sum_{i=0}^{\infty}\lambda^i y_{t-i} - bKH_{t-1} + e,$$

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:

$$\begin{aligned} PHMR_t &= \sum_{j=0}^{\infty} p_{t+j}\left(\prod_{i=0}^{j} E_t R_{t+i}\right) \\ &= p_t + E_t R_{t+1} p_{t+1} + E_t R_{t+1} E_t R_{t+2} p_{t+2} + \ldots \end{aligned}$$

where R is the discount factor and $E_tR_t = 1$. On the basis of above equation the following relation holds for the next periods real price of housing:

$$E_t R_{t+1} PHMR_{t+1} = E_t R_{t+1} p_{t+1} + E_t R_{t+1} E_t R_{t+2} p_{t+2} + \ldots$$

Substracting this from the above yields:

$$PHMR_t - E_t R_{t+1} PHMR_{t+1} = p_t = a\sum_{i=0}^{\infty}\lambda^i y_{t-i} - bKH_{t-1} + e$$

Lag with one period and multiply by λ:

$$\begin{aligned} \lambda(PHMR_{t-1} - E_{t-1} R_t PHMR_t) = \lambda p_{t-1} &= \lambda a\sum_{i=0}^{\infty}\lambda^i y_{t-i-1} - \lambda bKH_{t-2} + \lambda e \\ &= a\sum_{i=1}^{\infty}\lambda^i y_{t-i} - \lambda bKH_{t-2} + \lambda e \end{aligned}$$

Substracting this from the above yields:

$$\begin{aligned} (1-\lambda E_{t-1} R_t) PHMR_t - E_t R_{t+1} PHMR_{t+1} - \lambda PHMR_{t-1} \\ = ay_t - b(KH_{t-1} - \lambda KH_{t-2}) + (1-\lambda)e. \end{aligned}$$

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 δ is here assumed to be one in the above Case 3 of the Euler equation.

$$(1) \qquad x_t = ax_{t+1} + ax_{t-1} + (1-2a)x_t^*,$$

where x_t^* is fundamentals forcing x_t and $a = \alpha / (1+2\alpha)$.

Calculate the roots of equation (1) (λ_1 and λ_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:

$$(2) \qquad x_t = \lambda_1 x_{t-1} + (1-\lambda_1)x_t^*,$$

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 λ_1 and λ_2 are the roots of the lag polynominal. 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:

$$x_t = \frac{1}{(1-\lambda_1 L)(1-\lambda_2 L)} \frac{2a-1}{a} x_{t-1}^* + c_1 \lambda_1^t + c_2 \lambda_2^t$$

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:

$$\left(\frac{1-2a}{a}\right)\left(\frac{1}{\lambda_2 - 1}\right) = \left(\frac{1}{a} - 2\right)\left(\frac{1}{(1/\lambda_1) - 1}\right) = (\lambda_1 + \lambda_2 - 2)\left(\frac{1}{(1-\lambda_1)/\lambda_1}\right)$$

$$= \left(\lambda_1 + \frac{1}{\lambda_1} - 2\right)\left(\frac{\lambda_1}{1-\lambda_1}\right)$$

$$= \left(\frac{\lambda_1^2 - 2\lambda_1 + 1}{\lambda_1}\right)\left(\frac{\lambda_1}{1-\lambda_1}\right) = \frac{(\lambda_1 - 1)^2}{1-\lambda_1} = 1 - \lambda_1$$

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 BOF5 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 λ_1, λ_2 and λ_3 are the roots of the lag polynominal. Properties of the characteristic roots satisfy $-(\lambda_1 + \lambda_2 + \lambda_3) = a$, $\lambda_1\lambda_2 + \lambda_2\lambda_3 + \lambda_1\lambda_3 = b$ 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

$$(1-\lambda_1 L)x_{t+2} = \frac{1}{(1-\lambda_2 L)(1-\lambda_3 L)} x_t^*$$

$$\Leftrightarrow$$

$$(1-\lambda_1 L)x_{t+2} = \frac{1}{(\lambda_2-\lambda_3)}\left(-\frac{\lambda_2(\lambda_2 L)^{-1}}{1-(\lambda_2 L)^{-1}} + \frac{\lambda_3(\lambda_3 L)^{-1}}{1-(\lambda_3 L)^{-1}}\right) x_t^*$$

$$\Leftrightarrow$$

$$(1-\lambda_1 L)x_{t+2} = \frac{1}{(\lambda_2-\lambda_3)}\left(-\left(\frac{1}{1-\frac{1}{\lambda_2 L}}\right)x_{t+1}^* + \left(\frac{1}{1-\frac{1}{\lambda_3 L}}\right)x_{t+1}^*\right)$$

$$\Leftrightarrow$$

$$(1-\lambda_1 L)x_{t+2} = \frac{1}{(\lambda_2-\lambda_3)}\left(-\left(\sum_{i=0}^{\infty}\left(\frac{1}{\lambda_2}\right)^i x_{t+i+1}^*\right) + \left(\sum_{i=0}^{\infty}\left(\frac{1}{\lambda_3}\right)^i x_{t+i+1}^*\right)\right).$$

Lagging with two periods and assuming static expectation formation ie $x_t^* = E_t(x_{t+1}^*) = E_t(x_{t+2}^*) = \ldots$.

$$(1-\lambda_1 L)x_t = \frac{1}{(\lambda_2-\lambda_3)}\left(\left(-1-\frac{1}{\lambda_2}-\left(\frac{1}{\lambda_2}\right)^2-\ldots\right)+\left(1+\frac{1}{\lambda_3}+\left(\frac{1}{\lambda_3}\right)^2+\ldots\right)\right)x_t^*$$

$$\Leftrightarrow$$

$$x_t - \lambda_1 x_{t-1} = \frac{1}{(\lambda_2 - \lambda_3)}\left(\left(\frac{1}{1-\frac{1}{\lambda_3}}\right)-\left(\frac{1}{1-\frac{1}{\lambda_2}}\right)\right)x_t^*$$

$$\Leftrightarrow$$

$$x_t = \lambda_1 x_{t-1} + \frac{1}{(\lambda_2 - \lambda_3)}\left(\left(\frac{\lambda_3}{\lambda_3 - 1}\right)-\left(\frac{\lambda_2}{\lambda_2 - 1}\right)\right)x_t^*.$$

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[3]. 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 denstity 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, β_0 is the true value of unknown r-dimensional parameter vector, and $f(\bullet)$ 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:

$$E[v_t | I_t] = 0$$

[3] The GMM estimation method is described in detail in Hansen (1982), Large Sample Properties of Generalized Method of Moments Estimators, *Econometrica*, Vol. 50, No. 4 and Hansen and Singleton (1982), Generalized Instrumental variables estimation of Nonlinear Rational Expectations Models, *Econometrica*, Vol. 50, No. 5. For a textbook treatment see eg Hamilton (1994), *Time Series Analysis*.

where v_t is the disturbance vector ($v_t = f(\beta_0, X_t)$), I_t is the information set at time t, $E[\cdot|I_t]$ (= 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 $X_{t+1} \notin I_t$ then $E_t[Z_t X_{t+1}] = Z_t E_t[X_{t+1}]$. If $E_t[X_{t+1}]=0$ then $Z_t E[X_{t+1}]=0$.

Hence, the Euler equation together with the rational expectations hypothesis implies q orthogonal conditions (population moment conditions):

$$E\{\underset{(q\times k)}{Z_t}\ \underset{(k\times 1)}{f(\beta_0, X_t)}\} = \underset{(q\times 1)}{0}\ .$$

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 β_0 is the true value of the unknown vector of parameters β.

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:

$$\frac{1}{T}\sum_{t=1}^{T} \underset{(q\times k)}{Z_t}\ \underset{(k\times 1)}{f(\beta, X_t)} \xrightarrow{p} E\{\underset{(q\times k)}{Z_t}\ \underset{(k\times 1)}{f(\beta_0, X_t)}\}$$

This implies further that,

$$\lim_{T\to\infty} \frac{1}{T}\sum_{t=1}^{T} \underset{(q\times k)}{Z_t}\ \underset{(k\times 1)}{f(\beta_0, X_t)} = 0$$

Let $\hat{\beta}_T$ be the value that minimizes the quadratic form of the sample moments:

$$J_T(\beta) = \underset{(1\times q)}{[g(\beta; X_T)]'}\ \underset{(q\times q)}{\hat{D}_T^{-1}}\ \underset{(q\times 1)}{[g(\beta; X_T)]},$$

where ' denotes transposition, $\underset{(q\times 1)}{g(\beta; X_T)}$ is defined as above and $\hat{D}_T^{-1}$ is a $(q \times q)$ positive semidefinite symmetric matrix which satisfies almost surely that:

$$\lim_{T\to\infty} \underset{(q\times q)}{\hat{D}_T^{-1}} = D_0,$$

where D_0 is a positive definite symmetric matrix. Both $\hat{D}_T^{-1}$ and D_0 are also referred to distance matrices.

Assume that an interior optimum is achived by setting the derivative with respect to β to zero. Hence, the GMM estimate $\hat{\beta}_T$ is a solution to:

$$\left\{ \underset{(r\times q)}{\left.\frac{\partial g(\beta;X_T)}{\partial \beta'}\right|_{\beta=\tilde{\beta}_T}} \right\}' \underset{(q\times q)}{\hat{D}_T^{-1}} \underset{(q\times 1)}{[g(\beta;X_T)]} = \underset{(r\times 1)}{0},$$

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:

$$\hat{\beta}_T \approx N(\beta_0, \tilde{V}_T / T),$$

where $\tilde{V}_T = (\tilde{G}_T \tilde{D}_T^{-1} \tilde{G}_T')^{-1}$ and $\tilde{G}_T' = \left.\frac{\partial g(\beta;X_T)}{\partial \beta'}\right|_{\beta=\tilde{\beta}_T}$.

Furthermore, there exists an optimal distance matrix for the GMM estimator. Suppose, that when evaluating at the true value β_0, the process $f(\beta_0, X_t)$ is strictly stationary with zero mean and the ith autocovariance matrix:

$$\Gamma_i = E\{f(\beta_0, X_t) f(\beta_0, X_{t-i})'\}.$$

Assume that these autocovariancies 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 achived when $\hat{\beta}_T$ is chosen to minimise:

$$J_T(\beta) = \underset{(1\times q)}{[g(\beta;X_T)]'} \underset{(q\times q)}{S^{-1}} \underset{(q\times 1)}{[g(\beta;X_T)]}.$$

The model is overidentified when the number of orthogonality conditions exceeds the number of parameters to be estimated ie q>r. In this case Hansen's J-test for the overidentifying restrictions is:

$$[\sqrt{T}g(\hat{\beta}_T; X_T)]'\hat{S}_T^{-1}[\sqrt{T}g(\hat{\beta}_T; X_T)] \xrightarrow{L} \chi^2(q-r)$$

Appendix 2

Alternative equations without leads

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

Alternative 1: Balassa–Samuelson effect

$$\begin{aligned}INFPCPEX = {} & \underset{(.0229)}{(1-.13778)} * (INFPCP + INFPCP_{-4})/2 \\ & + .25 * [\underset{(.0229)}{.13778} * \Delta_4 \log PMGN \\ & + \underset{(.0323)}{.08770} * \Delta_4 \log\left(\frac{PD8}{PXGN}\right) \\ & + \underset{(.0370)}{.07855} * \log\left(\frac{GDP1 + GDP2}{GDP1T + GDP2T + GDP21}\right)]\end{aligned}$$

Method of estimation = Ordinary Least Squares
Estimation period = 1978Q1–1995Q4
$R^2 = .364$
DW = .425
SE = .01007

C.5 Private consumption

Alternative 1: Error-correction with static expectations model as fundamentals

$$\begin{aligned}\Delta \log C = {} & \underset{(.1070)}{.578246} * \Delta \log ZC \\ & - \underset{(.0726)}{.056966} * \log\left(\frac{C_{-1}}{ZC_{-1}}\right) \\ & + \underset{(.00132)}{.00243696}\end{aligned}$$

Method of estimation = Ordinary Least Squares
Estimation period = 1977Q2–1994Q2
$R^2 = .308$
DW = 2.057
SE = .010281

where

$$\begin{aligned}ZC = {} & \{\{[(1-.300798) * .047707 * (.25 * WEALTH_{-1} + YD)] \\ & + .300798 * YD\}/(.01 * PCP)\} \\ & /[1 - .853317 * (1-.300798)/(1 + RLBN/400 - INFPCPEX)]\end{aligned}$$

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

$$DLKF1 = .91193 * DLKF1_{-1} + 0.070034 * [PGDP1 * FK1 / PIF1 - (CCR1 + RS/400 - INFPIF1E)/(1 + RS/400 - INFPIF1E)] - 0.80575/1000$$

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

Alternative: Static expectations

$$DLKF2 = .92591 * DLKF2_{-1} + .045732 * [PREL2 * FK2 - (CCR2 + RS/400 - INFPIF2E)/(1 + RS/400 - INFPIF2E)] - 0.17624/1000$$

where

$$PREL2 = 100 * [(GDPV2 - GDPV21)/(GDP2 - GDP21)]/PIF2$$

I.20 Change in the volume of private fixed investment, residential construction

Alternative: Static expectations

$$\Delta IH = \underset{(.15551)}{.504040} * \Delta ZIH - \underset{(.08635)}{.319893} * (IH_{-1} - ZIH_{-1})$$

where

$$ZIH = 0.41945 * IH_{-1} + (1 - 0.41945) * [PHM_{-2} / PIH_{-2} + (.176483/1000) * D1090Q4 * (FCGH/(.01 * PIH) - 1143) - 1.98149 * (RLBN/400 - INFPHM) - .145520]/(.851889/10000)$$

Method of estimation = Ordinary Least Squares
Estimation period = 1974Q2–1993Q3
$R^2 = .197122$
DW = 2.17783
SE = 434.088

I.22 Real house price index

Alternative: Static expectations

$$\Delta \log PHMR = \underset{(.112789)}{.440499} * \Delta \log PHMR_{-1} + \underset{(.109803)}{.226435} * \Delta \log PHMR_{-2} - \underset{(.130713)}{.408159} * \log(PHMR_{-1} / ZPHMRSTA) + \underset{(.00896103)}{.029097}$$

Method of estimation = Ordinary Least Squares
Estimation period = 1976Q1–1993Q3
R^2 = .586121
DW = 1.98619
SE = .023745

where

$$ZPHMRSTA = .723834 * PHM_{-1} / PCP_{-1} + [.731117 - (RLBN_{-1} / 400 - INFPCPEX_{-1})] * \{.01 * .109936 * [(16.6 * (50812.66 * \log C - 498832.60) - (471956.9 * \log KH_{-1} - 5675668.0)) / 1000 - .723834 * (16.6 * (50812.66 * \log C - 498832.60) - (471956.9 * \log KH_{-2} - 5675668.0)) / 1000] - .052053\} / (1 - .731117 + RLBN / 400 - INFPCPEX)$$

I.30 Change in inventories

Alternative: Static expectations

$$\Pi = 0.66867 * \Pi_{-1} + (1 - 0.66867) * (\Delta KIIT) - \underset{(.076787)}{.711263} * (\Delta SALEA - (\Delta GDP1T_{-1} + \Delta GDP2T_{-1}))$$

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

$$\log(DPXGE * PXGN) = 0.33085 * \log(DPXGE_{-1} * PXGN_{-1}) + (1 - 0.33085) * \log ZPXGN$$

where

$$\log ZPXGN = 1.22 * (.449991 * \log PCOMP + (1 - .449991) * \log SMCXG)$$

L.5 Performed working hours, manufacturing

Alternative: Static expectations

$$logLH1 = .60122*logLH1_{-1} + (1 - .60122)*logLH1T$$

L.8 Performed working hours, the private non-manufacturing sector

Alternative: Static expectations

$$logLH2 = 0.70482*logLH2_{-1} + (1 - 0.70482)*logLH2T$$

W.7 Inflation expectations, (T + 2)

Alternative 1: Balassa-Samuelson effect

$$INFPCPE2 = \underset{(.0292)}{(1 - .17686)} * (INFPCP + INFPCP_{-4}) / 2 + .25 * \left[\underset{(.0292)}{.17686} * \Delta_4 \log PMGN + \underset{(.0430)}{.08037} * \Delta_4 \log\left(\frac{PD8}{PXGN}\right) + \underset{(.0472)}{.14181} * \log\left(\frac{GDP1 + GDP2}{GDP1T + GDP2T + GDP21}\right)\right]$$

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

$$logPD1 = .20235*logPD1_{-1} + (1 - .20235)*logSMC1$$

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

Alternative: Static expectations

$$\log P20 = .37076*\log P20_{-1} + (1 - .37076)*\log SMC2$$

R.2 Government bond rate (4–5 years)

Alternative: Static expectations, risk premium

$$RBTX = RS - (.05455/(1 - .76639))*(100*FCGN/GDPV)$$

R.8 Demand for money, M2

Alternative 1: Static expectations

$$\log(MON2 + DMON2) = .44744*\log(MON2_{-1} + DMON2_{-1}) + (1 - .44744)*\log ZMON2$$

Alternative 2: Error correction

$$\Delta \log MON2 = \underset{(.00255776)}{.010278} + \underset{(.083704)}{.228990}*\Delta \log MON2_{-1} + \underset{(.057511)}{.381553}*\Delta \log ZMON2 - \underset{(.057383)}{.204501}*\log(MON2_{-1} / ZMON2_{-1})$$

Method of estimation = Ordinary Least Squares
Estimation period = 1972Q1–1995Q4
R^2 = .453031
DW = 2.21141
SE = .012421

Appendix 3

List of variables

SUFFIXS EX = expected
* = exogenous

ATAX	Average income tax rate of wage and salary earners, estimate
ATAXCG	Average income tax-rate of households in central government taxation, estimate
BPCV	Current account, FIM million
BPSNV	Balance of services (SNA), FIM million
BPTNV	Trade balance, FIM million
BPTSNV	Balance of goods and services, FIM million
C	Private consumption, millions of 1990 FIM
*CAPCG	Capital consumption, central government, FIM million
*CAPH	Capital consumption, households, FIM million
*CAPLG	Capital consumption, local governments, FIM million
*CASHCG	Central government cash position, FIM million
*CCG	Central government consumption, millions of 1990 FIM
CCGV	Central government consumption, FIM million
*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
*CCRLG	Capital consumption rate, local government
*CCRS	Capital consumption rate, social security funds
CCV1	Consumption of fixed capital, manufacturing, FIM million
CCV2	Consumption of fixed capital, non-manufacturing private sector, FIM mill.
CCV21	Consumption of fixed capital, letting of own property, FIM million
CCV8	Consumption of fixed capital, private sector, FIM million
CCVCG	Consumption of fixed capital, central government, FIM mill.
CCVG	Consumption of fixed capital, public sector, FIM million
CCVH	Consumption of fixed capital, households, FIM million
CCVLG	Consumption of fixed capital, local government, FIM mill.
CCVS	Consumption of fixed capital, social security funds, FIM mill.
CCVT	Consumption of fixed capital, FIM million
*CDBF	Outstanding certificates of deposits issued by the Bank of Finland, (–), FIM million
CEX	C(t+1)
CFB1	Cash flow, manufacturing, FIM million
CFB2	Cash flow, non-manufacturing private sector, FIM million
CG	Public consumption, millions of 1990 FIM
CGV	Public consumption, FIM million
CLG	Local government consumption, millions of 1990 FIM
CLGV	Local government consumption, FIM million CPI Consumer price index, 1990=100
CPI	Consumer price index, 1990=100
CPIH	EU Harmonised consumer price index, 1996=100, Finland

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
FHNB	Net lending by households, flow of funds, FIM million
FK1	The marginal product of capital, manufacturing
FK2	The marginal product of capital, non-manfacturing private sector
FLGN	Net lending by local government, FIM million
*FMCGN	Foreign borrowing by the central government, net, FIM mill.
(*)FMPN	Foreign borrowing by private sector, FIM million

*FOCGN	Central government other markka loans, FIM million
*FREE	Banks' free reserves, FIM million
FSN	Net lending by social security funds, FIM million
*FXSUSD	Exchange rate, FIM/USD
*FXTW	Bank of Finland currency index, 1982=100
GCGI	Central government interest expenditure, FIM million
GCGTOTV	Central government expenditure (SNA), FIM million
GDP	GDP in purchasers' values, millions of 1990 FIM
GDP1	Production at factor cost, manufacturing, millions of 1990 FIM
GDP1T	The normal level of production with existing inputs, manufacturing, mills of 1990 FIM
GDP1TEX	GDP1T(t+1)
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
GDP2T	The normal level of prod. with existing inputs, non-manuf. priv. sector (excl. letting of own property), millions of 1990 FIM
GDP2TEX	GDP2T(t+1)
GDPCG	Production at factor cost, central government, millions of 1990 FIM
GDPF	GDP at factor cost, millions of 1990 FIM
GDPFV	GDP at factor cost, FIM million
GDPG	Production at factor cost, general govt, millions of 1990 FIM
GDPLG	Production at factor cost, local govt, mills of 1990 FIM
GDPS	Production at factor cost, social security funds, millions of 1990 FIM
GDPV	GDP in purchasers' values, FIM million
GDPV1	Production at factor cost, manufacturing, FIM million
GDPV2	Production at factor cost, non-manufacturing private sector, FIM million
GDPV21	Production at factor cost, letting of own property, FIM million
GDPV8	Production at factor cost, private sector, FIM million
GDPVCG	Production at factor cost, central govt, FIM million
GDPVG	Production at factor cost, general govt, FIM million
GDPVLG	Production at factor cost, local govt, FIM million
GDPVS	Production at factor cost, social security funds, FIM million
GFX	Foreign exchange reserves of the central bank, FIM million
(*)GFXN	Foreign claims of the central bank, net, FIM million
GILG	Requited current transfers, local government, FIM million
GIS	Requited current transfers, social security funds, FIM mill.
I	Private fixed investment, millions of 1990 FIM
*ICG	Central govt investment (excl. enterprises), millions of 1990 FIM
ICGV	Central govt investment (excl. enterprises), FIM million
IF	Private non-residential investment, mills of 1990 FIM
IF1	Private fixed investment, manufacturing, mills of 1990 FIM
IF2	Private fixed investment, non-manufacturing private sector, mills 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
IGV	Public investment, FIM million
IH	Residential construction, millions of 1990 FIM
IHEX	IH(t+1)
IHTV	Gross fixed capital formation, households, FIM million
IHV	Residential construction, FIM million
II	Change in inventories, millions of 1990 FIM
IIEX	II(t+1)
IIS	Inventory investment and statistical discrepancy, mills of 1990 FIM
IISV	Inventory investment and statistical discrepancy, FIM million
*ILG	Local government investment, millions of 1990 FIM
ILGV	Local government investment, FIM million
INFPCP	0.25*(PCP/PCP(t-4) – 1)
INFPCPE2	INFPCP(t+2)
INFPCPEX	INFPCP(t+1)
INFPHM	0.25*(PHM/PHM(t-4) – 1)
INFPHMEX	INFPHM(t+1)
INFPIF1	0.25*(PIF1/PIF1(t-4) – 1)
INFPIF1E	INFPIF1(t+1)
INFPIF2	0.25*(PIF2/PIF2(t-4) – 1)
INFPIF2E	INFPIF2(t+1)
INFPIH	0.25*(PIH/PIH(t-4) – 1)
INFPIHEX	INFPIH(t+1)
*INFSTAR	Inflation target
*ISOS	Social security funds investment, millions of 1990 FIM
ISOSV	Social security funds investment, FIM million
ITOT	Total fixed investment, millions of 1990 FIM
ITOTV	Total fixed investment, FIM million
IV	Private fixed investment, FIM million
KCDP	Bank certificates of deposits held by the public, FIM million
KDP	Bank deposits by the public, FIM million
KF1	Net stock of fixed capital, manufacturing, millions of 1990 FIM
KF2	Net stock of fixed capital, non-manufacturing private sector, millions of 1990 FIM
*KFBFO	Bank of Finland other foreign liabilities, net, FIM million
KFCG	Net stock of fixed capital, central govt, millions of 1990 FIM
KFG	Net stock of fixed capital, general 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
KH	Net stock of priv. residential capital, net, millions of 1990 FIM
KII	Stock of inventories, millions of 1990 FIM
KLMN	Foreign debt net, FIM million
KIIT	The target level of inventories, millions of 1990 FIM
KOBFN	Bank of Finland other balance sheet items, net, FIM million
KOBN	Balance sheet of the banks, other items, net, FIM million
*KOWNB	Banks' own capital, FIM million
LBC	Bank loans to the enterprises, FIM million
LBCD	Bank FIM denominated loans to the enterprises, FIM million

LBCF	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
LBTOT	Bank loans to the public, FIM million
LCD	Domestic currency denominated stock of loans of the non-banking priv. 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
LCGB	Central government gross debt, FIM million
LCGC	Central govt debt excl. debt to central govt pension fund, FIM mill
LCGH	Stock of central government housing loans, FIM million
*LCGPF	Central government debt to pension funds, FIM million
LDCG	Central govt sector's domestic currency denominated debt, FIM million
LE	Employment (SNA), 1000 persons
LES	Employment (Labour force survey), 1000 persons
LFCG	Foreign currency denominated central govt debt, FIM million
LFS	Labour force (labour force survey), 1000 persons
*LGINT	General government internal debt (correction for consolidated debt), FIM million
LGN	General government consolidated gross debt, (EMU-criterion), FIM million
LH	Performed working hours total, millions of hours
LH1	Performed working hours, manufacturing, millions of hours
LH1EX	LH1(t+1)
LH1T	Desired demand for labour, manufacturing, millions of hours (from inverted production function)
LH2	Performed working hours, non-manufacturing private sector, millions of hours
LH2EX	LH2(t+1)
LH2T	Desired demand for labour, non-manufacturing private sector, millions of hours
LH8	Performed working hours, private sector, millions of hours
LHE	Performed working hours, entrepreneurs, millions of hours
LHE1	Performed working hours, entrepreneurs,manufacturing, mills of hours

LHE2	Performed working hours, entrepreneurs, non-manufacturing private sector, mills of hours
LHG	Performed working hours, general govt, millions 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
LLGN	Local government debt (consolidated; ESA defin.), FIM million
*LSOSN	Social security funds debt, FIM million
LUS	Unemployment (labour force survey), 1000 persons
M	Imports of goods and services, millions of 1990 FIM
MDD	Mdd, demand variable in imports equation
MGN	Imports of goods, millions of 1990 FIM (SNA)
MGNV	Imports of goods, FIM millions (SNA)
*MNIG	Export markets, imports of Finland's major export countries, 1990=100
MON1	Monetary aggregate M1, FIM million
MON2	Monetary aggregate M2, FIM million
MON2EX	MON2(t+1)
MON3	Monetary aggregate M3, FIM million
MPL1	Marginal productivity of labour, manufacturing, 1990=100
MPL2	Marginal productivity of labour, non-manufacturing private sector, 1990=100
MSN	Imports of services, millions of 1990 FIM (SNA)
MSNV	Imports of services, FIM million (SNA)
MTAX	Average marginal income tax rate of wage and salary earners, estimate
MTAXCG	Average marginal income tax rate of wage and salary earners in central government taxation, estimate
MV	Imports of goods and services, FIM million
*N	Population of working age (15–74 years), 1000 persons
*OSV	Gross accumulation, other items, social insurance instit., FIM mills
P1	Producer prices in manufacturing, 1990=100
P2	Producer prices in non-manufacturing private sector, 1990=100
P20	Producer prices in non-manufacturing private sector excl. letting of own property, 1990=100
P20EX	P20(t+1)
P8	Producer prices in private sector, 1990=100
PCCG	Central government consumption prices, 1990=100
PCCGIO	Input-output estimate for deflator PCCG, 1990=100
PCDIO	Input-output estimate for deflator PCD, 1990=100
PCG	Public consumption prices, 1990=100
PCLG	Local government consumption prices, 1990=100
PCLGIO	Input-output estimate for deflator PCLG, 1990=100
PCOMP	Competitors' prices on export markets, 1990=100
PCP	Private consumption prices, 1990=100
PCPIO	Input-output estimate for deflator PCP, 1990=100
PCSOS	Social insurance institutions consumption prices, 1990=100
PCSOSIO	Input-output estimate for deflator PCSOS, 1990=100

PD1	Prices of manufactures sold on the domestic market, manufacturing, 1990=100
PD1EX	PD1(t+1)
PD8	Prices of manufactures sold on the domestic market, private sector, 1990=100
PGDP	Value added deflator, market prices, 1990=100
PGDP1	Value-added deflator for manufacturing, 1990=100
PGDP1IO	Input-output estimate for deflator PGDP1, 1990=100
PGDP2	Value-added deflator for non-manufacturing private sector, 1990=100
PGDP21	Value-added deflator for letting of own property, 1990=100
PGDP2IO	Input-output estimate for deflator PGDP2, 1990=100
PGDPCG	Value-added deflator for central government, 1990=100
PGDPF	Value-added deflator at factor cost, 1990=100
PGDPG	Value-added deflator for general government, 1990=100
PGDPLG	Value-added deflator for local government, 1990=100
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	PHMR(t+1)
PI	Private investment prices, 1990=100
PICG	Central government investment prices, 1990=100
PIF	Private non-residential investment prices, 1990=100
PIF1	Fixed investment prices, manufacturing, 1990=100
PIF2	Fixed investment prices, non-manufacturing private sector, 1990=100
PIFIO	Input-output estimate for deflator PIF, 1990=100
PIG	General government investment prices, 1990=100
PIH	Residential construction prices, 1990=100
PILG	Local government investment prices, 1990=100
PISOS	Social security funds investment prices, 1990=100
PITOT	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 tarif index, subsidies, 1990=100
PTARIF	Tax tarif index, net, 1990=100
PTAX	Tax tarif index, indirect taxes, 1990=100
PUI	Underlying inflation, 1990=100
PUIIO	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 excl. energy, 1990=100
PXGN	Export prices of goods, 1990=100 (SNA)
PXGNEX	PXGN (t+1)
PXSN	Export prices of services, 1990=100 (SNA)

Q1	Labour productivity, manufacturing, 1990=100
Q2	Labour productivity, non-manufacturing private sector, 1990=100
QG	Labour productivity, government sector, 1990=100
RBTX	Taxable government bond yield, approx. 5 years, per cent
RBTXEX	RBTX (t+1)
*RD	Bank of Finland base rate, per cent
RDEB	Market yield on debentures, per cent
RDT	Interest rate, time deposits, per cent
*RFOR	Foreign interest rate, 3-month commercial ECU (1991Q3 onwards), per cent
RLB	Bank lending rate, per cent
RLBN	Average rate on deposit banks' new lending, per cent
RPXGN	Relative export price of goods, estimate, 1990=1
RPXSN	Relative export price of services, estimate, 1990=1
(*)RS	Money market rate, 3-month HELIBOR (1987 onwards), per cent
SALEA	Sales, millions of 1990 FIM
SALEAEX	SALEA (t+1)
SMC1	Marginal costs in manufacturing, 1990=100
SMC2	Marginal costs in non-manufacturing private sector, 1990=100
SMCXG	Marginal costs in exports, 1990=100
SOC	Entrepreneurs' social security contributions, total, FIM million
SOC1	Entrepreneurs' social security contributions, manufacturing, FIM million
SOC2	Entrepreneurs' social security contributions, non-manufacturing private sector, FIM mill.
SOCG	Entrepreneurs' social security contributions, general government, FIM million
*SOCLELR	Entrepreneurs' contribution rate for temp.employee pension scheme
*SOCOR1	Entrepreneurs' other social security contribution rate, manufacturing
*SOCOR2	Entrepreneurs' other social security contribution rate, non-manufacturing private sector
*SOCORCG	Entrepreneurs' other social security contribution rate, central government
*SOCORLG	Entrepreneurs' other social security contribution rate, local government
*SOCORS	Entrepreneurs' other social security contribution rate, social security funds
SOCR1	Entrepreneurs' social security contrib.rate, manufacturing
SOCR2	Entrepreneurs' social security contrib.rate, non-manufacturing private sector
SOCR8	Entrepreneurs' social security contrib.rate, private sector
SOCRCG	Entrepreneurs' social security contrib.rate, central government
SOCRLG	Entrepreneurs' social security contrib.rate, local government
SOCRS	Entrepreneurs' social security contrib.rate, social security funds
SOCS	Entrepreneurs' security payments to social security funds, FIM mill.
*SOCSGR	Entrepreneurs' nat.pension & sickness ins.contribution rate, general government, FIM mill.
*SOCSPR	Entrepreneurs' nat.pension & sickness ins.contribution rate, private sector, FIM mill.

*SOCTELR	Entrepreneurs' contribution rate for employee pension schemes
*SOCUR	Entrepreneurs' unemployment insurance rate
SOL	Social security payments by employees and pensioners, total, FIM million
SOLCG	Central government employees' pension insurance contribution, FIM million
SOLN	Insured persons national pension and sickness insurance contributions, FIM million
*SOLNPR	Old age, invalidity and unemployment pensioners social security contribution rate
*SOLNR	Insured persons' nat.pension & sickness ins.contribution rate
SOLS	Social security payments by employees to social security funds, FIM million
SOLTEL	Employees' TEL-pension and unemployment insurance contributions, FIM million
*SOLTELR	Insured persons' employee pension schemes contribution rate
*SOLUR	Insured persons' unemployment security contribution rate
SOLVS	Non-obligatory social security payments of employees, FIM million
*STD	Statistical discrepancy, millions of 1990 FIM
*SUB	Commodity subsidies, FIM million
SUBC	Subsidies in private consumption, FIM mill.
SUBCG	Central government subsidies, FIM million
*SUBEU	Indirect taxes from the rest of the world, net, FIM million
SUBLG	Local government subsidies, FIM million
*SUBOCG	Central government other subsidies, FIM million
SUBR	Effective tax rate, commodity subsidies, 1990=1
TBSUB	Commodity subsidies, FIM million
TBTIOV	Tax base of other commodity taxes, FIM million
TBVAT	Tax base of value-added tax, FIM million
*TDEDCG	Share of taxable income minus deductions of tax base in centr gvt taxes on households
*TDEDLG	Share of taxable minus deductions of tax base in local gvt taxes on households
*TDEDTYC	Deductions in corporate taxation, per cent
TECH1	Technical development, rnanufacturing
TECH2	Technical development, non-manufacturing private sector
TICG	Central government revenue from indirect taxes, FIM million
TIN	Indirect taxes less subsidies, millions of 1990 FIM
TIOCG	Central government revenue from other indirect taxes, FIM million
TIOV	Other commodity taxes, FIM million
*TIOVR	Effective tax rate, other commodity taxes, 1990=1
TIR1	Indirect tax (excl. subsidies) rate on production, manufacturing
TIR2	Indirect tax (excl. subsidies) rate on production, non-manufacturing private sector
TIRC	Indirect tax & subsidies rate on private consumption
TIRCCG	Indirect tax rate on consumption, central government
TIRCLG	Indirect tax rate on consumption, local government
TIRCSOS	Indirect tax rate on consumption, social security funds
TIRIF	Indirect tax rate on fixed investment
TIRIF1	Indirect tax rate on fixed investment, rnanufacturing

TIRIFO	Indirect tax rate on fixed investment, other private investment
TIRXG	Indirect tax rate on exports of goods
TIV	Central government revenue from commodity taxes, FIM mill.
TIVC	Sales taxes in private consumption, FIM mill.
*TLGR	Average local government tax rate
*TOCG	Central government compulsory fees, fines and penalties, FIM million
*TOLG	Local government compulsory fees, fines and penalties, FIM million
*TRCGF	Central government transfers abroad, FIM million
TRCGH	Central government transfers to households, FIM million
*TRCGHO	Central government other current transfers to households, FIM million
*TRCGL	Central government transfers to local government, FIM million
TRCGPV	Central government pension insurance, FIM million
*TRCGPVDI	Central government pension insurance vol.index (C, R4), demography
TRCGS	Central govt transfers to the social security funds, FIM million
*TRCGSO	Central govt other current transfers to social sec. funds, FIM mill.
TRCGSU	Central govt unemployment allowances based on previous earnings, FIM mill.
TRCGTOT	Central govt transfer outlays to other sectors, total, FIM million
TRCGU	Central government basic unemployment allowances, FIM million
*TRCGUR	Central government contribution rate in unemployment benefits, FIM million
*TREND	Linear trend, 1960Q1 onwards 0.25+$TREND_{-1}$
*TRHGOV	Households other requited current transfers, FIM million
TRHGTOT	Households expenditure on unrequited current transfers, FIM million
*TRLGH	Local government transfers to households, FIM million
*TRLGO	Local government other current transfers, FIM million
TRLGPV	Local government pension insurance, FIM million
*TRLGPVDI	Local government pension insurance vol.index, demography
*TRLGS	Local government current transfers to social security funds, FIM mill.
TRLGTOT	Local government expenditure on unrequited current transfers, FIM million
*TRNHOV	Households other compensation from the social insurance instit., FIM mill.
*TRNHV	Social insurance instit. expenditure on nat. pension and sickness insurance, FIM mill.
TRPPV	Private sector pension insurance, FIM million
*TRPPVDI	Private sector pension insurance vol.index, demography
*TRSHOV	Social security funds other current transfers to households, FIM million
TRSHV	Social security funds current transfers to households, FIM million
*TRSOV	Social security funds other current transfers, FIM million
TRSTOT	Total transfers to other sectors by social security funds, FIM mill.
TRSU	Unemployment compensations tied to the level of earned income, FIM million
TSCG	Central government revenue from value-added tax, FIM million

*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 mill.
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
*TYPS	Central and local govt revenue from subsequently collected direct taxes on households, FIM million
*TYPSA	Central and local govt 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
YDLG	Disposable income of local government, FIM million

YDS	Disposable income of social security funds, FIM million
YDTOT	Disposable income, total, FIM million
YFIH	Factor incomes by households, FIM million
YFIN	Investment income from abroad, net, FIM million
YFINNA	Net investment income from abroad (SNA), FIM million
YFTR	Income transfers from abroad, net, FIM million
YFTRNA	Income transfers from abroad, net (SNA), FIM million
YIC	Interest income of enterprises, FIM million
YIC1	Interest income of manufacturing, FIM million
YIC2	Interest income of non-manufacturing private sector, FIM million
YICG	Central government's property and entrepreneurial income, FIM million
YIH	Interest income of households, FIM million
YILG	Interest (etc.) income of the local government sector, FIM million
YINH	Entrepreneurial and property income of the household sector, FIM million
YINS	Net interest income of social security funds, FIM million
YIS	Interest income of social security funds, FIM million
YLGTOT	Local government revenue, FIM million
YNOI	Net operating surplus, total (domestic), FIM million
YNOI1	Net operating surplus, manufacturing, FIM million
YNOI2	Net operating surplus, non-manufacturing private sector, FIM million
YNOI21	Net operating surplus, housing sector, FIM million
YNOIC	Net operating surplus, corporate sector, FIM million
YNOIH	Net operating surplus, households, FIM million
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
YOHN	Dividend and rest of property income of the household sector, FIM million
*YOLG	Local government other requited current transfers, FIM million
YSE	Entrepreneurial income of households, FIM million
YSOCG	Central government income from entrepreneurs' social security payments, FIM mill.
YTAXABLE	Taxable earned income of households, FIM million
YTAXCG	Tax base of households' earned income (taxable less tax deductions) in central government taxation, FIM million
YTAXLG	Tax base of households (taxable income less deductions) in local government taxation, FIM million
YTRCG	Central government transfer-income from other sectors, total, FIM million
*YTRCGO	Central government other transfer-income, FIM million
YTRH	Transfer income of households received from other sectors, FIM mill.
YTRHO	Other transfers received by households, FIM mill.
YTRLG	Transfer income, total, local government, FIM million
YTRS	Transfer incomes of social security funds, FIM million
*YTRSO	Other transfer incomes of social security funds, FIM million

YTYC	Tax base of corporate taxation, FIM million
YW	Wages and salaries, total, FIM million
YW1	Wages and salaries, manufacturing, FIM million
YW2	Wages and salaries, non-manufacturing private sector, FIM million
YWCG	Wages and salaries, central government, FIM million
*YWF	Wages, salaries and social security contributions from abroad, FIM mill.
YWG	Wages and salaries, general government, FIM million
YWLG	Wages and salaries, local government, FIM million
YWS	Wages and salaries, social security funds, FIM million

DUMMIES:

D1001Q1	Dummy for pension expenditures
D0183Q1	Dummy for widening the tax base
D0186Q1	Dummy for relevant interest rates in investment eq, –85.4 = 0, 86.1– = 1
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
D0193Q3	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 FMPN equation
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 (–85Q4=0, 85Q1=.25, 85Q2=.50,...,86Q4–=2)
DPXGE	Dummy to correct PXGN for bilateral trade
DPXGEEX	DPXGE(t+1)
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

	security funds, (– 94.2 = .0009)
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 –)
DTYPLOAN	Dummy for obligatory central government loan from taxpayers (1993–1995)
DTYPRE1	Dummy for timing of tax rebate; 1st year's Q4 propotion
DTYPRE2	Dummy for timing of tax rebate; 2nd year's Q4 propotion
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

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