BASMOD

An econometric model for the Swedish economy

Model description and manual

Version 2 developed for Sveriges Riksbank

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2005-01-26

Contents

1. Introduction

This document describes the macroeconomic model BASMOD (Bengt Assarsson's Swedish MODel) and briefly how to download and use it. The purpose with the model is to give a fairly detailed description of the Swedish economy and some basic relationships therein. The model aims at simulations and forecasts in the medium-term, i.e. 1-3 years ahead, which is roughly the perspective for monetary policy in Sveriges Riksbank. The model has been programmed in the econometrics package Eviews in order to be easy to handle and therefore available to many people.

The purpose with this document is to give a comprehensive description of the model and how to use it. Hopefully, by reading this document the reader should become acquainted with the model and perhaps start to use it. However, models of this size tend to change frequently and BASMOD is no exception. The model is therefore also described on a web page which is continuously updated. The web page – Home page of BASMOD – is located at a Riksbank server and can presently be reached at

X:\BM\BASMOD\index.htm

Add this link to Favorites in your Web browser!

Once acquainted with the model – by reading some or all of this document - you would probably prefer using the web page for getting further information. Some information related to the model can also be found in my personal web page on www.bassarsson.com.

This document starts with an introductory general description of the structure of the model, how it is documented and of how to get access to the model. The second chapter describes the structure of the model, starts with an overview and then goes more into detail. The third chapter is the user manual from which to learn how to run the model. Chapter 4 shows some results from evaluations of the model, divided into econometric results, simulation exercises and forecast errors. The fifth chapter discusses some possible extensions and developments for future work. In the first appendix the specifications of all stochastic equations are given. Some standard statistical details are also given there, such as on autocorrelation, standard error of regression, etc. In the second appendix all variable names are listed in alphabetical order and divided between foreign and domestic variables. Appendix 3 describes the smaller wage-price model AMOD, which possibly can be integrated into BASMOD. Finally, Appendix 4 gives the Eviews code for BASMOD.

1.1 General

BASMOD can be seen as a neo-Keyesian model. It can be described as a model with aggregate supply and aggregate demand in which prices and wages are rigid and agents to some extent are forward-looking. Aggregate demand consists of product and financial markets while the supply side has markets for labor and capital. Economic policy is endogenous and fiscal as well as monetary policy reacts to shocks in the model. Policy is also forward-looking.

BASMOD is a fairly large model with about 100 equations, of which approximately 25 are stochastic and estimated with classical (not Bayesian) econometric methods. Some parameters are determined by priors obtained from previous estimations or based on economic theory. Estimations are mostly done equation-by-equation since the model is too large to be estimated as a system. Equations are often in error correction form, The long run steady state can be derived analytically but this is not done. Rather, the steady state is obtained numerically through the simulations with the model. The long run solutions for key variables are shown below.

The design of the model has been governed by the demand from the monetary policy process at Sveriges Riksbank. That process uses a general macroeconomic framework in which many variables appear. The present state of monetary policy with an inflation target places macroeconomic forecasting – particularly the rate of inflation – at the forefront. Forecasts are built mainly on a judgmental basis based on forecasts from sectoral experts as the main input. In addition, some model based forecasts – including forecasts from BASMOD – are used in the process but it is at the moment somewhat unclear what role or dignity each input really has.

It has been an important starting point to make BASMOD accessible to many persons, notably the sectoral experts at the Riksbank. Therefore it has been programmed in Eviews, an econometric package familiar to most people at the Riksbank.

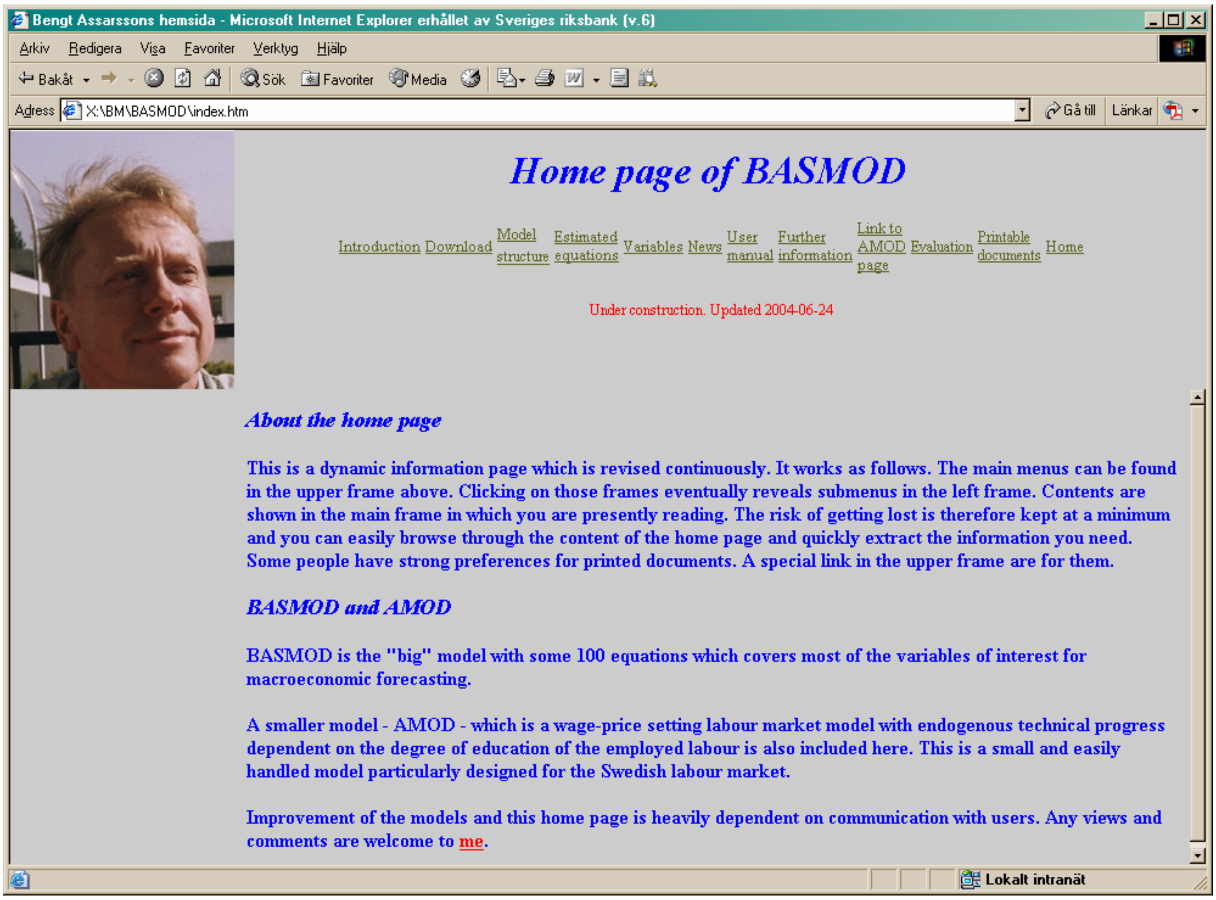
The documentation about BASMOD can be obtained either in this document or on the mentioned more up-to-date web site, the latter probably being preferred once some basic knowledge about the model has been reached. For those more inclined to follow the web site route it is probably suitable to read Chapter 1 and possibly Chapter 2 here and then go directly to the web site.

1.2 About the BASMOD home page

As mentioned, the BASMOD home page can be found in

X:\BM\BASMOD\index.htm

and the page below appears. Here, I briefly mention what can be found in the opening page and how the home page is organised.



On the Introduction pages you get information about the basics of BASMOD (Bengt Assarsson's Swedish MODel). In the upper frame of the home page you find the links

Intro-duction	Down-load	Model struc-ture	Estimated equations	Varia bles	News	User manual	Further informa-tion	Link to AMOD page	Evalu-ation	Printable docu-ments	Home

Clicking on the links in the upper frame makes new menus appear in the left frame. Results appear in the main frame in the center of the home page. Moving from left to right in the upper frame is more or less as moving from general to specific.

The Introduction gives general information about the organization of the home page and the model and how to practically use it.

The Download link informs you about how to download BASMOD to the disk from which you prefer to run the model.

The Model structure link gives detailed information about the model's structure.

The link Estimated equations gives information about every estimated equation in the model. It is easy to find the specific equation and get some information about parameters, standard error or equation, etc.

There is also a News link where you can find information about the latest updates.

Information about how to use the model is contained in the User manual link. There you find information on how to download the Eviews files from the S-disk on Sveriges Riksbank's server to your disk of preference. Before becoming an experienced user it is recommendable to have the BASMOD home page loaded in your browser simultaneously with running the model in Eviews.

The Further information link contains various kinds of information which may change over time.

BASMOD is a relatively large and detailed model. For users preferring a smaller and more comprehensible model AMOD (ArbetsmarknadsMODell) might be an alternative. A description of the smaller model is found in the Link to AMOD page. AMOD is a Wage-Setting/Price-Setting model with endogenous technical progress in the same spirit as BASMOD. It is primarily developed for the analysis of the labour market and the forecasting of labor market variables. A brief description of AMOD is also given in Appendix 3 in this document.

BASMOD is continuously evaluated with respect to simulations and forecasts. In the Evaluation link you can find information about different simulations performed with the model and other evaluations related to the theoretical consistency of the model. You can also discover forecast evaluations both with respect to within-sample prediction (equation fit) and out-of-sample predictions based both on a simulation basis and on historical forecasts done in the forecasting process in the Riksbank. Results from evaluations are also given in Chapter 4 in this document.

In addition to finding information through browsing the present home page you can consult the printed documents on different parts of the model or the complete model documentation. For printouts, go to the Printable documents.

You now should be able to guide yourself through the web site to gather the necessary information about the model.

1.3 How to download the model

BASMOD is downloaded by copying the appropriate Eviews workfile from APP's S: disc. Do the following procedure:

Go to

S:\APP\APP Modellenheten\BASMOD\BASE\0402\basmod0402.wf1

and find the version of the model used for the Inflation Report at the appropriate date (model for the second Inflation Report in this example).

The corresponding AMOD can (possibly) be found under

S:\APP\Modellenheten\AMOD\BASE\0402\amod0402.wf1

Make a copy of the downloaded file - e,g, My_basmod0402.wf1 – to a suitable directory and use the new file for your work.

All Eviews objects are stored in one single sheet in the workfile. You can open the model by clicking on Model or by inputting Show Model in the interactive command window. You can then verify that the model works properly by following the following steps:

1. Click on the Solve button.
2. Click on the Solver sheet.
3. Choose Previous period's solution
4. Choose Constant growth rate
5. Click OK

The model now should solve for Scenario X, which usually is Scenario 1. To view the solution for different variables, e.g. click on y_1 which gives you the solution for GDP in Scenario 1.

1.4 Reading guide

Depending on the type of interest in BASMOD I have the following suggestions to make reading easier:

Type of reader	Reading guide
Want to know about the structure of the model, not a user	1.2, 2, 4
Want to know about the model and how to use it	Home page, 1 - 3, Appendices 1-2
Want to know about some of the details of the model, e.g. some of the econometric specifications	Home page, Appendix 1
Want to know about the performance of the model	Home page, 4

1.5 Possible benefits from using the model

There are a number of possible benefits from using BASMOD.

- Get a consistent macroeconomic data base covering about 150 variables from the balance of resources, the labour market, price indexes, asset prices and financial variables.
- Use the model for forecasting and possibly place yourself among the top forecasters in Sweden. See the evaluation in Chapter 4.
- Pick your variable to forecast, compare with the BASMOD specification and try to possibly improve your model. (If you succeed please give a hint.)
- Link your specific model to BASMOD and make your exogenous variables endogenous in a simple way.
- Use the model for policy simulations by changing the monetary and fiscal policy rules.

2. Model structure

In this chapter I describe the structure of the model. The description starts out from an overview of the basic structure of the model. It then goes on and describes the details – divided into aggregate demand and aggregate supply. The equations of the model are desribed in general form – e.g. $Y = F(X, Z)$ – where *Y* is the dependent variable, *F* is any function and *X* and *Z* are the variables that *Y* depends on. We also discuss the relationships from a general theoretical point of view and postulate the expected sign of the effect of each of the variables – e.g. $Y = F(\overset{+}{X}, \overset{-}{Z})$ means that an increase in *X* is expected to lead to an increase in *Y* while an increase in *Z* is expected to lead to a decline in *Y*. The specific equations and the estimation output are presented in Appendix 1 and – in particular – in the BASMOD Web Site at:

X:\BM\BASMOD\index.htm

To find out more about the model than is presented here or to find out something about a specific item you should access the web site. You can also start BASMOD from the Eviews Workfile and from within the Model object, find out about the equations and the dependencies between the variables. You can learn more about that in the User manual in Section 3 below, particularly in Section 3.2.

2.1 Basic strucure

BASMOD is a macroeconomic model based on an extended Mundell-Fleming approach with price and wage setting similar to Layard-Nickell. Macroeconomic policy is endogenous in the model, i.e. fiscal and monetary policy reacts to shocks, using model consistent forward-looking expectations. The entire model is not forward-looking. Rather, forward-looking and model consistent expectations are imposed for variables for which this is considered particularly important, such as exchange rates, wages and long term interest rates.

One could think of the model as an IS/LM-Aggregate Demand model with an aggregate supply side allowing prices and wages to sluggishly respond to shocks and restore equilibrium with considerable delay. Rather than starting from microeconomic optimization BASMOD uses the macroeconomic relationships of the Mundell-Fleming type and optimization of individual agents is only implicit.

Models based on explicit optimization – see Smets and Wouters (2004) or Adolfsson *et. al.* (2004a,b) – tend to focus on the long run steady state and possibly pay less attention to the short run adjustment than is done in BASMOD. Whether macroeconomic models based on explicit optimising behaviour actually performs better in practice is an open question and I think depends very much on the particular details upon which the respective models are built. For instance, parameters derived from micro theory are changed when applied to macro data, possibly due to aggregation[1]. Such problems means that models derived explicitly from microeconomic optimizing behaviour still can be difficult to interpret. Another problem is that big macroeconometric models seldom are “first best” in the sense that it is derived from

[1] See Browning, Hansen and Heckman (1999) for a discussion about applying microeconomic theories on aggregate data.

first principles in every detail. If this is recognised, the model should be viewed in terms of "second best" and it is then more unclear how to view its merits, e.g. in terms of coherency. BASMOD is more loosely related to microeconomic theory, though equations in many instances can be shown to be derived from some microeconomic optimizing behaviour, at least in the long run.

The standard small-scale macroeconomic (textbook) model is extended in various ways:

1) BASMOD is much more detailed.
2) Stabilization policy is endogenous and forward-looking according to rules.
3) Various specifications are refined.
4) The model is fitted to data by econometric estimations and takes account of both long-run equilibrium and short-run adjustments simultaneously. The major effort is on the medium-term properties, i.e. some 1-4 years ahead.

In this section, the model structure is first presented in terms of macroeconomic demand and supply. Secondly, the structure of demand and supply is explained in detail. For further details the reader is referred to the BASMOD Web Site.

Demand and supply

The structure of the model is illustrated schematically in diagram 2.1.

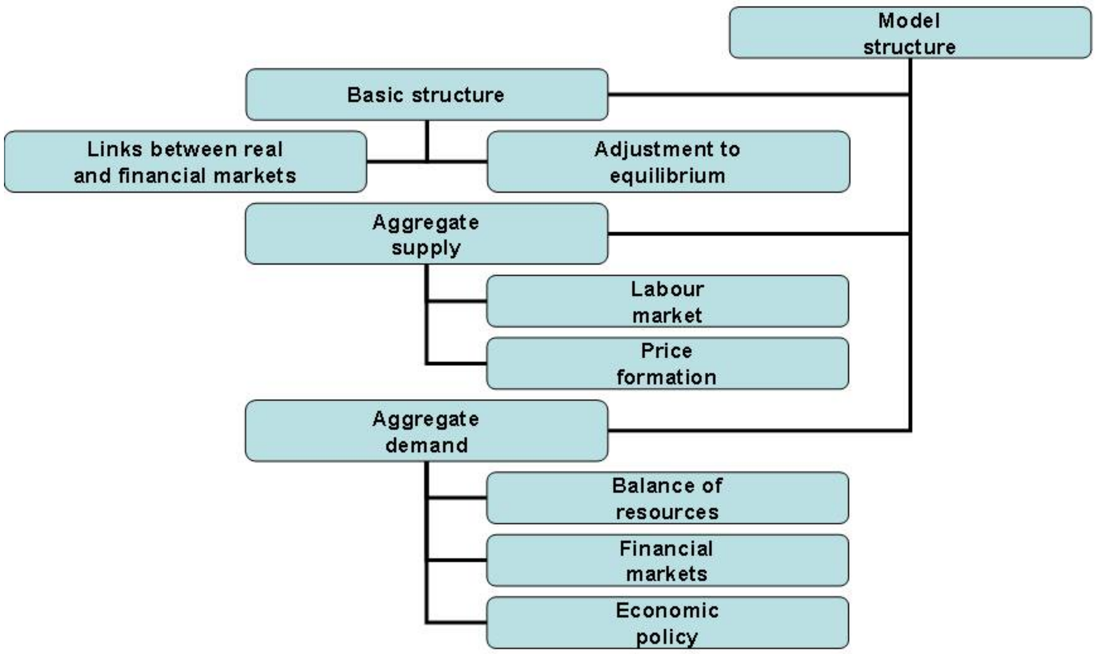


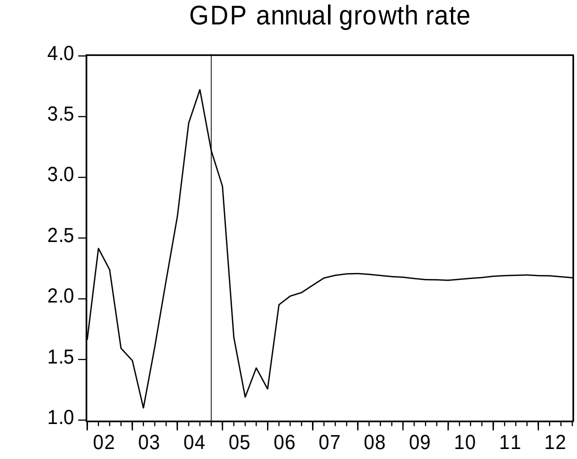
Diagram 2.1. A schematic illustration of the structure in BASMOD.

Aggregate demand is a (negative) relationship between GDP and the aggregate price level. An increase in the aggregate price level lowers demand/GDP – i.e. $Y = F(\overset{-}{P})$. An increase in the aggregate price level reduces demand through various channels. An increase in the aggregate price level increases the rate of inflation and – given some target inflation rate or for a given stock of money – raises the short-term interest rate. The increase in the short-term interest rate will to some extent also raise long term rates and the exchange rate will appreciate through the open interest rate parity condition. Foreign demand therefore decreases. The increase in interest rates also reduces domestic demand through its impact on asset prices, private wealth and therefore on household consumption expenditure and on Tobin's Q and therefore on private investments.

Once out of equilibrium it can take quite some time to restore the balance. Various rigidities – such as in prices and wages - explain the delays and the relationships in BASMOD try to take account of this, both in the demand and in the supply side of the model.

Excess demand is the outcome of either an aggregate demand or an aggregate supply shock. In a stable economy or model – such as BASMOD and most other macroeconomic models - some mechanisms should bring the economy back from the state of excess demand into equilibrium. The aggregate supply in the model can be written $Y = F(\overset{+}{P})$, i.e. when the price level increases the real wage tend to decline and the demand for labour to increase. This increases output and hence a positive relationship between *Y* and *P*. In BASMOD this is accomplished through price and wage adjustment in the labour and product markets that interact in the supply side of the model – through wage-setting and price-setting. Wage-setting is based on a model in which the labour share (in percent of nominal GDP) temporarily is influenced by the rate of unemployment (the business cycle) but in the long run depends on structural factors, such a the replacement ratio. Price-setting is determined by a model for a (representative) monopolistic firm, in which prices are determined as a mark-up on marginal costs. The equilibrium rate of unemployment is established when price-setting is consistent with wage-setting. A key factor in this is the cost function of the firm, since it is from this cost function the demand for labour as well as the marginal cost – which includes labour as well as capital costs - are derived. An implicit assumption is that the wage-setting is such that the real wage rate is set at such a high level that the demand for labour will determine employment. The equilibrium rate of unemployment can be derived analytically but in the model is solved numerically. There is no explicit computation of unemployment or output gaps, though these measures in principle could be estimated. Whereas in many macroeconomic models the output gap and the production function are essential parts and particularly important for price adjustment, this is not the case in BASMOD. Instead the cost function is central and – due to duality – is a sufficient representation of the supply side making output gaps superfluous.

The rigidities in wage- and price-setting interact with other rigidities and determine a complicated short-run dynamics that describe a system that slowly converge towards long-run equilibrium. Diagram 2.2 shows the forecast of GDP in annual growth rates and levels.



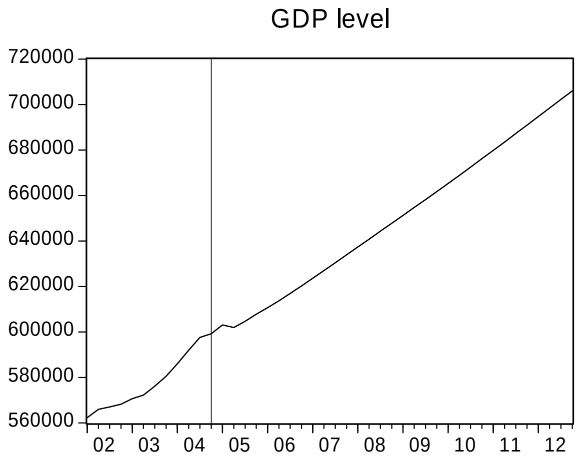


Diagram 2.2. The forecast of GDP in growth rates and levels. 2004:4 – 2012:4.

It also includes the focus horizon for the Riksbank forecast, i.e. 2004-2006 which is published in the fourth and last Inflation Report of 2004. In the long run, the growth rate converges to amply two percent. The short run dynamics is particularly pronounced during the forecast horizon of the Riksbank and can be seen in the upper part of the diagram where the growth figures are shown.

Important rigidities other than in prices and wages are in investments, the demand for labour and in exports and imports demand. BASMOD tries to capture these rigidities through the parameterization of the model. For instance, the response to a chock in the real exchange rate creates a J-curve in the current balance, which is in accordance with the stylized facts in this particular area. Tobin’s Q investment model is another model based on rigidities which explains the gradual adjustment of business investments in BASMOD.

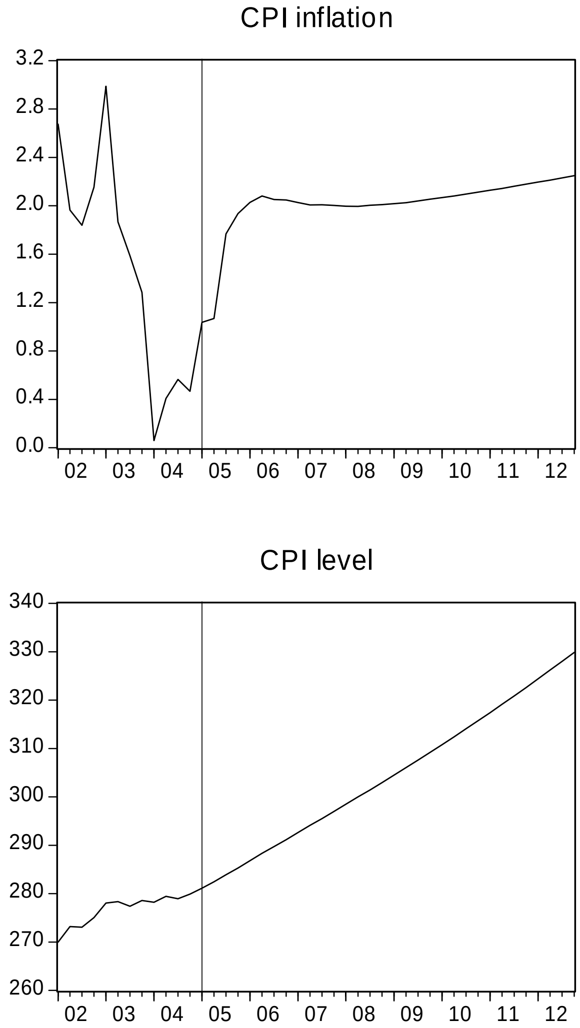


Diagram 2.3. The forecast of the consumer price index in growth rates and levels. 2004:4 – 2012:4.

Diagram 2.3 shows the corresponding figures for the Consumer Price Index. The low growth rates in 2004 are interpreted as temporarily low by the model and it is expected that the rate of inflation will increase from a level about 0.5 percent to its target level 2 percent within one year. The explanation for this forecast is mainly that the main factors explaining current inflation – marginal cost and price adjustment costs – at the moment temporarily have decreased inflation. These factors will adjust towards their long-run values causing inflation to increase.

The mechanisms described so far could possibly stabilise the economy without any help from economic policy. However, the real world contains policy-makers and so does BASMOD. The intention is to describe policy-making reasonably realistic, in which case the model could possibly be used for both policy simulations and forecasts. There is both fiscal and monetary policy and the design of policy is flexible, i.e. easy to change by the model user. Basically, fiscal policy is based on the EU stabilisation pact and stipulates that the government budget deficit on average should be 1.5 percent of GDP, a measure which will be reached with some delay through variations in direct taxes. Monetary policy is a policy rule in which the short term interest rate is set by the central bank and based on the Swedish target of 2 percent rate of inflation. Due to the rigidities and the time delay in the effects of interest rate changes, policy acts on the future expected rate of inflation. Economic policy hence possibly helps stabilise the economy.

Let us now look a little more into the details.

2.2 Demand

2.2.1 Asset markets

Households own all assets in the model including the firms. Households earn labour income and dividend income as firm owners. The two most important assets of the households are real estate (family houses) and equity. Household nominal wealth is given by

$$SETW = SENW + SEHW$$

where *SEHW* is housing wealth and financial net wealth is defined by

$$SENW = SEDEPTP + SERX \cdot SENA + SEMISC - SELIABS$$

where *SEDEBTP* is the nominal government debt, *SERX* the dollar exchange rate, *SENA* net foreign assets, *SEMISC* is miscellaneous financial assets which mainly consists of equity and *SELIABS* is liabilities, all in nominal terms.

There are similar equations to determine these asset prices. Equity prices are determined by $SEEQP = F(\overset{+}{SEPY \cdot SEY}, \overset{-}{SER3M})$, i.e. by nominal GDP and the nominal short run interest rate. Equity prices then affect the value of *SEMISC,* which is determined by

$$SEMISC = F(\overset{+}{SEPY \cdot SEY}, \overset{+}{SEDEBT}, \overset{+}{SELIABS}, \overset{+}{SEEQP})$$

and moves in line with nominal GDP in the long run.

The government debt is affected by the long run interest rate *SELR* such that an increase in the interest rate increases the debt. An increase in the interest rate will also increase the value of foreign assets *SENA,* which is measured in dollars. An increase in the interest rate will appreciate the *SEK.* For positive net foreign assets this will decrease wealth while for negative positions wealth will increase. Finally, household liabilities are assumed to change in proportion to household net income, i.e.

$$SELIABS = F(\overset{+}{SEPI - SETAX})$$

Finally there is housing wealth which changes in direct proportion to a house price index, which is measured by the Småhusbarometern. The values of financial wealth and housing wealth have been calibrated for 2000 where housing wealth consists of detached houses and summer cottages. Housing prices depend on capital costs and income according to the equation

$$SEHW = F(\overset{+}{SEPY} \cdot SEY, \overset{-}{SEUSER}, \overset{-}{SELR})$$

where *SEUSER* is the user cost of capital. The user cost of capital is defined as $SEUSER = 0.01\left[\frac{1}{2}\left(SER3M + SELR\right) + SEKPDEP\right]SEKP$, where *SEKP* is the private capital stock and *SEKPDEP* is the depreciation rate of the private capital stock. One could think of this equation as being derived from the first-order condition for the housing market (the relative price of houses equals the marginal product of housing capital).

The most important links between asset markets and the real economy then work through the evolution of equity prices, housing prices, interest rates and exchange rates. The open interest rate parity determines exchange rates through

$$SERX_t = \frac{SERX_{t+1}}{1 + SER3M_t - USR3M_t} + RP_t$$

where $SERX_t$ is the current the SEK/dollar exchange rate, $SERX_{t+1}$ is the at time t expected exchange rate at time t+1, *USR3M* is the short run U.S. interest rate and *RP* is a risk premium in the foreign exchange market.

The asset prices affect the asset values and the total real net wealth

$$SETRNW = \frac{SETW}{.01 \cdot SECED}$$

where *SECED* is the private consumption deflator normalized to 100 in 2000. Wealth then affects household consumption expenditure and the real economy. Another concept that is used is an approximation to Tobin's Q, defined as

$$SETQ = \frac{SEEQP}{SEPINV}$$

where *SEPINV* is the implicit price index of private investments. Tobin's Q affects private investments (business investments) *SEBI*.

2.2.2 Financial flows: The balance of payments and the financial savings

The balance of payments

The balance of payments is

$$SECBV \equiv SEX \cdot SEPX - SEM \cdot SEPM + SEIPDC + SEIPDD + SEBPT$$

where *SEX* is exports of goods and services, *SEPX* is an export price index and *SEM* the imports of goods and services. *SEIPDC* and *SEIPDD* are the interest profit, dividend, credit and debit respectively. *SEBPT* is balance of payment transfers. The equations for credits is

$$SEIPDC = F(\overset{+}{SEROR}, \overset{+}{SEGA}, \overset{+}{SERX})$$

where *SEROR* is the rate of return on financial assets, *SEGA* is gross financial assets in US dollars and *SERX* the SEK/dollar exchange rate. The rate of return is exogenous and assumed to be approximately 1.5 percent. The equation for debits is

$$SEIPDD = F(\overset{+}{SEGL}, \overset{+}{SERX}, \overset{-}{SEDEBT}, \overset{\pm}{SEEQPR}, \overset{\pm}{SEGIP})$$

where *SEGL* is gross foreign liabilities, *SEDEBT* is government debt in real terms, *SEEQPR* is the rate of return on foreign liabilities and *SEGIP* is government interest payments. The rate of return on foreign liabilities is exogenous and assumed to be approximately 1.5 percent in the long run.

$$SEGA = F(\overset{+}{SECBV}, \overset{+}{SEGL}, \overset{+}{SEPY}, \overset{+}{SEY}, \overset{\pm}{SERX})$$

which piles up with the surplus in the balance of payments and moves in line with nominal GDP in the long run.

Gross liabilities are determined by

$$SEGL = F(\overset{-}{SECBV}, \overset{+}{SEPY}, \overset{+}{SEY}, \overset{\pm}{SERX})$$

and piles up with the deficit in the balance of payments and otherwise go ahead with nominal GDP in the long run. It should be noted that gross foreign assets and liabilities both are adjusted with respect to the world deficit that occurs due to the measurement errors that these data contain. All in all, that means that assets and liabilities in the long run move in line with the world GDP development.

Finally, the balance of payment transfers (in real terms and deflated by the private consumption deflator) is determined by a 12-quarter moving average, which simply is written

$$SEBPT = F(\overset{\pm}{SERX}, \overset{\pm}{SECED})$$

Financial savings

As mentioned above the financial net wealth is

$$SENW = SEDEPTP + SERX \cdot SENA + SEMISC - SELIABS$$

and by definition the change in financial net wealth is equal to the private sector savings, i.e.

additions to $SENW = SECBV - SEBUD$

For this accounting identity to hold in the data one of the components of *SENW* is treated as a residual. Here the residual is the miscellaneous assets variable *SEMISC*, which includes especially equity wealth but also the money stock.

2.2.3 Balance of resources

The balance of resources is described by the basic income identity:

$$SEY \equiv SEC + SEGC + SEGI + SEBI + SEHI + SEXG + SEXS - SEMG - SEMS + SEDS$$

where *SEC* is household consumption expenditure, *SEGC* is government consumption expenditure, *SEGI* is government investment expenditure, *SEBI* is private business investments, *SEHI* is housing investments, *SEXG* is exports of goods, *SEXS* is exports of services, *SEMG* is imports of goods, *SEMS* is imports of services and *SEDS* is changes in inventories. The consumption functions is

$$SEC = F(\overset{+}{SEYD}, \overset{+}{SETRNW}, \overset{-}{SEU})$$

where *SEYD* is real private disposable income and *SEU* is the unemployment rate. The unemployment rate is included to capture income uncertainty[2]. Real private disposable income is defined by

$$SEYD \equiv \frac{SEWHB \cdot (SEHOURS \cdot SEE) + SEOPI + SETRAN - SETAX}{.01 \cdot SECED}$$

where *SEWHB* is the gross hourly wage rate, *SEHOURS* is the mean number of hours worked and *SEE* is the number of employed. *SEOPI* is other personal income, *SETRAN* is transfers and *SETAX* is direct taxes. Personal income is defined as

$$SEPI \equiv SECOMP + SEOPI + SETRAN$$

where total compensation *SECOMP* is defined by

$$SECOMP \equiv SEWHB \cdot (1 + SEWTR + SECOLLR) \cdot (SEHOURS \cdot SEE)$$

where *SEWTR* is the wage tax rate and *SECOLLR* the payroll tax rate.

This consumption function is one out of three basic alternatives and uses current and lagged values only. The second alternative uses a forward-looking income variable, *SEYDFORW*, which is the present value of incomes four year ahead. A third alternative is a disaggregated model in which household consumption is divided into six components[3]. This model can

[2] This model can be seen as a generalized specification based on a precautionary savings model with buffer stocks generation. The error correction form is motivated theoretically in Lettau and Ludvigson (2004). These papers show that a model based on current resources (labour income and net wealth) is reasonable and can be derived from optimizing behaviour. However, there also seems to be some aggregation problems since as Carroll (1997) shows the consumption function is concave and that the marginal propensity to consume to be decreasing in current resources.

[3] These are *SECNOND*=nondurables and services, *SECDUR*=durables and semidurables less cars, *SECCAR*=expenditure on cars (sales), *SECCH*=expenditure by non-profit organizations, *SECIN*=expenditure in Sweden by foreigners and *SECOUT*=expenditure abroad by Swedes. Another alternative which is currently developed is based on using a model for *SECNOND* and treating all durables as assets and part of the households' net wealth (as suggested by Lettau and Ludvigson (2004)). For further details on this development see the BASMOD Web Site.

partly be traced to Bernanke (1985) who derives Euler equations for components of private consumption, in which expenditure on one component depends on expenditure on other components. (See the web site for details.)

Government consumption and investments are simple random walks with drift. Private business investments is based on a paper by Assarsson, Berg and Jansson (2004)

$$SEBI = F(\overset{+}{SEY}, \overset{+}{SETQ})$$

where a model is used in which both an accelerator and Tobin's Q determines investment. According to the basic theory Tobin's marginal Q should be a sufficient determinant of investments. That model can be extended and a possibility opened for output to influence investments if firms are rationed in the home market. In the paper we also show that the measure *SETQ* above is a good approximation to a more sophisticated but less transparent measure of Q. From this we also note that an increase in interest rates lowers equity prices and Tobin's Q and hence lowers business investments.

Housing investments is determined by

$$SEHI = F(\overset{+}{SECED}, \overset{-}{SERR}, \overset{+}{SEHS}, \overset{+}{SEHW})$$

where *SERR* is the real rate of interest and *SEHS* is the number of housing starts. The number of housing starts is determined by

$$SEHS = F(\overset{+}{SEHW}, \overset{-}{SER3M}, \overset{-}{SEUSER})$$

Housing starts is used since there is a time delay between the decision to build a new house and until the house is finished, due to administrative factors.

Export and import equations for goods and services, respectively, are demand equations and as such it is important to find the most appropriate approximations of relative prices and income[4]. There are several alternatives in each case and I have tried numerous specifications. As relative prices there are relative export and import prices, relative unit labour costs, real effective exchange rates, consumer or producer prices, etc. The income variables are more straightforward and I have used Swedish export markets – *SES* – for exports and *SETFE = SEY + SEMG+SEMS,* total demand, for imports. Swedish export markets are defined as the export share weighted imports from other countries. The real effective exchange rate is also defined where relative consumer prices (consumption deflators) across countries are weighted with export shares. The nominal index is *SEEFEX* and the relative index is *SEREFEX*. These indexes are broader than the Swedish TCW-indexes but the correlation between them still is close to unity. Other measures that are possible and are included in the BASMOD data base and therefore easily can be tried out by anyone interested are *SERULT*=trend in relative unit labour cost, *SERPX*=relative export price index or *SERPM*=relative import price index. The final functions are

[4] See Assarsson (1999) for an analysis of different specifications.

$$SEXG = F(\overset{-}{SERPX}, \overset{+}{SES})$$ exports of goods

$$SEXS = F(\overset{-}{SEREFEX}, \overset{+}{SES})$$ exports of services

$$SEMG = F(\overset{+}{SEREFEX}, \overset{+}{SETFE})$$ imports of goods

$$SEMS = F(\overset{-}{SEPMG}, \overset{+}{SETFE})$$ imports of services

Finally, the investments in inventories – changes in inventories – is determined by

$$SEDS = F(\overset{-}{SESL}, \overset{-}{SELR}, \overset{+}{SEY})$$

where *SEDS* is changes in inventories and *SESL* is the stock of inventories. This completes the description of the demand side of the model apart from economic policy which in the model works via demand.

2.2.4 Economic policy

Economic policy works through two policy rules – one for fiscal and one for monetary policy. Apart from imposing chocks to these policies it is possible to introduce exogenous chocks to other parts of the model such as government expenditure, unemployment benefits, various taxes, etc. The main focus, however, is on changes in the policy rules.

2.2.4.1 Fiscal policy

Fiscal policy is governed by the long run solvency criterion as implemented by the EU stabilization pact. The target for the Swedish government budget surplus is set to 1.5 percent of GDP and the policy governed by the equation

$$\begin{aligned} SETAX_t &= -SEWT_t - SECOLL_t + (SETAX_{t-1} + SEWT_{t-1} + SECOLL_{t-1}) \cdot \Delta SEPI_t \\ &+ 0.01(SEPY \cdot SEY)_{t-1} \cdot 0.01(SEGBRT - SEGBR)_{t-1} \end{aligned}$$

which states that the changes in taxes relative to income should be equal to the lagged difference between target and actual budget surpluses valued at nominal GDP. In equilibrium at *SEGBR*=1.5 taxes will grow at the same rate as personal incomes, *SEPI*. If the budget surplus is lower than the target, taxes will be raised faster than personal income. In this particular case the adjustment is done through changes in direct taxes and not by *SEWT*, wage taxes, or *SECOLL*, payroll taxes[5].

Of course, the fiscal policy rule can be altered in line with the model users' preferences. I have run the model with adjustments in multiple tax rates and it would also be possible to change government expenditure or transfer payments.

2.2.4.2 Monetary policy

[5] In Swedish they are "löneskatt" and "arbetsgivareavgift", respectively.

The same goes for monetary policy where it has been an intense discussion in recent years about the specifications of the policy rule. In Sweden there is the inflation target for CPI at

$$\frac{(SEKPI80_t - SEKPI80_{t-4})}{SEKPI80_{t-4}} \cdot 100 = 2 \pm 1$$

where *SEKPI80* is the consumer price index with 1980=100 and here defined for the quarterly data[6].

It has been argued that the monetary transmission mechanism implies that it takes approximately two years for a change in the policy interest rate to achieve its maximum effect on inflation. Hence, the CB should change the policy rate in response to the two year ahead expected deviation of the actual from the target inflation rate. A smoother that makes the policy rate persistent is most often included and a possible rule then could be

$$SER3M_t = 1.5 + 0.7SER3M_{t-1} + 1.4\left[SEINF_{t+8} - 2\right]$$

This simple rule shows that the interest rate is rather persistent, that the response to deviations is fairly large and aims at increasing the real interest rate and that the long run equilibrium interest rate is five percent (hence a three percent real rate). A large number of experiments with this and other types of rules have been done. It is very easy to try out different variants in the model. Presently the following rule rules:

$$SER3M_t = 2.3 + 0.8SER3M_{t-1} + \sum_{i=1}^{10} w_i \left[SEINF_{t+i} - 2\right]$$

with policy weights increasing linearly with the 2,5 year's horizon. The equilibrium rate is about 4.6 percent.

2.3 Supply

2.3.1 Labour market

The supply side can be described as a price and wage setting model à la Layard-Nickell. In the very simple case such a model has a wage eqution that determines the wage rate at such a high rate that the demand for labour determines the employment rate. A simple production function then determines output while the price level is set as a markup on marginal cost.

To give the reader an intuition about the model properties I show the simplest possible specification (which is different from the BASMOD specification) of such a model. The reader is then referred to the specific parts of the labour market in BASMOD which basically works in the same way.

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[6] It could also be defined as an annual average growth rate:

$SEINF = \left[\frac{SEKPI80_t + SEKPI80_{t-1} + SEKPI80_{t-2} + SEKPI80_{t-3}}{SEKPI80_{t-4} + SEKPI80_{t-5} + SEKPI80_{t-6} + SEKPI80_{t-7}} - 1\right] \cdot 100$ which makes the policy a little bit smoother.

A Simple Basic Specification

Let the producer wage be $SEWHP \equiv SEWHB(1+SEWTR+SECOLLR)$. Let the wage equation be represented by the wage share equation

$$\frac{SEWHP \cdot SEHOURS \cdot SEE}{0.01 \cdot SEPY \cdot SEY} = F(\overset{-}{\alpha}, \overset{-}{U})$$

i.e. the wage share depends on the unemployment rate. α is an index that measures structural factors in the labour markets, such as the replacement ratio, unemployment insurance, etc. and defined such that it is supposed to have a negative effect on the labour share. Consider then the simple producer price equation

$$SEPY = F(\overset{+}{\mu}, SE\overset{+}{U}SER, SE\overset{+}{U}LC)$$

where μ is the markup (on marginal costs).

It is assumed that the bargaining system is such that it results in real wages that are high enough to let labour demand determine the total number of hours worked. The demand equation is

$$SEE = SEHOURS^{-1} \cdot F(\frac{SE\overset{-}{W}HP}{.01 \cdot SEPY}, SE\overset{+}{Y})$$

while the mean number of hours worked is determined by

$$SEHOURS = F(\frac{SE\overset{+}{W}HC}{.01 \cdot SECED})$$

the real consumer wage rate, where the relation to the producer wage rate is given by

$$SEWHC = \frac{\left(\frac{SEWHP}{1+SEWTR+SECOLLR}\right)(1-SETAXR)}{1+SEITR}$$

where *SETAXR* is the direct tax rate and *SEITR* is the indirect tax rate from which follows the tax wedge

$$SEWEDGE = 1-\frac{SEWHC}{SEWHP} = 1-\frac{\frac{1-SETAXR}{1+SEWT+SECOLLR}}{1+SEITR}$$

which at the moment is approximately 70 percent. These equations determine employment while the labour force is determined by the equation

$$SELF = F(SE\overset{+}{W}HP, SEW\overset{-}{E}DGE, SEC\overset{-}{E}D)$$

and the rate of unemployment residually by the identity

$$SEU \equiv \frac{SELF - SEE}{SELF} \equiv 1 - \frac{SEE}{SELF}$$

2.3.2 The capital stock and investments

The capital stock for the economy as a whole is divided into private and public, *SEKP* and *SEKG*, respectively. The capital stock is then generated by the investment equations shown above through the stock/flow equations:

$$SEKP_t = SEPSI_t + (1 - SEKPDEP) \cdot SEKP_{t-1}$$

where $SEPSI = SEBI + SEHI$ and *SEKPDEP* is the depreciation rate of the private sector capital stock. There is a similar equation for the public capital stock.

2.3.3 Production functions, cost functions, potential output and marginal cost

From the equilibrium of the labour and capital markets we can calculate potential output and marginal cost. The price mechanism in which prices rise as the economy overheats and fall in a downturn generally depends only on marginal cost and not on the output gap unless in the special case of a Cobb-Douglas technology. However, the Cobb-Douglas technology implies constant factor shares and hence is in conflict with the labour market model above. Discarding the Cobb-Douglas technology also implies that the output gap does not enter the price equation (cannot be substituted for marginal cost). Therefore in deriving demand for labour and marginal cost I have used alternative technologies.

Fairly standard is the CES production function:

$$SEY = \gamma \left[SECAPSH \cdot (SEKP + SEKG)^{-\rho} + (1 - SECAPSH)\left((SEE \cdot SEHOURS)\exp^{\lambda t} \right)^{-\rho} \right]^{-\frac{1}{\rho}}$$

where $SECAPSH$ is the capital share of output, γ is a scale parameter and ρ a parameter that determines the functional form. The elasticity of substitution is $\sigma = \frac{1}{1+\rho}$. λ determines the rate at which labour-augmenting technical progress proceed. From this production function we can derive potential output and an output gap by using the steady state values of capital and labour.

The parameters of the above production function can be estimated/calibrated from the labour demand function – which then must include a time trend to capture the labour-augmenting technical progress. In the CES function the parameter ρ determines the functional form and is calibrated to -1.64 and γ is calibrated to 1.52. The rate of technical progress and the elasticity of substitution are estimated from the labour demand equation.

There is also a cost function corresponding to the production function, which in this case is

$$SETC = \gamma^{-1} \cdot SEY \left[SECAPSH^{\sigma} \cdot SEUSER^{1-\sigma} + (1 - SECAPSH)^{\sigma} \cdot \left(\frac{SEWHP}{\exp^{\lambda t}} \right)^{1-\sigma} \right]^{\frac{1}{1-\sigma}}$$

where SETC is total cost. The marginal cost can be derived as

$$SEMC = \frac{\partial SETC}{\partial SEY} = F(\overset{+}{SEUSER}, \overset{+}{SEWHP}, \overset{+}{SEPMA}, \overset{+}{SEY}, \overset{-}{T})$$

which gives the equilibrating mechanism since – as shown below – the price level is determined by marginal cost. Also the input demand equations, for instance for labour demand can be derived as

$$SEE = SEHOURS^{-1} \frac{\partial SETC}{\partial SEWHP} = SEHOURS^{-1} F(\overset{+}{SEUSER}, \overset{-}{SEWHP}, \overset{+}{SEPMA}, \overset{+}{SEY}, \overset{+/-}{T})$$

Two points are worth mentioning. Since the input demand functions and the marginal cost functions are derived from the same cost function they will share the same parameters and those parameters should be identified in the econometric estimation by using cross-equation restrictions in the simultaneous estimation of price and input demand equations. That procedure allows the parameters of both the production and the cost function to be identified.

The above example uses the CES production function and derives potential output and the output gap and the latter can be included in the producer price equation. A drawback is the very simple form of technical progress that is assumed. A case where a flexible functional form is used (the generalised Translog form) and where the technical progress is endogenised and due to the education levels of the employed is used as an alternative. This is derived and estimated in the AMOD model and is presented in Appendix 3. It has also been implemented in BASMOD but is presently not the default. See the BASMOD Web Site for news and more details.

Hence, potential output will be determined by the same factors as the equilibrium rate of unemployment and in addition the labour force and the labour productivity. Potential output will grow in line with labour productivity and the labour force and be affected positively by the degree of competitiveness in the markets. This can be illustrated with a simpler version of the model[7].

[7] To easier understand the model consider the following simpler specific model. The wage share equation is $\frac{SEWHP \cdot SEHOURS \cdot SEE}{.01 \cdot SEPY \cdot SEY} = \alpha - \beta SEU$. Define labour productivity $A \equiv \frac{SEY}{SEHOURS \cdot SEE}$ and wage setting in terms of the real wage as $\frac{SEWHP}{0.01 \cdot SEPY} = A(\alpha - \beta SEU)$. Let price setting be $0.01 \cdot SEPY = (1+\mu)\frac{SEWHP}{A}$ and in terms of the real wage $\frac{SEWHP}{0.01 \cdot SEPY} = A\mu^{-1}$. We then can solve for the equilibrium unemployment rate as $SEU^{eq} = \frac{1}{\beta}(\alpha - \frac{1}{\mu})$. Since $SEU \equiv 100\frac{SELF - SEE}{SEE} \equiv 100\left(1 - \frac{SEE}{SELF}\right)$, where *SELF* is the labour force. For the simple production function $SEY = A \cdot SEE$ we can solve for potential output:

In deriving marginal cost, demand for inputs and possibly potential GDP and the output gap it seems crucial to apply a suitable functional form. The Cobb-Douglas form is a very restrictive form in which it is assumed that the elasticity of substitution $\sigma = 1$ whereas in the CES it is assumed to be constant. The Cobb-Douglas form implies that the cost shares are constant, a prediction which is very clearly rejected by the Swedish data[8], both in the short and in the long run.

With less restrictive functional forms the elasticity of substitution is allowed to vary. In addition to the CES form above two alternatives is the generalised Leontief function or the Translog model. The (generalised non-homothetic) Translog cost function is

$$\begin{aligned}
&\log SETC = \log Y + a_0 + a_w \log(SEWHP / A) + a_k \log SEUSER + \\
&.5[b_{11} \log(SEWHP / A)^2 + b_{12} \log(SEWHP / A) \cdot \log SEUSER + \\
&b_{21} \log(SEWHP / A) \cdot \log SEUSER + b_{22} \log SEUSER^2] + \\
&g_{wy} \log(SEWHP / A) \cdot \log Y + g_{ky} \log SEUSER \cdot \log Y
\end{aligned}$$

and this cost function is used to generate marginal costs and demand for labour in shares form. *A* is a labour-augmenting technological factor which is either a time trend as above or depends on certain factors, such as educational levels in the AMOD model. Both types of technological factors have been estimated. The educational model estimates δ_1 and δ_2 as the effects of high school (D_1) and university education (D_2) on productivity in

$$A = 1 + \delta_1 D_1 + \delta_2 D_2$$

in a simultaneous equation Translog model where marginal cost (producer price setting) and the demand for labour and capital is estimated simultaneously with theoretical constraints imposed on the parameters in the cost function above[9]. Using this model I estimated the following time series for *A*:

$SEY^{pot} = A\left[SELF\left(1 - \frac{1}{\beta}(\alpha - \frac{1}{\mu})\right)\right]$, which means that potential output depends on labour productivity, the labour force, structural factors in the labour market and on the degree of competition in product markets.

[8] This means that the demand for labour is $\frac{\partial \log SETC}{\partial \log SEWHP} = \frac{SEWHP \cdot SEE \cdot SEHOURS}{SEPY \cdot SEY} = 1 - SECAPSH$, which is a constant in the Cobb-Douglas model. For the last 10 years the coefficient of variation is about the same for the general price level as for the labour share.

[9] The employed are normalized for primary school education.

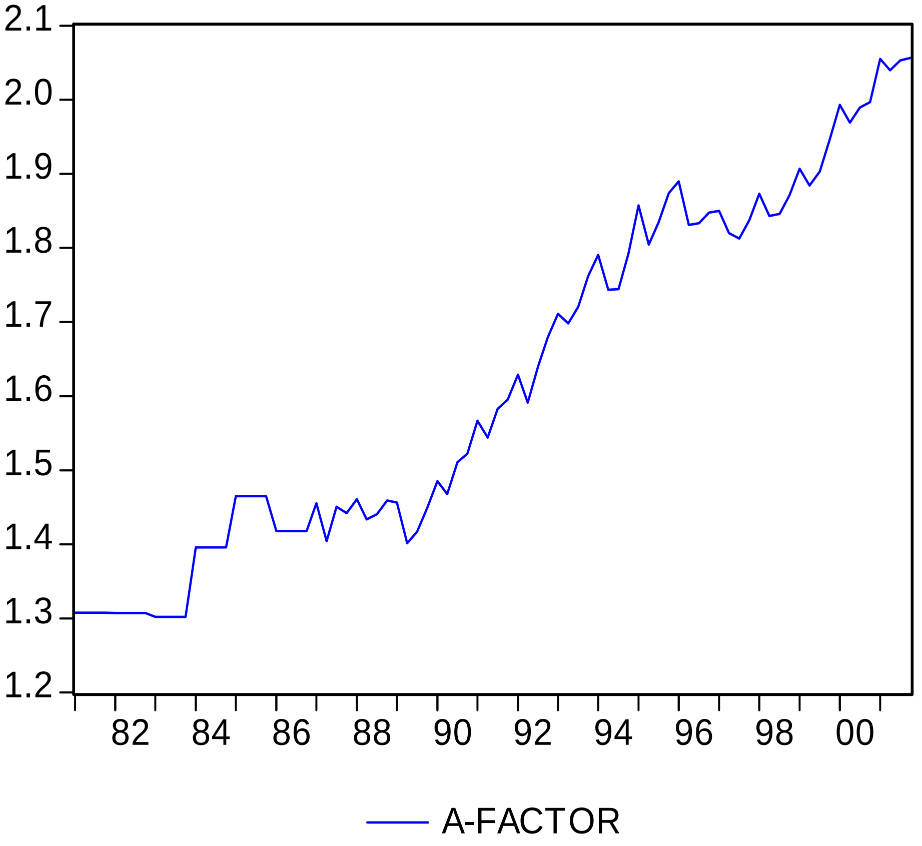


Diagram 2.3. Estimated $A = 1 + \delta_1 D_1 + \delta_2 D_2$ for 1981-2002.

It shows that the labour-augmenting technological progress on average is 2.2 percent per year for the period 1981-2002.

A positive technology shock would typically increase the *A*-factor and effective labour hours, lower the shadow wage rate, increase labour demand, the actual real wage rate and output.

2.3.4 Price formation

The price system is a little bit more complicated than in the basic model used for illustrative purposes above. Rather than using the GDP deflator alone prices are built from producer to consumer prices. Producer prices are assumed to follow the standard model and be based on a markup on marginal cost, while consumer prices are based on markups on producer prices.

I now describe the price system in more detail. I use the profit function and the cost function. Assuming firms are monopolists we can derive the first-order condition as

$$SEPP = F(\overset{+}{MC}, \overset{+}{\mu})$$

where

$$SEMC \equiv F(SEY, SEWHP, SEUSER, SEPMA, T) \equiv \frac{\partial C(SEY, SEWHP, SEUSER, SEPMA, T)}{\partial SEY}$$

is marginal cost and C is the cost function. For the competitive firm $SEPP = MC$. We can also use the general form

$$SEPP = \left[1 - \frac{V}{\varepsilon}\right]^{-1} F(\overset{+}{SEY}, \overset{+}{SEWHP}, \overset{+}{SEUSER}, \overset{+}{SEPMA}, \overset{-}{T})$$

where $0 \le V \le 1$ is an index showing the degree of competition. The price level depends on the degree of competition, the price elasticity of demand, the output level, the wage rate, the efficiency index and the user cost of capital.

The rate of unemployment and the level of output is essentially the same in equilibrium as in the simple model.

Output can be defined in terms of gross output rather than value added. Then the production function instead is defined in terms of energy and raw materials prices as well. One would then typically end up with a price equation of the form

$$SEPP = \left[1 - \frac{\overset{+}{V}}{\varepsilon}\right]^{-1} F(\overset{+}{SEY}, \overset{+}{SEWHP}, \overset{+}{SEUSER}, \overset{+}{SEPMA})$$

where *SEPMA* is an import price index for oil prices, metal prices, food prices and prices on imported manufactured goods.

The private consumption deflator is determined by

$$SECED = F(\overset{+}{SEPP})$$

and the consumer price index - the target variable for the Riksbank - is

$$SEKPI80 = F(SECED, \overset{+}{SEPP}, \overset{+}{SESKEW}, \overset{+}{SEVAR})$$

where *SESKEW* is the skewness of relative price changes and *SEVAR* the variance of relative-price changes. The underlying inflation rate is determined by

$$SEUND1X = F(\overset{+}{SEKPI80})$$

The specifications are done such that relative prices tend to be constant in the long run but allowing them to deviate substantially in the short run.

2.3.5 Inflation and Price Rigidity

It is well-known that prices tend to adjust with a considerable delay, such that it takes time to achieve the long run price levels described above. Therefore, the equation $SEPP = F(MC, \mu)$

describes the equilibrium price level in the long run, while the short run adjustment requires some special treatment.

In the new Keynesian models it is common to use a model for short run pricing emanating from Calvo (1983). In that model there are a number of identical firms where each firm has an exogenous probability $1-\theta$ for its price to change. This probability is assumed to be independent of the time since the most recent observed price change. It can be shown that the price level then is determined by

$$P_t = \theta P_{t-1} + (1-\theta)P_t^*$$

where the optimal price P_t^* depends on the expected future marginal cost and inflation is a function of unobservable variables. According to Bårdsen *et al* (2004) this Phillips curve can be operationalised as

$$\pi_t = \eta_1 \pi_{t+1} + \eta_2 x_t$$

where x_t is some approximation to contemporaneous marginal costs. Bårdsen *et al* show that the econometric difficulties embodied in the model are huge and it seems that there is no universally acceptable solution to these problems.

However, some alternatives are available, one of which takes into account the distribution of relative price changes, as suggested by Ball and Mankiw (1994,1995) for the United States with an empirical application for Sweden in Assarsson (2004). Their theory suggests that one should include higher moments of relative price changes – variance and skewness – in the specification of Phillips curves. These variables reflect the effects of short run price rigidity and hence accounts for the short run adjustment to the long run equilibrium relationships where prices basically depend on marginal cost.

Contrary to the pricing in the Calvo model – time dependent pricing – in Ball and Mankiw prices are state dependent. Firms face costs for adjusting prices. Then relative shocks appear in the markets and induce firms to adjust their nominal prices. If the distribution of relative prices – which is almost synonymous to relative shocks according to Ball and Mankiw (1995) – is positively skewed firms with large positive relative price changes adjust their prices while a number of firms with small negative relative price changes keep their prices constant. Hence, the positive skewness of relative price changes increases the inflation rate in the short run. If the distribution of relative price changes instead was symmetric price increases would be counterbalanced by decreases. It can also be shown that an increase in the variance of relative price changes may increase inflation and that it may reinforce the positive relationship between skewness and the mean.

Diagram 2.4 below shows that for a distribution of relative-price changes there is a range of inaction for which prices are not change since the marginal benefit of changing the price (approaching the optimal price) is lower than the marginal cost of changing the price. For a positively skewed distribution the price increases outweigh the price decreases and add on the rate of inflation.

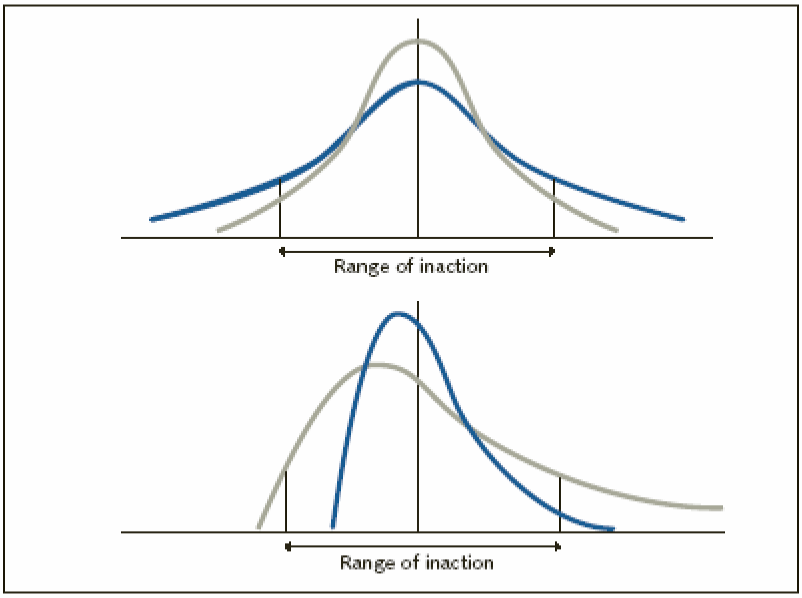


Diagram 2.4. The variance and skewness of relative price changes.

In the upper part of the diagram the distribution is symmetric and in the lower part positively skewed. The diagram shows that the range of action for price setters has a larger tail in the positive than in the negative region and that this effect is magnified by an increase in the variance.

Assarsson (2004) shows that estimated Phillips curves gain significantly from the inclusion of the distribution measures, skewness, lagged skewness, variance and the product of skewness and variance. When forecasting skewness and variance of relative-price changes presently I use a separate VAR model for that task. Further evaluations are done with respect to the forecasting performance.

2.4 The long run steady state and the short run dynamics

2.4.1 General

The long run equilibrium is not computed analytically but rather numerically. The long run values for real and nominal variables can be computed and they should turn out reasonable. The relationships are not consistently derived from microeconomic principles though it can be shown that the specifications in many instances could have been derived from a specific utility, cost or production function for a representative agent. But this is not done completely though the model is coherent and derived from macroeconomic principles.

Specifications are mostly done in terms of the well-known error correction model, such that both the short run dynamics (from relationships in differences) and the long run relationships (from relationships in levels) are captured in the macroeconomic time series data. Since the focus in monetary policy is on the forecast 1-3 years ahead, clearly the short run dynamics is of great importance.

Mostly the stochastic equations are estimated by single equations methods like OLS or TSLS, often with an MA term to capture the effects of temporal aggregation. Sometimes, as with the disaggregated consumption model (an option in the model) a systems method is used.

To specify the error correction model often a ARDL (autoregressive distributed lag) model is used from which the long run relationship is derived, possibly with parameter restrictions derived from economic theory (like homogeneity in the consumption function or the producer price equation). Otherwise, the equation is specified with the dependent variable in difference form but including both differences and levels on the right-hand side. A comparison with these methods and the more common Johansen method was done while specifying the investment model (see Assarsson, Berg and Jansson (2004)) and showed that the conclusion (the preferred investment model) based on the Johansen method were basically identical in all three methods.

Economic policy is designed in terms of policy rules and significantly contributes to make the model coherent and converge to a reasonable equilibrium. Both monetary policy (the interest rate) with an inflation target and fiscal policy (direct taxes) with a target for the budget deficit acts on shocks to stabilize the economy. As shown by Barrell (1996) and Barrell and Sefton (1997) fiscal policy is important for the stabilizing properties in this type of model.

2.4.2 Forecasts in the long run

In this section I show the long run solutions for a number of variables, divided into the balance of resources and its components, productivity growth, labour market variables, price variables and financial variables.

Balance of resources

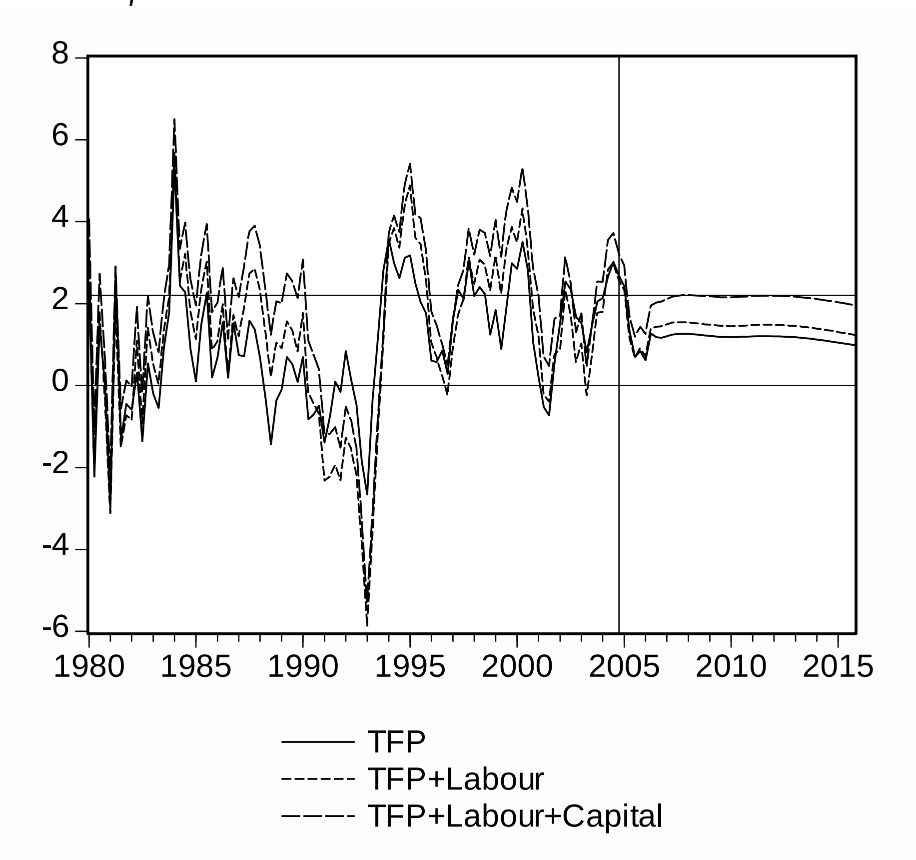


Diagram 2.5. Solow growth accounting according to recent forecast. 1980-2015. Forecast starts in 2004:4. Annual percentage growth rates. The “consensus” long run growth rate is marked at 2.2.

	TFP	TFP+Labour	TFP+Labour+ Capital
		1980-1992	
Mean	0.360915	0.591918	1.523621
Median	0.192398	1.060277	2.013968
Maximum	5.320584	5.689865	6.503283
Minimum	-2.984541	-3.861833	-3.234164
Std. Dev.	1.415281	1.904188	1.931425
		1993-2004	
Mean	1.729706	1.786139	2.509993
Median	2.038554	2.117008	2.872337
Maximum	3.572127	4.883761	5.411600
Minimum	-2.660097	-5.875286	-5.308526
Std. Dev.	1.255942	2.013696	2.041012
		2005-2015	
Mean	1.173841	1.408395	2.084055
Median	1.188203	1.455968	2.159093
Maximum	2.420824	2.335585	2.926262
Minimum	0.618368	0.687395	1.192033
Std. Dev.	0.236839	0.238276	0.267336

Table 2.1. Solow growth accounting during different periods. Annual percentage growth rates. Accumulated for TFP (total factor productivity), TFP + contribution from growth in hours worked and TFP + contribution from growth in hours worked+ contribution from growth in capital stock.

Diagram 2.5 and table 2.1 show the historical development and the forecast for the GDP growth rate and decomposed with Solow growth accounting. In the long run GDP growth is in line with the consensus rate 2.2 percent. The decomposition shows that productivity growth is 1.2 percent, labour growth 0.3 percent and capital stock growth 0.7 percent which is slightly lower than the growth rates during the past 10 years, particularly in TFP growth rates.

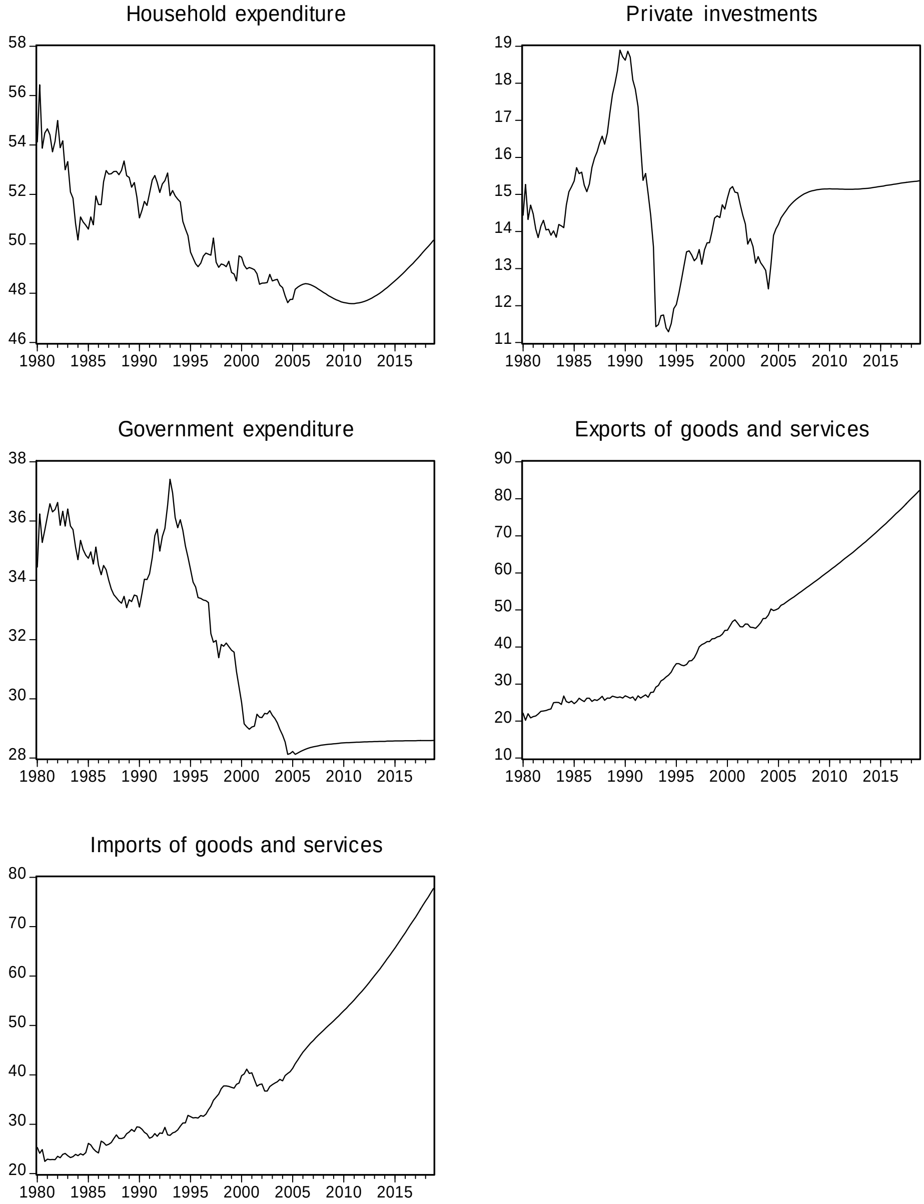


Diagram 2.6. GDP components as shares of GDP. Percent. 1980-2015.

Diagram 2.6 and table 2.2 show the development of GDP from the demand side, but now in terms of the components of the balance of resources as shares of GDP (in real terms). As can be seen, household expenditures are expected to increase in the long run, though there is a downturn the coming 5 years. Private investments is expected to increase its share of GDP and that is also the case for the private sector as a whole. The exports and imports shares show that the world markets are expected to increase.

	Household expenditure	Private invesments	Government expenditure	Exports	Imports
			1980-1992		
Mean	52.57923	15.71322	34.81899	25.10798	25.92544
Median	52.56864	15.32027	34.80521	25.63318	26.02024
Maximum	56.43506	18.89492	36.62350	27.80412	29.45749
Minimum	50.15258	13.58679	33.07519	20.20148	22.48700
Std. Dev.	1.275547	1.594745	1.095422	1.892384	2.157333
			1993-2004		
Mean	49.33649	13.38168	31.63563	41.15986	35.62936
Median	49.10199	13.46391	31.60612	42.48126	37.38167
Maximum	52.15408	15.20960	37.40949	50.26596	41.16661
Minimum	47.61778	11.29061	28.12383	29.13048	27.75198
Std. Dev.	1.105894	1.107155	2.614730	6.043593	3.980939
			2005-2015		
Mean	48.01488	15.03718	28.47202	61.73119	54.30188
Median	47.98316	15.14050	28.52068	61.43841	53.77766
Maximum	48.79058	15.24914	28.58082	73.99727	67.97762
Minimum	47.58107	14.19330	28.12729	50.40858	41.33157
Std. Dev.	0.340242	0.242252	0.120480	6.932410	7.499171

Table 2.2. Components of the balance of resources as shares of GDP in 2000 prices during different time periods.

Prices

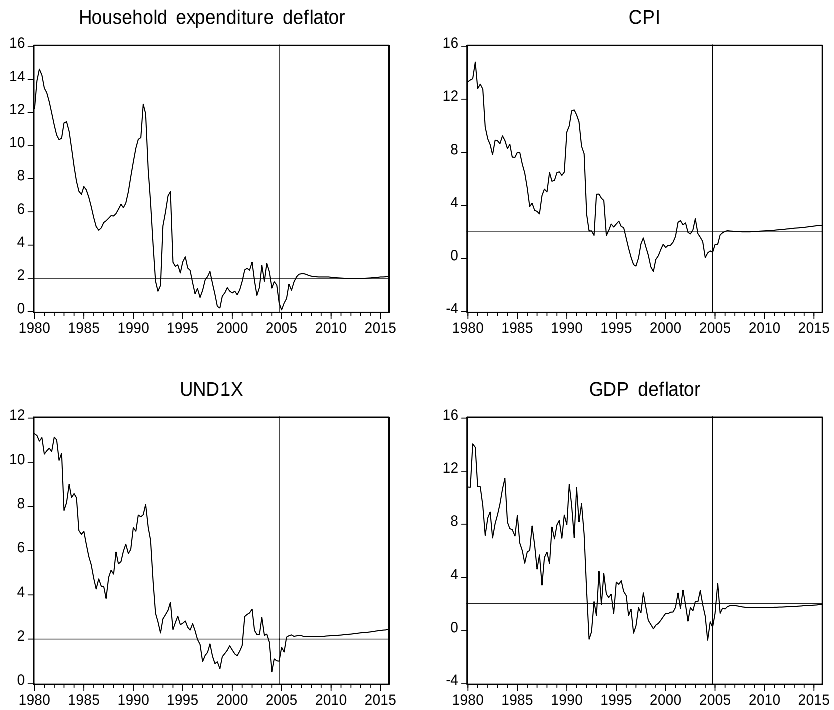


Diagram 2.7 Consumer prices and the GDP deflator. Annual percentage growth rates. 1980-2015.

Diagram 2.7 shows the historical developments and the forecasts for consumer price inflation and the growth rate of the GDP deflator. Growth rates are approximately 2 percent in the long run so that relative prices are approximately constant in the long run and consumer prices adjust to the inflation target.

Labour market

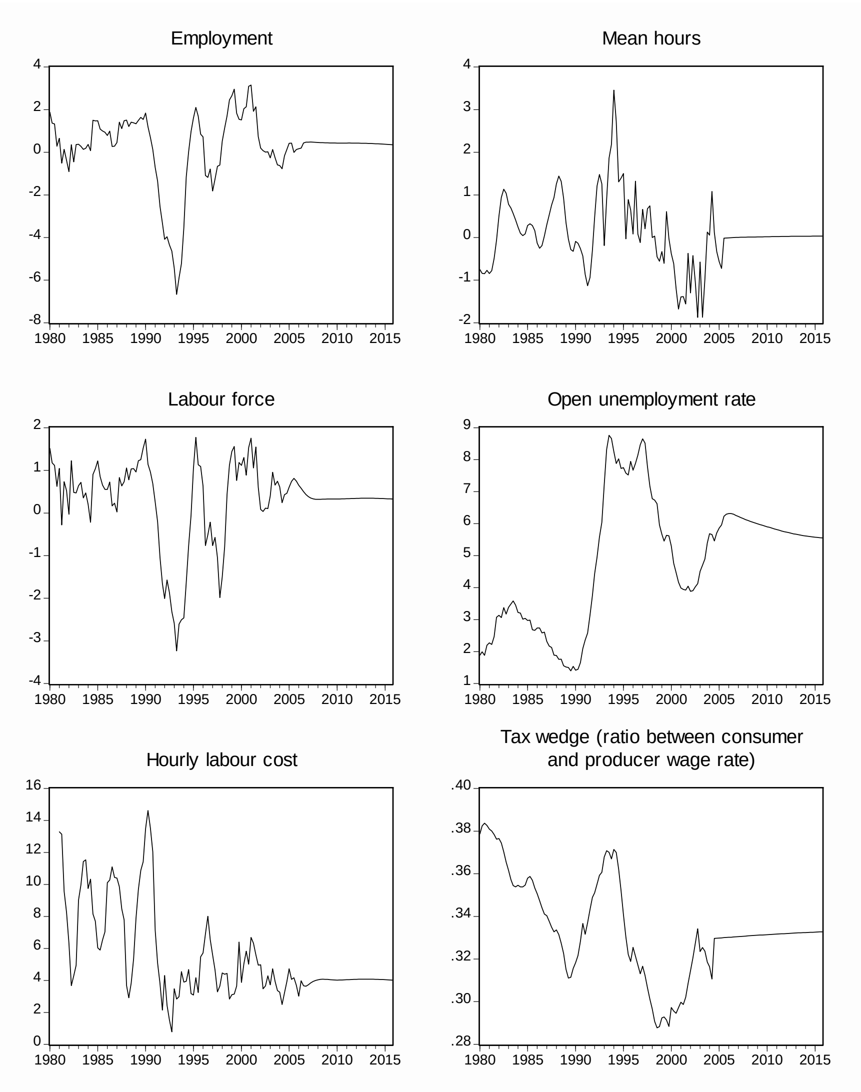


Diagram 2.8. Labour market variables. 1980-2015. All variables except the unemployment rate in annual percentage growth rates.

The historical developments and the forecast for labour market variables are shown in diagram 2.8. The rate of unemployment is expected to increase sligthly from the present level and then revert to approximately the same level. Hence, the long run level is lower than the high levels around 1995 but higher than the low levels in the 80ies. Of course, this depends on the developments of the other labour market variables in the diagram.

Financial variables

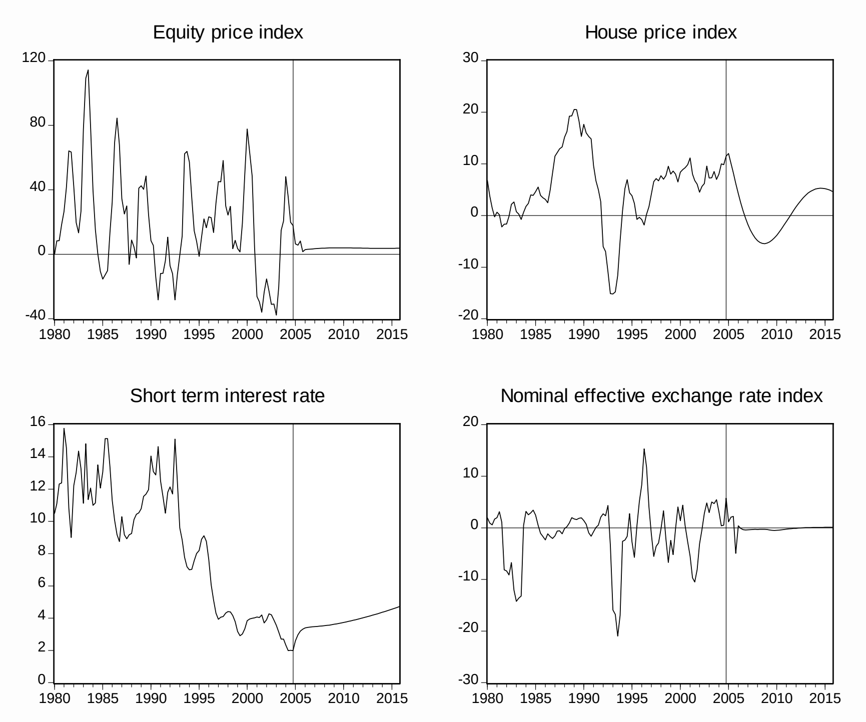


Diagram 2.9. Financial market flow variables. Annual percentage growth rates. 1980-2015.

The growth rates of the equity price index and the house price index are expected to decline to lower levels in the nearest future, as shown in diagram 2.9. Both are functions of the growth rate of nominal GDP and the rate of interest. Note that it is only house prices that are expected to decline. The forecast implies an increasing price level until 2006, then a decline to the levels around 2003 until 2010. The price level then increases and reverts to the 2006 level in about 2015. The short term interest rate increases from its present level of 2 percent to the long run equilibrium level around 4.5 percent. There are small changes in the nominal effective exchange rate.

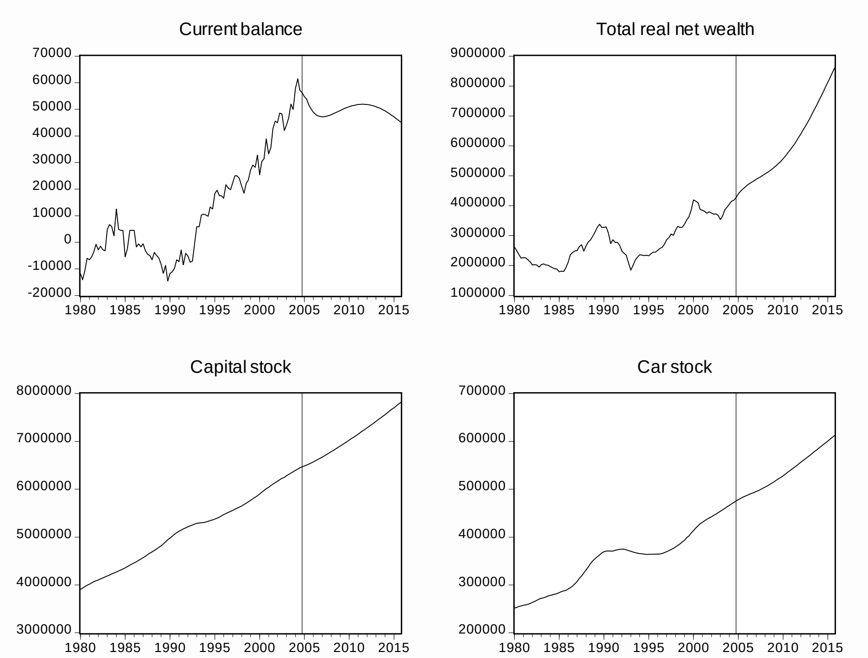


Diagram 2.10. Selected stock variables. Mn SEK. 2000 prices. 1980-2015.

Finally, diagram 2.10 shows a selection of stock variables. These should converge to some reasonable steady state values within a reasonable time span. The steady state values corresponds with the empirical specifications of certain flow variables. For instance, the current balance in the upper left corner wouldn't converge to a reasonable value unless the four export and import equations were reasonably well specified. The real net wealth variable is a key determinant of household expenditure part of which build the car stock in the lower right corner. Wealth and capital accumulation hence proceed reasonably in case the flow of expenditure on car sales and other consumption items are well specified. This seems to be the case throughout. Hence, the short run forecasts for 2-3 years ahead are probably not to badly affected by the long run equilibrium in the model.

2.4.3 The short run dynamics

Most equations are modeled in error correction form, such that both the short run adjustment and the long run equilibrium are reflected in the specifications. While the long run relationships are based on economic theory, the short run adjustments are more left for the data to decide about. However, sometimes economic theory also can say something relatively decisive about the short, as for instance in the consumer price equations where the Ball and Mankiw (1995) theory about price rigidities and relative prices is used to explain the short run price adjustment in the CPI.

The specifications are mostly done by using cointegration methods to decide about the long run relationships. However, sometimes long run relationships are imposed if it can be shown that this improves the overall performance of the model, for instance guarantees long run stability. The short run adjustments and the long run equilibrium can be estimated separately (as in the Engle-Granger case) or simultaneously (as in the Johansen methodology). I have sometimes used the latter. But I have also used methods suggested by Pesaran and Shin (1998,2002) using an autoregressive distributed lag model for the long run modeling, then deriving the long run solution for integration with the short run modeling. I have also used the method suggested by Pesaran and Shin (2000) in which a single equation method is used with variables in difference as well as levels form and simultaneous estimation of the short and long run. Hence, I haven't followed the same route in every case but used the method that was most suitable for the case at hand.

With this empirical approach to the short run modeling the short run adjustments are best studied by inspecting the simulations and forecasts and the specifications shown in Appendix 1.

2.5 Relation to sectoral experts

The structure of the model has been designed in accordance with the focus of the Riksbank and its organization with sectoral experts for a wide range of areas and the inherent paradigm of particularly the Board of Governors. I think this paradigm is very much influenced by macroeconomics as it is tought in today's universities, possibly with some specific recent developments concerning monetary policy. This view is also reflected in the work by sectoral experts and in the specific models they use.

In many central banks and finance ministries large-scale models are used to check the consistency of the sectoral experts' forecasts. The specifications in the large-scale model are then confronted with the specifications used by the sectoral experts. It seems valuable if this confrontation is fruitful to the extent that either (parts of) the big model or the sectoral models or both could be improved.

To some extent this is one of the results with BASMOD. Equations for private consumption expenditure, business investments, and for exports and imports of goods and services have been developed and are presently approximately the same in BASMOD as with the sectoral experts. If a sectoral expert improves a model it can probably be tested and integrated in BASMOD and vice versa. This possibility is of course not at hand in all models, notably not in e.g. VAR models.

A typical example where communication between the model builder(s) and the sectoral expert (s) is important concerns the monetary transmission mechanism. The effects of interest rate changes depend on the parameterization in the big vs. the sectoral models. The transmission in the big model should appeal to the sectoral experts. In case it doesn't there is a scope for discussion and possibly improvements. It is not practice if the models live their own lives with there own transmission mechanisms without being confronted with other models used for the same purposes (which is too often the case). Examples are the effects on household expenditure or private investment expenditure from changes in the interest rate or the effects on exchange rates and domestic price levels. These important effects should reasonably be of the same order of magnitude in the different models and they surely will be iff the models are confronted with each other.

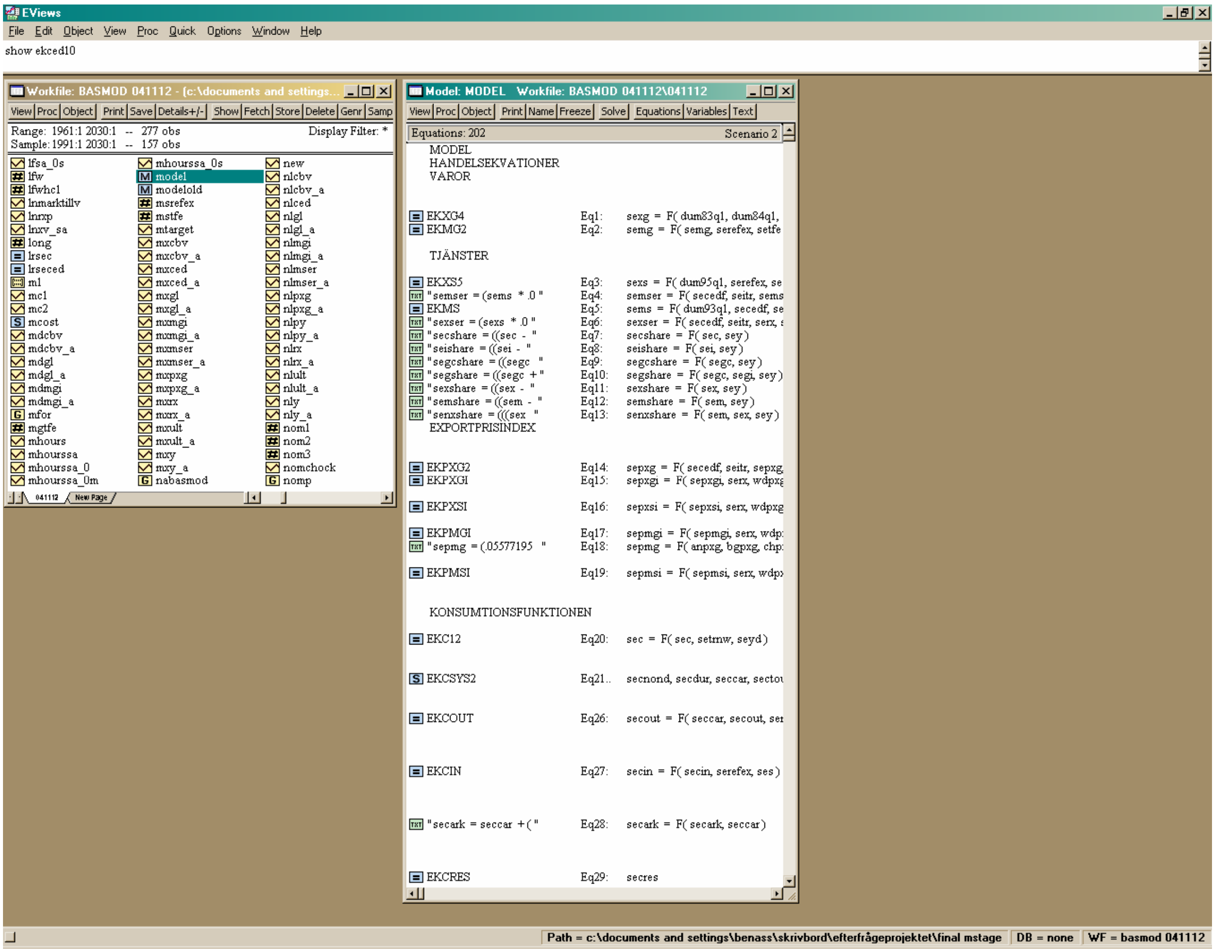
3. User manual

3.1 How to Get Started

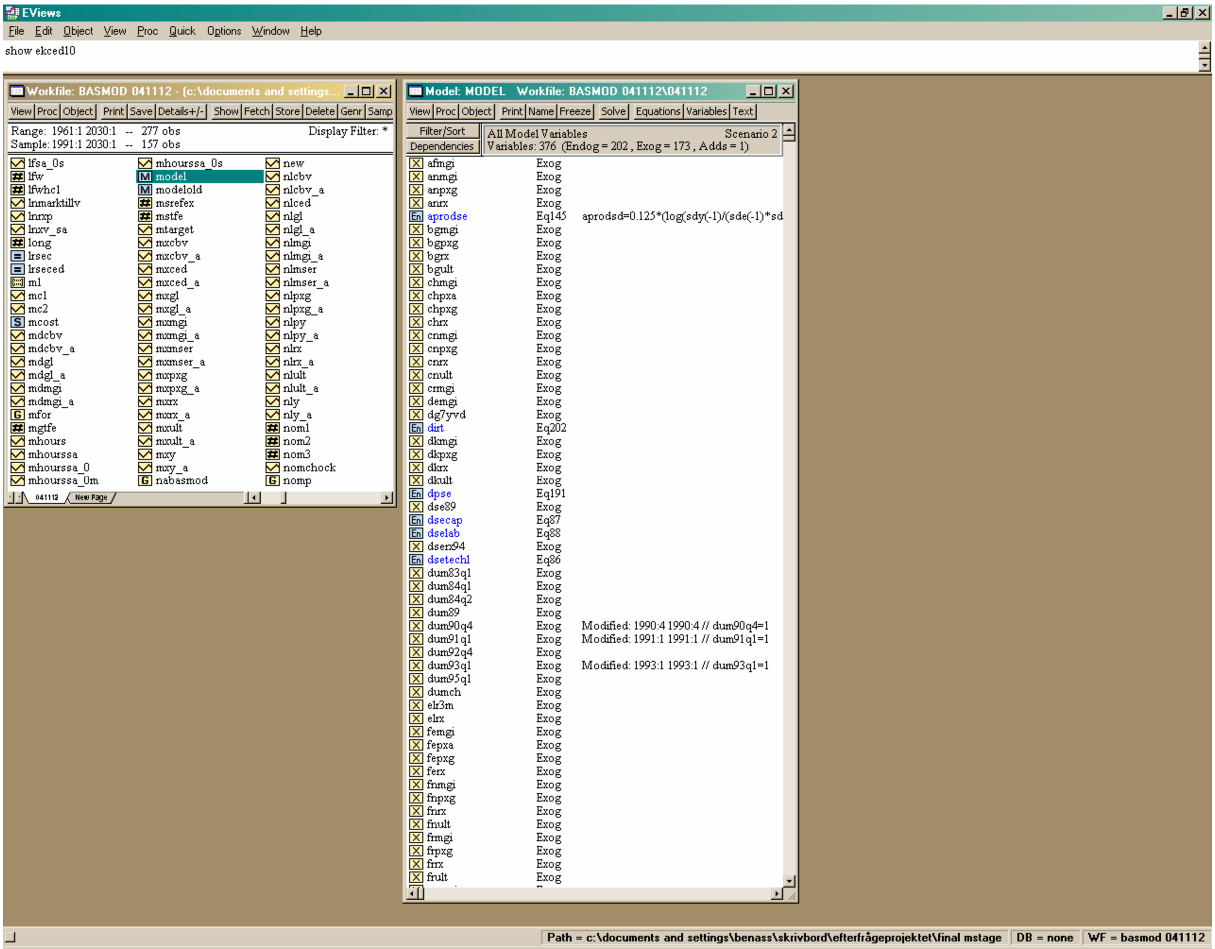
Download the model from

S:\APP\APP Modellenheten\BASMOD\BASE\0402\basmod0402.wf1

to your appropriate directory and start Eviews. Click on Model in the workfile and the following screen appears

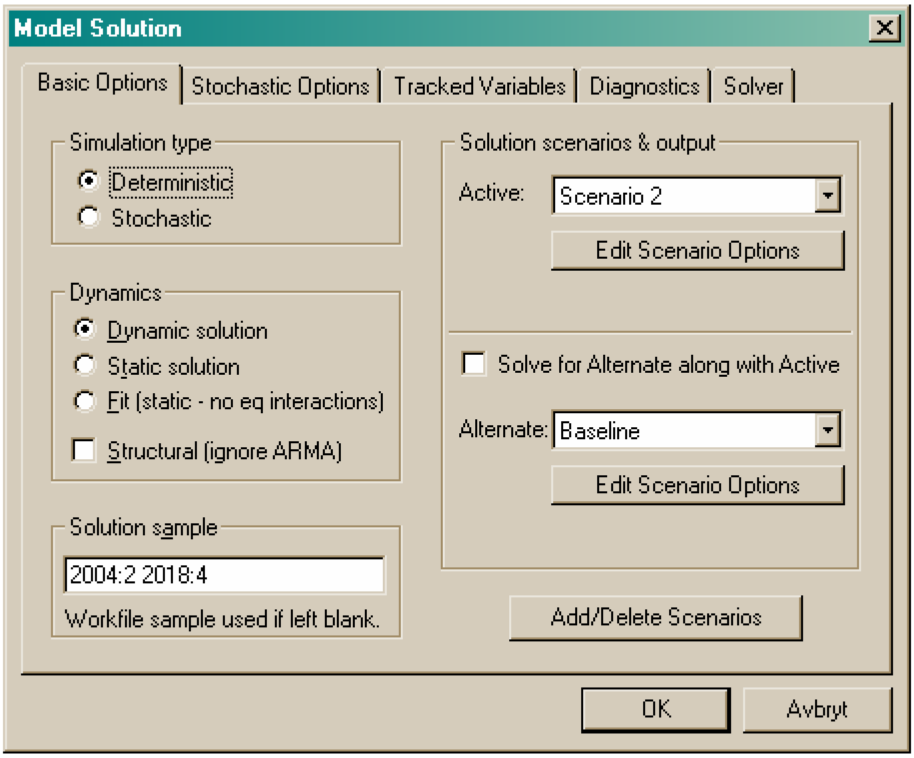


To the left we have the Workfile window and to the right the Model window. There are different views in the Model window and it is the Equations view that appears above. From the Equations view you can view the equations, add shocks or exogenise variables. In the Variables view

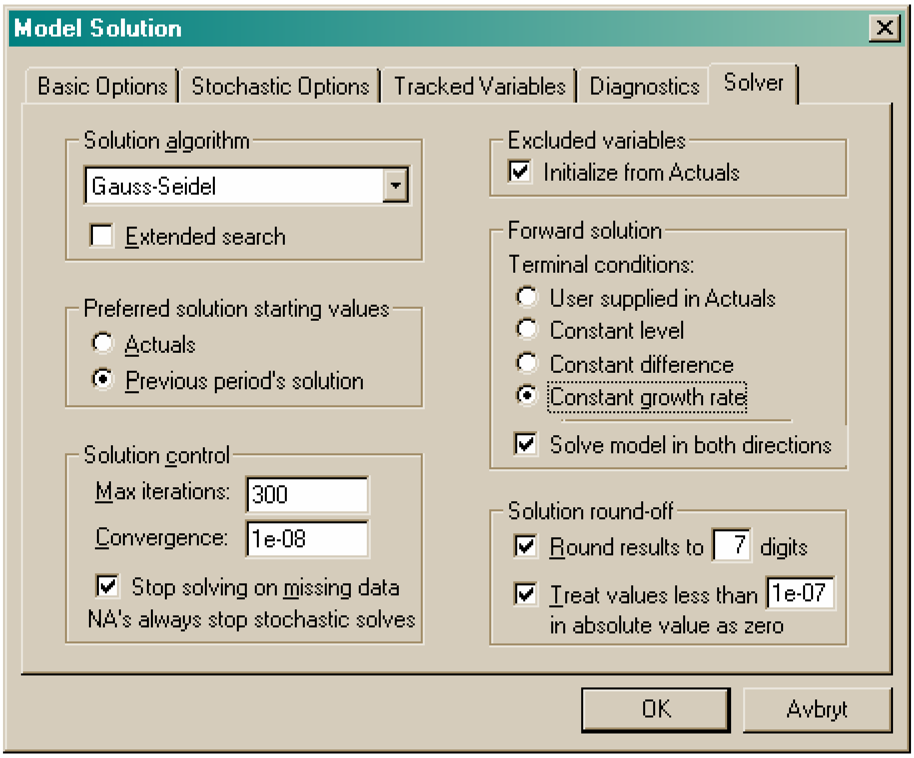


you can view the variables, create diagrams and tables. Note the Filter/Sort and Dependencies buttons in the upper left of the window. There you can sort the variables according to type (like exogenous, endogenous) or show which variables X depends on or variables that depend on X.

We now click on the Solve button to get



Click on Solver to get



where you click on Previous period's solution and on Constant growth rate. Then you go back to the Basic Options sheet and click OK. The model solves Scenario 2 and you're on to it running BASMOD.

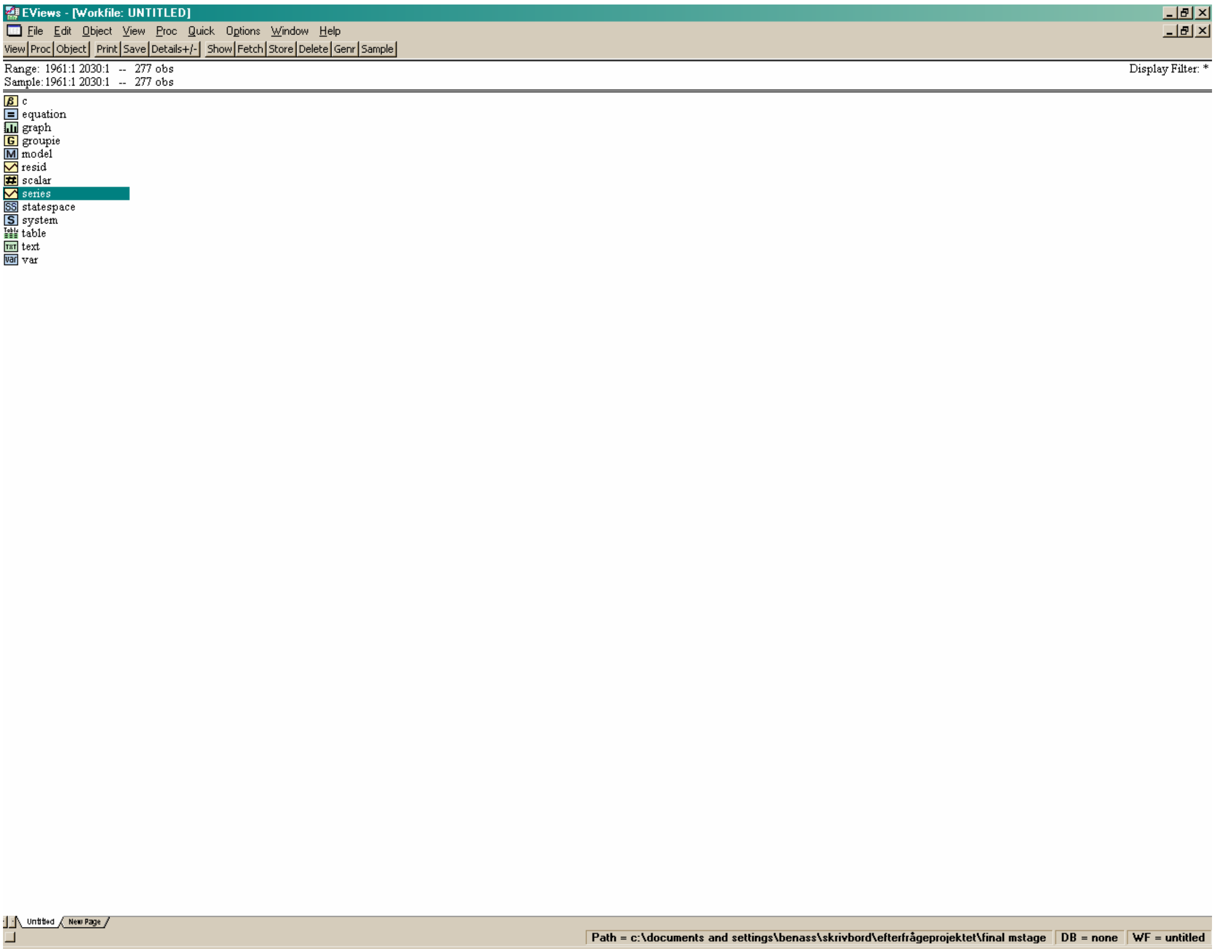
You can view the results by viewing the variables for Scenario 2, e.g. @pcy(sey_2) which is the annual growth rate for GDP in Scenario 2. You can also view the results in the Variables view, where you can create graphs and tables and transform the variables, e.g. from levels to annual growth rates.

3.2 The setup in Eviews

It is useful to be aware of the basic concepts in Eviews. To begin with you start with a so called Workfile which is a file in Windows operating system with extension .wf1. Eviews also recognises program files with extension .prg and text files with extensions .txt. However, operations take place within the workfile where you refer to various Objects. Eviews deals primarily with time series and consequently one object is Series. The variables in BASMOD are Series. The different Eviews objects that are used in BASMOD and stored in the Workfile can be listed:

- Series
- Scalar
- Coef
- Group
- Graph
- Text
- Equation
- System
- VAR
- Sspace
- Model

You open an object by double-clicking on the object in the Workfile. The object then opens in a new window. The exception is the Scalar object that only shows its value in the lower left corner of the Workfile window. It has a yellow icon with a #. The Coef object is a coefficient vector and has a yellow icon with a β . A group is a number of objects, presumably a number of Series and is shown by a yellow icon with a G. There are also Graph, Text and Table objects.



Then there are the objects

- Equation
- System
- VAR
- Sspace
- Model

The Equation object shows a single estimated equation. The equation can use different estimators and can be linear or nonlinear. The System object refers to a system of estimated equations which also can use different estimators and be linear or nonlinear. The VAR object is a special case of System that uses certain predefined procedures to produce impulse responses, variance decompositions, etc. The SS or Sspace object is a state space model in which you can define models with time varying parameters.

The Model object is a system of equations which can be solved for the endogenous variables given the values of the exogenous variables. The model can be static or dynamic and deterministic or stochastic. The model is written down in a text file which is contained in the Model object, i.e. you can start a new model object and write it down it the text module of the object and then save it. Identities such as the GDP identity

$$SEY = SEC + SEGC + SEI + SEX - SEM + SEDS$$

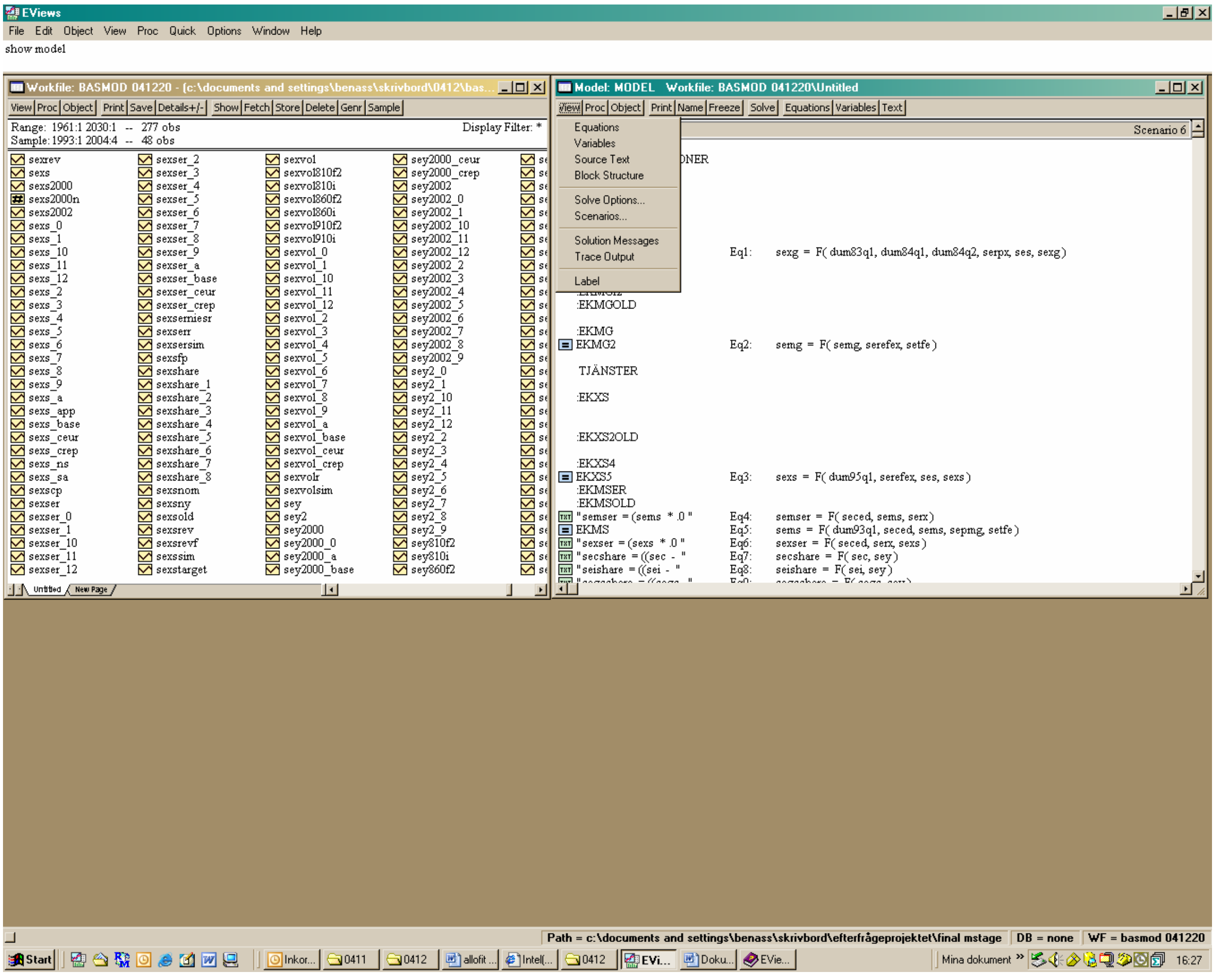
is simply written down in the text module of the Model object, while estimated equations are linked to the model. The aggregate consumption function is named ekc and the text module may then look like

‘ This is the consumption function and the GDP identity
:ekc
$SEY = SEC + SEGC + SEI + SEX - SEM + SEDS$

in the text module. A comment line is preceded by the ‘. The linking is done by the colon :

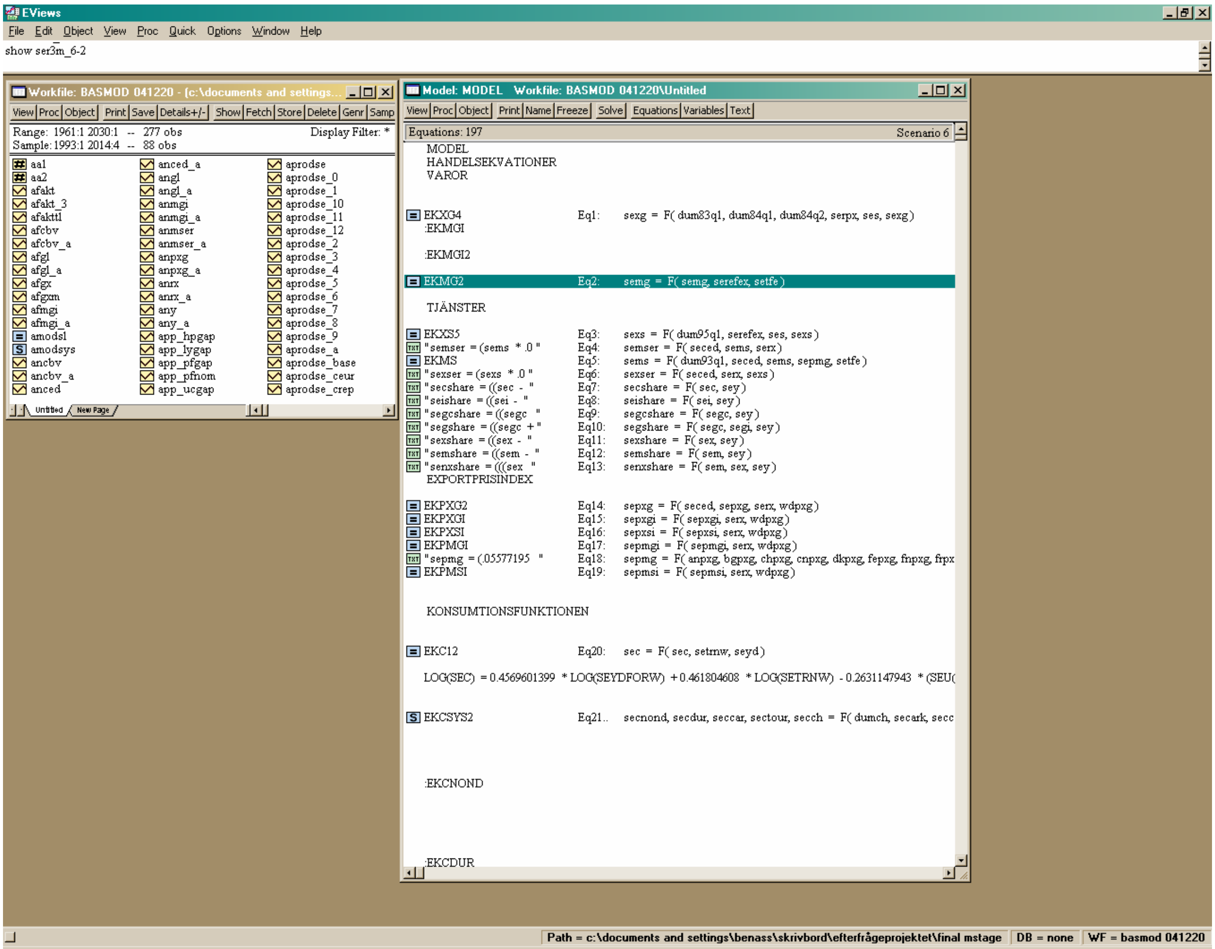
It is easy to change the specification in the model by reestimating or replacing equations. If you have an alternative consumption function you just replace ekc with the name of the alternative equation.

Let’s have a closer look into the Model object.



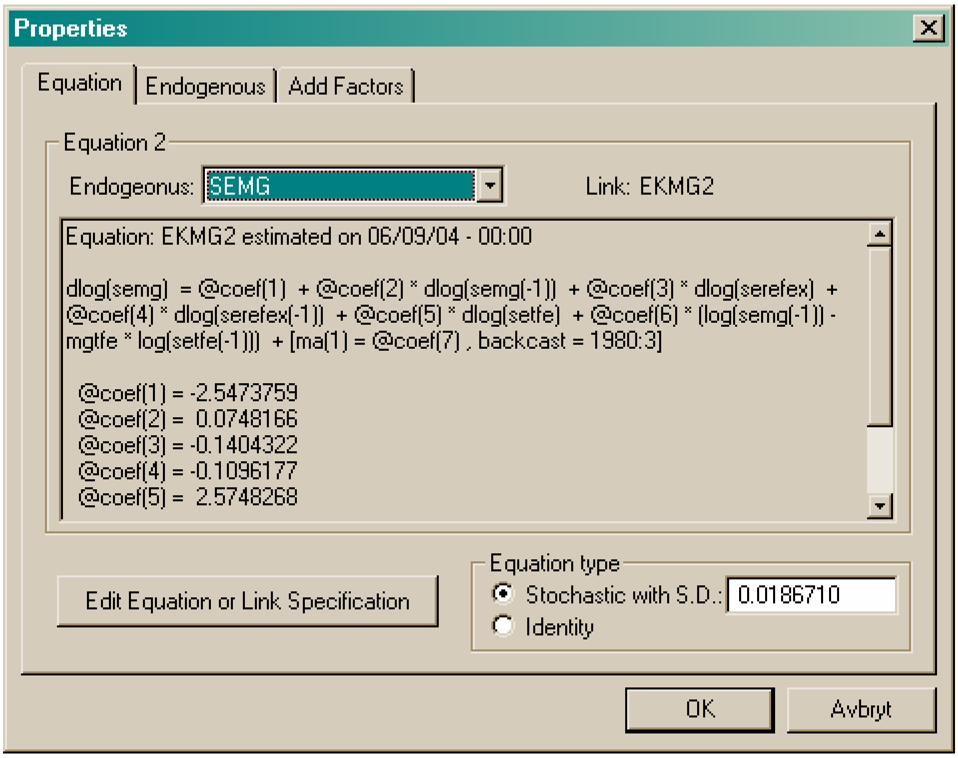
Above we see two open windows, the Workfile to the left and the Model to the right (the model object is named Model). There are 10 buttons by which you can change between different views.

The equations button lets you view and get summary information about the equations of the model, which is shown below.



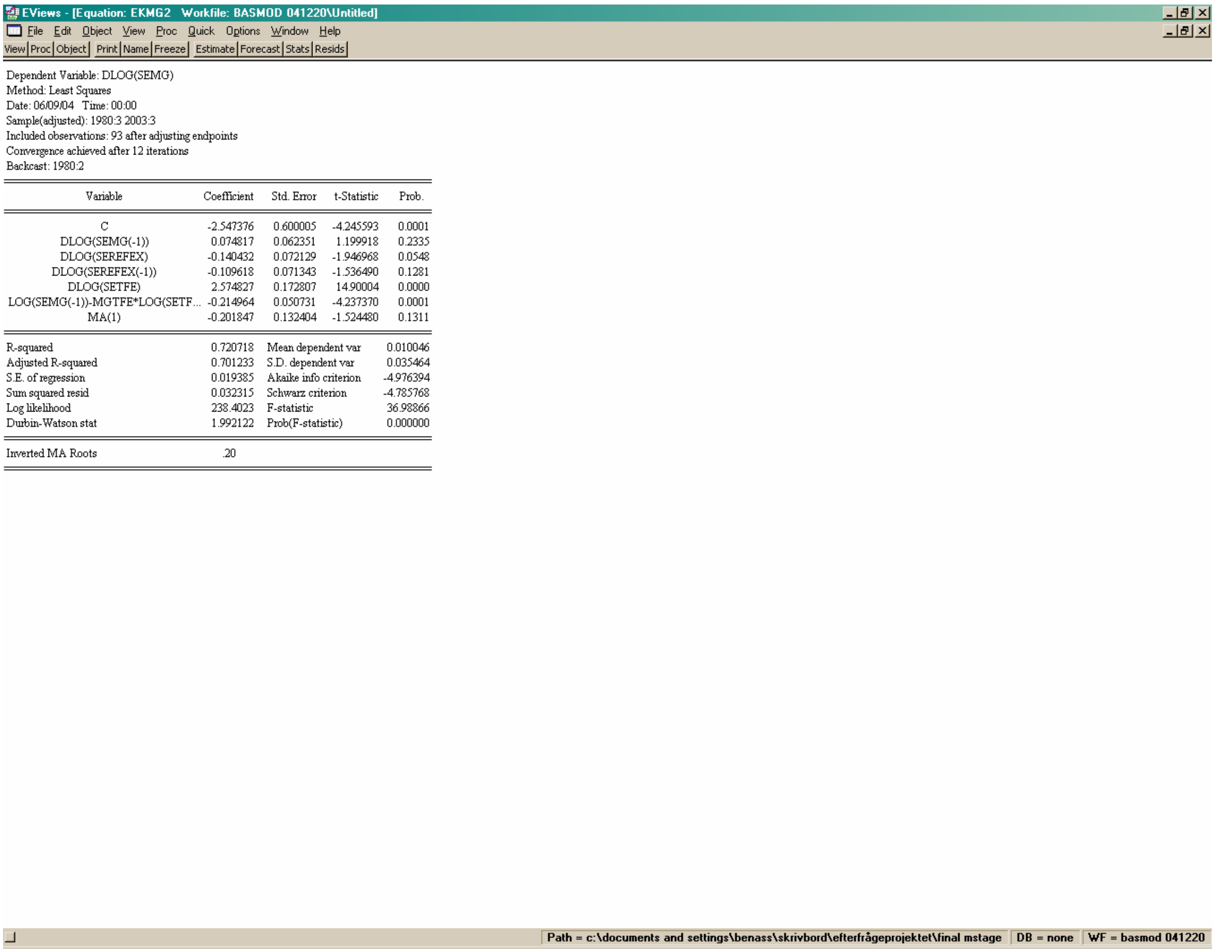
Here the dependencies are shown in the same form as above, e.g. sexshare = F(sex,sey) shows that the contribution of exports to GDP growth – sexshare – depends on exports – sex – and GDP – sey. Estimated equations are shown with a blue = icon and equations that are definitions or identities are shown with a green txt icon.

If you click on one of the equations, e.g. the EKMG2 for imports of goods, you find information about the equation under the Equation tag; the estimated parameters and the standard error of the regression reported in the lower right corner.



The other two tags – Endogenous and Add Factors – are useful when running simulations and forecasts – see section 3.4 below.

An alternative way to inspect the equation is to click on EKMG2 in the workfile window. The equation view then appears and a lot of detailed information about the specification is available. Of course, you can then perform various econometric tests with the equation, inspect residuals, etc. You can also re-estimate the equation and link it to the model.



EViews - [Equation: EKMG2 Workfile: BASMOD 041220\Untitled]

File Edit Object View Proc Quick Options Window Help

View | Proc | Object | Print | Name | Freeze | Estimate | Forecast | Stats | Resids

Dependent Variable: DLOG(SEMG)
Method: Least Squares
Date: 06/09/04 Time: 00:00
Sample(adjusted): 1980:3 2003:3
Included observations: 93 after adjusting endpoints
Convergence achieved after 12 iterations
Backcast: 1980:2

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-2.547376	0.600005	-4.245593	0.0001
DLOG(SEMG(-1))	0.074817	0.062351	1.199918	0.2335
DLOG(SEREFEX)	-0.140432	0.072129	-1.946968	0.0548
DLOG(SEREFEX(-1))	-0.109618	0.071343	-1.536490	0.1281
DLOG(SETFE)	2.574827	0.172807	14.90004	0.0000
LOG(SEMG(-1))-MGTFE*LOG(SETF...	-0.214964	0.050731	-4.237370	0.0001
MA(1)	-0.201847	0.132404	-1.524480	0.1311

R-squared	0.720718	Mean dependent var	0.010046
Adjusted R-squared	0.701233	S.D. dependent var	0.035464
S.E. of regression	0.019385	Akaike info criterion	-4.976394
Sum squared resid	0.032315	Schwarz criterion	-4.785768
Log likelihood	238.4023	F-statistic	36.98866
Durbin-Watson stat	1.992122	Prob(F-statistic)	0.000000

Inverted MA Roots	.20

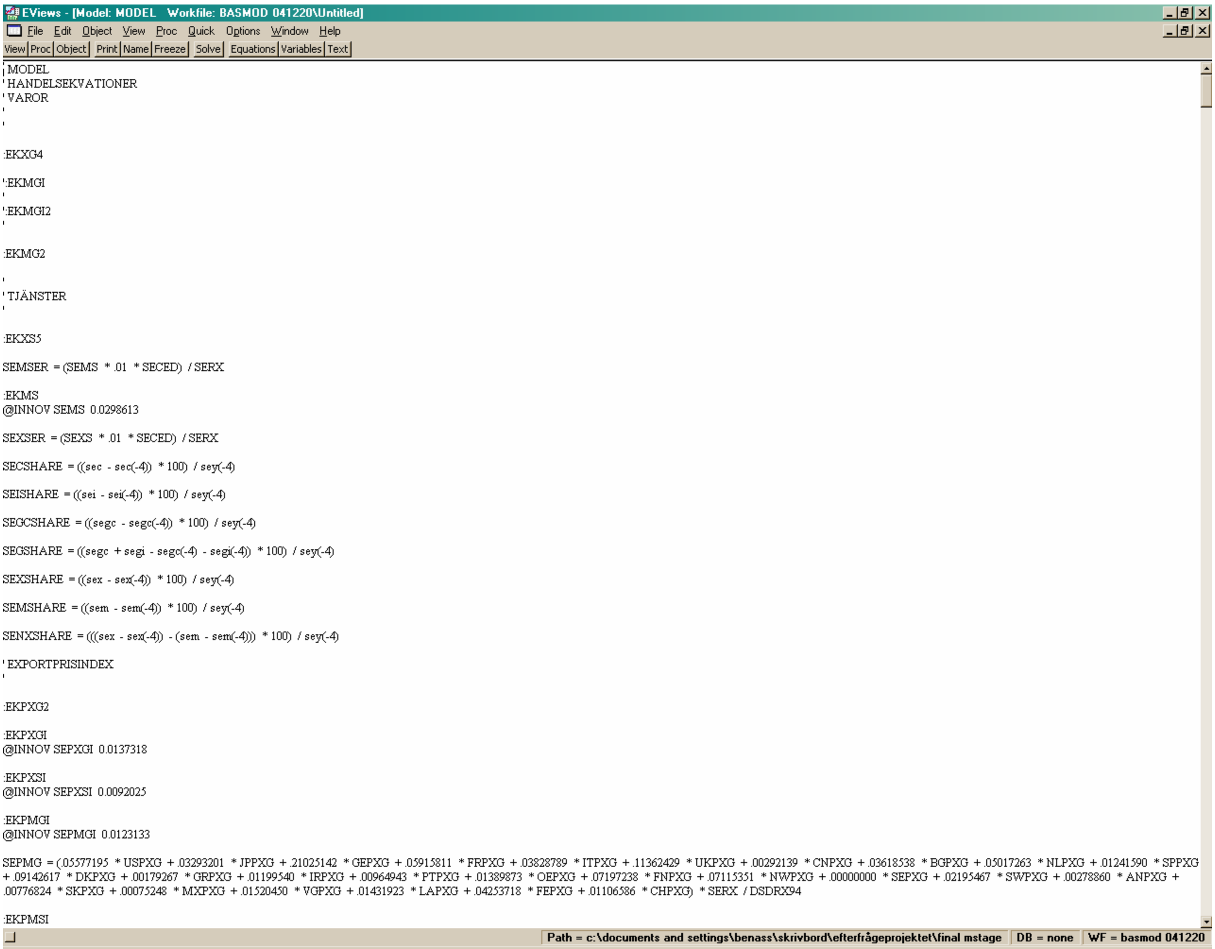
Path = c:\documents and settings\benass\skrivbord\efterfrågeprojektet\final mstage | DB = none | WF = basmod 041220

Return to the main menu and click on the Text button. The model as "it is actually written" appears in the window. Here you can revise the model by changing the text and linking various equations, systems of equations, VARs or state space models. For instance, in BASMOD some foreign variables are exogenous but if you prefer you can estimate a VAR named Foreign with the foreign variables and link it to the model through

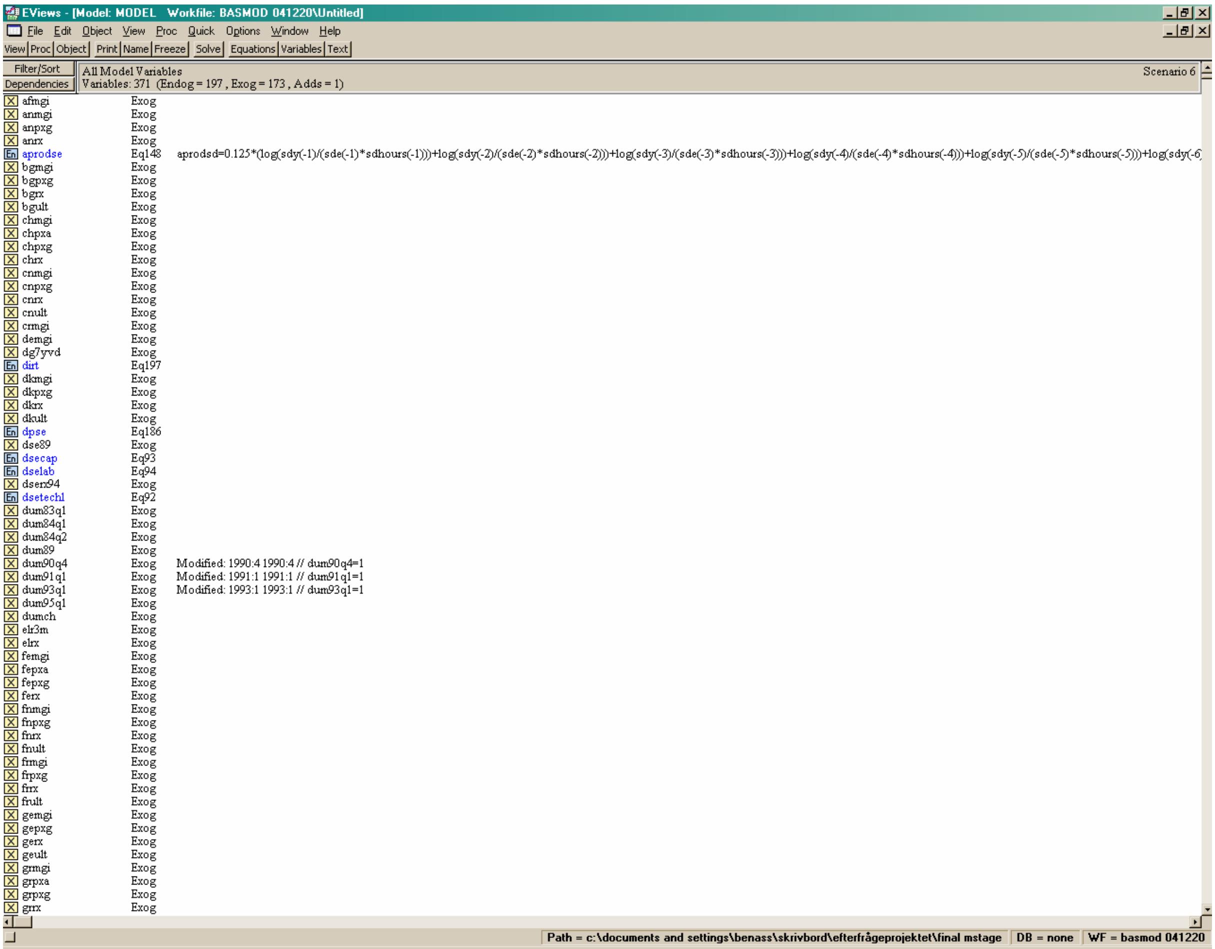
:Foreign

and then run the model with the foreign variables as endogenous. Similarly, if you believe that the effect of wealth on private consumption changes over time you can estimate the consumption function in the state space form with the name Change and link it to the model by

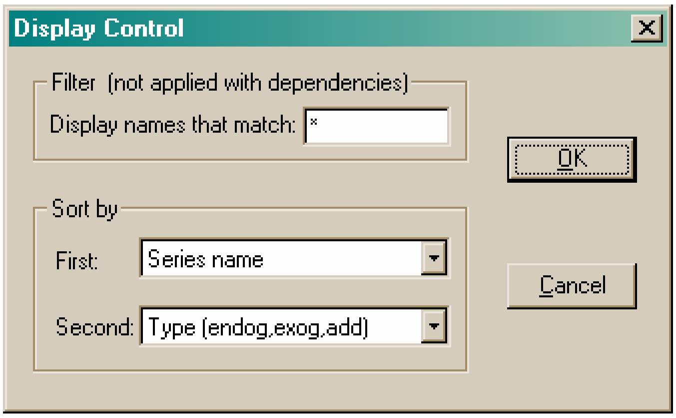
:Change



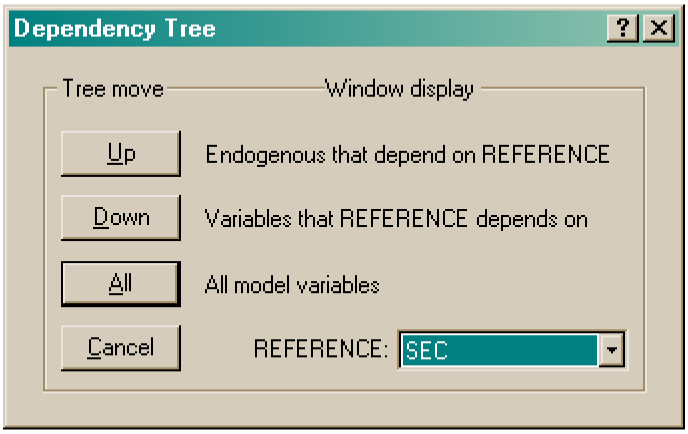
To view the objects in the model you can simply click on them in the workfile window. In the workfile window you can also store some objects that are presently not part of the model, perhaps in the event of using them later. An alternative is to view the model objects through the Variables button in the Model view:



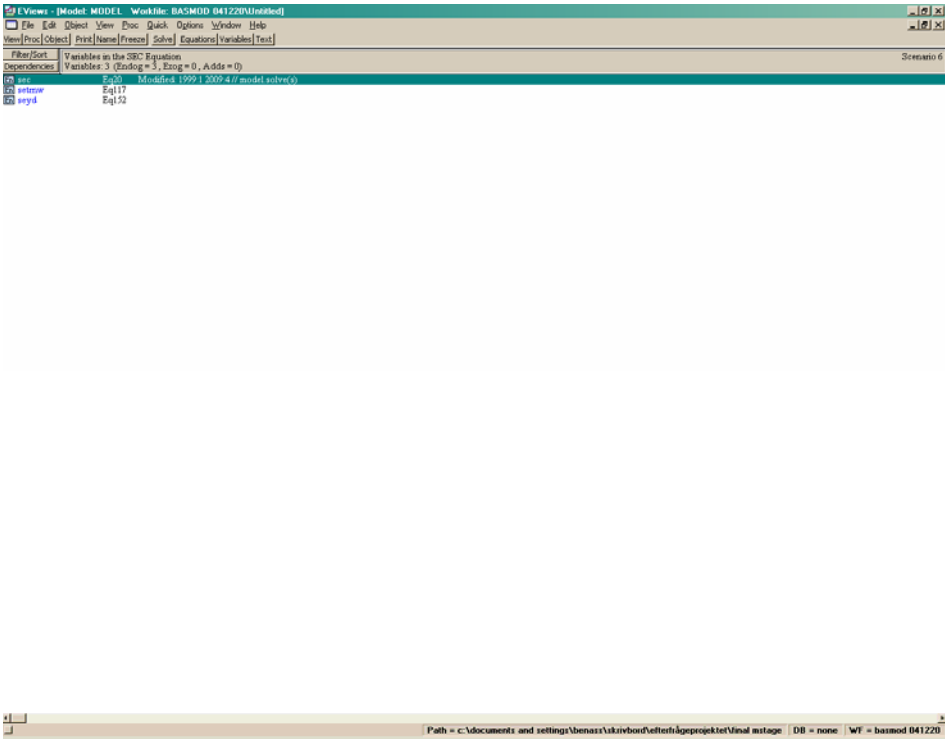
There are three types of variables in the model, endogenous, exogenous and add factors (which are also exogenous). You can sort the variables according to that or in alphabetical order by series name. Click on Filter/Sort:



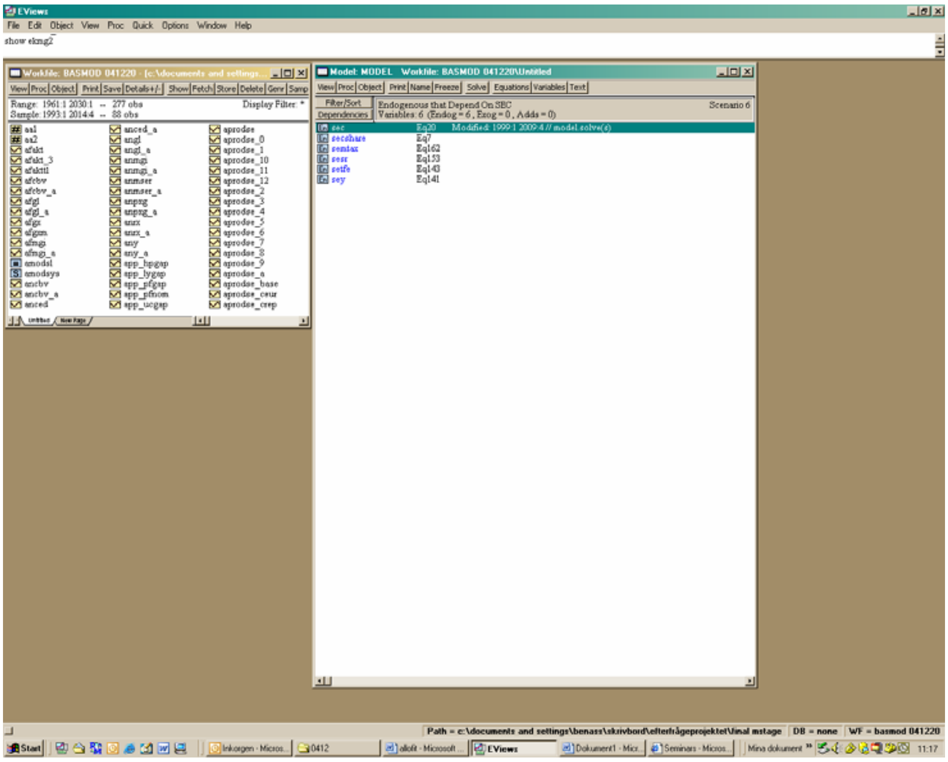
and you can choose how to sort the variables according to name, type or equation number. Another useful tool is to find out about the dependencies between the variables. Find the SEC variable which is private consumption expenditure, highlight it and then Click on the Dependencies button to get



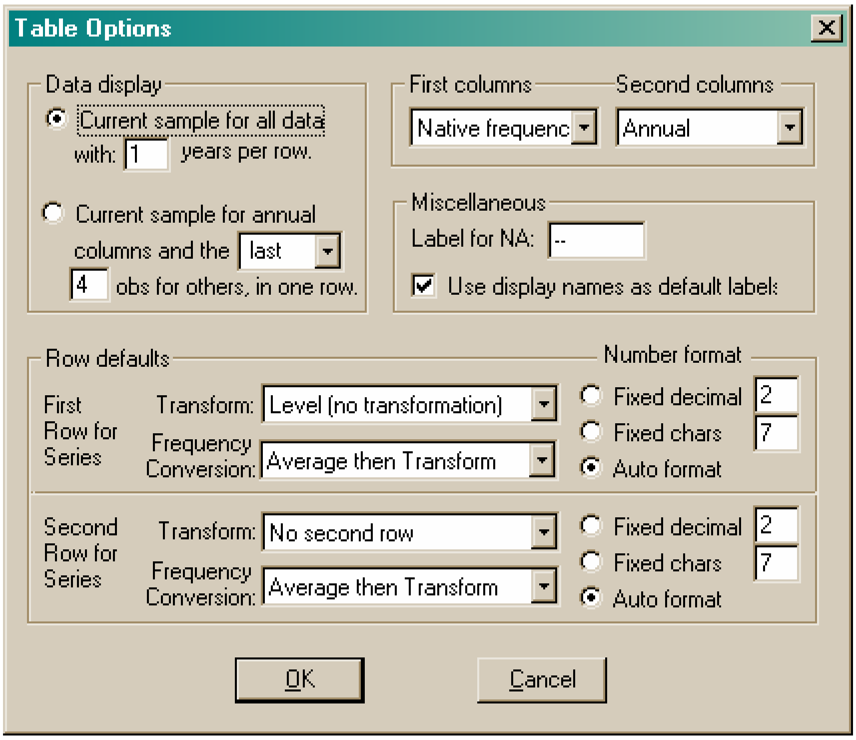
Click on the Down button and you can find out which variables that private consumption expenditure depends on, i.e. on total real net wealth and real private disposable income:



If we instead Click on the Up button we can find out which variables SEC affects:



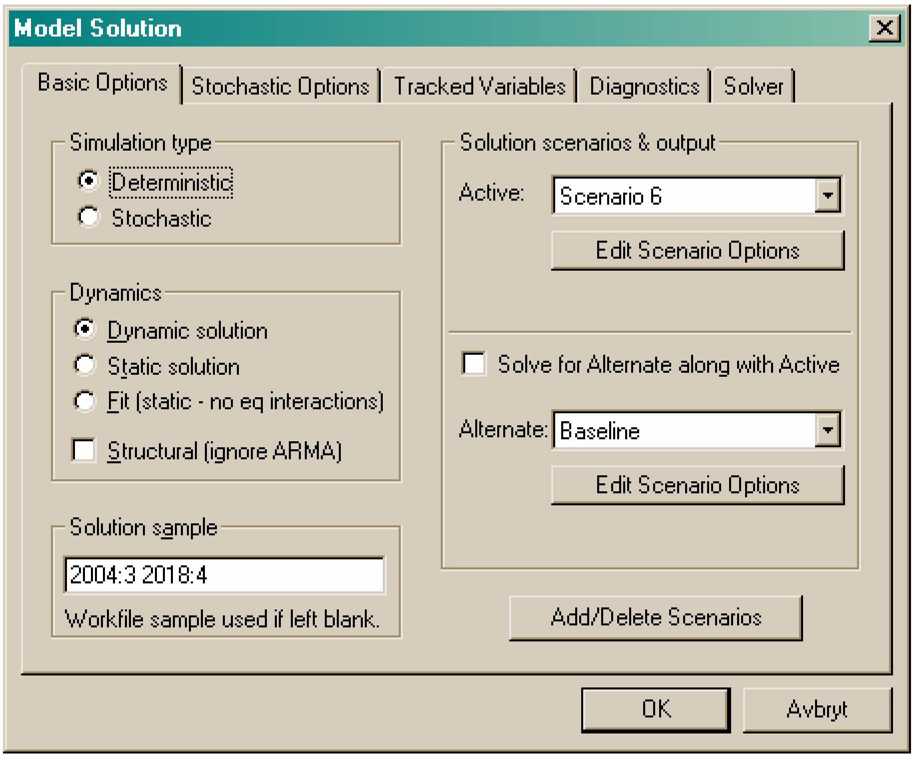
Within the Model view we can also view the variables in graphs and tables. Double-Click on two variables, SEBI and SEC. to open them (in a Group window). Choose the View button and you can show graphs and create tables. Choose Dated Data Table to create a table and click on the Tab Options button to get the Table Options menu.



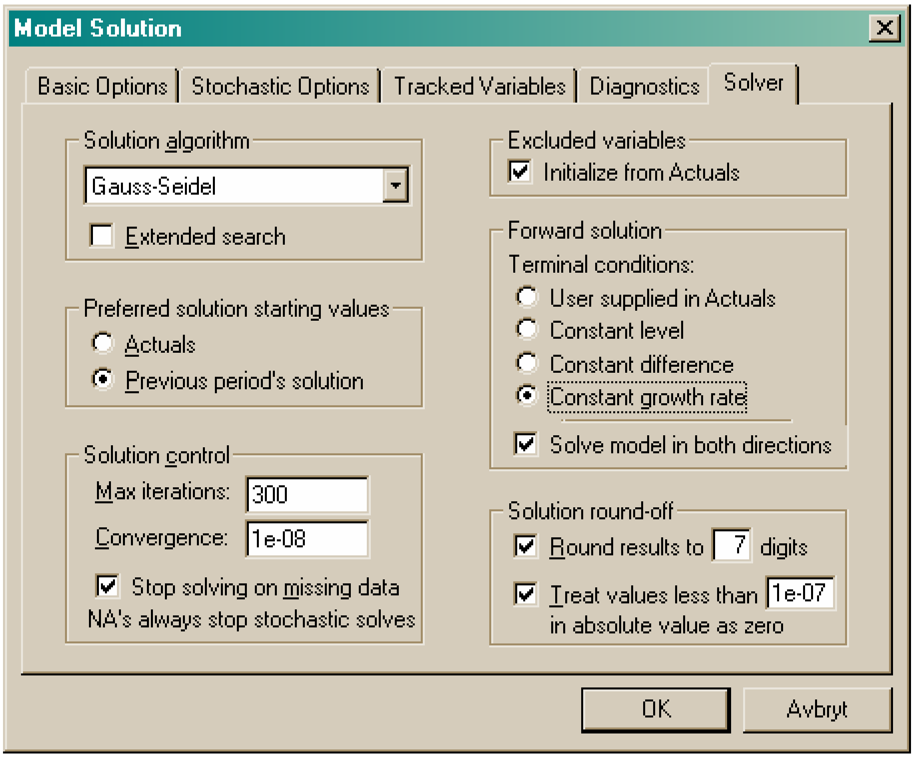
Here you can transform the variables from levels to quarterly or annualised percentage changes or to one year percentage changes which is very useful.

Solving the model

To solve the model you click on the Solve button in the main menu of the Model view to get



Among the Basic Options are to choose between determinstic or stochastic and dynamic or static solutions. Since the model is forward-looking it cannot be solved in the stochastic mode in Eviews. Normally, you would also choose the dynamic option, though the static mode can be used to evaluate the model's fit within the sample. A solution of the model always creates a numbered scenario and the solved variables given the extension _6 in the above example – e.g. SEY_6 for GDP in this example. The Solver tag gives further options:



Since the model is solved forward some solution must be reached for the forward-looking variables beyond the forecast horizon. For instance, if the model is solved until 2018:4 and wages depend on the expected prices four quarter ahead there must be a solution for prices up to 2019:4. This can be solved by assuming a constant growth rate from 2018:4 and onward or by giving exogenous values for the terminal year (User supplied in Actuals). I normally run the model with the former option, as in the example above.

Click on OK, the model runs and you probably get a message like

You can then study the outcome for Scenario 6, possibly comparing with some other scenarios.

3.3 Data

Data are quarterly and mainly collected from the Nigem database, which is updated four times a year. The exogenous variables are mainly foreign variables. BASMOD uses the forecasts of Nigem for the foreign variables. Appendix A2.3 describes how to update the data base in BASMOD from the data base in Nigem. In addition, some variables are updated "manually" as they appear more frequently or are so important that they are updated prior to the update of Nigem. The manually updated variables are

- National accounts balance of resources
- Disaggregated private consumption data
- Some labour market data from APP
- Financial data like interest rates and equity prices

- Consumer prices
- House prices
- Miscellaneous data such as housing starts, confidence indicators, etc.

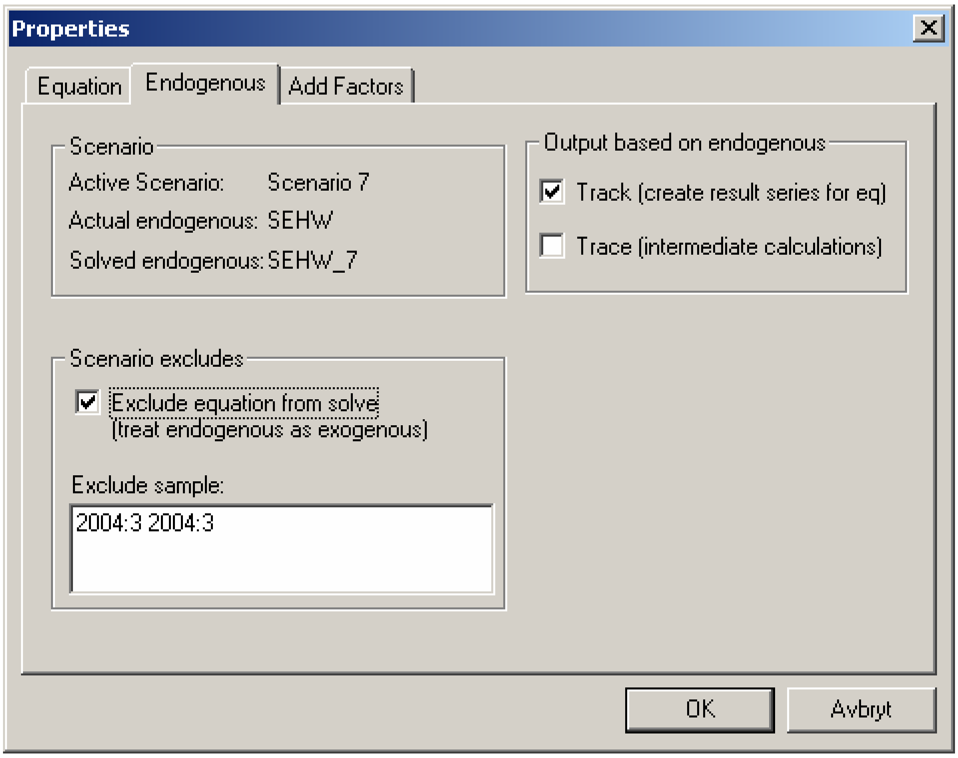
Some of the data are annual, such as tax revenues, and are transformed to quarterly data. Some data are seasonally adjusted by Niesr in case collected from the Nigem data base and often the adjustment then has been done by the statistic authority – Statistics Sweden mostly – but occasionally also by Niesr. Some variables – such as the components of investments – have been seasonally adjusted in Eviews – with the X12 historical method (see Eviews for details). The list of variables can be found in Appendix 2.

3.4 How to make forecasts and simulations

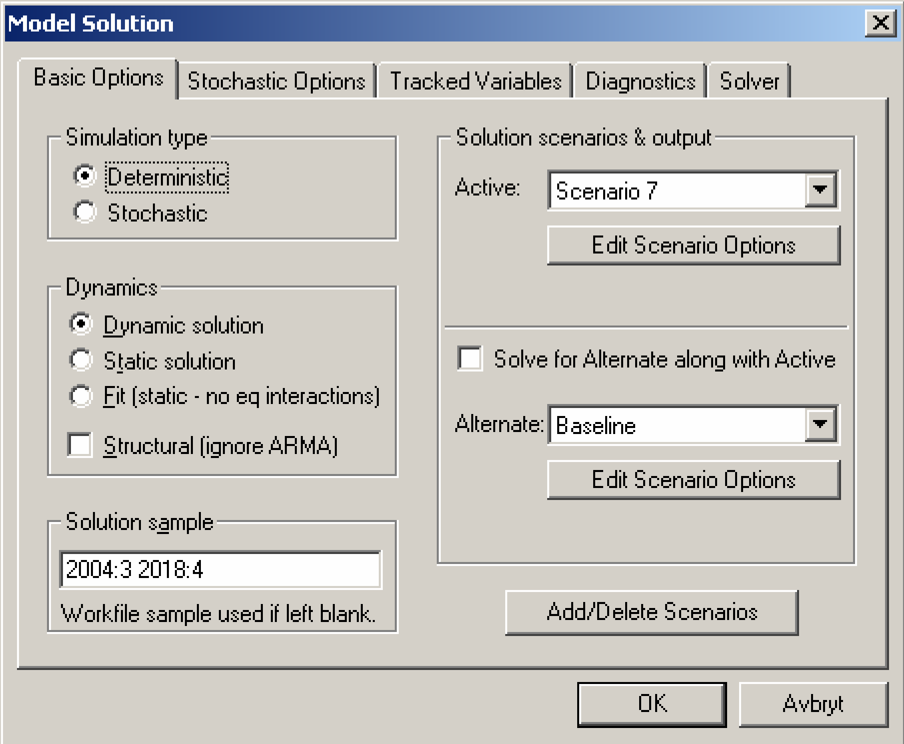
Conditional forecasts in APP

Making a forecast with BASMOD is creating a scenario by solving the model, as shown above. Often simulations are conditional – e.g. on a constant policy rate of interest. Let us look at a typical forecast as done in the APP at the Riksbank. We are about to make a forecast for the Policy Report in 2004:4. We have data up to 2004:2 for the National Accounts and for interest rates and some financial variables until 2004:3. We run three separate forecasts depending on assumptions on the repo interest rate: constant until 2009, following the implicit market rate of interest and being endogenous in the model.

We start the forecast in 2004:3, i.e. assume that in general data until 2004:2 are available. However for some variables data are available also for 2004:3. We then exogenise these variables for 2004:3. For SEHW, housing wealth, this is done by clicking the Equations button in the Model view and then open the SEHW equation EKHW, with the Endogenous tag:



Exogenise SEHW for 2004:3 and run the forecast from the same period:

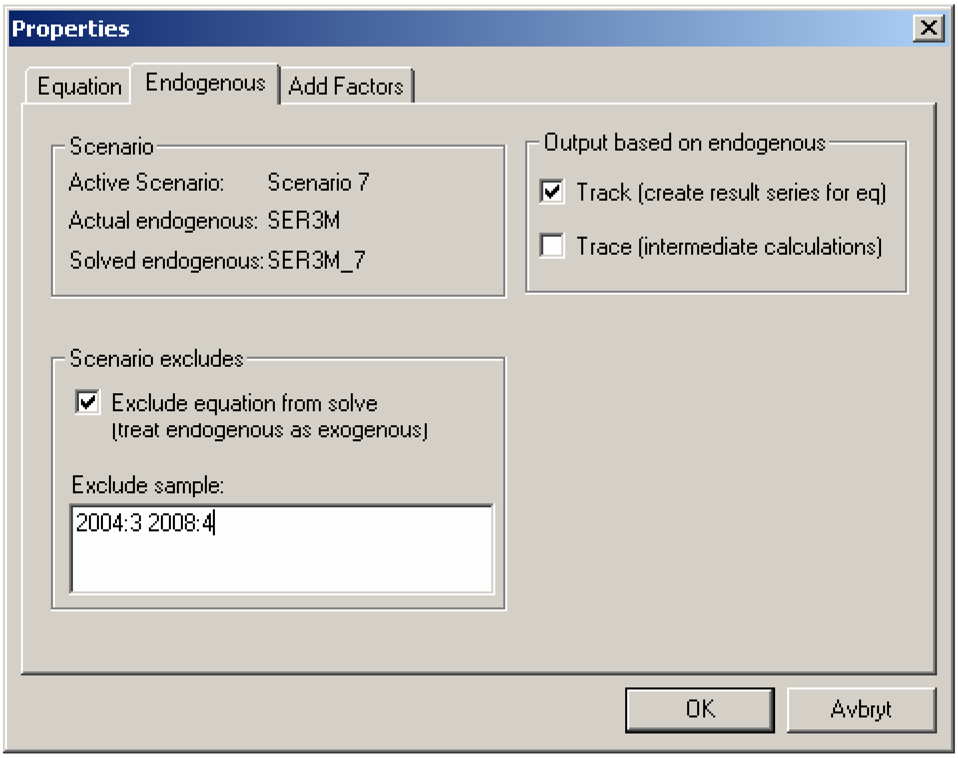


Do the same for other variables with the most recent data, perhaps even for 2004:4 for some variables.

To run the forecasts conditional on monetary policy we use different interest rate rules. The endogenous rule is the most simple. We use the following rule written in to the Text view of the Model object:

```
SER3M = .67 * SER3M(-1) + 1.5 + 1.2 * ((1 / 55) * (@PCY(SEKPI80(+1)) - 2) + (2 / 55) *
(@PCY(SEKPI80(+2)) - 2) + (3 / 55) * (@PCY(SEKPI80(+3)) - 2) + (4 / 55) *
(@PCY(SEKPI80(+4)) - 2) + (5 / 55) * (@PCY(SEKPI80(+5)) - 2) + (6 / 55) *
(@PCY(SEKPI80(+6)) - 2) + (7 / 55) * (@PCY(SEKPI80(+7)) - 2) + (8 / 55) *
(@PCY(SEKPI80(+8)) - 2) + (9 / 55) * (@PCY(SEKPI80(+9)) - 2) + (10 / 55) *
(@PCY(SEKPI80(+10)) - 2))
```

which says that the short run 3 months interest rate is set with respect to deviations of the expected from the target rate of 2 percent inflation up to 10 quarters ahead. Next, we run the model with the constant interest rate up to 2008. We then set SER3M to the present level 2.01 in the data and exogenise the above equation:



Using the implicit forward rates we simply create the series SER3MIT and solve the model accordingly. This is simply accomplished with these lines

```
'SER3M = .67 * SER3M(-1) + 1.5 + 1.2 * ((1 / 55) * (@PCY(SEKPI80(+1)) - 2) + (2 / 55) *
(@PCY(SEKPI80(+2)) - 2) + (3 / 55) * (@PCY(SEKPI80(+3)) - 2) + (4 / 55) *
(@PCY(SEKPI80(+4)) - 2) + (5 / 55) * (@PCY(SEKPI80(+5)) - 2) + (6 / 55) *
(@PCY(SEKPI80(+6)) - 2) + (7 / 55) * (@PCY(SEKPI80(+7)) - 2) + (8 / 55) *
(@PCY(SEKPI80(+8)) - 2) + (9 / 55) * (@PCY(SEKPI80(+9)) - 2) + (10 / 55) *
(@PCY(SEKPI80(+10)) - 2))

SER3M=SER3MIT
```

where the ' sign rules out the previous interest rate rule.

Simulations

Simulations show how one or more shocks affect the outcome of all the variables in the model. Shocks can be imposed in many different ways. For the historical data period(s), shocks appear as residuals from the econometric estimations. When you run a forecast or simulation it can be stochastic and normally errors will be drawn from distriubutions inferred from the errors of the estimations with historical data. Errors for the forecast period can also be so called add factors which may emanate from the desire to affect the forecasts by judgements or to adjust the forecasts from anomalies. Forecasts in BASMOD are generally run without add factors and the forecasts are deterministic in the sense that all residuals in the forecast period are assumed to be equal to their historical means, i.e. zero. However, the user may very well use add factors but should then note that it affects how shocks should be inferred in the model.

Divide shocks into four different categories:

	Endogenous	Exogenous
Permanent	I	III
Transitory	II	IV

For any endogenous variable *y* suppose

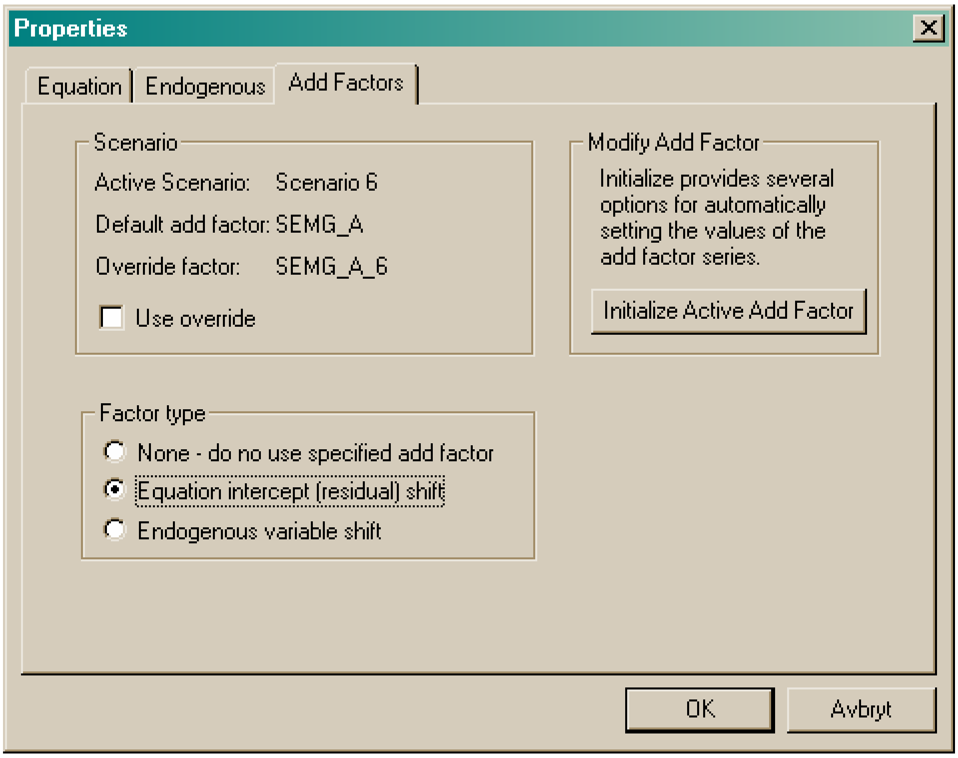
$$y_t = a + bx_t + \varepsilon_t$$

where *a* and *b* are parameters, x_t is a variable that explains *y* and ε_t is a disturbance term, an add factor in the Eviews language. A transformed dynamic version could typically be

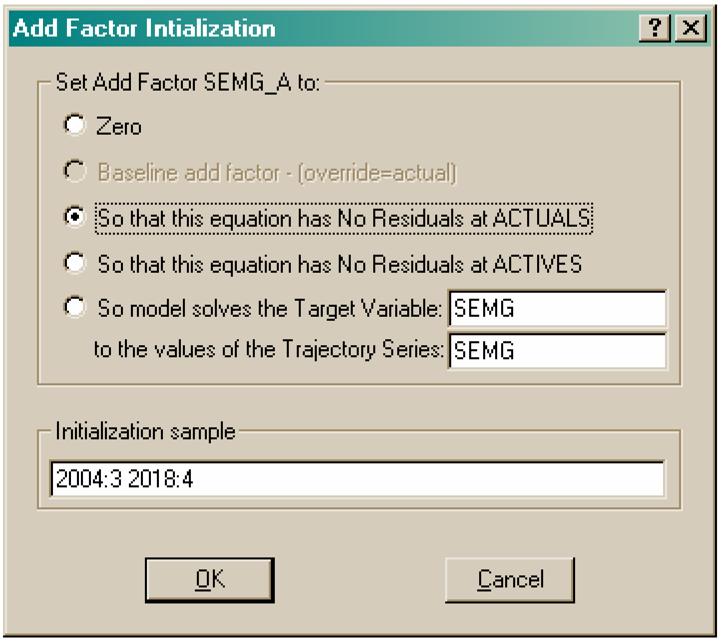
$$\Delta \log y_t = \theta + \phi \Delta \log \mathbf{x_t} + \gamma \Delta \log y_{t-1} + \delta \left[\log y_{t-1} - b' \log \mathbf{x_{t-1}} \right] + \varepsilon_t^{'}$$

Hence, usually $\varepsilon_t = 0$. A shock is introduced in the forecast period by just adding an add factor different from zero.

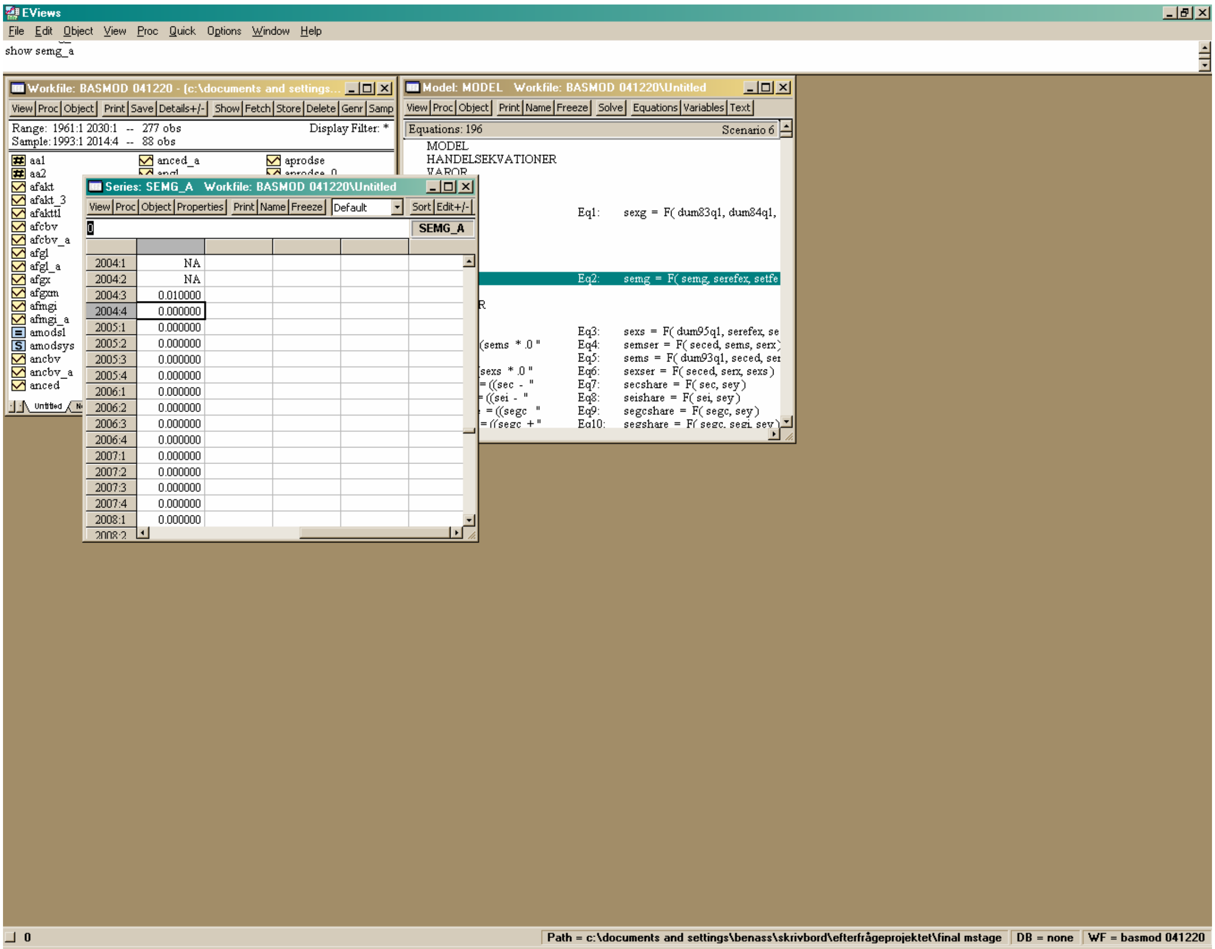
Click on the Add Factors tag and the following window appears in which you click on the Equation intercept (residual shift) followed by a click on Initialize Acitve Add Factor:



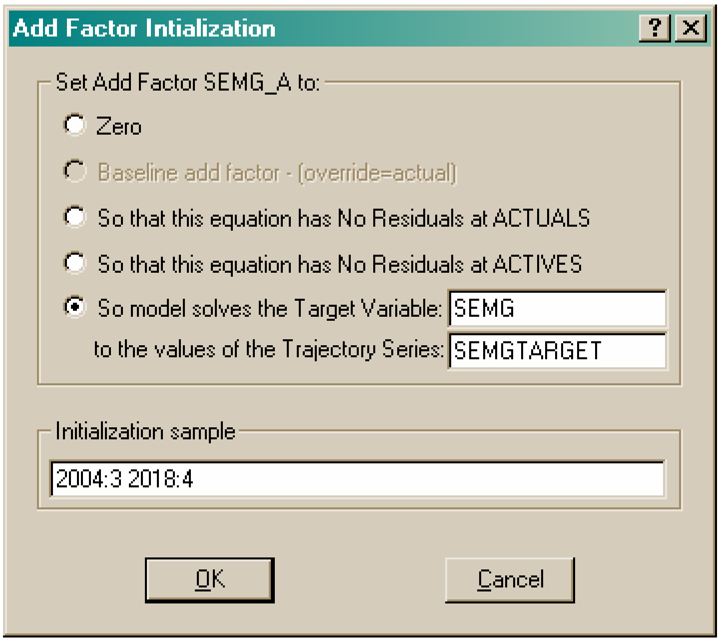
You are then prompted to initialize the add factor – in this example for the imports of goods – in the following window:



By clicking on So the this equation has No Residuals at ACTUALS you create the add factor SEMG_A which is an exogenous variable in the model and is equal to zero for the forecast period 2004:3 – 2018:4. Now you can edit this variable. Since the imports of goods equation is estimated in logarithmic form you can add a temporary one percent shock in the imports of goods in 2004:3 by opening the SEMG_A variable and add 0.01 in that period:



You can edit the add factor in a variety of ways to create the type of shock in line with your intentions. Another useful way to impose shocks is to solve the model so that an endogenous variable follows a predetermined path. Suppose you believe that the imports of goods will develop according to the path of SEMGTARGET. You then create that variable and let BASMOD solve for that:

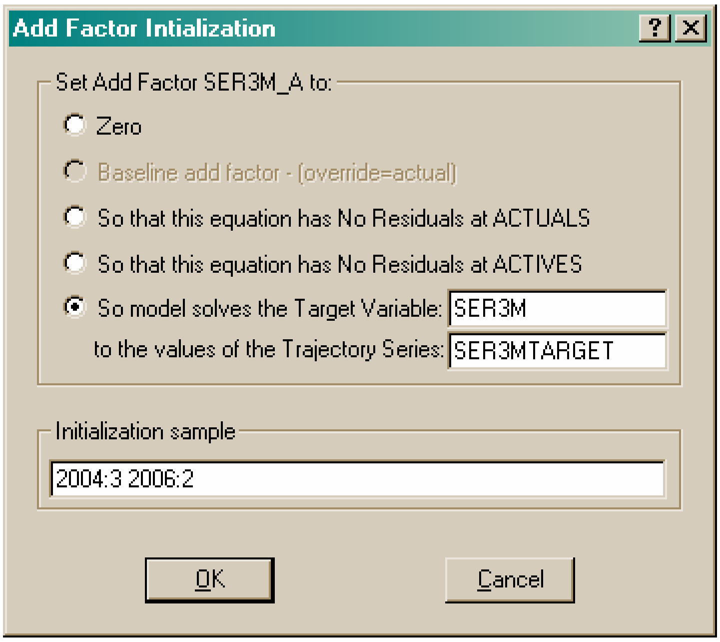


which means that the add factor SEMG_A is created such that SEMG=SEMGTARGET.

This procedure can also be followed in the event of keeping the policy interest rate constant for, say, 2 years. The following steps are needed.

- Create the target variable SER3MTARGET
- Let SER3MTARGET=2.01 which is the present policy rate of interest
- Initialize the add factor as above for the period 2004:3 - 2006:2
- Run the forecast for the period you wish such as 2004:3 - 2018:4

as shown below:



and the model creates SER3M_A such that these shocks (or add factors) to the policy rate of interest generates a constant policy rate for 2004:3 – 2006:2 and an endogenous policy rate without shocks for the period 2006:3 – 2018:4.

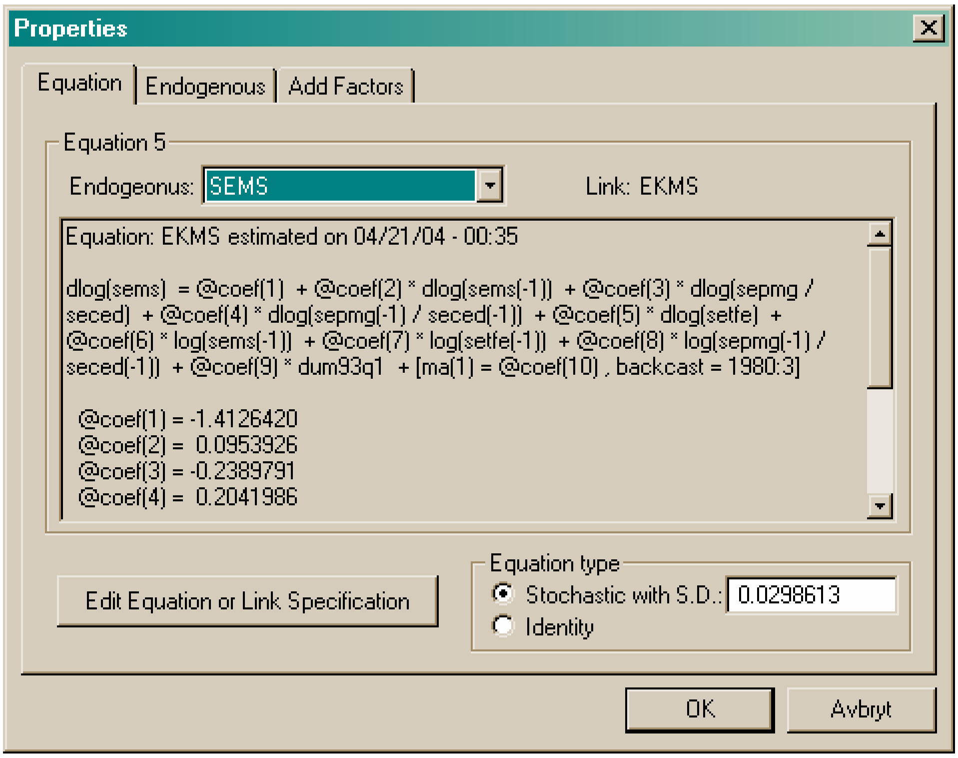
Several other possibilities are available and the reader is referred to the Eviews manual and help menus.

3.5 How to change the model

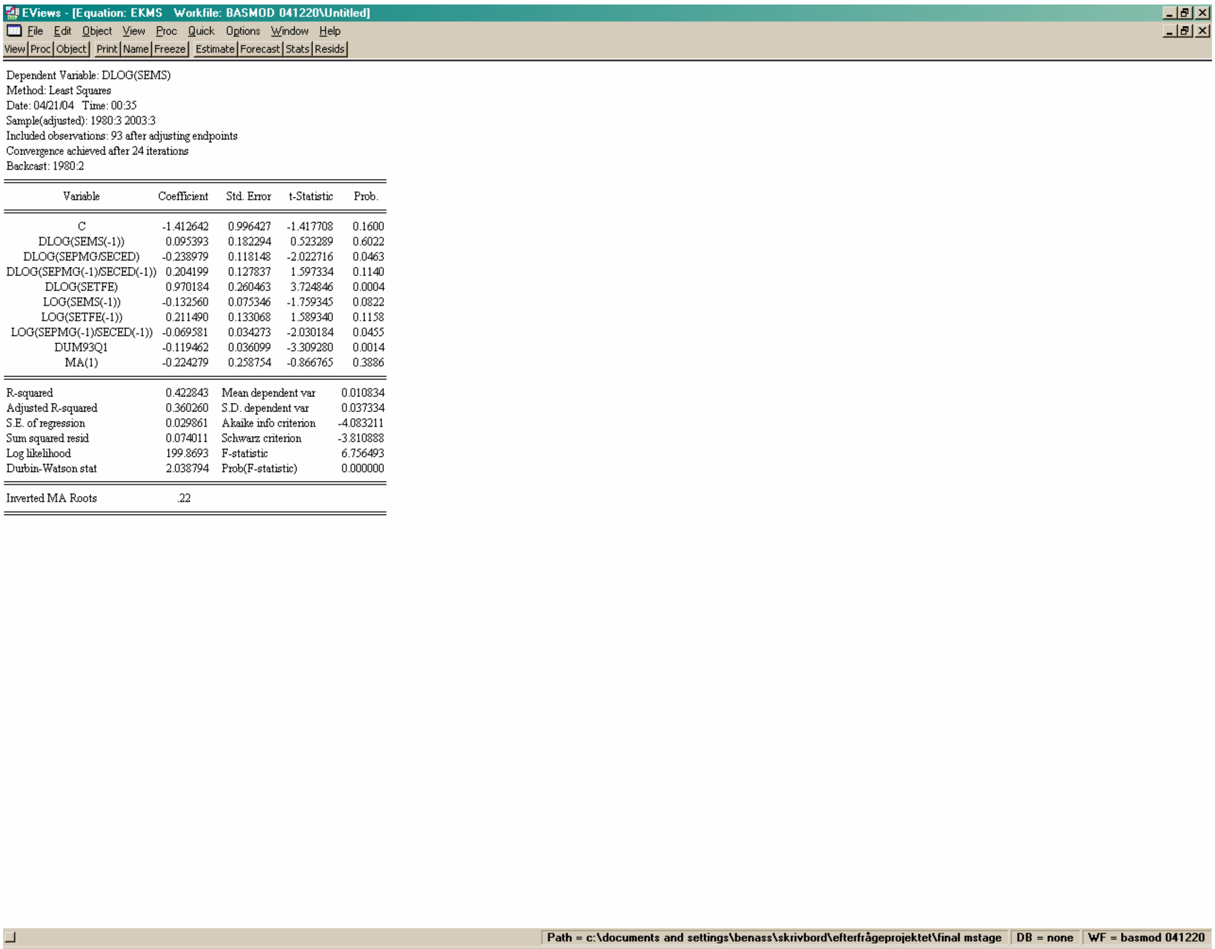
As briefly mentioned above it is easy to make changes to the model and it can be done in various ways. In the Text view of the Model object equations are written down either directly in text mode or linked from estimated equations:

SEC = 0.98 * SEC(-1)
:EKMS

where you can get information about the linked equation EKMS either from the Equations view in the Model object:



or from opening the Equation object for EKMS, in this case the Stats view:



Dependent Variable: DLOG(SEMS)
Method: Least Squares
Date: 04/21/04 Time: 00:35
Sample(adjusted): 1980:3 2003:3
Included observations: 93 after adjusting endpoints
Convergence achieved after 24 iterations
Backcast: 1980:2

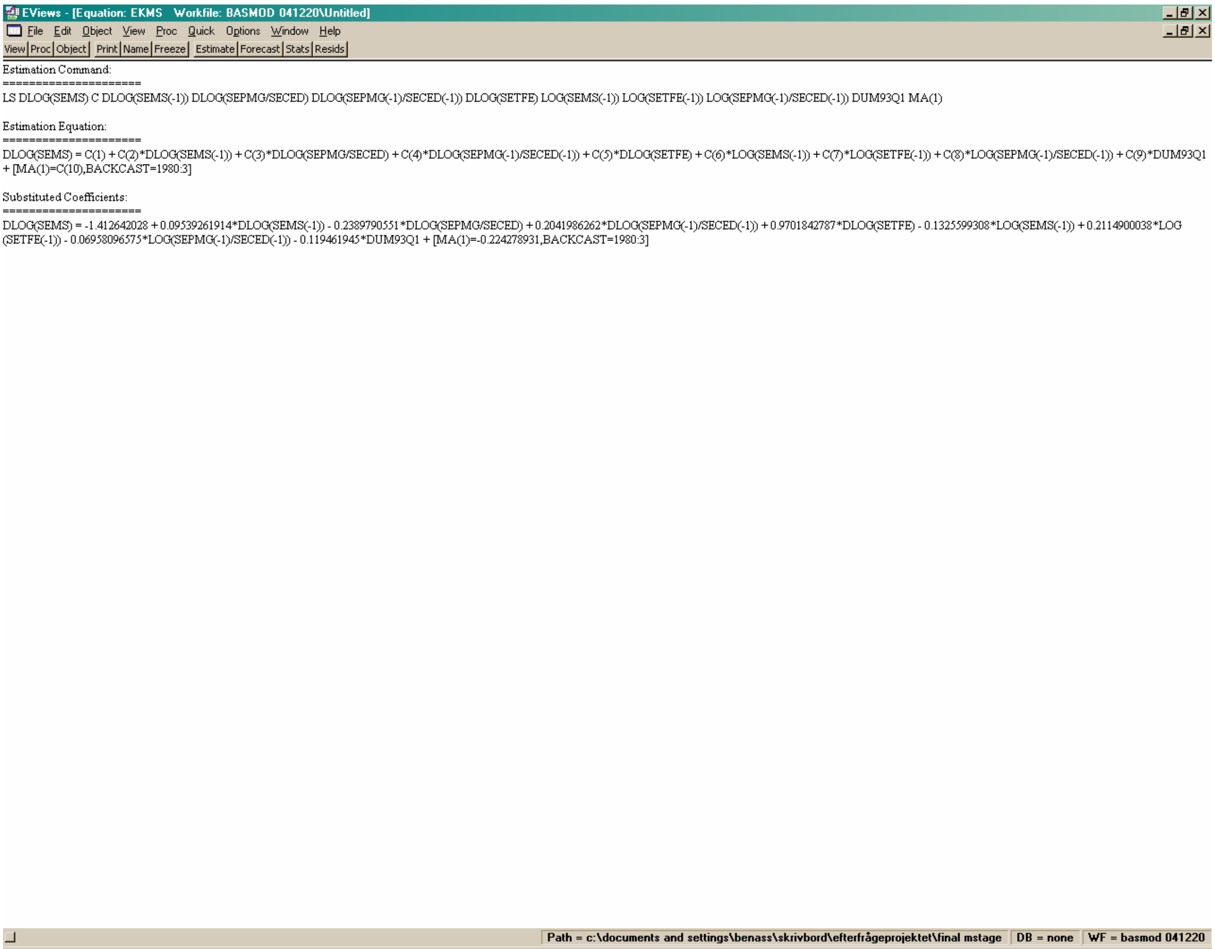
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-1.412642	0.996427	-1.417708	0.1600
DLOG(SEMS(-1))	0.095393	0.182294	0.523289	0.6022
DLOG(SEPMG/SECED)	-0.238979	0.118148	-2.022716	0.0463
DLOG(SEPMG(-1)/SECED(-1))	0.204199	0.127837	1.597334	0.1140
DLOG(SETFE)	0.970184	0.260463	3.724846	0.0004
LOG(SEMS(-1))	-0.132560	0.075346	-1.759345	0.0822
LOG(SETFE(-1))	0.211490	0.133068	1.589340	0.1158
LOG(SEPMG(-1)/SECED(-1))	-0.069581	0.034273	-2.030184	0.0455
DUM93Q1	-0.119462	0.036099	-3.309280	0.0014
MA(1)	-0.224279	0.258754	-0.866765	0.3886

R-squared	0.422843	Mean dependent var	0.010834
Adjusted R-squared	0.360260	S.D. dependent var	0.037334
S.E. of regression	0.029861	Akaike info criterion	-4.083211
Sum squared resid	0.074011	Schwarz criterion	-3.810888
Log likelihood	199.8693	F-statistic	6.756493
Durbin-Watson stat	2.038794	Prob(F-statistic)	0.000000

Inverted MA Roots .22

Path = c:\documents and settings\benass\skrivbord\efterfrågeprojektet\final mstage | DB = none | WF = basmod 041220

If you for some reason do not want to link the equation as above you can write it in text mode by clicking View/Representations to get



and copy the last two rows and paste them into the Text view of the Model object to get:

SEC = 0.98 * SEC(-1)
DLOG(SEMS) = -1.412642028 + 0.09539261914*DLOG(SEMS(-1)) - 0.2389790551*DLOG(SEPMG/SECED) + 0.2041986262*DLOG(SEPMG(-1)/SECED(-1)) + 0.9701842787*DLOG(SETFE) - 0.1325599308*LOG(SEMS(-1)) + 0.2114900038*LOG(SETFE(-1)) - 0.06958096575*LOG(SEPMG(-1)/SECED(-1)) - 0.119461945*DUM93Q1 + [MA(1)=-0.224278931,BACKCAST=1980:3]

These equations you can simply edit in the Text view of the Model object. For an estimated equation it is perhaps preferable to reestimate the equation and link the reestimated equation to the model. A convenient procedure is to make a copy of the original equation and give it a new name – e.g. EKMS2 – and link it to the model:

SEC = 0.97 * SEC(-1)
:EKMS2

Of course you can add new equations to the model by simply writing them in the above format into the Text view of the Model object. If you believe that the coefficient in the consumption equation which was changed from 0.98 to 0.97 is actually changing over time you can run a time varying parameters state space model – e.g. with the name SSC – and replace the original equation by the following link:

:SSC
:EKMS2

There are a lot of possibilities to change the model in various ways and the changes are easy to implement in BASMOD/Eviews. Note that if you reestimate a linked object and rerun the model you have to recompile the model by clicking Procs/Links/Update All Links – Recompile model to make the changes take effect.

3.6 Further information

Further information about how to run the model can be found in the BASMOD home page and also in the chapter on Models in the Eviews user manual.

4. Evaluations

4.1 Problems

It is hard to evaluate macroeconomic models and a number of difficult problems appear. One has to recognize that models are constructed and used in a dynamic environment. By that I mean that circumstances are changed very often, which is particularly true for big models in which specifications change frequently. Evaluations done at a certain point in time then soon become obsolete and do not apply to the model that have been changed at a later date. Likewise, the researchers that develop the model may change over time and the evaluation may aim at evaluating them.

Evaluations should be done in relation to the tasks of the model. Big macroeconometric models serve various purposes, should

- be able to answer many different questions
- make simulation results that mimics the ideas of the organisation
- make good forecasts
- be an educational tool in the organisation
- be easy to use and therefore a tool accessible to many
- be close to good practice, economic theory, etc.
- be focused on the most relevant aspects for the organisation
- be at least as good as the best competitor

Each one of these points could be part of an evaluation. The final verdict depends on how the model performs on the various points but there is no obvious way of putting weights or power to each of the points. In the end – I guess – there will always be a good deal of judgement to it.

Nevertheless, let’s have a look at the difficulties inherent in the points above. The first point points to one of the biggest advantages with big models – they can, at least potentially, answer a lot of questions that the small models can’t. As we all know, the governors in the central bank have a lot of questions and therefore a relatively big model like BASMOD has an advantage over smaller models.

The second point is about the paradigm that governs the organisation – in this case probably the views expressed in the central bank’s legislation and by the board of governors. It is then fairly easy to grasp the general views which are expressed in the central bank laws but less obvious with the details. The model could for instance describe the monetary policy rule with a 2 percent inflation target, but the governors also may have some view of the monetary policy transmission mechanism which might be expressed with less clarity. Nevertheless, there is some consensus about this mechanism saying that it takes something like two years for the repo rate to get its maximum effect on the rate of inflation. The model should be reasonably in line with some established stylized facts of this kind.

The third point is forecast performance and this is probably the aspect that is mostly empasized in evaluations. The new classical macroeconomic school emphasized the poor forecasting performance in their critique of the old Keynesian models. It seems to be a necessary but not sufficient condition that models forecast reasonably well. There are methods for estimating forecast errors (RMSE) that are used by most researchers and are not very controversial. However, such evaluations still are not without serious problems. First, you should pick what variables to forecast. Should it be inflation, GDP growth or some other variables as well? If many variables are involved, how should these be weighted? What if one model forecasts inflation well but GDP growth badly and the competitor model does the other way around? One model forecasts unemployment but the other model lacks that variable – how should that be evaluated? Secondly, forecasts are done at different points in time and under otherwise different conditions. Forecasts for the third quarter some year may be done in June by one forecaster and in August by another. How does that affect the comparisons? In Riksbanken and in similar organisations forecasts are finally done on a judgemental basis. In Riksbanken the staff makes forecasts that are influenced by model forecasts but in the end are judgemental. These forecasts are put forward to the Board of Governors who possibly put final judgements to it. One could evaluate the final forecasts and compare them to the model forecasts to get some idea about the value of the judgements. However, this is difficult since the different forecasts are not done simultaneously. Forecast evaluations should be done by conducting the forecasts in exactly the same way as they would have been done in reality. Forecasts done in Riksbanken are influenced by various circumstances. The data used are daily, monthly, quarterly, annual, etc and varies between variables. When a forecast is done by the staff in the beginning of June there are data for equity prices and interest rates for the beginning of June, labour market data for until April, consumer prices for April, preliminary national accounts data for the first quarter and preliminary household wealth data for the previous year. In model evaluation this information pattern could be taken into account. A model that for instance includes equity prices uses more recent information than a model that excludes equity prices, and it seems reasonable that the former model should be able to use that advantage in the evaluation. A researcher that treats all data equally (which is often the case in *ex ante* evaluations[10]) most likely misfavours that model. A conclusion from this is that it is very difficult to make fair forecast evaluations based on *ex ante* simulations with models. Perhaps the most reasonable comparisons are those based on actual forecasts.

The fourth aspect points to the role of models as pedagogical instruments. As such the model must be theoretically up to date and in some sense correct so that the staff could learn from using the model and benefit from having discussions around it. Of course, a question then is what is meant by a model that is up to date and correct. Macroeconomic models develop fast so there are always a number of models that pops up as potential candidates for being adopted. Textbooks from which staff learns develops much slower. In textbooks some models survive, others don't. Those who don't are probably not worth much consideration. One question then is how conservative one should be in updating models. Macroeconometric models are mostly derived from economic theory – unless time series models like VARs with loose or no restrictions. There is no unique theory from which models can be derived but rather a bunch of competing theories between which one discriminates. In addition, single macroeconomic models are often built on different theories. Recent dynamic models are based on neoclassical growth models but extended with Keynesian price rigidities. Modelling consumer behaviour is normally based on the life cycle hypothesis but may also be extended with credit constraints or buffer stock behaviour. Hence, various theories and specifications are used and evaluations could possibly test various constraints on these models.

The fifth point above relates to the package in which the model is served. Often models are not very accessible but require detailed programming skills which make the setup cost very

[10] Contrary to *ex post* published forecasts.

high. My experience is that for many sectoral experts the setup cost must be kept low in order to create incentives for using models. BASMOD uses Eviews for the code which is the most commonly used econometrics and modelling program in Riksbanken.

The seventh point has to do with focusing on the most relevant things (for the Riksbank). Of course, for monetary policy the inflation forecast is the most important thing. The inflation forecast of course depends on forecasts on other things as well and hence the scope for extending the forecast to other variables is considerable. However, the evaluation for the Riksbank should focus on a few variables, foremost inflation with the highest weight and some other variables with lower weights. Below I focus on inflation and GDP growth.

The final point in the list above is how to choose competing models for comparison. Evaluations in the scientific literature often pick a rather poor competitor, like a random walk, and then often show that the model at hand performs relatively well. The researcher do a lot a refinements, like adding dummies, moving average errors, adjusting the sample, etc. with his own model but do almost nothing like that with the competing models. That could make the comparisons unfair. Below I compare the forecasts of BASMOD with one of the structural VAR models at the bank and with a random walk. I also do a comparison with the forecasts actually done by the Board of Governors in the Inflation Report, which is the staff forecast possibly adjusted for judgements by the board, and with the forecasts from National Institute of Economic Researh (Konjunkturinstitutet).

4.2 Estimated equations

The estimated stochastic equations can be evaluated statistically. This can be done within and out of sample. Conventional statistical evaluations look at the properties of the within-sample forecast errors, on autocorrelation, heteroscedasticity, ARCH, normality, stability, etc. Below are examples of evauations for inflation and GDP growth.

4.2.1 Inflation

Here I focus on the ability to explain the historical development of CPI inflation, during the period 1980-2004. The CPI equation is specified in Appendix A1.3.2 and inflation depends on

SEKPI80 = F(SEKPI80F, SEITR, SECEDF, SEPPF, SESKEW, SEVAR, DUMMIES)

where

SEKPI80F = consumer price index less indirect taxes with 1980=100
SECEDF = household expenditure deflator less indirect taxes with 2000=100
SEPPF = producer price index less indirect taxes with 2000=100
SESKEW = skewness of relative price changes
SEVAR = variance of relative price changes
DUMMIES = dummies for various events

The exact specification is:

DLOG(SEKPI80F*(1+SEITR)) = 0.05098536114 + 0.7025349961*DLOG(SEKPI80(-1)) + 0.2076284383*DLOG(SEPPF*(1+SEITR)) + 1.706618948*SESKEW - 0.9226601088*SESKEW(-1) + 2.446191953*SEVAR + 84.18528297*SESKEW*SEVAR - 0.05174939449*(LOG(SEKPI80(-1))-

0.5765842874*LOG((SECEDF(-1)*(1+SEITR(-1))))-(1-0.5765842874)*LOG(SEPPF(-1)*(1+SEITR))) + 0.01295771806*DUM92Q4 + 0.02097195928*DUM91Q1 - 0.006850454073*DUM96Q1 - 0.0004195740618*SEU + [MA(1)=-0.9841626892,BACKCAST=1980:3]

and some econometric results can be read

Dependent Variable: DLOG(SEKPI80F*(1+SEITR))
Method: Least Squares
Date: 11/23/04 Time: 16:32
Sample (adjusted): 1980:3 2004:2
Included observations: 96 after adjustments
Convergence achieved after 46 iterations
Backcast: 1980:2

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.050985	0.012645	4.032012	0.0001
DLOG(SEKPI80(-1))	0.702535	0.040867	17.19082	0.0000
DLOG(SEPPF*(1+SEITR))	0.207628	0.027565	7.532300	0.0000
SESKEW	1.706619	0.730770	2.335370	0.0219
SESKEW(-1)	-0.922660	0.438848	-2.102460	0.0385
SEVAR	2.446192	1.246080	1.963110	0.0530
SESKEW*SEVAR	84.18528	425.9162	0.197657	0.8438
LOG(SEKPI80(-1))-0.5765842874*LOG((SECEDF(-1)*(1+SEITR(-1))))-(1-0.5765842874)*LOG(SEPPF(-1)*(1+SEITR))	-0.051749	0.013179	-3.926719	0.0002
DUM92Q4	0.012958	0.005601	2.313407	0.0232
DUM91Q1	0.020972	0.004821	4.350385	0.0000
DUM96Q1	-0.006850	0.006647	-1.030628	0.3057
SEU	-0.000420	0.000128	-3.287938	0.0015
MA(1)	-0.984163	0.031132	-31.61242	0.0000

R-squared	0.793419	Mean dependent var	0.010895
Adjusted R-squared	0.763552	S.D. dependent var	0.010970
S.E. of regression	0.005334	Akaike info criterion	-7.504066
Sum squared resid	0.002362	Schwarz criterion	-7.156810
Log likelihood	373.1951	F-statistic	26.56501
Durbin-Watson stat	1.918148	Prob(F-statistic)	0.000000
Inverted MA Roots	.98		

Table 4.1. Summary statistics for CPI inflation equation.

This equation passes all the mentioned conventional statistical tests above. In that sense it could be said to provide a satisfactory description of the historical development of CPI inflation.

The evaluation of this equation can also be done by comparing with estimates of competing equations. One competing equation is the staggered wage contracts model suggested by Taylor (1980) and the estimate of that equation is:

Dependent Variable: DLOG(SEKPI80F*(1+SEITR))
Method: Least Squares
Date: 11/24/04 Time: 14:11
Sample: 1980:3 2004:2
Included observations: 96

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.014909	0.002879	5.179415	0.0000
DLOG(SEKPI80(-1))	0.326788	0.093981	3.477164	0.0008
DUM92Q4	0.004004	0.008326	0.480926	0.6317
DUM91Q1	0.026002	0.008274	3.142676	0.0023
DUM96Q1	-0.004148	0.008343	-0.497191	0.6203
SEU(-1)	-0.001794	0.000461	-3.890480	0.0002
DLOG(SEPMA)-DLOG(SEPMA_HP)	-0.003541	0.026318	-0.134530	0.8933

R-squared	0.479406	Mean dependent var	0.010895
Adjusted R-squared	0.444309	S.D. dependent var	0.010970
S.E. of regression	0.008177	Akaike info criterion	-6.704785
Sum squared resid	0.005951	Schwarz criterion	-6.517801
Log likelihood	328.8297	F-statistic	13.65973
Durbin-Watson stat	2.038346	Prob(F-statistic)	0.000000

Table 4.2. Summary statistics for restricted CPI inflation equation.

and we can see that the standard error of the regression is significantly increased in this restricted model. Even though the more general model produces smaller within-sample forecast errors it might make worse out-of-sample errors. In particular, one might think it is difficult to predict the variance and skewness of relative-price changes.

4.2.2 GDP growth

Since there is no stochastic equation for GDP in the model the prediction of GDP growth is based on the identity

$$SEY \equiv SEC + SEGC + SEGI + SEBI + SEHI + SEXG + SEXS - SEMG - SEMS + SEDS$$

and the forecast errors in GDP depend on the errors in the components.

Below is shown a regression of GDP on the model fit (static forecast) of GDP, which is a measure of the model's fit to historical data. The residuals show no signs of serial correlation and the correlation is high.

Dependent Variable: SEY
Method: Least Squares
Date: 01/05/05 Time: 15:45

Sample (adjusted): 1984Q2 2003Q3
Included observations: 78 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-2788.381	3088.354	-0.902870	0.3694
PREDICTED SEY	1.005704	0.006517	154.3270	0.0000

R-squared	0.996819	Mean dependent var	470855.1
Adjusted R-squared	0.996777	S.D. dependent var	53579.89
S.E. of regression	3041.680	Akaike info criterion	18.90351
Sum squared resid	7.03E+08	Schwarz criterion	18.96394
Log likelihood	-735.2370	F-statistic	23816.82
Durbin-Watson stat	1.612761	Prob(F-statistic)	0.000000

Table 4.3. Summary statistics for regression of actual on fitted GDP level.

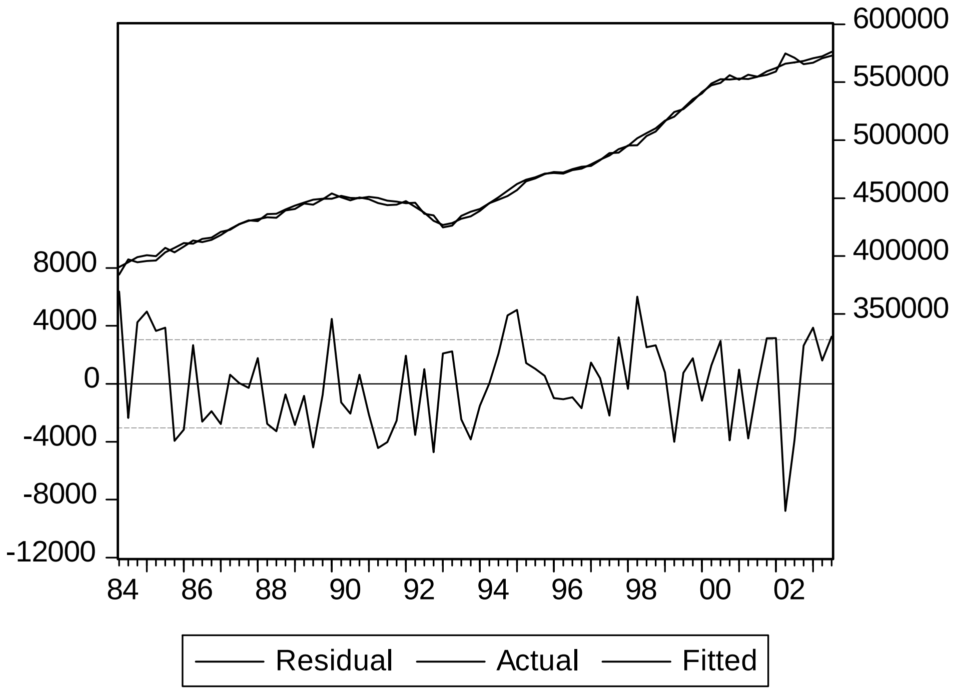


Diagram 4.1. Actual and fitted GDP level and estimated residual. 1984-2003.

The within-sample-fit can be compared with the fit for the VAR model used above with 9 variables and 4 lags which gives about 25 percent lower standard error for the forecast of GDP. But this merely reflects the overparameterization of the VAR model. If the lags in the VAR are reduced to two lags the standard error is only 10 percent lower than in BASMOD. Therefore, the fit to historical data seems satisfactory in BASMOD.

4.3 Simulations

In this section the effects of monetary and fiscal policy is studied. Since both monetary and fiscal policy are formulated in terms of policy rules, changes in policy is best analysed in terms of changes in these rules rather than as discretionary changes.

4.3.1 Effects of monetary policy

In the case of monetary policy the present forecasts with BASMOD are done with endogenous short interest rate (*SER3M*) or with implicit forward rates. The forecasts with forward rates are done by deriving shocks to the policy rule that creates the paths for implicit rates for the period 2005-2010. In the diagram below forecasts for the period 2004:4 – 2008:4.

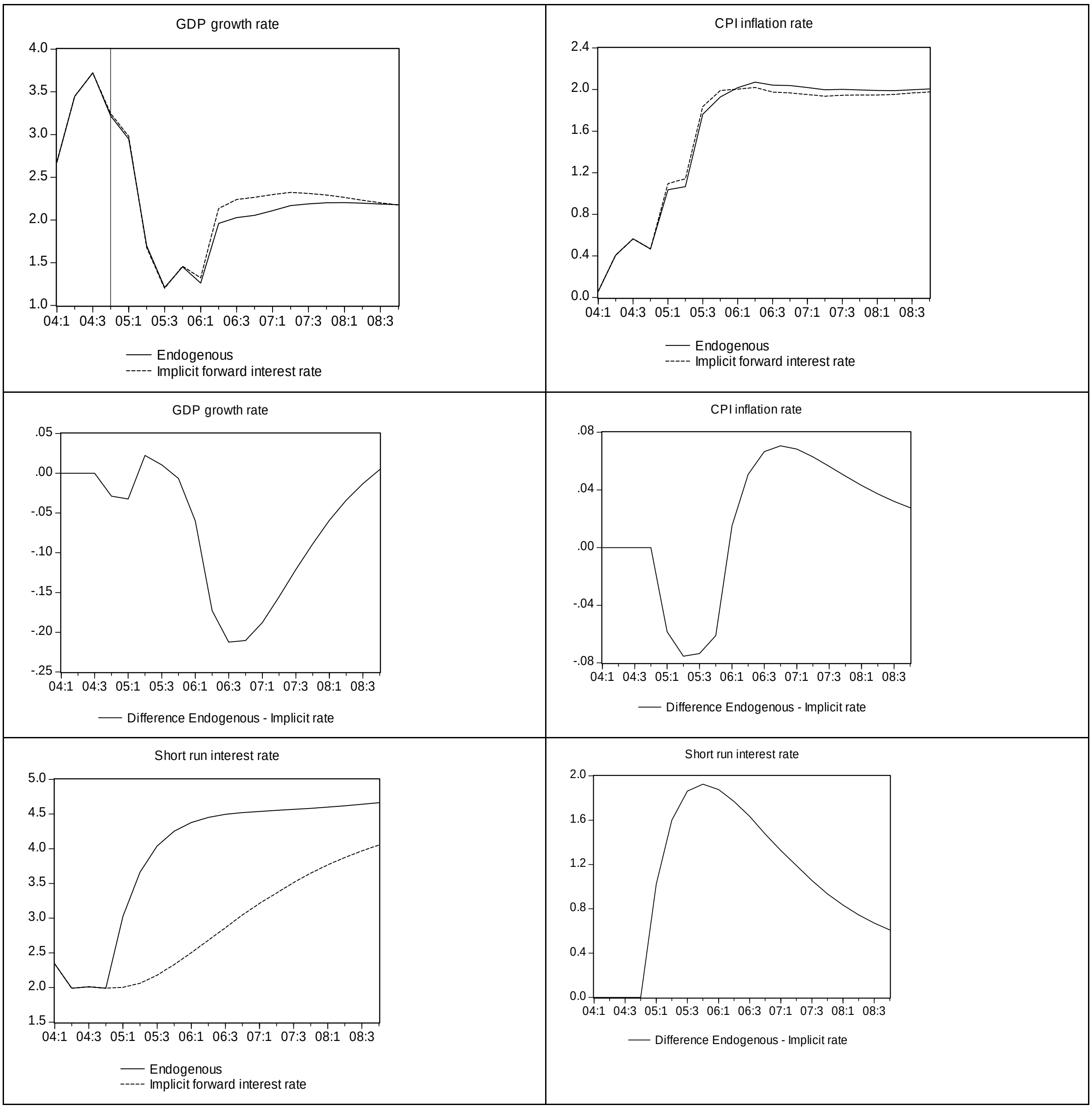


Diagram 4.2. Effects of monetary policy on GDP growth rate and inflation. Left panels show both scenarios and right panels the difference between scenarios. The two scenarios are 1) endogenous policy interest rate and 2) implicit forward interest rate.

The interest rate is for the forecast period 2004:4 – 2008:4 on average 1.1 percentage point higher with the endogenous interest rate which on average decreases GDP growth with 0.1 and the CPI inflation rate with 0.04 percentage points. The elasticity between output and inflation is about 0.3 for this type of shock. In general, the effects from changes in the interest rate is small in BASMOD. This can be interpretad as a case in which policy has to change inflationary expectations in order to create larger effects. That could be done by changing the inflation target in the model, a case in which the effects on inflation is much larger.

4.3.2 Effects of fiscal policy

In this section I simulate a change in the target rate of the government budget surplus, which is changed from 1.5 to 0.5 percent of GDP. It takes almost four years to achieve the goal, as can be seen in the lower right part of diagram 4.3 below.

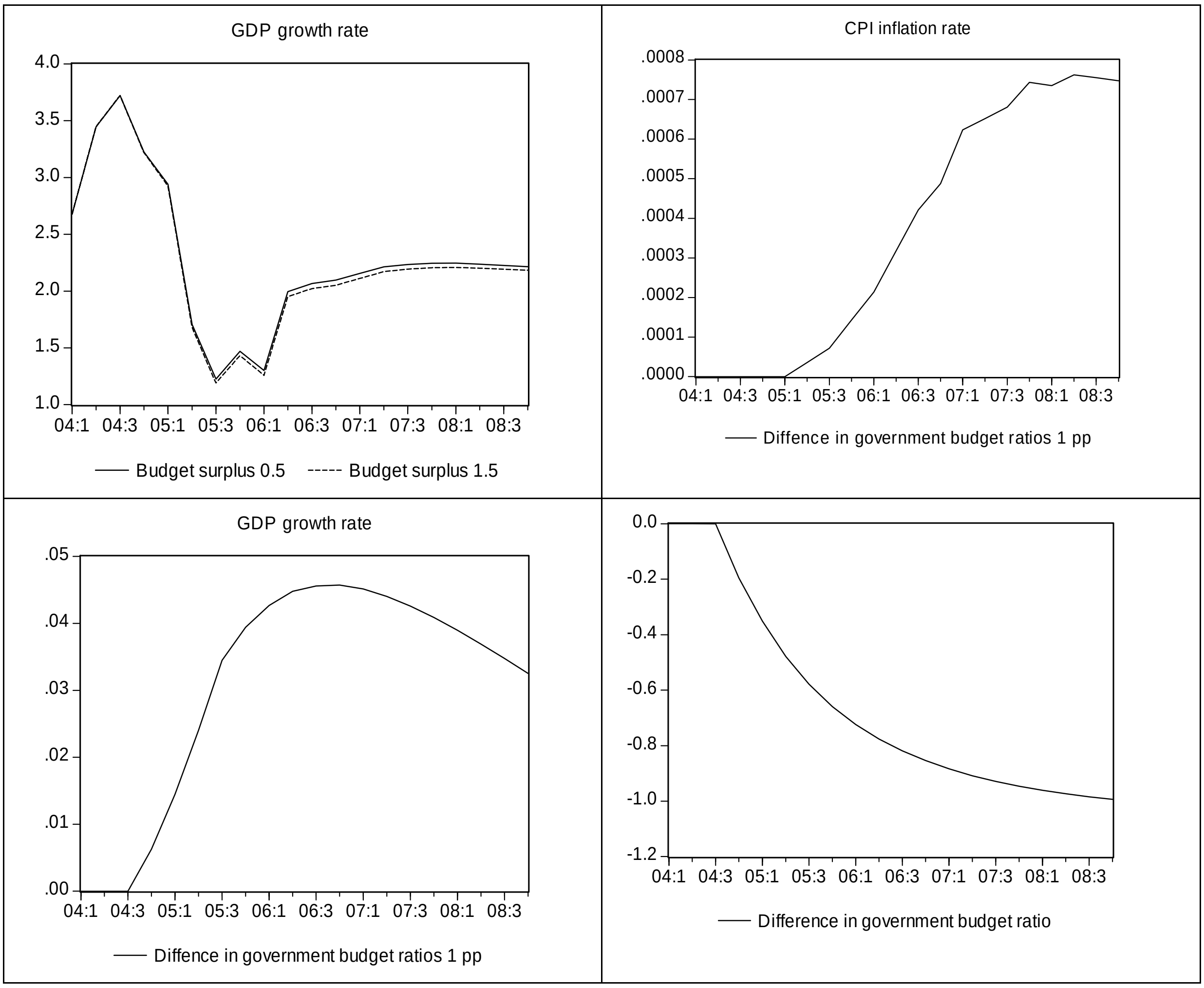


Diagram 4.3. Effects on GDP growth and CPI inflation rates from a decrease in the government budget surplus target with one percentage point.

The graphs in diagram 4.3 show that the budget surplus gradually decreases from 1.5 to 0.5 percent of GDP. This increases the GDP growth rate moderately, with 0.04 percentage point and the rate of inflation by about 0.007 percentage points. The elasticity of inflation with respect to the output gap is now lower, about 0.2. This shows that you should be careful in using rule-of-thumbs for these kinds of elasticities for endogenous variables.

4.4 Out-of-sample forecasts

4.4.1 Problems

Evaluation of out-of-sample forecasting performance is a difficult task, particularly if you want to compare the performance of different models. In this case I want to compare BASMOD with competing forecasts, for instance from the best VAR models or from the sectoral experts at the Department. Comparisons of out-of-sample forecasts can be done by comparing the actual forecasts put forward in actual forecasting processes or by making simulations of these. With the latter I mean a situation in which the researcher estimates the model up to a point and then makes out-of-sample forecasts.

Comparing actual forecasts is difficult since forecasts seldom start at the same point in time and under identical conditions. For instance, the forecasts of the Riksbank are conditioned on a constant repo interest rate which is not the case for most other forecasters. Also, forecasts are done at different points in time and hence with different information sets. I recognize these differences and therefore try to do the comparisons below as fair as possible. In the case of historical forecasts I use the actual forecasts put forward by BASMOD at various points in time and compare them with forecasts put forward by the Department at (approximately) the same point in time. I also compare these forecasts with forecasts from two competing models, a VAR[11] and a random walk. These models are then estimated up to the point in time where the forecasts start. For instance for the forecast put forward in 2000:1 I estimated the competing models up to 1999:4. This is probably not unfair to the competitors since a lot of data – like the national accounts – are published with longer lags than one quarter. The information sets also vary with the type of model that is used. The VAR models used here don’t use asset price data which are published with short lags and hence can be an advantage for models which incorporate them.

Another problem with the *ex post* evaluations of out-of-sample forecasts is how to treat exogenous variables. In the actual forecast some forecast of the exogenous variables are used. In BASMOD this is typically forecasts of some foreign variables. I usually collect them from the most recent forecast in Nigem. However, if I want to evaluate the forecasts for 1997-1999 today I would normally use the data available today (possibly the actuals) for the forecasts. However, normally today’s data are revised and the forecast that would have been done in 1996:4 would have used preliminary data for say 1995-1996. The same problem applies to VAR models and can only be solved if you use the same preliminary data that would have been used in the actual forecasts.

It is therefore difficult to reconstruct the situations in which forecasts are actually done, maybe not so much in principle as in practice, such that comparisons between models become fair. To me it seems as if the most reasonable comparisons can be achieved by comparing the actual forecasts. A problem with that is that time series for the same model often are not available for long periods. Below I still do some comparisons between BASMOD and the forecasts of the Riksbank. The VAR model and the random walk model is to some extent favoured by the fact that they use revised data while the actual forecasts use the preliminary data.

[11] See below for details about the VAR model.

4.4.2 Historical forecasts

Below you find actual forecasts from BASMOD put forward by the Riksbank (RB) between 2000:1 and 2003:2. 2003 is the last year for which actual values are observable.

Table 4.4. Evaluation of forecasts in BASMOD. Historical forecasts. Actuals within parentheses. Forecasts with VAR within []. Forecasts with random walk within {}. Riksbank (RB) forecasts within $\langle \ \rangle$. Forecasts in Rixmod within $\lvert \ \rvert$. Forecasts by NIER within $[\![\ ]\!]$.

	Inflation CPI			GDP-growth		
Start of fore-cast	Current year	About 1 year ahead	About 2 years ahead	Current year	About 1 year ahead	About 2 years ahead
2000:1	1,2 (1.0) [1.9] {0,8} $\langle 1.4 \rangle$ $\lvert 1.3 \rvert$ $[\![1.2]\!]$	1,9 (2,4) [1.5] {0,4} $\langle 1.6 \rangle$ $\lvert 1.3 \rvert$ $[\![1.9]\!]$	2,5 (2,2) [1.5]{0,0} $\lvert 1.3 \rvert$	4,1 (4,4) [5.3] {5,0} $\langle 4.0 \rangle$ $\lvert 3.6 \rvert$ $[\![3.9]\!]$	4,0 (1,2) [4.1]{5,0} $\langle 3.5 \rangle$ $\lvert 1.6 \rvert$ $[\![3.3]\!]$	3,2 (2,0) [3.9]{5,1} $\langle 2.6 \rangle$ $\lvert 1.8 \rvert$
2000:3	1,0 (1,0) [1.3] {0,9} $\langle 1.4 \rangle$ $\lvert 1.2 \rvert$ $[\![1.2]\!]$	1,3 (2,4) [2.4] {0,5} $\langle 2.0 \rangle$ $\lvert 2.2 \rvert$ $[\![1.5]\!]$	1,6 (2,2) [2.0]{0,1} $\lvert 2.2 \rvert$	4,2 (4,4) [4.9] {5,2} $\langle 4.0 \rangle$ $\lvert 4.5 \rvert$ $[\![4.1]\!]$	4,5 (1,2) [4.3]{5,4} $\langle 3.7 \rangle$ $\lvert 3.8 \rvert$ $[\![3.6]\!]$	3,5 (2,0) [4.0]{5,5} $\langle 3.0 \rangle$ $\lvert 3.1 \rvert$
2001:1	2,6 (2,4) [2.0] {1,0} $\langle 1.9 \rangle$ $\lvert 1.3 \rvert$ $[\![1.6]\!]$	2,4 (2,2) [1.5] {0,6} $\langle 2.0 \rangle$ $\lvert 1.3 \rvert$ $[\![1.6]\!]$	1,9 (2,0) [1.4]{0,2} $\lvert 1.7 \rvert$	1,9 (1,2) [2.7] {3,2} $\langle 2.4 \rangle$ $\lvert 3.7 \rvert$ $[\![2.8]\!]$	3,8 (2,0) [3.3]{3,2} $\langle 2.4 \rangle$ $\lvert 2.1 \rvert$ $[\![3.1]\!]$	2,2 (1,6) [3.5]{3,2} $\langle 2.7 \rangle$ $\lvert 1.8 \rvert$
2001:2	3 (2,4) [1.4] {1,5} $\langle 1.8 \rangle$ $\lvert 1.9 \rvert$ $[\![2.4]\!]$	3,5 (2,2) [1.3] {1,2} $\langle 2.2 \rangle$ $\lvert 2.0 \rvert$ $[\![1.8]\!]$	2,3 (2,0) [1.2]{0,8} $\lvert 1.7 \rvert$ $[\![1.9]\!]$	1,5 (1,2) [2.0] {2,3} $\langle 2.2 \rangle$ $\lvert 4.0 \rvert$ $[\![2.0]\!]$	1,6 (2,0) [3.2]{2,2} $\langle 2.5 \rangle$ $\lvert 2.2 \rvert$ $[\![3.1]\!]$	2,6 (1,6) [3.4]{2,2} $\langle 2.9 \rangle$ $\lvert 1.3 \rvert$ $[\![2.6]\!]$
2002:3	-	-	-	2,0 (2,0) [2.1] {2,2} $\langle 1.7 \rangle$ $\lvert 2.2 \rvert$ $[\![1.9]\!]$	1,8 (1,6) [2.5]{2,4} $\langle 2.3 \rangle$ $\lvert 1.7 \rvert$ $[\![2.7]\!]$	2,5 $\langle 2.1 \rangle$ $\lvert 2.2 \rvert$
2003:1	2,4 (2,0) [1,4] {1,9} $\langle 2.5 \rangle$ $\lvert - \rvert$ $[\![2.3]\!]$	2,0	2,0	1,8 (1,6) [1,2] {1,7} $\langle 1.7 \rangle$ $\lvert 2.2 \rvert$ $[\![1.4]\!]$	2,4	2,7
2003:2	2,5 (2,0) [2,6] {3,0} $\langle 1.3 \rangle$ $\lvert - \rvert$ $[\![1.8]\!]$	1,9	2,0	1,5 (1,6) [1,3] {1,6} $\langle 1.2 \rangle$ $\lvert 1.9 \rvert$ $[\![1.3]\!]$	3	2,9
RMSE	$0,38^{*}$ (0) [0,75]{0,69} $\langle 0.53 \rangle$ $\lvert 0.63 \rvert$ $[\![0.38]\!]^{*}$	0,89 (0) [0,73]{1,67} $\langle 0.46 \rangle^{*}$ $\lvert 0.72 \rvert$ $[\![0.63]\!]$	$0,37^{*}$ (0) [0,62]{1,87} $\lvert 0.59 \rvert$	$0,33^{*}$ (0) [0,60]{0,95} $\langle 0.66 \rangle$ $\lvert 1.48 \rvert$ $[\![0.73]\!]$	2,10 (0) [2,10]{2,62} $\langle 1.58 \rangle$ $\lvert 1.18 \rvert^{*}$ $[\![1.69]\!]$	1,12 (0) [1,90]{2,49} $\langle 1.03 \rangle$ $\lvert 0.59 \rvert^{*}$

Forecasts are compared with VAR, random walk, Riksbank (Monetary Policy Department plus eventual judgements from the Board of Governors) and Rixmod which is another big macroeconomic model used at the department. Forecasts were done for the preceding year and for about 1 and 2 years ahead. All in all there are 16 forecasts to evaluate. The first thing to note is that the random walk is clearly beaten by all the competitors (except for the current year inflation forecast where the VAR model is beaten by the random walk and for the current year GDP growth rate where Rixmod is beaten). Another thing to note is that both the big models perform well and generally beats the VAR model. The exception here is that the current year forecasts by Rixmod are poor. But Rixmod on the other hand has the best GDP growth forecasts for 2 and 3 years ahead. One can also note that BASMOD produces the best current year forecasts for both inflation and GDP growth.

I also computed the RMSE for the inflation forecast 2 percent (⇔ the inflation target). It turned out to be 0.4 which means that it on average beat all the models here. It doesn’t beat BASMOD on the current year forecast and is similar to the Riksbank second year forecast but beats all models for the third year forecast.

Table 4.5 shows a ranking of the forecasting performance on different horizons. BASMOD wins 3, Rixmod 2 and the Riksbank 1 of the competitions. The VAR model comes second for current year GDP growth forecast at best, but the winner BASMOD then has only 55 percent of the errors of the VAR model.

Table 4.5. Ranking of forecast performance on different horizons. Figures within parentheses show the winner’s errors relative to the competitor’s errors in percent.

Ranking of the forecasting performance for inflation.			
	Current year	Next year	Next next year
1	BASMOD/NIER	Riksbank	BASMOD
2	Riksbank (72)	NIER (73)	Rixmod (63)
3	Rixmod (60)	Rixmod (64)	VAR (60)
4	RW (55)	VAR (63)	RW (20)
5	VAR (51)	BASMOD (52)	
6		RW (28)	
Ranking of the forecasting performance for GDP growth.			
	Current year	Next year	Next next year
1	BASMOD	Rixmod	Rixmod
2	VAR (55)	Riksbank (75)	Riksbank (57)
3	Riksbank (50)	NIER (70)	BASMOD (53)
4	NIER (45)	BASMOD/VAR (56)	VAR (31)
5	RW (35)	RW (45)	RW (24)
6	Rixmod (22)		

Although the number of forecasts here is small and one should be careful to draw firm conclusions, the following results emerged:

- the Riksbank performs well on inflation forecasts 1-2 years ahead
- additional judgements by the Riksbank to the big models BASMOD and Rixmod add very little improvements to the forecasts
- both the big models perform well
- BASMOD performs best in the short run (1 year ahead or less)
- all forecasts beat the random walk

Table 4.6. Summary of RMSE in historical forecasts (mean for all horizons).

	BASMOD	VAR	RW	Riksbank	Rixmod
CPI-inflation	0.56	0.68	1.44	0.50	0.64
GDP-growth	1.32	1.59	2.02	1.12	1.21

4.4.3 Simulated forecasts

The evaluations above were done for the actual forecasts where the number of forecasts is small. The advantage with that type of evaluations is that you can be sure that no more information than is actually available has been used. The forecasts for the VAR and the random walk model were however produced ex post and should not have been a disadvantage for them, rather the opposite since revised and not preliminary data were used for those models. To make a comparison under similar circumstances I now generate forecasts with BASMOD and the VAR.

I forecast GDP growth and inflation in BASMOD and the competing VAR model used above. Both models are estimated up to approximately 2003:4 or at the most until 2004:2. In BASMOD some equations are not updated and the sample period varies in different equations. In the VAR model I use data up to 2004:2. The estimated VAR model is supposed to be close to one of the models used at the Monetary Policy Department and which has proved to produce reasonable forecasts. The VAR model uses the following variables

- inflation
- GDP
- rate of unemployment
- unit labour cost
- short run interest rate
- effective exchange rate
- world GDP
- world inflation
- world interest rate

and is estimated in first differences except for interest rates, unemployment and effective exchange rate which are estimated in levels. As in the departments' model, 4 lags are used. Forecasts are run three years ahead starting 1997-1999 and ending 2001-2003. Forecasts are evaluated at an annual basis to comply with the procedures in the Inflation Report.

Table 4.7 shows the forecasts for GDP growth. On average BASMOD produces slightly more accurate forecasts than the VAR model. This is the case for all horizons. BASMOD gives larger errors in the forecasts starting in 1997 and 1998 but lower errors for 1999-2001.On average for all horizons and periods the forecast errors are about 25 percent lower in BASMOD than in the VAR model.

Table 4.7. Forecast of annual GDP growth rates. Forecast errors and RMSE.						
	1997	1998	1999	2000	2001	RMSE
VAR	0.19	-0.35	0.87	0.64	-1.32	0.78
BASMOD	-0.30	0.22	0.78	0.58	0.55	0.53
	1998	1999	2000	2001	2002	
VAR	-0.59	0.75	1.31	-1.22	-0.65	0.95
BASMOD	0.71	1.60	0.81	-0.24	0.30	0.88
	1999	2000	2001	2002	2003	
VAR	0.18	1.29	-1.19	-0.13	1.95	1.18
BASMOD	1.85	0.71	-0.42	-0.20	0.22	0.92
	RMSE	RMSE	RMSE	RMSE	RMSE	
VAR	0.37	0.88	1.14	0.80	0.88	0.98
BASMOD	1.16	1.02	0.69	0.38	0.38	0.75

Table 4.8. Forecast of annual inflation rates. Forecast errors and RMSE.						
	1997	1998	1999	2000	2001	RMSE
VAR	0.55	-0.75	0.34	-0.99	-0.26	0.64
BASMOD	-0.29	-1.07	-0.36	0.0	0.9	0.66
	1998	1999	2000	2001	2002	
VAR	-0.74	-0.69	-0.15	-0.59	-0.77	0.63
BASMOD	-1.01	-0.92	-0.03	1.1	1.0	0.90
	1999	2000	2001	2002	2003	
VAR	-0.81	-0.68	0.27	-0.49	-1.01	0.70
BASMOD	-0.94	-0.06	1.06	0.9	0.4	0.77
	RMSE	RMSE	RMSE	RMSE	RMSE	
VAR	0.71	0.71	0.27	0.72	0.75	0.60
BASMOD	0.81	0.82	0.65	0.82	0.81	0.76

Table 4.8 presents the results for CPI inflation. It shows that the forecast errors now are larger in BASMOD than in the VAR model. On the one and three year horizons forecasts are similar but on the two year horizon BASMOD performs less well. On average for all horizons and periods the forecast errors are about 20 percent lower in the VAR model than in BASMOD.

Recall that these evaluations use the most recent parameter estimates for both models and hence use information that was not available at the date of forecasting. In the evaluations with historical forecasts for BASMOD, Rixmod and the Riksbank no other information than was actually available at the time of the forecasting was used. To evaluate the effects of parameter updating I estimated BASMOD up to the date of forecasting and investigated how the updating affected the forecasts. Generally the forecasts improve significantly when parameters are updated, though not so much for CPI inflation and GDP growth. This casts some doubts on the comparison with the VAR above and reinforces the argument that the best evaluations are probably done by using actual forecasts.

4.5 Summary

The often heard statement that VAR models produce better forecasts than “big” macroeconometric models seems to be a cock-and-bull story. I find no hard evidence for the statement in the academic lterature where the “small” models are not compared with the “big” models but rather with other “small” models. There are a lot of sweeping statements about the poor forecasting performance of the big Keynesian models from the 1960ies which are probably true. But today’s “big” macroeconometric models are quite different from the old ones and the “big” models deserve a fair evaluation prior to being dismissed in such a simple way.

The evaluation here shows that the “big” models are competitive and produce forecast errors, if not lower, of approximately the size of the best alternatives. No competitor proves to be significantly better than BASMOD for the forecasts that have been done with the model so far. BASMOD seems to generate the lowest forecast errors for the short run, one-year ahead forecasts for both CPI inflation and GDP growth rates. The other “big” model, Rixmod, produces the lowest forecast errors for GDP growth on the 2-3 year ahead horizon. It is a little bit surprising – at least to me – that the judgements of the Monetary Policy Department and the Board of Governors add so little improvements to the forecasts. This was not the experience for the U.S. Board of Governors who showed a good intuition[12] and improved model forecasts significantly.

[12] See Svensson (2004) for details.

5. Future developments

In this chapter I discuss som possible extensions or future developments of the model.

5.1 Fiscal policy

Presently fiscal policy is a simple solvency criterion by which the government increases the direct taxes in order to successively meet the target of a 2 percent budget surplus. Presently the model has direct taxes, payroll taxes, wage tax and indirect taxes which also could be instruments in the fiscal policy, as well as government expenditure.

I have done some experiments with this but they have not come out very satisfactory as yet and therefore some additional work could be done on this. Frequently questions about this appear in the department.

5.2 Monetary policy

I have run hundreds or thousands of simulations with different policy rules in which policy parameters have been estimated, imposed or both. It is easy to change policy rule in the model so this invites to further simulations.

5.3 Further evaluations

BASMOD fares relatively well in the evaluations above, where forecasting performance is competitive with those usually regarded as the best – National Institute of Economic Research and the Riksbank. Further evaluations can be done, especially since the model is updated in various respects and also since more forecast errors (actuals and not simulated) appear.

Forecast evaluations for inflation and GDP growth was done in chapter 4 but evaluations can be done for many other variables. An obvious extension is to evaluate the forecasts for the sectoral experts' variables. This would possibly be for

- Household expenditure
- Private investments
- Exports of goods
- Exports of services
- Imports of goods
- Imports of services
- Mean hours worked
- Employment
- Labour force
- Unemployment
- Wage rates
- Producer prices
- Export prices
- Exchange rates
- Equity price index
- House prices

and these evaluations could be compared to the sectoral experts' forecasts.

5.4 Inflation forecasts

The inflation forecasts, which at the moment are competitive on the 1 and 3 years horizon could possibly be improved – particularly on the 2 year horizon – by improving the forecasts on the relative-price skewness and variance variables.

5.5 The supply side

The supply side could be improved in several ways. Further work with the functional forms and implementation in estimation could improve the coherence of the model. Technical progress is either modelled as a time trend or depending on the levels of education of the labour force in a labour-augmenting manner. Further improvements could be done with this.

Output gaps are presently not calculated. But these could be estimated endogenously in the model for illustrative purposes or as indicator measures of the business cycle, fiscal stance, etc.

5.6 Household expenditures and asset markets

Presently there are two main alternatives for modelling consumer expenditure in BASMOD. On the one hand there is the aggregate consumption function defined for total expenditures on all items, nondurables as well as durables expenditures. This is a conventional error correction model where consumption expenditures depend on household real disposable income and real net wealth. On the other hand there is the disaggregate model in which six components of consumption expenditures are modelled in a demand system based on Euler equations for the components.

At the moment the wealth from owner-occupied housing is included in total real net wealth and affects household expenditure. Purchases of cars and the value of the car stock are determined in the disaggregate consumption model but the car stock (or other durables stock) is not included in wealth. As shown by several authors the property of housing (and other durables) means that the value of the stock on the one hand is an asset and as such subject to portfolio choice and on the other hand generates housing services along with services from other goods. Depending on the age of the household and other factors both choices (between owner-occupied house, rented house and other assets and between housing services and other goods) are done and affect each other. For instance, a young household may demand a relatively large service stream from housing and has to take a large mortgage to achieve that. By that the risk positions weakens and restrict the households' portfolio choice, Flavin and Yamashita (2002). This implies that the composition of wealth could affect aggregate consumption expenditure.

Another way that this could be the case is through income uncertainty and buffer-stock saving behaviour. Following the route of Carroll (1997) and Lettau and Ludvigson (2004) implies a disaggregated model in which expenditures on nondurables and durables are modelled and where expenditures on durables generates a durables capital stock which should be included in household wealth. Carroll also shows that the personal distribution of current wealth (current income plus wealth) affects the aggregate consumption function.

5.7 AMOD – a smaller model

The smaller wage-price model AMOD - which resembles basic ideas in BASMOD on the one hand but estimates a particular form of technical progress on the other hand – could be used by itself or integrated in BASMOD. The integration has been done but is presently not the default in BASMOD.

It would be possible to further dwelve with the smaller models in various ways, for instance by the sectoral experts on the labour market.

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Appendix 1: Estimated equations

In section 2 we described the model equations in general form. In this section we describe the estimation methods and how the equations are specified. We use the same structure here and divide the equations into demand and supply equations.

A1.1 Estimation methods

The model has about 25 stochastic equations. With that many independent variables it is impossible to estimate this in a simultaneous equation system, e.g. by FIML. The parameters are instead estimated mainly by single-equation methods. Problems with non-stationarity are treated by using the error-correction form for most equations. Since the equations are dynamic there is also typically temporal aggregation problems that are solved by including moving average error terms. In some cases economic theory implies cross-equation restrictions and then some equations have been estimated simultaneously, as was the case with the disaggregated consumption model (consumption divided into 6 categories).

When estimating in error correction form I have used single-equation procedures proposed by Pesaran and Shin (1996,1998,2002), in which variables in both levels and difference form are included in the equation. I have also used a variant of the Engle-Granger (1994) method where in the first stage the long run solution is obtained from a dynamic equation in levels form and used as the error correction mechanism in the second stage with variables in first differences.

A1.2 How to find the equations in the BASMOD home page

The easiest way to find out about the specification of the equations is to open the BASMOD home page at

X:\BM\BASMOD\index.htm

(or to continue to read this section). If you visit the web site you simply open the Variables link in the upper frame and choose among various parts of the model in the left frame. Then you click on the appropriate equation button that appears in the main frame. A new window pops up with the specification, estimation results, date of estimation and so on.

We now turn to those specifications.

A1.3 Demand equations

A1.3.1 The balance of resources

Private consumption expenditure

Dependent variable: SEC

Object name: EKC

Estimation Command:
=====================
LS(DERIV=AA) DLOG(SEC) C DLOG(SEC(-1)) DLOG(SETRNW) DLOG(SEYD) MA(1) LOG(SEC(-1))-YD1*LOG(SEYD(-1))-YW1*LOG(SETRNW(-1))

Estimation Equation:
=====================
DLOG(SEC) = C(1) + C(2)*DLOG(SEC(-1)) + C(3)*DLOG(SETRNW) + C(4)*DLOG(SEYD) + C(5)*(LOG(SEC(-1))-0.5012318576*LOG(SEYD(-1))-0.1804613918*LOG(SETRNW(-1))) + [MA(1)=C(6),BACKCAST=1980:2]

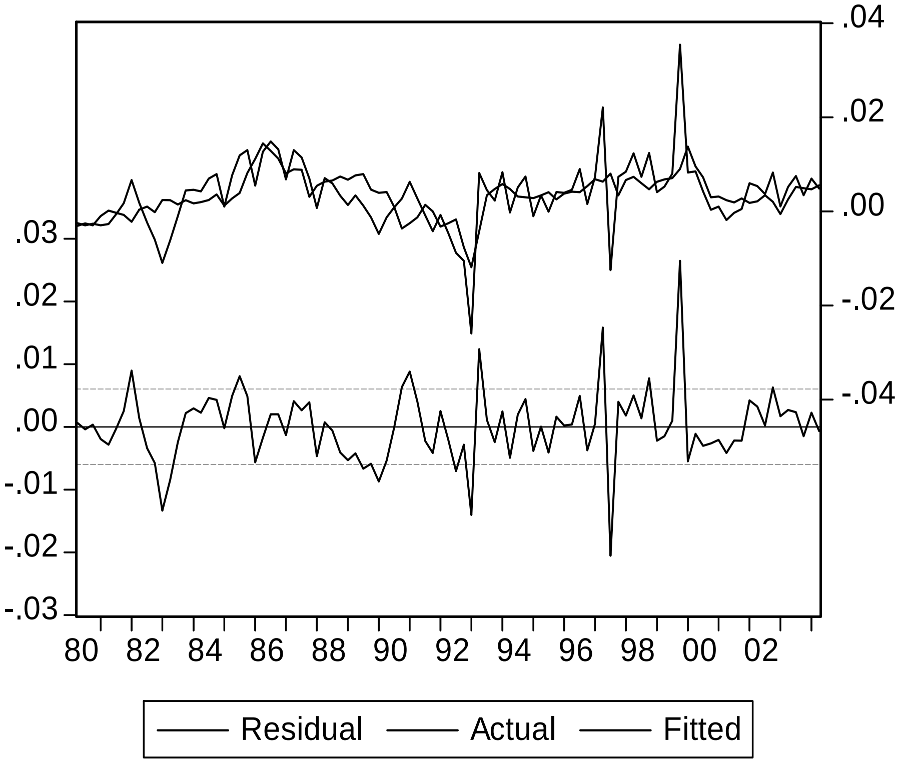
Substituted Coefficients:
=====================
DLOG(SEC) = 0.03940249788 + 0.6688938664*DLOG(SEC(-1)) + 0.05075268812*DLOG(SETRNW) + 0.05875974349*DLOG(SEYD) - 0.01121090943*(LOG(SEC(-1))-0.5012318576*LOG(SEYD(-1))-0.1804613918*LOG(SETRNW(-1))) + [MA(1)=-0.5818401382,BACKCAST=1980:2]

Dependent Variable: DLOG(SEC)
Method: Least Squares
Date: 10/20/04 Time: 00:20
Sample (adjusted): 1980:2 2004:2
Included observations: 97 after adjustments
Convergence achieved after 9 iterations
Backcast: 1980:1

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.039402	0.032983	1.194643	0.2353
DLOG(SEC(-1))	0.668894	0.091802	7.286294	0.0000
DLOG(SETRNW)	0.050753	0.011972	4.239382	0.0001
DLOG(SEYD)	0.058760	0.045880	1.280734	0.2035
LOG(SEC(-1))-0.5012318576*LOG(SEYD(-1))-0.1804613918*LOG(SETRNW(-1))	-0.011211	0.009594	-1.168495	0.2457
MA(1)	-0.581840	0.125644	-4.630849	0.0000

R-squared	0.360037	Mean dependent var	0.003505
Adjusted R-squared	0.324874	S.D. dependent var	0.007314
S.E. of regression	0.006010	Akaike info criterion	-7.331058
Sum squared resid	0.003286	Schwarz criterion	-7.171798
Log likelihood	361.5563	F-statistic	10.23914
Durbin-Watson stat	1.996196	Prob(F-statistic)	0.000000

Inverted MA Roots .58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Residual Actual Fitted

Consumption of Nondurables and services, Durables and semidurables, Cars, Tourism and Nonprofit-organisations

Dependent variables:
SECNOND
SECDUR
SECCAR
SECTOUR
SECCH

Object name:
EKCSYS

DLOG(SECNOND)=0.0+C(2)*DLOG(SECNOND(-1))+0.0*DLOG(SEYD)+C(4)*DLOG(SETRNW)+0.0*LOG(SECNOND(-1))+0.0*LOG(SEYD(-1))+C(7)*LOG(SETRNW(-1))+0.0*LOG(SECDUR(-1))+0.0*LOG(SECARK(-1))

DLOG(SECDUR)=C(11)+C(12)*DLOG(SECDUR(-1))+0.0*DLOG(SEYD)+C(14)*DLOG(SETRNW)+C(15)*LOG(SECDUR(-1))+C(16)*LOG(SEYD(-1))+C(17)*LOG(SETRNW(-1))+0.0*LOG(SECNOND(-1))+C(19)*LOG(SECCAR(-1))

DLOG(SECCAR)=0.0+C(22)*DLOG(SECCAR(-1))+0.0*DLOG(SEYD)+C(24)*DLOG(SETRNW)+C(25)*LOG(SECCAR(-1))+C(26)*LOG(SEYD(-1))+0.0*LOG(SETRNW(-1))+C(28)*LOG(SECNOND)+C(29)*LOG(SECDUR)+C(30)*LOG(SECARK(-1))

D(SECTOUR)=C(31)+0.0*D(SECTOUR(-1))+C(33)*DLOG(SEREFEX)+C(34)*DLOG(SEPMA)+C(35)*DLOG(SES)+C(36)*DLOG(SEYD)+C(37)*DLOG(SETRNW)+C(38)*SECTOUR(-1)+C(39)*LOG(SEREFEX(-1))+C(40)*LOG(SEPMA(-1))+0.0*LOG(SES(-1))+0.0*LOG(SEYD(-1))+C(43)*LOG(SETRNW(-1))+0.0*LOG(SECNOND+SECDUR+SECCAR+SECCH)

DLOG(SECCH)=C(51)+C(52)*DUMCH+0.0*DLOG(SECCH(-1))+C(54)*LOG(SECCH(-1))+C(55)*LOG(SECNOND+SECDUR+SECCAR)

' PARAMETRAR SATTA TILL 0
' C3 C13 C18 C27 C42 C44
' C1 C5 C9 C21 C23 C32 C41 C53
' C6 C8

System: EKCSYS
Estimation Method: Full Information Maximum Likelihood (Marquardt)
Date: 11/08/04 Time: 16:18
Sample: 1980:3 2004:2
Included observations: 96
Total system (balanced) observations 480
Convergence achieved after 56 iterations

	Coefficient	Std. Error	z-Statistic	Prob.
C(2)	-0.383650	0.117348	-3.269338	0.0011
C(4)	0.048448	0.028654	1.690819	0.0909
C(7)	0.000264	7.02E-05	3.758284	0.0002
C(11)	-2.153499	1.007518	-2.137430	0.0326
C(12)	-0.147518	0.133553	-1.104565	0.2693
C(14)	0.118970	0.080149	1.484355	0.1377
C(15)	-0.192171	0.060943	-3.153295	0.0016
C(16)	0.228934	0.119650	1.913355	0.0557
C(17)	0.071960	0.032449	2.217669	0.0266
C(19)	0.025721	0.019310	1.332012	0.1829
C(22)	-0.250618	0.125294	-2.000237	0.0455
C(24)	0.437480	0.255049	1.715277	0.0863
C(25)	-0.260188	0.098893	-2.631018	0.0085
C(26)	-1.586214	0.824574	-1.923677	0.0544

C(28)	2.213058	1.057621	2.092487	0.0364
C(29)	0.714818	0.452430	1.579951	0.1141
C(30)	-0.952635	0.510706	-1.865329	0.0621
C(31)	-42367.84	12473.59	-3.396603	0.0007
C(33)	11706.86	2168.821	5.397800	0.0000
C(34)	-1974.029	2528.318	-0.780768	0.4349
C(35)	3342.663	4497.854	0.743169	0.4574
C(36)	8515.292	5782.402	1.472622	0.1409
C(37)	3425.555	1653.051	2.072262	0.0382
C(38)	-0.362630	0.105956	-3.422461	0.0006
C(39)	7361.517	2094.578	3.514559	0.0004
C(40)	-2186.143	607.1775	-3.600500	0.0003
C(43)	1257.642	428.7589	2.933214	0.0034
C(51)	-1.131161	1.251625	-0.903754	0.3661
C(52)	0.031485	0.027072	1.163018	0.2448
C(54)	-0.214110	0.091302	-2.345073	0.0190
C(55)	0.244896	0.141088	1.735767	0.0826

Log Likelihood	-3681.833
Determinant residual covariance	1.57E-08

Equation: DLOG(SECNOND)=0.0+C(2)*DLOG(SECNOND(-1))+0.0
*DLOG(SEYD)+C(4)*DLOG(SETRNW)+0.0*LOG(SECNOND(
-1))+0.0*LOG(SEYD(-1))+C(7)*LOG(SETRNW(-1))+0.0
*LOG(SECDUR(-1))+0.0*LOG(SECARK(-1))
Observations: 96

R-squared	0.189590	Mean dependent var	0.003034
Adjusted R-squared	0.172161	S.D. dependent var	0.007367
S.E. of regression	0.006703	Sum squared resid	0.004179
Durbin-Watson stat	2.205011		

Equation: DLOG(SECDUR)=C(11)+C(12)*DLOG(SECDUR(-1))+0.0
*DLOG(SEYD)+C(14)*DLOG(SETRNW)+C(15)
*LOG(SECDUR(-1))+C(16)*LOG(SEYD(-1))+C(17)
*LOG(SETRNW(-1))+0.0*LOG(SECNOND(-1))+C(19)
*LOG(SECCAR(-1))
Observations: 96

R-squared	0.344279	Mean dependent var	0.006386
Adjusted R-squared	0.300073	S.D. dependent var	0.022147
S.E. of regression	0.018528	Sum squared resid	0.030554
Durbin-Watson stat	2.150610		

Equation: DLOG(SECCAR)=0.0+C(22)*DLOG(SECCAR(-1))+0.0
*DLOG(SEYD)+C(24)*DLOG(SETRNW)+C(25)
*LOG(SECCAR(-1))+C(26)*LOG(SEYD(-1))+0.0
*LOG(SETRNW(-1))+C(28)*LOG(SECNOND)+C(29)
*LOG(SECDUR)+C(30)*LOG(SECARK(-1))
Observations: 96

R-squared	0.305968	Mean dependent var	0.007442
Adjusted R-squared	0.259179	S.D. dependent var	0.106810

S.E. of regression	0.091932	Sum squared resid	0.752184
Durbin-Watson stat	1.961502		

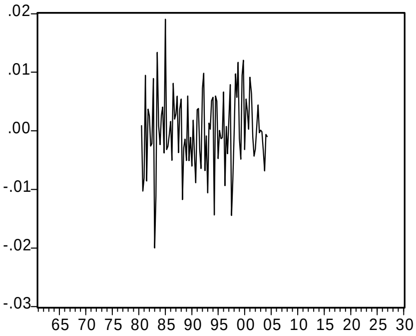
Equation: D(SECTOUR)=C(31)+0.0*D(SECTOUR(-1))+C(33)
*DLOG(SEREFEX)+C(34)*DLOG(SEPMA)+C(35)*DLOG(SES)
+C(36)*DLOG(SEYD)+C(37)*DLOG(SETRNW)+C(38)
*SECTOUR(-1)+C(39)*LOG(SEREFEX(-1))+C(40)
*LOG(SEPMA(-1))+0.0*LOG(SES(-1))+0.0*LOG(SEYD(-1))
+C(43)*LOG(SETRNW(-
1))+0.0*LOG(SECNOND+SECDUR
+SECCAR+SECCH)
Observations: 96

R-squared	0.601487	Mean dependent var	-26.81906
Adjusted R-squared	0.559783	S.D. dependent var	611.3938
S.E. of regression	405.6530	Sum squared resid	14151675
Durbin-Watson stat	2.166844		

Equation: DLOG(SECCH)=C(51)+C(52)*DUMCH+0.0
*DLOG(SECCH(-1))+C(54)*LOG(SECCH(-1))+C(55)
*LOG(SECNOND+SECDUR+SECCAR)
Observations: 96

R-squared	0.183031	Mean dependent var	0.006476
Adjusted R-squared	0.156391	S.D. dependent var	0.037297
S.E. of regression	0.034257	Sum squared resid	0.107964
Durbin-Watson stat	2.180830		

RESID17



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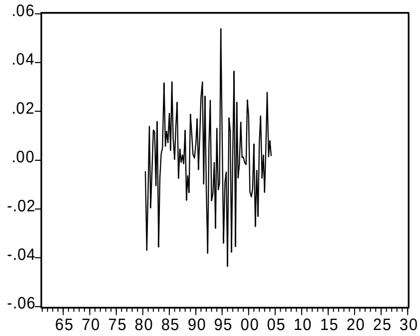

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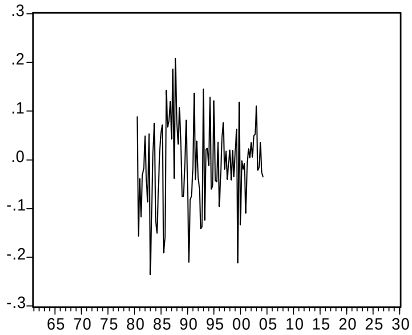

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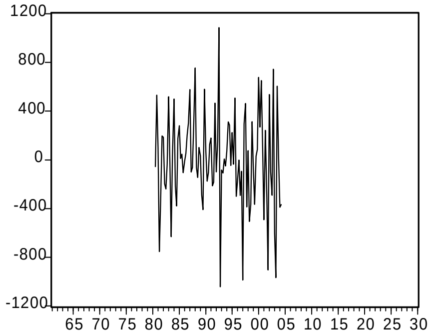

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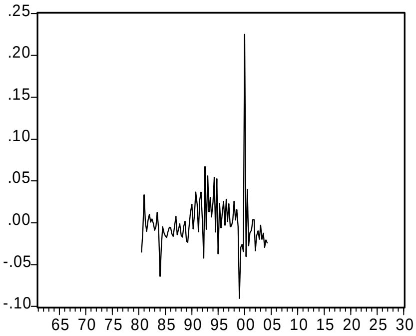
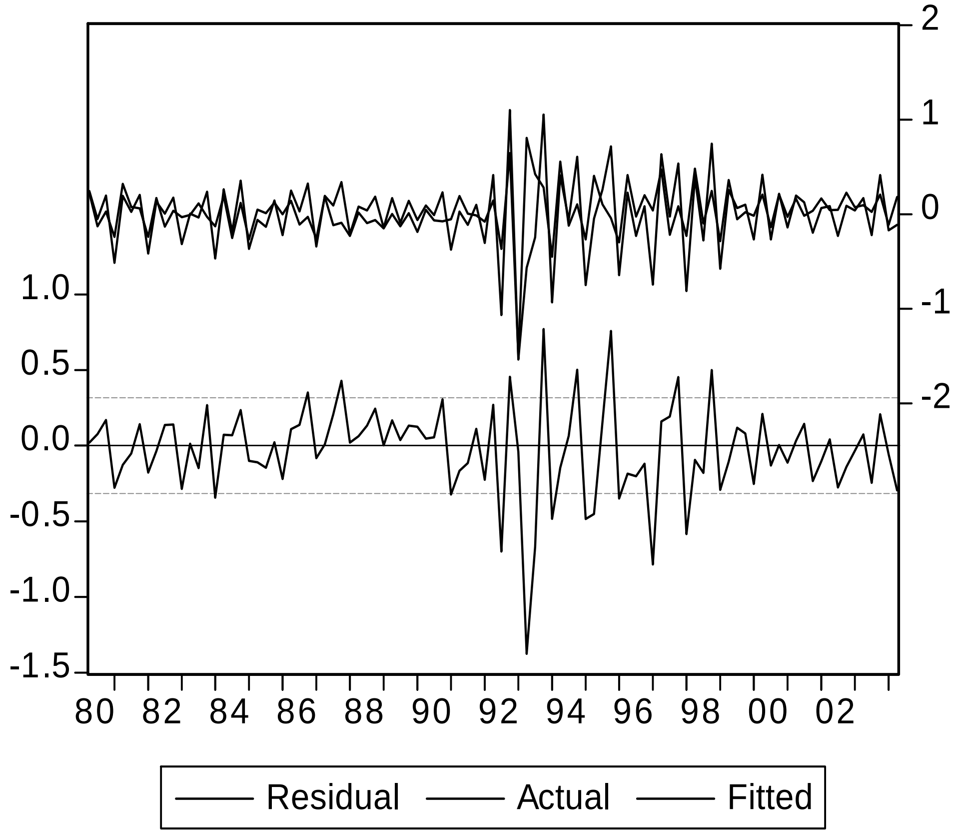


Housing starts Dependent variable: SEHS Object name: EKHS	Estimation Command: ===================== LS DLOG(SEHS) C DLOG(SEHS(-1)) DUM93Q1 D(SER3M) LOG(SEHS(-1))-HSLONG*LOG(SEHW(-1)/SEUSER2(-1)) Estimation Equation: ===================== DLOG(SEHS) = C(1) + C(2)*DLOG(SEHS(-1)) + C(3)*DUM93Q1 + C(4)*D(SER3M) + C(5)*(LOG(SEHS(-1))-HSLONG*LOG(SEHW(-1)/SEUSER2(-1))) Substituted Coefficients: ===================== DLOG(SEHS) = -1.920366333 - 0.4580150408*DLOG(SEHS(-1)) - 1.031343958*DUM93Q1 - 0.0394038648*D(SER3M) - 0.1017059818*(LOG(SEHS(-1))-HSLONG*LOG(SEHW(-1)/SEUSER2(-1)))

Dependent Variable: DLOG(SEHS)
Method: Least Squares
Date: 04/18/04 Time: 01:28
Sample(adjusted): 1980:2 2003:4
Included observations: 95 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-1.920366	1.286262	-1.492982	0.1389
DLOG(SEHS(-1))	-0.458015	0.087796	-5.216813	0.0000
DUM93Q1	-1.031344	0.348256	-2.961454	0.0039
D(SER3M)	-0.039404	0.028485	-1.383330	0.1700
LOG(SEHS(-1))-HSLONG*LOG(SEHW(-1)/SEUSER2(-1))	-0.101706	0.068246	-1.490293	0.1396

R-squared	0.427796	Mean dependent var	-0.005351
Adjusted R-squared	0.402365	S.D. dependent var	0.408628
S.E. of regression	0.315897	Akaike info criterion	0.584397
Sum squared resid	8.981198	Schwarz criterion	0.718811
Log likelihood	-22.75884	F-statistic	16.82163
Durbin-Watson stat	2.259978	Prob(F-statistic)	0.000000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<table>
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<td>Housing investments

Dependent variable: SEHI

Object name: EKHI</td>
<td>Estimation Command:
=====================
LS(DERIV=AA) LOG(SEHI) C LOG(SEHI(-1)) SERR(-8) LOG(SEHW(+4)/(SECEDF(+4)*(1+SEITR(+4)))) MA(1) DLOG(SEHS) LOG(SEHW(-1)) LOG(SEHS(-1))

Estimation Equation:
=====================
LOG(SEHI) = C(1) + C(2)*LOG(SEHI(-1)) + C(3)*SERR(-8) + C(4)*LOG(SEHW(4)/(SECEDF(4)*(1+SEITR(4)))) + C(5)*DLOG(SEHS) + C(6)*LOG(SEHW(-1)) + C(7)*LOG(SEHS(-1)) + [MA(1)=C(8),BACKCAST=1980:2]

Substituted Coefficients:
=====================
LOG(SEHI) = -0.2018438551 + 0.9166301968*LOG(SEHI(-1)) - 9.340013534e-005*SERR(-8) + 0.1170066404*LOG(SEHW(4)/(SECEDF(4)*(1+SEITR(4)))) + 0.0364808723*DLOG(SEHS) - 0.03668281372*LOG(SEHW(-1)) + 0.04506790936*LOG(SEHS(-1)) + [MA(1)=0.3117888046,BACKCAST=1980:2]

Dependent Variable: LOG(SEHI)
Method: Least Squares
Date: 11/11/04 Time: 10:27
Sample (adjusted): 1980:2 2003:3
Included observations: 94 after adjustments
Convergence achieved after 12 iterations
Backcast: 1980:1</td>
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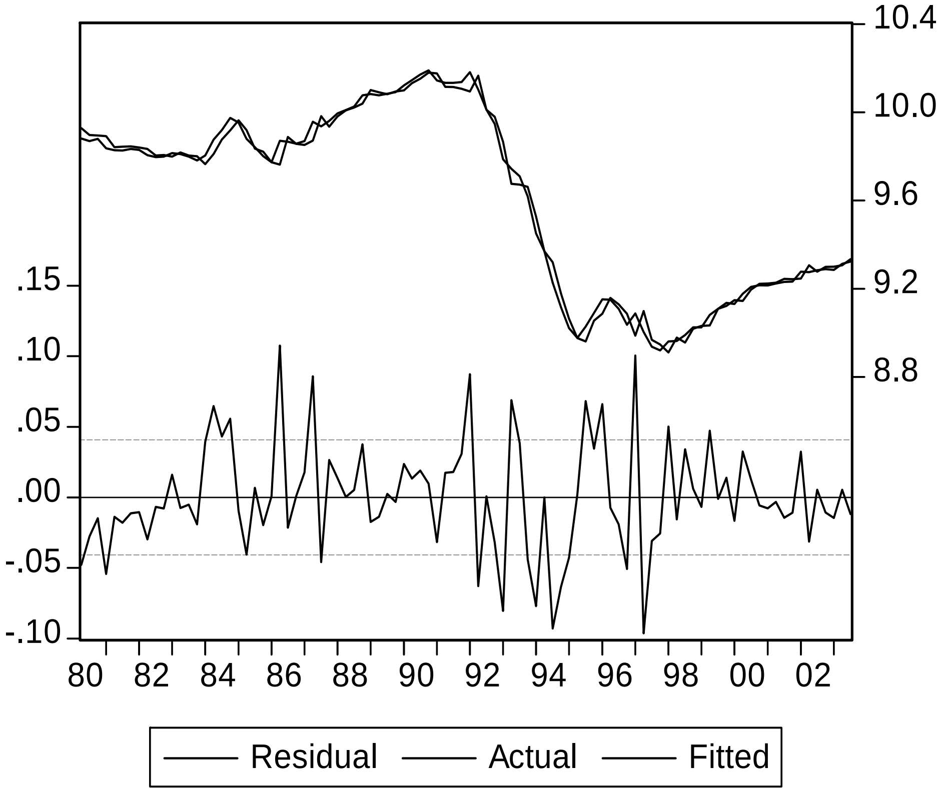
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.201844	0.515099	-0.391855	0.6961
LOG(SEHI(-1))	0.916630	0.029134	31.46202	0.0000
SERR(-8)	-9.34E-05	0.002252	-0.041473	0.9670
LOG(SEHW(4)/(SECEDF(4)*(1+SEITR(4))))	0.117007	0.054550	2.144924	0.0348
DLOG(SEHS)	0.036481	0.012694	2.873764	0.0051
LOG(SEHW(-1))	-0.036683	0.022397	-1.637873	0.1051
LOG(SEHS(-1))	0.045068	0.020142	2.237471	0.0278
MA(1)	0.311789	0.106362	2.931402	0.0043

R-squared	0.991015	Mean dependent var	9.605198
Adjusted R-squared	0.990284	S.D. dependent var	0.413152
S.E. of regression	0.040725	Akaike info criterion	-3.482703
Sum squared resid	0.142630	Schwarz criterion	-3.266252
Log likelihood	171.6870	F-statistic	1355.098
Durbin-Watson stat	1.946673	Prob(F-statistic)	0.000000

Inverted MA Roots	-.31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80 82 84 86 88 90 92 94 96 98 00 02
Residual
Actual
Fitted

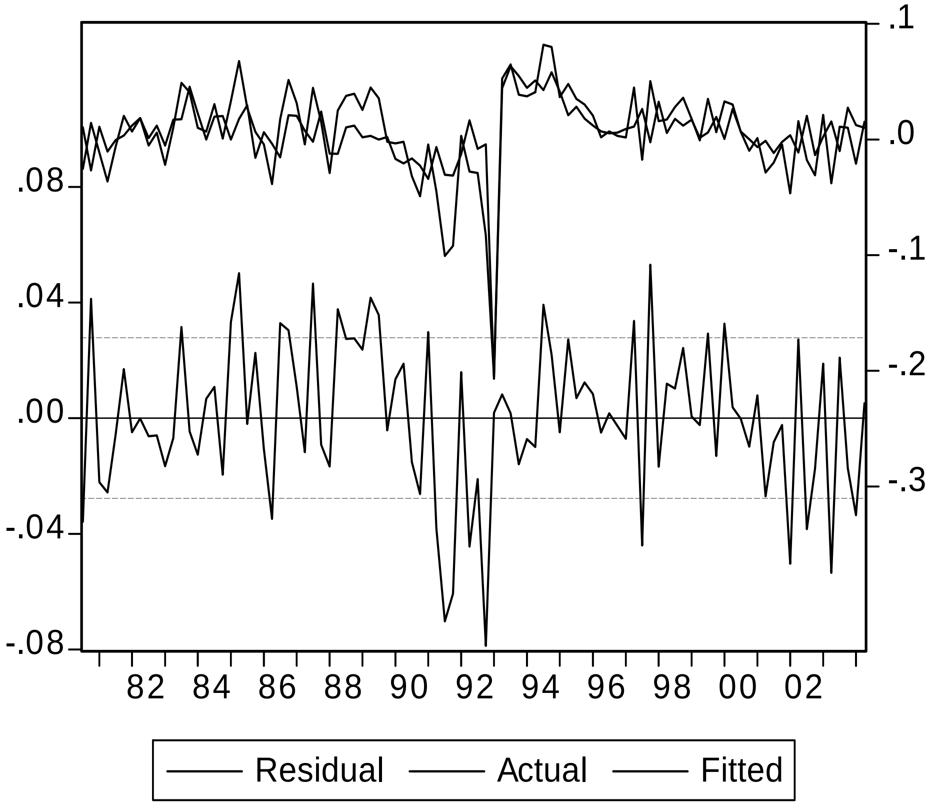
Business investment Dependent variable: SEBI Object name: EKBI	Estimation Command: ===================== LS(DERIV=AA) DLOG(SEBI) C DLOG(SEBI(-1)) DLOG(SEY) DLOG(SETQ) DUM93Q1 LOG(SEBI(-1))-LOG(SEY(-1))-BITQ2*LOG(SETQ(-1)) MA(1) Estimation Equation: ===================== DLOG(SEBI) = C(1) + C(2)*DLOG(SEBI(-1)) + C(3)*DLOG(SEY) + C(4)*DLOG(SETQ) + C(5)*DUM93Q1 + C(6)*(LOG(SEBI(-1))-LOG(SEY(-1))-0.1127169734*LOG(SETQ(-1))) + [MA(1)=C(7),BACKCAST=1980:3] Substituted Coefficients: ===================== DLOG(SEBI) = -0.298415643 + 0.07434920053*DLOG(SEBI(-1)) + 0.6350457943*DLOG(SEY) - 0.006723961474*DLOG(SETQ) - 0.1892959574*DUM93Q1 - 0.1368487771*(LOG(SEBI(-1))-LOG(SEY(-1))-0.1127169734*LOG(SETQ(-1))) + [MA(1)=0.428789722,BACKCAST=1980:3]

Dependent Variable: DLOG(SEBI)
Method: Least Squares
Date: 10/18/04 Time: 13:47
Sample (adjusted): 1980:3 2004:2
Included observations: 96 after adjustments
Convergence achieved after 10 iterations
Backcast: 1980:2

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.298416	0.080671	-3.699184	0.0004
DLOG(SEBI(-1))	0.074349	0.100834	0.737343	0.4629
DLOG(SEY)	0.635046	0.281882	2.252877	0.0267
DLOG(SETQ)	-0.006724	0.027279	-0.246486	0.8059
DUM93Q1	-0.189296	0.027534	-6.874896	0.0000
LOG(SEBI(-1))-LOG(SEY(-1))-0.1127169734*LOG(SETQ(-1))	-0.136849	0.036391	-3.760469	0.0003
MA(1)	0.428790	0.126809	3.381395	0.0011

R-squared	0.550066	Mean dependent var	0.006228
Adjusted R-squared	0.519734	S.D. dependent var	0.040024
S.E. of regression	0.027737	Akaike info criterion	-4.261964
Sum squared resid	0.068472	Schwarz criterion	-4.074980
Log likelihood	211.5743	F-statistic	18.13448
Durbin-Watson stat	1.994887	Prob(F-statistic)	0.000000

Inverted MA Roots	-.43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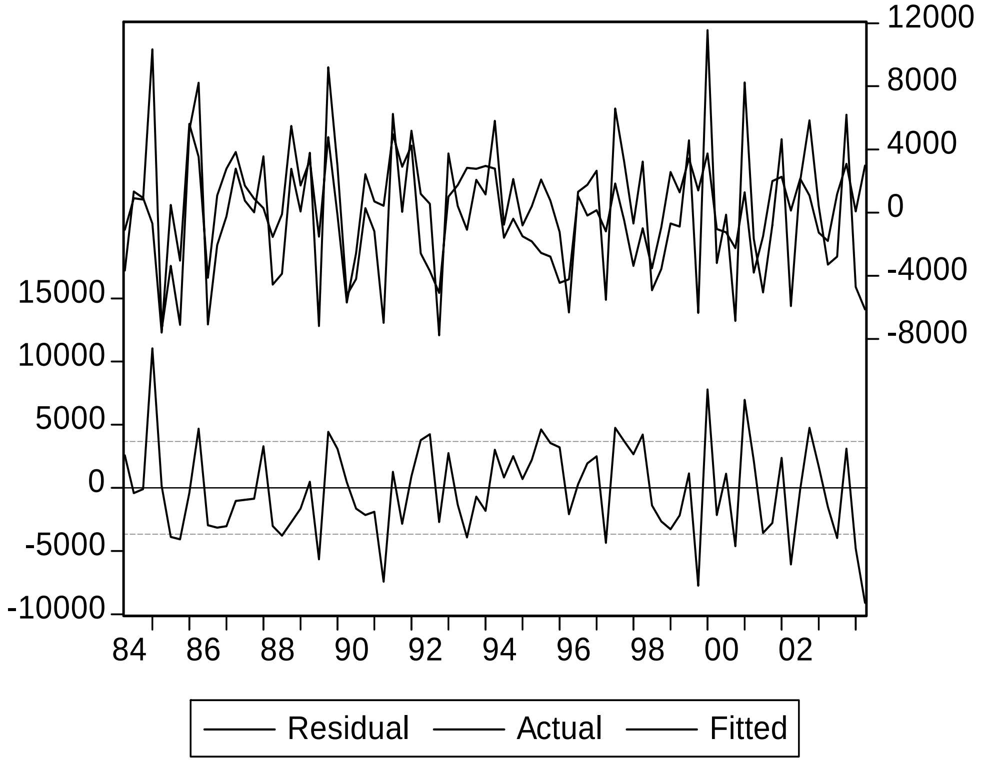
82 84 86 88 90 92 94 96 98 00 02
Residual
Actual
Fitted

Inventory investment Dependent variable: SEDS Object name: EKDS	Estimation Command: ===================== LS D(SEDS) SEDS(-1) SESL(-1) D(SEY) SEY(-1) D(SELR) SELR(-1) Estimation Equation: ===================== D(SEDS) = C(1)*SEDS(-1) + C(2)*SESL(-1) + C(3)*D(SEY) + C(4)*SEY(-1) + C(5)*D(SELR) + C(6)*SELR(-1) Substituted Coefficients: ===================== D(SEDS) = -0.5060428086*SEDS(-1) - 0.03724779717*SESL(-1) + 0.4971982399*D(SEY) + 0.02302803109*SEY(-1) - 361.880059*D(SELR) - 249.7748694*SELR(-1)

Dependent Variable: D(SEDS)
Method: Least Squares
Date: 09/02/04 Time: 12:05
Sample (adjusted): 1984:2 2004:1
Included observations: 80 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
SEDS(-1)	-0.506043	0.092599	-5.464906	0.0000
SESL(-1)	-0.037248	0.032161	-1.158179	0.2505
D(SEY)	0.497198	0.135005	3.682820	0.0004
SEY(-1)	0.023028	0.016405	1.403697	0.1646
D(SELR)	-361.8801	653.3243	-0.553906	0.5813
SELR(-1)	-249.7749	296.7705	-0.841643	0.4027

R-squared	0.377999	Mean dependent var	153.1105
Adjusted R-squared	0.335971	S.D. dependent var	4512.245
S.E. of regression	3676.936	Akaike info criterion	19.32959
Sum squared resid	1.00E+09	Schwarz criterion	19.50824
Log likelihood	-767.1834	Durbin-Watson stat	2.075594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10000
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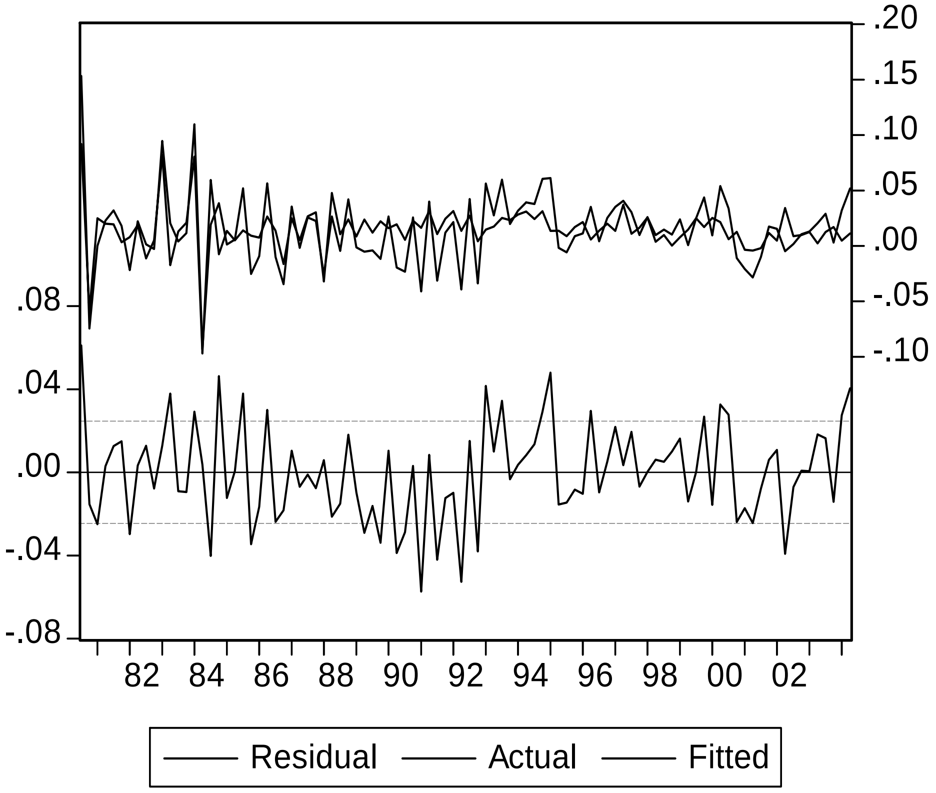
0
-5000
-10000
84
86
88
90
92
94
96
98
00
02
Residual
Actual
Fitted

Exports of goods Dependent variable: SEXG Object name: EKXG	Estimation Command: ===================== LS(DERIV=AA) DLOG(SEXG) C DLOG(SEXG(-1)) DLOG(SERPX) DLOG(SERPX(-1)) DLOG(SES) DLOG(SES(-1)) LOG(SEXG(-1))-XG4RPX*LOG(SERPX(-1))-LOG(SES(-1)) MA(1) DUM84Q1-DUM84Q2 DUM83Q1 Estimation Equation: ===================== DLOG(SEXG) = C(1) + C(2)*DLOG(SEXG(-1)) + C(3)*DLOG(SERPX) + C(4)*DLOG(SERPX(-1)) + C(5)*DLOG(SES) + C(6)*DLOG(SES(-1)) + C(7)*(LOG(SEXG(-1))+0.2955891136*LOG(SERPX(-1))-LOG(SES(-1))) + C(8)*(DUM84Q1-DUM84Q2) + C(9)*DUM83Q1 + [MA(1)=C(10),BACKCAST=1980:3] Substituted Coefficients: ===================== DLOG(SEXG) = 0.7242245729 - 0.4074185968*DLOG(SEXG(-1)) + 0.01741134745*DLOG(SERPX) - 0.007985696159*DLOG(SERPX(-1)) + 0.7615610386*DLOG(SES) + 0.1315863258*DLOG(SES(-1)) - 0.1008124222*(LOG(SEXG(-1))+0.2955891136*LOG(SERPX(-1))-LOG(SES(-1))) + 0.06306281114*(DUM84Q1-DUM84Q2) + 0.07540082414*DUM83Q1 + [MA(1)=0.3261822111,BACKCAST=1980:3] Dependent Variable: DLOG(SEXG) Method: Least Squares Date: 09/13/04 Time: 16:19 Sample (adjusted): 1980:3 2004:2 Included observations: 96 after adjustments Convergence achieved after 16 iterations Backcast: 1980:2

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.724225	0.398406	1.817805	0.0726
DLOG(SEXG(-1))	-0.407419	0.078782	-5.171450	0.0000
DLOG(SERPX)	0.017411	0.092140	0.188967	0.8506
DLOG(SERPX(-1))	-0.007986	0.109315	-0.073052	0.9419
DLOG(SES)	0.761561	0.169027	4.505557	0.0000
DLOG(SES(-1))	0.131586	0.177008	0.743390	0.4593
LOG(SEXG(-1))+0.2955891136*LOG(SERPX(-1))-LOG(SES(-1))	-0.100812	0.056187	-1.794233	0.0763
DUM84Q1-DUM84Q2	0.063063	0.015255	4.133890	0.0001
DUM83Q1	0.075401	0.027317	2.760224	0.0071
MA(1)	0.326182	0.130795	2.493852	0.0146

R-squared	0.525114	Mean dependent var	0.014706
Adjusted R-squared	0.475417	S.D. dependent var	0.033975
S.E. of regression	0.024607	Akaike info criterion	-4.473206
Sum squared resid	0.052075	Schwarz criterion	-4.206087
Log likelihood	224.7139	F-statistic	10.56623
Durbin-Watson stat	2.041299	Prob(F-statistic)	0.000000

Inverted MA Roots	-.33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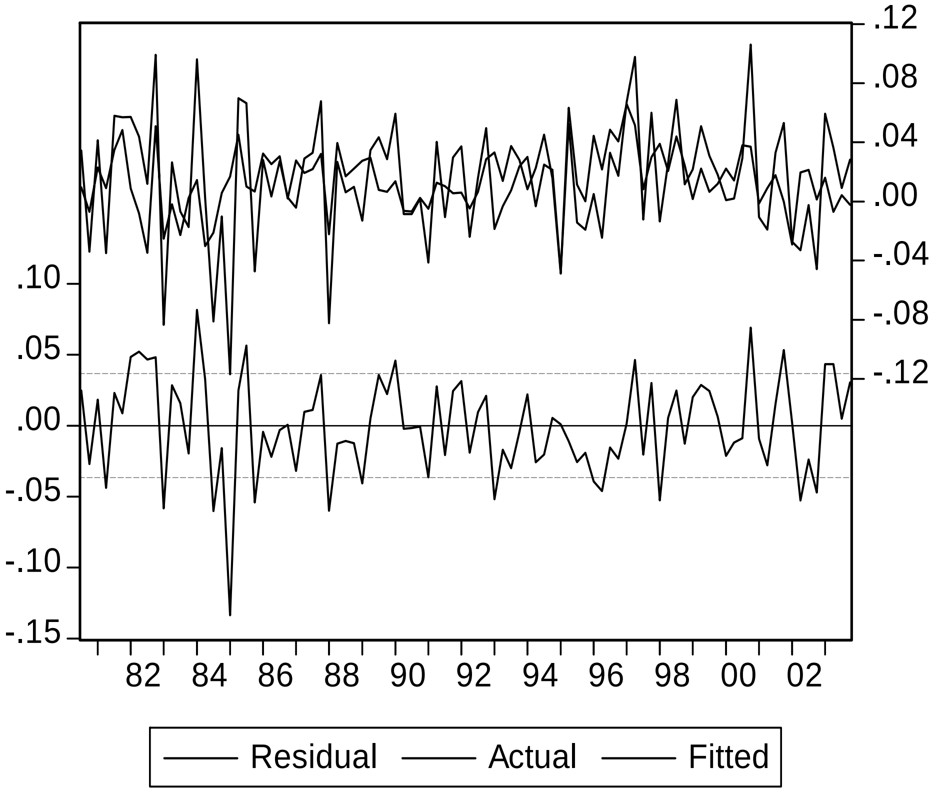
Exports of services Dependent variable: SEXS Object name: EKXS	Estimation Command: ===================== LS DLOG(SEXS) C DLOG(SEXS(-1)) DLOG(SEREFEX) DLOG(SES) LOG(SEXS(-1))-XSREFEX*LOG(SEREFEX(-1))-XSS*LOG(SES(-1)) DUM95Q1 Estimation Equation: ===================== DLOG(SEXS) = C(1) + C(2)*DLOG(SEXS(-1)) + C(3)*DLOG(SEREFEX) + C(4)*DLOG(SES) + C(5)*(LOG(SEXS(-1))-XSREFEX*LOG(SEREFEX(-1))-XSS*LOG(SES(-1))) + C(6)*DUM95Q1 Substituted Coefficients: ===================== DLOG(SEXS) = 1.522724665 - 0.1055174056*DLOG(SEXS(-1)) - 0.5171093129*DLOG(SEREFEX) + 0.5003717584*DLOG(SES) - 0.1848878836*(LOG(SEXS(-1))-XSREFEX*LOG(SEREFEX(-1))-XSS*LOG(SES(-1))) - 0.08617643212*DUM95Q1

Dependent Variable: DLOG(SEXS)
Method: Least Squares
Date: 06/09/04 Time: 00:01
Sample(adjusted): 1980:3 2003:4
Included observations: 94 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	1.522725	0.469304	3.244646	0.0017
DLOG(SEXS(-1))	-0.105517	0.093585	-1.127508	0.2626
DLOG(SEREFEX)	-0.517109	0.133710	-3.867390	0.0002
DLOG(SES)	0.500372	0.236505	2.115691	0.0372
LOG(SEXS(-1))-XSREFEX*LOG(SEREFEX(-1))-XSS*LOG(SES(-1))	-0.184888	0.057355	-3.223560	0.0018
DUM95Q1	-0.086176	0.037027	-2.327414	0.0222

R-squared	0.277049	Mean dependent var	0.014542
Adjusted R-squared	0.235972	S.D. dependent var	0.041857
S.E. of regression	0.036586	Akaike info criterion	-3.716579
Sum squared resid	0.117794	Schwarz criterion	-3.554241
Log likelihood	180.6792	F-statistic	6.744665
Durbin-Watson stat	1.956495	Prob(F-statistic)	0.000023



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Residual
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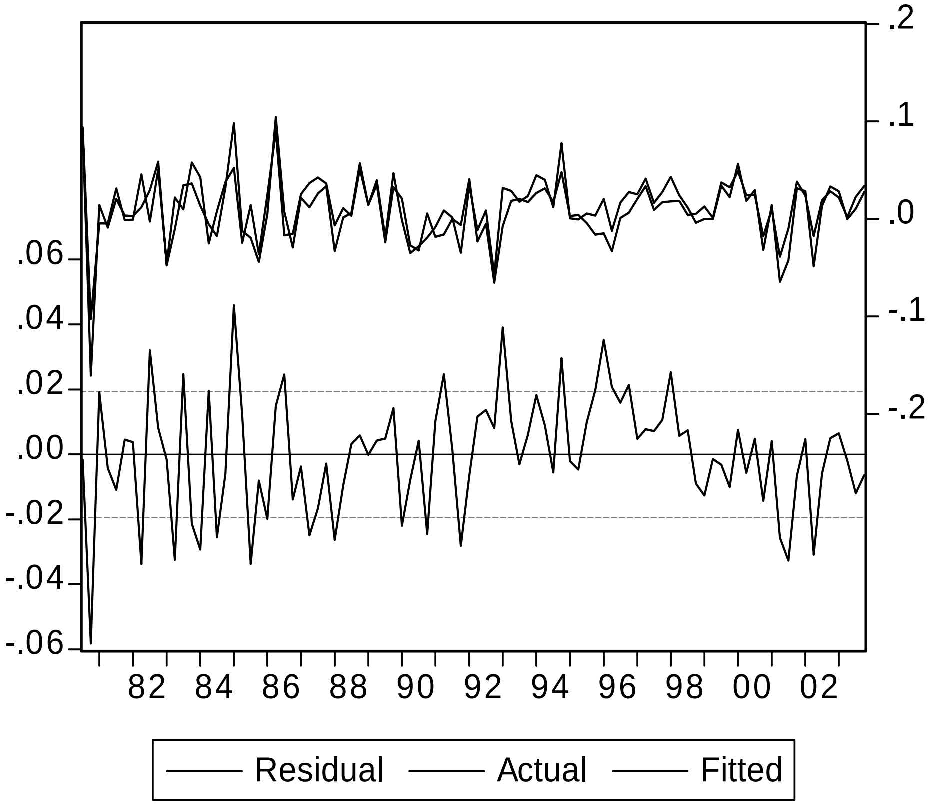
Imports of goods Dependent variable: SEMG Object name: EKMG	Estimation Command: ===================== LS DLOG(SEMG) C DLOG(SEMG(-1)) DLOG(SEREFEX) DLOG(SEREFEX(-1)) DLOG(SETFE) LOG(SEMG(-1))-MGTFE*LOG(SETFE(-1)) MA(1) Estimation Equation: ===================== DLOG(SEMG) = C(1) + C(2)*DLOG(SEMG(-1)) + C(3)*DLOG(SEREFEX) + C(4)*DLOG(SEREFEX(-1)) + C(5)*DLOG(SETFE) + C(6)*(LOG(SEMG(-1))-MGTFE*LOG(SETFE(-1))) + [MA(1)=C(7),BACKCAST=1980:3] Substituted Coefficients: ===================== DLOG(SEMG) = -2.54737588 + 0.0748166053*DLOG(SEMG(-1)) - 0.1404321613*DLOG(SEREFEX) - 0.1096176973*DLOG(SEREFEX(-1)) + 2.574826807*DLOG(SETFE) - 0.2149643719*(LOG(SEMG(-1))-MGTFE*LOG(SETFE(-1))) + [MA(1)=-0.2018473302,BACKCAST=1980:3]

Dependent Variable: DLOG(SEMG)
Method: Least Squares
Date: 06/09/04 Time: 00:00
Sample(adjusted): 1980:3 2003:3
Included observations: 93 after adjusting endpoints
Convergence achieved after 12 iterations
Backcast: 1980:2

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-2.547376	0.600005	-4.245593	0.0001
DLOG(SEMG(-1))	0.074817	0.062351	1.199918	0.2335
DLOG(SEREFEX)	-0.140432	0.072129	-1.946968	0.0548
DLOG(SEREFEX(-1))	-0.109618	0.071343	-1.536490	0.1281
DLOG(SETFE)	2.574827	0.172807	14.90004	0.0000
LOG(SEMG(-1))-MGTFE*LOG(SETFE(-1))	-0.214964	0.050731	-4.237370	0.0001
MA(1)	-0.201847	0.132404	-1.524480	0.1311

R-squared	0.720718	Mean dependent var	0.010046
Adjusted R-squared	0.701233	S.D. dependent var	0.035464
S.E. of regression	0.019385	Akaike info criterion	-4.976394
Sum squared resid	0.032315	Schwarz criterion	-4.785768
Log likelihood	238.4023	F-statistic	36.98866
Durbin-Watson stat	1.992122	Prob(F-statistic)	0.000000

Inverted MA Roots	.20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Residual
Actual
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Imports of services Dependent variable: SEMS Object name: EKMS	See below

Estimation Command:
=====================
LS(DERIV=AA) DLOG(SEMS) C DLOG(SEMS(-1)) DLOG(SEPMG/(SECEDF*(1+SEITR))) DLOG(SEPMG(-1)/(SECEDF(-1)*(1+SEITR(-1)))) DLOG(SETFE) LOG(SEMS(-1)) LOG(SETFE(-1)) LOG(SEPMG(-1)/(SECEDF(-1)*(1+SEITR(-1)))) DUM93Q1 MA(1)

Estimation Equation:
=====================
DLOG(SEMS) = C(1) + C(2)*DLOG(SEMS(-1)) + C(3)*DLOG(SEPMG/(SECEDF*(1+SEITR))) + C(4)*DLOG(SEPMG(-1)/(SECEDF(-1)*(1+SEITR(-1)))) + C(5)*DLOG(SETFE) + C(6)*LOG(SEMS(-1)) + C(7)*LOG(SETFE(-1)) + C(8)*LOG(SEPMG(-1)/(SECEDF(-1)*(1+SEITR(-1)))) + C(9)*DUM93Q1 + [MA(1)=C(10),BACKCAST=1980:3]

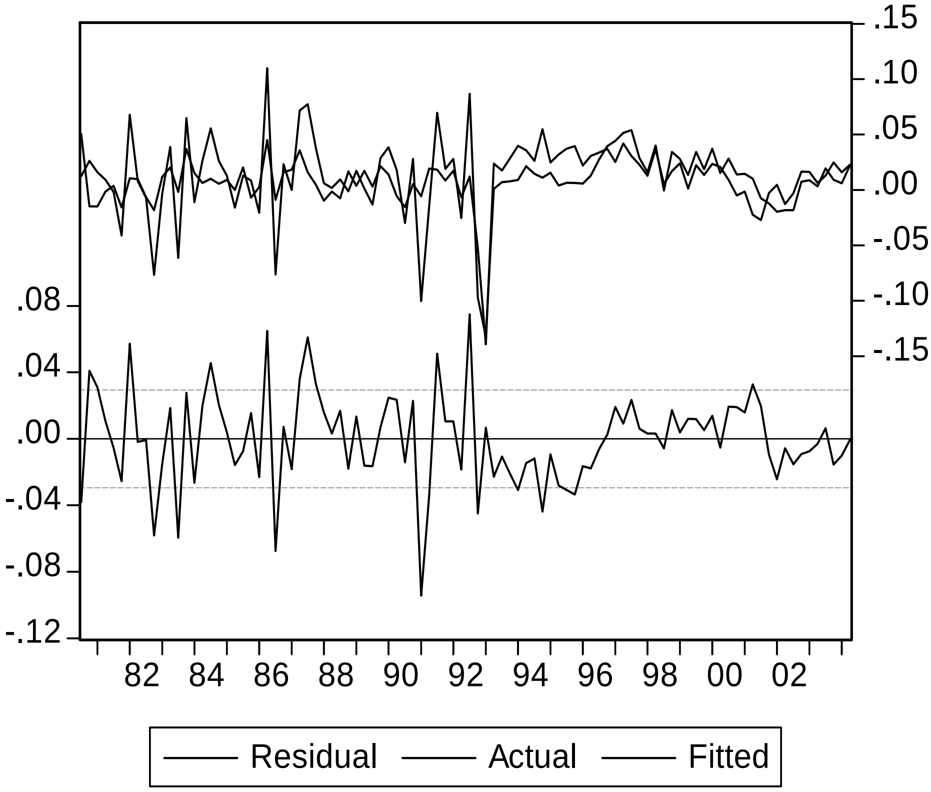
Substituted Coefficients:
=====================
DLOG(SEMS) = -1.213916035 + 0.1111607336*DLOG(SEMS(-1)) - 0.201862019*DLOG(SEPMG/(SECEDF*(1+SEITR))) + 0.2279225044*DLOG(SEPMG(-1)/(SECEDF(-1)*(1+SEITR(-1)))) + 0.9813586545*DLOG(SETFE) - 0.1291542924*LOG(SEMS(-1)) + 0.1938726904*LOG(SETFE(-1)) - 0.07733627557*LOG(SEPMG(-1)/(SECEDF(-1)*(1+SEITR(-1)))) - 0.1269746579*DUM93Q1 + [MA(1)=-0.2450705828,BACKCAST=1980:3]

Dependent Variable: DLOG(SEMS)
Method: Least Squares
Date: 11/11/04 Time: 10:21
Sample (adjusted): 1980:3 2004:2
Included observations: 96 after adjustments
Convergence achieved after 27 iterations
Backcast: 1980:2

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-1.213916	0.895686	-1.355292	0.1789
DLOG(SEMS(-1))	0.111161	0.165855	0.670228	0.5045
DLOG(SEPMG/(SECEDF*(1+SEITR)))	-0.201862	0.115817	-1.742932	0.0849
DLOG(SEPMG(-1)/(SECEDF(-1)*(1+SEITR(-1))))	0.227923	0.120972	1.884101	0.0629
DLOG(SETFE)	0.981359	0.258201	3.800759	0.0003
LOG(SEMS(-1))	-0.129154	0.070402	-1.834531	0.0700
LOG(SETFE(-1))	0.193873	0.121569	1.594753	0.1144
LOG(SEPMG(-1)/(SECEDF(-1)*(1+SEITR(-1))))	-0.077336	0.033804	-2.287752	0.0246
DUM93Q1	-0.126975	0.035100	-3.617554	0.0005
MA(1)	-0.245071	0.238145	-1.029081	0.3063

R-squared	0.420259	Mean dependent var	0.010475
Adjusted R-squared	0.359588	S.D. dependent var	0.036783
S.E. of regression	0.029436	Akaike info criterion	-4.114874
Sum squared resid	0.074516	Schwarz criterion	-3.847755
Log likelihood	207.5140	F-statistic	6.926898
Durbin-Watson stat	2.052505	Prob(F-statistic)	0.000000

	Inverted MA Roots	.25



A1.3.2 Asset markets

<table>
<tr>
<td>Housing wealth

Dependent variable: SEHW

Object name: EKHW</td>
<td>
Estimation Command:
=====================
LS(DERIV=AA) DLOG(SEHW) C DLOG(SEHW(-1)) DLOG(SEPY/100*SEY) LOG(SEHW(-1)) LOG(SEPY(-1)/100*SEY(-1)) SELR(-1) MA(1)

Estimation Equation:
=====================
DLOG(SEHW) = C(1) + C(2)*DLOG(SEHW(-1)) + C(3)*DLOG(SEPY/100*SEY) + C(4)*LOG(SEHW(-1)) + C(5)*LOG(SEPY(-1)/100*SEY(-1)) + C(6)*SELR(-1) + [MA(1)=C(7),BACKCAST=1976:3]

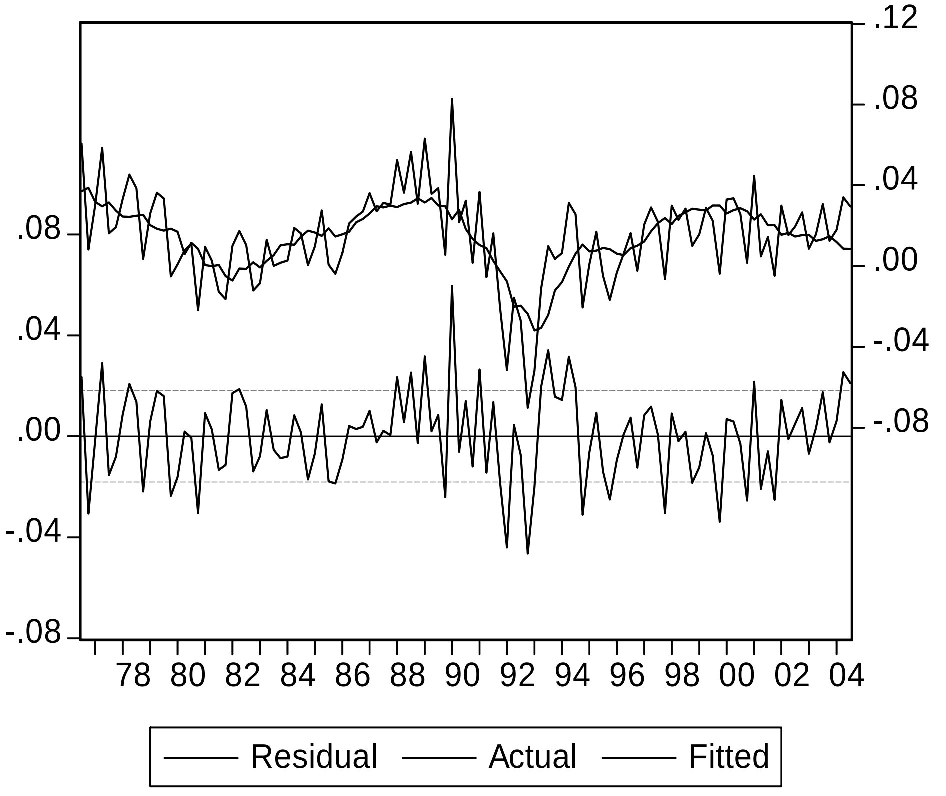
Substituted Coefficients:
=====================
DLOG(SEHW) = 0.09735819826 + 0.9250656985*DLOG(SEHW(-1)) + 0.1295398022*DLOG(SEPY/100*SEY) - 0.01857421075*LOG(SEHW(-1)) + 0.01277975324*LOG(SEPY(-1)/100*SEY(-1)) - 0.0006507484175*SELR(-1) + [MA(1)=-0.7798359042,BACKCAST=1976:3]

Dependent Variable: DLOG(SEHW)
Method: Least Squares
Date: 10/18/04 Time: 15:19
Sample (adjusted): 1976:3 2004:3
Included observations: 113 after adjustments
Convergence achieved after 14 iterations
Backcast: 1976:2
</td>
</tr>
</table>

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.097358	0.036693	2.653348	0.0092
DLOG(SEHW(-1))	0.925066	0.039647	23.33268	0.0000
DLOG(SEPY/100*SEY)	0.129540	0.108115	1.198162	0.2335
LOG(SEHW(-1))	-0.018574	0.004346	-4.273938	0.0000
LOG(SEPY(-1)/100*SEY(-1))	0.012780	0.002844	4.493138	0.0000
SELR(-1)	-0.000651	0.000256	-2.544149	0.0124
MA(1)	-0.779836	0.085864	-9.082200	0.0000

R-squared	0.409917	Mean dependent var	0.014459
Adjusted R-squared	0.376516	S.D. dependent var	0.022965
S.E. of regression	0.018133	Akaike info criterion	-5.122175
Sum squared resid	0.034855	Schwarz criterion	-4.953222
Log likelihood	296.4029	F-statistic	12.27263
Durbin-Watson stat	1.976989	Prob(F-statistic)	0.000000

Inverted MA Roots	.78



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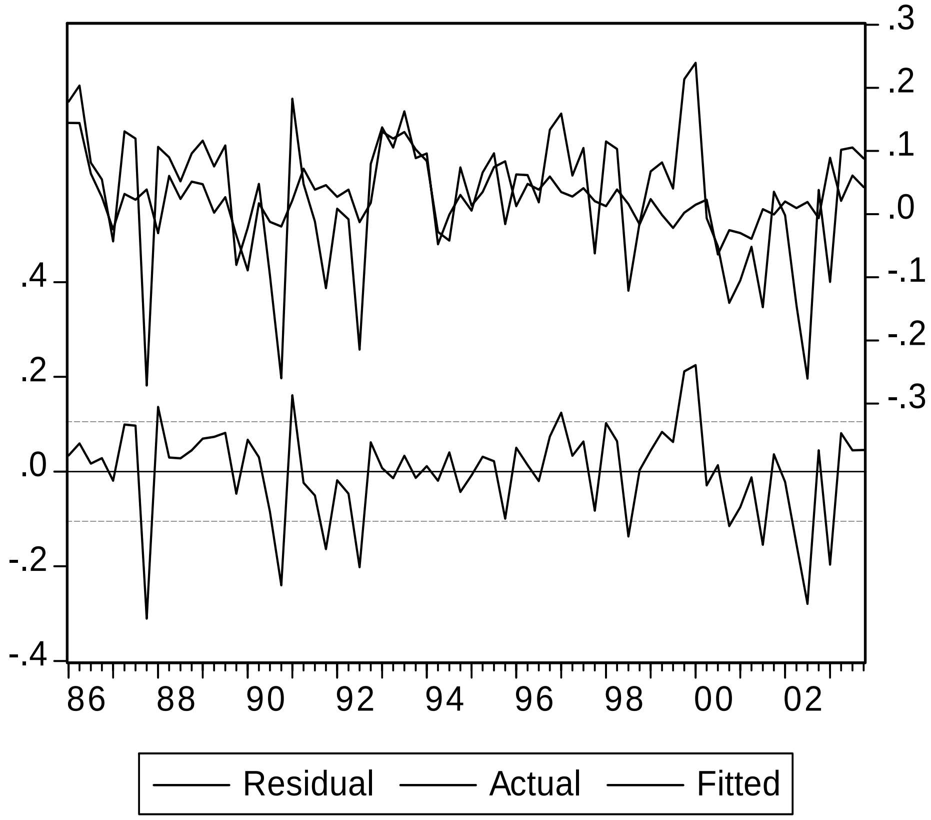
Equity price index Dependent variable: SEEQP Object name: EKEQP	Estimation Command: ===================== LS DLOG(SEEQP) C LOG(SEEQP(-1)/(DG7YVD(-1)*SERX(-1))) D(SELR) D(SELR(-1)) SELR(-1) MA(1) Estimation Equation: ===================== DLOG(SEEQP) = C(1) + C(2)*LOG(SEEQP(-1)/(DG7YVD(-1)*SERX(-1))) + C(3)*D(SELR) + C(4)*D(SELR(-1)) + C(5)*SELR(-1) + [MA(1)=C(6),BACKCAST=1986:1] Substituted Coefficients: ===================== DLOG(SEEQP) = -0.5883970924 - 0.1228940156*LOG(SEEQP(-1)/(DG7YVD(-1)*SERX(-1))) - 0.05110566066*D(SELR) + 0.008383716197*D(SELR(-1)) - 0.008175997548*SELR(-1) + [MA(1)=0.2603923328,BACKCAST=1986:1]

Dependent Variable: DLOG(SEEQP)
Method: Least Squares
Date: 04/21/04 Time: 00:09
Sample: 1986:1 2003:4
Included observations: 72
Convergence achieved after 8 iterations
Backcast: 1985:4

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.588397	0.315276	-1.866292	0.0664
LOG(SEEQP(-1)/(DG7YVD(-1)*SERX(-1)))	-0.122894	0.064324	-1.910552	0.0604
D(SELR)	-0.051106	0.021959	-2.327319	0.0230
D(SELR(-1))	0.008384	0.022035	0.380465	0.7048
SELR(-1)	-0.008176	0.007677	-1.064963	0.2908
MA(1)	0.260392	0.126527	2.057997	0.0435

R-squared	0.181217	Mean dependent var	0.027585
Adjusted R-squared	0.119187	S.D. dependent var	0.111937
S.E. of regression	0.105055	Akaike info criterion	-1.589007
Sum squared resid	0.728414	Schwarz criterion	-1.399285
Log likelihood	63.20427	F-statistic	2.921478
Durbin-Watson stat	1.972133	Prob(F-statistic)	0.019210

Inverted MA Roots	-.26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A1.3.3 Economic policy

<table>
<tr><td>Indirect tax rate

Dependent variable: SEITR

Object name: EKITR</td><td>Estimation Command:
=====================
LS SEITR C SEITR(-1) MA(1)

Estimation Equation:
=====================
SEITR = C(1) + C(2)*SEITR(-1) + [MA(1)=C(3),BACKCAST=1961:2]

Substituted Coefficients:
=====================
SEITR = 0.004001651885 + 0.986106365*SEITR(-1) + [MA(1)=0.6575832377,BACKCAST=1961:2]

Dependent Variable: SEITR
Method: Least Squares
Date: 02/13/04 Time: 01:20
Sample(adjusted): 1961:2 2020:1
Included observations: 236 after adjusting endpoints
Convergence achieved after 22 iterations
Backcast: 1961:1

<table>
<tr><th>Variable</th><th>Coefficient</th><th>Std. Error</th><th>t-Statistic</th><th>Prob.</th></tr>
<tr><td>C</td><td>0.004002</td><td>0.001949</td><td>2.052974</td><td>0.0412</td></tr>
<tr><td>SEITR(-1)</td><td>0.986106</td><td>0.007836</td><td>125.8481</td><td>0.0000</td></tr>
<tr><td>MA(1)</td><td>0.657583</td><td>0.049390</td><td>13.31405</td><td>0.0000</td></tr>
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<table>
<tr><td>R-squared</td><td>0.994711</td><td>Mean dependent var</td><td>0.245437</td></tr>
<tr><td>Adjusted R-squared</td><td>0.994665</td><td>S.D. dependent var</td><td>0.043245</td></tr>
<tr><td>S.E. of regression</td><td>0.003159</td><td>Akaike info criterion</td><td>-8.664765</td></tr>
<tr><td>Sum squared resid</td><td>0.002325</td><td>Schwarz criterion</td><td>-8.620734</td></tr>
<tr><td>Log likelihood</td><td>1025.442</td><td>F-statistic</td><td>21909.32</td></tr>
<tr><td>Durbin-Watson stat</td><td>1.325503</td><td>Prob(F-statistic)</td><td>0.000000</td></tr>
<tr><td>Inverted MA Roots</td><td>-.66</td><td></td><td></td></tr>
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</td></tr>
<tr><td>Policy interest rate

Dependent variable: SER3M

Object name: EKTAYLOR</td><td>Estimation Command:
=====================
LS(DERIV=AA) SER3M=.67*SER3M(-1)+C(1)+1.2*(@PCY(SEUND1X(+7))-2.0)

Estimation Equation:
=====================
SER3M=.67*SER3M(-1)+C(1)+1.2*(@PCY(SEUND1X(+7))-2.0)

Substituted Coefficients:
=====================
SER3M=.67*SER3M(-1)+1.43591194+1.2*(@PCY(SEUND1X(+7))-2.0)</td></tr>
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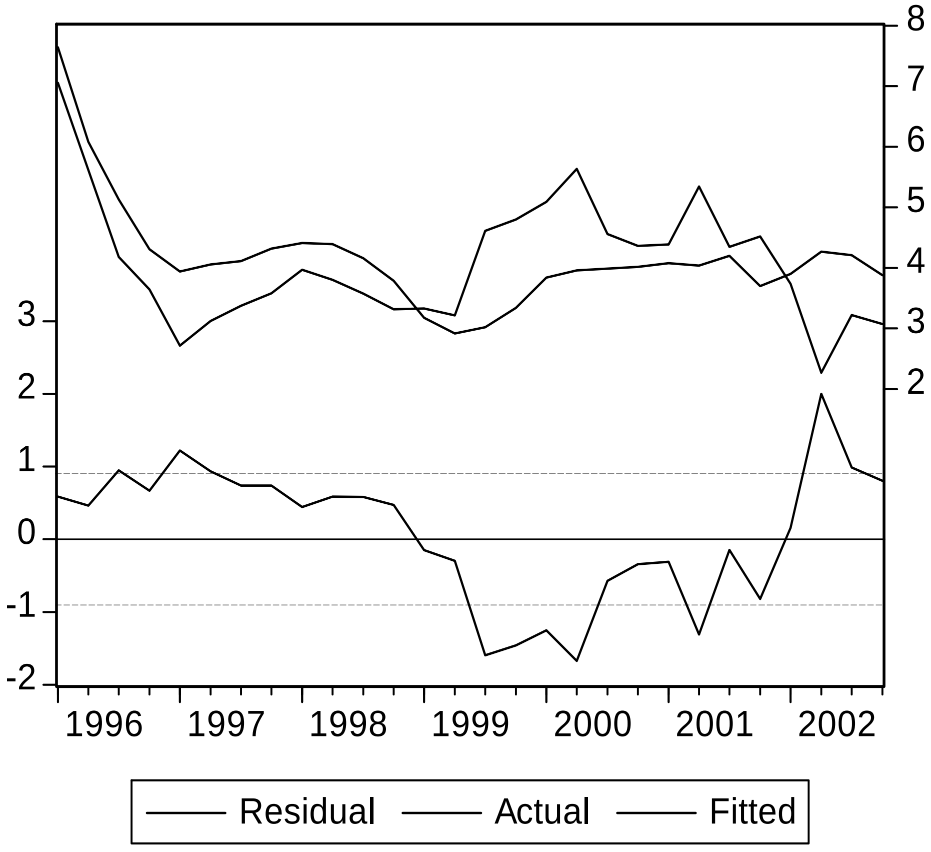
Dependent Variable: SER3M
Method: Least Squares
Date: 06/15/04 Time: 13:31
Sample (adjusted): 1996:1 2002:2
Included observations: 26 after adjustments
SER3M=.67*SER3M(-1)+C(1)+1.2*(@PCY(SEUND1X(+7))-2.0)

	Coefficient	Std. Error	t-Statistic	Prob.
C(1)	1.435912	0.177367	8.095727	0.0000

R-squared	0.072969	Mean dependent var	4.184615
Adjusted R-squared	0.072969	S.D. dependent var	0.939316
S.E. of regression	0.904396	Akaike info criterion	2.674604
Sum squared resid	20.44831	Schwarz criterion	2.722992
Log likelihood	-33.76985	Durbin-Watson stat	0.469000



A1.3.4 Other equations

VAR for forecasting SESKEW and SEVAR

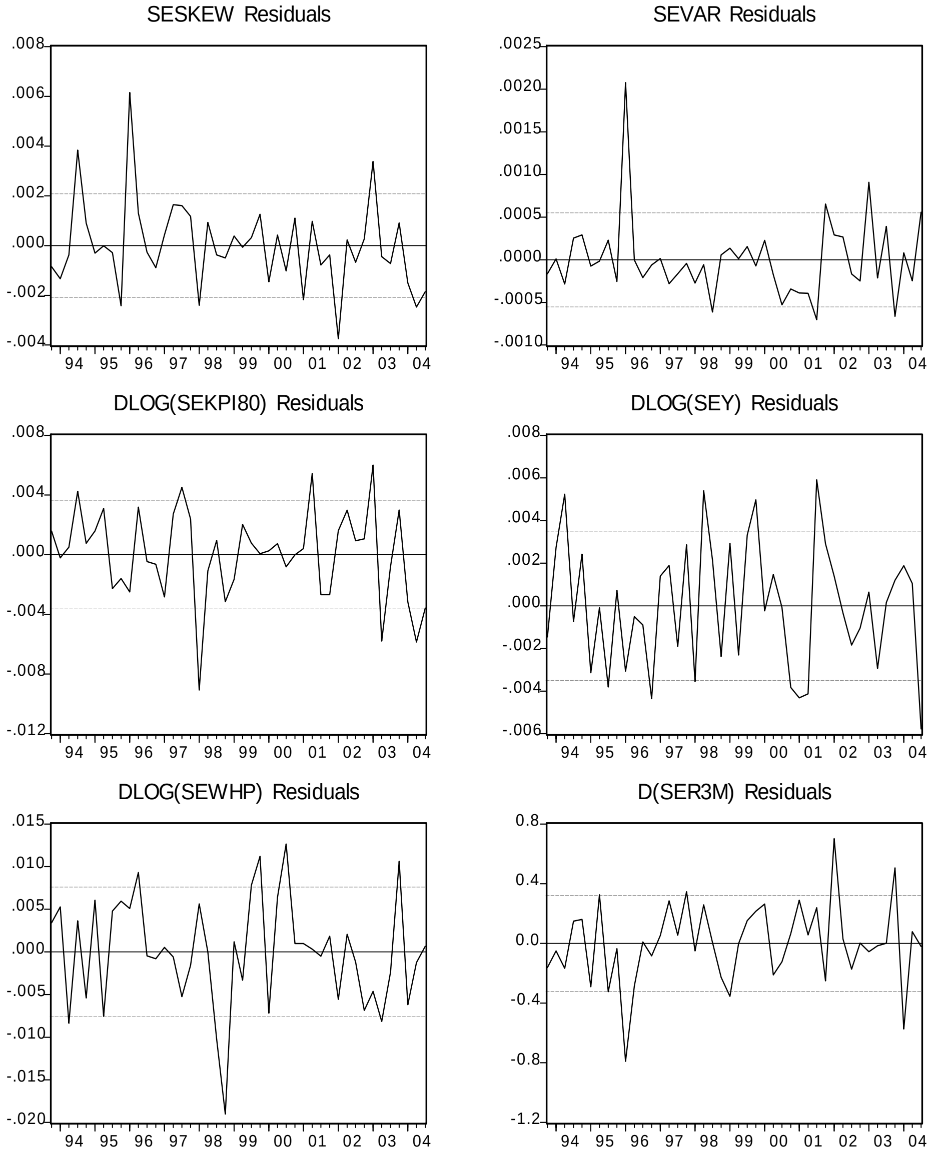
Vector Autoregression Estimates
Date: 10/13/04 Time: 15:26
Sample (adjusted): 1993:4 2004:3
Included observations: 44 after adjustments
Standard errors in ( ) & t-statistics in [ ]

	SESKEW	SEVAR	DLOG(SEKPI80)	DLOG(SEY)	DLOG(SEWHP)	D(SER3M)
SESKEW(-1)	-0.315417	0.038057	-1.007674	-0.161066	0.055017	-55.16507
	(0.21296)	(0.05631)	(0.37073)	(0.35710)	(0.77548)	(32.7535)
	[-1.48109]	[0.67588]	[-2.71809]	[-0.45103]	[0.07094]	[-1.68425]
SESKEW(-2)	-0.106891	0.081557	0.397299	0.962735	0.521383	7.964012
	(0.20290)	(0.05365)	(0.35322)	(0.34024)	(0.73886)	(31.2066)
	[-0.52681]	[1.52022]	[1.12479]	[2.82958]	[0.70566]	[0.25520]
SEVAR(-1)	-0.333426	-0.206163	2.270183	-0.245588	1.038867	-12.81978
	(0.58208)	(0.15390)	(1.01330)	(0.97606)	(2.11961)	(89.5239)
	[-0.57282]	[-1.33957]	[2.24039]	[-0.25161]	[0.49012]	[-0.14320]
SEVAR(-2)	-0.699568	-0.436524	-4.829468	-0.356077	-1.230023	-51.04192
	(0.64787)	(0.17130)	(1.12783)	(1.08638)	(2.35917)	(99.6422)
	[-1.07980]	[-2.54834]	[-4.28210]	[-0.32777]	[-0.52138]	[-0.51225]
DLOG(SEKPI80(-1))	0.136188	0.002895	0.245194	0.063653	-0.009078	34.06756
	(0.09933)	(0.02626)	(0.17292)	(0.16656)	(0.36170)	(15.2770)
	[1.37106]	[0.11023]	[1.41799]	[0.38216]	[-0.02510]	[2.22999]
DLOG(SEKPI80(-2))	0.173140	-0.049756	0.434738	-0.102928	-0.270612	13.52081
	(0.08752)	(0.02314)	(0.15236)	(0.14676)	(0.31871)	(13.4609)

		[1.97823]	[-2.15014]	[2.85335]	[-0.70133]	[-0.84910]	[1.00445]
	DLOG(SEY(-1))	0.101044	-0.020666	-0.313389	0.448194	-0.531241	20.13721
		(0.10641)	(0.02814)	(0.18525)	(0.17844)	(0.38749)	(16.3662)
		[0.94954]	[-0.73452]	[-1.69175]	[2.51177]	[-1.37097]	[1.23041]
	DLOG(SEY(-2))	0.045633	-0.059464	0.221642	0.182255	-0.339228	23.67460
		(0.11482)	(0.03036)	(0.19987)	(0.19253)	(0.41809)	(17.6587)
		[0.39745]	[-1.95881]	[1.10891]	[0.94664]	[-0.81137]	[1.34068]
	DLOG(SEWHP(-1))	-0.039106	-0.003923	0.051386	-0.141601	-0.276087	-4.659214
		(0.04772)	(0.01262)	(0.08307)	(0.08002)	(0.17377)	(7.33948)
		[-0.81947]	[-0.31090]	[0.61856]	[-1.76955]	[-1.58878]	[-0.63482]
	DLOG(SEWHP(-2))	-0.035753	0.002347	-0.126755	-0.034483	-0.177696	-5.535942
		(0.05036)	(0.01332)	(0.08767)	(0.08445)	(0.18340)	(7.74591)
		[-0.70990]	[0.17627]	[-1.44575]	[-0.40831]	[-0.96893]	[-0.71469]
	D(SER3M(-1))	-0.002981	-3.51E-05	0.000424	0.000543	-0.000815	0.389823
		(0.00131)	(0.00035)	(0.00228)	(0.00219)	(0.00476)	(0.20110)
		[-2.28001]	[-0.10156]	[0.18650]	[0.24752]	[-0.17112]	[1.93850]
	D(SER3M(-2))	0.000292	0.000440	-0.002210	-0.001832	0.003797	-0.231827
		(0.00099)	(0.00026)	(0.00172)	(0.00166)	(0.00359)	(0.15181)
		[0.29586]	[1.68583]	[-1.28602]	[-1.10653]	[1.05642]	[-1.52706]
	C	-0.000384	0.002252	0.004555	0.004723	0.024094	-0.427056
		(0.00165)	(0.00044)	(0.00287)	(0.00276)	(0.00600)	(0.25354)
		[-0.23263]	[5.16764]	[1.58719]	[1.70864]	[4.01356]	[-1.68434]
	DLOG(SEPMA)	-0.001635	0.001591	0.053967	-0.009369	-0.002484	3.214952
		(0.01344)	(0.00355)	(0.02339)	(0.02253)	(0.04892)	(2.06633)
		[-0.12166]	[0.44799]	[2.30744]	[-0.41586]	[-0.05076]	[1.55588]

R-squared	0.226230	0.425847	0.637645	0.541217	0.246648	0.650363
Adj. R-squared	-0.109070	0.177048	0.480625	0.342410	-0.079804	0.498853
Sum sq. resids	0.000131	9.14E-06	0.000396	0.000368	0.001733	3.092250
S.E. equation	0.002087	0.000552	0.003634	0.003500	0.007601	0.321053
F-statistic	0.674709	1.711609	4.060904	2.722332	0.755541	4.292553
Log likelihood	217.5517	276.0845	193.1600	194.8074	160.6872	-4.016899
Akaike AIC	-9.252350	-11.91293	-8.143637	-8.218520	-6.667602	0.818950
Schwarz SC	-8.684653	-11.34524	-7.575940	-7.650823	-6.099905	1.386647
Mean dependent	0.000327	0.000899	0.003634	0.007146	0.011122	-0.129091
S.D. dependent	0.001982	0.000608	0.005042	0.004317	0.007315	0.453518

Determinant resid covariance (dof adj.)	4.53E-28
Determinant resid covariance	4.55E-29
Log likelihood	1061.106
Akaike information criterion	-44.41392
Schwarz criterion	-41.00774


SESKEW Residuals
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.006
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.002
.000
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-.004
94 95 96 97 98 99 00 01 02 03 04
SEVAR Residuals
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.0020
.0015
.0010
.0005
.0000
-.0005
-.0010
94 95 96 97 98 99 00 01 02 03 04
DLOG(SEKPI80) Residuals
.008
.004
.000
-.004
-.008
-.012
94 95 96 97 98 99 00 01 02 03 04
DLOG(SEY) Residuals
.008
.006
.004
.002
.000
-.002
-.004
-.006
94 95 96 97 98 99 00 01 02 03 04
DLOG(SEWHP) Residuals
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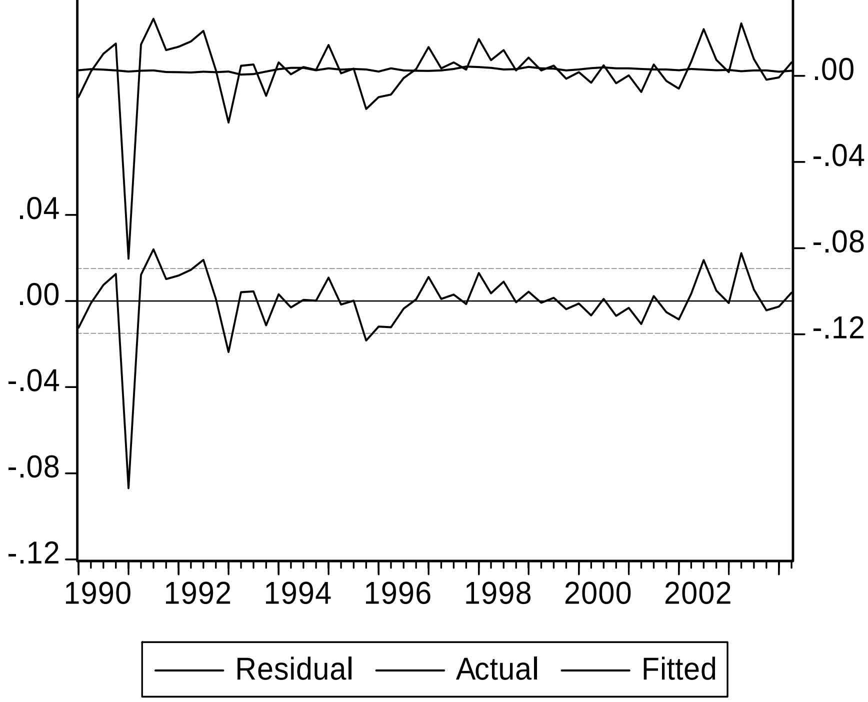
.010
.005
.000
-.005
-.010
-.015
-.020
94 95 96 97 98 99 00 01 02 03 04
D(SER3M) Residuals
0.8
0.4
0.0
-0.4
-0.8
-1.2
94 95 96 97 98 99 00 01 02 03 04

Transfer payments Dependent variables: SETRAN Object name: EKTRAN	Estimation Command: ===================== LS DLOG(SETRAN/(.01*(SECEDF*(1+SEITR)))) C D(SEU(-1)) Estimation Equation: ===================== DLOG(SETRAN/(.01*(SECEDF*(1+SEITR)))) = C(1) + C(2)*D(SEU(-1)) Substituted Coefficients: ===================== DLOG(SETRAN/(.01*(SECEDF*(1+SEITR)))) = 0.00288857861 - 0.001944100555*D(SEU(-1))

Dependent Variable: DLOG(SETRAN/(.01*(SECEDF*(1+SEITR))))
Method: Least Squares
Date: 11/11/04 Time: 10:39
Sample: 1990:1 2004:2
Included observations: 58

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.002889	0.002012	1.435465	0.1567
D(SEU(-1))	-0.001944	0.005080	-0.382718	0.7034

R-squared	0.002609	Mean dependent var	0.002745
Adjusted R-squared	-0.015202	S.D. dependent var	0.014943
S.E. of regression	0.015056	Akaike info criterion	-5.520202
Sum squared resid	0.012694	Schwarz criterion	-5.449152
Log likelihood	162.0859	F-statistic	0.146473
Durbin-Watson stat	2.054451	Prob(F-statistic)	0.703378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.00
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.04
.00
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-.12
1990
1992
1994
1996
1998
2000
2002
Residual
Actual
Fitted

A1.4 Supply equations

A1.4.1 Labor market

Wage equation as labor share

Dependent variable: SEWHB

Object name: EKLABSH

Estimation Command:
=====================
LS (SEWHB*(1+SEWTR+SECOLLR)*SEEE*SEHOURS)/(SEPY*SEY*.01) C SELABSHE(-1) LOG(SECED(+4)) @MOVAV(SEU/100,4) DUM93Q1 @MOVAV((SETRAN/SEU)/(SECOMP/SEEE),4)

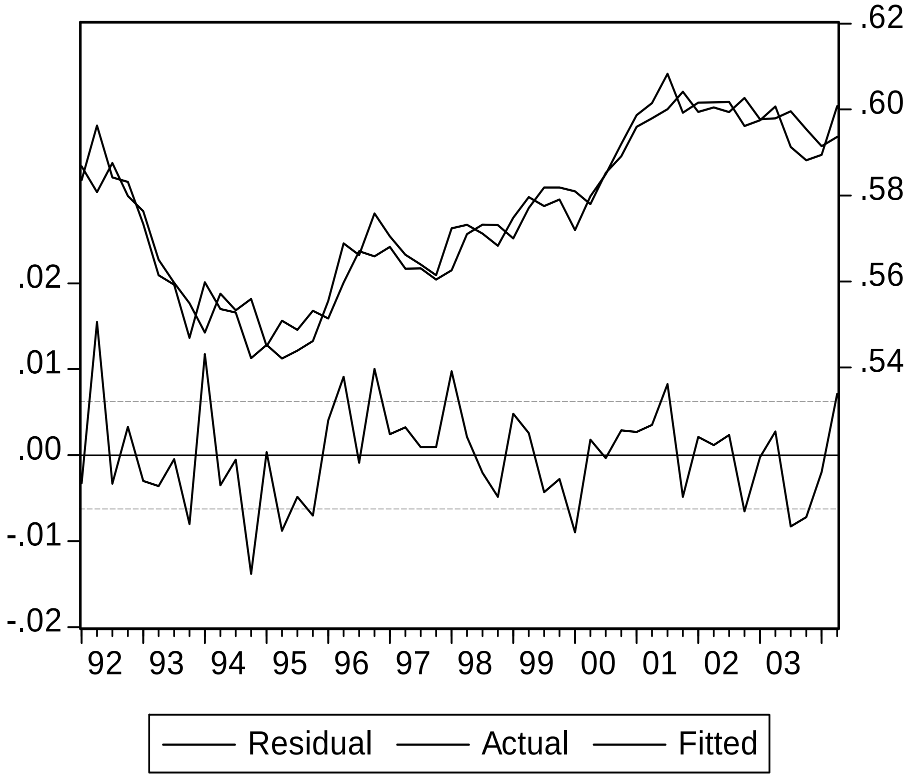
Estimation Equation:
=====================
(SEWHB*(1+SEWTR+SECOLLR)*SEEE*SEHOURS)/(SEPY*SEY*.01) = C(1) + C(2)*SELABSHE(-1) + C(3)*LOG(SECED(+4)) + C(4)*(@MOVAV(SEU/100,4)) + C(5)*DUM93Q1 + C(6)*(@MOVAV((SETRAN/SEU)/(SECOMP/SEEE),4))

Substituted Coefficients:
=====================
(SEWHB*(1+SEWTR+SECOLLR)*SEEE*SEHOURS)/(SEPY*SEY*.01) = 0.01608054064 + 0.6885886909*SELABSHE(-1) + 0.03566920207*LOG(SECED(+4)) - 0.2662886066*(@MOVAV(SEU/100,4)) - 0.01794423071*DUM93Q1 + 2.923689521e-06*(@MOVAV((SETRAN/SEU)/(SECOMP/SEEE),4))

Dependent Variable: (SEWHB*(1+SEWTR+SECOLLR)*SEEE*SEHOURS)/(SEPY*SEY*.01)
Method: Least Squares
Date: 04/18/04 Time: 14:27
Sample(adjusted): 1987:1 2003:3
Included observations: 67 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.016081	0.040504	0.397010	0.6927
SELABSHE(-1)	0.688589	0.071702	9.603415	0.0000
LOG(SECED(+4))	0.035669	0.007946	4.489175	0.0000
@MOVAV(SEU/100,4)	-0.266289	0.089092	-2.988913	0.0040
DUM93Q1	-0.017944	0.005611	-3.198277	0.0022
@MOVAV((SETRAN/SEU)/(SECOMP/SEEE),4)	2.92E-06	7.10E-06	0.411720	0.6820

R-squared	0.938742	Mean dependent var	0.521251
Adjusted R-squared	0.933721	S.D. dependent var	0.021289
S.E. of regression	0.005481	Akaike info criterion	-7.489867
Sum squared resid	0.001832	Schwarz criterion	-7.292432
Log likelihood	256.9105	F-statistic	186.9569
Durbin-Watson stat	1.928278	Prob(F-statistic)	0.000000



.62
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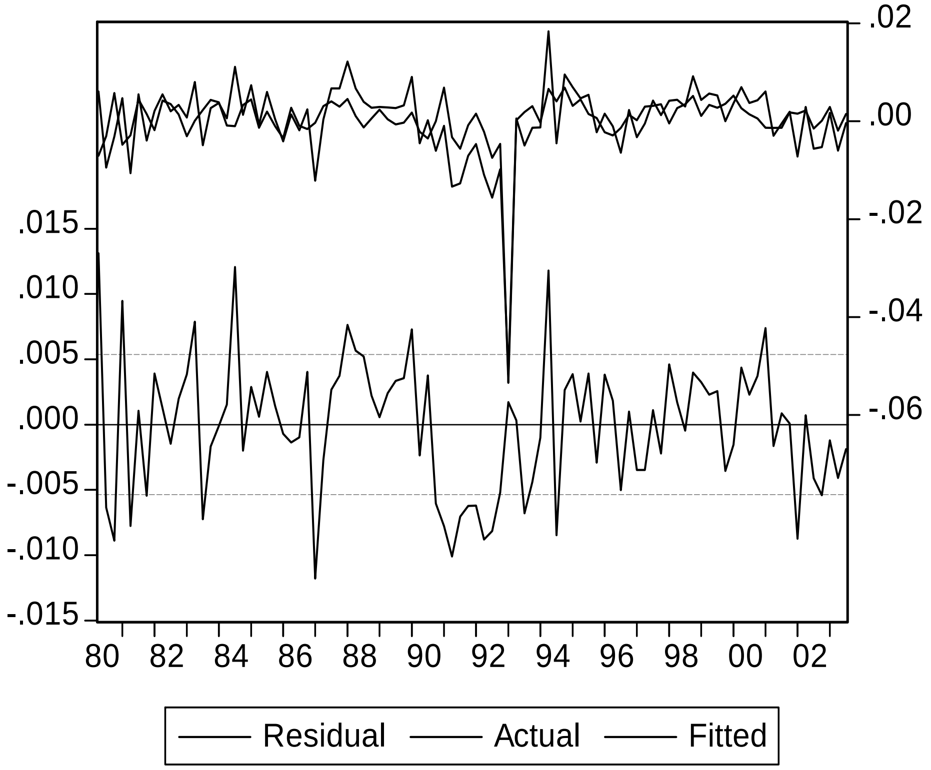
-.02
92 93 94 95 96 97 98 99 00 01 02 03
Residual
Actual
Fitted

Demand for labor Dependent variable: SEEE Object name: EKEE	Estimation Command: ===================== LS DLOG(SEEE*SEHOURS) C DLOG(SEWRP) DLOG(SEY) DLOG(SEY(-1)) LOG(SEEE(-1)*SEHOURS(-1))+0.761239*LOG(SEWRP(-1))-0.987735*LOG(SEY(-1)) DUM84Q1 DUM93Q1 Estimation Equation: ===================== DLOG(SEEE*SEHOURS) = C(1) + C(2)*DLOG(SEWRP) + C(3)*DLOG(SEY) + C(4)*DLOG(SEY(-1)) + C(5)*(LOG(SEEE(-1)*SEHOURS(-1))+0.761239*LOG(SEWRP(-1))-0.987735*LOG(SEY(-1))) + C(6)*DUM84Q1 + C(7)*DUM93Q1 Substituted Coefficients: ===================== DLOG(SEEE*SEHOURS) = -0.0005140073326 - 0.148900563*DLOG(SEWRP) + 0.2236169609*DLOG(SEY) + 0.2230196153*DLOG(SEY(-1)) - 0.004211374562*(LOG(SEEE(-1)*SEHOURS(-1))+0.761239*LOG(SEWRP(-1))-0.987735*LOG(SEY(-1))) - 0.003753719591*DUM84Q1 - 0.04891144715*DUM93Q1

Dependent Variable: DLOG(SEEE*SEHOURS)
Method: Least Squares
Date: 10/15/04 Time: 12:27
Sample (adjusted): 1980:2 2003:3
Included observations: 94 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.000514	0.001230	-0.417724	0.6772
DLOG(SEWRP)	-0.148901	0.050840	-2.928814	0.0043
DLOG(SEY)	0.223617	0.058337	3.833184	0.0002
DLOG(SEY(-1))	0.223020	0.059748	3.732698	0.0003
LOG(SEEE(-1)*SEHOURS(-1))+0.761239*LOG(SEWRP(-1))-0.987735*LOG(SEY(-1))	-0.004211	0.007626	-0.552240	0.5822
DUM84Q1	-0.003754	0.005694	-0.659259	0.5115
DUM93Q1	-0.048911	0.005809	-8.420244	0.0000

R-squared	0.587413	Mean dependent var	0.000150
Adjusted R-squared	0.558959	S.D. dependent var	0.008071
S.E. of regression	0.005360	Akaike info criterion	-7.548105
Sum squared resid	0.002500	Schwarz criterion	-7.358711
Log likelihood	361.7609	F-statistic	20.64412
Durbin-Watson stat	1.790944	Prob(F-statistic)	0.000000



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-.015
80
82
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86
88
90
92
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96
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00
02
Residual
Actual
Fitted

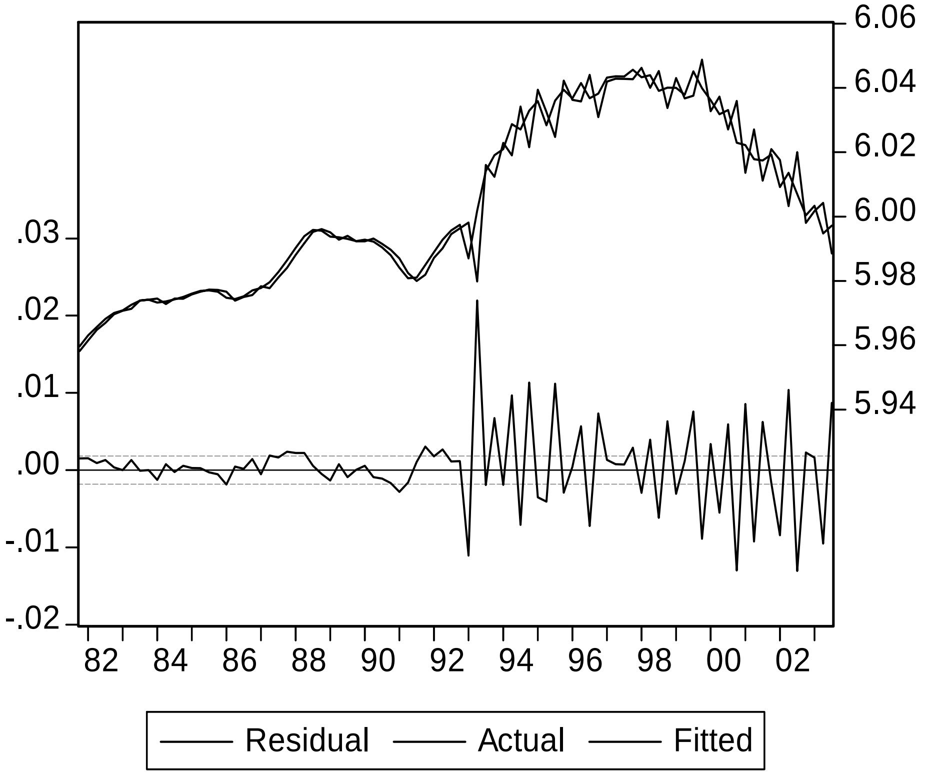
Mean hours worked Dependent variable: SEHOURS Object name: EKHOURS	Estimation Command: ===================== LS LOG(SEHOURS) C LOG(SEHOURS(-1)) @MOVAV(LOG(SEWRC),8) MA(1) Estimation Equation: ===================== LOG(SEHOURS) = C(1) + C(2)*LOG(SEHOURS(-1)) + C(3)*(@MOVAV(LOG(SEWRC),8)) + [MA(1)=C(4),BACKCAST=1981:4] Substituted Coefficients: ===================== LOG(SEHOURS) = 0.1448418267 + 0.9761592463*LOG(SEHOURS(-1)) + 0.0007129349162*(@MOVAV(LOG(SEWRC),8)) + [MA(1)=0.6602521633,BACKCAST=1981:4]

Dependent Variable: LOG(SEHOURS)
Method: Least Squares
Date: 02/12/04 Time: 14:39
Sample(adjusted): 1981:4 2003:3
Included observations: 88 after adjusting endpoints
Convergence achieved after 22 iterations
Backcast: 1981:3

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.144842	0.078460	1.846052	0.0684
LOG(SEHOURS(-1))	0.976159	0.012404	78.69774	0.0000
@MOVAV(LOG(SEWRC),8)	0.000713	0.004505	0.158251	0.8746
MA(1)	0.660252	0.085542	7.718429	0.0000

R-squared	0.995497	Mean dependent var	5.971930
Adjusted R-squared	0.995336	S.D. dependent var	0.026920
S.E. of regression	0.001838	Akaike info criterion	-9.715416
Sum squared resid	0.000284	Schwarz criterion	-9.602810
Log likelihood	431.4783	F-statistic	6189.991
Durbin-Watson stat	1.208558	Prob(F-statistic)	0.000000

Inverted MA Roots	-.66



6.06
6.04
6.02
6.00
5.98
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.03
.02
.01
.00
-.01
-.02
82
84
86
88
90
92
94
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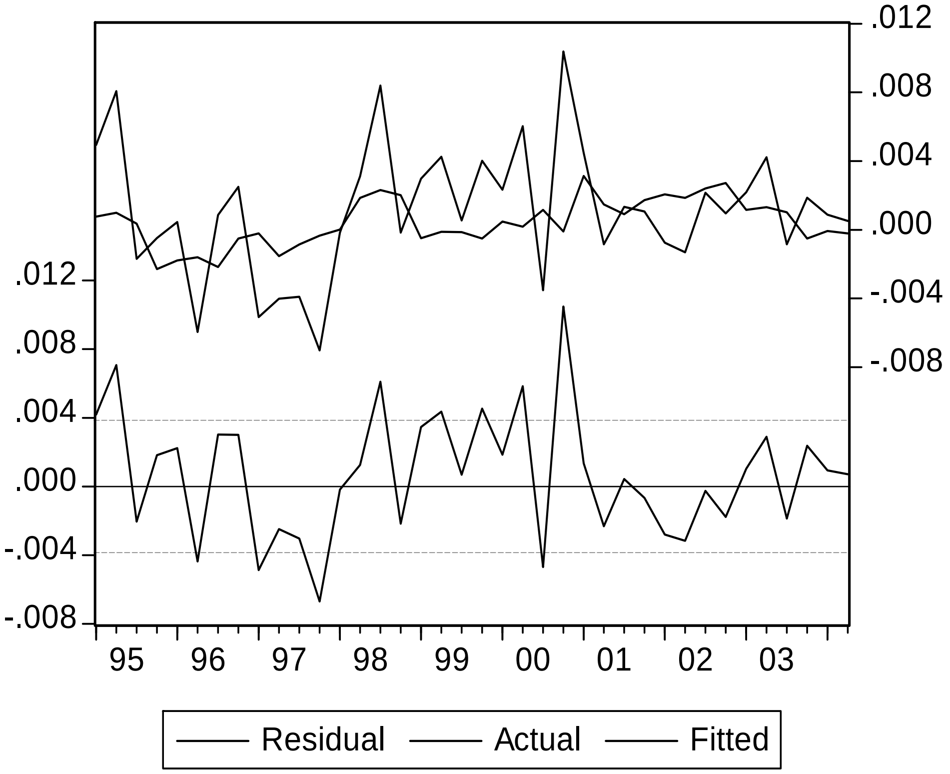
02
Residual
Actual
Fitted

Labor force Dependent variable: SELF Object name: EKLF	stimation Command: ===================== LS DLOG(SELF) C DLOG(SELF(-1)) DLOG(SEWHC/(SECEDF*(1+SEITR))) LOG(SELF(-1)) LOG(SEWHC(-1)/(SECEDF(-1)*(1+SEITR(-1)))) Estimation Equation: ===================== DLOG(SELF) = C(1) + C(2)*DLOG(SELF(-1)) + C(3)*DLOG(SEWHC/(SECEDF*(1+SEITR))) + C(4)*LOG(SELF(-1)) + C(5)*LOG(SEWHC(-1)/(SECEDF(-1)*(1+SEITR(-1)))) Substituted Coefficients: ===================== DLOG(SELF) = 1.659946707 + 0.2856126364*DLOG(SELF(-1)) + 0.03198570353*DLOG(SEWHC/(SECEDF*(1+SEITR))) - 0.1728705219*LOG(SELF(-1)) + 0.02855994384*LOG(SEWHC(-1)/(SECEDF(-1)*(1+SEITR(-1)))) Dependent Variable: DLOG(SELF) Method: Least Squares Date: 11/11/04 Time: 10:29 Sample (adjusted): 1995:1 2004:2 Included observations: 38 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	1.659947	1.061950	1.563111	0.1276
DLOG(SELF(-1))	0.285613	0.186987	1.527445	0.1362
DLOG(SEWHC/(SECEDF*(1+SEITR)))	0.031986	0.035928	0.890274	0.3798
LOG(SELF(-1))	-0.172871	0.111148	-1.555325	0.1294
LOG(SEWHC(-1)/(SECEDF(-1)*(1+SEITR(-1))))	0.028560	0.018910	1.510276	0.1405

R-squared	0.091583	Mean dependent var	0.001125
Adjusted R-squared	-0.018528	S.D. dependent var	0.003816
S.E. of regression	0.003851	Akaike info criterion	-8.158705
Sum squared resid	0.000489	Schwarz criterion	-7.943233
Log likelihood	160.0154	F-statistic	0.831732
Durbin-Watson stat	2.072737	Prob(F-statistic)	0.514724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-.004
-.008
95
96
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03
Residual
Actual
Fitted

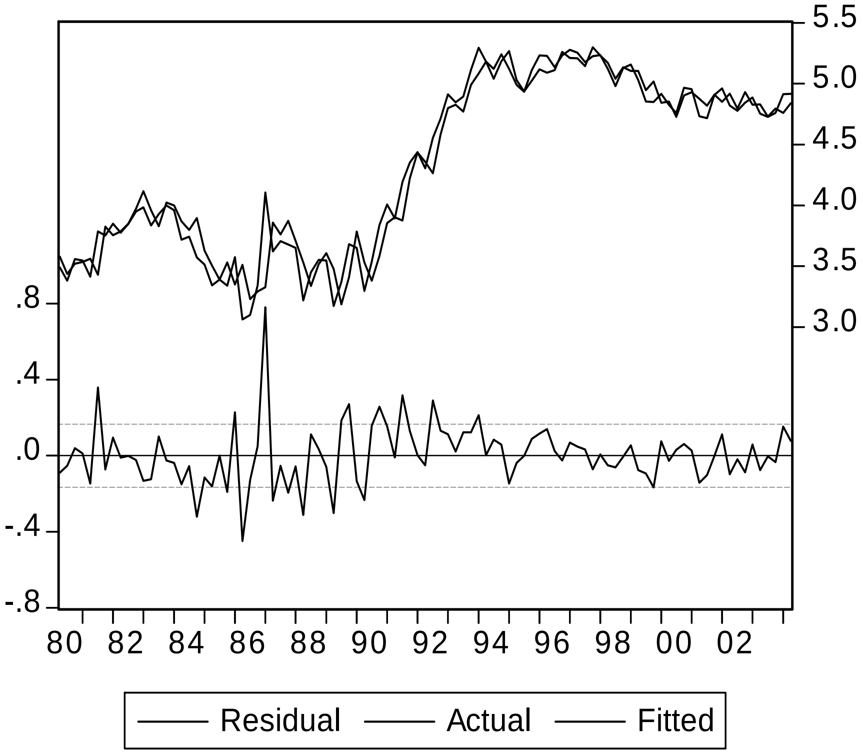
Discouraged workers Dependent variable: SELAT Object name: EKLAT	Estimation Command: ===================== LS(DERIV=AA) LOG(SELAT) C LOG(SELAT(-1)) LOG(SEREPR) LOG(SEREPR(-1)) MA(1) Estimation Equation: ===================== LOG(SELAT) = C(1) + C(2)*LOG(SELAT(-1)) + C(3)*LOG(SEREPR) + C(4)*LOG(SEREPR(-1)) + [MA(1)=C(5),BACKCAST=1980:2] Substituted Coefficients: ===================== LOG(SELAT) = 0.09086282441 + 0.9824296264*LOG(SELAT(-1)) + 0.9851816487*LOG(SEREPR) - 0.9835371999*LOG(SEREPR(-1)) + [MA(1)=-0.2322457032,BACKCAST=1980:2]

Dependent Variable: LOG(SELAT)
Method: Least Squares
Date: 10/15/04 Time: 13:59
Sample (adjusted): 1980:2 2003:3
Included observations: 94 after adjustments
Convergence achieved after 6 iterations
Backcast: 1980:1

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.090863	0.084006	1.081620	0.2823
LOG(SELAT(-1))	0.982430	0.025175	39.02341	0.0000
LOG(SEREPR)	0.985182	0.222419	4.429399	0.0000
LOG(SEREPR(-1))	-0.983537	0.212766	-4.622631	0.0000
MA(1)	-0.232246	0.109992	-2.111469	0.0375

R-squared	0.948080	Mean dependent var	4.305477
Adjusted R-squared	0.945747	S.D. dependent var	0.712755
S.E. of regression	0.166017	Akaike info criterion	-0.701724
Sum squared resid	2.452998	Schwarz criterion	-0.566442
Log likelihood	37.98101	F-statistic	406.2945
Durbin-Watson stat	1.988314	Prob(F-statistic)	0.000000

Inverted MA Roots	.23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-.8
80
82
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86
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90
92
94
96
98
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02
Residual
Actual
Fitted

A1.4.2 Price formation

Producer price index

Dependent variable: SEPP

Object name: EKPP

Estimation Command:
=====================
LS(DERIV=AA) DLOG(SEPPF*(1+SEITR)) C DLOG(SEPPF(-1)*(1+SEITR(-1))) DLOG(SEULC(-1)) DLOG(SEUSER3(-1)) DLOG(SEPMA) LOG(SEPPF(-1)*(1+SEITR(-1)))-PARU*LOG(SEULC(-1))-PARK*LOG(SEUSER3(-1))-(1-PARU-PARK)*LOG(SEPMA(-1)) MA(1)

Estimation Equation:
=====================
DLOG(SEPPF*(1+SEITR)) = C(1) + C(2)*DLOG(SEPPF(-1)*(1+SEITR(-1))) + C(3)*DLOG(SEULC(-1)) + C(4)*DLOG(SEUSER3(-1)) + C(5)*DLOG(SEPMA) + C(6)*(LOG(SEPPF(-1)*(1+SEITR(-1)))-0.3983866252*LOG(SEULC(-1))-0.3053925281*LOG(SEUSER3(-1))-(1-0.3983866252-0.3053925281)*LOG(SEPMA(-1))) + [MA(1)=C(7),BACKCAST=1988:1]

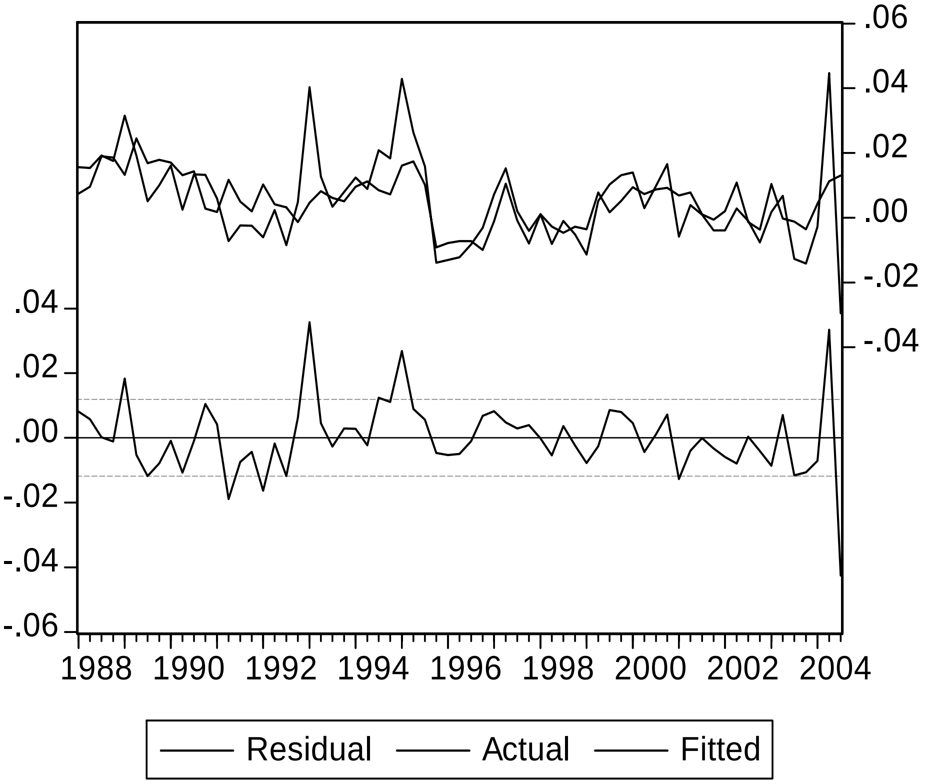
Substituted Coefficients:
=====================
DLOG(SEPPF*(1+SEITR)) = 0.3707769409 + 0.4960018592*DLOG(SEPPF(-1)*(1+SEITR(-1))) + 0.1869693682*DLOG(SEULC(-1)) + 0.04694827029*DLOG(SEUSER3(-1)) + 0.195845862*DLOG(SEPMA) - 0.08372491767*(LOG(SEPPF(-1)*(1+SEITR(-1)))-0.3983866252*LOG(SEULC(-1))-0.3053925281*LOG(SEUSER3(-1))-(1-0.3983866252-0.3053925281)*LOG(SEPMA(-1))) + [MA(1)=-0.3115087193,BACKCAST=1988:1]

Dependent Variable: DLOG(SEPPF*(1+SEITR))
Method: Least Squares
Date: 11/15/04 Time: 13:33
Sample (adjusted): 1988:1 2004:3
Included observations: 67 after adjustments
Convergence achieved after 15 iterations
Backcast: 1987:4

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.370777	0.237595	1.560540	0.1239
DLOG(SEPPF(-1)*(1+SEITR(-1)))	0.496002	0.209591	2.366528	0.0212
DLOG(SEULC(-1))	0.186969	0.145368	1.286181	0.2033
DLOG(SEUSER3(-1))	0.046948	0.054098	0.867845	0.3889
DLOG(SEPMA)	0.195846	0.055180	3.549202	0.0008
LOG(SEPPF(-1)*(1+SEITR(-1)))-0.3983866252*LOG(SEULC(-1))-0.3053925281*LOG(SEUSER3(-1))-(1-0.3983866252-0.3053925281)*LOG(SEPMA(-1))	-0.083725	0.053700	-1.559121	0.1242
MA(1)	-0.311509	0.336695	-0.925196	0.3586

R-squared	0.325289	Mean dependent var	0.005571
Adjusted R-squared	0.257818	S.D. dependent var	0.013775
S.E. of regression	0.011867	Akaike info criterion	-5.931476
Sum squared resid	0.008450	Schwarz criterion	-5.701135
Log likelihood	205.7045	F-statistic	4.821162
Durbin-Watson stat	1.772694	Prob(F-statistic)	0.000448

Inverted MA Roots	.31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2004
Residual
Actual
Fitted

Private consumption deflator

Dependent variable: SECED

Object name: EKCED

Estimation Command:
=====================
LS(DERIV=AA) DLOG((SECEDF*(1+SEITR))) C DLOG((SECEDF(-1)*(1+SEITR(-1)))) DLOG(SEPPF*(1+SEITR)) LOG((SECEDF(-1)*(1+SEITR(-1)))) LOG(SEPPF(-1)*(1+SEITR(-1))) MA(4) SESKEW

Estimation Equation:
=====================
DLOG((SECEDF*(1+SEITR))) = C(1) + C(2)*DLOG((SECEDF(-1)*(1+SEITR(-1)))) + C(3)*DLOG(SEPPF*(1+SEITR)) + C(4)*LOG((SECEDF(-1)*(1+SEITR(-1)))) + C(5)*LOG(SEPPF(-1)*(1+SEITR(-1))) + C(6)*SESKEW + [MA(4)=C(7),BACKCAST=1988:1]

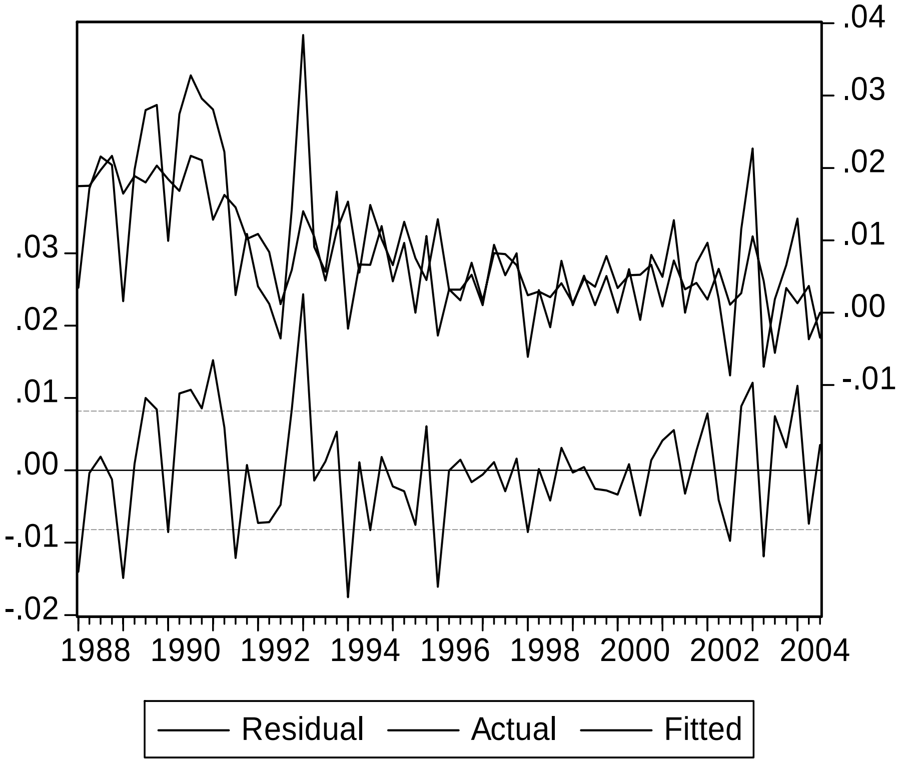
Substituted Coefficients:
=====================
DLOG((SECEDF*(1+SEITR))) = 0.05864783135 + 0.1792146559*DLOG((SECEDF(-1)*(1+SEITR(-1)))) + 0.1399284366*DLOG(SEPPF*(1+SEITR)) - 0.05202318823*LOG((SECEDF(-1)*(1+SEITR(-1)))) + 0.04017236441*LOG(SEPPF(-1)*(1+SEITR(-1))) + 1.070462277*SESKEW + [MA(4)=0.3248206009,BACKCAST=1988:1]

Dependent Variable: DLOG((SECEDF*(1+SEITR)))
Method: Least Squares
Date: 11/15/04 Time: 13:07
Sample: 1988:1 2004:3
Included observations: 67
Convergence achieved after 27 iterations
Backcast: 1987:1 1987:4

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.058648	0.069698	0.841455	0.4034
DLOG((SECEDF(-1)*(1+SEITR(-1))))	0.179215	0.117605	1.523868	0.1328
DLOG(SEPPF*(1+SEITR))	0.139928	0.086253	1.622309	0.1100
LOG((SECEDF(-1)*(1+SEITR(-1))))	-0.052023	0.027146	-1.916414	0.0601
LOG(SEPPF(-1)*(1+SEITR(-1)))	0.040172	0.038138	1.053335	0.2964
SESKEW	1.070462	0.552423	1.937757	0.0574
MA(4)	0.324821	0.139598	2.326835	0.0234

R-squared	0.423077	Mean dependent var	0.008474
Adjusted R-squared	0.365385	S.D. dependent var	0.010274
S.E. of regression	0.008185	Akaike info criterion	-6.674440
Sum squared resid	0.004020	Schwarz criterion	-6.444099
Log likelihood	230.5938	F-statistic	7.333350
Durbin-Watson stat	1.959166	Prob(F-statistic)	0.000007

Inverted MA Roots	.53+.53i	.53+.53i	-.53+.53i	-.53-.53i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1988 1990 1992 1994 1996 1998 2000 2002 2004
Residual
Actual
Fitted

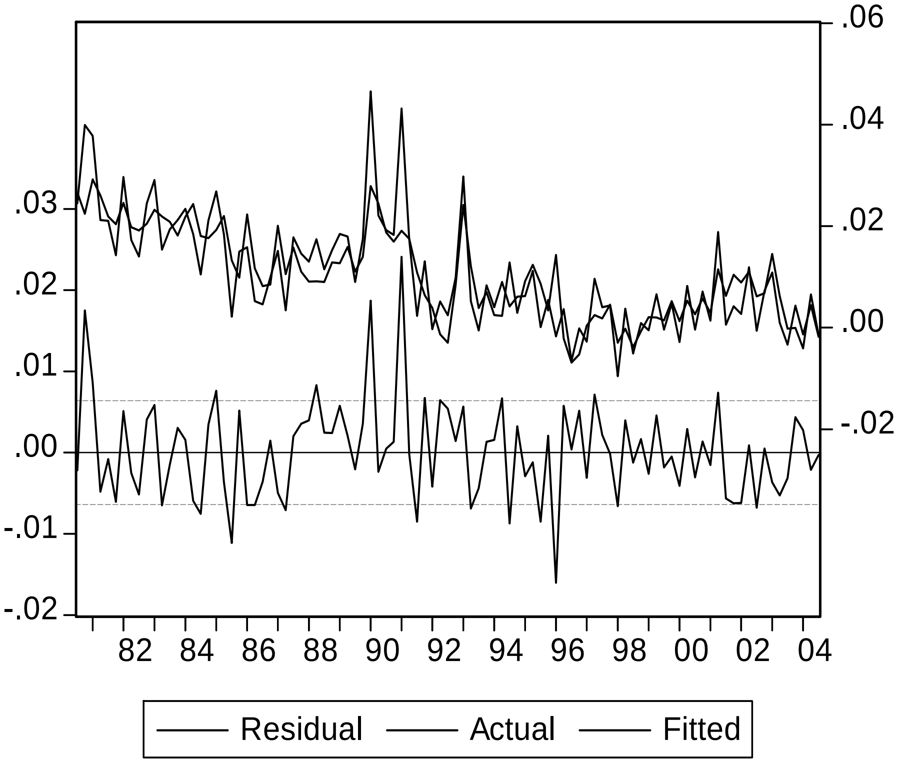
Consumer price index Dependent variable: SEKPI80 Object name: SEKPI80	Estimation Command: ===================== LS(DERIV=AA) DLOG(SEKPI80F*(1+SEITR)) C DLOG(SEKPI80(-1)) DLOG(SEPPF*(1+SEITR)) SESKEW SESKEW(-1) SEVAR SESKEW*SEVAR LOG(SEKPI80(-1))-KPICED*LOG((SECEDF(-1)*(1+SEITR(-1))))-(1-KPICED)*LOG(SEPPF(-1)*(1+SEITR)) MA(1) DUM92Q4 Estimation Equation: ===================== DLOG(SEKPI80F*(1+SEITR)) = C(1) + C(2)*DLOG(SEKPI80(-1)) + C(3)*DLOG(SEPPF*(1+SEITR)) + C(4)*SESKEW + C(5)*SESKEW(-1) + C(6)*SEVAR + C(7)*SESKEW*SEVAR + C(8)*(LOG(SEKPI80(-1))-0.5765842874*LOG((SECEDF(-1)*(1+SEITR(-1))))-(1-0.5765842874)*LOG(SEPPF(-1)*(1+SEITR))) + C(9)*DUM92Q4 + [MA(1)=C(10),BACKCAST=1980:3] Substituted Coefficients: ===================== DLOG(SEKPI80F*(1+SEITR)) = 0.04608983545 + 0.8695715699*DLOG(SEKPI80(-1)) + 0.1285272421*DLOG(SEPPF*(1+SEITR)) + 2.61900919*SESKEW - 1.528896868*SESKEW(-1) + 5.440521792*SEVAR - 919.0522126*SESKEW*SEVAR - 0.05167988499*(LOG(SEKPI80(-1))-0.5765842874*LOG((SECEDF(-1)*(1+SEITR(-1))))-(1-0.5765842874)*LOG(SEPPF(-1)*(1+SEITR))) + 0.01399256056*DUM92Q4 + [MA(1)=-0.7665415188,BACKCAST=1980:3]

Dependent Variable: DLOG(SEKPI80F*(1+SEITR))
Method: Least Squares
Date: 11/15/04 Time: 10:19
Sample (adjusted): 1980:3 2004:3
Included observations: 97 after adjustments
Convergence achieved after 30 iterations
Backcast: 1980:2

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.046090	0.015396	2.993533	0.0036
DLOG(SEKPI80(-1))	0.869572	0.035358	24.59311	0.0000
DLOG(SEPPF*(1+SEITR))	0.128527	0.029541	4.350870	0.0000
SESKEW	2.619009	0.777927	3.366650	0.0011
SESKEW(-1)	-1.528897	0.459069	-3.330432	0.0013
SEVAR	5.440522	1.342493	4.052552	0.0001
SESKEW*SEVAR	-919.0522	376.1346	-2.443413	0.0166
LOG(SEKPI80(-1))-0.5765842874*LOG((SECEDF(-1)*(1+SEITR(-1))))-(1-0.5765842874)*LOG(SEPPF(-1)*(1+SEITR))	-0.051680	0.015876	-3.255179	0.0016
DUM92Q4	0.013993	0.006341	2.206638	0.0300
MA(1)	-0.766542	0.085068	-9.010891	0.0000

R-squared	0.693517	Mean dependent var	0.010764
Adjusted R-squared	0.661811	S.D. dependent var	0.010988
S.E. of regression	0.006390	Akaike info criterion	-7.170768
Sum squared resid	0.003552	Schwarz criterion	-6.905334
Log likelihood	357.7823	F-statistic	21.87392
Durbin-Watson stat	2.086680	Prob(F-statistic)	0.000000

Inverted MA Roots	.77



Underlying inflation

Dependent variable: SEUND1X

Object name: EKUND1X

Estimation Command:
=====================
LS(DERIV=AA) DLOG(SEUND1X) DLOG(SEKPI80) LOG(SEUND1X(-1)) LOG(SEKPI80(-1)) LOG(SEUND1X(-4)) LOG(SEKPI80(-4)) MA(1)

Estimation Equation:
=====================
DLOG(SEUND1X) = C(1)*DLOG(SEKPI80) + C(2)*LOG(SEUND1X(-1)) + C(3)*LOG(SEKPI80(-1)) + C(4)*LOG(SEUND1X(-4)) + C(5)*LOG(SEKPI80(-4)) + [MA(1)=C(6),BACKCAST=1994:2]

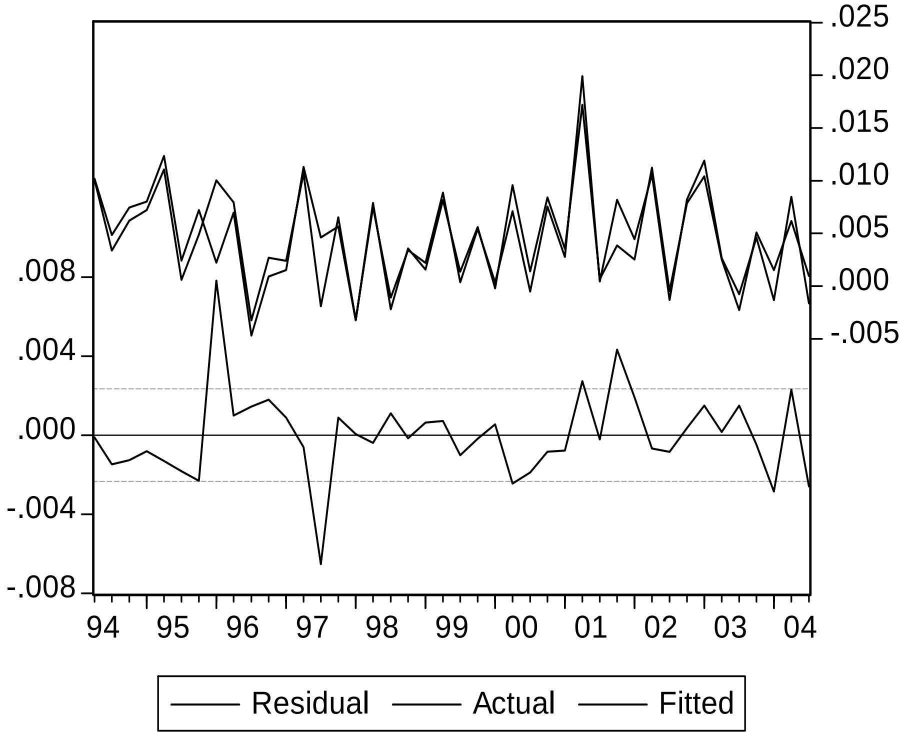
Substituted Coefficients:
=====================
DLOG(SEUND1X) = 0.7659063873*DLOG(SEKPI80) - 0.3618047333*LOG(SEUND1X(-1)) + 0.1992863208*LOG(SEKPI80(-1)) + 0.3223747175*LOG(SEUND1X(-4)) - 0.1590806754*LOG(SEKPI80(-4)) + [MA(1)=0.2790451689,BACKCAST=1994:2]

Dependent Variable: DLOG(SEUND1X)
Method: Least Squares
Date: 11/11/04 Time: 02:44
Sample (adjusted): 1994:2 2004:3
Included observations: 42 after adjustments
Convergence achieved after 17 iterations
Backcast: 1994:1

Variable	Coefficient	Std. Error	t-Statistic	Prob.
DLOG(SEKPI80)	0.765906	0.069095	11.08477	0.0000
LOG(SEUND1X(-1))	-0.361805	0.149387	-2.421937	0.0206
LOG(SEKPI80(-1))	0.199286	0.111212	1.791951	0.0815
LOG(SEUND1X(-4))	0.322375	0.141483	2.278544	0.0287
LOG(SEKPI80(-4))	-0.159081	0.104293	-1.525324	0.1359
MA(1)	0.279045	0.192971	1.446046	0.1568

R-squared	0.807397	Mean dependent var	0.004610
Adjusted R-squared	0.780647	S.D. dependent var	0.004998
S.E. of regression	0.002341	Akaike info criterion	-9.144869
Sum squared resid	0.000197	Schwarz criterion	-8.896631
Log likelihood	198.0423	Durbin-Watson stat	1.954079

Inverted MA Roots -.28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Residual
Actual
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GDP deflator

Dependent variable: SEPY

Object name: EKPY

Estimation Command:
=====================
LS(DERIV=AA) DLOG(SEPY) C DLOG(SEKPI80F*(1+SEITR)) DLOG((SECEDF*(1+SEITR))) LOG(SEPY(-1)) LOG(SEUND1X(-1)) DUM90Q4 DUM93Q1 MA(1)

Estimation Equation:
=====================
DLOG(SEPY) = C(1) + C(2)*DLOG(SEKPI80F*(1+SEITR)) + C(3)*DLOG((SECEDF*(1+SEITR))) + C(4)*LOG(SEPY(-1)) + C(5)*LOG(SEUND1X(-1)) + C(6)*DUM90Q4 + C(7)*DUM93Q1 + [MA(1)=C(8),BACKCAST=1989:2]

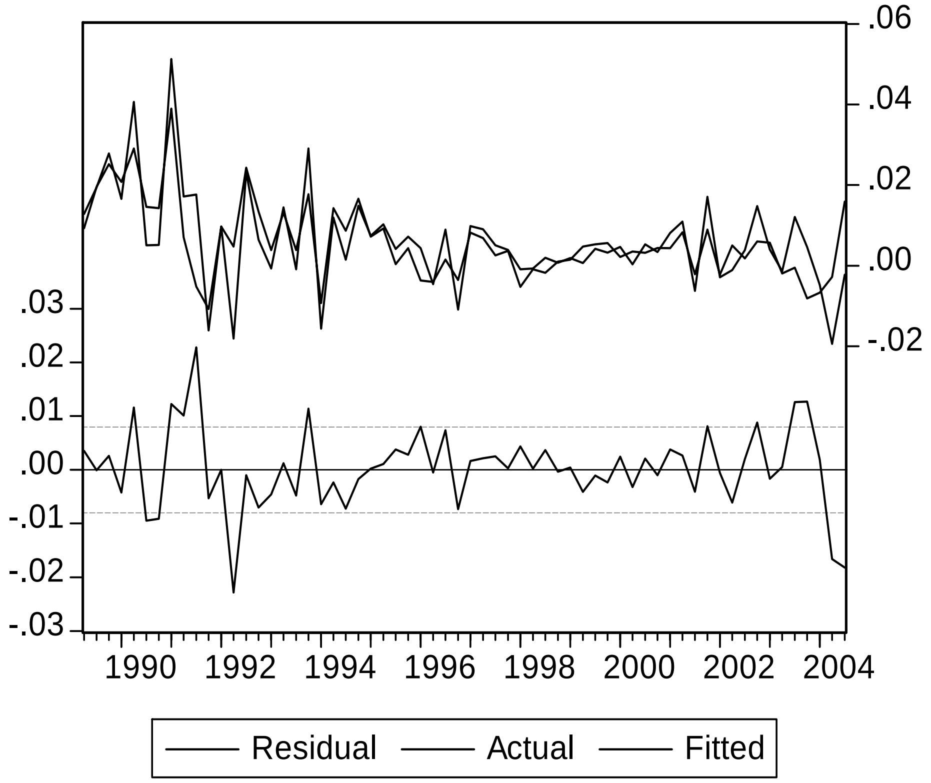
Substituted Coefficients:
=====================
DLOG(SEPY) = 0.06777283698 + 0.2814926498*DLOG(SEKPI80F*(1+SEITR)) + 0.4942994067*DLOG((SECEDF*(1+SEITR))) - 0.03339700305*LOG(SEPY(-1)) + 0.01561109254*LOG(SEUND1X(-1)) - 0.01876406899*DUM90Q4 - 0.03271960261*DUM93Q1 + [MA(1)=-0.963102416,BACKCAST=1989:2]

Dependent Variable: DLOG(SEPY)
Method: Least Squares
Date: 11/15/04 Time: 13:35
Sample: 1989:2 2004:3
Included observations: 62
Convergence achieved after 21 iterations
Backcast: 1989:1

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.067773	0.018992	3.568485	0.0008
DLOG(SEKPI80F*(1+SEITR))	0.281493	0.136655	2.059883	0.0442
DLOG((SECEDF*(1+SEITR)))	0.494299	0.192541	2.567240	0.0131
LOG(SEPY(-1))	-0.033397	0.068858	-0.485010	0.6296
LOG(SEUND1X(-1))	0.015611	0.056023	0.278653	0.7816
DUM90Q4	-0.018764	0.010080	-1.861541	0.0681
DUM93Q1	-0.032720	0.006374	-5.133027	0.0000
MA(1)	-0.963102	0.015788	-61.00250	0.0000

R-squared	0.624077	Mean dependent var	0.006286
Adjusted R-squared	0.575346	S.D. dependent var	0.012231
S.E. of regression	0.007970	Akaike info criterion	-6.706292
Sum squared resid	0.003430	Schwarz criterion	-6.431823
Log likelihood	215.8950	F-statistic	12.80662
Durbin-Watson stat	1.683231	Prob(F-statistic)	0.000000

Inverted MA Roots	.96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Appendix 2: Variables and data updating

A2.1 Foreign variables

Country prefixes:

AN	Australia, New Zeeland
BG	Belgium
CH	China
CN	Canada
CR	Check republic
DE	Developing economies
DK	Denmark
EL	EMU
FE	Far East
FN	Finland
FR	France
GE	Germany
GR	Greece
HU	Hungary
IR	Ireland
IT	Italy
JP	Japan
LA	Latin America
MX	Mexico
NL	Netherlands
NW	Norway
OE	Austria
PO	Poland
PT	Portugal
SE	Sweden
SK	South Korea
SL	Slovenia
SP	Spain
SW	Switzerland
UK	United Kingdom
US	USA
VG	Visegrad
WD	World

Suffix for foreign variables

GA	gross foreign assets, $ Bn
GL	gross foreign liabilities $ Bn
IPDC	interest profit, dividend, credit, $ Mn
IPDD	interest profit, dividend, debet, $ Mn
MGI	import of goods, index
PANF	agricultural non-food prices, 2000=100
PFDV	price on food from developed countries
PFLD	price of food from less developed countries
PMM	price index on metals
PO	price of oil, $ per barrell
PXA	overall export price index, 2000100
PXG	price index for export of goods
R3M	short run 3-month nominal interest rate
RX	exchange rate vs $
TT	total trade
ULT	trend in unit labour cost
Y	GDP

A2.2 Domestic variables

Prefix is SE

APROD	labour productivity [Y/(HOURS*E)]
BI	business investment, fixed 2000 prices, SEK Bn
BPT	balance of payments transfers, SEK Bn
BUD	government budget surplus, SEK Bn
C	household consumption expenditure, fixed 2000 prices, SEK
CAPSH	capital share [1 – LABSH
CARK	car capital stock in 2000 prices, SEK, Bn
CBR	current balance as percent of GDP
CBV	current balance value, SEK B
CCAR	household expenditure on cars, 2000 prices, SEK Bn
CCH	expenditures of non-profit oranisations, 2000 prices, SEK Bn
CDUR	household expenditure on durable and semi-durable goods, SEK Bn
CED	household consumption deflator, 2000=100
CEDF	household consumption deflator less indirect taxes, 2000=100
CIN	foreigners' consumption expenditure in Sweden, SEK Bn, 2000 prices
CNOND	household consumption expenditure on nondurables and services, SEK Bn, 2000 prices
COLL	total payroll taxes, SEK Bn
COLLE	payroll taxes for employed persons, SEK Bn
COLLR	payroll tax rate
COMP	total compensation, SEK Bn
COMPB	total compensation less payroll and wage taxes, SEK Bn
COMPBE	total compensation less payroll and wage taxes for employed persons, SEK Bn
COMPE	total compensation for employed persons, SEK Bn
CONSR	real discount factor for permanent income
COST	
COUT	Swedish households' consumption expenditure abroad, SEK Bn, 2000 prices
CPX	index of foreign export prices, 2000=100
CR	compensation ratio $\dfrac{\dfrac{TRAN}{U \cdot LF}}{\dfrac{COMP}{EE}}$
CSHARE	contribution from household expenditure to GDP growth rate
CTOT	household consumption expenditure as sum of components, SEK Bn, 2000 prices
CTOUR	CIN-COUT, net tourist expenditure, SEK Bn, 2000 prices
CU	capacity utilization
DAG	daily payment for unemployed, SEK
DEBT	public debt, SEK Bn, 2000 prices
DEBTP	public debt, SEK Bn

DS	changes in inventories, SEK Bn, 2000 prices
DTAX	miscellaneous taxes, SEK Bn
E	total number of employed persons, Th
EE	total number of employed employees, Th
EFEX	effective exchange rate
EK	replacement ratio
EQP	equity price index
EQPR	rate of return on foreign liabilities
FTAXR	corporate profit taxe rate
GA	gross foreign assets, SEK Bn
GBR	government budget surplus as percent of GDP
GBRT	government budget surplus as percent of GDP, target
GC	government consumption expenditure, SEK Bn, 2000 prices
GCSHARE	contribution from government consumption expenditure to GDP growth rate
GDR	government debt as percent of GDP
GDRM	government debt as percent of GDP, target
GI	government investment expenditure, SEK Bn, 2000 prices
GIP	government interest payments, SEK Bn
GL	gross foreign liabilities, SEK Bn
GSHARE	contribution from government expenditure to GDP growth rate
GW	household gross financial wealth, SEK Bn
HI	housing investment expenditure, SEK Bn, 2000 prices
HOURS	mean hours worked, Mn
HS	number of housing starts, Th
HW	housing wealth, SEK Bn
I	total investment expenditure, SEK Bn, 2000 prices
INF	rate of inflation, measured with the consumption expenditure deflator, percent
IP	index of industrial production, 1995=100
IPDC	interest profit, dividend, credit, $ Mn
IPDD	interest profit, dividend, debet, $ Mn
ISHARE	contribution from investment expenditure to GDP growth rate
IT	indirect taxes, SEK Bn
ITR	indirect tax rate
KCU	real user cost of capital, $\frac{USER}{0.01 \cdot CED}$
KG	government capital stock, SEK Bn, 2000 prices
KP	private sector capital stock, SEK Bn, 2000 prices
KPDEP	
KPI80	consumer price index, 1980=100
KPI80F	consumer price index less indirect taxes, 1980=100
LABSH	labour share, $\frac{HOURS \cdot E \cdot WHP}{0.01 \cdot PY \cdot Y}$
LABSHE	labour share employees, $\frac{HOURS \cdot EE \cdot WHP}{0.01 \cdot PY \cdot Y}$
LAT	latent employed (discouraged workers), Th
LF	labour force, number of persons, Th

LIABS	household liabilities, SEK Bn
LR	long run (10 year) nominal interest rate, percent
M	imports of goods and services, SEK Bn, 2000 prices
MG	imports of goods, SEK Bn, 2000 prices
MGV	imports of goods, SEK Bn
MISC	miscellaneous financial assets, SEK Bn
MS	imports of services, SEK Bn, 2000 prices
MSER	imports of services, SEK Bn
MSHARE	contribution from imports of goods and services to GDP growth rate
MVOL	MG+MS, imports of goods and services, SEK Bn, 2000 prices
NA	net foreign assets, SEK Bn
NOM	nominal GDP, $0.01 \cdot PY \cdot Y$
NW	household net financial assets, SEK Bn
NXSHARE	contribution from net exports of goods and services to GDP growth rate
OG	GDP output gap, percent
OPI	other personal income, SEK, Bn
PI	personal income, COMP+OPI+WT+TRAN-TAX-IT-WT-COLL-DTAX, SEK Bn
PINV	business investment deflator, 2000=100
PK	implicit price index on private capital stock, 2000=100
PMA	import price index, 2000=100
PMG	import price index for manufactured goods, 2000=100
PMGI	implicit price index for imported goods, 2000=100
PMSI	implicit price index for imported services, 2000=100
PP	producer price index, 2000=100
PPF	producer price index less indirect taxes, 2000=100
PREM	equity price risk premium
PROF	gross operating surplus, SEK Bn
PROFIT	business profits, SEK Bn
PSI	private sector investments, BI+HI, SEK Bn, 2000 prices
PXA	export price index, 2000=100
PXG	export price index for manufactured goods, 2000=100
PXGI	export price index for goods, 2000=100
PXSI	export price index for services, 2000=100
PY	GDP deflator, 2000=100
R3M	short (3 months) nominal interest rate
REFEX	real effective exchange rate
REPR	replacement ratio (unemployment benefit to wage rate)
RGW	real gross financial wealth, SEK Bn, 2000 prices
RHW	real housing wealth, SEK Bn, 2000 prices
RNW	real net financial wealth, SEK Bn, 2000 prices
ROR	rate of return on financial assets
RPX	relative export price index
RR	real rate of interest, LR - expected inflation
RULT	trend in unit labour costs, 2000=100
RX	dollar exchange rate, SEK/$
S	export markets, index, 2000=100

SAPP	Riksbank's measure of export markets
SKEW	skewness of relative price changes
SL	stock of inventories, SEK Bn, 2000 prices
SOLOW	Solow residual, $\frac{dY}{Y} - LABSH\frac{d(HOURS \cdot E)}{(HOURS \cdot E)} - CAPSH\frac{d(USER \cdot (KP + KG))}{(USER \cdot (KP + KG))}$
SR	savings ratio, $\frac{YD - C}{YD} \cdot 100$, percent
TAX	direct tax revenue, SEK Bn
TAXR	direct tax rate
TAXTOT	total tax revenues, TAX+COLL+WT+IT+FTAX+DTAX
TECHL	technological progress variable
TECHN	technological progress variable
TFE	total expenditure, Y-M, SEK Bn, 2000 prices
TFP	total factor productivity
TIM	total number of hours worked, Mn
TIME	total number of hours worked by employees, Mn
TNW	total wealth, HW+NW
TQ	Tobin's Q, $\frac{EQP}{PINV}$
TRAN	transfer payments, SEK Bn
TRNW	total real net wealth, SEK Bn
U	open unemployment rate, percent
ULC	unit labour cost, $\frac{COMP}{Y} = \frac{WHP}{\frac{Y}{HOURS \cdot E}} = \frac{WHP}{APROD}$
ULT	trend in unit labour cost
UND1X	underlying inflation index, 1980=100
UNDINF	underlying inflation, percent
USER	user cost of capital
UT	extended unemployment rate, percent
UTC	unit total cost, $ULC + \frac{USER \cdot (KP + KG)}{Y}$
VAR	variance of relative price changes
WEDGE	wedge between consumer and producer wage, $\frac{WHC}{WHP} = \frac{\frac{WHB(1-TAXR)}{1+ITR}}{WHB(1+COLLR+WTR)} = \frac{1-TAXR}{(1+ITR)(1+COLLR+WTR)}$
WHB	gross wage rate, $\frac{WHP}{1+COLLR+WTR}$
WHBE	gross wage rate for employees
WHC	consumer wage rate, $\frac{WHB(1-TAXR)}{1+ITR}$
WHCE	consumer wage rate for employees
WHP	producer wage rate
WHPE	producer wage rate for employed
WRB	gross real wage rate

WRC	real consumer wage rate
WRP	real producer wage rate
X	exports of goods and services, SEK Bn, 2000 prices
XG	exports of goods, SEK Bn, 2000 prices
XGV	exports of goods, SEK Bn, current prices
XS	exports of services, SEK Bn, 2000 prices
XSER	exports of services, SEK Bn, current prices
XSHARE	contribution from exports of goods and services to GDP growth rate
XVOL	exports of goods and services, SEK Bn, 2000 prices
Y	gross domestic product, GDP, Sek Bn, 2000 prices
YPOT	potential GDP, estimated from production function
YTREND	potential GDP, estimated through HP-filter

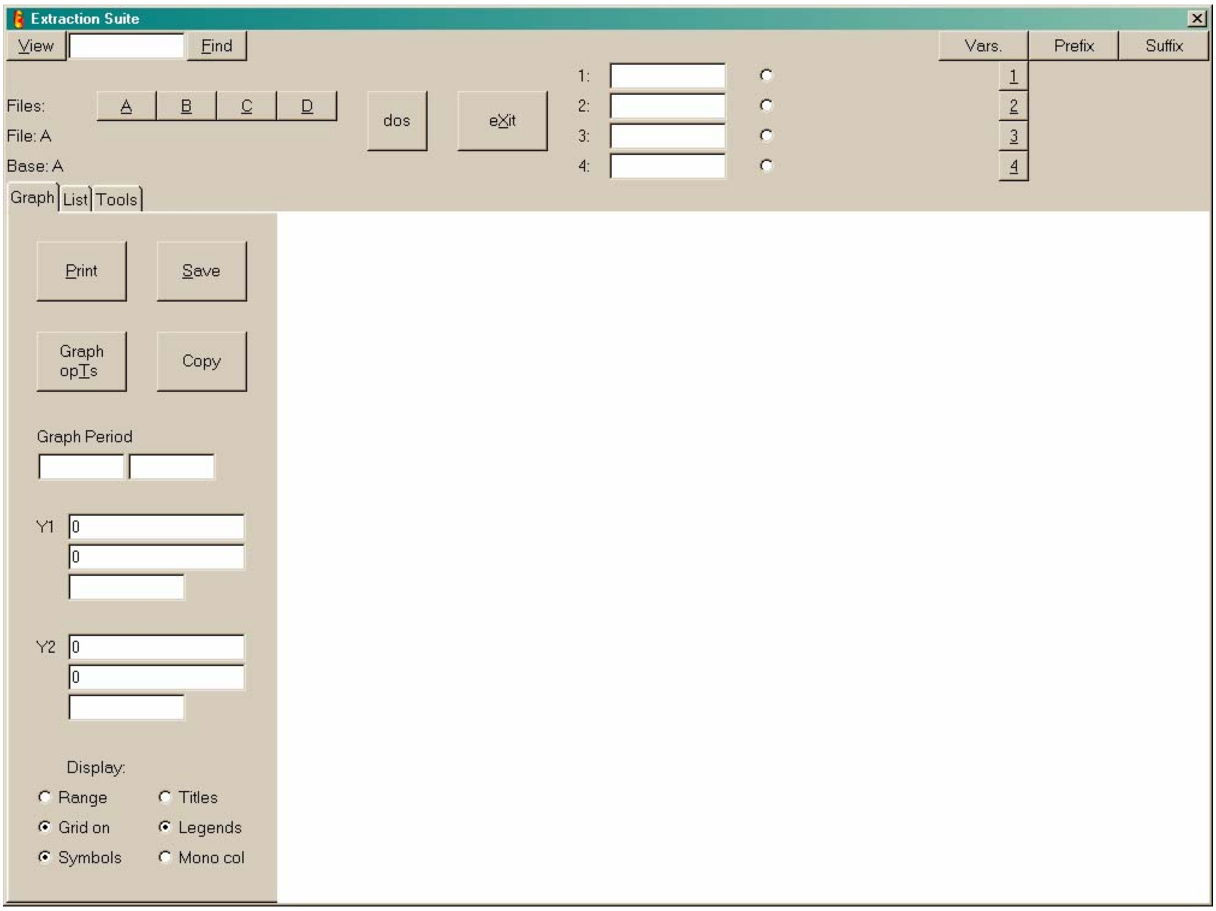
A2.3 Data updating

Data are mainly collected from the data base in Nigem (National Institute Global Econometric Model) and otherwise from Statistics Sweden or Ecowin. The data are quarterly and the base from Nigem hence is updated four times a year.

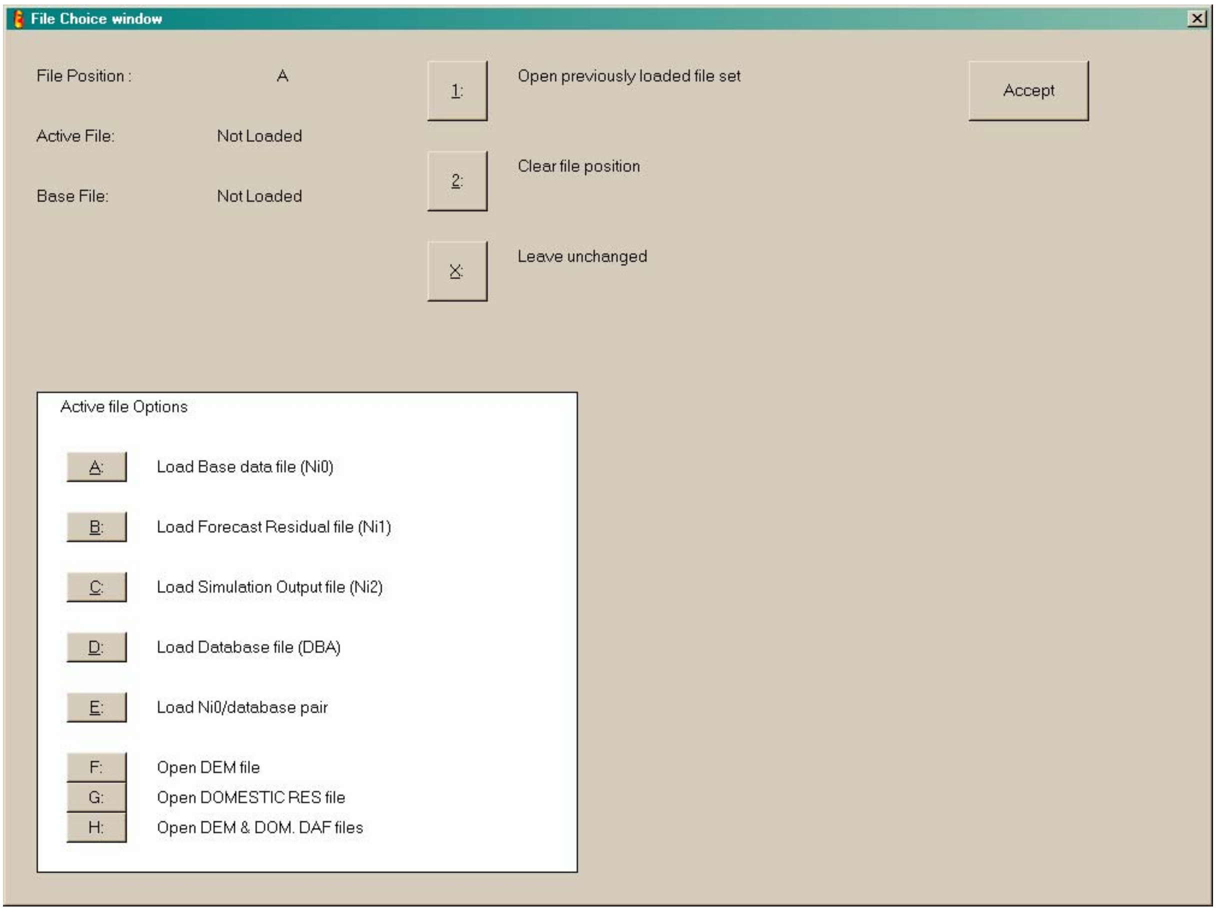
Data from Nigem presupposes that you have a license for that program and extract data from within Nigem. To do that open the

Niesr EXTGEM

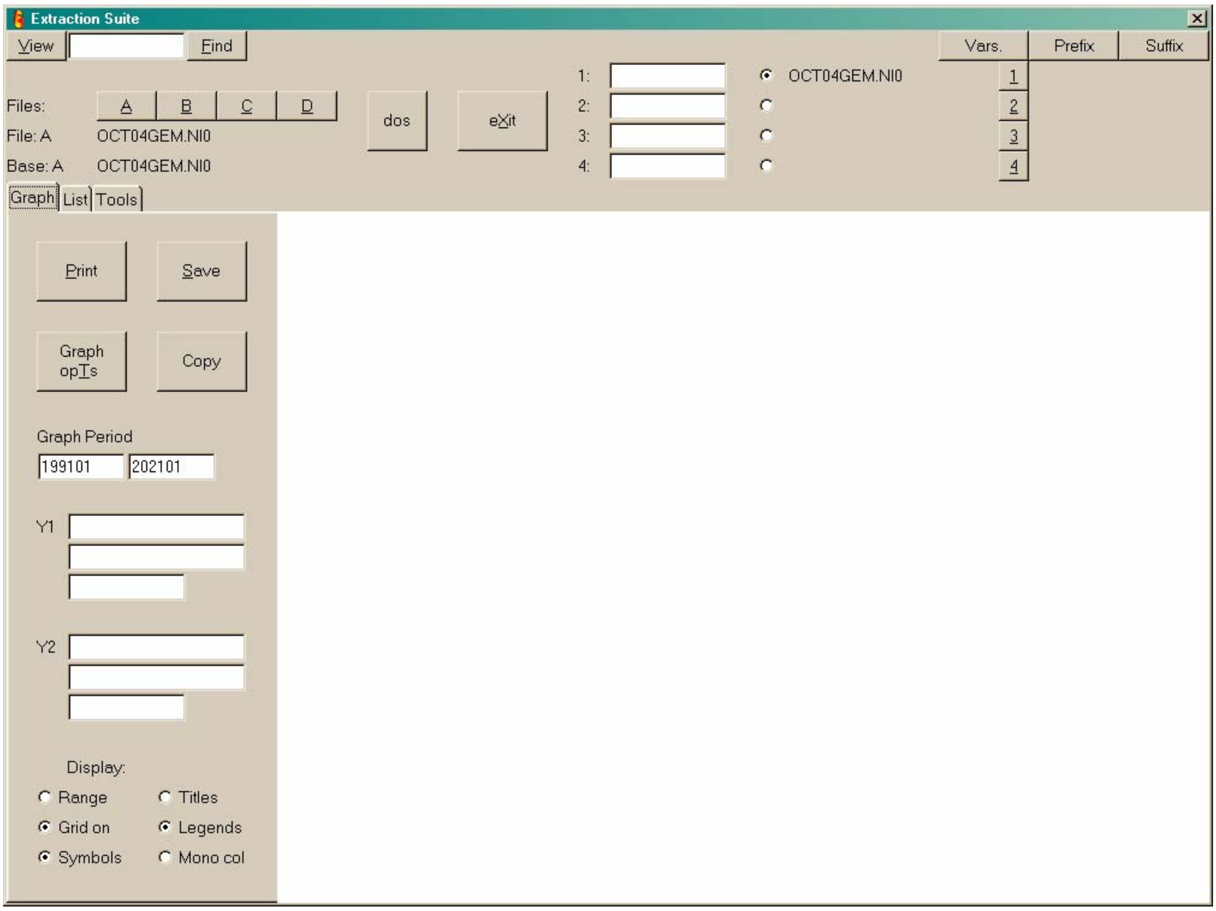
module and you'll find the following screen



Click on button A and you'll find

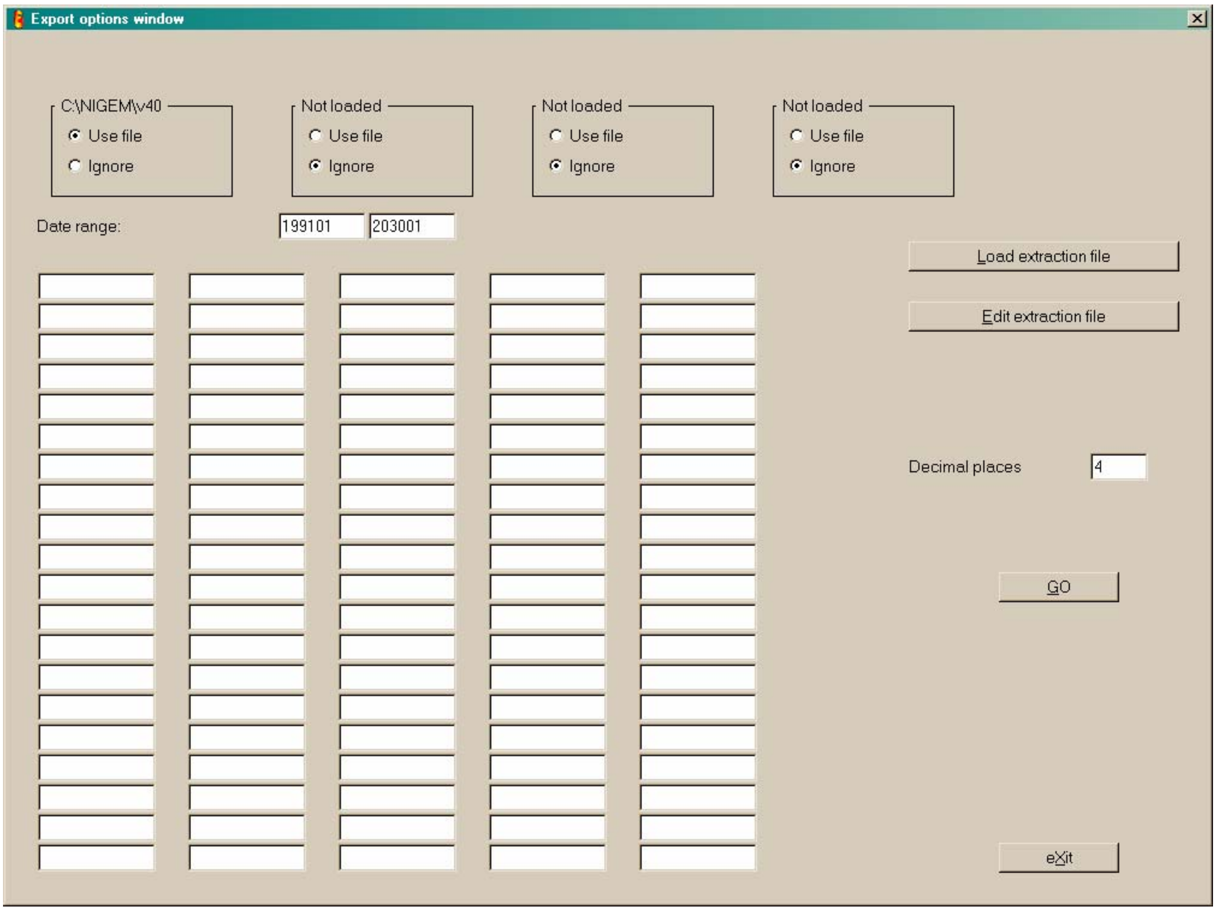


Click on A (Load Base data file (Ni0)) and choose the suggested file. Click on the button Accept. Then the following screen appears

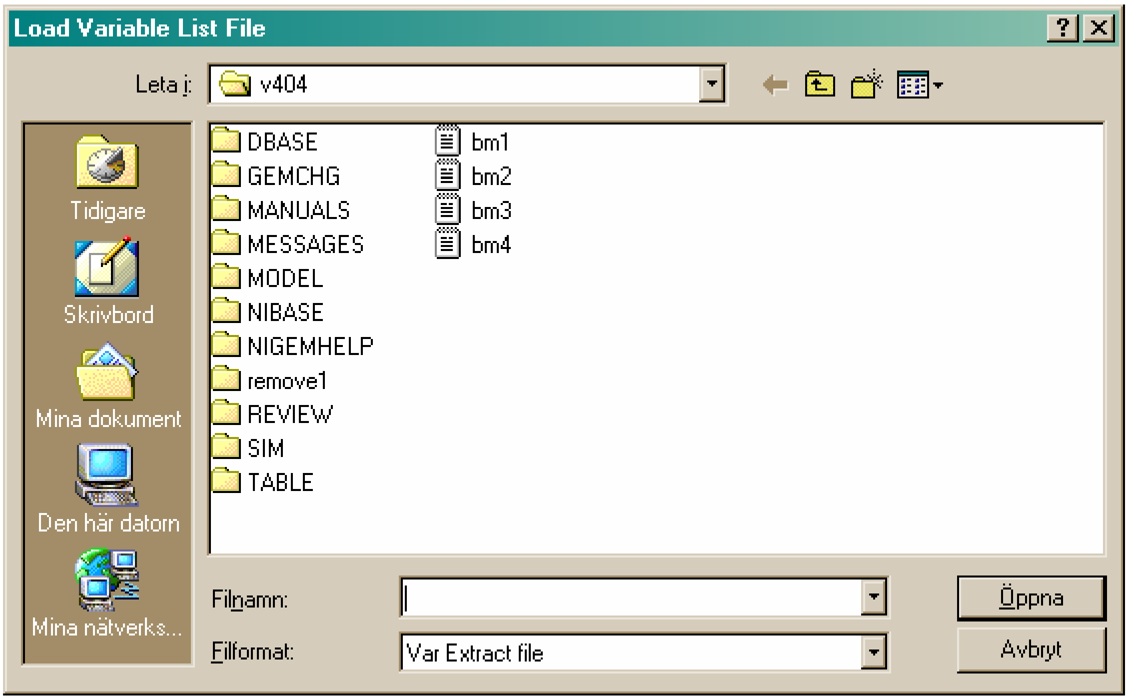


and you click on Tools to find

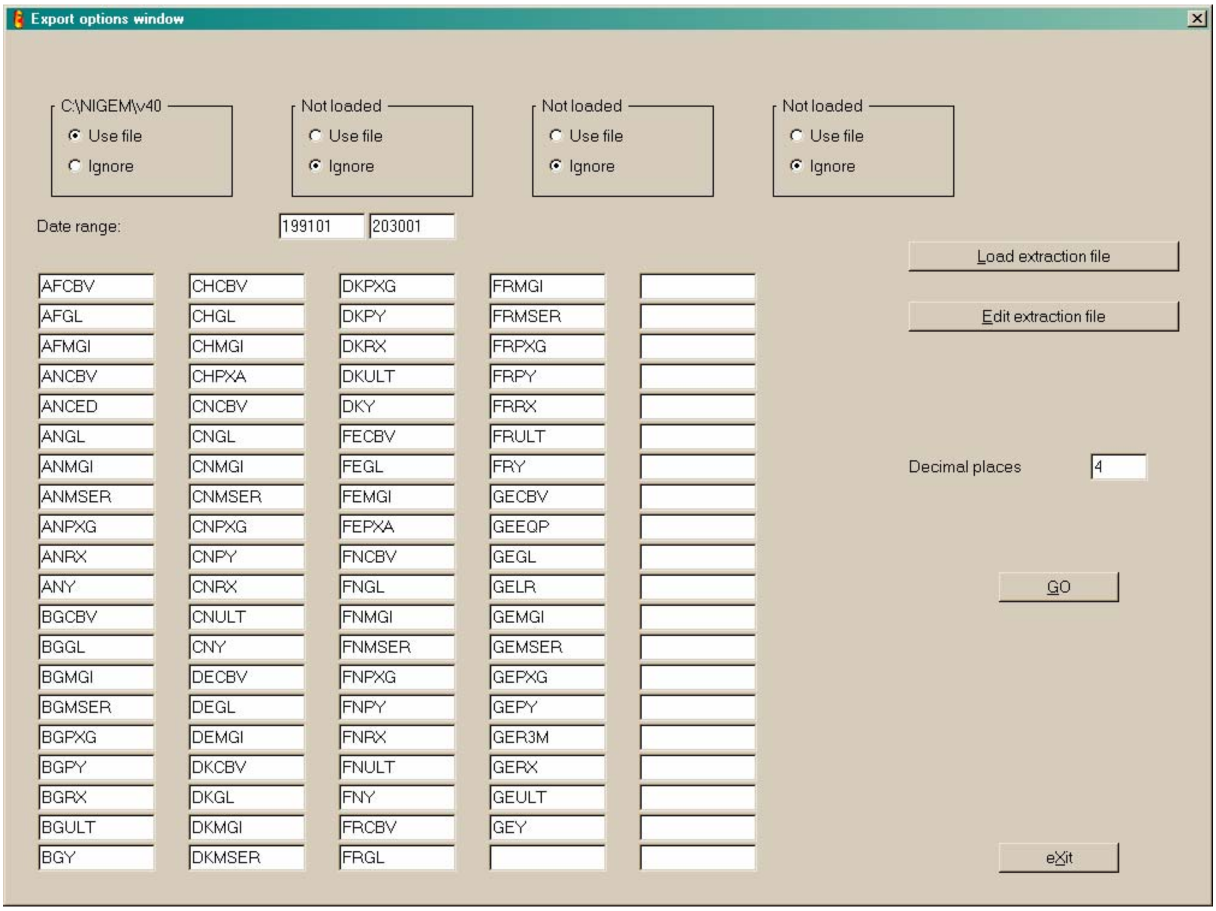
where you choose 1: Excel Import format. Then you find



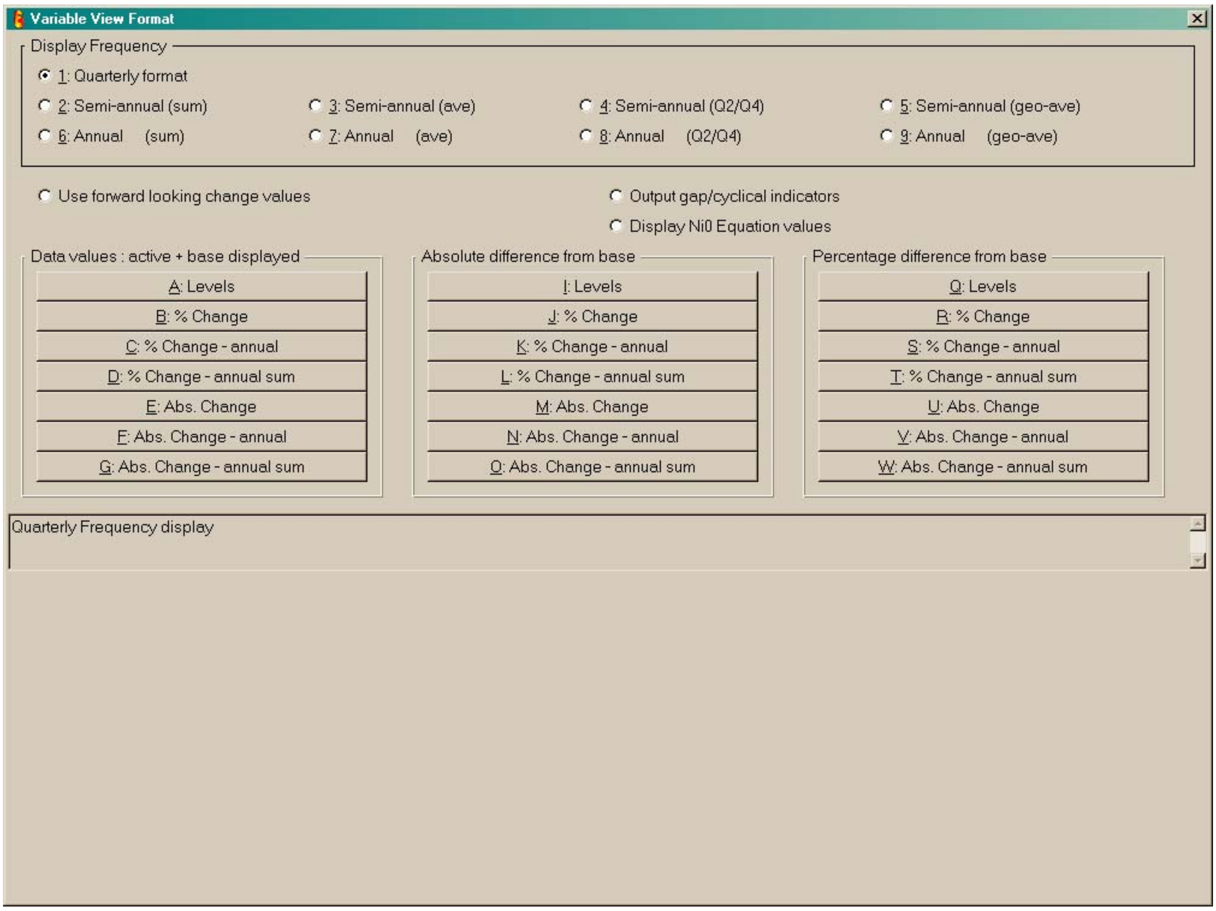
and you choose Load extraction file. Then the screen



pops up and you choose to open the suggested file bm1. The screen



then appears and you can notice that variables from AFCBV to GEY are going to be extracted. Click on Go and



appears. You choose A: Levels to get a new pop-up screen on which you choose a name for your Excel sheet. I choose bm1 and the file then will be

bm1.xlz

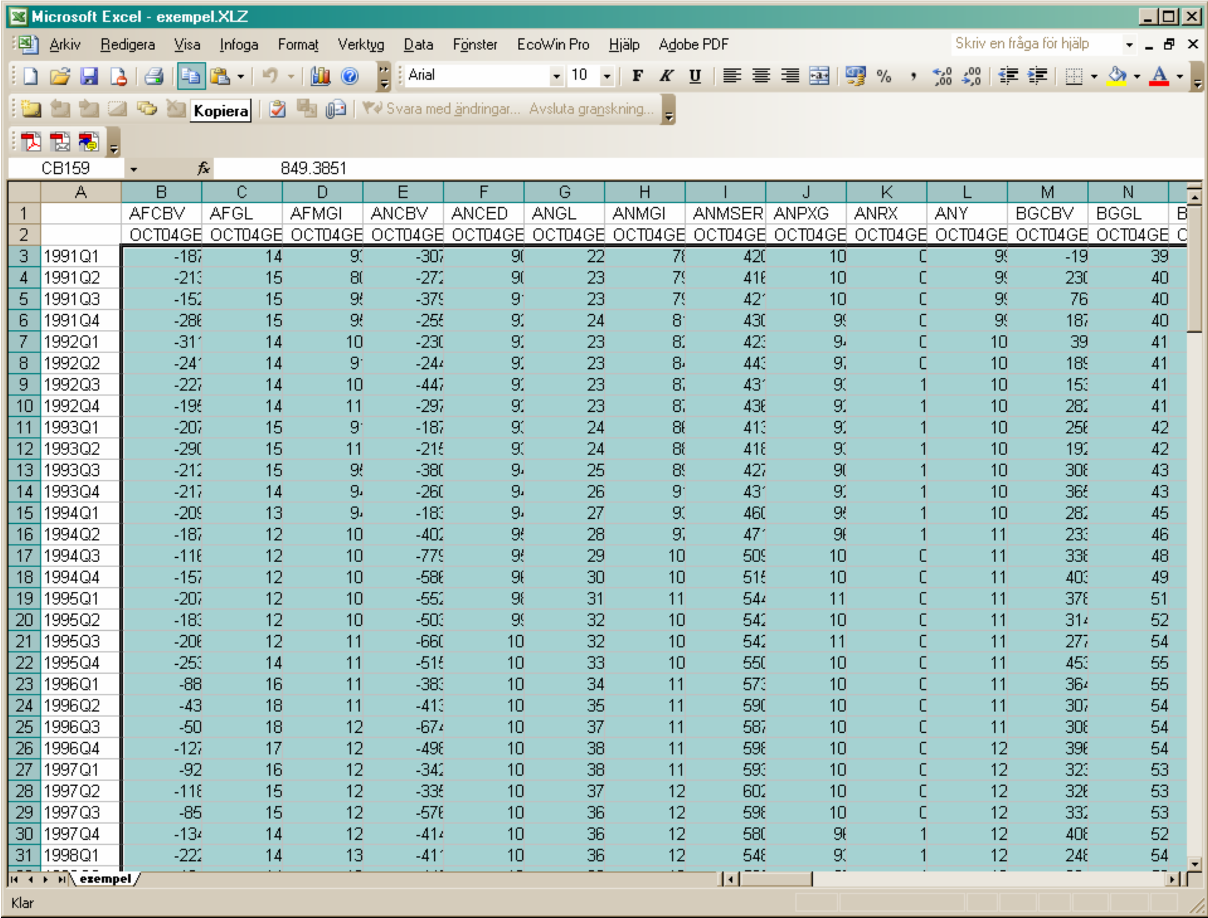
You will have to repeat these steps 4 times. You do it for all the extraction files

bm1.ext
bm2.ext
bm3.ext
bm4.ext

to get the Excel sheets

bm1.xlz
bm2.xlz
bm3.xlz
bm4.xlz

The next step is to copy and paste the data from Excel to Eviews. You then open the first Excel sheet bm1.xlz and choose Kopiera for all of the data in the sheet:

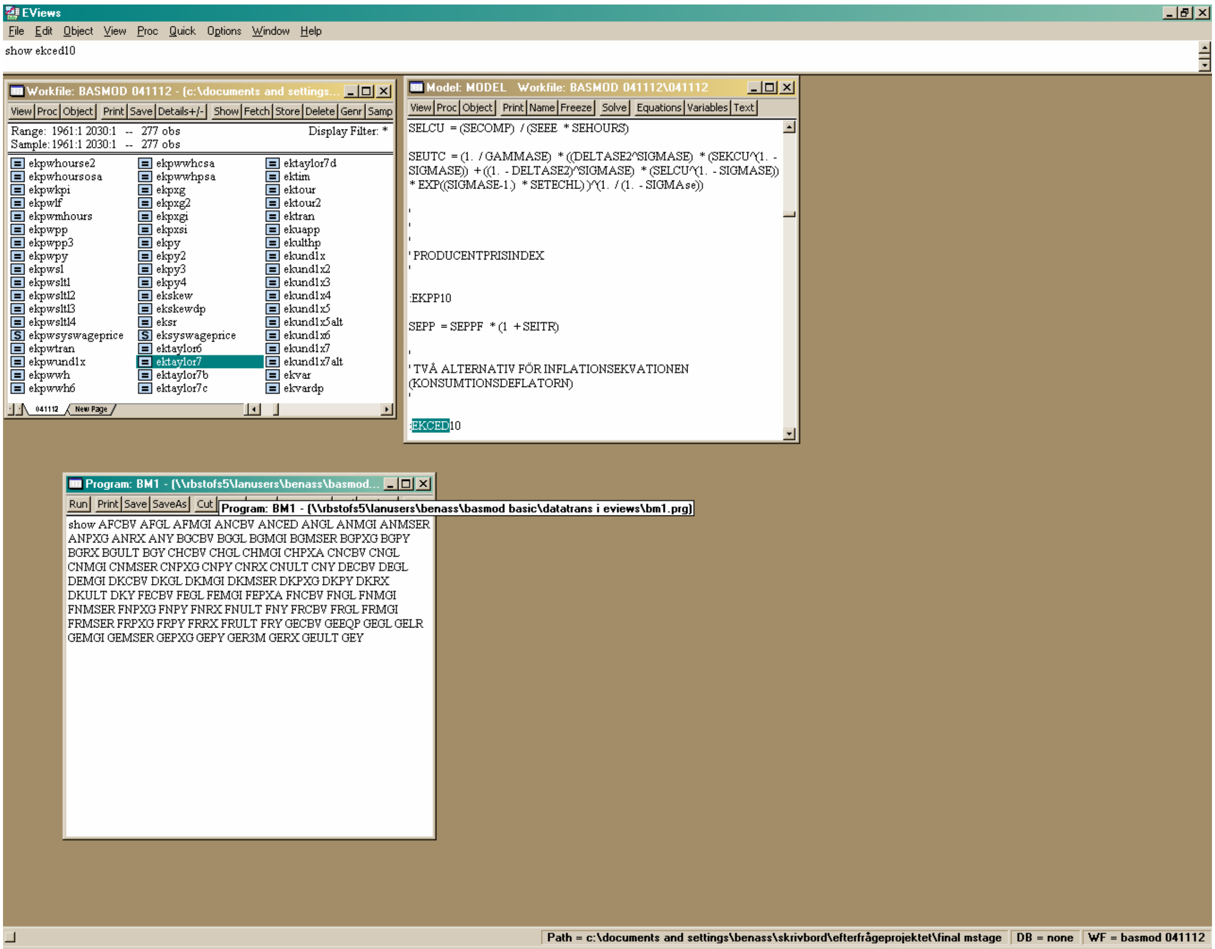


	A	B	C	D	E	F	G	H	I	J	K	L	M	N
1		AFCBV	AFGL	AFMGI	ANCBV	ANCED	ANGL	ANMGI	ANMSER	ANPXG	ANRX	ANY	BGCBV	BGGL
2		OCT04GE	OCT04GE	OCT04GE	OCT04GE	OCT04GE	OCT04GE	OCT04GE	OCT04GE	OCT04GE	OCT04GE	OCT04GE	OCT04GE	OCT04GE
3	1991Q1	-187	14	93	-307	90	22	78	420	10	0	99	-19	39
4	1991Q2	-213	15	80	-272	90	23	79	418	10	0	99	230	40
5	1991Q3	-152	15	98	-379	91	23	79	421	10	0	99	76	40
6	1991Q4	-288	15	98	-255	92	24	81	430	99	0	99	187	40
7	1992Q1	-311	14	10	-230	92	23	82	423	94	0	10	39	41
8	1992Q2	-241	14	91	-244	92	23	84	443	97	0	10	189	41
9	1992Q3	-227	14	10	-447	92	23	87	431	93	1	10	153	41
10	1992Q4	-195	14	11	-297	92	23	87	438	92	1	10	282	41
11	1993Q1	-207	15	91	-187	93	24	88	413	92	1	10	258	42
12	1993Q2	-290	15	11	-215	93	24	88	418	93	1	10	192	42
13	1993Q3	-212	15	98	-380	94	25	89	427	90	1	10	308	43
14	1993Q4	-217	14	94	-260	94	26	91	431	92	1	10	365	43
15	1994Q1	-209	13	94	-183	94	27	93	460	95	1	10	282	45
16	1994Q2	-187	12	10	-402	95	28	97	471	96	1	11	233	46
17	1994Q3	-116	12	10	-779	95	29	10	509	10	0	11	338	48
18	1994Q4	-157	12	10	-588	96	30	10	515	10	0	11	403	49
19	1995Q1	-207	12	10	-552	98	31	11	544	11	0	11	378	51
20	1995Q2	-183	12	10	-503	99	32	10	542	10	0	11	314	52
21	1995Q3	-208	12	11	-660	10	32	10	542	11	0	11	277	54
22	1995Q4	-253	14	11	-515	10	33	10	550	10	0	11	453	55
23	1996Q1	-88	16	11	-383	10	34	11	573	10	0	11	364	55
24	1996Q2	-43	18	11	-413	10	35	11	590	10	0	11	307	54
25	1996Q3	-50	18	12	-674	10	37	11	587	10	0	11	308	54
26	1996Q4	-127	17	12	-498	10	38	11	598	10	0	12	398	54
27	1997Q1	-92	16	12	-342	10	38	11	593	10	0	12	323	53
28	1997Q2	-118	15	12	-335	10	37	12	602	10	0	12	328	53
29	1997Q3	-85	15	12	-578	10	36	12	598	10	0	12	332	53
30	1997Q4	-134	14	12	-414	10	36	12	580	96	1	12	408	52
31	1998Q1	-222	14	13	-411	10	36	12	548	93	1	12	248	54

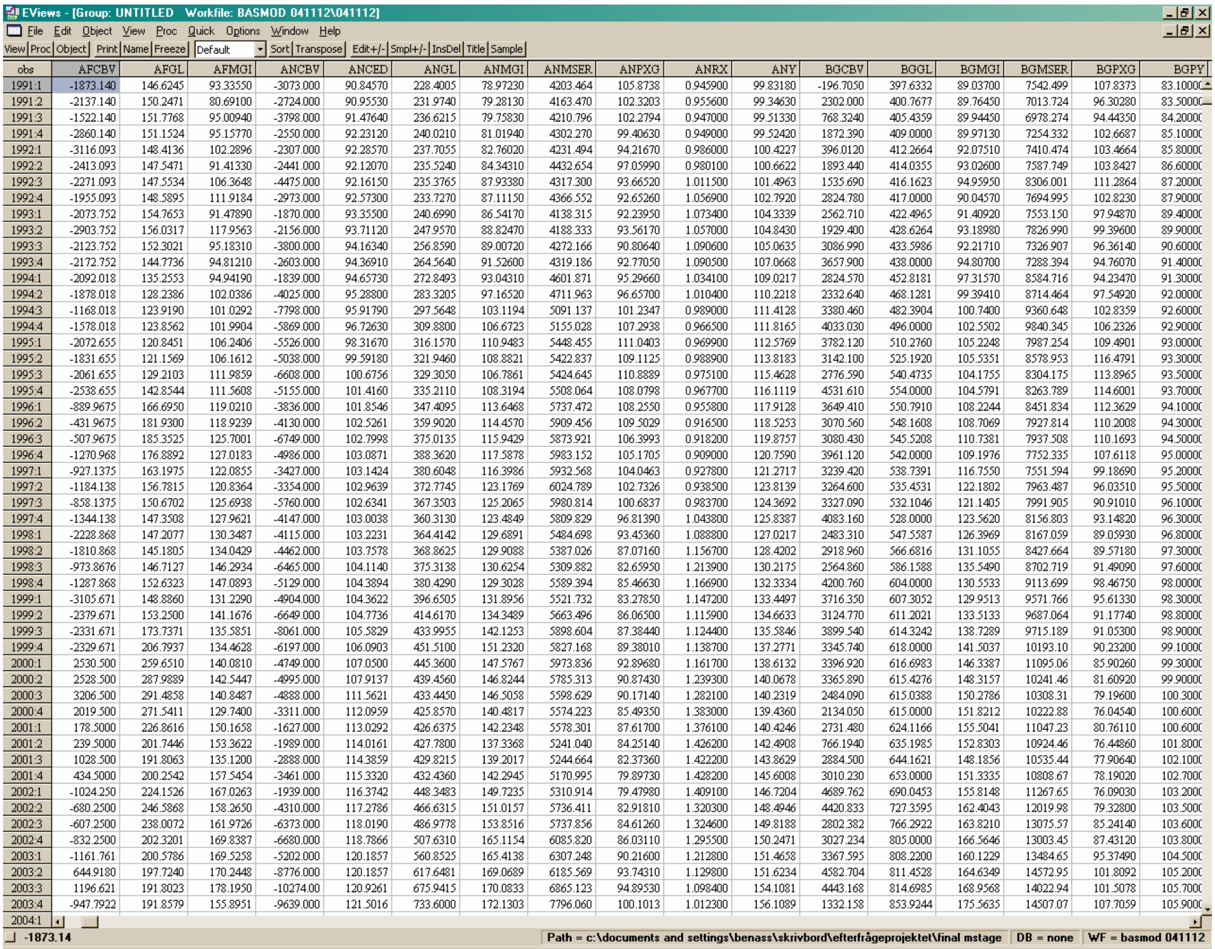
You should also open the Eviews workfile with BASMOD. Within Eviews you open the program file bm1.prg which is located on

S:\APP\APP Modellenheten\BASMOD\BASE\0402\bm1.prg

and find something like the following screen:



Click on the button Run in the Programs window and you find



the relevant variables opened in a Group window. You now shall copy the data from Excel inte Eviews. Put the cursor in the 1991:1 cell for AFCBV and then Click on the Edit+/- button.

Now you can Paste your data into Eviews by clicking on the right-button on your mouse and choose Paste.

Again, repeat these steps 4 times. Then the data extraction from Nigem to Eviews is finished.

Now you also have to do some transformations of the new data. You do that by loading the program

S:\APP\APP Modellenheten\BASMOD\BASE\0402\data transformations.prg

into Eviews and run it.

Hopefully, you are now finished and can run BASMOD with the new data. With a little luck you can perform this procedure on less than half an hour.

Appendix 3: The Labour Market with Prices and Wages in AMOD

(Notation is here changed to a more well-known and convenient form.)

In the simplified description above we used a production function in which output Y only depended on labour input H. Suppose instead that we use the more general production function

$$Y = F(K, HA)$$

where K is the capital stock and H is the number of hours worked. We also use the definition

$$E \equiv \frac{H}{H^M}$$

where H^M is the mean number of hours worked. HA is the number of efficient hours worked where A is an efficiency index. A can be measured in various ways and BASMOD uses two alternative specifications, one in which A follows a simple time trend and the other more complicated specification in which A depends on the degree of education of the employed.

The specification of the production function and other functions in the model is also a somewhat delicate matter. Macro models often employ simple functional forms – like the Cobb-Douglas. However, empirical studies often tend to reject the simple forms and favour more flexible models like the Translog or different versions of CES. Functional forms and the dynamic specification have been compared in the process of finding a suitable specification.

More generally, there is a profit function

$$\text{Profit} = P(Y)Y - WH - \rho K$$

where $P(Y)$ is the demand function and ρ the user cost of capital. An equivalent formulation is

$$\text{Profit} = P(Y)Y - \frac{W}{A}HA - \rho K$$

in terms of the shadow wage rate $W^* \equiv \dfrac{W}{A}$ and efficient hours $H^* \equiv HA$. With this setup the conventional analysis can be carried out in terms of shadow wages and efficient hours and a suitable specification of the efficiency index. The cost function can be written[13]

$$C = C(Y, W^*, \rho)$$

The cost function is very important since its partial derivatives determine both the demand for inputs and the marginal cost.

[13] To save notations we use the convention that C denotes both cost *and* the cost function and likewise for some other functions.

The demand for labour is determined by the partial derivative of the cost function w.r.t. W^* and gives

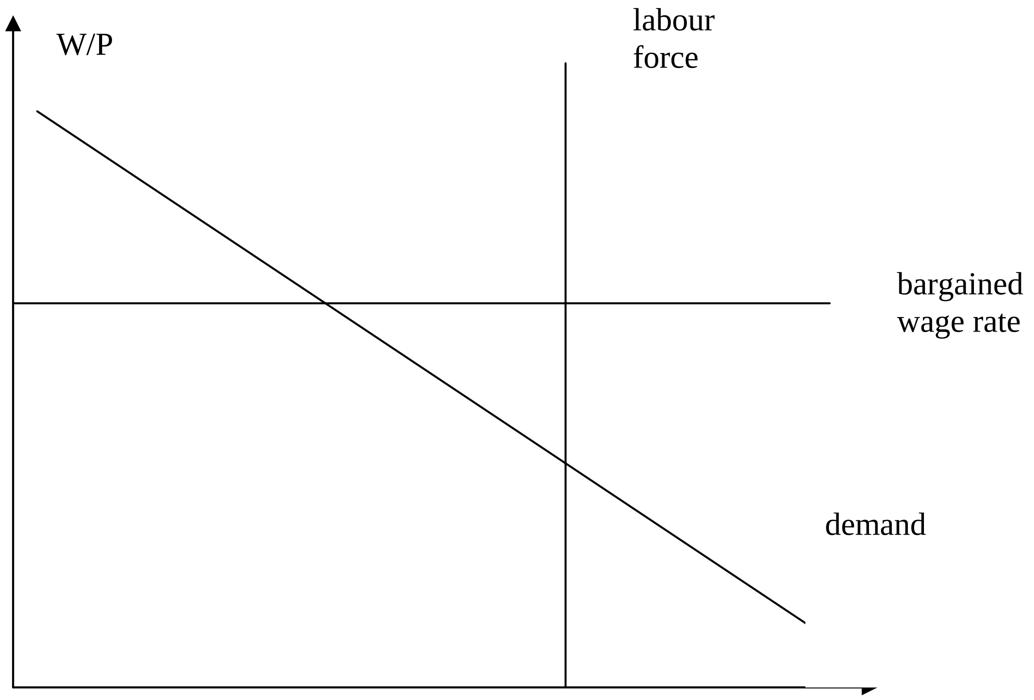
$$H = H(Y, W^*, \rho)A^{-1}$$

i.e. hours demanded generally depend on the same variables that enter the cost function. Note also that the demand system – i.e. the demand for labour as well as capital – implies that the demand for capital can be derived as a residual equation once the demand for labour has been estimated and established:

$$K = K(Y, W^*, \rho)$$

so that the system implied by the two demand functions above is singular.

It is then assumed that the labour market is characterized by union negotiations and that the unions try to achieve a high wage share. We assume that the wage share depends on some structural factors and the rate of unemployment. As it turns out, the wage share depends positively on the replacement ratio and negatively on the rate of unemployment [Pissarides, 2000]. It is also assumed that the power of the unions is strong so that the real wage rate ends up at a level above the competitive wage rate. Therefore the demand for labour determines equilibrium in the labour market. The properties of the market is illustrated in the diagram below.



The real wage rate is on the vertical axis and employment on the horizontal axis. The definition $E \equiv \frac{H}{H^M}$ is used so that the level of employment is determined once H^M is determined and the rate of unemployment once the labour force L is determined.

The mean number of hours is determined by the equation

$$H^M = H^M(\frac{W}{P})$$

and the labour force by the equation

$$L = L(\frac{W}{P}, T)$$

where T is a time trend.

Appendix 4: The code as of 2005-01-26

```
' MODEL
' HANDELSEKVATIONER
' VAROR
'
'

:EKXG
@INNOV SEXG  0.0246074

:EKMG
@INNOV SEMG  0.0193846

'
' TJÄNSTER
'

:EKXS
@INNOV SEXS  0.0365864

SEMSER  = (SEMS  * .01  * SECED)  / SERX

:EKMS
@INNOV SEMS  0.0298613

SEXSER  = (SEXS  * .01  * SECED)  / SERX

SECSHARE  = ((sec  - sec(-4))  * 100)  / sey(-4)

SEISHARE  = ((sei  - sei(-4))  * 100)  / sey(-4)

SEGCSHARE  = ((segc  - segc(-4))  * 100)  / sey(-4)

SEGSHARE  = ((segc  + segi  - segc(-4)  - segi(-4))  * 100)  / sey(-4)

SEXSHARE  = ((sex  - sex(-4))  * 100)  / sey(-4)

SEMSHARE  = ((sem  - sem(-4))  * 100)  / sey(-4)

SENXSHARE  = (((sex  - sex(-4))  - (sem  - sem(-4)))  * 100)  / sey(-4)

' EXPORTPRISINDEX

:EKPXG
@INNOV SEPXG  0.0132315

:EKPXGI
@INNOV SEPXGI  0.0137318

:EKPXSI
@INNOV SEPXSI  0.0092025

:EKPMGI
@INNOV SEPMGI  0.0123133

SEPMG  = (.05577195  * USPXG  + .03293201  * JPPXG  + .21025142  * GEPXG  + .05915811  * FRPXG  +
.03828789  * ITPXG  + .11362429  * UKPXG  + .00292139  * CNPXG  + .03618538  * BGPXG  + .05017263
* NLPXG  + .01241590  * SPPXG  + .09142617  * DKPXG  + .00179267  * GRPXG  + .01199540  * IRPXG
+ .00964943  * PTPXG  + .01389873  * OEPXG  + .07197238  * FNPXG  + .07115351  * NWPXG  +
```

```
.00000000  * SEPXG  + .02195467  * SWPXG  + .00278860  * ANPXG  + .00776824  * SKPXG  + .00075248
* MXPXG  + .01520450  * VGPXG  + .01431923  * LAPXG  + .04253718  * FEPXG  + .01106586  * CHPXG)
* SERX  / DSDRX94

:EKPMSI
@INNOV SEPMSI  0.0081483
'
' KONSUMTIONSFUNKTIONEN
'
:EKC
@INNOV SEC  0.0060096

:EKCSYS
@INNOV SECNOND  0.0067033
'
:EKCOUT
@INNOV SECOUT  0.0353542

:EKCIN
@INNOV SECIN  0.0424943

SECARK  = SECCAR  + (1  - 1  / 60)  * SECARK(-1)

:EKCRES
@INNOV SECRES  582.23542

SECTOT  = SECNOND  + SECDUR  + SECCAR  + SECCH  + SECOUT  - SECIN  + SECRES

'INVESTERINGSFUNKTIONEN OCH PRIS PÅ INVESTERINGAR

:EKPINV
@INNOV SEPINV  0.0097921

SEPSI  = SEHI  + SEBI

'TOBINS Q

SETQ  = (SEEQP  / SEPINV)

:EKHI
@INNOV SEHI  0.0411564

:EKBI
@INNOV SEBI  0.0270192

:EKHS

SEPSI  = SEHI  + SEBI

' LAGEREKVATIONEN

:EKDS
@INNOV SEDS  3676.9358

SESL  = SESL(-1)  + D(SEDS)

'
' OFFENTLIG KONSUMTION OCH INVESTERINGAR
'
:EKGC
```

```
@INNOV SEGC  0.0020856

:EKGI
@INNOV SEGI  0.0014927

SEI  = SEGI  + SEPSI

' ARBETSMARKNADEN
'
:EKUAPP
@INNOV SEUAPP  0.2614756

SEHOURSSHARE  = ((sehours  - sehours(-4))  * 100)  / setim(-4)

SEESHARE  = ((see  - see(-4))  * 100)  / setim(-4)

'
'TIMMAR

:EKHOURS
@INNOV SEHOURS  0.0018384

'
'SYSSELSÄTTNING

:EKEE
@INNOV SEEE  0.0053601

SETIM  = SEE  * SEHOURS

SETIME  = SEEE  * SEHOURS

SECOMPB  = SEWHB  * SETIM

SECOLL  = SECOLLR  * SECOMPB

SECOLLR  = SECOLLR(-1)

SEWT  = SEWTR  * SECOMPB

SEWTR  = SEWTR(-1)

SEWHP  = SEWHB  * (1  + SECOLLR  + SEWTR)

SEWHC  = (SEWHB  * (1  - SEDIRTR))  / (1  + SEITR)

:EKITR
@INNOV SEITR  0.0031586

SEWRP  = SEWHP  / (.01  * SECED)

SEWRB  = SEWHB  / (.01  * SECED)

SEWRC  = SEWHC  / (.01  * SECED)

SEWEDGE  = SEWHC  / SEWHP

SEDIRT  = (SEWHB  * SETIM)  * SEDIRTR

SEDIRTR  = SEDIRTR(-1)
```

```
SECOMP  = SEWHB  * (1  + SEWTR  + SECOLLR)  * SEEE  * SEHOURS

SECOMPE  = SEWHB  * (1  + SEWTR  + SECOLLR)  * (SEEE  * SEHOURS)

SECOMPBE  = SELABSHE

SECOLLE  = SECOLL  * (SEEE  / SEE)

SEWTE  = SEWT  * (SEEE  / SEE)

SEWHBE  = SECOMPBE  / (SEEE  * SEHOURS)

SEWHPE  = SECOMPE  / (SEEE  * SEHOURS)

SEWHCE  = (SEWHBE  * (1  - SEDIRTR))  / (1  + SEITR)

' TVÅ ALTERNATIV FÖR ARBETSUTBUDET

:EKLF
@INNOV SELF  0.0038523

'        TOTAL SYSSELSÄTTNING
'        Tusental
'

SEE  = SEE(-1)  + (SEEE  - SEEE(-1))  + (SEE(-1)  - SEEE(-1))  / SELF(-1)  * (SELF  - SELF(-1))

'
'          ARBETSLÖSHET
'          Procent av arbetskraften
'

SEU  = (SELF  - SEE)  / SELF  * 100.

SEUT  = SEU  + 100  * (SELAT  / (SELAT  + SELF))

:EKLAT
@INNOV SELAT  0.1660174

'SKATTEKIL - KVOTEN MELLAN KONSUMENT- O PRODUCENTLÖN

SELABSH  = SECOMP  / (.01  * SEPY  * SEY)

selabshe  = (sewhb  * (1  + sewtr  + secollr)  * seee  * sehours)  / senom

' LÖNER OCH TRANSFERERINGAR
'TIMLÖN

:EKLABSH6
@ADD SEWHB  SEWHB_A
@INNOV SEWHB  0.0111104

SEREPR  = SEREPR(-1)

'KONSTANT REAL ERSÄTTNINGSNIV

SEDAG  = SECED  * (SEDAG(-1)  / SECED(-1))

SEEK  = SEDAG  / SEWHC
```

```
'LÖNEEKVATION FÖR KENTS DATA
'
'
':EKW4KENT

log(SEMAXDAGP)  = log(SEMAXDAGP(-1))  + dlog(seund1x)

SEPTAX  = SEPTAX(-1)

SETAXRATE  = SETAXRATE(-1)

'LÖNESUMMA
'ERSÄTTNINGSNIVÅ PER PERSON

SECR  = (SETRAN  / (SELF  - SEEE))  / (SECOMP  / SEEE)

'ARBETSPRODUKTIVITET

SEAPROD  = SEY  / (SEE  * SEHOURS)

'TRANSFERERINGAR

:EKTRAN
@INNOV SETRAN  0.0106982

'ENHETSARBETSKOSTNAD

SEULC  = SEWHP  / (SEY  / (SEEE  * SEHOURS))

'TREND I ENHETSARBETSKOSTNAD
'TEKNISKA FRAMSTEG
'
'SETECHL  = 0.00365955  * TIME  * (1  - DUM89)  + (0.00410252  * TIME)  * DUM89  - 120  * DUM89  *
(0.00410252  - 0.00365955)

SETECHL  = (0.00410252  * TIME  - 0.0531564)

SETECHN  = TIME

'KAPACITETSUTNYTTJANDE

DSETECHL  = EXP(SETECHL  - 4  * 0.00410252)

DSECAP  = DELTASE  * ((SEKP  + SEKG)^DSERHO)

DSELAB  = (1  - DELTASE)  * (((SEE  * SEHOURS)  * DSETECHL)^DSERHO)

'
'SEYTREND Trend output

seytrend  = seytrend(-1)  + ((0.12036)  * (((deltase  * ((sekp  + sekg)^dserho))  + ((1.  - deltase)  * (((see  *
sehours)  * (exp(setechl  - 4.  * 0.0041025)))^dserho)))^(1.  / dserho)  - ((deltase  * ((sekp(-1)  + sekg(-
1))^dserho))  + ((1.  - deltase)  * (((see(-1)  * sehours(-1))  * (exp(setechl(-1)  - 4.  * 0.0041025)))^dserho)))^(1.
/ dserho)))  / 0.25

'
' SEOG     Output gap
'
```

```
seog  = (sey  - seytrend)  / seytrend


SEYPOT  = (1.517205146  * (SEKP  + SEKG)^  - 0.1775337187  + (1  - 1.517205146)  * (SEE  * SEHOURS  *
EXP(2650.333928  * TIME  / 10000))^  - 0.1775337187)^(1  /  - 0.1775337187)  + 3.053163599

'SECU  = SEY  / SEYPOT
'

secu  = 0.25  * sey  / ((0.12534  * (1.  - dum89)  + dum89  * 0.12036)  * ( ((deltase  * ( (sekp  + sekg)^dserho))
+ ((1.  - deltase)  * ( ((see  * sehours)  * dsetechl)^dserho)))^(1.  / dserho)))  + 0.03

SEKCU  = SEUSER  * (SECED  / 100.0)

SELCU  = (SECOMP)  / (SEEE  * SEHOURS)

SEUTC  = (1.  / GAMMASE)  * ((DELTASE2^SIGMASE)  * (SEKCU^(1.  - SIGMASE))  + ((1.  -
DELTASE2)^SIGMASE)  * (SELCU^(1.  - SIGMASE))  * EXP((SIGMASE-1.)  * SETECHL) )^(1.  / (1.  -
SIGMAse))

' PRODUCENTPRISINDEX
'
:EKPP
@INNOV SEPP  0.0119439

'
' TVÅ ALTERNATIV FÖR INFLATIONSEKVATIONEN (KONSUMTIONSDEFLATORN)
'
:EKCED
@INNOV SECED  0.0048024

' EN EKVATION FÖR UND1X
'
:EKUND1X5alt
@INNOV SEUND1X  0.0058699

SEUNDINF  = 100  * @PCHY(SEUND1X)

'
' EKVATION FÖR BNP-DEFLATORN
'
:EKPY
@INNOV SEPY  0.0055014

' EKVATION FÖR KPI
'
:EKKPI
@INNOV SEKPI80  0.0047816

':PRICESYSTEM
'
SESKEW  = SESKEWPRED

SEVAR  = SEVARPRED

':EKVAR
'
':EKVARDP
'
' VÄRLDSMARKNADSPRISER ENLIGT APP
```

```
WDXPI  = EXP(0.06  * LOG(BGPXG  * BGRX  / 33.423225)  + 0.046  * LOG(CNPXG  * CNRX  /
1365.549957)  + 0.022  * LOG(DKPXG  * DKRX  / 6.360575)  + 0.018  * LOG(FNPXG  * FNRX  / 5.223525)
+ 0.1  * LOG(FRPXG  * FRRX  / 5.547475)  + 0.203  * LOG(GEPXG  * GERX  / 1.622200)  + 0.078  *
LOG(ITPXG  * ITRX  / 1611.372742)  + 0.098  * LOG(JPPXG  * JPRX  / 102.187752)  + 0.066  *
LOG(NLPXG  * NLRX  / 1819.149994)  + 0.009  * LOG(NWPXG  * NWRX  / 7.057580)  + 0.022  *
LOG(OEPXG  * OERX  / 11.421850)  + 0.035  * LOG(SWPXG  * SWRX  / 1.3677)  + 0.097  * LOG(UKPXG
* UKRX  / 653.102066)  + 0.146  * LOG(USPXG  * USRX))

' VARLDSMARKNADSTILLVÄXT ENLIGT APP

SESAPP  = EXP((5.7  * LOG(DKMGI)  + 5.2  * LOG(FNMGI)  + 10.7  * LOG(GEMGI)  + 5.2  *
LOG(FRMGI)  + 3.7  * LOG(ITMGI)  + 9.1  * LOG(UKMGI)  + 5.0  * LOG(NLMGI)  + 4.4  * LOG(BGMGI)
+ 2.7  * LOG(SPMGI)  + 1.0  * LOG(OEMGI)  + 0.6  * LOG(GRMGI)  + 0.6  * LOG(IRMGI)  + 0.5  *
LOG(PTMGI)  + 8.2  * LOG(NWMGI)  + 1.7  * LOG(POMGI)  + 1.3  * LOG(SWMGI)  + 0.6  *
LOG(CRMGI)  + 0.4  * LOG(HUMGI)  + 0.2  * LOG(SLMGI)  + 3.5  * LOG(DEMGI)  + 10.2  *
LOG(USMGI)  + 2.9  * LOG(JPMGI)  + 2.1  * LOG(CHMGI)  + 0.6  * LOG(SKMGI)  + 3.5  * LOG(FEMGI)
+ 1.1  * LOG(ANMGI)  + 1.1  * LOG(CNMGI)  + 1.0  * LOG(MXMGI)  + 1.8  * LOG(LAMGI)  + 1.5  *
LOG(AFMGI))  / 96.1)

'
' EKVATION FÖR FASTIGHETSMARKNADEN
'

:EKHW
@INNOV SEHW  0.020871

SERHW  = SEHW  / (.01  * SECED)

SEGW  = SENW  + SELIABS

SERGW  = SEGW  / (.01  * SECED)

SETNW  = SEHW  + SENW

SETRNW  = SETNW  / (.01  * SECED)
'
' AKTIEMARKNADEN
'
':EKEQP
'
:EKEQP
@INNOV SEEQP  0.1050551

'
' TAYLOR-REGLER FÖR PENNINGPOLITIKEN
'
':EKTAYLOR
'
SER3M  = .6  * SER3M(-1)  + 1.65  + 1.2  * ((1  / 55)  * (@PCY(SEUND1X(+1))  - 2)  + (2  / 55)  *
(@PCY(SEUND1X(+2))  - 2)  + (3  / 55)  * (@PCY(SEUND1X(+3))  - 2)  + (4  / 55)  *
(@PCY(SEUND1X(+4))  - 2)  + (5  / 55)  * (@PCY(SEUND1X(+5))  - 2)  + (6  / 55)  *
(@PCY(SEUND1X(+6))  - 2)  + (7  / 55)  * (@PCY(SEUND1X(+7))  - 2)  + (8  / 55)  *
(@PCY(SEUND1X(+8))  - 2)  + (9  / 55)  * (@PCY(SEUND1X(+9))  - 2)  + (10  / 55)  *
(@PCY(SEUND1X(+10))  - 2))

'SER3M  = .67  * SER3M(-1)  + 1.5  + 1.2  * ((1  / 55)  * (@PCY(SEKPI80(+1))  - 2)  + (2  / 55)  *
(@PCY(SEKPI80(+2))  - 2)  + (3  / 55)  * (@PCY(SEKPI80(+3))  - 2)  + (4  / 55)  * (@PCY(SEKPI80(+4))  -
2)  + (5  / 55)  * (@PCY(SEKPI80(+5))  - 2)  + (6  / 55)  * (@PCY(SEKPI80(+6))  - 2)  + (7  / 55)  *
```

(@PCY(SEKPI80(+7)) - 2) + (8 / 55) * (@PCY(SEKPI80(+8)) - 2) + (9 / 55) * (@PCY(SEKPI80(+9)) - 2) + (10 / 55) * (@PCY(SEKPI80(+10)) - 2))
'
'SER3M = .67 * SER3M(-1) + 2.5 + 1.2 * ((1 / 55) * (@PCY(SEKPI80(+1)) - 2.75) + (2 / 55) * (@PCY(SEKPI80(+2)) - 2.75) + (3 / 55) * (@PCY(SEKPI80(+3)) - 2.75) + (4 / 55) * (@PCY(SEKPI80(+4)) - 2.75) + (5 / 55) * (@PCY(SEKPI80(+5)) - 2.75) + (6 / 55) * (@PCY(SEKPI80(+6)) - 2.75) + (7 / 55) * (@PCY(SEKPI80(+7)) - 2.75) + (8 / 55) * (@PCY(SEKPI80(+8)) - 2.75) + (9 / 55) * (@PCY(SEKPI80(+9)) - 2.75) + (10 / 55) * (@PCY(SEKPI80(+10)) - 2.75))
'

'VAXELKURS

SERX = SERX(+1) / (1.0 + (SER3M / 100) - (USR3M) / 100) - 0.16

secpx = 0.0974988 * uspxg + 0.0757028 * jppxg + 0.1554050 * gepxg + 0.0815971 * frpxg + 0.0607433 * itpxg + 0.0716316 * ukpxg + 0.0277375 * cnpxg + 0.0398269 * bgpxg + 0.0574854 * nlpxg + 0.0239021 * sppxg + 0.0225737 * dkpxg + 0.0024537 * grpxa + 0.0131337 * irpxg + 0.0077288 * ptpxg + 0.0177686 * oepxg + 0.0131367 * fnpxg + 0.0174807 * nwpxg + 0.0000000 * sepxg + 0.0245288 * swpxg + 0.0106347 * anpxg + 0.0148706 * skpxg + 0.0089329 * mxpxg + 0.0155221 * vgpxa + 0.0267359 * lapxa + 0.0919796 * fepxa + 0.0209889 * chpxa

SEPXGKR = SEPXG * SERX

SERPX = (SEPXGKR / SERX) / SECPX

'
' TOTAL IMPORT- RESPEKTIVE EXPORTVOLYM, KR 1994 P
'

semvol = semg + sems

sexvol = sexg + sexs

SEX = SEXG + SEXS

SEM = SEMG + SEMS

' EXPORTPRISER, ALLA VAROR OCH TJÄNSTER
' Variabel - PXA
' Index, 1994=100

SEPXA = (0.814984 * SEPXG + 0.02205 * (0.159459 * WDPO + 0.840541 * SEPXG) + 0.13833 * WDPFDV + 0.018035 * WDPANF + 0.002766 * WDPMM + 0.003834 * WDPFLD)

' IMPORTPRISER, ALLA VAROR OCH TJÄNSTER
' Variabel - PMA Index 1994=100
'
SEPMA = 0.735752 * SEPMG + (0.081919 * (0.65257 * WDPO + 0.34743 * WDPXG) + 0.124675 * WDPFDV + 0.011948 * WDPFLD + 0.036237 * WDPANF + 0.00947 * WDPMM) * SERX / DSDRX94

DLOG(WDYHP) = 0.022

:EKWDPP
@INNOV WDPP 0.0025133

' EXPORT AV VAROR OCH TJÄNSTER, VÄRDE
' Variabel - XGV Mijoner dollar

sexgv = (sepxa00 / 100.) * (sexgi / 100.) * (13.09276 / 100.) * 116879.50000

```
'       IMPORT AV VAROR OCH TJÄNSTER, VÄRDE
'       Variabel - MGV  Miljoner dollar

semgv  = ( (sepma00  / 100.)  * (semgi  / 100.)  * (95.14767  / 100.)  * 104968.75000)  / serx

'  TRANSFERERINGAR I BETALNINGSBALANSEN

SEBPT  = (SECED  / SERX)  / 12.  * (SEBPT(-1)  * SERX(-1)  / SECED(-1)  + SEBPT(-2)  * SERX(-2)  /
SECED(-2)  + SEBPT(-3)  * SERX(-3)  / SECED(-3)  + SEBPT(-4)  * SERX(-4)  / SECED(-4)  + SEBPT(-5)  *
SERX(-5)  / SECED(-5)  + SEBPT(-6)  * SERX(-6)  / SECED(-6)  + SEBPT(-7)  * SERX(-7)  / SECED(-7)  +
SEBPT(-8)  * SERX(-8)  / SECED(-8)  + SEBPT(-9)  * SERX(-9)  / SECED(-9)  + SEBPT(-10)  * SERX(-10)  /
SECED(-10)  + SEBPT(-11)  * SERX(-11)  / SECED(-11)  + SEBPT(-12)  * SERX(-12)  / SECED(-12))

'       BYTESBALANS
'       Miljioner dollar

SECBV  = SEXG  * .01  * (SEPXA00  / SERX)  - SEMG  * .01  * (SEPMA00  / SERX)  + SEXSER  -
SEMSER  + SEIPDC  - SEIPDD  + SEBPT

SECBV2  = SEXG  * SEPXGI  / SERX  + SEXS  * SEPXSI  / SERX  - SEMG  * SEPMGI  / SERX  - SEMS  *
SEPMSI  / SERX  + SEIPDC  - SEIPDD  + SEBPT

SECBR  = SECBV  * SERX  / (SEY  * SEPY  / 100.0)  * 100.0

SECBR2  = SECBV2  * SERX  / (SEY  * SEPY  / 100.0)  * 100.0

'       PRIVAT EFTERFRÅGAN
'       Kronor, fasta priser
' PRIVAT KAPITALSTOCK
'
:EKKP2
@INNOV SEKP  4233.6281

'sekp  = sekp(-1)  * (1.  - 0.25  * sekpdep)  + 0.8  * sepsi
'
'SEKP  = SEKP(-1)  * (1.  - 0.0112)  + SEPSI
'
' OFFENTLIG KAPITALSTOCK

SEKG  = SEKG(-1)  * (1.  - 0.0112)  + SEGI

'       BNP
'       1995 ÅRS PRISER

SEY  = SEC  + SEDS2  + SEBI  + SEHI  + SEGC  + SEGI  + SEXG  + SEXS  - SEMG  - SEMS

SEY2  = SECTOT  + SEDS2  + SEBI  + SEHI  + SEGC  + SEGI  + SEXG  + SEXS  - SEMG  - SEMS

' TOTALA UTGIFTER
'

SETFE  = SEC  + SEDS2  + SEBI  + SEHI  + SEGC  + SEGI  + SEXG  + SEXS

'
'       INDUSTRIPRODUKTION
'       Volymindex, 1994=100

SEIP  = EXP(LOG(SEIP(-1))  + LOG(SEY(-1)  / SEY(-2)))
```

```
'	ADAPTIVT FÖRVÄNTAD INFLATION

SEINF  = 400  * (-1  + EXP(0.4012907414  * DLOG(SECED(-1))  + 0.02904023898  * DLOG(SECED(-2))  +
0.03141088847  * DLOG(SECED(-3))  + 0.1347129797  * DLOG(SECED(-4))  + 0.08871474285  *
DLOG(SECED(-5))  - 0.3052552798  * DLOG(SECED(-6))  + 0.2202540343  * DLOG(SECED(-7))  +
0.3310412019  * DLOG(SECED(-8))  - 0.1315396014  * DLOG(SECED(-9))))

WSDINF  = SEINF  / 400.  + 1.

'  PRODUKTIVITET

aprodse  = 0.125  * ( LOG(SEY(-1)  / (SEE(-1)  * SEHOURS(-1)))  + LOG(SEY(-2)  / (SEE(-2)  * SEHOURS(-
2)))  + LOG(SEY(-3)  / (SEE(-3)  * SEHOURS(-3)))  + LOG(SEY(-4)  / (SEE(-4)  * SEHOURS(-4)))  +
LOG(SEY(-5)  / (SEE(-5)  * SEHOURS(-5)))  + LOG(SEY(-6)  / (SEE(-6)  * SEHOURS(-6)))  + LOG(SEY(-7)
/ (SEE(-7)  * SEHOURS(-7)))  + LOG(SEY(-8)  / (SEE(-8)  * SEHOURS(-8))) )

'	BNP-DEFLATOR
'	1994=100
'	KONSUMTIONSDEFLATOR
'	INKOMST; TRANSFERERINGAR
'	ÖVRIGA INKOMSTER
"
'	SUMMA INKOMST
'	Kronor
'
'

SEPI  = SEOPI  + SETRAN  + SECOMP  - SEWT

'	DIREKTA SKATTER
'	Krornor
'

SEGBRT  = 1.5

SETAX  =  - SEWT  - SECOLL  + (SETAX(-1)  + SEWT(-1)  + SECOLL(-1))  * (SEPI  / SEPI(-1))  + SEY(-1)
* SEPY(-1)  / 100.  * 0.01  * (0.20  * (SEGBRT(-1)  - SEGBR(-1)))

'  REAL DISPONIBEL INKOMST

SEYD  = (SEOPI  + SECOMP  + SETRAN  - SETAX  - SECOLL  - SEWT)  / (.01  * SECED)

SECONSR  = ((SER3M  - @PCY(SEUND1X))  * .01)

'SEYDFORW  = (SEYD  + SEYD(+1)  / (1  + SECONSR)  + SEYD(+2)  / ((1  + SECONSR)  * (1  +
SECONSR(+1)))  + SEYD(+3)  / ((1  + SECONSR)  * (1  + SECONSR(+1))  * (1  + SECONSR(+1)))  +
SEYD(+4)  / ((1  + SECONSR)  * (1  + SECONSR(+1))  * (1  + SECONSR(+1))  * (1  + SECONSR(+3)))  +
SEYD(+5)  / ((1  + SECONSR)  * (1  + SECONSR(+1))  * (1  + SECONSR(+1))  * (1  + SECONSR(+3))  * (1
+ SECONSR(+4)))  + SEYD(+6)  / ((1  + SECONSR)  * (1  + SECONSR(+1))  * (1  + SECONSR(+1))  * (1  +
SECONSR(+3))  * (1  + SECONSR(+4))  * (1  + SECONSR(+5)))  + SEYD(+7)  / ((1  + SECONSR)  * (1  +
SECONSR(+1))  * (1  + SECONSR(+1))  * (1  + SECONSR(+3))  * (1  + SECONSR(+4))  * (1  +
SECONSR(+5))  * (1  + SECONSR(+6)))  + SEYD(+8)  / ((1  + SECONSR)  * (1  + SECONSR(+1))  * (1  +
SECONSR(+1))  * (1  + SECONSR(+3))  * (1  + SECONSR(+4))  * (1  + SECONSR(+5))  * (1  +
SECONSR(+6))  * (1  + SECONSR(+7)))  + SEYD(+9)  / ((1  + SECONSR)  * (1  + SECONSR(+1))  * (1  +
SECONSR(+1))  * (1  + SECONSR(+3))  * (1  + SECONSR(+4))  * (1  + SECONSR(+5))  * (1  +
SECONSR(+6))  * (1  + SECONSR(+7))  * (1  + SECONSR(+8)))  + SEYD(+10)  / ((1  + SECONSR)  * (1  +
SECONSR(+1))  * (1  + SECONSR(+1))  * (1  + SECONSR(+3))  * (1  + SECONSR(+4))  * (1  +
SECONSR(+5))  * (1  + SECONSR(+6))  * (1  + SECONSR(+7))  * (1  + SECONSR(+8))  * (1  +
SECONSR(+9)))  + SEYD(+11)  / ((1  + SECONSR)  * (1  + SECONSR(+1))  * (1  + SECONSR(+1))  * (1  +
SECONSR(+3))  * (1  + SECONSR(+4))  * (1  + SECONSR(+5))  * (1  + SECONSR(+6))  * (1  +
```

SECONSR(+7)) * (1 + SECONSR(+8)) * (1 + SECONSR(+9)) * (1 + SECONSR(+10))) + SEYD(+12) / ((1 + SECONSR) * (1 + SECONSR(+1)) * (1 + SECONSR(+1)) * (1 + SECONSR(+3)) * (1 + SECONSR(+4)) * (1 + SECONSR(+5)) * (1 + SECONSR(+6)) * (1 + SECONSR(+7)) * (1 + SECONSR(+8)) * (1 + SECONSR(+9)) * (1 + SECONSR(+10)) * (1 + SECONSR(+11))) + SEYD(+13) / ((1 + SECONSR) * (1 + SECONSR(+1)) * (1 + SECONSR(+1)) * (1 + SECONSR(+3)) * (1 + SECONSR(+4)) * (1 + SECONSR(+5)) * (1 + SECONSR(+6)) * (1 + SECONSR(+7)) * (1 + SECONSR(+8)) * (1 + SECONSR(+9)) * (1 + SECONSR(+10)) * (1 + SECONSR(+11)) * (1 + SECONSR(+12))) + SEYD(+14) / ((1 + SECONSR) * (1 + SECONSR(+1)) * (1 + SECONSR(+1)) * (1 + SECONSR(+3)) * (1 + SECONSR(+4)) * (1 + SECONSR(+5)) * (1 + SECONSR(+6)) * (1 + SECONSR(+7)) * (1 + SECONSR(+8)) * (1 + SECONSR(+9)) * (1 + SECONSR(+10)) * (1 + SECONSR(+11)) * (1 + SECONSR(+12)) * (1 + SECONSR(+13))) + SEYD(+15) / ((1 + SECONSR) * (1 + SECONSR(+1)) * (1 + SECONSR(+1)) * (1 + SECONSR(+3)) * (1 + SECONSR(+4)) * (1 + SECONSR(+5)) * (1 + SECONSR(+6)) * (1 + SECONSR(+7)) * (1 + SECONSR(+8)) * (1 + SECONSR(+9)) * (1 + SECONSR(+10)) * (1 + SECONSR(+11)) * (1 + SECONSR(+12)) * (1 + SECONSR(+13)) * (1 + SECONSR(+14))) + SEYD(+16) / ((1 + SECONSR) * (1 + SECONSR(+1)) * (1 + SECONSR(+1)) * (1 + SECONSR(+3)) * (1 + SECONSR(+4)) * (1 + SECONSR(+5)) * (1 + SECONSR(+6)) * (1 + SECONSR(+7)) * (1 + SECONSR(+8)) * (1 + SECONSR(+9)) * (1 + SECONSR(+10)) * (1 + SECONSR(+11)) * (1 + SECONSR(+12)) * (1 + SECONSR(+13)) * (1 + SECONSR(+14)) * (1 + SECONSR(+15))) + SEYD(+17) / ((1 + SECONSR) * (1 + SECONSR(+1)) * (1 + SECONSR(+1)) * (1 + SECONSR(+3)) * (1 + SECONSR(+4)) * (1 + SECONSR(+5)) * (1 + SECONSR(+6)) * (1 + SECONSR(+7)) * (1 + SECONSR(+8)) * (1 + SECONSR(+9)) * (1 + SECONSR(+10)) * (1 + SECONSR(+11)) * (1 + SECONSR(+12)) * (1 + SECONSR(+13)) * (1 + SECONSR(+14)) * (1 + SECONSR(+15)) * (1 + SECONSR(+16)))) / 18
'
' SPARKVOTEN
'

SESR = (SEYD - SEC) / SEYD

'
' NOMINELLA BNP

SENOM = (SEY * SEPY / 100.0)

' MÅL FÖR NOMINELLA BNP
' LÅNGA RÄNTOR
'

SELR = (ser3m + ser3m(+1) + ser3m(+2) + ser3m(+3) + ser3m(+4) + ser3m(+5) + ser3m(+6) + ser3m(+7) + ser3m(+8) + ser3m(+9) + ser3m(+10) + ser3m(+11) + ser3m(+12) + ser3m(+13) + ser3m(+14) + ser3m(+15) + ser3m(+16) + ser3m(+17) + ser3m(+18) + ser3m(+19)) / 20 + 1.0

' REALRÄNTA

SERR = SELR - 100 * ((SEUND1X / SEUND1X(-4)) - 1)

' KONKURRENSMÅTT
'

SEEFEX = 100. * EXP(-LOG(SERX / DSDRX94) + .07851100 * LOG(USRX / DUSRX94) + .03301607 * LOG(JPRX / DJPRX94) + .18649535 * LOG(GERX / DGERX94) + .06131557 * LOG(FRRX / DFRRX94) + .04274535 * LOG(ITRX / DITRX94) + .11995558 * LOG(UKRX / DUKRX94) + .00857657 * LOG(CNRX / DCNRX94) + .04905880 * LOG(BGRX / DBGRX94) + .05815355 * LOG(NLRX / DNLRX94) + .01834814 * LOG(SPRX / DSPRX94) + .08839890 * LOG(DKRX / DDKRX94) + .00458968 * LOG(GRRX / DGRRX94) + .01006768 * LOG(IRRX / DIRRX94) + .00757191 * LOG(PTRX / DPTRX94) + .01564086 * LOG(OERX / DOERX94) + .06528130 * LOG(FNRX / DFNRX94) + .08683375 * LOG(NWRX / DNWRX94) + .00000000 * LOG(SERX / DSDRX94) + .02299069 * LOG(SWRX / DSWRX94) + .01141074 * LOG(ANRX / DANRX94) + .00933799 * LOG(SKRX / DSKRX94) + .00287648 * LOG(MXRX / DMXRX94) + .01882403 * LOG(VGRX / DVGRX94))

SEEFEX2 = 100. * EXP(-LOG(SERX / DSDRX94) + .07256377 * LOG(USRX / DUSRX94) + .03051510 * LOG(JPRX / DJPRX94) + .17236829 * LOG(GERX / DGERX94) + .05667090 * LOG(FRRX /

DFRRX94) + .03950738 * LOG(ITRX / DITRX94) + .11086893 * LOG(UKRX / DUKRX94) + .00792689 * LOG(CNRX / DCNRX94) + .04534259 * LOG(BGRX / DBGRX94) + .05374841 * LOG(NLRX / DNLRX94) + .01695826 * LOG(SPRX / DSPRX94) + .08170267 * LOG(DKRX / DDKRX94) + .00424201 * LOG(GRRX / DGRRX94) + .00930505 * LOG(IRRX / DIRRX94) + .00699834 * LOG(PTRX / DPTRX94) + .01445606 * LOG(OERX / DOERX94) + .06033623 * LOG(FNRX / DFNRX94) + .08025608 * LOG(NWRX / DNWRX94) + .00000000 * LOG(SERX / DSDRX94) + .02124915 * LOG(SWRX / DSWRX94) + .01054638 * LOG(ANRX / DANRX94) + .00863063 * LOG(SKRX / DSKRX94) + .00265859 * LOG(MXRX / DMXRX94) + .01739810 * LOG(VGRX / DVGRX94) + .01563874 * LOG(LARX / DLARX94) + .04540123 * LOG(FERX / DFERX94) + .01471019 * LOG(CHRX / DCHRX94))

SEREFEX = 100. * EXP(-LOG(SERX / DSDRX94 / WSDCED94) + LOG((USRX / DUSRX94 / WUSCED94)^.078511 * (JPRX / DJPRX94 / WJPCED94)^.033016 * (GERX / DGERX94 / WGECED94)^.186495 * (FRRX / DFRRX94 / WFRCED94)^.061316 * (ITRX / DITRX94 / WITCED94)^.042745 * (UKRX / DUKRX94 / WUKCED94)^.119956 * (CNRX / DCNRX94 / WCNCED94)^.008577 * (BGRX / DBGRX94 / WBGCED94)^.049059 * (NLRX / DNLRX94 / WNLCED94)^.058154 * (SPRX / DSPRX94 / WSPCED94)^.018348 * (DKRX / DDKRX94 / WDKCED94)^.088399 * (GRRX / DGRRX94 / WGRCED94)^.004590 * (IRRX / DIRRX94 / WIRCED94)^.010068 * (PTRX / DPTRX94 / WPTCED94)^.007572 * (OERX / DOERX94 / WOECED94)^.015641 * (FNRX / DFNRX94 / WFNCED94)^.065281 * (NWRX / DNWRX94 / WNWCED94)^.086834 * (SERX / DSDRX94 / WSDCED94)^.000000 * (SWRX / DSWRX94 / WSWCED94)^.022991 * (ANRX / DANRX94 / WANCED94)^.011411 * (SKRX / DSKRX94 / WSKCED94)^.009338 * (MXRX / DMXRX94 / WMXCED94)^.002876 * (VGRX / DVGRX94 / WVGCED94)^.018824))

log(seult) = 7.4664 + log(secomp / (seee * sehours)) - (2.14 * (1. - dse89) + 1.91 * dse89) * setechl

SERULT = SEULT * DSERX94 / SERX / (.11044201 * USULT * DUSRX94 / USRX + .07754669 * JPULT * DJPRX94 / JPRX + .18614632 * GEULT * DGERX94 / GERX + .10324917 * FRULT * DFRRX94 / FRRX + .07485195 * ITULT * DITRX94 / ITRX + .08870030 * UKULT * DUKRX94 / UKRX + .04258608 * CNULT * DCNRX94 / CNRX + .05073242 * BGULT * DBGRX94 / BGRX + .07286815 * NLULT * DNLRX94 / NLRX + .02996897 * SPULT * DSPRX94 / SPRX + .02836963 * DKULT * DDKRX94 / DKRX + .00315404 * GRULT * DGRRX94 / GRRX + .01722937 * IRULT * DIRRX94 / IRRX + .01000134 * PTULT * DPTRX94 / PTRX + .02112096 * OEULT * DOERX94 / OERX + .01609598 * FNULT * DFNRX94 / FNRX + .02254940 * NWULT * DNWRX94 / NWRX + .00000000 * SEULT * DSERX94 / SERX + .03079661 * SWULT * DSWRX94 / SWRX + .01359060 * MXULT * DMXRX94 / MXRX)

'
' DIVERSE SKATTER
'
'

dlog(semtax) = dlog(seced * sec)

'
'

seprofit = seprof

'

seftaxr = seftaxr(-1)
@INNOV SEFTAXR 0.0048547

'

'SECTAX = EXP(LOG(SECTAX(-1)) + LOG((SEPY * SEY) / (SEPY(-1) * SEY(-1))))
'
' OFFENTLIGA SEKTORNS RÄNTEBETALNINGAR
'

segip = .2 * (1. / 400.) * (ser3m * sedebt(-1) - ser3m(-1) * sedebt(-2)) + 0.80 * (1. / 400.) * (selr * (sedebt(-24) / 23. + sedebt(-1) - sedebt(-2)) - selr(-23) * (sedebt(-24) / 23.)) + segip(-1)

```
'           OFFENTLIGA SEKTORNS BUDGETSALDO
'
SEBUD  = SETAX  + SECOLL  + SEWT  + SEMTAX  + SEFTAX  - SETRAN  - SEGIP  - (SEGC  * SECED
/ 100.)  - (SEGI  * SEPY  / 100.)

segbr  = (sebud  / (sey  * sepy  / 100.0))  * 100.0

'
'           OFFENTLIGA SEKTORNS SKULDSTOCK
'
'
sedebt  = sedebt(-1)  - sebud  - 0.1  * ((sey  * seced  / 100.)  - (sey(-1)  * seced(-1)  / 100.))

'
'           SKULD SOM ANDEL AV BNP

SEGDR  = (SEDEBT  / (SEY  * SEPY  / 100.0))  * 100.0  / 4.0

SEGDRM  = 100.  * ( (.01  * SEGDRM(-1)  * .01  * (SEY(-1)  * SEPY(-1)  + SEY(-2)  * SEPY(-2)  + SEY(-3)
* SEPY(-3)  + SEY(-4)  * SEPY(-4)))  + (SEDEBT  - SEDEBT(-1)) )  / (.01  * (SEY  * SEPY  + SEY(-1)  *
SEPY(-1)  + SEY(-2)  * SEPY(-2)  + SEY(-3)  * SEPY(-3)))

'
'           BUDGETUNDERSKOTT SOM ANDEL AV BNP
'

SEDEBTP  = SEDEBTP(-1)  + 0.86  * (SEDEBT  - SEDEBT(-1))  + 0.80  * 0.55  * (SELR(-1)  / SELR  - 1.)  *
SEDEBTP(-1)

'
'   AKTIEPRISINDEX EKVATION
'
semisc  = (semisc(-1)  - (68550.0  * ((sey(-1)  * sepy(-1)  / 100.)  / 428622.3))  - seliabs(-1))  * (seeqp  / seeqp(-
1))  + (1.0  - 0.86)  * (sedebt  - sedebt(-1))  + seliabs  + (68550.0  * ((sey  * sepy  / 100.)  / 428622.3))

' FÖRMÖGENHET OCH TILLGÅNGAR I UTLANDET

seror  = seror(-1)  + 0.2  * (wdipdd(-1)  / (wdgl(-1)  * 1000.)  - seror(-1)  + 0.0008698)

sega  = (sega(-1)  + 0.5  * secbv  / 1000.  + ((segl(-12)  / ((sey(-12)  / 1000.)  * (sepy(-12)  / 100.)  / serx(-12)))  *
(((sey  * sepy  / 100.  - sey(-1)  * sepy(-1)  / 100.)  / 1000.)  / serx))  + (sega(-1)  / wdga(-1))  * wdrev)

'
'RÄNTEUTGIFTER PÅ UTLANDSSKULD
'
seipdd  = (((1000.  * segl(-1)  * serx(-1))  - (1.  - dsedebth)  * sedebt(-1))  * seeqpr  + (1.  - dsedebth)  * segip)  /
serx

'
'
'RÄNTEINKOMSTER PÅ UTLANDSFORDRINGAR
'
seipdc  = (1000.  * seror  * sega(-1))

'UTLÄNDSKA NETTOTILLGÅNGAR
'
SENA  = SEGA  - SEGL

'
```

'FINANSIELLA SKULDER

SELIABS = SELIABS(-1) * (EXP((1. / 12.) * LOG((SEPI(-1) - SETAX(-1)) / (SEPI(-13) - SETAX(-13)))))

'FINANSIELL NETTOFÖRMÖGENHET
'

SENW = SEDEBTP + 1000 * SERX * SENA + SEMISC - SELIABS

'
'REAL FINANSIELL NETTOFÖRMÖGENHET

SERNW = SENW / (.01 * SECED)

'UTLANDSSKULDER

segl = segl(-1) + seglrev - 0.5 * secbv / 1000. + ((segl(-12) / ((sey(-12) / 1000.) * (sepy(-12) / 100.) / serx(-12))) * (((sey * sepy / 100. - sey(-1) * sepy(-1) / 100.) / 1000.) / serx))

SEGLREV = 0.32 * (SEGL(-1) - (1. - 0.86) * (SEDEBT(-1) / 1000.) / SERX(-1)) * ((0.67 * (SEEQP / SEEQP(-1)) + (1.0 - 0.67) * (EXP(1. / 8. * LOG(SEEQP(-1) / SEEQP(-9))))) * SERX(-1) / SERX - 1.0) + (1. - 0.32) * ((SEGL(-1) - (1. - 0.86) * (SEDEBT(-1) / 1000.) / SERX(-1)) * (0.77011 * (0.58537 * (USRX(-1) / USRX - 1.0) + 0.04927 * (UKRX(-1) / UKRX - 1.0) + 0.06841 * (JPRX(-1) / JPRX - 1.0) + 0.03449 * (SWRX(-1) / SWRX - 1.0) + 0.26246 * (ELRX(-1) / ELRX - 1.0)) + (1. - 0.77011) * (SERX(-1) / SERX - 1.0))) + ((1. - 0.86) * ((SEDEBT(-1) / 1000.) / SERX(-1)) * (SERX(-1) / SERX - 1.))

'
'AVKASTNING PÅ UTLÄNDSKA SKULDER

SEEQPR = 0.004 + 0.32 * 0.0075 + (1.0 - 0.32) * ((1.0 - (67.0 / 87.0)) * SER3M / 400.0 + (67.0 / 87.0) * ((3089.0 / 5277.0) * USR3M / 400.0 + (260.0 / 5277.0) * UKR3M / 400.0 + (1385.0 / 5277.0) * ELR3M / 400.0 + (361.0 / 5277.0) * JPR3M / 400.0 + (182.0 / 5277.0) * SWR3M / 400.0))

'KAPITALKOSTNAD USER COST OF CAPITAL

TSE = 0.25 * ((SEFTAX / (.01 * SEY * SEPY - SECOMP)) + (SEFTAX(-1) / (.01 * SEY(-1) * SEPY(-1) - SECOMP(-1))) + (SEFTAX(-2) / (.01 * SEY(-2) * SEPY(-2) - SECOMP(-2))) + (SEFTAX(-2) / (.01 * SEY(-2) * SEPY(-2) - SECOMP(-2))))

DPSE = 0.25 * ((SECED / SEPY) + (SECED(-1) / SEPY(-1)) + (SECED(-2) / SEPY(-2)) + (SECED(-3) / SEPY(-3)))

seuser = (.01 * (selrr * (1. - (0.25 * (seftaxr + seftaxr(-1) + seftaxr(-2) + seftaxr(-3)))) - 0.30 + sekpdep * 100. + (drisk2se * seprem * 100.0))) / (1.0 - (0.25 * (seftaxr + seftaxr(-1) + seftaxr(-2) + seftaxr(-3))))

seuser3 = ((sepy * sey * .01) * (1 - selabsh)) / (sekp + sekg)

SEPK = ((1 - SELABSH) * (.01 * SEPY * SEY)) / ((SEKP + SEKG) * (SER3M / 200 + SELR / 200))

SEUSER2 = SEPK * (SER3M / 2 + SELR / 2)

SECAPSH = 1 - SELABSH

SETFP = @pcy(sey) - (selabsh * @pcy(see * sehours) + (1 - selabsh) * @pcy(sekp + sekg))

SETP = (@PCY(SEY) - SECAPSH * @PCY(SEKP + SEKG) - SELABSH * @PCY(SEE * SEHOURS)) / SELABSH

secost = secomp + seuser * (sekp + sekg)

```
' labour market model  AMOD 0
'
':ekpwwhcsa
'
':ekpwpp3
'
'
'
':ekpwkpi
'
'
'
':ekpwund1x
'
':ekpwsltl3
'
':ekpwmhours
'
':ekpwhoursosa
'
':ekpwlf
'
':ekpwtran
'
'whpsa  = (whcsa  * (1  + prt2)  * (1  + seitr))  / (1  - dirt)
'
'wsumsa  = (whpsa  * hourse)  - collsa
'
'collsa  = prt2  * wsumsa

prt2  = prt2(-1)

'empsa  = hourssa  / mhourssa
'
'unempsa  = lfsa  - empsa
'
'usa  = (unempsa  / lfsa)  * 100
'
'replr  = replr(-1)

dirt  = dirt(-1)

'hourse  = (slsa  * (.01  * sepy  * sey))  / whpsa
'
'hourssa  = hourse  + hoursosa
'
':ekpwempstud
'
'gyma  = empstud  * (gyma(-1)  / empstud(-1))
'
'gym  = empstud  * (gym(-1)  / empstud(-1))
'
'gymp  = empstud  * (gymp(-1)  / empstud(-1))
'
'unempsahp  = unempsahp(-1)
'
':ekpwdaypsa
'
'sewedge4  = (1  - dirt)  / ((1  + seitr)  * (1  + prt2))
'
```

'@INNOV SEMGI 0.0282817
'
'@INNOV SEMTAX 1261.8843
'
'@INNOV SEMTAX 1261.8843

@INNOV SEMGI 0.0282817

@INNOV SEXGI 0.016503