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THE BANK OF FINLAND QUARTERLY ECONOMETRIC MODEL AND ITS USE FOR SHORT AND MEDIUM-TERM ECONOMIC FORECASTING

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THE BANK OF FINLAND QUARTERLY ECONOMETRIC MODEL AND ITS USE FOR SHORT AND MEDIUM-TERM ECONOMIC FORECASTING

Monograph transmitted by the Government of Finland

(Prepared by Antero Arimo and Juhani Hirvonen,
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This monograph consists of four parts. First, the model will be described briefly. In the second part, the data used and the estimation of the model will be examined, the ADP system will also be described in this context. The third part deals with the use of the model in short-term simulation and forecasting. Finally a tentative experiment with the use of the model in medium-term (1974 - 1980) forecasting and fiscal policy simulation will be reported.

1. The model

The Bank of Finland quarterly econometric model[1] is a medium-sized, short-term macro-model of the Finnish economy. The model is primarily designed to supplement the more traditional short-term forecasting methods used in the Bank of Finland. It is also intended for short and medium-term simulation of the effects of monetary, fiscal and incomes policies.

The present version of the model is made up of about a hundred stochastic equations and a hundred definitional relations. It includes about 330 variables, of which about 130 are exogenous.

The model is linear in its parameters, but non-linear in its variables; logarithmic transformations and ratios of variables are the main types of non-linearities. These non-linearities are partly the result of the fact that economic hypotheses are usually framed in volume terms, whereas the national accounting identities are mainly in value terms. Furthermore the hypotheses or empirical experiments with the data may suggest non-linear equations. This non-linearity affects the

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1. The construction of the model was begun in 1970 under the direction of Dr. Pertti Kukkonen. An average of six research fellows have participated in the model project team. The solution for the first version of the whole model was found in 1973, but the work is still in progress on developing the model for practical forecasting and simulation purposes.

forecasting and simulation techniques, and numerical algorithms have been used to find solutions for the model.

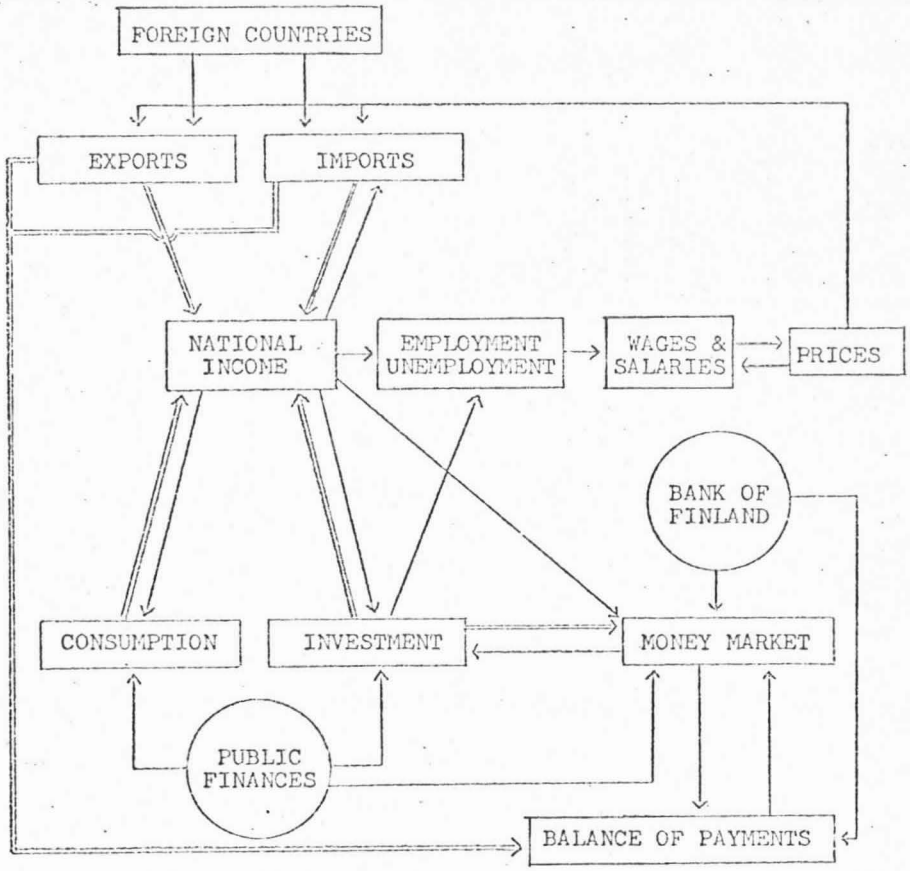
As a whole, the model is strongly simultaneous, i.e., it contains interrelationships between endogenous variables which are based on observations from the same period. This is due to the existence of lags in the causal relationships which are much shorter than the observations period. On the other hand, distributed lag functions are used extensively in the model: Almon lags are employed in the investment functions; the consumption functions use four quarter moving averages of real disposable income and Koyck type lags are included in the labour demand equations.

Like most other short-run macroeconomic models, the Bank of Finland model is a demand-oriented model constructed within the framework of balance identities of national accounting and the banking system. It was not possible to place the model on a uniform theoretical foundation and thus the specification has depended on diverse theoretical considerations, the availability of suitable data and special features of the Finnish economy. To a large extent, the model is based on the business cycle forecasting system developed at the Bank of Finland in the 1960s.

The structure of the model is only outlined in this mono-

graph.[1] Chart (1) shows the structure of the model in a concis

Chart (1): OUTLINES OF THE STRUCTURE OF THE MODEL



1. A more detailed, but slightly out-of-date picture of the total model is given in A Quarterly Model of the Finnish Economy, Bank of Finland Institute for Economic Research Publications, Series D:29, 1972. In addition, various blocks and their theoretical underpinnings have been dealt with, e.g. in the following publications: KOSKENKYLÄ, H., On Problems of the Theoretical and Empirical Analysis of Investment. A Study of Manufacturing Investment in Finland in 1948-1970, Same series D:28, 1972 (in Finnish). HALTTUNEN, H., Production, Prices and Incomes in the Quarterly Model of the Finnish Economy, Same series D:30, 1972 (in Finnish). LAHTINEN, S., Demand for Labour in the Quarterly Model of the Finnish Economy, Bank of Finland Publications, Series D:31, 1973 (in Finnish). AURIKKO, E., Foreign Trade in the Quarterly Model of the Finnish Economy, Same series D:33, 1973 (in Finnish). POHJOLA, I., An Econometric Study of the Finnish Money Market, Same series D:35, 1974 (in Finnish). ARIMO, A., Personal Income Taxation and the Distribution of Income, Yearbook of the Finnish Society for Economic Research, 1972. KUKKONEN, P., Features of the Finnish Monetary Relationships, Ekonomiska Samfundets Tidskrift, 1973:2.

form. In this chart the directions of relationships between the blocks of the model are marked with arrows. A single arrow presents a causal relationship and a double arrow a definitional relationship. The circles refers to economic policy variables and parameters.

The total model consists of ten blocks representing various sub-sectors of the economy: consumption, investment, balance of payments, production, prices, wage incomes, non-wage incomes employment, the money market and public finances.

In the model, private consumption depends mainly on real disposable income and the unemployment rate, the latter being used as a proxy for prevailing cyclical expectations. Different equations are specified for different consumption categories. The flexible acceleration principle has been used in the productive investment function, and a polynomially distributed (Almon) lag has been employed. Beside production and the stock of capital , the availability of credit is included as a explanatory variable. Housing investment depends mainly on real disposable income and the availability of credit. Inventory investment (plus the statistical error) is accounted for by a flexible accelerator model including only lagged values of production.

The balance of payments block includes explanatory equations for the volume of commodity imports and exports by category, export prices, trade in services and most of the capital account

items. The import demand equations are based on traditional foreign trade theory, where the main explanatory variables are domestic activity variables, such as production, investment and income formation, and the ratio between domestic and foreign prices. A market share approach has been used in the export demand equations. Thus exports depend mainly on the activity variables of Finland's most important trade partners and again on the ratio between domestic and foreign prices. In the export price equations, the explanation is based on domestic cost factors and foreign demand conditions. The equations for capital movements are all in stock form and mostly specified in net terms. The demand for assets in these models rests on portfolio theory suitably modified to take account of the special institutional features of Finland's financial markets. The supply side is taken into account by the domestic credit rationing variable and the proxy variables for the Bank of Finland's restrictions on capital movements.

Production, domestic prices and non-wage income make up a separate block system in the model and are based on the input-output framework. The economy has been divided into two sheltered sectors: agriculture and other non-competitive production (mainly services and residential construction) and two exposed sectors: forestry and other competitive production (mainly manufacturing). This sectoral breakdown affects the determination of prices in the model. While prices of agriculture and forestry are exogenous, prices in other non-com-

petitive production are determined on the basis of domestic cost developments, whereas prices in other competitive production are also affected by foreign price developments. The volume of production by sector is obtained from the demand for final products in accordance with the input-output framework. This framework also shows the development of incomes by sector, since prices and the sectoral volume of production are given.

In the model sectoral wages and salaries depend on general price developments, sectoral productivity and demand conditions in the labour market. In addition to wages and salaries paid, the model presents average negotiated wages and salaries for the total economy as a function of general price development and the development of productivity. Wage drift is the difference between paid and negotiated wages and salaries. The labour demand equations are based on production theory, supplemented by a dynamic adjustment mechanism. Employment by sector is thus determined by the volume of production, real wages and salaries, the rate of capacity utilization, and previous employment developments. The unemployment rate, rather than being determined by the difference between the supply of and the demand for labour, is related directly to the gross domestic product with a distributed lag (Almon).

The monetary block is linked to the real side of the model primarily by investment equations, where and indicator of the availability of credit is an important explanatory variable.

This indicator has been constructed by comparing bank lending to the central bank debt of the banks and allowing for the terms of this central bank credit. On the other hand, the real side affects the development of bank deposits through income variables. In addition, the self-financing of firms, the availability of financing from other sources and the value of investment determine the demand for bank credit. Bank lending plays such a central role in the model because the Finnish money market is dominated by banks and other financial institutions, the security market being of only slight importance. As nominal interest rates have been kept almost constant in Finland, the instruments of monetary policy are taken into account in the model mainly by considering the terms of central bank credit.

The public finance block includes both central and local government. On the whole expenditure items are exogenous. By changing public consumption and investment expenditure it is possible to affect production and employment in the model and thereby total domestic activity. Income transfers influence other blocks of the model through disposable income. Public revenue is largely endogenous in the model, and tax revenue is mainly explained by the relevant income or other tax base variables and tax parameters, the latter representing fiscal policy instruments.

Finally, it is worth noting that the model is connected with the international LINK project established in 1968. The aim of

this project is to link individual models of different countries or country groupings into a model for the world economy. Beside most Western European countries, the United States, Canada, Japan and Australia participate in the project. Furthermore, the project has constructed highly aggregated models for certain groupings of other countries. At present the project produces regular short-term forecasts for its participants. International trade flows and the most important macro-variables of participating countries are estimated in this process. The participants can also receive assistance and advice on building and using models in project meetings and through the circulation of research papers.[1]

2. Data, estimation and the ADP system

Seasonally adjusted[2] quarterly data are used in the model. In Finland, however, there are still many deficiences in the quarterly statistics. In these cases a special method has been used to construct the missing quarterly series from annual data and related quarterly reference series.

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1. For a more detailed description of the LINK project see, e.g., BALL, R.J. (Editor), The International Linkage of National Economic Models, London 1973.

2. The seasonal adjustment method, which uses iterated weighted moving averages, has been developed and extensively tested in the Bank of Finland by Pertti Kukkonen. See KUKKONEN, P., Analysis of Seasonal and Other Short-term Variations with Applications to Finnish Economic Time Series, Bank of Finland Institute for Economic Research Publications, Series B:28, 1968

One special data problem has been encountered in joining the model to the LINK system. The ICR classification has been used in building Finnish foreign trade equations. The LINK trade models are, however, based on the SITC classification. Thus transformation matrices from ICR to SITC classification have been estimated to allow the linkage of the Bank of Finland model to the LINK world trade model.

The estimation period covers the years 1958 - 1971. Because of lags, this has required information on some variables as far back as 1955. For earlier years, the quarterly data have been inadequate. Work is in progress to re-estimate the model for the period from 1958 to 1973.

The model has been estimated equation by equation with the ordinary least squares method (OLS). Because of the simultaneity of the model, the two stage least squares method with principal components of the predetermined variables (TSLSPC) has also been tried.[1]

In the estimation experiment, the individual TSLSPC estimates did not, in general, deviate much from the corresponding OLS estimates, but in the ex post multi-period simulations of the total model these slight differences cumulated and in-

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1. The TSLSPC method was applied in two different versions, both with alternative numbers of principal components. This experiment is reported in HIRVONEN, J., On the Use of Two Stage Least Squares with Principal Components, An Experiment with a Quarterly Model, Forthcoming in the Bank of Finland Publications Series D.

dicated the superiority of the TSLSPC results. In short-run forecasts, however, these differences are of little significance. The superiority of TSLSPC method for medium-term policy simulations also remains questionable because the OLS estimates of individual parameters might not be as sensitive to specification errors as the TSLSPC estimates.

The TSLSPC results were quite sensitive to the number of principal components used. The predictive performance of the model seemed to suggest that a small rather than a large number of principal components is most appropriate. This property makes one assume that the results may also be sensitive to the set of variables from which the principal components are calculated, even if the importance of an individual variable among the predetermined variables is minor. It may thus be troublesome to keep the TSLSPC estimates up-to-date if the specification of the model is still being modified.

For these reasons, the OLS estimates are at present considered to be adequate for practical forecasting and simulation exercises.

The ADP system employed in model work at the Bank of Finland rests on the econometric program system SIMULATOR developed at the Bank of Canada.[1] In broad lines, SIMULATOR consists

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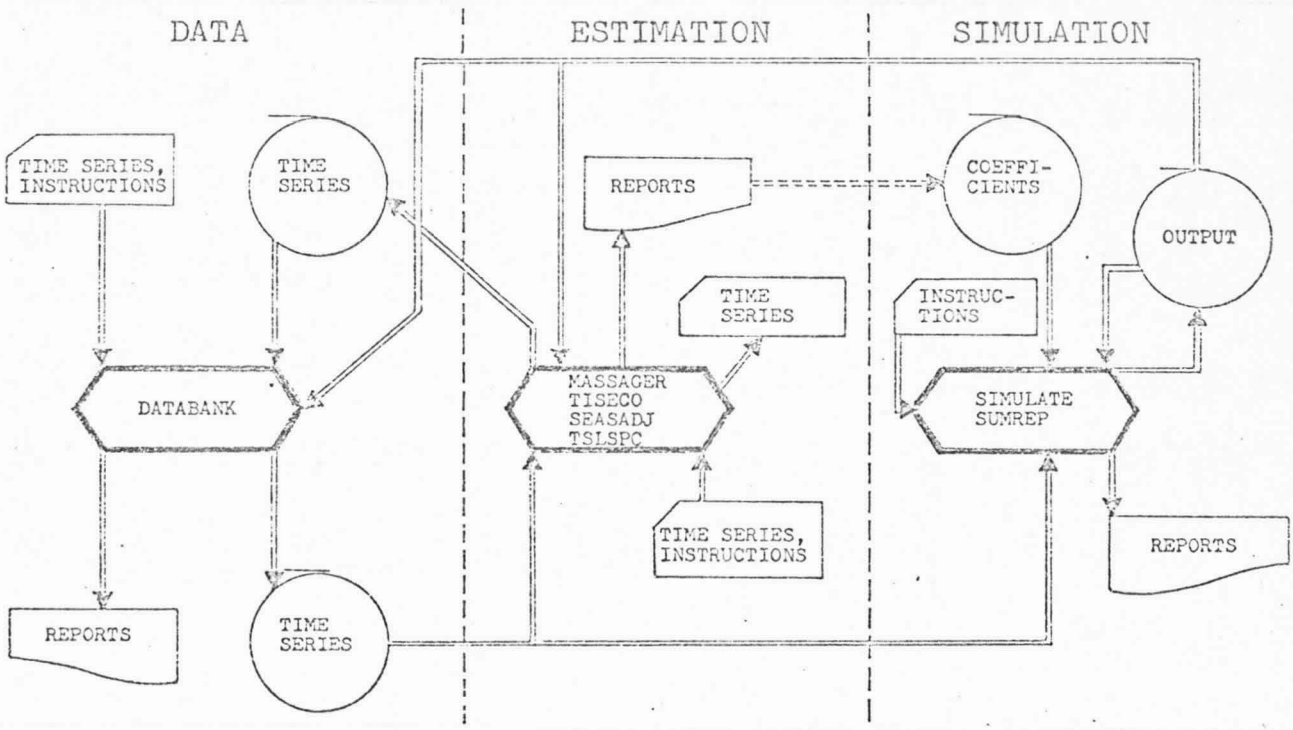
1. This is an example of the assistance received in the LINK project. For a detailed description of the SIMULATOR system, see : Simulator, A Systems Manual for Management and Simulation Econometric Models, Bank of Canada, 1972.

of three main parts for the three key stages of model work, i.e., DATABANK for data accumalation, MASSAGER for estimation and SIMULATE for model solution and simulation. In addition, some supporting programs constructed at the Bank of Finland have been linked to this basic system. Chart (2) shows the main characteristics of this econometric ADP system.

Chart (2): SCHEMATIC DIAGRAM OF THE ECONOMETRIC ADP SYSTEM



DATABANK is a program utilized to build and maintain magnetic data tapes. The program allows for the addition, deletion and editing of any series. The data can also be listed, indexed and copied onto other tapes. Each series on the tapes is stored with records describing its title and source, together with any special notes that may be required.

MASSAGER is a comprehensive program package of statistical data manipulation routines. It accepts inputs from the DATA-BANK tape or from cards, and performs user specified data manipulations. These manipulations include simple operations on a single series such as square roots, logarithms etc., and more complex operations on several variables such as multiple regressions, plots, etc.

SIMULATE is a self-contained and independent operating sub-system for solving, analyzing and simulating large simultaneous equation systems. It takes the data from a particular data tape that can be produced by DATABANK. The other inputs necessary for simulation, i.e., the labels of the variables, the esti-mated coefficients and the convergence criteria, are entered into SIMULATE from a separate coefficient tape. Because of non-linearities typical of econometric models, the program employs the Gauss-Seidel algorithm to find the model solutions.

The main supporting programs added at the Bank of Finland to MASSAGER are: TISECO for construction of quarterly time series from annual data and appropriate quarterly reference series, SEASADJ for seasonal adjustment and TSLSPC for two stage least squares estimation with principal components. In addition, the sub-routine SUMREP for summary output reporting (cf. chart (3) in the following section) has been linked with the SIMULATE program.

A UNIVAC 1108 computer has been used for the Bank of Finland

model computations. The programs in question are written in FORTRAN.

3. The use of the model

Until the spring of 1974 model work at the Bank of Finland was handled by a particular model project team. The work centred on building and developing the model. Dynamic properties and estimation alternatives were also studied. At present the stress is placed on testing the model for practical forecasting and simulation. Even if the model functions well in a technical sense, it cannot be used as such for a day-to-day forecasting. Continuous adjustment of the model is needed for changes in economic policy, and the relevant qualitative information should be included in the model or be taken into account when interpreting the results. For these reasons, the model work is now mainly performed in the Economics Department which is responsible for short and medium-term forecasts in the Bank of Finland.

The use of the model has required extra effort compared with traditional forecasting work. The model calculations and the traditional forecasts have been carried out simultaneously. Only in this way can experience on the workability of the model be obtained. It also makes it possible to see how the model, the data and the ADP system need to be developed. On the other hand, the results of the model calculations have

provided additional information for the department's forecast. Experiments with the model also provide information on how it can be used to replace manual calculations.

From a technical point of view, the structure of the model has been employed either as a whole or partially. In both cases, it has been usually necessary to take into account of information outside the model by changing some of the parameters or equations. In addition, outside information has also been considered through exogenizing individual equations or whole blocks of the model. These ways to take into account outside information are technically simple. Parameter changes or block exogenization require only one instruction card per change, whereas the change or the exogenization of an equation requires reprogramming.

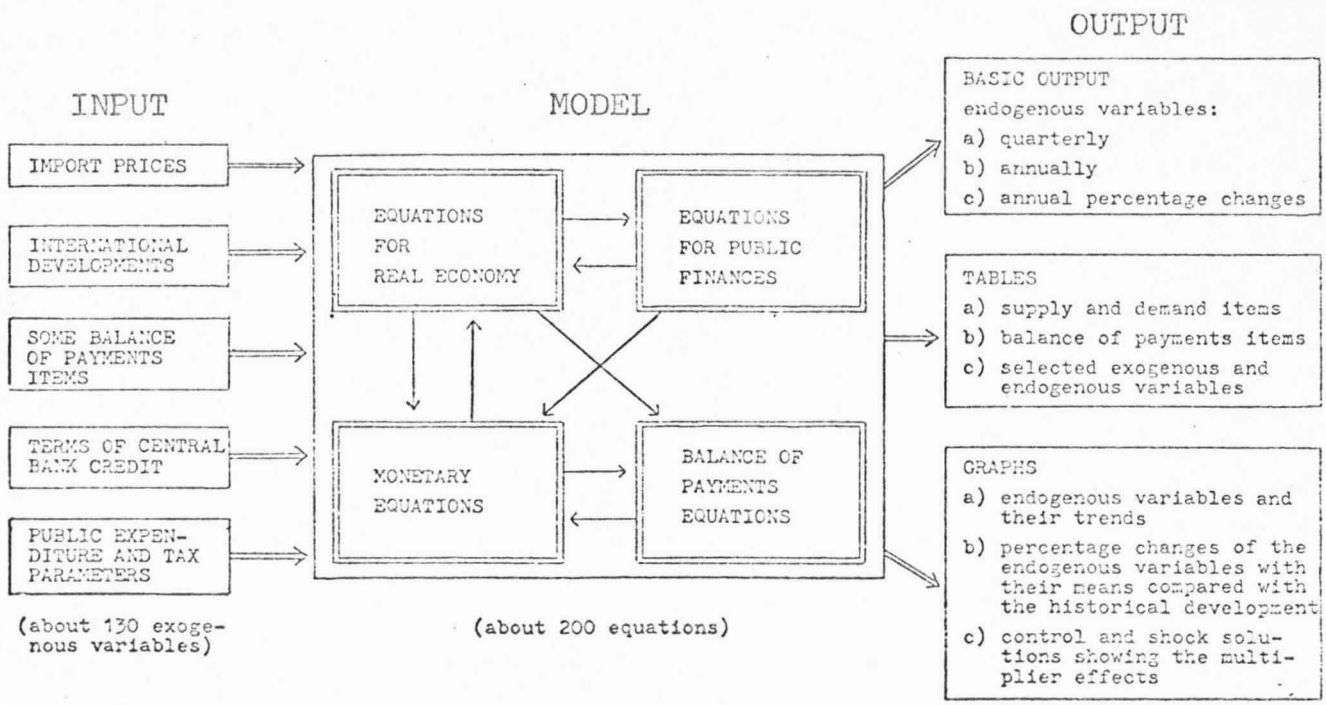
At present, forecasting (or policy simulation) with the model starts with the formulation of basic assumptions underlying the forecast. These assumptions are then quantified and fed into the model through exogenous or exogenized variables and changes in the structure of the model. For the exogenous variables, annual changes have to be fixed for the forecasting period. The quarterly values are then produced with the above mentioned TISECO program, if no other information is available or needs to be considered.

In the next phase, the results of the model solution are judged on the ground of the results of the traditional forecasting.

The evaluation may lead to further adjustments of the model structure and also to the reappraisal of the exogenous data. This iterative procedure is carried on until the results are reasonable.

The results of the model calculations are only used in the department. The reporting of the results takes place in the form of various summary tables and graphs, which are received from the above mentioned SUMREP program and from the standard output of the SIMULATE program. Chart (3) describes the main characteristics of recent input requirements and the output possibilities of the model.

Chart (3): INPUT AND OUTPUT CHARACTERISTICS OF THE MODEL



The preliminary use of the model for practical purposes has shown some of its shortcomings. First, the most serious fault from an economic point of view is the demand-orientated structure of the model in conditions,where various supply considerations are becoming more and more important constraints on economic growth. Second, the number of exogenous variables is quite great, which is a hindrance for the flexible use of the model in an iterative forecasting process. Third, the ADP routine has not yet been developed to a point where its potential can be fully utilized.

At present a team of three economists from the Economics Department who are assisted by one ADP programmer and two research secretaries from the ADP department are working on the model. In addition, other economists have participated in the development and analysis of the model. In the first place the model team is responsible for practical forecasting and simulation as well as the maintenance and development of the model. The model forecasts, however, are based on assumptio made and exogenous variables prepared by the whole department. The whole department participates in the evaluation of the results.

4. An Experiment

In this experiment a medium-term forecast was made with the model at the same time as a forecast was prepared with more qualitative methods. The two forecasts cover the years 1974 -

1980. In addition, a simple fiscal policy simulation has been carried out.

The version of the model used in the experiment is older and smaller than the one described above, because the updating of the data as well as the testing of the present version are still under way. In the balance of payments block, only the volume of commodity imports by categories is treated as endogenous. Further, the indicator for the availability of credit is taken as exogenous, which means that the monetary sector of the model is also mainly exogenous.

The basic economic assumptions used in this exercise are largel the same as for the traditional forecast. Export-led growth will be less important than earlier as a consequence of supply constraints. It is also assumed that demand will be sufficient for all that can be produced. In the model, an attempt has been made to deal with these supply constraints by exogenizing the variable for the unemployment rate, which is used as a proxy for capacity utilization in various equations.

The most important assumption concerning economic policy measures is that the progressive income tax rates will be lowered from the beginning of 1976. This is because the rate of inflation is expected to be markedly higher than it was earlier and would raise state tax revenue excessively in comparison with the growth of the disposable income of households. In addition, it has been assumed in this experiment that the state will

lower income taxes by 10 per cent for the last three quarters of 1975 in connection with the comprehensive incomes policy negotiations to be carried out early in 1975. The first fiscal policy assumption affects the basic forecast with the model, i.e. the control solution, and the second one is the only additional assumption for the shocked solution.

Most of the other assumptions made for the experiment have been quantified and introduced into the model through exogenous variables. In addition, some events which have already occurred and affect the forecast period have caused some changes in the estimated structure of the model. The import equations for fuels and lubricants, have been corrected because of the noticeable increase in oil prices. The incomes policy negotiations of the beginning of 1974 have also been taken into account in the equations for sectoral wages and state tax revenue.

The main results of the experiment are presented in the appendix. The control solution is shown in the summary tables and the figures for annual changes in selected variables. The figures for the multiplier effects of the extra 10 per cent reduction in income tax show the difference between the control and the shocked solution.

The tables and the figures in the appendix are self-explanatory, and detailed discussion of the results may not be needed in this context given the nature of the experiment. However, ther

is reason to note that in general the results are not unreasonable in light of those obtained with the conventional methods. In fact the explosive growth of the trade deficit is the only clearly unrealistic result. The trade balance, however, is very sensitive to small changes in exogenous import prices or the coefficients in import equations. The multiplier effects of the tax reduction also seem mostly to be in accordance with expectations. On the whole, the experiment shows that the quarterly model may be useful in practical medium-term forecasting and simulation work.

APPENDIX

Control solution, selected tables

BANK OF FINLAND QUARTERLY MODEL
FORECAST 1974-1980

TABLE NUMBER 1

SELECTED EXOGENOUS VARIABLES
ANNUAL % CHANGES

	MEAN	1974	1975	1976	1977	1978	1979	1980
VOLUME OF PUBLIC CONSUMPTION	5.3	6.0	6.0	5.0	5.0	5.0	5.0	5.0
PUBLIC NONRESIDENTIAL INVESTMENT	1.4	-1.0	4.0	7.0	-2.9	-10.0	4.9	7.9
LAND AND WATERWAY INVESTMENT	2.8	1.0	3.5	5.0	2.0	-1.0	5.0	4.0
PUBLIC EXPENDITURE	17.2	21.9	17.7	17.5	14.8	15.8	16.5	16.3
AGRICULTURAL PRICES	10.8	12.4	12.0	10.0	10.1	11.0	9.9	10.0
FORESTY PRICES	16.4	69.9	24.8	-15.1	.0	20.2	14.3	.0
VOLUME OF EXPORTS	6.4	5.5	4.5	10.0	11.0	6.5	4.0	3.0
VOLUME OF METAL INDUSTRY EXPORTS	13.1	21.0	8.0	15.0	20.0	12.0	10.0	8.0
VALUE OF COMMODITY EXPORTS	19.0	44.5	16.0	18.5	18.3	14.1	11.8	9.5
VALUE OF EXPORTS OF SERVICES	15.6	18.0	14.0	14.3	21.4	17.6	12.5	11.3
VOLUME OF IMPORTS OF SERVICES	6.6	10.0	7.0	12.0	6.0	6.0	.0	5.0
VALUE OF IMPORTS OF SERVICES	18.6	25.0	20.0	15.4	22.0	20.0	15.0	13.5
IMPORT PRICES OF RAW MATERIALS	10.3	33.9	5.9	5.9	4.9	-7.3	10.0	4.3
IMPORT PRICES OF INVESTMENT GOODS	10.3	11.2	11.8	8.0	10.1	10.8	11.2	9.0
IMPORT PRICES OF CONSUMER GOODS	9.8	9.9	10.0	8.2	9.7	11.1	11.0	9.3
IMPORT PRICES OF FUELS AND LUBRICANTS	31.3	179.8	3.0	5.0	6.0	8.1	10.0	7.0
COMMODITY IMPORT PRICES	12.1	39.6	3.9	7.8	7.3	9.1	10.0	8.5
IMPORTS OF LONG-TERM CAPITAL, MILL.MK	3194.	500.	1100.	1320.	1690.	4770.	6220.	6760.
IMPORTS OF SHORT-TERM CAPITAL, MILL.MK	619.	2050.	400.	-720.	520.	950.	810.	320.

BANK OF FINLAND QUARTERLY MODEL
FORECAST 1974-1980

TABLE NUMBER 2

SELECTED ECONOMIC INDICATORS

	MEAN	1974	1975	1976	1977	1978	1979	1980
*VOLUME OF GROSS DOMESTIC PRODUCT, % CHANGE	4.2	-4.1	2.1	3.9	5.9	5.1	4.7	3.4
*SHARE OF INVESTMENT OF GDP	.237	.248	.248	.237	.229	.229	.232	.237
*PRIVATE CONSUMPTION PRICES, % CHANGE	10.9	19.5	11.2	7.8	8.6	10.8	10.1	8.5
EXPORT PRICES, % CHANGE	11.3	31.9	10.7	7.1	7.0	7.7	7.7	6.8
IMPORT PRICES, % CHANGE	12.4	36.8	7.6	5.8	8.2	9.7	11.3	7.0
*TRADE BALANCE, MILL.MK	-5933.	-4206.	-4171.	-3126.	-3244.	-5440.	-9170.	-12177.
*CURRENT ACCOUNT, MILL.MK	-6311.	-3931.	-4197.	-3286.	-3454.	-5700.	-9850.	-13667.
*GOLD AND FOREIGN EXCHANGE RESERVES, MILL.M	-5527.	1080.	-1618.	-4303.	-5547.	-5527.	-8447.	-15025.
*UNEMPLOYMENT RATE, %	2.0	1.8	2.1	2.3	2.0	1.8	2.0	2.3
*PAID LABOUR INPUT, % CHANGE	1.8	4.0	1.6	-.4	2.0	2.1	1.5	-.8
*PRODUCTIVITY OF PAID LABOUR, % CHANGE	2.4	-.1	.5	3.5	3.8	2.9	3.2	3.5
*LEVEL OF EARNINGS, % CHANGE	14.9	18.4	14.5	12.7	13.8	15.2	15.6	13.9
*REAL EARNINGS, % CHANGE	3.7	-1.0	2.9	4.6	4.7	5.0	5.0	4.3
*CENTRAL BANK CREDIT, MILL.MK	4616.	2857.	3427.	3542.	4178.	4979.	6011.	7330.
*BANK LENDING, % CHANGE	19.7	20.3	19.9	18.1	18.0	19.7	20.8	21.7
TIGHTNESS OF CREDIT	7.3	8.0	8.0	7.0	7.0	7.0	7.0	7.0
*SHARE OF LABOUR INCOME	.528	.501	.507	.516	.526	.539	.552	.566
*PROPENSITY TO CONSUME	.852	.853	.861	.858	.851	.848	.843	.836
*TAX PAYMENTS, % CHANGE	21.4	26.7	20.3	14.5	20.2	24.6	23.2	20.1
*STATE BORROWING, NET, MILL.MK	-9787.	-2730.	-4060.	-5069.	-6545.	-11348.	-16988.	-22787.

* = ENDOGENOUS

BANK OF FINLAND QUARTERLY MODEL
FORECAST 1974-1980

TABLE NUMBER 3 A

ACCOUNTS OF SUPPLY AND DEMAND, ANNUAL % CHANGES
VOLUME

	MEAN	1974	1975	1976	1977	1978	1979	1980
*GROSS DOMESTIC PRODUCT	4.2	4.1	2.1	-3.9	5.3	5.1	4.7	3.4
*IMPORTS OF GOODS AND SERVICES	7.2	8.7	5.9	6.3	8.5	8.4	6.3	6.1
*TOTAL SUPPLY	4.9	5.2	3.0	-4.5	6.6	6.0	5.1	4.2
EXPORTS OF GOODS AND SERVICES	6.4	5.5	4.5	10.0	11.0	6.5	4.0	3.0
*CONSUMPTION	4.0	4.1	3.7	-3.3	4.1	4.6	4.2	3.8
* PRIVATE CONSUMPTION	3.6	3.6	3.1	2.9	3.8	4.5	4.0	3.6
PUBLIC CONSUMPTION	5.3	6.0	6.0	-5.0	5.0	5.0	5.0	5.0
*FIXED INVESTMENT	3.8	5.8	2.1	-.7	2.3	-5.1	6.4	6.3
* PRODUCTIVE & HOUSING INVESTMENT	4.2	7.3	1.8	-2.4	2.7	7.5	6.8	5.4
LAND & WATERWAY & PUBL NONRES INV	2.4	-.5	3.6	-5.5	.7	-3.2	5.0	4.9
*INVENTORY INVESTMENT & STAT ERROR	8.8	10.1	-2.6	-7.7	16.9	12.7	10.2	6.5
*TOTAL DEMAND	4.9	5.2	3.0	-4.5	6.6	6.0	5.1	4.2

* = ENDOGENOUS

BANK OF FINLAND QUARTERLY MODEL
FORECAST 1974-1980

TABLE NUMBER 3 B

ACCOUNTS OF SUPPLY AND DEMAND, ANNUAL % CHANGES
PRICES

	MEAN	1974	1975	1976	1977	1978	1979	1980
*GROSS DOMESTIC PRODUCT	12.1	18.3	13.4	7.9	8.9	12.4	11.6	12.0
IMPORTS OF GOODS AND SERVICES	12.4	36.9	7.6	5.8	8.2	9.7	11.3	7.0
*TOTAL SUPPLY	12.1	22.6	11.9	-7.3	8.7	11.6	11.6	10.5
EXPORTS OF GOODS AND SERVICES	11.3	31.9	10.7	7.1	7.0	7.7	7.7	6.8
*CONSUMPTION	11.5	21.3	11.9	-7.8	8.9	11.1	10.4	8.5
* PRIVATE CONSUMPTION	10.9	19.5	11.2	-7.8	8.7	10.6	10.0	8.7
* PUBLIC CONSUMPTION	12.6	26.1	13.2	-7.5	9.3	12.2	11.3	8.9
*FIXED INVESTMENT	11.4	20.7	12.3	-7.6	9.0	11.1	10.6	8.3
*INVENTORY INVESTMENT & STAT ERROR	22.3	9.2	10.8	-6.5	24.9	38.3	34.3	32.2
*TOTAL DEMAND	12.1	22.6	11.9	-7.3	8.7	11.6	11.6	10.5

* = ENDOGENOUS

BANK OF FINLAND QUARTERLY MODEL
FORECAST 1974-1980

TABLE NUMBER 3 C

ACCOUNTS OF SUPPLY AND DEMAND, ANNUAL % CHANGES
VALUE

	MEAN	1974	1975	1976	1977	1978	1979	1980
*GROSS DOMESTIC PRODUCT	16.8	23.2	15.8	12.1	15.4	18.1	17.0	15.6
*IMPORTS OF GOODS AND SERVICES	20.5	46.8	13.6	12.5	17.4	18.9	18.0	13.4
*TOTAL SUPPLY	17.6	28.0	15.3	12.2	15.9	18.7	17.4	15.2
EXPORTS OF GOODS AND SERVICES	18.3	39.2	15.7	17.8	18.9	14.7	12.0	9.9
*CONSUMPTION	15.9	26.2	16.0	11.4	13.9	16.3	15.1	12.5
* PRIVATE CONSUMPTION	14.9	23.8	14.7	10.9	12.8	15.6	14.4	12.0
* PUBLIC CONSUMPTION	18.6	33.6	20.0	12.9	14.7	17.8	16.8	14.4
*FIXED INVESTMENT	15.5	27.7	14.7	6.8	11.5	16.8	17.7	14.3
*INVENTORY INVESTMENT & STAT ERROR	33.4	20.2	7.9	14.7	46.0	56.8	48.0	41.0
*TOTAL DEMAND	17.6	28.0	15.3	12.2	15.9	18.7	17.4	15.2

* = ENDOGENOUS

BANK OF FINLAND QUARTERLY MODEL
FORECAST 1974-1980

TABLE NUMBER 4

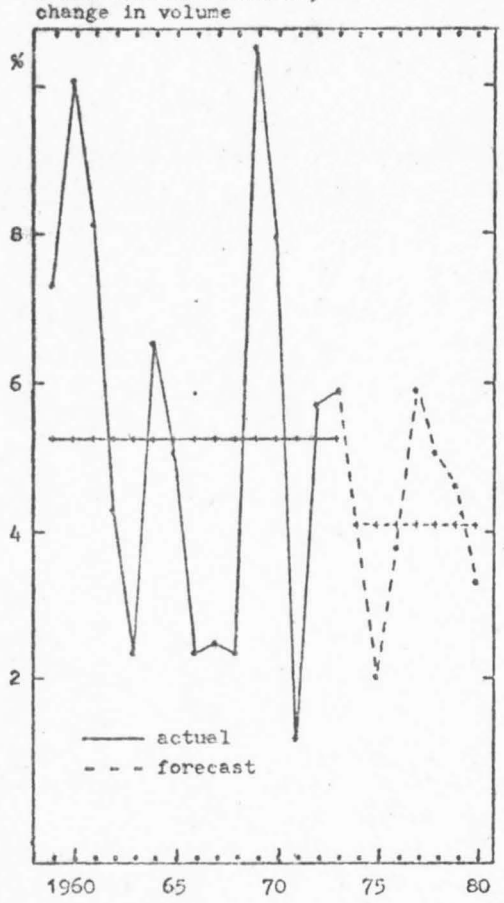
BALANCE OF PAYMENTS, MILL.MK

	MEAN	1974	1975	1976	1977	1978	1979	1980
EXPORTS OF GOODS	34265.	21104.	24481.	29000.	34300.	39150.	43600.	47300.
*IMPORTS OF GOODS	40198.	25310.	28652.	32170.	37584.	44580.	50980.	56177.
*TRADE BALANCE	-5933.	-4206.	-4171.	-3170.	-3284.	-5430.	-7380.	-10177.
EXPORTS OF SERVICES	8942.	4296.	4938.	5500.	6300.	7000.	8000.	10000.
IMPORTS OF SERVICES	5182.	2961.	3564.	4100.	5000.	6000.	6900.	7800.
*BALANCE OF TRADE AND SERVICES	-2173.	-2871.	-2827.	-1670.	-1984.	-3430.	-4280.	-7977.
INVESTMENT INCOME, NET	-1961.	-970.	-1740.	-1620.	-1350.	-2090.	-2800.	-2600.
TRANSFER PAYMENTS, NET	-100.	-90.	-130.	-140.	-150.	-180.	-210.	-240.
*CURRENT ACCOUNT	-4234.	-3931.	-4697.	-3296.	-3484.	-5700.	-6990.	-10677.
LONG-TERM CAPITAL ACCOUNT	3194.	500.	1100.	1300.	1690.	4770.	6920.	8340.
*BASIC BALANCE	-1040.	-3431.	-3697.	-1996.	-1794.	-930.	-70.	-2337.
SHORT TERM CAPITAL ACCOUNT	618.	2050.	400.	-720.	520.	950.	610.	330.
*OVERALL BALANCE	-2498.	-1381.	-2697.	-2686.	-1244.	20.	-2520.	-6677.

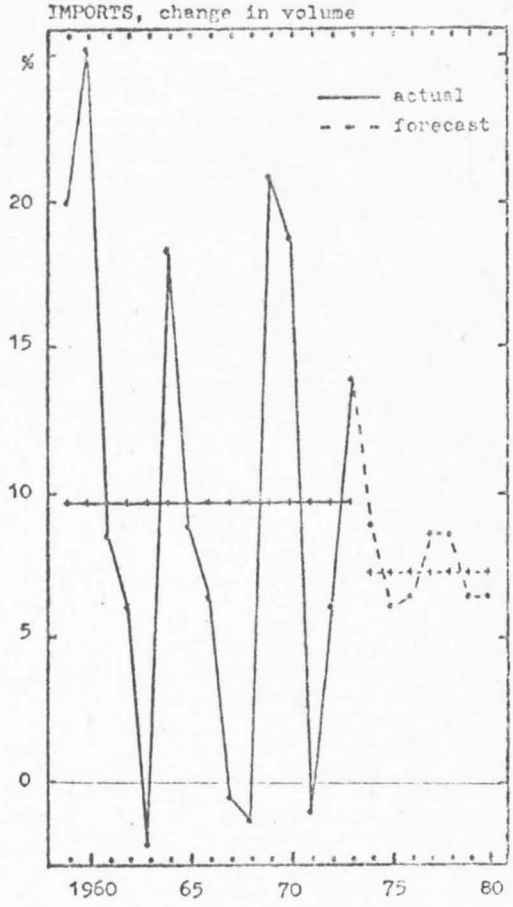
* = ENDOGENOUS

Control solution, selected figures

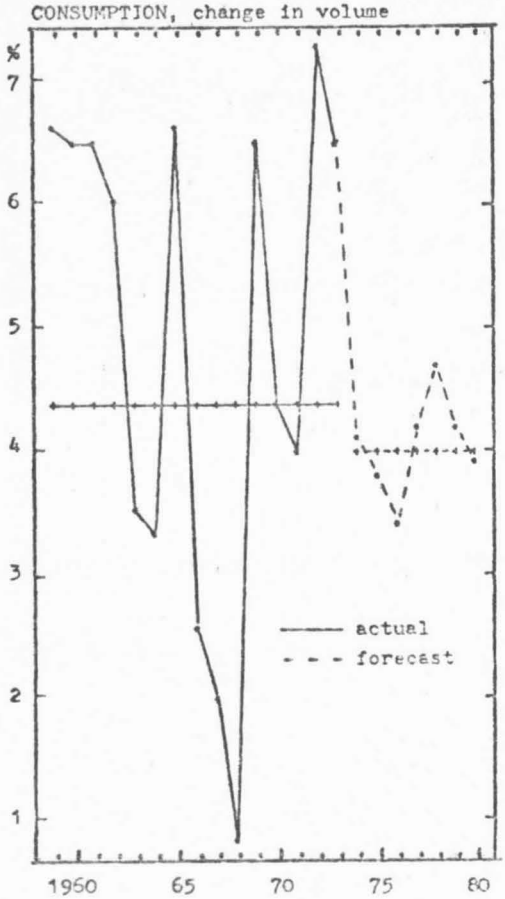
GROSS DOMESTIC PRODUCT, change in volume



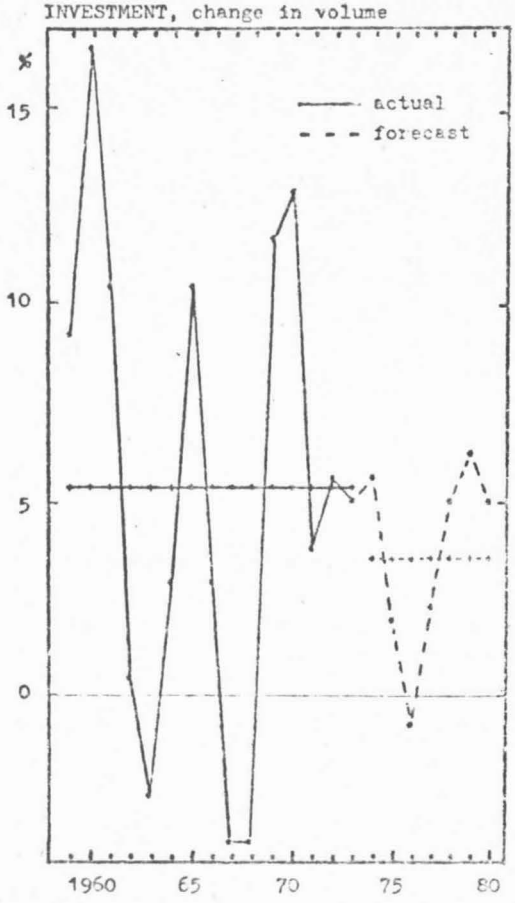
IMPORTS, change in volume



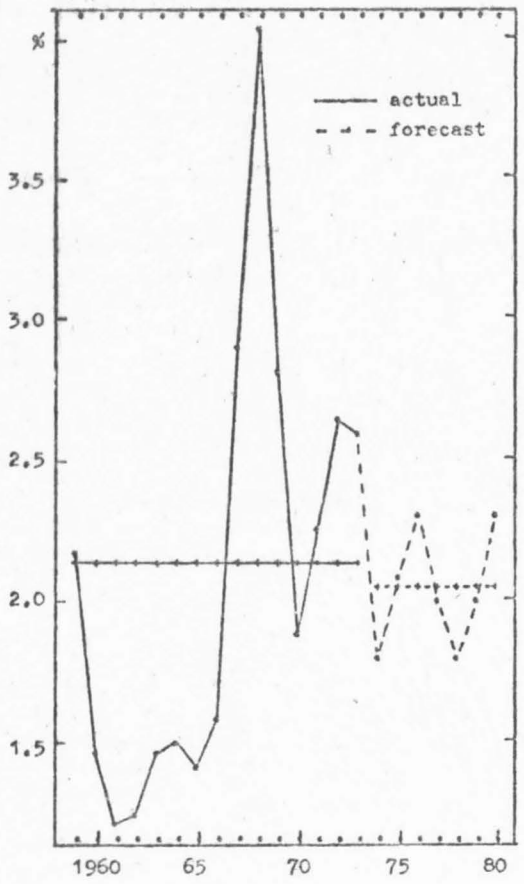
CONSUMPTION, change in volume



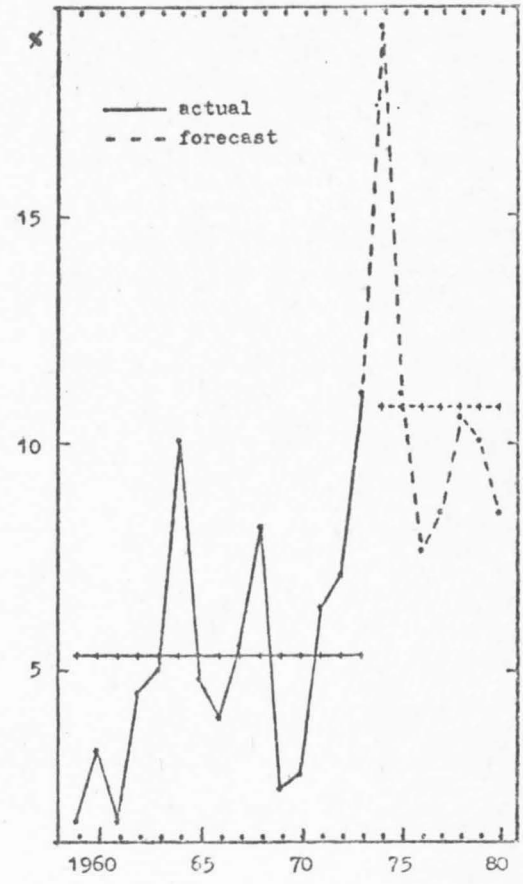
INVESTMENT, change in volume



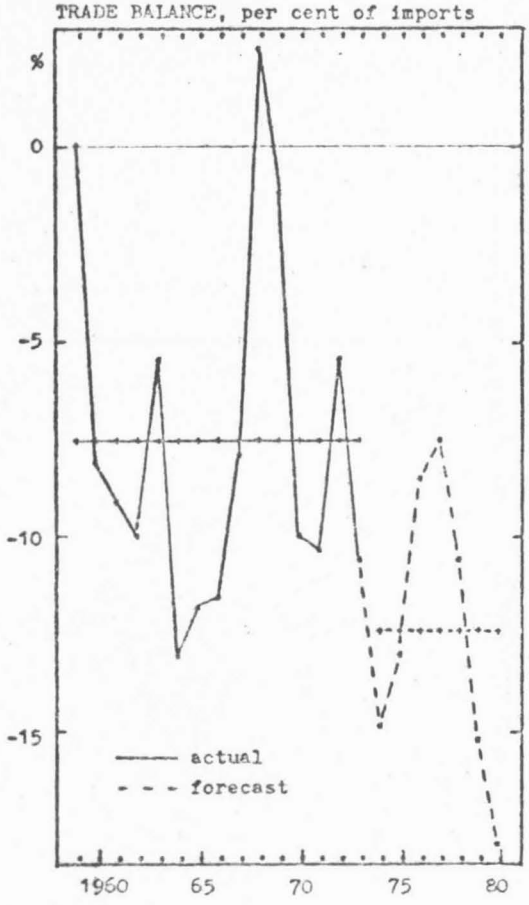
UNEMPLOYMENT RATE



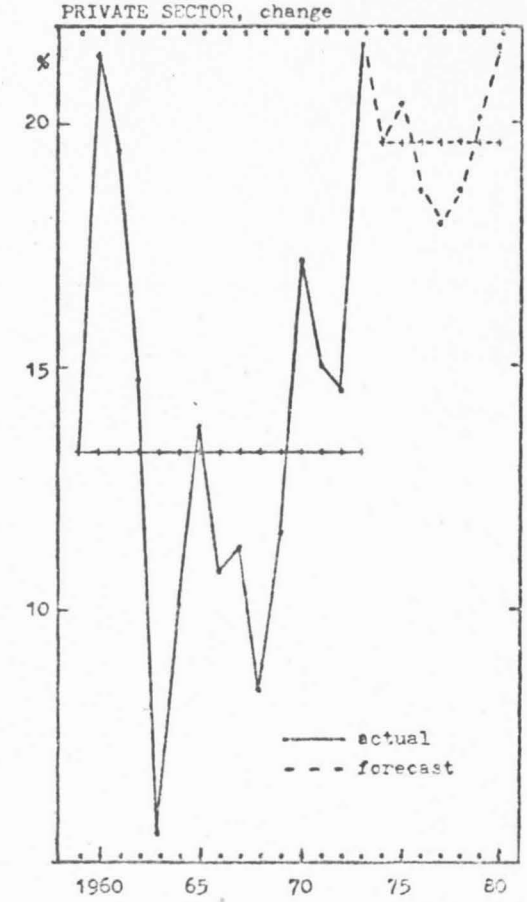
COST OF LIVING INDEX, change



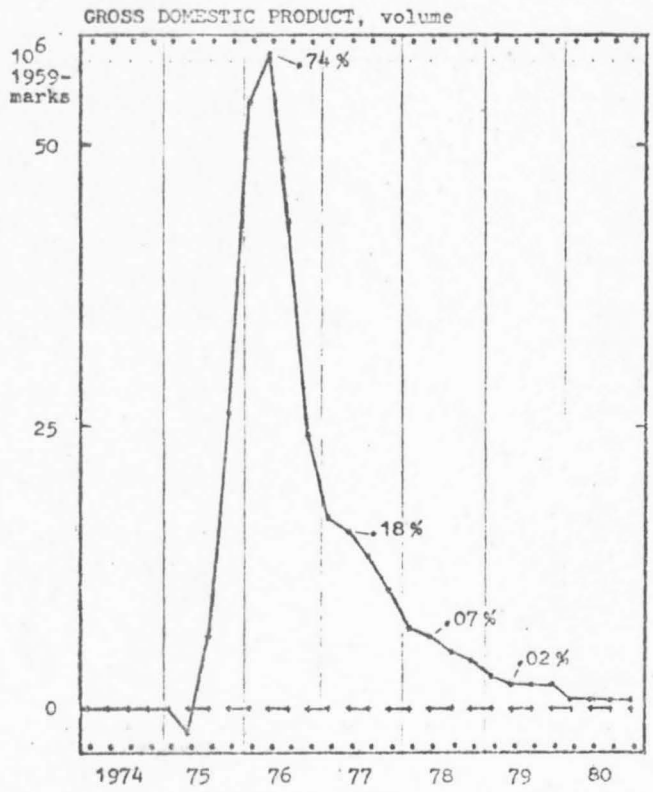
TRADE BALANCE, per cent of imports

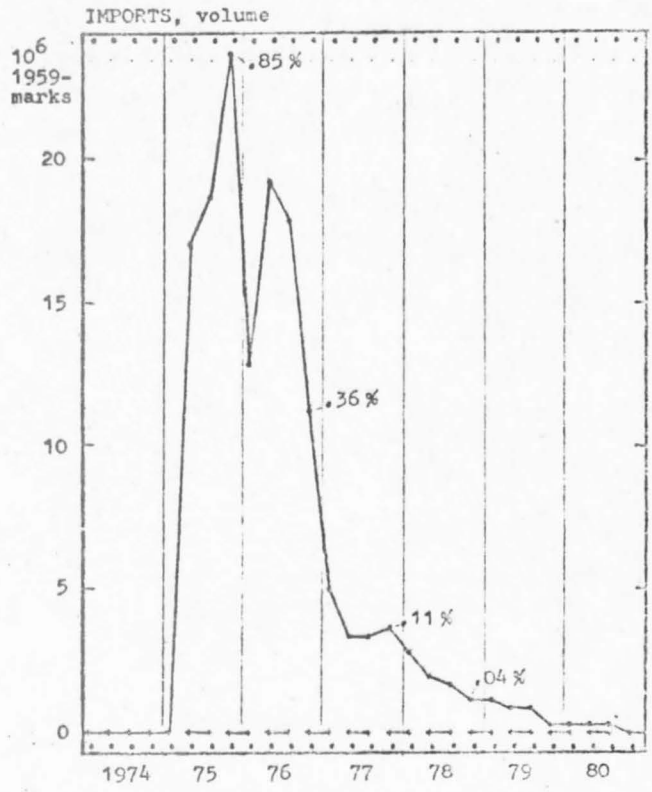


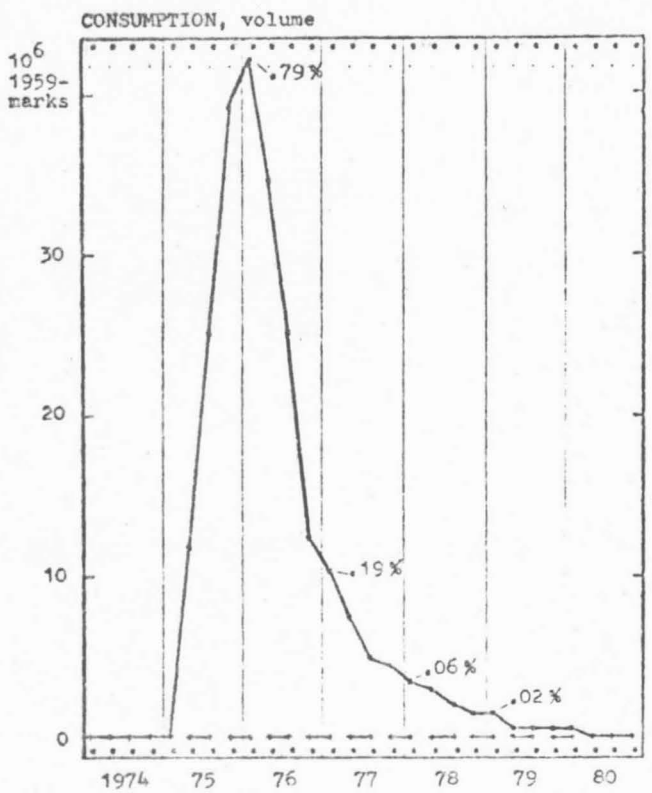
BANK CREDIT TO THE PRIVATE SECTOR, change

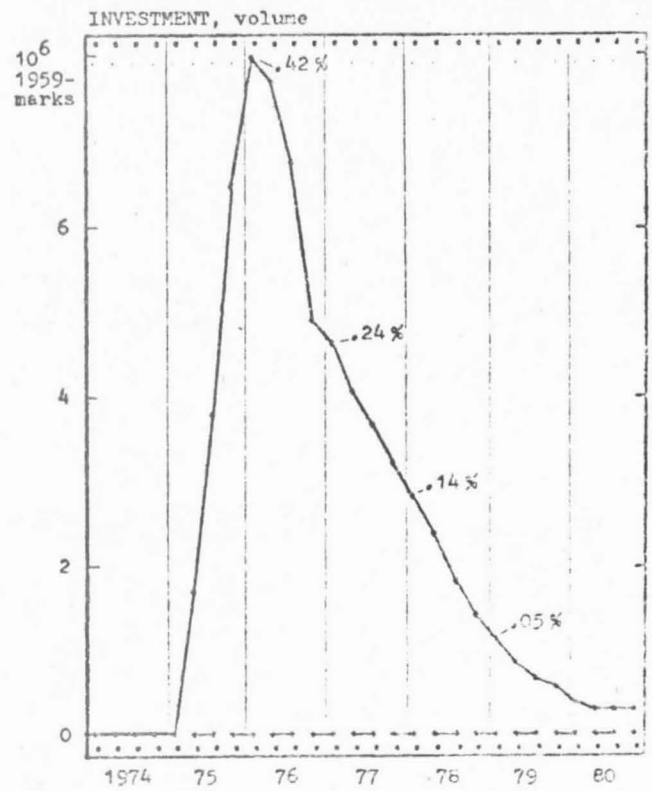


Shocked solution, response of some variables to the tax reduction impulse

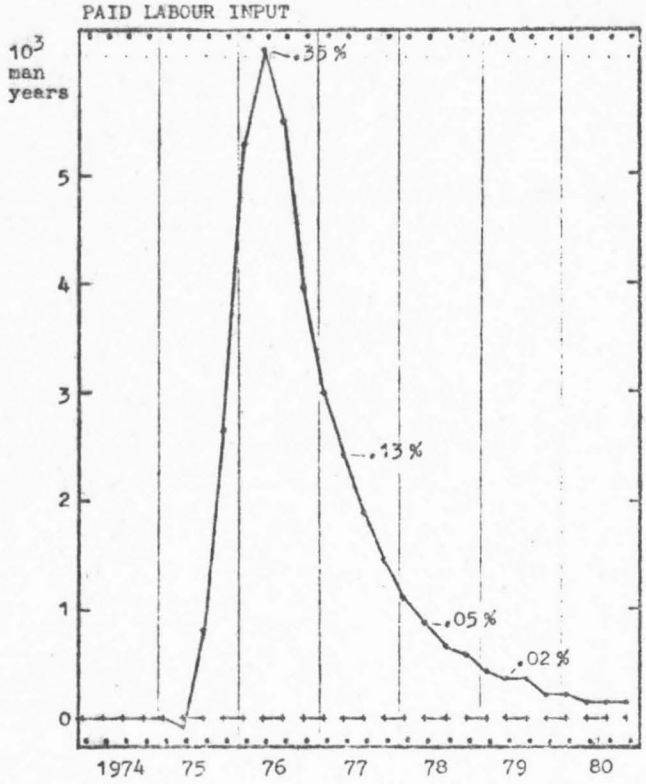




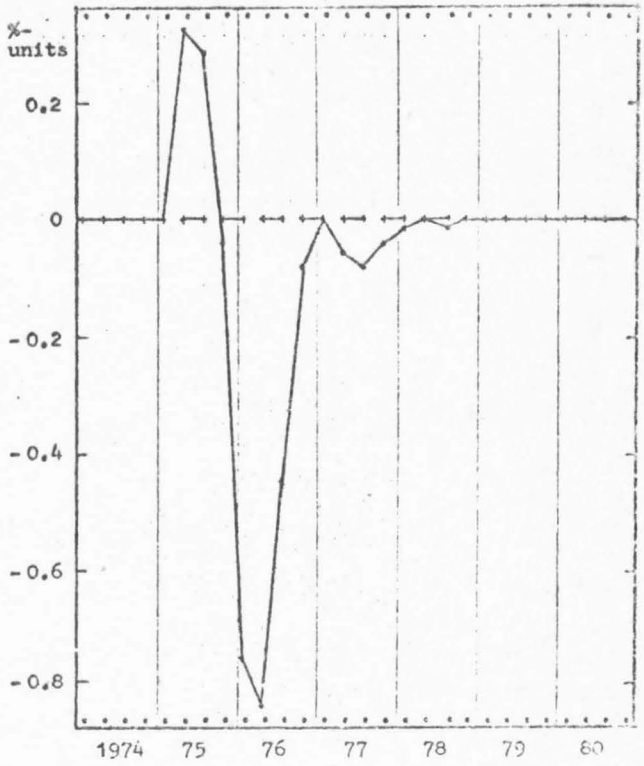




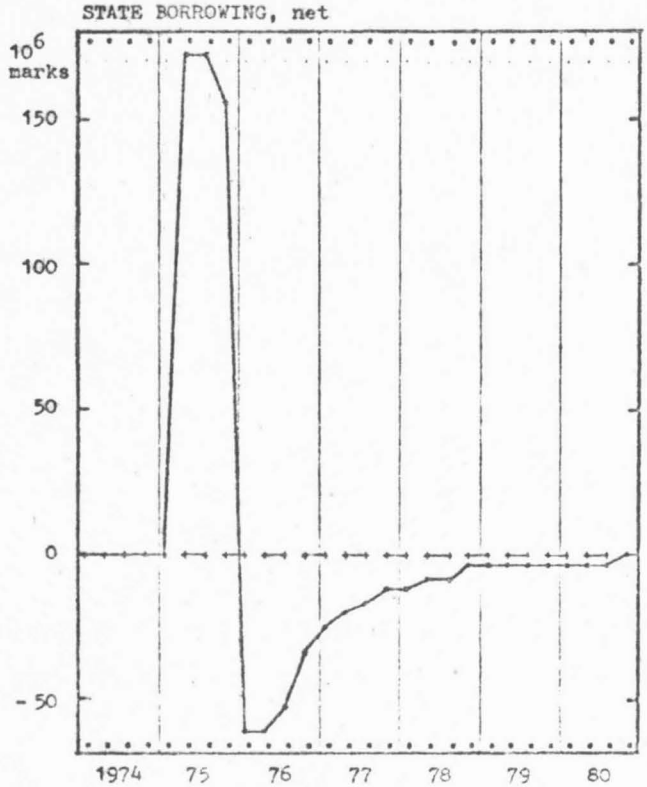
PAID LABOUR INPUT



SHARE OF LABOUR INCOME IN NATIONAL INCOME, %



STATE BORROWING, net



TIME DEPOSITS