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Abstract

SR-1Q, the small aggregate econometric model for the Slovak economy presented in the paper, is based on quarterly time series covering the period 1st quarter 1993 - 4th quarter 1996. SR-1Q is demand determined and presents a simultaneous system of 60 dynamic regression equations and identities expressing relations among 97 variables. The time series concerning real flows are expressed in fixed 1993 prices. For estimation of individual regression equations the unadjusted time series combined with seasonal dummies were used. The main endogenous variables of the model are the basic macroeconomic aggregates typical for a market economy. The external economic environment is characterized by three exogenous variables - total import of the European Union, import price index of the European Union and total import of the Czech Republic.

Keywords

Data base, econometric model, verification of the model

JEL-Classifications

E17

Comments

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1. Introduction

The economy of the Slovak Republic (SR) has been in transition process from a centrally planned economy to a market economy since January 1, 1991 when the price liberalization has started. After the splitting of the former CSFR, i.e. since January 1, 1993, it has performed as the economy of an independent state. Gradual stabilization of macroeconomic relations within the Slovak economy during last three years has improved conditions for activities as far as its macroeconomic modeling is concerned.

In recent years - in particular since 1993 - a growing demand for economic in-formation of higher frequency, especially for short-term forecasts of the economic development in the SR can be observed. On the macroeconomic level, it has been generated mainly by the central institutions (Ministry of Finance, National Bank of Slovakia, etc.). However, the shortage of objective macroeconomic forecasts of the Slovak economy has been still evident. It is assumed that this problem can be efficiently solved if there is a proper econometric model at disposal.

It should be noted that in recent years the Statistical Office of the SR has been trying to keep pace with the growing demand for short-term data by providing more and more monthly or quarterly information on all main macroeconomic indicators of the Slovak economy. In spite of that, however, the statistical data defined according to the concept of the system of national accounts (SNA) are still available only to a limited extend. Thus, when constructing econometric model for the Slovak economy which should be based on statistical data exclusively related to the transition period (in order to exclude a distorting influence of pre-transition period), it is evident that from the technical point of view (number of available observations) relatively better conditions exist for modeling on the basis of quarterly time series.

All above mentioned comments were the major arguments in favour of the construction of a quarterly econometric model. Therefore, following the Project Title "Econometric Modeling of the economy in transition", a small aggregate model for the Slovak economy was built (60 equations, 97 variables) covering almost all the major economic activities. Assuming that since the beginning of transition period the aggregate demand has started to play a decisive role in macroeconomic performance of the Slovak economy, the specification of behavioural equations is demand deter-mined.

The outline of this paper is as follows. In section 2, data base problems as well as general description of the model are presented. A basic specification of the core of the proposed quarterly model is given in section 3. Section 4 gives the complete system of model equations. In section 5, the focus is on more detailed economic interpretation of hypotheses

included in estimated regression equations. The results of ex-post model verification are briefly characterized in section 6. Section 7 concludes this pa-per with several final remarks, including a further model development and use.

2. Data Base and Economic Content of the Model

The data base of original time series for the quarterly model of the Slovak economy was compiled using the following sources:

- Statistical Yearbook of the Slovak Republic and other publications of the Statistical Office of the SR (SO SR),
- statistical publications of the National Bank of Slovakia (NBS),
- statistical publications of the Ministry of Finance of the SR (MF SR),
- statistical publications of the international institutions (EU, UN).

However, a length of needed quarterly time series in publications of the SO SR, NBS and MF SR is various and depends on availability of individual data. As a rule they contain either 24 or (mostly) 16 observations, i.e. they cover the period 1991-1996 or 1993-1996, respectively. The latter group is represented mainly by time series of exports and imports as well as by time series of other indicators derived by means of them. It is caused by the fact that the SO SR has started to compile customs data about foreign trade of the SR in 1993, while until 1993, i.e. during the former CSFR, the statistical data about foreign trade were compiled only on the federal level.

It should be noted that original time series of exports and imports (including other time series derived by means of them) were extended by official estimates produced by the SO SR for 1992. In addition, official estimates produced by the NBS for 1992 were used for extension those time series related to monetary sector. Consequently, all time series in the data base include at least 20 observations. Nevertheless, for estimation of a majority of behavioural equations only the information from the period 1993-1996, i.e. from the period when the Slovak economy has performed independently, was used. However, as an adequate specification of equations for quarterly model often assumes the introduction of lagged variables (by one quarter at least), the information from 1992 was used as well.

The data base created includes mostly the quarterly time series of macroecono-mic indicators of the Slovak economy. In addition, the data base contains also several other important variables describing the external environment of the Slovak economy as well as several auxiliary variables. The time series concerning real flows are ex-pressed in fixed 1993 prices. There are seasonally unadjusted data, however, for some indicators there are

seasonally adjusted data as well, e.g. for gross domestic product (GDP) and its main components (including their deflators), employment, wages, etc.

The seasonally adjusted data were experimentally calculated by applying the method X-11 available in the software package RATS [2]. It should be added that my attempt to analyse seasonality within the quarterly time series for the Slovak economy did not yield satisfactory results (apart from GDP and wages) mainly, as it seems, due to the short sample. Therefore, unadjusted time series combined with seasonal dummies were used for estimation of individual regression equations by the OLS (ordinary least squares) method.[1] Due to the short sample, it was also not useful to analyse stationarity on the basis of cointegration analysis and by means of error correction models.

The quarterly econometric model for the Slovak economy presents a simultaneous system of 60 dynamic regression equations and identities (16 regression equations - 4 linear and 12 non-linear - and 44 identities) expressing relations among 97 variables. Among 37 exogenous variables, 16 are dummies and 4 are seasonal dummy variables. From the point of view of economic content, the system of the model equations can be divided into the following 14 blocks:

- consumption and investment in constant (1993) prices,
- foreign trade in constant prices,
- trade balance in constant prices,
- GDP in constant prices,
- employment and unemployment,
- price indices and deflators,
- foreign trade in current prices,
- trade balance in current prices,
- foreign trade in USD,
- trade balance in USD,
- GDP in current prices,
- GDP in USD,
- wages and incomes of population,
- monetary sector.

[1] Considering that the model's equations form a simultaneous system, one should also apply simultaneous methods of estimation to obtain consistent estimators of the interdependent part of the model. Due to time pressure, consistent estimation procedures will be tried in the next model versions.

The main endogenous variables of the model are the basic macroeconomic aggregates which are typical for a market economy, namely GDP, private and government consumption, fixed investment, exports, imports, trade balance, employment and unemployment, deflator of GDP and deflators of its main components, nominal and real average wages, incomes of households, etc. The key exogenous variables primarily express the main instruments of macroeconomic policy like exchange rate and interest rate. Moreover, the model includes also so-called truly exogenous variables like import of the European Union and its price index, number of population, etc.

3. The Set of Hypotheses for Specification of Regression Equations

The starting point for theoretical formulation of the below presented hypotheses was the knowledge of the economic theory [4] along with experiences in modeling the former CSFR economy [6] as well as the Slovak economy [1]. A basic specification of the core of the proposed quarterly model may be expressed in the following form (expected signs of parameters in the behavioural equations are positive except for variables with minus signs, index -1 means one-period (quarter) lag, d means one-period difference):

- real private consumption C should be a function of real disposable income of households YRD (with the specification expressing the Houthakker-Taylor model of consumption) and real interest rate (ratio of the nominal interest rate on deposits RIDN to annual change in the private consumption deflator PC):

  C = C (YRD(-1), dYRD, C(-1), -RIDN / (PC/PC(-4)))

- real government consumption G should be determined by state budget expenditures F and prices in public sector PG:

  G = G (F, -PG, G(-1))

- real fixed investment I should primarily depend on expected real gross domestic product Y, which should be approximated with its lagged value and change; it should be affected also by lagged investment and real interest rate on credits RICN (expressed in relation to annual change in the GDP deflator PY):[2]

  I = I (Y(-1), dY, I(-1), -RICN / (PY/PY(-4)))

[2] Both real interest rate on deposits and real interest rate on credits can be expressed alternatively as a difference between respective nominal interest rate and the annual growth rate of given price indicator.

- real exports E and imports M should be functions of the corresponding activity variables (real European Union imports MEU and real GDP, respectively) and relative prices:

  E = E (MEU, -PE / (PMEU . RE))

  M = M (Y, -PM / PY)

  where

  PE, PM = exports and imports deflators

  PMEU = European Union imports price index

  RE = exchange rate

- real GDP (Y) will be determined from the demand side with the basic macroecono-mic identity:

  Y = C + I + G + dJ + E - M

  where

  J = stock of inventories

- demand for labour LD should be determined with an inverse of the production function, extended by real wages (nominal wages W deflated with producer price index PXI):

  LD = LD (Y, Y(-1), LD(-1), -T, -W / PXI)

  where

  T = time variable

- rate of unemployment RU will be defined in the usual form as a percentage of labour supply LS:

  RU = 100 (LS - LD) / LS

- exports and imports deflators (PE, PM) should be derived from European Union import prices PMEU and exchange rate RE; the export deflator should also depend on the GDP deflator PY:

PE = PE (PY, (PMEU . RE))

PM = PM (PMEU, RE)

- the producer price index PXI should be determined by the labour unit costs (gene-rated by dividing the nominal average wage W by the labour productivity (GDP per employee)), import prices PM, and its own lagged value:

PXI = PXI (W / (Y / LD), PM, PXI(-1))

- the consumer price index PU should be a function of the main sources of inflation: import prices PM, wage bill YW (in relation to nominal GDP (YP)), government budget deficit SG as well as its own lagged value:

PU = PU (PM, YW / YP, -SG, PU(-1))

- the private consumption deflator PC should be derived from the consumer price index PU:

PC = PU . QPC

where

QPC = ratio of PC to PU

- the government consumption deflator PG and the fixed investment deflator may be expressed as functions of the GDP deflator PY, imports deflator PM, and their own lagged values:

PG = PG (PY, PM, PG(-1))

PI = PI (PY, PM, PI(-1))

- the GDP deflator will be defined as a ratio of nominal and real GDP; nominal GDP will be defined as a sum of its real components multiplied by their respective deflators:

PY = YP / Y

YP = C . PC + I . PI + G . PG + dJ . PJ + E . PE - M . PM

where

PJ = deflator of inventories

- the nominal average wage W should be a function of labour productivity (GDP per employee), consumer prices PU, lagged wage and unemployment rate RU (according to the assumption of the Philips curve):

$$W = W(Y / LD,\ PU,\ W(-1),\ -RU)$$

- wage bill YW will be defined as a product of nominal wage W and employment LD; real disposable income of households YRD will be then defined as a sum of net wage income (wage bill reduced by wage tax rate QTW) and other income of households YO, deflated with consumer price index PU:

$$YW = W . LD$$

$$YRD = ((YW . (1 - QTW) + YO) / PU$$

- money supply M2 should be a function of incomes (approximated by real GDP), prices (approximated by GDP deflator), exchange rate RE, and its own lagged value:

$$M2 = M2(Y,\ PY,\ -RE,\ M2(-1))$$

- nominal interest rate on credits RICN or deposits RIDN should be determined by nominal GDP (YP) (in relation to money supply (M2)), exchange rate IRE, and their own lagged values:

$$RICN = RICN(YP / M2,\ IRE,\ RICN(-1))$$

$$RIDN = RIDN(YP / M2,\ IRE,\ RIDN(-1))$$

In the above basic specification, the seasonal dummies, dummy variables and other less important variables have been omitted. The full specification of the pro-posed Slovak quarterly model includes also many identities.

4. The System of Model Equations

In this part the complete quarterly econometric model for the Slovak economy is presented. Time index "t" is used explicitly only for lagged variables. The symbols used in individual equations are explained in Appendix 1. The results of estimation of individual regression equations including their statistical characteristics are given in Appendix 2 in form of tables produced by RATS. Appendix 3 includes the data base of the model, i.e. the quarterly time series of all endogenous and exogenous variables for the period 1st quarter 1992 - 4th quarter 1996. This version of the quarterly model is labeled SR-1Q.

MODEL SR-1Q

I. Consumption and investment (in constant 1993 prices)

1. C93 = 17.57329 + 0.21786 (YRD - YRD(-1)) + 0.28105 YRD(-1) +
   + 0.33367 C93(-1) - 2.53784 SD1 + 2.88522 UC93
2. G93 = 3.07376 + 0.33969 F - 5.06418 PG + 0.41069 G93(-1) +
   + 4.85412 SD1 + 5.13378 UG93
3. I93 = -11.77142 + 0.20949 Y93 + 0.78139 I93(-1) - 17.76234 SD1 +
   + 12.46255 SD4 + 5.06154 UI93

II. Foreign trade (in constant 1993 prices)

4. ln E93 = 1.37324 + 0.37056 ln MEU + 0.43601 ln MCZ -
   - 1.56632 ln (PE / (PMEU . IRE)) + 0.14733 UE93
5. EG93 = E93 . QEG
6. ES93 = E93 - EG93
7. ln M93 = -2.21719 + 1.37541 ln Y93 - 0.60169 ln (PM(-1) / PY(-1)) +
   + 0.11905 SD4 + 0.15961 UM93
8. MG93 = M93 . QMG
9. MS93 = M93 - MG93

III. Trade balance (in constant 1993 prices)

10. XG93 = EG93 - MG93
11. XS93 = ES93 - MS93
12. X93 = XG93 + XS93

IV. Gross domestic product (in constant 1993 prices)

13. Y93 = C93 + G93 + I93 + DJ93 + X93

V. Employment and unemployment

14. ln LD = -0.89689 + 0.27814 ln Y93 + 0.66430 ln LD(-1) - 0.02020 TIME -
    - 0.07238 (W(-1) / PXI(-1)) + 0.01174 ULD
15. LU = LS - LD . QLD
16. RU = 100 . LU / LS

VI. Price indices and deflators

17. ln PE = 0.62723 ln PY + 0.45464 ln PMEU + 0.17901 ln IRE + 0.02058 SD1 -
    - 0.06907 SD2 - 0.03804 SD3 + 0.07589 SD4 + 0.03443 UPE
18. ln PM = -0.01232 + 1.63834 ln PMEU + ln IRE + 0.02445 SD4 +
    + 0.06978 UPM
19. ln PXI = 0.01587 + 0.29883 ln PM + 0.62670 ln PXI(-1) + 0.05736 UPXI
20. ln PU = 0.02188 + 0.28822 ln PXI + 0.43626 ln PM + 0.31747 ln PU(-1) +
    + 0.04914 UPU
21. PC = PU . QPC
22. ln PG = 0.05684 + 0.80678 ln PY + 0.25964 ln PG(-1) - 0.19468 SD1 +
    + 0.07443 UPG
23. ln PI = 0.05079 + 0.48571 ln PM + 0.56205 ln PI(-1) - 0.06563 SD3 -
    - 0.06911 SD4 + 0.05848 UPI
24. PY = YP / Y93

VII. Foreign trade in current prices

25. EP = E93 . PE
26. EGP = EG93 . PE
27. ESP = EP - EGP
28. MP = M93 . PM
29. MGP = MG93 . PM
30. MSP = MP - MGP

VIII. Trade balance in current prices

31. XGP = EGP - MGP
32. XSP = ESP - MSP
33. XP = XGP + XSP

IX. Foreign trade in USD

34. EG$ = EGP / RE
35. ES$ = ESP / RE

36. E$ = EG$ + ES$

37. MG$ = MGP / RE

38. MS$ = MSP / RE

39. M$ = MG$ + MS$

X. Trade balance in USD

40. XG$ = EG$ - MG$

41. XS$ = ES$ - MS$

42. X$ = XG$ + XS$

XI. Gross domestic product in current prices

43. CP = C93 . PC

44. GP = G93 . PG

45. IP = I93 . PI

46. DJP = DJ93 . PJ

47. YP = CP + GP + IP + DJP + XP

XII. Gross domestic product in USD

48. Y$ = YP / RE

XIII. Wages and incomes of population

49. ln W = -2.30160 + 0.98360 ln (Y93 / LD) + 0.47821 ln PU(-1) +
+ 0.19037 ln W(-1) - 0.00710 RU - 0.04581 SD1 + 0.13651 SD4 +
+ 0.03888 UW

50. WR = W / PU

51. W$ = W / RE

52. YW = 3 . W . LD . QYW

53. YT = YW + YO

54. TW = YW . QTW

55. YD = YT - TW - TO

56. YRD = YD / PU

XIV. Monetary sector

57. M2 = -173.20780 + 1.94777 Y93 + 63.18154 PY + 0.66976 M2(-1) +
+ 35.11027 SD4 + 9.25791 UM2

58. ln RICN = 1.05973 + 0.69311 ln (YP / M2) + 0.81310 ln RICN(-1) +
+ 0.07015 SD1 + 0.08277 SD4 + 0.03565 URICN

59. ln RIDN = 1.26493 + 1.18108 ln (YP / M2) + 0.37398 ln IRE +
+ 0.87431 ln RIDN(-1) + 0.12151 SD1 + 0.15196 SD4 +
+ 0.07320 URIDN

60. IRE = RE / 30.79

5. Regression Equations of the Model - Results of Estimation

The purpose of this section is more detailed economic interpretation of hypo-theses included in the specification of estimated regression equations. Economic interpretation will respect the sequence of individual regression equations in the model SR-1Q.

5.1 Consumption and Investment

This submodel includes three linear regression equations. Regression equation No. 1 represents a consumption function which is based on a classical form of the Houthakker - Taylor (H-T) consumption model [5]. The effective demand for both consumer goods and services is represented by the real private consumption (C93). As indicated in section 3, it is assumed that the real private consumption in current period (quarter) is determined by the real disposable incomes of households (YRD) in the previous period and their change in the current period as well as by the effect of the consumption inertia, i.e. by the real private consumption in the previous period.

The estimation of the consumption function did not confirm an assumption concerning the influence of the real interest rate on real private consumption. On the other hand, two additional quazi-explanatory variables in consumption function are included. Their purpose is to correct either seasonal deviations (SD1) or otherwise unexplained largest deviations in the real private consumption (UC93) within the period 1993 - 1996.[3] The negative parameter standing with the seasonal dummy SD1 expresses regular decrease of the real private consumption in 1st quarters within observed period.

[3] As it follows from the section 4, the quazi-explanatory variables, i.e. seasonal dummies and dummy variables, were also used for the estimation of other regression equations.

The estimated parameters of consumption function were a starting point to de-rive the parameters of the original form of the H-T model. The original or so-called interpretation form of the H-T model

$$C(t) = \alpha + \beta\, s(t) + \gamma_0\, YRD(t) + u(t)$$

where

$$s(t) = (1 - \delta)\, s(t-1) + C(t)$$

s(t) is the status quantity

expresses a hypothesis according to which present consumption C(t) is determined by present real disposable income YRD(t) and the status quantity s(t) defined as stocks. The actual meaning of the "stock" variable s(t) results from the sign of the parameter β: if $\beta < 0$, s(t) is interpreted as physical stocks (which decrease the present consumption), and if $\beta > 0$, then s(t) has the meaning of "accumulated practice or habits" (which increase the present consumption).

As the quantity s(t) is not specified statistically it is not possible to estimate the interpretation form of the H-T model directly. According to [4] its parameters α, β, $\gamma 0$ and δ which characterize private consumption can be derived from estimated parameters of consumption function, as follows:

$$\alpha = [2\, b_0\, (b_2 - 0.5\, b_3)] / (b_1 + 1)\, b_3 \qquad \delta = b_3 / (b_2 - 0.5\, b_3)$$

$$\alpha = 7.25 \qquad \delta = 3.63$$

$$\beta = 2\, (b_1 - 1) / (b_1 + 1) + \delta$$

$$\beta = 2.63$$

$$\gamma_0 = [2\, (b_2 - 0.5\, b_3)] / (b_1 + 1) \qquad \gamma = \gamma_0\, .\, \delta / (\delta - \beta)$$

$$\gamma_0 = 0.12 \qquad \gamma = 0.42$$

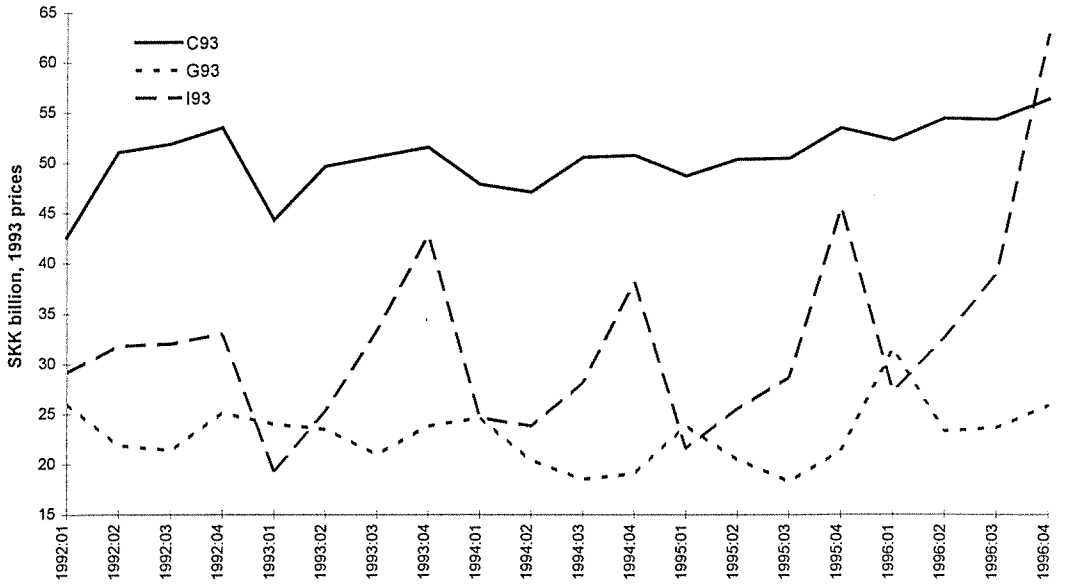
where

b_0, b_1, b_2, b_3 are estimated parameters of consumption function, i.e.

$b_0 = 17.57329$ $\qquad$ $b_1 = 0.33367$

$b_2 = 0.21786$ $\qquad$ $b_3 = 0.28105$

Private and Government Consumption and Fixed Investment



The positive parameter β indicates that the influence of consumers' habits of non-durable consumer goods (which increases the present consumption) prevails over the influence of the stock of durable consumer goods in total consumption. Parameter γ_0 implies that the short-term propensity to consume is lower than the long-term one ($\gamma_0 < \gamma$) and the long-term propensity to save is about 58%.

The consumer demand of public sector is represented by the real government consumption (G93) in regression equation No. 2. As government consumption is financed mainly from the state budget, the current expenditures from the state budget (F) are used as main explanatory variable. Real government consumption in current period (quarter) is also significantly determined by its own lagged value and modified by prices in public sector approximated by government consumption deflator (PG).

The investment demand function explaining the fixed investment (I93) is given by regression equation No. 3. It is assumed that the fixed investment depends primarily on desired production capacity. The basic demand factor is represented by real GDP (Y93), however, investments from previous periods appeared to be also statistically significant factor determining the fixed investment in current period.[4] Two seasonal dummies (SD1, SD4) cover seasonal fluctuations of the fixed investment - a decrease in 1st quarters and an increase in 4th quarters - within the observed period.

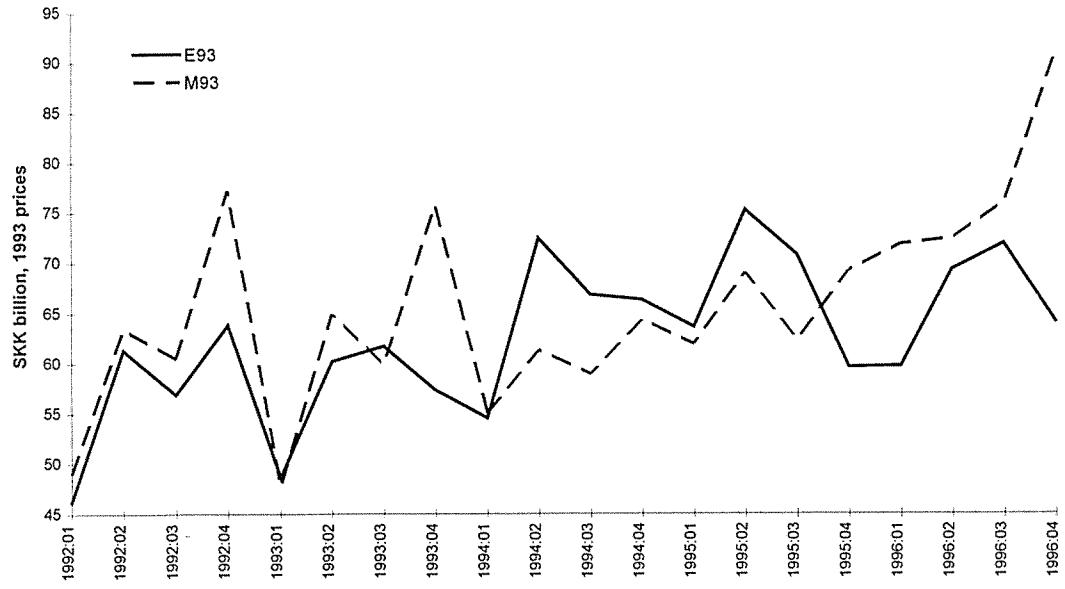
[4] Attempts to introduce the impact of the real interest rate on credits (as an approximation of investment costs) to the investment function did not produce satisfying results.

5.2 Foreign Trade

Within modeling foreign trade variables, two non-linear (power) regression equations were estimated. The export function - the regression equation No. 4 - is specified as a demand function of foreign countries for the total volume of real exports (E93). It is supposed that the foreign demand depends on the level of foreign activity and it adapts to relative prices offered by Slovak exporters. Because of the scarcity of data, both the total real imports of the European Union (MEU) and the total real imports of the Czech Republic (MCZ) are assumed to be the basic demand factors approximating the activity level of the countries trading with the SR.[5] On the other hand, the relative export prices are defined as a ratio of the domestic export prices (PE) to the import prices of the European Union (PMEU). The direct and indirect influences of the exchange rate (IRE) are also taken into consideration.

The import function - the regression equation No. 7 - is specified as a demand function of the internal economy for the total volume of real imports (M93). The level of internal demand is approximated by real GDP (Y93). On the other hand, the volume of real imports is modified by the relative import prices lagged by one period (de-fined as a ratio between the import prices (PM) and domestic prices represented by GDP deflator (PY)) which measures the competitiveness of imports.

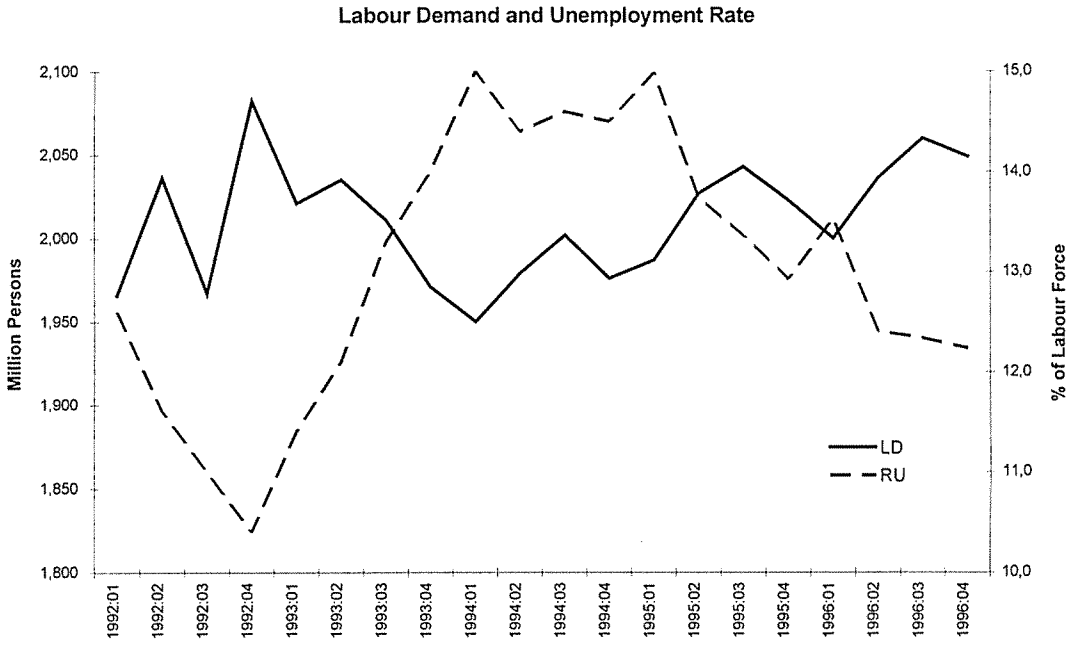
Exports and Imports



[5] In recent years, the share of exports from the SR to both the EU and the Czech Republic on the total exports from the SR has increased gradually. It represented more than 70% in 1996. For simplicity, both MEU and MCZ were derived using import price index of the European Union (PMEU).

5.3 Employment

The demand for labour (LD) is expressed by the regression equation No. 14. As a starting point for its construction, the inverted Cobb-Douglas production function was used. It means that the overall demand on the labour market is determined by the total output represented by the real GDP (Y93). However, the influences generated by inertia processes in employment play also a significant role. On the other hand, the demand for labour is modified (reduced) by level of a disembodied technical progress (TIME) as well as by the average real wage lagged by one period (derived from the nominal wages (W) deflated by the producer price index (PXI)).



5.4 Price Indices and Deflators

In this submodel I tried to explain the aggregate export and import deflators as well as the deflators of other main GDP components (except for deflator of inventories). However, this submodel includes also two additional regression equations explaining both the producer and consumer price index. The regression equations for all these price indicators - except for private consumption deflator - are formulated in a non-linear (power) form.

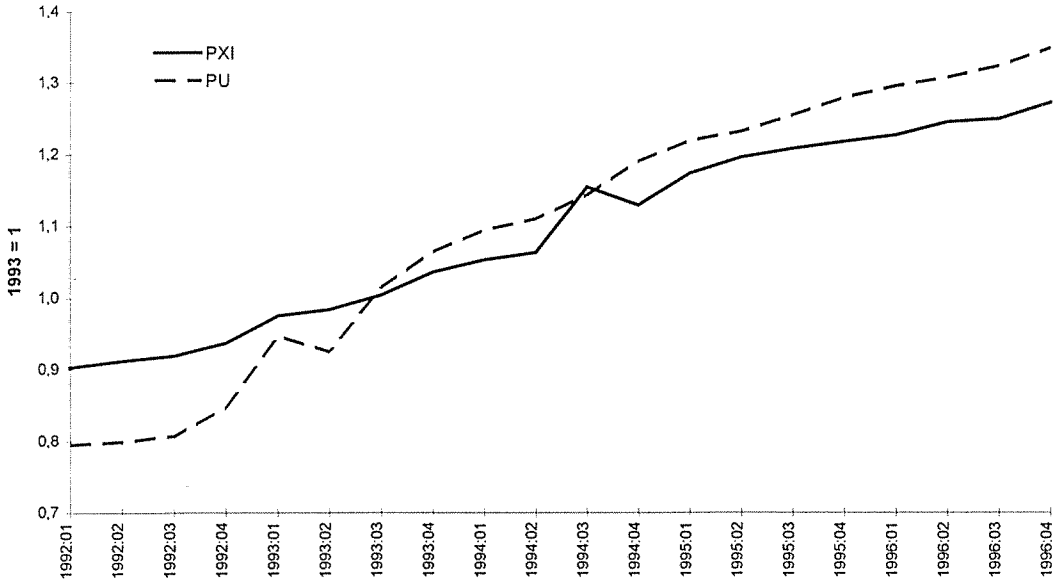
The regression equation No. 16 explaining the deflator of total exports (PE) indicates that the export prices are formed not only under the influence of world prices approximated by import prices of the European Union (PMEU), but also under the influence of the domestic prices represented by the GDP deflator (PY). This equation does not include a constant term, on the

other hand, as the only regression equation in the model includes all four seasonal dummies (SD1, SD2, SD3, SD4). According to the regression equation No. 17, the deflator of total imports (PM) is determined exclusively by world prices. In both these regression equations, the direct and indirect influences of exchange rate (IRE) are also taken into consideration.

The core of the system of equations explaining the selected indicators of the internal price system in this submodel are producer prices. Generally, the changes in producer prices reflect the pressures caused by both the cost push and the demand pull. However, the only explanatory variable for the producer prices (PXI) (except for their lagged value) in the regression equation No. 19 are the import prices (PM), i.e. variable reflecting the cost push. On the other hand, the consumer price index (PU) in the regression equation No. 20 depends primarily both on the domestic producers' prices (PXI) and on the prices of imported products (PM). It should be also noted that initial attempt to introduce in this equation the wage bill (in relation to nominal GDP) as a measure of demand pressures failed. The private consumption deflator (PC) is de-rived from the consumer price index (PU).

The regression equations No. 22 and 23 explain the development of the government consumption deflator (PG) and the fixed investment deflator (PI), respectively. The former is determined mainly by the GDP deflator (PY), the latter by the import prices (PM). The lagged values of respective deflators play also important role in given regression equations. The GDP deflator (PY) is defined by dividing aggregate demand in current prices (YP) by aggregate demand in constant prices (Y93).

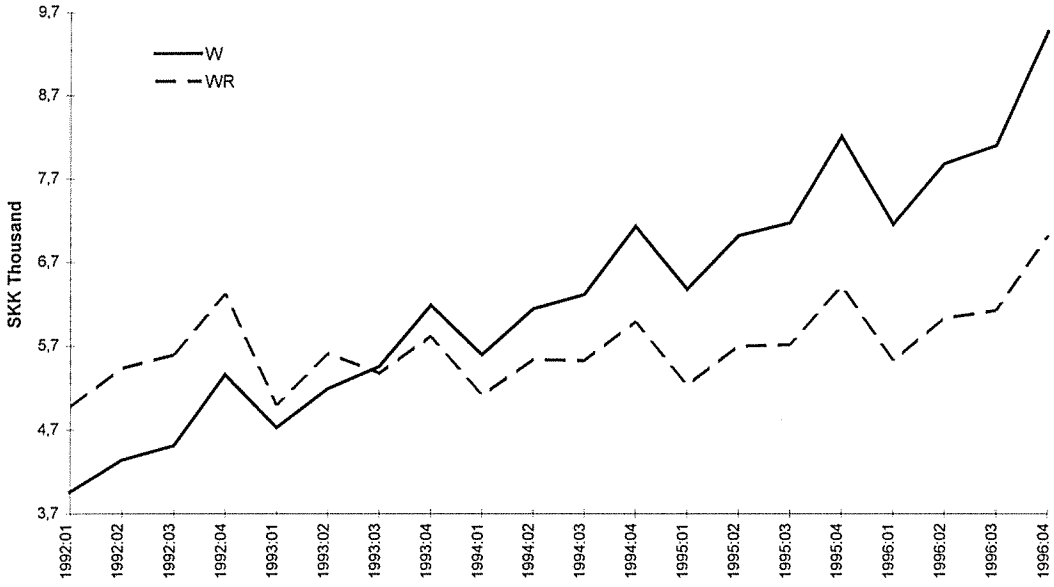
Producer and Consumer Prices



5.5 Average Nominal Wages

The regression equation No. 49 explaining average nominal wages (W) is one of the most important within the model. A long-term factor determining wages is the productivity of labour expressed as the volume of output (Y93) per one employee.[6] On the other hand, the inflation approximated by the consumer price index (PU) lagged by one period is the main factor determining the increase in wages, particularly in the short run. Moreover, the wages function includes the assumptions of the Phillips curve, too, i.e. the short-term impact of the unemployment rate (RU) on the increase of average wages. Seasonal dummies (SD1, SD4) cover seasonal fluctuations of nominal wages (a decrease in 1st quarters and an increase in 4th quarters).[7]

Nominal and Real Monthly Wages



5.6 Money Supply and Interest Rates

In this submodel, three regression equations are included with the purpose to establish feedbacks between monetary sector and real economy. Unfortunately, there are no feedbacks between this submodel and the rest of the model so far.

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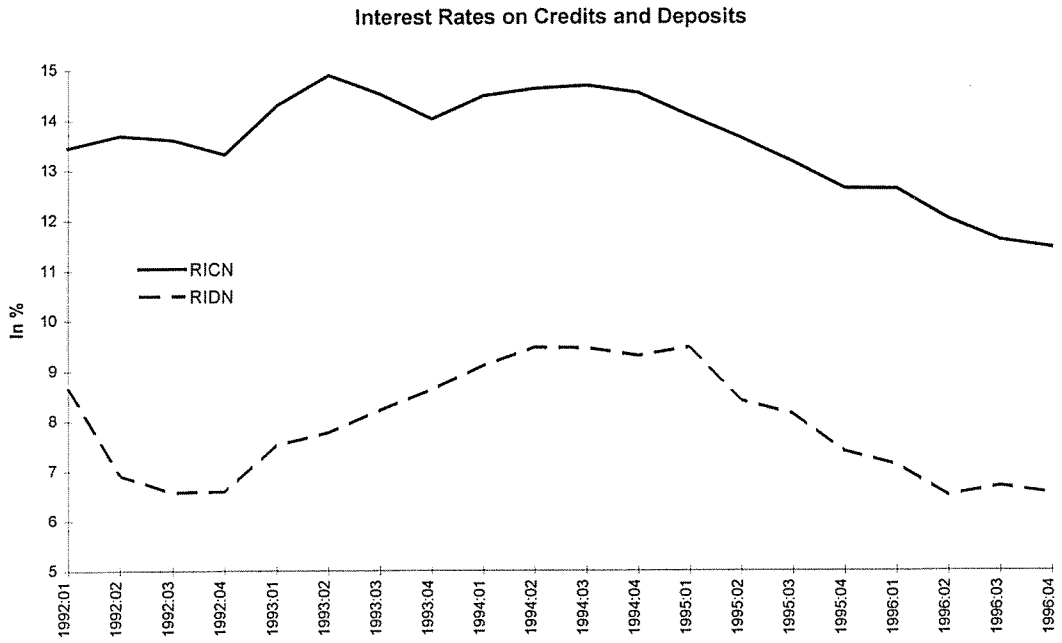
[6] It is an imperfect approximation compared with a more precise characteristic of the labour productivity, that is the output per one working time unit (hour).

[7] Multiplication by number 3 in equation No. 52 in this submodel expresses the derivation of the quarterly volume of wage income (YW) from the monthly average wages (W).

According to the regression equation No. 57, money supply (M2) depends positively on the level of income (Y93), and on the price level (PY). However, money supply in current period is significantly influenced by its own level in previous period (quarter) as well.[8]



The information concerning the interest rates allows to think about (at least) two groups of them, i.e. the interest rate on credits (RICN) and the interest rate on de-posits (RIDN). For both of them separate regression equations - No. 58 and No. 59, respectively - were estimated. With regard to their specification, it was found out that in the current period both interest rates depend mainly on the nominal GDP (YP) (in relation to M2) as well as on their own values in the previous period. Moreover, the interest rate on deposits depends on the exchange rate (IRE) as well.

6. The ex-post Verification of the Model

The estimated parameters of particular regression equations presented in section 4 are a result of a rather long lasting process of testing alternative hypotheses on available data base. It should be mentioned, however, that the results of estimation of some equations are not fully satisfactory yet. First of all, it is due to a small number of the degrees of freedom resulting from a small number of observations in the time series. Consequently, the obtained

[8] Attempts to introduce the impact of the exchange rate into this regression equation proved to be unsuccessful.

results have to be treated as a compromise between the theoretical requirements and the availability of data.

The verification of the model SR-1Q was solved by means of RATS and it was based on the Gauss-Seidel algorithm. The model was verified on the basis of ex-post simulation for the period 1st quarter 1993 - 4th quarter 1996 (i.e. on the basis of 16 quarterly observations) using the instruction THEIL [2]. Analyzing the Theil's U statistics one can find out that the accuracy of the model is satisfactory as the values of given statistical characteristics concerning all endogenous variables of the model do not exceed one.

7. Conclusions

The necessity of short-term forecasts of the Slovak economy requires to have at disposal not only appropriate statistical data but also a suitable model tools. For these purposes a small quarterly econometric model SR-1Q was developed. However, due to the limited data availability, the above presented model should be treated as its first experimental version. It is assumed that the gradual extension of time series will make it possible to undertake attempts to further improvement of its individual equations as well as to further enlargement of the model itself. So, the next enlarged and updated versions of this model could be more operational providing a basis for regular quarterly forecasting of the Slovak economy.

Undoubtedly, within the further research this experimental version of the model will have to be extended in several directions. It was already mentioned that be-cause of lack of appropriate quarterly information the model includes rather simple equations explaining mainly the demand side of the economy. Consequently, within the next versions of the model the supply side of the economy should be developed as well.

More emphasis should be also put on financial flows and monetary indicators which played only negligible role in the past, i.e. during the period of central planning. The role of both financial and monetary instruments in the market economy is very important, as they influence many real processes. Generally speaking, the next versions of the model should gradually include all main entities participating in the processes within the market economy, namely households, producers, government (re-presented by the budget), banking sector and foreign sector.

However, perhaps the greatest area for improvement of the model one can find in a broader application of the techniques developed in recent years for estimation and testing of the model equations. First of all, procedures aimed at testing the time series for stationarity and their relevant transformations allowing for cointegration of regressed variables should be implemented. Further, expectations (including rational expectations), especially in equations

explaining price and wages formation, investment decisions, etc. should be introduced into the next model versions as well.

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APPENDIX - 1

LIST OF VARIABLES FOR THE MODEL SR-1Q

I. Endogenous variables - in order of equations

Symbol	*Definition*
C93	Private consumption, bill. SKK, 1993 prices
G93	Government consumption, bill. SKK, 1993 prices
I93	Gross fixed investment, bill. SKK, 1993 prices
E93	Total exports, goods and services, bill. SKK, 1993 prices
EG93	Export of goods, bill. SKK, 1993 prices
ES93	Export of services, bill. SKK, 1993 prices
M93	Total imports, goods and services, bill. SKK, 1993 prices
MG93	Import of goods, bill. SKK, 1993 prices
MS93	Import of services, bill. SKK, 1993 prices
XG93	Trade balance, goods, bill. SKK, 1993 prices
XS93	Trade balance, services, bill. SKK, 1993 prices
X93	Trade balance, goods and services, bill. SKK, 1993 prices
Y93	Gross domestic product, bill. SKK, 1993 prices
LD	Employment, mill. persons, average for period
LU	Unemployment, mill. persons, average for period
RU	Rate of unemployment, %, average for period
PE	Exports deflator, goods and services, 1993=1
PM	Imports deflator, goods and services, 1993=1
PXI	Producer price index, 1993=1
PU	Consumer price index, 1993=1
PC	Private consumption deflator, 1993=1
PG	Government consumption deflator, 1993=1
PI	Fixed investment deflator, 1993=1
PY	Gross domestic product deflator, 1993=1
EP	Total exports, goods and services, bill. SKK, current prices
EGP	Export of goods, bill. SKK, current prices
ESP	Export of services, bill. SKK, current prices
MP	Total imports, goods and services, bill. SKK, current prices
MGP	Import of goods, bill. SKK, current prices
MSP	Import of services, bill. SKK, current prices
EG$	Export of goods, bill. USD, current prices
ES$	Export of services, bill. USD, current prices
E$	Total exports, goods and services, bill. USD, current prices
MG$	Import of goods, bill. USD, current prices
MS$	Import of services, bill. USD, current prices
M$	Total imports, goods and services, bill. USD, current prices
XGP	Trade balance, goods, bill. SKK, current prices
XSP	Trade balance, services, bill. SKK, current prices
XP	Trade balance, goods and services, bill. SKK, current prices
XG$	Trade balance, goods, bill. USD, current prices
XS$	Trade balance, services, bill. USD, current prices
X$	Trade balance, goods and services, bill. USD, current prices

CP	Private consumption, bill. SKK, current prices
GP	Government consumption, bill. SKK, current prices
IP	Gross fixed investment, bill. SKK, current prices
DJP	Inventory change, bill. SKK, current prices
YP	Gross domestic product, bill. SKK, current prices
Y$	Gross domestic product, bill. USD, current prices
W	Average monthly wages, thousands SKK, nominal
WR	Average monthly wages, thousands 1993 SKK, real
W$	Average monthly wages, thousands USD, nominal
YW	Wage incomes of households, bill. SKK, nominal
YT	Total incomes of households, bill. SKK, nominal
TW	Income taxes, bill. SKK
YD	Disposable incomes of households, bill. SKK, nominal
YRD	Real disposable incomes of households, bill. SKK, 1993 prices
M2	Money supply, bill. SKK
RICN	Interest rate on credits, %, nominal
RIDN	Interest rate on deposits, %, nominal
IRE	Exchange rate index SKK/USD, 1993=1

II. Exogenous variables

SD1	Seasonal dummy for 1st quarter
SD2	Seasonal dummy for 2nd quarter
SD3	Seasonal dummy for 3rd quarter
SD4	Seasonal dummy for 4th quarter
F	State budget expenditures, total, bill. SKK
MEU	Total imports of the European Union, bill. USD, 1993 prices
MCZ	Total imports of the Czech Republic, bill. USD, 1993 prices
PMEU	Imports deflator of the European Union, 1993=1
QEG	Share of export of goods in total exports
QMG	Share of import of goods in total imports
DJ93	Inventory change, bill. SKK, 1993 prices
TIME	Time trend
LS	Labour supply, mill. persons
QLD	Conversion factor for labour demand
QPC	Ratio of private consumption deflator to consumer price index
RE	Exchange rate, SKK/USD
PJ	Deflator of inventories, 1993=1
QYW	Conversion factor for wage incomes
YO	Other incomes of households, bill. SKK, nominal
QTW	Tax rate for wage incomes
TO	Other expenditures of households, bill. SKK, nominal
Uj	Dummy variables covering extraordinary deviations, alternatively in regression equations for j = C93, G93, I93, E93, M93, LD, PE, PM, PXI, PU, PG, PI, W, M2, RICN, RIDN

APPENDIX - 2

Model SR-1Q

Results of estimation of individual regression equations

(Tables produced by RATS)

Regression equation No. 1
****

Dependent variable C93 - Estimation by Least Squares
Quarterly Data From 93:01 To 96:04

Usable Observations	16	Degrees of Freedom	10
Centered R**2	0.934136	R Bar **2	0.901204
Uncentered R**2	0.999781	T x R**2	15.997
Mean of Dependent Variable	50.743750000		
Std Error of Dependent Variable	3.023677397		
Standard Error of Estimate	0.950395972		
Sum of Squared Residuals	9.0325250299		
Regression F(5,10)	28.3657		
Significance Level of F	0.00001336		
Durbin-Watson Statistic	1.984864		
Q(4-0)	5.738944		
Significance Level of Q	0.21951078		

	Variable	Coeff	Std Error	T-Stat	Signif
1.	Constant	17.57328530	5.57180750	3.15396	0.01026355
2.	DYRD	0.21785645	0.09484077	2.29708	0.04447505
3.	YRD{1}	0.28105254	0.10136901	2.77257	0.01970028
4.	C93{1}	0.33367387	0.12137675	2.74908	0.02051076
5.	SD1	-2.53783983	1.17808506	-2.15421	0.05666078
6.	UC93	2.88522432	0.43744674	6.59560	0.00006112

Where

DYRD = YRD - YRD{1}

Regression equation No. 2
****

Dependent Variable G93 - Estimation by Least Squares
Quarterly Data From 93:01 To 96:04

Usable Observations	16	Degrees of Freedom	10
Centered R**2	0.960720	R Bar **2	0.941080
Uncentered R**2	0.999244	T x R**2	15.988
Mean of Dependent Variable	22.687500000		
Std Error of Dependent Variable	3.281437693		
Standard Error of Estimate	0.796520334		
Sum of Squared Residuals	6.3444464220		
Regression F(5,10)	48.9162		
Significance Level of F	0.00000104		
Durbin-Watson Statistic	1.731064		
Q(4-0)	4.882403		
Significance Level of Q	0.29957787		

	Variable	Coeff	Std Error	T-Stat	Signif
1.	Constant	3.073762025	2.941796256	1.04486	0.32068771
2.	F	0.339689747	0.040865823	8.31232	0.00000841
3.	PG	-5.064177786	1.671018888	-3.03059	0.01266432
4.	G93{1}	0.410687942	0.066086579	6.21439	0.00009956
5.	SD1	4.854118857	0.657204322	7.38601	0.00002353
6.	UG93	5.133783346	0.737579789	6.96031	0.00003898

Regression equation No. 3
****

Dependent Variable I93 - Estimation by Least Squares
Quarterly Data From 93:01 To 96:04

Usable Observations	16	Degrees of Freedom	10
Centered R**2	0.984256	R Bar **2	0.976384
Uncentered R**2	0.998427	T x R**2	15.975
Mean of Dependent Variable	32.381250000		
Std Error of Dependent Variable	11.141108188		
Standard Error of Estimate	1.712116283		
Sum of Squared Residuals	29.313421669		
Regression F(5,10)	125.0315		
Significance Level of F	0.00000001		
Durbin-Watson Statistic	2.159319		
Q(4-0)	5.159797		
Significance Level of Q	0.27129079		

	Variable	Coeff	Std Error	T-Stat	Signif
1.	Constant	-11.77141669	6.78573394	-1.73473	0.11344585
2.	Y93	0.20949189	0.08223162	2.54758	0.02898382
3.	I93{1}	0.78138958	0.14021028	5.57298	0.00023640
4.	SD1	-17.76234431	2.69528574	-6.59015	0.00006154
5.	SD4	12.46255220	1.67073938	7.45930	0.00002162
6.	UI93	5.06153991	0.71739678	7.05543	0.00003476

Regression equation No. 4
****

Dependent Variable E93L - Estimation by Least Squares
Quarterly Data From 93:01 To 96:04

Usable Observations	16	Degrees of Freedom	11
Centered R**2	0.930770	R Bar **2	0.905595
Uncentered R**2	0.999949	T x R**2	15.999
Mean of Dependent Variable	4.1507473280		
Std Error of Dependent Variable	0.1160932192		
Standard Error of Estimate	0.0356701113		
Sum of Squared Residuals	0.0139959253		
Regression F(4,11)	36.9725		
Significance Level of F	0.00000256		
Durbin-Watson Statistic	1.796190		
Q(4-0)	1.962607		
Significance Level of Q	0.74263645		

Variable	Coeff	Std Error	T-Stat	Signif
1. Constant	1.373240747	0.923634432	1.48678	0.16516437
2. MEUL	0.370557192	0.161239623	2.29818	0.04216694
3. MCZL	0.436005618	0.048085425	9.06731	0.00000195
4. PEPMIRL	-1.566315789	0.164331273	-9.53145	0.00000119
5. UE93	0.147327366	0.024104572	6.11201	0.00007606

Where

E93L = ln E93
MEUL = ln MEU
MCZL = ln MCZ
PEPMIRL = ln (PE/(PMEU*IRE))

Regression equation No. 7
****

Dependent Variable M93L - Estimation by Least Squares
Quarterly Data From 93:01 To 96:04

Usable Observations	16	Degrees of Freedom	11
Centered R**2	0.928639	R Bar **2	0.902690
Uncentered R**2	0.999915	T x R**2	15.999
Mean of Dependent Variable	4.1839064472		
Std Error of Dependent Variable	0.1492999039		
Standard Error of Estimate	0.0465734418		
Sum of Squared Residuals	0.0238599403		
Regression F(4,11)	35.7866		
Significance Level of F	0.00000302		
Durbin-Watson Statistic	2.117920		
Q(4-0)	6.745090		
Significance Level of Q	0.14998802		

Variable	Coeff	Std Error	T-Stat	Signif
1. Constant	-2.217186278	0.852715174	-2.60015	0.02468745
2. Y93L	1.375405822	0.185034662	7.43323	0.00001304
3. PMPYL{1}	-0.601691152	0.314153711	-1.91528	0.08180566
4. SD4	0.119045849	0.030315826	3.92685	0.00236482
5. UM93	0.159612029	0.027970341	5.70647	0.00013688

Where

M93L = ln M93
Y93L = ln Y93
PMPYL = ln (PM/PY)

Regression equation No. 14
****

Dependent Variable LDL - Estimation by Least Squares
Quarterly Data From 93:01 To 96:04

Usable Observations	16	Degrees of Freedom	10
Centered R**2	0.969762	R Bar **2	0.954643
Uncentered R**2	0.999986	T x R**2	16.000
Mean of Dependent Variable	0.6983299720		
Std Error of Dependent Variable	0.0157190441		
Standard Error of Estimate	0.0033476973		
Sum of Squared Residuals	0.0001120708		
Regression F(5,10)	64.1426		
Significance Level of F	0.00000029		
Durbin-Watson Statistic	2.380197		
Q(4-0)	2.191487		
Significance Level of Q	0.70058804		

	Variable	Coeff	Std Error	T-Stat	Signif
1.	Constant	-0.896894402	0.151716700	-5.91164	0.00014871
2.	Y93L	0.278139026	0.030518701	9.11372	0.00000370
3.	LDL{1}	0.664302904	0.056230128	11.81400	0.00000034
4.	TIME	-0.002020414	0.000591426	-3.41618	0.00658960
5.	WRL{1}	-0.072379906	0.016685706	-4.33784	0.00147135
6.	ULD	0.011744060	0.002925178	4.01482	0.00245888

Where

LDL = ln LD
Y93L = ln Y93
WRL = ln (W/PXI)

Regression equation No. 17
****

Dependent Variable PEL - Estimation by Least Squares
Quarterly Data From 93:01 To 96:04

Usable Observations	16	Degrees of Freedom	8
Centered R**2	0.999445	R Bar **2	0.998959
Uncentered R**2	0.999755	T x R**2	15.996
Mean of Dependent Variable	0.1309456606		
Std Error of Dependent Variable	0.1200248572		
Standard Error of Estimate	0.0038725770		
Sum of Squared Residuals	0.0001199748		
Regression F(7,8)	2057.2842		
Significance Level of F	0.00000000		
Durbin-Watson Statistic	2.101209		
Q(4-0)	8.015725		
Significance Level of Q	0.09100387		

	Variable	Coeff	Std Error	T-Stat	Signif
1.	PYL	0.627231903	0.044830934	13.99105	0.00000066
2.	PMEUL	0.454639321	0.080209211	5.66817	0.00047140
3.	IREL	0.179010317	0.069502368	2.57560	0.03284026
4.	SD1	0.020586168	0.002251919	9.14161	0.00001652
5.	SD2	-0.069066775	0.002376694	-29.06002	0.00000000
6.	SD3	-0.038040151	0.002658436	-14.30922	0.00000056
7.	SD4	0.075894934	0.002907721	26.10117	0.00000000
8.	UPE	0.034425666	0.003368492	10.21990	0.00000721

Where

PEL = ln PE
PMEUL = ln PMEU
IREL = ln IRE

Regression equation No. 18
****

Dependent Variable PMIREL - Estimation by Least Squares
Quarterly Data From 93:01 To 96:04

Usable Observations	16	Degrees of Freedom	12
Centered R**2	0.988200	R Bar **2	0.985250
Uncentered R**2	0.994946	T x R**2	15.919
Mean of Dependent Variable	0.1306118492		
Std Error of Dependent Variable	0.1167530217		
Standard Error of Estimate	0.0141798333		
Sum of Squared Residuals	0.0024128121		
Regression F(3,12)	334.9721		
Significance Level of F	0.00000000		
Durbin-Watson Statistic	2.248639		
Q(4-0)	4.918249		
Significance Level of Q	0.29578902		

Variable	Coeff	Std Error	T-Stat	Signif
1. Constant	-0.012315046	0.005995685	-2.05398	0.06243087
2. PMEUL	1.638340386	0.053476722	30.63651	0.00000000
3. SD4	0.024448568	0.008221073	2.97389	0.01161690
4. UPM	0.069775004	0.010341987	6.74677	0.00002053

Where

PMIREL = ln (PM/IRE)
PMEUL = ln PMEU

Regression equation No. 19
****

Dependent Variable PXIL - Estimation by Least Squares
Quarterly Data From 93:01 To 96:04

Usable Observations	16	Degrees of Freedom	12
Centered R**2	0.986225	R Bar **2	0.982781
Uncentered R**2	0.995330	T x R**2	15.925
Mean of Dependent Variable		0.1242113729	
Std Error of Dependent Variable		0.0918666824	
Standard Error of Estimate		0.0120548910	
Sum of Squared Residuals		0.0017438448	
Regression F(3,12)		286.3752	
Significance Level of F		0.00000000	
Durbin-Watson Statistic		2.155933	
Q(4-0)		2.961219	
Significance Level of Q		0.56433617	

	Variable	Coeff	Std Error	T-Stat	Signif
1.	Constant	0.0158660120	0.0052691366	3.01112	0.01084031
2.	PML	0.2988329713	0.1244925532	2.40041	0.03349370
3.	PXIL{1}	0.6267038062	0.1329769663	4.71287	0.00050308
4.	UPXI	0.0573554580	0.0128662687	4.45782	0.00078212

Where

PXIL = ln PXI
PML = ln PM

Regression equation No. 20
****

Dependent Variable PUL - Estimation by Least Squares
Quarterly Data From 93:01 To 96:04

Usable Observations	16	Degrees of Freedom	11
Centered R**2	0.995773	R Bar **2	0.994235
Uncentered R**2	0.998459	T x R**2	15.975
Mean of Dependent Variable	0.1519355954		
Std Error of Dependent Variable	0.1188192363		
Standard Error of Estimate	0.0090213993		
Sum of Squared Residuals	0.0008952421		
Regression F(4,11)	647.7645		
Significance Level of F	0.00000000		
Durbin-Watson Statistic	1.838168		
Q(4-0)	7.909244		
Significance Level of Q	0.09495986		

Variable	Coeff	Std Error	T-Stat	Signif
1. Constant	0.0218817198	0.0057588307	3.79968	0.00294491
2. PXIL	0.2882213442	0.1453932171	1.98236	0.07297458
3. PML	0.4362613839	0.1021058175	4.27264	0.00131484
4. PUL{1}	0.3174720436	0.0742937078	4.27320	0.00131360
5. UPU	0.0491416057	0.0087305697	5.62868	0.00015361

Where

PUL = ln PU
PXIL = ln PXI
PML = ln PM

Regression equation No. 22
****

Dependent Variable PGL - Estimation by Least Squares
Quarterly Data From 93:01 To 96:04

Usable Observations	16	Degrees of Freedom	11
Centered R**2	0.993968	R Bar **2	0.991775
Uncentered R**2	0.997133	T x R**2	15.954
Mean of Dependent Variable	0.1661562060		
Std Error of Dependent Variable	0.1633322371		
Standard Error of Estimate	0.0148131287		
Sum of Squared Residuals	0.0024137166		
Regression F(4,11)	453.1625		
Significance Level of F	0.00000000		
Durbin-Watson Statistic	2.315775		
Q(4-0)	7.905607		
Significance Level of Q	0.09509778		

	Variable	Coeff	Std Error	T-Stat	Signif
1.	Constant	0.056843527	0.008262524	6.87968	0.00002658
2.	PYL	0.806777953	0.070307165	11.47505	0.00000018
3.	PGL{1}	0.259636286	0.050002904	5.19242	0.00029796
4.	SD1	-0.194680330	0.010894105	-17.87024	0.00000000
5.	UPG	0.074430468	0.010705797	6.95235	0.00002416

Where

PGL = ln PG
PYL = ln PY

Regression equation No. 23
****

Dependent Variable PIL - Estimation by Least Squares
Quarterly Data From 93:01 To 96:04

Usable Observations	16	Degrees of Freedom	10
Centered R**2	0.969070	R Bar **2	0.953604
Uncentered R**2	0.989102	T x R**2	15.826
Mean of Dependent Variable	0.1531620811		
Std Error of Dependent Variable	0.1166755920		
Standard Error of Estimate	0.0251314792		
Sum of Squared Residuals	0.0063159125		
Regression F(5,10)	62.6614		
Significance Level of F	0.00000032		
Durbin-Watson Statistic	1.931070		
Q(4-0)	1.260931		
Significance Level of Q	0.86796836		

Variable	Coeff	Std Error	T-Stat	Signif
1. Constant	0.050788753	0.012147345	4.18106	0.00188454
2. PML	0.485711772	0.205098692	2.36819	0.03939906
3. PIL{1}	0.562046921	0.160647489	3.49863	0.00573958
4. SD3	-0.065629003	0.016750653	-3.91800	0.00287570
5. SD4	-0.069105966	0.016833072	-4.10537	0.00212624
6. UPI	0.058477767	0.018106309	3.22969	0.00902569

Where

PIL = ln PI
PML = ln PM

Regression equation No. 49
****

Dependent Variable WL - Estimation by Least Squares
Quarterly Data From 93:01 To 96:04

Usable Observations	16	Degrees of Freedom	8
Centered R**2	0.998744	R Bar **2	0.997645
Uncentered R**2	0.999989	T x R**2	16.000
Mean of Dependent Variable	1.8940850161		
Std Error of Dependent Variable	0.1858158809		
Standard Error of Estimate	0.0090167708		
Sum of Squared Residuals	0.0006504172		
Regression F(7,8)	908.8895		
Significance Level of F	0.00000000		
Durbin-Watson Statistic	2.037762		
Q(4-0)	5.815179		
Significance Level of Q	0.21338255		

	Variable	Coeff	Std Error	T-Stat	Signif
1.	Constant	-2.301598582	1.020681007	-2.25496	0.05414627
2.	YLDL	0.983598281	0.281540415	3.49363	0.00815488
3.	PUL{1}	0.478208721	0.099022814	4.82928	0.00130583
4.	WL{1}	0.190366630	0.085023854	2.23898	0.05551381
5.	RU	-0.007096581	0.002983934	-2.37826	0.04466658
6.	SD1	-0.045814496	0.018258577	-2.50920	0.03641606
7.	SD4	0.136510324	0.018846064	7.24344	0.00008862
8.	UW	0.038883609	0.008000646	4.86006	0.00125571

Where

WL = ln W
YLDL = ln (Y93/LD)
PUL = ln PU

Regression equation No. 57
****

Dependent Variable M2 - Estimation by Least Squares
Quarterly Data From 93:01 To 96:04

Usable Observations	16	Degrees of Freedom	10
Centered R**2	0.999188	R Bar **2	0.998783
Uncentered R**2	0.999964	T x R**2	15.999
Mean of Dependent Variable	295.61875000		
Std Error of Dependent Variable	65.98846585		
Standard Error of Estimate	2.30233388		
Sum of Squared Residuals	53.007412765		
Regression F(5,10)	2462.4540		
Significance Level of F	0.00000000		
Durbin-Watson Statistic	1.880735		
Q(4-0)	6.617099		
Significance Level of Q	0.15756011		

	Variable	Coeff	Std Error	T-Stat	Signif
1.	Constant	-173.2079958	15.7705115	-10.98303	0.00000067
2.	Y93	1.9477693	0.2262935	8.60727	0.00000617
3.	PY	63.1815405	21.2561055	2.97239	0.01398841
4.	M2{1}	0.6697563	0.0405585	16.51333	0.00000001
5.	SD4	35.1102651	2.1304179	16.48046	0.00000001
6.	UM2	9.2579121	1.9877667	4.65744	0.00089780

Regression equation No. 58
****

Dependent Variable RICNL - Estimation by Least Squares
Quarterly Data From 93:01 To 96:04

Usable Observations	16	Degrees of Freedom	10
Centered R**2	0.982442	R Bar **2	0.973663
Uncentered R**2	0.999981	T x R**2	16.000
Mean of Dependent Variable	2.6032292256		
Std Error of Dependent Variable	0.0888083302		
Standard Error of Estimate	0.0144122965		
Sum of Squared Residuals	0.0020771429		
Regression F(5,10)	111.9101		
Significance Level of F	0.00000002		
Durbin-Watson Statistic	1.623003		
Q(4-0)	9.330279		
Significance Level of Q	0.05335390		

Variable	Coeff	Std Error	T-Stat	Signif
1. Constant	1.0597306980	0.2571967466	4.12031	0.00207606
2. YPM2L	0.6931079074	0.1189425560	5.82725	0.00016667
3. RICNL{1}	0.8130953676	0.0672383749	12.09273	0.00000027
4. SD1	0.0701494639	0.0102925600	6.81555	0.00004651
5. SD4	0.0827749750	0.0167570643	4.93971	0.00058743
6. URICN	0.0356544809	0.0077620461	4.59344	0.00099002

Where

RICNL = ln RICN
YPM2L = ln (YP/M2)

Regression equation No. 59
****

Dependent Variable RIDNL - Estimation by Least Squares
Quarterly Data From 93:01 To 96:04

Usable Observations	16	Degrees of Freedom	9
Centered R**2	0.997093	R Bar **2	0.995156
Uncentered R**2	0.999989	T x R**2	16.000
Mean of Dependent Variable	2.0830104684		
Std Error of Dependent Variable	0.1346136539		
Standard Error of Estimate	0.0093691701		
Sum of Squared Residuals	0.0007900321		
Regression F(6,9)	514.5788		
Significance Level of F	0.00000000		
Durbin-Watson Statistic	2.347526		
Q(4-0)	1.437432		
Significance Level of Q	0.83766380		

Variable	Coeff	Std Error	T-Stat	Signif
1. Constant	1.2649316494	0.0752453460	16.81076	0.00000004
2. YPM2L	1.1810798716	0.0606557241	19.47186	0.00000001
3. IREL	0.3739804982	0.0592408222	6.31289	0.00013884
4. RIDNL{1}	0.8743050150	0.0220189384	39.70696	0.00000000
5. SD1	0.1215060299	0.0066569829	18.25242	0.00000002
6. SD4	0.1519567591	0.0101051137	15.03761	0.00000011
7. URIDN	0.0731968941	0.0059503289	12.30132	0.00000062

Where

RIDNL = ln RIDN
YPM2L = ln (YP/M2)
IREL = ln IRE

APPENDIX - 3

The Data base of the Model SR-1Q

years	quarters	c93	g93	i93	e93	eg93	es93	m93	mg93	ms93	xg93	xs93	x93	y93
1992	1	42,6	26,0	29,2	46,2	33,576	12,638	49,0	38,176	10,832	-4,599	1,806	-2,8	93,7
1992	2	51,1	21,9	31,8	61,3	46,859	14,459	63,4	50,607	12,766	-3,748	1,693	-2,1	96,5
1992	3	51,9	21,4	32,0	56,9	41,302	15,609	60,5	47,807	12,707	-6,505	2,902	-3,6	99,7
1992	4	53,5	25,1	33,0	63,8	49,295	14,517	77,2	63,398	13,809	-14,103	0,708	-13,4	94,2
1993	1	44,3	24,0	19,3	48,6	37,914	10,683	47,7	37,826	9,861	0,088	0,822	0,9	90,0
1993	2	49,6	23,5	25,3	60,2	44,938	15,278	64,9	53,615	11,290	-8,677	3,988	-4,7	94,2
1993	3	50,6	21,0	33,3	61,7	44,345	17,353	59,9	47,826	12,055	-3,481	5,298	1,8	95,4
1993	4	51,5	23,8	42,8	57,3	40,717	16,579	75,7	57,396	18,316	-16,679	-1,737	-18,4	90,3
1994	1	47,8	24,6	24,6	54,5	43,843	10,652	55,0	46,341	8,654	-2,498	1,997	-0,5	93,3
1994	2	47,0	20,4	23,8	72,4	54,231	18,141	61,3	47,911	13,385	6,320	4,756	11,1	99,2
1994	3	50,5	18,5	28,1	66,8	47,041	19,746	58,9	46,706	12,197	0,335	7,549	7,9	100,4
1994	4	50,7	19,1	38,1	66,3	48,737	17,581	64,3	52,180	12,100	-3,443	5,482	2,0	95,2
1995	1	48,6	23,8	21,6	63,6	49,455	14,136	61,9	51,207	10,714	-1,752	3,422	1,7	98,6
1995	2	50,3	20,5	25,5	75,2	57,698	17,523	69,0	57,333	11,659	0,364	5,864	6,2	105,6
1995	3	50,4	18,3	28,6	70,8	54,008	16,822	62,3	50,506	11,801	3,502	5,021	8,5	108,1
1995	4	53,4	21,3	45,5	59,6	49,220	10,398	69,2	58,130	11,070	-8,910	-0,673	-9,6	102,2
1996	1	52,2	31,5	27,2	59,7	49,234	10,463	71,8	62,708	9,102	-13,473	1,362	-12,1	105,8
1996	2	54,4	23,3	32,6	69,3	57,019	12,285	72,4	61,308	11,076	-4,290	1,209	-3,1	112,9
1996	3	54,3	23,6	39,0	71,9	57,258	14,666	75,9	62,791	13,111	-5,534	1,555	-4,0	115,6
1996	4	56,3	25,8	62,8	64,1	51,328	12,762	90,8	74,954	15,866	-23,626	-3,104	-26,7	109,0

ld	lu	ru	pe	pm	pxi	pu	pc	pg	pi	py	ep	egp	esp	mp
1,966	0,316	12,6	1,017	0,957	0,903	0,795	0,808	0,777	0,818	0,834	47,0	34,147	12,853	46,9
2,036	0,291	11,6	0,941	0,931	0,912	0,799	0,824	0,895	0,874	0,864	57,7	44,094	13,606	59,0
1,967	0,276	11,0	0,984	1,013	0,919	0,807	0,836	0,944	0,888	0,861	56,0	40,641	15,359	61,3
2,082	0,261	10,4	1,144	1,031	0,937	0,847	0,836	0,996	0,885	0,902	73,0	56,393	16,607	79,6
2,021	0,290	11,4	0,998	0,973	0,975	0,947	0,973	0,863	0,943	0,967	48,5	37,838	10,662	46,4
2,035	0,308	12,1	0,925	0,946	0,984	0,925	1,000	0,987	0,992	0,982	55,7	41,568	14,132	61,4
2,011	0,339	13,3	0,966	1,012	1,004	1,015	1,012	1,057	1,015	1,000	59,6	42,837	16,763	60,6
1,971	0,357	14,0	1,117	1,054	1,036	1,064	1,012	1,101	1,019	1,052	64,0	45,481	18,519	79,8
1,950	0,382	15,0	1,079	1,091	1,053	1,094	1,128	0,967	1,081	1,094	58,8	47,307	11,493	60,0
1,979	0,367	14,4	0,999	1,049	1,063	1,110	1,138	1,147	1,139	1,126	72,3	54,177	18,123	64,3
2,002	0,372	14,6	1,111	1,112	1,154	1,143	1,139	1,238	1,189	1,136	74,2	52,262	21,938	65,5
1,976	0,369	14,5	1,244	1,145	1,129	1,190	1,138	1,377	1,126	1,191	82,5	60,629	21,871	73,6
1,987	0,381	15,0	1,203	1,166	1,173	1,219	1,216	1,008	1,218	1,193	76,5	59,494	17,006	72,2
2,027	0,349	13,7	1,134	1,161	1,196	1,232	1,256	1,259	1,298	1,223	85,3	65,429	19,871	80,1
2,043	0,340	13,4	1,169	1,231	1,208	1,255	1,268	1,372	1,196	1,247	82,8	63,135	19,665	76,7
2,023	0,329	12,9	1,362	1,263	1,218	1,279	1,243	1,366	1,253	1,306	81,2	67,038	14,162	87,4
2,000	0,348	13,5	1,258	1,238	1,227	1,295	1,289	1,117	1,324	1,262	75,1	61,937	13,163	88,9
2,036	0,319	12,4	1,163	1,271	1,245	1,307	1,333	1,335	1,396	1,291	80,6	66,313	14,287	92,0
2,060	0,317	12,3	1,211	1,274	1,250	1,323	1,335	1,424	1,287	1,316	87,1	69,339	17,761	96,7
2,049	0,314	12,2	1,423	1,329	1,272	1,348	1,311	1,508	1,290	1,376	91,2	73,040	18,160	120,7

mgp	msp	eg$	es$	e$	mg$	ms$	m$	xgp	xsp	xp	xg$	xs$	x$	cp
36,534	10.366	1,187	0,447	1,634	1,270	0,360	1,630	-2,387	2,487	0,1	-0,083	0,086	0,003	34,421
47.115	11.885	1.533	0,473	2,006	1,638	0,413	2,051	-3,021	1,721	-1,3	-0,105	0,060	-0,045	42,106
48.428	12.872	1.487	0.562	2,048	1,771	0,471	2,242	-7,787	2,487	-5,3	-0,285	0,091	-0,194	43,388
65,363	14,237	2,002	0,590	2,591	2,320	0,505	2,826	-8,970	2,370	-6,6	-0,318	0,084	-0,234	44,726
36,805	9,595	1,300	0,366	1,667	1,265	0,330	1,595	1,033	1,067	2,1	0,035	0,037	0,072	43,104
50,720	10,680	1,438	0,489	1,927	1,754	0,369	2,124	-9,152	3,452	-5,7	-0,317	0,119	-0,197	49,600
48,400	12,200	1,320	0,517	1,837	1,492	0,376	1,868	-5,563	4,563	-1,0	-0,171	0,141	-0,031	51,207
60,495	19,305	1,390	0,566	1,957	1,849	0,590	2,440	-15,014	-0,786	-15,8	-0,459	-0,024	-0,483	52,118
50,558	9,442	1,427	0,347	1,773	1,525	0,285	1,809	-3,251	2,051	-1,2	-0,098	0,062	-0,036	53,918
50,259	14,041	1,670	0,558	2,228	1,549	0,433	1,982	3,918	4,082	8,0	0,121	0,126	0,247	53,486
51,937	13,563	1,664	0,699	2,363	1,654	0,432	2,086	0,325	8,375	8,7	0,010	0,267	0,277	57,520
59,746	13,854	1,947	0,702	2,649	1,919	0,445	2,364	0,883	8,017	8,9	0,028	0,257	0,286	57,697
59,707	12,493	1,963	0,561	2,525	1,971	0,412	2,383	-0,213	4,513	4,3	-0,007	0,149	0,142	59,098
66,564	13,536	2,230	0,677	2,907	2,269	0,461	2,730	-1,135	6,335	5,2	-0,039	0,216	0,177	63,177
62,173	14,527	2,123	0,661	2,784	2,091	0,488	2,579	0,962	5,138	6,1	0,032	0,173	0,205	63,907
73,418	13,982	2,269	0,479	2,749	2,485	0,473	2,959	-6,380	0,180	-6,2	-0,216	0,006	-0,210	66,376
77,632	11,268	2,065	0,439	2,503	2,588	0,376	2,963	-15,695	1,895	-13,8	-0,523	0,063	-0,460	67,286
77,923	14,077	2,154	0,464	2,619	2,532	0,457	2,989	-11,610	0,210	-11,4	-0,377	0,007	-0,370	72,515
79,996	16,704	2,265	0,580	2,845	2,613	0,546	3,159	-10,657	1,057	-9,6	-0,348	0,035	-0,314	72,491
99,614	21,086	2,339	0,581	2,920	3,190	0,675	3,865	-26,574	-2,926	-29,5	-0,851	-0,094	-0,945	73,809

gp	ip	djp	yp	y$	w	wr	w$	yw	yt	tw	yd	yrd	m2	ricn
20,202	23.886	-0,5	78,1	2.715	3.961	4,982	0,138	23,900	56,00	1,952	42,500	53,459	182,8	13,45
19,601	27.793	-4.8	83,4	2.899	4,341	5,433	0,151	25,600	60,10	1,990	44,600	55,820	194,8	13,69
20,202	28,416	-0,9	85,8	3,138	4,511	5,590	0,165	27,200	64,30	1,821	46,900	58,116	192,9	13,60
25,000	29,205	-7,3	85,0	3,017	5,355	6,322	0,190	28,800	68,20	2,037	51,800	61,157	207,6	13,31
20,712	18,200	2,9	87,0	2,990	4,728	4,993	0,162	30,400	76,40	2,428	55,000	58,078	201,4	14,28
23,195	25,098	0,3	92,5	3,200	5,188	5,609	0,179	32,100	80,70	2,475	59,200	64,000	209,7	14,87
22,197	33,800	-10,8	95,4	2,941	5,453	5,372	0,168	33,400	83,90	2,264	61,600	60,690	218,0	14,49
26,204	43,613	-11,1	95,0	2,904	6,184	5,812	0,189	34,500	85,70	2,533	67,300	63,252	247,2	14,00
23,788	26,593	-1,0	102,1	3,079	5,593	5,112	0,169	35,500	85,70	2,803	60,500	55,302	241,3	14,46
23,399	27,108	-0,3	111,7	3,442	6,138	5,530	0,189	36,600	87,40	2,858	62,800	56,577	253,0	14,60
22,903	33,411	-8,4	114,1	3,634	6,315	5,525	0,201	38,100	90,30	2,614	66,000	57,743	266,1	14,66
26,301	42,901	-22,4	113,4	3,642	7,124	5,987	0,229	39,900	94,30	2,925	73,900	62,101	300,3	14,51
23,990	26,309	3,9	117,6	3,881	6,374	5,229	0,210	38,366	89,60	3,795	64,086	52,573	292,1	14,05
25,810	33,099	1,9	129,2	4,404	7,014	5,693	0,239	43,194	97,35	3,890	72,880	59,156	303,3	13,61
25,108	34,206	5,5	134,8	4,533	7,170	5,713	0,241	44,583	102,79	3,666	76,528	60,978	318,1	13,14
29,096	57,012	-12,8	133,5	4,519	8,204	6,414	0,278	51,859	116,60	4,457	85,411	66,780	357,2	12,61
35,186	36,013	8,8	133,5	4,450	7,152	5,523	0,238	44,683	104,36	4,670	72,930	56,317	361,6	12,60
31,106	45,510	8,0	145,7	4,734	7,880	6,029	0,256	51,455	112,99	5,251	81,351	62,243	367,9	12,00
33,606	50,193	5,4	152,1	4,969	8,098	6,121	0,265	53,367	117,68	4,797	84,850	64,135	376,5	11,58
38,906	81,012	-14,2	150,0	4,803	9,459	7,017	0,303	61,480	131,44	5,686	96,252	71,404	416,2	11,44

ridn	ire	sd1	sd2	sd3	sd4	f	meu	mcz	pmeu	qeg	qmg	dj93	time	ls
8.66	0,934	1	0	0	0	23.571	341,83	n/a	1,101	0,727	0,779	-1,3	1	2,507
6,91	0.934	0	1	0	0	30,786	368,58	n/a	1,101	0.764	0,798	-6,2	2	2,507
6,57	0.888	0	0	1	0	30,430	335,68	n/a	1,180	0.726	0,790	-2,0	3	2,507
6.59	0.915	0	0	0	1	39,022	420,43	n/a	1,090	0,773	0,821	-4,0	4	2,507
7.51	0.945	1	0	0	0	36,304	334,95	2,448	1,022	0.780	0,793	1,5	5	2,548
7,76	0,939	0	1	0	0	43,700	347,67	3,196	1,022	0,746	0,826	0,5	6	2,548
8,20	1,054	0	0	1	0	41,284	346,25	3,198	0,989	0,719	0,798	-11,3	7	2,548
8,61	1,062	0	0	0	1	52,065	386,12	3,848	0,978	0,711	0,758	-9,4	8	2,548
9,09	1,077	1	0	0	0	38,482	375,33	3,078	0,966	0,804	0,843	-3,2	9	2,546
9,45	1,054	0	1	0	0	39,801	388,80	3,592	1,011	0,749	0,782	-3,1	10	2,546
9,44	1,020	0	0	1	0	40,080	369,14	3,656	1,056	0,704	0,793	-4,6	11	2,546
9,29	1,011	0	0	0	1	43,639	420,18	4,162	1,079	0,735	0,812	-14,7	12	2,546
9,46	0,984	1	0	0	0	37,275	366,31	4,857	1,135	0,778	0,827	2,9	13	2,543
8,39	0,953	0	1	0	0	38,042	376,49	5,471	1,180	0,767	0,831	3,1	14	2,543
8,13	0,966	0	0	1	0	41,910	359,45	5,182	1,157	0,763	0,811	2,3	15	2,543
7,38	0,959	0	0	0	1	54,210	387,91	6,158	1,180	0,826	0,840	-8,4	16	2,543
7,11	0,974	1	0	0	0	43,893	383,83	5,548	1,157	0,825	0,873	7,0	17	2,568
6,50	1,000	0	1	0	0	41,761	440,49	6,078	1,146	0,823	0,847	5,7	18	2,568
6,68	0,994	0	0	1	0	47,418	398,70	5,871	1,169	0,796	0,827	2,7	19	2,568
6,54	1,014	0	0	0	1	58,817	438,63	6,484	1,169	0.801	0,825	-9,2	20	2,568

qld	qpc	re	pj	qyw	yo	qtw	to	uc93	ug93	ui93	ue93	um93	uld	upe
1,115	1.016	28.77	0,391	1.023	32.100	0,082	11,548	0,0	0,0	0,0	0,0	0,0	0,0	0,0
1,089	1.031	28.77	0,774	0.965	34,500	0,078	13,510	0,0	0,0	0,0	0,0	0,0	0,0	0,0
1,134	1,036	27.34	0.453	1.022	37.100	0.067	15,579	0,0	0,0	0,0	0,0	0,0	0,0	0,0
1,079	0,987	28.17	1,833	0.861	39,400	0,071	14,363	0,0	0,0	0,0	0,0	0,0	0,0	0,0
1,117	1,027	29,10	1,923	1,060	46,000	0,080	18,972	-1,5	-0,5	1,0	0,0	0,0	0,0	0,0
1,101	1,081	28.91	0,616	1,013	48,600	0,077	19,025	0,0	0,0	0,0	0,0	1,0	0,0	0,0
1,099	0,997	32,44	0,956	1.015	50,500	0,068	20,036	0,0	0,0	1,0	0,0	0,0	-1,0	0,0
1,112	0,951	32,71	1,185	0,943	51,200	0,073	15,867	0,0	0,0	0,0	0,0	1,0	0,0	0,0
1,110	1,031	33,16	0,312	1,085	50,200	0,079	22,397	0,0	0,0	0,0	0,0	0,0	0,0	0,0
1,101	1,025	32,45	0,095	1,004	50,800	0,078	21,742	-1,0	0,0	-1,0	0,0	0,0	0,0	-0,5
1,086	0,997	31,40	1,833	1,005	52,200	0,069	21,686	0,0	0,0	0,0	1,0	0,0	0,0	1,0
1,102	0,956	31,14	1,524	0,945	54,400	0,073	17,475	0,0	0,0	-1,0	1,0	0,0	0,0	0,0
1,088	0,998	30,30	1,346	1,010	51,237	0,099	21,722	0,0	0,0	0,0	0,0	0,0	1,0	0,0
1,082	1,019	29,34	0,618	1,013	54,155	0,090	20,579	0,0	0,0	0,0	0,0	0,0	0,0	0,0
1,078	1,010	29,74	2,382	1,015	58,204	0,082	22,593	0,0	0,0	0,0	0,0	-1,0	0,0	0,0
1,095	0,972	29,54	1,522	1,042	64,745	0,086	26,736	0,0	0,0	0,0	0,0	0,0	0,0	0,0
1,110	0,995	30,00	1,259	1,041	59,672	0,105	26,755	1,0	1,0	0,0	0,0	0,0	0,0	0,0
1,105	1,020	30,78	1,398	1,069	61,530	0,102	26,383	1,0	0,0	0,0	-1,0	0,0	0,0	0,0
1,093	1,009	30,61	2,004	1,066	64,316	0,090	28,036	0,0	0,5	0,0	0,0	0,0	0,0	-0,5
1,100	0,973	31,23	1,546	1,057	69,962	0,092	29,504	0,0	0,0	1,5	0,0	1,0	0,0	0,0

upm	upxi	upu	upg	upi	uw	um2	uricn	uridn
0,0	0.0	0.0	0.0	0.0	0.0	0.0	0,0	0,0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0,0	0,0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0,0
0,0	0.0	-1.0	0,0	0.0	0.0	0,0	1,0	0,0
0,0	0,0	0.0	0,0	0.0	0,5	0,0	0,0	0,0
0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
1,0	0,0	0.0	0,0	0.0	0,0	0,0	0,0	-1,0
0,0	0,0	0,5	0,0	0.0	0,0	0,0	0,0	0,0
0,0	1,0	0,0	0,0	1,0	0,0	0,0	1,0	0,0
0,0	0,0	0,0	1,0	0,0	0,0	0,0	0,0	0,0
0,0	0,0	0,0	-1,0	0,0	0,0	-0,5	-1,0	0,0
-1,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	-1,0
0,0	0,0	0,0	0,0	-1,0	0,0	0,0	0,0	0,0
0,0	0,0	0,0	-0,5	0,0	0,5	0,0	0,0	-1,0
0,0	0,0	0,0	0,0	0,0	0,0	1,0	1,0	0,0
0,5	0,0	0,0	0,0	0.0	0.0	0,0	0,0	0,0
0,0	0.0	0,0	0,0	0,0	0.0	-0,5	0,0	1,0
0.0	0,0	0,0	0,0	0,0	1,5	0,0	0,0	0,0

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