THE DEVELOPMENT OF THE LATVIAN INFORUM MODEL

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- Present situation
- At present, in Latvia, there has not been developed such a multisectoral macroeconomic model that could be actually used on a regular basis for the analysis and prognosis of economic processes, and for modelling and estimating the results of the economic policy as well as various economic shocks.

- This situation in many ways is related to the fact that the development and application process of multisectoral macroeconomic models demands:
  - an enormous amount of information,
  - particularly trained personnel,
  - solid and long-standing experience in the field of economic mathematical modelling,
  - dealing with many complicated and complex methodological problems,
  - as well as time and information technology resources.

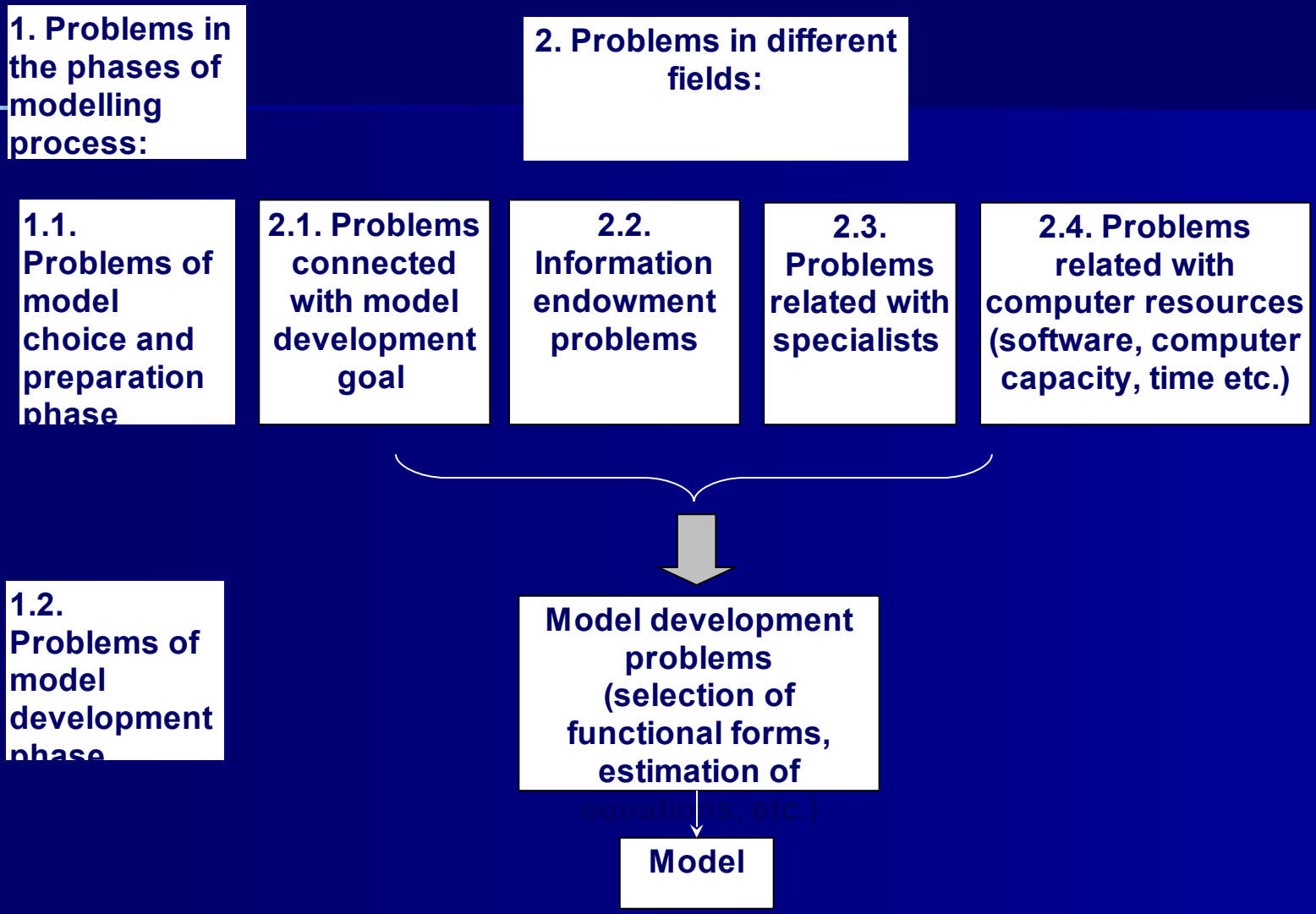
- The development process is heavily influenced by the low level and fragmentary government funding allocated for modelling purposes.

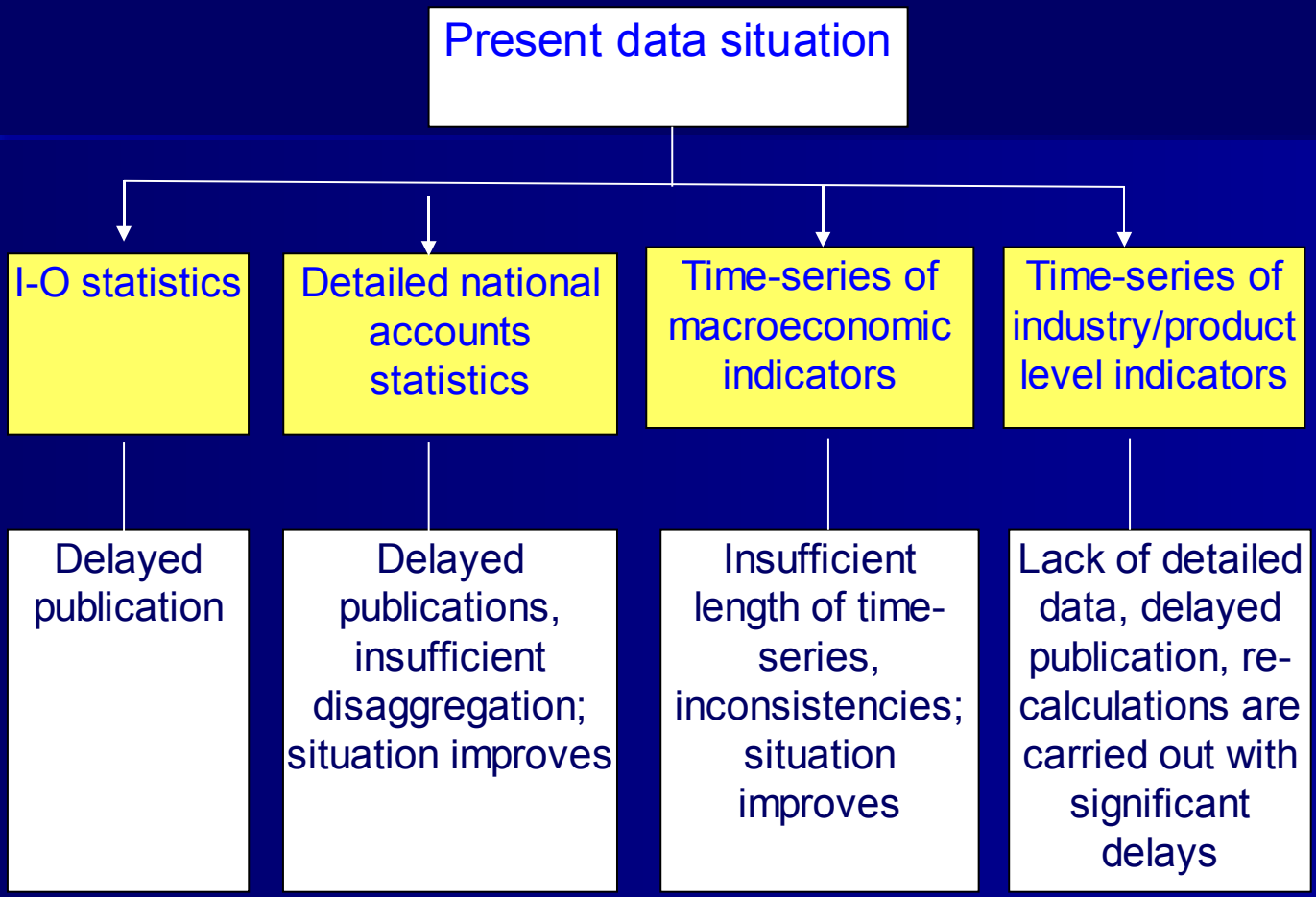
- In fact, only the enthusiasm of the modellers and the understanding of usefulness and wide variety of applications keep economic modelling traditions alive, which has mainly stimulated the recent development of multisectoral macroeconomic modelling in Latvia.

- To date, in Latvia, the INFORUM model is under construction.
- The development process of the INFORUM model is carried out with great assistance of the Italian colleagues (Prof. M.Grassini);
- The results were also reported at the 12th INFORUM conference in 2004 (Ascea, Italy).

- In 2005:
  - the problems concerning the multisectoral macroeconomic model development process in Latvia were ascertained and solutions were proposed;
  - the existing version of the model was upgraded (with great assistance of Prof. M.Grassini);
  - and specific issues concerning implementation of calculations were researched.

Grouping of model building problems




Present data situation
I-O statistics
Detailed national accounts statistics
Time-series of macroeconomic indicators
Time-series of industry/product level indicators
Delayed publication
Delayed publications, insufficient disaggregation; situation improves
Insufficient length of time-series, inconsistencies; situation improves
Lack of detailed data, delayed publication, re-calculations are carried out with significant delays

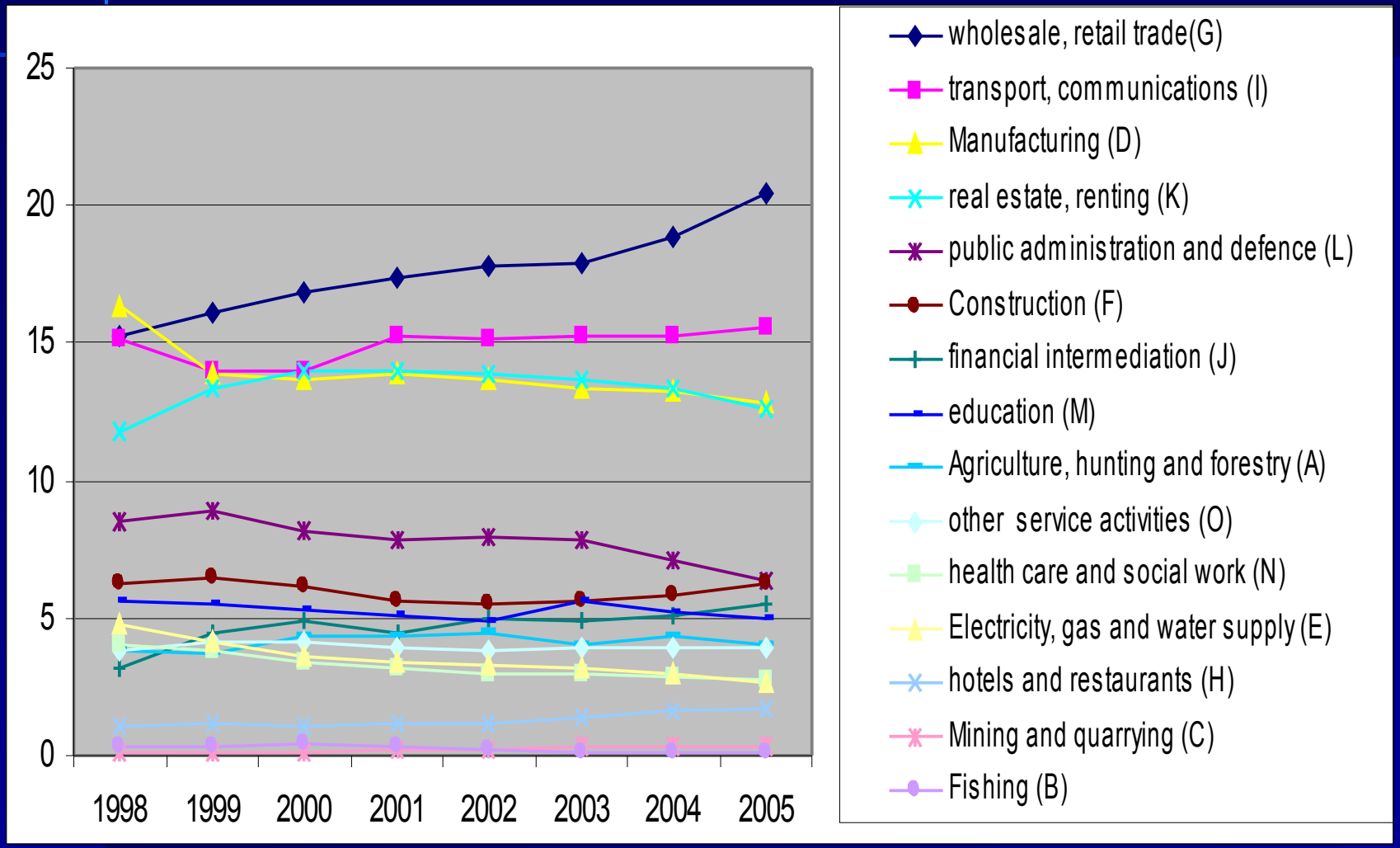
- Speaking about input-output tables, the major problem is connected with the delayed preparation and publication of input-output statistics in Latvia. This problem can be called as the most significant problem for multisectoral macroeconomic modelling in Latvia that impedes the development process.

- To modellers' regret, the latest published bulletin of input-output statistics in Latvia is only for 1998. This bulletin was published in 2003.

- According to the information obtained from the leading specialist of input-output statistics in the Central Statistical Bureau of Latvia (CSB), the input-output tables (and the corresponding tables) of 2000, 2002, 2003, and 2004 are still under construction.

- There are several reasons why the table of 1998 cannot be directly applied without corrections and modifications. The major reasons are the following (1):
  - Since 1998 the structure of the national economy has undergone significant and fundamental changes.
  - New industries (sub-industries) were developed in the field of information technologies, services, banking, transport, communications etc. In 1998, these sub-industries were underdeveloped or even did not exist at all.

Gross value added by kind of activity
(current prices; %)



Source: Databases of the Central Statistical Bureau of Latvia

- There are several reasons why the table of 1998 cannot be directly applied without corrections and modifications. The major reasons are the following (2):
  - The technologies and techniques used by the industries have been upgraded or even replaced by more modern and more productive ones. New-generation technologies have penetrated almost all fields. The changes in the economy have been too significant to ignore them.
  - The improvements of statistical methodology used by the CSB and the following re-calculations. The GDP value of 1998, according to the input-output table, is not the same as the re-calculated value of GDP in the latest bulletin of macroeconomic indicators.

- There are several reasons why the table of 1998 cannot be directly applied without corrections and modifications. The major reasons are the following (3):
  - The investment flow from the EU aimed at stimulating and converging the economy with the level of EU, has been notable during recent years (2004, 2005, and this year), but it was not the case in 1998.
  - The year of 1998 was not a typical year in the development process of Latvia's economy. The economy was significantly influenced and affected by the economic processes in Russia (the Russian financial crisis).

- The input-output table for 1998 provides a huge amount of information on how the national economy and individual industries operate.

- The problem for modellers is to decide and detect the nonconformity with the present situation. Everyone admits that the economy has experienced significant changes since 1998, but it is a very complicated task to detect the exact and numerical changes in the data at a high disaggregation level. Subjective judgments are inevitable.

- When analysing the national accounts statistics of Latvia, several years ago modellers faced quite similar problems as in the case of input-output statistics.
- However, the situation concerning the national accounts statistics is improving. The latest bulletin of national accounts statistics is for 2004.

- The problems concerning the length and creditability of time-series are very topical in Latvia. The insufficient length of time series is also a noteworthy problem for model builders and from time to time it incommodes the model development process. This situation is connected with the fact, that statistics prior to the mid 1990s cannot be used for modelling purposes.

- The data situation concerning industry-level indicators and the length of time-series is even worse. It is possible to point out two types of problems: lags and insufficient length of time-series. The preparation and publication process is very time, labour, and money intensive, and hence a significant lag has been observed.

- A separate problem that can be analysed is the problem connected with the changes in the statistical methodology used by the CSB and periodic re-calculation of the levels of indicators. As the statistical methodology has been upgraded several times during the past years, the values of indicators have been re-calculated.

- The major reason for this is the continuous and legitimate need to upgrade the statistical methodology used by the CSB. The problem usually arises because of very unexpected and unplanned re-calculations and there is no plan or schedule made available for modellers for them to know when and which indicator will be estimated and re-calculated.

- As re-calculation demands time, specialists and money, the values of many indicators have been re-calculated only for the periods starting from 2000. It means that the values of the same indicator for the years prior to 2000 cannot be compared with the respective values after 2000.

- Current issues in the INFORUM model development process:
  - Finalizing the input-table for 2000;
  - Estimation of econometric equations.

- For model development needs a tailored version of the input-output table for 2000 has been prepared based on the information obtained from the CSB.

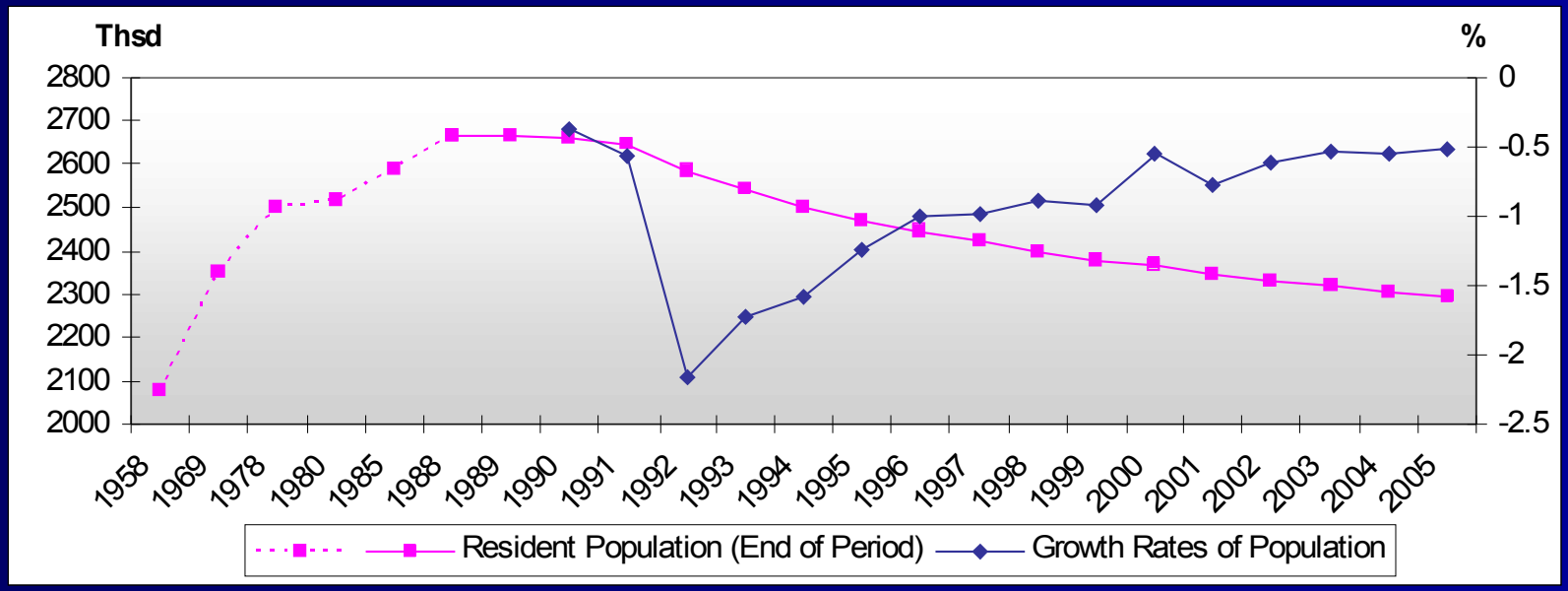
- The process of finalizing of the input-output table of 2000 is closely connected with the planned use of this table – to replace the present table in the Latvian INFORUM model.

- The drawbacks of finalizing of the table of 2000 by ourselves than by the specialists of the CSB:
  - Larger possibility to make erroneous assumptions and misinterpret the behaviour of the economy (numerically).
  - Numerical results are affected by personal modelling experience and knowledge.
  - In order to finalize the table it is necessary to have a role-model (because the amount of available data is limited), and the table of 1998 was used as a role model. The choice of this role-model also affects the results.

- The process of finalizing of the input-output table of 2000 has not been finished and still continues.

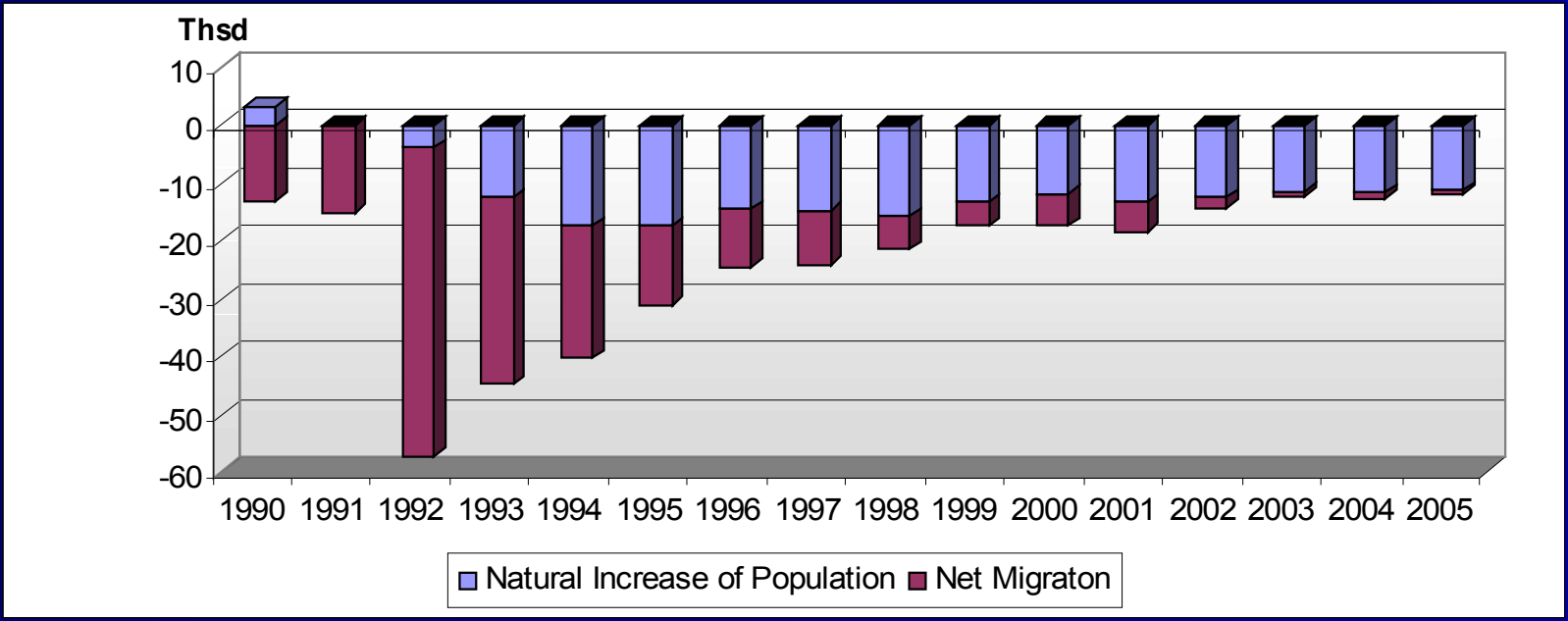
THE DEVELOPMENT OF ECONOMETRIC EQUATIONS FOR DEMOGRAPHIC INDICATORS AND EMPLOYMENT FORECASTING

Resident population and its growth rates



Source: Databases of the Central Statistical Bureau of Latvia

The factors of the decrease of the population in Latvia



Source: Databases of the Central Statistical Bureau of Latvia

Mathematical model

$$N = N_{t-1} + \Delta N$$

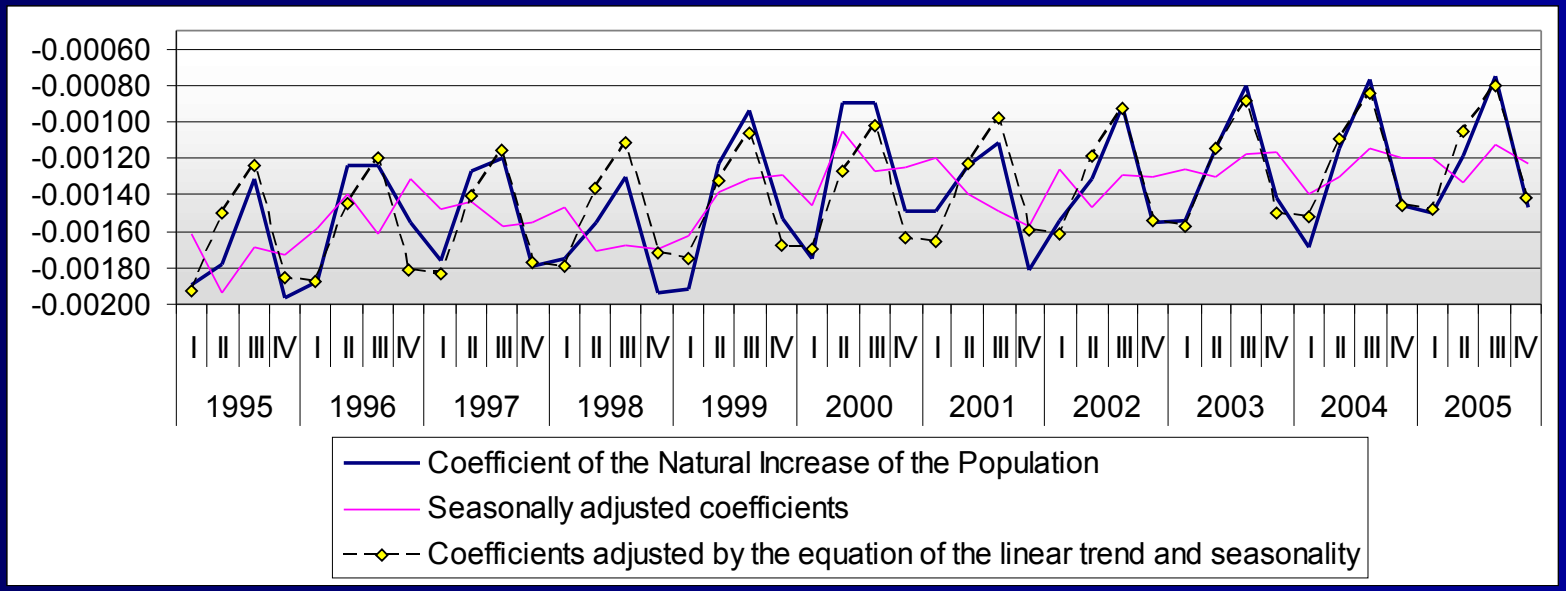
$$\Delta N = \Delta N_{nat} + \Delta M$$

$$\Delta N_{nat} = k_{nat} \cdot N_{t-1}$$

$$k_{nat} = f(t)$$

$$\Delta M = f(t)$$

Dynamics of the coefficient of natural increase of population



Equation for the coefficient of natural increase of population

$$k_{nat} = 0.000011 \cdot t - [0.00193 \cdot (@SEAS(1)) + 0.00152 \cdot (@SEAS(2)) + 0.00138 \cdot (@SEAS(3)) + 0.00190 \cdot (@SEAS(4))]$$

(6.5) (34.5) (26.6) (21.9) (32.0)

$R^2 = 0.84$ DW = 1.48 S.E. = 0.000143

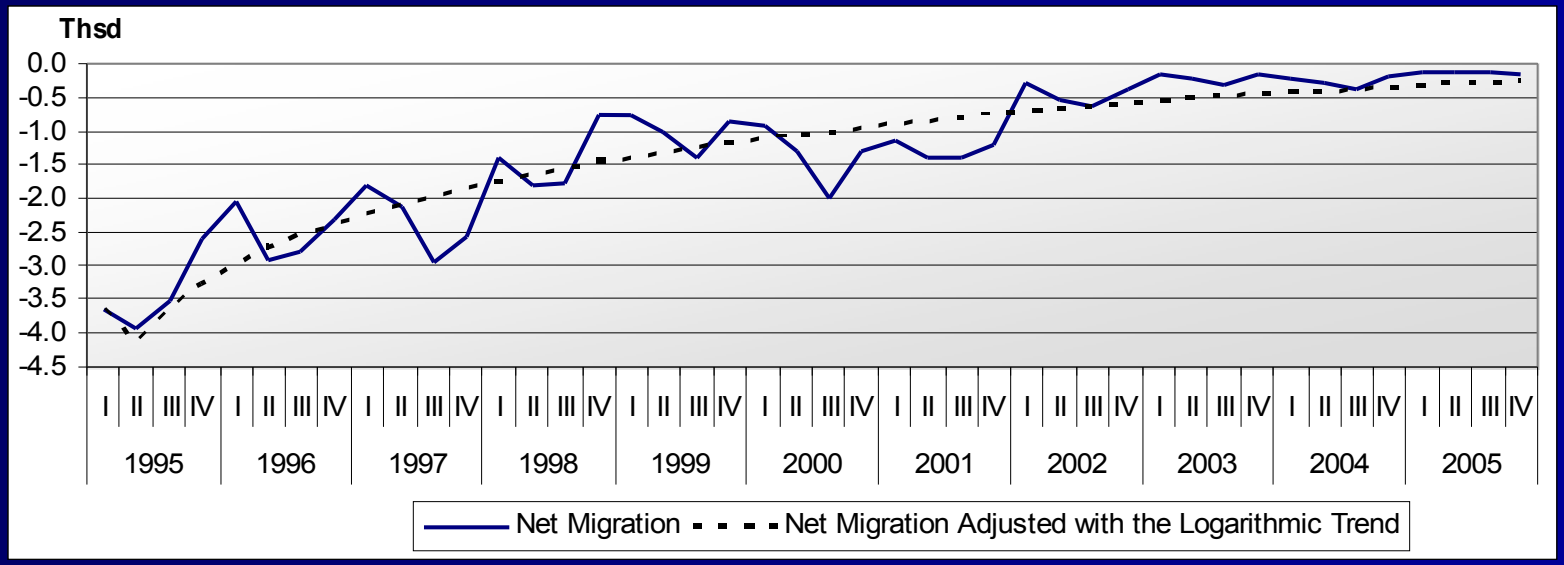
n = 44

where: t – time (trend factor) t = 1,2, ..., n;

n – number of observations;

@SEAS(i) – factors, which characterise seasonality for each quarter i (i = 1,2,3,4);

Dynamics of net migration (international migration)



Equations for net migration

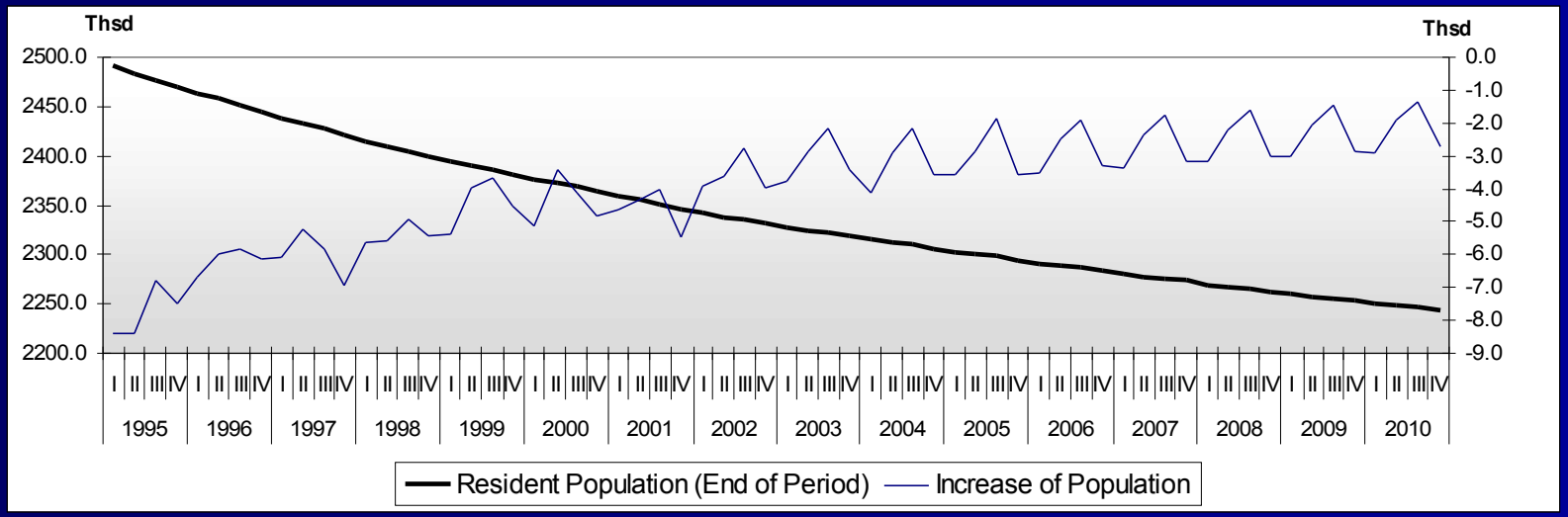
1. $i\_\Delta M = -5.05 + 1.29 \cdot \log(t)$
   (-14.7) (11.7)
2. $\Delta M = 0 \cdot [1 - @CNORM((0 - i\_\Delta M)/0.408)] +$
   $+ [@CNORM((0 - i\_\Delta M)/0.408)>0] \cdot$
   $\cdot [i\_\Delta M *(@CNORM((0 - i\_\Delta M)/0.408)) +$
   $+ 0.408*(-@DNORM((0 - i\_\Delta M)/0.408))]$

$R^2 = 0.77$ S.E. = 0.43 n = 40

where: CNORM, DNORM – fictive variables generated by the programme EViews;

i_ΔM – additional variable generated by EViews, which characterises the trend of net migration.

Short-term forecasts of the resident population of Latvia



1995-2005 – actual data

Equations for long-term forecasts

$k_{nat} = -0.00667 + 0.000176 \cdot t$

(-28.1) (5.0)

$R^2 = 0.74$ DW = 2.35 S.E. = 0.000366 n = 11

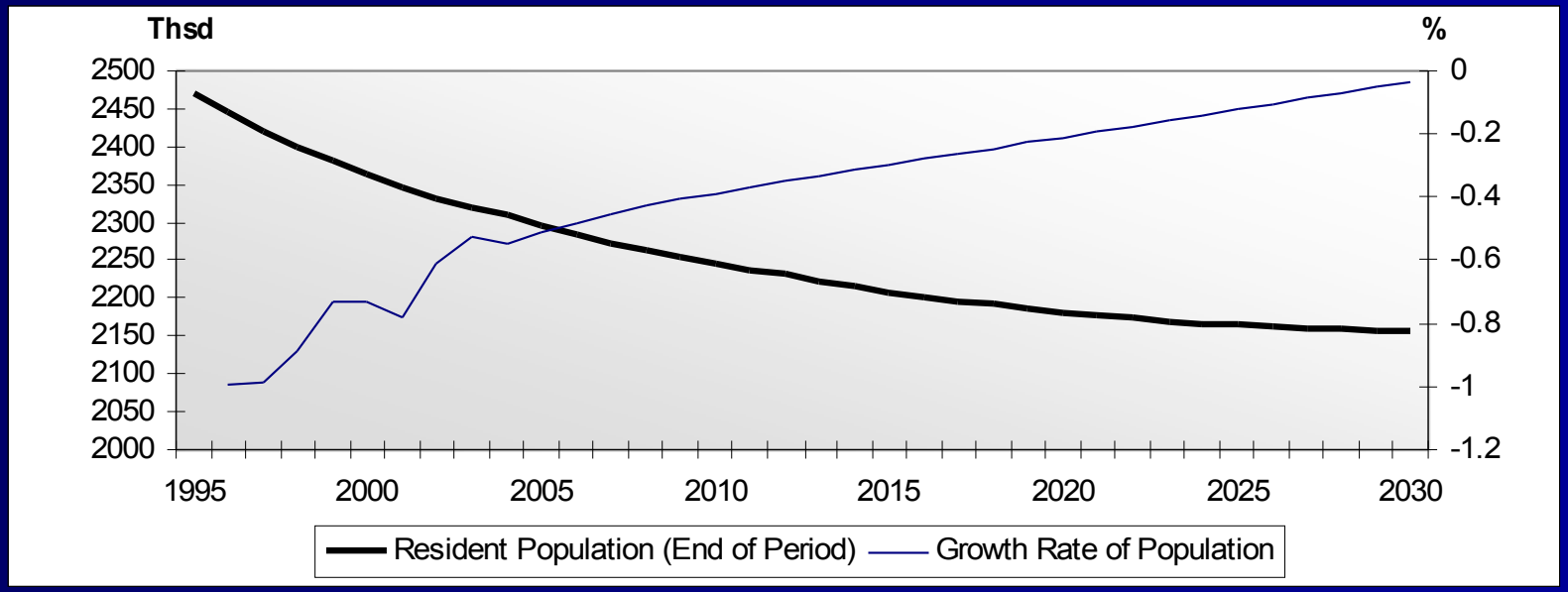
$i\_\Delta M = -14.17 + 5.59 \cdot \log(t)$

(-19.3) (13.3)

$\Delta M = 0 \cdot [1 - @CNORM((0 - i\_\Delta M)/0.991)] +$
$+ [@CNORM((0 - i\_\Delta M)/0.991)>0] \cdot$
$\cdot [i\_\Delta M \cdot (@CNORM((0 - i\_\Delta M)/0.991)) +$
$+ 0.991 \cdot (-@DNORM((0 - i\_\Delta M)/0.991))]$

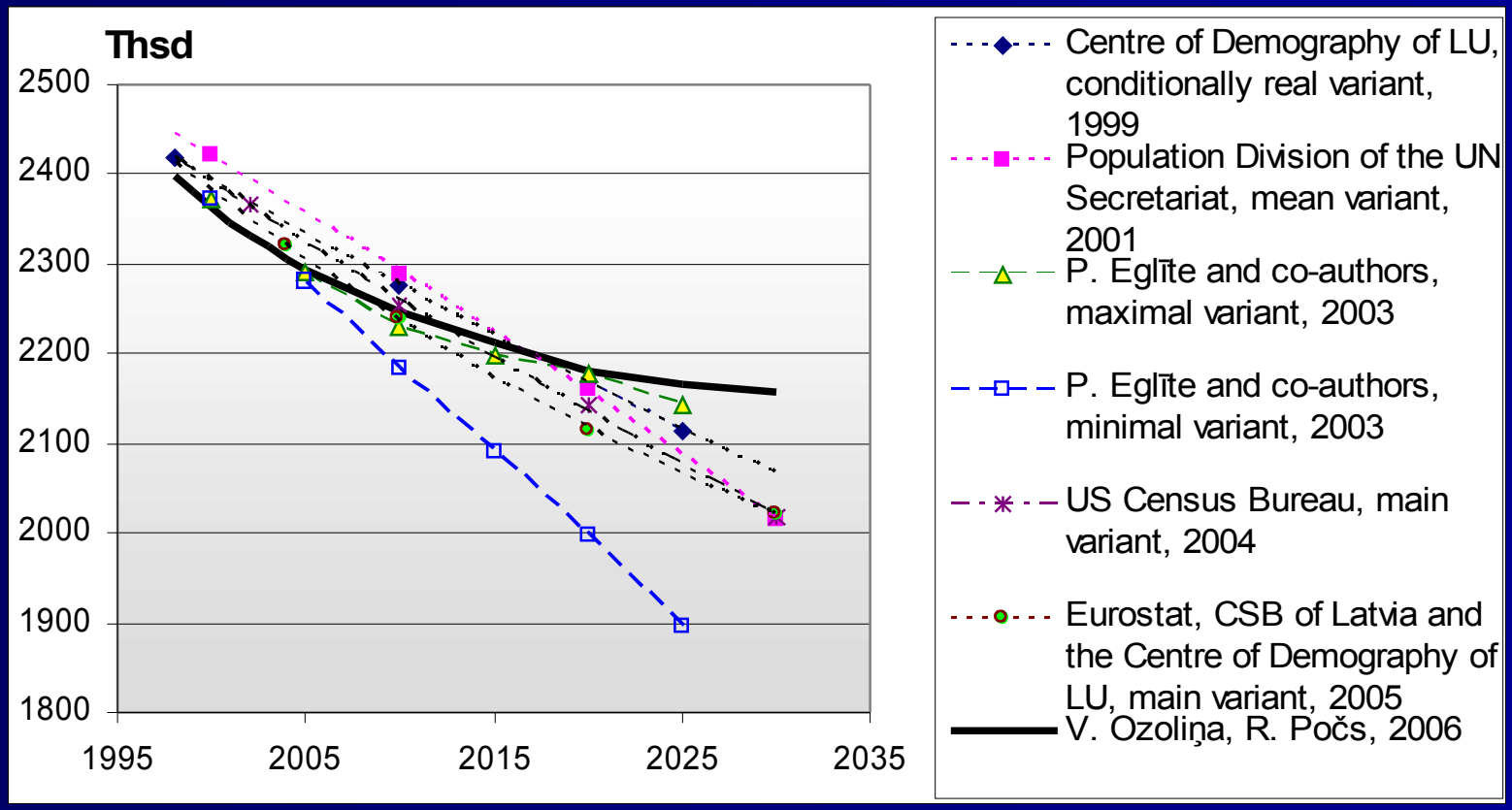
$R^2 = 0.94$ S.E. = 1.17 n = 11

Long-term forecasts of resident population of Latvia

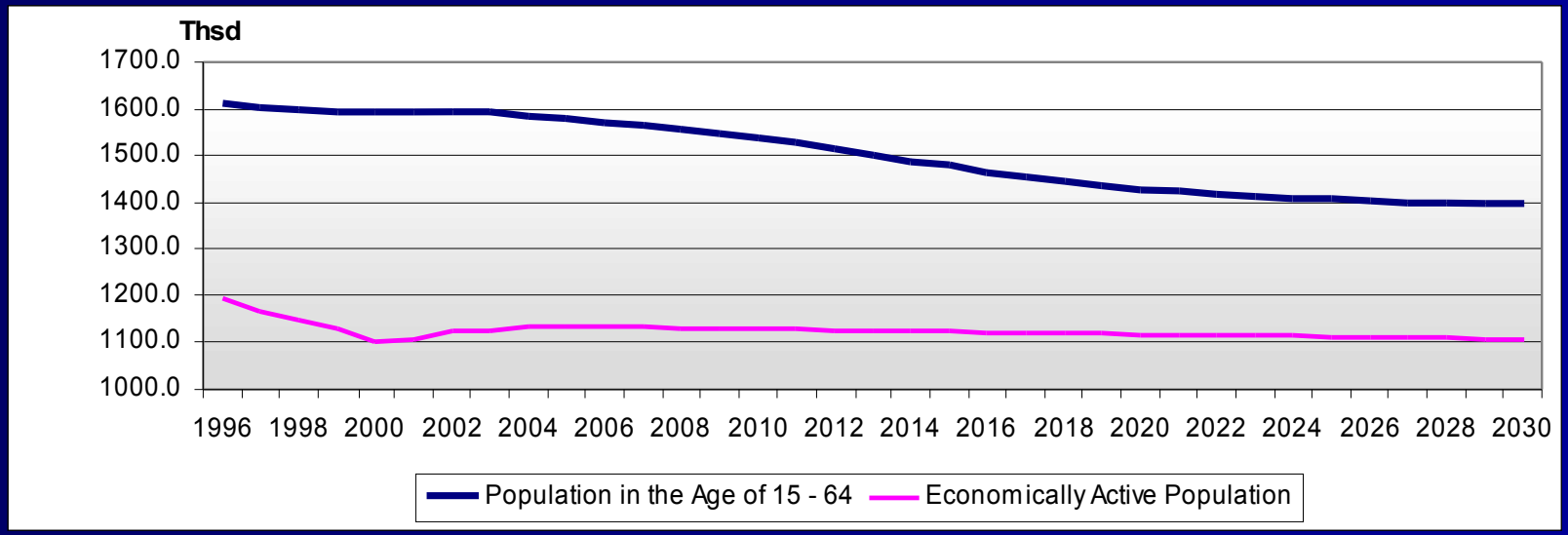


1995-2005 – actual data

Forecasts of resident population of Latvia



Economic activity of population



Source: 1995 - 2004 Databases of the Central Statistical Bureau of Latvia

Equations for employment by industries

$L_{01} = 54.981 + 236.004 \cdot (1 / t^{0.5})$	Agriculture, hunting and forestry
$L_{02} = L_{02, t-1} \cdot (1 + \Delta VA_{02} \cdot \varepsilon_{02})$	Fishing
$L_{03} = L_{03, t-1} \cdot (1 + \Delta VA_{03} \cdot \varepsilon_{03})$	Mining and quarrying
$L_{04} = L_{04, t-1} \cdot (1 + \Delta VA_{04} \cdot \varepsilon_{04})$	Manufacturing
$L_{05} = L_{05, t-1} \cdot (1 + \Delta VA_{05} \cdot \varepsilon_{05})$	Electricity, gas and water supply
$L_{06} = L_{06, t-1} \cdot (1 + \Delta VA_{06} \cdot \varepsilon_{06})$	Construction
$L_{07} = 160.893 - 85.140 \cdot (1 / t)$	Wholesale, retail trade
$L_{08} = 9.408 + 6.894 \cdot \log(t)$	Hotels and restaurants
$L_{09} = L_{09, t-1} \cdot (1 + \Delta VA_{09} \cdot \varepsilon_{09})$	Transport and communications
$L_{10} = L_{10, t-1} \cdot (1 + \Delta VA_{10} \cdot \varepsilon_{10})$	Financial intermediation
$L_{11} = L_{11, t-1} \cdot (1 + \Delta VA_{11} \cdot \varepsilon_{11})$	Real estate
$L_{12} = L_{12, t-1} \cdot (1 + \Delta L_{12})$	Public administration
$L_{13} = L_{13, t-1} \cdot (1 + \Delta L_{13})$	Education
$L_{14} = L_{14, t-1} \cdot (1 + \Delta L_{14})$	Health care and social work
$L_{15} = 80.701 - 183.773 \cdot (1 / t)$	Other service activities

Thank you for your attention!

Questions?