SEASONAL ADJUSTMENT OF TIME SERIES ON THE REGISTERED UNEMPLOYMENT IN HUNGARY

A FINAL REPORT IN PART C.1 OF THE EMPLOYMENT COMPONENT IN THE WORLD BANK 'DEVELOPEMENT OF HUMAN RESOURCES' PROJECT

JUNE, 1996

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FOREWORD

Speaking of adapting seasonal adjustment two questions arise: Is this so important, considering Hungary's present state of affairs, that among the number of problems to be solved this particular one should merit resources? Can only those countries that are wealthier than Hungary afford these statistical systems?

We ourselves were fairly surprised in 1993 on our study visit paid to Census Bureau, Bureau of Labour Statistics (USA) and Statistics of Canada that departments full of many highly skilled experts work continuously on seasonal adjusting data of economic interest, while they also keep tuning these procedures and further research in focus.

One evident explanation is indeed what the second question implies: these countries can afford using seasonal adjustment. However considering the tight budget limits set up in these countries, it turns out that these departments exist because they satisfy a vigorous need of market economy. So the answer to the above questions may read as follows: The wealth of more well-to-do countries than ours may be attributed eventually to developing, and continuously using, methods like the seasonal adjustment of economic data, i.e. the use of seasonal adjustment does not follow from being wealthy but, on the contrary, being wealthy follows from applying this sort of methods.

The main user of seasonally adjusted data is the government itself in market economies. One of the most important fields of use is the planning of the budget yearly, both on the expenditure and revenue sides. A good budget requires good input data. To extract trend in the case of data showing seasonal fluctuations, adjustment is unavoidable. The interim timing of budget related financial transactions assumes knowledge of the seasonal effects in time.

Therefore an accurate identification of seasonal effects is demanded for efficient cash-flow control and their filtering out is necessary to establish trends. Poorly designed and prodigal budgets cost an order of magnitude more than maintaining an expert group for seasonal adjustment. This revelation and need prompted to create information systems for seasonal adjustment.

We think that in the ongoing reform of public finances, aimed at shaping an efficient state one of the key elements of a statistical system supplying reliable, well-defined data should be a subsystem that performs seasonal adjustments. One of the prerequisites of Hungary's joining the European Union is to set up a new, reliable and accurate statistical system. So our planned integration into the European Union also demands the establishment of the above mentioned subsystem.

In the field of labour statistics it is also very important to know the latest trends by cleaning the time series of the seasonal movements. Without this e.g. it is impossible to decide whether a moderate growth, or just normal for the off-season, or there is a continuing decreasing trend behind. To make the necessary preparations for handling unemployment and to make the appropriate decisions **in time,** it is a must to adjust the time series when the conditions are given (i.e. the time series are long enough to get reliable results).

Our company began to work on a World Bank financed project of seasonal adjusting labour force data in 1994, after the above mentioned study visit in 1993, as a contractor for the National Labour Center (in Hungarian OMK).

The documents about our computer software development work, the design work for the information system and our research work done under this contract in 1994, 1995 and the first half of 1996 and the tests of the information system to be developed are the following:

1. **The methodology of the internationally used seasonal adjustment methods and its application to domestic economic data series - report (1994)**
2. **The Methodology of Seasonal Adjustment and a User Manual for Win-X11-ARIMA - user manual (1995)**
3. **A proposal for setting up an information system aimed at seasonally adjusting national and county-level registered unemployment data - report (1995)**
4. **An experimental application of X-11 ARIMA/88 to the registered unemployment time series - report (1995)**

This present final report is based on these documents. The English version is an extract of the original Hungarian final report [5].

Budapest, May 1996

Miklós Banai, István Varga

ACKNOWLEDGEMENT

We acknowledge and deeply appreciate the invaluable contributions made by György Lázár, Christopher O'Leary and Marietta Morry. We would also like to express our gratitude for their helpfulness and professional support.

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INTRODUCTION

In market economies, labour force data change primarily because of the seasonality. Consequently in order to learn about the trends of economic processes, which drive the changes in the background, one needs removing fluctuations due to seasonal effects. This is what seasonal adjustment, a now standard statistical procedure, is aimed at.

The Federal Reserve Bank, the Bureau of Economic Research, the Treasury, the analysers in the Wall Street, the advisors to the President on economic matters are all among the main consumers of seasonally adjusted data in the United States of America. Practically all studies on employment and unemployment at national or regional levels use seasonally adjusted data series. The time series published by the Administration (about 5,000 in total) are all seasonally adjusted time series. Consequently trends can be clearly seen from these data.

This study summarizes the adaptation and research work, aimed at applying seasonal adjustment to Hungarian labour force data according to the international practice, which was done for the National Labour Center (OMK), within the framework of Word Bank Program "Development of Human Resources".

The adaptation and research work was based on investigations, made in 1994, into seasonal adjusting Hungarian unemployment data as described in our Report titled "The methodology of internationally applied seasonal adjustment and its application to domestic economic data series". On account of this report, we carried out the following tasks.

We selected the fundamental procedure to be applied for seasonal adjustment in OMK, developed a user-friendly computer implementation, specified the process and methods of data evaluation, made plans for an information system , and we also started to implement and test it

The realization has been or is to be done in the following steps:

1. According to Report [1], we chose X-11-ARIMA/88, developed by Statistics Canada, as the fundamental procedure for seasonal adjustment for OMK. This procedure is used for the official seasonal adjustment of labour force and other economic data throughout North America. Tests made on more than a hundred time series generated from the OMK database clearly justify this choice.

2. We have obtained the source code for X-11-ARIMA/88 from Statistics Canada, on that condition that we are allowed to use it in this program only and we may not disclose it to third parties. Having studied the code, we made a detailed plan for a user-friendly, computerized solution to seasonal adjusting. Since we could not obtain a program module in time that identifies ARIMA models and estimates the parameters, we have undertaken

to develop such a program module. The detailed plans are ready now, coding and testing are well in the works.

3. We have developed program modules (input data filtering, a flexible user interface, ARIMA model identifier, a model estimator and forecaster module, postprocessing text output files, graphic visualisation) and tested them. We have also made a user manual [2].

4. We have selected more than one hundred time series from the OMK database and, for testing purposes, applied X-11-ARIMA/88 to these in 1995. Meanwhile the good applicability of the procedure has been proven. The process for data evaluation has been established, we proposed a customized checklist, based on the one used in BLS, which suits the characteristics of the Hungarian time series [4].

5. We have planned an information system that would produce seasonally adjusted unemployment data both at the national and county levels [3]. Moreover, based on our investigations, we proposed elementary time series for composing national and county level time series. The seasonally adjusted versions of the main national and county-level time series can be prepared from these seasonally adjusted elementary time series [5].

We commenced to do the following in 1996:

1. Implementation and testing of the information system as specified by the plans. Now we monthly do seasonal adjustment for both national and county level elementary time series. We also do directly the seasonal adjustment of the aggregated principal time series in order to check adjustment by composition. In addition we adjust more than a hundred national level time series in each month.

2. The reliability tests are being done monthly along with the yearly needed post-revision due at the end of the year.

3. We are developing a program module which is to aid us in evaluating reliability figures constantly. This will collect the necessary data from the output files of X-11-ARIMA and compute the specified reliability figures.

4. The module X-11-ARIMA is to be enhanced in two directions. Firstly we are to build in a new ARIMA segment which increases productivity by finding the best fitting model instead of choosing among five time series models and it does seasonal adjustments in this way. Secondly, we add intervention analysis which can handle changes in the time series that are due to administrative measures.

5. During this year we are going to hold a seminar for OMK staff on the significance and the how-to of seasonal adjustment.

6. After carrying out these tasks, seasonal adjustment can be officially introduced in OMK in January, 1997. The elementary time series and the prime time series for each county, while at the national level the elementary time series, the prime one and more than a hundred selected time series may be published from 1997 on.

1. REQUIREMENT FOR COMPUTER SOFTWARE TOOLS

We took into account the following requirements, as outlined in Section B) of the Introduction, while we were shaping system plans and we developed tools accordingly.

Enhancement of X-11-ARIMA tools:

The division between the program module carrying out the analysis and the user interface must be maintained as in the original version.

1. The analysing module receives instructions through a configuration file. The configuration file is assembled by the user interface.

2. The menu-driven user interface should be

   — graphic,
   — standard,
   — multilingual (at least Hungarian and English),
   — equipped with on-line help

   (all in all: user-friendly). Programs running under the operation system MS-Windows usually confirm to these requirements.

3. A modernised display of text-formatted results. MS-Windows wordprocessors and spreadsheets must be capable of using the output files.

4. A graphical display of results. One has two possibilities:

   a) Use general purpose, MS-Windows based graphing capabilities. Implementation of widely used file formats are needed to this end.
   b) Use a custom version graphical unit which is integrated to the analysing module. The unit certainly must provide MS-Windows basic functionality (use of clipboard, printing control, zooming, etc.).

   We chose the second possibility.

5. The preparation of the configuration file that contains instructions should be independent of the user interface.

6. Capability for batch runs, i.e. when automatically several analyses are done according to pre-made configurations. In this case user interaction is needed for the preparation of configurations and the evaluation of the results.

7. The analysing program should be modular so that the system should be improvable, e.g. adjustment of extremal points (e.g. outliers).

8. Preparation of a user manual which solves syntactical problems in the user manual of X-11-ARIMA.

Processing results:

A condition for applicability in a standard and controllable way is a check list, which may serve as a starting point for the official publication, and which is adapted to the domestic environment. The prototype was the checklist used in BLS. The checklist was developed, simultaneously with program development, by utilising experiences with more than a hundred time series made from OMK data (see below).

The program system and the checklist must be such that a user with minimal computer skills only, after running the program, must be capable of filling out the checklist unambiguously.

When the source code of X-11-ARIMA/88 was granted to us by Statistics Canada, all preconditions for fulfilment were met. Since Statistics Canada, in an initiative, gave a commission for re-writing X-11-ARIMA mainframe FORTRAN code into the C language, with their kind permission, the present program version is compiled with this C language code which also contains options not available in the original version for personal computers. For example, the present program offers five, instead of four, ARIMA models for model identification.

The user manual [2] gives detailed information about the analysing system as it was operational at the end of 1995.

The user manual consists of two main parts.

Part I contains the theoretical discussion of analysing methods and procedures used by the program. Consequently we present identification of seasonal ARIMA models, the estimation procedure for the parameters and forecasts obtainable with the classic Box-Jenkins methods [6]. This section contains also a detailed algorithmic description of the ARIMA module of the program which allows for an interpretation and assessment of results. Method X-11-ARIMA/88 is presented in a similar manner.

Part II contains the user manual itself which is also available as on-line help.

The computer program developing was made in a close co-operation with HT-Szoft Ltd. Our work was greatly facilitated by the helpfulness of the Time Series Analysis and Research Division of Statistics Canada.

We especially acknowledge the contribution of the leader of the Division, Ms. Marietta Morry.

2. APPLICATION OF THE X-11-ARIMA/88 SEASONAL ADJUSTMENT PROCEDURE, FOR TESTING, ON THE DATABASE OF OMK

In accordance with our proposal for the seasonal adjustment of labour force data series described in the last part of the basic study [1] we applied the X-11-ARIMA/88 method on the time series selected from the register database of National Labour Centre (OMK) and the check list of BLS were used for the evaluation of the results.

We present here the results of the tests (in details see [4, 5]). The presentation will include:

- The decomposition of time series applied for seasonal adjustment, and the correlation matrix of the time series studied.
- The identification of the time series under investigation.
- Tables to overview the runs.
- The evaluation of the checklist of the runs.
- Figures.

2.1 Conditions for disaggregation to the seasonal adjustment of the number of registered unemployed

We have listed the conditions needed to calculate the elementary time series, the aggregate of which gives the basic time series (the number of registered unemployed), in the Appendix III. of the Study titled "A proposal for setting up an information system aimed at seasonally adjusting nation-wide and county-level registered unemployment data" [3].

These conditions are as follows:

a) the time series must be identifiable
b) the decomposed time series cannot show large positive or large negative correlations
c) the elementary time series chosen should possibly not be mere mathematical abstractions, instead the decompositions chosen should have clear economic and sociological contents.

The correlation matrix of the seasonal factors of the time series in question allow for studying the correlations between the selectable time series. Based on this and considering the criteria formulated in condition c), we have selected decompositions as they follow:

1. Decomposition by sex and age

- male to 25 years old (ffkor_a)
- male from 26 to 45 (ffkor_b)
- male from 46 to 55 (ffkor_c)
- male from 55 years old (ffkor_d)
- female to 25 years old (nokor_a)
- female from 26 to 45 (nokor_d)
- female from 46 to 50 (nokor_c)
- female from 50 years old (nokor_d).

2. School leaver or not, decomposed by sex

- school leaver male (fpkezdi)
- non school leaver male (fpkezdn)
- school leaver female (npkezdi)
- non school leaver female (npkezdn).

3. Entrant code by age groups

- non new entrant to 20 years old (k1nemuj)
- non new entrant from 21 to 45 (k2nemuj)
- non new entrant from 45 years old (k3nemuj)
- new entrant to 20 years old (k1ujbe)
- new entrant from 21 to 45 (k2ujbe)
- new entrant from 45 years old (k3ujbe)
- re-entrant to 20 years old (k1ujra)
- re-entrant from 21 to 45 (k2ujra)
- re-entrant from 45 years old (k3ujra).

The selected elementary time series are disjunct and they sum up to the total number of registered unemployed. Correlation matrices in **Tables 1-3** show that the various time series are highly correlated.

We use the evaluations of the revisions to study the different decomposition possibilities.

These basic time series had to be composed, using criteria b). Thus obtained elementary time series were already suitable for studying the effects of decomposition.

Table 1

The correlation matrix for the time series in Decomposition 1.

	ffkor_a	ffkor_b	ffkor_c	ffkor_d	nokor_a	nokor_b	nokor_c	nokor_d
ffkor_a	1.00000	0.18741	0.27684	-0.23156	0.90973	0.32132	0.21628	-0.26454
ffkor_b	0.18741	1.00000	0.94305	-0.07967	-0.09397	0.86044	0.78304	-0.76317
ffkor_c	0.27684	0.94305	1.00000	-0.09548	0.03167	0.91773	0.91908	-0.73882
ffkor_d	-0.23156	-0.07967	-0.09548	1.00000	-0.04584	0.03242	-0.03688	0.49422
nokor_a	0.90973	-0.09397	0.03167	-0.04584	1.00000	0.06808	0.02171	0.06533
nokor_b	0.32132	0.86044	0.91773	0.03242	0.06808	1.00000	0.87859	-0.71134
nokor_c	0.21628	0.78304	0.91908	-0.03688	0.02171	0.87859	1.00000	-0.59666
nokor_d	-0.26454	-0.76317	-0.73882	0.49422	0.06533	-0.71134	-0.59666	1.00000

Table 2

The correlation matrix for the time series in Decomposition 2.

	fpkezdi	fpkezdn	npkezdi	npkezdn
fpkezdi	1.00000	-0.11102	0.97057	0.17851
fpkezdn	-0.11102	1.00000	-0.19689	0.50443
npkezdi	0.97057	-0.19689	1.00000	0.06626
npkezdn	0.17851	0.50443	0.06626	1.00000

Table 3

The correlation matrix for the time series in Decomposition 3.

	k1nemuj	k1ujbe	k1ujra	k2nemuj	k2ujbe	k2ujra	k3nemuj	k3ujbe	k3ujra
k1nemuj	1.00000	-0.51100	0.14443	0.19310	-0.19149	-0.09095	0.25941	-0.34486	-0.12196
k1ujbe	-0.51100	1.00000	0.28803	-0.14701	0.30962	0.11561	-0.05507	0.12144	0.03087
k1ujra	-0.14443	0.28803	1.00000	-0.38723	0.58667	0.93908	-0.46111	0.34263	0.90383
k2nemuj	0.19310	-0.14701	-0.38723	1.00000	-0.17711	-0.38163	0.48098	0.04021	-0.35737
k2ujbe	-0.19149	0.30962	0.58667	-0.17711	1.00000	0.62734	-0.74709	0.79338	0.62858
k2ujra	-0.09095	0.11561	0.93908	-0.38163	0.62734	1.00000	-0.58448	0.45124	0.96995
k3nemuj	0.25941	-0.05507	-0.46111	0.48098	-0.74709	-0.58448	1.00000	-0.70175	-0.64903
k3ujbe	-0.34486	0.12144	0.34263	0.04021	0.79338	0.45124	-0.70175	1.00000	0.52091
k3ujra	-0.12196	0.03087	0.90383	-0.35737	0.62858	0.96995	-0.64903	0.52091	1.00000

Taking into account reductions and the requirement that the time series should be disjunct, furthermore they should sum up to the total number of the unemployed, in addition the correlation of the basic time series should not be „too high”, we made up three sets of basic time series:

Version I. :

1. registered unemployed school leaver (opk),
2. registered unemployed non-school-leaver men, up to 45 years old (fnkab),
3. registered unemployed non-school-leaver men, over 45 (fnkcd),
4. registered unemployed non-school-leaver women, up to 45 years old (nnkab),
5. registered unemployed non-school-leaver women, over 45 (nnkcd).

Version II. :

1. registered unemployed school leaver (opk),
2. registered unemployed non-school-leaver, up to 25 years old (onka),
3. registered unemployed non-school-leaver men, between 26-55 years, plus registered unemployed non-school-leaver women, between 26-50 years (onkbc),
4. registered unemployed non-school-leaver men, over 55, plus registered unemployed non-school-leaver women, over 50 (onkd).

Version III:

1. registered unemployed school leaver (opk),
2. registered unemployed non-school-leaver men, up to 25 years old (fnka),
3. registered unemployed non-school-leaver women, up to 25 years old (nnka),
4. registered unemployed non-school-leaver men, between 26-55 years, plus registered unemployed non-school-leaver women, between 26-50 years (onkbc),
5. registered unemployed non-school-leaver men, over 55 years, plus registered unemployed non-school-leaver women, over 50 (onkd).

Tables 4–6. show the correlation matrices for the three versions:

Table 4

The correlation matrix for the time series in Version I

	fnkab	fnkcd	nnkab	nnkcd	opk
fnkab	1.00000	0.67474	0.54919	-0.62975	-0.07213
fnkcd	0.67474	1.00000	0.82312	-0.32356	-0.00312
nnkab	0.54919	0.82312	1.00000	-0.30463	0.15354
nnkcd	-0.62975	-0.32356	-0.30463	1.00000	0.14026
opk	-0.07213	-0.00312	0.15354	0.14026	1.00000

Table 5

The correlation matrix for the time series in Version II

	onka	onkbc	onkd	opk
onka	1.00000	0.80254	-0.59659	-0.07563
onkbc	0.80254	1.00000	-0.58645	-0.09878
onkd	-0.59659	-0.58645	1.00000	0.11004
opk	-0.07563	-0.09878	0.11004	1.00000

Table 6
The correlation matrix for the time series in Version III

	fnka	nnka	onkbc	onkd	opk
fnka	1.00000	0.71283	0.87610	-0.66717	-0.15420
nnka	0.71283	1.00000	0.47952	-0.36074	0.09685
onkbc	0.87610	0.47952	1.00000	-0.58645	-0.09878
onkd	-0.66717	-0.36074	-0.58645	1.00000	0.11004
opk	-0.15420	0.09685	-0.09878	0.11004	1.00000

We are going to investigate all these three sets of time series in 1996. The investigation focuses, on one hand, on that how much the disaggregated time series deviate from the directly adjusted basic time series, on the other hand, how big revisions are necessary when using various decomposition methods. We will decide, at the end of the experimental period in year 1996, by the help of the results of these investigations on that which decomposition methods we will use [5].

2.2 Time series of the registered unemployed tested in 1995 and in the first quarter of 1996 and their file identification codes

1. All registered

1. male and female together (osszrm)

2. Disaggregated by sex

2. male (ffrm)
3. female (norm)

3. Disaggregated by sex and age

4. male, up to 25 years old (ffkor_a)
5. male, 26-45 years old (ffkor_b
6. male, 46-55 years old (ffkor_c)
7. male, over 55 years old (ffkor_d)
8. female, up to 25 years old (nokor_a)
9. female, 26-45 years old (nokor_b)
10. female, 46-50 years old (nokor_c)
11. female, over 50 years old (nokor_d)

4. Disaggregated by education

12. primary school or lower (iv01)
13. technical school or comprehensive school (iv23)
14. comprehensive school or grammar school (iv456)
15. high school or university (iv78)
16. comprehensive school or grammar school plus high school or university (iv45678)

5. Disaggregated by sex and education

17. male, primary school or lower (ffiv01)
18. male, technical school or comprehensive school (ffiv23)
19. male, comprehensive school or grammar school (ffiv456)
20. male, high school or university (ffiv78)
21. male, comprehensive school or grammar school plus high school or university (fiv45678)
22. female, primary school or lower (noiv01)
23. female, technical school or comprehensive school (noiv23)
24. female, comprehensive school or grammar school (noiv456)
25. female, high school or university (noiv78)
26. female, comprehensive school or grammar school plus high school or university (niv45678)

6. Disaggregated by sex, age and education

27. male, up to 25 years old, primary school or lower (fkaia)
28. male, up to 25 years old, technical school or comprehensive school (fkaib)
29. male, up to 25 years old, comprehensive school or grammar school (fkaic)
30. male, up to 25 years old, high school or university (fkaid)
31. male, up to 25 years old, comprehensive school or grammar school plus high schoolor university (fkaicd)
32. male, 26-55 years old, primary school or lower (fkbcia)
33. male, 26-55 years old, technical school or comprehensive school (fkbcib)
34. male, 26-55 years old, comprehensive school or grammar school (fkbcic)
35. male, 26-55 years old, high school, university (fkbcid)
36. male, 26-55 years old, comprehensive school or grammar school plus high school, university (fkbcicd)
37. male, over 55 years old, primary school or lower (fkdia)
38. male, over 55 years old, technical school or comprehensive school (fkdib)
39. male, over 55 years old, comprehensive school or grammar school (fkdic)
40. male, over 55 years old, high school or university (fkbid)
41. male, over 55 years old, comprehensive school or grammar school plus high school or university (fkbicd)
42. female, up to 25 years old, primary school or lower (nkaia)
43. female, up to 25 years old, technical school or comprehensive school (nkaib)
44. female, up to 25 years old, comprehensive school or grammar school (nkaic)
45. female, up to 25 years old, high school or university (nkaid)
46. female, up to 25 years old, comprehensive school or grammar school plus high school or university (nkaicd)
47. female, 26-50 years old, primary school or lower (nkbcia)
48. female, 26-50 years old, technical school or comprehensive school (nkbcib)
49. female, 26-50 years old, comprehensive school or grammar school (nkbcic)
50. female, 26-50 years old, high school or university (nkbcid)
51. female, 26-50 years old, comprehensive school or grammar school plus high schoolor university (nkbcicd)
52. female, over 50 years old, primary school or lower (nkdia)
53. female, over 50 years old, technical school or comprehensive school (nkdib)
54. female, over 50 years old, comprehensive school or grammar school (nkdic)
55. female, over 50 years old, high school or university (nkdid)

56. female, over 50 years old, comprehensive school or grammar school plus high school or university (nkdicd)

7. School leaver or not

57. school leaver (pkezdi)
58. non school leaver (pkezdn)

8. School leaver or not, disaggregated by sex

59. school leaver male (fpkezdi)
60. non school leaver male (fpkezdn)
61. school leaver female (npkezdi)
62. non school leaver female (npkezdn)

9. Type of compensation

63. unemployment benefit (mkj)
64. income support (jpt)
65. benefit for school leavers (pks)
66. no-compensation (nemrv)

10. Type of compensation disaggregated by sex

67. Male with unemployment benefit (fmkj)
68. Male with income support (fjpt)
69. Male with benefit for school leavers (fpks)
70. Male with no-compensation (fnemrv)
71. Female with unemployment benefit (nmkj)
72. Female with income support (njpt)
73. Female with benefit for school leavers (npks)
74. Female with no-compensation (nnemrv)

11. Disaggregated by skils

75. Skilled worker (szmunk)
76. Unskilled worker (bsmunk)
77. Manager (vez)
78. Other white collar worker (eszell)

12. Disaggregated by skills and sex

79. Skilled worker, male (ffszmunk)
80. Unskilled male (ffbsmunk)
81. Manager, male (ffvez)
82. Other white collar male (ffeszell)
83. Skilled worker, female (noszmunk)
84. Unskilled female (nobsmunk)
85. Manager, female (novez)
86. Other white collar, female (noeszell)

13. Entrant code by age

87. New entrant male plus female, up to 20 years old (k1ujbe)
88. New entrant male plus female, 21-45 years old (k2ujbe)
89. New entrant male plus female, over 45 years old (k3ujbe)
90. New entrant male plus female, over 20 years old (k4ujbe)
91. Reentrant male plus female, up to 20 years old (k1ujra)
92. Reentrant male plus female, 21-45 years old (k2ujra)
93. Reentrant male plus female, over 45 years old (k3ujra)
94. Reentrant male plus female, over 20 years old (k4ujra)
95. Not a new entrant male plus female, up to 20 years old (k1nemuj)
96. Not a new entrant male plus female, 21-45 years old (k2nemuj)
97. Not a new entrant male plus female, over 45 years old (k3nemuj)
98. Not a new entrant male plus female, over 20 years old (k4nemuj)

14. Entrant code by sex and age

99. New entrant male, up to 20 years old (fk1ujbe)
100. New entrant male, 21- 45 years old (fk2ujbe)
101. New entrant male, over 45 years old (fk3ujbe)
102. New entrant male, up to 20 years old (fk4ujbe)
103. Reentrant male, up to 20 years old (fk1ujra)
104. Reentrant male, 21-45 years old (fk2ujra)
105. Reentrant male, over 45 years old (fk3ujra)
106. Reentrant male, up to 20 years old (fk4ujra)
107. Not a new entrant male, up to 20 years old (fk1nemuj)
108. Not a new entrant male, 21-45 years old (fk2nemuj)
109. Not a new entrant male, over 45 years old (fk3nemuj)
110. Not a new entrant male, up to 20 years old (fk4nemuj)
111. New entrant female, up to 20 years old (nk1ujbe)
112. new entrant female, 21-45 years old (nk2ujbe)
113. New entrant female, over 45 years old (nk3ujbe)
114. New entrant female, up to 20 years old (nk4ujbe)
115. Reentrant female, up to 20 years old (nk1ujra)
116. Reentrant female, 21-45 years old (nk2ujra)
117. Reentrant female, over 45 years old (nk3ujra)
118. Reentrant female, up to 20 years old (nk4ujra)
119. Not a new entrant female, up to 20 years old (nk1nemuj)
120. Not a new entrant female, 21-45 years old (nk2nemuj)
121. Not a new entrant female, over 45 years old (nk3nemuj)
122. Not a new entrant female, up to 20 years old (nk4nemuj)

2.3 The overview tables of X-11-ARIMA runs

We present below the results of the 5 runs in a summarized form. The tables contain 6 columns. The first column contains the file identification codes of the time series and the other 5 columns contain in order the main results of the runs. These are:

- the model form chosen is multiplicative or additive according to the 1. page of the checklist,
- whether the program fits an ARIMA model to the time series in the run corresponding to the model form chosen, if it is yes what is the form of the ARIMA model, and what is the type of the prior transformation of the time series (None means that there was no prior transformation, Log means that there was a logarithmic prior transformation of the time series, i.e. the ARIMA model was fitted to the logarithm of the time series),
- is the result of the run accepted or rejected by the checklist of the BLS.

File name	I. evaluation	II. evaluation	III. evaluation	IV. evaluation	V. evaluation
osszrm	additive (2,1,0)(0,1,1) None acceptable	additive (2,1,0)(0,1,1) None acceptable	additive (2,1,0)(0,1,1) None acceptable	additive (2,1,0)(0,1,1) None acceptable	multiplikatív (2,1,0)(0,1,1) Log fails
ffrm	additive none acceptable	additive none acceptable	additive none acceptable	additive none acceptable	multiplikatív (2,1,0)(0,1,1) None fails
norm	additive (2,1,0)(0,1,1) None fails	additive (2,1,0)(0,1,1) None fails	additive (2,1,0)(0,1,1) None fails	additive (2,1,0)(0,1,1) None fails	multiplikatív (2,1,0)(0,1,1) None fails
ffkor_a	additive none acceptable	additive none acceptable	additive none acceptable	additive none acceptable	multiplikatív (2,1,0)(0,1,1) Log acceptable
ffkor_b	additive none acceptable	additive none acceptable	additive none acceptable	additive none acceptable	additive (2,1,0)(0,1,1) None fails
ffkor_c	additive none acceptable	additive none acceptable	additive none acceptable	additive none acceptable	additive (2,1,0)(0,1,1) None fails
ffkor_d	multiplikatív none fails	multiplikatív none fails	multiplikatív none fails	multiplikatív none fails	multiplikatív none fails
nokor_a	multiplikatív none fails	multiplikatív none fails	multiplikatív none fails	additive (0,1,1)(0,1,1) None fails	additive (0,1,1)(0,1,1) None fails
nokor_b	additive none acceptable	additive none acceptable	additive none acceptable	additive none acceptable	additive (2,1,0)(0,1,1) None fails
nokor_c	additive none fails	additive none acceptable	additive none acceptable	additive none acceptable	additive (2,1,0)(0,1,1) None acceptable
nokor_d	multiplikatív none acceptable	multiplikatív none acceptable	multiplikatív none acceptable	multiplikatív none acceptable	additive (0,1,2)(0,1,1) None fails
iv01	additive none acceptable	additive none acceptable	additive none acceptable	additive none acceptable	additive (2,1,0)(0,1,1) None fails

File name	I. evaluation	II. evaluation	III. evaluation	IV. evaluation	V. evaluation
iv23	additive none acceptable	additive none acceptable	additive none acceptable	additive none acceptable	multiplikatív (2,1,0)(0,1,1) Log fails
iv456	multiplikatív none acceptable	multiplikatív none acceptable	multiplikatív none acceptable	multiplikatív none acceptable	multiplikatív (0,1,1)(0,1,1) Log acceptable
iv78	multiplikatív none acceptable	multiplikatív none acceptable	multiplikatív none acceptable	multiplikatív none acceptable	multiplikatív (0,2,2)(0,1,1) Log acceptable
iv45678	multiplikatív none acceptable	multiplikatív none acceptable	multiplikatív none acceptable	multiplikatív none acceptable	multiplikatív (0,2,2)(0,1,1) Log acceptable
ffiv01	additive none acceptable	additive none acceptable	additive none acceptable	additive none acceptable	additive (2,1,0)(0,1,1) None fails
ffiv23	multiplikatív none acceptable	multiplikatív none acceptable	multiplikatív none acceptable	multiplikatív none acceptable	multiplikatív (2,1,0)(0,1,1) Log fails
ffiv456	multiplikatív none acceptable	multiplikatív none acceptable	multiplikatív none acceptable	multiplikatív none acceptable	multiplikatív (2,1,0)(0,1,1) Log acceptable
ffiv78	multiplikatív none acceptable	multiplikatív none acceptable	multiplikatív none acceptable	multiplikatív none acceptable	multiplikatív (0,2,2)(0,1,1) Log acceptable
fiv45678	multiplikatív none acceptable	multiplikatív none acceptable	multiplikatív none acceptable	multiplikatív none acceptable	multiplikatív (0,2,2)(0,1,1) None acceptable
noiv01	additive none acceptable	additive none acceptable	additive none acceptable	additive none acceptable	additive (2,1,0)(0,1,1) None acceptable
noiv23	additive (2,1,0)(0,1,1)None acceptable	additive (2,1,0)(0,1,1)None acceptable	additive (2,1,0)(0,1,1)None acceptable	additive (2,1,0)(0,1,1)None acceptable	additive none fails
noiv456	multiplikatív none acceptable	multiplikatív none acceptable	multiplikatív none acceptable	multiplikatív none acceptable	multiplikatív (0,1,1)(0,1,1) None acceptable
noiv78	multiplikatív none acceptable	multiplikatív none acceptable	multiplikatív none acceptable	multiplikatív none acceptable	multiplikatív none acceptable
niv45678	multiplikatív none acceptable	multiplikatív none acceptable	multiplikatív none acceptable	multiplikatív none acceptable	multiplikatív (0,1,1)(0,1,1) None acceptable
fkaia	additive none acceptable	additive none acceptable	additive none acceptable	additive none acceptable	multiplikatív (2,1,0)(0,1,1) Log fails
fkaib	additive none fails	additive none acceptable	additive none acceptable	additive none acceptable	multipliakaitív (0,2,2)(0,1,1) Log acceptable

2. Application of the X-11-ARIMA/88 seasonal adjustment procedure, for testing, on the database of OMK

File name	I. evaluation	II. evaluation	III. evaluation	IV. evaluation	V. evaluation
fkaic	multiplikatív none acceptable	multiplikatív none acceptable	multiplikatív none acceptable	multiplikatív none acceptable	multiplikatív (0,1,1)(0,1,1) Log fails
fkaid	additive none fails	additive none fails	multiplikatív none fails	multiplikatív none fails	additive (0,1,1)(0,1,1) None fails
fkaicd	multiplikatív none acceptable	multiplikatív none acceptable	multiplikatív none acceptable	multiplikatív none acceptable	multiplikatív (0,1,1)(0,1,1) Log fails
fkbcia	additive none acceptable	additive none acceptable	additive none acceptable	additive none acceptable	additive (2,1,0)(0,1,1) None fails
fkbcib	additive none acceptable	additive none acceptable	additive none acceptable	additive none acceptable	additive (2,1,0)(0,1,1) None fails
fkbcic	additive (2,10)(0,1,1) None acceptable	multiplikatív none acceptable	multiplikatív none acceptable	multiplikatív none acceptable	multiplikatív (0,2,2)(0,1,1) Log fails
fkbcid	additive (2,1,0)(0,1,1) None fails	additive (2,1,0)(0,1,1) None fails	additive (2,1,0)(0,1,1) None fails	additive (2,1,0)(0,1,1) None fails	additive (0,2,2)(0,1,1) None fails
fkbcicd	additive (2,1,0)(0,1,1) None acceptable	additive (2,1,0)(0,1,1) None acceptable	additive (2,1,0)(0,1,1) None acceptable	additive (2,1,0)(0,1,1) None acceptable	additive (2,1,0)(0,1,1) None acceptable
fkdia	multiplikatív none fails	multiplikatív none fails	multiplikatív none fails	multiplikatív none fails	multiplikatív none fails
fkdib	additive none fails	additive none fails	additive none fails	additive none fails	additive none fails
fkdic	multiplikatív none acceptable	multiplikatív none acceptable	multiplikatív none acceptable	multiplikatív none acceptable	multiplikatív none acceptable
fkdid	multiplikatív none fails	multiplikatív none fails	multiplikatív none fails	multiplikatív (0,1,1)(0,1,1) None fails	additive (0,1,1)(0,1,1) None fails
fkdicd	multiplikatív none acceptable	multiplikatív none acceptable	multiplikatív none acceptable	multiplikatív none acceptable	multiplikatív none acceptable
nkaia	additive none fails	additive none fails	additive none fails	additive none acceptable	additive none fails
nkaib	multiplikatív none acceptable	multiplikatív none acceptable	multiplikatív none acceptable	multiplikatív none acceptable	additive (0,1,1)(0,1,1) None fails
nkaic	multiplikatív none fails	multiplikatív none fails	multiplikatív none fails	multiplikatív none fails	additive (0,1,1)(0,1,1) None fails

File name	I. evaluation	II. evaluation	III. evaluation	IV. evaluation	V. evaluation
nkaid	multiplikatív none acceptable	multiplikatív none acceptable	multiplikatív none acceptable	multiplikatív none acceptable	multiplikatív none fails
nkaicd	multiplikatív none fails	multiplikatív none fails	multiplikatív none fails	multiplikatív none fails	additive (0,1,1)(0,1,1) None fails
nkbcia	additive none acceptable	additive none acceptable	additive none acceptable	additive none acceptable	additive (2,10)(0,1,1) None acceptable
nkbcib	additive (0,2,2)(0,1,1) None acceptable	additive (0,2,2)(0,1,1) None acceptable	additive (0,2,2)(0,1,1) None fails	additive none fails	additive (2,1,0)(0,1,1) None fails
nkbcic	additive (0,2,2)(0,1,1) None fails	additive (0,2,2)(0,1,1) None fails	additive (0,2,2)(0,1,1) None fails	additive (0,2,2)(0,1,1) None fails	additive (2,1,0)(0,1,1) None fails
nkbcid	multiplikatív none acceptable	multiplikatív none acceptable	multiplikatív none acceptable	multiplikatív none acceptable	multiplikatív none acceptable
nkbcicd	additive (2,1,0)(0,1,1) None fails	additive (2,1,0)(0,1,1) None fails	additive (2,1,0)(0,1,1) None fails	additive (2,1,0)(0,1,1) None fails	additive (2,1,0)(0,1,1) None fails
nkdia	additive none fails	multiplikatív none acceptable	multiplikatív none acceptable	additive none fails	additive none fails
nkdib	multiplikatív none acceptable	multiplikatív none acceptable	multiplikatív none acceptable	multiplikatív none acceptable	additive (0,1,1)(0,1,1) None fails
nkdic	multiplikatív none acceptable	multiplikatív none acceptable	multiplikatív none acceptable	multiplikatív none acceptable	multiplikatív none fails
nkdid	multiplikatív none acceptable	multiplikatív none acceptable	multiplikatív none acceptable	multiplikatív none acceptable	additive (2,1,0)(0,1,1) none fails
nkdicd	multiplikatív none acceptable	multiplikatív none acceptable	multiplikatív none acceptable	multiplikatív none acceptable	multiplikatív none fails
pkezdi	multiplikatív none acceptable	multiplikatív none acceptable	multiplikatív none acceptable	multiplikatív none acceptable	additive (0,1,1)(0,1,1) None fails
pkezdn	additive none acceptable	additive none acceptable	additive none acceptable	additive none acceptable	additive (2,1,0)(0,1,1) NOne fails
fpkezdi	multiplikatív none acceptable	multiplikatív none fails	multiplikatív none fails	additive (0,1,1)(0,1,1) None fails	additive (0,1,1)(0,1,1) None acceptable
fpkezdn	additive none acceptable	additive none acceptable	additive none acceptable	additive none acceptable	additive (2,1,0)(0,1,1) None fails

File name	I. evaluation	II. evaluation	III. evaluation	IV. evaluation	V. evaluation
npkezdi	multiplikatív none fails	additive none fails	multiplikatív none acceptable	additive none fails	additive (0,1,1)(0,1,1) None fails
npkezdn	additive none fails	additive none fails	additive none fails	additive none fails	additive (2,1,0)(0,1,1) None fails
mkj	additive none acceptable	multiplikatív none acceptable	additive none acceptable	multiplikatív none acceptable	additive none fails
jpt	additive (2,1,0)(0,1,1) None fails	additive (2,1,0)(0,1,1) None fails	additive (2,1,0)(0,1,1) None fails	additive (2,1,0)(0,1,1) None fails	additive (2,1,0)(0,1,1) None fails
pks	additive (0,1,1)(0,1,1) None fails	additive (0,1,1)(0,1,1) None fails	additive (0,1,1)(0,1,1) None fails	additive (0,1,1)(0,1,1) None fails	additive none fails
nemrv	multiplikatív none fails	multiplikatív none fails	additive none fails	multiplikatív none fails	additive none fails
fmkj	additive none acceptable	additive none acceptable	additive none acceptable	additive none acceptable	additive none acceptable
fjpt	additive (2,1,0)(0,1,1) None fails	additive (2,1,0)(0,1,1) None fails	additive (2,1,0)(0,1,1) None fails	additive (2,1,0)(0,1,1) None fails	additive (2,1,0)(0,1,1) None fails
fpks	additive (0,1,1)(0,1,1) None fails	additive (0,1,1)(0,1,1) None fails	additive (0,1,1)(0,1,1) None fails	additive (0,1,1)(0,1,1) None fails	additive none fails
fnemrv	additive none fails	multiplikatív none fails	multiplikatív none fails	multiplikatív none fails	multiplikatív none fails
nmkj	multiplikatív none fails	additive none fails	additive none fails	additive none fails	additive none acceptable
njpt	additive none fails	additive none fails	additive none fails	additive none fails	additive (2,1,0)(0,1,1) NOne fails
npks	additive (0,1,1)(0,1,1) None fails	additive (0,1,1)(0,1,1) None fails	additive (0,1,1)(0,1,1) None fails	additive (0,1,1)(0,1,1) None fails	additive none fails
nnemrv	multiplikatív none fails	multiplikatív none fails	multiplikatív none fails	multiplikatív none fails	multiplikatív none fails
bsmunk	additive none acceptable	additive none acceptable	additive none acceptable	additive none acceptable	additive (2,1,0)(0,1,1) None fails
szmunk	additive none acceptable	additive none acceptable	additive none acceptable	additive none acceptable	multiplikatív (2,1,0)(0,1,1) Log acceptable

File name	I. evaluation	II. evaluation	III. evaluation	IV. evaluation	V. evaluation
vez	additive (2,1,0)(0,1,1) None fails	additive (2,1,0)(0,1,1) None fails	additive (2,1,0)(0,1,1) None fails	additive (2,1,0)(0,1,1) None fails	additive (2,1,0)(0,1,1) None fails
eszell	multiplikatív none acceptable	multiplikatív none acceptable	multiplikatív none acceptable	multiplikatív none acceptable	multiplikatív (0,2,2)(0,1,1) Log acceptable
ffbsmunk	additive none acceptable	additive none acceptable	additive none acceptable	additive none acceptable	additive (2,1,0)(0,1,1) None fails
ffszmunk	additive none acceptable	additive none acceptable	additive none acceptable	additive none acceptable	multiplikatív (2,1,0)(0,1,1) None acceptable
ffvez	additive none fails	additive none acceptable	additive none acceptable	additive none acceptable	additive (2,1,0)(0,1,1) None fails
ffeszell	multiplikatív none acceptable	multiplikatív none acceptable	multiplikatív none acceptable	multiplikatív none acceptable	multiplikatív (0,2,2)(0,1,1) Log acceptable
nobsmunk	additive none acceptable	additive none acceptable	additive none acceptable	additive none acceptable	additive (2,1,0)(0,1,1) None acceptable
noszmunk	additive (2,1,0)(0,1,1) None acceptable	additive (2,1,0)(0,1,1) None acceptable	additive (2,1,0)(0,1,1) None acceptable	additive (2,1,0)(0,1,1) None acceptable	additive (2,1,0)(0,1,1) None acceptable
novez	additive (2,1,0)(0,1,1) None fails	additive (2,1,0)(0,1,1) None fails	additive (2,1,0)(0,1,1) None fails	additive (2,1,0)(0,1,1) None fails	additive (2,1,0)(0,1,1) None fails
noeszell	multiplikatív none acceptable	multiplikatív none acceptable	multiplikatív none acceptable	multiplikatív none acceptable	multiplikatív (2,1,0)(0,1,1) Log fails
k1ujbe	multiplikatív none acceptable	multiplikatív none acceptable	multiplikatív none acceptable	multiplikatív none acceptable	multiplikatív (0,1,1)(0,1,1) None fails
k2ujbe	multiplikatív none fails	multiplikatív none acceptable	multiplikatív none acceptable	multiplikatív none acceptable	multiplikatív none acceptable
k3ujbe	multiplikatív none fails	multiplikatív none acceptable	multiplikatív none fails	multiplikatív none fails	multiplikatív none fails
k4ujbe	multiplikatív none fails	multiplikatív none fails	multiplikatív none fails	multiplikatív none fails	multiplikatív none acceptable
k1ujra	additive none fails	additive none fails	additive none fails	additive none fails	additive none fails
k2ujra	additive none fails	additive none fails	additive none fails	additive none fails	additive none fails

2. Application of the X-11-ARIMA/88 seasonal adjustment procedure, for testing, on the database of OMK

File name	I. evaluation	II. evaluation	III. evaluation	IV. evaluation	V. evaluation
k3ujra	additive none fails	additive none fails	additive none fails	additive none fails	additive none fails
k4ujra	additive none fails	additive none fails	additive none fails	additive none fails	additive none fails
k1nemuj	multiplikatív none acceptable	multiplikatív none acceptable	multiplikatív none acceptable	multiplikatív none acceptable	additive none fails
k2nemuj	additive none acceptable	additive none acceptable	additive none acceptable	additive none acceptable	additive (2,1,1)(0,1,1) None fails
k3nemuj	multiplikatív none fails	multiplikatív none fails	additive none fails	additive none fails	additive none fails
k4nemuj	additive none acceptable	additive none acceptable	additive none acceptable	additive none acceptable	additive (2,1,1)(0,1,1) None acceptable
fk1ujbe	multiplikatív none acceptable	multiplikatív none acceptable	multiplikatív none acceptable	multiplikatív none acceptable	multiplikatív (0,1,1)(0,1,1) None fails
fk2ujbe	multiplikatív none acceptable	multiplikatív none acceptable	multiplikatív none acceptable	multiplikatív none acceptable	multiplikatív none acceptable
fk3ujbe	multiplikatív none fails	multiplikatív none fails	multiplikatív none fails	mulitplikatív none fails	mulitplikatív none fails
fk4ujbe	multiplikatív none acceptable	multiplikatív none acceptable	multiplikatív none acceptable	multiplikatív none acceptable	multiplikatív none acceptable
fk1ujra	additive none fails	additive none fails	additive none fails	additive none fails	additive none fails
fk2ujra	additive none fails	additive none fails	additive none fails	additive none fails	additive none fails
fk3ujra	additive none fails	additive none fails	additive none fails	additive none fails	additive none fails
fk4ujra	additive none fails	additive none fails	additive none fails	additive none fails	additive none fails
fk1nemuj	multiplikatív none acceptable	multiplikatív none acceptable	multiplikatív none acceptable	multiplikatív none acceptable	multiplikatív none fails
fk2nemuj	additive none acceptable	additive none acceptable	additive none acceptable	additive none acceptable	additive (2,1,0)(0,1,1) None fails

File name	I. evaluation	II. evaluation	III. evaluation	IV. evaluation	V. evaluation
fk3nemuj	additive none fails	additive none fails	additive none fails	additive none acceptable	additive (0,2,2)(0,1,1) NOne fails
fk4nemuj	additive none acceptable	additive none acceptable	additive none acceptable	additive none acceptable	additive (0,2,2)(0,1,1) None fails
nk1ujbe	multiplikatív none acceptable	multiplikatív none acceptable	multiplikatív none acceptable	multiplikatív none acceptable	multiplikatív (0,1,1)(0,1,1) Log fails
nk2ujbe	multiplikatív none fails	multiplikatív none fails	additive none fails	mulitplikatív none acceptable	mulitplikatív none acceptable
nk3ujbe	multiplikatív none fails	multiplikatív none fails	multiplikatív none fails	mulitplikatív none fails	mulitplikatív none fails
nk4ujbe	multiplikatív none fails	multiplikatív none fails	multiplikatív none fails	mulitplikatív none fails	mulitplikatív none fails
nk1ujra	additive none fails	additive none fails	additive none fails	additive none fails	additive none fails
nk2ujra	additive none fails	additive none fails	additive none fails	additive none fails	additive none fails
nk3ujra	additive none fails	additive none fails	additive none fails	additive none fails	additive none fails
nk4ujra	additive none fails	additive none fails	additive none fails	additive none fails	additive none fails
nk1nemuj	multiplikatív none acceptable	multiplikatív none acceptable	multiplikatív none acceptable	multiplikatív none acceptable	additive (0,1,1)(0,1,1) None fails
nk2nemuj	additive none acceptable	additive none acceptable	additive none acceptable	additive none acceptable	additive (2,1,0)(0,1,1) None fails
nk3nemuj	additive none fails	additive none fails	additive none fails	additive none fails	additive none fails
nk4nemuj	additive none fails	additive none fails	additive none fails	additive none fails	additive (2,1,0)(0,1,1) None fails

2.4 Evaluation of the measures of the checklists

We executed the test of the X-11-ARIMA/88 procedure with 5 runs based on the timeseries selected from the database of NLC (National Labor Cencer) (in Hungarian OMK). The first 4 runs were done on time series shorter than 6 years long, while the 5th run was done on exactly 6 years long time series. We present the results of the test according to this decomposition.

2.4.1 Evaluation of the cheklists of runs ended with September, 1995, proposal for the Hungarian version of checklist

We selected more than 170 time series containing national aggregates from the OMK register database to test the seasonal adjustment method and to complete the conditions of its official application. However it turned out that the time series containing data disaggregated by branch are not complete mainly for the starting years. Therefore it is yet not possible to select time series of five years long by branches. One can study this kind of series later when at least five year long time series will be avalaible.

Finally we executed the test using 125 time series in four runnings: the first (1.) includes the time period January, 1990 – December, 1994, the second (2.) the time period January, 1990 – March, 1995, the fird (3.) the time period January, 1990 – June, 1995, the fourth (4.) January, 1990 – September, 1995. The results of these four runs are summarised as follows.

We ran the program X-11-ARIMA/88 in default setting and evalueted the outputs with the aid of the X-11-ARIMA CHECKLIST developed in the BLS to evaluate the runs of X-11-ARIMA for the seasonal adjustment of labour force series.

Choise of additive or multiplicative decomposition

Additive decomposition was resulted for 66 time series in all of the four runs, i.e. in a stable way, while multiplicative was resulted in a stable way for 47 time series. The choice of model decomposition varied (i.e. it was instable) for 13 time series: multiplicative model was choosen more times for 7 time series while the contrary was for 5 time series (cf. The overview tables in section 2.3).

The choice of ARIMA model

The program fitted ARIMA model for 20 among the 125 time series while was not able to fit for 105 time series. The ARIMA model fit was stable (i.e. the same ARIMA model was fitted in all runs) for 15 time series, while the fit was instable (i.e. the program chose occasionally, but the same ARIMA model in every case during the four runs) for 5 time series.

The fitted model types were

(2, 1, 0)(0, 1, 1) None for 12 cases
(0, 1, 1)(0, 1, 1) None for 6 cases
(0, 2, 2)(0, 1, 1) None for 2 cases.

(None means that the program fitted the ARIMA model without the prior transformation of the original time series.) (Cf. the overview tables in section 2.3)

The results of the seasonal adjustment according to the X-11-ARIMA/88

The acceptance criteria built in the program based on the so called Q statistics was acceptable for 110 time series in all of the four runs. Thus the seasonal adjustment was succesfull for 88 % of the all time series under study, i.e. it turned out that the X-11-ARIMA/88 method is unambigously applicable for the seasonal adjusment of the time series selected from the OMK's register database (cf. the arranged checklists of the runs in [4]).

The results of the seasonal adjustment according to the BLS checklist

The BLS checklist formulates a stronger criteria as the condition of the publication than the built in criteria of the X-11-ARIMA/88. The program evaluetes all the measures of BLS checklist so one can fill in the list with the aid of the output of the program. By overviewing the checklists filled in the four runs we obtain the following results.

The acceptance of seasonal adjustment was stable for 67 time series (54 % of all). The non acceptance of seasonal adjustment was stable for 48 time series (38 % of all). The results were not stable (sometimes acceptable sometimes not) for 10 time series (8 % of all). For 3 time series amongst the latters only the checklists of the run 1 provided non acceptable results, all the 3 other closed with acceptable results.

In these cases probably the time series used in run 1 were not long enough that a stronger criteria of seasonal adjustment acceptance be satisfied. It seems that as the time series get longer and longer the problem gets resolution. Therefore we can insert these three time series into the set of succesful time series, thus can be obtained acceptable result for 70 time series (56 % of the all) in a stable way.

We summarised the statistical measures of the checklists of 55 (=48+7) time series problematic in the sence of the BLS checklist in 4 tables arranged to the 4 runs (The statistical measures of problematic time series, Tables I.–IV. in [4]).

We present the numbers of failures of the statistical measures in the BLS checklist for the problematic time series according to the runs in Table I. We list the conditions denoted by the simbols of the statistical measures in the left column of the table. We set first the conditions, denoted by an asterisk in the BLS's checklist, they must be true for the acceptance in the checklist.

Table I.
How many times are fail the conditions of the checklist for the problematic time series

Condition/Run	Run 1	Run 2	Run 3	Run 4
Q≤1.0	14	13	14	13
M7≤1.0	39	35	37	35
F-Moving<2.2	35	28	26	28
F-Stable>7.0	40	38	41	38
M4≤1.0	9	9	7	7
MCD≤3	12	12	12	12
S≥I or I≤50	13	7	8	5
O<CI	10	7	8	8

We collected the values of the measures from the conditions V. and VII. of the checklists (which are denoted by asterisk in the BLS checklist) for the instable time series by runs in Table II.

Table II.
The values of measures belonging to the critical conditions of the checklist for the instable time series (FS=F-Stable, FM=F-Moving)

Time series code/Run	Run 1	Run 2	Run 3	Run 4
nokor c	FS=6.994	OK	OK	OK
fkaib	FM=2.24	OK	OK	OK
nkaia	FS=6.71,FM=2.95	FM=2.96, M7=1.05	FS=6.37	OK
nkbcib	OK	OK	FS=6.29, FM=7.62, M7=1.54	FS=6.78, FM=5.49, M7=1.32
nkdia	FM=3.68, M7=1.09	OK	OK	FM=3.15
ffpkezdi	FM=2.4	FM=2.5	FM=2.64	FM=2.73
nopkezdi	FM=2.22	FM=3.04	FS=7.0	FS=3.97, M7=1.05
k2ujbe	FM=2.511	OK	OK	OK
k3ujbe	FS=6.52	OK	FS=7.0	FS=6.28
nk2ujbe	FS=5.89	FS=6.59	FS=5.39, FM=2.4, M7=1.15	OK

One can read from Table II. the limit values of the three critical measures and the first values next to the limit values following from our investigation (the limit value is a minimum for F-Stable, it is a maximum for F-Moving and M7). These are:

Min FS = 3.97, the next FS = 5.39
Max FM = 7.62, the next FM = 5.49, the next to this FM = 3.68
Max M7=1.54, the next M7=1.32

Based on these values we have two alternatives to weaken the BLS criteria of the critical measures both of which fit better to the time series under study than the BLS criteria (of course in our proposal the built in acceptance criteria ($Q \leq 1.0$) of the X-11-ARIMA/88 remain valid!). These are:

I. $Q \leq 1.0$, $M7 \leq 1.4$, F-Moving < 3.7, F-Stable > 5.0,

II. $Q \leq 1.0$, $M7 \leq 1.6$, F-Moving < 7.7, F-Stable > 3.5.

One can collect the number of times the new criteria hold true with the aid of Tables I.–IV. in [4] containing the statictical measures of the problematic time series by runnings and thus the improvement can be determined. Table III. containes the numbers of times the conditions of case I. hold true, while Table IV. containes them for case II.

Table III.
The number of problematic time series satisfying criteria I.
by conditions and runs

Condition/Run	Run 1	Run 2	Run 3	Run 4
M7≤1.4	32	35	35	41
FM<3.7	39	40	39	38
FS> 5.0	24	27	25	28
All 4 together	16	18	16	17

Th set I. of conditions satisfies for 11 problematic time series in all of the 4 runs, thus accepting this proposal 81 time series are no problemetic among the 125 time series, i.e. 65 % of all.

Table IV.
The number of problematic time series satisfying the criteria II.
according to the conditions and runs

Condition/Run	Run 1	Run 2	Run 3	Run 4
M7≤1.6	39	44	43	46
FM<7.7	52	50	50	52
FS>3.5	38	36	35	37
All 4 together	32	30	31	34

Set II. of conditions satisfies for 27 problematic time series in all of the 4 runs, thus accepting this proposal 97 time series are no problemetic among the 125 time series, i.e. 77.6 % of all.

We can choose between the two set of conditions by studying later adjustments (post-revisions). Now we suggest set II. of criteria for preliminary use in such a way that it is reasonable to study both the criteria of BLS and of set I. and II. for basic time series during the experimental use in 1996.

Statistics M7 is devoted to measure the presence of identifyable seasonality in the time series. If its value is greater than 1 then this signals that the seasonality is not identifyable in the time series. However the cut-off point of M7 was based on **10-year monthly series** and it corresponds to a combination of FS and FM values that indicate 50% distortion in the seasonal factor estimate. In this case the M7 test statistic takes the following form [7]:

$$\mathrm{M7} = \sqrt{\frac{1}{2}\left(\frac{7}{FS} + \frac{3FM}{FS}\right)}.$$

If we insert the limit values of FM and FS given in set II. of the conditions, then we obtain the value 2.07 for M7, i.e. the limit value 1.6 for M7 is a stronger condition. On the contrary, we get the limit value, e.g. for FM, FM=3.64 from the above relation if we accept the M7=1.6 value.

The time series we studied are all shorter than 6-year. Thus the exact procedure would be to derive the above relation again for monthly time series shorter than 6-year based on the distortion test of M7. However it is not resasonable to execute this study from the following two reasons:

1. The time series under consideration are getting longer and longer. They will be more than 7 year long from the planed date of official application of seasonal adjustment.

2. We will apply the intervention analysis in this year to handle the effect of administrative interventions which affect the shape of the time series. Then this method will improve the possibility to detect the stable seasonality in the time series by subtracting the intervention effects from the seasonal effects.

Our expectation is that getting the time series longer and longer and applying the intervention analysis we can gradually disregard the weakened accaptance criteria for the M7 statistic and reaching the 10 year length we can recover the criteria of the BLS checklist.

The role of the ARIMA model fit to the time series in this seasonal adjustment procedure is that one can forecast and backcast the time series and handle in this way the end point problems appearing by taking moving averages. The number of revisions can be reduced in this way. Since it turned out in these tests that the set of ARIMA models built in the program is not sufficient to describe the time series under consideration with ARIMA models. The solution of this problem could be a development of the program which includes a comprehensive ARIMA model identification, estimation and forcasting module instead of a selected set of ARIMA models. In this version of the X-11-ARIMA software the ARIMA model fit and the forecast and backcast of the time series would be done with this module, while the other module of the program produces the seasonal adjustment of the forecasted and backcasted time series with the X-11 procedure.

2.4.2 Evaluation of the checklists of runs completed for the quarter IV. of 1995

We got the data of quarter IV. of 1995 in January 1996. Thus we supplemented our runs taking into account the data of the last quarter of 1995. Thus in this fith run be analysed time series spanned the time interval January, 1990 – December, 1995. This interval includes six complete years, i.e. the time series under consideration are 6 years long.

We ran in this case the X-11-ARIMA/88 program again in default option, we used to be evaluated the outputs of the runs by using the X-11-ARIMA CHECKLIST applied in the BLS for the evaluation of the outputs of the X-11-ARIMA in seasonal adjustment of labor force series and the Hungarian checklist based on the former four runs. We summarise the results as follows.

Additive or multiplicative model form

Aditive model form was obtained for 74 time series (61 % of all) while *multiplicative* for 48 time series (39 %). The choise of model form changed since the latest run (i.e. it was instable) in the case of 22 time series (18 %) (cf. the "Overview table" of runnings). Consequently the choice of model form has not changed essentially, only the number of instable time series rose to 22 from 13 [1].

Choice of ARIMA model

The program did choose ARIMA-model for 74 cases (61 %) of the 122 time series, while it did not for 48 cases (39 %). It is a significant change comparing to the earlier runs, where the corresponding percentages were 16 % and 84 % respectively. The explanation of this may be that the time series under investigation had become 6 years long which means that the years after the starting year 1990 also provide 5 years long time series. Thus the starting year when the shape of the time series are unformed is present with less weight in fitting the ARIMA model! The model type choosen are as follows:

(2, 1, 0)(0, 1, 1) None for 36 cases
(2, 1, 0)(0, 1, 1) Log for 8 cases
(0, 1, 1)(0, 1, 1) None for 15 cases
(0, 1, 1)(0, 1, 1) Log for 4 cases
(0, 2, 2)(0, 1, 1) None for 4 cases
(0, 2, 2)(0, 1, 1) Log for 6 cases
(0, 1, 2)(0, 1, 1) None for 1 cases.

(None means that the program fits the ARIMA model to the time series without prior transformation, while Log means that with logarithmic prior transformation.) (Cf. the "Overview table" of the runs in section 2.3)

The result of the seasonal adjustment by the X-11-ARIMA/88

The produced seasonal adjusment was acceptable for 101 time series according to the criteria based on the Q statistical test built in the program, while it failed for 21 cases. Thus the seasonal adjustment was successful for 83 % of the all time series, therefore the X-11-ARIMA/88 method was unambiguously proved applicable to provide the seasonal adjustment of the labour force series selected from the register database of the National Labour Centre.

The result of the seasonal adjustment by the checklist of BLS

The checklist of BLS requires a stronger acceptance criteria as the condition of the publication than the built in acceptance criteria of the X-11-ARIMA/88. The program evaluates all the measures included in the criteria, thus one can fill out the checklist by means of the output of the program. In the present run the BLS criteria is true only for 33 time series (27%), while it fails for 89 time series (73%). This result shows essential difference from the result of the former 4 runs, which can be explained by the completion of the time series to 6 year long.

As a consequence of this completion on the one hand the starting year appears in the seasonal adjustment with less weight **and** on the other the program can fit more ARIMA model to the time series from its ARIMA model set. In these cases the program applies the X-11 method to the extrapolated time series and **the weight of the observations causing non identifyable seasonality** (e.g. observations resulted by administrative interventions) **raises** in the extrapolated time series.

The critical measures of the BLS checklist (beside the Q statistic) are satisfied in the run as follows:

- The condition M7 ≤ 1.0 fails for 42 time series (34 %) and fulfils for 80 time series (66 %). For every cases where the Q statistic fails there the M7 statistic also fails.
- The condition FM < 2.2 (measuring the moving seasonality) fails for 75 time series (61 %) and fulfils for 47 time series (39%). This statistic fails the most frequently.
- The condition FS > 7.0 (measuring the stable seasonality) fails for 40 time series (33 %) and fulfils 82 time series (67 %).

The conditions of the **Hungarian checklist** proposed are satisfied as follows:

- The seasonal adjusments are accepted according to this checklist for 87 time series **(71 % succes)** and rejected for 35 time series (29 %).

The critical measures of the BLS checklist (beside the Q statistic) with the new limit values prescribed in the Hungarian checklist are satistied in the run as follows:

- The condition M7≤1.6 fails for 21 time series (17 %) and fulfils for 101 time series (83 %).
- The condition FM< 7.7 (measuring the moving seasonality) fails for 13 time series (11 %) and fulfils for 109 time series (89%).
- The condition FS>3.5 (measuring the stable seasonality) fails for 19 time series (16 %) and fulfils 103 time series (84 %).

Further essential notes:

- We found 23 cases in the first 4 runs where the seasonal adjustments were rejected by the checklist criteria.
- In run 5 we found 35 rejected cases. Among the 23 and 35 time series 19 were the same.

Therefore 4 time series became not problematic from the earlier problematic time series but at the same time 16 earlier not problematic became problematic.

Our expectation is that we can filter out the effects of administrative interventions by means of the **intervention analysis**, while we can obtain a more accurate description of the movement of the time series with proper ARIMA model identification and estimation. By implementing these new options in the program we will be able to improve the seasonal adjustments significantly.

Finally we list the time series of which the seasonal adjusment were rejected in run 5 by the criteria of the Hungarian checklist. These are by the their file code:

ffkor_d	nkdia	njpt	fk3ujra	nokor_d	nkdib	vez
fk4ujra	noiv23	nkdid	novez	nk1ujra	fkbcib	jpt
k1ujra	nk2ujra	fkdia	pks	k2ujra	nk3ujra	nkaic
nemrv	k3ujra	nk4ujra	nkaicd	fjpt	k4ujra	nk3nemuj
nkbcib	fpks	k3nemuj	nk4nemuj	nkbcic	fnemrv	fk1ujra
npks	nkbcicd	nmkj	fk2ujra			

2.4.3 The average values of statistics M1-M11 describing the quality of the seasonal adjustment of the common 122 time series of shorter than 6 year long and of exactly 6 year long

For completing the evaluation of the runs we present the average values of the statistics M1-M11 used by the X-11-ARIMA procedure to describe the quality of the seasonal adjustment, and the average value of the Q statistic determined as a weighted average of the M1-M11 staitistics for the 122 time series common in the 5 runs. One can think of these average values as the statistical measures of an average time series composed (by equal weights) from the 122 time series [7].

The quality control statistics M1-M11 measure the following quantities [1,6]:

M1: measurs the relative contribution of the irregulars to the variance over three months span,
M2: measures the relative contribution of the irregular component to the variance of the stationary portion of the series,
M3: measures the amount of month-to-month change in the irregular as compared to the amount of month-to-month change in the trend-cycle,
M4: measures the amount of autocorrelation in the irregular as described by the average duration of run,
M5: measures the number of months it takes the average absolute change in the trend-cycle to dominate that in the irregular,
M6: measures the amount of year-to-year change in the irregular as compared to the amount of year-to-year change in the seasonal,
M7: measures the amount of stable seasonality present relative to the amount of moving seasonality.

The last four quality control statistics describe the year-to-year movement in the seasonal component.

M8: measures the size of the fluctuations in the seasonal component throughout the whole series,
M9: measures the average linear movement in the seasonal component throughout the whole series,
M10: measures the size of the seasonal component fluctuations in the recent years (for four years before the last two years),
M11: measures the average linear movement in the seasonal component in recent years (for four years before the last two years).

The X-11-ARIMA/88 calculates only the M1-M7 measures for time series shorter than 6 years, it calculates all the M1-M11 measures for time series *at least six* years long (in accordance with the definition of M10 and M11).

The Q statistic is obtained as the weighted average of the M statistics for time series shorter than 6 years long as follows:

$$Q = 0.17M1 + 0.17M2 + 0.1M3 + 0.05M4 + 0.11M5 + 0.1M6 + 0.3M7,$$

and for time series at least 6 years long:

$$Q = 0.13M1 + 0.13M2 + 0.1M3 + 0.05M4 + 0.11M5 + 0.1M6 + 0.16M7 + 0.07M8 + + 0.07M9 + 0.04M10 + 0.04M11.$$

Then the average values of the M1-M7 measures and the average value of Q in run 4 for the 122 time series (shorter than 6 years long) are:

M1 = 0.5896
M2 = 0.3690
M3 = 0.0843
M4 = 0.4329
M5 = 0.1792
M6 = 0.3860
M7 = 0.8025
Q = 0.4919

The average values of the M1-M11 measures and the average value of Q in run 5 for the 122 time series (6 years long) are:

M1 = 0.6214
M2 = 0.3751
M3 = 0.1117
M4 = 0.5439
M5 = 0.1940
M6 = 0.4013
M7 = 0.9571
M8 = 0.8786
M9 = 0.8545
M10 = 0.8801
M11 = 0.8671
Q = 0.5737

If we compare the values of these measures with the values of these measures obtained in Statistics Canada by seasonally adjusting 421 time series varied in length from 5 to 30 years and can be found in [7], then we can see that the effect of the irregular component is smaller in our time series. This difference can be explained easily because the time series under consideration are the results of an administrative registration, i.e. they do not come from an estimation using survey data, thus they do not include sampling error. On the contrary the measures controlling the stability of the seasonal component and the change of its size show higher values. The explanation of these differences may be the more frequent interventions and as a results of an economy in transition. We expect the improvement of the quality of the seasonal adjustment, as we mentioned earlier, from the application of the intervention analysis and of proper ARIMA modeling.

2.5. Figures showing graphically the outputs of the seasonal adjustments of some representative time series

We present the result of the seasonal adjustment for 8 time series selected from the 122 time series tested in 5 runs in 1995 and 1996. We present the original time series together with the seasonally adjusted time series and the trend-cycle component produced by the X-11-ARIMA/88.

We note that similar figures were enclosed to the report [4] for all the 122 time series based on the run 4.

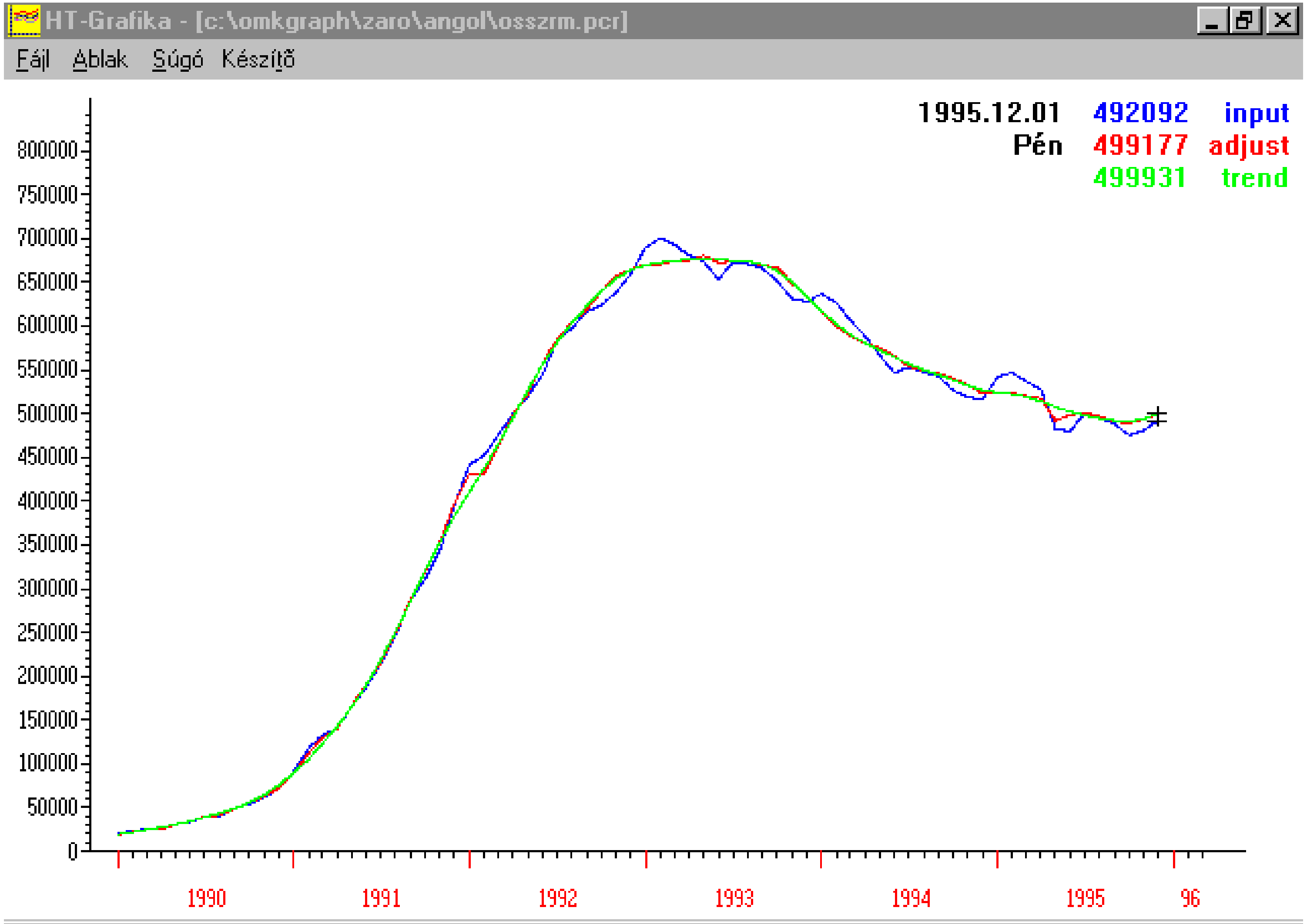


Figure 1
All registered, male and female together,
file-code: osszrm
(blue:original time series, green: trend-cycle, red: seasonally adjusted time series)

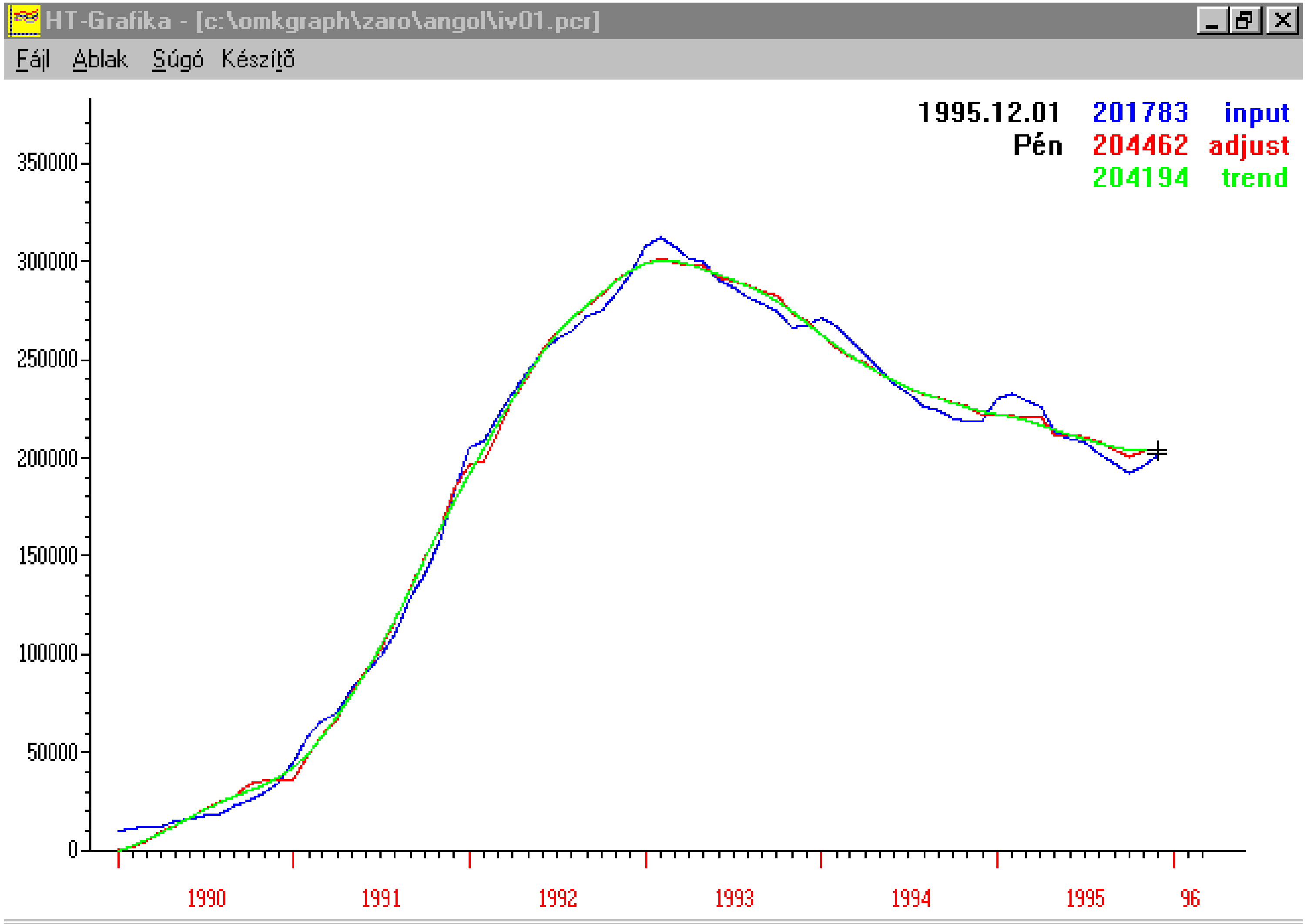


Figure 2

Registered unemployed with education level primary school or lower

file-code: iv01

(blue:original time series, green: trend-cycle, red: seasonally adjusted time series)

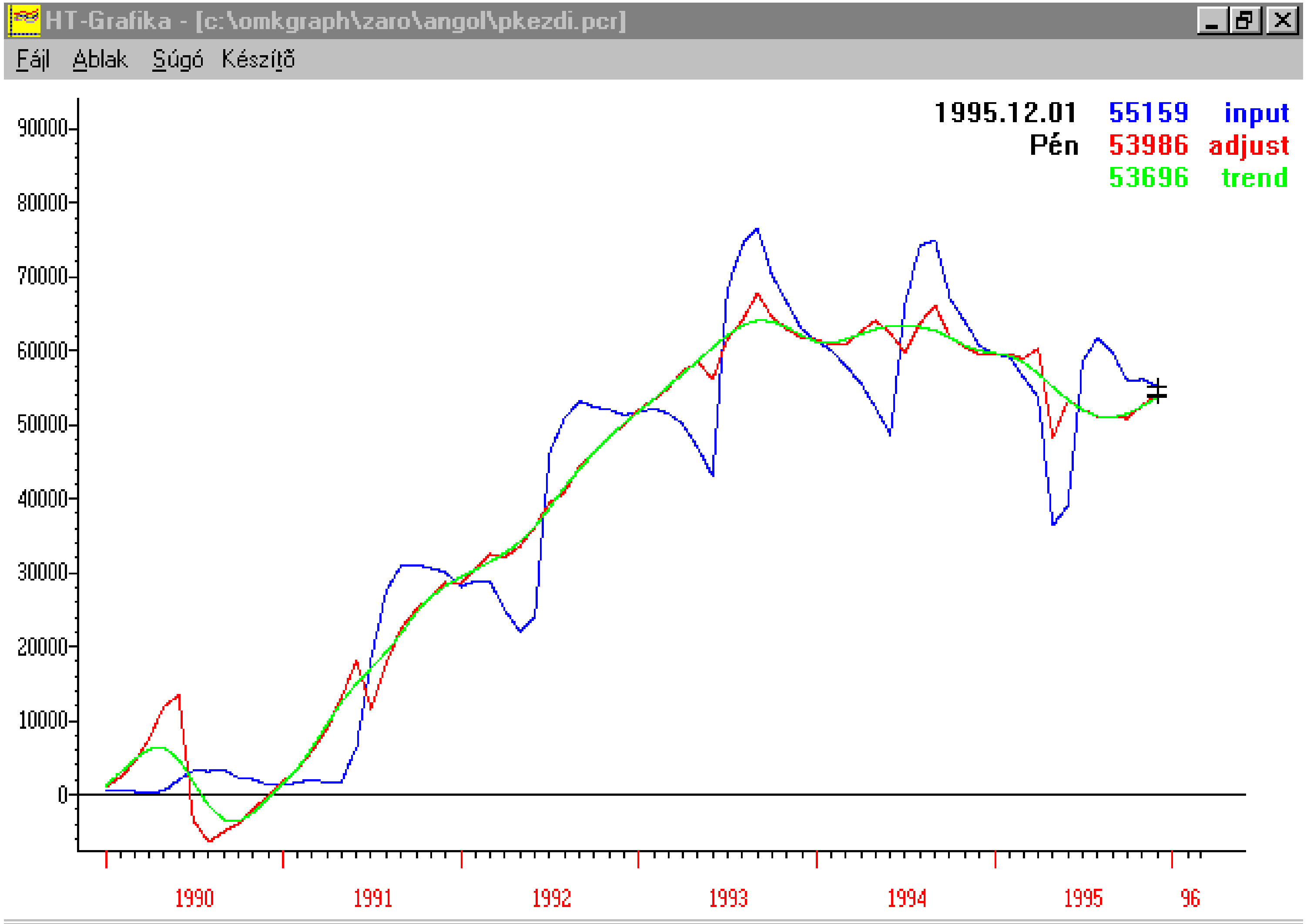


Figure 3

Registered unemployed, school leaver male and female together,
file-code: pkezdi
(blue:original time series, green: trend-cycle, red: seasonally adjusted time series)

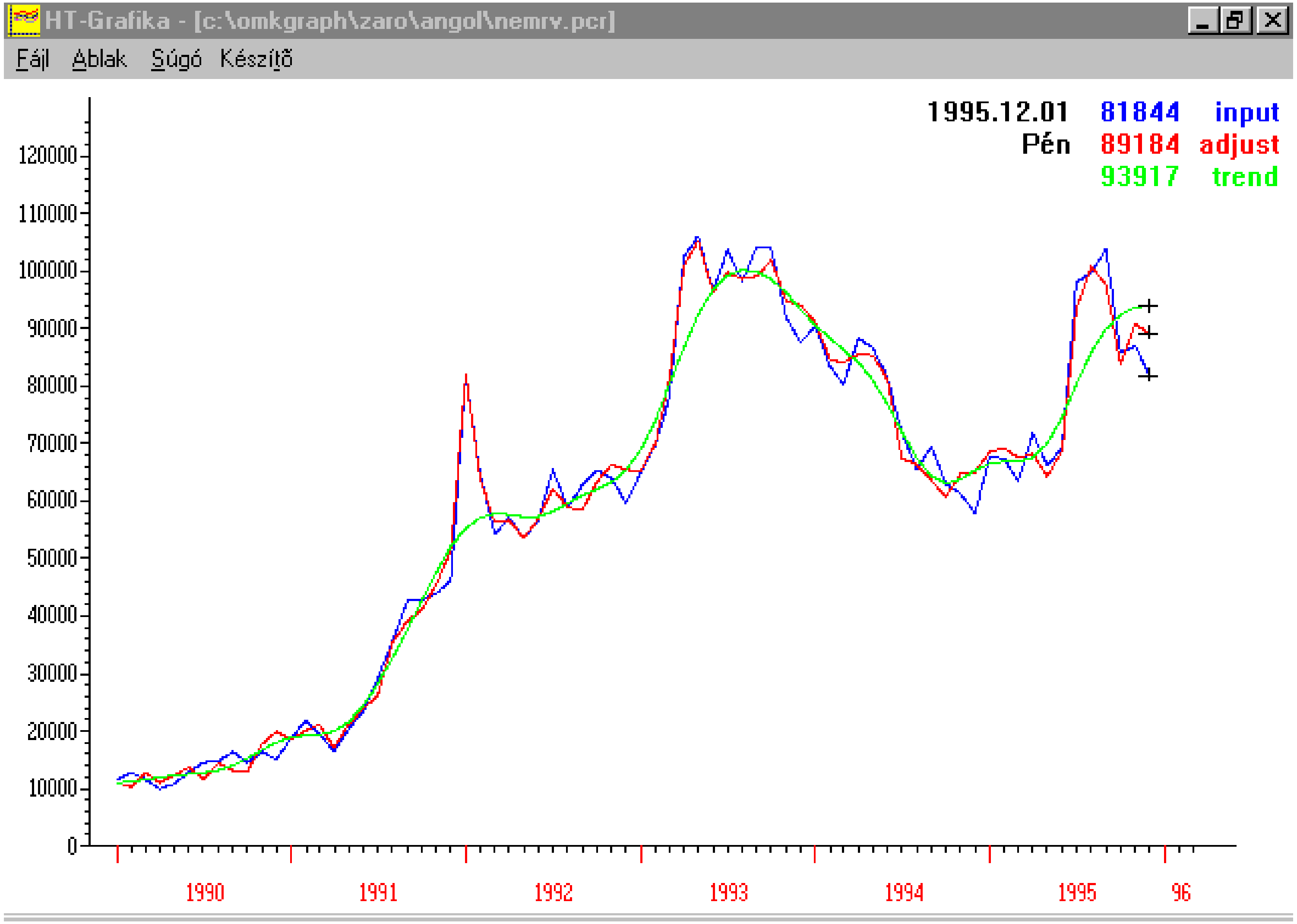


Figure 4
Registered unemployed, with no-compesation, male and female together,
file-code: nemrv
(blue:original time series, green: trend-cycle, red: seasonally adjusted time series)

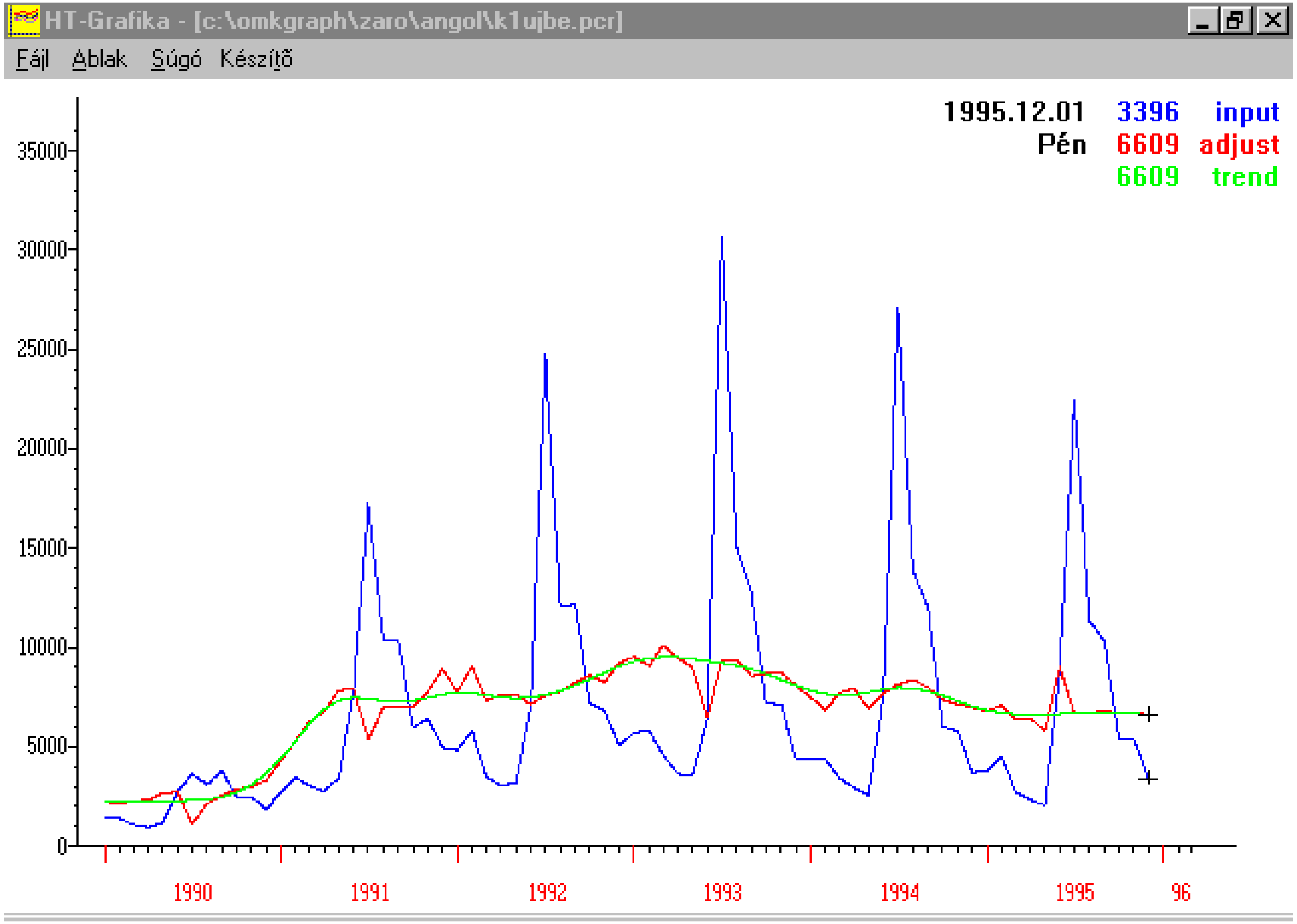


Figure 5

New entrant registered unemployed male plus female, up to 20 years old,
file-code: k1ujbe
(blue:original time series, green: trend-cycle, red: seasonally adjusted time series)

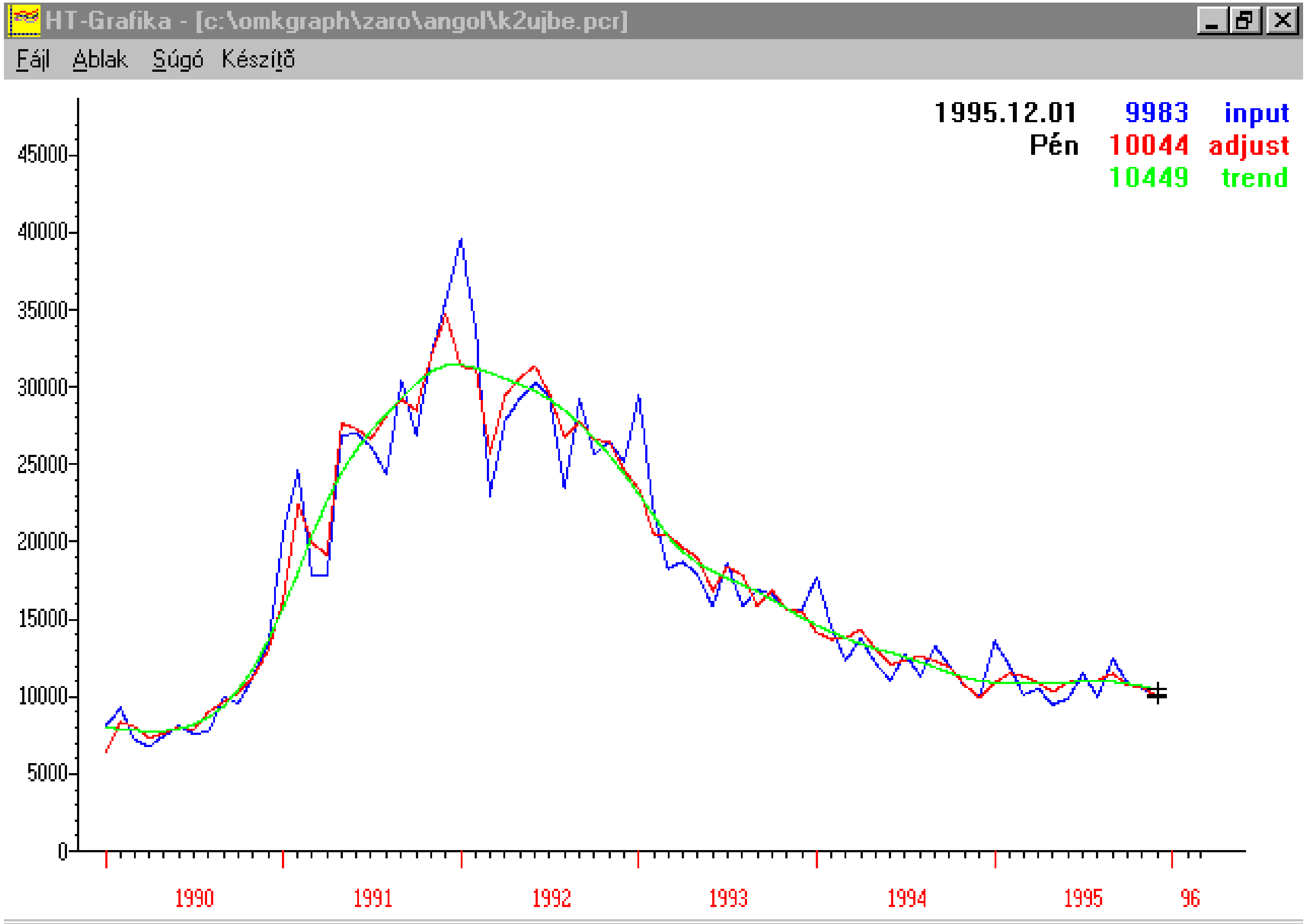


Figure 6

New entrant registered unemployed male plus female, 21-45 years old,
file-code: k2ujbe
(blue:original time series, green: trend-cycle, red: seasonally adjusted time series)

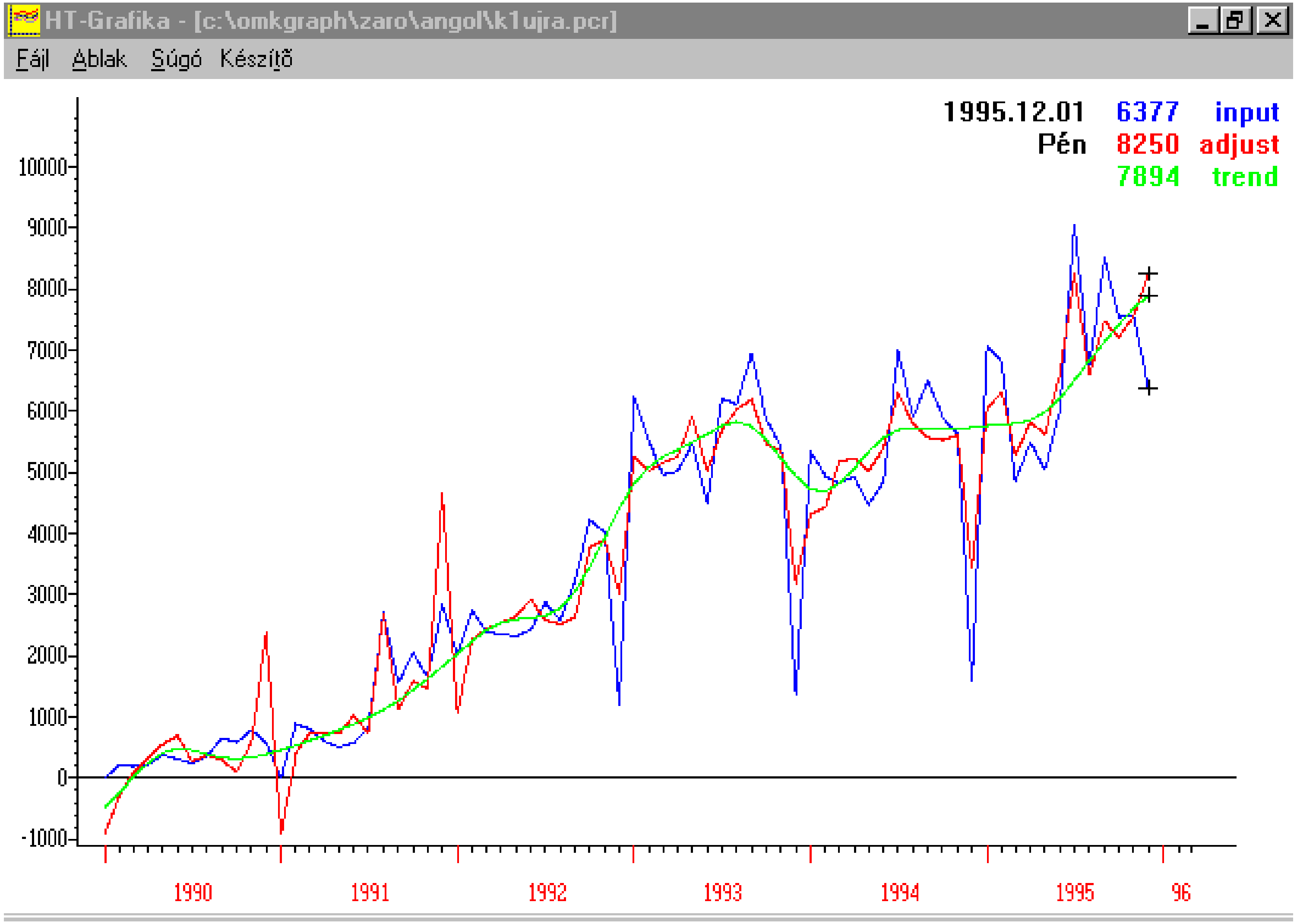


Figure 7

Reentrant registered unemployed male plus female, up to 20 years old,
file-code: k1ujra
(blue:original time series, green: trend-cycle, red: seasonally adjusted time series)

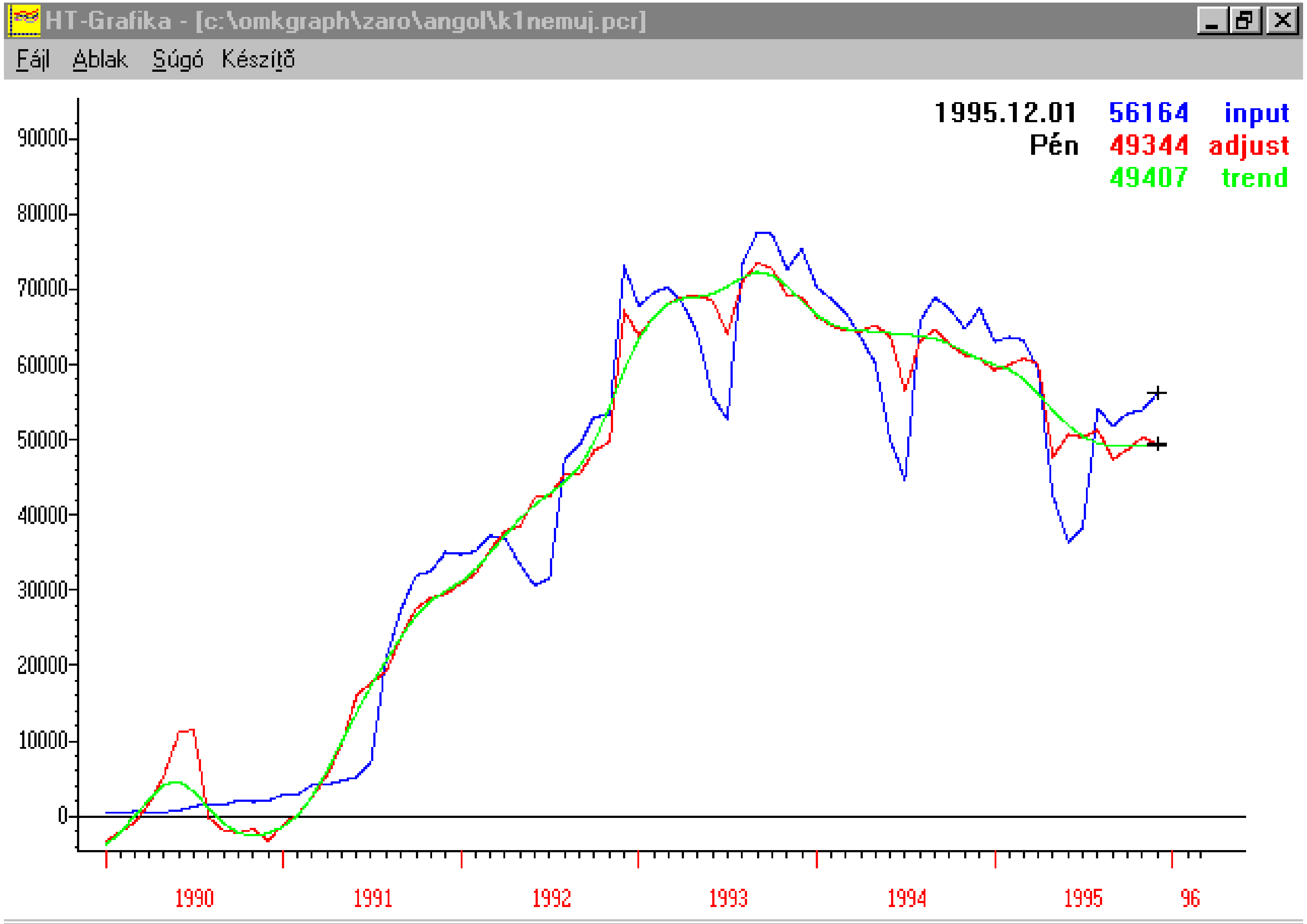


Figure 8

Not a new entrant registered unemployed male plus female, up to 20 years old,
file-code: k1nemuj
(blue:original time series, green: trend-cycle, red: seasonally adjusted time series)

3. A PROPOSAL FOR SETTING UP AN INFORMATION SYSTEM AIMED AT SEASONALLY ADJUSTING NATIONAL AND COUNTY-LEVEL REGISTERED UNEMPLOYMENT DATA

3.1 Design issues

Upon organising an information system which supplies seasonally adjusted data for registered unemployment, reliably and in a controlled manner, one needs to allow for the standpoints as follows:

1, Specify how input data needed for seasonal adjustment should be provided
2, Ensure software that works reliably for mathematical or statistical computations in seasonal adjustment
3, Guarantee manpower conditions to evaluate results
4, Decide whether seasonal factors needed in seasonal adjustment would be determined using current data or forecasted seasonal factors
5, Ensure that checking the obtained results is continuous and an appropriate documentation is made
6, Guarantee controlling and documenting reliability of adjustments for long periods of time
7, Provide for periodic revisions of seasonally adjusted data and the publication of revised data
8, Determine what level of administration hierarchy would perform the tasks prescribed in paragraphs 1-7
9, Schedule tasks prescribed in paragraphs 1-7 and consider time requirements
10, Plan how data publication is to be scheduled

To achieve tasks in paragraph 1-10 one needs to consider several constraints like these:

a) The present order of data acquisition and data processing
b) The method and the place for data archiving
c) The reliability of the mathematical-statistical procedures used
d) Time constraints, technical and manpower requirements of data processing

Constrains a) - c) are externally given which restrict possible solutions, while the technical and manpower requirements of constraint d) are primarily a question of finance and economic feasibility.

Below we first make a proposal how to carry out tasks in paragraphs 1-7. Then we present a possible data processing scheme in terms of regional structure and time schedules. Altogether four possible regional and temporal schemes are possible, but reliability consideration reduces these possibilities to two. We also present possible publication patterns. Regional and temporal structures are shown on flow charts as well.

3.1.1 Source and availability of input data

The main source for data to be processed are the closing data (stock figures) of regional offices. The closing date for them is the 20th of each month. Data are collected in county labour centres at the county level. Collected data are sent into OMK (National Labour Centre) on floppy disks. National database is completed on the 5th of each subsequent month. In addition a computer network (X-25 protocol) is also in use, though at the moment, because of expense and time considerations, floppy disk based data collection is preferred. (Data for a single month amounts to about 80-90 Mb. Transferring 1 Mb lasts about an hour on this network.) Data validation is done at the regional offices only. In OMK data is checked syntactically like exclusion of records with nonsense codes. The national and county level data yielding the time series to be adjusted are only extracts of the above mentioned client service database. Therefore there is a separate software program needed in order to produce indirect aggregated input data.

Some words about archiving are in place here. At present, an archiving of the client service database, in a consistent and systematic way, is being done only in OMK. There is also an archive of the extracted database so that one should be able to do testing. There exists a database of the time series for the time series to be used, and a filtering mechanism that produces current data, as well, for the same purposes.

3.1.2 Ensuring the reliability of the mathematical and statistical software

As we will see, the software needed for seasonal adjustment are the following:

a) X-11-ARIMA program
b) A validation program to be developed [3].
c) A filtering program that supplies data for time series

So far experience has shown that, as for the basic functions, X-11-ARIMA works satisfactorily. However, having the original source code examined, we discovered certain disfunctions. Therefore if one does not refrain from using only the basic functions, there arises a possibility of getting incorrect results. Note that, according to observations, the five basic built-in ARIMA models do not suffice to identify an ARIMA model for a significant number of time series.

3.1.3 Manpower requirement

The tasks, as detailed above, need minimally

a) one qualified computer expert who runs X-11-ARIMA with basic functions, the validation and the filter programs and maintains the programs

b) one assistant who does manual jobs such as data acquisition, filling out checklists and likewise manual things in connection with the program runs
c) one mathematician analyst who does model identification and confidence tests

3.1.4 Determination of adjusting seasonal factors

Having taken into consideration the methodology presented in Appendix 1 of Ref. [3] and the alternatives provided by paragraphs 9-11, one may choose between two procedures of adjustment:

a) the determination of the seasonally adjusting factors is done by using all available information (adjusting time series simultaneously)
b) the determination of the seasonally adjusting factors is done by forecasting for a half year time period (forecasting time series adjustment)

3.1.5 Continuously verifying obtained results and documenting the verification

The reliability of adjustment can be checked with methods as given in Appendix 2 of Ref. [3]. Checking reliability relies mainly on the extent of necessary post-revision which is a result of the continuous data update. It is a result of the methodological analysis presented in Appendix 1 of Ref. [3] that the greatest revision is expected to occur after re-adjusting a time series forecasted till one month later. Consequently to examine reliability one has to compare the adjusting factors of a time series, those referring to a given month, in subsequent months and look for their change. One may evaluate the reliability of a model with the help of the relative differences of the values coming from the original and later revisions; also with the distribution of the sign of these differences. Certainly one has to perform these tests for the differences between the current and forecasted adjustments when one uses the forecasting method.

As a result of the reliability tests one needs a "reliability card" for each times series examined. The current values, and their trends, would yield input for the internal reliability reports.

3.1.6 Checking reliability for longer periods of time

Reliability tests presented in Section 5 also include, in some sense, a long term testing for reliability. However one must extend these tests in two ways. Firstly record the relative differences of the original and the revised data in each month for a certain period of time, say for one year. (See Appendix 2 of Ref. [3].) One must evaluate the results of the annual (or semi-annual) revisions as well in a similar way.

Secondly revising the feasibility of the chosen disaggregation must also be done periodically. Appendix 3 of Ref. [3] contains the criteria which must be met to decide what indirectly adjusted time series should be aggregated to obtain a direct adjustment of aggregated time series. The fulfilment of these criteria must be checked each year. These long term reliability reports have to be also included in the internal reliability reports.

3.1.7 Data revision and publication

According to Appendix 1 of Ref. [3] the seasonal adjustment of principal unemployment time series, extended with new data, must be carried out annually. Though experience has shown that the revised data would deviate from the originally adjusted series only after the very first year, to ensure reliability a revision is made for five consecutive years in both the USA and Canada. Hungarian practice should be similar. The revised data would be published in the end of January each year.

3.1.8 Assignment of adjusting and control tasks to office hierarchy levels

It is an important issue of designing the information system that produces seasonally adjusted figures what office hierarchy levels should execute the adjustment procedure and the related revision tasks. It follows that the adjustment of the principal national time series must be done in OMK. Publication, documentation of national reliability measures and their regular evaluation must also fit in here. However it is well known that labour force issues, like the extent and characteristics of unemployment, are significantly different in the various regions in Hungary. So the seasonal adjustment of county level unemployment times series are also well worth. It is especially important to distinguish between trend and seasonal changes of unemployment, i.e. a sensitive indicator of economic tendencies, in those counties which show critical unemployment figures.

Independent analyses of county unemployment figures at the county level may assume a special role in the future. One must consider manpower need, expenses, reliable functioning and the speed of processing and publication in centralised vs. decentralised versions of the system plan. Details can be found in Ref. [3].

3.1.9 Scheduling tasks

Scheduling tasks may depend on co-operation between office hierarchies, the chosen adjustment methods, the revision procedures and publication obligations. Attention is paied to these considerations in Ref. [3].

3.1.10 Publication

Since publication is also dependent of the characteristics and time requirements of tasks to be carried out, we refer to the presentation of the versions, too.

3.2 Versions of the information system

Seasonal adjustment can be done either using forecasted or simultaneous factors. The realisation of possible processing and publication depends on this. Also, as indicated in Paragraph 8, centralisation vs. decentralisation, assigning tasks to office hierarchical and regional levels are also vital. We describe two possible scenarios below.

3.2.1 Version 1: Centrally executed adjustment using forecasted seasonal factors

1. Schedule for January and July

Forecasted seasonal factors would be computed in these months. Certainly the forecasting is valid for the next five months.

According to this plan, the national and county unemployment time series would be seasonally adjusted in a central location, namely in OMK. Evidently the reliability control computations and analysis pertaining to this would be carried out here as well. The models assigned to the principal national time series and the forecasted adjusting factors can be published in a publicly available newsletter.

The schedule of processing is given in terms of days: (The zeroeth day is when the national and county level database is complete. According to present practice, this is the 5th of the current month.)

1st day: Supplementing disaggregated (elementary) time series, needed to produce aggregated national and county level time series (number of the registered unemployed) , with current data. This amounts to extending about 100-200 time series. (The time series for the registered unemployed is being produced by the composition of 4-6 component time series.)

2nd day: The extended time series is made suitable for input to adjustment.

3-4th days: Running X-11-ARIMA

5-6th days: Model identification to establish current month's seasonal factors.

7th day: The principal seasonally adjusted national and county level unemployment figures become available for publication. Since the above time limits are meant in work days, public announcement of unemployment rates is possible on the 7th working day after obtaining new register data.

8-9th days: Forecasting seasonal adjustment factors for next five months.

10-15th days: Carrying out computations to evaluate current and long term reliability, as specified in Appendix 2 of Ref. [3].

16-21st days: Seasonally adjusting the chosen 100 principal national time series, computing forecasted adjustment.

Adjusting additional county level times series: Only the principal time series (the number of the unemployed and the related disaggregation series) of counties are adjusted regularly in this version. Certainly, if exceptional need arises, any other county level time series may be analysed.

Hardware requirements:

Devices needed in OMK and county OMK offices as specified in Ref. [8], along with equipment required for safe storing and archiving of data.

Software requirements:

1. filtering program to extend time series
2. X-11-ARIMA used in seasonal adjustment
3. program module to do computations for reliability tests

Manpower requirements:

1. one qualified computer operator
2. one analyst/statistician
3. one assistant

2. Revision tasks in January

According to international practice, adjusted data must be revised once a year by reprocessing newly extended time series and the thus obtained results must be published as revised data. This revision must be carried out for four years, so the final adjusted figures are available after four revisions.

Consequently the principal nation-wide and county level times series must be adjusted in January in each year. In connection with this, the revised data must be compared to the original data and reliability tests have to carried out.

The above tasks require about 12 work days in the first year, while in the subsequent years, because of the growing number of yearly data to be adjusted, competition of this work needs a whole month (21-22 work days)

Hardware requirement:

see above

Software requirements:

1. X-11-ARIMA
2. reliability testing program

Manpower requirements:

1. one qualified computer operator
2. one analyst/statistician
3. one assistant

3. Schedule for months except January and July

Though using forecasted factors the process of revision and publication becomes simpler and faster, trustworthy work and the need for reliability prescribes the very same tasks to be done.

1st day: Supplementing disaggregated time series, needed to produce aggregated national and county level time series, with current data. Having known current data and forecasted adjusting factors, carry out seasonal adjustment.

2nd day: Publication of adjusted data.

At the same time:

2-7th days: unning X-11-ARIMA with current data. Model identification, compute current (simultaneous) adjustment factors.

8-13th days: Carrying out computations to evaluate current and long term reliability, as specified in Appendix 2 of Ref. [3]. Evaluation of results, making reports about reliability.

14-20th days: Supplementing about 100 times series with current data and their adjusting with forecasted factors.

The **hardware**, **software** and **manpower requirements** of the above mentioned tasks are identical to that of those in January and July.

3.2.2 Version 2: Centrally executed adjustment using simultaneous seasonal factors

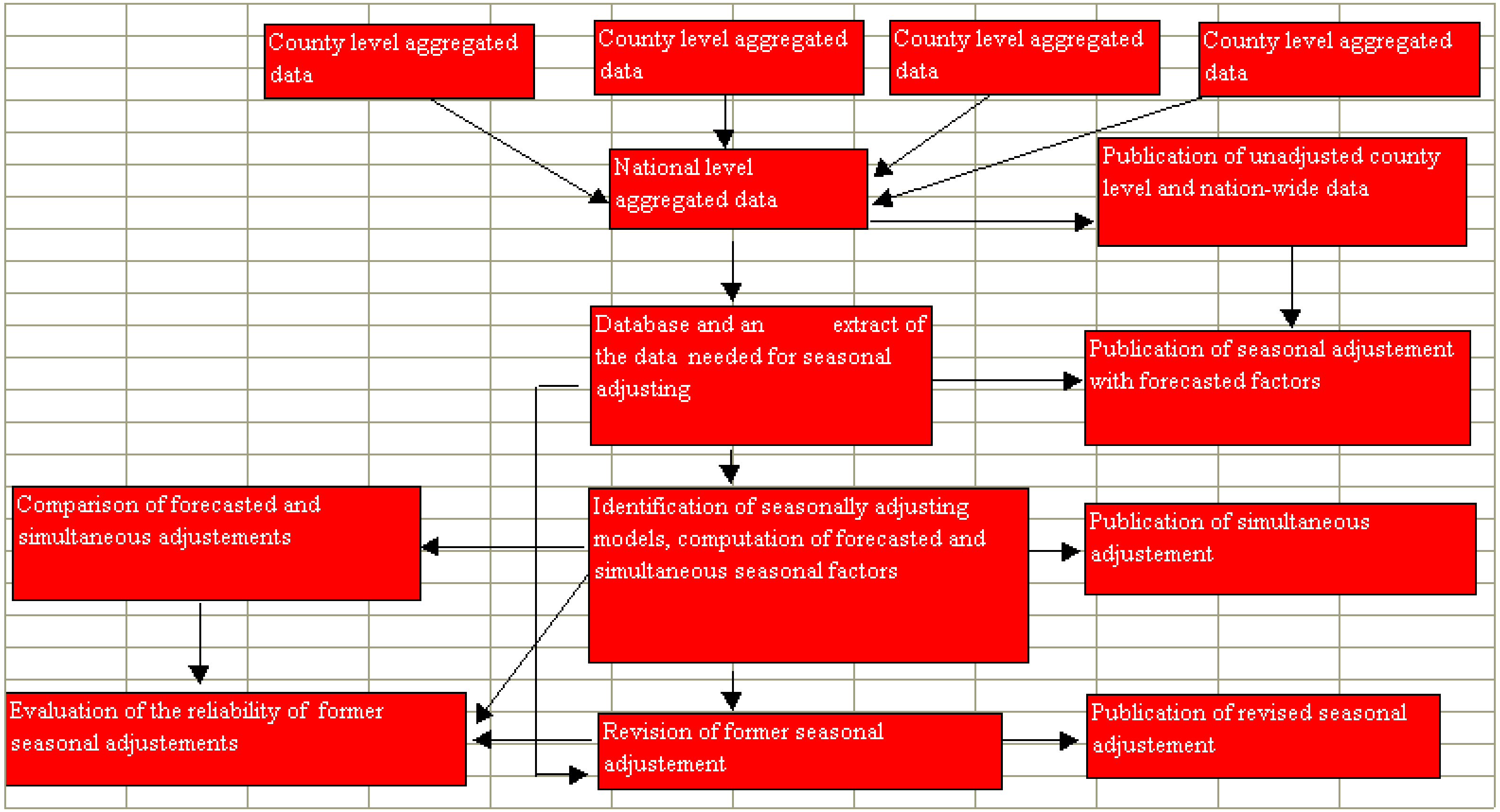
The schedule is identical in each month and it coincides with the January or July schedule in Version 1. Therefore publication of the first data can be made on the 7th working day after the availability of new data. Certainly the additional revision programme must be executed in January.

The decentralized versions are presented in Ref. [3]. However relaibility considerations as it turned out there prefer the two centralized versions presented above.

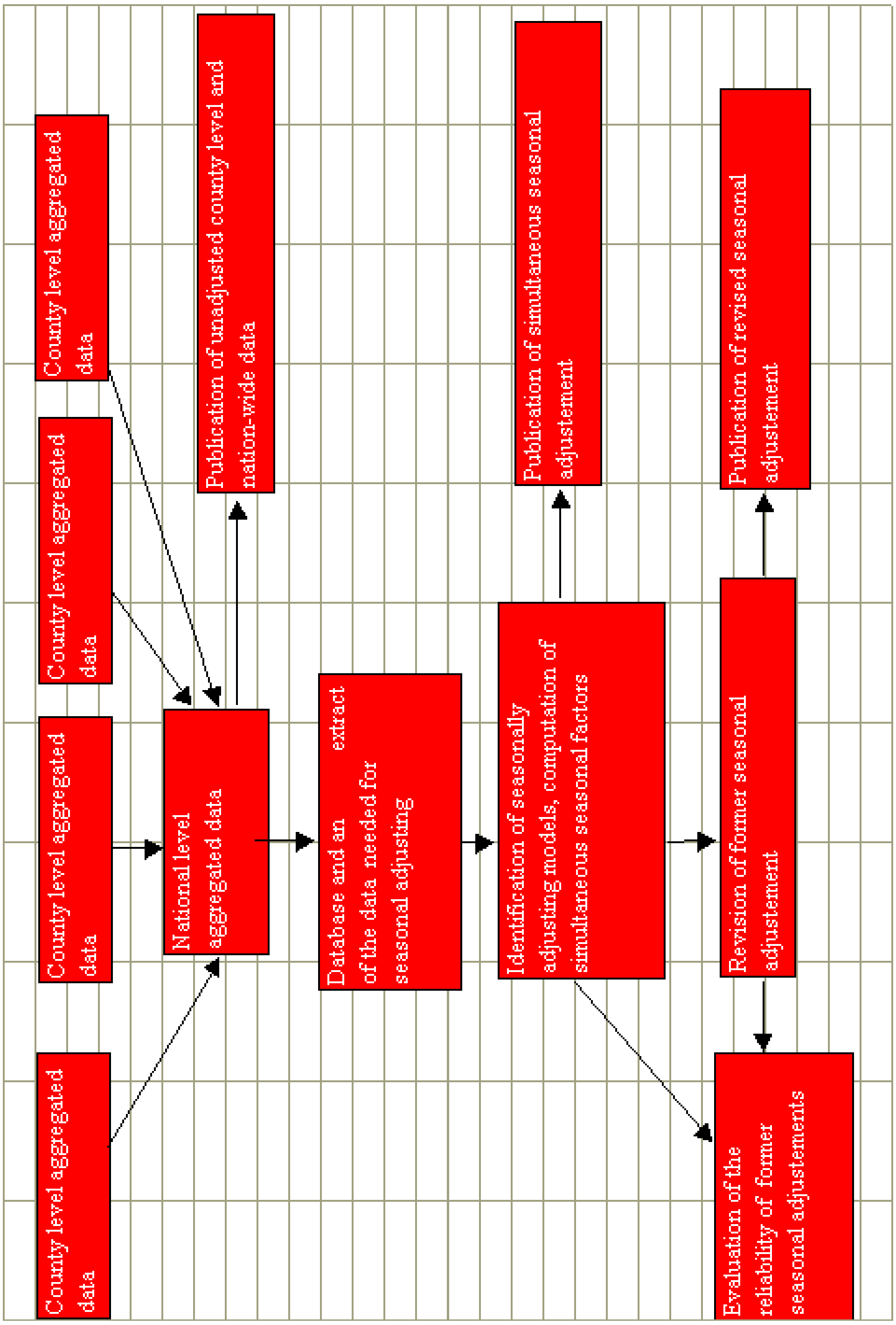
3.2.3 Flow charts for the presented two versions of the information system

The following two flow charts demonstrate the hierarchical structure of the centralized versions of the information system of seasonal adjustment of registered unemployment data.

The information system of forecasted seasonal adjustment
(flow chart)



The information system of simultaneous seasonal adjustment
(flow chart)



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