SYSTEMS RESEARCH INSTITUTE
POLISH ACADEMY OF SCIENCES

INTERNATIONAL INSTITUTE FOR APPLIED SYSTEMS ANALYSIS

CONTRACTED STUDY AGREEMENT REG / POL / 1

# "CONCEPTS AND TOOLS FOR STRATEGIC REGIONAL SOCIO-ECONOMIC CHANGE POLICY"

## STUDY REPORT

## PART 3

# APPENDIX: SOFTWARE AVAILABLE

COORDINATOR, IIASA: A. KOCHETKOV
COORDINATOR, SRI PAS: A. STRASZAK

ZTS / ZPZC / ZTSW 1-36/85

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Consisting of 3 Parts

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## IV. COMMENTS ON CALCULATION OF INVESTMENT DELAYS

by Krzysztof Cichocki and Waldemar Wojciechowski

The model presented in Part 1, Chapters IV and V, has not been fully solved as yet. The investment delay coefficients were calculated with the help of the personal microcomputer ATARI consistently with the method described in the Chapters mentioned. The additional parameters were estimated via a program ran on the Polish computer ODRA 1305. For instance, parameters of the relation between the so called calculation value of new investments $NI_{t-1}$ and the new investments $NV^N_{t-i}$ were obtained through a procedure referring to explicit minimization of the mean square error

$$\min_{a,b} \sum_{i=1}^{14} \left[ f(NV^N_{t-i}) - N_{I_{t-1}} \right]^2 ,$$

where $f(NV^N_{t-i}) = aNV^N_{t-i} + b$ .

In order to solve the above problem, the method of Household orthogonal transformations was applied (library routine elaborated by A.Stachurski).

In Table IV.1 exemplary estimates of the values of a and b are given for 14 sectors of Polish economy. In brackets the results of the t-Student test are cited, while D(a), D(b) denot standard errors of parameters a and b respectively. The last column of Table IV.1 contains appropriate values of the multipl correlation coefficient.

Additionally, in Table IV.2 the values are given for the energy sector of observable variables $NV^N_{t-i}$, together with the values of the observed variables, $NI_{t-1}$, as well as the expectations and variances of the above variables.

The square root of the correlation coefficient R, the standard errors D(·) and the results of Student test, t, are also presented in this Table.

TABLE IV.1.

$NI_t = a \cdot NV_t^N + b$; prices of 1982

| branch | a/(t=a/D(a)) | b/(t=b/D(b)) | $R^2$ |
|---|---|---|---|
| 1 | 3.64/(10.13) | 26.59/(0.9993) | 0.9504 |
| 2 | 2.57/(6.50) | 76.04/(4.675) | 0.8908 |
| 3 | 4.386/(11.09) | 2.4235/(0.1129) | 0.9581 |
| 4 | 4.7761/(8.29) | -0.2218 /(-0.1028) | 0.9285 |
| 5 | 2.6517/(7.64) | 8.1819/(1.43) | 0.9174 |
| 6 | 2.768/(8.949) | -8.024/(-0.0355) | 0.9377 |
| 7 | 3.4187/(7.3618) | -0.1100/(-0.1243) | 0.9117 |
| 8 | 2.3120/(4.42) | 22.74/(1.87) | 0.8002 |
| 9 | 1.8886/(11.25) | 0.2745/(0.3409) | 0.9592 |
| 10 | 1.9767/(8.1139) | 2.9495/(0.3069) | 0.9257 |
| 11 | 0.2729/(10.0197) | 19.68/(1.2390) | 0.9493 |
| 12 | 0.7562/(2.240) | 3.1935/(2.130) | 0.560 |
| 13 | 1.3465/(3.91) | 38.26/(1.2393) | 0.7629 |
| 14 | 2.1903/(2.540) | 20.35/(2.950) | 0.6081 |

Source: "Course of investment processes" and "Investment activities", reports of the Investment, Construction and Transport Department of Polish Main Statistical Office (in Polish).

Table IV.2.

NUMBER OF PARAMETERS N = 2 NUMBER OF OBSERVATIONS M = 13

SECTOR NUMBER 1 TOTAL NUMBER OF SECTORS 14

OBSERVATIONS OF EXPLANATORY VARIABLES $NV^{V}_{t-i}$:

| | | | | |
|---|---|---|---|---|
| 4.4400 | 2.7900 | 32.2500 | 30.8400 | 34.5000 |
| 37.5000 | 35.9100 | 18.8300 | 45.0600 | 26.3100 |
| 23.0000 | 25.0600 | 12.4700 | | |

OBSERVATIONS OF THE EXPLAINED VARIABLE, $NI_{t-i}$:

| | | | | |
|---|---|---|---|---|
| 22.5200 | 31.3600 | 126.9500 | 108.4800 | 119.3400 |
| 144.6800 | 130.8500 | 100.3000 | 197.7800 | 89.5100 |
| 97.0100 | 122.7200 | 37.2700 | | |

EXPECTED VALUE OF THE EXPLANATORY VARIABLE = 25.3046, E(NV)

VARIANCE OF THE EXPLANATORY VARIABLE = 12.3107, σ(NV)

EXPECTED VALUE OF THE EXPLAINED VARIABLE = 102.2131, E(NI)

VARIANCE OF THE EXPLAINED VARIABLE = 47.1515, σ(NI)

R = 0.9032

VECTOR OF STANDARD ERRORS OF PARAMETERS:

10.1092 0.3592 D(·)

VALUES OF t-STUDENT TESTS OF PARAMETERS:

0.9993 10.1327

## STUDY REPORT

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