

AUSTRIA 2 LINK

Macro-econometric model for the
Austrian economy

by

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of Project LINK at Bellagio

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A.1 PREFACE

Soon after the publication of the first Austrian macro-econometric model AUSTRIA I the econometric research team of the Institute for Advanced Studies (IAS) was encouraged to carry on the work on an enlarged version of this model. The main incentives for this project came from many valuable discussions both from the academic field and empirically oriented economic research. An important event that occurred during the revision of the model was the invitation to the IAS to join project LINK.

To realize such a project many different skills have to be formed to a team. Especially the authors draw many benefits from the members of the Computer Center of the IAS.

The authors give their thanks to the members of the Österreichisches Institut für Wirtschaftsforschung for their comments and goodwill during the process of collecting the data and specification of the equations.

Drs. J. J. Post from the Netherland's Central Planning Bureau who has been a consultant to the IAS for more than three years introduced our research team to the mysteries of model building and the authors admit with pleasure that many features of this model are based on his experiences.

In summer 1970 Prof. Lawrence R. Klein from the University of Pennsylvania gave at the IAS lectures on recent developments in econometric model building. The members of the econometric research team were very much inspired in their work by the many discussions with him and they wish to thank him for the time he spent together with them.

Vienna, April 1971

P. Fleissner

S. Schleicher

A.2 CHARACTERIZATION OF MODEL AUSTRIA 2 LINK

Model AUSTRIA 2 LINK is a short-term structural model for the Austrian Economy based on the experience of model AUSTRIA 1*. Annual data from 1954 to 1970 were used and the recent revision in the Austrian national account figures was taken into account.

The complete model consists of 41 equations among them 20 stochastic equations partly with nonlinear terms.

* P. Fleissner, E. Fürst, E. Löschner, F. Schebeck, S. Schleicher, G. Schwödiauer, H. Winter: Model Austria 1, Research Memorandum No. 44 and 45 of the Institute for Advanced Studies, Vienna 1970, (German).

P. Fleissner, K. Hietler: Stability of linear econometric models, Research Memorandum No. 51 of the Institute for Advanced Studies, Vienna 1970 (German).

S. Schleicher; Policy Simulation with Model Austria 1, Research Memorandum No. 50 of the Institute for Advanced Studies, Vienna 1970 (German)

A.3 SPECIFIC FEATURES OF MODEL AUSTRIA 2 LINK

A.3.1 Disaggregation of foreign trade

According to LINK-decisions separate import functions were estimated for the commodity categories food, etc. (SITC 0,1), raw materials (SITC 2,4) and manufactures, etc. (SITC 5-9). The function for export of goods contains a world trade variable.

A.3.2 Variable elasticities by nonlinear functions

As all variables in the model were transformed into relative first differences the estimated coefficients have the economic meaning of elasticities. For theoretical reasons it would be desirable to build a model with elasticities dependent on the extent of capacity utilization of the economy. This model tries to realize this concepts by introduction of quantitative terms for some variables as an approximation for the true nonlinear relationship.

B. LIST OF VARIABLES

Symbols without special indication refer to relative changes, levels are indicated by ... Capital symbols refer, as a rule, to values and numbers of persons, lower-case symbols to volumes and prices.

A	number of unemployed
C^{ci}	commercial and industrial credits
C^o	public consumption
C^P	total private consumption
C^{P2}	squared function of C^P (cf. equation 34)
d^C	dummy variable for C^P
d^{CP}	dummy variable for I^{CP}
d^{e1}	dummy variable for p^{ie}
d^{e2}	
d^h	index of domestic harvests
d^{ic}	dummy variable for p^{ic}
h	percentage change in working hours
I^C	gross investment in construction
I^{CO}	gross public investment in construction
I^{CP}	gross private investment in construction
I^e	gross investment in equipment
I^{eo}	gross public investment in equipment
I^{ep}	gross private investment in equipment
\tilde{I}^i	inventory changes
I^i	inventory changes (expressed as a percentage of U_{-1}^w):
I^i	$I^i = \frac{\Delta I^i}{U_{-1}^w}$

K	unit labour costs (ef. equation 28)
L^d	disposable labour income
L^o	gross wage bill in the public sector
L^p	gross wage bill in the private sector
I^p	labour income per employee in the private sector
M^0	world imports
$M^{0,1}$	import of foods, etc. (SITC 0 and 1)
$M^{2,4}$	import of raw materials, etc. (SITC. 2 and 4)
M^3	import of oil, etc. (SITC 3)
M^{5-9}	import of manufactures, etc. (SITC 5-9)
M^w	total import of goods
N^a	persons in military service
\tilde{N}^f	foreign employees
N^o	employees in the public sector
N^p	employees in the private sector
N^{th}	native employees
N^w	population in working ages
p^c	implicit deflator of C^p
$p^{c'}$	consumer price index
p^{co}	implicit deflator of C^o
p^{ic}	implicit deflator of I^c and I^{cp}
p^{ie}	implicit deflator of I^e and I^{ep}
p^{mw}	implicit deflator for total import of goods
p^{m-y}	margin between p^{mw} and $p^y_{-6/12}$
p^o	index of prices controlled by public authorities
p^u	implicit deflator of U^w
p^x	implicit deflator of X^w
p^y	implicit deflator of Y
\tilde{S}^{x-m}	net invisibles
S^{x-m}	changes in net invisibles (expressed as a percentage of \tilde{U}^w_{-1}):

$$S^{x-m} = \frac{\Delta \tilde{S}^{x-m}}{\tilde{U}^w_{-1}}$$

T^{dl}	direct taxes and social insurance of employees
T^{dz}	direct taxes and social insurance of entrepreneurs
t^i	incidence of indirect taxes minus subsidies (expressed as a percentage value of U^w)
T^{tp}	transfer payments and total pensions
U^w	u^w total output (less inventory changes and net invisibles)
U^{w2}	u^{w2} squared function of U^w resp. u^w (cf. equation 35 and 36)
X^w	total export of goods
Y	y gross national product, market prices
	y^e weighted real GNP of main European countries importing Austrian goods
Z	gross non-labour income
Z^d	disposable non-labour income
Z^{d2}	squared function of Z^d (cf. equation 37)

C. EQUATIONS OF MODEL "AUSTRIA 2 LINK"

C.1 REACTION EQUATIONSC.1.1 Expenditure categories

$$1. C^P = .517 L^d + .122 Z^d - 9/12 + .694 p^{ci} + 1.978 d^c$$

$$2. I^{ep} = .310 C^{ci} - 3/12 + .499 Z^d - 15/12 - 1.508 p^{ie} - 1 + .203 u^w - 1 + .265 \Delta u^w$$

$$3. I^{cp} = .981 C^{ci} + .019 Z^{d2} - 10.127 d^{cp}$$

$$4. I^i = .461 u^w - .800 p^u - .890 I^i / u^w - 2 - .460 I^i - 1 + .018 d^h$$

$$5. X^w = .698 M^0 - 9/12 + .704 y^e - 1 + .209 \Delta u^w$$

C.1.2 Import of goods

$$6. M^w = 1.769 u^w + .139 u^{w2} + 1.781 I^i - 6/12 + .736 p^{mw} - 6/12 - .039 d^h - 1$$

$$6a. M^{0,1} = .129 C^{p2} - 6/12 - .969 d^h$$

$$6b. M^{2,4} = .226 u^{w2} + .427 \Delta I^e + 4.511 I^i + .923 p^{m-y}$$

$$6c. M^{5-9} = .372 u^{w2} + 1.820 I^i$$

C.1.3 Employment and unemployment

$$7. N^P = -.198 l^P_{-1} + .059 u^W_{-6/12} - .230 h$$

$$8. A = .232 A_{-1} + 6.501 N^W - 3.518 N^{th} - 4.052 \Delta l^P$$

C.1.4 Income distribution

$$9. L^P = 1.788 p^C_{-6/12} + .227 u^W_{-1} - .230 A$$

$$10. Z = .105 u^W_{-9/12} - 3.30 K_{-9/12} + .706 \Delta X^W - .674 t^i_{-4/12}$$

C.1.5 Prices

$$11. p^y = .306 u^W_{-3/12} + .113 \Delta p^O + .136 l^P_{-1} + .174 \Delta l^P + \\ + .043 t^i_{-1} - .037 d^h$$

$$12. p^x = .141 l^P_{-1} + .111 \Delta X^W_{-1} + .430 \Delta p^{MW}$$

$$13. p^C = .264 C^P + .095 l^P_{-1} + .086 p^O - .011 d^h + .155 p^{MW}_{-6/12}$$

$$14. p^C' = .310 \Delta C^P + .150 p^{MW}_{-1} + .385 l^P_{-1} - .013 \Delta d^h$$

$$15. p^{CO} = .457 C^O + .235 \Delta C^O + .553 p^y_{-4/12}$$

$$16. p^{ie} = .264 l^P + .256 p^{MW} + 1.454 d^{e1} - 1.971 d^{e2}$$

$$17. p^{ic} = .332 l^P_{-1} + .343 \Delta \tilde{N}^f + 5.395 d^{ic}$$

C.2 DEFINITION EQUATIONSC.2.1 Relations between value and volume variables

$$18. c^P = C^P - p^c$$

$$19. i^{ep} = I^{ep} - p^{ie}$$

$$20. i^{cp} = I^{cp} - p^{ic}$$

$$21. u^w = U^w - p^u$$

$$22. y = Y - p^y$$

C.2.2 Total output and GNP

$$23. U^w = \frac{\tilde{C}^P}{\tilde{U}^w - 1} C^P + \frac{\tilde{C}^o}{\tilde{U}^w - 1} C^o + \frac{\tilde{I}^e}{\tilde{U}^w - 1} I^e + \frac{\tilde{I}^c}{\tilde{U}^w - 1} I^c + \frac{\tilde{X}^w}{\tilde{U}^w - 1} X^w$$

$$24. Y = \frac{\tilde{U}^w}{\tilde{Y} - 1} U^w + \frac{\tilde{U}^w}{\tilde{Y} - 1} I^i + \frac{\tilde{U}^w}{\tilde{Y} - 1} S^{x-m} - \frac{\tilde{M}^w}{\tilde{Y} - 1} M^w$$

$$24a. Y = \frac{\tilde{U}^w}{\tilde{Y} - 1} U^w + \frac{\tilde{U}^w}{\tilde{Y} - 1} I^i + \frac{\tilde{U}^w}{\tilde{Y} - 1} S^{x-m} - \frac{\tilde{M}^{0,1}}{\tilde{Y} - 1} M^{0,1} - \frac{\tilde{M}^{2,4}}{\tilde{Y} - 1} M^{2,4} - \frac{\tilde{M}^3}{\tilde{Y} - 1} M^3 - \frac{\tilde{M}^{5-9}}{\tilde{Y} - 1} M^{5-9}$$

$$25. p^u = \frac{\tilde{C}^P}{\tilde{Y} - 1} p^c + \frac{\tilde{C}^o}{\tilde{U}^w - 1} p^o + \frac{\tilde{I}^e}{\tilde{U}^w - 1} p^{ie} + \frac{\tilde{I}^c}{\tilde{U}^w - 1} p^{ic} + \frac{\tilde{X}^w}{\tilde{U}^w - 1} p^x$$

C.2.3 Total investment

$$26. I^e = \frac{\tilde{I}^{ep}}{\tilde{I}_{-1}^e} I^{ep} + \frac{\tilde{I}^{eo}}{\tilde{I}_{-1}^e} I^{eo}$$

$$27. I^c = \frac{\tilde{I}^{cp}}{\tilde{I}_{-1}^c} I^{cp} + \frac{\tilde{I}^{co}}{\tilde{I}_{-1}^c} I^{co}$$

C.2.4 Costs and margins

$$28. K = L^P - U^W$$

$$29. p^{m-y} = p^{mw} - p^y_{-6/12}$$

C.2.5 Incomes

$$30. I^P = L^P - N^P$$

$$31. L^d = \frac{\tilde{L}^p}{\tilde{L}_{-1}^d} L^p + \frac{\tilde{L}^o}{\tilde{L}_{-1}^d} L^o - \frac{\tilde{T}^{dl}}{\tilde{L}_{-1}^d} T^{dl} + \frac{\tilde{T}^{tp}}{\tilde{L}_{-1}^d} T^{tp}$$

$$32. Z^d = \frac{\tilde{Z}_{-1}}{\tilde{Z}_{-1}^d} Z - \frac{\tilde{T}^{dz}}{\tilde{Z}_{-1}^d} T^{dz}$$

C.2.6 Employment

$$33. N^{th} = \frac{\tilde{N}^p}{\tilde{N}_{-1}^{th}} N^p + \frac{\tilde{N}^o}{\tilde{N}_{-1}^{th}} N^o + \frac{\tilde{N}^a}{\tilde{N}_{-1}^{th}} N^a - \frac{1}{\tilde{N}_{-1}^{th}} \Delta \hat{N}^f$$

C.2.7 Squared functions

$$34. C^P2 = (C^P)^2 \text{ sign } (C^P)$$

$$35. U^W2 = (U^W)^2 \text{ sign } (U^W)$$

$$36. u^W2 = (u^W)^2 \text{ sign } (u^W)$$

$$37. Z^d2 = (Z^d)^2 \text{ sign } (Z^d)$$

BALANCE OF RESOURCES AND EXPENDITURES

\tilde{C}^P	Total private consumption	178.112
\tilde{C}^o	Public consumption	44.120
\tilde{I}^{ep}	Gross private investment in equipment	29.551
\tilde{I}^{eo}	Gross public investment in equipment	3.629
\tilde{I}^{cp}	Gross private investment in construction	30.654
\tilde{I}^{co}	Gross public investment in construction	15.108
\tilde{X}^W	Total export of goods	<u>51.708</u>
\tilde{U}^W	Total output (less inventory changes and net invisibles)	352.882
\tilde{I}^i	Inventory changes	3.618
\tilde{S}^{x-m}	Net invisibles	<u>10.625</u>
		367.125

L	Wages	149.921
Z ^s	Other income	75.583
T ⁱ	Indirect taxes minus subsidies	43.469
F	Depreciation	<u>33.256</u>
Y	GNP market prices	302.229
M ^w	Total import of goods	<u>64.896</u>
		367.125

TOTAL PRIVATE CONSUMPTION	C ^P	E 1.1
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$$C^P = .517 L^d + .122 Z^d + .694 P^{c'} + 1.978 d^c$$

-9/12

Explanation of variables

C^P total private consumption

L^d disposable labour income

Z^d disposable non-labour income

P^{c'} consumer price index

d^c dummy variable for total private consumption

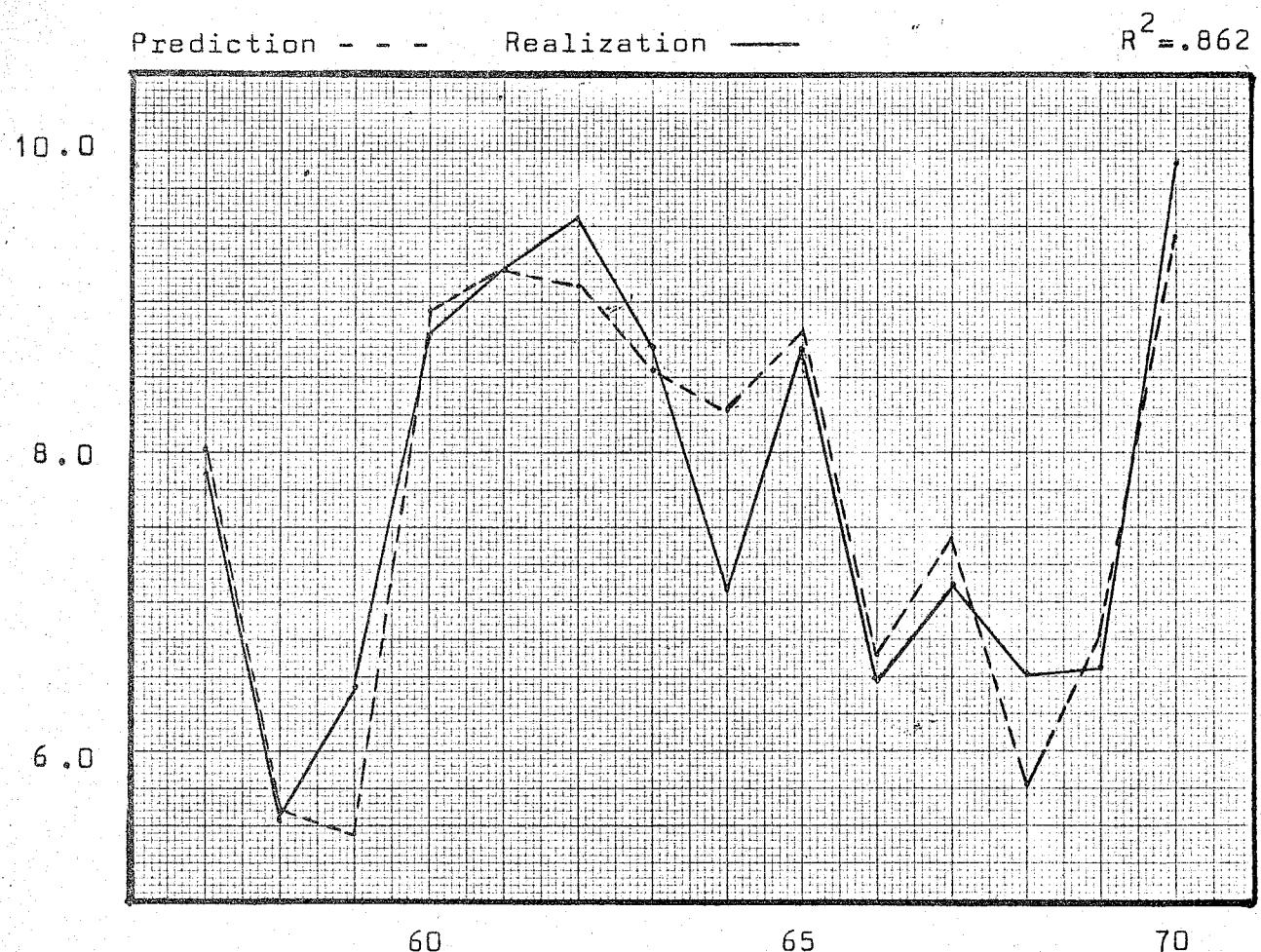
CP

E 1.2

DF=10

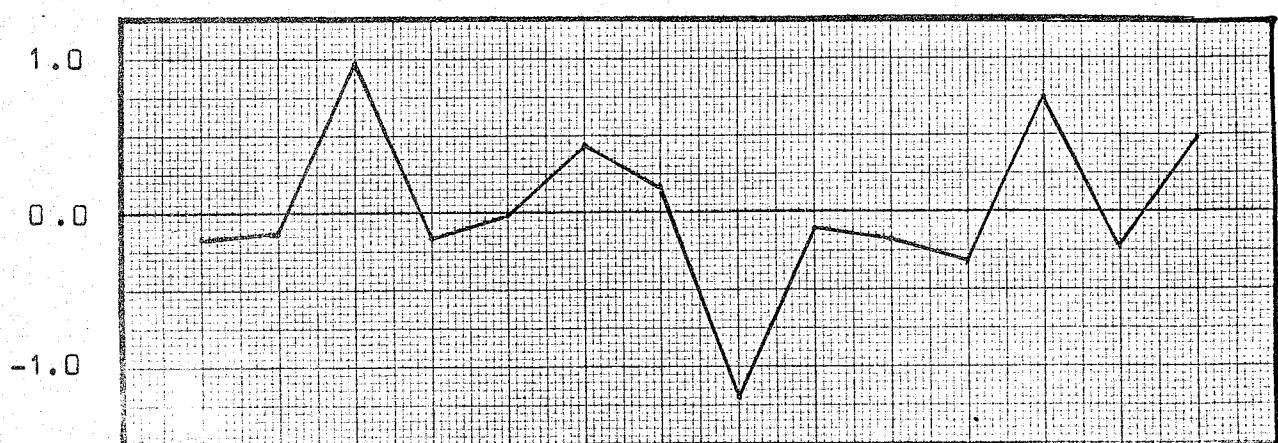
Independent Variables

x_i	L^d	$Z_{9/12}^d$	p^{C^t}	d^c
$\hat{\beta}_L$	.517	.122	.694	1.978
$\hat{\sigma}_{\hat{\beta}_L}$	.057	.032	.146	.475
$| \hat{\beta}_L / \hat{\sigma}_{\hat{\beta}_L} |$	11 %	26 %	21 %	24 %



Residuals

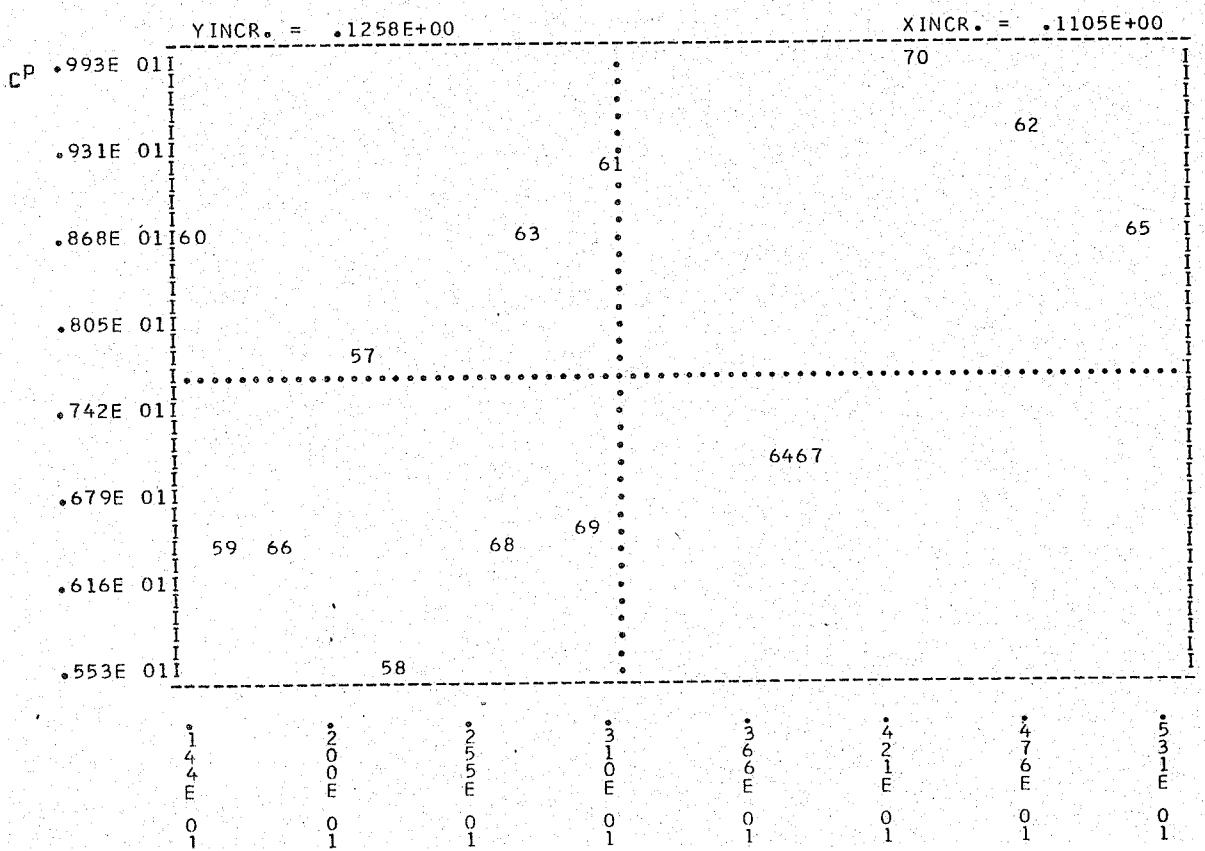
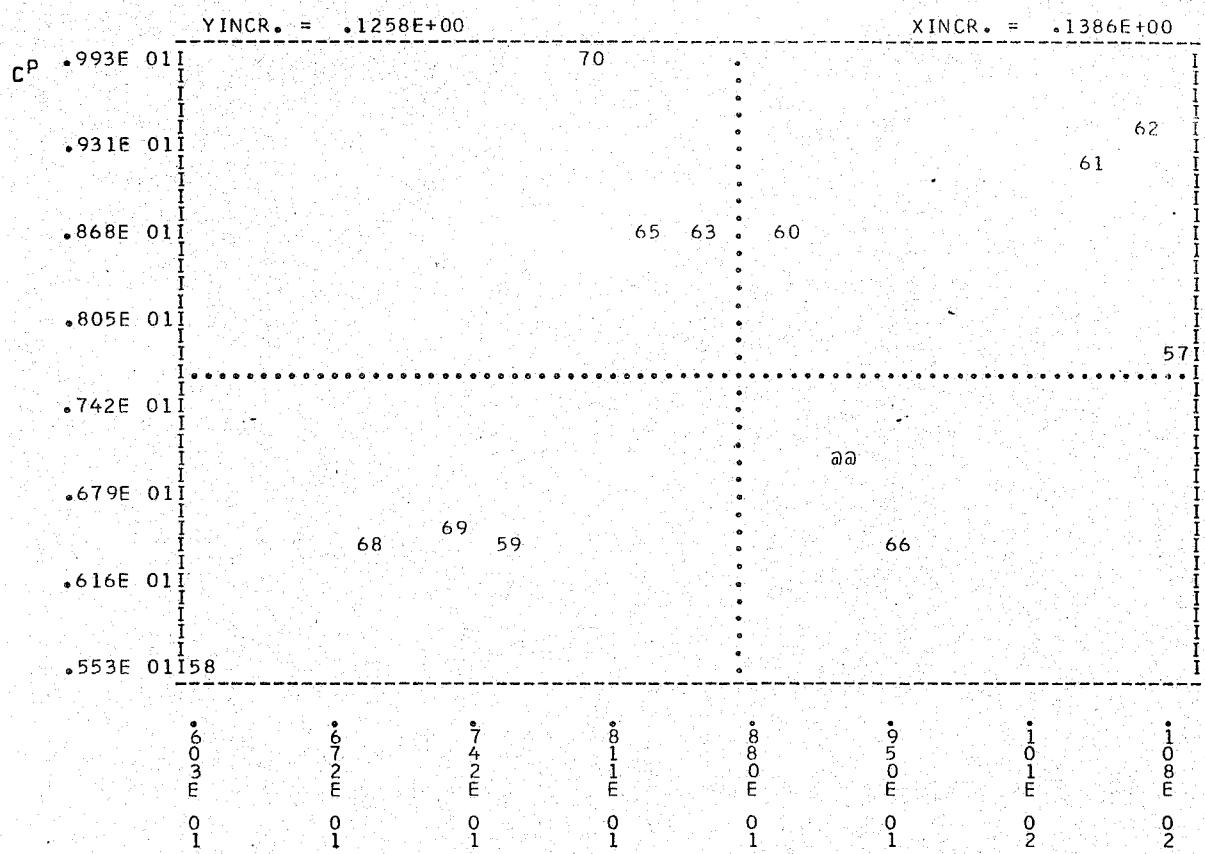
DW=2.30



Scatter Diagram

C^P

E 1.3



GROSS PRIVATE INVESTMENT IN EQUIPMENT

I^{EP}

E 2.1

$$I^{EP} = .310 C^{ci}_{-3/12} + .499 Z^d_{-15/12} + .265 \Delta u^{w2} + .203 u^{w2}_{-1} - 1.508 p^{EP}_{-1}$$

Explanation of symbols

I^{EP} gross private investment in equipment

C^{ci} commercial and industrial credits

Z^d disposable non-labour income

p^{EP} implicit deflator for gross private investment in equipment

u^{w2} squared function of total output (less inventory changes and exports of services)

I^{EP}

E 2.2

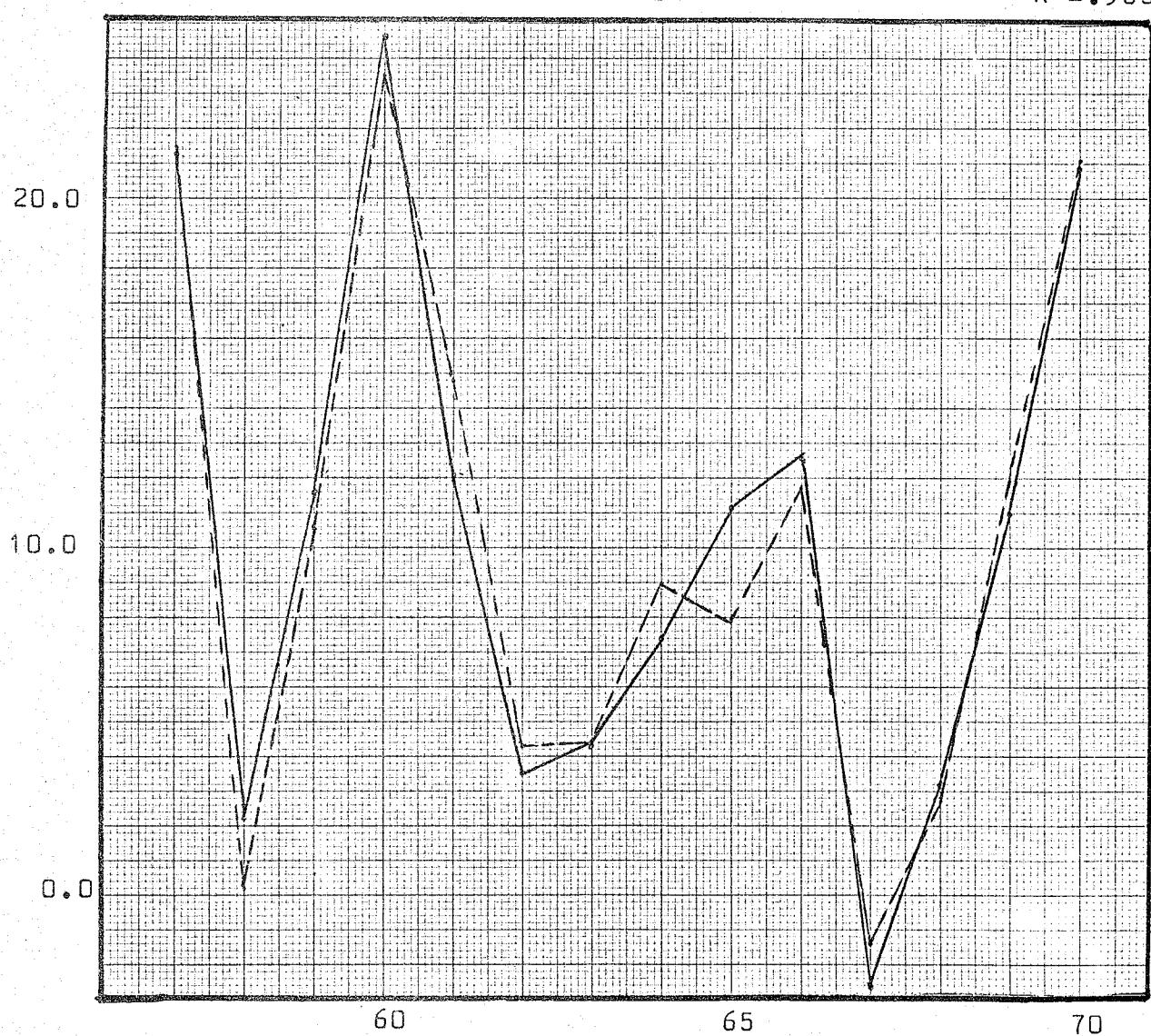
Independent Variables

DF=9

x_i	$c_{3/12}$	$z_{15/12}^d$	p_{-1}^{EP}	u_{-1}^{w2}	Δu^{w2}
$\hat{\beta}_i$	.310	.499	-1.508	.203	.265
$\hat{\delta}\hat{\beta}_i$	.140	.220	.452	.079	.037
$|\hat{\beta}_i| / \beta_i |$	45 %	44 %	30 %	34 %	14 %

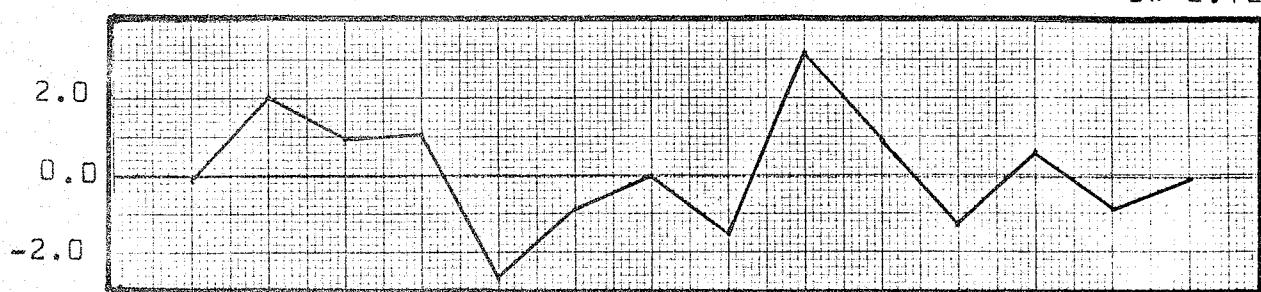
Prediction - - -

Realization —

 $R^2 = .963$ 

Residuals

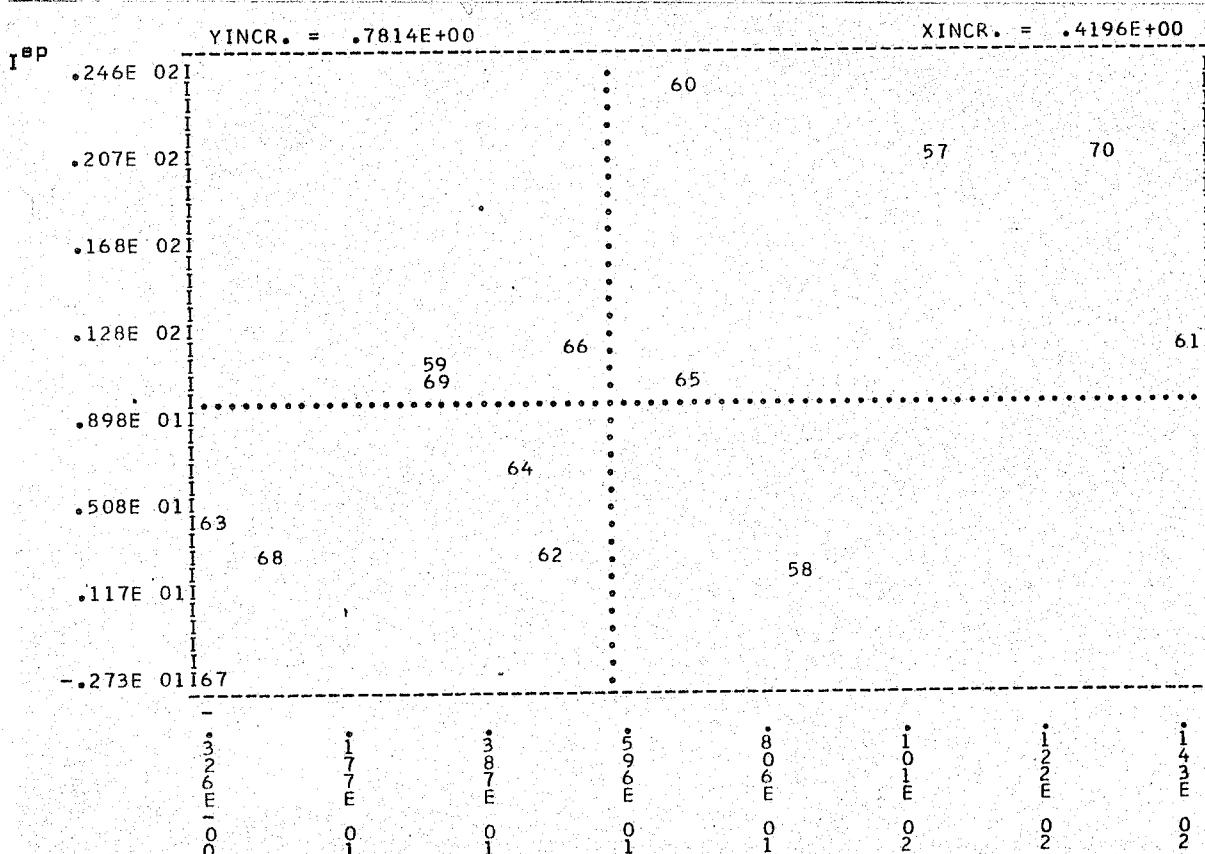
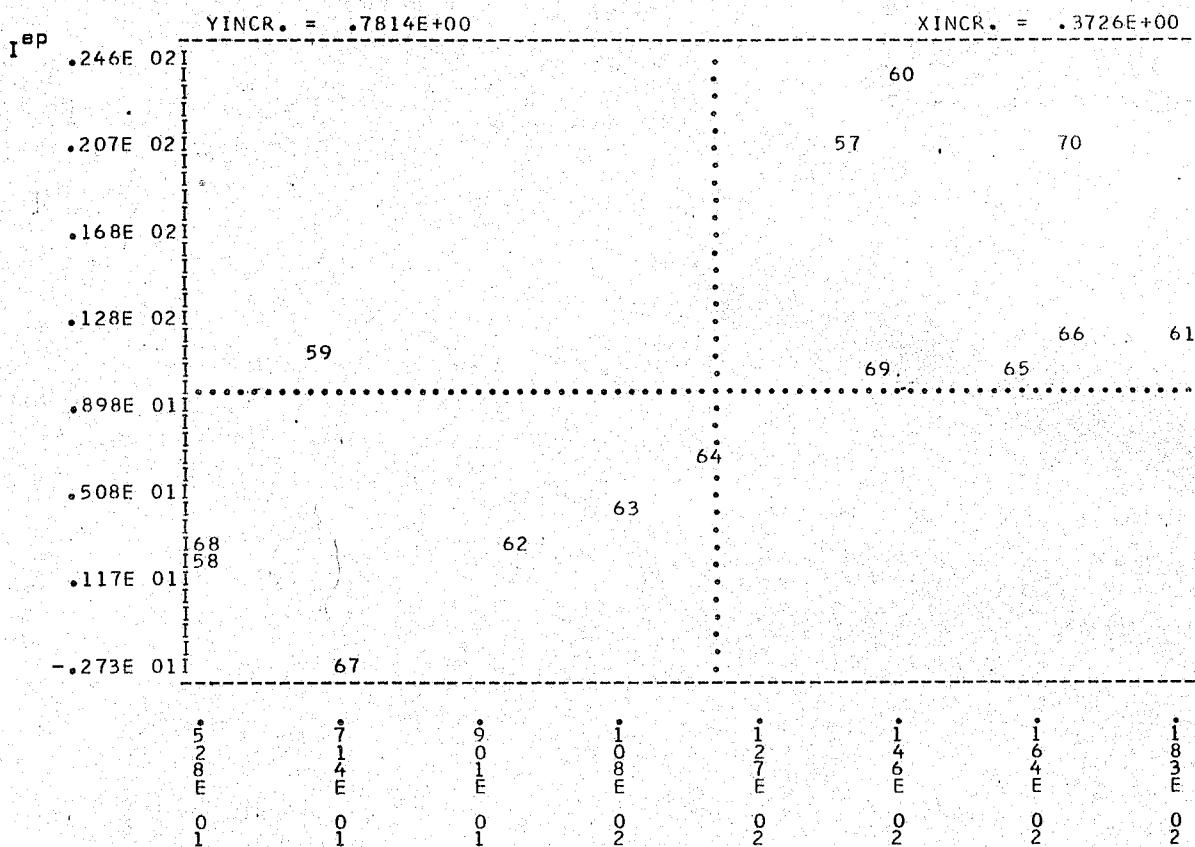
DW=2.12



Scatter Diagram

I^{EP}

E 2.3



GROSS PRIVATE INVESTMENT IN CONSTRUCTION

I^{CP}

E 3.1

$$I^{CP} = .981 C^{ci} + .019 Z^{d2} - 10.127 d^{CP}$$

Explanation of symbols

I^{CP} gross private investment in construction

C^{ci} commercial and industrial credits

Z^{d2} squared function of disposable non-labour income

d^{CP} dummy variable for gross private investment
in construction

I CP

E 3.2

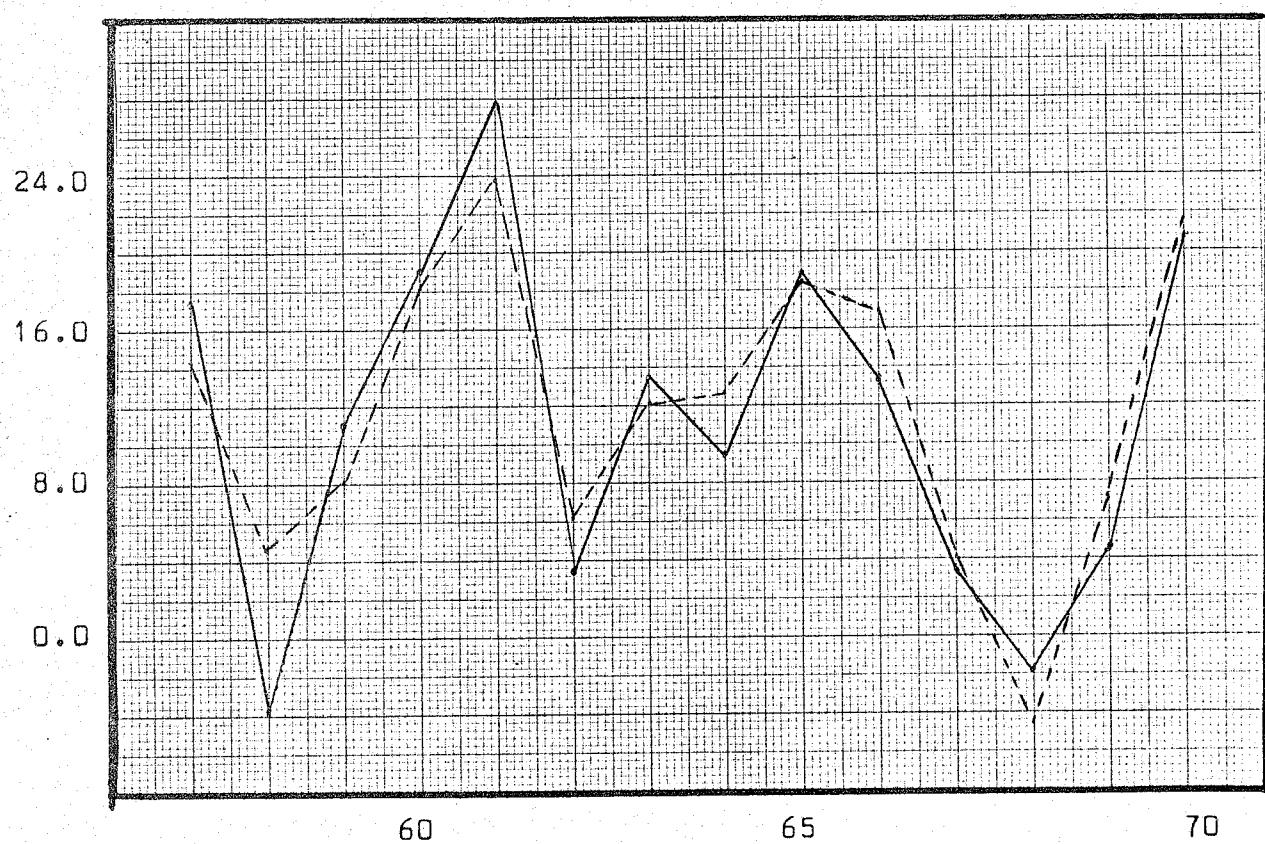
DF = 10

Independent Variables

x_i	c^{ci}	Z_{-1}^{d2}	d^{CP}
$\hat{\beta}_i$	.981	.019	-10.127
$\hat{\beta}_i$	.108	.012	2.836
$|\hat{\beta}_i|/\hat{\beta}_i$	11 %	65 %	28 %

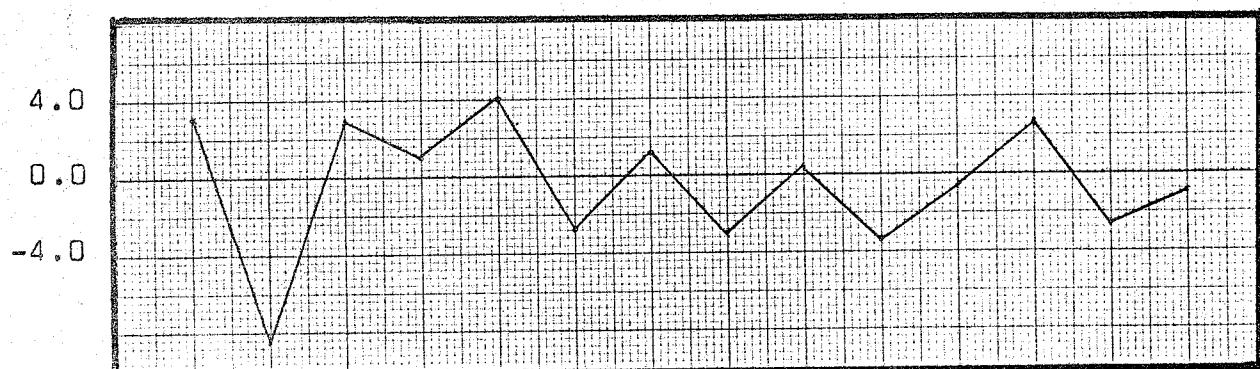
Prediction - - -

Realization —

 $R^2 = .869$ 

Residuals

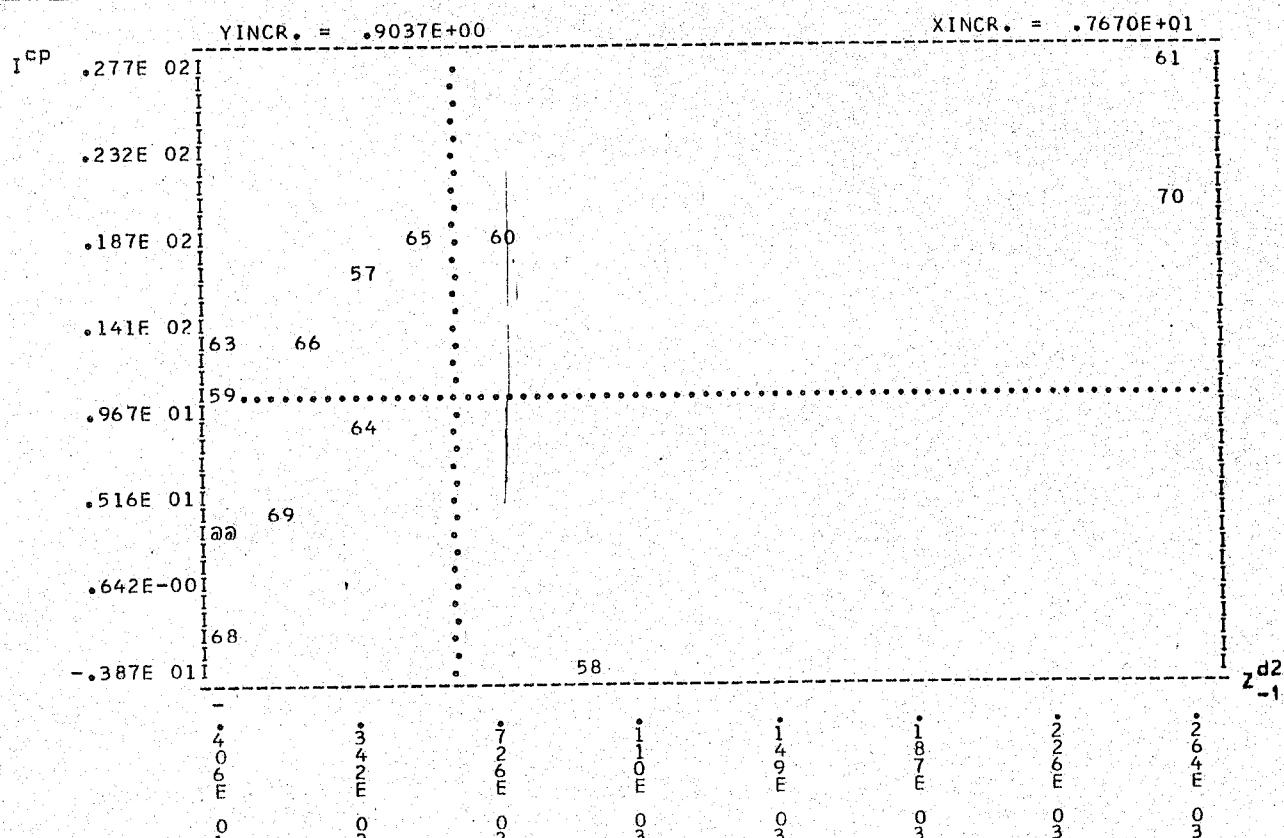
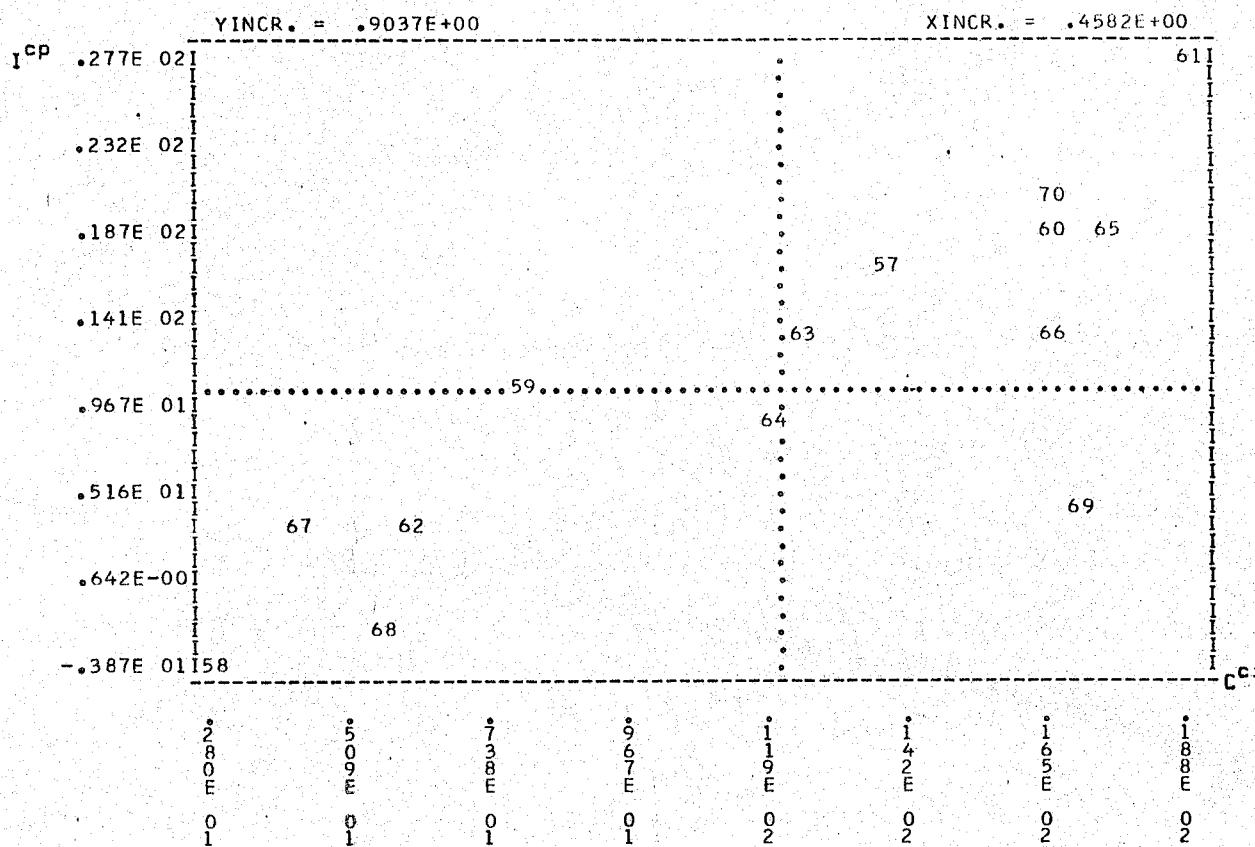
DW = 2.84



Scatter Diagram

I^cp

E 3.3



INVENTORY CHANGES	I ⁱ	E 4.1
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$$I^i = .461 U^w - .800 p^u - .890 \tilde{I}^i / \tilde{U}^w - .460 I^i_{-1} + .018 d^h$$

Explanation of symbols

Iⁱ inventory changes (expressed as a percentage of total output less inventory changes and net invisibles)

U^w total output (less inventory changes and net invisibles)

p^u implicit deflator of total output U^w

d^h index of domestic harvests

Iⁱ

E 4.2

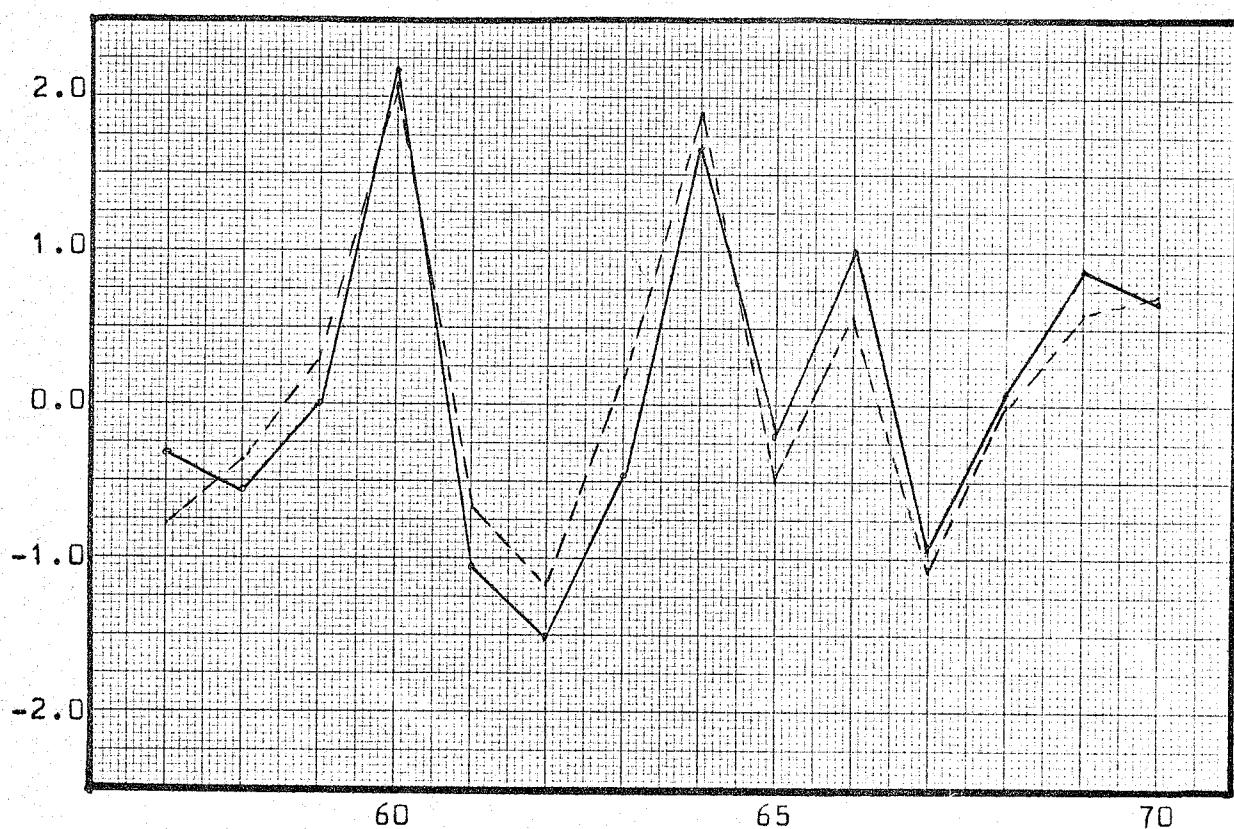
Independent Variables

DF=9

x_i	U^W	p^u	$\tilde{I}_2^i / \tilde{U}_{-1}^W$	I_{-1}^i	d^h
$\hat{\beta}_i$	.461	-.800	-.897	-.460	.018
$\hat{\sigma}_{\hat{\beta}_i}$	.065	.152	.125	.133	.006
$ \hat{\beta}_i / \beta_i$	14 %	19 %	14 %	29 %	32 %

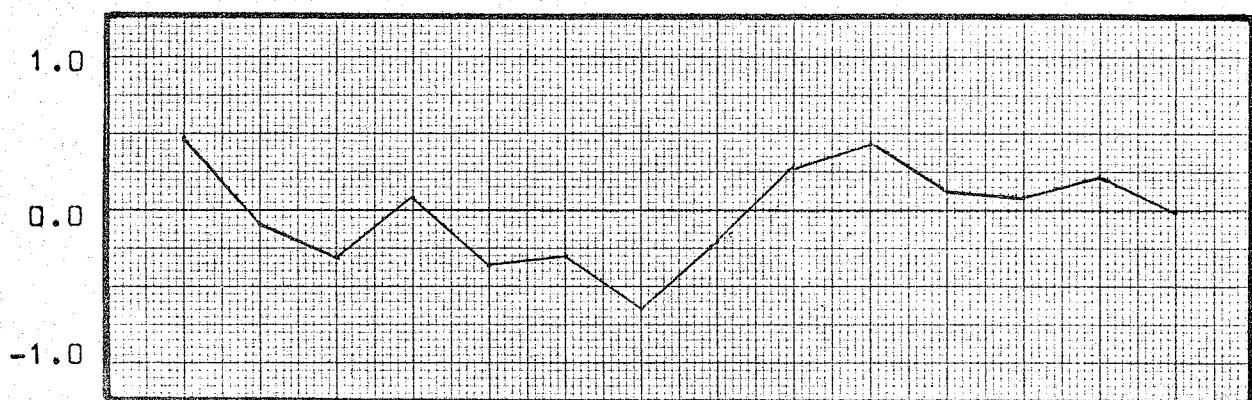
Prediction - - -

Realization —

 $R^2 = .906$ 

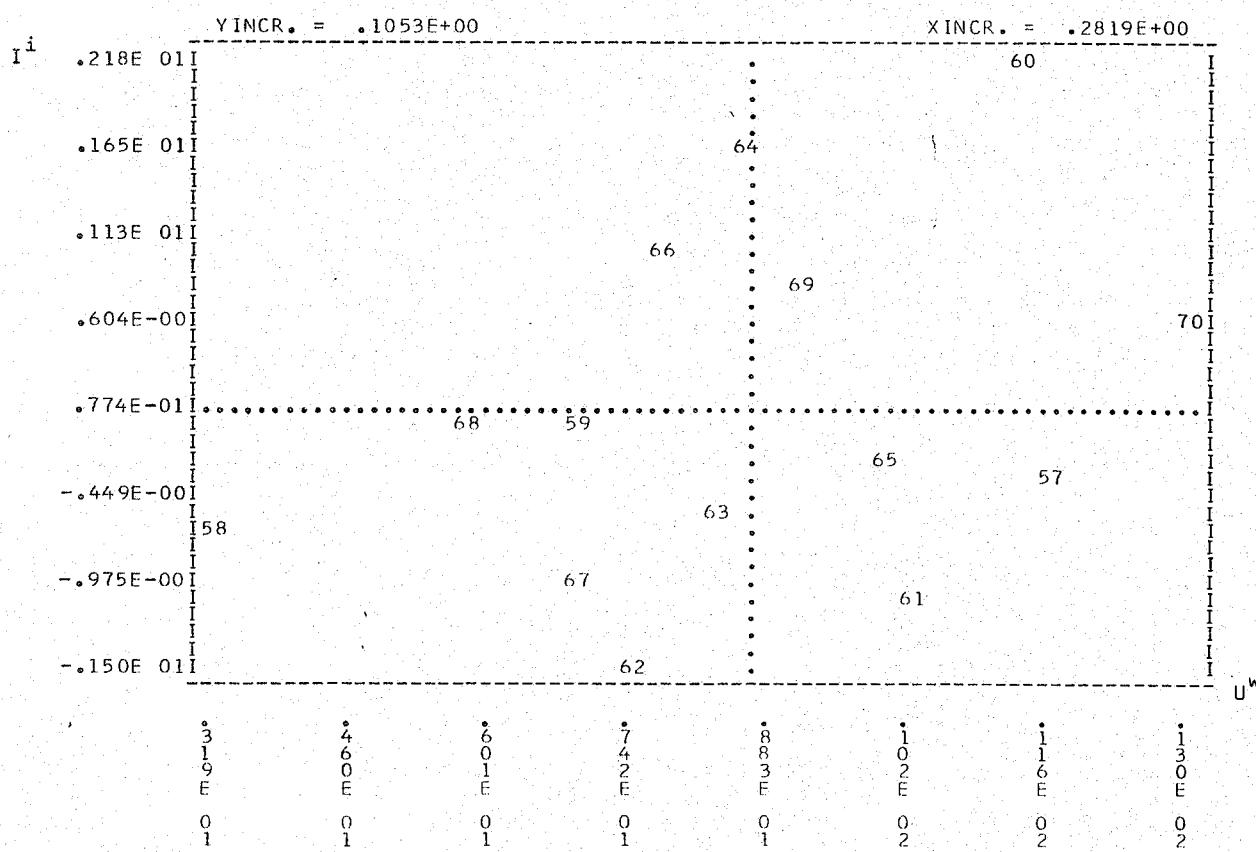
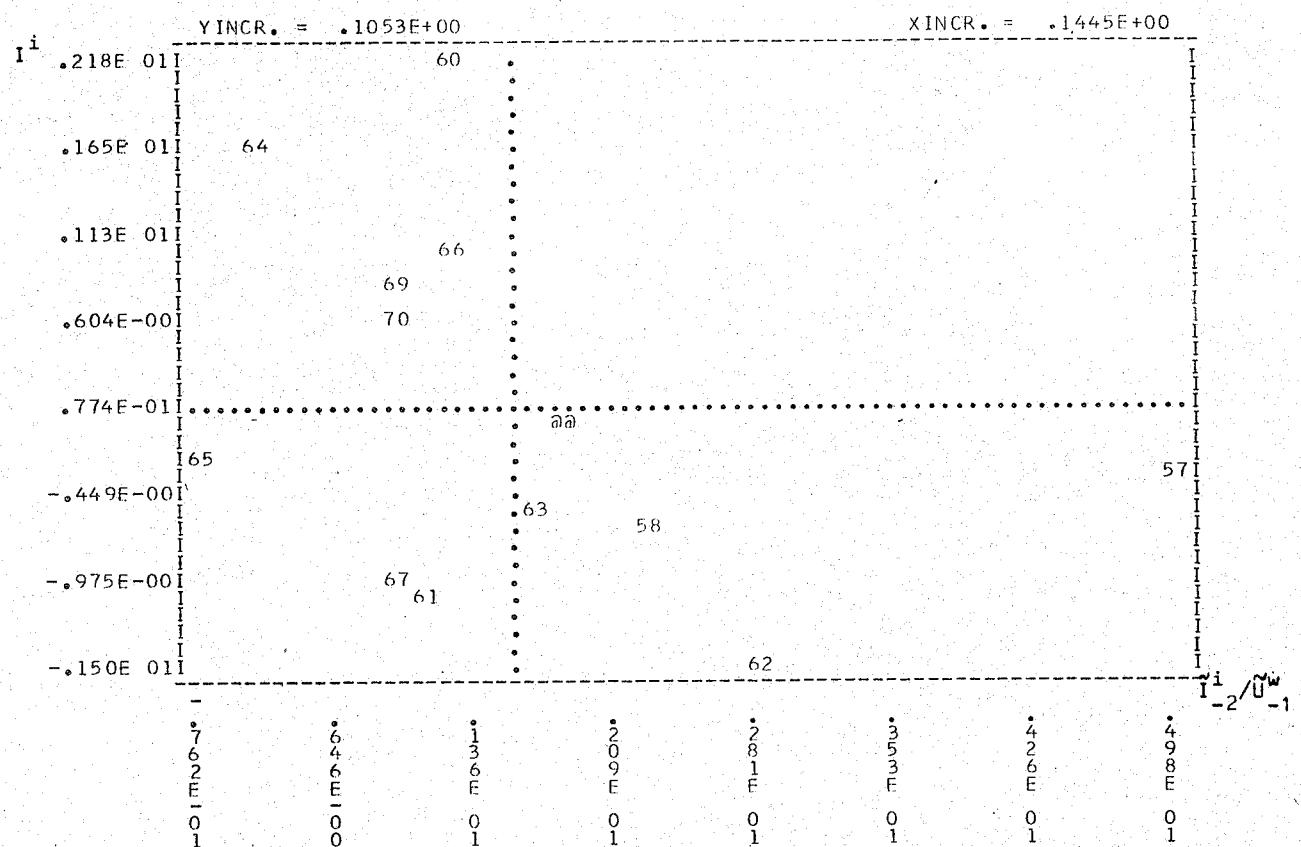
Residuals

DW=1.10



Scatter Diagram

I^i	$E \cdot 4.3$
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TOTAL EXPORT OF GOODS

X^w

E 5.1

$$X^w = .698 M^0_{-9/12} + .704 y^e_{-1} + .209 \Delta u^{w2}$$

Explanation of symbols

X^w total exports of goods

M⁰ world imports

y^e weighted real GNP of main European countries
importing Austrian goods

u^{w2} squared functions of total output (less inventory
changes and exports of services)

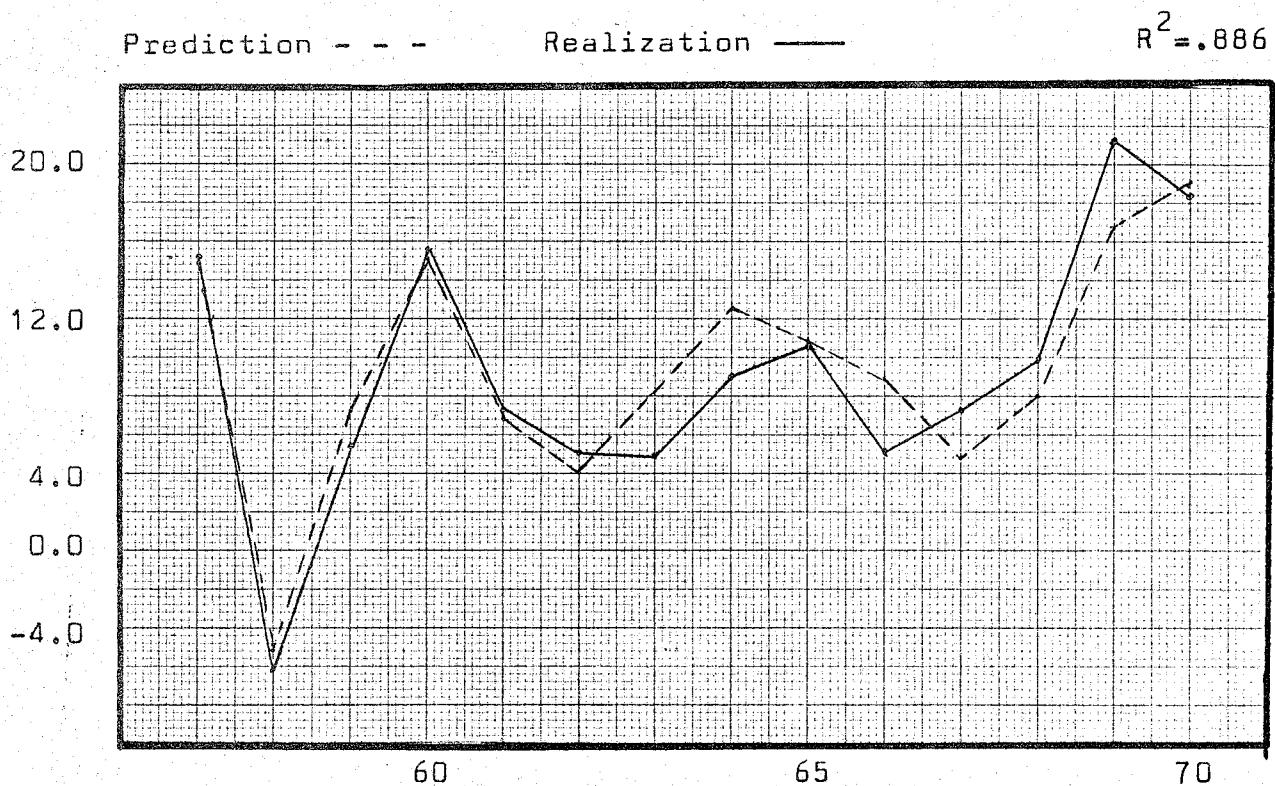
X^w

E 5.2

DF = 11

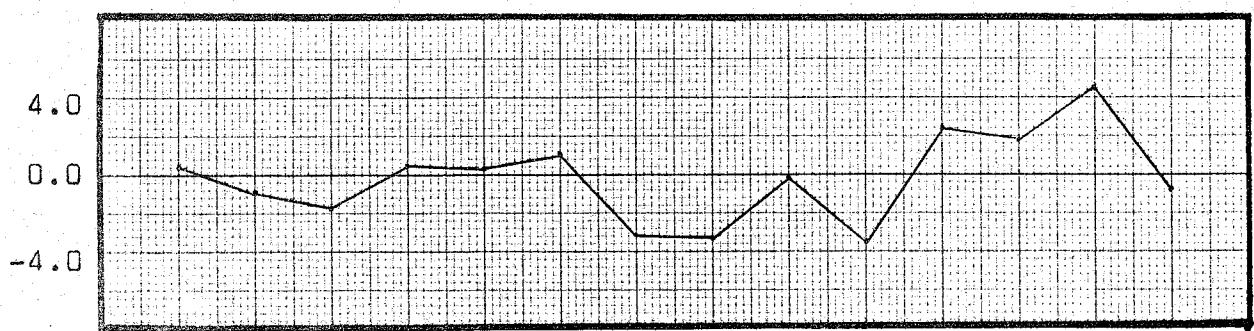
Independent Variables

x_i	$M^0_{-9/12}$	y^e_{-1}	Δu^{w2}
β_i	.698	.704	.209
$\hat{\beta}_i$.175	.275	.029
$ \hat{\beta}_i/\beta_i $	25 %	39 %	14 %



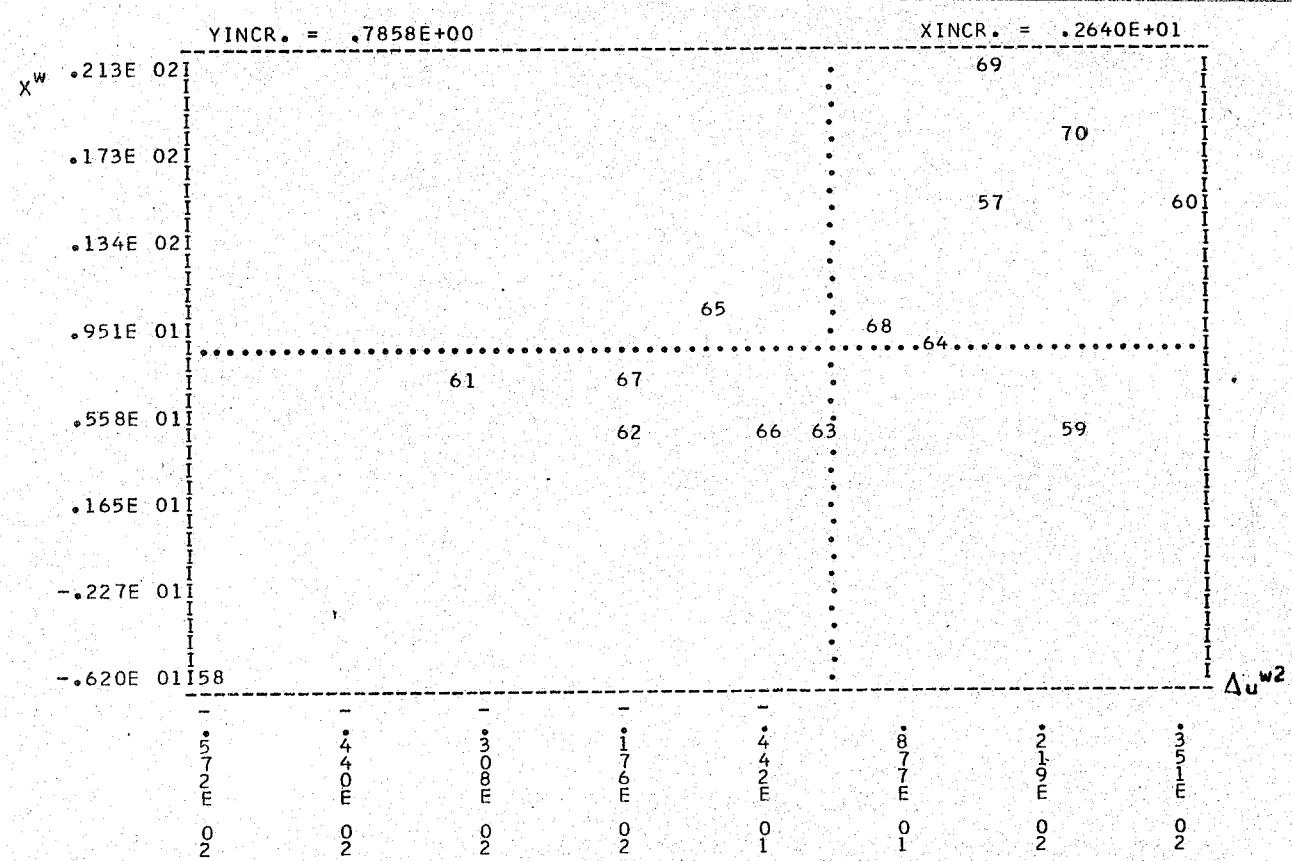
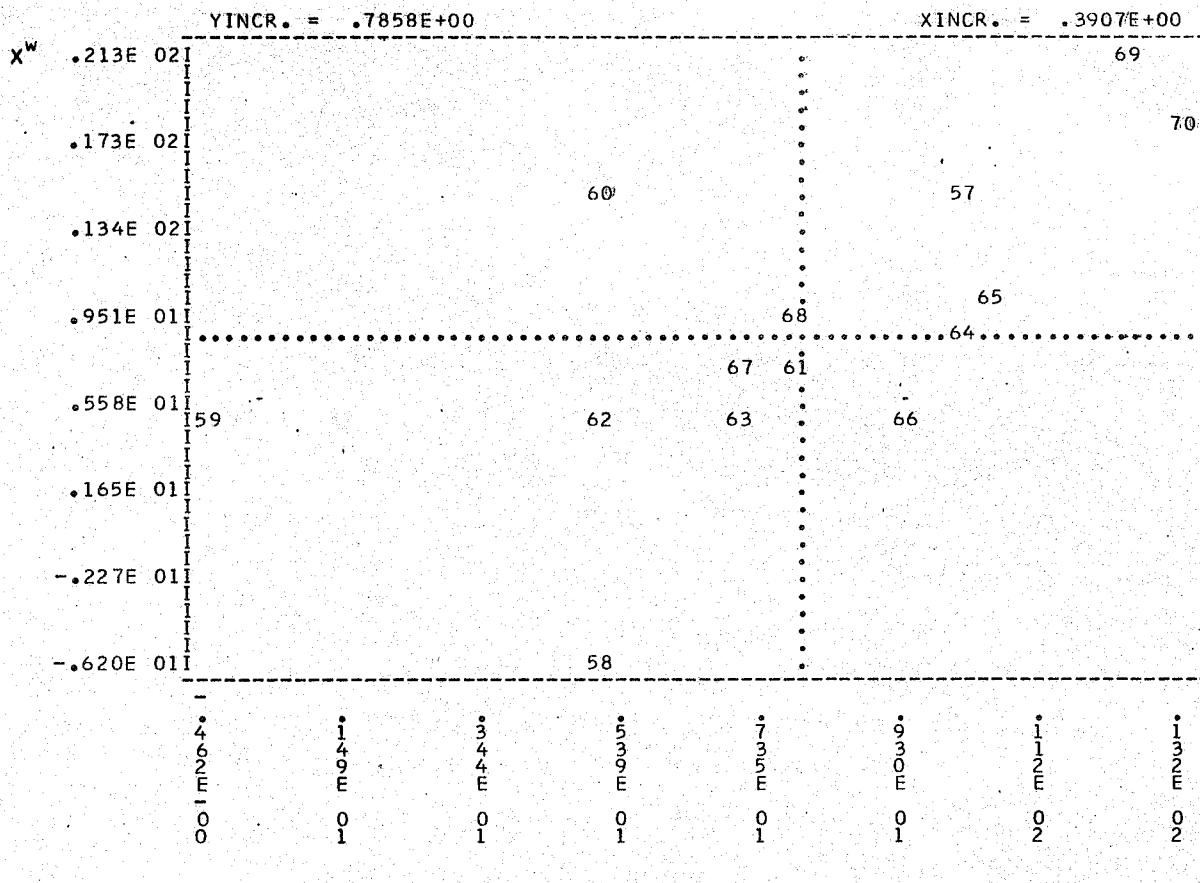
Residuals

DW = 1.70



Scatter Diagram

X^W	E 5.3
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TOTAL IMPORT OF GOODS

M^w

E 6.1

$$M^w = 1.769 u^w + .139 \Delta u^{w2} + 1.781 I^i_{-6/12} + .736 p^{mw}_{-6/12} - .093 d^h_{-1}$$

Explanation of symbols

M^w total import of goods

u^w total output (less inventory changes and net invisibles)

u^{w2} squared function of total output (less inventory changes and net invisibles)

Iⁱ inventory changes (expressed as a percentage of total output less inventory changes and net invisibles)

p^{mw} implicit deflator for total import of goods

d^h index of domestic harvests

M^w

E 6.2

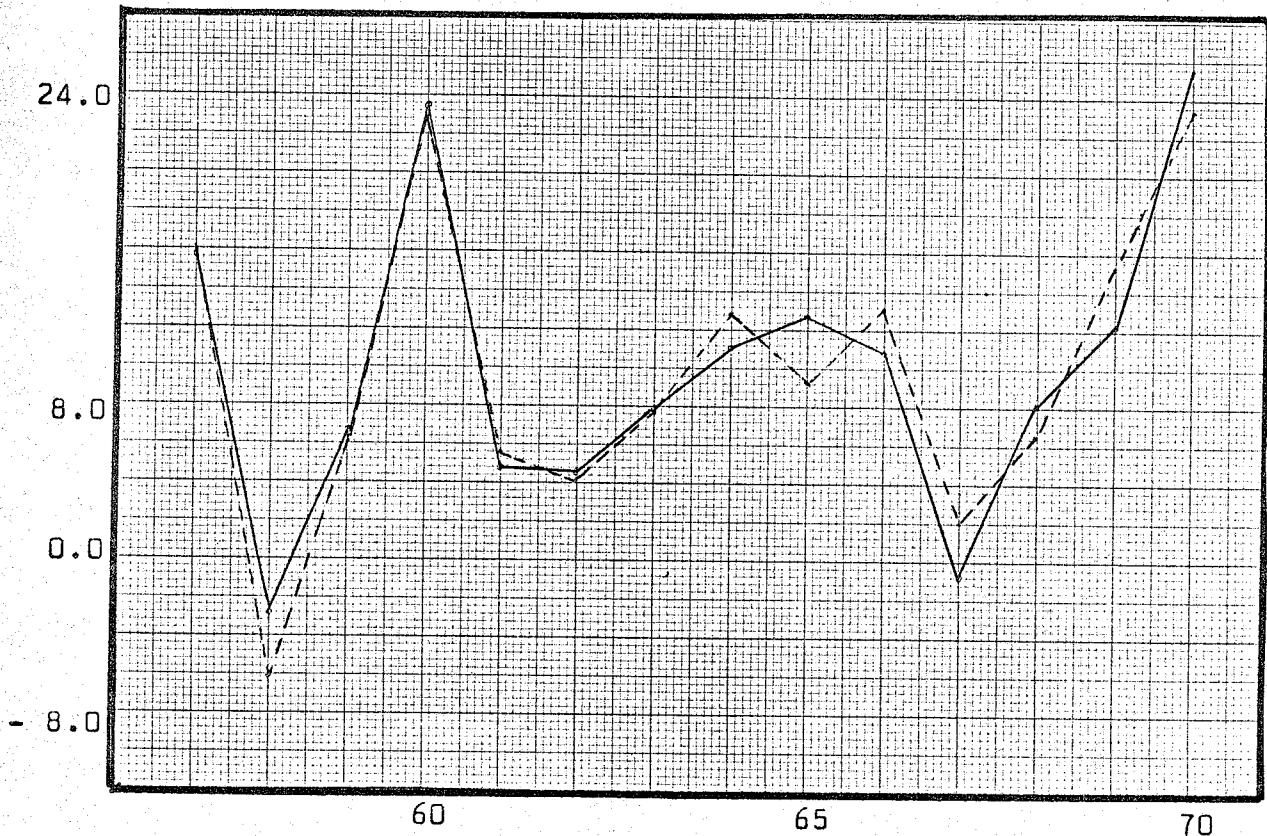
Independent Variables

DF=9

x_i	u^w	Δu^{w2}	$I_{-6/12}^i$	$P_{-6/12}^{mw}$	d_{-1}^h
$\hat{\beta}_i$	1.769	.139	1.781	.736	-.093
$\hat{\sigma}\hat{\beta}_i$	.106	.025	.730	.236	.033
$|\hat{\beta}_i|/\beta_i|$	6 %	18 %	41 %	32 %	35 %

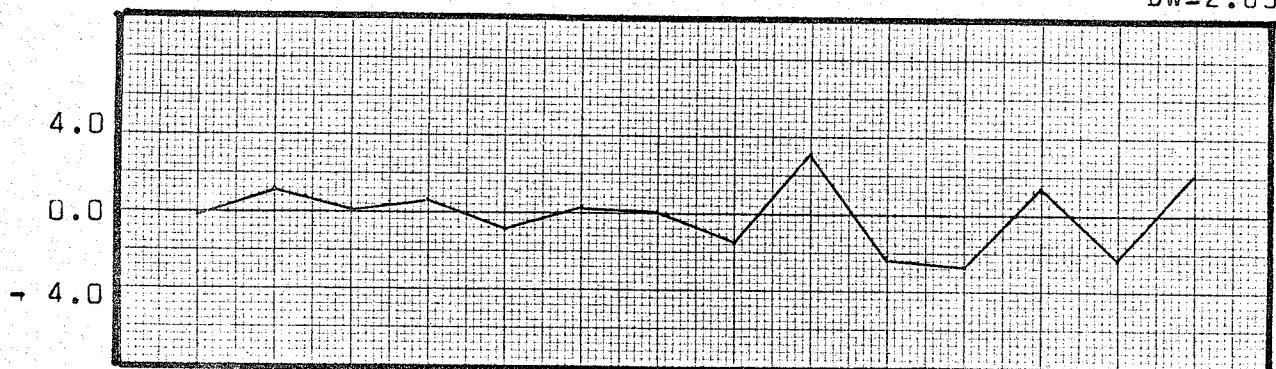
Prediction - - -

Realization —

 $R^2 = .955$ 

Residuals

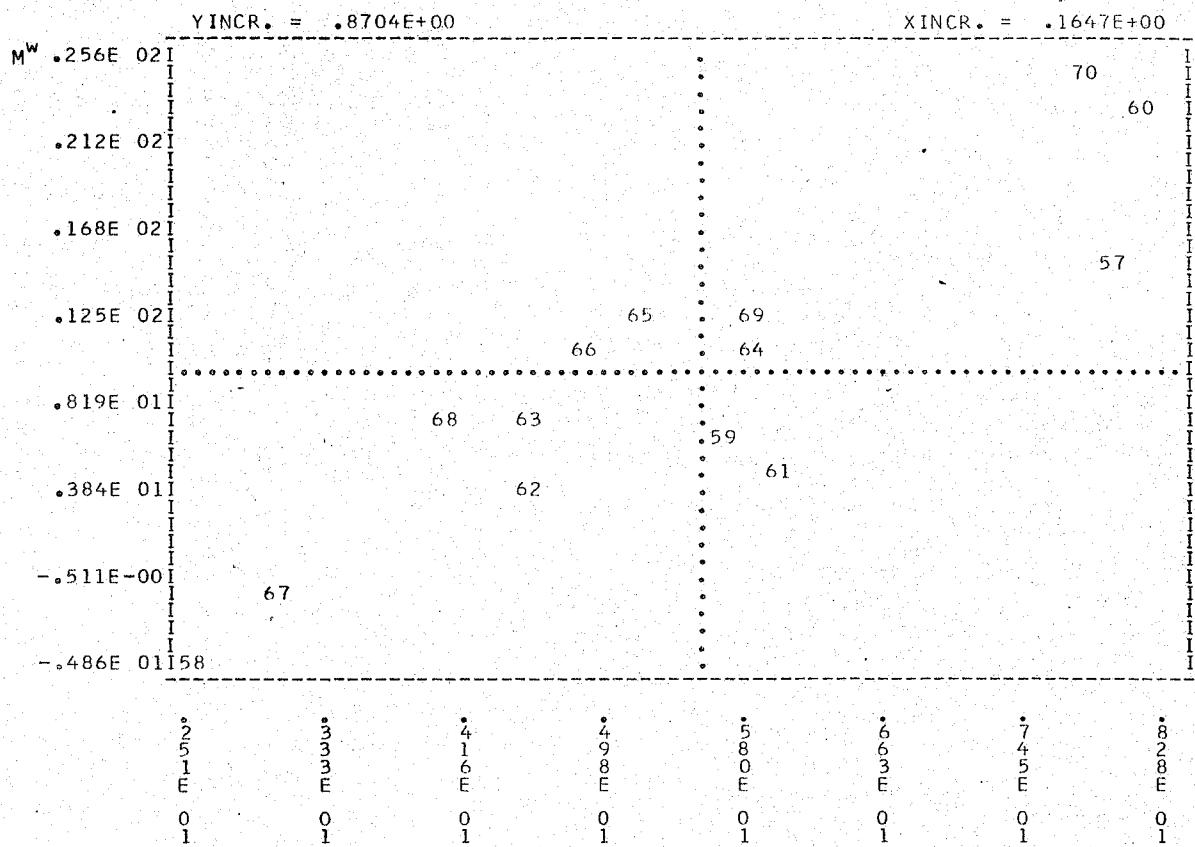
DW=2.85



Scatter Diagram

M^W

E 6.3



Δu^2

.632E	.152E	.241E	.329E	.418E	.507E	.596E	.685E
0 1	0 2	0 2	0 2	0 2	0 2	0 2	0 2

IMPORT OF FOODS, ETC.

M^{0,1}

E 6a.1

$$M^{0,1} = .129 C^{P^2} - .969 d^h$$

-6/12

Explanation of symbols

M^{0,1} import of foods, etc. (SITC 0 and 1)

C^{P^2} squared function of total private consumption C^P

d^h index of domestic harvests

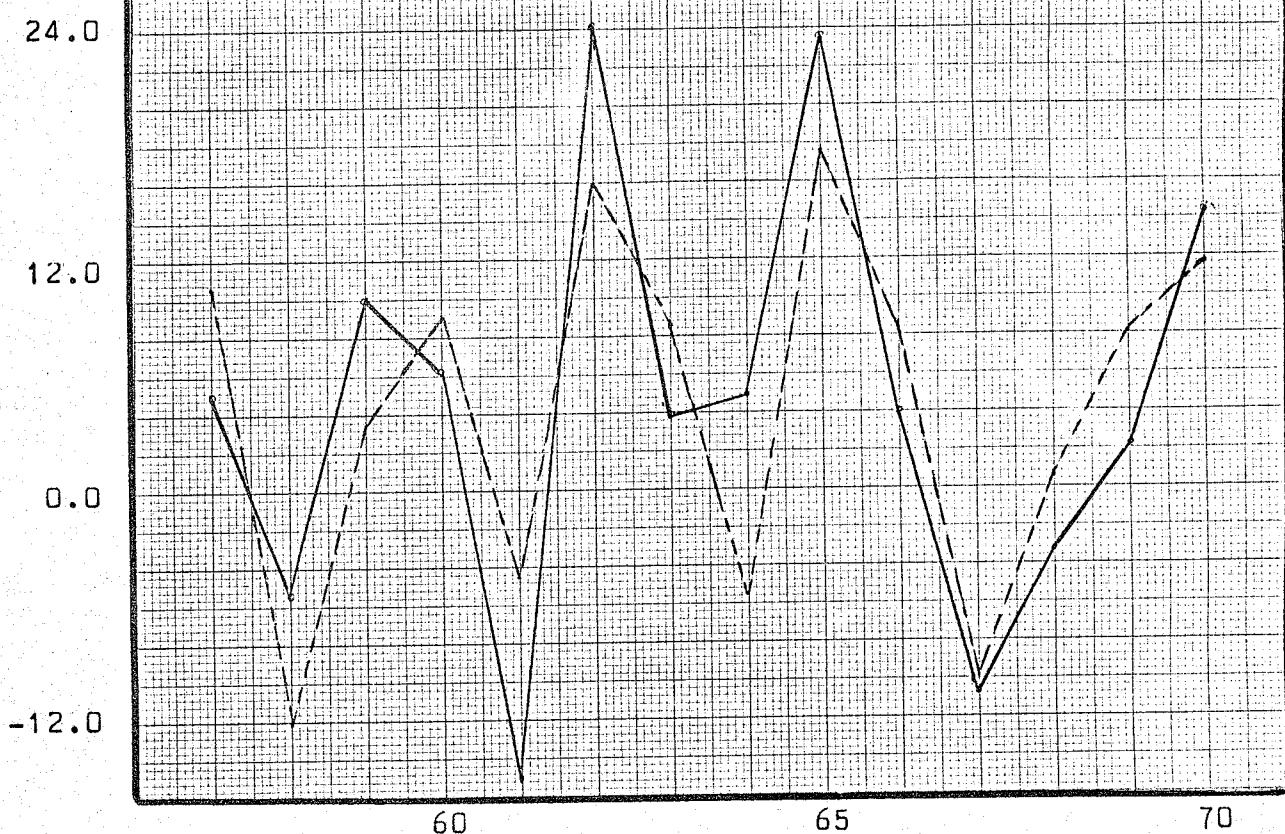
M ^{0,1}	E 6a.1
------------------	--------

DF=1.2

Independent Variables

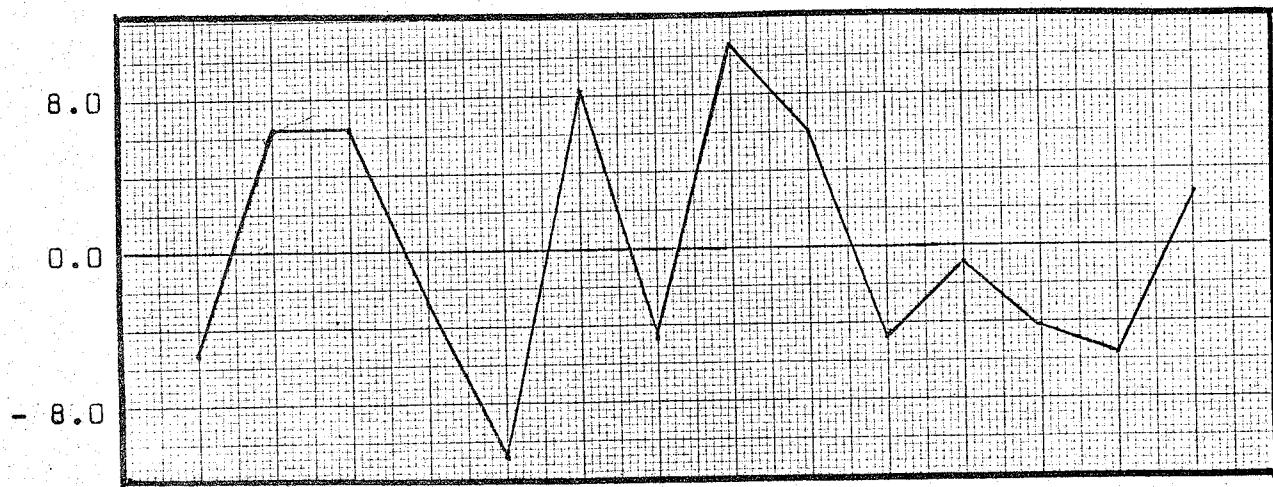
x_i	C^{P2}	$d^h_{-6/12}$
$\hat{\beta}_i$	.129	-.969
$\hat{\hat{\beta}}_i$	.028	.213
$|\hat{\hat{\beta}}_i / \hat{\beta}_i|$	22 %	22 %

Prediction - - - Realization — $R^2 = .671$



Residuals

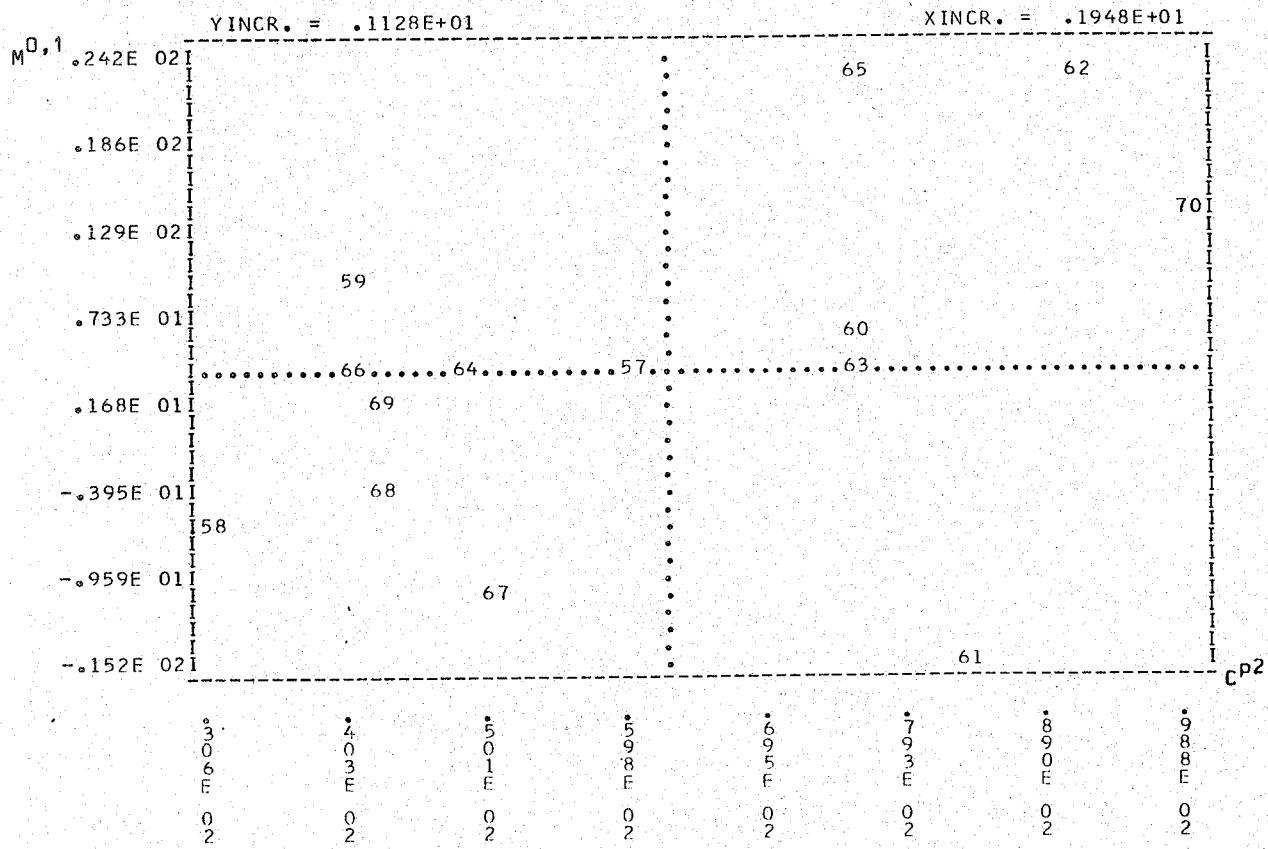
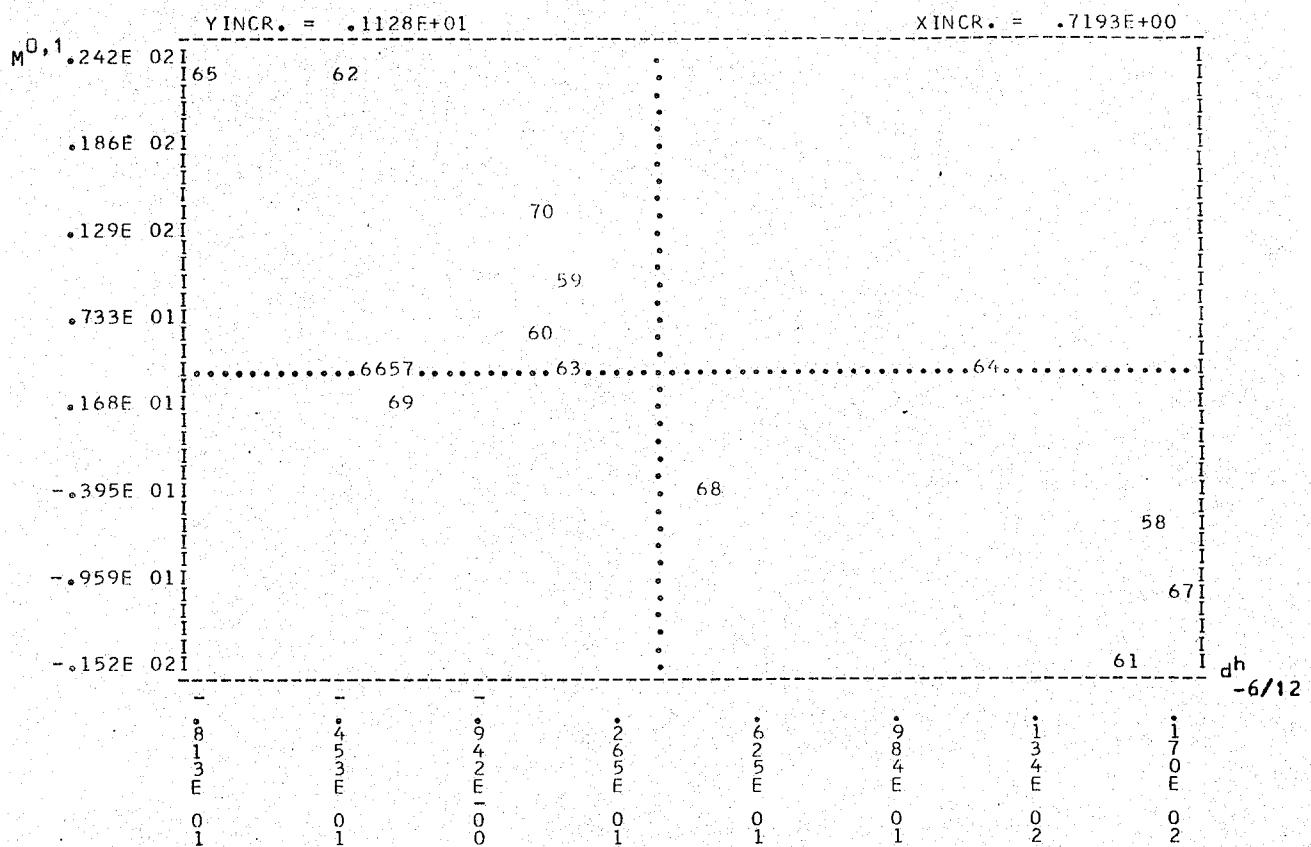
DW=2.31



Scatter Diagram

M⁰, 1

E 6a.3



IMPORT OF RAW MATERIALS	M ^{2,4}	E 6b.1
-------------------------	------------------	--------

$$M^{2,4} = .226 u^{w2} + .427 \Delta I^e + 4.511 I^i + .923 p^{m-y}$$

Explanation of symbols

M^{2,4} import of raw materials (SITC 2 and 4)

u^{w2} squared function of total output (less inventory changes and exports of services)

Iⁱ inventory changes (expressed as a percentage of total output less inventory changes and net invisibles)

I^e gross investment in equipment

p^{m-y} margin between p^{mw} and p^y

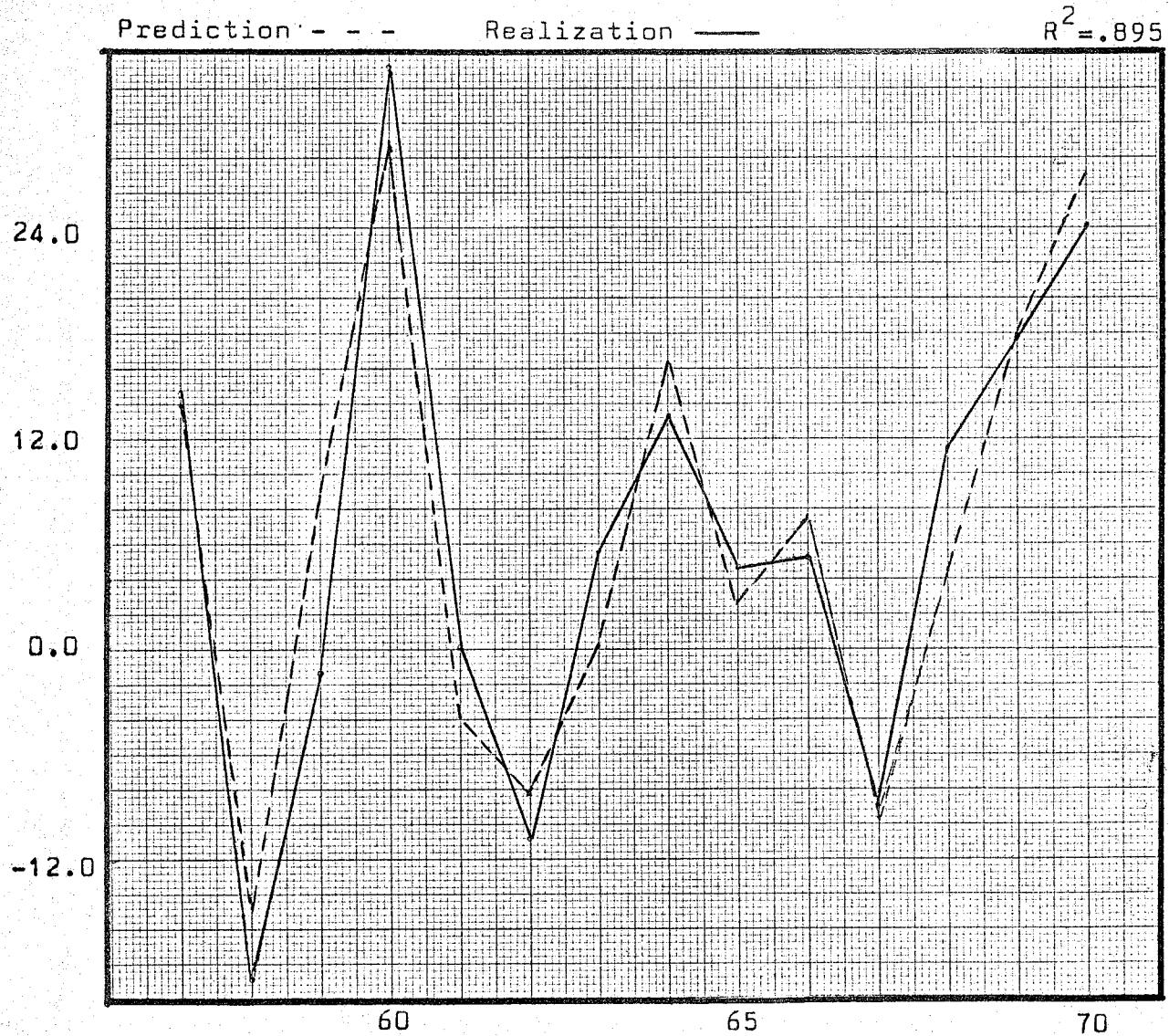
M^{2,4}

E 6b.2

DF=10

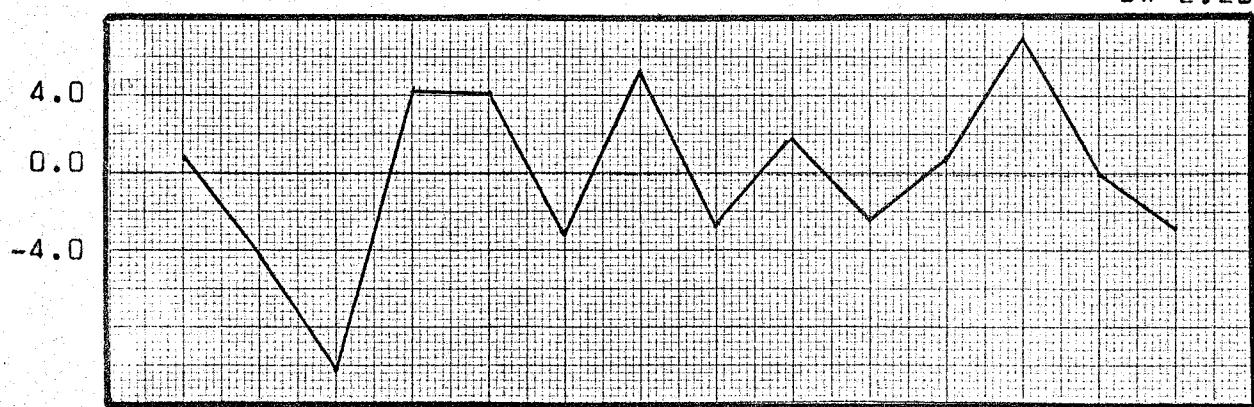
Independent Variables

x_i	u^{w2}	ΔI^e	I^i	p^{m-y}
β_i	.226	.427	4.511	.923
$\hat{\beta}_i$	.047	.175	1.759	.360
$|\hat{\beta}_i/\beta_i|$	21 %	.41 %	39 %	39 %



Residuals

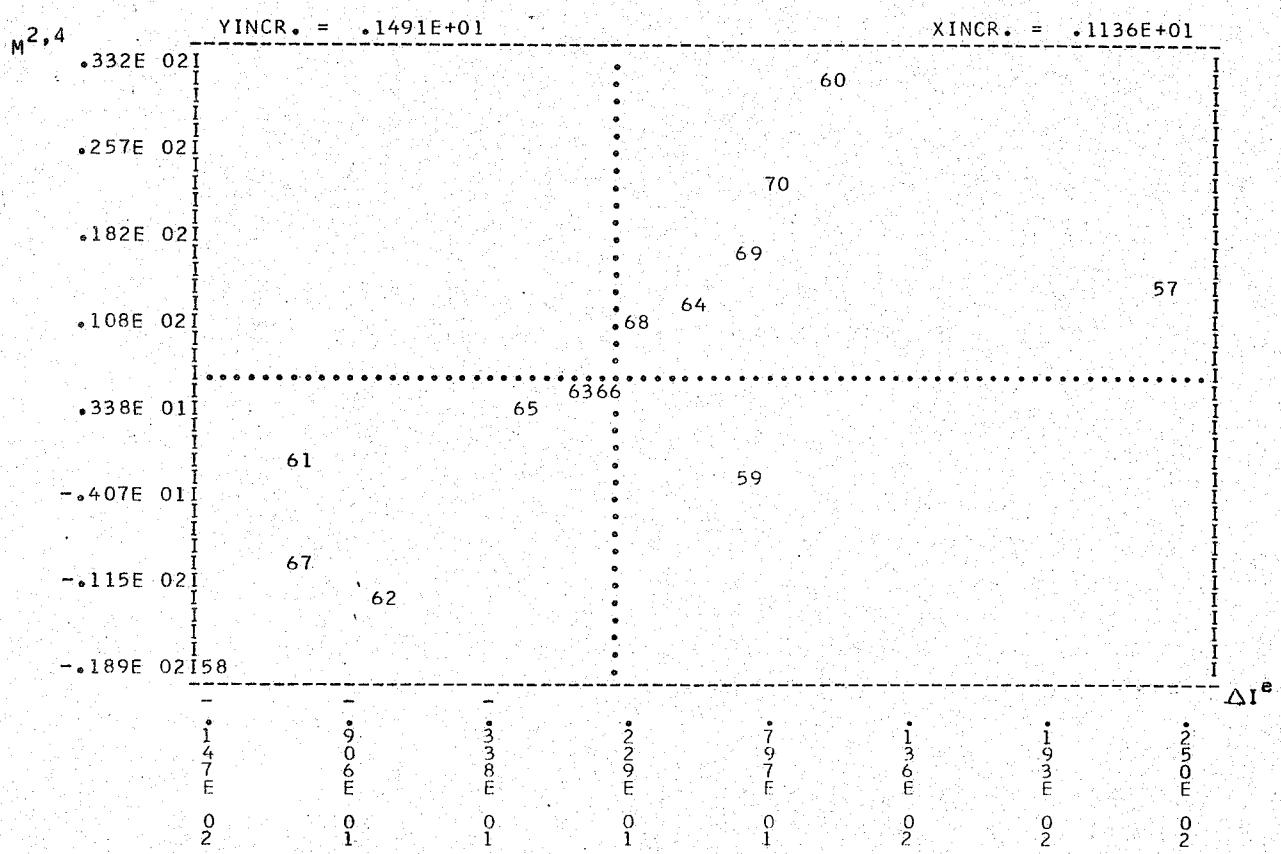
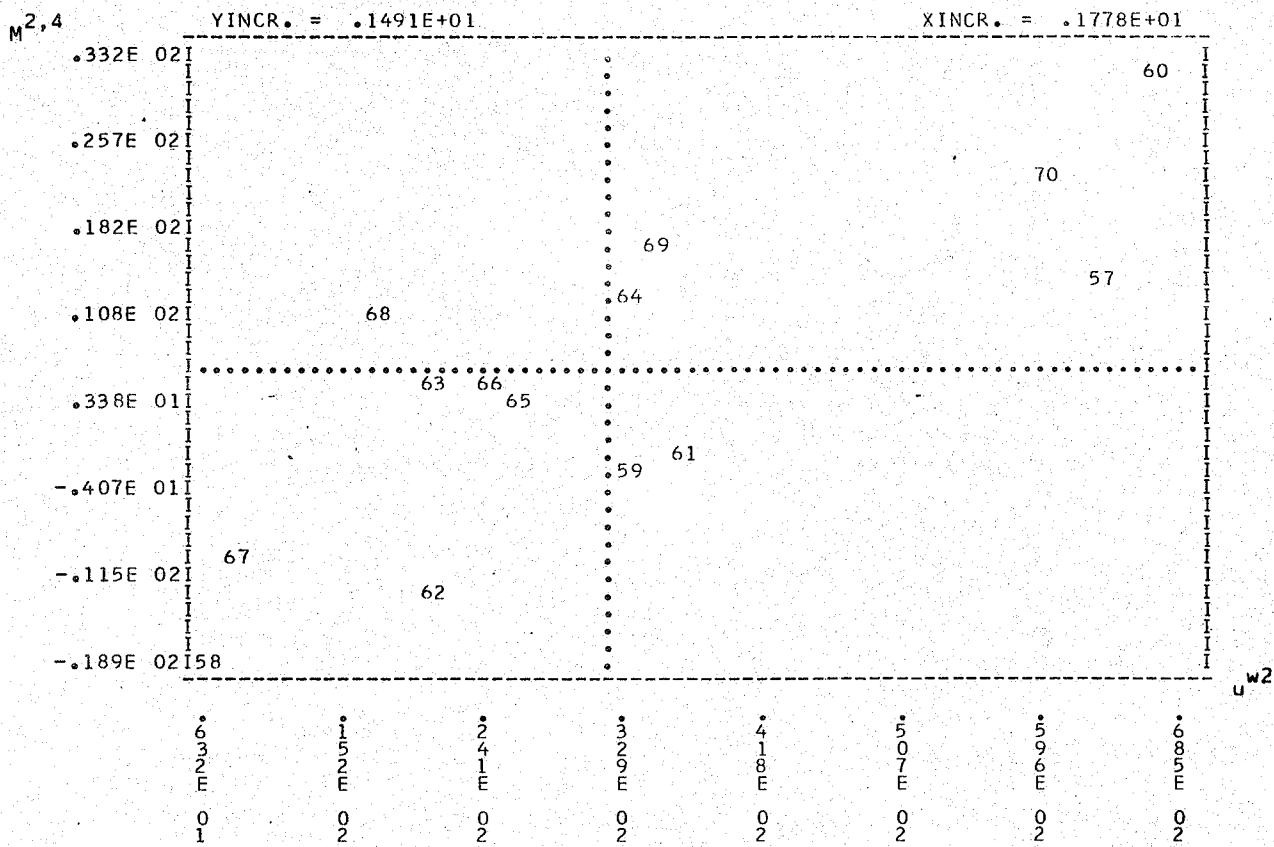
DW=2.25



Scatter Diagram

M^{2,4}

E 6b.3



IMPORT OF MANUFACTURES, ETC.

M⁵⁻⁹

E 6c.1

$$M^{5-9} = .372 u^{w2} + 1.820 I^i$$

Explanation of symbols

M⁵⁻⁹ import of manufactures, etc. (SITC 5 - 9)

u^{w2} squared function of total output (less inventory changes
and net invisibles)

Iⁱ inventory changes (expressed as a percentage of total
output less inventory changes and net invisibles)

M 5,9

E 6c.2

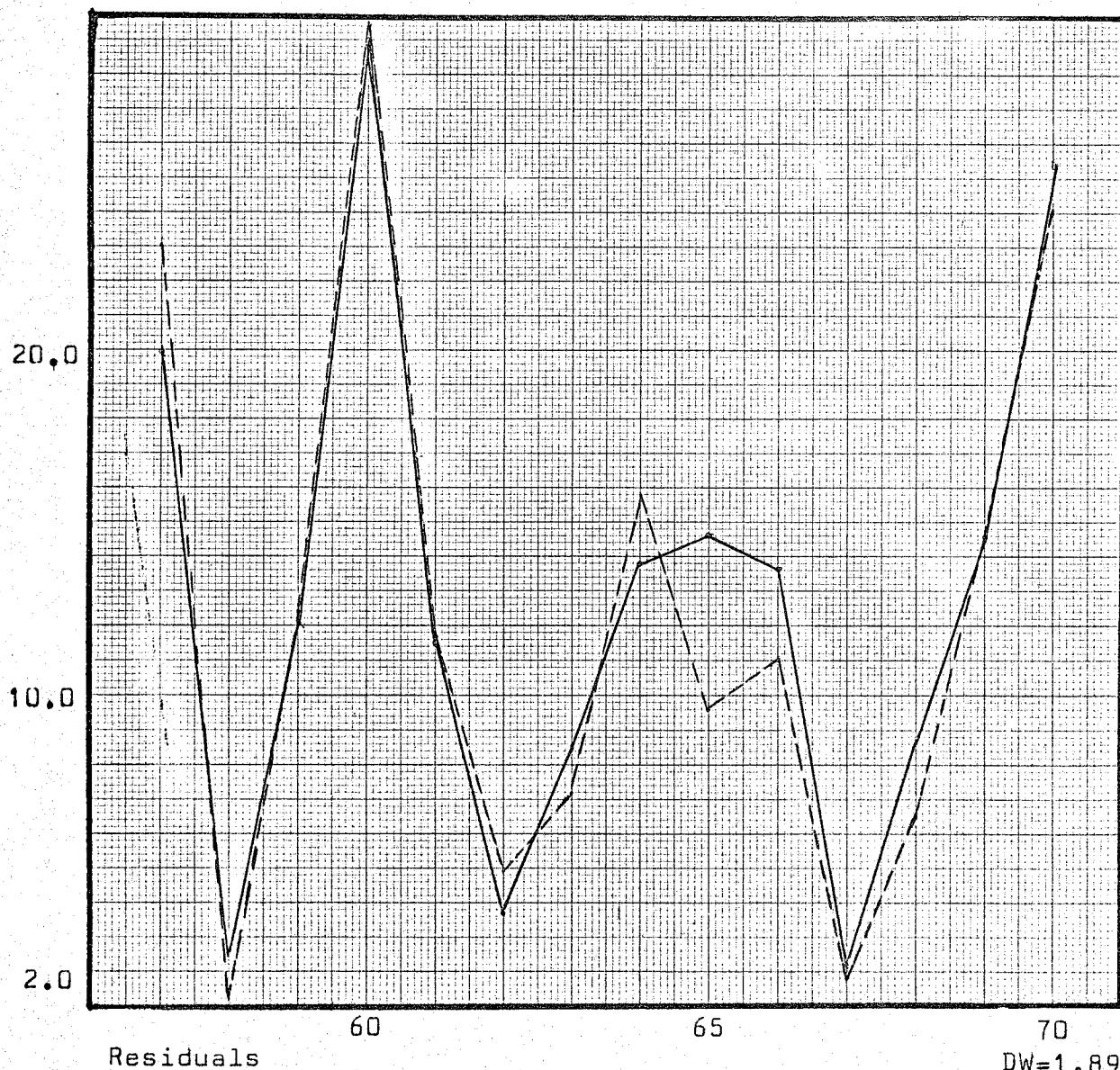
DF=12

Independent Variables

x_i	u^{w2}	I^i
$\hat{\beta}_i$	.372	1.820
$\hat{\sigma}_{\hat{\beta}_i}$	.015	.601
$|\hat{\beta}_i / \hat{\sigma}_{\hat{\beta}_i}|$	4 %	33 %

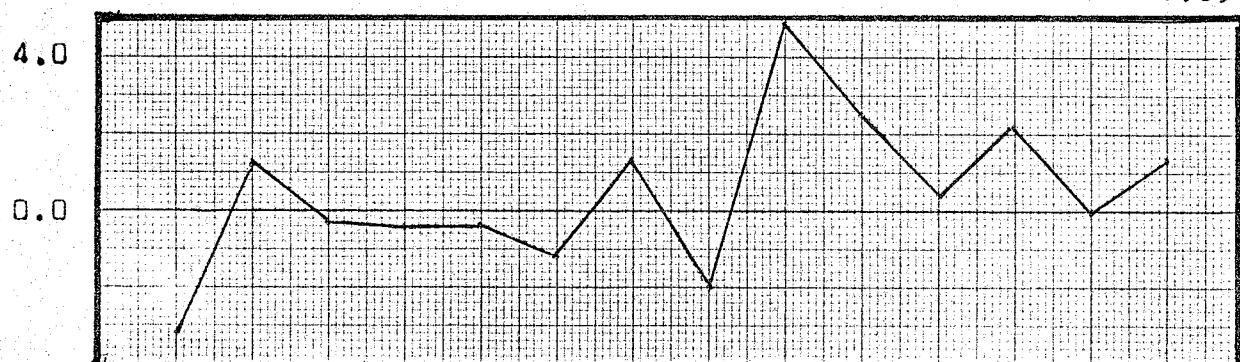
Prediction - - -

Realization —

 $R^2 = .940$ 

Residuals

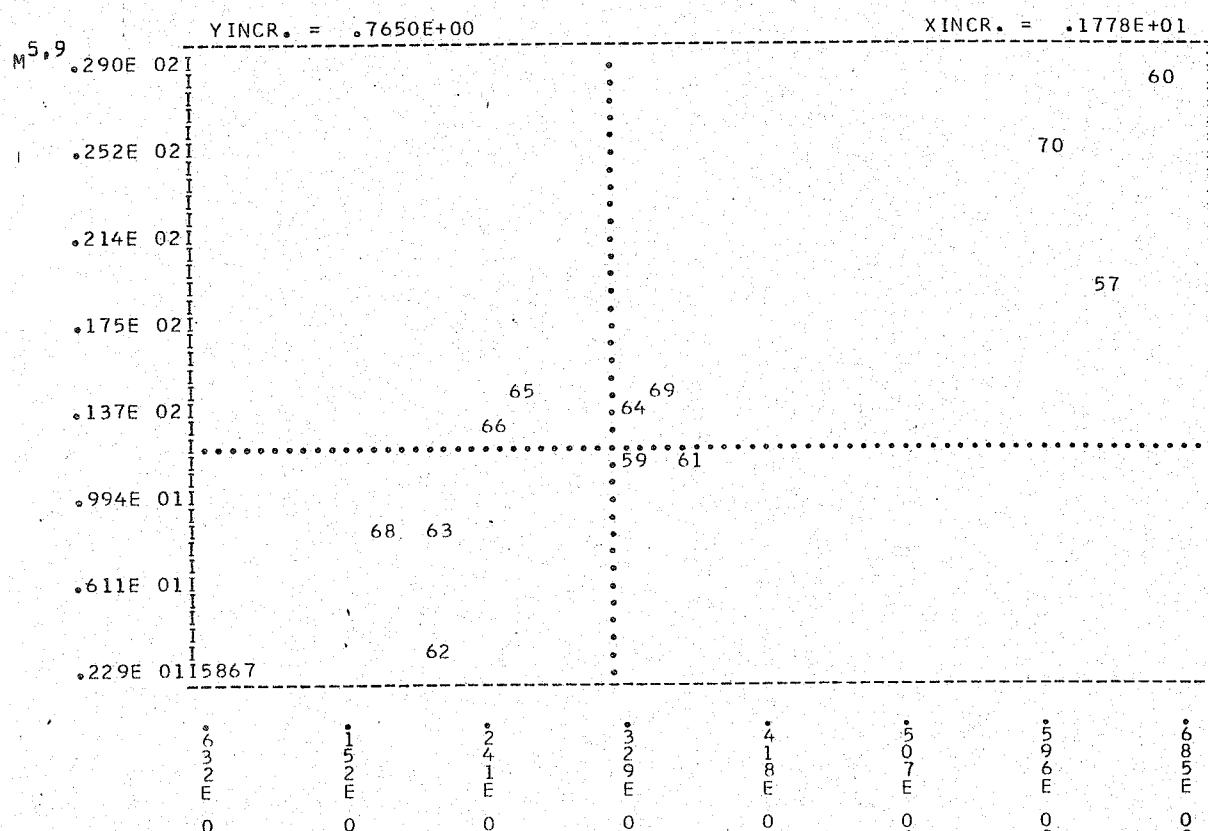
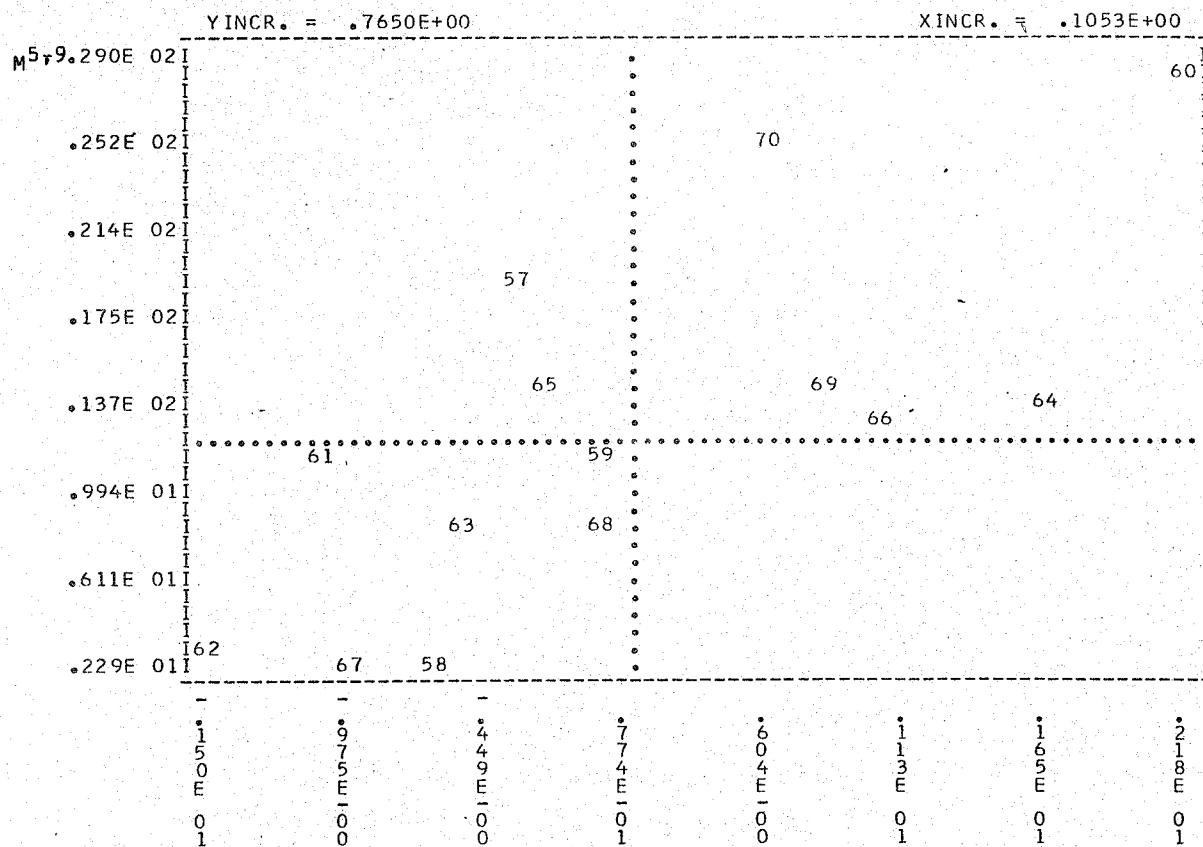
DW=1.89



Scatter Diagram

M⁵⁻⁹

E 6c.3



NUMBER OF EMPLOYEES IN PRIVATE SECTOR	N ^P	E 7.1
---------------------------------------	----------------	-------

$$N^P = .059 u^{w2} - .198 l^P - .230 h$$

-6/12 -1

Explanation of symbols

N^P number of employees in private sector

u^{w2} squared function of total output (less inventory changes
and net invisibles)

l^P gross wage bill in the private sector

h percentage change in working hours

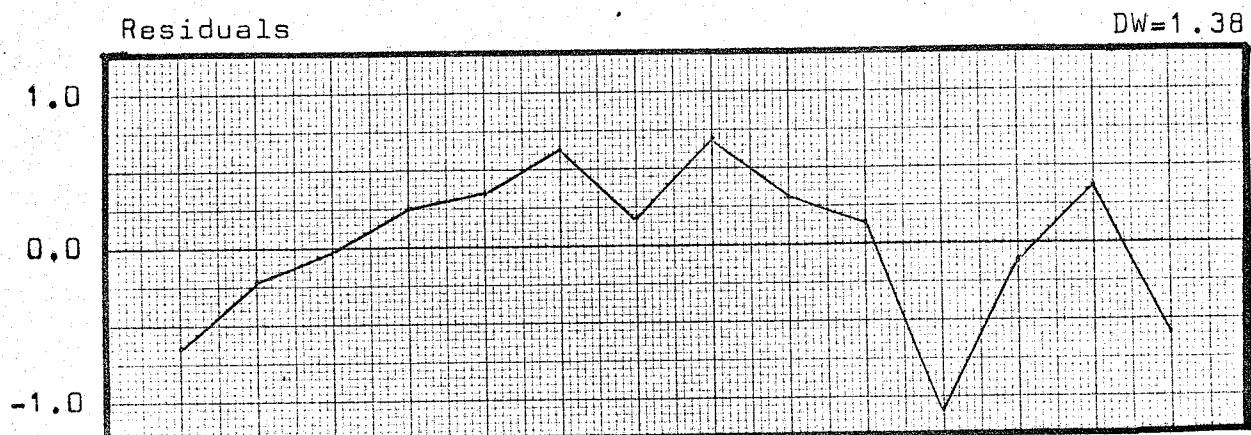
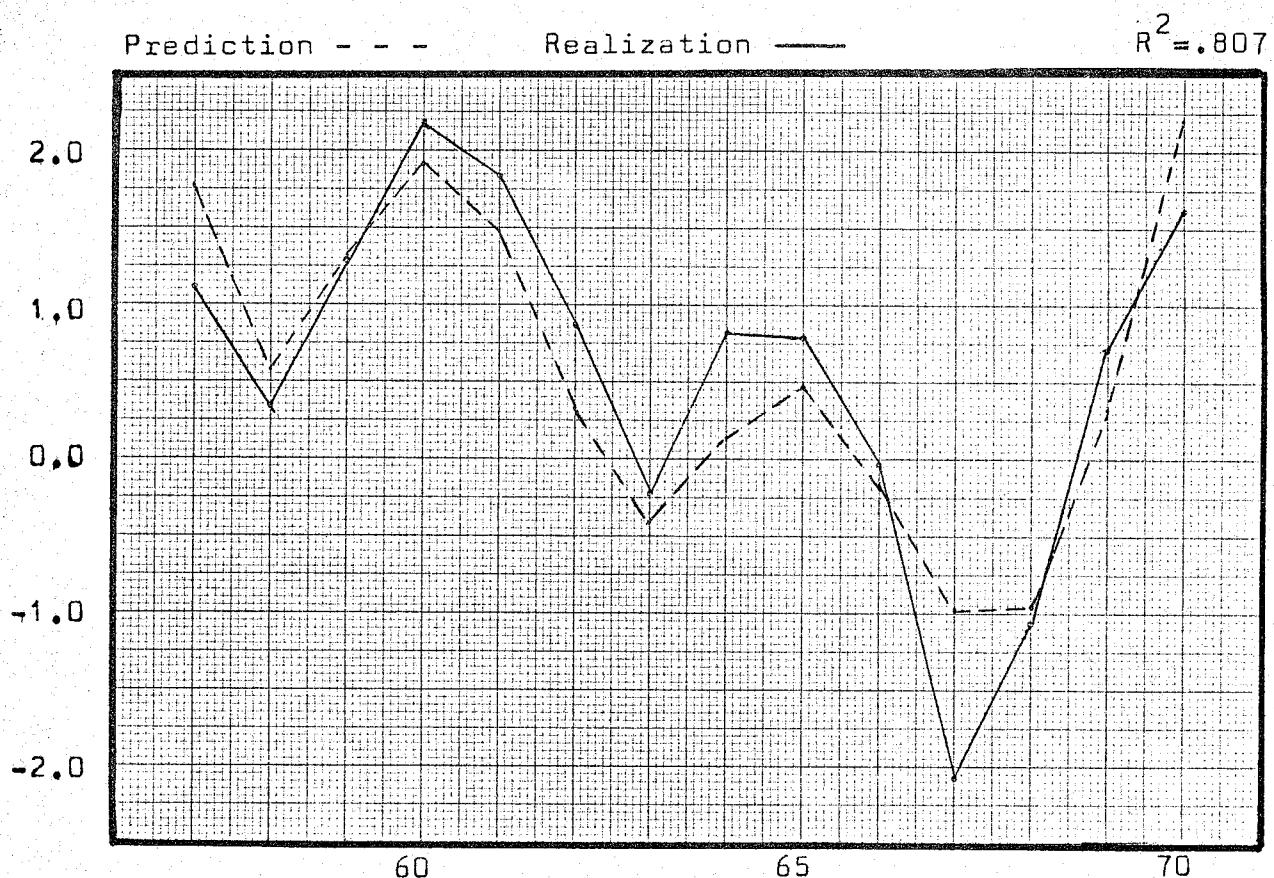
NP

E 7.2

DF=11

Independent Variables

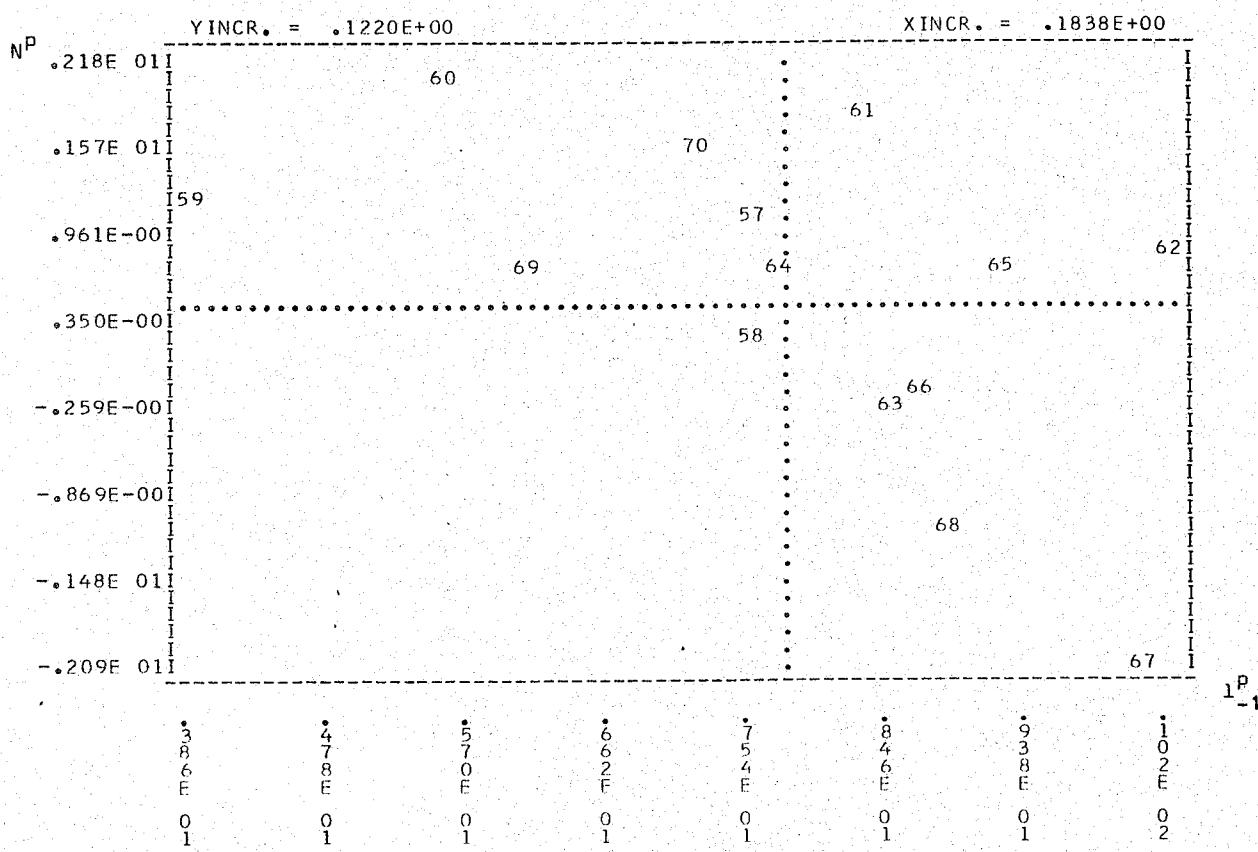
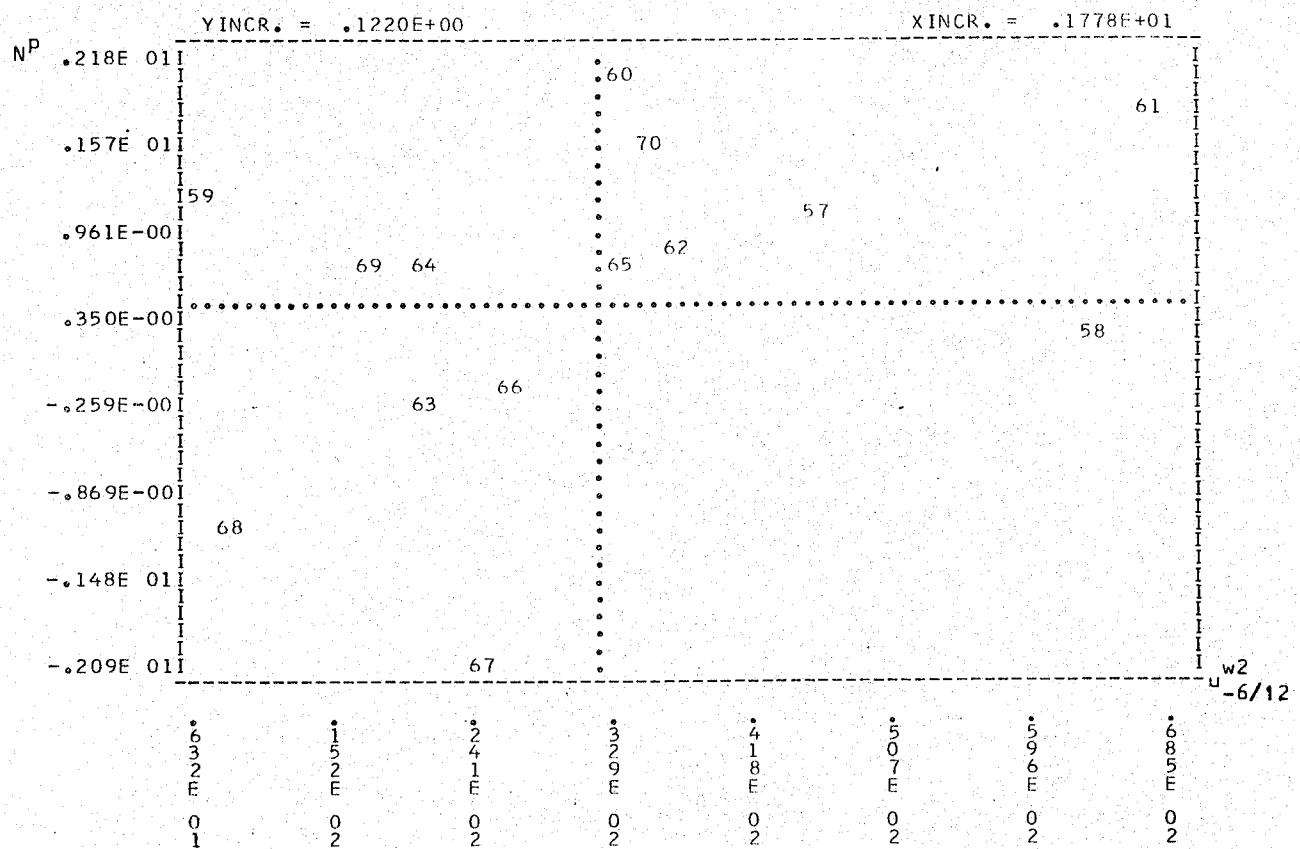
x_i	$w^2_{-6/12}$	l^P_{-1}	h
$\hat{\beta}_i$	.059	-.198	-.230
$\hat{\sigma}_{\hat{\beta}_i}$	.009	.040	.099
$| \hat{\beta}_i / \hat{\sigma}_{\hat{\beta}_i} |$	15 %	20 %	43 %



Scatter Diagram

N^P

E 7.3



NUMBER OF UNEMPLOYED

A

E 8.1

$$A = .232 A_{-1} + 6.501 N^W - 3.518 N^{th} - 4.052 \Delta l^P$$

Explanation of symbols

A number of unemployed

N^W population in working ages

N^{th} native employees

Δl^P gross wage bill in private sector

A

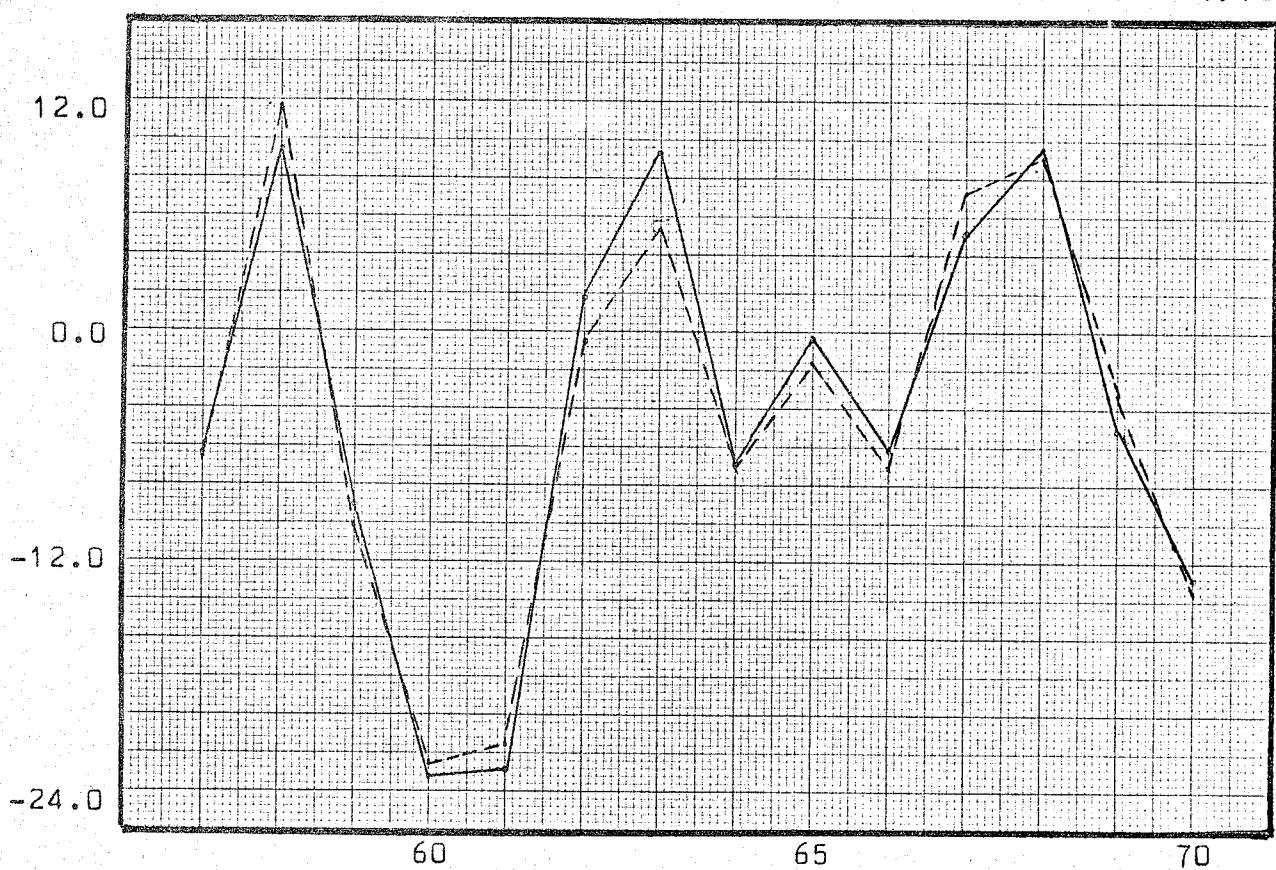
E 8.2

DF=10

Independent Variables

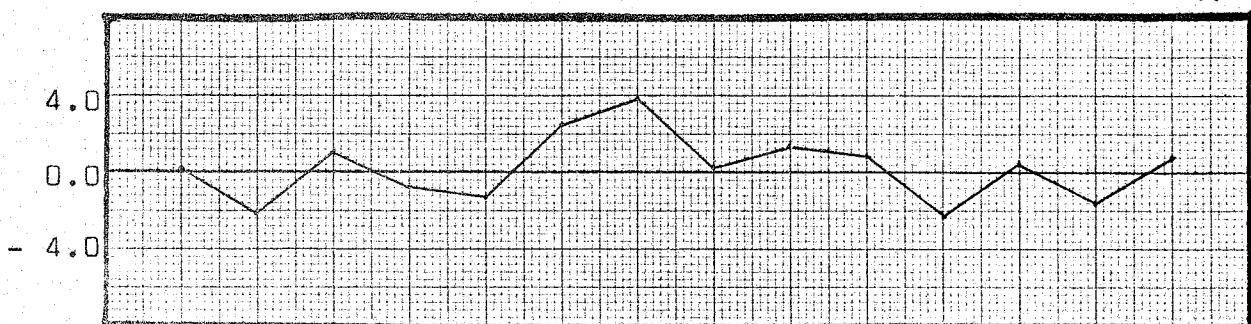
x_i	A_{-1}	N^W	N^{th}	$\Delta 1^P$
$\hat{\beta}_i$	.232	6.501	-3.518	-4.052
$\hat{\sigma}_{\hat{\beta}_i}$	.058	1.300	.528	.324
$|\hat{\sigma}_{\hat{\beta}_i}/\hat{\beta}_i|$	25 %	20 %	15 %	8 %

Prediction - - - Realization —

 $R^2 = .973$ 

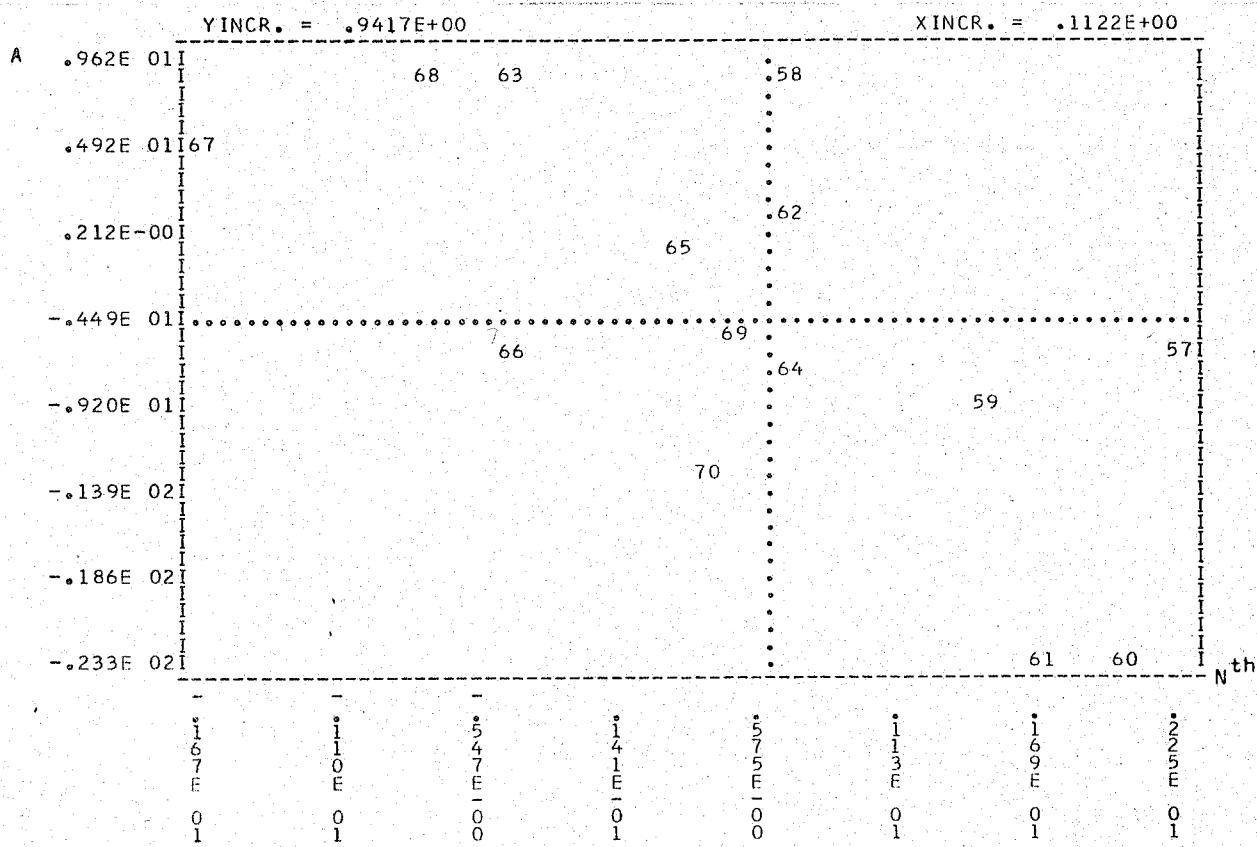
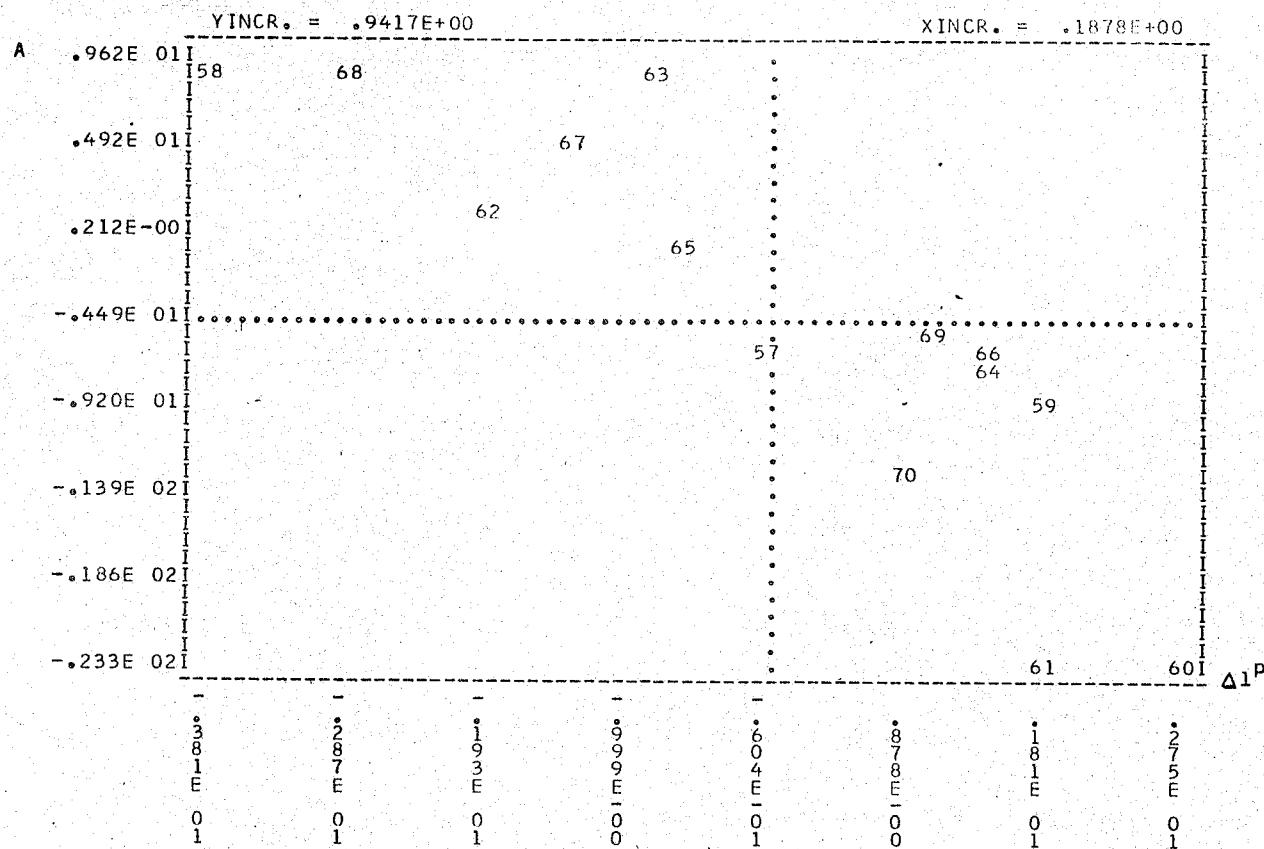
Residuals

DW=1.94



Scatter Diagram

A	E 8.3
---	-------



GROSS WAGE BILL IN PRIVATE SECTOR	L ^P	E 9.1
-----------------------------------	----------------	-------

$$L^P = 1.788 p^c'_{-6/12} + .227 u^w_{-1} - .230 A$$

Explanation of symbols

L^P gross wage bill in private sector

p^{c'} consumer price index

u^w total output (less inventory changes and net invisibles)

A number of unemployed

LP

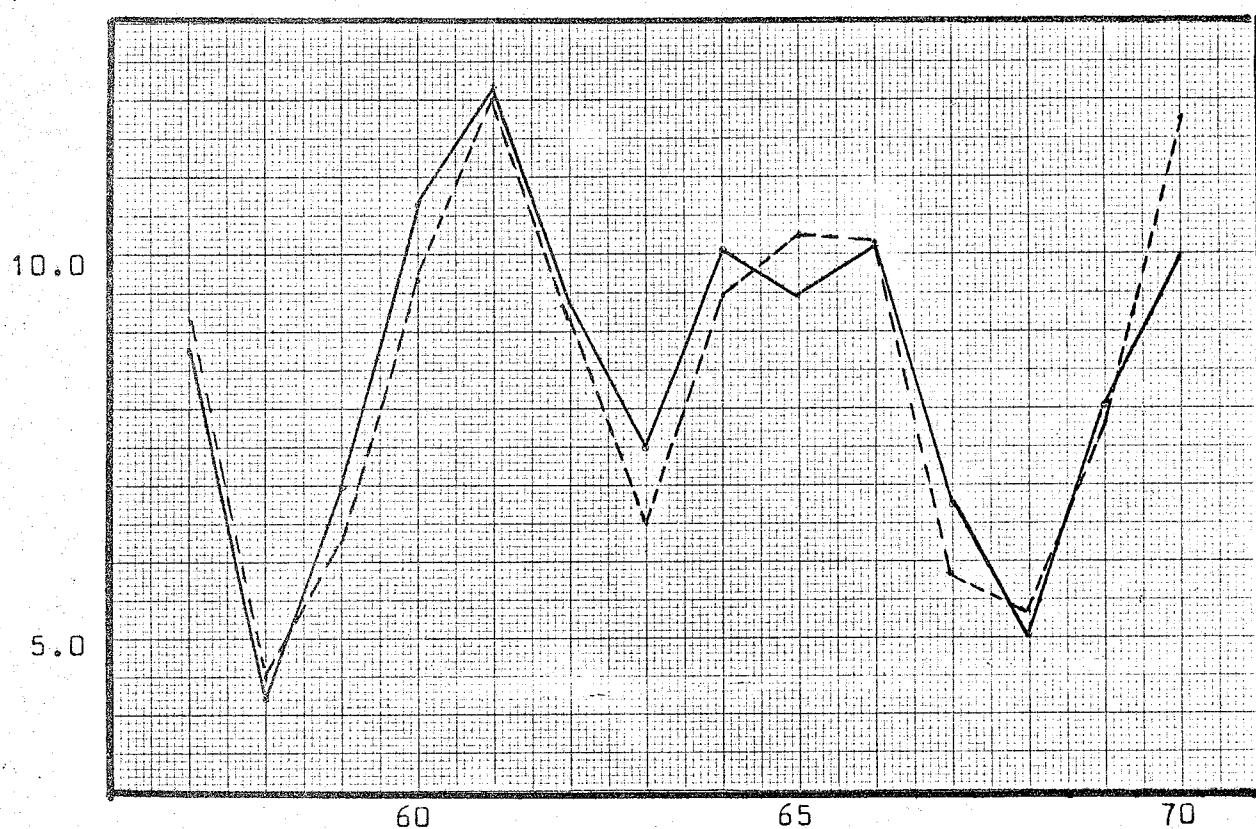
E 9.2

Independent Variables

DF = 11

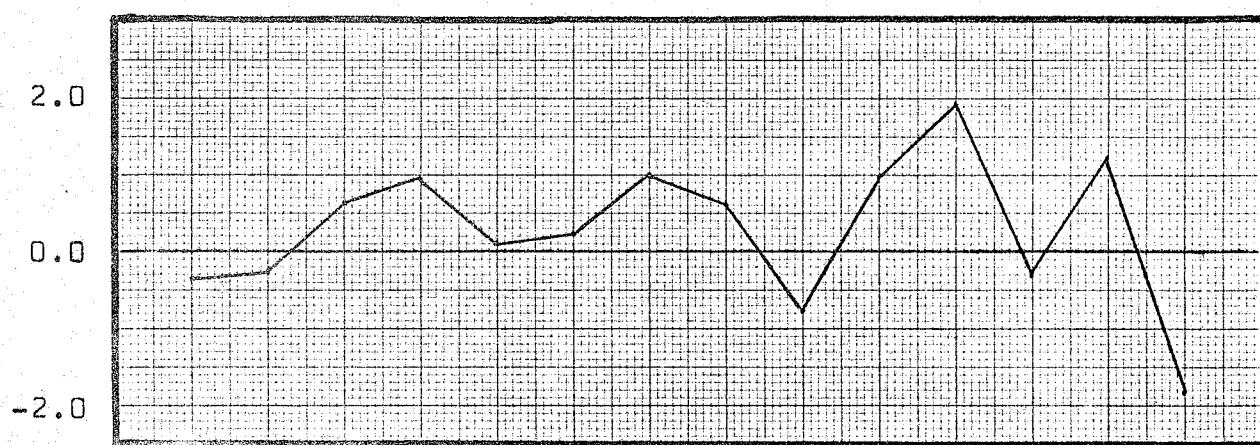
X_i	$P^{C'}_{-6/12}$	U^W_{-1}	A
$\hat{\beta}_1$	1.788	.227	-.230
$\hat{\sigma}_{\hat{\beta}_1}$	.215	.084	.021
$|\hat{\sigma}_{\hat{\beta}_1}/\hat{\beta}_1|$	12 %	37 %	9 %

Prediction - - - Realization —

 $R^2 = .893$ 

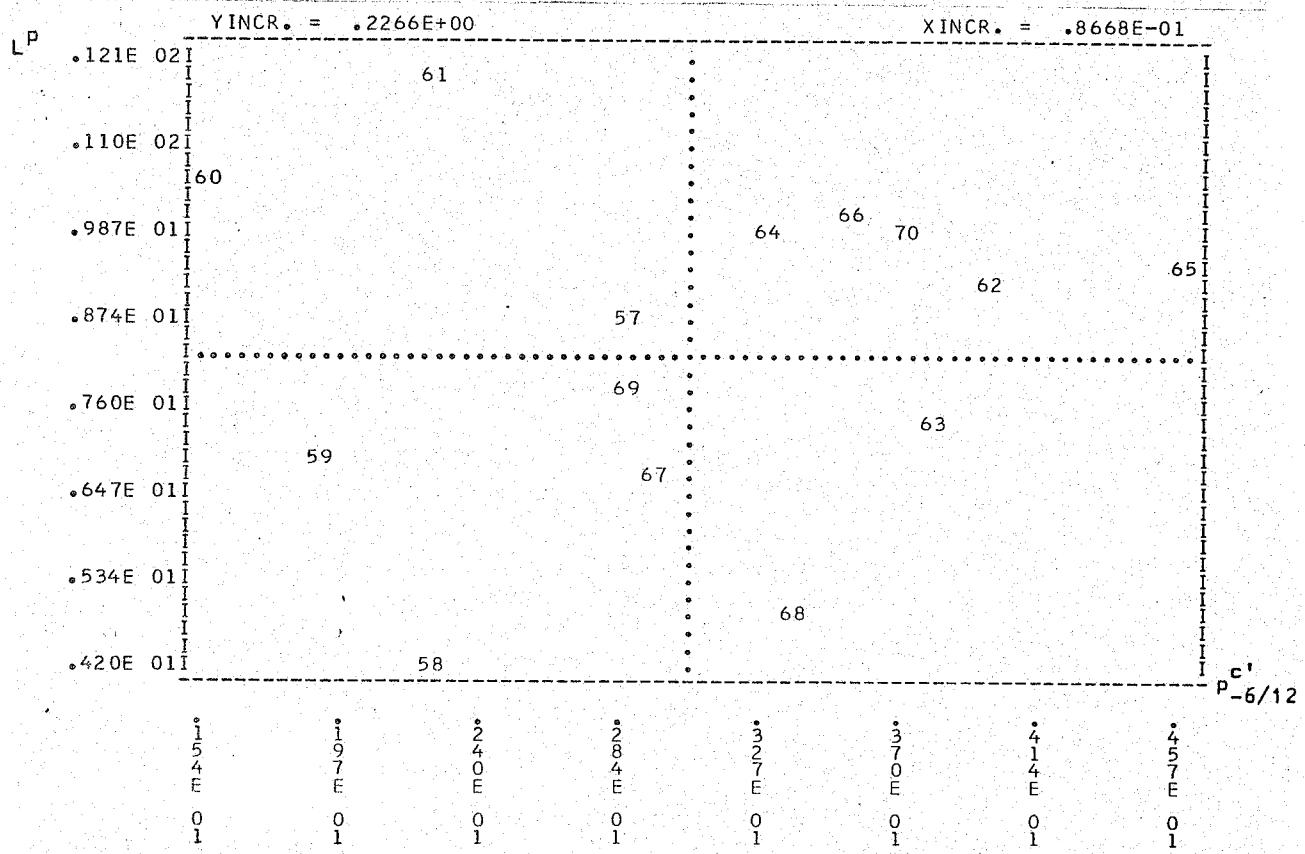
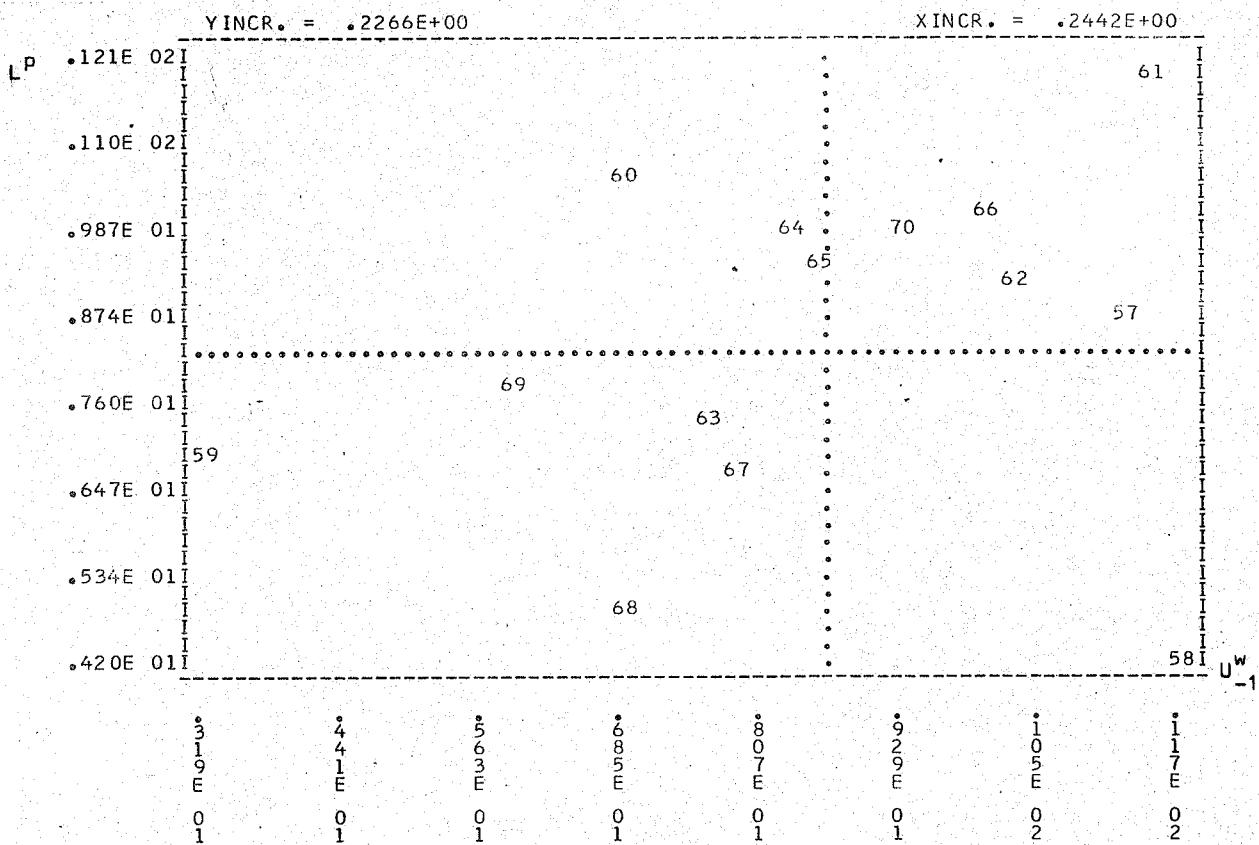
Residuals

DW = 1.48



Scatter Diagram

L P E 9.3



GROSS NON-LABOUR INCOME	Z	E10.1
-------------------------	---	-------

$$Z = .105 U^w - 3.038 K + .706 \Delta X^w - .674 t^i$$

-9/12 -9/12 -4/12

Explanation of symbols

Z gross non-labour income

U^w squared function of total output (less inventory changes and net invisibles)

K unit labour costs

X^w total export of goods

t^i incidence of indirect taxes minus subsidies

Z

E10.2

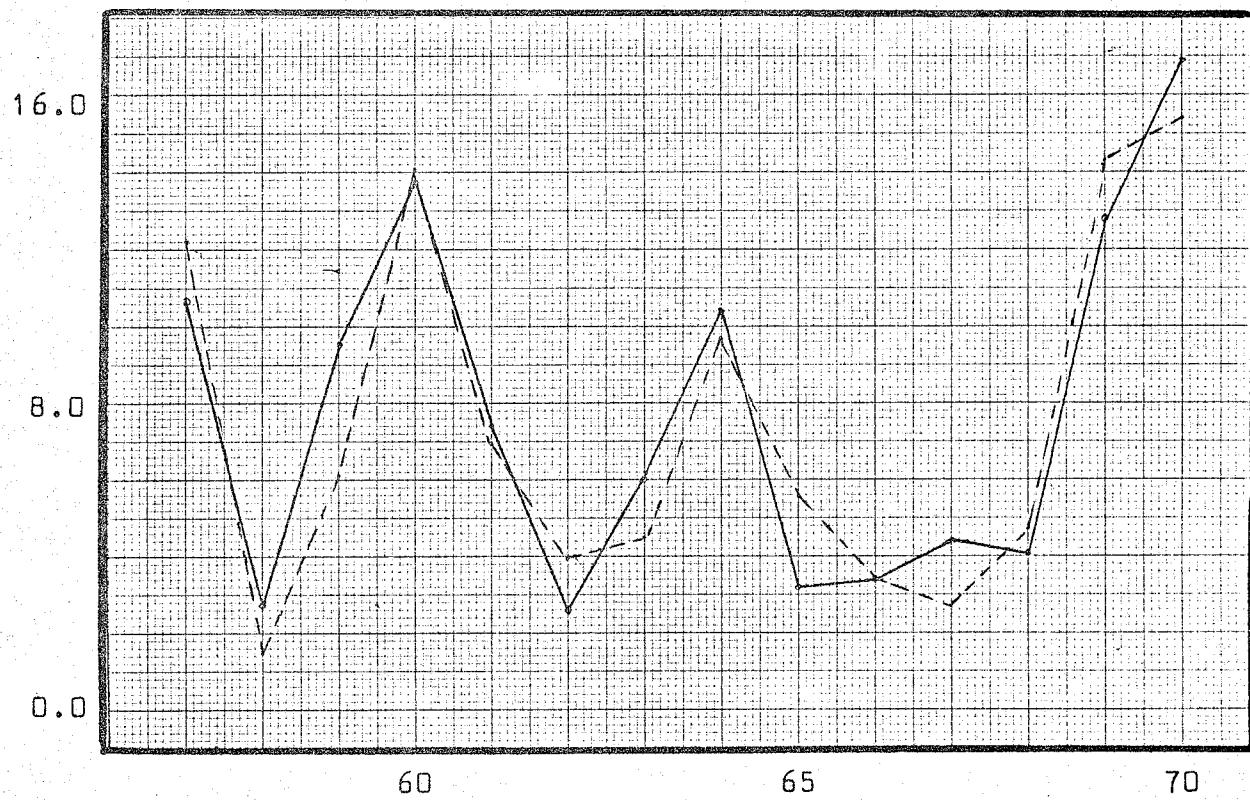
DF = 10

Independent Variables

x_i	$U_{-9/12}^{w2}$	$K_{-9/12}$	ΔX^w	$t_{-4/12}^i$
$\hat{\beta}_i$	.105	-3.038	.706	-.674
$\hat{\sigma}_{\beta_i}$	.017	.486	.071	.290
$|\hat{\beta}_i/\beta_i|$	6 %	16 %	10 %	43 %

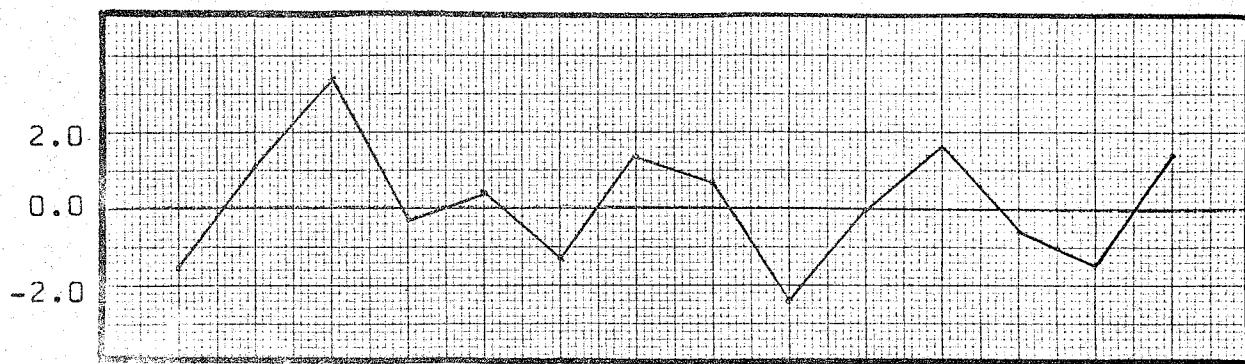
Prediction - - -

Realization —

 $R^2 = .886$ 

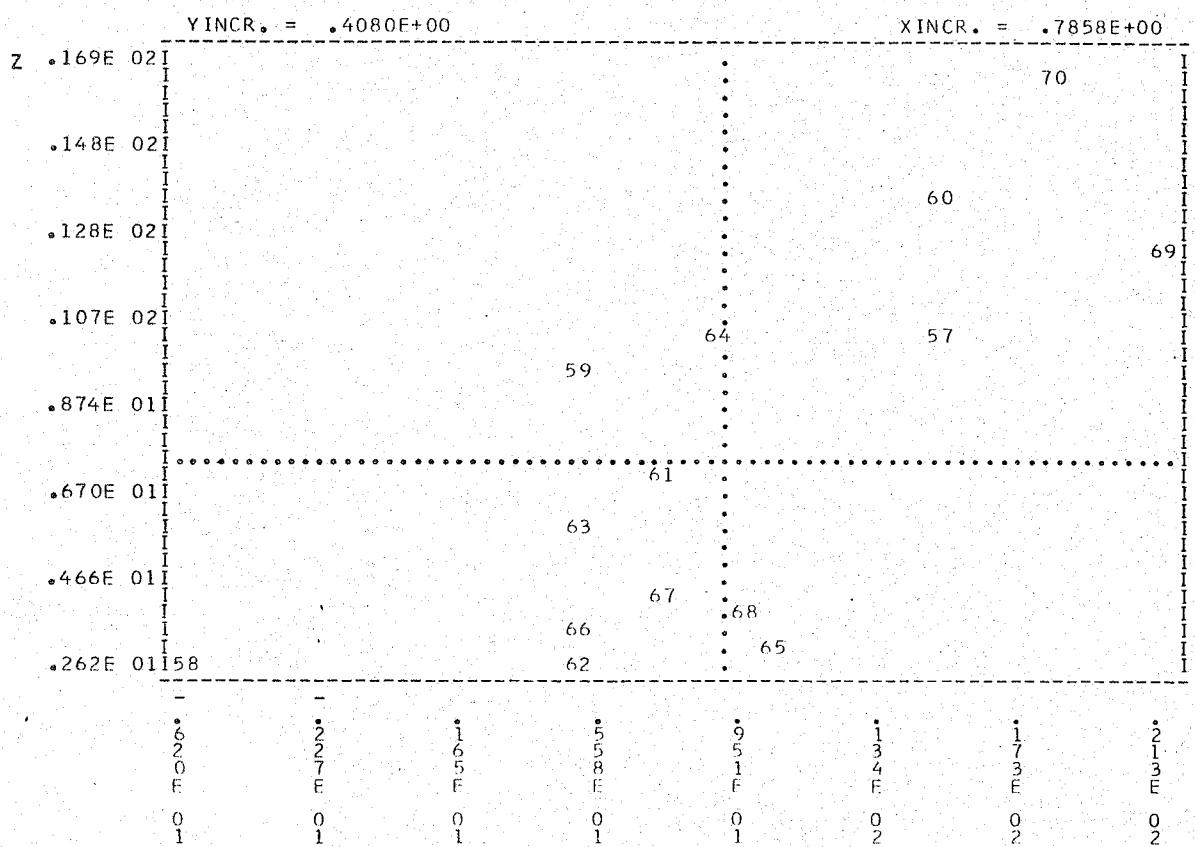
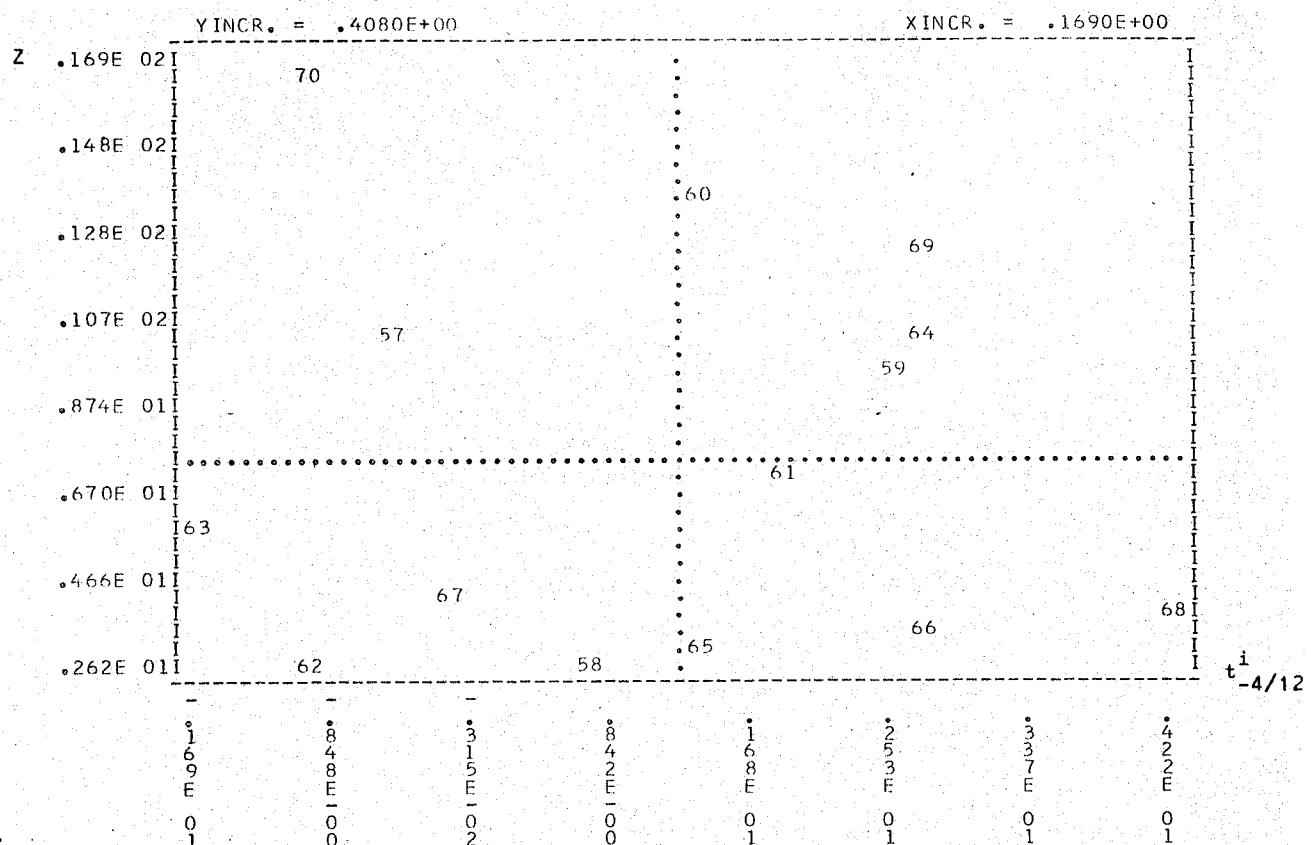
Residuals

DW=2.13



Scatter Diagram

Z E10.3



IMPLICIT DEFFLATOR OF GNP	p^y	E11.1
---------------------------	-------	-------

$$p^y = .306 u^w_{-3/12} + .113 \Delta p^o + .136 l^p_{-1} + .174 \Delta l^p + \\ + .043 t^i_{-1} - .037 d^h$$

Explanation of symbols

p^y implicit deflator of gross national product

u^w total output (less inventory changes and net invisibles)

p^o index of prices controlled by public authorities

l^p labour income per employee in the private sector

t^i incidence of indirect taxes minus subsidies

d^h index of domestic harvests

P^y

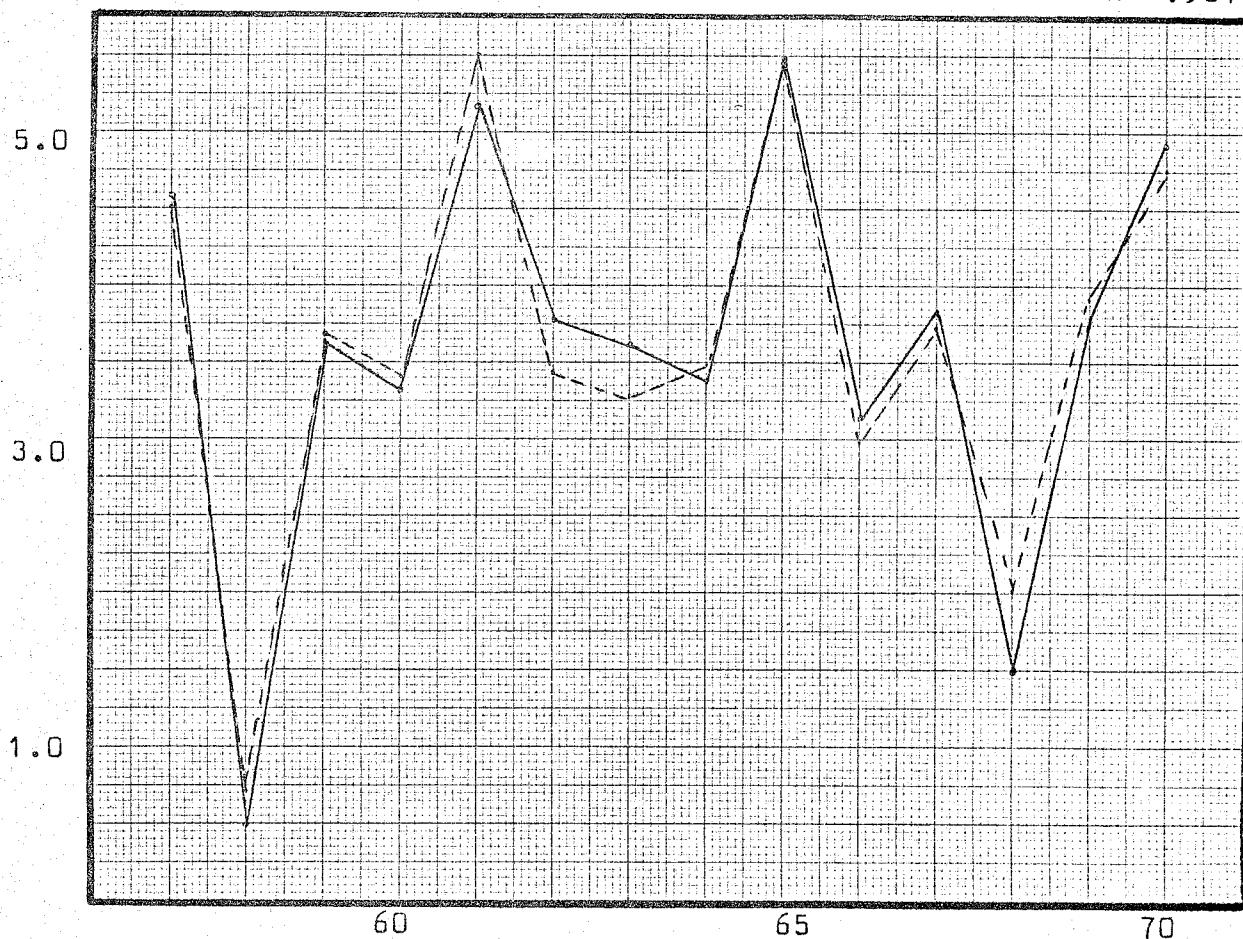
E11.2

Independent Variables

DF=8

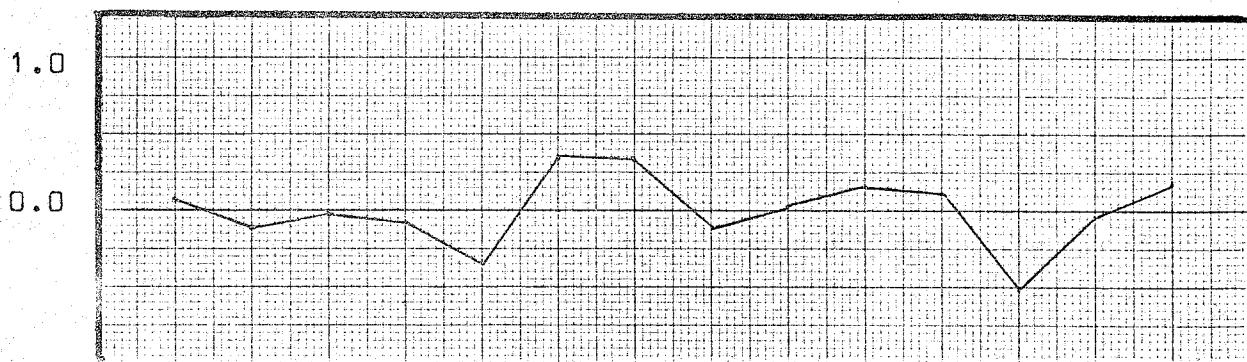
x_i	$U_{-3/12}^w$	ΔP_{t-1}^0	P_{t-1}	Δl^P	c_{t-1}^i	d^h
β_i	.306	.113	.136	.174	.043	-.037
$\hat{\sigma}_{\beta_i}$	.049	.025	.054	.073	.028	.004
$| \hat{\beta}_i / \beta_i |$	16 %	22 %	40 %	42 %	65 %	12 %

Prediction - - - Realization —

 $R^2 = .967$ 

Residuals

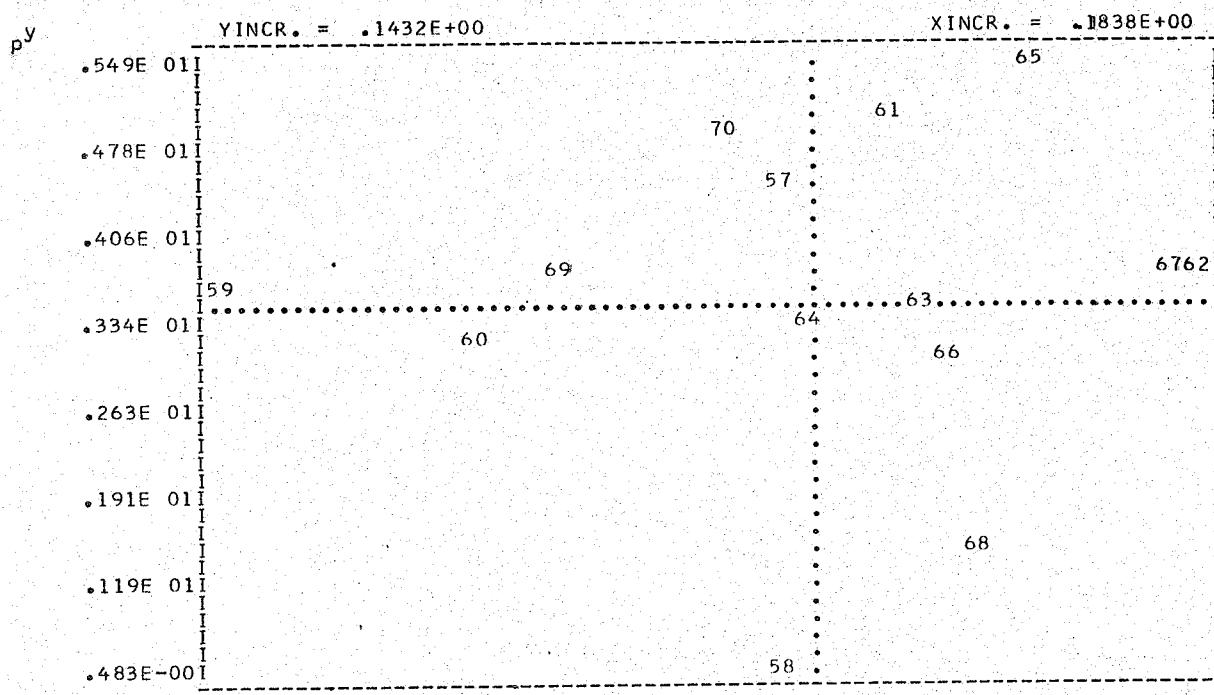
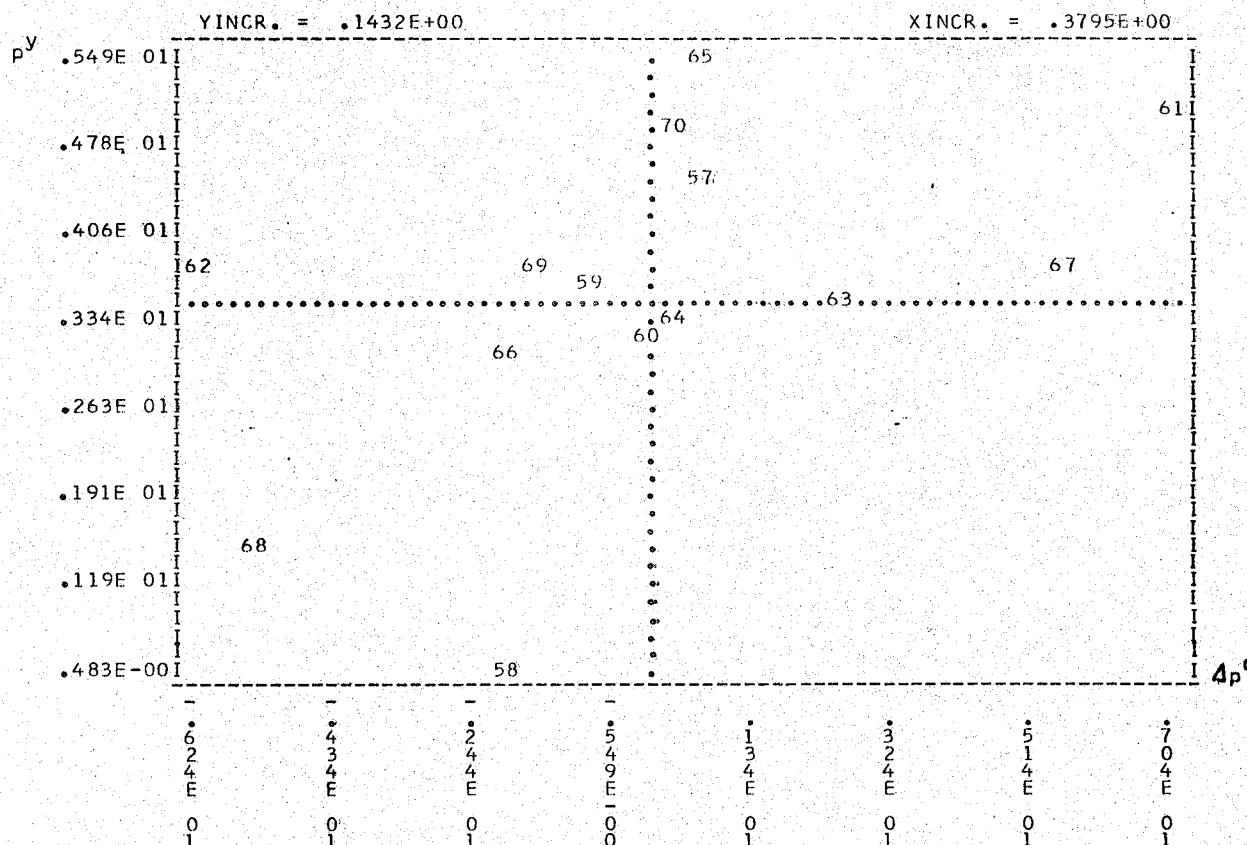
DW=1.94



Scatter Diagram

p^y

E11.3



3	4	5	6	7	8	9	10
8	7	6	5	4	3	2	1
6	8	7	6	5	4	3	2
F	E	E	E	F	E	E	F
0	0	0	0	1	0	0	1
1	1	1	1	0	1	0	2

IMPLICIT DEFULATOR OF TOTAL
EXPORT OF GOODS

p^X

E12.1

$$p^X = .141 l^P_{-1} + .111 \Delta X^W_{-1} + .430 \Delta p^{MW}$$

Explanation of symbols

p^X implicit deflator of total export of goods

l^P labour income per employee in the private sector

X^W total export of goods

p^{MW} implicit deflator of total import of goods

p^x

E12.2

Independent Variables

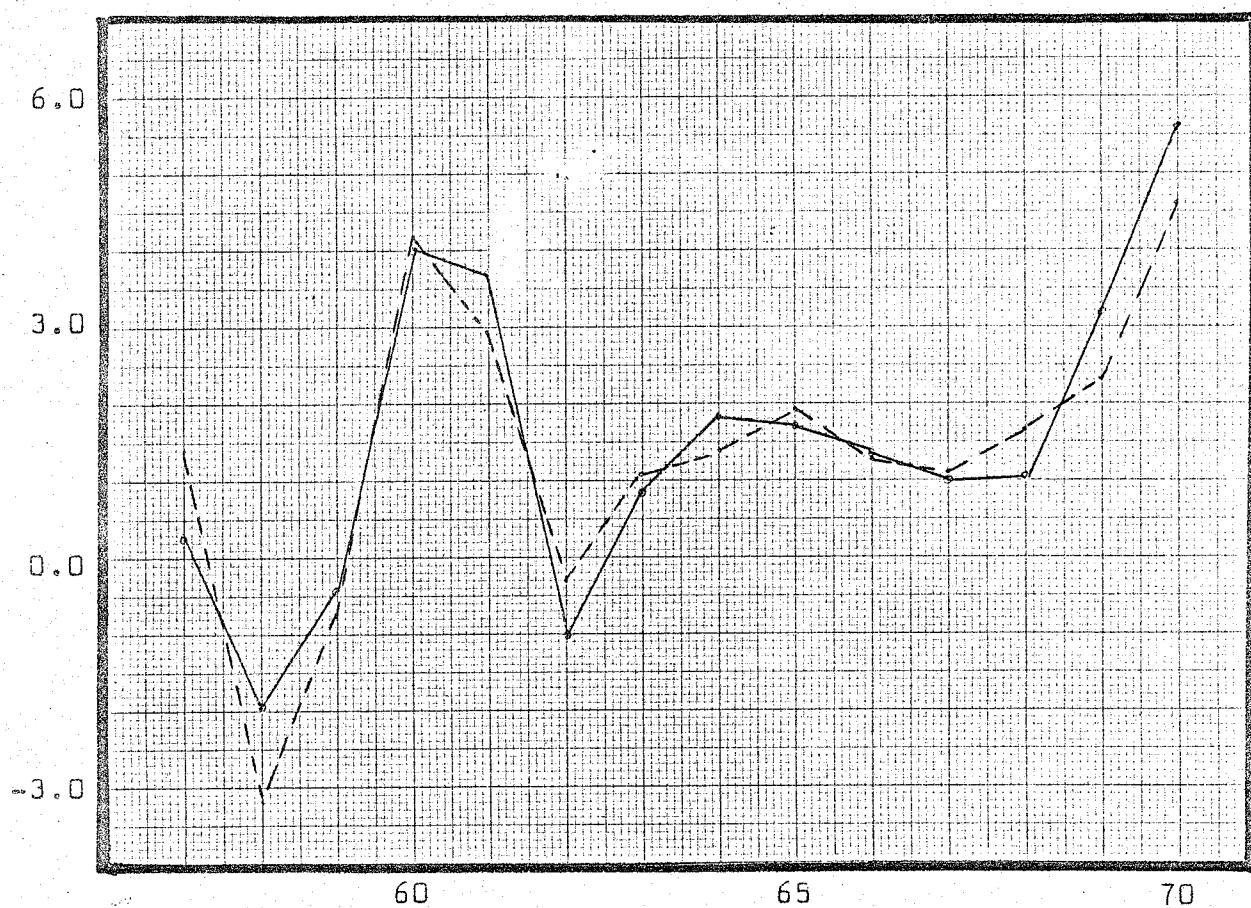
DF=11

p^x	I_{-1}^P	Δx_{-1}^W	Δp^{mw}
$\hat{\beta}_i$	.141	.111	.430
$\hat{G}\hat{\beta}_i$	.027	.028	.074
$|\hat{G}\hat{\beta}_i|/\hat{\beta}_i|$	19 %	25 %	17 %

Prediction - - -

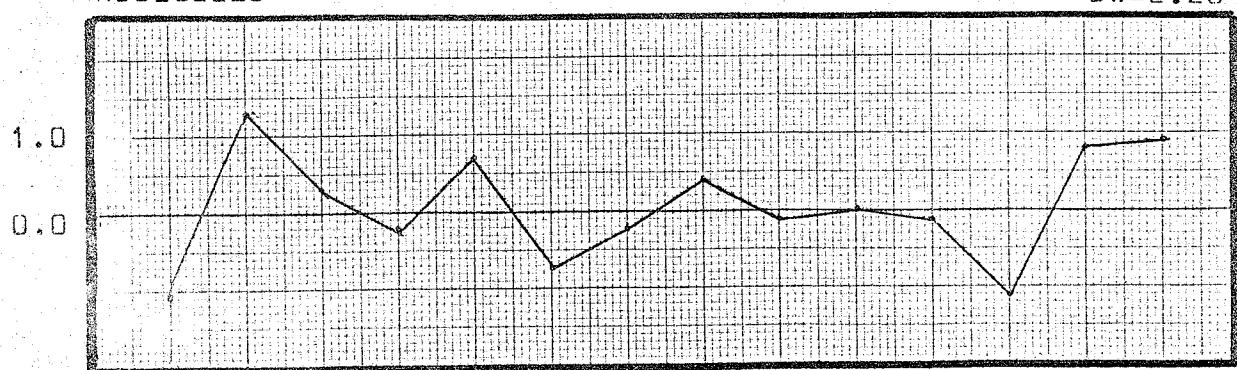
Realization —

$R^2 = .870$



Residuals

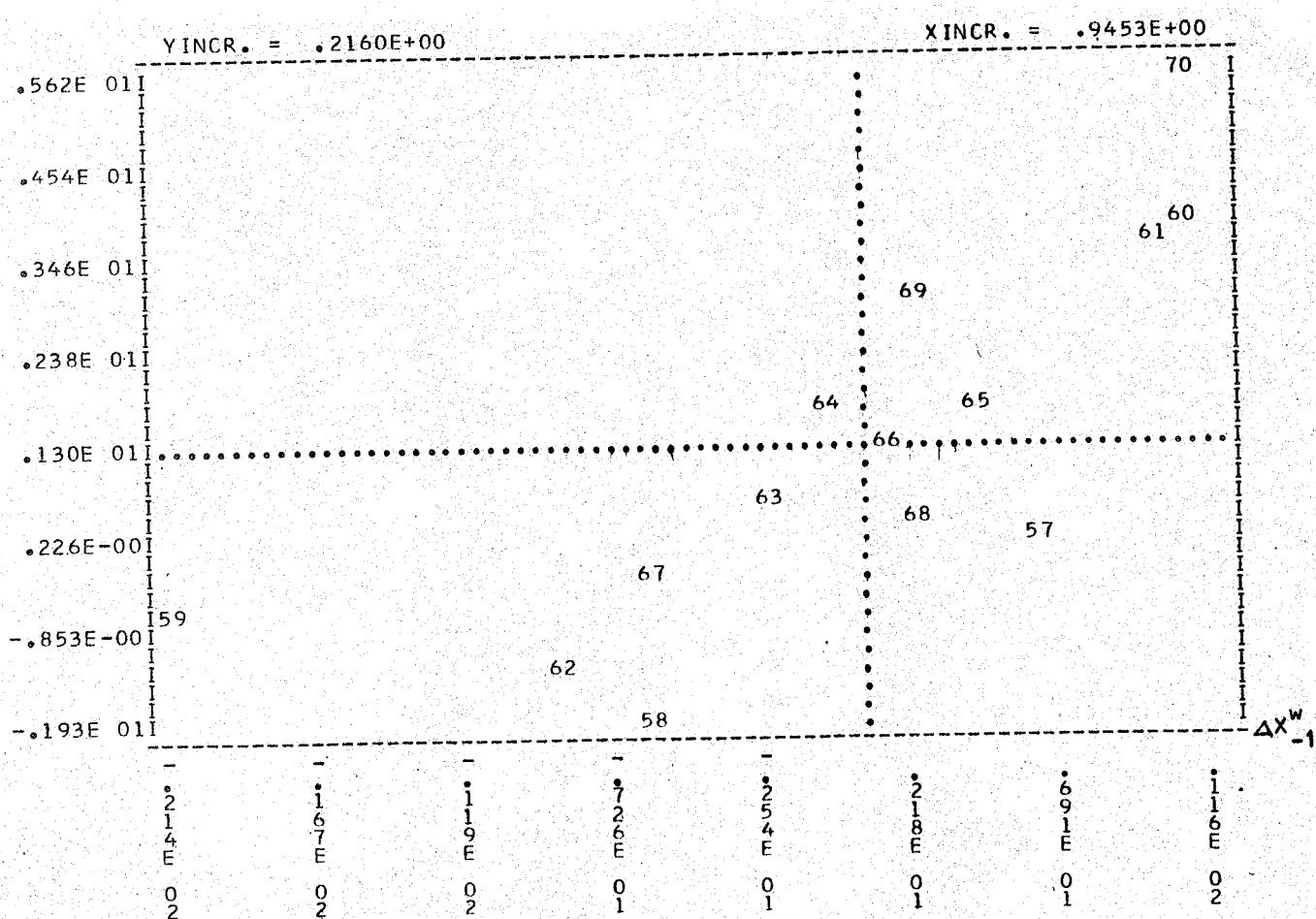
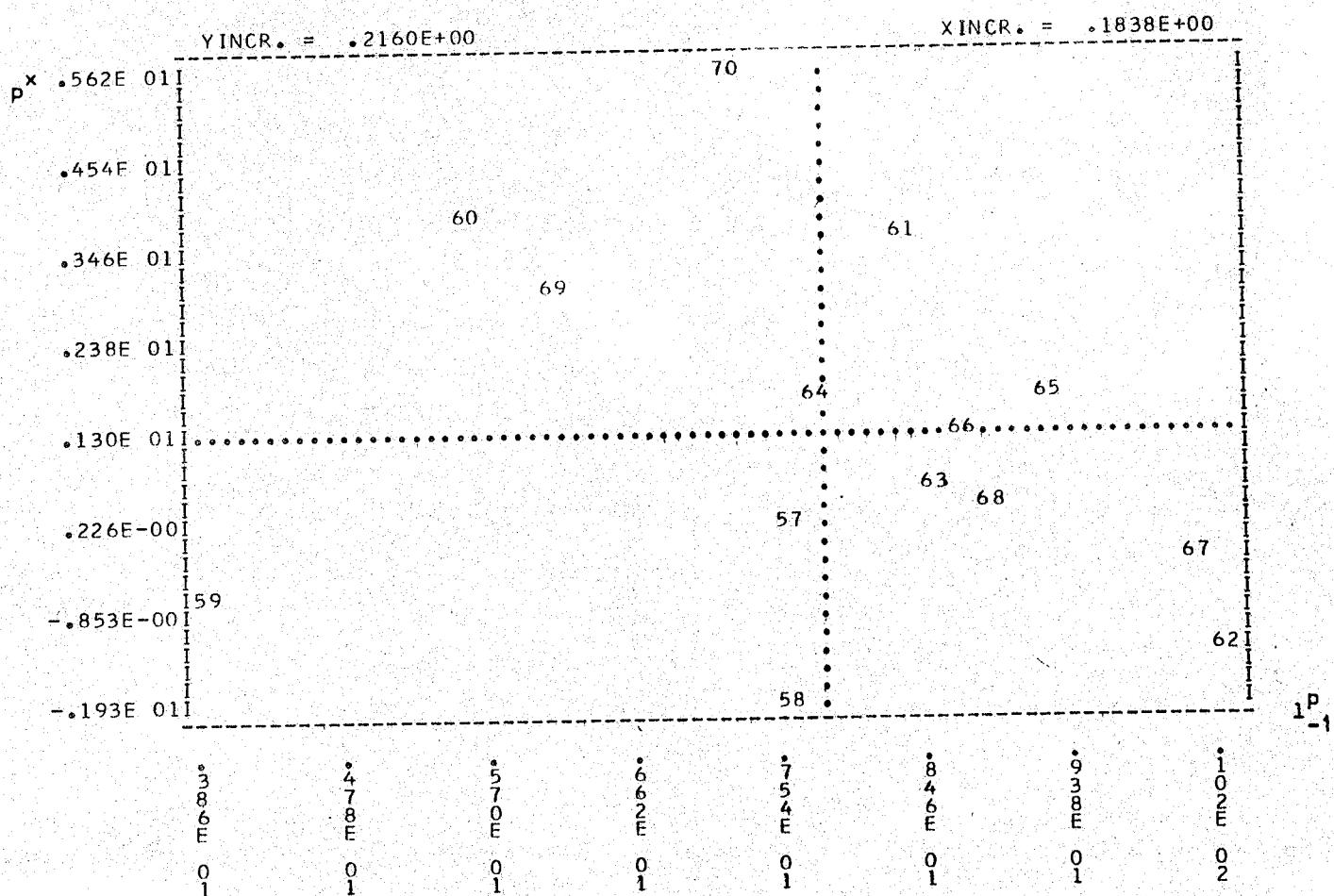
DW=2.20



Scatter Diagram

p^x

E12.3



IMPLICIT DEFULATOR FOR TOTAL
PRIVATE CONSUMPTION

p^c

E13.1

$$p^c = .264 c^p + .095 l^p + .086 p^o - .011 d^h + .155 p^{mw} \quad -6/12$$

Explanation of symbols

p^c implicit deflator for total private consumption

c^p total private consumption

l^p labour income per employee in the private sector

p^o index of prices controlled by public authorities

d^h index of domestic harvests

p^{mw} implicit deflator for total import of goods

P^C

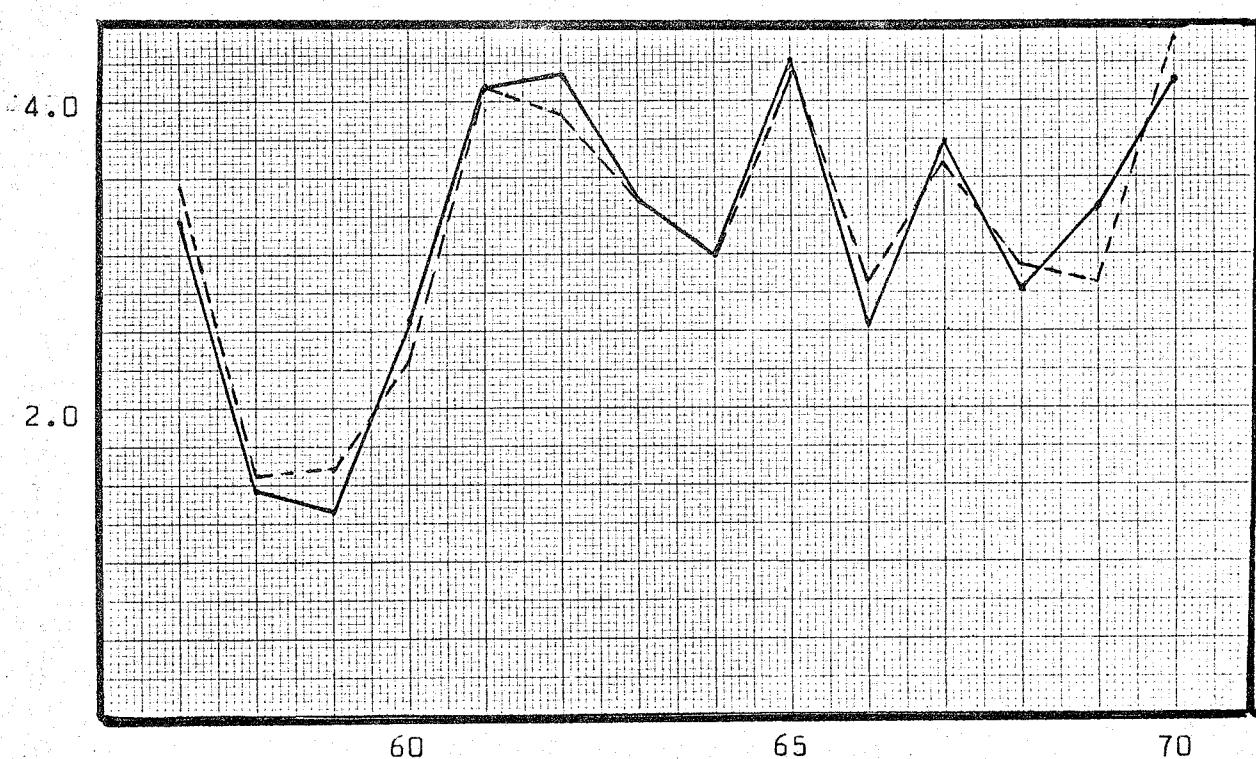
E13.2

Independent Variables

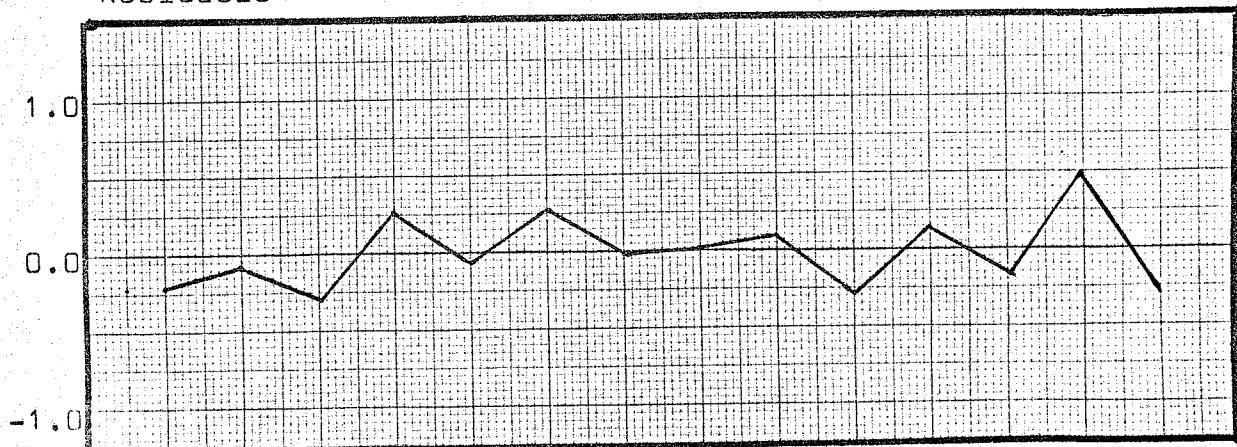
DF=9

x_i	c^P	l_{-1}^P	p^o	d^h	$\frac{mw}{P-6/12}$
$\hat{\beta}_i$	.264	.095	.086	-.011	.155
$\hat{\sigma}_{\hat{\beta}_i}$	.042	.050	.040	.004	.033
$|\hat{\beta}_i|/\beta_i|$	16 %	53 %	47 %	38 %	21 %

Prediction - - - Realization —

 $R^2 = .937$ 

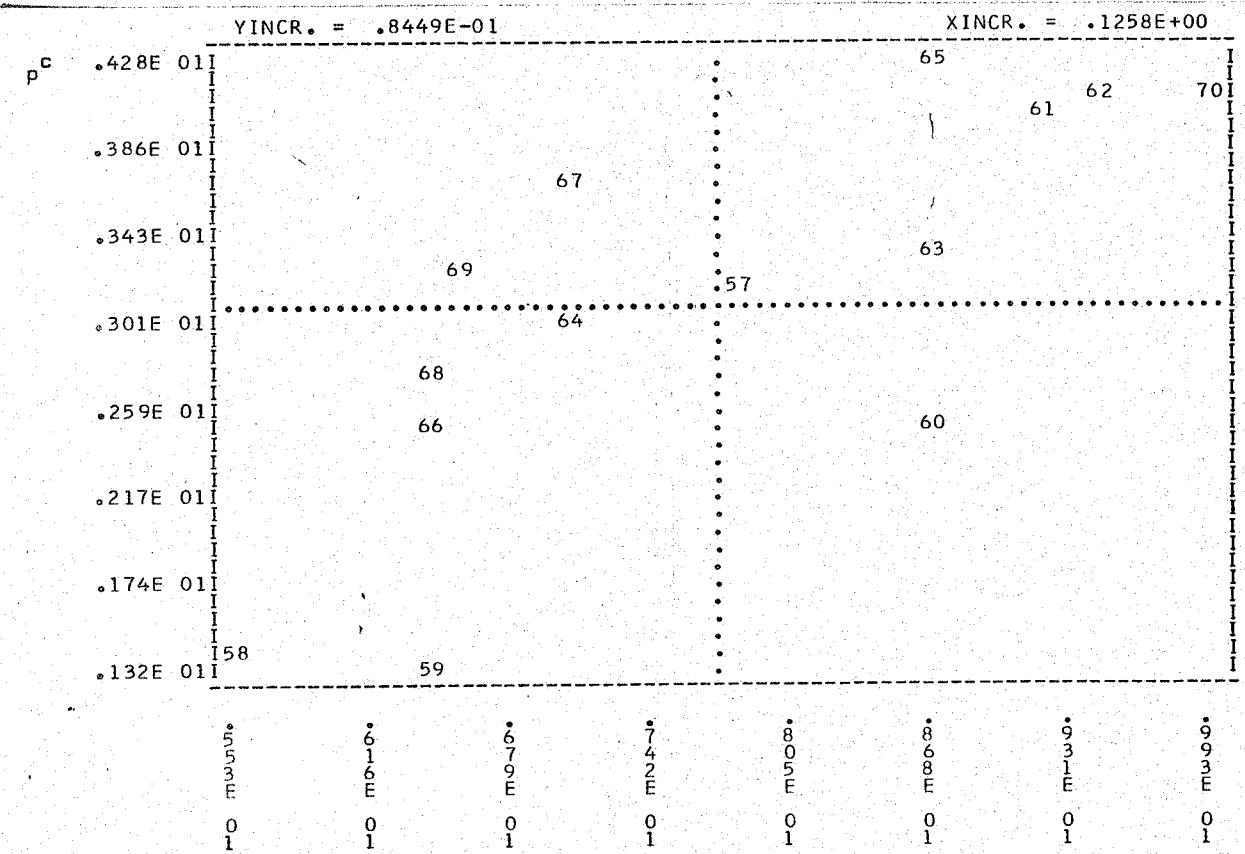
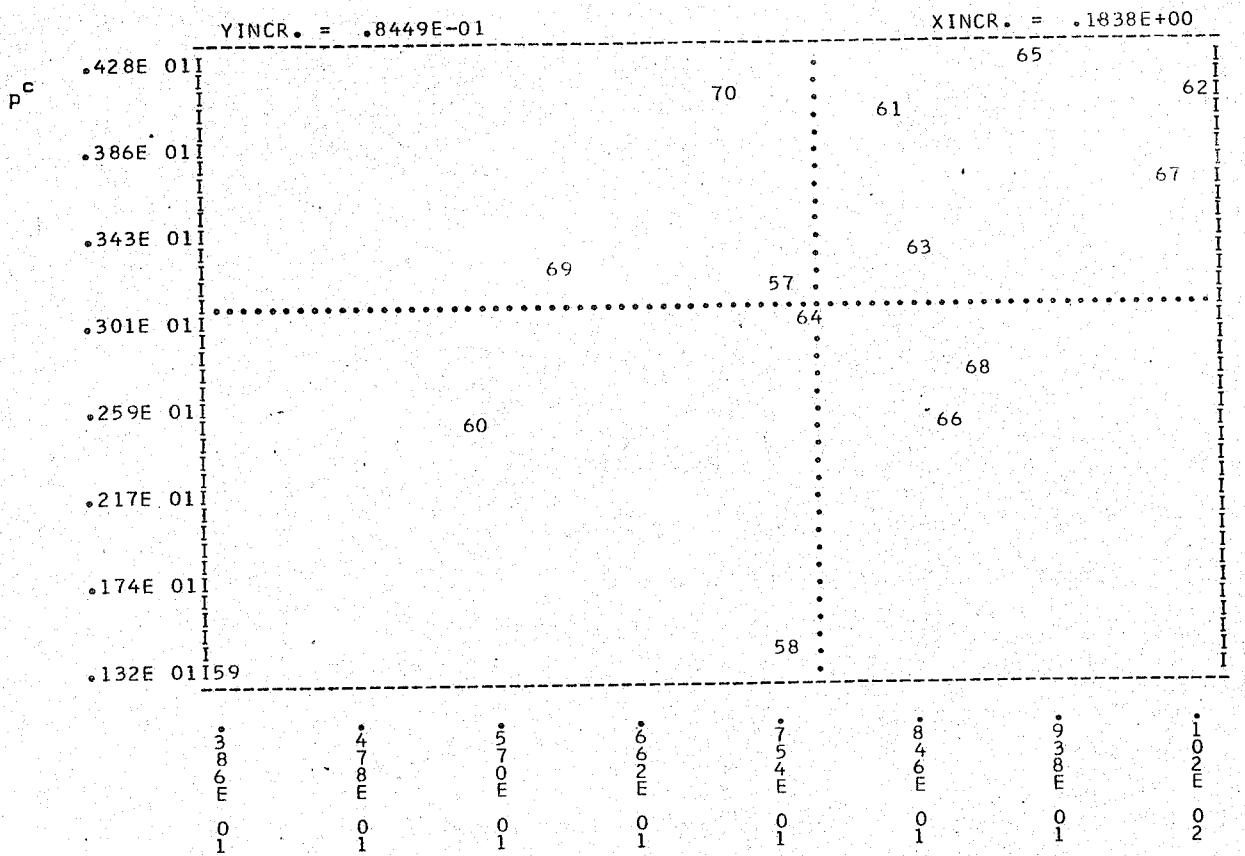
Residuals

 $DW = 2.73$ 

Scatter Diagram

p^c

E 13.3



CONSUMER PRICE INDEX	p^c'	E14.2
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$$p^c' = .310 \Delta c^P + .150 p^{mw} -1 + .385 l^P -1 - .013 \Delta d^h$$

Explanation of symbols

p^c' consumer price index

c^P total private consumption

p^{mw} implicit deflator for total import of goods

l^P labour income per employee in the private sector

d^h index of domestic harvests

P^c

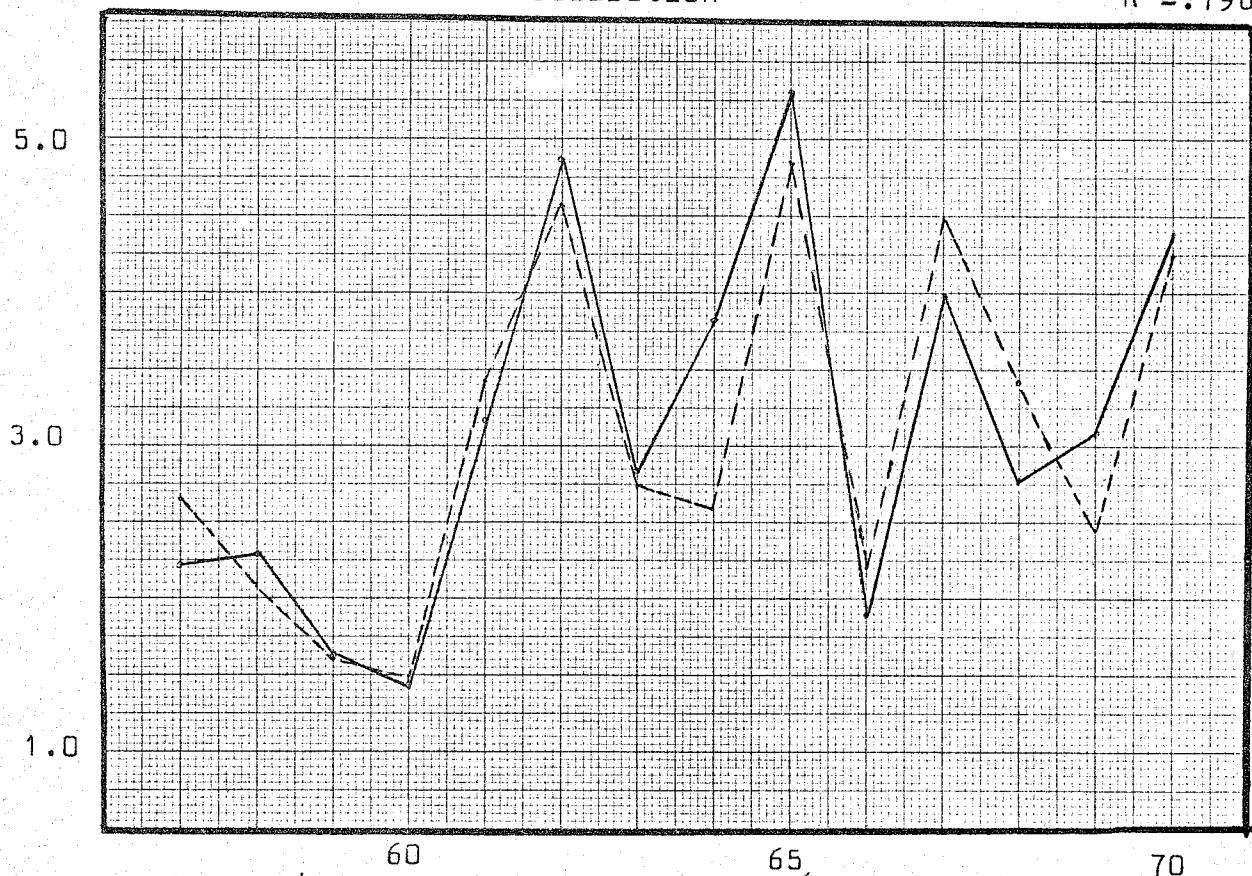
E14.2

Independent Variables

DF=10

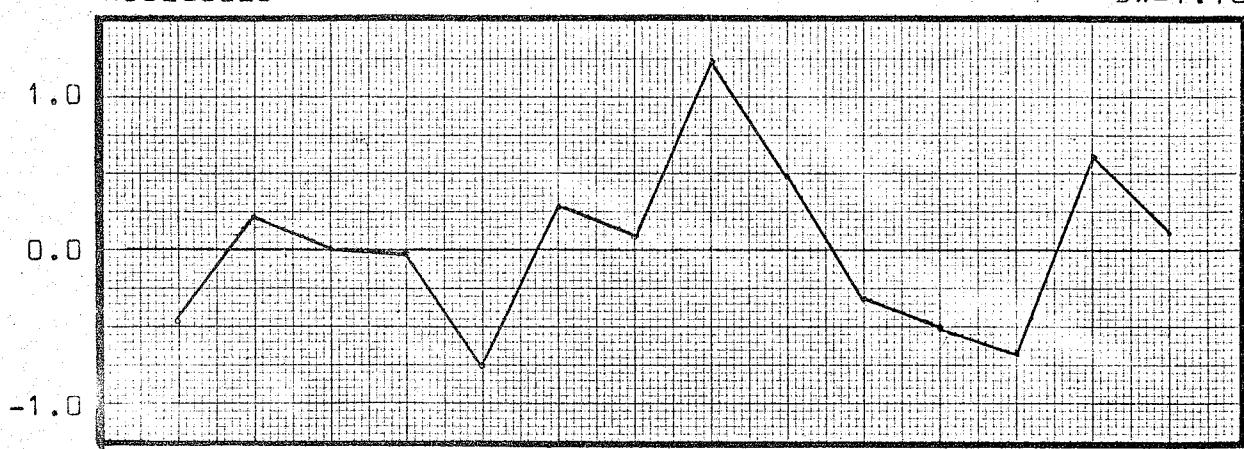
X_i	ΔC	P_{-1}^{mw}	ΔP_{-1}	Δd^h
$\hat{\beta}_i$	.310	.150	.385	-.013
$\hat{\theta}\hat{\beta}_i$	.102	.069	.019	.005
$|\hat{\theta}\hat{\beta}_i/\hat{\beta}_i|$	33 %	46 %	5 %	39 %

Prediction - - - Realization —

 $R^2 = .796$ 

Residuals

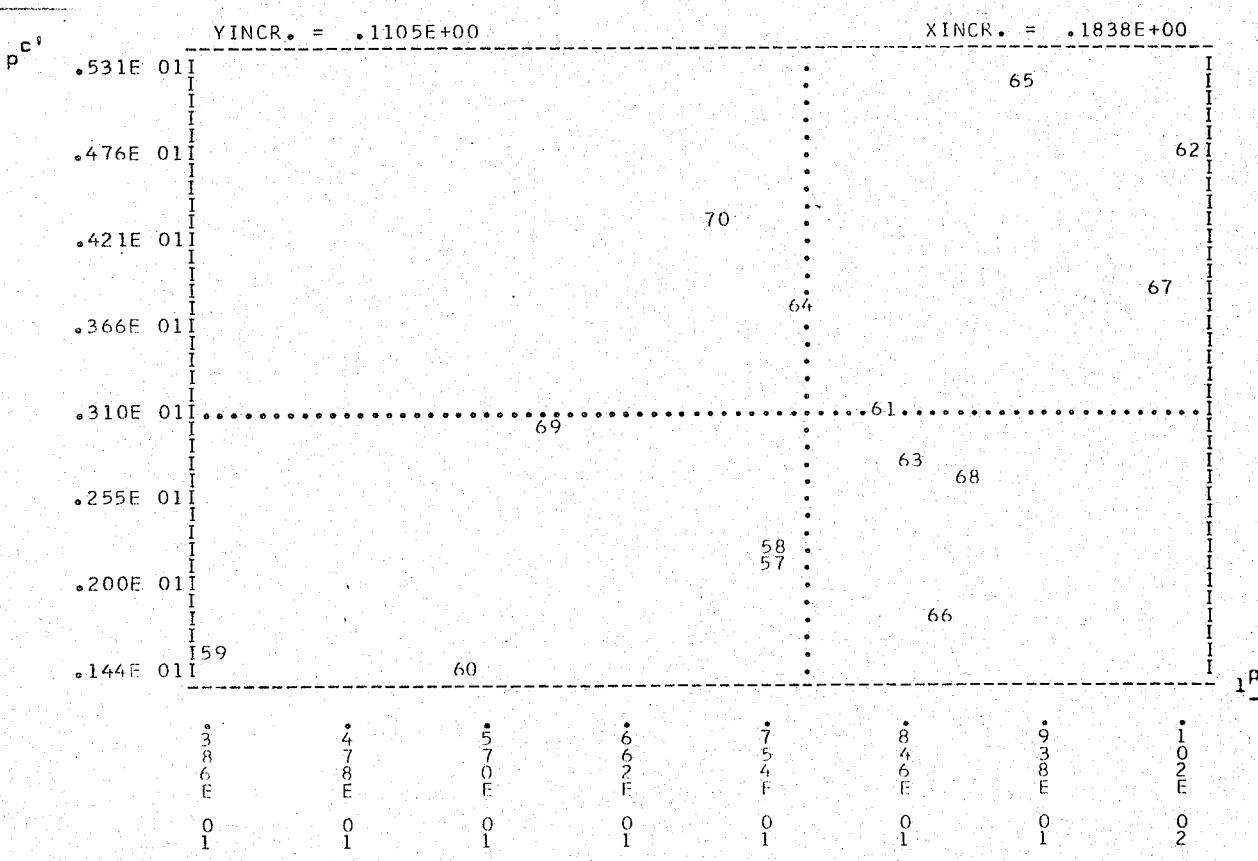
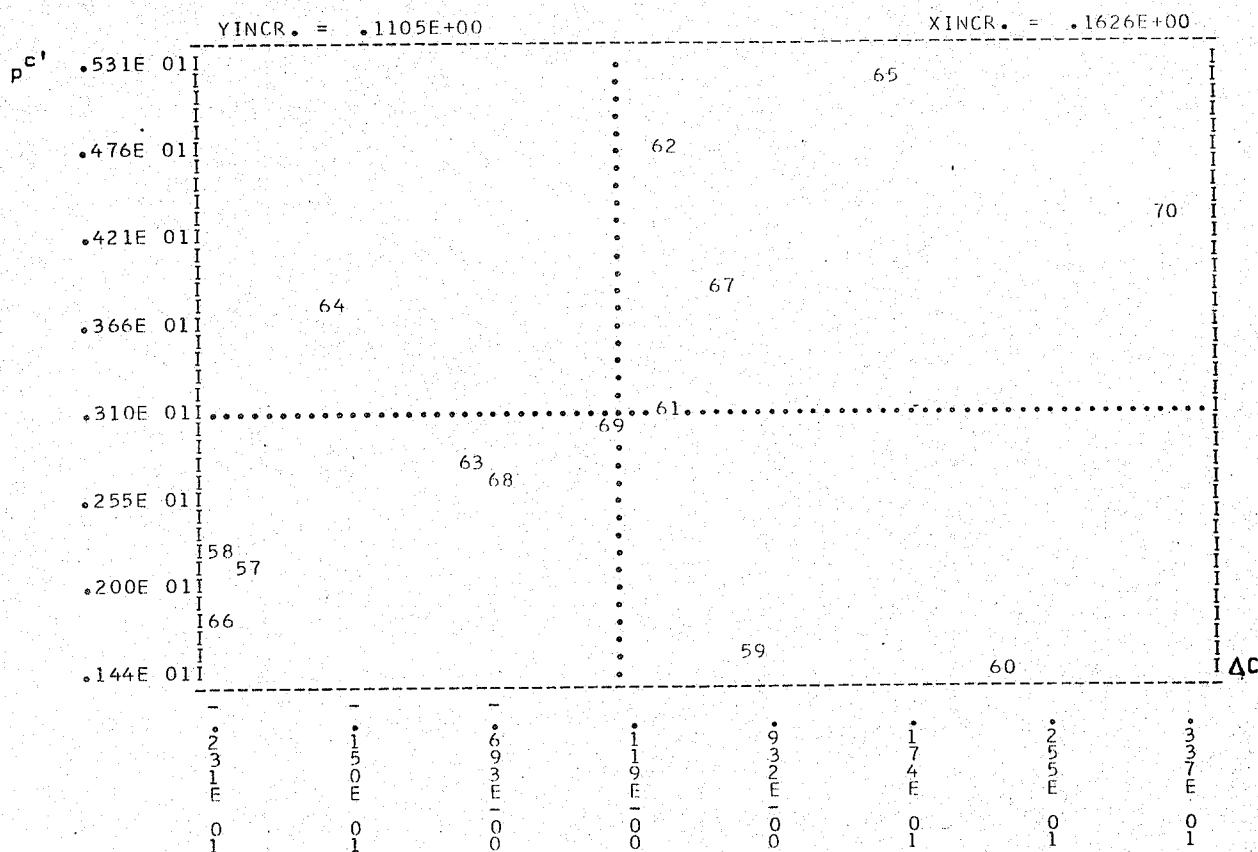
DW=1.70



Scatter Diagram

P C'

E14.3



IMPLICIT DEFULATOR OF PUBLIC CONSUMPTION	p^{co}	E15.1
--	----------	-------

$$p^{co} = .457 C^o + .235 \Delta C^o + .553 p^y$$

-4/12

Explanation of symbols

p^{co} implicit deflator of public consumption

C^o public consumption

p^y implicit deflator of gross national product

P^{CO}

E15.2

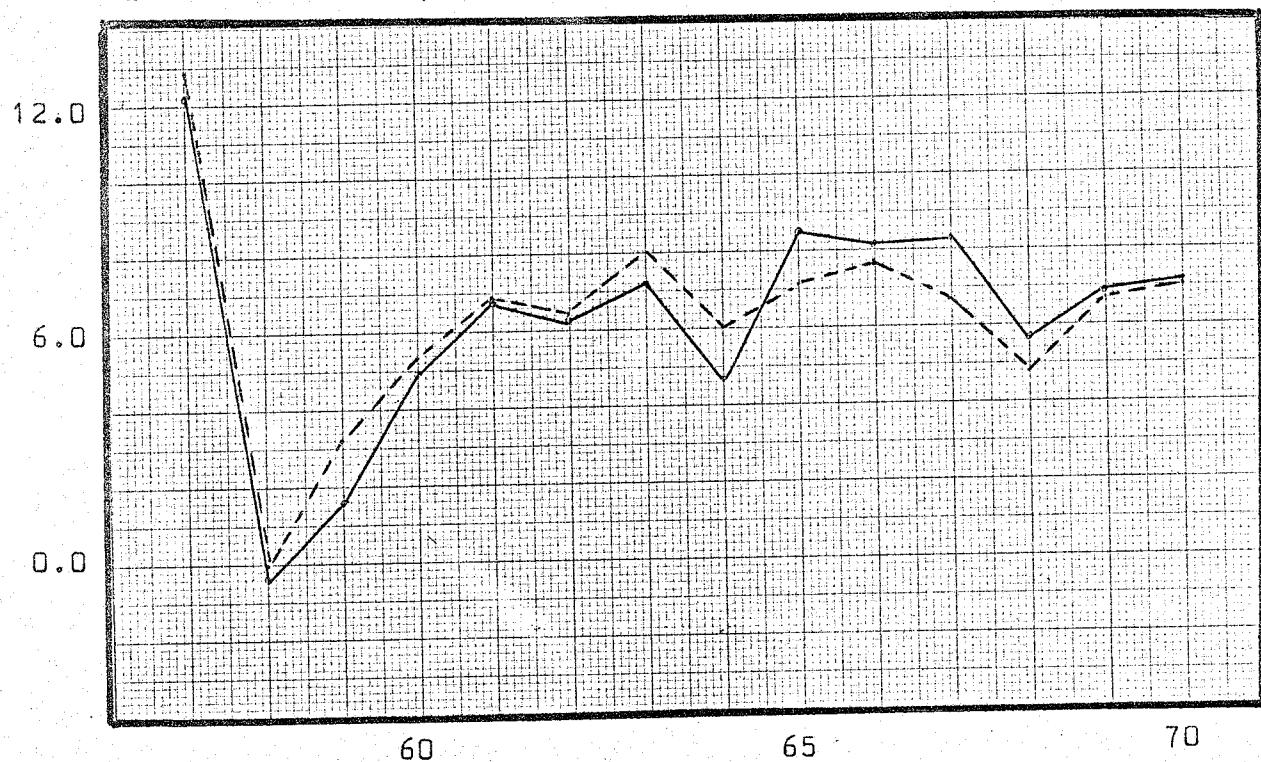
Independent Variables

DF=11

X_i	C^o	ΔC^o	$P_{-4/12}^y$
$\hat{\beta}_1$	.457	.235	.553
$\hat{\beta}_2$	.091	.061	.254
$|\hat{\beta}_i / \beta_i|$	20 %	26 %	46 %

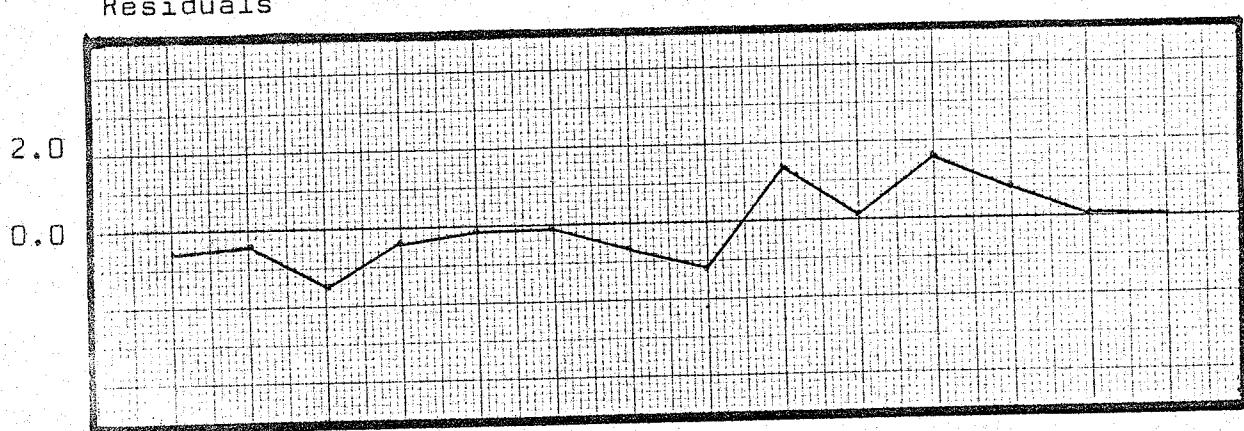
Prediction - - - , Realization —

$R^2 = .911$



Residuals

DW=1.23



Scatter Diagram

P^{CO}

E15.3

YINCR. = .3617E+00

XINCR. = .4231E+00

P^{CO}
 .122E 02I
 .104E 02I
 .859E 01I
 .678E 01I
 .498E 01I
 .317E 01I
 .136E 01I
 -.445E-00I 58

• 65 6766
 • 7069
 61 62 68
 60 64

57I

YINCR. = .3617E+00

XINCR. = .8458E-01

P^{CO}
 .122E 02I
 .104E 02I
 .859E 01I
 .678E 01I
 .498E 01I
 .317E 01I
 .136E 01I
 -.445E-00I 58

• 57
 • 67 66 65
 63
 69
 68
 6064
 59
 62
 70 61

• 183E 01 226E 01 268E 01 310E 01 352E 01 395E 01 437E 01 479E 01

IMPLICIT DEFULATOR OF GROSS PRIVATE
INVESTMENT IN EQUIPMENT

p^{ie}

E16.1

$$p^{ie} = 1.454 d^{e1} - 1.971 d^{e2} + .256 p^{mw} + .264 l^P$$

Explanation of symbols

p^{ie} implicit deflator of gross private investment
in equipment

d^{e1}
d^{e2}} dummy variables for p^{ep}

p^{mw} implicit deflator of total import of goods

l^P labour income per employee in the private sector

P^{ie}

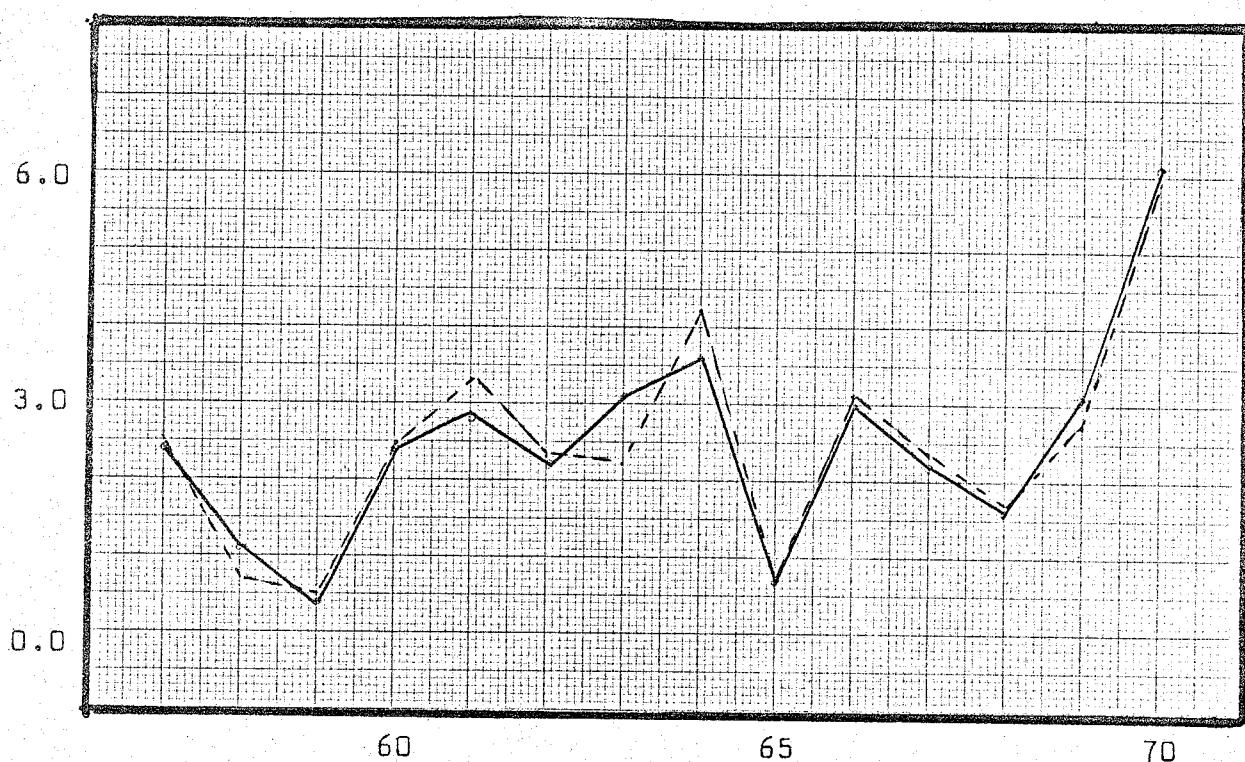
E16.2

Independent Variables

DF=10

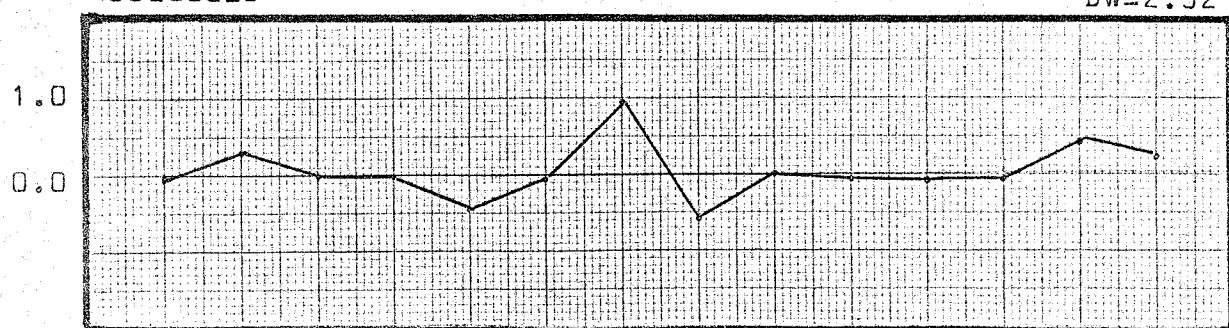
x_i	d^{e1}	d^{e2}	p^{mw}	l^p
β_i	1.454	-1.971	.256	.264
$\hat{\beta}_i$	.275	.452	.036	.016
$|\hat{\beta}_i/\beta_i|$	19 %	23 %	14 %	6 %

Prediction --- Realization —

 $R^2 = .930$ 

Residuals

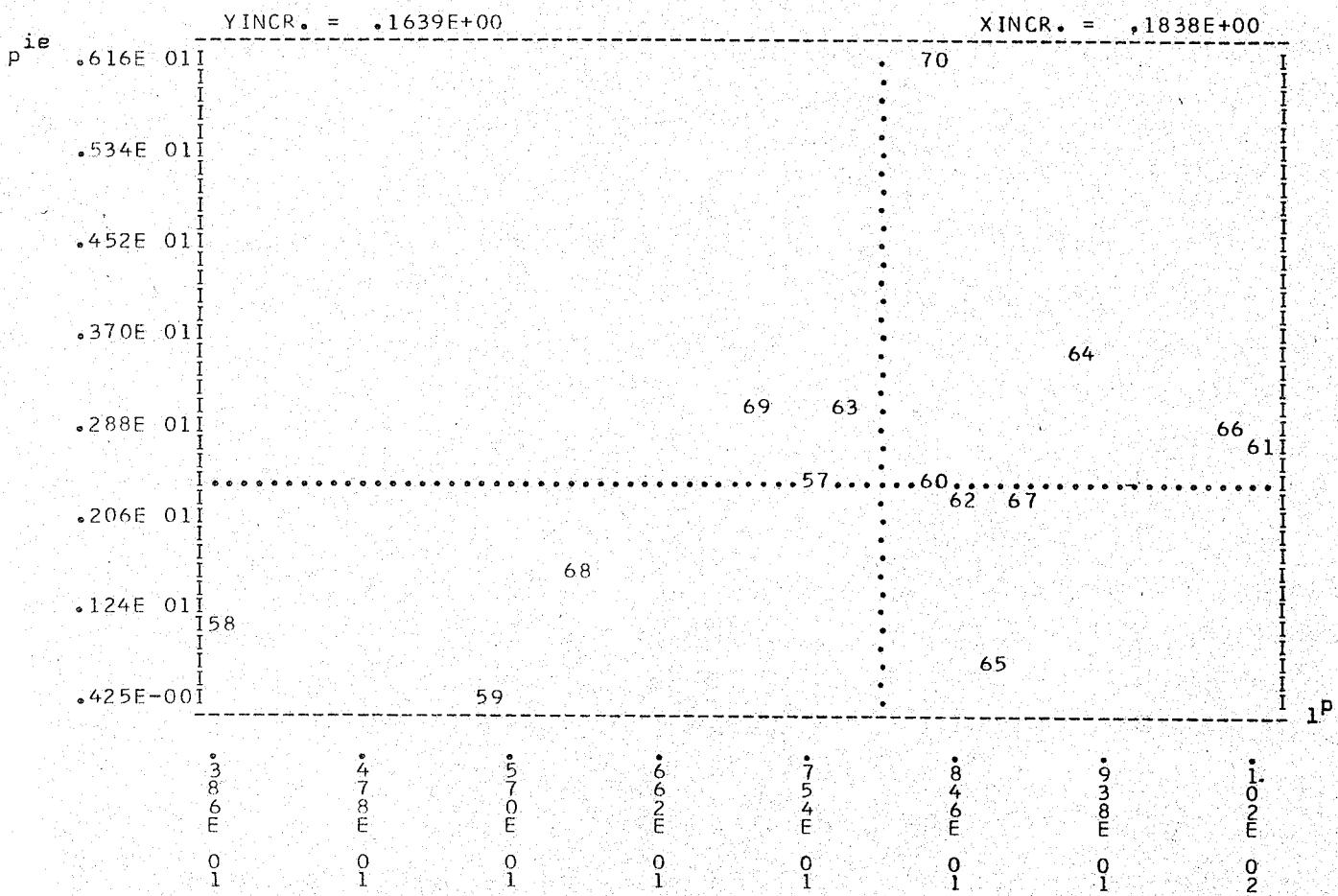
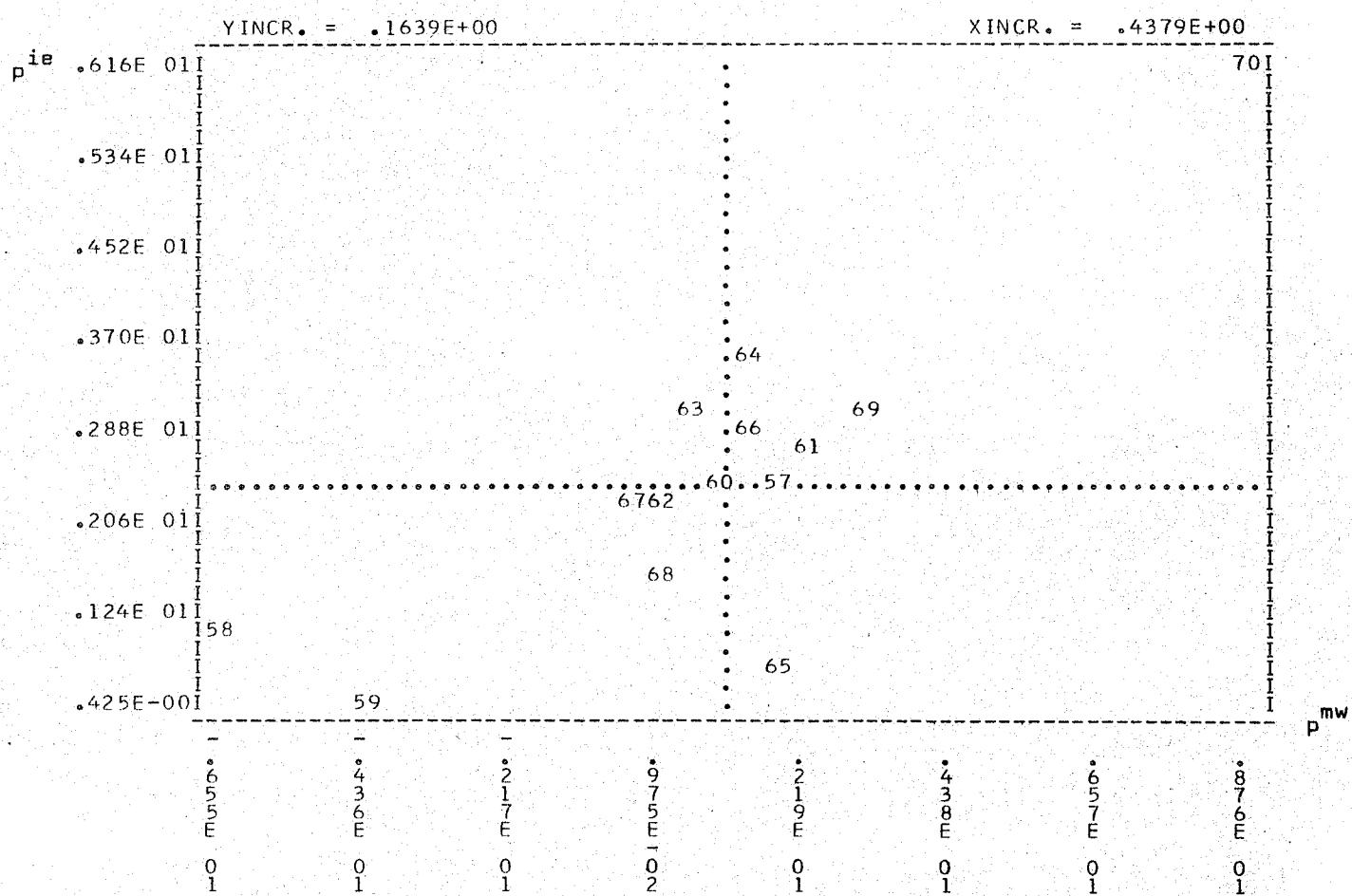
DW=2.52



Scatter Diagram

pie

E16.3



IMPLICIT DEFULATOR OF GROSS PRIVATE
INVESTMENT IN CONSTRUCTION

p^{ic}

E17.1

$$p^{ic} = 5.395 d^{ic} + .332 l^P + .343 \Delta \tilde{N}^f$$

-1

Explanation of symbols

p^{ic} implicit deflator of gross private investment
in construction

d^{ic} dummy variable of gross private investment in
construction

l^P labour income per employee in the private sector

N^f foreign employees

P^{ic}

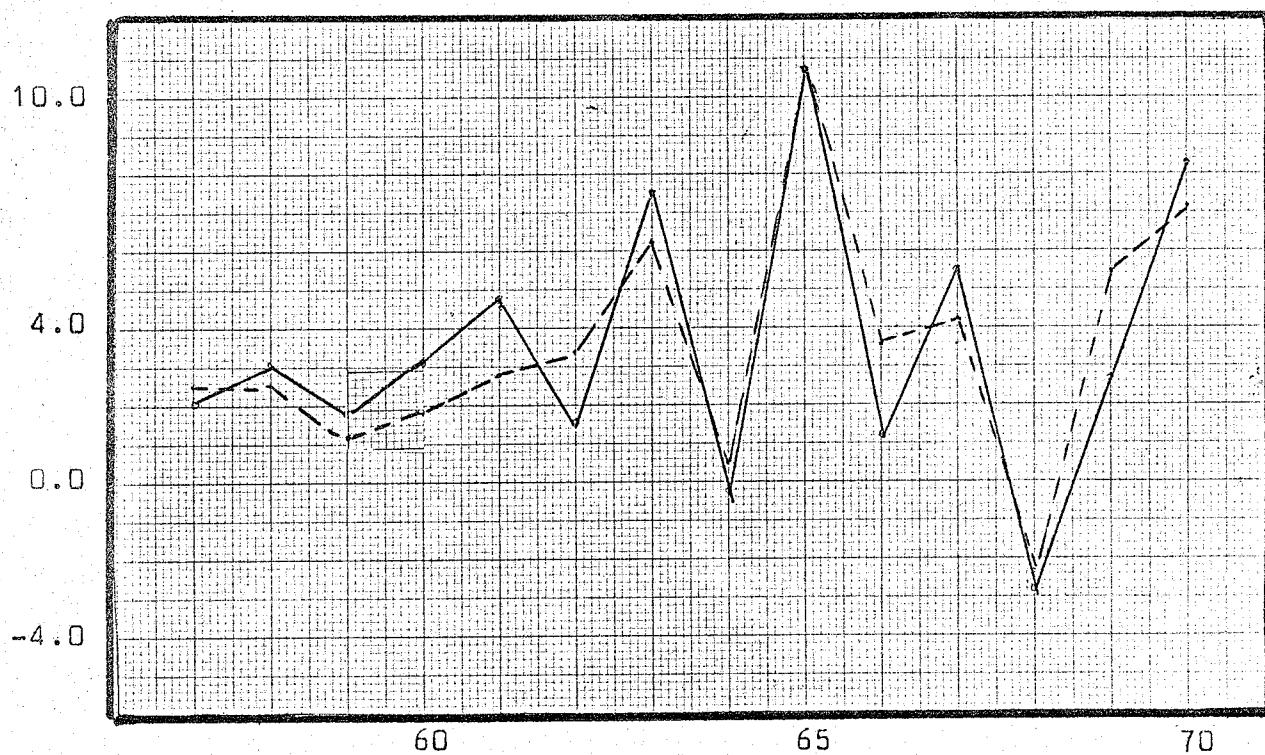
E17.2

Independent Variables

DF=11

x_i	d_{ic}	t_{-1}^p	$\Delta \hat{N}^f$
β_i	5.395	.332	.343
$\hat{\beta}_i$	1.780	.056	.062
$|\hat{\beta}_i / \beta_i|$	33 %	17 %	18 %

Prediction - - - Realization —

 $R^2 = .806$ 

Residuals

DW=2.64

