REGRESSION EQUATIONS IN TURINA

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1. INTRODUCTION

- This paper presents the estimation process and the results of the regression equations in Turina.

- There are five types regression equations.

- First set final demand categories: Personal consumption, investment, export.

- Second set: value added side: profit and depreciation.

2. Two Databanks
2.1 Macro databank (macro.stb)

- #\head Table of Turina data bank.
- #\dates 98 99 00 01 02 03 04 05 06 07 08 09
- #\under =
- #\9 1 65 2 2 11
- \decs 1
- &
- ;
- ;Population and other variables
- Pop   ; Population (1000)
- GDPnt; Target gdp nominal by Ministry of Development
- GDPrt; Target gdp real by Ministry of Development
- def   ; GDP Deflator (1998 = 1.00)
- cpi   ; Consumer price index (1998 = 1.00)
- exrat ; Exchange rate (TL per US Dollar)
- ;
-

2.1 Macro databank (macro.stb) (Cont)

- ;Variables from Turina vam bank
- ;
- totfcehh   ; Final consumption expenditure of dom hh
- totfcenp   ; Final cons expend of nonprofit organizations
- totgfcf   ; Gross fixed capital formation
- totcivv   ; change in inventories
- totexp   ; Total exports
- totimp   ; Total imports
- totfd   ; Final demand
- totout   ; Total output of all sectors (1-35)
- ;
- totwag   ; Total wage
- totpro   ; Total profit
- totdep   ; Total depreciation
- tottms   ; Total tax minus subsidies
- totva   ; Total value added
- ;

2.2 Vambank (Dyme.Def)

Vam.cfg file for the InterDyme Model of TURKEY TURINA
source file = C:\TURINA\DYME.DEF   (Q: Why not VAM.CFG?)
#--
#
#
1995 2028
#
- #   Matrices
- #
- am$ 35 35 p sectors.ttl sectors.ttl #   Input-output coefficient matrix in nominal, domestic + import
- am   35 35 p sectors.ttl sectors.ttl #   Input-output coefficient matrix in nominal, domestic + import
- amr   35 35 p sectors.ttl sectors.ttl #   Input-output coefficient matrix in real, domestic + import
- #
- #   Vectors
- #
- #   Final Demand side in Dollar terms
- #
- intout$ 35   1 0 sectors.ttl # Total Intermediate output, current price
- fcehh$ 35   1 0 sectors.ttl # Final consumption expenditure by households, current price
- fcenp$ 35   1 0 sectors.ttl # Final consumption expenditure by non-profit, current price
- fcegov$ 35   1 0 sectors.ttl # Final consumption expenditure by government, current price
- gfcf$ 35   1 0 sectors.ttl # Gross fixed capital formation, current price
- civv$ 35   1 0 sectors.ttl # Changes in inventory and valuables, current price
- exp$ 35   1 1 sectors.ttl # Exports, current price
- imp$ 35   1 1 sectors.ttl # Imports, current price
- fd$ 35   1 0 sectors.ttl # Final demand, current price
- ddtot$ 35   1 0 sectors.ttl # Domestic demand = fd+imp-exp, current price
- out$ 35   1 2 sectors.ttl # Gross output, current price
- #

2.2 Vambank (Dyme.Def) (Cont)

- #   Final Demand side in Million TL
- #
- intout   35 1 0 sectors.ttl # Total Intermediate output, current price
- fcehh   35 1 0 sectors.ttl # Final consumption expenditure by households, current price
- fcenp   35 1 0 sectors.ttl # Final consumption expenditure by non-profi, current price
- Fcegov 35 1 0 sectors.ttl # Final consumption expenditure by government, current price
- gfcf   35 1 0 sectors.ttl # Gross fixed capital formation, current price
- civv   35 1 0 sectors.ttl # Changes in inventory and valuables, current price
- exp   35 1 1 sectors.ttl # Exports, current price
- imp   35 1 1 sectors.ttl # Imports, current price
- fd   35 1 0 sectors.ttl # Final demand, current price
- ddtot   35 1 0 sectors.ttl # Domestic demand = fd+imp-exp, current price
- out   35 1 2 sectors.ttl # Gross output, current price
- #

2.3 LIST OF SECTORS

Agriculture, Hunting, Forestry and Fishing	c1
Mining and Quarrying	c2
Food, Beverages and Tobacco	c3
Textiles and Textile Products	c4
Leather, Leather and Footwear	c5
Wood and Products of Wood and Cork	c6
Pulp, Paper, Paper , Printing and Publishing	c7
Coke, Refined Petroleum and Nuclear Fuel	c8
Chemicals and Chemical Products	c9
Rubber and Plastics	c10

Other Non-Metallic Mineral	c11
Basic Metals and Fabricated Metal	c12
Machinery, Nec	c13
Electrical and Optical Equipment	c14
Transport Equipment	c15
Manufacturing, Nec; Recycling	c16
Electricity, Gas and Water Supply	c17
Construction	c18
Sale, Maintenance and Repair of Motor Vehicles and Motorcycles; Retail Sale of Fuel	c19
Wholesale Trade and Commission Trade, Except of Motor Vehicles and Motorcycles	c20

Retail Trade, Except of Motor Vehicles and Motorcycles; Repair of Household Goods	c21
Hotels and Restaurants	c22
Inland Transport	c23
Water Transport	c24
Air Transport	c25
Other Supporting and Auxiliary Transport Activities; Activities of Travel Agencies	c26
Post and Telecommunications	c27
Financial Intermediation	c28
Real Estate Activities	c29
Renting of M&Eq and Other Business Activities	c30

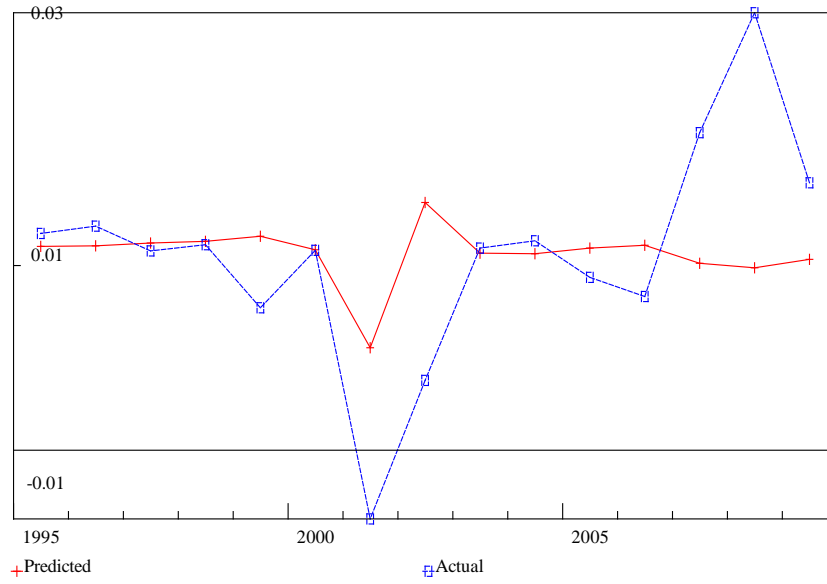|	
Public Admin and Defence; Compulsory Social Security	c31
Education	c32
Health and Social Work	c33
Other Community, Social and Personal Services	c34
Private Households with Employed Persons	c35
1	Sum

3. Consumption functions
3.1 Agriculture

- limits 1995 2009 2009
- ti 1 AGRICULTURE, HUNTING, FORESTRY AND FISHING
- f fcepc = fcehhR1/pop
- f wagr = wag1/cpi
- f pror = pro1/def
- f pci = (wagr + pror)/pop
- f relpri = pdd1/cpi
- r fcepc = pci,relpri
- :   1 AGRICULTURE, HUNTING, FORESTRY AND FISHING
-   SEE =   0.01 RSQ =   0.0733 RHO = 0.51 Obser =   15 from 1995.000
-   SEE+1 =   0.01 RBSQ = -0.0812 DW =   0.98 DoFree = 12 to   2009.000
-   MAPE =   50.92
-    Variable name   Reg-Coef Mexval Elas   NorRes   Mean   Beta
-    0 fcepc   - - - - - - - - - - - - - - - --------------------   0.01 - - -----
-    1 intercept   0.01427   2.9   0.98   1.08   1.00
-    2 pci   -2.02913   0.0   -0.12   1.06   0.00   -0.033
-    3 relpri   0.04791   3.1   0.15   1.00   0.05   0.287

Fig 3.1

1 AGRICULTURE, HUNTING, FORESTRY AND FISHING

3.2 MINING AND QUARRYING

- limits 1995 2009 2009
- ti 2 MINING AND QUARRYING
- f fcepc = fcehhR2/pop
- f wagr = wag2/cpi
- f pror = pro2/def
- f pci = (wagr + pror)/pop
- f relpri = pdd2/cpi
- r fcepc = pci,relpri

- :   2 MINING AND QUARRYING
- SEE =   0.00 RSQ   = 0.8864 RHO =   0.61 Obser =   15 from 1995.000
- SEE+1 =   0.00 RBSQ = 0.8674 DW =   0.79 DoFree =   12 to   2009.000
- MAPE =   194.48

Variable name	Reg-Coef	Mexval	Elas	NorRes	Mean	Beta
0 fcepc	- - - - - - - - - - - - - - - - - - -- - - - - - - - - --- -				0.01	- - -
1 intercept	-0.01460	28.5	-1.03	8.80	1.00	
2 pci	332.99822	120.9	2.37	3.78	0.00	0.671
3 relpri	-0.37288	94.5	-0.34	1.00	0.01	-0.569

2 MINING AND QUARRYING

Fig 3.2

- ti 3 FOOD , BEVERAGES AND TOBACCO

- f fcepc = fcehhR3/pop
- f wagr = wag3/cpi
- f pror = pro3/def
- f pci = (wagr + pror)/pop
- f relpri = pdd3/cpi

- r fcepc = pci,relpri
- :   3 FOOD , BEVERAGES AND TOBACCO
-   SEE =   0.01 RSQ = 0.6000 RHO =   0.47 Obser =   15 from 1995.000
-   SEE+1 =   0.01 RBSQ = 0.5333 DW =   1.07 DoFree =   12 to   2009.000
-   MAPE =   139.07

Variable name	Reg-Coef	Mexval	Elas	NorRes	Mean	Beta
0 fcepc	- - - - - - - - - - - - - - - - -		0.00	- - -		
1 intercept	-0.05453	53.3	-35.09	2.50	1.00	
2 pci	246.42655	57.0	36.07	1.00	0.00	0.780
3 relpri	-0.00038	0.1	0.02	1.00	-0.09	-0.031

3 FOOD , BEVERAGES AND TOBACCO

Fi

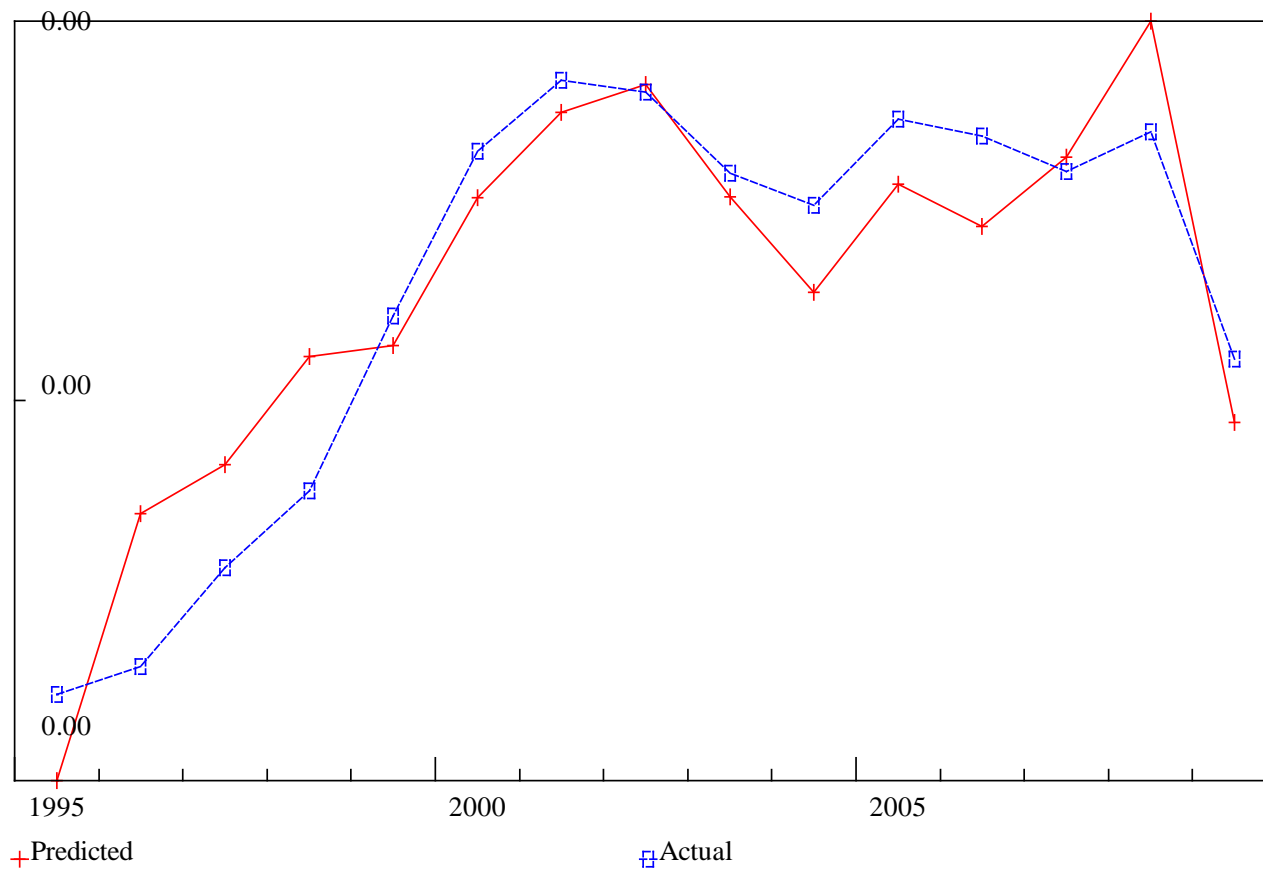+ Predicted   □ Actual

More consumption functions

- ti 17 ELECTRICITY, GAS AND WATER SUPPLY
- f fcepc = fcehhR17/pop
- f wagr = wag17/cpi
- f pror = pro17/def
- f pci = (wagr + pror)/pop
- f relpri = pdd17/cpi
- r fcepc = pci,relpri
- :   17 ELECTRICITY, GAS AND WATER SUPPLY
- SEE =   0.00 RSQ = 0.8435 RHO = 0.27 Obser = 15 from 1995.000
- SEE+1 =   0.00 RBSQ = 0.8174 DW = 1.46 DoFree = 12 to 2009.000
- MAPE =   25.58

Variable name	Reg-Coef	Mexval	Elas	NorRes	Mean	Beta
0 fcepc	- - - - - - - - - - - - - - - - - -			------	0.00 - - -	
1 intercept	-0.00030	0.5	-0.12	6.39	1.00	
2 pci	38.82198	129.1	2.91	5.11	0.00	0.978
3 relpri	-0.08408	126.1	-1.78	1.00	0.05	-0.962

17 ELECTRICITY, GAS AND WATER SUPPLY

+ Predicted   □ Actual

ti 19 Sale, maintenance and repair of m vehicles; resale of fuel
f fcepc = fcehhR19/pop
f wagr = wag19/cpi
f pror = pro19/def
f pci = (wagr + pror)/pop
f relpri = pdd19/cpi

r fcepc = pci,relpri
:   19 Sale, maintenance and repair of m vehicles; resale of fuel
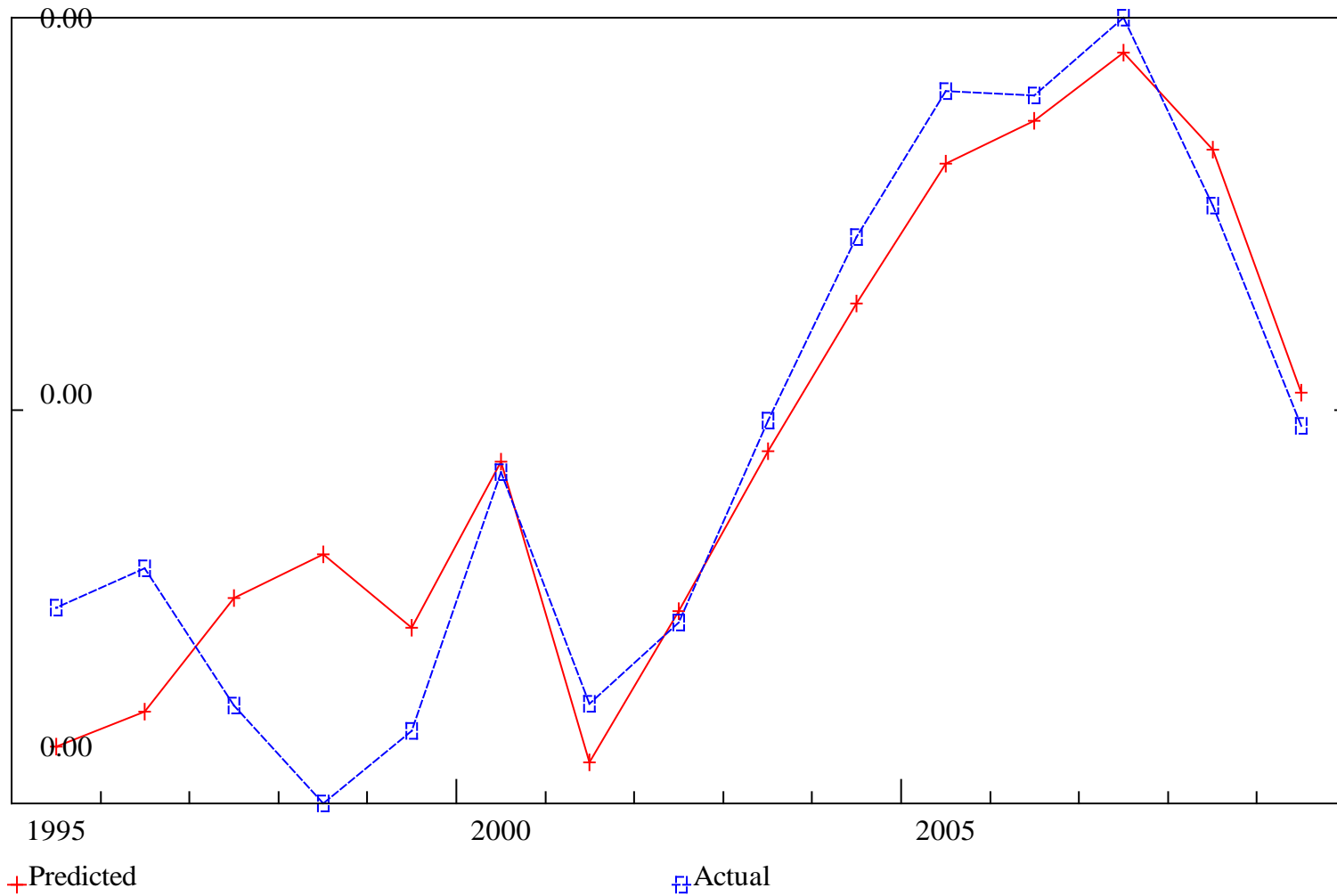 SEE =   0.00 RSQ = 0.8482 RHO = 0.53 Obser =   15 from 1995.000
 SEE+1 =   0.00 RBSQ = 0.8229 DW = 0.94 DoFree =   12 to   2009.000
 MAPE = 4.54

Variable name	Reg-Coef	Mexval	Elas	NorRes	Mean	Beta
0 fcepc	- - - - - - - - - - - - - - - - -	------------------			0.00 - - -	
1 intercept	0.00262	58.6	1.10	6.59	1.00	
2 pci	9.33521	83.0	0.81	3.12	0.00	0.609
3 relpri	-0.04035	76.7	-0.90	1.00	0.05	-0.579

19 Sale, maintenance and repair of m vehicles; rsale of fuel

Predicted   Actual

ti 20 Wholesale trade and commission tr, except m vehicles

f fcepc = fcehhR20/pop
f wagr = wag20/cpi
f pror = pro20/def
f pci = (wagr + pror)/pop
f relpri = pdd20/cpi
r fcepc = pci,relpri
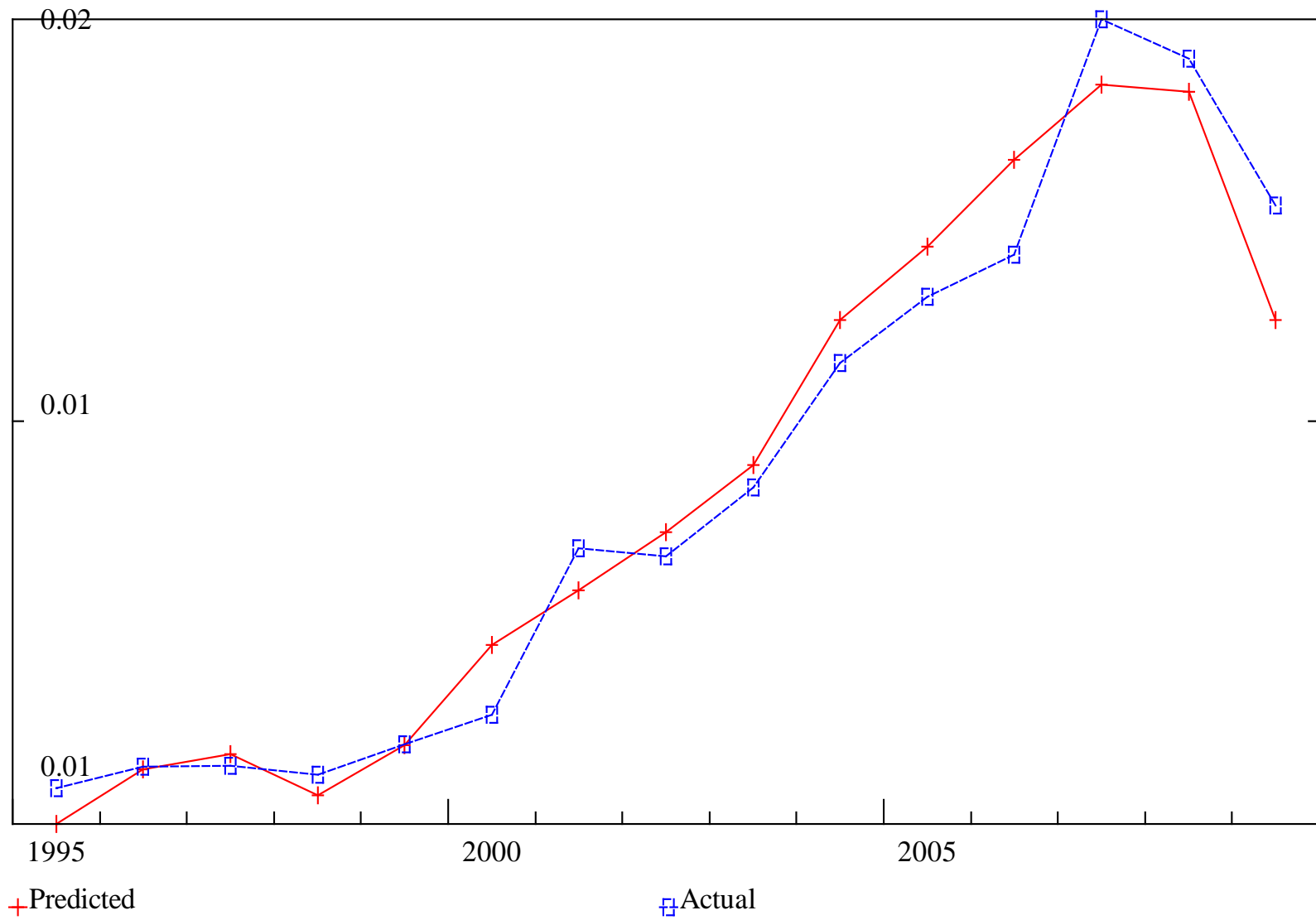:   20 Wholesale trade and commission tr, except m vehicles
 SEE =   0.00 RSQ = 0.9602 RHO = 0.27 Obser =   15 from 1995.000
 SEE+1 =   0.00 RBSQ = 0.9536 DW =   1.45 DoFree = 12 to   2009.000
 MAPE = 5.68

Variable name	Reg-Coef	Mexval	Elas	NorRes	Mean	Beta
0 fcepc	- - - - - - - - - - - - - - - - - -	------------------			0.01	- - -
1 intercept	0.00093	0.9	0.08	25.12	1.00	
2 pci	37.68118	174.8	1.72	24.86	0.00	0.643
3 relpri	-0.30197	398.6	-0.80	1.00	0.03	-1.227

20 Wholesale trade and commission tr, except m vehicles

Predicted   Actual

Comment on consumption function

- In the present model consumption in one sector is expressed as a function of sum of wages and profits earned in the same sector. However consumption in one sector depends on not only income in the same sector, but it depends on income generated by all sectors of the economy. We can say that the model is not specified properly (misspecification).
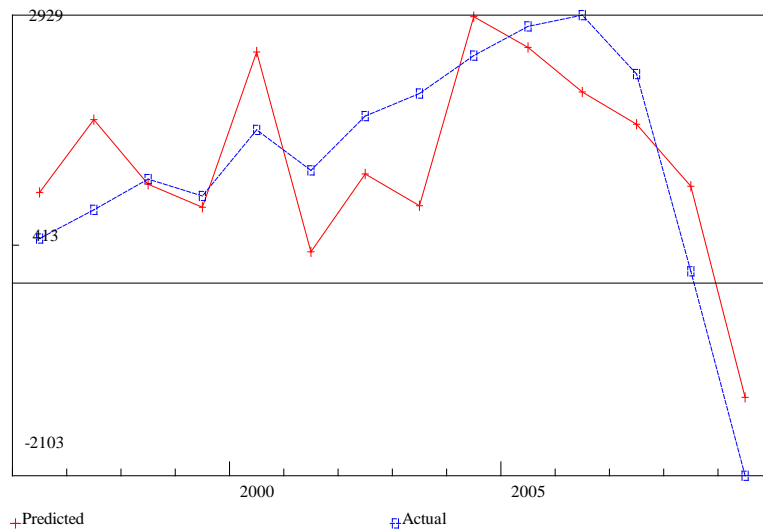
4. Fixed capital formation

4.1 MACHINERY, NEC

- limits 1996 2009 2009
- ti 13 MACHINERY, NEC
- f dout = outR13 - outR13[1]
- #r gfcf13 = dout, exp13[1]
- r gfcfR13 = pro13[1], dout
- :   13 MACHINERY, NEC
- SEE   =   731.48 RSQ   = 0.6639 RHO =   0.23 Obser =   14 from 1996.000
- SEE+1 =   720.95 RBSQ = 0.6028 DW =   1.54 DoFree =   11 to   2009.000
- MAPE =   92.62

Variable name	Reg-Coef	Mexval	Elas	NorRes	Mean	Beta
0 gfcfR13	- --------------------				1334.88	- - -
1 intercept	564.03661	8.4	0.42	2.98	1.00	
2 pro13[1]	0.04581	0.3	0.05	2.94	1512.80	0.045
3 dout	12.87664	71.4	0.53	1.00	54.48	0.822

13 MACHINERY, NEC

Predicted   Actual

Machinery nec

- limits 1996 2009 2009
- ti 15 TRANSPORT EQUIPMENT
- f dout = outR15 - outR15[1]
- #r gfcf15 = dout, exp15[1]
- r gfcfR15 = pro15[1], dout
- :   15 TRANSPORT EQUIPMENT
- SEE =   2197.46 RSQ = 0.7320 RHO = 0.70   Obser = 14 from 1996.000
- SEE+1 =   1656.07 RBSQ = 0.6833 DW = 0.60 DoFree = 11 to 2009.000
- MAPE =   231.69

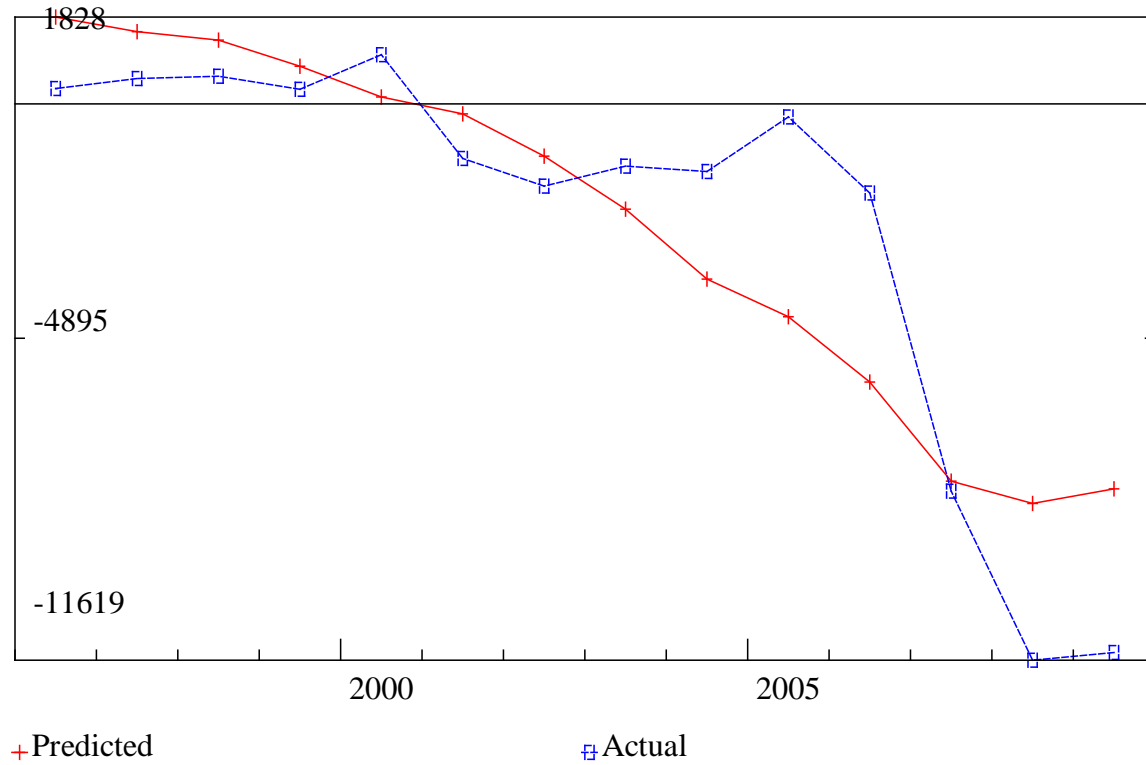| Variable name	Reg-Coef	Mexval	Elas	NorRes	Mean	Beta
0 gfcfR15	- - - - - - - - - - - - - - - - - -			-2575.95	- - -	
1 intercept	2103.85535	16.0	-0.82	3.73	1.00	
2 pro15[1]	-8.28770	84.4	1.76	1.02	547.08	-0.831
3 dout	-1.78149	1.1	0.06	1.00	81.84	-0.079

15 TRANSPORT EQUIPMENT

Fig 4.2 gfcf 15 Transport equipment

4. 3 Construction

- limits 1996 2009 2009
- ti 18 CONSTRUCTION
- f dout = outR18 - outR18[1]
- #r gfcf18 = dout, exp18[1]
- r gfcfR18 = pro18[1], dout
- :   18 CONSTRUCTION
-   SEE =   122.85 RSQ = 0.9054 RHO =   0.53 Obser =   14 from 1996.000
-   SEE+1 =   106.77 RBSQ = 0.8882 DW =   0.94 DoFree =   11 to   2009.000
-   MAPE =   6.12

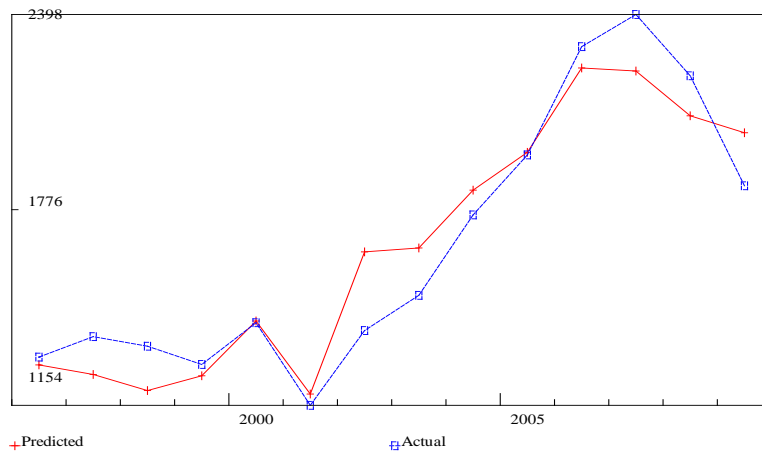| Variable name	Reg-Coef	Mexval	Elas	NorRes	Mean	Beta
0 gfcfR18	- - - - - - - - - - - - - - - - - - -			--------------	1658.97	- - -
1 intercept	1171.49141	494.7	0.71	10.57	1.00	
2 pro18[1]	0.04412	220.5	0.27	2.69	10115.99	0.968
3 dout	0.80569	63.9	0.02	1.00	51.03	0.413

Fig 4.3 Construction Investment

Comment on investment functions

- In this model investment (gfcf) is defined by producing sectors (investment by origin). In regression equations it is expressed as a function of change in output and profits in the same sector. Another example of misspecification. Investment should be treated by destination, i.e. investment demand by each of 35 sectors should be modeled.
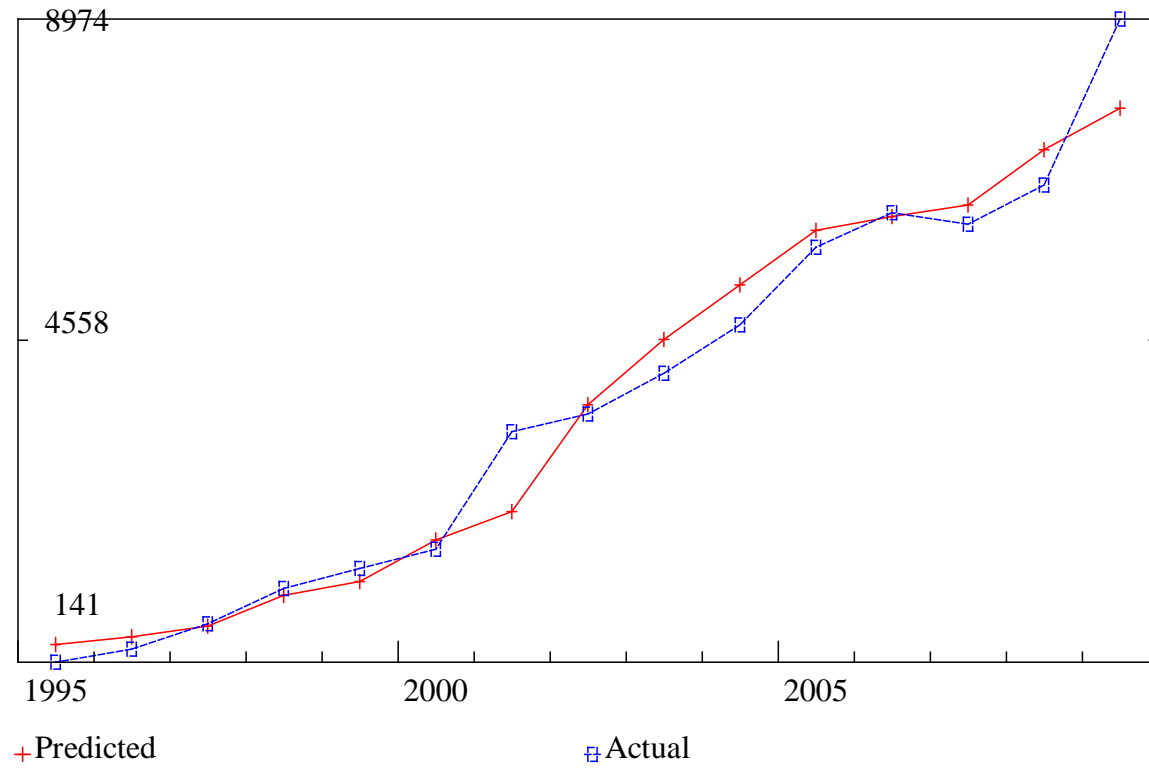
5. Export

5.1 Agriculture

- ti 1 AGRICULTURE, HUNTING, FORESTRY AND1995 FISHING

- r exp1 = out1
- :   1 AGRICULTURE, HUNTING, FORESTRY AND1995 FISHING
-   SEE   =   501.08 RSQ = 0.9640 RHO =   0.13 Obser =   15 from 1995.000
-   SEE+1 = 508.72 RBSQ = 0.9612 DW =   1.74 DoFree =   13 to   2009.000
-   MAPE =   22.67

Variable name	Reg-Coef	Mexval	Elas	NorRes	Mean	Beta
0 exp1	- - - - - - - - - - - - - - - - - -		- - - - - - - - - - - - - - - - - -		3669.89	- - ----
1 intercept	262.89915	4.9	0.07	27.78	1.00	
2 out1	0.06124	427.1	0.93	1.00	55630.83	0.982

Fig 5.1 Agriculture Export

5.2 Export
Textile and textile product

- ti 4 Textiles and textile

- r exp4 = out4
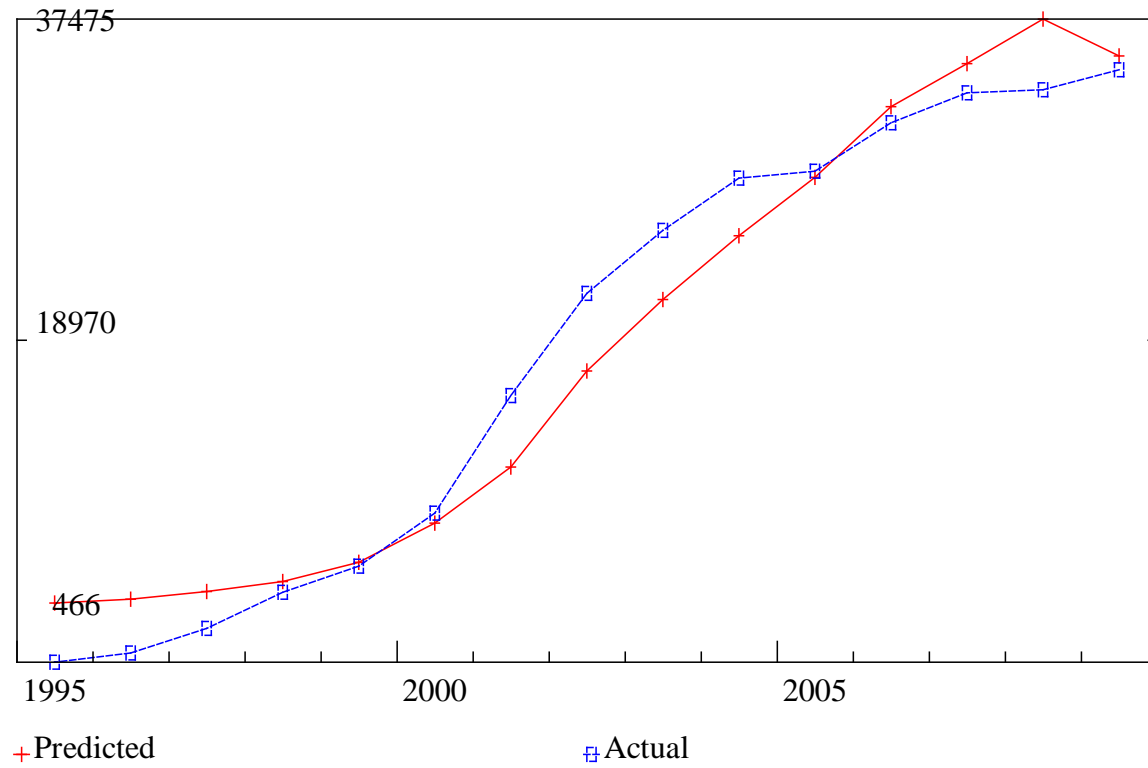
- :   4 Textiles and textile

  SEE   =   2725.87 RSQ   = 0.9547 RHO =   0.80 Obser =   15 from 1995.000

  SEE+1 =   1826.27 RBSQ = 0.9512 DW =   0.41 DoFree =   13 to   2009.000

- MAPE =   83.39

- Variable name   Reg-Coef Mexval Elas NorRes   Mean   Beta
- 0 exp4   -18380.76 - - -- - - -
- 1 intercept   3602.83438   31.5   0.20   22.09   1.00
- 2 out4   0.23114 370.0 0.80   1.00   63935.11 0.977
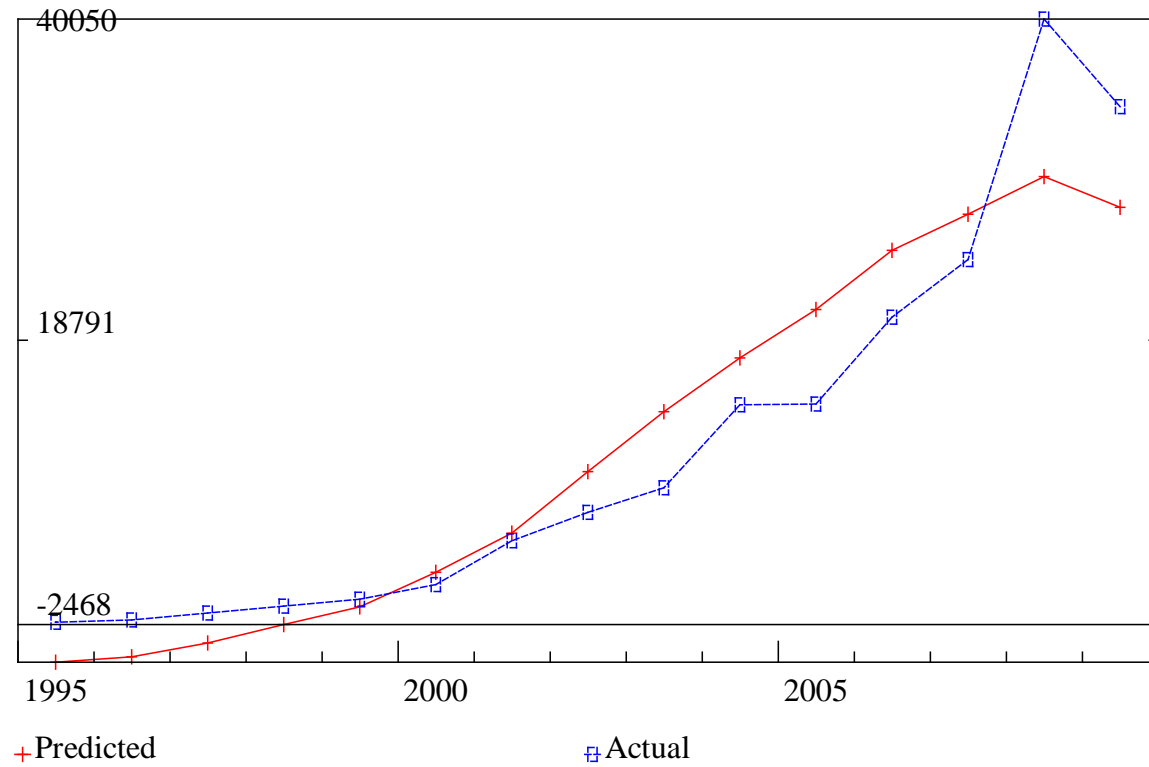
4 Textiles and textile

Fig. 5.2 Export in Textile

5.3 Export
Basic metals and fabricated metal

- ti 12 BASIC METALS AND FABRICATED METAL

- r exp12 = out12

- :   12 BASIC METALS AND FABRICATED METAL

 SEE   =   4340.97 RSQ = 0.8769 RHO =   0.60 Obser =   15 from 1995.000

 SEE+1 =   3620.84 RBSQ = 0.8674 DW =   0.81 DoFree = 13 to   2009.000

- MAPE =   212.67

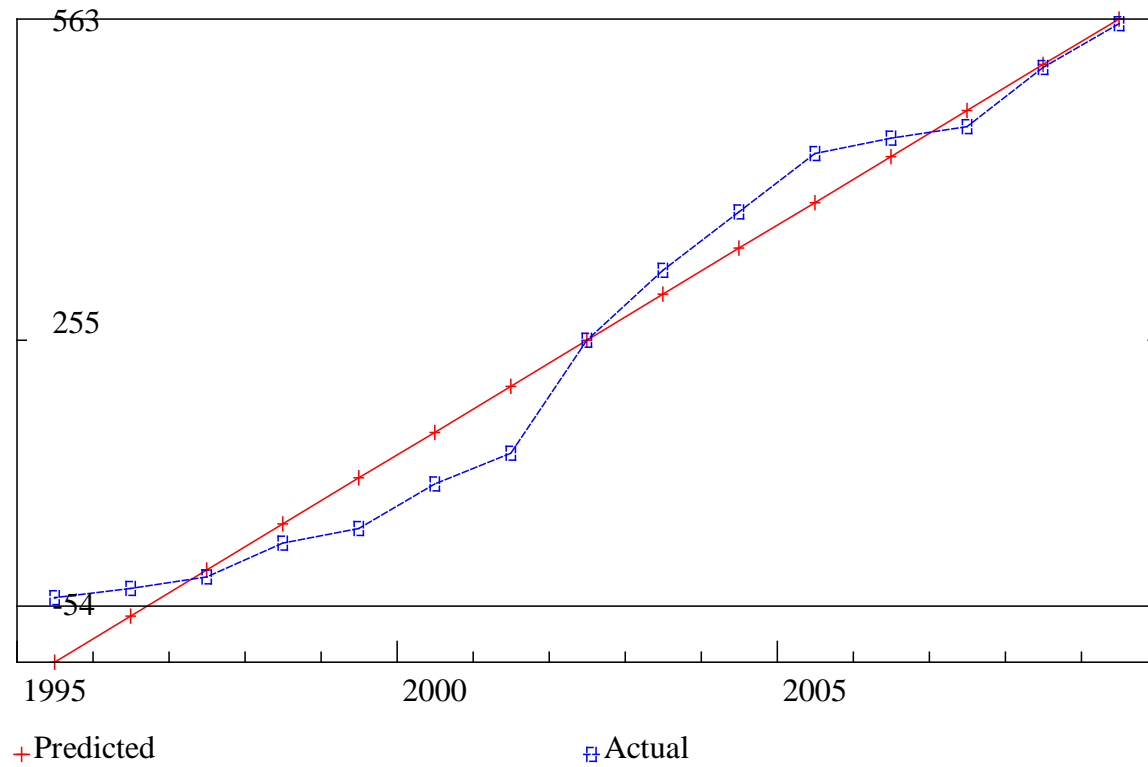| Variable name	Reg-Coef	Mexval	Elas	NorRes	Mean	Beta
0 exp12	- - - - - - - - - - - - - - - - - - -	- - - - - - - - - -	-11767.81	- - - - - -		
1 intercept	-2976.86849	8.6	-0.25	8.12	1.00	
2 out12	0.58137	185.0	1.25	1.00	25362.16	0.936

Fig 5.3 Basic metals and fabricated metals exp

6. Depreciation

6.1 Agriculture

- ti 1 AGRICULTURE, HUNTING, FORESTRY AND1995 FISHING

- r dep1= timet

- :   1 AGRICULTURE, HUNTING, FORESTRY AND1995 FISHING
- SEE =   35.02 RSQ = 0.9673 RHO =   0.71 Obser =   15 from 1995.000
- SEE+1 =   28.14 RBSQ = 0.9647 DW =   0.58 DoFree =   13 to   2009.000
- MAPE =   76.11

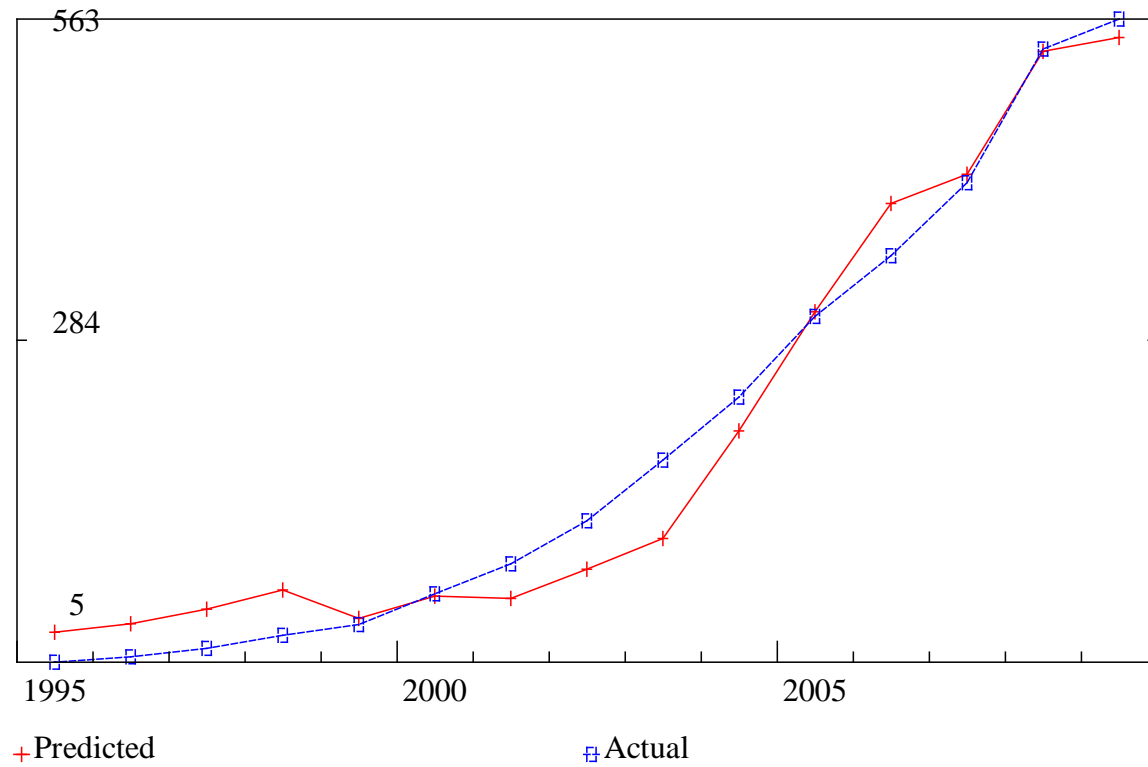| Variable name	Reg-Coef	Mexval	Elas	NorRes	Mean	Beta
0 dep1	- -				254.80	- - -
1 intercept	-87932.88373	451.1	-345.10	30.54	1.00	
2 timet	44.04979	452.6	346.10	1.00	2002.00	0.983

Fig 6.1 Agriculture

6.2 Mining

- ti 2 MINING AND QUARRYING

- r dep2 = gfcf2

- :   2 MINING AND QUARRYING
-   SEE   =   31.35 RSQ   = 0.9722 RHO =   0.70 Obser =   15 from 1995.000
-   SEE+1 =   23.25 RBSQ = 0.9701 DW =   0.61 DoFree =   13 to   2009.000
-   MAPE = 86.99
-   Variable name   Reg-Coef Mexval Elas   NorRes   Mean   Beta
-   0 dep2   -198.40 - - - - - - -
-   1 intercept   24.89151   5.6 0.13   36.01   1.00
-   2 gfcf2   4.49971   500.1 0.87   1.00   38.56   0.986

2 MINING AND QUARRYING

Fig 6.2 Mining Depreciation

6.3 Depreciation

- limits 1995 2009 2009

- ti 3 FOOD , BEVERAGES AND TOBACCO

- r dep3 = gfcf3

- :   3 FOOD , BEVERAGES AND TOBACCO
-   SEE   =   198.95 RSQ   = 0.9690 RHO =   0.67 Obser =   15 from 1995.000
-   SEE+1 =   158.58 RBSQ = 0.9666 DW =   0.65 DoFree =   13 to   2009.000
-   MAPE =   51.99

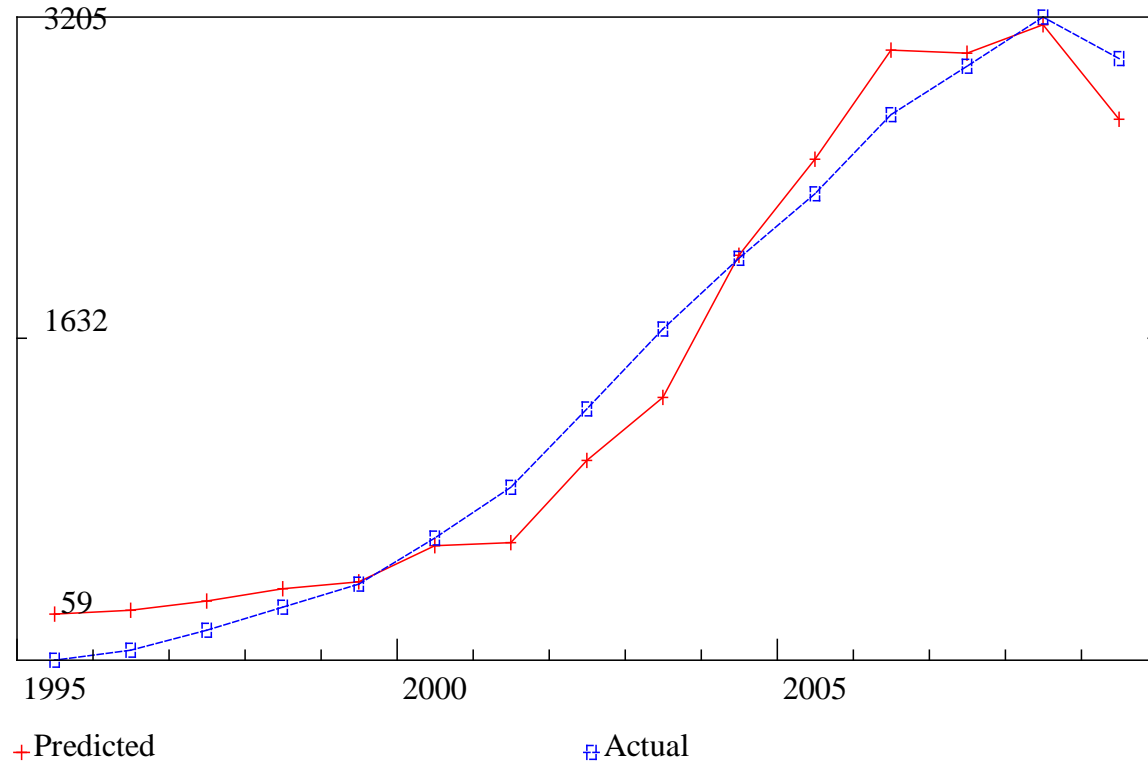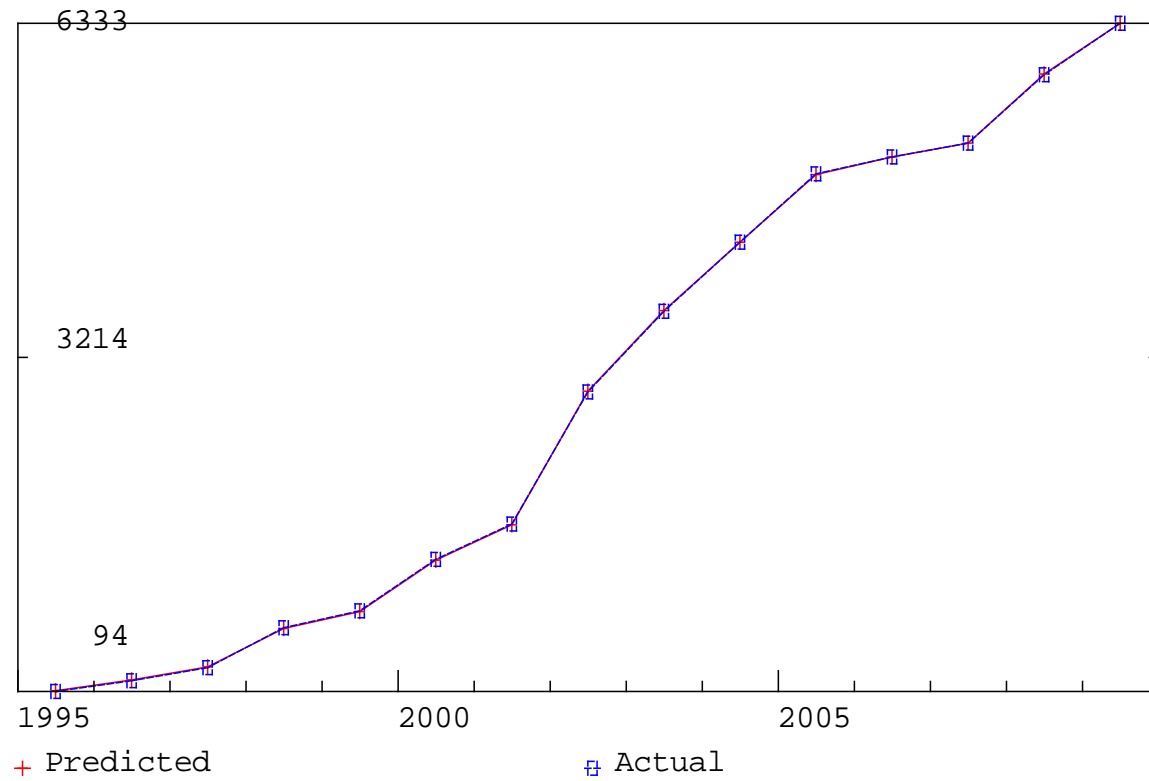| Variable name	Reg-Coef	Mexval	Elas	NorRes	Mean	Beta
0 dep3	- - - - - - - - - - - - - - - - - - -	- - - - - - - - - - -	1459.04	- - -
1 intercept	262.08994	34.3	0.18	32.25	1.00	
2 gfcf3	11.69336	467.9	0.82	1.00	102.36	0.984

3 FOOD , BEVERAGES AND TOBACCO

Fig 6.3 Food depreciation

7. Profit

7.1 Agriculture

- ti 1 AGRICULTURE, HUNTING, FORESTRY AND1995 FISHING

- r pro1 = out1

- : 1 AGRICULTURE, HUNTING, FORESTRY AND1995 FISHING
- SEE   =   4.18 RSQ   = 1.0000 RHO =   0.55 Obser =   15 from 1995.000
- SEE+1 =   3.57 RBSQ = 1.0000 DW =   0.90 DoFree =   13 to   2009.000
- MAPE =   0.78
- Variable name   Reg-Coef Mexval Elas   NorRes   Mean Beta
- 0 pro1   - - - - - - - - - - - - - - - - - - - - -- - - - - -   2887.73 - - -
- 1 intercept   4.16043   16.8   0.00 9999.99   1.00
- 2 out1   0.05183 52449.7 1.00   1.00 55630.83 1.000

Fig 7.1 Agriculture Profit

- ti 3 FOOD , BEVERAGES AND TOBACCO

- r pro3 = out3

- :   3 FOOD , BEVERAGES AND TOBACCO

 SEE   =   73.98 RSQ   = 0.9996 RHO =   0.68 Obser = 15 from 1995.000

SEE+1 =   61.38 RBSQ = 0.9995 DW =   0.64 DoFree = 13 to   2009.000
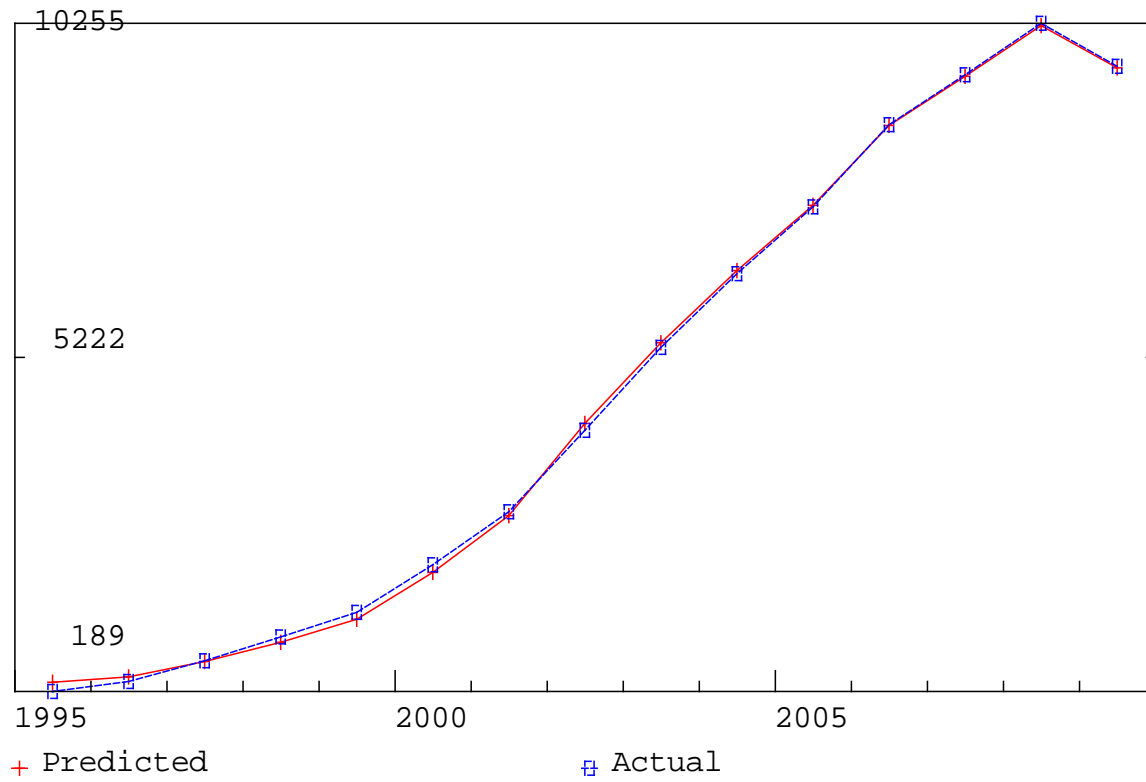
-    MAPE   =   8.32

-      Variable name   Reg-Coef Mexval Elas   NorRes Mean   Beta

-    0 pro3   --- -- - - - - - - 4668.59 - - -

-    1 intercept   203.18463   99.6   0.04 2387.68   1.00

-    2 out3   0.08444   4786.4 0.96   1.00 52880.25 1.000

3 FOOD , BEVERAGES AND TOBACCO

Fig 7.2 Food Profit

7.3 Coke, refined petroleum

- ti 8 Coke, refined petroleum and nuclear fuel

- r pro8 = out8

- :   8 Coke, refined petroleum and nuclear fuel
-   SEE   =   77.51 RSQ   = 0.7192 RHO =   0.63 Obser =   10 from 2000.000
-   SEE+1 =   78.01 RBSQ = 0.6841 DW =   0.74 DoFree = 8 to   2009.000
-   MAPE   =   10.52
-     Variable name   Reg-Coef Mexval Elas NorRes   Mean   Beta
-   0 pro8   -   ------------------- 604.30 - - -
-   1 intercept   167.03780   16.0   0.28 3.56   1.00
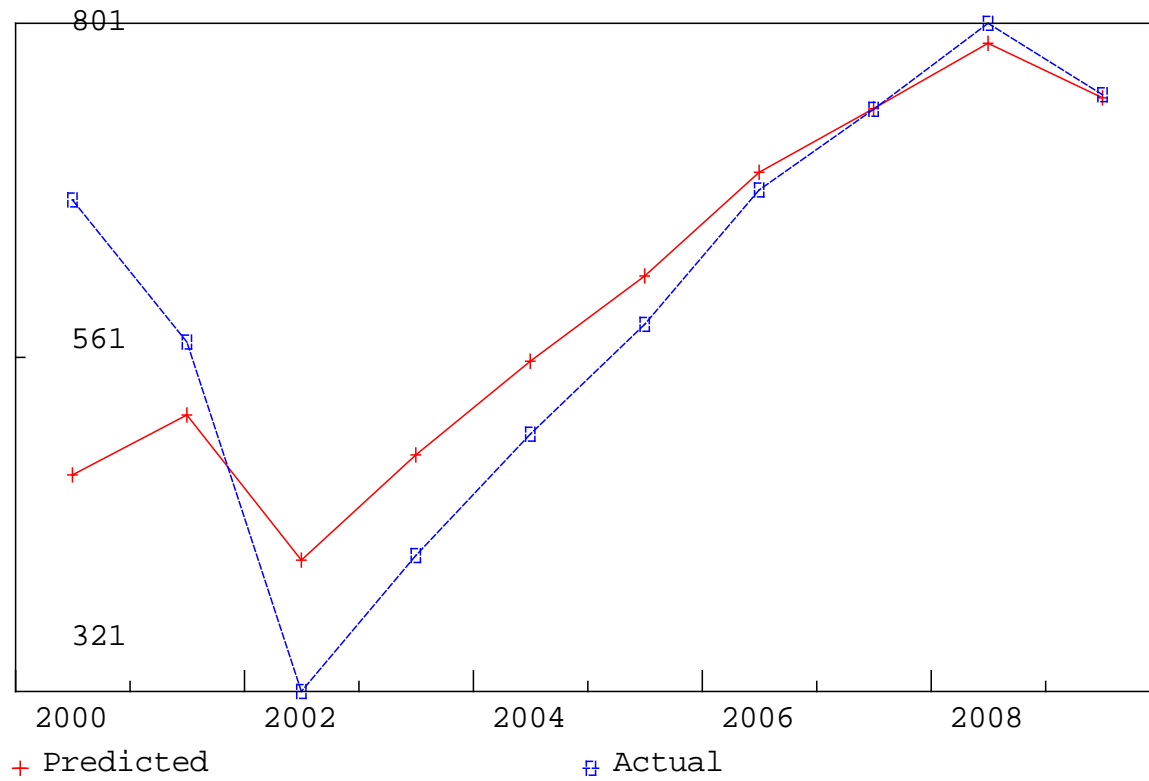-   2 out8   0.02584   88.7 0.72   1.00   16924.64 0.848

Fig 7.3 Coke refined petroleum

8. Conclusions

- Some regression equations need to be revised.

- Databank can be improved by adding new variables, such as, employment, investment by sectors.

- Model will be tested over a historical period before forecasting.

Thank you
for
your attention!