Multipliers, Forecasting, and Production Smoothing in an Econometric Model of Hiroshima Prefecture*

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Abstract: A thorough reconstruction of the Toyo Keizai Econometric Model of Hiroshima Prefecture is undertaken in the paper. The independence of the regional industry equations of the whole system is corrected. A lack of theoretical explanations of individual equations and the limitation in the number of periods in solving the simultaneous equations are lifted. The effectiveness of taking into account the trend of the changes in the industrial structure of the regional economy and the shifts of parameters of industry equations is evaluated in terms of dynamic multiplier analyses. The importance of having a workable national model as a part of the entire model in constructing a regional model was emphasized. Making use of a regional econometric model, a mechanism of production smoothing by inventory investment was described.

Key words: Regional economy, Rate of error, Dynamic multipliers, Changes in parameters, Forecasts, Structural changes.

The construction of regional econometric models has been relatively underdeveloped in Japan. Toyo Keizai Shinposha recently placed the econometric models of all of Japanese prefectures on the market (Macroeconometrics Kenkyukai (2000)). This paper uses the Toyo Keizai's data set in an attempt to build an econometric model of Hiroshima Prefecture. This project was directly motivated by a lack of theoretical explanations for individual equations of the Toyo Keizai model. The fact that the number of periods considered for the final tests of this professional model was very much shorter than the sample period for estimating equations of the model was another reason for trying to reconstruct the regional model. Moreover an excessive number of dummy variables seem to have been utilized by the professional model. The economy of Hiroshima Prefecture was singled out from the Chugoku-Shikoku Area version of the Toyo Keizai model as an experimental case to test for theoretical and empirical plausibility of this professional model. Those characteristics of the preceding model were deleted from the current paper.

While providing the theoretical basis to individual equations, it was not difficult to build a Hiroshima model which shows similar performance to the Toyo Keizai model. The use of the dummy variables was limited to the occasions that clear explanations for why they were necessary could be presented. As a result, only a small number of dummy variables were left in the current model. In addition to the above mentioned purpose of constructing a regional econometric model, an attempt was made to combine the behavioral equations of the industry variables with the substantial system of the entire model (Nishikawa (1975), Economic Planning Agency (1989)). In the professional model, the industrial variables which are endogenous, are independent of the rest of the system. Tests for parametric changes of some of the behavioral

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equations of the regional industries are made. The ratio of sales of the traditional industries to the whole sales of the region is assumed to (negatively) explain the secular movements of wages and employment in the region. The independence of other regional variables such as prefectural revenues and expenditures, prefectural government bonds, local taxes, and local public construction works is also broken. These variables were used as explanatory variables in the way that they contribute to the working of the entire model. As a brief attempt to identify a macroeconomic mechanism which can cause production smoothing through inventory investment, a slightly different version of the present model is constructed.

The paper is structured as follows. In the first section, the data set used is explained. The definition of the variables is represented by a list of both the endogenous and exogenous variables. The specifications of individual equations are explained in the second section. The period by period forecast errors of the model are compared with that of the professional model in the third section. In the fourth section, the dynamic multipliers for some representative endogenous variables are also compared across the two models. The out-of-sample period forecasting ability of the model is discussed based on the comparisons with the professional model in the following section. In the sixth section, the performances of the models with and without the dummy variables in industry equations are compared in terms of the final test errors and dynamic multipliers. Production smoothing by inventory investment is represented based on the dynamic multipliers in the seventh section. Concluding remarks complete the paper.

Ⅰ. Data.

The observation period for the data is from the fiscal year of 1975 through the fiscal year of 1996. The sample period for both estimation and dynamic simulation of the model is from 1977 through 1996 on the basis of the fiscal year. The data used were taken from the above mentioned professional model constructed by Toyo Keizai Shinposha. The original data sources which the Toyo Keizai model is based on are referred to within that model. Real values are evaluated in terms of the fixed prices of 1990. The regional variables have the letters “HR“ in the beginning of their names. The definition of the variables are generally the same as in the professional model, and are defined as follows:

Endogenous Variables

HRCP : Real Private Consumption Expenditures (million yen).

HRIH : Real Private Residential Investment (million yen).

HRIP : Real Business Fixed Investment (million yen).

HRJP : Real Private Inventory Investment (million yen).

HRSALES : Real Total Sales (million yen).

HRIG: Real Prefectural Government Fixed Investment (million yen).

HRCG: Real Prefectural Government Consumption Expenditures (million yen).

HREX : Regional Exports of Goods and Services (million yen).

HRM : Regional Imports of Goods and Services (million yen).

HRPCP : Private Consumption Deflator (1990=100).

HRPIP : Business Fixed Investment Deflator (1990=100).

HRPIH : Private Residential Investment Deflator (1990=100).

HRPEX : Regional Exports Deflator (1990=100).

HRPM : Regional Imports Deflator (1990=100).

HRPCG : Prefectural Government Consumption Deflator (1990=100).

HRPIG : Prefectural Government Fixed Investment deflator (1990=100).

HRYI : Nominal Prefectural Income (million yen).

HRW : Nominal Per Capita Employee's Compensations in the Region (million yen).

HRYWAG : Nominal Wages and Salaries (million yen).

HRYU : Nominal Proprietor's Income (million yen).

HRYRH : Nominal Household Property Income (million yen).

HRYC : Nominal Private Corporate Income (after dividend deducted. million yen).

HRSETAI : Number of Households (1000 households).

HRLWK : Number of Regional Employees (1000 persons).

HRLK : Number of Workers Engaged in the Region (1000 persons).

HRGVSPE : Nominal Prefectural Government Expenditures (million yen).

HRGVTAX : Nominal Prefectural Government Revenues from Local Taxes (million yen).

HRGVKOF : Nominal Local Allocation Tax (million yen).

HRGVBON : Nominal Prefectural Government Bonds Issued (million yen).

HRPUBK : Nominal Public Construction Works Started (million yen).

HRNEWH : Number of New Housing.

HRMANR : Real Manufacturing Shipments (million yen).

HRBANK : Nominal Bank Loans of the Region (in the end of march, million yen).

HRTRKTR : Truck Transportation (1000 tons).

HRELEC : Electricity Consumption (million kwh).

HRELED : Electricity Consumption for Lighting (million kwh).

HRUGAS : Supply of Gas (100 million kcal).

HRCARH : Number of Passenger Cars (1000 cars).

HRGASO : Sales of Gasoline (1000 kl).

HRGDP : Real Prefectural GDP (million yen).

*HRCP_N*01: Nominal Private Consumption Expenditures (million yen).

*HRCG_N*01: Nominal Prefectural Government Consumption Expenditures (million yen).

*HRIP_N*01: Nominal Business Fixed Investment (million yen).

*HRJP_N*01: Nominal Private Inventory Investment (million yen).

*HRIG_N*01: Nominal Prefectural Government Investment (million yen).

*HRIH_N*01: Nominal Private Residential Investment (million yen).

*HREX_N*01: Nominal Regional Exports (million yen).

*HRM_N*01: Nominal Regional Imports (million yen).

*HRGDP_N*01: Nominal Prefectural GDP (million yen).

HRPGDP : Regional GDP Deflator (1990=100).

HRYW : Nominal Employee's Compensations (million yen).

HRYH : Sum of Nominal Wages and Salaries, Households Property Income and Proprietor's Income (million yen).

HRKP : Real Private Capital Stock (million yen).

HRKJP : Real Private Stock of Inventories (million yen).

CP: Real Japanese Aggregate Consumption (million yen).

MC: Real Japanese Aggregate Imports (million yen).

GDP: Real Japanese GDP (million yen).

ALPHA: Sum of Sales of Industries such as Manufacturing, Gasoline, Electricity and Gas divided by total sales defined as the nominal GDP of the region minus the nominal inventory investment.

Exogenous Variables

HRPOPK : Total Population (1000 persons).

INTN : Interest Rate on Bank Loans (annual

rate in the national economy, %).

*DUM*79: Dummy Variable (1 in 1979, and 0 otherwise).

IG: Real Japanese Government Investment (million yen).

CG: Real Japanese Government Consumption Expenditures (million yen).

P: GNP Deflator (1990=100).

PC: Consumption Deflator for the National Economy (1990=100).

PI: Business Fixed Investment Deflator for the National Economy (1990=100).

PH: Private Residential Investment Deflator for the National Economy (1990=100).

WPI: Wholesale Price Index for the National Economy (1995=100).

HRPJP90: Private Inventory Investment Deflator (1990=100).

HRPJG90: Public Inventory Investment Deflator (1990=100).

*HRJG_N*01: Nominal Public Inventory Investment (million yen).

HRPOPTLJ: Total Population (based on the citizen registration, 1000 persons).

PGAS: Price of Gasoline.

PELD: Price of Electricity.

PUG: Price of Gas.

PELL: Price of Electricity for Lighting.

TIME: Time Trend (1 in the beginning of the sample period).

*DUM*94: Dummy Variable (1 in 1994, 0 otherwise).

POPT: Japanese Total Population (1000 persons).

PTW: World Trade Deflator (1980=100).

HRJG: Real Prefectural Government Inventory Investment (million yen).

HRSDF: Real Statistical Discrepancies (million yen).

HRSDF_N01: Nominal Statistical Discrepancies (million yen).

OTHERS: Total Real Investment except Real Central Government Fixed Investment plus Real Government Consumption Expenditures plus Real Aggregate Exports.

DUM9096: Dummy Variable (1 in 1990 through 1996, 0 otherwise).

DUM9396: Dummy Variable (1 in 1993 through 1996, 0 otherwise).

DUM8896: Dummy Variable (1 in 1988 through 1996, 0 otherwise).

DUM9496: Dummy Variable (1 in 1994 through 1996).

DUM7779: Dummy Variable (1 in 1977 through 1979).

Ⅱ. Specification.

In representing the regression equations, the statistical symbols are defined as follows. $\bar{R}^2$: the coefficient of determination adjusted for the degrees of freedom, *S.E.*: the standard error of the regression, *D.W.*: the Durbin=Watson statistic [1], *AR* (1): a symbol that means an equation was estimated by the maximum likelihood estimation method with the first order serial correlation structure incorporated in the error term. When this symbol appears with an estimated equation, it is implied that the equation is specified in terms of the quasi differences of explanatory variables using the autoregressive root of the error term, and that the lagged dependent variable times the autoregressive root is included in the right hand side. The numbers in the parenthesis: the t statistic [2], @PCH: the rate of change function which is intrinsic in the software called Econometric Views. The Gauss=Seidel algorithm serves as the nonlinear iterative routine for the current model. The lagged

[1] The order of the serial correlation considered is one throughout this paper.

[2] In accordance with the tradition of hypothesis testing in the framework of macroeconometric model, the possibility of distortion in the distribution of the t statistic caused by nonstationary time series data is not considered in this paper.

variables are defined by the negative number in the parenthesis, e.g. the value of a variable X in the previous period is denoted as X(-1), etc. A notation of $e \pm k$ is used to express 10 to the power of plus (minus) k to express very large (small) coefficient estimates in the representation of regression equations. The estimation method is OLS except the cases in which the symbol of AR(1) is denoted.

1. Private Consumption Expenditures.

$$\frac{HRCP}{HRPOPK} = 362.1262 + 0.6845 \frac{\frac{HRYH}{HRPCP} \times 100}{\text{HRPOPK}}$$

(4.2638) (17.5890)

-2193.391 (@*PCH*(*HRPCP*))

(-4.6308)

$\bar{R}^2 = 0.9696$ *S.E.* = 38.1078 *D..W.*=1.2824

The real per capita consumption expenditure is explained in terms of the real per capita household income and the inflation rate. The household income is defined as the sum of the wages and salaries, households property income and proprietor's income [3]. The marginal propensity to consume (MPC) out of the household income is 0.6845. It is assumed that the reduction in the real value of household financial assets due to inflation would stimulate saving by households. Such a behavior is represented by the rate of change of the consumer price index (Moriguchi (1983)). The goodness of fit is as high as the usual empirical consumption functions. The t values of the parameter estimates indicate that the null hypotheses of those parameters being zero in population are rejected at the ordinary level of significance.

2. Private Residential Investment.

$$HRIH = 113718.6909 + 0.0644\left(\frac{HRYH}{HRPCP}\right) \times 100$$

(2.0580) (6.6524)

$-10922.3165\ INTN - (@PCH\ (HRPCP) * 100)$

(-1.9389)

$\bar{R}^2 = 0.6921$ *S.E.* = 36045.38 *D.W.* = 1.6292

Decision making on the residential investment should depend on the household income and the cost of mortgage loans. The p values for the t statistics of the intercept and the coefficient of the real rate of interest are 5.5 % and 6.9 %, respectively. The null hypothesis of no first order serial correlation is accepted at the 2.5 % level of significance. The land price variable did not improve the equation's performance, and was discarded.

3. Business Fixed Investment.

$$HRIP = -1127411.477 + 0.7079 HRJP + 0.00721 GDP$$

(-6.8977) (3.7061) (7.5548)

$-0.0466 HRKP(-1) - 81112.9251 DUM79$

(-1.9835) (-1.3635)

$\bar{R}^2 = 0.9839$ *S.E.* = 55377.68 *D.W.* = 1.7420

The private inventory investment variable in the right hand side is assumed to reflect the business cycle. The gross domestic product of the entire nation and the private capital stock of the region in the end of the previous period are used based on the idea of the stock adjustment formulation of the investment behavior. The desired stock of capital in Hiroshima Prefecture is assumed to depend on the magnitude of the national output to which productive activities and transactions of the region are closely connected. The dummy variable is to control the influences of the Second Oil Crisis which took place in 1978, and should affect the economy in the subsequent year. The goodness of fit was considerable. The possibility of the first order serial correlation can be rejected at the 5 % significance level. The coefficient of the capital stock in the end of the previous period is significant at the 6.6 % level. The dummy variable, the coefficient of which has the p value of 0.193, was kept in the equation due to a fairly large increase in the coefficient of determination.

[3] Adding the lagged dependent variable in the right hand side did not improve the current form of the consumption function.

4. Private Inventory Investment.

$$HRJP = -407549.7 + 0.0634HRSALES$$
$$(-2.2367) \quad (2.4114)$$
$$-0.3064HRKJP(-1) + 0.4775HRJP(-1)$$
$$(-2.7919) \quad (2.7752)$$
$$0.0381[(HRBANK/HRPJP)*100$$
$$(1.5677)$$
$$-(HRBANK(-1)/HRPJP(-1))*100]$$

$\bar{R}^2 = 0.4734$ $S.E. = 73555.71$ $D.W. = 2.3328$

The relatively low goodness of fit for the equation could have been substantially improved by employing highly volatile explanatory variables such as the inflation rate which is expected to control the speculative motive of holding inventories, and the change in the interest rate which takes account of the costs of holding inventories. The successful performance in the partial test of the model observed in these specifications, however, does not necessarily insure the acceptable results in the final tests. It seemed to be necessary to accept the current form of the equation to maintain the overall forecasting abilities of the model as a whole. The value of the Durbin=Watson statistic shows the rejection of the possibilities of either the positive or the negative serial correlations at the 5 % level. The coefficients of the equation are significant at the conventional level of significance.

5. Prefectural Government Fixed Investment.

$$HRIG = 43655.67 + 0.0166IG + 0.5432HRPUBK$$
$$(0.9394) \quad (6.5850) \quad (3.0181)$$
$\bar{R}^2 = 0.9232$ $S.E. = 43095.56$ $D.W. = 1.5837$

The local public investment is explained by the public capital formation of the central government and public construction works in the region. This specification represents a sort of interlocking sharing of the costs of public investment on infrastructures by the central and local Japanese governments. The Durbin=Watson test of the serial correlation leads to the inconclusive decision.

6. Prefectural Government Consumption Expenditures.

$$HRCG = 19401.31 + 0.0283[CG - CG(-1)]$$
$$(0.5337) \quad (3.2903)$$
$$+0.1642HRGVTAX(-1) + 0.9210HRCG(-1)$$
$$(1.5399) \quad (13.1379)$$
$\bar{R}^2 = 0.9865$ $S.E. = 13784.11$ $D.W. = 2.5575$

The institutional dependence of the prefectural government revenues as the source of HRCG on the central government revenues as the source of CG is the basis of the specification of this equation. Local tax revenues were added to the equation as an additional source of financing the dependent variable. The test for the serial correlation is inconclusive.

7. Regional Exports.

$$HREX = -10767749 + 0.02128GDP$$
$$(-1.1173) \quad (8.3192)$$
$$+12008192\frac{P}{HRPGDP}$$
$$(1.1368)$$
$\bar{R}^2 = 0.9495$ $S.E. = 410842.2$ $D.W. = 0.6049$

The regional exports of goods and services are supposed to be absorbed by the nation's productive activities [4]. The coefficient of the relative price variable has the p value of 0.271. In an attempt made to correct for the serial correlation the presence of which is suggested by the low Durbin=Watson statistic, the p value became even worse. This variable, however, is retained, for the sign of this coefficient is as theoretically expected.

8. Regional Imports.

$$HRM = 2529601 - 1520660\frac{HRPM}{HRPGDP}$$
$$(0.9221) \quad (-0.8159)$$

[4] The influences of foreign trade on this variable did not turn out to be significant.

$$0.2007HRGDP(-1)+0.7001HRM(-1)$$
$$(0.6652) \qquad (2.3387)$$
$\bar{R}^2=0.9331$ $S.E.=431855$ $D.W.=1.3156$

The absorption of the regional imports of goods and services is controlled by the regional GDP in the previous period. The general price levels in and out of the region are represented by the regional GDP deflator and the regional import deflator, respectively. The p values of the coefficients of the relative price variable and the absorption variable are 0.43 and 0.52. These variables are retained because the sign conditions of their coefficients are satisfied. The lagged dependent variable works to adjust for the first order serial correlation. The decision on the serial correlation test is inconclusive according to the Durbin=Watson statistic.

9. Private Consumption Deflator.

$$HRPCP=4.3097+0.0009HRW+0.9152PC$$
$$(2.3525) \quad (1.6947) \quad (22.8089)$$
$\bar{R}^2=0.9975$ $S.E.=0.5441$ $D.W.=1.1776$

The per capita employee's compensation of the region is likely to work as the cost push factor for the determination of the regional consumer prices which are also influenced by the nation wide consumer prices. The p value of the coefficient of the wage variable is 0.11. The Durbin=Watson statistic of the equation falls in the area of inconclusive decision for the test of the serial correlaltion.

10. Business Fixed Investment Deflator.

$$HRPIP=3.2745+0.9116PI+8.5237\frac{\frac{HRW}{HRGDP}}{HRLK}$$
$$(1.1078) \quad (30.0808) \quad (3.0735)$$
$\bar{R}^2=0.9826$ $S.E.=0.5247$ $D.W.=1.2242$

The influences from the national economy and the unit labor cost determine the prices of the business fixed investment. The conclusion on the serial correlation test can not be drawn at the 5 % level.

11. Residential Investment Deflator.

$$HRPIH=0.0317+0.9998PH$$
$$(0.6005) \ (1617.121)$$
$$-0.0053[INTN-(@PCH(PC)*100)]$$
$$(-0.9814)$$
$\bar{R}^2=0.9999$ $S.E.=0.0284$ $D.W.=1.3404$

This specification states that the cost of housing construction in the Hiroshima region is determined by the corresponding deflator and the cost of housing mortgage loans in the national economy. The t statistic related to the real rate of interest is not significant with the p value of 0.34. That variable is retained due to the expected sign condition being satisfied. The dependent variable, however, is essentially exogenous, for it is explained solely by a set of exogenous variables.

12. Regional Exports Deflator.

$$HRPEX=26.8997+0.3687WPI+0.3168HRPEX(-1)]$$
$$(4.4430) \ (6.7676) \quad (3.6145)$$
$\bar{R}^2=0.9066$ $S.E.=1.5469$ $D.W.=0.9032$

The Durbin=Watson statistic falls in the area of the inconclusive decision for the relevant test of serial correlation at the 2.5 % significance level. Efforts (AR(1) adjustment, the use of HRPEX(-2) in the right hand side) to improve this statistic deteriorated the overall results. The competitive pricing of the region's products in the nation wide markets would explain the specification of the equation. The dependent variable of this equation, however, is essentially exogenous as in the previous equation as it does not depend on any endogenous variables of the regional economy.

13. Regional Imports Deflator.

$$HRPM=22.3681+0.7140WPI+[AR(1)=0.8335]$$
$$(3.7510) \ (13.0444) \quad (10.4337)$$
$\bar{R}^2=0.9669$ $S.E.=1.1533$ $D.W.=2.2885$

The prices of the imports from the areas outside the region can be appropriately measured by the WPI of

the national economy. The possibilities of the first order serial correlations are effectively dismissed by the value of the Durbin=Watson statistic at the 5 % level after AR(1) adjustment which is the sole difference of this specification from the counter part in the professional model.

14. Prefectural Government Consumption Deflator.

$$HRPCG = -42.9901 + 1.4235\,HRPCP + [\mathrm{AR}(1) = 0.7511]$$
$$(-3.1926)\quad (10.8354)\qquad (10.3329)$$
$$\bar{R}^2 = 0.9943 \quad S.E. = 1.0184 \quad D.W. = 1.3912$$

The idea behind this equation is that the costs of private and public consumptions are identical. The specification of this equation is the same as in the professional model except the AR(1) adjustment for the serial correlation. The Durbin=Watson statistic falls in the area of the inconclusive decision for the relevant serial correlation test at the 5 % level.

15. Prefectural Government Fixed Investment Deflator.

$$HRPIG = -37.7166 + 1.0078\,HRPIP + 0.0082\,HRW$$
$$(-3.2683)\quad (9.0714)\qquad (12.9702)$$
$$+ [AR(1) = 0.6042]$$
$$(3.0130)$$
$$\bar{R}^2 = 0.9914 \quad S.E. = 0.8352 \quad D.W. = 1.4778$$

The costs of public capital formation is identical with the one of private investment. The per capita employees' compensations are supposed to represent the labor charges of the public construction projects. This specification is the same as in the professional model except the AR(1) adjustment for the serial correlation. The decision for the test of the serial correlation is inconclusive at the 5 % level.

16. Prefectural Income.

$$HRYI = 103908.403 + 0.7882\,HRGDP\_N01$$
$$(0.6930)\quad (47.2412)$$
$$+ [AR(1) = 0.5862]$$
$$(2.7410)$$
$$\bar{R}^2 = 0.9988 \quad S.E. = 60198.68 \quad D.W. = 1.5526$$

The nominal prefectural income is highly dependent upon the nominal regional GDP.

17. Regional Per Capita Employee's Compensations.

$$HRW = 79.6956 + 20.0845\,HRPCP(-1)$$
$$(0.2095)\quad (5.93163)$$
$$+ 0.5446\,\frac{HRGDP}{HRLK} - 1345.206\,ALPHA$$
$$(11.6402)\qquad (-5.5868)$$
$$\bar{R}^2 = 0.9939 \quad S.E. = 64.2577 \quad D.W. = 1.6014$$

The lagged consumer price and the labor productivity variables represent the influences of the cost of living and the employers' attitudes in the labor contracts. The variable ALPHA is used in the present model to control the importance of the traditional sector of the region. The negative coefficient of ALPHA implies that as the weight of the traditional industries in the regional industrial structure declines, per capita employee's compensations tend to increase.

18. Wages and Salaries.

$$HRYWAG = 78230.308 + 0.1210\,HRGDP\_N01$$
$$(1.6153)\quad (3.3826)$$
$$+ 0.7575\,HRYWAG(-1)$$
$$(10.2419)$$
$$\bar{R}^2 = 0.9977 \quad S.E. = 50865.12 \quad D.W. = 1.9533$$

The sum of nominal wages and salaries is assumed to depend on the nominal regional GDP.

19. Proprietor's Income.

$$HRYU = -2452311.619 + 0.1546\,HRGDP\_N01$$
$$(-0.4483)\quad (2.6341)$$
$$-887377.4054\,ALPHA + [AR(1) = 0.9817]$$
$$(-2.8403)\qquad (29.1911)$$
$$\bar{R}^2 = 0.8800 \quad S.E. = 44733.44 \quad D.W. = 2.2166$$

The nominal proprietor's income depends on the nominal regional GDP, and the change in the regional industrial strucutre. It is assumed that decline of the weight of the traditional indutries increase proprietor's income.

20. Households Property Income.

$$HRYRH = -60264.2998 + 0.8216(HRYI - (HRYW \quad (-2.6785) \quad (8.4278)$$
$$+ HRYC + HRYU)) + 0.2543HRYRH(-1) \quad (1.4354)$$
$$+ 0.1387HRYRH(-2) \quad (1.1271)$$
$$\bar{R}^2 = 0.9894 \quad S.E. = 25324.86 \quad D.W. = 1.4351$$

The sum of the employees' compensations, the private corporate income and the proprietors' income is subtracted from the prefectural income to form the explanatory variable. The two lagged dependent variables are included to adjust for serial correlations. The decision on the serial correlation is inconclusive with the value of the Durbin=Watson statistic.

21. Private Corporate Income.

$$HRYC = 210528.6084 + 0.2036(HRGDP\_N01 \quad (0.6038) \quad (1.5950)$$
$$-(HRJP\_N01 + HRJG\_N01)) - 0.2236HRYW \quad (-1.1345)$$
$$-20148.0329INTN + [AR(1) = 0.6941] \quad (-1.0138) \quad (2.8417)$$
$$\bar{R}^2 = 0.9050 \quad S.E. = 62586.82 \quad DW = 1.7990$$

The corporate income is positively related to nominal regional sales, and is negatively related to the labor charges and the costs of borrowing.

22. Number of Households.

$$\frac{HRPOPTLJ}{HRSETAI} = 0.4710 + 0.8646\frac{HRPOPTLJ(-1)}{HRSETAI(-1)} \quad (1.5593) \quad (10.0822)$$
$$-0.0043TIME + [AR(1) = 0.4120] \quad (-1.9503) \quad (1.5683)$$
$$\bar{R}^2 = 0.9997 \quad S.E. = 0.0024 \quad D.W. = 1.5852$$

The average size of the regional household shows the positive serial movement and the negative linear time trend. The number of households is solved from this equation by inverting the both sides, and moving the denominator in the left hand side to the right hand side.

23. Number of Regional Employees.

$$HRLWK = 1090.053 + 8.65e - 0.5HRGDP \quad (4.0121) \quad (4.7920)$$
$$-0.0856\left(\frac{HRW}{WPI} * 100\right) - 409.5291ALPHA \quad (-1.7455) \quad (-1.7800)$$
$$\bar{R}^2 = 0.9252 \quad S.E. = 27.2617 \quad D.W. = 1.0340$$

The number of employees increases as the magnitude of production expands, and declines as the relative labor charges increase. The reduction of the weight of the traditional indutries tends to increase employment. The p value of this effect is 9.41 percent. The lagged dependent variable is included to adjust for the serial correlation.

24. Number of Employed Workers.

$$\frac{HRLK}{HRPOPK} = 0.1394 + 5.011e - 0.6\frac{HRGDP}{HRPOPK} \quad (1.9094) \quad (2.3228)$$
$$-0.3588\frac{@PCH(HRW)}{INTN} \quad (-2.4448)$$
$$+0.7158\frac{HRLK(-1)}{HRPOPK(-1)} - 0.0083\text{ALPHA} \quad (5.0677) \quad (-0.8388)$$
$$\bar{R}^2 = 0.9565 \quad S.E. = 0.0021 \quad D.W. = 2.0881$$

The ratio of the number of employed workers to the total population is likely to increase as the productivity increases. A proxy of the relative factor price turns out to be significant. The reduction of the weight of the traditional industries is assumed to increase the number of employed workers. The sign of this effect is

as expected, but the parameter is not statistically significant. The lagged dependent variable is to adjust for the serial correlation.

25. Prefectural Government Expenditures.

$$LOG(HRGVSPE) = -0.1264 + 0.228TIME$$
$$(-0.0292) \quad (2.4089)$$
$$+ 0.8208LOG(HRGDP)$$
$$(2.8966)$$
$$+ [AR(1) = 0.5805]$$
$$(4.3859)$$
$$\bar{R}^2 = 0.9928 \quad S.E. = 0.0268 \quad D.W. = 1.2959$$

The positive nonlinear trend seems to exist in the dependent variable. The magnitude of overall economic activities is likely to affect the local government expenditures.

26. Prefectural Government Revenues from Local Taxes.

$$HRGVTAX = 30245.9895 - 8277.3754TIME$$
$$(0.3149) \quad (-2.5509)$$
$$+ 0.048HRGDP\_N01 + [AR(1) = 0.5805]$$
$$(4.1111) \quad (4.2090)$$
$$\bar{R}^2 = 0.9872 \quad S.E. = 7739.818 \quad D.W. = 1.6834$$

The negative linear time trend represents the secular tendency of the dependent variable to decline. The nominal GDP of the region is supposed to be an important explanatory variable of this equation.

27. Local Allocation Taxes.

$$HRGVKOF = 9706.440 + 0.2514(HRGVSPE$$
$$(0.5395) \quad (8.1990)$$
$$- HRGVTAX) + [AR(1) = 0.6225]$$
$$(3.2734)$$
$$\bar{R}^2 = 0.9648 \quad S.E. = 8203.843 \quad D.W. = 1.5027$$

The equation represents the institutional aspect of the revenue-expenditure structure of the Japanese public sector as a whole, in that the central government appropriates the local allocation taxes to the circumstances that the local tax revenues fall short of the local government expenditures. The specification is the same as in the professional model except for the AR(1) adjustment.

28. Prefectural Government Bonds.

$$HRGVBON = -83910.5213 + 0.4221(HRGVSPE$$
$$(-1.7530) \quad (4.1803)$$
$$- (HRGVTAX + HRGVKOF))$$
$$+ [AR(1) = 0.7379]$$
$$(4.1449)$$
$$\bar{R}^2 = 0.9378 \quad S.E. = 10680.11 \quad D.W. = 2.2034$$

The local public bonds are issued to finance the local government deficits. The original equation in the professional model was modified by the AR(1) adjustment.

29. Public Construction Works.

$$HRPUBK = 83105.58 + 1.6426HRGVKOF$$
$$(2.3842) \quad (6.5208)$$
$$+ 1.0438[HRGVBON - HRGVBON(-1)]$$
$$(1.3906)$$
$$\bar{R}^2 = 0.7285 \quad S.E. = 46283.42 \quad D.W. = 1.1884$$

The magnitudes of public construction works undertaken by local governments of the country are apt to be determined in expectation of the receipt of the local allocation taxes from the central government. Issuing prefectural government bonds is a way to finance those activities represented by this variable.

30. Number of New Housing Construction.

$$HRNEWH = -6544.338 + 0.0853HRIH$$
$$(-1.5307) \quad (9.2863)$$
$$+ [AR(1) = 0.6373]$$
$$(3.7490)$$
$$\bar{R}^2 = 0.8946 \quad S.E. = 1710.809 \quad D.W. = 1.5399$$

The amount of the residential investment is

supposed to be closely related to the number of newly built housings.

31. Real Manufacturing Shipments.

$$HRMANR = -164718.2 + 0.8674\,HRGDP$$
$$(-0.3819) \quad (17.1185)$$
$$-766536.5\,DUM9396 + [AR(1) = 0.3384]$$
$$(-4.4261) \quad (1.4157)$$
$$\bar{R}^2 = 0.9755 \quad S.E. = 194536.3 \quad D.W. = 1.5981$$

Shipments of the manufacturing industries depend on the real regional GDP. Based on the scatter diagram of HRMANR and HRGDP (Figure 6) , the shift of the intercept of this equation in the period from 1993 through 1996 was estimated by the dummy variable.

32. Bank Loans.

$$HRBANK = 187062.9842 + 0.4905\,HRGDP\_N01$$
$$(0.6033) \quad (13.4223)$$
$$-159584.1\,INTN + 0.0956\,HRBANK(-1)$$
$$(-5.1038) \quad (1.5289)$$
$$+2105399.0\,DUM\,9096$$
$$(12.3685)$$
$$\bar{R}^2 = 0.9979 \quad S.E. = 3109691.8 \quad D.W. = 2.1975$$

The demand for loanable funds is assumed to depend positively on the nominal GDP, and negatively on interest rates. Based on the scatter diagram of HRBANK and INTN (Figure 1) , the shift of the intercept of this equation in the period from 1990 through 1996 was estimated by the dummy variable. The lagged dependent variable adjusts for the first order serial correlaltion.

33. Truck Transportation.

$$HRTRKTR = 64629.1449 + 0.0098\,HRMANR$$
$$(10.0892) \quad (11.2179)$$
$$-33136.48\,DUM\,94 + [AR(1) = 0.1756]$$
$$(-8.4510) \quad (0.7090)$$
$$\bar{R}^2 = 0.9200 \quad S.E. = 3846.7280 \quad D.W. = 1.6052$$

Manufacturing shipments provide the demand for truck transportation services. The dummy variable controls the negative effects caused by the 'Great Hanshin Earthquake'.

34. Electricity Consumption.

$$HRELEC = 7928.54 + 7.17e-05\,HRGDP$$
$$(8.2932) \quad (0.5555)$$
$$+0.00149\,HRGDP*DUM8896$$
$$(6.2305)$$
$$-13405.43\,DUM\,8896$$
$$(-5.8828)$$
$$\bar{R}^2 = 0.9428 \quad S.E. = 291.9048 \quad D.W. = 1.7142$$

The equation reflects the hypothesis that electricity consumption can be explained by the overall economic activities represented by the GDP. The dummy variable controls the shift in both the intercept and the slope of this equation in the period from 1988 through 1996 (Figure 2).

35. Electricity Consumption for Lighting.

$$HRELED = -536.6783 + 0.000283\,HRGDP$$
$$(-3.1880) \quad (4.2537)$$
$$+461.4102\,DUM\,9496$$
$$(3.8993)$$
$$+0.4767\,HRELED(-1)$$
$$(3.6248)$$
$$\bar{R}^2 = 0.9936 \quad S.E. = 82.0853 \quad D.W. = 1.8252$$

This specification's basis is similar to the one for the total electricity consumption. The scatter diagram of HRELED and HRGDP (Figure 3) suggests that the intercept of this equation has shifted upwards in the period from 1994 through 1996.

36. Supply of Gas.

$$HRUGAS = -28074.8345 + 46.5595\,HRSETAI$$
$$(-11.7032) \quad (18.7796)$$
$$+[AR(1) = 0.4610]$$
$$(1.7283)$$

$\bar{R}^2$=0.9863 *S.E.*=374.1618 *D.W.*=1.6974

The number of households seems to suffice in explaining the variation of the dependent variable which is actual gas sales.

37. Number of Passenger Cars.

$$HRCARH-HRCARH(-1)$$
$$=7.4176+8.795e-07HRGDP+13.3349DUM\,7779$$
$$(0.3711)\ (0.3389)\qquad (3.3585)$$
$$-137.2016DUM\,8896+1.62e$$
$$(-4.0393)\qquad (4.3447)$$
$$-05DUM\,8896*HRGDP$$

$\bar{R}^2$=0.9450 *S.E.*=3.8757 *D.W.*=2.0539

The regional GDP represents the demand for passenger cars. The scatter diagram of the dependent variable and HRGDP (Figure 4) suggests that the intercept of this equation has shifted in the period from 1977 through 1979, and from 1988 through 1996. The diagram also suggests that the slope of the equation shifted in the period from 1988 through 1996.

38. Sales of Gasoline.

$$HRGASO=137.2637+0.3622HRCARH+6.69e$$
$$(2.8994)\ (3.0757)\qquad (5.5708)$$
$$-05HRGDP+49.5400DUM\,9496$$
$$(2.6277)$$
$$+[AR(1)=0.5938]$$
$$(2.8316)$$

$\bar{R}^2$=0.9945 *S.E.*=13.2758 *D.W.*=1.7418

Both the number of passenger cars and the general economic activities (HRGDP) represent the demand for gasoline. The variable DUM9496 controls the shift of the intercept (Figure 5) of this equation in the period from 1994 through 1996.

39. Aggregate Consumption Expenditures [5].

$$CP/POPT=69.7808+0.3480[GDP/POPT]$$
$$(3.2074)\ (5.2065)$$
$$+0.3792[CP(-1)/POPT(-1)]$$
$$(3.1361)$$

$\bar{R}^2$=0.9974 *S.E.*=15.0284 *D.W.*=1.2881

40. Aggregate Imports.

$$MC=-61184217.58+0.2345GDP$$
$$(-1.7433)\qquad (3.5674)$$
$$+197222[@PCH(WPI)/@PCH(PTW)]$$
$$(0.9199)$$
$$+[AR(1)=0.8826]$$
$$(11.1490)$$

$\bar{R}^2$=0.9646 *S.E.*=2109864 *D.W.*=1.2487

41. Prefectural GDP.

$$HRGDP=HRCP+HRCG+HRIH+HRIP+HRIG$$
$$+HRJP+HRJG+HREX-HRM+HRSDF$$

42. Nominal Private Consumption Expenditures.

$$HRCP\_N01=HECP*HRPCP/100$$

43. Nominal Prefectural Government Consumption Expenditures.

$$HRCG\_N01=HRCG*HEPCG/100$$

44. Nominal Business Fixed Investment.

$$HRIP\_N01=HRIP*HRPIP/100$$

45. Nominal Prefectural Government Investment.

$$HRIG\_N01=HRIG*HRPIG/100$$

[5] The GDP instead of the disposable income was used here because it seems to suffice for the numerical evaluation of the dynamic multipliers in the case of the autonomous change in the national variable (IG).

46. Nominal Private Residential Investment.

*HRIH_N*01＝*HRIH***HRPIH*/100

47. Nominal Regional Exports.

*HREX_N*01＝*HREX***HRPEX*/100

48. Nominal Regional Imports.

*HRM_N*01＝*HRM***HRPM*/100

49. Nominal Prefectural GDP.

*HRGDP_N*01＝*HRCP_N*01＋*HRCG_N*01＋*HRIH_N*01
＋*HRIP_N*01＋*HRIG_N*01＋*HRJP_N*01＋*HRJG_N*01
＋*HREX_N*01－*HRM_N*01＋*HRSDF_N*01

50. GDP Deflator.

HRPGDP＝(*HRGDP_N*01/*HRGDP*)*100

51. Employees' Compensations.

HRYW＝*HRW***HRLWK*

52. Wages and Salaries, Households Property Income and Proprietors Income.

HRYH＝*HRYWAG*＋*HRYRH*＋*HRYU*

53. Private Capital Stock.

HRKP＝*HRIP*＋(1－0.08)*HRKP*(－1)

54. Private Stock of Inventories.

HRKJP＝*HRJP*＋*HRKJP*(－1)

55. GDP for the National Economy.

GDP＝CP＋IG－MC＋OTHERS.

56. Real Regional Sales.

HRSALES＝((HRGDP_N01/HRPGDP)*100)
－(((HRJP_N01/HRPJP90)*100)
＋((HRJG_N01/HRPJG90)*100)).

57. Nominal Regional Sales.

HRJP_N01＝(HRJP*HRPJP90)/100

58. Weight of Real Sales of the Traditional Indutries in the Regional GDP.

ALPHA＝(HRMANR*(HRPIP/100)＋(HRGASO*PGAS
＋HRELEC*PELD＋HRUGAS*PUG
＋HRELED*PELL))/(HRGDP_N01
－(HRJP_N01＋HRJG_N01))

Ⅲ. Solution.

The actual and fitted values of the endogenous variables of the model are compared in Figure 7 in which continuous lines represent the actual values, and dotted lines the fitted values. The names of the fitted values are formed by adding the letter F to the end of the names of the actual values. The performance of the model is adequate for most of the endogenous variables. The relatively large discrepancies between the actual and fitted values are observed with the variables such as HRIH, HRJP, HRM, HRIG, HRYU, HRYC, HRGVBON, HRPUBK, HRNEWH, HRIH_N01, HRJP_N01, and HRM_N01. To evaluate the in-sample forecast errors of these variables, the absolute rate of forecast errors of individual endogenous variables was calculated for each time period. They are represented in table 1 where the letter E was attached to the beginning of the original variable name to indicate "Error". The letter D at the end of the variable name stands for the fact that the equations for such industrial variables as HRBANK, HRELEC, HRELED, HRCARH, HRGASO, and HRMANR have the dummy variables to control their structural changes. Next (right) to this column is the

absolute rate of the in-sample forecast errors of the Toyo Keizai Econometric Model (Macroeconometrics kenkyukai (2000)) the symbol for which is formed by adding the letter "E" to the beginning and to the end of the original variable name. Some of the endogenous variables of the present model are not treated as endogenous, or do not appear in the professional model. They are HRJP, HRJP_N01, HRKJP, GDP, CP, MC, and ALPHA. These variables, therfore, do not have their forecast errors calculated on the professional model, and do not have a pairwise representation of the forecast errors in Table 1. Based on the rate of forecast error in Table 1, it can be said that the values of the variables except HRJP, HRJP_N01, HRKJP, HRYU, HRGVBON, and HRPUBK were well reproduced by the model. It was possible to substantially improve the coefficient of determination of the HRJP equation by modifying its specification. The improvement of the equation in this sense, however, did not necessarily lead to better performance of the model as a whole. The iterative procedure in the solution algorithm sometimes became explosive, and the time paths of the dynamic multipliers were likely to show unusual irregularities due to such a modification. The current specification of this variable was not altered because highly volatile movements of this variable are essentially difficult to simulate, and its explanatory power was not so poor as to destroy the working of the entire model. The large forecast errors of the nominal value of this variable (HRJP_N01) , and of the stock of inventories (HRKJP) which is obtained as the accumulated inventory investment were accepted for the same reason. The errors of HRYU, HRGVBON, and HRPUBK are similar or of a smaller order to the errors of these variables in the professional model in the period from 1986 through 1996. The magnitudes of the errors of these variables in the period from 1977 through 1985 are considerably large, but do not destroy the performance of the present model as a whole (Economic Planning Agency (1987) , (1998) , Ginama (1981) , Klein and Shinkai (1970) , Ueno and Muto (1975)).

Ⅳ. Multipliers.

An exogenous variable and two parameters were chosen to calculate dynamic multipliers. They are government investment (IG) , and the intercept of the equations for local allocation tax (HRGVKOF) and public construction works (HRPUBK).

1. Dynamic Effects of a Change in IG.

To estimate the effects of a change in an exogenous variable concerning the national economy, IG is raised by 100 billion yen in the fiscal year of 1977. This change is not sustained in the subsequent years. Figure 8 represents the dynamic multipliers effects of this change on some endogenous variables. The letters "IG77" are attached to the endogenous variables names, and stand for the name of the exogenous variable whose value was altered, and when they were altered. Regional imports rise after the shock because the regional GDP increases, and regional goods and services get less competitive in the prefectural markets as HRPGDP gets higher. Regional exports can rise due to the shock albeit HRPGDP gets higher because the increase in the national GDP absorbs goods and services from the prefecture. The effects tend to dissipate in two or three years because of a lack of consecutive exogenous injection of the demand for goods and services. The long run value to which the multipliers converges seems to be close to zero. Some of the deflators do not react to this exogenous shock at all due to the specifications of their equations. Prefectural government consumption (HRCG) is apt to take a longer time than other endogenous variables to converge to the long run value.

2. Dynamic Effects of the Sustained Change in IG.

The dynamic multipliers for the sustained change in IG on some of the endogenous variables are represented in Figure 9. IG is raised by 100 billion

yen during the period from 1977 through 1996. The letters "IG7796" are attached to the names of the endogenous variables to indicate the name of the exogenous variable whose value was altered and in what time period. In this case, the multipliers seem not to generally dissipate. The effects of the exogenous shock on the regional variables such as HRCP, HRIH, HREX, HRM, HRCG, HRIG, HRLK are likely to be permanent. The multiplier effects on other variables except for essentially the exogenous deflators (HRPIH, HRPEX, and HRPM) do not seem to converge to zero, although they decline over time. The shapes of the time paths of the multipliers for the variables such as HRGDP, HRCP, HRIH, HRIP, and HRJP seem to be identical if the differences of their magnitudes are ignored. It is a reasonable result because they are combined through the GDP identity. The declining tendency of the dynamic effects on HRGDP, however, is not shared by HRCP and HRIH (and HRIC, and HRIG. See Figure 9.) , but is shared by HRIP and HRJP. HRIP is partly dependent upon HRJP as a proxy of the business conditions. To look into a factor which started this declining tendency in the multipliers in private inventory investment equation, the time path of the increase in the real bank loans was investigated. The exogenous inventory investment deflator is irrelevant in the context of multiplier analysis. By subtracting the lagged bank loans from the both sides of bank loans equation, the relationship

$$HRBANK_t - HRBANK_{t-1} = -187062.9842 + 0.4905HRGDP\_N01 - 159584.1253INTN - 0.9044HRBANK_{t-1}$$

follows where the first difference of the bank loans negatively depends on the lagged bank loans. Figure 14 represents the first difference (denoted by the initial 'D' in the variable name for the diagram) of the multiplier effects on the bank loans. The large initial increase in this difference in 1978 is followed by the sharp reduction in the subsequent year. This would have been caused by the first order autoregressive influences of the lagged bank loans. The reduction in dynamic effects on HRJP induced by this influence would have led to the decrease in the dynamic effects on HRIP and HRGDP. It would be possible that the reductions in the multiplier effects on HRJP and HRIP, and on HRGDP in the initial periods were caused by such a mechanism. Bank loans, however, is partly dependent upon the nominal HRGDP. It would perhaps explain the similar oscillatory patterns observed with respect to bank loans, the regional GDP, and variables which are related to the regional GDP.

In Table 2 where the letter 'D' at the end of the variable name serves to the same purpose as in Table 1, the dynamic influences on the regional imports exceeds regional exports after the fiscal year of 1988 (See Table 2.). This implies that the negative net regional export contributed to the reduction of multiplier effects on the regional GDP and on the variables related to it after that point in time.

3. Dynamic Effects of an Exogenous Change in HRPUBK

Multipliers for a permanent shift of the intercept of HRPUBK equation are represented in Figure 10. 10 billion yen was added to the intercept of the equation. The time paths of these multipliers show the similar shape to the ones for a permanent change in IG except the influences on the variables such as HRPGDP and HREX. HRPGDP gets heavier influences by the change in regional public construction works than by the change in the national public investment. HRPGDP stands for the competitiveness of the region's goods and services in HREX equation. Consequently, the multiplier effects on HREX are different across Figures 9 and 10.

4. Dynamic Effects of an Exogenous Change in HRGVKOF

Multipliers for a permanent shift of the intercept

of HRGVKOF equation are represented in Figure 11. The shift of the intercept is 10 billion yen as in the case of HRPUBK equation. Compared with the multipliers in Figure 10, the dynamic influences of the increase in local allocation taxes on the variables such as HRGDP, HRCP, HRIH, HRIG, and HRPCG are likely to be more expansionary than in the case of regional public construction works. The influences on the variables such as HRPCG and HRPIG are declining, but the slope of the time paths is smaller than in Figure 10. Examining the specifications of the HRPCG and HRPIG equations, these variables are dependent upon variables such as HRPCP, HRW, and HRPIP which are eventually explained by labor productivity. Labor productivity is defined as the HRGDP divided by the number of workers engaged in the region. The fact that the multipliers on HRPCG and HRPIG decline across Figures 10 and 11 implies that the effects on employment are greater in magnitude than the ones on the HRGDP. The observation that the slope of the time paths of the dynamic effects on these variables is smaller (in absolute value) in Figure 11 than in Figure 10 implies that the effects of the change in HRGVKOF on employment are smaller than in the case of the change in HRPUBK. This can also be understood by comparing the dynamic influences on the per capita wage (HRW) in Figures 10 and 11. The effects on this variable in Figure 10 decline more rapidly than in Figure 11 implying that the effects of expansionary public construction works on regional employment are greater than the ones of the increase in transfer from the central to the local government.

V. Extrapolation

Tables 3 and 4 represent the rate of errors in extrapolation of the present and the professional models into the year of 1997 for which the actual values of some of the endogenous variables of these models are available in the Annual Reports of Prefectural Accounts (Economic Planning Agency [6]). The letter "E" was attached to the beginning of the variable name which is followed by the number and the letter "F" to denote the time period for which the prediction is made and to represent that the value is a forecast. The values of a set of exogenous variables were extended into the future in terms of the percentage rate of increase from the previous period of time, and are provided below the tables. The present model shows better forecasting performance than the professional model with respect to the variables such as HRCP, HRIH, HRM, and HRPGDP whereas the latter excels the former in forecasting such variables as HRCG, HRIG, HRGDP, HRIP, and HREX. It can be concluded, however, that both models show fairly accurate predictive ability in forecasting the future of one period ahead from the current period. It should, however, be noted that the solutions of the two models were reached on the basis of the actual values for the lagged endogenous variables. As the forecast time horizon becomes longer into the future, and the values of the greater number of lagged endogenous variables are replaced by the predicted values of the models, the accuracy of the models' forecast will tend to deteriorate.

VI. Implications of Shifts in Parameters of Industry Equations.

1. Rate of Error.

Figure 15 represents the rates of in-sample forecast errors for the models with and without dummy variables to control the changes in parameters in industry equations. The letter "E" was attached to the beginning of the variable names to indicate that the time series is related to errors, and the letter "D" to denote that the variable concerns with the model which has the dummy variables. It can be observed that such variables as HRGDP, HRCP, HRIH, HREX, HRM, HRYRH, HRSALES, and ALPHA are more accurately forecasted by the model with the dummy

[6] This government agency currently belongs to the Cabinet Office.

variables than by the model without the dummy variables. Such variables as HRJP, HRPGDP, and HRPIP, on the other hand, can be better forecasted by the model without the dummy variables. The fact that ALPHA, which stands for the weight of the traditional sector in the regional economy, can be better forecasted by the model with dummy variables has an important implication for the present model. When the industrial structure as measured by ALPHA changes, each industry would go through the process of structural changes as represented by statistically significant dummy variables. Table 5 has the forecast errors of other endogenous variables in the models with and without the dummy variables.

2. Multipliers.

Figure 12 represents the dynamic multipliers of a change in IG by 100 billion yen in the initial period on some endogenous variables for the model in which industry equations do not have any dummy variable to control structural changes of the intercept and slope. Figure 13 shows the dynamic multipliers for the case in which IG is permanently raised by 100 billion yen in the model which does not take account of the possibilities of the structural changes in industry equations. Comparisons between Figures 8 and 12, and Figures 9 and 13 reveal that the dynamic effects on the expenditure variables such as HRGDP, HRCP, HRIH, HRIP, HRJP, HREX, HRM, HRCG and HRIG in the model which does not have dummy variables in industry equations are greater than in the model with considerations for the parametric shifts (Refer to Table 6 for the dynamic effects on HRIG in the models with and without dummy variables to control the parametric changes. The letter 'D' at the end of the variable name serves to the same purpose as in the previous tables.). In contrast, the dynamic multipliers on the wage (HRW) , employment (HRLK) , and deflators (HRPGDP, HRPCP, HRPIP, HRPCG, and HRPIG) in Figures 12 and 13 are smaller than in Figures 8 and 9.

Ⅶ. Production Smoothing through Inventory Investment.

One of the macroeconomic paradoxes is more volatile production than sales when demand stochastically fluctuates (Blanchard (1983), Blinder (1986), Kahn(1987), Schu (1993), West (1988), Wilkinson (1989)). This phenomenon can be expressed as the increase in the stock of inventories right after demand shocks. The present model shows this property in a dynamic multiplier analysis represented in Figure 16 where the intercept of the HRIP equation is permanently raised by 10 billion yen (The letter 'IP' in the beginning of the variable name stands for this autonomous change.). The stock of inventories (HRKJP) starts rising from the initial period on. It was observed that the similar multiplier paths resulted in when the intercept of the equations for such variables as HRGVKOF, HRPUBK and HRIG were permanently raised by 10 billion yen. In order to derive a dynamic multiplier path that is consistent with the production smoothing process, the present model was modified with respect to such variables as HRIP, HRSALES, HRIG, HRM, HRW, HRLWK, HRGDP and HRJP as follows:

3. Business Fixed Investment.

$$HRIP = -1901404.79 + 0.4572\,HRSALES$$
$$(-7.1779) \qquad (8.6329)$$
$$-0.1025\,HRKP(-1) - 81156.2877\,DUM79$$
$$(-3.8939) \qquad (-1.3635)$$
$$+[AR(1) = 0.3504]$$
$$(1.8741)$$
$$\bar{R}^2 = 0.9739 \quad S.E. = 70321.77 \quad D.W. = 1.9525$$

4. Total Sales

$$HRSALES = -69426.6769 + 1.0075(HRCP + HRCG$$
$$(-1.1197) \qquad (142.6406)$$
$$+ HRIH + HRIP + HRIG + HREX - HRM)$$
$$\bar{R}^2 = 0.9990 \quad S.E. = 48336.30 \quad D.W. = 0.4630$$

5. Prefectural Government Fixed Investment.

$$HRIG = -16293.2601 + 0.01956IG$$
$$(-0.2834) \quad (8.4358)$$
$$+ 0.4274(HRPUBK/HRPCP)*100$$
$$(1.9675)$$
$$\bar{R}^2 = 0.9039 \quad S.E. = 47081.86 \quad D.W. = 1.2637$$

8. Regional Imports.

$$HRM = 1249868.624 - 905976.6\frac{HRPM}{HRPGDP}$$
$$(0.4577) \quad (-0.5020)$$
$$+ 0.4639HRSALES + 0.4928HRM(-1)$$
$$(1.6026) \quad (1.8557)$$
$$\bar{R}^2 = 0.9407 \quad S.E. = 406378.9 \quad D.W. = 1.3315$$

17. Regional Per Capita Employee's Compensations.

$$HRW = 1714.705 + 45.7978HRPCP(-1)$$
$$(1.4854) \quad (5.8667)$$
$$+ 0.6385\frac{HREX - HRM}{HRLK} - 2443.889ALPHA$$
$$(1.2477) \quad (-3.4891)$$
$$\bar{R}^2 = 0.9476 \quad S.E. = 188.7542 \quad D.W. = 0.7941$$

23. Number of Regional Employees.

$$HRLWK = 851.4018 + 8.73e - 0.5HRSALES$$
$$(3.7788) \quad (5.4327)$$
$$-0.0682\left(\frac{HRW}{WPI}*100\right) - 227.8209ALPHA$$
$$(-1.6800) \quad (-1.2149)$$
$$\bar{R}^2 = 0.9359 \quad S.E. = 25.2235 \quad D.W. = 1.1218$$

41. Prefectural GDP.

$$\frac{HRGDP}{HRLWK} = 6015.393 + 0.2404\frac{HRKP(-1)}{HRLWK}$$
$$(4.6644) \quad (1.7864)$$
$$+ [AR(1) = 0.8073]$$
$$(5.5144)$$
$$\bar{R}^2 = 0.9280 \quad S.E. = 211.6084 \quad D.W. = 1.0743$$

56. Private Inventory Investment

$$HRJP = HRGDP - HRSALES - HRJG$$

In modifying the specification of such expenditure variables as HRIP, HRM, the sales variable (HRSALES) was added as one of explanatory variables in one hand. The identity which determines the sales variable was replaced by a regression equation that explains sales in terms of the GDP components including HRIP and HRM. The prefectural GDP (HRGDP) is determined in the Cobb=Douglas type of linearly homogeneous production function. Based on these modifications of both the demand and supply sides of the regional economy, the private inventory investment was defined as the difference between the GDP and sales. The stock of inventories, in turn, is defined as being accumulated through inventory investment. In changing the specification of the labor market variables, HRW and HRLWK, they were expected to work as factors that prevent the system from exploding when the increase in the aggregate demand takes place.

Using the modified model, the dynamic influences of the permanent change in the intercept of the HRIP equation on the stock of inventories (denoted as IP_HRKJP) were calculated, and are represented in Figure 17 and Table 7. In the initial three periods, the magnitude of the stock of inventories declines implying that production increases less rapidly than sales [7]. It should, however, be noted that in the literature, finished goods inventories are supposed to work as the buffer to smooth production in response to unexpected fluctuations in demand. Inventory

[7] In the modified model, the increase in import (HRM) has negative effects on sales variable(HRSALES) in equation 4 in section Ⅶ.The reduction in sales dampens the number of employees (HRLWK) in equation 23, and lowers GOP in equation 41 in the same section. This path of influences would be responsible for the production smoothing phenomenon that the revised model represents. The importance of imports in the context of production smoothing via inventory behaviors is suggested in Ginama (2008 and 2010) for the cases of Okinawa Prefecture and the contemporary German economy.

investment and the stock of inventories in the present model contain not only finished goods but also semifinished goods and materials. The macroeconomic implication of production smoothing described in the present model, therefore, is limited in this respect.

Concluding Remarks

The Toyo Keizai Econometric Model of Hiroshima Prefecture contains 55 endogenous variables. In constructing the current model, two variables (HRCARR and HRLRGS) were deleted, and 5 variables (HRSALES, ALPHA, GDP, CP, and MC) were added to make the total number of endogenous variables 58. The two variables were abondoned because their number of observation was insufficient. The sales variable (HRSALES) was introduced as an explanatory variable in the equations of private inventory investment and private corporate income. The variable ALPHA, the value of which is declining over time (Figure 18), is the measure of structural change in the regional economy from the traditional to the newly developing industries, although the new and recently growing sector in the region was not explicitly defined. Especially ALPHA as defined in this paper does not include traditional industries such as agriculture and other primary industries, construction industry and the distribution sector, but includes the rapidly growing computer related manufacturing industries. In the definition of ALPHA, sales of the traditional industries is divided by the aggregate value added (HRGDP). This variable can take values greater than one due to the inconsistency of the two variables. Those deficiencies with the variable ALPHA is mainly due to the limitation in the availability of data.

The variables concerning the national economy were introduced to make the calculation of the dynamic multipliers more realistic than in the professional model. There are variables in the present model which are directly dependent upon the national GDP (HRIP and HREX). When the dynamic influences of a change in exogenous variable IG, public capital formation of the Japanese Government, are investigated, it is necessary to take account of the dynamic effects of a change of this variable on the national GDP. The professional model lacks this route of interdependence among the variables.

Many equations (21) of the professional model have the value of the Durbin-Watson statistic which is less than one. Based on this statistic, it can be said that the error term of those equations are first order autocorrelated at the 5 percent level of significance. When errors are autocorrelated, OLS estimators lack consistency. The present model, on the other, has two equations (of HREX and HRPEX) that are of first order autocorrelated errors at the same level of significance. In an effort to correct for the autocorrelation, the relative price variable lost its statistical significance in HREX equation, and the lagged dependent variable failed to correct for the problem in HRPEX equation in which another attempt made to alleviate the problem resulted the errorneous sign in the parameter of the lagged dependent variable.

The professional model seems to have problems with its specifications in the following equations:

1. Private Consumption

   The nominal interest rate enters the equation with the negative sign perhaps implying that the rise in the interest rate induces consumers to save more by reducing consumption. The appropriateness of using the real rate of interest is not referred to at all. Private residential investment equation has the same problem as this. The real rate of interest, however, is used and has the correct sign in the private fixed investment equation. Comparing the way of using the interest rate across the two equations, the professional model seems to conceive that firms are rational but consumers are not.

2. Private Residential Investment

   The reason why the dummy variable (DUM8790) appears in the equation is not clear.

3. Nominal Private Inventory Investment

   The real counter part of this variable is multiplied by the private fixed investment deflator, albeit the private inventory investment deflator can be reasonably calculated by dividing the dependent

variable of this equation by the real private inventory investment. In so doing, this regression equation would be replaced by the identical relationship HRJP_N01/HRJP＝HRPJP.

4. Number of Households

The definition of the per capita household in the professional model seems to be unusual, although the adjusted coefficient of determination turned out to be unity. The concept of the number of persons per household would perhaps be easier to understand. This paper used such a variable to determine the number of households.

5. Number of Workers Employed

To calculate the rate of the numbers of workers employed, a variable that can be observed only in the period after 1982 is used. Other specification is possible as in the present model, and the use of such a variable as an explanatory variable should not be the reason for solving the entire model only for a part of the entire sample period for which most of the regression equations are estimated. Actually the professional model was solved for the period from 1986 through 1996.

The substantial body of the professional model has nothing to do with the state of affairs of the variables such as HRGVSPE, HRGVTAX, HRGVKOF, HRGVBON, HRPUBK, HRMANR, HRELEC, HRBANK, HRTRKTR, HRNEWH, HRLRGS (Sales of large scale retail stores), HRCARR (Number of registered passenger cars), HRCARH, HRGASO, HRELED, and HRUGAS. It would even be possible to say that subtracting these 16 variables, the size of the professional model is actually of the order of 39 endogenous variables. Out of the 16 variables, 3 variables (HRNEWH, HRTRKTR, and HRCARH) can be separated from the rest of the present model. Two variables (HRCARR and HRLRGS) were dropped from the system for the reason mentioned above. The 11 variables left after subtracting these 5 variables are in close relationship with the working of the present model by entering other equations as explanatory variables, and by being included in the definition of the variable ALPHA.

It was found in the process of constructing the present model that considerably large forecast errors were likely to be observed in the first half period of the whole sample period from 1977 through 1996. This drawback of the model has been corrected. Based on this experience it is recommended that the professional model should be solved for the longer period of time to check its performance.

Visual inspection of the scatter diagrams of the variables such as HRBANK, HRELEC, HRELED, HRCARH, HRGASO, and HRMANR suggests that there have been shifts in parameters of the equations for these variables. The usual t-tests (with all of the reservations about small sample biases and nonstationarity of the relevant data involved in the present and the professional models) confirmed the hypotheses formed diagrammatically. That the solutions of the present model are likely to be more accurate than the ones of a hypothetical model in which shifts in the parameters of industry equations are not considered correspond to this result. The present model introduced an explanatory variable, ALPHA, to control the effects of the change in the industrial structure of the regional economy. A time series of this variable is declining over time. Based on this observation, this variable was assumed to represent a mirror image of the expansion of the recently developing industries. It was observed through dynamic multiplier analyses that the influences of the exogenous shocks on the expenditure variables such as HRGDP, HRCP, HRIH, HRIP, HRJP, HREX, HRM, HRCG, and HRIG are overestimated by the inaccurate model [8], whereas the influences on the wages, employment, and deflators are underestimated by the inaccurate model. These results point to the desirability of properly taking into account the possibilities of structural changes in industries. The matter of numerically evaluating the effects of macroeconomic policies in a regional economy should be analyzed in the framework of a model which is constructed with this consideration in mind.

[8] This stands for inaccuracy of the hypothetical model.

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Table 1

obs	EHRGDP_D	EHRGDPE	EHRCP_D	EHRCPE	EHRIH_D	EHRIHE
1977	0.139551	NA	0.011652	NA	0.039061	NA
1978	0.133454	NA	0.024739	NA	0.099537	NA
1979	0.050526	NA	0.042405	NA	0.13951	NA
1980	-0.003106	NA	0.046445	NA	-0.062155	NA
1981	-0.050211	NA	-0.010767	NA	-0.064796	NA
1982	-0.049949	NA	-0.037893	NA	0.044085	NA
1983	-0.020322	NA	-0.023813	NA	-0.093538	NA
1984	-0.036013	NA	-0.014887	NA	-0.171241	NA
1985	-0.036808	NA	-0.012257	NA	-0.101695	NA
1986	-0.019908	-0.034827	-0.032115	-0.025455	-0.085361	-0.129896
1987	-0.00593	-0.020017	-0.003949	-0.008046	0.078811	-0.036897
1988	-0.019294	0.000584	0.014506	0.006142	0.07476	-0.026696
1989	-0.004231	0.042573	0.034518	0.021628	0.066938	0.017409
1990	-0.034342	0.05272	0.022903	0.038005	0.068869	0.046004
1991	0.003496	0.067405	-0.008546	0.015027	-0.079449	-0.009376
1992	0.015247	0.030707	-0.019845	-0.017257	-0.117035	-0.061092
1993	0.048986	0.002786	-0.013715	-0.044319	0.052246	0.061938
1994	0.017563	-0.017808	-0.003211	-0.039313	0.105093	0.102804
1995	-0.019553	-0.019919	-0.002851	-0.039593	-0.061506	-0.085257
1996	-0.032901	-0.015738	0.038003	-0.029136	-0.034051	-0.047959

obs	EHRIP_D	EHRIPE	EHRJP_D	EHRJPE	EHRSALES_D	EHRSALESE
1977	0.247177	NA	3.63248	NA	0.120099	NA
1978	0.048874	NA	-6.163312	NA	0.123154	NA
1979	-0.03465	NA	-0.668225	NA	0.052734	NA
1980	-0.003177	NA	3.167854	NA	0.002848	NA
1981	-0.070024	NA	-0.638205	NA	-0.045465	NA
1982	-0.138287	NA	-2.255502	NA	-0.040787	NA
1983	-0.133107	NA	2.098752	NA	-0.002209	NA
1984	-0.096837	NA	13.28544	NA	-0.030618	NA
1985	0.008514	NA	0.01031	NA	-0.03712	NA
1986	0.011538	-0.008853	0.241722	NA	-0.0228	NA
1987	0.011188	-0.067709	1.403659	NA	0.009088	NA
1988	0.037757	0.013876	0.514333	NA	-0.027229	NA
1989	0.068571	0.063744	0.553152	NA	-0.011888	NA
1990	0.053806	0.170325	0.343898	NA	-0.044691	NA
1991	0.118868	0.202964	0.390091	NA	-0.003241	NA
1992	0.101555	0.098582	0.84856	NA	0.001912	NA
1993	0.075696	-0.021638	0.119194	NA	0.049471	NA
1994	-0.02714	-0.108382	0.89441	NA	0.025239	NA
1995	-0.046998	-0.080416	1.200192	NA	-0.011312	NA
1996	-0.055482	-0.027429	3.990663	NA	-0.026736	NA

Table 1 continued

obs	EHRIG_D	EHRIGE	EHRCG_D	EHRCGE	EHREX_D	EHREXE
1977	0.014489	NA	0.007019	NA	0.037102	NA
1978	-0.00161	NA	0.013877	NA	0.049346	NA
1979	0.006393	NA	-0.007005	NA	-0.004963	NA
1980	0.014056	NA	0.020106	NA	-0.049925	NA
1981	0.046428	NA	0.022124	NA	-0.002679	NA
1982	0.103177	NA	0.019026	NA	-0.024357	NA
1983	-0.083176	NA	0.018384	NA	-0.000131	NA
1984	-0.123475	NA	0.024947	NA	-0.024469	NA
1985	-0.100425	NA	-0.00183	NA	0.00267	NA
1986	-0.046909	-0.007452	-0.026567	-0.012526	0.011422	-0.005813
1987	0.00238	0.033612	-0.01641	-0.019653	-0.011143	-0.017669
1988	0.021181	0.068852	-0.01419	-0.021038	0.026884	0.0393
1989	-0.02071	0.033236	-0.023058	-0.033691	0.038782	0.07359
1990	-0.062346	-0.007841	-0.003091	-0.008854	0.078709	0.110051
1991	0.05552	0.087839	-0.032364	-0.034209	0.05935	0.081402
1992	0.069872	0.068045	-0.011569	-0.00366	0.000745	0.004863
1993	0.116206	0.088838	-0.000676	0.014737	-0.017	-0.037989
1994	-0.026236	-0.039201	-0.000388	0.018241	-0.039749	-0.06114
1995	0.006801	-0.009364	-0.003674	0.014842	-0.046604	-0.052386
1996	-0.116463	-0.11839	0.006756	0.015475	-0.042958	-0.037748

obs	EHRM_D	EHRME	EHRPCP_D	EHRPCPE	EHRPIP_D	EHRPIPE
1977	-0.048879	NA	0.008951	NA	-0.004568	NA
1978	-0.050834	NA	-0.002597	NA	-0.00535	NA
1979	-0.030347	NA	-0.000792	NA	0.000759	NA
1980	-0.030529	NA	0.008816	NA	0.004826	NA
1981	0.032588	NA	0.003104	NA	0.003755	NA
1982	-0.006615	NA	0.011736	NA	0.00298	NA
1983	-0.037655	NA	-0.002817	NA	0.001601	NA
1984	-0.030313	NA	-0.007872	NA	0.001103	NA
1985	0.023017	NA	-0.003953	NA	0.000476	NA
1986	0.007951	0.00512	-0.006082	0.004492	-0.001958	0.011205
1987	-0.019352	-0.014247	-0.007368	0.009231	-0.003658	0.006542
1988	0.073123	0.048402	-0.009154	-0.001164	-0.002747	0.00557
1989	0.083907	0.059817	-0.004993	0.007117	-0.001733	-0.000118
1990	0.145161	0.116009	-0.000737	0.012226	0.00075	0.015469
1991	0.084156	0.069515	0.005388	0.024837	5.14E-05	0.027199
1992	0.005843	-0.016176	0.002246	0.023241	0.00017	0.036557
1993	-0.052436	-0.058904	0.002902	0.03026	-0.00428	0.032565
1994	-0.073566	-0.083155	0.000575	0.029223	-0.006693	0.01168
1995	-0.050429	-0.074753	0.005606	0.020821	-0.00441	-0.00876
1996	-0.01737	-0.056238	-0.001044	0.00335	0.019014	-0.031443

Table 1 continued

obs	EHRPIH_D	EHRPIHE	EHRPEX_D	EHRPEXE	EHRPM_D	EHRPME
1977	0.000218	NA	-0.031959	NA	0.004369	NA
1978	0.000306	NA	-0.039123	NA	0.001563	NA
1979	-0.000313	NA	0.004543	NA	0.008839	NA
1980	-0.00034	NA	0.018069	NA	0.008608	NA
1981	-7.51E-05	NA	-0.00049	NA	-0.011417	NA
1982	-0.000349	NA	-0.012594	NA	-0.02049	NA
1983	-0.000233	NA	-0.012899	NA	-0.013733	NA
1984	0.000298	NA	-0.006954	NA	-0.0196	NA
1985	0.000216	NA	-0.009806	NA	-0.012697	NA
1986	0.000711	-0.038878	-0.026485	-0.039775	-0.02304	-0.015328
1987	-0.000237	-0.018036	-0.012376	-0.03432	-0.010526	-0.002258
1988	-0.000227	-0.022173	-0.007501	-0.03123	-0.019975	-0.009891
1989	-8.52E-05	-0.000736	0.012759	-0.002812	-0.002555	0.012947
1990	1.61E-05	0.013351	0.017915	0.005445	0.001369	0.019524
1991	-0.000253	0.027865	0.008004	-0.009289	0.00559	0.023818
1992	-0.000204	0.032316	0.010794	-0.012692	0.005439	0.023323
1993	-0.000216	0.041557	0.024566	-0.00959	0.034899	0.049973
1994	0.000254	0.036122	0.020293	-0.020229	0.022967	0.037687
1995	0.000266	0.025919	0.019825	-0.024168	0.020048	0.03461
1996	0.000275	0.020718	0.011886	-0.032448	0.004309	0.020065

obs	EHRPCG_D	EHRPCGE	EHRPIG_D	EHRPIGE	EHRYI_D	EHRYIE
1977	0.018135	NA	0.035898	NA	0.129539	NA
1978	0.013408	NA	0.023514	NA	0.114185	NA
1979	0.022349	NA	0.016919	NA	0.040164	NA
1980	0.002347	NA	0.020233	NA	0.004942	NA
1981	-0.015309	NA	-0.00166	NA	-0.061363	NA
1982	-0.024291	NA	-0.004345	NA	-0.056169	NA
1983	-0.03053	NA	-0.005832	NA	-0.037624	NA
1984	-0.028794	NA	-0.013005	NA	-0.051321	NA
1985	-0.020971	NA	-0.023015	NA	-0.053441	NA
1986	-0.025995	-0.020511	-0.025645	-0.015912	-0.030117	-0.060178
1987	-0.028621	-0.015889	-0.01951	-0.009923	0.001787	-0.031009
1988	-0.021756	-0.019975	-0.026627	-0.006363	0.000364	-0.00805
1989	-0.011472	-0.000583	-0.005535	0.014388	0.021959	0.045781
1990	0.004854	0.0207	-0.013601	0.028519	-0.008906	0.058921
1991	0.019065	0.045694	-0.003407	0.043102	0.006732	0.054994
1992	0.019871	0.050643	0.002531	0.042846	0.012852	0.01069
1993	0.013143	0.053109	0.004622	0.035624	0.039841	-0.0258
1994	0.003572	0.046024	0.006584	0.023331	0.02521	-0.037687
1995	0.013348	0.038562	0.004697	0.010615	-0.01223	-0.061288
1996	0.013328	0.026306	0.023292	-0.010559	-0.017745	-0.072126

Table 1 continued

obs	EHRW_D	EHRWE	EHRYWAG_D	EHRYWAGE	EHRYU_D	EHRYUE
1977	0.179283	NA	0.060901	NA	0.126004	NA
1978	0.104716	NA	0.049026	NA	0.22228	NA
1979	0.045818	NA	0.041055	NA	0.18398	NA
1980	-0.021454	NA	0.04659	NA	0.116938	NA
1981	-0.055658	NA	0.012099	NA	-0.055573	NA
1982	-0.046091	NA	-0.009177	NA	-0.040722	NA
1983	-0.025289	NA	-0.021161	NA	-0.038511	NA
1984	-0.040299	NA	-0.033581	NA	-0.17953	NA
1985	-0.049758	NA	-0.040627	NA	-0.122559	NA
1986	-0.004293	-0.016586	-0.014838	-0.018292	-0.21343	-0.148144
1987	0.000903	-0.000688	-0.014052	-0.003258	-0.036018	-0.073303
1988	-0.03818	-0.004416	-0.016898	-0.005818	0.021358	0.007775
1989	-0.027962	0.02167	-0.009703	0.019256	0.092256	0.075556
1990	-0.035633	0.036096	0.00205	0.040363	-0.008643	0.064076
1991	0.00696	0.056467	-0.00049	0.048539	-0.033446	0.025913
1992	0.028215	0.037739	-0.003967	0.03695	0.028178	0.012748
1993	0.035186	0.020758	-0.011142	0.020975	0.048194	-0.020522
1994	0.024971	0.021778	0.002939	0.032268	0.067492	-0.041938
1995	-0.007554	0.016777	-0.00336	0.022237	0.005913	-0.108987
1996	-0.013579	0.017734	0.00823	0.024424	-0.014488	-0.144978

obs	EHRYRH_D	EHRYRHE	EHRYC_D	EHRYCE	EHRSETAI_D	EHRSETAIE
1977	-0.115667	NA	-0.129587	NA	-0.00064	NA
1978	-0.071285	NA	0.04576	NA	-0.000473	NA
1979	-0.098893	NA	0.050654	NA	-0.000155	NA
1980	-0.079473	NA	-0.006799	NA	-0.000429	NA
1981	-0.052439	NA	-0.094529	NA	0.000335	NA
1982	-0.087743	NA	-0.114794	NA	0.002422	NA
1983	-0.079264	NA	-0.176286	NA	0.00271	NA
1984	-0.038631	NA	-0.012218	NA	0.002407	NA
1985	-0.069711	NA	0.08327	NA	0.001041	NA
1986	-0.159548	-0.251315	-0.015614	-0.092304	0.000141	-0.000669
1987	-0.132651	-0.129921	-0.004235	-0.115623	-0.000558	-0.00117
1988	-0.070589	-0.174584	0.170265	0.041084	-0.001563	-0.002022
1989	0.12908	0.049718	0.176095	0.106297	-0.002263	-0.002619
1990	0.213624	0.07499	0.128877	0.117044	-0.002738	-0.003043
1991	0.16419	0.047508	0.064442	0.060092	-0.002019	-0.002326
1992	0.016898	-0.033058	-0.01523	-0.097386	-0.000376	-0.000734
1993	0.074948	-0.050013	-0.089717	-0.294391	-0.000215	-0.00067
1994	-0.009922	-0.109575	-0.098432	-0.34099	-0.000124	-0.000715
1995	-0.056767	-0.272928	-0.11037	-0.416015	-0.00061	-0.001369
1996	0.04071	-0.405654	0.016797	-0.331458	3.37E-05	-0.000915

Table 1 continued

obs	EHRLWK_D	EHRLWKE	EHRLK_D	EHRLKE	EHRGVSPE_D	EHRGVSPEE
1977	0.025004	NA	-0.013608	NA	0.09863	NA
1978	0.013889	NA	-0.000391	NA	0.123487	NA
1979	-0.031855	NA	0.004231	NA	0.074663	NA
1980	0.010515	NA	0.017125	NA	0.018144	NA
1981	-0.008246	NA	0.01416	NA	-0.005494	NA
1982	-0.006886	NA	0.00758	NA	-0.016146	NA
1983	0.000959	NA	0.000807	NA	-0.053409	NA
1984	-0.011975	NA	8.86E-05	NA	-0.090543	NA
1985	-0.002119	NA	-0.004784	NA	-0.066627	NA
1986	0.021711	0.001543	-0.007159	-0.005597	-0.036545	-0.040094
1987	0.023414	0.002537	-0.00517	-0.009266	-0.010315	-0.00384
1988	0.003543	0.003243	0.002873	-0.011495	-0.039737	0.014749
1989	-0.015293	0.002538	0.002959	-0.010822	-0.010966	0.05412
1990	-0.032585	0.005468	0.004937	-0.002136	-0.053011	0.039965
1991	-0.02808	-0.002161	-0.006087	-0.008666	0.009603	0.082433
1992	-0.006671	-0.001794	-0.009203	-0.00702	0.038294	0.068721
1993	0.015867	0.002195	-0.008862	-0.002682	0.086631	0.065448
1994	0.022497	0.006938	-0.000765	0.006371	0.072062	0.068038
1995	0.012607	0.01026	0.010891	0.0147	-0.006096	0.013264
1996	-0.013383	0.000455	0.007158	0.012266	-0.05055	-0.008644

obs	EHRGVTAX_D	EHRGVTAXE	EHRGVKOF_D	EHRGVKOFE	EHRGVBON_D	EHRGVBONE
1977	0.212905	NA	-0.017853	NA	0.30478	NA
1978	0.095353	NA	0.151633	NA	0.438404	NA
1979	0.040646	NA	0.093845	NA	0.354179	NA
1980	-0.023337	NA	0.01047	NA	0.15918	NA
1981	-0.090409	NA	-0.04561	NA	0.135834	NA
1982	-0.068769	NA	-0.039799	NA	0.162889	NA
1983	-0.042962	NA	-0.089174	NA	-0.046101	NA
1984	-0.057147	NA	-0.172321	NA	-0.216109	NA
1985	-0.032941	NA	-0.081982	NA	-0.593747	NA
1986	-0.041942	-0.033826	-0.106138	-0.068074	-0.059204	-0.213839
1987	0.021604	0.009567	-0.048665	0.008252	0.049168	-0.012226
1988	0.051003	-0.026434	-0.053932	-0.040471	-0.127532	0.114493
1989	0.067575	0.031583	0.112989	0.126638	-0.393424	-0.090283
1990	0.00475	0.048418	0.028309	0.045794	-0.530538	-0.19225
1991	0.041138	0.058558	0.045076	0.055861	-0.375758	-0.0862
1992	0.005239	0.048928	0.056137	0.10763	-0.192571	-0.128324
1993	0.022664	-0.047513	0.048608	0.074948	0.226316	0.241431
1994	-0.008408	-0.08897	0.030203	0.082152	0.147966	0.21179
1995	-0.013742	-0.070771	-0.034582	0.041012	0.059745	0.174277
1996	-0.034313	-0.102819	-0.030566	0.073716	-0.043748	0.136438

Table 1 continued

obs	EHRPUBK_D	EHRPUBKE	EHRNEWH_D	EHRNEWHE	EHRMANR_D	EHRMANRE
1977	0.188749	NA	0.072537	NA	0.138648	NA
1978	0.160451	NA	0.160204	NA	0.084935	NA
1979	0.185082	NA	0.217779	NA	0.018064	NA
1980	0.110738	NA	-0.012971	NA	0.018541	NA
1981	0.063098	NA	-0.15999	NA	-0.006935	NA
1982	-0.106542	NA	-0.061151	NA	-0.024101	NA
1983	0.014013	NA	-0.134702	NA	-0.01119	NA
1984	-0.249648	NA	-0.096136	NA	-0.019721	NA
1985	-0.341355	NA	-0.018161	NA	-0.013263	NA
1986	-0.269143	0.988702	-0.073834	-0.144998	-0.01759	-0.016794
1987	-0.300497	0.988409	0.118424	-0.012866	-0.050529	-0.051931
1988	-0.285277	0.989199	0.14667	0.039237	-0.056197	-0.012409
1989	0.030628	0.991862	0.095727	0.04167	0.007573	0.059786
1990	-0.092315	0.990703	0.058619	0.030703	-0.009075	0.095192
1991	0.211425	0.992879	-0.222316	-0.141859	0.03097	0.130187
1992	0.212887	0.99198	-0.185194	-0.118814	-0.001711	0.070369
1993	0.171212	0.990688	0.085643	0.099049	0.070704	-0.029424
1994	-0.12665	0.988258	0.083607	0.086134	0.027981	-0.071788
1995	0.036726	0.9899	-0.139567	-0.157959	-0.046471	-0.093261
1996	-0.150944	0.988477	-0.077257	-0.080143	-0.056589	-0.070649

obs	EHRBANK_D	EHRBANKE	EHRTRKTR_D	EHRTRKTRE	EHRELEC_D	EHRELECE
1977	0.279074	NA	0.012004	NA	-0.024373	NA
1978	0.120492	NA	0.019576	NA	0.023986	NA
1979	0.05479	NA	0.05244	NA	0.044851	NA
1980	0.088283	NA	0.022569	NA	-0.002	NA
1981	-0.072846	NA	-0.00601	NA	-0.004238	NA
1982	-0.108496	NA	0.042105	NA	-0.034301	NA
1983	-0.082247	NA	-0.009257	NA	-0.020746	NA
1984	-0.105354	NA	-0.025454	NA	0.016761	NA
1985	-0.035111	NA	-0.012133	NA	0.027381	NA
1986	-0.031581	-0.373519	-0.041882	-0.04165	-0.01997	-6687.997
1987	-0.003581	-0.142812	-0.055116	-0.055994	-0.009989	-6821.424
1988	-0.042289	-0.295199	-0.000165	0.022464	-0.029843	-6789.653
1989	0.029451	-0.150176	0.044848	0.072919	-0.03154	-6552.442
1990	-0.003564	0.156923	0.000781	0.060335	-0.055252	-6117.212
1991	0.003119	0.14889	0.001248	0.060297	-0.013418	-5874.234
1992	0.000497	0.06895	-0.029384	0.013159	-0.006105	-6072.047
1993	0.032672	0.050054	0.027794	-0.028474	0.063364	-6283.281
1994	0.025517	0.056981	0.020788	-0.051268	0.096567	-5969.642
1995	-0.020373	-0.009698	-0.009939	-0.0351	-0.016407	-6223.305
1996	-0.000244	-0.019247	-0.032723	-0.040393	-0.055477	-6175.089

Table 1 continued

obs	EHRELED_D	EHRELEDE	EHRUGAS_D	EHRUGASE	EHRCARH_D	EHRCARHE
1977	0.132486	NA	0.020139	NA	0.001938	NA
1978	0.202825	NA	0.011503	NA	0.003701	NA
1979	0.126345	NA	0.038783	NA	0.003375	NA
1980	-0.000283	NA	0.035182	NA	0.007039	NA
1981	-0.046655	NA	0.021288	NA	0.004562	NA
1982	-0.092166	NA	-0.031485	NA	0.003339	NA
1983	-0.031673	NA	-0.05364	NA	0.001813	NA
1984	-0.040462	NA	0.006921	NA	0.000982	NA
1985	-0.038299	NA	-0.007563	NA	-0.003046	NA
1986	-0.042527	-0.124504	0.013498	-0.006037	-0.00073	-0.017645
1987	-0.018057	-0.11874	-0.012892	-0.037277	0.000536	-0.043211
1988	-0.032418	-0.122284	0.001252	-0.040543	-0.009925	-0.069649
1989	-0.037859	-0.060243	-0.0242	-0.036661	-0.010046	-0.077897
1990	-0.018058	0.018203	-0.035425	-0.031916	-0.002758	-0.063446
1991	-0.024728	0.007751	-0.015807	-0.011241	-0.000822	-0.050924
1992	0.001595	-0.025448	-0.014926	-0.028975	0.005091	-0.038831
1993	0.055938	-0.043544	-0.001824	-0.020646	0.008234	-0.036133
1994	0.050634	0.027486	-0.013575	-0.023236	0.013607	-0.023953
1995	0.011686	0.028723	0.000753	-0.005517	0.006789	-0.01416
1996	-0.027872	0.015842	0.030276	0.030994	-0.003529	-0.002381

obs	EHRGASO_D	EHRGASOE	EHRCP_N01_D	EHRCP_N01E	EHRCG_N01_D	EHRCG_N01E
1977	0.08819	NA	0.020498	NA	0.025027	NA
1978	0.097926	NA	0.022207	NA	0.027099	NA
1979	0.052884	NA	0.041643	NA	0.015501	NA
1980	-0.000632	NA	0.054857	NA	0.022406	NA
1981	-0.039542	NA	-0.007627	NA	0.007155	NA
1982	-0.050787	NA	-0.025715	NA	-0.004803	NA
1983	-0.037992	NA	-0.026696	NA	-0.011586	NA
1984	-0.033153	NA	-0.022872	NA	-0.003131	NA
1985	-0.038097	NA	-0.016258	NA	-0.022838	NA
1986	-0.030951	-0.051256	-0.038394	-0.020847	-0.053253	-0.033293
1987	0.00726	-0.022338	-0.011347	0.00126	-0.0455	-0.035853
1988	0.008085	-0.003265	0.005479	0.004983	-0.036255	-0.041431
1989	-0.007524	-0.008128	0.029699	0.02859	-0.034793	-0.034294
1990	-0.018995	0.006561	0.022186	0.049766	0.001778	0.012028
1991	-0.007472	-0.005938	-0.003115	0.039484	-0.012682	0.013047
1992	0.016176	-0.011797	-0.017557	0.006379	0.008531	0.047166
1993	0.045351	-0.031378	-0.010773	-0.012721	0.012476	0.067062
1994	0.027272	-0.007494	-0.00263	-0.008942	0.003185	0.063425
1995	-0.011429	-0.026489	0.002775	-0.017949	0.009723	0.05283
1996	-0.024254	-0.028064	0.037	-0.025684	0.019994	0.041374

Table 1 continued

obs	EHRIP_N01_D	EHRIP_N01E	EHRIG_N01_D	EHRIG_N01E	EHRIH_N01_D	EHRIH_N01E
1977	0.243738	NA	0.049866	NA	0.039272	NA
1978	0.043783	NA	0.021947	NA	0.099812	NA
1979	−0.033865	NA	0.023203	NA	0.13924	NA
1980	0.001663	NA	0.03401	NA	−0.062517	NA
1981	−0.066006	NA	0.044848	NA	−0.064875	NA
1982	−0.134896	NA	0.099283	NA	0.043751	NA
1983	−0.131295	NA	−0.0895	NA	−0.093793	NA
1984	−0.095627	NA	−0.138084	NA	−0.170892	NA
1985	0.008987	NA	−0.125754	NA	−0.101453	NA
1986	0.009602	0.002453	−0.073751	−0.023476	−0.08459	−0.173821
1987	0.00757	−0.060723	−0.017081	0.024025	0.078594	−0.055595
1988	0.035114	0.019371	−0.004884	0.062925	0.07455	−0.049458
1989	0.066956	0.063631	−0.026356	0.047148	0.066857	0.016683
1990	0.054512	0.183157	−0.076795	0.020901	0.068884	0.058739
1991	0.118912	0.224642	0.0523	0.127153	−0.079722	0.018748
1992	0.101707	0.131533	0.072225	0.107975	−0.117264	−0.026806
1993	0.071741	0.011629	0.12029	0.121296	0.052042	0.100919
1994	−0.034016	−0.095439	−0.019478	−0.014956	0.10532	0.13521
1995	−0.051615	−0.089883	0.011466	0.001349	−0.061224	−0.057131
1996	−0.035414	−0.059733	−0.090462	−0.130201	−0.033767	−0.026244

obs	EHRJP_N01_D	EHRJP_N01E	EHREX_N01_D	EHREX_N01E	EHRM_N01_D	EHRM_N01E
1977	3.673879	NA	0.006333	NA	−0.044299	NA
1978	−6.275969	NA	0.01216	NA	−0.049195	NA
1979	−0.694461	NA	−0.000397	NA	−0.021243	NA
1980	3.201943	NA	−0.030954	NA	−0.021657	NA
1981	−0.663968	NA	−0.003175	NA	0.021543	NA
1982	−2.306702	NA	−0.037252	NA	−0.027239	NA
1983	2.116036	NA	−0.013025	NA	−0.051908	NA
1984	13.47859	NA	−0.031596	NA	−0.050508	NA
1985	−0.005252	NA	−0.007113	NA	0.010612	NA
1986	0.229794	−0.040309	−0.014755	−0.045815	−0.014905	−0.010127
1987	1.410009	−0.040722	−0.023656	−0.052596	−0.030078	−0.016532
1988	0.506696	−0.051253	0.019579	0.009292	0.054606	0.038988
1989	0.546126	0.034519	0.051045	0.070985	0.081567	0.071988
1990	0.333577	0.007217	0.095217	0.114896	0.146332	0.133268
1991	0.380496	−0.006165	0.06688	0.072868	0.089274	0.091676
1992	0.846179	0.032452	0.011533	−0.007765	0.011254	0.007526
1993	0.105338	0.091821	0.007988	−0.047939	−0.015712	−0.005993
1994	0.892749	−0.048317	−0.018646	−0.082603	−0.048907	−0.042334
1995	1.203341	−0.023658	−0.025859	−0.077825	−0.029372	−0.037558
1996	4.03771	−0.03196	−0.030558	−0.071417	−0.012987	−0.035046

Table 1 continued

obs	EHRGDP_N01_D	EHRGDP_N01E	EHRPGDP_D	EHRPGDPE	EHRYW_D	EHRYWE
1977	0.132093	NA	-0.008668	NA	0.199806	NA
1978	0.104134	NA	-0.03384	NA	0.117153	NA
1979	0.050671	NA	0.000154	NA	0.015426	NA
1980	0.009025	NA	0.012096	NA	-0.010716	NA
1981	-0.046968	NA	0.003087	NA	-0.064368	NA
1982	-0.046728	NA	0.00307	NA	-0.053286	NA
1983	-0.028783	NA	-0.008297	NA	-0.024308	NA
1984	-0.036452	NA	-0.000425	NA	-0.052753	NA
1985	-0.042186	NA	-0.005191	NA	-0.051984	NA
1986	-0.032591	-0.062869	-0.012441	-0.027102	0.01751	-0.015019
1987	-0.017399	-0.050835	-0.011402	-0.030213	0.024293	0.001849
1988	-0.016946	-0.024746	0.002305	-0.025342	-0.034504	-0.00116
1989	0.007488	0.03294	0.01167	-0.010061	-0.043683	0.024152
1990	-0.01729	0.053162	0.016487	0.000466	-0.069379	0.041363
1991	0.010214	0.060321	0.006738	-0.007599	-0.020922	0.054428
1992	0.023578	0.023178	0.008463	-0.007766	0.021728	0.036008
1993	0.041421	-0.022927	-0.007959	-0.025791	0.050494	0.022905
1994	0.015779	-0.046351	-0.001819	-0.028047	0.046905	0.028562
1995	-0.012827	-0.060148	0.006595	-0.039447	0.005146	0.026861
1996	-0.014894	-0.067215	0.017432	-0.050681	-0.027145	0.018181

obs	EHRYH_D	EHRYHE	EHRKP_D	EHRKPE	EHRKJP_D	EHRKJPE
1977	0.057274	NA	0.032009	NA	0.968844	NA
1978	0.075613	NA	0.036148	NA	1.617431	NA
1979	0.055016	NA	0.021886	NA	1.273386	NA
1980	0.043183	NA	-0.009723	NA	1.076671	NA
1981	-0.006371	NA	-0.027511	NA	0.541464	NA
1982	-0.023997	NA	-0.035349	NA	0.148571	NA
1983	-0.031426	NA	-0.048989	NA	-0.70295	NA
1984	-0.051915	NA	-0.068235	NA	-1.007667	NA
1985	-0.054919	NA	-0.086871	NA	-0.588468	NA
1986	-0.056944	-0.064547	-0.07582	-0.004248	-0.369581	NA
1987	-0.032476	-0.028733	-0.071823	-0.021369	-1.040819	NA
1988	-0.018602	-0.02569	-0.07857	-0.03872	-0.487197	NA
1989	0.02452	0.03151	-0.073312	-0.04009	-0.216294	NA
1990	0.034919	0.04904	-0.072436	-0.024355	-0.021953	NA
1991	0.022317	0.045594	-0.052366	0.002293	0.055933	NA
1992	0.003147	0.023493	-0.019342	0.026463	0.172455	NA
1993	0.008511	0.005704	0.004227	0.031811	0.17604	NA
1994	0.00954	0.005132	0.008933	0.024296	0.107884	NA
1995	-0.007834	-0.025399	-0.002283	0.007694	0.019662	NA
1996	0.008415	-0.036346	-0.018546	-0.006329	-0.056402	NA

Table 1 continued

obs	EGDP_D	EGDPE	ECP_D	ECPE	EMC_D	EMCE
1977	-0.005064	NA	-0.002891	NA	0.039344	NA
1978	-0.004818	NA	0.00732	NA	0.10372	NA
1979	-0.001355	NA	0.015047	NA	0.116238	NA
1980	-0.012001	NA	-0.015592	NA	0.03377	NA
1981	-0.019851	NA	-0.031136	NA	0.019516	NA
1982	-0.003326	NA	-0.008019	NA	-0.019613	NA
1983	0.001495	NA	0.001234	NA	-0.010287	NA
1984	-0.003187	NA	-0.007787	NA	-0.018321	NA
1985	0.00253	NA	-0.006142	NA	-0.085878	NA
1986	0.007026	NA	0.004591	NA	-0.060089	NA
1987	0.011811	NA	0.010024	NA	-0.075875	NA
1988	0.01104	NA	0.016378	NA	-0.016527	NA
1989	0.004707	NA	0.010765	NA	0.015787	NA
1990	0.006652	NA	0.003126	NA	-0.049787	NA
1991	0.0095	NA	-0.002976	NA	-0.120306	NA
1992	0.008214	NA	-0.007016	NA	-0.134375	NA
1993	0.013455	NA	0.004677	NA	-0.116157	NA
1994	0.008981	NA	0.011213	NA	-0.02324	NA
1995	0.005975	NA	0.020017	NA	0.051834	NA
1996	0.001095	NA	0.010857	NA	0.044164	NA

obs	EALPHA_D	EALPHAE
1977	0.03089	NA
1978	-0.010346	NA
1979	-0.033349	NA
1980	0.004692	NA
1981	0.035278	NA
1982	0.010179	NA
1983	-0.008383	NA
1984	0.008629	NA
1985	0.02944	NA
1986	0.015864	NA
1987	-0.048681	NA
1988	-0.031376	NA
1989	0.003965	NA
1990	0.01622	NA
1991	0.024445	NA
1992	-0.012837	NA
1993	0.024114	NA
1994	0.000674	NA
1995	-0.042123	NA
1996	-0.025681	NA

Table 2

obs	IG7796HREX_D	IG7796HRM_D
1977	1272.099	162.3049
1978	1912.340	1295.040
1979	2382.229	2129.282
1980	2629.116	2573.835
1981	2829.430	2703.748
1982	2879.690	2761.632
1983	2909.875	2787.293
1984	2984.510	2815.736
1985	2932.363	2859.518
1986	2978.430	2912.289
1987	2981.322	2979.106
1988	2963.530	3014.396
1989	2960.342	3019.929
1990	2932.631	3001.261
1991	2925.936	2978.902
1992	2932.600	2975.735
1993	2973.214	2985.331
1994	2998.513	3028.875
1995	2974.620	3074.720
1996	3009.701	3075.661

Table 3

Present Model

EHRGDP_97F	EHRCP_97F	EHRCG_97F	EHRIP_97F	EHRIH_97F	EHRIG_97F	EHREX_97F	EHRM_97F	EHRPGDP_97F
−0.030799	0.014937	0.089496	0.017688	−0.084294	−0.091507	−0.07962	−0.029959	2.47E−07

1997	Rate of Change	1997	Rate of Change
PGAS	+0.3%	P	+0.3%
PELL	+0.3%	PC	+0.3%
PELD	+0.3%	PI	+0.3%
PUG	+0.3%	PH	+0.3%
HRPJP90	+0.3%	WPI	+0.3%
HRPJG90	+0.3%	PTW	+0.3%
HRJG	+1%	INTN	0%
HRJG_N01	+1%	CG	−5%
HRPOPK	−1%	IG	−5%
HRPOPTLJ	−1%	IP	+1%
		JP	+1%
HRSDF	0%		
HRSDF_N01	0%	I	+1%
		OTHERS	+1%

80 billion yen was subtracted from the intercept of the HRIH equation.

Table 4

Professional Model

EEHRGDP_97F	EEHRCP_97F	EEHRCG_97F	EEHRIP_97F	EEHRIH_97F	EEHRIG_97F	EEHREX_97F	EEHRM_97F	EEHRPGDP_97F
−0.027404	−0.027097	0.043386	−0.000752	−0.276898	−0.073186	−0.066364	−0.061931	−3.22E−07

1997	Rate of Change	1997	Rate of Change
PGAS	+0.3%		
PELL	+0.3%		
PELD	+0.3%		
PUG	+0.3%		
		WPI	+0.3%
HRJG	+1%	INTN	0%
HRJG_N01	+1%	CG	−5%
		IG	−5%
HRPOPTLJ	−1%		
HRSDF	0%		
HRSDF_N01	0%	GDP	+1%
HRJP	+1%		
HRPOPK15S	−1%		

Table 5

obs	S EHRGDP	S EHRCP	S EHRCG	S EHRIP	S EHRIH	S EHRJP
1977	-0.038603	-0.045955	0.000000	-0.022755	-0.036222	-0.559130
1978	-0.046010	-0.062229	-0.002150	-0.046513	-0.055732	-3.665867
1979	-0.027556	-0.043854	0.004851	0.031793	-0.040185	-0.358763
1980	-0.007343	-0.012747	-0.005862	-0.046716	0.010722	-3.638723
1981	-0.015935	-0.007191	-0.004311	-0.039582	-0.007812	-0.795779
1982	-0.010059	-0.008496	-0.002594	-0.027469	0.008828	-1.068997
1983	0.002904	0.003281	-0.001499	-0.006650	0.003190	-0.154626
1984	0.008593	0.011013	-0.001502	0.010982	0.013889	3.557849
1985	0.011814	0.007617	0.001439	-0.007576	0.018792	-0.098356
1986	0.018766	0.025852	0.002763	-0.011829	0.029361	-0.199760
1987	-0.006892	-0.022731	0.003872	-0.011292	-0.029738	0.204268
1988	0.007751	-0.021755	0.004924	-0.002068	-0.022121	-0.035897
1989	0.000764	-0.015297	0.005136	0.007533	-0.014514	0.116894
1990	0.010414	-0.011811	0.001636	-0.019754	-0.013376	-0.179774
1991	0.001317	0.008030	0.005262	0.004748	0.008587	0.055993
1992	-0.001481	0.013326	0.004497	0.009472	0.014311	0.131029
1993	0.002228	0.005890	-0.002498	0.008916	-0.006669	-0.276779
1994	-0.002973	-0.001090	-0.002445	-0.001313	-0.007586	-0.036638
1995	0.002957	0.001218	0.003401	0.004507	0.006103	0.127298
1996	0.000838	-0.002944	-0.003350	0.002245	0.003101	0.309369

obs	S EHRIG	S EHREX	S EHRM	S EHRPGDP	S EHRPCP	S EHRPCG
1977	-0.003046	-0.003515	-0.000533	-0.001976	0.000755	0.001121
1978	0.000721	-0.002558	0.007127	-0.001553	-0.000306	0.000457
1979	-0.001105	0.003770	0.013925	-0.001906	0.000453	-0.000672
1980	0.000826	0.009191	0.014095	0.005413	-4.12E-05	-6.20E-05
1981	0.000809	6.08E-05	-0.006634	0.002840	1.52E-05	-2.30E-05
1982	0.000200	0.003052	0.000826	0.001928	0.000147	-0.000225
1983	0.000751	-0.001089	-0.001751	-0.000732	-0.000259	-0.000393
1984	0.000575	-0.001385	-0.000341	5.35E-05	-0.000103	-0.000155
1985	0.001283	-0.000487	-0.001427	-0.000349	-8.90E-05	-0.000132
1986	0.001954	-0.001383	-0.003125	-0.001028	-0.000166	-0.000247
1987	-0.001565	0.001213	0.005791	-0.000916	-0.000194	-0.000289
1988	3.68E-05	-0.000267	-0.007098	0.000218	-3.29E-05	-4.85E-05
1989	-0.000293	-0.000346	-0.006175	0.000297	-0.000134	-0.000194
1990	0.001304	0.000651	-0.004121	-0.000607	0.000352	-0.000499
1991	0.000705	1.01E-05	-0.004990	-9.55E-06	0.000162	0.000226
1992	-0.000343	-0.000421	-0.003330	0.000375	0.000387	0.000534
1993	0.000384	-0.000144	0.002747	0.000128	9.48E-05	0.000131
1994	0.000515	-0.000188	0.001480	0.000164	3.84E-05	5.35E-05
1995	-0.000185	-0.000313	0.001666	-0.000277	-0.000104	-0.000144
1996	-0.000105	-0.000324	0.001754	-0.000296	7.84E-05	-0.000108

Table 5 continued

obs	S EHRPIP	S EHRPIH	S EHRPIG	S EHRPEX	S EHRPM	S EHRGDP N
1977	-0.004059	0.000000	0.011659	0.000000	0.000000	-0.037312
1978	-0.003893	0.000000	0.007319	0.000000	0.000000	-0.046293
1979	0.000443	0.000000	-0.002635	0.000000	0.000000	-0.025495
1980	-0.000342	0.000000	-0.000737	0.000000	0.000000	0.005788
1981	-0.000702	0.000000	0.000652	0.000000	0.000000	-0.019456
1982	-0.000260	0.000000	-0.001007	0.000000	0.000000	-0.012070
1983	0.000569	0.000000	-0.002938	0.000000	0.000000	0.002183
1984	0.000664	0.000000	-0.001655	0.000000	0.000000	0.009554
1985	0.000104	0.000000	-0.001716	0.000000	0.000000	0.011517
1986	-0.001381	0.000000	-0.003033	0.000000	0.000000	0.017971
1987	-0.001486	0.000000	-0.003384	0.000000	0.000000	0.016767
1988	-0.000578	0.000000	-0.000909	0.000000	0.000000	0.007513
1989	-0.000285	0.000000	-0.001498	0.000000	0.000000	-0.000457
1990	0.000192	0.000000	0.002976	0.000000	0.000000	0.010864
1991	-4.60E-05	0.000000	-0.001611	0.000000	0.000000	0.001298
1992	-0.000271	0.000000	0.000690	0.000000	0.000000	-0.001099
1993	-7.08E-05	0.000000	0.000943	0.000000	0.000000	0.002124
1994	-0.000320	0.000000	0.000670	0.000000	0.000000	-0.003139
1995	-0.000131	0.000000	-0.000855	0.000000	0.000000	0.003219
1996	-1.61E-06	0.000000	-0.000746	0.000000	0.000000	0.001129

obs	S EHRCP N01	S EHRCG N0	S EHRIP N01	S EHRIH N01	S EHRJP N01	S EHRIG N01
1977	-0.044831	0.001113	-0.019897	-0.036214	-0.567927	0.008518
1978	-0.062110	-0.001671	-0.043240	-0.055715	-3.723581	0.004867
1979	-0.044302	-0.005417	0.031324	-0.040198	-0.332941	-0.003702
1980	-0.012673	-0.005908	-0.041335	0.010725	-3.695932	8.20E-05
1981	-0.007184	-0.004355	-0.038655	-0.007813	-0.808294	0.000188
1982	-0.008549	0.002437	-0.027084	0.008831	-1.085799	0.001104
1983	0.003026	0.001160	-0.007288	0.003190	-0.157062	-0.002425
1984	0.010996	0.001395	0.010249	0.013885	3.613824	-0.001276
1985	0.015624	0.002040	-0.006760	0.018788	-0.099908	-0.000573
1986	0.025842	0.002582	-0.010502	0.029339	-0.202894	-0.001165
1987	-0.007929	0.003691	-0.009880	-0.029745	0.207480	-0.001776
1988	-0.021923	0.004983	-0.001517	-0.022126	-0.036459	-0.000928
1989	-0.015246	0.004998	0.007813	-0.014514	0.118731	-0.001823
1990	-0.012160	-0.005043	-0.019561	-0.013376	-0.182600	0.004480
1991	-0.002535	0.004930	0.004883	0.008589	0.056873	0.002230
1992	0.012908	-0.003871	0.010032	0.014314	0.133088	0.003476
1993	0.005778	-0.003900	0.009021	-0.006671	-0.281134	0.001217
1994	-0.002128	-0.003407	-0.001652	-0.007584	-0.037214	-0.000175
1995	-0.005104	-0.003500	0.004390	0.006102	0.129300	-0.001034
1996	-0.003022	-0.003413	0.002204	0.003100	0.314233	0.000730

Table 5 continued

obs	S EHREX N01	S EHRM N01	S EHRW	S EHRYW	S EHRYWAG	S EHRYRH
1977	-0.003627	-0.000530	0.021961	0.039275	-0.009212	-0.518816
1978	-0.002656	0.007116	0.008855	0.024976	-0.018691	-0.786207
1979	-0.002917	0.013802	-0.012885	-0.011755	-0.020054	-0.260547
1980	0.009026	0.013974	0.001263	0.002238	-0.010676	0.055432
1981	0.001046	-0.006710	-0.000454	0.002292	-0.002620	-0.098432
1982	0.003091	0.000843	-0.004359	-0.005618	-0.001215	-0.070106
1983	0.001113	-0.001775	-0.007495	-0.014002	-0.000324	0.062822
1984	-0.001395	-0.000347	-0.002950	-0.008011	0.002244	-0.033736
1985	0.000492	-0.001445	-0.002526	-0.008072	0.004608	-0.015871
1986	0.001420	0.003197	-0.004423	0.012493	0.007768	0.074223
1987	0.001228	0.005852	-0.003598	0.013759	0.010289	-0.019464
1988	-0.000270	-0.007240	-0.000831	-0.004727	0.009396	-0.041415
1989	-0.000342	-0.006190	-0.003314	-0.007324	0.006851	-0.109050
1990	0.000639	-0.004116	0.008534	0.012278	-0.007707	-0.047193
1991	9.79E-06	-0.004962	0.003840	-0.007422	-0.003745	-0.049066
1992	-0.000417	-0.003312	0.009145	0.017407	0.004116	-0.110423
1993	0.000140	0.002651	0.002261	0.004489	0.002538	-0.046275
1994	-0.000185	0.001446	0.000906	0.003216	-0.002630	-0.051304
1995	-0.000307	0.001632	0.002413	-0.002410	0.002743	0.039287
1996	-0.000320	0.001747	0.001765	0.002255	-0.002274	-0.016363

obs	S EHRYU	S EHRYH	S EHRYC	S EHRYI	S EHRLWK	S EHRLK
1977	0.121315	-0.050794	0.113248	-0.036263	0.021197	0.001403
1978	0.083845	-0.074107	-0.106709	-0.044506	0.009777	-0.001888
1979	0.014370	-0.055402	-0.030874	-0.025154	-0.001636	0.004102
1980	-0.000850	-0.014401	-0.008771	-0.002163	-0.000966	0.001729
1981	0.013067	-0.008941	-0.028518	-0.019342	0.002604	0.000976
1982	-0.005687	-0.010919	-0.005824	-0.011951	-0.001170	0.000418
1983	-0.034656	0.003677	0.032697	0.002161	-0.004190	0.000325
1984	-0.027117	0.014357	-0.001702	0.009523	-0.004818	-0.000756
1985	-0.031080	0.021112	-0.030096	0.011450	-0.005270	-0.001006
1986	-0.052509	0.033028	-0.019393	0.017641	0.008095	-0.000886
1987	-0.050075	0.025866	-0.044738	-0.017841	0.008801	-0.001006
1988	0.017260	0.009399	-0.018225	-0.007231	0.003087	0.001538
1989	0.015344	-0.018446	-0.012606	-0.000444	-0.003838	0.001003
1990	0.004025	-0.015043	0.002497	0.008082	0.003373	0.001603
1991	-0.014107	-0.010001	-0.009313	0.001287	-0.003483	-0.000190
1992	0.018755	-0.015004	-0.001112	-0.001098	-0.008355	-2.00E-05
1993	0.008516	-0.007328	0.006602	0.002101	0.002341	-0.001187
1994	0.008752	-0.009683	0.013833	-0.003071	0.002387	-0.001219
1995	-0.002193	0.006532	0.002213	0.003179	-2.71E-05	0.001574
1996	0.003631	-0.003745	0.001814	0.001119	0.000461	0.000901

Table 5 continued

obs	S EHRSETAI	S EHRG SPE	S EHRG TAX	S EHRG KOF	S EHRG BON	S EHRPUBK
1977	0.000000	-0.033330	-0.073767	0.016563	-0.028087	-0.013933
1978	0.000000	-0.038386	-0.093118	-0.016123	-0.033390	-0.011632
1979	0.000000	-0.022103	-0.046745	-0.010958	-0.024149	-0.004435
1980	0.000000	0.005895	-0.022541	-0.001544	-0.004160	0.003496
1981	0.000000	-0.012506	-0.033220	-0.002737	0.007229	0.003641
1982	0.000000	-0.007984	-0.020372	-0.001989	0.004963	-0.001083
1983	0.000000	0.002461	0.003726	0.001725	0.004997	-0.002888
1984	0.000000	0.007430	0.016233	0.002722	0.007983	0.002544
1985	0.000000	0.009988	0.018991	0.004822	0.018984	0.005814
1986	0.000000	0.015681	0.030477	0.008316	0.020506	0.009011
1987	0.000000	0.005144	-0.030334	0.008274	-0.017829	0.007832
1988	0.000000	0.006494	-0.011662	0.003301	0.007650	-0.000177
1989	0.000000	0.000632	-0.000710	-0.000465	0.001491	0.001002
1990	0.000000	0.008710	-0.017012	-0.003446	0.010515	0.004836
1991	0.000000	0.001074	0.002034	0.000507	-0.001382	0.002212
1992	0.000000	-0.001187	-0.001853	-0.000831	0.001946	-0.001198
1993	0.000000	0.001756	0.003764	0.000972	0.001450	0.001614
1994	0.000000	-0.002306	0.005651	-0.001088	-0.001681	0.002389
1995	0.000000	0.002395	0.005619	0.001075	-0.001632	-0.000761
1996	0.000000	0.000700	0.002015	0.000163	0.000265	-0.000439

obs	S EHRBANK	S EHRMANR	S EHRELEC	S EHRELED	S EHRUGAS	S EHRGASO
1977	-0.103022	-0.137573	-0.000192	0.068897	0.000000	-0.006071
1978	-0.458515	-0.149204	-0.093024	0.063233	0.000000	-0.021334
1979	-0.494376	-0.057588	-0.094057	0.001056	0.000000	-0.035544
1980	-0.216817	0.017131	-0.070272	-0.047760	0.000000	-0.027985
1981	0.007826	-0.046350	-0.031901	0.012656	0.000000	0.030615
1982	0.020774	-0.018753	0.013077	0.079989	0.000000	0.030042
1983	-0.067413	-0.010303	-0.003762	0.009842	0.000000	0.028914
1984	-0.092456	-0.000268	0.011535	0.034691	0.000000	0.029638
1985	-0.130743	-0.027029	0.013817	0.036312	0.000000	0.026445
1986	-0.125891	-0.051051	-0.057839	0.016274	0.000000	0.021085
1987	-0.112620	0.004432	-0.073380	0.002336	0.000000	-0.014496
1988	-0.125866	0.041211	-0.043008	0.017647	0.000000	-0.014600
1989	-0.143521	-0.020031	-0.008354	0.021469	0.000000	0.003722
1990	-0.072948	0.008561	0.051959	0.002660	0.000000	0.016860
1991	-0.013649	-0.011161	-0.002088	0.012937	0.000000	0.005953
1992	-0.007755	-0.043999	-0.007435	-0.025266	0.000000	-0.000149
1993	0.017081	-0.008943	0.049640	0.023966	0.000000	0.018977
1994	-5.64E-05	-0.024899	0.040498	0.019631	0.000000	-0.017897
1995	0.012450	0.007442	0.011043	-0.017396	0.000000	0.005741
1996	-0.036302	-0.003768	0.050293	0.021635	0.000000	0.015635

Table 5 continued

obs	S_EHRCARH	S_EHRNEWH	S_EHRTRKTR	S_EHRKP	S_EHRKJP	S_EHRSALES
1977	-0.019158	-0.039521	-0.064241	-0.002705	-0.149131	-0.035698
1978	-0.048290	-0.061161	-0.067222	-0.007610	-0.496066	-0.039939
1979	-0.077760	-0.043964	-0.025290	-0.010992	-0.670733	-0.022559
1980	-0.080202	0.012399	0.009591	0.003239	-0.362548	0.000549
1981	-0.078272	-0.010463	-0.022760	-0.002774	-0.001037	-0.009657
1982	-0.072232	-0.012145	0.008707	-0.005892	0.149270	-0.005695
1983	-0.063992	0.004100	0.002304	-0.005994	-0.281964	-0.002199
1984	-0.053133	0.015981	0.020267	-0.003858	-0.210602	0.007142
1985	-0.033648	0.014111	-0.003364	-0.002226	-0.083373	0.010670
1986	-0.022812	0.035516	0.037982	-0.000194	-0.008724	0.016802
1987	-0.006986	-0.034506	0.051270	0.001460	0.065296	-0.016776
1988	0.006432	-0.024571	-0.020616	0.001589	0.054830	0.007334
1989	0.009814	-0.016810	-0.010771	0.000121	0.010114	0.002389
1990	-0.015872	-0.016155	-0.005966	0.003474	-0.024793	0.005775
1991	-0.025555	0.011583	-0.006640	0.002134	-0.045350	-0.000359
1992	-0.027347	0.017950	0.028503	0.000443	-0.019422	-0.003600
1993	-0.018137	-0.007608	-0.005036	0.000719	-0.002099	0.000334
1994	-0.013354	-0.009170	-0.017834	0.000778	0.001178	-0.003271
1995	-0.016581	0.007719	0.004028	-0.000190	-0.009009	0.002073
1996	-0.015516	0.003786	-0.002108	9.63E-05	0.015107	0.000358

obs	S_EALPHA
1977	-0.110320
1978	-0.096250
1979	0.029997
1980	-0.003577
1981	0.028344
1982	0.009530
1983	-0.009044
1984	-0.028734
1985	-0.035731
1986	-0.061049
1987	0.025895
1988	0.029453
1989	-0.016656
1990	-0.005192
1991	-0.011643
1992	-0.016081
1993	-0.005487
1994	-0.018758
1995	0.005267
1996	-0.001907

Table 6

obs	IG77HRIG_D	IG77HRIG
1977	1685.758	1702.137
1978	-10.30942	-13.00441
1979	-1.037262	0.365414
1980	1.379800	0.357864
1981	0.007132	-0.844931
1982	0.139692	-0.387499
1983	0.181315	0.094089
1984	0.078684	0.162996
1985	0.403225	1.133717
1986	0.142402	0.661853
1987	0.005204	0.104207
1988	-0.046443	-0.172574
1989	-0.045176	-0.199515
1990	-0.032788	-0.140015
1991	-0.018283	-0.058320
1992	0.001349	0.033007
1993	0.006323	0.072534
1994	0.007490	0.080035
1995	0.006221	0.048260
1996	-0.004364	0.012804

Table 7

obs	IP_HRKJP
1977	-3467.932
1978	-4776.344
1979	-3185.145
1980	1524.045
1981	8117.848
1982	16680.22
1983	27398.2
1984	42510.74
1985	55364.34
1986	70800.59
1987	88996.77
1988	108121.5
1989	129593.1
1990	151451.6
1991	173791.5
1992	196443.2
1993	219486.4
1994	241934.8
1995	265101.7
1996	288980.3

Figure 1

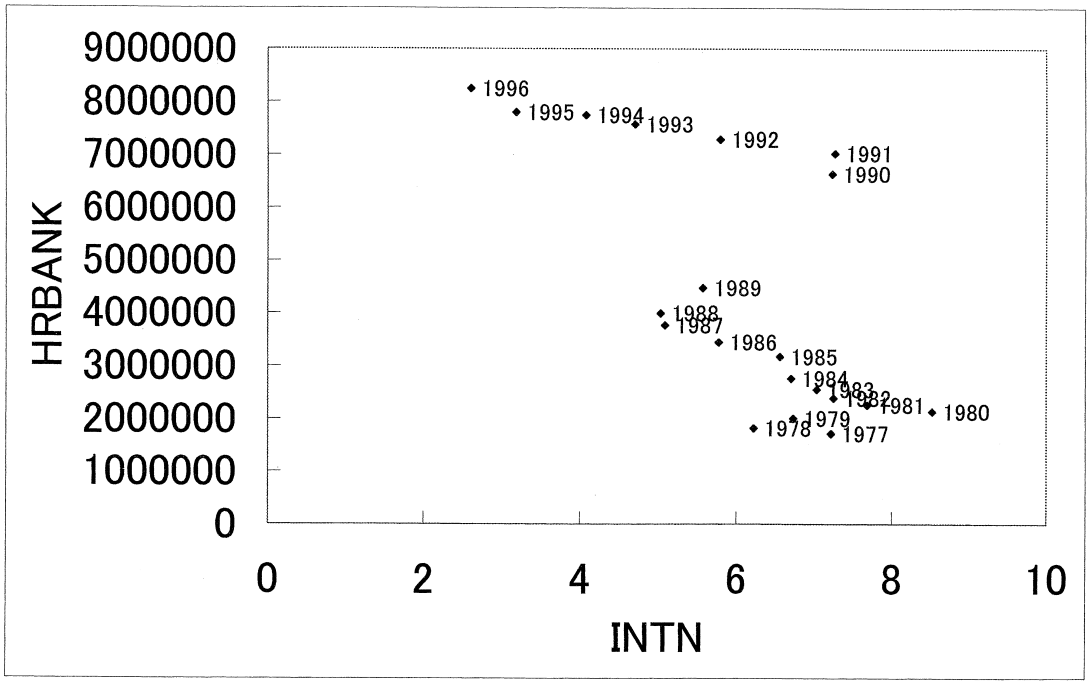


Figure 2

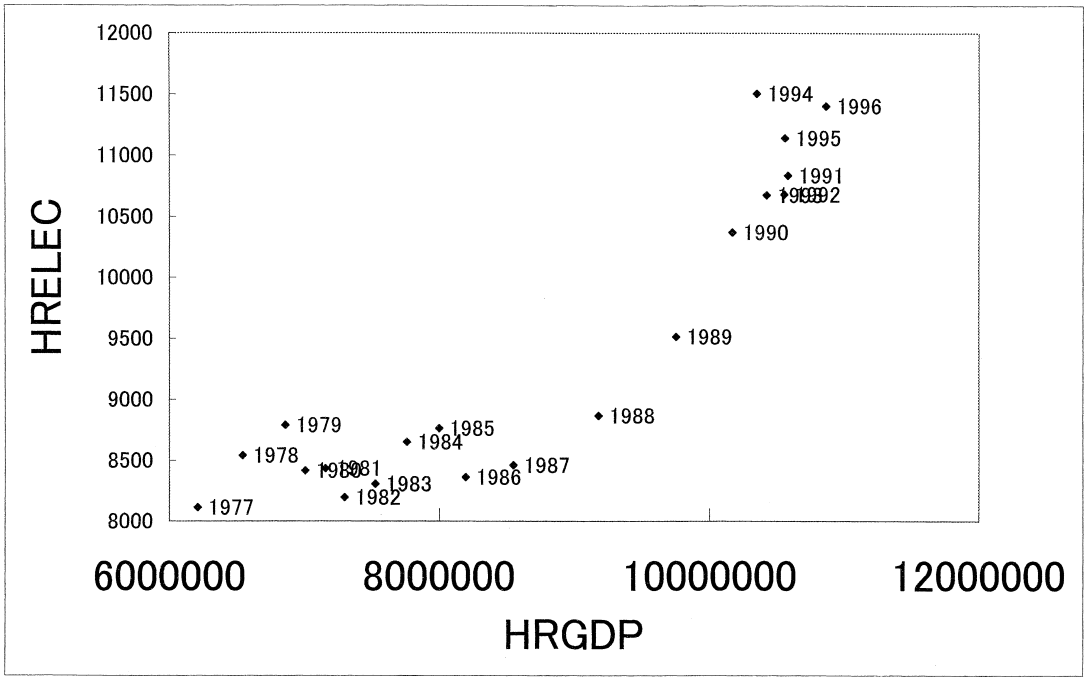
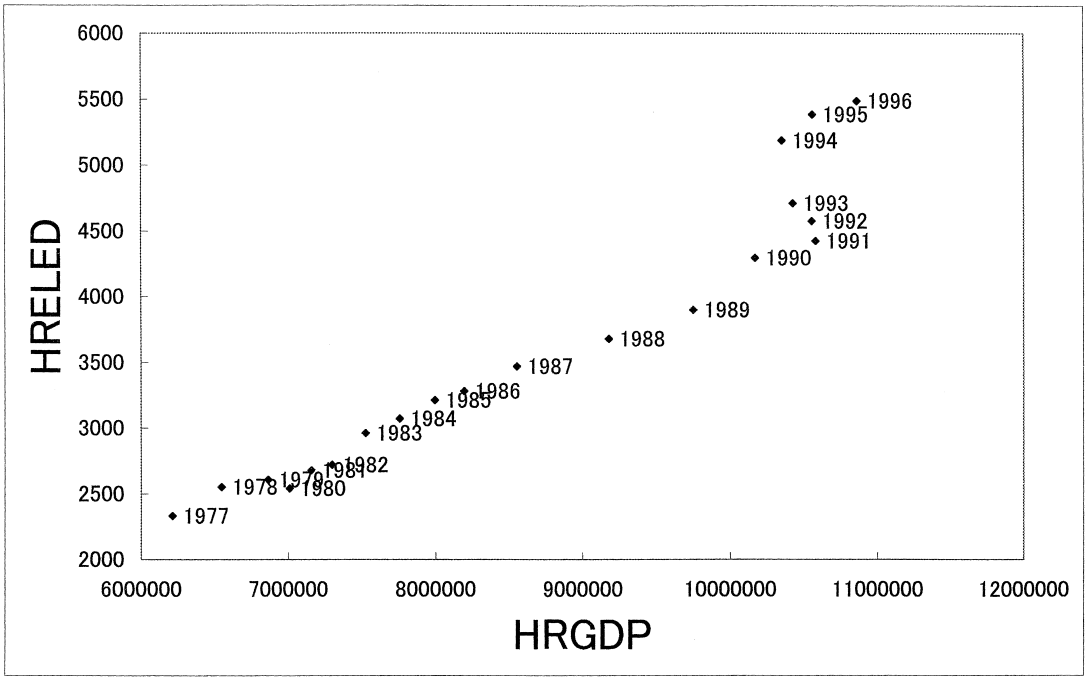


Figure 3



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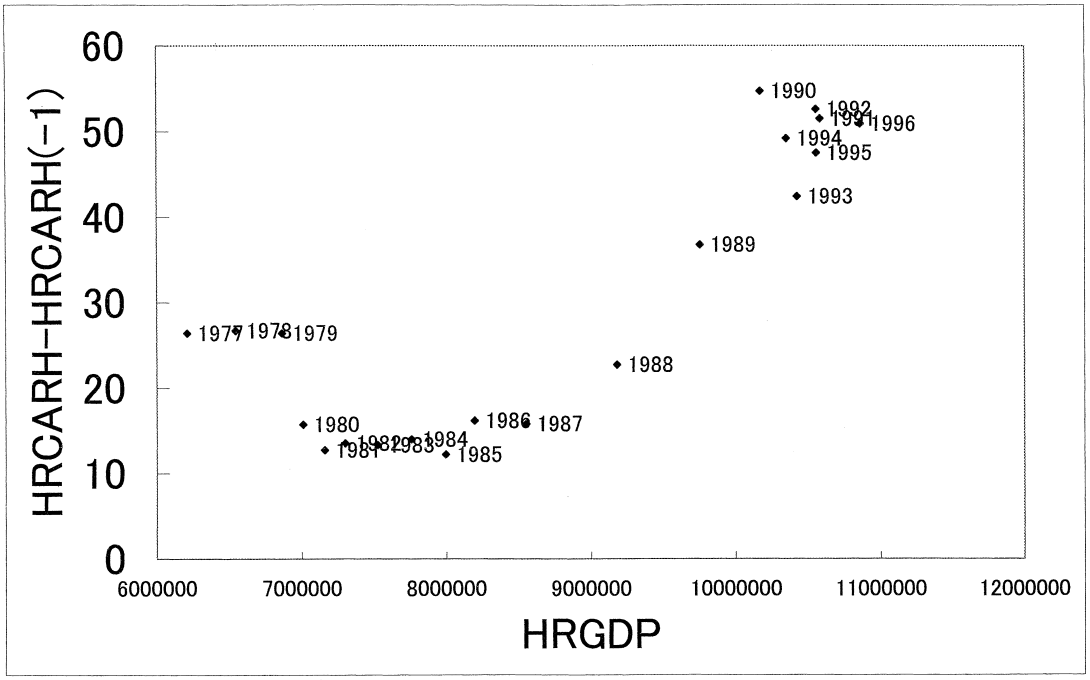
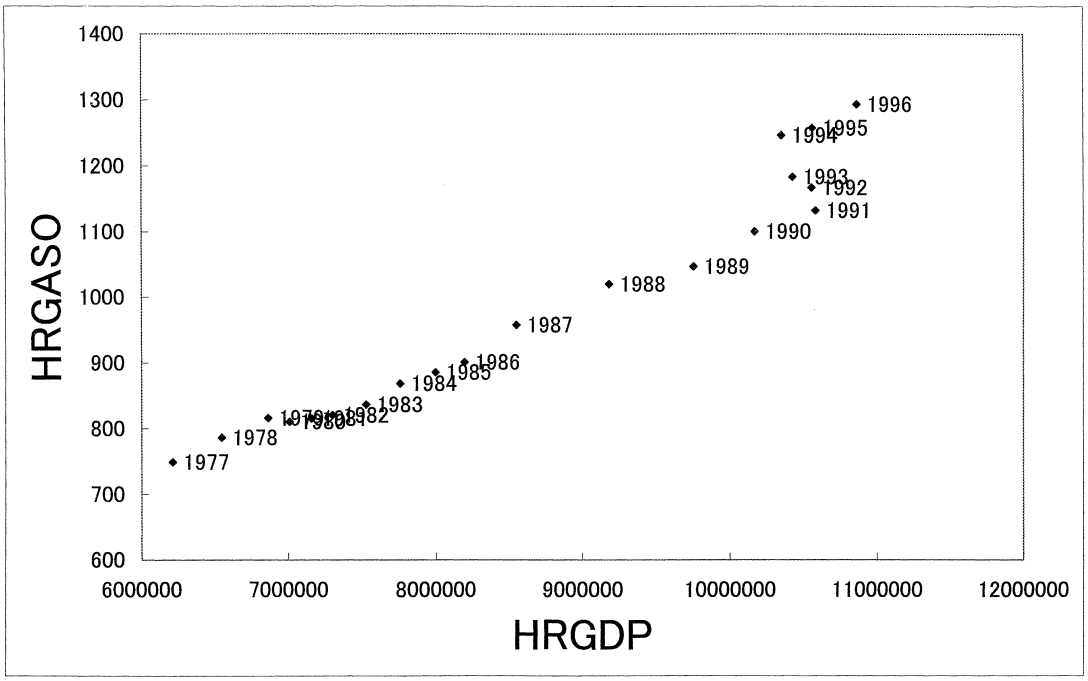


Figure 5



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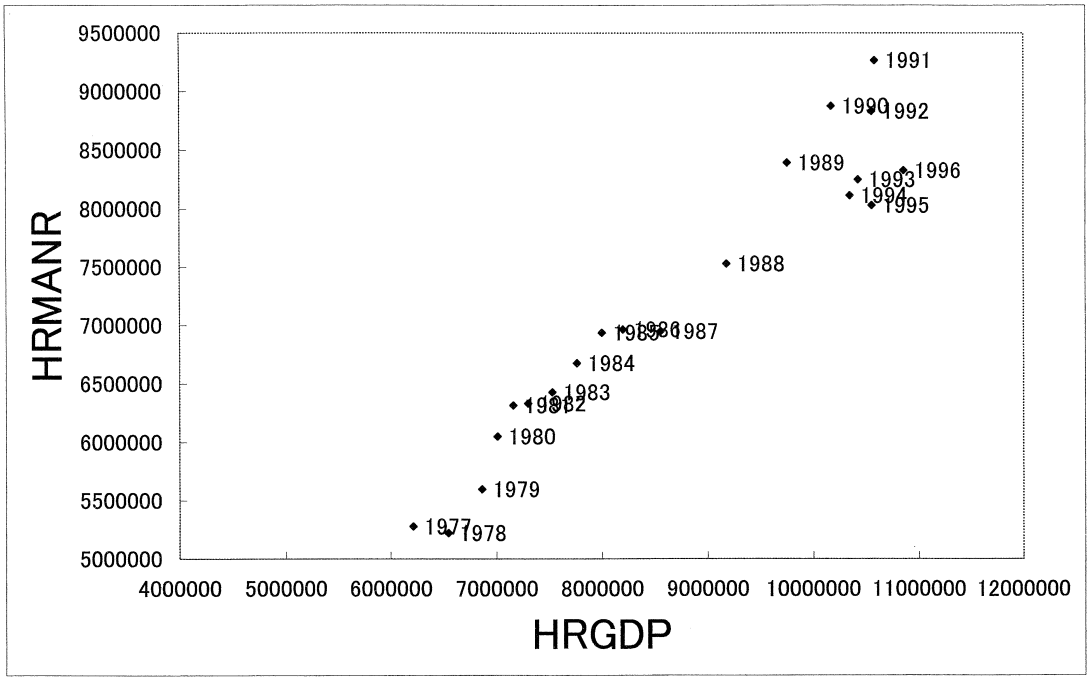
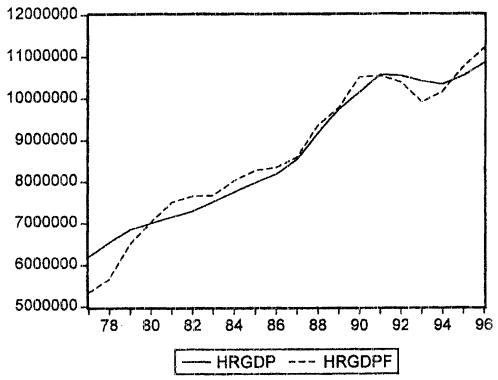


Figure 7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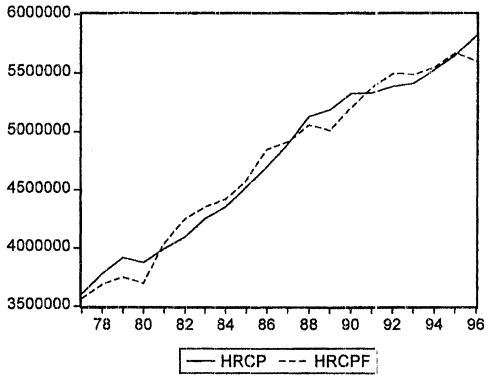
8000000
7000000
6000000
5000000
78 80 82 84 86 88 90 92 94 96
HRGDP --- HRGDPF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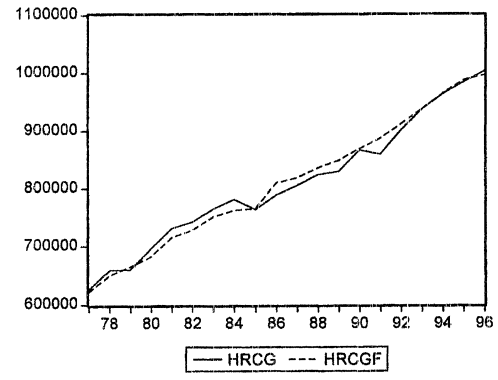
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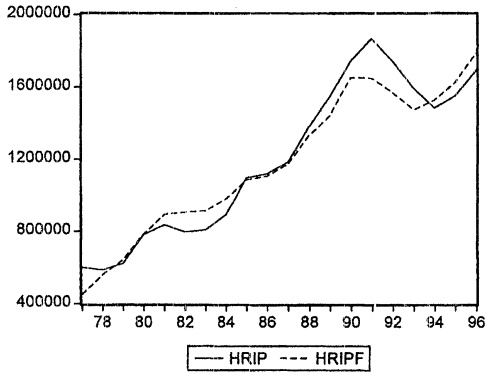
HRCG --- HRCGF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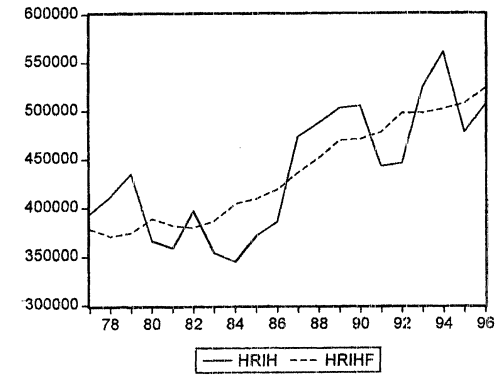
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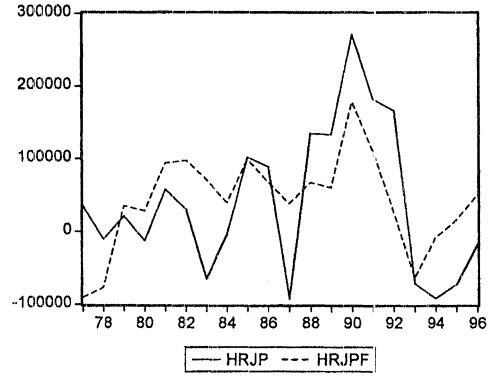
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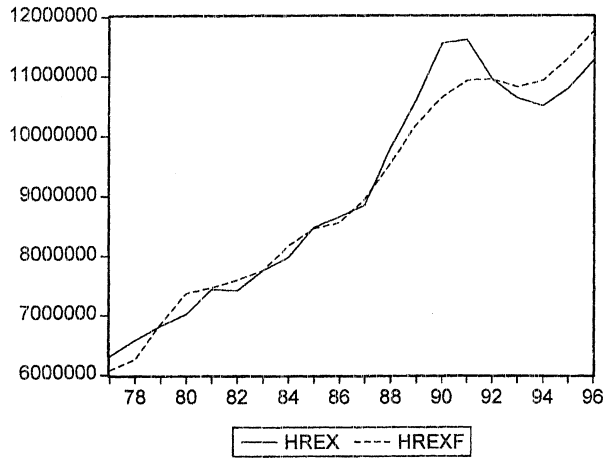
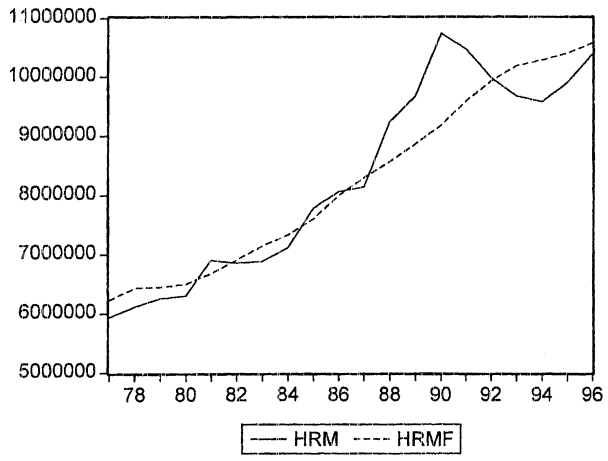
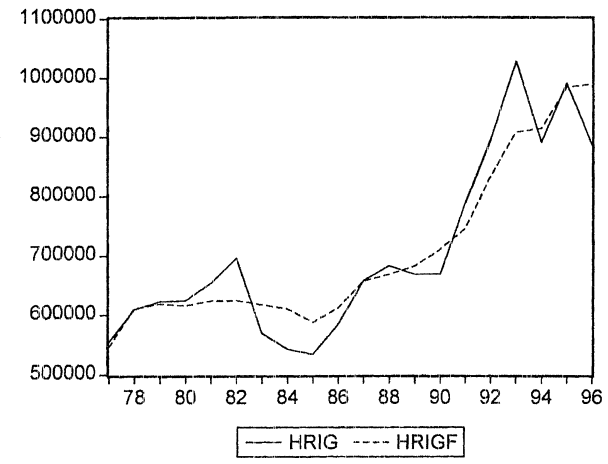
-100000
78 80 82 84 86 88 90 92 94 96
HRJP --- HRJPF

Figure 7 continued







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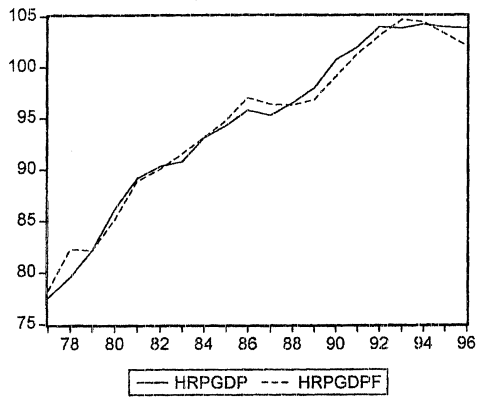

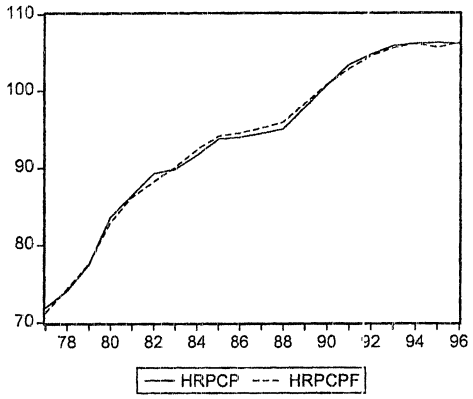

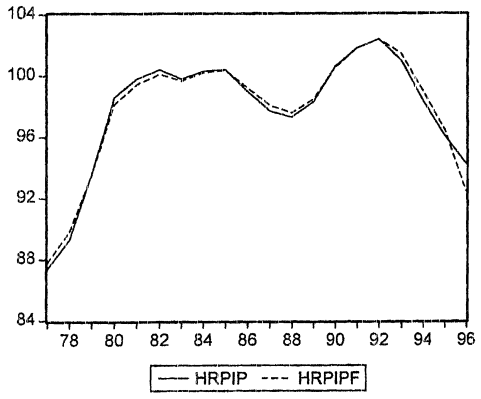

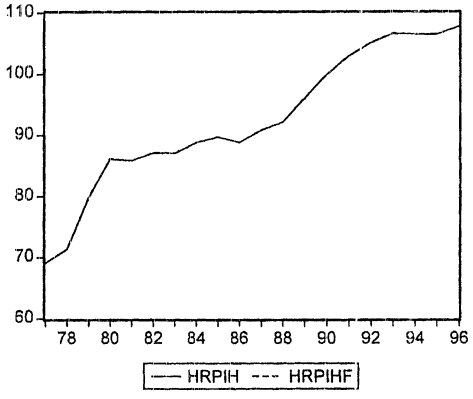

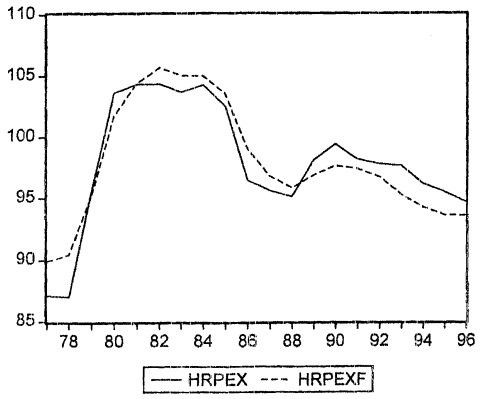

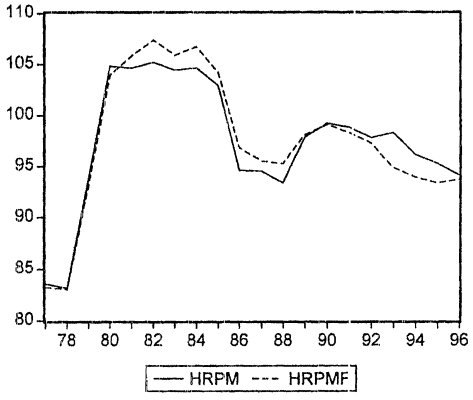

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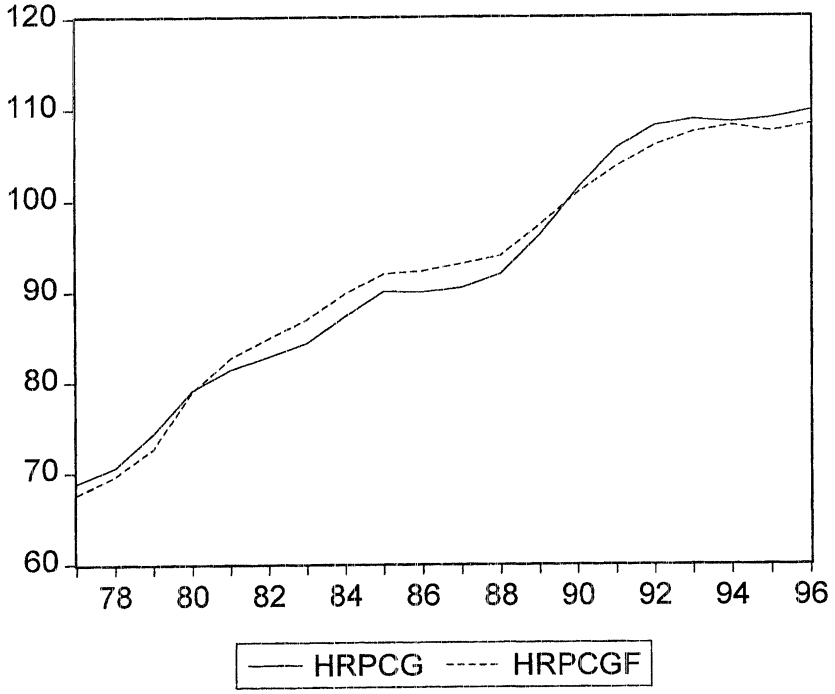

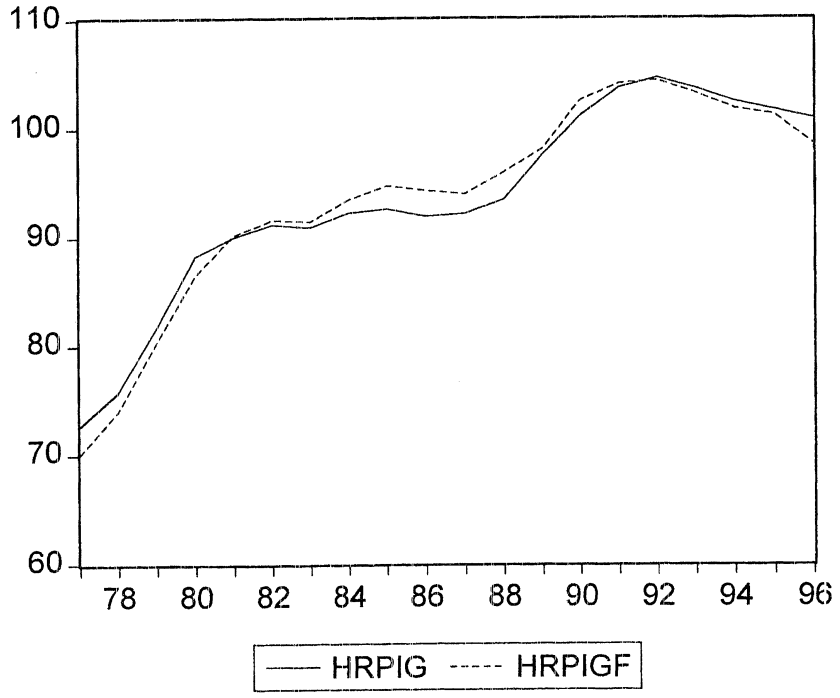

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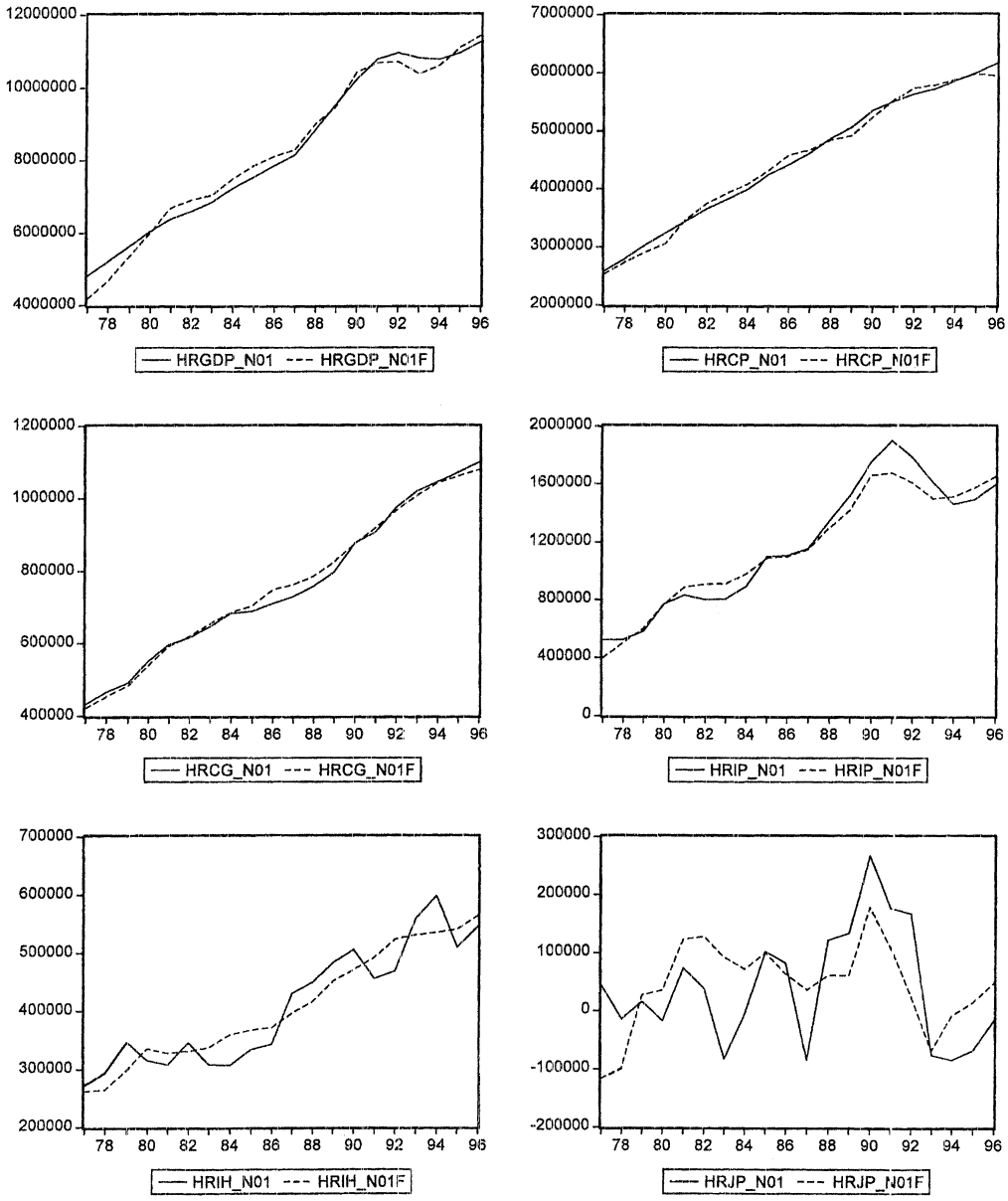

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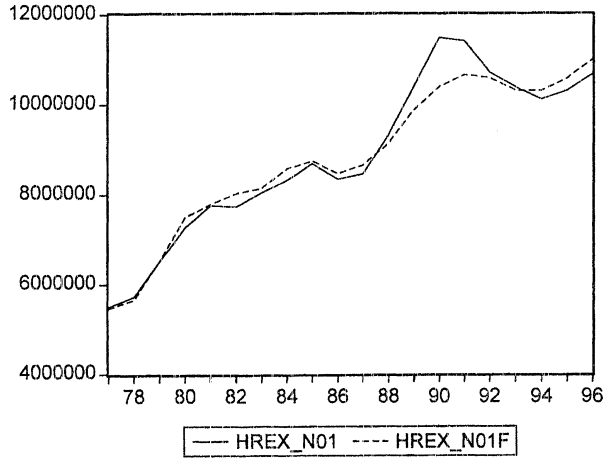

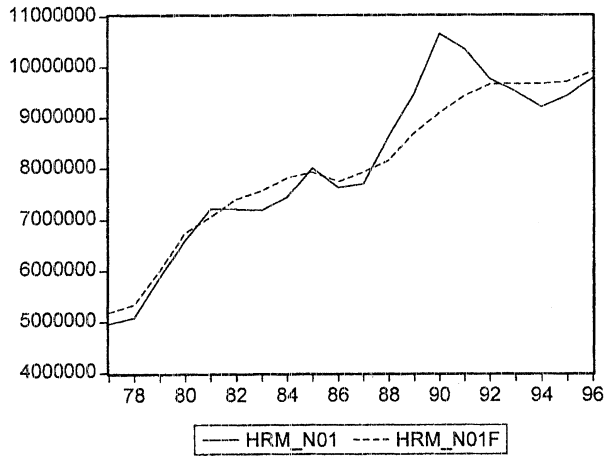

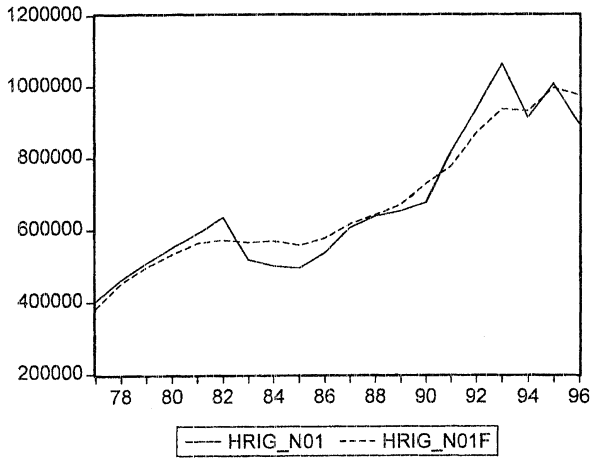

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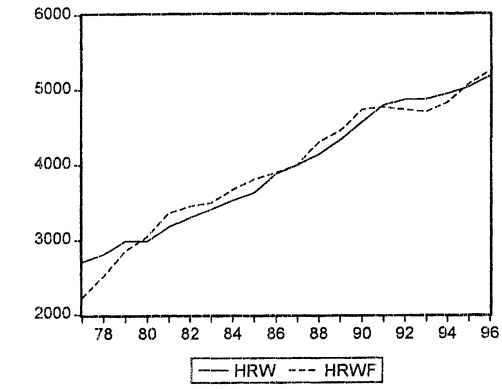

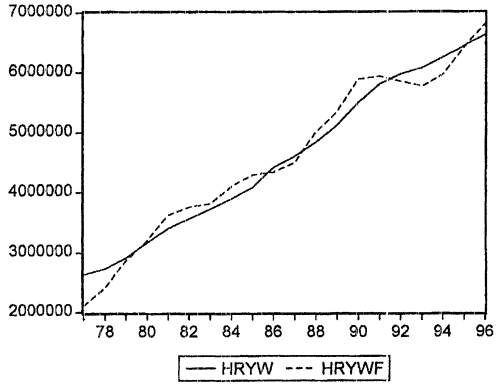

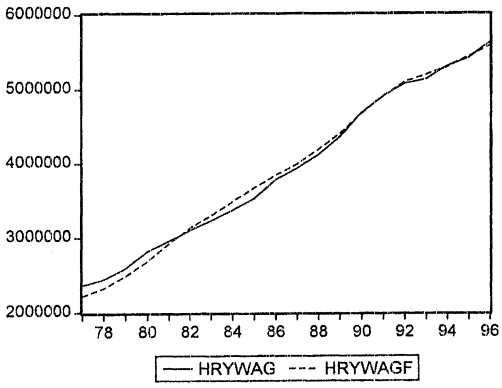

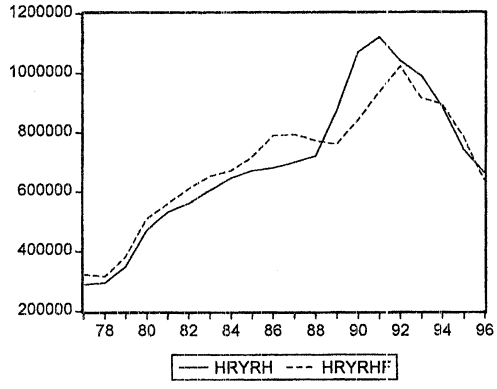

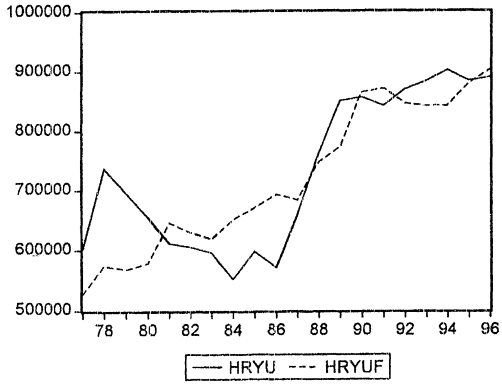

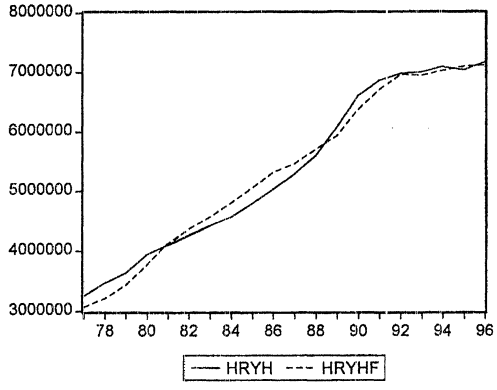

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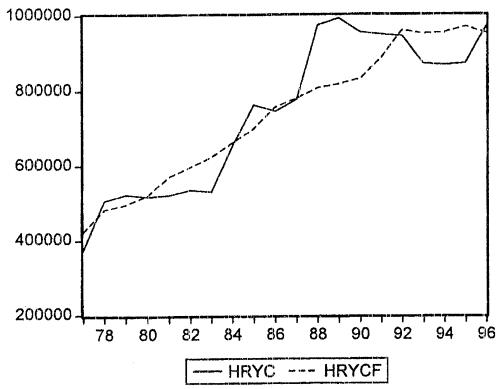

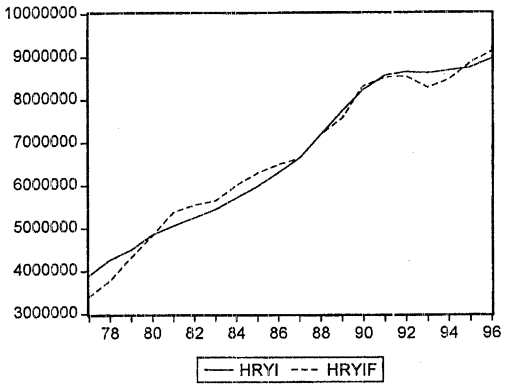

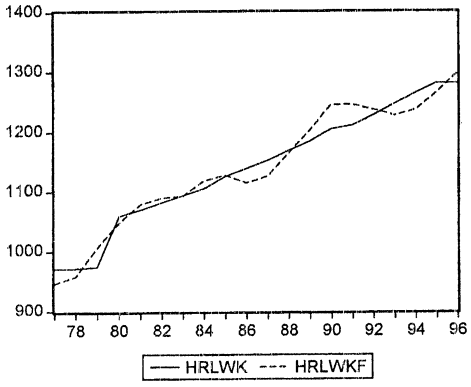

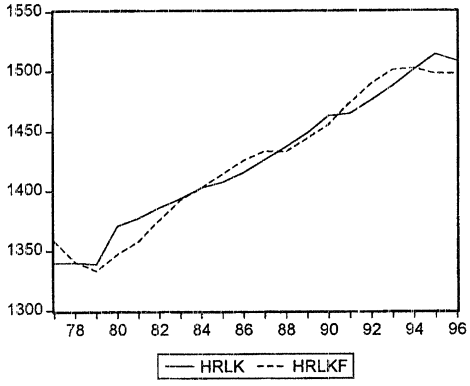

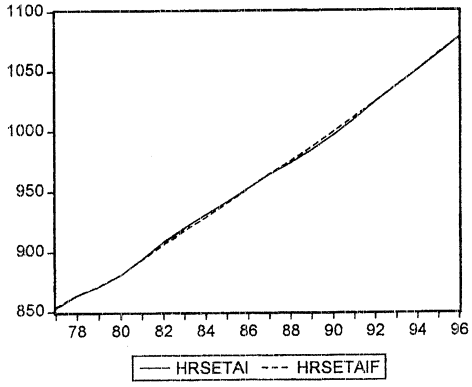

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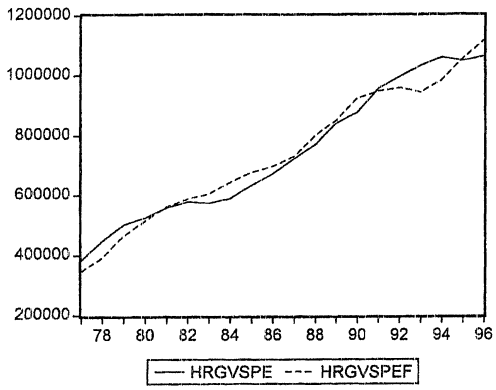

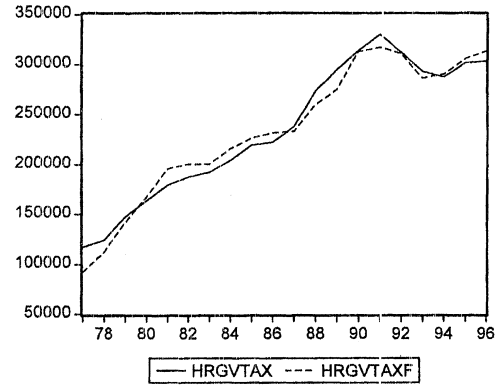

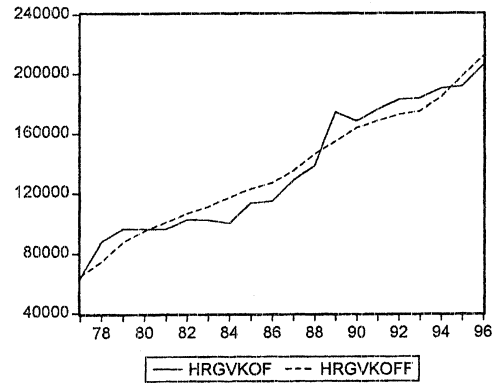

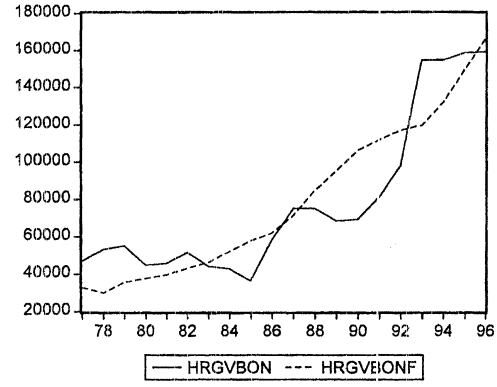

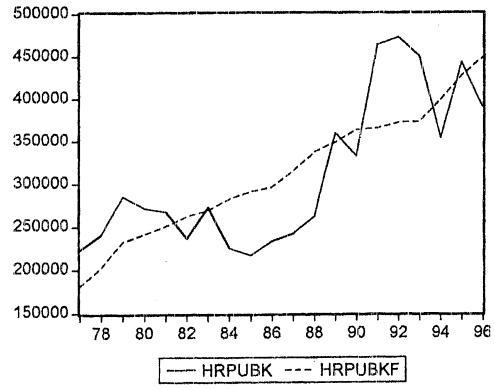

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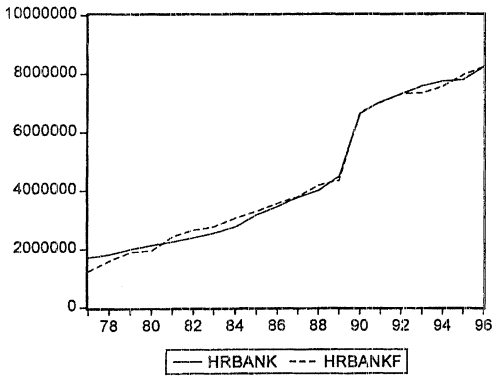

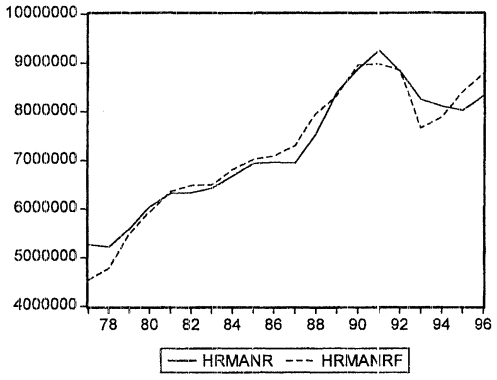

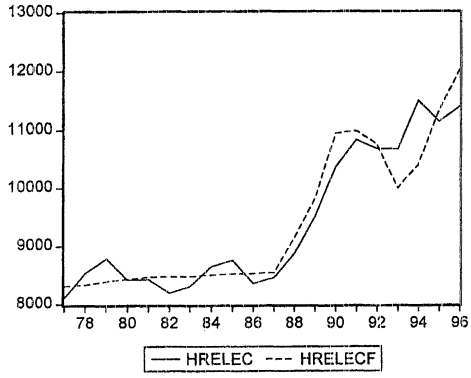

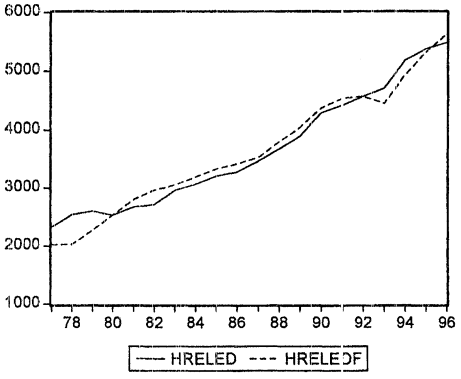

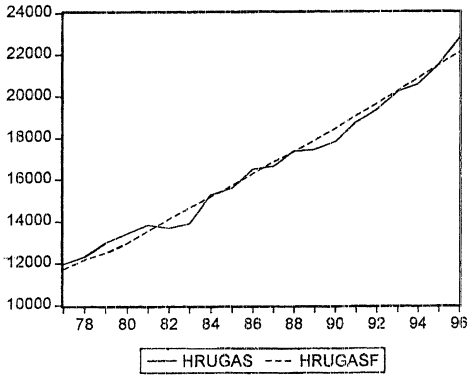

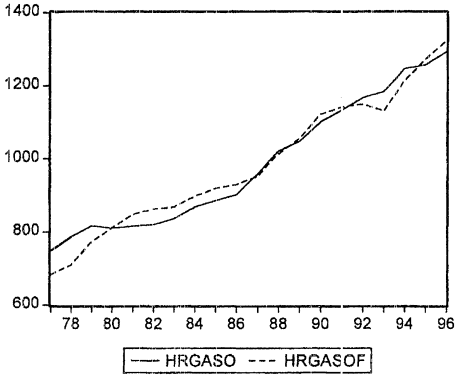

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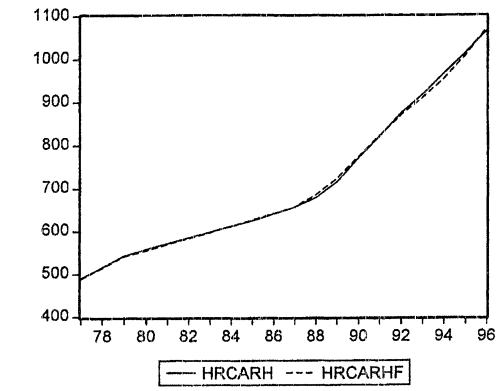

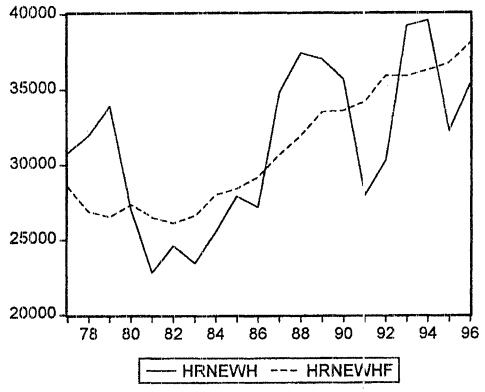

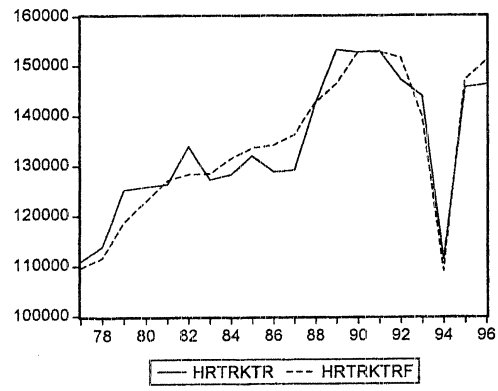

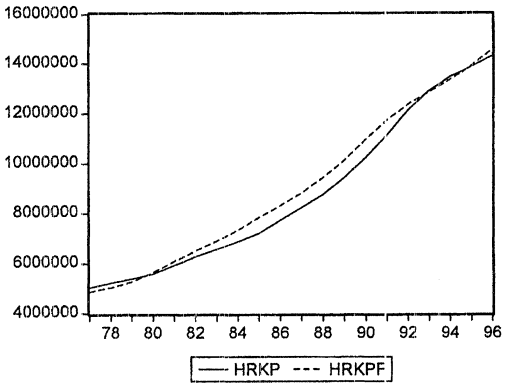

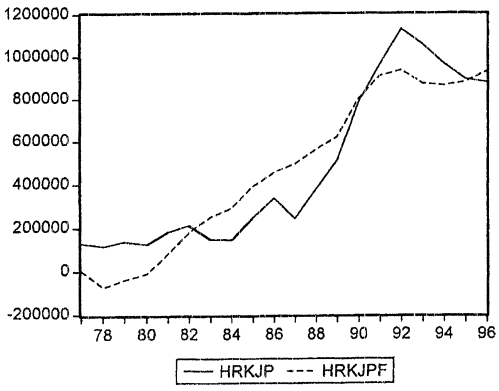

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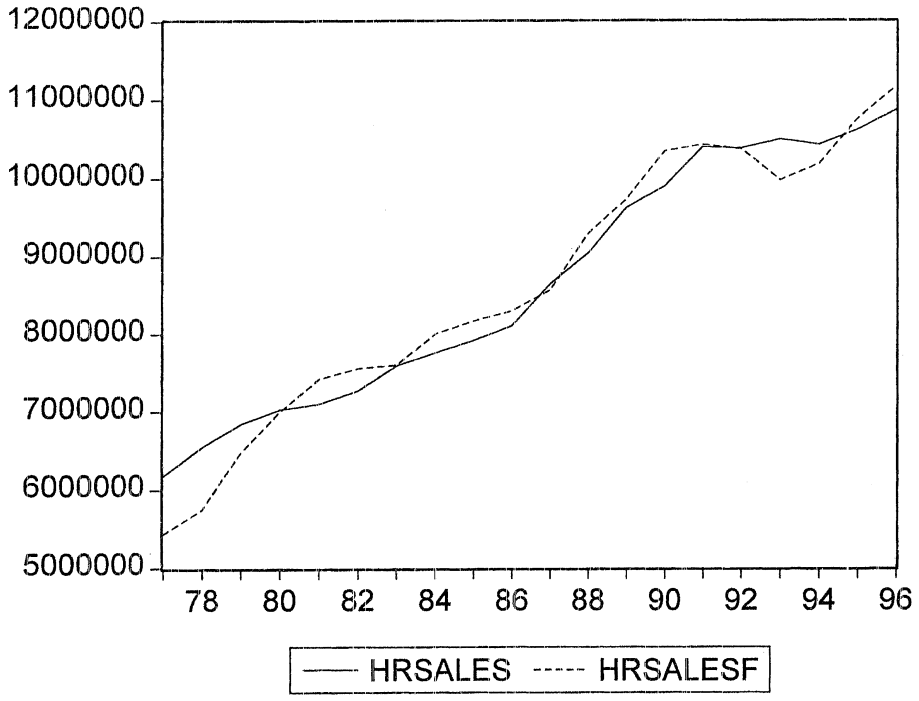

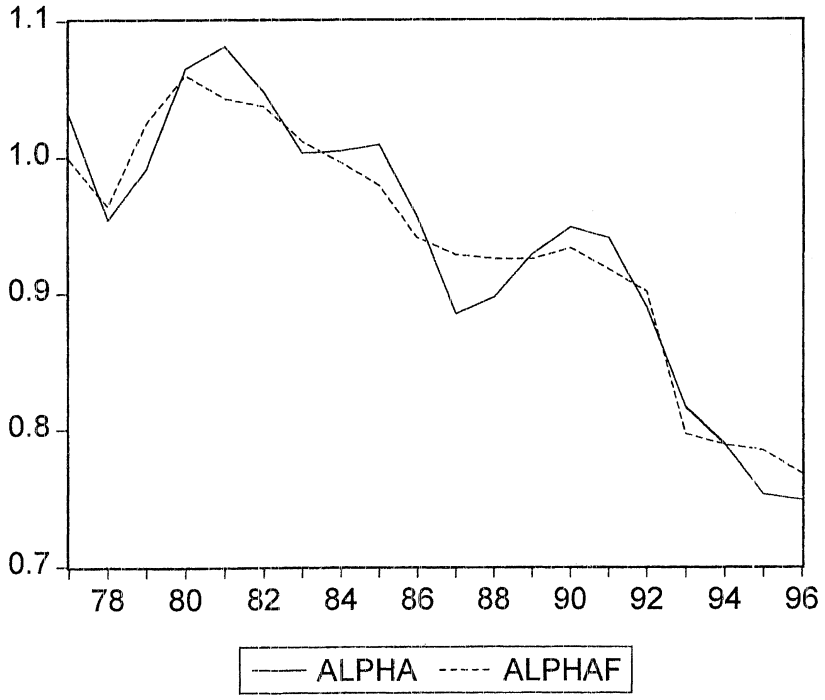

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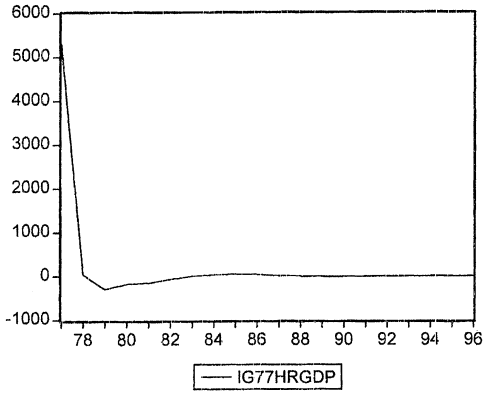
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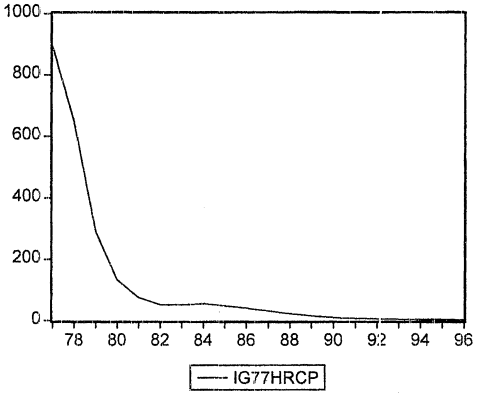
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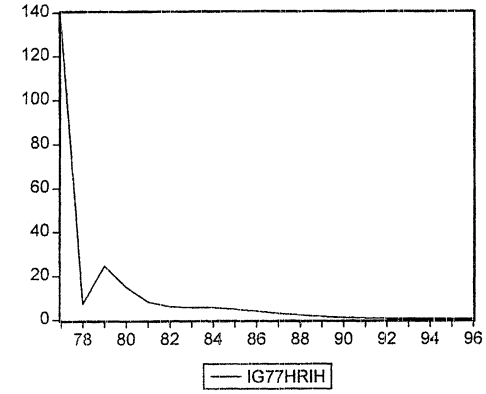
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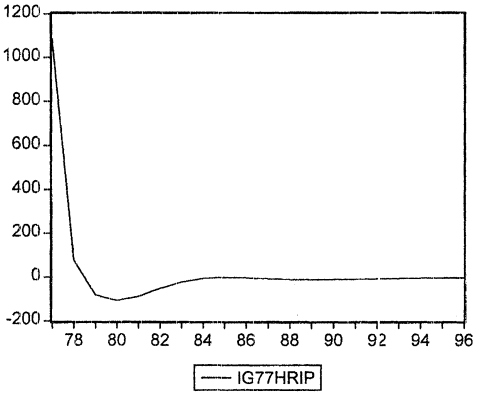
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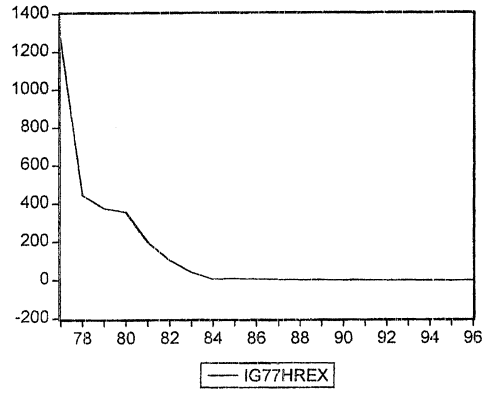
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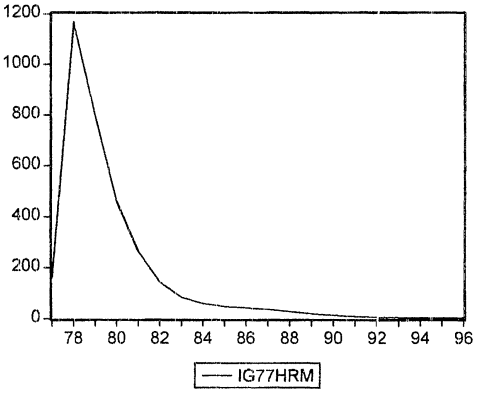
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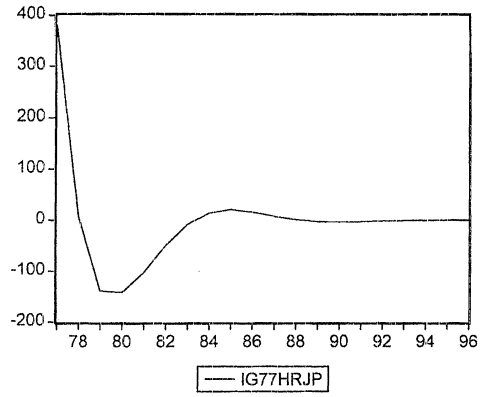

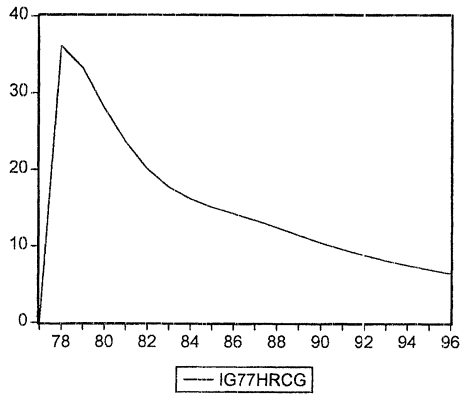

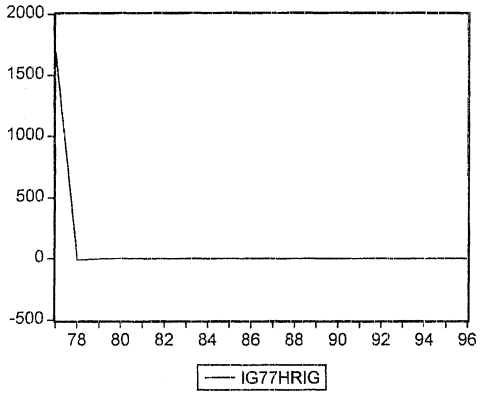

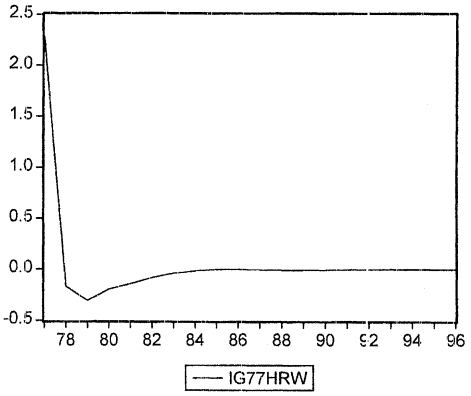

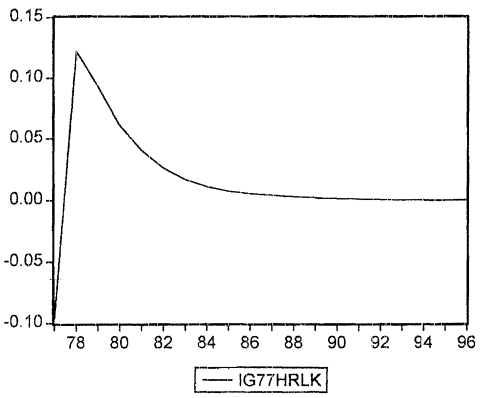

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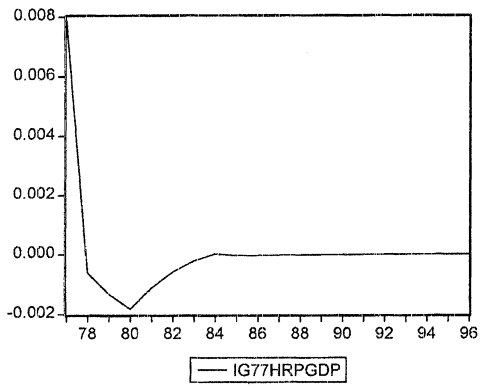

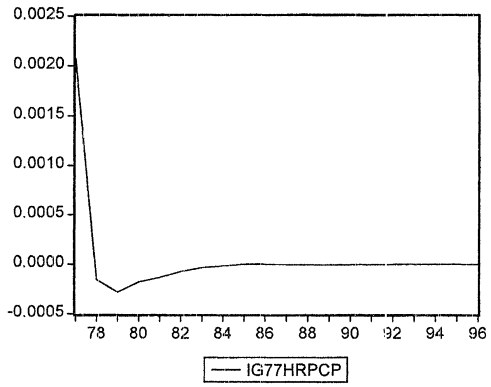

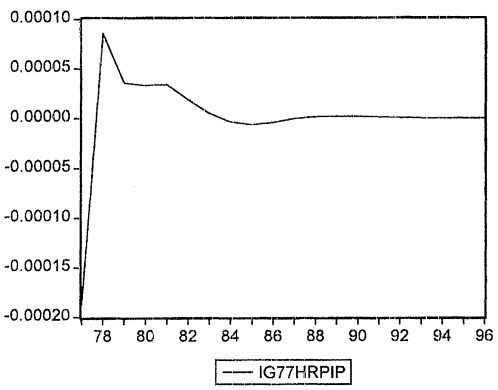

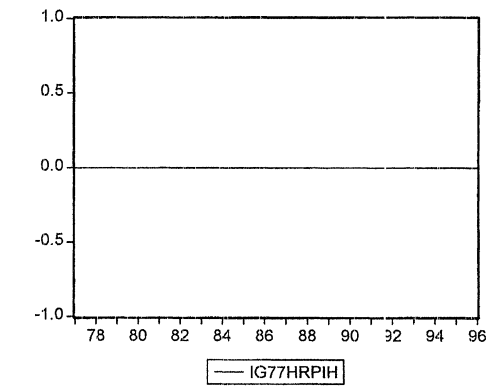

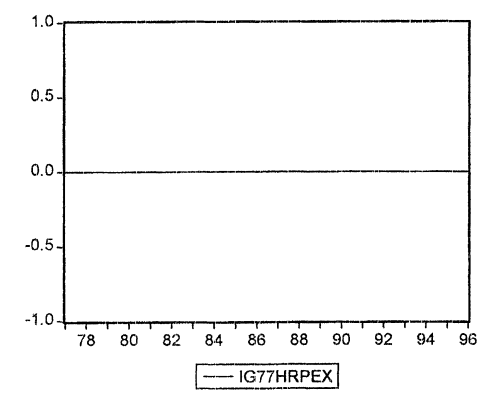

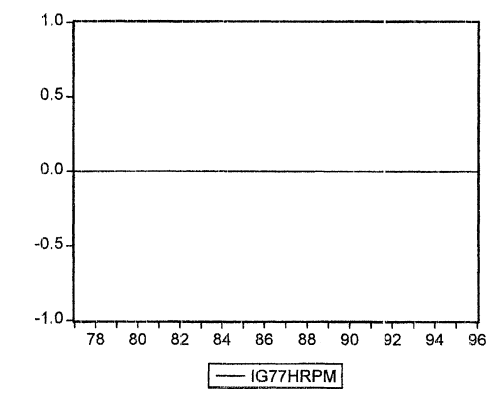

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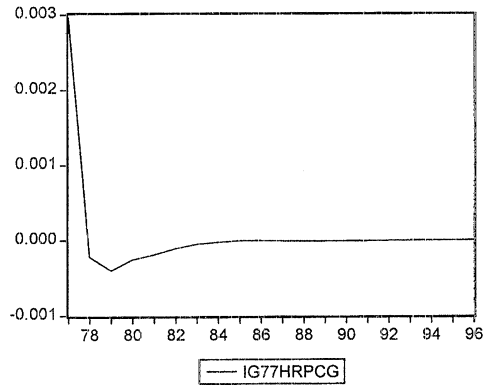
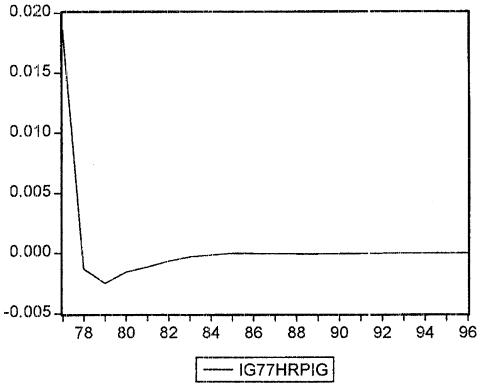
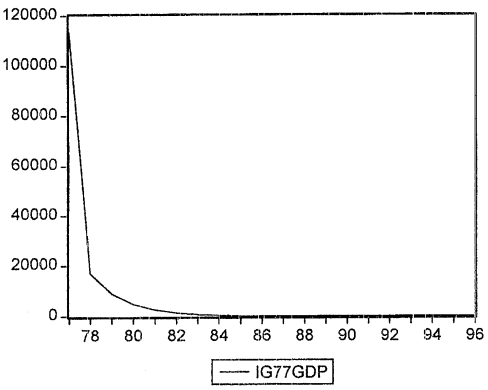
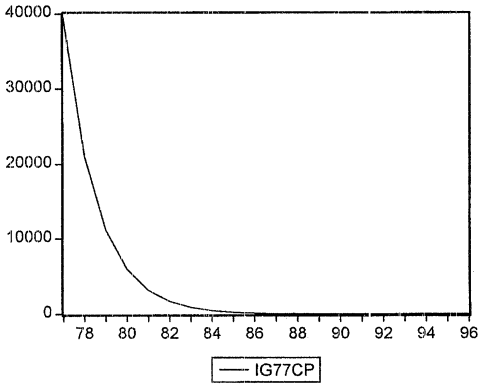








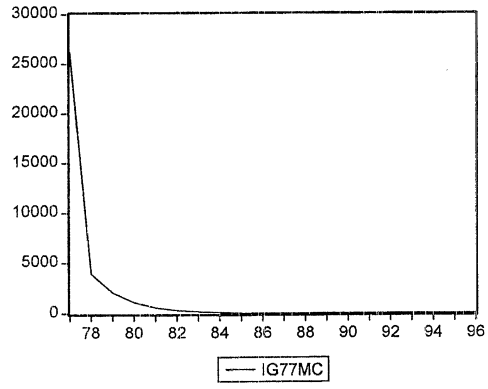
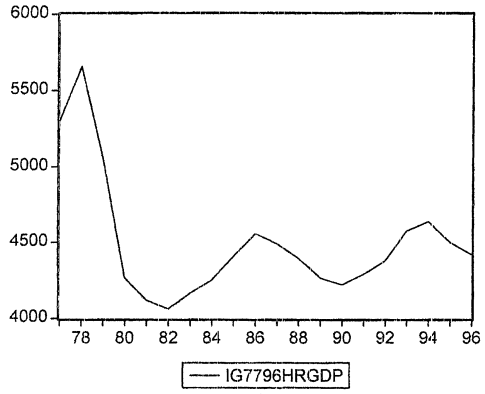


Figure 9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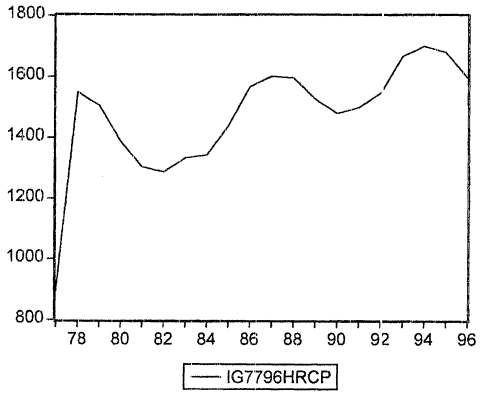
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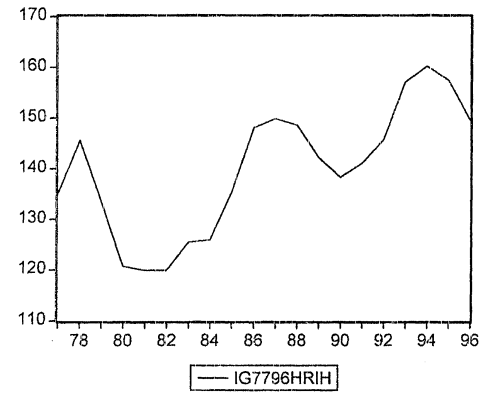
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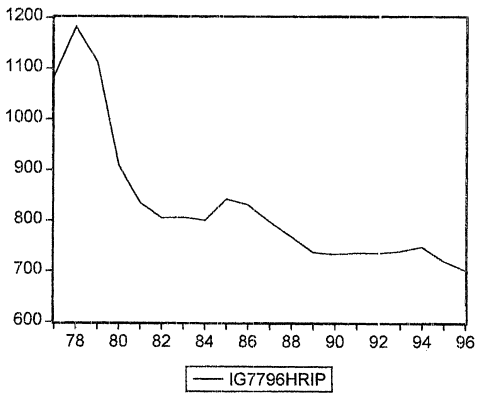
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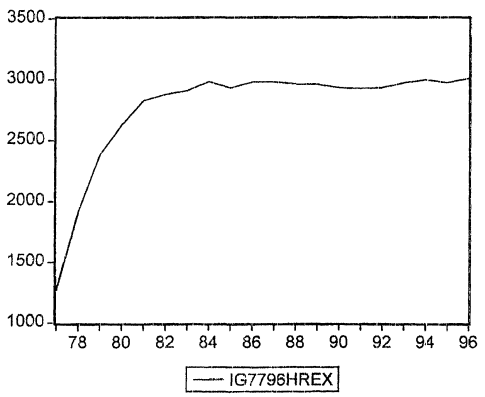
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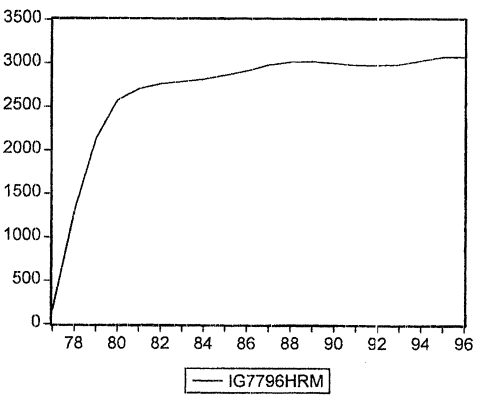
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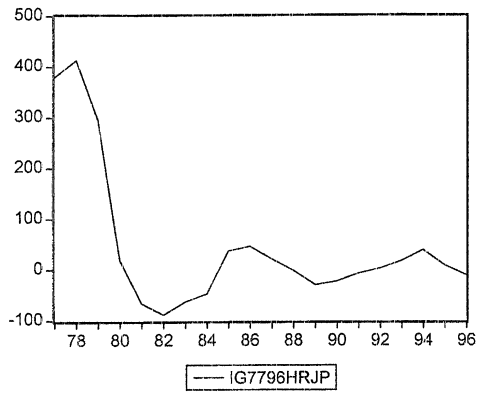

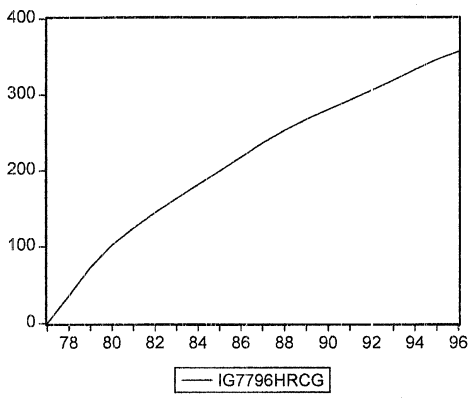

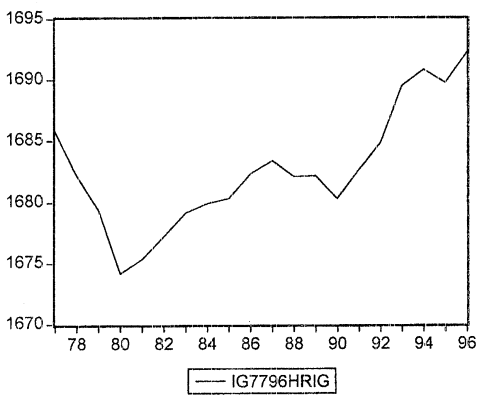

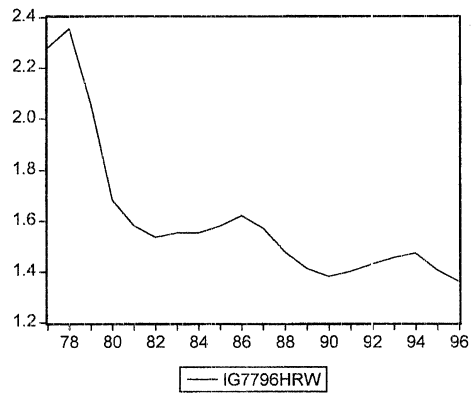

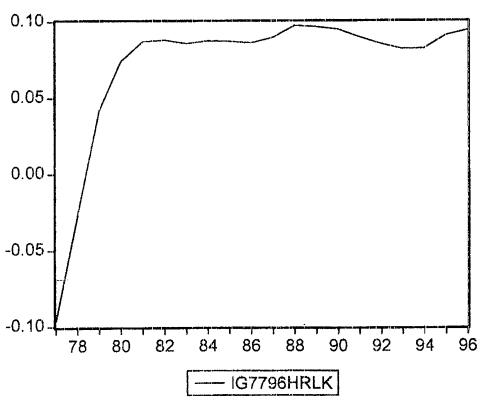

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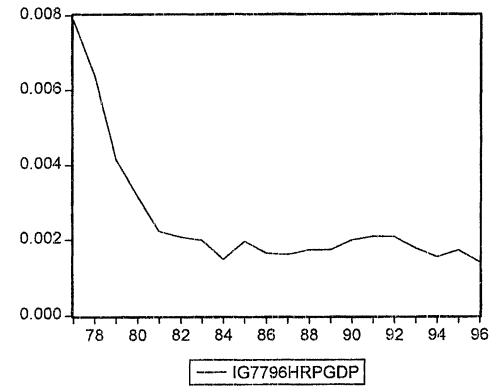

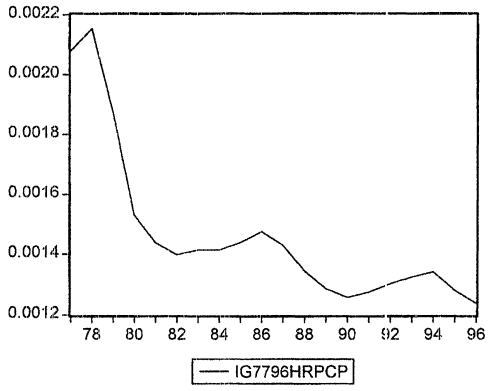

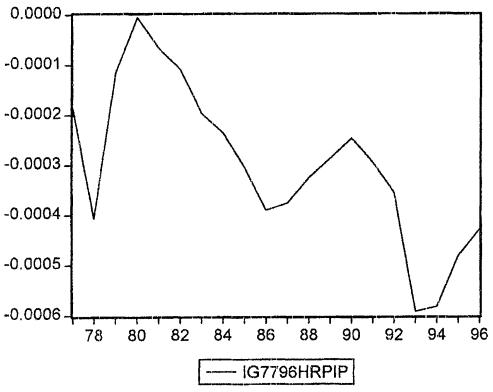

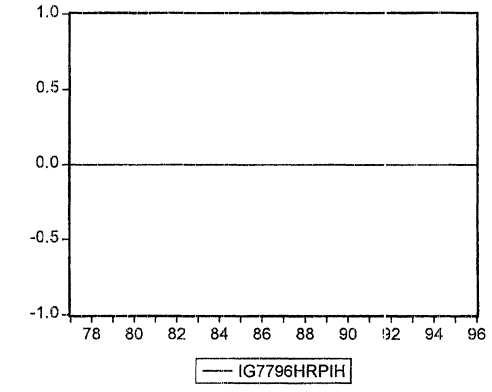

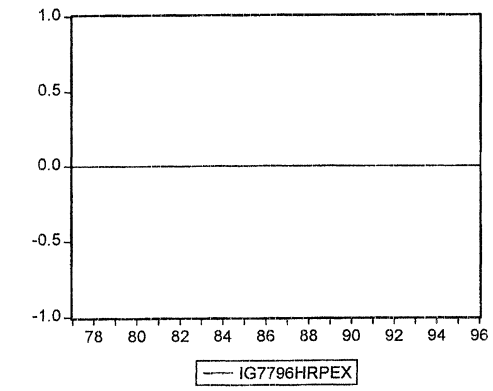

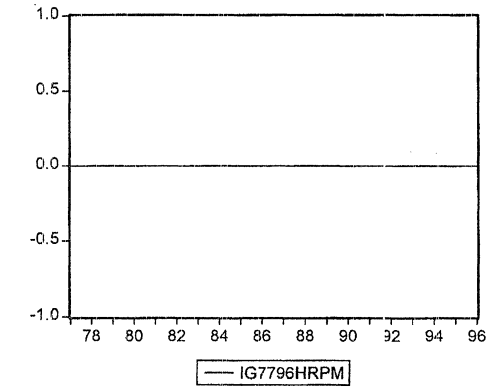

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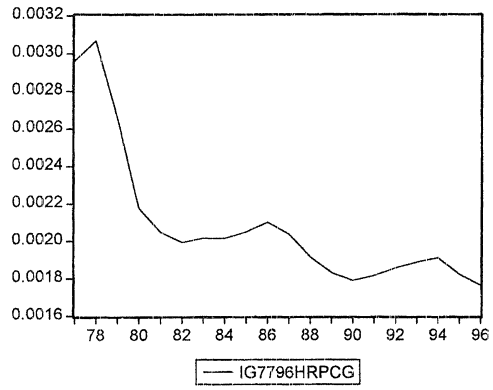

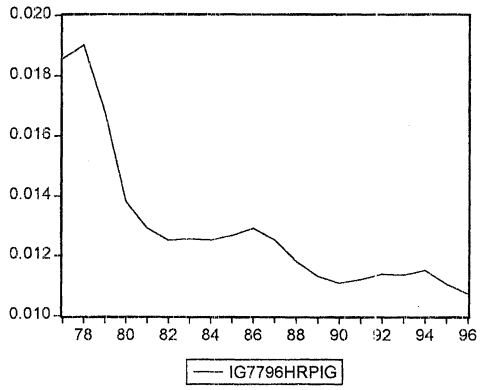

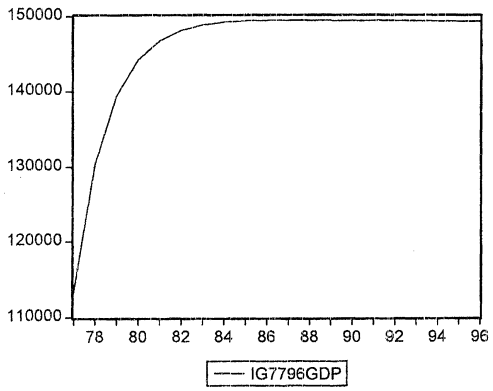

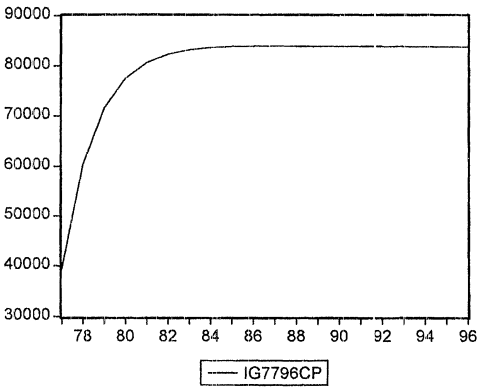

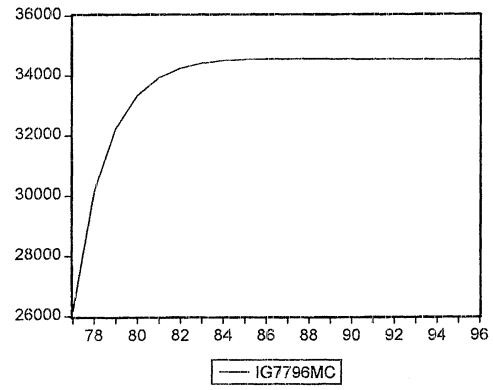

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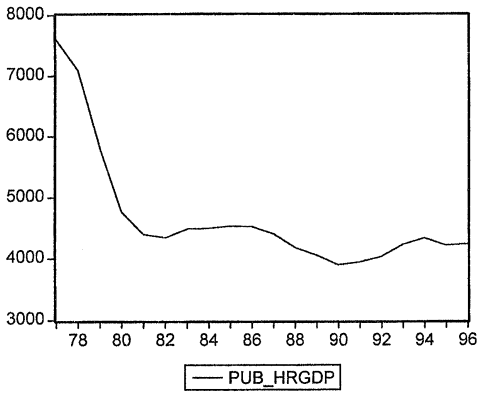
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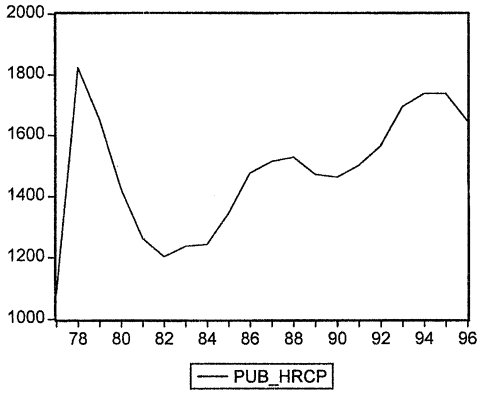
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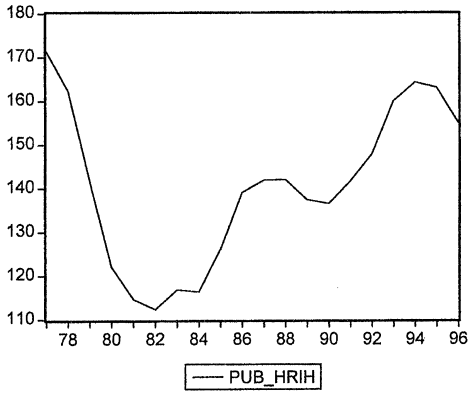
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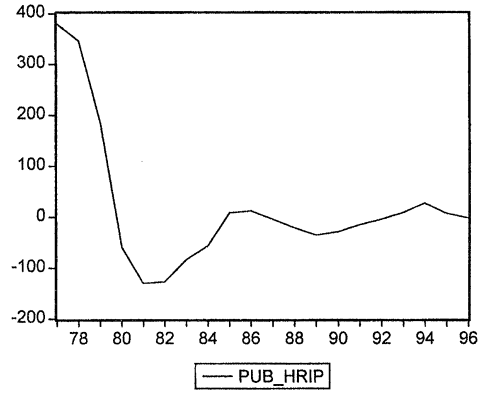
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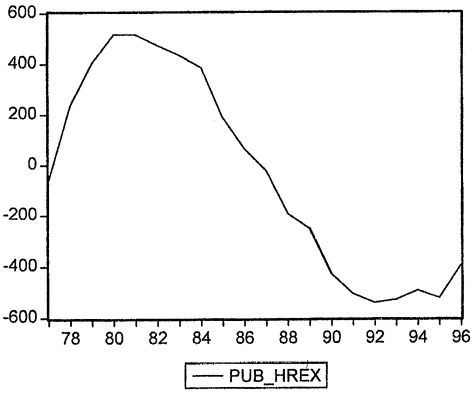
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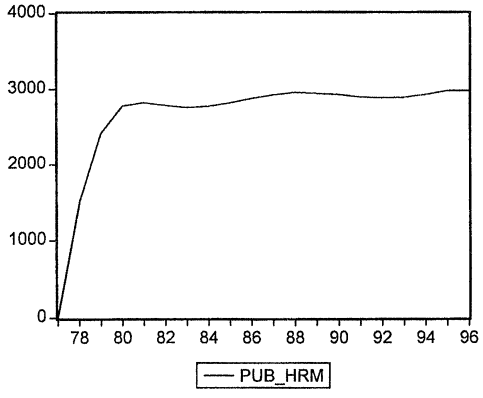
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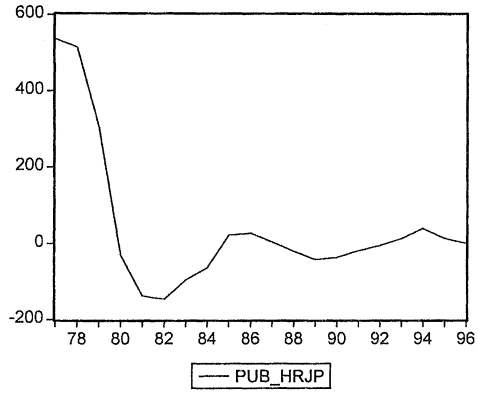

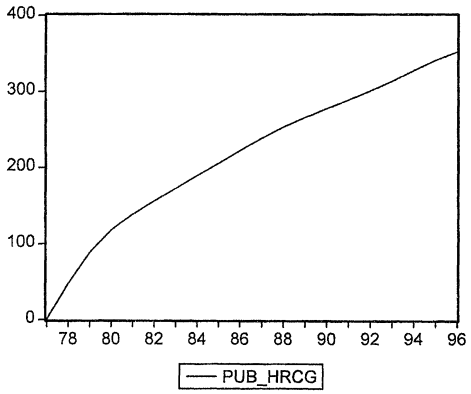

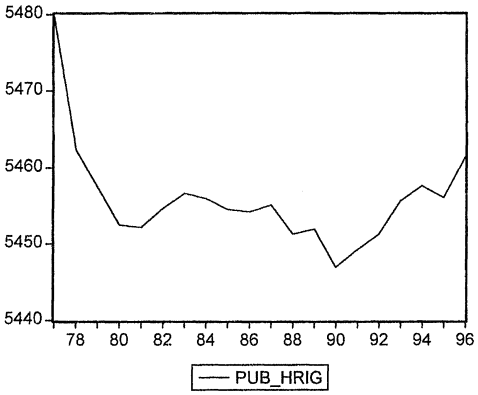

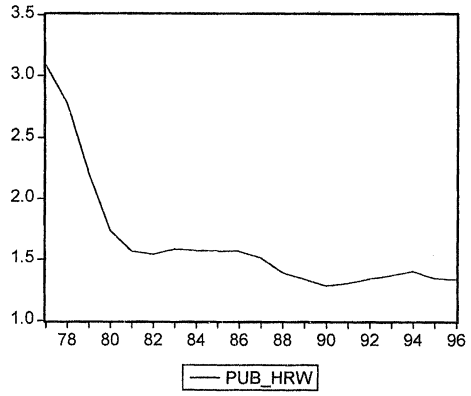

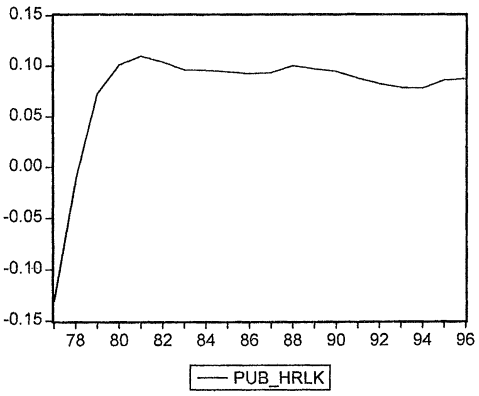

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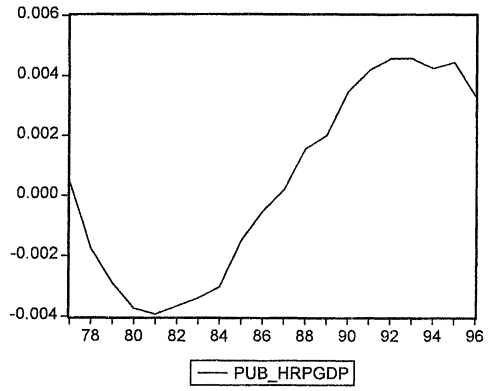

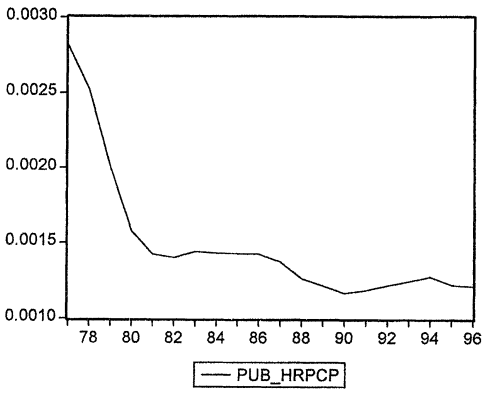

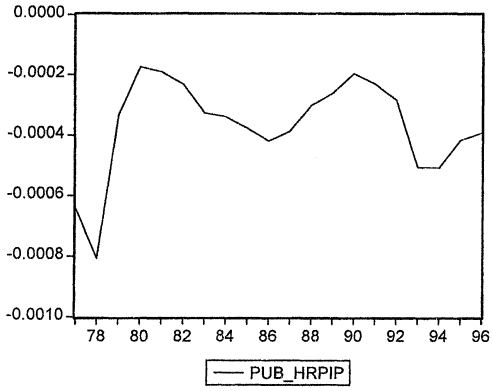

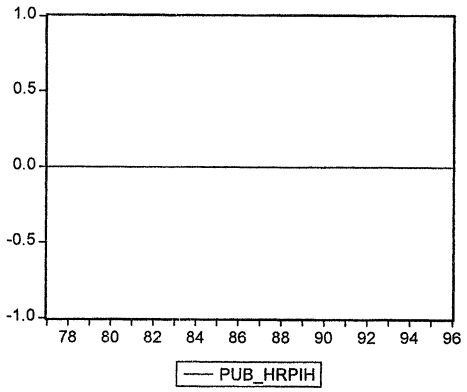

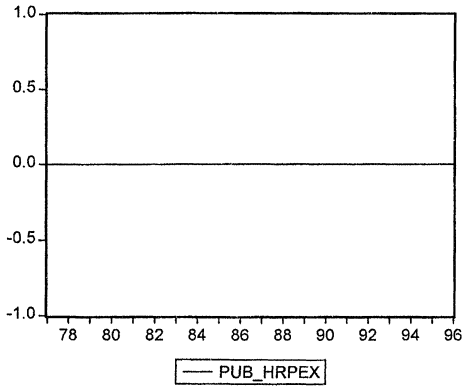

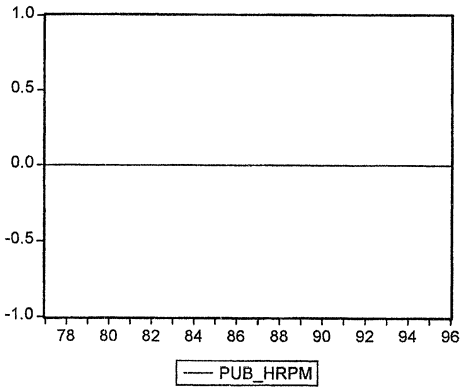

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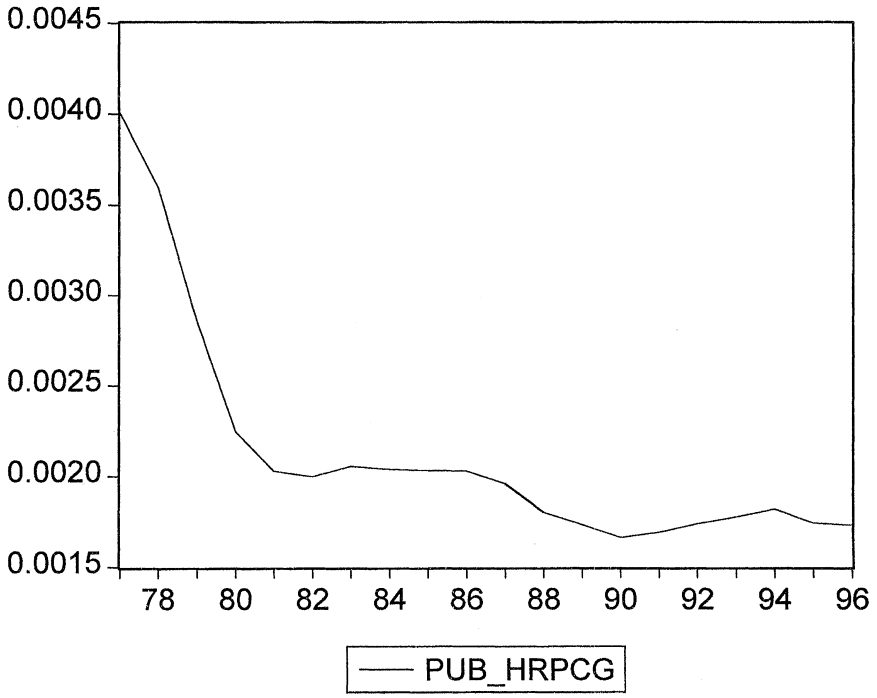

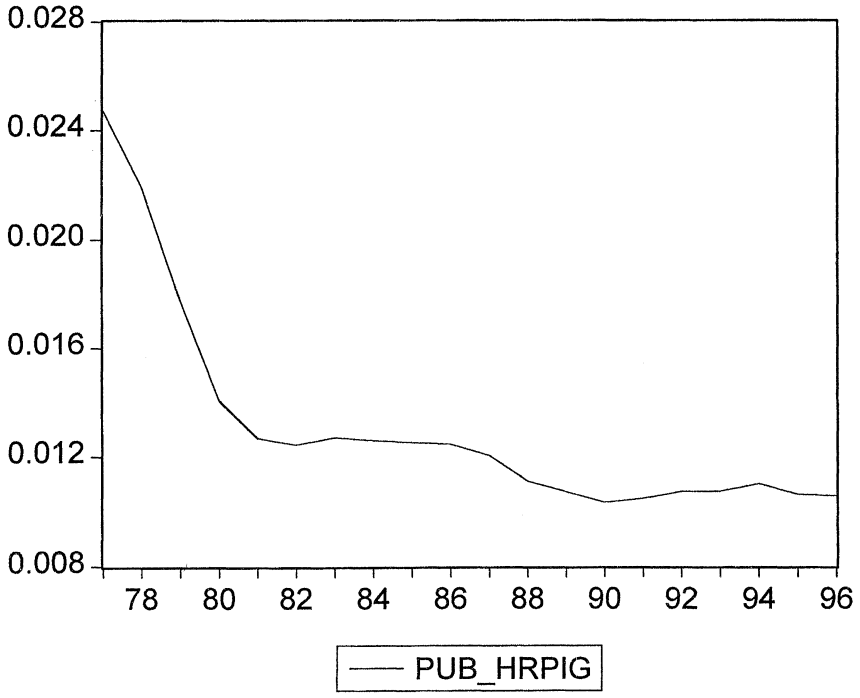

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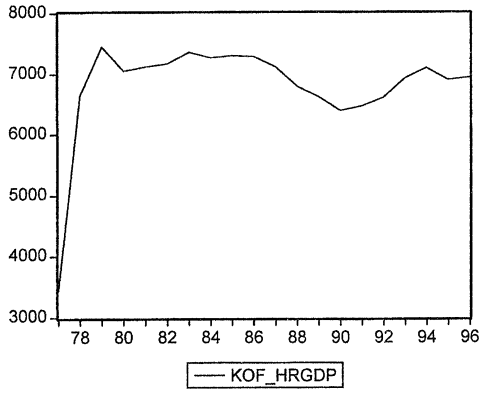
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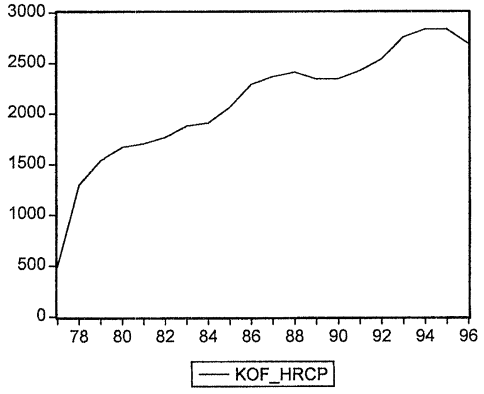
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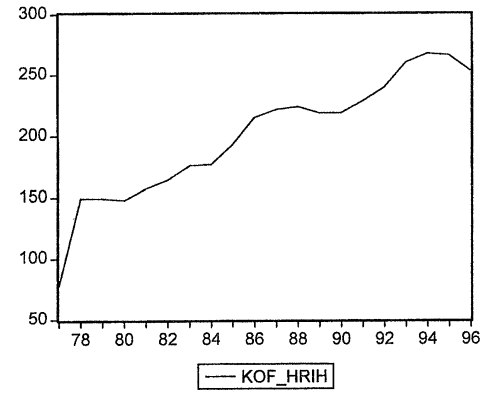
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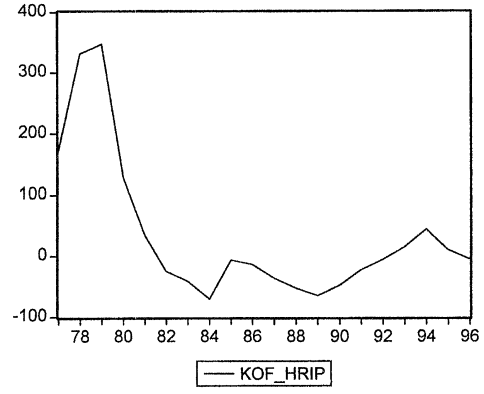
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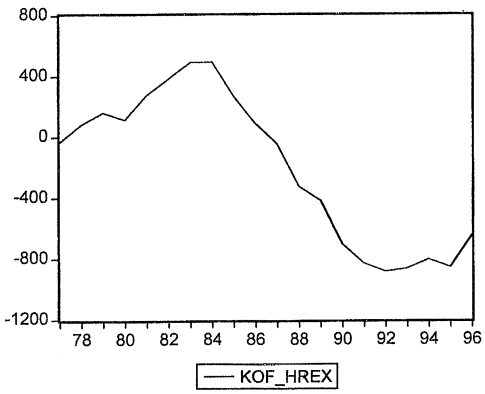
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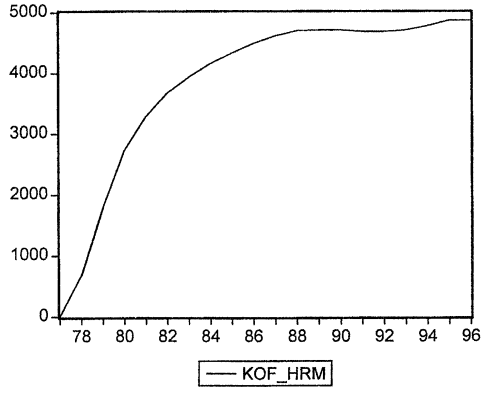
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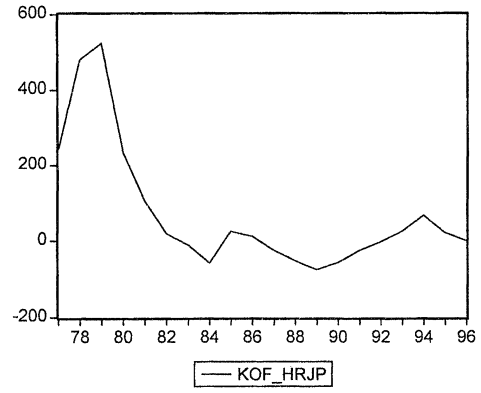

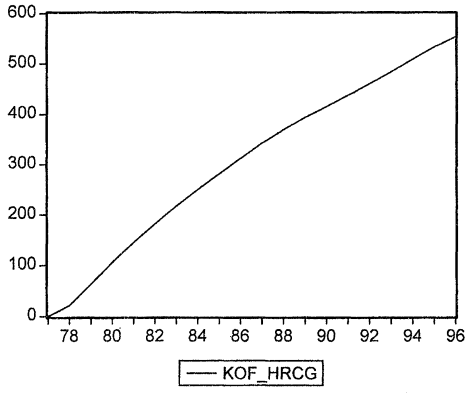

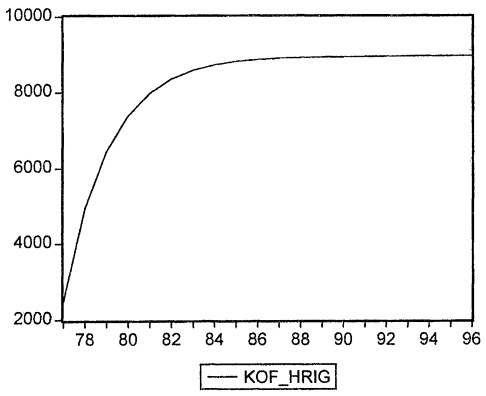

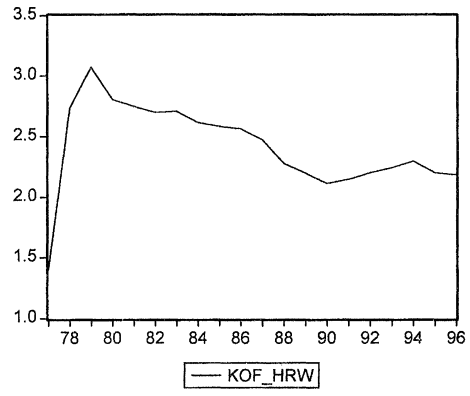

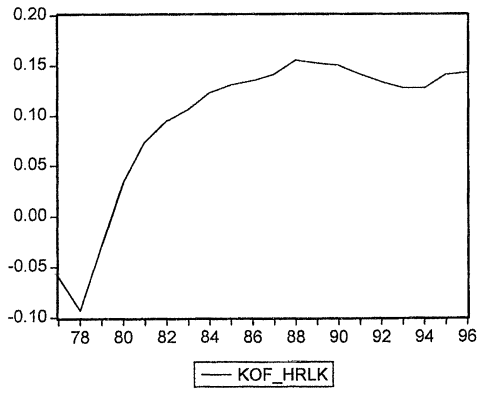

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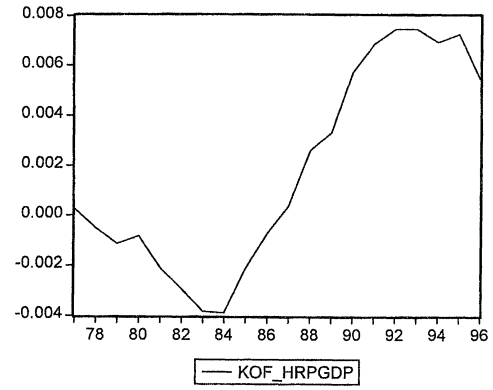

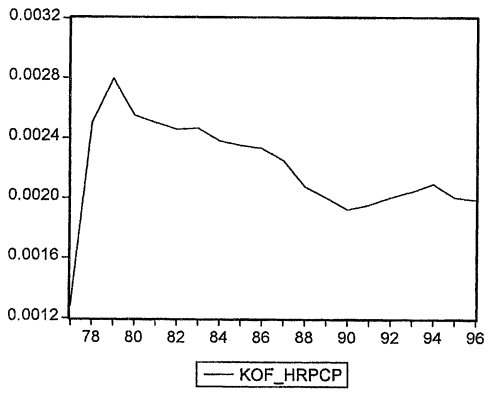

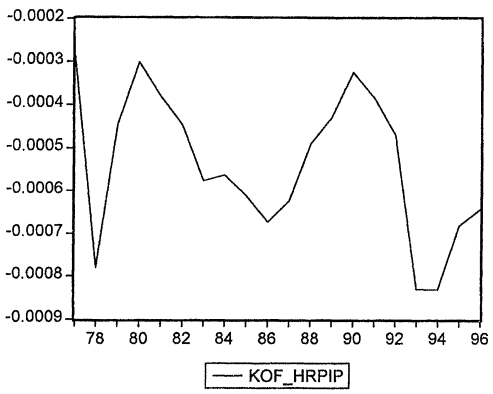

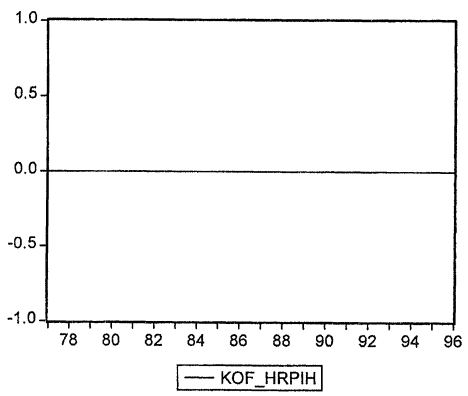

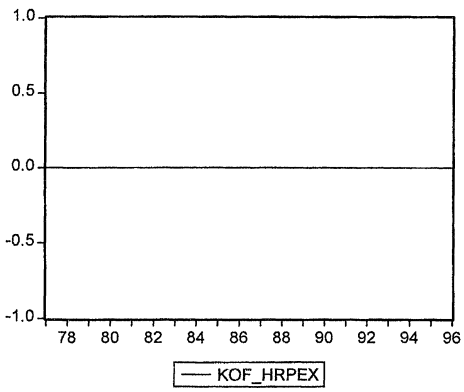

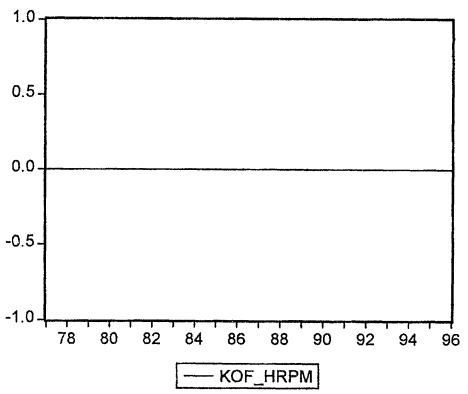

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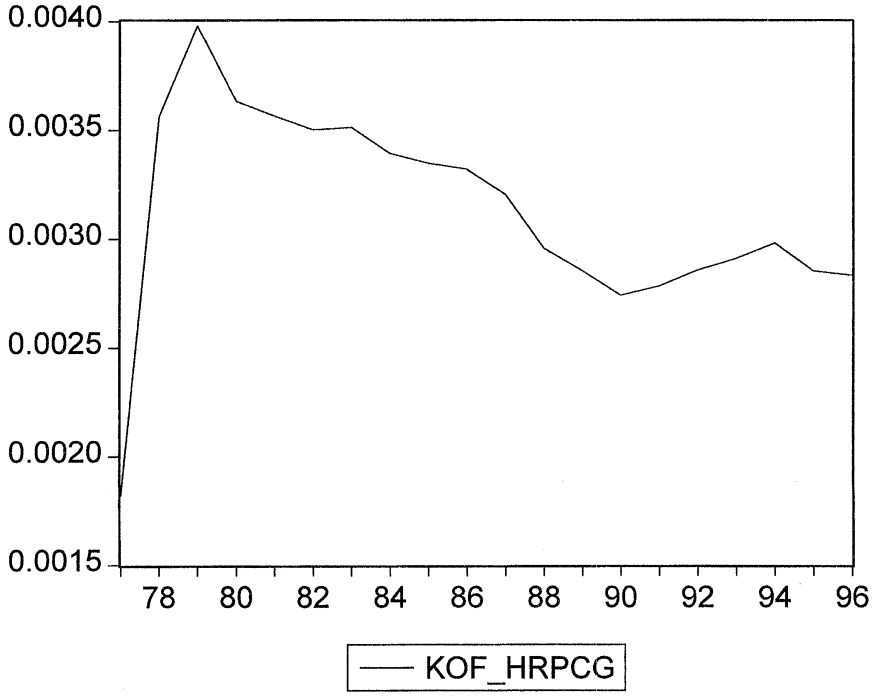

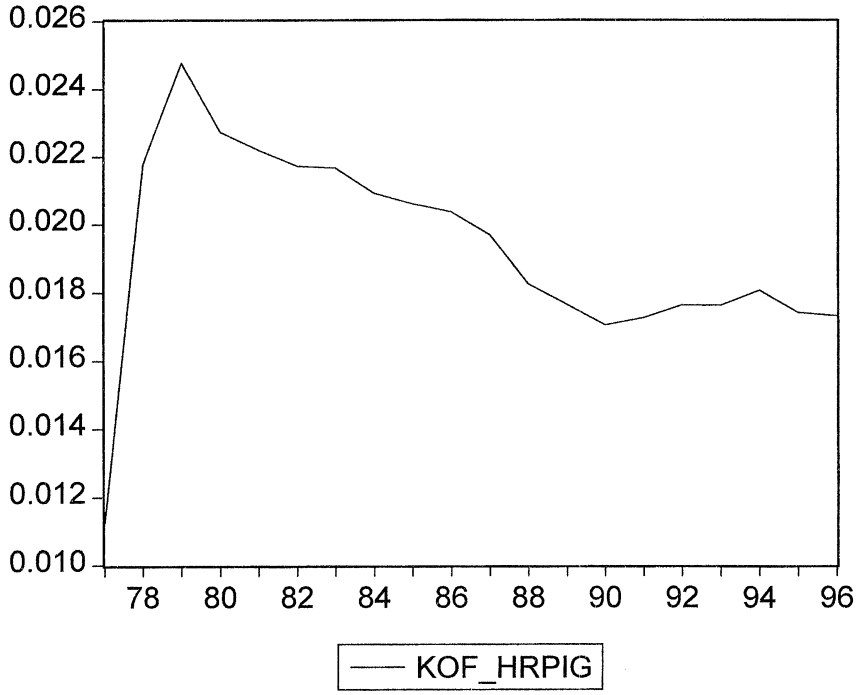

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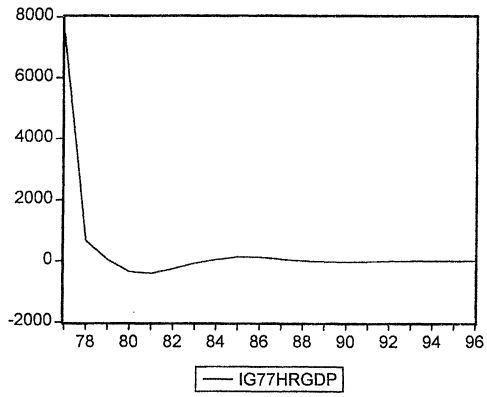
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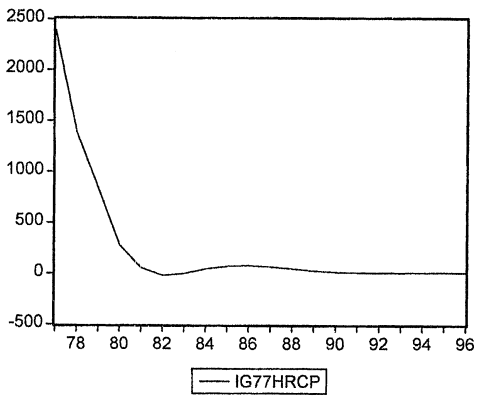
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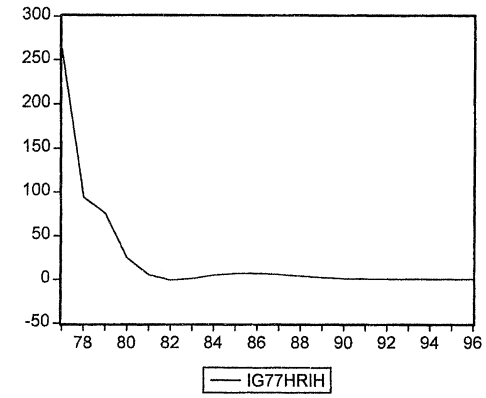
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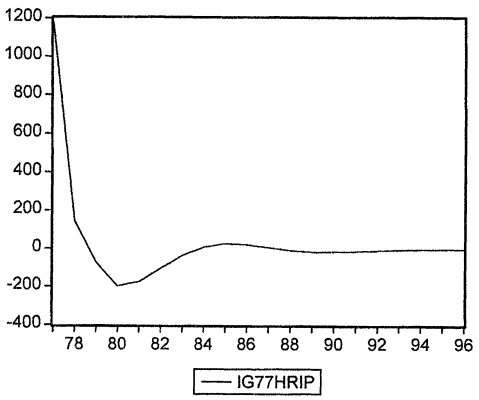
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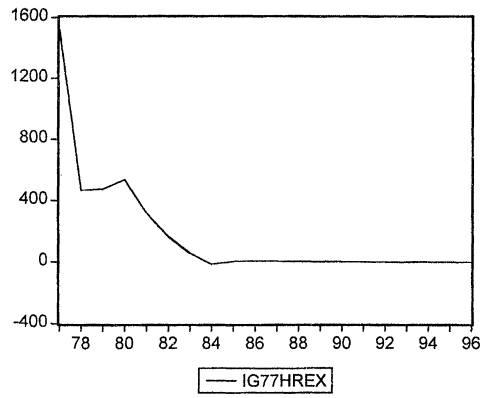
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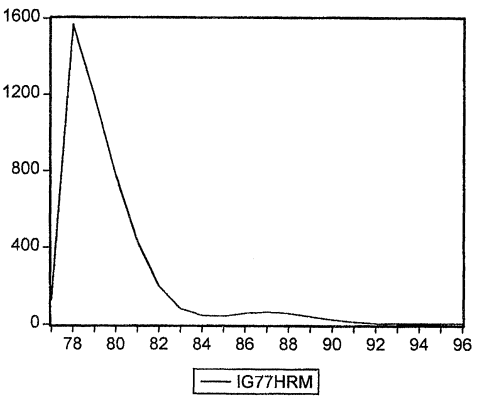
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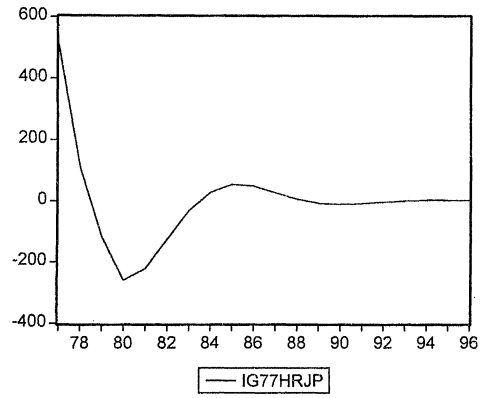

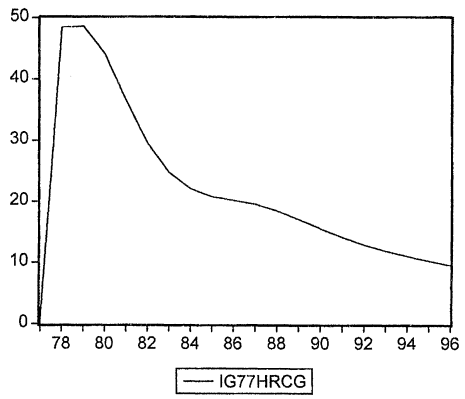

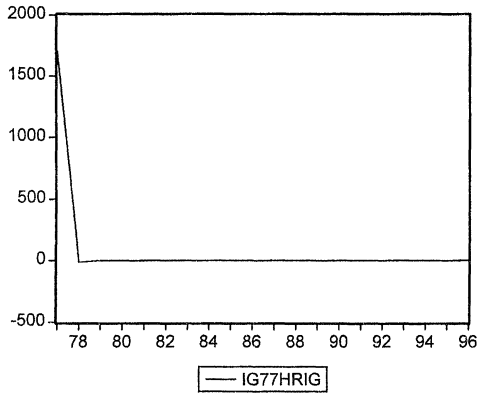

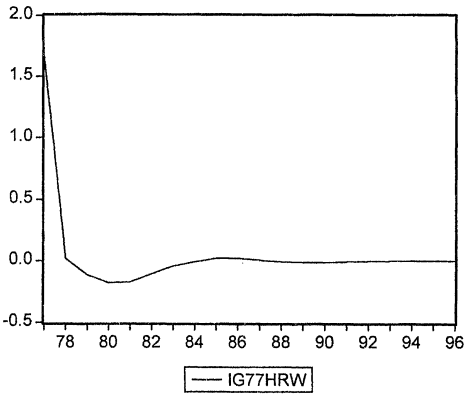

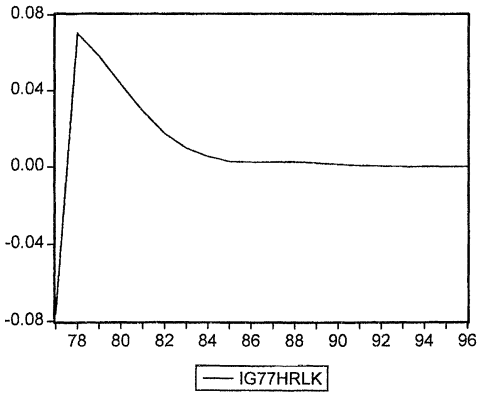

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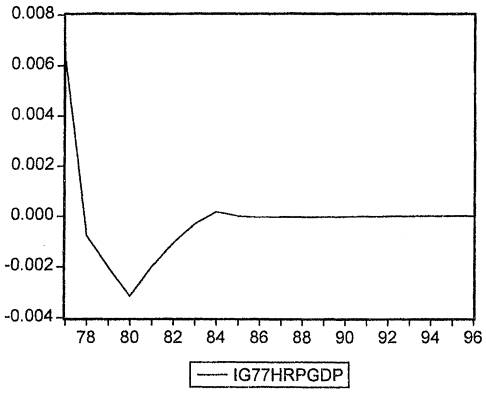

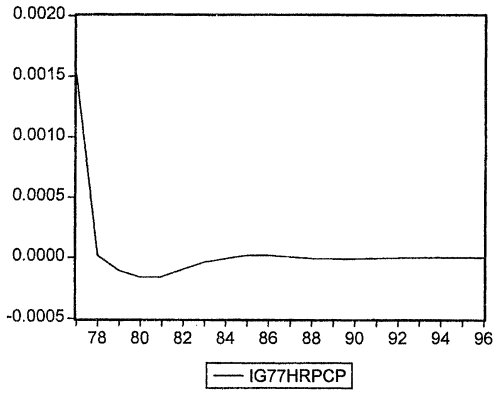

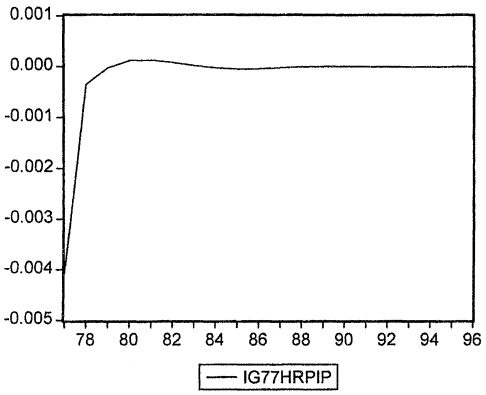

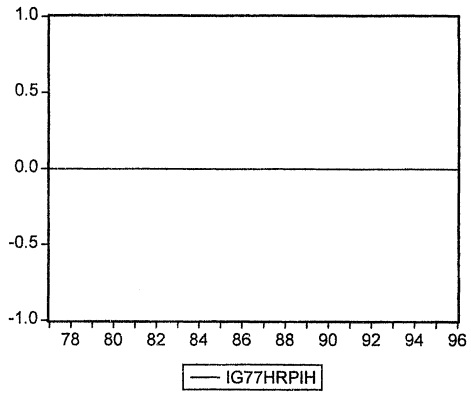

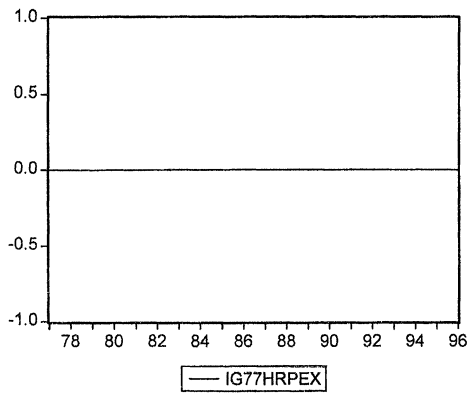

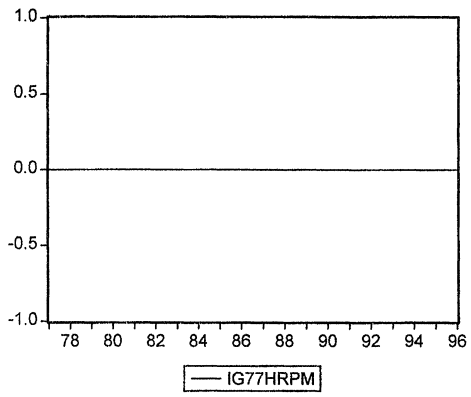

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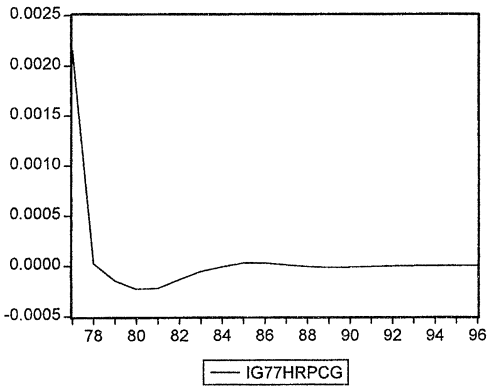

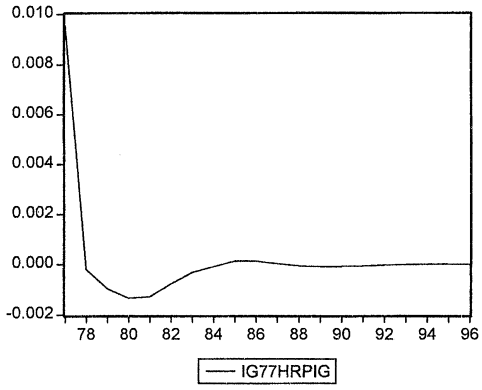

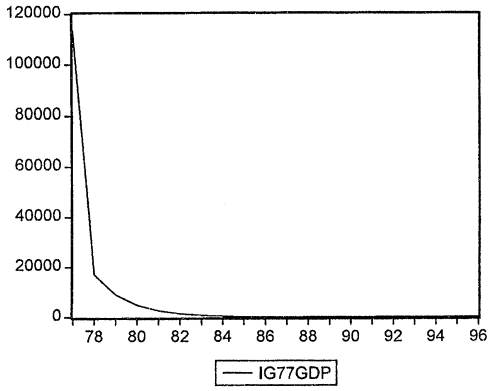

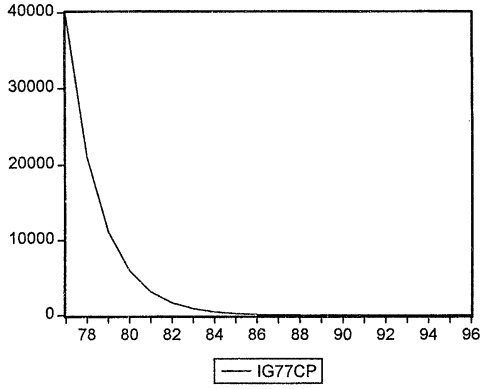

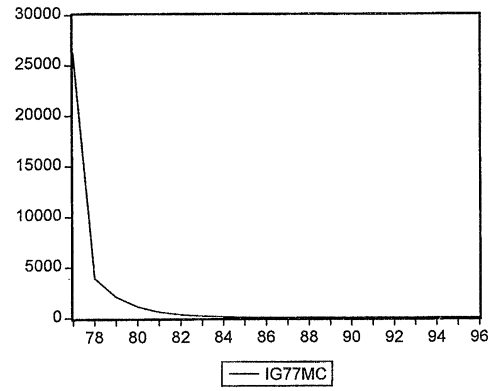

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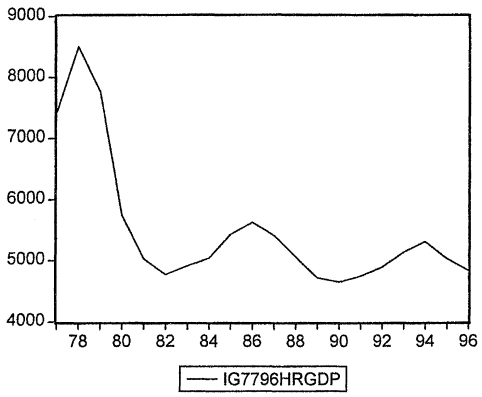
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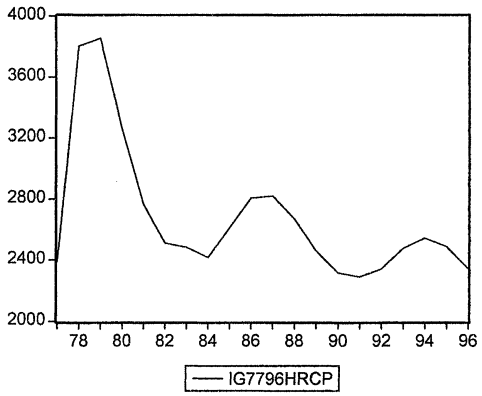
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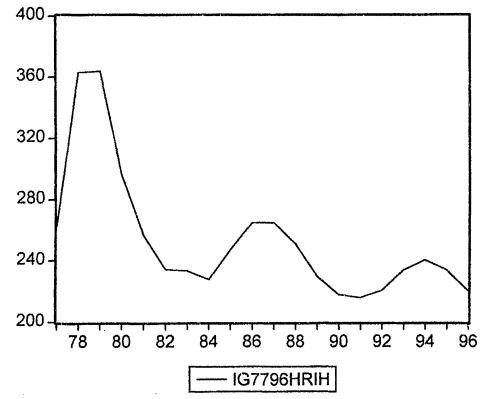
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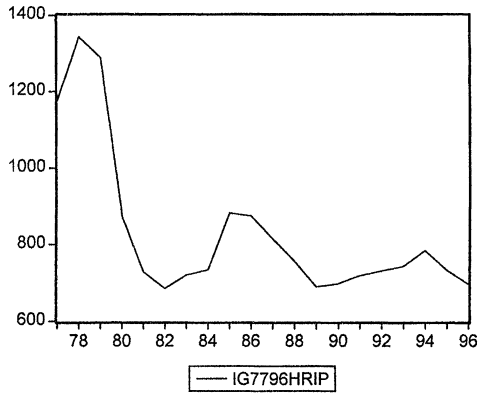
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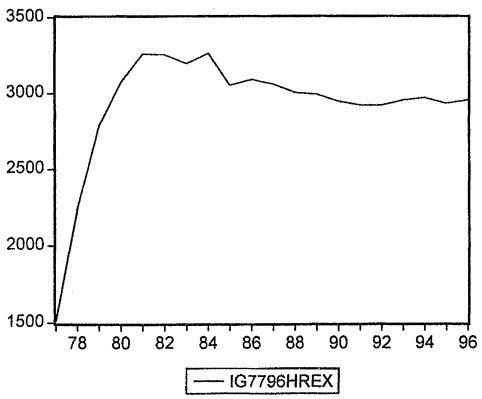
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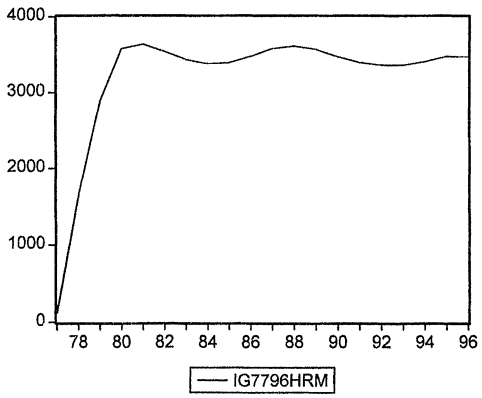
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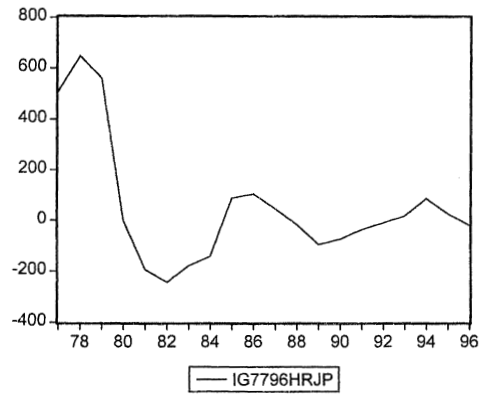

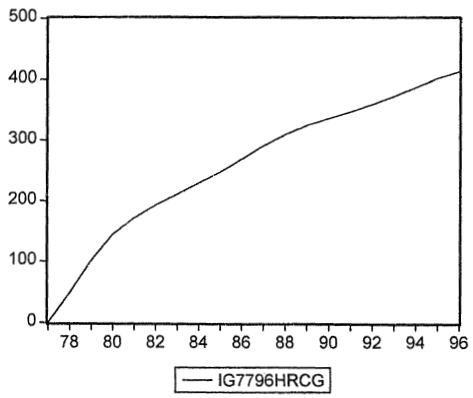

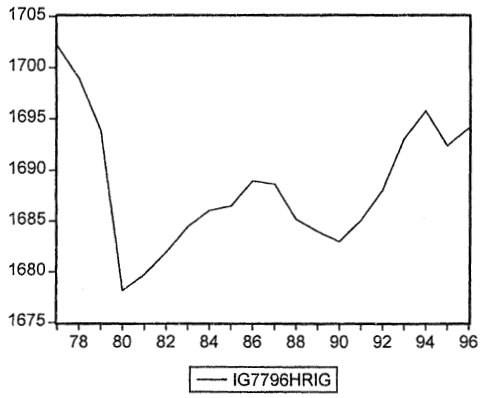

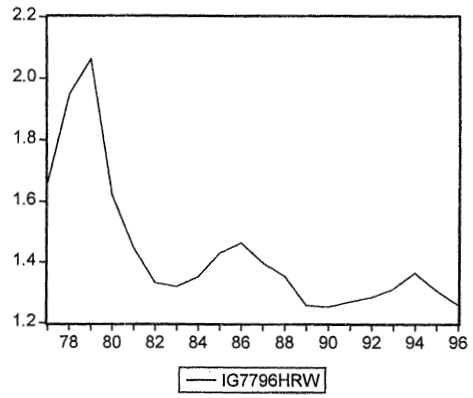

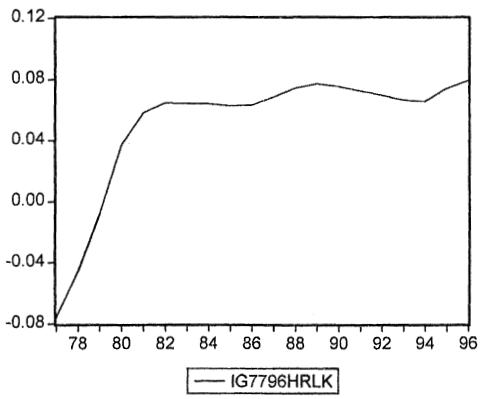

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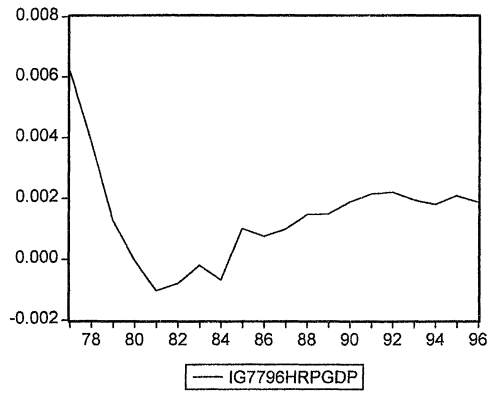

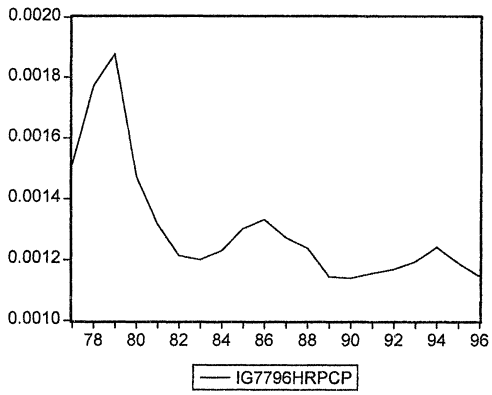

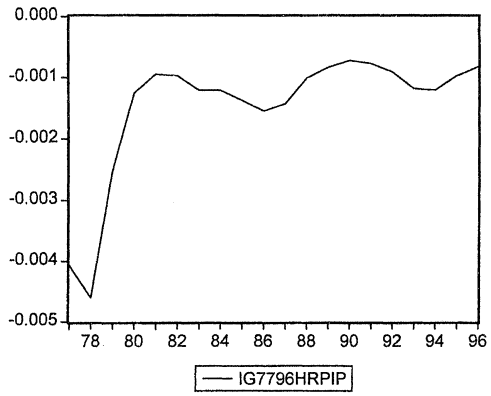

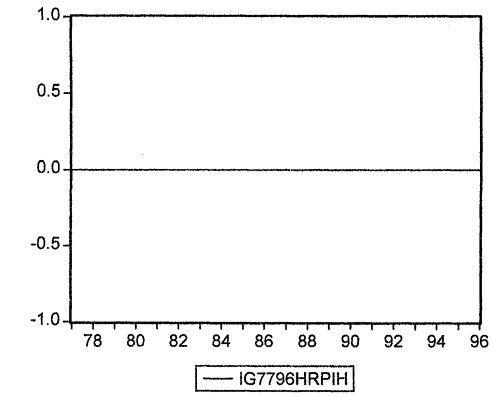

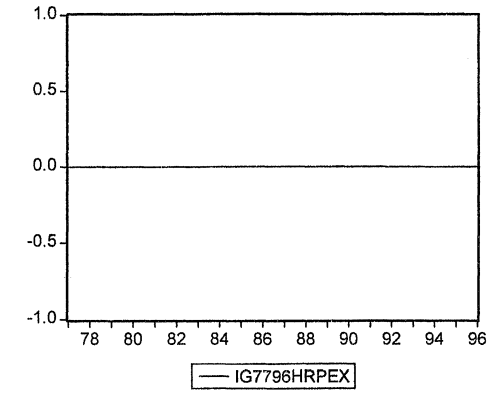

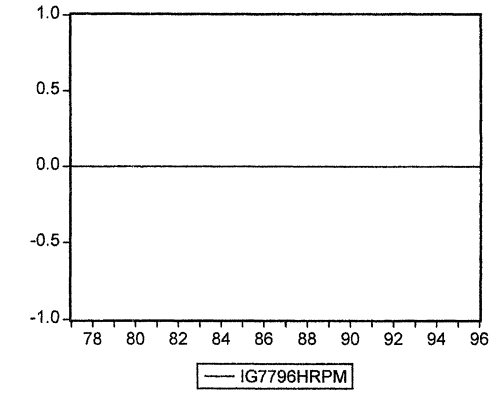

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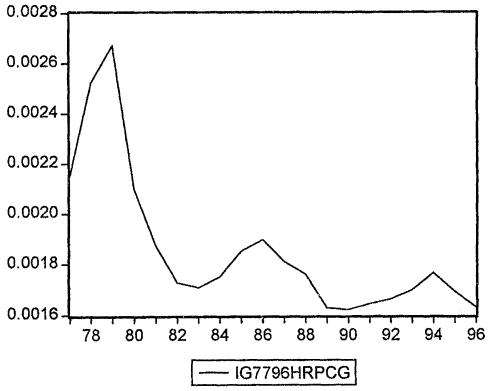
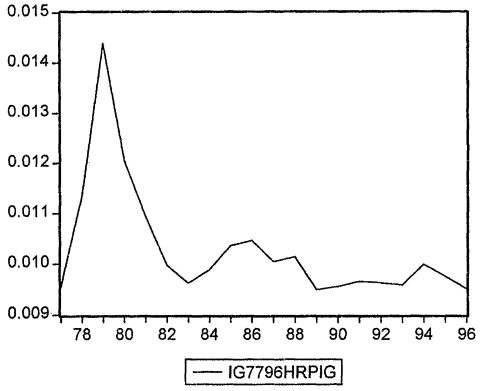
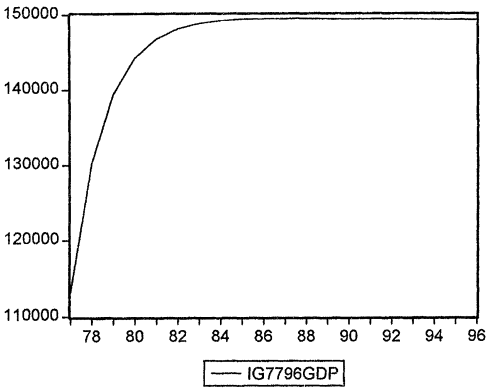
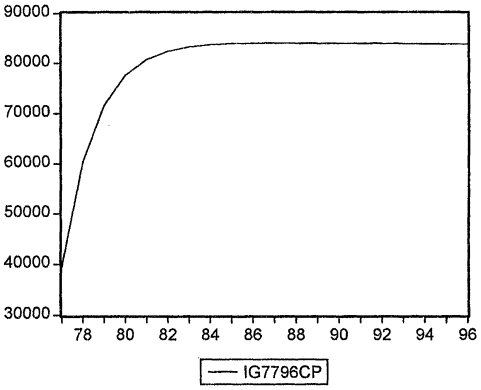








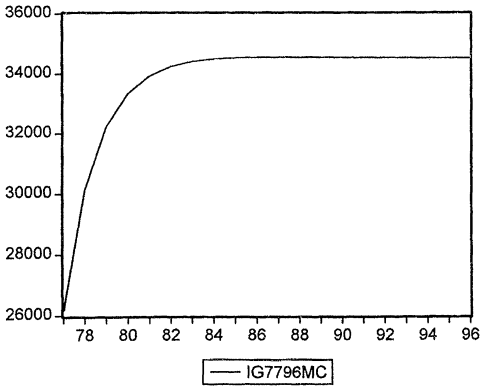


Figure 14

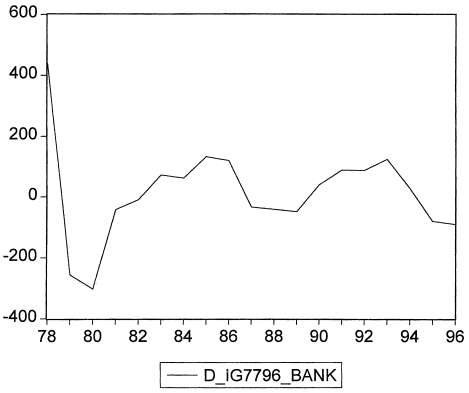
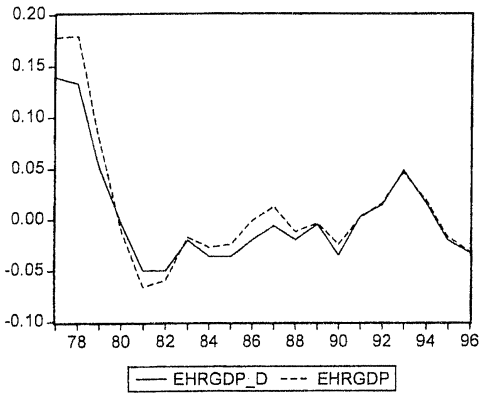
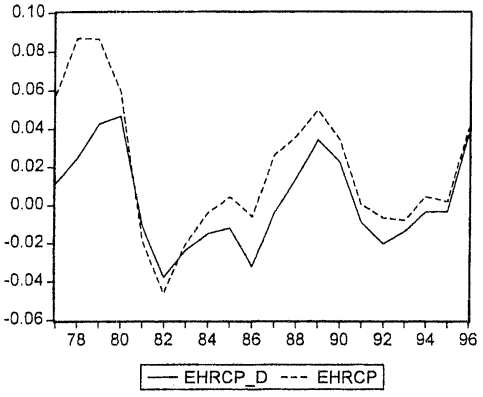
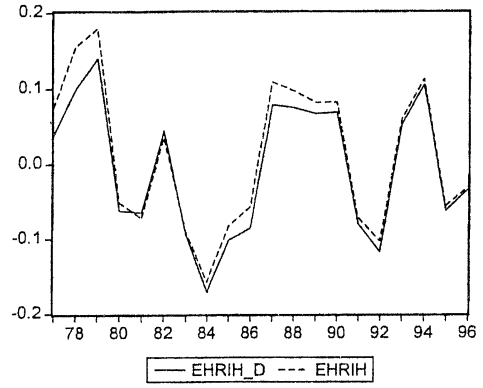
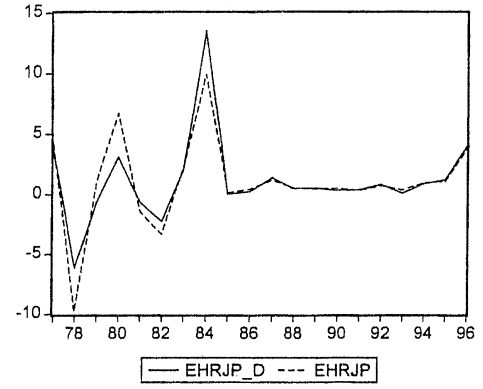


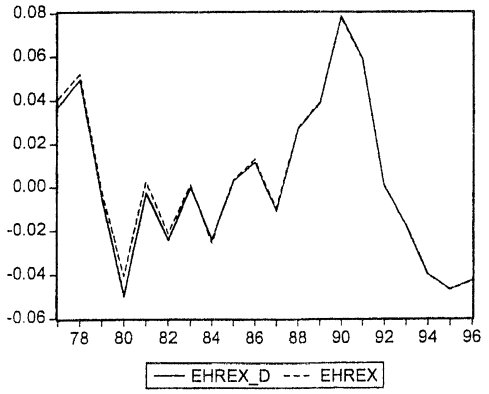
Figure 15


0.20
0.15
0.10
0.05
0.00
-0.05
-0.10
78 80 82 84 86 88 90 92 94 96
EHRGDP_D --- EHRGDP


0.10
0.08
0.06
0.04
0.02
0.00
-0.02
-0.04
-0.06
78 80 82 84 86 88 90 92 94 96
EHRCP_D --- EHRCP


0.2
0.1
0.0
-0.1
-0.2
78 80 82 84 86 88 90 92 94 96
EHRIH_D --- EHRIH


15
10
5
0
-5
-10
78 80 82 84 86 88 90 92 94 96
EHRJP_D --- EHRJP


0.08
0.06
0.04
0.02
0.00
-0.02
-0.04
-0.06
78 80 82 84 86 88 90 92 94 96
EHREX_D --- EHREX

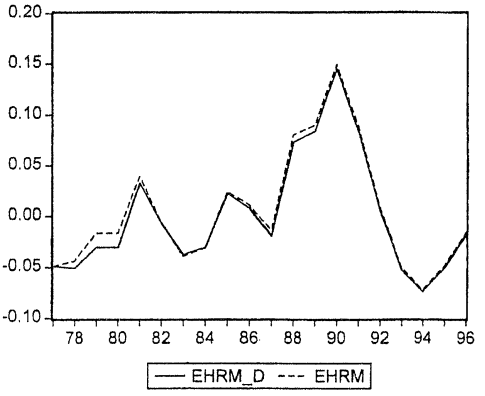
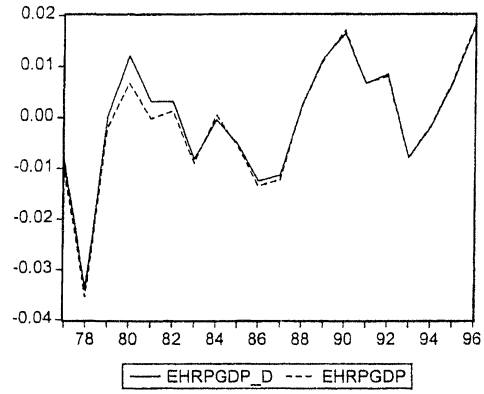
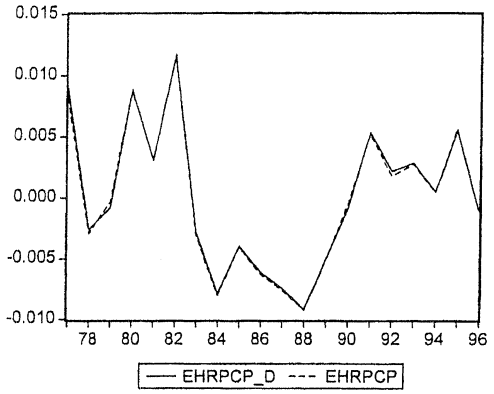
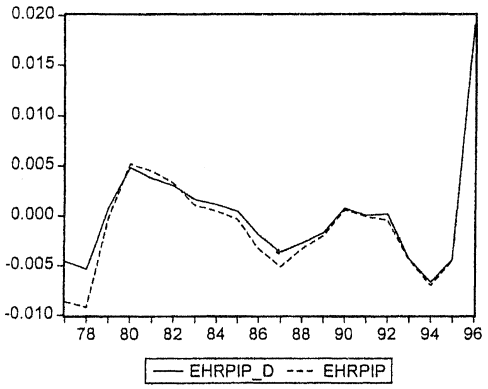
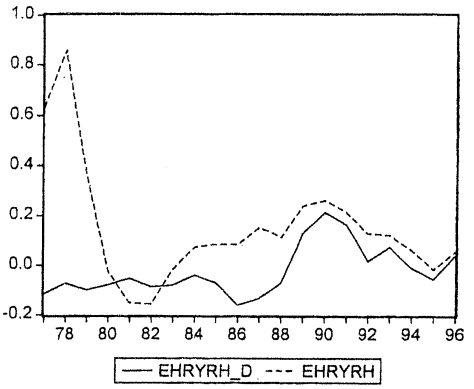

0.20
0.15
0.10
0.05
0.00
-0.05
-0.10
78 80 82 84 86 88 90 92 94 96
EHRM_D --- EHRM

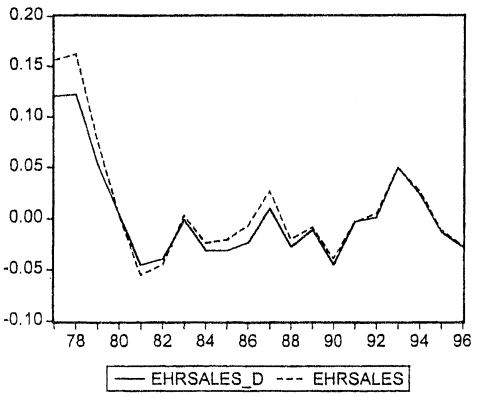
Figure 15 continued











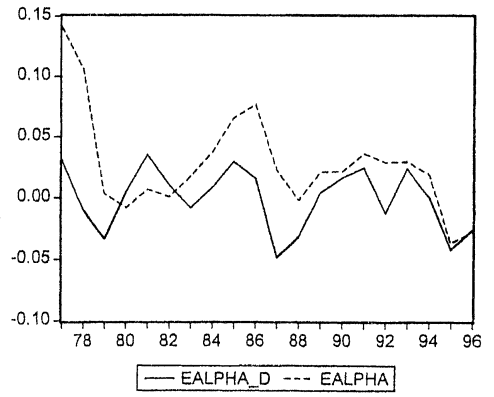


Figure 16

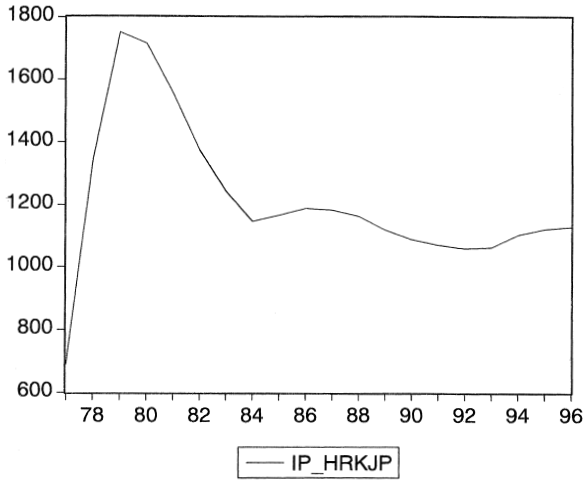


Figure 17

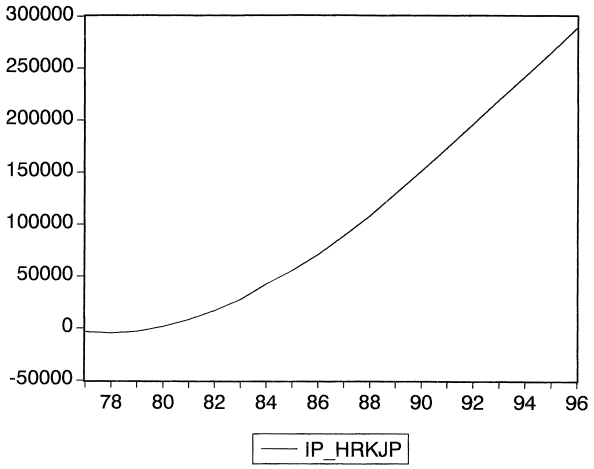


Figure 18