

**THE IMPACT OF THE PRICE OF OIL ON CHINA'S
ECONOMY**

by

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ABSTRACT

At the start of the 21st century, China's oil consumption rose rapidly. The negative impact of the high price of oil on China's economy is becoming more and more apparent. This paper describes the effect of high oil prices on the Chinese economy, and it examines the impact of fluctuations of oil prices on China's Gross Industrial Product per capita through regression analysis. The results show that there are asymmetric effects of oil price changes. Symmetric analysis suggests that every 10% increase (decrease) of oil price leads to approximate 0.4% decrease (increase) of Gross Industrial Product per capita (GIPC). If asymmetric outcomes are permitted, then a 10% increase in the price of oil leads to a 0.69% decrease in Gross Industrial Product per capita of China, but a 10% decrease in the price of oil leads to only a 0.15% increase in GIPC.

Keywords:

oil, price, China, economy

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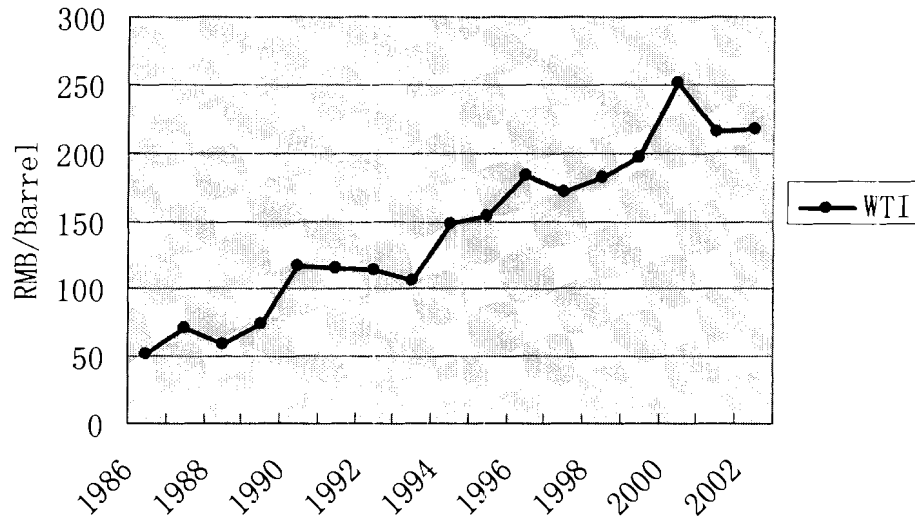
1 INTRODUCTION

Since 2004, the international price of oil has been increasing. The futures price of West Texas Intermediate oil once broke \$70 per barrel. The economic issue suggested by the recent oil price increase raises public concern again. During the past two decades, there has been a positive trend in oil prices. For China, a rapidly developing country, the demand for oil is increasing quickly, therefore, the impact of high oil prices on China's economy is getting more and more dramatic.

The Figure 1 plots the annual Cushing West Texas Intermediate real spot price from year 1986 to 2002. The rising price of oil is apparent, especially the increase at the turn of the year 2000. During this period, the Chinese oil consumption increased as well (Figure 2). China turned from an oil-exporting country to an oil-importing country in 1993. Importing oil and the subsequent move toward dependency, by which we mean the ratio of oil imports to consumption, follows a trend. In 2004, the quantity of China's imported oil was 120,000 thousand tons, and the dependency ratio,¹ is 42% (Figure 3).

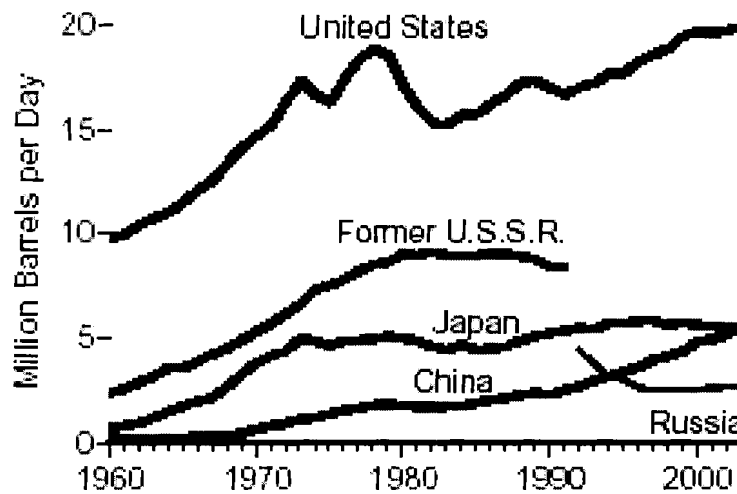
¹ The dependency is the amount of oil imports divided by the amount of oil consumption.

Figure 1.1. The Cushing West Texas Intermediate (WTI) spot price (RMB) (1986-2002)



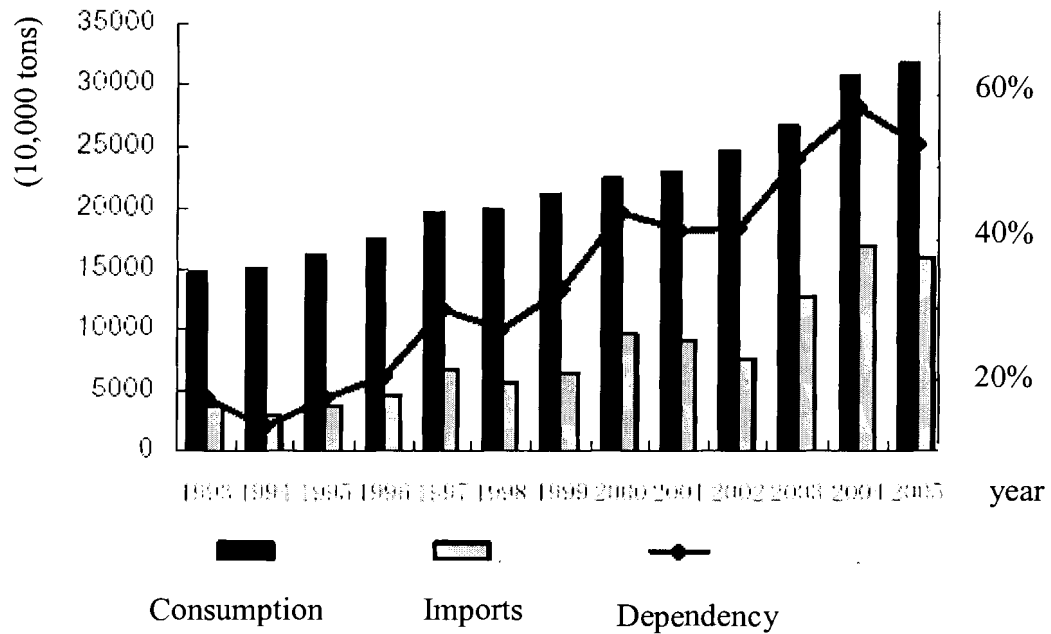
Source: U.S. Energy Information Administration (EIA)

Figure 1.2. Leading oil consumers.



Source: Annual Energy Review 2004, U.S. Energy Information Administration (EIA)

Figure 1.3. China's consumption, import and dependency on imported oil. (1993-2005)



Source: Forecasting Report CEFS-06-007, Center for Forecasting Science.

In the figure 3, solid columns are the Chinese oil consumption from 1993, and the lighter columns show oil consumption. The trend of both consumption and imports of oil is positive. The dots connected by a line are the ratio of imports to consumption, indicating how reliant China's oil consumption is on imports. The import of the above graphics is to show that China's economy is more and more dependent on the price of oil. This paper will analyze the increasingly conspicuous impact of oil fluctuations of the past two decades on China's economy.

2 LITERATURE REVIEW

In the past two decades, the price of oil has fluctuated substantially. These fluctuations had a considerable impact on the Chinese economy. Economists have examined the impact by analyzing different mechanisms. Several approaches found in the literature are discussed below.

2.1 Real Balance Effect

One way in which the rising price of oil can have a negative impact on the economy is through the *Real balance effect*. Pierce and Enzler (1974) suggest that the increase in price of oil would drive the prices of other products up as well. For an unchanged supply of money, real balances will fall, raising interest rates and causing a recession.

The real balance effect can be offset by the proper adjustment of monetary policy. Only when monetary policy cannot adjust to the price shock in a timely fashion, will the real balance effect have an effect. For example, in the early 1990s China was undergoing a period of high inflation rate. During that time, it was very hard to increase the rate of increase of the supply of currency. Consequently, higher prices reduced the supply of real balances which raised interest rates and had an unfavourable impact on China's economy.

2.2 Supply Shock Effect

“Supply shock effect” explains the impact of oil price fluctuations on the economy from an aggregate supply perspective. Barro (1984) argued that oil is the basic factor in producing investment. The rise in the price of oil means that oil is more expensive relative to other investment inputs. Therefore, the amount of oil used in production will fall, leading to a decline of labour productivity as producers substitute labour for oil. Falling productivity implies a corresponding fall in the wage rate. Because of an assumed downward rigidity of nominal wages, manufacturers are unable to hire additional workers that they need. This induces a further decrease of total output.

Today, China is in a period of heavy-industrialization. Oil is unavoidably a fundamental input. The increase in oil prices undoubtedly aggravates the difficulty in generating jobs as overall output does not increase as much as it might were oil prices stable. For China, a country with the largest population in the world, employment is a big issue. Many jobs vanish as a result of the increase in the price of oil, producing an adverse impact on the economy (each additional 10dollars/Barrel in the price of oil reduces the growth rate of employment decreases by 0.4 %(Yuan Jia, 2004). Following the recent run-up in prices, the “Supply shock effect” will have an influence on China’s economy.

2.3 Income Transferring Effect

Fried & Schulze (1975) emphasized the “Income transferring effect”. They indicated that rise in oil price leads to purchasing power transfers from in oil-importing

countries to oil-exporting countries. Because of the decline of purchasing power, oil-importing countries' consumption demand shrinks and induces a recession in their countries' economy.

From 1993, China turned from an oil-exporting country to oil-importing country and the quantity of imported oil has been getting larger and larger (Figure 3). That means, China needs to pay more for the increased imports. Since China is a relative cheap producer of goods, it is an exporter. Exports have been the one of the engines that impels China's economy. With higher oil prices, China's products cost more, and possibly relatively more. Therefore, if the price of oil remains high, China's economy may be influenced negatively.

2.4 Sectoral Shifts Effects

Lilien(1982) and Hamilton(1988) used "Sectoral Shifts Effect" to explain the impact of changing oil prices on economy. In their papers, they used a multi-sector model of an economy to explain the sectoral shifts. Due to imperfect labour mobility and training costs, it is costly to shift labour and capital inputs from one sector to another. Therefore, when there is a price shock, aggregate employment falls in the adversely affected sectors. Workers in such sectors are inclined to remain unemployed while they wait for better labour conditions rather than moving to another sector.

Therefore, for an economy that has several sectors, oil price fluctuations have different influences on different sectors. When oil prices are rising, the labour and capital demand in energy-intensive sectors, will fall while labour and capital demand in some

other sectors, like energy-developing sectors, will increase. However, because the transferring cost of specialized labour is very high when it transfers from one sector to another, it is costly to relocate the resources among the different sectors in a short time. The bad consequence is elevated unemployment and the inefficient usage of resources. That leads to recession.

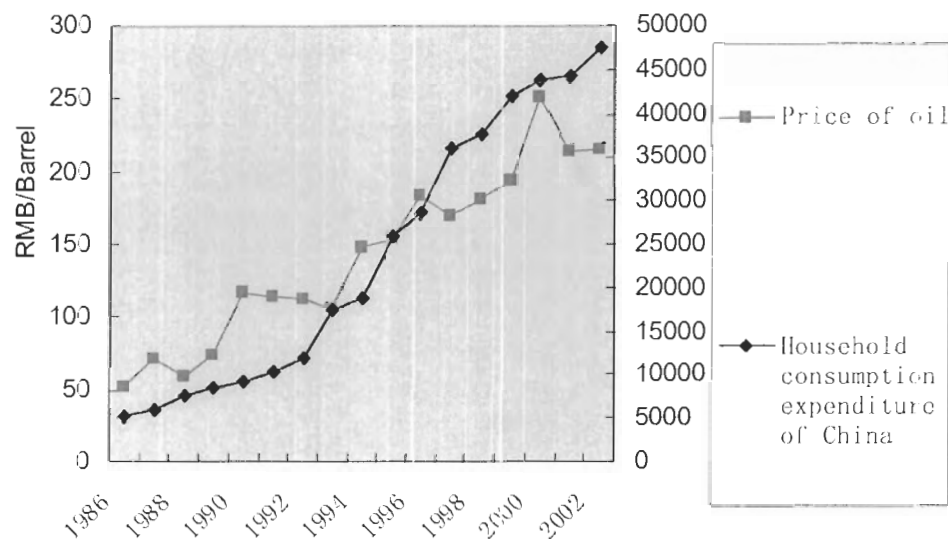
As for China, the oil-exploiting industry is monopolistic, so labour and capital are even harder to transfer between oil-exploiting sector and other sectors than they would be had they been competitive. That means, the unemployment in oil-consuming sectors will decline and because they are large, they influence the overall level of employment.

2.5 Microeffect

The jolt of oil price shocks not only has a direct effect on the macro-economy, but also indirectly influences the economy through the decisions made by individuals. Atkeson and Kehoe(1999) argued that when the price of oil is increasing, a profit-maximizing company should reduce the consumption of energy. However, the capital stock is fixed in the short term. In the short run, it cannot adjust to fully reflect the cost of higher energy leading to an upward sloping short run cost schedule. In addition, higher transition cost may shift the short run cost schedule upward in response to higher oil prices. This reduces the quantity of output and leads to recession. Moreover, rise in the current price of oil also increases the uncertainty of its future price. The uncertainty of future prices usually will delay the individual investment or consumption. Uncertainty about future oil prices reduces the demand for investment and accordingly has a negative

impact on economy. Hamilton (1988) suggests that, uncertainty about oil prices will postpone the consumption of durables, such as cars, and start the downturn shift in demand and economy.

Figure 2.1. The WTI Price and Household consumption expenditure of China (1986-2002)



Source: China's Yearbook(2003).

Figure 4 shows the total household consumption expenditure of China from 1986 to 2002. Comparing the trend in the price of oil with the consumption, we can find when there is an increase in oil price, a decreasing rate of growth in consumption occurs. The consumption level is related to the fluctuations of oil prices.

Thus far, we have looked from the perspective of several different economists. If we consider the effect of each of the mechanisms above individually, the fluctuations of oil prices have little effect on economy, however if we combine all the mechanisms

together, then the overall effect will be notable(Liu,2005). Therefore, this paper will only analyze the overall effect, and will not consider the the empirical consequences of each individually.

After asking what the effects are of an oil jolts to the economy, we can also wonder if the effects are symmetric: are they the same when the price goes up as when it goes down. Much empirical research has indicated that the impact of oil fluctuations are asymmetric. The asymmetry means the that depending on the direction of price waves, rising and falling, the impact on economy is different. The two effects are asymmetric: rising oil prices have a larger effect then decreasing prices (Mork, 1989). In Mork's paper, the results strongly confirm a large negative effect of an oil price increase on GDP. Mory (1993) divided oil fluctuations into periods of increasing prices and of decreasing prices. He found that the oil price increases were the main reason for the recession in United States, however, the negative price changes were not the key factor for increased economic growth. Research done by Mork showed that, the rise in the price of oil in 1970's did have a large negative impact on America's economy, whereas the fall in the price of oil in 1980's had negligible effect. Juncal Cunado and Fernando Perez de (2003) found the same result for some European countries. A rise in the oil price has a notably negative effect on Gross Industrial Production. A fall in price however does not have the some quantitative effect.

We should also notice that the above-mentioned research is primarily based on developed countries. GDP per capita was often used in the models to be the dependent variable that symbolized the output of the whole economy. For developed countries, such

as United States, there is no distinct gap between industry and agriculture, so GDP is a reasonable indicator of economy's state. However, for China, a developing country with a binary economy structure, energy consumption is low in villages while it is high in cities leaving a big gap between the two. GDP which draws on both the cities and the countryside does not reflect the development model of China with respect to oil consumption. Oil use is primarily based in the cities. Consequently, this paper will use China's Gross Industrial Product (GIP) as the indicator of the economy².

² Gross Industrial Product includes mining, manufacturing and the production of electronic power, gas and water.

3 METHODS

3.1 Variables and Data

This paper uses China's Gross Industrial Product (GIP) as the dependent variable, representing the economic developing level of China. Because population is an important factor in the economy of China, we use GIP per capita (GIPC) measured in renminbi(RMB).

$$\text{GIPC}=\text{GIP}/\text{Population}$$

Where Gross Industrial Product, Population and Exchange Rate (Renminbi to US Dollars) are from the *China's Yearbook*.

I chose Cushing West Texas Intermediate (WTI) spot price as the price independent variable P (changed to RMB), representing the international oil prices. The Data of WTI comes from U.S. Energy Information Administration (EIA). These data are annual data from 1986 to 2002.

Because taking the logarithm does not change the cointegration between variables, in order to linearize data, eliminate the heteroskedasticity in the series, I took the natural logarithm of GIPC and P, using Ln representing natural logarithm, that is: LnGIPC and LnP.

3.2 Stationarity Test

For time series, before running a regression, we need to discover if the series are stationary. Based on the cointegration test method, we apply Eviews software, taking variables LnGIPC and LnP as the test variables, and use the Augmented Dickey-Fuller (ADF) stationarity test. The results are shown in Table 1.

Table 3.1. Augmented Dickey-Fuller (ADF) stationarity test

Variable	ADF Test Statistics	5% Critical Value	Conclusion
LnGIPC	-2.652350	-3.7611	Non-stationary
D(LnGIPC)	-3.868207	-3.7921	Stationary
LnP	-2.833410	-3.7611	Non-stationary
D(LnP)	-4.485039	-3.7921	Stationary

From table 1, we can see the level of both variables are non-stationary, but their first differences are stationary, namely, they are both I(1) series.

3.3 Cointegration Test

Now that LnGIPC and LnP are non-stationary, and their first differences are stationary, therefore, they *may* be cointegrated. We conduct the Johansen Cointegration Test on these two variables. The result is shown in Table 2.

Table 3.2. Johansen Cointegration Test

Eigen value	5 Percent Critical Value
0.583703	25.32
0.348074	12.25

The result in Table 2 shows that LnGIPC and LnP are not cointegrated, so we cannot directly use LnGIPC and LnP- the level variables, to run the regression. What we can do is to use the first differences of these variables instead of the level of the variables to run the regression, as their first differences are stationary.

3.4 Regression

Considering the asymmetry of effects of oil price fluctuations on the economy, this paper establishes two models: the Symmetric Effect Model and the Asymmetric Effect Model.

(1) Symmetric Effect Model

Symmetric Effect Model neglects the asymmetric effects of oil price change, the regression equation is

$$\Delta \text{LnGIPC} = C + \alpha \Delta \text{LnGIPC}_{-1} + \beta \Delta \text{LnP}_{-1} + \varepsilon$$

Where LnGIPC_{-1} is the Gross Industrial Product per Capita of the previous period. LnP_{-1} is the logarithmic price of previous period, C is constant, and ε is the error term.

The regression result is shown in Table 3.

Table 3.3. Regression results for symmetric model

α	β	Adjusted R-squared	Durbin-Watson s tat
0.126595 (0.028948)*	-0.040380 (0.017452)*	0.402441	1.869792

Note: “*” indicate the coefficient is significant at 5% level.

From table 3, the symmetric model indicates that when the international oil price increases 10%, the gross industrial product per capita decreases 0.4%. The adjusted R-squared is 0.402, saying that this symmetric model can explain 40% of the gross industrial product per capita.

(2) Asymmetric Effect Model

Asymmetric Effect Model, which can also called price- decomposed model, considers the asymmetric effects of oil price change, partitioning the price change to positive change and negative change, that is:

$$\Delta \ln P = P \ln P + N \ln P$$

If the oil price increases, $P \ln P$ is the logarithmic current oil price minus the logarithmic price oil of one period earlier, otherwise, $P \ln P=0$; if the oil price decreases, then $N \ln P$ is logarithmic price oil of the previous period less the logarithmic price of oil in the current time period, otherwise $N \ln P=0$.

Now the regression equation for the asymmetric model is

$$\Delta \ln GIPC = C + \alpha \ln GIPC_{-1} + \beta_1 P \ln P + \beta_2 N \ln P + \varepsilon$$

Running the regression, the result is shown in Table 4.

Table 3.4. Regression results for asymmetric model

α	β_1	β_2	Adjusted R-squared	Durbin-Watson stat
0.209512 (0.046891)*	-0.069321 (0.021643)*	0.014859 (0.033998)	0.574749	1.942224

Note: “*” indicate the coefficient is significant at 5% level.

From table 4, in the price-decomposed model, when the international price of oil increases 10%, the Gross Industrial Product decreases by 0.69%; in contrast, when the price falls by 10%, then the Gross Industrial Product per Capita will rise only 0.14%, furthermore, not significant under 5% significance level. This result also supports the viewpoint that oil fluctuations have asymmetric effects on economy.

Comparing these two models, we can see that after we decompose the oil price change to positive change and negative change, the price’s increase has a larger impact on economy than the unpartitioned price. Moreover, the asymmetric does a better job in explaining the variables, for the adjusted R-squared go up from 0.402 to 0.574.

4 CONCLUSION

From the regressions discussed above, international oil prices have a substantial effect on China's economy. On average, the elasticity of gross industrial production per capita to the international oil price approximately is -0.04. However, if considering the asymmetric influences of oil price waves, by distinguishing the positive oil price shocks from the negative oil price shocks, the elasticity of China's gross industrial product per capita to the positive changes in the price of oil becomes to -0.069 or so. Furthermore, the negative effect of increased oil price far outweighs the positive effect of decreased oil price. The asymmetric model better explains the story.

As the structure of China's energy becomes more complex, China's demand for oil will increase continuously. China has to overcome the uncertainty caused by the oil fluctuations and improve its ability to cope with price increases. It may consider the policy to control the risk of high oil prices and to enhance energy conservation.

5 APPENDICES

5.1 Data

Year	GIP (100 million yuan)	Consumption (100 million yuan)	WTI Price (yuan)
1986	3967	5175	51.96464
1987	4585.8	5961	71.46432
1988	5777.2	7633	59.441937
1989	6484	8523	73.946564
1990	6858	9113	117.331896
1991	8087.1	10316	114.663882
1992	10284.5	12000	113.435322
1993	14143.8	15300	106.19366
1994	19359.6	19800	148.24164
1995	24718.3	26944	153.90893
1996	29082.6	32031	183.910104
1997	32412.1	36046	170.852778
1998	33387.9	37707	182.012305
1999	35087.2	42102	196.301644
2000	39047.3	44003	251.497792
2001	42374.6	44971	215.03646
2002	46535.7	47404	216.69186

5.2 ADF Test

5.2.1 Augmented Dickey-Fuller Unit Root Test on LNGIPC.

ADF Test Statistic	-2.652350	1% Critical Value*	-4.7315
		5% Critical Value	-3.7611
		10% Critical Value	-3.3228

*MacKinnon critical values for rejection of hypothesis of a unit root.

Augmented Dickey-Fuller Test Equation

Dependent Variable: D(LNGIPC)

Method: Least Squares

Date: 02/17/06 Time: 20:47

Sample(adjusted): 1988 2002

Included observations: 15 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LNGIPC(-1)	-0.873297	0.329254	-2.652350	0.0225
D(LNGIPC(-1))	0.320197	0.285590	1.121179	0.2861
C	4.010741	1.474603	2.719878	0.0199
@TREND(1986)	0.081831	0.031684	2.582696	0.0255
R-squared	0.398298	Mean dependent var		0.090426
Adjusted R-squared	0.234197	S.D. dependent var		0.126592
S.E. of regression	0.110781	Akaike info criterion		-1.339352
Sum squared resid	0.134996	Schwarz criterion		-1.150539
Log likelihood	14.04514	F-statistic		2.427155
Durbin-Watson stat	1.844006	Prob(F-statistic)		0.120596

5.2.2 Augmented Dickey-Fuller Unit Root Test on D(LNGIPC)

ADF Test Statistic	-3.868207	1% Critical Value*	-4.8025
		5% Critical Value	-3.7921
		10% Critical Value	-3.3393

*MacKinnon critical values for rejection of hypothesis of a unit root.

Augmented Dickey-Fuller Test Equation

Dependent Variable: D(LNGIPC,2)

Method: Least Squares

Date: 02/17/06 Time: 20:58

Sample(adjusted): 1989 2002

Included observations: 14 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LNGIPC(-1))	-1.530578	0.406708	-3.763335	0.0037
D(LNGIPC(-1),2)	0.385073	0.272265	1.414334	0.1876
C	0.086506	0.094795	0.912561	0.3829
@TREND(1986)	0.004404	0.008496	0.518367	0.6155
R-squared	0.653410	Mean dependent var		-0.010267
Adjusted R-squared	0.549433	S.D. dependent var		0.190858
S.E. of regression	0.128112	Akaike info criterion		-1.036871
Sum squared resid	0.164126	Schwarz criterion		-0.854283
Log likelihood	11.25809	F-statistic		6.284179
Durbin-Watson stat	2.310529	Prob(F-statistic)		0.011411

5.2.3 Augmented Dickey-Fuller Unit Root Test on LNP

ADF Test Statistic	-2.833410	1% Critical Value*	-4.7315
		5% Critical Value	-3.7611
		10% Critical Value	-3.3228

*MacKinnon critical values for rejection of hypothesis of a unit root.

Augmented Dickey-Fuller Test Equation

Dependent Variable: D(LNP)

Method: Least Squares

Date: 02/17/06 Time: 21:00

Sample(adjusted): 1988 2002

Included observations: 15 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LNP(-1)	-0.977002	0.344815	-2.833410	0.0163
D(LNP(-1))	0.367013	0.277969	1.320339	0.2135
C	2.779868	0.994006	2.796631	0.0174
@TREND(1986)	0.018285	0.011798	1.549869	0.1494
R-squared	0.437101	Mean dependent var		0.020672
Adjusted R-squared	0.283583	S.D. dependent var		0.213960
S.E. of regression	0.181099	Akaike info criterion		-0.356373
Sum squared resid	0.360763	Schwarz criterion		-0.167559
Log likelihood	6.672796	F-statistic		2.847230
Durbin-Watson stat	1.627627	Prob(F-statistic)		0.086389

5.2.4 Augmented dickey-Fuller Unit Root Test on D(LNP)

ADF Test Statistic	-4.485039	1% Critical Value*	-4.8025
		5% Critical Value	-3.7921
		10% Critical Value	-3.3393

*MacKinnon critical values for rejection of hypothesis of a unit root.

Augmented Dickey-Fuller Test Equation

Dependent Variable: D(LNP,2)

Method: Least Squares

Date: 02/17/06 Time: 21:00

Sample(adjusted): 1989 2002

Included observations: 14 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LNP(-1))	-1.709807	0.381224	-4.485039	0.0012
D(LNP(-1),2)	0.567713	0.250782	2.263775	0.0471
C	0.030684	0.135997	0.225624	0.8260
@TREND(1986)	0.003808	0.013358	0.285061	0.7814
R-squared	0.700458	Mean dependent var		0.013705
Adjusted R-squared	0.610596	S.D. dependent var		0.317520
S.E. of regression	0.198140	Akaike info criterion		-0.164732
Sum squared resid	0.392594	Schwarz criterion		0.017856
Log likelihood	5.153124	F-statistic		7.794782
Durbin-Watson stat	1.390554	Prob(F-statistic)		0.005653

5.3 Johansen Cointegration Test

Date: 02/17/06 Time: 21:01
 Sample: 1986 2002
 Included observations: 15

Test assumption:
 Linear
 deterministic trend
 in the data

Series: LNGIPC LNP
 Lags interval: 1 to 1

Eigenvalue	Likelihood Ratio	5 Percent Critical Value	1 Percent Critical Value	Hypothesized No. of CE(s)
0.583703	19.56272	25.32	30.45	None
0.348074	6.417368	12.25	16.26	At most 1

*(**) denotes rejection of the hypothesis at 5%(1%) significance level

L.R. rejects any cointegration at 5% significance level

Unnormalized Cointegrating Coefficients:

LNGIPC	LNP	@TREND(87)
-2.575419	-1.863328	0.273178
2.040544	-0.937105	-0.171220

Normalized Cointegrating Coefficients: 1 Cointegrating Equation(s)

LNGIPC	LNP	@TREND(87)	C
1.000000	0.723505 (0.20622)	-0.106071 (0.00599)	-6.585566
Log likelihood	19.62339		

5.4 Regression

5.4.1 Symmetric Price Change Model

$$\Delta \ln GIPC = C + \alpha \Delta \ln GIPC_{-1} + \beta \Delta \ln P_{-1} + \varepsilon$$

Dependent Variable: D(LNGIPC)

Method: Least Squares

Date: 02/17/06 Time: 21:05

Sample(adjusted): 1988 2002

Included observations: 15 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.103197	0.044469	2.320643	0.0314
D(LNGIPC(-1))	0.126595	0.028948	4.373186	0.0107
D(LNP(-1))	-0.040380	0.017452	-2.313774	0.0365
R-squared	0.445193	Mean dependent var		0.090426
Adjusted R-squared	0.402441	S.D. dependent var		0.126592
S.E. of regression	0.135485	Akaike info criterion		-0.983054
Sum squared resid	0.220274	Schwarz criterion		-0.841444
Log likelihood	10.37291	F-statistic		2.980183
Durbin-Watson stat	1.869792	Prob(F-statistic)		0.025686

5.4.2 Asymmetric Price Change Model

$$\Delta \ln GIPC = C + \alpha \ln GIPC_{-1} + \beta_1 P \ln P_{-1} + \beta_2 N \ln P_{-1} + \varepsilon$$

Dependent Variable: D(LNGIPC)

Method: Least Squares

Date: 02/17/06 Time: 21:07

Sample(adjusted): 1989 2002

Included observations: 14 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.088315	0.044958	1.964386	0.0779
D(PLNP(-1))	-0.069321	0.021643	-3.202929	0.0126
D(NLNP(-1))	0.014859	0.033998	0.437286	0.6273
D(LNGIPC(-1))	0.209512	0.046891	4.468064	0.0102
R-squared	0.613962	Mean dependent var		0.080389
Adjusted R-squared	0.574749	S.D. dependent var		0.125022
S.E. of regression	0.136655	Akaike info criterion		-0.907757
Sum squared resid	0.186746	Schwarz criterion		-0.725169
Log likelihood	10.35430	F-statistic		2.029364
Durbin-Watson stat	1.942224	Prob(F-statistic)		0.048916

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