

Dominant Factors of Fuel Oil Futures Prices in China

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Abstract—Aiming at the frequent fluctuations of fuel oil futures prices in China in recent years, This paper explored the dominant factors affecting its changes, mainly based on current status, use econometric model to do empirical analysis and inspection, draw four dominant factor: New York oil futures prices, OPEC oil supply, the dollar index and WTI prices spot price, and study quantity relationship between them and the change of Chinese fuel oil prices. The main meaning of this paper is for investors and the government to provide quantitative indices which effect the fluctuation on our country's fuel oil futures is the largest, most attention value, and help them to improve the effectiveness and accuracy of decision-making.

Keywords- fuel oil; futures; oil price

I. INTRODUCTION

With Chinese futures market gradually mature, the oil futures in Shanghai futures exchange is also increasingly active, by the welcome of broad hedgers and speculative arbitrage person to taste. How to reduce risk, increase profitability in today's fast-changing fuel oil futures market is focal point question broad investor concern.

But in China, the research on domestic fuel oil futures is less; research on international futures market is more. This article tries innovate attempt to summarize the study based on the former researches, Mainly embodied in the following four aspects: (1)the variable selection, selects variable of this paper is classification, covering comprehensive and representative, convenient for the phases of empirical analysis, (2) empirical steps, Advance eliminate not important factors, reducing the multiple altogether linear. (3) studied Chinese fuel oil futures, the domestic research in this area is less, most research international futures market.

II. FACTORS OF FUEL OIL FUTURES PRICES IN CHINA

A. Domestic Factors

1) Policy adjustment factors

In order to make our financial market smoothly healthy develop, in recent years, the government has adopted a series of measures, and the influence in futures market is very serious. Since 2008 financial crisis, a series of moderate loose macro policies promoted the fuel oil futures continue to rise, earlier this year the central bank by surprise raise

deposit reserve each 0.5 percentage points three times, caused considerable impact on fuel oil futures.

2) Our Domestic Oil Spot Market Factors

The supply and demand of Fuel oil spot market have direct relation with futures prices. China is the second largest oil consumer, but oil production is only the fourth, if want to satisfy our fuel oil in demand of nearly 4 million tons, many times of the output is also need, home appeared an obvious shortage of supply.

3) Other Financial Product Price Fluctuations Factors

Financial market is a market of news fast, Strong relevance, the fluctuations of other financial products (such as stock) can also influence on Chinese fuel oil futures.

B. International oil futures market

Compared with western developed countries, Chinese fuel oil futures market is still very "young", in most cases under the influence of international petroleum price. Crude oil futures, fuel oil futures in the New York stock exchange and the cloth of oil futures, Singapore fuel oil futures in the London stock exchange, affect Chinese oil futures most.

The figure1 is the simulations of four oil futures and our oil futures. the four futures become Shanghai fuel futures unit contract according to their respective standard, price also became RMB according to each spot rate, then five futures price movements were similar, more facilitate to analyze.

From figure1, the market trend of five oil futures was basically same. Four representative international oil futures and our fuel oil futures were highly related, and the correlation coefficients exceeded 80%, were 85.119% 80.334%, 82.4833%, 86.8227%. Also according to the statistics, the dependency of Chinese futures market to international futures market was similar to the dependency of the spot market, as high as nearly 50%.

C. Other International Factors

1) OPEC oil supply is the most valuable factor Impact global oil prices

OPEC controlled most of the world's oil production. It decided the spot and futures prices. In 2008 Chinese fuel oil futures prices have tumbled, OPEC high-key cut, crude oil prices were back up to 74 dollars a barrel, also effectively restrain our fuel oil futures prices fall, even appeared rebound signs.

2) The trend of dollar

First, oil import and export trade was normally with dollar as the monetary unit, thus the dollar depreciation have produced rising motivation on oil prices, especially have stability supporting role in recent period for Chinese fuel oil futures tends to downturn shocks. Secondly, the United States influenced OPEC extraordinary, it has a relatively stable oil source, and several big oil companies whose overseas shares were high, it is enough to make dollar trends affect fuel oil futures.

3) *The international oil market demand and oil substitute*

Demand, directly determined the OPEC supply, mutant demand was inevitable causes unbalanced of supply and demand, leading to the spot and futures prices short-term fluctuations.

4) *The global economic environment and political factors*

The global economy is the macroscopic way of futures price fluctuation, as the 2008 asset bubble burst, the strong futures market trends then died.

5) *Incident factors*

The most representative example is in 2003, the United States and other western countries scrambling for oil resources, launched the war in Iraq, and then international oil prices soaring. Furthermore, the impact of the earthquake and tsunami, fire, and other natural disasters on oil futures is immeasurable.

III. EMPIRICAL ANALYSIS

A. *Sample and Data*

By analyzing the status quo of the second part, can see the factors effect on our country's fuel oil futures are many, considering the possibility and accuracy of data, this paper selects some factors facilitate quantification.

1) *Domestic factors sample selection*

- Fuel oil spot price: fuel oil spot is the underlying assets of Chinese fuel oil futures. Samples select monthly average price, sample interval was from January 2008 to April 2010, altogether 28 samples.
- SHIBOR: Interest rate is the main macroeconomic control tool of Chinese government; SHIBOR was most influential in the financial markets. Samples select 5 daily line shows data of SHIBOR last day every month, sample interval was from January 2008 to April 2010, altogether 28 samples.
- Shanghai A-share Index: topix index is representative, and avoids multiple linear of stocks (like Chinese oil) with the spot market. Samples select grain month closing price, sample interval was from January 2008 to April 2010, altogether 28 samples.

2) *International oil futures sample selection*

NYMEX Crude oil futures and NYMEX fuel oil futures are the two contracts larger volume in American. History of London cloth oil futures is long, and daily trading volume is big; Singapore fuel oil futures is the futures developing relatively perfect in Asia, also plays effect of our fuel oil

futures. Samples select the contracts closing price, sample interval was from January 2008 to April 2010, total 112 samples.

3) *Other international factors sample selection*

- OPEC oil supply: Sample was the average of OPEC oil monthly supply, sample interval was from January 2008 to April 2010, altogether 28 samples.
- Dollar index: Samples select closing price of dollar index, sample interval was from January 2008 to April 2010, altogether 28 samples
- WTI prices spot price: Samples select the monthly average price of WTI prices to spot, sample interval was from January 2008 to April 2010, altogether 28 samples.

B. *Empirical Result and Conclusion*

Using EViews to do operation and inspection, if $\alpha = 0.01$, $t_{ent} = 2.467$, $F = 2.49$, $\chi^2(2) = 9.21$

1) *T-test, eliminating not important factors*

a) *Domestic factors*

Set our fuel oil futures prices as Y, interest rate of SHIBOR as X_1 , Shanghai index as X_2 , Chinese fuel oil spot price as X_3 . Establish model as follows

$$\hat{Y} = -1636.675 + 29.94868 X_1 + 0.039169 X_2 + 4.979998 X_3 \quad (1)$$

$$t = (5.02013) \quad (0.301606) \quad (0.360995) \quad (6.783775)$$

Checking t distribution table, only $t_3 > t$, then pass the test, has significant. Ignore the impact of X_1 , X_2 on our fuel oil futures price, retain X_3 for further research.

b) *International oil futures market*

Set NYMEX oil futures as X_4 , NYMEX fuel oil futures as X_5 , London cloth oil futures as X_6 , Singapore fuel oil futures as X_7 . Establish model as follows,

$$\hat{Y} = -2010.417 + 1.399980 X_4 - 0.080281 X_5 - 1.238796 X_6 + 0.563435 X_7 \quad (2)$$

$$t = (8.332987) \quad (2.557329) \quad (-0.253724) \quad (2.409211) \quad (2.097446)$$

only $t_4 > t$, pass the t-test, keep NYMEX oil futures (X_4)

c) *Other international factors*

Set OPEC oil supply as X_8 , dollar index as X_9 , WTI prices spot price as X_{10} . Establish model as follows,

$$\hat{Y} = 2434.943 + -180.1886 X_8 - 47.5534 X_9 - 40.50892 X_{10} \quad (3)$$

$$t = (1.182135) \quad (-3.323524) \quad (2.348511) \quad (8.388257)$$

$t_8 > t$, $t_{10} > t$, pass t-test. So keep OPEC oil supply (X_8), WTI prices spot price (X_{10}), for further research.

d) *Rebuilding model*

$$\hat{Y} = C + A_1 X_3 + A_2 X_4 + A_3 X_8 + A_4 X_{10} + u$$

2) *VIF testing multiple linear*

Set X_3 as dependent variable, X_4 , X_8 , X_{10} as independent got $R^2 = 82.2178\% < 90\%$, so X_3 and X_4 , X_8 , X_{10} don't exist multiple linear altogether. Similarly, X_4 and X_8 , X_{10} exist multiple linear altogether. $t_8 = -$

1.760642, $t_{10}=14.58401$, means the linear is from the impact of X_{10} to X_4 . So X_8 and X_{10} don't exist multiple linear altogether.

For the elimination of linear of X_4 and X_{10} , repairing the original model, and add X_9 , dollar index, establishing new model as follows

$$\begin{aligned} \text{LN}(Y) &= -1.7356 + 0.4487\text{LN}(X_4 * X_{10}) - \\ & 1.1322\text{LN}(X_8) + 1.7942\text{LN}(X_9) + 0.0642\text{LN}(X_3) \quad (4) \\ t &= (-0.9192) \quad (5.2866) \quad (-3.5377) \quad (4.840) \\ & (0.5082) \end{aligned}$$

so, $\text{LN}(X_3)$ does not t-test, exclude its interference, withhold other items, establish new models

$$\begin{aligned} \text{LN}(Y) &= 0.4876\text{LN}(X_4 * X_{10}) - \\ & 1.214\text{LN}(X_8) + 1.8646\text{LN}(X_9) \quad (5) \\ \text{Se} &= (0.035995) \quad (0.2723) \quad (0.3385) \\ t &= (13.54663) \quad (-4.458382) \quad (5.5084) \\ P &= (0.0000) \quad (0.0000) \quad (0.0000) \\ R^2 &= 0.9292 \quad F = 105.0198 \end{aligned}$$

3) White testing heteroscedastic

Calculated again by the variable electors of (5) auxiliary, obtained regression equation: $nR^2 = 1.558135 < \chi^2 (r) = 9.21$, $P = 81.6296\% > 10\%$, No heteroscedastic, Means the heteroscedastic of all the variance are with neat sex.

4) LM test between autocorrelation

$(n-p)R^2 = 2.5485 < \chi^2 (2) = 9.21$, $P = 27.96\% > 10\%$, No autocorrelation. Namely for different vantage point, the variance has independence. So (5) $\text{LN}(Y) = 0.4876\text{LN}(X_4 * X_{10}) - 1.214\text{LN}(X_8) + 1.8646\text{LN}(X_9)$ accords with classic hypothesis, is a reasonable model.

IV. CONCLUSIONS AND SUGGESTIONS

A. Conclusions

By empirical analysis, New York oil futures X_4 , OPEC oil supply X_8 , the dollar index X_9 and WTI oil spot prices X_{10} have dominant effect on our fuel oil futures prices can be concluded. The relationship of these four explanatory variables with Chinese fuel oil futures is

$$\text{LN}(Y) = 0.4876\text{LN}(X_4 * X_{10}) - 1.214\text{LN}(X_8) + 1.8646\text{LN}(X_9)$$

The dollar index, the whole of New York oil futures prices and WTI oil spot prices, are positively correlated with Chinese fuel oil futures prices. Including the whole increases each unit, our fuel oil futures increase 0.4876 unit; the dollar index increase each unit, our fuel oil futures increase 1.8646 unit. OPEC oil supply is correlation with Chinese fuel oil futures, it increases each unit, our fuel oil futures reduce 1.214 unit.

In the changes factors affecting our fuel oil futures price, 92.92% are from the explanatory variables in the model.

B. Advice to Investors

- Investors should pay more attention to international oil futures trend; it has guiding effect to Chinese fuel oil futures markets. NYMEX crude oil futures has the maximum impact on Chinese fuel oil futures, should focus on. In technical analysis, the NYMEX deviation as the reversal of the signal, when both rise,

investors who preference risk can choose the chase after go up.

- In addition, should pay attention to OPEC oil supply, the dollar index and WTI spot price prices changes.
- To understand selectively domestic information, such as policy and stock prices, increasing this news sensitivity. And analyze the spot price fluctuation these factors caused is temporary, or influence the long-term trends of fuel oil prices.
- Pertinently choose hedging strategy. Choose the futures contracts that could hedged New York oil futures, OPEC oil supply, the dollar index and WTI spot oil price, thus to minimize the risk of fuel oil futures.

C. Proposal for Government

Oil is one important strategic resources, strengthening the control of oil price can effectively enhance the strategic position of one country. For China, to master these strategic resources, control oil reserves and ownership is on the one hand, to lay the price also is critical.

Through the analysis, New York oil futures, OPEC oil supply, the dollar index and WTI oil spot prices have dominant effect on our fuel futures, if the government exert control on Chinese fuel oil futures prices, can take measures in view of the above four factors, thus indirectly to control our fuel oil futures prices. For example, when OPEC decided to increased production, to avoid spot oil and fuel oil futures prices tumbled, can advance take control the supply of fuel oil spot in our country, artificial adjusting supply and demand, keep prices stable.

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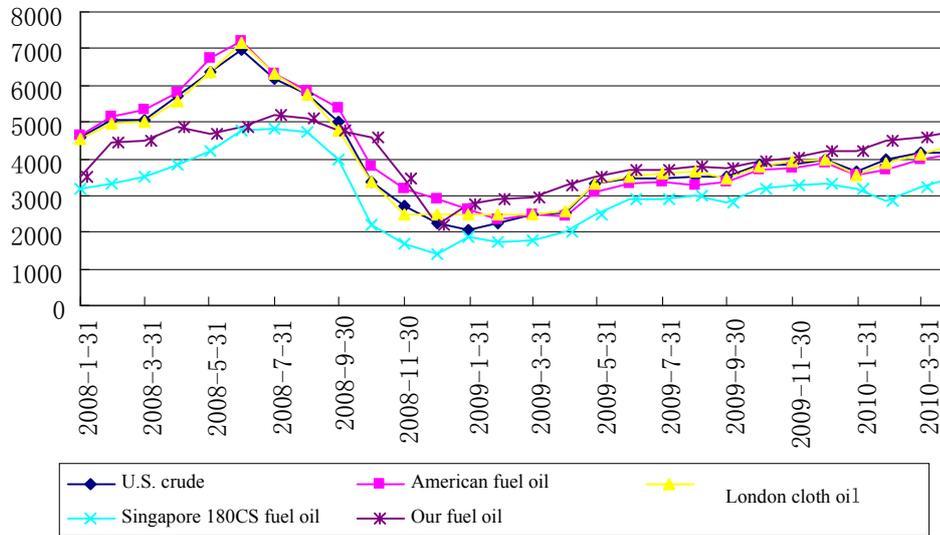


Figure 1. Simulations of four oil futures and our oil futures

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