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World oil prices and agricultural commodity prices: The evidence from China

Zhengwei MA[1], Rui XU[2], Xiucheng DONG[1]

[1]*School of Business Administration, China University of Petroleum, Beijing, P.R.China*
[2]*Business School, Central University of Finance and Economics, Beijing, P.R.China*

Abstract: It is acknowledged that crude oil prices affect agricultural prices through both direct and indirect transmission schemes (i.e. exchange rate). In China, the matter of energy security may be immediately transmitted to the food security, imposing a pressure to China's macro-economy to a certain extent. This paper examines the long-run and short-run influence caused by the world crude oil prices and the RMB-dollar exchange rate on the five individual agricultural commodity prices (soybean, maize, wheat, colza oil, and japonica rice) in China. In this paper, the Granger causality approach is applied to test the long-run interrelationships with the weekly data from June 2002 to August 2013. In addition, the impulse-response analysis is utilized to study how the agricultural prices react to the sudden shocks in oil prices and exchange rate in the short term. The results reveal that the impulse response curves demonstrate that agricultural prices are not significantly affected by the abrupt changes in either oil prices or the exchange rate. Consistently, agricultural prices are neutral to the changes in oil prices in the long run while the exchange rate only Granger causes the prices of soybean. Ultimately, we present some sound reasons to explain the statistical results and propose some policy suggestions aimed at the China's food and energy security.

Key words: agricultural commodity, world oil prices, exchange rate, Granger causality test, impulse response analysis

Because of the technological advances and the slow population growth, Paul Samuelson's prediction of the doomsday food crisis has not really appeared. In the 1900s, most agricultural prices remained stationary for most of the time. However, because of the severe weather and other external conditions, commodities prices have increased greatly, and the prices of major staples like grains and oilseeds have doubled during the previous two years. According to the statistics supported by the IMF, the IMF index of the internationally traded food commodities prices increased 130% from January 2002 to June 2008 and 56% from January 2007 to June2008 (Keith 2008) (Figure 1).

China is a large consumer of a broad range of primary commodities (Shaun 2012).As a major participant in the world commodity markets, China becomes sensitive to any changes in agricultural prices. Unfortunately, food prices rocket to a considerably high level since 2006 due to the short supply and high production costs (Figure 2). Take colza oil as an example; it was driven to a peak value of 15 209 Yuan per ton in the middle of the year 2008 which means a 34.2% increase compared to the previous year. Although the prices of soybean and colza oil began to decline in

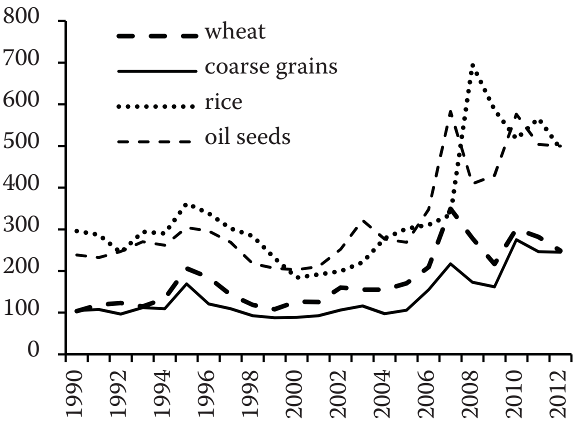

Figure 1. World prices of bulk food during 1990 to 2013 (US dollar/100 litres)

Data source: OECD

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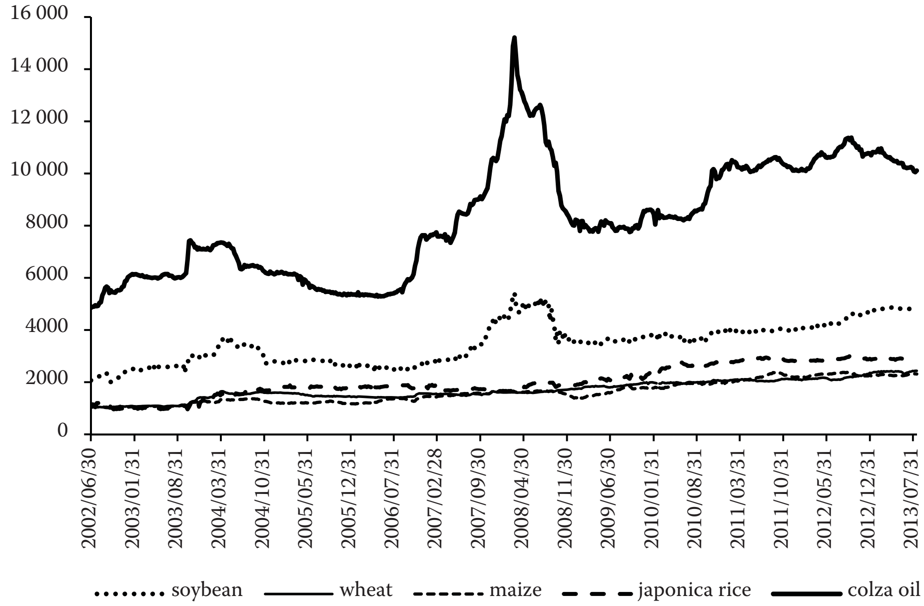

Figure 2. Five main agricultural commodity prices in China (RMB/ton)

the late-2008, they quickly recovered to a relatively high level. Moreover, the frequent fluctuation of the agriculture prices causes an indirect effect on the prices of other bulk commodities. For example, the prices of pork rose by 60% in the year 2007 and 40% in the year 2010. It was because of the rising prices of corns, wheat and other staples which pushed the cost of feeding to a higher level. In the meanwhile, the prices of soybean oil also ran high by 20% in the year 2010 (The State Statistical Bureau).

Indeed, the soaring agricultural prices broke the economic balance of almost all countries in the world especially for developing countries. Although higher food prices improved the terms of trade and the benefit level for the food exporters, such as the USA, Canada and so on, the number of net importers is three times larger than that of the net exporter (Von Braun 2008). As a consequence, food importers suffered widespread losses during the crisis. The governments paid more for the economic fluctuation. It was estimated by the Food and Agriculture Organization (FAO) that developing countries would pay an extra cost of 324 billion dollars in the face of the higher food prices (FAOSTAT). Based on the miserable situation, the governments of developing countries question the factors influencing the agricultural commodity markets. Abbott et al. (2008) proposed three key determinants which are also universally acknowledged by most economists, namely, the excess demand, the value of the US dollar, and the energy-agriculture linkage. Among the three factors, the concurrently increased energy prices are thought to play the critical role through both the direct and indirect schemes.

The prices of international crude oil rocketed to $140 per barrel from $20 per barrel at the end of the 1990s. By coincidence, the prices of corns showed the same trend of increase simultaneously (Figure 3). Hanson et al. (1993) analyzed the cost linkages between energy and agriculture using an input-output model and discovered that an increase in oil price would in turn cause extra costs to the feed agricultural commodities. Higher oil prices not only increase the prices of capital goods in the agricultural sector but also bring an unnecessary transportation cost. On the other side, the spiking oil prices stimulate the production of ethanol, a perfect substitution of the oil energy. Therefore, an expansion of biofuel demand causes the rise of the agricultural prices. Many countries even launch related policies to support and encourage the mass production of ethanol, also leading to an indirect excess demand for agricultural commodities. As the largest producer of ethanol, the USA put 25% of corns into the production of ethanol in 2007 (Figure 4), thus pushing the price of corn to a fairly high level. What is worse, the price of soybean was pulled high at the same time (US Department of Energy).

Furthermore, Harri et al. (2009) presented that the oil trade is conducted mainly in the US dollars, while the domestic agricultural prices are conducted in the RMB; hence, the changes in the oil prices will indirectly influence the commodity prices through the transmission of exchange rates (Figure 5). The depreciation/appreciation of the local currency will determine the price level of exportation to the foreign countries. For example, the depreciation of the

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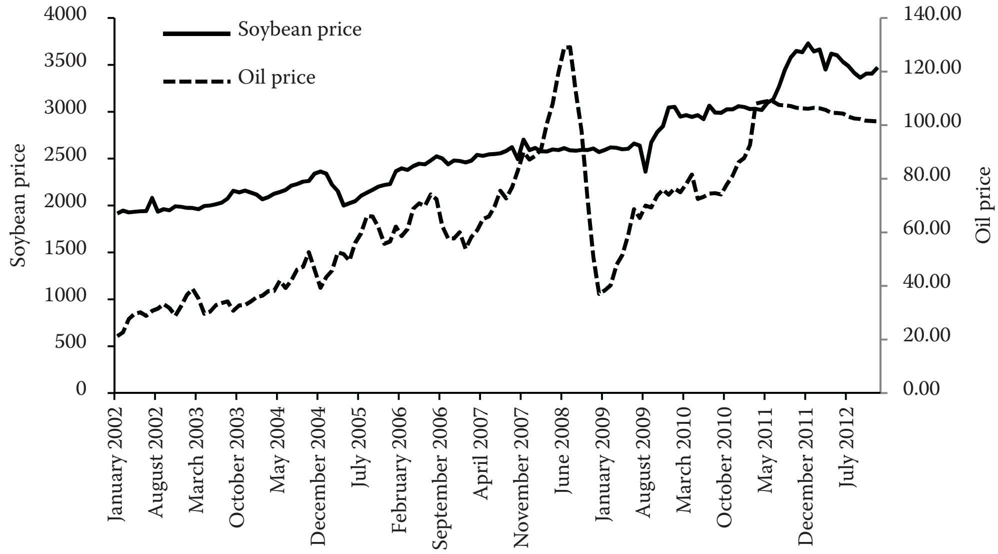

Figure 3. Prices of international crude oil and soybean (2002–2012) in the world (US dollar/gallon)

Data source: IEA report and OECD database

RMB will make the product cheaper to buy in China in the short-run. When the market regains balance, the commodity prices have already been pulled high. In contrast, the outside appreciation of the RMB will make the domestic commodities more expensive than in the foreign countries, stimulating the consumers to make the consumption abroad. The reduced domestic demand will in turn cause prices to a new balance. It is recorded in a report called the Chinese Luxury Traveller White Paper 2013 (2013) issued by Hurun and ILTM Asia that the Chinese tourists rank No.1 in terms of the abroad consumption in the year 2012, accounting for 24 percent of the global level, amounting to 85 billion dollars (equals to 529.6 billion RMB). The KPMG also made a similar survey that people tend to purchase abroad because the goods are cheaper (KPMG 2013).

From the knowledge we obtained, the direct and indirect effects of oil prices are not well discovered in the emerging markets and the relationship between the oil price and commodity prices is largely empirical. In this paper, we will discuss the direct and indirect effects (exchange rate) of the world oil prices on agricultural prices from the prospect of short-run and long-run. The authors also agree with Baffes (2007) on the usage of the individual

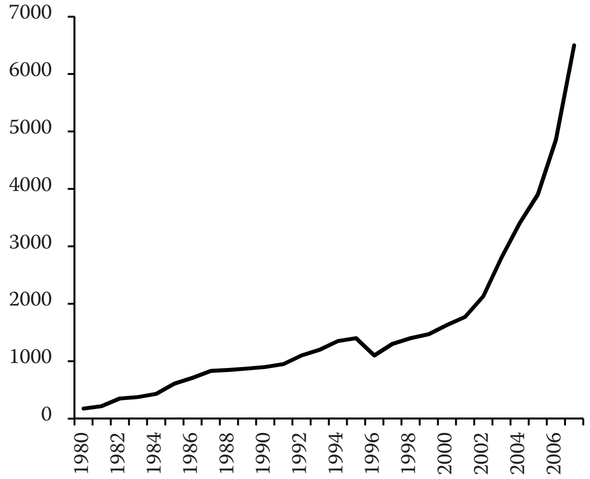

Figure 4. Production of bio-ethanol in the USA (million gallons)

Data source: Renewable fuels association

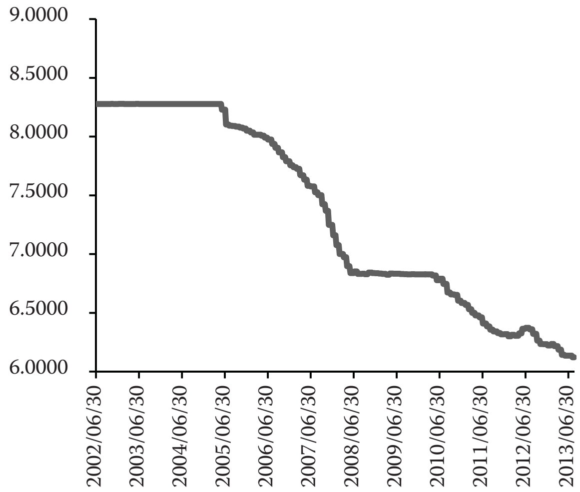

Figure 5. The exchange rate of RMB/dollar from 2002 to 2013

Data source: China Bureau of Statistics

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agricultural commodity prices rather than an aggregate index for the agricultural sector prices. We employ the Granger causality test and the generalized impulse response analysis to study the long-run and short-run situation respectively.

A better insight on the interactions between the oil price and the local commodity prices will help the policy makers to establish an effective money and fiscal policy. A sustained and abundant supply of food is also the guarantee of the security of a country. Producers or farmers can adjust promptly their production to cater for the variable demand, thus mitigating the producer's risk and the exchange rate risk as well.

LITERATURE REVIEW

The seemingly coincidental simultaneous soaring of the agricultural prices and the world oil prices has attracted the attention of a large number of economists from all over the world. The focus of the research is based on either the role of biofuels or the exchange rate changes.

Several brilliant articles shed light on the relationship between the crude oil prices and agricultural prices. Esmaeili and Shokoohi (2011) found that the crude oil prices have an indirect effect on food prices. Campiche et al. (2007) examine the co-variability between the crude oil prices and corn, sorghum, sugar, soybeans, soybean oil, and palm oil prices during the 2003–2007 time period. Johansen co-integration tests revealed no co-integrating relationships during the 2003–2005 time frame. However, the corn prices and soybean prices were co-integrated with the crude oil prices during the 2006–2007 time period. Oil price shocks can explain a minor friction of agricultural commodity price variations before the food crisis in 2006–2007, whereas in the post-crisis period, their explanatory abilities become much higher (Wang et al. 2014). And Nazlioglu (2011) found that there is a persistent unidirectional nonlinear causality running from the oil prices to the corn and to the soybeans prices. In a similar study conducted by Yu et al. (2006), the authors investigate the long-run interdependence between the major edible oil prices and examine the dynamic relationship between the vegetable and crude oil prices. The Johansen co-integration results indicate that the influence of the crude oil price on the edible oil prices is not significant over the study period.

In a study of Baffees (2007), he discovered the effect of the crude oil prices on the prices of 35 internationally traded commodities for the 1960-2005 periods. By deducing the regression equation, he gave the conclusion that if the oil prices remain high for some time, then the commodity prices boom is likely to last much longer than earlier. He also estimates the pass-through of the crude oil prices to the non-energy commodity index as 16%. Besides the individual commodity prices, he also used the data of price indices and put forward a valuable suggestion for the further study that they needed to be supplemented by the individual commodity analysis on the methodological side. Xiaodong Du et al. (2010) find that the oil price shocks appear to have triggered sharp price changes in the agricultural commodity markets because of the tighter interconnection between the food and energy markets. They utilize the weekly prices of crude oil, corn and wheat futures from 1998 to 2009 with the Bayesian Markov Chain Monte Carlo methods. The two studies above both demonstrate the significant relationship between the food prices and energy prices. Nevertheless, some economists give different results. Zhang and Reed (2008) concluded that the changes in agricultural prices of China did not result from the world crude oil prices when studying the scenario of China.

In addition, there is another linkage between the petroleum prices and the agricultural commodity prices put forward by Abbot et al. (2008). In this paper, the authors take the increase in the US current account deficit into consideration. The side effect of the increasing current account is the depreciation of the US dollar which makes the exports attractive and the imports less attractive (the exchange rate effect).

In the present market, with the prosperous international trade among countries, the exchange rate is considered as a crucial factor when it comes to the macroeconomic indicators. However, decades ago, the role of the exchange rate as an integral part of agricultural economics was overlooked until the year 1974. The seminal work on the role of the exchange rate in the agricultural trade is made by Schuh (1974). He argued in his paper that the overvalued US dollar reduced the exports due to the additional expenses in other countries. Kost (1976) reviewed the theoretical framework used to assess the trade impact of a devaluation or appreciation of a country's currency on any commodity of the country's economy. He points out that there is an upper maximum on how much price and quantity can change in response to an

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exchange rate change. At the same time, Vellianitis-Fidas (1976) made a cross-sectional study by using the stepwise ordinary least squares (OLS) method with the data from various time periods. In sum, both Kost and Vellianitis-Fidas agree that the US devaluations of the dollar were not the cause of high prices in 1972–1973. Chambers (1981) utilized a regression to test the Granger causality among the money supply, agricultural exports, agricultural imports and interest rates. His findings were important and were consistent with others' findings that the money supply/value of the dollar plays some role in the level of the agricultural trade. In contrast, Batten and Belongia (1984) support the view that the exchange rates do not matter. Batten and Belongia argue that the real stimulus for the export demand comes from the income enhancements in the importing countries. Chambers (1984) developed a theoretical model capable of examining the short-run effects of various monetary policies on the agricultural sector. Also a Vector Auto Regression (VAR) model was created to help solve the statistical problem. Kwon and Koo (2009) explored the reason of the surges of the food prices based on the method proposed by Toda and Yamamoto (1996) of the Granger causality tests. They find that the food prices are affected by the exchange rate and energy prices through various channels which is also proved by the previous empirical findings made by Abbott et al. (2008).

Since there are different opinions in the history of the research on the relationship between the exchange rate and the agricultural commodity prices, the authors make a summary of the relevant literature (Table 1).

EMPIRICAL METHODS

Co-integration test

EG co-integration test

Engle and Granger (1987) created a two-step test which is now named the unit root test to examine whether there exists the long-term stable relationship between the variables Y_t and X_t (i.e. co-integration relationship).

Step 1 Estimate the equation with the OLS method

$$Y_t = \alpha_0 + \alpha_1 X_t + \mu_t$$

After calculating the non-equilibrium error, we get

$$\widehat{Y_t} = \widehat{\alpha_t} + \widehat{\alpha_1} X_t \widehat{e_t} = Y_t - \widehat{Y_t}$$

which is called the co-integrating regression.

Step 2 Test the stability of the residual error obtained from step 1.

Table 1. Summary of the relevant literature

Author	Commodity	Method	Exchange rate – role
Johnson, Grennes and Thursby (1977)	Wheat	Deterministic short run forecasting model	somewhat important
Chambers and Just (1979)	General agriculture	Critique of exchange rate treatment	overly restricted in models
Collins, Meyers and Bredahl (1980)	Wheat, corn, soybeans and cotton	Simple analytic method	important
Chambers and Just (1981)	Wheat, corn, soybeans	Dynamic three stage least squares	important in the short run
Chambers and Just (1989)	Agricultural vs. non-agricultural sector	Vector auto-regression	important
Bessler (1984)	Brazilian agricultural prices	Vector auto- regression	not important
Batten and Belongia (1986)	General agriculture	Standard expression for export determination	inconclusive
Orden and Fackler (1989)	General agriculture	Non-recursive structurally identified model	play a role
Robertson and Orden (1990)	Agricultural prices	Vector auto-regression and Vector Error Correction	important
Henry, Peterson, Bessler and Farris (1993)	Beef cattle	Time series based on Bayesian VAR	
Babula,Ruppel and Bessler (1995)	Corn	Both structural econometric models and time series methods	not important
Vellianitis-Fidas (1975)	General agriculture	Ordinary Least Squares and Time Series	not important in 1972–1973

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If the residual error is a stationary series, then variables Y_t and X_t are considered to have the long-term stable relationship.

Johansen co-integration test

Although the method of the unit root test is simple to be realized, there exist obvious deficiencies in the principle of its test. An assumption of linearity is necessary to design a linear model for the OLS estimate. Johansen and Juselius (1988) brought about a new method based on the vector auto- regression (VAR) model. This method is mainly used to test the coefficients of multivariate regression.

First, we should build a VAR (q) model

$$y_t = \emptyset_1 y_{t-1} + \cdots + \emptyset_p y_{t-p} + Hx_t + \varepsilon_t,\ t = 1, 2, \ldots, T$$

in which each component of y_t is non-reposeful series and it is integrated of order 1. x_t is a fixed exogenous vector, indicating the constant term, trend term and other certain terms. ε_t is a disturbance vector of k dimension.

After doing the calculus of finite differences, we can get

$$\Delta y_t = \prod y_{t-1} + \sum_{i=1}^{p-1} \Gamma_i \Delta y_{t-i} + Hx_t + \varepsilon_t$$

$$\prod = \sum_{i=1}^{p} \emptyset_i - I$$

$$\Gamma_i = -\sum_{j=i+1}^{p} \emptyset_j$$

We can obtain the $I(0)$ process after doing the transformation of the finite difference of $I(1)$ process. As a consequence, when Πy_{t-1} is the vector of $I(0)$, Δy_t is a stationary process.

Granger causality test

The basic idea of the Granger causality test is to add a lagged variable to the equation and to test whether this variable will cause the lagged effect. If so, then we can say that it has the Granger causality relationship. The co-integration test can only explain whether there exists a long term equilibrium relationship. However, to examine the causal linkage needs a further study.

The hypothesis testing model is

$$y_t = c + \sum_{i=1}^{p} \alpha_i \Delta y_{t-i} + \sum_{j}^{q} \beta_j \Delta x_{t-j} + \varepsilon_t$$

The null hypothesis is x does not Granger cause y.

H_0: $\beta_1 = \beta_2 = \ldots = \beta_q = 0$

If the null hypothesis is true, we can get

$$y_t = c + \sum_{i=1}^{p} \alpha_i \Delta y_{t-i} + \varepsilon_t$$

The F-statistic can be defined as

$$F = \frac{(SSE_1 - SSE_0)/q}{SSE_0/(T - q - p - 1)}$$

p and q are the lag intervals for endogenous variables y and x, respectively, which is determined by the AIC criterion. The null hypothesis can be rejected only when the F-statistic is larger than the critical value, implying that x does not Granger cause y.

DATA PROCESS

Our empirical analysis makes use of the weekly prices of the world crude oil prices, the RMB/US dollar exchange rate, and the prices of soybean, maize, wheat, colza oil, late indica rice, early indica rice and japonica rice, covering the period of June 2002 to August 2013. Why did the authors pick the period of June 2002 to August 2013? In the 1900s, most agricultural products' prices remained stationary for most of the time. From 2002, the prices of major agricultural products increased more and more fast, some products' prices doubled during 2002–2013. So the authors want to study whether the oil price shocks can or cannot explain the situation.

The crude oil price is an average of the UK Brent which is measured in the US dollars per barrel. We get the data for this section from the US Energy Information Administration (EIA).The exchange rate shows the value of the US dollar, or the amount of the RMB you have to pay for one unit of the US dollar. We get the data for this section from the Central Bank of China. The data of the agricultural prices is obtained from www.cngrain.com.

The data are all transformed to their base-10 logarithms.

The descriptive statistics of the variables are summarized in Table 2.

From the descriptive statistics, we can find that the exchange rate has the largest volatility (0.055). It can be explained by the fact that the government launched a new policy which is called the Managed Floating Exchange Rate System. After July 2005, the exchange rate fluctuated unstably, determined largely

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Table 2. Descriptive statistics

	LCO	LJR	LM	LS	LW	LER	LO
Mean	3.900	3.287	3.193	3.530	3.220	0.862	1.801
Std. Dev.	0.116	0.140	0.113	0.101	0.098	0.047	0.181
Skewness	–0.005	–0.462	0.096	–0.075	–0.387	–0.070	–0.275
Kurtosis	1.824	2.492	1.799	1.962	2.507	1.406	1.935
Coefficient of variation	0.030	0.042	0.036	0.028	0.030	0.055	0.100
Sum	2 269.718	1 912.924	1 855.243	2 047.460	1 870.952	501.805	228.701
Sum Sq. Dev.	7.869	11.311	7.458	5.857	5.525	1.288	4.147
Observations	582	582	581	580	581	582	582

L in each name of variable denotes the logarithm (i.e. LCO = logarithm of the prices of colza oil; LJR = logarithm of the prices of japonica rice; LM = logarithm of the prices of maize; LS = logarithm of the prices of soybean; LW = logarithm of the prices of wheat; LER = logarithm of exchange rates; LO = logarithm of the prices of crude oil)

by the demand and supply forces. What is more, the financial crisis appeared in the US, leading the federal government to an awkward circumstance of twin deficits in finance and trade. So a temporary depreciation of the US dollar may help the state to get out of the dilemma, but that means that other currencies are faced with an era of appreciation against the US dollar. The prices of soybean, wheat and colza oil have a relatively smaller volatility than other agricultural commodities (0.028, 0.030, 0.030 respectively). Because soybean and wheat are delivered in the Dalian Commodity Exchange (DCE) and the Zhengzhou Commodity Exchange (ZCE), their prices are decided by the market mechanism to a great extent. The correlation coefficients are shown in Table 3.

The correlation matrix indicates a highly linear correlation among the agricultural prices. For example, the correlation is 0.948 between the prices of maize and wheat, and it is 0.837 between the prices of soybean and colza oil. A sudden shock in a single commodity will be quickly passed on to other commodity trading markets. However, each commodity price presents a negative correlation against the exchange rate. As discussed in the introduction section, the appreciation of the RMB makes foreign goods cheaper to purchase than in the domestic market, thus decreasing the domestic demand. Theoretically, the prices of domestic commodities will drop. At the same time, China has employed a loose monetary policy for a period of time. The government-issued currency in circulation outnumbered the real demand for money. In addition, the economic development in China relies primarily on the real estate, construction and other traditional industries. The asset bubble, particularly the property-value bubble, will also drive the local currency to be devalued. The pressure from the outside appreciation and the inside depreciation is formed. This factor may be attributed to the phenomenon of the negative correlation between the exchange rate and other commodity prices. In order to analyze the causality, we have to turn to advanced methods rather than a simple correlation analysis.

EMPIRICAL FINDINGS

Since the way of stochastic is different at each time point of the non-stationary series, the general

Table 3. Correlation matrix

	LCO	LER	LJ	LM	LO	LS	LW
LCO	1						
LER	–0.045013	1					
LJ	0.4869873	–0.65546	1				
LM	0.7457149	–0.527573	0.8704885	1			
LO	0.6445253	–0.426972	0.5903129	0.7460615	1		
LS	0.8366835	–0.369306	0.7700543	0.9450363	0.7613859	1	
LW	0.7127861	–0.533803	0.9235072	0.9479575	0.6708179	0.8968107	1

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Table 4. Results for the unit root tests

	ADF		PP	
	Statistic	Prob.**	Statistic	Prob.**
Levels				
Intercept	7.3979	0.9183	7.3065	0.9222
Intercept and trend	17.3448	0.2383	14.4267	0.4184
First-difference				
Intercept	693.13	0.0000**	950.16	0.0000**
Intercept and trend	960.96	0.0000**	1456.05	0.0000**

** denotes statistical significance at the 5% level of significance

stochastic of the series is hard to capture. Apart from that, there is a possibility to get the spurious regression. Hence, the unit root test is necessary to overcome these two problems. The results of the ADF and PP unit root tests in the Table 4 show that the maximum order of integration is one (d = 1). That means that the first-differenced variables with constant and trend are stationary. Then we can use the first-differenced variables to perform the co-integration analysis.

The Vector Auto Regression (VAR) model can be applied to predict the related time series system and to analyze the dynamic shock caused by the random disturbance. First, the Johansen co-integration test is conducted and its results are shown in the Table 5.

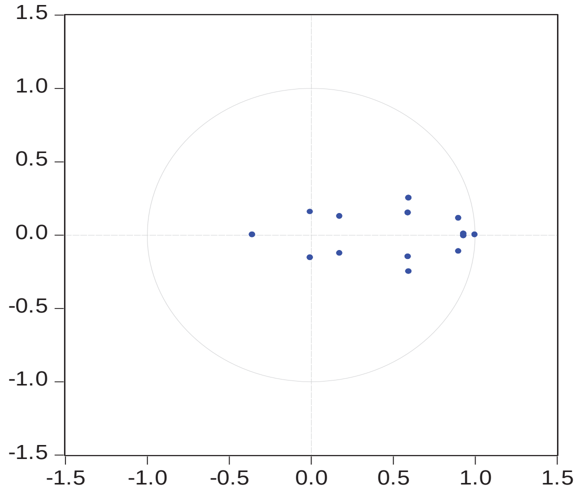

Figure 6. Inverse roots of AR characteristic polynomial

Although we have examined the co-integrating relationship, we should also verify its validity. Here, we use the AR Roots Graph which is straighter to understand (Figure 6).

Since the inverse roots are all depicted in the unit circle, we can assert that the VAR (2) model is stable and will not influence the standard deviation of the

Table 5. Johansen co-integration test

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistics	0.05 Critical Value	Prob.**
None *	0.373692	161.6181	125.6154	0.0001
At most 1*	0.270659	103.5968	95.75366	0.0129
At most 2	0.212035	64.46072	69.81889	0.1242
At most 3	0.1471	34.91139	47.85613	0.4527
At most 4	0.079789	15.18134	29.79707	0.7682
At most 5	0.038514	4.870412	15.49471	0.8224
At most 6	1.81E-06	0.000225	3.841466	0.9899

Trace test indicates 3 co-integrating equations at the 0.05 level
*denotes rejection of the hypothesis at the 0.05 level

Table 6. Results for the long-run causality test

	LCO	LER	LJ	LM	LO	LS	LW
LCO		2.7771	14.6124*	11.7515*	0.7873	14.6516*	30.4042*
LER	1.0748		0.5174	3.5030	4.9826*	4.1909	0.7764
LJ	1.0551	4.5402		0.6516	0.3820	0.2681	7.1709*
LM	1.3901	1.4193	1.5274		2.1750	6.5802*	0.7677
LO	3.2824	6.8046*	0.1627	2.9881		1.5165	8.9283*
LS	19.4954*	0.6605	2.5993	20.0643*	5.3243*		7.3345*
LW	0.9448	0.0443	11.7611*	8.6162*	0.9744	1.9461	

*denotes rejection of the hypothesis at the 0.05 level

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impulse response function. Afterwards, we can do the Granger causality test and obtain the Table 6 as follows.

The long-run causality test reveals a seemingly distinct result. The exchange rate does not Granger cause agricultural prices during the period selected. The authors think it is because the loose monetary policy in China weakens the conducting effect of the outside appreciation for the RMB. On the other hand, the oil price only Granger causes the price of soybean. This reasonable result can be explained

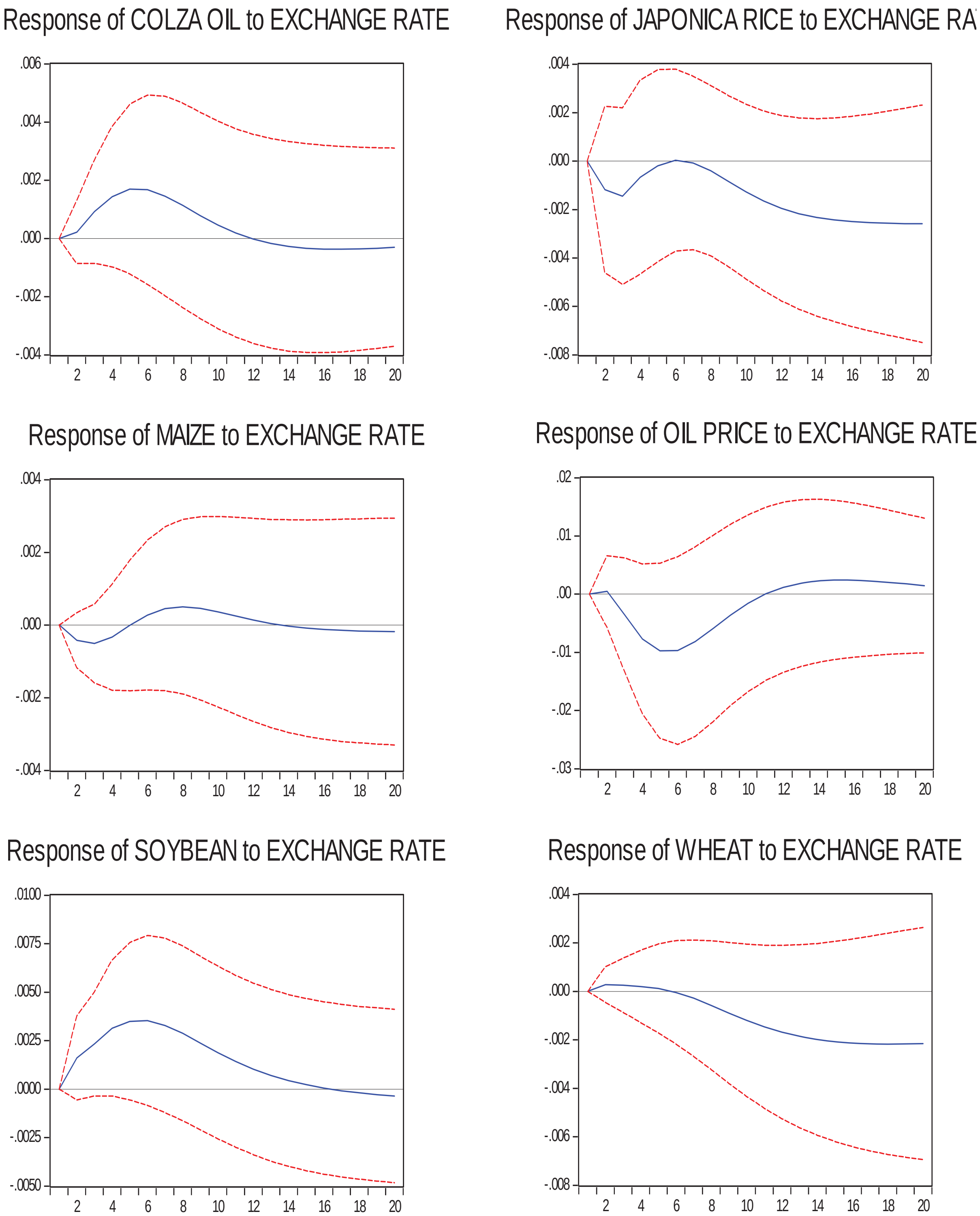

Figure 7. Response to one-standard deviation of the exchange rate

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that the soybean is a perfect raw material to produce biofuels, a substitution of crude oil. Therefore, these two factors show a strong negative relationship.

Since the long-run Granger causality analysis fails to indicate the linkages from the oil prices and the exchange rate, the authors use another statistic technique called the generalized impulse response analysis. Graphs depicted in the Figure 7 and Figure 8 illustrates the degree of deviation for different agricultural prices when given a one-standard deviation shock.

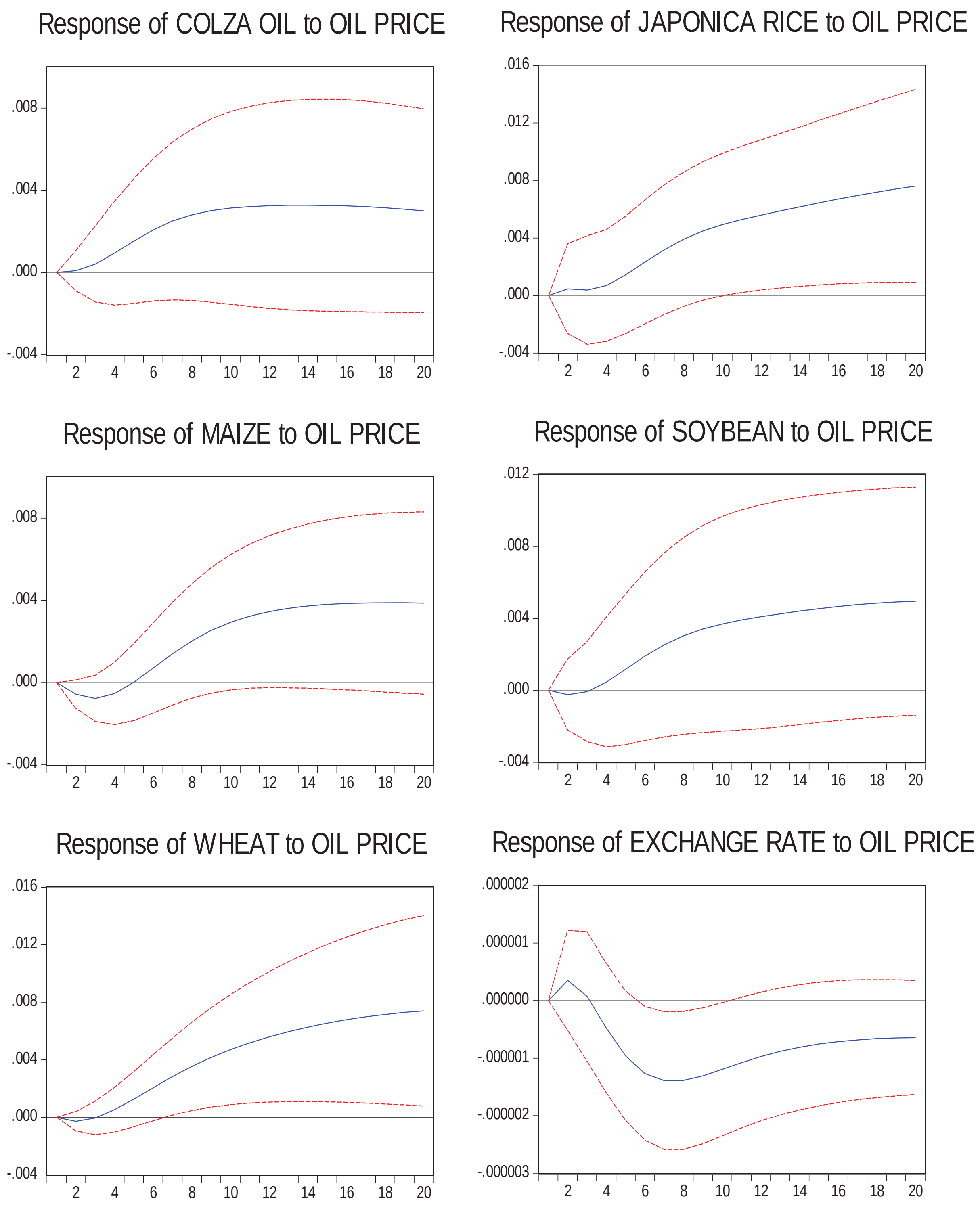

Figure 8. Response to one-standard deviation of the oil price

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The results show that the response functions are not statistically significant. Therefore, the conclusion conducted from the short-run prospect is consistent with the one from the long-run.

In conclusion, neither the Granger causality test nor the generalized impulse response analysis shows the causal linkages expected. The oil price Granger causes the price of soybean but does not Granger cause the prices of other agricultural commodities. One possible explanation is the substitution effect discussed before. Another possible explanation is that soybean is the only grain crop that can be traded in the world market. In other words, China's agricultural commodities cannot be traded freely to the foreign countries except soybean. Of all the grain crops, soybean has the largest foreign-trade dependency which has amounted to 80% in the year 2012. Hence, there should exist a linkage between the world oil prices and soybean prices.

The exchange rate does not Granger cause any price of the commodity. Firstly, the formation of the exchange rate mechanism in China is mainly controlled by the government, but not by the market mechanism. Secondly, the degree of integration for the domestic and global market is not strong enough to make the domestic commodity prices sensitive to the changes in the exchange rate.

CONCLUSION AND SUGGESTION

In this paper, the authors use the weekly prices from June 2002 to August 2013 of soybean, maize, wheat, colza oil, and japonica rice and try to find out the interrelationship among them. With the Granger causality test and the generalized impulse response analysis, the long-run and short-run scenarios are presented, respectively. The results reveal that the oil prices can only Granger cause the soybean price while the exchange rate is not the predominant factor influencing the agricultural prices.

The food security is as important as the energy security to a sovereign state. Although soybean is the only commodity traded in the world market, there is a trend that other agricultural bulk commodities will be transacted unrestrictedly in the future. So the government should guarantee the inventory of the agricultural crops and to decrease the foreign dependency of soybean. On the one hand, there should be developed a new cultivation technology to increase the yield per unit. Also, the farmers ought to be equipped with more subsidies to be encouraged to expand the production.

Besides, the mass production of biofuel will also exacerbate the situation. Take the US as an example; the production scale was expanded in 2005 due to the increase in the oil prices. The high oil prices stimulate the demand for maize, the raw material for the ethanol production. Maize will suffer a following surge in prices as well. What is worse, the soaring demand for maize will lead farmers to increase the planting of maize, thus decreasing the cultivated area for soybean. The short supply of soybean makes itself more expensive than before. The food security is one of the most important issues in China. The Chinese government should control the use maize and other foods as raw materials to produce biofuel. However, the government can encourage the manufactories to use the biological waste to produce biofuel, and give these manufactories an exemption from the value added tax.

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Contact address:

Zhengwei Ma, School of Business Administration, China University of Petroleum (Beijing), 18 Fuxue Road, Changping, Beijing, P.R.China, 102249
e-mail: ma_zhengwei@163.com