Price Dynamics and Forecasts of World and China Vegetable Oil Markets

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Background

Vegetable oil is one of the most important edible oils in China (Oil China, 2012). In 2010, the total consumption of vegetable oil in China was 27 million tons. This is 93% increase compared to year 2000. For many years soybean and rapeseed oil have been the most widely used vegetable oil in Chinese daily life. Consumption of soybean oil exceeded 10 million tons in 2010 accounting for 41% total domestic vegetable oil consumption (Xu and Xie, 2012). Furthermore, data from the China Statistics Bureau showed that China is the largest rapeseed oil consumer in the World. According to the National Food Security Long-term Plan (2008-2020) of China, in 2020 the per capita annual consumption of vegetable oil will reach 20kg, and the total consumption will reach 29 million tons. Therefore, China is a large vegetable oil consumer. The domestic production is insufficient, to meet the demand, and as a result China has been importing vegetable oil form the World market. According to the statistics of Customs Information Network, from January to July 2012, China imported a total of 400 million tons of edible vegetable oils. This is an increase of 17.9% compared to 2011, worth $ 4.7 billion.

According to Cheng (2012), 92% of soybean oil and 20% of rapeseed oil consumed in China are imported. This increasing dependence on international market for vegetable oil potentially has an impact on Chinese domestic price of such oils. That being said, we are expecting to shed light on short-run and long-run dynamic relationships between international and China vegetable oil prices. Consequently, we will be in position to explain impact of international vegetable oil prices on China domestic prices.

The extant literature on dynamics of vegetable oil prices shows that most studies centered attention to World vegetable oil prices, but failed to relate it to the dynamics of China domestic vegetable oil price. Our study relates the China domestic vegetable oil price to World price in a dynamic setting exploring short-run and long-run price movements and adjustments. Out-of-sample forecasts are generated for model validation as well.

Objectives

(1) to identify seasonal unit roots (monthly quarterly, annual) present in World and China soybean and rapeseed oil prices;

(2) to estimate seasonal vector error correction model (VECM) (Johansen and Schaumburg, 1999);

(3) to estimate impulse response functions and error variance decompositions to comment on short-run and long-run vegetable oil price movements;

(4) to estimate long-run adjustments in the presence of co-integrating World and China vegetable oil price vectors;

(5) to estimate historical error decompositions to study effects of China vegetable oil price policy on domestic oil prices;

(6) to perform out-of-sample forecasting exercise for model validation.

Data

Monthly domestic price of soybean and rapeseed oil from January 1994 through December 2010 (192 monthly observations) are collected from China Price Yearbook. Soybean and rapeseed oil prices for World market are collected from World Bank database. China domestic price is converted into U.S. dollars to maintain common ground with World prices.

Methodology

Initially, using 168 monthly observations (14 years of data from January 1994 – December 2008), a seasonal vector error correction model (VECM) will be estimated with appropriate seasonal frequency and price lags (Beaulieu and Miron, 1993; Johansen and Schaumburg, 1999; Depalo, 2009). Price lags are identified using information loss functions such as Akiake Information Criteria (Akiake, 1974).

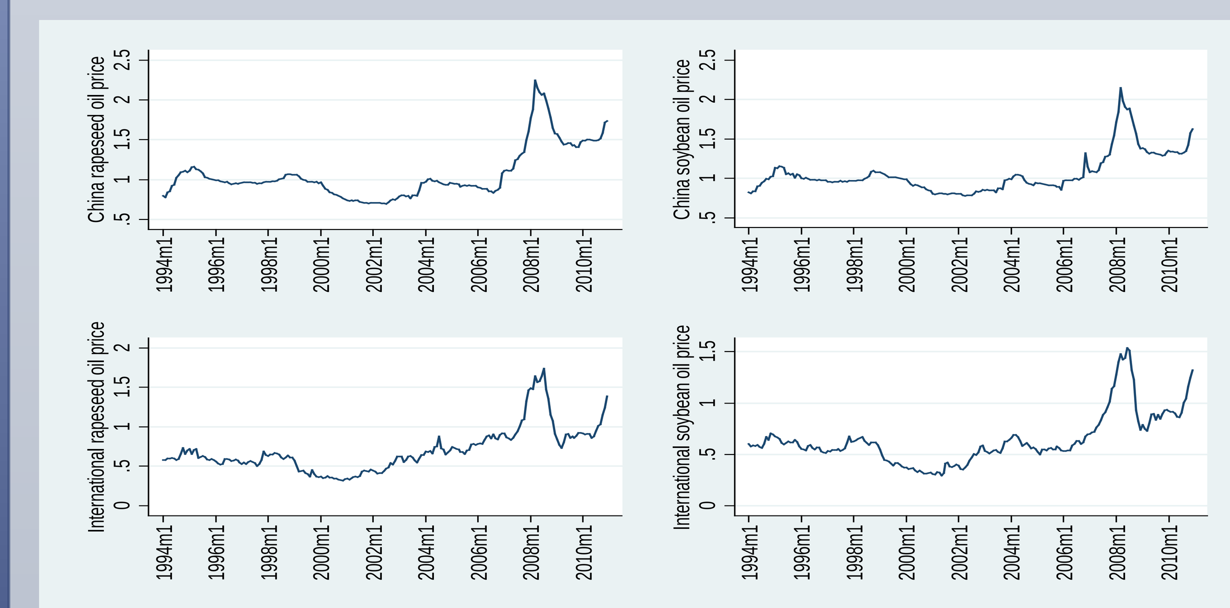
Data from year 2009 and 2010 (24 months) are saved to perform out-of-sample forecasting and model validation exercise.

Moving average representation of VECM is generated to investigate impulse response functions, error variance and historical error decompositions.

Long-run price adjustments from disequilibrium will be investigated using long-run matrix of coefficients of VECM.

Forecasting ability of the model is compared against random walk model (efficient markets are assumed to have random walk type behavior) using Theil's *U*-statistic (Theil, 1966; Doan, 1996).

Results and Discussion



		Augmented Dickey-Fuller Test
Level		
With trend	China rapeseed oil price	-1.879
	China soybean oil price	-1.830
	World rapeseed oil price	-2.170
	World soybean oil price	-0.931
First difference		
With trend	China rapeseed oil price	-9.385***
	China soybean oil price	-11.851***
	World rapeseed oil price	-4.658***
	World soybean oil price	-8.762***

	China rapeseed oil price	China soybean oil price	World rapeseed oil price	World soybean oil price	5% critical value
Z(t)-Fr0	-0.683	-0.975	-0.817	-0.791	-2.880
Z(t)-Fr 1/2	-5.102	-3.975	-4.581	-5.213	-1.950
Z(t)-L.Ann	0.164	-1.580	-0.545	-0.804	-1.900
Z(t)-Annual	-7.065	-6.975	-7.099	-5.865	-1.680
Joint annual	24.970	29.665	26.327	18.561	3.080
All Seas. Fr.	223.166	124.458	139.554	110.987	2.740
All freq.	167.418	93.841	105.200	83.353	3.37

Hypothesize No. of CE(s)	Trace Statistic	0.05 Critical Value	Max-Eigen Statistic	0.05 Critical Value
None *	62.4262	47.21	34.9693	27.07
At most 1	27.4569*	29.68	20.4732*	20.97
At most 2	6.9837	15.41	5.5485	14.07
At most 3	1.4352	3.76	1.4352	3.76

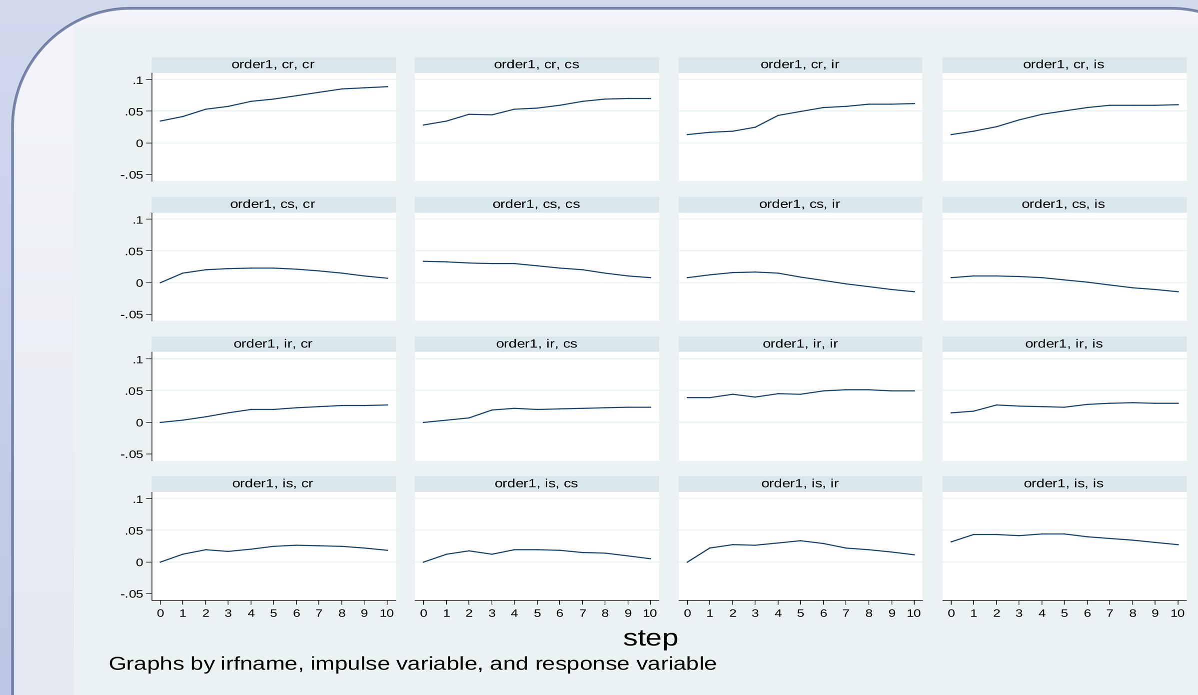
$$
\begin{pmatrix}\Delta cr\\ \Delta cs\\ \Delta ir\\ \Delta is\end{pmatrix}=\begin{pmatrix}-0.373555 & 0.422108 & -0.0100707 & 0.0202511\\ 0.1912415 & -0.2160978 & 0.0515568 & -0.1036757\\ 0.2249249 & -0.2541592 & 0.0606375 & -0.1219361\\ 0.2257641 & -0.2551074 & 0.0608637 & -0.122391\end{pmatrix}\begin{pmatrix}cr_{t-1}\\ cs_{t-1}\\ ir_{t-1}\\ is_{t-1}\end{pmatrix}
$$

$$
+\begin{pmatrix}0.0016387\\ 0.0003978\\ 0.0001395\\ -0.0002048\end{pmatrix}+\begin{pmatrix}-0.1683786 & 0.3265024 & -0.0487313 & 0.3618757\\ -0.0461827 & 0.1107951 & -0.1102665 & 0.496894\\ -0.309555 & 0.2979346 & -0.3300134 & 0.8282296\\ -0.1992537 & 0.2692693 & -0.1334947 & 0.5068135\end{pmatrix}\begin{pmatrix}\Delta cr_{t-1}\\ \Delta cs_{t-1}\\ \Delta ir_{t-1}\\ \Delta is_{t-1}\end{pmatrix}
$$

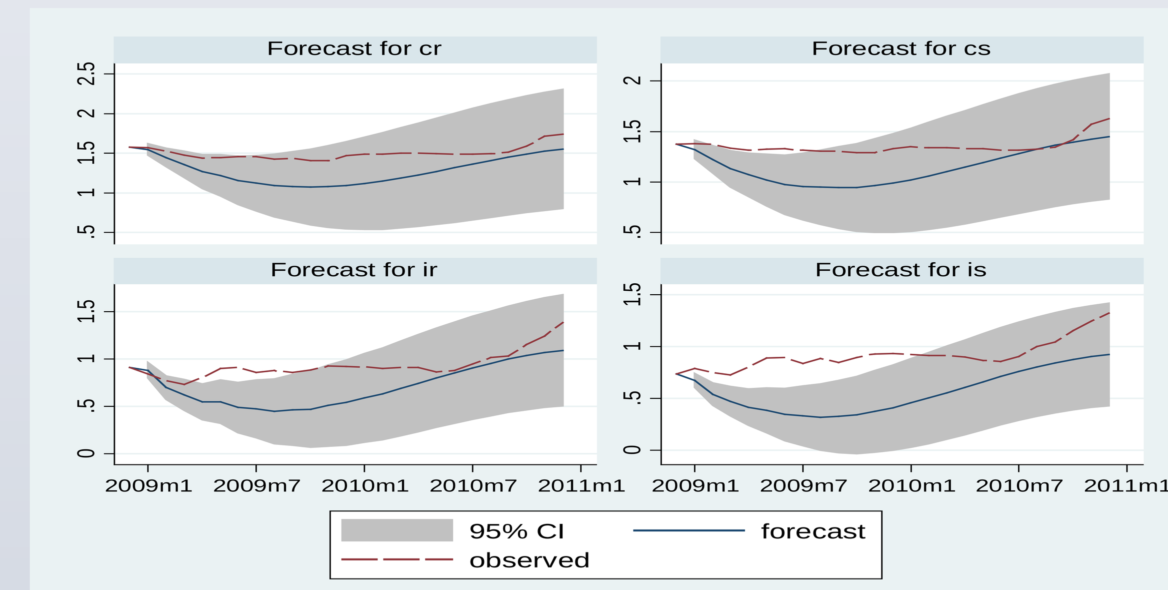
$$
+\begin{pmatrix}0.0647435 & 0.1728712 & 0.0834468 & 0.0384476\\ 0.1703211 & 0.051328 & -0.0138861 & 0.1469905\\ -0.352414 & 0.3258057 & -0.0194375 & 0.2194411\\ -0.0837313 & 0.2003667 & 0.2023281 & -0.102078\end{pmatrix}\begin{pmatrix}\Delta cr_{t-2}\\ \Delta cs_{t-2}\\ \Delta ir_{t-2}\\ \Delta is_{t-2}\end{pmatrix}
$$

$$
+\begin{pmatrix}-0.0652233 & 0.0613917 & 0.1378769 & -0.2769924\\ -0.2031617 & -0.0133325 & 0.2572566 & -0.1970784\\ -0.2240838 & 0.4108392 & -0.2967838 & 0.1238448\\ 0.0988169 & 0.2037524 & -0.1063016 & -0.102078\end{pmatrix}\begin{pmatrix}\Delta cr_{t-3}\\ \Delta cs_{t-3}\\ \Delta ir_{t-3}\\ \Delta is_{t-3}\end{pmatrix}
$$

$$
+\begin{pmatrix}0.0203886 & 0.2553743 & 0.0091889 & 0.1167779\\ -0.0344194 & 0.0692174 & -0.0276651 & 0.2761085\\ 0.0633483 & 0.2436907 & -0.0688074 & 0.3812025\\ 0.584059 & 0.329413 & -0.1358459 & 0.2003627\end{pmatrix}\begin{pmatrix}\Delta cr_{t-4}\\ \Delta cs_{t-4}\\ \Delta ir_{t-4}\\ \Delta is_{t-4}\end{pmatrix}+\begin{pmatrix}u_{1t}\\ u_{2t}\\ u_{3t}\\ u_{4t}\end{pmatrix}
$$



Graphs by irfname, impulse variable, and response variable



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