Revisiting the palm oil boom: An examination of consumption in the oils complex

D. Sanders[1]
J. Balagtas[1]
G. Gruere[2]

[1]Department of Agricultural Economics, Purdue University
[2]International Food Policy Research Institute

Poster prepared for presentation at the Agricultural & Applied Economics Association's 2011 AAEA & NAREA Joint Annual Meeting, Pittsburgh, Pennsylvania, July 24-26, 2011

Revisiting the palm oil boom: An examination of consumption in the oils complex

D. Sanders[1], J. Balagtas[1], & G. Gruere[2]

[1]Department of Agricultural Economics, Purdue University; [2]International Food Policy Research Institute

Introduction

Palm oil has demonstrated significant growth in production, trade, and market share in the last two decades. The majority of this growth has taken place in Malaysia and Indonesia; these two countries combined account for approximately 90% or more of world palm oil exports in recent years. As palm oil production has boomed, so have concerns about its sustainability, as well as the underlying causes for the unprecedented growth. The recent surge in biofuel production has provided one suspected culprit, although other disruptions could play a role as well. Import restrictions on genetically modified crops, specifically soybeans, as well as health concerns over issues such as trans fats may have changed the traditional structure of the edible oil complex. In turn, these shifts can change the price relationships in the market that reflect the underlying consumptive patterns. This project examines horizontal price transmission through the market complex, with particular focus on the short and long run responses of edible oil prices to exogenous changes in other oil prices.

Data

The data employed here comes from the statistical databases of the United Nations Conference on Trade and Development (*UNCTADstat*). Specifically, edible oil prices are taken from those of Oil World, an industry group. Monthly prices from January 1990 through February 2011 for seven commodities are used. All prices are in U.S. dollars per tonne. The seven commodities, origination and pricing points are:

Commodity	Origination	Pricing Point
Soybean Oil	The Netherlands	FOB ex-mill
Sunflower Oil	European Union	FOB NW European ports
Groundnut Oil	Any origin	CIF Rotterdam
Coconut Oil	Philippines/Indonesia	CIF European Ports
Palm Kernel Oil	Philippines	CIF Rotterdam
Palm Oil	Malaysia/Indonesia	CIF NW European ports
Cottonseed Oil	United States	CIF Rotterdam (1990-1994) FOB Gulf (1994-2011)

Model

The modeling framework utilized here is the vector error correction model (VEC). This model incorporates the cointegrating vectors that represent long-run equilibrium relationships into a vector autoregression framework made stationary through first differences. This model can be represented by:

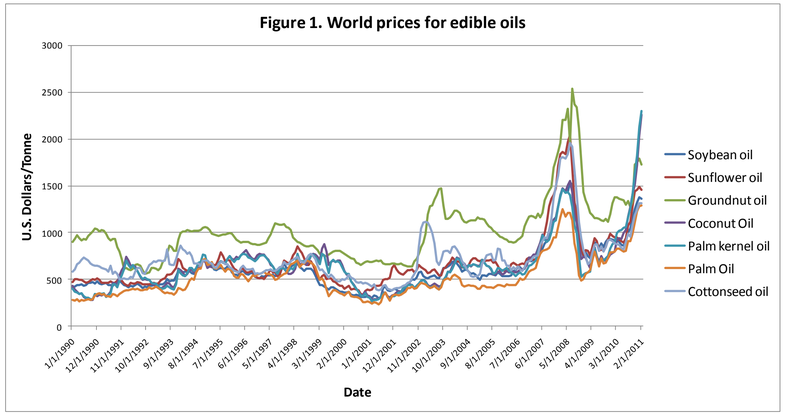
$$\Delta y_t = \alpha - Bz_{t-1} + \zeta_1 \Delta y_{t-1} + \zeta_2 \Delta y_{t-2} + \ldots + \zeta_{p+1} \Delta y_{t-p+1} + \varepsilon_t$$

where y_t is an $nx1$ vector of time series, α is an $nx1$ constant vector, B is an nxh matrix of cointegrating coefficients, z_t is a stationary $nx1$ vector of the transformed time series, and ζ_i is an nxn matrix of estimated coefficients.

State of the Edible Oils Complex

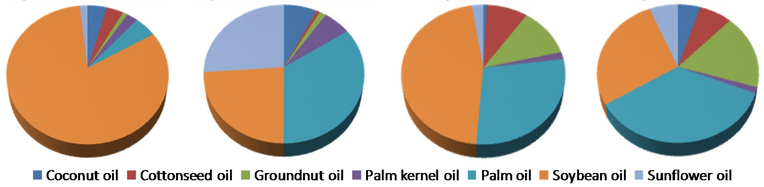
The edible oils complex for the world market has varied markedly in recent years. Figure 1 below demonstrates the price volatility that has appeared in the market. Figures 2-5 show the average share of domestic consumption for four major consumers of edible oils, while Figures 6-9 frame the rapid growth in the trade of these commodities.

Figure 1. World prices for edible oils



Figures 2-4. Average domestic edible oil consumption shares for four major edible oil consuming entities

Figure 2: United States | Figure 3: European Union | Figure 4: China | Figure 5: India



Figures 5-9. Net edible oil imports on a per-capita basis for four major edible oil consuming entities

Figure 6: United States | Figure 7: European Union

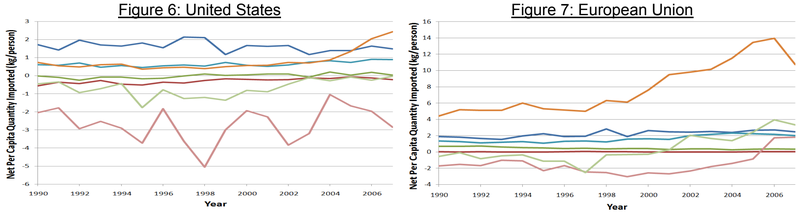
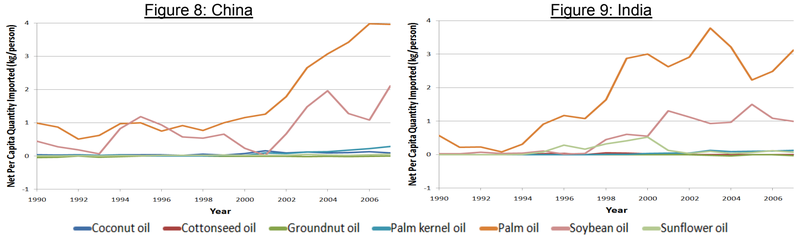


Figure 8: China | Figure 9: India



Granger Causality

Granger causality is a test for information flow between variables within a vector autoregression framework. With this test, a variable x is proposed to "Granger-cause' another variable y if the combination of the lagged values of x and y provide more information in explaining y than its own lags alone. The seven variables were tested for Granger causality using bivariate causality tests within the larger VEC framework. The p-values of each test are below, with a significant value indicating that the proposed exogenous variable Granger-causes the proposed endogenous variable. Clearly, as is common in relationships of this type, many edible oil prices are found to each Granger-cause each other, indicating that neither variable is exogenous to the relationship. There are a few one-way interactions, however. Sunflower oil is found to exogenously Granger-cause coconut, palm, and cottonseed oils. Palm kernel oil exogenously Granger-causes coconut oil, while coconut oil exogenously Granger-causes cottonseed oil.

Exogenous Oil \ Endogenous Oil	Soybean	Sunflower	Groundnut	Coconut	Palm Kernel	Palm	Cottonseed
Soybean		0.0039	0.0001	0.6026	0.506	0.9694	0.0039
Sunflower	0.0001		0.0001	0.0313	0.0645	0.0002	0.0001
Groundnut	0.0029	0.0076		0.0001	0.0039	0.0007	0.0126
Coconut	0.2928	0.8704	0.0001		0.2326	0.9452	0.0278
Palm Kernel	0.2116	0.6062	0.0001	0.0001		0.8682	0.0205
Palm	0.0923	0.0724	0.0001	0.1478	0.5709		0.0051
Cottonseed	0.0172	0.2505	0.0001	0.0802	0.0319	0.0160	

Conclusions

The world edible oils market contains a number of complex relationships among its member oils. The rising prices of the oils market make it important to understand the dynamic interactions among these oils and their prices. As was seen in the results of the Granger-causality tests, many of the oils share information in price discovery, such that adjustments to one of the oil markets will almost certainly be shared with the other oils as the entire complex adjusts. In particular, the contrasting relationships of soybean oil and sunflower oil with palm oil are worth noting. Soybean oil, often associated with biofuels production, does not affect palm oil, while sunflower oil, which is often regarded as a healthier oil choice, is found to exogenously Granger-cause palm oil. This distinction might suggest that drivers behind the recent tumult in edible oils might be more multi-dimensional than they initial appear.

References

Balcombe, K. and Rapsomanikis. 2008. "Bayesian estimation and selection of nonlinear vector error correction models: the case of the sugar-ethanol-oil nexus in Brazil." *American Journal of Agricultural Economics, 90*(3). 658-668.

Balagtas, J.V. and M.T. Holt. 2009. "Estimating structural change with smooth transition regressions: an application to U.S. meat demand." *American Journal of Agricultural Economics 91*(5). 1424-1431.

Bird, K. 2010. Unilever buys sustainable palm oil certificates for European business. FoodNavigator.com, 04/19/2010.

Byrne, J. 2010. Biofuels to blame for palm oil deforestation, says Nestle. FoodNavigator.com, 04/19/2010.

Carter, C.A. and G. P. Gruere. 2003. Mandatory labeling of GM food: Does it really provide consumer choice? *AgBioForum*, 6(1&2): 68-70.

Proforest. 2003. Palm oil, forests, and sustainability. Discussion paper for the Round Table on Sustainable Oil Palm. Oxford, UK: Proforest.

Yu, T., D.A. Bessler and S. Fuller. (2006). Cointegration and causality analysis of world vegetable and crude oil prices. *Selected Paper, American Agricultural Economics Association Annual Meeting; Long Beach, California, July 23-26, 2006.*

Zen, Z., Barlow, C. and R. Gondowarsito. 2005. Oil Palm in Indonesian Socio-Economic Improvement A Review of Options. Economic Department Working Paper 2005-11. Canberra, Australia: Australian National University.