The important Factors that Influencing of International Prices of Main Vegetable Oils

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Abstract : World production of vegetable oils has been estimated at 169 million tons. Of this total, palm oil ranked first by accounting for 34.6%. Results indicate that Indonesia and Malaysia rank on top of the main countries producing vegetable oils, especially palm oil, where they produce 30% of the world average production of vegetable oils for the period 2011-2015. Moreover, world exports of vegetable oils have been estimated at 71 million tons. In terms of exports, results indicate that Indonesia and Malaysia rank on top of the main countries exporting vegetable oils, especially palm oil, where they export 56% of the world average exports for the same period. Studying the international prices of vegetable oils over the period 2001-2015 indicate that they have been continuously increasing until reaching maximum in 2007, which can be attributed to the world food crisis following the world financial crisis. After that, they started declining, but increased again in 2010, then declined by 2015. Results obtained from studying the key factors influencing international prices of vegetable oils indicate that 90% of the changes occurring in the international prices of soybean oil can be attributed to quantity of soybean oil produced by Argentina and quantity of soybean oil imported by India; 60% of the changes occurring in the international prices of palm oil can be attributed to China's consumption of palm oil and quantity of palm oil imported by the European Union; 47% of the changes occurring in the international prices of rapeseed oil can be attributed to European Union's imports of rapeseed oil; and 41% of the changes occurring in the international prices of cottonseed oil can be attributed to India's production of cottonseed oil.

Key words:- World prices of vegetable oils - World production of vegetable oils - world exports of vegetable oils - world imports of vegetable oils - world consumption of vegetable oils - World stocks of vegetable oils.

Introduction

International market of vegetable oils no doubt influences evolutions occurring in vegetable oils in any part of the world, either in terms of quantity, quality or price. It is worth mentioning that average total world production of vegetable oils for the period 2011-2015 reached 169 million tons. Of this total, palm oil ranked first by accounting for 34.6%. Soybean and rapeseed oils followed by accounting for 27.3% and 15.3% of the world total production of vegetable oils, respectively. It is well known that prices are very sensitive to any forecasted declines in the quantities produced or imported by main production and import countries. Higher production usually affects the storage policy and stocks kept by main export countries, which sometimes resort to increasing the stocks in order to offset the impact of higher supply on sale prices. The higher prices of vegetable oils in recent years can be attributed to the fact that developed countries resorted to using vegetable oils in the production of biodiesel due to the abundant food quantities in such countries, the higher prices of

crude oil, and the problems associated with using crude oil like environmental pollution and heat emission. It should be noted that one of the middle goods used in biodiesel production in the United States of America and Brazil is soybeans, whereas palms, coconut and castor oils are used as the middle goods in biodiesel production in tropical countries, with increased interest in using jatropha too. Moreover, rapeseed is used in biodiesel production in the European Union[1].

Research Problem

In recent years, it has been noted that maintaining stability in the prices of vegetable oils in world markets is very difficult, where they became out of control due to the successive increases in the world prices of oilseed crops in world stock markets despite the fact that world supply of vegetable oils surpasses the quantity demanded. However, the main reason for the occurrence of such problem is that industrial countries resorted to using vegetable oils in fuel production due to the high prices of crude oil, where a large share, estimated at 30% of the produced vegetable oils, is used in biodiesel production[2]. Therefore, the current research investigates the problem of defining the key factors causing fluctuations in the international prices of vegetable oils despite applying the General Agreement on Tariffs and Trade (GATT), which represents a serious threat to the economies of the importing countries.

Research Objective

The research aims to study the key factors influencing the international prices of vegetable oils in world markets, specifically those extracted from soybeans, palms, rapeseed, cottonseed, sunflower, peanuts and olives, through studying the major countries in terms of production, export and stock, in addition to studying the international prices of vegetable oils and the key factors influencing such prices.

Methodology and Sources of Data

The research relied on descriptive statistics to identify the relative importance of the study variables, in addition to quantitative statistics by applying stepwise regression analysis to determine the factors influencing the international prices of vegetable oils. As for the sources of data, the research relied on the statistical database of the United States Department of Agriculture (USDA).

Evolution in World Production, Exports, Imports, Consumption and Stock of Vegetable Oils

Studying the evolution in world production of vegetable oils over the period 2001-2015 indicate that it averaged 134.6 million tons. Signs of the estimated regression equations presented in Table (1) reveal that world production of vegetable oils has been increasing by 6.7 million tons/year, statistically significant at 0.01 level, with annual rate of change amounting to 4.99%. In addition, the coefficient of determination indicates that 99% of the increase in world production of vegetable oils is due to the time variable.

As for the evolution in world exports of vegetable oils over the same period, results indicate that it averaged 55.7 million tons. Signs of the estimated regression equations presented in Table (1) reveal that world exports of vegetable oils has been increasing by 2.3 million tons/year, statistically significant at 0.01 level, with annual rate of change amounting to 4.13%. In addition, the coefficient of determination indicates that 99% of the increase in world exports of vegetable oils is due to the time variable.

Turning to the evolution in world imports of vegetable oils over the same period, results indicate that it averaged 53.1 million tons. Signs of the estimated regression equations presented in Table (1) reveal that world imports of vegetable oils has been increasing by 2.73 million tons/year, statistically significant at 0.01 level, with annual rate of change amounting to 5.14%. In addition, the coefficient of determination indicates that 99% of the increase in world imports of vegetable oils is due to the time variable.

As regards the evolution in world consumption of vegetable oils over the same period, results indicate that it averaged 132.2 million tons. Signs of the estimated regression equations presented in Table (1) reveal that world consumption of vegetable oils has been increasing by 6.5 million tons/year, statistically significant at 0.01 level, with annual rate of change amounting to 4.88%. In addition, the coefficient of determination indicates that 99% of the increase in world consumption of vegetable oils is due to the time variable.

Results regarding evolution in the world stock of vegetable oils over the same period indicate that it averaged 13.1 million tons. Signs of the estimated regression equations presented in Table (1) reveal that world consumption of vegetable oils has been increasing by 0.85 million tons/year, statistically significant at 0.01 level, with annual rate of change amounting to 6.8%. In addition, the coefficient of determination indicates that 89% of the increase in world stock of vegetable oils is due to the time variable.

Table (1) The equations of general time trend for each of the development of production , imports , exports , consumption and the Global stock of vegetable oil during the period (2001-2015)

variable	The equation		Average	R^2	F	The annual rate of change%
	A	**B**				
Global production (million tons)	80.91	6.72 (31.741)	134.6	0.987	1007.51[*]	4.99
Global exports (million tons)	31.68	2.3 (36.902)	55.66	0.991	1361.78[*]	4.13
Global imports (million tons)	31.33	2.7 (43.983)	53.13	0.993	1934.47[*]	5.14
Global consumption of oils(million tons)	80.59	6.5 (42.992)	132.18	0.992	1848.27[*]	4.88
Global stock (million tons)	5.95	0.89 (70.04)	13.08	0.792	49.565[*]	6.8

source:- www.usda.gov

Where (*) :- It refers to the moral level of significance at 0.01 level .

Current Situation of Major World's Vegetable Oils

As shown in Table (2), world production of the vegetable oils under study totaled 169 million tons, of which palm oil accounts for 34.6%. Soybean oil ranked second by accounting for 27.3%, followed by rapeseed oil (15.26%), sunflower oil (8.9%), peanuts oil (3.16%), cottonseed oil (3%) and olive oil that accounted for 2.39% of the world total production of vegetable oils.

Table (2): - global production, imports, exports, consumption and stocks of vegetable oils during the average period (2011-2015) million tons

The vegetable oils	Production		imports		exports		consumption		stock	
	Quantity	**%**	**Quantity**	**%**	**Quantity**	**%**	**Quantity**	**%**	**Quantity**	**%**
soybean	46.19	27.30	9.30	13.90	9.96	14.0	45.65	26.7	3.77	20.9
Palm	58.48	34.60	42.52	63.90	43.97	61.9	56.97	34.5	7.61	42.3
Rapeseed	25.79	15.26	3.95	5.90	4.01	5.6	25.24	15.3	4.01	22.3
Cottonseed	5.07	3.00	0.06	0.10	0.13	0.2	5.03	3.0	0.19	1.00
sunflower	15.00	8.90	6.00	9.00	7.00	9.9	14.00	8.5	2.00	11.0
Peanuts	5.34	3.16	0.21	0.31	0.21	0.3	5.36	3.2	0.05	0.20
Olive	2.93	1.73	0.65	1.00	0.78	1.1	2.84	1.7	0.41	2.30
The world	169		67		71		165		18	

source :- www.usda.gov

Main production countries of palm oil include Indonesia, Malaysia and Thailand, which production account for 89% of the world total production. China, the USA and Argentina produce 62% of the world total production of soybeans oil. As for rapeseed, China, the European Union and Canada produce 74% of the world total production of rapeseed oil. Russia, Ukraine and the European Union produce 73% of the world total production of sunflower oil. Turning to peanuts oil, China and India produce around 70% of the world total production of peanuts oil; China, India and the USA produce 58% of the world total production of cottonseed oil; and finally, Turkey and the European Union produce 74% of the world total production of olive oil as shown in Table (3).

Table (3): - The most important producing countries and importing and exporting of the vegetable oils in the world (million tons) .

vegetable oils	Production			imports			exports			consumption			stock		
	The most important countries	Quantity	%	The most important countries	Quantity	%	The most important countries	Quantity	%	The most important countries	Quantity	%	The most important countries	Quantity	%
Palm oil	Indonesia	30.2	52	India	8.5	20	Indonesia	22.1	50	India	8.7	15	Malaysia	2.2	29
	Malaysia	19.6	34	European Union	6.6	16	Malaysia	17.8	40	Indonesia	8.1	14	Indonesia	1.6	21
	Thailand	2.0	3	China	5.9	14				European Union	6.5	11			
										China	5.9	10			
The world		58.5			42.5			44			57			7.6	
soybean	China	12.5	27	India	2.1	23	Argentina	4.5	45	China	13.5	30	USA	0.9	24
	USA	9.3	20	China	1.2	13	Brazil	1.5	15	USA	8.6	19	China	0.8	21
	Argentina	7.1	15							Brazil	5.9	13			
The world		46.2			9.3			9.9			45.7			3.8	
Rapeseed	China	6.1	24	China	0.8	21	Canada	2.6	65	European Union	9.7	38	China	1.9	48
	European Union	9.7	38	India	0.2	5	European Union	0.3	8	China	6.8	27	Canada	0.2	5
	Canada	3.2	12	European Union	0.4	10				India	2.5	10	European Union	0.3	8
The world		25.8			3.9			4.0			25.2			4.0	
sunflower	Russia	3.7	25	European Union	0.9	15	Ukraine	3.7	53	European Union	3.7	26	Argentina	0.4	20
	Ukraine	4.4	29	Turkey	0.7	12	Argentina	0.5	7	Russia	2.0	14	European Union	0.2	10
	European Union	2.9	19				Russia	1.8	26	Turkey [1]	0.9	6			
The world		15.0			6.0			7.0			14.0			2.0	
Peanuts	China	2.6	49	China	0.1	48	China	0.01	5	China	2.7	50	India	0.02	40
	India	1.1	21	European Union	0.07	33	India	0.01	5	India	1.1	20	USA	0.01	20
										USA	0.1	2			
The world		5.3			.21			0.21			5.4			0.05	
Cottonseed	China	1.4	27	USA	0.01	17	USA	0.07	54	China	1.4	28	India	0.06	32
	India	1.3	25							India	1.3	26	USA	0.04	21
	USA	0.3	6							USA [1]	0.3	6			
The world		5.1			0.06			0.13			5.03			0.19	
Olive	Turkey	0.2	7	USA [1]	0.3	43	European Union	0.6	75	European Union	1.8	64	European Union	0.30	73
	European Union	2.2	76	European Union	0.1	14	Turkey	0.02	3	USA	0.3	11	Turkey	0.02	5
										Turkey	0.1	4			
The world		2.9			0.7			0.8			2.8			0.41	

source:- www.usda.gov

Results in Table (2) also indicate that world total imports of vegetable oils reached 67 million tons, of which palm oil accounts for 63.9%, followed by soybean oil, sunflower oil, rapeseed oil, olive oil, peanuts oil, and cottonseed oil, which imports account for 13.9% 0.9% 5.9% 0.1%, 0.31% and 0.1%, respectively.

Main importing countries of palm oil include India and the USA, which together import 50% of the world total imports of palm oil; China and India import 36% of the world total imports of soybeans oil; China, India and the European Union import 36% of the world total imports of rapeseed oil; the European Union and Turkey import 27% of the world total imports of sunflower oil; China and the European Union import around 81% of the world total imports of peanuts oil; the USA imports 17% of the world total imports of cottonseed oil; and finally, the USA and the European Union import 57% of the world total imports of olive oil, as shown in Table (3).

As regards world exports of major vegetable oils, results indicate that it reached 71 million tons. Palm oil ranked first by accounting for 61.9%, followed by soybean oil (14%), sunflower oil (9.9%), rapeseed oil (5.6%), olive oil (1.1%), peanuts oil (0.3%) and cottonseed oil (0.2%), as shown in Table (2).

Main export countries of palm oil include Indonesia and Malaysia, which together export 90% of the world total exports of palm oil; Argentina and Brazil export 60% of the world total exports of soybeans oil; Canada and the European Union export 73% of the world total exports of rapeseed oil; Ukraine and Argentina export 86% of the world total exports of sunflower oil; China and India export 10% of the world total exports of peanuts oil; the USA exports 54% of the world total exports of cottonseed oil; and finally, the European Union and Turkey export 78% of the world total exports of olive oil, as shown in Table (3).

Data in Table (2) indicate that world total consumption of vegetable oils reached 165 million tons. Palm oil consumption ranked first by accounting for 34.5%, followed by soybean oil (26.7%), rapeseed oil (15.3%), sunflower oil (8.5%), peanuts oil (3.2%), cottonseed oil (3%) and olive oil (1.7%).

Main consuming countries of palm oil include Indonesia, the European Union and China, which together export 50% of the world total consumption of palm oil; China, the USA and Brazil consume 62% of the world total consumption of soybean oil; the European Union, China and India consume 76% of the world total consumption of rapeseed oil; the European Union, Russia and Turkey consume 46% of the world total consumption of sunflower oil; China, India and the USA consume 72% of the world total consumption of peanuts oil; China, India and the USA consume 60% of the world total consumption of cottonseed oil; and finally, the European Union, the USA and Turkey export 79% of the world total exports of olive oil, as shown in Table (3).

It is clear from Table (2) that world total stock of vegetable oils reached 165 million tons. Palm oil stock ranked first by accounting for 42.3%, followed by the stocks of rapeseed oil (22.3%), soybean oil (20.9%), sunflower oil (11%), olive oil (2.3%), cottonseed oil (1%) and peanut oil (1.7%), as shown in Table (2).

Studying the main countries with significant amounts of vegetable oil stocks indicate that Indonesia and Malaysia keep 50% of the world total stock of palm oil; the USA and China keep 45% of the world total stock of soybean oil; China, Canada and the European Union keep 61% of the world total stock of rapeseed oil; Argentina and the European Union keep 30% of the world total stock of sunflower oil; India and the USA keep 60% of the world total consumption of peanut oil; India and the USA keep 53% of the world total stock of cottonseed oil; and finally, the European Union and Turkey keep 78% of the world total stock of olive oil, as shown in Table (3).

International Prices of Vegetable Oils

Studying the international prices of the vegetable oils under study indicate that they have been increasing between 2001 and 2006, where soybean price increased by 88.4%, palm oil price increased by 99%, rapeseed oil price increased by 70.5%, cottonseed price increased by 98.7%, sunflower price increased by 149.3% and peanut oil price increased by 75%. They further increased in 2007 with the emergence of the world food crisis following the world financial crisis, where they increased by 67.7%, 61.5%, 71.7%, 106.1%, 55.7% and 77.6%, respectively, compared to 2006. After that, they started fluctuating between 2007 and 2015 and recorded declines that reached 42.9%, 48.7%, 35.9%, 34.3%, 0.32% and 0.42% compared to 2015, respectively, as shown in Table (4).

Table (4): - World prices of vegetable oils in dollars per ton during the period (2001-2015)

The year	vegetable oils					
	Soybean	Palm	Rapeseed	Cottonseed	Sunflower	Peanuts
2001	363	329	220	396	513	716
2002	486	421	285	832	731	1034
2003	661	481	317	688	738	1317
2004	507	392	262	609	962	1171
2005	516	416	292	649	896	981
2006	684	655	375	787	1279	1253
2007	1147	1058	644	1622	2010	2225
2008	709	633	393	820	1108	1539
2009	793	793	419	888	1164	1353
2010	1173	1154	647	1202	1899	1806
2011	1144	1032	616	1173	1834	2247
2012	1039	791	579	1071	1452	1934
2013	843	803	505	1337	1304	1430
2014	697	626	417	1009	1471	1265
2015	655	539	413	1066	1367	1290

source:- www.usda.gov

Major Factors Influencing International Prices of Vegetable Oils

Equation (1) in Table (5) indicate that key factors influencing international prices of soybean oil include China's production of soybean oil (X_1), USA's production of soybean oil (X_2), Argentina's production of soybean oil (X_3), India's imports of soybean oil (X_4), China's imports of soybean oil (X_5), Argentina's exports of soybean oil (X_6), Brazil's exports of soybean oil (X_7), China's consumption of soybean oil (X_8), USA's consumption of soybean oil (X_9), Brazil's consumption of soybean oil (X_{10}), USA's stock of soybean oil (X_{11}) and China's stock of soybean oil (X_{12}). The estimated Coefficient of Determination indicates that 90% of the changes occurring in the international prices of soybean oil can be attributed to quantity of soybean oil produced by Argentina and quantity of soybean oil imported by India. The estimated relationship proved statistically significant at 0.01 level.

Equation (2) in Table (5) indicate that key factors influencing international prices of palm oil include Indonesia's production of palm oil (X_1), Malaysia's production of palm oil (X_2), Thailand's production of palm oil (X_3), India's imports of palm oil (X_4), European Union's imports of palm oil (X_5), China's imports of palm oil (X_6), Malaysia's imports of palm oil (X_7), Indonesia's exports of palm oil (X_8), India's consumption of palm oil (X_9), Indonesia's consumption of palm oil (X_{10}), European Union's consumption of palm oil (X_{11}), China's consumption of palm oil (X_{12}), Malaysia's stock of palm oil (X_{13}) and Indonesia's consumption of palm oil (X_{14}). The estimated Coefficient of Determination indicates that 60% of the changes occurring in the international prices of palm oil can be attributed to China's consumption of palm oil and quantity of palm oil imported by the European Union. The estimated relationship proved statistically significant at 0.01 level.

Equation (3) in Table (5) indicate that key factors influencing international prices of rapeseed oil include China's production of rapeseed oil (X_1), European Union's production of rapeseed oil (X_2), Canada's production of rapeseed oil (X_3), China's imports of rapeseed oil (X_4), India's imports of rapeseed oil (X_5), European Union's imports of rapeseed oil (X_6), Canada's exports of rapeseed oil (X_7), European Union's exports of rapeseed oil (X_8), European Union's consumption of rapeseed oil (X_9), China's consumption of rapeseed oil (X_{10}), India's consumption of rapeseed oil (X_{11}), China's stock of rapeseed oil (X_{12}), Canada's stock of rapeseed oil (X_{13}) and European Union's stock of rapeseed oil (X_{14}). The estimated Coefficient of Determination indicates that 47% of the changes occurring in the international prices of rapeseed oil can be attributed to European Union's imports of rapeseed oil. The estimated relationship proved statistically significant at 0.01 level.

Equation (4) in Table (5) indicate that key factors influencing international prices of cottonseed oil include China's production of cottonseed oil (X_1), India's production of cottonseed oil (X_2), USA's production of cottonseed oil (X_3), USA's exports of cottonseed oil (X_4), China's consumption of cottonseed oil (X_5), India's

consumption of cottonseed oil (X_6), USA's consumption of cottonseed oil (X_7), India's stock of cottonseed oil (X_8), USA's stock of cottonseed oil (X_9). The estimated Coefficient of Determination indicates that 41% of the changes occurring in the international prices of cottonseed oil can be attributed to India's production of cottonseed oil. The estimated relationship proved statistically significant at 0.01 level.

Table (5): - The most important factors that influencing of international prices *of Vegetable Oils*

Equations	The oil	The equation	R^2	f
1	Soybean	$Y= -24.102+201.352X_3-279.883X_4$ (9.527) (-7.728)	0.899	53.672
2	Palm	$Y= 324.718+195.049X_{12}-109.064X_5$ (3.041) (-2.252)	0.603	7.610
3	Rapeseed	$Y= 230.641+607.987X_6$ (2.970)	0.469	8.823
4	Cotton seed	$Y= -216.886+1120.432X_2$ (2.629)	0.409	6.912

source:- www.usda.gov

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