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Volatility Linkages between Agricultural Commodity Prices, Oil Prices and Real USD Exchange Rate

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ABSTRACT

This study examines the dynamic nexus betwixt oil prices, twenty-two world agricultural commodity prices and given the evolution of the relative strength of the US dollar in a panel setting. We use panel cointegration and panel Granger causality methods for a panel of twenty-two agricultural products based on annual observations ranging from 1980 to 2015. The empirical results provide a strong evidence of long-term relationship between Agricultural Commodity Prices, Oil Prices and Real USD Exchange Rate. Contrary to the findings of many studies in the literature that report neutrality of agricultural prices to oil price changes, we find strong support of bi-directional causal linkages among Agricultural Commodity Prices, Oil Prices and Real USD Exchange Rate. The long-run causality analysis thereby implies that the oil prices and the dollar have a predictive power to forecast the agricultural prices, which could be a good tool to prioritize the allocation of resources across industries to ensure agricultural scenario in general and economic outcomes.

Keywords: Oil prices; exchange rates; agricultural commodity prices; panel cointegration; FMOLS-DOLS estimators; panel Granger causality.
JEL classification: B22; C33; C51; F31; N50; Q02; Q11; Q41.
MSC2010: 62P20; 91B84; 62J05; 91B82; 91B24; 37M10.

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Vínculos de volatilidad entre precios de productos agrícolas, precios del petróleo y tipo de cambio del dólar estadounidense

RESUMEN

Este estudio examina la relación dinámica entre los precios del petróleo del mundo y veintidós precios de las materias primas agrícolas del mundo que explican cambios en la fuerza relativa del dólar estadounidense en un panel. Empleamos los métodos del cointegracin de panel y de la causalidad de Granger para un panel de veintidós productos agrícolas basados en las observaciones anuales que se extienden de 1980 a 2015. Los resultados empíricos proporcionan una prueba evidente de la relación a largo plazo entre los precios de las materias primas agrícolas, los precios del petróleo y el tipo de cambio real del dólar estadounidense. Al contrario de los hallazgos en muchos estudios en la literatura que exponen la neutralidad de los precios agrícolas frente a los cambios en el precio del petróleo, nosotros encontramos un fuerte respaldo a la existencia de acoplamientos causales bidireccionales entre precios de las materias primas agrícolas, precios del petróleo y el tipo de cambio real del dólar estadounidense. El análisis a largo plazo de la causalidad, de este modo, implica que los precios del petróleo y del dólar tienen un poder profético para prever los precios agrícolas, que podrían ser una buena herramienta para priorizar la asignación de recursos a través de industrias para asegurar el escenario agrícola en general y los resultados económicos.

Palabras claves: precios del aceite; tipos de cambio; precios de los productos agrícolas; cointegración del panel; estimadores FMOLS-DOLS; panel de causalidad Granger.
Clasificación JEL: B22; C33; C51; F31; N50; Q02; Q11; Q41.
MSC2010: 62P20; 91B84; 62J05; 91B82; 91B24; 37M10.

1. Introduction

Since the dawn of human civilisation, agriculture had a significant consideration as one of the major aspects for the existence and endurance of the humankind, which has gone through remarkable developments in different areas. Nowadays, the world is a subject to various changes in all fields; nevertheless, agriculture is still the key to its future as it covers different levels within human societies including: Food, territory, international trade, energy resources, relationship to nature, social balance... Additionally, with the 2008 overall food crisis and the increasing demand during the period of 2010-2011, the agriculture commodity markets became the core interest of the worldwide concerns and a top priority ever since. This priority; represented by agricultural commodity prices, exhibits co-movement alongside oil prices. From 2006 to 2008, there was a rise in agricultural prices but the important thing that was noticed is that this rise was accompanied by an increase in the world oil prices. Consequently, this spotted co-movement has opened the door to many researches to examine two principal hypotheses of transmission mechanisms between energy and food commodity prices.

On one hand, the first is based on the direct influence of oil prices on agricultural commodity prices. It indicates that rising oil-price levels generate a higher agricultural commodity prices across cost-push effects by increasing cost of production and also through higher demand for the agricultural commodities that need more biofuel production by increasing the demand of this latter. On the other hand, the second supposes that there is an indirect impact of energy prices on food commodity prices through the exchange rate. According to Abbott *et al.* (2008), the local currency depreciation arising from the increasing of current account deficit through exchange rate effects is a logical consequence of a rising in oil prices. In the same vein, Gilbert (2010) and Baffes and Haniotis (2010) put forward that in addition to weather shocks, energy shocks, increased biofuel usage and high world liquidity, weak dollar, fiscal and monetary expansion are other good enlightenments for the 2006 "food crisis".

The principal goal of this paper is to break down the interrelationships between these three critical definitive elements of the genuine monetary movement: The agricultural commodity price, the world crude oil price and real effective US dollar exchange rate. Oil price, agricultural commodity prices and exchange rate have mostly picked up unmistakable quality in cutting edge and developing nations; and as it is as of now referred to above, there are two primary clarifications for these causal connections between these factors (Headey and Fan, 2008), theory of direct effect and the second speculation alludes to aberrant impact. The principal speculation (coordinate impact) incorporates the distinctive instruments of macroeconomic execution and item value blasts which can be formed by major elements; for example, supply stuns (e.g., overload, charge limitations), climate stuns, profitability stoppage, stock decays and request developments (e.g., growth in demand from Turkey, Malaysia, China and other rising nations and biofuel request). Be that as it may, alternate theory of aberrant impact reflects non-crucial elements; for example, the money related strategy positions and fates markets, which are the determinants of low financing costs, the USD devaluation, likewise influence the valuing components of an economy. Alongside these drivers and components, the administrative approach changes; for example, the entry of the Renewable Fuel Standard in the Energy Policy Act of 2005 in the US have constituted a critical part in the expansion of the US ethanol production. This last yielded a more grounded connection between oil and rural ware costs and both the creation and interest for biofuels (Zhang *et al.*, 2010). Nevertheless, there is no unanimity on the impact of these strategy changes yet totally such arrangement measures make a considerably more unpredictable market circumstance.

Additionally, we put likewise the highlight on the genuine compelling US dollar conversion standard to our experimental models to get more palatable outcomes on the connection between the World Unrefined Petroleum Cost and the Farming Item Cost. Without a doubt, a weak USD taken after by a deterioration of the USD against real monetary forms, carries on higher item costs through expanding remote request and obtaining power (He *et al.*, 2010). Late reviews, as Akram (2009) or Harri *et al.* (2009), demonstrate the part of a frail dollar on the item cost swelling which prompts increment the ware costs.

A significant issue is the following: Is there a long-term relationship between Agricultural Commodity Price, World Crude Oil Price and real effective US dollar exchange rate? The reply to this query is the reason for the ranking of articles published about these relationships.

As indicated by the clarifications, data and furthermore to the inquiry expressed over, the general thought of this review is to examine the long-term connections among world unrefined petroleum value (Raw Petroleum Normal Cost: "Normal Oil Price of Dubai, UK Brent and West Texas Halfway"), genuine successful US dollar conversion standard and agricultural commodity prices (twenty-two farming wares), utilizing panel cointegration test and panel Granger causality test to decide the feeling of causality between these factors (impartial assumption, input suspicion or unidirectional causality presumption).

The remnant of this paper is organized as follows: Section 2 shows the study of the literature on Agricultural Commodity Price, World Crude Oil Price and real effective US dollar exchange rate. Section 3 presents the data and the methodology used in this study. Section 4 reports the results from the analysis of empirical results. Finally, conclusions and policy implications are presented in Section 5.

2. Literature review

In the most recent years, there are many reviews on the relations between raw petroleum and agrarian item showcases. A large portion of these papers concentrates on value relations and unpredictability overflows; see the survey in Serra and Zilberman (2013) and Zilberman *et al.* (2012). This paper highlights the value connections, so in this segment we will survey a few papers identified with this subject.

Yu *et al.* (2006) and Kaltalioglu and Soytas (2009) did not distinguish any impact of oil costs on consumable oil (sunflower oil, olive oil and so on) costs and furthermore on farming crude material value list, individually.

Zhang and Reed (2008) likewise manage that oil value stuns do not trigger a reaction in corn, soy supper and pork costs in China. For the case of Turkey, Nazlioglu and Soytas (2011) achieve closely resembling outcomes. Mutuc *et al.* (2010) demonstrate a confirmation of a powerless impact of oil costs on US cotton costs. In addition, Baffes (2007) gets some confirmation of solid impact of oil value change on nourishment value record, as well as he investigates singular item costs independently. A few years later, Baffes (2010) finds that the most astounding going through from vitality costs to non-vitality costs exists for manure list taken after by agribusiness. In spite of the fact that the significance of vitality costs for horticultural divisions is accentuated, there is still no agreement in the observational writing on the transmission of oil value stuns to individual agrarian markets.

Other reviews demonstrate that unrefined petroleum costs impressively affect rural item costs.

Among these reviews, direct relapse models (for example, VAR, VEC and the relating cointegration and causality tests) are generally utilized. Saghaian (2010) finds the cointegration connections between unrefined petroleum and corn, soybean and wheat costs and the causality running from oil costs to these farming ware costs. Utilizing the standard part examination and causality test, Esmaeili and Shokoohi (2011) locate that unrefined petroleum costs have impacts on nourishment generation file and, therefore, effectively affect sustenance costs. Cha and Bae (2011) utilize a basic VAR with sign confinement and demonstrate that increments in unrefined petroleum costs will expand the costs of and interest for corn. Chen *et al.* (2010a) utilize an autoregressive disseminated slack model (ARDL) to uncover that each grain cost is essentially influenced by raw petroleum and other grain costs. Reboredo (2012) applies distinctive copulas to demonstrate details with both time-invariant and time-shifting reliance structures to decide if key agrarian items (an indistinguishable horticultural merchandise from Chen *et al.* (2010); corn, soybean and wheat) are safe from the impacts of oil value changes. His outcomes demonstrate no causal effect of oil value spikes on rural costs.

In any case, the previously mentioned reviews may experience the ill effects of a discarded variable inclination, since oil and rural items are overwhelmingly exchanged US-Dollars. The conversion standard ought to be considered along these lines too (Nazlioglu and Soytas, 2012). The primary review considering the swapping scale as a driving variable of product costs was directed by Schuh (1974). He contends that the undervaluation of farming costs after World War II was because of the overvaluation of the US-Dollar. All the more as of late, Chen *et al.* (2010b) find that trade rates are helpful in estimating item costs.

Additionally, approaches that consider the swapping scale and the oil price as basic components have been directed. Harri *et al.* (2009) direct a Johansen cointegration examination between the conversion scale and prospects costs for unrefined petroleum, corn, soybeans, soybean oil, cotton and wheat for the period from 2000 to 2008. Except for wheat, they discover a cointegration connection between the farming costs and the oil costs, as well as the trade rates. Nazlioglu and Soytas (2012) direct a panel cointegration and causality investigation between 24 world farming product costs, world oil costs and trade rates. The creators find solid support for the theory of data transmission from oil to farming costs. Furthermore, they discover an effect of the conversion standard on farming costs.

A few scientists indicate blended outcomes on oil-agricultural item value connections. They discuss whether the impacts of oil value changes on rural item costs altogether depend on the time of information test, the particular nation, the particular horticultural wares and the extents of oil value changes. For instance, Natanelov *et al.* (2011) find that the co-development is period subordinate and that some monetary and strategy improvements may change the connection between wares. Campiche *et al.* (2007) locate that unrefined petroleum and primary farming ware costs are not cointegrated in the 2003-2005 period. In any case, corn costs and soybean costs are cointegrated with raw petroleum costs in the 2006-2007 period. Ciaian and Kancs (2011a) demonstrate that the interdependencies between sustenance and vitality markets are expanding after some time. Costs of nine farming items are all cointegrated with raw petroleum costs in the 2005-2010 period, though little proof of cointegration is found in 1993-1998 and 1999-2004. Their discoveries are additionally affirmed by Ciaian and Kancs (2011b). Kristoufek *et al.* (2012) dissect the connections between the costs of biodiesel, ethanol and related fills and horticultural products with utilization of negligible traversing trees and progressive trees. They look at the periods before and after the nourishment emergency of 2007-2008 and find that the associations are significantly more grounded for the post-emergency period. Wixson and Katchova (2012) locate the topsy-turvy relations that the sizes of reactions of agrarian product costs to increments and abatements in oil costs are distinctive. Rosa and Vasciaveo (2012) find that, in the sense of Granger, oil price can bring about wheat, corn and soybean costs in the US; however the causality does not hold for oil price and horticultural product costs in Italy.

Evidently, the specimen length and the information recurrence have a critical impact on exact outcomes. Particularly as to corn and soybeans, a cointegration connection with raw petroleum was dominatingly discovered all the more as of late because of, so the contention goes, the expansion of biofuel production.

3. Data and methodology

All the information utilized as a part of this review is yearly perceptions covering the period from 1980 to 2015, got from two sources: Information on Agricultural Commodity Price (genuine 2010 U.S. dollars) is got from the World Bank Commodity Price Data; the world raw petroleum costs (Average oil price of Dubai, UK Brent and West Texas Intermediate) are cited in genuine 2010 U.S. dollars and the genuine compelling swapping scale of the U.S. dollar characterized by file (2010 = 100) is separated from the World Bank Development Indicators (WDI). Our database incorporates 22 Agricultural Commodity (i=1,…, 22, see Table 1). We group all the products into just a single heterogeneous board to look at if there are any auxiliary contrasts. To maintain a strategic distance from information irregularity coming from measuring the costs in various units and to work with genuine qualities, we utilize the cost files (2010=100) that are acquired from the World Bank Data.

Table 1: Data description.

	Commodity Price	*Description*	*Unit*
1	Barley	Canada (Winnepeg)	U.S. dollars per metric ton
2	Maize	United States (US Gulf ports)	U.S. dollars per metric ton
3	Wheat, US HRW	United States (US Gulf ports)	U.S. dollars per metric ton
4	Sorghum	United States (US Gulf ports)	U.S. dollars per metric ton
5	Soybeans	United States (Rotterdam)	U.S. dollars per metric ton
6	Cotton, A Index	Liverpool index	U.S. dollars per kg
7	Coconut oil	Philippines (New York)	U.S. dollars per metric ton
8	Groundnut oil	Any origin (Europe)	U.S. dollars per metric ton
9	Palm oil	Malaysia (Rotterdam)	U.S. dollars per metric ton
10	Soybean oil	All Origins (Dutch ports)	U.S. dollars per metric ton
11	Cocoa	Brazil	U.S. dollars per kg
12	Coffee, Arabica		U.S. dollars per kg
13	Tea	Average 3 auctions (London)	U.S. dollars per kg
14	Tobacco	United States (all markets)	U.S. dollars per metric ton
15	Sugar	World	U.S. dollars per kg
16	Banana, US	Latin America (US ports)	U.S. dollars per kg
17	Orange	French import price	U.S. dollars per kg
18	Beef	Australia–NZ (US ports)	U.S. dollars per kg
19	Meat, sheep	New Zealand (London)	U.S. dollars per kg
20	Meat, Chicken	United States(Georgia)	U.S. dollars per kg
21	Fish meal	Any Origin (Hamburg)	U.S. dollars per metric ton
22	Rice, Thai 5%	Thailand (Bangkok)	U.S. dollars per metric ton
23	Oil prices	Average price[a]	U.S. dollars per barrel
24	Exchange rate	United States (effective)	Index number (2010=100)

[a] Average oil price of Dubai, UK Brent and West Texas Intermediate.

In the examination of the relationship in long-run panel information, the decision of the fitting system is an imperative hypothetical and observational question. Co-coordination is the most proper method to concentrate the long-term connection between Agricultural Commodity Price, World Crude Oil Price and genuine compelling US dollar conversion standard. The exact methodology utilized as a part of this paper can be partitioned into four fundamental stages. To begin, unit root tests in panel arrangement are embraced. Second, on the off chance that they are incorporated from a similar request, the panel co-joining tests are utilized. Third, if the arrangement is co-coordinated, the vector of co-combination in the long run will be evaluated by utilizing the FMOLS and DOLS strategies. Fourth, we lead an impulse-response work analysis. Fifth, in the wake of assessing the long-term relationship utilizing FMOLS and DOLS strategies and the investigation of the impulse-response diagram, we continue to panel Granger causality.

4. Empirical results

The general specification of the model that we estimate, can be written as follows

$$\mathrm{ACP}_{\mathrm{it}} = \mathrm{a}_{0\mathrm{i}} + \mathrm{b}_{1\mathrm{i}}\mathrm{OP}_{\mathrm{it}} + \mathrm{b}_{2\mathrm{i}}\mathrm{EXR}_{\mathrm{it}} + \varepsilon_{\mathrm{it}}$$

where: ACP is the Agricultural Commodity Price; OP is the World Crude Oil Price; EC is the real effective US dollar exchange rate; and ε_t is an error term. This equation is viewed as an adjusted long-term relationship on the off chance that it has co-reconciliation relations. The information should then be coordinated in the same order.

We will test the stationarity and the relationship of long-term arrangement of these factors; the specialized unit root and co-integration panel data require at least homogeneity, keeping in mind the end goal to reach more general conclusions. It is consequently that we constitute our example from 22 Agricultural Items to obtain more suitable conclusions.

4.1 Unit root tests

To research the stationarity of the series used, we have used the unit root tests on panel data (LLC, IPS and MW). The results of these tests are exhibited in Table 2.

Table 2: Results for panel unit root tests.

Null: unit root					
Methods / Variables		Levin, Lin and Chu, 2002 (LLC)	Im, Pesaran And Shin, 2003 (IPS) W-stat	MW–ADF Fisher Chi-square	MW–PP Fisher Chi-square
Level	LOGACP	-2.97483*	-2.29728	67.7889	77.5392*
		(0.0015)	(0.0138)	(0.0121)	(0.0013)
	LOGOP	-0.05951	0.97435	22.5243	23.6456
		(0.4763)	(0.8351)	(0.9970)	(0.9949)
	LOGGEXR	2.44557	-0.66704	35.4200	63.8384
		(0.9928)	(0.2524)	(0.8185)	(0.0268)
First difference	ΔLOGACP	-22.3694*	-22.9768*	472.955*	526.840*
		(0.0000)	(0.0000)	(0.0000)	(0.0000)
	ΔLOGOP	-16.6525*	-20.2239*	405.255*	405.255*
		(0.0000)	(0.0000)	(0.0000)	(0.0000)
	ΔLOGEXR	-10.7541*	-10.9043*	196.118*	179.049*
		(0.0000)	(0.0000)	(0.0000)	(0.0000)

* Significance at 1%. Δ is the first difference operator.

From the results of the unit root tests performed for the panel of the examination above, we can reach the following inferences: All the statistics are not significant at the 1% level for the three factors (ACP, Operation and EXR). After separation into first-level information, we see a critical way that all the information is stationary for all the factors. These results led us to a legitimate approach to test the presence or absence of a long-term relationship between all the factors by applying co-integration test.

4.2 Co-integration

Co-integration test requires that all factors must be incorporated with the same order. The aftereffects of panel unit root test demonstrate that ACP, Operation and EXR are coordinated at first order; we proceed to panel co-integration test and that by depending on Pedroni tests (Pedroni, 1999, 2004). The results are shown in Table 3.

Table 3: Results for panel cointegration tests.

Methods	Within dimension (panel statistics)			Between dimension (individual statistics)		
	Test	Statistics	Prob	Test	Statistics	Prob
LOGACP LOGOP LOGEXR						
Pedroni (1999)	Panel v-statistic	-0.097160	0.5387	Group ρ-statistic	-1.087748	0.1384
	Panel rho-statistic	-3.229271	0.0006*	Group pp-statistic	-5.454545	0.0000*
	Panel PP-statistic	-5.571464	0.0000*	Group ADF-statistic	-6.438234	0.0000*
	Panel ADF-statistic	-6.345920	0.0000*			
Pedroni (2004) (Weighted statistic)	Panel v-statistic	-1.951262	0.9745			
	Panel rho-statistic	-2.621413	0.0044*			
	Panel PP-statistic	-4.674052	0.0000*			
	Panel ADF-statistic	-6.858911	0.0000*			

* Significance at 1%. Δ is the first difference operator.

Table 3 reports panel co-reconciliation test insights of both within and between estimations for the panel. These insights rely on upon midpoints of the individual autoregressive coefficients related to the unit root test for the residuals of the panel. Table 3 lays out the consequences of seven statistical Pedroni co-incorporation; five probability qualities are under 1%. Panel rho-statistic, panel PP-statistic and panel ADF-statistic are generally regarding intra-solitary tests, and we have group PP-statistic and group ADF-statistic for testing between individual data; this exhibits that there is a long-term relationship (co-coordination) between the variables in the model.

The results that we have obtained show the significance and energy of co-incorporation tests in loading up and standing out from the trial of time arrangement. In this progression, we evaluate the whole deal associations, pooled and amassed, by using FMOLS techniques and DOLS estimators proposed by Pedroni (2001a, 2001b, 2004) and Mark and Sul (2003). FMOLS and DOLS estimators give particular results. Note that the DOLS methodology has the inconvenience of diminishing the amount of degrees of adaptability including leads and lags in the factors being inspected, which points out less dependable assessments. With respect to our basic example, especially in the common estimation, the assessed DOLS can give satisfactory results.

4.3 Estimating the long-term co-integration relationship in a panel context

We have set up that all factors are stationary of the same order and display long-term co-integration panel in the previous subsections. Next, we appraise the long-term effect of the World Crude Oil Price “OP” and the genuine effective US dollar conversion scale "EXR" on the Agricultural Commodity Price “ACP”. The aftereffects of panel FMOLS method are similar to those of DOLS estimators; all the outcomes are exhibited in Table 4.

Table 4: Estimated long-term relationship for twenty-two Agricultural Commodity Price

Dependent Variable	FMOLS		DOLS	
“LOGACP”	**Independent Variables**		**Independent Variables**	
Variables	LOGOP	LOGEXR	LOGOP	LOGEXR
Within Results	[0.315502 (0.0000)*	[-0.074693 (0.0002)*	[0.303487 (0.0000)*	[-0.235393 (0.0049)*
Between Results	[0.287038 (0.0000)*	[-0.134049 (0.0156)	[0.291807 (0.0000)*	[-0.166470 (0.0118)

* Significance at 1%.

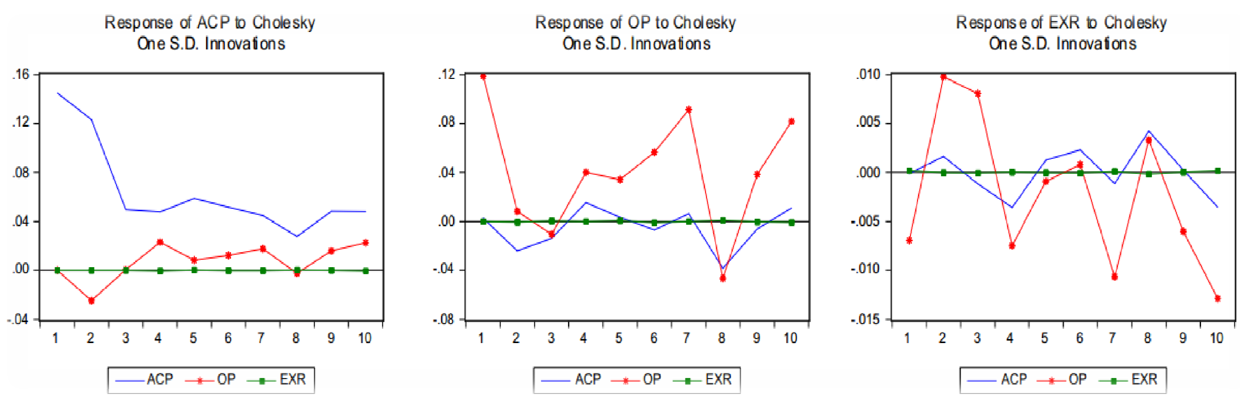
As indicated above, we used two methods for gaining evaluations of parameters of the long-term connection between Agricultural Commodity Price, World Crude Oil Price and genuine compelling US dollar swapping scale. Table 3 shows the eventual outcomes of FMOLS and DOLS. The coefficients of the heterogeneous panel in pooled estimation and amassed estimation are certain at the World Crude Oil Cost, negative for the genuine powerful US dollar transformation standard and they both are quantifiably essential at a significance level of 1% for FMOLS and DOLS system. The coefficients can be deciphered as adaptability since the variables are conveyed in typical logarithms. Overall, the consequences of this investigation show that there is a strong whole deal association between autonomous factors and ACP.

The results got for the all-heterogeneous panel in pooled and assembled estimation suggest that an increment of 1% in OP involves that the ACP increases, respectively, 0.315502% and 0.287038%; on the other hand, if EXR increases at 1%, then the ACP is reduced, respectively, at 0.074693% and 0.134049%. These results highlight the consideration of World Raw petroleum Cost and genuine compelling US dollar swapping scale to Horticultural Product Cost.

4.4 Impulse-response function analysis

The impulse-response capacity of this model is to analysis dynamic impacts of the framework when the model gets the impulse. As in our model, we have three factors. We can work the reaction between these factors. With a specific end goal to show more clearly the reaction, we plot the diagram as Figure 1.

Figure 1: Impulse-response graph.



In Figure 1, the left-side graph shows the response of ACP to ACP, OP and EXR advancements. Right when the motivation is ACP, the ACP response is positive at each response time period. With respect to the OP drive, for the underlying three years there is a negative response of the ACP; after the third year, this takes pretty much a positive direction. The estimation of ACP response to EXR progression wavers around the horizontal axis.

The central diagram in Figure 1 is the response of OP to ACP, OP and EXR advancements. Right when the drive is OP, we observe a criticality of variations for the OP response as esteemed in the outline. With regard to the ACP impulse, the OP response has an obvious instability between positive and negative values. The OP response to EXR shock shows a smooth instability around the horizontal axis.

The right-side graph reveals the response of EXR to ACP, OP and EXR advancements. Right when the motivation is OP, we raise a degree of sinusoidal variations for the EXR response as can be esteemed in the outline for the whole time frame, where the critical part is arranged in the negative side. Concerning the ACP drive, the EXR response additionally shows an observable assortment required in a positive and negative range. At last, the response of EXR to EXR innovations shows a low instability around the horizontal axis.

4.5 Panel Granger causality results

The nearness of co-joining proposes the nearness of causality at any rate in one heading. Having set up that there is a long-term association between APC, Operation and EXR, this progression is done fairly to take a look at the causal association between these variables by using panel Granger causality test. A panel Granger causality examination is performed to choose whether there will be a potential consistency control starting with one marker then onto the next.

Table 5 compress every consequence of causality. The ideal structure of deferrals was built up utilizing the Akaike and Schwarz data criteria (Akaike, 1974; Schwarz, 1978).

Table 5: Results of panel Granger causality test.

Lags = 11	ACP	OP	EXR
ACP	✗	3.80055* → (3.E-05)	10.7895* → (5.E-18)
OP	12.5573* → (3.E-21)	✗	369.061* → (2E-239)
EXR	5.84576* → (6.E-09)	55.3210* → (1.E-80)	✗

* Significance at 1%.

Table 5 demonstrates that there is a cause-and-effect relation, which can be summarized as Granger causality keeps running from OP to ACP, from EXR to ACP and from OP to EXR for various Agricultural products; as well as causality in the reverse direction. Therefore, the assumption of feedback (bidirectional connection between these factors pairwise in which the causality comes in both directions) is affirmed for these wares. In this way, the effect from World Crude Oil Price and genuine compelling US dollar Exchange rate will influence the Agricultural Commodity Price and the other way around. Similar comments can be stated for whatever other causality connection between factors.

5. Conclusion and policy implication

This survey is to investigate the hypothesis validity of dynamic connections between world oil costs, US dollar quality relative changes (genuine successful exchange rate of the U.S. dollar) and twenty-two world agrarian items costs in a panel setting. We use panel cointegration and Granger causality procedures for a panel made out of twenty-two cultivating products in light of yearly costs going from 1980 to 2015. Immediately, the results exhibit strong evidence of the impact of the oil costs on cultivating product costs. Regardless of the eventual outcomes of many surveys in the literature that raise the impartial causality of agrarian expenses to oil esteem changes, we get strong support for information transmission from world oil expenses to a couple of farming product costs. On the other hand, the beneficial outcome of a weak dollar on agrarian expenses is also asserted by a strategy of panel test. The discoveries indicated by Baffes and Haniotis (2010), prescribe that the association among essentialness and cultivating product expenses may depend on upon the level of precariousness. Any key system pointing the esteemed consistent quality must consider this fact. These results demonstrate the pressing requirement for arranging facilitated key courses of action for both essentialness and farming segments.

In addition, our results also recommend that money-related authorities should consider the way that product markets may be globally organized. More research on the determinants of significant worth insecurity and its impact on information transmission between business divisions could be critical. As suggested by Kaltalioglu and Soytas (2011), researching the way in which overall product markets affect neighborhood expenses may moreover be profitable. In addition, regardless of the non-feasibility for using high repeated data as in this survey, a demand-side approach may enhance the learning in his field.

References

Abbott, P. C.; Hurt, C. and Tyner, W. E. (2008). What's driving food prices? *Farm Foundation Issue Report*, July 2008.

Akaike, H. (1974). A new look at the statistical identification model. *IEEE Transactions on Automatic Control*, 19, 716-723.

Akram Q. F. (2009). Commodity prices, interest rates and the dollar. *Energy Economics*, 31: 838-851.

Baffes, J. (2007). Oil spills on other commodities. *Resources Policy*, 32, 126-134.

Baffes, J. (2010). More on the energy/non-energy price link. *Applied Economic Letters*, 17, 1555-1558.

Baffes, J. and Haniotis, T. (2010). Placing the 2006/08 commodity price boom into perspective. *World Bank Policy Research Paper* No. 5371.

Campiche, J. L.; Bryant, H. L.; Richardson, J. W. and Outlaw, J. L. (2007): Examining the evolving correspondence between petroleum prices and agricultural commodity prices. *2007 Annual Meeting*, July 29-August 1, 2007. Portland, Oregon: American Agricultural Economics Association.

Cha, K. S. and Bae, J. H. (2011). Dynamic impacts of high oil prices on the bioethanol and feedstock markets. *Energy Policy*, 39, 753-760.

Chen, S.-T.; Kou, H.-I. and Chen, C.-C. (2010a). Modeling the relationship between the oil price and global food prices? *Applied Energy*, 87(8), 2517-2525.

Chen, Y.-C.; Rogoff, K. S. and Rossi, B. (2010b). Can exchange rates forecast commodity prices? *The Quarterly Journal of Economics*, 125(3), 1145-1194.

Ciaian, P. and Kancs, d'A. (2011a). Food, energy and environment: Is bioenergy the missing link. *Food Policy*, 36, 571-580.

Ciaian, P. and Kancs, d'A. (2011b). Interdependencies in the energy–bioenergy–food price systems: A cointegration analysis. *Resource and Energy Economics,* 33, 326-348.

Esmaeili, A. and Shokoohi, Z. (2011). Assessing the effect of oil price on world food prices: Application of principal component analysis. *Energy Policy*, 39, 1022-1025.

Gilbert, C.L. (2010). How to understand high food prices. *Journal of Agricultural Economics,* 61, 398-425.

Harri, A.; Nalley, L. and Hudson, D. (2009). The relationship between oil, exchange rates, and commodity prices. *Journal of Agricultural and Applied Economics,* 41, 501-510.

He, Y.; Wang, S. and Lai, K.K. (2010). Global economic activity and crude oil prices: A cointegration analysis. *Energy Economics,* 32, 868-876.

Headey, D. and Fan, S. (2008). Anatomy of a crisis: The causes and consequences of surging food prices. *Agricultural Economics*, 39, 375-391.

Im, K.S.; Pesaran, M.H. and Shin, Y. (2003): Testing for unit roots in heterogeneous panels. *Journal of Econometrics*, 115, 53-74.

Kaltalioglu, M. and Soytas, U. (2009). Price transmission between world food, agricultural raw material, and oil prices. *2009 Proceedings of Global Business and Technology Association (GBATA)*, July 7-11, 2009. Prague: Global Business and Technology Association, pp. 596-603.

Kristoufek, L.; Janda, K. and Zilberman, D. (2012). Correlations between biofuels and related commodities before and during the food crisis: A taxonomy perspective. *Energy Economics*, 34, 1380-1391.

Levin, A.; Lin, C.F. and Chu, C.-H.J. (2002). Unit root tests in panel data: asymptotic and finite-sample Properties. *Journal of Econometrics,* 108, 1-24

Mark, N.C. and Sul, D. (2003). Cointegration vector estimation by panel DOLS and long-run money demand. *Oxford Bulletin of Economics and Statistics*, 65, 665-680.

Mutuc, M.; Pan, S. and Hudson, D. (2010). Response of cotton to oil price shocks. *Agricultural Economic Review,* 12, 40-49.

Natanelov, V.; Alam, M.J.; McKenzie, A.M. and Huylenbroeck, G.V. (2011). Is there co-movement of agricultural commodities futures prices and crude oil? *Energy Policy*, 39, 4971-4984.

Nazlioglu, S. and Soytas, U. (2011). World oil prices and agricultural commodity prices: Evidence from an emerging market. *Energy Economics*, 33, 488-496.

Nazlioglu, S. and Soytas, U. (2012). Oil price, agricultural commodity prices, and the dollar: A panel cointegration and causality analysis. *Energy Economics*, 34, 1098-1104.

Pedroni, P. (1999). Critical values for cointegration tests in heterogeneous panels with multiple regressors. *Oxford Bulletin of Economics and Statistics*, 61, 653-678.

Pedroni, P. (2001a). Fully modified OLS for heterogeneous cointegrated panels. In Baltagi, B.H. (ed.): *Nonstationary Panels, Panel Cointegration, and Dynamic Panels (Advances in Econometrics, Volume 15)*. New York: Emerald Group Publishing (pp. 93-130).

Pedroni, P. (2001b). Purchasing power parity tests in cointegrated panels. *Review of Economics and Statistics*, 83, 727-731.

Pedroni, P. (2004). Panel cointegration: Asymptotic and finite sample properties of pooled time series tests with an application to the PPP hypothesis. *Econometric Theory*, 20, 597-625.

Reboredo, J.C. (2012). Do food and oil prices co-move? *Energy Policy*, 49, 456-467.

Rosa, F. and Vasciaveo, M. (2012). Volatility in US and Italian agricultural markets, interactions and policy evaluation. *123rd EAAE Seminar "Price Volatility and Farm Income Stabilisation"*, February 23-24, 2012. Dublin: European Association of Agricultural Economists.

Saghaian, S. H. (2010). The impact of the oil sector on commodity prices: Correlation or causation? *Journal of Agricultural and Applied Economics,* 42, 477-485.

Schuh, G. E. (1974). The exchange rate and U.S. agriculture. *American Journal of Agricultural Economics*, 56, 1-13.

Schwarz, G. (1978). Estimating the dimension of a model. *Annals of Statistics*, 6, 461-464.

Serra, T. and Zilberman, D. (2013). Biofuel-related price transmission literature: A review. *Energy Economics,* 37, 141-151.

Wixson, S. and Katchova, A.L. (2012). Price Asymmetric Relationships in Commodity and Energy Markets. *123rd EAAE Seminar "Price Volatility and Farm Income Stabilisation"*, February 23-24, 2012. Dublin: European Association of Agricultural Economists.

Yu, T.-H.; Bessler, D.A. and Fuller, S. (2006). Cointegration and Causality Analysis of World Vegetable Oil and Crude Oil Prices. *2006 Annual Meeting*, July 23-26, 2006, Long Beach, California: American Agricultural Economics Association.

Zhang, Z.; Lohr, L.; Escalante, C. and Wetzstein, M. (2010). Food versus fuel: What do prices tell us? *Energy Policy*, 38: 445-451.

Zhang, Q. and Reed, M. (2008). Examining the impact of the world crude oil price on China's agricultural commodity prices: The case of corn, soybean, and pork. *2008 Annual Meeting*, February 2-5, 2008. Dallas, Texas: Southern Agricultural Economics Association.

Zilberman, D.; Hochman, G.; Rajagopal, D.; Sexton, S. and Timilsina, G. (2012). The impact of biofuels on commodity food prices: assessment of findings. *American Journal of Agricultural Economics,* 95, 275-281.