Bangladesh Development Studies
Vol. XXXVIII, March 2015, No. 1

Asymmetric Transmission of International Price of Edible Oil in Bangladesh

M. A. TASLIM[*]
MD. AMZAD HOSSAIN[**]

Market supplies of many essential commodities in Bangladesh, such as edible oil, consist of mostly imports since domestic production is small. An observed peculiarity of the pattern of price variations of these commodities is that when the international prices go up, domestic prices respond positively almost immediately, but domestic prices do not show the same fluidity when the world prices go down. It is frequently alleged that collusion among the business people prevents price flexibility in the downward direction. Using time series technique this paper finds evidence that although domestic price and international price move together in the long run, the speed of adjustment towards equilibrium is not symmetric: positive shocks are transmitted at a faster rate compared with the negative ones. This paper investigates the soybean oil market in depth and finds that this is not necessarily the result of collusion among the traders; the behaviour of the soybean oil price can be explained by the interplay of competitive market forces in the specific context of edible oil industry in Bangladesh. The level of stocks, price and supply expectations and the particular structure of the domestic edible oil market all contribute to the evolution of soybean oil prices.

Keywords: Asymmetric Price Transmission, Co-integration, Vector Error Correction Model, Granger Causality Test, Test of Asymmetry, Collusion

JEL Classification: C22, D40, L11, Q40, Q41

I. INTRODUCTION

Rising inflation is a matter of concern in any country; however, spiraling prices of essential food items are a particularly sensitive issue in developing countries that are at the lower end of the income scale. The sensitivity arises from

[*] Professor, Department of Economics, University of Dhaka, Bangladesh.
[**] Lecturer, Department of Economics, University of Dhaka, Bangladesh.
The authors wish to thank an anonymous referee for helpful comments. However, the authors alone are responsible for the contents and any remaining errors.

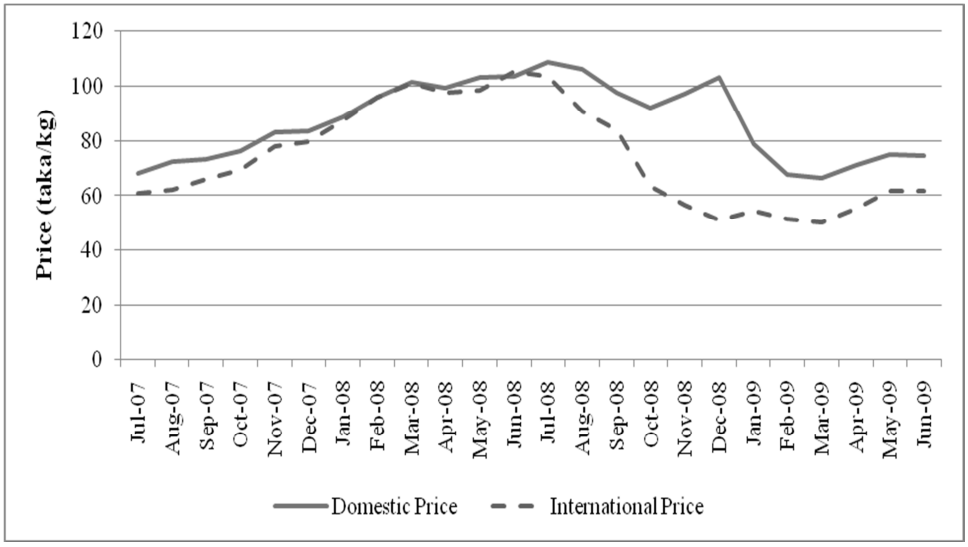
the fact that spending on essential food items has a far greater weight in the budget of poor and low income households than that of the non-poor households.[1] Hence, rising prices of the daily essentials are likely to have a greater adverse impact on the well-being of the poor households than on the welfare of the relatively well-off people. This is a matter of concern for the policy makers because of the political implications.

In a small open economy such as Bangladesh the domestic prices of imported goods closely follow world prices. However, recent experience of price movements in the markets of some commodities suggests that importers in Bangladesh are usually very prompt in passing through any increase in world prices, but they do not show the same agility in the case of reductions in world prices. This led to a perception in the county that the oil traders are in cahoots to take unfair advantage of market conditions.

The perception of collusion was strengthened by the specific behaviour of the fluctuations in the international price of soybean oil and the corresponding movement of the domestic price during 2007-2009. The international price of soybean oil rose incessantly all through the years 2006, 2007 and the first half of 2008 as did the world price of palm oil (see Figure 1 and Figure 2). However, these fell sharply from around the middle of 2008 onward and by December 2008 the soybean price was less than half its peak level in June 2008. The domestic price responded quickly to the international price and nearly doubled between January 2007 and August 2008. However, confirming the suspicion of the public the domestic price did not respond much to the sharp price reduction in the international soybean oil market during the next five months; it fell only after January 2009. It does behoove to ask why the market price remained nearly unchanged at the high level when the world price was tumbling.

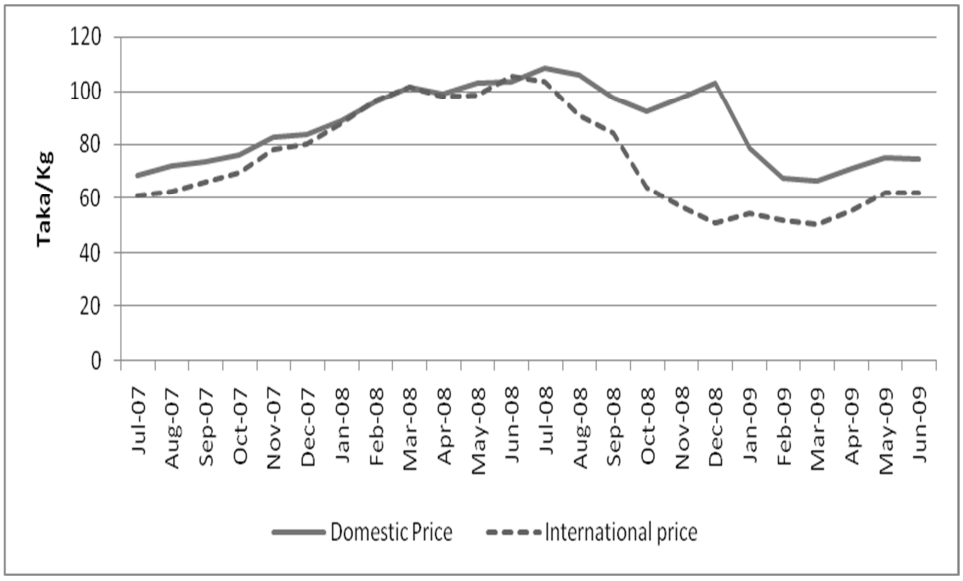
[1] Around 71.2 per cent of the total household expenditure of the lowest income decline in Bangladesh is devoted to food consumption. This share rises to 75.4 per cent in the case of the urban poor (BBS 2011).

Figure 1: Domestic and International Price of Soybean Oil



Source: World Bank Global Economic Monitor (GEM) database and Department of Agricultural Marketing (DAM), Bangladesh.

Figure 2: Domestic and International Price of Palm Oil



Source: World Bank Global Economic Monitor (GEM) database and Department of Agricultural Marketing (DAM), Bangladesh.

There has been no systematic attempt to study such asymmetry in the price transmission process from the world market to the domestic market of Bangladesh. This paper makes a modest effort to fill this lacuna in the literature. Using time series analysis this paper finds support for asymmetric price transmission i.e. positive price changes are transmitted more rapidly relative to the response to negative price changes. Using information from the soybean oil market during 2007-09, this paper, however, argues that the asymmetric price transmission was not necessarily the machination of some shadowy business houses that formed a cartel to control the market as perceived by many. The market behaviour could have been the natural outcome of interplay of competitive market forces with a few suppliers.

The paper is organised as follows. Section II gives a brief literature review of price transmission. Section III outlines a framework to study price transmission in the edible oil market of Bangladesh. Section IV conducts econometric tests and discusses the results. Section V dilates a plausible story of the asymmetric price transmission using the 2007-2009 monthly data and Section VI concludes.

II. LITERATURE REVIEW

Asymmetric price transmission, especially of fuel oil, has been the subject of intensive investigation. Price movements in the fuel oil market have been often dubbed "Rockets and Feathers" (Mclaren 2013) to indicate the tendency of prices to rise like rockets but fall like feathers. Many researchers have analysed the evolution of fuel oil prices. Tappata (2009), for instance, analysed the theoretical aspects of potential asymmetric responses of oil retail prices. Empirical studies such as Borenstein, Cameron and Gilbert (1997) and Galeotti, Lanza and Maneria (2003) came to the conclusion that asymmetry does indeed exist in the fuel oil market.

Studies on the transmission of price signals have basically evolved from the concept of competitive pricing behaviour. The classical paradigm of Law of One Price posits that identical goods under competitive conditions must sell for the same price across different countries when they are expressed in terms of a common currency in the absence of transportation cost and barriers to trade. Apart from this, the standard spatial price determination models (Samuelson 1952, Takayama and Judge 1972) provide insightful predictions on market integration and postulate that price transmission is complete with equilibrium price of a commodity sold on competitive foreign and domestic markets differing only by transfer costs when expressed in the same currency. According to these

models, changes in demand and supply conditions in one market will impact trade and prices in other markets through spatial arbitrage.

A large literature has developed on the nature of spatial transmission of prices. More recent studies on the nature of spatial transmission of prices used the properties of co-integration analysis to concentrate on the dynamics of the transmission process. Most of these empirical studies start by investigating the dynamic properties of the price series with the help of unit root test, followed by co-integration tests, specification of error correction models, and last but not least, tests for Granger causality.

Attempts have been made to extend the approach to allow for transmission to be affected by the presence of asymmetric tendencies. Models with asymmetric adjustment have been used in some of the studies (e.g. Morissett 1998) to investigate the presence of market power on the basis of the hypothesis that agents holding market power have the propensity for passing-through predominantly positive price changes but delaying transmission of negative changes. Some dynamic applications involve substituting the short-run adjustment term by two separate coefficients to account for the negative and positive deviations from the long run equilibrium and then testing for asymmetry by testing the restriction that the two coefficients are equal. Such applications have been employed, among others, by Goodwin and Holt (1999), Abdulai (2000) and Rapsomanikis, Hallam and Conforti (2003).

Prakash, Oliver and Balcombe (2001) have exercised a simpler method based on the significance of a dummy variable accounting for positive residuals in the static regression between the two price series involved. The idea is that if this variable is significantly different from zero and if the ECM coefficient of the model including this variable is greater than one without the dummy variable then it can be inferred that transmission is asymmetric i.e. positive shocks are passed through faster than the negative shocks.

Since the purpose of this paper is to analyse the transmission process of the world edible oil prices to the domestic market of Bangladesh, it adopts the time series econometric framework for the following reasons. First, despite its limitations[2] this approach can provide a useful starting point for more in-depth investigations to be conducted on specific cases (Conforti 2004), and second, time series analysis can provide useful insights into the issues of market integration and price transmission if an appropriate testing framework is employed and the results are interpreted correctly (Rapsomanikis, Hallam and Conforti 2003).

[2] For a detailed discussion of the limitations of such models, see Conforti (2004).

III. METHODOLOGY

It is well known that if two time series, such as the international and domestic prices of the same product, move together, they must be integrated of the same order. Hence, the first step in our empirical work was to analyse the dynamic properties of the price series in order to determine if they were integrated of the same order. This was achieved by testing for the presence of unit roots. Two different tests were used namely, the Augmented Dickey-Fuller (ADF) test and the Phillip-Perron (PP) test. Both these tests were run with and without a time trend and a constant. Although the ADF is the most commonly used test, it sometimes behaves poorly as its power has been found to be sensitive to the number of the lagged terms used in the model, as shown by Monte Carlo simulations. The PP tests are non-parametric tests of the null of the unit root and are often considered more powerful by many since they use consistent estimators of the variance.

Once it is established that the series are integrated of the same order, we test for cointegration. We perform two types of cointegration tests developed by Engle and Granger (1987) and Johansen (1988). Engle and Granger found that a linear combination of two or more non-stationary series may be stationary; and if such a stationary linear combination exists then the non-stationary time series are said to be cointegrated. More specifically, if two prices in spatially separated markets P_{1t} and P_{2t} contain stochastic trends and are integrated of the same order, say I(I), they are said to be cointegrated if the equation

$$p_{1t} - \beta p_{2t} = u_t$$

is I(0). The stationary linear combination is called the cointegrating equation and may be interpreted as a long-run equilibrium relationship among the variables.

In addition to Engle and Granger test of cointegration, we also perform the test of cointegration developed by Johansen (1988) and Johansen and Juselius (1990). The test is very useful in examining the long run equilibrium relationships between the variables. In this study, we used Johansen maximum likelihood (ML) approach to test the cointegration since this technique is currently most reliable one and is better for small sample properties. The method usually uses two statistics for testing the cointegration: the trace test and the maximum eigenvalue test. If both the trace and maximum eigenvalue tests suggest the presence of one cointegrating relationship, we infer there is a long-run relationship among the variables.

Apart from testing for market integration, the cointegration has an important implication in view of the Granger Representation Theorem (Engle and Granger

1987). This theorem says that if two trending variables, say $I(1)$), are cointegrated, then their relationship may be validly described by an Error Correction Model (ECM), and vice versa. Thus if the prices from two spatially separated markets, say p_{1t} and $p_{2t,}$ are cointegrated, then the Vector Error Correction (or VECM) model can be represented as:

$$\begin{pmatrix}\Delta p_{1t}\\ \Delta p_{2t}\end{pmatrix} = \begin{pmatrix}\mu_1\\ \mu_2\end{pmatrix} + \begin{pmatrix}\alpha_1\\ \alpha_2\end{pmatrix}(p_{1t-1} - \beta p_{2t-1}) + A_2\begin{pmatrix}\Delta p_{1t-1}\\ \Delta p_{2t-1}\end{pmatrix} + \dots\dots\dots\dots + A_k\begin{pmatrix}\Delta p_{1t-k}\\ \Delta p_{2t-k}\end{pmatrix} + \begin{pmatrix}v_{1t}\\ v_{2t}\end{pmatrix}$$

Along with the levels of the variables, p_{1t} and $p_{2t,}$ ECM includes their differenced terms Δp_{1t} and $\Delta\ p_{2t}$. Parameters contained in matrices A_2, ..., A_k measure the short run effects. β is the cointegrating parameter that characterises the long run equilibrium relationship between the two prices. $(p_{1t-1} - \beta p_{2t-1})$ is the cointegrating equation that reflects the errors or any divergence from this equilibrium. The vector $\begin{pmatrix}\alpha_1\\ \alpha_2\end{pmatrix}$ contains parameters, commonly known as error correction coefficients, which measure the extent of corrections of the errors that the market initiates by adjusting p_{1t} and p_{2t} towards restoring the long run equilibrium relationship.

We then test for the presence and direction of causality between the two prices. Granger (1988) argued that cointegration between two variables implies the existence of causality (in the Granger sense) between them in at least one direction. According to Granger, a variable is said to Granger-cause another variable if the past and present values of it help to predict the future values of the other. The hypothesis that p_1 Granger-causes p_2 and vice versa can be examined by testing the null that the coefficients of a subset of these jointly determined variables, the lagged p_1 terms, are equal to zero. In order to test for Granger non-causality between the pairs of prices, an ARDL model and its reverse form are estimated by dropping the contemporaneous coefficients, which takes the form:

$$P_{1t} = \alpha + \tau T + \sum_{j=1}^{j}\beta_j p_{1t-j} + \sum_{k=1}^{k}\gamma_k p_{2t-k} + e_t \quad (1)$$

$$P_{2t} = \delta + \lambda T + \sum_{j=1}^{j}\beta_j' p_{1t-j} + \sum_{k=1}^{k}\gamma_k' p_{2t-k} + z_t \quad (2)$$

Both equations were tested to test whether β_j, γ_k, β_j' and γ_k' are significantly different from zero for any *j* and *k*. Acceptance of the null implies

that past values of the series on the right hand side are not adding information on the actual values of the series on the left hand side, except what is provided by its own past values. If this is the case in both of the equations then it can be inferred that neither of the two series is Granger-causing the other. On the other hand, if the null can be rejected in one of the equation, then it can be concluded that the price appearing on the left hand side Granger-causes the other.

Finally, we test the symmetry of transmission between the price following Prakash, Oliver and Balcombe (2001). In this approach, a dummy variable is added to the ARDL model (1) above, assigning a value of 1 to the observations showing positive residuals in the static regression between each pair of prices and a value of 0 to the observations showing negative residuals. If this variable is statistically significantly different from zero, we can conclude that transmission between the price series is not symmetric. If this is the case then the comparison of the short and the long run parameters of the ECM specifications with the dummy and without the dummy will allow us to understand whether the positive price changes are passed on the other price series to a greater or smaller extent. More specifically, if the model with the dummy variable shows a higher speed and a higher degree of price transmission than the model without dummy, this implies that positive shocks are transmitted more and faster than negative ones.

IV. EMPIRICAL EVIDENCE

We test for market integration of the domestic edible oil market of Bangladesh with the international market. The import of edible oil comprises almost entirely of soybean and palm oil, and therefore, we look at these two markets individually. The data used in this paper have been obtained from mainly two sources. We have used monthly oil price data from July 1998 to December 2013. Data on domestic price have been taken from the Department of Agricultural Marketing (DAM), Bangladesh and data on international prices from the World Bank GEM database. For the time series analysis, we use the logarithmic transformation of the price series. The patterns of evolution of the domestic and international prices of soybean and palm oil are shown in Figure 3 and Figure 4 respectively. It is evident that the difference between the two prices gradually declined as import duties on edible oil were slashed and the country adopted a flexible exchange rate regime in 2003. Some summary statistics of the price series are given in Table I.

TABLE I
SUMMARY STATISTICS

Variables	Observations	Mean	Std. Dev.	Min	Max
Soybean Oil					
Domestic price (Taka/KG)	168	67.78	29.22	30.36	122.24
International price (Taka/KG)	168	54.76	28.52	16.26	107.19
Palm Oil					
Domestic price(Taka/KG)	168	55.86	23.38	27.02	101.83
International price(Taka/KG)	168	44.93	24.22	12.92	96.64

Figure 3: Domestic and International Price of Soybean Oil

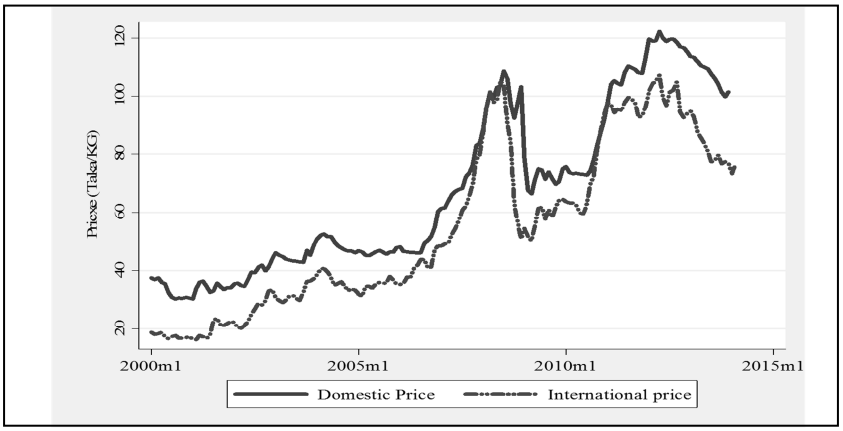
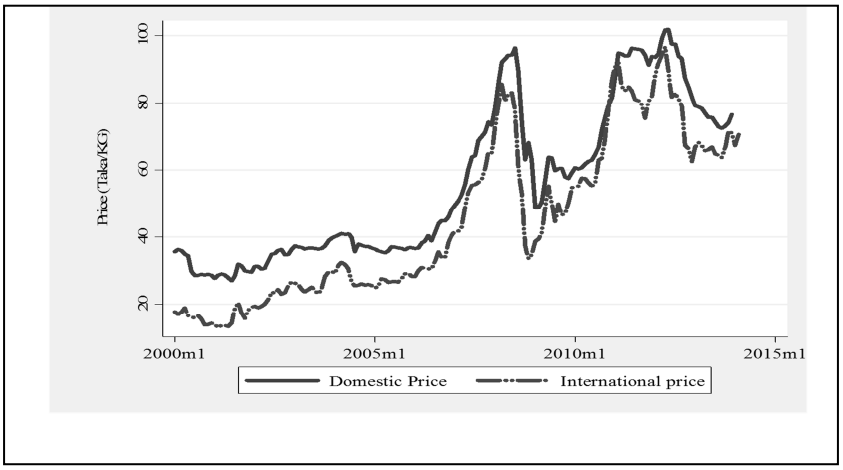


Figure 4: Domestic and International Price of Palm Oil



4.1 Soybean Oil

We tested for the order of integration employing ADF and PP tests with and without trend. Table II presents the unit root test results. Both of the ADF and PP tests suggest that there is insufficient evidence to reject the null hypothesis of non-stationarity of the two price series. This is true for both types of specifications - with and without a deterministic trend. However, both the tests reject the null hypothesis of non-stationarity when applied to the differenced series, implying that all price series are $I(1)$.

TABLE II

STATIONARITY TESTS OF SOYBEAN OIL AND PALM OIL PRICES

Variables	Augmented Dickey-Fuller Test				Phillip-Perron Test				
	In Level		In First Difference		In Level		In First Difference		Order of Integration
	Without Trend	With Trend	Without Trend	With Trend	Without Trend	With Trend	Without Trend	With Trend	
Soybean Oil									
Domestic price	-0.63	-1.97	-9.17	-9.14	-0.77	-2.45	-8.98	-8.95	I(1)
	(0.86)	(0.61)	(0.00)	(0.00)	(0.82)	(0.35)	(0.00)	(0.00)	
International price	-1.35	-1.24	-8.96	-8.98	-1.39	-1.99	-8.91	-8.92	I(1)
	(0.61)	(0.90)	(0.00)	(0.00)	(0.58)	(0.61)	(0.00)	(0.00)	
Palm Oil									
Domestic price	-0.68	-1.84	-8.71	-8.69	-0.93	-2.40	-8.66	-8.63	I(1)
	(0.85)	(0.68)	(0.00)	(0.00)	(0.77)	(0.38)	(0.00)	(0.00)	
International price	-1.05	-1.99	-9.04	-9.01	-1.21	-2.64	-8.93	-8.91	I(1)
	(0.73)	(0.61)	(0.00)	(0.00)	(0.67)	(0.26)	(0.00)	(0.00)	

Note: Figures in the parentheses denote respective P-Value.

We then checked for cointegration between the two price series by means of the Engle and Granger procedure. To this end we first ran a static regression between the domestic soybean oil price and the corresponding world reference price. Then the unit roots test was applied to the residuals of the static regression between the domestic and the world price. This test suggests that the residuals are stationary, indicating strong likelihood that the domestic price and the international price are cointegrated (Table III).

TABLE III

STATIONARITY OF RESIDUALS

Variables	Augmented Dickey-Fuller Test		Phillip-Perron Test		Comments
	In Level		In Level		
	Without Trend	With Trend	Without Trend	With Trend	
Soybean Oil	-3.42	-3.57	-3.47	-3.59	I(0)
	(0.01)	(0.03)	(0.01)	(0.03)	
Palm Oil	-3.91	-3.91	-3.81	-3.80	I(0)
	(0.00)	(0.01)	(0.00)	(0.00)	

Note: Figures in the parentheses denote respective P-Value.

We also tested for cointegration by applying the Johansen method. Both the trace test (Table IV) and maximum Eigen value test (Table V) suggest one cointegrating relation between the price series, implying a long-run relationship between the variables.

TABLE IV

JOHANSEN TESTS FOR COINTEGRATION (λ TRACE TEST)

	Null Hypothesis	Alternative Hypothesis	Trace Statistics	5% Critical value	1% Critical value	Number of cointegrating equations
Soybean Oil	$r = 0$	$r \geq 1$	30.06	15.41	20.04	1
	$r \leq 1$	$r \geq 2$	2.37	3.76	6.65	
Palm Oil	$r = 0$	$r \geq 1$	33.95	15.41	20.04	1
	$r \leq 1$	$r \geq 2$	2.06	3.76	6.65	

TABLE V

JOHANSEN TESTS FOR COINTEGRATION (λ MAX TEST)

	Null Hypothesis	Alternative Hypothesis	Max Statistics	5% Critical value	1% Critical value	Number of cointegrating equations
Soybean Oil	$r = 0$	$r \geq 1$	30.06	14.07	18.63	1
	$r \leq 1$	$r \geq 2$	2.37	3.76	6.65	
Palm Oil	$r = 0$	$r \geq 1$	31.89	14.07	18.63	1
	$r \leq 1$	$r \geq 2$	2.06	3.76	6.65	

We then test for Granger causality. The test statistic (Table VI) suggests that while we can safely reject the null hypothesis that the international soybean oil price does not Granger causes the domestic price, we cannot reject the null hypothesis that the domestic price does not Granger cause the international price. Therefore, we may conclude that the international price affects the domestic price but not vice versa. This is the expected outcome since Bangladesh is a small open economy, and hence a price-taker in the international market.

TABLE VI

GRANGER CAUSALITY TEST RESULT

	Null Hypothesis	Chi-Square	p> Chi-Square
Soybean oil	International price does not granger causes domestic price	52.84	0.00
	Domestic price does not granger causes international price	1.27	0.73
Palm oil	International price does not granger causes domestic price	72.58	0.00
	Domestic price does not granger causes international price	2.60	0.45

To study the short term adjustment behaviour we have estimated an error correction model. Having determined there is one cointegrating equation between the domestic and the international price series, we now estimate the parameters of a bivariate cointegrating ECM for these two series. From the ECM (Table VII), we see that the adjustment coefficients have the correct signs and their magnitudes imply rapid adjustment towards the equilibrium. The estimate of the error correction coefficient in domestic market equation is -0.18 and is statistically significant. Thus when the average price in Bangladesh is too high relative to the international price, it tends to fall back towards it gradually with about 55 per cent of the adjustments completed within 4 months.

TABLE VII

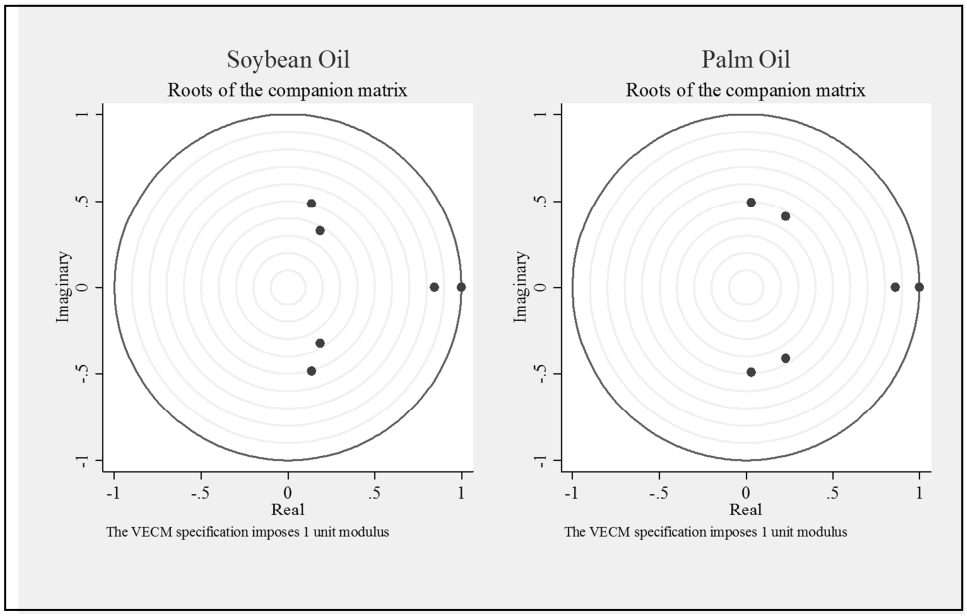
VECTOR ERROR CORRECTION MODEL

Regressors[a]	Dependent Variable: Δln(Domestic Price)	
	Soybean Oil	Palm Oil
ECM		
L1	-0.18***	-0.20***
	(0.03)	(0.04)
ln(Domestic Price)		
LD.	0.29***	0.19**
	(0.07)	(0.08)
L2D.	-0.21***	-0.21**
	(0.07)	(0.07)
ln(international price)		
LD.	0.09	0.13**
	(0.05)	(0.05)
L2D.	-0.04	0.03
	(0.06)	(0.05)
Constant	-0.0003	-0.001
	(0.002)	(0.002)

Note: [a]L1 means first lag, LD means lagged first difference and L2D means Lagged second difference.
*** indicates significance at 1 per cent level, ** at 5 per cent level and * at 10 per cent level.

Next we performed some VECM post-estimation tests. First, we checked the Eigen value stability condition in the error-correction model (VECM) fit. This test allows us to verify whether the number of cointegrating equations is misspecified or whether the cointegrating equations, which are assumed to be stationary, are actually non-stationary. In this type of test, the companion matrix of a VECM with k endogenous variables and r cointegrating equations has k-r unit eigenvalues. If the process is stable, the moduli of the remaining eigenvalues are strictly less than one. Our VECM specification imposes 1 unit moduli. The graph of the eigenvalues shows that there is only one unit Eigen value and none of the remaining eigenvalues appears close to the unit circle (Figure 5). Thus, the stability check does not suggest that our model is misspecified.

Figure 5: Stability of Vector Error Correction Model



We also test for serial correlation in the residuals. At the 5% level, we cannot reject the null hypothesis that there is no autocorrelation in the residuals for any of the orders tested (Table VIII). Thus this test finds no evidence of model misspecification.

TABLE VIII

LAGRANGE MULTIPLIER TEST FOR AUTOCORRELATION

Lag	Soybean Oil		Palm Oil	
	Chi-Square	P> Chi-Square	Chi-Square	p > Chi-square
1	6.51	0.16	7.33	0.12
2	8.52	0.07	8.11	0.09
3	4.57	0.33	11.43	0.02
4	8.89	0.06	7.82	0.10

H0: no autocorrelation at lag order n

We then perform asymmetry test. The dummy variable for the positive residuals of the static regression is significant (Table IX); and the ECM parameter of the model with dummy is larger (in absolute terms) in size than the corresponding parameters in the models without the dummies (Table X). This indicates that the domestic market smoothed the price reductions taking place in the world, while they fully passed through the increases in world prices i.e. positive price shocks are transmitted in the domestic market at a higher pace compared to negative ones. There is obviously an asymmetry in the transmission of international prices depending on whether it is rising or falling.

TABLE IX

ARDL TEST WITH DUMMY

Regressors[a]	Soybean Oil		Palm Oil	
	Coefficient	Standard error	Coefficient	Standard error
ln(Domestic Price)				
L1	1.04**	0.08	0.93***	0.09
L2	-0.49***	0.11	-0.39***	0.11
L3	0.18**	0.07	0.20***	0.07
ln(international price)				
L1	0.29***	0.06	0.31***	0.05
L2	-0.15**	0.08	-0.11	0.07
L3	0.07**	0.06	0.02	0.05
Dummy	0.02**	0.008	0.011	0.009
Constant	.33***	0.06	0.33***	0.07

Note: [a]L1 Implies first lag, L2 Implies second lag and L3 Implies third lag of the respective variables.

TABLE X

ASYMMETRY TEST

	Soybean Oil		Palm Oil	
	Coefficient	Std. Err.	Coefficient	Std. Err.
VECM without dummy	-0.18***	0.03	-0.20***	0.04
VECM with dummy	-0.27***	0.04	-0.26***	0.05

4.2 Palm oil

Following the same procedures as above, we checked for the pattern of transmission of the international price to the domestic market in the case of palm oil. The domestic and the international palm oil price series are integrated of order 1 (Table II). The unit root test applied to the residuals of the static regression between the domestic price and the world reference price suggests that these prices are cointegrated (Table III). The Johansen cointegration (Table IV and V) also suggests that the price series are cointegrated. Granger causality test (Table VI) shows only the international price Granger causes the domestic prices but not vice versa.

From the vector error correction model (Table VII), we can see that the adjustment estimates have the correct signs and imply rapid adjustment towards the equilibrium. The estimate of the error correction coefficient in the domestic market equation is -0.20. Thus when the average oil price in Bangladesh is too high, it fairly quickly falls back towards the international level. The eigenvalue stability condition in the vector error-correction model (VECM) shows the model is correctly specified (Figure 5). There is also no evidence of autocorrelation (Table VIII).

However, the asymmetry test shows that the dummy variable for the positive residuals of the static regression is insignificant (Table IX); Thus, unlike Soybean oil price, we do not find any evidence of asymmetry in the transmission of international price shocks to the domestic market.

V. STORY BEHIND STORY: 2007-09 ASYMMETRIC TRANSMISSION OF SOYBEAN OIL PRICE

The econometric results only confirm the general public conviction that rising international prices are immediately matched by the domestic business community, but they are rather sluggish in reducing prices when the international prices go down. However, these results do not tell us why or how this happens. How do the business firms hold the domestic prices much above the import prices for months? There is a widespread suspicion that such price behaviour is the outcome of unholy collusion among a small number of business firms engaged in edible oil import and refining to rip-off the hapless consumers.[3] The fact that import of edible oil is controlled by a small number of importers further

[3]An important characteristic of the edible oil industry of Bangladesh is that virtually all the importers of edible oil are also the refiners and suppliers to the domestic market.

fuels the allegation of cartelisation of the market.[4] However, as pointed out by Taslim (2010), the fact that the price did not fall quickly enough does not by itself imply there was collusion among the business firms. This could happen in an oligopolistic market even when it is keenly contested as was anticipated by Joseph Bertrand well over a century ago.

There were incessant increases in the world prices of edible oil from the beginning of 2005 to the middle of 2008. Such a long period of sustained price increases must have engendered expectations among edible oil importers of further increases in the prices. It would be then rational for them to stock up to avoid the expected higher prices of the future and thereby increase the windfall profit margin. Should the world prices suddenly crash, the importers would be caught with substantial stocks bought at previous high prices. If they were to sell the stocks at the new lower prices, they would obviously suffer from large losses.

Faced with such a situation the importers-cum-refiners would be reluctant to sell at the new low price of the world market, rather they would attempt to sell as much of the stocks as possible at the current high price. If there were no counter moves, it should not be difficult to sell at the current price as the market was already adjusted to it. Only if the market supply increased or demand fell could there be a reduction in the price. Hence, the best response of the importers was not to do anything to increase the market supply that would reduce the current market price, and simultaneously reduce import of edible oil to reduce the bloated high-cost stocks.

If all business houses were in a similar situation, all of them were likely to also act in a similar fashion. The reduction in import would reduce the industry stock. There would be no increase in the market supply, and hence there would be no pressure on the price to fall. The importer-cum-refiners would for a while import less crude and control the supply to the market to hold the price at the current high level and at the same time work-off the high cost stock. They would avoid making a loss due to the fall in the world price as long as everyone adhered to this strategy.[5]

---

[4] There were only 9 importers-cum-refiners in Bangladesh in 2010. See Helal and Taslim (2010).

[5] It is easy to see that the problem can be viewed in the light of Bertrand's competitive oligopoly model with constant cost. Since the excess stock was bought at the previous higher price, the unit costs of oil for all suppliers (refiners) would be the same. The price of the product set by each supplier would be equal to this cost. No one could gain from undercutting the market price, neither could anyone sell the homogenous product at a higher price. Thus the current market price would be a Nash equilibrium price. As the stocks of some refiners depleted and oil was imported at the lower price, the market price would start adjusting downward to the reduced cost.

There is some support for this story from the available data for soybean oil. Table XI shows that the average monthly import of soybean oil was about 35 thousand tons during the 8-month period from July 2007 to February 2008. This was a period of sharply rising soybean oil price in the international market. The rate of import during these months was far in excess of the average import (consumption) of 21 thousand tons during the corresponding period of the previous four years. The importers were most likely stocking up in anticipation of further increases in world price.

TABLE XI

MONTHLY IMPORT AND PRICE OF SOYBEAN OIL

	July 06 – Feb 07	July 07 - Feb 08	Mar 08 - June 08	June 08 - Dec 08	Jan 09 - Mar 09
Monthly import (ton)	21,233	34,727	12,117	11,841	24,056
Average import price (US$/ton)	657	1,096	1,462	1,092	755

The excessive import of soybean oil built up a large stock, which must have worried the importers as suggested by the fact that they drastically reduced import during March-June 2008 to just over 12 thousand tons even though the world price was still rising. They might have reduced import also in anticipation of a fall in the price soon. When the world price of soybean oil actually crashed in July 2008, they further reduced the rate of import to less than 12 thousand tons during the next six months. Thus within five months, the rate of import was cut by nearly two-thirds. The rate of monthly import bounced up to 24 thousand tons in the following three months (January-March 2009), which was about the average demand for soybean oil in the country. Apparently, the rate of import returned to normal. The domestic price followed suit.

A pertinent question to ask at this point is how could the edible oil importers prevent other business firms from importing at the much lower world price and undersell them to earn a large windfall profit? Was the market not sufficiently competitive? While this is a theoretical possibility, we believe the character of the particular industry and the natural frictions of the market, even a competitive market, played a dominant role.

Most of the edible oil imported into the country is crude oil. It is imported by a small number of importers who also refine the crude oil and sell it in the domestic market. The small size of the market restricts the number of importers

who can profitability operate in the market. A high import duty on refined oil in the earlier years and the modest value addition in refining resulted in a very high effective rate of protection that encouraged a rapid growth of the refining industry, which now has a capacity far in excess of the market demand. The high tariff also makes imported refined oil uncompetitive such that very little of it is imported.

Another important factor that restricts the number of firms in the industry is the very high capital cost of setting up an edible oil refinery. In addition, the capacity of the optimum plant is substantial.[6] These characteristics of the industry work as natural barriers to entry into the edible oil market, which allows the existing few importers-cum-refiners certain degree of influence over the market at least in the short-run.

Any new firm that wants to break these barriers will also find it very difficult to supply imported oil to the local market at a short notice since finding reliable international exporters takes time. Equally time consuming may be establishing local distribution network since the existing firms are most unlikely to allow a new entrant to use theirs. There are also very substantial investment costs of doing these, but the outcome is obviously uncertain. This would deter even the very adventurous entrepreneurs from entering the industry.

If the government wants to intervene in the edible oil market to keep the prices in check, it will also face difficulties in overcoming the aforementioned barriers easily or quickly. It can act only if it has substantial stocks and a distribution network. If it does not, its situation will be similar to that of a new entrant. Thus the current importers are assured that no new players could butt into the market within a short time.[7]

Under these market conditions the domestic price of the existing stock can be raised immediately after an increase in the world price without any concern that someone could undersell them unless there are excessive stocks held by one or a few of the importers. It would not be rational of any firm not to raise the price to the new equilibrium as it would be giving up an opportunity of a windfall profit.[8] Those who raise the price will be earning a windfall profit and hence will not

[6]In 2010, one firm had the capacity to supply more than one third of the market demand.
[7]However, they must be aware that if there are significant abnormal profits, some firms will eventually enter the fray.
[8]Only if the demand for this product is highly elastic, it is possible that by raising price the firm may earn less than what it could earn at the existing lower price. Since the demand for an essential commodity tends to be inelastic, such a situation is unlikely to obtain.

have incentive to sell at the lower price. The firm that refuses to sell at the higher price will in any case have to raise the price to the world level once its existing stock is exhausted. No new entrant could supply the market at less than the world price. Thus we see that the domestic price normally responds almost immediately to any increase in the world price.

Since a sharp increase in the prices of essential commodities has adverse political repercussions, the government may wish to intervene through its market intervention institution Trading Corporation of Bangladesh (TCB). It could sell oil from any stocks it holds or import refined oil immediately to sell in the market at a subsidized price. However, the record of TCB does not inspire any confidence that it could respond to emerging market situation quickly enough to deliver some benefits. Even if it could, it would have substantial fiscal costs. The intervention may not be worth the benefit.

Figure 3 and Figure 4 show that the market prices have fallen roughly in line with the import cost by February 2009. Hence, the government would not have been able to reduce the current price noticeably after February unless it had decided to provide subsidy on edible oil. The government can only use its current stock to prevent future rises in the domestic edible oil prices in excess of the import costs. However, there is a possibility that such intervention, if done injudiciously, could cause temporary market disruptions and hence, shortages and price spikes. The cure can be worse than the disease!

The story told above implies that the asymmetry depended on two things: substantial stocks held by most of the sellers, and the time it takes to import and supply to the market at the decreased price. The first is very unlikely to be substantial in a competitive market with a large number of sellers, but the second is also applicable to a competitive market. The domestic price can be maintained at the current high level until the import at the decreased international price starts arriving in the market, and this will not happen instantaneously. Hence, there will be a time gap between the time the international price falls and its transmission to the domestic price. In the case of edible oil, this time lag would be 1-2 months. Thus, it is unlikely that the domestic price will fall to the level of the decreased international price in 1-2 months.

VI. CONCLUSION

The evidence presented above supports the common belief that domestic edible oil market responds quickly to increases in international oil prices, but it is sluggish in the case of decreases. However, the important thing to note is that the

divergence between the local and world prices does not last very long as the price series are cointegrated. The government may not achieve much by intervening in the market. It will take considerable time for the government to fully comprehend the nature of a price divergence, and some more time to decide on if and what action should be taken. Yet more time would be spent on actually taking the offsetting action, such as importing. By this time the market price might have already moved to the import cost or equilibrium price such that little would be achieved by government action.

REFERENCES

Abdulai, A. 2000. "Spatial Price Transmission and Asymmetry in the Ghanaian Maize Market." *Journal of Development Economics*, 63:327-349.

BBS. 2011. *Report of the Household Income & Expenditure Survey, 2010.* Dhaka, Bangladesh: Bangladesh Bureau of Statistics, Ministry of Finance, People's Republic of Bangladesh.

Borenstein, S., A. C. Cameron and R. J. Gilbert. 1997. "Do Gasoline Prices Respond Asymmetrically to Crude Oil Price Changes?" *The Quarterly Journal of Economics*, 112 (1): 305-39.

Conforti, P. 2004. "Price Transmission in Selected Agricultural Market." FAO Commodity and Trade Policy Research Working Paper No. 7.

Engle, R. F. and C. W. J. Granger. 1987. "Cointegration and Error Correction: Representation, Estimation and Testing." *Econometrica,* 55:251-276.

Galeotti, M., A. Lanza and M. Maneria. 2003. "Rockets and Feathers Revisited: An International Comparison on European Gasoline Market." *Energy Economics,* 25(2):175-90.

Goodwin, B. K. and M. T. Holt. 1999. "Price Transmission and Asymmetric Adjustment in the US Beef Sector." *American Journal of Agricultural Economics,* 81: 630-637.

Granger, C. W. J. 1988. "Some Recent Developments in the Concept of Causality." *Journal of Econometrics*, 39:199-211.

Johansen, S. 1988. "Statistical Analysis of Cointegration Vectors." *Journal of Economic Dynamics and Control*, 12(2–3):231–254.

Johansen, S. and K. Juselius. 1990. "Maximum Likelihood Estimation and Inference on Cointegration with Application to the Demand for Money." *Oxford Bulletin of Economics and Statistics,* 52(2):169–210.

Helal, Uddin M. and M. A. Taslim.2010. *An Assessment of Competition in the Edible Oil Market of Bangladesh*. Bureau of Economic Research (BER), University of Dhaka.

McLaren, A. 2013. "Asymmetry in Price Transmission in Agriculture Market." Working Paper Series: WPS 13-04-01, University of Geneva.

Morisset, J. 1998. "Unfair Trade? The Increasing Gap between World and Domestic Prices in Commodity Markets during the Past 25 Years." *The World Bank Economic Review*, 12(3):503-26.

Prakash, A. B. 1999. *The Transmission of Signals in a Decentralised Commodity Marketing System. The Case of the UK Pork Market.* PhD. Thesis, Wye College, University of London.

Prakash, A., E. Oliver and K. Balcombe. 2001. "Does Building Roads Really Create Traffic: Some New Evidence." *Applied Economics*, 33: 1579-1585.

Rapsomanikis, G., D. Hallam and P. Conforti. 2003. "Market Integration and Price Transmission in Selected Food and Cash Crop Markets of Developing Countries: Review and Applications." In FAO, *Commodity Market Review.* Rome: FAO Commodities and Trade Division.

Samuelson, P. A. 1952. "Spatial Price Equilibrium and Linear Programming." *American Economic Review*, 42: 560-580.

Takayama, T. and G. G. Judge. 1971. *Spatial and Temporal Price Allocation Models*. Amsterdam: North Holland.

Tappata, M. 2009. "Rockets and Feathers: Understanding Asymmetric Pricing." *RAND Journal of Economics,* 40(4): 673-87.

Taslim, M. A. 2010. *The Woes of Commerce: What goes up does not come down in Unpleasant Economics.* Dhaka: Jagriti Prokashony, 47-54.