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Behavior of Retail Gasoline Prices in the Philippines to Changes in Crude Oil Prices: Is it Symmetric or Asymmetric?

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This study examines if the relationship between the behavior of retail gasoline prices in the Philippines and changes in world crude oil prices is indeed asymmetric or possibly symmetric. Based on weekly data from October 2005 to September 2010, test results reveal that there is no pattern symmetry between movements in retail gasoline prices and changes in crude oil prices. But there is amount symmetry in the responsiveness of unleaded retail gasoline prices changes to crude oil prices.

Keywords: Crude Oil, Retail Gasoline, Asymmetry, Symmetry

1 Introduction

Many people, both from the private and public sector, claim that retail gasoline price movements do not respond symmetrically to crude oil price changes. In particular, they believe that retail gasoline prices do not reflect decreases in crude oil prices as rapidly and fully as crude oil price increases.

In July 2008, the retail price of the gas significantly increased to Php 60.00 per liter. Since that time, the retail prices of gasoline has gone down to Php 31.00 per liter in December 2008 because of the huge decrease in world crude oil price. In July 2008 the West Texas Intermediate (WTI) crude oil was traded at a spot price of $145.31 per barrel; in December 2008, WTI crude oil decreased to a spot price of $36.73 per barrel. If we compare the magnitude of decrease in retail prices of gasoline with that of world crude oil prices, we can easily find that the former declined by only 50% while the latter fell by 75%. Interestingly, from April to July2008, Dubai crude oil prices increased by 42% and retail gas prices in Philippines increased by only 27%.

The perceived asymmetry in retail gas prices is of special concern especially to consumers who believe that they are being “gouged” by the oil companies. The social sensitivity to any kind of price hike has driven a lot of studies devoted to the examination of pricing behavior of gasoline, especially since this good is considered a vital input in the movement of goods and people.

The study examines if there is an asymmetry or symmetry between the behavior of retail gasoline prices in the Philippines and crude oil prices changes. Examining the response of retail gas price to oil price changes serves the public a great benefit. Understanding the pattern of the gasoline prices provides them with vital information to optimize gasoline consumption.

1.1 What is symmetry?

Price symmetry refers to the similarity between the behavior of prices of a good (in this case, retail price of gasoline) and the relevant input price (crude oil price). There are three types of symmetry: timing symmetry, amount symmetry, and pattern symmetry.

Timing symmetry refers to the length of time a crude oil price change works its way through the retail level. It examines if an increase in the crude oil price is passed along more quickly to the retail level than an equal crude oil price decrease.

Amount symmetry refers to the amount of a crude oil price that passes through to the consumer. It examines if, for instance, a 10-centavo increase in the crude oil price leads to a 7.5-centavo increase in the retail price while a 10-centavo decrease in the crude oil price leads to a similar decline in retail price.

Pattern symmetry is a combination of time and amount. The pattern of retail price response may differ for crude oil price increases and decreases. Although the retail price may adjust to a crude oil price increase and decrease by an equal total amount and length of time, the amount of adjustment in

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each period may not be equal for price increases and decreases. As an example, in instances where the crude oil price increases and decreases by 10-cents per gallon, retail prices may take two months to completely respond to both oil price changes.

2 Literature Review

There are a number of empirical studies on the asymmetry between crude oil prices and retail gasoline prices. For instance, Bacon (1991) finds asymmetry in the U.K. gasoline market. Karrenbrock (1991), Borenstein, Cameron, and Gilbert (1997), and the Government Accountability Office, GAO, report (1993) all find some evidence of asymmetric response in U.S. gasoline markets. However, Norman and Shin (1991) and Balke, Brown, and Yucel (1998) find symmetric response in U.S. gasoline markets.

Among these studies, the most complex and convincing is the one of Borenstein et al. (1997), also known as BCG. Using weekly and biweekly data from 1986 to 1992, they present a series of bivariate error correction models to test for the asymmetry in price and movements in each of the different stages of production and distribution of gasoline, from the crude oil through refinery to the retail pump. This study finds a strong and pervasive evidence of asymmetry (Balke et al., 1998).

U (2008) confirms that crude oil price is a determinant of retail gasoline prices. He also suggests that in pricing gasoline in the local market, one can compare with international prices, a benchmark like crude oil price. Behrens and Glover (2008) show that higher prices of crude oil translate directly into higher prices for gasoline. Crude oil accounts for about 54% of the cost of gasoline; refining, distributing and marketing account for 30%; and taxes accounts for the remaining 16%. These costs are passed on to retail gasoline prices.

The International Crude Oil Market Handbook (2004) publishes different internationally traded crude oils. These crude oils vary in terms of characteristics, quality, and market penetration. Generally, differences in the prices of these crude oils are related to quality differences; but other factors can also influence prices. From the handbook, two crude oils benchmark the gasoline prices in the market. WTI crude oil is an ideal benchmark in the United States, the largest consuming country in the world. Most WTI crude oils are refined in the Midwest region of the country. Brent blend is ideal for making gasoline and middle distillates, both of which are consumed in large quantities in Northwest Europe. Dubai crude oil, which is included in the OPEC Basket Price, marks Asia.

In 2006, the US Department of Energy, Energy Information Administration (DOE/EIA) said that one of the components of the retail price of gasoline is the cost of crude oil to refiners. To support the relationship between oil prices and retail gasoline prices, the GAO report (2007) confirms that crude oil prices are a major determinant of gasoline prices.

Borenstein et al. (1997) present the relationship between the retail gasoline prices and oil prices using a simple lag adjustment model. They estimate the rate at which gasoline prices adjust to crude oil price changes and assume this simple linear long-run relationship between retail gasoline prices, R, and crude oil prices, C, as follows:

$$R=\emptyset_0+\emptyset_1 C+e \tag{1}$$

Borenstein et al. (1997) use a simple empirical model for the adjustment of retail gasoline prices to changes of crude oil prices, allowing for the possibility of asymmetric rates. This model can be stated as:

$$\Delta Rt = \sum_{i=0}^{n}\left(\beta_i^{+}\ \Delta C_i^{+} + \beta_i^{-}\Delta C_i^{-}\right) + \varepsilon_t \tag{2}$$

where ΔR_t is the change in retail price from the period t change in crude oil price; n is the number of periods it takes for retail prices to complete adjustment to the period t change in crude oil prices.

Balke et al. (1998) present an econometric exercise that examines price asymmetry. They find that most of the price fluctuations originate upstream. Based on this finding, they introduce a new regression model with upstream and downstream prices, PU_t and PD_t, respectively. In linear form:

$$PD_t=a+bPU_t \tag{3}$$

where a and b are parameters indicating the relationship between the upstream and downstream prices. The markup, a, represents the cost of refining, marketing, transportation, and/or distribution. The scalar, b, allows for differences in units and heat content.

The model of Balke et al. (1998) has a different specification but it also shows asymmetric relationship exists between retail gasoline prices to crude oil prices. This model indicates a few cases and a small asymmetric relationship. This contrasts with BCG's model that shows pervasive evidence of asymmetry.

Some analysts and politicians argue that the retail gasoline prices do not symmetrically follow crude oil prices. When crude oil prices fall, there is always stickiness in gasoline price decreases. But the stickiness in gasoline prices is not observed when there is a rise in crude oil prices. This suggests that oil producers or refineries are principally responsible for the asymmetry (Karrenbrock, 1991).

Several studies show the presence of price symmetry in the gasoline market. Galeotti et al. (2003) test the relationship between crude oil prices and retail gasoline prices in the European gasoline markets and find little evidence of asymmetry. There are also evidence of price symmetry in the retail gasoline market in Canada (Godby et al., 1997) and the US (Shin, 1994; Bachmeier & Griffin 2003).

Karrenbrock (1991) examines the relationship between wholesale prices and retail gasoline prices using an approach model developed by Wolfram (1971). He follows Heien (1980) and Boyd and Brorsen (1988) in including an intercept to avoid a bias in the coefficient estimates. Karrenbrock (1991) suggests a way to check if there is an asymmetric relationship between the wholesale prices of gasoline and the retail gasoline prices. In this study, the wholesale price measures the price charged by the refiner or jobber to the retail gasoline station.

3 Data and Methodology

This study uses data on crude oil price from the US DOE/EIA and One Alternative Energy Blog in the Philippines. Weekly statistics on retail gasoline prices for 5 years from October 2005 to September 2010 were gathered. As countries import the crude oil from different sources, the price of each country's gas is also related with the relevant crude oil according to the International Crude Oil Market Handbook, 2004.[1] This study used Dubai crude oil and MOPS as the Philippines imports them. For the representative retail gasoline, unleaded gasoline, and diesel are used as they are the more common gasoline purchased by consumers in the Philippines. There are 10 oil or gasoline suppliers in the Philippines, namely, Chevron, Petron, Shell, Sea Oil, Flying V, Unioil, Total, City Oil, Jetti, and Eastern Petroleum. However, this study uses only 9 companies' 5 years historical prices excluding Eastern Petroleum due to the data availability.[2] Price information are collected from well-known energy web sites.[3] Since crude oil prices are quoted in U.S dollars per barrel, prices are converted to Philippine peso per liter using the exchange rate of every week for the Dubai crude oil.[4] However, due to the data availability, the test is done with the monthly data for MOPS pricing[5] Tests are done using STATA program with Ordinary Least Squares estimates.

This research uses Karrenbrock's (1991) model which shows a good way to test symmetric behavior of one price to changes of the other price although he used it for the relationship between the wholesale and retail gas prices.

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1 The Philippines and New Zealand import the Dubai crude oil, US does the WTI crude oil and many European countries do the Brent crude oil.

2 The weekly retail gas prices were obtained by computing the average of 9 companies' prices. In case of missing weeks, prices were obtained by getting the average of the previous month and the next month.

3 For the crude oil, it is U.S. EIA (http://www.eia.doe.gov)and for the retail gas, it is One Alternative Energy Blog (http://www.alternat1ve.com). The crude oil price is weekly Asia Dubai Fateh Spot Price FOB (Dollars per Barrel).

4 Dubai crude oil price for Philippines: (US$ per barrel * exchange rate) / 159 = peso per liter. Historical weekly currency exchange rates were used from the interbank rate of OANDA Information company (http://www.oanda.com).

5 MOPS price data was obtained from the Korean airlines expert's blog (http://ijcho.com/140144094286).

To test for the symmetric movements in retail price is based on a model in which the change in retail gasoline price (ΔR_t) is the function of the change in crude oil price (ΔC_t). This model shows the effect of a change in the crude oil price on the retail price.[6] The relationship is summarized as

$$\Delta R_t = a\_0 + a_1 \Delta C_t \tag{4}$$

However, since the effect of a change in crude oil price does not pass through only for the same period but accumulates, the test uses the following distributed lag model.

$$\Delta R_t = a_0 + a_{1,0}\Delta C_t + a_{1,1}\Delta C_{t-1} + a_{1,2}\Delta C_{t-2} + \cdots = a_0 + \sum_{i=0}^{p} a_{1,i}\Delta C_{t-i} + e_t \tag{5}$$

In order to examine how the effect of crude oil price increase differs from that of a decrease, periods of crude oil price increases and decreases must be separated. Since there can be a difference in the timing of price pass-through in increase and decrease, finding the optimal lag is the first job to be done for the whole symmetry tests. Shown below is the final model used to find the amount symmetry and pattern symmetry.

$$\Delta R_t = a_0 + \sum_{i=0}^{p} a_{1,i}\Delta CI_{t-i} + \sum_{i=0}^{q} a_{2,i}\Delta CD_{t-i} + e_t \tag{6}$$

where $\Delta R_t = R_t - R_{(t-1)}$; ΔCI_t is equal to $CI_t - CI_{(t-1)}$ if $(CI_t - CI_{(t-1)}) > 0$, and zero otherwise; ΔCD_t is equal to $CD_t - CD_{(t-1)}$ if $(CD_t - CD_{(t-1)}) < 0$, and zero otherwise. That is, all ΔCI_t are positive or zero and all ΔCD_t are negative or zero. The variable e_t is a random error term; p and q are the specified number of lags for the crude oil price increases and decreases.

Symmetry tests are classified into three---timing symmetry, amount symmetry, and pattern symmetry. Amount symmetry is divided into two sub-amount tests.

3.1 Timing symmetry

Hypothesis 1. The number of lags for increases is equal to the number of lags for decreases.

Differences in the timing of price pass-through can be indicated by differences in the number of lags for increases (p) and decreases (q). This hypothesis indicates if the length of time in which retail prices completely respond to a wholesale price change is symmetric or not.[7]

3.2 Amount symmetry

Hypothesis 2. The cumulative effect of a crude oil price increase is equivalent to that of a crude oil price decrease, i.e.,

$$\sum_{i=0}^{p} a_{1,i} = \sum_{i=0}^{q} a_{2,i} \tag{7}$$

To support amount symmetry, one more hypothesis is tested to check the full reflection of the crude oil price in the retail price.

Hypothesis 3. The crude oil price changes are fully reflected in the retail price, i.e.,

$$\sum_{i=0}^{p} a_{1,i} = 1 \text{ and } \sum_{i=0}^{q} a_{2,i} = 1 \tag{8}$$

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[6] Retail gasoline prices include federal and state tax.

[7] To find the optimal lag for increases and decrease, the test used the distributed lag model and checked the significance level of increasing lag.

3.3 Pattern symmetry

Hypothesis 4. The pattern of the retail price increases is not significantly different from that of the retail price decreases, i.e.,

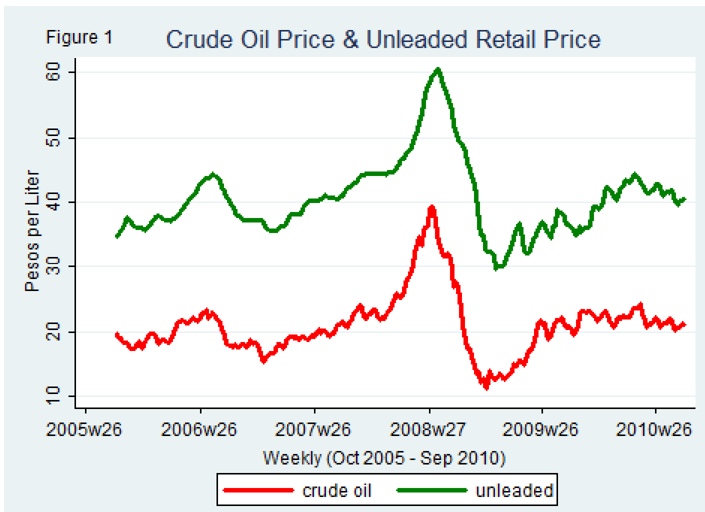
$$p = q \text{ and all } a_{(1,i)} = a_{(2,i)} \tag{9}$$

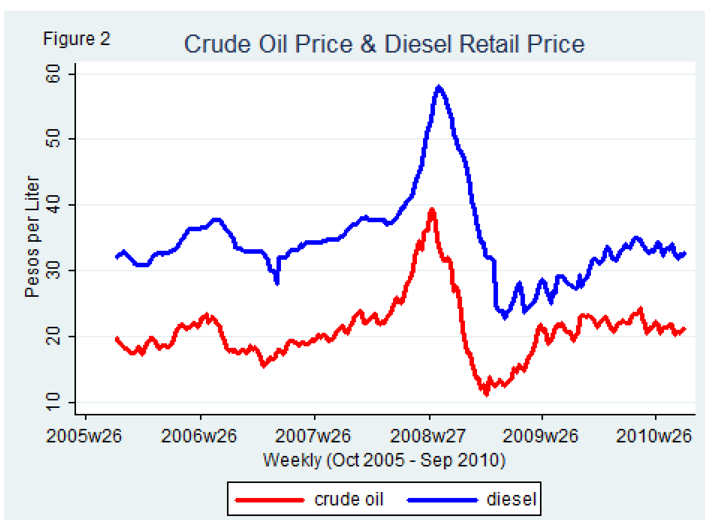
For pattern symmetry to be supported the optimal lag of increases should be equal to that of decreases and the estimated coefficient of each lag variable in increases should not be statistically different from those of the decreases.

4 Results and Discussion

4.1 Dubai crude oil vs. retail gas prices

After the Dubai crude oil prices were converted to pesos per liter, the five-year historical movement of retail gas prices in the Philippines is shown in the following figures.





Mere observation of the whole trend shows that the movement of crude oil price and retail gas price are symmetric, but the test revealed detailed differences.

4.1.1 Timing symmetry

When the distributed lag model is run to find the optimal lag for unleaded gas and diesel in increasing and decreasing, different results are obtained. Lag lengths used for periods of crude oil price increases are the same for unleaded gas and diesel, and they are all two. For periods of crude oil price decreases, the lag length of unleaded gas is longer by one period compared to diesel, i.e., the lag length of unleaded is 3 but that of diesel is 2. This means that crude oil price increases affect both unleaded and diesel retail prices for 3 weeks (the first week and two lagged weeks), but crude oil price decreases affect unleaded gas for 4 weeks and diesel for 3 weeks. Thus, hypothesis 1 which states that the length of time in which retail prices completely respond to a crude oil price change is symmetric can be rejected for unleaded gas but cannot be rejected for diesel.

4.1.2 Amount symmetry

The ordinary least squares estimates for the final model are summarized in the following table 1.

Table 1. Timing and Amount Symmetry Tests (Dubai)

	Timing		Amount		
	Number of weeks lagged		t-value for test of	t-value for test of	
Types of gasoline	CI	CD	$\sum a_{1,i} = \sum a_{2,i}$	$\sum a_{1,i} = 1$	$\sum a_{2,i} = 1$
Unleaded	2	3	0.37	1.87	1.61
Diesel	2	2	1.53	0.24	3.3

In hypothesis 2, the test checks if the cumulative effect of crude oil price increase is equivalent to that of crude oil price decrease by testing $\sum_{i=0}^{p} a_{1,i} = \sum_{i=0}^{q} a_{2,i}$. As shown in Table 1, t-statistics for first amount symmetric test for unleaded is very low, which indicates that the null hypothesis cannot be rejected. Even in the case of diesel, with t-statistic of 1.53, results indicate that the null hypothesis cannot be rejected at 5% significance level.

In hypothesis 3, the .test establishes if the crude oil price changes are fully reflected in the retail price by checking $\sum_{i=0}^{p} a_{1,i} = 1$ and $\sum_{i=0}^{q} a_{2,i} = 1$. This hypothesis cannot be rejected for unleaded retail gas since t-statistics are low for both increases and decreases. On the other hand, the hypothesis can be rejected for diesel because the t-statistic in price decreases is 3.3. This means that crude oil price increases are fully passed along to consumers, but crude oil prices are not fully passed along in case of diesel. Even if the test increase one more lag for diesel in price decreases, the result of testing hypothesis 3 did not change.

In testing hypothesis 2 & 3, it was shown that there is amount symmetry of price pass-through in unleaded retail gas but it is not complete in diesel retail gas.

4.1.3 Pattern symmetry

The test also tries to see if there is pattern symmetry in retail price responses in increases and decreases by checking the estimated coefficients. Table 2 shows the estimated figures.

Table 2. Pattern Symmetry Test (Dubai)
(Parameter Estimates)

	Crude oil increases			Crude oil decreases			
Types of gasoline	$a_{1,0}$	$a_{1,1}$	$a_{1,2}$	$a_{2,0}$	$a_{2,1}$	$a_{2,2}$	$a_{2,3}$
Unleaded	0.17	0.42	0.14	0.16	0.15	0.32	0.18
Diesel	0.20	0.56	0.19	0.07	0.10	0.39	---

* Estimated coefficients indicate statistical significance at the 5 percent level.

As shown in Table 2, the largest retail response occurs in the second week for unleaded and diesel for crude oil price increases. For crude oil price decreases, however, the largest retail response occurs in the third week. Figures 3 and 4 show this pattern graphically.

Figure 3 Pattern Symmetry in Unleaded Retail Price Response (Estimated Coefficients)

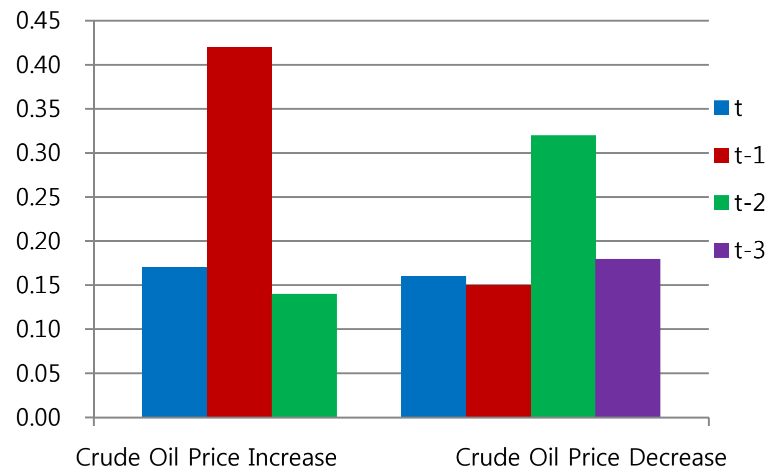
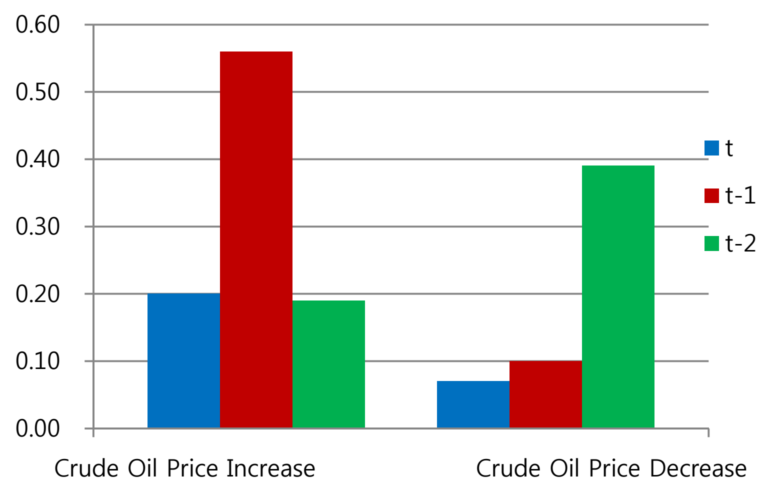


Figure 4 Pattern Symmetry in Diesel Retail Price Response (Estimated Coefficients)

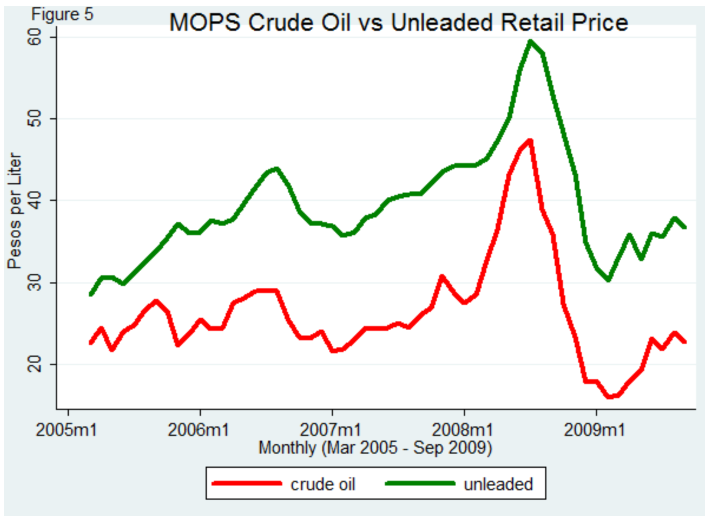


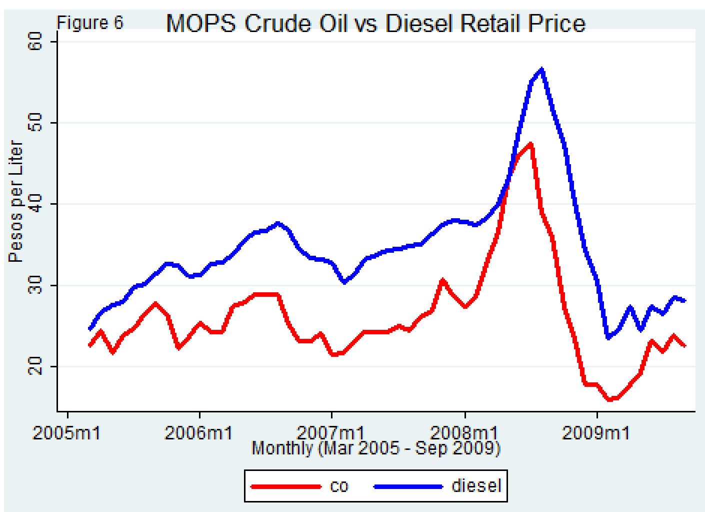
A direct interpretation of the coefficients, as reported in table 2, is as follows: a peso increase in crude oil price leads to 17-centavo increase in the unleaded retail gasoline price during the initial week, while a 1-peso decrease in crude oil price leads to 16-centavo decrease. Therefore there is only one-centavo difference in unleaded gasoline during the initial week. For diesel, the difference is 13 centavos implying that diesel responses faster in price increases than in price decreases during the first week. Hence, during the first week the pattern in price increases is similar to that in decreases for unleaded, but it is different in case of diesel.

During the second week, however, the pattern is really different in price increases and decreases for both retail gasoline. Retail gasoline prices both respond faster in price increases than in decreases. The difference between increases and decreases leads to 27 centavos and 46 centavos, respectively for unleaded and diesel. In the third week, the pattern is reversed, implying that the largest retail response occurs in decreases rather than in increases. Thus, the hypothesis assuming $a_{1,i} = a_{2,i}$ can be rejected for both unleaded and diesel. This indicates that, in each week, there is a different price pattern in price increases and decreases. In the first and second week, all estimated coefficients are bigger in increases than in deceases, but in the third week, the results are opposite. Analysis of pattern symmetry test shows that retail gas prices respond faster to crude oil price increases than decreases.

4.2 MOPS Crude Oil vs. Retail Gas Prices

According to the Department of Energy (DOE), the Philippines employs Mean of Platts Singapore (MOPS) as the benchmark for local fuel products.[8] Due to the scarcity of weekly data of MOPS prices, the test is done only with monthly data of MOPS from March 2005 until September 2009. The following figures show the historical movements in crude oil prices and retail gas prices in the Philippines. It is evident from these figures that there is a similarity between the two time series.





4.2.1 Timing symmetry

Using the distributed lag model, results show that two is the optimal lag for both unleaded gas and diesel in increasing and decreasing prices. This means that retail prices respond to a crude oil

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[8] An August 17, 2011 press release from the Department of Energy (http://www.gov.ph/2011/08/17/doe-mops-is-benchmark-for-local-fuel-products).

price change within the same time period regardless of the direction of price change. Thus, hypothesis 1 which states that the length of time in which retail prices completely respond to a crude oil price change is symmetric can be rejected for unleaded gas and also for diesel.

4.2.2 Amount symmetry

The ordinary least squares estimates for the final model are summarized in the following table 3.

Table 3. Timing and Amount Symmetry Tests (MOPS)

	Timing		Amount		
	Number of months lagged		t-value for test of	t-value for test of	
Types of gasoline	CI	CD	$\sum a_{1,i} = \sum a_{2,i}$	$\sum a_{1,i} = 1$	$\sum a_{2,i} = 1$
Unleaded	2	2	1.61	1.64	0.98
Diesel	2	2	0.3	0.28	0.22

In hypothesis 2, the test intends to check if the cumulative effect of crude oil price increase is equivalent to that of crude oil price decrease by testing $\sum_{i=0}^{p} a_{1,i} = \sum_{i=0}^{q} a_{2,i}$. As shown in Table 3, t-statistic for first amount symmetric test for unleaded and diesel is low, which indicates that the null hypothesis cannot be rejected.

In hypothesis 3, it is tested if the crude oil price changes are fully reflected in the retail price by checking $\sum_{i=0}^{p} a_{1,i} = 1$ and $\sum_{i=0}^{q} a_{2,i} = 1$. This hypothesis cannot be rejected for unleaded and diesel retail gas since t-statistics are low for both increases and decreases.

In testing hypothesis 2 and 3, it was shown that there is amount symmetry of price pass-through both in unleaded and diesel retail gas.

4.2.3 Pattern Symmetry

The test also tries to see if there is pattern symmetry of retail price responses in increases and decreases by checking the estimated coefficients. Table 4 shows the estimated figures.

Table 4. Pattern Symmetry Test (MOPS)
(Parameter Estimates)

	Crude oil increases			Crude oil decreases		
Types of gasoline	$a_{1,0}$	$a_{1,1}$	$a_{1,2}$	$a_{2,0}$	$a_{2,1}$	$a_{2,2}$
Unleaded	0.48	0.48	0.40	0.37	0.60	0.36
Diesel	0.46	0.58	0.55	0.18	0.66	0.47

* Estimated coefficients indicate statistical significance at the 5 percent level.

As shown in Table 4 the largest retail response occurs in the second month for both unleaded and diesel for crude oil price decreases. But when the crude oil increases, the movement for three months were not too different although the patterns of unleaded and diesel are a little different. Figures 7 and 8 show this pattern graphically.

Figure 7 Pattern Symmetry in Unleaded Retail Price Response (Estimated Coefficients)

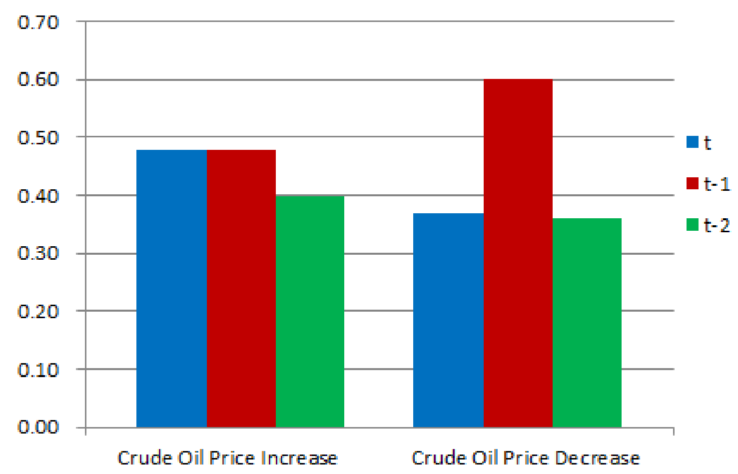
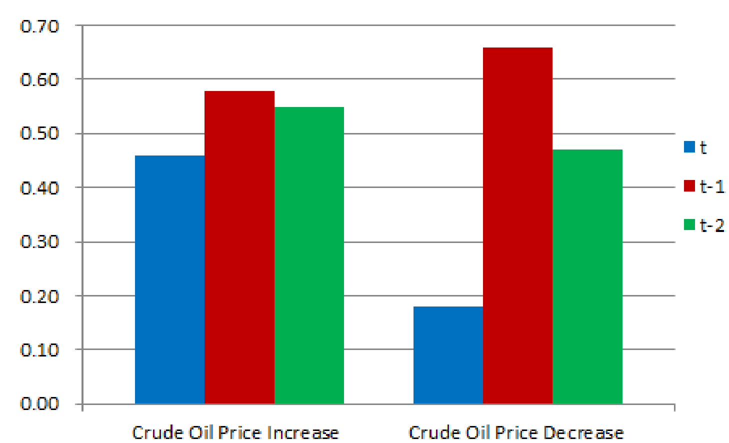


Figure 8 Pattern Symmetry in Diesel Retail Price Response (Estimated Coefficients)



The coefficients are bigger in the case of MOPS than that of Dubai crude oil as monthly data are used for MOPS and weekly for Dubai. It means that for a longer period, the price of crude oil affects more the price of retail gas. The important finding here is that when the crude oil price increases, the retail gas prices react consistently for the given time lag but when the crude oil price decreases, the retail gas prices move down slowly in the first month but greater in the second month. Like Dubai crude oil, analysis of pattern symmetry test for MOPS shows that retail gas prices respond faster to crude oil price increases than decreases.

5 Conclusion

This paper tests for symmetric retail gasoline price responses to changes in crude oil prices. For the Dubai crude oil, a discrepancy in results in three kinds of symmetry tests is obtained. In timing symmetry, there is a symmetric responsiveness of retail diesel prices to changes of crude oil, but there is none in unleaded. In amount symmetry, there is a symmetric responsiveness of retail gas prices to changes of crude oil prices for retail unleaded but not for retail diesel. In pattern symmetry test, however, both retail gas show asymmetric responses to crude oil price increases and decreases.

In the case of MOPS, timing and amount symmetry test show a symmetric responsiveness of retail prices to changes of crude oil for both unleaded and diesel. However, in pattern symmetry test both retail gas show asymmetric responses to crude oil price increases and decreases like the case of Dubai crude oil. Some people believe that retail gas price is sticky only when the crude oil decreases. If we consider the test result of the pattern symmetry test, we can see that retail gas prices respond slower in decreases than in increases.

Contrary to the popular belief that consumers do not benefit from crude oil price decreases, crude oil price decreases are finally passed along to consumers as fully as are crude oil prices increases in case of unleaded retail gasoline. Although diesel retail gas price behavior does show complete amount symmetry, at least it shows that the cumulative effect of a crude oil price increase is equivalent to that of a crude oil price decrease. As the test results show in pattern symmetry, there might be a time gap in retail gas responses; but eventually retail gasoline prices move symmetrically with increases and decreases.

From regular vehicle drivers who consume the gas up to the business sectors that use the retail gas as the main cost factor, it became a social issue or interest to know how the retail gas price is affected by changes of the crude oil price. They are curious about how long and how much the retail gas price is affected by the changes of the crude oil price. Besides, they wish to know the stream or the trend of the retail gas price when the crude oil price is changing because knowing the price pattern will help them economize on the gas or maximize the benefit of using it. However, it is not easy to get the correct information and sometimes the public even tend to miss the correct information. For example, one of the benchmarks crude oil in the Philippines' retail gasoline could be MOPS or Dubai crude oil but not WTI, but people usually see the prices' high changes of WTI in the mass media. In the peak month of 2008, Dubai crude oil did not increase as high as WTI crude oil.[9]

There should be errors or disturbances that should be controlled for us to have more accurate results, and there could be business transactions that can hardly be quantified to be adopted in the model. It is also possible that this study can be tested using more sophisticated symmetry model by adding more control variables. One of the possible variables could be a refined product's price or final product's since the major oil companies import not only crude oil but also the refined product itself. However, there should be a careful treatment for the model because the crude oil and the imported refined products are correlated.

Some other studies have shown before that symmetry existed but no one mentioned how strong, weak, or pervasive the relationship is.[10] Nevertheless, through this test, the behavior of the retail gas prices in the Philippines to changes of crude oil prices can be shown in different kinds of symmetry. Although the retail gas price cannot be completely predicted by knowing the changes of the crude oil, if the final consumers who are from the individual to the business sectors can figure out the pattern of the movements of the retail gas price depending on the changes of the crude oil price. The consumers might be able to get the benefit or advantage of optimizing the expenses of the retail gas by having the knowledge of the relationship of two prices.

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[9] The highest spot price for Dubai crude oil was US$ 136.7 per barrel and US$ 145.16 for WTI crude oil in July, 2008.

[10] Godby,et al., (1997): No asymmetry between retail gasoline prices (regular or premium) and crude oil prices. Shin (1994): No asymmetry between wholesale gasoline and crude oil price.

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