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Gasoline: From Rack Prices to Pump Prices, Relationship and Asymmetry

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(In Brief)

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GASOLINE: FROM RACK PRICES TO PUMP PRICES, RELATIONSHIP AND ASYMMETRY

1 INTRODUCTION

Although world oil prices are constantly fluctuating, some people are surprised that the price changes, particularly decreases, are not immediately reflected in the prices that consumers pay at the pump (the “pump price”).

A number of observers, including Quebec’s Régie de l’énergie,¹ consider the rack price of gasoline (the price paid by wholesalers) to be a better indicator of pump prices than world oil prices, because the rack price includes refining margins and the cost of transportation between production and storage sites, and because the time it takes for gasoline to move from the rack to the pump is generally short.

This document summarizes the various components of the pump price in Canada and briefly discusses the relationship between crude oil prices, rack prices and pump prices, including an empirical analysis of fluctuations in rack prices and pump prices in a given region and period.

2 BREAKDOWN OF PUMP PRICES IN CANADA

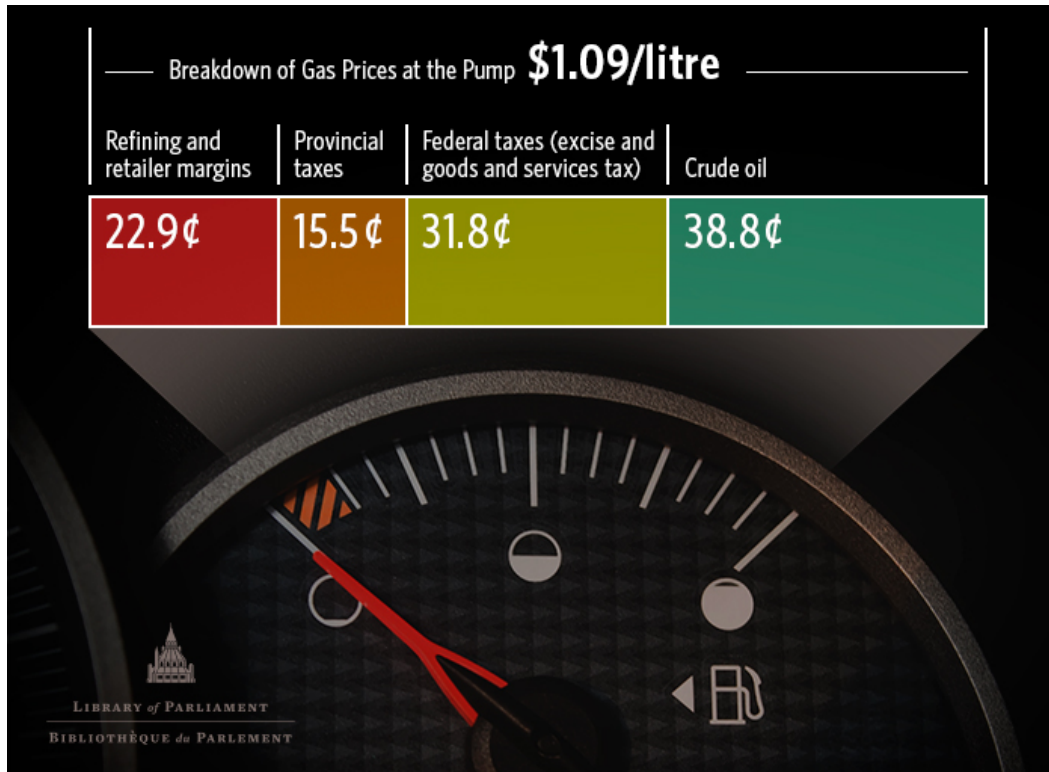
2.1 VARIOUS COMPONENTS OF THE PUMP PRICE

A number of components make up the pump price in Canada, including the price of the oil itself, consumption and excise taxes, transportation costs, and refining and retail margins.

In 2015, the average pump price in Canada was \$1.09, which can be broken down into the percentages noted below (see Figure 1):

- Taxes, the largest component, accounted for 43% of the pump price, distributed as follows:
 - federal taxes (excise tax and goods and services tax): 29% of the pump price; and
 - provincial taxes:² 14% of the pump price.
- Refining margins (crude oil refining costs and profits) and marketing margins (wholesale costs and profits) together accounted for 21% of the pump price.
- The cost of the oil itself accounted for only 36% of the pump price.³

Figure 1 – Components of the Pump Price in Canada, 2015



Source: Figure prepared by the author based on data from Natural Resources Canada, [Fuel Focus, 2015 Annual Review](#), 29 January 2016.

2.2 OTHER FACTORS

Various other factors can also affect the pump price, such as regulatory requirements and the value of the Canadian dollar. This last factor, the “currency effect,” is a significant one.

Since Canada is a crude oil producer, there is general downward pressure on the Canadian dollar when the price of oil falls. Because crude oil is traded in U.S. dollars and Canada imports over a third of the oil it consumes, it is unlikely that a drop in oil prices would result in an equivalent drop in Canadian pump prices. Lower oil prices in U.S. dollars will most often be offset by a corresponding drop in the value of the Canadian dollar.⁴

3 CRUDE OIL PRICE, RACK PRICE AND PUMP PRICE

Crude oil prices, set on international markets, generally affect pump prices only in the long term, given the time it takes for the commodity price to make its way down the extraction, transportation and processing chain to consumers. Rack prices, on the other hand, have a more immediate impact, in particular because of the much shorter time it takes for gasoline to move between the two points of sale.

In this study, the relationship between rack prices and pump prices was studied through an empirical analysis using Joliette, Quebec, and the surrounding area as an example.⁵ This analysis was also conducted in part to answer a frequently asked question, that of whether asymmetry exists in pump pricing, meaning whether pump prices respond more strongly to increases in rack prices than to decreases in rack prices.⁶

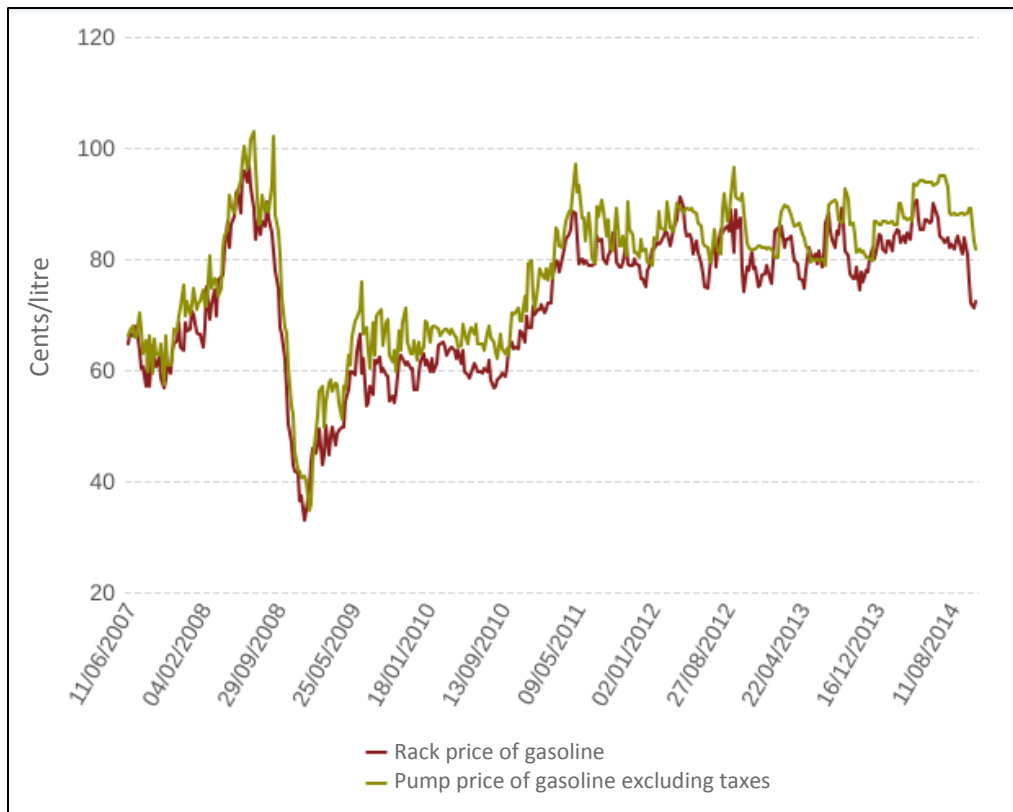
3.1 EMPIRICAL ANALYSIS

3.1.1 METHODOLOGY AND DATA

Weekly pump prices for regular unleaded gasoline in the Joliette area and weekly rack prices for the same type of gasoline in Montréal were obtained from Quebec's Régie de l'énergie⁷ for the period from 11 June 2007 to 17 September 2014.

Figure 2 presents this data and shows that the two prices were strongly correlated throughout the period.

Figure 2 – Joliette Area Pump Prices and Montréal Rack Prices, Weekly Data, 2007–2014



Source: Régie de l'énergie (Quebec), [Produits pétroliers: informations utiles](#). [Available in French only; Translation]

The models used in this document resemble models developed and used for similar studies by the Competition Bureau in 2005⁸ and Quebec's Régie de l'énergie in 2009.⁹ The following two sections summarize the results of calculations done by the author based on these models. (Given their rather technical nature and for the sake of readability, the detailed calculation and the statistical analysis appear in the appendix.)

3.1.2 IMPACT OF RACK PRICES ON PUMP PRICES¹⁰

Changes in pump prices excluding taxes over a one-week period in Joliette and the surrounding area were compared with the following two factors:

- the change in the Montréal rack price during the week before the period examined; and
- the change in the Montréal rack price during the second week before the period examined.

The purpose of this comparison was to see whether the change in pump prices during a given week was influenced by changes in rack prices during the two preceding weeks.

Analyzing the resulting correlation confirmed that rack prices had a strong impact on pump prices. The estimated coefficients are positive and, according to the standard statistical test, highly significant. Their sum for two weeks shows that a change in rack prices resulted in an equivalent change in pump prices throughout the period.

3.1.3 ANALYSIS OF ASYMMETRY IN PUMP PRICING¹¹

To determine whether there was asymmetry in pump pricing, two variables were added to the above calculation in order to examine increases and decreases in rack prices. This made it possible to isolate the impact of changes in rack prices. Where there is asymmetry, the coefficients of the variables are statistically significant, and vice versa.

The findings show that the coefficients of the added variables are not statistically significant, meaning that pump prices did not respond more strongly to increases than to decreases in rack prices during the period in question and, consequently, that there was no asymmetry.

3.1.4 COMMENTS

As a comparison, it is worth noting that these findings are consistent with those released by the Competition Bureau in 2005 for Canada and are partially consistent with other findings released by Quebec's Régie de l'énergie in 2009 for the city of Québec.¹²

4 CONCLUSION

World oil prices currently account for just over a third of the price paid at the pump by Canadian consumers. Moreover, fluctuations in world oil prices generally affect pump prices in the longer term and are often cushioned by fluctuations in the Canadian dollar, which is highly influenced by the price of oil. This means that rack prices are generally a better indicator of pump prices than are oil prices.

The findings obtained during this study show that

- a change in rack prices results in an equivalent change in pump prices; and
- pump prices do not respond more strongly to increases in rack prices than they do to decreases in rack prices (meaning that there is no asymmetry).

NOTES

1. Competition Bureau, [Gasoline Empirical Analysis: Update of Four Elements of the January 2001 Conference Board study: "The Final Fifteen Feet of Hose: The Canadian Gasoline Industry in the Year 2000"](#), March 2005.
2. Three Canadian municipalities collect an additional tax on gasoline: Vancouver (\$0.11 per litre), Victoria (\$0.033 per litre) and Montréal (\$0.03 per litre).
3. The oil price component of the pump price can obviously fluctuate based on world oil prices. When oil prices are very high, they can account for a greater share of the pump price than taxes.
4. In 2014, 37% of the oil shipped to Canadian refineries was imported, and over 50% of these imports came from the United States. For further information, see Natural Resources Canada, [Oil Supply and Demand](#).
5. This analysis was restricted to the local level (Joliette and surrounding area). Since pump prices are highly influenced by local market forces, an analysis that considered variations in the average pump price across Canada or Quebec would not produce relevant findings.
6. Competition Bureau (2005), p. 16.
7. Régie de l'énergie (Quebec), [Produits pétroliers: informations utiles](#). [Available in French only]
8. Competition Bureau (2005).
9. Régie de l'énergie (Quebec), [Avis sur les écarts de prix de vente et des marges de commercialisation de l'essence entre Montréal et Québec](#), Avis A-2009-02, 14 December 2009. [Available in French only]
10. See the detailed calculation and statistical analysis in section 1 of the appendix.
11. See the detailed calculation and statistical analysis in section 2 of the appendix.
12. The model used in this document includes more observations and a shorter frequency than the model used by the Competition Bureau, but fewer observations and a longer frequency than the one used by Quebec's Régie de l'énergie.

APPENDIX – CALCULATION AND STATISTICAL ANALYSIS OF THE IMPACT OF RACK PRICES ON PUMP PRICES

This appendix presents the detailed the calculation for and statistical analysis of the impact of rack prices (in Montréal) on pump prices (in Joliette, Quebec, and the surrounding area) from 11 June 2007 to 17 September 2014.

The estimation models used in the following calculations and analyses resemble the models developed and used for similar studies released by the Competition Bureau in 2005¹ and Quebec’s Régie de l’énergie in 2009.²

The models were estimated in *EViews 8* using the ordinary least squares regression method.

1 IMPACT OF RACK PRICES ON PUMP PRICES

The relationship between pump prices in Joliette and the surrounding area and rack prices in Montréal can be expressed and estimated as follows:

$$\Delta PPGET_t = \beta_1(\Delta RPG_{t-1}) + \beta_2(\Delta RPG_{t-2}) + E_t \quad \text{EQUATION 1}$$

where

- $\Delta PPGET_t$ represents the change in the pump price excluding taxes in Joliette and the surrounding area over a one-week period;
- ΔRPG_{t-1} represents the change in the rack price in Montréal over a one-week period (one week before);
- ΔRPG_{t-2} represents the change in the rack price in Montréal over a one-week period (two weeks before);
- E is an error term; and
- β_1 and β_2 are the coefficients to be estimated.

Equation 1 is used to determine whether the change in the pump price over a given week is influenced by changes in the rack price over the two preceding weeks.

Table 1 – Regression Results for Pump Prices (Joliette and Surrounding Area) as Compared with Rack Prices (Montréal), 2007–2014

Variable	Coefficient	t-test
ΔRPG_{t-1}	0.5745	6.9476 ^a
ΔRPG_{t-2}	0.2672	4.8810 ^a
$\Delta RPG_{t-1} + \Delta RPG_{t-2}$	1.0000	1.5620 ^b

Notes: a. Significant at a 5% level.
 b. Significant at a 10% level.

As expected, rack prices have a strong impact on pump prices. The estimated coefficients are positive and the standard *t*-test shows that they are highly significant. Furthermore, the sum of the significant coefficients is equal to 1, meaning that a change in rack prices leads to an equivalent change in pump prices.

2 ASYMMETRY IN PUMP PRICING

Pump price asymmetry is the assumption that pump prices respond more strongly to increases in rack prices than they do to decreases in rack prices.³

To determine whether there is asymmetry, two variables are added to equation 1:

$$\Delta PPGET_t = \beta_1(\Delta RPG_{t-1}) + \beta_2(\Delta RPG_{t-2}) + \beta_3(D \times \Delta RPG_{t-1}) + \beta_4(D \times \Delta RPG_{t-2}) + E_t$$

EQUATION 2

where *D* represents a dummy variable equal to “1” if the change in the rack price is positive, and “0” if it is negative.

The dummy variable isolates the impact of changes in rack prices. Where there is asymmetry, the coefficients for the variable expression including the dichotomous variable *D* will be statistically significant, and vice versa.

Table 2 – Asymmetry Regression Results, Fluctuations in Pump Prices (Joliette and Surrounding Area) and Rack Prices (Montréal), 2007–2014

Variable	Coefficient	t-test
ΔRPG_{t-1}	0.5745	6.9476 ^a
ΔRPG_{t-2}	0.2672	4.8810 ^a
$D \times \Delta RPG_{t-1}$	0.0879	-0.9199
$D \times \Delta RPG_{t-2}$	0.1224	0.4607

Note: a. Significant at a 5% level.

The results show that the coefficients for the dummy variables are not statistically significant, which means that pump prices did not respond more strongly to increases than to decreases in rack prices during the period in question and, consequently, that there is no asymmetry.

NOTES

1. Competition Bureau, [Gasoline Empirical Analysis: Update of Four Elements of the January 2001 Conference Board study: “The Final Fifteen Feet of Hose: The Canadian Gasoline Industry in the Year 2000”](#), March 2005.
2. Régie de l'énergie (Quebec), [Avis sur les écarts de prix de vente et des marges de commercialisation de l'essence entre Montréal et Québec](#), Avis A-2009-02, 14 December 2009. [Available in French only]
3. Competition Bureau (2005), p. 16.