AN ANALYSIS OF PATTERNS IN RETAIL GAS PRICE VARIATIONS IN CANADA

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ABSTRACT

This paper intends to study the patterns in retail gasoline price variations in Canada. In particular, we examine the following questions. First, we determine whether retail gasoline prices are higher on certain days of the week. Specifically, are the retail prices higher during the weekends than the weekdays in Canada? Second, we investigate specific differences in the retail gasoline prices over various days of the week across different Canadian cities and provinces. Finally, we compare the average retail gasoline prices across different provinces in Canada.

Keywords: Retail Gasoline Price, Canada, Alberta, Weekend Effect, Carbon Tax

INTRODUCTION AND LITERATURE SURVEY

Retail gasoline price in Canadian provinces varies over time and location. Previous efforts have been made to discover the reasons and patterns of such variability (Eckert, 2003; Atkinson et al., 2014) in different areas [10] [4]. However, the variability from one day to the next has not been explored in a week, except for Erutku (2007) [12]. The reason for wide variations in retail gasoline prices is one of the most widely debated issues in Canada. This paper intends to study Canada's retail gasoline price variations patterns, focusing on Alberta. In particular, we will examine the following key issues. First, we investigate whether there are specific differences in the trends in retail gasoline prices across various Canadian cities and provinces. Second, we examine whether retail gasoline prices are higher on certain days of the week, and is there a "weekend effect" in the sense that the retail prices are higher during the weekends than the weekdays? Further, if there is such an effect, is it present in each province in Canada? Our analysis of these issues leads to some interesting insights.

We start with a brief survey of the literature analyzing retail gasoline prices in Canada. Atkinson, Eckert, & West (2014) used data from the Kent Marketing website and GasBuddy.com and used several empirical tests and regression analyses to figure out pricing patterns [4]. They concluded that some Canadian cities have moved from Edgeworth price cycles to daily cycles or constant margins. They further noted that the Canadian retail gasoline prices are known to change daily. Earlier, the same authors had found similar

results for the city of Guelph [3]. They had also noted price increases occurred quicker than decreases. This latter paper also observed that in Guelph, most gas stations matched the price of a select few stations instead of the entire market, and prices are matched quicker on weekdays than on weekends. Noel (2007) also noted that retail gasoline prices follow an Edgeworth cycle pattern in many Canadian cities, like Toronto, applying Markov-switching regression analysis [16].

Retail gasoline price cycles do not necessarily follow wholesale price patterns. Studying patterns in retail prices for Windsor, Ontario, and using an estimated reduced form error correction model, Eckert (2003) observed that price decreases were caused by competing gas stations undercutting each other for grabbing higher market share. However, the cost of wholesale gasoline is responsible for price increases. He further concluded that wholesale prices and not seasonal demand increase prices [10]. A few studies in the United States (US) confirm the asymmetry [6] [7].

However, this asymmetric relationship between crude oil and retail gasoline prices may be more of a short-run occurrence. The long-run relationship between the two may instead be symmetric in that the retail gasoline prices broadly match both crude oil price increase and decreases. Using a lag adjusted regression model and a monthly series of data from Jan 1976 to Jan 2012, Bumpass, Ginn, & Tuttle (2015) concluded that retailers have little or no market power over a large time horizon [8].

In contrast, the study of how retail gas outlets change prices over the different days of a week is much less examined in the literature. We will start by mentioning a few studies that used data outside Canada. Hall et al. (2007) used prices from a gas station in West Virginia to investigate the hypothesis that gas stations raise prices on Fridays and lower them on Tuesdays [13]. They found no significant evidence that prices are higher on any particular day of the week relative to any other. Davis (2010) used four years of daily data for a gasoline station in Scranton, Pennsylvania, to perform a regression analysis with dummy variables for the days of the week and observed that prices were more likely to be raised at the beginning of the week than at the end or on the weekend [9]. He hypothesized that this is possibly due to demand inelasticities.

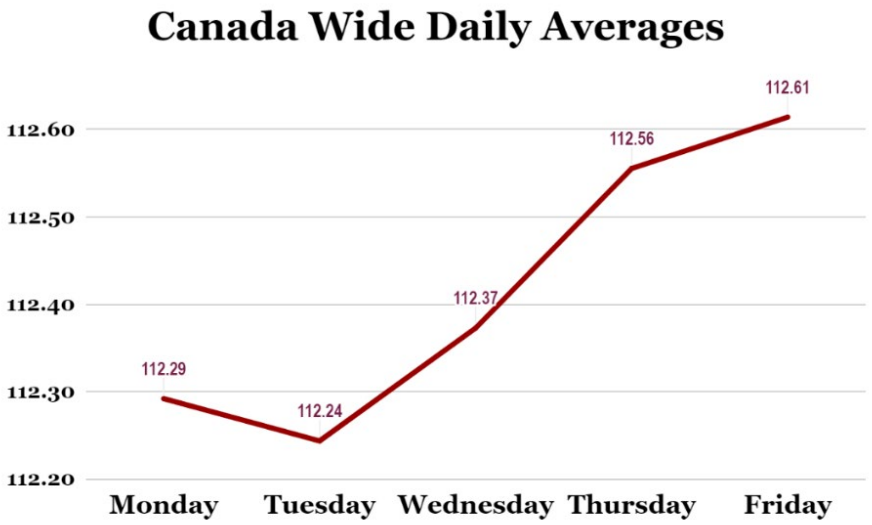
Coming to Canada, Eckert and West (2005), using station-specific daily data on gasoline prices from Vancouver, BC, noted that retail gas outlets undercutting their rivals in prices is approximately 0.06 more likely on weekends than weekdays [11]. This result supported their hypothesis that the consumers are more price aware on weekdays, so price differentials are less sustainable. Erutku (2007) investigated whether prices increased during long holiday weekends using data from 11 Canadian cities for four years. He reported no evidence of any long weekend effect in his data [12].

EMPIRICAL ANALYSIS

We have used data from Kent Group Inc. (presently Kalibrate), with cities from all over Canada, focusing on the province of Alberta [15]. We have considered six cities from Alberta and two cities from most other provinces (Newfoundland and PEI only had one city). Kent Group Ltd. only provided data from July 4, 2016, and we used data till June 30, 2021. Atkinson (2008), comparing internet-based data and collected primary data, conclude that internet data can be reliable for answering questions [1]. In that, our data set gathered from the secondary source can be considered good enough to examine the hypothesis we came up with. Data was converted from daily observations in a year into weekday data (Monday through Friday) to show daily averages of retail gasoline prices (including tax). Data were converted into a graph titled Canada Wide Daily Averages, which revealed significant evidence on what we call "The Tuesday Effect." Additional charts below the table present condensed observations per province to compare the daily price changes across Canada.

Our analysis reveals the "Tuesday Effect," where gasoline prices are lowest on Tuesdays during the week [Figure 1]. Reasons for this drop are not yet evident. We hypothesize the following: We believe if weekend retail gasoline prices are higher than those during the week, companies avoid issuing a sudden drop in prices, so they gradually lower the prices back down on Monday and reach the lowest on Tuesday before slowly building back up to those potentially higher weekend prices, as shown in Figure 1. Figure 1 also indicates that Friday holds the weekday record high in price, demonstrating that weekend gasoline prices are higher than weekday prices. However, the lack of data for weekends [Saturday and Sunday] cannot prove the hypothesis with certainty.

Figure 1: Weekly Gasoline Price Fluctuations in Canada (July 2016-June 2021)

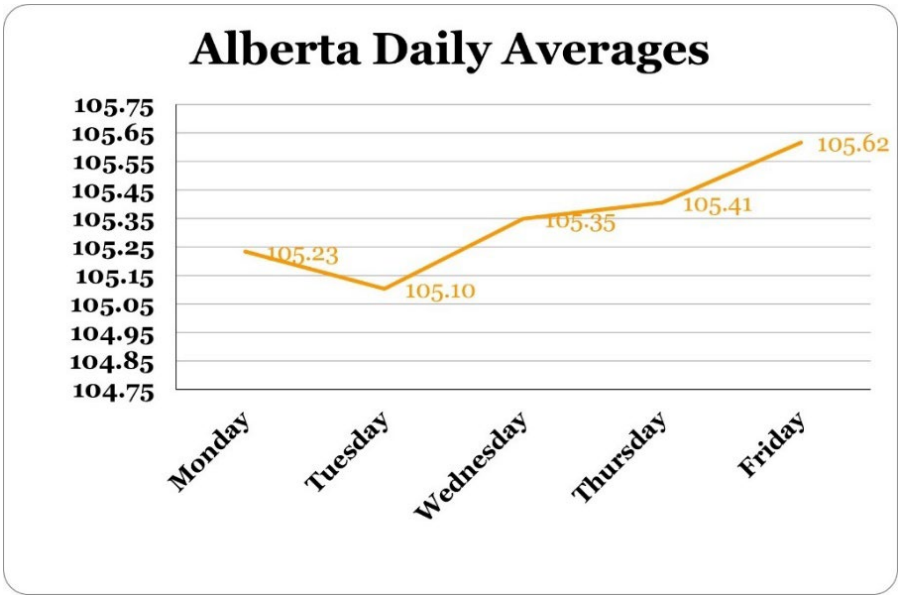


Next, we examine whether this "Tuesday Effect" holds for the different provinces in Canada, starting with Alberta, which is the province that we discuss in more detail. Brown and Yocel (2000), exploring the

gasoline prices in the US, suggest that gasoline price varies from one region to another for several reasons – refineries, transport costs, demand, etc. Canada is not an exception to that as it has variations of availability as well as demand. Western Canada, especially Alberta, is rich in oil with some availability to its two neighboring provinces, Saskatchewan and British Columbia. It is expected that the retail gasoline price should be lower in Alberta than in other provinces. It is also of interest whether the retail gasoline price in Alberta follows the same pattern as in Canada.

Our analysis shows that the abovementioned effect is valid in Alberta as well. We illustrate this effect in Figure 2.

Figure 2: Weekly Gasoline Price Fluctuations in Alberta (July 2016-June 2021)

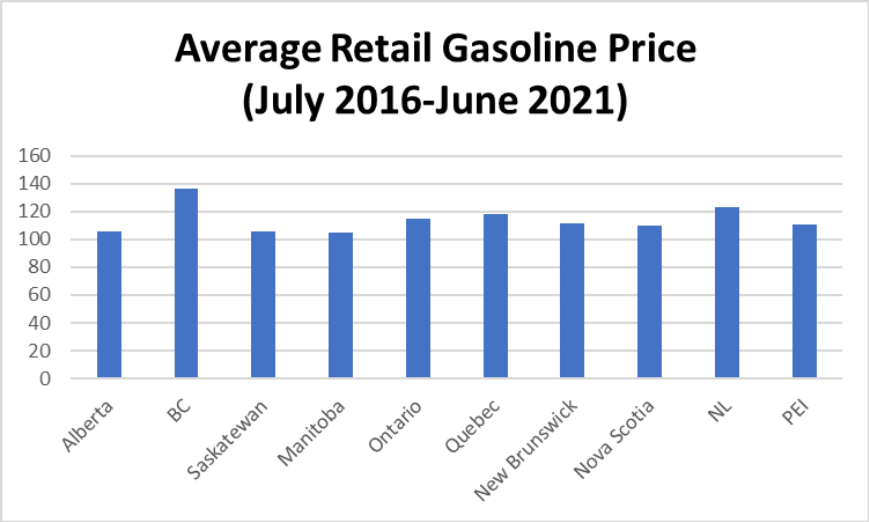


We have extended this study to consider the weekly variation in the retail gas prices over the different provinces in Canada. Interestingly, we find that the "Tuesday Effect" is present in Saskatchewan and Manitoba but not in the other Canadian provinces. In particular, British Columbia and Ontario reveal a reverse Tuesday effect. The prices are highest on Tuesdays, followed by Monday and Friday. In Quebec, the other big province in Canada, gasoline prices are lowest on Mondays. For the other provinces, prices on Tuesday are neither the highest nor the lowest.

However, we find that average retail gasoline prices are higher on Fridays than other days in almost all Canadian provinces, which supports our hypothesis that there is a weekend effect in the sense that the gasoline prices are higher on weekends across Canada. This result contrasts Erutku (2007) and Eckert and West (2005), who find no such evidence [12][11]. However, they had worked with data from specific Canadian cities. However, as mentioned before, the lack of data for weekends [Saturday and Sunday] cannot prove the hypothesis with certainty.

Further, we find that the average gasoline prices are the lowest in Alberta and Manitoba, closely followed by Saskatchewan. The average retail gasoline prices are the highest in BC. This is depicted in Figure 3.

Figure 3: Average Retail Gasoline Price in each Canadian Provinces (July 2016-June 2021)



Thus, our exploratory data analysis yields the following *stylized facts* about Canada's weekly retail gasoline price fluctuations.

1) Across all provinces in Canada, average retail gasoline prices are higher on Fridays than that on other days of the week. This result holds for each province separately.
2) When we examine the aggregate data across all Canadian provinces, there is a significant "Tuesday Effect" in that prices are the lowest on Tuesdays. This effect is also present
3) Across all the Canadian provinces, the average retail gasoline prices are the lowest in Alberta, Manitoba, and Saskatchewan. It is the highest in British Columbia.

It is apparent from the daily variations of the retail gasoline price that the retailer has market power – the gas pumps increase their prices to capture the higher driving demand during weekends. Such a hypothesis is a common belief. Also, it has been observed that the retailers respond much faster to an increase in crude oil price than a decrease, indicating harnessing market power. Although the principal reason for a change in retail gasoline price is found to be the change in crude oil price, the response is not symmetrical across time and space. Atkinson et al. (2009) offer a convincing argument that some Canadian retail gas stations set prices indicating some degree of market power [2]. Although most stations adjust gasoline prices within two hours of changes to neighboring stations, many take longer. Also, it depends on the direction of price change. An increase is often adjusted faster than a decrease – another indication of utilizing market power. On the other hand, Bumpass et al. (2014), examining the retail and wholesale price data from January 1976 to January 2012, find little or no market power of either the wholesalers or the retailers [8].

CONCLUSION

Our preliminary study suggests that there are variations in retail prices among different days in the week, with lower prices during the middle of the week and higher prices toward the weekend. With the lack of data for the weekend, we cannot conclude the observation we made for certainty. In addition, with further studies containing data from various provinces and locations, we can test this assertion. We intend to examine further this effect on micro-level, individual cities, and provinces with more rigor, i.e., statistical validity. We also plan to gather gasoline price data on Saturdays and Sundays to further support our "weekend effect" hypothesis on retail gasoline prices.

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