Kalibrate

First Quarter 2023
January - March

Despite Lower Crude Prices, Gasoline Prices Rose in the First Quarter, While Diesel Prices Declined Upon Lower Wholesale Prices

Retail gasoline prices climbed 8.3 cents per litre in the first quarter in Canada as wholesale prices rose and refining margins expanded; however, diesel prices experienced a significant decline as wholesale prices plummeted 30 cents per litre.

The War in Ukraine reached its one-year anniversary during the first quarter of 2023. Despite disruptions to the global petroleum supply chain in the months following the invasion from economic sanctions, which sent crude oil prices soaring, global crude oil trade routes appear to have adjusted, and crude prices trended toward levels seen before the invasion in the first quarter. In 2022, refiners benefited from record-high refining margins in the wake of the turmoil caused by the Russian invasion of Ukraine. Consequently, many refiners delayed maintenance activities to capture revenues while margins remained elevated. In the first quarter of 2023, refineries began seasonal shutdowns, and unlike in previous years, a reduction in refining activity is expected to be larger and extended longer than usual to catch up with required maintenance. Consequently, crude oil inventories increased this past quarter upon lower refinery crude runs and increased production, also lending support to lower crude oil prices. Fears of economic uncertainty persisted throughout the first quarter, also contributing to falling crude oil prices. The U.S. Federal Reserve raised its prime interest rate twice to reduce inflation this past quarter, and the Bank of Canada raised its prime interest rate at the beginning of the quarter and has since held it. As central banks increase interest rates to curb inflation, this can also lead to a slowing economy and decreased demand for fuel products. Lower crude oil prices contributed to lower retail diesel prices this past quarter but had little effect on retail gasoline prices.

Figure 1: Canadian Average Regular Gasoline and Component Prices

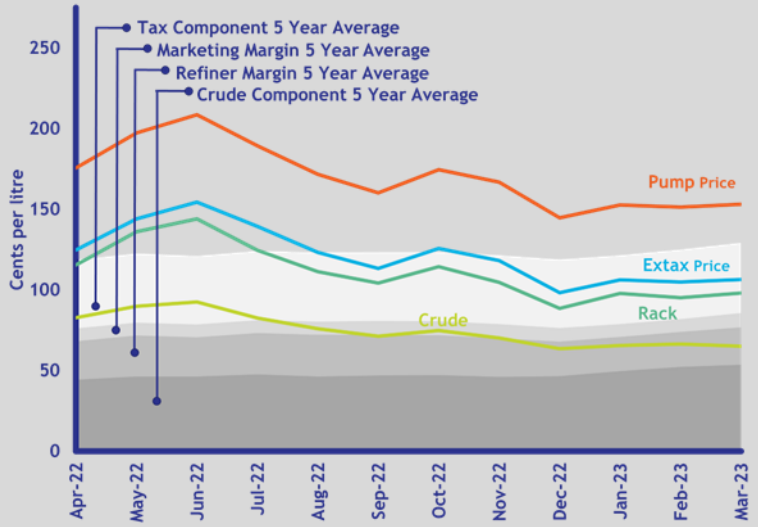
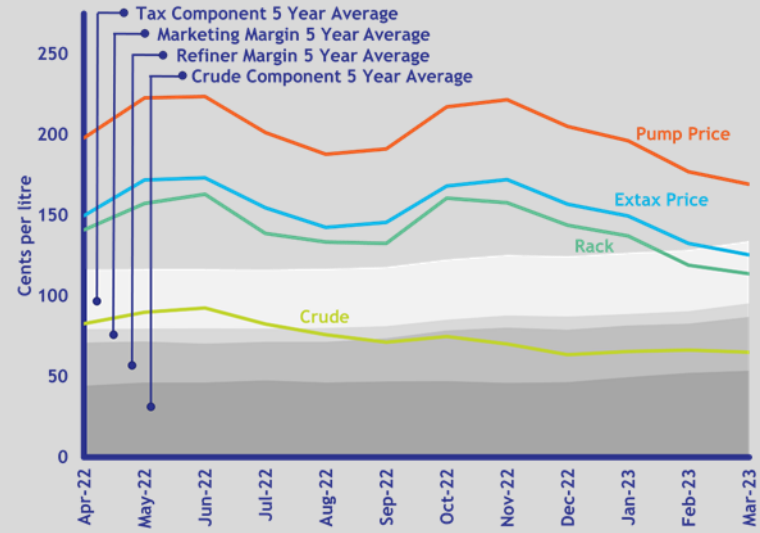


Figure 2: Canadian Average Diesel and Component Prices



Despite North American gasoline demand remaining below pre-pandemic levels, gasoline inventories were below the previous five-year range for most of the first quarter. Gasoline inventories were lower than seasonal norms as refiners continued to favour diesel production due to its higher refining margins. Canadian gasoline refining margins expanded 8.2 cents per litre during the first quarter, and averaged 9.4 cents per litre higher than the previous five-year average. As a result, Canadian gasoline pump prices rose 8.3 cents per litre in the first quarter to end the quarter at 153.1 cents per litre.

In contrast, North American distillate inventories showed signs of balancing in the first quarter after remaining below the previous five-year range for most of the last year, as demand declined in the first quarter due to a milder than usual heating season and lower economic activity. Also, distillate exports declined in the first quarter. In 2022, a large portion of distillate exports headed to Europe due to import bans on Russian crude oil and refined petroleum products, but European buyers began to source crude oil and fuel products from other markets this past quarter, such as West Africa and the Middle East. As a result, Canadian diesel refining margins fell substantially, falling 31.5 cents per litre over the quarter. Even so, by the end of the quarter, refining margins remained 16.8 cents per litre above the previous

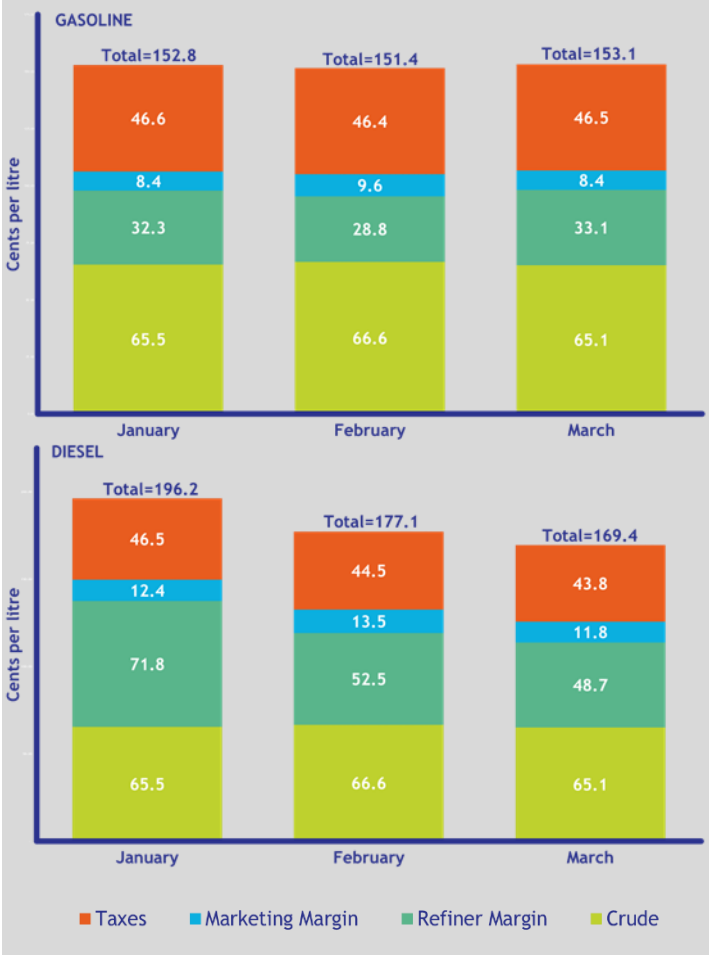
five-year average. Canadian retail diesel prices ended the quarter at 169.4 cents per litre, a 35.7 cents per litre decrease. **Figures 1 & 2** show the historical movement of retail gasoline and diesel prices in Canada and their component prices.

Crude prices generally declined throughout the first quarter, mainly upon lower North American refinery activity, increased production, and uncertain economic sentiments. The price of Brent crude (a global benchmark) began the quarter at 82.10 $US/BBL before falling to 79.77 $US/BBL by the quarter's end, a 2.8 percent decline. Similarly, the North American benchmark, WTI, began the quarter at 76.93 $US/BBL before declining, ending at 75.67 $US/BBL, a 1.6 percent decline. Brent's premium to WTI averaged 5.98 $US/BBL, almost unchanged from the previous quarter at 0.10 $US/BBL lower. The Canadian heavy crude oil discount declined in the first quarter, falling 47.4 percent, likely attributable to the restart of the Keystone pipeline in late December after a leak and increased Gulf Coast exports.

Gasoline and Diesel Market Overview

After rising 8.0 cents per litre in January, gasoline prices remained relatively flat for the remainder of the quarter. Retail gasoline prices may have ended the quarter 8.3 cents per litre higher than the end of the previous quarter, but gasoline prices were 24 cents per litre lower than a year ago. This was attributable primarily to lower crude prices, which declined over 22 cents per litre in the past year. Refining margins averaged 29.6 cents per litre in the first quarter, 7.5 cents per litre above the previous five-year average for the first quarter, likely attributable to lower North American gasoline inventories.

Figure 3: Canadian Average Gasoline and Diesel Price Components for 1st Quarter 2023



This past month, there were regional variances in gasoline price movements as the West Coast and Prairie Provinces experienced a nearly 17 cent per litre increase in wholesale prices over the quarter, while central and eastern regions experienced a more modest increase of roughly five and nine cents per litre. Western markets are more prone to price volatility due to geographical isolation from the rest of the country and limited re-supply options.

Canadians found some relief from high inflation as retail diesel prices declined significantly in the first quarter. After reaching a high of 221.7 cents per litre in November, retail diesel prices have declined for five straight months to a low of 169.4 cents per litre in March, a decline of 52.3 cents per litre. Since the beginning of last quarter, wholesale diesel prices have declined 46.9 cents per litre to 113.8 cents per litre in March. Rising inventories and reduced demand are the main factors in lower diesel prices.

Wholesale diesel prices in central Canada and along the East Coast saw a decline of nearly 33 cents per litre this past quarter, while wholesale prices along the West Coast declined a modest 3.1 cents per litre. The East Coast is more dependent on distillate fuel for home heating. A mild winter season and rising fuel inventories in this region allowed prices to drop this past quarter significantly.

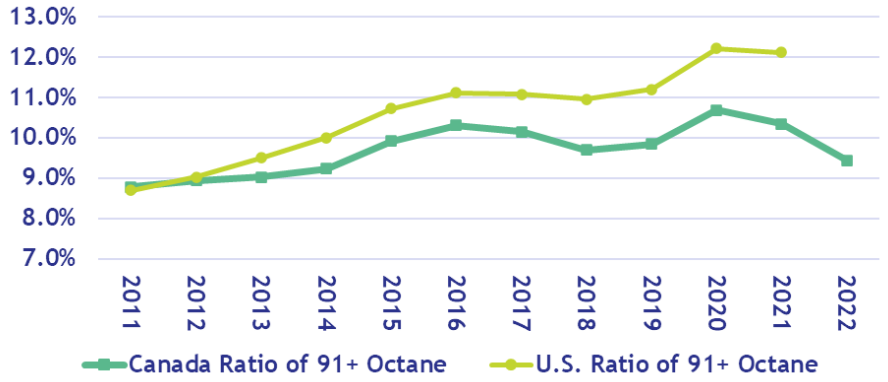
Next Quarter Market Outlook

A surprise production cut announced by the Organization of Petroleum Exporting Countries and allied countries (OPEC+) is expected to tighten crude oil markets and push prices higher in the coming months. In addition, increased demand from China as the country emerges from pandemic lockdowns could further tighten crude oil markets. Both factors could contribute to higher crude prices and push retail gasoline and diesel prices higher in the coming months. In Canada, we will likely see an uptick in gasoline demand as we head into the summer driving season. However, combined with lower than usual North American gasoline inventories, the typical price increase might be more pronounced. In contrast, lower expected economic activity and high inflation might lower diesel fuel demand and pressure prices diesel prices lower, particularly as North American diesel fuel inventories have recovered from lows experienced in the previous year. Fuel tax rate changes will increase prices in some provinces. The annual carbon tax increase takes effect April 1st for most provinces, others July 1st. In Alberta, the provincial tax relief of 13 cents per litre ends at the end of June, while tax relief in Ontario and Newfoundland will remain for the rest of the year.

Premium Fuel Demand Trends and Higher Prices Explained

In Canada, gasoline is sold in different grades known as regular, midgrade, premium and supreme, which refers to the level of octane contained within each grade. Regular gasoline has an octane level of 87, midgrade gasoline has an octane level of 89, and premium and supreme gasoline blends have an octane level of 91 or higher. Higher octane fuels burn slower and are less likely to ignite prematurely, which is known as "knocking." Knocking can be damaging to a vehicle's engine. Consequently, manufacturers of high-performance cars or luxury models may recommend fueling with higher-octane gasoline to reduce engine knocking and improve fuel efficiency. Car manufacturers are designing vehicles that increasingly recommend or require higher octane fuels for use in non-luxury/sports cars to allow for greater fuel economy without sacrificing engine power. However, higher octane fuels require more processing to manufacture, and are subsequently more expensive to refine. According to Kalibrate Canada volumetric data, Canadians filled their tanks 9.4 percent of the time in 2022 with premium or supreme fuel grades.

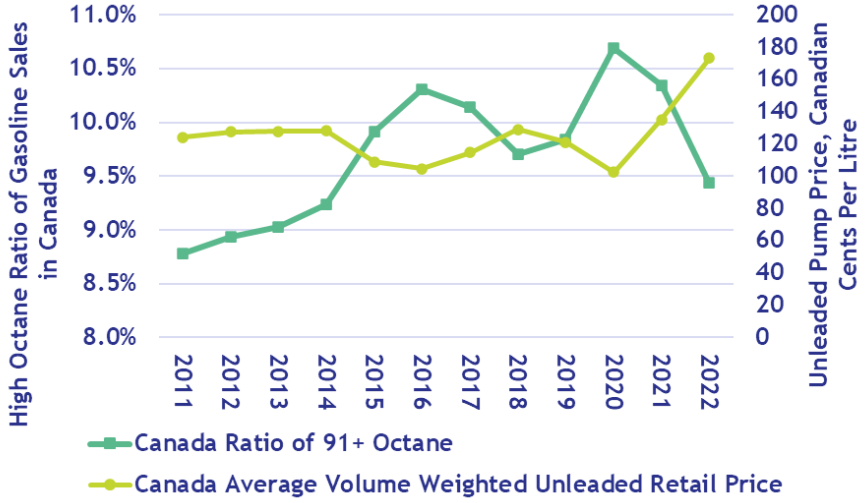
Figure 4: High Octane Ratio of Total Gasoline Consumption, 2011 - 2022



Source: Kalibrate Canada, Inc., U.S. Energy Information Administration (EIA) Rack Sales by Refiners

Data available from the U.S. Energy Information Administration (EIA) shows in the U.S., higher octane fuel use has grown from 8.7 percent in 2011 to 12.1 percent by 2021 (**Figure 4**). Canadian data shows a similar trend rising from 8.8 percent of the pool of fuel sold to 10.7 percent in 2020 before declining in the last two years to 9.4 percent. Although it may seem like the trend towards greater higher octane use is recent, the ratio of premium retail gasoline sales by refiners in the U.S. actually peaked in 1988 at 27.9 percent of the fuel pool (EIA, Refiner Motor Gasoline Sales Volumes) before falling to 7.8 percent in 2008, then beginning the trend of rising again. During the late 1980s, vehicle manufacturers replaced carburetors with electronic fuel injectors. As cars became more computerized, the need for higher octane fuel to reduce engine knock declined. The recent push in the last decade and a half to increase fuel efficiency while maintaining vehicle performance has led to an increase in higher octane fuel use.

Figure 5: High Octane Ratio of Total Gasoline Consumption versus Unleaded Retail Price, 2011 - 2022



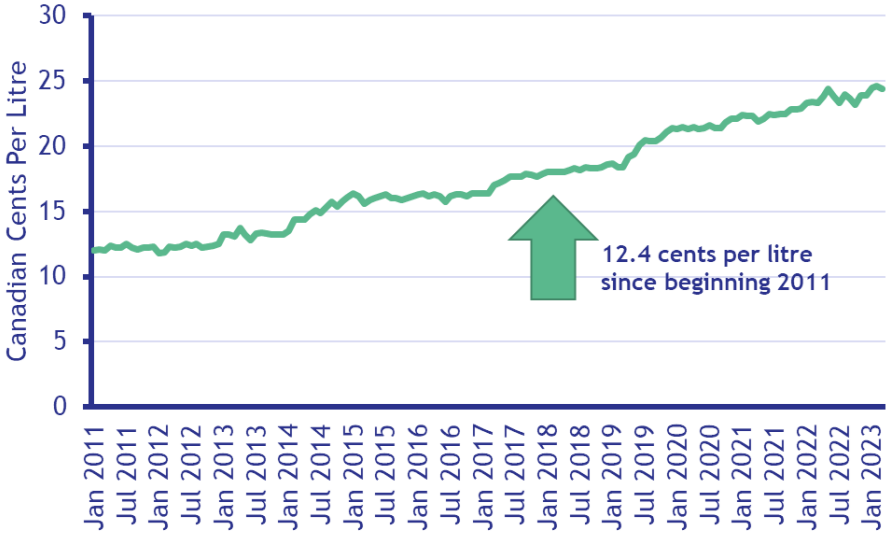
Source: Kalibrate Canada, Inc.

Gasoline is a commodity that is generally considered to have inelastic demand meaning that as the price of the commodity increases, the amount consumed remains mostly unchanged. Although gasoline shows some signs of demand elasticity in that consumers will attempt to find ways to reduce their fuel use in times of high prices, some things typically can not change, like going to work, school or buying food. Premium fuel use shows more demand elasticity. When regular gasoline prices fell in 2015 and 2016, the ratio of premium fuel use increased in Canada as the higher-priced fuel became more affordable (**Figure 5**). When prices climbed again in 2018, the ratio declined. The same phenomenon was observed in the last few years when prices sharply declined in 2020 and then reached record highs in 2022.

Figure 6 shows that the price differential between regular and premium gasoline has steadily climbed since 2011. In January 2011, the price differential between regular and premium gasoline was 12.4 cents per litre. As of March 2023, this differential was 24.4 cents per

litre after peaking in the prior month at 24.6 cents per litre. Some factors that may make premium gasoline more expensive include growing demand since 2008, the push for increased vehicle performance while not compromising fuel efficiency, and higher environmental standards.

Figure 6: Premium and Unleaded Price Differential, 2011 - 2023

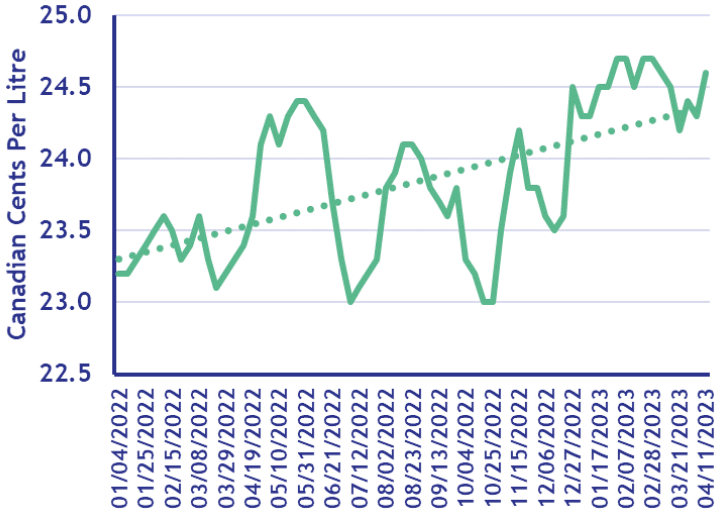


Source: Kalibrate Canada, Inc.

So what is octane, and how do fuel manufacturers boost gasoline octane levels? The octane level of a fuel is an average of two ratings – the motor octane rating (MOR) and the research octane rating (RON). The higher the average of these two numbers, the more stable the fuel. A higher octane level allows a vehicle to burn gas more slowly and avoid engine knock, providing greater fuel economy. When gasoline is produced at a refinery, additives are required to reach the desired octane level of the finished product. About 100 years ago, refiners first used lead to boost gasoline octane levels. Due to health concerns, by 1996, lead was banned for use in gasoline. Lead was mostly replaced by BTEX, which contains benzene, another product that was later determined to be a threat to public health and the environment. In 2007, benzene content in gasoline was capped at a lower amount. Now, ethanol is the most common octane booster used in gasoline. Refineries will produce gasoline at a sub-octane level (called sub-octane gas), then blend with ethanol which has an octane rating of over 100 to produce the desired finished octane level. As there are limitations on the amount of ethanol that can be blended into gasoline (typically a max rate of 10 percent or E10), to boost the octane level of sub-octane, refiners must invest in more complex methods to increase octane levels at the refining stage. Consequently, the desire to reduce the environmental impact of burning fossil fuels has increased the cost to produce these fuels, particularly as consumers do not want to compromise vehicle performance.

Looking at the last year, the price differential between premium and regular grades has continued to increase, rising nearly a cent and a half per litre (**Figure 7**). A decline of 4.6 percent in fuel consumption of 91+ octane level fuel in Canada in 2022 compared to the previous year (calculated from Kalibrate Canada, Inc. volumetric data) might lead us to expect the differential to decline. However, several factors are constraining the manufacture of gasoline, including premium gasoline. One factor is the war in Ukraine, which continues to affect petroleum markets as sanctions on crude oil and refined products are leading to less naphtha supply, a key component required for octane boosting in the manufacturing process of gasoline. Ongoing enhanced environmental standards in Canada and the U.S. generally means more hydrotreating is required to reduce sulphur content but at the cost of lower octane-level produced gasoline. Thus increased environmental standards mean more cost to produce refined products. And lastly, reduced North American refining capacity since the pandemic means less ability to produce refined products, leading to higher prices. Since the end of 2019, Canadian refining capacity has declined 7.7 percent (Canadian Energy Regulator), while U.S. refining capacity has declined 4.3 percent (EIA).

Figure 7: Premium and Unleaded Price Differential, 2022 to Present



Source: Kalibrate Canada, Inc.

So what does this mean for premium fuel use in Canada? In Canada and North America, we've seen that premium fuel use is generally recommended but not always required, and that the demand for premium fuel can be more elastic than that for regular-grade fuel. Consequently, as environmental standards continue to be more stringent, we'll likely see premium fuel prices continue to expand above regular fuel, and in turn, demand could decline. It depends on how much more consumers are willing to spend on premium fuel to enjoy the benefits of better fuel economy with increased vehicle performance.

We welcome media enquiries

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About Kalibrate

Kalibrate's decision-making software empowers fuel and convenience retailers across the globe with the market intelligence, micro-local data, and precision pricing and planning tools they need to gain real competitive advantage. For over 25 years, Kalibrate has been the chosen decision-making partner of 300+ fuel and convenience retailers in over 70 countries. The firm is headquartered in Manchester UK, with local offices in the USA, Canada, India, China, Australia, and Japan.

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Guide and glossary

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