

Supply, Demand, and Elasticity: a General Overview of Gasoline in Louisiana

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Question

There is always talk of consumer behavior in regard to changing gasoline prices, especially when prices stay high.

- Do people really buy less gas when prices increase? Do they lean towards more fuel efficient cars?
- Is the price elasticity of demand for gasoline stable?
- Is the price elasticity of demand elastic? Inelastic?

Methods

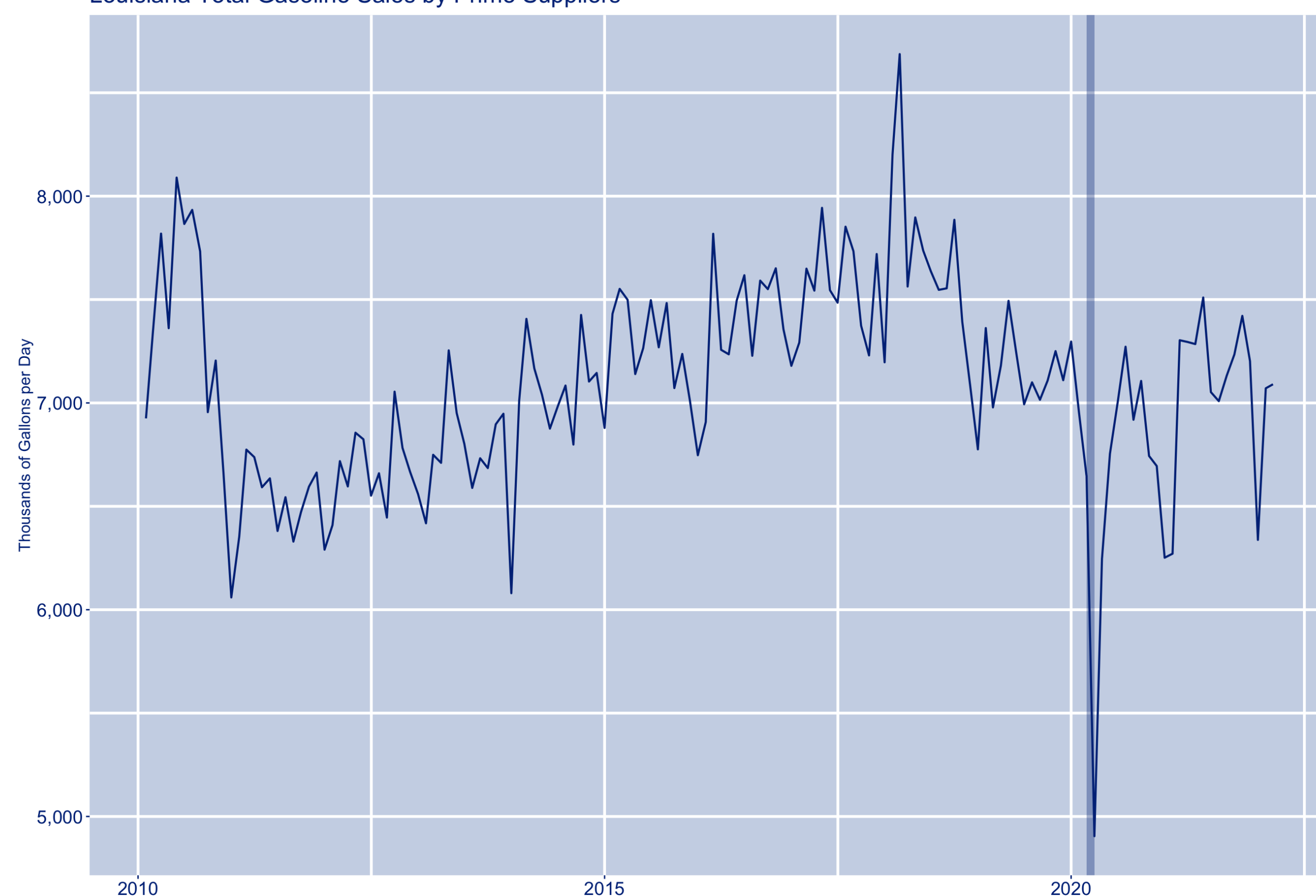
- Figure 1 shows state-wide gasoline sales in thousands of barrels sold per day by prime suppliers.
- Figure 2 shows averaged state-wide gasoline resale price- how much it is sold to suppliers for- including the flat \$0.20 excise tax.
- Figure 3 takes Figures 1 and 2, logs them, then takes the mean of each. These two means are divided to find the instantaneous rate of change of elasticity. This slope is then multiplied by each point along Figures 1 and 2 to create the elasticity at that distinct point, giving us time series data of elasticity.

$$\text{Slope} = \frac{\text{mean}(\log(\text{Fig.1}))}{\text{mean}(\log(\text{Fig.2}))}$$

$$\text{Elasticity} = \text{Slope} * \left(\frac{\log(\text{Fig.2})}{\log(\text{Fig.1})} \right)$$

Total Gasoline Sales

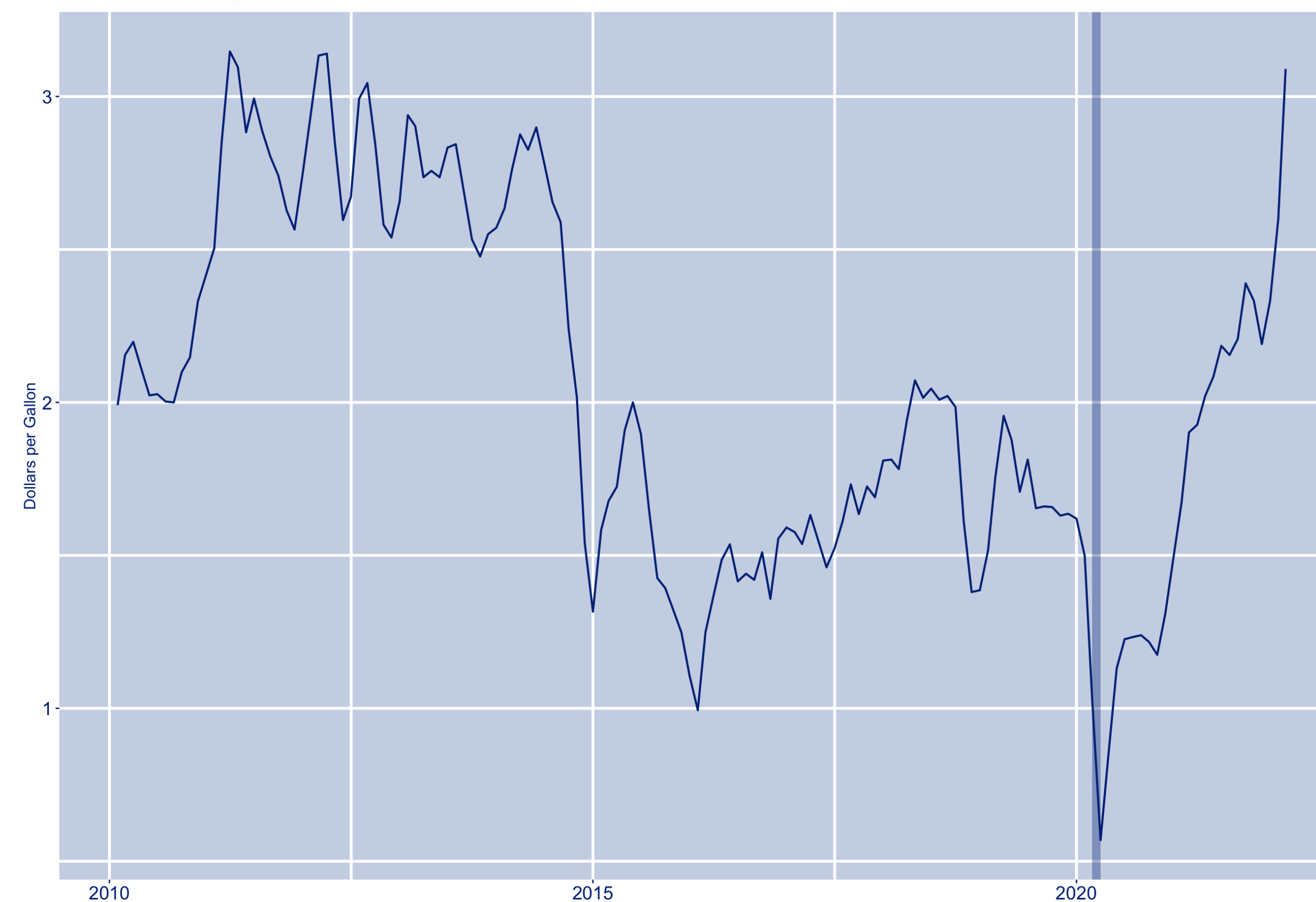
Louisiana Total Gasoline Sales by Prime Suppliers



- One notable point is 2020, where gas sold dropped the most from the otherwise stable trend. This resulted from the lock downs during the early stages of the pandemic, however this negative demand shock only lasted for only one financial quarter, after which it began to stabilize, reverting back to being within 6% of the mean after three months.
- Overall, while there are spikes in the trend, they are all very short term, and the amount sold tends back towards the mean, with the highest point being only 22% above the mean (in 2018) and the lowest point being 30% below the mean (in 2020). However, when you exclude the outlier that is the Q2 2020 data, the lowest point is only 15% below the mean (in 2011).

Gasoline Resale Price

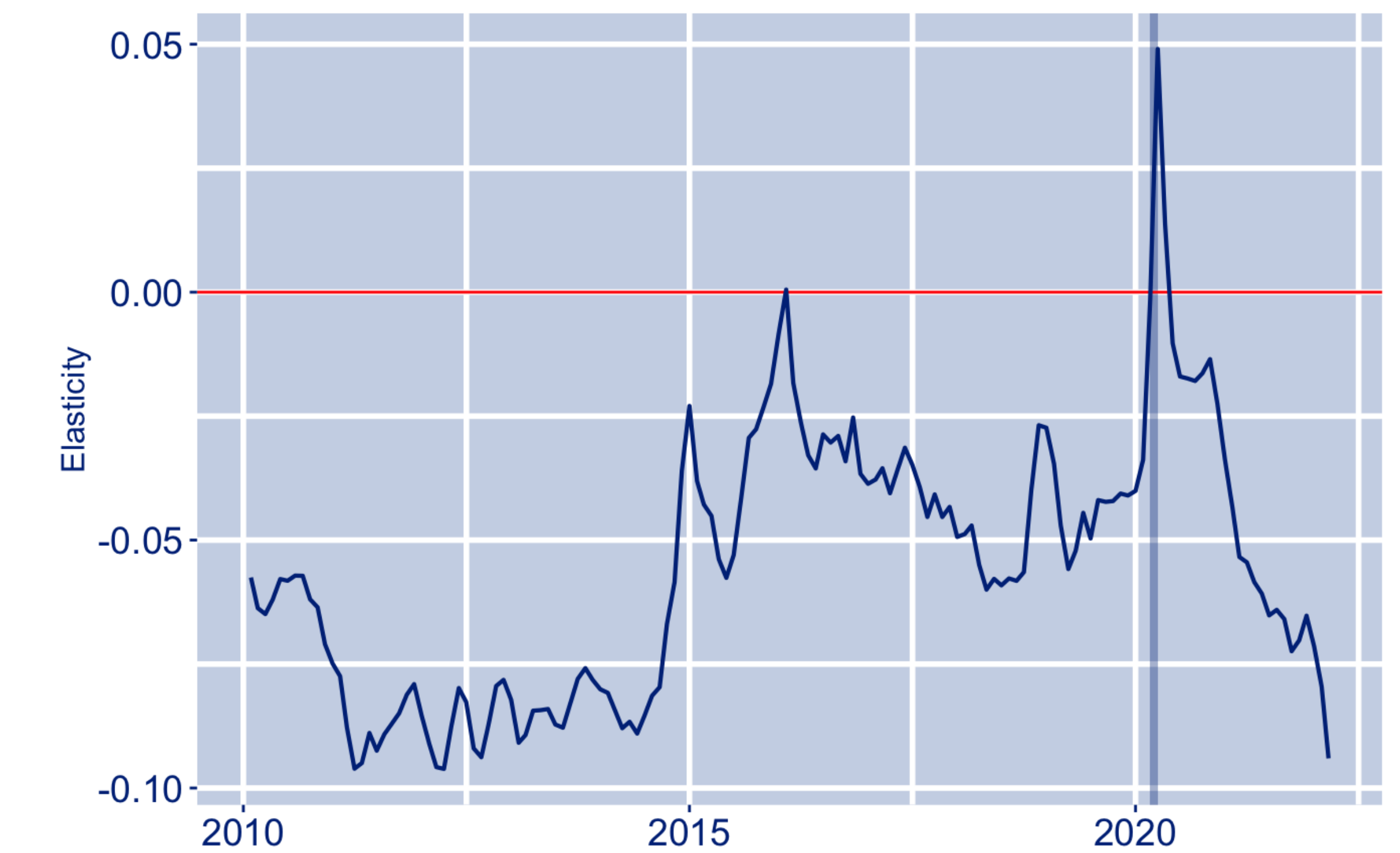
Louisiana Total Gasoline Resale Price



- Compared the the relatively stable Figure 1, which had a mean of 7093.5 ± 496.13, Figure 2 is relatively more unstable, even from a visual perspective, with a mean of \$2.04 ± \$0.60. The standard deviation of Figure 1 is only 6.99% of the mean, while the standard deviation of Figure 2 is 29.36% of the mean. This indicates that the price of gasoline is much less stable than the barrels of gasoline sold.
- One notable point is in January of 2015. In 2015, gasoline prices dropped by 35%, primarily due to a massive increase in supply, resulting from both from the fracking industry entering the market, and a slowdown in the Chinese economy, meaning more gasoline available in the domestic market.
- Another notable point is in April of 2020. In 2020, the price dropped by 73%, due primarily to the lock downs making many people unwilling and unable to drive or travel.
- Despite the relatively large price drops in both 2015 (35%) and 2020 (73%), amount of gasoline sold change to the same degree, increasing by only by 8.8% in 2015, and only dropping by 30% in 2020.

Demand Elasticity of Gasoline

Louisiana Gasoline Price Elasticity of Demand



- Figure 3 has a mean value of 0.0556 ± 0.0265. The standard deviation is 47.64% of the mean, much greater than the 29% of Figure 2, making elasticity of gasoline relatively unstable. However, because this relative scale and the resulting instability are both rather small on a more absolute scale- the instability does not result in gasoline being elastic in one point and inelastic in others- this does not make gasoline's price demand of elasticity significantly unstable.
- Looking back on Figures 1 and 2, there were two points of note- those being 2015 and 2020. In 2015, the elasticity was -0.025, meaning that, at that particular point in time, if price increased by 1%, demand would fall by 0.025%. Due to this being a relatively small change, this makes gasoline in 2015 an inelastic good.
- In 2020, elasticity became positive, meaning that as price increased, so too did demand. This is a a break from the norms of supply and demand, but begins to make sense when considering the surrounding context. During this period in time, nobody was buying gasoline, so the price plummeted by 73%. Due to this decrease in both demand and the resulting drop in price, companies started selling at a loss, so the overall faith in gasoline fell, as there is no reason to hold onto a good that cannot be sold. So, when price increased, consumers were once again able to buy it, and suppliers became willing to sell it.

Conclusion

Even though the supply drop in 2020 resulted in a very low price level, dropping to 27% of the mean, the number of barrels sold only dropped to ~70% of the mean amount. Despite the massive economic downturn and the fact that many people were unable to leave their homes, gasoline sales were still largely the same, if a little down. Additionally, when the 2015 price drop resulted in prices dropping by 35%, gasoline sold only increased by 4%. These two points in conjunction solidify gasoline as an inelastic commodity, meaning that the consumption of gasoline is influenced very little by price.