

ROAD FREIGHT MARKET IN BRAZIL: PRICE DETERMINANTS AND ASYMMETRIC TRANSMISSION

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June 8, 2021.

Introduction

- The use of diesel oil is intensified in Brazil due to its continental dimensions and the reason that road transport is the main means of transporting cargo, carried out by transport companies and autonomous truck drivers;
- In October 2016, the new fuel pricing strategy was implemented at Petrobras refineries, which had the main effect of frequent increases in fuel prices, thus promoting the truckers' strike in May 2018;
- It is imperative to emphasize the destructuring effect of the combination of volatility and the upward trend in prices, as occurred in the months leading up to the strike;
- After this strike, the Brazilian government adopted a set of measures, among them: the diesel price subsidy program and tax reductions to ensure a reduction of R\$ 0,46 in the diesel price, and the creation of the minimum table for the freight price;
- Thus, the present article aims to study the asymmetry process in the transmission of the final price of diesel to the price of grain road freight (corn and soy) in Brazil, in the period between January/2015 – April/2020.

Asymmetry in Price Transmission (APT)

- **Concept:**

"The asymmetric transmission (or asymmetric adjustment) of prices is the phenomenon that explains the discrepancy in the price adjustment of a given market between the reduction and increase in prices" (Silva *et al.*, 2011).

- **Types of APT:**

i. Asymmetry of Speed and Magnitude – the asymmetry of magnitude is determined as the divergence in the magnitude of final price adjustments in response to an increase or decrease in wholesale prices. Asymmetry of speed refers to different response times for positive and negative price adjustments;

ii. Positive Asymmetry (Phenomenon "Rockets" and "Feathers") or **Negative** (Phenomenon "Rock" and "Balloons") – in the case of positive asymmetry, the retail price responds more intensely and faster to increases in the wholesale price than to reductions. Whereas in the negative asymmetry, the retail price responds more intensely and faster to reductions in the wholesale price.

Asymmetry in Price Transmission (APT)

Rocket and Feather Effect ➡ prices increase quickly and intensely (rocket) and fall slowly and in lesser intensity (feather) ➡ usual result in the fuel market.

Rock and Balloon Effect ➡ prices fall quickly (rock) and rise slowly (balloon).

- **Causes of APT (factors related to imperfectly competitive markets):**

- i. The factors that can motivate the occurrence of asymmetric price transmissions are the institutional and regulatory aspects of a given market. As examples, we can mention the case of different ICMS rates practiced by the States and the mandatory addition of biodiesel to diesel. Thus, the greater the distance between distributors and biodiesel producers, the higher the transport costs will be, thus intensifying asymmetries.

Road Freight Market in Brazil

- The truckers' strike triggered a crisis in the road transport sector, which was already facing a contraction in demand due to the slowdown in economic activity and suffering the negative reflexes of the government's incentives to finance trucks;
- This led to an increase in the circulating fleet, promoting an overcapacity in the market and a decrease in the contracting of road freight;
- The structure of the road freight market is determined by the suppliers and demanders of transport services. Cargo owners (shippers) demand services from three modes of transport: fleet carriers, carriers with aggregates and agents;

Road Freight Market in Brazil

- The price of diesel is the most significant cost in the formation of the price of road freight, representing 35% of the cost of cargo transportation. Thus, the higher the price of diesel, the higher the cost of diesel consumption will be, and consequently, the higher the price of road freight;
- It is worth emphasizing that this transfer occurs differently between transport companies and autonomous truck drivers. Since, such companies establish formal contracts, the increase in the price of diesel is automatically passed on to the freight price. In turn, autonomous truck drivers are unable to pass on the increase in diesel prices to cargo owners, as they do not have a formal contract, thus, they end up assimilating the increase in cost in their structure;
- Finally, the price of freight charged in the market is very sensitive to the increase in fuel prices, as this significantly increases competition and decreases the profit margin of the activity.

Methods: Error Correction Model (ECM) and Asymmetric Adjustment

- To investigate the long-term relationships and short-term dynamics between diesel price and freight price in Brazil, the econometric model known as the Error Correction Model (ECM) was applied in its extended specification for the case of asymmetric, as follows:

$$\Delta P_t^f = \alpha + \sum_{j=0}^{j+} \gamma_j^+ \Delta P_{t-j}^{d+} + \sum_{j=0}^{j-} \gamma_j^- \Delta P_{t-j}^{d-} + \sum_{k=1}^{k+} \lambda_k^+ \Delta P_{t-k}^{f+} + \sum_{k=1}^{k-} \lambda_k^- \Delta P_{t-k}^{f-} + \theta^+ \hat{\mu}_{t-1}^+ + \theta^- \hat{\mu}_{t-1}^- + \varepsilon_t \quad (1)$$

Where Δ indicates the first difference operator and ε_t the error term. This expression includes the first differences in the diesel price variables (P^d) and road freight price (P^f) decomposed into positive and negative values. The same happens with the error correction term ($\hat{\mu}$).

- Test the Null Hypotheses:

$$H_0: \gamma_j^+ = \gamma_j^- \quad (2) \quad \Longrightarrow \quad \text{magnitude symmetry}$$

$$H_0: \theta^+ = \theta^- \quad (3) \quad \Longrightarrow \quad \text{speed symmetry}$$

Methods: Cost of Asymmetry to Consumers

- The cost of asymmetry to consumers is measured by calculating the differences between the positive and negative Cumulative Response Functions (CRF). Thus, for this exercise, the stage of transmission from the diesel price to the price of road freight is considered. The CRF is defined as the estimated and accumulated variation in the price of the product in period $t + j$ after a 1% variation in the price of the input in period t . Thus, the cost to the consumer is represented by:

$$\Delta \text{Consumer Cost} = \sum_{j=0}^J CRF_{t+j}^+ - CRF_{t+j}^- \quad (4)$$

Where:

$$CRF_{t+j}^+ = CRF_{t+j-1}^+ + \hat{\beta}_{t+j-1}^+ + \sum_{i=1}^I \hat{\theta}_i^+ \Delta P_{t+j-i}^{f+} + \lambda^+ (CRF_{t+j-1}^+ - \hat{\beta}) \quad \text{and}$$

$$CRF_{t+j}^- = CRF_{t+j-1}^- + \hat{\beta}_{t+j-1}^- + \sum_{i=1}^I \hat{\theta}_i^- \Delta P_{t+j-i}^{f-} + \lambda^- (CRF_{t+j-1}^- - \hat{\beta})$$

- The cumulative impact after t periods is the sum of the cumulative impact up to the previous period (CRF_{t+j-1}^+), of the contemporary cost impact ($\hat{\beta}_{t+j-1}^+$), from the dynamic effect of past changes in product price ($\sum_{i=1}^I \hat{\theta}_i^+ \Delta P_{t+j-i}^{f+}$) and the effect of being outside the long-term equilibrium trajectory ($\lambda^+ (CRF_{t+j-1}^+ - \hat{\beta})$). Analogously, the same reasoning holds for the negative cumulative response function.

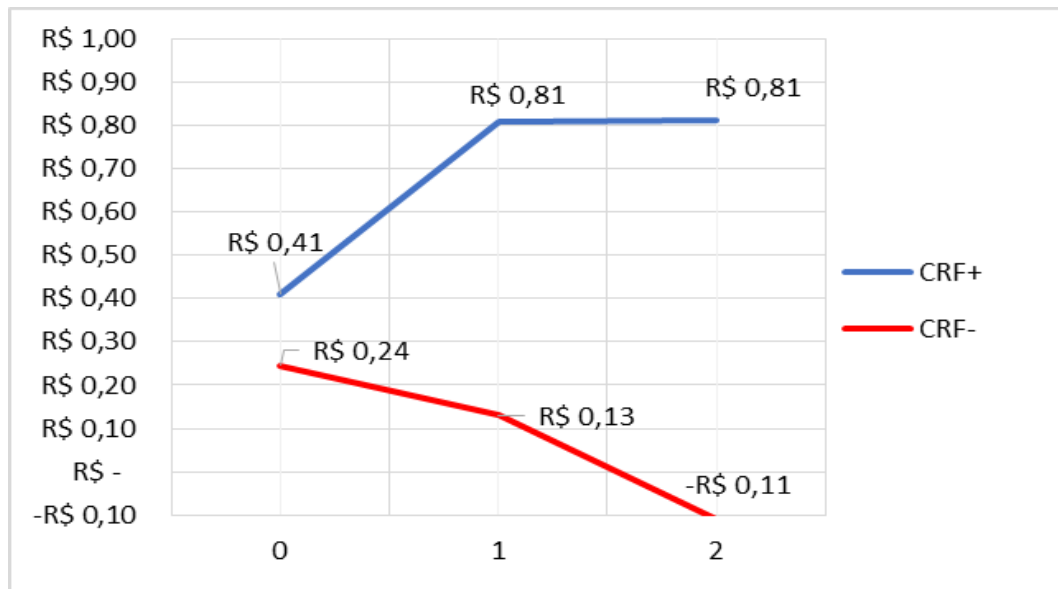
Results: Diesel Price Transmission to the Price of Road Freight

- The four models verified in equation (1) were estimated. After estimating the coefficients, the idea was to carry out two hypothesis tests to identify whether the positive and negative readjustments were passed on at the same magnitude and speed from the diesel price to the freight price, as in equations (2) and (3);
- The result of the hypothesis test is that one variable is significant and the other is statistically equal to zero, that is, it has asymmetry. Therefore, we reject the null hypothesis of both speed and magnitude and find asymmetry. Thus, the CRF is estimated to measure the cost of asymmetry and be able to classify it.

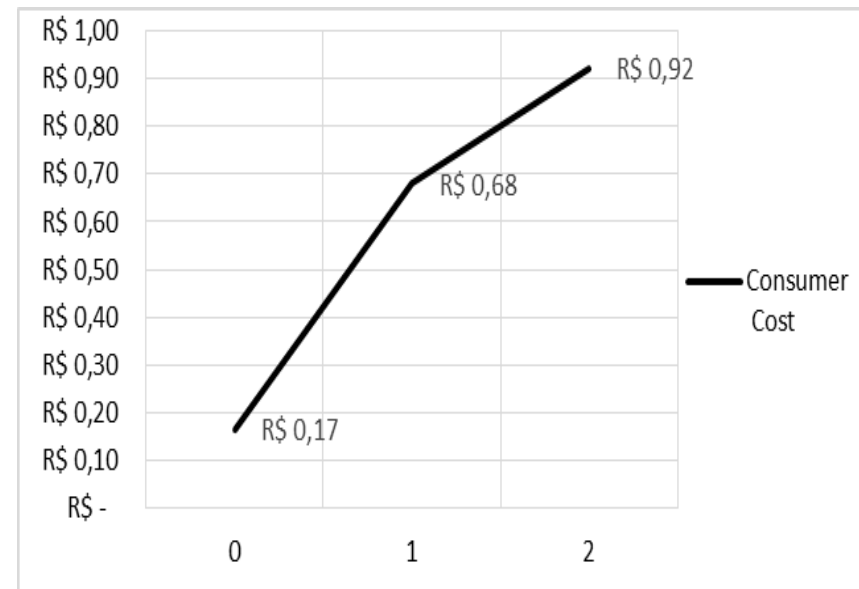
Results: Consumer Cost

- To perform the exercise, two 1% shocks were simulated, one positive and the other negative, on diesel prices so that the impacts on the price of road freight over time were measured, according to Equation (4). The consumer cost shows the losses arising from asymmetries.

Graph 1: Impact of Asymmetry on Consumers (Jan/2015-Apr/2020) Graph 2: Consumer Cost (Jan/2015-Apr/2020)



Source: Authors' elaboration. Note: t in weeks.



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Results: Consumer Cost

- CRF⁺ shows the accumulated impact over time when it has a positive shock at t_0 . If the diesel price increases 1% in t_0 , the price of road freight increases 0,41% in t_0 , and 0,81% in t_1 and t_2 . As it never completes 1,00, the price of road freight rises less and slowly, like a balloon up to t_2 , that is, until the second week;
- CRF⁻ shows the accumulated impact over time when there is a negative shock at t_0 . If the price of diesel falls by 1% in t_0 , the price of road freight falls by 0,24% in t_0 , 0,13% in t_1 and -0,11% in t_2 . In this case, there is a very strong indication of the feather effect, because when the price of diesel decreases, the price of road freight decreases. This feather effect lasts until the moment when the CRF curve that shows the cost to the consumer is less than 1,00, that is, in t_2 ;
- The balloon effect is the difficulty of passing on positive readjustments completely and instantaneously because there are many competitors in the road freight market (excess supply). As there are many suppliers in the road freight market, truck drivers have difficulties in transferring the increase in diesel prices to the price of road freight. If the truck driver transfers the entire diesel price increase to road freight, he will lose customers to competitors. Thus, the balloon effect motivated the 2018 truck drivers' strike.

Conclusions

- The usual result in the fuel market is rocket and feather effects. The interesting point of the article is to identify the different patterns that are the balloon and feather effects, and how the balloon effect may have motivated the dissatisfaction and the truck drivers' strike in 2018. In addition, the excess supply of road freight is determinant in the effect balloon;
- It is complex to clearly and objectively accommodate all the variables that determine the price of road freight, together with their particularities, in a table of minimum prices for road freight, whereas such a table besides generating distortions in the freight market ends up not solving the source of the problem, which is the excess capacity of road freight transport;
- Finally, the analysis is important to assist in the construction of specific public policies for the sector that aim to reduce the cost of transportation and the consequent increase in competitiveness.

Thank You!

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