Do petrol prices increase faster than they fall in market disequilibria?

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1. Introduction

The established literature has argued that gasoline prices respond quickly to crude oil price increases, but adjust more slowly to crude oil price decreases (Bacon, 1991; Borenstein et al., 1997; Bachmeier and Griffin, 2003). This phenomenon has been referred to as rockets and feathers for the reason that gasoline prices ‘shoot up like rockets’ in the face of positive oil price shocks and ‘float down like feathers’ in response to negative shocks (Bacon, 1991). While the rockets-and-feathers hypothesis has predominantly been examined in the U.S. market, it has been investigated extensively in other non-US markets such as the Spanish fuel market (Ballguer and Ripolles, 2012) and the Australian petrol market (Valadkhani, 2013), just to name two countries by way of example.1

Importantly the Australian study differs from the Spanish one in the use of weekly data rather than daily data. Ballguer and Ripolles (2012) highlighted the importance of using daily data on the basis that gas stations are able to adjust their prices daily, particularly given that gas stations set their prices according to the rapidly changing conditions in the wholesale fuel market. To that end, daily data would reveal more information about the retail price adjustment process. From an econometric standpoint, inadequate temporal disaggregation could result in the omission of important short time lags, which may introduce significant bias to estimates (Geweke, 1978). An important and well-established finding is that estimates from average data per week also suffer from temporal aggregation bias (Bachmeier and Griffin, 2003; Ballguer and Ripolles, 2012). And as we document in our study, this temporal aggregation in weekly price series can give rise to a different stationary property compared with daily price series. An important implication of the difference in results about the mean-reversion behavior of petrol prices is that it hinders the application of the long-run cointegration framework, which is commonly used for testing asymmetry in the retail price adjustments when it deviates from wholesale price. Consequently, there is a need to undertake further research that uses daily retail petrol prices in Australia.

This paper critically evaluates the model used by Valadkhani (2013) in testing the rockets-and-feathers hypothesis for Australia’s petrol market. In addition to employing daily data, which overcomes the temporal aggregation bias that has been documented in previous studies, this paper demonstrates the importance of testing for cointegration relationship between retail and wholesale petrol prices in the presence of a structural break, and the need for a robust model specification which captures important features of the data when testing for asymmetric responses of retail petrol price to wholesale price changes. To this end, we focus our analysis on the state of Queensland (QLD), a state which exhibited significant evidence of rockets-and-feathers behavior in retail petrol prices, apart from Tasmania (TAS) and New South Wales (NSW) (Valadkhani, 2013). The number of retail locations in QLD exceeds that of TAS but it is marginally lesser.

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1 Other country studies include Liu et al. (2010) who examined price asymmetry for diesel and petrol in New Zealand, and Bermingham and O’Brien (2011) who tested the rockets-and-feathers hypothesis in the Irish and UK petroleum and diesel markets.

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This paper tests the idea that petrol prices respond more quickly to price increases than to decreases. We show that the results previously documented in the literature for Australia are spurious due to failure to establish the stationarity property of the price series, and the co-integration relationship between retail and wholesale prices when neglecting to account for a regime shift in the data. Using a robust approach involving a threshold error correction model, we find little evidence to support the contention that retail petrol price reverts asymmetrically to long-run equilibrium. Asymmetric adjustments in retail prices are found only in four of the twenty-eight retail gas stations in Queensland. These results cast doubt on the previously reported pervasiveness of this asymmetric price response phenomenon in Australia. We further caution on erroneous inference with the use of weekly rather than daily data, and when failing to account for a regime shift in the data.

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than that of NSW and Australian Capital Territory (ACT) combined.\(^2\) For the purpose of exposition, the general reference to petrol is with regard to unleaded petrol.

Following the literature, Valadkhani (2013) estimated a long-run relationship between retail and wholesale petrol prices for which the resulting residuals from that regression form the error correction term which enters a second stage regression. Prior to running the second regression, he tested for the stationarity property of petrol prices. However, when neglecting to account for a structural break in the data, he erroneously concluded that the series are non-stationary when in fact they were stationary with a regime shift in both intercept and trend. Furthermore, he tested for co-integration between retail and wholesale prices even though the two series are I(0). Unfortunately, he also used a wrong set of critical values based on the Augmented Dickey Fuller critical values rather than the appropriate critical values for cointegration test. The results yield erroneous conclusion about the stationarity property of the residuals obtained from the first stage regression. Be that as it may, Valadkhani continued to assess evidence of asymmetry using the second stage regression. Specifically, he relied on the feedback coefficients, which are associated with the error correction term that is proxied by the residuals. The idea is that these feedback coefficients measure the different speeds of adjustment when deviations from the long-run equilibrium occur. For reasons not explained by Valadkhani (2013), he assumed that the residual (or the error correction term) followed a Gaussian normal distribution. The assumption of normality implies a symmetric distribution which allows him to choose two threshold levels (i.e. 0.44\(\sigma\) and 0.44\(\sigma\)) that divide the distribution into three equal portions. Here, \(\sigma\) denotes the standard deviation of petrol prices. The upper (lower) portion of the distribution is associated with the error correction (or residual) value that is greater (lesser) than or equal to 0.44\(\sigma\) (−0.44\(\sigma\)), which he defined as EC+ (EC−). The test for asymmetry amounts to testing the null hypothesis of equality in the coefficients of EC+ and EC−.

This study shows that the use of weekly data employed in Valadkhani (2013) fail to justify the application of a cointegration framework given the stationary property of petrol prices. In contrast, our results show that daily petrol prices exhibit non-stationary property when the regression specification used for testing a unit root properly accounts for a structural break in the data. For the 28 gas stations data examined, we find that only 15 retail prices display a long-run relationship with wholesale prices when a structural break is accounted in the cointegration regression. In addition, we show that the normality assumption imposed by Valadkhani (2013) on the error correction term and the residual of the regressions, are tenuous and that the data fail to support them. The Jarque-Bera test overwhelmingly rejects the null hypothesis of normality in the resulting regression residuals of the 15 retail prices. Consequently, consumers are expected to pay higher prices which reduce revenues by failing to adjust retail prices in accordance with movements of the wholesale prices. Their aim is to increase revenues by failing to adjust retail prices in accordance with movements of the wholesale prices. Consequently, consumers are expected to pay higher prices which reduce their welfare. (Galeotti and Lanza, 2003; Contín-Pilart and Correljé, 2009; Ballguer and Ripolles, 2012).

\(^2\) TAS has 8 retail locations, NSW and ACT (combined) have 30 while QLD has 28.
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