Energy Policy 78 (2015) 41–50

Contents lists available at ScienceDirect

Energy Policy

journal homepage: www.elsevier.com/locate/enpol

Long- and short-run price asymmetries and hysteresis in the Italian gasoline market

Alberto Bagnai [a,b,c,*], Christian Alexander Mongeau Ospina [b]

[a] Department of Economics, University "Gabriele D'Annunzio", viale Pindaro 42, I-65127 Pescara, Italy
[b] a/simmetrie, Italian Association for the Study of Economic Asymmetries, via Filippo Marchetti 19, I-00199 Roma, Italy
[c] INFER – International Network for Economic Research, Germany

HIGHLIGHTS

- The pass-through of crude oil prices and exchange rate into gasoline prices is examined.
- We use an extended NARDL model to test for asymmetric reactions and hysteresis.
- Asymmetric pricing behaviour features only in the long run.
- The sign of the asymmetry differs between exchange rate and crude price changes.
- The results are robust to the inclusion of several variables usually related to asymmetry.

ARTICLE INFO

Article history:
Received 1 August 2014
Received in revised form
14 November 2014
Accepted 10 December 2014
Available online 24 December 2014

JEL Classifications:
C22
D43
E31
L71
Q41

Keywords:
Energy prices
Asymmetric cointegration
Asymmetric price adjustment
Exchange rate pass-through
Hysteresis

ABSTRACT

Using monthly data from 1994 to 2013 we study the long-run relation of the pre-tax retail prices of gasoline with crude price and the nominal exchange rate. We find a strongly significant long-run relation. We then use the nonlinear ARDL (NARDL) model to assess the asymmetries on both the short- and long-run elasticities, as well as the presence of hysteresis in the pricing behaviour. The estimation results confirm the presence of asymmetry in the long-run elasticities, with significant differences between the crude price and the exchange rate, as well as the presence of hysteresis in the relation between the retail price of gasoline and crude oil price.

1. Introduction

The asymmetry between gasoline and crude oil prices has long been studied in the theoretical and applied literature, starting from Bacon (1991) "rockets and feathers" paper. The recent meta-analysis by Perdiguero-García (2013) indicates that price asymmetry is pervasive. These results are consistent with those of Frey and Manera (2007), who carry out a meta-analysis on the econometric models of asymmetric price transmission in various markets and find that asymmetry is robust across different settings.

Price asymmetries have received a special attention in the market of crude-derived fuels, for several reasons: the relevance of these products for the general public, the large swings experienced by crude oil prices in the last decade, and the policy implications of the asymmetry. Asymmetry may indicate that the producers are exploiting their market power, or that the retailers are taking advantage of the consumers' search costs (Balke et al., 1998). This would call for different policy responses, such as

* Corresponding author at: Department of Economics, University "Gabriele D'Annunzio", viale Pindaro 42, I-65127 Pescara, Italy. Fax: +39 06 8081100.
E-mail address: bagnai@unich.it (A. Bagnai).
URLS: http://bagnai.org, http://www.infer-research.net/ (A. Bagnai).

http://dx.doi.org/10.1016/j.enpol.2014.12.017
0301-4215/

antitrust policies, or the obligation for the retailers to display prices.[1] However, Peltzman (2000) shows that "prices rise faster than they fall" even in competitive markets. In principle, if asymmetry may coexist with competitive market forces, one should weigh the advantages of addressing the (supposed) market imperfections with the costs determined by reducing the economies of scale. Tappata (2009) suggests that asymmetry does not necessarily imply collusive behaviour and can be determined by consumers' imperfect information. Moreover, other empirical work points out that the asymmetry may also depend on more benign causes, such as inventory management (Kaufmann and Laskowski, 2005), and refining adjustment costs (Balke et al., 1998). At the same time, Perdiguero-García (2013) suggests that the asymmetry depends mainly on the non-competitive nature of retail markets: the last segment of the market (i.e., the one where final consumers are involved) is more likely to show price asymmetries, relative to the first segments, which face higher levels of competition in international markets.

Another relevant policy issue is related to the correct measurement of the impact on domestic gasoline prices of an increase in crude oil price or of exchange rate devaluation. The latter issue is especially important in the Southern countries of the Eurozone, owing to the ongoing debate on the possible inflationary consequences of a euro breakup. A recurrent argument against a segmentation of the Eurozone is that the expected nominal devaluation in Southern countries would lead to an immediate increase in gasoline prices and, through this channel, in the average inflation rate, with devastating effects on their economies.

Despite the large empirical literature (Grasso and Manera, 2007), a consensus on the causes, the size and the sign of asymmetries in the gasoline market has not been reached. This inconclusiveness could depend on three shortcomings of the previous empirical analyses: usually, they do not consider the possible presence of asymmetries in the long-run coefficients; quite often they do not assess separately the impact on domestic gasoline price of a variation in crude oil price and in the exchange rate; finally, they do not take into account the fact that the response of the domestic price may depend not only on the sign, but also on the size of the shock in the explanatory variables (i.e., they ignore the possible presence of hysteresis). The purpose of this study is to evaluate the empirical relevance of these issues by studying the relation of the pre-tax retail prices of gasoline with the crude price and the nominal exchange rate in the Italian market, using monthly data from 1994:1 to 2013:12.

As for the first point, Honarvar (2009) points out that previous empirical research relies mostly on "asymmetric ECM" (A-ECM; Granger and Lee, 1989) or "threshold ECM" (TAR-ECM; Hansen, 2000) approaches, where asymmetry is allowed only in the adjustment parameters (short-run elasticities and error correction parameter), not in the long-run elasticities (a recent exception is Atil et al. (2014)). If the underlying long-run relation has asymmetric parameters, a symmetric specification may lead to biased estimates, thus compromising the reliability of the long- and short-run parameters estimates. In order to address this issue, we adopt the nonlinear autoregressive distributed lag (NARDL) approach proposed by Shin et al. (2014) that allows for asymmetries in both the short- and long-run parameters.[2]

As for the second point, some studies skip the estimation of the exchange rate pass-through to gasoline price by converting the price of crude oil in domestic currency. This amounts to imposing the constraint that the elasticities of gasoline price to both crude price and the exchange rate are equal, both in the short and in the long run. As Warmedinger (2004) points out, this restriction appears to be sensible only in the long run. However, the recent literature shows us that at an aggregate level the long-run exchange rate pass-through coefficients differ significantly from those of the other "shifters" variables (the variables used to proxy marginal costs, among which crude oil price; Campa and Goldberg, 2005), and are asymmetric in the long run (Delatte and López-Villavicencio, 2012). As far as the existing studies on gasoline prices are considered, whenever the crude price and the exchange rate are considered separately, their short-run coefficients are both asymmetric and different from each other. Once again, an untested assumption of equality between two long-run coefficients could lead to biased estimates. For this reason, in our NARDL model the crude price and the exchange rate are considered separately.

As for the third point, the size and distribution of the shocks to the exchange rate and to crude oil price have historically been very different, with variation in the crude oil price being larger and negatively skewed. Since Baldwin (1989), it is known that the presence of sunk costs (such as marketing research, establishment of the distribution channels, and so on) may call for the adoption of ad hoc pricing policies, where the producers may pass-through to the consumer only the small variations in prices, while adopting a strategic behaviour in front of large positive or negative swings, in order to preserve (or expand) their market shares. This implies that pricing behaviour will be hysteretic, i.e., prices will depend not only on the level of the costs and the exchange rate, but also on the size of the (positive or negative) shocks to those variables. More specifically, there will be an "inaction band", defined by an upper and a lower threshold, within which the retailers will not modify their mark-up, thus translating into the final price all the (small) movements in the explanatory variables. Outside this band, the mark-up will be modified in order to compensate for the variations in the costs variables, thereby leading to smaller (and possibly asymmetric) long-run elasticities. The presence and extent of the hysteresis will depend on whether local currency pricing (LCP) or producer currency pricing (PCP) stabilisation will prevail. Antoniades (2012) shows that in the Eurozone producer currency pricing (PCP) prevails, especially for products with low elasticity of substitution (as gasoline typically is: see Baumeister and Peersman (2013)). However, he does not take into account the possible presence of asymmetry, nor the presence of hysteresis (explored, among others, by Belke et al. (2013)). Previous empirical testing of the PCP vs. LCP behaviour (e.g., Campa and Goldberg, 2005) found the evidence to be inconclusive (with the possible prevalence of PCP in the long run for some categories of goods). Inconclusive results may depend on the fact that by ignoring asymmetry and hysteresis, the estimated elasticities are actually mixing up the values that feature in the three different regimes of the "true" model: the "large positive shock", the "inaction band", and the "large negative shock" regime. In principle, if hysteretic behaviour prevails, we would expect the inaction band elasticities to be larger and not significantly different to one, while outside the inaction band we would expect smaller elasticities (possibly not different from zero), as the retailers compensate for swings in the marginal costs by adjusting the mark-up. In order to cope with this issue, we follow Fedoseeva and Werner (2014) by estimating a NARDL model that takes into account the possible existence of three regimes.

The remainder of the paper falls in five sections. Section 2 provides a survey of previous studies on price asymmetries in the Italian market. Section 3 describes the NARDL approach used in this study, setting out the methodology used to take into account both long-run asymmetry and hysteresis. Section 4 presents the

[1] On the Italian motorways, for instance, it is mandatory to display on billboards located at each toll booth the prices of gasoline and diesel oil in each station located in the next stretch, highlighting the retailer that offers the lowest price, in order to facilitate the consumers' search process.

[2] A previous application of this approach to the gasoline market is Atil et al. (2014). However, these authors do not consider the exchange rate pass-through.