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Do energy bills respond faster to rising costs than falling costs?

Discussion

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Overview:

This document examines whether customer energy bills respond faster to rising costs compared with falling costs. It gives a description of the modelling technique we have used to answer this question. This document also summarises the results from our modelling, and discusses how the results could be interpreted.

Context

Wholesale energy costs account for over half of a customer's energy bill, and represent the most volatile element of bills. As a result they are the main driver of changes to bills. The speed of cost pass through to consumers can be indicative of the level of competitive pressure faced by suppliers when making pricing decisions.

This analysis builds on the work for the 2008 Energy Supply Probe to test whether energy retail energy bills follow an asymmetric trajectory, ie whether customer bills increase rapidly in response to supplier cost increases but respond more slowly when supplier costs decrease. This previous analysis was inconclusive – mainly because there were only a few periods where wholesale costs fell, so we could not draw strong conclusions from the data.

We now have more data since the last publication, which importantly for our test includes more periods where wholesale costs are falling. The previous work also outlined ways to improve the accuracy of the results through making changes to the methodology. These changes have now been taken on board to improve our approach to test for asymmetry. This work has been carried out by Ofgem staff and reviewed by Dr Melvyn Weeks (Senior Lecturer, University of Cambridge).

Associated documents

- Energy Supply Probe - Initial Findings Report (140/08), 6 October 2008
- Electricity and Gas Supply Market Report (36/11), 21 March 2011
- Retail Market Review Consultation Document (34/11), 21 March 2011

  The above documents are available via the Ofgem website at the following location:
  http://www.ofgem.gov.uk/Markets/RetMkts/rmr/Pages/rmr.aspx

Contents

Executive Summary

We have found some evidence that customer energy bills respond more rapidly to rising supplier costs compared with falling costs. Whilst this finding depends on both the technique used as well as how we assume suppliers purchase their energy in advance, we do not believe there is any systematic bias in our assumptions that would cause this asymmetry.

We have used two approaches to answer this question. Firstly, we carried out a simple statistical comparison of what happened to bills, depending on whether wholesale costs were rising or falling. Secondly, we constructed an econometric model which controls for additional factors to test whether bills adjust asymmetrically. These tests were carried out on industry average data; they are therefore not necessarily reflective of any specific tariff with an individual supplier.

There are a range of potential explanations for the asymmetric pattern found. It could indicate a lessening of competitive pressure faced by suppliers when costs are falling compared to when they are rising. It could also reflect that vertically integrated companies' balance profits across the business, rather than in the supply or generation arm separately. Because of the number of different possible reasons for finding asymmetry, the implication for consumer harm is not clear cut.

1. Intuition, approach and data description

This chapter describes the intuition underpinning our analysis. This informs the choice of econometric analysis used to test for asymmetry. We also look at the three data series used in this test– customer bills (the dependent variable), wholesale energy costs and other supplier costs.

Intuition

1.1. In a competitive market, we may expect cost increases to be passed through to consumers promptly. The same argument should work in reverse, meaning that wholesale cost falls would be passed on just as quickly otherwise suppliers may not be pricing competitively.

1.2. Our approach to testing for asymmetry involves looking at the long run relationship between supplier costs and customer bills. Economic theory suggests that in a competitive market there will be a tendency for the difference between supplier costs and bills (ie gross margins) to converge at a long run equilibrium rate. When margins are above this rate, there will be competitive pressure on suppliers to reduce bills to prevent loss of market share from competitors. When margins are below competitive levels, there will be upward pressure on bills, to keep suppliers from exiting the market. Through modelling this long term relationship, we can test whether these two effects are equivalent.

Approach

1.3. We included the above long run relationship in our test through creating a model to explain how customer bills depend on wholesale energy costs and other supplier costs. This model was then used to find out how far margins were from their average historic level (an output from the model) in each period. We then tested for asymmetry within this long run relationship. This was done through the following steps:

i. We transformed the variables into logs as we want to look at margins in percentage terms over the period.

ii. We examined which econometric technique was best suited to test our economic theory. This was done through testing if the data was stationary. All of the cost and customer bills variables were found to be non-stationary, ie they contained an upward trend.

iii. Given the variables are non-stationary; we tested our economic theory that a stable equilibrium relationship exists between them. We found a linear combination of the cost and bills data that is stationary, which indicates a stable long run relationship. This was done through carrying out a Johansen test for cointegration on the three variables. This is the basis for construction of the long run equation (Engle and Granger, 1987)

$$R_t = \beta_1 + \beta_2 W_t + \beta_3 OC_t + \upsilon_t \qquad (1)$$

iv. In this equation R is the (retail) customer energy bill, W is the wholesale energy price and OC is the other supplier costs (excluding the suppliers own internal operating costs).

v. We want equation (1) to tell us how far margins were from their historic average level in the last quarter[1]. We therefore took the residual from the last quarter (υ_{t-3}). This residual series is stationary when tested. As the Johansen test for cointegration indicated three cointegrating relationships, it is appropriate to include this lagged residual within a short run model. This lagged residual is defined as the Equilibrium Correction Mechanism (ECM) term, and indicates in each period how far margins are from their average level.

vi. This ECM term was then split into two variables, conditional on whether margins are above or below their average level[2].

vii. These two ECM terms were then included within a model to capture both the long run dynamics of customer bills and supplier costs. In this model the dependent variable is the quarterly change in retail bills as a function of the change in wholesale costs and the ECM terms.

$$\Delta R_t = \alpha_1 + \alpha_2 \upsilon^{+}_{t-3} + \alpha_3 \upsilon^{-}_{t-3} + \alpha_4 \Delta W^{+}_{t} + \alpha_5 \Delta W^{-}_{t} + \alpha_6 \Delta R_{t-x} + \alpha_7 MA_{t-x} + \varepsilon_t \qquad (2)$$

viii. In this equation ΔR is the change in (retail) customer energy bill, ΔW is the change in wholesale energy price. υ_{t-3} is the ECM term (the lagged residuals from equation (1). ΔR_{t-x} and MA_{t-x} represents the autoregressive (lagged values of the dependent variable) and Moving Average terms included to improve the model's congruence.

ix. The model choice was determined by starting with many variables and selectively dropping some variables depending on whether or not they are significant (a general to specific modelling approach). In choosing the final model, we tested whether it showed any signs of failure in a number of (diagnostic) tests to assess whether we can use the model to make valid assertions.

x. We tested for asymmetry through assessing whether α_2 and α_3 in equation (2) are significantly different from each other. Note that this test is different to the dummy

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[1] Note that the variables are lagged one quarter, as wholesale cost data is calculated on a quarterly basis.

[2] The historic level of gross margin is estimated by the long run equation in this approach, rather than being a direct input to the model.

variable used to test for asymmetry in the Energy Supply Probe. This new technique represents an improvement as we are testing for asymmetry within a long run relationship between supplier costs and customer bills. Through testing for asymmetry by comparing the two co-efficients, the test considers the magnitude of change – not accounted for by the use of a dummy variables, used in the previous technique.

Data description

1.4. The data used for our test is also used in our regular Electricity and Gas Supply Market Reports, which contain additional information and analysis. This data is from the perspective of a typical dual fuel customer - as such it is not representative of a specific supplier, but uses average data, which is representative of the Big 6. We use monthly data, from January 2004 up until March 2010 (87 observations).

1.5. We assume a constant level of consumption per customer over the period, with electricity consumption at 4MWh and gas consumption at 16.9MWh.

Average customer bill (R_t)

1.6. The average customer bill is an estimate of the average cost paid by GB retail energy customers. It is constructed using monthly prices charged by the Big 6 companies and those of suppliers bought by, or merged with, the Big 6[3] since 2004. Each supplier's standard regional tariffs are averaged to give a national average price for each payment method. These national averages are weighted by the proportion of customers on each payment method and weighted by the market share of each company. Around 75%[4] of customers are currently on these standard tariffs.

1.7. One limitation of using this data series is that there is a high level of aggregation, as customer bill data is aggregated across suppliers, regions and payment types. This means that the results will reflect the industry average rather than evidence of asymmetric adjustment for a particular company.

Wholesale energy costs (W_t)

1.8. The proportion of a customer's final energy bill which is accounted for by wholesale costs varies between suppliers and over time with changing wholesale costs and other

[3] Source:TheEnergyShop.com
[4] DECC (2010) Energy Trends.

costs. Our analysis indicates that on average across the industry wholesale costs account for over half of a customer's energy bill[5].

1.9. Wholesale prices can be volatile. Suppliers therefore buy much of their energy requirement ahead of delivery (hedging), to reduce the effect of large changes in wholesale price. This helps suppliers to smooth costs and provides them with more certainty over future costs. Wholesale prices on any given day are therefore not a good indicator of suppliers' wholesale costs, nor are short term products such as within-day or day-ahead products. Wholesale costs used in the econometric modelling are based on a range of hedging strategies[6] (from 12 months to 2 years). These alternative hedging strategies are informed through information we received for the Energy Supply Probe from suppliers.

1.10. Our analysis is based on a forward looking wholesale cost; in other words, it estimates the expected cost of supplying energy to a customer for the next year at each point in time, based on pricing information available at that time. Costs are based on buying seasonal and quarterly products on the OTC market in electricity and gas respectively.

1.11. Suppliers operate a range of hedging strategies, including purchasing energy internally and on long-term contracts. By using market-based prices to estimate wholesale costs, we are pricing energy at the price which suppliers are able to sell the energy at on the wholesale market, ie at opportunity cost.

1.12. Actual weighted average cost of electricity and gas could be different from this if companies purchase energy internally from their upstream generation business at a price different from the prevailing market price. Any margins made on energy bought below market prices would mean equivalently lower margins in the generation business.

1.13. Prices are weighted to take account of seasonal consumption trends (by quarter for gas and by season for electricity) and an assumption about shaping costs[7] is factored into this wholesale price for electricity. Wholesale energy cost is calculated by averaging forward electricity and gas product prices over the buying period, assuming a constant rate of purchase.

1.14. Our assumption on how suppliers purchase their energy requirement in advance is crucial to test for asymmetry. We have therefore carried out a sensitivity check on this assumption, by examining a range of hedging strategies. These vary from a 12 month to 24 month hedging strategy.

[5] This varies by fuel, supplier, hedge strategy, region, consumption and other factors.
[6] The 4 hedging strategies are 12 months, 18 months, 24 months and 90% purchased over 18 months with 10% bought on the day ahead market.
[7] This is the cost of shaping the purchasing costs of electricity to match the demand profile of domestic consumers.

1.15. Our assumption on how suppliers' hedge remains constant over the period. In practice, the forward purchasing of energy will differ between suppliers. Individual suppliers are also likely to change their hedging strategy over time.

Other Costs (OC_t)

1.16. These are the costs a supplier faces from operating a supply business that are outside the control of the firm ie they do not include the firm's own internal operating costs.

1.17. The components of other supply costs are network charges (transmission and distribution), balancing, gas storage costs, environmental costs (Energy Efficiency Commitment – EEC, Carbon Emissions Reduction Target – CERT, and Renewable Obligation Certificates – ROCs), other direct costs such as social tariffs and VAT. Note that electricity losses are included within the wholesale cost.

1.18. Note that these supplier cost assumptions are for industry as a whole rather than an individual supplier.

2. Results

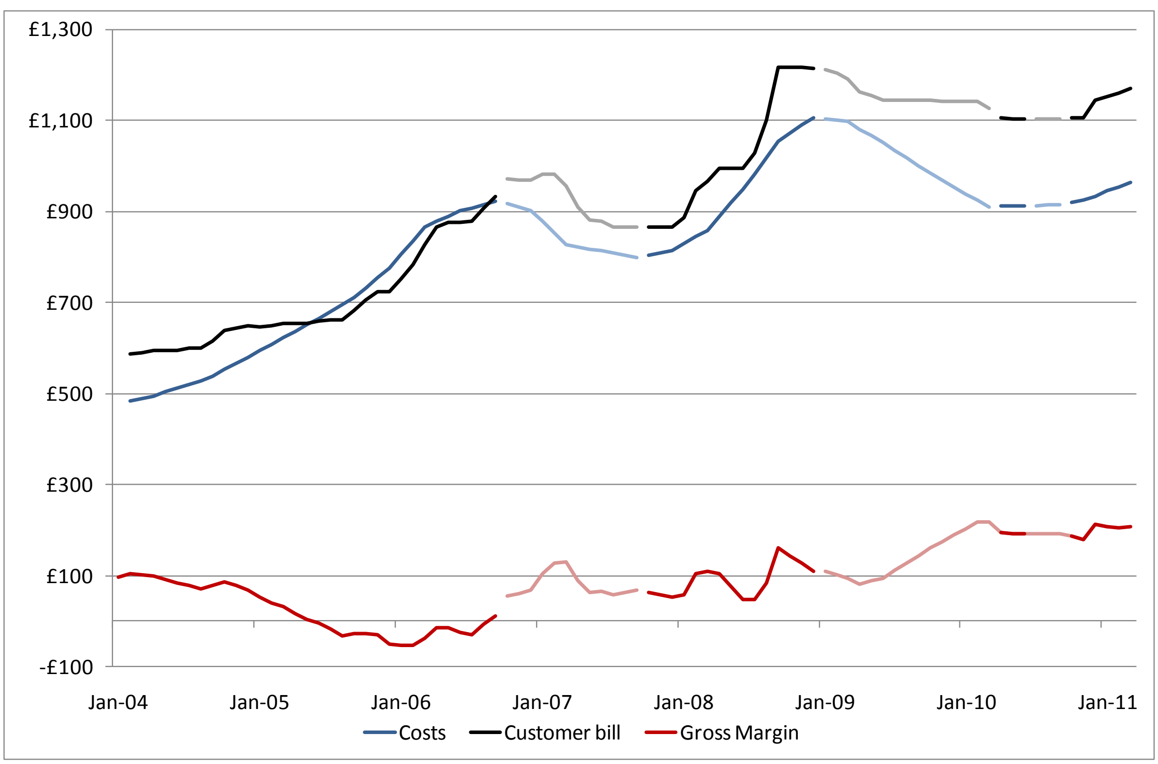
This chapter shows the results of a simple comparison to test for asymmetry. We then control for additional factors to test for asymmetry within an econometric model.

Through this analysis we find some evidence that customer bills follow an asymmetric trajectory. Whilst this finding is dependent on both our choice of technique used as well as how far we assume suppliers purchase their energy requirement in advance (their hedging strategy), we do not believe there is any systematic bias in our assumptions that would cause asymmetry.

Simple comparative statistics

2.1. This section provides a simple illustration of whether customer bills follow an asymmetric trajectory using a simple T-test. This examines whether there is a significant difference between the change in customer bills depending on whether wholesale costs are rising or falling.

Figure 1: Dual fuel costs, customer bill and gross margin



2.2. Figure 1 graphically illustrates the intuition behind our test for asymmetry. It shows supplier cost data (wholesale and other costs combined) and customer bill data from 2004 onwards. The difference between these two lines is gross margin, and this is shown by the red line in the chart. The lighter tones in the chart denote periods of falling wholesale costs. The graph shows that there are three sustained periods of falling wholesale costs (assuming an 18 month hedging strategy). We want to find out whether there is a different relationship between supplier costs and customer bills, depending on whether wholesale costs are rising or falling. If prices adjusted symmetrically, we would expect bill changes to be equivalent in magnitude, regardless of direction.

Figure 2: T-test of customer bill changes dependent on whether bills are rising or falling.

Change in dual fuel bill dependent on whether wholesale costs are rising or falling				
	Change in wholesale cost		**Change in customer bills**	
	Rising wholesale costs	**Falling wholesale costs**	**Rising wholesale costs**	**Falling wholesale costs**
Average change (£ per dual fuel bill)	£12	£13	£13	£5
Std. deviation	£9	£8	£22	£14
Observations	56	30	56	30
T test	37%		2%	
T test interpretation	No signficant difference between whether wholesale costs are rising or falling.		wholesale cost rises passed through significantly more than falls.	

2.3. The above table shows both wholesale costs and customer bills, split by whether wholesale costs are rising or falling for a typical dual fuel customer. It indicates that the average wholesale costs rise of £12 is broadly equivalent in magnitude to the average wholesale cost fall of £13. However, it also shows that when wholesale costs are rising, the average annual customer bill rises by £13, but when wholesale costs are falling, customer bills fall by an average of only £5. These tests indicate a significant difference[8] in the change in customer bills, depending on whether wholesale costs are rising or falling – accounting for both the average change and amount of variation in these samples. This result is consistent across the 4 hedging strategies tested. This test provides a simplistic indication of asymmetry. However, we want to control for other factors, which is why we look at the speed of adjustment within an equilibrium relationship.

2.4. The results shown in Figure 2 do not consider other supplier costs. To strengthen how robust this test is, we carried out an additional T-test. To do this we created a series where other supplier costs were directly deducted from customer bills. This new series is the change in customer bills after supplier costs. We then deducted this new series from

[8] Note the T-test requires like for like comparison; therefore wholesale costs changes are compared in absolute terms, and customer bill changes conditional on wholesale cost falls are inverted.

wholesale cost changes, and as before, split this series depending on whether wholesale costs were rising or not. We then ran a T-test on the split series of wholesale less retail changes. This more sophisticated test also indicates a significant difference between the samples, when tested on an 18 month hedging strategy.

Results from econometric modelling

2.5. This section details the results from our econometric analysis. This analysis includes testing for asymmetry within a long term relationship. The details of how we tested this are outlined in chapter 1.

2.6. Economic theory suggests that we may expect a stable long run relationship between supplier costs and customer bills in a competitive market. Our econometric analysis has found evidence of this relationship over the time period we are examining. Modelling this relationship tells us how far gross margins are from their historic average in each period. This relationship is outlined below.

Figure 3: Results from the long run equation[9]

Dependent Variable: Log(customer bills)	
Sample: 2004M01 2011M03	
Included observations: 87	
	Coefficient
C	-0.23
Log(other cost)	0.85**
Log(Wholesale cost)	0.35**
Adjusted R-squared	0.96

2.7. Figure 3 shows the results of this long run equation where customer bills depend on wholesale energy costs as well as other supplier costs. The table shows that both of these variables are significant in driving the level of customer bills. As you would expect there is a positive relationship between customer bills and wholesale energy costs and other supplier costs.

2.8. The co-efficient for wholesale costs imply that a 10% increase of this cost will feed through to a 3.5% increase in customer bills. This is slightly lower than we may expect, as wholesale energy costs account for around half of the customer bill. With an instantaneous 100% pass-through, we would expect this co-efficient to be around 0.5. The co-efficient for Other Costs implies a 10% increase in other costs will increase bills by 8.5%. This seems a stronger effect than we would expect as other costs make up less than half of the customer bill. This co-efficient may be higher than expected because of a lack of volatility in the series Other Costs, which makes econometric estimation more difficult.

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[9] ** Indicates 1% statistical significance

2.9. The residuals from the equation in Figure 3 are stationary when we test for a unit root. As the Johansen test for cointegration indicated three cointegrating relationships - we can include the lagged residual in a model which also captures the short run dynamics of the relationship between customer bills and supplier costs. This model is shown in Figure 4.

2.10. Figure 4 details the results from the four models where we tested for asymmetry – where each model assumes a different hedging strategy for wholesale cost. This table sets out how changes in customer bills (ΔR) depend on supplier costs (OC), wholesale energy costs (W) and how far current margins are from their historic average (the ECM term).

2.11. Figure 4 shows that the ECM variable is split into 2 depending on whether a positive or negative observation is recorded. The significance of the ECM terms indicates that:

- If margins were above average in the previous quarter, there is downward pressure on customer bills.
- If margins were below average in the previous quarter, there is upward pressure on customer bills.

2.12. When tested, we find that this second effect is significantly greater than the first. This is true for three of the four models shown. This implies that customer bills respond more quickly to increasing costs compared to falling costs.

2.13. On average, customer bills have increased by just over 2% a quarter since 2004. This is the average value of the dependent variable in the model. The results of the 18 month hedge model shown in Figure 4, indicate that if margins were 1% higher than average (as measured by the ECM term), customer bills grow at only 0.8% a quarter. If margins were 1% lower than average, then bills increase at a rate of 3.7%.

2.14. The ECM term includes information on both wholesale costs and other supplier costs (as it is constructed through looking at the equilibrium relationship between customer bills and costs). The ECM term is a powerful driver of customer bills, and as such it dominates the wholesale cost change and other cost change variables. These other variables are not significant when included with the ECM terms in the model. Please see Sensitivities section for further details on this.

2.15. We carried out a number of standard tests for congruence in our models. We used intercept correction to account for one outlying observation in our dataset (the outlier dummy variable). This period is in September 2008, when customer bills increased substantially. Please see Sensitivities section for further details on this.

Figure 4: Summary of results from four models – each with a different assumption about how suppliers' hedge

Hedge assumed in model	ECM^{+} from LR model	ECM^{-} from LR model	Δ^{+} WS costs	Δ^{-} WS costs	Outlier dummy	Other costs	AIC	F-test on ECM+ against ECM-
18 Month	-1.26**	-1.74**	0.06	0.12	0.04**	0.73	-5.58	Sig dif**
12 Month	-0.88**	-1.12**	-0.1	-0.1	0.04**	1.51	-5.49	not sig dif
24 Month	-1.42**	-1.82**	0.16	0.4	0.03**	0.77	-5.48	Sig dif*
18M 10% Day ahead	-1.30**	-1.64**	0.14	0.1	0.04**	0.76	-5.48	Sig dif*

Notes

- Note the dependent variable is the change in customer bills for all four models.
- There is evidence of three (long term) cointegrating relationships between, customer bills, other costs and wholesale costs for all four of the models when tested. Please see chapter 1 for an explanation of this long run relationship.
- Historic data points are included in the model to help accurately explain changes in customer bills. These are referred to as ARIMA (Autoregressive Integrated Moving Average) terms. All four models share the same ARIMA structure, which is AR(1), AR(2) and MA(3).
- The 12 month hedge model uses Heteroskedasticity Consistent Standard Errors. No other models displayed evidence of failure in the diagnostic tests that were carried out.
- * Denotes significance at 5% level. ** Denotes significance at 1% level.

Sensitivities

2.16. To test the robustness of our results we have carried out a number of sensitivities on the main assumptions underpinning the analysis. We do not believe there is any systematic bias related to any of these assumptions, but would welcome views on this and other sensitivity analysis we should do. The sensitivity analysis we have undertaken is described below:

a) **Hedging strategy**: This sensitivity is outlined through the range of non-nested models shown in Figure 4.There is significant evidence of asymmetry under three of the four hedges tested. The choice of hedging strategies was determined by information gathered for the Energy Supply Probe, but in practice, individual suppliers are likely to change their hedging strategy over time.

b) **Modelling in real terms:** There is significant evidence of asymmetry when using the Consumer Price Index to model this relationship in real terms. For simplicity the modelling results are presented in nominal terms.

c) **Dropping the ECM terms:** Wholesale energy costs and other cost become significant in explaining customer bill changes when the ECM terms are dropped. This indicates that the ECM terms capture some of the information within these cost variables.

d) **Using a single ECM term:** This variable is significant at 1% and negative. As this variable is not separated out by positive and negative observations, we cannot test for asymmetry.

e) **Running the model with a truncated sample:** There is still evidence of asymmetry when truncating the sample at the time of the previous analysis (October 2008; although it is not as robust because we are using less observations than in the full sample – notably we are losing observations when wholesale costs are falling).

f) **Intercept correction term dropped:** There is still significant evidence of asymmetry, but residuals are no longer normally distributed because the model is not adjusted for the single outlying observation.

g) **Insignificant variables dropped:** No change to the finding of asymmetry when the insignificant variables were dropped from the model. The co-efficients of the significant variables did not change substantially when the insignificant variables were dropped.

3. Interpretation and conclusion

This chapter explores possible reasons why customer bills may follow an asymmetric trajectory. It also looks at what further work can be done in this area.

Why we may observe asymmetry

3.1. In a competitive market, wholesale cost increases will be passed through to consumers promptly. The same argument should work in reverse, meaning that wholesale cost falls would be passed on just as quickly otherwise suppliers would not be pricing competitively. This section explores the reasons why this may not occur in practice.

3.2. The possible explanations for asymmetry are derived from both economic theory as well as from market observation. We run through these possible explanations below. The tests for asymmetry outlined in this document are not able to ascribe asymmetry to a single cause, and various factors may be at work.

Consumer behaviour intensifies competitive pressure when prices are rising

3.3. Asymmetry in cost pass through can be an indication of a lack of competitive pressures faced by suppliers, especially when prices are falling. This could arise if consumers are less likely to search out alternative suppliers and offers when prices are stable or falling. This will tend to decrease competitive pressure on suppliers during times of falling wholesale costs and allow them to take their time in cutting retail prices.

3.4. This explanation would imply that margins may be higher when prices are falling than when they are rising. A recent academic study[10] gave this as an explanation for asymmetry in the US gasoline market. Switching gasoline supplier is less costly than changing energy suppliers, and so we may expect a greater degree of asymmetry in the energy supply market.

Transfer of profit through to the generation business by vertically integrated companies

3.5. This analysis focuses on the domestic supply market. All of the Big 6 however, own upstream generation assets. These tests assume the Big 6 value the output from their generation at its opportunity cost (ie the market price).

[10] M. Lewis, 2009.

3.6. One explanation for asymmetry is that if energy companies are managing margins in such a way to achieve stability across their total business / all elements in the value chain. Rising wholesale costs may be passed through to the supply segment of the business but generators typically increase profitability at this time; and so companies can allow their supply business to be less profitable. Conversely when wholesale costs fall, generation margins may typically fall, and so companies allow their supply margins to adjust downwards at a slower rate to compensate.

3.7. We note that the net effect of this source of asymmetry is to smooth prices which may benefit consumers through reducing volatility in their bills. However, the resulting volatility in supply business margins makes entry more difficult for a non-vertically integrated supplier. If vertical integration is necessary to enter the supply market, this might represent a significant barrier to entry – which would limit the competitive pressure in the market. This could act to the detriment of consumers.

Similar pricing and hedging strategies between suppliers

3.8. Energy suppliers risk losing market share if their wholesale energy costs are significantly out of line with the competition. In this circumstance, a competitor could use an advantageous hedge to undercut the supplier.

3.9. Suppliers therefore have an incentive to align their hedging strategies with the competition. This can be done in two ways i) gaining knowledge of how their competitors hedge and ii) signalling the supplier's own hedging position through their pricing decisions.

3.10. In signalling their own hedging position, suppliers face an asymmetric loss function:

- When wholesale costs increase, suppliers raise prices quickly to signal that they face cost increases in their hedging strategy.
- When wholesale costs fall, suppliers cut prices more slowly, as they don't want to send a signal to competitors that are looking to aggressively cut margins, rather than signalling on their hedging position.

Further work

3.11. The following further work could provide further insight into the relationship between wholesale costs and retail prices. In particular:

a) Test for asymmetric adjustment on additional parts of the market. This could include gas only customers, electricity only customers, individual payment methods rather than an average, as well as customers on non-standard tariffs. We have not had sufficient time to carry out this extra work.

b) Use actual supplier monthly wholesale cost data. We do not have accurate monthly information on this.

c) Incorporate suppliers own internal operating costs into the analysis. We do not have accurate monthly information on this.

Conclusion

3.12. This analysis found some evidence that energy bills follow an asymmetric trajectory. Whilst this finding is dependent on both our choice of technique used as well as how far we assume suppliers purchase their energy requirement in advance (their hedging strategy), we do not believe there is any systematic bias in our assumptions that would cause asymmetry.

3.13. When wholesale costs are falling, new entrants to the market would have a cost advantage relative to existing particpants - who are likely to have purchased their energy requirement at times of higher prices. However, we have found some evidence that competitive pressure is weaker when prices are falling, which implies a lack of competitive pressure from either new entry or the threat of new entry.

3.14. There are a range of potential explanations for the asymmetric pattern found. It could indicate a lessening of competitive pressure faced by suppliers when costs are falling compared to when they are rising. It could also reflect that vertically integrated companies' balance profits across the business, rather than in the supply or generation arm separately. Because of the number of different possible reasons for finding asymmetry, the implication for consumer harm is not clear cut.

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