

# **Annex 19**

## **Frontier Economics' Report on "Volume Modelling for the Price Control"**

**A Review of Methodological Issues by Professors  
Jean-Pierre Florens, Helmuth Cremer and Philippe De Donder,  
University of Toulouse**

# **Frontier Economics' Report on "Volume Modelling for the Price Control"**

## **A Review of Methodological Issues by Professors Jean-Pierre Florens, Helmuth Cremer and Philippe De Donder, University of Toulouse**

### **Context**

Royal Mail has prepared a response to Frontier Economics' report for Postcomm, "Volume Modelling for the Price Control", June 2005.<sup>1</sup> This focuses on Frontier's approach to volume modelling and the implications of this for the volume projections Frontier has prepared for Postcomm.

In its report, Frontier raises a number of methodological issues and makes a number of claims regarding the validity of its approach from a theoretical perspective. These points are raised in Royal Mail's response and as noted there Royal Mail has invited an independent review by acknowledged academic experts of the methodological and theoretical issues raised by Frontier.

This annex contains that review which follows the structure of Frontier's report and is in two parts. The first of these is on the econometric modelling of pre-competitive entry volumes where Frontier's report is largely based on Royal Mail's Inland Letter Traffic Model (ILTM(2004)). This review by Professor Jean-Pierre Florens, University of Toulouse, who is one of the leading experts on the econometric modelling of mail volumes and has published extensively in the world's leading econometrics journals.

The second part of the Frontier's report develops a model to project the impact of competition on Royal Mail volumes. The methodological and theoretical issues raised by that part of Frontier's report are reviewed by Professor Helmuth Cremer and Professor Philippe De Donder, both of University of Toulouse, who are among the leading experts on the application of formal economic analysis to the modelling of competition and entry in the postal sector. Both have published extensively in the world's leading journals on regulatory, competition and industrial economics.

The opinions expressed in their paper are those of the authors and may not reflect those held by Royal Mail.

Royal Mail  
August 2005

---

<sup>1</sup> Royal Mail. August 2005. *Royal Mail's Response to Postcomm's Initial Proposals for the 2006 Price and Service Quality Review*. Annex 18.



# **Frontier Economics' Report on "Volume Modelling for the Price Control":**

**A Review of Methodological Issues**

**Helmuth CREMER**

*Professor, University of Toulouse  
Research Director, Institut D'Economie Industrielle  
Toulouse, France*

**Philippe DE DONDER**

*Research Associate, Centre National Recherche Scientifique  
Research Director, Institut D'Economie Industrielle  
Toulouse, France*

**Jean-Pierre FLORENS**

*Professor, University of Toulouse and  
Institut Universitaire de France  
Research Director, Institut D'Economie Industrielle  
Toulouse, France*

**August 2005**

# **PART I**

## **Econometric Forecasting for Mail Demand**

The demand models developed by Royal Mail for projecting mail volumes and commented on by Frontier Economics<sup>2</sup> are three error correction equations estimated in two steps: the long term relations and the relation between stationary variables (differences and cointegrated linear relation). Then, implicitly, the different demand equations are parts of larger systems including at least mail demand and the GNP variable. However if we assume that the feedback impact of mail demand variation on GNP is negligible the demand equations may be treated as dynamic regression models and may be rewritten as:

$$\alpha(L)Y_t = \beta(L)' Z_t + U_t$$

where  $Y_t$  is the demand level and  $Z_t$  a vector of explanatory variables, including GNP, prices, dummies and trend. Then, given scenarios on the future values of  $Z_t$  variables, this model may be mechanically used for the construction of forecast of the  $Y$  variable and confidence intervals are canonically associated to these predicted values. Two kinds of questions arise: how should this model be used for forecasting? Is it sufficient to base the prediction on the model only?

## 1 - Forecasting from a dynamic model

Dynamic time series models, such as error correction models, can be used to construct forecasts that are conditional (to the available information) means of future values and the uncertainty surrounding these projections can be assumed to come from the residual terms only.

Let us first consider the origin of the uncertainty. Two others sources exist: the error on the estimation of the parameters and the errors on the future scenarios on the explanatory variables. Errors on the parameters are well known (given the value of the explanatory variables) and are very often negligible comparable to the residual terms (see Frontier report). This point should be analysed more carefully. In particular I think that small variations on the GNP and on the trend parameters will affect forecasts for the growth in mail volumes and to a greater extent forecasts for the level of mail volumes in an important way, at least after some periods (remember that in this type of autoregressive models forecast errors cumulate where the horizon increases). This will also be the case for any non-stationary explanatory variable. Such an analysis may be done by theoretical computations or by Monte Carlo simulations (by drawing parameters in their sampling distribution).

The errors on the explanatory variables are less explicitly incorporated in the forecasting mechanism. Frontier has tested the sensitivity to some changes in the scenarios on the prediction. Actually this analysis may be completed by the specification of a whole distribution of the explanatory variables which may be an asymmetric distribution around the mode (see the recent literature on asymmetry in forecasting, e.g. Wallis (1999)). In that case the uncertainty on the explanatory variables (combined with the uncertainty of the parameters in a non linear way) plus the error terms may create, where the horizon increases, more complex distributions than the usual normal and with a larger dispersion.

---

<sup>2</sup> Frontier Economics, *Volume Modelling for the Price Control*, June 2005

The second element is related to the selection of a forecasting value. In the normal case (where the residuals only are introduced and if these residuals are normal) the forecasting errors are also normal and mean, median and mode coincide. We have remarked before that this property is no longer true if errors on the explanatory variables are introduced. Following several papers a consensus seems to select the mode which typically generated asymmetric confidence intervals (see e.g. Wallis (2003)).

There are also strong arguments in favour of a different value to the conditional mean. The selection of a single value for forecasting is a decision problem and its solution depends on the user's loss function. It would be useful to model the impacts on Royal Mail of under or over forecasting mail demand. Forecasting errors may encourage the regulator to make poor decisions whose impacts may be highly asymmetric (i.e. overestimating the future demand for mail may have considerably higher consequences on welfare than underestimating demand). In this case the "best" forecasting rule is usually a fractile of the distribution (the lower quantile for example) and not a control parameter (as median or mean) (see Clements (2004)).

Postal demand is a complex phenomena which is difficult to model by a constant parameter specification, in particular in the recent period. This demand analysis should incorporate unobservable regimes which switch the parameters to different values. Theoretically it is possible to construct such a data generating process which would encompass the phenomena pointed out in the Frontier report (page 18): different specifications selected by econometricians for different periods of observations, same behaviour of stability tests and systematic over prediction of the models<sup>3</sup>.

A natural objective for the econometric analysis of mail demand would be to construct a dynamic model which incorporates switching between different regimes in order to improve its predictive performance. However such a model requires substantial quantities of data which are not available today because the phenomena appeared only very recently. Moreover the process which generates the switching has certainly not the stability (such as an homogeneous Markov process) needed for predictions.

## **2 – A need for expert opinions and out of sample change of the model**

The limit of a mechanistic use of a model for forecasting is recognised by all the forecasting institutes and some of them have abandoned econometric modelling in favour of an aggregation mechanism of expert opinions (see Blix and Sellin (1999)). This is not my opinion, as econometric models should be able to incorporate changes in the behaviour of economic agents.

This is precisely the main argument in favour of structural econometric modelling: in a structural model the parameters are "causal parameters" (see Heckman (2000)) and represent agents' behaviour. In particular these parameters may change independently keeping the other parameters constant. This change cannot be realised in a reduced form model (consider a simple market model: a change of price elasticity of the demand may be calculated without

---

<sup>3</sup> We have shown by a Monte Carlo argument the difficulty to identify and to use a dynamic demand model in the Postal sector in Cazals and Florens (2002) in presence of unobservable heterogeneity of the consumers.

constraints on all the other structural parameters but all the reduced form parameters will be affected). The claim in favour of structural modelling is precisely to introduce out of sample changes of the behaviour of agents.

This is precisely the strategy followed by Royal Mail. The time trend is not a very structural variable but it may be considered as a proxy of the evolution of consumption habits and there are strong reasons to think that these habits will change in the next future. This is motivated by observation of the US postal market and by Royal Mail experts' opinions. By definition the introduction of a modification of a parameter need not be justified by a within sample argument because it is assumed that the change occurs outside the sample period used to estimate the model.

The position of Frontier for the analysis of the first observations obtained after the sample is not fully relevant. These new data are essentially in the confidence interval of the predictions made without the overlays added but they are also certainly in the confidence interval with the overlay. The effect of a structural change will be more important over a longer horizon than one year. If we wish to explicitly test the change of the trend effect in the sample one can search for an adapted non linear specification of the trend. I understand that a previous version of the model which included quadratic terms led to non-sensible long-term forecasts for the demand for mail (due to the tail behaviour of second order polynomial). Perhaps a smooth change between linear trends could be adopted, although this may be difficult to identify if the change is very recent. The graph presented in the Frontier report (fig 6 p 25) is not also fully relevant. If an overlay on the trend is accepted the confidence interval should incorporate this overlay. The confidence intervals reported by Frontier illustrate the role of the noise in the prediction and not a change in the behaviour of the consumers. The comparison between mean prediction with overlay and confidence interval without overlay is therefore questionable.

### **3 – Conclusion**

Econometric models should certainly be used for forecasting as an important information source. Basically an econometric forecast is the best way to describe the future if nothing changes except the explanatory variables incorporated in the model: the behaviour of agents and of the non modelled environment should be stable. Then also the econometric structural model is useful because this non-statistical analysis may take the form of a change in the parameters.

This change in the parameters or more generally the use of other information is necessarily not based on a statistical argument (because in that case it should have been introduced in the model). The history of forecasting is an argument to weight econometric predictions by other sources of information but not in a statistical way.

All information is relevant. The US demand is not interesting by itself: if it was the variable should have been included in the model. The US demand is interesting because experts use it to form their opinions. Consequently data on US demand should not be used statistically but as a non-statistical element of information which appears to be relevant for forecasting.

## References

- Blix, M. and P. Sellin, 1999, "Inflation Forecasts with Uncertainty Intervals", *Quarterly Review*, **2**.
- Cazals, C and J.P. Florens (2002), « Econometrics of Mail Demand: A Comparison between Cross-Section and Dynamic Data » in *Postal and Delivery Services: Pricing, Productivity, Regulation and Strategy*, M.A. Crew and P.R. Kleindorfer (eds.) Kluwer, Boston, 119-140.
- Clements, M.P., 2004, "Evaluation the Bank of England Density Forecasts of Inflation", *The Economic Journal*, **114**, 844-866.
- Heckman, J.J., 2000, "Causal Parameters and Policy Analysis in Economics. A Twentieth Century Retrospective", *The Quarterly Journal of Economics*, **115-1**, 45-97
- Wallis, K., 1999, "Asymmetric Density Forecasts of Inflation and the Bank of England's Fan Chart", *National Institute Economic Review*, January.
- Wallis, K., 2003, "Chi-squared Tests of Interval and density forecasts, and the Bank of England's Fan Charts", *International Journal of Forecasting*, **19**, 165-175.

## **PART II**

# **Economic Analysis of Entry in the Postal Sector**

We concentrate our comments on Section 3, entitled “Volume shares”. In this section, Frontier Economics presents its Competitive Postal Market Model (CPMM) and attempts to contrast it with Royal Mail’s Entry Pricing Model (EPM). The authors claim that “The CPMM is considered to be preferable to the EPM because it is transparent, it incorporates the main factors that are expected to influence decisions in the market, and it is economically sensible.(...) The (CPMM) model is internally consistent, and based on sound fundamental principles (...)”(p 43-44). The authors also claim that “the CPMM is more transparently grounded in economic analysis of competitive behaviour (than EPM)” (p29).

We contest the qualification of the CPMM as an economic model. It is rather, like the EPM, an operational model, in the sense that the behaviour of economic actors is not actually modelled. Rather, at the heart of both the EPM and CPMM models lie various assumptions on the reactions of both postal operators (range, price, cost and quality of products offered) and customers (market shares taken by postal operators given their offerings). The main difference between CPMM and EPM is that the CPMM is less sophisticated and effectively much more ad hoc than the EPM. Nowhere in the CPMM is there a modelling of how the operators end up choosing the characteristics of their offering, and how the consumers decide which of the various products to buy. In other words, CPMM offers no model of entry, of strategic interactions between operators, and of consumers’ demand behaviour (see Cremer et al.(2001) for such a model). To be able to predict the market outcome under various scenarios in a reliable and robust way, one would need to build a structural model of the industry. A first step would be a consistent specification of demand behaviour and an explicit modelling of the operators’ strategies and the resulting market equilibrium. While the ultimate goal would still be to make numerical predictions the first step would be to understand how the industry works and how specific assumptions translate into results.

The authors claim that “The first module (of CPMM) is a model of competition in the absence of switching costs(...) Specifically, potential market shares are calculated by reference to a classical model of undifferentiated Bertrand duopoly with a quality and brand dimension added”(p. 30). And the authors have found an impressive way to summarize hundreds of papers on product differentiation in a spectacularly simple way: when the incumbent’s price does not exceed that of the entrant by more than 10 percent, he keeps the entire market; otherwise he loses it all. It appears to be rather pretentious to qualify this as an “economically founded” assumption. For a model to yield the specific demand behaviour on which CPMM is based, one would need to make rather peculiar assumptions.<sup>4</sup> Now it is clear that to construct scenarios of market liberalization one has to make some restrictive assumptions. But then one should be honest about their nature and not attempt to sell them on the basis of their “economic foundations”. Here the authors effectively only use “back of the envelope” calculations.

To sum up, we consider that CPMM is, like Royal Mail’s EPM, an operational model of the postal market under competition, and not an economic model comparable to those used in industrial or regulatory economics. As such, it is certainly not more transparently grounded

---

<sup>4</sup> For instance, the CPMM assumes that the incumbent retains all the market if its price is less than 110% of the entrant’s price, and loses it all if it increases its price above this threshold. In short, the economic literature on quality (vertical differentiation) assumes that all consumers agree on which product is of a better quality, but that they differ on how much they value quality, and thus on their willingness to pay for a good of a higher quality. Given the qualities and prices of the goods offered, consumers buy one or the other, but one would need a very peculiar configuration of preference (all consumers should value quality in exactly the same way) to obtain a sharp discontinuity in market shares with prices as in the CPMM.

in economic analysis of competitive behaviour. Both models share many assumptions. For instance, switching curves are at the heart of both models and are exogenously given rather than obtained from a precise modelling of economic behaviour. The main difference between EPM and CPMM is that the first is focused on segments of traffic or “routes” while the second is focused on customers. We do not think that this change of focus makes CPMM more transparent at all. Moreover, the focus on customers runs the risk of missing the geographical dimension of the sending and delivery of mail, which is of paramount importance in this sector.<sup>5</sup> The fundamental question which underlies this issue is the problem of the proper definition of a product or as economists say a good in the postal sector. In standard microeconomic theory, a good is not just characterized by its physical properties, but also by the time and the place at which it is available (and possibly the “state of nature”). Macroeconomists on the other hand often take a very aggregate view and use models with a single good. But macroeconomists are interested in issues like growth of GDP or firms’ market shares and not in specific markets’ outcomes. To study the postal sector it is clear that some level of disaggregation is necessary. A piece of mail sent to a deep rural area is not the same good as a letter sent to an urban area. If they are aggregated, issues like uniform prices and uniform service are no longer accounted for in the model. While considering every single route may be too disaggregated (and not reflect the customers decision making), it is clear that the CPMM approach very much overshoots in the other direction. A compromise may be to rank routes (or delivery points) by cost and then let customers and operators decide on cut-off levels (as in Cremer et al.(2001)).

To conclude, an economist cannot be entirely happy with shortcut models such as the EPM. However, as we have pointed out in the past, EPM represents an acceptable compromise between consistent and economically founded modelling and operational character. There is certainly room to improve upon EPM but CPMM represents a step in the wrong direction.

## REFERENCES

Cremer H., J.P. Florens, A. Grimaud, S. Marcy, B. Roy and J. Toledano, “Entry and competition in the postal market: foundations for the construction of entry scenarios”, *Journal of Regulatory Economics*, 19, 2001, 107-121.

---

<sup>5</sup> The CPMM assigns to each type of customers a product mix, which then has to be associated to a mix of routes, either by using data from EPM (for top 100 and residential customers) or by making additional assumptions (for “other and non-local businesses”). CPMM assumes that both the product mix and the associated route mix reflect actual patterns and will not be affected by competition. Since entrants and RM compete for a customer, a customer’s product or for a weightstep in the customer’s product, entrants are not allowed to tailor their offer according to the geographical characteristics of the sending and delivery of mail.