CCR - Competition Competence Report Autumn 2013/1

Merger Simulation Models: Part 1

Introduction

Merger simulation aiming to predict price changes of a merger follows three distinct steps.

1) The first step specifies and estimates a demand system.
2) The second step makes an assumption about the equilibrium behavior, typically a multi-product Bertrand-Nash equilibrium to compute the products current profit margins and their implied marginal costs.
3) The third step usually assumes that marginal costs are constant, and predicts how prices will change after the merger, accounting for increased market power, cost efficiencies and perhaps remedies.

Demand models

Why are demand elasticities so important when using merger simulation models? After a merger, the merged entity has reason to increase prices, as the merger lessens the price-elasticity of demand for its products. The lost sales may be regained through the merged entity. The extent to which the elasticity falls depends largely on the closeness of substitution between the merging parties' products and the substitutability to goods of non-merged firms.

Thus, the first step to any merger simulation model is choosing a functional form of demand that matches consumer behaviour and choice. There are different demand models available e.g. linear, log-linear, (nested) logit, almost ideal demand systems (AIDS) and PCAIDS.

Linear demand models

A linear demand curve is the graphical representation of the relationship between the price of a good and the quantities of that good consumer are willing to purchase. The first law of demand states that as price increases, less quantity is demanded. This is why the demand curve slopes down to the right.

Slope and elasticity are different concepts. Slope measures the steepness or flatness of a line in terms of the measurement units for price and quantity. Elasticity measures the relative response of quantity to changes in price. In other words, how much will a change in price affect the quantity demanded or supplied. The price elasticity of demand is different at each point on a demand curve with constant slope. In addition, price elasticity of demand is almost always negative because price and quantity move in opposite directions on the demand curve.

An alternative approach to a linear demand model is to consider a linear relationship among log-transformed variables. This is called a log-log model. The dependent variable as well as all explanatory variables are transformed to logarithms. Since the relationship among the log variables is linear some researchers call this a log-linear model. The parameters of the log-log model have an interpretation as elasticities. So the log-log model assumes a constant elasticity over all values of the data set. This assumption of constant elasticities is criticized. As a result, linear and log-linear models are scarcely used.

Use of linear demand models by the European Commission

The European Commission used a linear demand model e.g. in the Honeywell/Novar case (COMP/M.3686) in 2005. The Commission calibrated a simulation model based on a linear pricing contract assumption between non-integrated upstream and downstream firms. As a result of its merger simulation exercise, the Commission found that the quantities available on the market would be reduced by a significant amount. Prices would increase in turn.

The Commission cleared the transaction.

Logit demand models

A more popular form used in merger simulation models are (nested) logit demand models. This type of model is part of the discrete-choice demand models family.

Discrete choice models explain and predict choices between two or more discrete alternatives. Techniques such as regression or conjoint analyses are used for empirical analysis of discrete choice.

Discrete choice models are based on utility theory. Consumers choose to buy a unit of the product that maximizes their personal utility function. The assumption is that the consumer utility function depends on observable product characteristics, including price, and unobservable product characteristics as well as individual-specific coefficients.

A nested logit model relaxes the IIA property (independence of irrelevant alternatives) of the simple logit model, and allows consumers to have correlated preferences for products that belong to the same subgroup or group.

Use of logit demand models by the European Commission

Cases in which the European Commission itself has run merger simulations based on nested logit demand models include Unilever/Sara Lee (COMP/M.5658), TomTom/Tele Atlas (COMP/M.4854) and Lagardère/Natexis/VUP (COMP/M.2978).

Unilever/Sara Lee – 2010

Anticompetitive effects in the deodorant market were the Commission's concern in Unilever/Sara Lee.

The Commission itself developed a nested logit demand model. To simulate the demand function, a one-level and a two-level nested logit model was applied. Nests were male and non-male deodorants brands, the sub-nests skin friendly or not. In addition, a standard Bertrand-Nash market equilibrium was used.

The Commission used different data sources for the model. First of all, retail scanner data (data that is gathered by the cashier ṡ scanner device) produced by Nielsen from April 2006 to March 2009. These detailed store and transaction level data are generally available. The Commission used country level datasets for four countries: Belgium, the Netherlands, Spain, and the UK.

Secondly, the Commission used data on the individual product level also covering the years 2006 to 2009 on a weekly basis. For each product, the following variables were observed: the total value and volume of sales, the number of units sold and also some product characteristics (size, gender proposition, format). For the estimations, the data were aggregated to a quarterly level. In addition, Unilever provided its classification of the scanner data along with further dimensions of product differentiation.

Third, Unilever and Sara Lee, submitted their own (separate) internal transaction data. These data tracked the companies' sales to their customers, mostly retailers. The data covered 2007-2009 on a monthly basis on a detailed product level (brand, sub-brand, gender, format, size). The observed variables included the value of sales, volume of sales, gross profits, and gross profit margins.

The Commission carried out a simulation for eight markets (male and non-male deodorants in the four countries), finding estimated price increases between 1 and 6%. Competition concerns were ultimately raised for five of these markets, all with estimated price increases of 2% or higher. The largest overall predicted price increases were those for Belgium around 4-5%. The figures for the Dutch market were somewhat lower (3.8%) followed by the UK and Spanish numbers (2-2.5%).

The Commission cleared the transaction.

TomTom/Tele Atlas – 2008

The merger between TomTom and Tele Atlas was a case of backward integration, where a downstream manufacturer (TomTom) acquired one of its input providers (Tele Atlas). The Commission calculated in this case how much sales TomTom would be able to capture downstream post-merger. To estimate the downstream elasticities, the Commission used a nested logit model.

The model used retail data covering monthly sales and volumes of the product for the last three years. On the basis of the estimated own-price and (inter and intra-nest) cross-price elasticity parameters for each product, it was calculated that a price increase of 1% by all TomTom ṡ competitors (except Garmin) would lead to an increase in the number of PNDs sold by TomTom in the range of 0.3-0.5%.

Result of the Commission ṡ model was that the sales captured by the merged entity downstream by raising its rivals 'costs would not be sufficient to compensate for the lost sales upstream if it engaged in input foreclosure.

The Commission cleared the transaction.

Lagardère/Natexis/VUP - 2004

The French group Lagardère acquired part of the publishing business of Editis (formerly known as Vivendi Universal Publishing or VUP), through its subsidiary Hachette Livre. Editis is the biggest publisher, marketer and distributor of French books, while Hachette is number two.

The European Commission used a nested logit model developed by Foncel and Ivaldi. Data on prices and volumes concerning the 5,000 bestsellers in pocket format in 2002 and 1,500 bestsellers in large format were provided by IPSOS. The sample covered a big share of the market in 2002. These books accounted for over 96% of pocket-format sales and 44% of large-format sales. The econometric study was based on a Bertrand competition model in which consumer preferences were represented by a nested logit model.

Consumers' demand decisions are assumed to be hierarchical in that first, the type of book (humor, thriller, etc.), and then, on the second level, a specific book is chosen. The simulated price increase for the merging parties' books was 4.84%. A 3% decrease in marginal costs was assumed too.

The Commission cleared the transaction.

Other merger simulation models in European Commission's cases

In the majority of merger cases, external experts to the parties develop the merger simulation models. Merging parties need to put forward enough evidence for the Commission to support a decision of the merger.

Either the notifying or the complaining parties submit such simulation models. The Commission is usually not duplicating the parties' efforts with its own simulation exercises. The Commission checks the calculations only. To understand the calculations easier, the Commission has published best practices that inform which data should be provided to the Commission.

The following table lists some of the European Commission cases where different forms of merger simulation models were use.

Year	Case
2013	Norsk Hydro/Orkla/JV
2012	Deutsche Börse/ NYSE Euronext
2012	Universal Music Group/EMI Music
2011	Votorantim/Fischer/JV
2011	Caterpilla/MWM
2009	RWE/Essent
2009	Kraft Foods / Cadbury
2009	EDF/Segebel
2008	REWE/ADEG
2008	Itema/Barcovision
2008	EDF/British Energy
2007	Ryanair/Aer Lingus
2007	Thales/Finmeccanica/Alcatel Alenia Space & Telespazio
2006	Dong/Elsam/Energi E2
2006	T-Mobile Austria/Tele.ring
2005	Vattenfall/Elsam and E2 Assets
2005	HP/Nasdaq
2003	Philip Morris/ Papastratos
2003	Sydkraft/Graninge
2001	General Electric/Honeywell
2000	Scania Volvo

Conclusion

Given the increasing quality of merger simulation models it is assumed that simulation models will continue to stay a solid contribution in any future Commission decisions on mergers.