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How to use quantitative analysis in your merger analysis

Contents

Introduction

1 The Commission's *Mergers and Acquisitions Guidelines* describe how the Commission may assess whether or not an acquisition of a firm's assets or shares would be likely to substantially lessen competition in a market.

2 This Advisory Note concerns quantitative evidence, which can help to inform economic analysis. A party may choose to submit quantitative evidence in addition to, or instead of, other types of evidence to support submissions it is making to the Commission. For example, parties may provide quantitative evidence to support their view of how the market should be defined, how closely firms compete with one another, or how likely entry might be.

3 In order to have the greatest impact, quantitative analysis needs to be clear, understandable, relevant to the issue it is seeking to address, and based on reliable data. This Advisory Note describes characteristics of good quantitative analysis. It then describes the following common types of quantitative analysis, points parties should have regard to when submitting these types of analysis, and examples of decisions where the type of analysis has been used:

- → critical loss analysis;
- → price correlation;
- → switching analysis and diversion ratios;
- → upwards pricing pressure measures;
- → entry analysis;
- → econometric analysis; and
- → merger simulation.

4 As stated in the *Mergers and Acquisitions Guidelines*, whether an acquisition is likely to substantially lessen competition is a matter of judgment based on the evidence available. The weight placed on quantitative and qualitative evidence will vary from case to case – no one type of evidence or analysis is necessarily superior to another. The intention of this Advisory Note is not to suggest that parties must provide quantitative analysis in support of a merger clearance or authorisation application. This Advisory Note is merely explanatory and we recommend that parties obtain the necessary expert advice before deciding whether to submit any quantitative analysis to the Commission.

5 The discussion in this Advisory Note is, by its nature, general and does not attempt to address every issue that might arise in any case. Further, these are not the only types of quantitative evidence that may be relevant. Quantitative analysis is an evolving area so the value and usefulness of quantitative analysis in any particular case depends on the relevant issues and the amount of data available. We recommend parties to talk to their advisors about the type of quantitative analysis that may best suit their needs.

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1. In particular, the Court of Appeal has recently made clear, in *Godfrey Hirst NZ Ltd v Commerce Commission* [2016] NZCA 560; (2016) 14 TCLR 517 at [35] – [38], that: "[Q]uantitative analysis … cannot dominate the Commission's approach. In cases where the Commission is able to undertake parallel assessments of a qualitative and quantitative nature, each must be informed by and ultimately integrated within the Commission's determination by exercising its institutional expertise. Qualitative factors can be given independent and, where appropriate, decisive weight".

Characteristics of good quality quantitative analysis

6   The Commission has published *Guidelines for Quantitative Analysis*[2] on its website. These set out the principles that apply to any quantitative analysis used in the Commission's decision-making. Those five principles are:

→   Principle 1: the analysis has a clear objective.

→   Principle 2: the analysis uses appropriate approaches and techniques.

→   Principle 3: the analysis is repeatable and replicable.

→   Principle 4: the results of the analysis are robust and explainable.

→   Principle 5: all quantitative analysis is reviewed to identify its limitations, ensure it meets its objectives, and is error free.

7   We encourage parties to adopt those principles if submitting quantitative analysis.

Submitting quantitative analysis

8   To enable the Commission to properly consider any quantitative evidence we encourage parties to provide the following information, if relevant, when submitting any quantitative analysis.

→   An explanation of the hypothesis being tested and how this relates to the issues the Commission is or should be considering.

→   An explanation of the quantitative technique used and, where relevant, the economic theory that supports its use.

→   An explanation of the source of the data used for the quantitative analysis and its reliability.

→   A data key detailing variables used, the units in which variables are measured, any formulae used to arrive at that variable, what they represent (eg, wholesale prices), the level of aggregation (eg, by each retail outlet), and the time period over which the data is measured (eg, monthly).

→   For example, when using prices, the parties should note any relevant qualifications such as whether the price is a wholesale price or retail price, net of GST, delivered, before discounts, the relevant currency, etc. The formula used to arrive at the price might be:

ex-gate invoice price (NZD) = retail price including GST − 10% trade discount

→   All assumptions underpinning the analysis as well as explanations and evidence supporting the use of those assumptions. It is good practice to include analysis showing the sensitivity of the results to the core assumptions used.

→   An explanation of any limitations to the analysis.

→   An explanation of the sample size, margin of error and response rate in any survey.

→   The raw underlying data in native format and any electronic spreadsheet (such as Microsoft Excel) where data has been collated for analysis.

High Court rules for external experts

9   If parties choose to engage external experts to carry out the quantitative analysis, parties may wish to ask the expert to refer to, and be bound by, the High Court Rules on providing expert evidence.

Confidentiality

10   The Commission's approach to confidentiality is set out in the Commission's *Mergers and Acquisitions Guidelines*.

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2.   http://www.comcom.govt.nz/the-commission/commission-policies/guidelines-for-quantitative-analysis/.

Critical loss analysis

Overview

11   Critical loss analysis can be employed to assist in defining the relevant markets for a merger analysis.

12   As outlined in the Mergers and Acquisition Guidelines, the hypothetical monopolist test can be used as a conceptual tool to help us assess whether, if prices increased, customers would switch sufficient purchases to alternative products or locations. The test asks whether a hypothetical sole supplier would find it profitable to raise the price[3] of a product or set of products by a small (but significant) amount, or whether customers would react to this price increase by switching sufficient purchases to alternative product or products in other locations so as to render the price increase unprofitable.

13   Critical loss analysis is a means of carrying out the hypothetical monopolist test. Critical loss measures the minimum sales volumes that a hypothetical monopolist would need to lose over a candidate set of products to make a small, but significant, non-transitory increase in price (SSNIP) unprofitable. A price increase of between 5% and 10% is typically chosen for the SSNIP.[4]

14   The critical loss is then compared to the actual loss of sales that the sole supplier would be likely to endure if it increased prices by the SSNIP. Critical loss analysis does not estimate the likely actual loss, which is instead inferred from other evidence.

15   If the actual loss is likely to be less than the critical loss, this suggests the price increase over the candidate set of products would be profitable, and so suggests that that set of products constitutes a relevant market.

16   If the actual loss is likely to be greater than the critical loss, this suggests the price increase over the candidate set of products would not be profitable, and that a relevant market is yet to be found.

17   To find a profitable price increase, the process is repeated on an incrementally wider set of products, adding the next best substitute in each round, until it would likely be profitable for the hypothetical monopolist to impose a SSNIP. In critical loss analysis, the actual loss needs to be estimated, either qualitatively or quantitatively, for each iteration or candidate market before arriving at a possible relevant market.

An example of where the Commission relied on critical loss analysis is the Tomarata Sands/Coastal Resources merger (Decision no.696 2010)

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3.   The Commission's *Mergers and Acquisitions Guidelines* (at 3.21) notes that this base price is typically taken as the prevailing price.

4.   Critical loss provides the quantity that would have to be lost for a particular price increase to be unprofitable. If a 10% price increase is unprofitable, this does not mean that a 12% price increase is not profitable. Therefore, it may be important to assess different hypothetical price increases over a set of candidate products to see whether a larger price increase would be profitable.

Calculation

$$Critical\ loss\ =\ \frac{SSNIP}{SSNIP + M}$$

where M is the price-cost margin in percentage terms.
M = ((initial (average) price – initial (average) variable cost)/initial (average) price)*100

18   Both the critical loss and the actual loss resulting from a price increase by a hypothetical monopolist needs to be estimated.

19   The critical loss is calculated using two inputs: the SSNIP (price increase) and the margin earned on the candidate set of products. Margins are calculated based on the initial product price (averaged over the candidate set of products) and the corresponding costs of those products. The appropriate measure of cost can vary depending on the fact situation, but average variable cost is typically used.

20   Typically the initial candidate set of products tested consists of products currently sold by the merging parties so the prices and costs of those products are generally known.

21   If the candidate set of products is expanded to include the next best substitutes, then the merging parties' costs are often used to proxy for the costs of those candidate substitute products if the products are similar. The method for cost estimation should be explained, as there can be complexities depending on usefulness of the data available and whether merging parties' costs are an appropriate proxy for wider market costs.

22   Actual loss requires losses from a hypothesised price increase over a candidate set of products to be estimated. Actual losses can be estimated, qualitatively or quantitatively, on the basis of customer reactions to past price increases, or some other source of information on how sensitive consumers might be to a price increase and their switching behaviour.

Interpretation

23   A low critical loss figure for the merging firms' products (suggesting that only a small amount of lost sales can be tolerated before a small price increase becomes unprofitable) does not mean that a price increase over the merging firms' products following a merger would be unprofitable. Such a conclusion implicitly assumes that the actual loss is likely bigger than the calculated critical loss, but this assumption is best tested against some evidence of likely actual loss. For example, critical loss will be low when margins are high. High margins might indicate that consumers are not price sensitive (inelastic demand) and therefore actual losses from a price increase might also be small.

24   If the actual loss is greater than the critical loss, this suggests that the market is wider than the products of the merging firms.

Correlation

Overview

25 Correlation is a measure of the extent to which variables, such as prices or quantities, move together over time.

→ Variables are said to be positively correlated if they move together in the same direction. That is, when one increases, the other also increases.

→ Variables are said to be negatively correlated if they move in opposite directions. That is, when one increases, the other decreases.

26 Assessing the degree of correlation between different products or their prices can suggest whether there is a degree of substitutability between them. Even if the products are priced quite differently because they are differentiated,[5] they can still compete. For example, a premium product might constrain the price of a standard product even if a premium product maker can charge more for its products. A correlation coefficient indicates how closely these prices move together so that the absolute differences in prices are removed from the analysis.

Figure 1: Price correlation between standard and premium products
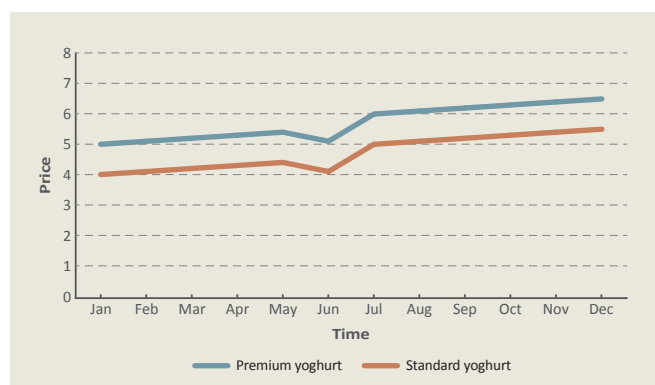

27 Although the prices of products in the same market would typically be expected to be positively correlated, correlation does not conclusively show that the products are in the same market. Price trends can be driven by common costs and so product prices may be positively correlated for that reason. For example, yoghurt and town milk prices may both be affected by the wholesale price of milk (a key input) without being in the same market.

28 Alternatively, if product prices are uncorrelated, this may suggest that the products are not in the same market.

29 If product volumes are negatively correlated, this may suggest that the products are substitutes, and so in the same market, since switching between the products may be taking place – as the price of one good increases, its product volume decreases while the product volume of its substitute increases. However, market dynamics may suggest other reasons for this relationship. For example, a shift in demand, perhaps brought about by changing tastes, may produce a correlation in quantities that is unrelated to a movement along the demand curve in response to a change in price.

30 Correlations are also prone to spurious relationships. For example, the price of laptops and bicycles might be positively correlated even though they are otherwise unrelated.

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5.   Differentiation refers to differences in terms of attributes or location so that the products are not perfect substitutes.

Calculation

31   The degree of correlation is indicated by a correlation coefficient. As a rule of thumb, strong correlation is typically indicated by a correlation coefficient of above 0.7 or below -0.7.

32   The correlation coefficient can be calculated using data over a suitable time period. The period over which data would be required is likely to vary depending on the volatility of the variable of interest. If prices are volatile, it may only be necessary to obtain data from a short time period to assess correlation. If prices are stable, data over a longer time period may be required.

33   The data used for this calculation should be representative of general pricing or quantity trends. The correlation coefficient reported over a shorter time period when the market was experiencing shocks may be significantly different to the correlation coefficient over a longer time period when these shocks are smoothed. *Figure 2* illustrates that price correlation might not seem strong if a short period is considered (shaded area), with a correlation coefficient of 0.65 whereas this pricing relationship looks much stronger over a longer period of time, with a correlation coefficient of 0.95.

Figure 2: Effect of time window on correlations
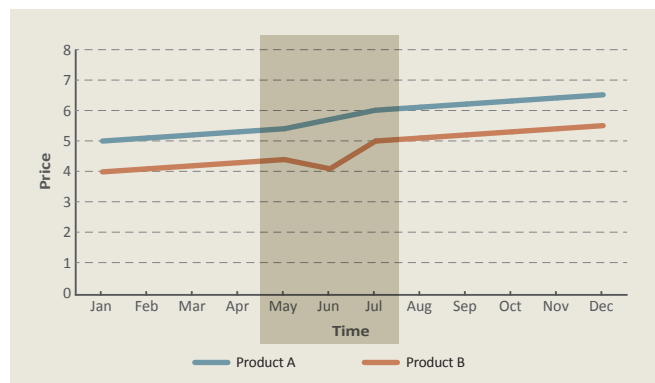
Interpretation

34   As discussed above there is potential for the correlation to be driven by factors other than the substitutability between different products. For instance, the products in question may be manufactured using similar inputs. Therefore, changes in common input costs which feed through into changes in product prices may result in price correlation even if the products are not substitutes. For this reason, more sophisticated statistical methods may be appropriate such as regression analysis (discussed below).

35   Price correlation measures may be more useful for indicating when products are unlikely to be in the same market. That is, if the prices of two products are uncorrelated this may more reliably indicate that the products are not substitutes. For example, if the prices for apples in region A are not positively correlated with the price of apples in region B, then this may suggest that the two geographic regions are in separate markets.

Switching analysis and diversion ratios

Overview

36 Switching analysis is a technique used to help assess how substitutable two products may be. In particular, it seeks to understand the amount of sales that are lost to firm B should firm A raise its prices.

37 If two firms – firm A and firm B – are seeking to merge, it can be useful to look at what currently happens in response to a price increase. If firm A increases its price, and firm B captures a large portion of the total quantity lost by firm A, this may indicate that the two firms would find it profitable to increase the price of one of their products post-merger. This is because the merger allows the merged entity to re-capture sales that would otherwise be lost to the other firm without the merger.

38 Switching analysis can be particularly useful when assessing how closely differentiated products, such as consumer goods, compete. For example, while all types of cars may provide some competitive constraint on each other, certain types of cars are more likely to compete more closely.

Calculation

39 The diversion ratio measures the proportion of sales that a firm would lose to a particular rival (firm, brand or product) should it raise the price of its own product.

$$D_{AB} = -\frac{\Delta Q_B}{\Delta Q_A}$$

where D_{AB} is the diversion ratio from product A to product B, ΔQ_A is the total decrease sales of A and ΔQ_B is the change in the quantity of sales of B if the price of product A is increased.

40 Diversion ratios can be indicated by:

→ The firm's own-price elasticity and cross-price elasticities of demand. Cross-price elasticity measures the responsiveness of quantity demanded of one product to a change in the price of another product. Own price elasticity measures the responsiveness of demand for a product to changes in its own price. Products with high cross-price elasticity are likely to be close substitutes and therefore have relatively high diversion ratios. Estimating own and cross price elasticities is data intensive (often requiring econometric estimation of data) and requires parties to estimate their demand or otherwise have some knowledge of their demand elasticities.

→ Win-loss statements. If the acquiring firm mainly loses or gains customers from the target firm, this suggests high diversion from the acquiring firm's to the target firm's products.

→ Consumer surveys that show consumers' likely response if a product's price increases or if a product is unavailable – specifically, any products they would purchase instead, or any different locations they would purchase from.

Relationship with market definition

41   Diversion ratios can be used in place of or in addition to a SSNIP analysis because they directly measure the competitive constraint between the merging parties' products that would be lost through the merger.

42   For example, consider that the price of car type A increases by a SSNIP. This results in customers purchasing 100 fewer of such cars. The manufacturer of car type A finds such a price increase unprofitable because the increased profit on the cars it continues to sell are outweighed by the loss in profits from the reduced car sales. Some of the customers that would have purchased car type A switch to purchasing car type B instead. This results in sales of car type B increasing by 50 units. The diversion ratio is therefore 50/100 = 0.5 or 50%. If the manufacturer of car type A applied to purchase the manufacturer of car type B, it may be the case that post-merger the previously contemplated price increase is now profitable. This is because some of the profits lost from the decrease in the sales of car type A would be compensated for by the increased sales of car type B. That is, the profits on the re-captured sales (sales diverted to car type B) may significantly change the profit-maximising price of car type A.

Interpretation

43   Diversion ratios should, where possible, be calculated for both the acquiring firm's products and the target firm's products. This is because those firms may impose a different degree of constraint on each other. For example, the acquirer might be a large firm that constrains the price of smaller, niche players. In contrast, the target may be a niche player that does not constrain the price of the acquirer.

44   An absence of historical evidence of switching does not necessarily mean that the diversion ratio is low if historical prices are quite static. For instance, there may not be high incidences of switching because competition pre-merger is strong and price increases have not been attempted. In these cases customer feedback on the strength of their options may be more likely to indicate closeness of competition than pre-merger levels of switching.

45   Similarly, in bidding markets it may be the case that firms often retain their customers and so switching is low. However, the competitive constraint may come from the other firms bidding to win a tender. In these cases, rather than information on switching, it may be more useful to understand which firms have bid or been shortlisted for a tender than which firm won the tender.

Upward pricing pressure measures

Overview

46　Like diversion ratios, upward pricing pressure indices seek to demonstrate how closely firms or products compete, and the value of those competing sales, so as to better understand merging parties' incentives to raise prices post-merger.

47　To illustrate: the acquirer's product (A) competes with the target's product (B). Pre-merger, the acquirer might not find a price increase to be profitable because the price of A is already set at the acquirer's profit-maximizing level. Post-merger, however, the merged firm realises that for every unit of A it loses due to a price increase, it gains some additional sales of B (see the discussion on the diversion ratio above). The benefit of this increase in sales of B depends on the margin on those sales. In general, the incentive to increase price is greater the greater the sales re-captured by the target (ie, the greater the diversion ratio) and the greater the margin earned on those re-captured sales. It is the strength of this incentive effect that upward pricing pressure indices try to capture, rather than the size of any price increases.

48　The gross upward pricing pressure index (GUPPI) is one such index. It is referred to as 'gross' because it does not consider any possible efficiency gains from the merger. The GUPPI expresses the merged firm's incentive to increase prices based on the additional profits the merged firm earns on increased sales of B relative to the revenue the merged firm would lose from reduced sales of A. A smaller GUPPI suggests a lower incentive for the merged firm to increase price and, therefore, a smaller price increase. The converse is likely to be true with a high GUPPI.

49　The merging parties may supply a number of products which may constitute separate relevant markets. If so, the GUPPI is best assessed for each of the relevant products.

50　The GUPPI does not rely on having defined the relevant market and so can be relevant for understanding the potential for unilateral effects in cases where delineating the specific boundaries to a market is difficult, such as markets with differentiated products and price competition.

Calculation

$$GUPPI \text{ for product } A = D_{AB} * M_B * \frac{P_B}{P_A}$$

where D_{AB} is the diversion ratio from product A to product B, P_A is the price of product A, P_A is the price of product B, and M_B is the percentage margin on product B.

51　There are three inputs required to calculate the GUPPI:

→　the diversion ratio from Product A to Product B (or two sets of products),

→　the margin on the product to which sales are being diverted (Product B), and

→　the pre-merger prices of the two products.

52　The prices and margins should generally be available to the merging parties, but, as discussed above, the diversion ratio may be more difficult to estimate.

Interpretation

53 The GUPPI always reports an incentive to increase prices as long as there are positive diverted sales between the parties. Among other things, the GUPPI does not take into account any possible efficiencies arising from the merger nor the dynamic responses to the merger of existing and potential competitors. As such, it is not determinative of the likelihood of a price increase. It can only be suggestive of the strength of the incentive to increase price. Establishing whether a merger is likely to substantially lessen competition requires analysis of all the factors set out in the *Mergers and Acquisitions Guidelines*.

Relationship to price

54 The results of pricing pressure indices – diversion ratios in particular – can also be fed into a demand model, in an illustrative price rise (IPR) test, to see how the incentive to increase price potentially might translate into a price increase.

$$\textit{IPR for linear demand} = \frac{MD}{(2(1-D))} \qquad\qquad \textit{IPR for isoelastic demand} = \frac{MD}{(1-M-D)}$$

where M is the pre-merger margin = (P – C)/P, and D is the diversion ratio.

55 To estimate the likely price increase of a merger on the basis of diversion ratios either requires data-intensive demand modelling or an assumption about the likely shape of the demand curve. The IPR test assumes that the demand curve is either isoelastic or linear.[6] The choice of demand curve is critical to the estimation of the price increase since an isoelastic demand curve assumption will result in higher estimated price increases than under a linear demand curve assumption. The choice of demand curve assumed should be supported.

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6. Under an isoelastic demand curve the consumer's demand response will be the same at different starting prices. Under a linear demand curve, demand will decrease more in response to a price increase when the initial price is high as compared to when the initial price is low.

Entry analysis

Overview

56   In assessing whether a merger would be likely to have the effect of substantially lessening competition, we consider whether, if prices increase, existing competitors would invest in additional production facilities to expand their sales, or new competitors would enter. We can also consider whether these new or larger firms would effectively compete with the merged firm. Our entry or expansion assessment will generally consider whether entry or expansion is likely to be sufficient in extent in a timely fashion to constrain the merged firm and prevent a substantial lessening of competition. This is referred to as the 'LET test' and is explained in the *Mergers and Acquisitions Guidelines*.

57   Whether firms can profitably enter or expand the market in light of relevant entry and expansion conditions is relevant to this assessment.

> The Commission modelled entry when considering potential constraints in the
> Epay/EziPay merger (Decision no.13 June 2012)

Calculation

58   The necessary inputs to a model calculating profitability of entry include relevant costs (typically the merging firm's costs are used) and prices. Assumptions are made about the necessary payback period and rate of return required to prompt investment. Assumptions are also made about the level of sales the entrant will achieve (at various points in time). When a market is characterised by economies of scale, or large initial investments, entry might not be viable incrementally. This in itself may be a barrier to entry, as well as adding significant capacity to the market which might depress prices making entry less profitable.

> Discounted expected cash flows can be used to model the price at which entry would be profitable. This may in turn suggest how much the merging parties could likely increase prices without inviting entry or expansion.
>
> $$NPV\,(i, N) = \sum_{t=0}^{N} \frac{R_t}{(1+i)^t}$$
>
> Where i is the discount rate, t is the number of periods, and R is the net cash flow (profits) at time t.

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7.   Where the LET test measures the likelihood, extent and timeliness of entry or expansion.

59   In making these assumptions, it can be useful to consider modelling conducted in-house or based on previous entry episodes. The following inputs can be used to calculate a price increase that would make entry profitable. This price increase can be conservatively estimated by assuming that the lowest hurdle for entry would be for the entrant to break-even over the estimated payback period.

- → The discount rate (i) is effectively the rate of return an investor expects to earn on an investment of equal risk (opportunity cost), and as such reflects the investor's required rate of return.[8] The higher the discount rate, the lower the present value of a given future cash flow and therefore the less likely the investment. The riskier entry is, the greater the expected returns to compensate for such risk and so incentivise investment. Sunk costs should be considered, which are costs a firm incurs on entry that it would not be able to recover if it later exits the market.[9]

- → Entry is unlikely to be costless. Net outflows on entry (R_0) typically indicate the initial fixed costs of entry (eg, land and buildings). The lower the initial investment or sunk costs relative to expected revenues, the smaller the price increase would need to be to make entry profitable.

- → The time it takes for an entrant to break even (NPV=0) is compared to the required payback periods that are typical in that industry or against the entrants next best investment option.[10]

Interpretation

60   The price increase estimated by the model which turns entry from unprofitable to profitable may suggest how much the merging parties could increase prices without provoking entry.

61   The barriers modelled here are primarily based on the profitability of entry. There are barriers that are more difficult to model such as regulatory barriers, scarce resources and strategic behaviour by incumbent firms.

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8.   The discount rate also takes into account inflation and the nature of cash flows. For example, if expected cash flows are monthly, an annualised discount rate is converted to a monthly rate.

9.   Examples of sunk costs include various start-up costs such as developing and testing products, installing equipment, and advertising and marketing.

10.   For example, if a firm can break even in five years in a New Zealand market compared to three years in Indonesia, then while entry may be profitable in New Zealand, it may be less likely to take place if the firm can instead expand more profitably in Indonesia.

Econometric analysis

Overview

62 Econometrics is a set of statistical techniques used to estimate and test empirical relationships.

63 Econometrics can be used, among other things, to support an applicant's arguments about market definition, the closeness of competition, how entry may constrain post-merger prices, or to support assertions about the wider context or effects of a merger.

64 For market definition, econometrics could be used to provide evidence on the degree of substitutability between products. Statistical analysis can explore historical relationships between price changes and switching thereby indicating whether two products are likely to be in the same market, for instance by estimating cross-price elasticities of demand.

65 To explore the possible effects of a merger, econometrics might also be used to explore the drivers of price (or other) changes in an industry. For example, econometrics may provide evidence that imports or input cost changes – rather than the rivalry of a particular firm – explain changes in price or quality.

66 Econometric techniques are complex. If they are to be useful, the statistical analyses should capture relevant drivers of the dependent variable and explain observable facts before making predictions. Context (such as natural experiments, described below) can also be used to help separate true relationships from spurious or coincidental ones.

Calculation

67 A common technique used in econometrics is regression analysis. Regressions are used to estimate to what extent a "dependent" variable, such as a firm's price, can be explained by other variables, such as a rival firm's price, quantities supplied, industry conditions and/or consumers' circumstances. These "explanatory variables" can be specific to the question at hand including, for example, the time of year for goods with seasonal demand.

68 These techniques can show how the variables are associated while removing the effect of all the other explanatory variables in a regression, rather than proving causality. For example, a regression could show that the presence of a particular rival is associated with lower pricing by the target firm independent of the impact of other rivals on the target. The precise techniques used can vary widely depending on the relevant question and data available.

Interpretation

69 To make good use of econometrics, it is important to include the variables of interest and to be aware of sometimes hidden complexities in how they interact.

70 There may be feedback effects between variables that could bias results and lead to models incorrectly attributing too much influence, or any at all, to a given explanatory variable. For example, econometric analysis could find that the popularity of golf tends to increase with the increased consumption of whiskey – based on data showing that whiskey consumption and golf-playing have moved in apparent lockstep for several years. However, this would omit that a likely cause of the apparent pattern was rising incomes driving whiskey consumption and golf-playing separately. This also underscores the need to have a cogent theory of the relationship across variables before testing whether the proposed relationship holds.

71   To effectively explore the relationship between variables, it can be useful to consider their relationships over a wide set of players, as well as across time. Panel datasets collect observations with both a cross-sectional and time element, and can be the most informative and robust source of data for econometric work. Having only time-series data may not generally allow comparison between different markets or firms. Having only cross-sectional data may not tell us how markets react over time to changes in pricing or rivalry.

72   A particularly informative way of exploiting richer datasets involves looking for 'natural experiments' where there have been well-defined changes in a market that disturb competition. These disruptions can suggest how firms or customers may actually react following the merger. Natural experiments can include firms entering, changing structure or exiting, even if that 'exit' is a temporary closure of a store. An econometric model could show that players in the market have responded to firms exiting by increasing their prices. Alternatively, the model could show that increases in concentration do not significantly drive up prices and so support an argument that such competitors do not provide a strong competitive constraint.

73   There may, however, be differences between the markets/firms of concern and the markets/firms affected by the natural experiment.

74   Changes affecting a market from the outside can also make for useful natural experiments with which to test econometric findings about a market. For example, cost shocks, such as significant changes to input prices like the global oil price, might be useful for testing the elasticity of demand.

Merger simulation

Overview

75   Merger simulation is a technique for estimating the price effect of a merger. It does this by combining estimates of the demand that each firm in the market faces with an assumption of how competition works.

76   The estimated price changes from a merger simulation model reflect potential market outcomes prior to any consideration of product repositioning or entry.

77   While detailed modelling can be complicated and data intensive, pragmatic assumptions about parameters can alleviate the data burden.

> An example of where the Commission undertook a simulation as a 'quantitative sense check' is the Cavalier Wool Holdings Limited/New Zealand Wool Services Limited authorisation [2015] NZCC 31. See the Commission's first draft determination of 26 March 2015.

Calculation

78   A merger simulation involves a set of equations that describes each market participant's profit function. The first stage in merger simulation is to identify the market participants and to arrive at each market participant's profit function.

79   The firms' profit functions are calibrated to reflect current prices, quantities and costs in the market. It is assumed that these variables are at profit-maximising levels given current market conditions (ie, demand and how firms compete). The merger is then simulated by recalibrating what the new profit-maximising prices and quantities would be were one of the firms removed.

80   The most challenging part of determining a firm's profit function is estimating the demand that each firm faces.

81   Demand consists of a functional form that describes:

→   what demand is shaped like (eg, linear, isoelastic); and

→   the elasticities of demand (own- and cross-price elasticities).[11]

82   The structure of demand can be assumed and the corresponding elasticities calculated based on basic price, cost or output data. If the structure of demand is assumed, it should be informed by market characteristics so that the demand function that best fits the market can be used. The results of any merger simulation will be sensitive to the structure of demand.

83   Alternatively, demand can be estimated. Estimating demand is typically a complex, resource-intensive exercise involving the use of econometrics to analyse large sets of data.[12]

84   Once there is a system of demand equations for the market participants, these are combined with pre-merger prices, quantities and costs to arrive at each firm's profit function. The profit functions are then attached to a model of competition.

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11.   Own-price elasticity of demand measures how sensitive a firm's demand is to changes in its own price, and cross-elasticity of demand measures how sensitive a firm's demand is to changes in the price of other products.

12.   Simplifying assumptions that restrict the information requirements of demand estimation can also be made.

85   A model of competition describes how firms respond to each other's behaviour. This model of competition has to be appropriate to the market. For example, Cournot competition, which assumes firms compete on the basis of the amount of output they place on the market for sale, is more likely to be appropriate when considering the sale of commodity type products. The differentiated Bertrand model, which assumes firms compete on price, is more likely to be appropriate for the sale of differentiated products.

86   Finally, the effect of the merger is simulated by re-calibrating what the profit-maximising price and output levels would be were there one fewer market participant.

Interpretation

87   A key issue with merger simulations is that the predicted post-merger price can vary significantly depending on the model of demand used. As such, if the demand function is assumed, the choice of the demand system should be supported by observed market characteristics.

88   Simulations also do not model any post-merger product repositioning, entry, or the use of countervailing power by a buyer. As a result, simulation results are considered carefully, alongside other information about likely post-merger effects.

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