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Critical Loss Analysis: A Merger Lawyer's View

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**Jeffrey Schmidt, Director
Bureau of Competition
Federal Trade Commission**

* The views expressed herein are solely those of the author and do not necessarily reflect those of the Federal Trade Commission

Critical Loss Analysis in Merger Cases

- Critical Loss Analysis is a framework for determining whether it is profitable for a firm to raise price by a given amount.
- It has the potential to inform the Merger Guidelines' market definition test and its competitive effects analysis.

Critical Loss Analysis in Merger Cases

- Economists disagree about the import and proper application of Critical Loss Analysis.
- To explain the debate, it is necessary first to review the economics of pricing.

Downward Sloping Demand

- A firm considering a price increase faces a trade-off:
 - higher prices reduce sales, which decreases profits for any given price, but
 - higher prices increase the profit from each retained sale.
- Balancing this trade-off is the key to pricing for profit-maximizing firms.

Margin and Elasticity Estimates are Central to Critical Loss Analysis

- The loss in unit sales from a price increase is determined by the *elasticity of demand* for the firm's product.
- The forgone profit from a lost sale is the *margin* the firm would have earned had the sale not been lost.
- Thus, *margins* and *elasticities* are central to optimal pricing and Critical Loss Analysis.

Open Issues

- Economists generally agree that Critical Loss Analysis may be a useful tool, if applied properly.
- “Proper” application, however, remains the subject of considerable debate.

Standard Critical Loss Analysis

Standard Critical Loss Analysis Involves Three Steps:

Step 1: Estimate “Critical Loss”

What amount of sales would have to be lost to make a hypothetical price increase unprofitable?

Step 2: Estimate “Actual Loss”

What amount of sales would actually be lost as a result of a hypothetical post-merger price increase?

Step 3: Compare “Critical Loss” to “Actual Loss”

Step 1: Estimate “Critical Loss”

- “Critical Loss” is the percentage loss in unit sales that would make a theoretical price increase unprofitable.

Simple Formula: **Critical Loss = $X / (X + M)$**

where X = the percentage increase in price, and
 M = profit margin

Critical Loss Calculations

- Using the formula, the Critical Loss for a 5% SSNIP assuming a 10% margin is 33%.
 - Critical Loss = $5\% \div (5\% + 10\%) = 33\%$
 - In other words, with 10% margins, a 5% SSNIP will be profitable unless sales decrease by 33% or more.
- The Critical Loss for a 5% SSNIP assuming a 50% margin is 9%.
 - Critical Loss = $5\% \div (5\% + 50\%) = 9\%$
 - With 50% margins, a 5% SSNIP would be profitable unless sales decrease by 9% or more.

More Critical Loss Calculations

The “Critical Loss” for a 5% SSNIP is:

Margin	Critical Loss
5%	50%
10%	33%
20%	20%
40%	11%
80%	6%
95%	5%

Note that Critical Loss decreases as the Margin increases

Limits of Critical Loss

- The larger the margin, the smaller the Critical Loss.
 - i.e., at higher margins, a small amount of lost sales might make a price increase unprofitable
- Calculating Critical Loss is only the first step of the analysis.
 - Critical Loss must be compared with Actual Loss to determine if a price increase would be profitable.

Step 2: Estimate “Actual Loss”

- “Actual Loss” is the percentage loss in unit sales predicted to result from a theoretical price increase.

Deceivingly Simple Formula: **Actual Loss = X × E**

where X = the percentage increase in price, and
E = elasticity

Examples:

For a 5% SSNIP, an elasticity of 3 yields a 15% Actual Loss (5%×3) and an elasticity of 1 yields a 5% Actual Loss (5%×1)

Actual Loss is a Function of Elasticity

- The Actual Loss for a given SSNIP is determined by the elasticity of demand.
- Elasticities are best estimated by observing the impact of price changes on unit sales.
 - This typically requires careful analysis of comprehensive price, cost, and sales data.

Estimating Elasticity

- Economists differ sharply over how to estimate elasticity where, as in most merger cases, sufficient data is not available.
- The debate is particularly fierce regarding the use of accounting margins and the Lerner index to estimate elasticity.

Estimating Elasticity from Margin

- The Lerner Index summarizes the mathematical equations characterizing profit maximization in the form of a simple relationship between a given firm's elasticity of demand and its margin:

$$\text{Lerner Index: } M = 1 / E$$

where M = margin, and
 E = elasticity

Examples:

A 10% margin implies an elasticity of 10 ($.10=1/10$);
a 50% margin implies an elasticity of 2 ($.50=1/2$).

The Lerner Index

The Lerner Index implies that elasticity decreases as the margin increases:

Margin (M)	Elasticity (1/M)
5%	20
10%	10
20%	5
40%	2.5
80%	1.25
95%	1.05

Some Reject the Lerner Index

- Proponents of standard Critical Loss Analysis believe that the Lerner Equation oversimplifies real world pricing behavior and they reject its elasticity estimates.
- They may instead draw inferences about elasticity from qualitative evidence such as consumer surveys and industry expert opinions.
- The different approaches can lead to dramatically different conclusions, particularly in industries with large pre-merger margins.

The Implications of Large Margins

- Recall that large pre-merger margins imply a small Critical Loss
 - In these situations, any qualitative evidence of price sensitivity may validate the simple intuition that Actual Loss likely exceeds Critical Loss.
- Under the Lerner Equation, however, large margins imply a low elasticity and a small Actual Loss.

Implications for Actual Loss

- Where traditional estimates are not possible, the Lerner Index may be the only available source for point estimates of elasticity.
- Those who reject it must rely on more qualitative evidence of price sensitivity and may not be able to mathematically compare Critical Loss to Actual Loss.
- Critics of standard Critical Loss Analysis often reject qualitative evidence that does not comport with the Lerner Index estimates as misinterpreted or methodologically flawed.

Standard Actual Loss is Not the End

- Critics of standard Critical Loss Analysis also complain that it does not adjust for the changed incentives post-merger.
- As explained below, a post-merger price increase may be profitable even where standard Actual Loss exceeds Critical Loss.

The Merger Changes Incentives

- Remember, Actual Loss is determined by elasticity.
- When a firm merges with a competitor, its elasticity typically decreases by an amount proportional to its cross elasticity with that competitor.
- The Actual Loss, or cost of a price increase, is therefore smaller post merger than it was the pre-merger.

Diversion and Actual Loss

- Economists approximate the effect of cross elasticity on Actual Loss through analysis of diversion ratios.
- The “Diversion Ratio” between merging firms’ products is the percentage of total standard Actual Loss that is recaptured by the merged firm.

Diversion and Actual Loss

- Recall that Actual Loss is the percentage loss in unit sales resulting from a price increase.
- It is possible to track where those lost sales go.
 - Data analysis, including event studies and other methods, provide robust estimates of cross elasticity and diversion.
 - Consumer surveys, internal analyses, and other sources may provide reasonable estimates as well.
- To evaluate the profitability of a post merger price increase, it is necessary to analyze the percentage of “lost” sales recaptured by the now merged firm.

Standard Critical Loss Analysis

Example *Without* Diversion Analysis

Example:

Firm A plans to acquire Firm B.

- If Firm A raises prices 10%, all else being equal, Firm A's total unit sales decrease by 33% (i.e., Actual Loss = 33%)
- Firm A and Firm B each earn a 30% margin.
 - Critical Loss, therefore, equals $25\% = (10\% \div (10\% + 30\%))$

Conclusion Before Diversion Analysis:

For a 10% SSNIP, Actual Loss exceeds Critical loss such that the price increase would not be profitable and the market must therefore be expanded to include more than Firms A and B.

Standard Critical Loss Analysis *With Diversion Analysis*

Example (continued):

In the hypothetical, Actual Loss = 33% and Critical Loss = 25%.

- Now assume that 40% of Firm A's lost sales go to Firm B
 - Firm B therefore captures 13% of Firm A's lost sales (40% of 33%) in the event of a 10% price increase by Firm A.
- Actual Loss, therefore, equals 20% (33%-13%) for the hypothetical merger of A and B.

Revised Conclusion:

For a 10% SSNIP, Critical Loss (25%) is greater than Actual Loss (33% - 13% = 20%) such that the price increase would be profitable post-merger, and A and B together comprise a relevant market.

Critical Loss Analysis and Mergers

- Antitrust cases are won or lost on relevant market definition.
- As the examples above show, Critical Loss Analysis can produce contradictory market definitions depending on whether Actual Loss is adjusted for Diversion.
- Differences over the estimation of elasticity and the implications of large margins also may imply conflicting market definitions.

Conclusions

- Critical Loss Analysis offers an apparently simple way to apply the Merger Guidelines tests.
- In practice, Critical Loss Analysis is much more complex and its conclusions are extremely sensitive to the underlying assumptions adopted.