Is an Automaker's Road to Bankruptcy Paved with Customers' Beliefs?

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Online Appendix

*A. Proof that Equilibrium Is Unique When Consumers Don't Care about Survival (γ = 1)*

When $\gamma = 1$, Equation 3 becomes $\alpha(p - c) = 1 + \exp(\delta - \alpha p)$. The left-hand side increases monotonically in p, while the right-hand side falls monotonically in p and is larger than the left-hand side when $p = c$, its minimum value. Thus the optimal price is unique. In Equation 2, σ disappears from the left-hand side when $\gamma = 1$. Thus the derivative of the left-hand side with respect to $\bar{\xi}$ is $-(1 + r) < -1$. The derivative of the right-hand side with respect to $\bar{\xi}$ is $-(1 - F(\bar{\xi}))$ > -1, so this side falls slower in $\bar{\xi}$ than the left-hand side. Because the left-hand (right-hand) side falls from ∞ to $-\infty$ (∞ to 0) as $\bar{\xi}$ rises from $-\infty$ to ∞, the two sides of the equation have a unique crossing $\bar{\xi}$.

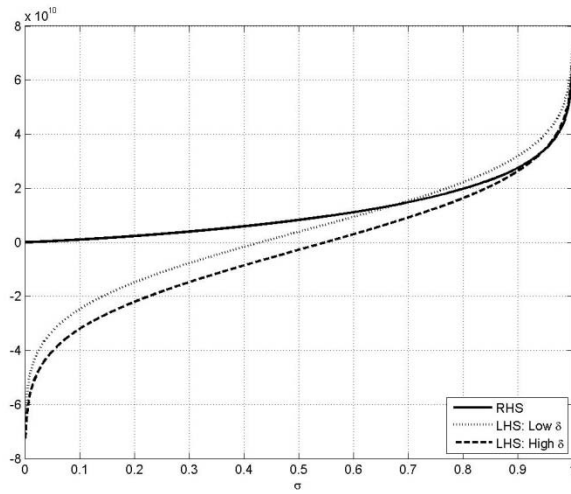*B. Examples of How Parameters α, c, and δ Affect Equilibrium Uniqueness and Multiplicity*

Price sensitivity α:
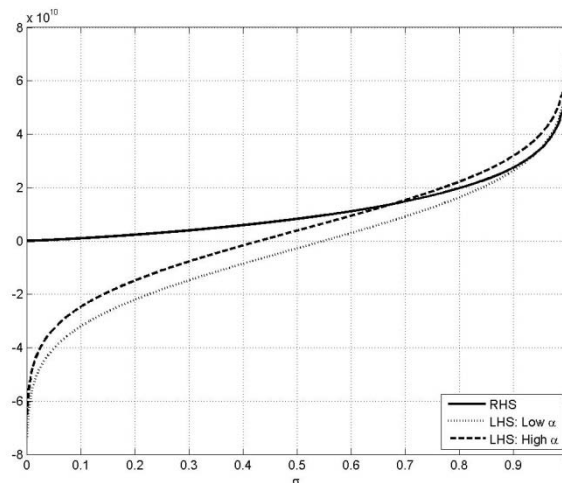
Marginal cost c:
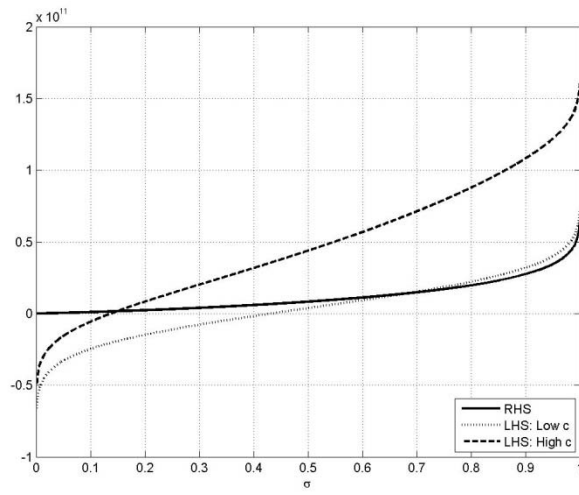
Mean utility δ:

C. Data Sources

Total market size, M:

M = 13.493 million. From U.S. "New Vehicle Sales and Leases" series, Bureau of

Transportation Statistics.

http://www.bts.gov/publications/national_transportation_statistics/html/table_01_17.html

Debt service obligation, b:

b = \$4.5938 billion. From "Financial Highlights - Exhibit 1 General Motors Company

and Subsidiaries Supplemental Material,"

(http://media.gm.com/content/dam/Media/gmcom/investor/2010/Q1FinancialHighlights.p

df). The number was obtained from multiplying the sum of "short-term borrowings,"

"current portion of long-term debt," and "long-term debt" from the consolidated balance

sheet as of 3/31/09, by r = 10 percent, which we take to be a reasonable rate on a consol

analog to the entire reported composition of short- and long-term GM debt.

Survival probability σ:

We averaged daily five-year maturity credit default swap (CDS) spreads on GM debt

over 1/1/08-12/31/08. These data were obtained from Thomson Financial DataStream.

Assuming risk-neutrality, CDS spreads reflect the market's perception of default

probabilities. Thus GM's average CDS spread over 2008 was 3217.5 basis points implies

a survival probability of 0.67825.

New car price p:

From

http://www.carbuyersnotebook.com/archives/2008/02/average_new_vehicle_cost_1.htm,

which is itself based on the Comerica Auto Affordability Index data.

GM's operating margin:

The margin we used, 3 percent, is a rough average of GM's reported operating margins over 2004-2008.