Measuring Incentive Elasticities from the Model Level to Industry

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The Problem

- Competitive dynamics and high fixed costs have led the automotive industry to a promotion (incentive) war
- Promotion planners face a daunting task in identifying efficient/effective promotion programs
  - For the same level of promotion cost per unit, an efficient program could generate a lift more than 3 times higher than the one from an inefficient program
  - But, which are those efficient programs?
  - Multiple promotion tools and a complex consumer acquisition process further complicates the promotion planning process
High Variation Of Lifts For Any Given Level Of Promotion Expenditure

Jeep Wrangler
Acquisition of Automobiles: A Complex Consumer Decision

- Vehicle type (e.g., midsize sedan, truck, SUV, etc.)
- Vehicle make and model (e.g., Ford Taurus, Honda Accord, Toyota Camry, etc.)
- Acquisition type
  - Purchase vs. Lease
  - Financing term
Consumers Face An Intricate Menu Of Promotions (Incentives):

- **Purchase incentives**
  - Consumer rebates
    - which may or may not be combined with other incentives
  - Subsidized financing
    - different “subvented” APRs for 24, 36, 48, 60 months
    - credit qualifying requirements

- **Lease incentives**
  - Lease cash
  - Subsidized lease interest rate
  - Enhanced residual value

- **Loyalty/conquest programs**

- **Dealer incentives**
  - sometimes contingent on volume objectives
Example: Current Programs For Ford Ranger
PIN Incentive Modeling Approach

- Based on point-of-sales transaction data
  - Only one transaction per household

- Nested Logit
  - Brand choice
  - Transaction-type
  - Financing Term

- Regional heterogeneity through hierarchical Bayes
Nested Logit Structure

F-150

Purchase

Lease

24m  36m  48m  60m

Silverado 1500

Purchase

Lease

24m  36m  48m  60m

Rebate (no financing)

Financing

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PIN Incentive Modeling can be used to determine the optimal level of spending and incentive type.

**Demand Curve: Example**

![Graph showing the relationship between incentive spending per vehicle and annualized sales volume. The graph includes data points for different types of incentives such as rebates, APR, dealer cash, lease cash, and combo, with a trend line indicating the current program.](image-url)
PIN Incentive Planning Capabilities

- To be used for:
  - Planning and evaluating pricing actions and incentive actions
  - Evaluating competitive actions
  - Simulating competitive responses
  - Evaluating short-term actions to handle over/under supply
  - Evaluating cost of New Incentives
Incentive Effects on Auto Industry

- Incentive offers help manufacturers gain market share
- Do incentives have an effect on overall vehicle sales?
- Can long-run effect be quantified?
Monthly Sales

SAAR of Light Vehicle Sales

SAAR of Light Vehicle Sales

units (million)

Jan-98 Jan-99 Jan-00 Jan-01 Jan-02 Jan-03 Jan-04

month
Incentives on an Upward Trend

Per Vehicle Incentives (rebate + apr/lease subvention)
Seasonality in Real Price

Real Vehicle Price

Jan-98 Jan-99 Jan-00 Jan-01 Jan-02 Jan-03 Jan-04

$21,500 $22,000 $22,500 $23,000 $23,500 $24,000 $24,500 $25,000 $25,500 $26,000
Seasonality In Real Price After Incentives

Real Vehicle Price with no Incentives

$21,000 $21,500 $22,000 $22,500 $23,000 $23,500 $24,000 $24,500

Jan-98 Jan-99 Jan-00 Jan-01 Jan-02 Jan-03 Jan-04

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Industry Production Index

Auto Industry Production Index

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\begin{itemize}
  \item **Macroeconomic Model**: (Jan 1998 – Mar 04)
  \begin{itemize}
    \item Vector Autoregression Impulse Response Function
      (Cholesky Decomposition)
    \item Variables: (all in logs)
      - auto industry production index (x1)
      - real vehicle price excluding offered incentives (x2)
      - real incentives per vehicle (x3), CA as proxy for national (corr > 0.9)
      - monthly SAAR of light vehicle and truck sales (x4)
  \end{itemize}
  \begin{align*}
  \Delta x_t &= A_0 + A_1 \Delta x_{t-1} + A_2 \Delta x_{t-2} + A_2 \Delta x_{t-3} + e_t \\
  x_t &= \begin{bmatrix}
    x_{1t} \\
    x_{2t} \\
    x_{3t} \\
    x_{4t}
  \end{bmatrix}
  \end{align*}
\end{itemize}
Industry Incentive Elasticity

Incentive Elasticity On SAAR Of Industry Sales
Change In SAAR Volume Per 1% Change In Total Incentives Per Vehicle

Elasticity

Month

Period | Avg Incentive | Avg Real Price
---|---|---
1998-2003 | $1,081 | $24,003

1% change in incentives = $10.81
Percentage change in real price = 10.81/24,003 = 0.00045
Expected change in sales = 0.089% = 0.00089
Implied price elasticity =1.98

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Final Remarks

- Long-run elasticity of incentives are less than short-run, as expected
- There is a pull-forward effect of incentives on industry sales
- A 1% permanent change in incentives per vehicle increases industry volume by about 0.089% in the long-run (about a year)
- There are other shocks affecting total sales volume and hence the elasticity represents how sales would react in time if all other shocks were out of the picture
- Segment level analysis can be performed with a similar model
- Cross-segment shopping needs to be incorporated for a better assessment on incentives on the industry.
Elasticity Interpretation

- April 2003 – March 2004 SAAR = 16.74 million
- Average monthly incentive = $1601
- 25% increase in incentives = $400
- 2.2% increase in sales
- 17.10 million SAAR