An Illustration of How Game Theory and Nash Equilibrium can be Leveraged to Improve Demand Estimates in the Pharma Industry

Game Theory in Marketing
Econometrics is the application of linear regression or time-series models to economic data for the purpose of understanding the factors that influence economic decisions. Game theory provides a theoretical construct for strategic decision-making. Used primarily in economics, psychology, and politics to understand decision-making behavior. Perhaps its most widespread use has been in economics – as a tool for understanding the economic behavior of companies and individuals.

Nash Equilibrium Theory
Nash Equilibrium describes a set of strategies that different competitors employ in a market. The simulated market scenarios assume that competitors respond to a particular market change so as to maximize their shares. These actions and reactions are repeated until a state of equilibrium is finally attained and competitors’ strategies are maximized their potential return. This approach has been employed in CPU markets but not in pharmaceutical markets.

Approach

**Determine Market:**
We identified the HIV market as a good one for testing the ability of game theory to influence demand because of its complexity, the richness of the pipeline, and the potential impact of generic competition.

**Determine Data Source:**
Because of the uniqueness of this approach, we developed a dummy dataset that focused on a subset of medications within this market consisting of 2 established medications, 2 generic entrants, and 2 pipeline medications.

**Analysis:**
We compare demand assessments generated with and without leveraging an approach in which competitive responses are factored into final share estimates.

Medications: We Focused on NNRTIs

“Cost” to Make a Strategic Response During the Simulation is also Varied by Attribute

- **Efficacy Measures**
- **Patient Drug Assistance Programs**
- **Sales Force Support**
- **Dosing / Administration**
- **Price**

How It Works
Base case scenario is set and shares are calculated. The simulator identifies and then makes competitive adjustments (either to price alone or to multiple attributes) and share is recalculated. Process is repeated until a state of equilibrium is attained.

<table>
<thead>
<tr>
<th>First Simulation</th>
<th>Second Simulation</th>
<th>‘n’th Simulation</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Price</strong></td>
<td><strong>Dosing / Administration</strong></td>
<td><strong>Efficacy Endpoints:</strong> Viral Load / CD4+ Counts</td>
</tr>
</tbody>
</table>

The Model Consisted of 5 Attributes

- **1. Price**
- **2. Dosing / Administration**
- **3. Availability of Patient Drug Assistance Programs**
- **4. Sales Force Support**
- **5. Efficacy Endpoints:** Viral Load / CD4+ Counts

The Price Equilibrium Results in Small Yet Significant Share Changes for Newer Agents

The Full Nash Equilibrium Results in More Significant Share Changes

www.hallandpartners.com

PBIRG 2014