Supply Chain Analytics Lab

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Rutgers Business School
Mission

Data Analytics ×
Supply Chain Management

Beyond Common Sense

http://scal.business.rutgers.edu/
People

• Data scientists, professors and industry experts
• Universities: Rutgers, HBS, William and Mary, …
• Expertise:
  – Data Science
  – Supply chain management
  – Marketing and online retailing
  – Healthcare operations
  – …
• Half a dozen PhD students, and growing
Sample Research

- Sridhar Seshadri, Ramandeep Randhawa, Irene Gerlovin, Yao Zhao. **Machine Learning and Business Intelligence: A Survey** (Work in Progress).
- Kris Johnson Ferreira, Bin Hong Alex Lee, David Simchi-Levi. **Analytics for an Online Retailer: Demand Forecasting and Price Optimization**.
- Kwon Gi Mun, Raza Rafique, Yao Zhao. **Designing Hydro Supply Chains for Water, Food, Energy and Flood Nexus**.
- W. Chen and L. Shi. **Nested Partitions for Large-Scale Optimization in Supply Chain Management**.
- Lei Wang, Eric Anderson, Karsten Hansen, Duncan Simester. **How Price Affects Returns?**
**PhD Theses and Placement I**


PhD Theses and Placement II


- Kathleen Iacocca, Ph.D. 2011, “Essays on Drug Distribution and Pricing Models.” Tenure-track assistant professor at the Kania School of Management, University of Scranton. Scranton, PA.

Sample Industry Projects

• A major telecommunication company: push (stores) vs. pull (showrooms) distribution strategies
• Special Olympics: transportation planning and scheduling
• A major pharmaceutical company: Drug pricing and distribution
• A major logistics company: fulfillment diagnostics
• Korean Air-Cargo: dynamic pricing and revenue management
• A major financial services/mortgage firm: proactive supply risk analytics
• A retail chain: inventory positioning, stockout prevention
• Martini 494: SKU rationalization
• Coach: logistics network design
• Overlook hospital: staff planning and scheduling
• Kenya Coffee Cooperatives: commodity trading, price hedging
Store vs. Showroom

- Push vs. pull distribution strategies: Use supply chain analytics to determine which type of phone to sell in store or via showroom + DC drop-ship
Special Olympics

- Transportation planning for mega event; crew scheduling; route design, driver scheduling; genetic algorithms.

Drug Pricing I

- What factors contribute to prescription drug prices?

<table>
<thead>
<tr>
<th>Variable</th>
<th>Est. Coefficient</th>
<th>Variable</th>
<th>Est. Coefficient</th>
<th>Variable</th>
<th>Est. Coefficient</th>
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<tbody>
<tr>
<td>Constant</td>
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<td>M6</td>
<td>-0.033</td>
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<td>1.418***</td>
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<td># of Generics</td>
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<td>0.082</td>
<td>M22</td>
<td>-0.175</td>
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<tr>
<td># Dosing Levels</td>
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<td>M10</td>
<td>0.549</td>
<td>M23</td>
<td>-0.071</td>
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<tr>
<td>Rare</td>
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<td>M11</td>
<td>-0.099</td>
<td>M24</td>
<td>0.397</td>
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<tr>
<td>Life Threatening</td>
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<td>M12</td>
<td>0.74**</td>
<td>M25</td>
<td>0.236</td>
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<tr>
<td>Rare &amp; Life Threatening</td>
<td>0.827***</td>
<td>M13</td>
<td>0.013</td>
<td>M26</td>
<td>0.343</td>
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<td>M1</td>
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<td>M2</td>
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<td>M28</td>
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<tr>
<td>M3</td>
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<td>M16</td>
<td>-0.016</td>
<td>M29</td>
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<tr>
<td>M4</td>
<td>0.378</td>
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<tr>
<td>M5</td>
<td>-0.308</td>
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<td>-0.024</td>
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</table>
Drug Pricing II

- What factors contribute to prescription drug prices?

<table>
<thead>
<tr>
<th>Variable</th>
<th>Est. Coefficient</th>
<th>Variable</th>
<th>Est. Coefficient</th>
</tr>
</thead>
<tbody>
<tr>
<td>Anti-Infective</td>
<td>0.099</td>
<td>Hormones</td>
<td>-0.430**</td>
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<tr>
<td>Blood Modifying</td>
<td>0.052</td>
<td>Miscellaneous</td>
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<tr>
<td>Cancer</td>
<td><strong>0.711</strong></td>
<td>Neuromuscular</td>
<td>0.256</td>
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<tr>
<td>Central Nervous</td>
<td>0.152</td>
<td>Pain Relief</td>
<td>-0.148</td>
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<tr>
<td>Insulin</td>
<td>-0.720</td>
<td>Respiratory</td>
<td>-0.411</td>
</tr>
<tr>
<td>Eye</td>
<td>-0.556</td>
<td>Skin Conditions</td>
<td>-0.410</td>
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<tr>
<td>Genitourinary</td>
<td>0.276</td>
<td>Topical</td>
<td>-0.352</td>
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<tr>
<td>Heart/Circulatory</td>
<td>-0.147</td>
<td>Viral Infections</td>
<td><strong>1.086</strong>*</td>
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</tbody>
</table>

Branded Drug Distribution

- Direct vs. resell model; pharmaceutical distribution; drug pricing

Fulfillment Diagnostics

85.07% at 10th Week
Air-Cargo

40% order can come in the last ½ hour!
Proactive Supply Risk Analytics

- Risk detection, alert classification, disaster prediction.
Multi-echelon Inventory Analysis

- Inventory positioning, stockout prevention
SKU Rationalization

- Optimize assortments by classifying and decommissioning non-productive merchandise.

![SKU Rationalization Diagram]

- Low volume Low profit
- High volume Low profit
- Low volume High profit
- High volume High profit
Logistics Network Design

- Distribution network, logistics, location optimization

Hospital Nurse Staffing

- Seasonal demand, capacity planning, staff scheduling
Commodity Hedging

• Commodity trading, inventory hedging, risk management, global supply chains

Rose Karimi Kiwanuka, Yao Zhao “From Farm to Cup: The Coffee Supply Chain in Kenya” Sping 2010. RBS-SCM case study.
Beyond Common Sense!