What SMJ Seeks to Publish

The *Strategic Management Journal* seeks to publish the highest quality research with questions, evidence and conclusions that are relevant to strategic management and engaging to strategic management scholars. We receive manuscripts with a diverse mix of topics, framings, and methods, and our acceptances reflect this diversity.

More specifically, The *Strategic Management Journal* seeks to publish papers that develop and/or test theory, explore interesting phenomena, and evaluate the many methodologies used in our field. We welcome a diverse range of researcher methods and are open to papers that rely on statistical inference, qualitative studies, conceptual models, computational models, and various kinds of mathematical models.
Multiple Organizational Goals: Complexity and Asymmetry

Songcui Hu
University of Arizona
songcuih@email.arizona.edu

Rich Bettis
University of North Carolina
r_bettis@unc.edu
Motivation of Research

- Goals (or aspirations) are pervasive in the practice of strategy, but largely absent from introductory or advanced MBA strategy courses.

- Goals play a major role in BTOF.
  - Sequential Attention Rule.
  - Bargaining Process among various interest groups. (slack)

- Empirical studies in BTOF tradition have overwhelming studied only a single goal. (Few studied two goals.)

- But, when \( n \) is greater than ‘2’ sequential attention is ambiguous. Furthermore, complex correlations structures can (and do) exist among multiple goals. Such situations are very realistic, but largely unstudied and potentially difficult analytically.
When the number of goals is greater than 2, extant theory is ambiguous and complex. Interdependence structures can be present.

We lack baseline understanding of such realistic goal structures.

Exploratory research necessary to bootstrap theory development and testing.

Methodology: PVAR

Research Context: Automotive Industry

Results and Discussion
Goal Interdependence
Goal Interdependence
Empirical Setting

- Automotive Industry: auto models sold in U.S market
- Timeline
  - 1980 - 2009
- Goals
  - Safety
  - Reliability
  - Fuel efficiency
- Data Source
Why Automotive Industry?

- Complex product and demanding goals on different dimensions (e.g. safety, reliability, and fuel efficiency).
- Intense competition among auto models on safety, reliability, and fuel efficiency.
- The industry in conjunction with the government has developed standard measures for the key performance dimensions.
- Objective data available from independent consumer organizations (e.g. Consumer Union).
- Cars are not commodities.
# Key Variables & Measure

<table>
<thead>
<tr>
<th>Variables</th>
<th>Measure</th>
</tr>
</thead>
<tbody>
<tr>
<td>Safety</td>
<td>Rating from 1 to 5 with equal intervals based on each model’s CR overall safety score: 0-20 (1); 21-40 (2); 41-60 (3); 61-80 (4); 81-100 (5).</td>
</tr>
<tr>
<td>Efficiency</td>
<td>Rating from 1 to 5 with approximately equal intervals based on each model’s overall mileage per gallon (mpg): ≤15 (1); 16-20 (2); 21-25 (3); 26-30 (4); ≥ 31 (5).</td>
</tr>
<tr>
<td>Reliability</td>
<td>Rating from 1 to 5 with approximately equal intervals based on frequency of repair record and problem rate: average rate 7-9% (3), average + / - 2.5 % ( 2/4); average +/- 5% (1/5)</td>
</tr>
</tbody>
</table>
Model – PVAR

- Panel Vector Autoregression (PVAR)

\[
\begin{bmatrix}
Y_{1,t} \\
Y_{2,t} \\
Y_{3,t}
\end{bmatrix} = 
\begin{bmatrix}
a_1 \\
a_2 \\
a_3
\end{bmatrix} + 
\begin{bmatrix}
a_{11} & a_{12} & a_{13} \\
a_{21} & a_{22} & a_{23} \\
a_{31} & a_{32} & a_{33}
\end{bmatrix} \begin{bmatrix}
Y_{1,t-1} \\
Y_{2,t-1} \\
Y_{3,t-1}
\end{bmatrix} + 
\begin{bmatrix}
\varepsilon_{1,t} \\
\varepsilon_{2,t} \\
\varepsilon_{3,t}
\end{bmatrix}
\]

- Panel data
- A first-order three-variable VAR model

\[ Y_{it} = A_0 + A_1 Y_{it-1} + e_t \quad (1) \]

where \( Y_{it} \) is the three-variable vector: \{safety, reliability, efficiency\}
Model – PVAR (Cont’)

• Why PVAR?
  – Co-evolution of multi interdependent variables
  – Each dimension occurs both exogenously and endogenously
  – Correct for unobserved heterogeneity for each auto model

• Impulse-response function (IRF)
  – Simulation of each of the three estimated equations from VAR analysis
  – It shows the response of one variable of interest to a shock in another variable of interest, while holding other shocks constant.
### Descriptive Statistics\(^a\) for Key Variables

<table>
<thead>
<tr>
<th>Variable</th>
<th>Obs.</th>
<th>Mean</th>
<th>Std. Dev.</th>
<th>Min</th>
<th>Max</th>
<th>Median</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Safety</td>
<td>1764</td>
<td>3.67</td>
<td>.99</td>
<td>1</td>
<td>5</td>
<td>4</td>
</tr>
<tr>
<td>2. Efficiency</td>
<td>1950</td>
<td>2.32</td>
<td>1.18</td>
<td>1</td>
<td>5</td>
<td>2</td>
</tr>
<tr>
<td>3. Reliability</td>
<td>2104</td>
<td>3.11</td>
<td>1.33</td>
<td>1</td>
<td>5</td>
<td>3</td>
</tr>
<tr>
<td>4. Z_safety(^b)</td>
<td>1764</td>
<td>.02</td>
<td>.99</td>
<td>-2.75</td>
<td>2.14</td>
<td>.22</td>
</tr>
<tr>
<td>5. Z_efficiency</td>
<td>1950</td>
<td>-.04</td>
<td>.96</td>
<td>-2.47</td>
<td>2.96</td>
<td>-.17</td>
</tr>
<tr>
<td>6. Z_reliability</td>
<td>2104</td>
<td>.03</td>
<td>1.00</td>
<td>-1.99</td>
<td>1.74</td>
<td>-.06</td>
</tr>
</tbody>
</table>

\(^a\) The data have 2583 observations.

\(^b\) Z\_safety, Z\_efficiency, Z\_reliability are the Z scores (standard scores) of safety, efficiency, and reliability.
Correlations Among Key Variables and Lagged Values

<table>
<thead>
<tr>
<th>Variable</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
<th>11</th>
<th>12</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Safety</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Efficiency</td>
<td>.05</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Reliability</td>
<td>.04</td>
<td>.32</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. Safety&lt;sub&gt;(t-1)&lt;/sub&gt;</td>
<td>.70</td>
<td>.06</td>
<td>.04</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. Efficiency&lt;sub&gt;(t-1)&lt;/sub&gt;</td>
<td>.04</td>
<td>.90</td>
<td>.33</td>
<td>.05</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6. Reliability&lt;sub&gt;(t-1)&lt;/sub&gt;</td>
<td>.04</td>
<td>.32</td>
<td>.81</td>
<td>.03</td>
<td>.32</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7. Z_Safety</td>
<td>.94</td>
<td>.11</td>
<td>.06</td>
<td>.65</td>
<td>.09</td>
<td>.07</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8. Z_Efficiency</td>
<td>.12</td>
<td>.88</td>
<td>.36</td>
<td>.12</td>
<td>.79</td>
<td>.36</td>
<td>.10</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9. Z_Reliability</td>
<td>.04</td>
<td>.35</td>
<td>.99</td>
<td>.04</td>
<td>.35</td>
<td>.81</td>
<td>.07</td>
<td>.36</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10. Z_Safety&lt;sub&gt;(t-1)&lt;/sub&gt;</td>
<td>.67</td>
<td>.12</td>
<td>.05</td>
<td>.94</td>
<td>.10</td>
<td>.05</td>
<td>.69</td>
<td>.10</td>
<td>.05</td>
<td>1.00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>11. Z_efficiency&lt;sub&gt;(t-1)&lt;/sub&gt;</td>
<td>.08</td>
<td>.79</td>
<td>.37</td>
<td>.11</td>
<td>.87</td>
<td>.37</td>
<td>.07</td>
<td>.88</td>
<td>.37</td>
<td>.09</td>
<td>1.00</td>
<td></td>
</tr>
<tr>
<td>12. Z_reliability&lt;sub&gt;(t-1)&lt;/sub&gt;</td>
<td>.04</td>
<td>.34</td>
<td>.81</td>
<td>.03</td>
<td>.35</td>
<td>.99</td>
<td>.07</td>
<td>.36</td>
<td>.81</td>
<td>.05</td>
<td>.37</td>
<td>1.00</td>
</tr>
</tbody>
</table>

<sup>a</sup> Coefficients in magnitude equal to or greater than .04 are significant at the .05 level.

<sup>a</sup> Coefficients greater in magnitude than .04 are significant at the .05 level.
System GMM Results of PVAR Model

\[
\begin{bmatrix}
Y_{1,t} \\
Y_{2,t} \\
Y_{3,t}
\end{bmatrix} =
\begin{bmatrix}
a_1 \\
a_2 \\
a_3
\end{bmatrix} +
\begin{bmatrix}
a_{11} & a_{12} & a_{13} \\
a_{21} & a_{22} & a_{23} \\
a_{31} & a_{32} & a_{33}
\end{bmatrix}
\begin{bmatrix}
Y_{1,t-1} \\
Y_{2,t-1} \\
Y_{3,t-1}
\end{bmatrix} +
\begin{bmatrix}
\varepsilon_{1,t} \\
\varepsilon_{2,t} \\
\varepsilon_{3,t}
\end{bmatrix}
\]

<table>
<thead>
<tr>
<th></th>
<th>Safety</th>
<th>Efficiency</th>
<th>Reliability</th>
</tr>
</thead>
<tbody>
<tr>
<td>Safety</td>
<td>0.41***</td>
<td>-0.34***</td>
<td>-0.14**</td>
</tr>
<tr>
<td></td>
<td>(11.74)</td>
<td>(-2.91)</td>
<td>(-2.28)</td>
</tr>
<tr>
<td>Efficiency</td>
<td>-0.026</td>
<td>0.22***</td>
<td>-0.11***</td>
</tr>
<tr>
<td></td>
<td>(-1.22)</td>
<td>(2.61)</td>
<td>(-2.62)</td>
</tr>
<tr>
<td>Reliability</td>
<td>-0.01</td>
<td>0.16**</td>
<td>0.53***</td>
</tr>
<tr>
<td></td>
<td>(-0.28)</td>
<td>(2.01)</td>
<td>(12.72)</td>
</tr>
</tbody>
</table>

* Significant at .1 level  ** Significant at .05 level  *** Significant at .01 level  Obs.= 823
Analysis Results from PVAR

- IRF Graphs

Response of safety to efficiency shock

Percent Deviation from Mean

Time Periods

-30%
-25%
-20%
-15%
-10%
-5%
0%

efficiency (p5|p95)

efficiency
Response of safety to safety shock

Response of safety to efficiency shock

Response of safety to reliability shock

Response of efficiency to safety shock

Response of efficiency to efficiency shock

Response of efficiency to reliability shock

Response of reliability to safety shock

Response of reliability to efficiency shock

Response of reliability to reliability shock
Results

• Complex Interdependency

• Directional Asymmetry
Implications and Contributions
Obama sets fuel economy target of 54.5 mpg by 2025

White House says rule backed by automakers representing 90% of all vehicles sold in U.S.

Neil Roland and David Phillips

WASHINGTON - President Obama, flanked by the chiefs of U.S. and import-brand automakers, today proposed doubling corporate average fuel economy standards to 54.5 mpg by 2025.

The targets, if finalized next July as expected, would continue the pace at which mileage standards were raised by the Obama administration, which moved to 35.5 mpg by 2016. The president's new goal would be equivalent to 4.82 gallons per 100 miles (5.16 liters per 100 kilometers) and would apply to the fleet of all cars and light-duty trucks sold in the U.S. over the period 2027 to 2025.

The standards are in line with the Obama administration's efforts to cut oil imports and reduce greenhouse gas emissions. The guidelines seek to have 55% of new vehicles sold in the U.S. by 2025 be either electric, plug-in hybrid or battery-powered, a goal it notes is in line with China's targets for 2025.

'Climate Change is a National Security Threat'

In a statement, White House spokesperson Jay Carney called the proposed changes 'smart policy changes' that would help the U.S. reduce its reliance on imported energy and 'reduce greenhouse gas emissions to protect the environment and our national security.'

The new targets are based on a study by the National Academy of Sciences, which found that the nation's vehicle fleet is expected to grow by 60 million vehicles over the next decade. The study is expected to be completed in November, according to Carney.

The automakers will have until May 2011 to respond to the proposed rule changes, which would apply from model year 2016 through 2025. The final standards for the 2016 through 2025 years, however, will be determined by a projected future market for plug-in hybrid and electric vehicles.

The guidelines are expected to cause a significant spike in demand for electric vehicles and related services, and the industry will need to be prepared to meet this demand,
U.S. fuel-economy rules projected to spur at least 10% cut in car weight

The U.S. government’s new corporate average fuel economy target has spurred automakers to launch a campaign to slash the weight of their vehicles. There appears to be a growing consensus that vehicle weight must be reduced 10 to 15 percent to achieve the government’s 54.5 mpg fuel economy standard, effective by the 2025 model year. This month, research firm Ducker Worldwide of suburban Detroit issued a report that forecast vehicle weight reductions of 10 to 12 percent by 2025. ...
Managerial Example

• "We are trying to find the engineering man-hours for these quality issues. The surging demand for engineers in safety is forcing Toyota to rebalance resources in product development while trying to keep products on schedule. In some cases, that may result in slowed product development, growth may slow as engineers are shifted, but we are trying to avoid it… Shifting resources to safety was the right compromise at the right time. Toyota needs to move faster to respond to customer needs…”

- Seigo Kuzumaki, project general manager for vehicle safety in Toyota, during a conversation with Automotive News on its national safety recall (Automotive News, Vol. 84 Is. 6412, 2009)
Managerial Example

• “As CEO, I focused on highly profitable but fuel guzzling sport utility vehicles and light trucks. …The worst decision of my tenure of GM was axing the EV1 electric-car program and not putting the right resources into hybrids”

### Table 1 - Key Variables & Measure

<table>
<thead>
<tr>
<th>Variables</th>
<th>Measure</th>
</tr>
</thead>
<tbody>
<tr>
<td>Safety</td>
<td>Safety rating (1 to 5) is based on CR’s Safety Assessment. Each model is assigned with an overall safety score from 0 to 100. The overall safety score is equally divided into 5 ranges: 0-20 (1); 21-40 (2); 41-60 (3); 61-80 (4); 81-100 (5). The overall safety score equally combines the accident-avoidance and crash-protection ratings. Accident avoidance reflects CR’s test results for braking performance, emergency handling, acceleration, driving position, visibility, and set comfort. Crash protection is based on the most current crash tests (IIHS offset-crash results and either frontal- or side-crash results from NHTSA).</td>
</tr>
<tr>
<td>Z_Safety</td>
<td>( \frac{\text{Safety}_{i,t} - \text{IndustrySafety}_t}{\text{PopulationStandardDeviation}_t} )</td>
</tr>
<tr>
<td>Variables</td>
<td>Measure</td>
</tr>
<tr>
<td>------------</td>
<td>-------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Efficiency</td>
<td>Fuel efficiency rating (1 to 5) is based on CR’s annual car road test, and the efficiency information published by EPA. The overall mileage per gallon (MPG) of each model was coded as follows: &lt; 15 (1), 16-20 (2), 21-25 (3), 26-30 (4), and &gt;31 (5).</td>
</tr>
<tr>
<td>Z_Efficency</td>
<td>( \frac{(\text{Efficiency}_{i,t} - \text{IndustryEfficiency}_t)}{\text{PopulationStandardDeviation}_t} )</td>
</tr>
</tbody>
</table>
### Table 1 - Key Variables & Measure (Cont’d)

<table>
<thead>
<tr>
<th>Variables</th>
<th>Measure</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reliability</td>
<td>Reliability rating (1 to 5) is based on each model’s frequency of repair record and problem rate from CR’s annual customer surveys. By comparing with the similar models in the market, each vehicle model is rated from 1 to 5 with approximately equal intervals and 5 as the best rating. Specifically, a problem rate not far from the average gets the average rating of 3, to earn a rating of 2 or 4, a model’s problem rate differs by 2.5 percentage points. To earn a rating of 1 or 5, a model’s problem rate differs by at least 5 percentage points.</td>
</tr>
<tr>
<td>Z_Reliability</td>
<td>$Z_{\text{Reliability}} = \frac{\text{Reliability}<em>{i,t} - \text{IndustryReliability}</em>{t}}{\text{PopulationStandardDeviation}_{t}}$</td>
</tr>
</tbody>
</table>
Why Do Car Companies Have Different Goals?

Shaquille O'Neal squeezes into a Smart Car
It's official. If he can fit, so can you.

Warranty Direct ranks **Honda Accord** as number one out of the 100 most reliable cars of the last decade

**Volvo S80**: 2009 Top Safety Picks Award winner by Insurance Institute for Highway Safety (IIHS)