A STRUCTURAL EQUATIONS MODEL OF CORPORATE REPUTATION USING R

Mihaela Cornelia Sandu (mihaela.sandu@faa.unibuc.ro)
Rodica Ianel (rodica.ianole@faa.unibuc.ro)

Faculty of Business and Administration
University of Bucharest
Corporate reputation

• Warren Buffet: “You need 20 years to build a reputation and only 5 minutes to destroy it”

• Benjamin Franklin: "It takes a lot of good things to build a good reputation and only one bad thing to lose it"
Corporate reputation

• Is a valuable and highly sensitive intangible asset

• Is the result of repeated actions obtained in time and from experience accumulated

• Is the way that others perceive us

• Helps a company to achieve its objectives and to maintain competitive advantage
The rationale of our study

• Each stakeholder may perceive *a slightly different* dimension of the reputational phenomenon

• The aim is to test the perception about corporate reputation:
  ▫ from the posture of a potential buyer
  ▫ from the posture of a potential investor
  ▫ from the posture of a potential employee
  ▫ from the posture of an individual that recommends the company to other people
The approach

• A 46-items questionnaire and answers were measured on a 5-point Likert scale

• The questionnaire was adapted in Romanian from the study of Puncheva-Michelotti (2008)

• It follows the line of the Reputation Quotient scale, considered a balanced instrument of inquiry in this area
Ten latent variables

1. Emotions associated to reputation or the perception on reputation work place
2. Workplace
3. The customer value for the company
4. Management and leadership
5. Product/service differentiation
6. The credibility of the company
7. Social contribution and impact on customers
8. Ethics and social responsibility
9. Economic performance
10. Patriotism
Research method: structural equation modeling (SEM)

- Explains on average between 57% and 65% of the total variance in the reputation of the company

- Emphasizes the set of significant latent factors named earlier for each of the four cases
Implementation of SEM in R

• `install.packages("lavaan", dependencies = TRUE)`

• `install.packages("semTools")`

• `install.packages("semPlots")`
Call those packages using the function “library”

- `library(lavaan)`
- `library(semPlots)`
- `library(semTools)`
Examine the working dataset

- `class(...)`
- `str(....)`
- `head(...)`
The R code for the baseline model

- `myModel <- "`
- `emotional_appeal =~ v1 + v2 + v3`
- `workplace =~ v4 + v5 + v6`
- `customer_value =~ v8 + v9 + v10 + v11 + v12`
- `management_leadership =~ v7 + v13 + v14 + v15 + v16 + v17 + v18 + v19 + v20`
- `differentiating =~ v21 + v22 + v23`
- `credibility =~ v24 + v25 + v26`
- `social_contribution_customer_impact =~ v27 + v28 + v29 + v30`
- `ethical_social_responsibility =~ v31 + v32 + v33 + v34 + v35 + v36 + v37`
- `economical_performance =~ v38 + v39 + v40 + v41 + v42`
- `patriotism =~ v43 + v44 + v45 + v46"`
Graphic representation of the baseline model
Step 1.
Confirmatory factor analysis (CFA)

• `fit <- cfa(myModel, data = .... )`

• `summary(fit, fit.measures = TRUE, rsq=T)`
The output of CFA consists of three parts:

1. The first six lines form the header

2. The second part contains additional fit measures

3. The third part contains the parameter estimates
CFA output for buying decision

lavaan (0.5-20) converged normally after 151 iterations

Number of observations: 105

Estimator: ML
Minimum Function Test Statistic: 1906.653
Degrees of freedom: 944
P-value (Chi-square): 0.000

Model test baseline model:
Minimum Function Test Statistic: 4013.718
Degrees of freedom: 1035
P-value: 0.000

User model versus baseline model:
Comparative Fit Index (CFI): 0.677
Tucker-Lewis Index (TLI): 0.646

Loglikelihood and Information Criteria:
Loglikelihood user model (HO): -5437.166
Loglikelihood unrestricted model (H1): -4483.840
Number of free parameters: 137
Akaiki (AIC): 11148.333
Bayesian (BIC): 11511.926
Sample-size adjusted Bayesian (BIC): 11079.117

Root Mean Square Error of Approximation:
RMSEA: 0.099
90 Percent Confidence Interval: 0.092 0.105
P-value RMSEA <= 0.05: 0.000

Standardized Root Mean Square Residual:
SRMR: 0.098

Parameter Estimates:
Information: Expected
Standard Errors: Standard
CFA for the four models

<table>
<thead>
<tr>
<th>Indicator</th>
<th>Expected value</th>
<th>Value in the model (buy from a company)</th>
<th>Value in the model (invest in a company)</th>
<th>Value in the model (work for a company)</th>
<th>Value in the model (promote a company)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Convergence &amp; number of iterations</td>
<td>Yes, 151 iterations</td>
<td>Yes, 172 iterations</td>
<td>Yes, 139 iterations</td>
<td>Yes, 164 iterations</td>
<td></td>
</tr>
<tr>
<td>Observations</td>
<td>As big as possible</td>
<td>105</td>
<td>102</td>
<td>108</td>
<td>99</td>
</tr>
<tr>
<td>Chi-square</td>
<td>&gt; 0.05</td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
</tr>
<tr>
<td>CFI</td>
<td>&gt; 0.95</td>
<td>0.677</td>
<td>0.707</td>
<td>0.736</td>
<td>0.741</td>
</tr>
<tr>
<td>TLI</td>
<td>&gt; 0.95</td>
<td>0.646</td>
<td>0.679</td>
<td>0.710</td>
<td>0.716</td>
</tr>
<tr>
<td>RMSEA</td>
<td>&lt; 0.07</td>
<td>0.099</td>
<td>0.097</td>
<td>0.079</td>
<td>0.086</td>
</tr>
<tr>
<td>90% Confident Interval</td>
<td>(0; 1)</td>
<td>(0.092; 0.105)</td>
<td>(0.090; 0.103)</td>
<td>(0.072; 0.086)</td>
<td>(0.079; 0.093)</td>
</tr>
<tr>
<td>SRMR</td>
<td>&lt; 0.08</td>
<td>0.098</td>
<td>0.098</td>
<td>0.087</td>
<td>0.086</td>
</tr>
<tr>
<td>AIC</td>
<td>As small as possible</td>
<td>11148.333</td>
<td>8599.412</td>
<td>10704.875</td>
<td>8624.821</td>
</tr>
</tbody>
</table>
Improving the model

• We can eliminate variables with an R-squared value smaller than 0.5

• OR,

• We can eliminate those variables that do not fit; (by calculating modification indices and eliminating those with the biggest values - \textit{modindices}(fit) )
CFA for the four models after improvements

<table>
<thead>
<tr>
<th>Indicator</th>
<th>Expected value</th>
<th>Value in the model (buy from a company)</th>
<th>Value in the model (invest in a company)</th>
<th>Value in the model (work for a company)</th>
<th>Value in the model (promote a company)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Observations</td>
<td>As big as possible</td>
<td>105</td>
<td>102</td>
<td>108</td>
<td>99</td>
</tr>
<tr>
<td>Chi-square</td>
<td>&gt; 0.05</td>
<td>0.298</td>
<td>0.084</td>
<td>0.063</td>
<td>0.148</td>
</tr>
<tr>
<td>CFI</td>
<td>&gt; 0.95</td>
<td>0.992</td>
<td>0.981</td>
<td>0.969</td>
<td>0.979</td>
</tr>
<tr>
<td>TLI</td>
<td>&gt; 0.95</td>
<td>0.989</td>
<td>0.968</td>
<td>0.957</td>
<td>0.974</td>
</tr>
<tr>
<td>RMSEA</td>
<td>&lt; 0.07</td>
<td>0.033</td>
<td>0.070</td>
<td>0.061</td>
<td>0.037</td>
</tr>
<tr>
<td>90% Confident Interval</td>
<td>(0; 1)</td>
<td>(0; 0.082)</td>
<td>(0; 0.123)</td>
<td>(0; 0.100)</td>
<td>(0; 0.064)</td>
</tr>
<tr>
<td>SRMR</td>
<td>&lt; 0.08</td>
<td>0.046</td>
<td>0.051</td>
<td>0.056</td>
<td>0.067</td>
</tr>
<tr>
<td>AIC</td>
<td>As small as possible</td>
<td>2434.637</td>
<td>1329.810</td>
<td>2172.685</td>
<td>3395.625</td>
</tr>
</tbody>
</table>
Step 2. Structural equation modeling

- To perform `sem()` first we will complete the code for the baseline model with the following syntax:
  - `emotional_appeal ~ workplace + customer_value + management_leadership + differentiating + credibility + social_contribution_customer_impact + ethical_social_responsibility + economical_performance + patriotism`

- The R code used to fit the model and to see the results is the following:
  - `fit <- sem(myModel, data = .....)`
  - `summary(fit, standardized=TRUE)`
The R code for the SEM

- plot resulted using `semPaths` function in `qplots`
  - `semPaths(fit,"std",edge.label.cex = 0.5, curvePivot= TRUE, layout="tree")`
- or
  - `semPaths(fit, what='path', whatLabels='std')`
Model 1 - the “buy from a company” case
Model 2 - the “invest in a company” case
Model 3 - the “work for a company” case
Model 4 - the “promoting a company” case
Conclusions (1)

- Latent variables that determine “emotional appeal” in the four different cases analyzed:
  - for the decision to buy from a company - economical performance of the company and the patriotism;
  - for the decision to invest in a company - differentiating and economical performance;
  - for the decision to work for a company - management & leadership and economical performance;
  - for the decision to promote a company - customer value, social contribution & customer impact, ethical & social responsibility and patriotism.
Conclusions (2)

• Reputation is a representation in the mind.
• It affects attitudes, which in turn affect behavior.
• Economic performance is present in three of the four cases analyzed – dominance of economic rationality for the formation of corporate reputation
• The fourth case is distinctive from the others – economic performance was replaced by more intrinsic attributes like customer values, social contribution and ethical aspects.
Thank you for your attention!
😊