SEM_Exercise

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08/11/2016

Introduction

This document is about testing and performing Structural equation modeling with the Sense of Place(SOP) dataset. Earlier, factor analysis model for SOP was built that identified the significant dimentsions and indicators. Building on the factor model we build the SEM.

Datasets

For this analysis we depend on two datasets named *mainFile*. The file contains both the attitudinal responses and socio-demographic characteristics. Note that for factor analysis the responses for dimensions were used. For SEM we would be using both SOP dimension and socio-demographic variables. The mainFile was used to create two different files depending on how the missing values were treated. Numerous responses to SOP attitude questions were NA therefore we decided to convert the NA values to "4" being neutral. Note that NA means responders did not have any attitude towards that question. For the other file no changes were made. However, it is important to note that for our analysis we use the dataset that has NA values converted to 4. The code for the data preperation is not shown here.

Factor Analysis Results

As discussed earlier, we use the results from factor analysis to start building the simple structural equation models. For simplicity, we look at the final factor structure for RPM, which is given in Figure 1. Based on the figure we know of the 6 dimensions dependence and identity does not explain the factor structure. Therefore indicators associated with those dimensions are not necessary. Additionally, many other indicators of each dimensions present in SOP structure are missing, which are also unnecessary. In the *workingFile* generated to do the analysis, the indicators are removed and structures are set based on the factor structure shown in the figure.

The indicators to be included for RPM are:

1. Social: friend, family, atmosphere
2. Satisfaction: food, amenities, entertainment, people, motor vehicle parking, bicycle parking, bike/walking access, transit access.
3. Attachment: happy, dissapointed, connected
4. Aesthetics: architecture, artistic, beau

In addition if any indicators are negatively worded are switched to positive.

```
require(sem)
```

```
## Loading required package: sem
```

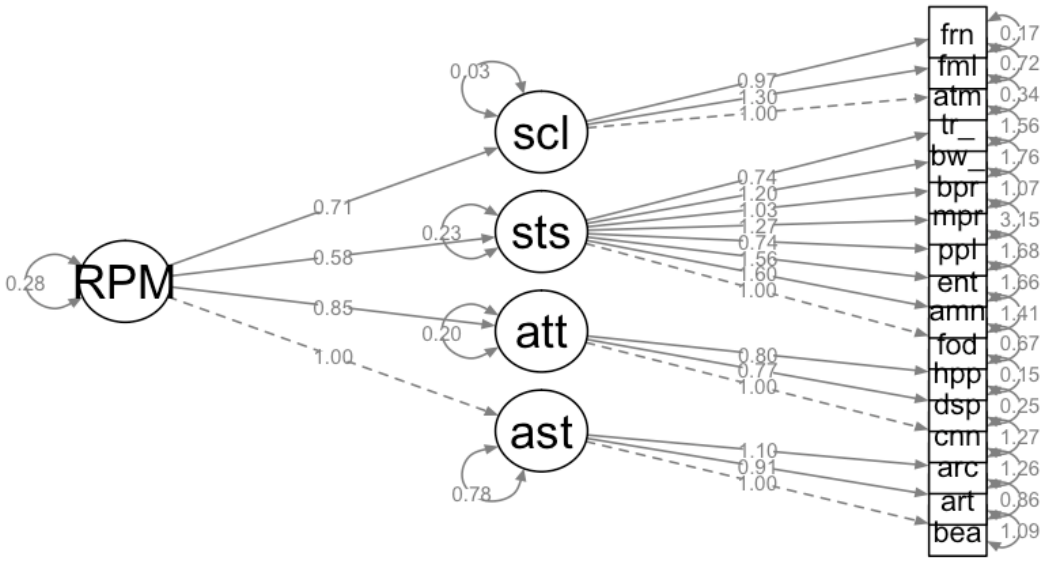

Figure 1: Factor Structure for Rochester Public Market

```
require(DiagrammeR)
```

```
## Loading required package: DiagrammeR
```

```
require(semPlot)
```

```
## Loading required package: semPlot
```

```
require(lavaan)
```

```
## Loading required package: lavaan

## This is lavaan 0.5-20

## lavaan is BETA software! Please report any bugs.

##
## Attaching package: 'lavaan'

## The following objects are masked from 'package:sem':
##
##     cfa, sem
```

```
workds_NA4$no_vehicle<-as.numeric(as.character(workds_NA4$no_vehicle))
```

```
## Warning: NAs introduced by coercion
```

```
workds_NA4$no_drivers<-as.numeric(as.character(workds_NA4$no_drivers))
```

```
## Warning: NAs introduced by coercion
```

```
model<-specifyModel(text = "
  no_vehicle -> no_drivers, pi, NA
  no_drivers<->no_drivers, var1, NA
  no_vehicle<->no_vehicle, var2, NA"
)
```

```
## NOTE: it is generally simpler to use specifyEquations() or cfa()
##       see ?specifyEquations
```

```
#fitting the model
fit<-sem::sem(model,data=workds_NA4[,c("no_vehicle","no_drivers")]) #data should contain only necessary
```

```
## Warning in sem.semmod(model, data = workds_NA4[, c("no_vehicle",
## "no_drivers")]): -18 observations removed due to missingness
```

```
#pathDiagram(fit,edge.labels = "both",style = "ram")
semPaths(fit,whatLabels = "est",rotation = 2)
```

Figure 2: Strucytre of a Simple SEM

```
summary(fit)
```

```
##
##  Model Chisquare =  -2.051692e-13   Df =  0 Pr(>Chisq) = NA
##  AIC =  6
##  BIC =  -2.051692e-13
##
##  Normalized Residuals
##       Min.    1st Qu.     Median       Mean    3rd Qu.       Max.
```

```
## -1.415e-15 -3.537e-16  0.000e+00 -3.537e-16  0.000e+00  0.000e+00
##
##  R-square for Endogenous Variables
## no_drivers
##     0.5026
##
##  Parameter Estimates
##      Estimate  Std Error  z value  Pr(>|z|)
## pi   0.6703434 0.04104514 16.33186 5.857356e-60 no_drivers <--- no_vehicle
## var1 0.4484109 0.03902916 11.48913 1.496192e-30 no_drivers <--> no_drivers
## var2 1.0082047 0.08775295 11.48913 1.496192e-30 no_vehicle <--> no_vehicle
##
##  Iterations =  0
```