Box-Tidwell Transformation Realization with R language

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Overview

Intro

Step by Step Procedure

Step Zero

$$y = \beta_0 + \beta_1 w_1 + \cdots + \beta_k w_k + \epsilon$$

$$w_j = f(x) = \begin{cases} x_j^{\alpha_j} \alpha \neq 0 \\ ln(x_j), \alpha = 0 \end{cases}$$

The method accommodates exponents on one or more of the regressor variables. $\alpha_1, \alpha_2, \ldots, \alpha_k$

Step by Step Procedure (Continued)

Step One (Inital Model)
We can get $W = X^{\alpha} \Rightarrow w_i = x_i^{\alpha_i}$, note that $\underbrace{\alpha_1, \alpha_2, \alpha_3, \ldots, \alpha_k}_{\text{The inital } \alpha} = 1$, we can get that $W = X^a lpha = X^1$ since Equation 4
the **new regression model is**:

$$y = \beta_0 + \beta_1 w_1^* + \cdots + \beta_k w_k^* be\hat{t}a_0, \hat{\beta}_1, \ldots, \hat{\beta}_k \Rightarrow \beta_{out} = (\beta_0, \beta_1, \beta_k)_{1\times(k+1))}$$

Step by Step Procedure (Continued)

Step Two (New Model)
Then, We add Z to the equation as $z_i = w_i ln(w_i)$ and we can get the new β and γ:

$$y = \beta_0 + \beta_1 w_1^* + \cdots + \beta_k w_k^* + \gamma_1 z_1^* \gamma_2 z_2^* + \cdots + \gamma_k z_k^* \Rightarrow \hat{\gamma_1}, \hat{\gamma_2}, \ldots, \hat{\gamma}_k$$
$$\beta_{out} = (\beta_0', \beta_1', \ldots, \beta_k, \hat{\gamma_1}, \hat{\gamma_2}, \ldots, \hat{\gamma}_k)$$

Step by Step Procedure (Continued)

Step Two (Update Term)
We compute the update $\hat{alpha}_j$ with the formula:

$$\hat{\alpha}_j = (\frac{\hat{\gamma}_j}{\hat{\beta}_j} + 1) \times (\text{ Current Value of } \hat{\alpha}_j)$$

We can get the new α for the new iteration, after n times iterations ($|(\alpha_{k-1} - \alpha_{k-2}| \leq \epsilon$,$\epsilon$ is the tolrance value), we can stop the iteration and at that time, the α is what we need: the relative best fitting curve. In multiple regression it can also be a good use of this method, one more variable is to do a set of data loop.

Motivation

Paragraphs of Text

Sed iaculis dapibus gravida. Morbi sed tortor erat, nec interdum arcu. Sed id lorem lectus. Quisque viverra augue id sem ornare non aliquam nibh tristique. Aenean in ligula nisl. Nulla sed tellus ipsum. Donec vestibulum ligula non lorem vulputate fermentum accumsan neque mollis.

Sed diam enim, sagittis nec condimentum sit amet, ullamcorper sit amet libero. Aliquam vel dui orci, a porta odio. Nullam id suscipit ipsum. Aenean lobortis commodo sem, ut commodo leo gravida vitae. Pellentesque vehicula ante iaculis arcu pretium rutrum eget sit amet purus. Integer ornare nulla quis neque ultrices lobortis. Vestibulum ultrices tincidunt libero, quis commodo erat ullamcorper id.

Model

Verbatim

Example (Theorem Slide Code)

```
\begin{frame}
\frametitle{Theorem}
\begin{theorem}[Mass--energy equivalence]
$E = mc^2$
\end{theorem}
\end{frame}
```

TeX

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- TeX was created by Donald Knuth in 1978
- A typesetting macro language and compiler:
  - Readable mathematics
  - Better hyphenation
  - Optimized justification
  - Font management tools
  - Cross-compatibility
- Code – Compile – Visualize

Data and Method

Figure

Figure 1: CUHK Business School

Editors and Compilers

- To install in your machine
  - Check `latex-project.org`
- In the cloud
  - ShareLatex : `www.sharelatex.com`
  - Overleaf : `www.overleaf.com`

Please give me Mb of space on Overleaf

https://www.overleaf.com/signup?ref=d1806010dac8

Multiple Columns

Heading

1. Statement
2. Explanation
3. Example

Lorem ipsum dolor sit amet, consectetur adipiscing elit. Integer lectus nisl, ultricies in feugiat rutrum, porttitor sit amet augue. Aliquam ut tortor mauris. Sed volutpat ante purus, quis accumsan dolor.

Conclusion

Table and Equation

Treatments	Response 1	Response 2
Treatment 1	0.0003262	0.562
Treatment 2	0.0015681	0.910
Treatment 3	0.0009271	0.296

Table 1: Table caption

$$\begin{bmatrix} a_{11} & \cdots & a_{1n} \\ \vdots & \ddots & \vdots \\ a_{n1} & \cdots & a_{nn} \end{bmatrix}^T = \begin{bmatrix} a_{11} & \cdots & a_{n1} \\ \vdots & \ddots & \vdots \\ a_{1n} & \cdots & a_{nn} \end{bmatrix} \tag{1}$$

References

John Smith (2012)
Title of the publication
Journal Name 12(3), 45 – 678.

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