Empirical Analysis of the Role of Energy in Economic Growth

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Abstract

********** Add abstract **********

Keywords: economic growth, energy, cobb-douglas, CES, LINEX

Caleb, put your LaTeX code here.

1. Cobb-Douglas Without Energy

```
createCDParamsGraph <- function(){
  # Create a data table with the following columns:
  # country abbrev, parameter (lambda, alpha, or beta), -95% CI, value, +95% CI
  dataTable <- do.call("rbind",
                       lapply(countryAbbrevs,
                              cobbDouglasCountryRowsForParamsGraph))
  print(class(dataTable))
  print(dataTable)
  print(str(dataTable))
  # Make a graph. I want the following:
  ### two-letter country abbreviation on the horizontal axis
  ### dots for the values of each parameter
  ### error bars to the top and bottom of the dots representing the 95% CI
  ### three panels, one for each parameter (lambda, alpha, and beta)
```

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```
  #
  # Note that "segplot" is in the "latticeExtra" package.
  # But, at this point, I obtain the following error:
  # "Error:  range not meaningful for factors"
  graph <- segplot(country ~ upperCI + lowerCI | parameter,
                   data = dataTable,
                   centers = value)
  segplot(reorder(factor(county), rate.male) ~ LCL95.male + UCL95.male,
          data = subset(USCancerRates, state == "Washington"),
          draw.bands = FALSE,
          centers = rate.male)
  return(graph)
}
createCDParamsGraph()
```

```
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```

```
[1] "data.frame"
     country parameter    lowerCI      value   upperCI
US.1      US    lambda  0.0086771  0.0101555  0.011627
US.2      US     alpha  0.2131286  0.2741825  0.335459
US.3      US      beta  0.6645339  0.7258175  0.787101
UK.1      UK    lambda -0.0104340  0.0097166  0.030275
UK.2      UK     alpha -0.2450552  0.4440764  1.119149
UK.3      UK      beta -0.1264745  0.5559236  1.238322
JP.1      JP    lambda  0.0021493  0.0051741  0.008193
JP.2      JP     alpha  0.4370443  0.5156307  0.594141
JP.3      JP      beta  0.4058692  0.4843693  0.562869
CN.1      CN    lambda -0.0405221  0.0187922  0.077906
CN.2      CN     alpha  0.1085060  0.7124315  1.318149
```

```
CN.3      CN      beta -0.3196146  0.2875685  0.894751
ZA.1      ZA    lambda -0.0007174  0.0007712  0.002223
ZA.2      ZA     alpha  0.4614415  0.5974666  0.733549
ZA.3      ZA      beta  0.2646978  0.4025334  0.540369
SA.1      SA    lambda -0.0159263 -0.0123104 -0.008736
SA.2      SA     alpha  0.2148204  0.4484552  0.682794
SA.3      SA      beta  0.3199303  0.5515448  0.783159
IR.1      IR    lambda  0.0031544  0.0038507  0.004538
IR.2      IR     alpha  0.4911317  0.5966724  0.702640
IR.3      IR      beta  0.2970793  0.4033276  0.509576
TZ.1      TZ    lambda -0.0039142  0.0014995  0.006784
TZ.2      TZ     alpha  0.5041669  0.7265790  0.951643
TZ.3      TZ      beta  0.0490171  0.2734210  0.497825
ZM.1      ZM    lambda  0.0217845  0.0249136  0.028040
ZM.2      ZM     alpha  1.2494792  1.4100217  1.572885
ZM.3      ZM      beta -0.5714535 -0.4100217 -0.248590
'data.frame': 27 obs. of  5 variables:
 $ country  : Factor w/ 9 levels "US","UK","JP",..: 1 1 1 2 2 2 3 3 3 4 ...
 $ parameter: Factor w/ 3 levels "lambda","alpha",..: 1 2 3 1 2 3 1 2 3 1 ...
 $ lowerCI  : num  0.00868 0.21313 0.66453 -0.01043 -0.24506 ...
 $ value    : num  0.01016 0.27418 0.72582 0.00972 0.44408 ...
 $ upperCI  : num  0.0116 0.3355 0.7871 0.0303 1.1191 ...
NULL
```

2. Cobb-Douglas With Energy

We can force α, β, and γ to be in $[0, 1]$ by a reparameterization:

$$a \in [0,1], b \in [0,1], \alpha = \min(a,b), \beta = |b-a|, \gamma = 1 - \max(a,b)$$

2.1. Cobb-Douglas with Q

2.2. Cobb-Douglas With X

2.3. Cobb-Douglas With U

3. CES

3.1. CES with Q

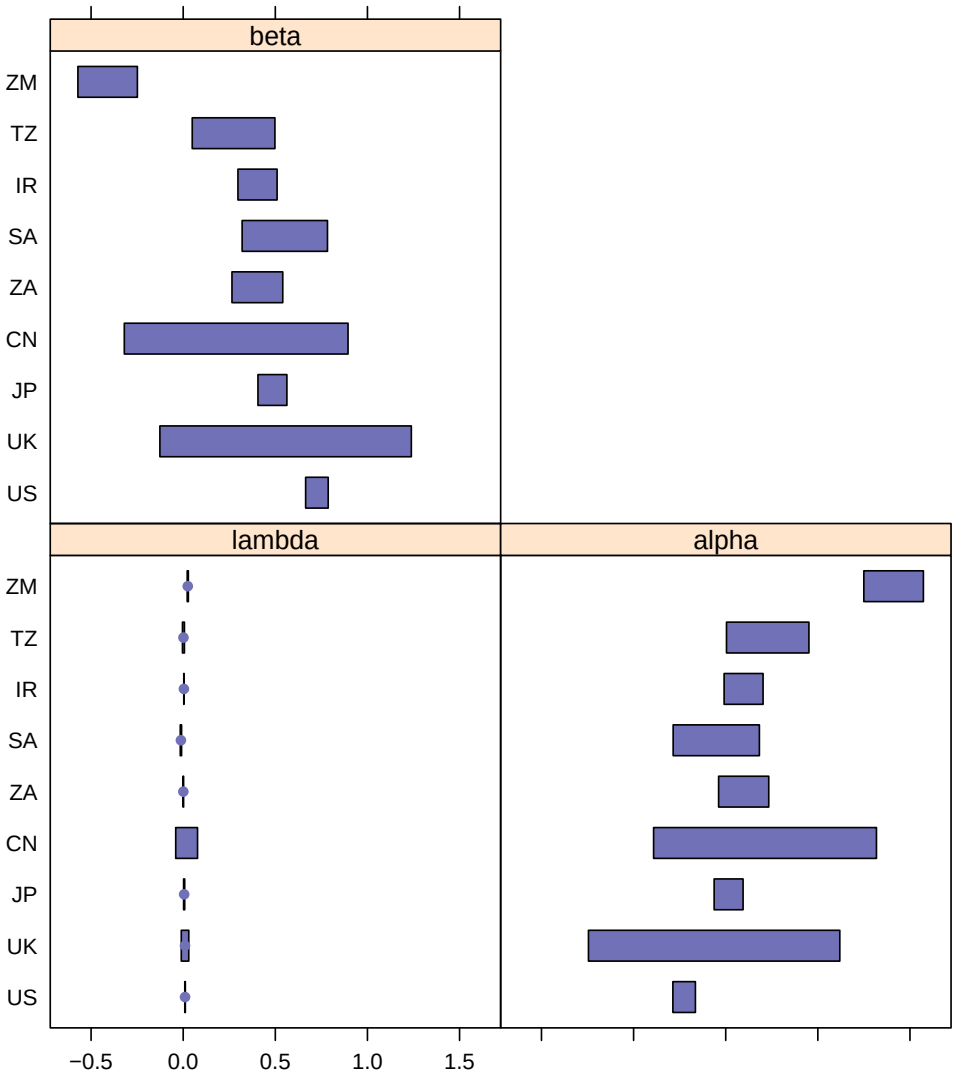

Figure 1: Cobb-Douglas (without energy) model parameters.