Stata is the best tool to start data analysis

Miklós Koren   Márton Fleck

What are we comparing?

1. Programming language
2. Software application
3. Documentation
4. Community

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1. **Programming language**
2. Software application
3. Documentation
4. Community

1. Designed for data
2. Designed for humans
3. Works right away

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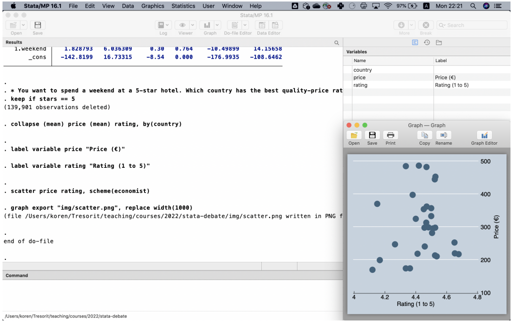

```
   1.weekend    1.828793   6.036309     0.30   0.764    -10.49899    14.15658
       _cons   -142.8199   16.73315    -8.54   0.000    -176.9935   -108.6462

.
. * You want to spend a weekend at a 5-star hotel. Which country has the best quality-price rat
. keep if stars == 5
(139,901 observations deleted)

. collapse (mean) price (mean) rating, by(country)

.
. label variable price "Price (€)"

. label variable rating "Rating (1 to 5)"

.
. scatter price rating, scheme(economist)

. graph export "img/scatter.png", replace width(1000)
(file /Users/koren/Tresorit/teaching/courses/2022/stata-debate/img/scatter.png written in PNG f

.
end of do-file

.
```

Name	Label
country	
price	Price (€)
rating	Rating (1 to 5)

/Users/koren/Tresorit/teaching/courses/2022/stata-debate

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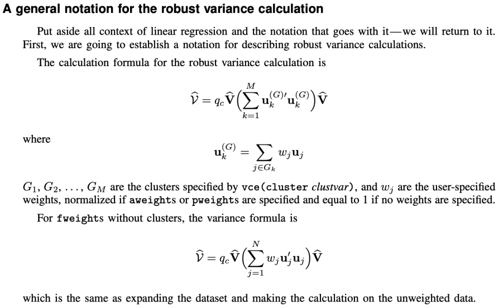

A general notation for the robust variance calculation

Put aside all context of linear regression and the notation that goes with it—we will return to it. First, we are going to establish a notation for describing robust variance calculations.

The calculation formula for the robust variance calculation is

$$\widehat{\mathcal{V}} = q_c \widehat{\mathbf{V}} \Big(\sum_{k=1}^{M} \mathbf{u}_k^{(G)\prime} \mathbf{u}_k^{(G)} \Big) \widehat{\mathbf{V}}$$

where

$$\mathbf{u}_k^{(G)} = \sum_{j \in G_k} w_j \mathbf{u}_j$$

$G_1, G_2, \dots, G_M$ are the clusters specified by `vce(cluster` *clustvar*`)`, and w_j are the user-specified weights, normalized if `aweights` or `pweights` are specified and equal to 1 if no weights are specified.

For `fweights` without clusters, the variance formula is

$$\widehat{\mathcal{V}} = q_c \widehat{\mathbf{V}} \Big(\sum_{j=1}^{N} w_j \mathbf{u}_j' \mathbf{u}_j \Big) \widehat{\mathbf{V}}$$

which is the same as expanding the dataset and making the calculation on the unweighted data.

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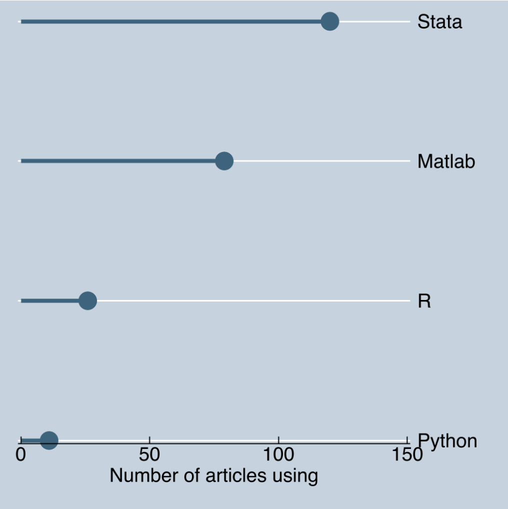

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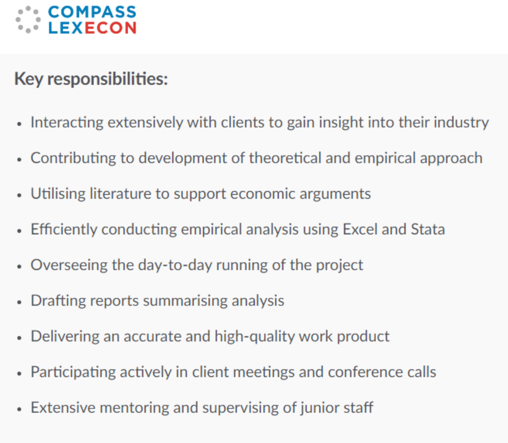

COMPASS LEXECON

Key responsibilities:

- Interacting extensively with clients to gain insight into their industry
- Contributing to development of theoretical and empirical approach
- Utilising literature to support economic arguments
- Efficiently conducting empirical analysis using Excel and Stata
- Overseeing the day-to-day running of the project
- Drafting reports summarising analysis
- Delivering an accurate and high-quality work product
- Participating actively in client meetings and conference calls
- Extensive mentoring and supervising of junior staff

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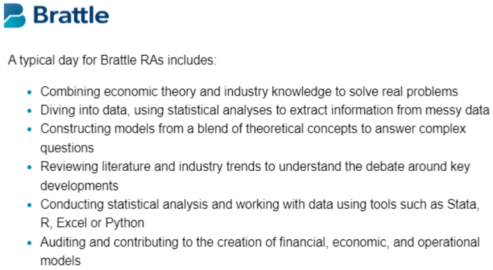

Brattle

A typical day for Brattle RAs includes:

- Combining economic theory and industry knowledge to solve real problems
- Diving into data, using statistical analyses to extract information from messy data
- Constructing models from a blend of theoretical concepts to answer complex questions
- Reviewing literature and industry trends to understand the debate around key developments
- Conducting statistical analysis and working with data using tools such as Stata, R, Excel or Python
- Auditing and contributing to the creation of financial, economic, and operational models

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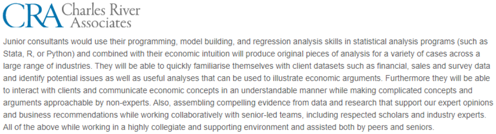

CRA Charles River Associates

Junior consultants would use their programming, model building, and regression analysis skills in statistical analysis programs (such as Stata, R, or Python) and combined with their economic intuition will produce original pieces of analysis for a variety of cases across a large range of industries. They will be able to quickly familiarise themselves with client datasets such as financial, sales and survey data and identify potential issues as well as useful analyses that can be used to illustrate economic arguments. Furthermore they will be able to interact with clients and communicate economic concepts in an understandable manner while making complicated concepts and arguments approachable by non-experts. Also, assembling compelling evidence from data and research that support our expert opinions and business recommendations while working collaboratively with senior-led teams, including respected scholars and industry experts. All of the above while working in a highly collegiate and supporting environment and assisted both by peers and seniors.

Data Wrangling and Regression

```
/* Hotel price data */
use "hotels-europe_price.dta", clear
/* Add hotel features (location,
  stars, ratings, etc.) */
merge m:1 hotel_id using
  "hotels-europe_features.dta"
/* Censor prices that are too high */
replace price = 1000 if price > 1000
/* Regress price on ratings, stars,
  plus month, weekend dummies */
regress price rating stars i.month
  i.weekend, vce(cluster country)
```

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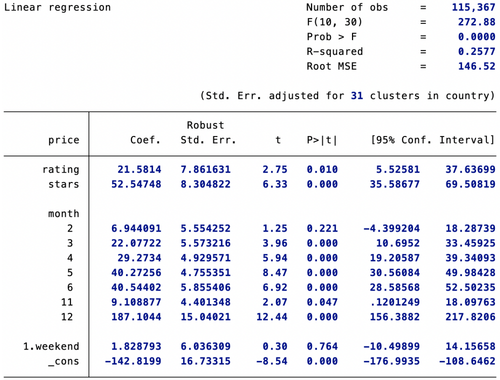

```
Linear regression                               Number of obs     =    115,367
                                                F(10, 30)         =     272.88
                                                Prob > F          =     0.0000
                                                R-squared         =     0.2577
                                                Root MSE          =     146.52

                                  (Std. Err. adjusted for 31 clusters in country)
------------------------------------------------------------------------------
             |               Robust
       price |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
      rating |    21.5814   7.861631     2.75   0.010      5.52581    37.63699
       stars |   52.54748   8.304822     6.33   0.000     35.58677    69.50819
             |
       month |
          2  |   6.944091   5.554252     1.25   0.221    -4.399204    18.28739
          3  |   22.07722   5.573216     3.96   0.000      10.6952    33.45925
          4  |    29.2734   4.929571     5.94   0.000     19.20587    39.34093
          5  |   40.27256   4.755351     8.47   0.000     30.56084    49.98428
          6  |   40.54402   5.855406     6.92   0.000     28.58568    52.50235
         11  |   9.108877   4.401348     2.07   0.047     .1201249    18.09763
         12  |   187.1044   15.04021    12.44   0.000     156.3882    217.8206
             |
   1.weekend |   1.828793   6.036309     0.30   0.764    -10.49899    14.15658
       _cons |  -142.8199   16.73315    -8.54   0.000    -176.9935   -108.6462
------------------------------------------------------------------------------
```

Data Wrangling and Visualization

```
/* keep only 5-star hotels */
keep if stars == 5
/* mean price and rating by country */
collapse (mean) price (mean) rating,
  by(country)
label variable price "Price (€)"
label variable rating "Rating (1 to 5)"
scatter price rating, scheme(economist)
```

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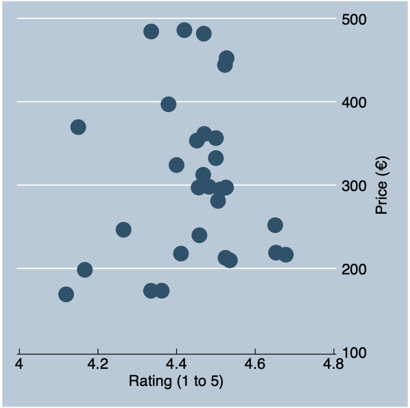


Much simpler than R

```
scatter price rating, scheme(economist)
```

```
ggplot(five_star_data,
  aes(x=mean_price, y=mean_rating)) +
  geom_point() +
  labs(x="Price (€)",
    y="Rating (1 to 5)") +
  scale_color_economist()
```

Much clearer than Python

```
replace price = 1000 if price > 1000
```

```
data.loc[data["price"] > 1000,
  "price"] = 1000
```

Burn

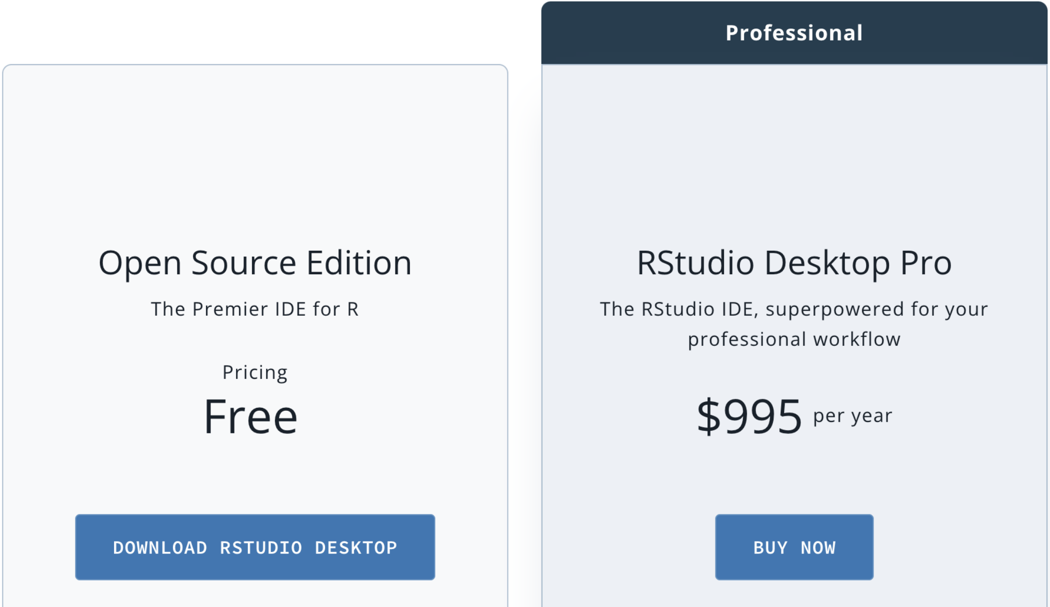
Same in Python

```
import pandas as pd
import matplotlib.pyplot as plt

# load hotel price data
price_data = pd.read_stata("hotels-europe_price.dta")

# add hotel features (location, stars, ratings, etc.)
features = pd.read_stata("hotels-europe_features.dta")
data = price_data.merge(features, on="hotel_id", how="left")

# replace high prices with 1000
data.loc[data["price"] > 1000, "price"] = 1000

# regress price on ratings, stars, plus month, weekend dummies
data = pd.get_dummies(data, columns=["month", "weekend"])
result = sm.OLS(data["price"], data[["rating", "stars"] + list(data.columns[data.columns.str.startswith("month_")])
  + list(data.columns[data.columns.str.startswith("weekend_")])]).fit(cov_type="cluster", cov_kwds={"groups": data["country"]})

# keep only 5-star hotels
data = data[data["stars"] == 5]

# calculate mean price and rating by country
data = data.groupby("country").mean()[["price", "rating"]]

# label variables
data.rename(columns={"price": "Price (€)", "rating": "Rating (1 to 5)"}, inplace=True)

# scatterplot
data.plot(x="Price (€)", y="Rating (1 to 5)", kind="scatter", colormap="tab10", figsize=(8, 6))
plt.show()
```

Same in R

```r
library(tidyverse)
library(ggplot2)

# load hotel price data
price_data <- read_dta("hotels-europe_price.dta")

# add hotel features (location, stars, ratings, etc.)
features <- read_dta("hotels-europe_features.dta")
data <- left_join(price_data, features, by="hotel_id")

# replace high prices with 1000
data <- data %>% mutate(price=if_else(price > 1000, 1000, price))

# regress price on ratings, stars, plus month, weekend dummies
data <- data %>% mutate(month=factor(month), weekend=factor(weekend)) %>% nest(-country)
result <- data %>% mutate(model=map(data, ~ lm(price ~ rating + stars + month + weekend, data=.)),
                         summ=map(model, broom::tidy)) %>%
                unnest(summ)

# subset data for 5-star hotels only
five_star_data <- data %>% filter(stars == 5) %>%
                        group_by(country) %>%
                        summarize(mean_price=mean(price), mean_rating=mean(rating))

# create scatterplot
ggplot(five_star_data, aes(x=mean_price, y=mean_rating)) +
  geom_point() +
  labs(x="Price (€)", y="Rating (1 to 5)") +
  scale_color_economist()
```

RStudio pricing



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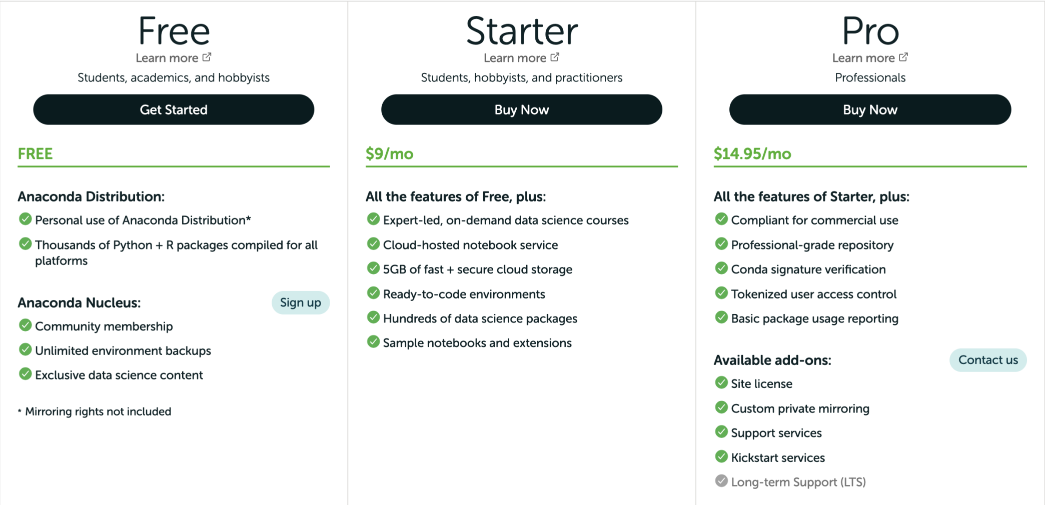

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