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

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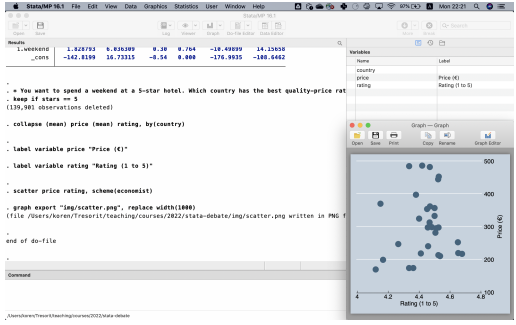

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A general notation for the robust variance calculation

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

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

$G_1, G_2, \ldots, G_M$ 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

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

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

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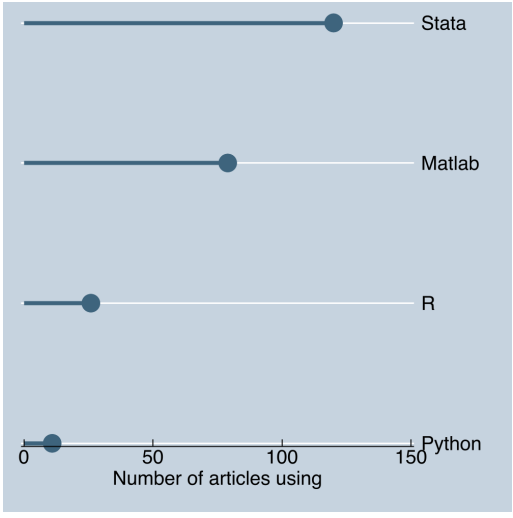

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COMPASS LEXECON

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)

price	Coef.	Robust 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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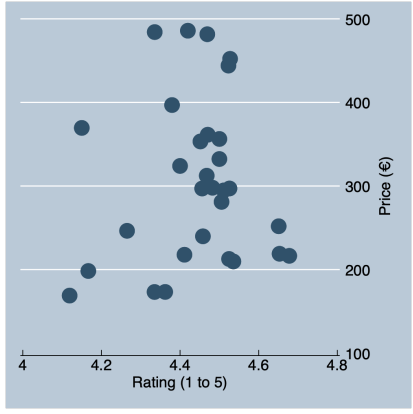

Much simpler than R

```
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()
```

Stata vs 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()
```

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