Quantitative methods

Week #3

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Notes

Outline

Notes

Types of research topics

Definition, examples

Define the type of the following topics:

- Homeless people living at Budapest
- Reintegrating homeless people (?)
- Popular books in Hungary
- Living costs in London
- Why is it so freaking expensive to live in London?

What is (the difference between) exploratory, descriptive and explanatory studies?

Notes

Types of variables and attributes

Towards methodology

Types of variables

- explanatory variables
  - dependent variables
    - qualitative variables
    - quantitative variables
  - independent variables
    - qualitative variables
    - quantitative variables
- extraneous variables
  - control variables
  - other variables

Let's make up some examples based on the above list!

Notes

Levels of Measurement

Qualitative and quantitative variables in depth

Qualitative variables:

- Nominal: exhaustive labels with no intersect (mutual exlcusivity) not in a specific order
- Ordinal: an (possible) ordered variable with exhaustive labels not intersecting

	Nominal	Ordinal	Interval	Ratio
Classification	X	X	X	X
Rank order		X	X	X
Equal intervals			X	X
Nonarbitrary zero				X

Quantitative variables:

- Interval: equal distances between the ordered labels (numbers)
- Ratio: a scale with a zero point

Notes

Levels of Measurement

Examples

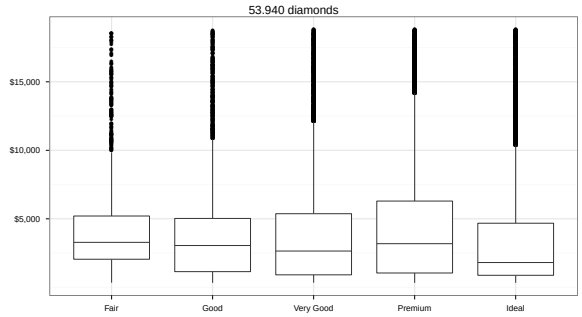
Determine the level of measurement of the following variables!

- Gender
- Education
- Salary
- IQ
- Scholastic record
- Place of birth
- Favorite color

Notes

Relation between variables

A visual example




```
ggplot(diamonds, aes(cut, price)) + geom_boxplot() + xlab('') + ylab('') +
scale_y_continuous(formatter="dollar") + theme_bw() + opts(title="53.940 diamonds")
```


Notes

The structure of the demo dataset

ggplot2/diamonds

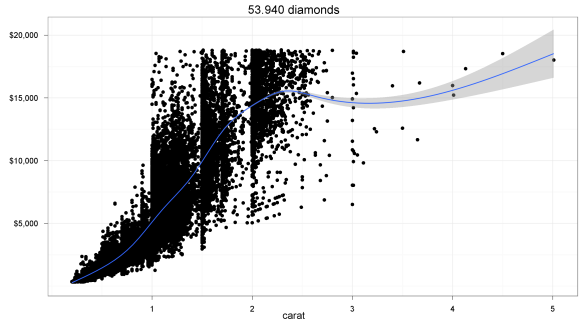
```
Prices of 50,000 round cut diamonds

Description:
     A dataset containing the prices and other attributes of almost
     54,000 diamonds.  The variables are as follows:
```

- price. price in US dollars (\$326--\$18,823)
- carat. weight of the diamond (0.2--5.01)
- cut. quality of the cut (Fair, Good, Very Good, Premium, Ideal)
- colour. diamond colour, from J (worst) to D (best)
- clarity. a measurement of how clear the diamond is (I1 (worst), SI1, SI2, VS1, VS2, VVS1, VVS2, IF (best))
- x. length in mm (0--10.74)
- y. width in mm (0--58.9)
- z. depth in mm (0--31.8)
- depth. total depth percentage = z / mean(x, y) = 2 * z / (x + y) (43--79)
- table. width of top of diamond relative to widest point (43--95)

Notes

Relation between variables

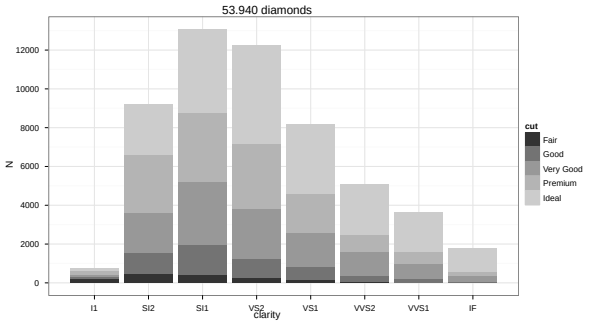
A visual example




```
ggplot(diamonds, aes(carat, price)) + geom_point() + geom_smooth() + ylab('') +
scale_y_continuous(formatter="dollar") + theme_bw() + opts(title="53.940 diamonds")
```


Notes

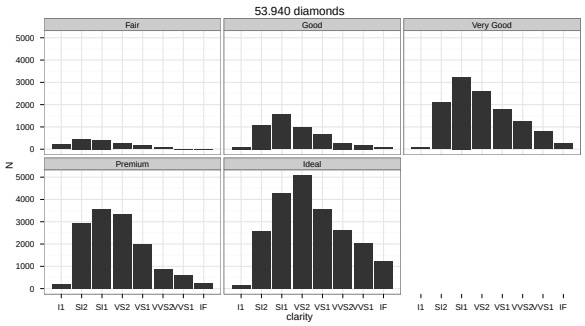
Relation between variables
A visual example




```
ggplot(diamonds, aes(clarity, fill=cut)) + geom_bar() + ylab("N") +
theme_bw() + opts(title="53.940 diamonds")
```


Notes

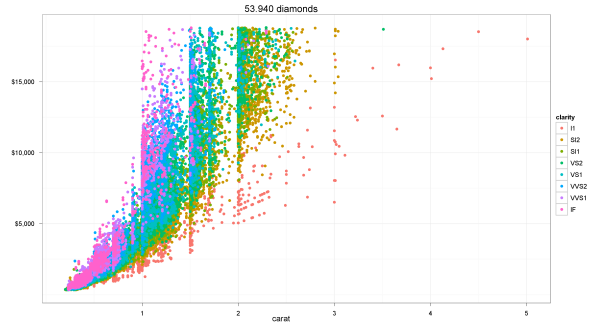
Relation between variables
A visual example




```
ggplot(diamonds, aes(clarity)) + geom_bar() + ylab("N") + facet_wrap(~ cut) +
theme_bw() + opts(title="53.940 diamonds")
```


Notes

Relation between variables
A visual example

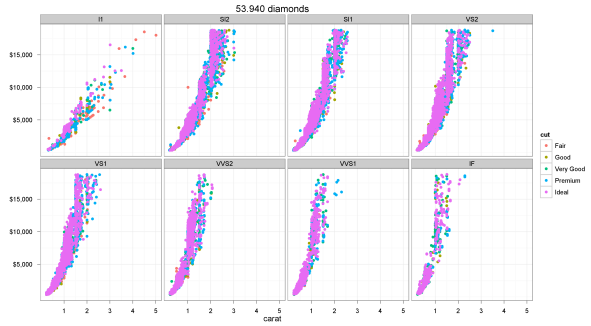



```
ggplot(diamonds, aes(carat, price, color=clarity)) + geom_point() + ylab('') +
scale_y_continuous(formatter="dollar") + theme_bw() + opts(title="53.940 diamonds")
```


Notes

Relation between variables

A visual example

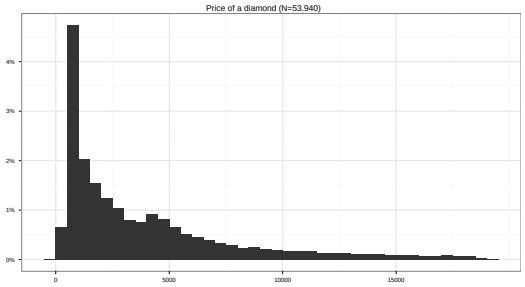



```
ggplot(diamonds, aes(carat, price, color=cut)) + geom_point() + ylab('') + facet_wrap(~ clarity,nrow=2) +
scale_y_continuous(formatter="dollar") + theme_bw() + opts(title="53.940 diamonds")
```


Notes

Test your knowledge!

Reliability and validity



A survey was taken place about diamonds available for sale on the Internet.
What do you think of the realiability and validity of this research?

Notes

Types of variables and attributes in practice

Relationship between variables

Possible relationship between variables:

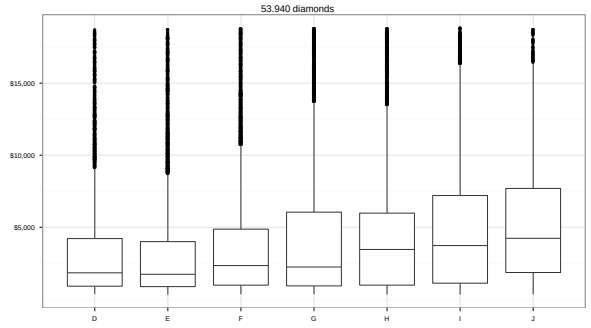
- association,
- correlation,
- spurious relationship,
- influence,
- direction of influence,
- **causality**.

STATISTICALLY SIGNIFICANT

Notes

Relation between variables

Direction of influence




```
ggplot(diamonds, aes(color, price)) + geom_boxplot() + xlab('') + ylab('') +
scale_y_continuous(formatter="dollar") + theme_bw() + opts(title="53.940 diamonds")
```


Notes

Cheatsheet

Diamonds' colors

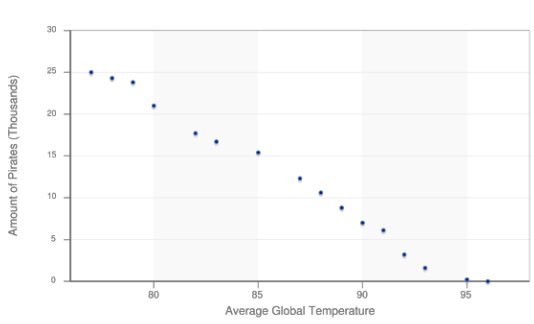
GIA Status: current	AGS Status: current	AGS Status: historical: pre 1995	CIBJO Status: current	IDC Status: current	Scan. D.N.	Status: current	Old World Terms	Status: historical
grade and description[1]	grade and electronic colorimeter scale[1]	grade and electronic colorimeter scale[1]	grade[1]	grade and description[1]	grade for .5ct and over[1]	grade for under .5ct	series 1 scale[1]	series 2 scale[1]
D Colorless	0 0–0.40	0 0–0.75	Exceptional white +	Exceptional white +	River	White	Finest White	Jager
E	0.5 0.5–0.99	1 0.76–1.35	Exceptional white	Exceptional white				River
F	1.0 1.0–1.49	2 1.36–2.00	Rare white +	Rare white +	Top Wesselton		Fine White	Top Wesselton
G Near Colorless	1.5 1.5–1.99		Rare white	Rare white				
H	2.0 2.0–2.49	3 2.01–2.50	White	White	Wesselton		White	Wesselton
I	2.5 2.5–2.99	4 2.51–3.0	Slightly tinted white	Slightly tinted white	Top Crystal	Slightly tinted white	Commercial White	Top Crystal
J	3.0 3.0–3.49	5 3.01–3.75			Crystal		Top silver cape	Crystal
K	3.5 3.5–3.99	6 3.76–4.5	Tinted white	Tinted white	Top cape	Tinted white	Silver cape	Top cape
L Faint Yellow	4.0 4.0–4.49		Tinted color 1	Slightly colored				
M	4.5 4.5–4.99	7 4.51–5.50			Cape		Light cape	Cape
N	5.0 5.0–5.49		Tinted color 2		Light yellow		Cape	Low Cape
O	5.5 5.5–5.99	8 5.51–7.0						Very light yellow
P Very Light Yellow	6.0 6.0–6.40						Dark cape	Light yellow
Q	6.5 6.5–6.99							
R	7.0 7.0–7.40							
S Light Yellow	7.5 7.5–7.99	9 7.01–8.5	Tinted color 3	Tinted color	Yellow	Tinted color		
T	8.0 8.0–8.40							
U	8.5 8.5–8.99	10 8.51–10						
V	9.0 9.0–9.40							
W	9.5 9.5–9.99							
X								
Y	10 10+	10+						
Z								

Source: http://en.wikipedia.org/wiki/Diamond_color

Notes

Relation between variables

High correlation

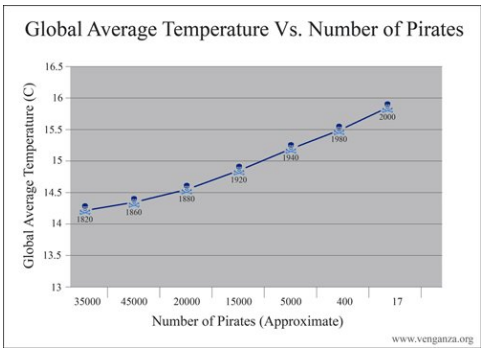


A high correlation can be pointed out. Please explain!

Notes

Relation between variables

High correlation

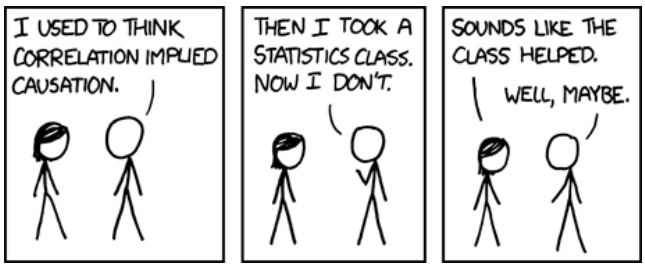


A high correlation can be pointed out. So what?

Notes

Relation between variables

Correlation does not imply causality!

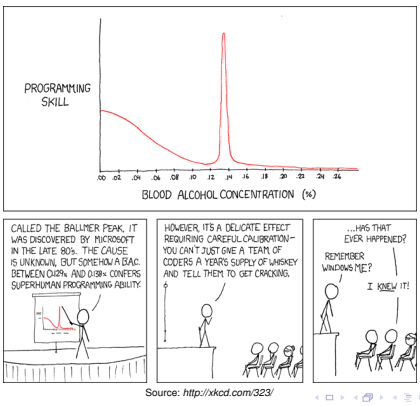


Source:http://xkcd.com/552/

Notes

Relation between variables

No correlation. No relationship?

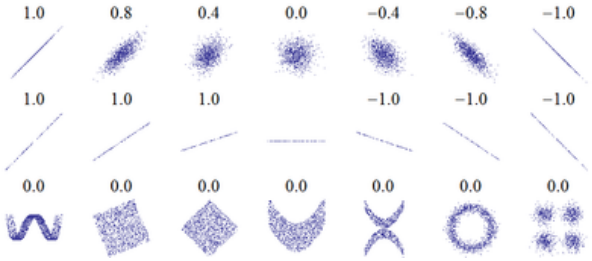


Source: *http://xkcd.com/323/*

Notes

Relation between variables

Correlation coefficient



Positive (direct: $R = 1$), negative (inverse: $R = -1$), linear, curvilinear and uncorrelated ($R = 0$) relationships
R: correlation coefficient

Notes

Preparation of Research Design

Conceptualization and Operationalization

Conceptualization:

Definition

Conceptual definition is the process of formulating and clarifying concepts.

Operationalization:

Definition

Operational definition describes the research operations that will specify the value or category of a variable on each case.

Notes

Conceptualization

A catchy example

Let us make a research about Friendship!

- “Friends have all things in common.” (Plato)
- “Misfortune shows those who are not really friends.” (Aristotle)
- “What is a friend? A single soul in two bodies.” (Aristotle)
- “A friend to all is a friend to none.” (Aristotle)
- “One loyal friend is worth ten thousand relatives.” (Euripides)
- “My best friend is the one who brings out the best in me.” (H. Ford)
- “In a friend you find a second self.” (Isabelle Norton)
- “A friend should be a master at guessing and keeping still.” (Nietzsche)

Notes

Operationalization
A catchy example (continued)

Do you have a best friend?

- Yes, I have one or two best friends with whom I share almost everything.
- Yes, I have several friends whom I consider tobe my best friend.
- No, I don't have a best friend.

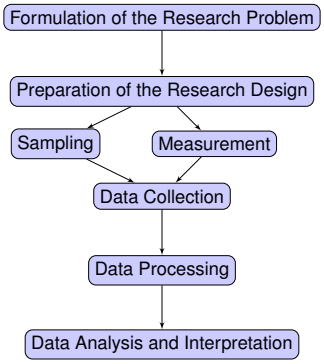
Why do we need a friend?

- We need someone to confide into.
- We need someone who can listen to all our tantrums.
- We need someone with whom we can have fun.
- All of the above.
- We don't really need friends.

Source: http://www.samplequestionnaire.com/mcgill-friendship-questionnaire.html

Notes

Stages of Social Research
A flowchart



Notes

It was a pleasure!

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Notes