

PROPORTIONS

MPA 635: Data Visualization

October 2, 2018

PLAN FOR TODAY

Reproducibility

Proportions

Examples and
ggplot tips

REPRODUCIBILITY

WHY AM I MAKING YOU LEARN R?

PivotTables do the same thing!

The screenshot shows a Microsoft Excel spreadsheet with a PivotTable. The PivotTable Fields pane is open, displaying the following settings:

- FIELD NAME**: Search fields
- Sum of Female**: Values
- Film**: Row Labels
- Race**: Column Labels
- Female**: Values
- Male**: Values (unchecked)

The PivotTable itself contains the following data:

		Elf	Hobbit	Man	Grand Total
Row Labels	Sum of Female	1229	14	0	1243
	The Fellowship Of The Ring	183	2	268	453
	The Return Of The King	331	0	401	732
	Grand Total	1743	16	669	2428

WHY AM I MAKING YOU LEARN R?

More powerful

Reproducibility

AUSTERITY AND EXCEL

Growth in a Time of Debt

Carmen M. Reinhart and Kenneth S. Rogoff

NBER Working Paper No. 15639

January 2010, Revised January 2010

JEL No. E2,E3,E6,F3,F4,N10

ABSTRACT

We study economic growth and inflation at different levels of government and external debt. Our analysis is based on new data on forty-four countries spanning about two hundred years. The dataset incorporates over 3,700 annual observations covering a wide range of political systems, institutions, exchange rate arrangements, and historic circumstances. Our main findings are: First, the relationship between government debt and real GDP growth is weak for debt/GDP ratios below a threshold of 90 percent of GDP. Above 90 percent, median growth rates fall by one percent, and average growth falls considerably more. We find that the threshold for public debt is similar in advanced and emerging economies. Second, emerging markets face lower thresholds for external debt (public and private)—which is usually denominated in a foreign currency. When external debt reaches 60 percent of GDP, annual growth declines by about two percent; for higher levels, growth rates are roughly cut in half. Third, there is no apparent contemporaneous link between inflation and public debt levels for the advanced countries as a group (some countries, such as the United States, have experienced higher inflation when debt/GDP is high). The story is entirely different for emerging markets, where inflation rises sharply as debt increases.

Debt:GDP = 90%+ → -0.1% growth

THE PATH TO PROSPERITY

RESTORING AMERICA'S PROMISE



FISCAL YEAR 2012 BUDGET RESOLUTION

House Committee on the Budget
Chairman Paul Ryan of Wisconsin
budget.GOP.gov

AUSTERITY AND EXCEL



Finally, Ms. Reinhart and Mr. Rogoff allowed [researchers at the University of Massachusetts](#) to look at their original spreadsheet — and [the mystery of the irreproducible results was solved](#). First, they omitted some data; second, they used unusual and highly questionable statistical procedures; and finally, yes, they made an Excel coding error. Correct these oddities and errors, and you get what [other researchers have found](#): some correlation between high debt and slow growth, with no indication of which is causing which, but no sign at all of that 90 percent “threshold.”

AUSTERITY AND EXCEL

Table 1. Real GDP Growth as the Level of Government Debt Varies:
Selected Advanced Economies, 1790-2009
(annual percent change)

Country	Period	Central (Federal) government debt/ GDP			
		Below 30 percent	30 to 60 percent	60 to 90 percent	90 percent and above
Australia	1902-2009	3.1	4.1	2.3	4.6
Austria	1880-2009	4.3	3.0	2.3	n.a.
Belgium	1835-2009	3.0	2.6	2.1	3.3
Canada	1925-2009	2.0	4.5	3.0	2.2
Denmark	1880-2009	3.1	1.7	2.4	n.a.
Finland	1913-2009	3.2	3.0	4.3	1.9
France	1880-2009	4.9	2.7	2.8	2.3
Germany	1880-2009	3.6	0.9	n.a.	n.a.
Greece	1884-2009	4.0	0.3	4.8	2.5
Ireland	1949-2009	4.4	4.5	4.0	2.4
New Zealand	1952-2009	2.3	2.3	3.3	3.3
Norway	1880-2009	2.9	4.4	n.a.	n.a.
Portugal	1851-2009	4.8	2.5	1.4	n.a.
Spain	1850-2009	1.6	3.3	1.3	2.2
Sweden	1880-2009	2.9	2.9	2.7	n.a.
United Kingdom	1830-2009	2.5	2.2	2.1	1.8
United States	1790-2009	4.0	3.4	3.3	-1.8
Average		3.7	3.0	3.4	1.7
Median		3.9	3.1	2.8	1.9
Number of observations =	2,317	866	654	445	352

Debt:GDP = 90%+ → 2.2% growth

GENES AND EXCEL

Septin 2

Membrane-Associated
Ring Finger (C3HC4) 1

2310009E13

Actual value	What Excel turns it into
SEPT2	2-Sep
MARCH1	1-Mar
2310009E13	2.31E+19

20% of genetics papers between 2005–2015

GENERAL GUIDELINES

Don't touch the raw data
If you do, explain what you did!

Use self-documenting code
R Markdown!

Ensure code is reproducible
R Markdown!

Use open formats
Use .csv, not .xlsx

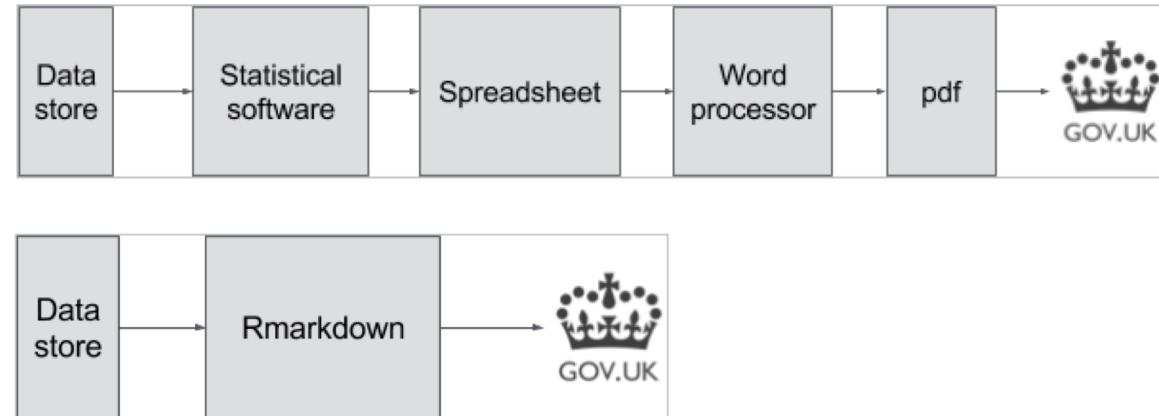
R MARKDOWN IN REAL LIFE

3.1.2 Data Visualization

We use `ggplot2` as our main package to create ad-hoc exploratory graphics as well as polished-looking customized visualizations. When combined with tools to clean and transform data, `ggplot2` allows analysts to quickly translate insights into high quality, compelling visualizations. In addition to the static graphics of `ggplot2`, we often make interactive visualizations or dashboards using R packages such as `plotly` (Sievert et al. 2017), `leaflet` (Cheng et al. 2017), `dygraphs` (Vanderkam et al. 2017), `DiagrammeR` (Sveidqvist et al. 2017), and `shiny` (Chang et al. 2017).

3.1.3 Reproducible Research

At Airbnb, all R analyses are documented in `rmarkdown`, where code and visualizations are combined within a single written report. Posts are carefully reviewed by experts in the content area and techniques used, both in terms of methodologies and code style, before publishing and sharing with the business partners. The peer review process is



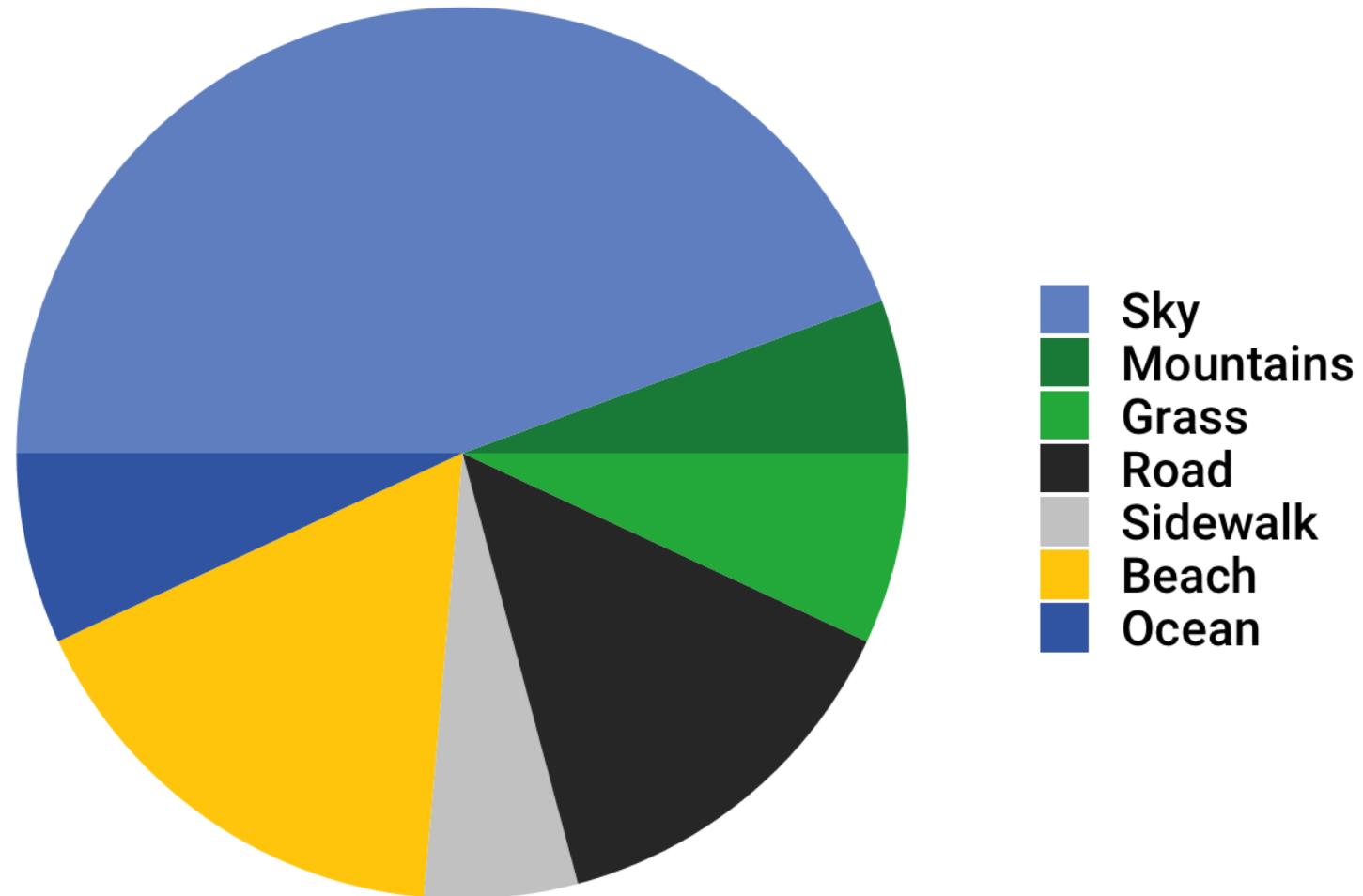
PROPORTIONS

PROBLEMS WITH PIE CHARTS

Why do people hate them?

Why are they bad?

When are they okay?



ALTERNATIVES

29

Percent of Computer Scientists in 2003 who were female

4

Percent of Computer Scientists who were female and African American

2

Percent of Computer Scientists who were female and Asian

1

Percent of Computer Scientists who were female and Hispanic



Percent of Computer Scientists in 2003 who were female



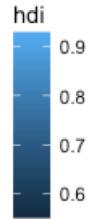
Percent of Computer Scientists who were female and African American



Percent of Computer Scientists who were female and Asian



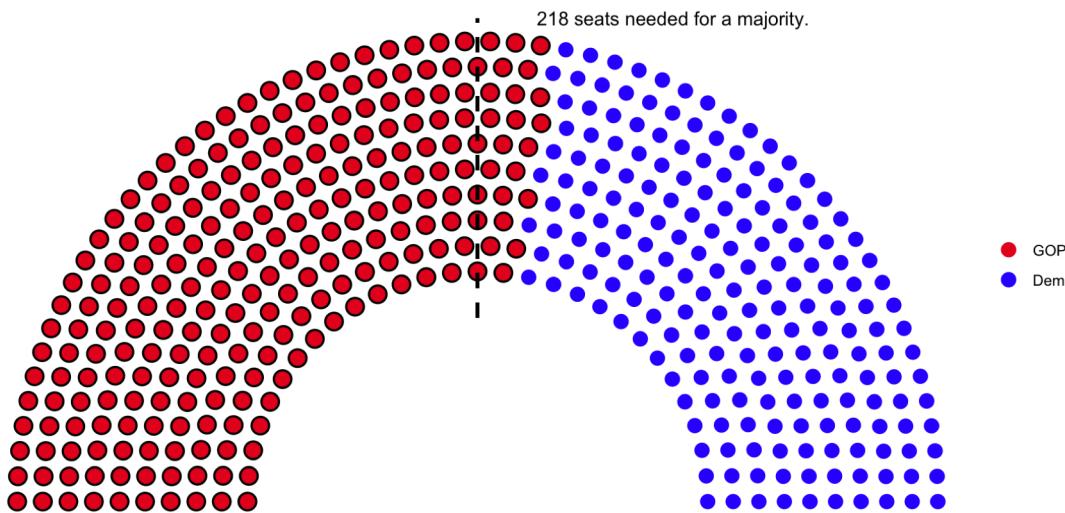
Percent of Computer Scientists who were female and Hispanic



ALTERNATIVES

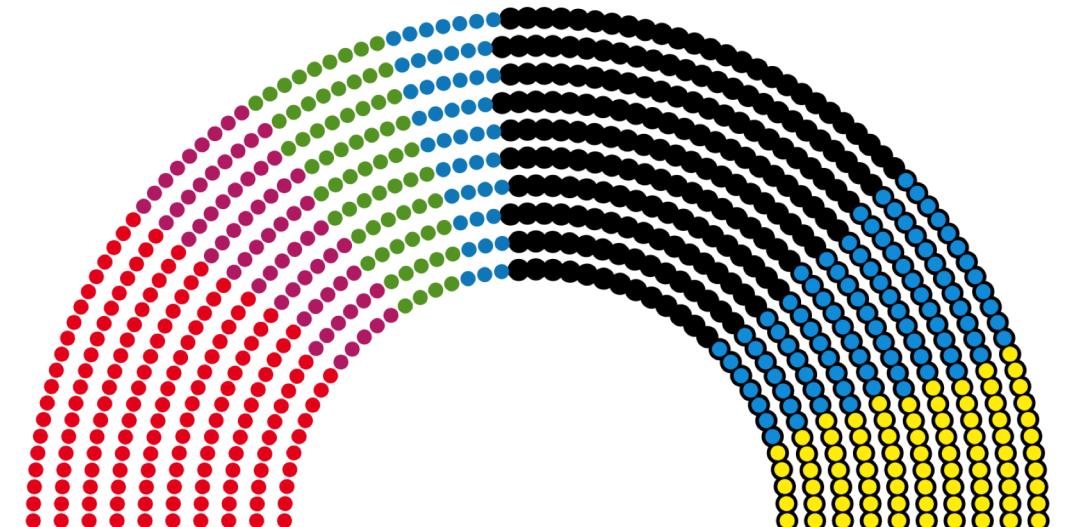
United States House of Representatives

Party that controls the House highlighted.

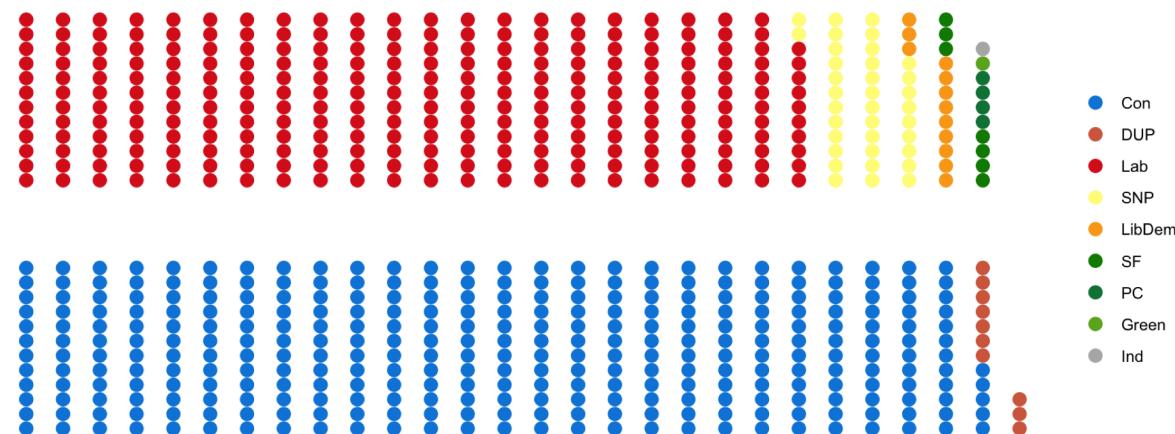


German Bundestag

Government circled in black.



UK parliament in 2017



EXAMPLES AND GGPLOT TIPS