Finance PhD Student Tutorial: Producing Figures Workflow

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Today's Agenda

Focus: How do I build figures that are clear, persuasive, and easy to update in my paper workflow?

1. **Opening Discussion and Reflection (10 min):** What does my current workflow look like to produce figures?
2. **Figure Workflow Overview & Examples (20 min):** What does the flow of figures in a high-quality paper normally look like?
3. **Practical (20 min):** Good versus bad design principles & code workflow
4. **Wrap-up (10 min):** Questions + Applying to your own work

How Do You Currently Build Figures?

Reflect on Your Experience

1. What does your current workflow for producing figures look like?
   - What programming language(s) do I use to produce these and how are they integrated into my paper?
   - Are there any limitations I face in designing or programming figures?

Discussion time: 10 minutes

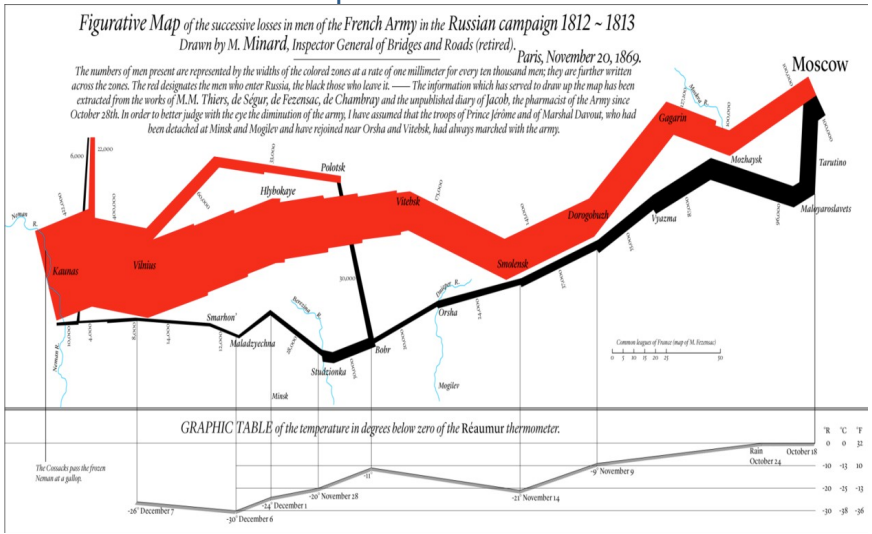
Why Figures Matter?

- Results should be presented in the format that communicates the paper's message most clearly
- Readers typically process evidence in this order:
  1. Figures
  2. Tables
  3. Words
- Tables are often overused because they are easier to produce
- Well-designed figures highlight what is most important in the data
- Figures are most powerful when they are designed around a specific message

A Repeatable Workflow for Producing Figures

1. Start with the question the figure should answer
2. Decide what type of figure best answers it
3. Build a rough version quickly
4. Link the figure to your data/code workflow (so it updates automatically)
5. Remove clutter and label clearly
6. Add one sentence of takeaway text
7. Get feedback: Share your figure with others
8. Revise until the message is obvious

Example: Charles Minard's Map of France's 1812 Invasion of Russia



- Graph shows: (1) geography of campaign, (2) enormous troop losses, (3) location of losses, and (4) extreme temperatures faced

Typical Order of Figures in a Paper

- Most papers rely on the following types of figures

1. **Summary/descriptive figures:** Plot distribution or composition of variable of interest
2. **Motivating figures:** Show growth of key trend of interest, variation in pattern of interest
3. **Event-study figures:** Show dynamic treatment effects graphically
4. **Regression Robustness Figures:** Show robustness of regression results graphically across design choices
5. **Heterogeneity Figures:** Show how the effect varies across groups or settings (time or location)

Examples of High-Quality Figures

1. Did Lenders Facilitate PPP Fraud?: Griffin *et al.* (2023a)
2. Is Fraud Contagious? Social Connections and the Looting of COVID Relief Programs: Griffin *et al.* (2023b)
3. Is Bitcoin Really Untethered?: Griffin & Shams (2020)
4. Beyond the Status Quo: A Critical Assessment of Lifecycle Investment Advice: Anarkulova *et al.* (2023)
5. The Rise in Insurance Costs for Commercial Properties: Causes, Effects on Rents, and the Role of Owners: Kim *et al.* (2024)

- Each paper has a different focus and style depending on where the contribution of the paper lies

Eric Zwick's Graphing Advice: 11 Keys (Zwick, n.d.)

1. Learn from strong examples
2. Use graphs to explore data, not just present regressions
3. Identify the message
4. Let the data be the hero
5. Iterate relentlessly
6. Use colors and shapes deliberately
7. Label axes clearly
8. Put takeaway text directly on graphs
9. Use binscatters carefully
10. Graphs are useful even in theory
11. Good graphs make presentations engaging

Messy versus Clean Figures: What's Different

Messy/Unclear Figure

Figure A.1: Relationship between IPO Withdrawal and Nasdaq Returns
This figure shows the time-varying shift in the relationship between IPO withdrawal and Nasdaq fluctuations from 1985 to 2012. An increase in magnitude indicates a strengthening of the relationship while a reduction indicates a weakening of the relationship. The dotted vertical lines in 1996 and 2007 correspond to the structural breaks in time that result in the smallest Bayesian Information Criterion (BIC). Coefficient estimates of the effect of Nasdaq return fluctuations on the probability of IPO completion are at the monthly level.

Clear/Compelling Figure

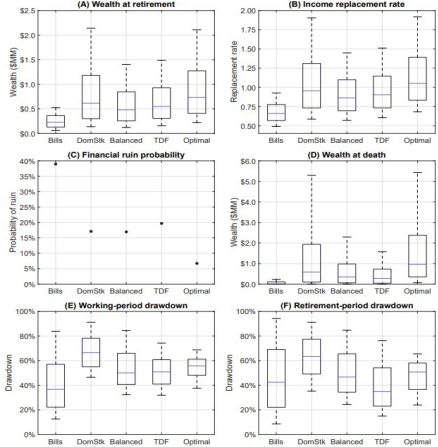


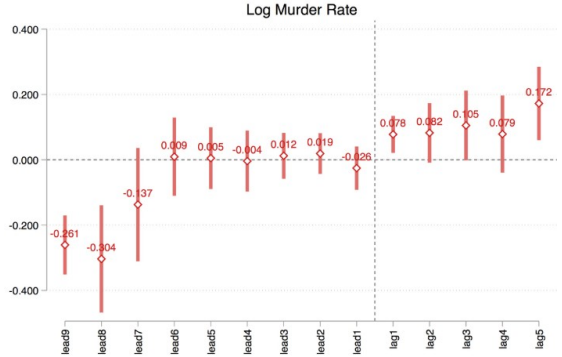
Figure 5. Measures of investment performance. The figure summarizes the distribution of real wealth at retirement (Panel A), the distribution of the real income replacement rate (Panel B), the probability of financial ruin (Panel C), the distribution of real wealth at death (Panel D), the distribution of the working-period drawdown (Panel E), and the distribution of the retirement-period drawdown (Panel F) across 1,000,000 bootstrap simulations for households adopting various asset allocation strategies. In each box-and-whiskers plot, the middle line corresponds to the median, the box covers the interquartile range, and the whiskers cover the 10th through 90th percentiles.

Integration of Coding Resources is your Friend:

Sample Stata Code

```
use https://github.com/scunning1975/mixtape/raw/master/castle.dta,
      clear
set scheme cleanplots

* define global macros
global crime1 jhcitizen_c jhpolice_c murder homicide robbery
      assault burglary larceny motor robbery_gun_r
global demo blackm_15_24 whitem_15_24 blackm_25_44 whitem_25_44
global lintrend trend_1-trend_51
global region r20001-r20104
global exocrime l_larceny l_motor
global spending l_exp_subsidy l_exp_pubwelfare
global xvar l_police unemployrt poverty l_income l_prisoner
      l_lagprisoner $demo $spending

xi: xtreg l_homicide i.year $region $xvar $lintrend post
      [aweight=popwt], fe vce(cluster sid)

* Event study
xi: xtreg l_homicide i.year $region lead9-lead1 lag1-lag5
      [aweight=popwt], fe vce(cluster sid)

coefplot, keep(lead9-lead1 lag1-lag5) ///
    yline(0) xline(9.5) vertical ///
    msymbol(D) mfcolor(white) ///
    title(Log Murder Rate)
```

Stata plot: Cheng & Hoekstra (2013)



- We can also dynamically call figures from R or Stata to reproduce all figures with one click

Before Next Week (1 Hour)

- Reflect (30 minutes):
  1. How can my current figure workflow be improved?
  2. Do I need to invest more time understanding the design of figures or improving my coding?
- Explore (30 minutes):
  1. Find one paper with excellent graphical analysis in your area of interest
  2. R Graph Gallery
  3. Data Visualization in Stata
  4. Eric Zwick's Advice
  5. Economist's Craft pp. 108–112

References

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