

# MATERIALS FOR ARE212

ETHAN LIGON

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A pdf version of this file can be found at README.pdf

## 1. GENERAL POLICIES

### 1.1. Grading.

1.1.1. *Final Exam.* The final exam will be “take-home”, and be made available by 6pm on Monday, May 11. It will be due 24 hours later, by 6pm Tuesday May 12.

### 1.2. Readings.

- “Hansen” refers to Gary Hansen’s Econometrics Textbook.
- Unresolved references of the form “**foo84**” or similar are keys with values that can be looked up in are212.bib. This last is a bibtex database which you’re free to use. The bibtex file includes some links to pdf files which you may find useful.

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. *Date:* April 23, 2020.

### 1.3. Discussion Sections.

1.3.1. *When: Fridays 10:10-11am.*

1.3.2. *Where: Zoom.* Benjamin Krause's Personal Meeting Room

Join Zoom Meeting <https://berkeley.zoom.us/j/5519986624>

Meeting ID: 551 998 6624 One tap mobile +16692192599,,5519986624#  
US (San Jose) +16699006833,,5519986624# US (San Jose)

Dial by your location +1 669 219 2599 US (San Jose) +1 669 900  
6833 US (San Jose) +1 312 626 6799 US (Chicago) +1 646 558 8656  
US (New York) Meeting ID: 551 998 6624 Find your local number:  
<https://berkeley.zoom.us/j/5519986624>

Join by SIP 5519986624@zoomcrc.com

Join by H.323 162.255.37.11 (US West) 162.255.36.11 (US East)  
221.122.88.195 (China) 115.114.131.7 (India Mumbai) 115.114.115.7  
(India Hyderabad) 213.19.144.110 (EMEA) 103.122.166.55 (Australia)  
209.9.211.110 (Hong Kong) 64.211.144.160 (Brazil) 69.174.57.160 (Canada)  
207.226.132.110 (Japan) Meeting ID: 551 998 6624

1.3.3. *Discussion Section Materials.*

- Section Notes on R can be found on bcourses
  - Zoom recording on March 20, 2020 (first remote section)
- Section Notes on Python can be found in the folder above
  - Python 01.ipynb and the zoom recording on April 03, 2020
  - Python 02.ipynb and the zoom recording on April 10, 2020
  - Python 03.ipynb and the zoom recording on April 17, 2020

1.3.4. *Learning goals for this series of discussion sections.*

- Build off of skills we developed with R to provide a basic familiarity of coding in Python (and deepen your overall understanding of coding for econometrics in the process)
- Move from (potentially) no previous Python experience to being able to follow lecture applications and engage in bcourses discussions via Python

1.3.5. *GSI expectations for the rest of the semester.*

- See the Discussion Section Syllabus for general information.
- Office Hours are going to continue to be by appointment, and primarily via email.

### 1.3.6. *Reminder of Additional Services and Support.*

- UC Berkeley Covid-19 News and Information
- Covid-19 info for UC Berkeley Grad Students
- Counseling and Psychological Services: These services continue to be available for all of us. If you're struggling, they're here to help.
  - Phone: (510) 642-9494
  - Counseling after-hours support line: (855) 817-5667
- Crisis Text Line: (Not affiliated with the University) For 24/7 support for those in crisis, text HOME to 741741 anywhere in the United States. "Social distancing may be lonely, but you're not alone."

## 2. VIDEOS

See ARE212 Youtube Channel for videos of lectures, etc.

### 2.1. **HowTos.**

**GitHub:** How to view, files, fork, edit, and issue pull requests (PRs). <https://youtu.be/krDQk5ZzP8U>

**GitHub to DataHub:** How to use datahub to run & edit code from github: <https://youtu.be/1Y4D-Li3UgY>

## 3. TOPICS

### 3.1. **Multiple Equation Models.**

- Notes on Multiple Linear Equation Models
- Reading
  - Hansen Ch. 11. General contemporary reference on systems of linear regressions.
  - Trygve Haavelmo. 1944. The probability approach in econometrics. *Econometrica* 12 (Supplement): 1–118. Classic discussion of the "probability approach" to estimating economic models; one of the key documents distinguishing econometrics from statistics; one of the key
  - Carl F Christ. 1994. The Cowles Commission's contributions to econometrics at Chicago, 1939-1955. *Journal of Economic Literature* 32 (1): 30–59. <https://www.jstor.org/stable/pdf/2728422.pdf>. Discussion of the birth of econometrics at the Cowles Commission; beyond its historical importance, worth reading to understand the source of much of the jargon we now use.

- Stock and Trebbi 2003; S. Wright 1921; P. G. Wright 1928 (Appendix B). On the origins of instrumental variables. The Wright papers are some of the earliest and clearest discussions of identification.
- Jupyter notebooks
  - file:random\_variables0.ipynb
  - classical\_regression.ipynb
  - file:weighted\_regression.ipynb

### 3.2. Causality & Correlation.

- Notes on Causality & Correlation
- Reading
  - Ragnar Frisch. 2011. *A dynamic approach to economic theory: lectures by Ragnar Frisch at Yale University*. Edited by Olav Bjerkholt and Duo Qin. Lectures given by Frisch at Yale in 1930. Routledge. Highly insightful and only recently published lectures Frisch gave at Yale in 1930.
  - Trygve Haavelmo. 1943. The statistical implications of a system of simultaneous equations. *Econometrica, Journal of the Econometric Society*: 1–12. A founding document of the structural (Cowles Commission) approach to economics.
  - Trygve Haavelmo. 1944. The probability approach in econometrics. *Econometrica* 12 (Supplement): 1–118. Classic statement regarding the “probability approach” to economics.
  - Arthur S. Goldberger. 1972. Structural equation methods in the social sciences. *Econometrica* 40 (6): 979–1001. Insightful, historically informed reflections on identification of structural models in economics.
  - Judea Pearl. 2015. Trygve Haavelmo and the emergence of causal calculus. *Econometric Theory* 31 (1): 152–179; James Heckman and Rodrigo Pinto. 2015. Causal analysis after Haavelmo. *Econometric Theory* 31 (1): 115–151; Judea Pearl. 2013. Reflections on Heckman and Pinto’s “causal analysis after haavelmo”. Unpublished working paper. <https://escholarship.org/content/qt5b27h1nm/qt5b27h1nm.pdf>. Back and forth between Pearl & Heckman/Pinto. They agree on one thing: Frisch & Haavelmo were right.

- Judea Pearl. 2009. *Causality*. Models, Reasoning, and Inference. Second. New York: Cambridge University Press. Pearl’s textbook on causality.
- Milton Friedman. 1953. The methodology of positive economics. In *Essays on positive economics*, 3–43. Chicago: University of Chicago Press. Classic essay on the usefulness of “falsifying” economic models and the role of assumptions.
- Stanford Encyclopedia of Philosophy, “The Problem of Induction”
- Hume, An enquiry concerning human understanding
- Sewell Wright <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC1200501/pdf/111.pdf>
- Guido W Imbens and Donald B Rubin. 2015. *Causal inference in statistics, social, and biomedical sciences*. Cambridge University Press. Up-to-date statement and discussion of the Neyman-Rubin potential outcomes model, with focus on the assignment model.
- James J Heckman. 2010. Building bridges between structural and program evaluation approaches to evaluating policy. *Journal of Economic literature* 48 (2): 356–98. Contemporary survey comparing “reduced form” and “structural” approaches to causal inference.
- James J. Heckman. 1997. Instrumental variables: a study of implicit behavioral assumptions used in making program evaluations. *The Journal of Human Resources* 32 (3): 441–462. <http://www.jstor.org/stable/146178>. Critique of potential outcome approach in program evaluation.
- Jupyter notebooks
  - wright34.ipynb

### 3.3. Identification & Instrumental Variables.

- Notes on Identification and Instrumental Variables
- Reading
  - Hansen Chapter 12
  - Joshua D Angrist and Alan B Krueger. 2001. Instrumental variables and the search for identification: from supply and demand to natural experiments. *Journal of Economic Perspectives* 15 (4): 69–85
  - Timothy G Conley, Christian B Hansen, and Peter E Rossi. 2012. Plausibly exogenous. *Review of Economics and Statistics* 94 (1): 260–272

- Victor Chernozhukov and Christian Hansen. 2008. The reduced form: a simple approach to inference with weak instruments. *Economics Letters* 100 (1): 68–71. [https://faculty.chicagobooth.edu/christian.hansen/research/ch\\_weakiv\\_mar07.pdf](https://faculty.chicagobooth.edu/christian.hansen/research/ch_weakiv_mar07.pdf)
- Data
  - Angrist-Krueger (1991)

### 3.4. Generalized Method of Moments.

- Notes on GMM
- Reading
  - Hansen Chapter 13
  - Review normal linear regression model (E.g., Hansen Chapter 5)
  - Gary Chamberlain. 1987. Asymptotic efficiency in estimation with conditional moment restrictions. *Journal of Econometrics* 34:305–334
  - Whitney K. Newey and Kenneth D. West. 1987. Hypothesis testing with efficient method of moments estimation. *International Economic Review* 28 (3): 777–787
- Further notes on GMM Estimation
- Jupyter notebook exploring GMM in finite samples (github/datahub)

### 3.5. Resampling & the Bootstrap.

- Notes on Data Generating Processes and the Bootstrap
- Reading
  - Hansen Chapter 10

## REFERENCES

- Angrist, Joshua D, and Alan B Krueger. 2001. Instrumental variables and the search for identification: from supply and demand to natural experiments. *Journal of Economic Perspectives* 15 (4): 69–85.
- Chamberlain, Gary. 1987. Asymptotic efficiency in estimation with conditional moment restrictions. *Journal of Econometrics* 34:305–334.
- Chernozhukov, Victor, and Christian Hansen. 2008. The reduced form: a simple approach to inference with weak instruments. *Economics Letters* 100 (1): 68–71. [https://faculty.chicagobooth.edu/christian.hansen/research/ch\\_weakiv\\_mar07.pdf](https://faculty.chicagobooth.edu/christian.hansen/research/ch_weakiv_mar07.pdf).

- Christ, Carl F. 1994. The Cowles Commission's contributions to econometrics at Chicago, 1939-1955. *Journal of Economic Literature* 32 (1): 30-59. <https://www.jstor.org/stable/pdf/2728422.pdf>.
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- . 2015. Trygve Haavelmo and the emergence of causal calculus. *Econometric Theory* 31 (1): 152–179.
- Stock, James H, and Francesco Trebbi. 2003. Retrospectives: who invented instrumental variable regression? *Journal of Economic Perspectives* 17 (3): 177–194.
- Wright, Philip G. 1928. *Tariff on animal and vegetable oils*. Macmillan Company, New York.
- Wright, Sewell. 1921. Systems of mating. I. The biometric relations between parent and offspring. *Genetics* 6:111–123. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC1200501/pdf/111.pdf>.