Practical Data Curation for Reproducibility

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Semantics

- Not the point of this presentation
- Using these terms informally:
 - Curation
 - Data management
 - Replication
 - Reproducibility
 - Etc.

Broad definition of validation

Type	Example Files	Use
Verification*	Original Dataset Original Code	Original Dataset Original Code
Reanalysis*	Original Dataset	Original Dataset New or Altered Computer Code
Reproduction*	Original Code	Original Code New Dataset within Original Population
Extension*	Original Code	Original Code New Dataset within New Population
Reuse	Original Dataset	Original Dataset Combined with New Dataset New Code
Exact Reproduction	Table/Graph/Chart File	Reproduced in Review Section

*Clemens, Michael A. (2015). "The meaning of failed replications: A review and proposal." Journal of Economic Surveys, 31(1): 326-342. <https://doi.org/10.1111/joes.12139>

Reproducibility

- Answering the question:
“What can I do to make my data usable in the future to relevant stakeholders?”
- Break down in (almost) reverse order
 - Data
 - Stakeholders
 - Future
 - Usable

One size does not fit all

- No across-the-board template
- Various standards for specific purposes
- Use the strategy that meets your needs

Ver 1: **STAT. after LOG-LINX**

① BGP growth: $\bar{g}^*$
 $\Delta \lambda^* = \bar{\lambda}$

② BGP point
 Numeraire: $X_1^* = 1$

③ Log-lin around $\{X_1^*, g_1^*\}$
 $\log g_t - \log g_1^* = (\log g_0 - \log g_1^*) + g_2^* \lambda_0^* \log \lambda + u_g^t$

"What can I do to make **my data** usable in the future to relevant stakeholders?"

$$g_t^* = \lambda^{\frac{g_2^*}{1+g_2^*}} g_{t-1}^*$$

$$\begin{aligned} X_t^* &= \lambda^{\bar{\lambda}} X_{t-1}^* \\ X_t^* &= (1+\bar{\lambda}) X_{t-1}^* \\ X_{t-1}^* &= \frac{X_t^*}{1+\bar{\lambda}} \end{aligned}$$

How I know numerical values of BGP points at $t=1$

$$\{X_1^*, g_1^*\} = \left[1, \frac{g_2^*}{1+\bar{\lambda} - g_1^*} \right]$$

$$\frac{1}{1+\bar{\lambda}} \hat{X}_{t-1}^* + u_g^t$$

BGP property $\rightarrow$ constant

Spectrum of (research) types

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Home > Publications > Research & Data Publications > Research Working Papers > A Model of Monetary Policy shocks for Financial Crises and Normal Conditions

Research Working Paper

A Model of Monetary Policy shocks for Financial Crises and Normal Conditions

By John W. Keating, Logan J. Kelly, A. Lee Smith and Victor J. Valcarcel

A Model of Monetary Policy Shocks for Financial Crises and Normal Conditions

Download paper, RWP 14-11, February 16, 2018

Deteriorating economic conditions in late 2008 led the Federal Reserve to lower the target federal funds rate to near zero, inject liquidity into the financial system through novel facilities, and engage in large scale asset purchases. The combination of conventional and unconventional policy measures prevents using the effective federal funds rate to assess the effects of monetary policy beyond 2008. This paper develops an approach to identify the effects of monetary policy shocks in such instances. We employ a newly created broad monetary aggregate to elicit the effects of monetary policy shocks both prior to and after 2008. Our model produces plausible responses to monetary policy shocks free from price, output, and liquidity puzzles that plague other approaches. It also produces a series of monetary policy shocks which aligns well with major changes in the Fed's asset purchase programs.

JEL Classification: E3; E4; E5

Article Citation

- Keating, John W., Logan J. Kelly, A. Lee Smith, Victor J. Valcarcel. 2018. "A Model of Monetary Policy Shocks for Financial Crises and Normal Conditions," Federal Reserve Bank of Kansas City, working paper no. 14-11, February, available at <https://doi.org/10.18651/RWP2014-11>

Related Research

- Christiano, Lawrence J., Martin Eichenbaum, and Charles L. Evans. "Monetary policy shocks: What have we learned and to what end?." *Handbook of macroeconomics* 1 (1999): 65-148.
- Belongia, Michael T., and Peter N. Ireland. "Interest rates and money in the measurement of monetary policy." *Journal of Business & Economic Statistics* 33.2 (2015): 255-269.

Additional Files

- Appendix
- Replication Code and Data

FIND DATA • START SHARING DATA • MEMBERSHIP • SUMMER PROGRAM • TEACHING & LEARNING • DATA MANAGEMENT & CURATION •

ICPSR Find & Analyze Data

Log In/Create Account

FIND DATA • SEARCH/COMPARE VARIABLES • DATA-RELATED PUBLICATIONS • RESOURCES FOR STUDENTS • HELP

Economic Behavior of the Affluent, 1964 (ICPSR 7429)

Published: Mar 2, 2010 [View this study](#) | [Share this study](#)

Principal Investigator(s):
 Robin Barlow, Harvey Brazer, James N. Morgan
<https://doi.org/10.3886/ICPSR07429.v2>

Version V2

Download Analyze Online (R)

At A Glance

Project Description

Summary

This study investigated high-income individuals in their roles as investors and workers. Questions were asked about savings objectives and investment policies, trust fund ownership, delegation of investment management, sources of information on investing, kinds of assets held, reasons for choosing particular assets, gifts and inheritances received, philanthropic giving and gifts to relatives, and capital gains and losses. Respondents' acquisition, handling, and expected disposition of assets were also explored, along with factors affecting portfolio decisions and the work effort of heads of households and their spouses. Finally, information was collected on occupation and work experience of both family head and spouse, family income and income patterns, and taxes and tax considerations, as well as structure and social characteristics of the family. Demographic data on respondents include sex, race, year of birth, marital status, number of dependents, level of education, religious preference, and political identification.

Citation

Barlow, Robin, Brazer, Harvey, and Morgan, James N. Economic Behavior of the Affluent, 1964. Ann Arbor, MI: Inter-university Consortium for Political and Social Research [distributor], 2010-03-02. <https://doi.org/10.3886/ICPSR07429.v2>

Export Citation:

- (generic format for RefWorks, EndNote, etc.)
-

Funding

National Science Foundation
 Ford Foundation
 Brookings Institution

Subject Terms

Scope of Project

Methodology

Version(s)

311 downloads

Notes

- Data in this collection are available only to users at ICPSR member institutions.

ICPSR

This study is provided by ICPSR. ICPSR provides leadership and training in data access, curation, and methods of analysis for a diverse and expanding social science research community.

And everything in between

- Source data (primary or secondary)
- Excerpted data
- Intermediate data
- Final (output) data
- Code

“What can I do to make my data usable
in the future to **relevant stakeholders**?”

Who are you doing this for?

- Public trust and confidence
 - Reproducibility Crisis
 - Loss of trust in public institutions
- Policies and mandates
 - Journals
 - Funders
- Internal operations
 - Passing the baton
 - Record retention guidelines
- Yourself
 - Increase citations?

Oh fun, more work

- The “right thing to do” is not always terribly incentivizing for day-to-day tasks
- Journal/funder/audit mandates = bare minimums
- Researcher = #1 stakeholder
 - Curate for you!

Often separate processes

Build incrementally

Make your life easier!

- File naming
- Versioning
- Logical organization
- Open source or ubiquitous file formats

Not as bad as it seems

- Reproducibility can get a bad rap
 - compliance
 - second-guessing of results
- Reproducibility *practices* can make life easier – research integrity is a bonus!

Our method

- Make recommendations
- Provide evidence, reasoning, support, horror stories
- Up to researcher what makes most sense

A wide-angle photograph of a construction site showing a large wooden roof deck under construction. Numerous workers in safety gear (hard hats, high-visibility vests) are visible across the site. Some are standing on the roof, while others are near the edge. The background shows a dense forest of evergreen trees under a clear sky. The text "What can I do to make my data usable in the future to relevant stakeholders?" is overlaid in the center. The words "in the future" are highlighted in yellow.

“What can I do to make my data usable
in the future to relevant stakeholders?”

You can't reproduce what doesn't exist

- A data/code file not being actively preserved is at risk of:
 - Bit rot/file corruption
 - Obsolescence
 - Personal knowledge loss
 - Disappearance into the abyss (no inventory)
- Preservation is necessary to ensure reproducibility in 1, 5, 10, 20+ years (economic research half-life)

Preservation mechanisms

- Established repositories are experts
 - Use their expertise!
- Restricted data can get tricky

DIY projects

- Strategy
 - Technology agnostic
- SaaS – Open source is like free puppies
- Preservation platform $\neq$ discovery platform

Desirable features

- Software
 - OAIS compliance (ISO 14721)
 - 3-2-1 backup
 - Fixity repairs
 - File format migration
 - User Friendly
- Process
 - Dedicate point person(s)
 - Coordination, consistency
 - Manage timelines/expectations
 - Manual work, reduce burden
 - Accept everything
 - Automate when possible

“What can I do to make my data **usable**
in the future to relevant stakeholders?”

Just three little topics

- Permissions and Restrictions
- Metadata/Documentation
- File Handling

Permissions and Restrictions

Where do restrictions come from?

Primary Data

- IRB Study
- Non-disclosure agreement to participants
- End User License Agreement
- Site License
- State Law
- Federal Law

Secondary Data

- End User License Agreement
- Site License
- State Law
- Federal Law
- Formal Contracts

Restrictions

- At a minimum, understand the terms
- Even better, negotiate better terms!
- Don't be afraid to ask for additional permissions later
 - *Note: this is **not** a “better to ask for forgiveness” situation*

Checklist

- Publications
 - Review requirements
 - Citations
 - Reporting
- Data
 - Sharing internally, externally
 - Authorized users (co-authors)
 - Aggregation levels
- Termination
 - Continued use
 - Preservation/purging

Pay it forward

- Specify restrictions in documentation
 - Proprietary vendors will be appreciative!
- Do not give permissions that you do not have the authority to give

*Any data provided herein is provided pursuant to a license between the data provider and the Federal Reserve Bank of Kansas City, is proprietary, and may not be redistributed. The Federal Reserve Bank of Kansas City does not own the data and cannot authorize its redistribution to any other party. Please contact the data provider for any questions concerning redistribution of the included data.

Metadata and Documentation

Legitimate products of research

- Force11 Principle #1:

"Data should be considered legitimate, citable products of research. Data citations should be accorded the same importance in the scholarly record as citations of other research objects, such as publications."

Citations

- For your data
- For the data sources
- Formatting not yet standardized but should include:
 - Title
 - Author/Creator
 - Publication Date
 - Persistent Identifier
 - Publisher/Distributor

Legitimate products of research

- Force11 Principle #1:

"Data should be considered legitimate, citable products of research. Data citations should be accorded the same importance in the scholarly record as citations of other research objects, such as publications."

- Take it a step further:

*Data should be considered legitimate, **discoverable** products of research. Data **metadata** should be accorded the same importance in the scholarly record as **metadata** of other research objects, such as publications.*

Typical article metadata

- Title
- Author, Affiliations
- Abstract
- Keywords
- Citation
- Date(s)
- Identifier (e.g., DOI)
- Copyright
- References
- Publisher
- Funding

What's missing?

- Data Collector / Producer
- Sampling and Sampling Procedures
- Weighting
- Substantive, Temporal and Geographic Coverage
- Data Source(s)
- Unit(s) of Analysis / Observation
- Variables
- Technical Information on Files
- Data Collection Instruments
- Flowchart of the Data Collection Instrument
- Abbreviations and Other Conventions
- Interviewer Guide
- Coding Instrument
- And more...

Helpful context

Job Opening and Labor Turnover Survey

The Job Opening and Labor Turnover Survey (JOLTS) is a monthly dataset that samples approximately 16,400 private, nonfarm establishments and government offices regarding job openings, hires and separations.

The Job Opening and Labor Turnover Survey (JOLTS) is a monthly dataset that samples private, nonfarm establishments and government offices regarding employment. Specifically, JOLTS asks approximately 16,400 establishments several questions about employment, job openings, hires, and separations. Participating establishments provide data for up to 24 months. These data are publicly available back to December 2000 and are collected by the Bureau of Labor Statistics.

The JOLTS Museum Room

Data Access

Data for the Job Opening and Labor Turnover Survey (JOLTS) can be found on [FRED](#) or on the [BLS website](#).

Key Concepts

Information on the content of the JOLTS data. Specifically, the purpose of the survey, details and definitions of the main data series, and technical information.

Related Research

A sample of Federal Reserve System research that uses JOLTS data.

Metadata at a Glance (Full Metadata)

Sample population or universe: Private, nonfarm U.S. establishments and government offices

Collection method: Survey, participants provide data for up to 24 months

Frequency and timeframe: Monthly since December 2000

Notion of dimension: 16,400 in scope establishments each month give data for half a dozen data series

Purpose and main content: Provides information on employers with regards to employment, job openings, hires, and separations.

Access and use information: Publicly available

Producer and publisher: Bureau of Labor Statistics

Acknowledgments

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Research Working Paper

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Additional Files

- [Appendix](#)
- [Replication Code and Data](#)

ReadMe

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License

For research that uses this data, please cite:

Smith, A. Lee. 2018. Data and Code Files for the paper "How Much of the Fall in Inflation Can be Explained by Energy and Import Prices?" Federal Reserve Bank of Kansas City, The Macro Bulletin, January 16, 2016. Available at <https://www.kansascityfed.org/people/andrewleesmith>

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Manifest

Folder	File Name	File Type	Description
2018_smith_mb-20160115_data-code	ReadMe.pdf	PDF	License, citations, and information on file types and use
2018_smith_mb-20160115_data-code	oil_var_labels.xlsx	Microsoft Excel Worksheet	
2018_smith_mb-20160115_data-code	rats_var_code.RPF	RATS Program File	This is the main script that produces the output used to create Figure 2 in The Macro Bulletin
2018_smith_mb-20160115_data-code	mcfevdtable.src	RATS Source File	
2018_smith_mb-20160115_data-code	mcgraphirf.src	RATS Source File	
2018_smith_mb-20160115_data-code	mcvardordraws.src	RATS Source File	
2018_smith_mb-20160115_data-code	varlagselect.src	RATS Source File	

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Data Citations

Bureau of Economic Analysis (BEA). 2015. Personal Consumption Expenditures (PCE). January 1985 – October 2015. Accessed through Haver Analytics.

Bureau of Economic Analysis (BEA). 2015. Personal Consumption Expenditures (PCE) excluding food and energy. January 1985 – October 2015. Accessed through Haver Analytics.

Bureau of Labor Statistics (BLS). 2015. Consumer Price Index (CPI). January 1985 – October 2015. Accessed through Haver Analytics.

Federal Reserve Board of Governors. 2015. Foreign Exchange Rates – G.5 Monthly: Broad. January 1985 – October 2015. Accessed through Haver Analytics.

London Baltic Exchange. 2015. Baltic Dry Index (BDI). January 1985 – October 2015. Accessed through Thomson Reuters.

U.S. Energy Information Administration (EIA). 2015. Production of Crude Oil including lease condensate. January 1985 – October 2015. Accessed through Haver Analytics.

Wall Street Journal and U.S. Energy Information Administration (EIA)¹. 2015. Spot Price Crude Oil West Texas Intermediate (WTI). January 1985 – August 2015. Accessed through Haver Analytics.

¹ According to Haver Analytics, this series was discontinued by the Wall Street Journal in August 2013 and is since continued by the EIA.

ReadMe

- Project description
- List of authors with contact info
- Information on use
 - Configuration, dependencies
 - Compiled? Inputs, outputs
- Mechanism(s) to provide feedback

Embeddedness

- Metadata contained with the object itself; or
- Metadata applied within a content management system; or
- Metadata embedded within a related file in the same collection

Description level

- Describing individual objects can be resource-intensive; collection description usually more efficient
- Examples of when to consider granular description:
 - Security restrictions on the source dataset differ from the calculated results
 - no need to restrict the whole collection
 - Code requires a specific version of software to run
 - don't want to lose context

Examples

Field	Embeddedness*	Hierarchical Level*
Title	File	File
Author	File	Collection
File format	Associated File (ReadMe)	File
License	Associated File (ReadMe)	Collection
Access Rights	Applied	File
Subject	Applied	Collection

*Lowest level, could also be included at higher levels

Cat is out of the bag

- Make (some) metadata available for restricted data
 - If they can know the data exists, they can know *something* about it
- Can help with understanding research
- Can help determine if obtaining access is possible and/or worthwhile

Seven core characteristics

- Sample Population or Universe
- Collection Method
- Frequency and Timeframe
- Notion of Dimension
- Purpose and Main Content
- Access and Use Information
- Producer or Publisher

Examples

Current Population Survey

The Current Population Survey is a monthly address-based survey of U.S. households that gathers geographic, demographic, and employment status information. These data are used to calculate several national indicators of employment, such as the unemployment rate and labor force participation. In its current iteration, data on over 150,000 respondents are collected monthly to create around 400 variables. The CPS survey data are collected by the Census on behalf of the Bureau of Labor Statistics and are publically available dating back to 1976.

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[Acknowledgments](#)

Multiple metadata mapping

- Don't expect one schema or standard to meet all needs
 - Be careful with frankenschemas
- Map similar terms
 - title should mean the same thing across relevant schemas
- Consider a repository
 - Help illuminate both consistencies and inconsistencies

File Handling

Naming

- Use meaningful names (i.e., NOT draft1)
- Use lower case (hyphens, underscores)
- Standardize dates (ISO YYYY-MM-DD)
- Ex: 2018_smith_mb-20160115_data-code
Ex: 20180618_butler_data-citation_twp

Formats and organization

- Work in open source or ubiquitous formats
 - Document or provide open source alternatives
- Organize logically
- Use relative paths in code

Variable naming

- Clear but succinct
 - Too long: `variable_for_iterating_over_loop`
 - Too short: `i`
- Avoid using “tmp” and meaningless 1up numbering (`fn1`, `fn2`, ...)
- Be consistent

Code commenting

- Files, functions, and classes should have a brief description (what/why)
 - “how” not necessary, code should do that
- Provide enough information so the user does not have to read the code to understand
 - Expected input(s)/output(s) and data types

Use small functions

- Generic, can be shared between projects
- Easier to read, remember
- Easier to update/replace/improve
- Easier to isolate and debug

Suggestion rule of thumb: fit on one page (no scrolling)

Containerization

- In addition to data and code, preserve the *environment*
- Helps with dependency issues (OS, software, libraries, environment variables, etc.)
 - Only dependent on container platform (i.e. Singularity, Docker)
- Content of a container operates identically across hardware

Stack 'em

- Stackable
- Allows reuse of computing environment across multiple projects

Final Thoughts

Work from standards

- No need to reinvent the wheel
- No shortage of resources available
- Helpful community willing to share!

<https://cf10rugbytrust.org/blog/the-truth-is-out-there>

Something is always better than nothing

- Start with what makes *your* life easier
- Build practices to meet specific needs
- Simply: describe it, make it usable, keep it around

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Thealexa Becker

Greg Woodward

Tom Cook

Christina M. Kulp

A. Lee Smith

Thank you!

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