Replication files for "Structural Breaks in an Endogenous Growth Model" by Timothy Cogley and Boyan Jovanovic, Review of Economic Studies MS26008 (revised May 11, 2021)

Overview

The replication files are organized by section. Our programs are written in Matlab and draw on subroutines in NAG's Matlab toolbox as well as Miranda and Fackler's (2002) CompEcon toolbox for Matlab.

Files for reproducing the figures are labeled figure\*m. The relevant data can be found in the same subdirectory as each figure file.

Data

*Real private-sector GDP*

The data are annual and cover the period 1889-2015. Two sources are spliced together at 1929. Data for the period 1889-1929 are taken from Kendrick (1961), while those for the period after 1929 were downloaded from the US Bureau of Economic Analysis National Income and Product Accounts (BEA).

1889-1929: Real gross private domestic product was copied from Kendrick (1961), Appendix A, Table A-III, column 8, and entered into an excel spreadsheet (See kendrick-gordon\_data.xls in our archive, entries H2:H55). Kendrick’s book is publically available and can be found in many university libraries.

1929-2015: Real gross private domestic product was computed using various series from the US BEA National Income and Product Accounts. The BEA data are publically available and can be downloaded by going to <https://apps.bea.gov/iTable/iTable.cfm?reqid=19&step=2&isuri=1&1921=survey#reqid=19&step=2&isuri=1&1921=survey>

Then select the following options:

* Section 1: Domestic Product and Income
* Table 1.1.6: Real Gross Domestic Product, Chained Dollars
* Modify: 1929-present, billions, annual
* Download

Real gross domestic product can be found in line 1.

*Adjusting for government’s share*

As explained in appendix A, two series were used to adjust for government’s share,

* Nominal gross domestic product, 1929-2016
* Nominal government expenditures, 1929-2016

To download nominal gross domestic product, go back to

<https://apps.bea.gov/iTable/iTable.cfm?reqid=19&step=2&isuri=1&1921=survey#reqid=19&step=2&isuri=1&1921=survey>

Then select

* Section 1: Domestic Product and Income
* Table 1.1.5: Nominal Gross Domestic Product
* Modify: 1929-present, billions, annual
* Download (we used an excel format)

Nominal GDP can be found in line 1.

To download nominal government expenditures, return to

<https://apps.bea.gov/iTable/iTable.cfm?reqid=19&step=2&isuri=1&1921=survey#reqid=19&step=2&isuri=1&1921=survey>

Then select

* Section 3: Government Current Receipts and Expenditures
* Table 3.1: Government Current Receipts and Expenditures
* Modify: 1929-present, billions, annual
* Download (we used an excel format)

Nominal government expenditures can be found in line 20.

*Real Private-Sector Capital*

The capital stock is defined as private fixed assets, structures plus equipment. Data for the period 1889-1925 come from Kendrick (1961), while those for the period 1925-2015 are from the Bureau of Economic Analysis National Income and Product and Fixed Assets Accounts.

1889-1929: Real structures and equipment was copied from Kendrick, Appendix A, Table A-XVI, columns 7 and 9 and entered into an excel spreadsheet. (See kendrick-gordon\_data.xls in our archive, entries C2:C55 for structures and D2:D55 for equipment).

1925-2016: Index numbers for structures and equipment were downloaded from BEA Fixed Asset Accounts Table 2.2. The indices were converted to 2009 dollars by multiplying by nominal structures and equipment for that year. Following Whelan (2002), price and quantity indices for capital were computed by constructing Fisher ideal indices from the indices on equipment and structures. See appendix A for details.

The BEA Fixed Asset Accounts are publically available and be downloaded at

<https://apps.bea.gov/iTable/iTable.cfm?ReqID=10&step=2>

To download the index numbers, select

* Section 2: Private fixed assets by type
* Table 2.2. Chain-Type Quantity Indexes for Net Stock of Private Fixed Assets, Equipment, Structures, and Intellectual Property Products by Type
* Modify 1925-present
* Download

Index numbers for equipment and structures can be found in lines 2 and 35, respectively.

To download data on nominal stocks, select

* Section 2: Private fixed assets by type
* Table 2.1. Current-Cost Net Stock of Private Fixed Assets, Equipment, Structures, and Intellectual Property Products by Type
* Modify 1925-present
* Download

Nominal values for equipment and structures can be found in lines 2 and 35, respectively.

*Equity Q data*

Data for aggregate *q* come from Wright (2004). In the published article (p. 563), Professor Wright states that “It is hoped that the dataset will provide a basis for research on a wide range of topics: downloading of the data is actively encouraged.” The dataset is no longer posted at the web address listed in his article, but a copy can be found at <http://piketty.pse.ens.fr/files/capitalisback/CountryData/USA/Other/?C=N;O=D>. We use Wright’s measure of “Nonfinancial Equity Q” (Wright2004dataset.xls, sheet ‘equity q data 1871-2002', entries K31:K133).

Wright’s measure is extended through 2018 by splicing the Federal Reserve Board's measure of equity q (Nonfinancial corporate business; corporate equities as a percentage of net worth, Financial Accounts of the United States - Z.1, series FL103164106.A). The Federal Reserve data is publically available and can be downloaded by going to

<https://www.federalreserve.gov/datadownload/Choose.aspx?rel=z1>

Select ‘Build Package’, then select the following options.

Line1: ‘Financial Accounts of the United States – Z.1’

Line 2: ‘FL Levels, NSA’

Line 3: ‘Nonfinancial Corporate Business’

Line 4: ‘Corporate Equities: Liability’

Line 5: ‘Ratio Series’

Line 6: ‘Annual’

*NBER Business Cycle Chronology*

NBER business cycle dates are used to add recession bars to figure 1 and to calibrate transitions probabilities in the model in section 3.2.2. These data are publically available and can be downloaded from <https://www.nber.org/research/data/us-business-cycle-expansions-and-contractions>.

List of data files included in the archive

* beafaa\_table\_2p1.xls., Nominal stock of structures and equipment, from the Bureau of Economic Analysis (2017a), Fixed Asset Accounts.
* beafaa\_table\_2p2.xls, Chain-type indices for structures and equipment, from the Bureau of Economic Analysis (2017b), Fixed Asset Accounts.
* bea\_table\_1p1p6.xls, Real GDP, from Bureau of Economic Analysis (2017c), National Income and Product Accounts.
* bea\_table\_1p1p5.xls, Nominal GDP, from the Bureau of Economic Analysis (2017d), National Income and Product Accounts.
* bea\_table\_3p1.xls. Nominal government expenditures, from the Bureau of Economic Analysis (2017e), National Income and Product Accounts.
* frb\_z1\_q\_data.xls. Corporate equities as a percentage of net worth for the nonfinancial corporate sector, from the Board of Governors of the Federal Reserve System (2021), table Z.1.
* Kendrick-Gordon\_data.xls. From Kendrick (1961), we copied two series:

1. Real gross private domestic product, Appendix A, Table A-III, column 8.
2. Appendix A, Table A-XVI, columns 7 and 9

* Wright2004dataset.xls. Nonfinancial Equity Q, from Wright (2004).

Programs

Programs are organized by section.

Section 1:

The file figures\_1\_and\_Appendix1.m reproduce figure 1 in the main text as well as figure 1 in the appendix. The main file calls a function file rshade.m to add recession bars. These programs were run using Matlab version R2017a (64 bit).

Section 3:

The programs figure\_2.m through figure\_5.m reproduce the figures in section 3. These are written in Matlab Matlab version R2016a and call subroutines from Miranda and Fackler’s (2002) CompEcon toolbox. The CompEcon toolbox can be downloaded at <https://pfackler.wordpress.ncsu.edu/compecon/154-2/>.

Section 4:

Programs for this section use Matlab version R2017a (64 bit) along with the NAG Matlab Toolbox version 25 release 1 (64 bit).

The Matlab program figure\_6.m reproduces figure 6.

Subsection 4.1:

Programs for maximizing the log posterior for parameters governing the shock processes can be found in the ...\maximize\_log\_posterior subdirectory. The main file is max\_log\_post\_master.m. The other files are subroutines called by this master file. Details can be found in appendix E. The raw data for estimation is stored in the matlab data file tim\_data.mat. This is the same data as in figure 1 in the main text.

Before drawing the figures, you have to solve the integral equation for *w(s)* (equation 34 in the appendix). The relevant files can be found in the ...\integral\_equation subdirectory. The main file is fixed\_point\_batch.m. All the other files are subroutines called by this master file. Details can be found in appendix D.

Once the integral equation has been solved, the figure\*.m files will read the output and produce the figures shown in the text.

These programs draw on subroutines in the NAG toolbox for Matlab, which can be downloaded at <https://www.nag.com/content/nag-toolbox-matlab>. A license is required.

Subsection 4.2:

These files are organized in the same way as those for subsection 4.1, but apply to *lnq* instead of *lnz*.

References

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BUREAU OF ECONOMIC ANALYSIS (2017a). Fixed Asset Accounts, Current-Cost Net Stock of Private Fixed Assets, Equipment, Structures, and Intellectual Property Products by Type, Table 2.1. Available at <https://apps.bea.gov/iTable/iTable.cfm?ReqID=10&step=2>. Last accessed May 9, 2017.

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