Replication package
"The Fed and the Secular Decline in Interest Rates"
by Sebastian Hillenbrand

1) Code and folder description

Code to generate results

The code to generate the individual figures and tables can be found in the folder *code_results*. The do-file *2_generate_results.do* runs all do-files to generates the tables and figures of the paper.

- There is no need to generate the data ahead of running the results code.
- To replicate Figure 7, you will need the addition of intraday data from GovPX which is not provided in the replication package.

Code to generate results

The processing of each individual data source can be found in the *code_data* folder. The *0_clean_data.do* will run all of the individual data processing do-files at once. After running the *0_clean_data.do*, you will need to run *1_merge_data.do* to create the aggregate final dataset.

- Many of the data processing do-files pull the data directly from sources including CBOE, Federal Reserve and FRED. Prior to accessing FRED data, you will need to obtain a FRED API key from: https://fred.stlouisfed.org/docs/api/api_key.html
- You will need to change the XXX in line to be the FRED API key ("set fredkey XXX, permanently") of the do-file *0_clean_data.do*

Folder Structure

There are 5 folders: *code_data*, *code_results*, *data*, *figures*, and *tables*. Note that the folder structure should be maintained to allow for the correct running of the code.

- *code_data* contains the individual data processing do-files (as mentioned above)
- *code_results* has the individual do-files for creating tables and figures
- *data* contains the folders for each data source. There is a *raw_data* and *clean_data* subfolder within each.
    - *final_data_fed_secular_decline.dta* is the final dataset that is created by the do-file *1_merge_data.do*.
- Upon the running of the results code, the figures and tables will be saved in the figures and tables folders respectively.

2) Key data variables

Variable(s) name:	**Variable:**	**Source:**
fomc_meet	FOMC meeting dates	Various sources, see paper
sveny_, fwd_y_y	Treasury yields and forward rates	Fed website
usgg	On-the-run Treasury yields	Bloomberg
tipsy, bkeven	TIPS and Breakeven yields	Fed website
gtii	On-the-run TIPS yield	Bloomberg
usswit	Inflation swaps	Bloomberg
ffr_chg	Federal funds rate target changes	FRED

neg_kuttner	Negative Kuttner monetary policy shocks	Kuttner website, Bloomberg
dot	Dot plot	Bloomberg
pcelr	SEP long-run inflation projections	FRED
usrecd	NBER recession indicator	FRED
slope	Treasury slope (10-year minus 3-month)	FRED
lagged_bbkmleix	Brave-Butters-Kelley leading index	FRED
lagged_cfnai	Chicago Fed National Activity Index	FRED
spx, spx_ret	S&P 500 price and returns	Bloomberg
bcom, bcomag	Bloomberg commodity index	Bloomberg
nfp_std	Nonfarm Payroll Surprise	Bloomberg
move	MOVE	Bloomberg
vix	VIX	CBOE website

3) Data Sources

The data used in this paper is available through a variety of sources, including from the Federal Reserve and Bloomberg. Note any data accessed from FRED requires an API key which can be obtained from: https://fred.stlouisfed.org/docs/api/api_key.html

Federal Open Market Committee (FOMC) Meetings

The dates of the FOMC meetings used in the paper are those days on which the policy decision has been released publicly. The calendar of the relevant dates can be found in the appendix of the paper laid out in table form. These dates have been derived from information available on the website of the Federal Reserve as well as dates from Kuttner (2001, 2003).

- This data is included as an Excel file and is processed in the do-file: *dofile_fomc_dates.do*

Treasury yield and forward rates data from the Federal Reserve Board of Governors

Zero coupon yield data for a variety of tenors—of most relevance that of the 5y and 10y Treasurys—is based off the methodology established by Gürkaynak, Sack, and Wright (2007) and is available on the website of the Fed Board. Similarly instantaneous forward rates are found on this website.

- Within the Stata code, the data is pulled directly from the Fed website. The relevant do-file is: *dofile_gsw_treasurys.do*

On-the-Run Treasury Data from Bloomberg

Treasury yield data has also been pulled from a Bloomberg Terminal for the relevant window of June 1, 1989, to June 30, 2021. The variables pulled include: the then on-the-run 5 year Treasury (Bloomberg Ticker USGG5YR Index), the then on-the-run 10 year Treasury (USGG10YR Index), and the then on-the-run 30 year Treasury (USGG30YR Index). The data used is the mid values (and is as of Bloomberg's recording of close at 5:15 pm).

- The data needs to be pulled from the Bloomberg terminal as a xlsx document and then subsequently imported into Stata. The do-file *dofile_bloomberg.do* conducts the appropriate cleaning of the data.

Treasury Inflation-Protected Securities (TIPS) and Breakeven from the Federal Reserve Board

In addition to the nominal Treasury data, the data for the Treasury Inflation-Protected Securities and breakeven yields is also pulled from the website of the Fed Board. This data is per the methodology of Gürkaynak, Sack, and Wright (2010).

- The Stata code is directly pulled from the Board of Governors website in csv format. The relevant do-file is: *dofile_gsw_tips.do*

On-the-run TIPS and inflation swaps from Bloomberg

In the same manner as the on-the-run yields, TIPS yields (GTII) and inflation swaps (USSWIT) are pulled from the Bloomberg terminal on a daily frequency in the relevant window. The mid value is used and is as of Bloomberg's recording of close at 5:15pm.

- The data needs to be pulled from the Bloomberg terminal as a xlsx document and then subsequently imported into Stata. The do-file *dofile_bloomberg.do* conducts the appropriate cleaning of the data.

Federal funds rate target change

The federal funds target change is a dummy from FRED which takes the value of 1 if the Federal Reserve Board changed the target at the FOMC meeting.

- The federal funds rate target change is in *FOMC_meeting_dates.xlsx* raw file and processed in *dofile_fomc_dates.do*.

Kuttner Monetary Policy Shocks

The Kuttner Monetary Policy Shocks come from two sources. The majority of the data is from Kenneth Kuttner's website; however, the data available on the website ends June 19, 2019. For the remaining period of the data, the data is constructed using the prices of 30-day Federal Funds Futures retrieved from Bloomberg.

- The data from the Kuttner website can be found in the data folder. The details on the construction of the Kuttner shocks can be found in the do-file *dofile_kuttner_shocks.do*.

FOMC Dot Plots from Bloomberg

The Fed began releasing dot plots in January 2012 and has released them quarterly since then. The dot plots are downloaded from Bloomberg using the "DOTS" function and subsequently save as the related Excel.

- The data is processed in the do-file: *dofile_dotplot.do*.

Supplementary Data

Supplementary data from FRED

Multiple additional pieces of data are obtained from FRED including Statement of Economic Projections (SEP) inflation projections, NBER recession indicator, Treasury slope, Brave-Butters-Kelley leading index, and the Chicago Fed National Activity Index. All of these indices

are pulled directly from the FRED website with exception of the slope which is calculated as the difference between the 10 year and 3 month yield.

- The do-file *dofile_fred.do* pulls and processes the data. As a reminder, you need to obtain a FRED API key prior to being able to download the code.

Supplementary data from Bloomberg

There are several additional data sourced from Bloomberg that are used in the paper. The additional data includes S&P 500 prices, S&P 500 returns, the Bloomberg Commodity Index, and the Bloomberg Agriculture Subindex.

- The data needs to be pulled from the Bloomberg terminal as a xlsx document and then subsequently imported into Stata. The do-file *dofile_bloomberg.do* conducts the appropriate cleaning of the data.

Non-Farm Payroll from the Philadelphia Fed and Bloomberg

Due to data availability, the Non-Farm Payroll (NFP) data comes from two sources. For the data prior to 1997, the standardized value of the actual data from the Philadelphia Federal Reserve is used. For dates on or after 1997 the standardized value of the surprise (actual data – Bloomberg survey median) is used as the NFP value.

- The Philadelphia Fed data is directly pulled from the website whereas Bloomberg data is pulled from a Terminal in an Excel spreadsheet. The data is processed in the do-file: *dofile_nonfarm_payrolls.do*.

VIX Data from the Chicago Board Options Exchange

Information for the VIX Index can be found on the Chicago Board Options Exchange (CBOE) website. As the paper's sample size includes 1989, the VXO is used for most of the sample (which measures the implied volatility of the S&P 100). There is an error on October 18, 2000, for the VXO data, which is addressed in the Stata code in order to allow for the destringing of variables.

- The Stata code directly pulls from the CBOE in an Excel format. The downloading and processing of the data is in the do-file: *dofile_vix.do*.

Intraday Data from GovPX

Intraday bond data is obtained from GovPX. The data is processed such that quotes of the then on-the-run 10-year Treasury Note are obtained on a 5-minute frequency. After cleaning the data is saved as *govpx_ontherun10y.dta*. This is a screenshot of how the data looks:

date	datetime	trading_min	time	cusip	bidprc	bidyld	askprc	askyld	indbid	indbyld	indask	indayld	midyld	indmyld
11jul2005	07/11/2005 15:10:00	910	15:10	912828DV	100.1719	4.103	100.2188	4.097	100.184	4.1015	100.219	4.097	4.1000001	4.09925
11jul2005	07/11/2005 15:15:00	915	15:15	912828DV	100.1719	4.103	100.2188	4.097	100.193	4.10033	100.229	4.09567	4.1000001	4.0979999
11jul2005	07/11/2005 15:20:00	920	15:20	912828DV	100.1836	4.1015	.	.	100.211	4.098	100.25	4.093	.	4.0955
11jul2005	07/11/2005 15:25:00	925	15:25	912828DV	100.1875	4.101	.	.	100.203	4.099	100.24	4.09433	.	4.0966666