# What drives the recent surge in inflation?

# The historical decomposition roller coaster

# - READ ME FILE -

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## Overview

This document describes the replication files for *What drives the recent surge in inflation? The historical decomposition roller coaster*. The software used for the estimations is *MATLAB version 2022b*. The codes are written so that it should be easy for readers to follow. The replicator should expect to let the code run for about 2 hours. A description of the data and the codes are given below.

## Data availability

### Statement about Rights

- We certify that the authors of the manuscript have legitimate access to and permission to use the data used in this manuscript.
- We certify that the authors of the manuscript have documented permission to redistribute/publish the data contained within this replication package.

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## Details on each Data Source

All the data used for the estimations are stored in the folder *Data*. This folder contains four data files in *.xlsx* format:

1. *US_bivariate.xlsx*: Contains the series used in the main (bivariate) VAR model for the US.

    - *GDPC1*: U.S. Bureau of Economic Analysis, Real Gross Domestic Product, retrieved from FRED, Federal Reserve Bank of St. Louis: https://fred.stlouisfed.org/series/GDPC1, May 5, 2023.
    - *GDPDEF*: U.S. Bureau of Economic Analysis, Gross Domestic Product: Implicit Price Deflator, retrieved from FRED, Federal Reserve Bank of St. Louis: https://fred.stlouisfed.org/series/GDPDEF, May 5, 2023.

2. *US_large.xlsx*: Contains the series used in the larger VAR model for the US.

    - *GDPC1*: U.S. Bureau of Economic Analysis, Real Gross Domestic Product, retrieved from FRED, Federal Reserve Bank of St. Louis: https://fred.stlouisfed.org/series/GDPC1, May 5, 2023.
    - *GDPDEF*: U.S. Bureau of Economic Analysis, Gross Domestic Product: Implicit Price Deflator, retrieved from FRED, Federal Reserve Bank of St. Louis: https://fred.stlouisfed.org/series/GDPDEF, May 5, 2023.
    - *GPDIC1*: U.S. Bureau of Economic Analysis, Real Gross Private Domestic Investment, retrieved from FRED, Federal Reserve Bank of St. Louis: https://fred.stlouisfed.org/series/GPDIC1, May 5, 2023.
    - *AHETPI*: U.S. Bureau of Labor Statistics, Average Hourly Earnings of Production and Nonsupervisory Employees, Total Private, retrieved from FRED, Federal Reserve Bank of St. Louis: https://fred.stlouisfed.org/series/AHETPI, May 5, 2023.
    - *FEDFUNDS*: Board of Governors of the Federal Reserve System (US), Federal Funds Effective Rate, retrieved from FRED, Federal Reserve Bank of St. Louis: https://fred.stlouisfed.org/series/FEDFUNDS, May 5, 2023.

3. *EuroArea_FRED.xlsx*: Contains the series used in the model for the euro area.

    - *HICP*: Eurostat, Harmonized Index of Consumer Prices: All-Items HICP for Euro Area (19 Countries) [CP0000EZ19M086NEST], retrieved from FRED, Federal Reserve Bank of St. Louis: https://fred.stlouisfed.org/series/CP0000EZ19M086NEST, June 14, 2023.

- *INPR*: Organization for Economic Co-operation and Development, Production: Industry: Total Industry Excluding Construction for Euro Area (19 Countries) [EA19PRINTO01IXOBSAM], retrieved from FRED, Federal Reserve Bank of St. Louis: https://fred.stlouisfed.org/series/EA19PRINTO01IXOBSAM, June 14, 2023.

4. *IMF_data_different_countries.xlsx*: Contains the series used in the VAR models for Sweden, Norway, Canada and Australia.

    - *SE:NGDP_R_SA_XDC*: IMF, Gross domestic product (GDP), Constant prices, Seasonally adjusted (SA), Domestic currency, Sweden, retrieved from IMF National Economic Accounts (NEA) Dataset (Series name: SWE.B1GQ.Q.SA.XDC.Q): https://data.imf.org/en/Data-Explorer?datasetUrn=IMF.STA:QNEA(7.0.0), June 10, 2024.
    - *SE:PCPI_IX*: IMF, Consumer Price Index (CPI), Sweden, retrieved from IMF Consumer Price Index (CPI) Dataset (Series name: SWE.CPI._T.IX.Q): https://data.imf.org/en/Data-Explorer?datasetUrn=IMF.STA:CPI(3.0.1), June 10, 2024.
    - *NO:NGDP_R_SA_XDC*: IMF, Gross domestic product (GDP), Constant prices, Seasonally adjusted (SA), Domestic currency, Norway, retrieved from IMF National Economic Accounts (NEA) Dataset (Series name: NOR.B1GQ.Q.SA.XDC.Q): https://data.imf.org/en/Data-Explorer?datasetUrn=IMF.STA:QNEA(7.0.0), June 10, 2024.
    - *NO:PCPI_IX*: IMF, Consumer Price Index (CPI), Norway, retrieved from IMF Consumer Price Index (CPI) Dataset (Series name: NOR.CPI._T.IX.Q): https://data.imf.org/en/Data-Explorer?datasetUrn=IMF.STA:CPI(3.0.1), June 10, 2024.
    - *CA:NGDP_R_SA_XDC*: IMF, Gross domestic product (GDP), Constant prices, Seasonally adjusted (SA), Domestic currency, Canada, retrieved from IMF National Economic Accounts (NEA) Dataset (Series name: CAN.B1GQ.Q.SA.XDC.Q): https://data.imf.org/en/Data-Explorer?datasetUrn=IMF.STA:QNEA(7.0.0), June 10, 2024.
    - *CA:PCPI_IX*: IMF, Consumer Price Index (CPI), Canada, retrieved from IMF Consumer Price Index (CPI) Dataset (Series name: CAN.CPI._T.IX.Q): https://data.imf.org/en/Data-Explorer?datasetUrn=IMF.STA:CPI(3.0.1), June 10, 2024.
    - *AU:NGDP_R_SA_XDC*: IMF, Gross domestic product (GDP), Constant prices, Seasonally adjusted (SA), Domestic currency, Australia, retrieved from IMF National Economic Accounts (NEA) Dataset (Series name: AUS.B1GQ.Q.SA.XDC.Q):

https://data.imf.org/en/Data-Explorer?datasetUrn=IMF.STA:QNEA(7.0.0), June 10, 2024.

- *AU:PCPI_IX*: IMF, Consumer Price Index (CPI), Australia, retrieved from IMF Consumer Price Index (CPI) Dataset (Series name: AUS.CPI._T.IX.Q): https://data.imf.org/en/Data-Explorer?datasetUrn=IMF.STA:CPI(3.0.1), June 10, 2024.

# Computational requirements

The code requires at least 2.5 GB of free disk space. It takes around 48 hours to run on a laptop with the following specifications:

- Processor: 11th Gen Intel(R) Core(TM) i5-1135G7 @ 2.40 GHz (1 processor, 4 cores)
- RAM: 16 GB
- Operating system: Windows 11

## Software requirements

The following software is required:

1. Matlab (code was run with Matlab Release 2022b)

## Controlled randomness

The seed for the random number generator is set at the beginning of each Matlab script.

# Description of the codes

The following scripts should be run to replicate the results:

1. *macro_VAR_diffuse.m* This code estimates the bivariate VAR model for U.S. output and inflation (see Section  for data series), using a diffuse prior over the sample period from 1983:Q1 to 2022:Q4. The structure of the code is the following: It loads the data (line 20), estimates the reduced form model (lines 37 - 52), identifies a demand and a supply shock, using sign restrictions on impact (lines 54 - 60), computes the historical decompositions for all draws (line 63), and finds the draws closest to the point-wise median IRFs (line 66). Finally, it plots Figure 1, Figure 2, Figure 3 (a) and (b), and Figure 10 (a).

2. *macro_VAR_diffuse_83_19.m* This code does the same as *macro_VAR_diffuse.m*, except that it uses a sample from 1983:Q1 to 2019:Q4. It plots Figure A-3.

3. *macro_VAR_diffuse_bq.m* This code does the same as *macro_VAR_diffuse.m*, except that it identifies the structural shocks using a Blanchard-Quah decomposition. It plots Figure A-1 (a).

4. *macro_VAR_diffuse_cholesky.m* This code does the same as *macro_VAR_diffuse.m*, except that it identifies the structural shocks using a Cholesky decomposition. It plots Figure A-1 (b)

5. *macro_VAR_diffuse_long_sample.m* This code does the same as *macro_VAR_diffuse.m*, except that it uses a sample from 1949:Q1 to 2022:Q4.It plots Figure 3 (e).

6. *macro_VAR_diffuse_no_constant.m* This code does the same as *macro_VAR_diffuse.m*, except that it de-means the data prior to estimation, and estimates the model without a constant. It plots Figure 9.

7. *macro_VAR_EA_diffuse.m* This code estimates the bivariate VAR model for euro area output and inflation (see Section  for data series), using a diffuse prior over the sample period from 2001:M1 to 2023:M3. The code follows the same structure as *macro_VAR_diffuse.m*. It plots Figure F-1 and Figure F-2.

8. *macro_VAR_EA_SUR.m* This code does the same as *macro_VAR_EA_diffuse.m*, except that it uses the single-unit-root prior for estimation of the reduced form model. It plots Figure 7.

9. *macro_VAR_minnesota.m* This code does the same as *macro_VAR_diffuse.m*, except that it uses a Minnesota-like prior for estimation of the reduced form model. It plots Figure 3 (d) and Figure 10 (c).

10. *macro_VAR_NIW.m* This code does the same as *macro_VAR_diffuse.m*, except that it uses a Normal-Inverse-Wishart prior for estimation of the reduced form model. It plots Figure 3 (c) and Figure 10 (b)

11. *macro_VAR_SUR.m* This code does the same as *macro_VAR_diffuse.m*, except that it uses a single-unit-root prior for estimation of the reduced form model. It plots Figure 6, Figure 10 (d) and Figure A-2.

12. *macro_VAR_sur_AU.m* This code estimates the bivariate VAR model for Australian output and inflation (see Section  for data series), using a single-unit-root prior over the sample period from 1993:Q1 to 2022:Q4. The structural shocks are identified using sign restrictions on impact. It plots Figure 8 (e)

13. *macro_VAR_sur_CA.m* This code estimates the bivariate VAR model for Canadian output and inflation (see Section  for data series), using a single-unit-root prior over the sample period from 1993:Q1 to 2022:Q4. The structural shocks are identified using sign restrictions on impact. It plots Figure 8 (c)

14. *macro_VAR_sur_NO.m* This code estimates the bivariate VAR model for Norwegian output and inflation (see Section  for data series), using a single-unit-root prior over the sample period from 1993:Q1 to 2022:Q4. The structural shocks are identified using sign restrictions on impact. It plots Figure 8 (b)

15. *macro_VAR_sur_SE.m* This code estimates the bivariate VAR model for Swedish output and inflation (see Section  for data series), using a single-unit-root prior over the sample period from 1993:Q1 to 2022:Q4. The structural shocks are identified using sign restrictions on impact. It plots Figure 8 (a)

16. *macro_VAR_US_5variables_diffuse.m* This code estimates the larger VAR model for U.S. output, inflation, investment, real wage and the Fed funds rate (see Section  for data series), using a diffuse prior over the sample period from 1983:Q1 to 2022:Q4. The structural shocks are identified using sign restrictions on impact (see identifying restrictions in table E-1 in the appendix of the paper). It plots Figure 3 (f) and Figre E-1.

17. *macro_VAR_US_5variables_SUR.m* This code does the same as *macro_VAR_US_5variables_diffuse.m* except that it uses a single-unit-root prior for estimation of the reduced form model. It plots Figure E-2 and Figure E-3

18. *simulation_VAR.m* This code produces artificial data based on a known data generating process, which has the structure of a bivariate VAR(1) model. Two different datasets are generated (lines 23 - 60): one where variable 1 is more persistent, and one where variable 1 is less persistent. It estimates a VAR(1) models for different sample lengths and with different priors (lines 76 - 341). Finally, it plots Figure 4, Figure C-2 and Figure C-3.

19. *simulation_VAR_different_delta.m* This code estimates VAR(1) models on the artificial (simulated) data, using the single-unit-root prior with different values for $\delta$. Produces Figure 5 (a) and (b).

20. *simulation_VAR_diffuse_ar02.m* This code does the same as *simulation_VAR.m*, except that it has a lower coefficient on variable 1's own lag. It plots Figure C-1.

21. *simulation_VAR_dispersion.m* This code estimates VAR(1) models on the artificial (simulated) data, using the single-unit-root prior with different values for $\bar{Y}_0$ and $\delta$, and calculates the relative dispersion between the posterior draws. It plots Figure 5 (d).

22. *simulation_VAR_marginal_likelihood_different_delta.m* This code estimates VAR(1) models on the artificial (simulated) data, using the single-unit-root prior with different values for $\delta$, and calculates the log-marginal likelihood. It plots Figure 5 (c).

23. *simulation_VAR_min_sur_forecasting.m* This code estimates VAR(1) models recursively on the artificial (simulated) data, using both the Minnesota-like prior and the single-unit-root prior. It produces forecasts for each iteration, which are evaluated against the actual data, by computing the root mean squared errors (RMSE). It produces Table C-1.

# Instructions to Replicators

- All relevant scripts that runs estimations are stored in the main folder.
- The functions and supplementary code that are used by these scripts are stored in the folder *Functions*
- All data files are in *.xlsx* format and stored in the folder *Data*
- The output files are stored in the folder *Figures*

# Figures and programs

Comments in the relevant scripts indicates which figure is produced by each cell. An overview of relevant code is also provided in Table 1, below.

**Table 1:** List of tables and figures and relevant code

| **Figure/Table** | **Program** | **Line number** |
|---|---|---|
| Figure 1 | macro_VAR_diffuse.m | 72-126 |
| Figure 2 a | macro_VAR_diffuse.m | 128-164 |
| Figure 2 b, left | macro_VAR_diffuse.m | 166-195 |
| Figure 2 b, right | macro_VAR_diffuse.m | 197-222 |
| Figure 3 a | macro_VAR_diffuse_bq.m | 105-133 |
| Figure 3 b | macro_VAR_diffuse_cholesky.m | 99-127 |
| Figure 3 c | macro_VAR_NIW.m | 52-80 |
| Figure 3 d | macro_VAR_minnesota.m | 55-81 |
| Figure 3 e | macro_VAR_diffuse_long_sample.m | 71-96 |
| Figure 3 f | macro_VAR_US_5variables_diffuse.m | 186-211 |
| Figure 4 a | simulation_VAR.m | 340-391 |
| Figure 4 b | simulation_VAR.m | 393-445 |
| Figure 5 a | simulation_VAR_different_delta.m | 165-191 |
| Figure 5 b | simulation_VAR_different_delta.m | 192-217 |
| Figure 5 c | simulation_VAR_marginal_likelihood_different_delta.m | 132-152 |
| Figure 5 d | simulation_VAR_dispersion.m | 193-212 |
| Figure 6 a | macro_VAR_sur.m | 54-86 |
| Figure 6 b, left | macro_VAR_sur.m | 88-113 |
| Figure 6 b, right | macro_VAR_sur.m | 115-137 |
| Figure 7 a | macro_VAR_EA_SUR.m | 54-86 |
| Figure 7 b, left | macro_VAR_EA_SUR.m | 88-114 |
| Figure 7 b, right | macro_VAR_EA_SUR.m | 116-138 |
| Figure 8 a 1 | macro_VAR_sur_SE.m | 106-137 |
| Figure 8 a 2 | macro_VAR_sur_NO.m | 106-138 |
| Figure 8 a 3 | macro_VAR_sur_CA.m | 107-138 |
| Figure 8 a 4 | macro_VAR_sur_AU.m | 107-139 |
| Figure 8 b 1 | macro_VAR_sur_SE.m | 141-163 |
| Figure 8 b 2 | macro_VAR_sur_NO.m | 142-164 |
| Figure 8 b 3 | macro_VAR_sur_CA.m | 142-164 |
| Figure 8 b 4 | macro_VAR_sur_AU.m | 143-165 |
| Figure 9 a | macro_VAR_diffuse_no_constant.m | 74-110 |
| Figure 9 b, left | macro_VAR_diffuse_no_constant.m | 112-140 |
| Figure 9 b, right | macro_VAR_diffuse_no_constant.m | 142-167 |
| Figure 10 a | macro_VAR_diffuse.m | 224-248 |
| Figure 10 b | macro_VAR_NIW.m | 82-105 |
| Figure 10 c | macro_VAR_minnesota.m | 83-107 |
| Figure 10 d | macro_VAR_sur.m | 139-162 |
| Figure A-1 a | macro_VAR_diffuse_bq.m | 135-187 |
| Figure A-1 b | macro_VAR_diffuse_cholesky.m | 129-180 |
| Figure A-2 | macro_VAR_sur.m | 165-178 |
| Figure A-3 | macro_VAR_diffuse_83_19.m | 70-101 |
| Figure C-1 | simulation_VAR_diffuse_ar02.m | 156-175 |
| Figure C-2 | simulation_VAR.m | 446-529 |
| Figure C-3 | simulation_VAR.m | 531-624 |
| Figure D-1 a | simulation_VAR_D1a.m | 250-293 |
| Figure D-1 b | simulation_VAR_D1b.m | 247-289 |
| Figure D-1 c | simulation_VAR_D1c.m | 252-295 |
| Figure E-1 | macro_VAR_US_5variables_diffuse.m | 214-243 |
| Figure E-2 | macro_VAR_US_5variables_sur.m | 135-170 |
| Figure E-3 | macro_VAR_US_5variables_sur.m | 172-207 |
| Figure F-1 | macro_VAR_EA_diffuse.m | 160-188 |
| Figure F-2 | macro_VAR_EA_diffuse.m | 190-212 |
| Table C-1 | simulation_VAR_min_sur_forecasting.m | 78-112 |