# README for Replication Package Accompanying "Diagnostic Business Cycles"

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## 1 Software

All codes were executed on a 2021 14-inch MacBook Pro (Apple M1 Pro) running Matlab R2021b. The Statistics and Machine Learning toolbox is required to execute the codes. All codes, except for `runmh.m`, take no more than a few seconds to execute. It takes approximately 7 hours to run the full Metropolis-Hastings simulation in `runmh.m`.

## 2 Content

The package includes codes necessary to reproduce all Figures and Tables in the main text and the Online Appendix. We list and describe the codes corresponding to each Figures and Tables below. Since some Figures use the estimation results generated by other components of the package, it is recommended that codes be run in the order listed below.

1. To reproduce Figure 1, run `Figure_1.m` in folder `PIH_model`.

2. To reproduce the local projection impulse response used for the estimation in Section 4, first run `getdata.m` and then run `jorda.m`, both in folder `Local_projection`. The code generates `locproj_result.mat` that will be used for the impulse-response-matching estimation.

3. To conduct the estimation of the RE New Keynesian model, run `runmh.m` in folder `RE_baseline` in folder `Estimation_additional`. The code will generate `pastmode.mat`, which stores posterior mode estimates, and `pastrun.mat`, which stores the Metropolis-Hastings output. Finally, run `summary.m`, which produces `estimate_RE.mat` that is used to produce Figures 2, 3, and F.2 (Online Appendix). This code also displays the pertinent entries of Table F.1 (Online Appendix) in the Matlab command window.

4. To conduct the estimation of the DE New Keynesian model with a constraint $J = 1$, run `runmh.m` in folder `DE_J=1` in folder `Estimation_additional`. The code will generate `pastmode.mat`, which stores posterior mode estimates, and `pastrun.mat`, which stores the Metropolis-Hastings output. Finally, run `summary.m`, which produces `estimate_DE_J1.mat` that is used to produce Figures 2, and 3.

5. To conduct the baseline estimation of the DE New Keynesian model, run `runmh.m` in folder `Estimation_baseline`. The code will generate `pastmode.mat`, which stores posterior mode estimates, and `pastrun.mat`, which stores the Metropolis-Hastings output. Finally, run `summary.m`, which produces Figures 2, 3, 4, 5, 6, and F.4 (Online Appendix). This code also displays the pertinent entries of Table F.1 (Online Appendix) in the Matlab command window.

6. To conduct the estimation of the RE New Keynesian model without habit, run `runmh.m` in folder `RE_no_habit` in folder `Estimation_additional`. The code will generate `pastmode.mat`, which stores posterior mode estimates, and `pastrun.mat`, which stores the Metropolis-Hastings output. Finally, run `summary.m`, which produces `estimate_RE.mat` that is used to produce Figure F.1 (Online Appendix).

7. To conduct the estimation of the DE New Keynesian model without habit, run `runmh.m` in folder `DE_no_habit` in folder `Estimation_additional`. The code will generate `pastmode.mat`, which stores posterior mode estimates, and `pastrun.mat`, which stores the Metropolis-Hastings output. Finally, run `summary.m`, which produces Figure F.1 (Online Appendix).

8. To conduct the estimation of the DE New Keynesian model with an alternative prior for $\theta$, run `runmh.m` in folder `DE_alternative_theta_prior` in folder `Estimation_additional`. The code will generate `pastmode.mat`, which stores posterior mode estimates, and `pastrun.mat`, which stores the Metropolis-Hastings output. Finally, run `summary.m`, which produces Figure F.2 (Online Appendix).

9. To conduct the estimation of the RE New Keynesian model matching survey data, run `runmh.m` in folder `RE_match_survey` in folder `Estimation_additional`. The code will generate `pastmode.mat`, which stores posterior mode estimates, and `pastrun.mat`, which stores the Metropolis-Hastings output. Finally, run `summary.m`, which produces `estimate_RE.mat` that is used to produce Figure F.3 (Online Appendix).

10. To conduct the estimation of the DE New Keynesian model matching survey data, run `runmh.m` in folder `DE_match_survey` in folder `Estimation_additional`. The code

will generate `pastmode.mat`, which stores posterior mode estimates, and `pastrun.mat`, which stores the Metropolis-Hastings output. Finally, run `summary.m`, which produces Figure F.3 (Online Appendix).

# 3 Data Availability Statement

All data used in the paper are collected in folder `Local_projection`.

1. `data.xlsx` contains the macroeconomic data. Specifically, it contains quarterly time series of real per capita GDP (row `M`), real per capita consumption (row `N`), real per capita investment (row `O`), per capita hours worked in the nonfarm business sector (row `P`), GDP deflator inflation (row `W`), and the Federal Funds rate (row `U`). Footnote 15 in the main text describes the procedures to construct this data. The raw data were downloaded from U.S. Bureau of Economic Analysis (2020b) and U.S. Bureau of Economic Analysis (2020c) and FRED (`https://fred.stlouisfed.org/`, U.S. Bureau of Economic Analysis (2020a), U.S. Bureau of Labor Statistics (2020), and Board of Governors of the Federal Reserve System (2020)).

2. `medianGrowth.xlsx` contains the Survey of Professional Forecasters (2020) expectations on inflation and GDP growth.

3. `RR_MPshocks_Updated.xls` contains the monetary policy shock series from Coibion et al. (2017).

# References


**Board of Governors of the Federal Reserve System**, "Federal Funds Effective Rate [FEDFUNDS]," 2020. retrieved from FRED, Federal Reserve Bank of St. Louis; `https://fred.stlouisfed.org/series/FEDFUNDS`, accessed February 11, 2020.

**Coibion, Olivier, Yuriy Gorodnichenko, Lorenz Kueng, and John Silva**, "Data for: Innocent Bystanders? Monetary Policy and Inequality," *Journal of Monetary Economics*, 2017, *88*, 70–89. `https://eml.berkeley.edu/~ygorodni/`.

**Survey of Professional Forecasters**, "Median Forecast: Survey of Professional Forecasters," 2020. `https://www.philadelphiafed.org/surveys-and-data/real-time-data-research/median-forecasts`.

**U.S. Bureau of Economic Analysis**, "Population [POPTHM]," 2020. retrieved from FRED, Federal Reserve Bank of St. Louis; `https://fred.stlouisfed.org/series/POPTHM`, accessed February 11, 2020.

_ , "Table 1.1.3. Real Gross Domestic Product, Quantity Indexes," 2020. https://apps.bea.gov/iTable/?reqid=19&step=2&isuri=1&categories=survey#eyJhcHBpZCI6MTksInN0ZXBzIjpbMSwyLDNdLCJkYXRhIjpbWyJjYXRlZ29yaWVzIiwiU3VydmV5Il0sWyJOSVBBX1RhYmxlX0xpc3QiLCIzIl1dfQ==, January 30, 2020 estimates, (accessed February 11, 2020).

_ , "Table 1.1.5. Gross Domestic Product," 2020. https://apps.bea.gov/iTable/?reqid=19&step=3&isuri=1&1910=x&0=-99&1921=survey&1903=1&1904=1998&1905=2018&1906=q&1911=0#eyJhcHBpZCI6MTksInN0ZXBzIjpbMSwyLDNdLCJkYXRhIjpbWyJOSVBBX1RhYmxlX0xpc3QiLCI1Il0sWyJDYXRlZ29yaWVzIiwiU3VydmV5Il1dfQ==, January 30, 2020 estimates, (accessed February 11, 2020).

**U.S. Bureau of Labor Statistics**, "Nonfarm Business Sector: Hours Worked for All Employed Persons [HOANBS]," 2020. retrieved from FRED, Federal Reserve Bank of St. Louis; https://fred.stlouisfed.org/series/HOANBS, accessed February 11, 2020.