README for "A Macro-Finance Model with Sentiment"

Overview

This replication package provides the Matlab code and underlying datasets needed to reproduce the results in the article.

Data Availability and Provenance Statements

- Data from Greenwood et al. (2022) was downloaded directly from *The Journal of Finance*'s Supporting Information section. The authors' replication code and data can be downloaded from https://doi.org/10.1111/jofi.13105. A copy is provided as part of this archive for replication purposes.
- Data from He et al. (2017) was downloaded from Asaf Manela's website. Data can be downloaded from https://apps.olin.wustl.edu/faculty/manela/data.html. A copy is provided as part of this archive for replication purposes.
- Data on the investment-output ratio and the dividend-price ratio were downloaded from the Jordà-Schularick-Taylor Macrohistory Database. Data can be downloaded from https://www.macrohistory.net/database/. A copy of the fourth release is provided as part of this archive for replication purposes.
- Data on SPF growth forecasts was downloaded from the Federal Reserve Bank of Philadelphia. Data can be downloaded from https://www.philadelphiafed.org/surveys-and-data/real-time-data-research/median-forecasts. A copy is provided as part of this archive for replication purposes.
- Data on credit spreads and GDP growth were downloaded from FRED (maintained by the Federal Reserve Bank of St. Louis). The specific series used are BAA10Y, GNPC96, and GDPC1. Data can be downloaded from https://fred.stlouisfed.org/. A copy is provided as part of this archive for replication purposes.
- Data on forecast errors reported in Figure 1 of Bordalo et al. (2018) is not provided as part of this archive. It was kindly provided to me by the authors, but can be imputed directly from Figure 1 of Bordalo et al. (2018). To do so, create a file BGS_errors.xlsx in which column A contains the year, column B contains the quarter, and column C contains the forecast error (the blue line in Figure 1 of Bordalo et al. (2018)).

Dataset List

Data file	**Source**	**Provided**
Data/GHSSdata.csv	Greenwood et al. (2022)	Yes
Data/He_Kelly_Manela_Factors_quarterly.csv	He et al. (2017)	Yes
Data/JSTdatasetR4.xlsx	Jordà et al. (2019)	Yes
Data/medianGrowth.xlsx	Philadelpha Fed	Yes
Data/BAA10Y.xls	FRED	Yes
Data/GDPC1.xls	FRED	Yes
Data/GNPC96.xls	FRED	Yes
Data/BGS_errors.xlsx	Bordalo et al. (2018)	No

Computational Requirements

The Matlab code used to generate the results in the article is uploaded to the repository.

Software Requirements

- Matlab (code was run with Matlab release 2018b)

Memory and Runtime Requirements

- This code was run on a 4-core Intel-based laptop with 16GB of RAM
- The model under the baseline calibration takes roughly 40 minutes to solve
    - Once an equilibrium and crisis hitting probabilities have been determined, almost all subsequent calculations are relatively fast (i.e., a few minutes or less)[1]

Description of Programs

- Run main_macrofinance_sentiment.m to solve the model
    - This program is set up so that it also produces all tables/figures that are derived from the benchmark calibration (see variable additionalAnalysis)
    - To solve the model under alternate calibrations, change variable perturbation_case (see model_calib.m for definitions)
    - To solve the model under rational expectations, change variable DE_flag
- Once all alternate calibrations have been solved and saved in the modelOutput directory, run nonBenchmarkCalib_results.m to produce all tables/figures that are derived from non-benchmark calibrations (these results are all in the paper's Appendix)
- Run DE_examples.m to plot stylized examples of diagnostic expectations, as applied to an arithmetic Brownian motion (Figure 1) and Ornstein-Uhlenbeck processes (Appendix)
- The subfunctions directory contains additional Matlab scripts that are used when solving for an equilibrium and/or generating results
- The Data directory contains the external datasets used in this project (see above)
- The 'main' code is set up so that figures save to the figs directory and the Matlab workspace (.mat file) saves to the modelOutput directory

Instructions to Replicators

- Running main_macrofinance_sentiment.m will solve for an equilibrium under the benchmark calibration, and will produce all of the figures/tables that are derived from that benchmark equilibrium (as described in 'List of Tables and Programs' below)
- To generate the relevant equilibria for non-benchmark calibrations (i.e., robustness checks, comparative statics, and belief perturbations):
    - Change variable perturbation_case in the 'main' code (as defined in model_calib)
        - Perturbations 3 through 6 are robustness checks

[1] The one other calculation that takes roughly 10 minutes is the Feynman-Kac calculation in the "IRF_sim" code

        - Perturbations 7.1, 7.3, 7.5, 7.6, 7.7, 7.01, and 7.015 update the half-life of beliefs from 1 year through 15 years
        - Perturbations 11 through 19 are comparative statics
    - To generate the recalibrated REE equilibrium, set DE_flag = 0 in the 'main' code (and set perturbation_case = 0)
    - Once all 21 of these other calibrations have been solved/saved, running the script nonBenchmarkCalib_results.m will output all of the figures/tables that are generated from non-benchmark equilibria (again as described in 'List of Tables and Programs' below)

List of Tables and Programs

Figure/Table #	**Program**	**Output File**	**Notes**
Table 1	calibration_sim.m	See variables: > calib_params > calib_moments	
Table 2	crisisDuration.m	See variables: > meanRecovery > meanRecovery_REE	
Appendix Table 3	nonBenchmarkCalib_results.m	See variable: > crisisFrequencyRobustness	Assumes output has already been created for different robustness perturbations
Appendix Table 4	calibration_sim.m	See variables: > calib_params > calib_moments	Started from running: nonBenchmarkCalib_results.m (assuming output already created)
Appendix Table 5	crisisDuration.m	See variables: > meanRecovery_REE	Started from running: nonBenchmarkCalib_results.m (assuming output already created)
Appendix Table 6	LRR_comparison.m	See variable: > outputTableLRR	
Figure 1	DE_examples.m	DEexample_ABM.png	Set var. ctsProcess = 0
Figure 2	plot_soln_figs.m	model_soln_6.png	
Figure 3	plot_soln_figs.m	dynamics_3yr_shock0.png	
Figure 4	plot_soln_figs.m	model_dist.png	
Figure 5	plot_soln_figs.m	hitting_prob_531.png	
Figure 6	behaviorAroundCrises.m	RP_crises_withPerceived_raw.png	
Figure 7	IRF_sim.m	IRF_i_positive_noFF.png IRF_i_negative_noFF.png	
Figure 8	plot_soln_figs.m	model_dist_compare.png	
Figure 9	macro_ts_dynamics.m	autocorr_dp_Intl.png autocorr_iy_Intl.png	
Figure 10	crisisLongView.m	SPF_sentiment.png	
Figure 11	crisisLongView.m	model_finCrisis_full_1.png model_finCrisis_full_2.png model_finCrisis_full_3.png	Figure model_finCrisis_full_3.png will be missing one line. It can be restored by adding back the data from Bordalo et al. (2018) Fig. 1 (see data description above)

Appendix Fig. 1	kappaCalibration.m	kappa_calibration.png	Started from running: nonBenchmarkCalib_results.m (assuming output already created)
Appendix Fig. 2	arbitrageurs.m	arbitrageurRelativeLeverage.png HFReturns_660_epsiAll.png	
Appendix Fig. 3	nonBenchmarkCalib_results.m	riskPremium_true_perturb11.png riskPremium_true_perturb12.png … riskPremium_true_perturb19.png	Assumes output has already been created for different comparative static perturbations
Appendix Fig. 4	plot_soln_figs.m	hitting_prob_531_perturb3.png hitting_prob_531_perturb4.png hitting_prob_531_perturb5.png hitting_prob_531_perturb6.png	Started from running: nonBenchmarkCalib_results.m (assuming output already created)
Appendix Fig. 5	behaviorAroundCrises.m	RP_crises_withPerceived_raw_preturb3.png RP_crises_withPerceived_raw_preturb4.png RP_crises_withPerceived_raw_preturb5.png RP_crises_withPerceived_raw_preturb6.png	Started from running: nonBenchmarkCalib_results.m (assuming output already created)
Appendix Fig. 6	IRF_sim.m	IRF_i_positive_noFF_perturb3.png IRF_i_positive_noFF_perturb4.png IRF_i_positive_noFF_perturb5.png IRF_i_positive_noFF_perturb6.png	Started from running: nonBenchmarkCalib_results.m (assuming output already created)
Appendix Fig. 7	macro_ts_dynamics_REE compare.m	autocorr_dp_Intl_REECompare.png autocorr_iy_Intl_REECompare.png	Started from running: nonBenchmarkCalib_results.m (assuming output already created)
Appendix Fig. 8	crisisLongView.m	model_finCrisis_full_long.png	
Appendix Fig. 9	crisisLongView.m	model_finCrisis_full_1_ hiddenLeverage.png	
Appendix Fig. 10	plot_soln_figs.m	model_soln_8.png	
Appendix Fig. 11	plot_soln_figs.m	model_riskPremium_delevered.png	
Appendix Fig. 12	behaviorAroundCrises.m	investment_rate_crises.png	
Appendix Fig. 13	behaviorAroundCrises.m	RP_crises_raw_withREE.png	
Appendix Fig. 14	IRF_sim.m	IRF_i_positive_expected.png IRF_i_negative_expected.png	
Appendix Fig. 15	IRF_sim.m	IRF_i_positive_bigShock.png IRF_i_negative_bigShock.png	
Appendix Fig. 16	macro_ts_dynamics.m	autocorr_dp_USA.png autocorr_iy_USA.png	

Appendix Fig. 17	DE_examples.m	DEexample_OU_0pt25.png DEexample_OU_0pt5.png DEexample_OU_1.png DEexample_OU_2.png DEexample_OU_errors.png	Set var. ctsProcess = 1
Section 6.2 Results (in-text)	GHSS_analysis.m	See variables: > shareFirst > RzoneGiven1st > RzoneGivenDD > FrothyShareFirst > FrothyShareResidual > ShareFirstModel > FrothyShareResidual	

References

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