Summary of Data and Code for:
"Counterfactual Modeling of Multispecies Fisheries Outcomes Under Market-Based Regulation"
By: Birkenbach, A.M., Lee, M.-Y., Smith, M.D.
Last revised: July 28, 2023

This "ReadMe" file briefly documents the data and code that were uploaded to DATAVERSE and how the code fits together.

Data used for this analysis is confidential as provided for the Magnuson-Stevens Fishery Conservation and Management Act. Authors will make this proprietary data available with a signed confidentiality agreement between the requestor and NOAA. See https://www.noaa.gov/organization/administration/nao-216-100-protection-of-confidential-fisheries-statistics for further details.

The code consists of four main parts:

1. **Discrete choice model estimation**
    a. Set input and output directories.
    b. Run "1__DISCRETE_CHOICE.do."

2. **Data preparation for simulations**
    a. Set input and working directories.
    b. Run "2__DATA_FOR_SIMULATIONS.do."

3. **Simulations.** Download and unzip the file "3_Simulations.zip" from the dataverse.
    a. You can go to this DOI: **10.5281/zenodo.8193046** to download the simulation code as of July 28, 2023
    b. Or to this github repository https://github.com/NEFSC/READ-SSB-Lee-Counterfactual_Modeling_of_Multispecies_Fisheries/tree/d4949273a5fceb37a5ed9c8986fd9bb12af6a072

These economic simulations are intended to be integrated into a bioeconomic model of groundfish. However, to focus on the counterfactual vs status-quota simulations, we have removed most of the biological and ecosystem machinery.

Replicating the simulations will take a few steps.

1. Obtain the simulation data. The simulation data should be placed into the ``/data/data_raw/econ`` folder.

2. Set up the data. Run the following 3 stata do files and 2 R scripts that are in the ``/preprocessing/economic`` directory:

``/preprocessing/economic/wrapper_common.do``

``/preprocessing/economic/wrapper_validation.do``

``/preprocessing/economic/wrapper_CF.do``

``/preprocessing/economic/pre_process_econ_AB_counterfactual.R``

``/preprocessing/economic/pre_process_econ_AB_validation.R``

Different types of simulations are run by passing different parameters into the model using the various ``mprocEcon_XXX.csv`` files.

Validation (Catch Share) simulations

To run the validation (CS) simulation, ensure that line 18 in ``/modelParameters/set_om_parameters_global.R`` is:

```
mprocfile<-"mprocEcon_validate.csv"
```

Then, run ``/processes/runSim_Econonly_validation.R.`` Model results in the manuscript correspond to the output data where ``m==2`` (see the file ``/modelParameters/mprocEcon_validate.csv``). These data are used for:

1. The 75th and 25th percentile CS Range and Predicted CS line in Figures 1-4 and Figures 8-9

2. The predicted (CS) line in Figure 5

3. Figures 6,7,10,11, A1, and A2 in combination with the Counterfactual (DAS) Simulations

There are three other models that are robustness checks.

Counterfactual Simulations

To run the Countefactual (DAS) simulations, change line 18 in ``/modelParameters/set_om_parameters_global.R`` to read:

```
mprocfile<-"mprocEcon_counterfactual_closemult.csv"
```

```

Then, run ``/processes/runSim_Econonly_counterfactual_closemult.R.`` Model results in the manuscript correspond to the output data where ``m==2`` (see the file ``/modelParameters/mprocEcon_validate.csv``). These data are used for:

1. The 75th and 25th percentile DAS Range and Predicted DAS line in Figures 3-4 and Figures 8-9

2. The predicted (DAS) line in Figure 5

3. Figures 6,7,10,11, A1, and A2 in combination with the CS Simulations

## Counterfactual Simulations V2

We also simulated the models under regulatory scenario in which reaching the catch limit for stock A *does not* result in cessation of fishing for other stocks caught along with stock A. This is a bit unrealistic. If you want to run this type of model, change line 18 in ``/modelParameters/set_om_parameters_global.R`` to read:

```

mprocfile<-"mprocEcon_counterfactual_single.csv"

```

Then, run ``/processes/runSim_Econonly_counterfactual_closesingle.R.``

## Combining results.

The code output are day-vessel level predictions of trips and catch. Aggregate these into monthly outputs by running ``postprocessing/economic/summary_econ_running.R,`` changing the ‘stub’ as necessary.

4. **Graphing**
    a. Set input, working, and output (graph) directories.
    b. Run “4_GRAPHS.do.”

**Final output files:**

1. Figure 1: “GILLNETSlandingsvalidationALL.png”
2. Figure 2: “TRAWLlandingsvalidationALL.png”
3. Figure 3: “GILLNETSlandingscounterfactualALL.png"
4. Figure 4: “TRAWLlandingscounterfactualALL.png"
```

5. Figure 5: “cumulqty.png”
6. Figure 6: “revdiffsgf.png”
7. Figure 7: “bennet.png”
8. Figure 8: “GILLNETSdaysfished.png”
9: Figure 9: “TRAWLdaysfished.png”
10. Figure 10: “revhbar1.png”
11. Figure 11: “revhbar2.png”