

- a. Dataset will add from excel likewise line 14. However, I chose USA Unemployment rate data as an example and we added USA economic factors data at line 16. In the last or 9th line of the data is USA unemployment data for the years of 2000-2019.
- b. In this study we use the years of 2000-2019 dataset, and 9 economic factors used for each country.
- c. We run the code for each factor of country (that is, firstly we chose country and then we run the code respectively for each factor (totally we run the code 9 country x 9 factors=81)) for each code.

#### *A. MODELING*

1. Look at the 'Modeling' file. 'CC, Dkrrn, F1, fitting, U' files are required for modeling file to work.
2. In the line 5, m is equal to the total factors number, and this is stabil variable.
3. M and l values choose in this dataset M=10, l=10. M value is effected to dimension of A matrix, l is past data number. M and l can changable according to the experince, when M and l tahe higher value MAPE is getting lower. In addition to this, dimension of A matrix equals to polynomial degree [].
4. Run the code.
5. In Line 37 give me the modeling results, Niumin is optimal fractional order ( $0 < \nu \leq 1$ ) and MAPE ismean absolute percentage error.
6. With line 38, we can save modeling  $f(x)$  values. With line 39, we can save the fractional order and MAPE value.

#### *B. IMPACT FACTOR*

1. Look at the 'ImpactFactor' file
2. In line 7, m value show me total number of data functions (in this study we have nine economic factors)
3. In line 8, we give Nout= 9 because of the we choosed the USA unemployment rate data ( $f^{(9)}$ )
4. In line 26, we can change l value. In this study we take results for l=3,5,10.
5. Run the code
6. In line 142 we can save the weighted average impact factor values ( $A_{lr}$ ).

#### *C. PREDICTION*

1. Look at the 'Prediction' file
2. In line 20, we give Nout= 9 because of the we choosed the USA unemployment rate data ( $f^{(9)}$ ), for example when we change as Nout=3 we will predict USA 2019 GDP growth data ( $f^{(3)}$ )
3. In line 22, predstep shows how many years you want to predict the last, for example predstep=1, we predict year of 2019 data, however we choose the predstep=2 we will predict years of 2018 and 2019 data.
4. In line 27, l value is given in the range 2 and 9. By trying each of them, we can find best prediction by looking at the last years. This range is changable.
5. Run the code

6. Line 178 give reel data for last year when we choose predstep=1. We write `reel=data(Nout,20)`; 20 give the last data in this dataset.
7. Line 178 give prediction data for last year when we choose predstep=1.
8. We can save the optimal  $l$  value, reel and prediction data, and MAPE value in line 184.