# Replication Instructions for "Asset Prices and Unemployment Fluctuations: A Resolution of the Unemployment Volatility Puzzle"

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## 1   Summary

The replication package consists of two main folders, `KLMP_data` and `KLMP_model`. This note explains how to replicate the data construction and the construction of the statistics on the job-finding rate, unemployment, employment, and separations overall and by age group reported in the paper using the material provided in the folder `KLMP_data` as well as to reproduce the model-based simulation results reported in the paper using the material provided in the folder `KLMP_model`.[1] We certify that the authors of the manuscript have legitimate access to and permission to use the data used in the manuscript. All data are publicly available.

## 2   Replication of Results from the Data

All files described here are contained in the folder `KLMP_data`.

### 2.1   Data Sources

The data provided in the folder `KLMP_data` come from three sources: the Bureau of Labor Statistics (BLS), the Current Population Survey (CPS), and the replication material for Krolikowski (2017), which uses data from the Panel Study of Income Dynamics (PSID), available at https://www.aeaweb.org/articles?id=10.1257/mac.20140064. Some of the BLS data we use are from the St. Louis Fed's Federal Reserve Economic Data (FRED) website. The data inputs are organized as indicated in Table 1. The following steps detail how to obtain them:

1. Download the CPS micro data from IPUMS at https://cps.ipums.org/cps-action/variables/group as follows:

    (a) Select the following (harmonized) variables:

        - In Household/Core/Technical, select "year", "serial" and "month";
        - In Household/Core/Linking, select "cpsid";
        - In Person/Core/Demographics, select "age";
        - In Person/Core/Work, select "empstat" and "durunemp";
        - In Person/Core/Technical, select "pernum" and "wtfinl";
        - In Person/Core/Linking, select "cpsidp".

Table 1: Data Sources

| Data file | Source | Notes | Provided |
|---|---|---|---|
| Data/cps.dta | IPUMS | Public | Yes |
| Data/data_fred.xlsx | FRED St. Louis Fed | Public (combines multiple data sources) | Yes |
| Data/BLS_data.txt | BLS | Public | Yes |
| Data/ln_ages.txt | BLS download.bls.gov/pub/time.series/ln/ | Public | Yes |
| Data/ln_series.txt | BLS download.bls.gov/pub/time.series/ln/ | Public | Yes |
| Data/rw_2006_wage_growth_nlsy.xlsx | Table 2b from Rubinstein and Weiss (2006) | Public (computed using data from NLSY) | Yes |
| Data/rw_2006_wage_growth_psid.xlsx | Table 2b from Rubinstein and Weiss (2006) | Public (computed using data from PSID) | Yes |
| Krolikowski 2017/Data/1988rawfam.dta | Krolikowski (2017) | Public | Yes |
| Krolikowski 2017/Data/1989rawfam.dta | Krolikowski (2017) | Public | Yes |
| Krolikowski 2017/Data/1990rawfam.dta | Krolikowski (2017) | Public | Yes |
| Krolikowski 2017/Data/1991rawfam.dta | Krolikowski (2017) | Public | Yes |
| Krolikowski 2017/Data/1992rawfam.dta | Krolikowski (2017) | Public | Yes |
| Krolikowski 2017/Data/1993rawfam.dta | Krolikowski (2017) | Public | Yes |
| Krolikowski 2017/Data/FAM1994ER.txt | Krolikowski (2017) | Public | Yes |
| Krolikowski 2017/Data/FAM1995ER.txt | Krolikowski (2017) | Public | Yes |
| Krolikowski 2017/Data/FAM1996ER.txt | Krolikowski (2017) | Public | Yes |
| Krolikowski 2017/Data/FAM1997ER.txt | Krolikowski (2017) | Public | Yes |
| Krolikowski 2017/Data/IND2013ER.txt | Krolikowski (2017) | Public | Yes |

(b) Choose "Select Samples":

- "Cross Sectional";

- All "Basic Monthly" samples from 1990-1999 and 2000-2009;

- Submit sample selections.

(c) Click on "View Cart":

- Then on "Create Data Extract";

- For the data format, select "Stata" (dta);

- Submit the extract.

(d) Once the request is processed:

- Click on "Download Stata" to download the data file. It should appear as a compressed GZ file;

- Unzip it following the instructions at https://www.bls.gov/help/instructions-for-opening-gz-files.htm;

- Place the data file in the subfolder `Data` and rename it `cps.dta`.

2. The data in the file `data_fred.xlsx` in the folder `KLMP_Data\Data` is from the St. Louis' FRED website. Specifically, the series of interest are:

(a) Employment level (SA) at https://fred.stlouisfed.org/series/CE16OV;

(b) Unemployment Level (SA) at https://fred.stlouisfed.org/series/UNEMPLOY;

(c) Number Unemployed for Less Than 5 Weeks (SA) at https://fred.stlouisfed.org/series/UEMPLT5;

(d) Unemployment Rate (SA) at https://fred.stlouisfed.org/series/UNRATE;

(e) Unemployment Rate (not SA) at https://fred.stlouisfed.org/series/UNRATENSA;

(f) Unemployment Rate - 16-24 Yrs (SA) at https://fred.stlouisfed.org/series/LNS14024887;

(g) Unemployment Rate - 16-24 Yrs. (not SA) at https://fred.stlouisfed.org/series/LNU04024887;

(h) Unemployment Rate - 25-34 Yrs. (SA) at https://fred.stlouisfed.org/series/LNS14000089;

(i) Unemployment Rate - 25-34 Yrs. (not SA) at https://fred.stlouisfed.org/series/LNU04000089;

(j) Unemployment Rate - 35-44 Yrs. (SA) at https://fred.stlouisfed.org/series/LNS14000091;

(k) Unemployment Rate - 35-44 Yrs. (not SA) at https://fred.stlouisfed.org/series/LNU04000091;

(l) Unemployment Rate - 45-54 Yrs. (SA) at https://fred.stlouisfed.org/series/LNS14000093;

(m) Unemployment Rate - 45-54 Yrs. (not SA) at https://fred.stlouisfed.org/series/LNU04000093;

(n) Number Unemployed for Less Than 5 Weeks (not SA) at https://fred.stlouisfed.org/series/LNU03008396;

(o) Civilian Labor Force Level (SA) at https://fred.stlouisfed.org/series/CLF16OV;

(p) Civilian Labor Force Level (not SA) at https://fred.stlouisfed.org/series/LNU01000000.

3. The BLS data were downloaded from from the BLS website, in particular:

(a) The `BLS_data.txt` file from https://download.bls.gov/pub/time.series/ln/ln.data.1.AllData;

(b) The `ln_ages.txt` file from https://download.bls.gov/pub/time.series/ln/ln.ages;

(c) The `ln_series.txt` file from https://download.bls.gov/pub/time.series/ln/ln.series.

When downloading these files, do not copy and paste them into txt files, rather use your browser to save the page of interest.

4. For the replication material from Krolikowski (2017):

(a) Go to the AEA website https://www.aeaweb.org/articles?id=10.1257/mac.20140064;

(b) Under "Additional Materials", choose "Data Set";

(c) If you do not have an OPENICPSR account, create one, then click on "Download This Project";

(d) Follow the instructions provided in the replication material. Note that this step will require you to download data from the PSID as described by the author and that we perform a few modifications to the do files provided as described in Section 2.4 below. All the necessary data are provided in our own replication material, thus there is no need to reconstruct them.

5. For the data in `rw_2006_wage_growth_nlsy.xlsx` and `rw_2006_wage_growth_psid.xlsx`, see Table 2b in the chapter by Rubinstein and Weiss (2006) in the Handbook of the Economics of Education at https://www.sciencedirect.com/science/article/pii/S1574069206010014.

## 2.2 Seasonality Adjustment in Stata

The first step consists of installing the `sax12` package in Stata, which uses the X-13ARIMA-SEATS program for the seasonality adjustment of data provided by the U.S. Census Bureau. The folder named `Census x13` contains two files: the ado file `sax12.ado` and the executable file `x13.exe`. The executable file can be downloaded from the

webpage of the U.S. Census Bureau at https://www.census.gov/data/software/x13as.Win_X-13.html.[2] The `sax12` package in Stata is an interface for the software provided by the U.S. Census Bureau that executes it by calling the `x13.exe` executable file. However, the Stata package is corrupt. Thus before using it, the original `sax12.ado` file automatically installed by Stata needs to be replaced with the one we provide in this folder.

The steps to install the `sax12` program in Stata are as follows:

1. Type "`help st0255`" in Stata and proceed to install the package;

2. Locate the local path of the pre-installed `sax12.ado` file using the `findfile` command in Stata. If Stata cannot find the file, browse the directory listed after typing in Stata `sysdir`. This is the directory where the ado files are stored;

3. Once the file `sax12.ado` is located, replace it with the one that we provide in the folder `Census x13`;

4. Close and re-open Stata. The `sax12` package should be operational.

## 2.3   Replication Steps

Once the seasonality adjustment program is installed, modify the main path in the file `0_master_replication.do` and run it. To ensure a smooth execution of the program:

 - Verify that the `sax12` package is properly installed as per the steps provided in Section 1.1;

 - Make sure that the path to the working directory is not too long, otherwise the seasonality adjustment program may not run properly;

 - If the replication material is installed in Dropbox, then pause any Dropbox synchronization before running the program to make sure that files can be read and erased as needed.

## 2.4   Organization of the Material

The folder consists of five do files:

1. `0_master_replication.do`: this is the master file that executes the replication program;

2. `1_adjfactor.do`: this file uses the raw CPS micro data described above to compute adjustment factors for aggregate short-term unemployment and short-term unemployment by age group to account for the redesign of the CPS survey in 1994;

3. `2_stats_agg.do`: this file uses the BLS data described above to compute labor market statistics for the aggregate economy;

4. `3a_stats_byage.do`: this file uses the BLS data to compute labor market statistics by age group;

5. `3b_data_byage.do`: this file extracts and deseasonalizes data on employment and unemployment by age group from the BLS;

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[2]See there the instructions on compatible operating systems.

6. `4_wage_growth_interpolation.do`: this file interpolates and extrapolates estimates of annual wage growth with experience provided by Rubinstein and Weiss (2006) based on data from the National Longitudinal Survey of Youth (NLSY) and the PSID (see the online appendix for details);

7. `5_psid_analysis.do`: this file computes the average change in wages experienced upon an employment-nonemployment-employment (ENE) transition following Krolikowski (2017) (see the online appendix for details).

The code uses inputs from three folders:

1. `Data`: this folder contains data from the BLS (the files `BLS_data.txt`, `ln_ages.txt`, and `ln_series.txt`), FRED (the file `data_fred.xlsx`), and the Integrated Public Use Microdata Series (IPUMS) CPS (the file `cps.dta`) on unemployment and employment, and estimates of annual wage growth with experience from the NLSY and the PSID (the files `rw_2006_wage_growth_nlsy.xlsx` and `rw_2006_wage_growth_psid.xlsx`, respectively, provided by Rubinstein and Weiss (2006, Table 2b));

2. `Census x13`: this folder contains the X-13ARIMA-SEATS seasonality adjustment program described;

3. `Krolikowski 2017`: this folder contains the replication files from Krolikowski (2017), which we have slightly modified, used by `5_psid_analysis.do`. Running the file `main.do` in the folder `Krolikowski 2017\Do files` produces the dataset `psid_analysis_1988_1997.dta`, saved in the folder `Krolikowski 2017\Output`, and executes four additional do files:

   (a) `step1_extractfam_1988_1997.do`: this file inputs the raw data from the year-by-year PSID family files;

   (b) `step2_extractind_1988_1997.do`: this file inputs the raw data from the cross-year PSID individual (person) files. The file `IND2015ER.txt` in the folder `Krolikowski 2017\Data`, which we provide, contains all the years up to 2013, just as in Krolikowski (2017). Our only addition consists of renaming the following education variables:

       i. ER30620 → $educind1989$;
       ii. ER30657 → $educind1990$;
       iii. ER30703 → $educind1991$;
       iv. ER30748 → $educind1992$;
       v. ER30820 → $educind1993$;
       vi. ER33115 → $educind1994$;
       vii. ER33215 → $educind1995$;
       viii. ER33315 → $educind1996$;
       ix. ER33415 → $educind1997$;

   (c) `step3_merge_indfam.do`: this file merges the individual and family files;

   (d) `step4_restrictions_analysis.do`: this file performs an analysis of monthly individual employment and unemployment transitions and corresponding wage changes. We have introduced two changes to this file. First, our analysis applies to individuals aged 16 and older whereas Krolikowski (2017) selects individuals aged 18 to 65 (included). This different sample selection criterion leads to a different

measured average change in wages after a nonemployment spell. We have added to the master file a global dummy variable `ichange` that is equal to 1 by default and performs an age adjustment of the data selecting all individuals aged 16 and older. If the variable `ichange` is set equal to 0, instead, the code reverts to Krolikowski's (2017) original age selection of individuals aged 18 to 65. Second, we have converted all nominal dollar amounts into real 2000 USD rather than real 2007 USD as in Krolikowski (2017). Again, this change can be reversed by setting the variable `ichange` equal to 0.

The code we provide produces an Excel file, `statistics.xlsx`, that contains labor market statistics for the aggregate economy and by age group and experience, which we use in our quantitative exercises.

# 3    Replication of Results from the Model

All files are contained in the folder `KLMP_model`. Running the file `main_klmp.m` reproduces the results in the paper. The code makes use of Matlab's statistics toolbox as well as the Compecon library available at https://aede.osu.edu/sites/aede/files/imce/files/Miranda/CompEcon2021.zip or http://www4.ncsu.edu/ pfackler/compecon/toolbox.html. Make sure that the Compecon library runs properly by following the installation instructions, and include it in Matlab's path before executing `main_klmp.m`.

## 3.1    List of Auxiliary Data Files

The following additional public data files are used to compute targeted moments in some simulations from the model as detailed in the paper:

1. `CPIAUCNS.xlsx`. Source: Fred. Availability: Public. Provided: Yes;

2. `CPIAUCSL.xlsx`. Source: Fred. Availability: Public. Provided: Yes;

3. `datagsw.xlsx`. Source: Federal Reserve. Availability: Public. Provided: Yes. These data are the Gurkaynak-Sack-Swanson and Gurkaynak-Sack-Wright yield curve data available at:

   (a) https://www.federalreserve.gov/econresdata/researchdata/feds200628.xls;
   (b) https://www.federalreserve.gov/econresdata/researchdata/feds200805.xls;

4. `FamaFrench_Portfolios_Formed_on_ME.xlsx`. Availability: Public. Provided: Yes, obtained from Kenneth R. French's website at https://mba.tuck.dartmouth.edu/pages/faculty/ken.french/data_library.html;

5. `FamaFrench_Portfolios_Formed_on_ME_Wout_Div.xlsx`. Availability: Public. Provided: Yes, obtained from Kenneth R. French's website at https://mba.tuck.dartmouth.edu/pages/faculty/ken.french/data_library.html;

6. `FamaFrench_Research_Data_Factors.xlsx`. Availability: Public. Provided: Yes, obtained from Kenneth R. French's website at https://mba.tuck.dartmouth.edu/pages/faculty/ken.french/data_library.html;

7. `Fernald_tfp.xlsx`. Availability: Public. Provided: Yes, obtained from John G. Fernald's website at https://www.johnfernald.net/TFP;

8. `FlowofFunds_fu103.xlsx`. Source: Federal Reserve. Availability: Public. Provided: Yes, obtained from the Flow of Funds at https://www.federalreserve.gov/releases/z1/;

9. `Fred_MacroVariables.xlsx`. Source: Fred. Availability: Public. Provided: Yes;

10. `Shiller_ie_data.xlsx`. Availability: Public. Provided: Yes, obtained from Robert Shiller's website, http://www.econ.yale.edu/ shiller/data.htm.

## 3.2 List of Figures

Here we list which script (and which line of the code) reproduces each figure:

1. Figure A.2a: `klmp_habits/endowment_cc/graphS_plot.m`, line 50;

2. Figure A.2b: `klmp_habits/endowment_cc/graphq_plot.m`, line 45;

3. Figure 1a/A.2c: `klmp_habits/isovolalines/graphS_plot.m`, line 53;

4. Figure 1b/A.2d: `klmp_habits/isovolalines/graphq_plot.m`, line 46;

5. Figure 2a: `klmp_habits/model_klmp_habits.m`, line 1304;

6. Figure 2b: `klmp_habits/model_klmp_habits.m`, line 1317;

7. Figure 3a: `klmp_habits/main_klmp_habits.m`, line 283;

8. Figure 3b: `klmp_habits_40y/main_klmp_habits.m`, line 212;

9. Figure 4a: `klmp_habits/model_klmp_habits.m`, line 1014;

10. Figure 4b: `klmp_habits/model_klmp_habits.m`, line 987;

11. Figure 5a: `klmp_habits/model_klmp_habits.m`, line 1291;

12. Figure 5b: `klmp_habits/model_klmp_habits.m`, line 1035;

13. Figure A.1a: `klmp_habits/model_klmp_habits_sensitivity.m`, line 466;

14. Figure A.1b: `klmp_habits/model_klmp_habits_sensitivity.m`, line 484;

15. Figure A.1c: `klmp_habits/model_klmp_habits_sensitivity.m`, line 502;

16. Figure A.1d: `klmp_habits/model_klmp_habits_sensitivity.m`, line 528.