```
>> [data, model, estimation, misc] = OpenBDLM_main;
```

Step 1: Start OpenBDLM

```
_____________________________________________

     Starting OpenBDLM_V1.0
_____________________________________________

            Time series analysis using
            Bayesian Dynamic Linear Models
_____________________________________________

— Start a new project:

     *      Enter a configuration filename
     0   —> Interactive tool

— Type D to Delete project(s), V for Version control, Q to Quit.

     choice >> 0
```

Step 2: Choose the interactive tool

```
_____________________________________

          Starting a new project...
_____________________________________

— Enter a project name (max 25 characters):
     choice >> Example_DISP
```

Step 3: Enter the project name

```
— Does this project aim to create synthetic data ? (y/n)
     choice >> no
```

Step 4: Disregard generating synthetic data

```
     Load data...

— Choose a database

     0   —> Build a new database

     choice >> 0
```

Step 5: Load new data

```
— Data available:

     Time series number #      Reference name            Size
     ____________________________________________________________

     1                         DISP                      [19366x1]
     ____________________________________________________________

     — How many model classes do you want for each time-series?
     choice >> 1
```

Step 6a: Select the number of model classes

```
    ____________________________________________________________
    BDLM Component reference numbers
    ____________________________________________________________

    11: Local level
    12: Local trend
    13: Local acceleration
    21: Local level compatible with local trend
    22: Local level compatible with local acceleration
    23: Local trend compatible with local acceleration
    31: Periodic
    41: Autoregressive process (AR(1))
    51: Kernel regression
    61: Level Intervention
    ____________________________________________________________

- Identify components for time series #1; e.g. [11 31 41]
    choice >> [11 31 31 41]
```

Step 6b: Select the block components

```
    Building model...
    Saving project...
    Project saved in saved_projects/PROJ_Example_DISP.mat.
    Printing configuration file...
    Saving data...

    Database saved in data/mat/DATA_Example_DISP.mat
    Configuration file saved in config_files/CFG_Example_DISP.m.


    ________________________________________________
/   OpenBDLM main menu. Choose from
________________________________________________

    1  ->  Learn model parameters values
    2  ->  Estimate initial hidden states values
    3  ->  Estimate hidden states values

    11 ->  Display and modify current model parameter values
    12 ->  Display and modify current initial hidden states values
    13 ->  Display and modify current training period
    14 ->  Plots
    15 ->  Display model matrices
    16 ->  Create synthetic data
    17 ->  Export
    18 ->  Display current options in configuration file format
```

```
    Type Q to Save and Quit

    choice >> 1

_____________________________________________
/ Learn model parameters
_____________________________________________

    1 —>  Newton—Raphson
    2 —>  Stochastic Gradient Ascent

    Type R to return to the previous menu

    choice >> 1   Step 7b: Start the Newton-Raphson algorithm

    Learning model parameters (Newton—Raphson) ...

   \Start Newton—Raphson maximization  algorithm
   (finite difference method)

     Training period:                                    1—Inf [days]
     Maximal number of iteration:                        3
     Total time limit for calibration :                  60 [min]
     Convergence criterion:                              1e—07*LL
     Nb. of search levels for \lambda:                   4*2

          Initial LL: 36627.6547
                      AR|M1|1         AR|M1|1         |M1|1
     parameter names: \phi            \sigma_w        \sigma_v
      initial values: +7.50e—01       +1.74e—02       +8.70e—03
_____________________________
   Loop #1 : AR|M1|1 | \sigma_w
      delta_param: 0.0048527
   log—likelihood : 40472.2846
   param change   : 0.0174 —> 0.022253

                     AR|M1|1         AR|M1|1         |M1|1
  parameter names: \phi            \sigma_w        \sigma_v
   current values: +7.50e—01       +2.23e—02       +8.70e—03
 current f.o. std: +0.00e+00       +5.63e—05       +0.00e+00
    previous dLL: +1.00e+06        +3.84e+03       +1.00e+06
       converged: +0.00e+00        +0.00e+00       +0.00e+00

_____________________________
```

```
    Loop #2 : AR|M1|1 | \phi
       delta_param: 0.16243
    log-likelihood : 46976.3494
    param change   : 0.75 -> 0.91243

                    AR|M1|1         AR|M1|1         |M1|1
   parameter names: \phi            \sigma_w        \sigma_v
    current values: +9.12e-01       +2.23e-02       +8.70e-03
  current f.o. std: +1.94e-03       +5.63e-05       +0.00e+00
      previous dLL: +6.50e+03       +3.84e+03       +1.00e+06
         converged: +0.00e+00       +0.00e+00       +0.00e+00

_____________________________
    Loop #3 : |M1|1 | \sigma_v
       delta_param: -0.0056165
    log-likelihood : 47795.5556
    param change   : 0.0087002 -> 0.0030837

                    AR|M1|1         AR|M1|1         |M1|1
   parameter names: \phi            \sigma_w        \sigma_v
    current values: +9.12e-01       +2.23e-02       +3.08e-03
  current f.o. std: +1.94e-03       +5.63e-05       +2.02e-04
      previous dLL: +6.50e+03       +3.84e+03       +8.19e+02
         converged: +0.00e+00       +0.00e+00       +0.00e+00

          Warning: the optimization has reached the
          maximum number of loops (3) without convergence

 ________________________
    Final results
 ________________________
   log-likelihood: 47795.5556
                    AR|M1|1         AR|M1|1         |M1|1
  parameter names: \phi            \sigma_w        \sigma_v
   current values: +9.12e-01       +2.23e-02       +3.08e-03
 current f.o. std: +1.94e-03       +5.63e-05       +2.02e-04

_____________________________________________________
/     OpenBDLM main menu. Choose from
_____________________________________________________

     choice >>  2
```

Step 8: Estimate the initial hidden states values

```
 ____________________________________________________
 /    OpenBDLM main menu. Choose from
```

```
_____________________________________________________

    choice >> 3
```
Step 9a: Access hidden states estimation menu

```
_____________________________________________________
/    State estimation
_____________________________________________________

     1 —>  Filter
     2 —>  Smoother

     Type R to return to the previous menu

     choice >> 1
```
Step 9b: Estimate the hidden states

```
_____________________________________________________
/    OpenBDLM main menu. Choose from
_____________________________________________________

     choice >> 17
```
Step 10a: Access the export menu

```
_____________________________________________________
/    Export menu
_____________________________________________________

     1 —>  Export the project in a configuration file
     2 —>  Export data in CSV format
     3 —>  Export results in CSV format
     4 —>  Create and export figures

     Type R to return to the previous menu

     choice >> 1
```
Step 10b: Export the project in a configuration file

```
     Printing configuration file...
     Saving data...
     Database saved in data/mat/DATA_Example_DISP.mat
     Configuration file saved in config_files/CFG_Example_DISP.m.

 _____________________________________________________
/    OpenBDLM main menu. Choose from
_____________________________________________________

     choice >> Q
```
Step 11: Save and quit