**Online Appendix**

In the online appendix, full Matlab codes are provided to replicate the applied example and solve the exercise problem. The codes can be used for a typical MSM estimator and are based on the log of Matlab programming language; however, they are written in a way which is understandable for users of other programming languages as well. Files included in the online appendix are:

* + *MSM\_Applied\_Example.zip*; including full matlab codes and a Vensim model (Figure 2.2).
  + *MSM\_Exercise\_Obesity.zip*; including full matlab codes, data, a Vensim model, and a sample solution.

To run the Matlab codes, execute *RUN\_MSM.m* file. Codes are written in different script files (files with the extension ‘.*m*’) presented in Table 2.7.

**[Table 2.7 near here]**

Table 2.7: Matlab script files for the firms example

|  |  |
| --- | --- |
| **Script file** | **Action** |
| *RUN\_MSM.m* | Follows the MSM steps and saves estimated parameters, confidence intervals and J-test results in a ‘.*mat*’ file. |
| *UserInput\_MSM.m* | Includes the number of simulations, *K* in equation (2), and the number of simulations to estimate ,  and  in equation (4). |
| *UserInput\_Model.m\** | Includes model constants (e.g. the number of firms and Reference Resources in the firms example). It also includes the true values of the parameters (see Table 2.3). These values are only used to generate a data set out of which actual moments are extracted. |
| *OptimizationInitiation.m* | Includes the optimization tolerance (as a stopping criterion), the lower and the upper bounds for the unknown parameters, and the initial points to be used by the optimization solver. It also includes the choice of solver (‘GlobalSearch’ or ‘MultiStart’). See Matlab Help for more information about optimization solvers. |
| *MomentSelection.m\** | Selects the moments (e.g. mean of profits) from the data. |
| *EmpiricalMoments.m\** | Executes the *FirmExample.m* and *MomentSelection.m* to capture the empirical moments. |
| *SimulatedMoments.m\** | Executes the *FirmExample.m* and *MomentSelection.m* to capture the simulated moments. |
| *FirmExample.m†* | Executes two functions to run the firms example: *PinkNoise.m* and *FirmsModel.m*. |
| *PinkNoise.m†* | Generates the pink noise used in the firms example. |
| *FirmsProfits.m†* | Generates profits of the firms. |
| *W1.m* | Calculates a weighting matrix with diagonal elements of . This weighting matrix is used in the first round of optimization. |
| *Optimization.m* | Runs the optimization solver based on user-provided information in the *OptimizationInitiation.m*. Note that the objective function for the optimization solver is *MSM\_Obj\_Fn.m* file. |
| *MSM\_Obj\_Fn.m* | Estimates simulated moments and then follows Equation (3) in the first round of optimization—it follows Equation (5) when is estimated. |
| *Weight.m* | Estimates the weighting matrix () based on estimated parameters in the first round of optimization. |
| *EstimatedVar.m* | Estimates the variance-covariance matrix of the estimated parameters, see Equation (7). |
| *ChangeParameters.m* | Shifts estimated parameters one epsilon up and down. The output of this function is used in *Delta.m*. |
| *Delta.m* | Estimates the sensitivity of the simulated moments to the estimated parameters based on the outputs of *ChangeParameters.m*. |
| *ConfInt.m* | Calculates confidence intervals of the estimates parameters based on a confidence level (e.g. 95%). |
| *J\_test.m* | Runs the J-test, see Equation (8). |
| *SingularityWarningFlag.m* | Checks for singularity and near singularity of the matrix that is being inverted. If the matrix is singular or nearly singular, a flag with value 1 is saved. |
| *NumOfMomWarningFlag.m* | Checks the number of moments vs the number of unknown parameters. Note that the number of moments should not be less than the number of unknown parameters; otherwise, a flag with value 1 is saved. |

\* Functions which are customized for the firms example.  
*†* Functions which excusively present the dynamic model of the firms example.