Matlab code for:
"Model Averaging in Risk Management with an Application to Futures Markets" by M. Hashem Pesaran, Christoph Schleicher and Paolo Zaffaroni

1. Directories

- **\rawData** (contains csv files of the raw data – Prices.csv and Returns.csv)
- **\volatility models** (contains the code of the various univariate and multivariate volatility models)
    a. `estimate_parameters.m` estimates the parameters of the volatility models using the function `estimate_volatilityModel.m`
    b. the list of models to be estimated are contained in the files
        i. `listOfModels.m` (for multivariate models) and
        ii. `listOfUnivariateModels.m` (for univariate models)
    c. the code for the individual volatility models is located in the sub-directories **\ADCC**, **\CCC**, **\DCC**, **\EQMA**, **\EWMA**, **\GARCH**, **\GEWMA**, **\GJR**, **\MMA**, **\OGARCH**, **\Risk Metrics**, **\TDCC**
- **\compute likelihoods** (compute likelihoods, AICs, SBCs, and one-step predictors)
    a. `compute_likelihoodsAndPredictors.m` (computes in-sample likelihoods, AICs, SBCs, and one-step ahead covariance predictors)
- **\portfolio choic**e (compute the optimal positions subject to VaR constraint)
    a. `meanVariancePortfolio_t.m` portfolio choice for single models
    b. `meanVariancePortfolio_average.m` portfolio choice for average models using the secant method
    c. `meanVariancePortfolio_average_Newton.m` portfolio choice for average models using the Newton method (faster than secant method)
- **\active risk management** (chooses an optimal portfolio for a given volatility model and computes the VaR diagnostic tests)
    a. `do_activeRiskManagementSingleModel.m` (for single models)
    b. `do_activeRiskManagementAverageModel.`m (for average models)
    c. `listOfStrategies.m` (list of strategies for constructing average models)
- **\passive risk management** (computes the VaR diagnostic tests for portfolios with exogenous weights)
    a. `do_passiveRiskManagementSingleModel.m` (for single models)
    b. `do_passiveRiskManagementAverageModel.m` (for average models)

- **\ranks** (computes the fraction of times a volatility model is selected in given percentiles, as well as the AIC and SBC weights)
- **\IPT tests** (computes the Kolmogorov-Smirnov and Kuiper tests based on the Integral Probability Transform)
- **\generate tables** (generates LaTeX files of the tables used in the paper)
    a. `create_the_tables.m` (main program, which calls all other functions)
- **\generate figures** (generates eps files of the figures used in the paper)
- **\general** (contains several utilities)

2. Running the main program

The results of the paper can be replicated by running the script `marm_main.m` in the base directory. As a first step it is necessary to edit the file `marm_globalSettings.m`, which determines the base directory from which the program is executed. The directories listed in section 1 should be subdirectories of this base directory. `marm_globalSettings.m` also amends the Matlab search path to include the GARCH toolbox, which is part of the spatial econometrics toolbox (www.spatial-econometrics.com).

`marm_main.m` is structured in the following way:

1. import the raw data => structure `data`
2. generate AR(1) out-of-sample forecasts (`cond_m_ar1`) and forecast errors (`ret_res`)
3. estimate volatility models => structure `EstimationOutput`
4. compute (i) the in-sample likelihoods, AICs, SBCs (structure `SampleLikelihoods`) and (ii) the one-step-predictors of the covariance matrix (structure `OneStepPredictors`)
5. active risk management => structure `ActiveRiskManagement`
6. passive risk management => structure `PassiveRiskManagement`
7. univariate models (not discussed in the paper) => structure `UnivariateOutput`
8. compute ranks and average Bayesian weights => structures `Ranks` and `BayesianWeights`
9. compute statistical diagnostic tests based on integral probability transforms => `IPT_tests`

All computations were done on a PC with Matlab version 7.3.0 (R2006b) and version 2.0 of the UCSD GARCH toolbox. Note that the programs do not run under Matlab version 7.4.0 (R2007a), because of incompatibilities with the UCSD GARCH toolbox.