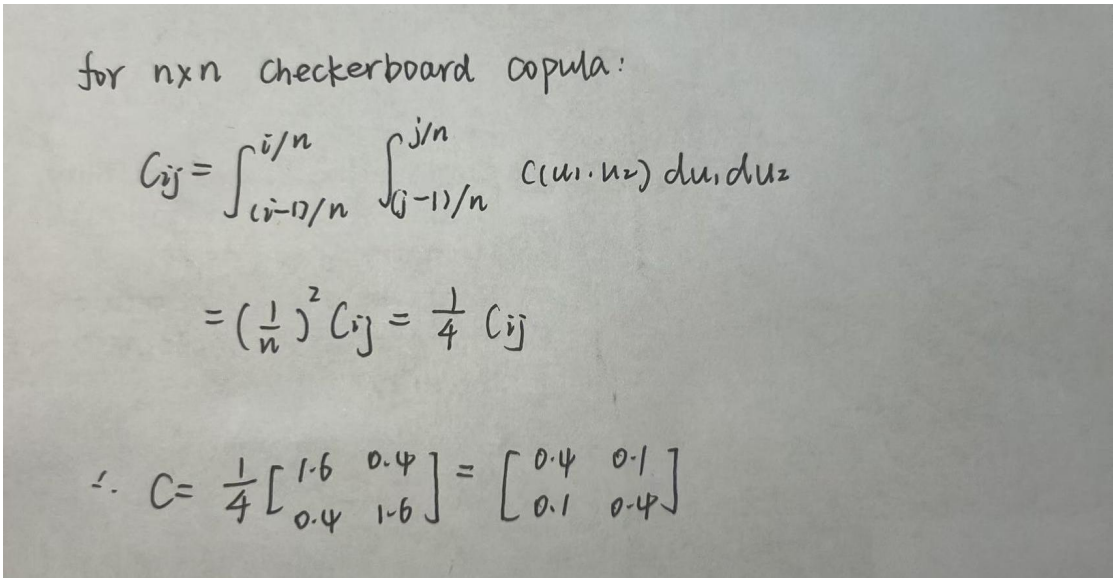
Problem 1



Problem 2

Checkerboard Copula Defined by Sums of Random Variables

In this section, we use MATLAB to complete the following steps:

- **1. Compare MAE and MSE Code**

We first reviewed the example code for both MAE and MSE methods. And find the only difference lies in the `%% Construct Problem` section:

MAE uses: `' meanabs_err(matrix_scenarios_05)'`

MSE uses: `' meansquare_err(matrix_scenarios_05)'`

- **2. Implement the Mixed Error Objective**

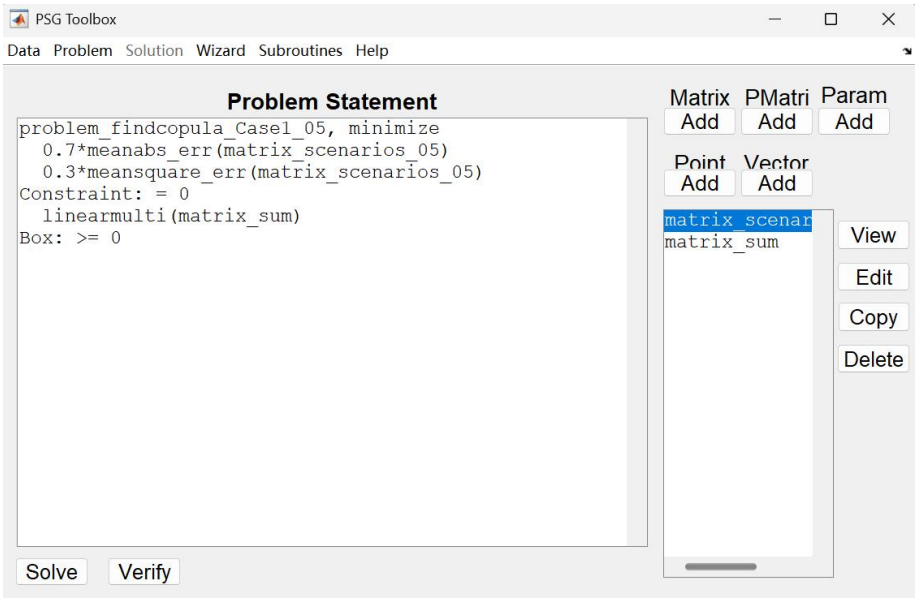
Since the problem requires the following mixed error:

0.7 × meanabs err + 0.3 × meansquare err

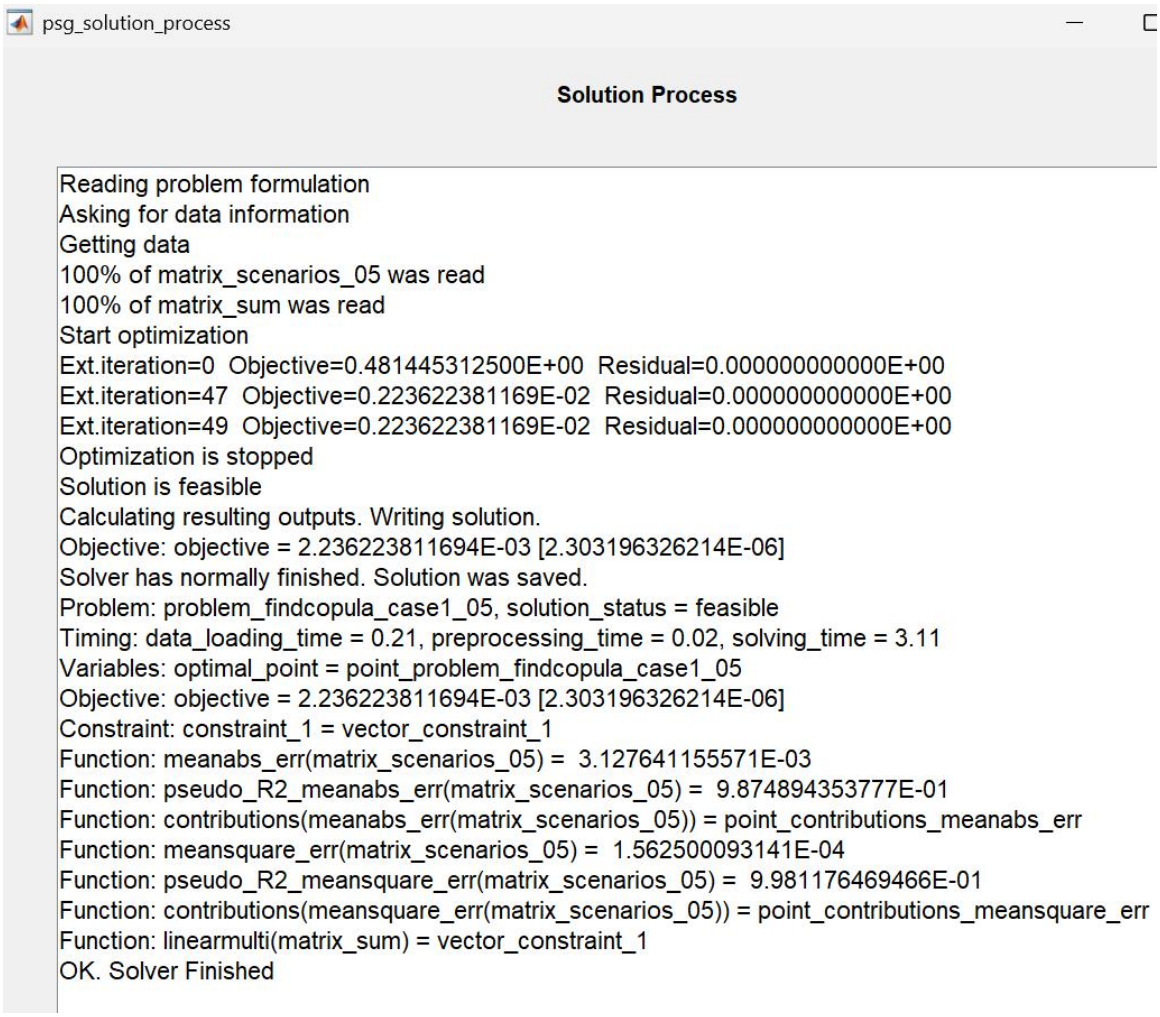
So we just need to follow the hint and modify the `%% Construct Problem` section.

```
problem_statement=sprintf('%s\n', ...
'problem_findcopula_Case1_05, minimize', ...
'  0.7*meanabs_err(matrix_scenarios_05)', ...
'  0.3*meansquare_err(matrix_scenarios_05)', ...
'Constraint: = 0', ...
'  linearmulti(matrix_sum)', ...
'Box: >= 0');
```

Then we ran the problem using the PSG toolbox.



- **3. Solution Process& Results**



```
Problem: problem_findcopula_case1_05, solution_status = feasible
Timing: data_loading_time = 0.21, preprocessing_time = 0.02, solving_time = 3.11
Variables: optimal_point = point_problem_findcopula_case1_05
Objective: objective = 2.236223811694E-03 [2.303196326214E-06]
Constraint: constraint_1 = vector_constraint_1
Function: meanabs_err(matrix_scenarios_05) =  3.127641155571E-03
Function: pseudo_R2_meanabs_err(matrix_scenarios_05) =  9.874894353777E-01
Function: contributions(meanabs_err(matrix_scenarios_05)) = point_contributions_meanabs_err
Function: meansquare_err(matrix_scenarios_05) =  1.562500093141E-04
Function: pseudo_R2_meansquare_err(matrix_scenarios_05) =  9.981176469466E-01
Function: contributions(meansquare_err(matrix_scenarios_05)) = point_contributions_meansquare_err
Function: linearmulti(matrix_sum) = vector_constraint_1
```

The solver successfully returned a feasible solution with objective value ≈ 0.002236.

The individual error components were:

MAE = 0.00313

MSE = 0.000156

pseudo-R^2(MAE) ≈ 0.987

pseudo-R^2(MSE) ≈ 0.998

This confirms that the optimization was carried out correctly with the desired mixed-error objective.