

Row and Column Combine Stack Tables and Matrices

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Generate Some Tables and Matrixes for Combination

```
close all;

% Generate Table 1
ar_fl_abc1 = [0.4 0.1 0.25 0.3 0.4];
ar_fl_abc2 = [0.4 0.1 0.2 0.3 0.4];
number1 = '123';
number2 = '456';
mt_data_a = [ar_fl_abc1' ar_fl_abc2'];

tb_test_a = array2table(mt_data_a);
cl_col_names_a = {'col' num2str(number1)}, ['col' num2str(number2)];
cl_row_names_a = strcat('rowA=', string((1:size(mt_data_a,1))));

tb_test_a.Properties.VariableNames = cl_col_names_a;
tb_test_a.Properties.RowNames = cl_row_names_a;
disp(tb_test_a);
```

| | col123 | col456 |
|--------|--------|--------|
| rowA=1 | 0.4 | 0.4 |
| rowA=2 | 0.1 | 0.1 |
| rowA=3 | 0.25 | 0.2 |
| rowA=4 | 0.3 | 0.3 |
| rowA=5 | 0.4 | 0.4 |

```
% Generate Table 2
rng(123);
ar_fl_abc3 = rand(size(ar_fl_abc1));
ar_fl_abc4 = rand(size(ar_fl_abc1));
ar_fl_abc5 = rand(size(ar_fl_abc1));

mt_data_b = [ar_fl_abc3' ar_fl_abc4' ar_fl_abc5'];

tb_test_b = array2table(mt_data_b);
cl_col_names_b = {'col' num2str(33)}, ['col' num2str(44)], ['col' num2str(55)];
cl_row_names_b = strcat('rowB=', string((1:size(mt_data_a,1))));

tb_test_b.Properties.VariableNames = cl_col_names_b;
tb_test_b.Properties.RowNames = cl_row_names_b;
disp(tb_test_b);
```

| | col33 | col44 | col55 |
|--------|---------|---------|----------|
| rowB=1 | 0.69647 | 0.42311 | 0.34318 |
| rowB=2 | 0.28614 | 0.98076 | 0.72905 |
| rowB=3 | 0.22685 | 0.68483 | 0.43857 |
| rowB=4 | 0.55131 | 0.48093 | 0.059678 |

rowB=5 0.71947 0.39212 0.39804

Combine Tables Together Stack Columns

Tables with the same number of rows, add more columns with named variables

```
% a and b must have the same row names
tb_test_b_withArownames = tb_test_b;
tb_test_b_withArownames.Properties.RowNames = tb_test_a.Properties.RowNames;
tb_ab_col_stacked = [tb_test_a tb_test_b_withArownames];
disp(tb_ab_col_stacked);
```

| | col123 | col456 | col133 | col144 | col155 |
|--------|--------|--------|---------|---------|----------|
| rowA=1 | 0.4 | 0.4 | 0.69647 | 0.42311 | 0.34318 |
| rowA=2 | 0.1 | 0.1 | 0.28614 | 0.98076 | 0.72905 |
| rowA=3 | 0.25 | 0.2 | 0.22685 | 0.68483 | 0.43857 |
| rowA=4 | 0.3 | 0.3 | 0.55131 | 0.48093 | 0.059678 |
| rowA=5 | 0.4 | 0.4 | 0.71947 | 0.39212 | 0.39804 |

Combine Tables Together Stack Rows

Tables with the same number of columns, add more rows variables

```
% Select only 2 columns to match table a column count
tb_test_b_subset = tb_test_b(:,1:2);

% Make Column Names consistent
tb_test_b_subset.Properties.VariableNames = cl_col_names_a;

% Reset Row Names, can not have identical row names
tb_test_a.Properties.RowNames = strcat('row=', string((1:size(mt_data_a,1))));
tb_test_b_subset.Properties.RowNames = ...
    strcat('row=', string(((size(mt_data_a,1)+1):(size(mt_data_a,1)+size(tb_test_b_subset,1)))));
% tb_test_b_subset.Properties.RowNames =

% Stack Rows
tb_ab_row_stacked = [tb_test_a; tb_test_b_subset];
disp(tb_ab_row_stacked);
```

| | col123 | col456 |
|--------|---------|---------|
| row=1 | 0.4 | 0.4 |
| row=2 | 0.1 | 0.1 |
| row=3 | 0.25 | 0.2 |
| row=4 | 0.3 | 0.3 |
| row=5 | 0.4 | 0.4 |
| row=6 | 0.69647 | 0.42311 |
| row=7 | 0.28614 | 0.98076 |
| row=8 | 0.22685 | 0.68483 |
| row=9 | 0.55131 | 0.48093 |
| row=10 | 0.71947 | 0.39212 |

ND Dimensional Parameter Arrays, Simulate Model and Stack Output Tables

Now we will first column combine matrixes, model parameters and model outcomes, and then row combine matrixes from different simulations.

A model takes a N parameters, solve the model over M sets of parameters. Each time when the model is solved, a P by Q table of results is generated. Each column is a different statistics (mean, std, etc.), and each row is a different outcome variable (consumption, asset choices, etc.). Stack these P by Q Tables together, and add in information about the N parameters, each of the tables been stacked initially had the same column and row names.

The resulting table should have P times M rows, for M sets of model simulations each with P rows of results. And there should be N + Q columns, storing the N parameters as well as the Q columns of different outcomes.

```
rng(123);
% Generate A P by Q matrix of random parameter Values
it_param_groups_m = 5;
it_params_n = 2;
it_outcomes_p = 3;
it_stats_q = 3;

% Parameter Matrix and Names
ar_param_names = strcat('param_', string(1:it_params_n));
mt_param_m_by_n = round(rand([it_param_groups_m, it_params_n])*5, 2);

% Loop over the parameters
for it_cur_param_group=1:1:it_param_groups_m

    % Current Parameters
    ar_param = mt_param_m_by_n(it_cur_param_group,:);

    % Some Model is simulated
    mt_model_simu = normrnd(mean(ar_param), std(ar_param), [it_outcomes_p, it_stats_q]);

    % Model Results are Saved As Table With Column and Row Information
    tb_model_simu = array2table(mt_model_simu);
    cl_col_names = strcat('stats_', string((1:size(mt_model_simu,2))));
    cl_row_names = strcat('outvar_', string((1:size(mt_model_simu,1))));
    tb_model_simu.Properties.VariableNames = cl_col_names;
    tb_model_simu.Properties.RowNames = cl_row_names;

    % Convert Row Variable Names to a Column String
    outvar = string(tb_model_simu.Properties.RowNames);
    tb_model_simu = addvars(tb_model_simu, outvar, 'Before', 1);

    % Parameter Information Table that Shares Row Names as Simu Results
    mt_param_info = zeros([it_outcomes_p,it_params_n]) + ar_param;
    tb_param_info = array2table(mt_param_info);
    tb_param_info.Properties.VariableNames = ar_param_names;
    tb_param_info.Properties.RowNames = cl_row_names;

    % Combine Parameter Information and Simulation Contents
    tb_model_simu_w_info = [tb_param_info tb_model_simu];
    % Update Row Names based on total row available
    ar_rows_allsimu = (1:it_stats_q)' + (it_cur_param_group-1)*it_stats_q;
```

```

tb_model_simu_w_info.Properties.RowNames = strcat('row=', string(ar_rows_allsimu));

% Show One Example Table before Stacking
if (it_cur_param_group == round(it_param_groups_m/2))
    disp(tb_model_simu);
    disp(tb_param_info);
    disp(tb_model_simu_w_info);
end

% Stack all results
if(it_cur_param_group == 1)
    tb_model_allsimu_w_info = tb_model_simu_w_info;
else
    tb_model_allsimu_w_info = [tb_model_allsimu_w_info; tb_model_simu_w_info];
end

end

```

| | outvar | stats_1 | stats_2 | stats_3 | | |
|----------|------------|----------|------------|----------|---------|---------|
| outvar_1 | "outvar_1" | 0.056853 | 2.1703 | 2.1098 | | |
| outvar_2 | "outvar_2" | 3.1545 | 2.0634 | 0.7798 | | |
| outvar_3 | "outvar_3" | -0.49033 | 2.2566 | 1.7896 | | |
| | param_1 | param_2 | | | | |
| outvar_1 | 1.13 | 3.42 | | | | |
| outvar_2 | 1.13 | 3.42 | | | | |
| outvar_3 | 1.13 | 3.42 | | | | |
| | param_1 | param_2 | outvar | stats_1 | stats_2 | stats_3 |
| row=7 | 1.13 | 3.42 | "outvar_1" | 0.056853 | 2.1703 | 2.1098 |
| row=8 | 1.13 | 3.42 | "outvar_2" | 3.1545 | 2.0634 | 0.7798 |
| row=9 | 1.13 | 3.42 | "outvar_3" | -0.49033 | 2.2566 | 1.7896 |

Show all Simulation Joint Table Outputs:

```
disp(tb_model_allsimu_w_info);
```

| | param_1 | param_2 | outvar | stats_1 | stats_2 | stats_3 |
|--------|---------|---------|------------|----------|---------|---------|
| row=1 | 3.48 | 2.12 | "outvar_1" | 2.2665 | 1.1885 | 1.924 |
| row=2 | 3.48 | 2.12 | "outvar_2" | 3.3427 | 2.4647 | 2.3548 |
| row=3 | 3.48 | 2.12 | "outvar_3" | 2.6714 | 3.6132 | 2.918 |
| row=4 | 1.43 | 4.9 | "outvar_1" | 3.3859 | 5.3759 | 1.5816 |
| row=5 | 1.43 | 4.9 | "outvar_2" | 3.9499 | 3.8698 | 2.2693 |
| row=6 | 1.43 | 4.9 | "outvar_3" | 5.7745 | 4.6871 | 1.7334 |
| row=7 | 1.13 | 3.42 | "outvar_1" | 0.056853 | 2.1703 | 2.1098 |
| row=8 | 1.13 | 3.42 | "outvar_2" | 3.1545 | 2.0634 | 0.7798 |
| row=9 | 1.13 | 3.42 | "outvar_3" | -0.49033 | 2.2566 | 1.7896 |
| row=10 | 2.76 | 2.4 | "outvar_1" | 2.9611 | 2.6847 | 2.4986 |
| row=11 | 2.76 | 2.4 | "outvar_2" | 2.9333 | 2.3457 | 3.0629 |
| row=12 | 2.76 | 2.4 | "outvar_3" | 2.5814 | 2.4372 | 2.4806 |
| row=13 | 3.6 | 1.96 | "outvar_1" | 2.7199 | 3.3129 | 3.0577 |
| row=14 | 3.6 | 1.96 | "outvar_2" | 3.9804 | 1.4529 | 2.9285 |
| row=15 | 3.6 | 1.96 | "outvar_3" | 2.8445 | 4.4117 | 2.6576 |