

# FF\_SUMM\_ND\_ARRAY Examples

back to [Fan's Intro Math for Econ](#), [Matlab Examples](#), or [Dynamic Asset Repositories](#)

This is the example vignette for function: `ff_summ_nd_array` from the [MEconTools Package](#). This function summarizes policy and value functions over states.

## Test FF\_SUMM\_ND\_ARRAY Defaults

Call the function with defaults.

```
ff_summ_nd_array();
```

| xxx   | Summ over (a,z), | condi | age as cols, | kids/marriage as rows | xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx |             |
|-------|------------------|-------|--------------|-----------------------|----------------------------------|-------------|
| group | marry            | kids  | mean_age_18  | mean_age_19           | mean_age_20                      | mean_age_21 |
| 1     | 0                | 1     | 0.52456      | 0.51689               | 0.48412                          | 0.54526     |
| 2     | 1                | 1     | 0.49355      | 0.52906               | 0.5583                           | 0.47342     |
| 3     | 0                | 2     | 0.49085      | 0.51315               | 0.45158                          | 0.43201     |
| 4     | 1                | 2     | 0.58096      | 0.50596               | 0.47985                          | 0.58791     |
| 5     | 0                | 3     | 0.57811      | 0.6068                | 0.55221                          | 0.50677     |
| 6     | 1                | 3     | 0.53023      | 0.49258               | 0.48728                          | 0.43352     |
| 7     | 0                | 4     | 0.50339      | 0.48449               | 0.53618                          | 0.45993     |
| 8     | 1                | 4     | 0.44418      | 0.5223                | 0.55657                          | 0.48583     |

## Test FF\_SUMM\_ND\_ARRAY with Random 2 Dimensional Matrix

Summarize over 6 dimensional array, iteratively change how many dimensions to group over.

First, generate matrix:

```
st_title = "Random 2D dimensional Array Testing Summarizing";
rng(123)
mn_polval = rand(5,4);
bl_print_table = true;
ar_st_stats = ["mean"];
cl_mp_datasetdesc = {};
cl_mp_datasetdesc{1} = containers.Map({'name', 'labval'}, ...
    {'a', linspace(0,1,size(mn_polval,1))});
cl_mp_datasetdesc{2} = containers.Map({'name', 'labval'}, ...
    {'z', linspace(-1,1,size(mn_polval,2))});
disp(mn_polval);
```

|        |        |        |        |
|--------|--------|--------|--------|
| 0.6965 | 0.4231 | 0.3432 | 0.7380 |
| 0.2861 | 0.9808 | 0.7290 | 0.1825 |
| 0.2269 | 0.6848 | 0.4386 | 0.1755 |
| 0.5513 | 0.4809 | 0.0597 | 0.5316 |
| 0.7195 | 0.3921 | 0.3980 | 0.5318 |

Second, show the entire matrix (no labels):

```
it_aggd = 0;
bl_row = 1;
ff_summ_nd_array(st_title, mn_polval, bl_print_table, ar_st_stats, it_aggd, bl_row);
```

```
xxx Random 2D dimensional Array Testing Summarizing xxxxxxxxxxxxxxxxxxxxxxxxxxxx
```

| group | vardim2 | mean_vardim1_1 | mean_vardim1_2 | mean_vardim1_3 | mean_vardim1_4 | mean_vardim1_5 |
|-------|---------|----------------|----------------|----------------|----------------|----------------|
| 1     | 1       | 0.69647        | 0.28614        | 0.22685        | 0.55131        | 0.71947        |
| 2     | 2       | 0.42311        | 0.98076        | 0.68483        | 0.48093        | 0.39212        |
| 3     | 3       | 0.34318        | 0.72905        | 0.43857        | 0.059678       | 0.39804        |
| 4     | 4       | 0.738          | 0.18249        | 0.17545        | 0.53155        | 0.53183        |

Third, rotate row and column, and now with labels:

```
it_aggd = 0;
bl_row = 1;
ar_permute = [2,1];
ff_summ_nd_array(st_title, mn_polval, bl_print_table, ar_st_stats, it_aggd, bl_row, ...
  cl_mp_datasetdesc, ar_permute);
```

```
xxx Random 2D dimensional Array Testing Summarizing xxxxxxxxxxxxxxxxxxxxxxxxxxxx
```

| group | a    | mean_z__1 | mean_z__0_33333 | mean_z__0_33333 | mean_z__1 |
|-------|------|-----------|-----------------|-----------------|-----------|
| 1     | 0    | 0.69647   | 0.42311         | 0.34318         | 0.738     |
| 2     | 0.25 | 0.28614   | 0.98076         | 0.72905         | 0.18249   |
| 3     | 0.5  | 0.22685   | 0.68483         | 0.43857         | 0.17545   |
| 4     | 0.75 | 0.55131   | 0.48093         | 0.059678        | 0.53155   |
| 5     | 1    | 0.71947   | 0.39212         | 0.39804         | 0.53183   |

Fourth, dimension one as columns, average over dim 2:

```
it_aggd = 1;
bl_row = 1;
ff_summ_nd_array(st_title, mn_polval, bl_print_table, ar_st_stats, it_aggd, bl_row, ...
  cl_mp_datasetdesc);
```

```
xxx Random 2D dimensional Array Testing Summarizing xxxxxxxxxxxxxxxxxxxxxxxxxxxx
```

| group | x | mean_z__1 | mean_z__0_33333 | mean_z__0_33333 | mean_z__1 |
|-------|---|-----------|-----------------|-----------------|-----------|
| 1     | 1 | 0.49605   | 0.59235         | 0.3937          | 0.43186   |

Fifth, dimension one as rows, average over dim 2:

```
it_aggd = 1;
bl_row = 0;
ff_summ_nd_array(st_title, mn_polval, bl_print_table, ar_st_stats, it_aggd, bl_row, ...
  cl_mp_datasetdesc);
```

```
xxx Random 2D dimensional Array Testing Summarizing xxxxxxxxxxxxxxxxxxxxxxxxxxxx
```

| group | z        | sum    | mean    | std     | coefvari | min      | max     |
|-------|----------|--------|---------|---------|----------|----------|---------|
| 1     | -1       | 2.4802 | 0.49605 | 0.22895 | 2.1666   | 0.22685  | 0.71947 |
| 2     | -0.33333 | 2.9617 | 0.59235 | 0.24524 | 2.4154   | 0.39212  | 0.98076 |
| 3     | 0.33333  | 1.9685 | 0.3937  | 0.23907 | 1.6468   | 0.059678 | 0.72905 |
| 4     | 1        | 2.1593 | 0.43186 | 0.24575 | 1.7573   | 0.17545  | 0.738   |

Sixth, dimension two as rows, average over dim 1:

```
ar_permute = [2,1];
```

```

it_aggd = 1;
bl_row = 0;
ff_summ_nd_array(st_title, mn_polval, bl_print_table, ar_st_stats, it_aggd, bl_row, ...
    cl_mp_datasetdesc, ar_permute);

```

| xxx | Random | 2D   | dimensional | Array   | Testing | Summarizing | xxxxxxxxxxxxxxxxxxxxxxxxxxxx |         |
|-----|--------|------|-------------|---------|---------|-------------|------------------------------|---------|
|     | group  | a    | sum         | mean    | std     | coefvari    | min                          | max     |
|     | 1      | 0    | 2.2007      | 0.55019 | 0.19636 | 2.8019      | 0.34318                      | 0.738   |
|     | 2      | 0.25 | 2.1784      | 0.54461 | 0.37514 | 1.4518      | 0.18249                      | 0.98076 |
|     | 3      | 0.5  | 1.5257      | 0.38143 | 0.23212 | 1.6432      | 0.17545                      | 0.68483 |
|     | 4      | 0.75 | 1.6235      | 0.40587 | 0.23269 | 1.7443      | 0.059678                     | 0.55131 |
|     | 5      | 1    | 2.0415      | 0.51036 | 0.15361 | 3.3226      | 0.39212                      | 0.71947 |

## Test FF\_SUMM\_ND\_ARRAY with Random 6 Dimensional Matrix

Summarize over 6 dimensional array, iteratively change how many dimensions to group over.

First, generate matrix:

```

st_title = "Random ND dimensional Array Testing Summarizing";
rng(123)
mn_polval = rand(8,7,6,5,4,3);
bl_print_table = true;
ar_st_stats = ["mean"];

```

Second, summarize over the first four dimensions, row group others:

```

it_aggd = 4;
bl_row = 0;
ff_summ_nd_array(st_title, mn_polval, bl_print_table, ar_st_stats, it_aggd, bl_row);

```

| xxx | Random | ND      | dimensional | Array  | Testing | Summarizing | xxxxxxxxxxxxxxxxxxxxxxxxxxxx |            |         |
|-----|--------|---------|-------------|--------|---------|-------------|------------------------------|------------|---------|
|     | group  | vardim5 | vardim6     | sum    | mean    | std         | coefvari                     | min        | max     |
|     | 1      | 1       | 1           | 836.78 | 0.49808 | 0.29255     | 1.7026                       | 8.1888e-05 | 0.99964 |
|     | 2      | 2       | 1           | 842.15 | 0.50128 | 0.28968     | 1.7305                       | 6.7838e-05 | 0.99936 |
|     | 3      | 3       | 1           | 831.45 | 0.49491 | 0.28851     | 1.7154                       | 0.00091373 | 0.99989 |
|     | 4      | 4       | 1           | 843.9  | 0.50232 | 0.28154     | 1.7842                       | 0.00012471 | 0.99731 |
|     | 5      | 1       | 2           | 838.99 | 0.4994  | 0.2911      | 1.7156                       | 0.00029749 | 0.99938 |
|     | 6      | 2       | 2           | 830.81 | 0.49453 | 0.28634     | 1.7271                       | 0.00027113 | 0.9992  |
|     | 7      | 3       | 2           | 832.59 | 0.49559 | 0.28682     | 1.7279                       | 0.00035994 | 0.99936 |
|     | 8      | 4       | 2           | 820.42 | 0.48835 | 0.29032     | 1.6821                       | 0.00096259 | 0.99896 |
|     | 9      | 1       | 3           | 870.56 | 0.51819 | 0.29111     | 1.7801                       | 0.0010616  | 0.99951 |
|     | 10     | 2       | 3           | 854.68 | 0.50874 | 0.28458     | 1.7877                       | 0.001884   | 0.99965 |
|     | 11     | 3       | 3           | 838.29 | 0.49898 | 0.2891      | 1.726                        | 0.0019192  | 0.99945 |
|     | 12     | 4       | 3           | 842.83 | 0.50169 | 0.2877      | 1.7438                       | 0.00016871 | 0.99963 |

Third, summarize over the first four dimensions, column group 5th, and row group others:

```

it_aggd = 4;
bl_row = 1;
ff_summ_nd_array(st_title, mn_polval, bl_print_table, ["sum"], it_aggd, bl_row);

```

| xxx | Random | ND      | dimensional   | Array         | Testing       | Summarizing   | xxxxxxxxxxxxxxxxxxxxxxxxxxxx |  |
|-----|--------|---------|---------------|---------------|---------------|---------------|------------------------------|--|
|     | group  | vardim6 | sum_vardim5_1 | sum_vardim5_2 | sum_vardim5_3 | sum_vardim5_4 |                              |  |

|   |   |        |        |        |        |
|---|---|--------|--------|--------|--------|
| 1 | 1 | 836.78 | 842.15 | 831.45 | 843.9  |
| 2 | 2 | 838.99 | 830.81 | 832.59 | 820.42 |
| 3 | 3 | 870.56 | 854.68 | 838.29 | 842.83 |

Fourth, summarize over the first five dimensions, column group 6th, no row groups:

```
it_aggd = 5;
bl_row = 1;
ff_summ_nd_array(st_title, mn_polval, bl_print_table, ["mean", "std"], it_aggd, bl_row);
```

| xxx   | Random | ND | dimensional | Array  | Testing  | Summarizing | xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx |        |         |        |
|-------|--------|----|-------------|--------|----------|-------------|----------------------------------|--------|---------|--------|
| group | x      |    | mean_var    | dim6_1 | mean_var | dim6_2      | mean_var                         | dim6_3 | std_var | dim6_1 |
| 1     | 1      |    | 0.49915     |        | 0.49447  |             | 0.5069                           |        | 0.28805 |        |

Fifth, summarize over all six dimensions, summary statistics over the entire dataframe:

```
it_aggd = 6;
bl_row = 0;
ff_summ_nd_array(st_title, mn_polval, bl_print_table, ar_st_stats, it_aggd, bl_row);
```

| xxx   | Random | ND | dimensional | Array   | Testing | Summarizing | xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx |  |         |  |
|-------|--------|----|-------------|---------|---------|-------------|----------------------------------|--|---------|--|
| group | x      |    | sum         | mean    | std     | coefvari    | min                              |  | max     |  |
| 1     | 1      |    | 10083       | 0.50017 | 0.28831 | 1.7349      | 6.7838e-05                       |  | 0.99989 |  |

## Test FF\_SUMM\_ND\_ARRAY with Random 7 Dimensional Matrix with All Parameters

Given a random seven dimensional matrix, average over the 2nd, 4th and 5th dimensionals. Show as row groups the 3, 6 and 7th dimensions, and row groups the 1st dimension. Show Coefficient of Variation only.

```
st_title = "avg VALUE 2+4+5th dims. groups 3+6+7th dims, and row groups the 1st dim.";
rng(123)
mn_polval = rand(3,10,2,10,10,2,3);
ar_permute = [2,4,5,1,3,6,7];
bl_print_table = true;
ar_st_stats = ["coefvari"];
it_aggd = 3; % mean over 3 dims
bl_row = 1; % one var for row group
cl_mp_datasetdesc = {};
cl_mp_datasetdesc{1} = containers.Map({'name', 'labval'}, ...
    {'age', [18, 19, 20]});
cl_mp_datasetdesc{2} = containers.Map({'name', 'labval'}, ...
    {'savings', linspace(0,1,10)});
cl_mp_datasetdesc{3} = containers.Map({'name', 'labval'}, ...
    {'borrsave', [-1,+1]});
cl_mp_datasetdesc{4} = containers.Map({'name', 'labval'}, ...
    {'shocka', linspace(-5,5,10)});
cl_mp_datasetdesc{5} = containers.Map({'name', 'labval'}, ...
    {'shockb', linspace(-5,5,10)});
cl_mp_datasetdesc{6} = containers.Map({'name', 'labval'}, ...
    {'marry', [0,1]});
```

```

cl_mp_datasetdesc{7} = containers.Map({'name', 'labval'}, ...
    {'region', [1,2,3]});
% call function
ff_summ_nd_array(st_title, mn_polval, bl_print_table, ar_st_stats, it_aggd, bl_row, cl_mp_data)

```

```

xxx  avg VALUE 2+4+5th dims. groups 3+6+7th dims, and row groups the 1st dim. xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx
    group      borrsave      marry      region      cv_age_18      cv_age_19      cv_age_20
-----
     1          -1           0           1          1.7607          1.7534          1.7065
     2           1           0           1          1.6566          1.7501          1.7042
     3          -1           1           1          1.6608          1.7658          1.7291
     4           1           1           1           1.756          1.7479          1.7606
     5          -1           0           2          1.7314          1.7506           1.786
     6           1           0           2          1.7347          1.728          1.738
     7          -1           1           2          1.7811          1.755          1.7568
     8           1           1           2          1.7445          1.7398          1.7746
     9          -1           0           3          1.7025          1.7286           1.69
    10           1           0           3           1.74          1.7549          1.7356
    11          -1           1           3          1.7147          1.7287          1.7341
    12           1           1           3          1.7919          1.7313          1.7452

```