FF_SUMM_ND_ARRAY Examples

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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  xxxxxxxxxxxxxxxxxxxxxxxxxxx
    group    marry    kids    mn_age_18    mn_age_19    mn_age_20    mn_age_21    cv_age_18    cv_age_19    cv_age_2
    _____    _____    ____    _________    _________    _________    _________    _________    _________    _______

      1        0        1       0.59079      0.53324      0.55055      0.48708       1.9219       1.8165       1.8001
      2        1        1       0.49876       0.5033      0.48682      0.45402       1.7356       1.5975       1.5387
      3        0        2       0.50857       0.4829      0.49712      0.52998       1.7159       1.6774       1.7651
      4        1        2       0.45619      0.51721      0.50414      0.56312       1.6098       1.7708       1.7753
      5        0        3       0.52992      0.56536      0.41866      0.50231       1.8123       1.8939       1.5224
      6        1        3       0.53958      0.54057      0.52793       0.4703       1.8546       1.8906       1.7381
      7        0        4       0.46439      0.49755      0.52478      0.55786       1.5849       1.8126       1.7073
      8        1        4        0.4126      0.48144      0.47836      0.48858       1.4588       1.6086       1.6158
```

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  xxxxxxxxxxxxxxxxxxxxxxxxxx
    group    vardim2    mn_vardim1_1    mn_vardim1_2    mn_vardim1_3    mn_vardim1_4    mn_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  xxxxxxxxxxxxxxxxxxxxxxxxxx
    group     a      mn_z__1    mn_z__0_33333    mn_z_0_33333    mn_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  xxxxxxxxxxxxxxxxxxxxxxxxxx
    group    x    mn_z__1    mn_z__0_33333    mn_z_0_33333    mn_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  xxxxxxxxxxxxxxxxxxxxxxxxxx
    group       z          mean         std       coefvari       min          max
    _____    ________    _______    _______    ________    ________    _______

      1            -1    0.49605    0.22895      2.1666      0.22685    0.71947
      2      -0.33333    0.59235    0.24524      2.4154      0.39212    0.98076
      3       0.33333     0.3937    0.23907      1.6468     0.059678    0.72905
      4             1    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  xxxxxxxxxxxxxxxxxxxxxxxxxxx
    group     a       mean        std       coefvari      min         max
    _____    ____    _______    _______    ________    ________    _______

      1         0    0.55019    0.19636     2.8019      0.34318      0.738
      2      0.25    0.54461    0.37514     1.4518      0.18249    0.98076
      3       0.5    0.38143    0.23212     1.6432      0.17545    0.68483
      4      0.75    0.40587    0.23269     1.7443     0.059678    0.55131
      5         1    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  xxxxxxxxxxxxxxxxxxxxxxxxxxx
    group    vardim5    vardim6     mean        std       coefvari       min          max
    _____    _______    _______    _______    _______    ________    __________    _______

      1          1          1       0.49808    0.29255     1.7026     8.1888e-05    0.99964
      2          2          1       0.50128    0.28968     1.7305     6.7838e-05    0.99936
      3          3          1       0.49491    0.28851     1.7154     0.00091373    0.99989
      4          4          1       0.50232    0.28154     1.7842     0.00012471    0.99731
      5          1          2        0.4994     0.2911     1.7156     0.00029749    0.99938
      6          2          2       0.49453    0.28634     1.7271     0.00027113     0.9992
      7          3          2       0.49559    0.28682     1.7279     0.00035994    0.99936
      8          4          2       0.48835    0.29032     1.6821     0.00096259    0.99896
      9          1          3       0.51819    0.29111     1.7801      0.0010616    0.99951
     10          2          3       0.50874    0.28458     1.7877       0.001884    0.99965
     11          3          3       0.49898     0.2891      1.726      0.0019192    0.99945
     12          4          3       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, ar_st_stats, it_aggd, bl_row);
```

```
xxx  Random ND dimensional Array Testing Summarizing  xxxxxxxxxxxxxxxxxxxxxxxxxxx
    group    vardim6    mn_vardim5_1    mn_vardim5_2    mn_vardim5_3    mn_vardim5_4
    _____    _______    ____________    ____________    ____________    ____________
```

```
    1        1        0.49808        0.50128        0.49491        0.50232
    2        2         0.4994        0.49453        0.49559        0.48835
    3        3        0.51819        0.50874        0.49898        0.50169
```

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, ar_st_stats, it_aggd, bl_row);
```

```
xxx  Random ND dimensional Array Testing Summarizing  xxxxxxxxxxxxxxxxxxxxxxxxxx
    group    x    mn_vardim6_1    mn_vardim6_2    mn_vardim6_3
    _____    _    ____________    ____________    ____________

      1      1      0.49915         0.49447          0.5069
```

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  xxxxxxxxxxxxxxxxxxxxxxxxxx
    group    x     mean        std       coefvari       min           max
    _____    _    _______    _______    ________    _________    _______

      1      1    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.

```
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 = ["mean", "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_datas
```

```
xxx  avg VALUE 2+4+5th dims. groups 3+6+7th dims, and row groups the 1st dim.  xxxxxxxxxxxxxxxxxxxxxxxxxxx
```

group	borrsave	marry	region	mn_age_18	mn_age_19	mn_age_20	cv_age_18	cv_age_19	cv_age_
1	-1	0	1	0.50503	0.50389	0.49788	1.7607	1.7534	1.7065
2	1	0	1	0.4829	0.50795	0.49205	1.6566	1.7501	1.7042
3	-1	1	1	0.48123	0.50734	0.50109	1.6608	1.7658	1.7291
4	1	1	1	0.49987	0.49852	0.49519	1.756	1.7479	1.7606
5	-1	0	2	0.49859	0.50866	0.51752	1.7314	1.7506	1.786
6	1	0	2	0.50451	0.49802	0.50439	1.7347	1.728	1.738
7	-1	1	2	0.50967	0.49651	0.50556	1.7811	1.755	1.7568
8	1	1	2	0.50209	0.49224	0.50252	1.7445	1.7398	1.7746
9	-1	0	3	0.48885	0.49229	0.49692	1.7025	1.7286	1.69
10	1	0	3	0.49534	0.50183	0.50266	1.74	1.7549	1.7356
11	-1	1	3	0.50312	0.50535	0.48959	1.7147	1.7287	1.7341
12	1	1	3	0.51204	0.49998	0.50738	1.7919	1.7313	1.7452