Small Test Grid Search Solution

This is the example vignette for function: **snw_vfi_main_grid_search** from the **PrjOptiSNW Package.** This function solves for policy function using grid search. Small Solution Analysis. Small Solution Analysis, husband 5 shocks, wife 1 shocks.

Test SNW_VFI_MAIN_GRID_SEARCH Defaults Small

Call the function with defaults parameters.

```
mp_param = snw_mp_param('default_small');
[V_VFI,ap_VFI,cons_VFI,mp_valpol_more] = snw_vfi_main_grid_search(mp_param);
```

```
SNW_VFI_MAIN_GRID_SEARCH: Finished Age Group:18 of 18
SNW_VFI_MAIN_GRID_SEARCH: Finished Age Group:17 of 18
SNW_VFI_MAIN_GRID_SEARCH: Finished Age Group:16 of 18
SNW_VFI_MAIN_GRID_SEARCH: Finished Age Group:15 of 18
SNW_VFI_MAIN_GRID_SEARCH: Finished Age Group:14 of 18
SNW_VFI_MAIN_GRID_SEARCH: Finished Age Group:13 of 18
SNW_VFI_MAIN_GRID_SEARCH: Finished Age Group:12 of 18
SNW_VFI_MAIN_GRID_SEARCH: Finished Age Group:11 of 18
SNW_VFI_MAIN_GRID_SEARCH: Finished Age Group:10 of 18
SNW_VFI_MAIN_GRID_SEARCH: Finished Age Group:9 of 18
SNW_VFI_MAIN_GRID_SEARCH: Finished Age Group:8 of 18
SNW_VFI_MAIN_GRID_SEARCH: Finished Age Group:7 of 18
SNW_VFI_MAIN_GRID_SEARCH: Finished Age Group:6 of 18
SNW_VFI_MAIN_GRID_SEARCH: Finished Age Group:5 of 18
SNW_VFI_MAIN_GRID_SEARCH: Finished Age Group:4 of 18
SNW_VFI_MAIN_GRID_SEARCH: Finished Age Group:3 of 18
SNW_VFI_MAIN_GRID_SEARCH: Finished Age Group:2 of 18
SNW_VFI_MAIN_GRID_SEARCH: Finished Age Group:1 of 18
Elapsed time is 5.586732 seconds.
Completed SNW_VFI_MAIN_GRID_SEARCH;SNW_MP_PARAM=default_small;SNW_MP_CONTROL=default_base
```

Small Param Results Define Frames

Define the matrix dimensions names and dimension vector values. Policy and Value Functions share the same ND dimensional structure.

```
% Grids:
age_grid = [19, 22:5:97, 100];
agrid = mp_param('agrid')';
eta_H_grid = mp_param('eta_H_grid')';
eta_S_grid = mp_param('eta_S_grid')';
ar_st_eta_HS_grid = string(cellstr([num2str(eta_H_grid', 'hz=%3.2f;'), num2str(eta_S_grid', 'wz
edu_grid = [0,1];
marry_grid = [0,1];
kids_grid = (1:1:mp_param('n_kidsgrid'))';
% NaN(n_jgrid,n_agrid,n_etagrid,n_educgrid,n_marriedgrid,n_kidsgrid);
cl_mp_datasetdesc = {};
cl_mp_datasetdesc{1} = containers.Map({'name', 'labval'}, {'age', age_grid});
cl_mp_datasetdesc{2} = containers.Map({'name', 'labval'}, {'savings', agrid});
cl_mp_datasetdesc{3} = containers.Map({'name', 'labval'}, {'Hshock', eta_H_grid});
cl_mp_datasetdesc{4} = containers.Map({'name', 'labval'}, {'edu', edu_grid});
cl_mp_datasetdesc{5} = containers.Map({'name', 'labval'}, {'marry', marry_grid});
```

```
cl_mp_datasetdesc{6} = containers.Map({'name', 'labval'}, {'kids', kids_grid});
```

Analyze Savings and Shocks

First, analyze Savings Levels and Shocks, Aggregate Over All Others, and do various other calculations.

```
% Generate some Data
mp_support_graph = containers.Map('KeyType', 'char', 'ValueType', 'any');
mp_support_graph('cl_st_xtitle') = {'Savings States, a'};
mp_support_graph('st_legend_loc') = 'best';
mp_support_graph('bl_graph_logy') = true; % do not log
```

MEAN(VAL(A,Z)), MEAN(AP(A,Z)), MEAN(C(A,Z))

Tabulate value and policies along savings and shocks:

```
% Set
% NaN(n_jgrid,n_agrid,n_etagrid,n_educgrid,n_marriedgrid,n_kidsgrid);
ar_permute = [1,4,5,6,3,2];
% Value Function
tb_az_v = ff_summ_nd_array("MEAN(VAL(A,Z))", V_VFI, true, ["mean"], 4, 1, cl_mp_datasetdesc, ar
```

```
xxx  MEAN(VAL(A,Z))  xxxxxxxxxxxxxxxxxxxxxxxxxxx
```

group	savings	mean_Hshock__1_8395	mean_Hshock__0_91976	mean_Hshock_0	mean_Hshock_0_91976	mea
1	0	-17.394	-9.166	-4.4582	-1.6255	
2	0.0097656	-16.968	-9.0297	-4.383	-1.5651	
3	0.078125	-15.017	-8.2656	-3.9672	-1.2425	
4	0.26367	-11.958	-6.9235	-3.2427	-0.73314	
5	0.625	-8.614	-5.2917	-2.3144	-0.18776	
6	1.2207	-5.6438	-3.6124	-1.3711	0.33039	
7	2.1094	-3.2727	-2.0767	-0.51202	0.8309	
8	3.3496	-1.4899	-0.79383	0.23904	1.2876	
9	5	-0.18672	0.21807	0.87882	1.6686	
10	7.1191	0.75696	0.99324	1.4131	1.9855	
11	9.7656	1.4411	1.5836	1.8494	2.2522	
12	12.998	1.9409	2.0281	2.1992	2.4786	
13	16.875	2.3126	2.3665	2.4779	2.6713	
14	21.455	2.5903	2.6255	2.6981	2.8331	
15	26.797	2.8009	2.8241	2.8737	2.968	
16	32.959	2.9638	2.9792	3.0129	3.0797	
17	40	3.0907	3.1014	3.1247	3.1725	
18	47.979	3.1906	3.1981	3.2147	3.2492	
19	56.953	3.2703	3.2756	3.2877	3.3131	
20	66.982	3.3347	3.3386	3.3473	3.3663	
21	78.125	3.3872	3.39	3.3965	3.4106	
22	90.439	3.4302	3.4324	3.4373	3.448	
23	103.98	3.4659	3.4675	3.4712	3.4795	
24	118.82	3.4957	3.497	3.4998	3.5062	
25	135	3.5208	3.5218	3.524	3.529	

```
% Aprime Choice
tb_az_ap = ff_summ_nd_array("MEAN(AP(A,Z))", ap_VFI, true, ["mean"], 4, 1, cl_mp_datasetdesc, a
```

```
xxx  MEAN(AP(A,Z))  xxxxxxxxxxxxxxxxxxxxxxxxxxx
```

group	savings	mean_Hshock__1_8395	mean_Hshock__0_91976	mean_Hshock_0	mean_Hshock_0_91976	mea
1	0	1	1.1111	1.5694	2.5926	

2	0.0097656	1.0463	1.1852	1.6343	2.6065
3	0.078125	1.7917	1.9815	2.1806	2.8519
4	0.26367	2.9306	3.0231	3.2083	3.6065
5	0.625	4.0509	4.1296	4.2454	4.5185
6	1.2207	5.1296	5.2176	5.2639	5.3889
7	2.1094	6.1065	6.1852	6.2361	6.2454
8	3.3496	7.0324	7.0648	7.1574	7.1481
9	5	7.9259	7.963	8.037	8.0648
10	7.1191	8.8519	8.875	8.9306	9.0093
11	9.7656	9.7824	9.7963	9.8472	9.9259
12	12.998	10.593	10.625	10.639	10.722
13	16.875	11.481	11.491	11.537	11.597
14	21.455	12.407	12.407	12.426	12.486
15	26.797	13.282	13.296	13.306	13.356
16	32.959	14.116	14.12	14.153	14.19
17	40	14.981	14.981	14.991	15.032
18	47.979	15.88	15.88	15.884	15.912
19	56.953	16.75	16.769	16.782	16.796
20	66.982	17.681	17.685	17.699	17.722
21	78.125	18.495	18.5	18.509	18.551
22	90.439	19.338	19.338	19.347	19.37
23	103.98	20.25	20.264	20.269	20.278
24	118.82	21.097	21.097	21.13	21.144
25	135	21.963	21.968	21.977	21.995

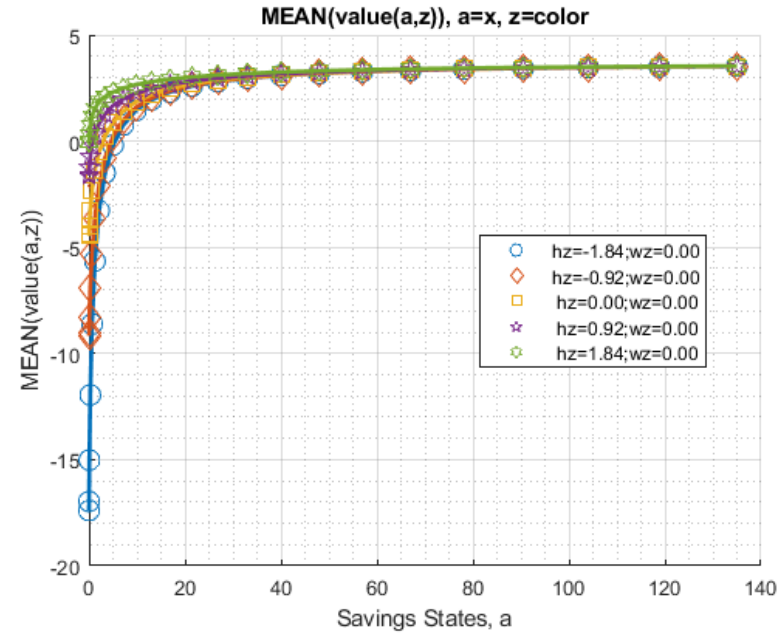
```
% Consumption Choices
tb_az_c = ff_summ_nd_array("MEAN(C(A,Z))", cons_VFI, true, ["mean"], 4, 1, cl_mp_datasetdesc, a
```

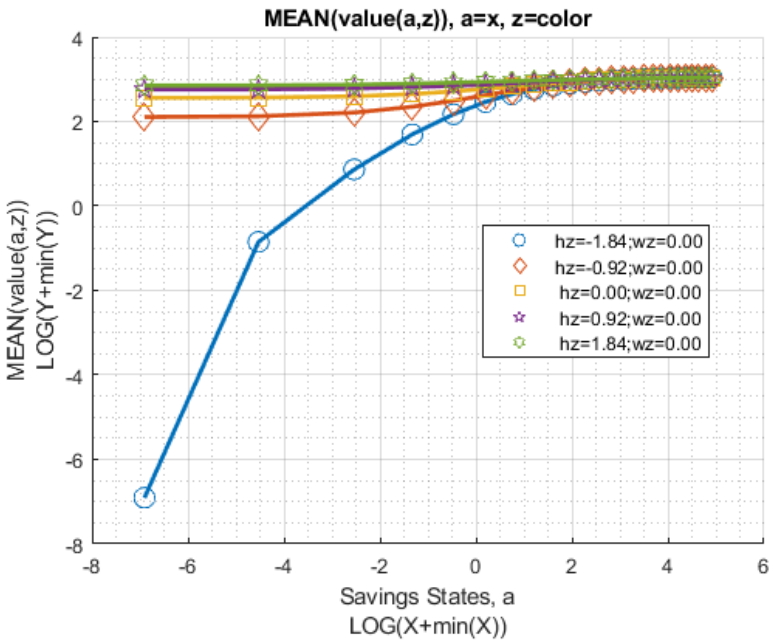
xxx MEAN(C(A,Z)) xxxxxxxxxxxxxxxxxxxxxxxxxx

group	savings	mean_Hshock__1_8395	mean_Hshock__0_91976	mean_Hshock_0	mean_Hshock_0_91976	mea
1	0	0.31042	0.44057	0.71427	1.2574	
2	0.0097656	0.3215	0.4505	0.72262	1.2662	
3	0.078125	0.38861	0.50889	0.7788	1.329	
4	0.26367	0.51067	0.62506	0.88538	1.4326	
5	0.625	0.686	0.78667	1.0455	1.6042	
6	1.2207	0.9128	0.98784	1.2592	1.8667	
7	2.1094	1.2523	1.3082	1.5599	2.2603	
8	3.3496	1.7189	1.8031	1.9833	2.7116	
9	5	2.3724	2.4345	2.6057	3.2749	
10	7.1191	3.1536	3.2269	3.4012	3.948	
11	9.7656	4.0911	4.176	4.3322	4.8361	
12	12.998	5.4598	5.4763	5.7216	6.1634	
13	16.875	6.9683	7.0533	7.1634	7.6403	
14	21.455	8.5994	8.7201	8.9245	9.3583	
15	26.797	10.632	10.678	10.918	11.355	
16	32.959	13.22	13.312	13.401	13.881	
17	40	16.041	16.161	16.385	16.799	
18	47.979	18.978	19.099	19.35	19.836	
19	56.953	22.58	22.534	22.697	23.281	
20	66.982	26.096	26.175	26.329	26.804	
21	78.125	30.85	30.924	31.108	31.367	
22	90.439	35.936	36.056	36.235	36.674	
23	103.98	40.993	40.925	41.151	41.738	
24	118.82	47.079	47.199	47.025	47.532	
25	135	53.5	53.545	53.689	54.103	

Graph Mean Values:

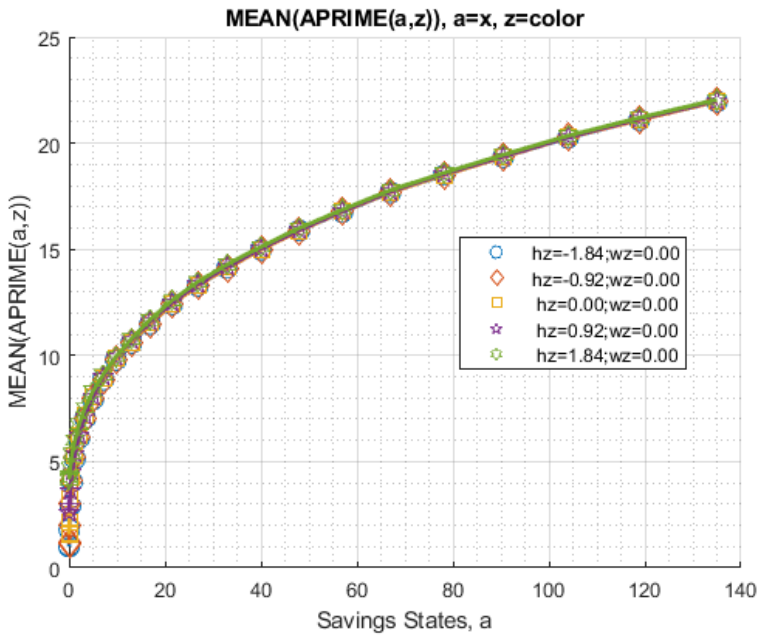
```
mp_support_graph('cl_st_graph_title') = {'MEAN(value(a,z)), a=x, z=color'};
mp_support_graph('cl_st_ytitle') = {'MEAN(value(a,z))'};
ff_graph_grid((tb_az_v{1:end, 3:end})', ar_st_eta_HS_grid, agrid, mp_support_graph);
```

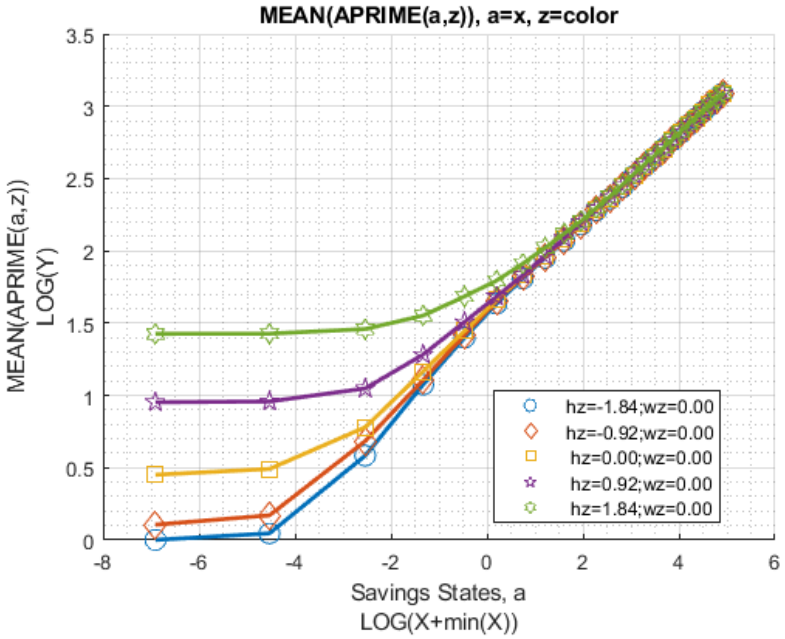




Graph Mean Savings Choices:

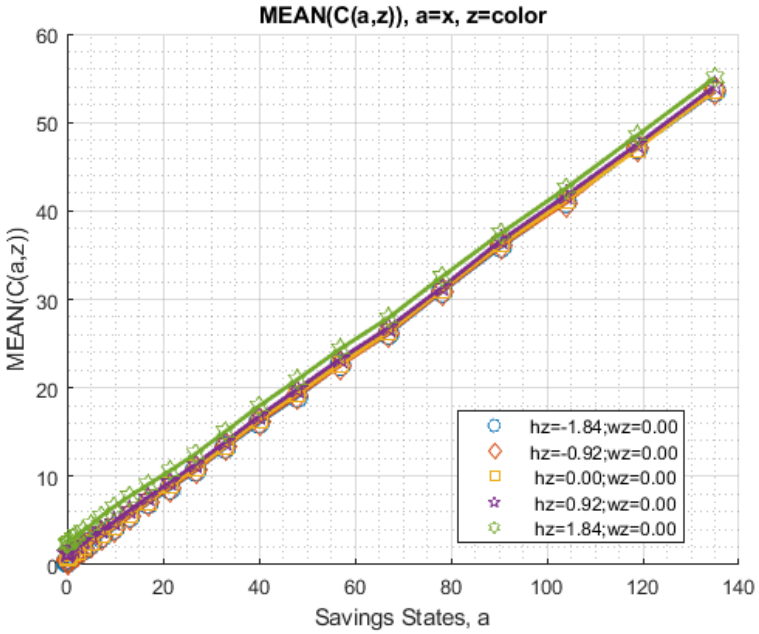
```
mp_support_graph('cl_st_graph_title') = {'MEAN(APRIME(a,z)), a=x, z=color'};
mp_support_graph('cl_st_ytitle') = {'MEAN(APRIME(a,z))'};
ff_graph_grid((tb_az_ap{1:end, 3:end})', ar_st_eta_HS_grid, agrid, mp_support_graph);
```

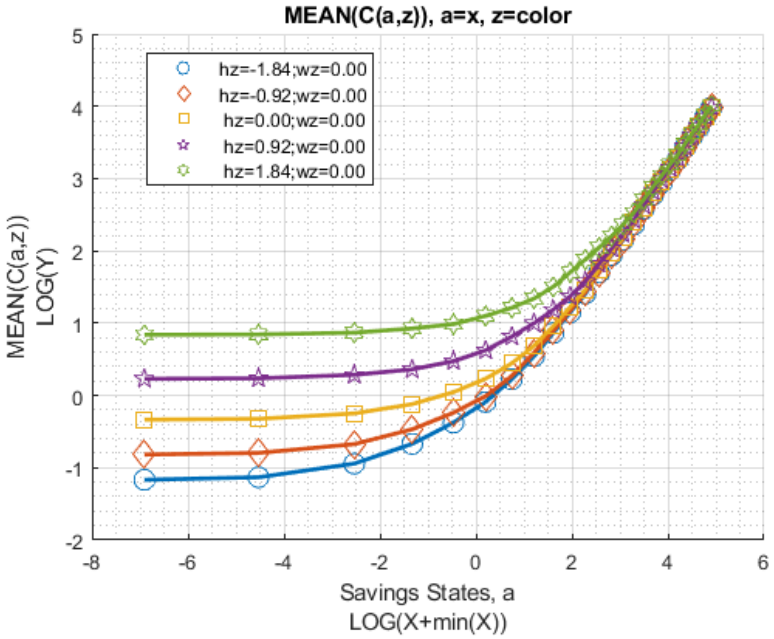




Graph Mean Consumption:

```
mp_support_graph('cl_st_graph_title') = {'MEAN(C(a,z)), a=x, z=color'};
mp_support_graph('cl_st_ytitle') = {'MEAN(C(a,z))'};
ff_graph_grid((tb_az_c{1:end, 3:end})', ar_st_eta_HS_grid, agrid, mp_support_graph);
```





Analyze Kids and Marriage and Age

Aggregating over education, savings, and shocks, what are the differential effects of Marriage and Age.

```
% Generate some Data
mp_support_graph = containers.Map('KeyType', 'char', 'ValueType', 'any');
ar_row_grid = ["k0M0", "K1M0", "K2M0", "k0M1", "K1M1", "K2M1"];
mp_support_graph('cl_st_xtitle') = {'Age'};
mp_support_graph('st_legend_loc') = 'best';
mp_support_graph('bl_graph_logy') = true; % do not log
mp_support_graph('st_rounding') = '6.2f'; % format shock legend
mp_support_graph('cl_scatter_shapes') = { 'o', 'd' ,'s', 'o', 'd', 's'};
mp_support_graph('cl_colors') = {'red', 'red', 'red', 'blue', 'blue', 'blue'};
```

MEAN(VAL(KM,J)), MEAN(AP(KM,J)), MEAN(C(KM,J))

Tabulate value and policies:

```
% Set
% NaN(n_jgrid,n_agrid,n_etagrid,n_educgrid,n_marriedgrid,n_kidsgrid);
ar_permute = [2,3,4,1,6,5];
% Value Function
tb_az_v = ff_summ_nd_array("MEAN(VAL(KM,J))", V_VFI, true, ["mean"], 3, 1, cl_mp_datasetdesc, a
```

```
xxx  MEAN(VAL(KM,J))  xxxxxxxxxxxxxxxxxxxxxxxxxxx
    group    kids    marry    mean_age_19    mean_age_22    mean_age_27    mean_age_32    mean_age_37    mean_age_42
    _____    ____    _____    ___________    ___________    ___________    ___________    ___________    ___________

      1       1        0         1.4134         1.6987         1.8877         1.9428         1.9141         1.8282
      2       2        0        -0.11224        0.38086        0.75969        0.96426        1.0617         1.0785
      3       3        0        -0.88391       -0.40356       -0.0148         0.20487        0.31925        0.35976
      4       1        1         1.9721         2.188          2.3283         2.3713         2.3479         2.2743
      5       2        1         0.97335        1.2928         1.5422         1.6825         1.7486         1.7527
      6       3        1         0.52474        0.81914        1.0571         1.1945         1.2619         1.277
```

```
% Aprime Choice
tb_az_ap = ff_summ_nd_array("MEAN(AP(KM,J))", ap_VFI, true, ["mean"], 3, 1, cl_mp_datasetdesc,
```

```
xxx  MEAN(AP(KM,J))  xxxxxxxxxxxxxxxxxxxxxxxxxxx
    group    kids    marry    mean_age_19    mean_age_22    mean_age_27    mean_age_32    mean_age_37    mean_age_42
    _____    ____    _____    ___________    ___________    ___________    ___________    ___________    ___________

      1       1        0          12.948         12.92          13.052         13.152         13.22          13.264
      2       2        0          12.924         12.88          13.004         13.092         13.156         13.1
      3       3        0          12.856         12.848         12.972         13.08          13.104         13.02
      4       1        1          12.86          12.856         12.972         13.072         13.132         13.184
      5       2        1          12.876         12.82          12.956         13.028         13.096         13.124
      6       3        1          12.8           12.784         12.912         12.984         13.056         13.032
```

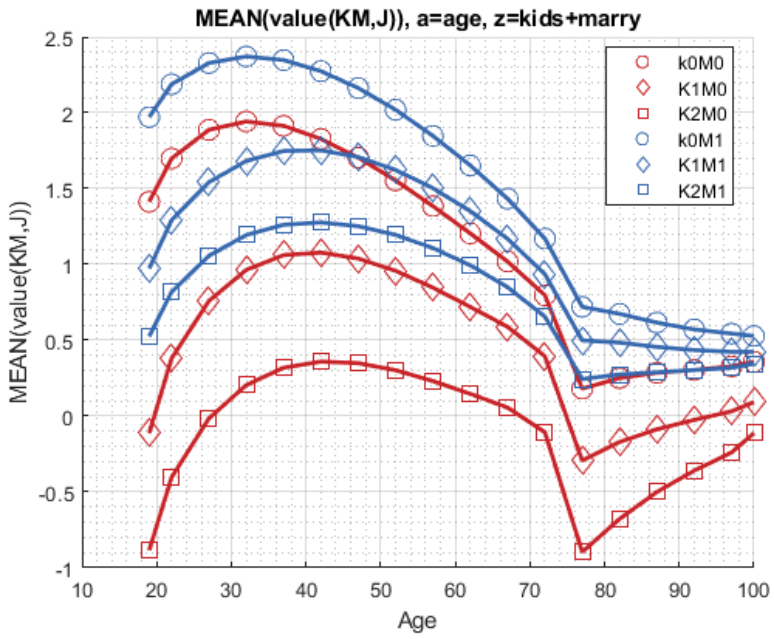
```
% Consumption Choices
tb_az_c = ff_summ_nd_array("MEAN(C(KM,J))", cons_VFI, true, ["mean"], 3, 1, cl_mp_datasetdesc,
```

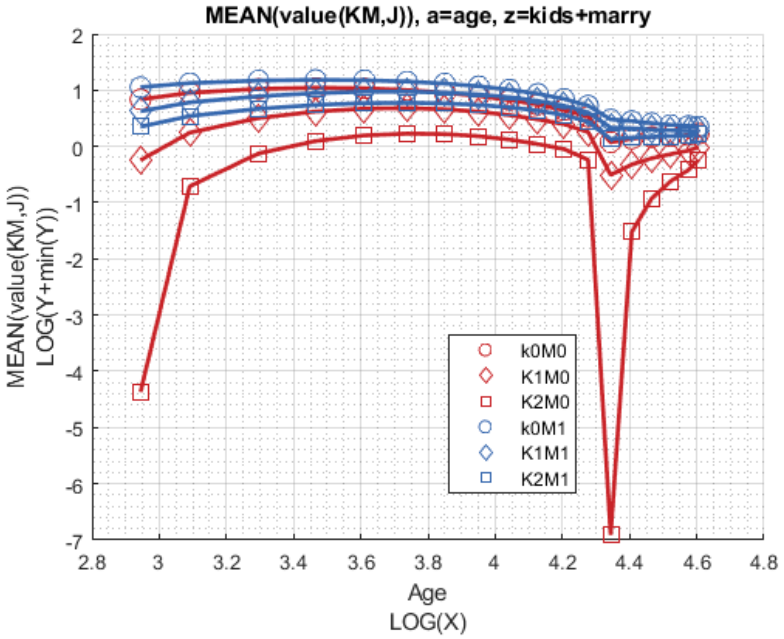
```
xxx  MEAN(C(KM,J))  xxxxxxxxxxxxxxxxxxxxxxxxxxx
    group    kids    marry    mean_age_19    mean_age_22    mean_age_27    mean_age_32    mean_age_37    mean_age_42
    _____    ____    _____    ___________    ___________    ___________    ___________    ___________    ___________

      1       1        0          6.6347         6.7448         6.9773         7.1425         7.2321         7.2843
      2       2        0          6.6476         6.7581         6.9907         7.1658         7.2726         8.8505
      3       3        0          6.6714         6.7696         7.0001         7.1702         7.8471         9.5071
      4       1        1          6.885          7.0096         7.2673         7.4592         7.5807         7.6332
      5       2        1          6.856          6.987          7.2319         7.4245         7.5495         7.8087
      6       3        1          6.8708         6.9855         7.2175         7.4148         7.5369         8.689
```

Graph Mean Values:

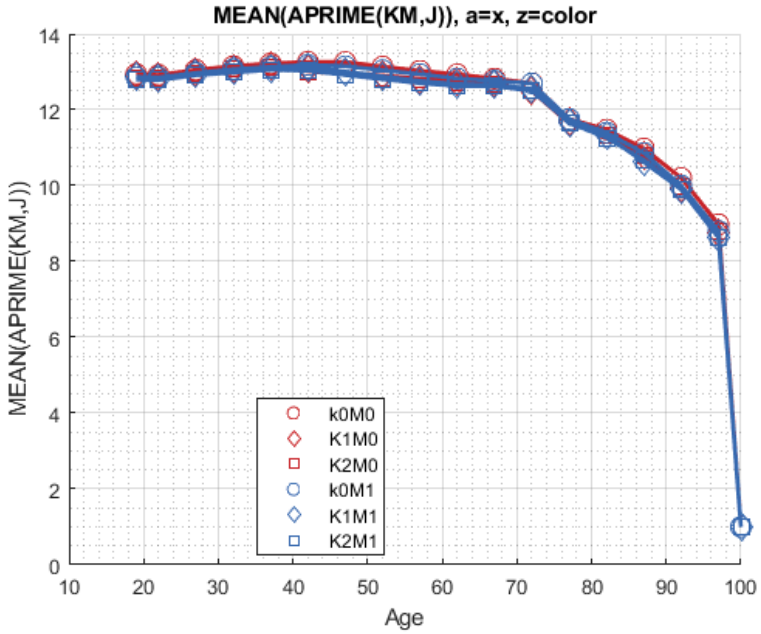
```
mp_support_graph('cl_st_graph_title') = {'MEAN(value(KM,J)), a=age, z=kids+marry'};
mp_support_graph('cl_st_ytitle') = {'MEAN(value(KM,J))'};
ff_graph_grid((tb_az_v{1:end, 4:end}), ar_row_grid, age_grid, mp_support_graph);
```

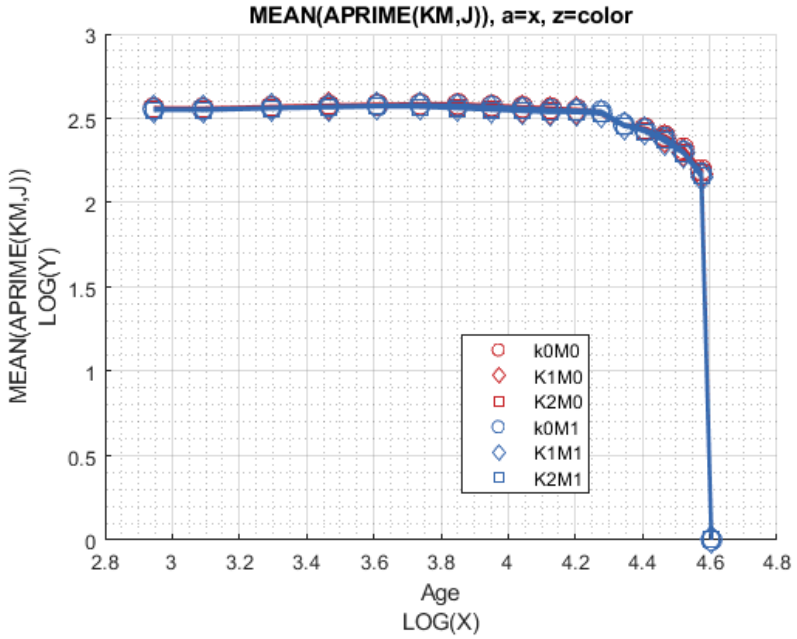




Graph Mean Savings Choices:

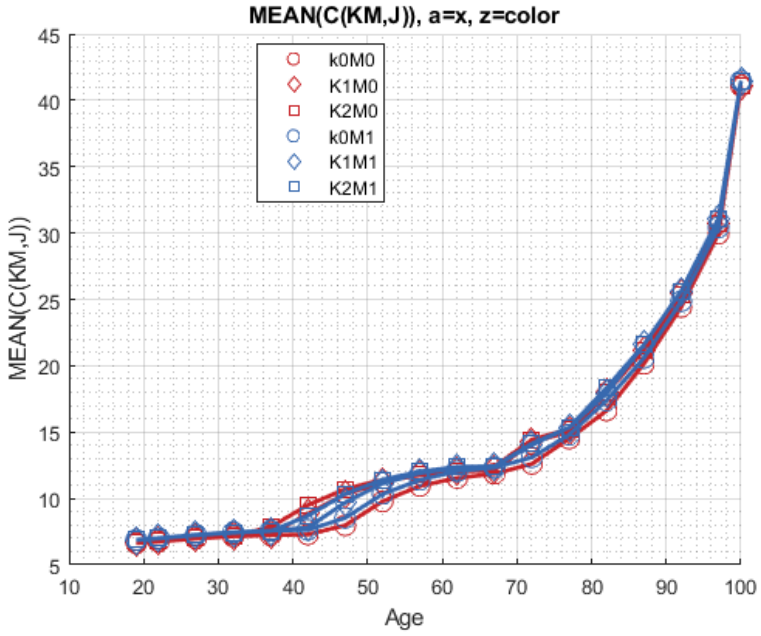
```
mp_support_graph('cl_st_graph_title') = {'MEAN(APRIME(KM,J)), a=x, z=color'};
mp_support_graph('cl_st_ytitle') = {'MEAN(APRIME(KM,J))'};
ff_graph_grid((tb_az_ap{1:end, 4:end}), ar_row_grid, age_grid, mp_support_graph);
```

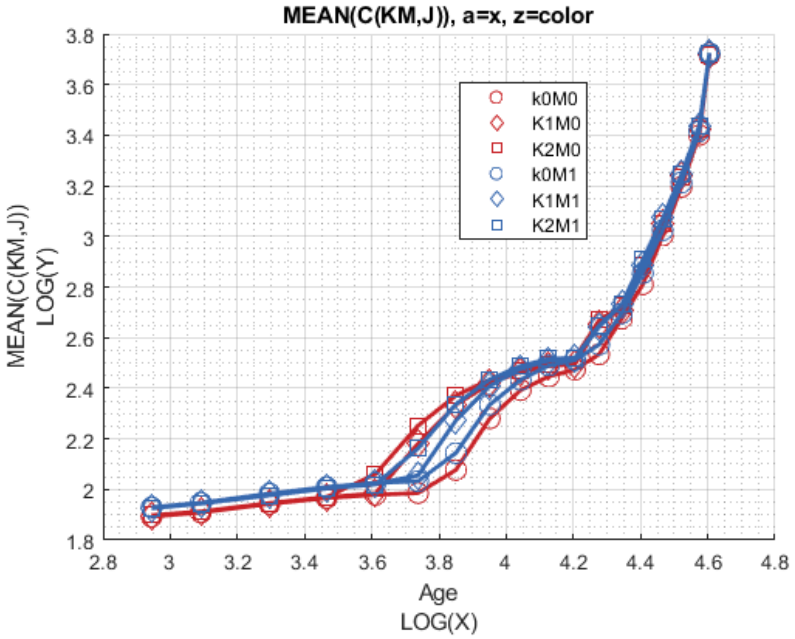




Graph Mean Consumption:

```
mp_support_graph('cl_st_graph_title') = {'MEAN(C(KM,J)), a=x, z=color'};
mp_support_graph('cl_st_ytitle') = {'MEAN(C(KM,J))'};
ff_graph_grid((tb_az_c{1:end, 4:end}), ar_row_grid, age_grid, mp_support_graph);
```





Analyze Education and Marriage and Age

Aggregating over education, savings, and shocks, what are the differential effects of Marriage and Age.

```
% Generate some Data
mp_support_graph = containers.Map('KeyType', 'char', 'ValueType', 'any');
ar_row_grid = ["E0M0", "E1M0", "E0M1", "E1M1"];
mp_support_graph('cl_st_xtitle') = {'Age'};
mp_support_graph('st_legend_loc') = 'best';
mp_support_graph('bl_graph_logy') = true; % do not log
mp_support_graph('st_rounding') = '6.2f'; % format shock legend
mp_support_graph('cl_scatter_shapes') = {'*', 'p', '*','p' };
mp_support_graph('cl_colors') = {'red', 'red', 'blue', 'blue'};
```

MEAN(VAL(EKM,J)), MEAN(AP(EKM,J)), MEAN(C(EKM,J))

Tabulate value and policies:

```
% Set
% NaN(n_jgrid,n_agrid,n_etagrid,n_educgrid,n_marriedgrid,n_kidsgrid);
ar_permute = [2,3,6,1,4,5];
% Value Function
tb_az_v = ff_summ_nd_array("MEAN(VAL(EKM,J))", V_VFI, true, ["mean"], 3, 1, cl_mp_datasetdesc,
```

xxx MEAN(VAL(EKM,J)) xxxxxxxxxxxxxxxxxxxxxxxxxxx

group	edu	marry	mean_age_19	mean_age_22	mean_age_27	mean_age_32	mean_age_37	mean_age_42
1	0	0	-0.27576	0.0889	0.38392	0.55759	0.6492	0.67483
2	1	0	0.55395	1.0284	1.3712	1.5171	1.5475	1.5028
3	0	1	0.78157	1.0452	1.254	1.3788	1.4422	1.453
4	1	1	1.5319	1.8215	2.0311	2.12	2.1301	2.083

```
% Aprime Choice
tb_az_ap = ff_summ_nd_array("MEAN(AP(EKM,J))", ap_VFI, true, ["mean"], 3, 1, cl_mp_datasetdesc,
```

xxx MEAN(AP(EKM,J)) xxxxxxxxxxxxxxxxxxxxxxxxxxx

group	edu	marry	mean_age_19	mean_age_22	mean_age_27	mean_age_32	mean_age_37	mean_age_42
1	0	0	12.989	12.976	13.032	13.091	13.125	13.069
2	1	0	12.829	12.789	12.987	13.125	13.195	13.187
3	0	1	12.933	12.923	12.976	13.021	13.067	13.075
4	1	1	12.757	12.717	12.917	13.035	13.123	13.152

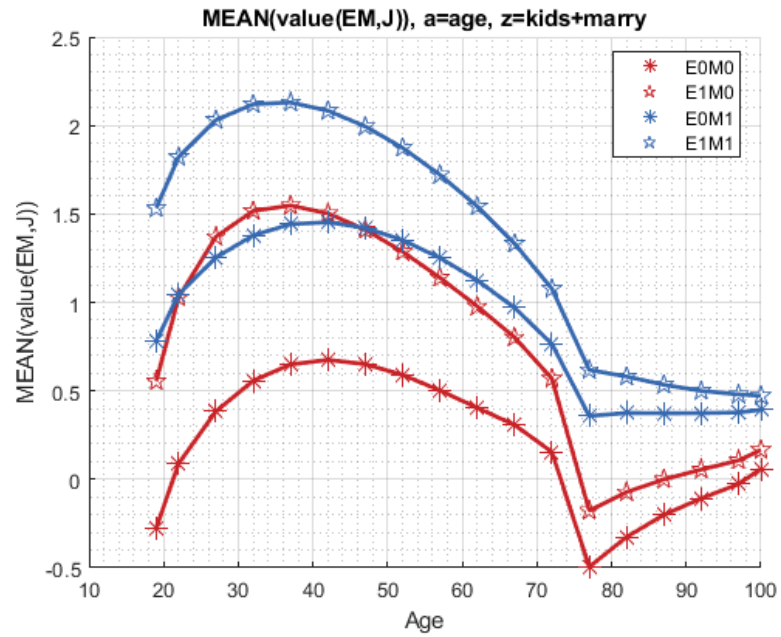
```
% Consumption Choices
tb_az_c = ff_summ_nd_array("MEAN(C(EKM,J))", cons_VFI, true, ["mean"], 3, 1, cl_mp_datasetdesc,
```

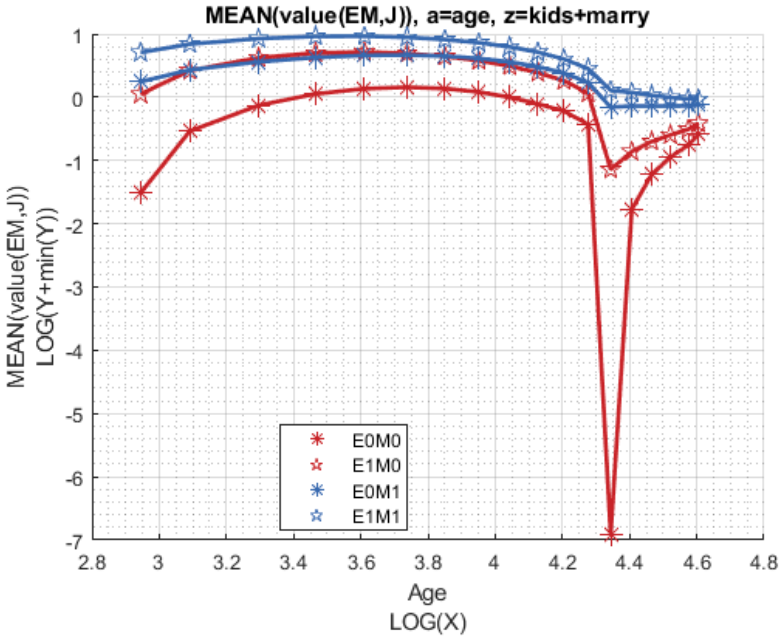
xxx MEAN(C(EKM,J)) xxxxxxxxxxxxxxxxxxxxxxxxxxx

group	edu	marry	mean_age_19	mean_age_22	mean_age_27	mean_age_32	mean_age_37	mean_age_42
1	0	0	6.6262	6.6905	6.8287	6.9345	7.2519	8.4212
2	1	0	6.6762	6.8246	7.1501	7.3846	7.6493	8.6734
3	0	1	6.8114	6.8929	7.0479	7.1732	7.262	7.8099
4	1	1	6.9297	7.0952	7.4299	7.6925	7.8494	8.2774

Graph Mean Values:

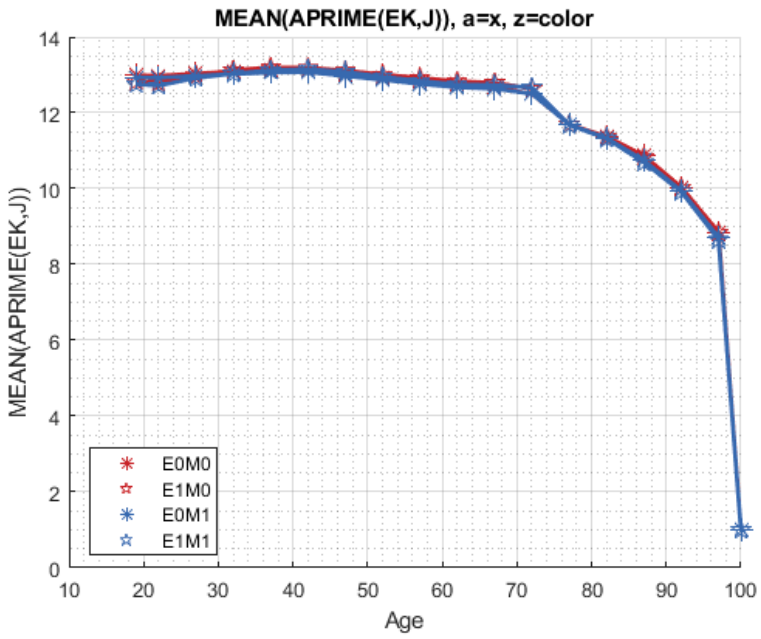
```
mp_support_graph('cl_st_graph_title') = {'MEAN(value(EM,J)), a=age, z=kids+marry'};
mp_support_graph('cl_st_ytitle') = {'MEAN(value(EM,J))'};
ff_graph_grid((tb_az_v{1:end, 4:end}), ar_row_grid, age_grid, mp_support_graph);
```

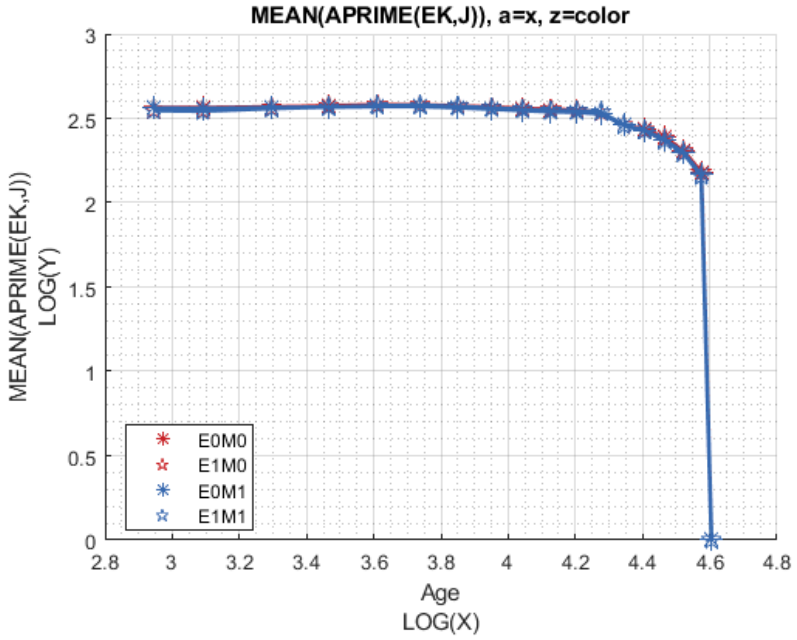




Graph Mean Savings Choices:

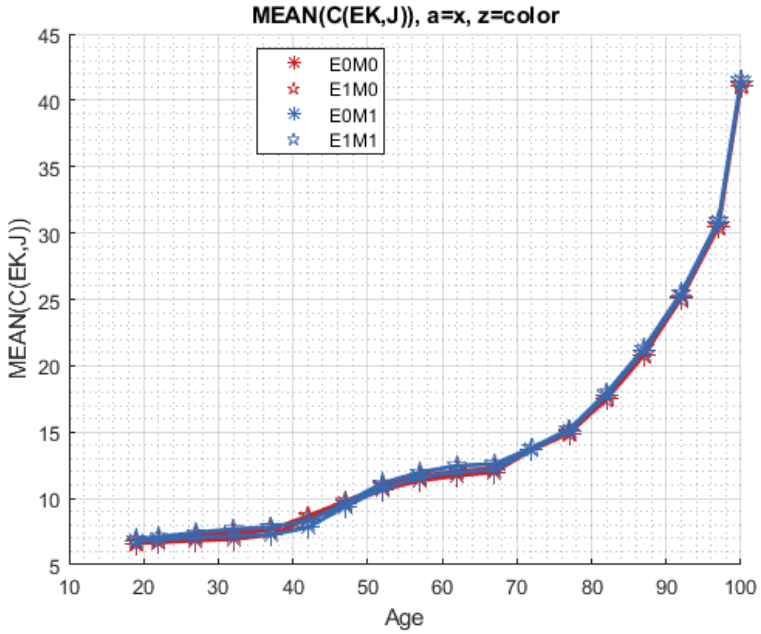
```
mp_support_graph('cl_st_graph_title') = {'MEAN(APRIME(EK,J)), a=x, z=color'};
mp_support_graph('cl_st_ytitle') = {'MEAN(APRIME(EK,J))'};
ff_graph_grid((tb_az_ap{1:end, 4:end}), ar_row_grid, age_grid, mp_support_graph);
```

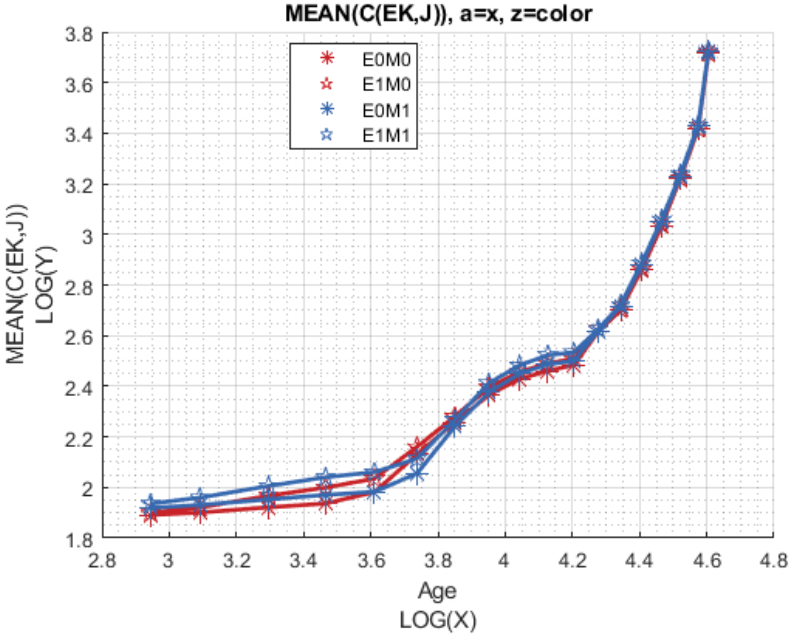




Graph Mean Consumption:

```
mp_support_graph('cl_st_graph_title') = {'MEAN(C(EK,J)), a=x, z=color'};
mp_support_graph('cl_st_ytitle') = {'MEAN(C(EK,J))'};
ff_graph_grid((tb_az_c{1:end, 4:end}), ar_row_grid, age_grid, mp_support_graph);
```


MEAN(C(EK,J)), a=x, z=color
E0M0
E1M0
E0M1
E1M1
MEAN(C(EK,J))
Age


MEAN(C(EK,J)), a=x, z=color
E0M0
E1M0
E0M1
E1M1
MEAN(C(EK,J))
LOG(Y)
Age
LOG(X)