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 5.839670 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))  xxxxxxxxxxxxxxxxxxxxxxxxxx
```

group	savings	mean_Hshock__0_91976	mean_Hshock__0_45988	mean_Hshock_0	mean_Hshock_0_45988	me
1	0	-7.2621	-5.3086	-3.7492	-2.4926	
2	0.0097656	-7.1445	-5.2223	-3.6785	-2.4286	
3	0.078125	-6.489	-4.7412	-3.2884	-2.0835	
4	0.26367	-5.3573	-3.8789	-2.6221	-1.5232	
5	0.625	-4.0454	-2.8494	-1.8168	-0.89616	
6	1.2207	-2.7343	-1.8181	-0.98298	-0.25711	
7	2.1094	-1.5234	-0.86783	-0.22453	0.35789	
8	3.3496	-0.46769	-0.030108	0.4355	0.88833	
9	5	0.39914	0.68023	0.99893	1.3355	
10	7.1191	1.0817	1.2609	1.4733	1.7121	
11	9.7656	1.6112	1.7245	1.8649	2.03	
12	12.998	2.0172	2.0904	2.183	2.2964	
13	16.875	2.3301	2.3771	2.439	2.5167	
14	21.455	2.5712	2.6024	2.6436	2.6973	
15	26.797	2.758	2.779	2.8073	2.8446	
16	32.959	2.9047	2.9189	2.9383	2.9646	
17	40	3.0205	3.0304	3.044	3.0625	
18	47.979	3.1125	3.1195	3.1293	3.1426	
19	56.953	3.1866	3.1917	3.1987	3.2085	
20	66.982	3.2468	3.2505	3.2556	3.2628	
21	78.125	3.296	3.2988	3.3026	3.3079	
22	90.439	3.3366	3.3386	3.3415	3.3456	
23	103.98	3.3704	3.3719	3.3741	3.3772	
24	118.82	3.3987	3.3999	3.4015	3.4039	
25	135	3.4225	3.4234	3.4247	3.4266	

```
% 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))  xxxxxxxxxxxxxxxxxxxxxxxxxx
```

group	savings	mean_Hshock__0_91976	mean_Hshock__0_45988	mean_Hshock_0	mean_Hshock_0_45988	me
1	0	1.1204	1.3194	1.7407	2.4259	

2	0.0097656	1.1389	1.3611	1.787	2.4676
3	0.078125	1.8241	1.9861	2.3009	2.7731
4	0.26367	2.912	3.0509	3.2315	3.5833
5	0.625	3.9861	4.1435	4.2269	4.4815
6	1.2207	5.0231	5.1806	5.2407	5.3009
7	2.1094	6.0741	6.1806	6.2037	6.2176
8	3.3496	7.0463	7.1157	7.1528	7.1574
9	5	7.9537	7.9954	8.0509	8.0741
10	7.1191	8.8657	8.9028	8.9398	8.9861
11	9.7656	9.787	9.787	9.8426	9.875
12	12.998	10.606	10.63	10.639	10.685
13	16.875	11.481	11.495	11.532	11.556
14	21.455	12.407	12.407	12.421	12.458
15	26.797	13.259	13.287	13.296	13.315
16	32.959	14.093	14.102	14.125	14.144
17	40	14.972	14.977	14.986	15.005
18	47.979	15.843	15.866	15.87	15.88
19	56.953	16.75	16.75	16.773	16.782
20	66.982	17.653	17.657	17.667	17.699
21	78.125	18.477	18.486	18.495	18.505
22	90.439	19.315	19.319	19.329	19.347
23	103.98	20.218	20.222	20.227	20.245
24	118.82	21.083	21.083	21.083	21.097
25	135	21.944	21.949	21.954	21.958

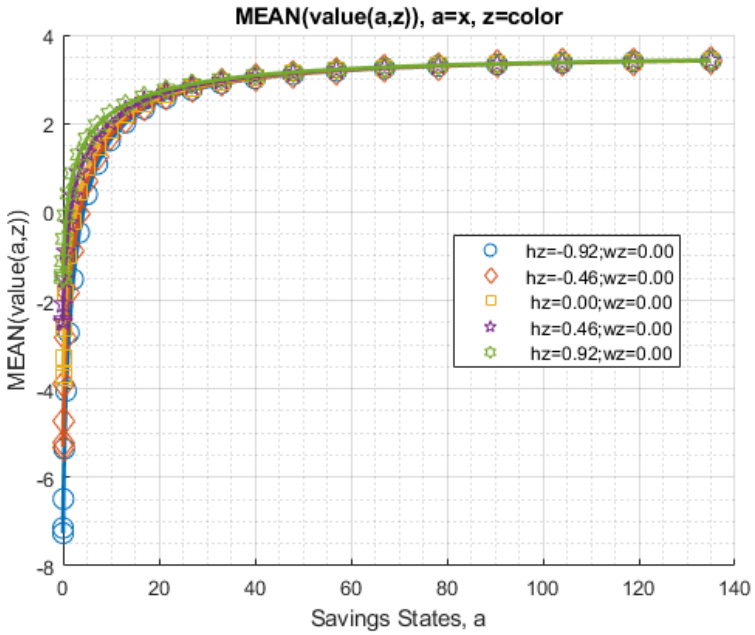
```
% Consumption Choices
tb_az_c = ff_summ_nd_array("MEAN(C(A,Z))", cons_VFI, true, ["mean"], 4, 1, cl_mp_datasetdesc, a
```

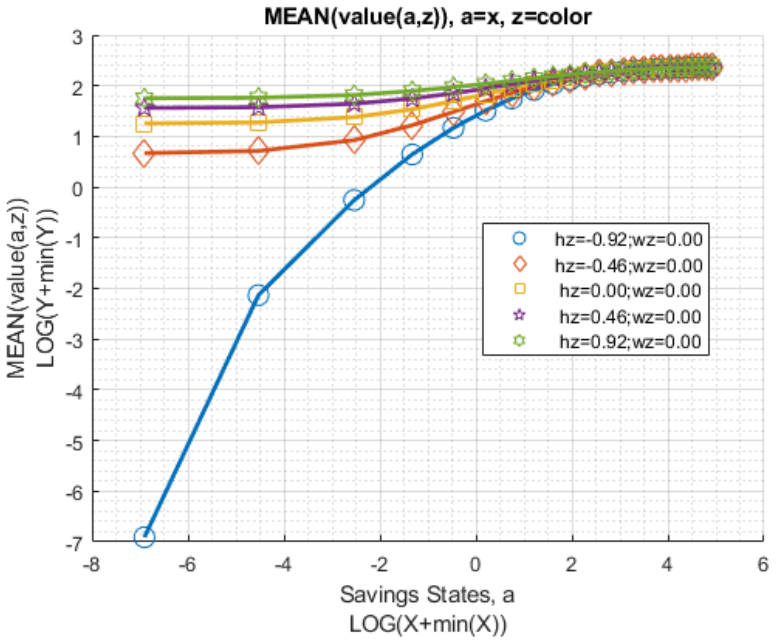
xxx MEAN(C(A,Z)) xxxxxxxxxxxxxxxxxxxxxxxxxx

group	savings	mean_Hshock__0_91976	mean_Hshock__0_45988	mean_Hshock_0	mean_Hshock_0_45988	me
1	0	0.47561	0.60477	0.78755	1.0221	
2	0.0097656	0.48688	0.61444	0.79661	1.0285	
3	0.078125	0.55276	0.67316	0.84544	1.0812	
4	0.26367	0.68068	0.79387	0.9582	1.1664	
5	0.625	0.87413	0.95556	1.1377	1.3323	
6	1.2207	1.1386	1.1823	1.359	1.6442	
7	2.1094	1.4348	1.4767	1.6678	1.9853	
8	3.3496	1.8593	1.9088	2.0737	2.3969	
9	5	2.4822	2.5483	2.6665	2.9566	
10	7.1191	3.276	3.3318	3.4625	3.6919	
11	9.7656	4.2223	4.356	4.4176	4.6587	
12	12.998	5.5639	5.6224	5.8007	5.9774	
13	16.875	7.1191	7.1983	7.2626	7.4988	
14	21.455	8.7496	8.8825	9.0265	9.1825	
15	26.797	10.88	10.865	11.023	11.249	
16	32.959	13.483	13.559	13.624	13.835	
17	40	16.255	16.355	16.497	16.692	
18	47.979	19.414	19.362	19.532	19.783	
19	56.953	22.728	22.861	22.86	23.102	
20	66.982	26.496	26.587	26.701	26.705	
21	78.125	31.189	31.223	31.332	31.559	
22	90.439	36.369	36.444	36.537	36.645	
23	103.98	41.558	41.627	41.772	41.846	
24	118.82	47.433	47.565	47.772	47.903	
25	135	53.934	53.998	54.13	54.386	

Graph Mean Values:

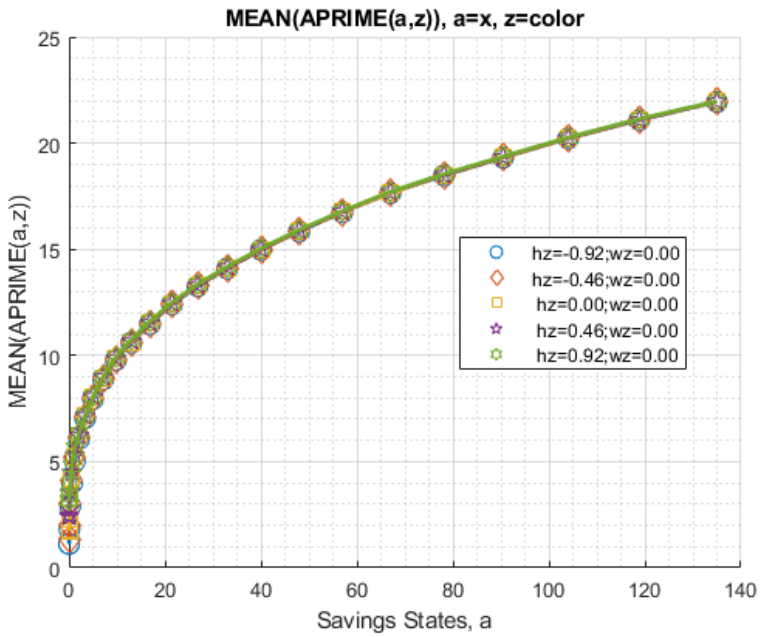
```
mp_support_graph('cl_st_graph_title') = {'MEAN(value(a,z)), a=x, z=color'};
mp_support_graph('cl_st_ytitle') = {'MEAN(value(a,z))'};
ff_graph_grid((tb_az_v{1:end, 3:end})', ar_st_eta_HS_grid, agrid, mp_support_graph);
```

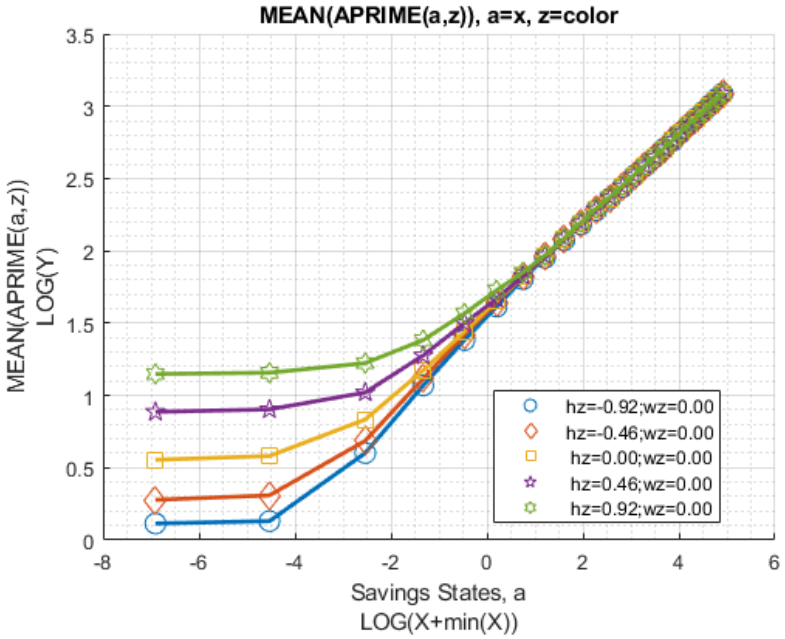




Graph Mean Savings Choices:

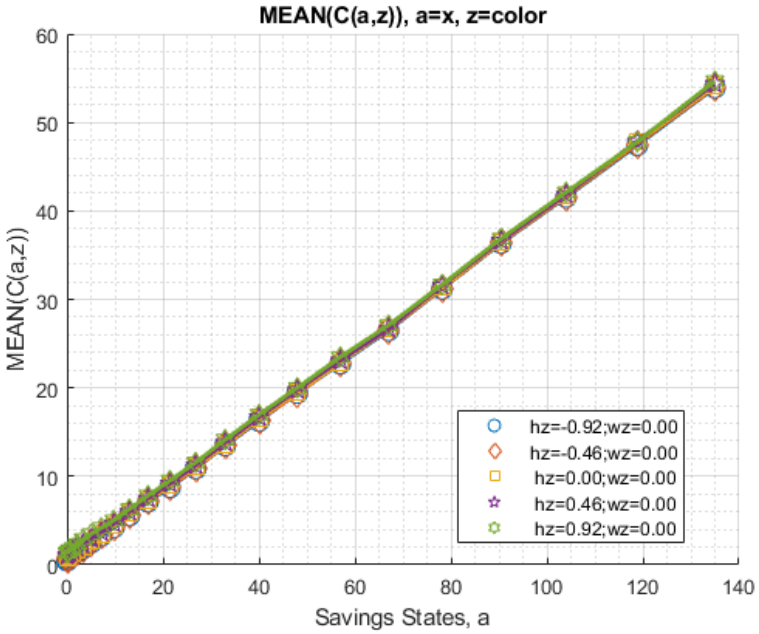
```
mp_support_graph('cl_st_graph_title') = {'MEAN(APRIME(a,z)), a=x, z=color'};
mp_support_graph('cl_st_ytitle') = {'MEAN(APRIME(a,z))'};
ff_graph_grid((tb_az_ap{1:end, 3:end})', ar_st_eta_HS_grid, agrid, mp_support_graph);
```

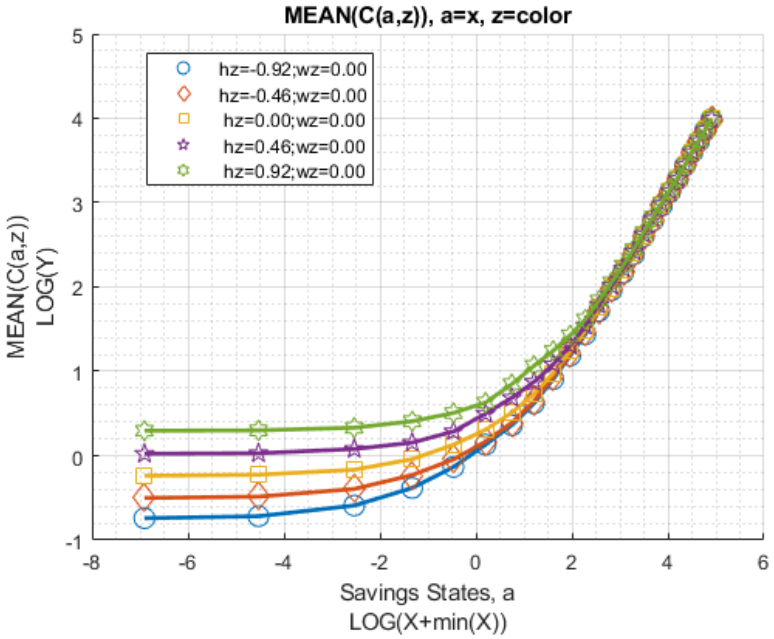




Graph Mean Consumption:

```
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         2.5769          2.726         2.8073         2.7855         2.6939         2.5501
      2       2        0         1.5197         1.8098         2.0206         2.1004         2.0952         2.0212
      3       3        0         0.9869         1.2649         1.4811         1.5698         1.5738         1.5134
      4       1        1         2.3544         2.5201         2.6205         2.6297         2.5748         2.4711
      5       2        1          1.564         1.8114         1.9978         2.0809         2.0936         2.0476
      6       3        1         1.2123         1.4401         1.6171         1.6965         1.7071          1.666
```

```
% 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          12.876          12.86         12.976         13.068          13.14         13.176
      2       2        0           12.86          12.84         12.916         13.016          13.06         12.952
      3       3        0          12.824         12.792         12.884         12.988          12.94         12.884
      4       1        1          12.832         12.796         12.892          12.98         13.052           13.1
      5       2        1          12.824         12.788         12.856          12.94         13.004          12.98
      6       3        1          12.768         12.724         12.828         12.904         12.972         12.888
```

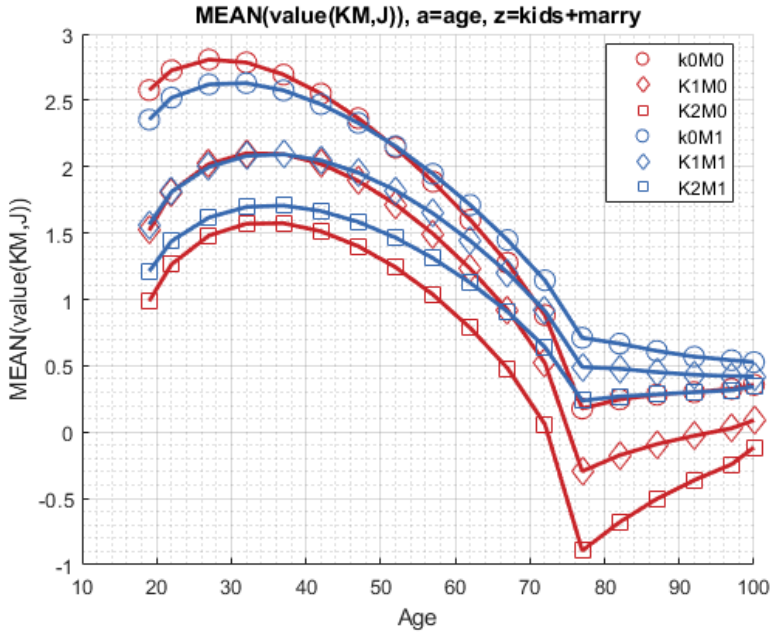
```
% Consumption Choices
tb_az_c = ff_summ_nd_array("MEAN(C(KM,J))", cons_VFI, true, ["mean"], 3, 1, cl_mp_datasetdesc,
```

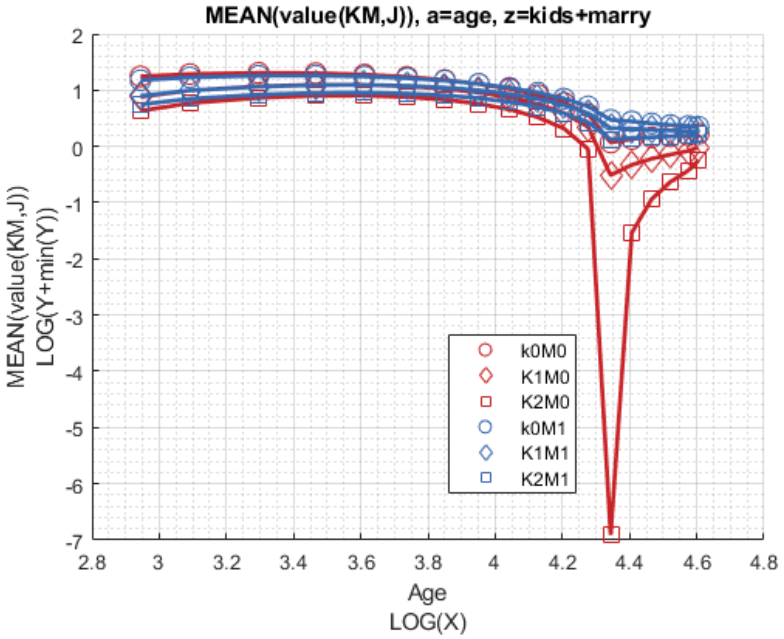
```
xxx  MEAN(C(KM,J))  xxxxxxxxxxxxxxxxxxxxxxxxxxx
    group    kids    marry    mean_age_19    mean_age_22    mean_age_27    mean_age_32    mean_age_37    mean_age_42
    _____    ____    _____    ___________    ___________    ___________    ___________    ___________    ___________

      1       1        0         6.3895         6.4629         6.6288         6.7554         6.8327          6.866
      2       2        0         6.4025         6.4709         6.6411         6.7667         7.2326         9.0966
      3       3        0         6.4139         6.4906         6.6473         6.7745         8.3105         9.6757
      4       1        1         6.6365         6.7334         6.9186         7.0691         7.1681         7.2225
      5       2        1         6.6219         6.7043         6.8923         7.0386         7.1354         8.2428
      6       3        1         6.6135         6.7111         6.8733         7.0145         7.1123         9.0255
```

Graph Mean Values:

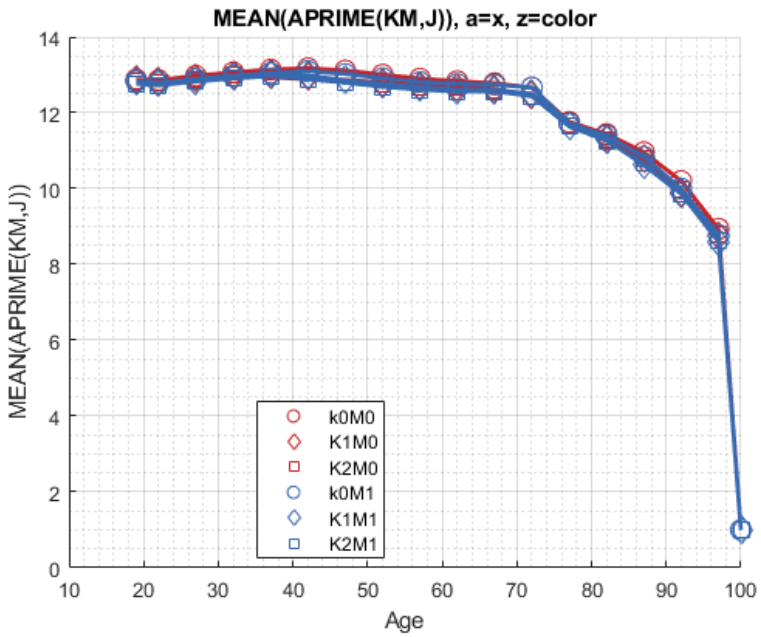
```
mp_support_graph('cl_st_graph_title') = {'MEAN(value(KM,J)), a=age, z=kids+marry'};
mp_support_graph('cl_st_ytitle') = {'MEAN(value(KM,J))'};
ff_graph_grid((tb_az_v{1:end, 4:end}), ar_row_grid, age_grid, mp_support_graph);
```

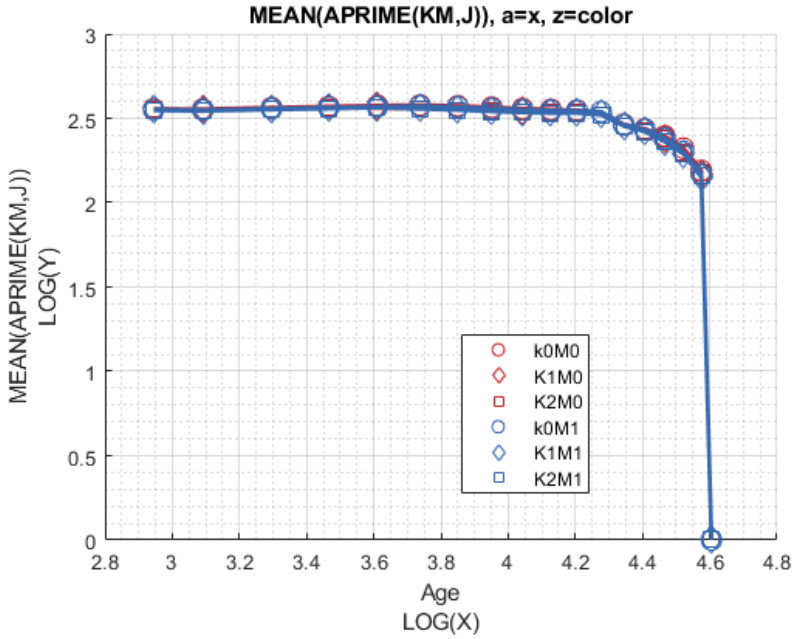




Graph Mean Savings Choices:

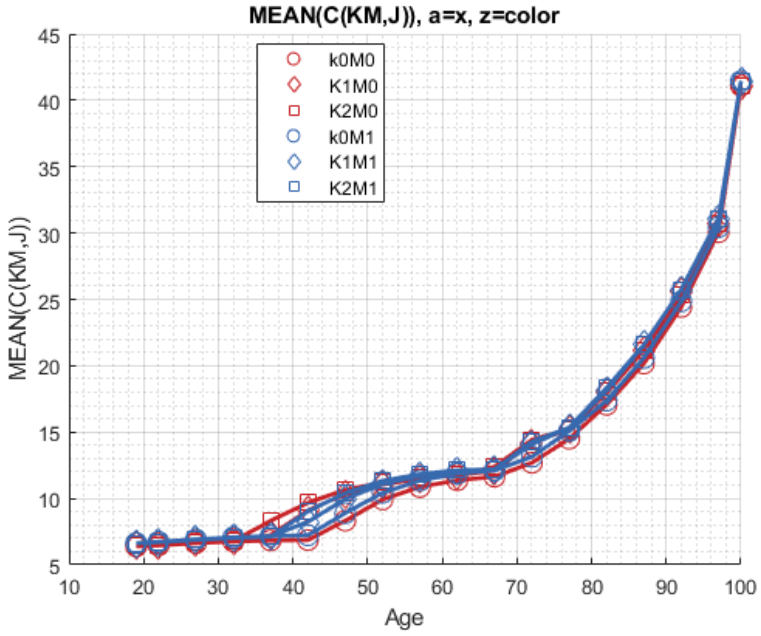
```
mp_support_graph('cl_st_graph_title') = {'MEAN(APRIME(KM,J)), a=x, z=color'};
mp_support_graph('cl_st_ytitle') = {'MEAN(APRIME(KM,J))'};
ff_graph_grid((tb_az_ap{1:end, 4:end}), ar_row_grid, age_grid, mp_support_graph);
```

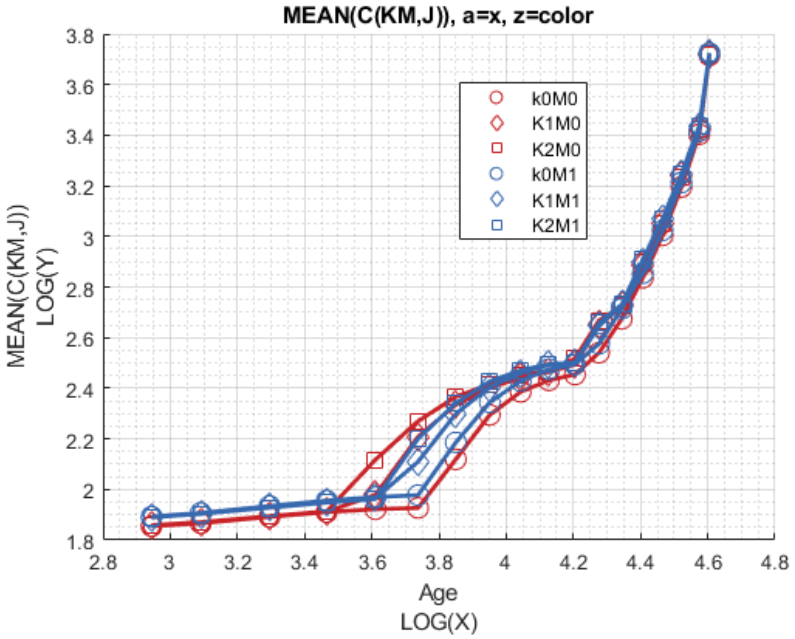




Graph Mean Consumption:

```
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	1.397	1.5992	1.7503	1.807	1.7952	1.7249
2	1	0	1.9919	2.268	2.4556	2.4968	2.4467	2.3315
3	0	1	1.3943	1.589	1.7371	1.8066	1.8173	1.7774
4	1	1	2.0262	2.2588	2.4199	2.4648	2.4331	2.3457

```
% 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	12.923	12.909	12.957	13.011	13.016	12.968
2	1	0	12.784	12.752	12.893	13.037	13.077	13.04
3	0	1	12.883	12.837	12.899	12.949	12.987	12.952
4	1	1	12.733	12.701	12.819	12.933	13.032	13.027

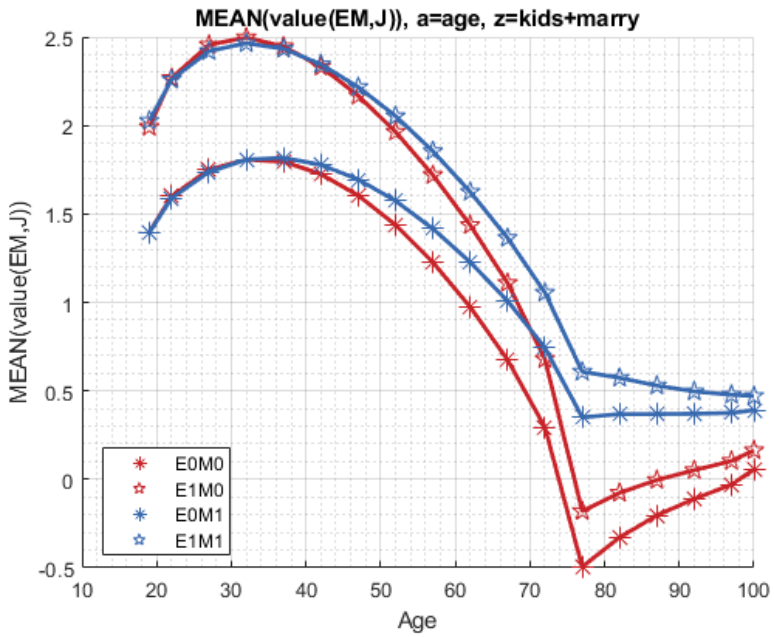
```
% Consumption Choices
tb_az_c = ff_summ_nd_array("MEAN(C(EKM,J))", cons_VFI, true, ["mean"], 3, 1, cl_mp_datasetdesc,
```

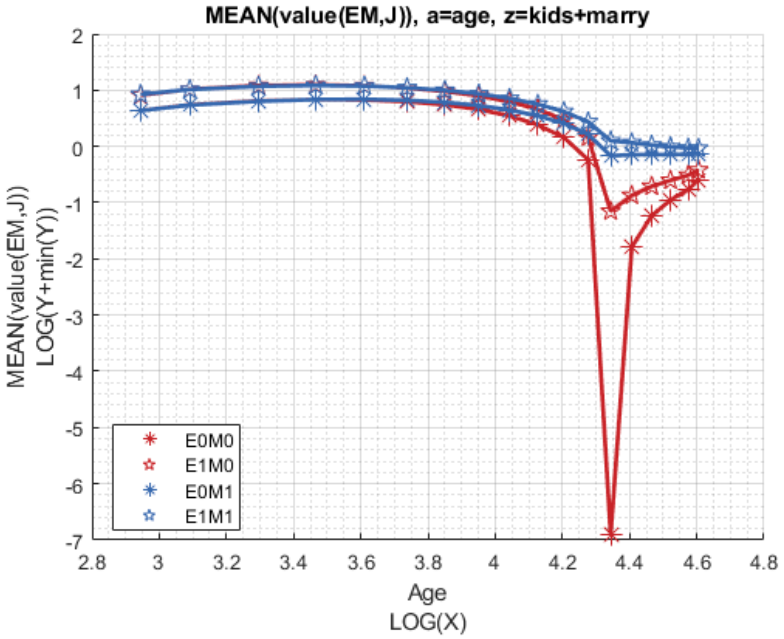
xxx MEAN(C(EKM,J)) xxxxxxxxxxxxxxxxxxxxxxxxxxx

group	edu	marry	mean_age_19	mean_age_22	mean_age_27	mean_age_32	mean_age_37	mean_age_42
1	0	0	6.3781	6.4224	6.5232	6.6018	7.3509	8.4324
2	1	0	6.4259	6.5271	6.7549	6.9292	7.5663	8.6599
3	0	1	6.5686	6.6336	6.7481	6.8408	6.9145	8.0279
4	1	1	6.6793	6.799	7.0414	7.2407	7.3627	8.2993

Graph Mean Values:

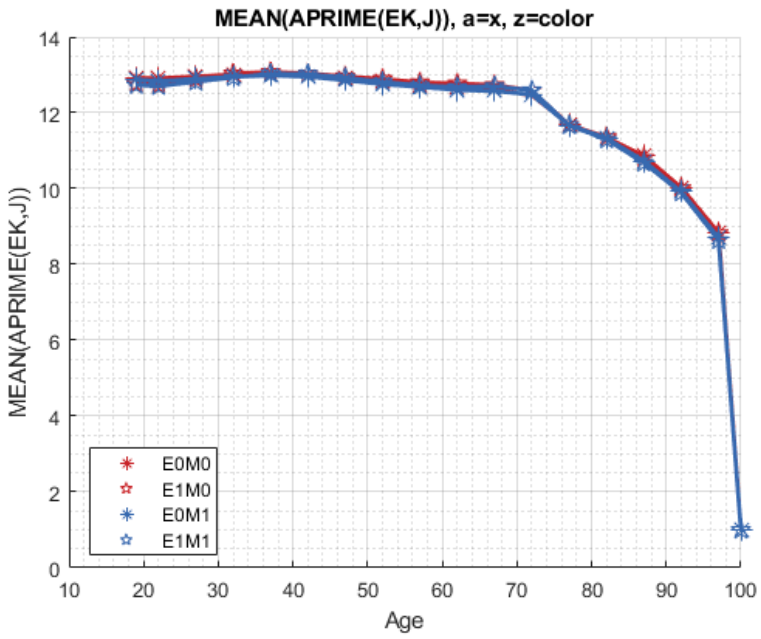
```
mp_support_graph('cl_st_graph_title') = {'MEAN(value(EM,J)), a=age, z=kids+marry'};
mp_support_graph('cl_st_ytitle') = {'MEAN(value(EM,J))'};
ff_graph_grid((tb_az_v{1:end, 4:end}), ar_row_grid, age_grid, mp_support_graph);
```

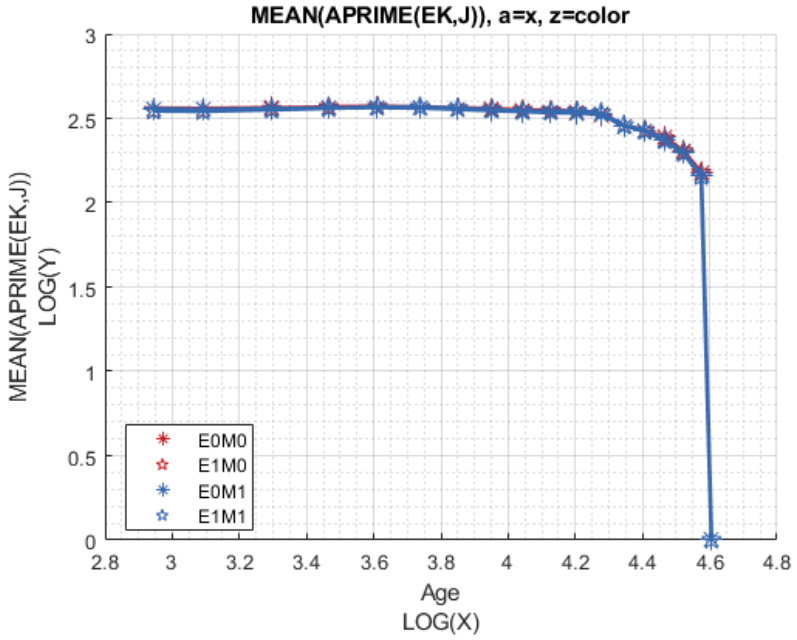




Graph Mean Savings Choices:

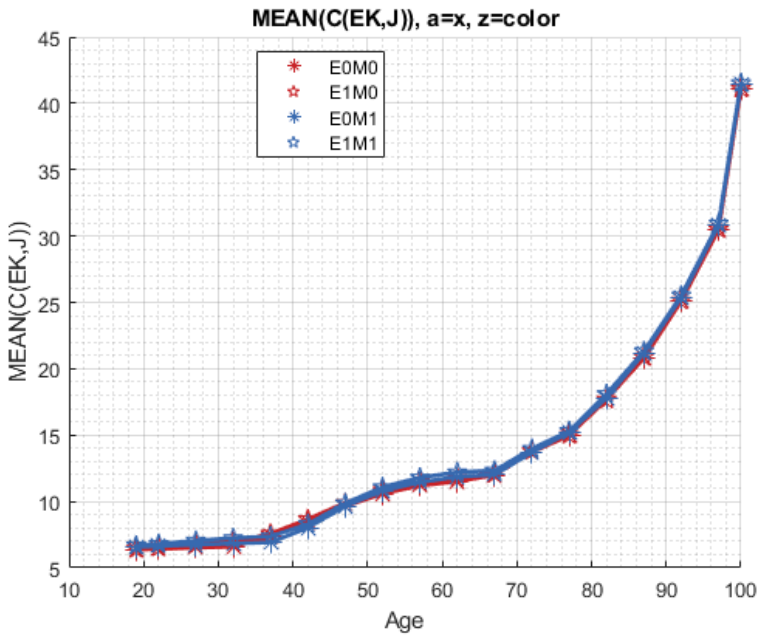
```
mp_support_graph('cl_st_graph_title') = {'MEAN(APRIME(EK,J)), a=x, z=color'};
mp_support_graph('cl_st_ytitle') = {'MEAN(APRIME(EK,J))'};
ff_graph_grid((tb_az_ap{1:end, 4:end}), ar_row_grid, age_grid, mp_support_graph);
```

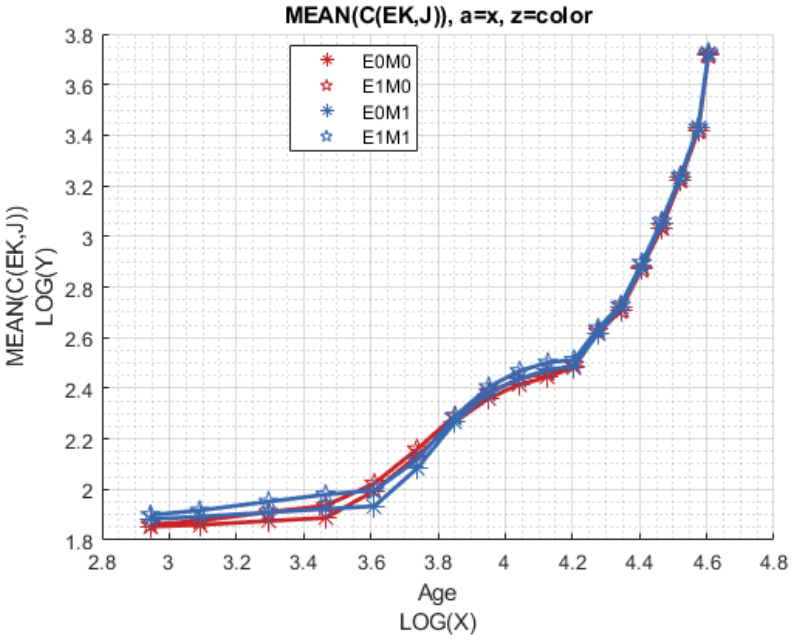




Graph Mean Consumption:

```
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)