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 6.771761 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	-17.723	-9.4806	-4.7079	-1.8282	
2	0.0097656	-17.287	-9.3335	-4.6223	-1.7575	
3	0.078125	-15.289	-8.5102	-4.1607	-1.3897	
4	0.26367	-12.169	-7.0906	-3.3823	-0.82837	
5	0.625	-8.7667	-5.3975	-2.4071	-0.24676	
6	1.2207	-5.7445	-3.6744	-1.4216	0.29453	
7	2.1094	-3.3257	-2.112	-0.53821	0.80697	
8	3.3496	-1.5195	-0.81731	0.22515	1.2742	
9	5	-0.20516	0.20391	0.87016	1.6615	
10	7.1191	0.74607	0.98431	1.4069	1.9813	
11	9.7656	1.4347	1.5779	1.8454	2.2495	
12	12.998	1.9367	2.0246	2.1961	2.4767	
13	16.875	2.3099	2.364	2.476	2.6699	
14	21.455	2.5887	2.6239	2.6967	2.8321	
15	26.797	2.7998	2.8231	2.8727	2.9673	
16	32.959	2.963	2.9785	3.0123	3.0792	
17	40	3.0902	3.1009	3.1242	3.1721	
18	47.979	3.1902	3.1978	3.2144	3.2489	
19	56.953	3.27	3.2754	3.2875	3.3128	
20	66.982	3.3345	3.3384	3.3471	3.3661	
21	78.125	3.3871	3.3899	3.3964	3.4105	
22	90.439	3.4301	3.4323	3.4372	3.4479	
23	103.98	3.4658	3.4674	3.4712	3.4794	
24	118.82	3.4957	3.4969	3.4998	3.5062	
25	135	3.5208	3.5218	3.524	3.5289	

```
% 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	1.1435	1.5972	2.5926	

2	0.0097656	1.0463	1.213	1.6574	2.6157
3	0.078125	1.8009	2.0093	2.1991	2.875
4	0.26367	2.9491	3.0648	3.2454	3.6204
5	0.625	4.0602	4.1806	4.2546	4.5417
6	1.2207	5.1481	5.2454	5.2731	5.4074
7	2.1094	6.1389	6.213	6.25	6.2593
8	3.3496	7.0556	7.1019	7.1713	7.162
9	5	7.9537	7.9815	8.0556	8.0787
10	7.1191	8.8611	8.8889	8.9398	9.0093
11	9.7656	9.7824	9.7963	9.8519	9.9259
12	12.998	10.606	10.63	10.648	10.731
13	16.875	11.481	11.491	11.537	11.597
14	21.455	12.407	12.407	12.431	12.491
15	26.797	13.287	13.301	13.306	13.356
16	32.959	14.13	14.13	14.167	14.199
17	40	14.981	14.981	14.991	15.032
18	47.979	15.88	15.88	15.884	15.921
19	56.953	16.75	16.773	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	19.352	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

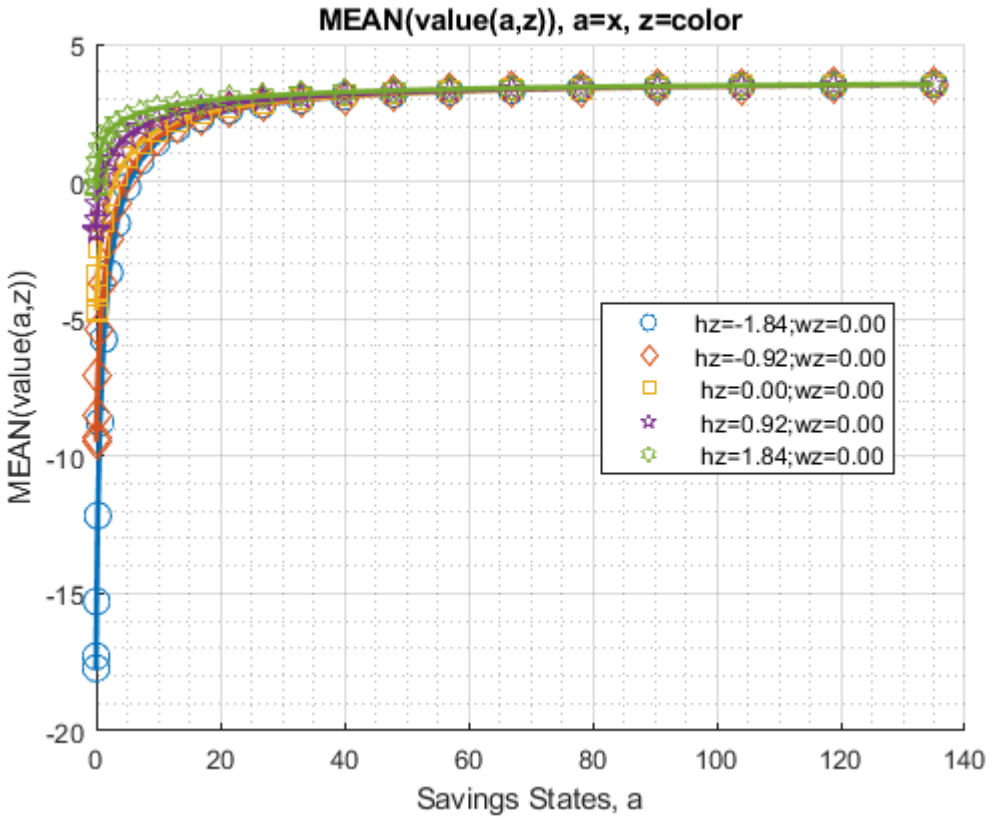
```
% Consumption Choices
tb_az_c = ff_summ_nd_array("MEAN(C(A,Z))", cons_VFI, true, ["mean"], 4, 1, cl_mp_datasetdesc, a
```

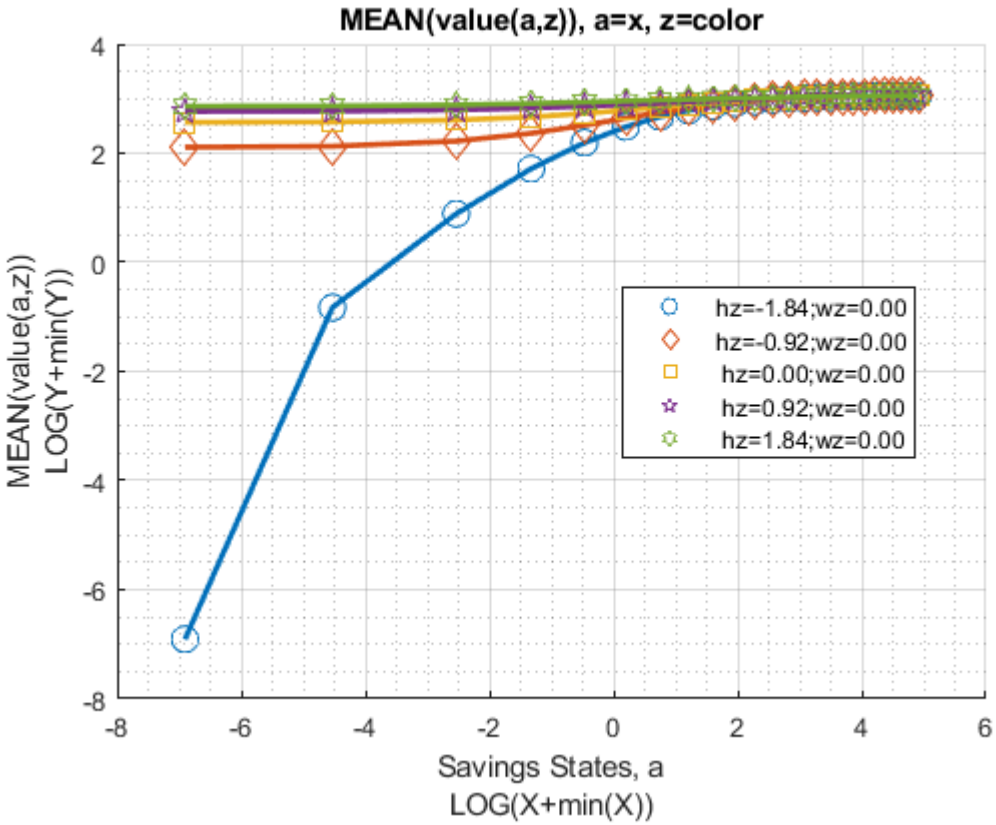
```
xxx  MEAN(C(A,Z))  xxxxxxxxxxxxxxxxxxxxxxxxxx
```

group	savings	mean_Hshock__1_8395	mean_Hshock__0_91976	mean_Hshock_0	mean_Hshock_0_91976	mea
1	0	0.30277	0.43205	0.70498	1.2497	
2	0.0097656	0.31384	0.44176	0.71311	1.2574	
3	0.078125	0.38061	0.49936	0.768	1.3132	
4	0.26367	0.50208	0.6111	0.86902	1.423	
5	0.625	0.67677	0.76238	1.0363	1.5854	
6	1.2207	0.89732	0.96685	1.2492	1.8485	
7	2.1094	1.2189	1.2789	1.543	2.2417	
8	3.3496	1.6892	1.7561	1.9651	2.6933	
9	5	2.3251	2.4024	2.5736	3.2505	
10	7.1191	3.1269	3.1903	3.3745	3.9408	
11	9.7656	4.0839	4.1689	4.3128	4.829	
12	12.998	5.4106	5.457	5.6873	6.1291	
13	16.875	6.9612	7.0462	7.1563	7.6332	
14	21.455	8.5924	8.7131	8.8962	9.3301	
15	26.797	10.6	10.647	10.911	11.348	
16	32.959	13.149	13.269	13.33	13.839	
17	40	16.034	16.154	16.378	16.792	
18	47.979	18.971	19.092	19.343	19.756	
19	56.953	22.573	22.485	22.69	23.274	
20	66.982	26.089	26.168	26.322	26.797	
21	78.125	30.843	30.917	31.101	31.36	
22	90.439	35.929	36.049	36.177	36.667	
23	103.98	40.986	40.918	41.144	41.731	
24	118.82	47.072	47.192	47.018	47.525	
25	135	53.493	53.538	53.682	54.096	

Graph Mean Values:

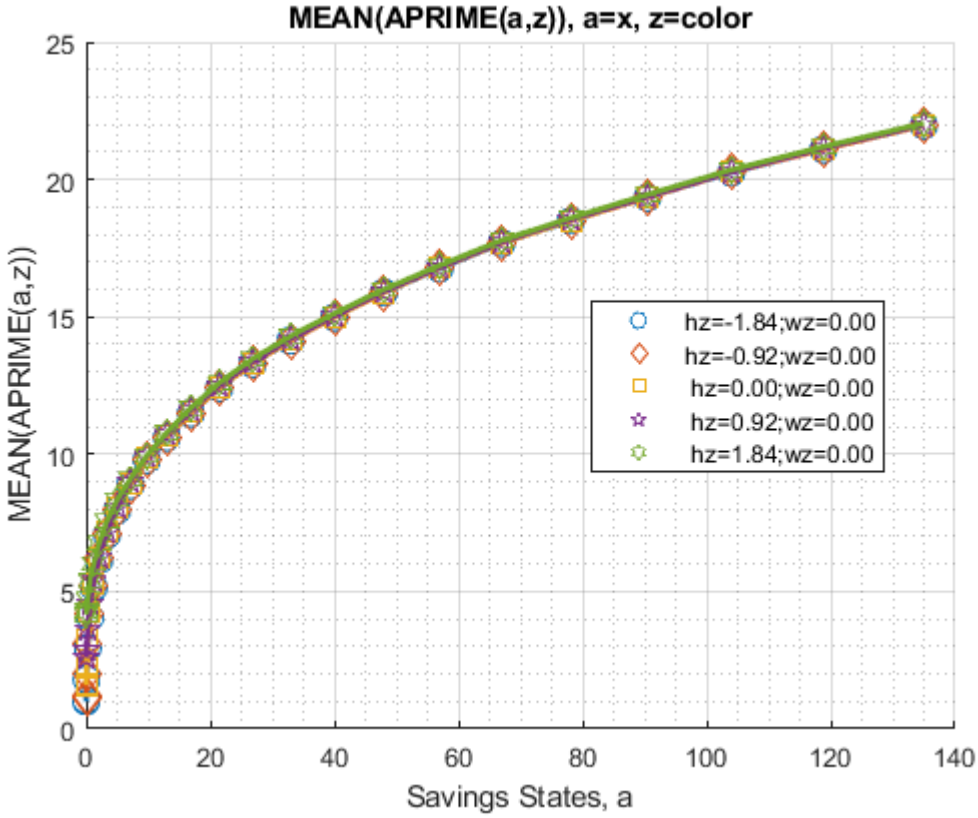
```
mp_support_graph('cl_st_graph_title') = {'MEAN(value(a,z)), a=x, z=color'};
mp_support_graph('cl_st_ytitle') = {'MEAN(value(a,z))'};
ff_graph_grid((tb_az_v{1:end, 3:end})', ar_st_eta_HS_grid, agrid, mp_support_graph);
```

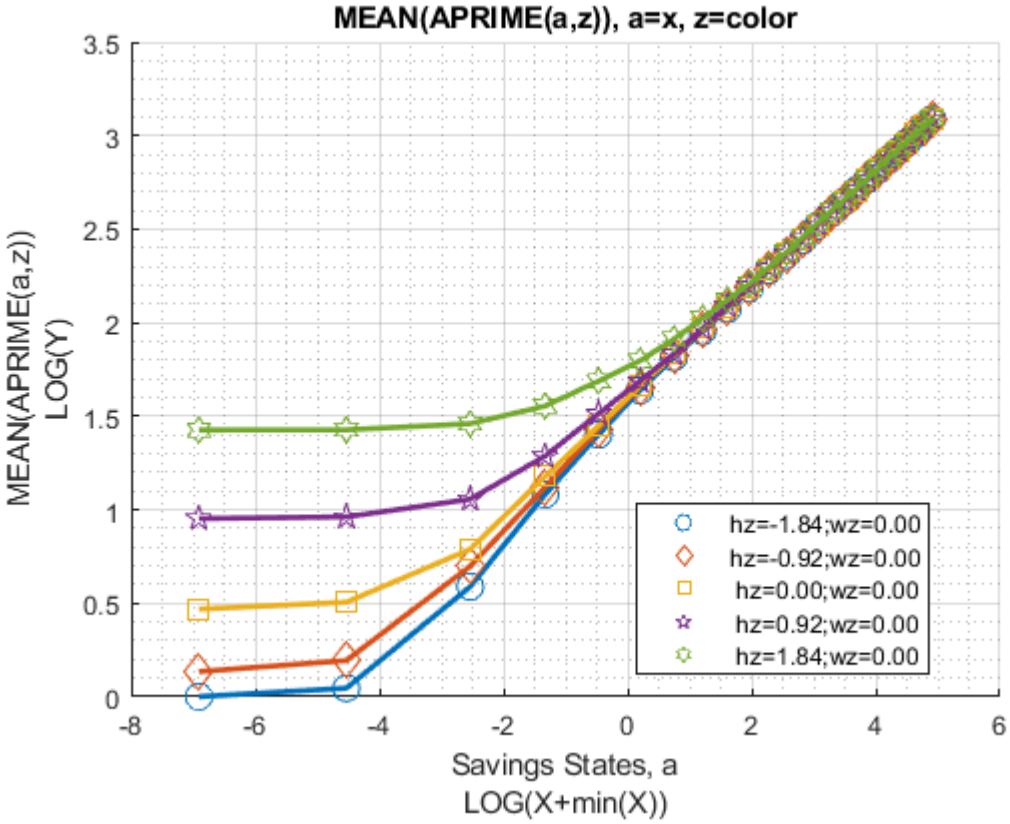




Graph Mean Savings Choices:

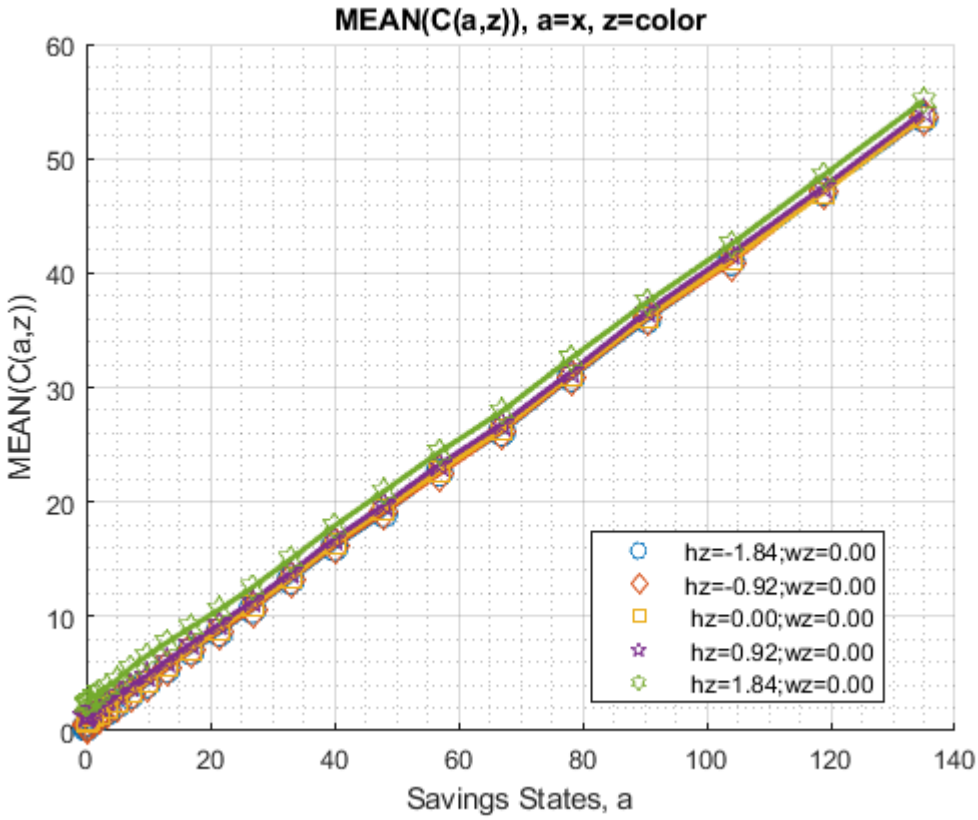
```
mp_support_graph('cl_st_graph_title') = {'MEAN(APRIME(a,z)), a=x, z=color'};
mp_support_graph('cl_st_ytitle') = {'MEAN(APRIME(a,z))'};
ff_graph_grid((tb_az_ap{1:end, 3:end})', ar_st_eta_HS_grid, agrid, mp_support_graph);
```

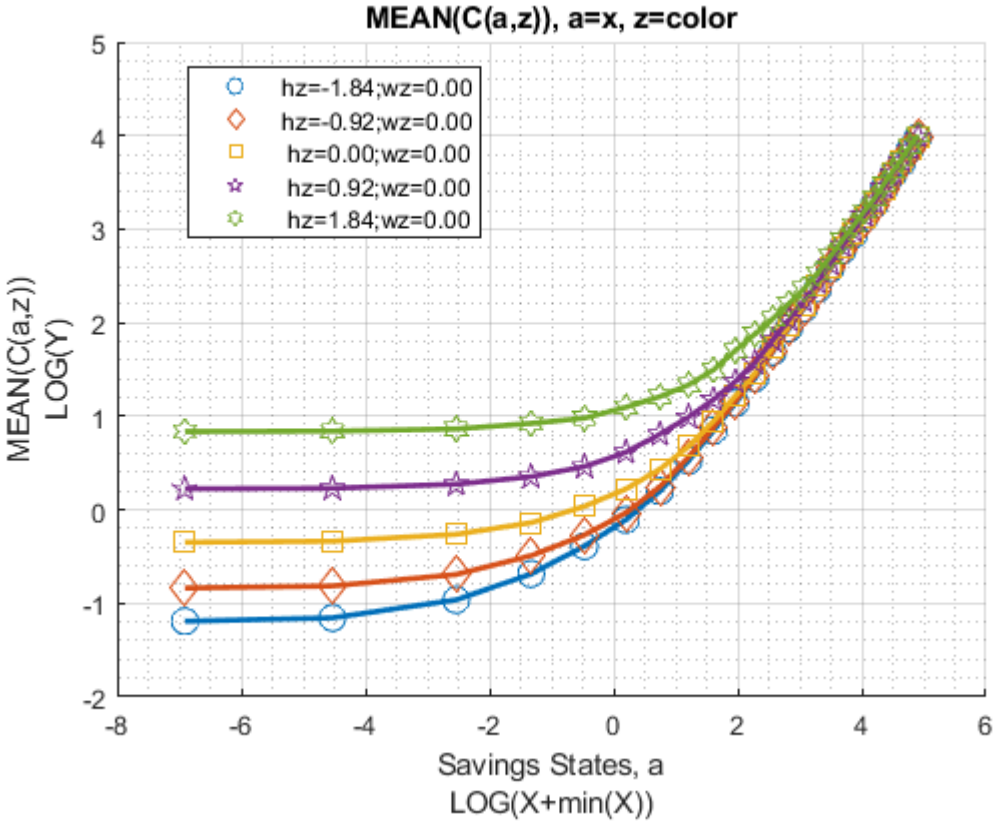




Graph Mean Consumption:

```
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))  xxxxxxxxxxxxxxxxxxxxxxxxxx
    group    kids    marry    mean_age_19    mean_age_22    mean_age_27    mean_age_32    mean_age_37    mean_age_42
    _____    ____    _____    ___________    ___________    ___________    ___________    ___________    ___________

      1       1        0          1.402         1.6857         1.8728         1.9257          1.894          1.8046
      2       2        0       -0.12483        0.36646         0.7436         0.9457         1.0402          1.0532
      3       3        0       -0.89708       -0.41863       -0.032067        0.18508        0.29597         0.33212
      4       1        1          1.967         2.1822         2.3218         2.3638         2.3393          2.2644
      5       2        1        0.96762         1.2863         1.5349         1.6741          1.739          1.7415
      6       3        1        0.51874         0.8123         1.0493         1.1855         1.2514          1.2646
```

```
% 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))  xxxxxxxxxxxxxxxxxxxxxxxxxx
    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         12.924         13.052         13.152         13.224          13.264
      2       2        0          12.924          12.88         13.008         13.096          13.16          13.108
      3       3        0           12.86         12.848         12.972         13.084         13.108          13.024
      4       1        1           12.86         12.856         12.972         13.076          13.14          13.184
      5       2        1          12.876          12.82         12.956         13.028           13.1          13.124
      6       3        1          12.804         12.784         12.912         12.984          13.06          13.036
```

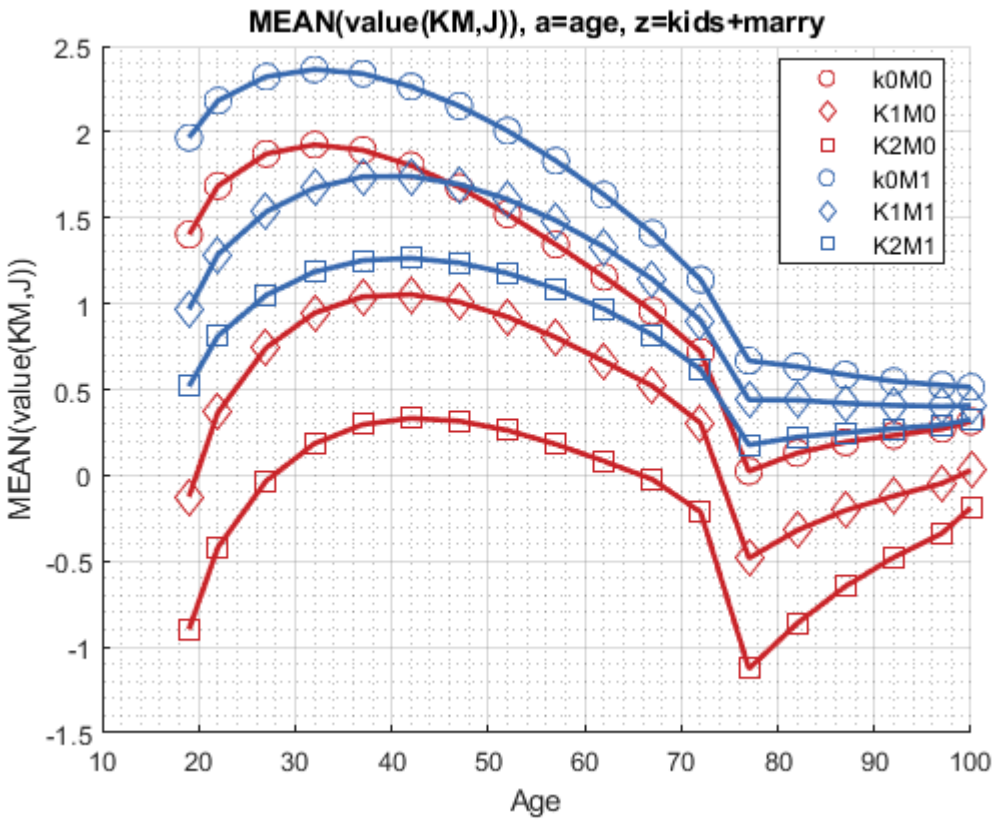
```
% Consumption Choices
tb_az_c = ff_summ_nd_array("MEAN(C(KM,J))", cons_VFI, true, ["mean"], 3, 1, cl_mp_datasetdesc,
```

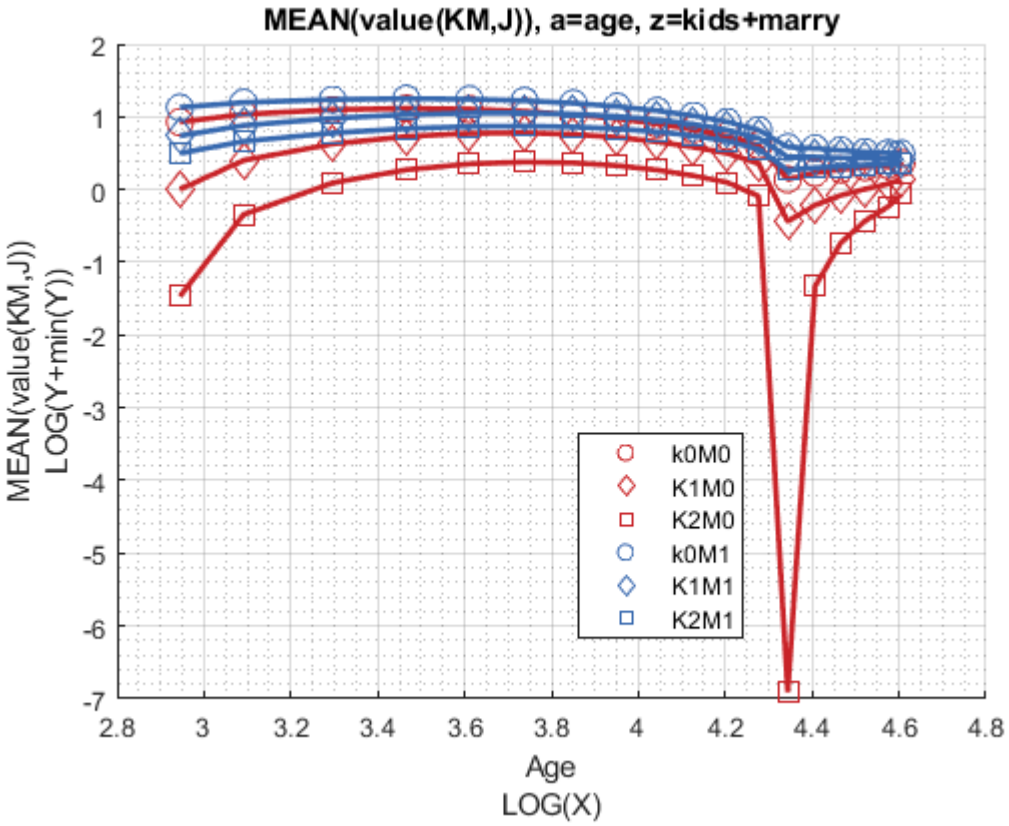
```
xxx  MEAN(C(KM,J))  xxxxxxxxxxxxxxxxxxxxxxxxxx
    group    kids    marry    mean_age_19    mean_age_22    mean_age_27    mean_age_32    mean_age_37    mean_age_42
    _____    ____    _____    ___________    ___________    ___________    ___________    ___________    ___________

      1       1        0          6.6347         6.7441         6.9773         7.1425         7.2307          7.2843
      2       2        0          6.6476         6.7581         6.9904         7.1656         7.2723          8.8488
      3       3        0          6.6679         6.7696         7.0001         7.1694         7.8468          9.5068
```

4	1	1	6.885	7.0096	7.2673	7.4584	7.5792	7.6332
5	2	1	6.856	6.987	7.2319	7.4245	7.5481	7.8087
6	3	1	6.8672	6.9855	7.2175	7.4148	7.5346	8.6883

Graph Mean Values:

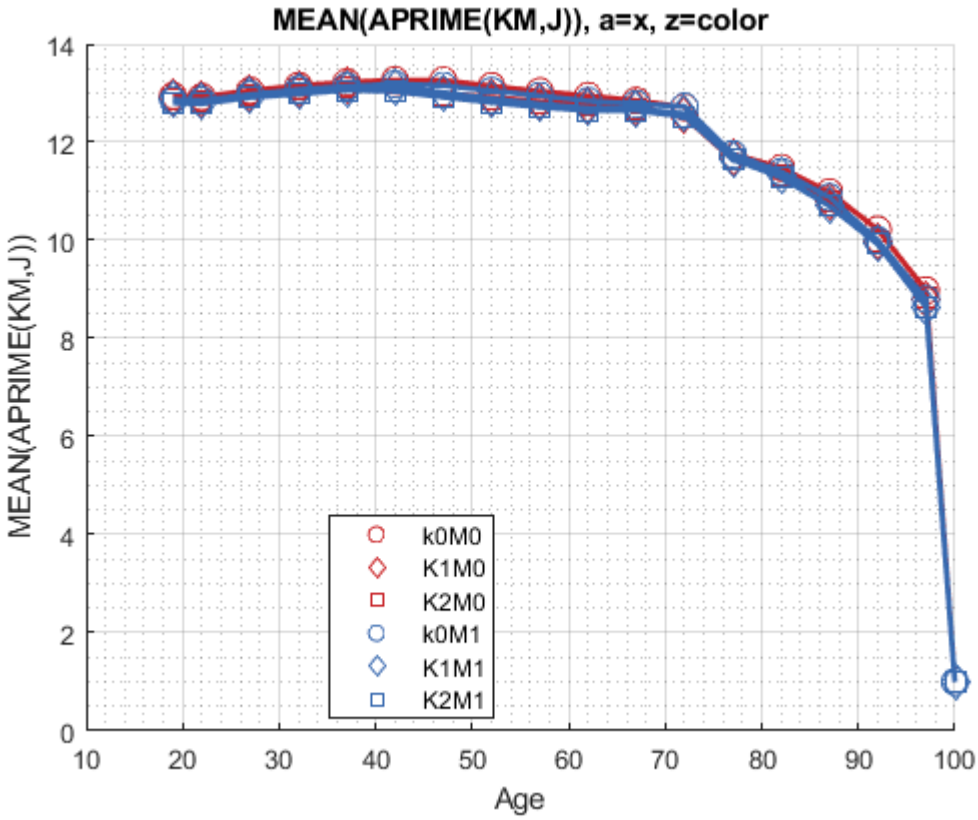
```
mp_support_graph('cl_st_graph_title') = {'MEAN(value(KM,J)), a=age, z=kids+marry'};
mp_support_graph('cl_st_ytitle') = {'MEAN(value(KM,J))'};
ff_graph_grid((tb_az_v{1:end, 4:end}), ar_row_grid, age_grid, mp_support_graph);
```

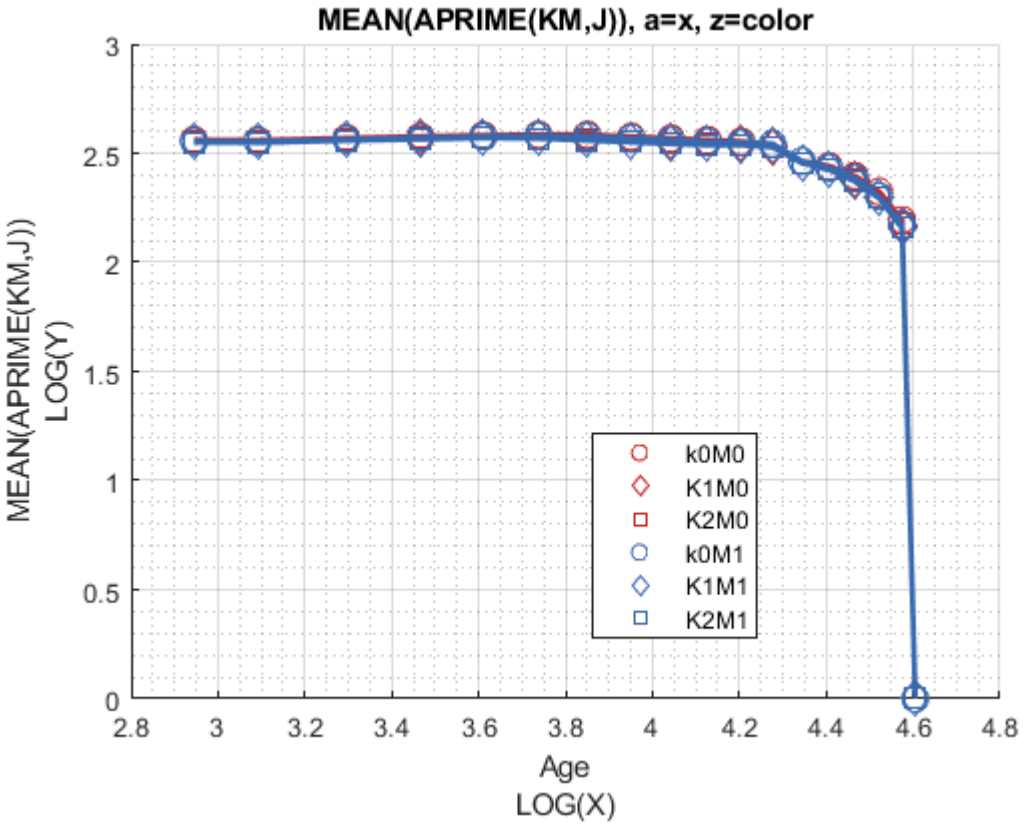




Graph Mean Savings Choices:

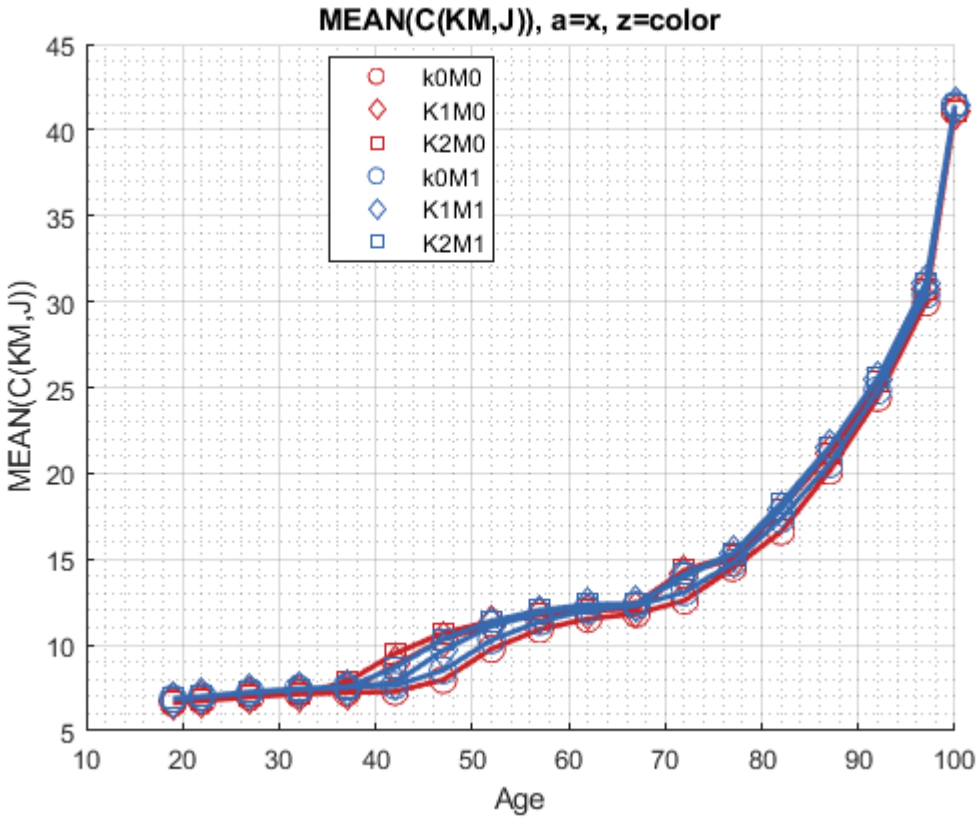
```
mp_support_graph('cl_st_graph_title') = {'MEAN(APRIME(KM,J)), a=x, z=color'};
mp_support_graph('cl_st_ytitle') = {'MEAN(APRIME(KM,J))'};
ff_graph_grid((tb_az_ap{1:end, 4:end}), ar_row_grid, age_grid, mp_support_graph);
```

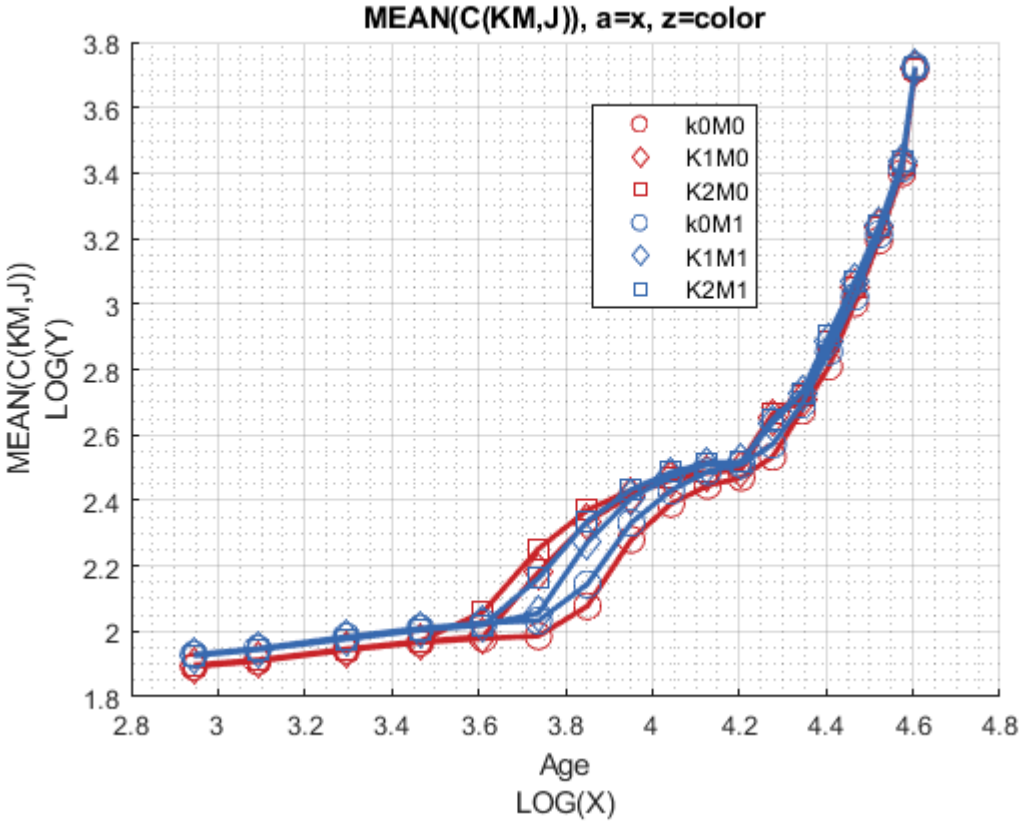




Graph Mean Consumption:

```
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	-0.28978	0.072789	0.36537	0.53629	0.6243	0.64554
2	1	0	0.54315	1.0162	1.3575	1.5014	1.5291	1.4811
3	0	1	0.77529	1.038	1.2458	1.3693	1.4312	1.4402
4	1	1	1.5269	1.8159	2.0249	2.1129	2.1219	2.0734

```
% 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	12.979	13.035	13.093	13.131	13.077
2	1	0	12.832	12.789	12.987	13.128	13.197	13.187
3	0	1	12.933	12.923	12.976	13.021	13.072	13.075
4	1	1	12.76	12.717	12.917	13.037	13.128	13.155

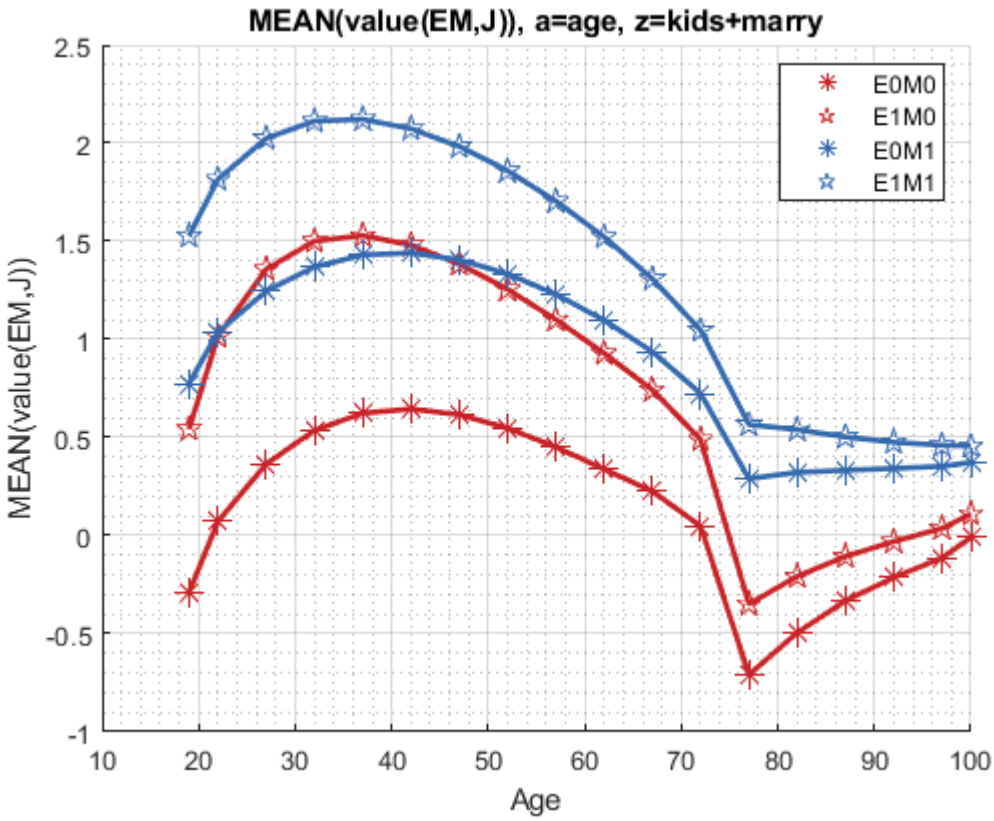
```
% Consumption Choices
tb_az_c = ff_summ_nd_array("MEAN(C(EKM,J))", cons_VFI, true, ["mean"], 3, 1, cl_mp_datasetdesc,
```

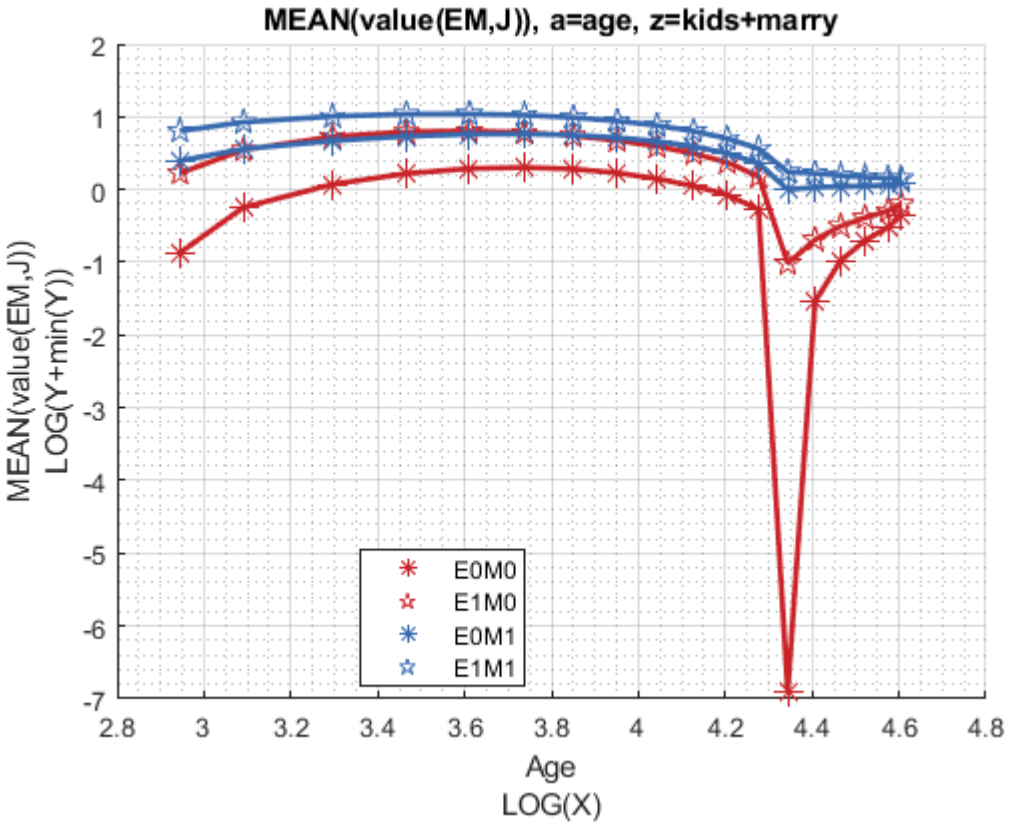
xxx MEAN(C(EKM,J)) xxxxxxxxxxxxxxxxxxxxxxxxxxx

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	6.69	6.8285	6.9343	7.2515	8.4199
2	1	0	6.6738	6.8246	7.1501	7.3841	7.6483	8.6734
3	0	1	6.8114	6.8929	7.0479	7.1732	7.26	7.8099
4	1	1	6.9273	7.0952	7.4299	7.692	7.848	8.2769

Graph Mean Values:

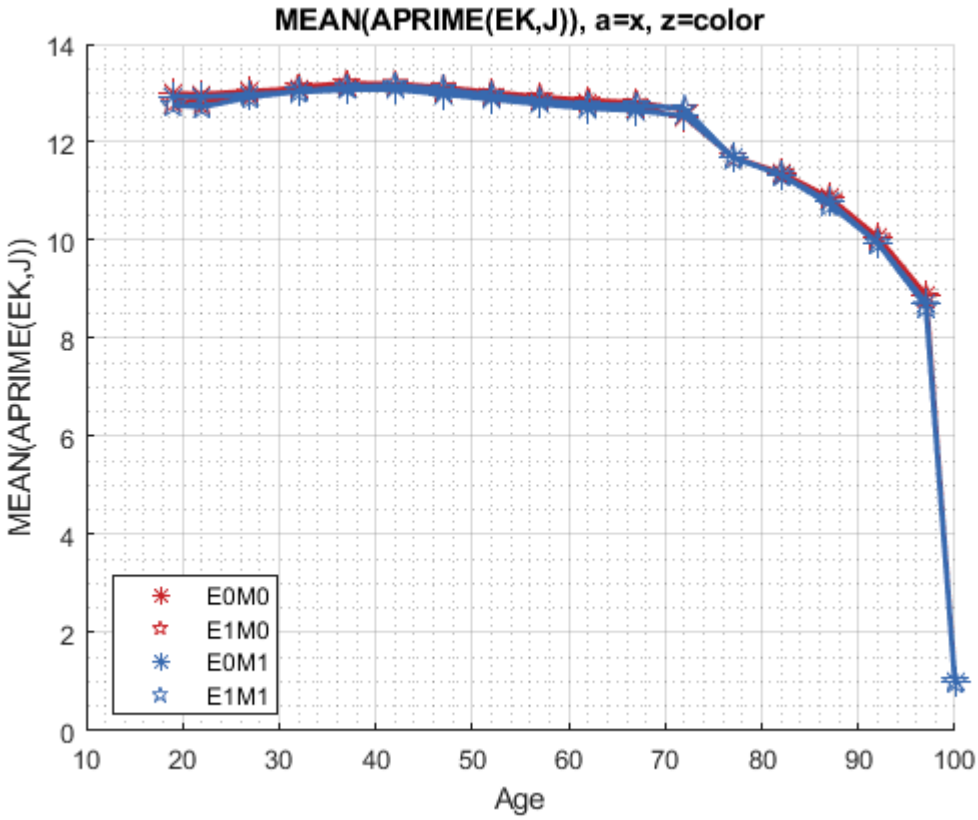
```
mp_support_graph('cl_st_graph_title') = {'MEAN(value(EM,J)), a=age, z=kids+marry'};
mp_support_graph('cl_st_ytitle') = {'MEAN(value(EM,J))'};
ff_graph_grid((tb_az_v{1:end, 4:end}), ar_row_grid, age_grid, mp_support_graph);
```

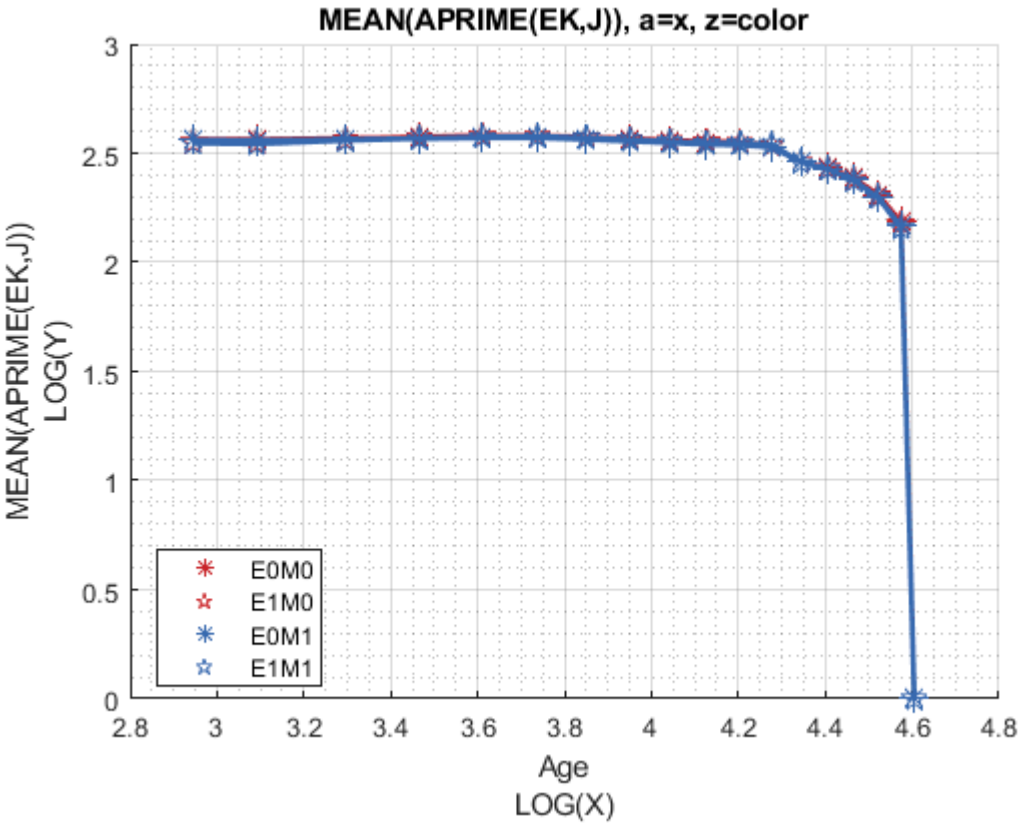




Graph Mean Savings Choices:

```
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);
```