Life Cycle Dynamic Programming with Marital Status, Children and Savings

This is the example vignette for function: **snw_vfi_main_bisec_vec** from the **PrjOptiSNW Package.** This function solves for policy function with vectorized bisection. More Dense Solution Analysis.

Test SNW_VFI_MAIN_BISECT_VEC Defaults More Dense

Call the function with defaults.

```
mp_param = snw_mp_param('default_docdense');
[V_VFI,ap_VFI,cons_VFI] = snw_vfi_main_bisec_vec(mp_param);
```

```
SNW_VFI_MAIN_BISEC_VEC: Finished Age Group:83 of 82, time-this-age:1.3477
SNW_VFI_MAIN_BISEC_VEC: Finished Age Group:82 of 82, time-this-age:2.772
SNW_VFI_MAIN_BISEC_VEC: Finished Age Group:81 of 82, time-this-age:2.6886
SNW_VFI_MAIN_BISEC_VEC: Finished Age Group:80 of 82, time-this-age:2.6034
SNW_VFI_MAIN_BISEC_VEC: Finished Age Group:79 of 82, time-this-age:2.4025
SNW_VFI_MAIN_BISEC_VEC: Finished Age Group:78 of 82, time-this-age:2.5892
SNW_VFI_MAIN_BISEC_VEC: Finished Age Group:77 of 82, time-this-age:2.4135
SNW_VFI_MAIN_BISEC_VEC: Finished Age Group:76 of 82, time-this-age:2.5798
SNW_VFI_MAIN_BISEC_VEC: Finished Age Group:75 of 82, time-this-age:2.4211
SNW_VFI_MAIN_BISEC_VEC: Finished Age Group:74 of 82, time-this-age:2.5768
SNW_VFI_MAIN_BISEC_VEC: Finished Age Group:73 of 82, time-this-age:2.5754
SNW_VFI_MAIN_BISEC_VEC: Finished Age Group:72 of 82, time-this-age:2.6072
SNW_VFI_MAIN_BISEC_VEC: Finished Age Group:71 of 82, time-this-age:2.5104
SNW_VFI_MAIN_BISEC_VEC: Finished Age Group:70 of 82, time-this-age:2.5658
SNW_VFI_MAIN_BISEC_VEC: Finished Age Group:69 of 82, time-this-age:2.4148
SNW_VFI_MAIN_BISEC_VEC: Finished Age Group:68 of 82, time-this-age:2.5182
SNW_VFI_MAIN_BISEC_VEC: Finished Age Group:67 of 82, time-this-age:2.3762
SNW_VFI_MAIN_BISEC_VEC: Finished Age Group:66 of 82, time-this-age:2.5053
SNW_VFI_MAIN_BISEC_VEC: Finished Age Group:65 of 82, time-this-age:2.4224
SNW_VFI_MAIN_BISEC_VEC: Finished Age Group:64 of 82, time-this-age:2.5013
SNW_VFI_MAIN_BISEC_VEC: Finished Age Group:63 of 82, time-this-age:2.4094
SNW_VFI_MAIN_BISEC_VEC: Finished Age Group:62 of 82, time-this-age:2.4546
SNW_VFI_MAIN_BISEC_VEC: Finished Age Group:61 of 82, time-this-age:2.3964
SNW_VFI_MAIN_BISEC_VEC: Finished Age Group:60 of 82, time-this-age:2.5196
SNW_VFI_MAIN_BISEC_VEC: Finished Age Group:59 of 82, time-this-age:2.3948
SNW_VFI_MAIN_BISEC_VEC: Finished Age Group:58 of 82, time-this-age:2.5256
SNW_VFI_MAIN_BISEC_VEC: Finished Age Group:57 of 82, time-this-age:2.3984
SNW_VFI_MAIN_BISEC_VEC: Finished Age Group:56 of 82, time-this-age:2.5195
SNW_VFI_MAIN_BISEC_VEC: Finished Age Group:55 of 82, time-this-age:2.4202
SNW_VFI_MAIN_BISEC_VEC: Finished Age Group:54 of 82, time-this-age:2.5087
SNW_VFI_MAIN_BISEC_VEC: Finished Age Group:53 of 82, time-this-age:2.3967
SNW_VFI_MAIN_BISEC_VEC: Finished Age Group:52 of 82, time-this-age:2.5908
SNW_VFI_MAIN_BISEC_VEC: Finished Age Group:51 of 82, time-this-age:2.4273
SNW_VFI_MAIN_BISEC_VEC: Finished Age Group:50 of 82, time-this-age:2.4934
SNW_VFI_MAIN_BISEC_VEC: Finished Age Group:49 of 82, time-this-age:2.4106
SNW_VFI_MAIN_BISEC_VEC: Finished Age Group:48 of 82, time-this-age:2.4987
SNW_VFI_MAIN_BISEC_VEC: Finished Age Group:47 of 82, time-this-age:2.5508
SNW_VFI_MAIN_BISEC_VEC: Finished Age Group:46 of 82, time-this-age:2.6959
SNW_VFI_MAIN_BISEC_VEC: Finished Age Group:45 of 82, time-this-age:2.5636
SNW_VFI_MAIN_BISEC_VEC: Finished Age Group:44 of 82, time-this-age:2.6548
SNW_VFI_MAIN_BISEC_VEC: Finished Age Group:43 of 82, time-this-age:2.5629
SNW_VFI_MAIN_BISEC_VEC: Finished Age Group:42 of 82, time-this-age:2.6513
SNW_VFI_MAIN_BISEC_VEC: Finished Age Group:41 of 82, time-this-age:2.542
SNW_VFI_MAIN_BISEC_VEC: Finished Age Group:40 of 82, time-this-age:2.6668
SNW_VFI_MAIN_BISEC_VEC: Finished Age Group:39 of 82, time-this-age:2.543
SNW_VFI_MAIN_BISEC_VEC: Finished Age Group:38 of 82, time-this-age:2.6489
SNW_VFI_MAIN_BISEC_VEC: Finished Age Group:37 of 82, time-this-age:2.5832
```

```
SNW_VFI_MAIN_BISEC_VEC: Finished Age Group:36 of 82, time-this-age:2.6481
SNW_VFI_MAIN_BISEC_VEC: Finished Age Group:35 of 82, time-this-age:2.6059
SNW_VFI_MAIN_BISEC_VEC: Finished Age Group:34 of 82, time-this-age:2.7
SNW_VFI_MAIN_BISEC_VEC: Finished Age Group:33 of 82, time-this-age:2.5998
SNW_VFI_MAIN_BISEC_VEC: Finished Age Group:32 of 82, time-this-age:2.6749
SNW_VFI_MAIN_BISEC_VEC: Finished Age Group:31 of 82, time-this-age:2.5805
SNW_VFI_MAIN_BISEC_VEC: Finished Age Group:30 of 82, time-this-age:2.649
SNW_VFI_MAIN_BISEC_VEC: Finished Age Group:29 of 82, time-this-age:2.5965
SNW_VFI_MAIN_BISEC_VEC: Finished Age Group:28 of 82, time-this-age:2.6474
SNW_VFI_MAIN_BISEC_VEC: Finished Age Group:27 of 82, time-this-age:2.593
SNW_VFI_MAIN_BISEC_VEC: Finished Age Group:26 of 82, time-this-age:2.6669
SNW_VFI_MAIN_BISEC_VEC: Finished Age Group:25 of 82, time-this-age:2.6025
SNW_VFI_MAIN_BISEC_VEC: Finished Age Group:24 of 82, time-this-age:2.6214
SNW_VFI_MAIN_BISEC_VEC: Finished Age Group:23 of 82, time-this-age:2.5912
SNW_VFI_MAIN_BISEC_VEC: Finished Age Group:22 of 82, time-this-age:2.7036
SNW_VFI_MAIN_BISEC_VEC: Finished Age Group:21 of 82, time-this-age:2.5499
SNW_VFI_MAIN_BISEC_VEC: Finished Age Group:20 of 82, time-this-age:2.6382
SNW_VFI_MAIN_BISEC_VEC: Finished Age Group:19 of 82, time-this-age:2.6067
SNW_VFI_MAIN_BISEC_VEC: Finished Age Group:18 of 82, time-this-age:2.6643
SNW_VFI_MAIN_BISEC_VEC: Finished Age Group:17 of 82, time-this-age:2.5918
SNW_VFI_MAIN_BISEC_VEC: Finished Age Group:16 of 82, time-this-age:2.6505
SNW_VFI_MAIN_BISEC_VEC: Finished Age Group:15 of 82, time-this-age:2.6052
SNW_VFI_MAIN_BISEC_VEC: Finished Age Group:14 of 82, time-this-age:2.6762
SNW_VFI_MAIN_BISEC_VEC: Finished Age Group:13 of 82, time-this-age:2.6089
SNW_VFI_MAIN_BISEC_VEC: Finished Age Group:12 of 82, time-this-age:2.6791
SNW_VFI_MAIN_BISEC_VEC: Finished Age Group:11 of 82, time-this-age:2.6401
SNW_VFI_MAIN_BISEC_VEC: Finished Age Group:10 of 82, time-this-age:2.8111
SNW_VFI_MAIN_BISEC_VEC: Finished Age Group:9 of 82, time-this-age:2.6367
SNW_VFI_MAIN_BISEC_VEC: Finished Age Group:8 of 82, time-this-age:2.6476
SNW_VFI_MAIN_BISEC_VEC: Finished Age Group:7 of 82, time-this-age:2.6136
SNW_VFI_MAIN_BISEC_VEC: Finished Age Group:6 of 82, time-this-age:2.69
SNW_VFI_MAIN_BISEC_VEC: Finished Age Group:5 of 82, time-this-age:2.6314
SNW_VFI_MAIN_BISEC_VEC: Finished Age Group:4 of 82, time-this-age:2.6429
SNW_VFI_MAIN_BISEC_VEC: Finished Age Group:3 of 82, time-this-age:2.6004
SNW_VFI_MAIN_BISEC_VEC: Finished Age Group:2 of 82, time-this-age:2.7677
SNW_VFI_MAIN_BISEC_VEC: Finished Age Group:1 of 82, time-this-age:2.625
Completed SNW_VFI_MAIN_BISEC_VEC;SNW_MP_PARAM=default_docdense;SNW_MP_CONTROL=default_base;time=213.0023
```

More Dense 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 = 18:100;
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'}, {'eta', 1:length(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') = 'eastoutside';
mp_support_graph('bl_graph_logy') = true; % do not log
mp_support_graph('it_legend_select') = 21; % how many shock legends to show
mp_support_graph('cl_colors') = 'jet';
```

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_eta_1	mean_eta_2	mean_eta_3	mean_eta_4	mean_eta_5	mean_eta_6	mean_
1	0	-103.74	-100.83	-97.586	-94.14	-90.628	-87.143	-83
2	0.00051498	-103.59	-100.7	-97.463	-94.031	-90.531	-87.056	-83
3	0.0041199	-102.58	-99.796	-96.656	-93.308	-89.883	-86.475	-8
4	0.013905	-100.29	-97.718	-94.774	-91.606	-88.347	-85.088	-81
5	0.032959	-96.882	-94.566	-91.879	-88.957	-85.929	-82.883	-79
6	0.064373	-92.787	-90.727	-88.306	-85.65	-82.877	-80.073	-77

```
% 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_eta_1	mean_eta_2	mean_eta_3	mean_eta_4	mean_eta_5	mean_eta_6	mean_
1	0	0	0	0	0	0	0	6.640
2	0.00051498	0	0	0	3.2355e-07	8.8303e-07	1.3402e-06	1.685
3	0.0041199	2.1751e-05	4.5233e-05	7.0015e-05	8.0443e-05	8.1722e-05	7.8394e-05	7.290
4	0.013905	0.0013265	0.0013801	0.0014236	0.0014497	0.0014591	0.0014589	0.00
5	0.032959	0.0055555	0.005738	0.0058748	0.0059489	0.005964	0.0059453	0.0
6	0.064373	0.015298	0.015639	0.015844	0.015934	0.015945	0.015905	0.0

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

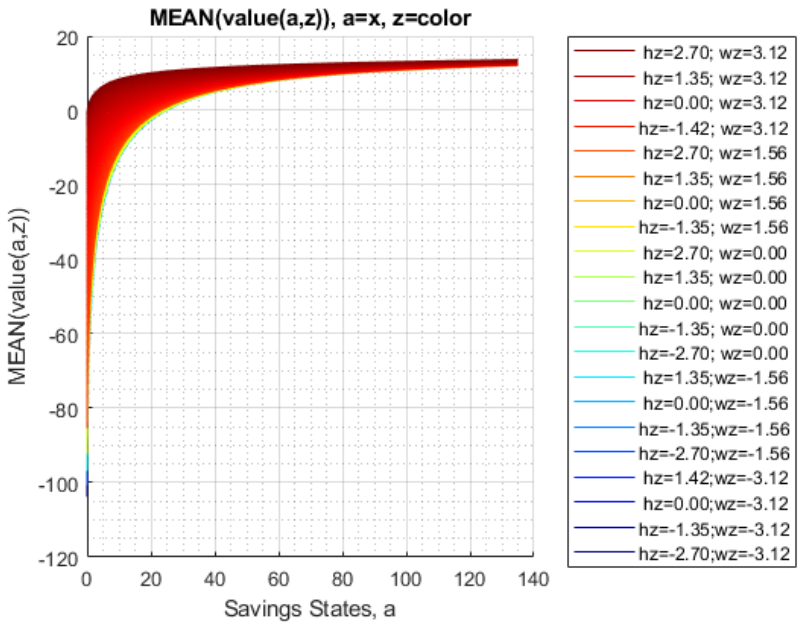
```
xxx  MEAN(C(A,Z))  xxxxxxxxxxxxxxxxxxxxxxxxxx
```

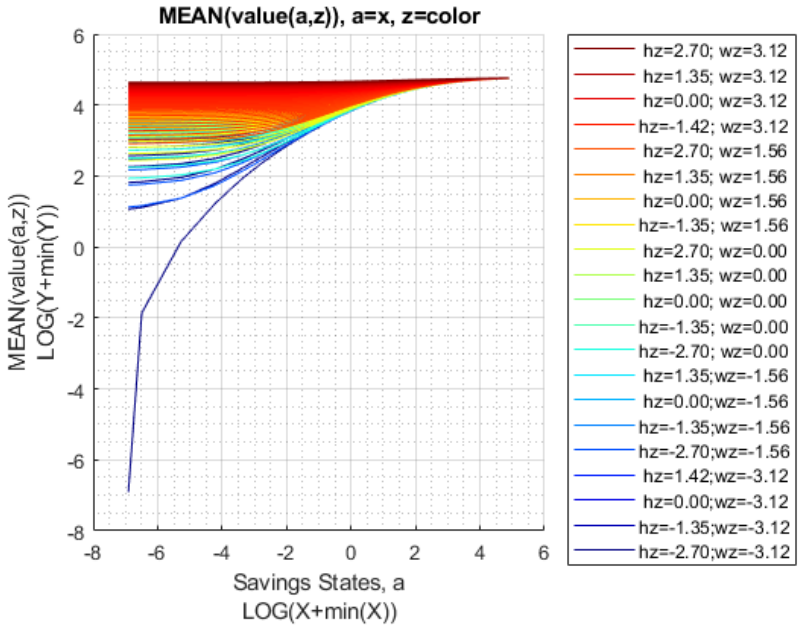
group	savings	mean_eta_1	mean_eta_2	mean_eta_3	mean_eta_4	mean_eta_5	mean_eta_6	mean_
1	0	0.14271	0.14506	0.14755	0.15021	0.15304	0.15606	0.15

```
     2     0.00051498     0.14324     0.14559     0.14808     0.15074     0.15358     0.15659     0.1
     3      0.0041199     0.14695     0.14927     0.15175     0.15439     0.15722     0.16024    0.16
     4       0.013905     0.15578     0.15807     0.16052     0.16315     0.16597     0.16899     0.1
     5       0.032959     0.17127     0.17343     0.17579     0.17837     0.18119     0.18422    0.18
     6       0.064373     0.19405     0.19605     0.19833      0.2009     0.20371     0.20676    0.21
```

Graph Mean Values:

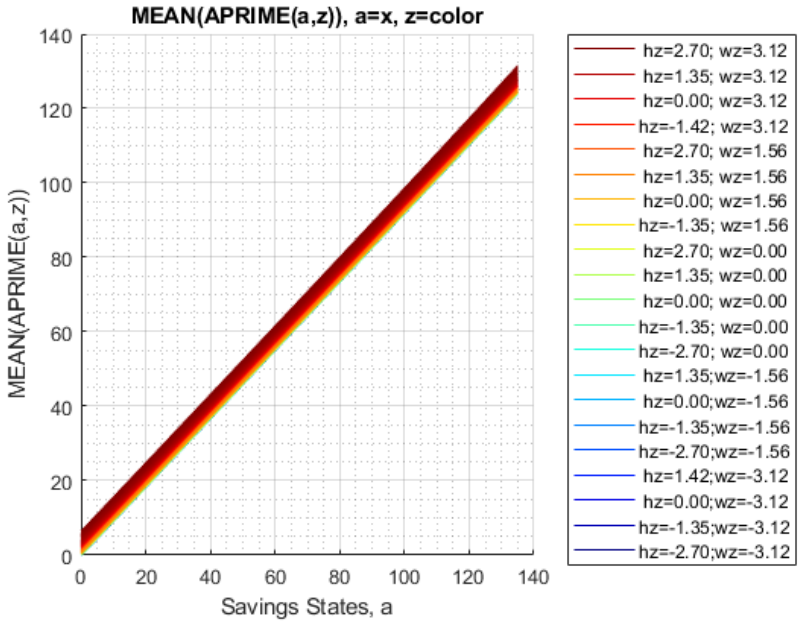
```
mp_support_graph('cl_st_graph_title') = {'MEAN(value(a,z)), a=x, z=color'};
mp_support_graph('cl_st_ytitle') = {'MEAN(value(a,z))'};
ff_graph_grid((tb_az_v{1:end, 3:end})', ar_st_eta_HS_grid, agrid, mp_support_graph);
```

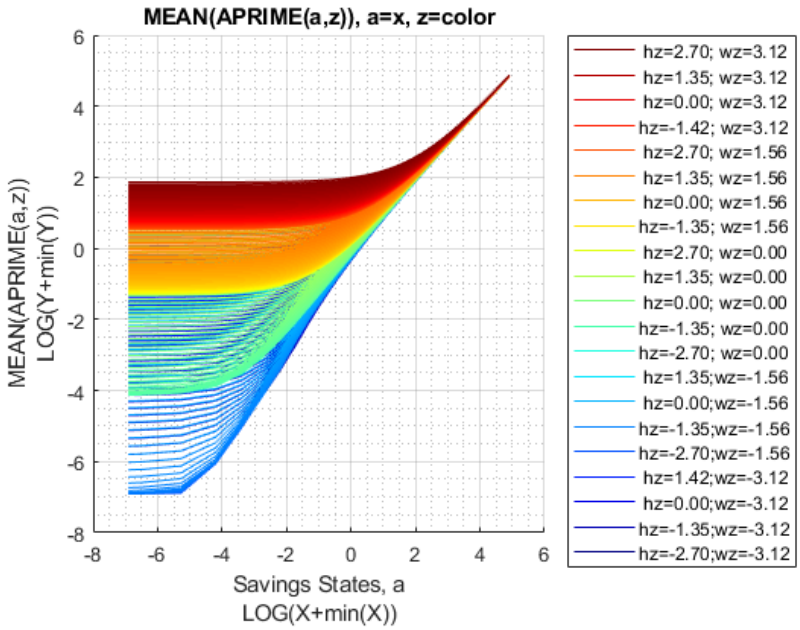




Graph Mean Savings Choices:

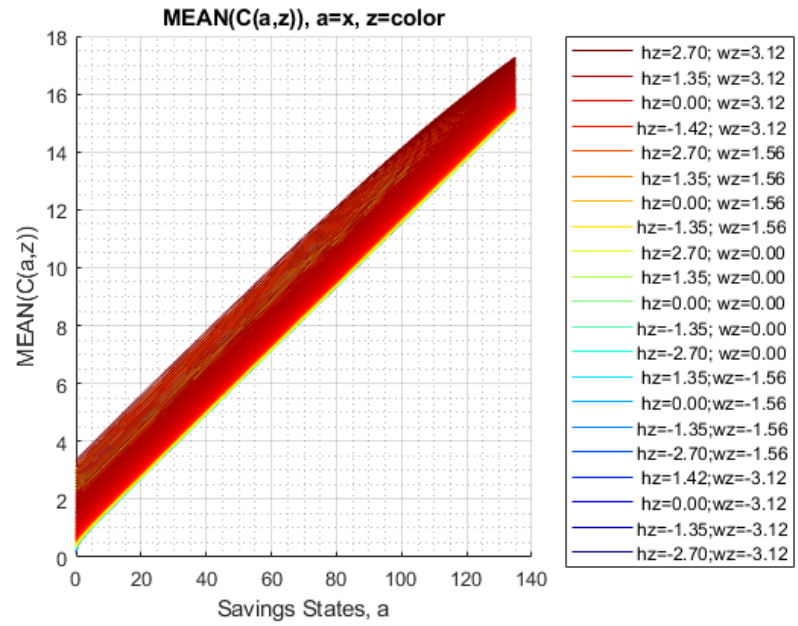
```
mp_support_graph('cl_st_graph_title') = {'MEAN(APRIME(a,z)), a=x, z=color'};
mp_support_graph('cl_st_ytitle') = {'MEAN(APRIME(a,z))'};
ff_graph_grid((tb_az_ap{1:end, 3:end})', ar_st_eta_HS_grid, agrid, mp_support_graph);
```

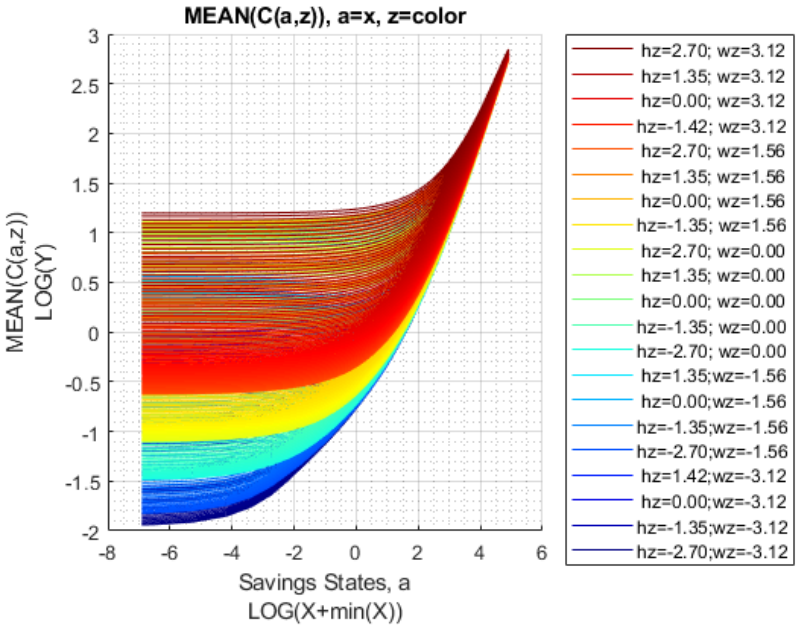




Graph Mean Consumption:

```
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", "K3M0", "K4M0", ...
    "k0M1", "K1M1", "K2M1", "K3M1", "K4M1"];
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', 'x', '*', ...
    'o', 'd', 's', 'x', '*'};
mp_support_graph('cl_colors') = {...
    'red', 'red', 'red', 'red', 'red'...
    'blue', 'blue', '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_18	mean_age_19	mean_age_20	mean_age_21	mean_age_22	mean_age_23
1	1	0	-9.6123	-8.574	-7.5952	-6.6749	-5.8609	-5.1427
2	2	0	-17.183	-15.851	-14.558	-13.309	-12.171	-11.137
3	3	0	-20.909	-19.563	-18.242	-16.949	-15.768	-14.686
4	4	0	-24.758	-23.406	-22.06	-20.727	-19.5	-18.369
5	5	0	-27.561	-26.288	-25.009	-23.73	-22.552	-21.464
6	1	1	2.1559	3.0013	3.7773	4.4944	5.1268	5.6806
7	2	1	-2.4375	-1.4691	-0.55596	0.31118	1.0968	1.8059
8	3	1	-4.6483	-3.672	-2.7454	-1.8583	-1.0517	-0.32031
9	4	1	-7.2434	-6.2806	-5.3574	-4.4633	-3.6454	-2.8983
10	5	1	-9.2948	-8.3935	-7.5263	-6.6822	-5.9134	-5.2138

```
% 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_18	mean_age_19	mean_age_20	mean_age_21	mean_age_22	mean_age_23
1	1	0	34.494	34.456	34.416	34.452	34.489	34.527
2	2	0	34.3	34.256	34.21	34.238	34.268	34.298
3	3	0	34.146	34.101	34.055	34.082	34.11	34.139
4	4	0	34.053	34.01	33.964	33.991	34.02	34.048
5	5	0	33.97	33.929	33.885	33.915	33.946	33.976
6	1	1	35.208	35.246	35.285	35.413	35.545	35.678
7	2	1	34.951	34.976	35	35.11	35.222	35.335
8	3	1	34.708	34.724	34.739	34.838	34.939	35.041
9	4	1	34.506	34.516	34.523	34.613	34.704	34.796
10	5	1	34.221	34.218	34.212	34.286	34.363	34.44

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

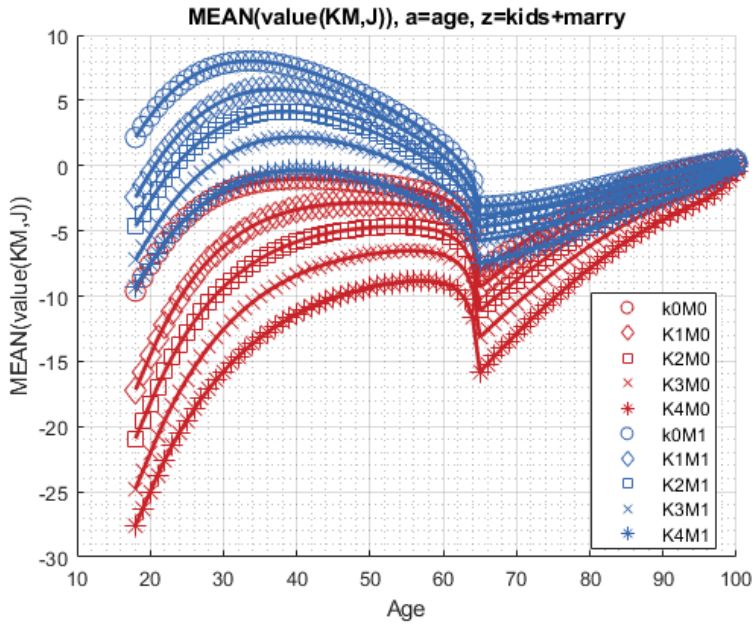
xxx MEAN(C(KM,J)) xxxxxxxxxxxxxxxxxxxxxxxxxx

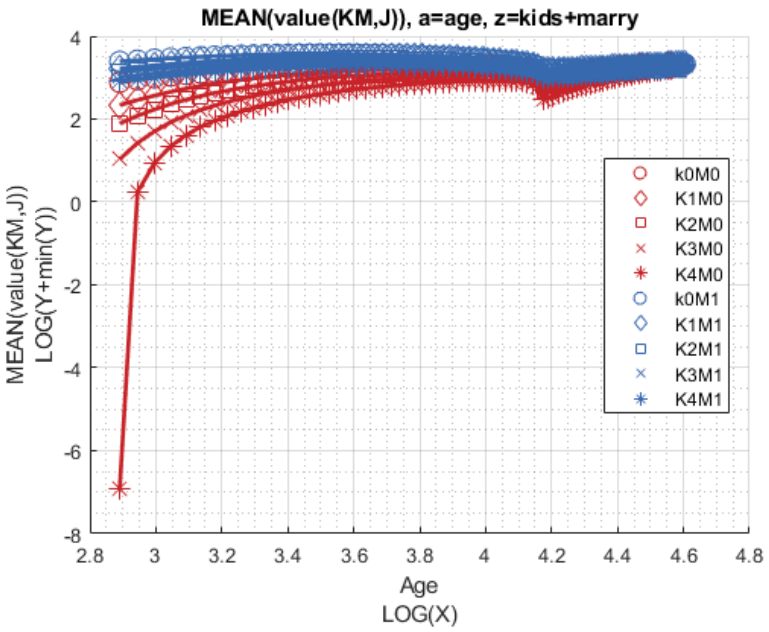
group	kids	marry	mean_age_18	mean_age_19	mean_age_20	mean_age_21	mean_age_22	mean_age_23
1	1	0	2.0632	2.102	2.1418	2.184	2.2244	2.2628
2	2	0	2.2579	2.3019	2.348	2.3975	2.4457	2.4924

3	3	0	2.4119	2.4563	2.503	2.5537	2.6031	2.6511
4	4	0	2.5046	2.5481	2.594	2.6445	2.6938	2.7418
5	5	0	2.5877	2.6287	2.6724	2.7207	2.7678	2.8136
6	1	1	2.6183	2.6787	2.7402	2.8051	2.8674	2.9269
7	2	1	2.681	2.7395	2.8002	2.8656	2.9293	2.991
8	3	1	2.7896	2.8462	2.9054	2.9698	3.0325	3.0933
9	4	1	2.8528	2.9056	2.9612	3.0222	3.0816	3.1393
10	5	1	2.9174	2.966	3.0172	3.0737	3.1281	3.1806

Graph Mean Values:

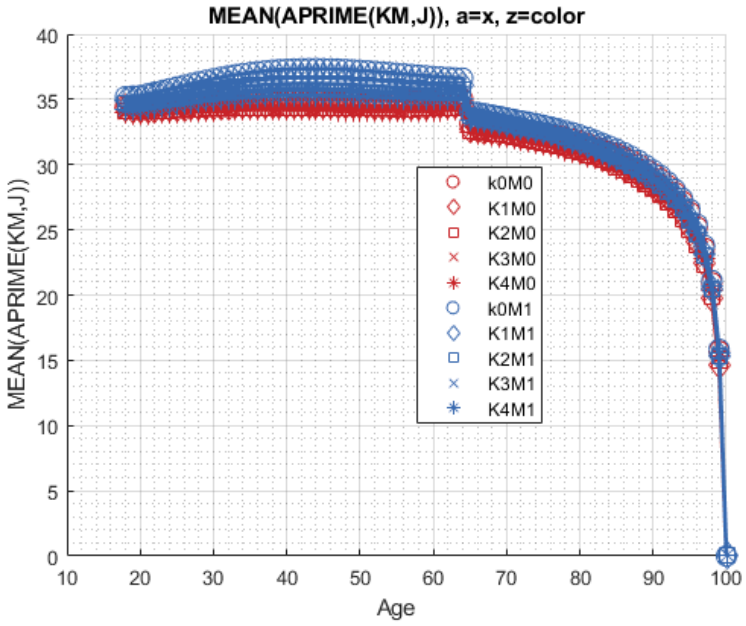
```
mp_support_graph('cl_st_graph_title') = {'MEAN(value(KM,J)), a=age, z=kids+marry'};
mp_support_graph('cl_st_ytitle') = {'MEAN(value(KM,J))'};
ff_graph_grid((tb_az_v{1:end, 4:end}), ar_row_grid, age_grid, mp_support_graph);
```

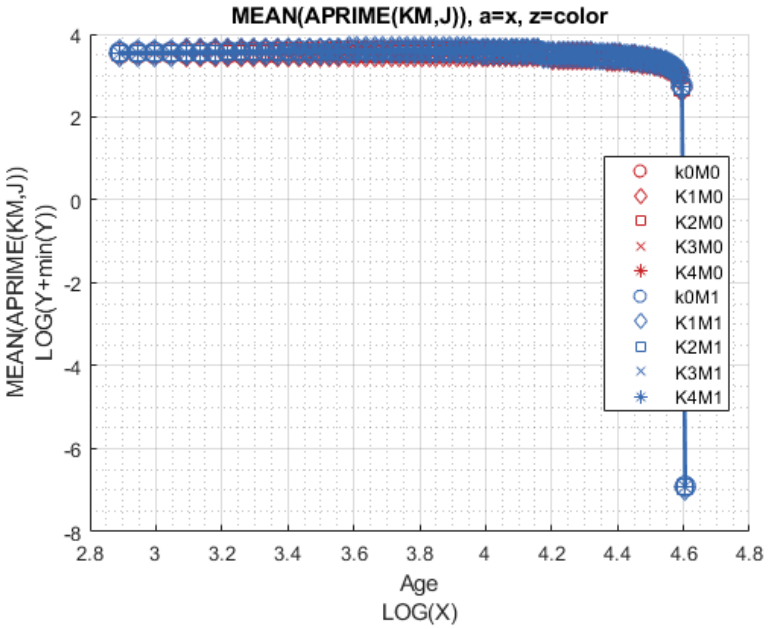




Graph Mean Savings Choices:

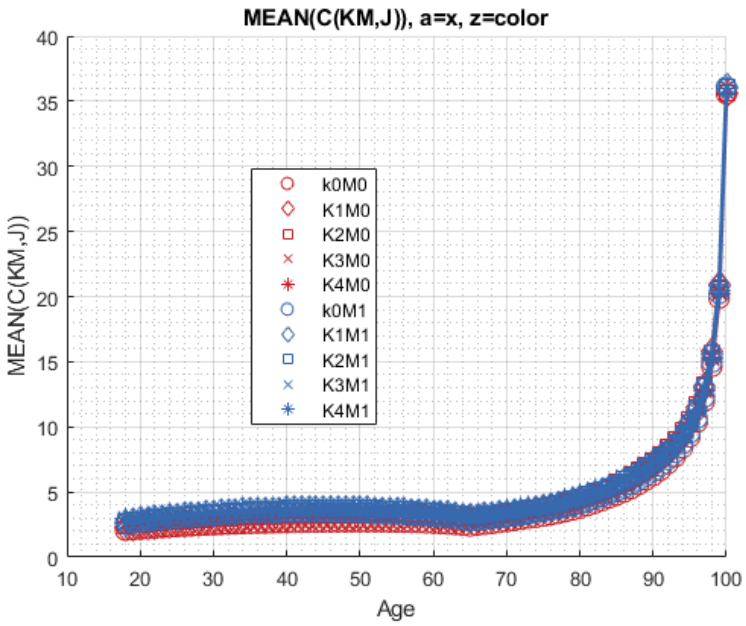
```
mp_support_graph('cl_st_graph_title') = {'MEAN(APRIME(KM,J)), a=x, z=color'};
mp_support_graph('cl_st_ytitle') = {'MEAN(APRIME(KM,J))'};
ff_graph_grid((tb_az_ap{1:end, 4:end}), ar_row_grid, age_grid, mp_support_graph);
```

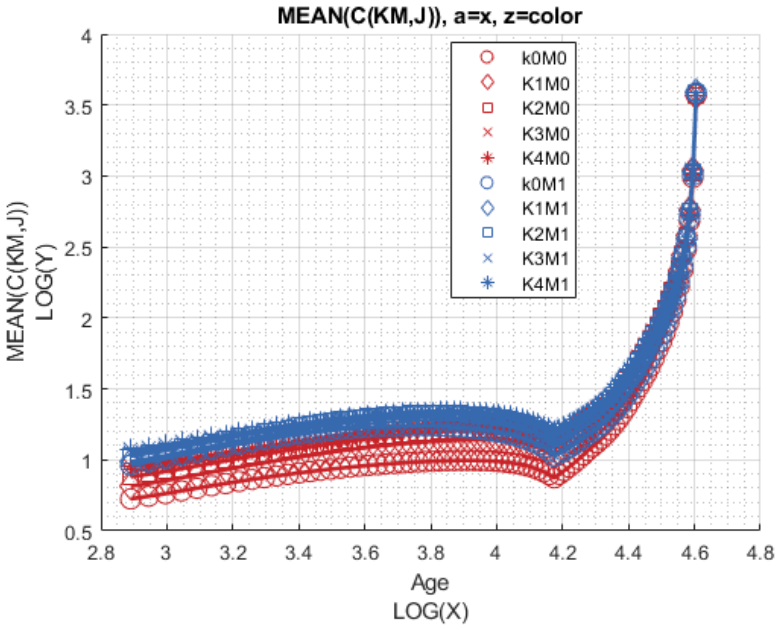




Graph Mean Consumption:

```
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_18    mean_age_19    mean_age_20    mean_age_21    mean_age_22    mean_age_23
    _____    ___    _____    ___________    ___________    ___________    ___________    ___________    ___________

      1       0       0         -23.27         -22.094        -20.941        -19.811        -18.761        -17.785
      2       1       0        -16.739         -15.379        -14.045        -12.745         -11.58        -10.535
      3       0       1        -6.6189         -5.6779        -4.7885        -3.9435        -3.1707        -2.4661
      4       1       1        -1.9684         -1.0477       -0.17465        0.66417         1.4159         2.0877
```

```
% 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_18    mean_age_19    mean_age_20    mean_age_21    mean_age_22    mean_age_23
    _____    ___    _____    ___________    ___________    ___________    ___________    ___________    ___________

      1       0       0         34.294         34.261         34.226         34.237         34.247         34.256
      2       1       0         34.091          34.04         33.986         34.035         34.087         34.139
      3       0       1         34.769         34.789         34.809          34.88         34.951         35.023
      4       1       1         34.669         34.683         34.695         34.824         34.958         35.094
```

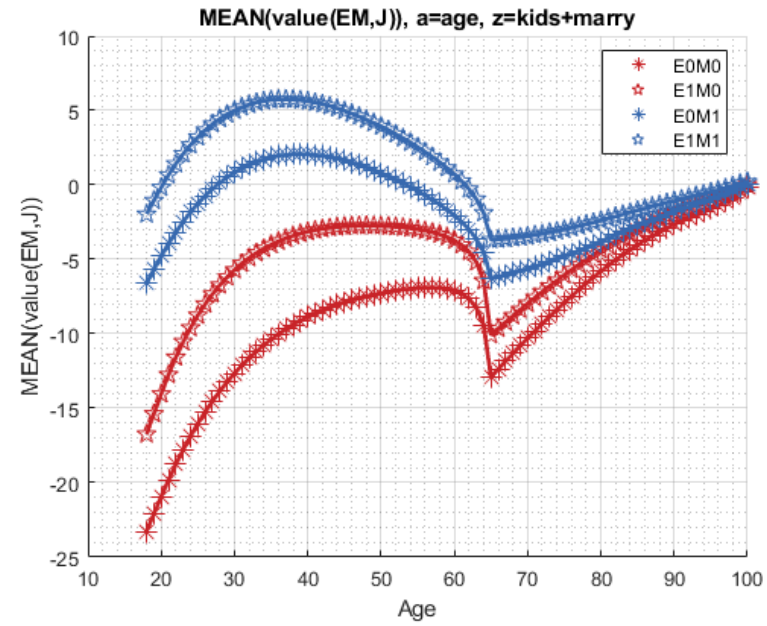
```
% Consumption Choices
tb_az_c = ff_summ_nd_array("MEAN(C(EKM,J))", cons_VFI, true, ["mean"], 3, 1, cl_mp_datasetdesc,
```

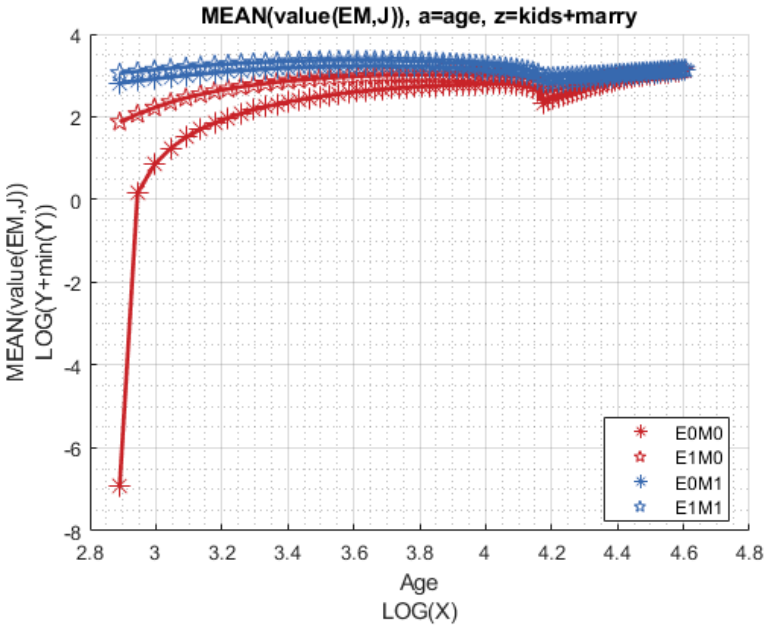
```
xxx  MEAN(C(EKM,J))  xxxxxxxxxxxxxxxxxxxxxxxxxxx
    group    edu    marry    mean_age_18    mean_age_19    mean_age_20    mean_age_21    mean_age_22    mean_age_23
    _____    ___    _____    ___________    ___________    ___________    ___________    ___________    ___________

      1       0       0          2.2635         2.2969         2.3317         2.3683         2.4043         2.4395
      2       1       0          2.4666         2.5178          2.572         2.6319         2.6896         2.7452
      3       0       1          2.6261         2.6712         2.7175         2.7661         2.8135         2.8598
      4       1       1          2.9175         2.9832         3.0522         3.1285          3.202         3.2726
```

Graph Mean Values:

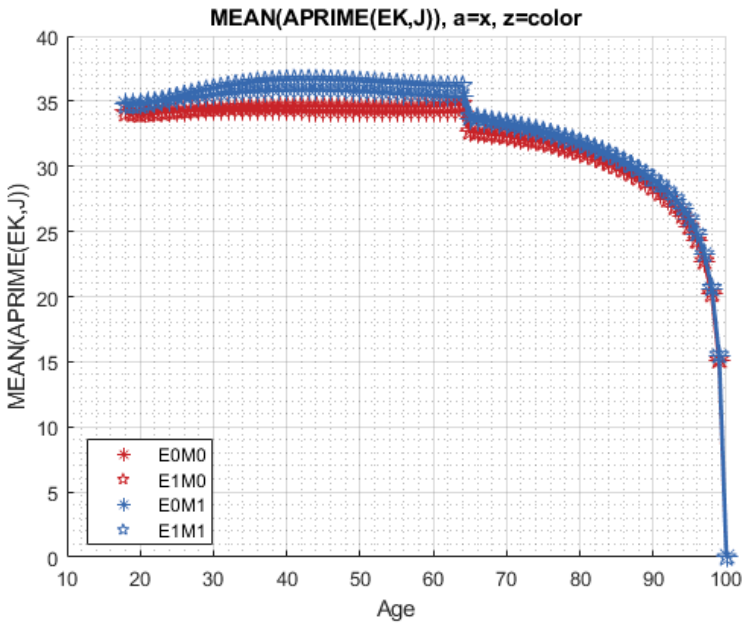
```
mp_support_graph('cl_st_graph_title') = {'MEAN(value(EM,J)), a=age, z=kids+marry'};
mp_support_graph('cl_st_ytitle') = {'MEAN(value(EM,J))'};
ff_graph_grid((tb_az_v{1:end, 4:end}), ar_row_grid, age_grid, mp_support_graph);
```

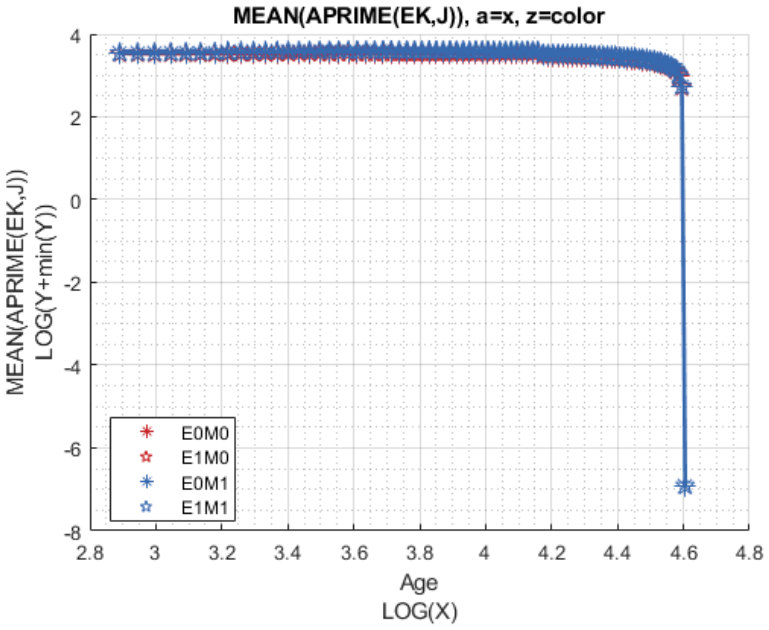




Graph Mean Savings Choices:

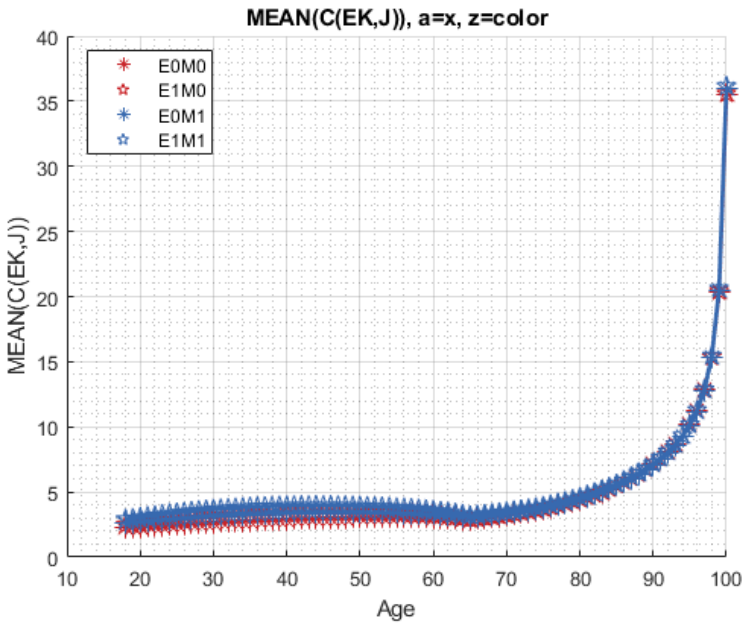
```
mp_support_graph('cl_st_graph_title') = {'MEAN(APRIME(EK,J)), a=x, z=color'};
mp_support_graph('cl_st_ytitle') = {'MEAN(APRIME(EK,J))'};
ff_graph_grid((tb_az_ap{1:end, 4:end}), ar_row_grid, age_grid, mp_support_graph);
```

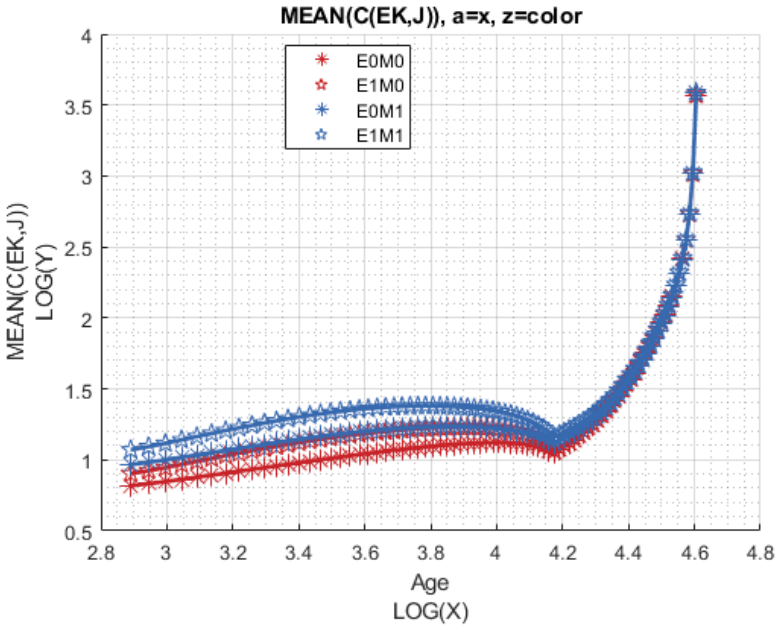




Graph Mean Consumption:

```
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)