

Model Calibration

Taking advantage of `snw_calibrate_beta_norm_gdp` from the [PrjOptiSNW Package](#), this function calibrates the discount factor and also solves for the normalizing constant.

Calibrate Parameter Controls for SNW Functions

Set up controls for shock process and tiny/small/dense/densemore

```
clear all;
bl_print_mp_params = false;
% st_shock_method = 'rouwenhorst';
st_shock_method = 'tauchen';
% st_param_group = 'default_tiny';
% st_param_group = 'default_small';
% st_param_group = 'default_base';
% st_param_group = 'default_dense';
% st_param_group = 'default_moredense';
st_param_group = 'default_docdense';
mp_params = snw_mp_param(st_param_group, bl_print_mp_params, st_shock_method);
Pop = mp_params('Pop');
```

Set up print defaults

```
mp_controls = snw_mp_control('default_test');
mp_controls('bl_timer') = true;
mp_controls('bl_print_vfi') = false;
mp_controls('bl_print_vfi_verbose') = false;
mp_controls('bl_print_ds') = false;
mp_controls('bl_print_ds_verbose') = false;
```

Calibrate Routine

Test this for 3 iterations

```
%% Calibration
err=1;
tol=0.005;
it_counter = 1;
while err>tol && it_counter <= 10
    disp('');
    it=1;

    while it>0

        % Solve optimization problem and get the distribution
        tm_start_a2 = tic;
        a2_old = mp_params('a2');
        [Phi_true,~,A_agg,Y_inc_agg,it,mp_dsvfi_results, a2] = snw_ds_main(mp_params, mp_controls);
        mp_params('a2') = a2;
        tm_end_a2 = toc(tm_start_a2);
        disp(['a2_old:' num2str(a2_old) ', a2_new:' num2str(a2) ', tm_end_a2:' num2str(tm_end_a2)]);
    end
end
```

```

end

% Get Stats
mp_cl_mt_xyz_of_s = mp_dsvfi_results('mp_cl_mt_xyz_of_s');
tb_outcomes = mp_cl_mt_xyz_of_s('tb_outcomes');
A_agg_alt = tb_outcomes{'a_ss', 'mean'}*sum(Pop);
Aprime_agg_alt = tb_outcomes{'ap_ss', 'mean'}*sum(Pop);
Y_inc_agg_alt = tb_outcomes{'y_all', 'mean'}*sum(Pop);
Y_inc_median = tb_outcomes{'y_all', 'p50'};

% Comparison
name='Median household income (target=1.0)=';
name2=[name,num2str(Y_inc_median)];
disp(name2);
name='Aggregate wealth to aggregate income (target=3.0)=';
name2=[name,num2str(A_agg/Y_inc_agg)];
disp(name2);

err1=abs(Y_inc_median-1.0); % Target: Median household income (normalized to 1 in the model)
err2=abs((A_agg/Y_inc_agg)-3.0); % Target: Annual capital/income ratio of 3

err=max(err1,err2);

% Beta and Theta
theta = mp_params('theta');
beta = mp_params('beta');
param_update=[theta;beta];

if err>tol

    theta=theta*((1.0/Y_inc_median)^0.2); % Normalize theta such that median household income is 1
    beta=beta*((3.0/(A_agg/Y_inc_agg))^0.025); % Calibrate beta such that annual capital/income ratio is 3

end

mp_params('theta') = theta;
mp_params('beta') = beta;

param_update=[param_update(1,1),theta;param_update(2,1),beta];

it_counter = it_counter + 1;
name='Old/updated theta: ';
st_theta=[name, num2str(param_update(1,:))];
name='Old/updated beta: ';
st_beta=[name,num2str(param_update(2,:))];
disp(['counter=' num2str(it_counter) ...
    ';beta=' num2str(beta) ...
    ';theta=' num2str(theta)]);
end

```

```

Completed SNW_VFI_MAIN_BISEC_VEC;SNW_MP_PARAM=default_docdense;SNW_MP_CONTROL=default_test;time=489.7954
Completed SNW_DS_MAIN;SNW_MP_PARAM=default_docdense;SNW_MP_CONTROL=default_test;time=1835.3351
a2_old:1.5286, a2_new:1.4349, tm_end_a2:2440.3793
Completed SNW_VFI_MAIN_BISEC_VEC;SNW_MP_PARAM=default_docdense;SNW_MP_CONTROL=default_test;time=487.6941
Completed SNW_DS_MAIN;SNW_MP_PARAM=default_docdense;SNW_MP_CONTROL=default_test;time=1447.245
a2_old:1.4349, a2_new:1.4342, tm_end_a2:2051.784

```

Completed SNW_VFI_MAIN_BISEC_VEC;SNW_MP_PARAM=default_docdense;SNW_MP_CONTROL=default_test;time=483.8874
 Completed SNW_DS_MAIN;SNW_MP_PARAM=default_docdense;SNW_MP_CONTROL=default_test;time=1352.0741
 a2_old:1.4342, a2_new:1.4342, tm_end_a2:1951.1421
 Median household income (target=1.0)=1.0024
 Aggregate wealth to aggregate income (target=3.0)=3.0822
 counter=2;beta=0.97051;theta=0.56495
 Completed SNW_VFI_MAIN_BISEC_VEC;SNW_MP_PARAM=default_docdense;SNW_MP_CONTROL=default_test;time=493.7443
 Completed SNW_DS_MAIN;SNW_MP_PARAM=default_docdense;SNW_MP_CONTROL=default_test;time=1570.3759
 a2_old:1.4342, a2_new:1.4374, tm_end_a2:2178.0519
 Completed SNW_VFI_MAIN_BISEC_VEC;SNW_MP_PARAM=default_docdense;SNW_MP_CONTROL=default_test;time=487.6095
 Completed SNW_DS_MAIN;SNW_MP_PARAM=default_docdense;SNW_MP_CONTROL=default_test;time=1348.532
 a2_old:1.4374, a2_new:1.4374, tm_end_a2:1948.8124
 Median household income (target=1.0)=0.99971
 Aggregate wealth to aggregate income (target=3.0)=3.0379
 counter=3;beta=0.9702;theta=0.56499
 Completed SNW_VFI_MAIN_BISEC_VEC;SNW_MP_PARAM=default_docdense;SNW_MP_CONTROL=default_test;time=486.5732
 Completed SNW_DS_MAIN;SNW_MP_PARAM=default_docdense;SNW_MP_CONTROL=default_test;time=1503.2336
 a2_old:1.4374, a2_new:1.439, tm_end_a2:2101.4027
 Completed SNW_VFI_MAIN_BISEC_VEC;SNW_MP_PARAM=default_docdense;SNW_MP_CONTROL=default_test;time=485.2243
 Completed SNW_DS_MAIN;SNW_MP_PARAM=default_docdense;SNW_MP_CONTROL=default_test;time=1334.6119
 a2_old:1.439, a2_new:1.439, tm_end_a2:1933.0606
 Median household income (target=1.0)=0.99853
 Aggregate wealth to aggregate income (target=3.0)=3.0176
 counter=4;beta=0.97006;theta=0.56515
 Completed SNW_VFI_MAIN_BISEC_VEC;SNW_MP_PARAM=default_docdense;SNW_MP_CONTROL=default_test;time=503.3757
 Completed SNW_DS_MAIN;SNW_MP_PARAM=default_docdense;SNW_MP_CONTROL=default_test;time=1423.8673
 a2_old:1.439, a2_new:1.4393, tm_end_a2:2041.1993
 Completed SNW_VFI_MAIN_BISEC_VEC;SNW_MP_PARAM=default_docdense;SNW_MP_CONTROL=default_test;time=497.2516
 Completed SNW_DS_MAIN;SNW_MP_PARAM=default_docdense;SNW_MP_CONTROL=default_test;time=1386.4679
 a2_old:1.4393, a2_new:1.4393, tm_end_a2:1998.5793
 Median household income (target=1.0)=0.99813
 Aggregate wealth to aggregate income (target=3.0)=3.0084
 counter=5;beta=0.96999;theta=0.56536
 Completed SNW_VFI_MAIN_BISEC_VEC;SNW_MP_PARAM=default_docdense;SNW_MP_CONTROL=default_test;time=501.2822
 Completed SNW_DS_MAIN;SNW_MP_PARAM=default_docdense;SNW_MP_CONTROL=default_test;time=1375.2408
 a2_old:1.4393, a2_new:1.4393, tm_end_a2:1990.0337
 Median household income (target=1.0)=0.99829
 Aggregate wealth to aggregate income (target=3.0)=3.0041
 counter=6;beta=0.96999;theta=0.56536