One-asset model

!AS OF NOW I HAVE NOT SPECIFIED THE TRANSITORY AND PERMANENT INCOME PROCESSES!

We present a simple one-asset model in finite horizon with one choice variable , and two state variables and . We adopt a CRRA utility function.

The Bellman equation is

Where

Now we have all we need to know to solve the model (i.e., states today, choices today and transition equation).

Now, to reduce the dimensionality of the state space to one variable, we normalize by permanent wrt. Permanent income using the definition . Normalization is possible due to unit-root in permanent income as we can divide everything by P AND utility specification (homothetic) s.t. utility is scale invariant. Furthermore, budget constraint must also be consistent with homothetic preferences.

Defining we obtain

Thus, the Bellman equation in ratio form is

Where the adjustment factor is due to changes in permanent income.

**Solution method (Note, this is not EGM solution method!)**

Now we can confirm the relationship by the original value function and ratio-form value function. Using that in the terminal period since no bequest

Knowing the solution to the terminal period, we also need to solve for by backwards induction

We evaluate expecatations as

Now to solve using a computer we need to descretize into sum (Gauss-Hermite)

And interpolate for values off the