Computational Macro - Problem set 4

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Question 1.

For part a), I used the Nedler-Mead algorithm inside the bellman operator to find the optimal choice of (k', l) simultaneously. In part b), I used the labor intratemporal FOC to find labor for a given level of k', and I iterated this procedure to find the optimal k'. For both the choice of l (inside loop) and k' (outside loot), I used the Brent algorithm.

In all cases I used a polynomial curved grid space with $\theta = 3.6$ and 20 grid points to speed up computation and maximize accuracy. Since I know that the value function is monotonically increasing in capital, I used monotonic cubic splines to interpolate the value function and I used cubic splines to interpolate the policy functions.

Method to find (k', l)	**Number of iterations**	**Time**
Multivariate optimization (Nelder-Mead)	701	14.447 seconds
Sequential univariate optimization (Brent)	782	14.7 seconds

Table 1: VFI optimization

a)

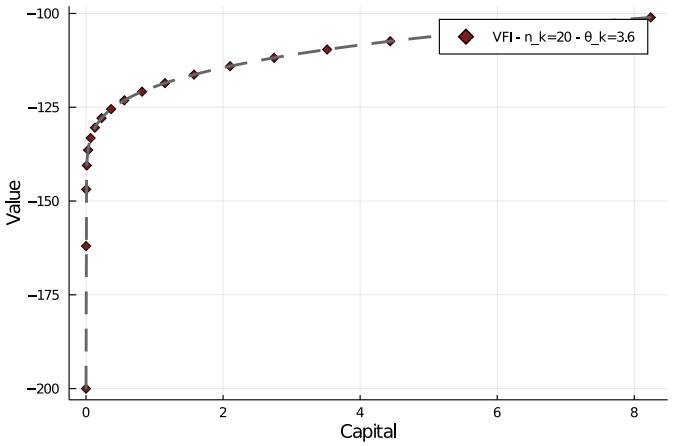

Figure 1: Value Function (Multivariate - Nelder-Mead)

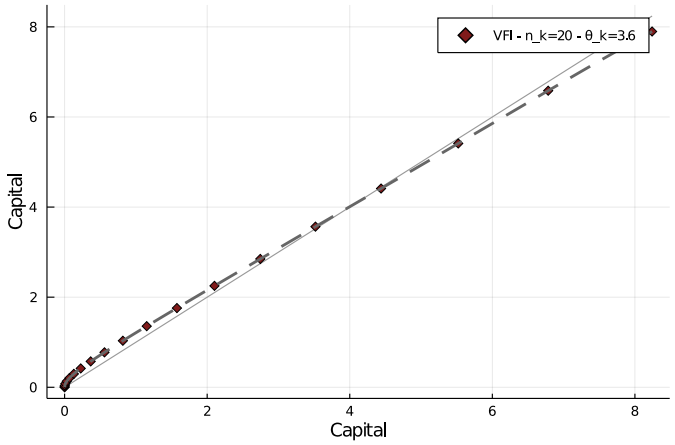

Figure 2: Capital Policy Function (Multivariate - Nelder-Mead)

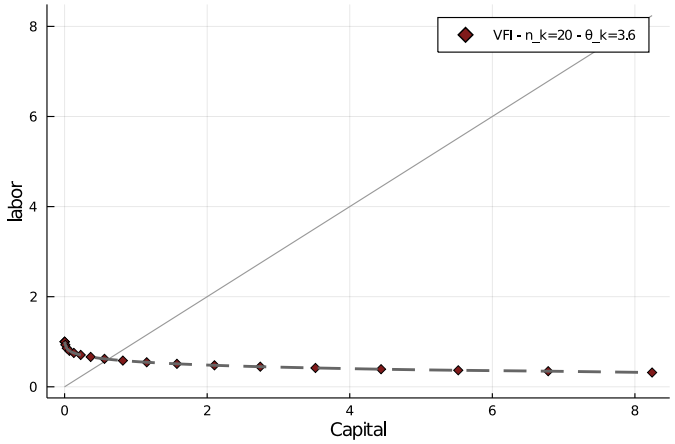

Figure 3: Labor Policy Function (Multivariate - Nelder-Mead)

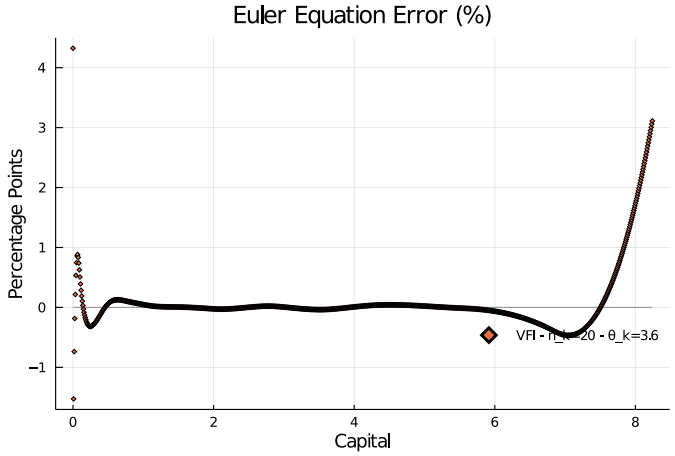

Figure 4: Euler Percentage Error (Multivariate - Nelder-Mead)

b)

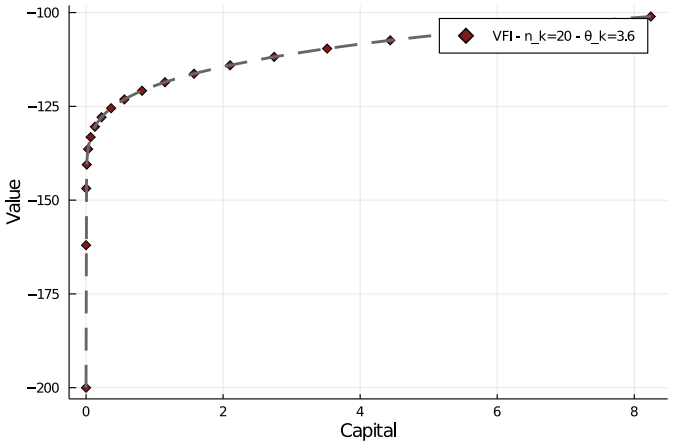

Figure 5: Value Function (Univariate - Brent)

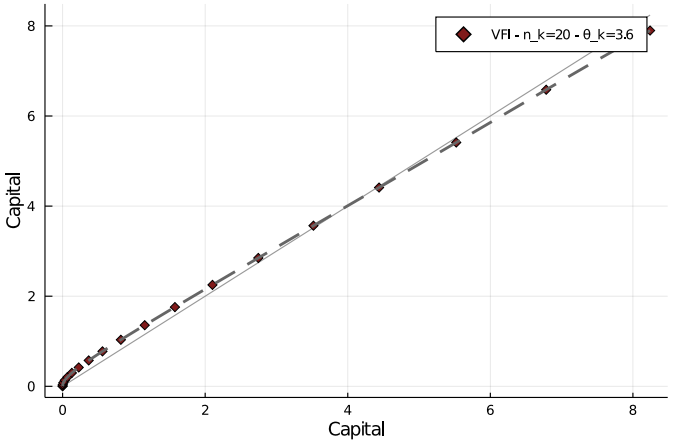

Figure 6: Capital Policy Function (Univariate - Brent)

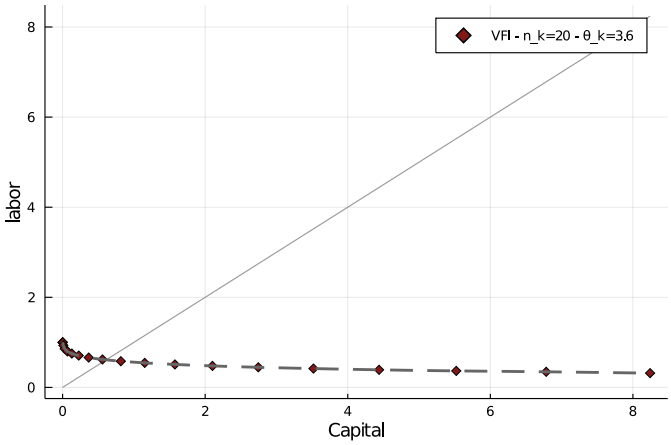

Figure 7: Labor Policy Function (Univariate - Brent)

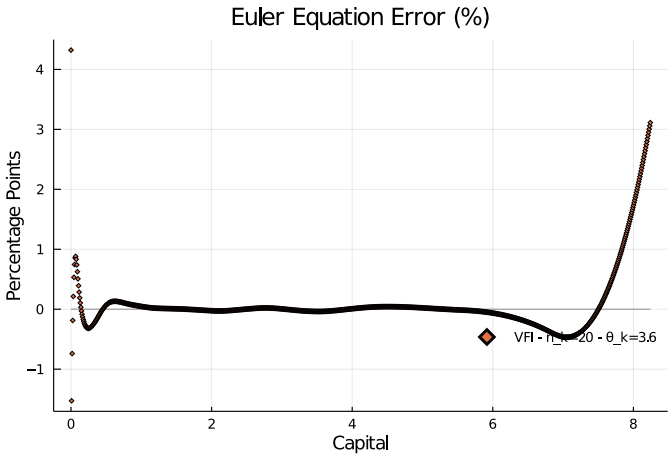

Figure 8: Euler Percentage Error (Univariate - Brent)