Problem Set #1

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1. The dynamic programming problem is:

$$\max_{\{K_{t+1},C_t\}_{t=1}^{\infty}} \mathbb{E}\left[\sum_{t=1}^{\infty}\beta^t \log\left(C_t\right)\right] \text{ s.t. } C_t+K_{t+1}-(1-\delta)K_t \leq Z_t K_t^{\theta} \ \forall t=1,2,3,...$$

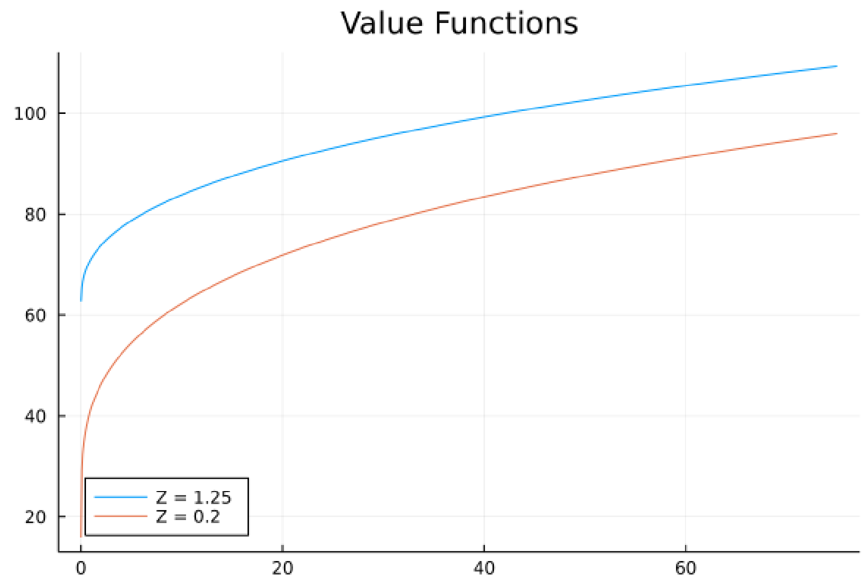
   Which can be represented by the following Bellman equation:

$$V(K,Z)=\max_{K'}\ \left\{\log\left(ZK^{\theta}+(1-\delta)K-K'\right)+\beta\mathbb{E}\left[V(K',Z)|Z\right]\right\}$$

   I did not complete the programming exercise in Fortran, but I completed it in Julia, both parallelized and not (see edgel_ps1.jl, edgel_growth_model.jl, edgel_ps1_unparrallel.jl, and edgel_growth_model_unparrallel.jl). For the timing comparison, I asked Michell Valdéz Bobes for his Fortran times. The timing comparisons are provided below, for unparallelized code, code that parallelizes the state space loop, and code that parallelizes the capital state space loop.

	Unparallelized	Parallelized, Z	Parallelized, K
Julia	13.63	15.38	14.02
Fortran	15.35	4.71	*N/A*

2. The value function for each state, Z, is plotted below. For each state, the value function is clearly both increasing and concave.



3. The policy function for each state is displayed below, and the decision rule is clearly increasing in both K and Z, as is saving.