Fall 2019 - ECON 634 - Advance Macroeconomics - Problem Set 2

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1. Since the Resource constraint (Social Planner Problem) is $c_t = A_t k_t^\alpha + (1-\delta)k_t - k_{t+1}$ we can write the budget constraint in recursive form as $c = Ak^\alpha + (1-\delta)k - k'$

   - **State variable**: k, A
   - **Control variable**: k'

   Therefore, the Bellman equation:

$$V(k, A) = \underset{k'}{\text{Max}} \left\{ \frac{(Ak^\alpha + (1-\delta)k - k')^{1-\sigma}}{1-\sigma} + \beta \sum_{A' \in A} \Pi(A'|A) V(k', A') \right\}$$

   subject to

$$c \in [0, f(k)] \tag{1}$$

$$k' \in [0, f(k)] \tag{2}$$

2. Using the VFI, the Graphs are like follows:

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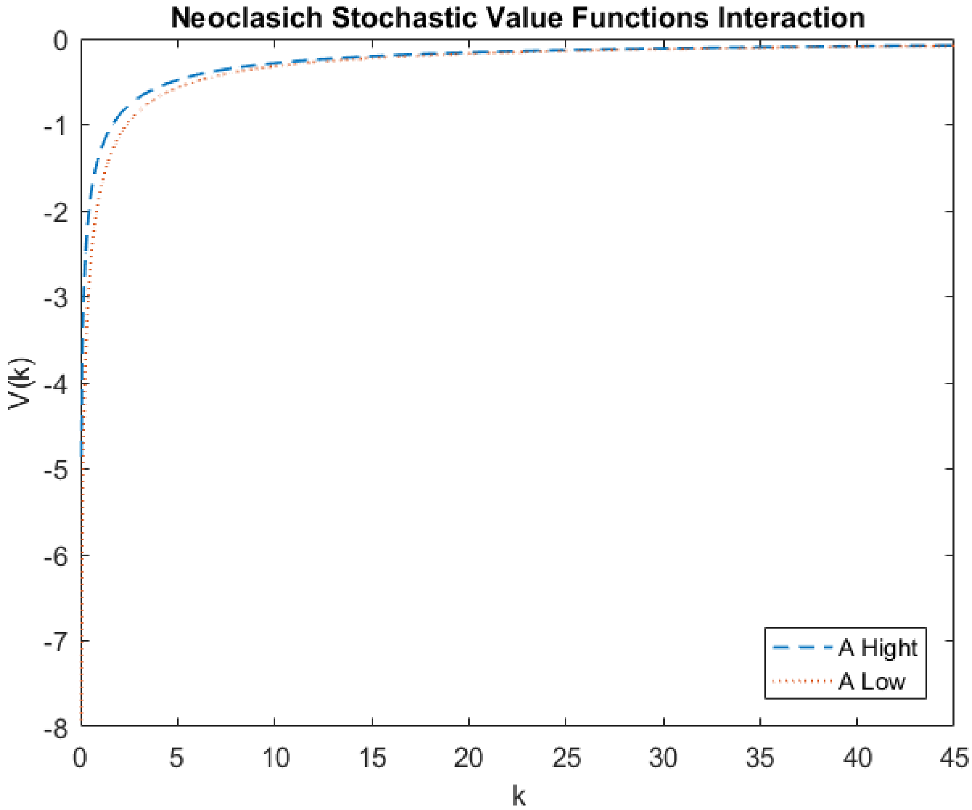
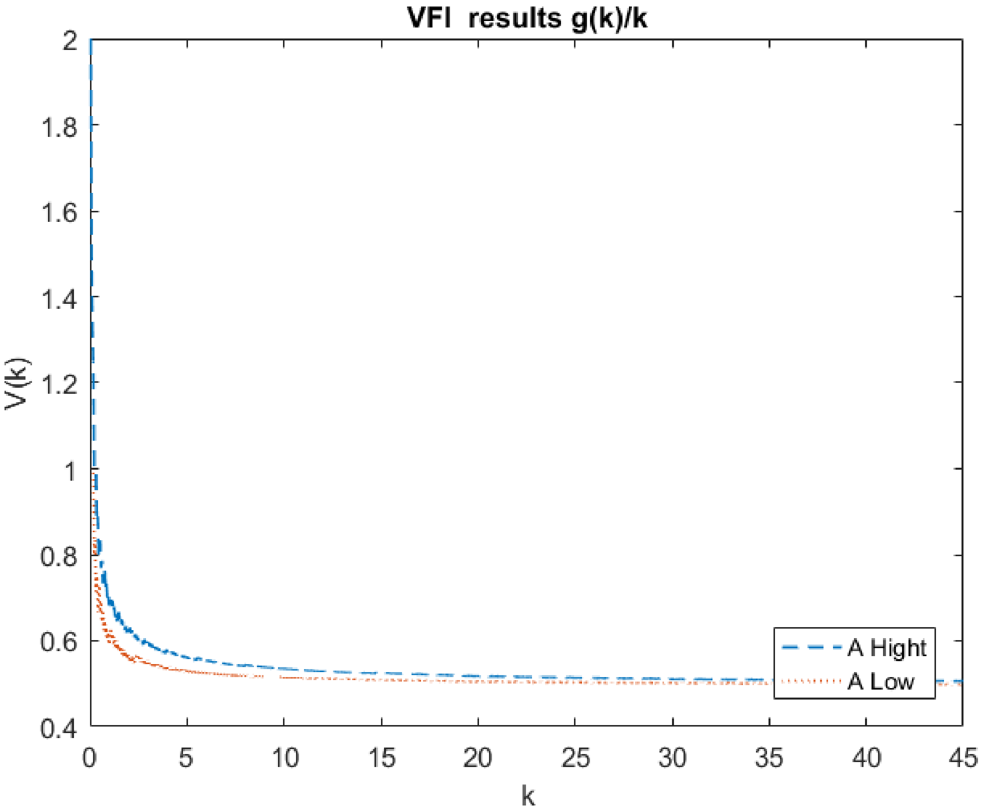


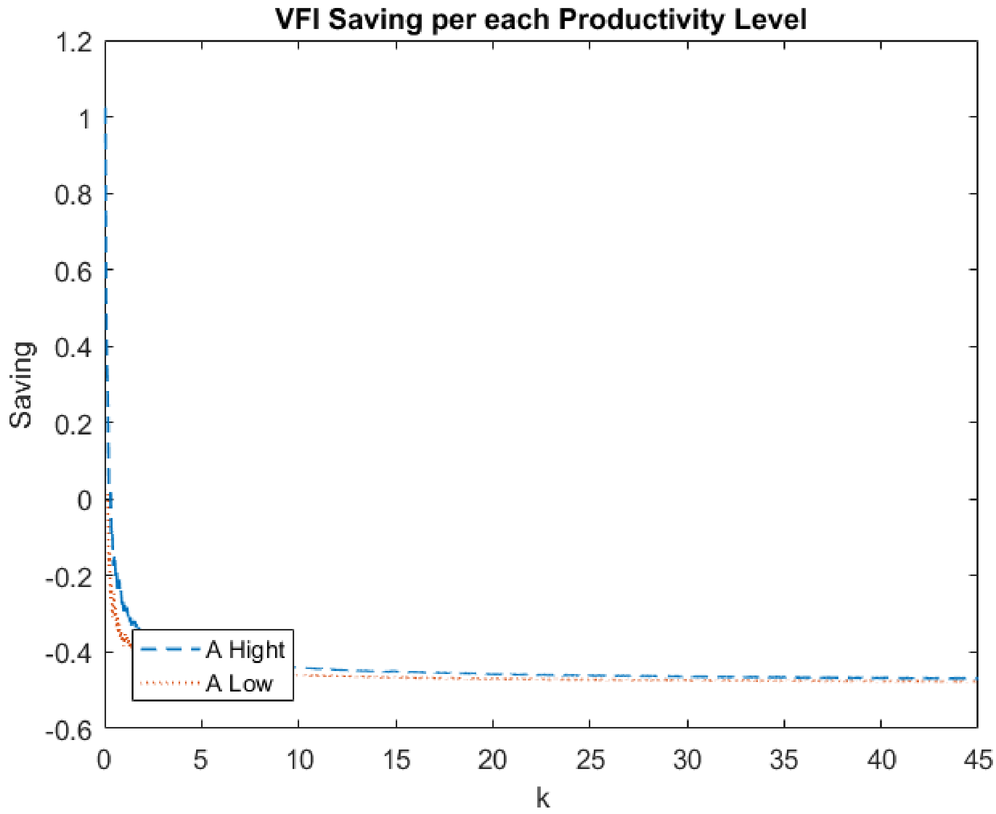
As we can see, both are increasing and concave functions.

3. The Policy function over k looks as follows:



This relationship is decreasing in k but increasing in A.

Assuming that by saving, it means what is left from production after consumption: $s = Ak^{\alpha} - c$, the Saving over k looks as follows:



where this relationship is decreasing in k and in A. This make sense because

4. Need to choose A, such that $std(y) = std(Ak^{\alpha}) = 1.8\%$. We also know that $\frac{rk}{y} = 0.35$, then $k = \frac{0.35y}{r}$

5. See Code **VFIP5**. Using two loops over all K is quite slow and does spend a long time to find a solution.

   The time on the previous program is