

Economics 512 – Homework 6

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Question 1. Given a stock of unharvested wood k and price p at time t , the firm's dynamic problem can be summarized as:

$$\begin{aligned} \max_{x \in [0, k]} \quad & p_t x - 0.2x^{1.5} + \delta E[V(p_{t+1}, k_{t+1}) | p_t] \\ \text{subject to} \quad & k_{t+1} = k - x \end{aligned}$$

where x is the harvested stock at period t and $V(p, k)$ is the value function. By Bellman principle of optimality and by letting k' to be the stock available at period $t+1$, the firm's problem would be summarized as:

$$V(p, k) = \max_{k' \in [0, k]} \pi(k', p) + \delta E[V(p', k') | p] \quad (1)$$

The state variables are the current stock and current price. Stock transition is deterministic while price follow an AR(1) process $p_{t+1} = p_0 + \rho p_t + u_{t+1}$. The policy variable is consumption x (or next period stock $k' = k - x$).

Question 2. See attached code. The 21 grids points span the $[0.65; 1.35]$ price space. The stock (current and remaining) is assumed to take only integers value from 0 to 100.

Question 3-5. See attached code and figure 1 through 4.

Question 6. Changing the grid representation in the price space. See code and Figure 5 and 6.

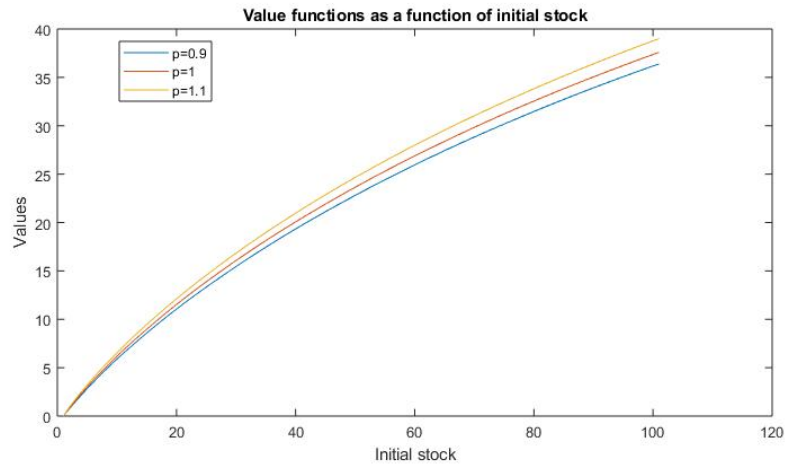


Figure 1: Question 3

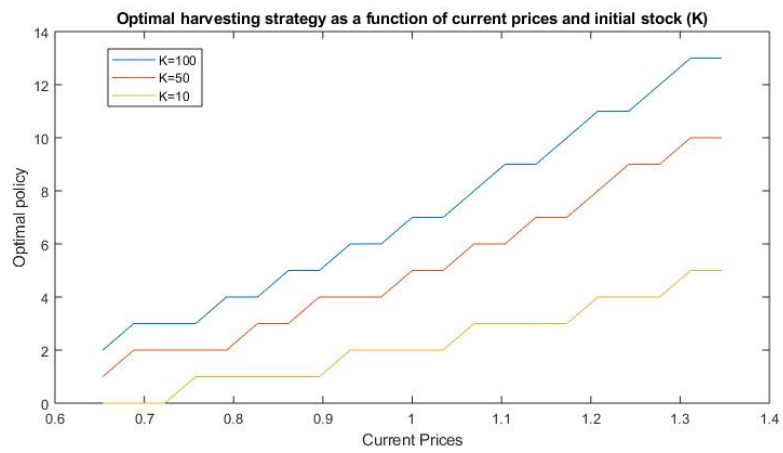


Figure 2: Question 4

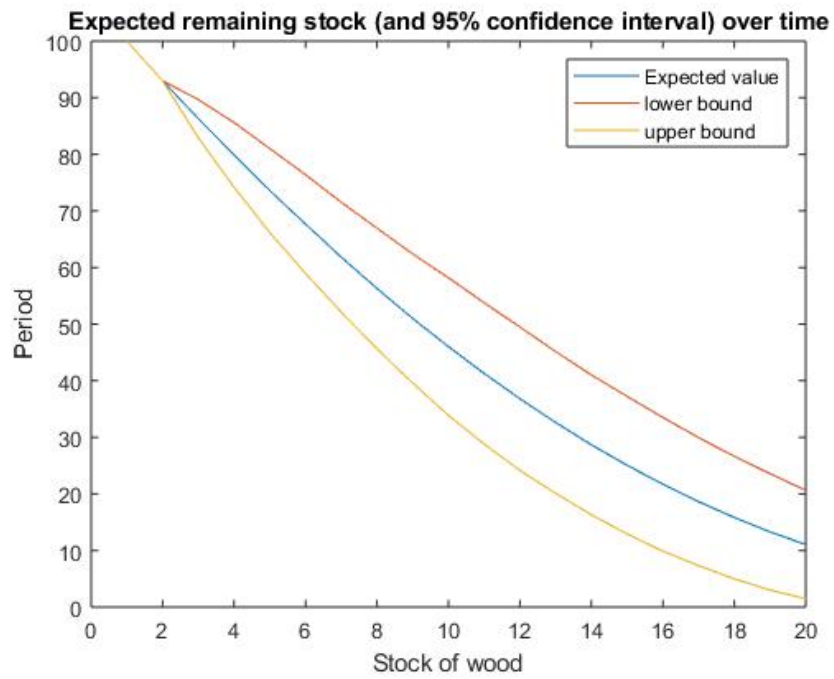


Figure 3: Question 5a

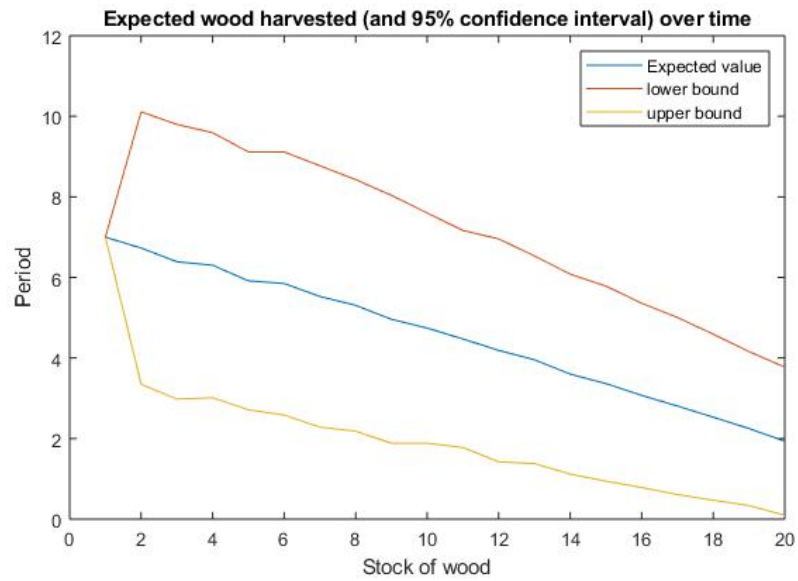


Figure 4: Question 5b

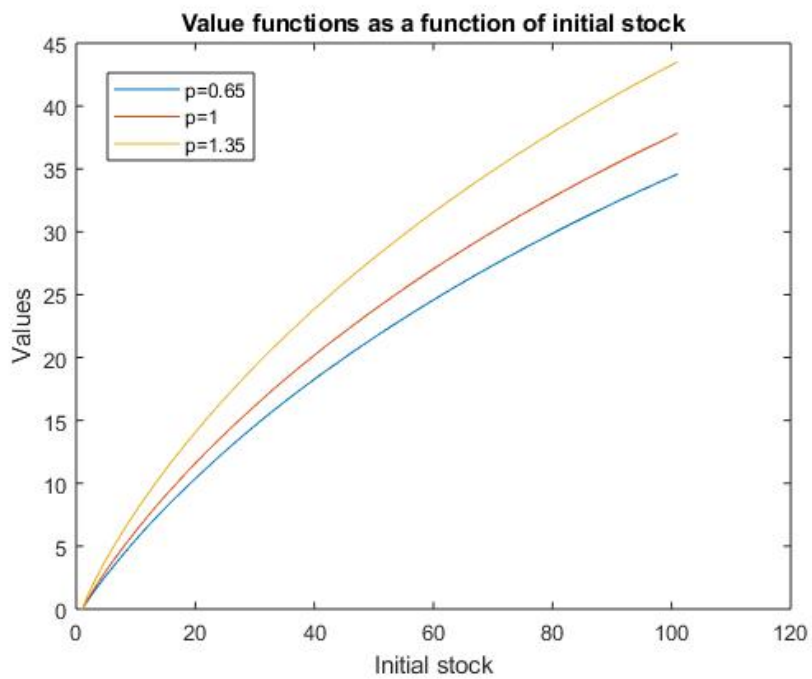


Figure 5: Question 6a

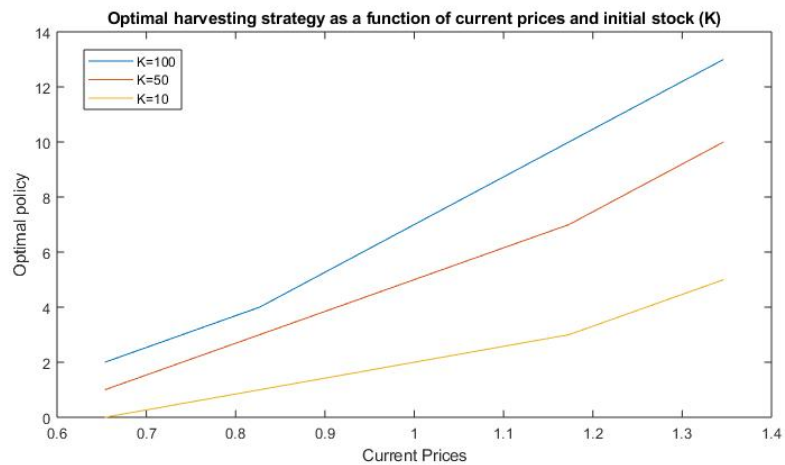


Figure 6: Question 6b