Problem Set 1

1 Analytical Questions

1. Ljungqvist and Sargent question 6.1
2. Ljungqvist and Sargent question 6.2
3. Ljungqvist and Sargent question 6.9

2 Numerical Question

2.1 McCall Search Model

Consider the job search model described in lecture and in section 6.3 of Ljungqvist and Sargent. Recall that workers live forever, when unemployed the worker draws a wage each period from the distribution $F(w)$, once a wage is accepted the jobs last forever, the worker receives unemployment benefit c when not employed, and has discount factor β. The value function for this problem satisfies the Bellman equation

$$V(w) = \max \left\{ \underbrace{\frac{w}{1-\beta}}_{\text{accept wage } w}, \underbrace{c + \beta E[V(w')]}_{\text{reject wage } w} \right\}.$$

1. For the following parameters: $\beta = 0.9$, $c = 2$, and the wage distribution described by

w_i	1	2	3	...	99	100
Prob $W = w_i$	0.01	0.01	0.01	...	0.01	0.01

, write a Matlab program to solve the Bellman equation by value function iteration. Hint. You might proceed as follows:

   - Create the following four {100 by 1} vectors: $\{V0, V1, w, p\}$. Create the scalars $beta$=0.90 and c=2.
     - Start with all the elements of $V0$ and $V1$ equal to zero. w should contain the wages 1...100 and p should contain the probabilities of drawing the wages (all 0.01 for now).
       * i) Define $V0 = V1$.

* ii) Calculate

$$V1 = \max\left(\frac{w}{1-beta}, c + beta * [p' * V0]\right).$$

Note that $E[V0] = \sum_{i=1}^{100} p_i V0_i = p' * V0$. $V1$ will be a $\{100 \text{ by } 1\}$ vector where each element i contains $\max\left\{\frac{w_i}{1-beta}, c + beta * [p' * V0]\right\}$.

* iii) Calculate $||V1 - V0||$. If $||V1 - V0|| < 10^{-5}$ stop. Otherwise go back to i) and repeat. (you can use Matlab's `norm` command to calculate $||V1 - V0||$).

2. What does the reservation wage equal?

3. Repeat 1) and 2) for a wage offer distribution with a "thin right tail". Specifically, assume that for $w_i = \{1, 2, 3, \ldots, 100\}$,

$$\Pr(W = w_i) = \frac{w_i^{-1}}{\sum_{j=1}^{100} w_j^{-1}}.$$

4. How does the reservation wage differ? What about the Value Functions? Why?

5. What happens when you increase/decrease the model parameters, c and β? In particular what happens as $\beta \to 0$ and $\beta \to 1$?