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Hand-in problem set 1

In this task we were trying to determine the present value of the decision made by an unemployed person to accept or decline a job offer in McCall search model in discrete time. A person is offered a job (all jobs are identical except for the wage) every period with a wage randomly (according to the distribution) drawn from the wage sample. They asses if the infinite sum of discounted wages is higher than the unemployment benefit they get this period if they remain unemployed plus discounted value of the same decision tomorrow. Since the equation has fractal-like structure we can not really solve it analytically the way we usually do. However, we can come up with some initial value of the decision, put it into both parts of the equation and check how close we are, then change our guess in the direction of the difference we observe and try again until we get fairly close. This is exactly done by my code which is attached.

$$v(w) = \max\left\{\frac{w}{1-\beta}, b + \beta\sum_{i=1}^{n} v(w_i)p_i\right\}$$

The initial parameter values:

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b=unemployment benefit=10;
bet=β=0.9;
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We also create a tolerance level which determines exactly how close to true value of
v(w) we want to get (to get rid of too many iterations for unnecessary precision).
conv_tol=0.1;
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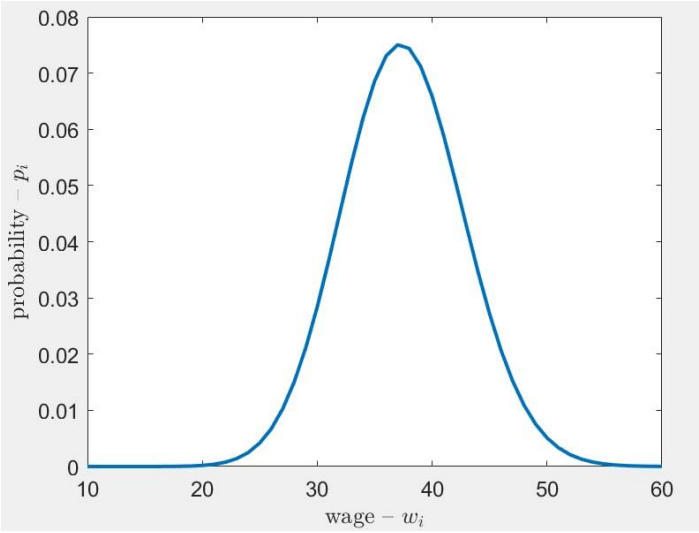
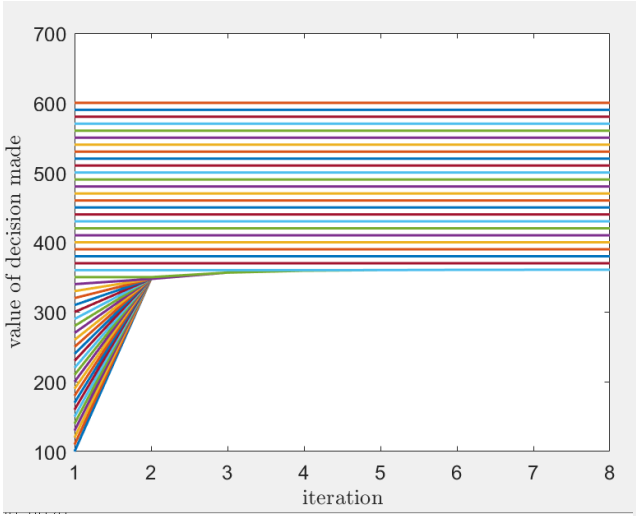
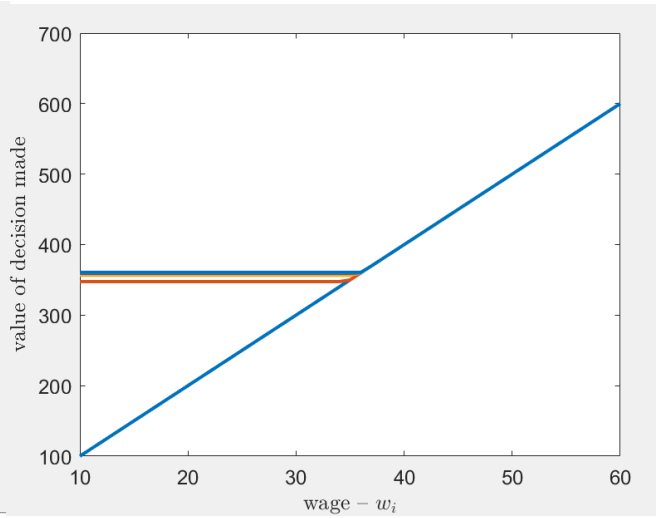
We also create a distribution of wages. Wage can be any integer from 10 to 60 and the probability distribution of it is binomial(0.25;150).



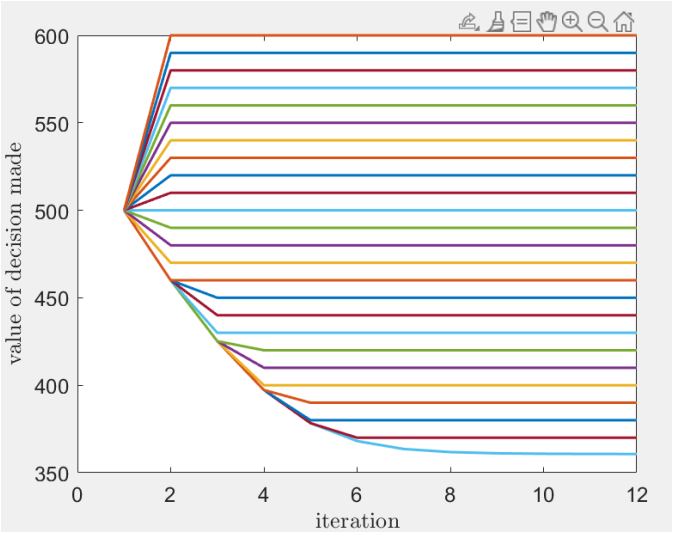
a-b. The initial guess for *v* in this case is equal to accepting the offer, no matter the wage, which means *v=w/(1- в).* In this case we get the result in 7 iterations: the reservation wage is equal to 36.06423. We can see on the graph below that for values high enough (corresponding to values of wage higher than the reservation wage) no change occurs at all. That is since for those values the agent does indeed make the decision to accept the offer so the initial guess is correct. For the rest the initial guess is too low, rejecting the offer would actually let them benefit more and they would choose to do so, which is why the value of the made decision grows from value of accepting until it gradually reaches value of declining.

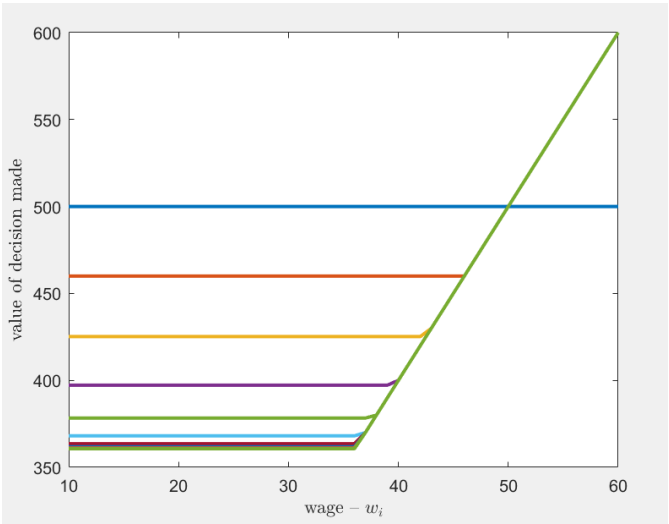
The graph on the right in my opinion reflects the process a bit more clearly: the value of decision made depending on the wage and we can see the iterations, the blue line shows the initial decision value guess.





c. Now the initial guess is independent of w, I chose 500. The resulting reservation wage is equal to 36.0696. Number of iteration is 11. We can see on the graph that that is an overestimation for the most part of the vector. We can see matlab tries to establish a lower level each iteration until it gets to the correct one. The green line here (on the right graph) is the final guess and blue- the first.





d. They do not converge to the same vector, the reservation wage (and thus the v vector) are different, but only a tiny bit, the reservation wage in c is higher by 0.005. The v vector converges quicker in b. If we change the tolerance level to 0.00001 they converge to almost the same vectors. With the initial guess in b the vector converges in 16 iterations now and c -in 20.

e. From the heat map below we can see that higher b and betas lead to higher reservation wages, which makes sense: if person is paid higher unemployment benefits they are less willing to get a job as well as if

they value their present more than their future (even more). (The initial guess here is that all offers are accepted).