

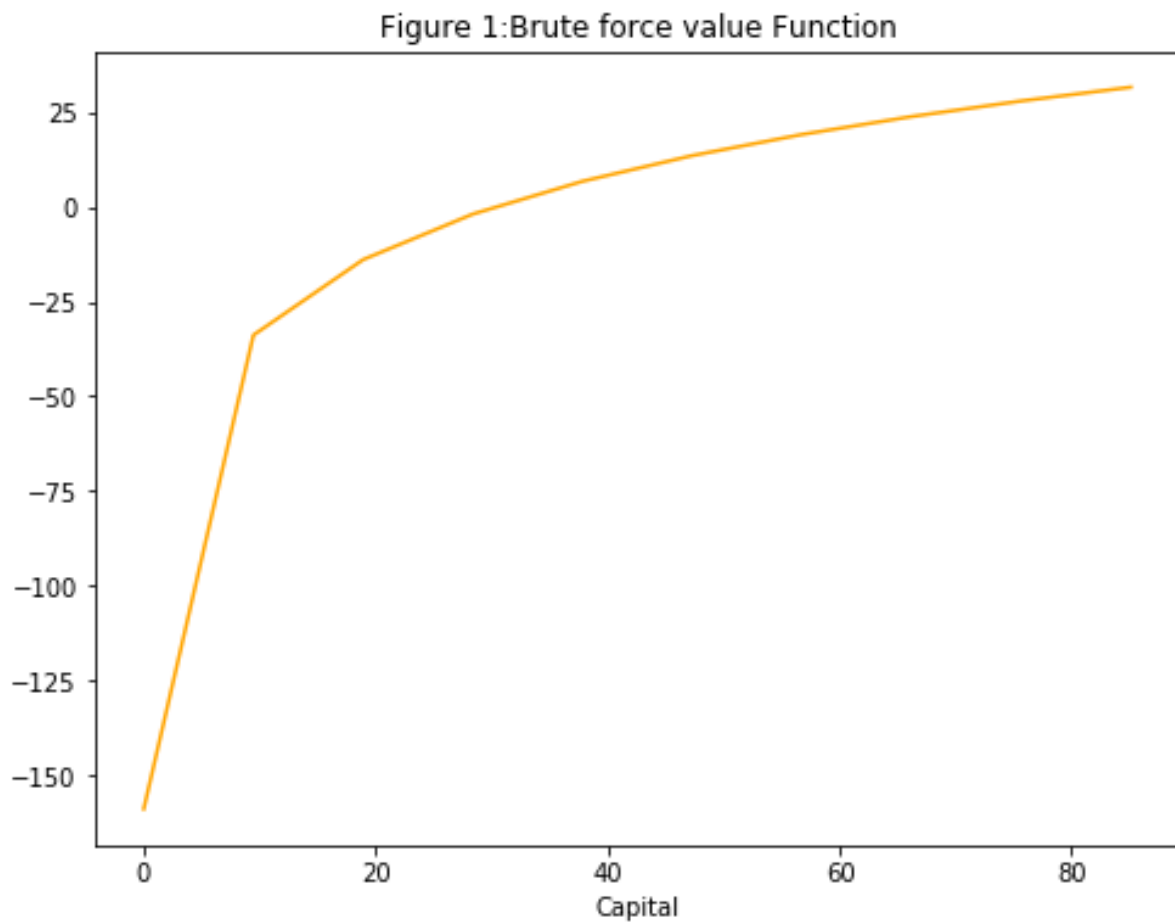
Macroeconomics Homework 4

Name: Giada Bozzelli, Abhinav Khemka, Richard Sparkes

Question 1.1

All the value functions were evaluated with an initial $v=0$.

Brute force Value function graph:



Part	Value function conditions	Time	Time Improvements
a	Brute force	0.0184	
b	Monotonicity	0.0124	Including monotonicity reduces slightly the time of iteration.
c	Concavity	0.0097	Including concavity the time of iterations shows a strong improvement.
d	Local Search	0.0107	Local search also shows an improvement from both brute force and monotonicity.
e	Monotonicity and Concavity	0.0109	Similar to local search in terms of number of iterations and time.

Part	Value function conditions	Iterations
a	Brute force	9
b	Monotonicity	226
c	Concavity	398
d	Local Search	400
e	Monotonicity and Concavity	400

We have tried different grid sizes and reducing the size greatly reduces the number of iterations. Monotonicity reduced the number of iterations compared with local search and method e. However, brute force shows a really low number of iterations.

Question 1.2

Brute force Value function with labor supply graph:



Part	Value function condtions	Time	Time Improvements
a	Brute force	0.0370	
b	Monotonicity	0.0494	Including monotonicity increases the time of iteration.
c	Concavity	0.0292	Including concavity time is better than brute force; the value iteration has a strong improvement.
d	Local Search	0.0211	Local search also shows a massive improvement from both brute force and monotonicity. Compared to concavity there is only a slight improvement.
e	Monotonicity and Concavity	0.4262	Including monotonicity and concavity increase the time compared than all other conditions. Number of iterations are really high.

When compared to Ex 1.1, for all conditions the value function with labor supply takes longer. This is mainly due to the fact that now there is an extra parameter to be evaluated. We can also see a similar trend for most conditions except when both monotonicity and concavity is included in comparison to the first value function.

Part	Value function condtions	Iterations
a	Brute force	399
b	Monotonicity	379
c	Concavity	390
d	Local Search	195
e	Monotonicity and Concavity	23065

Local search is the only conditions which reduces the number of iterations drastically.