Instituto Tecnológico Autónomo de México

Prof. Carlos Urrutia

Dynamic Macroeconomics 1: Lab. 1

Luis Gerardo Martínez Valdés

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Contents

1. Question 1

1.1 (i)

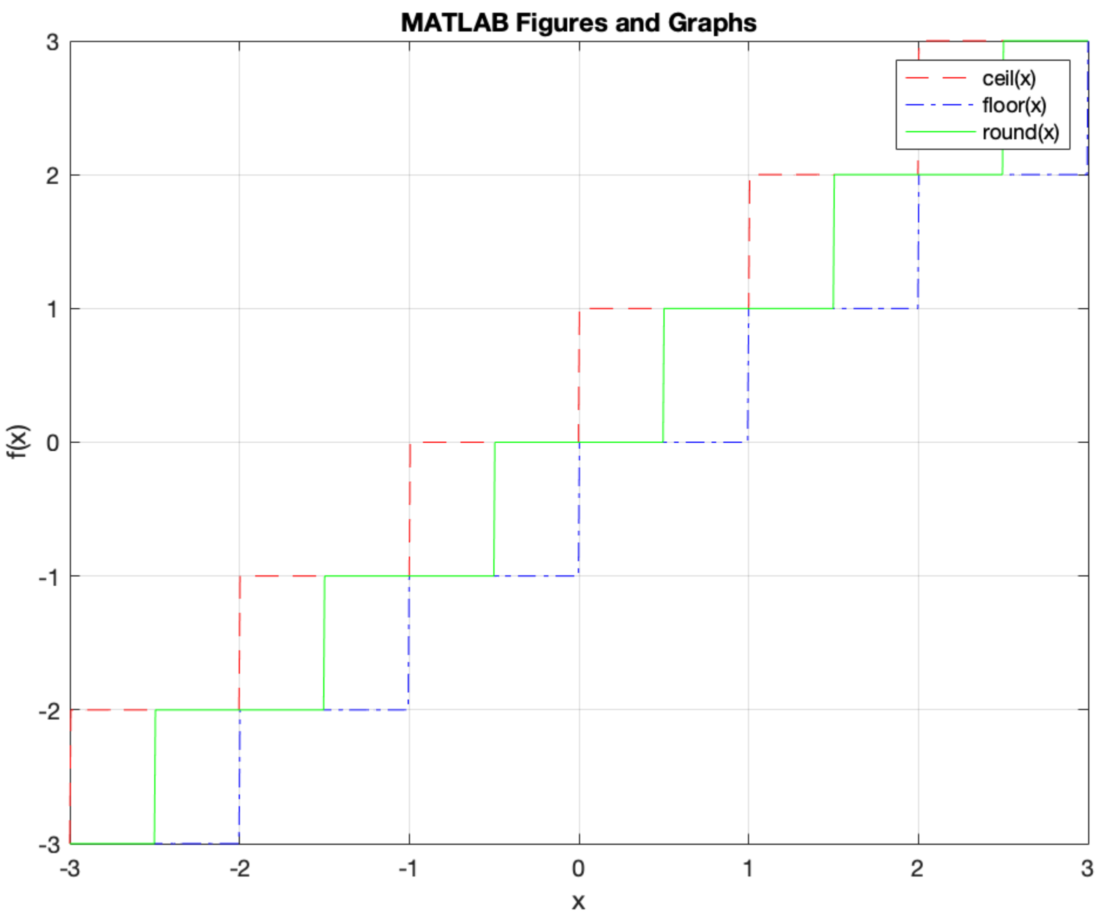

Figure 1.1: `MATLAB` Functions 1

1.2 (ii)

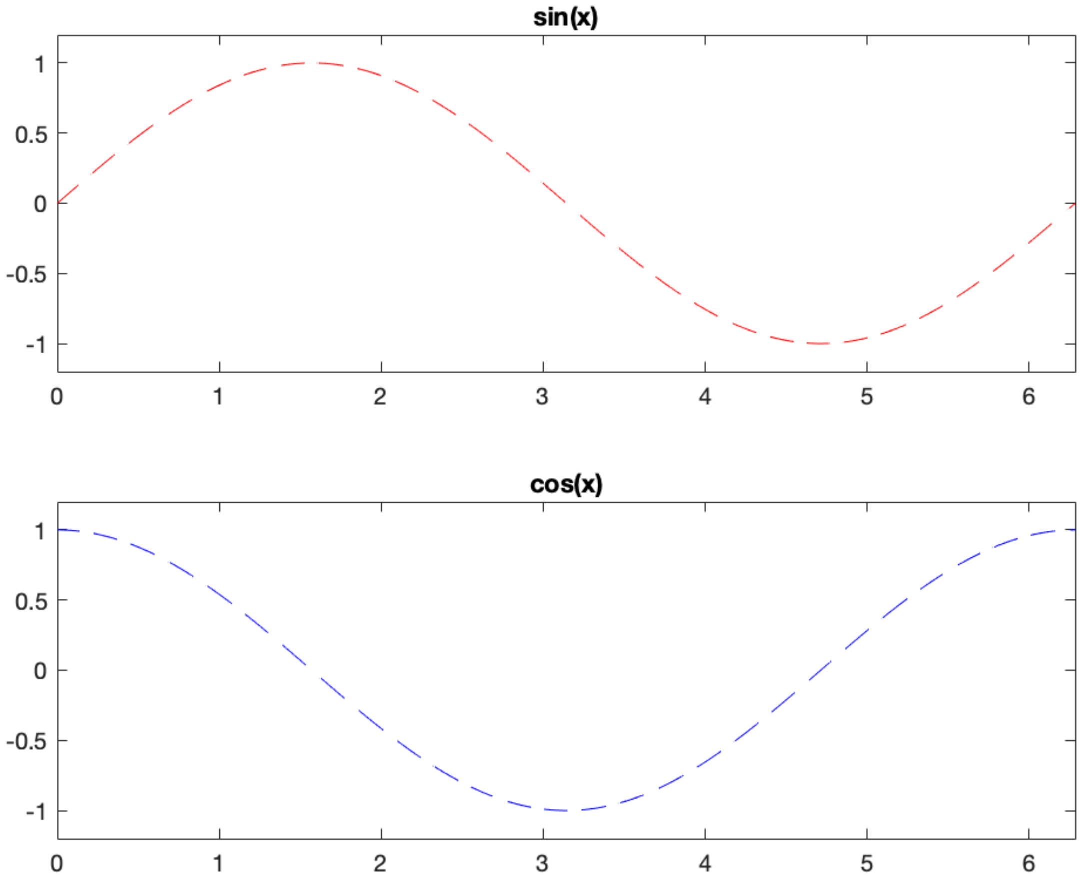

Figure 1.2: `MATLAB` Functions 2

2. Question 2

2.1 (i)

Solving equation $\frac{(5x-4)}{(x-1)} = 0$ using **fsolve** with initial guesses $x_0 \in \{0.75, 0.87, 1.02\}$.

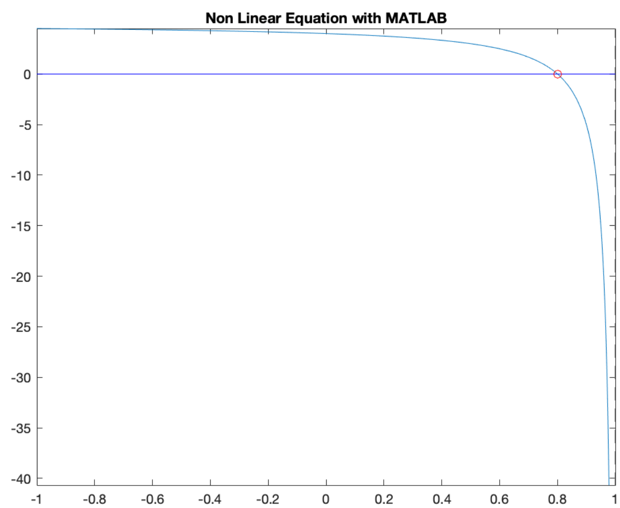

Figure 2.1: Non-Linear Equations with `MATLAB`

Listing 2.1: Question 2

```
% First 2 Guesses
ans =

    0.7500    0.8000
    0.8700    0.8000

% 3rd Guess
ans =

   1.0e+03 *

    0.0010    2.1990
```

2.2 (ii)

So, what's happening with initial guess x_0?

A simple explanation is: Initial guess is too far off the real solution. This is because of the solving method we are using.

Numerically, if the initial guess is far from the real solution (or numerical for that matter) it will get trapped in a vicinity of that guess.

Why? **fsolve** is a local method, no matter if we adjust the tolerance, this method cannot escape the "locality" of our initial guess. Therefore it will always diverge.

3. Question 3

3.1 (i)

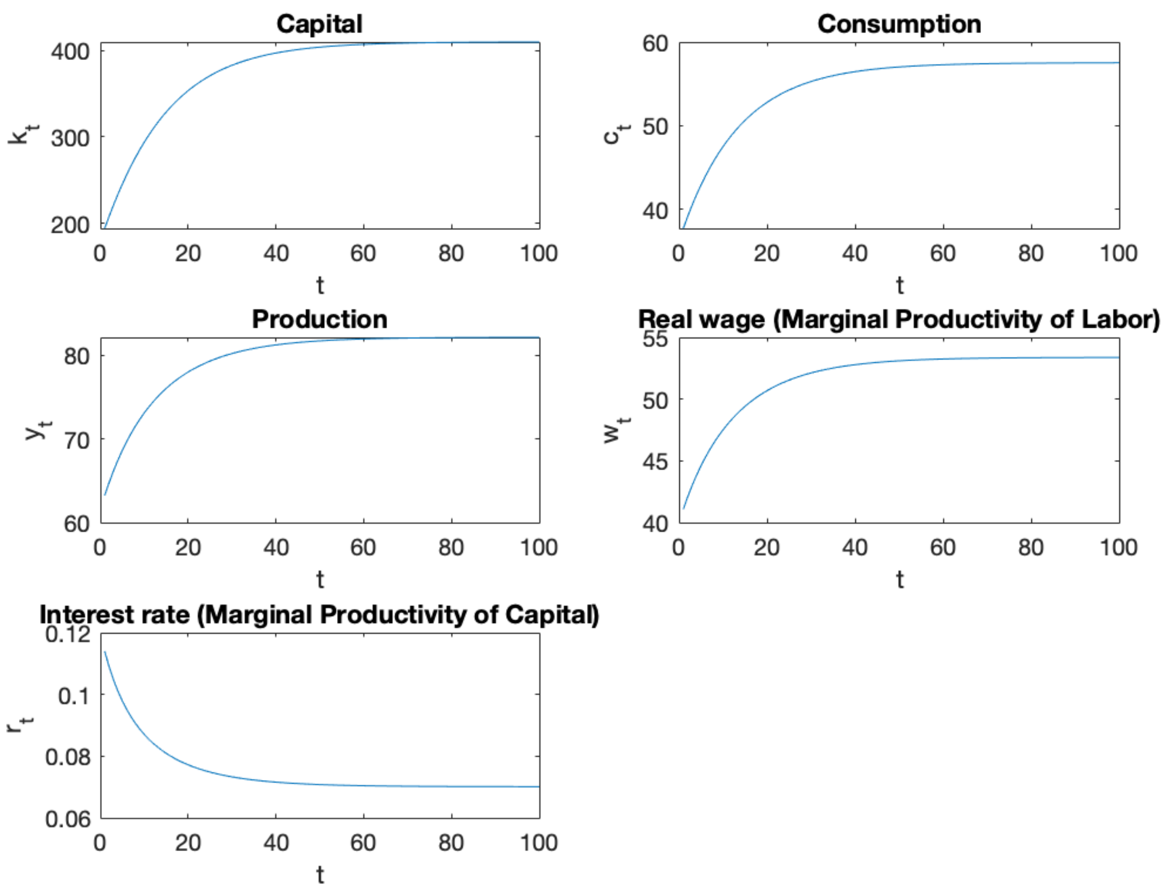

Figure 3.1: Sequential Neoclassical Growth Model with `MATLAB`

3.2 (ii)

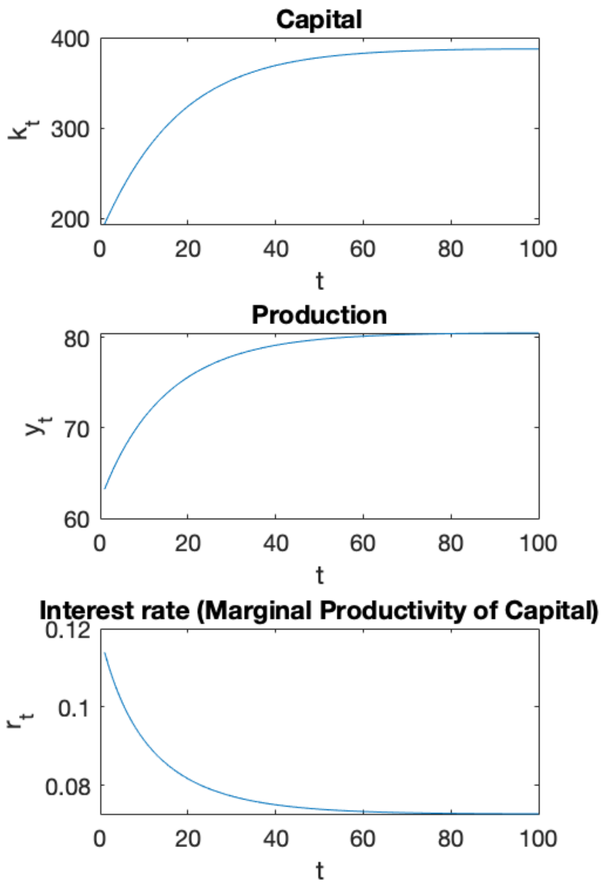

Figure 3.2: Sequential Neoclassical Growth Model with Income Tx=0.2 in `MATLAB`

- Consumption converges to a lower steady state than before. We are taking money out of our individuals' hands, this is obvious, as c_t depends negatively to τ.
- Capital converges slower to the new steady state. Naturally, we know that capital depends negatively to τ.
- It is not clear that production is significantly affected by tax distorsion. We would that the growth path flattened as production is negatively correlated with τ
- Apparently real wages converge slower to the new (lower) steady state. Negative shock on real wages.
- Interest rates (or Marginal Productivity of Capital) will converge faster to a lower steady state as they decrease more rapidly with the tax imposition.

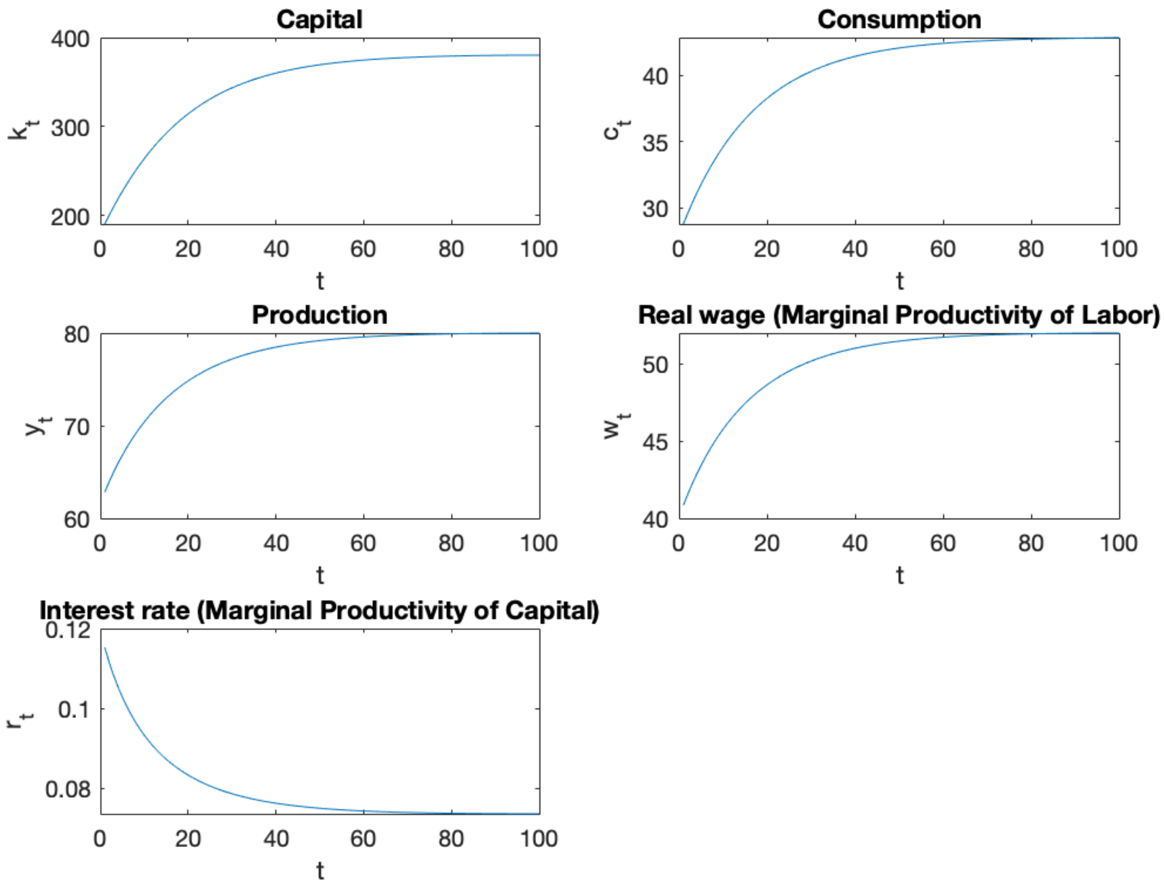

Figure 3.3: Sequential Neoclassical Growth Model with Income Tx=0.25 in `MATLAB`

3.3 (iii)

- Consumption converges to an even lower steady state than in (ii). Individuals' consumption is greatly affected by a 25% increase in the income tax.
- Capital converges even slower to the new steady state.
- We can see that the production growth path flattens even more with this increase.
- Now, a decrease in real wages is clearer. The fraction of income recieved in wages is heavily affected by the tax increase.
- Interestingly, interest rates (or Marginal Productivity of Capital) stays practically the same.

4. Question 4

4.1 (i)

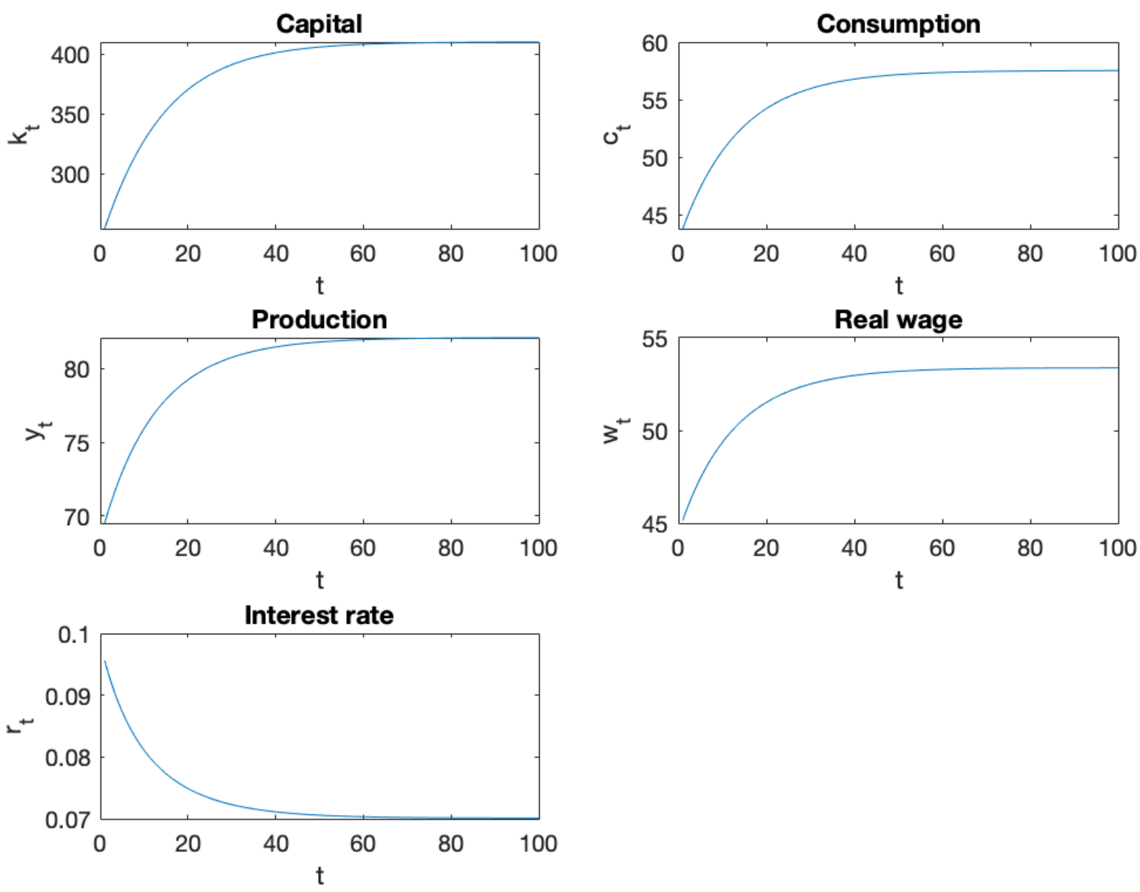

Figure 4.1: Recursive Neoclassical Growth Model in `MATLAB`

Sames results as in **3.1** section. Please see **Appendix (5)** for code on this particular question.

4.2 (ii)

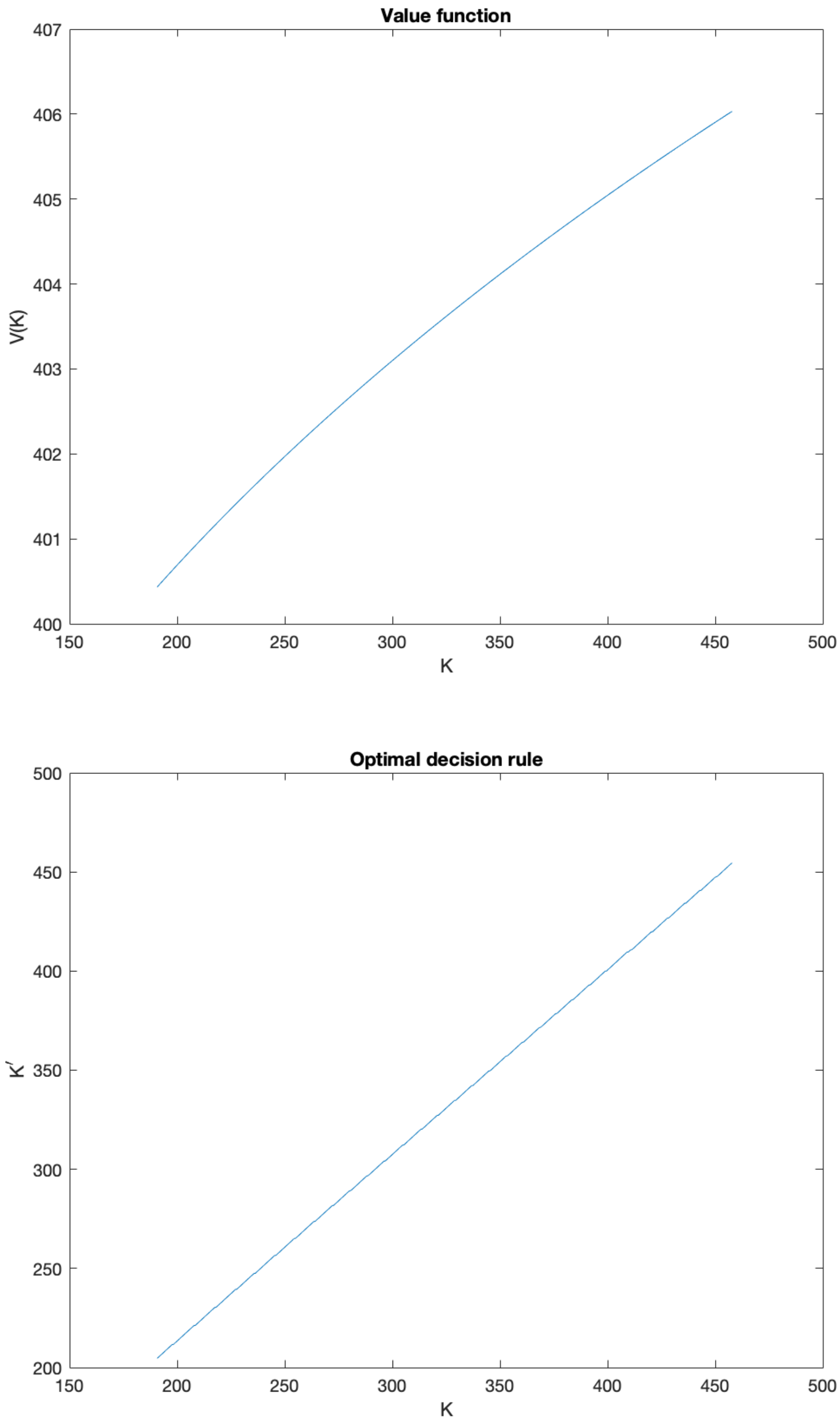

Figure 4.2: Recursive Neoclassical Growth Model in `MATLAB`

5. Códigos en MATLAB

Listing 5.1: Recursive Neoclassical growth Model Question 4 Part 1

```
delta = 0.06;  % depreciation rate
beta  = 0.99;  % discount factor
alpha = 0.35;  % capital elasticity of output

nbk = 20;      % # of points in K grid
nbk = 1000;    % # of points in C grid
crit =1;
epsi = 1e-6;

ks = ((1-beta*(1-delta))/(alpha*beta))^(1/(alpha-1));

dev = 0.9;
kmin = (1-dev)*ks;
kmax = (1+dev)*ks;
kgrid = linspace(kmin,kmax,nbk);
cmin = 0.01;
cmax = kmax^alpha;
c = linspace(cmin,cmax,nbc);
v = zeros(nbk,1);
dr = zeros(nbk,1);
util = log(c);

end
crit = max(abs(tv-v)); % Compute convergence criterion
v = tv;                % Update the value function
end

%
% Final solution
%
kp = kgrid(dr);
c = kgrid.^alpha+(1-delta)*kgrid-kp;
y = A .* kp .^ alpha;
w = (1 - alpha) .* y;
r = (alpha ./ kp) .* y;
util= log(c);
```

```
v = util/(1-beta);
```