

# How to Reduce Unemployment Without Creating Poverty

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[www.macro.economics.uni-mainz.de](http://www.macro.economics.uni-mainz.de)

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## Problem Set 2

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Pissarides: Unemployment, Vacancies, and Real Wages (1985)

### Question 1

Given an exogenous separation probability  $s$ , formulate how unemployment changes over time in response to the flows in and out of jobs. In doing so,

a) explain in words the following first-order differential equation:

$$\dot{u} = (1 - u)s - a(x)p(\theta)u, \quad (1)$$

where a dot denotes a time derivative;

b) assuming that  $a$  and  $p$  are constants,

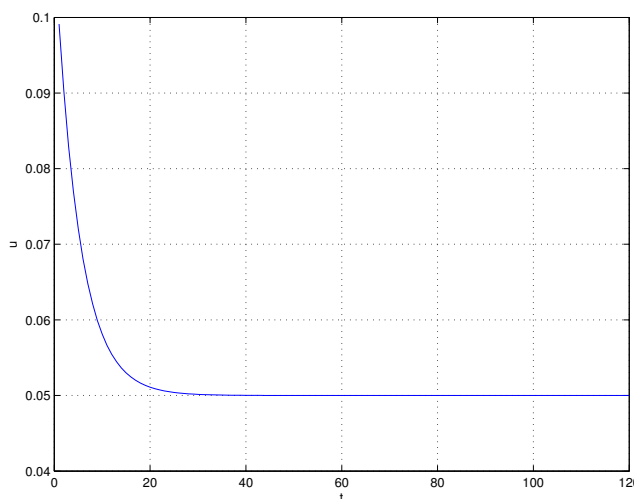
- check that

$$u = \frac{s}{s + ap} + \left( \bar{u} - \frac{s}{s + ap} \right) e^{-(s+ap)t} \quad (2)$$

is the solution of equation (1);

- show the existence and uniqueness of the steady state solution of (1) based on a phase diagram.

c) Given the solution (2) and values  $s = 0.01$  and  $ap = 0.19$ , compute how long it takes to reduce the unemployment rate from 11% (Germany 2005) to 5% (Germany 2014).



## Question 2

a) Explain in words the Bellman equations of a firm:

$$rV - \dot{V} = -k + aq(J^e - V), \quad (3)$$

$$rJ(y) - \dot{J}(y) = y - w(y) + s(V - J(y)), \quad (4)$$

where  $V$  is the asset value of a vacancy,  $J^e$  is the expected asset value of a filled job,  $J(y)$  is the asset value of production,  $k$  is a cost per unit of time of having an open vacancy,  $r$  is the fixed interest rate and  $w(y)$  is the wage rate.

b) Given that the equilibrium value  $V = 0$ , find

$$J^e = \frac{k}{a(x)q(\theta)}. \quad (5)$$