

Economic Growth Theory:

Problem set 8:

Paulo Brito

Universidade de Lisboa

Email: pbrito@iseg.ulisboa.pt

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Growth and government debt

1. Consider a growth model with a government that finances expenditures with debt. Let the consumer problem be

$$\max_C \int_0^{\infty} \ln(C(t))e^{-\rho t} dt, \rho > 0$$

subject to $\dot{K} + \dot{B} = Y + rB - C - T$ given $B(0), K(0)$ and a non-Ponzi game condition. The production function be $Y = K^\alpha G^{1-\alpha}$ with $0 < \alpha < 1$. (Hint: G and T are taken by the consumer as externalities). Notation: consumption, C , physical capital stock K , government debt B and r is the interest rate. The government budget constraint is $\dot{B} = G - T + rB$. There are two policy instruments: taxes are defined as $T = \tau Y$ and there is a rule of keeping the debt ratio constant as $B/Y = \bar{b} > 0$.

- (a) Write the DGE in (z, g) where $z = C/K$ and $g = G/Y$ and provide an intuition why this represents the detrended DGE dynamic system.
- (b) Find the long-run growth rate.
- (c) Study the growth facts associated to the model.

2. Consider a growth model with a government that finances expenditures with debt. Let the consumer problem be

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subject to $\dot{K} + \dot{B} = Y + rB - C - T$ given $B(0), K(0)$ and a non-Ponzi game condition. The production function be $Y = K^\alpha G^{1-\alpha}$ with $0 < \alpha < 1$. (Hint: G and T are taken by the consumer as externalities). Notation: consumption, C , physical capital stock K , government debt B and r is the interest rate. The government budget constraint is $\dot{B} = G - T + rB$. There are two policy instruments: taxes are defined as $T = \tau Y$ and there is a rule of keeping the government deficit constant relative to the GDP $\dot{B}/Y = \beta > 0$.

- (a) Write the DGE in (z, g) where $z = C/K$ and $g = G/Y$ and provide an intuition why this represents the detrended DGE dynamic system. Prove that it is

$$\begin{aligned} \dot{g} &= ((1-g)A(g) - z)(\beta + \tau - g) \\ \dot{z} &= (z - z(g))z \end{aligned}$$

where $A(g) = g^{\frac{1-\alpha}{\alpha}}$ and

$$z(g) \equiv ((1-g) - \alpha(1-\tau))A(g) + \rho$$

- (b) Find the steady state and draw the phase diagram.
 (c) Study the growth facts associated to the model.