

Problem Set 2  
Answers

**Question 1**

- a) True. The four tigers are East Asian economies (Singapore, Taiwan, Hong Kong, South Korea) that have been growing rapidly.
- b) False. Investment in education (human capital), public infrastructure (transportation, communication etc.), and technological progress are also very important for growth.
- c) False. Population growth may be so rapid that investment may not be large enough to even sustain current standards of living. Also, if investment is smaller than depreciation then the capital stock in the economy will decline.
- d) False. Growth is mostly a phenomenon of the last 200 years. See pp. 194-196 in the book.
- e) False. Saving is essential in order to provide resources for investment which increases the stock of capital and thus drives growth.
- f) True. A regression tells us whether the two variables are correlated, but this is not a proof of causality.
- g) False. It will always be the case that some actual values are above the regression line (larger than the fitted values) and some are below it (smaller than the fitted values). The regression tries to best fit the line in the "middle" of the cloud of actual observations.

**Question 2 (Macro Model)**

Define:  $Y$  =GDP,  $W$  =wage,  $D$  =dividends,  $Y_D$ =disposable income,  $T$  =taxes,  $C$  =consumption,  $I$  =investment,  $M$  =imports,  $X$  =exports,  $G$  =government purchases.

a) Exogenous:  $G$ ,  $X$ ,  $r$ .

Endogenous and behavioral equations:

$$Y = W + D$$

$$Y_D = Y - T$$

$$T = 0.25(W + D)$$

$$C = 0.8Y_D$$

$$I = 0.1Y - 100r$$

$$W = 0.8Y, D = 0.2Y, M = 1/3 * C$$

A note on grading: citing only the "combined" form for  $C$ ,  $I$ ,  $T$  and  $M$  is also acceptable.

**b)**  $C = 0.8Y_D = 0.8(Y - T) = 0.8(Y - 0.25Y) = 0.6Y$ . Consumption is 60% of GDP.

**c)** Equilibrium condition:  $Y = C + G + I + X - M$ .

$Y = 0.6Y + 500 + 0.1Y + 1000 - 0.2Y \Rightarrow Y = 3000, C = 1800$ .

$T = 0.25Y = 750 \Rightarrow T - G = 750 - 500 = 250$ . Budget surplus of \$250.

**d)**  $Y = 0.6Y + 500 + 0.1Y + 1100 - 0.2Y \Rightarrow Y = 3200, \Delta Y = 200 > \Delta X = 100$ , multiplier effect.

**e)**  $\Delta G = 100$ . Need the same size of increase in the autonomous demand.

**f)**  $Y = 0.6Y + 600 + (0.1Y - 100r) + 1000 - 0.2Y$

$0.5Y = 1600 - 100r$ , but we want  $Y = 3000$  so  $0.5 * 3000 = 1600 - 100r \Rightarrow$

$r = 1$ .

The Fed needs to raise the interest rate by 1 percentage point from 0% to 1%. This lowers investment and thus aggregate demand.

### Question 3 (Econometrics)

**a)** The fitted value is  $\hat{C}_t = 5 + 0.7 * 100 = 75$ . The actual value of  $C_t$  is 125;  $residual = C_t - \hat{C}_t = 50$ . The residual for observation  $t$  is the difference between the actual value of the dependent variable and the value that is predicted by the model (the fitted value) given the value of the independent variable. The residual here is the part of consumption at time  $t$  that is not explained by the model, i.e., by income at time  $t$ .

**b)** In equation (1)  $\beta$  tells us by how much  $C$  changes if  $Y$  changes by 1 unit (the unit in which  $Y$  is measured). In equation (2)  $\beta$  indicates the relation between the *percentage change* in  $Y$  and the *percentage change* in  $C$ . If  $Y$  changes by 1 percent,  $C$  will change by  $\beta$  percent. ( $\beta$  is also called the *elasticity* of consumption with respect to income)

**c)**  $\beta_2$  is the effect of income in the previous period on current consumption. If income last year were high we might have saved some of it for this year thus allowing us to consume more today ( $C_t$ ).