

# Macro Problem Set 2 Solutions

## Q1

a. The following table presents the numbers and associated rates.

Manpower category	Number ('000s)
Labour force	2,397.8
Unemployed	111.2
Discouraged workers	11.6
Unavailable job seekers	14.5
Available potential job seekers	23.9
Time-related under-employed persons	80.8

Numbers for **labour force** and **unemployed** are obtained from Tables 1 and 2 in the *Labour Force in Singapore, 2021* report. The concepts are essentially the same as found in lecture.

Numbers for **discouraged workers** are found in Table 122. The concept is the same as found in lecture.

Numbers for **unavailable job seekers** and **available potential job seekers** are found in Sections 9.7 and 9.8 of the report. These two concepts were not found in lecture, but they are used by the International Labour Organization to identify people that are somewhat attached to the labour force. Thus, the closest lecture equivalent would be “other marginally attached.” Note that there are no obvious associated rates.

Numbers for **time-related under-employed persons** are found in Table 64. This concept is the same as “working part-time for economic reasons” in the lecture.

- b. A measure U-6(SG) that is similar to U-6 can be constructed as a ratio with numerator and denominator described below:
- The numerator is given by the sum of the unemployed, discouraged workers, unavailable job seekers, available job seekers, and time-related under-employed persons. This works out to be 242,000.
  - The denominator is given by the sum of the labour force, discouraged workers, unavailable job seekers and available job seekers. This works out to be 2,447,800.
  - Thus U-6(SG) is  $242,000 / 2,447,800 = 9.9\%$ . This is substantially higher than the non-seasonally adjusted unemployment rate of 4.6%.

## Q2

No solutions are provided. Draw conclusions from your own tutorial discussion.

## Q3

- a. Growing from a poor country to a rich country is an immensely complex process. The large number of factors involved makes it hard to generalize the experience of one country to another. Each country undergoes just one experience, and experiments cannot be conducted. There are too few observations for cross-country statistical analysis to provide definitive answers.
- b. Being open to trade is part of the 'institutional condition' of openness. 'Privatizing state-owned industries' can also be considered an 'institutional condition' under market orientation. "Don't run big fiscal deficits" is a Classical Model prescription for growth.
- c. They maintained the extensive use of private markets and private ownership. They have focused their industrial policy mainly on export manufacturing, where the discipline of international competition prevents the protection of inefficient 'national champions.' They are willing to let incompetent companies be wound up.

## Q4

- a. The filled-in version of Table 1 is provided below.

Table 1

	2007	2008	2008 growth rate
GDP in chained (2015) dollars	\$291.3 billion	\$296.8 billion	1.89%
Population	4.59 million	4.84 million	5.45%
Employment	2.63 million	2.86 million	8.74%
Average hours worked per week	46.3	46.3	0.00%
GDP per capita in chained (2015) dollars	\$63,464	\$61,322	-3.38%
Employment-Population Ratio	57.30%	59.09%	3.12%

- b. Politicians, the press, and the business community pay more attention to the growth rate of real GDP. But the growth rate of real GDP per capita (which is much worse here!) is a better indicator of progress in living standards.
- c. According to the growth equation ( $g_{\text{GDP per capita}} \approx g_{\text{Productivity}} + g_{\text{average hrs.}} + g_{\text{EPR}}$  where  $g$  denotes growth rate), the growth rate of productivity is approximately given by  $-3.38\% - 0.0\% - 3.12\% = -6.50\%$ . For an exact calculation, one must first build GDP in chained (2015) dollars per hour worked. For 2007 this is  $\$291.3 \text{ billion} / (2.63 \text{ million} \times 46.3 \text{ hours per week} \times 52 \text{ weeks}) = \$46.00/\text{hr}$ . For 2008 this is  $\$296.8 \text{ billion} / (2.86 \text{ million} \times 46.3 \times 52) = \$43.10/\text{hr}$ . The growth rate is thus  $(43.10 - 46.00)/46.00 = -6.30\%$ . The approximation is off by just 0.2 percentage points in magnitude.
- d. The growth rate of real GDP per capita is negative, because of a large fall in productivity that is only counterbalanced by a significant rise in the employment-population ratio, with average hours holding steady. Such large increases in EPR are not sustainable and not desirable.<sup>1</sup> For sustainable growth in real GDP per capita, productivity growth must be the foundation.
- e. Productivity growth via knowledge creation and innovation is essential for Singapore, as it has largely exhausted growth through increasing average hours<sup>2</sup>, increasing EPR

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<sup>1</sup> Another ten years of 3-percentage-point increases would result in an EPR of nearly 90 percent, meaning just about every person aged 15+ would have to work!

<sup>2</sup> 46.3 hours a week gives slightly more than 2,400 hours a year. Use Google to find out how this compares with other high-income countries like Germany and Japan. You might be surprised!

and capital deepening. Some policies include

- Investment tax credits can be given specifically to promote R&D activities.
- Facilities to allow fledgling entrepreneurs to obtain seed funding.
- More grants can be given to research institutes and universities for basic research.
- A calibration of intellectual property protection to balance the need for incentives against the need for knowledge dispersion.
- Financial support to re-train workers for knowledge work, both at the company level and at the individual level (e.g., [SkillsFuture](#)).

## Q5

a.

**When encountering algebraic equations in economics, always check if the coefficients have sensible signs!**

In the consumption equation:

- A positive sign for  $(Y - T)$  means that if disposable income rises, consumption rises, other things being equal. This is a sensible description that also fits casual empirical observation.
- A negative sign for  $r$  means that if the interest rate rises, consumption falls, other things being equal. This is also sensible because a rising interest rate implies that saving becomes more lucrative, so saving will rise.

In the investment equation, a negative sign for  $r$  means that, other things equal, if the interest rate rises, planned investment falls. This is a sensible description because a higher interest rate means the cost of borrowing rises, which should lead to some investment projects being cancelled.

b. Fill in the blank: ... the economy's equilibrium output and income level is \$2,000.

c.

The government is running a budget deficit, so it is on the demand side. The loanable funds demand equation includes both private and government demand, and is as follows:

$$\begin{aligned}
 \text{Quantity demanded} &= I^P + (G - T) \\
 &= 1,900 - 10,000r + (600 - 300) \\
 &= 2,200 - 10,000r
 \end{aligned}$$

d.

The Loanable funds supply equation comes from the saving function. This can be derived from the consumption function, since saving is, by definition, the remainder from income after net taxes and consumption are deducted. The loanable funds supply equation is:

$$\begin{aligned}
 \text{Quantity supplied} = S &= (Y - T) - C \\
 &= (Y - T) - (300 - 2,000r + 0.8(Y - T)) \\
 &= -300 + 2,000r + 0.2(Y - T) \\
 &= -300 + 2,000r + 0.2(2,000 - 300) \\
 &= 40 + 2,000r
 \end{aligned}$$

e.

At equilibrium, quantity demanded = quantity supplied. Using  $r^*$  to denote the equilibrium interest rate,

$$\begin{aligned}
 2,200 - 10,000r^* &= 40 + 2,000r^* \\
 r^* &= 0.18
 \end{aligned}$$

With the equilibrium interest rate found to be 0.18, the other variables can be found:

$$\begin{aligned}
 I^P &= 1,900 - 10,000(0.18) = 100(\$) \\
 S &= 40 + 2,000(0.18) = 400(\$). \\
 C &= (Y - T) - S = 2,000 - 300 - 400 = 1,300(\$)
 \end{aligned}$$

This means that the \$2,000 output of the economy is split between the three expenditure components  $C = \$1,300$ ,  $I^P = \$100$ ,  $G = \$600$ .

f.

- i. The government demand for funds is now reduced by \$300 and is eliminated, so the demand curve shifts left by \$300. The supply curve is unchanged.
- ii.

The new demand equation is

$$\text{Quantity demanded} = 1,900 - 10,000r$$

At equilibrium, quantity demanded equals quantity supplied. Using  $r^{**}$  to denote the new equilibrium interest rate:

$$1,900 - 10,000r^{**} = 40 + 2,000r^{**}$$

$$r^{**} = 0.155$$

The new equilibrium interest rate is thus 0.155, lower than the original 0.18. One should thus expect that planned investment will rise, while saving will fall.

Planned investment becomes

$$I^P = 1,900 - 10,000(0.155) = 350(\$).$$

This is an increase of \$250.

Saving and consumption become:

$$S = 40 + 2,000(0.155) = 350(\$).$$

$$C = (Y - T) - S = 2,000 - 300 - 350 = 1,350(\$)$$

Saving has decreased by \$50, while consumption has increased by \$50.

Thus, the \$300 fall in  $G$  is exactly matched by the combined \$300 rise in  $C$  and  $I^P$ . Say's Law holds.

g.

- i. **The demand curve shifts left by \$300**, just as in part f(i). However, a \$300 rise in net taxes  $T$  also reduces disposable income by \$300. Households will reduce consumption immediately by  $0.8 \times \$300 = \$240$  and reduce saving immediately by  $0.2 \times \$300 = \$60$ . **Thus, the supply curve shifts left by \$60.**
- ii. Compared to part (f), there is the addition of a leftward shift in the supply curve. Thus, one should expect that the equilibrium interest rate would fall by less, and that the level of planned investment in equilibrium will consequently be lower. The computation of the exact numbers is left as an exercise.