Suggested Solutions to EC2102 Macroeconomic Analysis I
Tutorial 9, Week 12, April 5-9, 2010

Question 1, PART A

(*i*) Let W_1 be fixed at $\overline{W}_1$. Given price level $\widehat{P}_1$, $\overline{w}_1 = \frac{\overline{W}_1}{\widehat{P}_1}$, know $\widehat{N}_1$ and $\widehat{Y}_1$. So we have one point on AS_1 curve of $\left(\widehat{Y}_1, \widehat{P}_1\right)$

To derive AS_1 curve, let price increase from $\widehat{P}_1$ to $\widetilde{P}_1$. Since W_1 is fixed at $\overline{W}_1$, real wage falls to $\widetilde{w}_1 = \frac{\overline{W}_1}{\widetilde{P}_1}$, so we move down N_1^d curve, and current employment rises to $\widetilde{N}_1$, and output rises to $\widetilde{Y}_1$. Hence we have another point on AS_1 curve of $\left(\widetilde{Y}_1, \widetilde{P}_1\right)$

Continually changing prices, we can construct the whole AS_1 curve.
(10 points)

(*ii*) Each point on AD_1 curve shows intersection of IS_1 and LM_1. To construct the AD_1 curve, we have to let price vary.

Recall that we drew LM_1 curve for a given price level $\widehat{P}_1$. Suppose that IS_1 intersects LM_1 at $\left(\widehat{Y}_1, \widehat{r}_1\right)$. We have one point on our AD_1 curve, $\left(\widehat{Y}_1, \widehat{P}_1\right)$. Now suppose that $\widehat{P}_1$ falls to $\widetilde{P}_1$. We know from above that LM_1 shifts downwards to $\widetilde{LM}_1$. IS_1 now intersects LM_1 at $\left(\widetilde{Y}_1, \widetilde{r}_1\right)$. So we now have another point on our AD_1 curve, $\left(\widetilde{Y}_1, \widetilde{P}_1\right)$.

Continually changing prices, we can construct entire AD_1 curve.

Question 2

Since the question does not say where the economy was initially at, let me assume that the

economy is as illustrated in Figure 1, where the labour market does not clear:

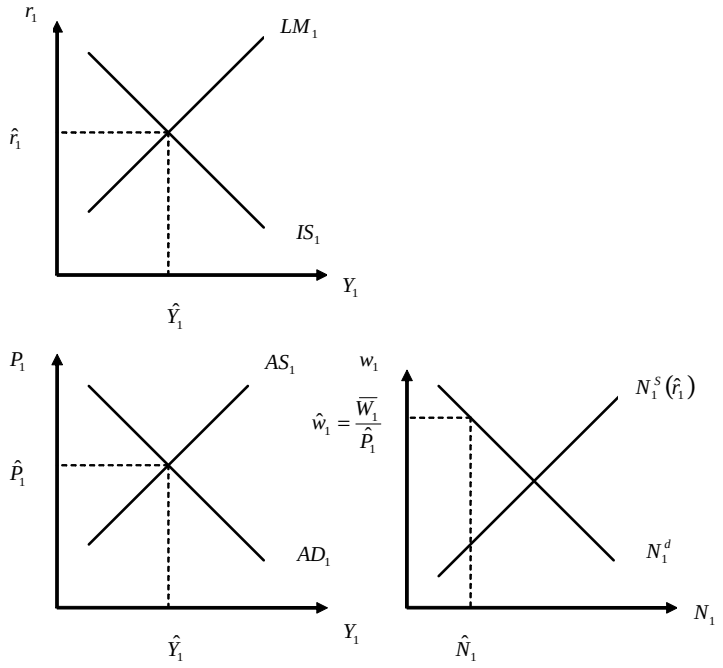


Figure 1

Let us suppose that government increases government expenditure today, by $\Delta G_1 > 0$, and let us assume that this is enough to restore equilibrium, and that all other periods' government expenditures stay the same.

$\Delta G_1 > 0 \Longrightarrow \nearrow$ in PV of govt expenditures $\Longrightarrow \nearrow$ in PV of taxes as well, because for the government's LBC to hold:

$$\underbrace{G_1 + \frac{G_2}{1+r_1} + ...}_{PV \text{ of expenditures}} = \underbrace{T_1 + \frac{T_2}{1+r_1} + ...}_{PV \text{ of taxes, } \tau}$$

Hence,

$$\Delta G_1 = \Delta \tau$$

$\Longrightarrow \Delta \omega^d = -\Delta \tau < 0$.

In the labor market, $N_1^s(\widehat{r}_1)$ curve shifts to the right to $\widehat{N}_1^s(\widehat{r}_1)$ (ω^d falls and consume less leisure which is a normal good, that is, work more).

In terms of goods demanded, there are two effects. First, the government spends more:

$$\Delta G_1 > 0$$

Second, as consumer's ω^d has decreased, Y_1^d is affected by a change in consumption:

$$\Delta C_1 = MPC \Delta \omega^d = -MPC \Delta G_1 < 0.$$

Overall change in Y_1^d, ΔY_1^d, is:

$$\begin{aligned}
\Delta Y_1^d &= \left(\frac{1}{1-MPC}\right)(\Delta G_1 + \Delta C_1) \\
&= \left(\frac{1}{1-MPC}\right)(\Delta G_1 - MPC\Delta G_1) \\
&= \left(\frac{1}{1-MPC}\right)\Delta G_1\,(1-MPC) \\
&= \Delta G_1.
\end{aligned}$$

This means that Y_1^d changes by ΔG_1, i.e., Y_1^d, which is also IS_1, shifts out to the right to $\widetilde{IS}_1$.

This shift of IS_1 to the right to $\widetilde{IS}_1$ in turn causes AD_1 to shift to the right to $\widetilde{AD}_1$. by $\left(\widehat{\widehat{Y}}_1 - \widehat{Y}_1\right)$ At the original equilibrium price $\widehat{P}_1$, aggregate demand exceeds aggregate supply, so the price will start to rise. This in turn causes LM_1 to shift up, which causes a movement up along $\widetilde{AD}_1$.curve from point b, and at the same time, we move up the AS_1 curve from point c due to a movement downwards along the N_1^d curve.

The shift up of LM_1 to $\widetilde{LM}_1$ is smaller than the shift to the right of IS_1 because an increase in government expenditures is expansionary, as is clearly illustrated by looking at the AS/AD diagram where output has increased from $\widehat{Y}_1$ to $\widetilde{Y}_1$. Hence, real interest rate has risen from $\widehat{r}_1$ to $\widetilde{r}_1$, real output has risen from $\widehat{Y}_1$ to $\widetilde{Y}_1$.

Price has risen from $\widehat{P}_1$ to $\widetilde{P}_1$. The increase in real interest rate causes labour supply to shift further. In equilibrium, labour supply will have shifted to $\widetilde{N}_1^s(\widetilde{r}_1)$, and prices have risen by enough to decrease real wages such that equilibrium is restored at the labour market at $\left(\widehat{\widehat{N}}_1, \widetilde{w}_1\right)$, where $\widetilde{w}_1 = \frac{\widehat{W}_1}{\widetilde{P}_1}$.

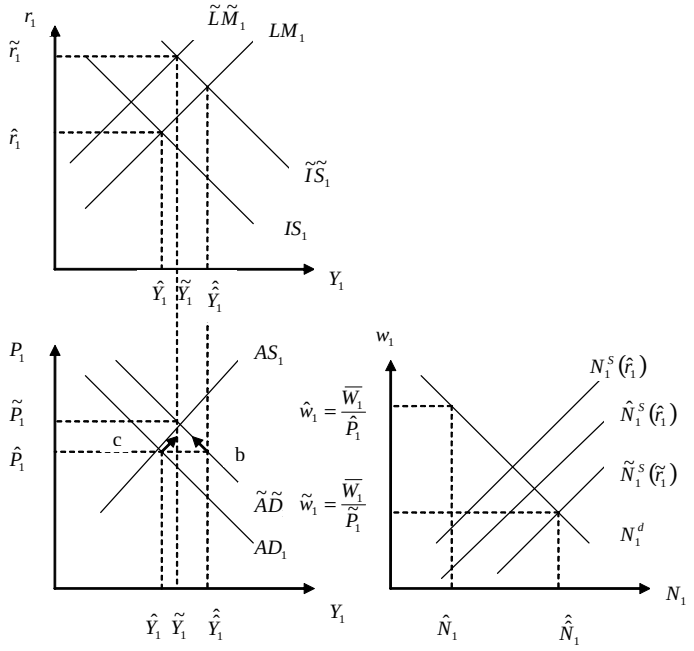

r_1
$\tilde{\tilde{L}}\tilde{\tilde{M}}_1$
LM_1
$\tilde{\tilde{r}}_1$
$\hat{r}_1$
$\tilde{\tilde{I}}\tilde{\tilde{S}}_1$
IS_1
Y_1
$\hat{Y}_1$ $\tilde{\tilde{Y}}_1$ $\hat{\hat{Y}}_1$
P_1
AS_1
$\tilde{\tilde{P}}_1$
$\hat{P}_1$
c
b
$\tilde{\tilde{A}}\tilde{\tilde{D}}$
AD_1
Y_1
$\hat{Y}_1$ $\tilde{\tilde{Y}}_1$ $\hat{\hat{Y}}_1$
w_1
$\hat{w}_1 = \frac{\overline{W_1}}{\hat{P}_1}$
$\tilde{\tilde{w}}_1 = \frac{\overline{W_1}}{\tilde{\tilde{P}}_1}$
$N_1^S(\hat{r}_1)$
$\hat{N}_1^S(\hat{r}_1)$
$\tilde{\tilde{N}}_1^S(\tilde{\tilde{r}}_1)$
N_1^d
N_1
$\hat{N}_1$
$\hat{\hat{N}}_1$

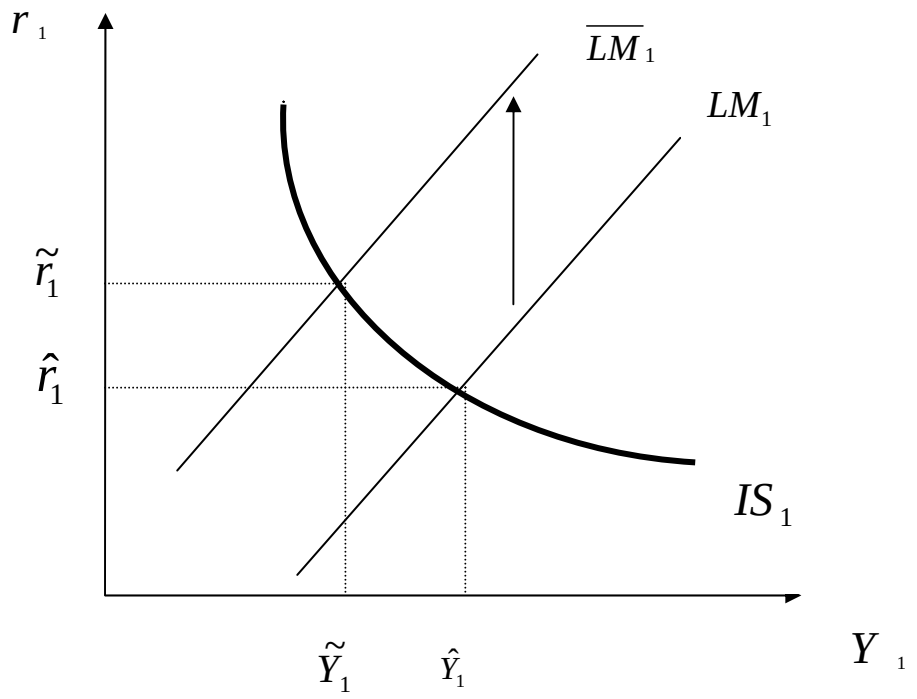
Figure 2

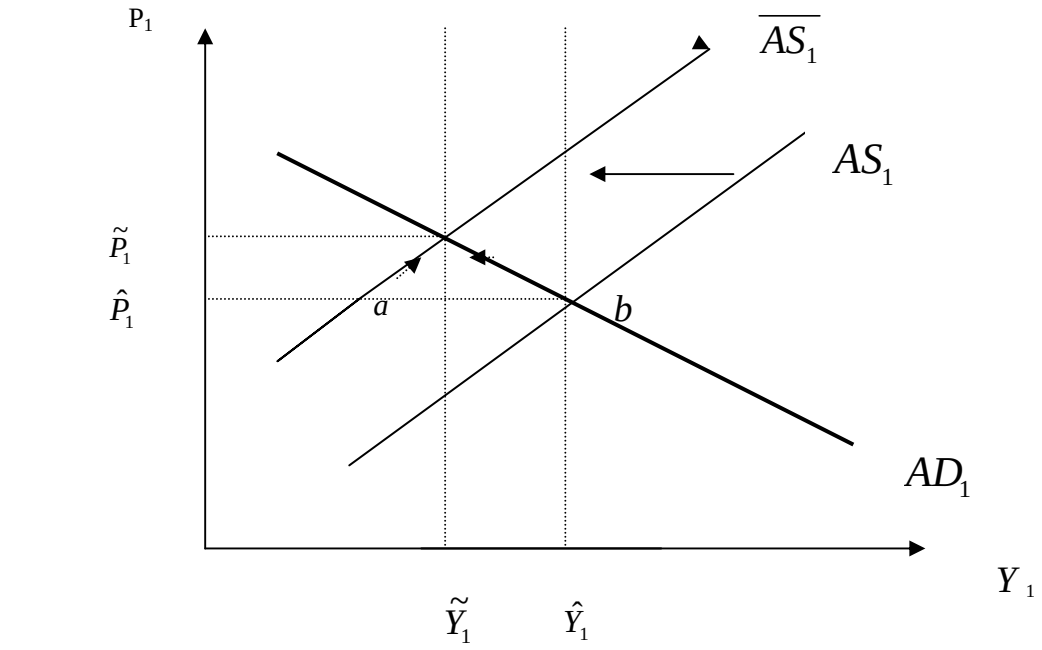
Question 3

Since the question does not say where the economy was initially at, let me assume that the economy is as illustrated in Figure 1, where the labour market does not clear.

A decrease in current total factor productivity z_1 shifts the labor demand curve N_1^d to the left to $\tilde{N}_1^d$, and hence AS_1 shifts to the left to $\overline{AS_1}$, as in Figure 1. At the price level P_1, there is excess demand, so the price level has to increase. When the price level starts to increase, since the nominal wage is fixed at $\overline{W_1}$, the increase in the price level decreases the real wage, and we start to move down the $\tilde{N}_1^d$ curve, which causes a movement up the $\overline{AS_1}$ curve from point *a*. At the same time, a rise in the price level causes the LM_1 curve to start shifting up, which causes a movement up the AD_1 curve from point *b*. And this rise in interest rate will cause the N_1^S curve to start shifting to the right.

Equilibrium is restored when price level has risen sufficiently such that IS_1 intersects $\overline{LM}_1$ at the lower output of $\tilde{Y}_1$ and the higher interest rate of $\tilde{r}_1$, the price is now higher at $\tilde{P}_1$, and employment is ambiguous depending on the relative magnitudes of the labor supply and demand shifts. In the case we have drawn, there has been an increase in employment**.**





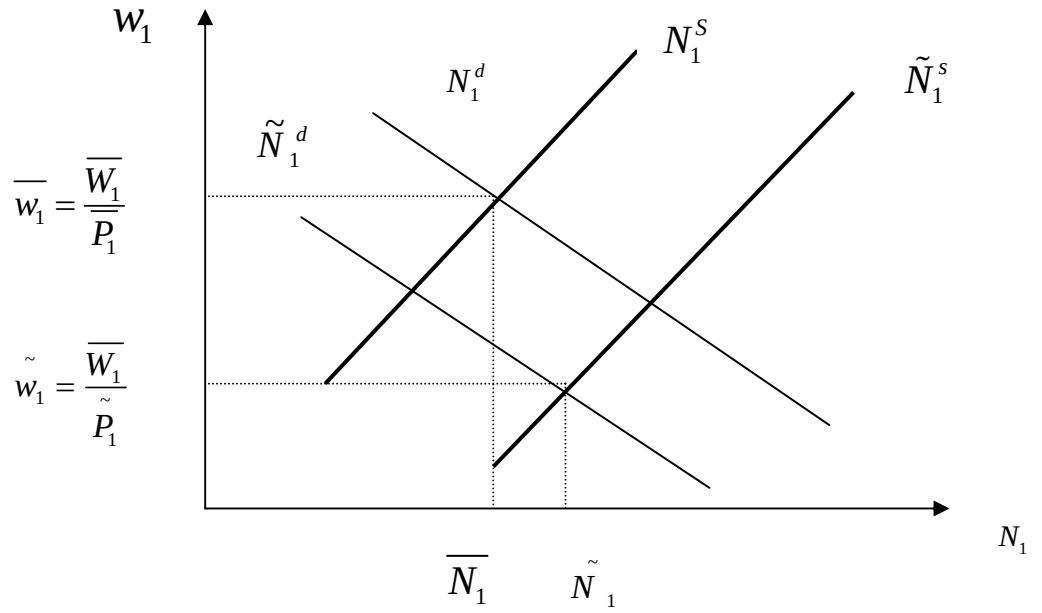


Figure 3

(<u>NOTE</u>: In this question, like question 2, it was not stated if the initial TFP shock is just enough to restore equilibrium, so the above analysis assumes that we do indeed go back to equilibrium where all markets clear. However, you could have just analyzed an initial TFP shock which affects the economy but not necessarily by enough to restore equilibrium in all the markets; in particular the labor market need not clear, so you can then talk about how unemployment changes. But in both questions, you have to say where the economy was at before the "shock" hits.)