

14.02 Principles of Macroeconomics

Problem Set #1, Answers

Posted: Thursday, February 14, 2002

Due Date: Thursday, February 21, 2002

Part I: True/False Questions: Decide whether each statement is true or false and justify your answer with a short argument. (5 points each, 50 points total)

1. **True:** The labor supply curve will shift up-left and a new equilibrium with a higher real wage will exist. This is, in part, due to the pro-cyclical mark-up assumption
2. **False:** When unemployees volunteer, they will still be considered unemployed until they find a job *with a prevailing wage*, as long as they are still looking actively for a job. In fact, the volunteers might compete with the unemployees causing higher unemployment.
3. **False.** The NAIRU is the non-accelerating inflation rate of unemployment. If the constant in the Phillips curve is zero, then it is equal to voluntary unemployment. In this case it is the level of unemployment at which everyone who wants a job at the current market wage has one.
4. **True:** Separation rate negatively depends on age: experience, education level, skill, seniority, social security and family responsibility. See also graph in slide 8.
5. **False:** As the data in the lecture slides and the book suggests, the unemployment rate and the inflation rate *apparently* were negatively correlated till the 1960s, this correlation did not prevail thereafter. In fact, as it will be evident in the course, there has been a negative correlation between the unemployment rate and the *change* in the inflation rate.
6. **True:** See lecture slides for the rules of thumb regarding inflation.
7. **True:** The policymaker faces a tradeoff: level of unemployment rate vs. changes in inflation rate as the following:

$$RP - RP_{-1} = -0.5 * (U - U^{VOL})$$

In other words, there are two endogenous variables: RP and U (inflation rate and unemployment rate), and one cannot control both simultaneously. Notice that U is highly and negatively correlated with the GNP (U is varying inversely with GNP); hence, the endogenous variables are RP and GNP. This also explains why the Fed (or Greenspan) was worry to see the economy is growing fast between 1995-2000.

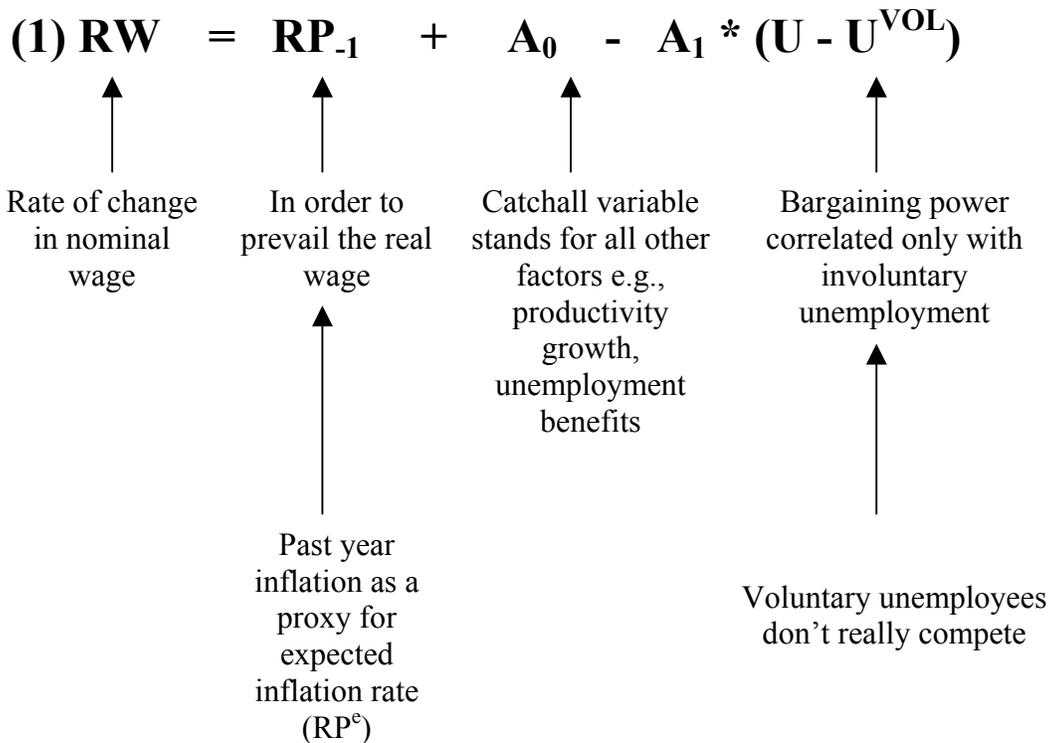
8. **False:** Higher exchange rates (when it is defined as the price of one unit of foreign currency in terms of the domestic currency) tend to boost export (foreigners demand for our GDP) and decrease import (domestic demand for foreign GDP) and therefore, the aggregate demand $[C+G+I+(X-M)]$ increases and the equilibrium Y (GNP)

increases too. Of course, it's the opposite when one defines the exchange rate as the price of one unit of domestic currency in terms of the foreign currency.

9. **True:** Contraction fiscal policy decreases GNP in equilibrium, which decreases the investment. If the Fed cuts interest rates (to make sure the cut in spending doesn't lead to recession), then this will have a positive effect on investment, and might dominate the first effect.
10. **True:** (a) Final value (200) = the value of sales to consumers (200); (b) The added value (140) = the value of the final goods (200) minus the value of the intermediate goods (60); and (c) The household income (140) = wages (50) + profits (90=200-50-60).

Part II: A model of unemployment vs. changes in inflation (5 points each, 25 points total)

1.



2. K is a simple markup ("cost plus pricing": $k=1+\mu$) on unit labor costs, i.e. nominal wages (W) relative to productivity (A). There is a positive correlation between prices and both the markup and nominal wages. However, when productivity increases, then

there will be more competition and prices will tend to fall. The change in prices (inflation rate) is:

$$RP = RK + RW - RA$$

Note: in general, if $W_t = X_t Y_t / Z_t$ then by taking the natural logarithm we get that: $\ln(W_t) = \ln(X_t) + \ln(Y_t) - \ln(Z_t)$, and therefore, by deriving by t we get that: $[dW/dt]/W = [dX/dt]/X + [dY/dt]/Y - [dZ/dt]/Z$, or by definition: $RW = RX + RY - RZ$; where d denotes the change in absolute value over time (derivative w.r.t time) and R denotes the relative change in percentages (rate) over time.

3. The markup falls when the economy is sluggish (pro-cyclical), because there is less demand for goods and also lower nominal wages. The markup is negatively affected by aggregate supply shocks (e.g., changes in oil and other imported goods prices).
4. By substituting the above equations, we get that:

$$RP - RP_{-1} = (A_0 + B_0 - RA) - (A_1 + B_1) * (U - U^{VOL})$$

The modified Philips equation states that the change in the inflation rate is negatively correlated with the involuntary unemployment rate. In other words, the acceleration in prices is tied to the level of excess demand for labor (=Involuntary unemployment).

5. During the first half of the previous century, the USA experienced a zero inflation rate in average, i.e., $RP_{-1} = 0$. Therefore, the above equation was observed as:

$$RP = (A_0 + B_0 - RA) - (A_1 + B_1) * (U - U^{VOL})$$

Which supported the original Philips curve (observed in the UK and US), according to which, the level of the inflation rate is negatively correlated with the unemployment rate. However, since the early 1970, the US started experiencing an increasing inflation rate above zero percentage, therefore, the original Philips relationship could not anymore prevail.

Part III: The National Accounting and Government Budget (5 points each, 25 points total)

1. **(a)** Consumers have to spend a minimum amount in order to survive (even if their income is zero, in which case they borrow). The equation implies also, that the consumers increase their spending by 60% of their income increase. **(b-c)** Since consumption function is linear and identical for all consumers, the income distribution is irrelevant. The aggregate consumption function is $C = \$150 \text{ million} + 0.60 (Y - T)$.

2. The equilibrium condition is $Y=C+I+G+X-M$. It is a national accounting identity (gross national income is equal to total spending on gross domestic production), or, aggregate supply equals aggregate demand. This is the sum of spending by consumers, gross investment by firms, and government spending. If the economy is open to trade, we have to subtract off the spending on foreign goods and services and add the amount foreigners spend on domestic goods and services. Substituting the values given and solving for Y yields $Y=2.5(800 - 0.6T - i)$.
3. The multiplier is 2.5 independent of the values of T and i . If $T=0$ and $i=10$, then the autonomous value is $(800 - 0.6 * 0 - 10) = 790$, and if there is a budget balance, $T=550$ and $i=10$, then the autonomous value is $(800 - 0.6 * 550 - 10) = 460$.
4. **(a)** It is enough that we know the multiplier, which exactly tells us by how much the GNP reacts to a *change* in the autonomous value: $2.5 * \$400 = +\$1,000$ increase in GNP. **(b)** If we increase both G and T by 400, then the total change in the autonomous value will be only (1-60%) $\$400 = +\160 , and therefore, the change in GDP will be $160 * 2.5 = +\$400$.
5. In the new equilibrium, the $GDP= 2(800 - 0.5T - i) = 2(800 - 0.5 * 550 - 10) = 1030$ from 1150 before. Savings in fact does not change, and stays 100 (check). Note, if investment was positively correlated with GDP, then investments and savings will decrease (the Savings Paradox).