III. Technological progress: The short-run and the medium-run

Lecture 12

1. Suppose that the labor market of an economy in the medium-run is characterized by the following equations:

Price setting: $P = (1+m)\frac{W}{A}$

Wage setting: $W = A^e P^e (1-u)$

a) Solve for the unemployment rate (that is, find the natural rate of unemployment) if $P^e = P$, but A^e does not necessarily equal A, so that $A^e \neq A$. What would be the effect of A/A^e on the natural rate of unemployment?

Hints: First, conceptually define the natural rate of unemployment.

Second, derive the natural rate of unemployment, u_n. Given that $P^e = P$, from the wage setting equation we have that:

$W = A^e P^e (1-u) = A^e P(1-u) \Longrightarrow \frac{W}{P} = A^e(1-u)$

And from the price setting equation we have:

$P = (1+m)\frac{W}{A} \Rightarrow \frac{W}{P} = \frac{A}{1+m}$

The real wage ($\frac{W}{P}$) from both equations needs to be equal in order to find u_n:

$A^e(1-u_n) = \frac{A}{1+m}$

$$1 - u_n = \frac{A}{A^e}\frac{1}{1+m}$$

$u_n = 1 - \frac{A}{A^e}\frac{1}{1+m}$

Suppose now that the expected productivity level is equal to the actual productivity level, so that $A^e = A$. What does this imply? What is the u_n in this case?

Suppose now that $A^e > A$. What does this mean? How is this u_n compared to the one derived assuming that $A^e = A$?

Suppose now that $A^e < A$. What does this mean? How is this u_n compared to the one derived assuming that $A^e = A$?

Therefore, what happens to the u_n when $A^e > A$? What happens to the u_n when $A^e < A$?

b) Suppose now that expectations of both prices P and productivity A are accurate, so that $P^e = P$ and $A^e = A$. Solve for the natural rate of unemployment if the markup (m) is equal to 5%.

$$u_n = 1 - \frac{1}{1+m} = 1 - \frac{1}{1+5\%} \approx 4.76\%$$

c) Given your answers to parts (a) and (b), does the natural rate of unemployment depend on productivity? Explain the logic behind your answer.

Hint: If $P^e = P$ and $A^e = A$, then $u_n = 1 - \frac{1}{1+m}$. What does this mean? Does the u_n depend on the productivity level if the expectations of productivity (A^e) are equal to the actual productivity level (A)? What type of expectations are we assuming if this is the case? Illustrate the effects of an increase in A on the u_n when $A^e = A$ using the relevant diagram.

On the other hand, if $A^e \neq A$ then $u_n = 1 - \frac{A}{A^e}\frac{1}{1+m}$. Conceptually, what does this mean? Suppose that productivity growth declines, so A increases more slowly than before; but A^e adjusts more slowly compared to A. This means that A^e will grow faster than A for some time, so that $A^e > A$. What will happen to the u_n? Explain the logic behind your answer and illustrate your response using the relevant diagram.

2. Discuss the effects of profitability and current cash flow on investment decisions.

Hints: Discuss your answers in the context of the new investment function:

$$I_t = I[V(\Pi_t^e), \Pi_t]$$

Define the present value of expected future profits, $V(\Pi_t^e)$. What does it represent, profitability or current cash flow?

What are static expectations? Derive an equation for $V(\Pi_t^e)$ assuming static expectations.

How does I_t respond to changes in $V(\Pi_t^e)$? How does I_t respond to changes in the user cost of capital, $r_t + \delta$?

What does the rate of profit, Π_t, represent, profitability or current cash flow?

What is Π_t a function of?