Chapter 9

Keynesian Models and Monetary Policy
Learning Outcomes

➢ Keynesian Aggregate Supply – Upward sloping AS

➢ Monetary Policy & Real economy
  ➢ Phillips Curve
  ➢ Friedman & Phelps - Augmented Phillips curve
  ➢ Okun’s law

➢ Monetary Policy & Prices
  ➢ McCallum (1989) - Sticky Prices
  ➢ Multi period pricing

➢ Predictable and unpredictable components of Money supply
  ➢ Policy Ineffectiveness Policy (PIP)
  ➢ Lucas Critique
9.1.1 Keynesian AS function

Assumptions

- Sticky nominal wages - nominal wages will not adjust instantaneously to changes in market conditions.

- Firms employ workers up to the point where the marginal product of labour is equal to the marginal cost

- Right to manage - Firms can choose how much labour to employ, even if this is more than the amount workers wish to supply at the going real wage.
9.1.2 Keynesian AS function

Short run - Transmission Mechanism – An increase in price level

1. W/P declines
2. Higher labour demand
3. More labour hours supplied
4. Higher Output

In the short run, output is above full employment level
9.1.2 Keynesian AS function

Long run - Transmission Mechanism - An increase in price level

- $W$ negotiated upwards
- $W/P$ increases
- Lower labour demand
- Lower output

In the long run, real wages and output remain unchanged
9.1.3 Keynesian AS function

The effect of monetary policy
9.2.1 Phillips curve

A key weakness of the sticky wage assumption is that it implies that the real wage is strongly countercyclical. Empirical evidence suggests otherwise.

Assumptions

- Exogenously fixed wages - nominal wage depends on recent values of unemployment

- If unemployment was high, trade unions, and labour in general, could not negotiate larger pay increases since firms would have a large pool of unemployed with which to fill its vacancies.
9.2.2 Phillips curve

Key result

\[ \ln W_t = \zeta(u_{t-1}) + \ln W_{t-1} \]

\[ \Rightarrow \Delta w_t = \zeta(u_{t-1}) \quad \text{with} \quad \zeta' < 0 \]

- Firms that maximise profits will set the marginal product of labour equal to the real wage.

- The relationship states that there is a permanent trade off between inflation and unemployment.

- In the 1970s the Phillips curve relationship broke down and this was explained, and indeed predicted, by Friedman (1968) and Phelps (1970) who emphasised the importance of inflation expectations.
9.2.2 Phillips curve

Empirical Findings

Source: Phillips, relationship between unemployment, and the rate of change of money wage rates
9.2.3 Phillips curve
What agents really care about is the goods and services that can be purchased with their wages. Ie: Real wages

But since there is no current information about inflation, it must be anticipated

\[ \Delta w_t = \zeta (u_{t-1}) + \Delta p_t^e \quad \text{with } \zeta' < 0. \]

The expectations augmented Phillips curve explained the breakdown of the simple version that occurred in the 1970s.

They claimed that there is a number of short-run Phillips curves, one for each level of expected inflation.
9.3 Augmented Phillips curve
9.4 Okun’s Law

- A negative relationship exists between unemployment and departures of output from potential output.

- The tradeoff between inflation and output is captured by Okun’s law:
  \[ \Delta p_t = \gamma(y_t - y^*) + \Delta p^e_t \quad \text{with } \gamma' > 0 \]

  \[ \Rightarrow y_t = y^* + \frac{1}{\gamma}(\Delta p_t - \Delta p^e_t). \]

- Okun’s law is similar to the Lucas island problem but has different microeconomic foundations.

- In the case of the former, the Phillips curve assumes nominal rigidities while the latter is based on imperfect information.
9.5.1 Sticky Prices

- Prices are set at the beginning of the period and cannot change to accommodate shocks or other developments in the economy.

- Firms produce as much as is demanded at the price that was set at the beginning of the period, even if this means supplying more than they would ordinarily wish to produce given those market conditions.

Rationale for sticky prices

- Menu Costs

- Firms do not wish to disturb loyal customers
9.5.2 McCallum (1989) – Model of sticky prices

Key Identities

AD Curve => 
\[ y_t = \beta_0 + \beta_1 (m_t - p_t) + \beta_2 E_{t-1} [p_{t+1} - p_t] + \nu_t. \]

Market clearing conditions => 
\[ p_t = E_{t-1} [p^*_t]. \]

Determining market clearing price => 
\[ p^*_t = \frac{\beta_0 - y^*_t + \beta_1 m_t + \beta_2 E_{t-1} [p_{t+1}] + \nu_t}{\beta_1 + \beta_2} \]

Determining market clearing output => 
\[ y^*_t = \delta_0 + \delta_1 t + \delta_2 y^*_{t-1} + \eta_t. \]

Money Supply => 
\[ m_t = \mu_0 + \mu_1 m_{t-1} + \epsilon_t \]
9.5.3 Sticky prices & Monetary Policy

Key Result

\[ y_t - y^*_t = \beta_1 e_t + \nu_t - u_t. \]

- The systematic component of monetary policy has no real effect on output
- Only unexpected shocks to money supply have real effects
9.5.4 Multi-period pricing

Setup

- Firms revise future prices at particular points in time
- Different firms revise prices at different times

Diagram:

- ‘A’ firms set prices for $t-2$ and $t-1$
- ‘B’ firms set prices for $t-1$ and $t$
9.5.4 Multi-period pricing

Key identities

AD $\Rightarrow$

Market Clearing Condition $\Rightarrow$

Market clearing output $\Rightarrow$

Monetary Policy $\Rightarrow$

Setting prices $\Rightarrow$

$$y_t = \beta_0 + \beta_1 (m_t - p_t) + \nu_t.$$  

$$p_t = \mathbb{E}_{t-1}[p^*].$$  

$$y^*_t = d_0 + d_1 t.$$  

$$m_t = \mu_0 + \mu_1 m_{t-1} + e_t.$$  

$$p_t = \frac{\mathbb{E}_{t-1}[p^*] + \mathbb{E}_{t-2}[p^*]}{2}. $$
9.5.4 Multi-period pricing

Key Result

\[ y_t - y_t^* = \beta_1 e_t + \frac{1}{2} \beta_1 \mu_1 e_{t-1} + \nu_t. \]

- Shocks to money supply at time t-1 has real effects at both date t-1 and date t
- The systematic component of monetary policy now has real effects
9.6.1 Predictable & unpredictable components of Money supply

Monetary policy authorities take action in the following two scenarios:

\[
m_t = \mu_0 + \mu_1 m_{t-1} + e_t
\]

1. **Systematic shock** - part of the money stock that depends on variables such as unemployment, past money stocks etc that are predictable

2. **Non-systematic shock** – These are monetary shock that either originate from the authorities themselves or in the financial markets,
9.6.2 Monetary policy and Rational expectations

\[ E_{t-1}[m_t] = \mu_0 + \mu_1 m_{t-1}. \]

- In rational expectations models we assume that monetary shocks are purely random/white noise and hence its unconditional mean is zero.

- For simple models, where the monetary authorities and the public share the same information sets, the expected money supply will simply be the predictable component.
9.6.3 Policy Ineffectiveness proposition (PIP)

- Criticized the fact that economic agents formulate expectations based on rational expectations rather than on adaptive expectations

\[ y_t = \beta_0 + \beta_1 (m_t - p_t) + \beta_2 E_t [p_{t+1} - p_t] + \nu_t. \]

- Hence people are able to change their price/wages etc in anticipation of policy changes

- Assuming rational expectations, it is not possible for the predictable component of monetary policy to have real effects for functions of the form that depend on lagged money, inflation etc.
9.6.4 Lucas Critique

- This refers to the instability of reduced-form expressions used for policy making or policy appraisal.

- The equation we derive is a mixture of aggregate demand equation, price equation and monetary policy reaction functions.

- If policy makers attempt to take advantage of statistical relationships, effects operating through expectations may cause the relationships to break down.
9.7 Learning Outcomes

- explain the importance of nominal rigidities and why such sticky prices occur in the real world
- examine the effects of monetary policy in the short and long run when there are nominal rigidities
- describe the workings of the Phillips curve and augmented Phillips curve, noting the differences between the two
- build and work through models of sticky prices, examining the effects of monetary policy
- explain why multi-period pricing can lead to real and persistent effects of monetary policy
- discuss the merits of various sticky price models, noting, in particular, the different short-run and long-run effects of monetary policy.