Chapter 12
Monetary policy and the Phillips Curve

Outline of Chapter 12 lectures
12.1. The MP curve
12.2. Using the IS-MP model
12.3. Term structure of interest rates
12.4. Phillips Curve and the IS-MP model
12.5. The end of the Great Inflation
12.6. The start of the Great Inflation
12.7. Reconciling short- and long-run model
12.8. Details of implementing monetary policy

12.4. Phillips Curve and the IS-MP model

- We originally motivated the Phillips Curve as an empirical relation (something we see in the data)
- If output is above potential in year $t$ ($\bar{Y}_t > 0$), then inflation in year $t$ is likely to be higher than last year ($\pi_t > \pi_{t-1}$ or $\Delta \pi_t > 0$)

• Question today: is there an economic theory that could help us understand why there might be such a relation?
Suppose you’re running a business and everything is going just as you wanted. You expect your costs and everybody else’s prices to rise this year by \( \pi_f \). You would probably raise your prices by \( \pi_f \) too. If everybody behaved like this, we would observe \( \pi_t = \pi_f \) when \( \tilde{Y}_t = 0 \).

Suppose instead that you have lots of excess capacity and sales are below what you planned for. You might try to lower prices (or raise them by less than you expect your competitors) to try to gain more customers. If everybody behaved like this, we would observe \( \pi_t < \pi_f \) when \( \tilde{Y}_t < 0 \).

And if you’re operating above capacity and paying extra costs for overtime, you might conclude it makes sense to raise prices faster than \( \pi_f \). If everybody behaved like this, we would observe \( \pi_t > \pi_f \) when \( \tilde{Y}_t > 0 \).

\[
\pi_t = \pi_t^e + \tilde{\nu} \tilde{Y}_t
\]

Adaptive expectations: people expect same inflation rate this year as last.

\[
\pi_t^e = \pi_{t-1}
\]

This implies

\[
\pi_t = \pi_{t-1} + \tilde{\nu} \tilde{Y}_t
\]

\[
\Delta \pi_t = \tilde{\nu} \tilde{Y}_t
\]

which is the empirical relation we found in the data.
Other factors can also affect inflation. For example, an oil price increase might raise costs above normal even if $\bar{Y}_t = 0$. Will represent these other shocks by $\bar{\sigma}$.

Shocks raising inflation: $\bar{\sigma} > 0$

Shocks lowering inflation: $\bar{\sigma} < 0$

Phillips Curve:
\[ \Delta \pi_t = \bar{\nu} \bar{Y}_t + \bar{\sigma} \]

- Normal times: $\bar{\sigma} = 0$
- Big oil price increase: $\bar{\sigma} > 0$
- Big oil price decline: $\bar{\sigma} < 0$

- There was a big oil price increase in 1974 (OPEC embargo)
- $\bar{\sigma} > 0$ for $t = 1974$

- There was a big oil price decrease in 1986 (Saudi Arabia flooded market)
- $\bar{\sigma} < 0$ for $t = 1986$
12.5. The end of the Great Inflation

By the end of the 1970s, inflation was very high and everybody expected it to continue. How did the Fed bring inflation down?

Volcker Disinflation

Paul Volcker was appointed to head the Fed by President Carter in 1979 to bring inflation down. Volcker did this by raising real interest rates which contributed to the recessions of 1980 and 1982 but eventually succeeded in bringing inflation down.
12.6. The start of the Great Inflation
But how did inflation get so high to begin with?
(1) Policy makers overestimated potential GDP
   – Thought GDP was way below potential and economy needed more stimulus
   – Actually GDP was above potential so stimulus increased inflation

How did inflation get so high to begin with?
(1) Policy makers overestimated potential GDP
(2) Policy makers were using a different version of the Phillips Curve
   – Original Phillips Curve did not include expected inflation

Phillips Curve without expected inflation:
$$\pi_t = \bar{\pi} + \nu \tilde{Y}_t$$
$$\tilde{Y}_t > 0 \Rightarrow \pi_t \text{ high (but steady)}$$
Why not tolerate a little inflation if it helps keep unemployment low?
Phillips Curve with expected inflation:
\[ \pi_t = \pi_t^* + \tilde{\nu} \tilde{Y}_t \]
Adaptive expectations: \[ \pi_t^* = \pi_{t-1} \]
\[ \Delta \pi_t = \tilde{\nu} \tilde{Y}_t \]
\[ \tilde{Y}_t > 0 \Rightarrow \pi_t \text{ keeps going higher and higher.} \]
This is what happened in the 1960s and 1970s.

How did inflation get so high to begin with?
(1) Policy makers overestimated potential GDP
(2) Policy makers were using a different version of the Phillips Curve
(3) Oil price shocks of the 1970s (OPEC embargo 1974, Iranian Revolution 1978) gave temporary boost to inflation
   Given (1) and (2), this led to entrenched expectations of higher inflation that were hard for the Fed to reverse

\[ \Delta \pi_t = \tilde{\nu} \tilde{Y}_t + \bar{o} \]
Normal times: \[ \bar{o} = 0 \]
Oil price shock: \[ \bar{o} > 0 \]

12.7. Reconciling the short- and long-run model
- The long-run model (Chapter 8) also had a theory of inflation
- How does this relate to the short-run model?

- In the long-run model, the Fed did not choose the real interest rate.
- \[ R_t = \tilde{r} = MPK \] in the long-run model.
- Instead, in the long-run model the Fed chooses \( \bar{g}_M \), the rate of growth of money supply.
If $g_Y$ denotes the growth rate of potential GDP, the long-run model in Chapter 8 predicted an inflation rate $\pi^*$ given by

$$\pi^* = \bar{g}_M - \bar{g}_Y.$$ 

If for example $\bar{g}_M = 8\%$, $\bar{g}_Y = 3\%$, then $\pi^* = 5\%$.

Long-run model:

Long run growth rate ($g_Y$) determined by population, capital stock, technology (nothing to do with monetary policy).

Monetary policy only controls inflation by controlling rate of growth of money supply.

Called the "classical dichotomy": in the long-run model, the real and nominal parts of the economy are completely separate.

Suppose the economy has been in long-run equilibrium for some time.

1. Output has been growing steadily at the rate $\bar{g}_Y$ with $\bar{Y}$, always zero.
2. Real rate $R_t$ has been constant at $\bar{r} = \text{marginal product of capital}$.
3. Inflation has been constant at $\pi^* = \bar{g}_M - \bar{g}_Y = 5\%$ (so $\Delta \pi$ has been zero and $\pi_t = \pi^*$).

IS-MP in long-run and short-run equilibrium

- Real GDP growing at same rate as potential GDP means $\bar{Y} = 0$
- If Fed does not want to change inflation from $\pi^* = 5\%$ then it sets $R = \text{MPK}$

Phillips Curve in long-run and short-run equilibrium

- Real GDP growing at same rate as potential GDP means $\bar{Y} = 0$
- If Fed sets $R = \text{MPK}$, then inflation does not change from $\pi^* = 5\%$ so $\Delta \pi = 0$

Short-run inflation model:

$$\pi_t = \pi_{-1}^{t} + \nu \bar{Y}_t + \delta$$

Plus adaptive expectations

$$\pi_t = \pi_{-1} + \delta$$

Gave us the Phillips Curve

$$\pi_t = \pi_{-1} + \nu \bar{Y}_t + \delta$$

$$\Delta \pi_t = \nu \bar{Y}_t + \delta$$
\[ \Delta \pi_t = \tilde{v} \tilde{Y}_t + \delta \]

The Phillips Curve says to bring inflation down \( (\Delta \pi_t < 0) \) must have \( \tilde{Y}_t < 0 \).
This was what happened when Volcker brought inflation down.
Everyone expected \( \pi_t \) to continue at 5\% \( (\pi_t^* = 5\%) \).
Would only increase wages and prices less than 5\% given pressure of \( \tilde{Y}_t < 0 \)

\[ \pi_t = \pi_t^* + \nu \tilde{Y}_t \]
In long-run equilibrium, \( \pi_t^* = \pi^* = \tilde{g}_M - \tilde{g}_Y \).
Suppose:
(1) Fed simply announces it’s slowing money growth \( \tilde{g}_M \) from 8\% to 3\%.
(2) Everybody believes this will instantly cut inflation from 5\% to 0\%.
(3) Everybody immediately foregoes their planned wage and price increases this year.
Then we would be able to reduce inflation without all the pain caused by Volcker.

Why doesn’t it work?
(1) People don’t believe the Fed
(2) Other factors also influence inflation (e.g., shocks to potential GDP, oil price, or money demand)
(3) Inflation expectations are sticky \( (\pi_t^* \) doesn’t change instantly).
(4) Some wage and price changes are already built in (e.g., contracts)

Conclusion:
Frictions in changing expectations, changing wages, and changing prices are a key reason classical dichotomy does not hold in short run and the Volcker recession was the only way to end the Great Inflation