Topics for Today

1.) Keynesian vs. Friedman-Lucas AS Curves

2.) The Phillips Curve
   - The "Expectations-Augmented Phillips Curve"
   - Credible vs. Non-Credible Disinflations

3.) The Natural Rate Hypothesis

4.) The Instruments of Monetary Policy

5.) Pros & Cons of Inflation Targeting

6.) The Taylor Rule

Keynesian vs. Lucas (classical) AS Curves

- Macroeconomists agree about the properties of the AD curve (e.g., why it slopes down, and why it shifts).

- Macroeconomists disagree about the AS curve. The data suggests it slopes up (because inflation + output tend to be positively correlated), and that it is unstable (because the correlation between output + inflation is unstable). The disagreement is about why it slopes up.

- Keynesians attribute it to slowly adjusting wages + prices (due to procyclical real wages, most Keynesians models feature slow price adjustment rather than slow wage adjustment.)

- Classical economists attribute it to informational imperfections. (People tend to have better info about local market conditions, and sometimes get confused between inflation + relative price changes.

- In both theories the AS curve takes the form:

$$Y = \bar{Y} + b(P - P^e)$$

where b is a positive parameter
(Note: the economic interpretation of b is different in the 2 theories!)

- In both theories, firms + households try to forecast inflation, and will not alter their output + employment decisions in response to anticipated changes in AD.

- Given this, why do we care which is true?!

- The answer is that they have very different policy implications.

- In Keynesian theories, firms forecast inflation in order to set appropriate prices & wages.

- If a forecast turns out to be wrong, they may "have to" endure (because it is too costly to re-set prices) a period of suboptimal prices & wages.

- In classical models, firms & workers can re-set prices & wages at any time. They will not be fooled for long, and they will not be fooled systematically (according to the "Rational Expectations Hypothesis")

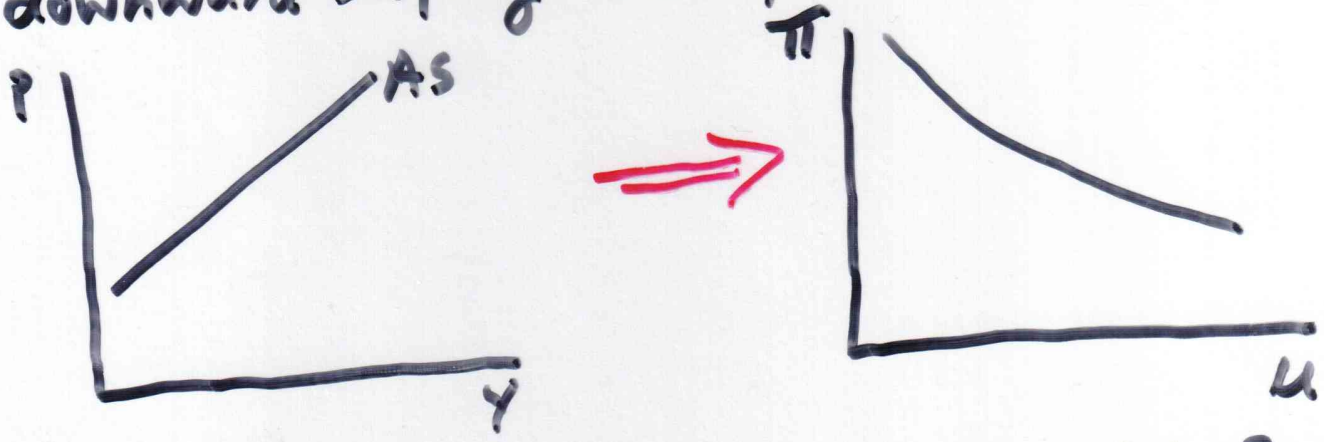
- The key difference then, is that the output effects of unanticipated AD shifts may be long lasting in Keynesian models. What's more, they may respond to counter cyclical monetary & fiscal policies. In contrast, classical models predict that output responses are short-lived & unresponsive to policy.

- Hence, it is important to be able to distinguish between these theories. But how?

Intro to Macro Policy

- In practice, macro policy tends to focus on potential inflation/unemployment trade-offs. Low inflation + full employment are obviously desirable policy objectives, so if there is a trade-off, this suggests some difficult choices might need to be made.

- Keep in mind, there is no essential difference between an upward sloping AS curve and a downward sloping "Phillips Curve".



- Focusing on the Phillips curve is useful from a policy perspective. Policy can directly influence the AD curve, but it can only indirectly influence the Phillips Curve, since it summarizes technology + pricing decisions that are made in the private sector. Hence, the Phillips Curve does in a sense describe available policy options (but as we'll see, it's a very unreliable + elusive set of options!).

FIGURE 13.1

THE PHILLIPS CURVE AND THE CANADIAN ECONOMY DURING THE 1960s

During the 1960s, Canadian rates of inflation seemed to lie along a Phillips curve. Inflation rose and unemployment fell fairly steadily during this decade, and policymakers had apparently decided to live with higher inflation in order to reduce unemployment.

Source: Adapted from the following: Unemployment rate: *Historical Statistics of Canada*, Series D233; Inflation rate, 1960–61: Calculated using GNP deflator, *Historical Statistics of Canada*, Series K17; 1961–69: Calculated using GDP deflator, Statistics Canada CANSIM II, series v1997756.

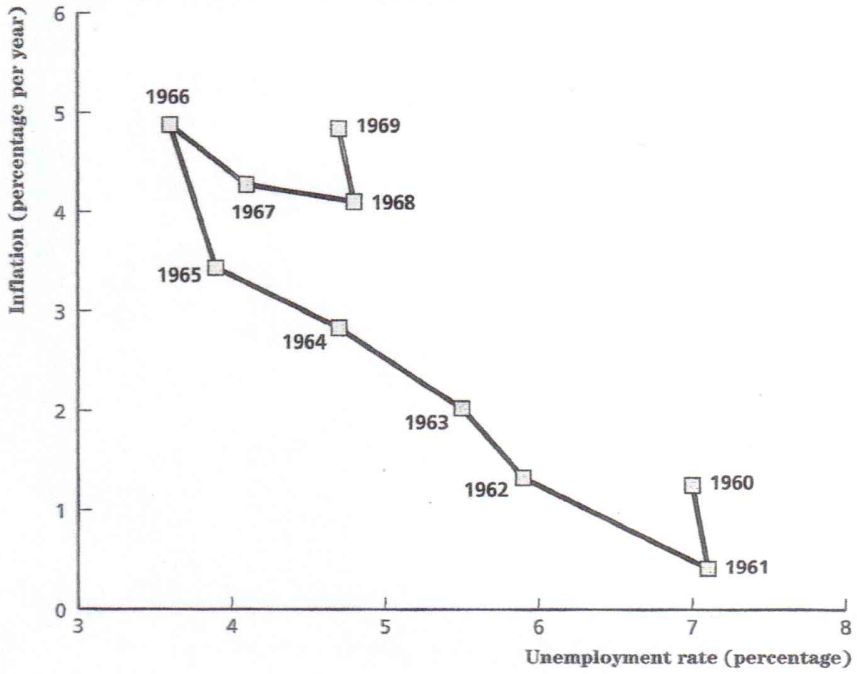
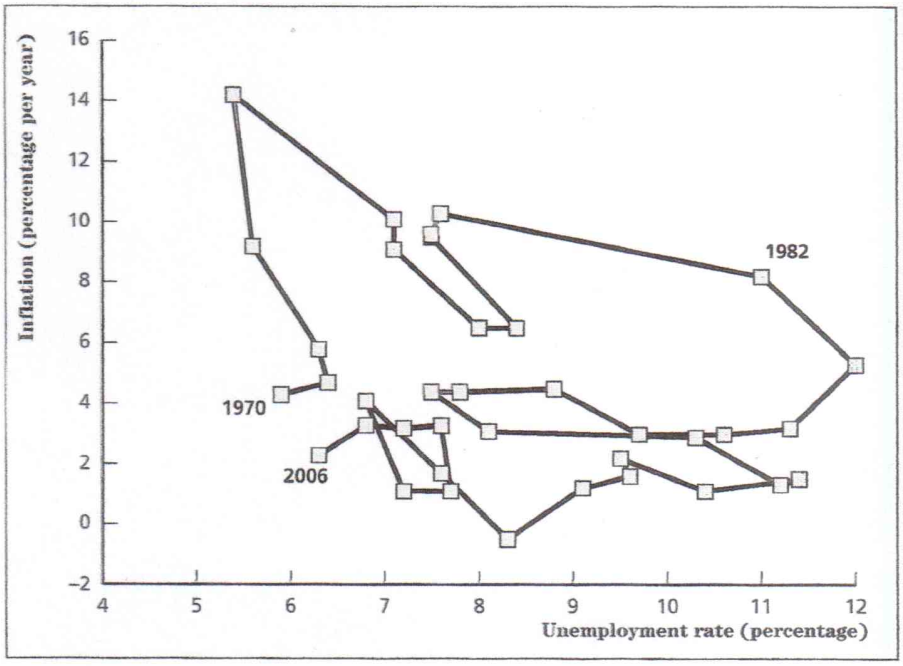


FIGURE 13.2

INFLATION AND UNEMPLOYMENT IN CANADA, 1970–2006

The figure shows the combinations of inflation and unemployment experienced in Canada each year from 1970 to 2006. Unlike the situation during the 1960s (see Figure 13.1), after 1970, the relationship between inflation and unemployment seemed to change from what it had been in the 1960s.

Source: Adapted from the following: Unemployment rate, 1970–75: *Historical Statistics of Canada*, Series D233; 1976–2006: Statistics Canada CANSIM II, series v2461224; Inflation rate: Calculated using GDP deflator, Statistics Canada CANSIM II, series v1997756.



Shifts in the Phillips Curve

- Clearly, the data indicate that the Phillips Curve is unstable. Why does it shift?

- There are 2 main reasons:

  1.) Expectations of inflation causes it to shift. Only unanticipated inflation should matter

  2.) Changes in the long-run level of "full employment", due perhaps to technology or institutional changes.

- Therefore, we can write down a more sophisticated version of the Phillips Curve, sometimes called the "expectations-augmented Phillips Curve"

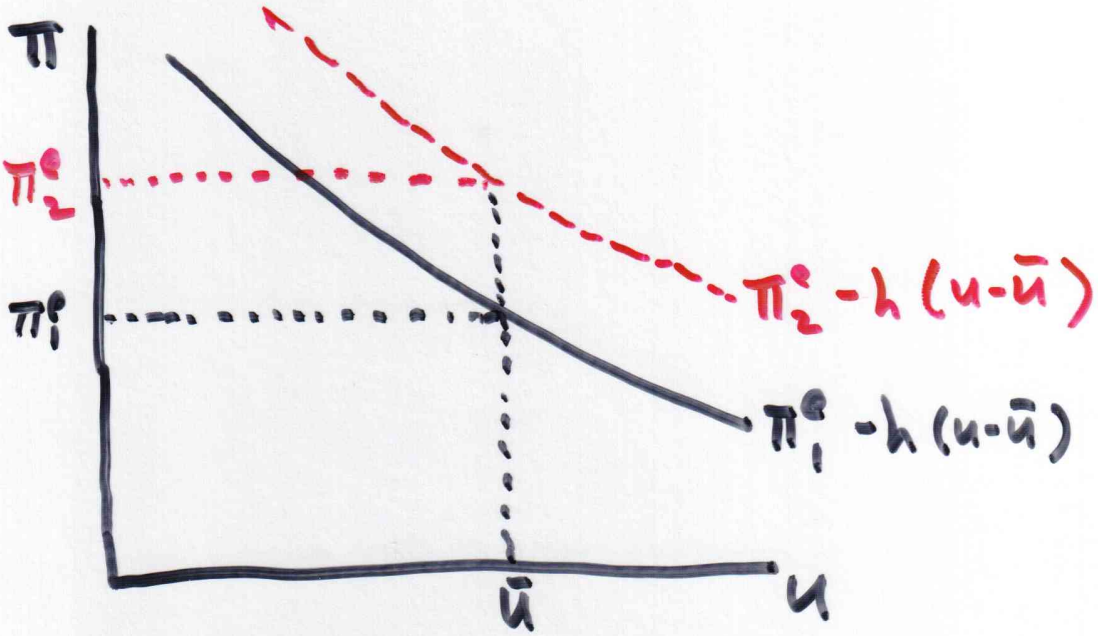
$$\pi = \pi^e - h(u - \bar{u})$$

} Expectations Augmented Phillips Curve

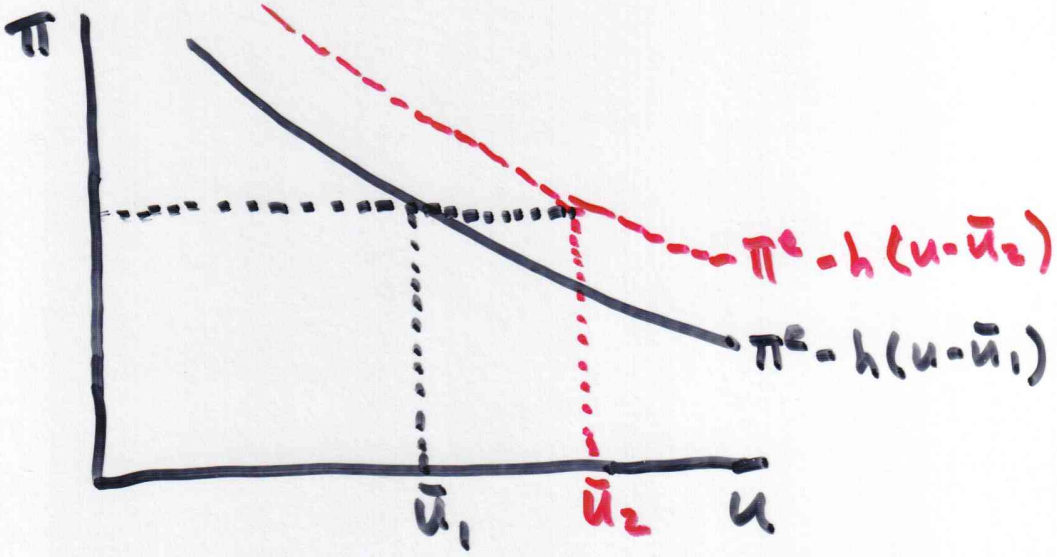
π^e: expected inflation

$\bar{u}$: "full employment" the "natural rate of unemployment"

① $\pi^e \uparrow$



② $\bar{u} \uparrow$

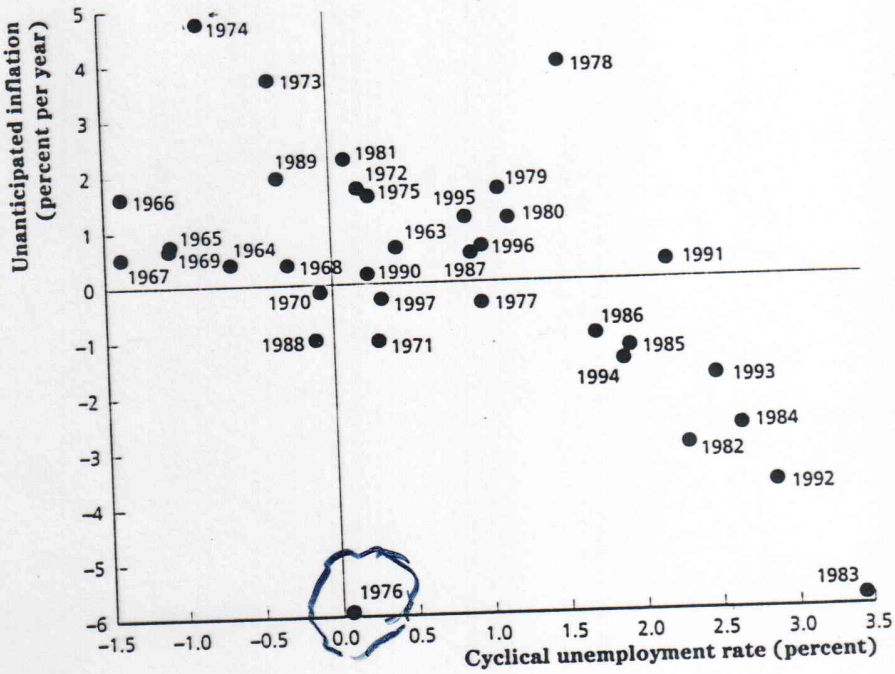


Notice that both shifts worsen the inflation/unemployment trade-off

Figure 14.7
The expectations-augmented Phillips curve in Canada, 1963–1997

The expectations-augmented Phillips curve is a negative relationship between unanticipated inflation and cyclical unemployment. The figure shows this relationship for the years 1963 to 1997 in Canada. Unanticipated inflation equals actual inflation minus expected inflation, where expected inflation in any year is measured here as the average inflation rate for the preceding two years. Cyclical unemployment for each year is the actual unemployment rate minus an estimate of the natural unemployment rate for that year (see Fig. 14.9). Note that years in which unanticipated inflation is high usually are years in which cyclical unemployment is low.

Source: unemployment rate, 1963–1965: *Historical Statistics of Canada*, Series D233; 1966–1997: *Canadian Economic Observer, Historical Statistical Supplement*, Table 8; natural rate of unemployment: see Fig. 14.9; CPI inflation rate: *Canadian Economic Observer, Historical Statistical Supplement*, Table 12.

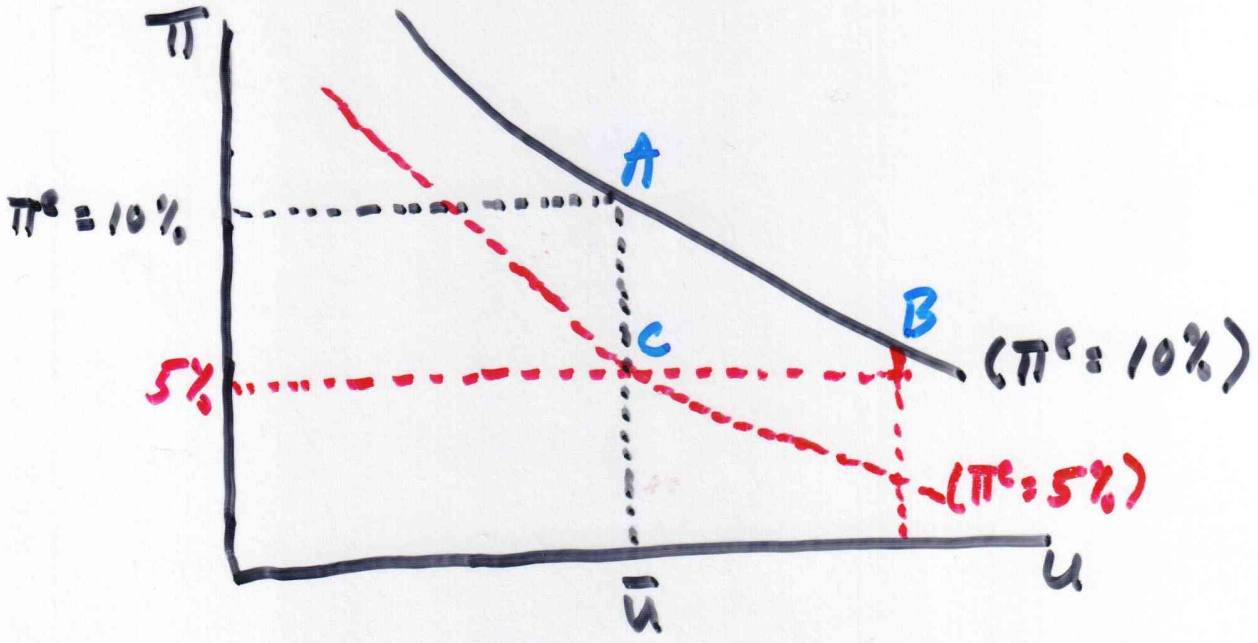


$$\pi_t = \pi^e - b(u - u^n)$$

$$\pi^e = \tfrac{1}{2}(\pi_{t-1} + \pi_{t-2})$$

Credible vs. Non-Credible Disinflations

- Suppose the economy has been experiencing inflation of 10% for some time, so that $\pi^e = .10$ and $u = \bar{u}$.
- Policy makers decide to reduce inflation to 5%. What will be the result? It depends on whether their policy is credible.



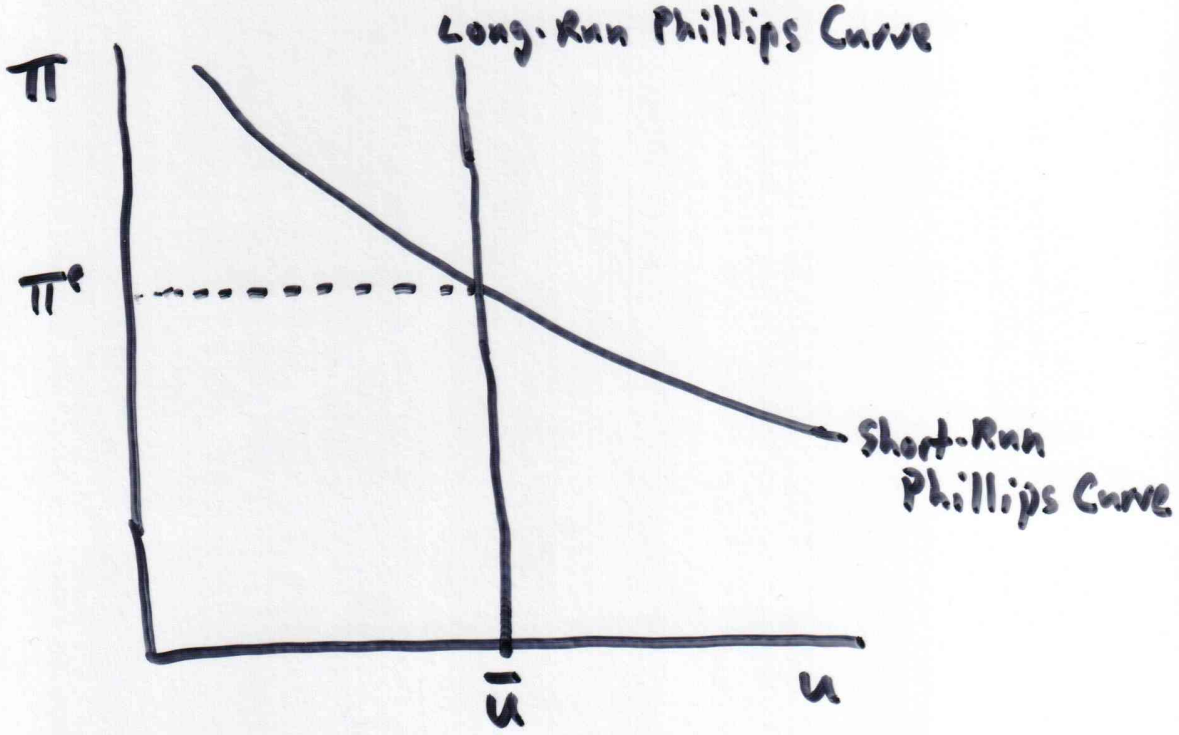
1.) A → B Non-Credible Disinflation. Expectations adjust slowly, unemployment rises.

2.) A → C Credible Disinflation. Expectations adjust immediately unemployment doesn't change.

The Natural Rate of Unemployment

- According to the Natural Rate Hypothesis, the unemployment rate tends to gravitate towards the "natural rate". Only unanticipated changes in inflation (due perhaps to unanticipated changes in AD) cause the unemployment rate to deviate from the natural rate.

- In terms of the Phillips Curve, the NRH says that in the long-run (when $\pi = \pi^e$), the Phillips Curve is vertical.



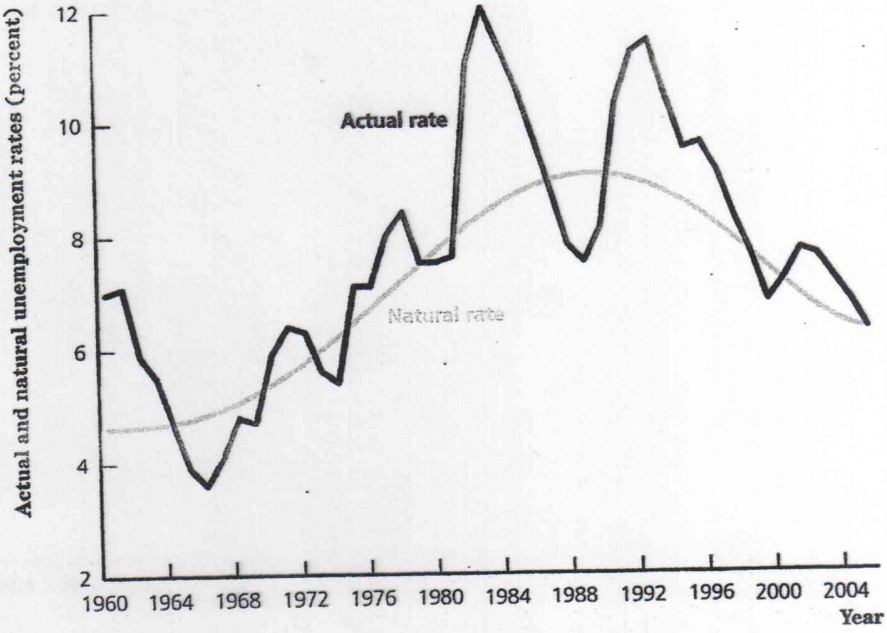
- But what exactly is this natural rate? Is it really "natural"? How do you measure it? Can policy influence it?

- In a sense, we've already addressed these questions. The natural rate can be interpreted as the unemployment rate that is consistent with the "full employment" level of output (FE Line).

$$(Y - \bar{Y})\uparrow \iff (u - \bar{u})\downarrow$$

- However, this just changes the question to what determines $\bar{Y}$. Moreover, changes in the labor force participation rate can lead to independent changes in $\bar{Y}$ and $\bar{u}$.

- Therefore, it is useful to have separate measures of $\bar{Y}$ and $\bar{u}$.



Actual and Natural Unemployment Rates in Canada

The figure shows the actual unemployment rate and an estimate of the natural rate of unemployment in Canada for the period 1960–2006. The difference between the actual and natural unemployment rates is the cyclical unemployment rate. Note that the natural rate of unemployment rose from the 1960s to the 1980s but has been fallen since.

Source: Unemployment rate: see Figure 13.2; natural rate of unemployment, estimated by the authors.

There are 2 general approaches to measuring $\bar{u}$

1.) Statistical Methods

$$\pi_t - \pi_t^e = \beta_1 (u_t - \bar{u}) + \varepsilon_t$$

Suppose $\pi_t^e = \pi_{t-1}$ (adaptive expectations)

Then run regression

$$\Delta\pi_t = \beta_0 + \beta_1 u_t + \varepsilon_t \qquad [\Delta\pi_t = \pi_t - \pi_{t-1}]$$

Then notice $\beta_0 = -\beta_1 \bar{u}$, so $\bar{u} = -\beta_0/\beta_1$

2.) Theoretical Methods

Develop an explicit theoretical model of the labor market which incorporates all the relevant institutional features of the labor market.

Determinants of the Natural Rate

1.) Demographics

2.) Technology

3.) Labor Market Institutions
(e.g., EI, job training programs etc.)

? 4.) The recent history of unemployment itself (hysteresis)

Testing the NRH

Can we test whether the NRH is true?

Idea #1: Run the regression, $\boxed{\pi_t = \alpha_0 \pi_t^e - \alpha_1 (u_t - u^n)}$

Note; in LR $\pi^e = \pi$

$$\Rightarrow \pi_t = \alpha_0 \pi_t - \alpha_1 (u_t - u^n)$$

$$\Rightarrow \pi_t = \frac{-\alpha_1}{1-\alpha_0} (u_t - u^n)$$

Slope of LR Phillips Curve $= \frac{-\alpha_1}{1-\alpha_0}$

Becomes vertical when $\alpha_0 = 1$

Thus, $\boxed{\text{NRH} \Rightarrow \alpha_0 = 1}$

Problem #1: π_t^e is unobservable

Idea #2: Assume $\pi_t^e = \sum_{i=1}^{N} \beta_i \pi_{t-i}$ [Adaptive Expectation

$$\Rightarrow \pi_t = \alpha_0 (\beta_1 \pi_{t-1} + \beta_2 \pi_{t-2} + \cdots) - \alpha_1 (u_t - u^n)$$

Problem #2: α_0 and β_i's cannot be separately estimated!

Idea #3: Impose the "intuitive" restriction that $\sum \beta_i = 1$

(A permanent one-time increase in inflation eventually becomes fully anticipated).

Empirical Results: $\alpha_0 < 1 \Rightarrow$ NRH rejected (Long-Run Phillips Curve Appears to slope Down, suggesting a LR trade-off).

Problem #3: The restriction $\sum \beta_i = 1$ may be inconsistent with the way inflation has historically evolved. For example, if inflation has been "stationary" in the past, then $\sum \beta_i < 1$. If this is true, then imposing $\sum \beta_i = 1$ leads to an underestimate of α_0 and a potentially false rejection of NRH.

Solution: Assume "Rational Expectations"
Estimate the β_i's from historical data, and impose these values in the NRH regression.

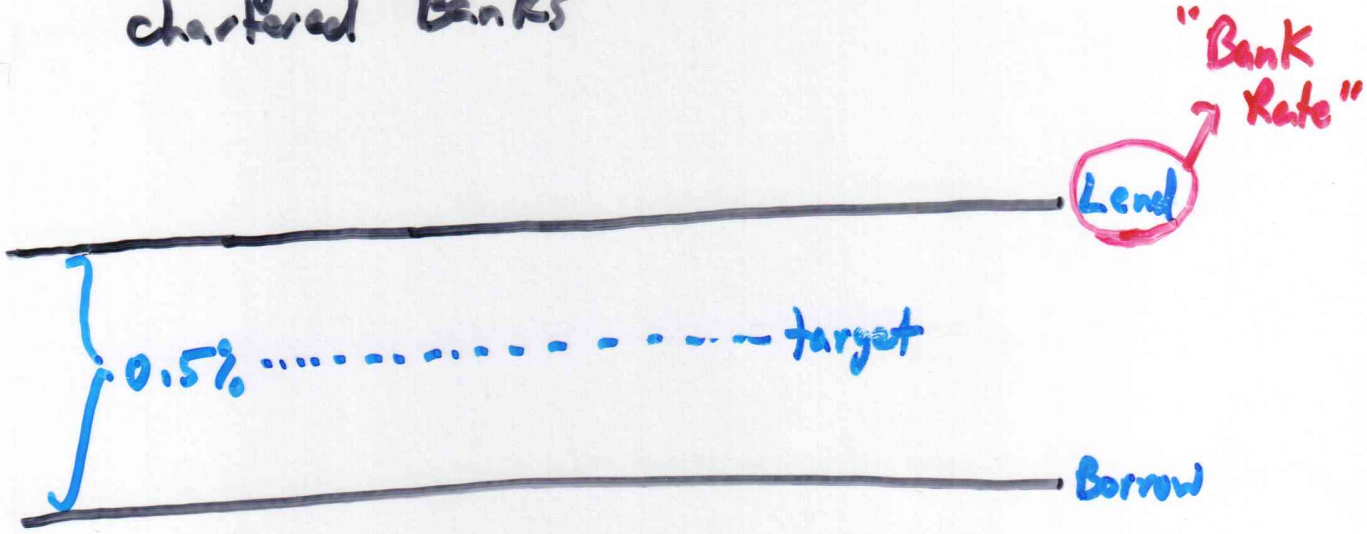
Empirical Result: $\alpha_0 = 1$. NRH confirmed!

The Instruments of Monetary Policy

- The Bank of Canada influences financial market conditions in 2 main ways:

1.) Open-Market Operations
(Buying & Selling Govt. Bonds)

2.) Setting the "target overnight rate" among chartered Banks



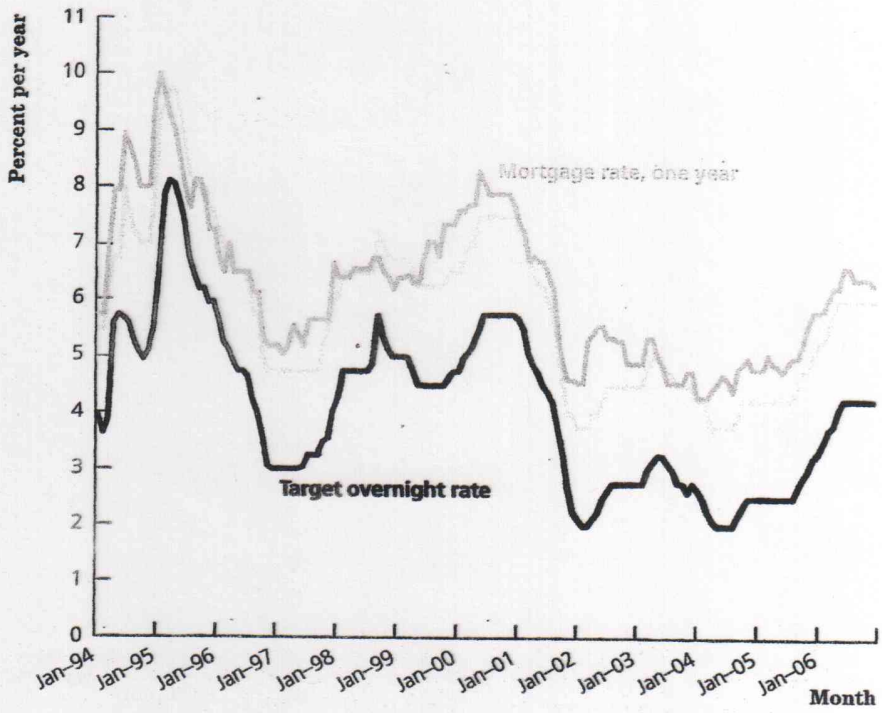
- When the Bank of Canada lends funds it increases the Monetary Base
- When the Bank of Canada absorbs funds it decreases the Monetary Base
- Therefore, the Bank of Canada can influence the Monetary Base by shifting the target overnight rate and its associated bands.

FIGURE 34.3

SHORT-TERM INTEREST RATES, 1994–2006

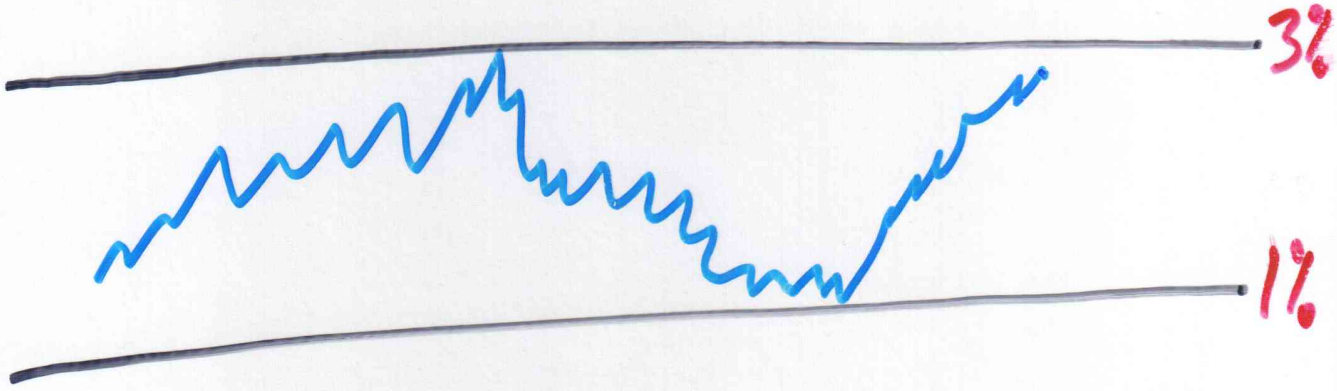
The figure shows monthly averages of the target overnight interest rate, the prime rate, and the interest rate on one-year mortgages during the period 1994–2006. Changes in the target overnight rate lead to similar changes in the interest rates administered by banks on loans and mortgages. This is a key way in which monetary policy influences the economy.

Source: Adapted from Statistics Canada, CANSIM II series v39079, v122495, and v122520.



The Goals of Monetary Policy

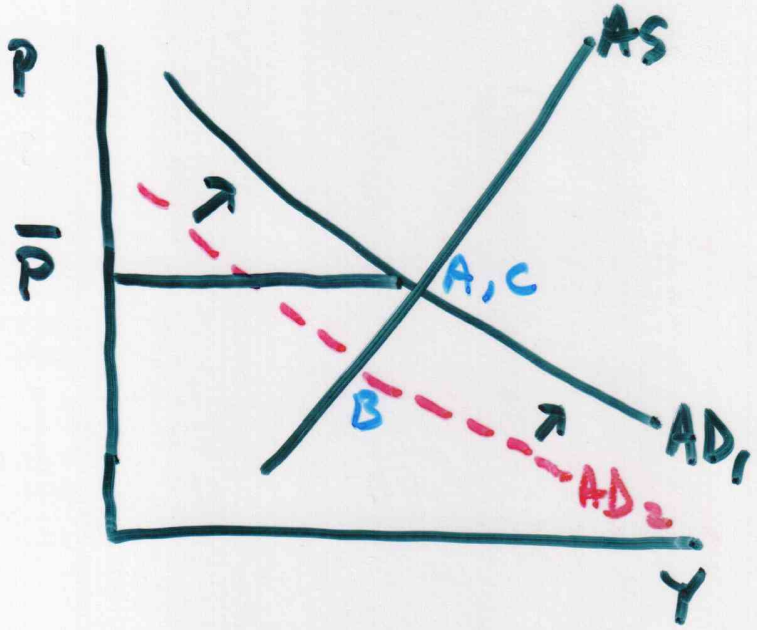
- Why does the Bank of Canada attempt to influence financial market conditions? What is it trying to achieve?
- Since 1991, Canada has followed a formal "inflation targeting" monetary policy strategy. According to this strategy, the primary goal of the Bank of Canada is a low and stable inflation rate (defined to be in the (1% to 3%) range



- As long as inflation remains within the target band, the Bank of Canada is free (indeed, is expected to) take actions that attempt to stabilize output + employment.

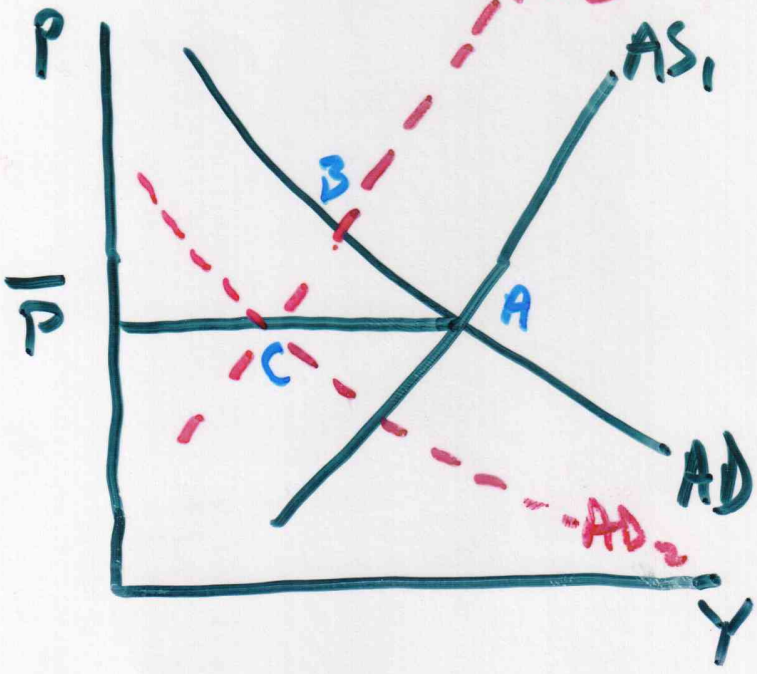
Pros & Cons of Inflation Targeting

① Demand Shocks



Inflation-Targeting stabilizes output when there are AD shocks

② Supply Shocks



Inflation-Targeting de-stabilizes output when there are AS shocks

Practical Difficulties in the Conduct of Monetary Policy

1.) Information / Data Lags

2.) Lags in the effects of monetary policy
$\Longrightarrow$ actions must be based on forecasts

3.) Uncertainty about how monetary policy affects the economy ("model uncertainty").

4.) Expectational Feedback. (Expectations concerning future policy influence outcomes today).

The Taylor Rule

- The benefits of basing monetary policy on an explicit objective are now widely appreciated by most countries

- There is also widespread agreement that, operationally, Central Banks should base policy on a systematic (but flexible) rule.

- Unfortunately, there is less agreement about what exactly this rule should be.

- In practice, it appears that many Central Banks follow a simple rule whereby the interest rate responds to just two variables
  1.) The current deviation of inflation from the inflation target
  2.) The current "output gap" (deviation between current output & the full-employment output).

- These kinds of rules are called "Taylor Rules".

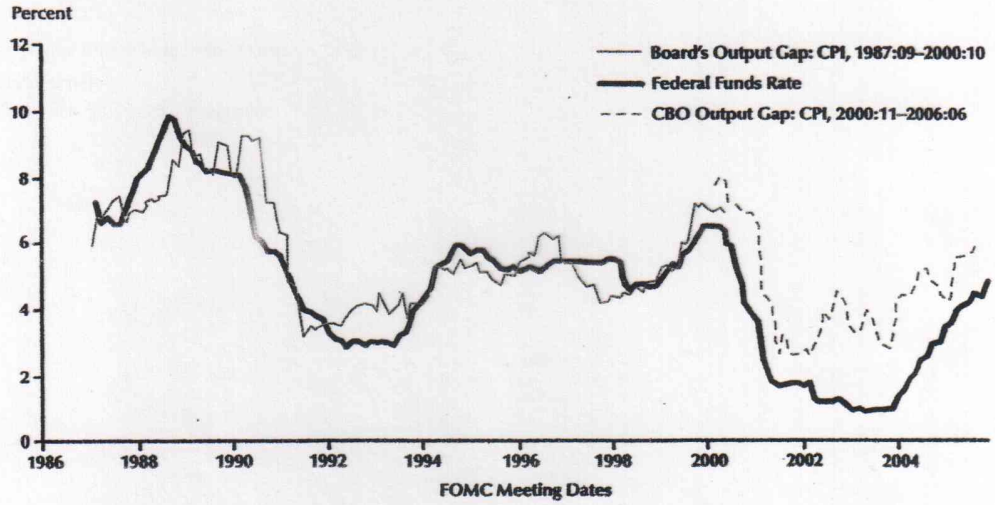
The Taylor Rule

$$i_t = \pi_t + r^* + 0.5(\pi_t - \pi^*) + 0.5(y_t - \bar{y}_t)$$

- r^*: the "natural" rate of interest
- π^*: target inflation
- y_t: actual output
- $\bar{y}_t$: full employment output

Figure 1

Greenspan Years: Federal Funds Rate and Taylor Rule
(CPI $p^* = 2.0$, $r^* = 2.0$) $a = 1.5$, $b = 0.5$



- In practice, estimating $\bar{y}_t$ can be challenging. If $\bar{y}_t$ is mismeasured, it can produce policy errors.