

MEDIUM-TERM ADJUSTMENT AND THE INFLATION DYNAMIC

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STATE OF YOUR KNOWLEDGE

- Shocks can divert output from the long-term trend. → **generating business cycles volatility.**
- Deviation from the long-term level can be in conjunction with the inflation/deflation → **generating business cycles comovement.**
- Account for general properties of business cycles under two different contexts: **closed v.s. opened economy**

DEVIATION FROM TREND.

Questions:

Can this be occurring permanently?

If not, what is the adjustment process?

How long does it take time?

Think about the effect of money shocks as an example.

MONEY AND BUSINESS CYCLES

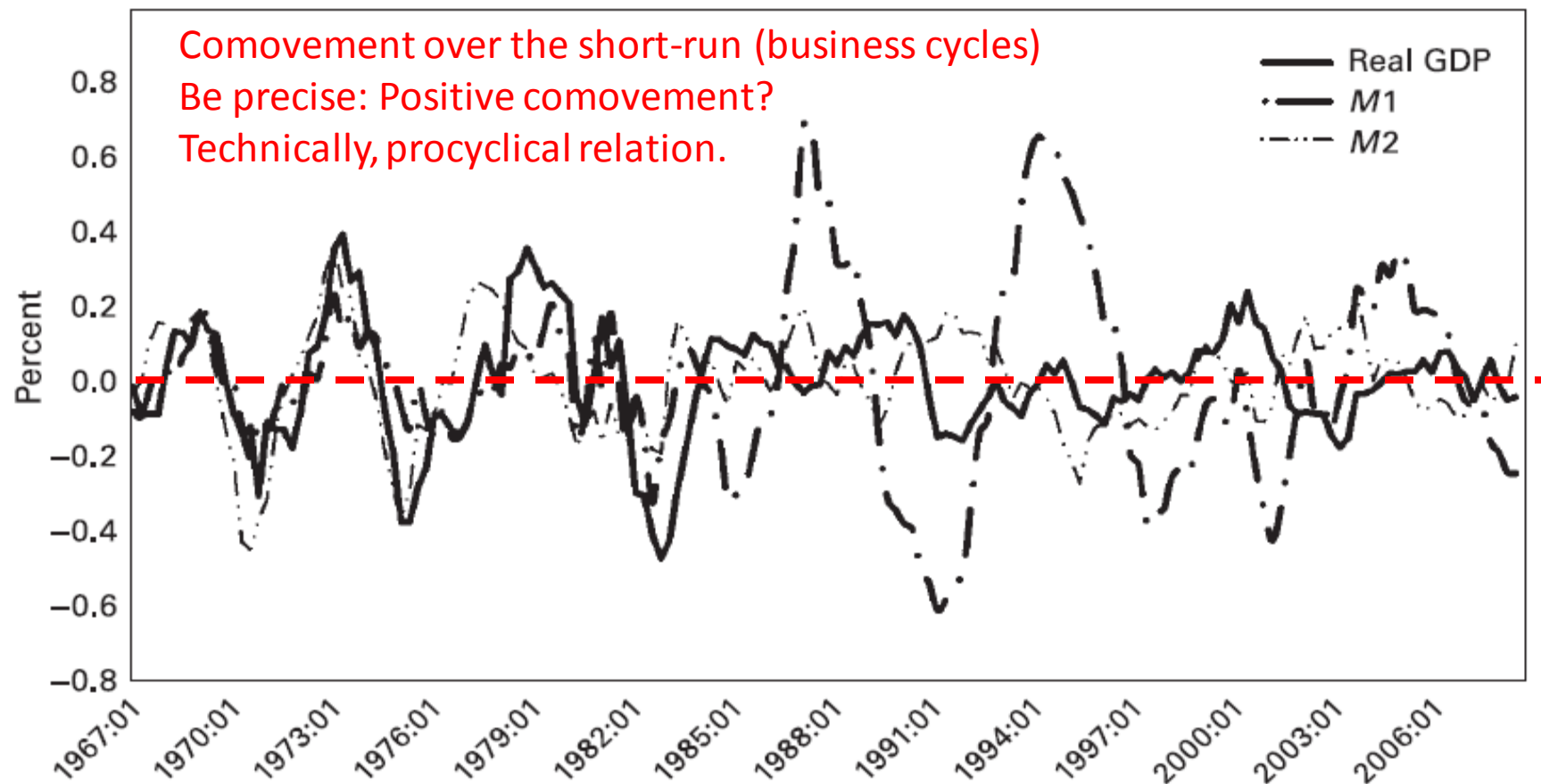
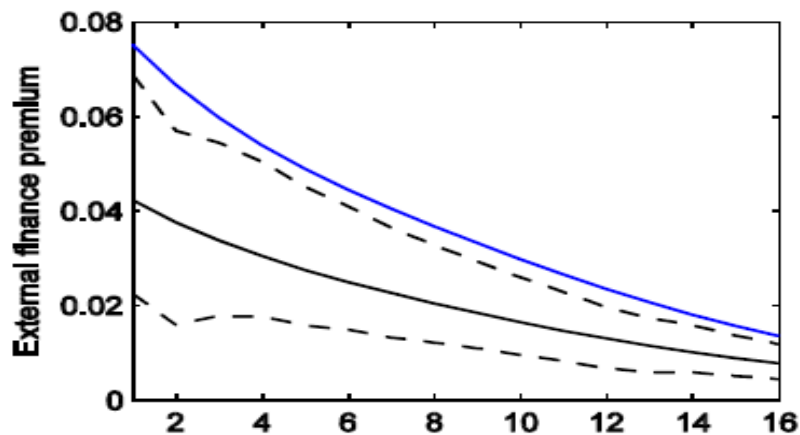
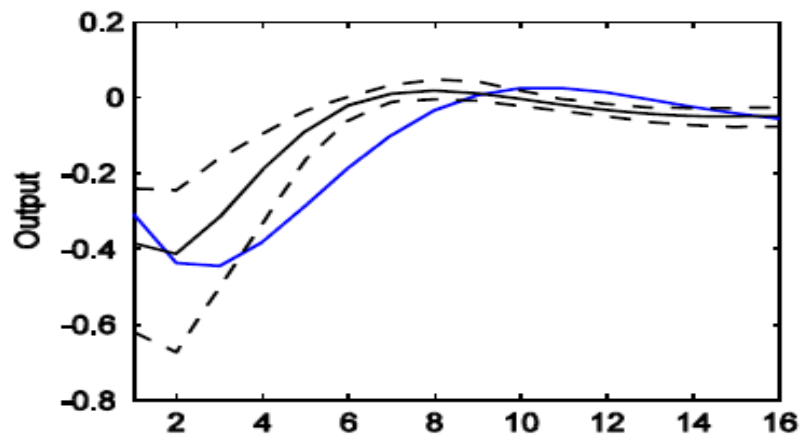
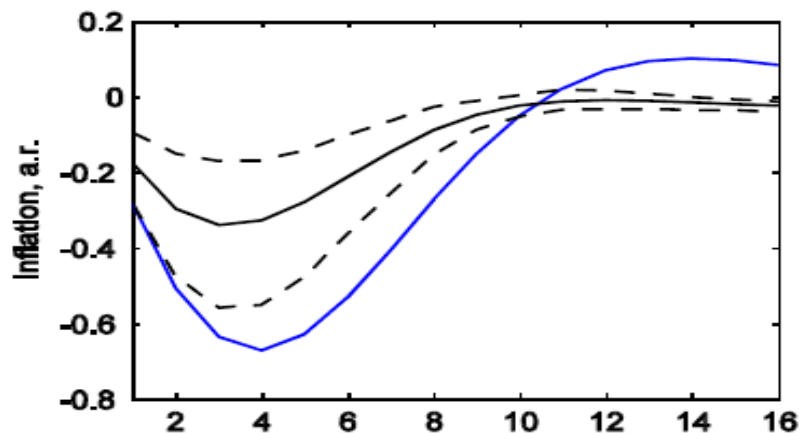
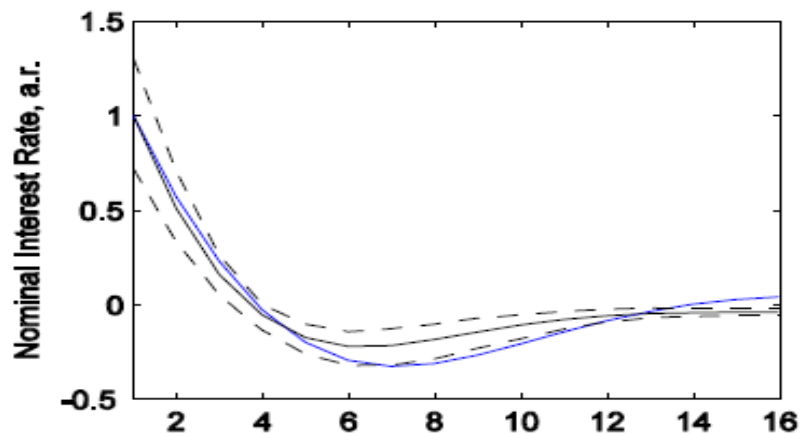


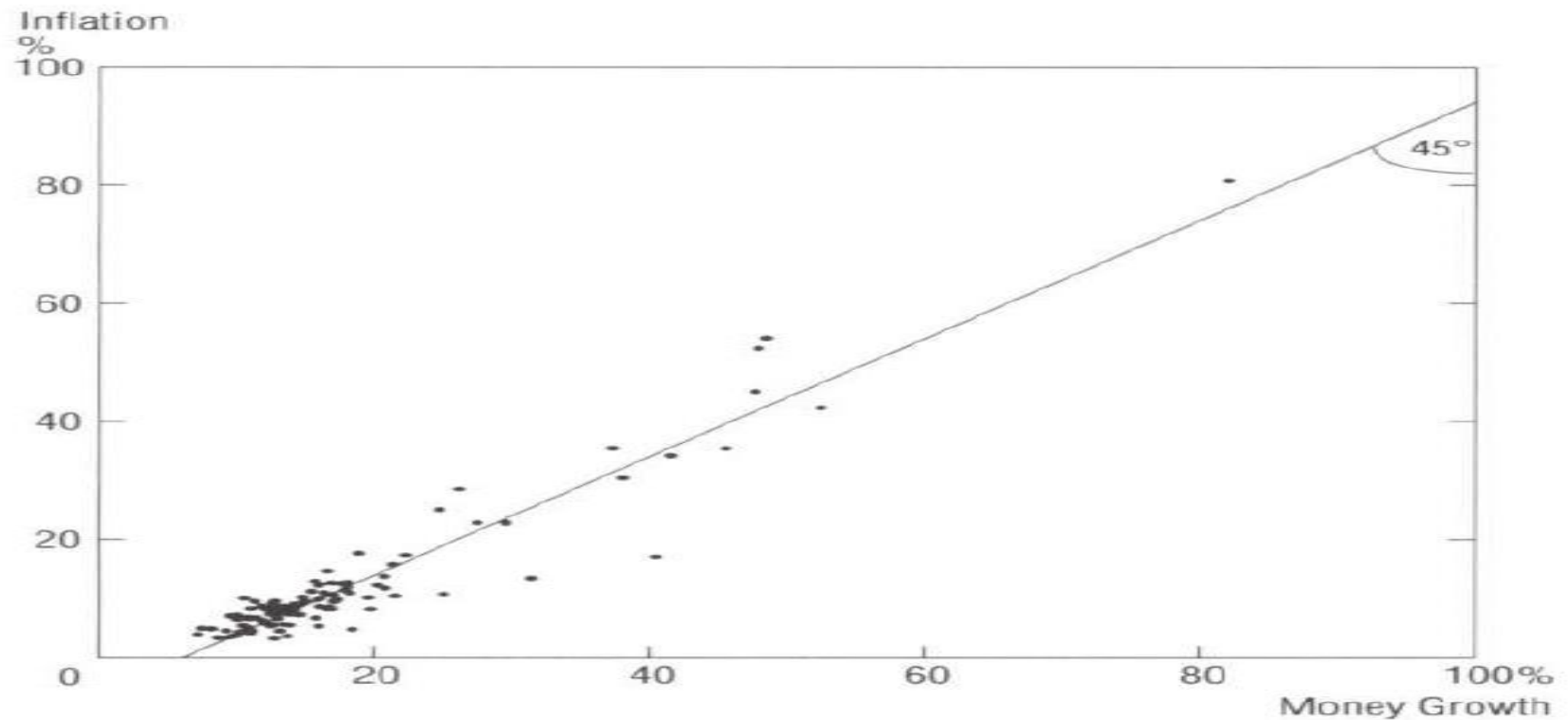
Figure 1.6
Detrended money and real GDP, 1967:1–2008:2.

SHOCK DOES NOT LAST FOREVER.



MONEY AND INFLATION: LONG-TERM EVIDENCE

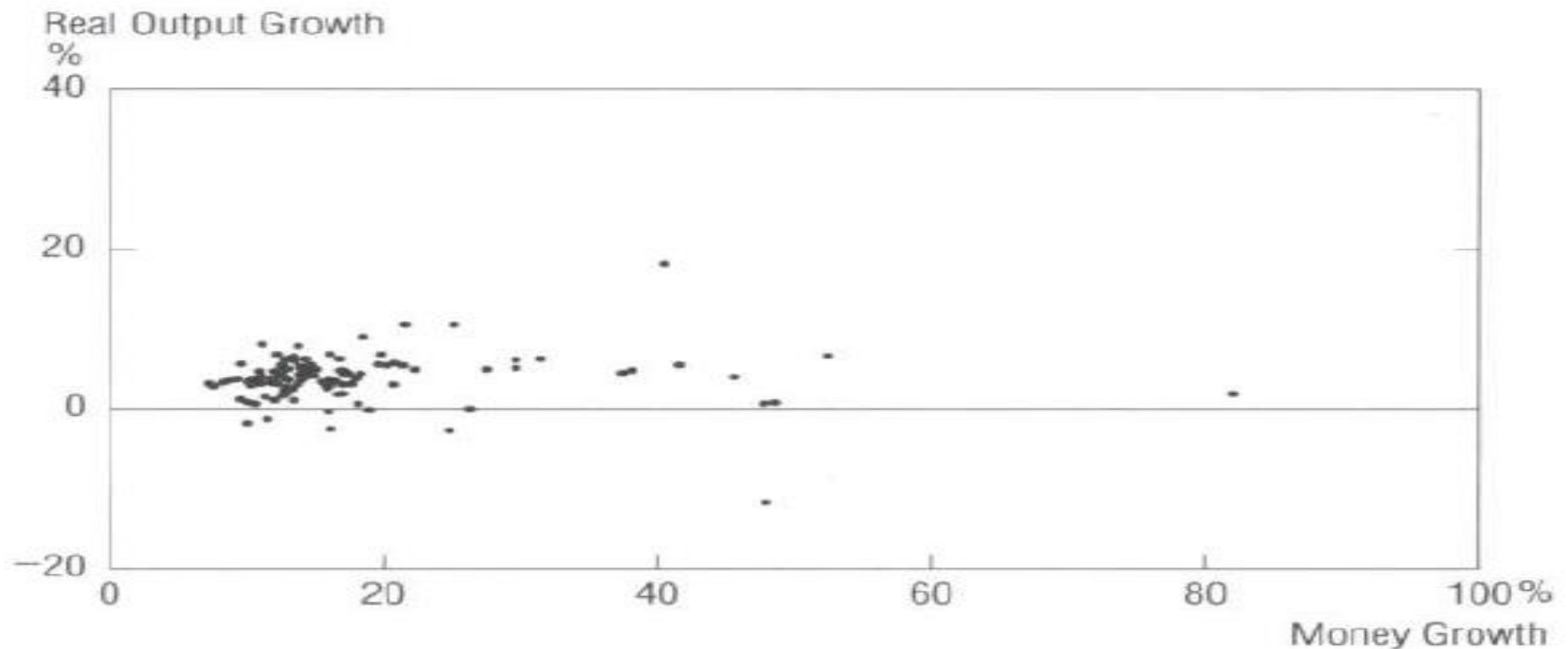
Average Annual Rates of Growth in M2 and in Consumer Prices During 1960–90 in 110 Countries



Source: International Monetary Fund

MONEY AND OUTPUT: LONG-TERM EVIDENCE

Average Annual Rates of Growth in M2
and in Nominal Gross Domestic Product, Deflated by Consumer Prices
During 1960–90 in 110 Countries



Source: International Monetary Fund

DEVIATION FROM TREND.

Question:

- Can this be occurring permanently? If not, what is the adjustment process? How long does it take time?
 - Empirically, the answer appears to be NO.
 - Doesn't seem to last forever.
 - Slowly converge back to trend line...

- Statistical evidences... but why?

MEDIUM-TERM ADJUSTMENT THEORY

- Conventional wisdom drawn from **statistical evidences** is that output would tend to revert to the trend through some adjustments process in **labor market** and **inflation dynamic**.
- Provide “**theoretical foundations**” that explains about inflation/labor market adjustment and how economy reverts to the long-term trend, called **medium-term adjustment**.

HISTORICAL EVOLUTION OF COMPETING THEORIES

- Knowledge on medium-term theory and Inflation dynamic has its **long history**.
- The state-of-art on our existing knowledge has by far come a long way, undergoing **several battles and debates in their ideas and beliefs**. (at least since 1960s)
- It is worth understanding **how theory has evolved over time**, and how academic literature has gradually reached to the point where we are currently standing.

COMPARE / CONTRAST ON

- **Question 1:** What do they view about inflation dynamic? Essential features?
- **Question 2:** How we reach medium-term adjustment?
- **Question 3:** Policy implications

HISTORICAL EVOLUTION OF COMPETING THEORIES

Keynesian

- Q1: Permanent trade-off in inflation / unemployment / output
- Q2: No discussion about medium-term adjustment.
- Q3: Supporting activism policy (fiscal policy)

Monetarist revolution

- Q1: No permanent trade-off; Natural level exists
- Q2: Inflation expectation acceleration
- Q3: Constant money supply rule.

HISTORICAL EVOLUTION OF COMPETING THEORIES:

New classical

- Q1: No permanent trade-off / price misinterpretation.
- Q2: Inflation expectation; quick response.
- Q3: Rule-based policy; avoid being a source of shock

New Keynesian

- Q1: No permanent trade-off / price/wage rigidity
- Q2: Inflation expectation; but slowly adjust because of frictions.
- Q3: Systematic Feed-back policy

AGENDA

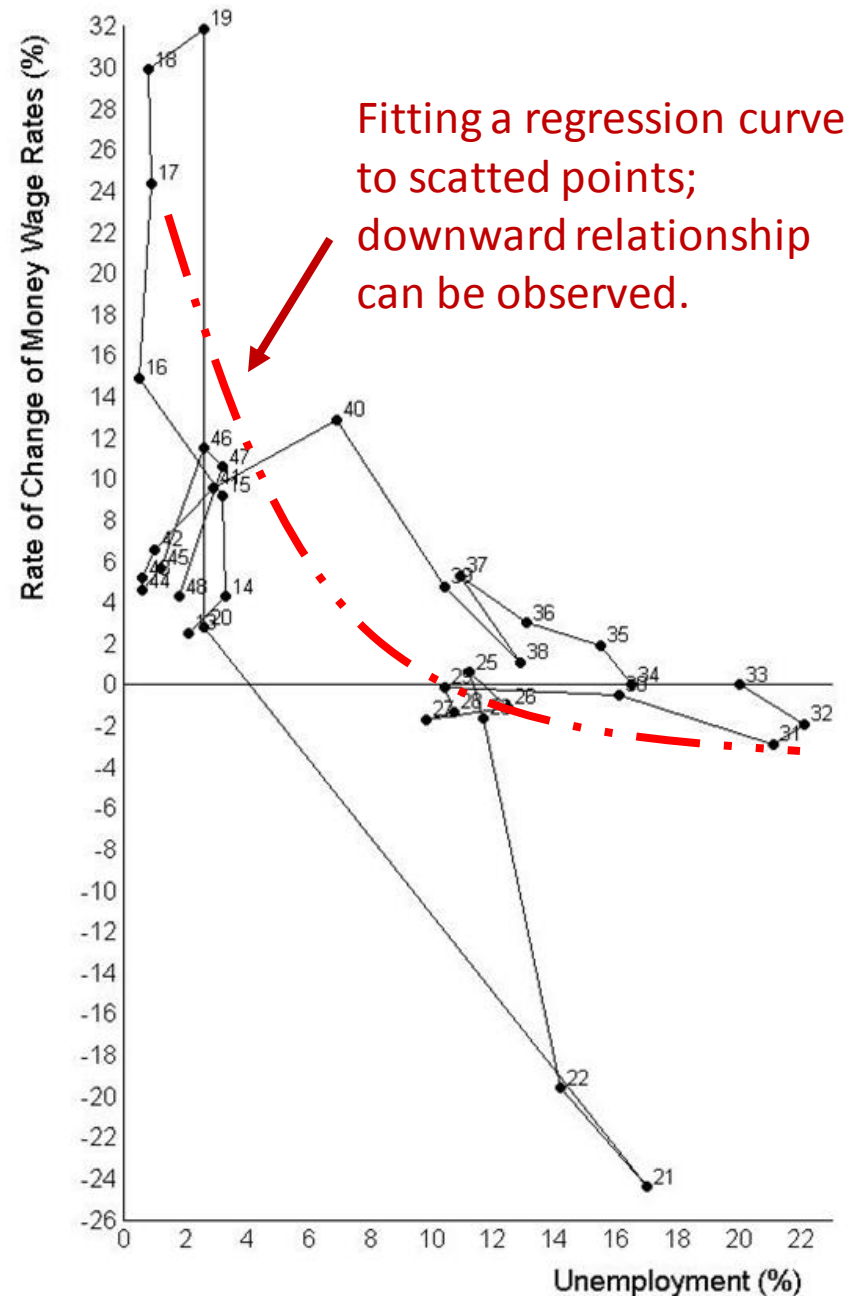
- **Keynesian**
- Monetarist
- New Classical
- New Keynesian

THE DISCOVERY OF INFLATION DYNAMIC

- Comovement between **prices** and **real economic activities** was first mentioned in economics in 1958.
- 1958 **A.W. Phillips** discovered the inverse relation between the rate of unemployment and the rate of increase in money wages.
 - **Wage inflation** decreases with **unemployment rate**.
 - Studies based on the UK data for 1861-1957.
 - The relation has been highly stable.

THE DISCOVERY

- The relation between wage inflation and unemployment rate for the UK during 1913-1948.



THE NAME '*PHILLIPS CURVE*'



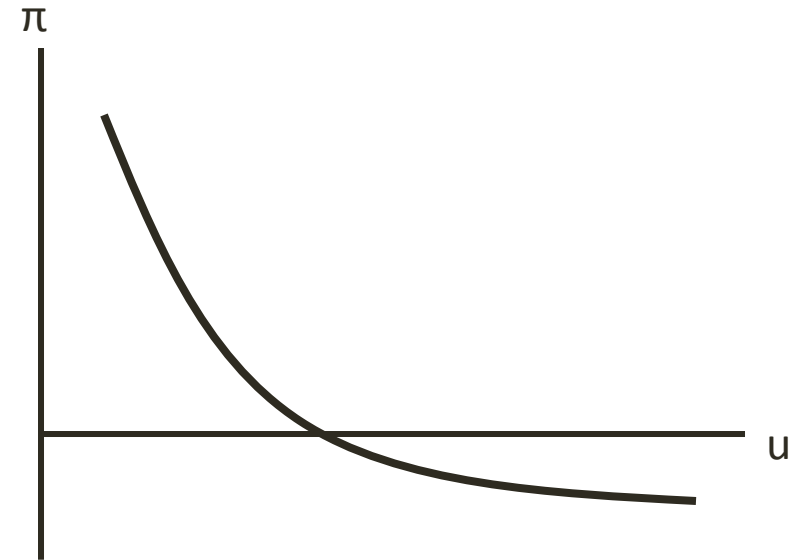
Alban William Phillips (1914-1975),
the London School of Economics.

- 1960 Paul Samuelson and Robert Solow found a similar relation in the US data for 1900-1960.
 - The relation is dubbed '**the Phillips curve**'.
- Subsequently, economists uncovered a similar relation when looking into the comovement between the **CPI inflation** and the **unemployment rate**.

THE PHILLIPS CURVE

Non-linear Phillips curve

$$\pi_t = \varepsilon \left(\frac{1}{u_t} \right)$$



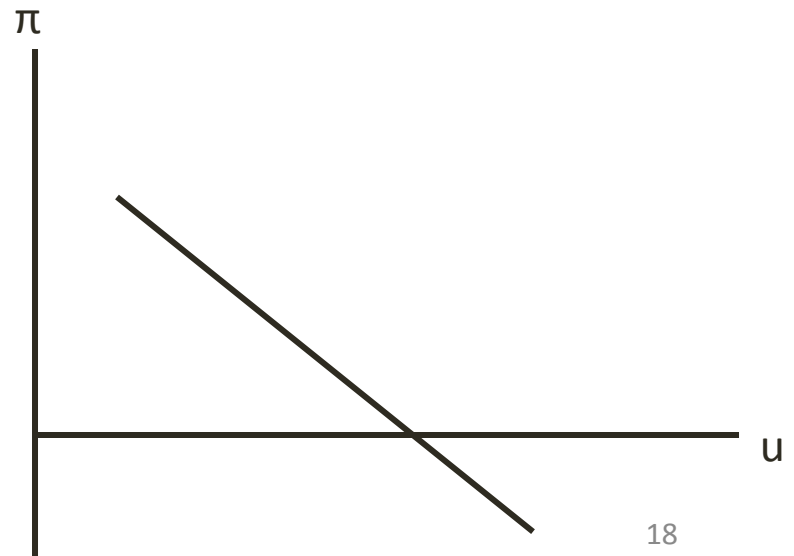
π = the rate of inflation.

u = the rate of unemployment.

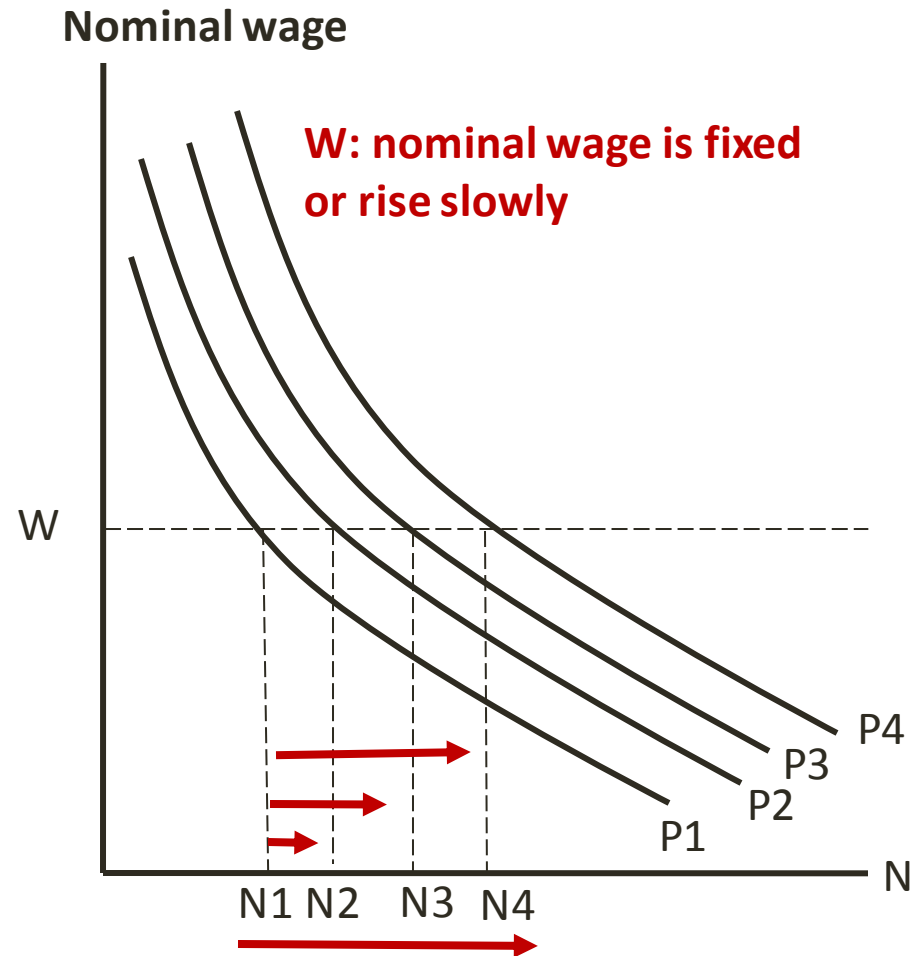
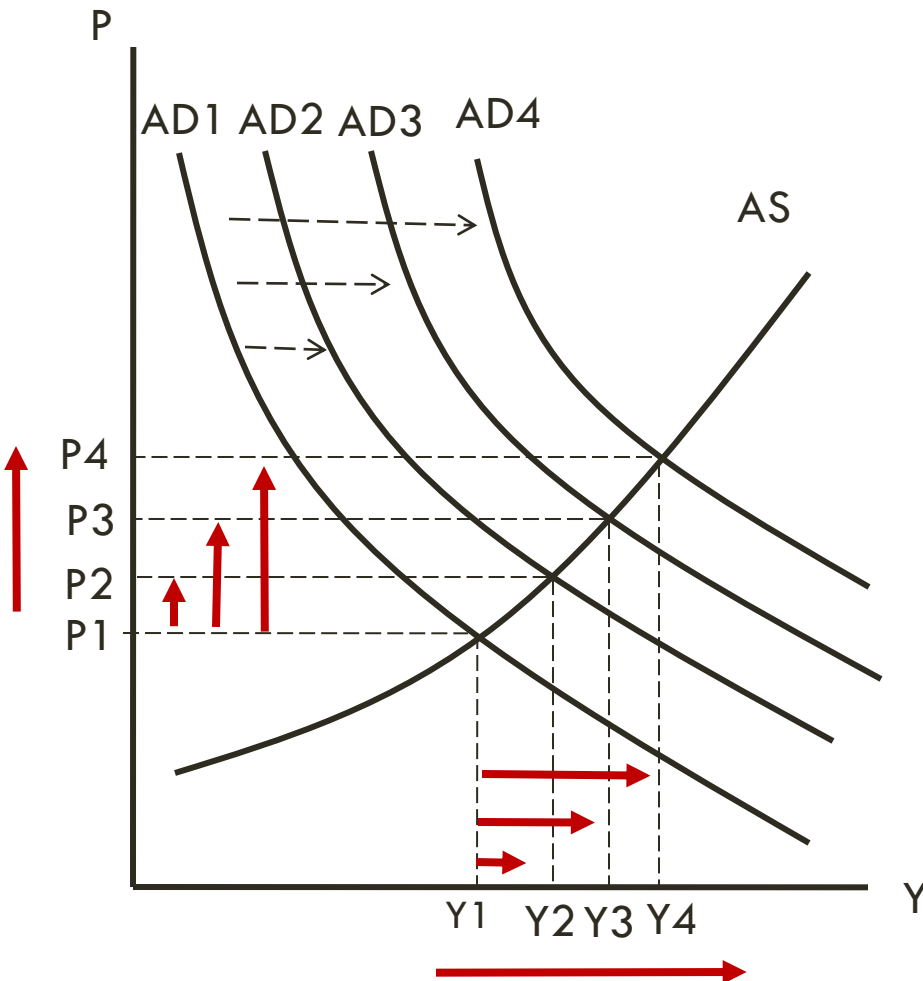
ε = the strength of the effect of u_t on π_t .

Linear Phillips curve

$$\pi_t = -\varepsilon(u_t)$$

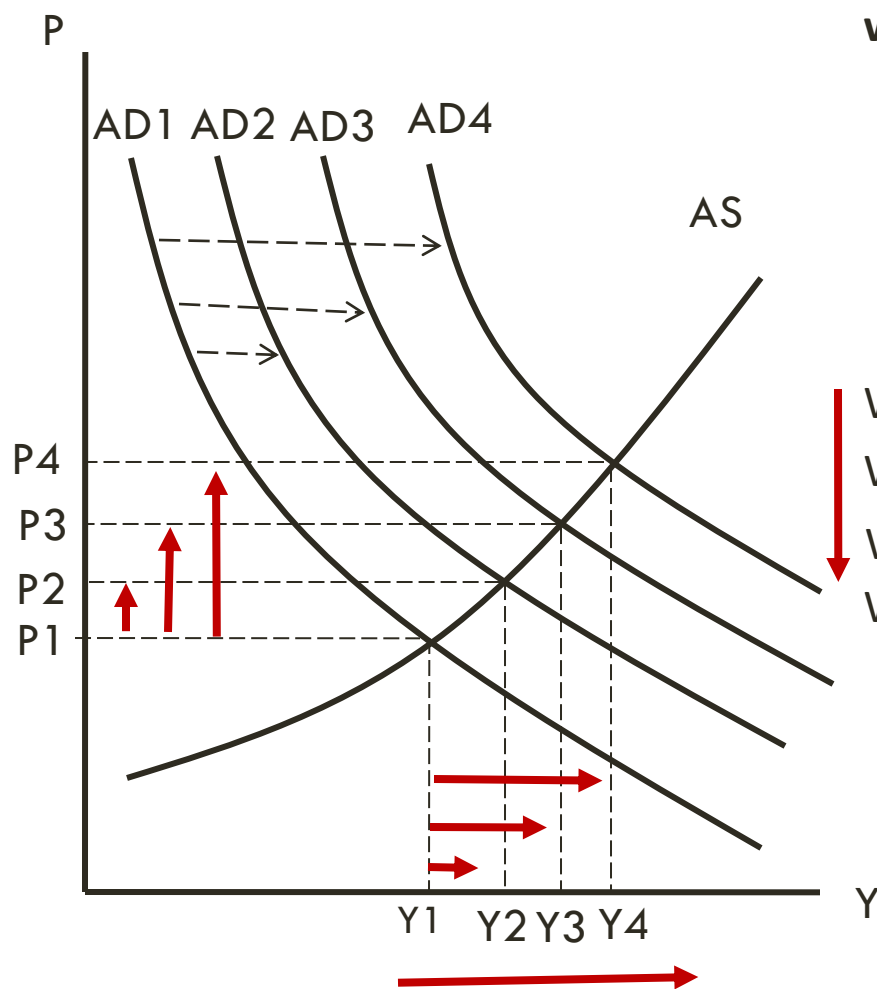


KEYNESIAN INTERPRETATION: NOMINAL WAGE

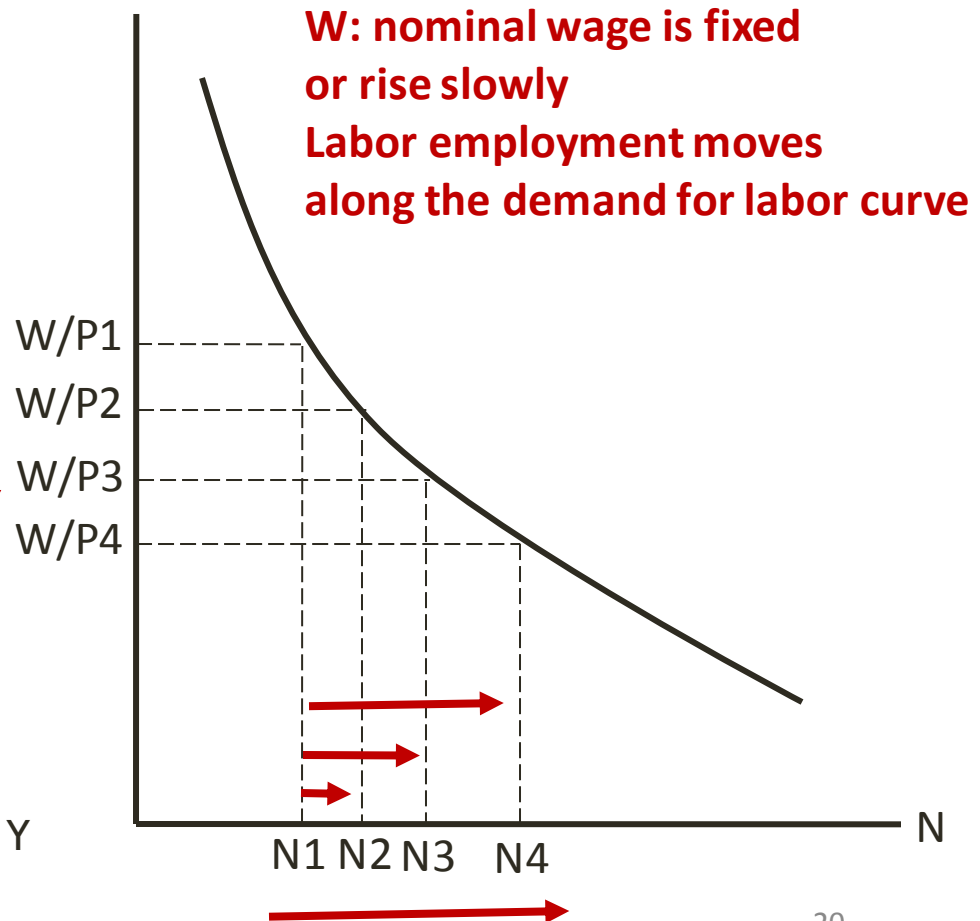


Higher employment; lower unemployment rate

KEYNESIAN INTERPRETATION: REAL WAGE



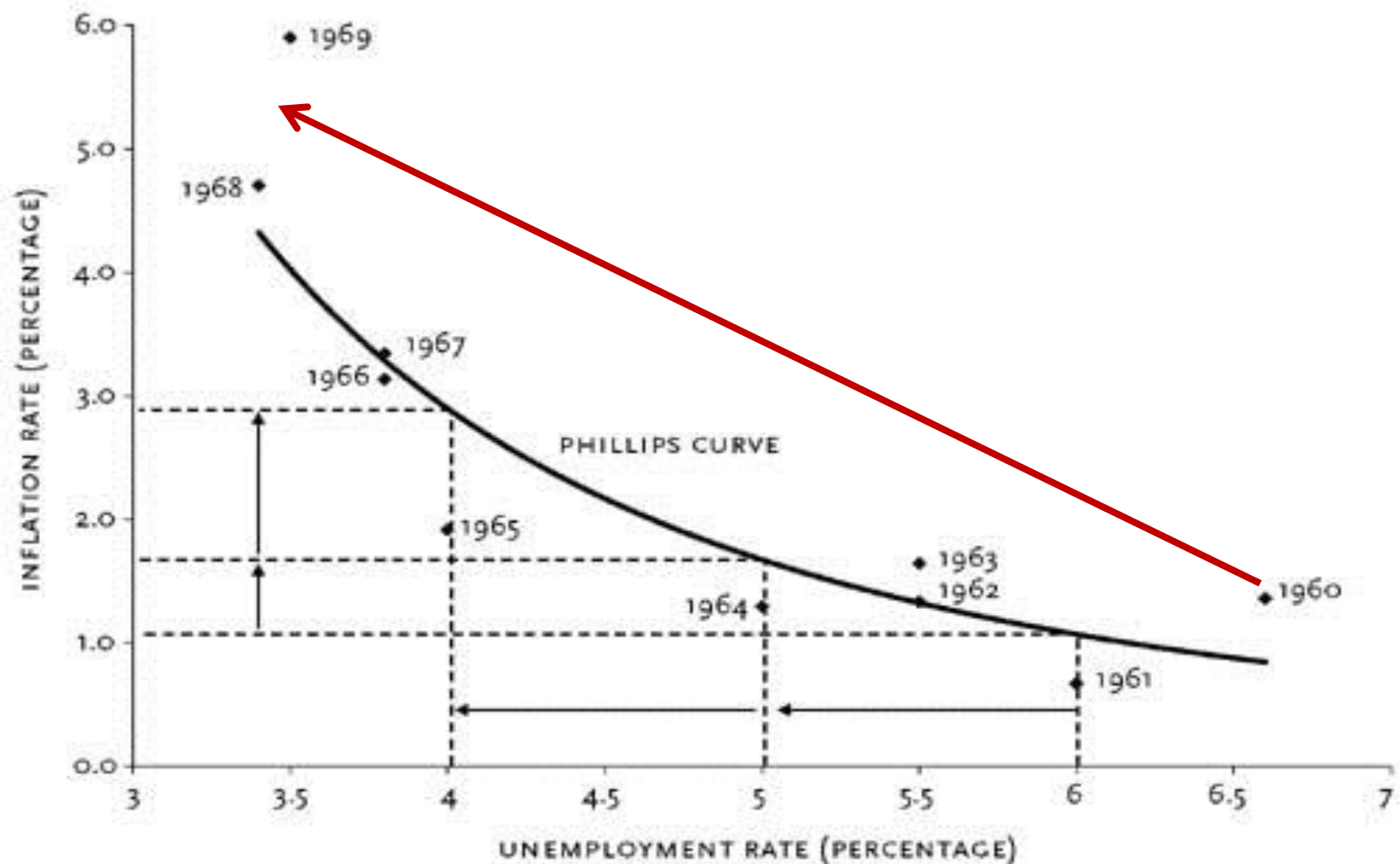
$w = W/P$ (real wage)



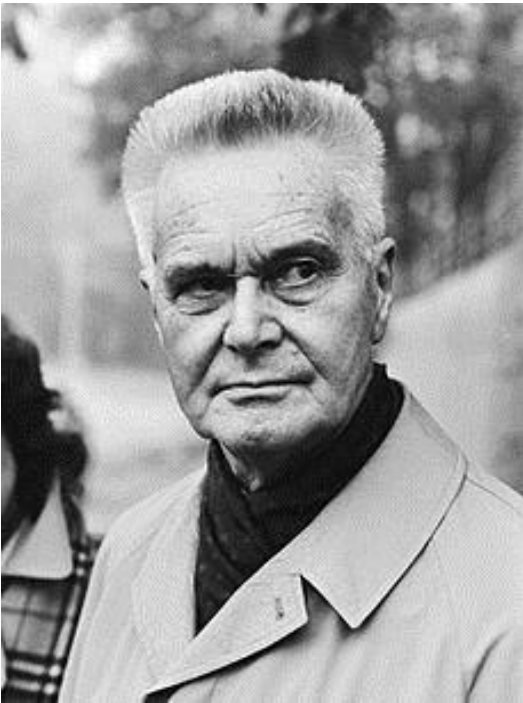
POLICY IMPLICATIONS

- Provide no discussion about medium-term adjustment.
- There is a **trade-off** between *inflation* and *unemployment*; it is thought to be a **permanent** one!
 - Active intervention works, i.e. interventionist!
- Policymakers can choose between different **combinations of inflation and unemployment**, based on **preferences**.
 - (observed) Outcomes determined by preference.

Inflation and unemployment outcome between 1960 – 1969: The role of (endogenous) evolution of policy preferences.



THEORY OF ECONOMIC POLICY



Dutch economist (1903-1994)
Nobel Laureate in 1969
(Prize shared with Ragnar Frisch)

Contributions:

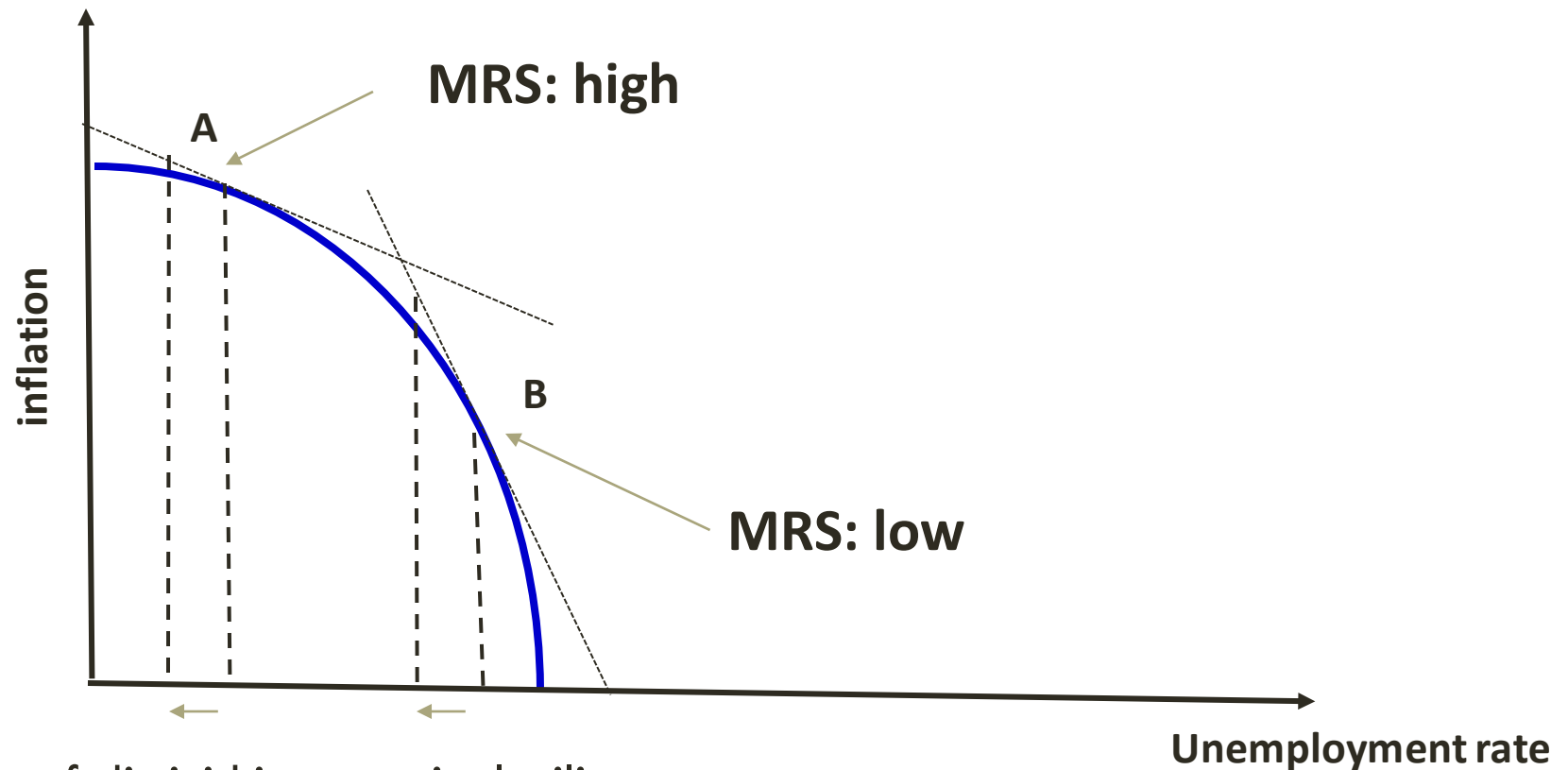
- Applied **statistical/econometric framework** in dynamic macroeconomics analysis.
- Advocate the use of **macroeconometrics model** for **policy planning decision**.
- Provide a framework of the theory that guides economic policy decision-making, i.e. **theory of economic policy** (Tinbergen 1952)
 - #Instruments = #Goals

POLICY PREFERENCE

- One common (intuitive) way to capture policymakers' preference is to consider a **loss function**.
- Why loss function?
 - Both inflation and unemployment are **BAD**.
- A commonly used loss function is the **quadratic loss function**.

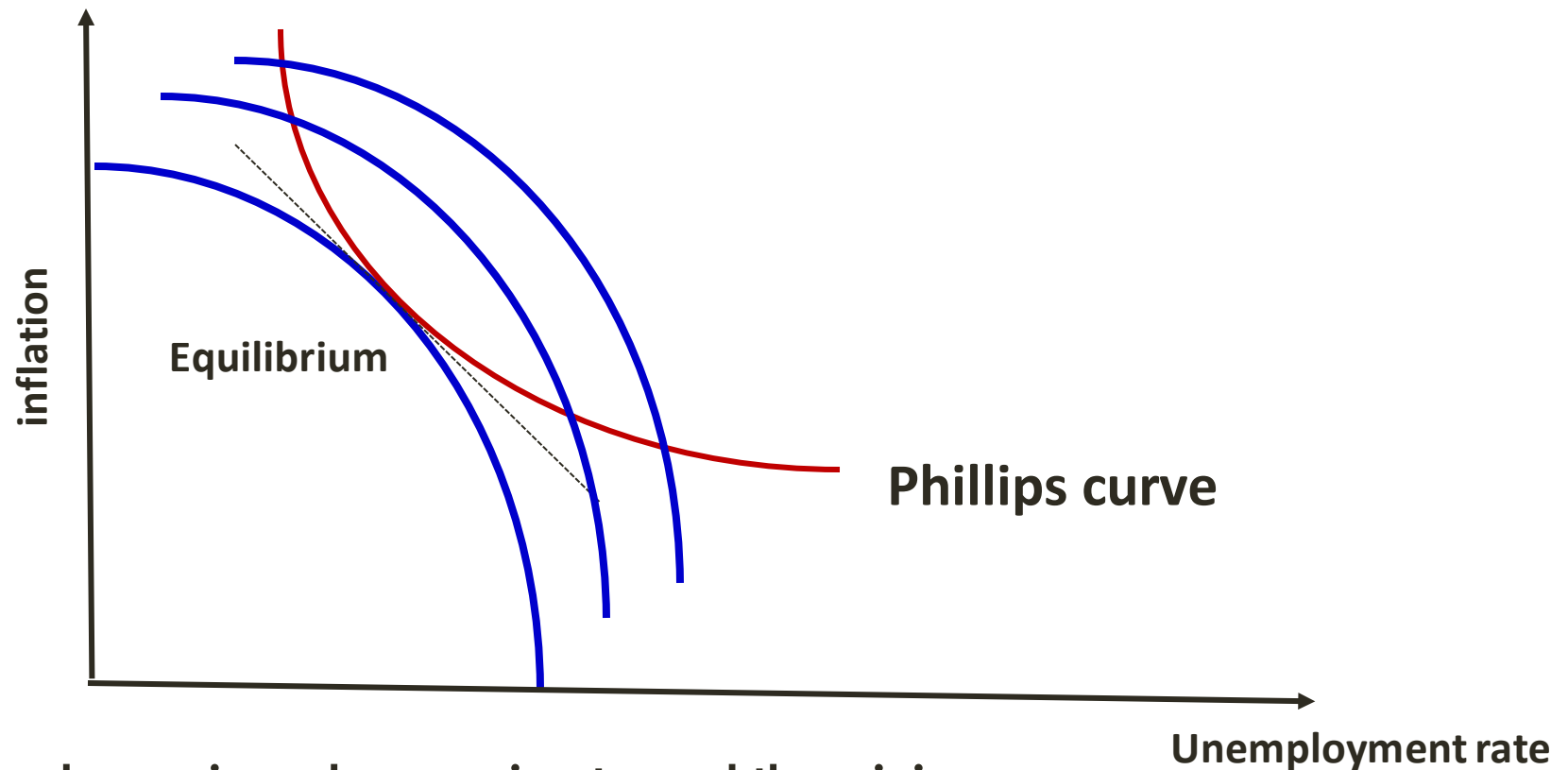
$$L = \alpha_{\pi}\pi^2 + \alpha_u u^2$$

POLICY PREFERENCE



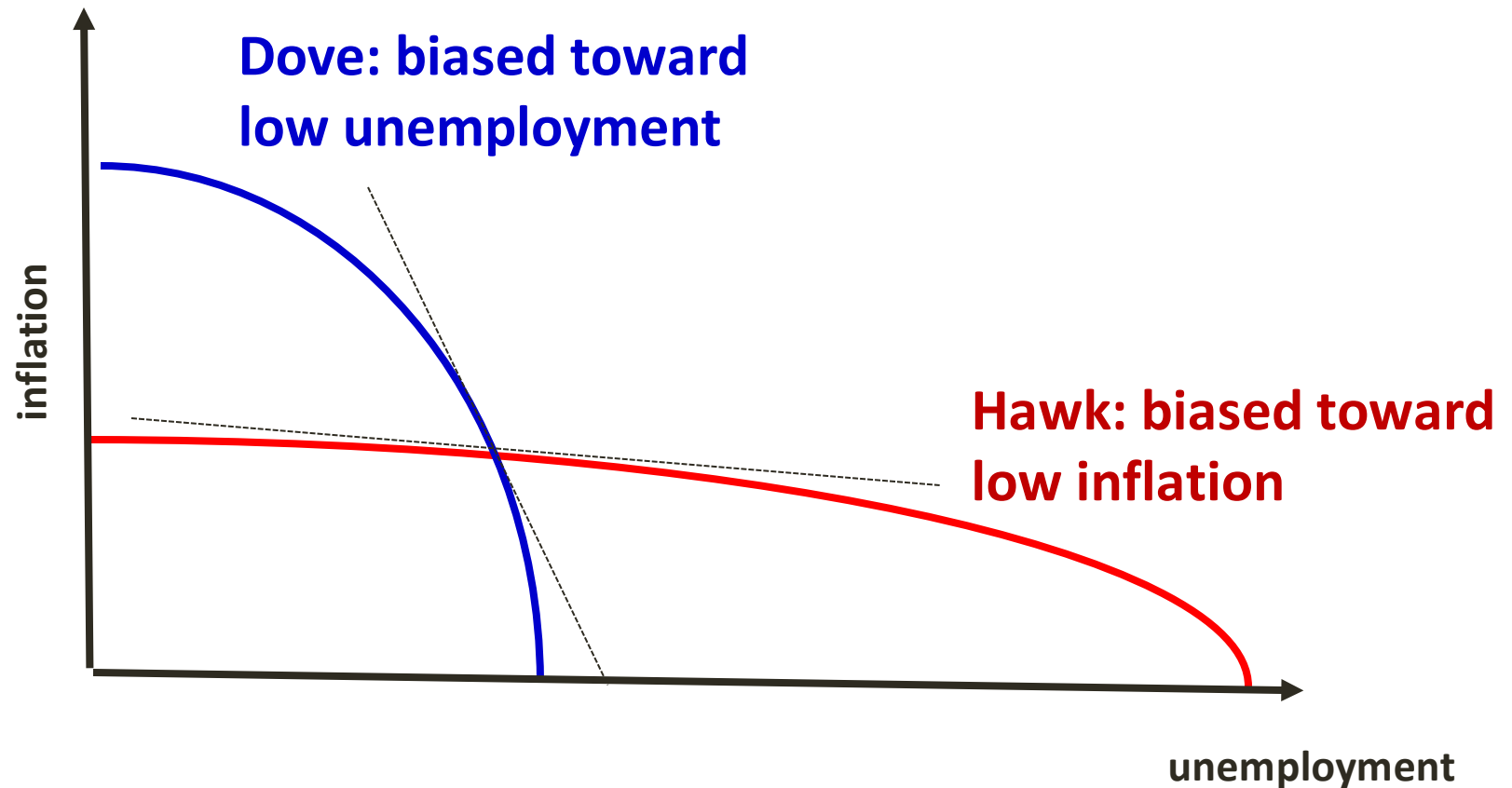
- Law of diminishing marginal utility
- Government is **willing to sacrifice** with **higher inflation** rate for a lower 1% unemployment **more under B** (low inflation) **than under A** (high inflation).

INFLATION/UNEMPLOYMENT AS A RESULT OF POLICY CHOICE DECISION



- Loss decreasing when moving toward the origin.
- **Equilibrium: loss function is tangent to the Phillips curve.**
 - $MRS = \text{Actual sacrifice ratio implied by Phillips curve.}$

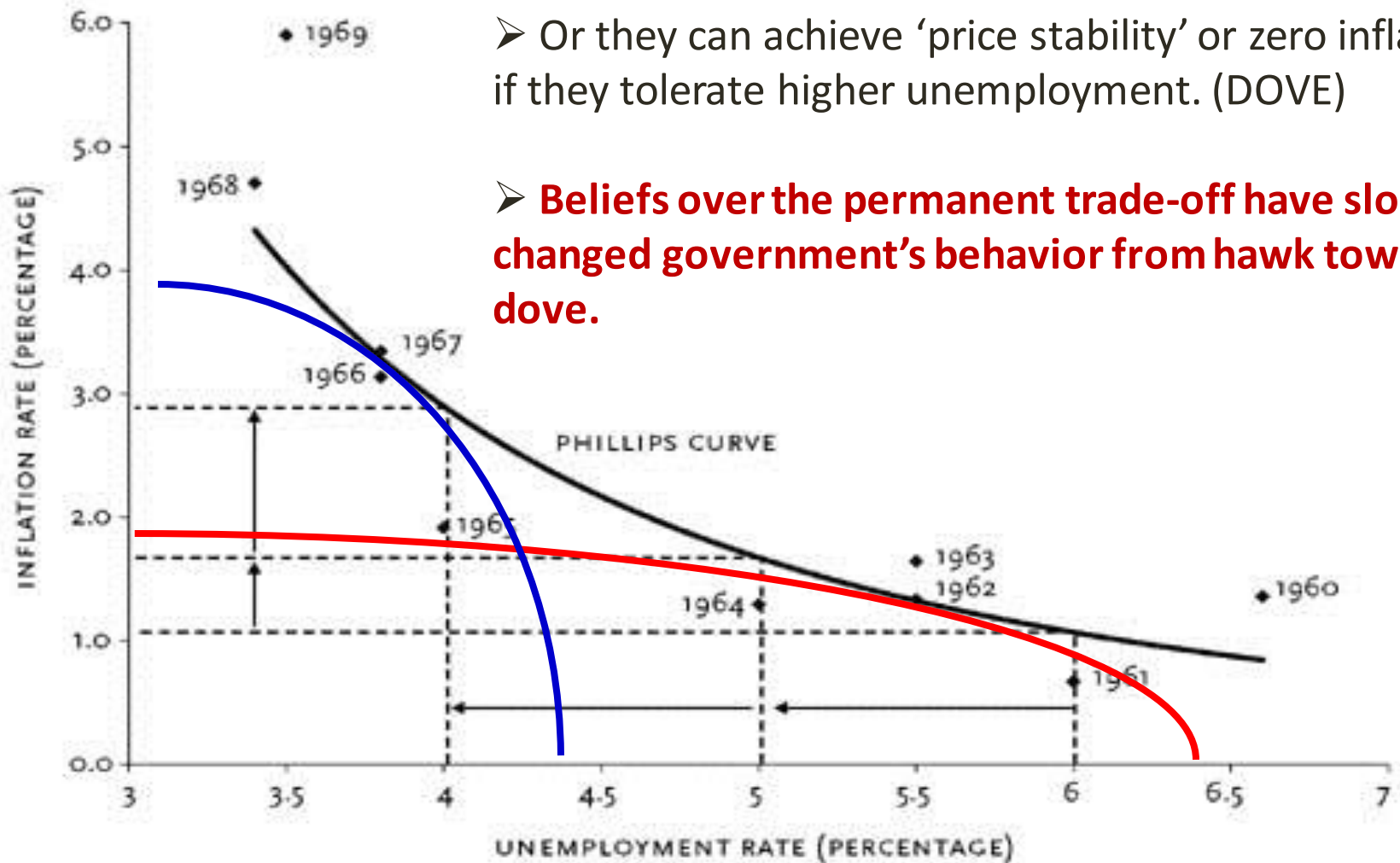
POLICY PREFERENCE: *HAWK V.S. DOVE*



➤ They can achieve low unemployment if they are willing to tolerate higher inflation. (HAWK)

➤ Or they can achieve 'price stability' or zero inflation if they tolerate higher unemployment. (DOVE)

➤ **Beliefs over the permanent trade-off have slowly changed government's behavior from hawk towards dove.**



The curve became an empirical basis of Keynesian economics of the 1960s.

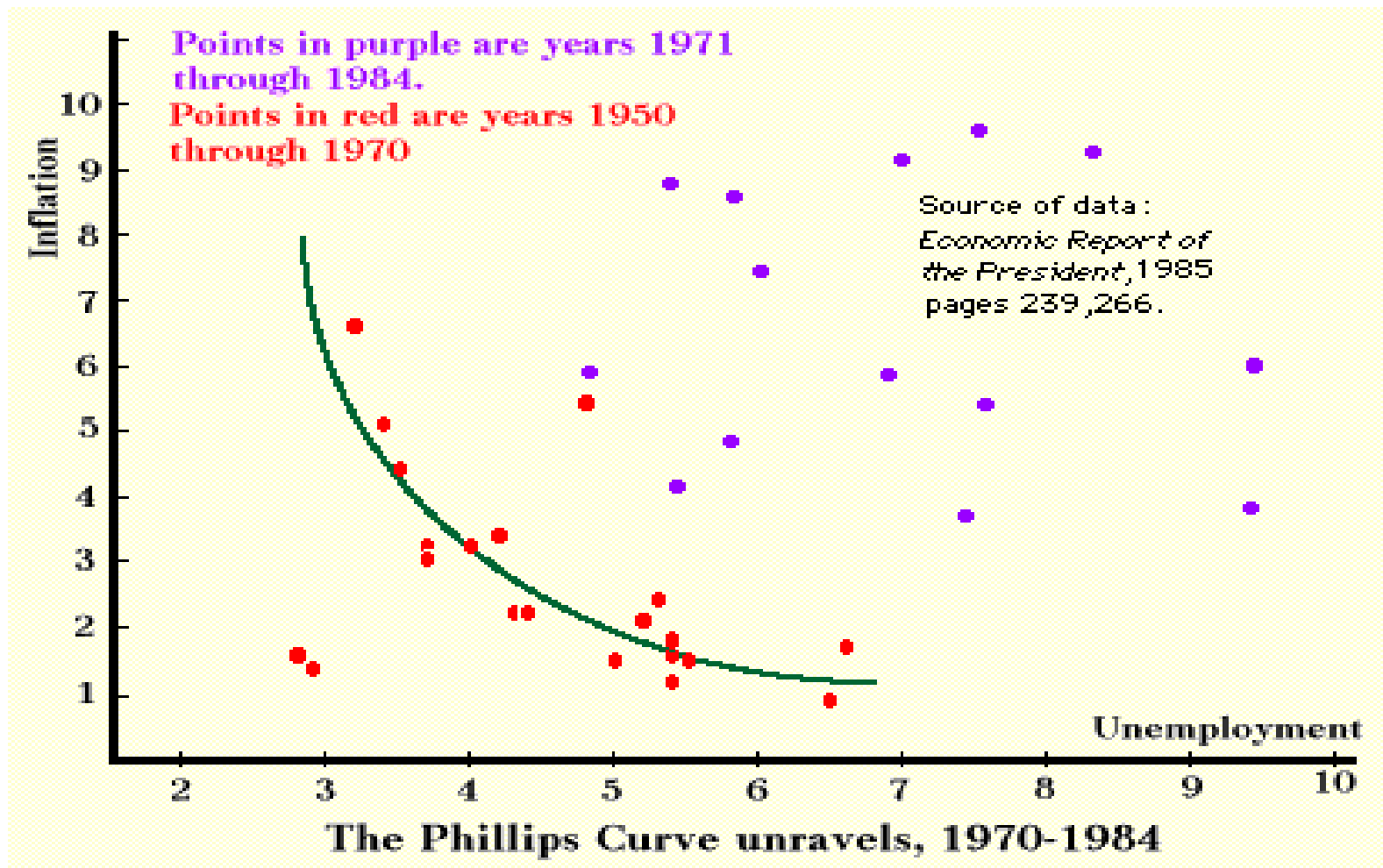
AGENDA

- ~~Keynesian~~
- **Monetarist**
- New Classical
- New Keynesian

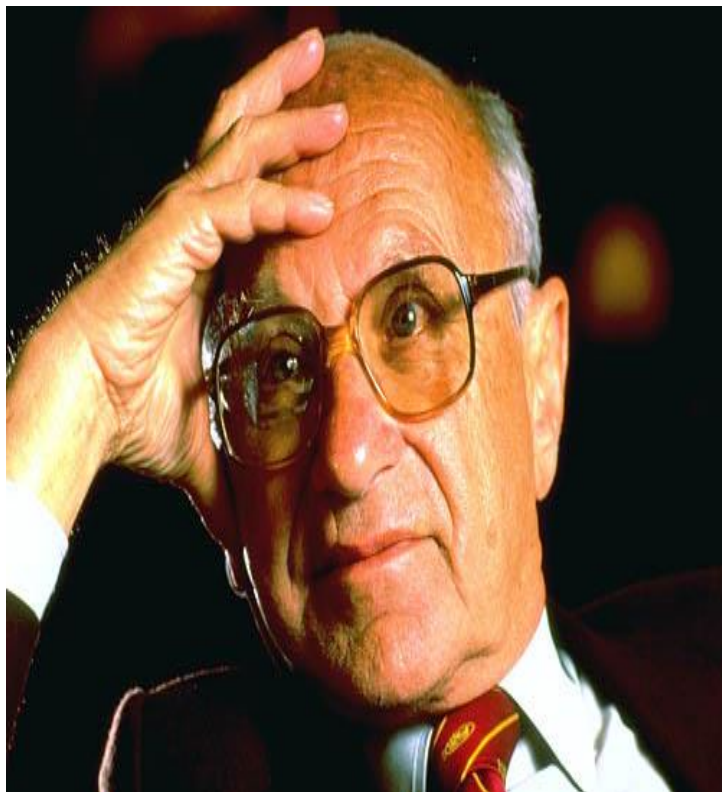
THE BREAKDOWN

- Some economists warned that the relation may be **superficial**; however, no one listened back then.
 - No proof of the data supporting their idea.
- **In the 1970s, the Phillips curve broke down.**
- High inflation and high unemployment --- **stagflation**.
 - Oil price hikes by the OPEC.
 - Persistent positive inflation caused people to amend their expectations about inflation and their behaviors --- **expected inflation**.
 - Effects of expected inflation on wage/price settings.

THE TRADE-OFF BREAKDOWN

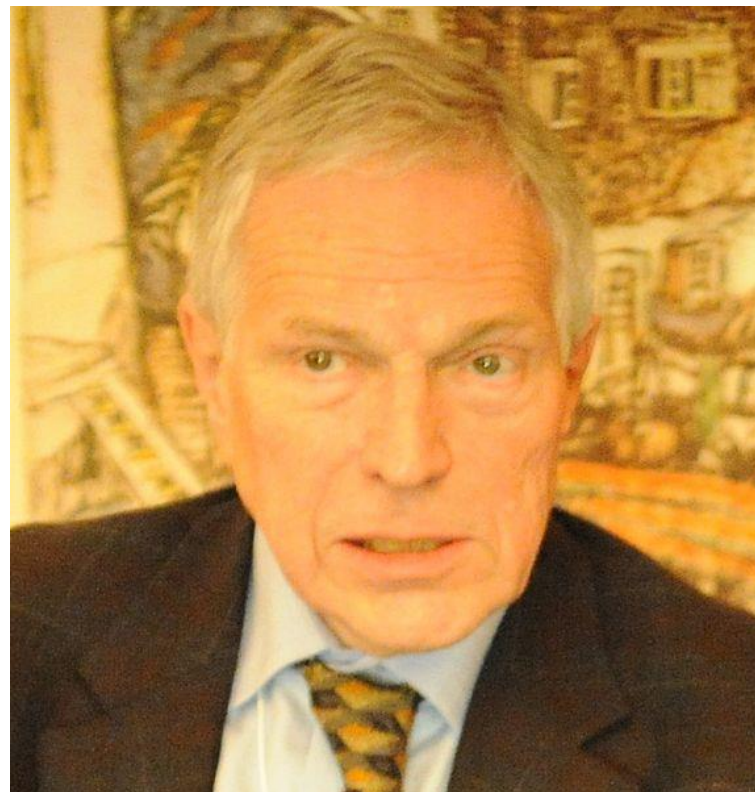


“Theory ahead of the measurement”



Milton Friedman (1912-2006),
University of Chicago

Nobel Prize 1976.



Edmund S. Phelps, Jr. (b1933),
Columbia University

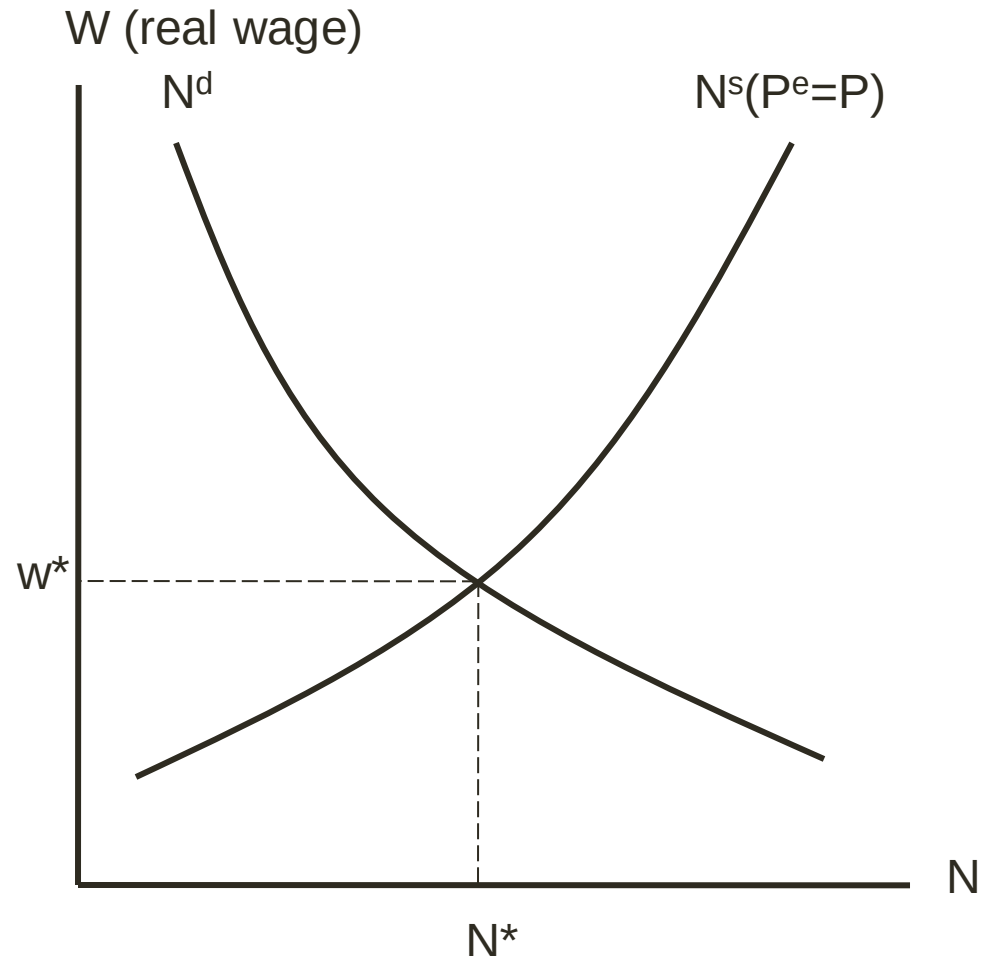
Nobel Prize 2006.

CRITIQUE BY FRIEDMAN AND PHELPS

- Milton Friedman and Edmund Phelps (1968):
- The trade-off works if ***inflation is near zero***.
 - It requires workers to under-predict inflation repeatedly. (Why wouldn't labor raise wage to keep up with inflation?)
 - **The natural rate of unemployment** exists in the labor market.
 - If the government keeps unemployment below the natural rate, the result will be higher inflation.
 - **The trade-off disappears in the long run, i.e. vertical long-run Philips curve.**

THE NATURAL RATE OF UNEMPLOYMENT

The equilibrium **real wage rate** (w^*) when workers have adjusted to the price change.



THE NATURAL RATE OF UNEMPLOYMENT

- Natural rate of unemployment is **positive**.
- It is determined by the structure (and efficiency) of the labor market, i.e. **frictions and distortions**.
 - Legal minimum wage rate, other benefits from employers, unemployment benefits.
 - Labor unions' strength; labor protection laws.
 - Labor market information cost and availability.
- It changes overtime as the labor market structure changes.

THE EXPECTATIONS-AUGMENTED PHILLIPS CURVE

$$\pi_t = \pi_t^e - \varepsilon(u_t - u^*)$$

π_t = the inflation rate at period t .

π_t^e = the *expected inflation* rate for period t .

u_t = the unemployment rate at period t .

u^* = the natural rate of unemployment.

ADAPTIVE EXPECTATIONS HYPOTHESIS

$$\pi_t^e = \theta \pi_{t-1}$$

$$0 \leq \theta \leq 1$$

$$\pi_t = \theta \pi_{t-1} - \varepsilon(u_t - u^*)$$

The agent predicts current inflation based on *past inflation*.

NEAR-ZERO INFLATION BEFORE 1970

The UK and US economies before 1970 had very low inflation --- θ is near zero.

- So the **traditional Phillips curve** was valid, given u^* .

$$\pi_t = \pi_t^e - \varepsilon(u_t - u^*)$$

$$\pi_t^e = 0$$

$$\pi_t = -\varepsilon(u_t - u^*) = \varepsilon u^* - \varepsilon u_t$$

NEAR-ZERO INFLATION BEFORE 1970

$$\pi_t^e = \theta \pi_{t-1}$$

$$0 \geq \theta \geq 1$$

$$\pi_t = \theta \pi_{t-1} - \varepsilon(u_t - u^*)$$

$\theta = 0$: stable relation between inflation and unemployment --- **traditional Phillips curve**.

$\theta > 0$: current inflation depends on past inflation and unemployment.

$$\pi_t = \theta \pi_{t-1} - \varepsilon(u_t - u^*)$$

$$\theta = 1$$

$$\pi_t - \pi_{t-1} = -\varepsilon(u_t - u^*)$$

$\theta = 1$, the unemployment rate affects the rate of change in the inflation rate, given u^* .

- If $u > u^*$, decelerating (decreasing) inflation.
- If $u < u^*$, accelerating (increasing) inflation.

HIGH PERSISTENT INFLATION FROM 1970

- The case for augmented-expected inflation began to receive the support in 1970s.
- People change the way they form **inflation expectations**.
 - The value of θ was rising quickly and finally close to 1.
 - This-year inflation is expected to be the same as last-year inflation.
 - The original Phillips curve (and trade-off) broke down.

THE MODIFIED PHILLIPS CURVE

$$\pi_t - \pi_{t-1} = -\varepsilon(u_t - u^*)$$

- The **change in inflation** depends on the difference between the actual and the natural unemployment rates, i.e. **unemployment gap**.
- When $u > u^*$, inflation decreases (decelerating).
 - When $u < u^*$, inflation increases (accelerating).
 - If $u = u^*$, inflation is constant.

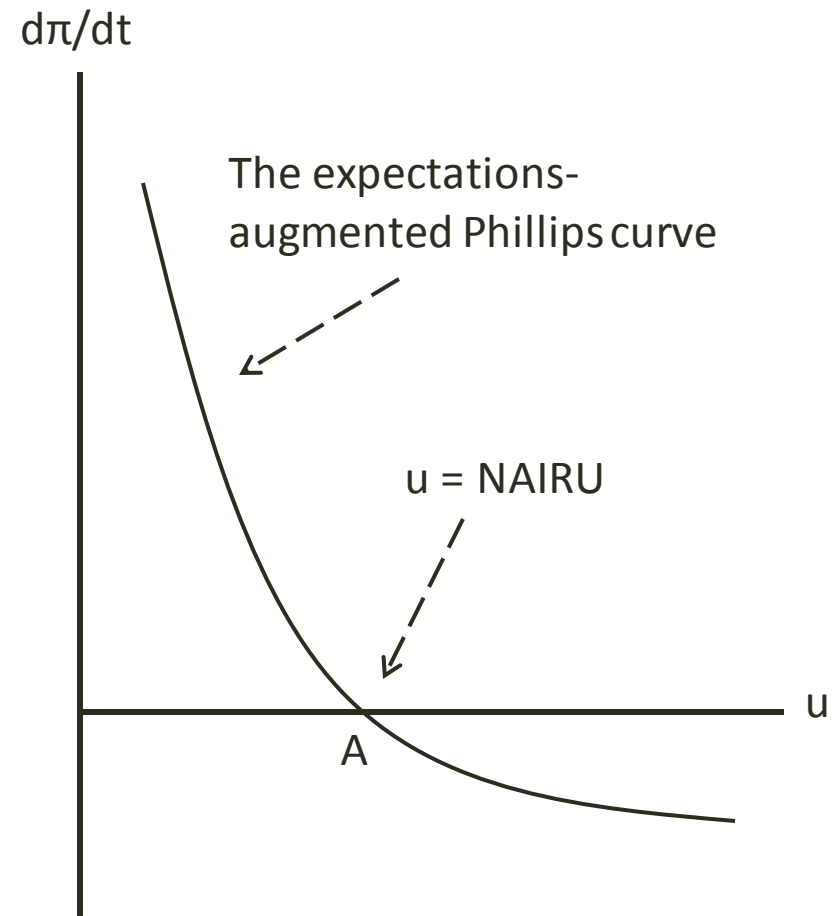
THE MODIFIED PHILLIPS CURVE

Change in inflation =
 $f(\text{unemployment gap})$

A = unemployment with constant
inflation.

Actual inflation equals expected
inflation.

Or the **non-accelerating inflation
rate of unemployment --- NAIRU**



POLICY IMPLICATIONS UNDER MONETARISM

- Fiscal v.s. monetary policy?
- The optimal design of monetary policy?

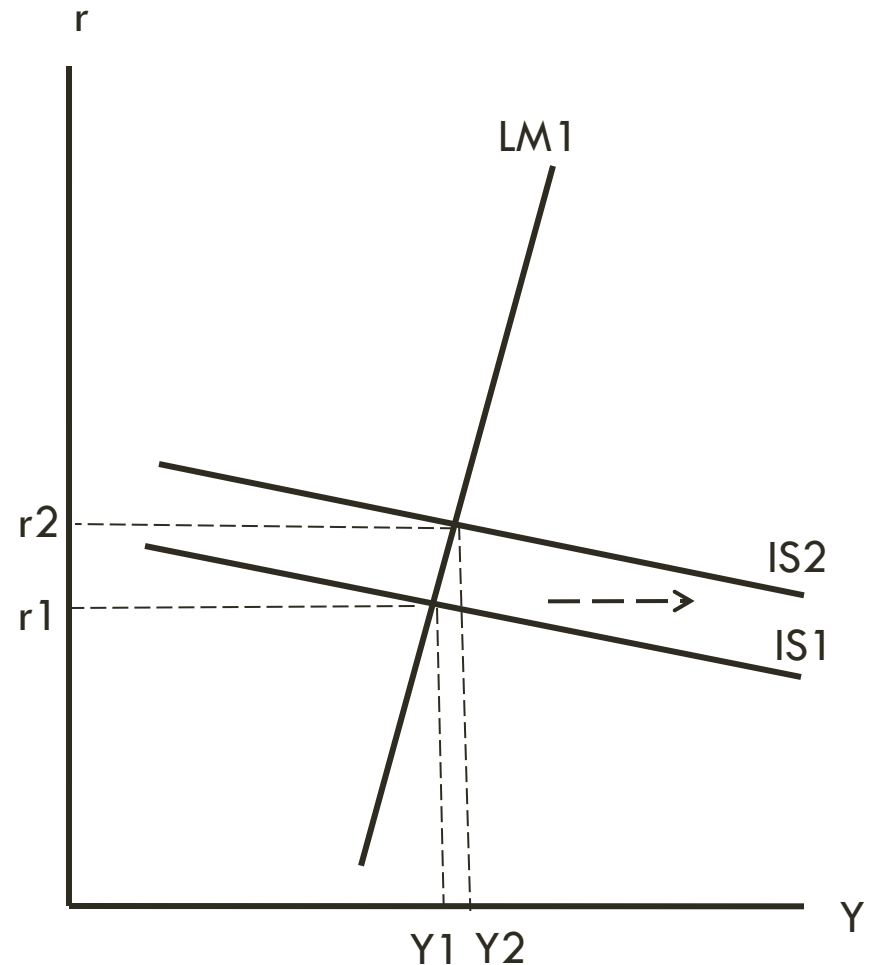
FISCAL V.S. MONETARY POLICY

- The first issue **has nothing to do** with the implications drawn from the inflation dynamic and medium-term adjustment theory.
- Milton Friedman's attack on Keynesianism.
 - Private investment is highly sensitive to the interest rate (flat IS curve).
 - Money demand is interest-rate inelastic (steep LM curve).
- Fiscal policy financed by bond issue is **NOT** effective --- very strong crowding-out effect.
- Monetary policy is very powerful.

BOND-FINANCED FISCAL POLICY

An increase in G shifts IS right.

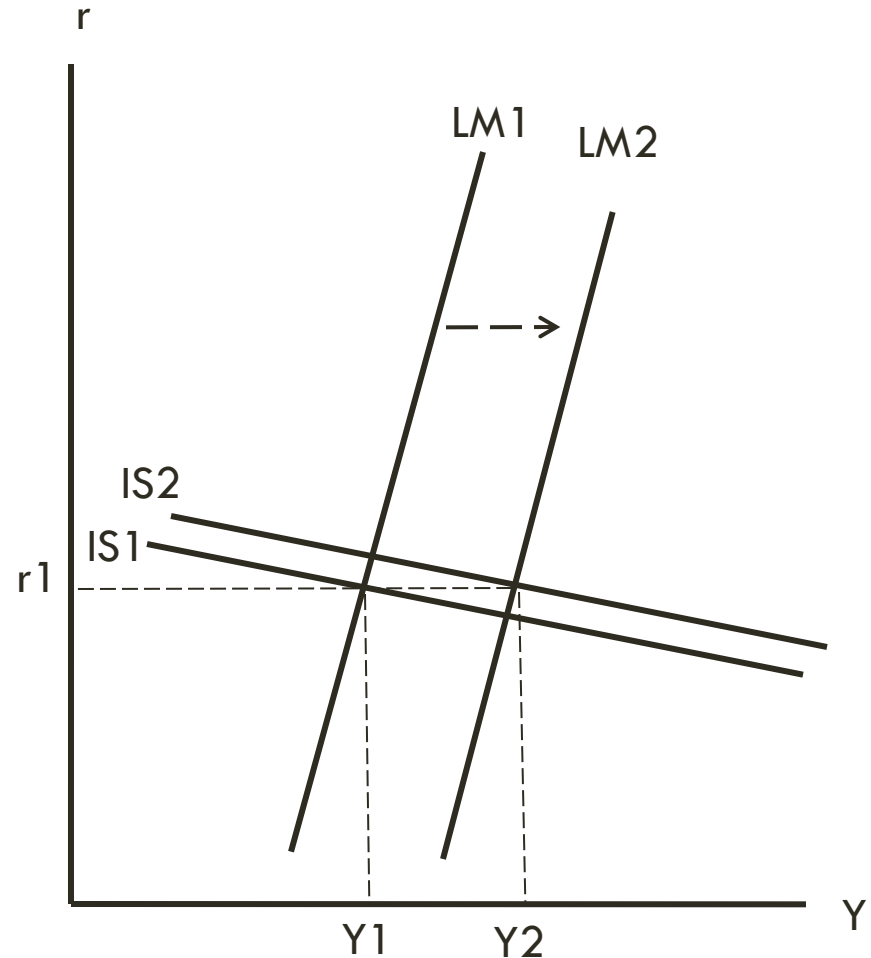
Bond financing raises the interest rate which depresses private consumption and investment.



FISCAL POLICY + PRINTING MONEY: DEBT-MONETIZED

An increase in G financed by new money shifts both IS-LM to the right with **no crowding-out effect**.

It is a **fiscal-monetary policy mix!**

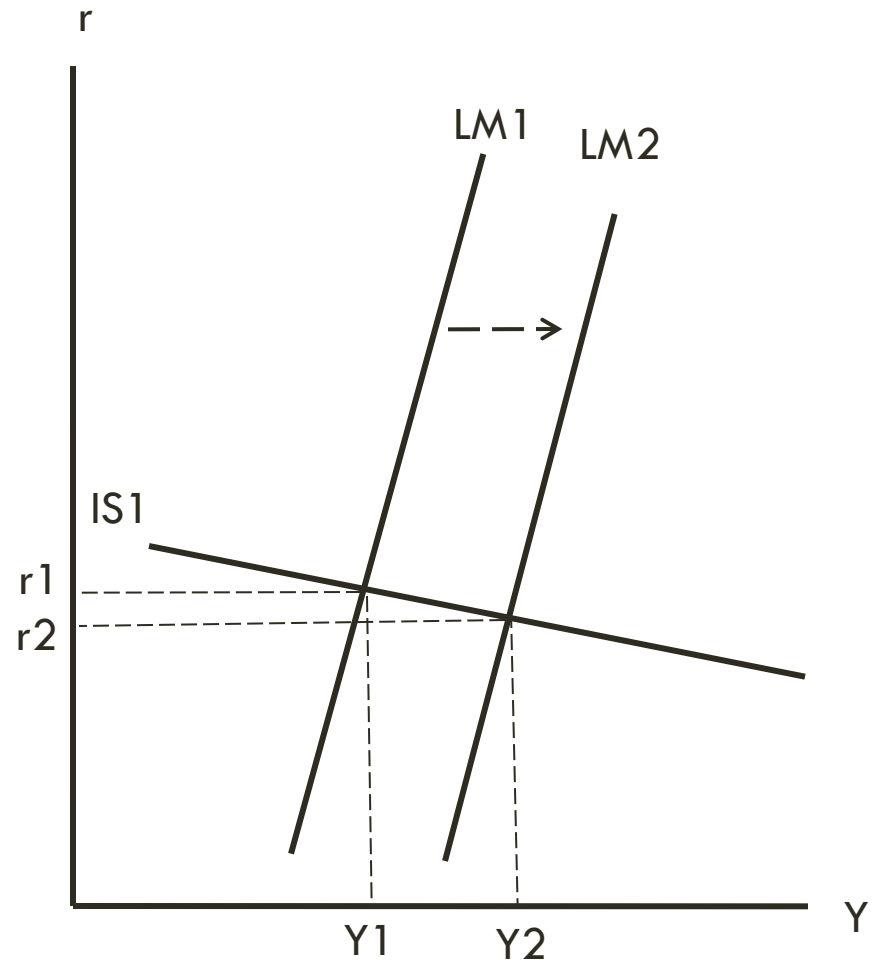


STRONG MONETARY POLICY

An increase in M^s shifts LM right.

Lower interest rate causes
sensitive investment to increase.

AE and output increase strongly.



OPTIMAL DESIGN OF MONETARY POLICY

- Two important implications drawn from the inflation dynamic that guides the design of monetary policy
- **Principle 1:** Don't be too ambitious as we are constrained by the long-term natural rate or NAIRU.
- **Principle 2:** Maintaining low inflation is good for the long-term → anchoring low expected inflation.

OPTIMAL DESIGN OF MONETARY POLICY: PRINCIPLE 1

- **Principle 1:** Don't be too ambitious as we are constrained by the **long-term natural rate or NAIRU**.
- This obviously follows from the **modified version of Phillips curve**.
 - Inflation will keep rising if central bank attempts to push the economy beyond its limit (natural level); no permanent trade-off
 - So, choosing $u = u^*$ and hence keeping the inflation rate constant is more desirable then.

OPTIMAL DESIGN OF MONETARY POLICY: PRINCIPLE 2

➤ **Principle 2:** Maintaining low inflation is good for the long-term → anchoring low expected inflation.

- Following the principle 1, inflation is driven by expected inflation.

$$\pi_t = \pi_t^e - \varepsilon(u_t - u^*)$$

$$\pi_t = \pi_t^e \quad \text{if } u_t = u^*$$

- **Committing to a low inflation rate will bring about a low inflation rate then.**
- Why low inflation is good?

WHY LOW INFLATION IS IMPORTANT?

- Inflation affects consumers' welfare.
 - Price stability is preferred by consumers and firms.
- Stable price (and low inflation) is favorable to the private sector's smooth growth.
 - High inflation is typically associated with high volatility in inflation rate, followed by costly management to avoid the inflation risk.
- If negative shocks hit inflation, credible commitment of low inflation would mitigate the impact of negative shocks.
 - Agents believe that it will be temporary. They won't drastically revise their inflation expectation.

RULE V.S. DISCRETION

- To anchor low stable inflation, **monetary policy rules are recommended.**
- Two competing approaches: **Rule V.S. Discretion**
 - **Discretionary monetary policy** is difficult and costly; targets are missed most of the time.
 - Persistent high inflation in the 1970s discredited such policy.
- Rule-based approach to monetary policy make the way inflation expectation gets anchored much more easier than under the discretion approach.

FEEDBACK V.S. NON-FEEDBACK RULE

- Two competing approaches for policy rules: **Feedback v.s. Non-feedback rule**
- Friedman (1968) advocated the latter.
 - It is hard to design a feedback rule that can be timely implemented.
 - Lag effects of policy can lead to serious misperceptions and mistakes when using feedback policy rules.

THE CONSTANT MONEY-GROWTH RULE

- Operationally, he instead suggested a constant money-growth rule.
 - Set a **constant growth rate of some monetary aggregates** (e.g., M1 or M2).
 - Closely monitor the level of money supply growth.
- The idea is supported by the **quantity theory of money**.

FRIEDMAN'S QUANTITY OF MONEY

- Quantity theory of money:

$$MV = PQ \rightarrow \hat{M} + \hat{V} = \hat{P} + \hat{Q}$$

- If “v” is stable, nominal income growth is determined by money growth.
- Unfortunately, the relation broke down after 1980s; countries were forced to abandon this policy approach.