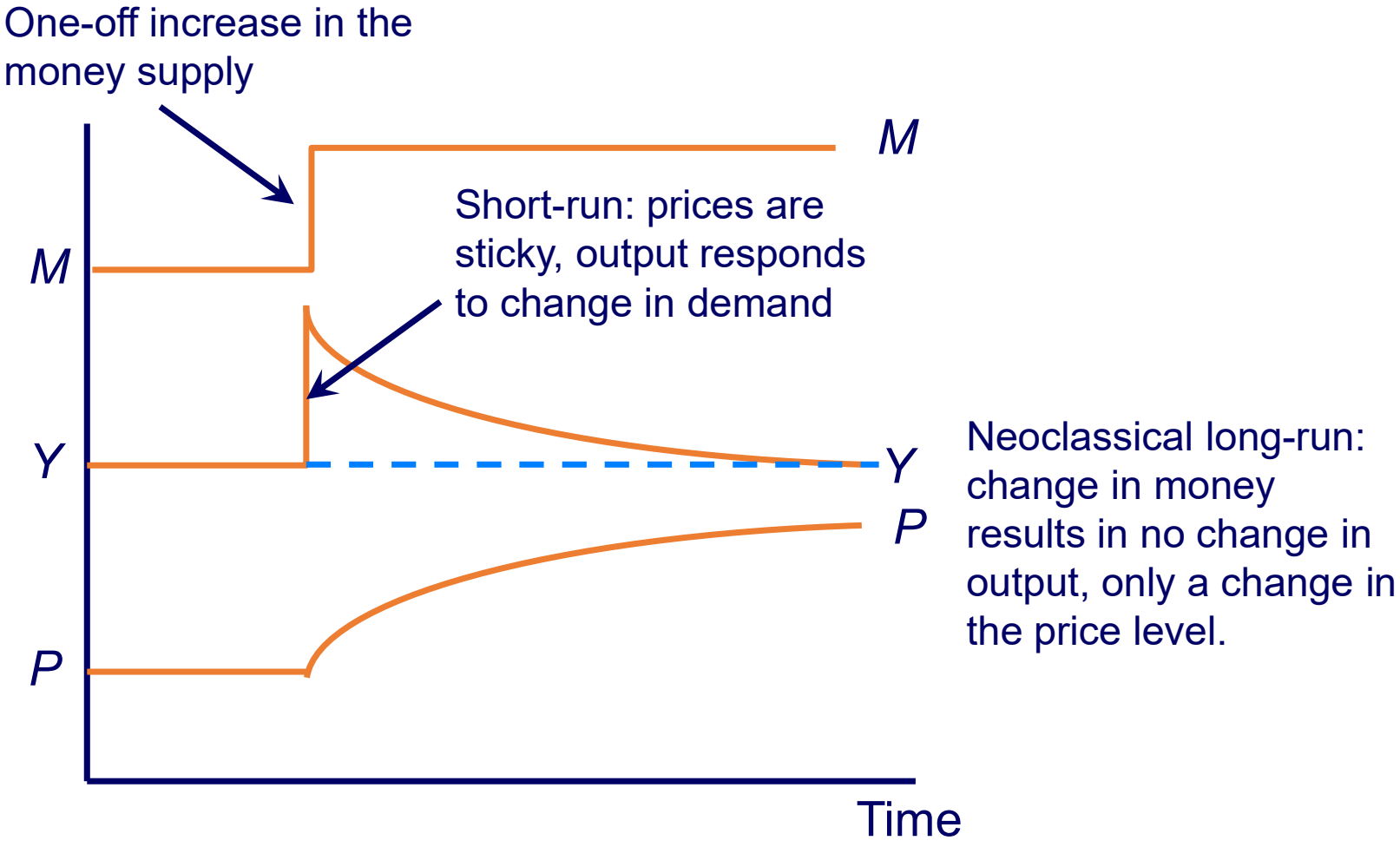
Inflation and unemployment

Figure 13.1 (a)

From the Short to the Long Run



The story of the Philips curve

The Neoclassical Synthesis

- Post-war economic conditions, with full employment and rising inflation, revealed that constant price levels was not a general case.
- The neo-classical synthesis was an attempt to qualify the Keynes ideas and merge them with those of early economists.

Samuelson

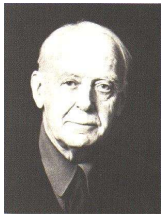
Paul Samuelson wrote the first modern economics textbook

The **neoclassical synthesis** refers to a large consensus that emerged in the early 1950s.
Contributions:

- IS-LM (Hicks, Hansen)
- Theories of consumption (Modigliani, Friedman)
- Theories of Investment (Tobin, Jorgensen)
- Money demand (Tobin)
- Phillips curve
- Large macroeconomic models (Lawrence Klein developed the first U.S. macroeconomic model in the early 1950s. The model was an extended *IS* relation, with 16 equations).

The neoclassical synthesis was to remain the dominant view for another 20 years

The Neoclassical Synthesis

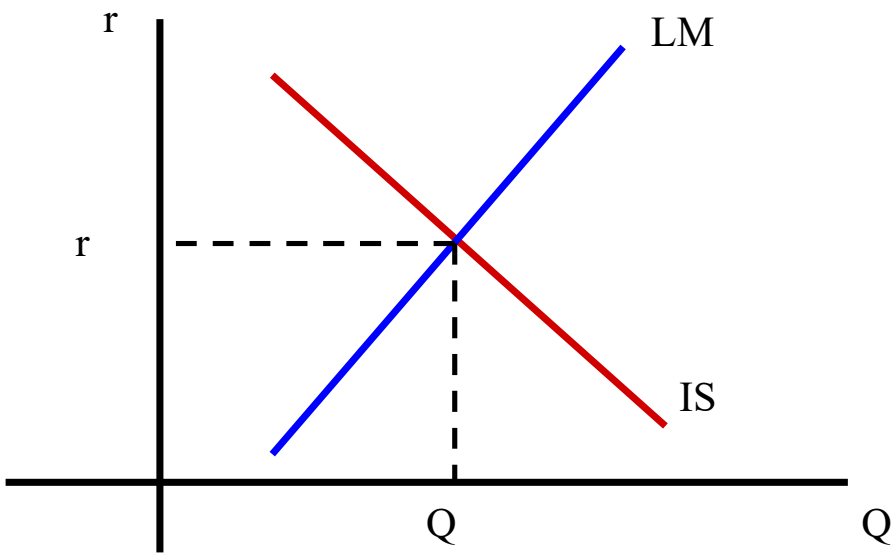


Sir John HICKS (1904-1989)

The *IS–LM* Model

- The most influential formalization of Keynes's ideas was the *IS-LM* model, developed by John Hicks and Alvin Hansen in the 1930s and early 1940s.
  - **Level of income will also affect demand for money**
  - Need simultaneous determination of equilibrium levels of i and Q
- Discussions became organized around the slopes of the *IS* and *LM* curves.

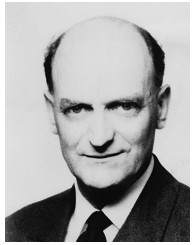
Hicks-Hansen Synthesis (IS-LM)



The Phillips curve

- Empirical regularity in the UK found by A. W. Phillips in 1958
  - Popularized by Samuelson and Solow in 1960 (the 3%-5% rule)

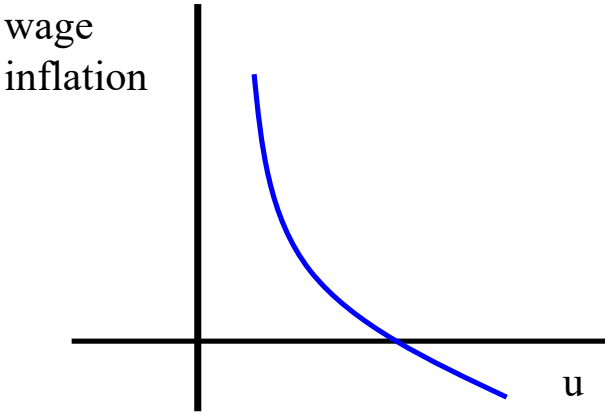
- The idea behind the Phillips curve is intuitive. When labor markets are *tight*—that is, the unemployment rate is *low*—firms may have difficulty hiring qualified workers and may even have a hard time keeping their present employees. Because of the shortage of workers in the labor market, firms will raise wages to attract needed workers and raise their prices at a more rapid rate



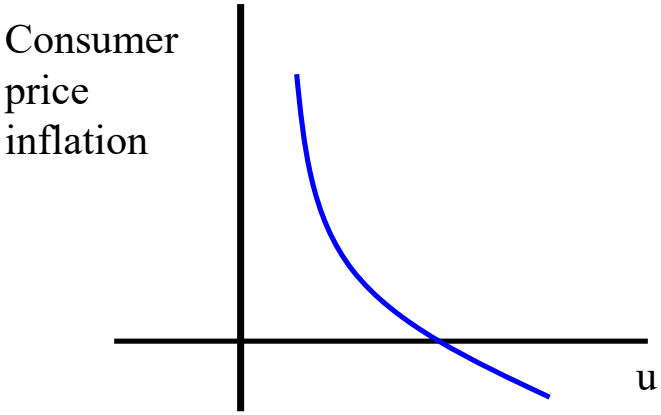
Phillips

Samuelson

Solow



Phillips' curve



Samuelson-Solow Curve

The Neoclassical Synthesis

Incorporation of the Phillips curve

- There was a period in which policymakers believed they could exploit the "trade-off between inflation and unemployment", expanding the economy at the cost of a small additional inflation.
- This Phillips curve was integrated in the neo-classical synthesis, and included in official macroeconomic simulation and forecasting models, such as those developed by Lawrence Klein for the US, in the early 1960

Large Macroeconomic models

Klein

- Lawrence Klein developed the first U.S. macroeconomic model in the early 1950s.
- The model was an extended *IS* relation, with 16 equations.

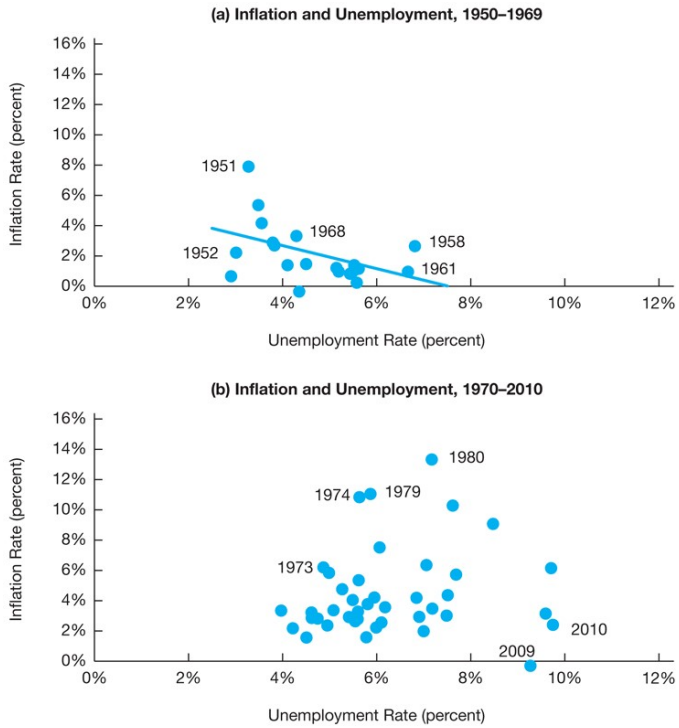
Stagflation in the 1970s

After World War II, economists believed that government intervention could be used to influence employment and output and could reduce the amplitude of the business cycle without creating inflation.

In the 1960s and 1970s, these policies were put into practice, but the results were not as good as expected.

- In the 1970s, inflation accelerated, and unemployment increased
- The new phenomenon of **stagflation** challenged the economic thinking in general and the Phillips curve in particular.

Inflation and Unemployment in the United States



Source: Economic Report of the President. www.gpoaccess.gov/eop/.

The New Classical revival

This episode paved the way for the recovery of classical ideas, such as of self-correction and the neutrality of money.

Three waves:

1. Monetarism (Milton Friedman):
    - Monetary policy effective in the short run.
    - In the long run there is no trade-off
2. Rational Expectations (Lucas, Sargent)
    - Monetary policy ineffective.
    - Once policymakers try to exploit the trade-off, it disappears.
3. Real Business Cycles (Prescott).
    - Fluctuations in the natural rate

Friedman

Lucas

Sargent

Barro

Prescott

The Expectations augmented Phillips Curve

$$\pi = -\delta\left(u - u_n\right) + \pi^e \qquad u_n = NAIRU$$

- There is a Phillips Curve for each level of expected inflation.

Phelps

Friedman

The Phillips curve had become part of the Neoclassical synthesis, but Milton Friedman and Edmund Phelps argued that the apparent trade-off between unemployment and inflation would quickly vanish if policy makers actually tried to exploit it.

They established the *expectations augmented* Phillips curve and restated the long-run neutrality proposition implied by a vertical aggregate supply schedule.

By the mid 1970s, the consensus was that there was **no long-run trade off** between inflation and unemployment.

"It is possible to generate business cycles in a context where markets clear and prices are flexible"

The worker misperception model


Friedman

- Key assumption: imperfect information
  - Wages completely flexible with respect to expected changes in the price level.
  - A rise in the expected price level will result in an immediate and equal rise in wages because workers try to keep their real wages from falling when they expect the price level to rise.
  - Markets clear in expected terms
- Business cycle explained by expectation errors
  - If expectations are not realized, an output gap will emerge.
- No long run trade-off between inflation and unemployment
  - Acceleracionist hypothesis: only ever accelerating inflation could maintain output above its “natural rate”.
  - Any attempt to reduce unemployment below its **natural rate** will be inflationary, without permanent effects on output

The worker misperception model

Labour demand, Supply function

- Production function

$$Q = zN^{1-\beta}$$

- Profit Maximization

$$N^d = \left[z(1-\beta)\left(\frac{P}{W}\right)\right]^{1/\beta}$$

$$Q^s = z^{1/\beta}\left[(1-\beta)\left(\frac{P}{W}\right)\right]^{\frac{1-\beta}{\beta}}$$

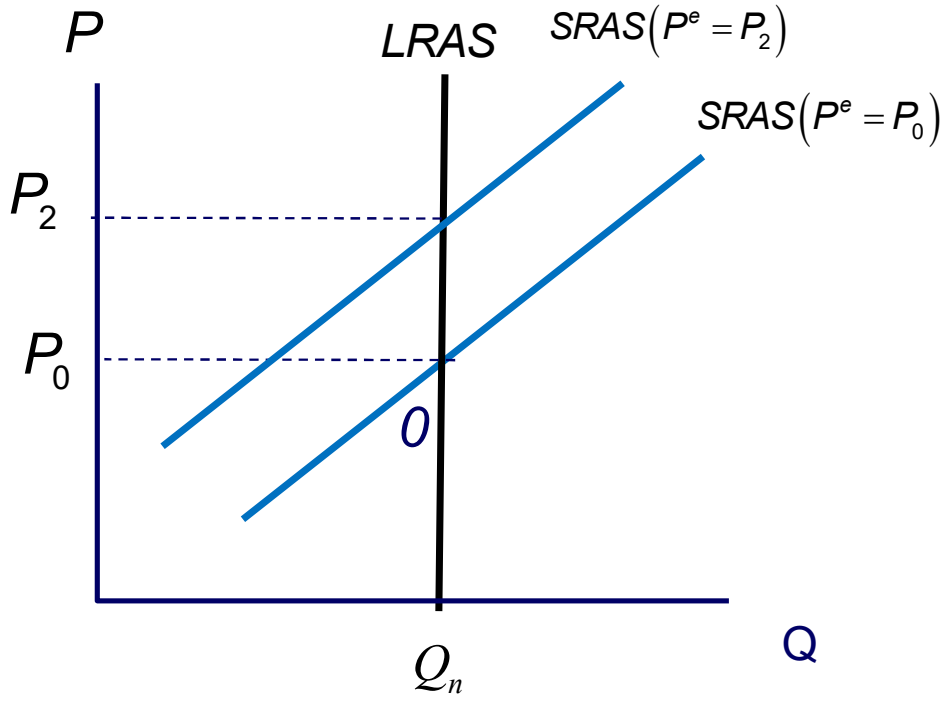
Labour supply

$$W = P^e \omega$$

Aggregate supply

$$Q = Q_n \left(\frac{P}{P^e}\right)^{\frac{1-\beta}{\beta}}$$

$$Q_n = z^{\frac{1}{\beta}} \left(\frac{1-\beta}{\omega}\right)^{\frac{1-\beta}{\beta}}$$



Dynamic AS

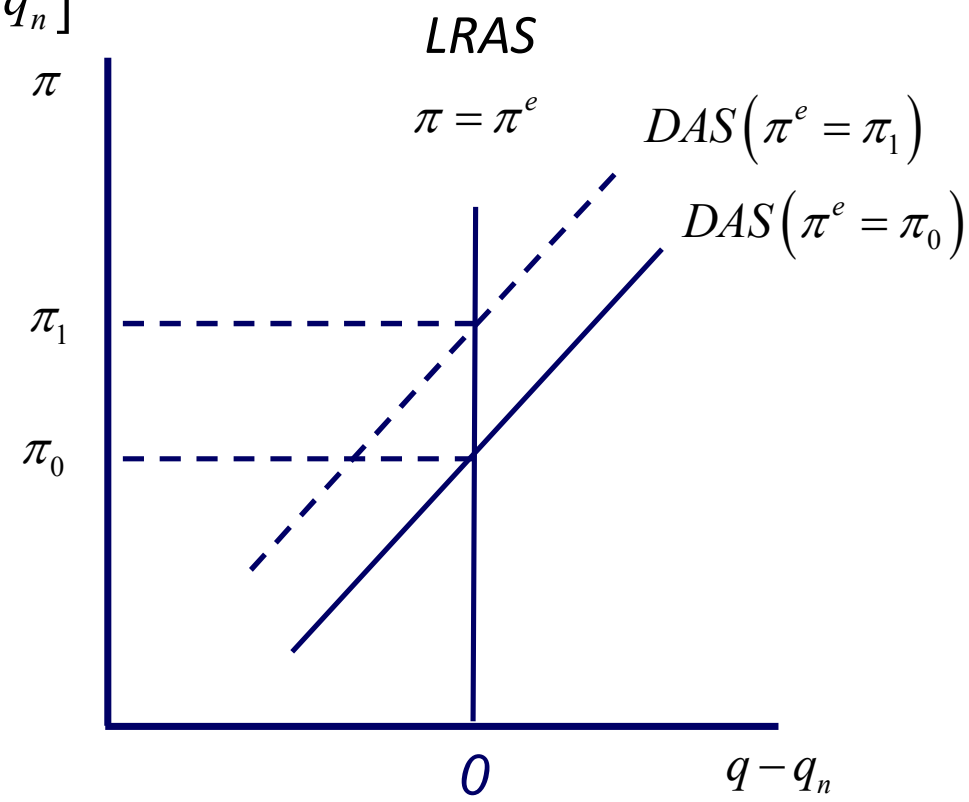
$$q = q_n + \frac{1-\beta}{\beta}\left[p - p^e\right]$$

$$\pi = p - p_{-1}$$

$$\pi^e = p^e - p_{-1}$$

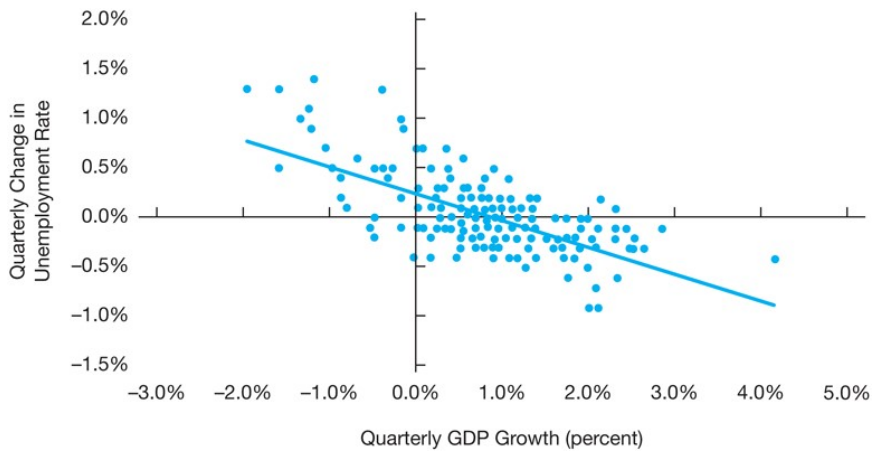
$$\pi = \pi^e + \gamma\left[q - q_n\right]$$

- Long-run:
  - Determined by amount of capital and labor and the available technology
  - Vertical at the natural rate of output
- Short-run:
  - Imperfect information in wage or price setting
  - Generates an upward sloping D*AS*
  - Trade off between inflation and unemployment in the short run only



Okun's Law

- Okun's law states that for each percentage point that output is above potential, the unemployment rate is one-half of a percentage point below the natural rate of unemployment.
- We can translate the short-run aggregate supply curve into the modern Phillips curve by replacing the unemployment gap by the output gap.



Source: Unemployment, quarterly, 1960–2010 and real GDP growth, quarterly, 1960–2010. Bureau of Labor Statistics and Bureau of Economic Analysis.

$$\pi = \pi^e + \gamma\left[q - q_n\right]$$ • Dynamic AS

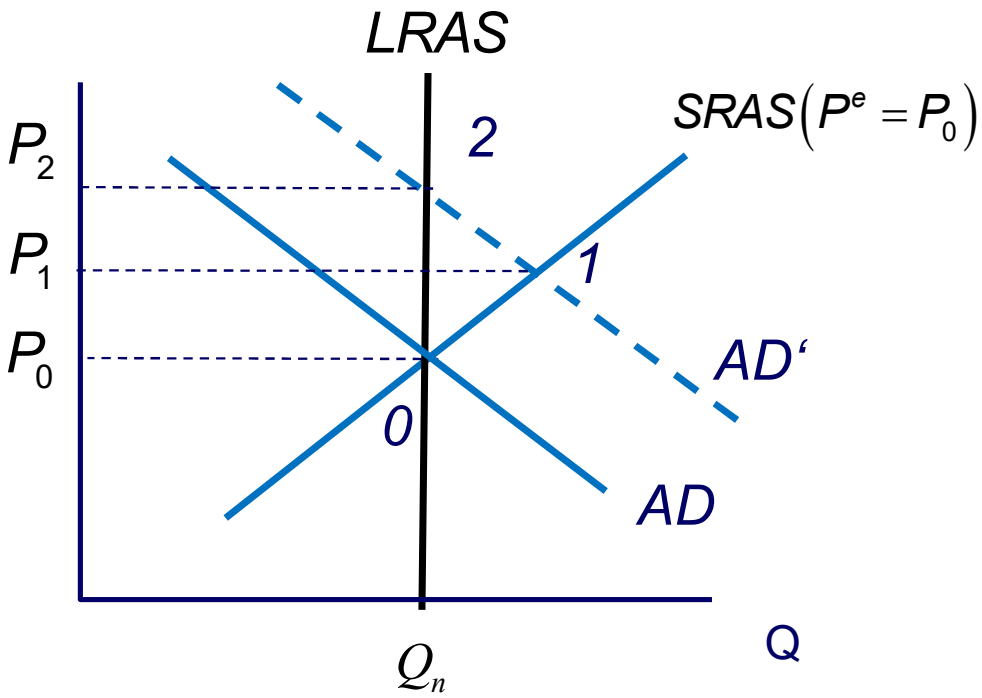
$$q - q_n = -\upsilon\left(u - u^*\right)$$ • Okun's Law

$$\pi = -\delta\left(u - u_n\right) + \pi^e$$ • Phillips curve

Unanticipated shift in money supply

$$Q = Q_n \left(\frac{P}{P^e} \right)^{\frac{1-\beta}{\beta}}$$

$$M = PQ$$



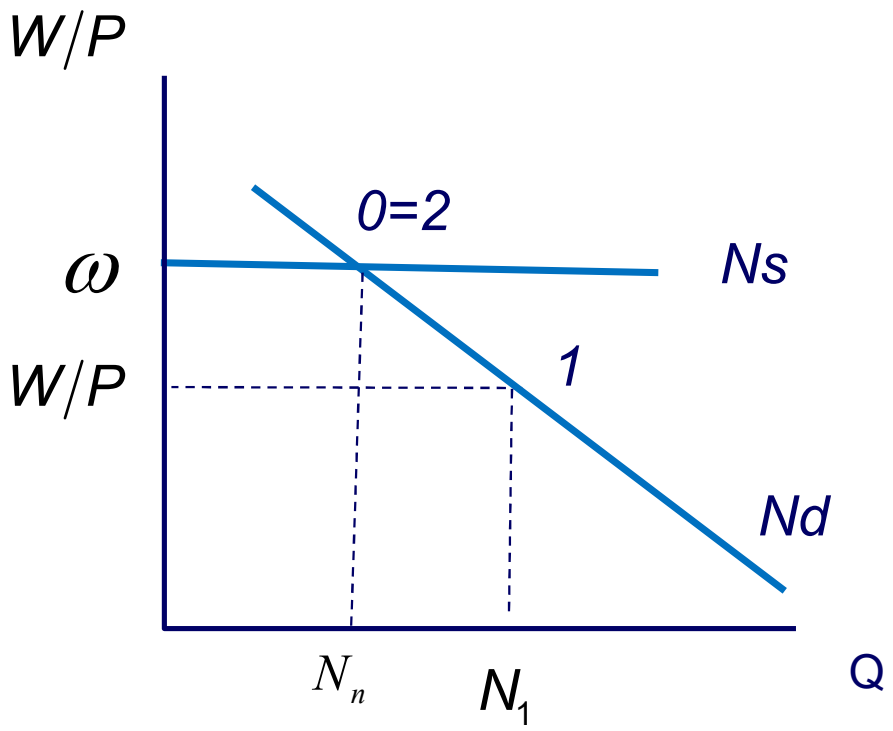
The difference relative to the Classical model is that aggregate output may depart from the natural rate level as a result of **unanticipated** movements in prices.

- Because the AD shift is unexpected, the expected price level remains at P_0 and the short-run aggregate supply curve remains unchanged.
- Equilibrium is now at point 1, and aggregate output increases above the natural rate
- In the short run, a business cycle is generated, even with flexible prices

The difference relative to the Keynesian model is that the wages will adjust once expectations are revised.

- In the **long run** there is **no trade-off** between inflation and unemployment. The economy returns **slowly** to point 2.
- Key question: how slow?

Unanticipated shift in money supply

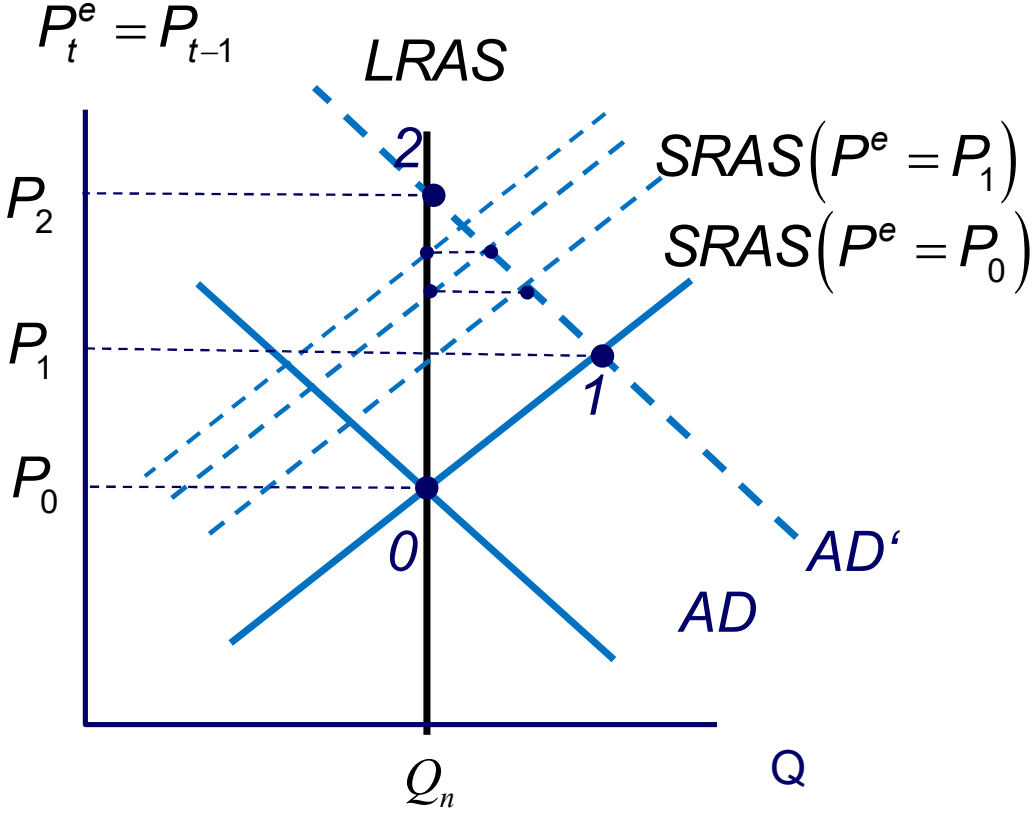


- Workers do not perceive the fall in real wage
  - In point 1 workers are out of their labour supply.
- Firms, observing the fall in real wage, optimally decide to hire more labour.
- The labour market clears in expectations only
- Problem: Real wages are not counter-cyclical

Adaptative expectations

$\lambda = 1$

$P_t^e = P_{t-1}$



The process through which workers adjust their expectations can be "surprisingly long".

Friedman

$$P_t^e = P_{t-1}^e + \lambda\left[P_{t-1} - P_{t-1}^e\right]$$

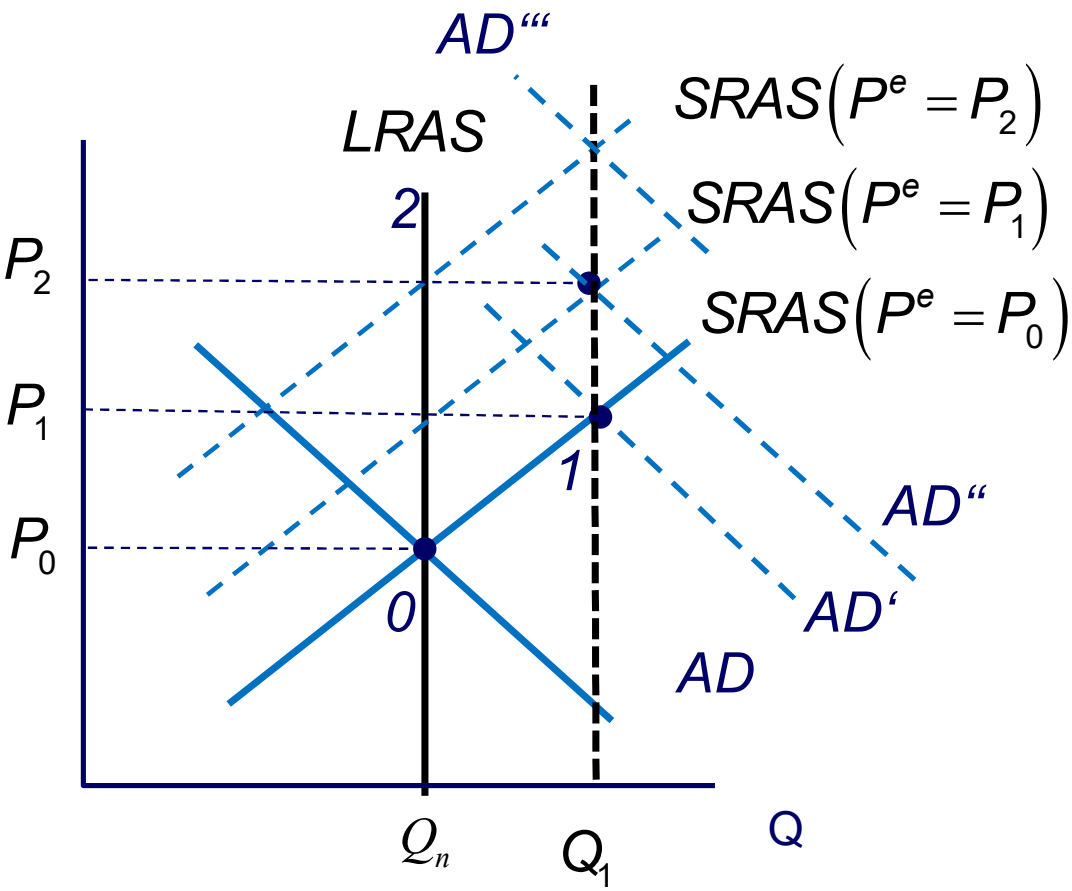
$$0 \le \lambda \le 1$$

$$P_t^e = \lambda \sum_j (1-\lambda)^j P_{t-j}$$

Phelps

- Adaptive expectations:
  - Expected inflation is an average of past inflation rates.
  - This average is not affected by the public's predictions of future policy; predictions of future policy do not affect the aggregate supply curve.
  - Workers will be fooled and fooled again, until the LR equilibrium is met

The accelerationist hypothesis



- It would be possible to maintain output (unemployment) permanently above (below) the natural rate at the cost of ever-acceleration of prices.
- But at no gain: workers would not be better off

Milton Friedman

- Belief in free markets
  - Contrast to Keynes that stressed the role of market failures.
- Challenged the effectiveness of **fiscal** policy:
  - The **permanent income hypothesis** (building on the inter-temporal analysis of Irving Fisher (1867-1947).
- Re-established the **quantity theory**, according to which **money is neutral**
  - **B**ut stressed that this will **only** hold in the **long run**.
  - In 1963, Friedman and Anna Schwartz concluded that **monetary policy is very effective in the short run** and that movements in money explained most of the fluctuations in output in the US.
    - They interpreted the Great Depression as the result of "terrible policy mistake"
  - In any case: policymakers may lack the knowledge and the willingness to stabilize the economy
  - Rules rather than discretion

Friedman

Milton Friedman (Chicago School) was the intellectual leader of the monetarists

The Role of Policy

1- Intervention is not needed because the market economy is **self-regulating**

2 – Even when the adjustment process is slow, policymakers may not **know the enough** to do better

- **Data lag**: the time it takes for policy makers to obtain data indicating what is happening in the economy
- **Recognition lag**: the time it takes for policy makers to be sure of what the data are signaling about the future course of the economy
- **Legislative lag**: the time it takes to pass legislation to implement a particular policy
- **Implementation lag**: the time it takes for policy makers to change policy instruments once they have decided on the new policy
- **Effectiveness lag**: the time it takes for the policy actually to have an impact on the economy

3 - Even if policymakers had the gift, they may not have the **incentives** to stabilize

- Political pressures
- Private agendas
- Friedman believed that political pressures to "do something" in the face of relatively mild problems may do more harm than good

Friedman

Skeptical that economists knew enough to stabilize output, and that policy makers could be trusted to do the right thing, Friedman advocated the use of simple **rules**, such as steady money growth

The Rational Expectations Revolution

Lucas (1972)

- Workers should learn with past mistakes
- Business cycles are longer than information failures

Proposed a model with **rational expectations** (Muth, 1962):

- "People don't make systematic mistakes".
- "People do the best forecast given the information they have".

He concluded that:

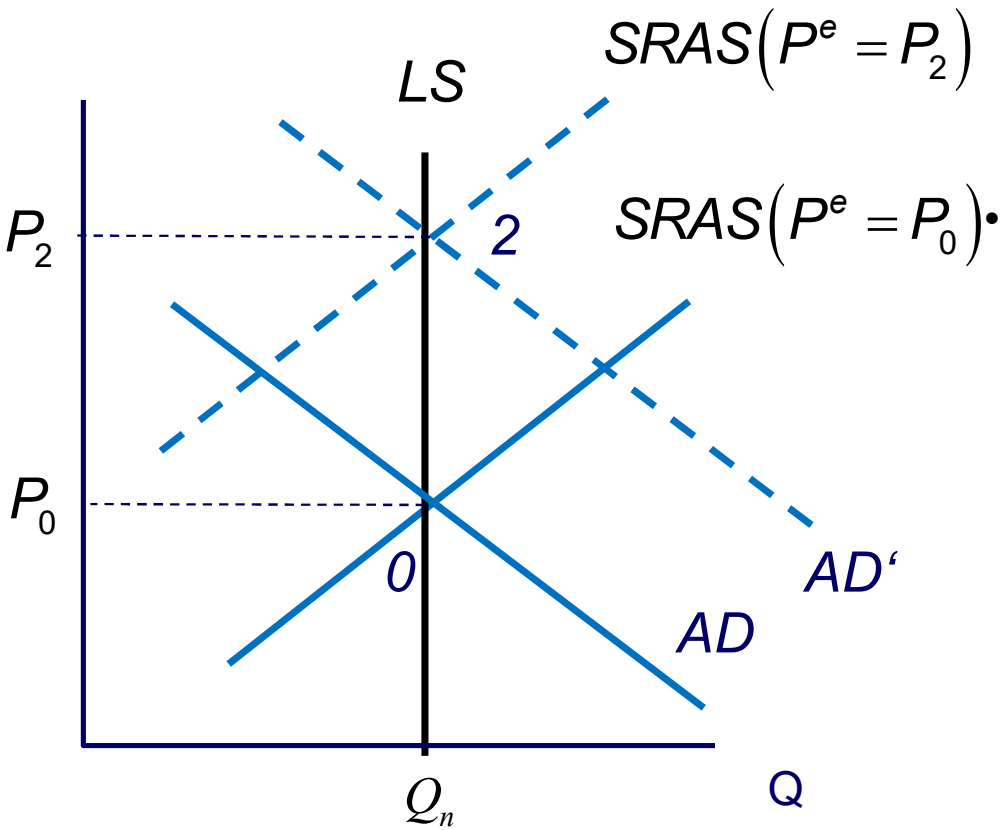
- Aggregate output does not increase as a result of anticipated expansionary policy: "Only inflation surprises matter"
- The trade-off between inflation and unemployment disappears once policymakers try to explore it

Lucas

Sargent

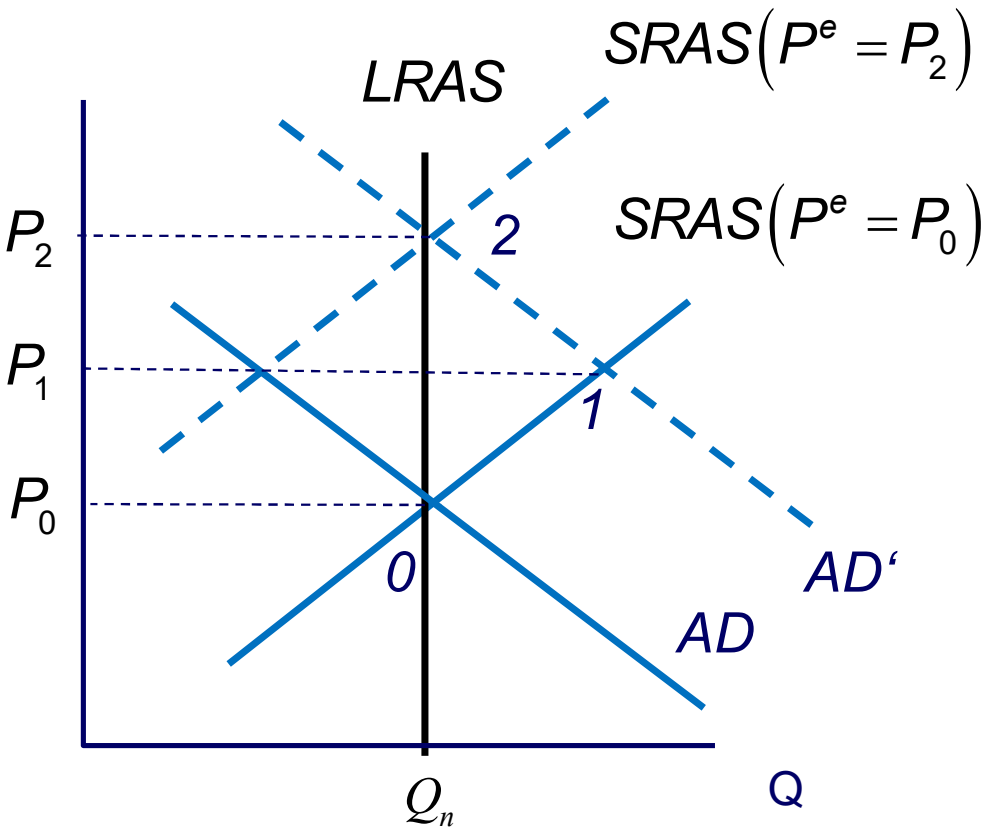
- *In the early 1970s, Robert Lucas, Thomas Sargent, and Robert Barro led a strong attack against mainstream macroeconomics.*

Anticipated monetary policy



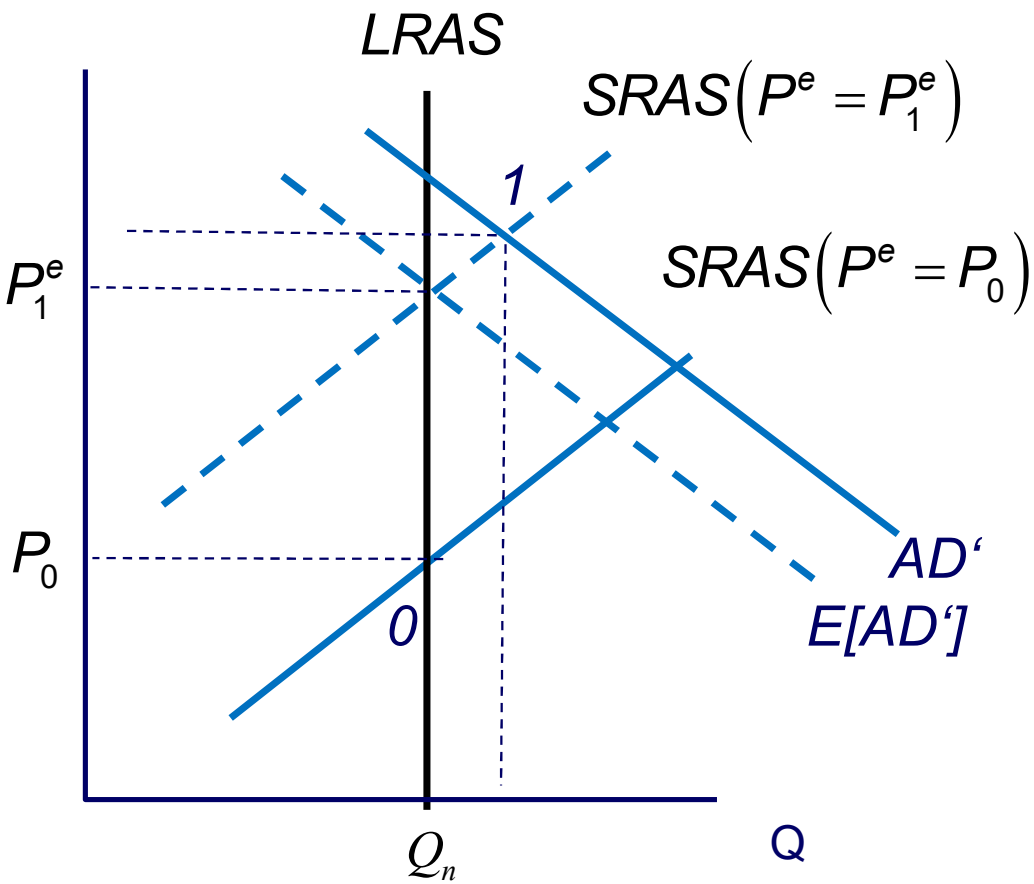
- The central bank conducts an open market purchase which the public **expects** because they have seen it done in the past.
  - ➢ The expansionary policy is anticipated.
- Rational expectations:
  - Workers and firms recognize that an expansionary policy will shift the aggregate demand curve to the right and will expect the aggregate price level to rise to P_2.
  - Workers will demand higher wages so that their real earnings will remain the same when the price level rises.
  - The short-run aggregate supply curve then shifts leftward and intersects AD at point 2
  - Aggregate output remains at the natural rate level Q_n and the price level has risen to P_2.

Unanticipated shift in money supply



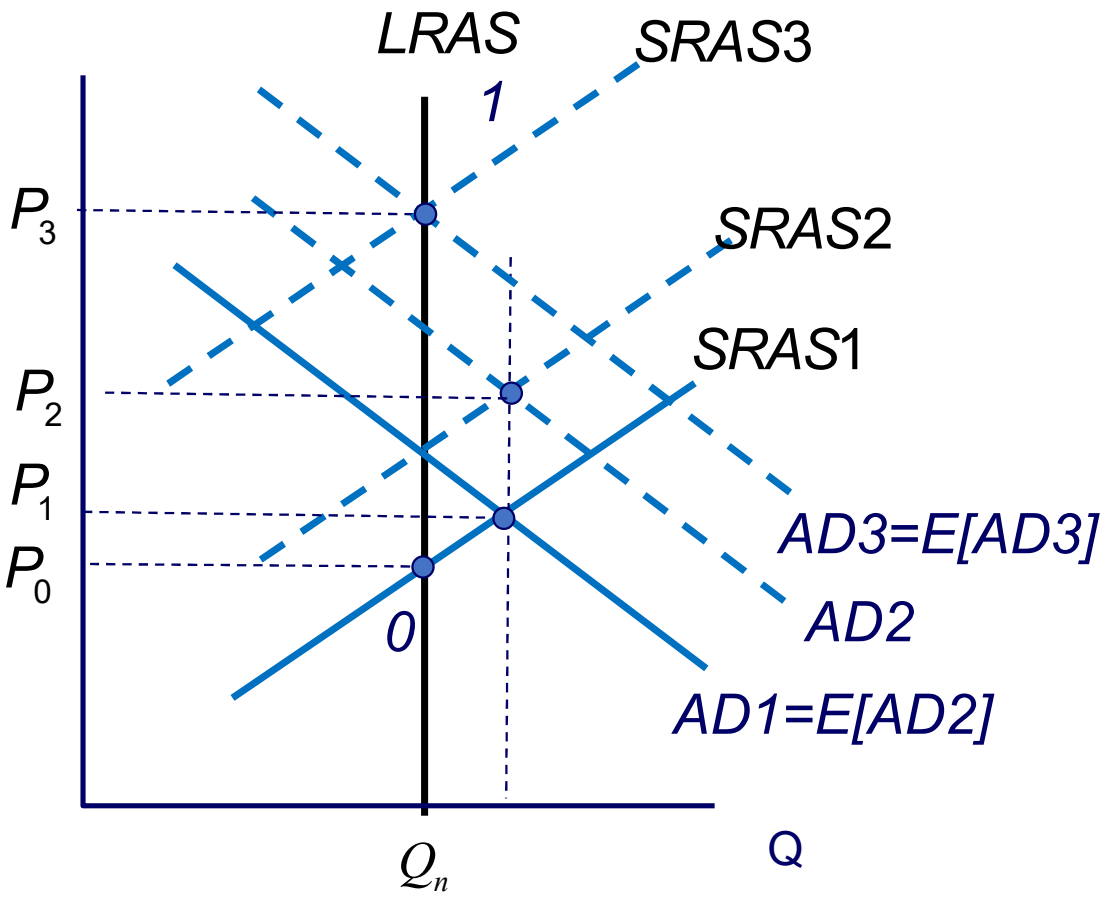
- RE is not perfect foresight
  - Forecasting errors are possible
- The central bank, concerned about the unemployment rate, conducts an open market purchase **unexpected** by the public.
  - The money supply increases and as a result the aggregate demand curve shifts rightward to AD'.
  - Because this shift is unexpected, the expected price level remains at P_1 and the short-run aggregate supply curve remains at AS_1.
- Unanticipated policy changes produce real effects.
- But people will soon understand that the new equilibrium will be point 2.
  - There will be a rapid adjustment to the new equilibrium.
- Monetary shocks cannot explain long lasting business cycles

Only surprises matter



- **Forecasting errors**
  - Deviations of output from the natural rate may arise because of forecasting errors
    - In the figure the anticipated component of the AD shift does not produce real effects
    - But the forecasting error produces a real expansion
  - Still forecasting errors cannot be systematic
    - People learn

Incredibly imaginative



- Once the Central Bank deviates from previous actions, forecasts change accordingly
- The central bank would need to be **incredibly imaginative** to keep surprising people

The integration of Rational Expectations

Policy ineffectiveness proposition.

- Anticipated policy has no effect on the business cycle.
- Deviations of output from full employment are **short lived**, because information lags are themselves short-lived

Call for real business cycles theory

- Lucas: "If deviations of output from its natural level are short lived, economists should turn to explaining fluctuations in the context of fully flexible prices".
- This claim set the agenda for Prescott and others.

Game theory

- RE implies that agents will try to guess what the others will do:
- Game theory deals with interaction: it is the right tool to think policy in the context with rational expectations
- Words such as "credibility", "reputation", "Commitment"

Case for rules

- Expanding employment at the cost of creating uncertainty comes along with undesirable volatility
- Policymakers should follow a non-activist rule policy and promote as much certainty about policy actions as possible
- Kydland and Prescott in 1977: under discretion it will not be possible for the central bank to credibly commit with low inflation

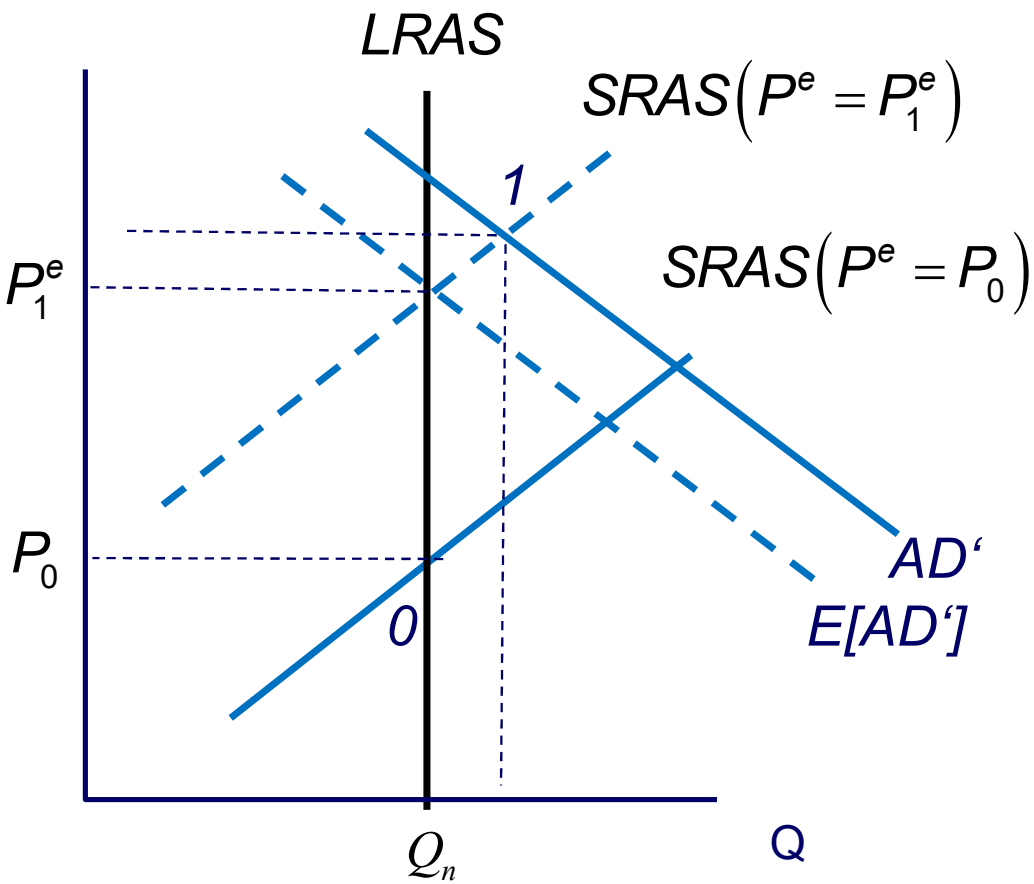
Lucas Critique

- Conventional econometric models should not be relied on to evaluate the potential impact of particular policies on the economy

The Theory of Policy

- By the end of the 1980s, the challenges raised by the rational-expectations critique had led to a complete overhaul of macroeconomics.

Unpredictable outcomes



- The conduct of policy can be viewed as a **game** in which the public and the policymakers are always trying to guess the other's intentions and expectations.
- The outcome of this game is that activist policies have no predictable effect on output and cannot be relied on to stabilize economic activity.
  - ✓ Policymakers' attempts to use discretionary policy may lead to unpredictable policy changes, which in turn cause undesirable fluctuations around the natural rate level of aggregate output.
    - ✓ *Under discretion, good intentions by the policymaker can led to disaster*
  - ✓ Such an undesirable effect is exactly the opposite of what the activist stabilization policy is trying to achieve.
- Case for rules: Policymakers should follow a non-activist rule policy and promote as much certainty about policy actions as possible

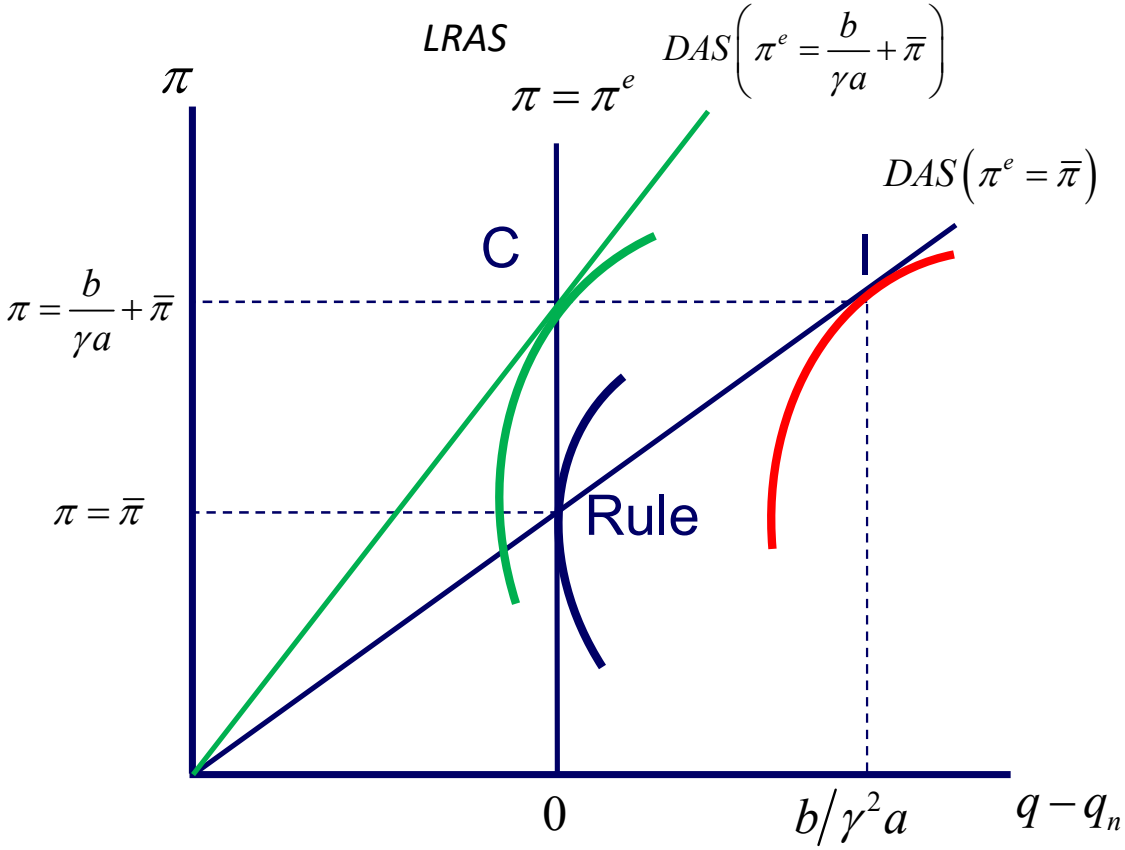
Time inconsistency

$$\underset{\pi}{Max}\, U = b(q - q_n) - \frac{a}{2}(\pi - \bar{\pi})^2$$

$$q - q_n = \frac{1}{\gamma}(\pi - \pi^e)$$

- Discretionary policy is subject to the time-inconsistency problem—the tendency of policymakers to deviate from good long-run plans when making short-run decisions.
- Knowledgeable about the policymakers' incentives, people will anticipate these deviations
- The end results will be higher inflation but no increase in output.
- To avoid this, policymakers should follow a non-activist rule policy and promote as much certainty about policy actions as possible.

Kidland and Prescott



The Integration of Rational Expectations
Real Business Cycle Theory

Prescott

Key assumptions:

- Competitive markets
- Fully flexible prices (AS is vertical, even in the short run)

…Hence:

- Output always at its natural level (all unemployment is voluntary)
- The distinction between growth and cycles is somehow artificial
- Although the distinction between transitory and permanent shocks matters

Tools:

1- Intra-temporal choices

- Firms maximize profits
- Households trade off leisure and consumption

2 – Inter-temporal choices

- Consumption today versus in the future (interest rate)
- Leisure today versus in the future (relative wages, interest rate)
- When the interest rate increases, people work harder today and consume more in the future.

Claims:

1 - Business cycles reflect fluctuations in the natural rate of unemployment:

- Trend growth is not smooth (waves of creative destruction)

2 – Permanent productivity improvements come along with higher output and wages

3 – Temporary productivity shifts also come along with higher employment

New Keynesian model

New Keynesian Economics

- New synthesis departing from **rational expectations** and **microeconomic** foundations but accounting for **market failures** that produce the traditional Keynesian results.
- Accept rational expectations, but not the assumption of wage and price flexibility:
  - Sticky wages: long term contracts
  - Sticky prices: firms optimize by setting prices, and accept quantities (production levels) as given.
  - Real rigidities (union wage setting, efficient wages, implicit insurance in wage contracts, imperfect competition).

Claims:

- Long run neutrality of money
- But anticipated policy shifts affect aggregate output
- Business cycles are driven by demand shocks
- Slow adjustment: recessions produce long lasting effects
- Propagation: business cycles are amplified by financial market frictions.
- Macroeconomic externalities: individual optimization may have adverse macro effects
- Markets are sufficiently dysfunctional to make well designed government stabilization desirable

Nominal Rigidities

Fischer

Taylor

Stanley Fischer and John Taylor showed that the adjustment of prices and wages in response to changes in unemployment can be slow *even under rational expectations.*

Long-term labor contracts are one source of rigidity that prevents wages and prices from responding fully to changes in the expected price level (called wage-price stickiness).

They pointed to the **staggering** of both wage and price decisions, and explained how a slow return of output to the natural level can be consistent with rational expectations in the labor market.

Menu Costs

Akerlof

- Adjusting prices is costly
  - A firm might hold prices constant even if demand fell
  - Catalogs, menu costs, fixed price contracts
  - Costumer goodwill
- Price cuts do not necessarily translate into benefits for the adjusting firm (externality)
- This leads to lack of synchronization, leapfrog adjustments
- The menu cost explanation of output fluctuations attributes even small costs of changing prices to the infrequent and staggered price adjustment.
- With staggered prices, money expansion produces real effects

New Phillips curve

Woodford

Gali

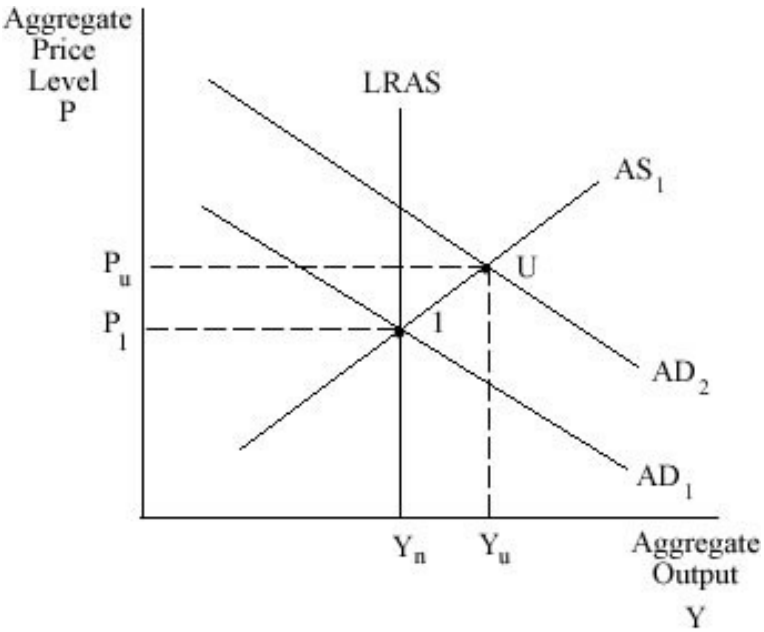
- Woodford, Gali, and a number of co-authors have developed a model, known as the **New-Keynesian model**, that embodies utility and profit maximization, rational expectations, and nominal rigidities.
- IS curve whereby next period affects current consumption (households strive to smooth their consumption) and a Phillips curve whereby anticipated changes in monetary policy matter (agents do not change prices very often).
- It also includes a systematic response of monetary policy to fluctuations in inflation and output (**Taylor rule**).

Results:

- Fiscal and monetary policies can play a role in stabilization.
- Because expectational errors are a source of undesirable fluctuations, Central banks need to be transparent (forward guidance).

Effects of Unanticipated Policy

The short-run response to an unanticipated expansionary policy for the new Keynesian model is identical to that of the new classical model.



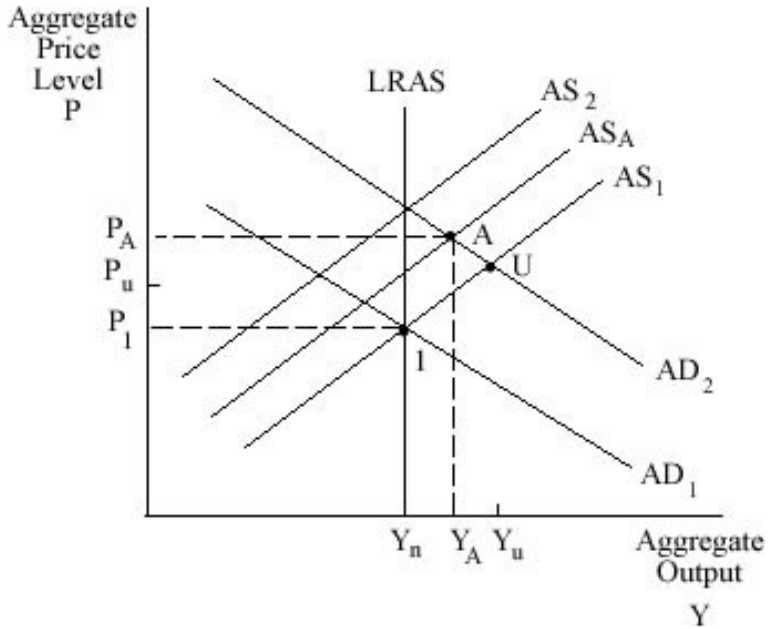
When the Fed pursues an expansionary policy and increases the money supply, the aggregate demand curve shifts rightward to AD_2.

Because the expansionary policy is unanticipated, the expected price level remains unchanged, leaving the short-run aggregate supply curve unchanged.

Thus the economy moves to point U, where aggregate output has increased to Yu and the price level has risen to P_u.

Effects of Anticipated Policy – New Keynesian model

When the monetary expansion is anticipated and expectations are rational, the expected price level increases, causing wages to increase and the short-run aggregate supply curve to shift to the left.



Because of rigidities that do not allow complete wage and price adjustment, the short run aggregate supply curve does not shift all the way to AS_2 as it does in the new classical model.

- Point A: intermediate position between the adaptive expectations and rational expectations models.
- Anticipated policy affects the aggregate supply curve, but due to rigidities such as long-term contracts, wage and price adjustment is not as complete as in the new classical model
- **Anticipated policy has a smaller effect** on output than unanticipated policy does but a larger effect on the price level.

Because the new Keynesian model indicates that anticipated policy has an effect on aggregate output, it does not rule out beneficial effects from **activist** stabilization policy.

Policy implications

- Long run neutrality
- The trade-off exists even if anticipated
  - Expected prices do not translate into immediate adjustment in prices
  - Anticipated monetary changes have real effects
  - But the slope of the Phillips curve will change after the trade-off is explored
  - Exploring short term gains will come at the cost in the future (disinflation will come with a recession)
- Monetary policy should be used for stabilization, not to achieve short-term gains
  - Offset unexpected shocks that hit on inflation and unemployment
  - For instance, monetary expansion to offset the inflation and employment implications of a fall in consumer' confidence
- Monetary policy rules:
  - To reduce uncertainty and improve policy credibility
  - To avoid the time inconsistency problem

Disinflation

- If prices were flexible, the central banks could respond to inflation surges with shock therapy, as this would enhance credibility, allowing agents to align faster their expectations with the policymaker intentions, and delivering faster price adjustment and lower output costs ("cold turkey" argument).
- When however agents are locked in multi-year contracts, prices cannot adjust swiftly. Thus, there will be real costs even when the policy is credible.
- Therefore, the best policy will be a **gradual** adjustment, so as to give agents time to revise their contracts.
- Such policy should be **smooth and communicated** as much in advance as possible, so as to avoid agents to be taken by surprise: disinflation costs are unavoidable, but they are lower when the policy is credible.
- Of course gradual policies are inherently less credible than shock therapies. But the central bank may be able to overcome this by building up reputation. The new wisdom is that central banks may help stabilize the economy, but following clear rules, being transparent regarding their forecasts and committed with their intentions.

New classical vs New Keynesians

New consensus

Most macroeconomists agree that:

- In the short run, shifts in aggregate demand affect output.
- In the medium run, output returns to the natural level.
- In the long run, capital accumulation and the rate of technological progress are the main factors that determine the evolution of the level of output.
- Monetary policy affects output in the short run, but not in the medium run or the long run.
- Fiscal policy has short-run, medium-run, and long-run effects on output.

Sources of contention

•Some of the disagreements involve:

- The length of the "short run," the period of time over which aggregate demand affects output.
- The role of policy. Those who believe that output returns quickly to the natural level advocate the use of tight rules on both fiscal and monetary policy. Those who believe that the adjustment is slow prefer more flexible stabilization policies.
- In any case: because policymakers may have wrong incentives, the institutional framework should impose constraints in their choices .