Diploma Macro Paper 2

Monetary Macroeconomics

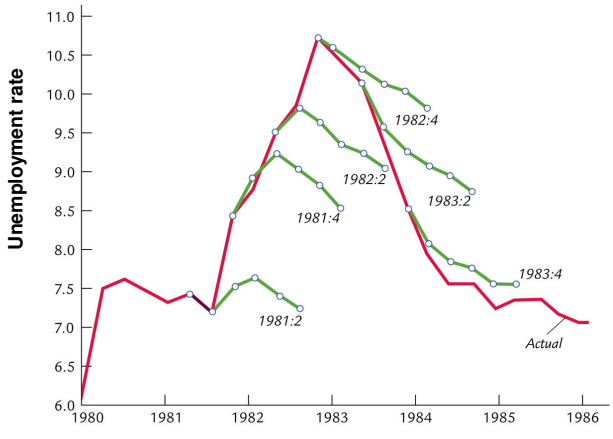
Lecture 7

Policy effectiveness and inflation targeting

Mark Hayes

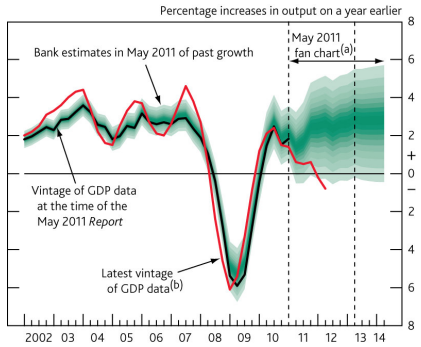
1

Mistakes forecasting the 1982 US recession



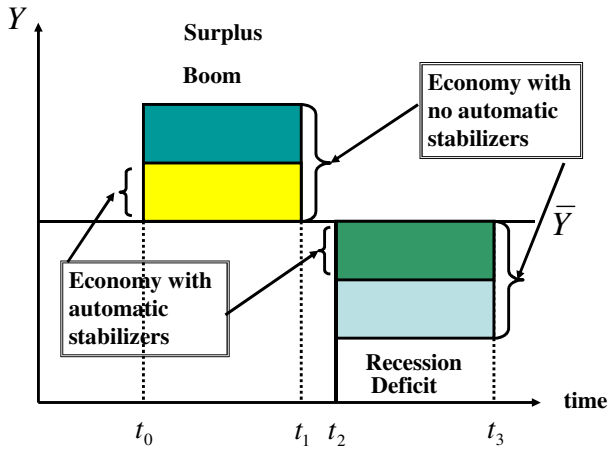
2

Chart C GDP outturns and projection in the May 2011 *Inflation Report*



3

The Cycle and Automatic Stabilizers



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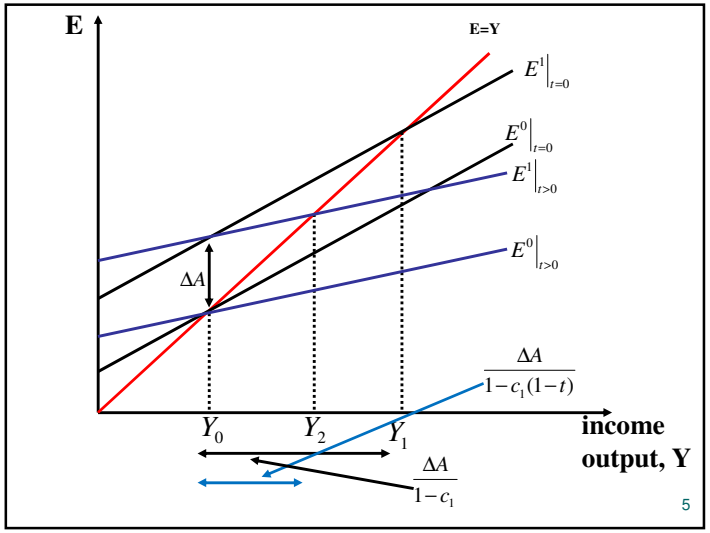
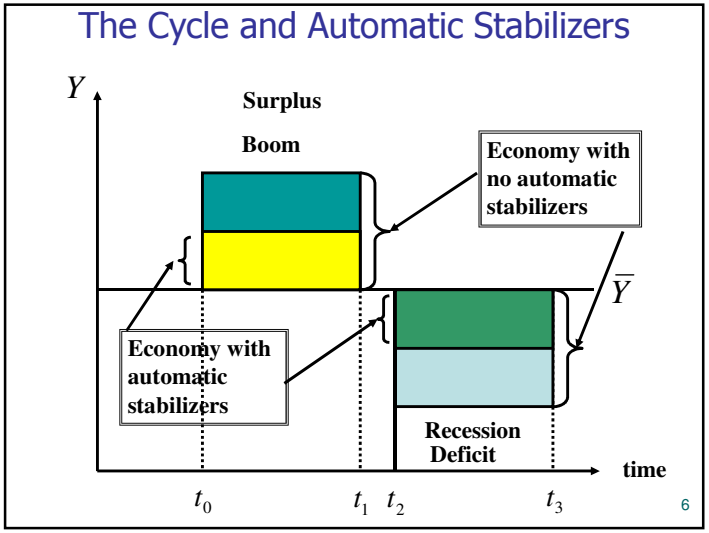
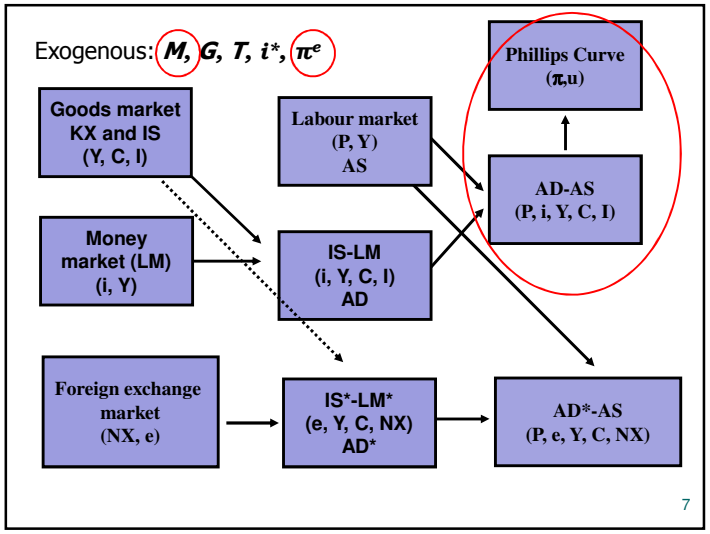
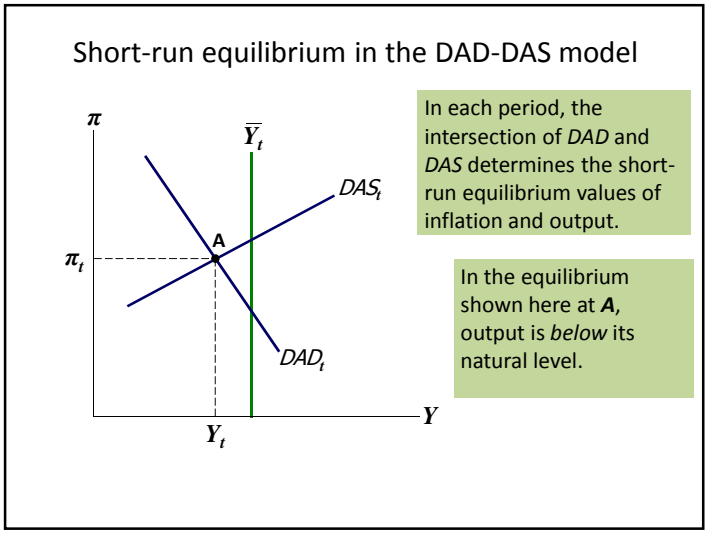

E
E=Y
$E^1|_{t=0}$
$E^0|_{t=0}$
$E^1|_{t>0}$
$E^0|_{t>0}$
ΔA
$\frac{\Delta A}{1-c_1(1-t)}$
Y_0
Y_2
Y_1
income
output, Y
$\frac{\Delta A}{1-c_1}$
5


The Cycle and Automatic Stabilizers
Y
Surplus
Boom
Economy with no automatic stabilizers
$\overline{Y}$
Economy with automatic stabilizers
Recession
Deficit
time
t_0
t_1
t_2
t_3
6


Exogenous: M, G, T, i*, π^e
Goods market KX and IS (Y, C, I)
Money market (LM) (i, Y)
Foreign exchange market (NX, e)
Labour market (P, Y) AS
IS-LM (i, Y, C, I) AD
IS*-LM* (e, Y, C, NX) AD*
Phillips Curve (π,u)
AD-AS (P, i, Y, C, I)
AD*-AS (P, e, Y, C, NX)
7


Short-run equilibrium in the DAD-DAS model
π
$\overline{Y}_t$
DAS_t
A
π_t
DAD_t
Y
Y_t
In each period, the intersection of *DAD* and *DAS* determines the short-run equilibrium values of inflation and output.
In the equilibrium shown here at ***A***, output is *below* its natural level.

The *DAD-DAS* Equations

$$Y_t = \bar{Y}_t - \alpha \cdot (r_t - \rho) + \varepsilon_t$$ Demand Equation

$$r_t = i_t - E_t \pi_{t+1}$$ Fisher Equation

$$\pi_t = E_{t-1}\pi_t + \phi \cdot \left(Y_t - \bar{Y}_t\right) + \nu_t$$ Phillips Curve

$$E_t \pi_{t+1} = \pi_t$$ Adaptive Expectations

$$i_t = \pi_t + \rho + \theta_\pi \cdot \left(\pi_t - \pi_t^*\right) + \theta_Y \cdot \left(Y_t - \bar{Y}_t\right)$$ Monetary Policy Rule

The model's variables and parameters

- Endogenous variables:
  - Y_t = Output
  - π_t = Inflation
  - r_t = Real interest rate
  - i_t = Nominal interest rate
  - $E_t \pi_{t+1}$ = Expected inflation

The model's variables and parameters

- Exogenous variables:
  - $\bar{Y}_t$ = Natural level of output
  - π_t^* = Central bank's target inflation rate
  - ε_t = Demand shock
  - ν_t = Supply shock
- Predetermined variable:
  - π_{t-1} = Previous period's inflation

The model's variables and parameters

- Parameters:
  - α = Responsiveness of demand to the real interest rate
  - ρ = Natural rate of interest
  - ϕ = Responsiveness of inflation to output in the Phillips Curve
  - θ_π = Responsiveness of i to inflation in the monetary-policy rule
  - θ_Y = Responsiveness of i to output in the monetary-policy rule

Output: The Demand for Goods and Services

$$Y_t = \bar{Y}_t - \alpha(r_t - \rho) + \varepsilon_t$$

output — Y_t

natural level of output — $\bar{Y}_t$

real interest rate — r_t

$\alpha > 0, \ \rho > 0$

Assumption: There is a negative relation between output (Y_t) and interest rate (r_t). The justification is the same as for the *IS* curve of Ch. 10.

Output: The Demand for Goods and Services

$$Y_t = \bar{Y}_t - \alpha(r_t - \rho) + \varepsilon_t$$

measures the interest-rate sensitivity of demand — α

"natural rate of interest" — ρ

This is the long-run real interest rate we had calculated in Ch. 3

demand shock, random and zero on average — ε_t

Note that *in the absence of demand shocks,*

$Y_t = \bar{Y}_t$ *when* $r_t = \rho$

The demand shock is *positive* when C_0, I_0, or G is *higher* than usual or T is *lower* than usual.

The Real Interest Rate: The Fisher Equation

$$r_t = i_t - E_t \pi_{t+1}$$

ex ante (i.e. expected) real interest rate — r_t

nominal interest rate — i_t

expected inflation rate — $E_t \pi_{t+1}$

Assumption: The real interest rate is the inflation-adjusted interest rate. To adjust the nominal interest rate for inflation, one must simply subtract the expected inflation rate during the duration of the loan.

The Real Interest Rate: The Fisher Equation

$$r_t = i_t - E_t \pi_{t+1}$$

ex ante (i.e. expected) real interest rate — r_t

nominal interest rate — i_t

expected inflation rate — $E_t \pi_{t+1}$

π_{t+1} = increase in price level from period t to $t+1$, not known in period t

$E_t \pi_{t+1}$ = expectation, formed in period t, of inflation from t to $t+1$

We saw this before in Ch. 4

Inflation: The Phillips Curve

$$\pi_t = E_{t-1}\pi_t + \phi(Y_t - \bar{Y}_t) + \nu_t$$

- π_t: *current inflation*
- $E_{t-1}\pi_t$: *previously expected inflation*
- ν_t: *supply shock, random and zero on average*
- $\phi > 0$: *indicates how much inflation responds when output fluctuates around its natural level*

Expected Inflation: Adaptive Expectations

$$E_t \pi_{t+1} = \pi_t$$

Assumption: people expect prices to continue rising at the current inflation rate.

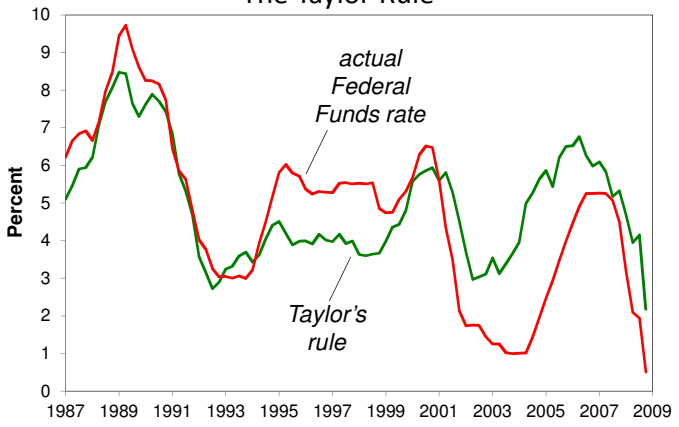
Examples: $E_{2000}\pi_{2001} = \pi_{2000}$; $E_{2010}\pi_{2011} = \pi_{2010}$; etc.

Monetary Policy Rule

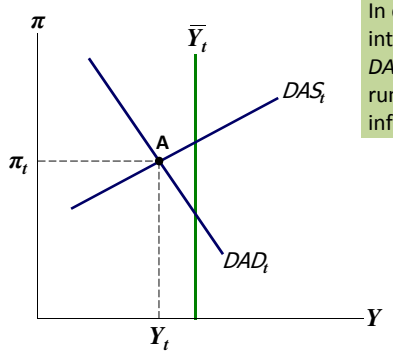
$$i_t = \pi_t + \rho + \theta_\pi \cdot (\pi_t - \pi_t^*) + \theta_Y \cdot (Y_t - \bar{Y}_t)$$

- i_t: Nominal interest rate, set each period by the central bank
- π_t: Current inflation rate
- ρ: Natural real interest rate
- θ_π: Parameter that measures how strongly the central bank responds to the inflation gap
- $\pi_t - \pi_t^*$: Inflation Gap: The excess of current inflation over the central bank's inflation target
- θ_Y: Parameter that measures how strongly the central bank responds to the GDP gap
- $Y_t - \bar{Y}_t$: GDP Gap: The excess of current GDP over natural GDP

CASE STUDY
The Taylor Rule



Short-run equilibrium in the DAD-DAS model



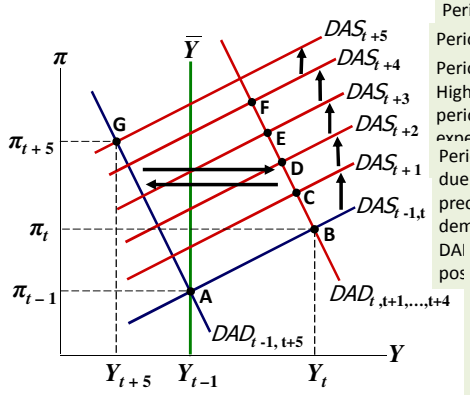
In each period, the intersection of *DAD* and *DAS* determines the short-run equilibrium values of inflation and output.

In the equilibrium shown here at ***A***, output is *below* its natural level.

A Series of Aggregate Demand Shocks

- Suppose the economy is at the long-run equilibrium
- Then a positive aggregate demand shock (ε>0) hits the economy for five successive periods, and then stops (ε = 0)
- How will the economy be affected in the short run?
- How will the economy adjust over time?

A shock to aggregate demand



Period ***t* – 1**: initial equilibrium at **A**

Period ***t***: Positive demand

Period ***t* + 1**: Higher inflation

Periods ***t* + 2** to ***t* + 4**: Higher inflation in previous period raises inflation expectations, shifts DAS up

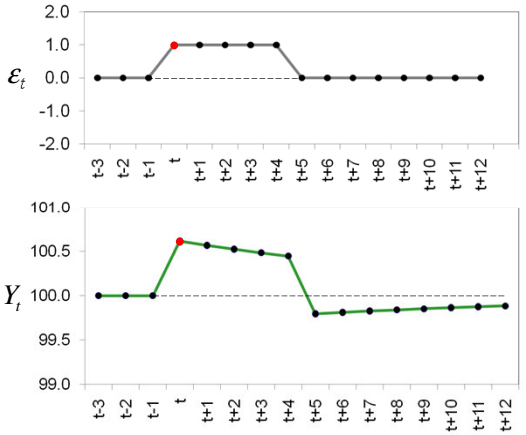
Period ***t* + 5**: DAS is higher due to higher inflation in preceding period, but demand shock ends and DA pos

Periods ***t* + 6** and higher: DAS gradually shifts down as inflation and inflation expectations fall. The economy gradually recovers and returns to long run equilibrium at **A**.

Parameter values for simulations

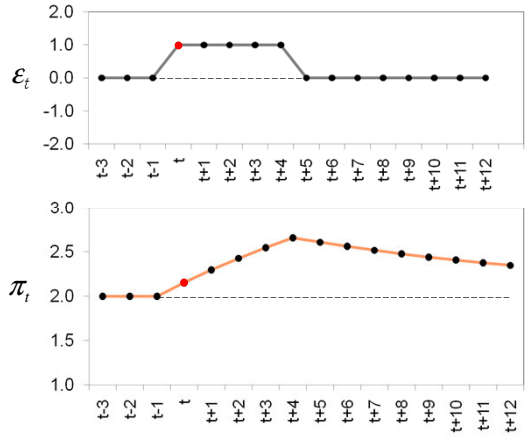
$\bar{Y}_t = 100$	Thus, we can interpret $Y_t - \bar{Y}_t$ as the percentage deviation of output from its natural level.
$\pi_t^* = 2.0$	The central bank's inflation target is 2 percent.
$\alpha = 1.0$	A 1-percentage-point increase in the real interest rate reduces output demand by 1 percent of its natural level.
$\rho = 2.0$	The natural rate of interest is 2 percent.
$\phi = 0.25$	When output is 1 percent above its natural level, inflation rises by 0.25 percentage point.
$\theta_\pi = 0.5$	These values are from the Taylor Rule, which approximates the actual behavior of the Federal Reserve.
$\theta_Y = 0.5$	

The dynamic response to a demand shock



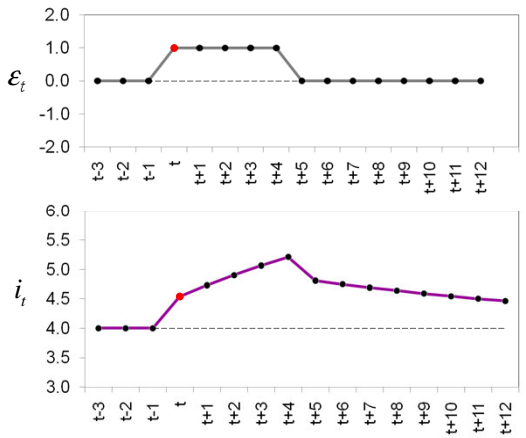
The demand shock raises output for five periods. When the shock ends, output falls below its natural level, and recovers gradually.

The dynamic response to a demand shock



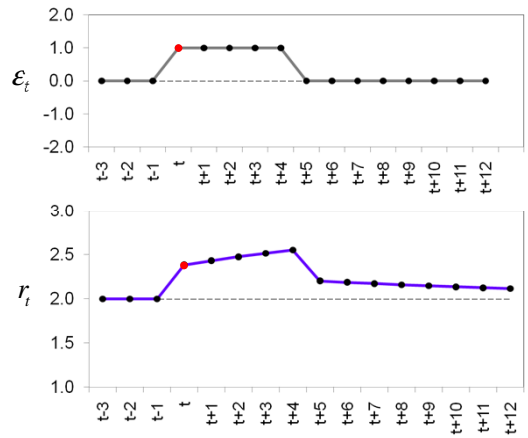
The demand shock causes inflation to rise. When the shock ends, inflation gradually falls toward its initial level.

The dynamic response to a demand shock



The central bank raises the money interest rate in response. After the shock ends, the money interest rate falls, first sharply, then gradually returns to its initial level.

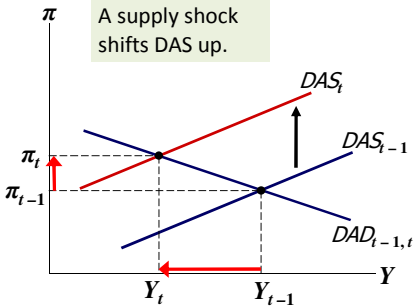
The dynamic response to a demand shock



The real interest rate is the resultant of the money interest rate and inflation.

APPLICATION:
Output variability vs. inflation variability

CASE 1: θ_π is large, θ_Y is small



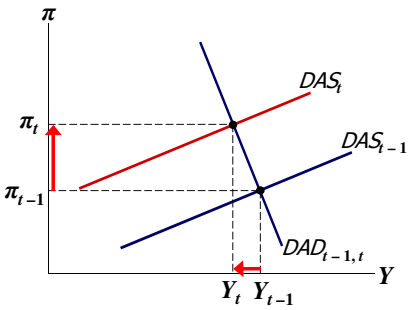
A supply shock shifts DAS up.

In this case, a small change in inflation has a large effect on output, so DAD is relatively flat.

The shock has a large effect on output, but a small effect on inflation.

APPLICATION:
Output variability vs. inflation variability

CASE 2: θ_π is small, θ_Y is large



In this case, a large change in inflation has only a small effect on output, so DAD is relatively steep.

Now, the shock has only a small effect on output, but a big effect on inflation.

APPLICATION:
Output variability vs. inflation variability

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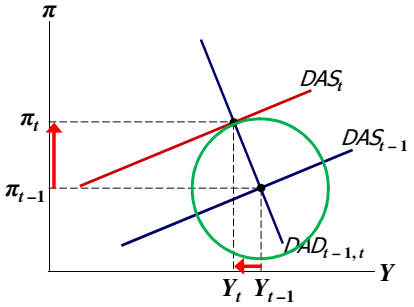

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APPLICATION:
Output variability vs. inflation variability

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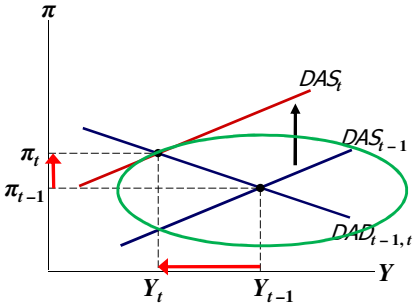

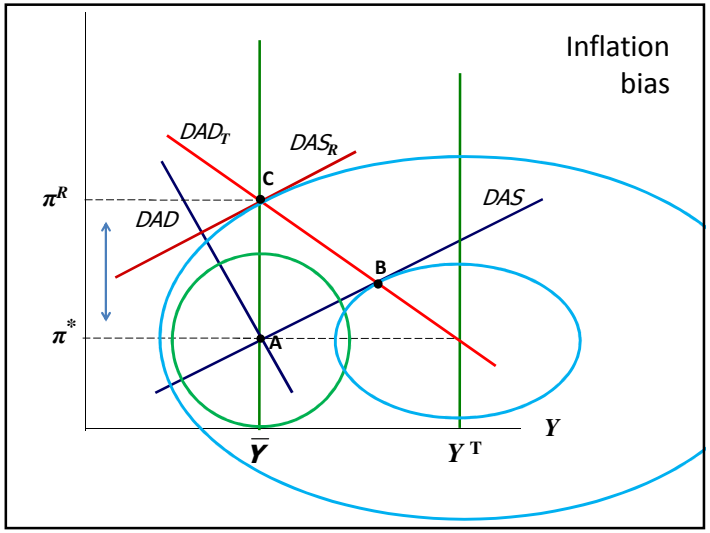

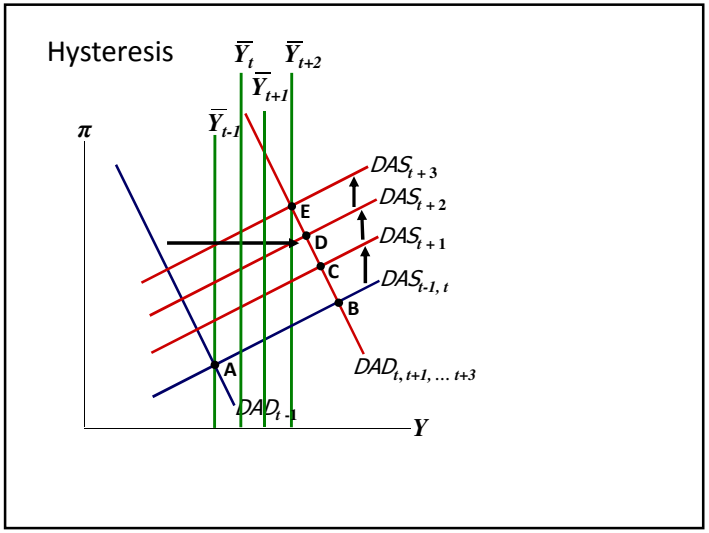

Next time

- Origins of the North Atlantic and Euro crises

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