
Inflation and the DAD – SAS Model: A General Framework for Macroeconomic Analysis, Part 4

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Agenda

- Inflation and the Triangle Model.
 - The DAD – SAS Model.
 - Inflation Adjustment and the Attainment of General Equilibrium.
 - Inflation, Disinflation, and Deflation.
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Inflation and the triangle model

- Definition of inflation:

$$\pi_t = \{ (P_t - P_{t-1}) / P_{t-1} \} * 100$$

- Where P is the general price level.
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Inflation and the triangle model

- Three explicit factors for explaining inflation.
 - Called the triangle model.
 - Inflation, π , depends on 3 components:
 - Inflationary expectations, π^e .
 - Excess demand, π^{ED} .
 - Inflation shocks, π^Z .
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Inflation and the triangle model

- Inflationary expectations, π^e :
 - If people expect a particular level of inflation, that level will likely occur even without any pressure from the output or labor market.

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Inflation and the triangle model

- Inflationary expectations, π^e :
 - Modeling π^e is extremely difficult.
 - Rational expectations
 - Based on forward-looking behavior.
 - Adaptive expectations
 - Based on backward-looking behavior
 - Dependent on effect of staggered wage and price behavior.

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Inflation and the triangle model

- Inflationary expectations, π^e :
 - **Key Assumption:** Inflation expectations are formed by simple adaptive expectations.

$$\pi^e = \pi_{t-1}$$

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Inflation and the triangle model

- Excess demand inflation, π^{ED} :
 - Excess demand is measured by the output gap.

$$\pi^{ED} = f(Y - Y^*)$$

- Where $f > 0$.
 - The bigger is the output gap, the faster is the change in π , for any given f .
 - The bigger is f , the faster is the change in π , for any given output gap.

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Inflation and the triangle model

- Excess demand inflation, π^{ED} :
 - **Key Assumption**: Because of wage and price stickiness, current excess demand inflation depends on lagged excess demand.

$$\pi^{ED}_t = f(Y_{t-1} - Y^*_{t-1})$$

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Inflation and the triangle model

- Inflation shocks, π^Z :
 - Inflation shocks are assumed to be exogenous.
 - Changes in input costs that are independent of demand.
 - Changes in imported goods prices, especially oil.
 - » Foreign price versus exchange rate.
 - Changes in competitive pressures.

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Inflation and the triangle model

- Inflation shocks, π^Z :
 - **Key Assumption**: Inflation shocks affect inflation contemporaneously.

$$\pi^Z_t = Z_t$$

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Inflation and the triangle model

- **Inflation:**

$$\pi_t = \pi_{t-1} + f(Y_{t-1} - Y^*_{t-1}) + Z_t$$

- Expected inflation, plus
- Excess demand inflation, plus
- Inflation shocks.

- This is also the **new** SRAS curve.

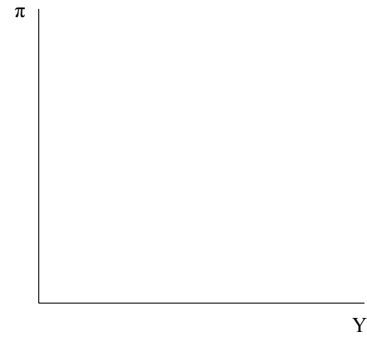
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The SRAS curve

- The original SRAS curve was based on P-level adjustment
- The new SRAS curve is now based on π adjustment

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The SRAS Curve



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The Phillips curve and the SRAS curve

- The expectations-augmented Phillips curve:

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

- Okun's Law:

$$(Y^* - Y) / Y^* = 2(u - \bar{u})$$

➤ or

$$u - \bar{u} = 0.5(Y^* - Y) / Y^*$$

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The Phillips curve and the SRAS curve

- Short-run Aggregate Supply (SRAS) curve:

$$\pi = \pi^e + g(Y - Y^*)$$

➤ If

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

➤ then

$$\pi_t = \pi_{t-1} + g(Y_{t-1} - Y_{t-1}^*)$$

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The Phillips curve and the SRAS curve

- Short-run Aggregate Supply (SRAS) curve:

$$\pi_t = \pi_{t-1} + g(Y_{t-1} - Y^*_{t-1})$$

- Adding inflation shocks:

$$\pi_t = \pi_{t-1} + g(Y_{t-1} - Y^*_{t-1}) + Z_t$$

- and we have the new SRAS curve.

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The Phillips curve and the SRAS curve

- Short-run Aggregate Supply (SRAS) curve:

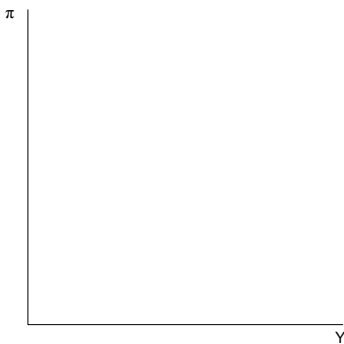
$$\pi_t = \pi_{t-1} + g(Y_{t-1} - Y^*_{t-1}) + Z_t$$

- Inflation equals:

- Expected inflation, plus
- Excess demand inflation, plus
- Inflation (or supply) shocks.

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The new SRAS Curve



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The AD Curve

- The Aggregate Demand (AD) curve is based on levels of the underlying variables.
 - The level of C^d , I^d , G , T , L , and M^s => level of Y and P .

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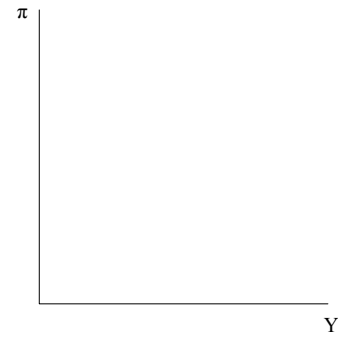
The *DAD* Curve

- The ***Dynamic Aggregate Demand*** (DAD) curve is based on growth rates of the underlying variables.

➤ Growth rate of C^d , I^d , G , T , L , and M^s => growth rate of Y and P (or π).

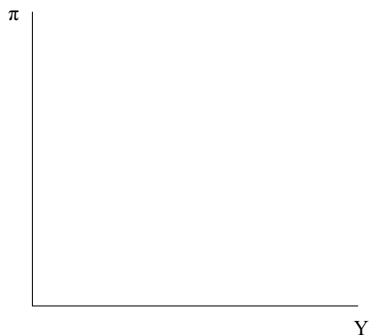
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The *DAD* Curve



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General equilibrium in the *DAD-SAS* model



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The *DAD-SAS* model and π adjustment

- π adjustment can occur because of:
 - Demand shocks (shifts in the DAD curve),
 - Inflation shocks (shifts in the SRAS curve), or
 - Supply shocks (shifts in both the SRAS and LRAS curves).

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The *DAD–SAS* model and π adjustment

- Types of DAD Shock:
 - Favorable (increases Y relative to Y^*):
 - Rightward shifts in the IS curve and/or the LM curve that increases output relative to full-employment output.
 - Unfavorable (decreases Y relative to Y^*):
 - Leftward shifts in the IS curve and/or the LM curve that decreases output relative to full-employment output.

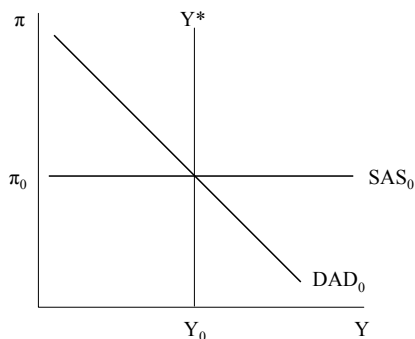
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The *DAD–SAS* model and π adjustment

- An increase in government purchases:
 - In Year 0, the economy is in general equilibrium.
 - Denote the general equilibrium level of output by Y^* .

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An increase in government purchases



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The *DAD–SAS* model and π adjustment

- An increase in government purchases:
 - In Year 1, government purchases increase.
 - Assume Ricardian equivalence does NOT hold.
 - An increase in government purchases shifts both the *IS* and *DAD* curves to the right.

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The *DAD-SAS* model and π adjustment

- An increase in government purchases:
 - In Year 1, the increase in government purchases increases output but leaves inflation unchanged.
 - Short-run equilibrium at the *DAD* and *SRAS* intersection.
 - The labor market is temporarily out of equilibrium.
 - π adjustment does NOT take place in Year 1 because of:
 - Lagged adjustment to excess demand, and
 - Inflationary expectations (which are lagged inflation).

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The *DAD-SAS* model and π adjustment

- An increase in government purchases:
 - In Year 2, inflation begins to rise.
 - In Year 2, the *SRAS* curve shifts up because of excess aggregate demand in Year 1, i.e., $Y_1 > Y^*$.
 - How far the *SRAS* curve shifts up depends on the explicit inflation adjustment process for the economy.
 - Generally it is a multiyear process dependent on the amount of excess aggregate demand.

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The *DAD-SAS* model and π adjustment

- An increase in government purchases:
 - In Year 2, inflation begins to rise.
 - Higher inflation reduces the real money supply, M^s/P .
 - Alternatively, the purchasing power of the nominal money supply, M^s , has been reduced.
 - A lower real money supply shifts the *LM* curve to the left, raising the real interest rate.

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The *DAD-SAS* model and π adjustment

- An increase in government purchases:
 - In Year 2, inflation begins to rise.
 - A higher real interest rate will:
 - Reduce interest-sensitive spending,
 - Reduce output and employment, and
 - Raise the unemployment rate.

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The *DAD-SAS* model and π adjustment

- An increase in government purchases:
 - In Year 3, inflation continues to rise.
 - In Year 3, the *SRAS* curve shifts up again because of excess aggregate demand in Year 2, i.e., $Y_2 > Y^*$.
 - Because excess aggregate demand in Year 2 is less than in Year 1, the upward shift of the *SRAS* in Year 3 will be smaller than in Year 2.

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The *DAD-SAS* model and π adjustment

- An increase in government purchases:
 - In Year 4 and beyond, this process continues until general equilibrium is re-established in both the *IS-LM* and *DAD-SAS* models.
 - Output will be at its full-employment level.
 - The real money supply is lower.
 - The real interest rate is higher.
 - Inflation will be permanently higher.

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The *DAD-SAS* model and π adjustment

- Results of demand shocks:
 - The economy reaches Y^* through the repetition of π adjustment year after year.
 - Each year, conditions in the previous year determine π in the current year:
 - Inflationary expectations and
 - Excess/insufficient demand.

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The *DAD-SAS* model and π adjustment

- Types of Inflation Shocks:
 - Unfavorable (increases π):
 - Higher imported goods and/or raw material prices.
 - Especially oil.
 - Weaker currency.
 - Reduced competitive pressures.
 - Exogenous wage push.
 - Reduced globalization.
 - Increased regulation.

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The *DAD-SAS* model and π adjustment

- Types of Inflation Shock:
 - Favorable (reduces π):
 - Lower imported goods or raw material prices.
 - Especially oil.
 - Stronger currency.
 - Increased competitive pressures.
 - Globalization.
 - Decreased regulation.

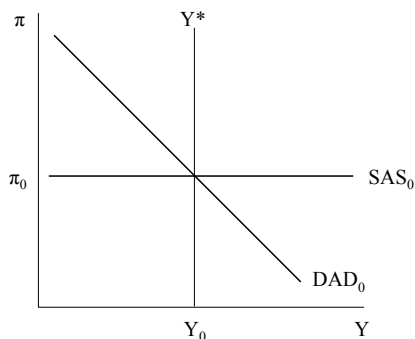
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The *DAD-SAS* model and π adjustment

- A short-run adverse inflation shock:
 - In Year 0, the economy is in general equilibrium.

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A short-run adverse inflation shock



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The *DAD-SAS* model and π adjustment

- A short-run adverse inflation shock:
 - In Year 1, imported goods inflation increases.
 - An increase in imported goods inflation immediately increases the inflation rate and shifts the *SRAS* curve up.
 - Higher inflation reduces the real money supply, M^s/P .
 - A lower real money supply shifts the *LM* curve shifts to the left, raising the real interest rate.

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The *DAD-SAS* model and π adjustment

- A short-run adverse inflation shock:
 - In Year 1, the increase in imported goods inflation raises the inflation rate and decreases output.
 - A higher real interest rate will:
 - Reduce interest-sensitive spending,
 - Reduce output and employment, and
 - Raise the unemployment rate.

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The *DAD-SAS* model and π adjustment

- A short-run adverse inflation shock:
 - In Year 2, inflation will begin to fall.
 - In Year 2, the *SRAS* curve shifts down because of the insufficient aggregate demand in Year 1, i.e., $Y_1 < Y^*$.
 - As the *SRAS* curve shifts down, inflation falls.
 - A lower price level increases the real money supply.
 - A higher real money supply shifts the *LM* curve to the right, reducing the real interest rate.

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The *DAD-SAS* model and π adjustment

- A short-run adverse inflation shock:
 - In Year 2, inflation will begin to fall.
 - A lower real interest rate:
 - Increases interest-sensitive spending,
 - Increases output and employment, and
 - Decreases the unemployment rate.

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The *DAD-SAS* model and π adjustment

- A short-run adverse inflation shock:
 - In Year 3 and beyond, inflation continues to fall until general equilibrium is re-established in both the *IS-LM* and *DAD-SAS* models.
 - Output will be at its full-employment level.
 - The real money supply is back to its original level.
 - The real interest rate is back to its original level.
 - Inflation will be back at its original level.

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The *DAD-SAS* model and π adjustment

- Results of inflation shocks:
 - The economy reaches Y^* through the repetition of π adjustment year after year.
 - Each year, conditions in the previous year determine π in the current year:
 - Inflationary expectations and
 - Excess/insufficient demand.

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The *DAD-SAS* model and π adjustment

- Summary of (Short-term) Effects:
 - Favorable DAD Shock
 - Higher Y (relative to Y^*) and π .
 - Unfavorable DAD Shock
 - Lower Y (relative to Y^*) and π .
 - Favorable SAS Shock
 - Higher Y (relative to Y^*) and lower π .
 - Unfavorable SAS Shock
 - Lower Y (relative to Y^*) and higher π .

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The *DAD-SAS* model and π adjustment

- (Long-run) Supply shocks:
 - Supply shocks occur when there are permanent changes in:
 - Productivity.
 - Competitive pressures.
 - (Long-run) Supply shocks change Y^* .
 - Because Y^* changes, the π adjustment process is altered.
 - and permanently change π .

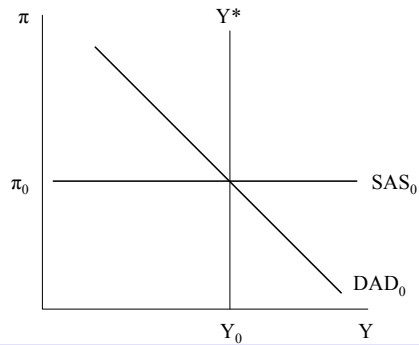
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The *DAD-SAS* model and π adjustment

- A long-run adverse supply shock:
 - In Year 0, the economy is in general equilibrium.

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An adverse supply shock



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The *DAD-SAS* model and π adjustment

- A long-run adverse supply shock:
 - In Year 1, there is a decrease in productivity.
 - A decrease in productivity shifts **BOTH** the *SRAS* curve up and the *LRAS* curve (and the *FE* line) to the left.
 - The short-run effects could be:
 - » Greater than,
 - » Equal to, or
 - » Less than the long-run effects.

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The *DAD-SAS* model and π adjustment

- A long-run adverse supply shock:
 - In Year 1, the upward shift of the *SRAS* curve:
 - Increases inflation,
 - Reduces the real money supply,
 - Shifts the *LM* curve to the left,
 - Raises the real interest rate,
 - Reduces interest-sensitive spending, and
 - Reduces output and employment.

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The *DAD-SAS* model and π adjustment

- A long-run adverse supply shock:
 - In Year 1, the leftward shift of the *LRAS* curve also reduces the economy's full-employment level of output.
 - Which reduces general equilibrium output.

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The *DAD-SAS* model and π adjustment

- A long-run adverse supply shock:
 - In Year 2, if the short-run effects are less than the long-run effects, then:
 - Output in Year 1 is greater than the new, lower full-employment level of output, i.e., $Y_1 > Y_1^*$.
 - So there is excess aggregate demand and the *SRAS* curve will shift up and inflation will rise.
 - This process continues until general equilibrium is re-established.

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Aggregate Demand and Aggregate Supply

- A long-run adverse supply shock:
 - Once general equilibrium has been re-established:
 - Output is at its new, lower full-employment level.
 - Inflation will be permanently higher.

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The *DAD-SAS* model and π adjustment

- An adverse supply shock:
 - The economy moves to its **new** Y^* and results in a permanent change in π .
 - It is likely that the new Y^* will be reached through a repetition of π adjustment year after year.
 - Each year, conditions in the previous year determine π in the current year:
 - Inflationary expectations and
 - Excess/insufficient demand.

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Inflation & Deflation

- The key to understanding rates of change in inflation is the π adjustment equation.

$$\pi_t = \pi_{t-1} + g(Y_{t-1} - Y_{t-1}^*) + Z_t$$

- This equation can describe the process of:
 - Steady inflation,
 - Accelerating inflation,
 - Disinflation, or
 - Deflation

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Inflation, disinflation and deflation

- Stable inflation, $\pi_t = \pi_{t-1}$:
 - Inflation stabilizes when $Y_{t-1} = Y^*_{t-1}$.
 - $u = \bar{u}$
- Accelerating inflation, $\pi_t > \pi_{t-1}$:
 - Inflation accelerates when $Y_{t-1} > Y^*_{t-1}$.
 - $u < \bar{u}$

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Inflation, disinflation and deflation

- Disinflation, $\pi_t < \pi_{t-1}$:
 - Inflation decelerates when $Y_{t-1} < Y^*_{t-1}$.
 - $u > \bar{u}$
 - Policy makers can choose a disinflationary path.
 - The deeper the recession, the faster the disinflation
 - The shallower the recession, the slower disinflation
 - Either way, u must rise above \bar{u} .

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Inflation, disinflation and deflation

- Deflation, $\pi_t < 0$:
 - Prices declines generally requires that Y_{t-1} be substantially below Y^*_{t-1} .
 - $u > \bar{u}$ by a substantial amount and
 - for a sustained period of time.

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