MONETARY POLICY AND INFLATION

Objectives:

- To review the institutions, goals, and instruments of monetary policy in Canada.
- To develop a model to analyse the short-run determinants of output and inflation in an economy which practices inflation targeting.
- To discuss various contemporary issues in the conduct of monetary policy.

I. Canadian Monetary Policy: A Review of Institutions, Goals, and Instruments

1. What is monetary policy and who is responsible for it?

- ***Monetary policy*** is the set of decisions taken by a government to influence the economy by altering the amount of money in circulation and the level of interest rates.

- In Canada monetary policy is implemented by our central bank, **the Bank of Canada.**

- The Bank of Canada is a Crown corporation, not a federal government department, and operates with considerable independence subject to the following:

  - The **goal** of Canadian monetary policy is **set jointly** by the Bank and the federal government.
  - The Bank of Canada Act requires **regular consultation** on the direction of monetary policy between the Governor of the Bank of Canada (currently Mark Carney) and the Federal Minister of Finance (currently Jim Flaherty).
  - If a significant disagreement were to occur between the Bank and the Government the Minister could **issue a written directive to the Governor.** Such a directive has never been issued and, if issued, would probably result in the Governor's resignation.

2. The goal of Canada's monetary policy

- Canada's monetary policy is conducted with the goal of maintaining a ***relatively low and stable rate of price inflation***.

- Specifically, the goal is to maintain the rate inflation, as measured by the annual rate of increase of the Consumer Price Index (CPI), ***within the range of 1 to 3 per cent with a target rate of 2 per cent, the midpoint of that range***.

- This approach to monetary policy is called ***inflation targeting.*** Other countries which have adopted such an approach include Australia, New Zealand, Sweden and the UK; the US Federal Reserve Board does not formally target inflation.

3. Why the focus on the control of inflation?

- Economic theory and empirical evidence provide support for three propositions:
  - **Inflation is costly** to households and firms and damaging to the economy [Chapter 4], while a low and stable rate of inflation contributes to long-run growth by increasing incentives for savings, investment, and productivity improvement. [Chapter 8].

- **In the long run the rate of price inflation is directly related to the rate of growth of the money supply** [Chapter 4] which in turn is controlled by the Bank of Canada.

- **Monetary policy is unable to exert a sustained, or long-lasting, influence on other variables such as output, and unemployment.** [Recall from Chapter 11 that changes in money supply have no long-run effects on real GDP (*Y*)].

4. The instruments or tools of monetary policy.

- A ***policy instrument***, or policy tool, is the specific method by which a policy is implemented.

- In implementing monetary policy a central bank must choose between directly controlling one of two possible policy instruments:

  - the **money supply;**
  - the level of **interest rates**

- Recall (Chapters 10, 11) that the money supply and the level of interest rates **cannot** be controlled independently of one another:

  - the choice of a level of money supply determines the level of interest rates for a given money demand function;

  - the choice of a level of interest rates requires that the quantity of money supplied be adjusted to accommodate the resulting money demand.

- Like many other central banks, the Bank of Canada has chosen to implement monetary policy through control of the level of **interest rates** because:
  - the Bank can control a particular interest rate more effectively than it can control the money supply;
  - monetary policy has its impact on aggregate demand through changes in interest rates which are more effectively controlled directly rather than indirectly through changes in money supply;
  - it is easier for the Bank to communicate its policy actions through changes in interest rate rather than changes in money supply.

- The Bank of Canada's main policy instrument or tool in conducting monetary policy is the ***Target for the Overnight Interest Rate***.

- Commercial banks (e.g. BMO, CIBC etc) lend to one another for a day at a market-determined rate of interest known as the ***overnight rate***.

- The Bank of Canada can keep that rate of interest within a narrow band of 50 basis points (half a percentage point) by announcing a **target value for the overnight rate** **(**known as the ***key policy rate*****)** and being prepared to lend unlimited amounts at a rate (known as ***the Bank Rate***) which is 25 basis points above the target rate and borrow unlimited amounts at a rate 25 basis points below the target rate.

- The Bank of Canada announces a target for the overnight interest rate on **eight pre-determined dates** over the year.

- By changing its target for the overnight rate the Bank can influence the **whole spectrum of interest rates** from yields on 30-day treasury bills ("T-bills") to yields on 30-year government bonds and long-term mortgages.

- Changes in the level of short-term interest rates lead to changes in money demand which the Bank of Canada **accommodates** through changes in the money supply.

- ***In summary, in setting a target for the overnight rate, the Bank of Canada influences interest rates to achieve a level of spending and economic activity consistent with achievement of the inflation target.***

5. The flexible exchange rate framework

- A **flexible** exchange rate is an essential part of the Bank of Canada's policy framework. The Bank has an inflation target but **no exchange rate target**.

- As we discussed in Chapter 12, if the Bank chose to control the **exchange rate** (fixed exchange rates) it could not also control the money supply and interest rates to achieve an inflation target. Instead, it would have to set interest rates and money supply at levels consistent with the choice of the fixed exchange rate.

- When the exchange rate is flexible, changes in the exchange rate are an important part of the "***transmission mechanism***" of monetary policy. Specifically, a policy-induced rise in interest rates causes an appreciation of the exchange rate and a consequent decline in net exports (Chapter 12.)

II. A Dynamic Model of Output, Inflation, and Monetary Policy

1. Overview

- In this section we develop a dynamic model of output and inflation determination within an economy in which the central bank practices inflation targeting and adjusts interest rates to achieve that target.

- We apply that model to analyse the short- and long-run effects of changes in the inflation target and of temporary shocks to aggregate demand and aggregate supply.

2. The Phillips Curve

- In analysing the determinants of the rate of inflation (π) economists use the framework provided by the ***Phillips curve*** whose equation is:

$$\pi_t = \pi_t^e + \beta(Y_t - \bar{Y}) + v_t, \qquad \beta > 0$$

- The above equation states that the rate of inflation in year *t* is the sum of the effects of **three** individual factors:

  - the rate of inflation **expected** to prevail in year *t*, or π_t^e;
  - the size of the ***output gap*** or the difference between **actual** output in year *t* (Y_t) and the level of **full-employment**, or natural, output ($\bar{Y}$);
  - any exogenous **supply shock** in year *t* (v_t).

- The term β is a parameter, or constant, which determines the responsiveness of the rate of inflation to a change in the output gap.

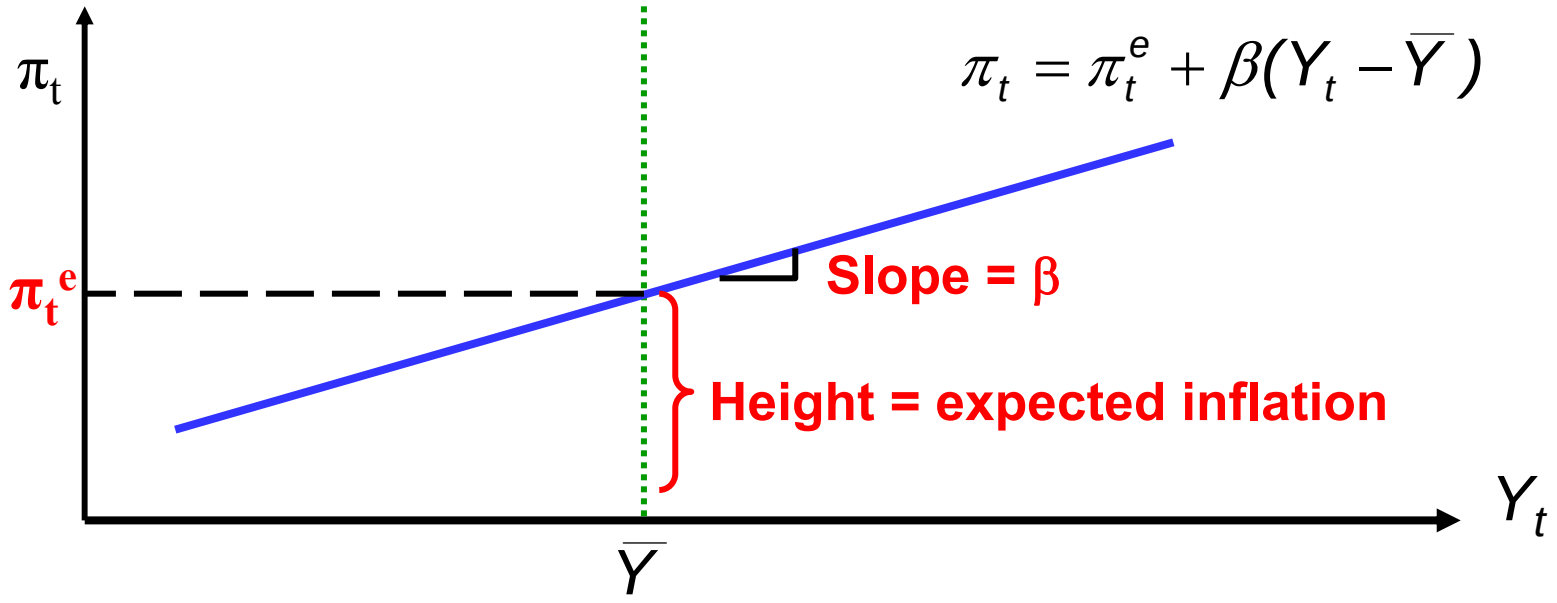
- Inflation depends on expected inflation because money wages (and other input prices) are typically set in advance and reflect expectations of future inflation. Other things being equal, the higher the expected rate of inflation the higher the rate of increase of money wages and other input prices and, because prices depend on unit costs of production, the higher the **actual** rate of price inflation.

- For a given expected rate of inflation, the inflation rate will vary directly with the output gap ($\beta > 0$). When the **economy is booming** ($Y_t > \overline{Y}$) shortages of labour and other inputs will cause wages, and other input prices, to rise **faster** than the expected rate of price inflation which will cause actual inflation to **exceed** expected inflation ($\pi_t > \pi_t^e$).

- Conversely, when the **economy is in recession** ($Y_t < \overline{Y}$) wages, and other input prices, will increase at a rate **slower** than expected inflation, thus causing actual inflation to be **less than** expected inflation ($\pi_t < \pi_t^e$).

- Finally, the supply shock term (v_t) is a random variable whose value fluctuates from period to period around an **average of zero**. For example, if oil prices surge (an "adverse" supply shock) v_t is **positive**; if they collapse (a "favourable" supply shock), v_t is **negative.**

- Assuming the absence of supply shocks ($v_t = 0$), then for a given expected rate of inflation and a given value of $\overline{Y}$ the Phillips curve equation implies that the rate of inflation **varies directly with the actual level of output (Y_t),** as shown in the diagram below.



- The slope of the line equals β and the vertical height of the line when $Y_t = \overline{Y}$ equals the expected rate of inflation ($\pi_t = \pi_t^e$).

- An increase (decrease) in the expected rate of price inflation will **shift** the Phillips curve vertically upwards (downwards) by the change in expected inflation ($\Delta\pi^e$).

- An adverse supply shock ($v_t > 0$) will **shift** the Phillips curve vertically **upwards** by the size of that shock (v_t); a favourable supply shock ($v_t < 0$) will **shift** the Phillips curve vertically **downwards** by the size of that shock (v_t).

3. Adaptive expectations and the dynamics of inflation

- The ***actual*** rate of inflation in period *t* depends partly upon the rate of inflation which is ***expected*** to occur in that period. But what determines the expected rate of inflation?

- The simplest model of expectations formation is the ***adaptive expectations hypothesis*** which states that people expect the rate of inflation in the current year to be unchanged from the actual rate of inflation experienced in the previous year:

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

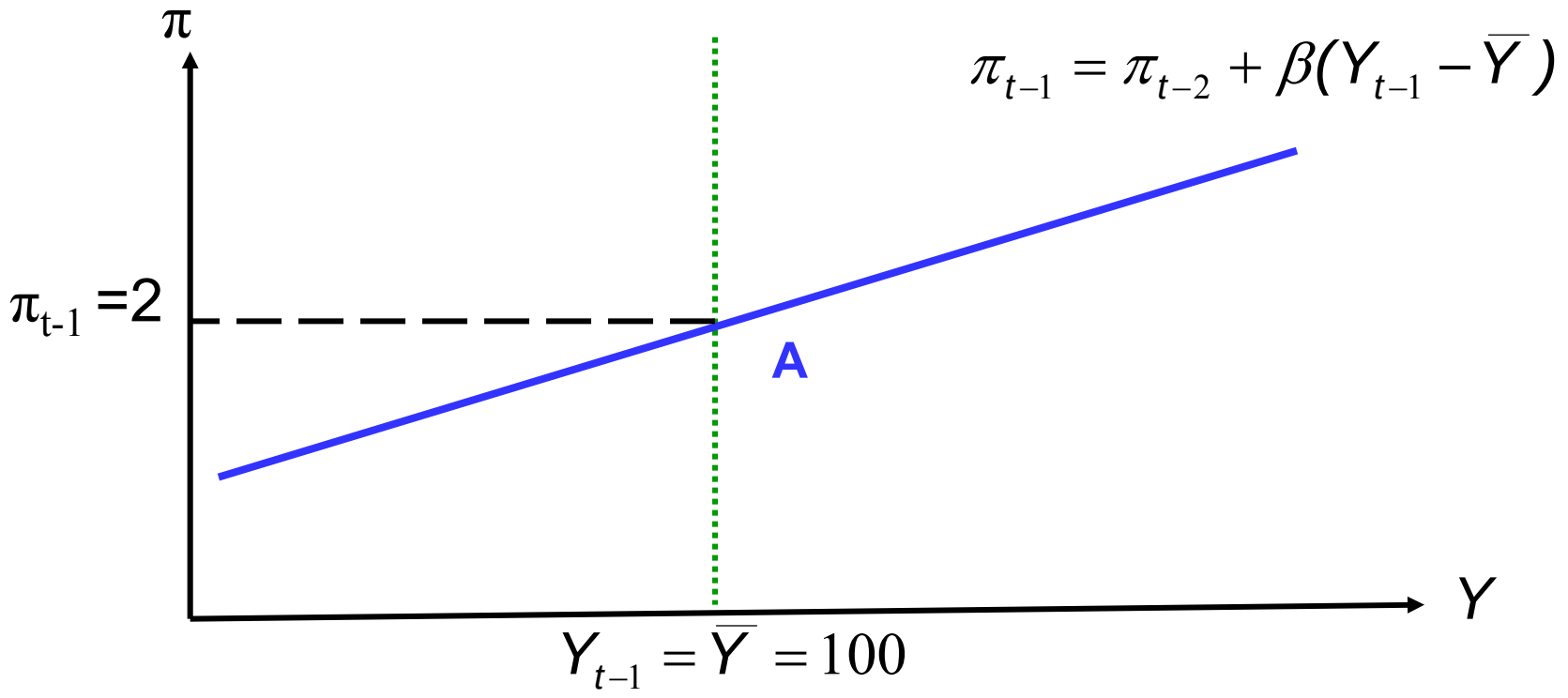
- By substitution (and ignoring supply shocks) we obtain the following equation for the Phillips curve with adaptive expectations:

$$\pi_t = \pi_{t-1} + \beta(Y_t - \bar{Y}) + v_t$$

- The above equation implies that the size of the output gap determines whether the **rate of inflation is increasing, decreasing, or stable** from one year to the next.

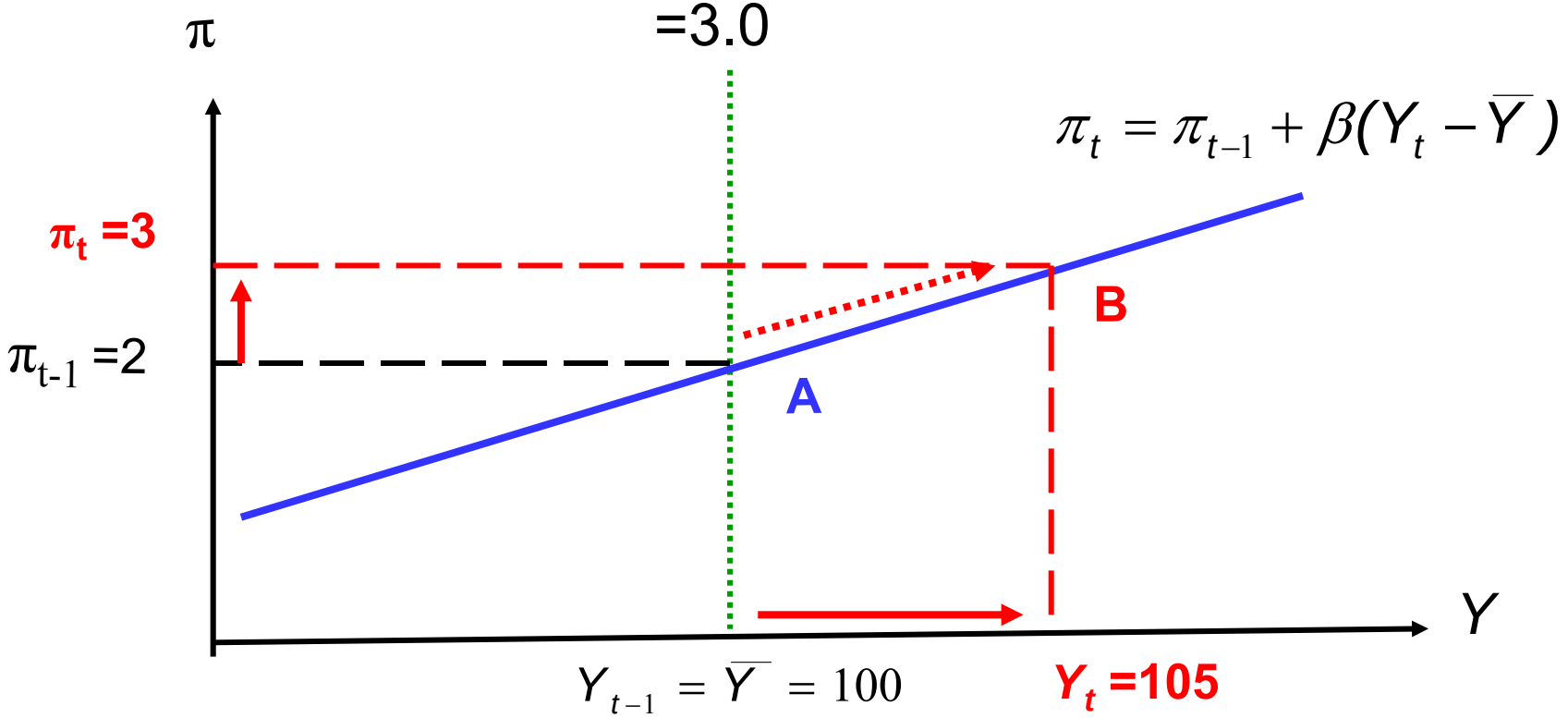
- Specifically,
  - $Y_t > \overline{Y}$ ✡ **accelerating** inflation
  - $Y_t < \overline{Y}$ ✡ **decelerating** inflation or **disinflation**
  - $Y_t = \overline{Y}$ ✡ **stable** inflation

- To illustrate, suppose that in period *t*-1, output equals its natural level to which we will assign the value of 100 ($\bar{Y}$ = 100). Suppose also that in period *t*-1 inflation is stable at a rate of 2 percent: $\pi_{t-1} = \pi_{t-2} = 2.0$. The economy is situated at point **A** in the diagram below.



- Now suppose that in period ***t*** output increases by 5 to 105 and further suppose that inflation increases by 0.2 percent for each unit increase in output (**β=0.2**). Then in period *t* the rate of **inflation will rise to 3 percent** as shown by point **B:**

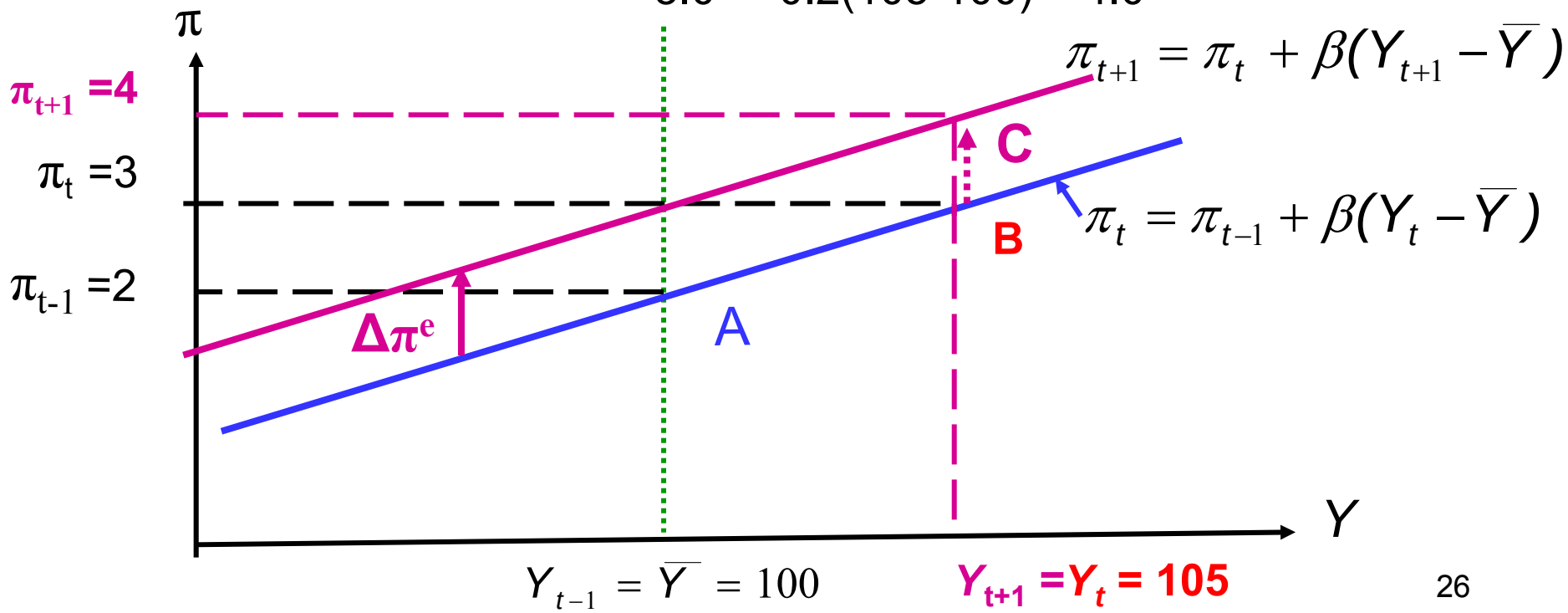
$$\pi_t = \pi_{t-1} + \beta(Y_t - \bar{Y})$$
$$= 2.0 + 0.2(105\text{-}100)$$
$$= 3.0$$



- Now suppose that in period ***t*+1** output remains at 105. The Phillips curve in period *t*+1 **shifts upwards by one percentage point** reflecting the increase in the expected rate of inflation from 2 percent to 3 percent. **The rate of inflation in period *t*+1 will accelerate to 4 percent** as shown by point **C:**

$$\pi_{t+1} = \pi_t + \beta(Y_{t+1} - \overline{Y})$$

$$= 3.0 + 0.2(105\text{-}100) = 4.0$$



- If in period *t*+2 and beyond output remains at 105, the rate of inflation will continue to accelerate by one percentage point each year as the Phillips curve continues to shift vertically upwards as the expected rate of inflation rises.

- **Conclusion: a persistent positive output gap ($Y_t > \overline{Y}$) leads to accelerating inflation; a persistent negative output gap ($Y_t < \overline{Y}$) leads to continuous disinflation. Inflation is stable only when the output gap is zero ($Y_t = \overline{Y}$).**

4. The IS curve and the determination of the level of output

- Assuming a closed economy, and using the model of short-run output determination developed in chapters 10 and 11 (the IS-LM model), the equation for equilibrium output is simply that of the (closed-economy) IS curve:

$$Y_t = C(Y_t - \bar{T}) + I(r_t) + \bar{G} + \gamma_t$$

- The last term in the IS equation (γ_t) is a random variable representing exogenous **shifts in demand** for output (**demand shocks**). The value of γ_t fluctuates from period to period around an average of zero.

- For example, a sudden **increase in confidence** causes an exogenous increase in spending, resulting in a **positive** demand shock reflected in a **positive** value for γ_t; conversely, a **fall in confidence** causes an exogenous decrease in spending, resulting in a **negative** demand shock reflected in a **negative** value of γ_t.

5. The monetary policy rule (MPR)

- We assume that the central bank pursues a policy of **inflation targeting** with a target rate of inflation which we denote as $\bar{\pi}$. For simplicity, we assume that the central bank attempts to achieve this target precisely each period.

- The policy instrument which the central bank uses to achieve its inflation target is the interest rate.

- Specifically, the central bank conducts monetary policy by setting the real interest rate in accordance with the following **monetary policy rule** (called a "***Taylor rule***" after economist John Taylor of Stanford University):

$$r_t = \bar{r} + \theta(\pi_t - \bar{\pi}) \qquad \theta > 0$$

- In the above equation the term $\bar{r}$ denotes the ***natural rate of interest***, defined to be the value of real rate of interest for which, in the absence of any positive or negative demand shock (γ_t =0), actual **output will equal its natural level** ($Y_t = \bar{Y}$). Specifically,

$$Y_t = C(Y_t - \bar{T}) + I(\bar{r}) + \bar{G} + \gamma_t = \bar{Y} \qquad \text{for} \quad \gamma_t = 0$$

- The monetary policy rule implies that when the actual rate of inflation is equal to its target value the central bank will set the real interest rate at its natural level ($\bar{r}$) with the aim of keeping output equal to its natural level and the rate of inflation stable at its target value.

- When the current rate of inflation **rises above target**, $(\pi_t \uparrow \Rightarrow \pi_t > \bar{\pi})$ the central bank will **raise** the real interest rate above its natural value in order to reduce spending and output, creating a **negative** output gap which will **lower** the rate of inflation:

$$\Rightarrow \quad \pi_t > \bar{\pi} \Rightarrow \uparrow r_t \Rightarrow \downarrow Y_t \Rightarrow Y_t < \bar{Y} \Rightarrow \downarrow \pi$$

- Conversely that when the current rate of inflation **falls below target** $(\pi_t \downarrow \Rightarrow \pi_t < \bar{\pi})$ the central bank will **lower** the real interest rate below its natural value in order to increase spending and output, creating a **positive** output gap which will **raise** the rate of inflation:

$$\Rightarrow \quad \pi_t < \bar{\pi} \Rightarrow \downarrow r_t \Rightarrow \uparrow Y_t \Rightarrow Y_t > \bar{Y} \Rightarrow \uparrow \pi$$

- The **parameter** 🗎 in the monetary policy rule equation measures how aggressively monetary policy responds to inflation. For example, if 🗎 =0.5 an inflation rate which is 2 percentage points above target will lead the central bank to raise the real interest rate by one percentage point above its natural level.

- Note that, for simplicity, we have assumed that the central bank controls the **real** rate of interest; in practice the Bank of Canada controls a particular **nominal** interest rate: the overnight rate. However, the real interest rate is related to the nominal rate by the Fisher Equation: $r_t = i_t - \pi_t$. Hence, by controlling the **nominal** interest rate the Bank implicitly controls the **real** interest rate.

6. Combining the IS curve and the MPR: deriving the dynamic aggregate demand (DAD) curve

- By substitution of the monetary policy rule (MPR) into the equation of the IS curve we obtain:

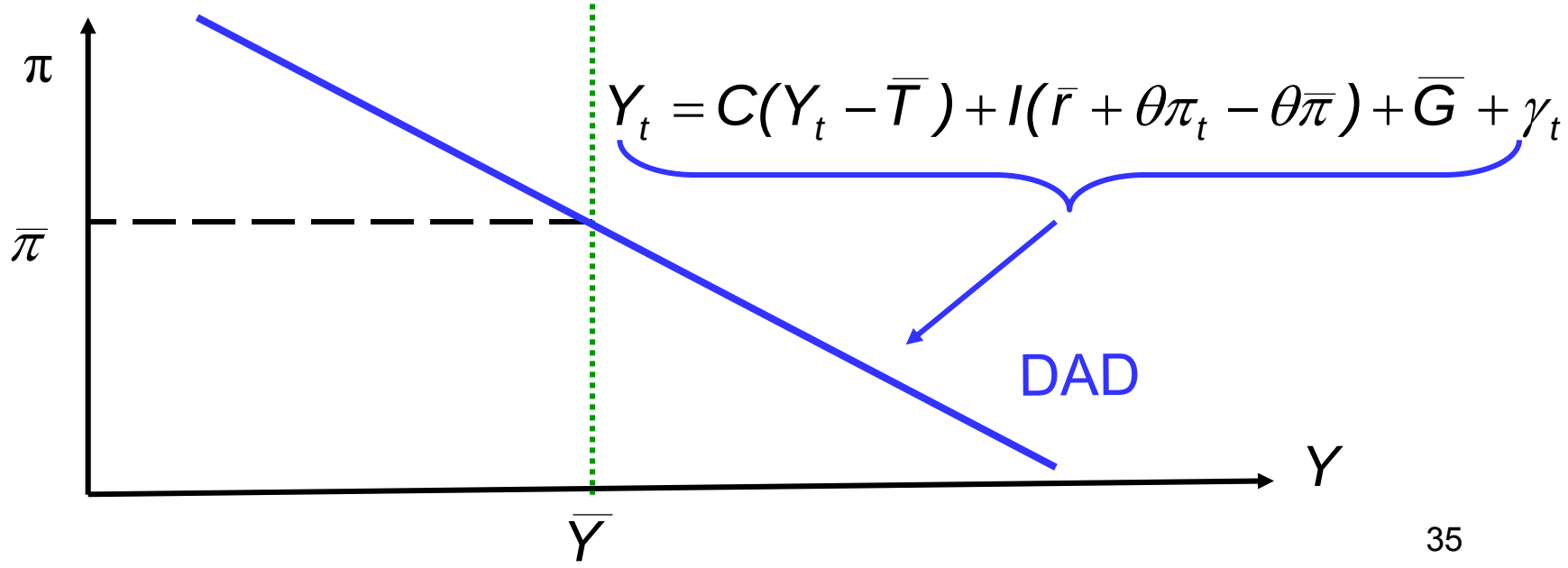
$$Y_t = C(Y_t - \bar{T}) + I(\bar{r} + \theta\pi_t - \theta\bar{\pi}) + \bar{G} + \gamma_t$$

- *Other things being equal, actual* ***output is a decreasing function of the actual rate of inflation****: an increase in the actual rate of inflation relative to its target causes the central bank to raise real interest rates which reduces investment spending, overall spending and output:*

$$\uparrow \pi_t \Rightarrow \downarrow I(\bar{r} + \theta\pi_t - \theta\bar{\pi}) \Rightarrow \downarrow Y_t$$

- This negative relationship between output and the rate of inflation is shown by the downward-sloping ***dynamic aggregate demand curve (DAD)*** in the diagram below.

- Note that, in the absence of any positive or negative demand shock (γ_t =0), the DAD curve intersects the vertical line at $Y_t = \bar{Y}$ at a rate of inflation equal to the target rate: $\pi_t = \bar{\pi}$



7. The complete dynamic aggregate demand – aggregate supply (DAD –DAS)model

- The complete dynamic aggregate demand-aggregate supply model consists of two equations in two unknowns (Y_t and π_t):

$$Y_t = C(Y_t - \bar{T}) + I(\bar{r} + \theta\pi_t - \theta\bar{\pi}) + \bar{G} + \gamma_t$$

✡ **DAD curve**

$$\pi_t = \pi_{t-1} + \beta(Y_t - \bar{Y}) + v_t$$

✡ **DAS curve**

(the Phillips Curve)

- Note that we have re-titled the Phillips curve the **dynamic aggregate supply curve (DAS)** because it shows the (positive) relationship between output and inflation on the supply side of the economy.

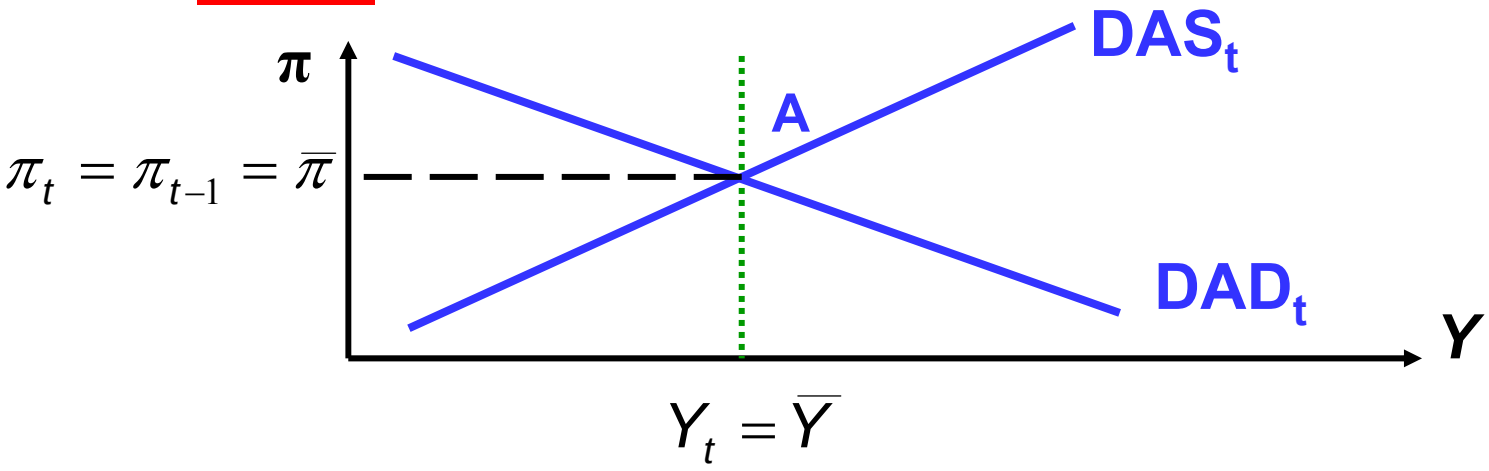
- The economy is in **short-run equilibrium** in period *t* when both output and the rate of inflation are stable within that period – a situation which occurs at the intersection of the DAD and DAS curves for period *t.*

- The economy is in **long-run, or steady-state, equilibrium** when there are no demand or supply shocks ($\gamma_t = v_t = 0$) and the rate of inflation is stable both within the current period **and from one period to the next** ($\pi_t = \pi_{t-1}$).

- ***Thus, long-run equilibrium will exist when there are no demand or supply shocks, output and the real interest rate are at their natural levels, and inflation is fully-anticipated, and equal to its target rate:***

$$Y_t = \overline{Y}; r_t = \bar{r}; \pi_t = \pi_{t-1} = \overline{\pi}; \gamma_t = v_t = 0$$

- Long-run equilibrium occurs at point A in the diagram below where the DAD and DAS curves for period *t* **intersect at the natural level of output and the target rate of inflation**.



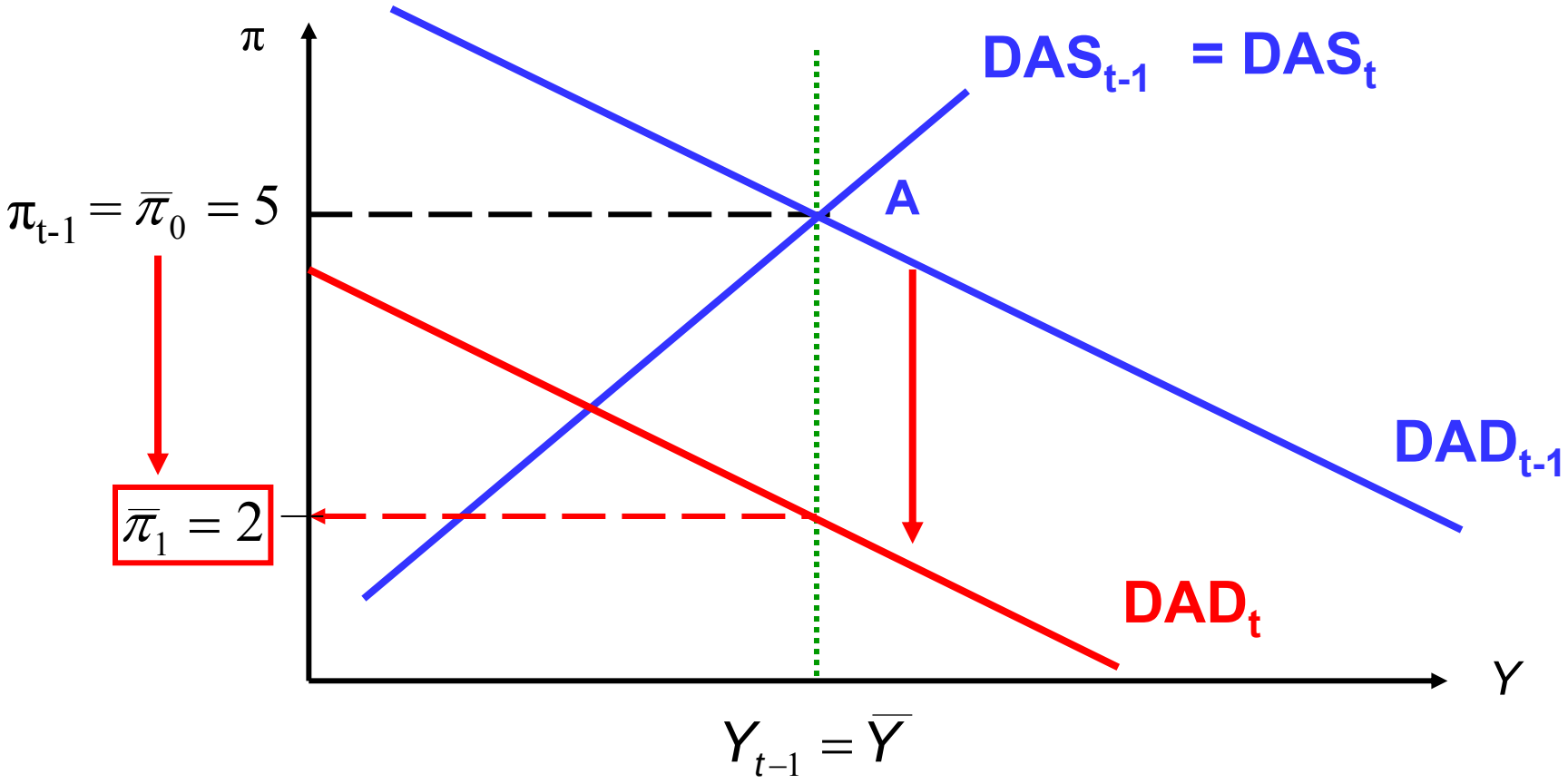
8. The short-run and long-run effects of a decrease in the target rate of price inflation ($\downarrow \bar{\pi}$).

- Suppose that in period *t*-1 the economy is in long-run equilibrium at point A in the diagram below with an initial target rate of inflation of $\bar{\pi}_0$ which we suppose to be 5 percent:

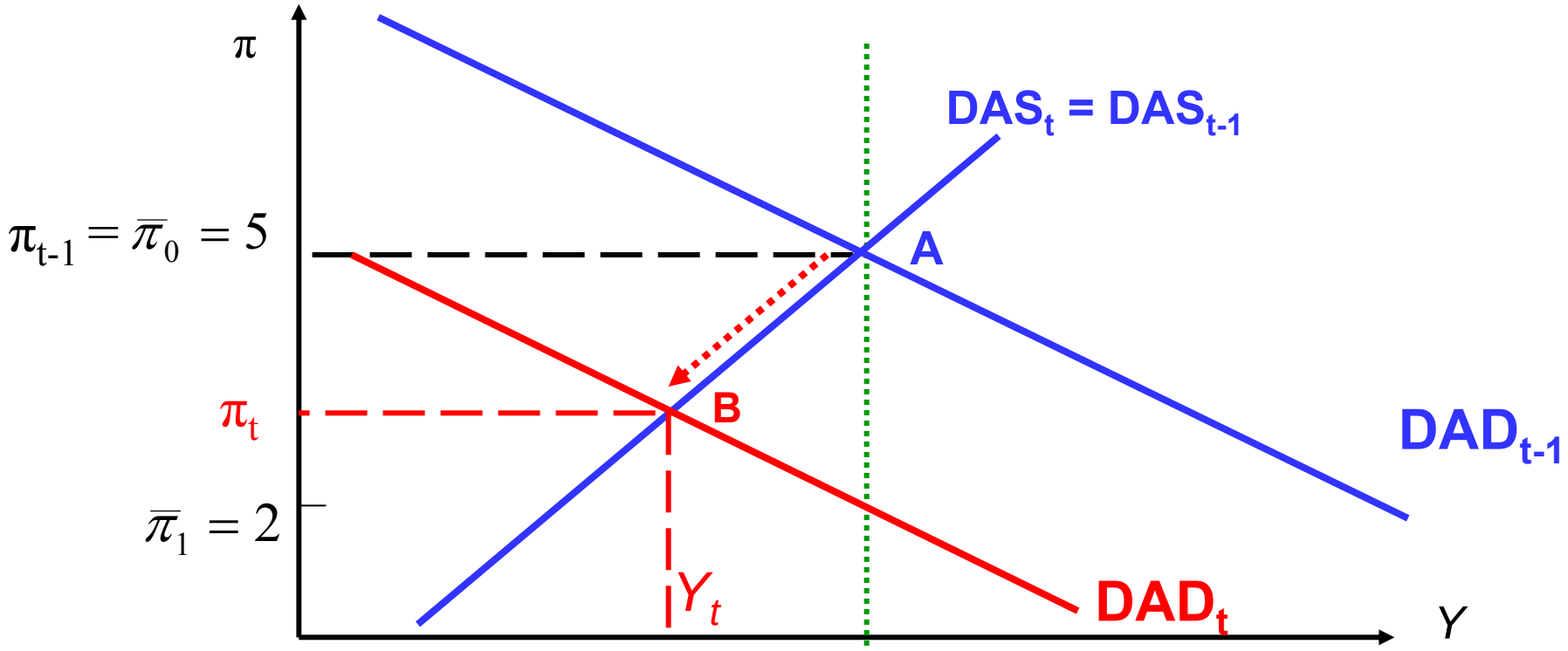
$$Y_{t-1} = \bar{Y} \quad \text{and} \quad \pi_{t-1} = \pi_{t-2} = \bar{\pi}_0 = 5$$

- In period *t* the central bank decides to adopt **a policy of disinflation** with a **reduction** in the target rate of price inflation to 2 percent ($\bar{\pi}_1 = 2 < = 5$).

- The effect of this decrease in target inflation is to **shift the DAD curve** for period *t* vertically **downwards** by the **change in the target rate of inflation**, or 3 percent.

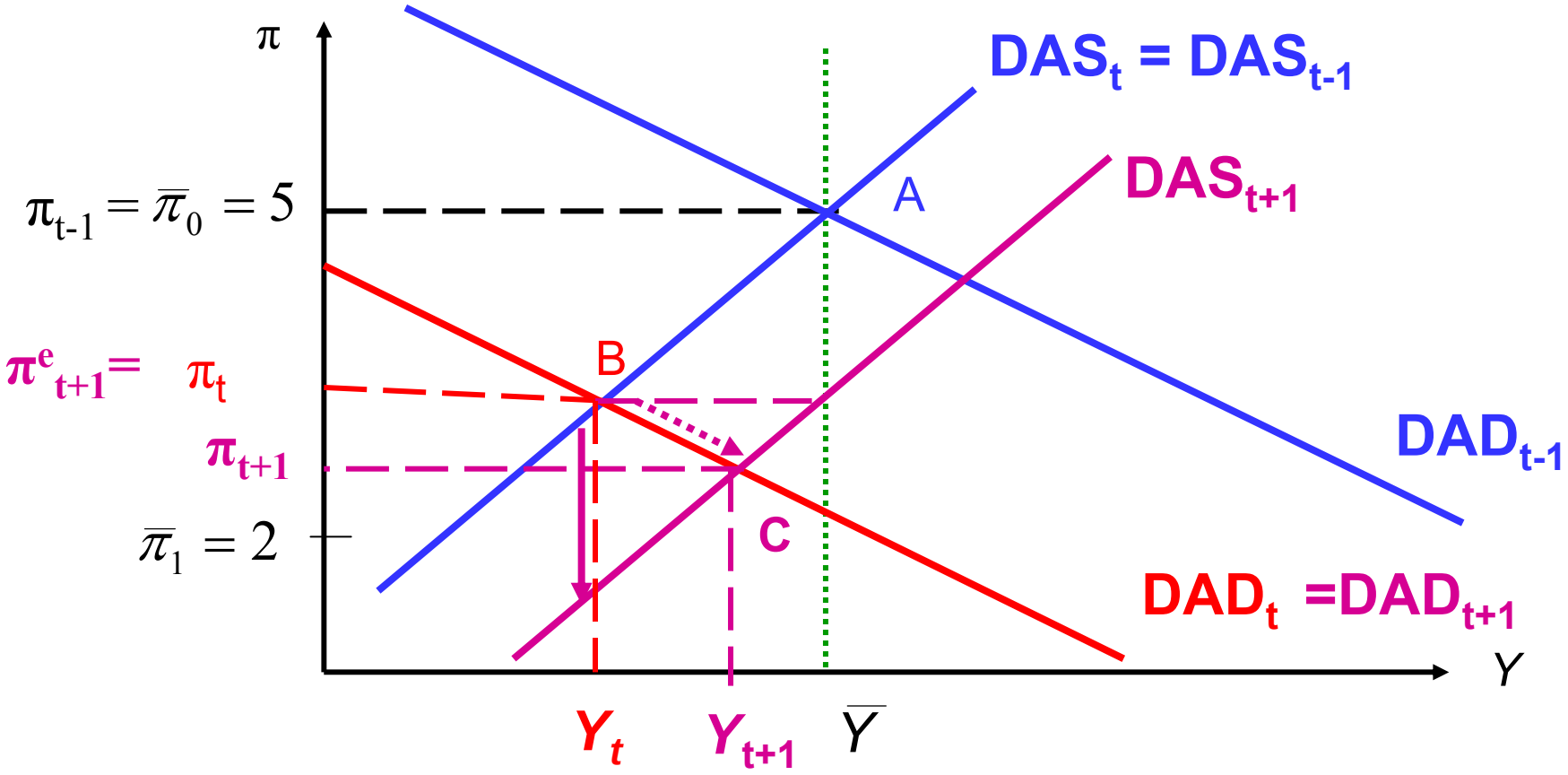


- Because the current rate of inflation (5 percent) exceeds the new, lower target rate of 2 percent, the central bank **raises the real interest rate** (by 3 percent).



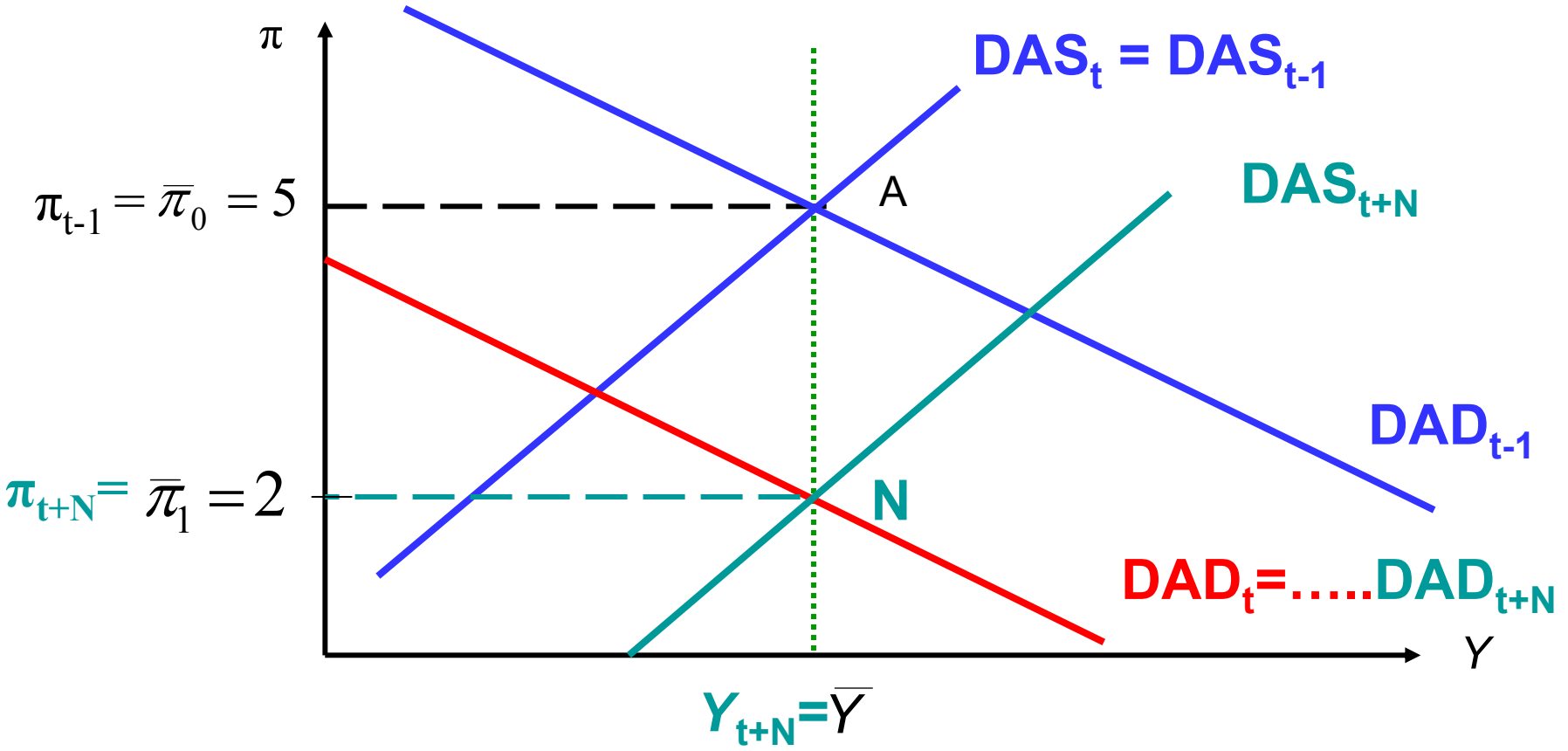
- The rise in the real interest rate reduces investment spending and output creating a **negative output gap** which in turn **lowers the rate of price inflation**; the economy reaches a new short-run equilibrium at **B**.

- Then in period *t*+1 the **Phillips curve (DAS curve) shifts down** to reflect a **decrease in the expected rate of inflation**, lowering the actual rate of price inflation and increasing the level of output (point C in the diagram).



- The process continues until **a new long-run equilibrium** is reached in period ***N*** where (as shown by point ***N*** in the diagram):

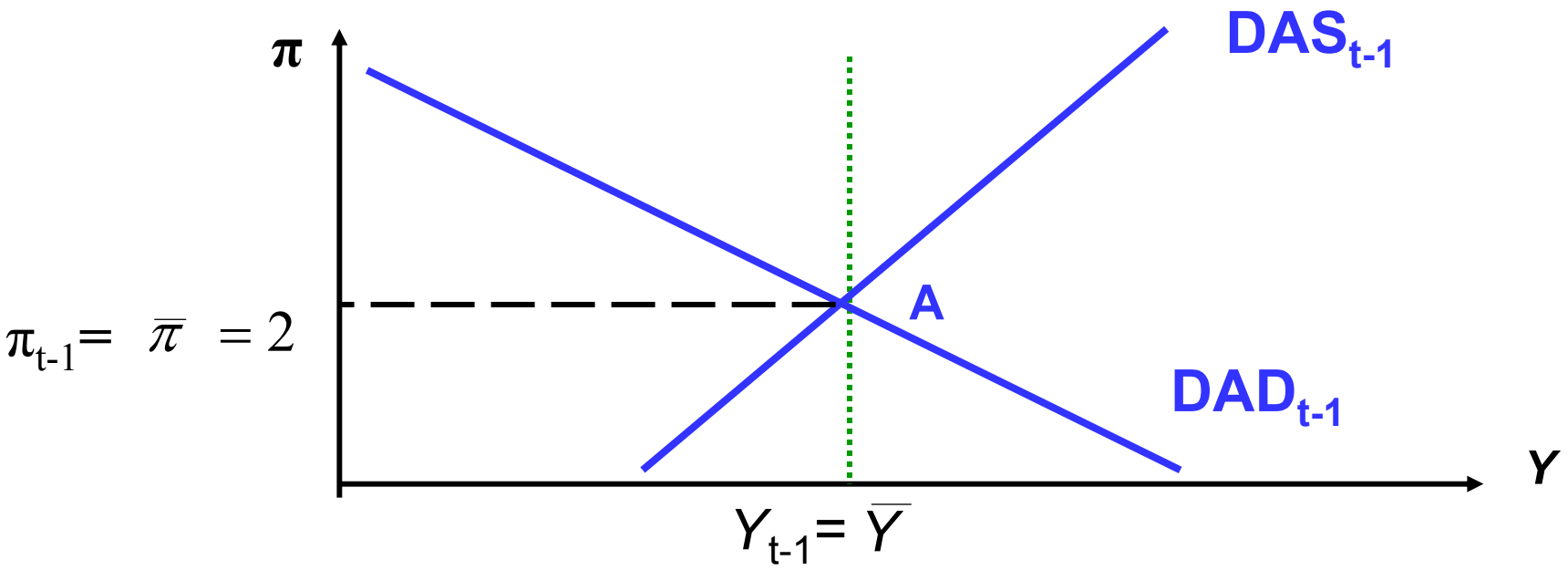
$$Y_{t+N} = \bar{Y} \; ; \; r_{t+N} = \bar{r} \; ; \text{ and } \pi_{t+N} = \pi_{t+N-1} = \bar{\pi}_1 = 2$$



- **Conclusion: a change in monetary policy in the form of a decrease in the target rate of inflation causes a short-run fall in output (a recession) but has no long-run effects on real variables such as the level of real GDP or the real interest rate (from Chapter 4 recall the concepts of long-run *neutrality of money* and the *classical dichotomy*.)**

9. The short-run and long-run effects of an adverse supply shock (Δv_t)

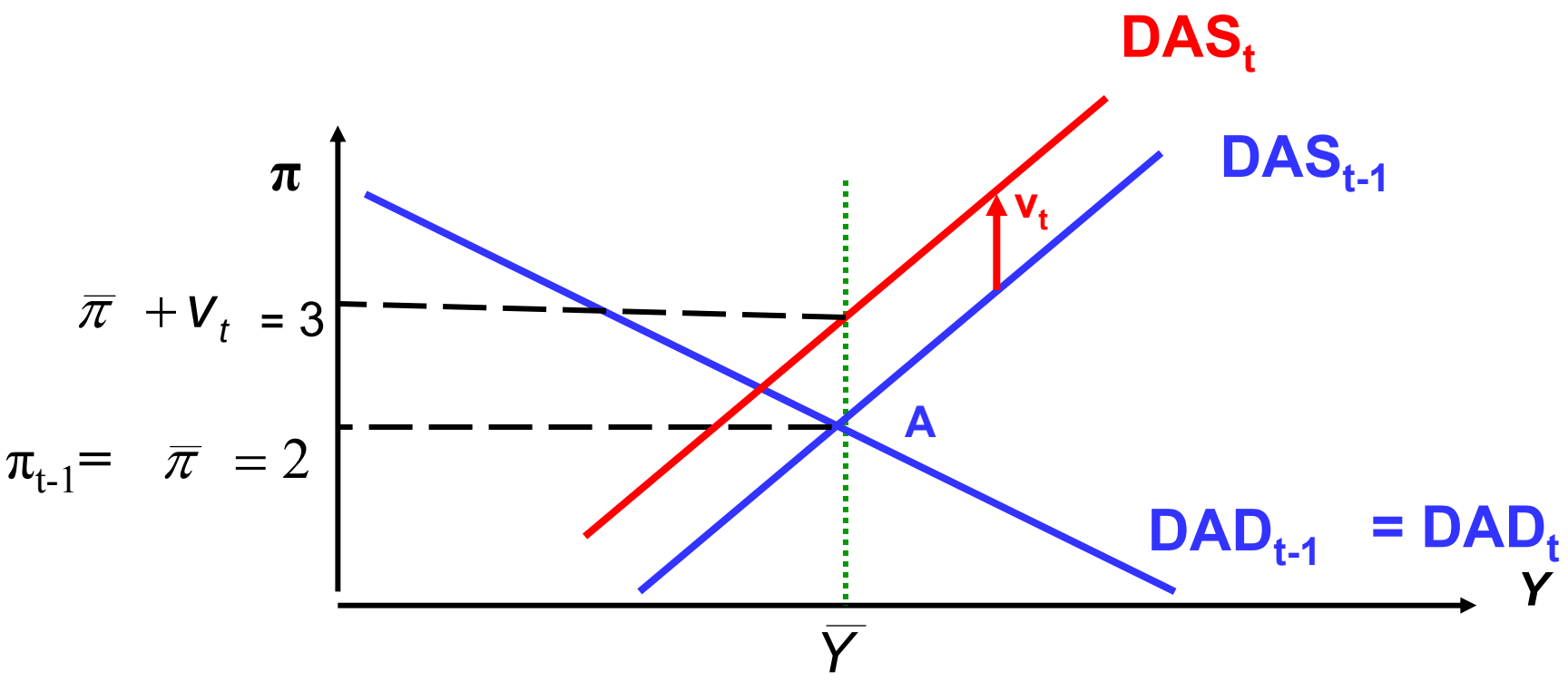
- Suppose that in period *t*-1 the economy is in long-run equilibrium at point **A** in the diagram below with a target rate of inflation of 2 percent.



- In period *t* there is a **sudden rise in the price of oil** which increases v_t from zero to **1.0 percent**. For simplicity, we assume that this supply shock lasts only **one period** after which the supply shock term (*v*) returns to zero:

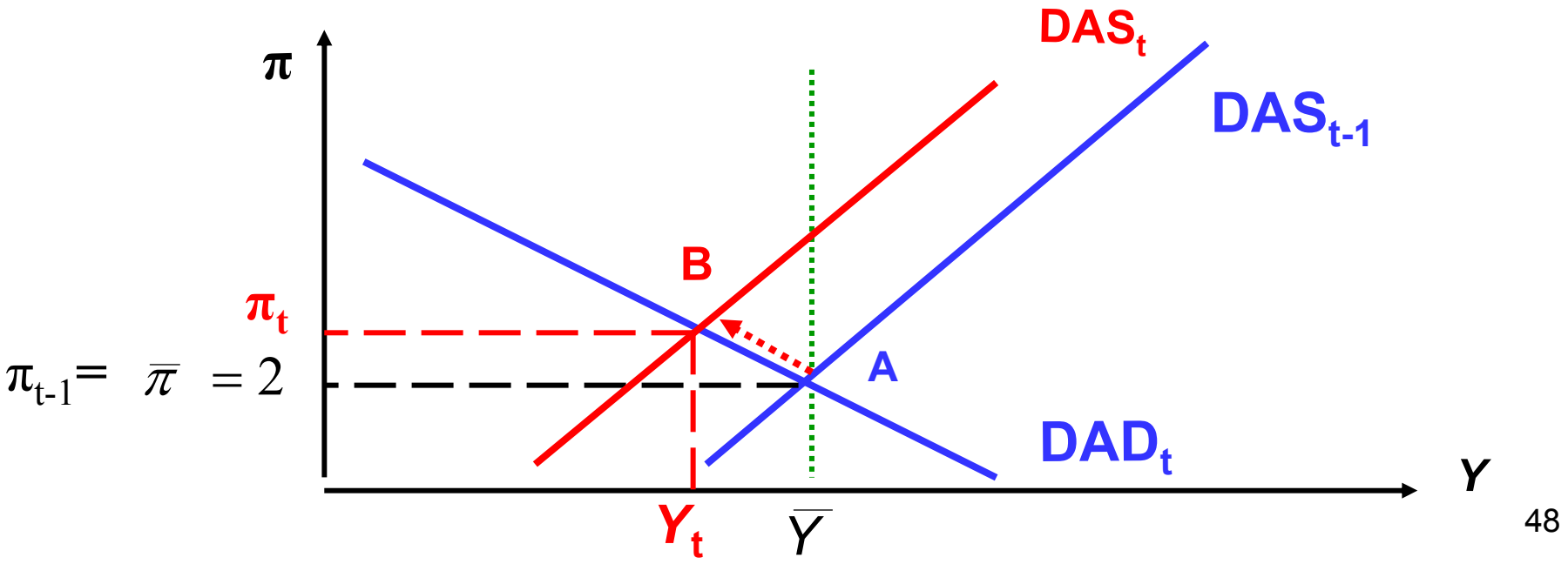
$$v_t = 1.0 > v_{t-1} = 0, \quad \text{and } v_{t+1} = v_{t+2} = v_{t+3} \ldots\ldots = 0$$

- The effect of this supply shock is to **shift the Phillips curve or DAS curve** for period *t* vertically **upwards** by the exogenous increase in inflation (v_t = 1.0). There is **no** shift in the DAD curve.



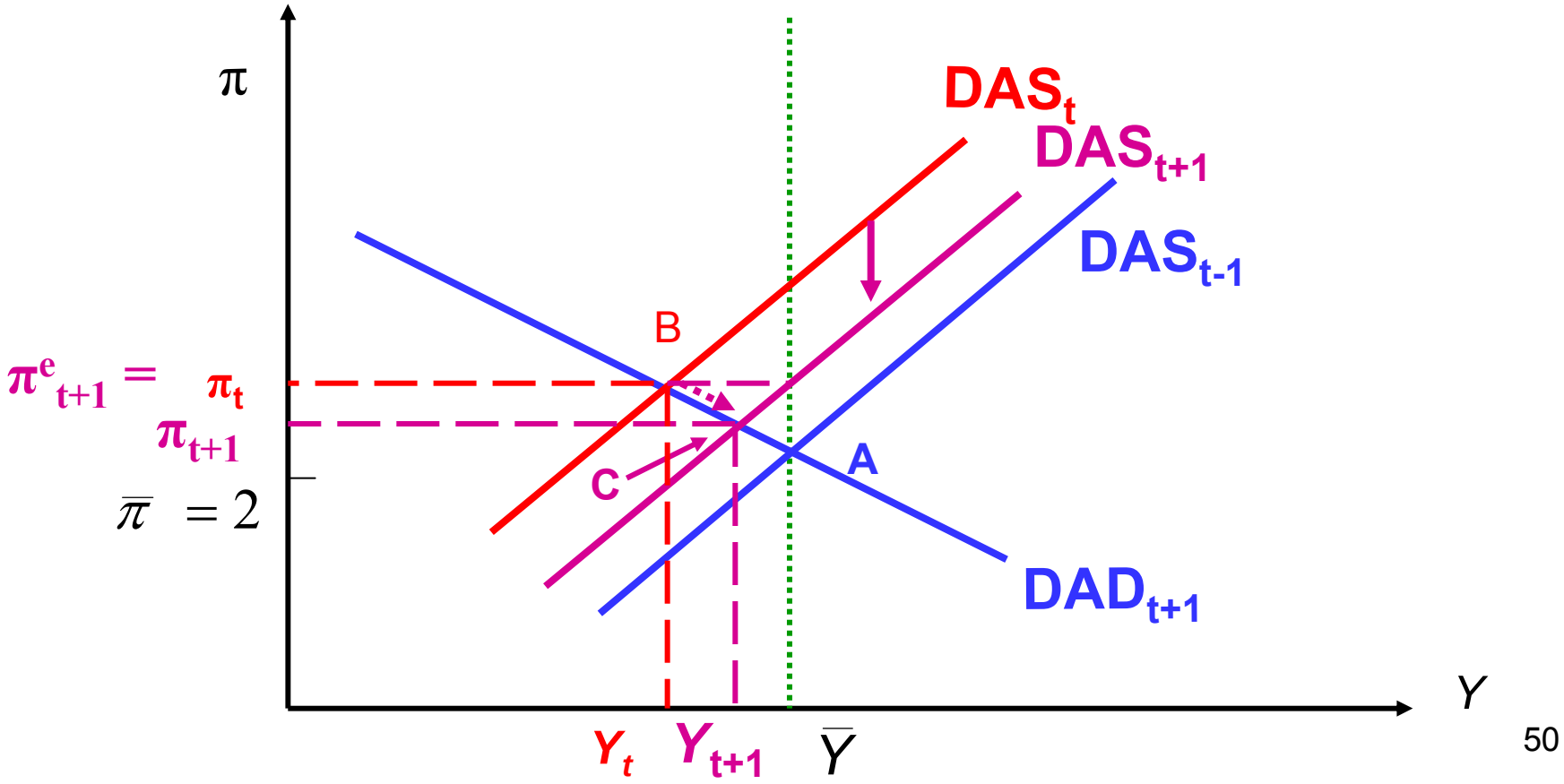
- The immediate increase in the rate of inflation from 2 percent to 3 percent causes the central bank to **raise the real interest rate** (by 🗎 percent).

- As the real interest rate rises investment spending falls and output contracts to Y_t causing the rate of inflation π_t to decreases from 3 percent to a level between 2 and 3 percent; the economy reaches a new short-run equilibrium at point **B** in the diagram.



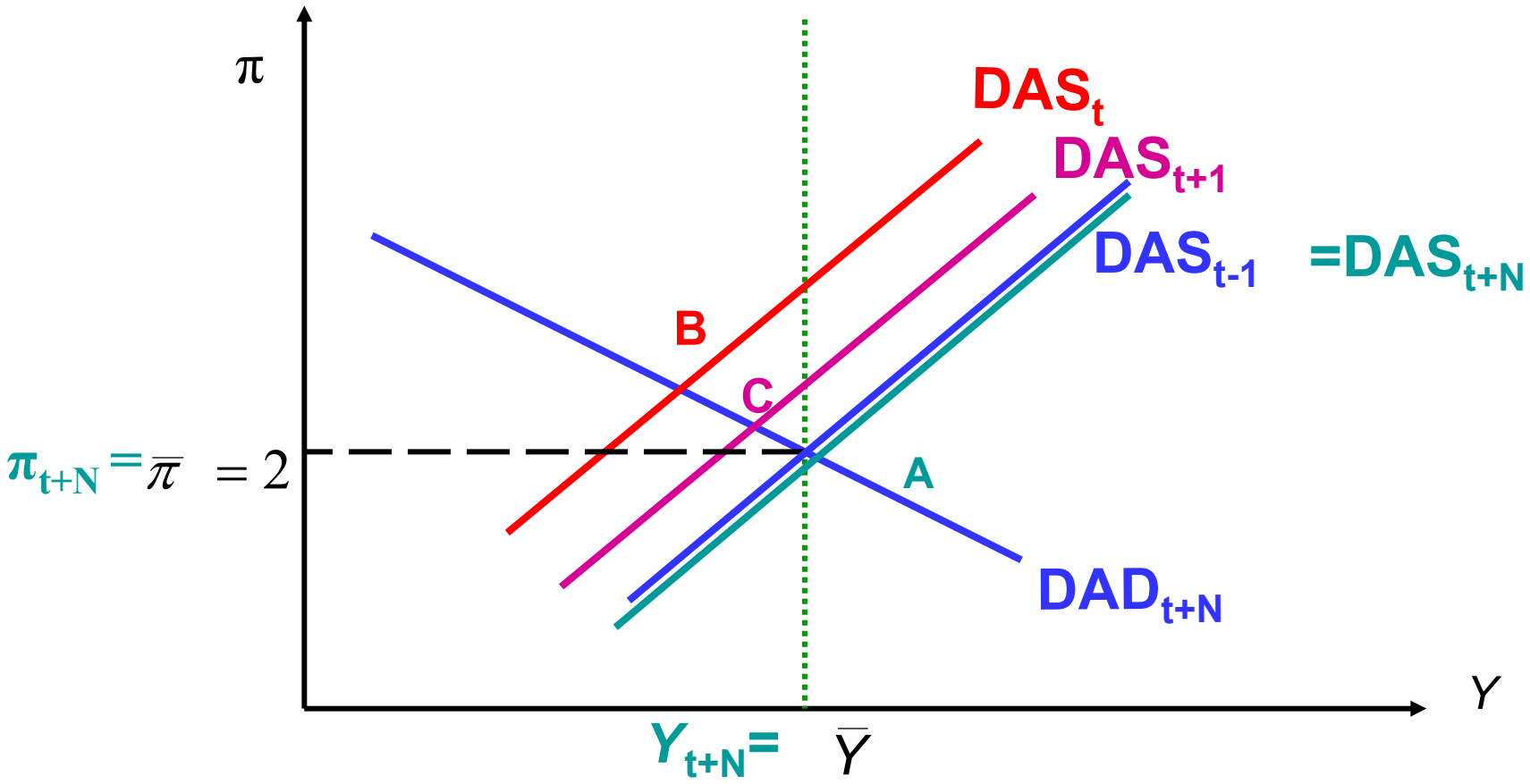
- Note that in the face of a **supply** shock, pursuit of a policy of inflation targeting acts to **destabilize output**. The size of the short-run fall in output depends upon how aggressively the central bank responds to the increase inflation by raising real interest rates; a very aggressive response (high 🗎) results in a relatively flat DAD curve and a relatively large contraction of output.

- In period t+1 the supply shock disappears (v_{t+1}=0) but the expected rate of inflation increases to π_t . The **net** effect is to **shift the DAS** curve for period t+1 **downwards**, lowering the actual rate of inflation to π_{t+1}>2 and increasing the level of output to Y_{t+1}; the economy moves to point C in the diagram.



- The process continues until **a new long-run equilibrium** is reached in period ***N*** at point **A** with inflation equal to its target level and output equal to the natural level

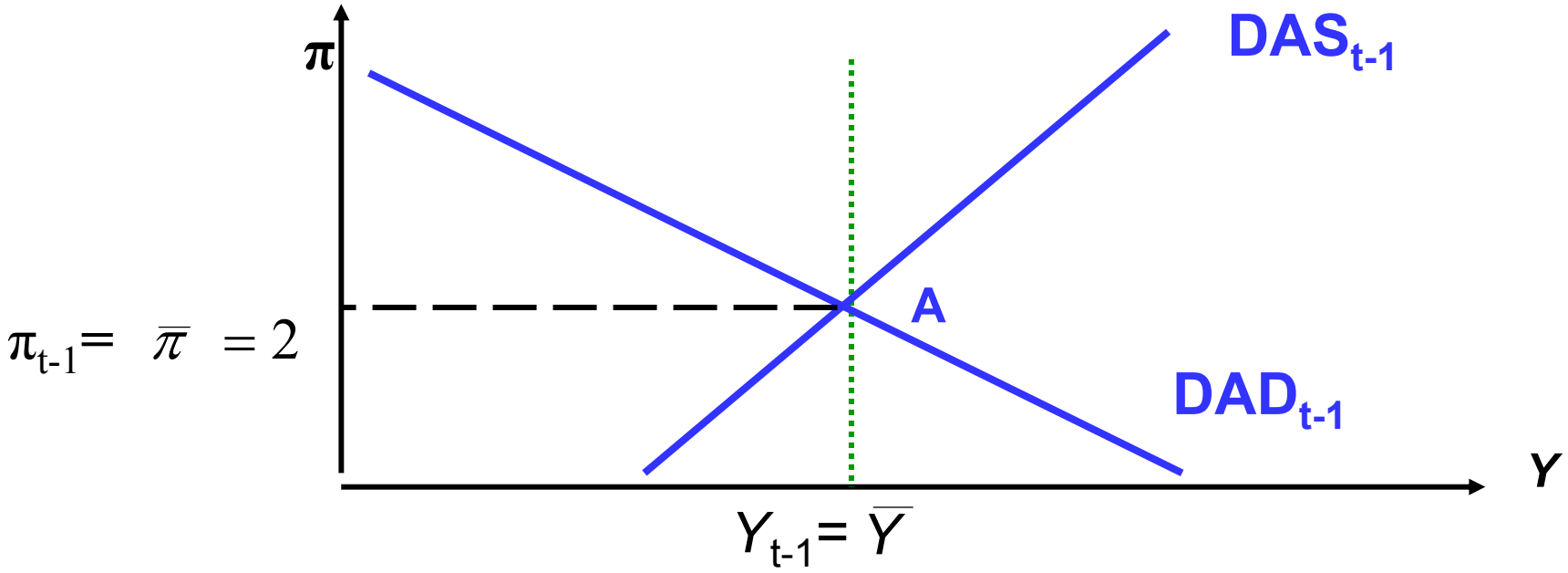
$$Y_{t+N} = \bar{Y}; \; r_{t+N} = \bar{r}; \text{ and } \pi_{t+N} = \pi_{t+N-1} = \bar{\pi} = 2$$



- **Conclusion: a temporary adverse supply shock causes an increase in inflation accompanied by a fall in output (*stagflation*) in the short run but has no long-run impact on output or inflation.**

10. The short-run and long-run effects of a positive demand shock (🖱☎$_t$)

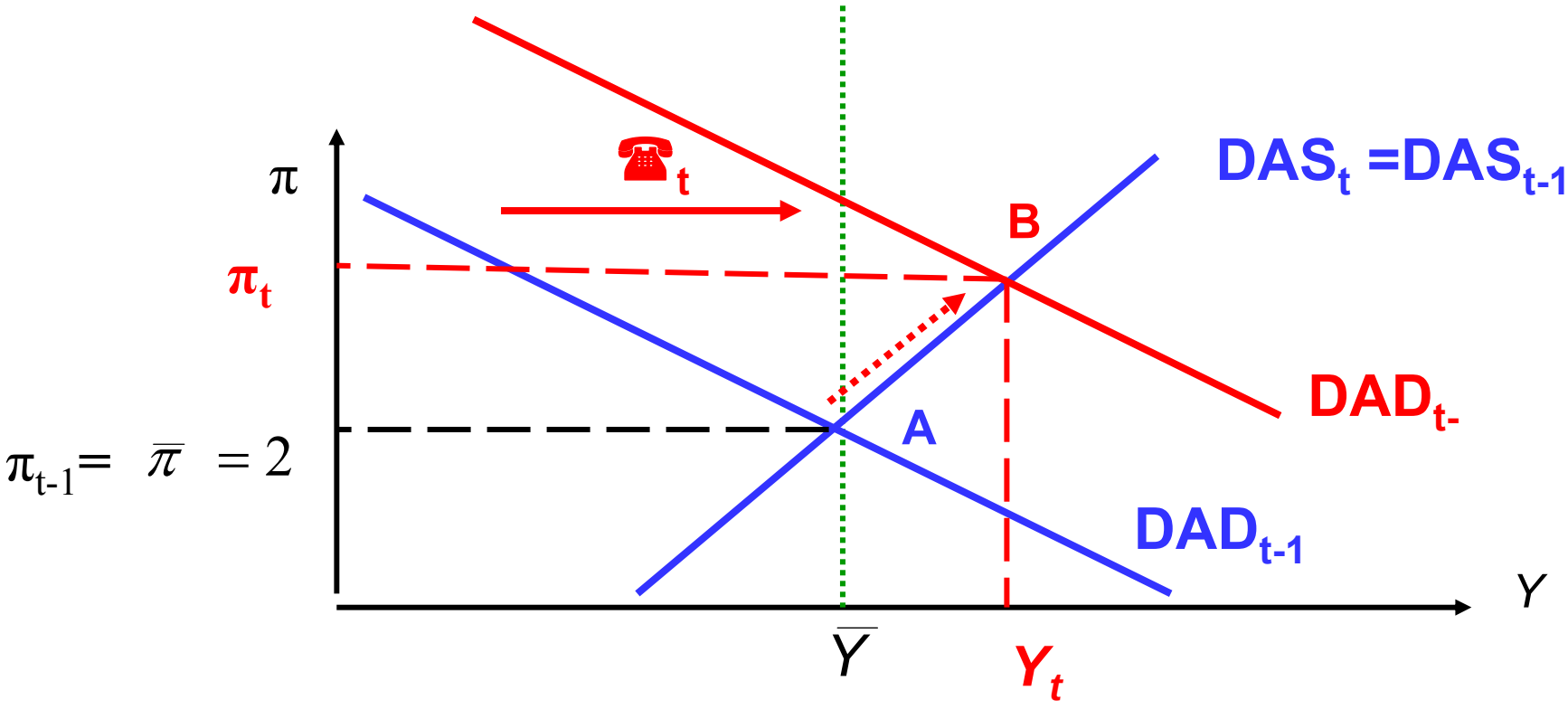
- Suppose that in period *t*-1 the economy is in long-run equilibrium at point **A** in the diagram below with a target rate of inflation of 2 percent, $\bar{\pi} = 2$.



- In period *t* there is a sudden **rise in confidence** which increases ☎$_t$ from zero to some **positive** value (a positive demand shock). For simplicity, we assume that this demand shock lasts **two** periods (*t* , *t*+1) after which the demand shock term (☎$_t$) returns to zero:

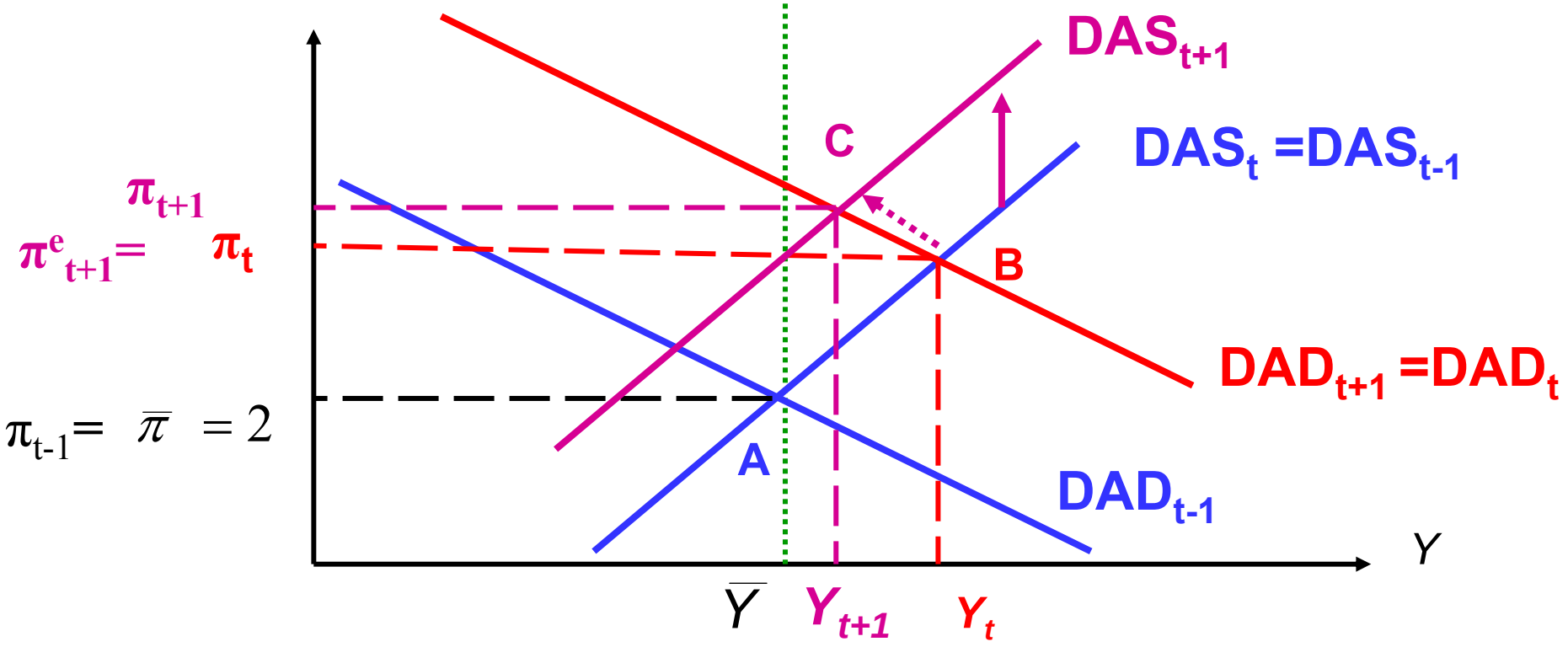
$$☎_{t+1} = ☎_t > ☎_{t-1} = 0, \quad \text{and } ☎_{t+2} = ☎_{t+3} = ☎_{t+4} \ldots\ldots\ldots\ldots = 0$$

- The effect of this demand shock is to **shift the DAD curve** for period *t* to the **right** raising the level of output to $Y_t > \overline{Y}$ and increasing the rate of inflation to $\pi_t > \overline{\pi}$; the economy reaches a new short-run equilibrium at point **B** in the diagram.

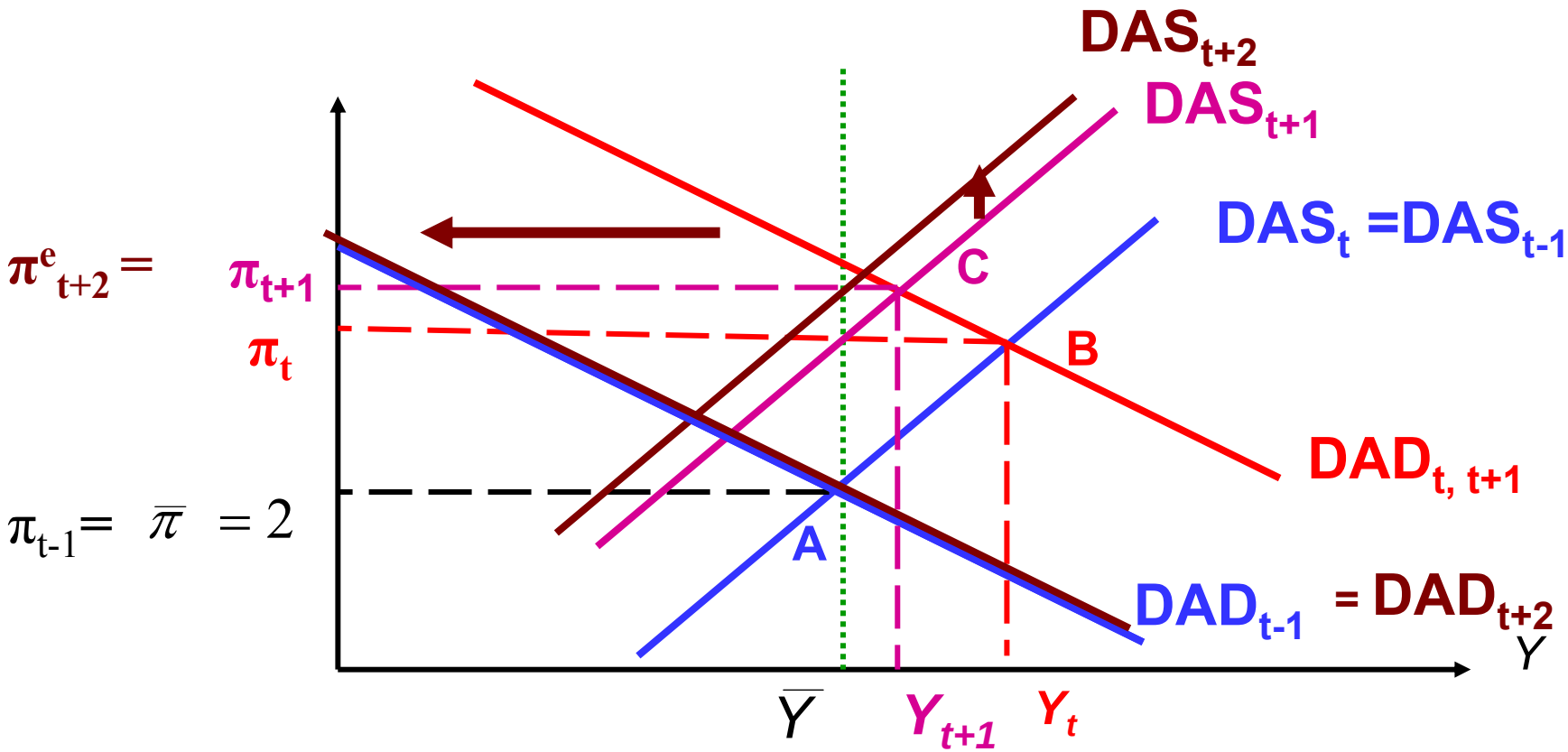


- Note that in the face of a **demand** shock, the pursuit of a policy of inflation targeting acts to **stabilize output**. The size of the short-run increase in output in response to the demand shock depends on how aggressively the central bank responds to the increase inflation by raising real interest rates; a very aggressive response (high 📄) results in a relatively flat DAD curve and a relatively small response of output to the demand shock (relatively stable output).

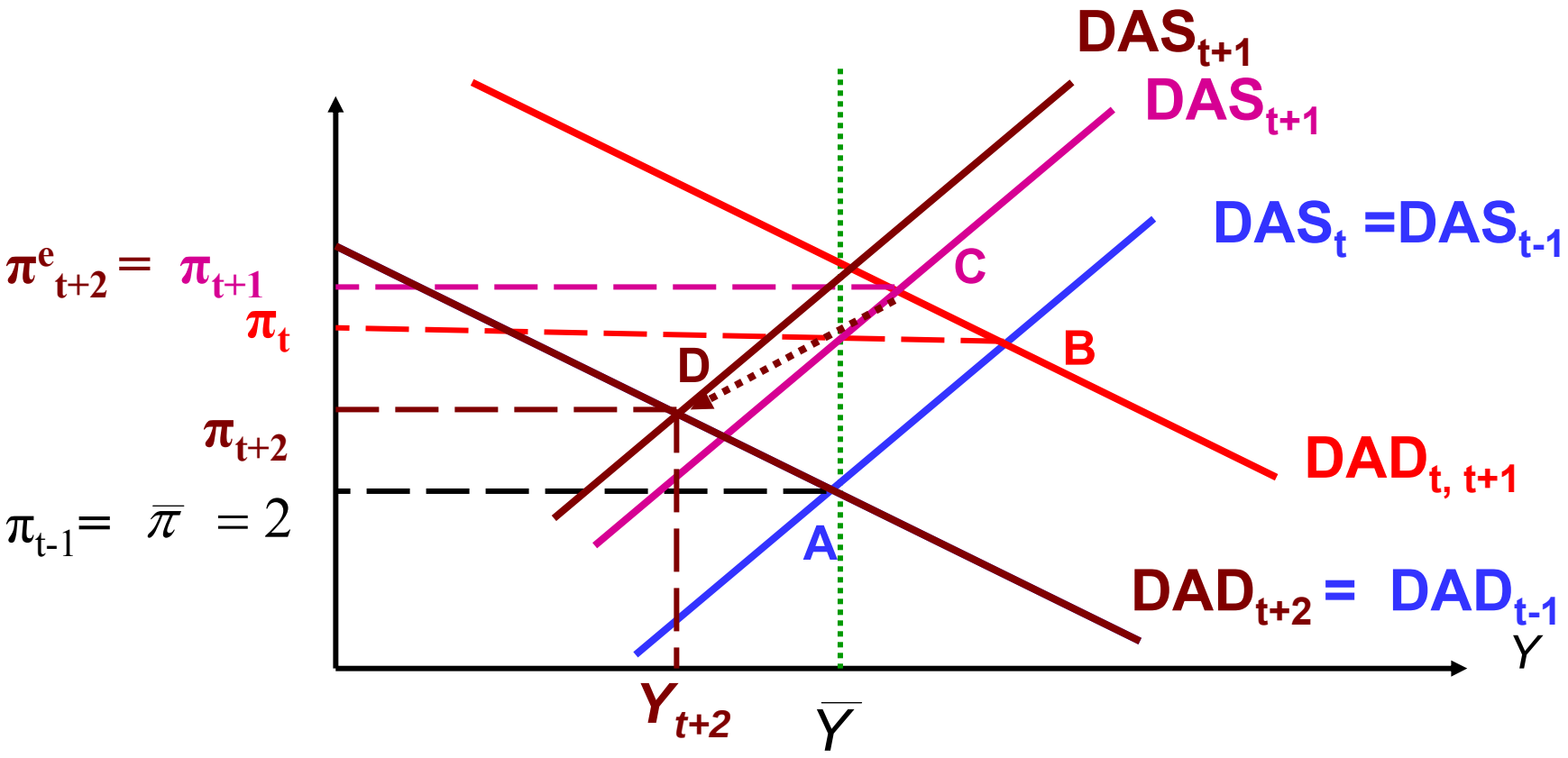
- In period *t*+1 with the persistence of the demand shock there is no shift in the DAD curve but the **DAS curve shifts up as the expected rate of inflation rises** to π_t. The actual rate of inflation rises to π_{t+1} and the level of output falls to Y_{t+1} as shown by point C in the diagram.



- In period *t*+2 the demand shock disappears **shifting the DAD curve back to its original position** in period *t*-1. At the same time the expected rate of inflation increases further to π_{t+1} **shifting the DAS curve for period *t*+2 upwards**.



- In period t+2 short-run equilibrium occurs at point **D** where output has fallen to a level **below** the natural level ($Y_{t+2} < \bar{Y}$) but inflation remains higher than 2 percent ($\pi_{t+2} > 2$).



- The process of adjustment of inflation and output continues until long run equilibrium is restored in period *N* at point A with inflation equal to its target level and output equal to the natural level :

$$Y_{t+N} = \bar{Y};\ r_{t+N} = \bar{r};\ \text{and } \boldsymbol{\pi_{t+N}} = \boldsymbol{\pi_{t+N-1}} = \bar{\pi} = 2$$

- **Conclusion: a temporary, positive demand shock causes initial short-run increases in both output and inflation but has no long-run impact on output or inflation.**

III. Contemporary Issues in Monetary Policy

1. Should monetary policy be conducted by rule or by discretion?

- Many economists have long argued that central banks are best able to achieve the objectives of monetary policy by conducting monetary policy by **rule** rather than by **discretion**.

- Monetary policy is conducted **by rule** when the central bank announces in advance a particular formula for the conduct of monetary policy and commits itself to follow that formula.

- Monetary policy is conducted **by discretion** when the central bank is free to choose to adopt whatever change in monetary policy seems appropriate to the circumstances.

- Rules may be specified in terms of the policy **goal** (e.g. "aim for 2 percent annual inflation") or the policy **instrument** (e.g. "raise the target for the overnight interest rate when inflation is above its target value" – the Taylor rule). Indeed, an instrument rule such as the Taylor rule may be viewed as a complement to the policy goal rule of inflation targeting.

- Monetary policy can be conducted according to rules and yet be **active** rather than **passive** in its response to the business cycle; as we showed in the previous section, a policy of inflation targeting, combined with a Taylor rule of interest rate adjustment, can be ***automatically stabilizing*** in the face of demand shocks.

- Rules have the following advantages:
  - The central bank's actions are **more transparent and less apt to misinterpretation** by the public;
  - By committing itself to an explicit policy rule the central bank provides **a "benchmark" by which to evaluate its performance** and increases its accountability;
  - Adherence to a rule designed to achieve a low and stable rate of inflation **helps to "anchor" expectations of inflation** and minimizes "expectational inflation";

- Sticking to a rule **prevents a central bank from undermining its long-range objectives for short-term results**. For example, a central bank may want to keep inflation low in the long run but in the short run a little more (unanticipated) inflation can (temporarily) reduce unemployment to the benefit of a government seeking re-election. Adherence to an explicit policy rule prevents the central bank from adopting actions that are politically expedient in the short run but inconsistent with the achievement of its long-run objectives. (This is known as ***the time inconsistency problem***.)

2. What variable should the central bank target?

- The two main examples of monetary policy rules are:
  - **Money supply targeting** - the practice of setting a target rate of growth of the money supply;
  - **Inflation targeting** - the practice of setting a target rate of inflation.

2.1 Money supply targeting

- An early proponent of money supply targeting was the economist Milton Friedman who advocated the adoption of a **constant-money-growth rule** whereby the central bank should let the money supply grow at a constant annual rate.

- To understand the theoretical basis for such a rule recall from Chapter 4 that in the long run, assuming constant velocity of circulation of money, the rate of inflation is equal to the difference between the rate of growth of the money supply and the long-run average rate of growth of (natural) output:

$$\pi = \%\Delta M - \%\Delta \bar{Y}$$

- Thus, adoption of a target rate of money supply growth equal to the long run average rate of growth of output, should, **in theory**, result in long run price stability; **in practice**, money supply targeting has been less than fully effective.

- In 1975, faced with a 10 percent rate of inflation, the Bank of Canada announced that it would target the rate of growth of the narrowly-defined money supply (M1 = currency +demand deposits at banks) and over time set successively lower target rates of growth of M1 to gradually lower inflation (*gradualism*).

- But the Bank's experiment with money supply targeting was a failure; although inflation fell in 1975 and 1976 it trended up again and by the early 1980s had passed 10 percent once more.

- What went wrong? Economists believe that the relationship between the rate of growth of M1 (“narrow money”) and inflation broke down during this period due to a series of financial innovations which had the effect of significantly increasing the velocity of circulation of M1. These innovations included the widespread adoption of automated teller machines (ATMs) and the introduction of daily interest savings accounts and daily interest checking accounts.

2.2 Inflation targeting

- In 1991, the federal government and the Bank of Canada jointly announced a series of targets for reducing total CPI inflation to the midpoint of a range from 1 to 3 percent by the end of 1995. Since 1991, this inflation control target range has been extended a number of times, most recently in November 2006 until 2011.

- The Bank has been remarkably successful in keeping inflation within the target range.

- Relative to money supply targeting, inflation targeting offers the following advantages:

  - The Bank targets the variable (inflation) of primary interest rather than an intermediate variable (the money supply) whose link to inflation is complex and subject to some variability over time (as shown by Canada's experiment with money supply targeting in the late 1970s).

  - An inflation target is better understood by the public than is a money supply target thus increasing transparency and accountability.

3. Should the target rate of inflation be lower than 2 percent?

- A lower inflation target would have the advantage of further reducing the costs of inflation.

- There are three traditional arguments **against** the adoption of a lower inflation target:

  - A lower target for inflation increases the risk of actual **deflation** (a falling price level) which could lead to a drop in demand by encouraging consumers and firms to delay spending.

- A lower inflation target increases the likelihood that that monetary policy will at some point be constrained by the **zero lower bound of nominal interest rates**. Recall (Chapter 4) that by Fisher's hypothesis a low (expected) rate of inflation implies a low level of nominal interest rates. When nominal interest rates are close to zero (their lower limit) there is less scope for the Bank of Canada to further lower interest rates to stimulate the economy.

- In a low-inflation environment, adjustments in relative wages (wages for workers in one occupation or industry relative to others) may require actual decreases in nominal wages for some workers (as opposed to a slower rate of increase in money wages for those workers.) **But workers tend to resist nominal wage cuts** resulting in costly strikes and/or unemployment.

4. Should the central bank be independent?

- A central bank is called ***independent*** if, legally, elected officials (usually the minister of finance) cannot directly influence its policy.

- In the last 15 years the dependence of central banks on elected officials has been decreasing in many countries:

  - The Bank of England was made independent by the Blair Government 4 days after it won its first election in 1997.

  - The European Central Bank – a new institution set up as Euro was introduced – is independent.

- The reason for making the central bank independent of elected officials is to separate its incentives from the short-term incentives of the government.

- Because of the Phillips curve relationship the government is tempted to engineer a sudden inflation in order to reduce the level of unemployment (especially close to an election).

- Rational agents understand this and so would not believe promises of the central bank to maintain low inflation.

- On the other hand, an independent central bank mandated to keep inflation low is ***credible***. It is therefore easier for an independent central bank to lower inflation expectations. The lower are inflation expectations, the lower is the actual inflation rate.