

Lecture 8: Intermediate macroeconomics, autumn 2009

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Lectures 8-10

- **Inflation and unemployment**
 - **Degree of activism of monetary policy**
 - **The credibility problem of monetary policy**
 - **Degree of independence of central banks**
- **Intertemporal consumption theory and the effects of fiscal policy**
- **Fiscal policy and budget deficits**
 - **Deficits and long-run debt**
 - **Sustainability of fiscal policy**

Topics today

- **Modelling aggregate supply**
 - A sticky-price model
 - A sticky-wage model
- **Inflation-unemployment trade-offs and the expectations-augmented Phillips curve**
- **Adaptive expectations**
- **Stabilisation policy in practice – problems**
- **The time inconsistency problem of monetary policy**
- **Commitment mechanisms**
- **Central bank independence**
- **Monetary policy in practice**
- **Monetary policy in the current recession**

*Literature: Mankiw-Taylor chapters 13 and 14;
OECD Economic Outlook chapter 1.*

Aggregate supply

- **How is aggregate supply determined?**
- **Three models of aggregate supply (surprise supply function)**
 - **The sticky-price model**
 - **The sticky-wage model**
 - **The imperfect-information model**

- **The short-run aggregate supply equation:**

$$Y = \bar{Y} + \alpha (P - P^e)$$

- **Output deviates from its equilibrium level (natural rate) if the actual price level deviates from the expected price level (surprise inflation).**
- **The deviation of output from its equilibrium level is proportional to the expectational error.**

Sticky-price model

Two types of firms

- Flexible-price firms
- Rigid-price firms

Flexible-price firms

$$p = P + a (Y - \bar{Y})$$

Rigid-price firms

$$p = P^e + a (Y^e - \bar{Y}^e)$$

Assume $Y^e = \bar{Y}^e$. Then $p = P^e$

s = share of firms with rigid prices

$1 - s$ = share of firms with flexible prices

Aggregate price level

$$P = sP^e + (1 - s)[P + a (Y - \bar{Y})]$$

Solve for P :

$$P = P^e + [(1 - s) a/s] (Y - \bar{Y})$$

Alternatively, one can solve for $Y - \bar{Y}$:

$$Y - \bar{Y} = \frac{\overbrace{s}^{\alpha}}{a(1 - s)} (P - P^e)$$

Thus:

$$Y - \bar{Y} = \alpha (P - P^e)$$

Sticky-wage model

$\omega = W/P^e$ **Real wage target**

$W = \omega \cdot P^e$ **Nominal wage**

$W/P = \omega \cdot P^e/P$ **Actual real wage**

**Actual real wage = Real wage target · Expected price level /
Current price level**

$P > P^e \Rightarrow W/P < \omega$ **Unanticipated inflation**

$P < P^e \Rightarrow W/P > \omega$ **Unanticipated deflation**

$L = L^d(W/P)$ **Labour demand**

$Y = F(L)$ **Production function**

$Y = \bar{Y} + \alpha (P - P^e)$ **Surprise supply function**

Sticky-wage model (cont.)

\bar{Y} = Equilibrium output

\bar{L} = Equilibrium employment

$\bar{L} = L(\omega)$ Employment when $W/P = \omega$

$\bar{Y} = F(\bar{L})$ Production when $\bar{L} = L$

$L > \bar{L}$ when $W/P < \omega \Leftrightarrow P > P^e \Leftrightarrow Y > \bar{Y}$

$L < \bar{L}$ when $W/P > \omega \Leftrightarrow P < P^e \Leftrightarrow Y < \bar{Y}$

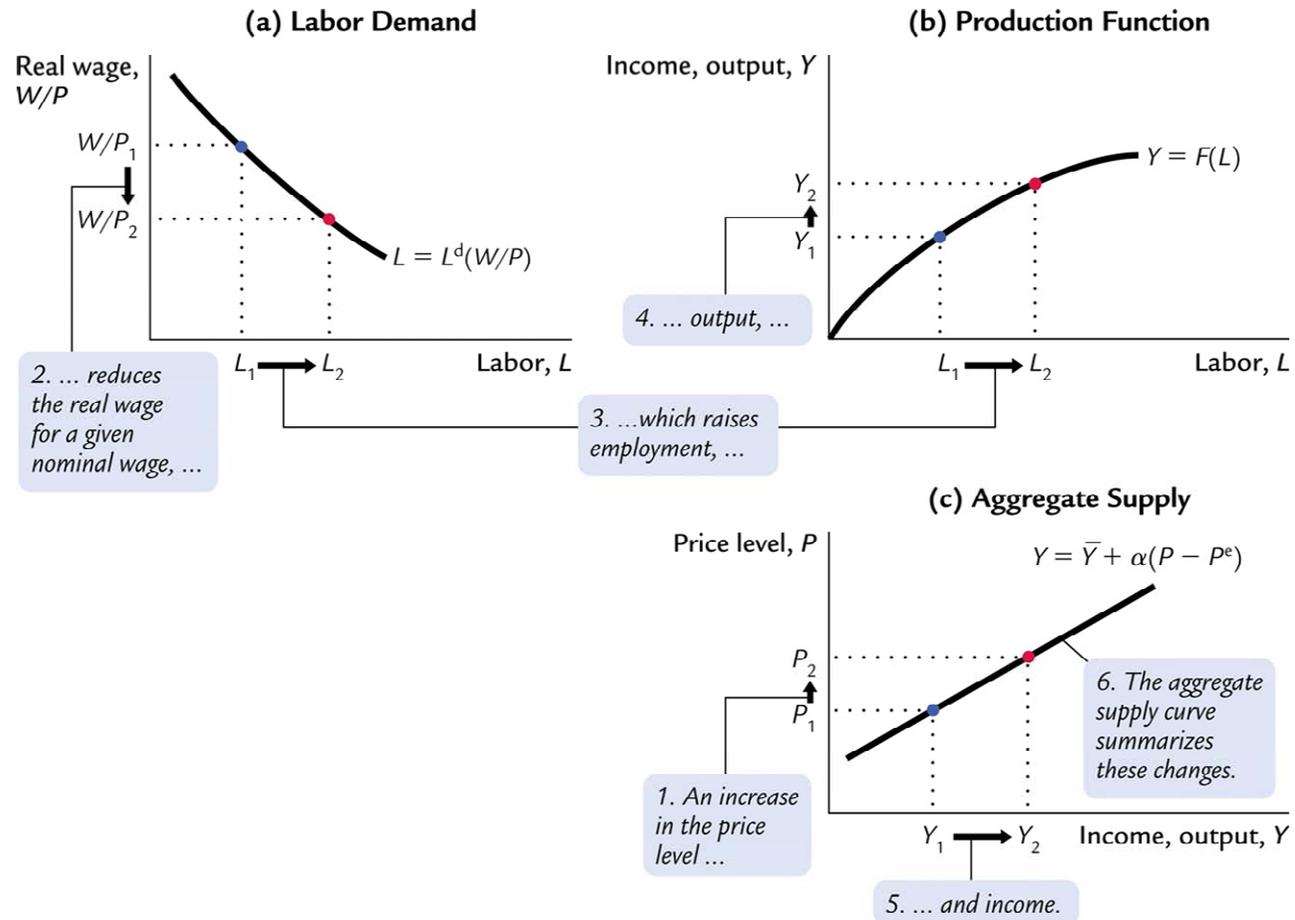


Figure 13.1 The Sticky-Wage Model

Mankiw: Macroeconomics, Sixth Edition
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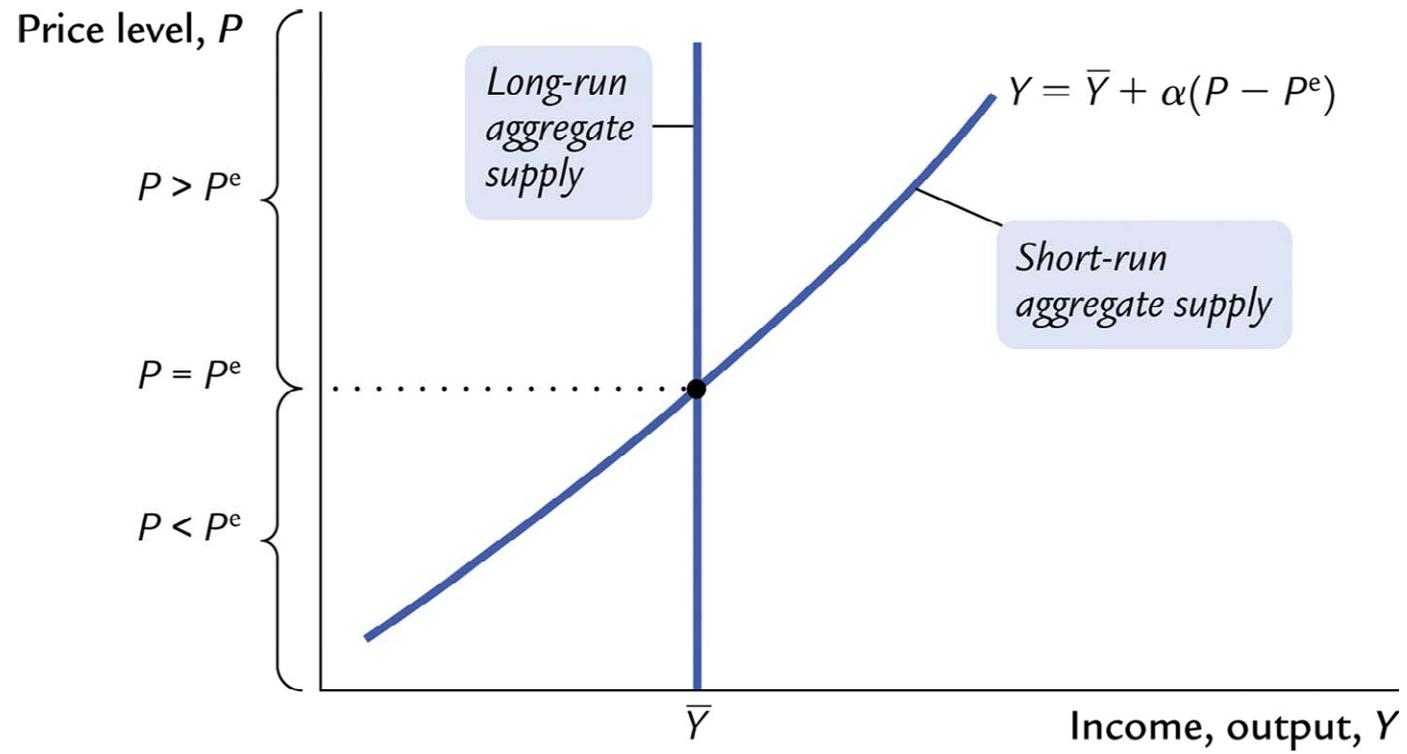


Figure 13.3 The Short-Run Aggregate Supply Curve
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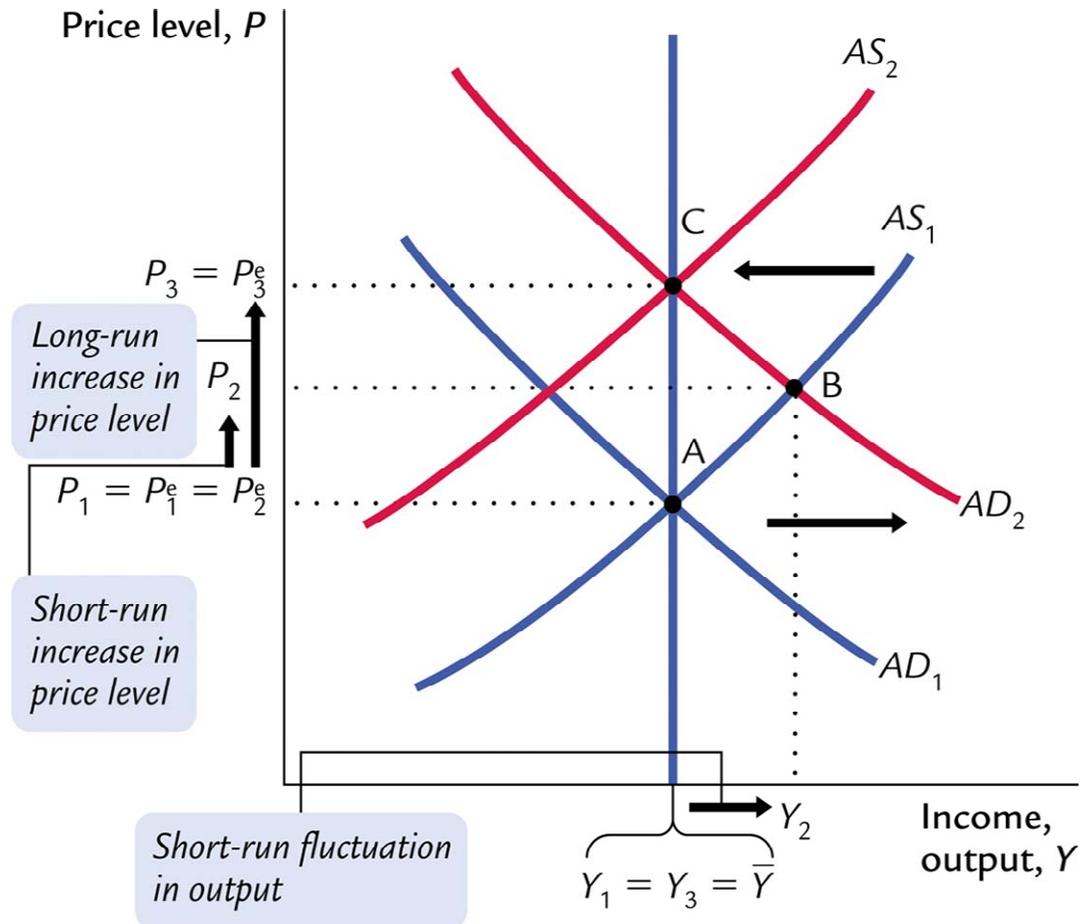


Figure 13.4 How Shifts in Aggregate Demand Lead to Short-Run Fluctuations
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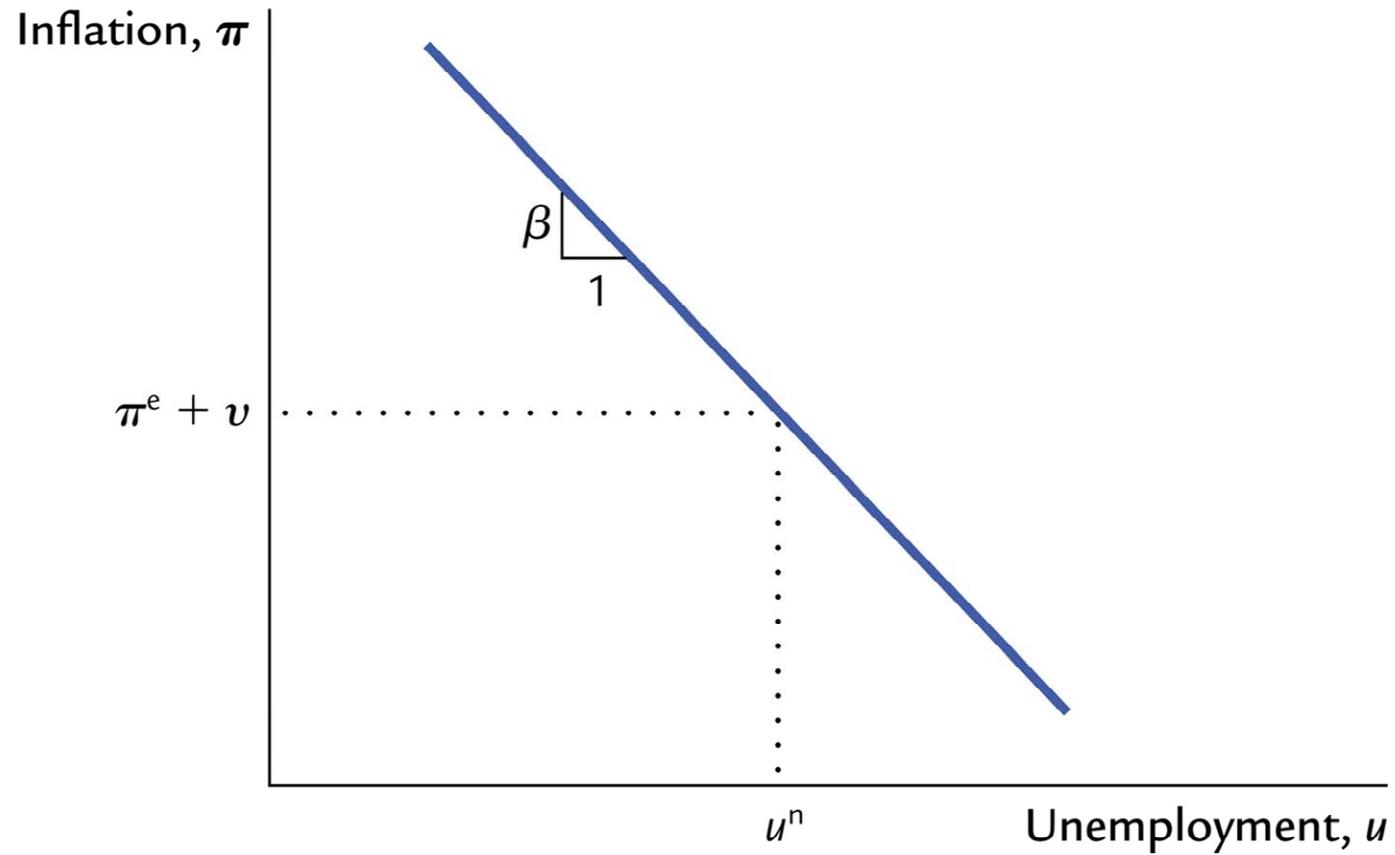


Figure 13.6 The Short-Run Tradeoff Between Inflation and Unemployment
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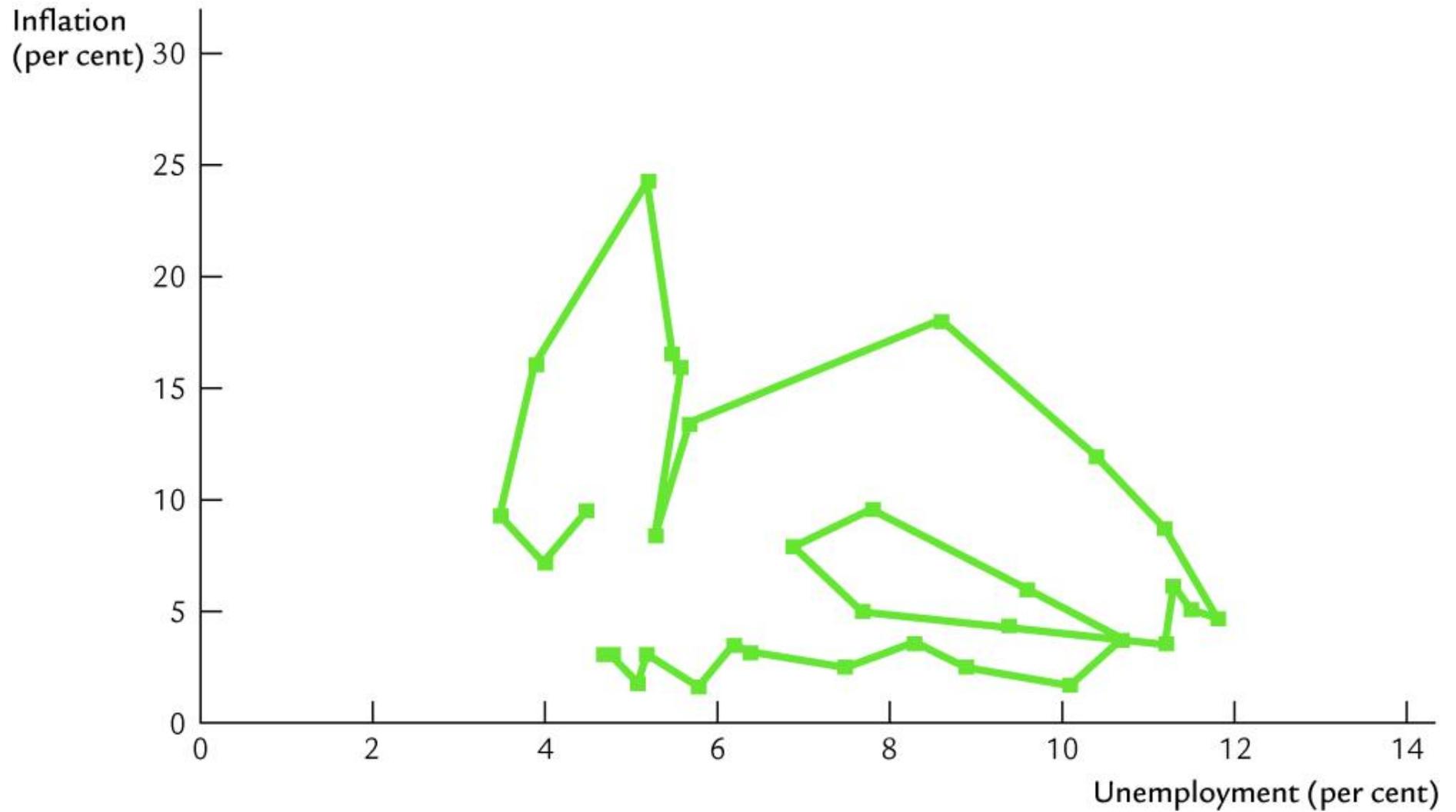


Figure 13.5 Inflation and unemployment in the United Kingdom since 1971

The expectations-augmented Phillips curve

- $\pi^e =$ **expected inflation**
- $u - u^n =$ **cyclical unemployment**
- $v =$ **supply shock**
- **The expectations-augmented Phillips curve:**
$$\pi = \pi^e - \beta(u - u_n) + v$$

The expectations-augmented Phillips curve (cont.)

- **If $v = 0 \Rightarrow \pi = \pi^e - \beta(u - u_n)$**
- **Moreover, $\pi = \pi^e \Rightarrow -\beta(u - u_n) = 0$**
- **This implies: $u = u_n$**
- **Interpretation: if there is no supply shock and perfect foresight, then unemployment is at its equilibrium (natural) level.**
- **Alternative interpretation: if unemployment is at its equilibrium (natural) level and there is no supply shock, then actual inflation is equal to expected inflation.**

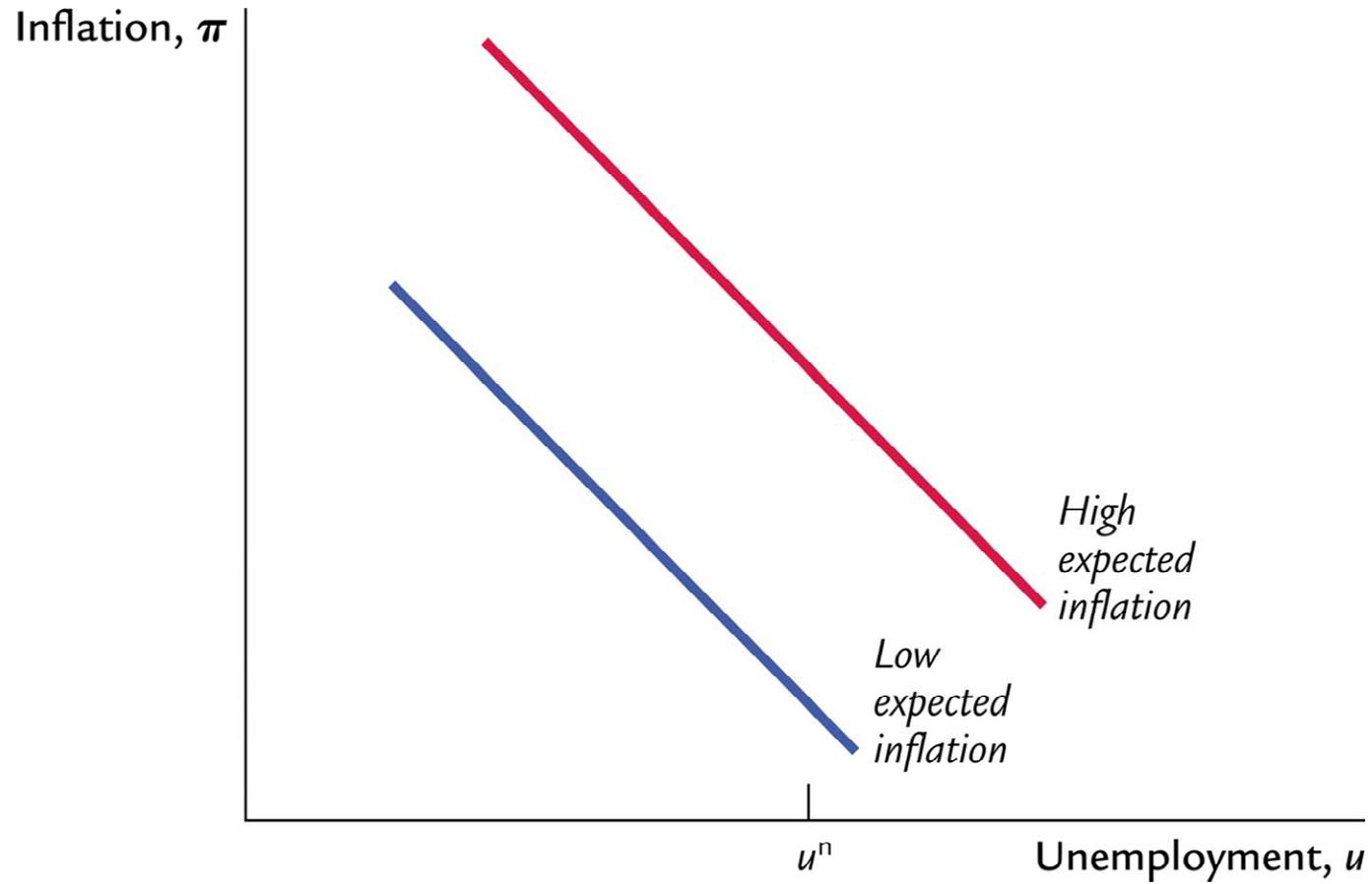


Figure 13.7 Shifts in the Short-Run Trade-off
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The Phillips curve and the surprise supply function

- The expectations-augmented Phillips curve and the surprise supply function can be seen as two sides of the same coin.

$$Y - \bar{Y} = \alpha(P - P^e)$$

$$P - P^e = \frac{1}{\alpha}(Y - \bar{Y}) \Rightarrow$$

$$\pi - \pi^e = \frac{1}{\alpha}(Y - \bar{Y})$$

- According to Okun's law the output gap is related to the deviation of unemployment from its equilibrium (natural rate).

$$u - u_n = \gamma(Y - \bar{Y})$$

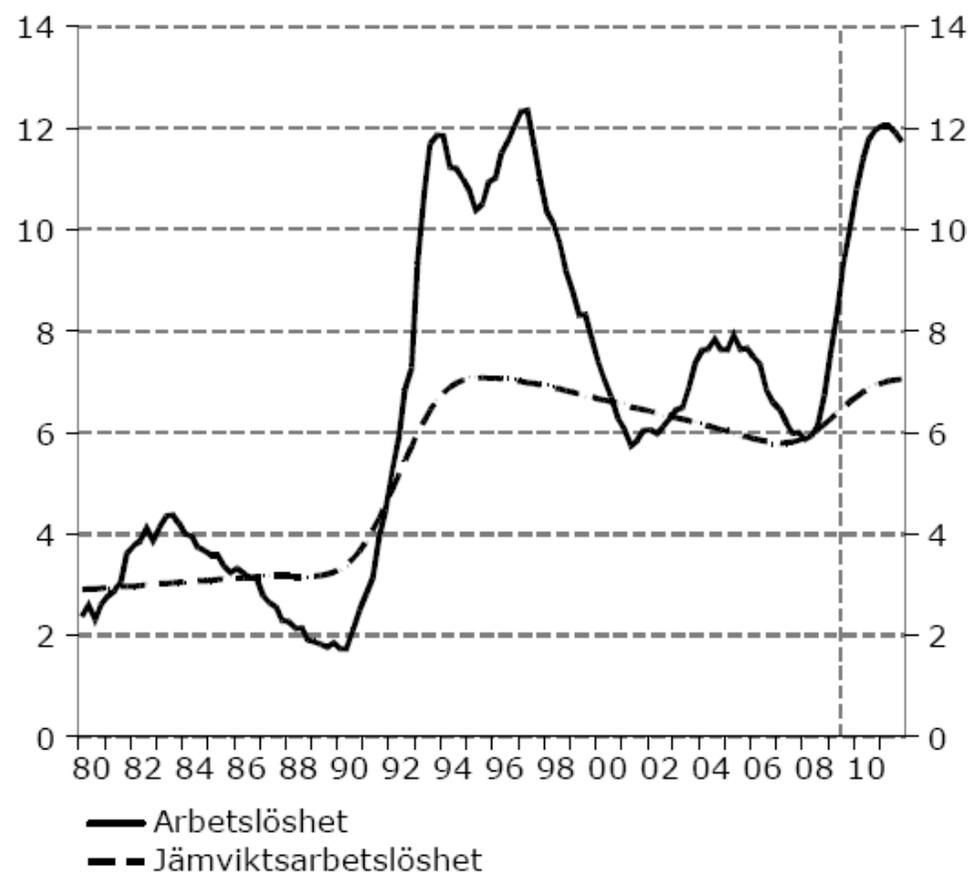
$$Y - \bar{Y} = \frac{1}{\gamma}(u - u_n)$$

- Hence:

$$\pi - \pi^e = \frac{1}{\alpha} \cdot \overbrace{\frac{1}{\gamma}}^{\beta} (u - u_n) = \beta(u - u_n)$$

Diagram 139 Jämviktsarbetslöshet

Procent av arbetskraften



Källor: SCB och Konjunkturinstitutet.

Diagram 142 BNP-gap

Procent av potentiell BNP, säsongrensade kvartalsvärden



Källa: Konjunkturinstitutet.

The Phillips curve and adaptive expectations

- $\pi = \pi^e - \beta(u - u^n)$
- **Adaptive expectations:** $\pi^e = \pi_{-1}$
- **Expected inflation = inflation in the previous year**

$$\pi - \pi_{-1} = -\beta(u - u^n)$$

$$\pi = \pi_{-1} - \beta(u - u^n)$$

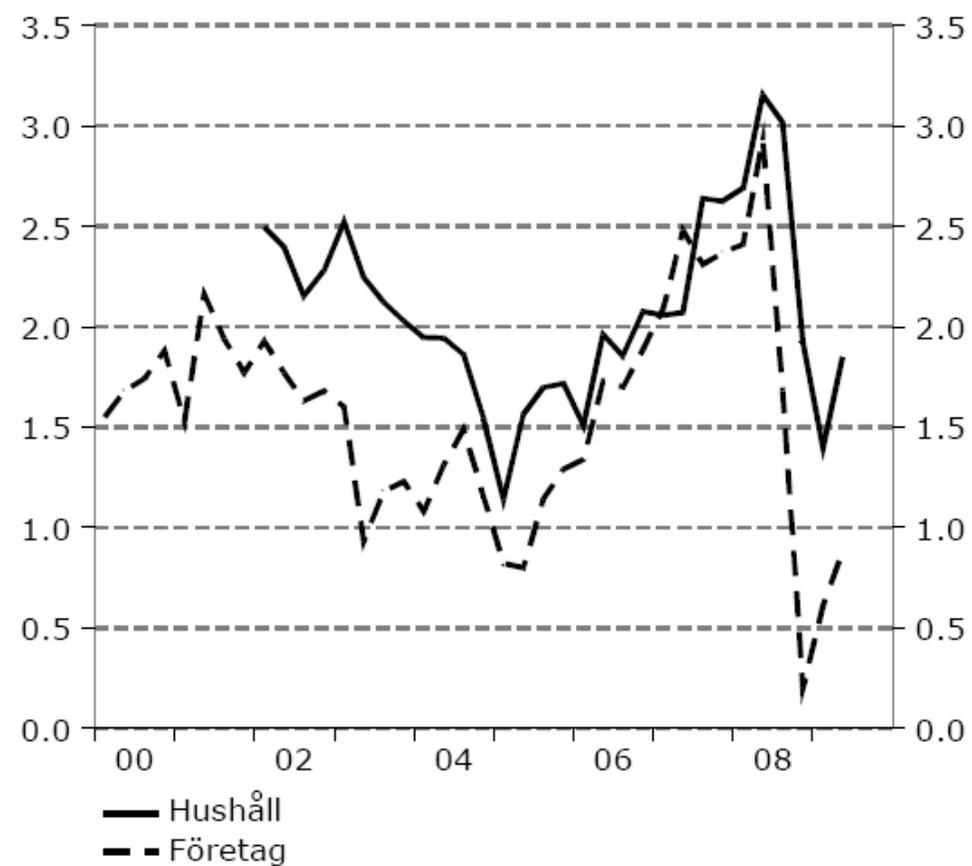
- **The rate of change of inflation is proportional to the deviation from equilibrium unemployment.**
- **Actual unemployment = equilibrium unemployment**
implies a constant rate of inflation, since $u = u^n \Rightarrow \pi = \pi_{-1}$.
- $u < u_n \Rightarrow \pi > \pi_{-1}$, that is inflation is increasing if actual unemployment is lower than equilibrium unemployment. This is the reason why the equilibrium rate of unemployment is sometimes labelled the NAIRU (Non-accelerating inflation rate of unemployment).

Alternative hypothesis on expectations

- **Rational inflation expectations that are formed on the basis of all available information.**
- **Since it takes time for monetary policy to influence inflation, central banks find it important to influence inflation expectations.**

Diagram 167 Inflationsförväntningar

Procent, kvartalsvärden



Källa: Konjunkturinstitutet.

Stabilisation policy in practice: problems

1. Time lags

- **Inside lags: recognition lag and decision lag**
- **Outside lags: effect lag**
- **Longer decision lag for fiscal policy than for monetary policy (parliamentary process where also other considerations than stabilisation aspects enter)**
- **The effect lag of monetary policy (until it affects the inflation rate) is often assessed to be around two years**

2. Difficulties of economic forecasting

3. Economic relationships are often unstable

- **The Lucas critique**
- **Examples: the Phillips curves and exchange rate pass-throughs**

Stabilisation policy in practice: problems (cont.)

- 4. Measures often taken for political-economy reasons. Do not coincide with what is optimal from a stabilisation policy view.**
- **Political business cycles: expansionary policy before an election (tax cuts and expenditure increases)**
 - **It is more popular to stimulate aggregate demand in a downturn than it is to stimulate it in a boom: the result is likely to be a *deficit bias* of fiscal policy (and an *inflation bias* of monetary policy)**
 - **Time inconsistency problem: a certain policy may be optimal *ex ante* (in advance) but not *ex post* (afterwards).**

Economic policy paradigms

The post-war period up to the mid 1970s

- **An activist (Keynesian) view dominated**
- **Full-employment goal**
- **The economy is fundamentally unstable and needs to be stabilised through policy**
- **Discretionary policy: at any point of time one should choose the policy that is viewed as the best (no rules)**

1980s

- **An activist stabilisation policy with a full-employment goal is perceived to create an inflation bias**
- **The economy is fundamentally stable; shocks originate instead to a large extent from overambitious, but failed, attempts to stabilise the economy**
- **Rules-based policy instead of discretionary policy**
- **Fight unemployment with structural labour market reforms!**

Economic policy paradigms: Today

Today

- **Compromise between earlier paradigms**
- **Monetary policy has become more discretionary and activist again**
- **The price stability objective (an inflation target) is seen as the primary objective for monetary policy**
- **Independent central banks in charge of monetary policy**
- **Monetary policy is the primary stabilisation policy tool**
- **Rules-based fiscal policy**
 - **budget objective over the business cycle**
Sweden: budget surplus of 1 percent of GDP over the cycle;
EU: structural (cyclically adjusted) budget outcome should be in surplus or close to balance and deficit as well as debt ceilings for the government
 - **government expenditure ceiling (Sweden)**
 - **decision of overall government expenditures taken before decisions on individual expenditures (so if one wants to increase one type of expenditure, one must reduce another once the overall decision has been taken)**
 - **discretionary fiscal policy should be used as a stabilisation policy tool only under special circumstances (such as now)**

Recent belief in the Great Moderation: lower output and inflation volatility

- **Larger importance for less volatile service sectors**
- **Good luck – absence of shocks**
- **Better macroeconomic management (because of better institutions?)**
- **Has the great moderation now come to an end?
Financial crisis and world depression?**

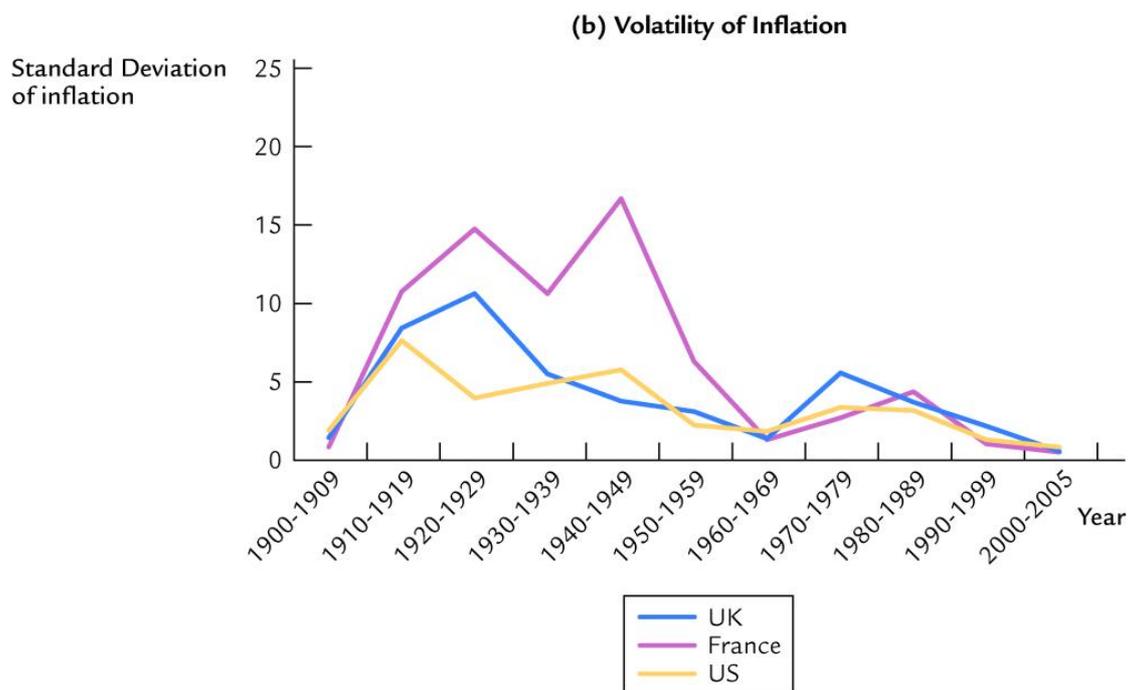
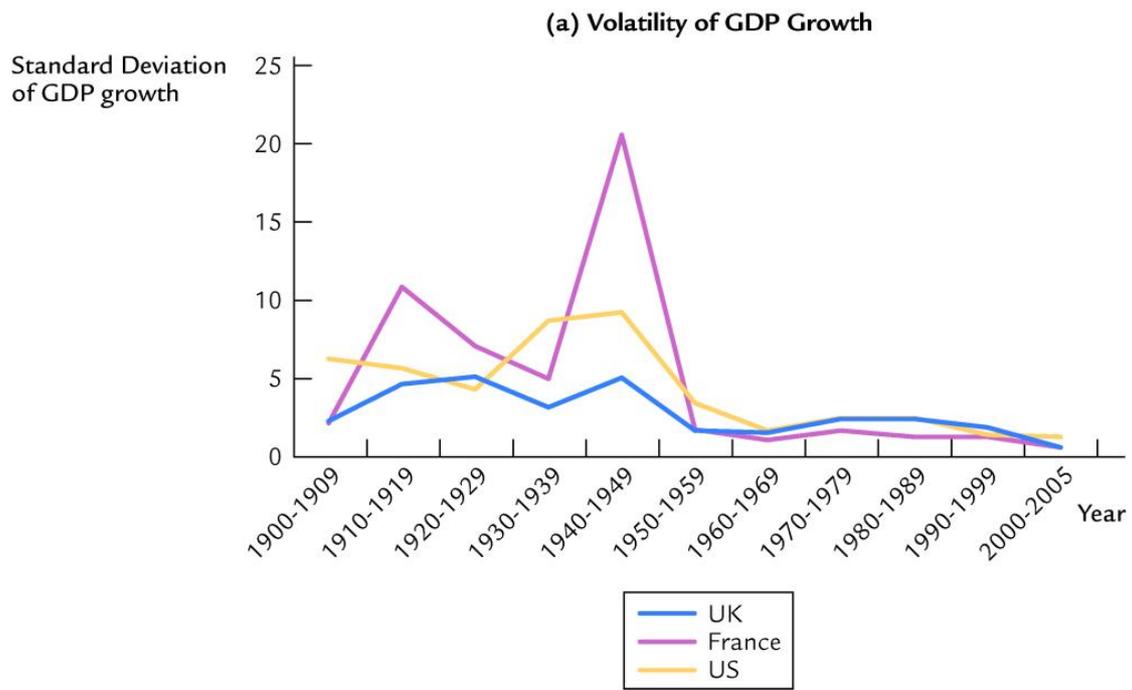
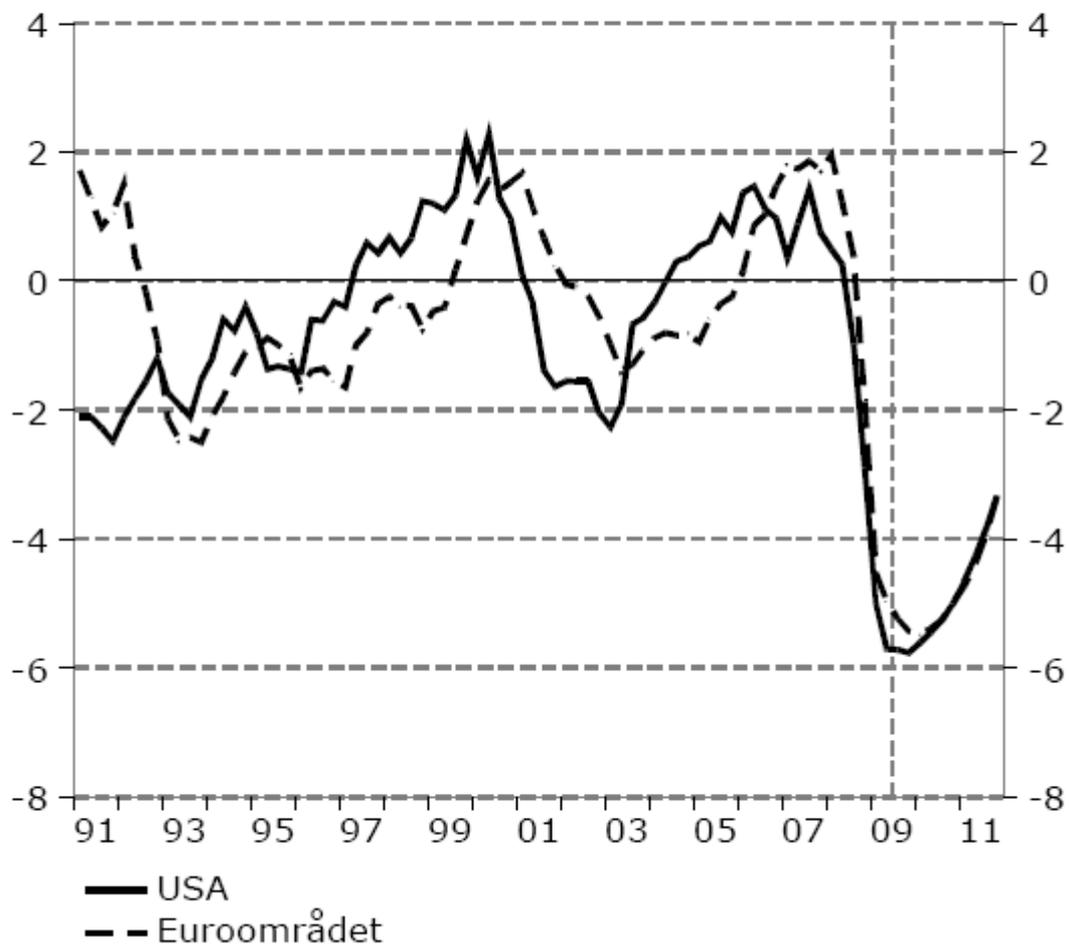


Figure 14.1 Macroeconomic volatility in the UK, France and the US since 1900.

Diagram 1 BNP-gap i USA och euroområdet

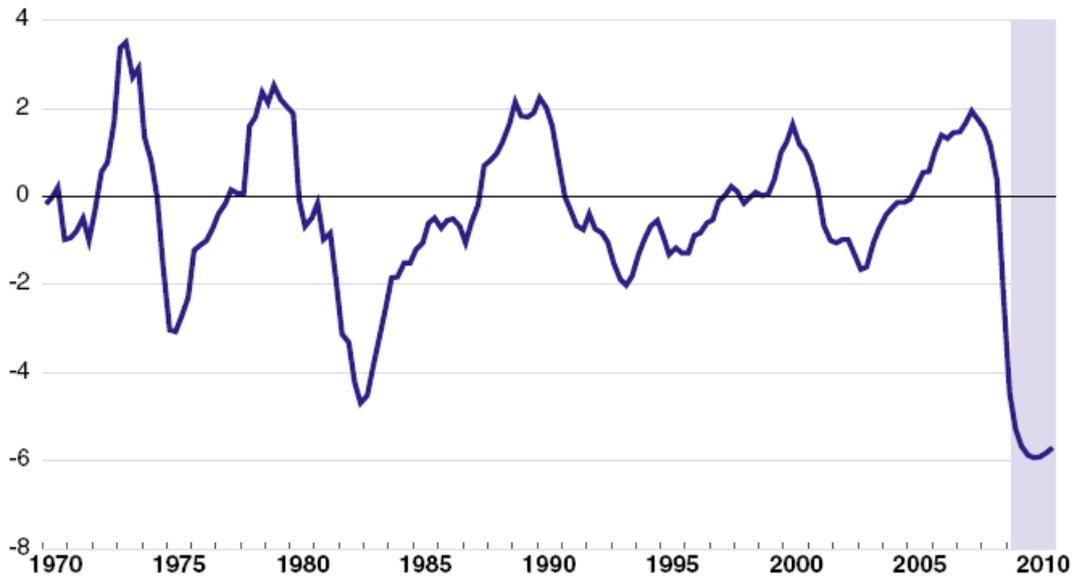
Procent av potentiell BNP, kvartalsvärden



Källor: OECD och Konjunkturinstitutet.

Figure 1.16. **The OECD output gap will be the largest in four decades**

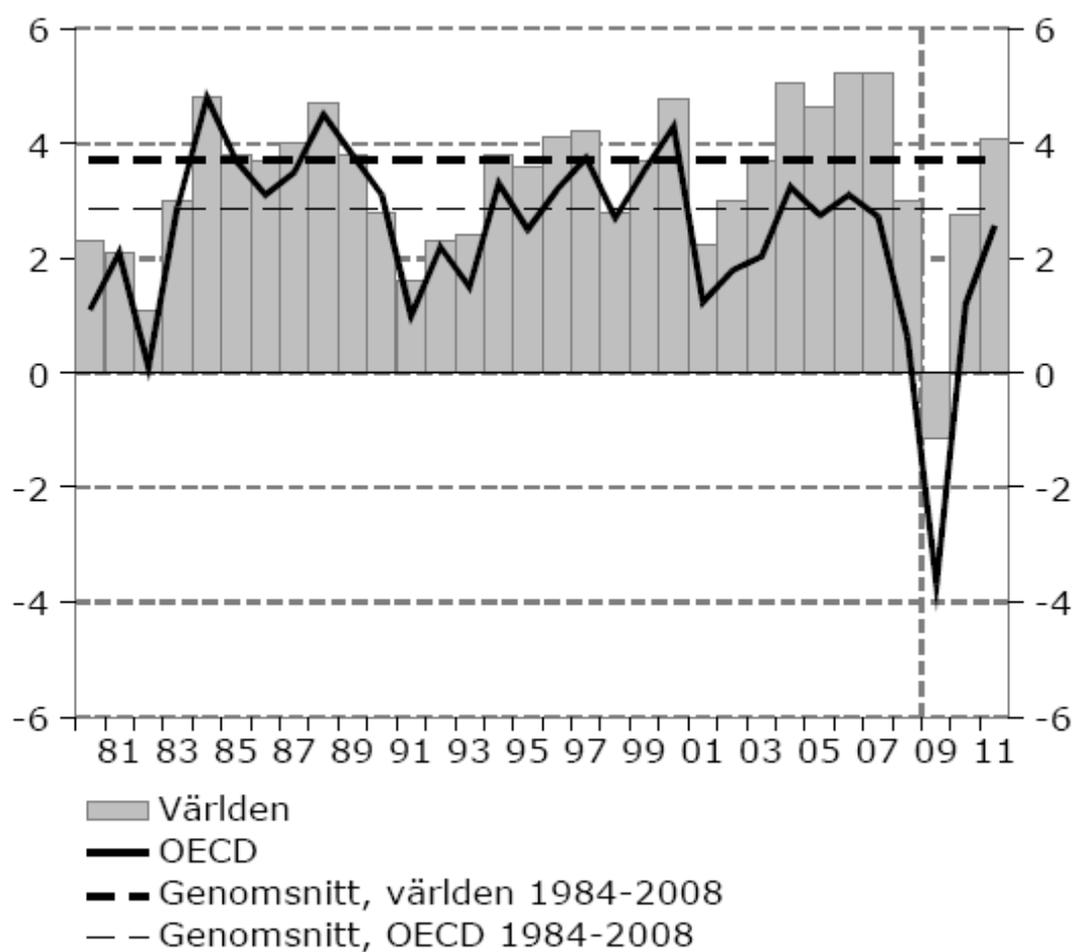
In percentage of potential output



Source: OECD Economic Outlook 85 database.

Diagram 4 BNP i världen och OECD

Årlig procentuell förändring



Källor: OECD, IMF och Konjunkturinstitutet.

The time inconsistency (credibility) problem of monetary policy

- **Policy makers strive for both low inflation and low unemployment**
- **It is optimal to announce a low-inflation policy *ex ante*: if credible, anticipated inflation is reduced and low nominal wage increases are agreed**
- **But once wage agreements have been concluded, it is tempting for monetary policy makers to let inflation increase, because this reduces real wages and thus raises employment**
- **Hence the optimal monetary policy is time inconsistent**
- **But such policy cannot work in the long run: both wage earners and employers learn to anticipate policy**
- **The economy gets stuck in an inflation equilibrium with high inflation without reaching lower unemployment (actual unemployment = equilibrium unemployment when actual inflation is anticipated)**

The optimisation problem of the central bank when monetary policy is discretionary

Surprise supply function

$$u = u^n - \alpha(\pi - \pi^e)$$

Loss (disutility) function

$$L = u + \gamma\pi^2$$

Substitution of supply function into loss function:

$$L = u^n - \alpha(\pi - \pi^e) + \gamma\pi^2$$

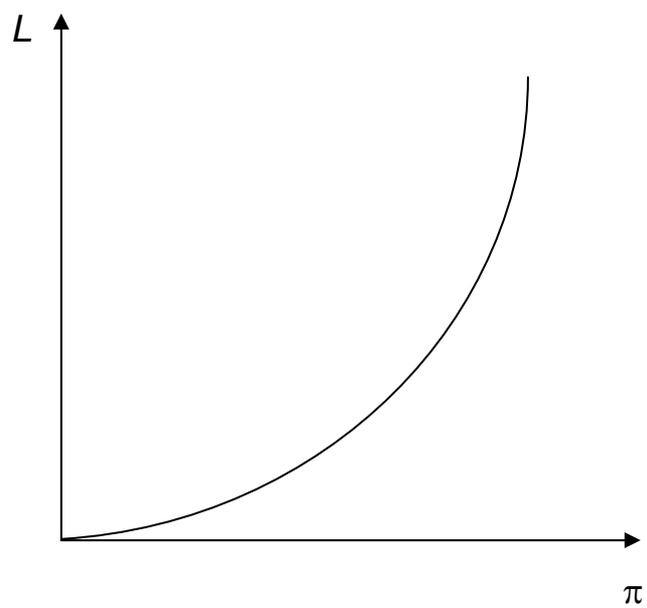
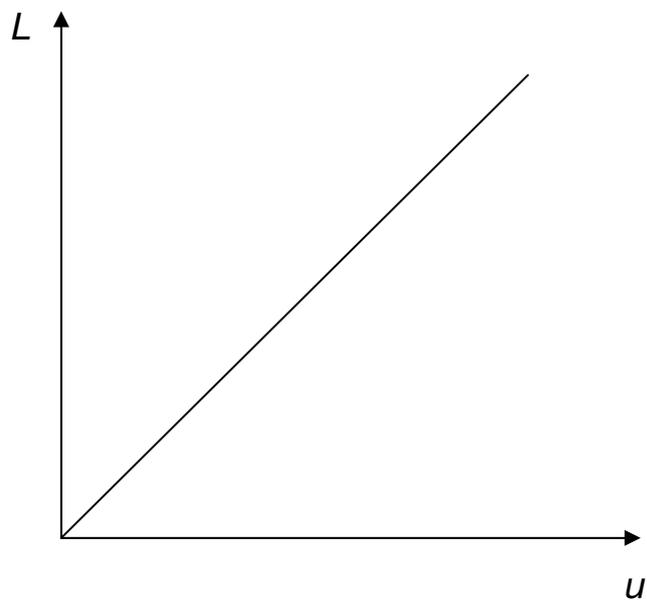
Policy makers choose π so as to minimise L (taking π^e as given):

$$\frac{\partial L}{\partial \pi} = -\alpha + 2\gamma\pi = 0$$

$$\pi = \frac{\alpha}{2\gamma}$$

$$\alpha = 1 \text{ och } \gamma = 10 \Rightarrow \pi = \frac{1}{20} = 0,05$$

Loss function



Rules are better than discretion in the model

$$u = u^n - \alpha(\pi - \pi^e)$$

$$L = u + \gamma\pi^2$$

- **In equilibrium with discretionary policy:** $\pi = \pi^e = \alpha / 2\gamma$

Hence: $u = u^n$

$L^D =$ **loss (disutility) under discretion**

$$L^D = u^n + \gamma\left(\frac{\alpha}{2\gamma}\right)^2 = u^n + \frac{\alpha^2}{4\gamma}$$

- **Commitment to $\pi = \pi^e = 0$ (binding rule)**

$L^C =$ **loss (disutility under commitment)**

$$L^C = u^n + 0 = u^n$$

- **Comparison of discretion and commitment**

$$L^C = u^n < u^n + \frac{\alpha^2}{4\gamma} = L^D$$

- **Commitment gives smaller loss than discretion**
- **Hence commitment is better than discretion in the model**

Why cannot the central bank announce a zero-inflation policy under discretion and then stick to it?

- **Assume that policy makers announce a policy of zero inflation and that the announcement is believed!**

$$\pi^e = 0$$

- **Hence:**

$$u = u^n - \alpha(\pi - \pi^e) = u^n - \alpha\pi$$

$$L = u + \gamma\pi^2 = u^n - \alpha\pi + \gamma\pi^2$$

- **Policy makers choose inflation to minimise L :**

$$\frac{\partial L}{\partial \pi} = -\alpha + 2\pi\gamma = 0$$

$$\pi = \alpha / 2\gamma$$

- ***Ex post* the government thus chooses to inflate all the same.**

Methods of commitment

- 1) Gold standard**
- 2) Bretton Woods fixed exchange rate**
- 3) Currency board**
- 4) Constitutional stipulations**
- 5) Common currency (Italy, Finland)**
- 6) Independent central bank**
 - conservative governor(s)**
 - inflation target**

Central bank independence

- **Long periods of office for governors**
- **Governors cannot be fired during period of office**
- **Prohibitions both for governments to give instructions and for central bankers to receive them**
- **Governors should have professional competence (this potentially rules out politicians)**
- **Freedom to use monetary policy instruments**
- **Ban on government borrowing in the central bank**
- **Transparent objective (inflation target)**

Central bank independence (cont.)

Conflict of goals: accountability (democratic control) versus efficiency of monetary policy (low inflation and effective stabilisation)

- **New Zealand: the minister for finance can fire the Governor of the central bank after recommendation by the board of the central bank**
- **UK: deviations from the inflation target must be explained publicly (formal letter to the Chancellor of the Exchequers)**
- **Public hearings (Riksbanken: the Finance Committee of the Swedish Parliament; ECB: the Committee for Monetary Affairs in the European Parliament)**

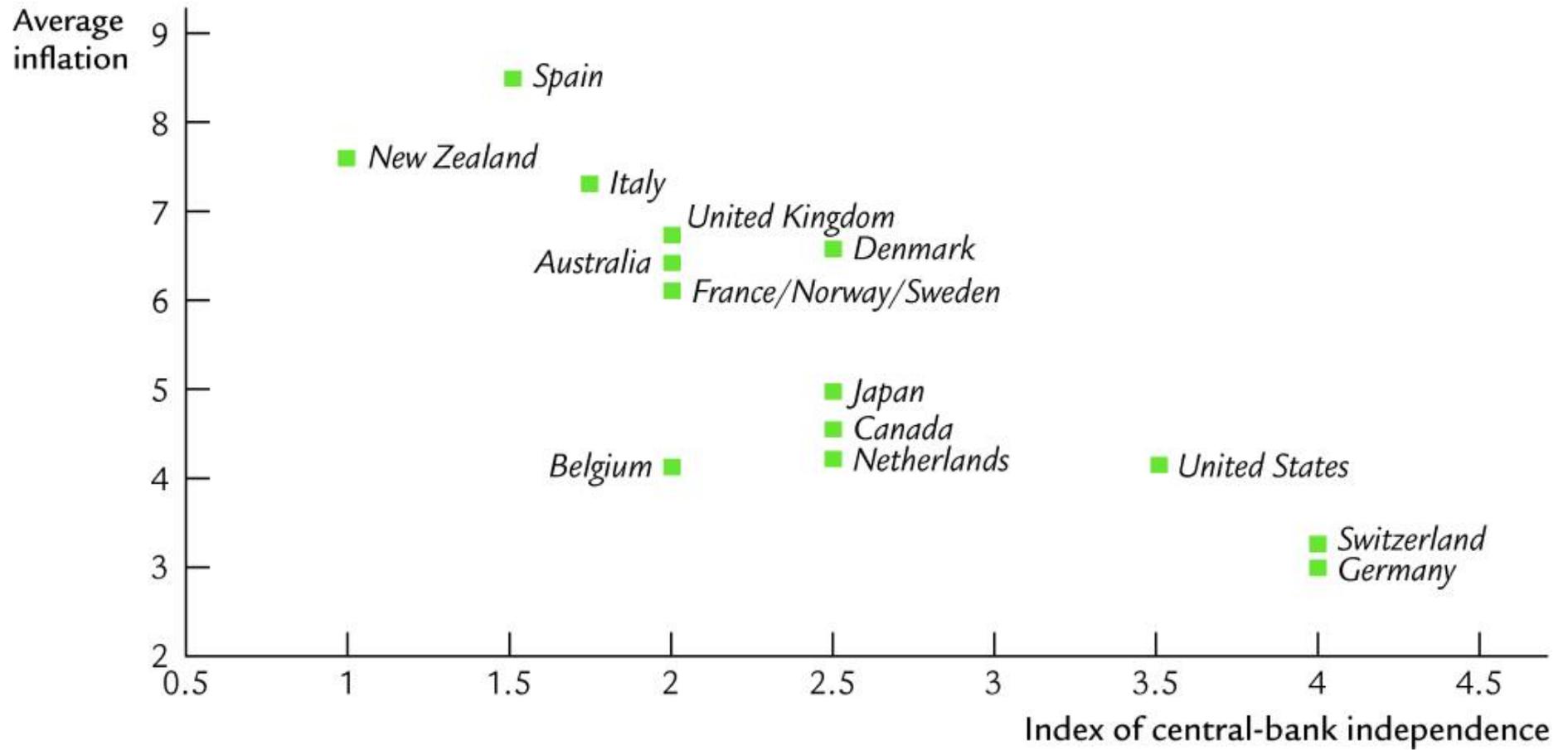


Figure 14.2 Inflation and central bank independence

Principles of monetary policy

- **The Taylor rule (John Taylor)**
- **The US Federal Reserve but also other central banks**

$$R_t = \pi_t + r_t + .5(\widehat{\pi}_t - \pi^*) + .5(y_t - y^*)$$

R_t : **nominal official interest rate**

π_t : **current inflation**

r_t : **equilibrium real interest rate**

$\widehat{\pi}_t$: **medium-term inflation forecast**

π^* : **inflation target**

$y_t - y^*$: **output gap, shows how much higher output is relative to its equilibrium level (Note: Mankiw-Taylor defines the output gap as $y^* - y_t$ and therefore have a minus sign in front of the output gap.)**

The Taylor rule: numerical examples

$$r_t = 2 \text{ percent}$$

$$\pi^* = 2 \text{ percent}$$

Suppose $y_t - y^* = 0$, so that output is at its equilibrium level and that $\widehat{\pi}_t = \pi_t = 2$ percent. The repo rate is

$$R_t = 2 + 2 + .5 \cdot (2 - 2) + .5 \cdot 0 = 4$$

Suppose $y_t - y^* = 2$, so that output is above its equilibrium level and that $\widehat{\pi}_t = \pi_t = 4$ percent. The repo rate is

$$R_t = 4 + 2 + .5 \cdot (4 - 2) + .5 \cdot 2 = 8$$

To dampen inflation, the nominal interest rate must be raised more than inflation so that the real interest rate goes up.

The Taylor rule in the recession

$$r_t = 2 \text{ percent}$$

$$\pi^* = 2 \text{ percent}$$

Suppose $y_t - y^* = -6$ percent and that $\pi_t = \widehat{\pi}_t = 0$ percent.

The repo rate according to the formula should be

$$R_t = 0 + 2 + .5 \cdot (0 - 2) + .5 \cdot (-6) = -2$$

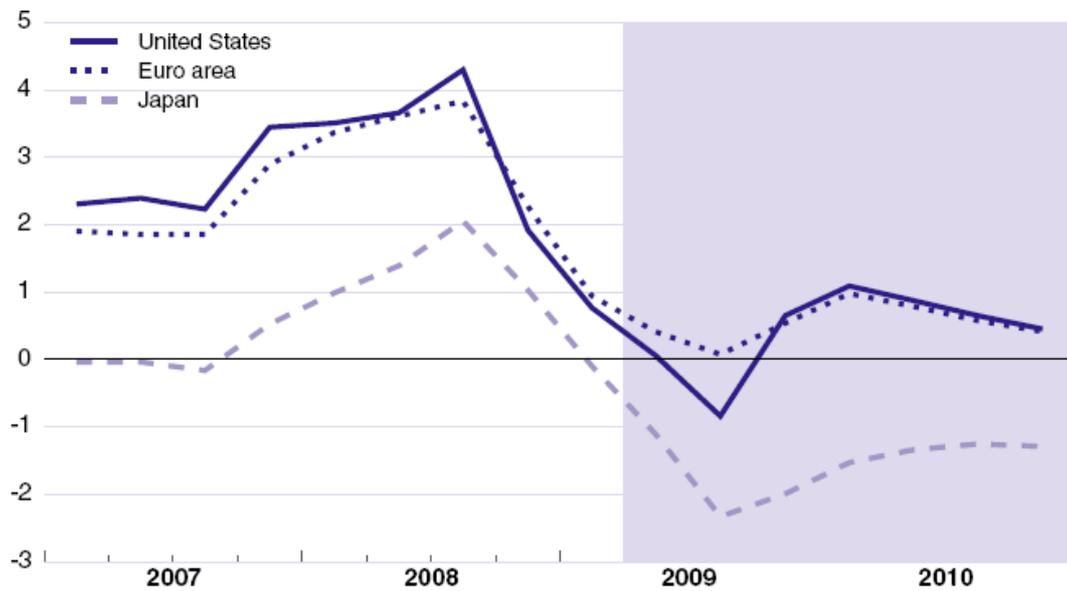
A negative repo rate would be required.

Negative interest rates

- **Traditional view: zero interest rate bound**
- **This view is being questioned**
 - **negative interest rate for bank deposits in central bank**
 - **in principle the central bank could pay banks to borrow in the central bank**
 - **bills (“sedlar”) could lose a fraction of their value at a certain date**
 - **agents might still hold bank deposits with negative interest rate (instead of having money in the mattress and pay for protection)**
- **But central banks are unwilling to enter uncharted territory**
 - **quantitative easing: purchases of long-term government and commercial bonds**
 - **lending to banks against collateral of lower quality**
 - **provision of liquidity through operations with longer maturity**

Figure 1.18. **Inflation will fall to very low levels**

Year-on-year growth rate, %

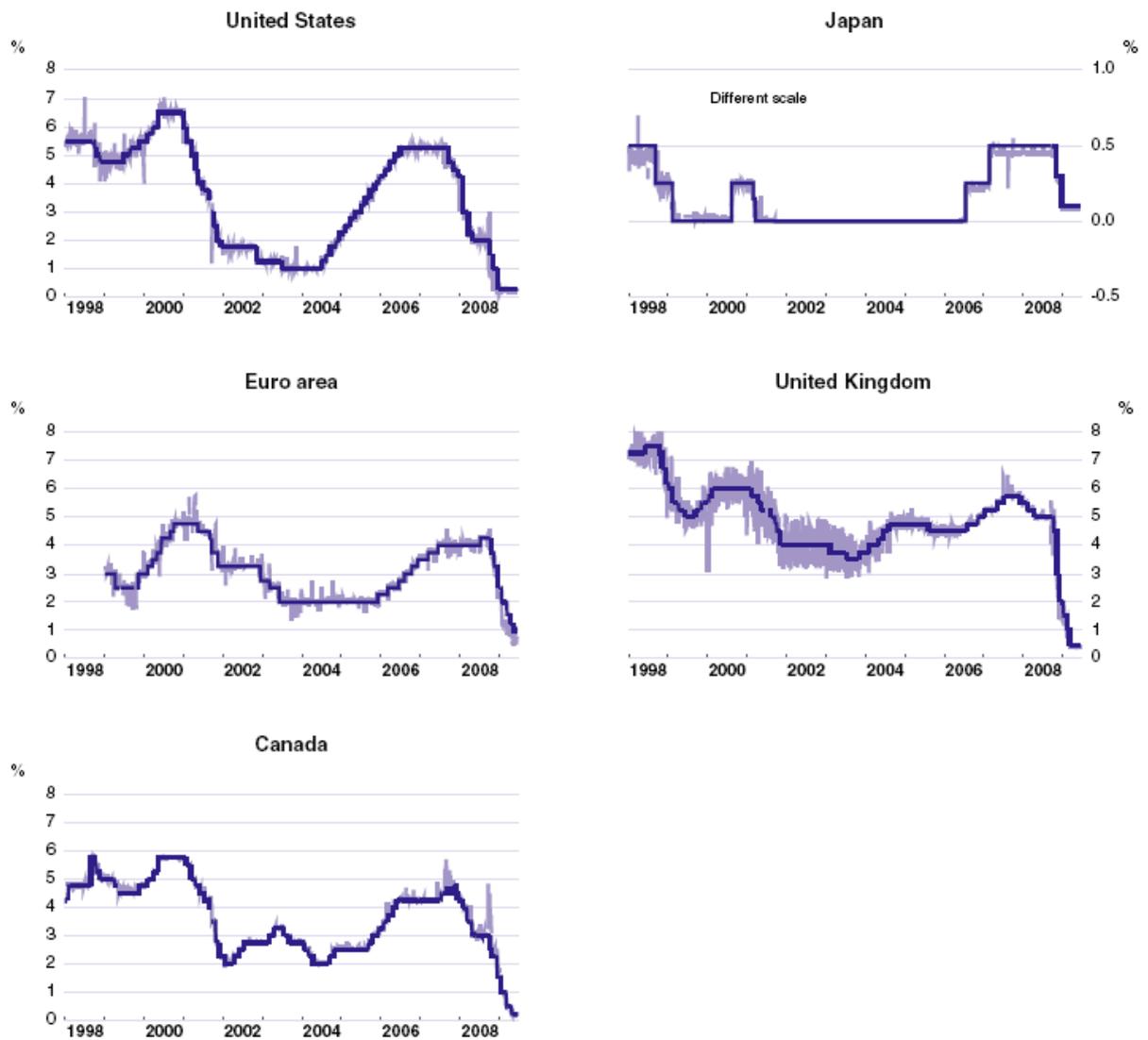


Note: Personal consumption expenditures deflator for the United States; Harmonised index of consumer prices for euro area; Consumer price index for Japan.

Source: OECD Economic Outlook 85 database.

Figure 1.19. Policy rates are very close to zero in most major OECD economies

Last observation: 10 June 2009

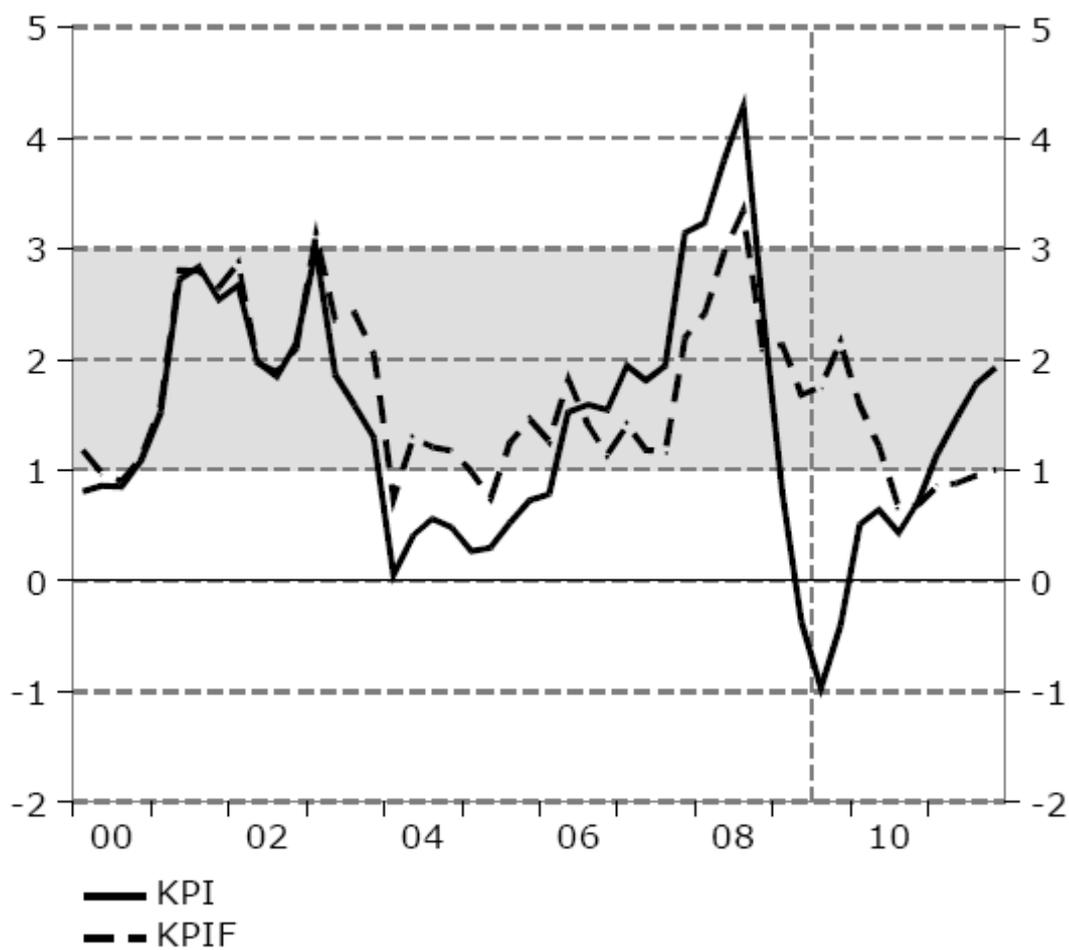


Note: The dark line represents the main policy rate of the central banks. The light line plots the effective overnight rate.

Source: Bloomberg, Bank of Japan, Datastream, ECB.

Diagram 165 Konsumentpriser

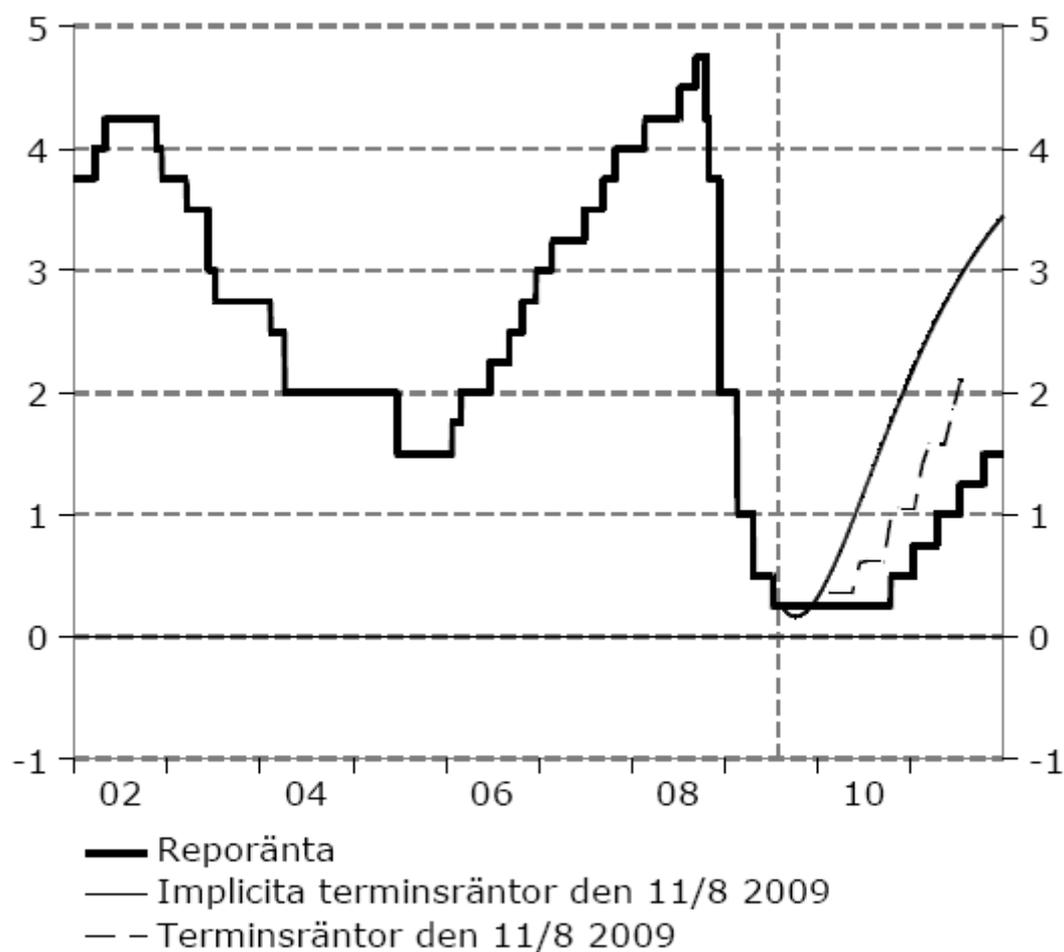
Årlig procentuell förändring, kvartalsvärden



Källor: SCB och Konjunkturinstitutet.

Diagram 60 Reporäntan i Sverige

Procent, dagsvärden



Anm. Enligt avkastningskurvan den 11/8 2009.

Källor: Reuters, Riksbanken och Konjunktur-
 institutet.

Diagram 61 Real reporänta

Procent, månadsvärden

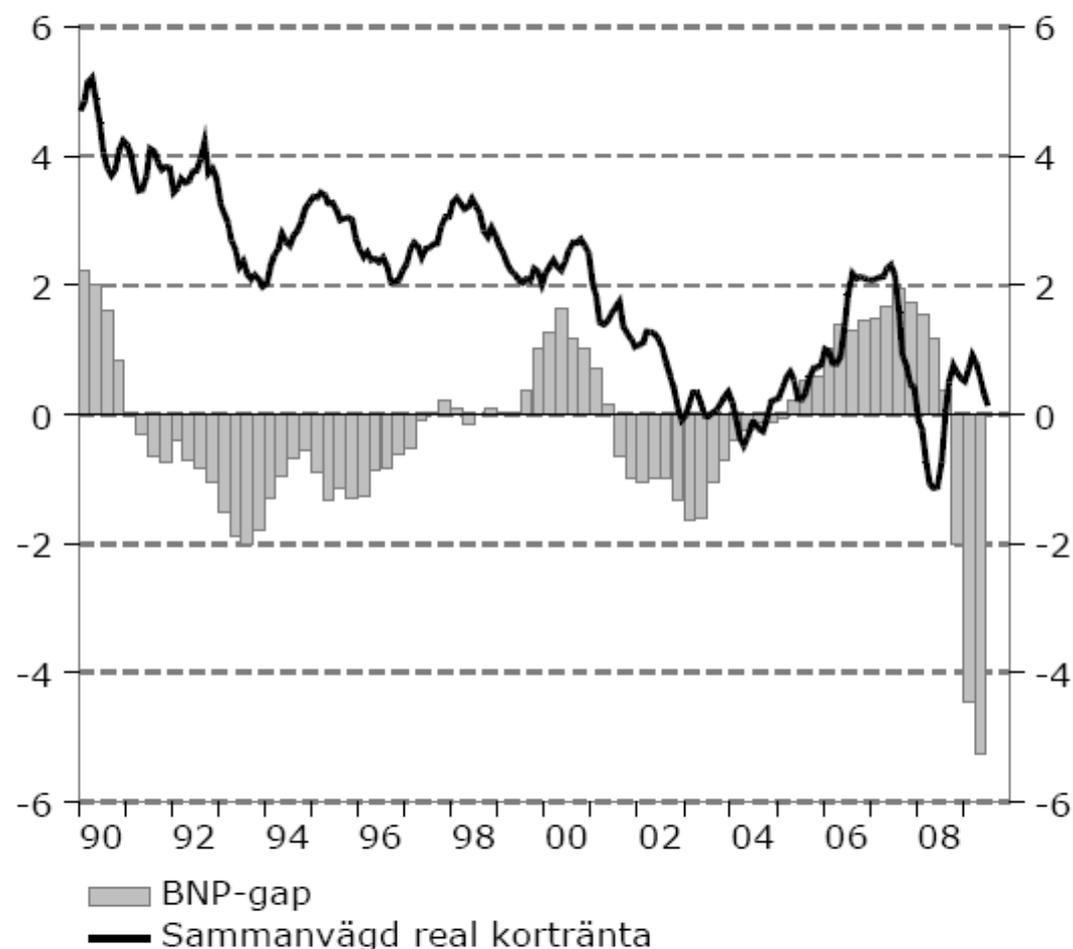


Anm. Beräknad som medelvärde av Konjunkturinstitutets reporänteprognos för det kommande året minus prognosen för KPIF-inflationen för motsvarande period.

Källor: Riksbanken, SCB och Konjunkturinstitutet.

Diagram 57 BNP-gap och sammanvägd real korränta för OECD-området

Procent av potentiell BNP, kvartalsvärden
respektive procent, månadsvärden

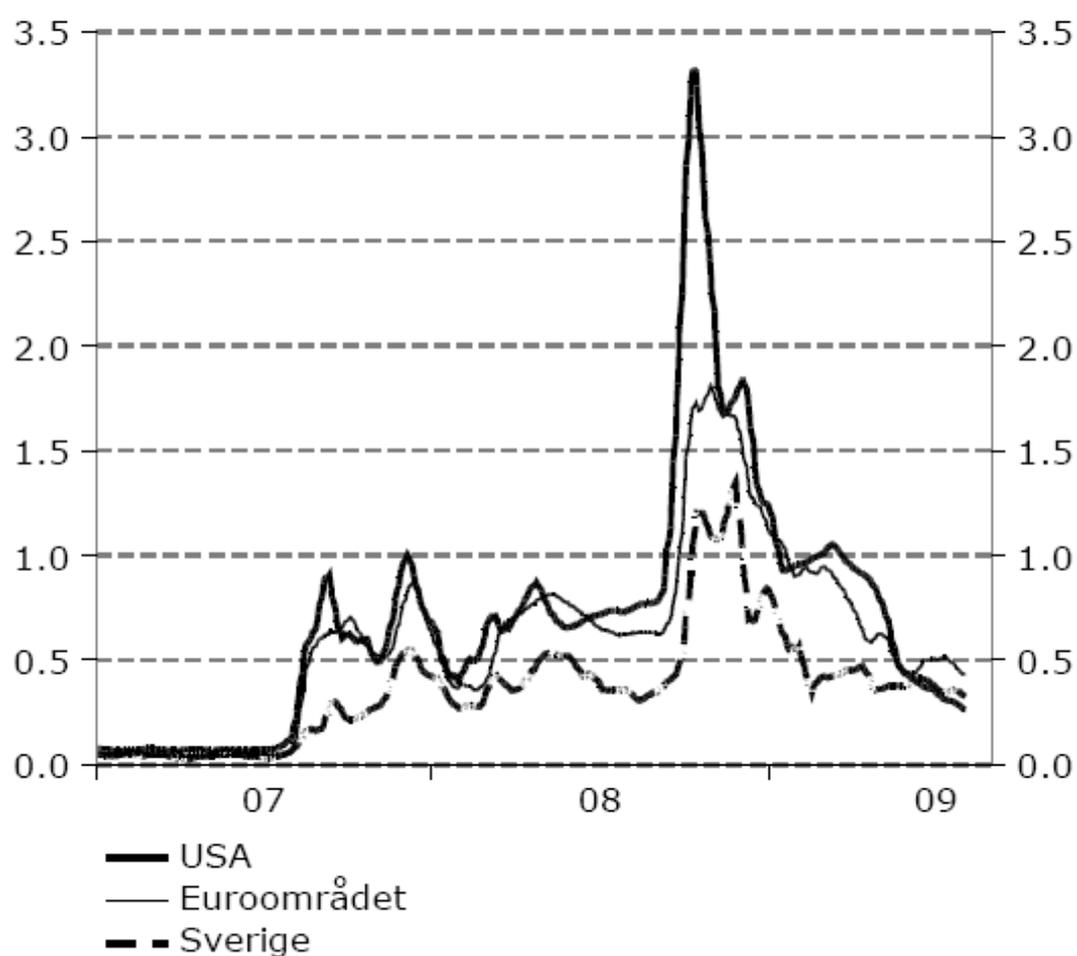


Anm. Sammanvägd med BNP-vikter. Realräntan beräknad som räntan på en tremånaders statsskuldsväxel minus genomsnittlig inflation under växelns löptid.

Källor: Reuters, OECD, IMF och Konjunkturinstitutet.

Diagram 47 Ränta på interbanklån, differens mot förväntad styrränta (basis-spread)

Procentenheter, dagsvärden, 10-dagars glidande medelvärde

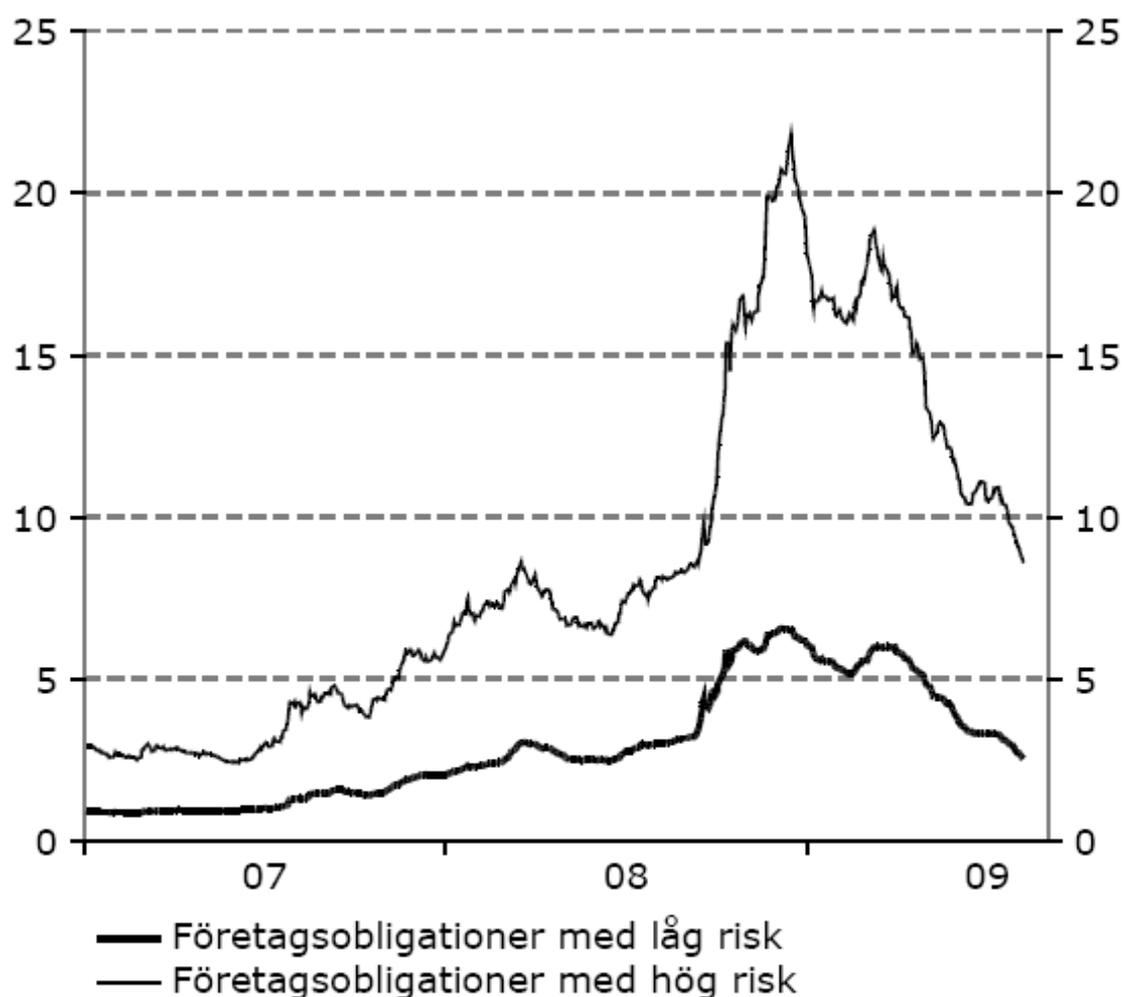


Anm. Löptid: 3 månader.

Källor: British Bankers' Association och Reuters.

Diagram 48 Ränta på företagsobligationer, differens mot statsobligationsräntan, USA

Procentenheter, dagsvärden



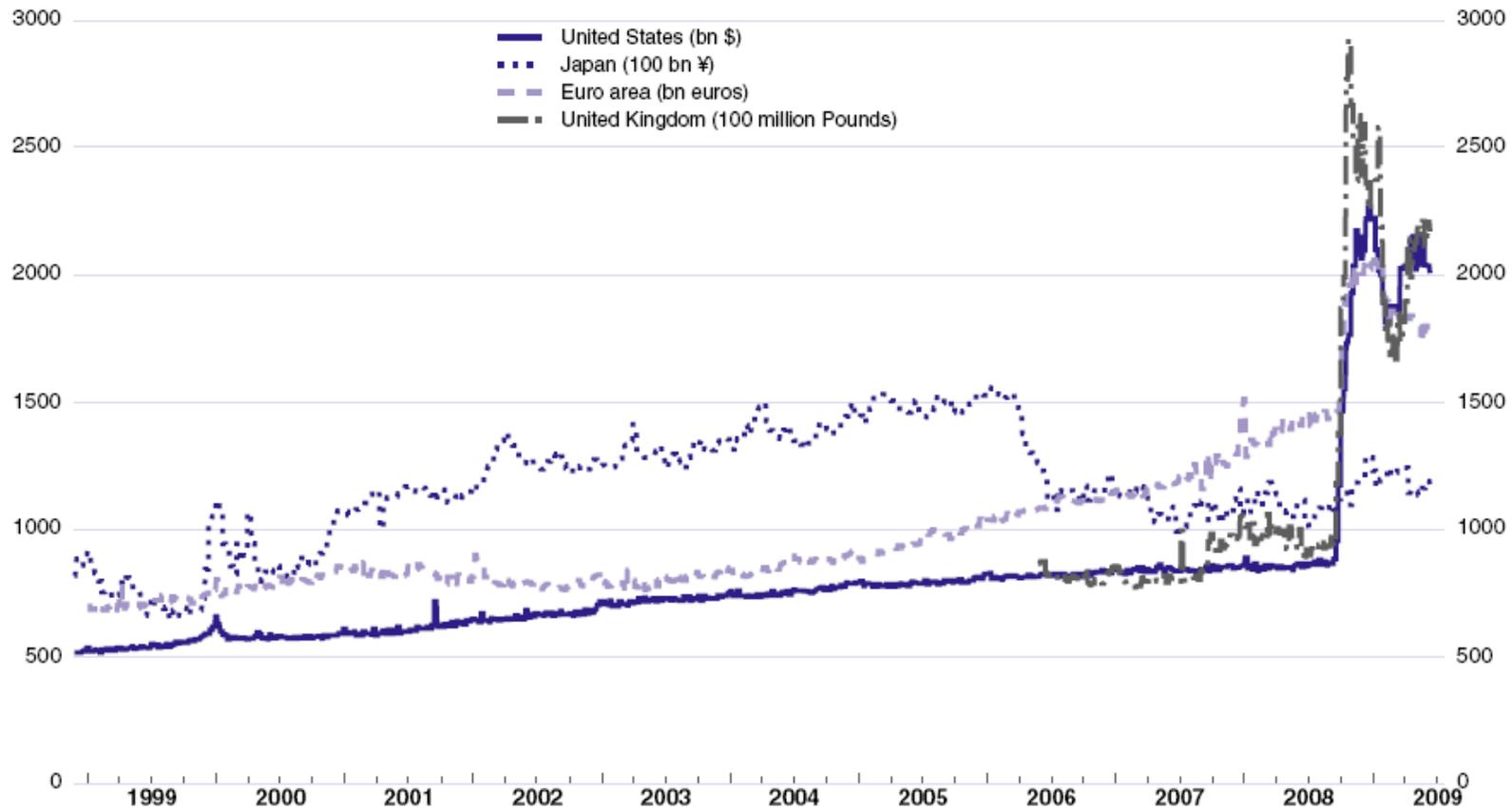
Anm. Hög risk: Ba/BB eller lägre. Låg risk: Baa/BBB eller högre. Båda klassificeringarna enligt Moody's/Standard & Poor's

Räntorna avser index över ett flertal löptider.

Källa: Merrill Lynch.

Figure 1.20. **Unconventional measures have led to expansion of central banks' balance sheets**

Latest available date: 11 June 2009



Source: Datastream.

The financial crisis last autumn

- **Interbank interest rates above central bank key interest rates**
- **High interest rate spreads**
- **Bank did not lend to each other**
- **Solvency problem**
 - **banks have “toxic” assets**
 - **subprime loans and mortgage-backed securities**
 - **losses on these assets**
 - **uncertain values**
 - **difficult to know who is holding the most toxic assets**
- **Bankruptcies**
 - **Lehman Brothers**
 - **contagion effects**
- **Government interventions**
 - **government support to bank take-overs**
 - **government take-overs**
 - **government guarantees of bank lending**
 - **capital injection programmes**

Two possible approaches to deal with impaired assets in banks

- **Ring-fencing strategy**
 - **public guarantee to cover losses above a certain level (UK)**

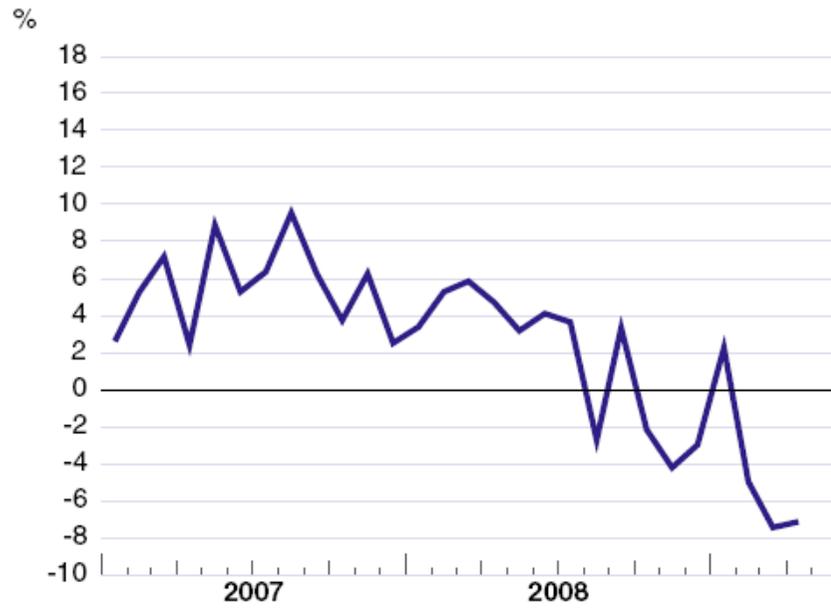
- **Purchases of toxic assets**
 - **above market value but below book value**

- **Moral hazard problems**

Figure 1.12. **Credit is contracting**

Annualised monthly rate of change of seasonally adjusted stocks, per cent

Total US consumer loans



Euro area bank loans to the private sector



Note: Euro area data are adjusted for the impact of securitisation.

Source: Datastream and ECB.