It’s Baaack: Japan’s Slump and the Return of the Liquidity Trap

Based on the corresponding paper of P. R. KRUGMAN

ZHANG Rui, KHIMICH Aleksandra, SALEMI Francesco

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Agenda

- Introduction

- Theoretical implications and critics
  - Basic model: liquidity trap in economy with flexible and fixed prices
  - Investments in the economy with liquidity trap
  - International mobility of goods and capital
  - Financial intermediaries and monetary aggregates
  - Fiscal and monetary policy

- Some specific questions on Japan's slump
  - Slowdown and Output Gap
  - Savings and Investments
  - Banking Problem
  - Policy Options and Consequences

Introduction

- Motivation: over the past several years, Japanese money market rates have been below 1%, but the bank cannot do more through monetary expansion. What' s the reason behind?

- Can we not just pull the old models out of the basement and put them to work?

- Particularly identify three standards of modern thought that miss from IS-LM

  1. The intertemporal nature of decisions (taking into account of rational expectations)

  2. Openness of the economy (ignore foreign trade and capital mobility)

  3. Traditional IS-LM analysis neglects the role of financial intermediaries, we have to fit it into the liquidity trap picture

The Theory of Liquidity Traps

- **Definition**: a liquidity trap may be defined as a situation in which conventional monetary policies have become **impotent** because nominal interest rates are at or near zero: injecting monetary base into the economy has no effect (increasing monetary expansion will decrease the interest rate and induce more investment , consumptions ,and productions…etc)

- **Normal view**: money is neutral, an increase in the money supply produces a roughly equiproportional increase in the general price level

- Many **common explanations fail** to explain why Japanese monetary is ineffectual. For instance, they do not explain why increases in the monetary base should fail to raise prices, or output

- If monetary expansion **does not work**, it must be because the public does not expect it to be sustained

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Specific model: Minimalist model (1/2)

- Because a liquidity trap fundamentally involves **expectations and credibility**; using models that explicitly recognize **the intertemporal aspects** of the problem helps to clarify this point

$$U = \frac{1}{1-\rho} \sum c_t^{1-\rho} D^t$$

- This is a two stages process, government engages in open market operations buying or selling bonds, and at the end, collect or distribute lump-sum taxes and transfers

- On equilibrium: price level will remain constant as well as the interest rate at **P*=M*/y***, ***i*=(1-D)/D**, and the cash in advance constraint will be binding: Pc=Py=M, so that

$$P = M / y$$

Specific model: Minimalist model (2/2)

- The second relationship comes from intertemporal choice: by holding one less yen in period one, we give up 1/P units of first period consumption but allows myself to consume (1+i)/P* additional units in period two. This change leaves me indifferent at an optimum

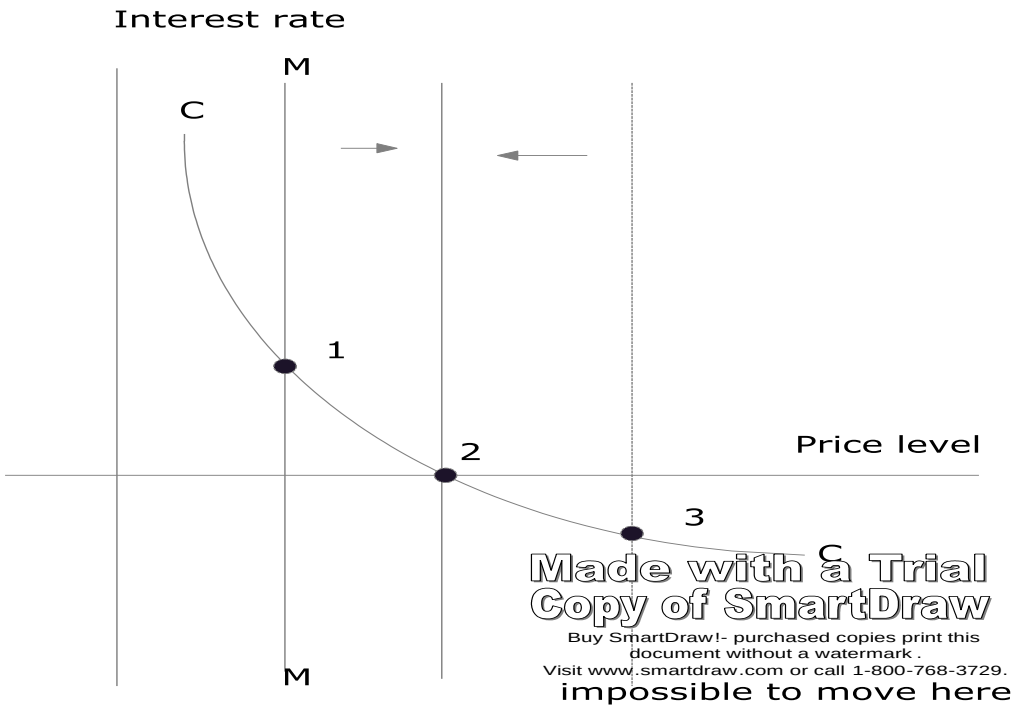
$$MU_c^1 = c^{-\rho}$$

$$MU_c^2 = D(c^*)^{-\rho}$$

$$c^{-\rho}\frac{1}{P} = D(c^*)^{-\rho}(1+i)/P^*$$

$$1+i = \frac{P^*}{DP}(y^*/y)^{\rho}$$

- The higher is the current price level, the lower is the nominal interest rate



The Liquidity Trap in a Flexible price Economy

- As an initial open market operation that **increases the first period money supply**, the operation will **increase the price level and reduce the interest rate**, driving the economy down the CC curve as far as point 2

- But the interest rate **cannot be negative**, otherwise money would then dominate bonds as an asset (stop at point 2)

- Suppose that the central bank tries to impose a rate of deflation that exceeds this maximum, the economy **will cease to be cash-constrained**, and any excess money will **have no effect**, monetary policy does not work anymore

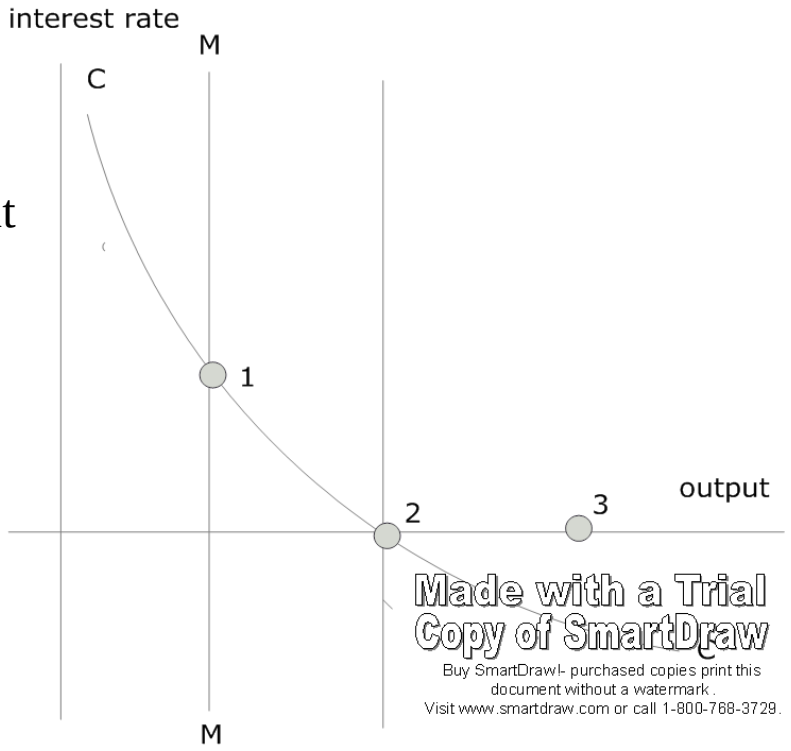
- Market clearing will require a negative real interest rate if the marginal utility of consumption in period 2 **is greater** than that in period 1,the case if the economy's **future output** is expected to be sufficiently **less than its current output**

The Hicksian Liquidity Trap (1/2)

- In this case, monetary policy can affect output by the assumption the price in period 1 is predetermined. Assume that consumption in period 2 will be the output in period 2

$$c = y = y^{*}(P^{*}/DP)^{1/\rho}(1+i)^{-1/\rho}$$

- As long as the nominal interest rate is **positive**, the cash in advance constraint will be binding. y=M/p**, increasing** money Supply will **increase output** until the point 2. beyond this level the money will be substituted for bonds. So **no** open market operation can get the economy **to full employment**. (classic Hicksian liquidity trap)



The Hicksian Liquidity Trap (2/2)

- Under what conditions will such a liquidity trap occur?

  1. P>P* people expect deflation, so even zero nominal interest rate is high real rate

  2.product is high compared with the future even if prices are expected to be stable. or people's expected future real income is low compared with the amount of consumption needed to use today's capacity. It needs a **negative real interest rate** to persuade people to spend enough now which is impossible

- From the point of view of macroeconomics, if people **have low expectations** about their future incomes, even with 0 interest rate, they may want to **save more than** the economy can absorb, therefore no matter what the central bank does with the current money supply, **it cannot** reflate the economy sufficiently to restore full employment

Investment, productive capital and Tobin's q

- Until now we can see specified models can indeed generate a liquidity trap, however, they omit some important aspects of standard macroeconomic models, like it has **no investment, no foreign trade or capital mobility, and no financial intermediation**, so can the same story be told if these elements are introduced?

- Liquidity trap occurs when the equilibrium real interest rate is negative, how this can happen in an economy in which productive investment can take place and the marginal product of capital can hardly be negative?
  1. Equity premium
  2. The rate of return on investment depends not only on the ratio of capital's marginal product to its price, but also on the expected rate of change of that price

International mobility of goods and capital (1/2)

Is investing the access savings abroad is a possible solution given zero interest rate in the local economy?

Critics:

1. In the large economies the bulk of employment and value added is in goods and services which remain non-tradable - > capital export (even at zero rate) can not be enough to escape a liquidity trap

2. If Share of IM/EX in GDP is low and price elasticities of EX/IM are low (which is true for large economies) -> even perfect capital mobility provides only limited extra scope for monetary expansion

International mobility of goods and capital (2/2)

$$U = \frac{1}{1-\rho}\sum_t D^t \left[c_{Tt}^{\tau} c_{Nt}^{1-\tau}\right]^{1-\rho}$$

c_{Nt} - consumption of non-tradable good

c_{Tt} - consumption of tradable good

- In this economy, agents can borrow/lend on world markets at a given interest rate r_T in terms of tradable good

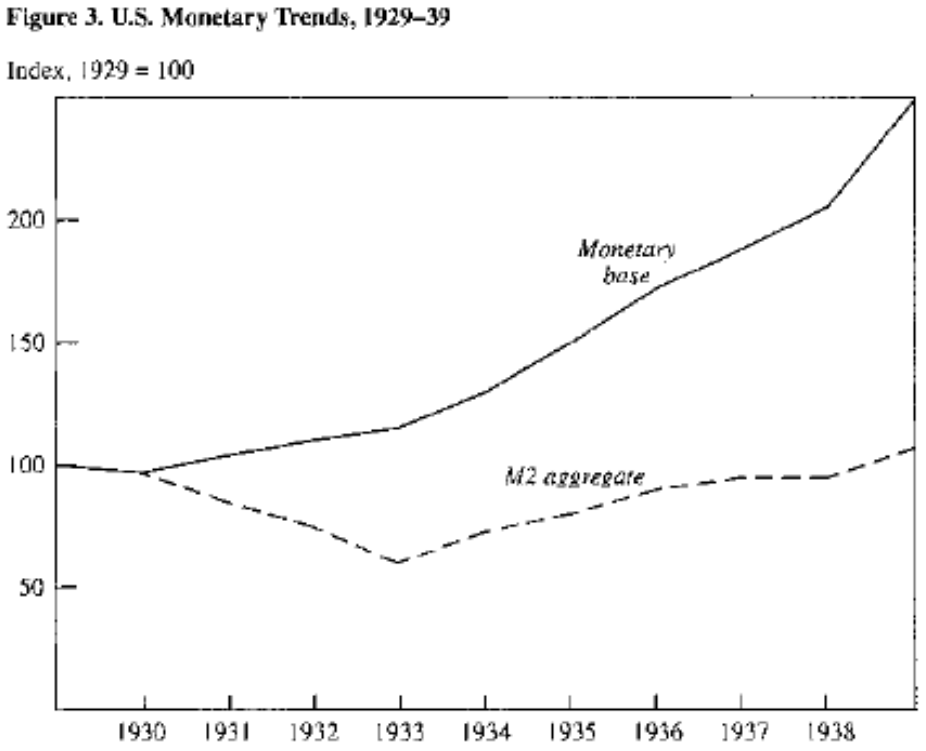
- If $\rho = 1 \longrightarrow U = \sum_t D^t \left[\tau \ln\left(c_{Tt}\right) + (1-\tau)\ln\left(c_{Nt}\right)\right]$

- For each good should hold: $1 + r = D^{-1}\left(c_{t+1} / c_t\right)$

- While for traded goods **real interest rate** is exogenous, for non-traded sector it will be adjusted to local production (thus can possibly be **negative** even **with perfect capital mobility**)

Financial intermediation and monetary aggregates (1/3)

Depression is a main historical example for liquidity trap



- Broad aggregate (M2) is the proper measure of the money supply (Freedman, Schwartz)
- Decline in the money multiplier is a result of financial disintermediation (Bernanke, Cooper and Corbae)

Financial intermediation and monetary aggregates (2/3)

Consider one-good endowment economy:

1. Individuals trade currency for bonds on a capital market and are also able to make deposits at a class of banks

2. Individuals discover whether they derive utility from consuming in the current period

3. Those who do want to consume withdraw the necessary cash from their bank accounts

Financial intermediation and monetary aggregates (3/3)

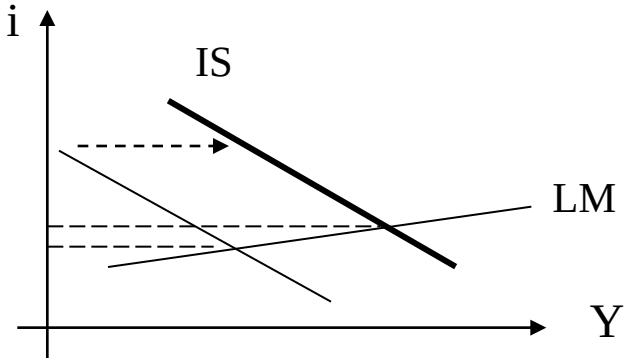
Nominal interest rate is positive	- > consumers deposit savings on their accounts - > banks, keeping minimum for withdrawals, keep the rest in bonds	-> monetary aggregate (which is defined as currency plus deposits) will consist of **no currency** but a volume of reserves (which is a multiple of the money base)
Close to zero interest rate	- > consumers and banks are indifferent between holding money in cash or deposits/bonds	-> **only if** consumers will substitute cash for bonds (rather than deposits) it will have an impact on the increase in the monetary aggregate -> in any case there will **no** be **effects on price** level/nor on the **output** if prices are non-flexible

Under **liquidity trap** conditions, increase in monetary base will:

- Expand a broad aggregate slightly, but only because public holds more currency
- Reduce deposits, because some of that currency substitutes for deposits
- Reduce bank credit even more, because banks will add to reserves

Fiscal policy

- In case of liquidity trap the classic Keynesian answer for the possible policy responses would be fiscal expansion



- However, in the model developed above the role of fiscal policy is quite insignificant, as representative agent faces Ricardian equivalence

Reminder:

- Ricardian equivalence suggests consumers internalize the government's budget constraint and thus the timing of any tax change does not affect their change in spending
- It does not matter whether a government finances its spending with debt or a tax increase, the effect on total level of demand in an economy being the same

Credibility and Monetary policy

- Only **temporary** monetary expansions are inefficient in case of liquidity trap

- In case monetary expansion is **permanent**, it will raise prices (in a full-employment model) or output (if current prices are predetermined)

$$c = y = y^{*}(P^{*}/DP)^{1/\rho}(1+i)^{-1/\rho}$$

- Thus, Central Bank should credibly promise to be irresponsible – convincing the market that it will allow price to rise sufficiently

- Monetary expansion will lead to a currency depreciation. However, the effects of increasing net exports and increasing (!) net imports may offset, making thus negligible the current account impact. This is true for both traditional and new developed models

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Japan's Slowdown (1/2)

Table 4. Economic Performance in Japan, 1981–97

Percent

Year	*Real GDP growth*	*Inflation*	*Unemployment rate*	*Money market interest rate*
1981	3.2	4.1	2.2	. . .
1982	3.1	1.8	2.4	. . .
1983	2.3	1.8	2.7	. . .
1984	3.9	2.6	2.7	6.5
1985	4.4	2.1	2.6	6.6
1986	2.9	1.8	2.8	5.1
1987	4.2	0.1	2.8	4.2
1988	6.2	0.7	2.5	4.5
1989	4.8	2.0	2.3	5.4
1990	5.1	2.3	2.1	7.7
1991	3.8	2.7	2.1	7.2
1992	1.0	1.7	2.2	4.3
1981–92 average	3.7	2.0	2.5	5.7
1993	0.3	0.6	2.5	2.9
1994	0.6	0.2	2.9	2.3
1995	1.5	−0.6	3.1	1.2
1996	3.9	−0.5	3.4	0.6
1997	0.9	0.6	3.4	0.6
1993–97 average	1.4	0.1	2.4	1.5

Source: *International Financial Statistics*, 1998.

Japan's Slowdown (2/2)

- Japan's Slowdown: Japan suffered a period of **slow growth rates** after having experienced a rapid and sustained growth
  - the 1981-92 average growth rate is 3.7;
  - the 1993-97 average growth rate is 1.4.

- In the 1981-92 period, also the potential output would seem to have risen about 3.7% annualy
  - same unemployment rate at the beginning and the end of the period and lower inflation rate.

- Projecting the 3.7% growth rate forward, 1998 output is overpredicted by about 14%.

Liquidity Trap

- Another striking feature of the post-1992 Japanese economy are the very **low interest rates** (very close to zero after 1995)

- How important it has been this liquidity trap to determine the Japan's growth slowdown and slump?

- Let’s check the output gap!

Output Gap (1/4)

- **Output gap** is defined $Y_t - Y_t^\star$, where

Y_t : actual output

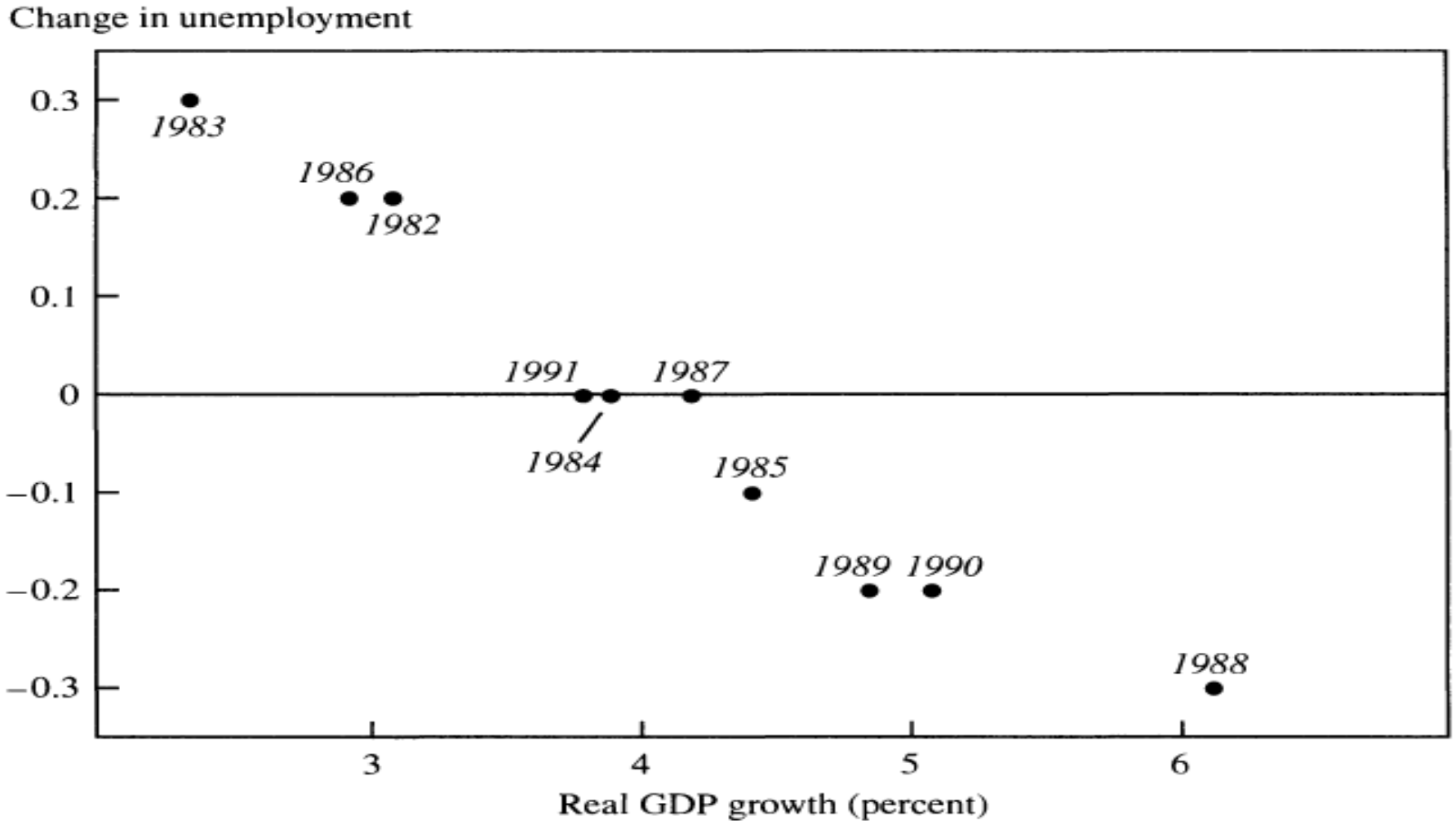
$Y_t^\star$: potential output

-

- It is usually estimated combining an **estimate of the natural rate of unemployment** and and an estimate of the **Okun's Law coefficient** relating the change in unemployment to the change in GDP

Output Gap (2/4)

Figure 4. Okun's Law for Japan, 1982–91



Source: *International Financial Statistics*, 1998.

Output Gap (3/4)

- From the picture we can deduce the Okun's Law coefficient is around 6

- Using the average unemployment rate in the period before the slump (2.5%) as an estimate of the natural rate of unemployment, the 3.4% unemployment rate in 1997 would imply an output gap of more than 5%

- This is a **conservative estimate**, since presumably the potential output was rising even during the slowdown, which implies that the gap at the end of 1998 could be as great as 10%

Output Gap (4/4)

- Most of the estimates of the output gap at that period were far smaller than the ones computed by Krugman

- Many of these estimates (e.g. IMF estimates) were based on the Hodrick-Prescott filter, which systematically **underestimates** the estimated shortfall

Hodrick-Prescott Filter (1/2)

The **Hodrick-Prescott filter** minimizes a weighted sum of squared deviations of actual from potential output and square changes in the growth of potential output

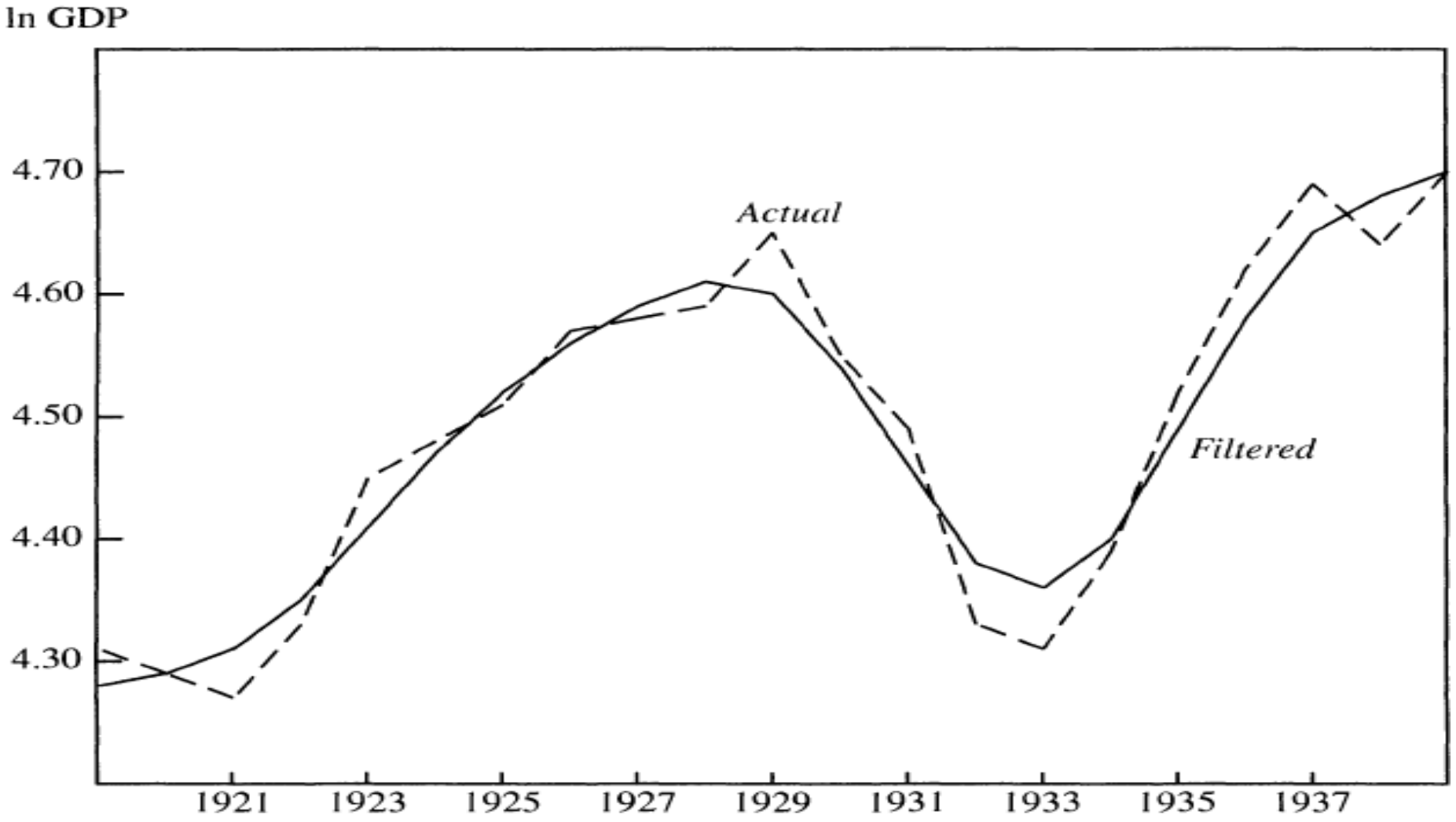
$$\sum_{t=1}^{T} (lnY_t - lnY_t^{\star})^2 + \lambda \sum_{t=2}^{T-1} \left[\left(lnY_{t+1}^{\star} - lnY_t^{\star} \right) - \left(lnY_t^{\star} - lnY_{t-1}^{\star} \right) \right]^2$$

It has **two disadvantages** when applied to a slumping economy

- it assumes the average deviation from potential being zero over the whole period, so that when the economy slumps, the filter reevaluates the earlier period as overheated (above-potential)
- any sustained drop in output gets built into the estimated potential growth rate

Hodrick-Prescott Filter (2/2)

Figure 5. U.S. Gross Domestic Product, 1919–39



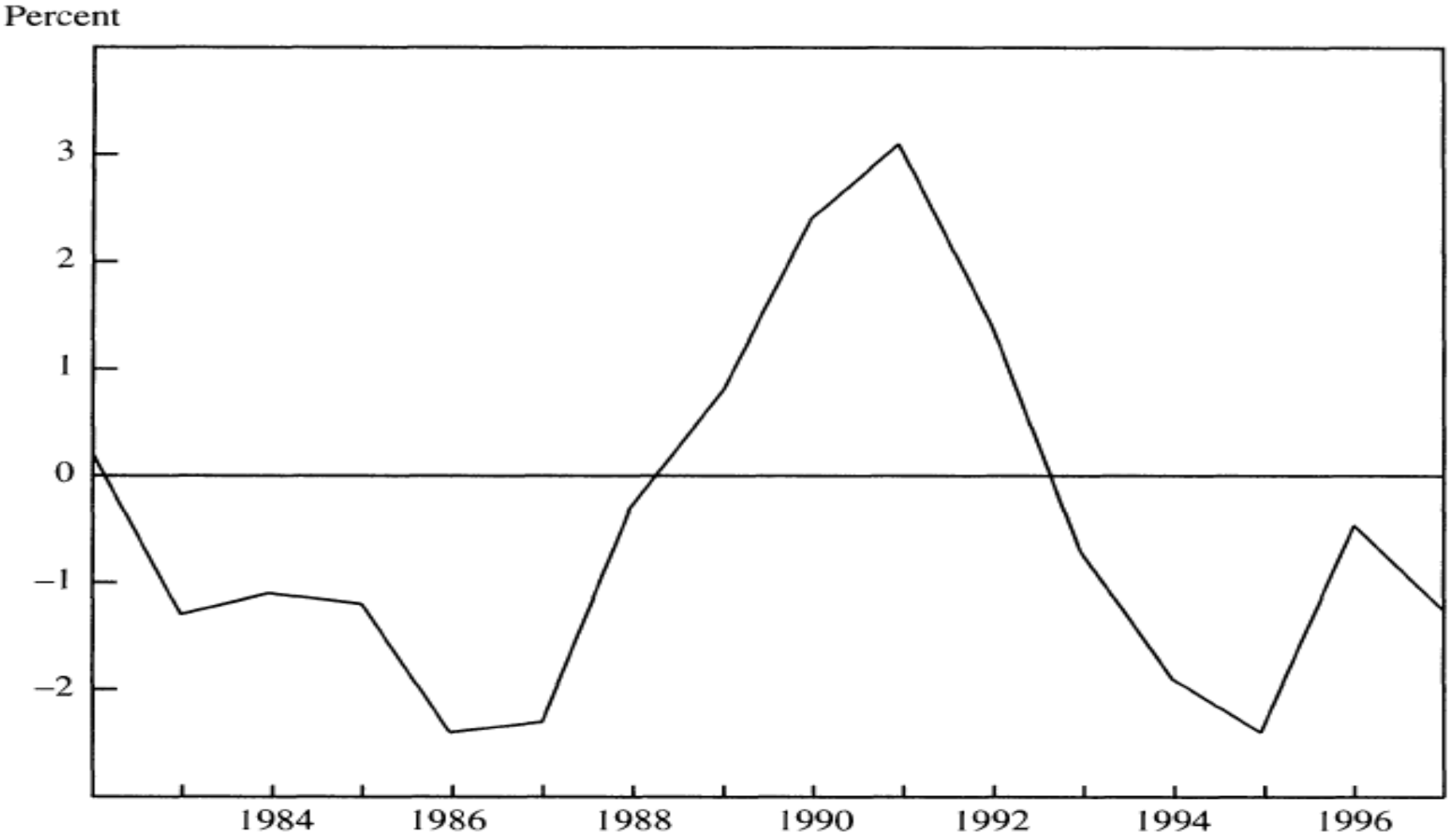
Source: Author's calculations based on data from U S Bureau of Economic Analysis (1973).

OECD Estimate of Japan's output gap (1/3)

- **Remarkably small** estimate of output gap in 1997: -1.2%
- This seems to be due to the fact that their estimation method updates the estimates of normal worker hours and worker productivity in such a way that cyclical component get reinterpreted as structural trends
- With this method Japan's potential growth during the slump is **underestimated**

OECD Estimate of Japan's output gap (2/3)

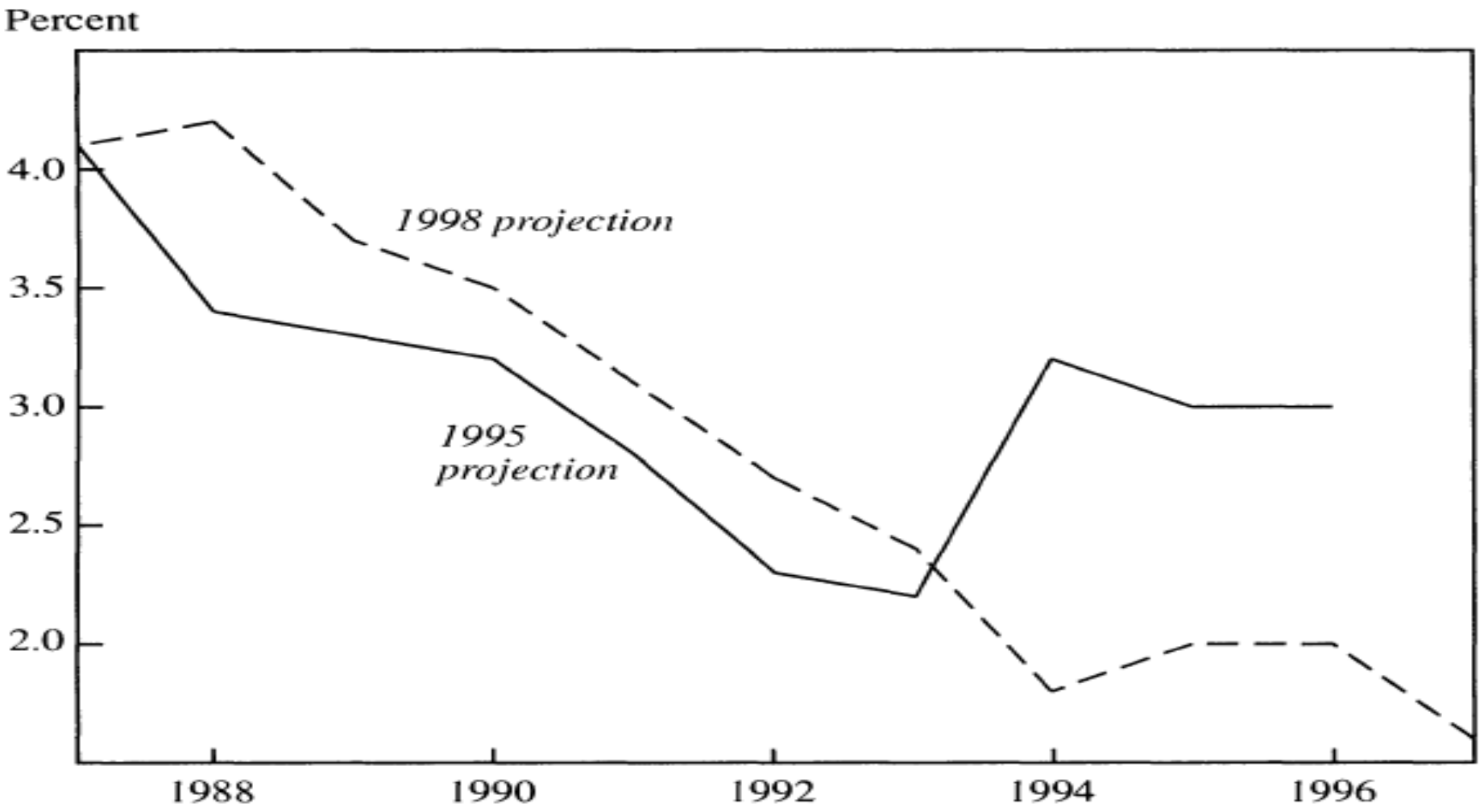
Figure 6. Output Gap for Japan, 1982–97



Source. *OECD Economic Outlook*, June 1998

OECD Estimate of Japan's output gap (3/3)

Figure 7. OECD Estimates of Japanese Potential Growth, 1987–97



Source: Giorno and others (1995); *OECD Economic Outlook*, June 1998

Savings and Investments (1/5)

Table 5. Private Consumption as a Share of GDP, Japan and the United States, 1991–97

Percent

Year	*Japan*	*United States*
1991	57.1	67.1
1992	57.8	67.6
1993	58.6	68.0
1994	59.7	67.8
1995	60.1	68.2
1996	59.9	68.2
1997	60.6	67.9

Source: *International Financial Statistics*, 1998.

Savings and Investments (2/5)

- Trying to understand the excess of desired savings with respect to desired investments in a liquidity trap
- Japan's consumption ratios **lower** than US ones
- Japan's consumption ratio **slightly increased** over the period
- This suggest that a liquidity trap might reflect **declining investment demand** rather than **rising saving supply**

Savings and Investments (3/5)

- How significant is the difference between Japanese and US consumption ratios?

- Consider a fiscal contraction in 1997 that would smash US consumption ratio down to the level of the Japanese one and assume that the Fed tries to offset it with a looser monetary policy. What would be its effect?

- Considering that a budget deficit of approx. 3% of GDP in 1980 was widely held to have risen the short-term interest rates by 3-4 perc. points and that the difference between US and Japanese consumption is **more than twice as large**, this fiscal-monetary switch would have significantly reduced US interest rates.

Savings and Investments (4/5)

- An alternative approach is to estimate the impact of such monetary-fiscal switch in a veriety of econometric models

- Both the **mean** and the **median effects** of a monetary-fiscal switch equivalent to a 1% decline in the consumption ratio are around around a 3 percentage point decline in the short term interest rate

Savings and Investments (5/5)

Table 6. Effect on U.S. Short-Term Interest Rates of a Fiscal-Monetary Switch Equivalent to a 1 Percent Decline in the Consumption Ratio

Percent

Model[a]	
DRI	−4.3
EEC	−4.4
EPA	−5.3
LINK	−1.9
LIVERPOOL	−2.2
MCM	−4.3
MINIMOD	−2.9
MSG	−3.3
OECD	−2.3
TAYLOR	−0.7
VAR	−0.4
WHARTON	−5.3
Summary statistic	
Median	−3.1

Source: Frankel (1988, pp. 21, 23)

a Models are those used in table 1

High Investments before 1990s (1/3)

- How was Japan able to invest so much at high interest rates before 1990s?
  - an obvious explanation would be that investments were high because of Japanese sustained growth rates (mainly the growth of potential output)
  - the subsequent slump can be explained as a slowdown in the underlying sources of Japanese potential growth

- It is likely that there has been a slowdown in the growth rate of TFP in those years

High Investment before 1990s (2/3)

- Japan's long-run growth would have had eventually to reduce because of a **demographic problem**
  - by 1995, the decline in fertility rates had already started to reduce the working age population
  - predicted decline in the working-age population at an annual rate of 0.7% over the period 1995-2025, accelarating to 1% in the following 25 years (OECD Economic Surveys: Japan 1997, p.113)
  - this prospective demographic decline should have reduced current investments

High Investment before 1990s (3/3)

- The looming shortage of working-age people in Japan it has been visible for a long time even before 90s

- One reason why this prospect did not affect long-term investment project earlier is the **asset bubble** of the late 1980s
  - businesses may have believed that TFP would have grown rapidly enough to make up for a declining work force
  - it may have the underlying decline in investment opportunities, delaying the day of reckoning

Banking Problem (1/3)

- Huge problem of bad bank loans (conventional wisdom placed their value at a trillion dollars), partly due to the burst of the bubble economy of late 1980s

- Japan needed to engage in a **cleanup** operation of the financial system

- Discussion of the impact of the banking problems on the macroeconomic difficulties of Japan

Banking Problem (2/3)

Table 7. Japanese Financial Data, 1994–97

Index, 1994 = 100

Year	*Monetary base*	*M2 plus certificates of deposit*	*Bank credit*
1994	100.0	100.0	100.0
1995	107.8	103.3	100.8
1996	117.0	106.5	100.6
1997	125.6	110.6	100.9

Source: *International Financial Statistics*, 1998

Banking Problem (3/3)

- A fairly rapid growth in monetary base has failed to produce an equivalent growth in broad monetary aggregates and has been accompanied by stagnation in bank credit

- Even though this would seem to confirm a central role of banking problems in Japanese slump, this is exactly the situation we **would expect to see** in a liquidity trap (independently of banks' financial status)

Moral Hazard Problem

- At the time **no widespread run** by depositors
  - similar to the US thrifts, whose financial problems were widely recognized well before the cleanup, but whose depositors remained calm because of an underlying government guarantee
  - no fire-sale liquidation of loans, abrupt removal of credit lines typical of bank-centered financial crysis

- **Moral hazard** problem
  - As long as a(n) (near) insolvent bank is able to hold on deposit thanks to the government guarantee, it has an incentive to overlend to risky projects (e.g. **jūsen**)

Credit Crunch

- At the end of 1997/beginning of 1998 the emergence of a problem **credit rationing** started to be widely recognized

- Caused by the announcement (October 1997) of **new capital adequacy standards** to be effective from April 1998
  - banks started cutting loans requiring large capital backing and in general to operate in order to dress-up their balance sheets

- The cleanup of the financial system, seems to be at the root of the credit crunch that deepened Japan's slump
  - **microeconomic motivation**: get rid of the distorsion in the direction of investments resulting from moral hazard

Policy Options and Consequences (1/2)

- Fiscal Expansion
  - could impact significantly the **size and duration** of the **deficit**
  - political problems
  - only a fiscal expansion would be hardly enough
- Banking Reform
  - it is **vital on microeconomic grounds** to eliminate the distotion in investment decisions
  - it must be **carried out quickly** (no gradual adjustment of excessively lenient initial criteria) to avoid a credit crunch
  - unlikely to jolt Japan out of the slump

Policy Options and Consequences (2/2)

- Managed Inflation
  - implementation: **credible commitment** to inflation
  - inflation target: we can estimate its size by asking how large the interest rate reduction should be to **eliminate** Japan's output gap
  - **sustained period** (at least a decade) of inflation, to reduce the real long-term rate sufficiently to close the output gap

Conclusions

- Starting from 90s economy of Japan is facing a very low interest rate, which makes monetary expansion tool almost ineffective. In economic theory this situation is call "liquidity trap"
- Basic macroeconomic models can indeed generate a liquidity trap, however, they don't take into account **intertemporal choice** and omit some important aspects of standard macroeconomic models (investment, foreign trade or capital mobility and financial intermediation
- Inconsistency in dynamics of the broader money supply does not necessarily imply faults in the financial intermediation (banking system)
- Whatever the specifics of the situation is, the liquidity trap is always a product of the credibility problem
- Theoretical results of the model proposed by P. R. Krugman can help to interpret the Japan's slump