Article

The Effectiveness of Monetary Policy in the Depression of Japan and Finland[#]

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Abstract

The paper focuses on the effectiveness of money demand in Japan and Finland, standing on the position that monetary policy can be still effective even in the depression when short term interest rates fall into the low level. It is crucial to testify that money demand function is stable under the depression, because it has an important implication for the effectiveness of monetary policy. Since the latter half of the 1980s, Japan and Finland experienced asset price inflation, or so called "the bubble". Both countries experienced severe recession after the burst of the bubble. The financial system was severely damaged by the mounting amount of nonperforming loan, which led to the substantial instability in estimated money demand. The effectiveness of monetary policy is impossible to assess on the basis of a model with unstable money demand function. The paper will clarify how the Japanese and Finnish economy caused asset inflation and plunged into a serious depression with an attention to a behavior of money demand.

The paper will perform the cointegration test to investigate the relationship between money and real economic activity, taking into consideration the precautionary demand caused by the financial anxiety. EGARCH model will be used to quantify the financial anxieties in the Japanese case. The estimation results of both economies suggest that the relationship between money sock and the economy is still stable in the depression.

Keywords: bubble, financial liberalization, money stock, cointegration, financial anxieties
***JEL** classification:* E21, E22, E24, E44

1. Introduction

In the latter half of the 1980s, a bubble economy emerged not only in Japan but also in many other industrial courtiers, including United States, the United Kingdom, Germany, Australia and Nordic countries. However the countries which experienced the biggest fluctuation in asset prices seem to be Japan and Nordic countries. Those countries had suffered from the mounting non performing loans after the burst of the bubble. The paper will analyze the cause of the bubble and clear the mechanism behind the emergence and expansion of the bubble, comparing the Japan's experiences with those of Nordic countries, especially Finland.

[#] The original paper is *Financial Crisis and Money Demand---in the case of Japan and Finland* , Research Paper, No.123, 2008, Economics Department, University of Turku, Finland.

The Japanese economy was on the verge of financial panic, especially in 1997 and 1998, when major financial institutions had failed. The Finnish economy also experienced the same financial distress in 1990-93. A common background factor behind the radical economic change is the financial liberalization under the easing money. The paper will clarify how the Japanese and Finnish economy fell into a serious depression with a reflection on the role of the money stock. We will perform the cointegration test to investigate the relationship between money and real economic activity, paying attention to the precautionary demand caused by the financial anxiety. The recessions of both countries are characterized by rapid decline in asset prices which substantially accumulated the nonperforming loans. The mounting nonperforming loans, especially in the financial sectors, hampered the normal functions of financial intermediaries and Japanese economy as well as Finnish economy came to the verge of financial panic. Financial panic caused the financial anxieties which had very negative effects on the economic activities. We will focus on the unobservable variable, financial anxiety, in the statistical estimation. We will use the EGARCH model to quantify the financial anxieties in the Japanese case. We will make it clear that there still exists a cointegration among the money stock and the real economic factors in the both economies. Thus, our estimation results of both economies suggest that the central bank should pay an attention to the behavior of money stock in conducting monetary policy, because money stock still has a stable relationship with real economy.

Before the statistical test, we will chronologically review the both economies before and after the burst of the bubble. The financial distress and deflation is rooted in the so-called bubble economy of the latter half of the 1980s when the economy had experienced the rapid rise in asset prices. The review will focus on how the economic bubble occurred, how the recession started with the collapse of the bubble and how the authority, government and central bank responded to its deterioration.

2. The Japanese depression

2-1. The bubble

Heated debates had been done over the cause of the prolonged recession. Debates were basically divided into two parties. One party insisted that the recession came from real factors, such as an aging society, cheap goods imported from Asian countries, and the internationally converged technical level. They thought the microeconomic policies were necessary and there was no economic growth without structural reform. The other stressed the importance and necessity of macroeconomic policy, using the aggregate demand and supply (AD-AS) model in the textbook. They focused on the shortage of demand caused by the leftward shift of the AD curve. Under the assumption the macro stimulating policy, such as government expenditure, reduction of tax, monetary policy would be needed. These debates remind us of the Great Depression in the 1930s. People thought the liquidation was important, because the economic system was very inefficient at the first stage of depression[1]. Demands side was ignored. The recent researches clearly explain that the idea of liquidationists deepened the recession and developed the simple recession into the Great Depression. Inefficiency in the market cannot explain the increasing rate of unemployment. Declining prices, deflation, caused the vicious circle of depression as Irving Fisher (1930) suggested.

[1] The quotation of Treasury Secretary Andrew Melow who advised President Hoover is well known; Liquidate labor, liquidate stocks, liquidate the farmers, liquidate real estate. It will purge the rottenness out of system. High costs of living and high living will come down. People will work harder, live a more moral life. Values will be adjusted, and enterprising people will pick up the wrecks from less competent people. See Randal Parker (2002), Ch.1.

In 2003, the BOJ announced that there existed no more cointegration between the money stock and the real economic variables based on formal statistical tests. Besides, several economists pointed that the Japanese economy was in a liquidity trap at the inter-bank rate near zero. At a very low interest rate, people are unwilling to hold bonds, preferring money instead as J.M. Keynes suggested. So increasing money stock is absorbed only as idle balance and has no effect on the economy. Under a liquidity trap monetary policy would be ineffective and central bank would have no responsibility for the recession.

The Japanese bubble had appeared with the progress of financial liberalization under easy money condition. With the removable of the restriction on the fund-raising in the securities market, the major firms became less dependent on the banks. On the contrary, the liberalization of interest rates on the deposits was gradual. As a consequence the profits of the banks gradually declined. They are obliged to seek new lending opportunity among small business and property-related firms. See Table 1 which shows that financial liberalization reduced the banks' profits.

Table 1 Interest Margins of Commercial Banks
(net interest income/assets)

	1980	1984	1987	1990	1991
Finland	2.28	1.65	1.57	1.60	1.25
Sweden	2.26	2.21	2.49	2.08	2.09
Norway	3.50	3.30	2.78	2.63	2.49
Japan	1.61	1.36	1.20	0.90	1.11

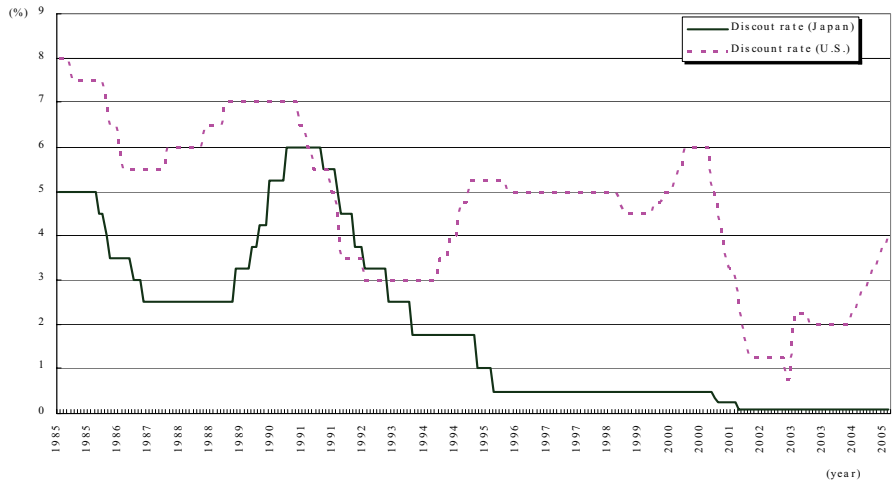
(Source) Shigemi (1995)

However financial liberalization itself does not cause the asset inflation. The most important factor behind the asset price inflation is the monetary easing. The monetary easing compounded with the liberalization caused the rapid asset inflation. The reason why monetary easing occurred in the Japanese economy can be explained as follows. Mounting Japanese trade surplus was often condemned by other countries, especially by United States of America. The trade friction between Japan and U.S got worse year by year, especially after President Ronald Reagan started so-called Reaganomics by adopting monetarist policy and supply side policy. His policy, targeting a low inflation rate and strong dollar, had caused twin deficit of trade and budget in U.S. The U.S trade deficit with Japan accounted for over half of its total trade deficit in the 1980s. U.S congress took very hard stance to the Japanese increasing trade surplus and threatened with retaliating trade measures.

In the February 1987 Louvre agreement, Japan was demanded to take much easier monetary policy. The Bank of Japan reduced the official discount rate to 2.5 percent, then the lowest level (Figure 1). Money growth started to rise in 1987 Q1. It grew more than 10 percent from 1987 Q1 through 1990 Q2 (Figure 2). It was the beginning of the Japanese bubble.

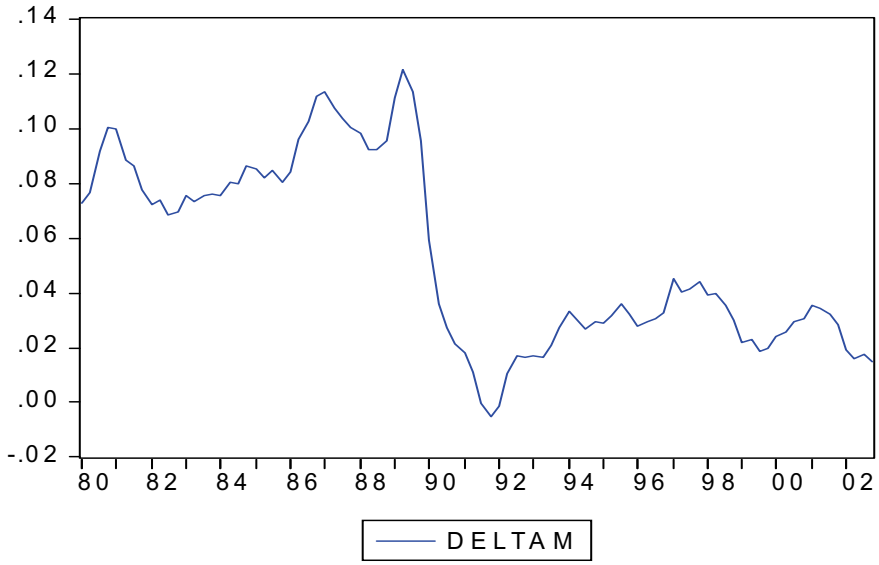
Under the assumption of affluent funds available, banks were very aggressive and competitive in their loan business. Anybody could get loans very easily from the banks as far as they had lands as the collateral because land price was believed to keep increasing forever. Large firms could get funds easily by using "equity finances". So banks had tried to expand the loans to small firms and property-related firms. Both the stock and land prices had rapidly increased from 1988 through 1989, which could not be explained rationally by the fundamentals.

Figure 1 Official Discount Rate: US and Japan



(source) Bank of Japan

Figure 2 Money Growth Rate (year on year)



(source) Bank of Japan

2-2. The burst of the bubble

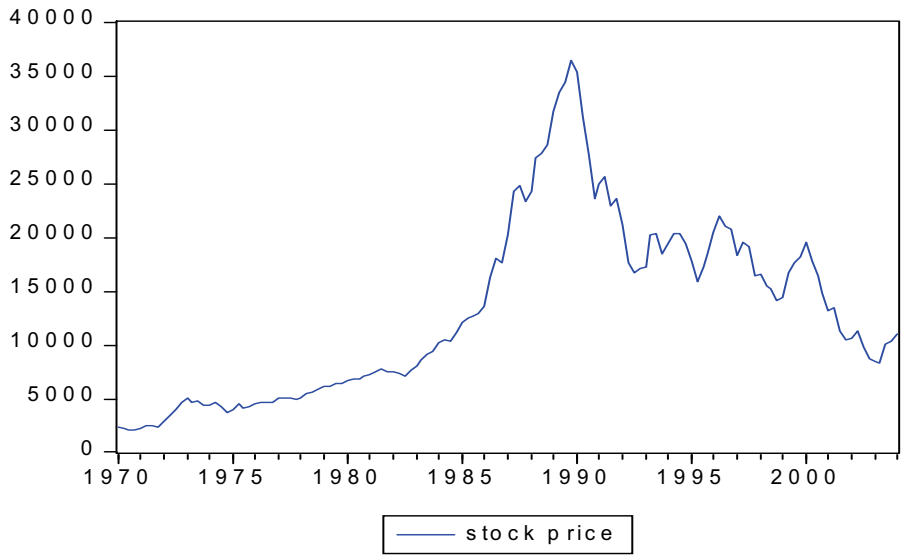
The BOJ implemented the third rise of discount rate from 3.75 to 4.25 percent in December 1989 when a new governor Yasuo Mieno had taken his office. However the market was still bullish. Land and stock prices continued to rise to levels that could not be rationalized by the fundamentals of the Japanese economy. He had showed very strong stance to the bullish economy by fourth rise of

discount rate from 4.25 to 5.25 percent[2]. He took the role of arbitrage of asset prices, unfortunately for the Japanese economy[3]. Furthermore governor Mieno had implemented the fifth rise of discount rate to 6.0 percent to avoid the homemade inflation caused by the Gulf War in August 1990 as shown in Figure 1. In addition the government also placed a ceiling on the total amount of financing available for real estate purchase.

The burst of the bubble began at last. The money stock (M2+CD) rapidly declined. It recorded negative year on year growth in mid –1992 as shown in Figure 2. After hitting a record high of 38,915 yen at the end of 1989, the stock price (Nikkei Dow-Jones Index) rapidly began to decline. In August 1992, stock price dipped below 15,000 yen, a 63 percent plunge from a peak level in Figure 3. Land price began to fail after hitting a peak in September 1990 and kept falling until now as shown in Figure 4. In response to the asset price decline, the BOJ reduced the discount rate six times from July 1991 to February 1993. The discount rate was ultimately reduced from 6.0 percent to 2.5 percent in Figure 1. The government also implemented the fiscal stimulus by spending a total of 29.9 trillion yen in two years from 1992 to 1993.

Land and stock prices were promoted to decline. Prices continued to decline and increased the deflationary pressure. Firms were obliged to continue the adjustment of their balance sheet damaged by the decline of asset prices.

Figure 3 Stock Price (Nikkei Dow-Jones Index)

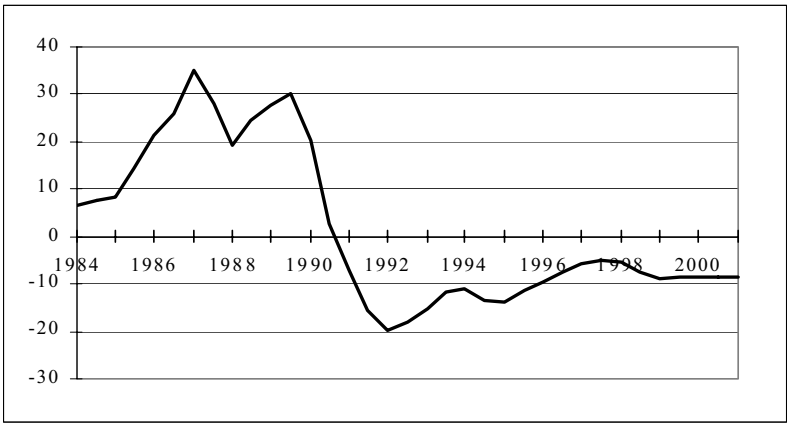


(source) Tokyo Stock Exchange

[2] New governor Mieno was hailed as an “Onihei of Heisei era”, a famous police leader, who had strongly fought against the gangs in the Edo era more than 200 years ago. The bubble was mainly discussed from the view point of income and asset distribution. This Mieno’s episode reflect well the public feeling that “bubble-bursting” was a right minded from ethical view point.

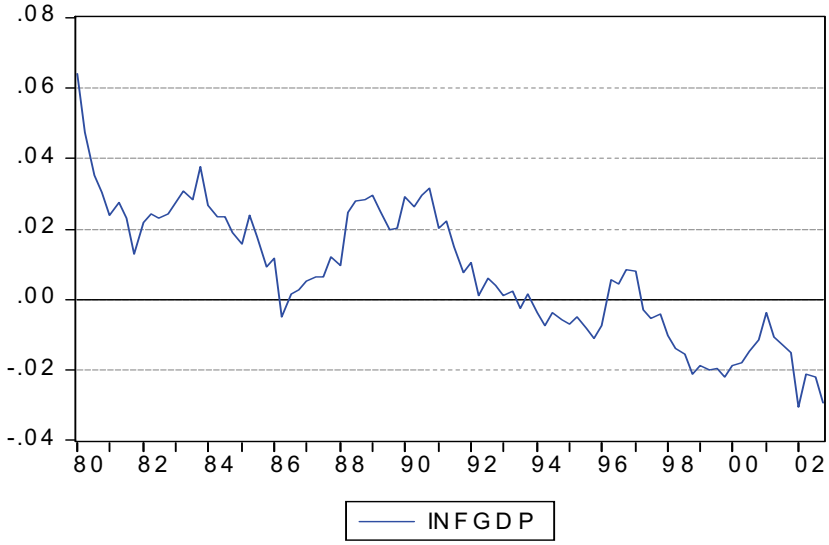
[3] Nowadays many economists understand that central bank should not take the role of the arbitrage of asset prices. See Randal Parker (2002).

Figure 4 Change of Land Price (year on year)



(source) Japan Real Estate Institute, 6 Large Urban Areas, average (residential, commercial, and industrial)

Figure 5 Price Change (GDP deflator)



(source) Bank of Japan

Prime Minister Hashimoto, worried about the future of the government finance, implemented measures to reconstruct the financial structure. He was afraid that fiscal condition would get worse and worse with the coming of aging society in Japan. He decided to increase the consumption tax from 3 to 5 percent and abolish a special income tax cut in April 1997, which amounted to a tax increase of 9 trillion yen. Consumption had rapidly shrunk in response to Hashimoto's tax increase policy. Unfortunately for the Japanese economy, the East Asian economic crises occurred in July

1997. The fiscal contraction compounded by the Asian crisis decreased the aggregate demand substantially.

Under the deflationary conditions, a financial panic occurred. Hokkaido Takushoku Bank, one of Japan's city banks (largest twenty banks), and Yamaichi Securities Company, one of Japan's four largest security companies, failed in November 1997. The failure of two big financial institutions sent the sign that the government gave up the "too big to fail" policy. People thought no financial institutions were immune from failures. Rumors about the other banks' failure had spread out through Japan. The stock prices of many financial institutions sharply declined and "Japan premium" in the international money market jumped by around 100 basis points. Japanese banks were obliged to pay the additional basis points for raising funds in the oversea financial markets. The premium is calculated as the difference between the quoted rates of TIBOR in the Tokyo offshore market and LIBOR in the London offshore market. Bonds issued not only by Japanese financial institutions but also by Japanese government were downgraded at the investment grade ratings by international credit-rating agencies, such as Moody's.

In response to the serious situation, the government decided to provide 30 trillion yen funds by issuing bonds. The government was not willing to inject public funds into the problem banks by considering the negative sentiments of the congress and public at first. However the financial panic was so severe that neither the congress nor the public strongly opposed an injection of public funds to assist the problem banks. The 30 trillion yen was divided into the following two categories: 13 trillion yen was prepared for the enforcement of the Deposit Insurance System, while the remaining 17 trillion yen was intended for the capital injection of the problem financial institutions.

The government actually injected 1.8 trillion yen to 21 large banks to raise their capital ratio in March 1998. However it had no significant effect on the banks because it was lax. Long-Term Credit Bank and Nippon Credit Bank had failed in 1998 after the injection of public funds. 7.5 trillion yen was again injected in March 1999. The implementation was quite different from the former injection. Banks were strongly required to submit a detailed and meaningful restructuring plan[4].

The government hesitated to quickly resolve the nonperforming loans and bank problems which weakened financial institutions and caused long recession. The government officially announced in late 1995 that nonperforming loans totaled 38 trillion yen, 4 percent of outstanding loans. In 1998, nonperforming loans increased to 73.1 trillion yen, 12 percent of all loans or 10 percent of GDP. All efforts by the government and private banks to decrease nonperforming loans did not succeed in reducing them at all because of the severe deflationary pressure.

The signs of deflation were apparent. In response to the serious situation, both the BOJ and the government admitted at last that Japanese economy had fallen into the deflation. The Japanese economy was thus caught in a vicious circle, so-called deflationary spiral indicated by Irving Fisher (1933). Decline in demand—Decline in production and price—Decline in employment (decline in consumption) and Increase in loan in real term (decline in investment)—Decline in demand. GDP recorded negative growth for 5 consecutive quarters from the 1997 Q4 onward (for the first time since the start of GDP statistics in 1955).

The BOJ which realized the risky situation of the Japanese economy at last reduced the call rate to 0.25 percent in 1998. The BOJ also took the so-called zero interest policy by reducing it to virtually zero percent in February 1999. Furthermore the BOJ adopted the untraditional monetary policy, so-called quantitative easy policy by putting the bank reserve on its target. Owing to the expansionary policy, the financial panic seemed to settle down. The Japanese economy began to show signs of recovery.

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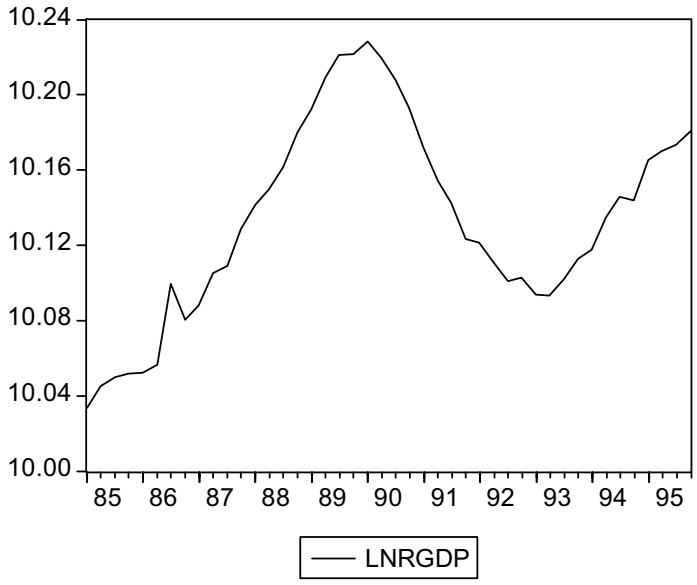
[4] See M. Hutchison and K. McDill (1999) p. 66.

3. The Finnish Depression[5]

The Finnish economy also had a severe recession in 1990s. Real GDP rapidly decreased from 1990 to 1993. The GDP growth rate fall more than 14 percent for 4 years. It reached at a peak in 1990, and then fell sharply toward the end of 1992 as shown in Figure 6. The depression was caused by the financial liberalization at first. As a consequence of the financial liberalization, bank lending rapidly expanded especially after 1985 and peaked in 1990 as shown in Figure 7 . Capital inflow from foreign countries also contributed to the increase of lending booms.

Financial liberalization itself does not cause rapid asset price inflation. When the financial markets are deregulated under the monetary easing, the asset price increases. Money stock started to increase gradually. Year on year growth rate of Money stock (M1) reached at a peak, 17.7 percent in 1989q1. M2 growth rate also peaked 18.4 percent in 1988q1. Both growth rates sharply declined after its peak as shown in Figure 8 .

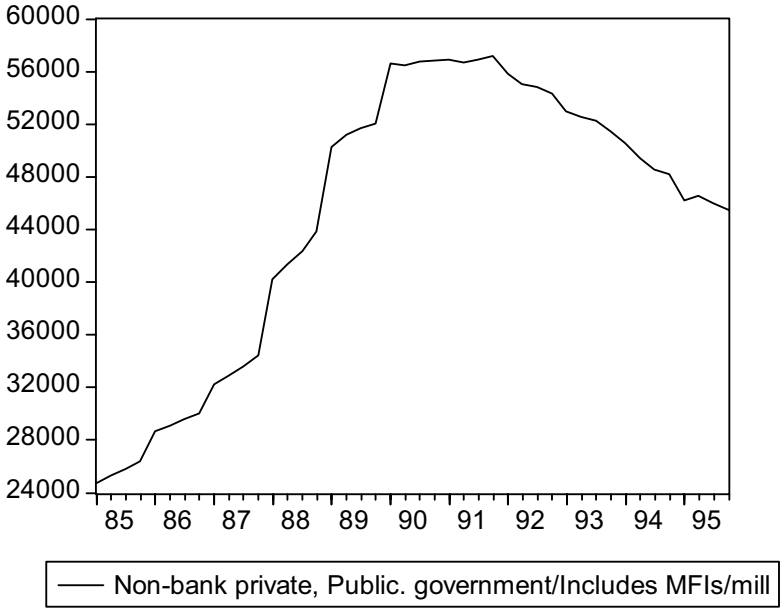
Figure 6 log(real GDP)



(Source) OECD database

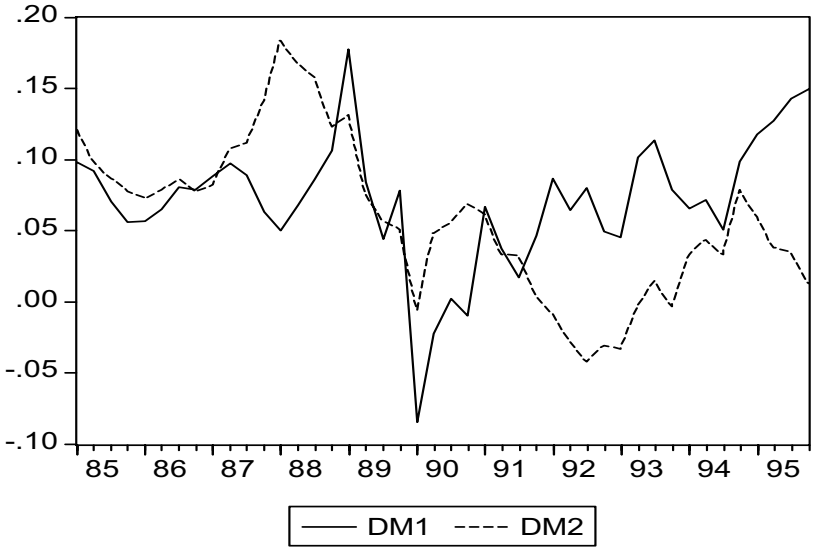
[5] This section mainly depends on Kalela, Kiaander, Kivikuru, Loikkanen & Simpura, (2002) and Nyberg and Vihriala(1994)

Figure 7 Bank lending



(Source) OECD database

Figure 8 Money Stock (growth rate)



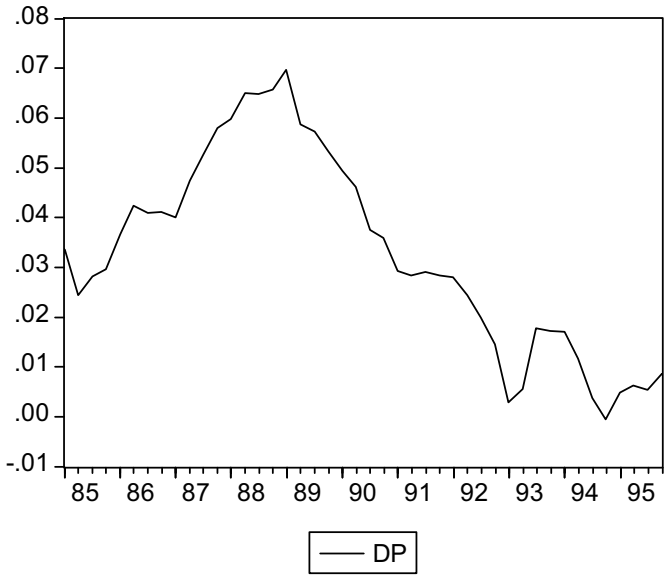
(Source) OECD database

There is a strong similarity between Finland and Japan regarding the timing of financial liberalization and asset inflation. In Finland indirect finance was dominant while the direct finance was not developed well before the 1980s when the financial deregulation started. Deposits banks were centre to the financial market. Deposit banks also controlled the firms through financing.
In Finland the periods of the bubble and its burst are as follows: the bubble period from 1985 to 1990 while the depression by the burst of bubble from 1991 to 1993.The average GDP growth rate from 19985 to 1990 was 3.4 percent. The bubble has started around 1986.The factors behind the bubble can be summarized in the following three factors.

First factor is the financial liberalization. As a result, security market rapidly developed and borrowing from abroad substantially increased because of the abolition of exchange rate control in the latter half of 1980s. The liberalization of both of bank lending rate and private borrowing from abroad brought about the rapid expansion of bank loan and large capital inflow from foreign countries. Second is the sharp improvement of the terms of trade. The decline of oil price and the rise in world market prices of forest products promoted the Finnish export. Third is monetary easing. Average money growth rate is more than 10% in 1986-87 (Figure 8).

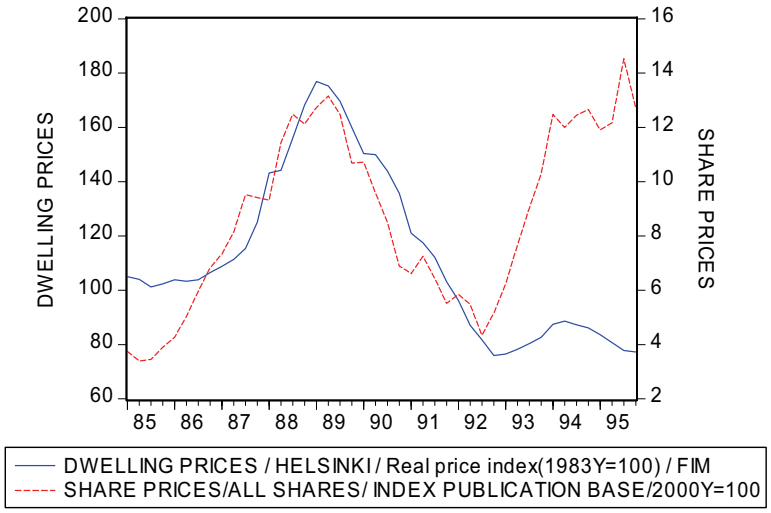
The inflation rate gradually began to increase in the boom. Consumer prices rose from around 2 % in 1986 to around 8% in 1990 (Figure 9). The rapid rise in inflation rate weekend the Finnish export competitiveness and caused serious current account problems. Under the deregulation and monetary easing, banks became very competitive to find the borrowers. Especially savings banks became very aggressive to risk taking. Banks' profits gradually declined with the progress of financial liberalization in Finland too, as shown in Table 1. In addition, capital inflow from foreign countries rapidly increased. As a consequence, the real estate and other assets price substantially increased (Figure 10).

Figure 9 Consumer Price Change



(Source) OECD database

Figure 10 Asset Price



(Source) OECD database

The economic boom had turned around in 1990 when the real GDP started to decline. The GDP continued to decline by the fall of 1993. The Finnish exports gradually declined by losing the price competitiveness and the deterioration of terms of trade. Moreover, the collapse of Soviet Union strongly reduced the Finnish exports to Russia[6]. Bank of Finland had to take tight monetary policy because speculative attack to the Markka had begun from 1990. However tight monetary policy seriously damaged the economy.

With the fall in the economy, asset prices started to decline and bankruptcies of firms began to increase. By mid-1991 the number of bankruptcies had increased to a monthly average of some 600 from around a year before[7]. The non-performing loans which banks hold rapidly accumulated in 1991-92. Some 40 % of banks' non-performing loan were related to construction, real estate and retail trade[8]. The financial crisis had occurred. The banks which were most severely damaged were the savings banks. They had aggressively expanded the loans during the boom. They increased the loans to small firms and property related firms. Unfortunately, many of their loans were denominated in foreign currencies. So the depreciation of the Markka strongly damaged their borrowers. As a consequence Skopbank, a central bank of the saving banks was the first commercial bank which got into the trouble. The banking problems continued and peaked in 1992.

The Finnish Markka was changed to the floating system in September, 1992. Bank of Finland was relieved of its legal obligation to keep the exchange rate at the decided zone. As well known as the irreconcilable trinity of an open economy in international finance, three objectives; fixed exchange rate system, independent monetary policy and free international capital flows, cannot be achieved simultaneously. Under the new currency regime Bank of Finland came to implement freely monetary policy concentrating on the domestic economy. Bank of Finland also decided to take inflation target with the change of exchange rate regime. Price level targeting framework is a

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[6] The loss of Soviet export markets brought about a negative demand shock of the order of 2.5% of GDP, including indirect effects. See Nyberg and Vihriala(1994).

[7] See Chart 13 in Nyberg and Vihriala(1994).

[8] The banks' non-performing loan rapidly increased from FIM 42 billion to FIM 77 billion during 1992. See Nyberg and Vihriala(1994).

signal that BOF would not cause inflation. This framework contributed to mitigate concerns that new exchange rate system might eventually lead to the inflationary economy. The government injected public funds to the problem banks in early 1992. Public injection continued through 1994. The public funds totally injected to the financial system reached at 7.4% of nominal GDP. The depreciated Marrka also contributed to the rise in exports. As a result, the Finnish economy recovered since 1994.

4. The Cointegration Analysis

For later use, symbolic notations are described here.

	Japan	Finland
rm	log(m2+cd/p)	log(m1/p)
rm_{adj}	rm-k*DV1	rm-k*$\|u^-\|$
y	log(GDP/p)	log(GDP/p)
r	spread(=long - short)	central bank base rate
p	GDP deflator	GDP deflator
DV1	financial anxieties	
u		Business survey data (bbs_ec_sa)
u^-		min{u, 0}

We identified the order of integration maintained by each of the variables using both DF-GLS test and KPSS test. All variables except for financial anxieties DV1 were shown to be nonstationary and their first difference to be stationary. Test results will be shown upon request.

4-1. Japanese case

We perform a formal cointegration test to identify whether or not there exists a long-run equilibrium relationship between the money stock and the economic activity in Japan. We focus on the relationship between three variables; the real money stock, real GDP, and the opportunity cost of holding money. For the opportunity cost, two interest rate series are used. One is the difference between the interest rates on the money stock and that on other financial assets, actually the spread between 3 months CD rate and rate on government bond (ten years maturity). The other is just interest rate on government bond (ten years maturity) for the long rate. Both interest rates are alternatively used in estimation. M2+CD is the best available measure which the BOJ uses as an important policy variable.

If a long-run equilibrium relationship exists between the real money stock, real GDP, and the opportunity cost, we could say that money demand rises in line with increase in real GDP or decline in the opportunity cost. The system model is described by the VECM in the following:

$$\Delta rm(t) = c_{m0} + \alpha_m ect(t-1) + \sum_{i=1}^{k} c_m^i \Delta rm(t-i) + \sum_{i=1}^{k} d_m^i \Delta y(t-i) + \sum_{i=1}^{k} e_m^i \Delta r(t-i) + \varepsilon_m(t) \quad (1)$$

$$\Delta y(t) = c_{y0} + \alpha_y ect(t-1) + \sum_{i=1}^{k} c_y^i \Delta rm(t-i) + \sum_{i=1}^{k} d_y^i \Delta y(t-i) + \sum_{i=1}^{k} e_y^i \Delta r(t-i) + \varepsilon_y(t) \quad (2)$$

$$\Delta r(t) = c_{r0} + \alpha_r ect(t-1) + \sum_{i=1}^{k} c_r^i \Delta rm(t-i) + \sum_{i=1}^{k} d_r^i \Delta y(t-i) + \sum_{i=1}^{k} e_r^i \Delta r(t-i) + \varepsilon_r(t) \quad (3)$$

$$ect(t) = rm(t) + \beta_y y(t) + \beta_r r(t) + const. \quad (4)$$

where
rm(t) is real money stock
y(t) is real GDP
r(t) is opportunity cost
ect(t) is an error correction term

Our results of cointegration test are in brief as follows. The detail will be shown later.

1. A long-run equilibrium relationship between the real money stock, the real GDP, and the opportunity cost can be found in the sample period before late 1997.
2. However, the long-run equilibrium relationship can no longer be detected in the sample period expanded beyond late 1997, when financial anxieties over the Japanese financial system emerged.

The reason why the relationship between the money stock and economic activity has been unstable seems to be related to the financial anxiety which rapidly increased after the sudden collapse of big financial institutions in 1997 and 1998. The financial anxieties drastically increased the precautionary demand by both firms and households.

We need to comprise a new variable to explain the rise of precautionary demand for money since autumn 1997. The new variable has to capture the psychological change of people due to the financial anxieties. We used the Corporate Financial Position Diffusion Index issued quarterly by Bank of Japan known as TANKAN in order to qualify the unobservable variable.

We used an EGARCH model in which a change of corporate financial position (ΔDI) is regressed by a change of bank lending rate ($\Delta rate$)[9]. $h^2(t)$ is the financial anxieties which can be captured as the conditional variance of $\varepsilon(t)$. The estimation result we got is as follows.

$$\Delta DI(t) = \underset{(0.18)}{0.0446} - \underset{(-0.37)}{0.0037}\Delta rate(t) - \underset{(-2.26)}{0.0236}\Delta rate(t-1) + \varepsilon(t),$$

[9] Kimura and Fujita (1999) used the following GJR model.

$$DI(t) = c_0 + c_1 rate(t) + c_2 rate(t-1) + \varepsilon(t),$$

$$h_t^2 = \alpha_0 + \alpha_1 \varepsilon_{t-1}^2 + \beta h_{t-1}^2 + \gamma \varepsilon_{t-1}^2 I_{t-1},$$

where I_{t-1} = 1 if $\varepsilon_{t-1} < 0$

= 0 otherwise.

In this model, for GJR effect, the asymmetry term $\gamma > 0$ and the condition for non-negativity will be $\alpha_0 \geq 0$, $\alpha_1 \geq 0$, $\beta \geq 0$ and $\alpha_1 + \gamma \geq 0$. The conditional variance h_t^2 is subject to an impact α_1 from good news ($\varepsilon_{t-1} \geq 0$), while an impact ($\alpha_1 + \gamma$) from bad news ($\varepsilon_{t-1} < 0$). However their result cannot be explained rationally from an economic point of view. For example financial anxieties increases in the bubble period in the latter half of 1980s. Furthermore, the estimated β takes a negative value. Therefore, in our case, we introduce the growth rate model of ΔDI regressed by $\Delta rate$ and consider the logarithm of $h^2(t)$ in the EGARCH model.

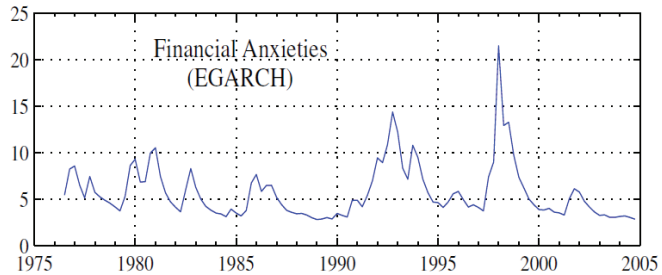
$$\log(h^2(t)) = 0.3565 + 0.7746\log(h^2(t-1)) + 0.2249\frac{|\varepsilon(t-1)|}{h(t-1)} - 0.168\frac{\varepsilon(t-1)}{h(t-1)},$$

(1.21) (4.26) (1.08) (–1.59)

where values in the parentheses are t-values.

The financial anxieties (h^2) is given in Figure 11. Anxieties variable denoted by DV_t ($=h^2_{t+1}$) is seen to rise at first from 1992 to 1994 (the first financial anxiety in Japan), when small credit unions and cooperatives failed because of an increase in the nonperforming loans caused by the rapid decline of stock and land prices after the bust of the bubble. The Japanese economy began to show the signs of a modest recovery in late 1995, when real GDP began to increase and the official estimation of NPLs decreased. The Ministry of Finance had issued a report entitled "Reorganizing the Japanese Financial system (kinyu shisutemu no kinoukaifuku nituite)" in June 1995, in which they showed a diehard attitude to tackle the NPLs problems by officially disclosing the magnitude of bad loans totalled 40 trillion yen (about 4 percent of the loans held by depository institutions).

Figure 11 Financial Anxieties



Furthermore the MOF strongly pledged the complete deposit guarantee by March 2001, with a reform of the Deposit Insurance Corporation and Prompt Corrective Act, which had been already implemented with a success in the United States in 1991 after the financial crisis in the end of 1980s. As a result the financial anxieties had been dispelled in 1995.

However, as we already discussed, the economy sharply declined in 1997 when Prime Minister Ryutaro Hashimoto had decided the rise of the consumption tax from 3 to 5 percent and the end of temporary income tax cut. Major Japanese financial institutions failed. Rumours about financial panic spread out through Japan when government took a very negative view to using public funds to help affected banks. People's anxieties tremendously increased, as indicated in the rise of *DV* in 1998.

Then *DV* rapidly decreased after 1999. The decline can be understood as follows. The Bank of Japan had adopted an aggressive monetary easing policy to reduce the inter-bank money rate to a low level in February 1999. Thanks to this so-called zero interest policy, the uncollateralized overnight call rate was lowered to 0.01 percent and further declined to 0.001 percent when the BOJ introduced the so-called quantitative easy policy in March 2001. The Japanese government also decided to inject public funds to the banking sector; the amounts were 1.8 trillion yen in 1998, and 7.8 trillion yen in 1999 as already reviewed. Both efforts of the BOJ and the government succeeded in dispelling the financial anxiety. Thus, *DV* rapidly decreased after 1999.

We shall newly define the adjusted money stock as follows, by letting $DV1(t) \equiv h^2(t+1)$.

$$rm_{adj}(t) = rm(t) - k * DV1(t)$$

Furthermore, we assume that (rm_{adj}(t), y(t), r(t)) satisfies the above system in Eqs. (1) to (4) with rm(t) replaced by rm_{adj}(t). Using the definition of rm_{adj}(t), the variable rm_{adj}(t) in VECM can be rewritten by rm(t) and DV1(t) in the following manner:

$$\Delta rm_{adj}(t) = c_{m0} + k\Delta DV1(t) + \alpha_m ect(t-1) + \sum_{i=1}^{k} c_m^i (\Delta rm(t-i) - k\Delta DV1(t-i)) + \sum_{i=1}^{k} d_m^i \Delta y(t-i) + \sum_{i=1}^{k} e_m^i \Delta r(t-i) + \varepsilon_m(t) \quad (5)$$

$$\Delta y(t) = c_{y0} + \alpha_y ect(t-1) + \sum_{i=1}^{k} c_y^i (\Delta rm(t-i) - k\Delta DV1(t-i)) + \sum_{i=1}^{k} d_y^i \Delta y(t-i) + \sum_{i=1}^{k} e_y^i \Delta r(t-i) + \varepsilon_y(t) \quad (6)$$

$$\Delta r(t) = c_{r0} + \alpha_r ect(t-1) + \sum_{i=1}^{k} c_r^i (\Delta rm(t-i) - k\Delta DV1(t-i)) + \sum_{i=1}^{k} d_r^i \Delta y(t-i) + \sum_{i=1}^{k} e_r^i \Delta r(t-i) + \varepsilon_r(t), \quad (7)$$

where *ect* (t) is concerned with variables (*rm* (t) – k*DV*1 (t)), *y* (t) and *r* (t).
Every parameter including k in Eqs. (5) to (7) should be estimated with the criterion:

$$\min. \sum_{t=1}^{T} \{\varepsilon_m^2(t) + \varepsilon_y^2(t) + \varepsilon_r^2(t)\}, \qquad \text{w. r. t. unknown parameters} \quad (8)$$

The estimation procedure is shown in Appendix. Our results of cointegration estimation are as follows. Cointegration still holds when we delete the precautionary demand caused by financial anxiety from real money stock, even in the sample beyond 1998. The cointegration results are exemplarily exhibited in Table 2. For comparison, the cointegration results without anxieties are also exhibited in Table 3.

Real money (*rm(t)*) and adjusted money stock ($rm_{adj}(t)$) are shown in Figure 12, where the estimated period is [1980q1-2003q2] and adjusted money is estimated by *rm(t)-0.0141*DV*. The difference between two money stocks indicates the precautionary demand caused by financial anxiety. The big differences shown in around 1993 and 1998 suggest that both firms and household rapidly increased their money holdings facing the financial crisis. It means that there was rather shortage of money stock, though the BOJ insisted they provided enough money to the private sector by a low interest policy. The increase of precautionary demand for money means the decline of active money which has positive effects on the economy. The results shown here are in the case of interest spread as opportunity cost. Although the results of bond rate are not shown, they are almost same as of the interest spread. The adjusted money in the case of bond rate is estimated by *rm (t)-0.0081*DV*.

Figure 12 Real Money and Adjusted Money

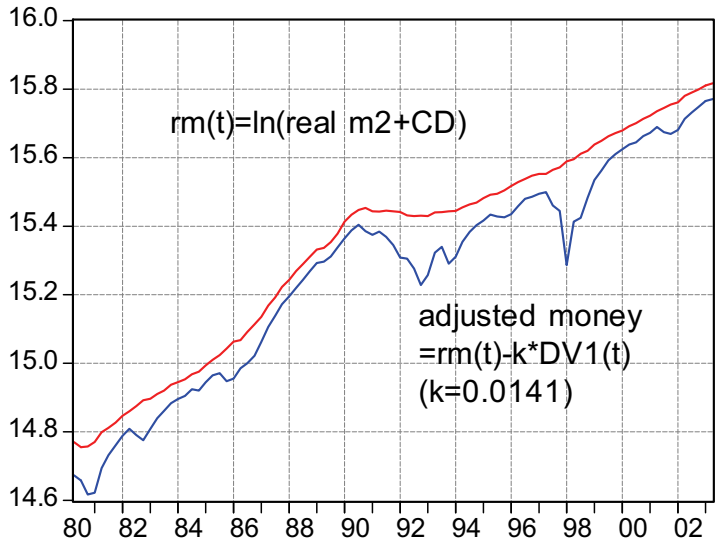


Table 2 Cointegration Test with adjusted money (Japan)

		cointegration		$rm_{adj}=b_0+b_1*y+b_2*r$	
	k	P(trace)	P(max-eigenvalue)	b_1	b_2
1980q1-1999q2	0,0143	n=0: p=0.0002* n=1: p=0.0217*	n=0: p=0.0025* n=1: p=0.0584**	1,569	-0,02
1980q1-2000q2	0,0144	n=0: p=0.0024* n=1: p=0.0555**	n=0: p=0.0144* n=1: p=0.1045	1,629	-0,0332
1980q1-2001q2	0,0157	n=0: p=0.0098* n=1: p=0.0809**	n=0: p=0.045* n=1: p=0.1524	1,671	-0,0608
1980q1-2002q2	0,0143	n=0: p=0.0719** n=1: p=0.429	n=0: p=0.0703** n=1: p=0.5798	1,701	-0,1211
1980q1-2003q2	0,0141	n=0: p=0.0341* n=1: p=0.4369	n=0: p=0.0275* n=1: p=0.5185	1,694	-0,1169

* (**) denotes rejection of hypotheses at 5% (10%) significance.

P (trace) is p-value for trace detection of cointegration. P (max-eigenvalue) is p-value for max-eigenvalue detection. These p-values are due to Mackinnon-Haug-Michelis(1999). Delay order of cointegration is fixed to be "3" At n="1" or "2", cointegration test results are almost similar as n="3" and coefficients b1 and b2 have similar tendency.

Table 3 Cointegration Test with real money (Japan)

	cointegration		r(m2cd)=b_0+b_1*y+b_2*r	
	P(trace)	P(max-eigenvalue)	b_1	b_2
1980q1-1997q2	n=0: p=0.0242* n=1: p=0.1295	n=0: p=0.0753** n=1: p=0.533	1.586	-0.0274
1980q1-1998q2	n=0: p=0.0178* n=1: p=0.1056	n=0: p=0.066** n=1: p=0.292	1.581	-0.024
1980q1-1999q2	n=0: p=0.0872** n=1: p=0.1519	n=0: p=0.254 n=1: p=0.303	1.588	-0.0363
1980q1-2000q2	n=0: p=0.1338 n=1: p=0.1655	n=0: p=0.3643 n=1: p=0.3729	1.538	-0.083
1980q1-2001q2	n=0: p=0.1709 n=1: p=0.3573	n=0: p=0.2459 n=1: p=0.4468	1.466	-0.1413
1980q1-2002q2	n=0: p=0.2238 n=1: p=0.5137	n=0: p=0.2301 n=1: p=0.4444	1.347	-0.233
1980q1-2003q2	n=0: p=0.1255 n=1: p=0.5051	n=0: p=0.1132 n=1: p=0.4716	1.458	-0.1432

4-2. Finnish case

We also perform a formal cointegration test in the Finnish economy, focusing on the relationship between three variables; the real money stock, real GDP, and the opportunity cost of holding money. We use M1 as money stock. For the opportunity cost, central bank base rate is used. The system model is the same VECM as in the Japanese economy in Eqs.(1) to (4):

$$\Delta rm(t) = c_{m0} + \alpha_m ect(t\text{-}1) + \sum_{i=1}^{k} c_m^{\,i} \Delta rm(t\text{-}i) + \sum_{i=1}^{k} d_m^{\,i} \Delta y(t\text{-}i) + \sum_{i=1}^{k} e_m^{\,i} \Delta r(t\text{-}i) + \varepsilon_m(t) \quad (9)$$

$$\Delta y(t) = c_{y0} + \alpha_y ect(t\text{-}1) + \sum_{i=1}^{k} c_y^{\,i} \Delta rm(t\text{-}i) + \sum_{i=1}^{k} d_y^{\,i} \Delta y(t\text{-}i) + \sum_{i=1}^{k} e_y^{\,i} \Delta r(t\text{-}i) + \varepsilon_y(t) \quad (10)$$

$$\Delta r(t) = c_{r0} + \alpha_r ect(t\text{-}1) + \sum_{i=1}^{k} c_r^{\,i} \Delta rm(t\text{-}i) + \sum_{i=1}^{k} d_r^{\,i} \Delta y(t\text{-}i) + \sum_{i=1}^{k} e_r^{\,i} \Delta r(t\text{-}i) + \varepsilon_r(t) \quad (11)$$

$$ect(t) = rm(t) + \beta_y y(t) + \beta_r r(t) + const. \quad (12)$$

where
rm(t) is real money stock
y(t) is real GDP
r(t) is opportunity cost
ect(t) is an error correction term

Cointegration property can be found in the periods of 1985Q1-1990Q1 and 1997q1-2007q1. The results are shown in Tables 4 and 5.

Table 4 Cointegration test of (rm1, y, r) in 1985Q1-1990Q1, (Finland)

Test for the number of cointegration vectors

Eigenvalue	0.66251	0.426471	0.145811
Hypothesized	$r_c=0$	$r_c \leqq 1$	$r_c \leqq 2$
λ_{max}	22.81058*	11.67489	3.309654
$p(\lambda_{max})$	0.0288	0.1235	0.0689
λ_{trace}	37.79513*	14.98455	3.309654
$p(\lambda_{trace})$	0.0049	0.0596	0.0689
Adjustment Coefficients α (standard error in parentheses)			
Δrm	-1.341633		
	(0.40738)		
Δy	0.072232		
	(0.25722)		
Δr	-12.45254		
	(11.7918)		
Normalized Cointegrating Coefficients β' (t-statistics in [ ])			
	rm	y	r	c
Coint Eq.	1.000000	-0.585315	0.014423	-4.34374
		[-10.1297]	[4.23725]	

where * denotes rejection of the hypothesis at the 0.05 level,
$p(\lambda_{max})$ and $p(\lambda_{trace})$ are p-values by MacKinnon-Haug-Michelis (1999),
and where lags interval is set to be 3.

Table 5. Cointegration test of (rm1, y, r) in 1997Q1-2007Q1, (Finland)

Test for the number of cointegration vectors

Eigenvalue	0.477501	0.249518	0.030695
Hypothesized	$r_c=0$	$r_c \leqq 1$	$r_c \leqq 2$
λ_{max}	26.61443*	11.76864	1.278209
$p(\lambda_{max})$	0.0076	0.1196	0.2582
λ_{trace}	39.66128*	13.04685	1.278209
$p(\lambda_{trace})$	0.0027	0.1131	0.2582
Adjustment Coefficients α (standard error in parentheses)			
Δrm	-0.007052		
	(0.05786)		
Δy	0.010117		
	(0.02278)		
Δr	-4.719787		
	(1.2362)		

Normalized Cointegrating Coefficients β' (t-statistics in [ ])				
	rm	y	r	c
Coint Eq.	1.000000	-1.603469	0.032353	5.903025
		[-8.46298]	[1.67995]	

where * denotes rejection of the hypothesis at the 0.05 level,
$p(\lambda_{max})$ and $p(\lambda_{trace})$ are p-values by MacKinnon-Haug-Michelis (1999),
and where lags interval is set to be 3.

Cointegration seems to hold except the period 1990-1993. This reminds us of the rapid increase in the precautionary money demand caused by the financial anxiety. The unexpected rise in precautionary demand might break a long-run equilibrium relationship between the real money stock, the real GDP, and the opportunity cost which existed before 1990.

The reason why the relationship between the money stock and economic activity has been unstable seems to be related to the financial anxiety which rapidly increased after the sudden collapse of big financial institutions in 1991-92. The financial anxieties drastically increased the precautionary demand by both firms and households.

Thus, we need to re-estimate the model by taking into consideration the financial anxiety. However we could not get the Finnish data corresponding to the TANKAN diffusion indexes by BOJ. Instead we get the business survey data (denoted by bbs_ec_sa) which is considered to reflect the financial anxiety in Finland.

$$u = bbs\_ec\_sa$$

$$u^{-} = min\{u, 0\}$$

The behavior of the data is shown in Figures 13a and 13b.

Figure 13a The Business Survey Data u

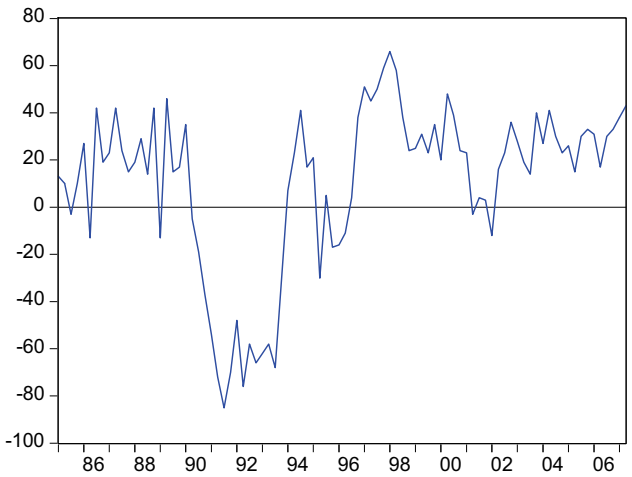
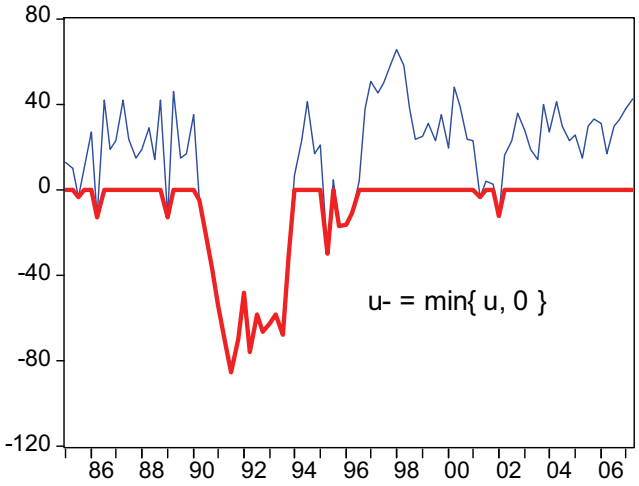


Figure13b The Financial Anxiety u-



We shall newly define the adjusted money stock as follows.

$$\text{Precautionary demand} = c0 + c1^{*}|u^{-}| \tag{13}$$

$$rm_{adj}(t) = rm1(t) - \text{precautionary demand} \tag{14}$$

We estimate the following VECM.

$$\Delta rm_{adj}(t) = c_{m0} + \alpha_m ect(t-1) + \sum_{i=1}^{k} c_m^i \Delta rm_{adj}(t-i) + \sum_{i=1}^{k} d_m^i \Delta y(t-i) + \sum_{i=1}^{k} e_m^i \Delta r(t-i) + \varepsilon_m(t) \tag{15}$$

$$\Delta y(t) = c_{y0} + \alpha_y ect(t-1) + \sum_{i=1}^{k} c_y^i \Delta rm_{adj}(t-i) + \sum_{i=1}^{k} d_y^i \Delta y(t-i) + \sum_{i=1}^{k} e_y^i \Delta r(t-i) + \varepsilon_y(t) \tag{16}$$

$$\Delta r(t) = c_{r0} + \alpha_r ect(t-1) + \sum_{i=1}^{k} c_r^i \Delta rm_{adj}(t-i) + \sum_{i=1}^{k} d_r^i \Delta y(t-i) + \sum_{i=1}^{k} e_r^i \Delta r(t-i) + \varepsilon_r(t), \tag{17}$$

Inserting the relation (13) and (14) into Eqs.(15) to (17), every parameter including c_1 in the above system should be estimated with the criterion:

$$\min. \sum_{t=1}^{T} \{\varepsilon_m^2(t) + \varepsilon_y^2(t) + \varepsilon_r^2(t)\}, \qquad \text{w.r.t. unknown parameters}$$

Notice that c_0 cannot be estimated because

$$\Delta(rm_{adj}(t)) = \Delta(rm1(t) - c_0 - c_1 * | u^{-}(t) |) \quad (18)$$

and

$$\Delta(c_0) = 0 \quad (19)$$

However, c_0 is not necessary for showing the existence of cointegration property. Therefore, we set c_0=0 without loss of generality.

The parameter c_1 is estimated as c_1=0.0035 in the period of 1985Q1-2007Q1. Therefore, the adjusted money is expressed as

$$rm_{adj}(t) = rm1(t) - 0.0035 * | u^{-}(t) | \quad (20)$$

The cointegration test of (rm_{adj}(t), y(t), r(t)) in 1985Q1-2007Q1 is shown in Table 6.

Furthermore, Cointegration property of (rm_{adj}, y, r) is investigated in other periods of 1985Q1-1995Q1, 1985Q1-1995Q2, …, 1985Q1-2007Q1, where the estimated parameter c_1=0.0035 in 1985Q1-2007Q1 is fixed. In every period stated above, we can see the existence of cointegration property. But in Table 7, we only show the results in several periods for economy of space.

Table 6 Cointegration of (rm_{adj}, y, r) in 1985Q1-2007Q1, (Finland)

(rm_{adj} = rm1-0.0035*|u^{-}|)

Test for the number of cointegration vectors

Eigenvalue	0.330345	0.130388	0.003925
Hypothesized	r_c=0	$r_c \leqq 1$	$r_c \leqq 2$
λ_{max}	34.88633*	12.15465	0.342109
p(λ_{max})	0.0003	0.1050	0.5586
λ_{trace}	47.38309*	12.49676	0.342109
p(λ_{trace})	0.0002	0.1346	0.5586
Adjustment Coefficients α (standard error in parentheses)			
Δrm_{adj}	-0.301365		
	(0.08794)		
Δy	0.034651		
	(0.02046)		
Δr	-2.330606		
	(0.92829)		

Normalized Cointegrating Coefficients β' (t-statistics in [ ])				
	rm_{adj}	y	r	c
Coint Eq.	1.000000	-1.032981	0.057117	-0.116687
		[-9.92577]	[6.87133]	

where * denotes rejection of the hypothesis at the 0.05 level,
p(λ_{max}) and p(λ_{trace}) are p-values by MacKinnon-Haug-Michelis (1999),
and where lags interval is set to be 2.

Table 7 Cointegration test with adjusted money (Finland)

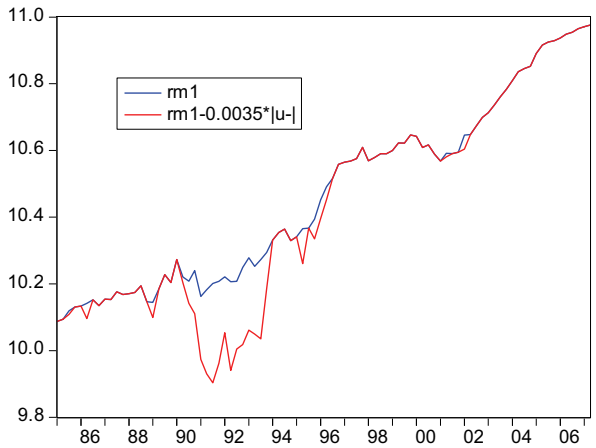
	k (fixed)	cointegration		$rm_{adj}=b_0+b_1*y+b_2*r$	
		P(trace)	P(max-eigenvalue)	b_1	b_2
1985q1-1995q1	0,0035	n=0: p=0.0133* n=1: p=0,1594	n=0: p=0.0311* n=1: p=0,6092	0,5482	-0,0659
1985q1-1998q1	0,0035	n=0: p=0.0040* n=1: p=0.2662	n=0: p=0.0042* n=1: p=0.3699	0,7817	-0,0714
1985q1-2001q1	0,0035	n=0: p=0.0003* n=1: p=0.0993	n=0: p=0.0008* n=1: p=0.2275	0,6554	-0,0731
1985q1-2004q1	0,0035	n=0: p=0.0001* n=1: p=0.165	n=0: p=0.0002* n=1: p=0.1221	0,8128	-0,0673
1985q1-2007q1	0,0035	n=0: p=0.0002* n=1: p=0.1364	n=0: p=0.0004* n=1: p=0.1083	1,014	-0,0583

The results indicate that cointegration property with adjusted money still hold even in the sample period containing 1990-1993.

Real money ($rm(t)$) and adjusted money stock ($rm_{adj}(t)$) are shown in Figure 14, where the estimated period is [1985q1-2007q1] and adjusted money is estimated by $rm_{adj}(t) = rm1(t) - 0.0035^* | u^{-}(t) |$.

The difference between two money stocks indicates the precautionary demand caused by financial anxiety. The big differences shown in the period from 1990 to 1994 suggest that both firms and household rapidly increased their money holdings facing the financial crisis. It means that there was rather shortage of money stock just as in the case of Japan's crisis. The increase of precautionary demand for money means the decline of active money which has positive effects on the economy. The results shown here also show the importance to provide much more liquidity with the economy in the case of financial crisis.

Figure 14 Real Money and Adjusted Money



5. Conclusion

In Finland asset prices, such as housing price and share price reached at a peak in 1989, and then fell sharply towards the end of 1992. In Japan share prices reached at a peak, 38,915 yen in end – December 1989 and sharply fell to 14,309 yen in August, 1992. Land price also declined reached at the peak in September 1991 and continued to decline. Both economies underwent an extremely severe recession after the rapid decline of asset price. There is a strong similarity between Japan and Finland regarding the timing of financial liberalization and asset inflation.

Both countries experienced the financial liberalization in the 1980s. The funds availability for borrowers rapidly increased owing to the financial liberalization. Large firms which traditionally depended on the bank lending were able to access directly to the capital market. They switched their fund raise from banks to capital market. The financial intermediaries had to find other borrowers in order to keep their profits at the same level as before because their business remained at the same in size. They were obliged to increase the lending to new but more risky borrowers such as small sized or property related firms which were not their traditional customs.

However financial deregulation itself does not cause the asset inflation and financial crisis. More important factor behind financial crisis commonly observed in both countries is monetary easing. It should be understood that continuing easy monetary policy behind the deregulation caused the credit expansion and asset inflation.

From this point of view, we focused on the relationship between money stock and economic activity. In the case of Japan, the superficial relationship between money and the real economy has changed significantly since autumn 1997 when the Japanese economy was involved into the severe financial crisis. The cointegartion test showed that cointegration property among money and economic activity did not hold in the sample period extended beyond late 1997. In the Finnish case, cointegration property did not hold either in the sample including the period of 1990-1993. People increased the liquidity from precautionary motives reflecting mounting uncertainty, which seemed to break down the cointegration relationship among money and economic activity. We defined precautionary demand as money demand which people additionally hold to prepare for the uncertainty in the future financing. We re-examined in both countries whether the relationship between money and the economy became unstable even when taking precautionary demand into account. Our results showed that cointegration property still hold in both cases of Japan and Finland.

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Appendix : Estimation Procedures of Adjusted Money

We consider the VECM of $(rm_{adj}(t), y(t), r(t))$ of the form:

$$\Delta rm_{adj}(t) = c_{m0} + \alpha_m ect(t\text{-}1) + \sum_{i=1}^{k} c_m^{\,i} \Delta rm_{adj}(t\text{-}i) + \sum_{i=1}^{k} d_m^{\,i} \Delta y(t\text{-}i) + \sum_{i=1}^{k} e_m^{\,i} \Delta r(t\text{-}i) + \varepsilon_m(t) \quad \text{(A-1)}$$

$$\Delta y(t) = c_{y0} + \alpha_y ect(t\text{-}1) + \sum_{i=1}^{k} c_y^{\,i} \Delta rm_{adj}(t\text{-}i) + \sum_{i=1}^{k} d_y^{\,i} \Delta y(t\text{-}i) + \sum_{i=1}^{k} e_y^{\,i} \Delta r(t\text{-}i) + \varepsilon_y(t) \quad \text{(A-2)}$$

$$\Delta r(t) = c_{r0} + \alpha_r ect(t\text{-}1) + \sum_{i=1}^{k} c_r^{\,i} \Delta rm_{adj}(t\text{-}i) + \sum_{i=1}^{k} d_r^{\,i} \Delta y(t\text{-}i) + \sum_{i=1}^{k} e_r^{\,i} \Delta r(t\text{-}i) + \varepsilon_r(t) \quad \text{(A-3)}$$

$$ect(t) = rm_{adj}(t) + \beta_y y(t) + \beta_r r(t) + const. \quad \text{(A-4)}$$

Inserting the relation

$$rm_{adj}(t) = rm(t) - k * DV1(t) \ ,$$

we shall regard the above system as that of variables $(rm(t), DV1(t), y(t), r(t))$. Every parameter in the above system should be estimated in the criterion of

$$min. \sum_{t=1}^{T} \{\varepsilon_m^2(t) + \varepsilon_y^2(t) + \varepsilon_r^2(t)\}, \quad \text{w.r.t. unknown parameters} \quad \text{(A-5)}$$

Estimation Algorithm

Procedure (1). $k^{(0)}$=initial estimation of k, where a candidate of $k^{(0)}$ is given by regressing $rm(t)$ by regressors of $(DV1(t), y(t), r(t))$ and adopting the coefficient of $DV1(t)$ as $k^{(0)}$, or another candidate is by assuming the cointegration among $(rm(t), DV1(t), y(t), r(t))$ and adopting the coefficient of $DV1(t)$ as $k^{(0)}$.

Procedure (2). Calculate an adjusted money:

$$rm_{adj}(t) = rm(t) - k^{(0)} * DV1(t)$$

and estimate the VECM and *ect(t)* in a usual manner with variables $(rm_{adj}(t), y(t), r(t))$.

Procedure (3). Carry out the nonlinear optimization of (A-5), where every parameter in Eqs.(A-1) to (A-4) obtained in the **procedure (2)** is used as initial conditions of optimization. The optimization should be done except in the error correction term *ect(t-1)*, that is, all parameters in *ect(t-1)* should be fixed. Notice that $k^{(0)}$ inside *ect(t-1)* should be fixed and that $k^{(0)}$ ouside *ect(t-1)* obtain a newly estimated value.

Procedure (4). Replace $k^{(0)}$ by a newly estimated k in the **Procedure (3)** and go to the **Procedure (2)**. Iterate the procedures till k converges to $k^{(0)}$.

If there is no cointegration, then the estimation procedures become simpler. VAR model should be taken into consideration instead of VECM