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# Financial deregulations, Conflict of interest and banking crisis in Japan: A Decision-theoretic-GARCH approach to analyze the management behavior

*by*

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<sup>+</sup> The views expressed in this paper are my own and do not necessarily reflect those of the institutions with which I am affiliated. Any remaining errors are, of course, mine.

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# Financial deregulations, Conflict of interest and banking crisis in Japan: A Decision-theoretic-GARCH approach to analyze the management behavior

## *Abstract*

This paper proposes an empirical model framework to analyze management behavior that is crucial at the outset of financial deregulations, and/or crisis. In a learning model setting, the proposed framework shows that management efficiency is a function of conditional heteroschedasticity of profitability (productivity), and it can be estimated by the GARCH model of Bollerslev (1986). Application of the GARCH model in analyzing management behavior enables to consider information theory explicitly, and it has been found effective in explaining causality of the Japanese banking crisis. Moreover, the paper also shows how to explain the sources of variations in the behavior of the bank management.

## **1. Introduction**

If banking crisis is occurred in a financial system that is underwent financial deregulations, how could the causality of the crisis be explained? Is it the “conflict of interest” between the regulator and banks that made the situations worse with the ongoing deregulatory measures? How does the bank management behave in a 'conflict of interest' environment? These issues are examined to explain causality of the Japanese banking crisis at the outset of financial deregulations in the 1980s and subsequent crisis in the 1990s. This paper takes the issue “conflict of interest” as the potential causality of the crisis and proposes a model to capture the notion from the behavior of the bank-management.

When market becomes competitive with the ongoing deregulatory measures, which also helps reducing operating expense and increasing net income, where are these increased efficiencies embodied? Is it the bank management, who makes better operating decisions with experience, or bank capital that is being debugged, or putting it another way- is it an 'increased efficiency' or a 'matter of conflict of interest'? Conflict of interest is a common phenomenon in the financial services, and it is highly prevalent when new products or deregulatory measures are introduced in the system. How *conflict of interest* can be explained from the behavior of the

bank-management at the outset of financial deregulations?

Successful financial deregulations mostly relies on the rational behavior of the management of the financial institutions that depends on- how they learn from the signals of deregulatory policies, how is their initial beliefs and how is the standard of their own skills. If the speed of management's learning process is slow but bank's profitability (productivity) is high, how the situation can be described? It is simply the outcome of conflict of interest. The conflict of interest is important because by changing the regulatory environment through interest rate deregulation and/or closure rule forbearance, any conflicting risk taking incentives of management, either through monetary policy or weaknesses of corporate governance can be accentuated and the degree of risk taking is increased. This risk taking behavior of the management can lead to a crisis. With the advent of conflict of interest, bank management can increase their short-term profit through costly investments, these investments can turn out to be non-performing if the authority corrects the conflict. If the non-performing assets are huge in amount, it might contribute to the crisis.

How conflict of interest can be explained empirically and be contributed to the crisis is the main focus of this paper. It is the bank management who makes operating decisions based on their own skills as well as their learning about exogenous policy shocks. Therefore, it is necessary to examine the decision making process of the management, how much variations in the profitability of banks can be explained by the variations of their own skills and by variations of exogenous policy shocks.

We argue that the decisions of the bank management be affected in two ways: one, by their own skills (here we refer skills to knowledge about bank's capital, liquidity, profitability etc.) and, second, by exogenous policy shocks. Even if we consider that the skills of all banks management are the same, variability in productivity may be due to their learning of the signals of deregulatory policies. However, bank management's decision might be optimal, but may not

be the best due to lack of information and knowledge, and their behavior sometimes might not be rational.

This paper makes an attempt to capture the notion of conflict of interest in a modified Learning Model (a decision-theoretic approach), which captures the information theory explicitly with the introduction of the GARCH framework of Bollerslev (1986) in the model. The modification has been done because the conflict of interest in the financial sector cannot be captured through the usual learning model or regression technique very neatly. The usual learning model is based on decisions that have readily measurable impact on production process. But in the financial or banking system, management makes decisions but it is difficult to measure the impact of those decisions on the productivity of banks by the usual learning model, as the financial data are not readily available and they are interacted with many other factors. The detailed framework of the proposed decision-theoretic-GARCH approach is discussed in Section-2. The proposed approach is termed as "decision-theoretic-GARCH approach" throughout the paper, and it shows that management inefficiency can be measured in terms of the conditional variance of banks profitability (productivity).

The paper proceeds as follows. After introduction, Section 2 outlines the framework of the theory and solution of the model. Section 3 provides an overview of financial deregulations, conflict of interest and the Japanese banking crisis. Section 4 provides empirical results, and Section 5 concludes the paper.

## **2. FRAMEWORK**

*Management efficiency, Capital adequacy requirement, productivity*

During the high peak of the bubble of the Japanese economy, the authority adopted Basel Accord capital adequacy requirement for the Japanese banks in 1989. Some papers argue that these capital adequacy requirements contributed to the failure of the banks in the 1990s, some say it did not (for instance, see Okina, 2001, Hall, 1998, Hoshi and Patrick, 2000). At the outset

of the financial deregulations, banks profitability shows increasing pattern during the whole decade of the 1980s. Then a potential question is that when new deregulatory policies are on the way, and when operating costs decline with experience, where is the increased efficiency embodied? Is it the bank's management that makes better operating decisions, or banks capital stock that is being debugged?

The issue is important because new deregulatory policies differ widely in bank's capital intensity, their complexity and so on. This is because, in Japan, most of the failed banks were smaller in size, e.g. the Regional Tier II, credit cooperatives etc. One thing is clear that as experience accumulates, the management makes better decisions. Thus, on an abstract level, productivity growth can be seen as the result of a better management decision that solves some optimizing problem. The issue implicitly triggers the issue of corporate governance too.

As is mentioned, in our model, skill is knowledge. At each period, the management must set a profitability target, must make a decision. With each repetition of the activity, the management makes the decision better and better. Hence the model generates a learning curve- a positive relationship between experience and productivity.

*Deregulations, Conflict of interest, Asymmetry of information, Management's decision*

Now the question, how exogenous policy (the deregulatory policy or other shocks) from the central authority affect the management's decision? With a deregulatory policy, authority send a signal that allows the management to make a best decision, the development of skill is essential for narrowing the gap between actual and the best decision.

We assume that actual decisions are optimal in that they reflect information received to date. But optimal decisions do not often coincide with the best decision simply because the management has not learned what the best decision is. This can be described in different way. Suppose, the management has an initial belief about the meaning of the signal from the deregulatory policies, and that they learn their correct meaning in a Bayesian fashion, by

updating his initial beliefs. The learning can be a two-way track: by correcting own belief or by the change of policy by the regulator due to its wrong signal to the management.

Of course, much of what may look like *learning by doing* is in fact the result of costly investments. These investments are concentrated at the outset of a liberalized system introduced. For example, in Japan, banks extended credit to the real estate businesses and small and medium enterprise (SME) market aggressively in the 1980s as a result of the outcome of deregulations to make the banks less dependent on big corporate customers by allowing corporations to raise their fund from security market in 1980. But banks were not allowed at that time to do business in security markets and bond market until 1989 as a compensation of losing big customers. By and large, banks aggressive behavior helped in creating the bubble, and after burst of the bubble these investments became non-performing due to continuing plunge of land prices (because land was collateral asset to banks). The decision and behavior of bank management also were affected by asymmetry of information as well as moral hazard problem. Therefore, it is necessary to include information theory explicitly to get a learning curve, what will make it different from deterministic learning curve.

#### *Banks productivity, convergence rate of learning*

We take banks profitability, the return on asset, as a measure of productivity of banks without loss of generality. From Figure-1, three episodes are apparent in the distribution of profitability of banks.

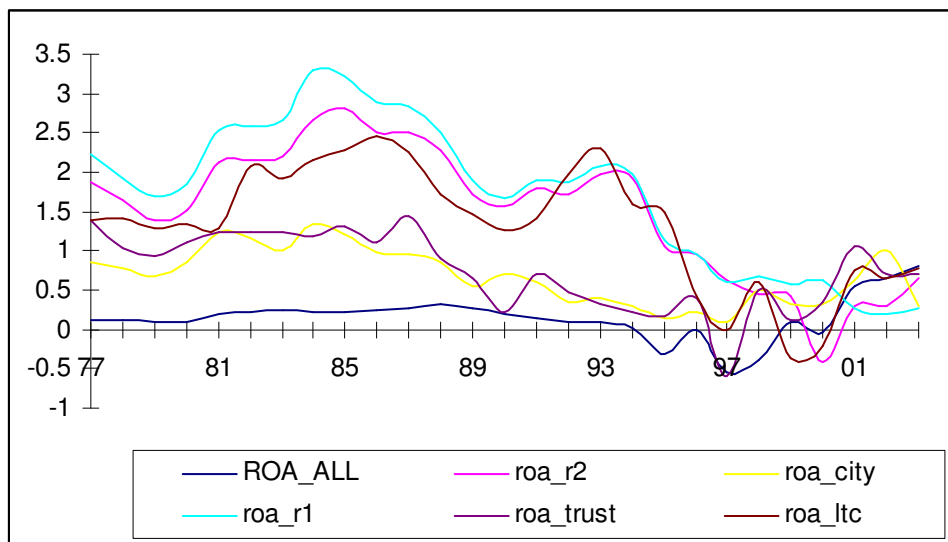
1. Before 1980, it was declining. Slower growth in the 1970s may indicate that learning is optimal, and behavior is rational.

2. After 1980, it was increasing until the late 1980s. High growth during this period indicates learning is optimal but behavior was irrational. Because, high money supply, monetary easing, lack of prudential regulations, economic upturn, overall reduced dependency of old big customers on bank borrowing at that time indulged bank management to extend excessive credit

to the growing and profitable real estate businesses as well as SME market. But behavior was irrational because management was supposed to have asymmetry of information, induced by moral hazard, and they couldn't anticipate asset prices etc.

3. High negative growth in the 1990s after burst of the asset price bubble. We assume that at that time management had realized the situation and what they did, so their decision might be optimal and behavior might be somewhat rational.

Figure 1: Profitability of the Japanese banks (1977-2003)



The statistical analysis finds strong autocorrelation in the noise, reduces signal-to-noise ratio in the profitability. The autocorrelation function shows exponential decay. This indicates the learning parameter slowed, but not the profitability growth.

## 2.1 SOLVING THE MODEL

In our decision-theoretic approach, it is necessary to include information theory explicitly to get a learning curve. This makes it different from the deterministic learning curve. A deterministic curve is defined as

$$\frac{\partial q_t}{\partial t} = b[c - q(t)], \quad (1)$$



where  $q(0)$  given, as  $q(t)$  is a measure of management's efficiency or variations in productivity,  $b$  and  $c$  are constant while  $b$  measures the speed of learning. The problem with this equation is that it considers first moments only. But in fact, learning has something to do with variability of productivity, even among equally experienced bank management. Therefore, second moments are necessary to consider in the model. Our model, based on the theme of the Bayesian learning model (Jovanvic and Nyarko, 1995), embodies the skewness in the distribution of efficiencies, and variations of efficiency. Moreover, the estimated parameters governing the speed and scope of learning also determine the *switching cost* due to policy shift of management (updating knowledge) or exogenous policy shock.

We model learning in a way that abstracts from the details of the decision problem at hand. We assume that efficiency,  $q$ , depends on how closely a decision,  $z$ , matches an ideal level, or target,  $y$ . We also assume that  $y$  is random and that the bank management must choose  $z$  before seeing  $y$ , and instead of learning exact value of  $y$ , the management would be learning about the distribution of  $y$  with known mean  $\mu$ . Ideally,  $y$  is the targeted profit where  $z$  denotes the attained profit of banks at time  $t$ .

We define the efficiency of management by

$$q_t = A_t [1 - (y_t - z_t)^2] \quad (2)$$

The maximum level of  $q$ , attainable under ideal conditions, is  $A$ . Consider, a bank management has to take multiple actions  $i = 1, 2, \dots, \tau - 1$  at time  $t$  to maximize its profit, where  $\tau$  denotes the cumulative number of actions taken by bank management. Then the management efficiency for cumulative actions at  $t$  is

$$q_{\tau,t} = A_t \left[ 1 - (y_{\tau,t} - z_{\tau,t})^2 \right] \quad (3)$$

Assuming the same level of management skills, exogenous policy shock leads to a new value of  $y$  at period  $t$ ,

$$y_t = \mu + \varepsilon_t, \text{ for all banks (aggregate)} \quad (4)$$

$$y_t = \mu_i + \varepsilon_t, \text{ for specific types (cohort) of banks.} \quad (5)$$

where  $\varepsilon/\Omega_{t-1} \sim iid N(0, h_t)$ . Since we assume mean  $\mu$  is constant, variations in  $y$  is dependent on  $h_t$  conditioned on past information set  $\Omega_{t-1}$ . Let  $E_\tau(\cdot)$  denotes the management's expectation of some variable conditional on past information he has and he is risk neutral and seeks to maximize profit. In that case,  $E_\tau(q_t)$  is strictly concave in the vector of  $z_{\tau,t}$  assuming that for each  $z_{\tau,t}$ ,  $E_\tau(q_t) > 0$ . The optimal decision is therefore,

$$z_{\tau,t} = E_{\tau}(y_t) = \mu = \text{constant, for all banks} \quad (6)$$

$$z_{\tau,t} = E_{\tau}(y_t) = E(\mu_i), \text{ variable among the same cohort of banks} \quad (7)$$

This decision is dynamically optimal as well, because the amount of information that the management gets does not depend on the value of  $z$  that he chooses.

From equations (3), (4) and (5), the following equation emerges

$$q_{\tau,t} = A_t [I - \varepsilon_{\tau,t}^2] \quad (8)$$

From equations (3), (4) and (5), we also have for panel of banks,

$$q_{\tau,t} = A_t [I - (\mu - E(\mu_i) - \varepsilon_{\tau,t})^2]. \quad (9)$$

This is the *learning curve*, which follows chi-square distribution. Then the expected efficiency would be

$$E(q_{\tau,t}) = A_t [I - E(\varepsilon_{\tau,t}^2)] = A[I - h_t] \quad (10)$$

and, following (9),

$$E(q_{\tau,t}) = A_t [I - E(\mu_i - E(\mu_i))^2 - E(\varepsilon_{\tau,t}^2)] = A[I - v_t - h_t] \quad (11)$$

Equations (10) and (11) can be rewritten in terms of regression equations as follows:

$$E(q_{\tau,t} / A_t) = \gamma_0 + \gamma_1 \hat{h}_t + \xi \quad (12)$$

$$E(q_{\tau,t} / A_t) = \gamma_0 + \gamma_1 \hat{h}_t + \gamma_2 \hat{v}_t + \xi \quad (13)$$

From equations (12) and (13), management efficiency can be expressed as a ratio of operating expense over net income which depends on the conditional variance of productivity or profitability.

We assume that the conditional variance  $h_t$  of a time series in (10) and (11) depends upon the squared residuals of the process and has the advantage of incorporating heteroschedasticity into the estimation procedure of the conditional variance. The conditional variance can be estimated by means of the generalized autoregressive conditional heteroschedasticity (GARCH) model of Bollerslev (1986):

$$h_t = \alpha_0 + \sum_{j=1}^q \alpha_j \varepsilon_{t-j}^2 + \sum_{j=1}^p \beta_j h_{t-j} \quad (14)$$

where restrictions imposed are  $\alpha_0 > 0$ ,  $\alpha_j > 0$  and  $\beta_j > 0$  to ensure that the conditional variance ( $h_t$ ) is positive. In the current setting, without loss of generality, the coefficients  $\alpha$  and  $\beta$  provide the

speed of learning and the scope of learning respectively. According to Bollerslev et al. (1992), the model in (14) can be viewed as a reduced form of a more complicated dynamic structure for the time varying conditional second order moments. Therefore, comparing (12) and (14), management efficiency depends on its own skills as well as how well they learn about the signal of exogenous policy shocks.

If the coefficients in (12) and (13) have been found significant, the necessary next step would be to investigate the possible sources of variations. This can be done by fitting the following regression:

$$\hat{h}_t = \gamma_0 + \sum_j \gamma_j f(p_t) + \sum_k \gamma_k f(I_t) + \sum_l \gamma_l f(C) + \omega_t \quad (15)$$

In (15), the dependent variable is the estimated conditional variance from (14). Here  $f(p)$  denotes the function of exogenous policy variables,  $f(I)$  denotes banking-industry related variables,  $f(C)$  denote the conflicting variables if any, and  $\omega$  denotes error term.

### **3. Financial deregulations, Conflict of interest and Japanese banking crisis: An overview**

The Japanese financial system is predominantly bank-based. Post-war Japanese financial system was highly regulated and banks were heavily dependent on Bank of Japan's (BOJ) subsidies (window guidance) and borrowings of enterprise groups. The characteristics of Japanese model of financial system during post-war economic growth included high debt/equity ratios, greater reliance on bank loans than securities markets, closer relationship between banks and borrowers, extensive corporate cross-shareholding, greater guidance from the government in credit allocation etc. (see Suzuki, 1987; Ito, 1992 etc.) The system is well known as 'main bank' system<sup>1</sup>. It is evident from many research works that this 'main bank' system in Japan contributed greatly to the post-war high economic growth of Japan although the varieties of

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<sup>1</sup> The main bank system had important historical antecedents as the pre-war banking system and industrial system (including Zaibatsu) evolved (Aoki and Patrick, 1994). The core of an enterprise group is usually the *Main Bank*. Group affiliation interlocks stock shares among industrial enterprises, banks and other financial institutions. The arrangements between main-bank and group involved both the financial and non-financial. The financial arrangements included the sharing financial risk through mutual support, preferential loans from the financial institutions and the control of stock voting power through ownership within the group. The non-financial arrangements included joint sale and purchase arrangements, for instance through a trading company- vertical integration, assured markets and sources of supply, technological affinity, combined research, and cooperative planning. This structure of Japanese banks might be the so-called "Industrial bank" (also available in Germany as House bank) rather than modern commercial bank.

functions played by the main bank were not usually associated with the concept of commercial banking. This type of Japanese banking system is characterized by clearly defined structural policy on the part of the government for stimulating and maintaining specialization among financial institutions, which has been termed as ‘convoy system’<sup>2</sup> by some economists.

Unlike American and many other countries’ banks, Japanese banks are allowed to own equity in other corporations. The shares of group member firms owned by banks form an important link in the interlocking structure of enterprise groups. In addition to interlocking shares, banks provide preferential loans and board members to the group affiliated firms. A group bank serves as a screening agent for the investment projects of the group firms and stands ready to lend funds whenever they are needed (Hoshi et al. 1991).

The liberalization of the Japanese financial system had been started from the mid 1970s in the form of financial deregulations. The main features of these deregulations were interest rate deregulation, relaxation of regulation to raise funds in the securities and investment market by firms, initiation of freely floating exchange rate, allowing banks and firms to participate in the capital market etc. to increase the ability of the Japanese banking system to meet international competition. These deregulations also aimed at dissolution of cross-shareholding<sup>3</sup>. Many have attributed the significant financial liberalization that has taken place to the sharp increase in government budget deficits in the late 1970s and the resulting need to sell large amounts of government bonds (see Cargill and Royama, 1988).

The recent developments in regulatory frameworks after 1990 (right after burst of the bubble) allow banks to do business in the capital and risk market to increase their profit as compensation to the loss of main-bank customers. Under these regulatory frameworks, Japanese banks are

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<sup>2</sup> Suzuki Y. (1987) used the term ‘convoy system’ of management in describing the situation of the absence of destructive competition through interest rate control and other regulatory measures during high growth period of Japan.

<sup>3</sup> The Anti Monopoly Law Reform, 1977 was one-step forward in reducing cross-shareholding. Okabe (2001) shows that cross-shareholding is gradually reducing in the Japanese financial system.

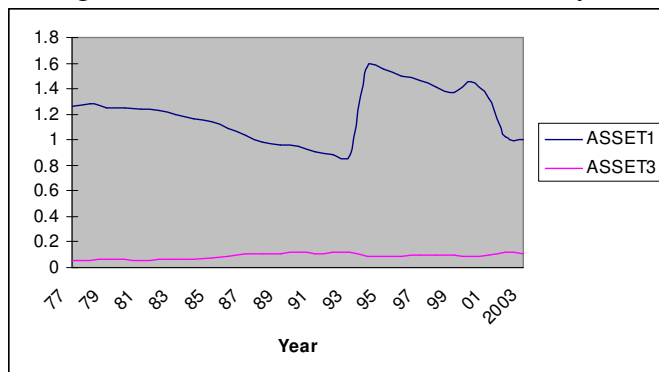
allowed to do conventional non-banking activities like lease financing, investment and merchant banking, underwriting, insurance business etc. Thus, these types of regulatory frameworks allow banks to expand their businesses in risk market (security and insurance), capital market (investment banking) as well as money market. This model follows universal banking-type system rather than complete modern commercial banking. A detailed analysis of the deregulations and its outcome is available in Hall (1998), Sato (1999), Hoshi and Patrick (2000) etc.

Let us take a note on the background of the Japanese banking crisis. With ongoing deregulations in the 1980s, the Japanese banks had extended credit aggressively to the real estate businesses, SME markets etc. that helped later on in creating asset price bubble. After deliberating effort of the regulator to burst the bubble in late 1989, the asset prices started to decline and banks assumed a huge NPL due to continuing plunge of collateralized asset prices. As an effort to stop banks in taking aggressive lending, authority also adopted Basel Accord of capital adequacy requirements in 1989. After burst of the bubble in early 1990, a decade of the crisis starts when many banks (180 up to 2003 according to the statistics of the Deposit Insurance Corporation, Japan) had failed, huge burden of NPL had occurred, and macroeconomic consequences such as deflation, recession etc. prolonged. Of the failed banks, 19 were ordinary banks and the rest were small credit cooperatives-type banks.

Two questions are important regarding the causality of the crisis: (1) why did the bank management behave aggressively or took excessive risk in lending? And (2) why had the most successful banking system of the 1960s and the 1970s failed? The answer of these questions rests on the inconsistent deregulatory policies as well as inefficient behavior of the management that is also related to the weaknesses of the corporate governance of the Japanese banks. Both the problems created a huge conflict of interest in the financial system during the ongoing deregulations in the 1980s, the breed of the crisis was actually laid down at that time.

This conflict of interest is important because it influences bank's risk taking behavior, and crisis is dependent on the degree of risk taking. Some examples of conflict of interest are noteworthy. The decrease of the large firms' dependency on banks borrowing in 1980 created conflict of interest for the banks as no alternative was suggested. for banks as a compensation. Thus banks shifted aggressively their mode of investment to the real estate businesses, SMEs, NBFIs etc. (see Figure 2) during the whole 1980s and that was happened partly due to lack of prudential regulations for banks too. The aggressive investment to the SMEs and other real-estate sector comes through a process of asymmetry of information and moral hazard problem. Figure 2 clearly shows that risky lending behavior of the management continues during the 1990s too, that can be explained by moral hazard, weak monitoring due to ownership structure, big size of banks etc.

Figure 2: Growth of asset ratios over the years



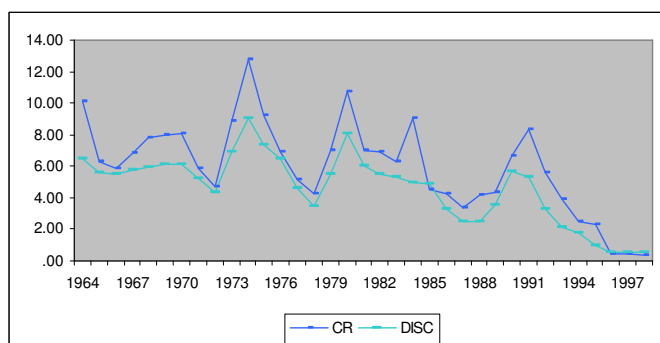
\* *Asset1* denotes ratio of total loans outstanding over total assets  
*Asset3* denotes the ratio of real estate loans outstanding over total loans outstanding.

Monetary policy of that time also helped the situation to become worse. Monetary easing in the mid 1980s along with structural changes indulged banks to expand risky investments aggressively which contributed to the asset price bubble of the late 1980s. At that time, money supply increased to more than 10% (Figure 3), and after the Plaza accord in 1987, discount rate was lowered to a record minimum of 2.5% from 5% within a year, 1986-87. During ongoing financial deregulations, growth of money supply and lowering discount rate at an extraordinary

level creates a room for *moral hazard* for the banks with the presence of deposit insurance provision. Although Bank of Japan is highly criticized for their policy at that time, they had not had much options at that time due to the then macroeconomic situations, as well as they were suffering from lack of coordination with fiscal authority.

Another conflicting issue is interest rate hike during the bubble period. At that time, short-term interest rates were higher than long-term interest rates, and lasted for a considerable length of time. The result was the deterioration in profitability for the banks since the long-term loans accumulated more losses. Some other conflicting policies were listed in Table A of Appendix. But it is the bank management whose behavior is at the core of the debate.

Figure 3: Trend of call rate and discount rate



Risk taking behavior of the management can also be explained by the ownership structure of the Japanese banking system. Saunders et al. (1990) show that ownership structure has a more powerful effect on the risk characteristics of banks in periods of deregulations relative to periods of regulation. Because, by changing the regulatory environment such as interest rate deregulation, and/or closure rule forbearance, any conflicting risk taking incentives of stockholders and managers can be accentuated, and the degree of risk taking by stockholder-controlled banks increased.

A typical Japanese bank has four groups of shareholders: life insurance companies, corporate borrowers of the bank, bank employees and other banks, and they constitute the top shareholders

of the banks (Harazaki et al., 2004). Fukao (2004) shows that life insurance companies were heavily dependent on banks for their funding (as of March 200, it was 2.3 trillion yen). The lack of incentives for shareholders of banks and as employees constitute a big portion of the shareholders, there is reluctance in exercising their corporate governance power over the management. Moreover, *amakudari*<sup>4</sup> practice, private benefits for extending risky loans, promotion policy on the basis of lending volume are some other issues that lead to the inefficient behavior of the management.

Regarding causality of the crisis, Hoshi (2001) claimed that slow and partial financial deregulations created problems for the banks as they could not cope with the new environment while Hossain (2005) claimed that weaknesses of corporate governance of banks are mainly responsible for the Japanese banking crisis. Some studies claim that, the increased capital adequacy requirements also helped in creating the banking crisis, but Montgomery (2005) and some other studies showed that increased capital adequacy requirements had not had any significant effect on banks portfolio of investments and subsequent crisis as well. This paper takes "conflict of interest" in the middle of the above two thoughts to explain the causality of the crisis, for which behavior of the bank management is crucial.

#### **4. Empirical Illustrations**

In this paper I take the Japanese banking crisis case as an example to show the application of the proposed model framework. For this purpose, I use aggregate data for all domestically licensed banks, and data sources are the Bank of Japan's CD-ROM and Japanese Bankers Association. Table-1 gives the ARCH and GARCH estimates for all banks' as well as specific types of banks' profitability.

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<sup>4</sup> This refers to the practice that banks provide job opportunities to retired employees of the bank that are their large shareholders.



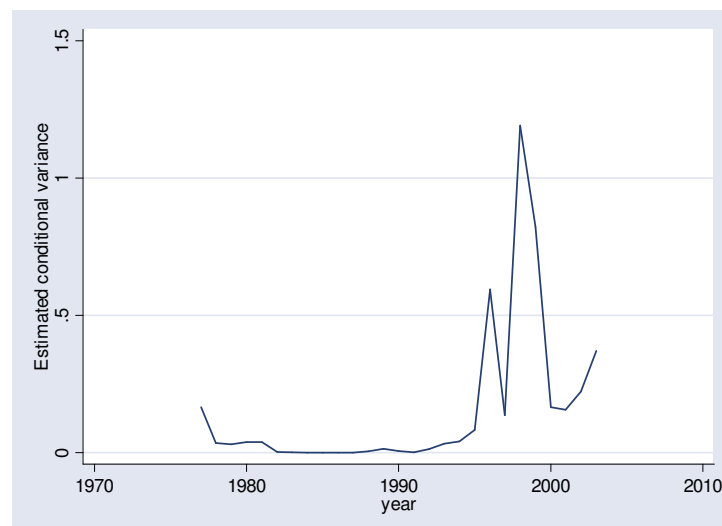
Table 1: (G)ARCH estimates for all banks profitability (1977-2003)

Coefficients	All banks: GARCH(1,1)	City banks: GARCH(1,1)	Regional Tier I: GARCH(1,1)	Regional Tier II: GARCH(1,1)	Trust Bank: GARCH(1,1)	Long Term Credit Bank: ARCH(1,1)
$\alpha_0$	0.000102 (0.41)	0.053 (0.76)	0.16** (1.94)	0.0847 (0.76)	-0.037 (-0.28)	0.1815** (2.39)
$\alpha_1$ (ARCH coefficient)	2.018*** (1.84)	0.525 (0.51)	1.146 (1.49)	1.483** (2.20)	-0.122 (-0.89)	0.97805*** (1.71)
$\beta_1$ (GARCH coefficient)	0.0526 (0.36)	0.079 (0.08)	-0.292 (-0.72)	-0.1599 (-0.62)	1.286* (2.51)	-
Log-likelihood	13.57	-9.09	-18.68	-15.57	-11.329	-28.32
$\mu$ ( $y_t = \mu + \varepsilon_t$ )	0.2286* (7.92)	0.6695* (9.21)	1.91* (19.99)	1.648* (23.62)	0.71* (39.8)	1.224* (77.64)
N	27	27	27	27	27	27

Note: \*  $p \leq 0.01$ , \*\*  $p \leq 0.05$ , \*\*\*  $p \leq 0.10$ ; t-values are in parentheses.

Significance of ARCH coefficients suggests that variability in profitability clusters for the Regional Tier II and LTC banks, and interesting to see that these two types of banks were the mostly crisis-prone banks. Moreover, it indicates that management's learning speed was slow although profitability growth was very high. Plot of conditional variance in Figure 4 clearly shows that there was no variations in the behavior of bank management up to 1997. This pinpoints the 'conflict of interest' in the behavior of the management of these banks that led them to risk taking approach in lending practice. On the other hand, GARCH coefficient has been found significant and ARCH coefficient is insignificant for the trust banks. This indicates that management's speed and scope of learning was better, and perhaps that's why none of these banks failed.

Figure 4: Pattern of estimated conditional variance



Now let us examine the significance of estimated conditional variance on management efficiency according to equation (12). The results in Table 2 indicate that the conditional variance of profitability does not have significant effect on ME for the whole sample period 1981-2003, but it is highly significant for 1981-1997 and moderately significant for the period 1981-89. However, significance of the coefficient of  $h_t$  indicates inefficiency of the management behavior. Therefore, two structural breaks are visible in the behavior of management: one in 1989 and another in 1997. These two breaks are contrasted from each other because 1989 was the year of bubble burst and profitability started declining and 1997 was the year of huge crisis and after that profitability was showing improving sign as the regulator started injecting capital and taking other measures. The contrast between these two points strongly implies policy inconsistency in the deregulation process, i.e. strong influence of exogenous policy on management behavior that created conflict of interest.

The behavior analysis from the conditional variance of profitability for the period after burst of the bubble (1990 onward) is somewhat conditional on their behavior during the 1980s, the period at which the deregulatory measures were undertaken and the asset price bubble was created. Thus, the period of the 1980s was the most conflicting for the banks, and it takes another decade for the authority to correct the conflict.

Table 2: Significance of conditional variance of profitability on bank management's efficiency

Dependent variable: Management Efficiency (q/A)	(1) 1981-2003	(2) 1981-1989	(3) 1981-1997
All banks	ME=69.20+962.31 $\hat{h}_t$ (0.29) (1.41)	ME=23.26*+319.47** $\hat{h}_t$ (10.8) (1.99)	ME= -131.75+7842.95* $\hat{h}_t$ (-1.60) (14.27)
R <sup>2</sup>	R <sup>2</sup> = 0.086	R <sup>2</sup> = 0.36	R <sup>2</sup> = 0.93

- \* p<=0.00, \*\*p<=0.10; t-values are in parentheses

The model equation (12) has also been fitted for the most troubled banks- regional banks Tier II and the Long-term credit banks. The coefficient of  $h_t$  has been found significant at 1% and 10%

level of significance (Table 3). This indicates inefficient behavior of the management of these banks.

Table 3: Significance of conditional variance of profitability on troubled bank management's efficiency

Dependent variable: Management Efficiency (q/A)	1989-2003
Regional banks Tier-II	ME=1.40***+1.31* $\hat{h}_t$ (2.19) (3.22) R <sup>2</sup> = 0.29
Long Term credit banks	ME=11.15* - 2.49** $\hat{h}_t$ (7.22) (-1.76) R <sup>2</sup> = 0.005

- \*\*\* p<=0.05, \*p<0.01; t-values are in parentheses

#### 4.1 Sources of variations in management behavior

Fitting the regression equation (15), the possible sources of variations in management's risk taking behavior can be identified. We consider the estimated conditional variance as dependent variable to proxy management's risk taking behavior. The following independent variables might have strong influence in management behavior.

##### *Macroeconomic variables and ownership structure*

As is mentioned in Section 3, due to the 'conflict of interest' created during ongoing deregulations, excessive monetary easing, and interest rate deregulation (interest-margin) helped banks extend loans aggressively to real estate markets. This excessive risk taking behavior of management was safeguarded by weak monitoring capacity of the mostly stable ownership structure of banks for the period 1980-2000. On the other hand, for all banks, top five largest shareholders such as banks, life insurers, employees etc. constitutes on an average around 18% of total shares in the 1980s, and the 1990s and 20% in 2000 (Harazaki et al., 2004). So, the ownership structure of the banks, money supply, discount rate and interest margin are expected to be positively related with risk (or, conditional variance). Ownership structure of the Japanese banks is also an important element of weak corporate governance.

##### *Deregulatory environment*

Growth of investment and securities can be considered as a direct outcome of the deregulations. Although late, banks were allowed to participate in short-term bond market from 1989, which is thought as a compensation of reduced dependency of banks big customers from

1980, and probably to stop banks from risky lending. As a continuous effort, the Financial System Reform Act 1992, was enforced in April, 1993 that allows banks to conduct trust businesses either through trust bank subsidiaries or by themselves and securities businesses through securities subsidiaries. The Financial System Reform Law of 1998 allows banks to conduct insurance businesses through subsidiaries from October, 2000. As a result of these deregulations, the share of securities and investment increases significantly in banks portfolio after bubble burst in 1990 that goes against the risky behavior of the management. So, securities and investment should be negatively related to risk.

#### *Bank size*

The larger a bank the greater should be its potential to diversify its asset risk. Alternatively, the larger the banking firms the more information that is likely to be collected by financial analyst and the lower the information risk from holding its stock (See Banz, 1981). Management may believe that regulators are unwilling to let larger banks fail, in which the value of implicit failure guarantees rise with bank size. This leads the management to take extra risk in lending behavior. These effects suggest that growth of size (measured by log of total asset) and risk taking behavior should be positively related.

#### *Liquidity*

Banks usually are threatened with failure because of losses on assets, and liquidity indicates the ability of a bank to open in spite of these losses. Excessive risky lending can make liquidity position vulnerable. So liquidity ratio (measured by Liquid asset/Total asset) should be negatively related to risky behavior. Diamond and Rajan (2005) show that aggregate liquidity shortage can be a cause of contagious bank failure.

#### *Capital requirements*

Capital adequacy requirement allow losses to be offset by current or past income. It acts as a safeguard, so management may be reluctant in taking risk. Thus capital adequacy requirement

(Capital reserve/Total asset) is expected to be positively related with management's risky behavior.

#### 4.1.1 Results for all banks

In Table 4, first two specifications of the regression model (15) are fitted just to avoid spurious correlation between capital adequacy ratio and average proportion of the top five large shareholders of banks. This is because both the variables show stability over time. Third specification is fitted to see the relationship between stable conditional variance (as is evident in Figure 4) up to 1997 and covariates. The period 1980-1997 is considered as the most controversial period in the financial system of Japan, and most of the failure had occurred in the year 1997.

Table 4: Sources of variations in the behavior of management (all banks: 1978-2000)

Dependent variable: Estimated conditional variance of ROA	Specification-1	Specification-2	Specification-3 (1978-1997)
	Coeff. (t-value) p	Coeff. (t-value) p	Coeff. (t-value) p
Money supply	0.057** (2.25) 0.05	0.08 (2.07) 0.06	-0.055 (-2.02) 0.08
GDP growth	0.042 (0.54) 0.60	-0.007 (-0.09) 0.93	0.08 (1.91) 0.10
Discount rate	0.10 (1.77) 0.11	0.09 (1.65) 0.12	0.12 (2.23) 0.06
Interest margin	0.88 (1.76) 0.11	0.86 (2.01) 0.07	-0.004 (-0.01) 0.98
Log(Total Asset)	11.32 (3.09) 0.01	9.90 (3.02) 0.01	-7.73 (-1.90) 0.10
Liquidity ratio	-19.25 (-2.19) 0.05	-25.01 (-4.01) 0.01	-24.51 (-2.55) 0.04
Capital adequacy ratio		0.46 (2.13) 0.05	--
Growth of inv. & securities	---	-8.54(-2.89) 0.01	9.87 (2.32) 0.05
Average percentage of top five large shareholders of banks	0.40 (1.97) 0.08	--	-0.26 (-1.78) 0.11
Constant	-26.29 (-4.37) 0.001	-15.25 (-2.99) 0.01	-0.44 (-0.08) 0.94
	R <sup>2</sup> =0.81 N=19	R <sup>2</sup> =0.73 N=21	R <sup>2</sup> =0.81 N=19

\* Robust standard errors are used.

Regression results show that money supply, bank size (log of total asset), banks aggregate liquidity, banks ownership structure and capital adequacy ratio are significant to management's inefficient or risk taking behavior, albeit sign is different but expected one. Discount rate and

interest margin are also found moderately significant to influence management behavior. The significance of the variables in the third specification is same as other two specifications, but sign is quiet different. This indicates poor learning of the management about policy signals as the conditional variance was stable during the period 1980-97.

As is discussed, during slow and partial deregulations, severe conflict of interest is apparent in the behavior of banks, and excessive money supply, low discount rate etc. exogenous policy shocks motivated them to behave speculatively as they were not effectively monitored by large shareholders and were complacent due to big size of banks. That is the reason why the ownership structure and bank size is positively significant to risky behavior of the management.

Growth of investment and securities in the portfolio of banks is found significant but negatively related to the risk taking behavior of the management. Liquidity ratio is highly negatively significant to risky behavior, perhaps due to shortage of liquidity after burst of the bubble.

Overall management behavior during the period of deregulation and crises (1980-2000) was found inefficient and their risk taking behavior can be explained by inconsistent monetary policies, delayed and partial deregulations, and weak corporate governance. Macroeconomic situations also indulge the management to take risky actions.

#### **4.1.2 Results for specific banks**

Table 5 demonstrates regression results of the equation (15) for city banks, regional banks, regional tier II banks, trust banks and long term credit banks (LTCB). These banks vary significantly in their capital intensity, business opportunity etc. Out of 19 failed banks, 15 were regional tier II (last failure in 2002), two LTCBs (out of 3 LTCB in 1998), one city bank (in 1997) and one regional bank (in 2003). No trust bank was failed.

Table 5: Sources of variations in the behavior of management (specific banks: 1978-2003)

Dependent variable: Estimated conditional variance of ROA	City	Regional	Regional-II	Trust	LTCB
Money supply	-.00060 (-0.70)	.0627702 (0.88)	.0417423 (0.63)	-.001226 (-0.29)	.0332524 (0.59)
GDP growth	-.003707 (-0.28)	<b>-.1423434</b> (-1.38)	-.0757488 (-0.66)	-.0075852 (-1.19)	-.0646359 (-0.54)
Discount rate	-.006193 (-0.41)	<b>-.1490073</b> (-1.63)	<b>-.2020154</b> (-2.66)	<b>-.0078634</b> (-1.20)	<b>-.073717</b> (-1.41)
Interest margin	.0581987 (0.50)	-.7672012 (-0.84)	-.1999163 (-0.27)	--	--
Log(Tot. Asset)	.05643 (0.55)	-.5661289 (-0.72)	.4671999 (0.81)	<b>-.0430571</b> (-1.62)	<b>.5646774</b> (2.33)
Liquidity ratio	-1.31049 (-0.92)	<b>-68.83356</b> (-2.05)	<b>-6.446638</b> (-1.18)	<b>1.441843</b> (5.49)	<b>-20.43417</b> (-2.46)
Capital ad. ratio	<b>-.134275</b> (-1.88)	.3402659 (0.23)	<b>-1.69819</b> (-1.47)	<b>-.0625539</b> (-2.29)	7.83e-06 (0.11)
Constant	-.50907 (-0.35)	12.09603 (1.02)	-4.030774 (-0.56)	<b>.7333022</b> (2.20)	<b>-5.766801</b> (-2.00)
R <sup>2</sup>	0.30	0.47	0.41	0.76	0.61
N	24	24	24	27	27

\* Robust standard errors are used.

Regression results show that liquidity ratio is highly negatively significant to risky behavior of the management for regional tier I and II, and LTCB banks, which can be thought of as significant determinants of failure. But for trust bank, it is significant but positive. Capital reserve ratio has been found negative but moderate significant for city and regional II banks, but highly positively significant for the Trust banks. Trust bank's situation gives a nice comparison of financial situations with other failed banks. The results indicate that weak financial positions of the failed banks lead the management to extend risky lending to real estate and other sectors that finally contributed in failure.

#### 4.2 Does inefficiency of management have impact on banking failures?

This is a potential question that one may ask. For this purpose, it is necessary to run an appropriate regression using ME as covariate. Here I may refer to another of my study (for instance, see Hossain (2005)) that uses Cox's proportional hazard model to identify the determinants of the Japanese banking crisis which finds ME as significant to crisis. This paper extends the view of that paper by providing a theoretical and empirical basis on how

management behaves inefficiently, and how it can be a cause of concern. Therefore, we make comment that management inefficiency, as a result of conflict of interest due to ongoing financial deregulations, might be a potential causality of the banking crisis in Japan.

## **5. Summaries and Conclusion**

This paper provides a theoretical justification of the problems at hand- how to analyze the efficiency of the bank management and how to determine the sources of variations in the behavior of the management at the outset of financial deregulations and/or crisis. For this purpose, this paper extends the basic learning model to explain management's inefficiency and shows that management inefficiency is a function of conditional variance of banks profitability (productivity). To estimate the conditional variance, it proposes to apply the GARCH framework of Bollerslev (1986). Application of the GARCH model in analyzing management behavior enables to incorporate information theory explicitly in the decision-theoretic learning model. To the best of my knowledge, this is a new approach that is able to explain the causality of banking crisis through analyzing motives and outcomes of risky behavior of the management.

The proposed model framework "Decision-theoretic-GARCH" has been found effective in analyzing very different behavior of the bank or other financial institutions' management at the outset of financial deregulations and/or other situations that had created huge conflict of interest in Japan in the 1980s and 1990s. The findings obtained by the proposed model framework are robust in the sense that these are consistent with some other early studies such as Hossain (2005), Hoshi (2001), Ueda (2000) etc. Moreover, the model findings capture the notion of *conflict of interest* in the Japanese financial system during ongoing financial deregulations that is thought as the potential causality of the subsequent crisis. The findings of this paper encompass the two important views of the causality of crisis- 'slow and partial deregulations' and 'weaknesses of



corporate governance of banks', through 'conflict of interest'. In that sense, the proposed model framework provides an adequate and systematic illustration.

The model framework is also flexible in determining the sources of variations in the behavior of the management that is important for any financial system.

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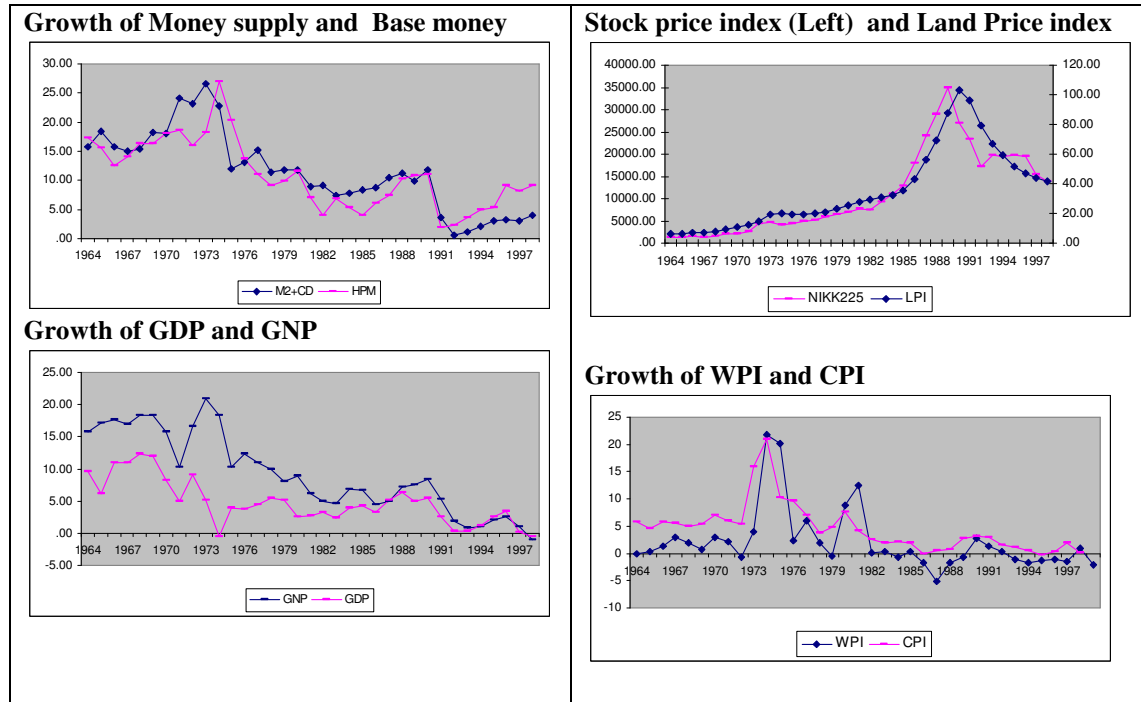
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**APPENDIX:**

**Figure-A: Different indicators of the Japanese economy during 1964-2003**



**Table A: Agency conflicting issues**

Conflict	Events	Conflicted with	Conflicting period	Response by banks	Comments	Conflict
1 (Reduction of dependency on corporate groups)	Removal of restrictions for corporations on fund raising in securities market: 1980- onward.  <i>Objective: To decrease dependency on banks</i>	Banking institutions are allowed to participate in short-term government bond market from 1987 (6-month bond) and 1989 (3-month bond) [ <i>As a compensation to reduced dependency of large corporate groups</i> ]	<b>1980-87/89</b> Banks did not find any alternative source of profit with decrease of large corporate groups dependency on bank during this period.	Credit extensions to Real Estate and SME market aggressively	Lack of prudential regulations help them to make a room for moral hazard	Conflict of interest between banks and large corporate groups
2 (Deregulation of shareholding/ Corporate governance)	Interlocking shares needed to be reduced to 5% by 1987.	Still shareholding are significantly prevalent; employee-shareholders and non-bank shareholders have less influence on bank management	<b>1980-89</b>	Aggressive credit extensions, Management was not efficient to anticipate asset price fluctuations and to find alternative mode of investment	Weak corporate governance	Conflict due to policy inconsistency

3 (Monetary policy inconsistency)	Money supply (M2+CD) started to increase during 1983-89	Interest rate decrease (1983-85)(1988-89)	<b>1983-89</b>	Credit extension to SMEs and Real Estate: the asset price bubble in 1988-89	During financial deregulation, the growth rate of money supply might be a misleading signal	Time Conflict with fiscal authority regarding fiscal expansion; time conflict with implementation of monetary policy
4			1983-85			
5 (Monetary Easing vs Fiscal Policy)	Monetary easing (discount rate lowered from 5% to 2.5%): 1986-87	Fiscal expansion as well as banks Corporate governance	<b>1986-87</b>	Credit extensions aggressively	Asset price bubble started to emerge	Conflict of monetary policy with fiscal and exchange rate policy
6			<b>1987-88</b>		Bubble created	
7 (Monetary tightening)	Discount rate increased 1988-89	Early expansion of fiscal policy vs. monetary policy	<b>1988-89</b>	Bankruptcy of creditor and debtor companies	Bubble burst in 1990	Conflict of interest among financial intermediaries

Note: The issues are also discussed in Section 3.