

Correlation risk between stockholdings and loans or bondholdings at Japan's banks

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Stockholdings by Japan's banks have been a factor undermining their profits. Along with the holding of particular firms' stocks, banks have extended a large amount of loans to those firms. Banks would suffer losses on both loans and stocks if such firms defaulted. Moreover, banks have increased investment in bonds, particularly government bonds, amid sluggish borrowing demand in the private sector. Banks' stockholdings are large even after considering the hedging effect between stockholdings and bondholdings in normal market conditions where stock prices and interest rates move in the same direction. A shock in financial markets may destroy such a relationship, which results in banks' large losses on both stockholdings and bondholdings. Therefore, banks should reexamine the merits arising from business ties strengthened by stockholdings and then reduce their risk associated with stockholdings at a measured pace.

Introduction

Stockholdings by Japan's banks have been a risk factor for their management. Capital gains and losses on stockholdings have been one of the factors undermining banks' profits.¹ Moreover, market risk associated with stockholdings could correlate with credit risk and interest rate risk depending on the circumstances of the real economy and financial markets. If such risks materialized simultaneously, banks' losses on securities holdings would accumulate. This amplification of losses where banks incur losses on stockholdings as well as on loans and bondholdings at the same time is a characteristic risk that Japan's banks bear. This report first identifies the effects on banks' profits and losses on stockholdings, and then explains the loss-amplification mechanism in which market risk associated with stockholdings correlate with credit risk and interest rate risk.

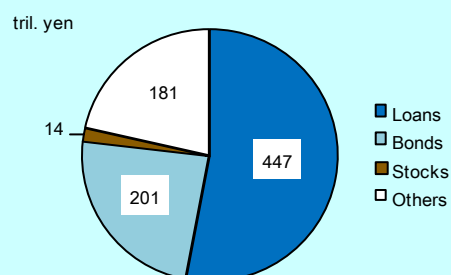
Stock Price Volatility and its Effects on Profits

Total assets of Japan's banks amounted to about 840 trillion yen at the end of September 2011. The amount comprised about 450 trillion yen of loans and 200 trillion yen of bonds (Chart 1). The amount of stocks totaling 14 trillion yen, which was much smaller than the amount of loans or bonds, accounted for only

about 2 percent of total assets. On the other hand, banks' profits have heavily depended on realized and unrealized gains and losses on stockholdings. There have frequently been cases of banks recording net losses due mainly to large losses on stockholdings (Chart 2).²

Behind this major impact of apparently small stockholdings on banks' profits lies the degree of stock price volatility. Volatility of stock prices is overwhelmingly larger than that of interest rates for bondholdings or of credit costs for loans. In fact, the amount of market risk associated with stockholdings per unit investment (measured by losses with a 1 percent probability of occurrence for one year period) reached about 25 times the amount of interest rate risk

[Chart 1] Composition of banks' assets



Note: Stocks exclude those of subsidiaries and affiliated companies. 12 major banks and 106 regional banks are counted. The data are as of the end of the first half of fiscal 2011.

and 30 times that of credit risk (Chart 3).³ Accordingly, banks' stockholdings posed considerable risk even though the amount itself was small.

Thus, banks' stockholdings carry significant risk as changes in gains and losses on those cause their profits to fluctuate. Moreover, if market risk associated with stockholdings materialized simultaneously with credit risk and interest rate risk, banks' losses on securities holdings would accumulate and could affect their management significantly. The rest of the report considers the effects of banks' stockholdings on their management when risk associated with stockholdings correlates with credit risk and interest rate risk, respectively.

Correlation Risk between Stockholdings and Loans

Strategic stockholdings by Japan's banks

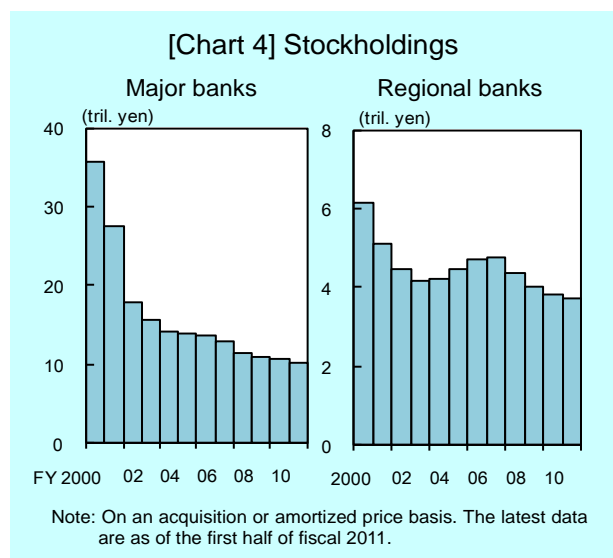
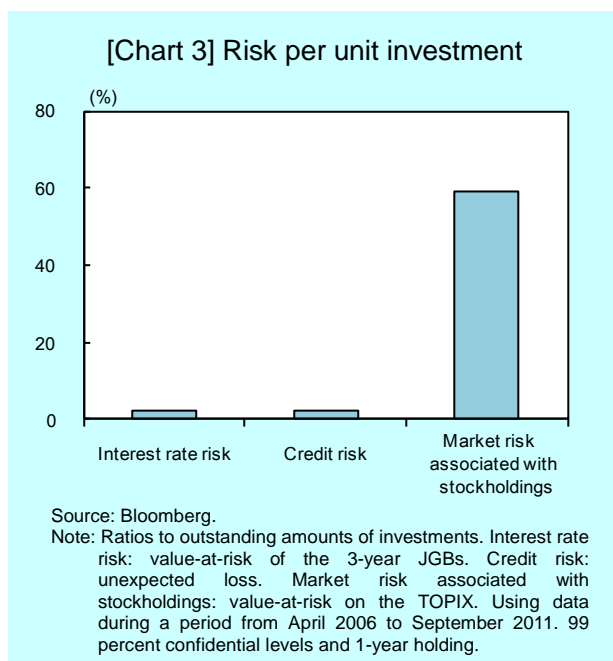
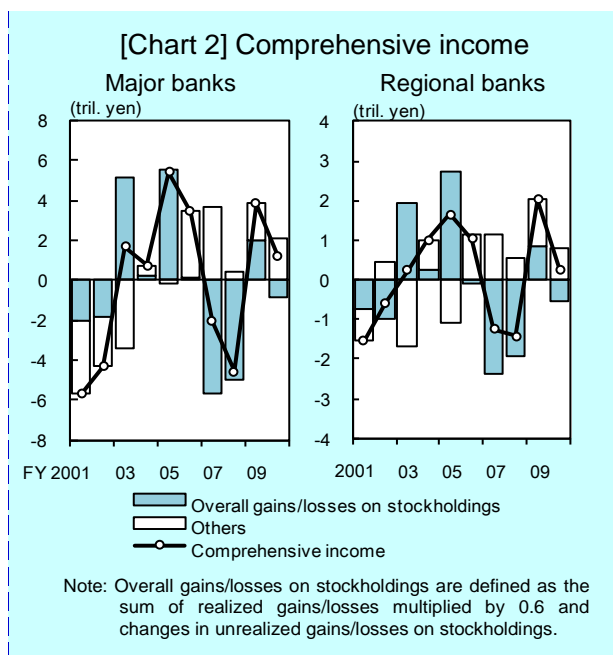
Japan's banks have held a large amount of stocks of firms with close business ties (strategic stockholdings). At the same time, banks have extended a large amount of loans to such firms. Since the 2000s, banks have reduced their stockholdings as they have gradually unwound their cross-stockholdings (Chart 4). The amount outstanding of bank loans has been on a decreasing trend, in particular loans extended to large firms.

However, the pace of reduction in banks' stockholdings has been slow in recent years, and they still hold 14 trillion yen of stocks as aforementioned. Moreover, large firms with borrowings and whose stocks are held by banks (borrowing firms with capital ties) comprise more than 20 percent of large firms with borrowings (Chart 5).⁴

Stockholdings and credit concentration risk

If banks extend credit to a particular firm through both loans and stocks, the concentration risk of total credit will be greater. If such firms defaulted, banks would suffer large losses on not only loans but also stockholdings, which is different from the case of general borrowers.

As for large firms with borrowings and capital ties, average amount of loans is 5.4 billion yen and is greater than 3.7 billion yen of the borrowing firms without capital ties (Chart 6). This indicates that the loan concentration risk is relatively high at the borrowing firms with capital ties. If risk associated



[Chart 5] Number of borrowers

(number of borrowers)

	Large firms	SMEs	Total
Borrowers without capital ties	5,712	135,045	140,757
Borrowers with capital ties	1,634	1,152	2,786
Total	7,346	136,197	143,543

Source: Teikoku Databank, "SPECIA."

Note: Excluding subsidiaries with a capital contribution of more than 50 percent. "SMEs" stands for small and medium-sized enterprises. As of fiscal 2010.

[Chart 6] Amounts of loans and equity investments (per borrower)

(bil. yen)

	Large firms		SMEs	
	Loans	Stocks	Loans	Stocks
Borrowers without capital ties	3.7	0.0	1.0	0.0
Borrowers with capital ties	5.4	1.3	1.0	0.1

Source: Teikoku Databank, "SPECIA."

Note: See the note in Chart 5.

with stockholdings is counted (totaling 1.3 billion yen on average), the concentration risk of total credit will be even higher.⁵

Based on the above, banks' expected losses from the bankruptcy of the borrowing firms with capital ties are estimated to be more than double the losses from the bankruptcy of the borrowing firms without capital ties (the left-hand side of Chart 7). One reason for this is that losses on loans are partly covered by collateral and guarantees, whereas there is no such protection for stocks, which are subordinated in liquidation.

Moreover, banks tend to hold more of stocks issued by firms to which they extend a larger amount of loans (Chart 8). This would add to banks' losses on stockholdings if firms with large borrowings defaulted (Chart 9). Although the probability of default is small since such firms are mostly large firms with stable financial conditions, banks would suffer huge losses once the firms defaulted.⁶

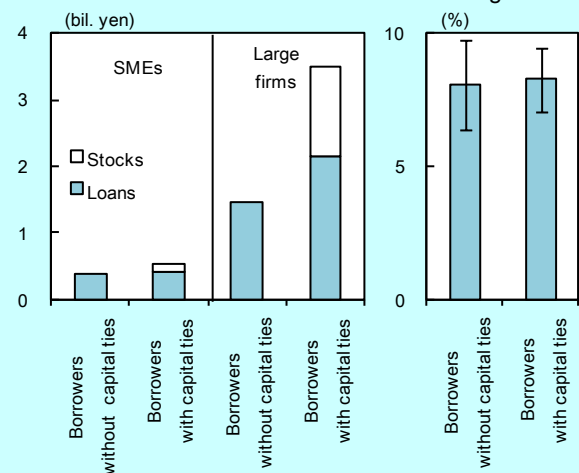
Merits of stockholdings

It is essential for banks to secure benefits complementary to the large risk they bear from particular borrowers with capital ties. However, whether banks can obtain such benefits is not necessarily apparent. For instance, the ROEs of borrowing firms with capital ties hardly differ from those without such ties (the right-hand side of Chart 7).

[Chart 7] Losses at default and ROEs

Losses at default

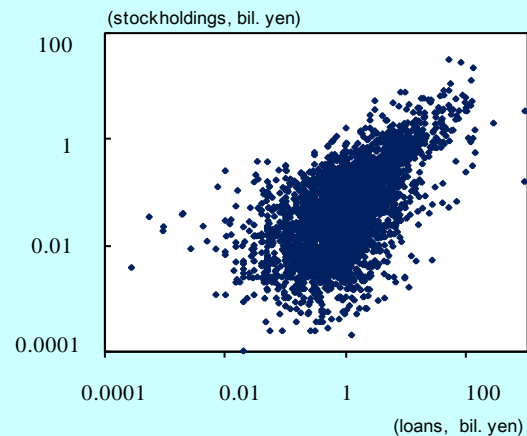
ROE of large firms



Source: Teikoku Databank, "SPECIA."

Note: Per borrower. Covered ratio is assumed to be 60 percent for loans. Error ranges in the right chart indicate two sided 95 percent confidential intervals. See the note in Chart 5.

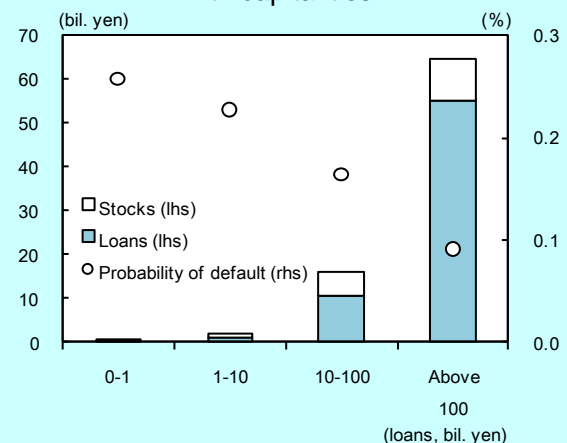
[Chart 8] Outstanding amount of loans and stockholdings



Source: Teikoku Databank, "SPECIA."

Note: The data are as of fiscal 2010.

[Chart 9] Losses at default of borrowers with capital ties



Sources: Teikoku Databank, "SPECIA"; CRD.

Note: Per borrower. Probability of default is estimated by CRD.

No special gain from stockholdings has been apparent in the ROEs, and the likelihood of loan repayment does not seem to have increased. Moreover, the possibility is pointed out that banks have not secured income from interests, dividends, or commissions compatible with the cost of holding stocks.⁷

The high concentration risk of credit inclusive of stockholdings is one of characteristics of Japan's banking system. In particular, major banks that extend loans to listed companies are likely to bear such risk.

Correlation Risk between Stockholdings and Bondholdings

Bondholdings by Japan's banks

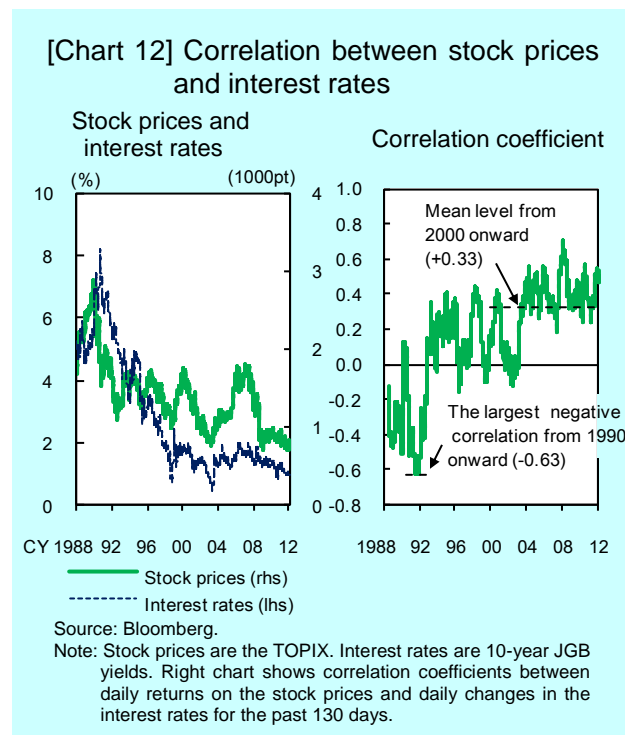
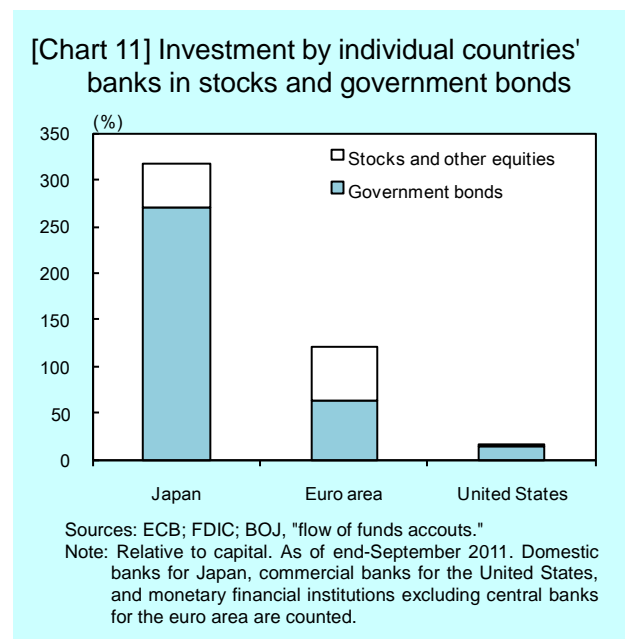
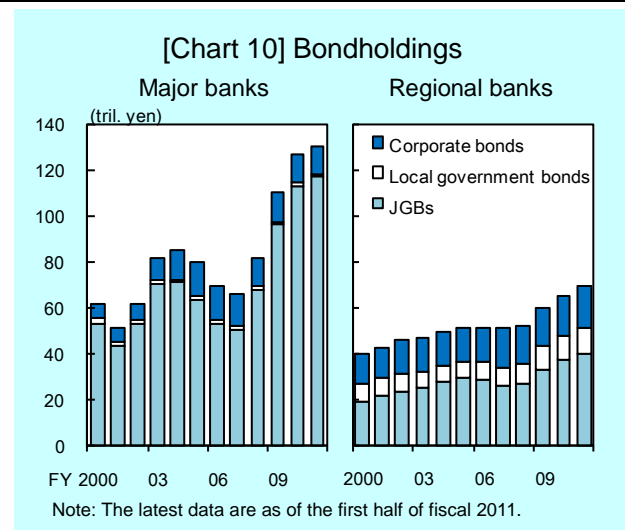
Borrowing demand in the private sector remains sluggish due mainly to the decline in the working-age population and aging of society. Under these circumstances, Japan's banks have increased investment in bonds, particularly government bonds (Chart 10). Since the Lehman shock in 2008, the outstanding amount of banks' bondholdings has increased dramatically amid considerable expansion of deposit inflows. As a result, Japan's banks hold large amounts of both stocks and bonds when compared internationally (Chart 11).

Greater stockholding risk than hedging effects

Based on the extent of stockholdings and bondholdings, concern arises regarding the risk of Japan's banks suffering large losses simultaneously on stockholdings and bondholdings. In recent years, however, such a situation has been averted.

From 2000 in Japan, stock prices and interest rates tend to move in the same direction (i.e., stock prices and bond prices move in the opposite direction) with an average positive correlation of 0.33 (Chart 12). In such market conditions, losses on securities holdings as a whole are contained with the hedging effect between stockholdings and bondholdings, where gains/losses on one portfolio offset those on the other. In fact, overall gains/losses on stockholdings have offset those on bondholdings as shown in the components of banks' overall gains/losses on securities holdings (Chart 13).

However, stock prices are much more volatile than bond prices as aforementioned, and thus banks' overall gains/losses on stockholdings more than offset those on bondholdings. This indicates that banks bear large



market risk associated with stockholdings even when the hedging effect between stockholdings and bondholdings is taken into account.

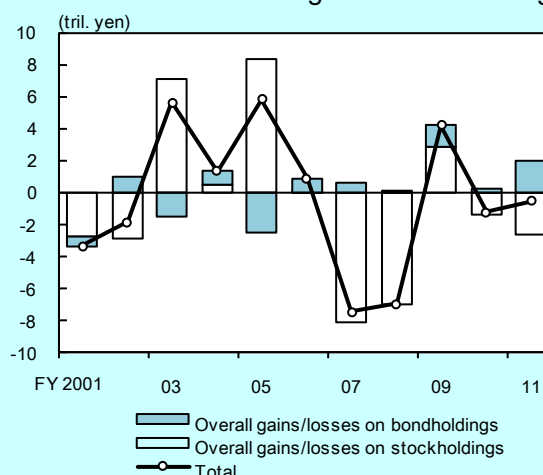
Effects of negative correlation

Furthermore, if overall financial markets are exposed to a severe shock, the positive correlation between stock prices and interest rates could be disrupted and turn negative. In many European countries, particularly Italy, interest rates had frequently risen due to increasing fiscal concern toward the end of 2011, while stock prices had dropped (Chart 14). Previously in Japan, the correlation between stock prices and interest rates was not always positive and stable (Chart 12).

If the correlation between stock prices and interest rates became negative, the hedging effect would disappear and banks would suffer losses on both stockholdings and bondholdings. Based on these, the amount of risks in the securities portfolio is estimated with varying correlation under a shock to both stock prices and interest rates (with a 1 percent probability of occurrence and one year holding period; Chart 15).⁸ Under the assumption of the largest negative correlation (minus 0.63) observed in the period from 1990 onward in Japan, banks as a whole would suffer substantial losses on securities holdings, amounting to 24 percent of their Tier I capital. This is about 1.4 times the amount of risk under average market circumstances (18 percent of Tier I capital) with the positive correlation of 0.33 observed in the period from 2000 onward. The distribution of losses at individual banks shows that more than 20 percent of banks would incur losses of over 30 percent of their Tier I capital (Chart 16).

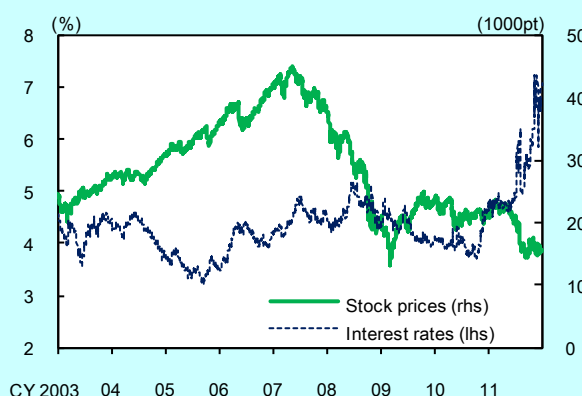
This outcome is based on the low volatility of Japan's interest rates observed in the past. However, market interest rates could surge sporadically, as observed recently in Europe. Attention should be paid to the possibility that, in such a case, a greater-than-estimated amount of risk would materialize.

[Chart 13] Overall gains/losses on stockholdings and bondholdings



Note: The major banks and the regional banks are counted. The latest data are annualized as of the first half of fiscal 2011. See the note in Chart 2 for the definition of overall gains/losses on stockholdings. Those on bondholdings are defined similarly.

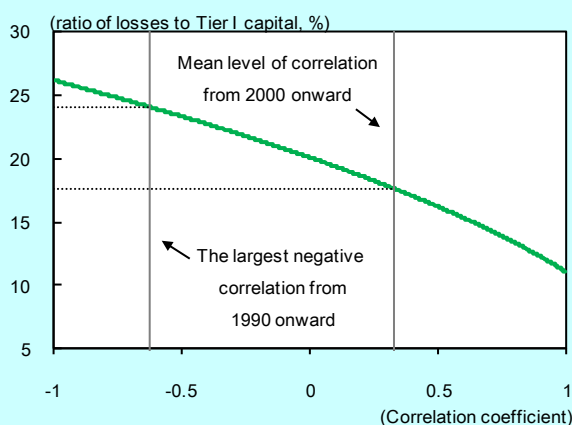
[Chart 14] Italian stock prices and interest rates



Source: Bloomberg.

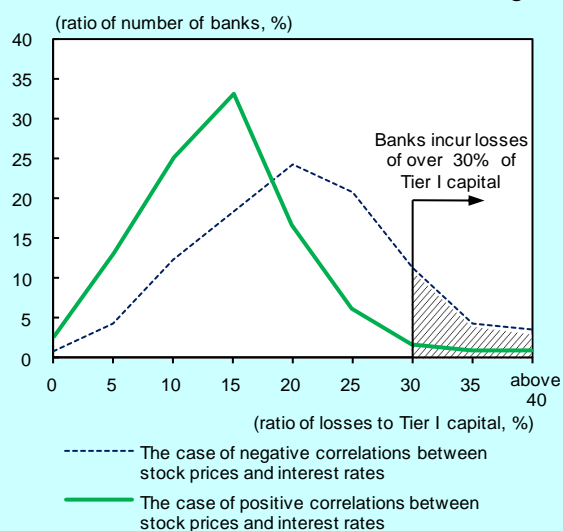
Note: Stock prices are the FTSE Italia All-Share Index. Interest rates are 10-year government bond yields. The latest data are as of end-December 2011.

[Chart 15] Losses on securities holdings by correlation coefficient



Note: Losses under a stress inducing a negative shock on securities holdings with a 1 percent probability of occurrence. The major banks and the regional banks are counted. Estimated based on the data as of end-September 2011.

Chart 16: Losses on securities holdings



Note: The major banks and the regional banks are counted. Estimated based on the data as of end-September 2011.

Conclusion

Stockholdings by Japan's banks have been a factor undermining their profits because stock prices have been volatile. Moreover, stockholdings could amplify banks' losses through the correlation with credit risk and interest rate risk. As concern over the debt problem has intensified in developed countries, attention should be paid to a severe shock in financial markets and deterioration in the real economy.

In order to prepare for such risks, banks need to further strengthen their capital bases and profitability. Of importance is that banks should conduct risk management comprehensively by paying attention to correlations among various risks. Banks should also reexamine the merits arising from business ties strengthened by stockholdings and then reduce their risk associated with stockholdings at a measured pace.

¹ In the following, unless otherwise stated, gains and losses on stockholdings or bondholdings stand for overall gains/losses on them, which contain unrealized gains/losses. Profits stand for comprehensive income, which contain unrealized gains/losses on securities holdings.

² For details about comprehensive income of Japanese banks, see Yamashita, Yuji, and Toshiyuki Sakiyama, "Profits of Japanese banks and market valuations -- comparison between net income and comprehensive income," Bank of Japan Review, No. 2011-E-5, October 2011.

³ Value-at-risk (VaR) on stockholdings or bondholdings is calculated as VaR for one year holding period converted from standard deviations of daily returns on stock prices or changes in interest rates. Unexpected losses of credit risk are estimated

using probabilities of default (PD), which are calculated using borrower classification, and losses given default (LGD) on banks' lending. VaR shows the maximum losses that could materialize under a certain probability of occurrence. By contrast, unexpected losses are obtained by subtracting expected losses from the maximum losses that could materialize under a certain probability of occurrence. The expected losses on banks' lending do not affect their profits since the provision for loan losses is made in advance. Therefore, credit risk here is defined as unexpected losses.

⁴ Banks' stockholdings include those derived from Debt Equity Swap (DES) in addition to cross-stockholdings. DES is a measure to support corporate revivals by exchanging borrowers' debt for their equity.

⁵ The amounts of banks' stockholdings are market values estimated by multiplying net assets of firms issuing stocks by ratios of stockholdings. Capital is used for the estimation instead of net assets when the former is larger than the latter.

⁶ When a borrower suffers from a business downturn, banks of high lending shares are strongly asked to take over lending by other banks of low lending shares. This leads to greater lending by the former banks and higher loan concentration risk.

⁷ For details, see Otani, Satoshi, Yuko Suda, Chikara Toyokura, Naohisa Hirakata, and Yasuo Miyaaki, "Kabushiki Hoyu wo Zentei toshita Ginkou no Kigyuu Torihiki no Sougou Saisansei ni tuite (Overall profitability of credit trading with borrowers considering banks' stockholdings)," Bank of Japan Review, No. 2007-J-13, November 2007 (available only in Japanese).

⁸ Losses on securities holdings are those under a stress inducing a negative shock on the securities portfolio with a 1 percent probability of occurrence. They are calculated using parameters which include volatilities estimated under the following assumptions: stock prices follow the geometric Brownian motion; and interest rates follow Vasicek model. The securities portfolio consists of domestic stocks and bonds. We use daily data during the period from January 2000 to November 2011. For details about Vasicek model, see Vasicek, O., "An equilibrium characterization of the term structure," *Journal of Financial Economics*, Vol.5 (2), November 1977.

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