

**Price discovery functions
in Japan's corporate bond market:
An event study of the recent fall 1997 financial crisis**

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Abstract

This paper presents study of how a series of collapses of financial institutions in November 1997 – financial crisis – influenced the price discovery process in the corporate bond market. The purpose of the paper is to examine why issuance activities in the primary market for corporate bonds have been moving at record highs while trading activities on the secondary market have declined since the financial crisis. Based on such examination, some implications are discerned. An outline of the findings in the paper is as follows. After the financial crisis of November 1997, market participants began to make more conservative assessments of credit risk, which led to an increase in risk premiums, followed by an increase in price volatility and widespread downgrades in credit ratings. At the same time, changes such as a rise in short-term interest rates and considerable tightening of banks' lending policies were also observed. As a result, market making for corporate bonds became more difficult in the secondary market, as dealers' inventory risk increased and financing costs for their inventory increased. Meanwhile, credit spread, measured in terms of yield difference between corporate bonds and government bonds, widened in the primary market earlier than in the secondary market. This might have encouraged new investors to enter the primary market for corporate bonds. From the issuers' side, needs for companies to raise funds through bond issuance intensified against the background of tighter bank lending policies. In reflection of these developments, activities in the primary market for corporate bonds were quite robust for more than six months since the beginning of 1998. The difference in performance in the primary and secondary markets may imply that differences in market microstructures – e.g. dealer-markets or auction-markets – can affect the robustness of price discovery functions, even when the same financial products are traded. The difference may also imply that market participants' preferences of market microstructure may change when the market is under stress.

* The views expressed in this paper are solely those of the author, and do not necessarily represent the views of the Bank of Japan.

Introduction

When a market experiences stress and its negative impacts persist over a period of time, the market's liquidity declines and market conditions become unstable. Under such stress, the price discovery function – an important mechanism in markets – is debilitated, which leads to higher price volatility and lower market liquidity. A classic example of this is 1987's Black Monday. A similar case was also observed in Japan in 1997, after a series of major financial institution collapses in November. The shock spread and influenced transactions and price formation in various financial markets. This paper aims to examine the changes of the price discovery functions in the primary and secondary markets for corporate bonds in Japan before and after November 1997.¹ In more detail, the paper focuses on the fact that (i) the functions in the corporate bond secondary market declined for some time after several financial institutions collapsed, while (ii) in the primary market, the issuance amount has increased since December 1997 and is moving at record highs. The paper tries to identify factors behind these changes and consider some implications of these changes in terms of robustness of the price discovery function.

The structure of this paper is as follows. The first section outlines Japan's corporate bond market. The second section presents some facts on changes in the corporate bond market after the financial institution collapses in November 1997. In the third section, some hypotheses on why these changes occurred are given and analysed. The fourth section presents a summary of findings. Finally, the last section tries to identify possible areas for future study.

1. Overview of Japan's corporate bond market

As of 31 December 1997, issues outstanding in Japan's straight bond market was 31 trillion yen and the amount issued in 1997 was 6.5 trillion yen. This formed 20% of the 158 trillion yen outstanding in the government bond market (excluding TB and FB) underwritten by the private sector and 30% of the same market's 21 trillion yen of issued amount. As for the number of issues, there were 40 government bond issues in 1997, whereas there were 444 corporate bond issues. The lot size per corporate bond issue was 15 billion yen, only 3% of government bonds' 500 billion yen lot size. In addition, outright trading volume in the secondary market was 19 trillion yen in 1997, only 1% of that in the government bond market's 1,123 trillion yen.

Next, the two markets' market structures are compared. In the primary market, publicly offered issues are placed according to the following schedule: securities companies which are lead managers create syndicates, the terms and conditions of the issues are set, and the issues are offered. The period for placement of these issues is usually one to several days. In the secondary market, only a few issues are traded in the authorised exchanges, but virtually all issues are traded over the counter (OTC). The OTC market consists of a dealer-customer market and an interdealer market. The OTC market is a quote-driven market in which dealers quote bid-ask prices. In the interdealer market, besides interdealer-broker transactions are conducted in addition to direct transactions between dealers.

Settlement of corporate bonds is conducted through a registration system where one private bank works as a registrar for an issue. Until December 1997, this required paperwork, then electronic transfers were introduced. The lag between contract and settlement is a T+5 basis, which is longer than the T+3 basis for government bonds. Delivery-versus-payment (DVP) settlement is not available for corporate bonds, unlike for government bonds.

¹ This paper will focus on straight corporate bonds offered in the domestic market.

2. Developments since fall 1997

The last several years have revealed weaknesses in the fiscal conditions of Japan's financial institutions. Specifically, in November 1997, several large and medium-scale banks and securities companies successively defaulted: Sanyo Securities (3 November), Hokkaido Takushoku Bank (17 November), Yamaichi Securities (24 November), and Tokuyo City Bank (26 November). In this paper, these events are referred to as "the financial crisis".

Under these circumstances, various changes were observed in the corporate bond market. The most notable changes were:

(a) Greater difficulties in securities companies' market making activities in the secondary market and a steep decrease in trading volume in the interdealer market

Trading volume in the interdealer market decreased steeply in November 1997 and has not picked up significantly since then (Graph 1).² Interviews with major securities companies indicate that the market making function stopped performing properly since November 1997, as most dealers began to significantly widen their bid-ask spreads, and even refrain from making quotes on certain issues in the secondary corporate bond market.³

(b) Surge in corporate bond issuance

While trading in the secondary market stagnated, issuance of corporate bonds in the primary market surged in December 1997, when it reached a record high for monthly basis. Activities in the primary market have continued to be quite active since then, and the record for highest monthly bond issuance has been repeatedly broken since February 1998. The outstanding amount in terms of net basis – the amount issued minus the amount redeemed – also increased, which indicates that the growth in issuance is not only spurred by the need to cover redemption amounts (Graph 2).

(c) Moderate growth in over-the-counter market activities

Following the steep increase in monthly issuance of corporate bonds, trading volume in the OTC market – in both the dealer-customer market and interdealer market – also increased, but the pace of this increase seems to have been much slower than that of the issuance amount. The ratio of trading volume to issuance amount has been declining since December 1997 (Graph 3). Taking a longer time perspective, trading volume was only about 1.5 times the issuance amount in the first and second quarters of 1998, the lowest level since 1990 (Graph 4). Accordingly, activities in the secondary market seem to have been relatively sluggish when that issuance volume in the primary market has been at record levels.

Let us now assess whether the changes that were discussed above – sluggish activities in the secondary interdealer market and increase in issuance amounts – were only seen in the corporate bond market.

First, let us consider the secondary market. Graph 5 shows trading volume in the interdealer market by type of securities. Although the trading volume of government bonds has not decreased considerably since November 1997, trading volume for bonds with government guarantees, municipal bonds, and bank debentures dropped significantly in November 1997. This is mainly due to a special factor; a

² As a proxy for trading volume in the interdealer market, data from the Japan Bond Trading Co. (JBT), the largest interdealer-broker, is used in this paper.

³ In Japan, securities companies are not required to give both bid and ask quotes in the corporate bond market.

significant change in the settlement system for securities other than government bonds.⁴ Trading volume for these securities has started to grow again, but not at the same pace for all types of securities. Trading volume for corporate bonds and bank debentures has not recovered to its level before the financial crisis, while trading volume for securities with government guarantees and municipal bonds reached or surpassed its pre-crisis level, in February 1998. In short, after the bond market was temporarily affected by an institutional change in the settlement system, higher credit risk concerns caused by the financial crisis had a persistent influence only on the interdealer trading volume of corporate bonds and bank debentures, both issued by the private sector.

Next, developments in the primary market are examined. The issuance of stocks, convertible bonds, and bonds with warrants had been sluggish since the beginning of 1997, and did not pick up after November 1997 (Graph 6). The issuance volume for corporate bonds in the Euro-yen market has been low since about August 1997 (Graph 7). This indicates that the steep increase in the issuance amount was a unique phenomenon observed in the domestic corporate bond market.

3. Analyses

In this section, the two questions presented below lead into some hypotheses on why such changes occurred as well as some empirical analyses.

- (1) How did the increase in credit risk lead to a decline in the market making function and sluggish trading activities in the secondary market for corporate bonds?
- (2) Why did the issuance of corporate bonds increase to record-high levels, despite a downturn in secondary market activities?

(1) How did the increase in credit risk lead to a decline in the market making function and sluggish trading activities in the secondary market for corporate bonds?

Since the financial crisis of November 1997, pricing in the corporate bond market has changed significantly. Data on daily movements of yield spread between government bonds and corporate bonds (hereafter credit spread) with different credit ratings in the secondary market reveal that credit spread widened since 25 November 1997 – following the announcement of Yamaichi’s collapse on 24 November (Graph 8).⁵ The widening of spreads was most pronounced for bonds with low credit ratings. A regression test to analyse the relationship between credit ratings – using dummy variables – and credit spread is conducted by dividing the data into two periods; the periods between 1 July and 21 November 1997 and between 25 November 1997 and 30 April 1998. The explanatory power of the dummy variable increases in the latter period, and the t-value for AA credit rating dummies, which is

⁴ Registration transfers of corporate bonds had been processed solely on a paper basis until December 1997, when an on-line electronic settlement system (JB Net) was introduced. Preceding this change, the certificate of registration for bond transfers was discontinued on 11 November 1997. This created a gap of about a month on a contractual basis where rights of the bond purchasers were not legally secured. For this reason, when such bonds were traded, investors preferred issues held as actual inventories by securities companies with high credit ratings. This might have induced the steep decline in trading volume of corporate bonds in the interdealer-broker market.

⁵ Moody’s credit ratings are used. Indication rates announced by the Japan Securities Dealers Association are used as the yield in the secondary market.

not valid for the first set of data, is valid for the second.⁶ This widening of credit spread after November 1997 may be interpreted as a manifestation of market participants' decisions to incorporate credit risk into corporate bond pricing in a way which reflects the increase in default probability. Such widening of credit spread seemed to cease after mid-February 1998 except for issues with BB credit ratings.

What is the mechanism that caused the secondary market functions to decline and dealers' market making activities to become more difficult, as market participants became more conservative in their evaluation of issuers' credit risk after the financial crisis? Four hypotheses explaining this will be listed and analysed below.

(a) *The increase in price volatility in the secondary market of corporate bonds caused an increase in inventory risks for dealers and hence a decline in their market making function.*

This hypothesis focuses on how an increase in credit risk leads to an increase in price volatility in the corporate bond market.

Corporate bond prices are influenced not only by changes in expectation of interest rates in general, but also by changes in issuers' credit risk premiums. As mentioned above, issuers' credit risk seems to have been better incorporated in secondary market prices for corporate bonds since November 1997. Theoretically, a change in credit risk premiums will lead to a change in corporate bond prices, even when market participants' expectations of interest rates remain stable. If this had been the case, the volatility of credit risk premiums would have increased after November 1997. An analysis of credit spread volatility in the secondary market through the use of credit ratings before and after the financial crisis shows lower credit ratings mean a larger expansion of volatility (Graph 9).⁷

Such increase in price volatility reflecting credit risk leads to larger inventory risk for dealers which causes them to be more conservative in their quotes. According to interviews with major securities companies, the bid-ask spreads quoted by dealers in the several months after November 1997 were so wide at times that trading execution became impossible. Graph 11 plots the changes in bid-ask spreads for corporate bonds by credit ratings, based on results of a survey of major securities companies. This graph shows that the spreads widened for every rating since November 1997, and the change was more significant in bonds with lower ratings. Such developments in the bid-ask spreads indicate that the inventory risk for dealers was higher for corporate bonds with greater credit risk.

(b) *Decreased availability of issues with high credit ratings in the secondary market, as a result of downgrades in issuers' credit ratings, made market making difficult.*

This hypothesis concentrates on the effect of downgrades in issuers' credit ratings for matters other than pricing.

⁶ Using dummy variables for credit ratings – AA, A, BBB, and BB – the yield spreads between corporate bonds with a remaining life of 9 to 10 years and government bonds are regressed. The sample period is between 1 July and 21 November 1997, and between 25 November 1997 and 30 April 1998. The results of the least squares method are outlined below.

Observation period	Constant	AA	A	BBB	BB	R ²
7/1 - 11/21/1997	0.2789 (14.44)	0.0219 (0.80)	0.0170 (6.21)	0.2735 (10.01)	0.8473 (36.03)	0.77
11/25 - 4/30/1998	0.3810 (26.90)	0.0545 (2.72)	0.3599 (17.97)	0.5679 (28.36)	1.0171 (50.79)	0.86

The figures in parentheses represent t-values, the estimated intercept is the average spread of other issues with AAA rating issues, and the dummies represent differences with spread of issues with AAA credit ratings.

⁷ For purpose of analyses in this paper, the liquidity risk premium is not considered.

With respect to fixed-income securities, even government bonds have different characteristics for each issue such as coupon, remaining life, and issue size. For corporate bonds, the issuers' credit risk is another factor differentiating issues. In practice, several different corporate bond issues with similar conditions, such as same remaining life and credit rating, are often treated as similar issues in the market. Ratings BBB and above are generally considered investment-grade and those BB and below are considered speculative. Many institutional investors in Japan, however, are said to use "single-A credit ratings and above" as an internal criteria for investment. An increase in credit risk after the financial crisis might have led to a shortage of tradable issues which meet investors' criteria.

Credit ratings of corporate bonds traded in the secondary market before and after the financial crisis⁸ indicate that a larger portion of issues had lower credit ratings after the financial crisis. Also, the number of issues quoted in the secondary market – especially those with credit ratings below BBB – increased with the pickup in issuance since early 1998 (Graph 11). Data broken down by remaining life shows that issues with credit ratings of A or higher decreased from November 1997 to January 1998 for the long-term issues – between 7 and 10 years⁹ – but started to increase as a result of increase in new issues from February 1998. In contrast, for medium-term issues – between 4 and 7 years – issues with credit ratings of A or better have decreased since November 1997 and had not recovered in the first half of 1998.¹⁰ In short, the number of investment-grade issues has decreased on the whole for investors who use a credit rating of A or higher as their investment criteria, at least for the few months after the financial crisis.

Moreover, analysis of the changes in corporate credit ratings for every six months after December 1996 shows that a larger number of firms were downgraded in the six months between December 1997 and May 1998, when compared to the two earlier periods. It should also be noted that the number of firms which were downgraded by more than 2 notches increased significantly in this period (Graph 12).¹¹ In other words, the volatility of credit ratings increased after the financial crisis. Historically, larger and more frequent changes in credit ratings have also caused market participants to be concerned about possible near-term downgrades of issues with high credit ratings, and thus have contributed to further decreased availability of investment-grade issues. This decrease in bond issues which meet investors' investment criteria in the secondary market may have been a factor leading to difficulties in dealers' market making through an increase in implicit transaction costs – e.g. longer time to obtain enough securities to fill customers' orders, and greater price-impact on trade executions.

(c) *Hitches in the short-term money market led to difficulty in dealers' inventory financing.*

This hypothesis focuses on how larger credit risk leads to an increase in inventory financing cost in the market.

In early November 1997, Sanyo Securities collapsed and defaulted on their claims in the uncollateralised call money market. Thereafter, lenders in the interbank market expressed more concern over borrowers' credit risk. The volatility of the overnight rates in the uncollateralised call money market increased significantly, reflecting higher credit risk premiums (Graph 12). Although public data on the financing rates of securities companies in the call money market are not available, the rates seemed to be higher than average, because the collapse of Sanyo Securities was seen as a source of instability in the market. Furthermore, the fact that most lenders lowered their credit lines to borrowers led to a significant decrease in the amount that securities companies were able to raise in

⁸ Moody's credit ratings are used for this analysis.

⁹ Issues with less than 3-years of remaining life, which are low in liquidity, are excluded from this analysis.

¹⁰ Such differences according to remaining life may be due to differences in issuance conditions. After the financial crisis, long-term bond issuance became difficult for issuers with low credit ratings. Meanwhile, since early 1998, issuers with high-credit ratings have seemed to prefer issuing long-term bonds, reflecting market participants' expectations that long-term interest rates had bottomed out.

¹¹ This could simply mean that a larger number of credit rating changes follow the preceding change of market participants' view of market conditions and thus do not exert additional influences on market prices. In this paper, however, extraordinary and sizable changes in credit ratings are considered to influence prices as a new irregular factor.

the uncollateralised call money market in November 1997 (Graph 13). The average uncollateralised call money market rate declined to its former level in early December as the Bank of Japan injected an unprecedented amount of high-powered money into the market, but the volatility of the rates did not decrease until mid-January 1998. In addition, the amount raised through the call money market did not recover to its former level until March 1998 when securities companies began to use the collateralised call money market as their main market for fund raising. This unfavourable environment for funding in the short-term money market led to increased financing costs for securities companies' inventory, and thus, market making became more difficult.¹²

(d) Restrictions on price movement made market making difficult.

This hypothesis focuses on the influence of restrictions on price movement which only applies to the secondary market for corporate bonds.

In Japan, the Japan Securities Dealers Association¹³ (hereafter JSDA) announces "indication prices on public securities in the OTC market (hereafter indication prices),"¹⁴ every business day by issue for all unlisted bonds – including corporate bonds. Securities companies are prohibited from trading bonds at prices outside a range of plus or minus 3% of the previous day's indication prices. After November 1997, when prices became highly volatile, this restriction may have hindered dealers from trading at a price which reflected the wider spread to accommodate the higher inventory risk.

Restrictions on price movements do not seem to have been a major impediment to trading, since the range of plus or minus 3% is quite large considering the daily price volatility of corporate bonds. However, the problem is that indication prices (the average reported prices of 21 dealers) may not fully reflect the true market value of securities. This is because not all reporting dealers actively trade corporate bonds, and thus, they tend to simply report that prices are unchanged for the day for issues which are not actually traded that day. As a result, the indication prices tend to deviate from true market price, which may cause the plus or minus 3% rule to be a tighter restriction when the market is under stress. In addition, because the restrictions are imposed on a price basis, the influence of this restriction is stronger on lower priced issues.¹⁵

Let us conduct a simple simulation test to assess the extent to which actual market prices may fall below the minus 3% limit of the previous day's indication prices. Graph 14 plots the market prices and the lower limit of the restriction under certain conditions¹⁶ over a ten-day period. As of 21 November 1997, the issues with the lowest indication prices were around 50 yen. For these issues, actual prices would be below the lower limit if prices were to fall by 1 yen for more than two consecutive days. For issues priced at 70 yen and 100 yen, market prices would only be below the lower limit if prices were to fall by 1 yen for three and six consecutive days, respectively. Actually, it is quite rare for bond prices to fall more than 1 yen for several consecutive days, considering that macroeconomic factors may influence prices upwards. In addition, there were only about five issues priced around the 50 yen range, and about ten issues priced below 80 yen at the time. This implies that

¹² Securities companies could have raised funds using CPs or Repos. However, these instruments were not available as alternative financing tools at the time, because issuance of CPs also became very difficult after the financial crisis, and Repos were rare in Japan for securities other than government bonds.

¹³ JSDA is a self-regulating body under the Securities Transaction Law.

¹⁴ The average is calculated from data on indication rates by issue at the end of daily trading – compound interest yield and bid-ask middle basis – for 2,200 bond issues traded in the OTC market, gathered from 28 member securities companies.

¹⁵ After the financial crisis, the lower the credit rating and the lower the price of an issue, the higher the volatility. For example, on 21 and 25 November 1997, the number of issues for which indication prices declined by more than 40 sen – maximum of 106 sen – were ten and thirteen, respectively. All issues had low credit ratings (BB).

¹⁶ The simulation is based on the following assumptions, arbitrarily formulated by the author: (1) 1/3 of the reporting dealers trade a certain security every day, 1/3 trade every three days, and the other 1/3 trade once every six days. (2) The dealers report the most recent prices, i.e. if the security is traded on a certain day, the contract price is reported, and if not, the price for the previous day is reported. (3) The market prices fall by 1 yen or 1/2 yen every day, for securities originally priced 100, 70, and 50 yen, respectively.

market prices are rarely under the lower limit of the restriction criteria, which means the restriction played a relatively minor role in impeding market making.

(2) Why did the issuance of corporate bonds increase to record-high levels in the primary market, despite a downturn in activities in the secondary market?

Although market making in the secondary market for corporate bonds became inactive for several months starting in November 1997, the situation in the primary market seemed to be the opposite. The amount of monthly issuance increased sharply in December 1997 to reach record highs. It has remained high since reaching record highs in February and June 1998. Why was the primary market able to continue to be active despite the fact that market participants became more sensitive to credit risk? Two hypotheses are offered below.

(a) *After November 1997, when the market was under stress, prices in the primary market better reflected credit risk for investors than those in the secondary market.*

According to this hypothesis, the price discovery function worked better in the primary market than in the secondary market since November 1997, and hence it attracted more investors. This may be inconsistent with general perception in two aspects. Generally, price discovery is more frequent in the secondary market than in the primary market, and the primary market for corporate bonds in Japan is often said to be “issuer-oriented”, meaning issuance conditions favour issuers rather than investors.¹⁷ Presented below is some evidence – including anecdotal ones – that support the above hypothesis.

How did evaluations of credit risk in the primary market for corporate bonds change since November 1997? After the financial crisis, investors became more sensitive to issuers’ credit risk. Analysis results indicate that credit spread, measured by differences between corporate bond yield and government bond yield, steadily widened from December 1997 to February 1998 (Graph 15). Graph 16 compares credit spread in the primary and secondary markets.¹⁸ It shows that credit spread in the primary market expanded for several months after the financial crisis, preceding changes in the secondary market. This graph also indicates that the spread increased in the secondary market before the financial crisis, but that the spread in the primary market for issues with lower credit ratings increased after the crisis. This reversed again in mid-February 1998, and the spread in the secondary market continued to increase since then. An issue-by-issue comparison using coupons of new 5-year corporate bond issues – which many firms with lower credit ratings rushed to issue after the financial crisis – and yields of outstanding issues with a remaining life of 5 years in the secondary market provides more vivid support for this finding (Graph 17). It should be noted that over-par bonds are not actively traded in the secondary market because of accounting reasons in Japan,¹⁹ and new issues can always be purchased at par-price in the primary market. Therefore, there is a bias toward a larger spread in the secondary market under normal market conditions. A larger credit spread in the primary market in the few months following the financial crisis may imply that the price discovery function was relatively more efficient in the primary market, at least during the period.

This earlier expansion of credit spread in the primary market is considered a factor that attracted investors into the primary market. When conditions for a new issuance of corporate bonds favoured issuers, corporate bond investors in the primary market were mainly small or local financial institutions. Large institutional investors were not considered active in the primary market. The

¹⁷ In the past, because there were no actual defaults of domestic corporate bonds – trustee banks repaid principal even when issuers collapsed – investors’ sensitivity to credit risk was kept low.

¹⁸ For this analysis, credit spreads in the primary market are calculated using coupons of new issues on an issue-by-issue basis, while spreads in the secondary market are calculated using the average indication rate for each credit rating as announced by the JSDA.

¹⁹ Historical cost accounting is applied to unlisted securities, so if dealers hold over-par bonds, losses will be incurred upon redemption. For companies which need to amortise these securities, amortisation losses will also be incurred. Many investors in Japan are said to avert such losses.

situation, however, seemed to change after the crisis. According to monthly surveys of fund managers and securities traders by an investment research company, the number of respondents interested in investing in corporate bonds increased since January 1998 (Graph 18). The increase in purchases in the primary market by major institutional investors, such as insurance companies and trust banks, is consistent with the survey's results (Graph 19).

(b) *Issuance of corporate bonds may have been boosted by a shift in large companies' fund raising from bank loans to corporate bonds, as a result of banks' tighter lending policies*

The second hypothesis focuses on the supply-side of corporate bonds. It assumes that an increase in credit risk pressured banks to tighten their credit channels, which in turn induced companies to shift part of their funding activities from bank loans to corporate bonds. After the financial crisis of 1997, the fall in stock prices and the depreciation of the yen forced banks to improve their asset quality in order to fulfil the BIS capital adequacy requirements. Accordingly, banks seem to have tightened their lending policies considerably, particularly near the end of March 1998, the end of their fiscal year (Graph 20). Under these circumstances, concerns of banks' credit tightening sharply increased between December 1997 and March 1998 (Graph 21); hence, companies may have had to rush into bond issuance in order to satisfy their funding needs. In this case, if the increase in bond issuance was solely spurred by banks' actions to improve asset quality to meet year-end fiscal requirements, increased activity in the primary market for corporate bonds would not have continued after April. On the other hand, had a self-enforcing mechanism to satisfy supply-demand conditions been at work in the market, a higher level of activity could have been sustained.

In the following paragraphs, the process in which funding shifted from bank loans to corporate bonds is analysed. There are three possible routes through which this occurred.

- (i) The simplest route is that banks underwrote new issues of major companies in order to maintain relationships, instead of reducing loan assets. This explanation is not wholly rational as bank loans and corporate bonds are both 100% risk-weighted assets for banks. To prove this gap is rational, bank purchases of corporate bonds did not increase after the financial crisis (Graph 19).
- (ii) Another possible explanation is that banks themselves did not underwrite corporate bonds, but subsidiary securities companies of these banks acted as intermediaries for corporate bond issuance.²⁰ This would enable banks to maintain their relationships with their client companies. The share of issues underwritten by bank-subsidary securities companies followed an upward trend, while competition with other securities companies to obtain the position of lead manager intensified, and increased steeply after the fall of 1997. In January 1998, the share held by bank-subsidary securities companies grew to 80% of the market (Graph 22). Therefore, it is to say that the increase in the issuance of corporate bonds after December 1997 was triggered by issuers' growing concerns of banks' tightening their lending policies and their active brokering of corporate bond issuance through their subsidiary securities companies.

However, bank-subsidary securities companies' share in underwriting corporate bonds has gradually decreased since February 1998 to its normal levels by April 1998.²¹ It is worth noting that the amount of bonds issued were at record highs even after April, despite a decline in the share of underwriting by bank-subsidary securities companies. Thus, the increase in activities in the primary market cannot be fully explained by the second route.

²⁰ Conducting banking business and securities business in one company is not permitted, due to a firewall regulation. However, after 1993, banks have been allowed to establish wholly-owned subsidiary securities companies.

²¹ These changes occurred along with a (i) lifting of the underwriting prohibition on the largest securities company, upon which it went back into operation, and (ii) a relative loosening of restrictions on banks' asset compositions once they survived past March 1998, the end of their fiscal year.

- (iii) There is also another route where demands of corporate bond issuers and investors are autonomously adjusted through price mechanisms. As seen in the first hypothesis, (2)-(a), the change in pricing in the primary market may have induced investors to enter the market. Meanwhile, the number of companies registering to issue corporate bonds has increased notably from February to April 1998 (Graph 23). When companies register for bond issuance, they are expected to issue bonds on a regular basis and to follow disclosure rules. Therefore, the growth in such registration may indicate that companies are using corporate bonds not just as a temporary substitute for bank loans, but also as an integral part of their funding strategies. It is interesting to note that the number of companies registering to issue bonds increased in February 1998 – when the credit spread almost stopped widening – which virtually coincides with the investors’ increased interest on investment in corporate bonds.
- (iv) A rather bold assessment of the above analysis is that the increase in corporate bond issuance, which may have been initially triggered by the tightened lending policy of banks immediately after the financial crisis, led to further widening of credit spread. A larger concern of investors about issuers’ credit risk, as explained in hypothesis (a), may also have contributed to the extraordinary and sizable expansion in credit spread. Although companies continued to issue more bonds due to their concerns of a possible decrease in the availability of bank loans, the widened credit spread attracted investors to the primary market. Accordingly, credit spread expansion started to slow around February 1998, when a new price equilibrium reflecting credit risk might be found with an autonomous price mechanism which adjusts supply-demand conditions between issuers and investors. This may have led to sustainable growth in the issuance of bonds.²²

(3) Interpretation of analysis results

The above analyses explain the robustness in the primary market and the concurrent decline in market functions in the secondary market. However, a new question is raised. Why was the price discovery function more robust in the primary market, even though theory suggests both markets should have been influenced by the same factors discussed in (1)? This paper does not offer an empirical answer to this question, but some interpretations are presented below.

First, different microstructures of the primary and secondary markets might have caused performance differences. Existing literature on market microstructure (e.g. Madhavan, 1992) examines which type of market – the dealer market or the auction-agency market – is more resilient to shocks. Of course, it is difficult to draw a concrete conclusion regarding the capacity of dealers (market makers) to influence the outcome. However, under stress, the price discovery function is more likely to be undisrupted in the auction-agency market, especially the periodic call (batch) auction market, where orders are concentrated in the order-book and matched at certain intervals at a single price which clears both buy-orders and sell-orders.

The secondary market for corporate bonds is a dealer market where dealers provide bid-ask quotations and function as the counterparty of the contract. Therefore, the increase in price volatility and short-term interest rates may have caused the decline in the functioning of the market due to the widened bid-ask spreads caused by the increased inventory risk and financing cost, etc. However, the primary market for corporate bonds is more like an auction-agency market. In the primary market, lead manager securities companies interview issuers and investors to determine issuance conditions such as coupon rates. This coupon setting process can be a proxy for periodic call auctions where securities companies function as neutral auction agencies. Of course, if issuance conditions favoured issuers as in the past, securities companies may not have been neutral auction agencies. However, the

²² The robust activities in the corporate bond market since April 1998 may be influenced by a cyclical factor. Because long-term interest rates – yield on government bonds – declined to record-low levels from April to June 1998, the financing cost for issuers on the corporate bond market was lower than before, even when considering the added credit spread. Meanwhile, the incentive for investors to participate in the corporate bond market was also strong, because yield declined for newly issued government bonds.

increase in credit risk concerns after November 1997 might have brought securities companies closer to such neutral auction agencies. This is because, if the coupon rate does not fully reflect the credit risk of the issuer, the lead manager securities company may face larger market risk and default risk when it cannot sell all the underwritten securities. Investors may also have favoured a periodic call auction market where the price discovery function is relatively robust, even under stress. This paper's findings may indicate that the robustness of the price discovery mechanism may differ according to market microstructure and the market participants' preference of microstructures may also differ under different market conditions.

Second, there are differences in the degree of supply restrictions on securities in the primary and secondary markets. A decrease in the number of issues that meet investors' investment criteria – resulting from the downgrades of issuers – exerts a large impact, particularly on the secondary market. This is because, for dealers, the overall supply of issues in the secondary market is given. In order to increase the supply of issues in the secondary market, dealers can only try to induce investors to sell the issues from their portfolios by quoting a higher bid price. However, when credit risk increases in the market, they need to lower their bid prices in preparation for inventory risk. Meanwhile, in the primary market, securities companies can enhance the supply of issues by prompting companies to issue bonds which meet investors' needs. Of course, the supply will not increase if issuers are not satisfied with the conditions from the investors' side. However, during a financial crisis, such a mismatch is unlikely because of the issuers' strong demand for bond issuance under banks' tightened lending policies.

4. Summary

A summary of the analysis and conclusions of this paper is outlined below.

- a. A series of collapses of financial institutions in November 1997 led to an increase in credit risk. This in turn caused market participants to become more sensitive to whether market prices reflected credit risk. In the corporate bond market, this caused a widened credit spread, increased price volatility, and a decreased number of issues available for investment. Also, in other markets, short-term interest rates (uncollateralised call money market rates) rose, funding conditions tightened, and banks tightened their lending policies.
- b. These changes influenced both the primary and secondary markets for corporate bonds, but these markets were affected differently. In the secondary market, which is a dealer market, market making became difficult with the increase in inventory risk, inventory-financing costs, and transaction costs.
- c. On the other hand, the price discovery mechanism in the primary market worked relatively well in periods of stress, as exemplified by the faster expansion of credit spread as compared to the secondary market until around mid-February. This indicates that the primary market, which can be regarded as an auction-agency market, may have been more resilient to shock, and market participants may prefer different market microstructures according to prevailing market conditions. Banks' tighter lending policies may have led to a surge in demand for issuing corporate bonds, which contributed to further widening of credit spread.
- d. The preceding expansion of credit spread in the primary market attracted investors to the market, and induced companies to increasingly raise funds by issuing corporate bonds from around February 1998, when the widening of the credit spread virtually stopped. This may indicate that a self-enforcing price mechanism to fulfil supply and demand conditions in the primary market started functioning at the time, and supported the market to be active at a sustainable pace for about half a year.

5. Areas for future study

Theoretical and empirical analyses of factors that determine market liquidity have enhanced our knowledge of market liquidity under normal market conditions. Further analyses of how market liquidity changes under stress situations would also contribute to deeper understanding of market liquidity. Market stress is not a condition that can or should be created for analytical purposes; so conducting event studies of actual periods of stress are important. However, the determinants of market liquidity and their relevance differ across products and market microstructures. The effects of private information on the price discovery mechanism have different degrees of influence on government bonds and stocks because of the different nature of these products; so the extent to which information asymmetry explains changes in market liquidity will also be different. The factors of market liquidity and the influence of these factors also vary according to the market structure in which these products are traded – i.e. auction-agency market or dealer market. Furthermore, the preference of market participants regarding microstructure of the market may differ according to market conditions, even when the same products are traded. This paper only discusses some of these products and market structures. Event studies for other markets may be explored in the future examination.

References

O'Hara, Maureen, "Market Microstructure Theory," *Blackwell Publishers Ltd*, 1995.

Madhavan, Ananth, "Trading mechanisms in Securities Markets," *Journal of Finance* 47, 607-642, 1992.

Sekino, Katsuhiko, "Credit Risk; Evaluation and Realistic Application," *Kinzai*, 1996.

Table 1
Changes in credit ratings for Japanese companies
(Number of companies)

	December 1996 - May 1997		June 1997 - November 1997		December 1997 - May 1998	
	Down	Up	Down	Up	Down	Up
Non-financial sector	3	1	2	0	8	3
by 1 notch	1	1	2	0	4	1
by 2 notches	2	0	0	0	3	2
by 3 notches	0	0	0	0	1	0
Financial sector	0	0	3	1	15	4
by 1 notch	0	0	2	0	5	2
by 2 notches	0	0	1	1	9	2
by 3 notches	0	0	0	0	1	0
Total	3	1	5	1	23	7
by 1 notch	1	1	4	0	9	3
by 2 notches	2	0	1	1	12	4
by 3 notches	0	0	0	0	2	0

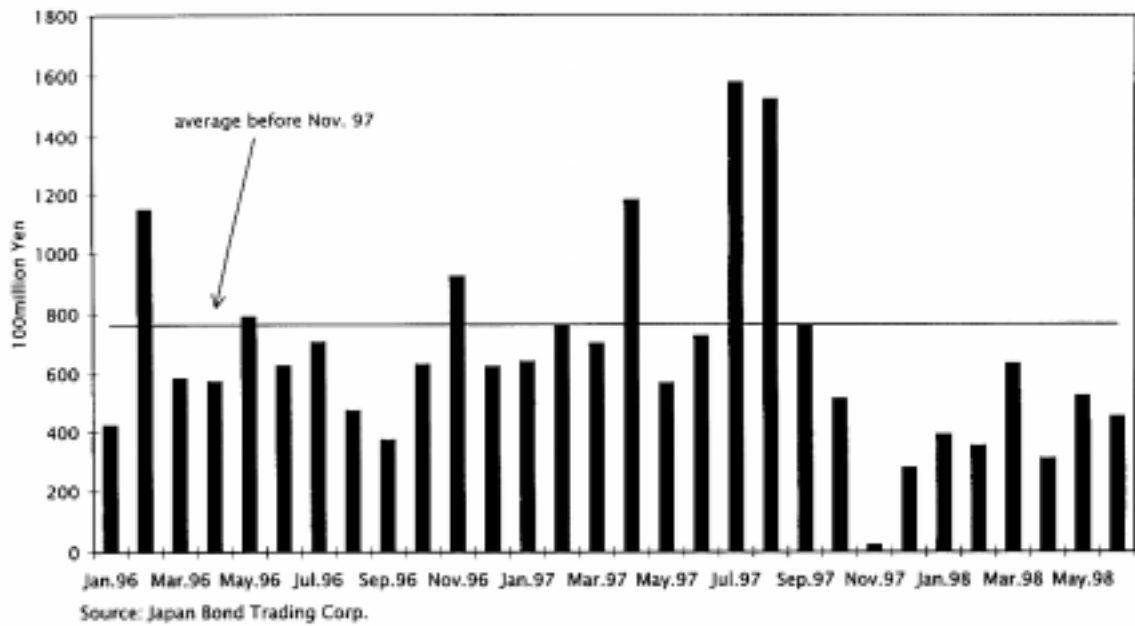
Source: Author's calculations based on data from Moody's.

Note: 1. 252 companies are covered.

2. Financial sector includes banks, securities firms, and insurance companies.

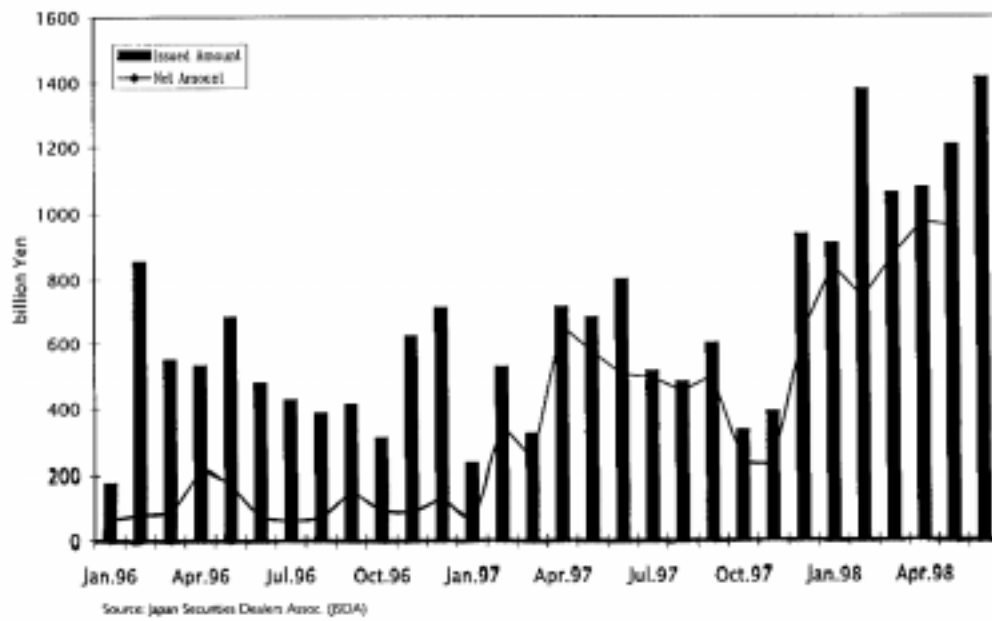
Graph 1

Trading Volume of Corporate Bonds in the Interdealer Market



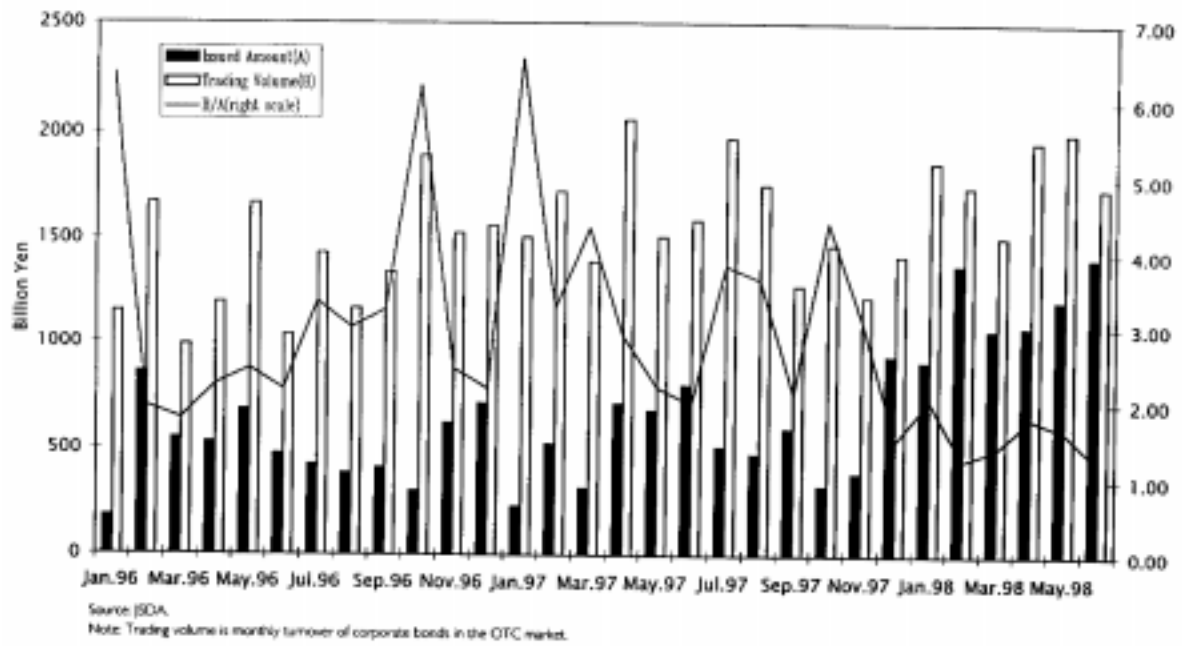
Graph 2

Corporate Bond Issuance



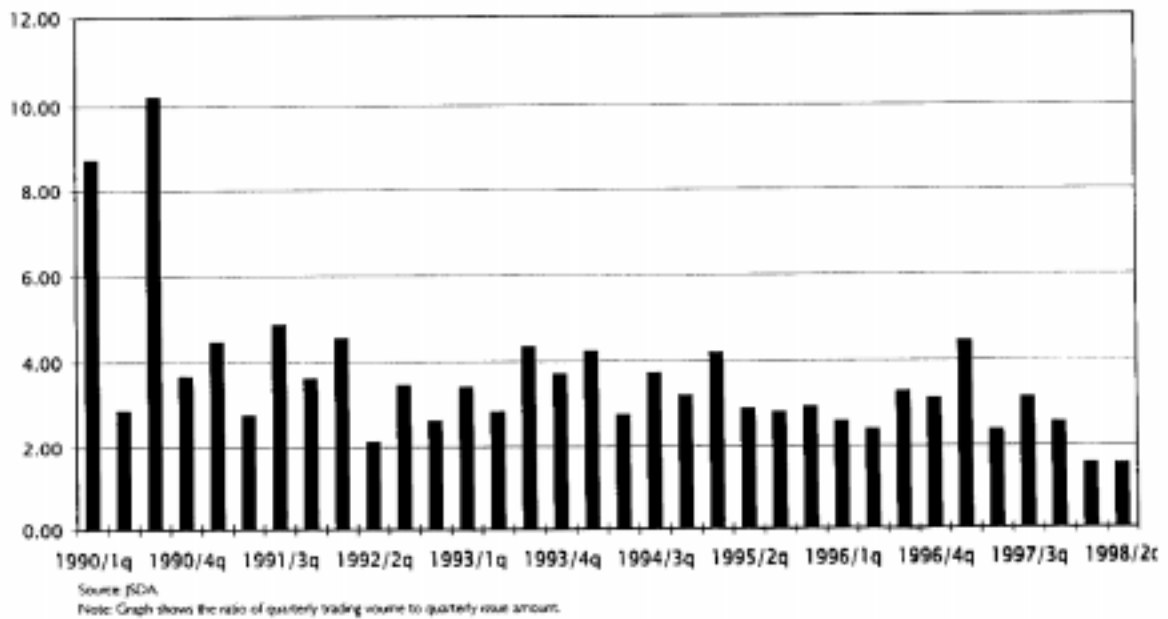
Graph 3

Corporate Bond Issuance and Trading Volume

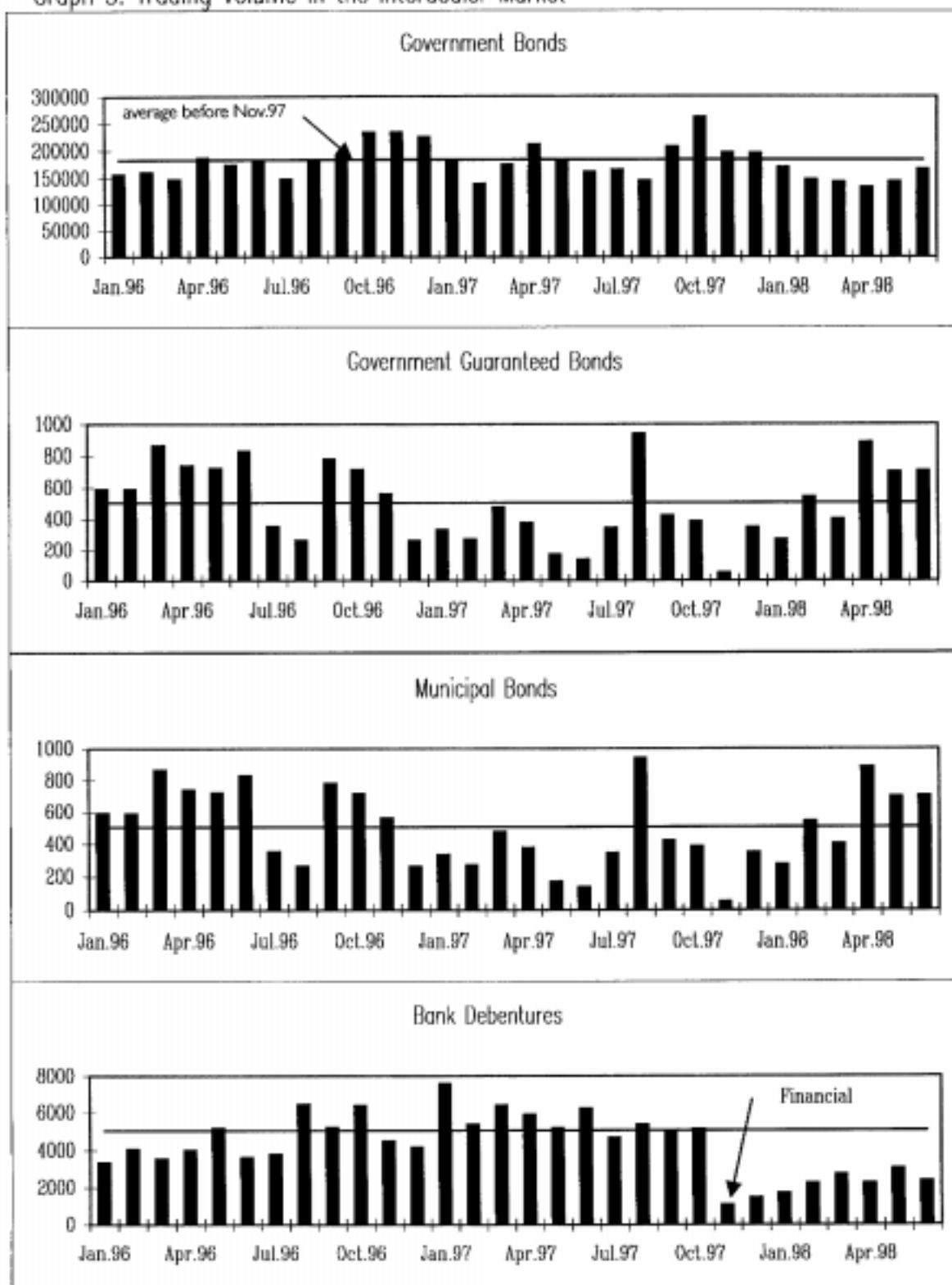


Graph 4

Turnover/Issuance Ratio



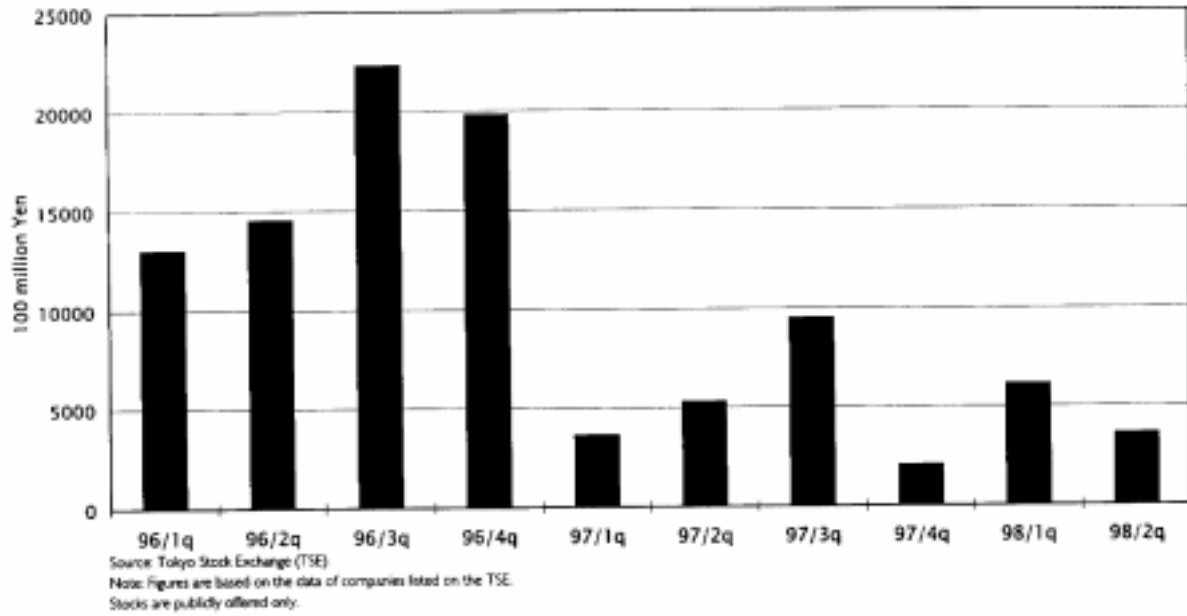
Graph 5. Trading Volume in the Interdealer Market



Source: Japan Bond Trading Co.

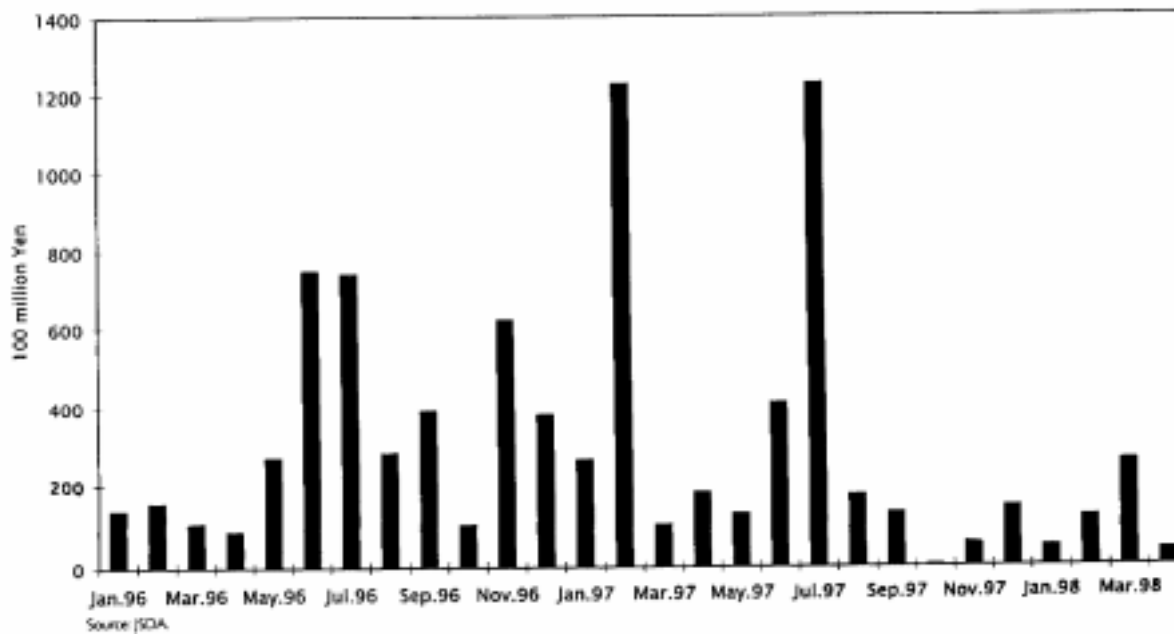
Graph 6

Issued Amount of Stocks, CBs, WBs



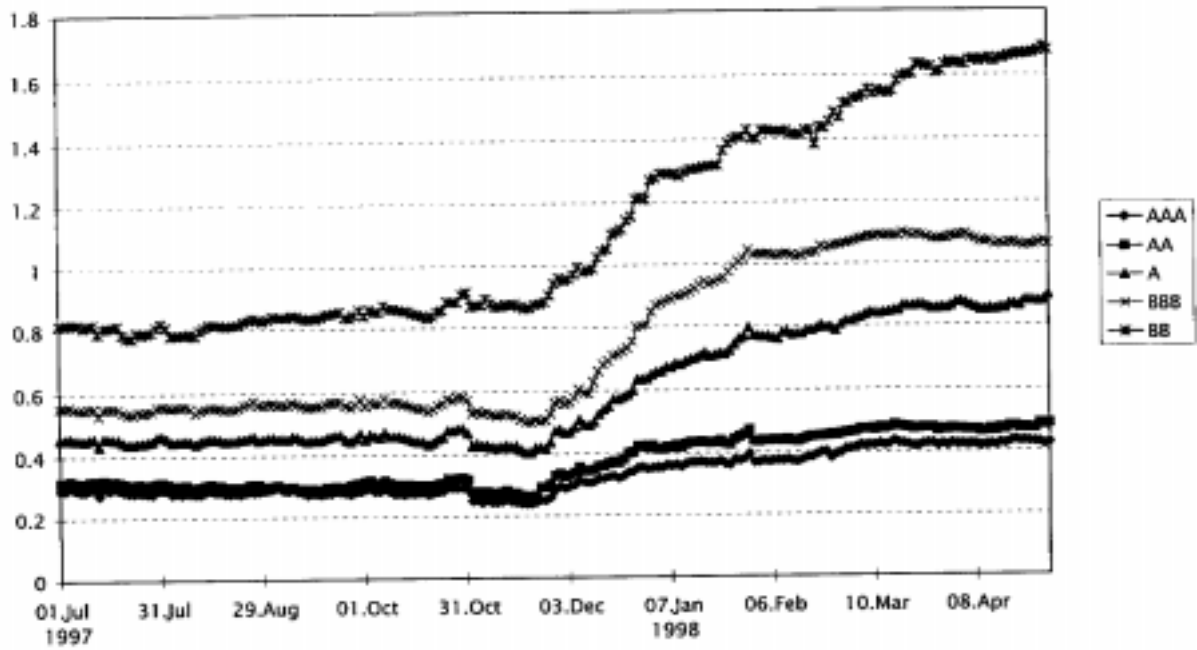
Graph 7

Euro-Yen Bond Issuance by Japanese Companies



Graph 8

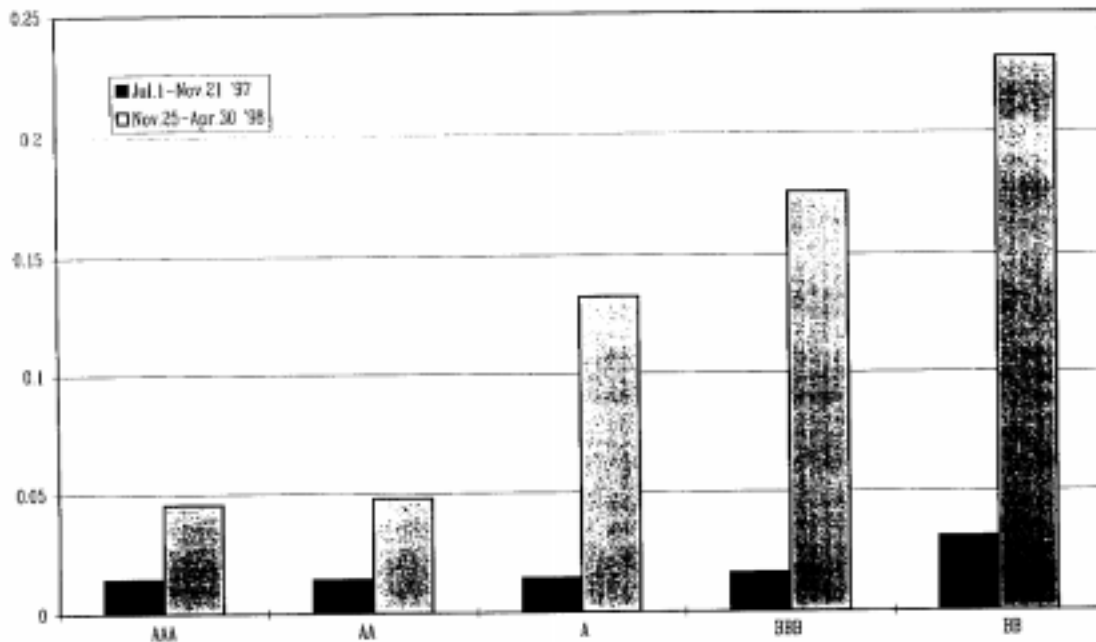
Yield Spreads between Corporate Bonds and Government Bonds (remaining Life: 9-10years)



Source: Author's calculations based on data from TSE and SDA. Moody's credit ratings are used.

Graph 9

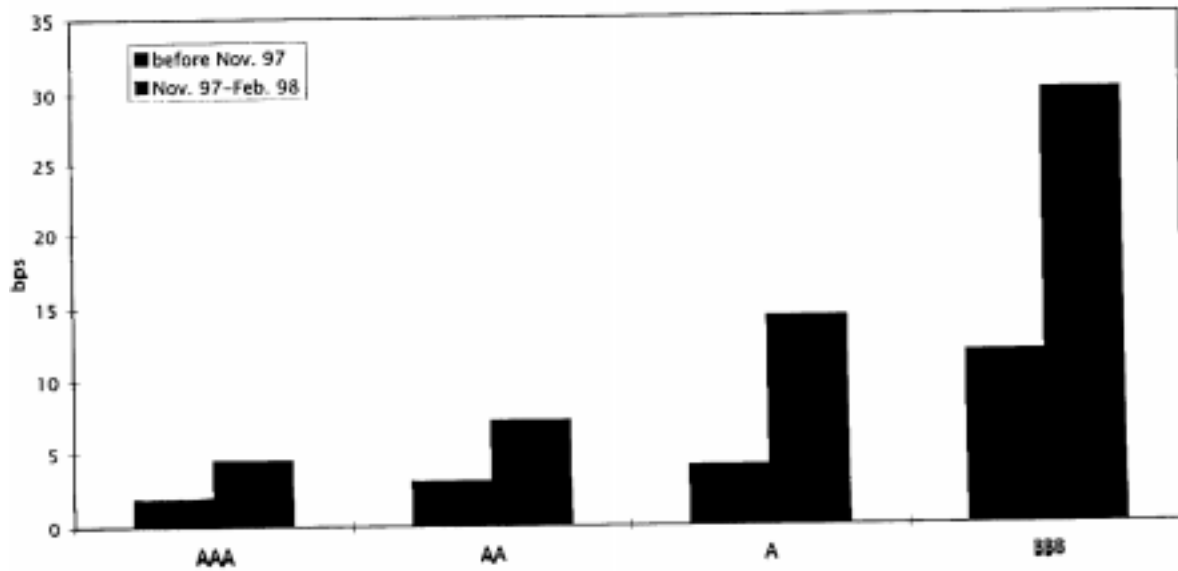
Standard Deviation of the Yield Spreads between Corporate Bonds and Government Bonds



Source: Author's calculations based on data from TSE and SDA. Moody's credit ratings are used.

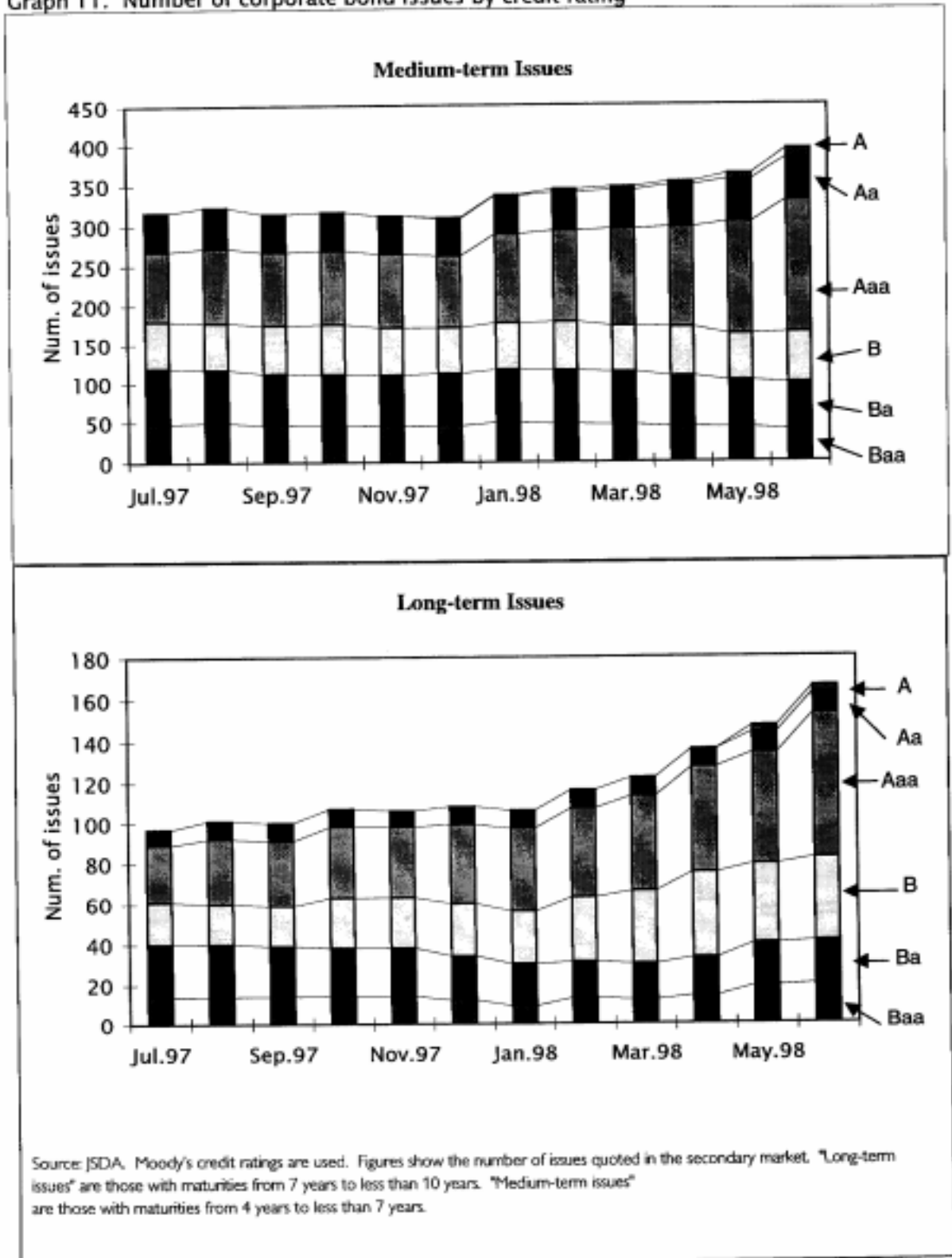
Graph 10

Bid-Ask Spreads for Corporate Bonds before and after the Financial Crisis

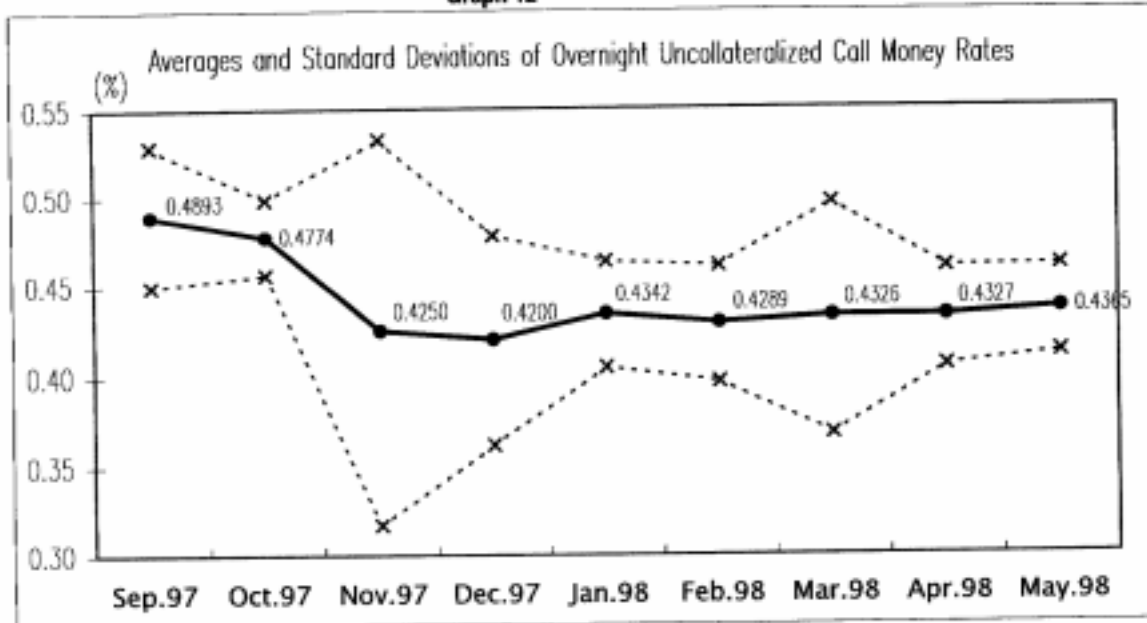


Source: Author's calculations based on survey of major securities companies.

Graph 11. Number of corporate bond issues by credit rating



Graph 12

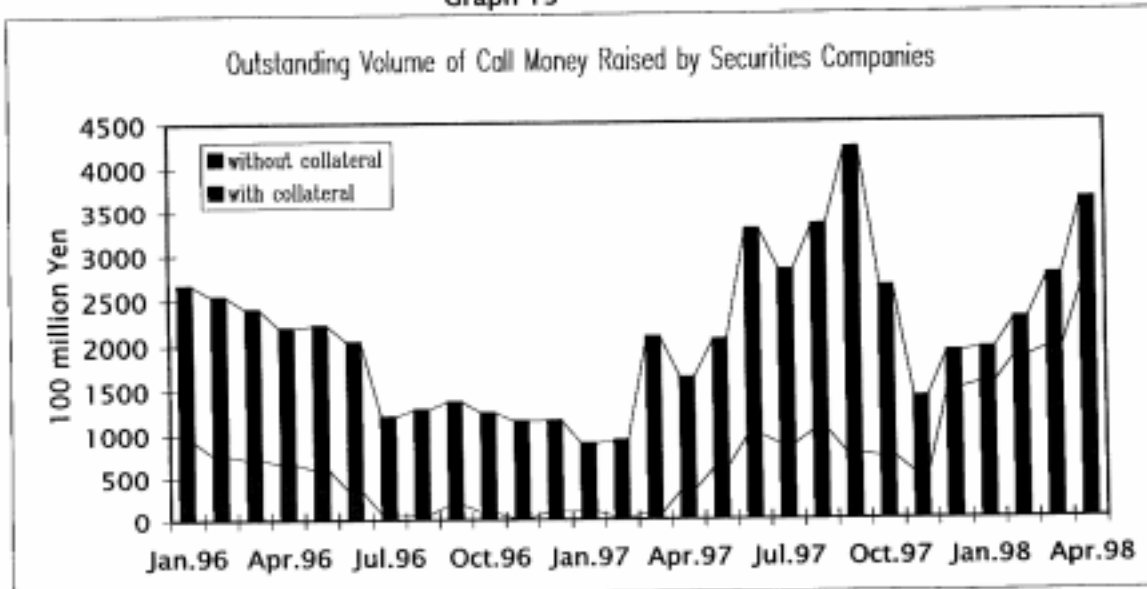


Source: Bank of Japan.

Note: 1. Bold line shows averages. Dotted lines show standard deviations.

2. Time scale shows the maintenance period of reserves, which starts from the 16th of a month to the 15th of the next month.

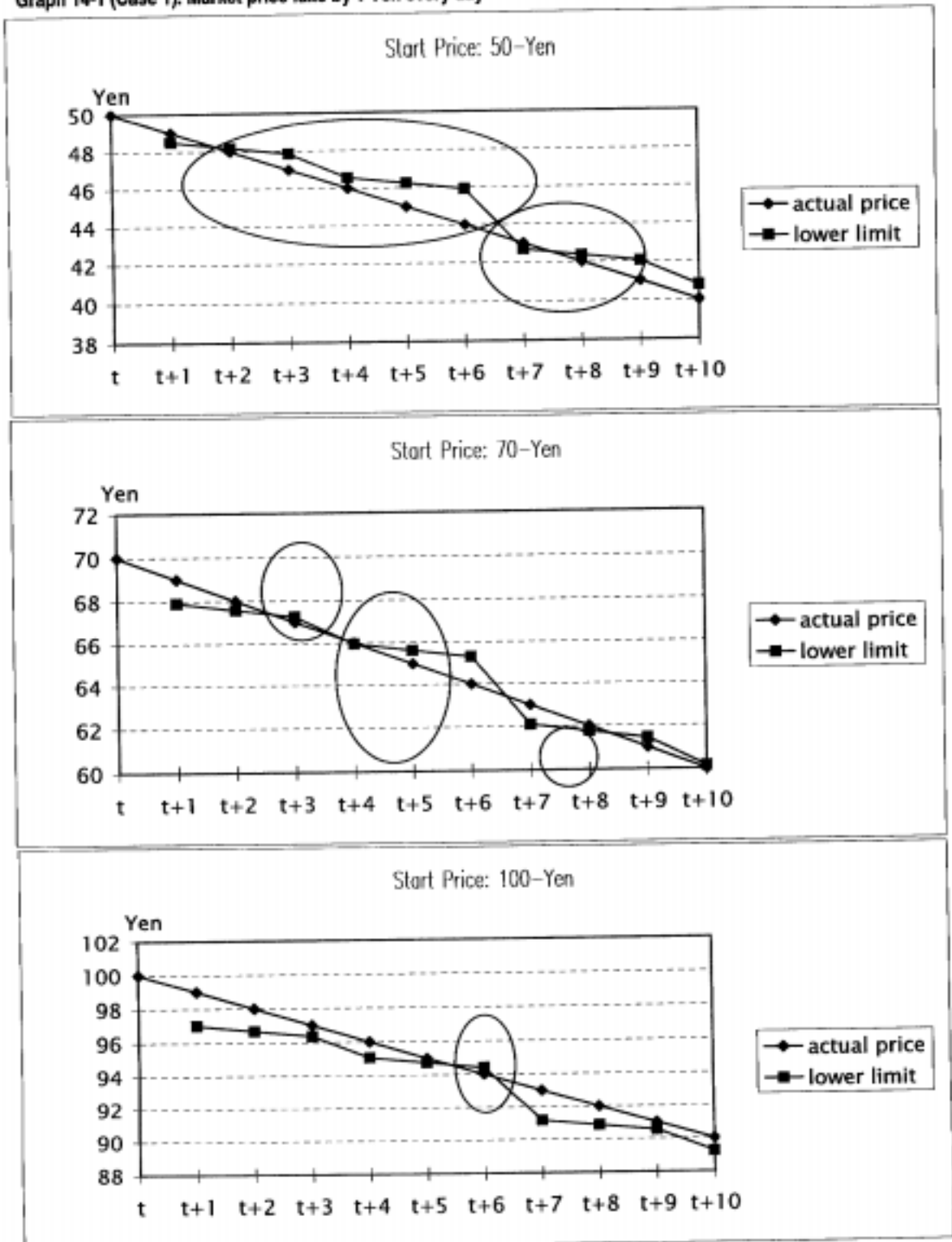
Graph 13



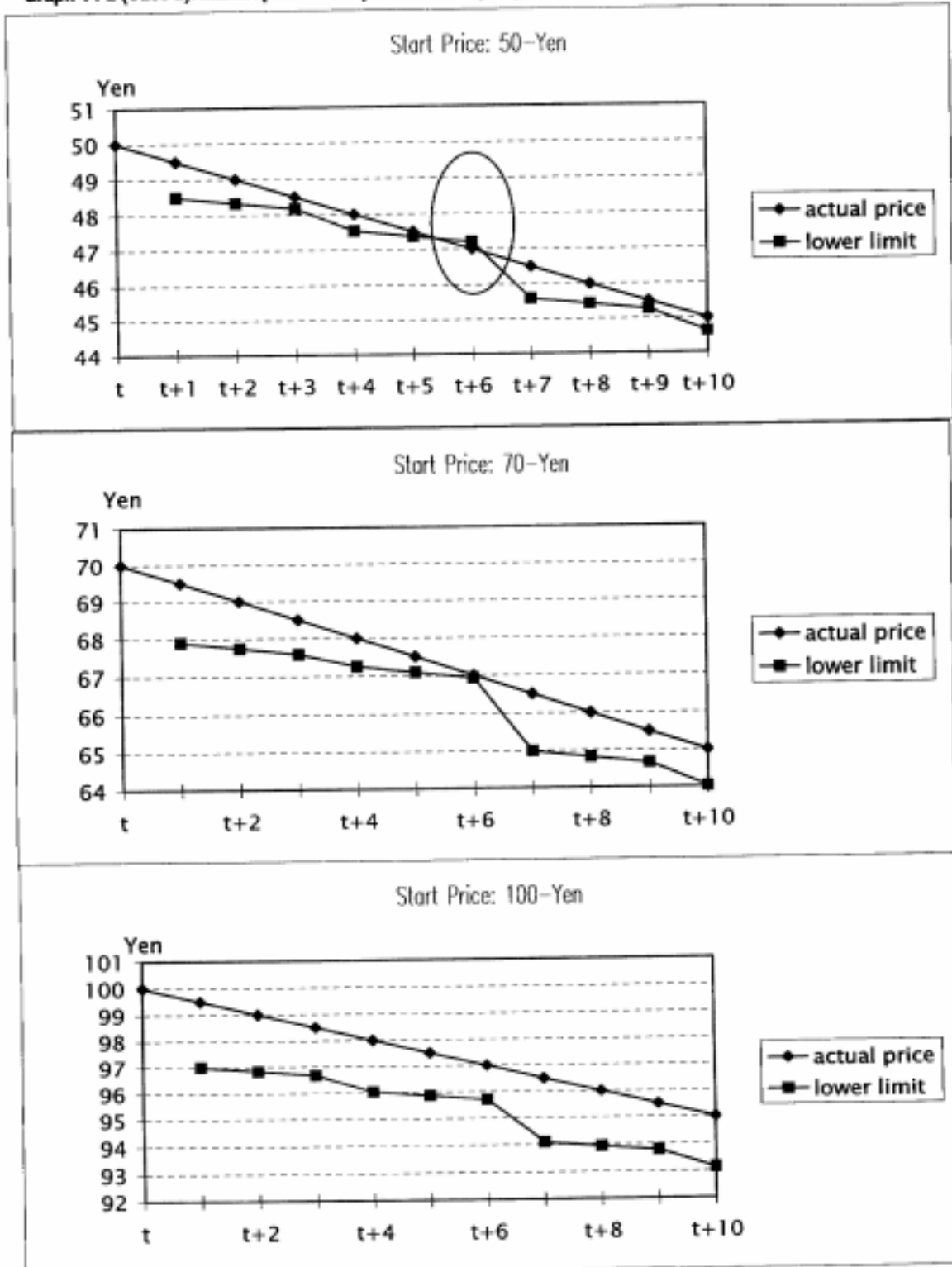
Source: Bank of Japan.

Graph 14. Simulation Results
(movement of actual prices and lower limits)

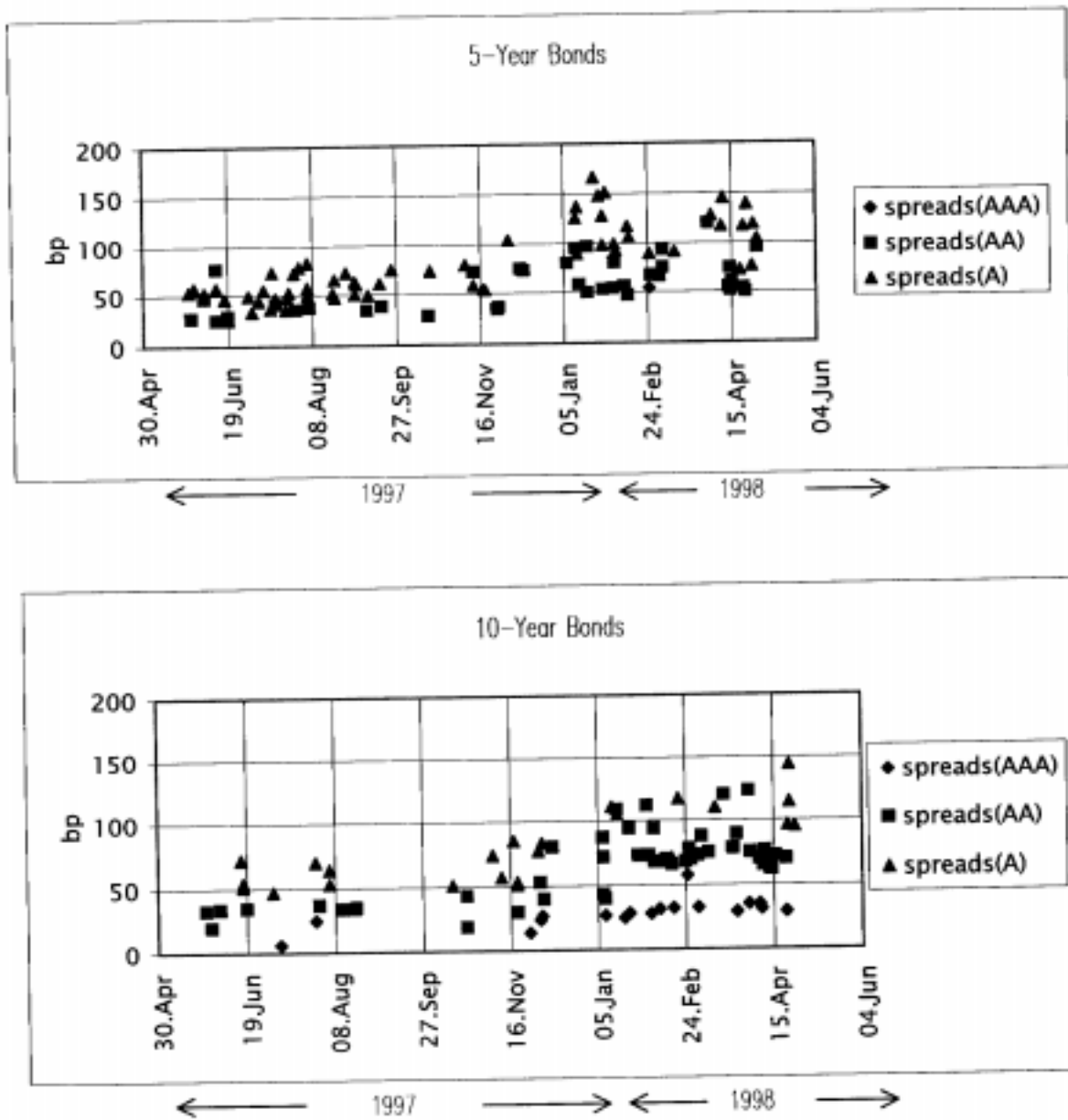
Graph 14-1 (Case 1). Market price falls by 1 Yen every day



Graph 14-2 (Case 2). Market price falls by 1/2-Yen every day

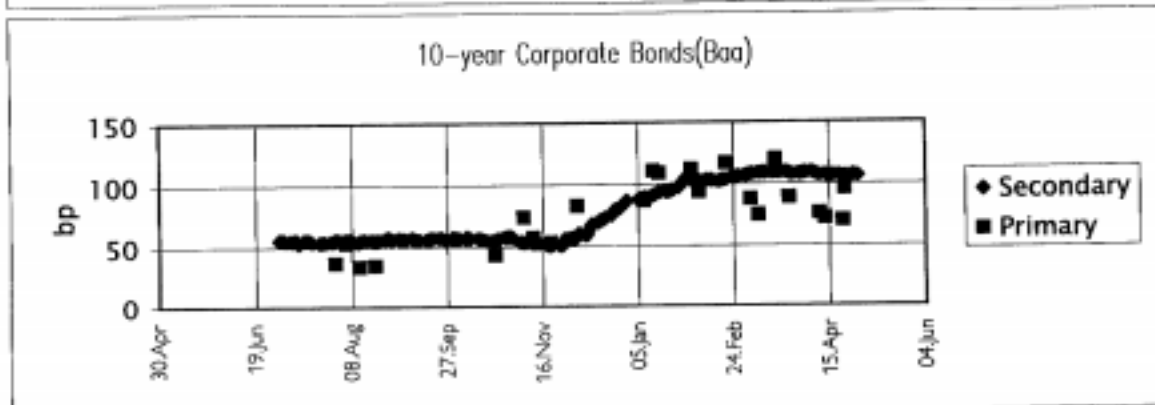
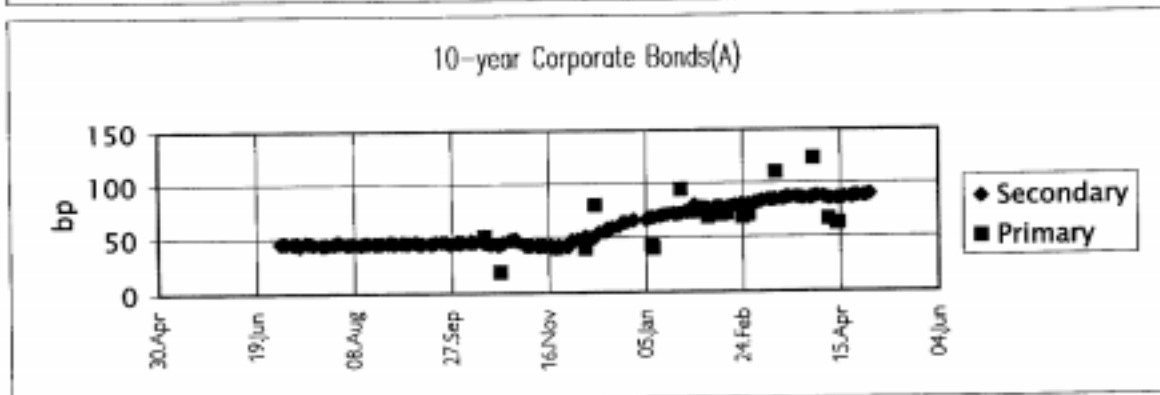
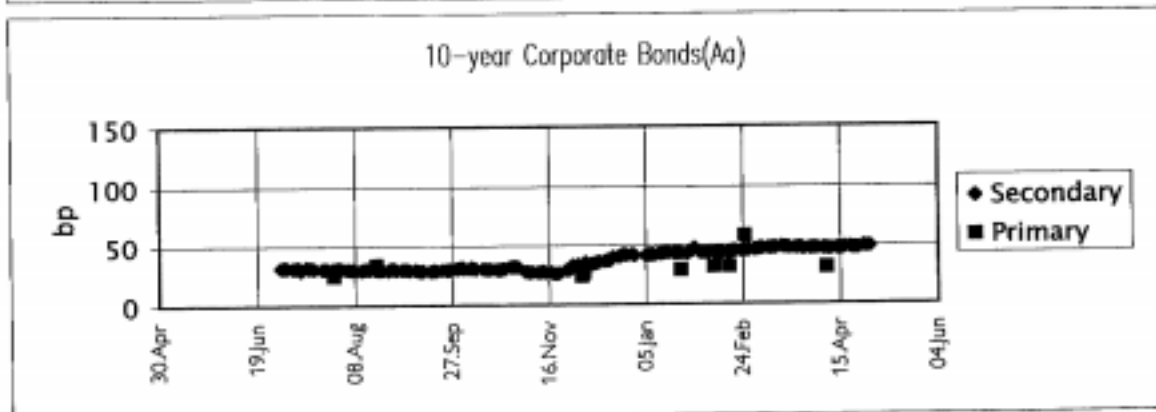
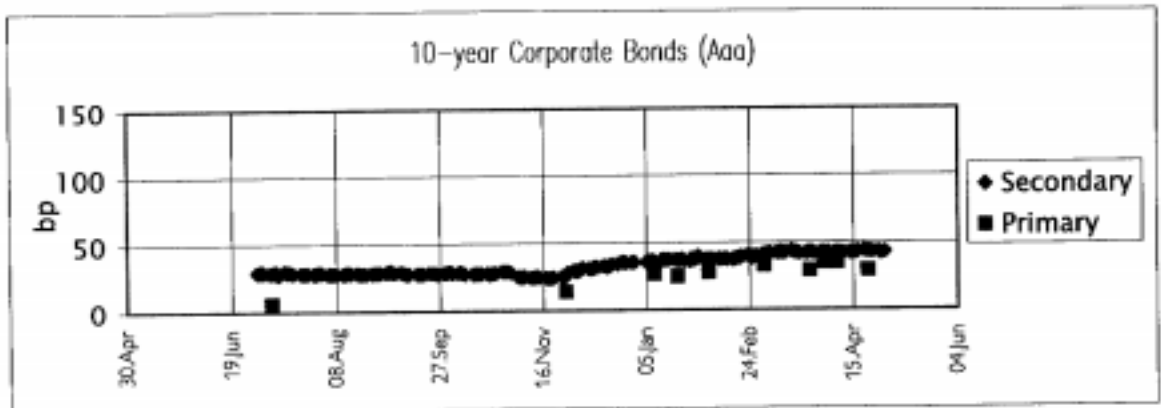


Graph 15. Spreads between Corporate Bond Coupons and Government Bond Yields



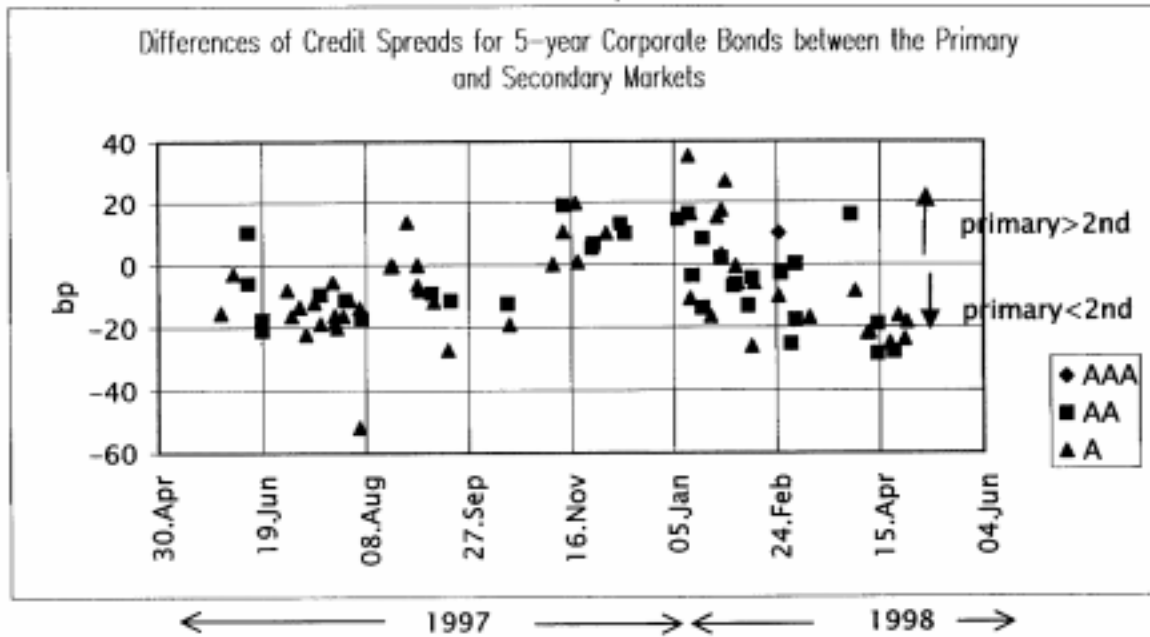
Source: Author's calculations based on data from JSDA and TSE.

Graph 16. Credit Spreads of Corporate Bonds in the Primary and Secondary Marke



Source: Author's calculations based on data from JSDA and TSE.

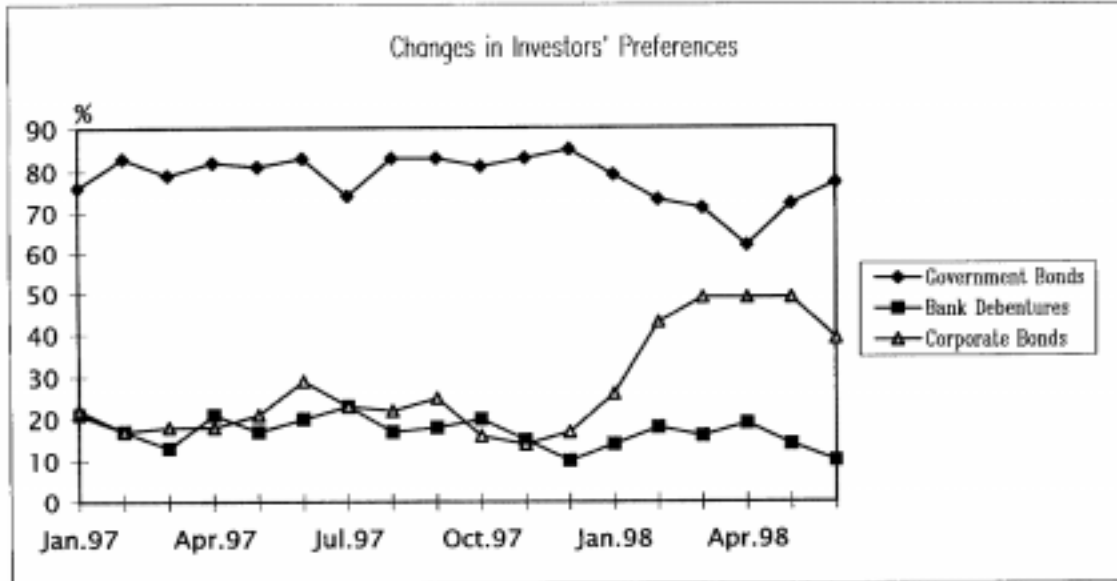
Graph 17



Source: Author's calculations based on data from JSDA and TSE.

Note: Credit spreads in the primary market are the spreads between coupons of newly issued 5-year corporate bonds and yields on 5-year government bonds. Credit spreads in the secondary market are the yield spreads between the same issuer's corporate bonds quoted in the secondary market and government bonds, both with a remaining life of 4-6 years.

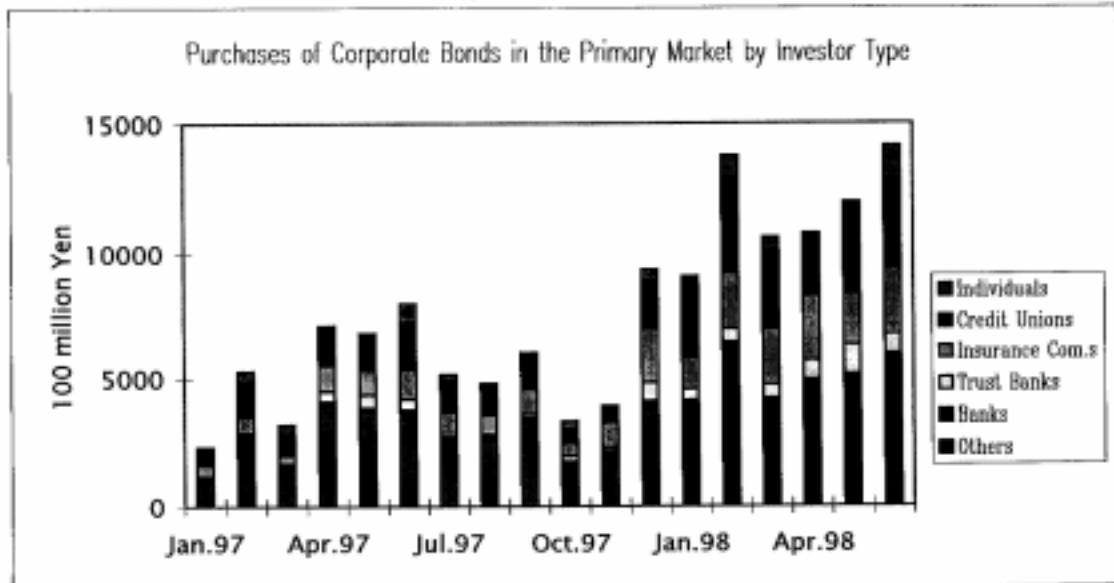
Graph 18



Source: Nikkei Quick "Monthly Survey on Securities Investment".

Note: Figures show percentage of answers to the question: "What's the most attractive type of securities at the moment?" Duplicate answers are allowed.

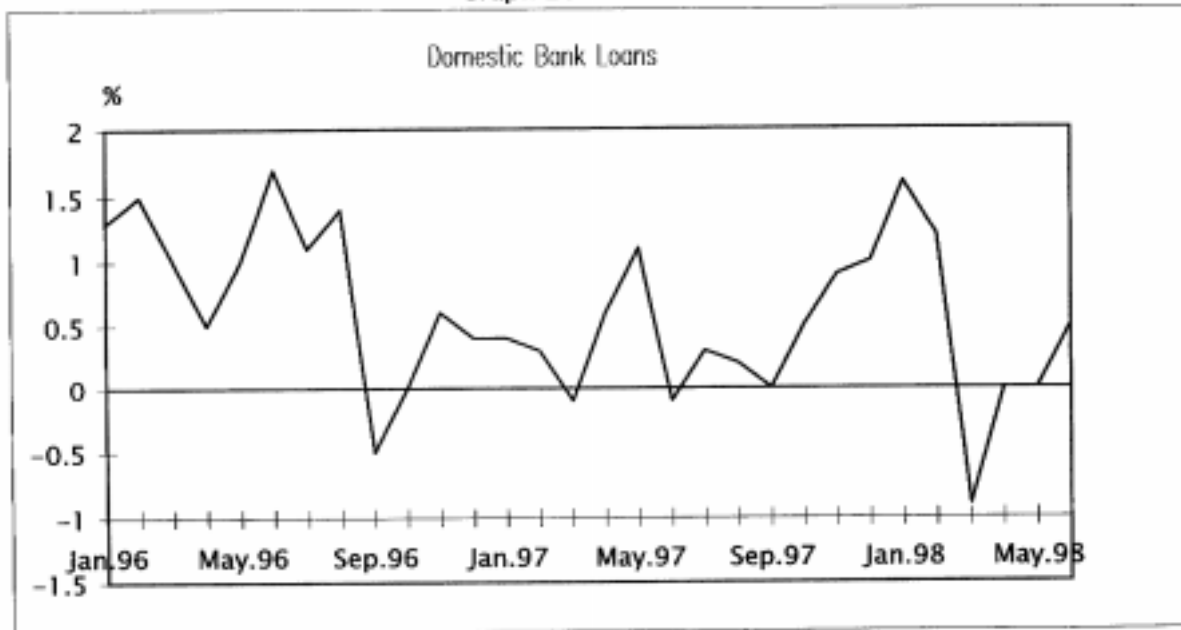
Graph 19



Source: Japan Securities Dealers Association.

Note: 1. Banks include city banks, long-term credit banks, regional banks, regional banks II, and foreign banks' branches in Japan.
 2. Credit unions include Shinkin banks, agricultural cooperatives, Norinchukin bank, Shokochukin bank, etc.

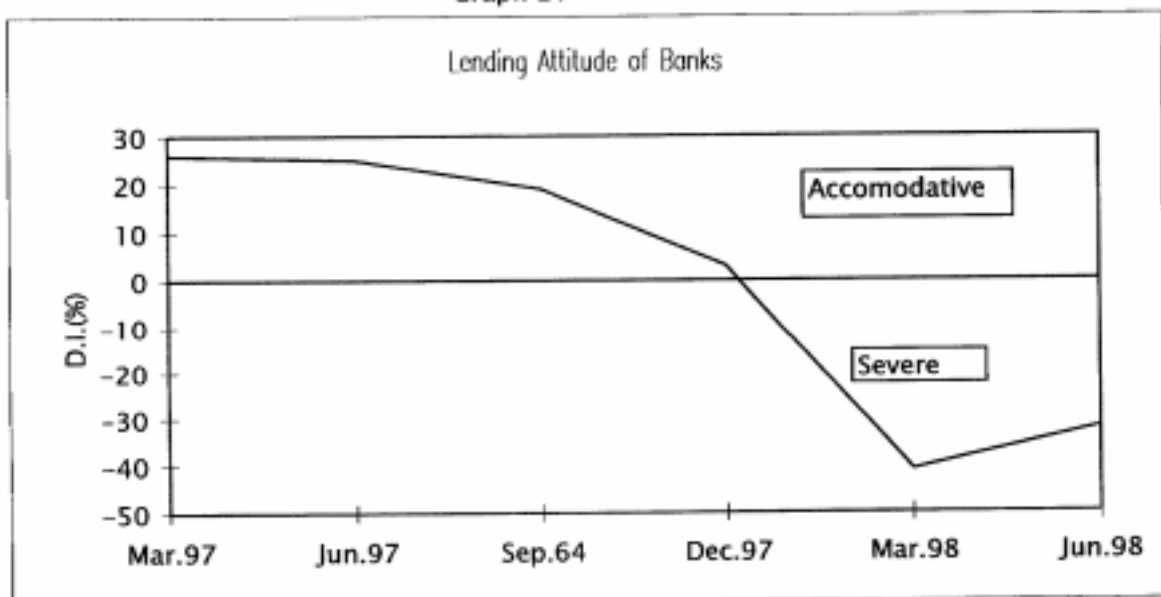
Graph 20



Source: Bank of Japan.

Note: Figures show year to year changes in the outstanding amount of loans by domestic banks at month's end.

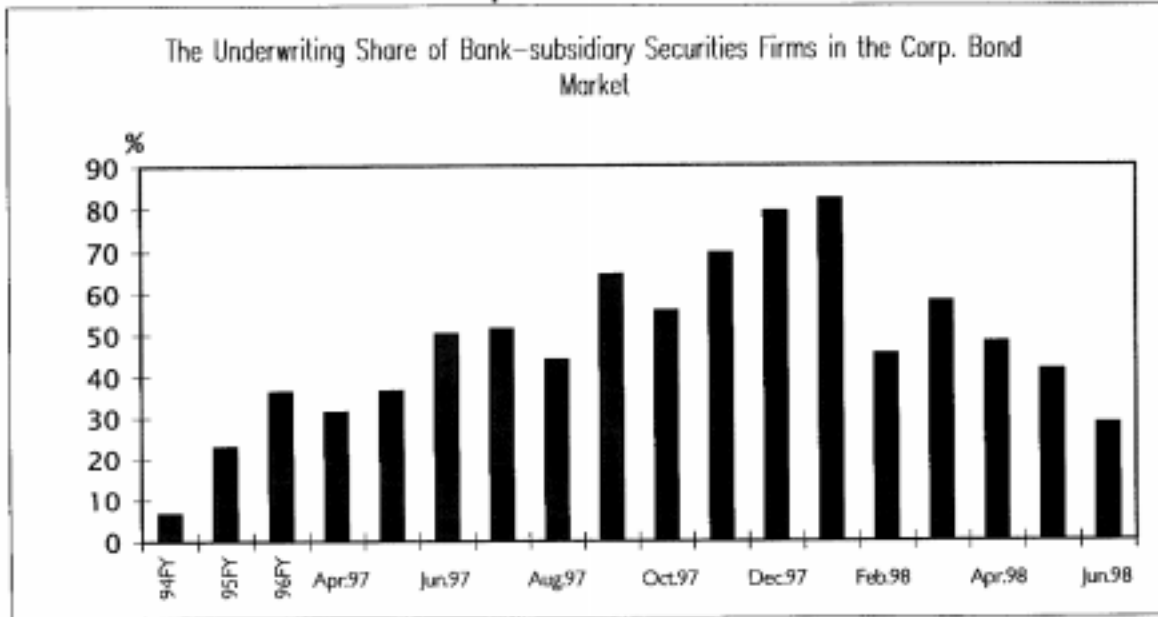
Graph 21



Source: Bank of Japan "Short-Term Economic Survey of Principal Enterprises (Tankan)."

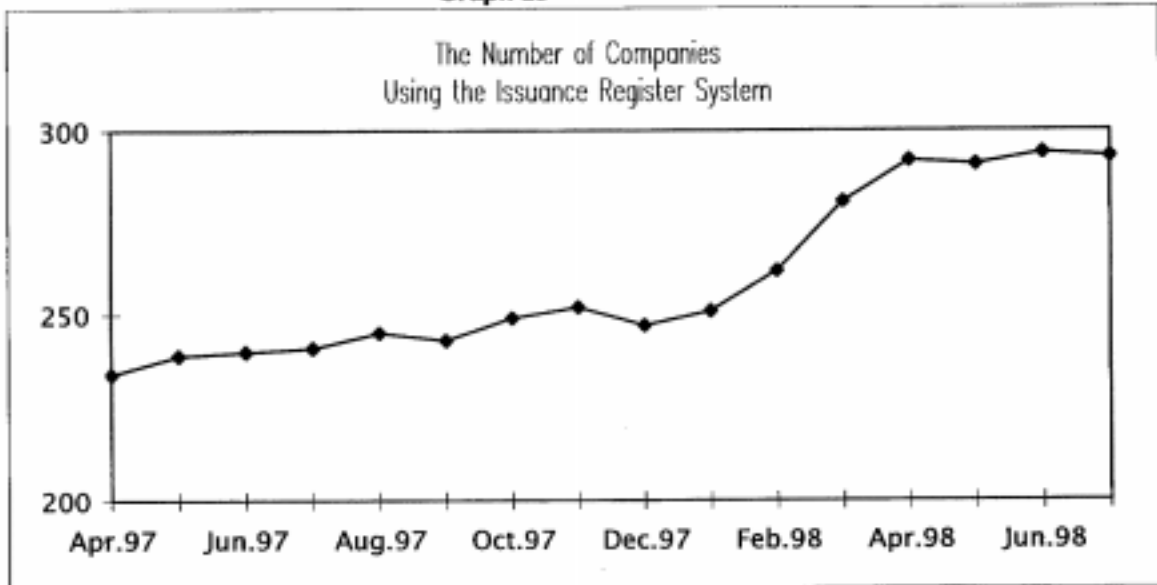
Note: Figures show Diffusion Index(%) on banks' lending attitude. The index is calculated by subtracting the share of respondents who answered "severe" from the share of those who answered "accommodative."

Graph 22



Source: Author's calculations based on data from Japan Securities Dealers Association.

Graph 23



Source: JSDA