Accelerated Rise and Distorted Vigor

Unconventional Interventions into an Emerging Market of Japan*

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Abstract

Japan experienced a rapid expansion of the capital market in the 1880-1900s, introducing Western institutions combining it with Japan's traditional bond market regime, which provided financial source of industrialization. The rapid expansion of the infant capital market was in fact accelerated by the banking sector. Faced with the first financial crisis, the central bank decided to directly prop-up the capital market leveraged by the banking sector, through rediscounting accommodation bills collateralized by specified corporate shares. The intervention asymmetrically sustained share prices, distorted risk distribution, but stabilized the young market by socializing equity-risk of shares designated as collateral.

Key words: Capital market and the central bank, unconventional monetary policy, Japan.
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Introduction

If asymmetry of information about types of the parties before concluding a contract or about actions of the parties after concluding a contract, and if the third-party enforcement by the judicial system is not available, governance of trades based on long-term and personal relationships is preferred to curb adverse-selection or moral-hazard. Meanwhile, asymmetry of information is calmed by technological development or effective judicial systems are formed, impersonal trades expand. The modern market economy, for instance, is an economy where the judicial system provided by the state with enforcement ability govern impersonal trades.

In financial markets, too, it depends on how asymmetric relevant information is and what kind of institutions deal with the asymmetry whether relational or personal arrangement of financing serves a firm. Diversity of these arrangements can be decomposed the ones due to evolution of individual firms and of the economic society as a whole. If markets of a society are not well integrated and hence transaction cost with a firm or an entrepreneur is prohibitively high to other market participants than those who have repeatedly traded with a firm or an entrepreneur, financing within networks composed of long-term relationships such as kinship or regional community. It is because risk premium of financing beyond long-term relationships would be prohibitively high. Aside from mutual loans of farmers in early modern Japan, which were the primary sources of agricultural financing, also in late 19th century Japan, regional financial cliques and networks, which drove industrialization in the provinces, were typical examples.[1] Then, as market integration proceeds, with the judicial system developed that enforces verifiable contracts, financial institutions specialized in screening and monitoring extend their reach beyond traditional personal networks. When the market integration progresses more and information about major industries is socially shared, individual investors invest in corporate shares and bonds, which is direct financing.

Independent of this society-wide development per se, individual industries and individual firms experience parallel evolutions. A young firm that has just been founded has not yet established its reputation in the market, and therefore other market participants than those who have long-term relationships with the founding entrepreneur cannot properly evaluate risk and profitability of the business and hardly prevent the entrepreneur from cheating. It is followed that kinship and local communities, or networks of venture capitalists fund the firm. Then, after the business is well run and the firm grows, the firm comes to depend on credit from financial institutions with expertise of monitoring. Until the point when the firm becomes matured as a going concern and is listed at a stock exchange, the firm has established its own reputation in the market and risk premium required by individual investors become accordingly lowered and thus the firm moves from indirect financing to direct financing for fund raising.

The period of Japan's nation-wide industrialization was a phase where individual firms of major industries simultaneously expanded fund procurement through direct financing, which was accompanied by the nation-wide market integration toward direct financing. This overlapping resulted in massive expansion of direct financing within a short period. Either the

[1] See Nakanishi (2009), pp. 157-299; Suzuki, Kobayakawa and Wada (2009), pp. 193-383; and Nakamura (2010), pp. 100-242.

modern cotton-spinning and the railway were completely new industry to Japanese people. As to institutional aspects, the Tokyo Stock Exchange and the Osaka Stock Exchange were established in 1878, the Code of Civil Procedure was promulgated and came into force in 1890, the Commercial Code in 1899. Along with this development, from the early 1880s, modern cotton-spinning companies and railway companies were founded as joint stock companies based on technologies introduced from the Western world. While they raised fund by share issuance and bank loan at the beginning, from the 1890s, they replaced bank loan with bond issuance and augmented reliance on direct financing as they established reputation in the market. As the young national market was being rapidly integrated, growth of young modern industries kept pace, which realized a rapidly expanding capital market in early 20th century Japan.

Given the existing challenges, rapid expansion of direct financing to implanted industries in a developing economy could never be easy to achieve. It is a question to be inquired how it indeed happened nonetheless. Direct intervention to the capital markets by central banks such as massive bond and share purchases has become a normal instrument rather than an usual one in the last two decades to calm the collapse of the asset prices. The current version of the quantitative easing is directly originated from disparate efforts of the Bank of Japan from the 1990s to the early 2000s amid the persistent deflation and then has been referred by Western central banks (Miyao (2002); Honda and Kuroki (2006); Ogawa (2007) and Wieland (2009)). Also more than a century ago, it was the case in Japan as well. This paper quantitatively revisits the significance of bank loans to individual investors collateralized by shares and of rediscounting by the Bank of Japan of accommodation bills collateralized by shares, which has been descriptively mentioned.[2]

1 Bank loans collateralized by shares and the Bank of Japan

1.1 The stock exchanges during Japan's industrialization

In early modern Japan ruled by the Tokugawa shogunate, rice-denominated bonds issued by local feudal lords were actively traded in secondary bond markets such as the Osaka Dojima Rice Exchange and the Otsu Rice Exchange, and these markets formed efficient bond prices in terms of the weak form.[3] After the Meiji Restoration, under the 1876 Rice Exchange Act, these rice exchanges were reorganized and the Dojima Rice Exchange in Osaka Prefecture, the Omi Rice Exchange in Shiga Prefecture, the Kabutocho Rice Exchange and the Kakigaracho Rice Exchange in Tokyo Prefecture, the Kyoto Rice Exchange in Kyoto Prefecture, the Akamagaseki Rice Exchange in Yamaguchi Prefecture were established in 1876. In 1878, the Stock Exchange Act, which was based on the Rice Exchange Act with some modification such as increased requirement of capitalization, was came into force and the Tokyo Stock Exchange and the Osaka Stock Exchange were established in the year.[4]

[2] See Oshima (1952), pp. 35-80; Nagaoka (1971), pp. 17-34; and Takamura (1980), p.4.
[3] See Takatsuki (2012), pp. 294-367.
[4] See Kobayashi (2012), pp. 73-96.

After the leading firms such as the Osaka Cotton Spinning and the Japan Railway Company showed successful results in the early 1880s, the rush of corporation establishment followed particularly in the cotton-spinning and railway industries. This boom led Japan's industrialization went along with expansion of the capital market in the late 1880s and the direct financing continuously increased its share in corporate finance.[5]

While fund raise of those joint stock companies by share issuance was directly met by individual investors, it was not only household assets of wealthy class but also bank loans to investors which sustained the investment boom from the middle 1880s. Investor **A** first purchased some shares by his household assets. Then **A** borrowed money by collateralizing the shares he purchased from a bank and purchased more shares. Then **A** again collateralized the shares, borrowed more, and purchased more shares. The bank loans collateralized by shares allowed highly leveraged investment and it supported the stock investment boom.[6] More than forty percent of bank loans and bank overdrafts are estimated to have been collateralized by corporate shares from the middle 1890s to the middle 1910s,[7] which indicates that the rush of startups from the middle 1880s should not have been possible without bank loans and overdrafts collateralized by shares.

1.2 Financial crisis in 1890 and rediscount of accommodation bills with collateral

The National Bank Act and other lows and regulations had assumed commercial banking business of the British type but did not assume loans to investors for stock investment. Regardless of the government policy, these loans to stock investment endogenously grew in the late 1880s. However, the credit expanded by loans collateralized by shares suddenly began to contract as soon as the slowdown beginning in early 1890 triggered a fall of share prices. The credit contraction accelerated the fall of share prices and led to the peak of tension in the financial market. When the share price level that had been sustained under highly leveraged investment based on loans collateralized by shares began to fall, it devalued collateral held by banks, and debased banks' assets. Faced with de-leveraging process accompanied with falling share prices and banks' fail, the Bank of Japan and the government needed to decide whether to let the financial system go meltdown and force banks to back to commercial banking business or to recognize the role of bank loans collateralized by shares and to control it.

After all, in May 1890, the Bank of Japan designated shares of major companies such as railway companies as acceptable collateral and publicly opened the channel of rediscounting accommodation bills discounted by banks if the notes were collateralized by the designated shares. Even before this decision, the Bank of Japan sometime loaned or rediscounted with collateral of corporate shares and bonds, but the procedure was not publicly opened. Furthermore, the Bank of Japan Act did not allow the bank to discount accommodation bills without basis of commercial transactions. As an exception, the Bank of Japan decided to rediscount

[5] See Hoshi and Kashyap (2001), pp. 15-44 and Teranishi (2006), pp. 17-18.

[6] See Shimura (1969), pp. 52-59.

[7] See Ishii (n.d.), p. 43 and Ishii (2010), pp. 265, 274-275.

accommodation bills collateralized by corporate shares the bank designated on the basis of collateral value the bank specified.[8]

1.3 Expansion of rediscounting bills collateralized by shares

Since then, "rediscount of bills collateralized by shares," with "rediscount of promissory notes," became primary channels of rediscounting at the central branch of Tokyo and the branch of Osaka of the Bank of Japan, which together amounted to roughly forty percent of total rediscount until the middle 1890s.[9] Furthermore, the bank extended the designation of corporate shares to those of medium-sized railway companies.

Rediscount of accommodation bills with collateral became more than fifty percent of total rediscount of the Bank of Japan in the late 1890s, and sixty percent in the early 1900s. Corporate shares accounted to about sixty percent of total collateral in rediscounting, then fell to thirty percent in the middle 1900s, and dropped to 2 percent, as corporate shares were replaced by the Japanese Government Bonds as collateral.[10] Therefore, it was from the 1890s to the early 1900s when the Bank of Japan directly injected fund to stock investment.

2 The effect of rediscount with collateral shares

2.1 Data

While it has been mentioned that rediscounting accommodation bills collateralized by corporate shares by the Bank of Japan could distort,[11] the effect of the policy on the capital market as a whole has not been quantitatively addressed. The Bank of Japan recorded prices and trade volumes of all on-market trades at the Tokyo Stock Exchange from October, 1890 to May, 1898, and at the Osaka Stock Exchange from January, 1891 to October, 1899 in the document titled "Nihon Ginko tokei geppo (Monthly statistics of the Bank of Japan)." In addition, over-the-counter prices of designated corporate shares were recorded from October, 1890 to May 1898 on the monthly basis. Furthermore, "Nihon Ginko tokei geppo" reports amounts of rediscounting. Based on these records, this paper builds monthly series of share prices, trade volumes, amount of rediscounting, and examines the policy effect on the capital market. Estimation is based on the first difference series.

Panel unit root test of on the level of the share price series rejects hypotheses of common unit root and individual unit root for the Tokyo Stock Exchange and individual unit root.[12]

[8] See Nihon Ginko enkakushi dai 1 shu dai 2 kan(History of the Bank of Japan, Series 1, volume 2), p.187 and Oshima (1952), pp. 73-75.

[9] "Nihon ginko tokei geppo (Monthly statistics of the Bank of Japan)," held by the Bank of Japan.

[10] See Nihon Ginko Hyakunenshi hensan iinkai (Editorial committee of the one hundred history of the Bank of Japan), *The one hundred history of the Bank of Japan, volume 2*, pp. 56-59.

[11] See Ishii (2010), p. 266.

[12] (1) Tokyo Stock Exchange: a) Common unit root test (Levin, Lin and Chu test): *t* statistics: -6.4576^{***}, Number of cross sections: 95, Number of total observation: 2,609; b-1) Individual unit root test (Im, Pesaran and Shi test): *W* statistics: -5.0264^{***}, Number of cross sections: 84, Number of total observations: 2,576; b-2) Individual unit root test (ADF-Fisher test): χ^2 : 256.2844^{***}, Number of cross sections: 95, Number of

That is, both in Tokyo and Osaka, individual share price series were not random walk and an assumption that they were stationary in level terms is not rejected. We thus exercise panel estimation on level terms in the following sections.

2.2 Effects of quantitative intervention in the Tokyo market

Table 1 shows that how the Bank of Japan policy measures, official discount rate of the Bank of Japan (TKDR_t), value of promissory bills that were rediscounted by the Bank of Japan (TKPND_t), and value of bills collateralized by securities that were rediscounted by the Bank of Japan (TKPNCD_t) affected share price of firm i at the Tokyo Stock Exchange ($\mathrm{TKP}_{i,t}$). Rediscounting bills collateralized by securities was rediscounting of bills backed by securities such as shares and rediscounting promissory bills was rediscounting of bills with collateral commodities or without putting up collateral. To control for common exogenous shocks, a diffusion index is inserted as a regressor as well.

If the official discount rate (TKDR_t), the conventional price intervention, was effective for increase in share prices, it is presumed to have a significantly negative coefficient. However, in model 1-1, a pooled estimation, the official discount rate (TKDR_t) has a positive but insignificantly coefficient. The reason was selective security purchases. Model 1-2 controls for the interaction term between the official discount rate (TKDR_t) and the dummy variable of being designated as collateral for rediscount by the Bank of Japan ($\mathrm{BOJC}_{i,t}$), and then this interaction term ($\mathrm{TKDR}_t \times \mathrm{BOJC}_{i,t}$) has a significantly positive coefficient while the official discount rate (TKDR_t) has a insignificantly negative coefficient. Under the gold standard, the Bank rose the official discounting rate to cool down the overheated economy and to decrease current account deficit. Through this conventional channel, increase in the official discounting rate is presumed to be followed by decrease in share prices. Meanwhile, the Bank purchased designated shares through rediscounting bills collateralized by designated shares to avoid collapse of the whole market. The latter upward effect dominated the former downward effect.

Rediscounting bills collateralized by designated shares was introduced in May 1890 to avoid further deepening of the stock market collapse. From the beginning, the object of the unconventional policy was offsetting the share price drops. If this unconventional measure was effective, rediscounting of bills collateralized by designated shares (TKPNCD_t) is presumed to have positive coefficient. Both of models 1 and 2 support this prediction. Further, with controlling for the interaction term between rediscounted bills collateralized by designated shares (TKPNCD_t) and the dummy variable of being designated as collateral for rediscount by the Bank of Japan ($\mathrm{BOJC}_{i,t}$), both this interaction term ($\mathrm{TKPNCD}_t \times \mathrm{BOJC}_{i,t}$) and the rediscounted bills collateralized by designated shares (TKPNCD_t) still have a significantly positive coefficient in model 1-3. Rediscounting collateralized by designated shares propped

total observations: 2,609; b-3) Individual unit root test (PP-Fisher test): χ^2: 268.5740^{***}, Number of cross sections: 95, Number of total observations: 2,746. (2) Osaka Stock Exchange: a) Common unit root test (Levin, Lin and Chu test): *t* statistics: -0.7330, Number of cross sections: 47, Number of total observations: 1,571; b-1) Individual unit root test (Im, Pesaran and Shin test): *W* statistics: -0.0335, Number of cross sections: 47, Number of observations: 1,591; b-2) ADF-Fisher test: χ^2: 135.4938^{***}, Number of cross sections: 47, Number of total observations: 1,591, b-3) PP-Fisher test: χ^2: 117.4364^{**}, Number of cross sections: 47, Number of total observations: 1,723.

up the whole market as the significantly positive coefficient of the rediscounted bills collateralized by designated shares (TKPNCD_t) shows, while prices of designated shares enjoyed additionally rises as the positive coefficient of the interaction term ($\mathrm{TKPNCD}_t \times \mathrm{BOJC}_{i,t}$) indicates. Unconventional selective purchases shares shored up the whole market, but with a significant distortion between designated and non-designated shares.

Once a share was designated as an official collateral by the Bank of Japan, that decision was not rescinded in the sample period. Therefore, designation by the Bank was included in fixed characteristics for shares designated from 1890s. Indeed, in fixed effect models 1-4, 1-5, and 1-6, effect of designation by the Bank of Japan ($\mathrm{BOJC}_{i,t}$) disappears and the official discount rate (TKDR_t) has a significantly positive coefficient as predicted.

2.3 Effects of quantitative intervention in the Osaka Market

Table 2 provides the results of the same estimations for individual share prices (OSP_{imt}) as those in **Table 1** for the Osaka market. The results are in contrast to those for Tokyo. First, the official discount rate (OSDR_t) has, as conventional views predict, a significantly negative coefficient in all specifications.

Rediscounting policy of bills collateralized by designated shares did not differ in Tokyo and in Osaka. A significantly positive coefficient of the interaction term between official rediscount rate and the dummy variable of collateral designation ($\mathrm{OSDR}_t \times \mathrm{BOJC}_{i,t}$) in model 2-2 indicates that this unconventional policy effect rose the prices of designated shares as it did in Tokyo. In Osaka, however, this effect of unconventional policy was dominated by price movements of non-designated shares, which resulted in a significantly negative coefficient of the official discount rate (OSDR_t).

Rediscounting of bills collateralized by designated shares behaved in the same way as in Tokyo. As the significantly positive coefficient of the interaction term between the rediscounted bills collateralized by designated shares and the collateral designation dummy variable ($OSPNCD_t \times \mathrm{BOJC}_{i,t}$) in model 2-3 shows, rediscounting of bills collateralized by designated shares selectively increased prices of the designated shares. Still this effect did not dominate the whole market in Osaka.

The number of designated shares were 20 out of 145 listed at the Tokyo Stock Exchange and 14 out of 99 listed at the Osaka Stock Exchange. So the ratio of designated shares over the all listed shares was not smaller in Osaka. However, railway companies, a representative sector of designation by the Bank of Japan, were actively traded at the Tokyo Stock Exchange while cotton spinning companies, which were not designated by the Bank of of Japan, were actively traded in Osaka. Shares not directly propped-up by financial policy were dominant in trades at Osaka and it resulted in the results contrasting to those of Tokyo. In Osaka, after all, official bank rate, the conventional measure, took a dominant role in the Osaka Market.

3 Outcome of distorted risk distribution

3.1 Designated corporate shares at the Tokyo market

When contemporary central banks quantitatively intervention the markets through purchases of securities, they do so not because they expect effects from continuously monopolist purchases by themselves. What they in general expect is that declaration of securities purchases revitalize trades of locked-up shares in the market, which potentially lead to general price rises. Thus in this section let us examine how the Bank of Japan interventions affected trade volumes in the market.

Table 3 shows how the Bank of Japan policies affected trade volumes at the Tokyo Stock Exchange ($TKVOL_t$). If the conventional credit eases, the official discount rate (TKDR_t) decrease, revitalized the stock market, it should have a negative coefficient. Model 3-1 indeed shows a significantly negative coefficient of the rate (TKDR_t). Meanwhile, the interaction term between the official discount rate and the collateral designation dummy variable ($\mathrm{TKDR}_t \times \mathrm{BOJC}_{i,t}$) has a significantly negative coefficient in model 3-2, which implies that the trade volume of designated shares moved in opposite direction. When the official discount rate (TKDR_t) rose and credit was tightened, shares designated by the Bank of Japan were more actively traded.

Further, with controlling for the interaction term between the rediscounted bills collateralized by designated shares and the collateral designation dummy variable ($\mathrm{TKPNCD}_t \times \mathrm{BOJC}_{i,t}$) in model 3-3, this interaction term itself has a significantly positive coefficient but the rediscounted bills collateralized by designated shares (TKPNCD_t) does not have a significant variable. Rediscounting of shares collateralized by designated shares increased trade volumes only of designated shares. As a robustness check, model 3-5 and model 3-6 control for fixed effect including designation by the Bank of Japan. Then model 3-5 provides a significantly negative coefficient of the interaction term between the official discount rate and the collateral designation dummy variable ($\mathrm{TKDR}_t \times \mathrm{BOJC}_{i,t}$) and model 3-6 provides a significantly negative coefficient of the interaction term between the rediscounted bills collateralized by designated shares and the collateral designation dummy variable ($\mathrm{TKPNCD}_{i,t} \times \mathrm{BOJC}_{i,t}$), which supports our inference.

The Bank of Japan was under the silver standard until September 1897 and under the gold standard from October 1897. Under either system, the most prioritized policy target was maintaining the exchange rate of yen as being fixed to silver or gold. In practice, expansion in a booming phase was likely accompanied by increase in trade deficit, and to maintain international confidence for yen, the Bank needed to cool domestic demand by tightening credit through discount rate increases. To ascertain the confidence for yen, in not a few cases, the Bank did not hesitate to trigger a shock to the domestic financial market by discount rate rises.

Results in **Table 1** and **Table 3** real that shares designated as collateral by the Bank of Japan were selectively shielded from these shocks of the discount rate rises. When the Bank of Japan rose the official discount rate, the Bank simultaneously increased rediscounting of bills collateralized by designated shares, it sustained prices of designated shares and maintained trade volumes of designated shares.

3.2 Over-the-counter trades of designated shares

Also in the Osaka market, shares designated as collateral by the Bank of Japan behaved differently from other shares. **Table 4** shows how policy measures affected trade volumes at Osaka. Model 4-1 shows a significantly positive coefficient of the interaction term between the official discount rate and the collateral designation dummy variable ($\mathrm{OSDR}_t \times \mathrm{BOJC}_{i,t}$) shows that trade volumes of shares designated as collateral by the Bank of Japan increased in tightening phases at Osaka as well.

In model 4-3, the interaction term between the rediscounted bills collateralized by designated shares and the collateral designation dummy variable ($\mathrm{OSNPCD}_t \times \mathrm{BOJC}_{i,t}$) has a significantly positive coefficient, which indicates that rediscounting of bills collateralized by designated shares selectively activated trades of shares designated as collateral by the Bank of Japan.

As in Tokyo, in tightening phases, the market predicted purchases of designated shares by the Bank of Japan and hence trades of designated shares were maintained. However, weights of designated shares in the market was so small that it did not dominate the whole market behavior, different from Tokyo.

3.3 Decreasing equity premium

We have shown that rediscounting of bills collateralized by designated shares affected individual price movements of designated shares. It implies that the policy measures brought asymmetric effects on risk of designated shares. Once a share was designated as a collateral, bills collateralized by the designated share was presumed to be discounted by the specified collateral value without limit. In particular under downward pressures, increase in rediscounting of bills collateralized by designated shares are expected to have increased share prices. In designated shares, railway companies occupied a large portion, and thus the asymmetric policy effect was large especially in the Tokyo market. Meanwhile, designation was public information and as soon as a share was declared, it was factored in the price of the designated share. Except for the very first moment, any holder of designated shares could not earn excess return.

Then, where did a potential distortion of asymmetric intervention come up? It was a considerable decrease in equity risk premium, which was required by investors against price volatility risk. **Table 5** and **Table 6** give equity-risk premium, which is the price growth plus the dividend minus the yield of the Japanese government bonds, a presumably risk-free asset, for the shares, whose information about paid-in capital and dividend is available (Kling, Nakabayashi and Yuki (2009)).

In the Tokyo market, the equity-risk premium drastically decreased from over 10 percent on average in 1880-1889 to less than 0 percent on average in 1890-1899 (**Table 5**). Shares listed at the Tokyo Stock Exchange, particular railway companies designated as collateral by the Bank of Japan, came to yield almost the same return as the government bond or saving account did.

In the Osaka market, where designated shares accounted for smaller portion, decrease in equity-risk premium in the sam period was much smaller than that in Tokyo (**Table 6**).

This smaller distortion in Osaka might be interpreted as a distortion when the central bank constrains its asymmetric intervention within a limit such that it does not dominate the whole market.

Conclusion

Equity finance in Japan rapidly grew being supported by the banking sector in the 1880s, and the equity finance boosted by the banking sector further expanded under the Bank of Japan's rediscounting of bills collateralized by designated shares in the 1890s. Since collateral designation itself was public information, designation was factored in the price as soon as it was declared and the share price was adjusted in the upward direction. It resulted in a drastic fall of the equity-risk premium in the 1890s.

It meant that designated sectors, mainly the railway industry, came to be able to raise funds as cheap as saving account or the government bonds did. This cheap money was supplied through socialization of investment risk for specific industries by the Bank of Japan. Why direct corporate financing could drastically grew and fund industrialization of Japan in the 1890s? At least a cause was distortion of risk taking through discounting policy of the Bank of Japan. Japan experienced a serious credit contraction in the recession from 1900, which was arguably exacerbated by unconventional policy measures of the Bank of Japan, and so the Bank backed to a conventionally conservative policy from 1900. At the same time, the stock market propped-up by the Bank enabled massive investment in infrastructure of emerging Japan. Japan is still a railway-based economy and the most of existing trunk lines were built in the period. Even with counting a potential distortion of resource allocation due to the asymmetrically unconventional policy measures by the Bank of Japan, a positive effect of the big push by the Bank to emerging Japan does not seem to be negligible.

References

Honda, Yuzo and Yoshihiko Kuroki, "Financial and capital markets' responses to changes in the central bank's target interest rate: The case of Japan," *The Economic Journal*, Jul 2006, *116* (513), 812–842.

Hoshi, Takeo and Anil Kashyap, *Corporate financing and governance in Japan: The road to the futre*, Cambridge, MA: The MIT Press, 2001.

Ishii, Kanji, "Kigyo kinyu no keisei (Formation of corporate finance)," in Takeshi Abe and Naofumi Nakamura, eds., *Koza Nihon keieishi 2 Sangyo kakumei: 1882-1914 (Japanese Business History volume 2, Industrial revolution: 1882-1914)*, Minerva Kyoto 2010, pp. 257–278.

____ , "Senzen Nihon no kabushiki toushi to sono shikin gensen (Stock investment and its source of fund in prewar Japan)."

Kling, Gerhard, Masaki Nakabayashi, and Takenobu Yuki, "The equity-premium puzzle: Evidence from Japan and Germany, 1870-1913," August 2009. mimeo, presented at the session J7 of the 15th World Economic History Congress.

Kobayashi, Kazuko, *Nihon shoken shiron: Senzenki shijo seido no keisei to hatten (A history of the stock exchange: Formation and development of the prewar market regime)*, Tokyo: Nihon Keizai Hyoronsha, 2012.

Miyao, Ryuzo, "The effects of monetary policy in Japan," *Journal of Money, Credit and Banking*, May 2002, *134* (2), 376–392.

Nagaoka, Shinkichi, *Meiji kyoko shi josetsu (An introduction to the business cycle history of the Meiji period)*, Tokyo: The University of Tokyo Press, 1971.

Nakamura, Takafusa, *Chiho kara no sangyo kakumei: Nihon ni okeru kigyo bokko no gendoryoku (An industrial revolution from the provinces: The origin of the rise of modern businesses)*, Nagoya: Nagoya University Press, 2010.

Nakanishi, Satoru, *Umi no fugo no shihonshugi: Kitamaesen to nihon no sangyoka (Capitalism of wealthy coastal traders: Northern coastal traders and Japan's industrialization)*, Nagoya: Nagoya University Press, 2009.

Ogawa, Kazuo, "Why commmercial banks held excess reserves: The Japanese experience of the late 1990s," *Journal of Money, Credit and Banking*, Feb 2007, *39* (1), 241–257.

Oshima, Kiyoshi, *Nihon kyoko shi ron, Jo (Business cycle history of Japan, vol. 1)*, Tokyo: The University of Tokyo Press, 1952.

Shimura, Kaichi, *Nihon shihon shijo bunseki (Analysis of the Japanese capital market)*, Tokyo: The University of Tokyo Press, 1969.

Suzuki, Tsuneo, Yoichi Kobayakawa, and Kazuo Wada, *Kigyoka network no keisei to tenkai: Database kara mita kindai nihon no chiiki keizai (Formation and development of entrepreneurs' networks: A database inquiry on local economies of modern Japan)*, Nagoya: Nagoya University Press, 2009.

Takamura, Naosuke, *Nihon shihonshugi shi ron (History of the Japanese capitalism)*, Kyoto: Minerva, 1980.

Takatsuki, Yasuo, *Kinsei kome shijo no keisei to tenkai: Bakufu shiho to Dojima Kome Kaisho no hatten (Formation and evolution of the early modern rice market: The shogunate judicial system and development of the Dojima Rice Market)*, Nagoya: Nagoya University Press, 2012.

Teranishi, Juro, "Senzen Nihon no kinyu system ha ginko chushin de atta ka (Did bank loans dominate the financial system of prewar Japan?)," *Kinyu Kenkyu (Research in Finance)*, March 2006, *25* (1), 13–40. The Bank of Japan.

Wieland, Volker, "Quantitative easing: A rationale and some evidence from Japan," *NBER International Seminar on Macroeconomics*, 2009, *6* (1), 354–366.

Appendix Table Variable definitions.

$TKP_{i,t}$	Average share price of firm i in period t (month) at the Tokyo Stock Exchange: (traded value)/(traded volume).
$TKVOL_{i,t}$	(Traded volume of firm i at the Tokyo Stock Exchange in period t (month))+1.
$TKDR_t$	Official discount rate of the Tokyo central branch of the Bank of Japan in period t (month).
$TKPND_t$	Value of promissory bills that were rediscounted by the Tokyo central branch of the Bank of Japan in period t (month).
$TKPNCD_t$	Value of bills collateralized by securities that were rediscounted by the Tokyo central branch of the Bank of Japan in period t (month).
$OSP_{i,t}$	Average share price of firm i in period t (month) at the Osaka Stock Exchange: (traded value)/(traded volume).
$OSVOL_{i,t}$	(Traded volume of firm i at the Osaka Stock Exchange in period t (month))+1.
$OSDR_t$	Official discount rate of the Osaka branch of the Bank of Japan in period t (month).
$OSPND_t$	Value of bills collateralized by securities that were rediscounted by the Osaka branch of the Bank of Japan in period t (month).
$OSPNCD_t$	Value of bills collateralized by securities that were rediscounted by the Osaka branch of the Bank of Japan in period t (month).
$BOJC_{i,t}$	Dummy variable of being designated as collateral for rediscount by the Bank of Japan: =1 if share of firm i was designated in period t, 0 otherwise.
DI_t	Diffusion index.
C	Constant.

Source : TKP, TKVOL, TNPND, TKPNCD, OSP, OSVOL, OSPND, OSPNCD, and BOJC: "Nihon Ginko Tokei Geppo," held by the Bank of Japan. TKDR and OSDR: Historical Statistics provided by Institute for Monetary and Economic Studies, Bank of Japan (http://www.imes.boj.or.jp/hstat/). Diffusion index: Shozaburo Fujino and Fukuo Igarashi, *Tokei Shiryo Series No.2, Keiki Shisu: 188-1940 nen (Statistics Data Series No.2 Diffusion Index: 1888-1940)* , Institute of Economic Research, Hitotsubashi University, 1973, p. 75, Appendix Table 2-9.

Table 1 Financial policy and stock prices at the Tokyo Stock Exchange: Monthly, October 1890 - May 1898.

	1-1		1-2		1-3		1-4		1-5		1-6	
Estimation method	panel least squares		panel least squares		panel least squares		panel extended generalaized least squares		panel extended generalaized least squares		panel extended generalaized least squares	
Dependent variable	$\log[TKP_{i,t}]$		$\log[TKP_{i,t}]$		$\log[TKP_{i,t}]$		$\log[TKP_{i,t}]$		$\log[TKP_{i,t}]$		$\log[TKP_{i,t}]$	
Cross-sectional dimension	pooled (no control)		pooled (no control)		pooled (no control)		fixed effect		fixed effect		fixed effect	
Period dimension	pooled (no control)		pooled (no control)		pooled (no control)		pooled (no control)		pooled (no control)		pooled (no control)	
Independent variables	coefficient	*t* statistc	coefficient	*t* statistc	coefficient	*t* statistc	coefficient	*t* statistc	coefficient	*t* statistc	coefficient	*t* statistc
C	-1.6523	-3.5380 ***	-1.7654	-3.8150 ***	-1.7662	-3.8168 ***	-0.7130	-3.3345 ***	-0.6955	-3.2362 ***	-0.7041	-3.2758 ***
$\log[TKDR_t]$	0.0506	0.3463	-0.0288	-0.1983	-0.0031	-0.0214	-0.3268	-5.4752 ***	-0.3366	-5.5268 ***	-0.3302	-5.4800 ***
$\log[TKDR_t]\times BOJC_{i,t}$			0.1424	7.3235 ***					0.0164	0.8118		
$\log[TKPND_t]$	0.0790	2.6637 ***	0.0966	3.2776 ***	0.0966	3.2787 ***	0.0744	6.2482 ***	0.0759	6.2984 ***	0.0752	6.2364 ***
$\log[TKPNCD_t]$	0.1369	3.7855 ***	0.1175	3.2712 ***	0.1145	3.1837 ***	0.1378	8.9459 ***	0.1354	8.6273 ***	0.1363	8.6325 ***
$\log[TKPNCD_t]\times BOJC_{i,t}$					0.0189	7.3442 ***					0.0011	0.4187
$\log[DI_t]$	0.5213	7.4231 ***	0.5776	8.2552 ***	0.5765	8.2420 ***	0.4843	16.6863 ***	0.4864	16.6914 ***	0.4854	16.6601 ***
Cross sections observed	129		129		129		129		129		129	
Periods (month)	93 (1890/10-1898/05)		93 (1890/10-1898/05)		93 (1890/10-1898/05)		93 (1890/10-1898/05)		93 (1890/10-1898/05)		93 (1890/10-1898/05)	
Total observations	2,696		2,696		2,696		2,696		2,696		2,696	
adjusted R^2	0.0604		0.0784		0.0785		0.8590		0.8590		0.8589	
F statistic	44.3162 ***		46.8732 ***		46.9377 ***		125.3582 ***		124.4040 ***		124.3769 ***	

Source : See notes of **Appendix Table.**

Notes : For definitions of the variables, see **Appendix Table**. ***, **and * respectively denote 1 percent, 5 percent and 10 percent level of significance.

Table 2 Financial policy and share prices at the Osaka Stock Exchange: Montly, October 1890 - October 1899.

	2-1		2-2		2-3		2-4		2-5		2-6	
Estimation method	panel least squares		panel least squares		panel least squares		panel extended generalaized least squares		panel extended generalaized least squares		panel extended generalaized least squares	
Dependent variable	$\log[OSP_{i,t}]$		$\log[OSP_{i,t}]$		$\log[OSP_{i,t}]$		$\log[OSP_{i,t}]$		$\log[OSP_{i,t}]$		$\log[OSP_{i,t}]$	
Cross-sectional dimension	pooled (no control)		pooled (no control)		pooled (no control)		fixed effect		fixed effect		fixed effect	
Period dimension	pooled (no control)		pooled (no control)		pooled (no control)		pooled (no control)		pooled (no control)		pooled (no control)	
Independent variables	coefficient	*t* statistc	coefficient	*t* statistc	coefficient	*t* statistc	coefficient	*t* statistc	coefficient	*t* statistc	coefficient	*t* statistc
C	1.7606	3.1821 ***	1.3836	2.5370 **	1.3798	2.5291 **	0.8408	3.5130 ***	0.8921	3.7398 ***	0.8747	3.6609 ***
$\log[OSDR_t]$	-0.3699	-2.1511 **	-0.3970	-2.3495 **	-0.3362	-1.9889 **	-0.5878	-8.5967 ***	-0.6186	-9.0389 ***	-0.5865	-8.6014 ***
$\log[OSDR_t]\times BOJC_{i,t}$			0.1596	8.6469 ***					0.0762	4.3295 ***		
$\log[OSPND_t]$	0.1132	2.1437 **	0.1325	2.5513 **	0.1334	2.5678 **	0.2139	10.2465 ***	0.2164	10.4082 ***	0.2164	10.3841 ***
$\log[OSPNCD_t]$	-0.0312	-0.7076	-0.0398	-0.9178	-0.0481	-1.1091	-0.0085	-0.5041	-0.0154	-0.9169	-0.0173	-1.0171
$\log[OSPNCD_t]\times BOJC_{i,t}$					0.0210	8.5851 ***					0.0079	3.3668 ***
$\log[DI_t]$	0.3650	4.5380 ***	0.4057	5.1255 ***	0.4048	5.1129 ***	0.2627	8.3302 ***	0.2685	8.5461 ***	0.2671	8.4860 ***
Cross sections observed	99		99		99		99		99		99	
Periods (month)	106(1890/10-1899/10)		106(1890/10-1899/10)		106(1890/10-1899/10)		106(1890/10-1899/10)		106(1890/10-1899/10)		106(1890/10-1899/10)	
Total observations	2,060		2,060		2,060		2,060		2,060		2,060	
adjusted R^2	0.0200		0.0539		0.0535		0.8658		0.8670		0.8665	
F statistic	11.4942 ***		24.4794 ***		24.2615 ***		131.2744 ***		131.3607 ***		130.7966	

Source : See notes of **Appendix Table.**

Notes : For definitions of the variables, see **Appendix Table**. ***, **and * respectively denote 1 percent, 5 percent and 10 percent level of significance.

Table 3 Financial policy and trade volumes at the Tokyo Stock Exchange: Monthly, October 1890 - May 1898.

	3-1			3-2			3-3			3-4			3-5			3-6		
Estimation method	panel least squares			panel least squares			panel least squares			panel extended generalaized least squares			panel extended generalaized least squares			panel extended generalaized least squares		
Dependent variable	log[TKVOL$_{i,t}$]			log[TKVOL$_{i,t}$]			log[TKVOL$_{i,t}$]			log[TKVOL$_{i,t}$]			log[TKVOL$_{i,t}$]			log[TKVOL$_{i,t}$]		
Cross-sectional dimension	pooled (no control)			pooled (no control)			pooled (no control)			fixed effect			fixed effect			fixed effect		
Period dimension	pooled (no control)			pooled (no control)			pooled (no control)			pooled (no control)			pooled (no control)			pooled (no control)		
Independent variables	coefficient	*t* statistc		coefficient	*t* statistc		coefficient	*t* statistc		coefficient	*t* statistc		coefficient	*t* statistc		coefficient	*t* statistc	
C	5.7940	3.9631	***	4.9769	3.5815	***	4.9747	3.5795	***	9.0793	8.2134	***	8.6556	7.8138	***	8.6059	7.7756	***
log[TKDR$_t$]	-3.3280	-7.2735	***	-3.8820	-8.9070	***	-3.7007	-8.5029	***	-4.8066	-15.5735	***	-4.5638	-14.5322	***	-4.6203	-14.8819	***
log[TKDR$_t$]×BOJC$_{i,t}$				0.9980	17.0958	***							-0.4045	-3.8935	***			
log[TKPND$_t$]	0.1587	1.7082	*	0.2815	3.1801	***	0.2812	3.1764	***	0.3470	5.6348	***	0.3099	4.9874	***	0.3046	4.9041	***
log[TKPNCD$_t$]	0.2691	2.3757	**	0.1336	1.2382		0.1129	1.0449		-0.1737	-2.1804	**	-0.1139	-1.4086		-0.0953	-1.1719	
log[TKPNCD$_t$]×BOJC$_{i,t}$							0.1320	17.0757	***							-0.0612	-4.3866	***
log[DI$_t$]	0.2599	1.1822		0.6587	3.1349	***	0.6495	3.0916	***	1.0370	6.9100	***	0.9844	6.5507	***	0.9811	6.5367	***
Cross sections observed	129			129			129			129			129			129		
Periods (month)	93 (1890/10-1898/05)			93 (1890/10-1898/05)			93 (1890/10-1898/05)			93 (1890/10-1898/05)			93 (1890/10-1898/05)			93 (1890/10-1898/05)		
Total observations	2,697			2,697			2,697			2,697			2,697			2,697		
adjusted R^2	0.022			0.117			0.117			0.600			0.602			0.602		
F statistic	15.904		***	72.553			72.413		***	31.588		***	31.638		***	31.718		***

Source : See notes of **Appendix Table.**

Notes : For definitions of the variables, see **Appendix Table**. ***, **and * respectively denote 1 percent, 5 percent and 10 percent level of significance.

Table 4 Financiap policy and trade volumes at the Osaka Stock Exchange: Monthly, October 1890 - May 1898.

	4-1			4-2			4-3			4-4			4-5			4-6		
Estimation method	panel least squares			panel least squares			panel least squares			panel extended generalaized least squares			panel extended generalaized least squares			panel extended generalaized least squares		
Dependent variable	log[OSVOL$_{i,t}$]			log[OSVOL$_{i,t}$]			log[OSVOL$_{i,t}$]			log[OSVOL$_{i,t}$]			log[OSVOL$_{i,t}$]			log[OSVOL$_{i,t}$]		
Cross-sectional dimension	pooled (no control)			pooled (no control)			pooled (no control)			fixed effect			fixed effect			fixed effect		
Period dimension	pooled (no control)			pooled (no control)			pooled (no control)			pooled (no control)			pooled (no control)			pooled (no control)		
Independent variables	coefficient	*t* statistc		coefficient	*t* statistc		coefficient	*t* statistc		coefficient	*t* statistc		coefficient	*t* statistc		coefficient	*t* statistc	
C	-7.9305	-4.6087	***	-10.2810	-6.4070	***	-10.3288	-6.4403	***	-2.1135	-1.7239	*	-2.3952	-1.9615	*	-2.3584	-1.9325	*
log[OSDR$_t$]	1.1027	2.0600	**	0.9404	1.8899	*	1.3159	2.6460	***	-0.5310	-1.5144		-0.3620	-1.0321		-0.5397	-1.5475	
log[OSDR$_t$]×BOJC$_{i,t}$				0.9802	18.0309	***							-0.4179	-4.6348	***			
log[OSPND$_t$]	1.0982	6.6774	***	1.2161	7.9480	***	1.2230	7.9979	***	0.6646	6.2048	***	0.6510	6.1071	***	0.6471	6.0704	***
log[OSPNCD$_t$]	-0.6611	-4.8147	***	-0.7133	-5.5877	***	-0.7657	-5.9975	***	-0.5092	-5.8981	***	-0.4710	-5.4599	***	-0.4458	-5.1307	***
log[OSPNCD$_t$]×BOJC$_{i,t}$							0.1302	18.1159	***							-0.0567	-4.7406	***
log[DI$_t$]	1.5607	6.2459	***	1.8180	7.8135	***	1.8148	7.8052	***	1.8752	11.6247	***	1.8432	11.4752	***	1.8435	11.4801	***
Cross sections observed	99			99			99			99			99			99		
Periods (month)	106(1890/10-1899/10)			106(1890/10-1899/10)			106(1890/10-1899/10)			106(1890/10-1899/10)			106(1890/10-1899/10)			106(1890/10-1899/10)		
Total observations	2,061			2,061			2,061			2,061			2,061			2,061		
adjusted R^2	0.0391			0.1699			0.1710			0.6429			0.6466			0.6468		
F statistic	21.9514		***	85.3522		***	85.9927		***	37.3596		***	37.5924		***	37.6208		***

Source : See notes of **Appendix Table.**

Notes : For definitions of the variables, see **Appendix Table**. ***, **and * respectively denote 1 percent, 5 percent and 10 percent level of significance.

Table 5 Equity risk premium of shares listed at the Tokyo Stock Exchange: 1880 - 1914.

year	Comsuer price index	growth rate of nominal per capita GNP	growth rate of real per capita GNP	Average ratio of change in share prices	Average dividend yield	Average equity return	Yield of risk-free asset: Yield of Japanese Government Bonds	Equity risk premium
	a	*b*	*c*	*d*	*e*	*f=d+e*	*g*	*i=f-g*
average 1880-1889	-0.081	1.422	2.037	11.582	5.838	17.419	6.587	10.832
average 1890-1899	3.379	8.308	2.073	1.222	3.794	5.016	4.991	0.025
average 1900-1909	3.028	3.910	0.487	2.721	3.837	6.558	5.469	1.089
average 1910-1914	1.682	3.336	0.417	4.332	3.326	7.658	5.069	2.589

Source : Kling, Nakabayashi, and Yuki (2009). Original sources are, a) share prices and diviends: *Tokyo Shoken Torihikijo 50 nenshi (Fifty years of Tokyo Stock Exchange)* , Tokyo: Tokyo Stock Exchange, 2002, b) GNP : Kazushi Okawa, Nobukiyo Takamatsu, and Yuzo Yamamoto, *Estimates of Long-Term Economic Statistics of Japan since 1868, volume 1, National Income* , Tokyo: Toyo Keizai Shinposha, 1974, p. 237, c) Consumer price index: Kazushi Okawa, Tsutomu Noda, Nobukiyo Takamatsu, Saburo Yamada, Minoru Kumazaki, Yuichi Shionoya and Ryoshin Minamin, *Estimates of Long-Term Economic Statistics of Japan since 1868, volume 8, Prices* , Tokyo: Toyo Keizai Shinposha, 1967, p. 135.

Table 6 Equity risk premium of shares listed at the Osaka Stock Exchange, 1880-1914.

year	Comsuer price index	growth rate of nominal per capita GNP	growth rate of real per capita GNP	Average ratio of change in share prices	Average dividend yield	Average equity return	Yield of risk-free asset: Yield of Japanese Government Bonds	Equity risk premium
	a	*b*	*c*	*d*	*e*	*f=d+e*	*g*	*i=f-g*
average 1880-1889	-0.75	1.36	3.44	17.93	5.42	23.36	5.72	17.64
average 1890-1899	3.38	8.31	2.07	4.24	4.75	8.99	4.99	4.00
average 1900-1909	3.03	3.91	0.49	2.87	6.21	9.08	5.47	3.61
average 1910-1914	1.68	3.34	0.42	0.93	5.17	6.10	5.07	1.03

Source : Kling, Nakabayashi, and Yuki (2009). Original sources are, a) share prices and dividends: *Daikabu 50 nenshi (50 years of the Osaka Stock Exchange)* , Osaka: Osaka Stock Exchange, 1928. b) GNP and consumer price index: see the notes of **Table 5**.