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Corporate Social Performance and Market Liquidity Risk: The Case of the Japanese Banking Sector

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Abstract:

This study investigates the relationship between market liquidity risk and the social performance of Japanese banks during the period of the global financial crisis and its aftermath. The empirical results show that Japanese banks with better CSR awareness may be exposed to higher market liquidity. This result suggests that banks' CSR strategy to enhance trust over the long term and their liquidity risk management over the short term are not sufficiently consistent in a situation in which the business environment of the banking sector has become increasingly unstable. In addition, we recognize that the institutional and historical backgrounds of the Japanese banking sector based on relationship banking might contribute to diversifying and differentiating the relationship between banks' market liquidity risk profile and their corporate social performance.

Keywords: market liquidity risk, corporate social performance, bank risk management, Japanese banking

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1. Introduction

Triggered by recent volatile financial markets and the diffusion of financial crises, there has been increasing concern about the banking sector's liquidity risk management. With the shift from conventional relationship-oriented business to more market-oriented business, Japanese banks have been involved in a variety of trading activities both domestically and internationally and have been exposed to more market liquidity risk. Thus, market liquidity is an important research agenda in the field of banking business. In this study, we focus on the relationship between corporate social responsibility (CSR) practices, in which trust in banks is constructed over the long term, and market liquidity risk, which banks tend to manage over the short term. More specifically, we explore empirical research on the link between corporate social performance (CSP) and the market liquidity risk that Japanese banks have faced amid globalization of banking business since the late 2000s.

Numerous studies have been conducted on the relationship between CSP and corporate financial performance in general (Boutin-Dufresne and Savaria, 2004; Girerd-Potin et al., 2014; Mishra and Modi, 2013), but the empirical research on the financial sector, especially the banking sector, are limited by comparison. Within research on banking risk management, the relationship between banks' social awareness and their risk management should be highlighted more. How does CSP affect liquidity risk management of banks? To the best of our knowledge, this study is the first to answer this question with empirical evidence.

The study uses CSP indexes originally developed by Suto and Takehara (2014, 2016a) and two different measures for market liquidity risk—the liquidity cost or price impact (market liquidity risk-adjusted VaR model) and the illiquidity ratio (Amihud's ILLIQ model)—for the sample period from 2007 to 2014. Both liquidity risk measurement models applied here are endogenous liquidity measures owing to features of the Japanese financial market and data availability.

We find that the price impact of market liquidity risk has a positive link with CSP and illiquidity has no significant link with CSP. It is suggested that higher CSR awareness of banks links to more market liquidity risk. The relationships between CSP and market liquidity risk of Japanese banks seem to differ from the results of some prior studies on credit risk in the context of the US banking sector. For example, Berrios (2013) finds a negative relationship between corporate governance-related issues and bank performance, and Goss and Roberts (2011) demonstrate that US firms with the lowest CSR scores pay more for bank debt than firms with higher scores. By contrast, Suto and Takehara (2016b) find that the cost of debt capital of Japanese firms has a positive link with CSP. This finding suggests that high CSP does not link to low credit risk in relationship-oriented banking. Thus, we recognize that the institutional and historical backgrounds of the banking sector might contribute to diversifying and differentiating the relationship between banks' market liquidity risk profile and their CSP. This study contributes to extending research for risk management of banking.

The rest of this paper is organized as follows. Section 2 provides the background and framework of this research. After providing a brief outline about the specific characteristics of Japanese banks, we review the literature on market liquidity risk and CSR in the banking sector in general. Section 3 explains the methodology in measuring market liquidity risk and addresses the construction of CSP indexes and selection of related financial variables. Section 4 conducts preliminary analyses to explore the relationship between CSP and the two liquidity risk measures. Section 5 constructs the regression model and sums up the estimation results. Section 6 discusses

the implications of our findings and refers to some possibilities for future research development.

2. Research Background and Literature Review

2.1 Japanese banking sector and relationship lending

The Japanese financial system is a typical bank-centered system, as 52.7% of household assets comprise currency and deposits, and 24.1% of corporate liabilities of private non-financial corporations consist of loans.[1] Japanese commercial banks are often divided into city banks and regional banks.[2] City banks are nationwide institutions that provide comprehensive banking services mainly to large corporate customers, dominate most segments of the domestic market, and are active internationally. On the other hand, regional banks in general provide region-based full retail services and commercial lending.[3] As of 2013, there were 111 domestic commercial banks: 6 city banks and 105 regional banks. City banks include three mega-banks (named the "Big Three"), which provide full banking services and integrated financial services under bank holding companies. Between these two types of commercial banks, there are huge differences in general in firm size, range of business, and asset/liability structure;[4] however, there is no segregated regulation between city banks and regional banks.

Japanese commercial banks as a whole have a strong domestic deposit base, which is regarded as a stable funding source as rapid outflows and inflows are uncommon. Japanese banks have comparably less of the originate-to-distribute type of business often seen in the US and Europe as well as smaller contingent liability. In addition, both major and regional Japanese banks are characterized by their holding of a large proportion of highly liquid securities, such as government and local bonds (Bank of Japan, 2009, p.8). All these attributes indicate the unique liquidity risk management of the banking sector in Japan, whose major banks, in particular, are regarded as robust in terms of yen-denominated liquidity risk.[5]

The Japanese banking sector, recovering from long financial distress after the Bubble burst at the end of the 1990s, began business and organizational restructuring from the 2000s. The profile of commercial banks is dichotomized into major banks that run integrated financial businesses under holding companies and other banks that are still largely dependent on traditional banking business. In the process, however, the banking business as a whole has been shifting from being relationship oriented to being more market oriented with the resolution of cross-shareholding between banks and corporate customers.[6] The shareholdings of all listed companies on the

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[1] Bank of Japan (2015).

[2] In addition, there were 267 credit unions and 158 credit associations as of 2015.

[3] "Regional banks I" is a category of medium-sized institutions whose activities have a regional focus. They have a strong connection with local firms and households. "Regional banks II" (or Tier 2 regional banks) were established as mutual banks, but were transformed into regional banks under the 1992 Banking Act.

[4] In the 1990s, loans by city banks were mostly comparable with deposits while loans by regional banks were always smaller than deposits. Thus, the regional banks tended to invest their surplus funds into the financial markets. In addition, since the beginning of the 2000s, loans by major banks have fallen below deposits partly due to the contraction of the magnitude of a fund shortage in the corporate sector (Bank of Japan, 2009, pp.7–8) The commercial banks increased investment in government bonds with their surplus.

[5] According to the Bank of Japan (2009), Japanese banks have expanded recently to invest in securitized products with relatively low market liquidity. However, the size of those investments is relatively small.

[6] Cross-shareholding structure, which tends to strengthen business ties between banks and clients, was common in Japan. With the internationalization of ownership since the late 1990s, however, cross-shareholdings between

stock exchanges by commercial banks reduced rapidly in the 1990s, from 19.9 % in 1980 to 7.7% in 2001, and was 3.7% in 2014.[7] Following the resolution of cross-shareholding, the business ties between banks and corporate customers have been relaxed while regulation and oversight on liquidity risk management of banks have been strengthened.

Liquidity risk management became increasingly important for Japanese banks that were recovering from the financial distress of the early 1990s[8]. Globally, the banking sector's liquidity risk management gained further intensive attention after the 2007–2008 financial market turmoil. Within the context of liquidity risk management, such institutional and historical backgrounds have to be reflected in both measurement and management processes. In this study, we recognize that the institutional and historical backgrounds of the banking sector might contribute to diversifying and differentiating the relationship between banks' market liquidity risk profile and their CSP. As shown in Sections 4 and 5, we conduct analyses explicitly considering the difference in business models between city banks and regional banks with the categorized data of commercial banks, including city banks and excluding city banks or regional banks.

2.2. Liquidity risk in the banking sector

Unlike other risk types that threaten the solvency of a financial institution more directly, for example, credit risk, interest rate risk, and foreign exchange risk, liquidity risk has been regarded as a normal aspect of the daily management of a financial institution. Only in extreme cases, it develops into a solvency risk problem. However, the recent global financial crisis and post-crisis market volatility provide a good showcase of such a situation. This urges us to take a closer look at the liquidity risk in the financial sector, especially for banks.

2.2.1 Defining liquidity risk

Hull states in his 2015 book that "*it is important to distinguish solvency from liquidity. Solvency refers to a company having more assets than liabilities, so that the value of its equity is positive. Liquidity refers to the ability of a company to make cash payments as they become due. Financial institutions that are solvent can—and sometimes do—fail because of liquidity problem*" (Hull, 2015, p.499). This again highlights how it is possible for liquidity risk to cause the stability of the financial sector, including banks, to deteriorate and threaten the robustness of their balance sheets and trading positions (i.e., due to the increased bid–offer spread caused by the liquidity problem). In general, liquidity risk arises from the asset side, the liability side, or both sides of the banks' balance sheets. The problem described by Hull above belongs to the liability-side reason of liquidity risk[9]. The

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banks and their business customers have been resolved steadily. The 2015 Japanese corporate governance code, which aims to improve the responsiveness to shareholders and other stakeholders, accelerates the resolution of cross-shareholding.

[7] 2015 Kabushiki Bumpujyoukyou Chosa (Report on Shareholder Structure of All Listed Companies) by Tokyo Stock Exchange.

[8] Public funds were injected into Risona, Aozora, and Sinsei banks after the bubble. Aozora and Risona finished paying back the loans in 2015 but Sinsei has not yet done so.

[9] The asset side of liquidity risk is related to the financial institution's need to run down its cash assets, and/or sell off other liquid assets to meet liquidity needs, for example, those arising from funding loan commitments to meet a borrower's demands.

Basel Committee on Banking Supervision provides a definition covering both sides of liquidity risk: "*Liquidity is the ability of a bank to fund increases in assets and meet obligations as they come due, without incurring unacceptable losses"* (Basel Committee on Banking Supervision, 2008, p.1).

Based on the recent studies on the liquidity risk in the context of banks' liquidity risk management and the Basel regulation, it is predominantly categorized into the following types: funding liquidity risk and market-related liquidity risk (Brunnermeier and Pedersen, 2009; Drehmann and Nikolaou, 2010; Muranaga, and Ohsawa, 1997; Van den End, 2012; Van den End and De Haan, 2013). Funding liquidity risk has been recognized as having played an important role in all historical banking crises and therefore, it has been well studied, and has not been limited to the above mentioned aspects only. It can be defined as the risk arising when a bank is not able to meet its cash flow (current and future) and collateral needs with immediacy (Drehmann and Nikolaou, 2010; Tarantino, 2011). It relates more to the bank's balance sheet and possibility to drain out its liquidity due to loan repayment. In contrast to the wide interest on funding liquidity risk, discussions on market liquidity risk have appeared more in empirical studies, in conjunction with market risk measurement (Brunnermeier and Pedersen, 2009; Muranaga, and Ohsawa, 1997; Van den End, 2012; Van den End and De Haan, 2013). This is because liquidity risk in trading arises from the characteristics of the market, such as the ability and cost of market participants to execute or liquidate trading positions.

2.2.2 Market liquidity risk

Market liquidity risk (Tarantino, 2011), also known as "liquidity trading risk" (Hull, 2015, p. 447), relates to a bank's inability and cost to easily offset or eliminate a position at the market price because of inadequate market depth or market disruption. In addition, it can be regarded as uncertainty of liquidation of assets in a given trading system and market structure.

Market liquidity risk and funding liquidity risk are inter-correlated. A bank can meet its funding requirements through liquidating part of its trading book[10]. On the one hand, funding risk could trigger an impact on the market-trading rate and price level. Under the assumption of there being no lender of last resort, this leads to trading position losses. These losses are linked to two cost-relevant components of market liquidity risk, that is, execution cost—*the cost of immediacy*—and opportunity cost—*the cost of waiting (*Muranaga, and Ohsawa, 1997). On the other hand, less trading positions or more costs associated with market illiquidity increases the funding constrains of the bank through higher margins (Van den End, 2012). Under the extreme case, such trading-related liquidity risk combined with funding risk could develop into systematic risk.

Thus, market liquidity risk could be influenced by long-term scope risk management of the financial institution as well as its market position in given surroundings. Trust and reputation that the financial institution has built in the market could mitigate selling pressure even in a stressed market. Conversely, long-scoped risk management of the bank might not be influential in the short-term decision-making of those market participants, or simply the traders in general are rather indifferent toward long-focused risk management of the bank. Therefore, in

[10] The liquidity related to the banks' funding needs is sourced from liquidating trading book positions and borrowing in the wholesale market at short notice as well as from the central bank in order to attract retail deposits and securitize assets at short notice.

this study, we draw on the market liquidity risk of the Japanese banking sector, and extend it to align with the CSR concept in terms of the long-term success and sustainability of corporations.

2.3 Corporate social responsibility and liquidity risk of banking

2.3.1 Corporate social responsibility and financial risk

CSR has become a core concept in corporate management in terms of long-term success and sustainability. Many studies have discussed and examined whether firms explore business opportunities, improve organizational efficiency, build the trust of stakeholders, and are rewarded for meeting the expectations of shareholders by enhancing long-term market value of the corporation. Wood (1991, p.693) defines CSP as "a business organisation's configuration of principles of social responsibility, processes of social responsiveness, and policies, programs and observable outcomes as they relate to the firm's social relationships." Many studies examine the relationship between CSP and corporate financial performance (CFP), focusing on conceptualizing, specifying, and testing the link (Cochran and Wood, 1984; Graves and Waddock, 1994; Russo and Fouts, 1997).

Although the empirical results on the association between CSP and profitability are inconclusive, many findings support the risk reduction aspect of CSP (see Orlitzky et al., 2003; Van Beurden and Gossling, 2008). There are studies concerned with the financial market's perception of CSR in the determination of risk. Many find a negative relationship between CSP and idiosyncratic risk (Boutin-Dufresne and Savaria, 2004; Girerd-Potin et al., 2014; Mishra and Modi, 2013). In addition, CSR activities lower capital constraints (e.g., difficulties accessing financing) by enhancing investor trust in the firm and limit the likelihood of short-term opportunistic behavior (Chen et al., 2014). Some recent studies investigate the link between CSR and capital cost and debt cost. El Ghoul et al. (2011) demonstrate the effectiveness of CSR in reducing the cost of equity capital. Goss and Roberts (2011) and Menz (2010) examine the links between CSR and credit risk premium or cost of debt capital for debt markets. Goss and Roberts (2011) focus on banks' specialized role as delegated monitors of borrowing firms and examine the link between CSP and bank loans. Their empirical results demonstrate that US firms with the worst CSR scores pay more for their bank debt compared to firms with higher scores. Menz (2010) investigates the relationship between the valuation of Euro corporate bonds and CSP, and concludes that CSR has not yet been incorporated into pricing in the arm's length credit market.

Thus, previous research suggests that CSR-related information or CSP is relevant to the valuation of credit risk in financial markets. However, there is no research to analyze the relationship of CSR practices to market liquidity risk management from a long-term perspective .

2.3.2 Corporate social responsibility and liquidity risk

Among the CSR studies, there is rather limited research undertaken using banking sector data. Soana (2011) examines the CSP–CFP relationship in the banking sector using Italian data and shows no evidence of a significant relationship between CSP and CFP. Berrios (2013) explores the relationship between bank credit risk and CSP with US commercial bank data and finds corporate governance-related issues are negatively related to bank performance. However, there is no study published that explicitly considers exploring the relationship between liquidity risk of

banking and CSR/CSP. From the perspectives of financial regulators and bank management, a study is necessary to explore the relationship between liquidity risk management and the CSR/CSP of banks.

From the stakeholder perspective, liquidity risk management of banks that are vital to the economy would significantly affect the trust of depositors and the decisions made by market participants in the long-run as well as financial stability from a short-run perspective. In this study, as stated above, we take a "long-term" view to incorporate liquidity risk management within banks' CSP. First, CSR intrinsically should be evaluated from a long-term view and therefore, it is measured based on long-term observations. Second, although market liquidity risk can be calculated daily and is triggered by short-term market disruption, actually it is closely related to confidence from market participants who reinforce market depth. Since CSR contributes to improving organizational efficiency and building good stakeholder relationships, higher CSP banks could enhance the trust of depositors and confidence in the market, which mitigate the liquidity risk the banks face. On the other hand, there are costs associated with CSR practices; however, the expected results are accompanied by uncertainty. Furthermore, depositors and market participants may be indifferent to CSP or they could question banks' CSR practices. In such a case, even a high bank CSP would not be positively linked to the trust and reputation of the bank itself, or a negative relationship between them could be observed.

From a long-term risk management point of view, the CSP of banks not only could be influential on the default risk side but also could affect liquidity risk, in particular, the market liquidity risk of banks. If CSP is a proxy of bank trust, we would assume that high bank CSP might promote the trading-related willingness of counterparties in the market. There could be a negative relationship between CSP and market liquidity risk. On the other hand, if the market participants were indifferent to the banks' CSP, there could be an observed non-negative relationship between the market liquidity risk and CSP. Consequently, there would be a gap between the bank's CSR strategy and the market perception of CSP. This study examines the relationship between CSP and market liquidity risk from a long-term risk management view in the context of the Japanese banking sector with available CSP data.

3 Variables and Data

3.1 Market liquidity risk measures

In incorporating market liquidity risk into a value-at-risk (VaR) model, it is noted that *an established market risk model* is well accepted although there are challenging issues in the application (Basel Committee on Banking Supervision, 2011; Berkowitz, 2000a, 2000b; Cosandey, 2001; Hull, 2015; Jorion, 2006). One of the issues, which is always the first step in applying the VaR model to measure market liquidity risk, is to distinguish between exogenous and endogenous liquidity (Basel Committee on Banking Supervision, 2011). From the viewpoint of the banking sector, in contrast to the exogenous liquidity that refers to the transaction cost for trades of average size (i.e., bid–ask spread), endogenous liquidity, which is the concept used in this study, is related to the cost of unwinding portfolios. The portfolios, however, are large enough so that the bid–ask spread cannot be taken as given, and instead, is affected by the trades themselves (Bangia et al., 1999; Bervas, 2006). Most studies on the endogenous liquidity measure based on the VaR model suggest adding liquidity cost to position returns before carrying out the VaR calculations (Berkowitz, 2000b; Bervas, 2006; Jarrow and Subramanian, 2001). Among other

authors, Berkowitz (2000b) proposes incorporating price impact of immediate liquidity via the concept of demand elasticity. Our approach to measure market liquidity risk-based VaR follows the work of Berkowitz (2000b), Berkowitz and O'Brien (2002), and Uylangco and Li (2015).

Berkowitz's (2000b) method draws on the impact of the seller actions on prices to reflect and measure the liquidity risk and incorporate such measures into a standard market risk model—the VaR. According to his definition of "seller impact,"[11] a bank would raise a given amount of cash for its clients or meet some debt obligation by redeeming assets, for example, by selling a given amount of shares, M_t, within a given horizon, T. Therefore, the maximized revenue from the sales within the required time is (Berkowitz, 2000b, p.5),

$$\max_{\{q_t\}} E_t \left[\sum_t^T p_t \, q_t \right], or \sum_t^T q_t = \mathrm{M_t}$$

The asset price is described as

$$p_{t+1} = p_t + x_t - \theta q_t$$

where q_t is the amount of asset sold, p_t is the price function at time T, and x_t is the market-wide changes in asset prices. $p_t + x_t$ relates to the market risk component and θq_t accounts for possible price changes resulting from the market reaction to the sales. This framework enables us to quantify the additional market liquidity risk due to the seller's own impact on asset prices.

However, Berkowitz (2000b)'s framework lacks details on structuring a related VaR model for its application. We then refer to Berkowitz and O'Brien (2002) and Uylangco and Li (2015) for the VaR model. First, the net returns are adjusted by the market liquidity risk component following Berkowitz's (2000b) framework. Then, the daily VaR-adjusted for market liquidity risk is calculated using a parametric model with 99% confidence, which is consistent with the Basel III requirements.

Another well-accepted measure for endogenous liquidity risk is Amihud's (2002) ILLIQ, in which his focus on illiquidity provides an alternative scope to understand and assess the market liquidity status. Amihud (2002) proposes a price impact of illiquidity in daily transactions over all days in the observed period and suggests that the expected excess return of shares partly represents an illiquidity premium, in other words, a daily liquidation cost. Market illiquidity is defined as the average ratio of the daily absolute return to the trading volume on that day.

$$ILLIQ_{iy} = 1/D_{iy} \sum_{t=1}^{Diy} \left| R_{iyd} \right| / \, VOLD_{ivyd}$$

where D_{iy} is the number of days for which data are available for share i in year y, R_{iyd} is the return on stock i on day d of year y, and $VOLD_{ivyd}$ is the respective daily volume in yen.

Both the market liquidity risk-adjusted VaR and Amihud's ILLIQ are calculated daily at the initial stage of the analysis. Our CSP data as described in Subsection 3.2are structured with a comparably longer-term focus with an

[11] Berkowitz (2000b, p. 5) defines market liquidity risk as the "uncertain change in portfolio value caused by liquidating assets to meet future cash requirements, above and beyond exogenous changes in factor prices."

annual format. After considering this, we annualize the VaR and ILLIQ measures to match the format between the liquidity risk measures and the CSP data as well as our intention for this study.

In measuring liquidity risk for the Japanese banking sector, we should employ the modified VaR model described. More specifically, the Japanese banking sector is characterized by laddering tick-size, and the tick-size categories have been changed frequently. In addition to this step function problem in tick size, the price discovery, including bid–ask and effective spreads, of Japanese listed firms including banks has changed drastically at the launch of the "arrowhead" trading system on January 4, 2010. This makes it impossible to use any spread type of liquidity measure that is common for the exogenous case. Therefore, we use both a modified VaR model incorporating the market liquidity risk adjustment and Amihud's (2002) illiquidity measure—ILLIQ— as the market liquidity risk measures.

In calculating liquidity risk measures, we selected the sample by the availability of the CSP data, as described in Subsection 3.2. The daily share prices for the 32 Japanese banks (4 city banks and 28 regional banks) listed on the TSE's Nikkei 225 index and the banks' turnover data were collected from Datastream for the period from January 1, 2007 to December 31, 2014 to match with the observed period of CSP data that were available from 2007.[12] In the modified VaR model, we use a 1-year time frame to determine the parameters of μ and σ, where

$$\text{VaR} = \mu - 2.33\sigma$$

For a 99% parametric model, μ is the mean of the daily net returns adjusted for the market liquidity risk and σ is the standard deviation of the market liquidity risk-adjusted daily net returns. **Table 1** summarizes the basic statistics of the two market liquidity risk measures, the market liquidity risk-adjusted VaR and the ILLIQ measures.

--Insert Table 1 around here--

3.2 CSP data and sample

The CSP indexes used in this study are developed by Suto and Takehara (2014, 2016a) based on the annual CSR questionnaire survey administered by Toyo Keizai Incorporated. The indixes include five dimensional indexes according to the stakeholder approach (employment, environment, social contribution, safety and security, and internal governance) and a consolidated composite index.[13] The questionnaire was sent to all public firms

[12] In the case of a bank owned by a holding company, we use the share price of the holding company as a proxy of market value.

[13] The original database consists of three parts: employee relations (Part I), an overall survey-related CSR (Part II), and environmental preservation (Part III). We subdivided Part II into three distinct CSR dimensions, which correspond to the stakeholder relations chosen. First, we selected 17 questions related to employee relations, 21 questions concerning CSR in a general sense, and 18 questions regarding environmental preservation. We first converted the quantitative data (e.g., proportion of female employees) to three- or four-level categorical data. Then, we made within-sector adjustments because some questions had different meanings among sectors. For each of the five CSP attributes, we used principal component analysis to construct the CSP dimensional indexes. On the basis

listed on the Tokyo Stock Exchange (TSE) as well as the major listed companies on other exchanges in Japan. The composite CSR index as a CSP metric is used in this study with a sample period from 2007 to 2014, which is the longest available set of observations in the Suto–Takehara CSP dataset.[14] The sample banks selected for this study are those that responded to the questionnaire continuously for at least 2 years during the observed period for 2007–2014, including 4 city banks and 28 regional banks.[15] **Appendix 1** summarizes our 194 bank-year pooling observations**.**

3.3 Firm-specific variables

To examine the relationship between CSP and the market liquidity risk of banks, we introduce three types of firm-specific variables that are related to the risk management of banks as the control variables in the regression model—*firm size*, *corporate financial performance*, and the *firm-level attributes of the banking business*—given the institutional or regulatory framework. Firm size and financial performance are key determinants to enhance the trust of both depositors and borrowers in the banks' management and are assumed to have the potential to mitigate their market liquidity risk. In this study, firm size is defined as the natural logarithm of total assets, **ln TA**. As proxies of corporate financial performance, we employ two accounting-based variables, **ROA** (Operating profit/Total assets) and **ROE** (Operating profit/Equity capital) and a market-based variable, **Tobin's Q** (Market value + Total debts)/Total assets.[16]

To represent the firm-level attributes of the banking business, with a specific focus on the banking sector's asset–liability structure, three variables are adopted in the model: two variables are related to the traditional financing model of conventional banking and leverage. *Dependency on deposits* is defined here as **DD** (Total deposits/ Total debts) and *demand deposit proportion* is defined as **DDEP** (Demand deposits/Total debts). These two variables show dependency on the traditional banking business model. *Leverage* **LEV** (Total debts/equity capital) is a proxy reflecting the credit risk of the banks.

On the asset side, another three variables are used to describe the banking business attributes. *Dependency on loans* is defined as **LN** (Total loans/Total assets), *internal liquidity* is defined as **CH** (Cash / Total assets), and the *securities investment proportion* as **SEC** (Securities investment / Total assets). More specifically, LN (dependency on loans) is a conventional banking business model-related proxy addressing the long-term relationship with customers while SEC is a proxy of diversification of assets and exposure of market risk. CH is a proxy of buffer

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of the responses to the questions, we kept 13 scores regarding employee relations (*EMP*), five scores regarding social contributions (*SC*), five scores regarding the security of the firm and product safety (*SS*), six scores regarding internal governance and risk management (*IG*), and five scores regarding environmental preservation (*ENV*). More detail is provided in Suto and Takehara (2014, 2016a).

[14] CSR data icalculated based on the results of the questionnaire survey conducted in June and financial data are from annual financial statements for the fiscal year. The fiscal year of banks is from April to the following March. The average response rate to Toyo Keizai's CSR questionnaire survey for 2007 to 2011 was 29.7% (Suto and Takehara, 2014, 2016a).

[15] According to this classification by the Japanese Bankers' Association, Mizuho Corporate Bank and Saitama Risona Bank are formally included in the city bank group; however, the range of their business is not nation-wide retail banking. MCB is biased toward wholesale banking and SRB is biased toward regional retail banking. Furthermore, both banks have a city bank counterpart in the same financial group to which each belongs; Mizuho and Risona banks. Therefore, we exclude the MCB and SRB from our sample.

[16] In the case in which the bank is held by a holding company, the stock price of the holding company is used.

for liquidity risk for the bank.

Table 2 summarizes the basic statistics of the firm-specific variables during the sample period. We observe that there is a significant difference in the asset size and corporate performance between city banks and regional banks. City banks are much larger than regional banks. ROA and ROE are calculated based on the past 3-year average and show that city banks perform better (0.009; 0.247) than regional banks (0.006; 0.113), although minor difference on market-based performance reflected by Tobin's Q can be observed (0.997 for city banks and 0.984 for regional banks). As expected, the business attributes are distinct between the two bank groups. City banks seem less dependent on the traditional banking model than the regional banks, as shown by the smaller DD (0.723 for city banks and 0.929 for regional banks) and LN (0.510 for city banks and 0.630 for regional banks). By contrast, the DDEP of city banks (0.610) is larger than that of the regional banks (0.462). In addition, city banks show higher leverage (LEV of 27.673) than regional banks (22.520). The CH of city banks is 0.090, which is more than double that of the regional banks (0.044). Regional banks, however, are comparably more active in the investment securities market with SEC of 0.284, which is slightly higher than that of the city banks (0.265). This is largely because regional banks invest mainly in government securities, as they are still under traditional relationship-based banking. Insufficient demand for loans from the regional markets makes regional banks invest in this category of securities.

Table 2 suggests there are distinct differences in business models as well as liquidity management attributes between the city banks and regional banks. This has potential to help us explore and interpret the relationship between CSP and the market liquidity risk level in the context of the Japanese banks in the following Sections 4 and 5.

--Insert Table 2 around here--

4. Research Methodologies

4.1 Liquidity risk measures and firm-specific variables

Table 3 demonstrates correlations between market liquidity risk measures (market liquidity risk-adjusted VaR and Amihud's ILLIQ) and the 10 firm-specific variables explained in Section 3. **Table 3** presents some interesting findings. First, both VaR and ILLIQ in general are negatively correlated with asset size (ln TA) and corporate performance variables (ROE, ROA, and Tobin's Q). Second, market liquidity risk measures are positively correlated with DD and LN for both the entire sample and regional banks, although the correlation between LN and IILIQ is not statistically insignificant. These facts essentially suggest that smaller sized banks with lower levels of corporate financial performance and higher dependency on the traditional banking model (i.e., higher proportions of deposits and loans) are potentially more exposed to market liquidity risk.

On the liability side, **Table 3** shows an interesting finding that banks with higher levels of leverage and higher dependency on demand deposits are actually less exposed to market liquidity risk. Both VaR and ILLID variables are negatively correlated with LEV and DDEP for the entire sample. On the asset side, the negative (positive)

correlation between the CH (SEC) and market liquidity risk measures indicates that a higher cash-based internal liquidity level and lower level of investment securities' share of banks' asset would enable sample banks to be less exposed to market liquidity risk. For the entire sample, both VaR and ILLIQ measures have consistent results.

However, when the correlation is explored only within the regional bank group, the correlations of both liquidity risk measures to some firm-specific variables (DDEP, LEV, CH, and SEC) are not statistically significant. The correlation of the VaR measure with LN is significantly negative for the regional bank group, which is in contrast to the significantly positive correlation for the entire sample. When the analysis is limited to the regional banks, banks with high dependency on loans are exposed to less liquidity risk measured by VaR. The correlation between regional banks' loan dependency and their VaR shows a different story from the entire sample testing. As the VaR model adopted in this study incorporates the liquidity risk-related cost while the Amihud's ILLIQ focuses on the illiquidity ratio, the divergent results could be largely attributed to a different structure of business model between city and regional banks.

--Insert Table 3 around here--

4.2 Correlation between CSP indexes, liquidity risk measures, and firm-specific variables

As a part of the preliminary examination before running the regression analysis, we calculate correlations between CSP indexes and other variables. **Table 4** shows the correlations between CSP indexes (composite CSP and five dimensional CSPs), liquidity risk measures, and firm-specific variables for the entire sample and only regional banks. This table demonstrates that market liquidity risk measures (by both VaR and ILLIQ) have negative correlations with composite CSP index (CSP) and five dimensional indexes: employee relations (*EMP*), social contributions (*SC*), security of the firm and product safety (*SS*), internal governance and risk management (*IG*), and environmental preservation (*ENV*). Composite CSP has statistically significant correlations with both liquidity risk measures at the 1% level. This indicates that banks with higher CSP could be less exposed to market liquidity risk. Regional banks' CSP indexes show similar negative correlations with ILLIQ but correlation with VaR is insignificant but positive. This suggests that market liquidity risk by VaR could be linked to business models but ILLIQ is not influenced by difference in business model and size of assets.

With respect to the control variables, larger banks (ln TA) or those performing well financially (ROE, ROA, and Tobin's Q) with high demand deposits (DDEP), higher investment securities proportions (SEC), and higher leverage used (LEV) as well as those holding more cash-type internal liquidity (CH), as indicated by Table 4, have comparably better CSP performance for all 32 banks. At the same time, the banks' dependency on deposits and loans is negatively related to their CSP performance. In Panel B, regional banks' CSP shows a similar correlation pattern with their market liquidity risk measures and firm-specific variables, except LEV and CH. However, the correlations are comparably less and more statistically insignificant.

Regarding liquidity, the theoretical literature reveals that the implicit and explicit costs of transacting drive the liquidity of a security (Stoll 2003). However, from our study, it seems that the liquidity "cost" or the price impact

from immediate liquidity (as measured and adjusted in a VaR model to reflect the banks' market liquidity risk) is not as sensitive as the illiquidity ratio in terms of reacting to the CSP information of regional banks, which is relatively small and more dependent on traditional relationship banking.

--Insert Table 4 around here--

4.3 Correlations between firm-specific variables

To construct our regression model, we calculate correlations between control variables for the entire sample. **Table 5** demonstrates the correlation matrix. Firm size ln TA has significantly negative correlation with dependency on deposits: DD (−0.892) and DDEP (0.741) and loan dependency LN (−0.666). We need to devise a method for excluding size effect in regression analyses. With respect to business attributes, LN has high correlation with DD (0.696) and DDEP (−0.629). To improve the analytical accuracy, we retain DD and remove LN as a proxy of dependency of traditional business and select SEC as a proxy of business diversity.

--Insert Table 5 around here--

4.4 Regression models

We construct the following regression model to explore and examine the precise relationship between Japanese banks' CSP and their market liquidity risk exposures. Based on the correlation across all firm-level variables mentioned in Section 4, we finally select six firm specific variables, including ln TA, DD, DDEP, LEV, CH, and SEC as control variables. In addition, we incorporate three dummy variables to address the differences in terms of banks' business types, target customers or markets, and markets. The first dummy variable **CBD** is to identify the different types of business models between city banks and regional banks (1 for city banks, and 0 for regional banks). The second dummy variable is to identify the degree of banks' exposure to the international banking context, which can be represented by their compliance with the international capital adequacy framework. This dummy variable, **IBD**, addresses the banks' levels of internationalization, with 1 representing banks' compliance with the Bank for International Settlements (BIS) capital adequacy method and 0 for compliance with a domestic method instead. The third dummy variable is year dummies to control the periodic market condition that could potentially influence banks' risk management and performance. This is particularly meaningful as our sample period covers the global financial crisis around 2007–2008. Although the Japanese banking system was less affected by this crisis than other developed economies, it is indispensable and would be interesting to introduce this periodic aspect to the regression estimation.

Our regression model is defined by (1). The explanatory variable is composite CSP and the dependent variable is market liquidity risk measures (MLRM), or VaR and ILLIQ. The regression is run separately with VaR and ILLIQ measures.

$$MLRM_{jt} = \alpha+\beta_1 CSP_{jt}+\beta_2 lnTA_{jt}+\beta_3 performance_{jt}+\beta_4 DD_{jt}+\beta_5 DDEP_{jt}+\beta_6 LEV_{jt}+\beta_7 SEC_{jt}+ \beta_8 CH_{jt}+\beta_9 CBD_{jt}+\beta_{10} IBD_{jt}+\sigma year\ dummy+\varepsilon jt \quad (1)$$

where $MLRM_{jt}$ = each of market liquidity risk measures (VaR; ILLIQ) of bank j at time t

CSP_{jt} = CSP index of bank j at time t

$Ln\ TA_{jt}$ = Size of bank j at time t

$Performance_{jt}$ = ROE_{jt}, ROA_{jt}, or $Tobin's\ Q_{jt}$, which are the *ROE*, *ROA,* or *Tobin's Q* of bank j at time t

DD_{jt} = Deposit/debt of bank j at time t

$DDEP_{jt}$= Demand deposit/debt of bank j at time t

LEV_{jt}= Leverage of bank j at time t

SEC_{jt} = Investment securities/assets of bank j at time t

CH_{jt}= Cash/assets of bank j at time t

CBD_{jt} = Dummy variable (1 for city banks, and 0 for regional banks)

IBD_{jt}= Dummy variable (1 for banks complying with the BIS capital adequacy method, and 0 for complying with a domestic method instead)

As there are high correlations between firm size with other variables, we conduct two methods of estimation for regression (1). First, we run the regression analyses with and without the size variable, and compare the results to identify the size effect. Second, to exclude correlation between CSP and firm size, we estimate the regressions with size-adjusted CSP. We exclude ln TA from regression (1) and replace the CSP variable with size-adjusted CSP in the regressions. Size-adjusted CSP is calculated by estimating the residual in equation (4).

$$CSPjt = \alpha+\beta lnSizejt +\varepsilon jt \quad (2)$$

For each case of regressions, the standard errors are collected by using the robust standard error correction method with the Huber–White sandwich estimators.[17]

5 Results and implications

Table 6 demonstrates the estimation results of our basic regression model. Regression analyses are conducted individually each time with one corporate performance variable—ROA (Case 1), ROE (Case 2), and Tobin's Q (Case 3). By excluding the size variable (Ln TA), which has a strong correlation with the CSP variable, as explained above, another three regressions (Cases 4, Case 5, and 6) are conducted in a similar way without Ln TA. Thus, **Panel A** of **Table 6** shows the VaR regression results for the six cases.

Cases 1, 2, and 3 indicate that the VaR coefficients are statistically significantly positive with CSP but are statistically significantly negative with size (ln TA) and all three corporate financial performance variables (ROA,

[17] We do not employ unbiased panel data regression but instead introduce three dummies for cross-sectional and time-series differences because the results of unbiased panel regressions are not stable due to our small sample data.

ROE, and Tobin's Q). This result potentially suggests that larger and financially better performing banks would be exposed less to market liquidity risk. However, if size variables are excluded in Cases 4, 5, and 6, CSP coefficients are negative but not statistically significant. This suggests that the positive relationship between CSP and VaR is due to size effects rather than corporate social awareness of the banks.[18]

It seems that the corporate social performance of banks in the context of the Japanese market has not been sufficiently perceived as the key determinant of the trust and confidence that could potentially mitigate or buffer against the market liquidity risk. Related to this point, Suto and Takehara (2016b), who examine the link between CSP and the cost of capital of Japanese firms for 2007 to 2013, find that the cost of debt capital has a positive link to CSP. This finding suggests that CSP does not reduce the credit risk premium but rather, is perceived as cost spending while CSP reduces the cost of equity capital through mitigating information asymmetry. Our results, as interpreted in this study, disclose a similar phenomenon between CSP and market liquidity risk in reference to Suto and Takehara (2016b). In the Japanese banking context, as discussed in Subsection 2.1, CSP is not incorporated into risk management sufficiently.

The results of the banking business-type dummy variable CBD show that city banks are less exposed to market liquidity risk than their regional banking peers, as the coefficients of CBD are negative and statistically significant for all cases. In addition, more internationalized banks have higher market liquidity risk exposure, as suggested by the positive relationship between the IBD variable and VaR. This result is statistically significant in cases 1, 2, and 3. These results are expected due to the risky nature of those internalized banks' business structure. With regard to other business attributes, banks with higher cash-holding proportions in their assets actually are more exposed to market liquidity risk. This could be partially due to differences in the banks' risk management procedures or practices. However, on this point, future study is required for a better explanation. Furthermore, greater dependency on traditional banking as reflected by the higher proportion of deposit (DD) in general is not observed but the lower proportion of demand deposit (DDEP) in particular indicates a higher risk exposure for Japanese banks.

Panel B of **Table 6** demonstrates the results based on another market liquidity risk measure— ILLIQ. First, in contrast to the results in Panel A based on the market liquidity risk-adjusted VaR, both the CSP and size variables (Ln TA) are negative but statistically insignificant with market liquidity risk for all cases. This is distinct from what has been observed between them with the VaR measure. Among all three corporate financial performance variables, only Tobin's Q has a significantly negative relationship with the market liquidity risk. The market liquidity risk as measured by the ILLIQ shows only a positive relationship with the deposit proportion (DD) and the proportion of investment securities (SEC) that are normally regarded as marketable assets. This is interesting, as shown by the positive coefficient of CBD listed in Panel B, and suggests that city banks are more exposed to the market liquidity risk than regional banks are, which is contrary to the result of Panel A. There is no obvious evidence suggesting a significant relationship between CH (representing the cash-holding proportion) and IBD (representing the extent of the banks' internationalization). In both Panels A and B, we find no evident relationship between LEV (leverage) and the market liquidity risk measures.

In general, asset size seems to be the key factor that has an impact on mitigating the market liquidity risk of the

[18] We conduct regression (1) for the regional bank group. In general, similar results are found.

Japanese banks. When the market liquidity risk is measured based on the liquidity cost or price impact of immediate liquidity (VaR), Japanese banks' corporate social performance probably has more influence on the market liquidity risk from the way in which it increases the risk potential compared to buffering. On the illiquidity position of the banks as per the ILLIQ, the results suggest that CSP has no significant impact, as expected. This implies that the long-term scope of CSR practices and the related performance information either have been linked sufficiently to the banks' liquidity risk management or are not embedded in the market participants' decision-making. This is likely the case for the regional bank group in particular.

--Insert Table 6 around here--

Next, further regression analyses are conducted with a size-adjusted CSP variable. The results are presented in **Table 7**. **Panel A** of **Table 7** demonstrates the results on the VaR measure. CSP has positive coefficients with risk exposure for all cases with different financial performance, of which Case 3 has a statistically significant result. Therefore, we have weak evidence of a positive association between CSP and short-term price impact reflected on the VaR. We interpret this result as CSR practices potentially conflicting with short-term liquidity management for Japanese banks during the sample period. With respect to firm-specific variables, all corporate financial performance variables have significantly negative association with VaR. The deposit (DD) and cash-holding proportion (CH) are positive with the risk metric, which suggests that more traditional banking activities involve higher risk exposure. In addition, banks with higher dependency on demand deposit (DDEP) are less exposed to the market liquidity risk. These results essentially are similar to Panel A of Table 6 except for the deposit variable DD. The results for the ILLIQ measure-based regression are summarized in **Panel B** of **Table 7.** As all coefficients of CSP are negative but statistically insignificant, we find no evident relationship between the CSP and market illiquidity. Regarding other variables, the results are similar to those in Table 6. Thus, the results are robust as a whole and consistent with what we observed from Table 6.

--Insert Table 7 around here--

6 Conclusions

In this study, we investigated the relationship between the corporate social performance of a group of 32 Japanese banks and their market liquidity risk exposure during the sample period from 2007 to 2014. Our results suggest that Japanese banks with better CSR awareness and higher CSP may be more exposed to market liquidity risk. We interpret this finding as follows: the banks' long-term CSR strategy and liquidity risk management are not sufficiently consistent with each other and are rather indifferent to each other. Among all firm-level characteristic variables, size is absolutely influential in terms of mitigating the market liquidity risk for the Japanese banking sector. Banks with better financial performance tend to be less exposed to market liquidity risk, which is a common observation in financial markets.

Considering the conventional business models of Japanese banks, we found that banks that depend on more

traditional banking based on long-term relationships could face higher risk exposure. In addition, we found that more internationalized banks are exposed to higher market liquidity risk. This could be explained by their involvement in various trading activities in the international markets. Furthermore, city banks that run more market-oriented businesses than regional banks deal with a higher price impact and cost-related market liquidity risk. Leverage has not played a visible role in changing Japanese banks' exposure to market liquidity risk, according to our results. Banks' conservative strategies in risk taking and the history of relationship-oriented business are probably two reasons for this.

This study provides a new approach to CSP and financial risk and contributes to exploring the research on bank management. However, further development of research is needed to explore the relationship between risk management of banks and their CSR. One interesting topic to tackle is to investigate the influence of CSP and funding liquidity risk. It would be worthwhile to develop research by incorporating these two types of liquidity risk and investigating the impact of CSP on the risk management of banks. These are the next items on our research agenda.

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Table 1 Basic Statistics of Market Liquidity Risk-adjusted VaR and ILLIQ Measures

Total sample (Annualised Data), city banks: 4, regional banks: 28 covering a period from January 1, 2007 to December 31, 2014								
		Average	Standard deviation	Minimum	25% Tile	Median	75% Tile	Maximum
Market liquidity risk-adjusted VaR	Total sample	-0.0220	0.0118	-0.0709	-0.0262	-0.0196	-0.0147	-0.0247
	City banks	-0.0389	0.0122	-0.0709	-0.0437	-0.0376	-0.0296	-0.0247
	Regional banks	-0.0200	0.0102	-0.0619	-0.0237	-0.0180	-0.0143	-0.0619
ILLIQ	Total sample	8.47013E-07	2.72229E-06	0	9.72829E-09	7.68712E-08	3.07725E-07	1.98588E-05
	City banks	1.78292E-09	2.5507E-09	1.95172E-10	3.42492E-10	6.02755E-10	1.17291E-09	4.28408E-09
	Regional banks	9.43611E-07	2.85831E-06	0	2.0622E-08	9.86263E-08	3.65124E-07	1.98588E-05

Table 2 Basic Statistics of Firm-specific Variables

Total sample (commercial banks): 194, City banks: 27, Regional banks: 167 Sample size=number of banks *years								
		Average	Standard deviation	Minimum	25% Tile	Median	75% Tile	Maximum
LN TA (Total assets) (¥billion)	Total sample	16997.1	38132.7	655.3	2526.4	4089.0	6673.2	181692.1
	City banks	98098.3	53214.5	25583.6	28652.4	103536.4	148409.1	181692.1
	Regional banks	3885.0	2072.7	655.3	2262.8	3660.3	5015.9	9076.0
ROE (past 3-year average)	Total sample	0.132	0.166	-1.061	0.087	0.155	0.208	0.518
	City banks	0.247	0.145	-0.143	0.200	0.251	0.331	0.518
	Regional banks	0.113	0.162	-1.061	0.081	0.148	0.196	0.400
ROA (past 3-year average)	Total sample	0.006	0.006	-0.027	0.004	0.007	0.009	0.025
	City banks	0.009	0.005	-0.002	0.006	0.011	0.013	0.017
	Regional banks	0.006	0.006	-0.027	0.004	0.006	0.008	0.025
Tobin's Q (past 3-year average)	Total sample	0.986	0.017	0.952	0.975	0.984	0.993	1.062
	City banks	0.997	0.017	0.980	0.984	0.989	1.005	1.037
	Regional banks	0.984	0.016	0.952	0.974	0.983	0.992	1.062
DD (Deposits ／ Debts)	Total sample	0.900	0.083	0.605	0.881	0.930	0.951	0.994
	City banks	0.723	0.066	0.605	0.670	0.718	0.788	0.813
	Regional banks	0.929	0.038	0.821	0.907	0.935	0.956	0.994
DDEP (Demand deposits) ／ Deposits	Total sample	0.483	0.086	0.261	0.437	0.476	0.540	0.678
	City banks	0.610	0.038	0.540	0.589	0.606	0.637	0.678
	Regional banks	0.462	0.072	0.261	0.424	0.466	0.506	0.622
LEV (Leverage)	Total sample	23.237	6.125	13.904	18.967	21.963	26.419	53.702
	City banks	27.673	8.893	19.830	20.275	25.696	32.967	53.702
	Regional banks	22.520	5.245	13.904	18.444	21.600	26.207	39.897
LN (Loans ／Assets)	Total sample	0.613	0.078	0.416	0.574	0.617	0.671	0.771
	City banks	0.510	0.085	0.416	0.438	0.474	0.605	0.681
	Regional banks	0.630	0.062	0.458	0.588	0.627	0.674	0.771
CH (Cash ／Assets)	Total sample	0.050	0.038	0.009	0.026	0.039	0.060	0.239
	City banks	0.090	0.060	0.037	0.049	0.065	0.129	0.239
	Regional banks	0.044	0.029	0.009	0.024	0.035	0.056	0.186
SEC (Investment securities／Assets)	Total sample	0.281	0.073	0.055	0.235	0.286	0.329	0.438
	City banks	0.265	0.073	0.129	0.194	0.271	0.330	0.393
	Regional banks	0.284	0.072	0.055	0.244	0.290	0.329	0.438

Table 3 Correlations between Market Liquidity Risk Measures and Firm-specific Variables

VaR: Liquidity-adjusted VaR, ILLIQ: Amihud Ratio, TA: Total Assets, DD: Deposits/Debts, DDEP: Demand deposits／Deposits, LEV: Leverage, LN: Loans／Assets , CH: Cash／Assets, SEC: Investment securities／Assets

	Total sample :194				Regional banks: 167			
	VaR		ILLIQ		VaR		ILLIQ	
Ln TA	-0.623	***	-0.155	**	-0.202	***	-0.056	
ROE	-0.192	***	-0.066		-0.012		-0.027	
ROA	-0.173	**	-0.094		-0.087		-0.069	
Tobin's Q	-0.423	***	-0.175	**	-0.316	***	-0.155	**
DD	0.569	***	0.211	***	0.065		0.196	**
DDEP	-0.406	***	-0.027		-0.039		0.081	
LEV	-0.299	***	-0.048		0.048		-0.005	
LN	0.251	***	0.093		-0.142	*	0.016	
CH	-0.214	***	-0.108		0.037		-0.065	
SEC	0.168	**	0.046		0.114		0.036	

*** 1% significance level, ** 5% significance level, * 10% significance level.

Table 4 Correlations between CSP Indexes, Market Liquidity Risk Measures, and Firm-specific Variables

LAV: Liquidity-adjusted VaR, ILLIQ: Amihud Ratio, TA: Total Assets, DD: Deposits/Debts, DDEP: Demand deposits／Deposits, LEV: Leverage, LN: Loans／Assets, CH: Cash／Assets, SEC: Investment securities／Assets. CSP: Composite CSP, EMP: Employee relations, SC: Social contribution, SS: Security and safety, IG: Internal governance, ENV: Environment preservation

Panel A Total commercial banks: 194 number of banks *years (2007–2013)

	CSP		EMP		SC		SS		IG		ENV	
VAR	-0.28	***	-0.072		-0.353	***	-0.137	*	-0.075		-0.212	***
ILLIQ	-0.19	***	-0.065		-0.359	***	-0.312	***	-0.501	***	-0.07	
Ln TA	0.616	***	0.236	***	0.609	***	0.358	***	0.259	***	0.488	***
ROE	0.194	***	0.090		0.201	***	0.277	***	0.089		0.109	
ROA	0.206	***	0.047		0.148	**	0.330	***	0.138	*	0.127	*
Tobin's Q	0.202	***	-0.090		0.181	**	0.068		0.138	*	0.212	***
DD	-0.523	***	-0.231	***	-0.564	***	-0.391	***	-0.291	***	-0.405	***
DDEP	0.340	***	0.192	***	0.353	***	0.180	**	0.029		0.221	***
LEV	0.066		0.016		0.256	***	-0.221	***	0.079		0.145	**
LN	-0.419	***	-0.283	***	-0.464	***	-0.149	**	-0.288	***	-0.305	***
CH	0.240	***	0.164	**	0.235	***	0.255	***	0.240	***	0.179	**
SEC	0.066		0.199	***	0.118		-0.084		-0.003		0.020	

Panel B Regional banks: 167 number of banks *years (2007–2013)

	CSP		EMP		SC		SS		IG		ENV	
VAR	0.062		0.036		0.026		0.041		0.051		0.079	
ILLIQ	-0.138	*	-0.044		-0.348	***	-0.316	***	-0.53	***	-0.015	
Ln TA	0.409	***	0.228	***	0.337	***	0.186	**	0.066		0.384	***
ROE	0.061		-0.010		0.101		0.139	*	0.076		0.016	
ROA	0.110		-0.057		0.080		0.215	***	0.140	*	0.068	
Tobin's Q	0.127		-0.093		0.064		0.065		0.097		0.181	**
DD	-0.177	**	-0.181	**	-0.300	***	-0.157	**	-0.162	**	-0.210	***
DDEP	0.055		0.105		0.064		-0.080		-0.102		0.003	
LEV	-0.066		0.050		0.096		-0.229	***	0.010		0.011	
LN	-0.155	**	-0.297	***	-0.213	***	-0.020		-0.079		-0.096	
CH	-0.035		0.043		-0.018		0.004		0.143	*	-0.063	
SEC	0.106		0.260	***	0.214	***	-0.042		-0.050		0.071	

*** 1% significance level, ** 5% significance level, * 10% significance level.

Table 5 Correlations between Control Variables

Total Assets, DD: Deposits/Debts, DDEP: Demand deposits／Deposits, LEV: Leverage, LN: Loans／Assets, CH: Cash／Assets, SEC: Investment securities／Assets.

Total commercial banks: 194 number of banks *years

	Ln TA		ROE		ROA		TobinQ		DD		DDEP		LEV		LN		CH	
ROE	0.321	***																
ROA	0.292	***	0.932	***														
Tobin's Q	0.256	***	0.097		0.187	***												
DD	-0.892	***	-0.352	***	-0.278	***	-0.117											
DDEP	0.741	***	0.300	***	0.220	***	-0.022		-0.636	***								
LEV	0.112		-0.206	***	-0.373	***	0.229	***	-0.174	**	0.143	**						
LN	-0.666	***	-0.188	***	-0.070		0.173	**	0.696	***	-0.629	***	-0.227	***				
CH	0.373	***	0.230	***	0.240	***	-0.024		-0.461	***	0.321	***	0.097		-0.343	***		
SEC	0.131	*	-0.009		-0.126	*	-0.469	***	-0.175	**	0.297	***	-0.011		-0.660	***	-0.248	***

*** 1% significance level, ** 5% significance level, * 10% significance level.

Table 6 Regression Results

Panel A: VaR

	Dep. var: VaR											
Indep. var	(1)		(2)		(3)		(4)		(5)		(6)	
CSP	0.0006	**	0.0006	**	0.0006	**	1.75E-05		-5.50E-05		2.90E-04	
	0.0003		0.0003		0.0003		2.14E-04		2.12E-04		2.34E-04	
Ln Size	-0.0034	***	-0.0037	***	-0.0031	***						
	0.0010		0.0011		0.0011							
ROA	-0.2253	***					-0.2522	***				
	0.0767						0.0960					
ROE			-0.0057	**					-0.0053	*		
			0.0025						0.0032			
Tobin's Q					-0.0395						-0.0941	***
					0.0288						0.0293	
DD	-0.0091		-0.0096		-0.0057		0.0094		0.0113		0.0078	
	0.0107		0.0109		0.0110		0.0095		0.0094		0.0088	
DDEP	-0.0054		-0.0051		-0.0081		-0.0195	***	-0.0208	***	-0.0193	***
	0.0070		0.0071		0.0072		0.0056		0.0056		0.0053	
LEV	-0.0001		-0.0001		0.0000		-0.0001		0.0000		0.0001	
	0.0001		0.0001		0.0001		0.0001		0.0001		0.0001	
SEC	0.0066		0.0094	*	0.0061		0.0060		0.0094		-0.0003	
	0.0056		0.0056		0.0063		0.0064		0.0061		0.0069	
CH	0.0186	*	0.0180	*	0.0186	*	0.0220	*	0.0219	*	0.0201	*
	0.0105		0.0107		0.0108		0.0118		0.0126		0.0113	
CBD	-0.0126	***	-0.0120	***	-0.0135	***	-0.0168	***	-0.0166	***	-0.0178	***
	0.0032		0.0033		0.0030		0.0025		0.0026		0.0025	
IBD	0.0015	*	0.0016	**	0.0015	*	0.0010		0.0011		0.0008	
	0.0008		0.0008		0.0009		0.0008		0.0008		0.0009	
Observations	194		194		194		194		194		194	
Year dum.	YES		YES		YES		YES		YES		YES	
F	57.16		55.07		55.91		56.18		52.4		60.14	
R-squared	0.8741		0.8706		0.8674		0.8606		0.8545		0.8593	

Upper figures are coefficients and lower figures are standard deviation.

*** 1% of significance level, ** 5% significance level, * 10% significance level.

Panel B: ILLIQ

	Dep. var: ILLIQ					
Indep. var	(1)	(2)	(3)	(4)	(5)	(6)
CSP	-1.39E-07	-1.39E-07	-1.17E-07	-1.40E-07	-1.40E-07	-9.02E-08
	1.68E-07	1.67E-07	1.66E-07	1.51E-07	1.50E-07	1.57E-07
lnSize	-6.13E-09	-3.95E-09	2.68E-07			
	1.43E-07	1.52.E-07	1.81E-07			
ROA	-1.65E-06			-1.70E-06		
	1.71E-05			1.73E-05		
ROE		3.26E-07			3.26E-07	
		5.78E-07			5.69E-07	
Q			-1.90E-05 ***			-1.40E-05 ***
			5.83E-06			4.53E-06
DD	8.41E-06 **	8.61E-06 **	8.77E-06 **	8.44E-06 ***	8.63E-06 ***	7.59E-06 **
	3.51E-06	3.60E-06	3.51E-06	3.10E-06	3.13E-06	3.05E-06
DDEP	1.68E-06 *	1.56E-06	1.10E-06	1.65E-06	1.54E-06	2.07E-06 *
	9.78E-07	9.85E-07	1.02E-06	1.20E-06	1.17E-06	1.20E-06
LEV	-3.44E-09	8.32E-12	1.02E-08	-3.34E-09	8.64E-11	3.15E-09
	1.11E-08	1.11E-08	1.20E-08	1.10E-08	1.12E-08	1.28E-08
SEC	2.68E-06	2.79E-06 *	5.16E-07	2.68E-06	2.79E-06 *	1.08E-06
	1.72E-06	1.65E-06	1.42E-06	1.72E-06	1.64E-06	1.47E-06
CH	2.93E-06	3.01E-06	2.64E-06	2.93E-06	3.01E-06	2.51E-06
	2.03E-06	2.07E-06	1.97E-06	2.01E-06	2.04E-06	1.95E-06
CBD	9.87E-07 **	9.67E-07 **	4.65E-07	9.79E-07 **	9.62E-07 *	8.41E-07
	4.73E-07	4.59E-07	4.60E-07	5.27E-07	5.17E-07	5.31E-07
IBD	4.59E-07	4.70E-07	3.35E-07	4.58E-07	4.70E-07	3.95E-07
	4.16E-07	4.20E-07	4.23E-07	4.21E-07	4.24E-07	4.30E-07
Observations	194	194	194	194	194	194
Year dum.	YES	YES	YES	YES	YES	YES
F	1.55	1.51	1.99	1.57	1.52	2.12
R-squared	0.1111	0.1121	0.1285	0.1111	0.1121	0.1242

Upper figures are coefficients and lower figures are standard deviation.

*** 1% significance level, ** 5% significance level, * 10% significance level.

Table 7 Regression Results with Size-adjusted CSP

Panel A: VaR							Panel B: ILLIQ					
	Dep. var: VaR						Dep. var: ILLIQ					
Indep. var	(1)		(2)		(3)		(1)		(2)		(3)	
CSP	0.00032		0.00027		0.00051	*	-1.47E-07		-1.48E-07		-1.11E-07	
	0.00023		0.00023		0.00026		1.68E-07		1.68E-07		1.67E-07	
ROA	-0.25518	***					-2.61E-06					
	0.09561						1.76E-05					
ROE			-0.00533	*					3.37E-07			
			0.00313						5.77E-07			
Tobin's Q					-0.09430	***					-1.50E-05	***
					0.02891						3.94E-06	
DD	0.00847		0.01055		0.00611		8.97E-06	**	9.18E-06	**	7.93E-06	**
	0.00945		0.00945		0.00881		3.48E-06		3.53E-06		3.35E-06	
DDEP	-0.01833	***	-0.01984	***	-0.01776	***	1.26E-06		1.14E-06		1.79E-06	*
	0.00568		0.00568		0.00550		9.49E-07		9.07E-07		9.84E-07	
LEV	-0.00006		0.00001		0.00009		-2.03E-09		1.91E-09		5.03E-09	
	0.00012		0.00011		0.00009		1.14E-08		1.17E-08		1.31E-08	
SEC	0.00576		0.00923		-0.00048		2.65E-06		2.78E-06	*	9.86E-07	
	0.00645		0.00611		0.00698		1.73E-06		1.65E-06		1.50E-06	
CH	0.02245	*	0.02244	*	0.02016	*	3.05E-06		3.14E-06		2.53E-06	
	0.01174		0.01255		0.01113		2.06E-06		2.10E-06		1.96E-06	
CBD	-0.01691	***	-0.01680	***	-0.01762	***	8.48E-07	*	8.29E-07	*	7.60E-07	*
	0.00253		0.00259		0.00250		4.52E-07		4.43E-07		4.47E-07	
IBD	0.00080		0.00083		0.00071		4.35E-07		4.48E-07		3.92E-07	
	0.00087		0.00088		0.00094		4.08E-07		4.11E-07		4.07E-07	
Observations	194		194		194		194		194		194	
Year dum.	YES		YES		YES		YES		YES		YES	
F	55.58		51.89		59.72		1.59		1.54		2.11	
R-squared	0.8615		0.8551		0.8606		0.1102		0.1112		0.1261	

Upper figures are coefficients and lower figures are standard deviation.

*** 1% significance level, ** 5% significance level, * 10% significance level.

Appendix 1 Commercial Banks in Sample

id	Bank name	Category	2007	2008	2009	2010	2011	2012	2013	2014	Total
1	Mizuho Bank	City Bank		1	1	1	1	1	1	1	7
2	Bank of Tokyo Mitsubishi	City Bank				1	1	1	1	1	5
3	Sumitomo Mitsui	City Bank	1	1	1	1	1	1	1	1	8
4	Resona Bank	City Bank		1	1	1	1	1	1	1	7
5	Aomori Bank	Regional Bank	1	1	1	1	1	1	1		7
6	Michinoku Bank	Regional Bank	1	1	1	1	1	1	1	1	8
7	Akita Bank	Regional Bank	1	1	1	1	1	1	1	1	8
8	Tohoku Bank	Regional Bank		1	1	1	1	1			5
9	77 Bank	Regional Bank	1	1	1	1	1	1	1	1	8
10	Joyo Bank	Regional Bank			1	1	1	1			4
11	Hachijuni Bank	Regional Bank	1		1	1	1	1	1	1	7
12	Hokkoku Bank	Regional Bank	1	1	1	1	1	1	1		7
13	Shizuoka Bank	Regional Bank	1	1							2
14	Suruga Bank	Regional Bank	1	1	1	1	1	1	1	1	8
15	Ogaki Kyoritsu Bank	Regional Bank	1	1	1	1	1	1	1	1	8
16	Hyakugo Bank	Regional Bank	1	1	1	1	1	1	1	1	8
17	Shiga Bank	Regional Bank	1	1	1	1	1	1	1	1	8
18	Bank of Kyoto	Regional Bank	1	1	1	1	1	1	1	1	8
19	Nanto Bank	Regional Bank	1	1	1	1	1	1	1	1	8
20	Kiyo Bank	Regional Bank			1	1	1				3
21	Hyakujushi Bank	Regional Bank	1	1	1	1	1	1	1	1	8
22	Iyo Bank	Regional Bank	1	1	1	1	1	1	1	1	8
23	Shikoku Bank	Regional Bank	1	1	1	1	1	1	1	1	8
24	Bank of Saga	Regional Bank		1	1	1	1	1	1	1	7
25	North Pacific Bank	Regional Bank		1	1						2
26	Gifu Bank	Regional Bank	1	1	1						3
27	Aichi Bank	Regional Bank	1	1	1	1					4
28	Bank of Nagoya	Regional Bank			1	1	1	1	1	1	6
29	Tokushima Bank	Regional Bank	1	1							2
30	Kagawa Bank	Regional Bank	1	1							2
31	Bank of Kochi	Regional Bank		1	1	1	1	1	1	1	7
32	Yachiyo Bank	Regional Bank				1	1	1			3
			21	26	27	27	26	25	22	20	194

Appendix 2 Definition of Variables

Variables	Detailed definition
ln TA	Natural logarithm of total assets
ROA	Operating profit/Total assets (past 3-year average)
ROE	Operating profit/Equity capital (past 3-year average)
Tobin's Q	(Market value + Total debts) / Total assets (past 3-year average)
DD	Total deposits / Total debts
DDEP	Demand deposits /Total deposits
LEV	Total debts /Equity capital
LN	Total loans / Total assets
SEC	Investment securities/Assets
CH	Cash / Total assets
IBD	BIS equity capital ratio (1, 0)
CBD	City bank (1, 0)