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Recession and Financial Flexibility in Japanese Firms

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Abstract

This study investigates Japanese firms' financial flexibility management and tries to answer the question that whether or not Japanese firms prepare for recessions by accumulating financial flexibility. We employ an improved model to predict recession probability that is more appliable for Japan and use it as independent variable. Our empirical analysis results indicate that overall, Japanese firms do not prepare for recessions by increasing financial flexibility, except for the period of 1997 to 1998, which is right after bubble collapsing of Japan's economy in 1990s and known as with extremely high financing cost. We fail to find similar evidence for 2008 global financial crisis period. Our research contributes to the understanding of financial flexibility management especially for Japanese firms.

Keywords: Financial Flexibility, Cash holdings, Term structure of interest rate, recession probability
JEL Classification: G30; G32

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1 Introduction

Companies need to be prepared for unexpected investment opportunities during boom periods and unexpected capital shortages during recessions. In the field of corporate finance, this discussion of financial flexibility is a topic of interest not only to researchers but also to practitioners. On what basis do business managers look ahead to future business cycles? And what is the relationship between that outlook and financial flexibility? The purpose of this paper is to analyze the relationship between the future economic outlook of Japanese corporate managers and corporate debt management.

The information contained in the yield curve is useful in quantifying future economic outlook. Within the yield curve, the difference between long- and short-term interest rates has been shown to be closely related to future economic fluctuations. Previous studies (Harvey, 1988; Estrella and Hardouvelis, 1991; Estrella and Mishkin, 1997) have shown that term spreads are closely related to future macroeconomic variables[1] (consumption, economic growth, and inflation rate). In addition, several studies (Estrella and Hardouvelis, 1991; Estrella and Mishkin, 1997; Estrella and Mishkin, 1998; Bernard and Gerlach, 1998; Moneta, 2005; Erdogan et al; 2015) used probit models to estimate recession probabilities from term spreads and reported that term spreads are a useful variable in predicting the arrival of a recession in advance. Therefore, in this study, the recession probability estimated based on the term spread is used as a proxy variable for the economic outlook of Japanese firm managers.

However, these research results are mainly the result of using data from Western countries. Japanese term spreads are known to have weak explanatory power for macroeconomic variables and business cycles (Nakaota 2005; Okimoto and Takaoka, 2017). Therefore, following Erdogan et al (2015), Nyberg (2010), and Ishii (2022),

[1]Estrella (2005) discusses the theoretical background behind the usefulness of term spreads in explaining future trends in economic activity.

this study estimates recession probabilities based on a model that uses stock market information[2] in addition to term spreads. For example, market capitalization is the total discounted present value of future cash flows or dividends of a listed company and can be considered to reflect some future economic trends. Therefore, stock market information has relevance as a variable to explain future economic trends. Other studies, such as Næs et al. (2011), report a link between stock market liquidity and business cycles.

Many previous studies have been accumulated on the relationship between financial flexibility and economic fluctuations. Cook and Tang (2010) argue that it is easier for firms to adjust their leverage in good times than in difficult times. A firm suffers more when financing necessary funds in economic fluctuations than in good times, or we say firms facing higher financing costs in difficult times. Financial flexibility is a kind of ability of a firm to response to unexpected funding requirements, such as growing opportunities, or cash shortfalls, it is more valuable for firms with higher financing cost (Denis, 2011). Bates et al. (2009) find that firms increase their cash holding when cash flow becomes riskier, so that firms manage their liquidity based on so-called "precautionary motive". Ang and Smedema (2011) add a piece to the puzzle of how firms manage their liquidity under anticipation of economic decline, they expect that firm managers would increase firms' financial flexibility when recession probability is high and provide empirical evidence that it is true for financially unconstrained firms; financially constrained firms and firms with cash shortage do not seem to follow what precautionary motive hypothesis expects, so that the whole sample provide results that implies firms rather decrease financing flexibility when recession probability is increasing.

Our research is another piece adding to the puzzle of firms' financial flexibility management under the anticipation of economic recession. We follow Ang and Smedema (2011) to investigate how Japanese firms manage their financial flexibility,

[2]In a classic empirical study, Fama (1990) and Schwert (1990) report the association between stock market information and economic activity.

as Japanese firms are known as holding much cash holdings and insufficient usage of it. We find that, consistent with Ang and Smedema (2011), overall, Japanese firms do not seem to prepare themselves by accumulating financial flexibility for recession, cash ratio decrease when recession probability increase. However, during the time of 1997 to 1998, the results are different, cash ratio increase as recession probability increase, which means that firms accumulate financial flexibility for preparation for recession, just as precautionary motive hypothesis suggests. This period of time is very close to bubble collapsing of Japan' economy in 1990s, in these years, Japanese firms suffered from extremely limited borrowing resources from bank, which is fatal for Japanese firms as they mainly depend on bank for external financing. This is known as kashi-shiburi problem in Japanese, naturally, financing cost in this period of time is high for Japanese firms. Our results imply that Japanese firm may have prepared for recession by accumulating financing flexibility in this difficult time right after bubble collapsing of 1990s. Meanwhile, we do not find similar results during the period of global financial crisis in 2008, which is considered as another difficult time for external financing though.

This paper contributes to the understanding to the financial flexibility management under the scenario with prediction of recession following And and Smedema (2011), especially for Japanese firms. Japanese firms tend to hold enormous cash holdings and debt simultaneously even though they are capable of repaying all the debt with cash holding. Because holding cash is costly (especially for those firms without adequate investment opportunities), it has been long under debate why they are doing so. Our research provides a potential explanation that this behavior could be the remaining of financial flexibility accumulations origin from difficult time in 1990s.

The remainder of this paper is organized as follows. Section 2 depicts a model of a financial flexibility based on the economic outlook of Japanese managers. Section 3 shows the estimation results. Section4 discusses the findings. Finally, Section 5

concludes the paper.

2 Methodology

In this section, we consider substituting recession probabilities for business managers' economic outlook. We then conduct an empirical analysis of the relationship between recession probabilities and firms' debt trends to shed light on debt management in preparation for recession shocks.

2.1 Recession probability

Following Ang and Amedema (2011), this study considers recession as one of the risks in corporate management. Business managers need to keep abreast of economic trends and build a capital structure that can cope with shocks during a recession. Typically, managers use some optimal measure to predict future recessions in order to avoid the risk of recession. Numerous previous studies Estrella and Hardouvelis, 1991; Estrella and Mishkin, 1997; Estrella and Mishkin, 1998; Bernard and Gerlach, 1998; Moneta, 2005; Erdogan et al; 2015) have discussed what variables are effective in predicting recessions. Among them, the term spread (long-term interest rate minus short-term interest rate) is known to be useful in predicting future recessions. Ang and Amedema (2011) and other previous studies model recession probabilities and term spreads as follows:

$$P(X_t = 1) = \Phi\left(\alpha_o^k + \alpha_1^k \cdot TERM_{t-k}\right) \tag{1}$$

where X_t is a dummy variable that takes 1 during recessions and 0 during expansions at time t. $TERM_{t-k}$ is the term spread[3] of the ten-year Japanese government bond (JGB) interest rate[4] and the six-month JGB interest rate at time $t-k$. $\Phi(\cdot)$ indicates the cumulative distribution function. Equation (1) is a standard static probit model.

[3]We calculate the spot rate based on the bootstrap method from 6-month JGB interest rates obtained from Refinitiv EIKON and yield data published by the Japanese Ministry of Finance.

[4]In the robustness check we use the 10-year rate minus the 1-year rate as our term spread.

However, those previous studies analyzed the relationship between recessions and term spreads in the U.S. and European countries, and it is not appropriate to apply their methods to Japan. For example, Okimoto and Takaoka (2017) report that Japanese term spreads do not have strong explanatory power for business cycle fluctuations. Ishii (2022) also reports that Japanese term spreads alone cannot explain a recession in advance. Therefore, in this study, we employ a model to predict Japan's future recession probability by incorporating stock market information, not only term spreads, as analyzed in Erdogan, Bennett, and Ozyildirim (2015) and Ishii (2022).

Erdogan et al. (2015) use market capitalization and trading volume of the stock index market as information on the stock market. Following those previous studies, this study adopts the market capitalization and trading volume of firms listed on the first and second sections of the Tokyo Stock Exchange[5] (TSE) in Japan, and defines Macro-depth measure (MD) and Macro-liquidity measure (ML) as the respective variables transformed per seasonally adjusted GDP in Japan.

Market capitalization is an aggregate of the stock prices of domestic companies. As basic corporate finance theory indicates, stock prices are determined by future cash flows or dividends. Therefore, MD can be considered to be closely related to future corporate activities, i.e., economic activity.

Next, this study defines Macro-liquidity-deviation (MLD) as a variable that represents the relative trend between trading volume (ML) and market capitalization (MD). If the market capitalization is relatively large in relation to the trading volume, the market can be considered overheated. If the market capitalization is relatively large in relation to the trading volume, the market can be considered overheated. MLD can be considered to have useful information for predicting future economic fluctuations. In this study, we define MLD as the first-order difference of the residuals estimated from the following regression model, in accordance with

[5]In April 2022, the JPX is reorganizing the market segmentation of the TSE.

previous studies.

$$ML_t = \beta_0 + \beta_1 \times MD_t + u_t \tag{2}$$

where u_t indicates an error term.

In this study, we consider substituting management's outlook on economic trends with the recession probability estimated from the following model:

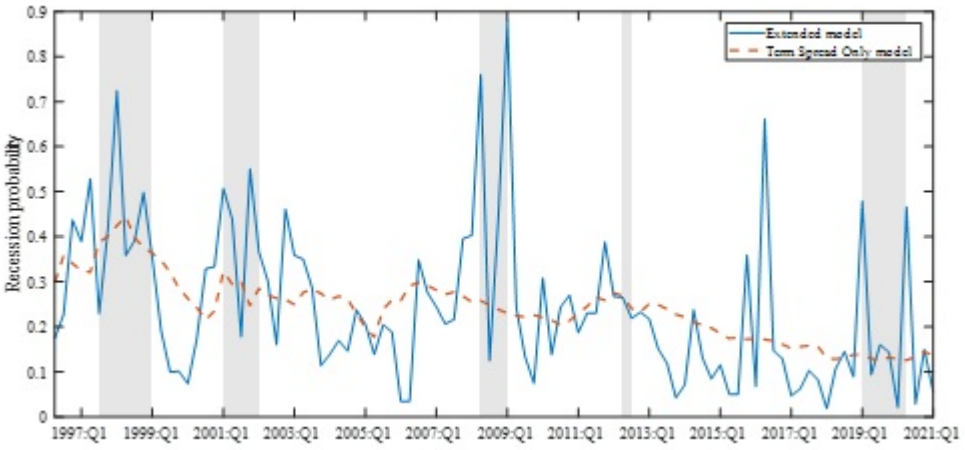
$$P(X_t = 1) = \Phi\left(\gamma_0^k + \gamma_1^k \cdot TERM_{t-k} + \gamma_2^h \cdot MLD_{t-h} + \gamma_3^h \cdot DMD_{t-h}\right) \tag{3}$$

where DMD is the first difference of the Macro-depth measure. Define RP_t as the predicted value of the recession probability estimated based on Equation (3). In this study, following Ishii (2022)[6], we employ $k = 8$ and $h = 1$. In estimating recession probabilities, we use the sample period 1994:Q1 to 2021:Q1 for term spread, stock market capitalization, and trading volume data, respectively.

Figure 1 shows the estimated recession probability from Equations (1) and (3) from 1996:Q2 to 2021:Q1. The dashed line is the result of estimating recession probabilities based solely on term spread information (Equation (1)), while the solid line is the result of estimating recession probabilities using stock market information in addition to term spreads (Equation (3)). As shown in Figure 1, the model that incorporates stock market data outputs recession probabilities that are more in line with business cycle fluctuations. Using Estrella (1998)'s adjusted[7] pseudo-R^2, the adjusted pseudo-R^2 for the extended model is 0.11, while the pseudo-R^2 for the term spread only model is 0.02. This result clearly shows the usefulness of using stock market information to estimate recession probabilities. In the next section, we consider the recession probability as a proxy variable for the economic outlook

[6]Erdogan et al. (2015) use $k = 4$ and $h = 1, 2$ in equation (3).

[7]Estrella (1998) calculated pseudo-R^2 from $1 - (\ln L_u / \ln L_c)^{-(2/T)\ln L_c}$, where $\ln L_u$ is the log-likelihood of the probit model and $\ln L_c$ is the log-likelihood of the constant only model. Adjusted pseudo-R^2 is calculated as $1 - (1 - ps.R^2)(T-1)/(T-K-1)$, where ps.$R^2$, K, and T indicate the pseudo-R^2, the number of estimated parameters, the number of observations, respectively.



Note: The dashed and solid line indicates the recession probability estimated from Equations (1) and (3). The estimated period is from 1996:Q2 to 2021:Q1.

Figure 1: Recession probability estimated from the probit model.

of Japanese managers and analyze the relationship between the economic outlook and debt management.

2.2 Model for change in cash holding

In accordance with previous studies (Ang and Smedema, 2011), this study adopts a partial adjustment model of financial flexibility:

$$\Delta Flex_{it} = \lambda \left(Flex^{*}_{it} - Flex_{it-1} \right) + u_{it} \tag{4}$$

where Δ indicates the first difference operator, $Flex^{*}_{it}$ represents the target level of financial flexibility for firm i at time t, and u_{it} indicates an error term. Financial flexibility is supposed to provide fundings resource instantly whenever a firm is in need, however, holding financing flexibility is also costly, because it means keep investable capital without using, Therefore, firm managers should see through at what level the benefit and cost of holding financial flexibility balance each other. This specific level of financial flexibility is considered as the target of this firm. Opler et al. (1999) provide a classic model to identify target financial flexibility, which is measured by cash ratio, by using a series of firm characteristics. Based on Opler et

al. (1999), we include the recession probability into Equation (4).

$$\Delta Flex_{it} = \lambda \left(Z_{it}\zeta - Flex_{it-1} \right) + u_{it} \tag{5}$$

where Z_i is the vector of variables which determines target level of financial flexibility (Opler et al. 1999) and RP_t is the probability of a future recession at time t. Algebraically, Equation (5) reduces to:

$$Flex_{it} = (1 - \lambda) Flex_{it-1} + \rho RP_t + \delta Z_{it} + u_{it} \tag{6}$$

where $\delta = \lambda\zeta$ and $\rho = \lambda\phi$. Equation (6) is our baseline function. A firm prepare for a recession in advance means that its financial flexibility will increase when recession probability is increase, therefore we expect the parameter ρ in Equation (6) is positive.

Existing literature provides various measures of financial flexibility, among which, we choose cash ratio for its versatility in meeting a firm' s funding requirements and common acceptance in existing literature. For robustness check, we also employ funds ratio, which represents the available funds that a firm is assumed to have. For other variables, we follow Opler et al. (1999) and choose cash flow ratio, cash flow volatility, market to book ratio, firm size, new working capital, leverage, R&D expenses, dividend payment dummy and capital expenditure. The definitions of variables are as follows: cash ratio is defined as natural log of the ratio of cash holding to the difference of total assets and cash holdings; funds ratio is defined as natural log of the ratio of sum of accessible debt capacity and cash holdings to the difference of total assets and cash holdings; accessible debt capacity is defined as a non-negative variable, which equals to the difference of expected debt level and total debt, when the difference is negative, the accessible debt capacity takes 0; the expected debt level is calculated by the medium of debt to total asset ratio of the industry of the firm multiplies one lag of the total asset of the firm; CF ratio is defined as cash flow to asset ratio; CF volatility is cash flow volatility, which is defined as the standard deviation of cash flow in corresponding industry of the year;

M/B is market to book ratio; Size is natural log of book assets, NWC represents new working capital; R&D is R&D to sales ratio; Dividend is a dummy variable which takes 1 if a firm pays dividend in the corresponding year and 0 otherwise; CAPEX represents capital expenditure.

3 Results

We employ data from Nikkei NEEDS Financial Quest which includes Japanese listed firms from 1996 to 2015. Table 1 shows the statistic summary of dataset. Table 2 shows the results of baseline analysis based on Equation (6). Column (1) presents OLS results, Column (2) presents results of fixed effect model. Because our model incorporates lag term of dependent variable as independent variable, we use GMM to control endogeneity issue, Column (3) of Table (2) presents results of GMM baseline regression.

Opposite to what we expected, the recession probability shows negative and mostly significant results. This imply that Japanese firms decrease cash holdings when recession probability increase, in other words, they do not prepare for recession

Table 1: Summary statistics.

Variable	Obs	Mean	Std. Dev.	Min	Max
Recession 1	37798	0.293	0.152	0.043	0.550
Recession 2	37798	0.292	0.151	0.044	0.543
Cash ratio	37798	−1.948	0.930	−8.389	3.976
Funds ratio	35966	−1.658	0.913	−7.669	3.401
CF ratio	35966	0.071	0.062	−3.634	0.537
CF Volatility	35966	0.053	0.026	0.007	0.302
M/B	35966	1.076	0.637	0.064	41.284
Size	37798	10.704	1.513	4.382	19.311
NWC	34165	0.003	0.066	−0.911	1.166
Leverage	37798	2.810	20.813	0.000	2604.833
R&D	37798	0.018	0.075	0.000	7.275
Dividend	35966	0.939	0.239	0.000	1.000
CAPEX	35966	0.005	0.085	−7.895	0.865

Note: This table presents summary statistics of the sample data.

Table 2: Estimation results of the baseline regression.

VARIABLES	(1) OLS	(2) FE	(3) GMM
Recession	-0.008	-0.092^{***}	-0.047^{***}
	(0.014)	(0.014)	(0.014)
Lagged Flex	0.884^{***}	0.598^{***}	0.708^{***}
	(0.003)	(0.004)	(0.007)
CF ratio	0.312^{***}	0.355^{***}	0.395^{***}
	(0.039)	(0.053)	(0.045)
CF Volatility	1.009^{***}	0.490^{***}	1.258^{***}
	(0.081)	(0.087)	(0.091)
M/B	-0.011^{***}	-0.037^{***}	-0.002
	(0.004)	(0.005)	(0.005)
Size	-0.031^{***}	-0.285^{***}	-0.074^{***}
	(0.002)	(0.008)	(0.002)
NWC	-0.026	0.175^{***}	-0.204^{***}
	(0.035)	(0.034)	(0.0389
Leverage	0.000	0.000	0.000
	(0.000)	(0.000)	(0.000)
R&D	0.415^{***}	0.581^{***}	0.711^{***}
	(0.034)	(0.062)	(0.039)
Dividend	-0.044^{***}	-0.013	-0.043^{***}
	(0.009)	(0.011)	(0.011)
CAPEX	-0.017	0.167^{***}	0.168^{***}
	(0.027)	(0.028)	(0.030)
Constant	0.067^{***}	2.247^{***}	0.137^{***}
	(0.018)	(0.089)	(0.019)

Note: This table presents the results of baseline regression. Standard errors are in the parentheses. R-squares are shown below the standard errors. ***, ** and * indicate $p < 0.01$, $p < 0.05$, and $p < 0.1$ respectively.

but use their cash holding during recessions. One possible explanation is that, as the external financing becomes costly with recessions coming, Japanese firms have to depend more on internal financing and draw on cash holdings. This result is also consistent with Ang and Smedema (2011).

Meanwhile, we also find some results that is different from Ang and Smedema (2011). They find that firms with more growth opportunity and firms that pay dividend tend to have more cash holdings. These results are consistent with precautionary motive hypothesis of financial flexibility. For those firms with more growth

opportunity, giving up investment projects with positive NPV due to inadequate funds is more expensive, so having enough financial flexibility is more crucial to them. Dividend payment means that a firm has free cash flow to payout, these firms are more capable of accumulating cash holdings. However, in our analysis, market to book ratio and dividend payment dummy show negative and mostly significant results, which means that firms with little growth opportunity and firms that do not pay dividend are likely to have more cash holdings. The result of market to book ratio is consistent with existing literature of Japanese firms (Cui, 2020), that Japanese firms with less growth opportunity are more likely to have cash holdings that exceed outstanding debt. Although existing literature mostly provide evidence about firms have low debt level or high cash holdings to prepare themselves for investment, our results again suggest that the story of Japanese firms may be different, that firms do not accumulate financial flexibility initiatively, but passively allow cash holdings to increase.

Table 3 provide robustness check for results in Table 2 by using different definition of key variables. Panel A shows the results of using cash ratio, while Panel B shows the results of using funds ratio as measurement of financial flexibility. All results of recession probability are negative and mostly significant, our main conclusion from Table 2 holds.

However, the attitude towards financial flexibility is not unchangeable. We have heard stories about how firms dramatically lower their leverage after 2008 global financial crisis (See Bessler et al. 2013 for an example), it is not surprising if Japanese firms also have different preference over accumulating financial flexibility. We choose to conduct this periodic analysis by practice baseline regression function upon specified periods of time. Table 4 shows the results of periodic analysis, each column shows the recession probability results of the corresponding period. We can see that in 1997-1998 period, all results of recession probability are significant, and more important, positive. These results means that at least in 1997-1998 period, Japanese

Table 3: Summary of robustness check results.

	(1) OLS	(2) FE	(3) GMM
Panel A: Cash ratio			
Recession 1	-0.008	-0.092^{***}	-0.047^{***}
	(0.014)	(0.014)	(0.014)
Recession 2	-0.005	-0.090^{***}	-0.044^{***}
	(0.014)	(0.014)	(0.014)
Panel B: Funds ratio			
Recession 1	-0.031^{**}	-0.062^{***}	-0.056^{***}
	(0.014)	(0.013)	(0.014)
Recession 2	-0.025^{*}	-0.059^{***}	-0.052^{***}
	(0.014)	(0.013)	(0.014)

Note: This table presents the summary of robustness check results of baseline regression. Standard errors are in the parentheses. R-squares are shown below the standard errors. ***, ** and * indicate $p < 0.01$, $p < 0.05$, and $p < 0.1$ respectively.

firms increase cash holdings when recession probability is about to increase, or in other words, they prepare for recession by accumulating financing flexibility. This conclusion is opposite from what we have seen in Table 2. Also, it is noticeable that the results in Table 4 are stronger than what we have seen in Table 2, from which the absolute value of coefficient of recession probability is up to 0.092, but up to 0.868 in Column (1) of Table 4. A larger absolute value of recession probability coefficient means that a firm tend to accumulate more cash regarding same increase in recession probability. This numeric change from Table 2 to Table 4 indicates that Japanese firms not only have different financial flexibility management in the face of recession probability, but also different sensitive to recession risk. Furthermore, for the period of 2007-2008, the results of recession probability are positive but insignificant, after that, the results turn to negative in 2009-2010, which means that the 2008 global financial crisis did not drive Japanese firms to increase their cash holdings as preparation for recessions.

Table 4: Periodic analysis.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	1997–1998	1999–2000	2001–2002	2003–2004	2005–2006	2007–2008	2009–2010	2011–2012	2013–2014
Panel A: Cash ratio									
Recession 1	0.665***	0.118***	0.061	0.065	−0.387*	0.090	−0.031	−0.187**	−0.025
	(0.244)	(0.040)	(0.098)	(0.060)	(0.211)	(0.143)	(0.043)	(0.085)	(0.073)
Recession 2	0.868***	0.143***	0.079	0.062	−0.361*	0.068	−0.031	−0.163**	−0.025
	(0.254)	(0.038)	(0.090)	(0.060)	(0.196)	(0.161)	(0.045)	(0.078)	(0.072)
Panel B: Funds ratio									
Recession 1	0.487**	−0.148***	0.306***	0.002	−0.117	0.223	−0.234***	−0.142*	0.158**
	(0.194)	(0.042)	(0.096)	(0.061)	(0.181)	(0.159)	(0.041)	(0.085)	(0.069)
Recession 2	0.487**	−0.070*	0.324***	−0.002	−0.112	0.221	−0.243***	−0.139*	0.156**
	(0.208)	(0.040)	(0.090)	(0.061)	(0.168)	(0.179)	(0.043)	(0.078)	(0.069)

Note: This table presents the results of periodic analysis. Standard errors are in the parentheses. ***, ** and * indicate $p < 0.01$, $p < 0.05$, and $p < 0.1$ respectively.

4 Discussion

Although we have observed that Japanese firms seem to have precautionary motive for having financial flexibility in 1997-1998 period, this still could be a factual coincidence rather than a causality relation. In the early 1990s, Japanese government adjusted both short-term and long-term interest rate which decreases spread in our model and eventually lower the recession probability in 1997-1998 period in data set. Meanwhile, banks in Japan suffered in 1997-1998 period as they were forced to get rid of their non-performing assets and therefore had to constrain lending scale. As result, Japanese firms had to practice cash holding in 1997-1998, cash ratio decrease naturally. The simultaneously decrease in recession probability and cash holdings could results in a positive relationship between recession probability and cash holdings, as what we have seen in Table 4.

To rule out the possibility of spurious relationship between financial flexibility and recession probability, we need to clarify through what mechanism recession probability is recognized by firm managers and eventually leads to change in financial flexibility, which is out of the reach of this paper, and we shall not unfold in here.

5 Conclusion

This study examines the financial flexibility management of Japanese firms and attempts to answer the question of whether or not Japanese firms prepare for recessions by accumulating financial flexibility. In addition to term spreads, we use a recession probability forecasting model modified to be more applicable to Japan by employing stock market information as the independent variable. The results of our empirical analysis indicate that, on the whole, Japanese firms do not prepare for recessions by increasing financial flexibility, except for the period from 1997 to 1998, which is right after the bubble burst of the Japanese economy in the 1990s and is known as a period with extremely high financing costs. We do not find similar

evidence for the 2008 global financial crisis period. The detailed mechanisms by which recession risk affects corporate cash holdings require further examination.

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