On the impact of quantitative easing on credit standards and systemic risk: the Japanese experience

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On the Impact of Quantitative Easing on Credit Standards and Systemic Risk:

The Japanese Experience.

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Abstract

This study provides empirical evidence on the impact of quantitative easing on credit standards and systemic risk in Japanese banks. Quantitative easing leads to softened credit standards of approving loan applications. Bank systemic risk, however, decreases following the expansion of asset purchase programs.

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1. Introduction

This paper presents empirical evidence on the latent repercussions of quantitative easing (QE) policy on financial intermediaries in Japan, contributing to the related macroeconomic literature (Matsuki et al., 2015). Under the expectation of ample liquidity and the *insurance effect* (Altunbas et al., 2014) via QE, banks tend to relax their lending attitude, also to facilitate the aim of QE in boosting lending to households and the nonfinancial sectors. Banks might lend to riskier borrowers to "search for yield" (Nucera et al., 2017). Because of low interest rates, asset prices and collateral value increase, resulting in banks issuing credit to firms with higher risk (Jiménez et al., 2014). In this accommodative environment, the principal-agent problem characterised by implicit government safety net and liquidity injection gives rise to greater bank risk taking (Maddaloni and Peydró, 2011). To the best of my knowledge, at the macro level, there is no empirical evidence on the impact of QE on bank credit standards of approving loan applications (CSs) in Japan for both QE periods (03/2001-03/2006 and from 10/2010, when comprehensive monetary easing was reactivated, with quantitative and qualitative easing (QQE) starting in 04/2013). This paper attempts to fill this gap.

As QE has been in effect in Japan over an extended period, its implications on bank systemic risk provide insights into its overall effectiveness. QE could increase systemic risk via the risk taking channel, the signalling channel and the portfolio effects (Colletaz et al., 2018; De Nicolò et al., 2010)[1]. Low interest rates make safe assets less attractive, pushing banks to invest in riskier ones. The increase in asset prices leads to higher value of equity, thus liberating risk budget and encouraging banks to engage in more positions. The fall in leverage could also result in banks increasing their demand for assets, inflating further the asset bubbles. However, if QE is effective in encouraging socially desirable risk taking (Lucas, 2014), facilitating higher

[1] See these papers for a comprehensive literature review.

income for households and businesses, we can expect lower default risk and greater financial stability. This study offers micro-level results on the effect of QE on bank systemic risk, extending Mamatzakis and Vu (2018) which partially addresses QE and nonperforming loans/bank stability.

2. The model and data

Following Maddaloni and Peydró (2011), I examine whether QE leads to an easing in CSs. A short-run Structural Vector Autoregressive model (SVAR) is employed:

$$\mathrm{A}\left(\mathrm{I}_K - \mathrm{A}_1 L - \mathrm{A}_2 L^2 - \cdots - \mathrm{A}_p L^p\right) y_t = \mathrm{A}\epsilon_t = \mathrm{B}e_t \quad (1)$$

where: Y_t is a $(k \times 1)$ vector of quarterly (06/2000-12/2018) variables (CSs, QE, the short-term interest rate, and inflation and GDP growth as control variables)[2], L is the lag operator, ϵ_t is the original shocks with covariance matrix Σ, e_t is a vector of orthogonalized disturbances with covariance matrix I_K. Identification is obtained by placing restrictions on matrices A and B. As monetary policy affects economic variables with a lag, and QE is enforced after low interest rates have been ineffective, the ordering is as follows: inflation, GDP growth, interest rates, QE, CSs. The focus is on CSs which are contemporaneously affected by shocks to other variables. CSs are diffusion indices of approving loan applications from large firms (CSLF), medium-sized firms (CSMF), small firms (CSSF), and households (CSHH). A positive (negative) value of the index denotes an easing (a tightening) in CSs.[3] Five proxies of QE are used respectively: Bank of Japan's assets, current account balances, reserves, Japanese

[2] I use the innovative outliers model Clemente et al. (1998) unit root test, allowing for two structural breaks. GDP growth and interest rates are I(0), QE is I(2), the rest is I(1).
[3] Details about the index are available on the Bank of Japan's website.

government bonds, and the amount of asset holdings (commercial papers, corporate bonds, bills purchased (till July 2006), and Japanese government securities).[4]

I employ instrumental-variables models (2) to examine the impact of QE on systemic risk at the bank level with semi-annual data:

$$Systemic\ Risk_{i,t} = f\left(Systemic\ Risk_{i,t-1}, QE_{i,t-1}, Interest\ Rate_{i,t-1}, Control_{i,t-1}\right) + \varepsilon_{i,t} \quad (2)$$

where *Control* is a vector of bank-specific variables which are competition (the bank-level Boone indicator[5]), capitalisation (capital/assets), asset diversification (securities/assets), and performance (cost/income). The model addresses endogeneity concerns between competition, interest rates, and QE (Leroy and Lucotte, 2015; Mamatzakis and Vu, 2018). There are 4,654 observations of Japanese banks (10 City Banks, 65 Regional Banks I, 56 Regional Banks II, 17 Trust Banks[6]) from 2000 to the first half of 2018 (financial years).

Systemic risk is proxied by SRISK, "the expected capital shortfall of a financial firm in a systemic crisis where the broad market index falls by more than 40% in a six-month period" (Acharya et al., 2017), available at http://vlab.stern.nyu.edu/welcome/risk/.[7] As the majority of banks are private, I also use size (the share of the bank assets in total assets) as another measure of systemic risk (Basel, 2013; Varotto and Zhao, 2018).

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[4] Due to space constraints, I select the model specifications that produce many significant parameters to report results. All results are available upon request.
[5] The methodology is as reported in Mamatzakis and Vu (2018). The generalized cross validation method indicates α=0.23.
[6] For simplicity, Trust Banks, long-term credit banks and others are referred as one category which is Trust Banks.
[7] See the website for detailed information on SRISK.

3. Results

3.1. QE and credit standards

Figures 1 and 2 display the trend of CSs and QE. CSs were more relaxed in the first QE timeframe (03/2001-03/2006), when the amount of asset purchases was significantly less than that in the second phase (since 2010).

Figure 1. Quarterly Credit Standards

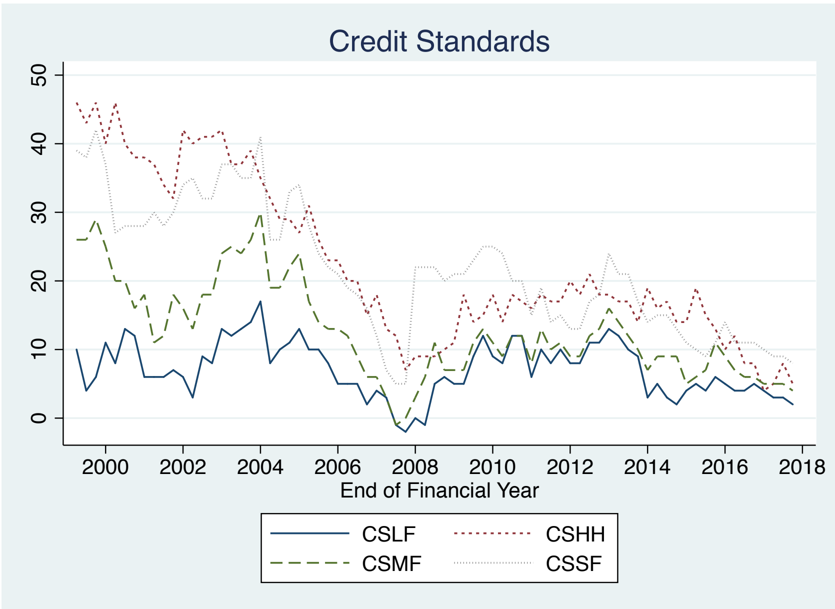


Figure 2. Quarterly Quantitative Easing

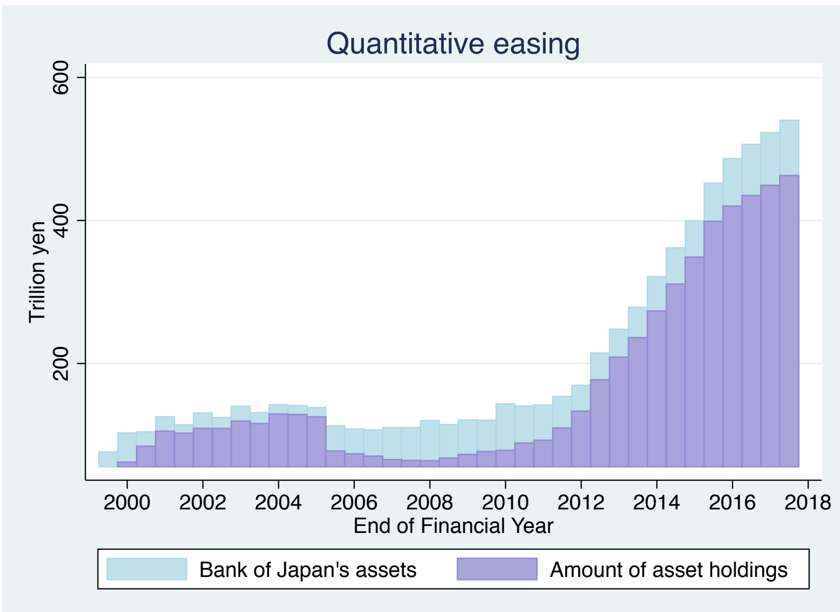


Table 1 reports the SVAR results for the impact of QE on CSLF, CSMF, CSSF, CSHH, respectively. The impulse response functions for CSs are depicted in Figure 3, and variance decompositions are reported in Table 2. The models allow for a maximum of 8 lags and account for structural breaks. The results show a significant effect of QE in relaxing CSs, with stronger magnitude on CSLF and CSHH. Reducing short-term interest rates leads to softened CSMF, in line with findings of Maddaloni and Peydró (2011) for banks in the Eurozone. However, CSLF appears to be tightened following low rates, which could imply that banks, being aware of the potential risks associated with low rates, could indeed be more cautious in granting loans to large firms. On GDP growth, the findings suggest that banks tend to relax lending standards and expand credit in good times (Maddaloni and Peydró, 2011). CSLF and CSHH being softened with higher inflation, in the Japanese case, could be to support the Bank to maintain the momentum of the economy heading towards the inflation target.[8] Following Fukuda (2018), a dummy for the negative interest rate periods is included to capture its potential impact on banks behaving as risk takers overseas through more investments in Asian financial assets.[9] The results are very similar to the baseline SVAR models.

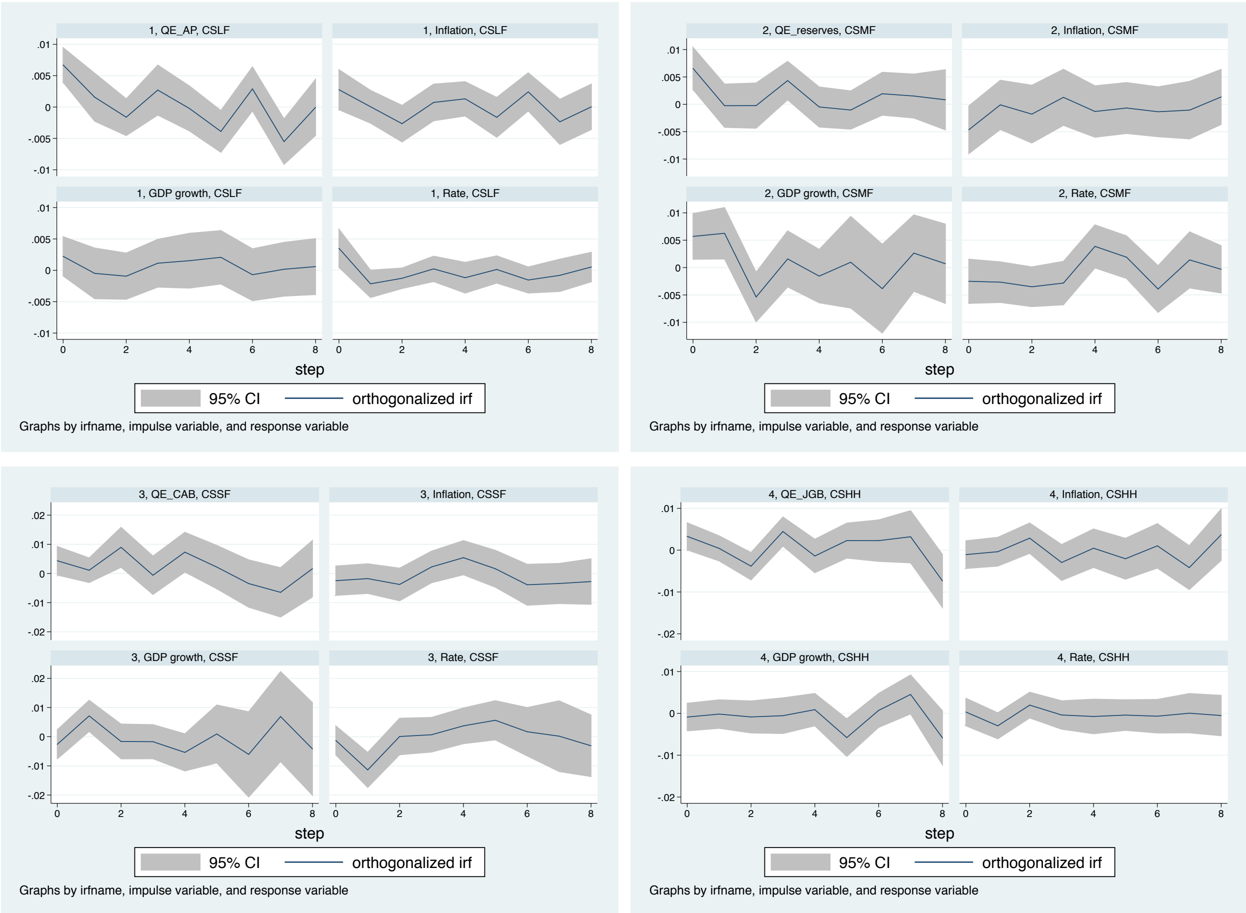
[8] See footnote 11.
[9] The author thanks an anonymous referee for this suggestion.

Table 1. SVAR-Credit standards of approving loan applications

Impulse variable_Response variable	1	2	3	4
Infl_CS	0.0173***	-0.0001	-0.0147	0.0077
	(0.006)	(0.008)	(0.016)	(0.011)
GDPg_CS	0.0132***	0.0178***	-0.0033	0.0017
	(0.004)	(0.005)	(0.007)	(0.005)
Rate_CS	0.382***	-0.2642**	-0.0565	0.0159
	(0.157)	(0.124)	(0.148)	(0.100)
QE_CS	0.295***	0.0709***	0.0624*	0.2718**
	(0.056)	(0.020)	(0.036)	(0.135)
Infl_GDPg	-0.3464	-0.3446*	-0.8942***	-0.2521
	(0.215)	(0.194)	(0.286)	(0.276)
Infl_Rate	0.0091*	0.0302***	0.0193	0.0104
	(0.005)	(0.007)	(0.013)	(0.011)
GDPg_Rate	0.0036	0.0204***	0.0191***	0.0200***
	(0.003)	(0.004)	(0.005)	(0.005)
Infl_QE	-0.0202	-0.1036**	-0.0683	-0.0525***
	(0.014)	(0.048)	(0.055)	(0.009)
GDPg_QE	-0.029***	-0.0200	-0.0307	-0.0158***
	(0.008)	(0.030)	(0.024)	(0.004)
Rate_QE	0.1615	1.4612**	-0.3103	0.0130
	(0.345)	(0.734)	(0.517)	(0.095)
CS	CSLF	CSMF	CSSF	CSHH
QE_proxy	AP	reserves	CAB	JGB
N	65	65	65	61
R2 (CS equation)	0.8473	0.9147	0.9338	0.7904

Notes: Infl: Inflation, I(1); GDPg: GDP growth, I(0); Rate: average overnight call rate, I(0); QE: I(2); CS: I(1). AP: asset purchases, CAB: current account balances, JGB: Japanese government bonds. Structural break dummies are included; standard errors in parentheses. *,**,***: significant at 10%, 5%, and 1% levels.

Figure 3. SVAR-Impulse Response Functions (IRFs)



Note: This figure corresponds to SVAR results in Table 1. Full IRFs are available upon request.

Table 2. SVAR-Variance Decompositions

Response variables	Period	Impulse variables				
		Inflation	GDPg	Rate	QE	CSLF
CSLF	4	0.0607	0.0294	0.0743	0.2293	0.6061
	8	0.0902	0.0422	0.0670	0.3238	0.4769
CSMF	4	0.0546	0.2122	0.0694	0.1272	0.5365
	8	0.0548	0.2216	0.1201	0.1194	0.4841
CSSF	4	0.0341	0.0759	0.1582	0.1209	0.6109
	8	0.0612	0.1245	0.1265	0.1492	0.5388
CSHH	4	0.0625	0.0064	0.0447	0.1567	0.7297
	8	0.1032	0.1436	0.0357	0.1712	0.5463

Note: This Table corresponds to SVAR results in Table 1. Full variance decompositions are available upon request.

3.2. QE and bank systemic risk

Table 3 reveals that QE reduces systemic risk. Low interest rates, however, increase it. Overall, the effect of QE in facilitating macroeconomic conditions could be passed onto banks through lower default risk of firms and households (Krishnamurthy and Vissing-Jorgensen, 2011). Nevertheless, the low interest rate environment may neutralise the benefits of QE by raising systemic risk via the risk-taking channel. As QE induces lax CSs which in turn could imply higher default risk, I also control for CSs in the model, together with a dummy for the negative interest rate periods (columns 2 and 4).[10] The results confirm that lax CSs are associated with higher systemic risk (although with a small magnitude) and strengthen the literature (Jiménez et al., 2014).

The negative impact of competition on systemic risk supports the *competition-fragility* hypothesis that Liu and Wilson (2013) report for all Japanese banks during 2000-2009. Diversification can help systemically important banks reduce their SRISK (column 1). On the accounting measure of performance, inefficient banks carry greater systemic risk.

[10] The author thanks an anonymous referee for this suggestion.

Table 3. QE and systemic risk

	1	2	3	4
L.SRisk	0.9627***	0.9616***	0.8480***	0.9731***
	(0.011)	(0.013)	(0.009)	(0.005)
L.QE	-0.0566***	-0.0910**	-0.0071**	-0.0040***
	(0.013)	(0.042)	(0.003)	(0.002)
L.Boone	-0.0550***	-0.0494**	-0.0062**	-0.001
	(0.019)	(0.024)	(0.003)	(0.002)
L.Rate	-0.0307***		-0.0014**	
	(0.009)		(0.001)	
L.Capta	-0.0099	-0.0345	-0.0004	0.0001
	(0.029)	(0.037)	(0.003)	(0.002)
L.Sectoa	0.0444**	-0.0022	0.001	0.0005
	(0.022)	(0.033)	(0.001)	(0.001)
L.Costinc	-0.0104***	-0.0144***	-0.0009**	-0.0002
	(0.003)	(0.005)	(0.000)	(0.000)
L.CS		0.0050**		0.0004**
		(0.002)		(0.000)
negr		0.0023		0.0002
		(0.003)		(0.000)
depvar	SRISK	SRISK	MSSR	MSSR
QE_proxy	AP	JGB	BoJTA	BoJTA
N	807	806	4199	4198
R2	0.9594	0.7698	0.9858	0.9888

Notes: Instrumental variables regression with lags of endogenous covariates as instruments. Depvar: dependent variable, AP: asset purchases, JGB: Japanese government bonds, BoJTA: Bank of Japan's total assets, CS: credit standards, negr: negative interest rates dummy, rate: average overnight call rate, Boone: the Boone indicator, capta: capital/assets, sectoa: securities/assets, costinc: cost/income. Based on panel unit root tests, QE and CS are I(1), in columns 1&2, rate and sectoa are I(1). Bank dummies are included; standard errors in parentheses. *,**,***: significant at 10%, 5%, and 1% levels.

5. Concluding remarks

Systemic risk decreases corresponding to more powerful QE, supporting the Bank of Japan's claim that no serious problem has been identified in the functioning of financial intermediation.[11] Softened bank CSs, however, should be closely monitored to prevent unintended consequences of QE and greater systemic risk.

[11] Available at: https://www.boj.or.jp/en/announcements/press/koen_2018/ko180802a.htm/

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