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# **The Bank of Japan's equity purchases and stock price crash risk**

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## **Abstract**

This paper documents a negative relationship between the Bank of Japan's indirect ownership, through ETFs, in a firm and the firm's stock price crash risk. This relationship strengthens further after the introduction of the Stewardship Code due to improved corporate governance.

**JEL Classification:** G11, G14, G23

**Keywords:** Bank of Japan, Monetary policy, ETF, Crash risk

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## **1. Introduction**

The Bank of Japan (BOJ) is the only central bank that has purchased stock ETFs as part of its unconventional quantitative and qualitative easing policy. This policy is unprecedented and substantial in terms of both length and scale. It has started in 2010 and currently the BOJ holds an average of 4.6% of the market capitalization of the entire Tokyo Stock Exchange.

The BOJ's ETF purchase program has attracted growing research interest that focuses on the macroeconomic and stock price implications (e.g., Vu, 2020). In this paper, we provide insights on the impact of this program on the underlying stock market. More precisely, we study the effect of the BOJ's ETF purchases on the future stock price crash risk, which is one of the biggest factors preventing wealth accumulation over time.

Crash risk is defined as the conditional skewness of stock return distribution; thus, it captures extreme negative returns (Kim et al., 2014). This is particularly important for investors and firms alike because crash risk affects their risk management and investment decisions; and this monetary intervention plan by the BOJ may influence crash risk. Hattori et al. (2016) show that the unconventional monetary policy announcements by the Federal Reserve in the United States have substantially reduced the option-implied likelihood of tail risks in the stock market.

In 2014, the Japanese Government passed the Stewardship Code which requires institutional investors (including asset management companies operating ETFs) to monitor their investee firms and to publicly disclose their voting results (Tsukioka, 2020). This law improved the corporate governance (through monitoring) of portfolio firms (Sai and Yamada, 2022). We exploit this shock as a potential corporate governance channel to explain the relation between the BOJ's ETF purchases and stock price crash risk.

## **2. Data and methodology**

Our sample includes 26,328 firm-year observations for 3,305 Japanese firms between 2011 and

2021. Data are collected from the BOJ's website, Eikon, and Nikkei NEEDs.

As suggested by Jia (2018), we take the negative of the third moment of firm-specific weekly returns for each year and normalize it by the standard deviation of weekly returns raised to the third power. This negative conditional skewness of firm's weekly returns over the fiscal year is our first measure for crash risk: *NCSKEW*. The construct is multiplied by a negative one such that a higher value of *NCSKEW* indicates higher crash risk. For our second crash risk measure, we separate firm-specific weekly returns into "down (up)" weeks if the returns are below (above) the annual mean. The standard deviation of weekly returns is calculated separately for each of these two groups, and *DUVOL* is the natural logarithm of the ratio of the standard deviation in the "down" weeks to the standard deviation in the "up" weeks.

Independent variable *BOJ* is the proportion of a firm's shares owned by the BOJ through ETFs. We follow El Kalak et al. (2022), where we assume that the BOJ allocates the purchases of ETFs tracking the Nikkei 225, TOPIX, and JPX400 according to the total market capitalization between the three types of ETFs. For each type of ETF, we aggregate the BOJ's daily purchases within a year to obtain the total monetary amount owned by the BOJ. We combine this dataset with annual holding data of all ETFs showing for each firm the total amount of a firm's shares owned by each ETF. This exercise gives us the final data set on firms' indirect ownership by the BOJ.

Following Jia (2018), we control for variables associated with crash risk. *DTURN* is the detrended stock trading volume for investor heterogeneity. One year-lagged *NCSKEW* controls for the potential serial correlation of stock price crash risk. *SIGMA* is the standard deviation of weekly returns over the fiscal year. *RET* is the mean (in %) of weekly returns over the fiscal year. *SIZE* is the natural logarithm of market value. *MB* is market-to-book ratio. *LEV* is long-term debt over total assets, and profitability is measured by return on assets (*ROA*). *ACC* is abnormal accruals as the residuals from the modified Jones model (Dechow et al.,

1995), estimated by each year and each 2-digit industry code. All variables are winsorized at 1% and 99% levels.

Table 1 shows that average (median) ownership by the BOJ is about 1.49% (1%). The mean values for *NCSKEW* and *DUVOL* are 0.044 and 0.067, respectively. While average *RET* and *ROA* are 0.67% and 8%, the mean values for *SIZE*, *MB* and *LEV* are 10.63, 1.364 and 47%, respectively.

**Table 1: Descriptive statistics**

|         |        |           | 25 <sup>th</sup> |        | 75 <sup>th</sup> |
|---------|--------|-----------|------------------|--------|------------------|
|         | Mean   | Std. Dev. | Percentile       | Median | Percentile       |
| BOJ     | 1.493  | 1.796     | 0.123            | 0.999  | 2.375            |
| NCSKEW  | 0.044  | 1.075     | -0.608           | 0.035  | 0.658            |
| DUVOL   | 0.067  | 0.746     | -0.413           | 0.072  | 0.547            |
| DTURN   | 0.000  | 0.165     | -0.015           | 0.000  | 0.013            |
| SIGMA   | 1.116  | 0.236     | 0.948            | 1.091  | 1.258            |
| RET (%) | 0.679  | 0.385     | 0.403            | 0.640  | 0.914            |
| SIZE    | 10.633 | 1.791     | 9.388            | 10.495 | 11.704           |
| MB      | 1.364  | 1.148     | 0.834            | 1.003  | 1.381            |
| LEV     | 0.470  | 0.201     | 0.311            | 0.467  | 0.621            |
| ROA     | 0.080  | 0.068     | 0.049            | 0.077  | 0.113            |
| ACC     | 0.000  | 0.089     | -0.043           | -0.005 | 0.036            |

The baseline model is an OLS fixed effects panel regression:

$$Crash\ Risk_{i,t+1} = \alpha + \beta BOJ_{i,t} + \Theta X_{i,t} + \eta_i + \phi_t + \varepsilon_{i,t} \quad (1)$$

where  $Crash\ Risk_{i,t+1}$  represents *NCSKEW* and *DUVOL* for firm  $i$  in year  $t+1$ .  $BOJ_{i,t}$  is the ownership by the BOJ.  $X_{i,t}$  is a vector of control variables.  $\eta_i$  represents industry fixed effects while  $\phi_t$  denotes year dummies. Standard errors are clustered at the firm level.

We argue that corporate governance is a potential channel through which BOJ ownership affects the underlying stock price crash risk. Hence, we examine this channel by exploiting the unanticipated passage of the 2014 Stewardship Code which represents a shock

to the voting behavior of asset management firms (including the authorized participants of ETFs) in their portfolio firms. Relying on this shock, we use the following difference-in-difference and parallel trend models, respectively:

$$Crash\ Risk_{i,t+1} = \alpha + \beta BOJ_{i,t} + \gamma (BOJ \times Post)_{i,t} + \Theta X_{i,t} + \eta_i + \phi_t + \varepsilon_{i,t} \quad (2)$$

$$Crash\ Risk_{i,t+1} = \alpha + \beta BOJ_{i,t} + \Psi (Year\ Dummy \times BOJ)_{i,t} + \Theta X_{i,t} + \eta_i + \phi_t + \varepsilon_{i,t} \quad (3)$$

where *Post* is a binary variable representing 2014 – 2021. The Equation (2) does not have *Post* as a stand-alone variable as it is subsumed by year fixed effects.  $(Year\ Dummy \times BOJ)_{i,t}$  is a vector of interaction between BOJ and year dummies i.e.,  $D(k)$  with  $k$  is [2012; 2020] around the corporate governance shock in 2014. We examine the impact of the BOJ's ownership on crash risk of constituent firms through the 2014 Stewardship Code, denoted by the interaction terms i.e.,  $(BOJ \times Post)_{i,t}$  and  $(Year\ Dummy \times BOJ)_{i,t}$ .

### 3. Findings

Table 2 reports our main results. In Columns I and II, the negative coefficients for *BOJ* indicate that the increased BOJ ownership is associated with a decrease in those firms' stock price crash risk in the following year. Particularly, a one standard deviation jump in *BOJ* decreases *NCSKEW* by 0.02% ( $= -0.010 \times 1.796\%$ ). We reach a similar conclusion with *DUVOL* results. The difference-in-difference model in Columns III and IV reveals the channel explaining our findings more precisely. Firms have a lower stock price crash risk by 0.12% ( $= -0.069 \times 1.796\%$ ) and 0.08% ( $= -0.042 \times 1.796\%$ ) as *NCSKEW* and *DUVOL*, respectively, when the BOJ ownership increases by one standard deviation in those companies starting 2014 Stewardship Code prompts the monitoring by asset management firms in Japan.

**Table 2: Impact of BOJ's Monetary Policy on Crash Risk**

|                             | NCSKEW <sub>t+1</sub> | DUVOL <sub>t+1</sub> | NCSKEW <sub>t+1</sub> | DUVOL <sub>t+1</sub> | NCSKEW <sub>t+1</sub> | DUVOL <sub>t+1</sub> |
|-----------------------------|-----------------------|----------------------|-----------------------|----------------------|-----------------------|----------------------|
|                             | I                     | II                   | III                   | IV                   | V                     | VI                   |
| BOJ <sub>t</sub>            | -0.010**<br>(0.004)   | -0.006**<br>(0.003)  | 0.057***<br>(0.020)   | 0.034**<br>(0.014)   | 0.138*<br>(0.071)     | 0.073*<br>(0.039)    |
| Post x BOJ <sub>t</sub>     |                       |                      | -0.069***<br>(0.020)  | -0.042***<br>(0.015) |                       |                      |
| D(k-2) x BOJ <sub>t</sub>   |                       |                      |                       |                      | -0.032<br>(0.072)     | -0.008<br>(0.044)    |
| D(k-1) x BOJ <sub>t</sub>   |                       |                      |                       |                      | -0.117<br>(0.075)     | -0.059<br>(0.042)    |
| D(k) x BOJ <sub>t</sub>     |                       |                      |                       |                      | -0.184**<br>(0.073)   | -0.100**<br>(0.042)  |
| D(k+1) x BOJ <sub>t</sub>   |                       |                      |                       |                      | -0.151**<br>(0.072)   | -0.058<br>(0.041)    |
| D(k+2) x BOJ <sub>t</sub>   |                       |                      |                       |                      | -0.164**<br>(0.070)   | -0.096**<br>(0.041)  |
| D(k+3) x BOJ <sub>t</sub>   |                       |                      |                       |                      | -0.153**<br>(0.073)   | -0.080**<br>(0.040)  |
| D(k+4) x BOJ <sub>t</sub>   |                       |                      |                       |                      | -0.130*<br>(0.072)    | -0.074*<br>(0.040)   |
| D(k+5) x BOJ <sub>t</sub>   |                       |                      |                       |                      | -0.162**<br>(0.072)   | -0.087**<br>(0.040)  |
| D(k+6) x BOJ <sub>t</sub>   |                       |                      |                       |                      | -0.137*<br>(0.072)    | -0.075*<br>(0.040)   |
| DTURN <sub>t</sub>          | 0.033<br>(0.047)      | 0.082**<br>(0.033)   | 0.033<br>(0.046)      | 0.083**<br>(0.033)   | 0.036<br>(0.047)      | 0.083**<br>(0.033)   |
| NCSKEW <sub>t</sub>         | -0.025***<br>(0.007)  | -0.017***<br>(0.005) | -0.026***<br>(0.007)  | -0.018***<br>(0.005) | -0.026***<br>(0.007)  | -0.018***<br>(0.005) |
| SIGMA <sub>t</sub>          | 0.004<br>(0.029)      | -0.066***<br>(0.020) | 0.004<br>(0.029)      | -0.065***<br>(0.020) | 0.003<br>(0.029)      | -0.066***<br>(0.020) |
| RET <sub>t</sub>            | 0.037*<br>(0.021)     | -0.078***<br>(0.015) | 0.036*<br>(0.021)     | -0.079***<br>(0.015) | 0.036*<br>(0.021)     | -0.079***<br>(0.015) |
| SIZE <sub>t</sub>           | 0.032***<br>(0.004)   | 0.021***<br>(0.003)  | 0.034***<br>(0.004)   | 0.022***<br>(0.003)  | 0.001*<br>(0.000)     | -0.001***<br>(0.000) |
| MB <sub>t</sub>             | 0.066***<br>(0.008)   | 0.050***<br>(0.006)  | 0.066***<br>(0.008)   | 0.050***<br>(0.006)  | 0.033***<br>(0.004)   | 0.022***<br>(0.003)  |
| LEV <sub>t</sub>            | 0.093**<br>(0.039)    | 0.067**<br>(0.026)   | 0.088**<br>(0.039)    | 0.064**<br>(0.026)   | 0.066***<br>(0.008)   | 0.050***<br>(0.006)  |
| ROA <sub>t</sub>            | 0.506***<br>(0.112)   | 0.113<br>(0.078)     | 0.511***<br>(0.113)   | 0.115<br>(0.078)     | 0.091**<br>(0.039)    | 0.065**<br>(0.026)   |
| ACC <sub>t</sub>            | -0.016<br>(0.084)     | -0.088<br>(0.057)    | -0.017<br>(0.084)     | -0.089<br>(0.056)    | 0.510***<br>(0.113)   | 0.116<br>(0.078)     |
| Year Dummy<br>& Industry FE | YES                   | YES                  | YES                   | YES                  | YES                   | YES                  |
| Observations                | 26,328                | 26,328               | 26,328                | 26,328               | 26,328                | 26,328               |
| Adj. R <sup>2</sup>         | 0.033                 | 0.059                | 0.034                 | 0.059                | 0.034                 | 0.059                |

Notes: k = 2014. The \*\*\* indicates statistical significance at the 1% level.

Columns V and VI reveal further interesting and reassuring findings from the parallel trend model. Statistically insignificant results for the interaction between *BOJ* and a set of year

dummies before 2014 ( $D_{k-2}$  and  $D_{k-1}$ ) imply no significant relation between firms' stock price crash risk and the BOJ ownership in them. However, those interaction variables have negative and statistically significant coefficients consistently across all years starting 2014 ( $D_k$  to  $D_{k+6}$ ). In 2014, the crash risk, i.e.,  $NCSKEW$ , drops by 0.33% ( $= -0.184 \times 1.796\%$ ) for 1.8% increase in BOJ ownership in those firms. With the biggest impact in 2014, such reduction in stock price crash risk continues every year between 2014 and 2020. We obtain similar results considering  $DUVOL$ , too. These findings indicate a steady decrease in crash risk for Japanese listed firms as corporate monitoring by the asset management companies improves and the BOJ expands its ETFs purchase as the monetary policy.

#### **4. Concluding remarks**

In this paper, we show that one of the unintended consequences of the BOJ ownership is the reduction of the future stock price crash risk in the market. This finding highlights the role of the BOJ's large-scale equity purchases program in reducing the negative tail events in the stock market. The results are consistent with an improved corporate governance story using an exogenous shock (i.e., the 2014 Stewardship Code) to the voting behavior of ETFs in their portfolio firms. This shock leads ETFs to increase their monitoring on their underlying firms, which, in turn, reduces the stock price crash risk.

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