Bank of Japan as a Contrarian Stock Investor: Large-Scale ETF Purchases

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Bank of Japan as a Contrarian Stock Investor: Large-Scale ETF Purchases*

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Abstract

This study unveils the Bank of Japan's behavior of purchasing exchange-traded funds (ETFs) on the Tokyo Stock Exchange. The Bank purchases ETFs after observing a significantly negative stock return over the previous night and during the morning market. The Bank stops purchasing ETFs when an overnight and morning stock return becomes positive. This unique counter-cyclical purchase behavior is consistent with its objective of decreasing equity risk premia and stimulating spending. Our study sheds light on a central bank's program to purchase equity when the interest-rate policy is ineffective.

JEL codes: E52, E58, G11

Keywords: large-scale asset purchases (LSAP), quantitative easing (QE), central banking, exchange-traded funds (ETF), unconventional monetary policy

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1. Introduction

The Bank of Japan (BOJ) started purchasing equity exchange-traded funds (ETFs) in October 2010 as part of its large-scale asset purchases (LSAPs), in addition to purchasing real estate investment trust (REIT) shares and long-term Japanese Government Bonds. The Bank enhanced these programs under the Quantitative and Qualitative Monetary Easing (QQE) regime and has become one of the largest investors in ETFs (approximately 5% of the market capitalization) and REITs (approximately 3% of the market capitalization). The bank started to purchase equity because it already had implemented the zero-interest-rate policy since 1999 and bond-LSAPs since 2001, well before other central banks started LSAPs (Krishnamurthy and Vissing-Jorgensen, 2013). The Bank's ETF/REIT purchases are the most extensive monetary program aiming to decrease risk premia for various financial assets by attracting more funds into the financial markets and stabilizing the economy (Shirakawa, 2010). This program deviates from the standard monetary policy in which asset prices do not play a central role (Bernanke and Gertler, 2001).

This is the first study that unveils the BOJ's ETF purchase behavior by using intra-day stock return data. In particular, we estimate the causal effect of overnight returns on the BOJ's purchase on the following day. Unlike in other bond purchase programs, the BOJ makes no advance announcement for its discretionary equity purchases. The extant studies treat BOJ's purchases as exogenous shocks to the ETF market and estimate their daily price impacts (e.g., Barbon and Gianinazzi, 2019; Charoenwong et al. 2019; Harada and Okimoto, 2019). Thus, understanding the BOJ's asset demand is essential in evaluating equilibrium asset prices and the aim of this monetary program.

We estimate a linear probability model and the Cox hazard model of the BOJ's purchase decisions. The BOJ primarily responds to a low overnight and morning return on the Tokyo Stock Exchange, particularly when it is below the third decile of the historical return distribution. However, lunchtime returns tend to be higher on the day of the BOJ's purchase, suggesting that the Bank is likely to submit a purchase order after the morning market closes. After a sequence of daily purchases, the BOJ is more likely to stop ETF purchases when overnight and morning TOPIX returns are positive. Thus, we conclude that the BOJ applies a counter-cyclical intervention rule based on the overnight and morning TOPIX returns, which is remarkably consistent with its REIT share purchase rule (Hattori and Yoshida, forthcoming).

Our contribution is to shed light on the BOJ's discretionary equity purchase program, which is unprecedented in the history of central baking. Although other central banks' policy also impacts equity prices in the US (Jansen and Zervou, 2017) and the EU (Henseler and Rapp, 2018; Kholodilin et al., 2009), the Federal Reserve and the European Central Bank purchase only debt instruments. How bond-LSAPs impact long-term interest rates is extensively studied (e.g., D' Amico et al., 2012; Krishnamurthy and Vissing-Jorgensen, 2011, 2013): (1) through future short-term rate policies (the expectations/signaling channel), (2) by reducing bonds available to private investors (the scarcity channel), (3) by reducing the aggregate exposure to duration risks (the duration-risk channel), (4) by reducing the aggregate exposure to prepayment risks (the prepayment-risk channel), and (5) by reducing an under-diversification premium (the capital-constraint channel). For bond-LSAPs to work through these channels, a central bank does not need to time the market. In sharp contrast, the BOJ's ETF purchases are contingent on intra-daily stock returns. The Bank's counter-cyclical purchase behavior is consistent with its objective to decrease

equity risk premia and stimulate spending. Our study documents how the BOJ attempts to impact equity risk premia when its interest-rate policy is ineffective.

2. Bank of Japan's purchase of ETF

The BOJ set up a trust in October 2010 to purchase ETFs up to a balance limit of 450 billion JPY. After several increases, the balance limit was raised to 2.1 trillion JPY in October 2012. The BOJ further enhanced the program under QQE by removing the balance limit and introducing an annual purchase limit of 1 trillion JPY. After three increases, the annual purchase limit was increased to 6 trillion JPY in July 2016. At the end of 2019, the BOJ's ETF holdings corresponded to approximately 5 % of the total market capitalization on the Tokyo Stock Exchange (Fig. 1). The BOJ's share in the equity ETF market increased to approximately 70% at the end of March 2019. In March 2020, the BOJ temporarily increased the limit to 12 trillion JPY per year to mitigate the negative economic impact of the COVID-19 pandemic.

The BOJ initially purchased only the ETFs tracking TOPIX and Nikkei 225 but included those tracking JPX-Nikkei 400 in November 2014. In December 2015, the Bank launched a new program to purchase daily 1.2 billion JPY of ETFs that track companies "proactively making investment in physical and human capital." The BOJ announces an annual budget each year and reports daily purchase amounts. However, the Bank does not make an advance notice about specific date and amount, unlike for regular JGB auctions (Hattori, 2020).

3. Data and empirical strategy

We obtained the date and amount of daily ETF purchases from the BOJ's website. We use

TOPIX to compute stock index returns from December 2010 to December 2019 by dividing each trading day into four subperiods: the overnight period (from 15:00 on the previous trading day to 09:00), the morning market (from 09:00 to 11:30), the lunchtime (from 11:30 to 12:30), and the afternoon market (from 12:30 to 15:00).

We first estimate a linear probability model of the BOJ's ETF purchase decisions for each subperiod $i = \{overnight, morning, lunchtime, afternoon\}$:

$$\mathbb{I}_t = \alpha_1^i + \sum_{d=\{1,\ldots,5,7,\ldots,10\}} \beta_1^{i,d}\, \mathbb{r}_t^{i,d} + \varepsilon_{1,t}^i, \qquad (1)$$

where $\mathbb{I}_t$ denotes a dummy for an ETF purchase on date t, and $\mathbb{r}_t^{i,d}$ denotes a dummy for decile-group d of a subperiod-i return on date t. The coefficient $\beta_1^{i,d}$ represents the incremental probability of the BOJ's purchase when a subperiod return is in the dth-decile group as opposed to the sixth-decile group. Causal inferences need to be made carefully depending on the unobservable timing of BOJ's orders. If the BOJ submits a purchase order after a morning market closes, the coefficients on overnight and morning returns represent causal effects because these returns are determined before the BOJ makes a daily decision. By contrast, the coefficients on lunchtime and afternoon returns represent reverse causality because these returns are determined after the Bank submits orders.

An issue in a linear probability model is that it does not distinguish the first of consecutive purchases from subsequent daily purchases. To analyze the BOJ's decision conditional on a sequence of its past decisions, we estimate the Cox (1972) hazard model by allowing for a time-dependent covariate vector $\boldsymbol{X}(t)$ (e.g., Dirick et al., 2019):

$$\lambda\big(t\big|\boldsymbol{X}(t)\big) = \lambda_0(t)\, exp\left(\sum_i \beta_2^i\, r_t^i + \gamma_2^i\, r_{t-1}^i\right), \qquad (2)$$

where $\lambda(t|\boldsymbol{X})$ denotes the hazard function that represents an instantaneous rate of failure conditional on survival up to time t, $\lambda_0(t)$ denotes an unspecified baseline hazard function, r_t^i denotes a subperiod-i TOPIX return on date t. We analyze both starting and stopping decisions by defining failure events by the start and the discontinuation of consecutive purchases, respectively. A negative coefficient β_2^i indicates that a lower return is associated with a larger conditional probability of starting or stopping decisions, depending on the definition of failure events.

4. Result

Fig. 2 depicts the estimated coefficients for the linear probability model. For overnight and morning returns (Panels A and B), the estimated coefficients are monotonically decreasing in return decile groups. The coefficients are positive and statistically significant for the first, second, and third decile groups. In particular, the BOJ is 50-60% more likely to purchase ETFs when overnight and morning stock returns are in the first decile group than in the sixth decile group. In contrast, the BOJ is less likely to purchase ETFs when these returns are high. However, for lunchtime and afternoon returns (Panels C and D), the coefficients are generally increasing in return deciles. In particular, the coefficients are positive and statistically significant for the ninth and the tenth decile return groups. This result implies that the BOJ submits a purchase order after observing a morning return and increases stock prices at the beginning or during the afternoon market.

Table 1 shows the estimated coefficients for the Cox hazard model. The reported coefficients are the natural logarithm of the hazard ratio for a one basis-point higher return. In

columns (1) and (2), the coefficients on overnight and morning returns are negative and statistically significant. Thus, the BOJ is more likely to start purchasing ETFs after a period of inaction when it observes negative overnight and morning returns. The coefficients on lunchtime and afternoon returns are positive and statistically significant, implying that the BOJ's first purchase impacts stock prices after the morning market. For stopping decisions (columns (3) and (4)), the coefficients on overnight and morning returns are positive and statistically significant. Thus, after consecutive daily purchases, the BOJ is more likely to stop purchases when overnight and morning returns are positive. Insignificant coefficients on lunchtime and afternoon returns in the stopping case confirm our inference about the timing of BOJ's purchases.

5. Conclusion

This paper analyzes how the Bank of Japan purchases ETFs as part of unconventional monetary policy. We find clear evidence of a counter-cyclical intervention rule, contingent on intra-day stock returns. Although this purchase behavior is hardly justified as conventional monetary policy under normal economic conditions, it is consistent with the Bank's attempt to influence equity risk premia after having exhausted other monetary policy instruments, including the policy rate, inflation targeting, and bond-LSAPs. Thus, our study contributes to the discussion of monetary policy under prolonged zero interest rate and a deflationary economic environment.

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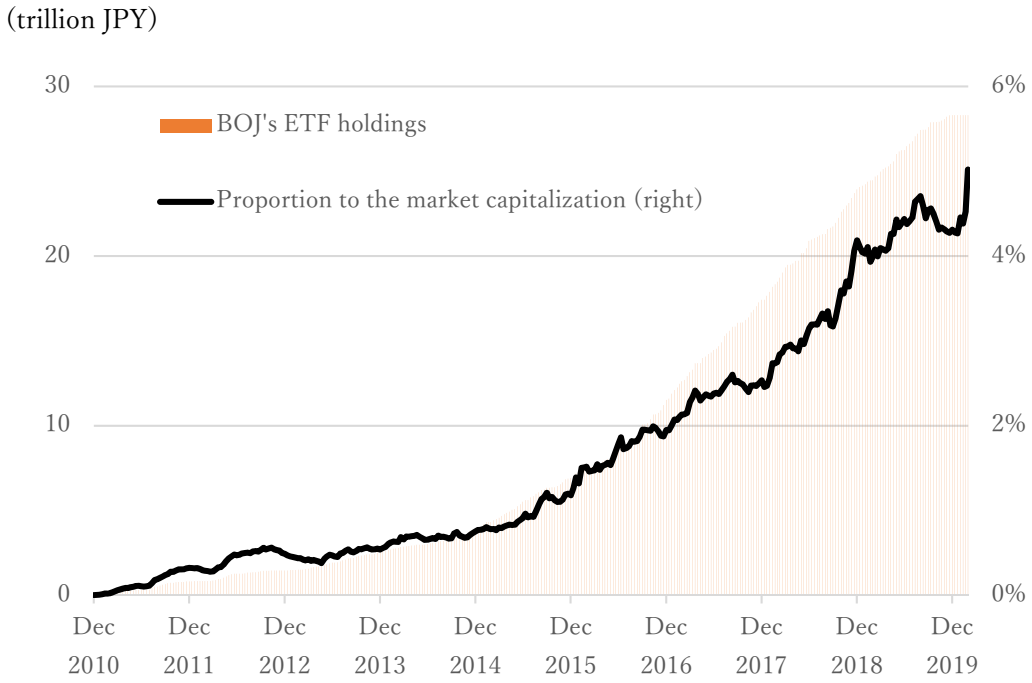

Fig. 1 The BOJ's ETF holdings.

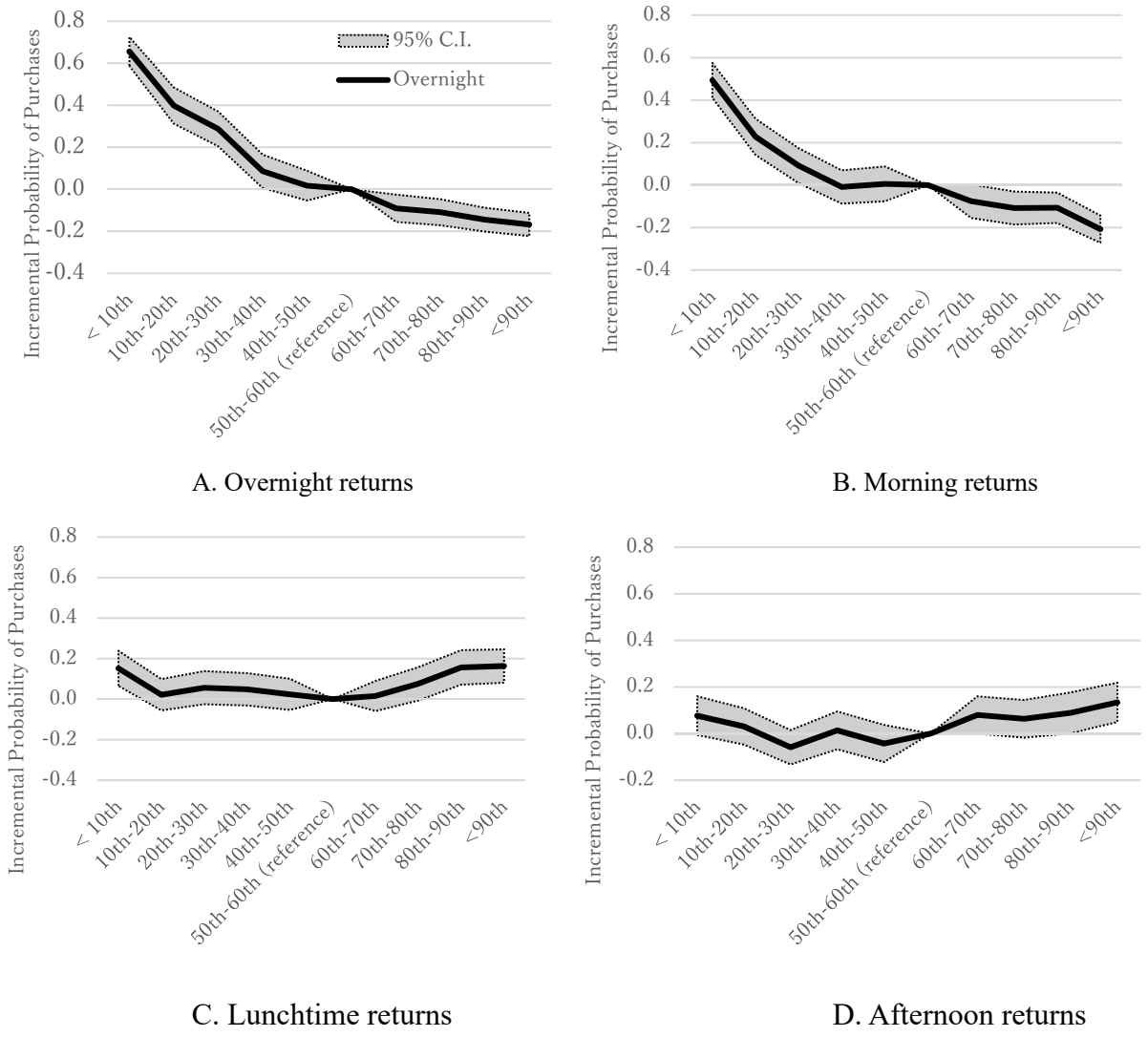

Fig. 2. Purchase probability by return decile groups.

Notes: The confidence intervals are based on Newey-West standard errors.

Table 1

The Cox hazard model

	Starting Decisions				Stopping Decisions			
	(1)		(2)		(3)		(4)	
Overnight	-0.010	***	-0.010	***	0.005	***	0.005	***
	(-13.87)		(-14.16)		(7.36)		(7.14)	
Morning	-0.006	***	-0.007	***	0.004	***	0.004	***
	(-7.56)		(-8.30)		(5.27)		(5.12)	
Lunchtime	0.008	***	0.009	***	-0.002		-0.002	
	(2.85)		(3.31)		(-0.87)		(-0.85)	
Afternoon	0.002	**	0.002	**	-0.001		-0.001	
	(2.40)		(2.31)		(-1.60)		(-1.34)	
Lagged Overnight			0.001				-0.001	
			(1.19)				(-0.65)	
Lagged Morning			-0.001				0.000	
			(-0.89)				(0.49)	
Lagged Lunchtime			0.003				0.000	
			(1.18)				(-0.14)	
Lagged Afternoon			0.002	**			0.000	
			(2.11)				(-0.43)	
N	1618		1617		596		595	

Note: This table shows the estimated coefficients on TOPIX returns measured in basis points in Equation (2). The z-statistics are in parentheses. ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively.