To Lend or Not to Lend: The Bank of Japan's ETF Purchase Program and Securities Lending [1]

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Introduciton

1. Introduciton: Summary

▶ We examine the effects of BOJ's ETF purchase, particularly focusing on the role of the stock lending market.

▶ Specifically, check if the following mechanism is working:

1. ETF purchases directly push up stock prices.

2. Stocks purchased by BOJ are supplied in the lending market.

3. Increases in lendable stocks decreases lending fees.

4. Stock borrowing transactions (= short sells) increase.

5. Exert downward pressure on stock returns.

▶ Existing literature: focus on only 1. (1: **Direct Channel**)

▶ This study: focus on 1-5. (2-4: **Stock Lending Channel**)

2. Introduction: Underlying Story

1. As BOJ purchases ETFs under the program, associated ETFs are newly created.

2. Beccause those ETFs (= TOPIX or Nikkei 225 Tracking ETFs) are non-synthetic, the ETFs need to hold a market basket.

Figure: Balance sheet of an ETF

| Assets	Liabilities
Liquidity [Cash/Call loan]	Others
Individual Stocks [=market basket]	Principals and Surplus

3. ETF managers can freely lend out their holding stocks in the stock lending market.

3. Intro: ETF mangers' incentives to lend stocks

▶ ETF fund managers have incentives to lend stocks in ETFs to the stock lending market. → to earn lending fees.
  ⋆ It is particularly true for ETFs held by the BOJ, given that the BOJ does not have plans to sell its ETF holdings.

▶ The following figures (next page) show recent expansions of stock lending business by ETFs.
  ⋆ Stock lending ratios (= No. of lending shares to the total No. of shares in ETFs) have increased over time.

▶ Unique to the BOJ's program, compared to other LSAP programs of CBs!

4. Intro: ETF BS data: Nomura TOPIX-tracking

TOPIX-linked ETF by asset management company X
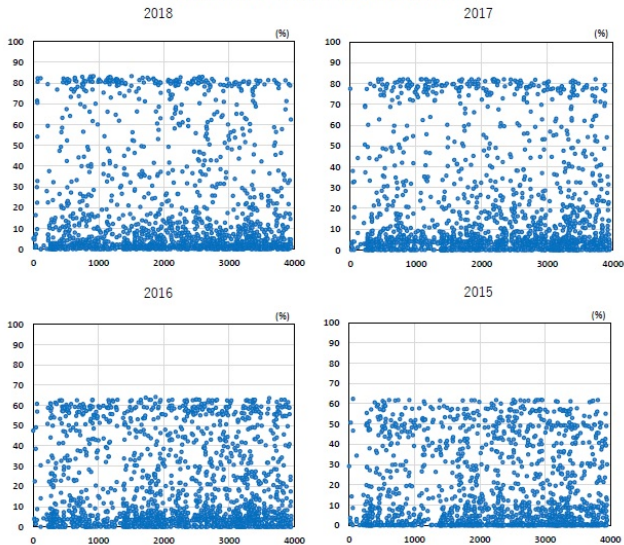
Y axis: stock lending rate. X axis: (normalized) security code number.

5. Main Findings

▶ Our analysis shows evidence of the two channels through which the ETF purchase program affects stock markets: Direct Channel and Stock Lending Channel.

 ⋆ Direct Channel: ETF purchases directly push up stock returns by shifting the demand curve upward in the stock market.
 ⋆ Stock Lending Channel: The accumulated purchases by the BOJ increase the supply of lendable shares in the lending market, push down lending fees, which eventually weakens the effects of the BOJ's purchases on stock returns.
  ▶ This mechanism works particularly (i) over the longer term and (ii) for those stocks with high lending fees (= special stocks).

▶ Such security lending channel should be taken account of in evaluating policy effcts of the program.

Conceptual framework and testable hypotheses

6. Conceptual Framework and Testable Hypotheses

1. To make testable hypotheses, we use the model of Blocher et al. (JFE, 2013) analyzing interconectedness between stock (spot) market and its lending market.

2. To identify the effects of the BOJ's ETF purchase program, especially those produced via the stock lending market, it is useful to divide all stocks into two categories: special stocks and non-special stocks.

   ⋆ Special Stocks: lending fee (=price in lending marked) is determined at the intersection of supply- and demand curves in the lending market thus is relatively high.
   ⋆ Non-special stocks: lending fee is (close to) zero because excess supply exists in the lending market.

7. 4 Hypotheses

▶ We establish 4 testable hypotheses.
   ⋆ In the paper, they are heuristically found by using Blocher's model, but skip in today's talk..

▶ 3 for stock returns + 1 for lending fees.

cf. Blocher et al. (JFE, 2013)'s 2-market models
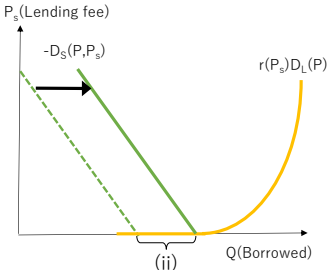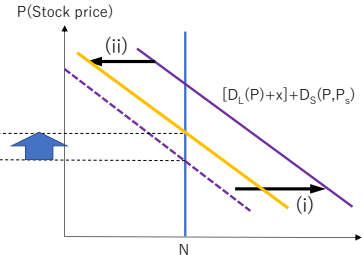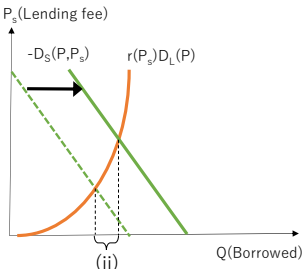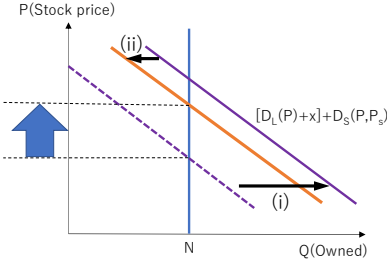
2 markets assumed: stock spot mkt (Left) + lending market (Right)

– The 1st hypothesis is quite intuitive and never related to stock
lending channel:

▶ **Hypothesis R.0.: The BOJ's ETF purchases increase
stock returns for both special and non-special stocks.**

– For the 2nd hypothesis, consider the stock lending market.

– When stock returns are overvalued, investors have incentive to borrow stocks for short sells.

– Other thing being equal, non-special stocks are easier to be borrowed, because of its excess supply in the lending market.

– For non-special stocks, the effects of pushing back the stock prices is larger.

► **Hypothesis R.1. The BOJ's ETF purchases increase the returns of the special stocks more than those of the non-special stocks.**

– For the 3rd hypothesis, consider the effects of accumulation of purchased ETFs on the lending market.

– As BOJ continues to purchase ETFs, more stocks are provided from the accumulated ETFs in the lending market thus the supply curve shifts rightward.

– The rightward shift of the supply curve pushes down lending fees, particularly of special stocks, resulting in increases in short sells.

– Downward pressure exerts on special stocks' return

▶ **Hypothesis R.2.: As the BOJ's ETF purchases proceed, the effect of ETF purchases to push up the returns of special stocks is reduced.**

– As discussed, downward pressures exert on lending fees over such longer terms as ETFs purchased by BOJ are accumulated.

► **Hypothesis F: The BOJ's ETF purchases lower lending fees of the special stocks in the medium to longer term.**

Empirical analysis

12. Effects on Stock Returns

To examine **Hypotheses on Stock returns**, we consider the following:

$$
\begin{aligned}
CR_{it} = {} & \beta_0 ETF_{it} + \beta_1 SP_{it-1} \times ETF_{it} + \beta_2 CumETF_{it-1} \times ETF_{it} \\
& + \beta_3 SP_{it-1} \times CumETF_{it-1} \times ETF_{it} \\
& + \alpha_i + TimeFE_t + \gamma Control_{it} + \epsilon_{it}.
\end{aligned}
\tag{1}
$$

where

- ▶ CR_{it}: weekly stock return.
- ▶ ETF_{it}: the ratio of the amount purchased by the BOJ to total market value at t.
- ▶ $CumETF_{it-1}$: cummulative sum of ETF_{it-1} from the start of the program to $t-1$.
- ▶ SP_{it-1} : dummy taking 1 if stock i is special at $t-1$ and 0 o.w.
- ▶ $Control_{it}$: control variables.

13. Effects on Stock Returns

$$CR_{it} = \beta_0 ETF_{it} + \beta_1 SP_{it-1} \times ETF_{it} + \beta_2 CumETF_{it-1} \times ETF_{it}$$
$$+ \beta_3 SP_{it-1} \times CumETF_{it-1} \times ETF_{it}$$
$$+ \alpha_i + TimeFE_t + \gamma Control_{it} + \epsilon_{it}.$$

▶ **Hypothesis R.0** is tested by checking if β_0 is positive.

▶ **Hypothesis R.1** is tested by checking if β_1 is positive.

▶ **Hypothesis R.2 (←Lending Channel)** is tested by checking if β_3 is negative (or by checking contrast of β_2 and β_3).

  ⋆ As ETFs purchased by BOJ pile up, the effects of a (unit) purchase on special stocks' returns becomes smaller.

14. Effects on Stock Returns

	(1)	(2)	(3)	(4)	(5)
ETF (β_0)	13.67***	13.86***	178.4***	19.92***	177.7***
	(1.793)	(1.806)	(12.380)	(2.547)	(12.420)
SP $\times$ ETF (β_1)		21.59***	14.26***	28.79***	20.02***
		(5.101)	(5.037)	(5.903)	(6.058)
CumETF$\times$ETF (β_2)				-1.025***	-0.0598
				(0.211)	(0.194)
SP$\times$CumETF $\times$ETF (β_3)				**-4.819***	-3.299**
				(1.336)	(1.485)
Control vars.	Yes	Yes	Yes	Yes	Yes
Control vars. $\times$ ETF	No	No	Yes	No	Yes
N	518992	518992	518992	518992	518992
Individual FE	Yes	Yes	Yes	Yes	Yes
Time FE	Yes	Yes	Yes	Yes	Yes

Notes: * $p < 0.10$, ** $p < 0.05$, ** $p < 0.01$. Clustered standard errors at the individual stock level are in parentheses.

15. Effects on Lending Fees

To examine **Hypothesis on Lending Fees**, we estimate the following:

$$\Delta Fee\_XXw_{it} = \beta_0 ETF\_XXw_{it} + \beta_1 SP_{it} \times ETF\_XXw_{it}$$
$$+\alpha_i + TimeFE_t + \gamma Control_{it} + \epsilon_{it}.$$

where:

- ▶ ΔFee_XXw_{it}: the change in lending fees of stock i from time t to XX weeks afterward. $XX \in \{1, 2, 5, 15, 25, 50, 75\}$.

- ▶ ETF_XXw_{it}: cumulative amount of BOJ's ETF purchases of stock i from time t to XX weeks afterward, measured by the ratio of BOJ's ETF purchases to the total market value of stock i at t.

We test **Hypothesis F.** by checking if β_1 is negative for larger XXs (= longer time horizons).

16. Effects on Lending Fees

The results support **Hypothesis F.** and are robust to different defs of specialness.

	(1) ΔFee_1w	(2) ΔFee_2w	(3) ΔFee_5w	(4) ΔFee_15w	(5) ΔFee_25w	(6) ΔFee_50w	(7) ΔFee_75w
SP × ETF_1w	-0.729 (0.656)						
SP × ETF_2w		-0.546 (0.429)					
SP × ETF_5w			-0.34 (0.374)				
SP × ETF_15w				-0.302 (0.338)			
SP × ETF_25w					**-0.658**** (0.278)		
SP × ETF_50w						**-0.948***** (0.207)	
SP × ETF_75w							**-1.134***** (0.163)
Ctrl. Vars.	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	517101	648947	748176	777152	781018	790807	798960
Ctrl.×ETF_XXw	No	No	No	No	No	No	No
Individual FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Time FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Notes: * $p < 0.10$, ** $p < 0.05$, ** $p < 0.01$. Clustered standard errors at the individual stock level are in parentheses.

Conclusions

17. Conclusions

▶ Two different channels: Direct Channel and Lending Channel in BOJ's ETF purhcase program.

▶ Particular focus of this study is Lending Channel:

1. ETFs purchased by BOJ contribute to increasing supply in the stock lending market.
2. Supply curve in the lending market shifts rightwards
3. Lending fee decreases and stock lending/borrowing transactions increases
4. Dowonward pressure on stock returns.

▶ We show that the BOJ's accumulated purchases lower lending fees over longer terms and weaken the effects on stock returns.

▶ In evaluating the effect of an LSAP on asset prices, the lending channel should be considered, especially when the assets purchased by a CB can be lent out in the associated lending market.

Thank you for listening!

Figure: Effects on Lending Fees

(Estimated Coefficients)
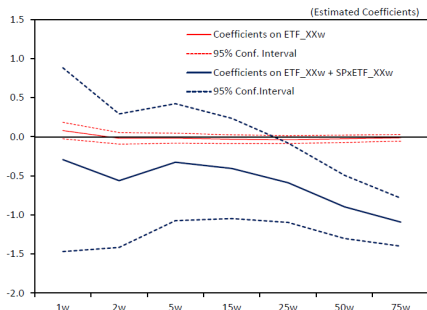
- The estimated effects on lending fees of special stocks vs non-special stocks.
- For special stocks, the ETF purchase clearly exerts downward pressure on fees for a longer time horizon.
- For non-special ones, in addition to the around-zero effect of the purchase, confidence interval is much tighter. → Fees of non-special stocks are less sensitive to changes in the supply in the lending market.

Figure: Marginal Effects on Stock Returns
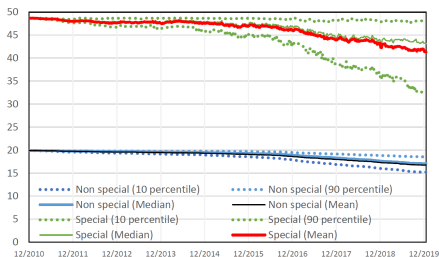
- The estimated marginal effects on stock returns of special stocks vs non-special stocks, based on Column (4) of the estimation result.
- For special stocks, an increase in the BOJ's ETF purchase has the decreased the average marginal effect by 15%.

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