

Stock Lending Market and the BOJ's ETF purchasing program: Micro-Evidence from ETF Balance Sheet Data and Equity Repo Trading Data

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Abstract

The ETF (Exchange Traded Fund) purchasing program currently implemented by the Bank of Japan (BOJ) has, in contrast to other asset purchasing programs, a unique characteristic: stocks that constitute ETFs held by the BOJ can be lent freely by ETF managers. This study (1) examines whether the ETF purchasing program actually causes an expansion of the stock lending market, and (2) identifies the determinants of stock lending (or equivalently equity repo trading). We focus on two different micro-datasets of stock lending: ETF balance sheet data released by asset management companies and equity repo trading data released by the Japan Securities Dealers Association. Our empirical analysis of these datasets shows that the expansion of the ETF purchasing program has caused the substantial growth of stock lending markets. Panel regression results suggest that the size of equity repo trading tends to be larger for stocks with (a) lower free-float rates, (b) smaller market values (both are proxies for market liquidity), (c) higher valuations such as PBR, and (d) higher volatility. These results also imply that the program has contributed significantly to activating stock lending trades at the times of the bank's decisions to increase the target amounts of purchases of the program, as well as to influencing the sensitivities of the trades to market liquidity and valuations.

Keywords: Stock lending, ETF purchasing program, Bank of Japan

JEL classification codes: E58, G12

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1 Introduction

1.1 The Bank of Japan's ETF purchasing program

At the monetary policy meeting (MPM) held on October 28, 2010, the Bank of Japan (BOJ) decided to establish a program to conduct outright purchases of various financial assets and fixed-rate funds-supplying operations against pooled collateral (hereafter the asset purchase program) ¹.

Specifically, in order to encourage a decline in longer term interest rates and various risk premiums, the BOJ established a program on its balance sheet to purchase various assets such as JGBs, T-Bills, CPs, corporate bonds, ETFs, and J-REITs. The sum of these assets to be purchased was set at about 5 trillion yen. The total size of the program, including fixed-rate funds-supplying operations against pooled collateral, was set at about 35 trillion yen. Of the 5 trillion yen, 0.45 trillion yen was allocated to ETF purchases as the maximum outstanding amount of ETF to be purchased ².

The target amount of ETFs to be purchased had increased repeatedly since the introduction of the program, and the sizes of the increases were substantial. At the MPM held on March 14, 2011, immediately after the Great East Japan Earthquake, the decision was made to double the purchases of ETFs from 0.45 trillion yen to 0.90 trillion yen, which was later increased further to 1.4 trillion yen (the total size of the asset purchase program was increased, from the initial 35 trillion yen, to 40 trillion yen and later to 50 trillion yen). During 2012, the BOJ decided to increase the size of ETF purchases (1) from 1.4 trillion yen to 1.6 trillion yen at the April MPM (associated size of the asset purchase program: 65 → 70 trillion yen) and (2) from 1.6 trillion yen to 2.1 trillion yen at the October MPM (total size of the asset purchase program: 80 → 91 trillion yen). The need for these policy changes were emphasized by press release language such as “With a view to preempting a deterioration in business sentiment and an increase in risk aversion in financial markets from adversely affecting economic activity,...”(March 2011) and “in order to make financial conditions for such economic entities as firms and households even more accommodative by further encouraging a decline in longer-term market interest rates and reduction in risk premiums ”(October 2012).

With the introduction of quantitative and qualitative monetary easing (QQE) in April 2013, the asset purchase program was terminated. However, the BOJ decided to continue each asset

¹For details of the bidding patterns of fixed-rate funds-supplying operations within the asset purchase program, see Shino [28] [29].

²The maximum outstanding amount for each asset (other than ETFs) to be purchased was: (1) about 1.5 trillion yen of JGBs, (2) about 2 trillion yen of T-Bills, (3) about 0.5 trillion yen of CPs, (4) about 0.5 trillion yen of corporate bonds, and (5) about 0.05 trillion yen of J-REITS. Please refer to [3] for details.

purchasing program under QQE. Specifically, the bank decided to increase annual purchases of ETFs to 1 trillion yen, with a view to lowering the risk premiums of these assets. Thereafter, at the MPM held in October 2014, when the QQE policy was expanded, the BOJ decided to increase annual ETF purchases to about 3 trillion yen (a tripling of the size of the program). Furthermore, at the MPM held in December 2015, to supplement QQE the BOJ decided to establish a new program for purchasing ETFs to support firms that proactively invest in physical and human capital. The annual size of this secondary program was 300 billion yen.

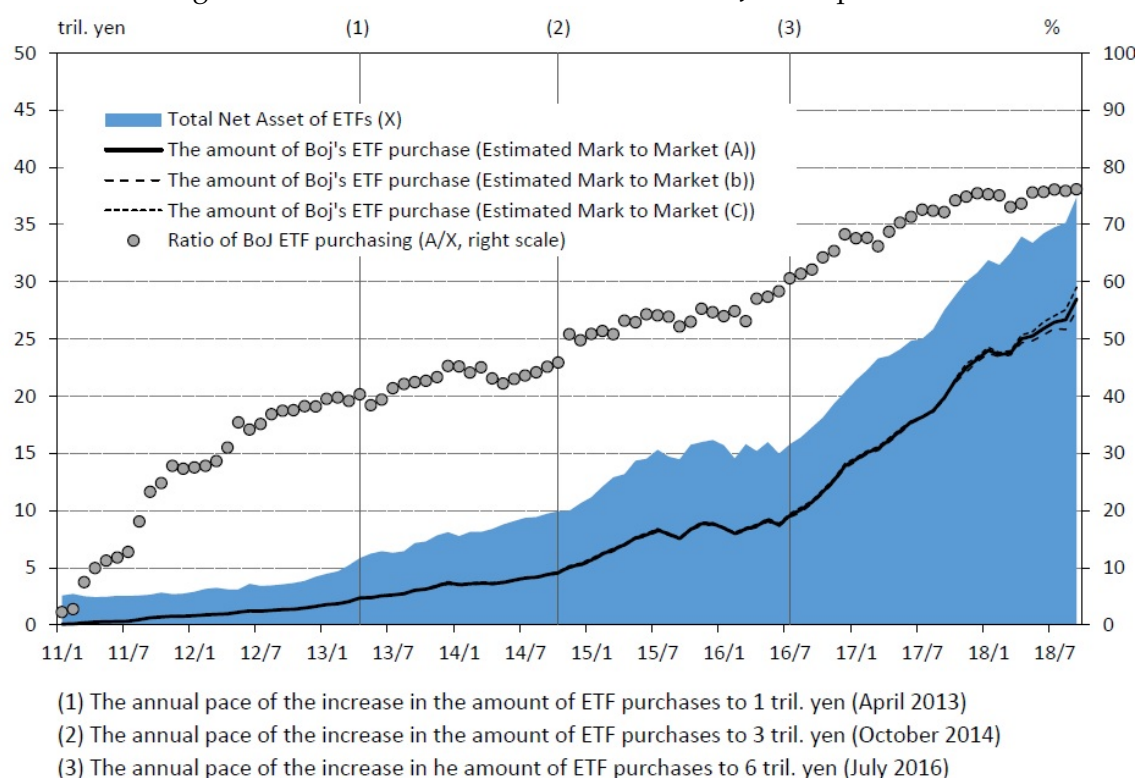
At the MPM held in July 2016, taking into account increased uncertainties surrounding overseas economies, mainly against the backdrop of the United Kingdom's vote to leave the EU, the BOJ decided to almost double its purchases of ETFs to about 6 trillion yen, in order to prevent these uncertainties from leading to a deterioration in business confidence and consumer sentiment.

At the MPM held in September 2016, the BOJ decided that the maximum amount of each ETF to be purchased would take into account the total market value of that ETF and the coverage of the index that ETF tracks in order to facilitate smooth market operations. Specifically, the BOJ decided to make the following changes to the maximum amount of each ETF to be purchased: (1) Of the annual purchase amount of 5.7 trillion yen, 3 trillion yen would be used for ETFs that track any of the three indices (TOPIX, Nikkei 225 Stock Average, or JPX-Nikkei Index 400) as before. The maximum amount of each ETF to be purchased would be set so that the bank's purchase would be roughly proportionate to the total market value of that ETF. (2) The remaining 2.7 trillion yen would be used for ETFs that track the TOPIX. The maximum amount of each ETF to be purchased would be set so that the bank's purchase would be roughly proportionate to the total market value of that ETF. These changes increased the ratio of TOPIX-tracking ETFs to total ETF purchases, while those of the Nikkei 225 and JPX-Nikkei 400 declined. At the July 2018 MPM, while the annual pace of 6 trillion yen was preserved, the following sentences were added to the policy statement: *"With a view to lowering risk premiums of asset prices in an appropriate manner, the bank may increase or decrease the amount of purchases depending on market conditions."*

1.2 The Japanese ETF market

Fig.1 shows the total net value of ETFs in Japan since 2011. An upward trend in the net value is evident throughout this period, and the pace of the increase appears to accelerate at around the middle of 2016. This acceleration coincides with the expansion of the BOJ's ETF purchases doubling to about 6 trillion yen.

Figure 1: Total net assets of ETFs and the BOJ's ETF purchases



(Source) Bank of Japan, Investment Trust Association, Japan.

We can compare the total net ETF assets with the BOJ's ETF purchases in a more direct way. The BOJ releases data on ETF purchases on a daily basis (Bank of Japan [1]). As any ETFs purchased by the BOJ have not been sold (that is, the BOJ has not "exited" the policy) and every ETF has no duration, the sum of all purchases (flows) equals the outstanding amount of purchases (stock). It is still inappropriate to use this outstanding amount to directly compare the net ETF assets because the former is book valued, whereas the latter is market valued. However, we can estimate the market value of the outstanding amount of ETF purchases by using market returns, because most ETFs held by the BOJ—excluding ETFs "to support companies that are proactively investing in physical and human capital"³—are market index linked (TOPIX or Nikkei 225).

Fig.1 shows three estimated outstanding amounts of BOJ ETF holdings measured at market values. The monthly returns of the TOPIX, Nikkei 225, and the average of those returns are used in the estimation of (A), (B) and (C) in Fig.1, respectively. There seem to be no significant differences among these three estimations. The figure clearly shows that the BOJ's ETF purchases have contributed substantially to the recent expansion of the Japanese ETF market. Since the beginning of 2011, net ETF assets have increased by 34.8 trillion yen (from 2.5

³Note that the returns of these ETFs are assumed to generally follow market returns.

trillion yen to 37.3 trillion yen, +1352%), while the increase in the BOJ's ETF holdings during the same period is estimated to be in the range of 27 to 29 trillion yen, and the ratio of BOJ holdings to total net ETF assets is currently as high as around 75% compared with less than 3% at the beginning of 2011.

1.3 ETF creation and stock lending

Such a large-scale ETF purchasing program and the resulting rapid expansion of the Japanese ETF market have created some concerns among market participants. One of them is that the purchasing program may induce an excessive tightening of demand–supply conditions in the equity market and thus push individual stock prices up to a “overvalued” level ⁴. As the BOJ purchases a certain amount of ETF under the program, associated amounts of ETFs are newly created and each is a marketable security backed by a “market basket” of individual stocks. A market-tracking ETF needs to hold such a market basket because its mandate is to generate market returns and to minimize tracking errors. In terms of an ETF balance sheet (Fig.2), the size of the principals and surplus on the liabilities side must be balanced by the amount of individual stocks on the assets side. Therefore, newly created ETFs triggered by BOJ purchases result in increases in demands for individual stocks, and thus exert upward pressure on stock prices. This is an underlying mechanism that is taken into account in the above concern.

However, here it should be noted that, unlike other central banks' asset purchase programs, the ETF purchasing program has a unique characteristic: individual stocks that constitute ETFs can be utilized for *equity lending* or *equity repo trading* by ETF managers⁵. Suppose that demand–supply conditions for an individual stock i become tightened and investor j considers the current stock price p_i to be overvalued compared with i 's fair value \tilde{p}_i . A possible strategy for investor j is to short-sell i . This results in an increase in demand for stock borrowing, and thus we can naturally expect that stocks constituting an ETF are an appropriate resource for such stock lending trading.

⁴Other concerns include sustainability of the purchasing and possible damage to corporate governance. See, for example, Imai [20] and Ide [19].

⁵In this study we use the words “equity lending” and “equity repo trading” interchangeably.

Figure 2: Balance sheet of an ETF (image)

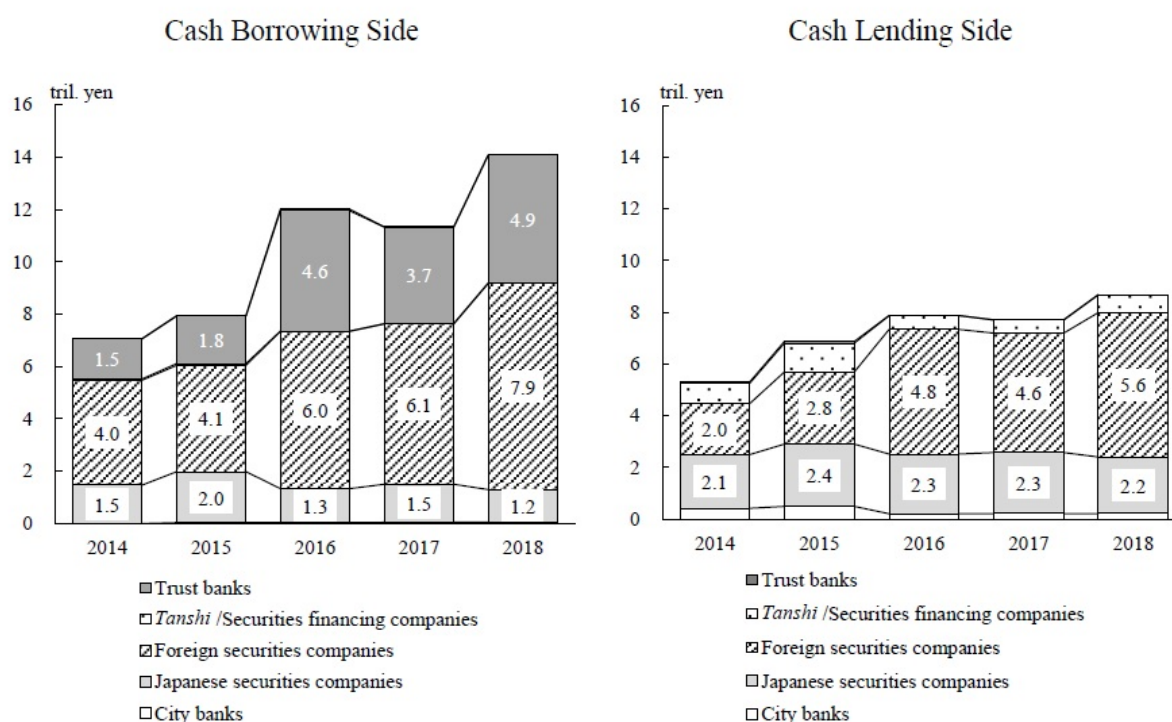
Assets	Liabilities
Liquidity [Cash/Call loan]	Others
Stocks	Principals and Surplus

From the supply side of stock lending trading, ETF managers such as asset management companies are naturally considered to have practical incentives to lend stocks from the stock pool of an ETF purchased by the BOJ. First, ETF managers can earn stock lending fees. They generally need to cover costs of running the fund, such as personnel and administrative expenses. Second, the BOJ is considered to act as a pure “buyer and holder” of ETFs under the program, that is, the BOJ will not sell ETFs nor ask for redemption as it follows the guideline of the operation (“*Principal Terms and Conditions for Purchases of ETFs and J-REITs*,” Bank of Japan [2]). Therefore, ETF managers do not have to hold a certain portion of ETF stocks in preparation for sudden or large redemptions. As we will see in the following section, while Japanese major asset management companies seem to impose an upper bound on the stock lending rate ($= (A) \text{market value of stock } i \text{ constituting a ETF and used for stock lending} / (B) \text{market valued of stock } i \text{ constituting the ETF}$) for each individual stock, such upper bounds and actual lending ratios under those restrictions have increased in recent years.

In this study, we examine whether these arguments hold in actual financial markets, that is, whether the BOJ ETF purchasing program caused the recent expansion of the equity lending market through the effects of the program on the size of the ETF market. If this is the case, it has serious implications. In terms of data, this analysis uses two different types of micro-datasets. The first contains balance sheet data of major Japanese market-tracking ETFs. Each ETF issues financial statements and balance sheets providing detailed lending data for individual stocks constituting the ETF. The second contains comprehensive equity lending trades data released by Japan Securities Dealers Association (JSDA). This dataset has some advantages in terms of frequency (released weekly) and length of time series (data from 2010 are available). We will estimate panel regressions with this dataset to identify the determinants of lending rates as well as the effects of several expansions of the BOJ purchasing program, check the robustness of our observations derived from the ETF balance sheet data, and present some policy implications, especially the effects of the expansion of the lending trades on prices and valuations in the equity market.

Before examining these two micro-datasets, we briefly examine the aggregate size of the stock lending market. The Bank of Japan's *Tokyo Money Market Survey* [4] provides appropriate data. This survey covers eligible counterparties in the BOJ's market operations, as well as other major participants in the money market such as asset management companies and life insurance companies. There were about 300 respondents in the survey (with a response rate of 100 percent, from 2014 to 2018). Based on the survey, the outstanding amount in the equity repo market at July 2018 was about 15 trillion yen (Fig.3, institutional credit trading, general margin trading, and equity lending between a financial instruments business operator and a securities finance company are excluded).

Figure 3: Amount outstanding in the equity repo market
By Investor Type



(Note) The total amount of "Cash Borrowing Side" does not equate to that of "Cash Lending Side" because certain types of investors such as foreign investors are not included in this survey.
 (Source) Bank of Japan "Tokyo Money Market Survey."

The remainder of the paper is organized as follows. In Section 2, we review the related literature. Section 3 examines the ETF balance sheet data. Section 4 focuses on the JSDA stock lending microdata and presents panel regression results for the stock lending rate. Section 5 concludes the analysis.

2 Related literature

Stock lending markets play an important role in complementing stock markets in terms of market liquidity provision and price formation. However, empirical analyses of stock lending markets are not as rich as those on stock markets, partly because data availability on stock lending markets is restricted in general. One of the central topics of the existing studies is the effects of short-selling restrictions on stock prices or volatilities. Using US data for the 1920s and 30s, Jones [21] shows that stocks facing strong short-selling constraints tend to have high valuations and thus low expected returns. Miller [23] points out the possibility that restrictions on short selling tend to cause overvaluation of equity prices. Hong and Stein [18] and Abreu and Brunnermeier [6] suggest that restrictions enhance volatility and destabilize equity price formation. Beber and Pagano [7] argue that regulation of short selling from 2007 to 2009 contributed to a deterioration in market liquidity provision and the price discovery function, while the effects of the regulation to prevent stock prices from further falling cannot be identified. On the other hand, Diamond and Verrecchia.[11] conclude that regulation skews stock price returns, but does not cause overvaluation.

As for the effects of the amount of executions of stock lending trades on stock markets, Seneca [27] and Figlewski [16] find that these stocks underperform as they are more used for stock lending. Reed [24] uses daily stock lending data provided by major US securities lenders and shows that an individual stock with higher short-selling costs tends to have larger reactions to negative firm financial announcements.

Existing research about the effects of changes in demand–supply conditions in equity markets shows divergent results, and there seems to be no clear consensus. Kaplan et al. [22] show that changes in actual amount of stock lending trades has no effect on equity price formation, while Duffie [12] and Duffie et al. [13] argue that it is not the actual amount of stock lending trades executed, but instead the lending market capacity of executing a number of equity repo trades that influences equity prices.

Regarding empirical analyses about ETFs and various type of funds, Evans et al. [15] show that a fund manager who lends securities and stocks constituting the fund tends to earn higher returns. Blocher and Whaley [8] focus on stock lending patterns in ETFs and find that ETF managers have greater incentives to lend stocks with higher lending rates to offset the various costs of managing the fund. Dunham et al. [14] argue that a manager of an index-tracking fund, aiming to minimize tracking error, tends to use stock lending to earn fees because tracking errors can become large when outflows from fund occur, which negatively affects the manager’s performance.

There is a large number of existing studies on the effects of central bank asset purchases on various asset markets and the risk premiums faced by investors and households. However, partly because there are no previous episodes of central banks purchasing ETFs directly ⁶, there are virtually no academic analyses of the effects of such programs, apart from a few exceptions such as Shirota [30], Imai, [20] and various market reports and articles in newspapers. Empirical analyses of the Japanese stock lending market, except for some important contributions such as Uno et al. [5], are also very limited. Our analysis contributes to the literature by examining the Japanese stock lending market and the ETF purchasing program simultaneously.

3 Stock lending data from market-tracking ETF balance sheets

Section 1 reviewed the expansion of the BOJ's ETF purchases, which has caused substantial increases in the size of the Japanese ETF market ([A] in Fig.4). In this section, we examine whether the growth of the ETF market caused the expansion in equity lending ([B]).

Figure 4: Graphical image of the analysis



Specifically, we analyze the stock lending data in the balance sheets of major market-tracking ETFs. As an ETF is listed and traded as a marketable security, each ETF—in practice, the asset management company that launches the fund—has a duty to make public its financial statements. Furthermore, most of these statements provide data about stock lending for each individual stock constituting the fund. The sum of the net assets of the ETFs providing such lending data for 2018 account for around 97% of all TPX- or NKY 225-tracking ETFs ⁷, and among those about 80% provided comprehensive time-series stock lending data from 2014 to 2018.

Fig.14 to Fig.22 show all the data examined in this section. Each scatter chart shows the stock lending ratio (vertical axis) of an individual stock with its security code, arranged in ascending order (horizontal axis). The stock lending rate for security code i in the charts is defined as the

⁶Exceptions include (1) the BOJ's stock purchases held by financial institutions since 2002 for financial stability to enhance their efforts to reduce shareholdings, and (2) the Hong Kong Monetary Authority's stock purchases to counter speculative selling during the Asian Financial Crisis of 1997.

⁷At the end of 2018, the sum of the net assets of all TPX- or NKY 225-tracking ETFs was about 28.9 trillion yen (leveraged and sector-tracking types are excluded), representing 79.9% of all ETFs in Japan.

amount of stocks i used for lending divided by the amount of stock i in the ETF, both measured by market value.

Some intriguing results can be observed in these figures. First, each fund seems to have an “upper limit” on stock lending rates. The existence of upper limits is consistent with the fact that ETF managers need to prepare for sudden or large redemptions in the future, as mentioned in the previous section. Second, the level of the upper bound varies among funds and asset management companies, and the range of the upper bounds is wide, ranging from 10% to 80%. Third, some funds seem to have raised their upper bound during the period from 2014 to 2018 (e.g., TOPIX- and Nikkei-linked ETFs by the asset manager X and Nikkei-linked by Z), while no funds appear to have reduced their upper bounds. Furthermore, some funds obviously expanded their lending operations during the period, as some “upward shifts” are evident in the charts for TOPIX-linked ETFs by W and Z and Nikkei-linked by Z.

Fig.5 and Fig.6 show the lending rates for the major index-tracking funds (TPX for Fig.5 and Nikkei for Fig.6, respectively). Specifically, (1) column [C] in each table shows the lending rates as the ratio of the number of issues (names) used for lending trades to the total number of issues constituting the fund, and (2) the ratios in column [F] are calculated as the total market value of stocks for lending divided by the total market value of all stocks in each fund. The clear uptrends in column [C] suggest that ETF managers or asset management companies have started to utilize stock lending operations as profit-seeking opportunities. This may be not only because the amounts of ETFs and stocks constituting those funds have expanded but also because they do not have to care about sudden redemption in the situation where the BOJ continuously purchases ETFs without any redemptions or exit announcements.

Column [F] in Fig.5 also shows uptrends of the lending rates measured by market values, where the pace of growth is moderate compared with column [C], and this characteristic can be reidentified in Fig.7. This figure shows time series of (1) the total amount of stock lending and (2) the stock lending ratio for the major ETFs in Fig.5 and Fig.6. The left chart shows the sum of the five ETFs that provided stock lending data in every year from 2014 to 2018, while the right one includes these five funds plus one providing the same data from 2015 to 2018. Fig.7 shows that the stock lending rates have increased to about 8% in 2018 from about 4% in 2015⁸. The second observation is that the amount of stock lending has also increased substantially. The right chart of Fig.7 shows that the amount of stock lending for the major six ETFs increased by 2 trillion yen from 2015 to 2018, while Fig.3 (cash borrowing = stock lending side) indicates

⁸Based on Rowley et al. [25], the corresponding rates in investment trusts and ETFs are estimated to be 2 – 3%. While direct comparison may not be appropriate, it suggests that the currently observed rate of 8% is not particularly low.

Figure 5: Stock lending from ETF(1): TOPIX-tracking

(1) TOPIX-linked ETF by asset management company X							(2) TOPIX-linked ETF by asset management company Y						
[A] # of issues constitut ing ETF	[B] # of issues used for lending	[C]= [B]/[A] (%)	[D] Mark. val. of all stocks in ETF(tril.yen)	[E] Mark. val. of all stocks used for lending (tril.yen)	[F]= [E]/[D] (%)		[A] # of issues constitut ing ETF	[B] # of issues used for lending	[C]= [B]/[A] (%)	[D] Mark. val. of all stocks in ETF(tril.yen)	[E] Mark. val. of all stocks used for lending (tril.yen)	[F]= [E]/[D] (%)	
2014	1553	1259	81.1	1.58	0.12	7.5	1555	563	36.2	0.76	0.07	8.8	
2015	1638	1196	73	2.55	0.14	5.4	1639	568	34.7	1.20	0.06	5	
2016	1742	1579	90.6	2.40	0.39	16.2	1744	869	49.8	1.12	0.09	8.1	
2017	1840	1659	90.2	5.06	0.47	9.3	1842	923	50.1	2.32	0.14	6.1	
2018	1950	1858	95.3	7.44	0.64	8.6	1952	1043	53.4	3.28	0.21	6.3	

(3) TOPIX-linked ETF by asset management company W							(4) TOPIX-linked ETF by asset management company Z						
[A] # of issues constitut ing ETF	[B] # of issues used for lending	[C]= [B]/[A] (%)	[D] Mark. val. of all stocks in ETF(tril.yen)	[E] Mark. val. of all stocks used for lending (tril.yen)	[F]= [E]/[D] (%)		[A] # of issues constitut ing ETF	[B] # of issues used for lending	[C]= [B]/[A] (%)	[D] Mark. val. of all stocks in ETF(tril.yen)	[E] Mark. val. of all stocks used for lending (tril.yen)	[F]= [E]/[D] (%)	
2014	---	---	---	---	---	---	1430	387	27.1	1.05	0.05	4.6	
2015	1640	220	13.4	0.37	0.01	1.8	1511	474	31.4	1.18	0.05	4.1	
2016	1744	931	53.4	0.39	0.06	15.5	1606	460	28.6	1.11	0.06	5.1	
2017	1842	1212	65.8	0.71	0.06	8.7	1701	950	55.8	2.34	0.41	17.5	
2018	1950	1273	65.3	1.00	0.10	10	1833	1164	63.5	3.55	0.42	11.9	

(Source) ETF balance sheets, Bloomberg, EDINET, NEEDS-Financial QUEST. .

that the total increase in repo trading during same period is 6 trillion yen. Therefore, more than 30% of the total increase in stock lending is attributable to the direct effect of lending from these six ETFs ⁹.

We next try to identify the possible determinants of stock lending rates using the balance sheet data. Fig.8 and Fig.9 show the relations between stock lending rates (taking the average of the five funds in Fig.7 for each year from 2014 to 2018) and some financial variables that could influence stock lending suggested by market participants.

Fig.8 plots the average lending rates with the liquidity variables in ascending order. The left chart focuses on the relation the lending rate and free float weights (FFW). The FFW is the percentage of listed shares deemed to be available for trading in the market. Here, we use the FFW calculated by the Tokyo Stock Exchange (TSE) ¹⁰. FFW is taken as a proxy for liquidity, and

⁹The following have been suggested as other factors behind the recent expansion of equity lending markets: (1) conservative attitude of security dealers toward utilizing their own positions, (2) increased demand by buy-and-hold type investors such as public pension funds for individual stocks and resulting in tightening demand–supply conditions in spot equity markets, and (3) the increased demand by investors such as hedge funds for short selling.

¹⁰Specifically, the FFW is calculated by (1) first estimating the number of non-free-float shares (listed shares deemed not to be available for trading in the market) using securities reports and other statutory documents required by the Financial Instruments and Exchange Act, as well as publicly available documents released by each listed company.

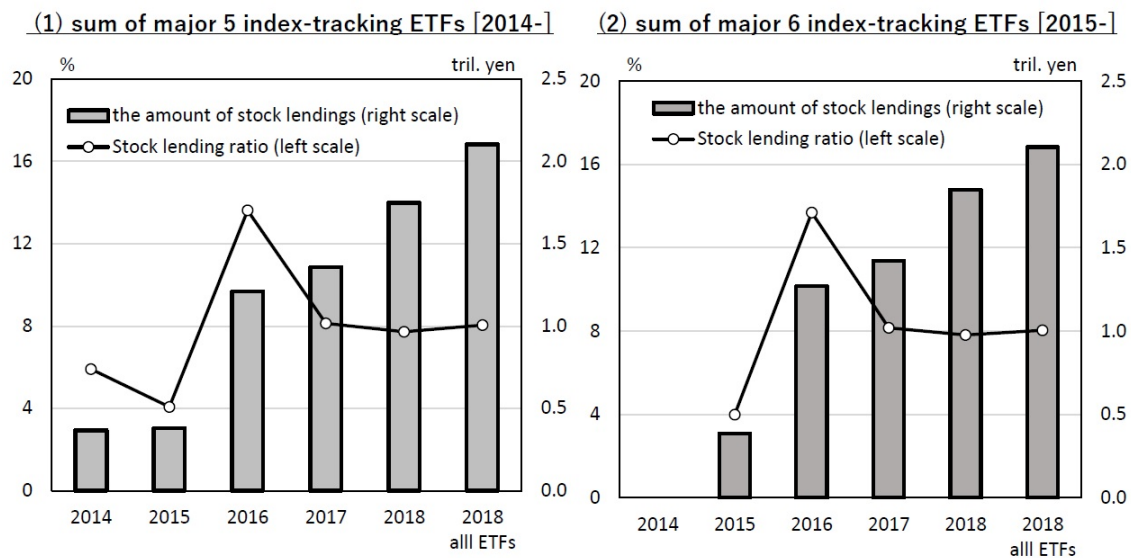
Figure 6: Stock lending from ETF(2): Nikkei225-tracking

(5) NKY 225-linked ETF by asset management company X							(6) NKY 225-linked ETF by asset management company Y						
[A] # of issues constituting ETF	[B] # of issues used for lending	[C]= [B]/[A] (%)	[D] Mark. val. of all stocks in ETF(tril.yen)	[E] Mark. val. of all stocks used for lending (tril.yen)	[F]= [E]/[D] (%)		[A] # of issues constituting ETF	[B] # of issues used for lending	[C]= [B]/[A] (%)	[D] Mark. val. of all stocks in ETF(tril.yen)	[E] Mark. val. of all stocks used for lending (tril.yen)	[F]= [E]/[D] (%)	
2014	225	80	35.6	1.88	0.08	4.2	225	70	31.1	0.93	0.05	5.6	
2015	225	92	40.9	2.98	0.09	3.1	225	31	13.8	1.40	0.04	2.7	
2016	225	143	63.6	2.84	0.60	21.2	225	108	48	1.42	0.07	5	
2017	225	118	52.4	4.53	0.27	6	225	103	45.8	2.45	0.06	2.6	
2018	225	144	64	5.51	0.34	6.3	225	101	44.9	2.85	0.13	4.7	

(7) NKY 225-linked ETF by asset management company W							(8) NKY 225-linked ETF by asset management company Z						
[A] # of issues constituting ETF	[B] # of issues used for lending	[C]= [B]/[A] (%)	[D] Mark. val. of all stocks in ETF(tril.yen)	[E] Mark. val. of all stocks used for lending (tril.yen)	[F]= [E]/[D] (%)		[A] # of issues constituting ETF	[B] # of issues used for lending	[C]= [B]/[A] (%)	[D] Mark. val. of all stocks in ETF(tril.yen)	[E] Mark. val. of all stocks used for lending (tril.yen)	[F]= [E]/[D] (%)	
2014	---	---	---	---	---	---	---	---	---	---	---	---	
2015	---	---	---	---	---	---	---	---	---	---	---	---	
2016	---	---	---	---	---	---	---	---	---	---	---	---	
2017	---	---	---	---	---	---	225	2	0.9	2.06	0.00	0	
2018	225	199	88.4	1.41	0.09	6.7	225	169	75.1	2.53	0.26	10.1	

(Source) ETF balance sheets, Bloomberg, EDINET, NEEDS-Financial QUEST.

Figure 7: Stock lending from ETF (3): Time series developments of major ETFs



(Note) 1. the amount of stock lending is measured by market value in each period.

2. Stock lending ratio = the amount of stock lending / market value of all stocks in each ETF.

3. Five ETFs (left chart) include Nomura, Nikko, Daiwa TOPIX-tracking ETFs and Nomura and Nikko NKY-tracking ETFs. Six ETFs (right chart) include the five ETFs plus Mitsubishi TOPIX-tracking ETF. The former accounts for around 65% of total net assets of all ETFs, while the latter accounts for slightly less than 70%.

a smaller FFW suggests poor liquidity. Therefore, a demand–supply conditions of individual stocks with lower FFW can tighten easily, resulting in greater need for stock borrowing and a higher lending ratio. Related to this, it is pointed out by market participants that security dealers tend to borrow stocks instead of directly purchasing stocks to avoid large price changes in equity spot markets. The observed downward slope of each line in the left chart of Fig.8 is consistent with this argument.

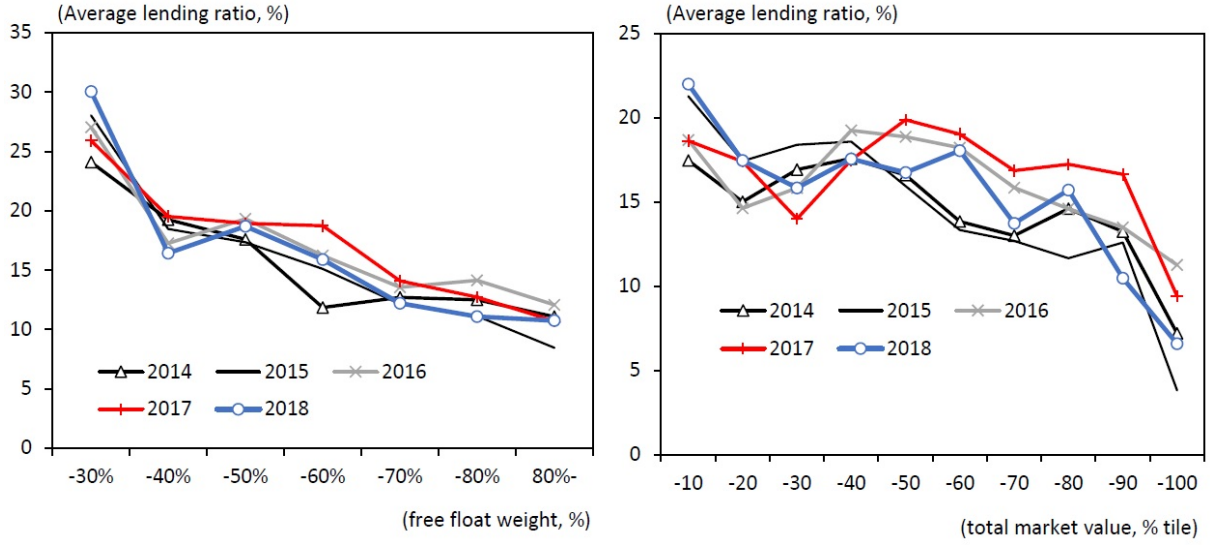
A proxy for liquidity in the right chart of Fig.8 is total market value of stock i . It is widely recognized among market participants that an individual stock with a large total market value has relatively high liquidity. This is partly because foreign investors, one of the main investor types in the Japanese stock market, face information asymmetry regarding future earnings of medium- to small-sized Japanese firms, and thus they have a tendency to invest in large cap firms. The observed downward relation also suggests that low liquidity stocks generate strong demand for stock lending trades.

The left chart of Fig.9 plots lending rates against valuation (PBR) in ascending order. Suppose that an investor thinks that the stock price of a company with security code i is overvalued in terms of its PBR. As briefly discussed in the Introduction, for such an investor a possible strategy to profit is to borrow stock i and short-sell. If this mechanism works, lending rates will increase as PBRs increase, and the upward relation observed in Fig.9 supports such a mechanism.

The right chart of Fig.9 indicates a tendency for the lending rate to increase as market volatility increases. An investor engaged in short selling is assumed to focus not only on stocks with high valuations, but also those experiencing firm-specific events such as M&As. Based on the fact that those events drive high volatility of stock prices, the upward relation in Fig.9 between lending rates and market volatilities suggests that such trades through stock borrowing are actually executed.

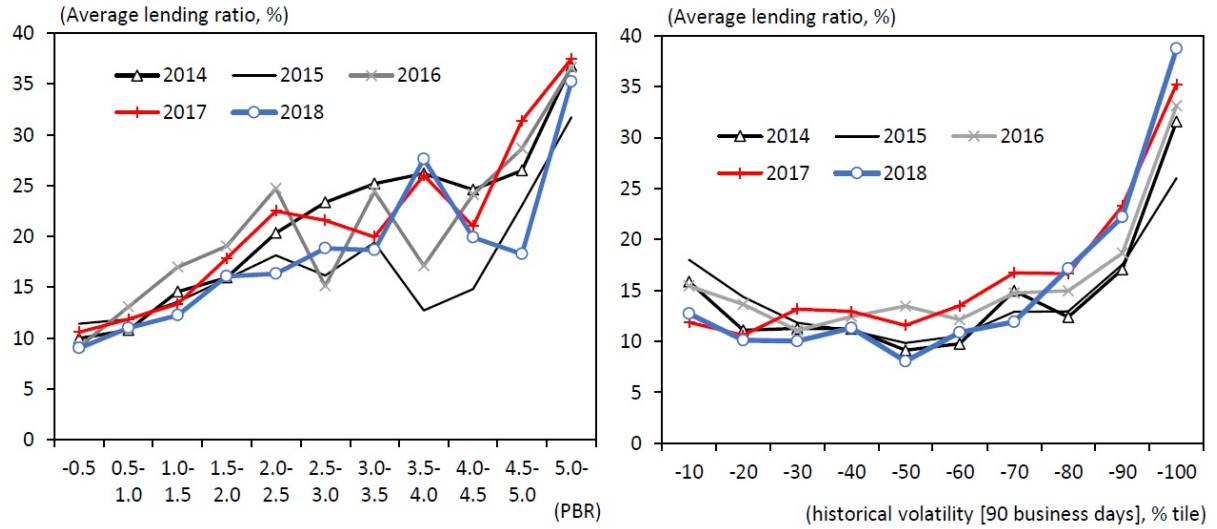
Then (2) the non-FFW ratio (non-free-float shares / total listed shares) is calculated, and finally (3) FFW is obtained by subtracting the non-free-float factor from 1 ($1 - \text{Non} - \text{FFW}$).

Figure 8: Liquidity and stock lending



(Source) ETF balance sheets, EDINET, Bloomberg.

Figure 9: Valuation, volatility, and stock lending



(Source) ETF balance sheets, EDINET, Bloomberg. .

Based on the above findings and as a summary of this section, we estimate the following panel regression with fixed effects f_i using the balance sheet data:

$$R_{it} = c + \beta_1 FFW_{it} + \beta_2 marval_{it} + \beta_3 PBR_{it} + \beta_4 hist_vol_{it} + f_i + u_{it}, \quad (1)$$

where $t \in \{2014, 2015, 2016, 2017, 2018\}$, and

- R_{it} : stock lending rate of stock i at t . All five funds release stock lending data as of the

first or second week of July in each year.

- FFW_{it} : free float weights (FFW) of i at t . Data are from the Tokyo Stock Exchange and at the end of June each year.
- $marval_{it}$: market value of i at t (end of June and taking logs).
- PBR_{it} : i 's PBR at the end of June for each year.
- $hist_vol_{it}$: past 90 business days of historical volatility of i 's stock price at the end of June for each t . As our focus is the change in volatility driven by firm-specific events, we normalize i 's historical volatility by dividing market (TOPIX) historical volatility in the same period.
- u_{it} : error term.

Estimation results are shown in Fig.10. For all identifications Hausman tests reject the null of a random-effects model, and thus a fixed-effects model is adapted. Column [A] is the result for the sum of the data for the five ETFs, and from columns [B] to [F], the estimation results for each of the five funds are shown, respectively. Fund 1 (TOPIX-tracking, column [B]) and Fund 4 (Nikkei 225 (NKY)-tracking, column [E]) were launched by the same asset management company (AM) X, Fund 2 (TOPIX-tracking, column [C]) and Fund 5 (NKY-tracking, column [F]) were launched by AM Y, and Fund 3 (TOPIX-tracking, column [D]) was created by AM Z.

The results in Fig.10 are generally consistent with our findings in Fig.8 and Fig.9. In column [A], all estimated parameters are statistically significant and the signs of the parameters (plus or minus) are reasonable, while the results for each fund from columns [B] to [F] vary to some degree.

Two additional remarks should be made. First, we have not statistically checked the effects of the BOJ's ETF purchasing program on stock lending. This is mainly because the stock lending data from the balance sheets is annual and available for five years only from 2014 to 2018. Second, the above fact findings and estimation results have some policy implications. One typical criticism of the ETF purchasing program is that continuous and massive purchases have tightened demand–supply conditions excessively for specific firms' stocks. However, if stock lending trades have expanded especially for stocks with low market liquidity, such distortions are expected to wane. Moreover, the same argument can be applied to valuation (PBR). If stock lending contributes to the correction of possible distortions of valuations among individual stocks, a type of “distortion stabilizer” may naturally exist in the program ¹¹. These

¹¹However, this argument raises an additional issue. If stock lending reduces the valuations or prices of all stocks,

issues will be discussed again in the concluding section and in the next section, we focus on the detailed micro-lending data released by the Japanese Securities Dealers Association which have a much longer and more frequent time series.

Figure 10: Panel estimation [1]: Determinants of lending ratio

dependent var: lending rate (%)	[A] 5-ETFs	TOPIX-linked			NKY-linked	
		[B]	[C]	[D]	[E]	[F]
		Fund-1 by AM X	Fund-2 by AM Y	Fund-3 by AM Z	Fund-4 by AM X	Fund-5 by AM Y
explanatory variables	Coef. [t-value]	Coef. [t-value]	Coef. [t-value]	Coef. [t-value]	Coef. [t-value]	Coef. [t-value]
FFW	-9.80** [-2.51]	-17.9*** [-3.59]	-12.08** [-2.17]	5.20 [1.21]	-17.32 [-1.27]	-4.69 [-0.39]
marval	-4.24*** [-6.27]	-8.58*** [-9.93]	-3.58*** [-3.72]	3.29*** [4.45]	-8.92*** [-3.60]	-7.65 [-3.50]
PBR	0.27* [1.69]	0.76*** [3.69]	0.04 [0.17]	-0.45** [-2.47]	-0.314 [-0.31]	-1.40 [-1.56]
hist_vol	2.89*** [10.37]	3.35*** [9.42]	1.78*** [4.47]	3.14*** [10.29]	-1.59 [-1.24]	-0.24 [-0.22]
constant term	42.48*** [9.24]	75.38*** [12.82]	42.12*** [6.42]	-18.18*** [-3.61]	104.21*** [4.30]	81.2*** [3.81]
Periods	2014-2018	2014-2018	2014-2018	2014-2018	2014-2018	2014-2018
# of obs.	8,780	8,685	8,694	8,047	1,105	1,105
F-test: Prob>F=	0.000	0.000	0.000	0.000	0.000	0.000
Hausman: Prob>chi2=	0.000	0.000	0.000	0.000	0.000	0.000
[R2:within]	0.020	0.02	0.01	0.03	0.03	0.04
[R2:between]	0.150	0.12	0.07	0.01	0.06	0.02
[R2:overall]	0.080	0.06	0.04	0.00	0.04	0.02

(Note) 1. ***, ** and * represent statistical significance at the 1%, 5%, and 10% levels, respectively.

(Source) ETF balance sheets, Bloomberg, EDINET, NEEDS-Financial QUEST.

4 Stock lending data from the Japanese Securities Association: Examination of Determinants of Stock Lending

This section further examines the determinants of stock lending trades using the dataset from the JSDA, and because it provides much longer and frequent time-series data, it becomes

the purchasing program may fail to achieve the intended policy effects. While this issue appears to be important, it is beyond the scope of this paper and therefore an issue for future research

possible to identify the effects of the various changes in the BOJ's ETF purchasing program on stock lending markets.

Specifically, we construct a dataset by combining individual firms' financial and market variables with JSDA stock lending statistics. These statistics are released weekly and the amounts of stock lending and borrowing for every listed stock are available from the first week of 2011. We use lending data at a monthly frequency from January 2011 to September 2018, combined with monthly market and financial data. As all stocks, not only for real firms but also REITs and ETFs, that have a security code are included in the JSDA data, we pick only real firms for which continuous data are available and include them in our dataset. The number of observations for each period is about 1200.

Note that the JSDA statistics are sourced and released from weekly reports submitted by all "regular" (=proper) members of the JSDA, most of which are securities dealers. Therefore, the amounts outstanding of entities such as city, trust and regional banks and insurance companies (which are "special" members of the JSDA) are excluded from the statistics. Therefore, the sums of the amounts outstanding of stock lending or borrowing naturally differ from those in the Bank of Japan's *Tokyo Money Market Survey* [4] in Fig.3. However, these are the only statistics that provide comprehensive micro stock lending trading data and the comparison of the JSDA data with the Bank of Japan's survey in Fig.11 seems to show no critical differences. As such, we scrutinize the JSDA data and compare our findings with those from ETF balance sheet analysis in the previous section.

Figure 11: JSDA data and BOJ survey data

[Trillion yen]	2014 July	2015 July	2016 July	2017 July	2018 July
BOJ money market survey [cash borrowing side]	7.0	7.9	11.9	11.3	14.0
JSDA data [cash borrowing side]	7.0	7.5	8.9	9.4	11.7
BOJ money market survey [cash lending side]	4.1	5.2	7.1	6.9	7.8
JSDA data [cash lending side]	4.8	5.9	8.1	7.9	9.5

(source) Bank of Japan, Japan Securities Dealers Association

Using the JSDA dataset, we regress the stock lending rate of i at period t , denoted by R_{it} , on several financial and market variables that possibly influence R_{it} . Note that R_{it} is slightly different from those defined in the previous section and are defined in this section as the ratio of the amount of stock i used for stock lending to the total market value of i , instead of to all market-valued stocks in the ETF.

Specifically, consider the following stock lending rate function with fixed effect f_i :

$$R_{it} = X_{it}\beta_1 + Dum_{it}\beta_2 + f_i + u_{it}, \quad (2)$$

where X_{it} includes:

- FFW_{it} : TSE-base free float weights (FFW) of i at t . Based on our observations in the previous section, the estimated parameter is expected to be negative.
- $marval_{it}$: market value of the individual stock i at t (taking logs). If we take $marval_{it}$ as a proxy for market liquidity, the estimated parameter is expected to take a negative number, similarly to FFW_{it} .
- PBR_{it} : 1-period (=month) lagged PBR. Given investors' needs to short-sell overvalued stocks, as we discussed, a positive estimated parameter value is expected.
- $px - tpx_{it}$: monthly excess return of stock i relative to the market index return. TOPIX is chosen as the market index. This variable is also used as stock i 's valuation. Therefore, similarly to PBR, the estimated parameter value is also expected to be positive. A one-period lag is used.
- $hist_vol_{it}$: historical volatility of stock i for the past 90 business days at t , normalized by market index (TOPIX) historical volatility to identify the changes in the volatility of i driven by firm-specific events. A positive estimated parameter value is expected.
- $volume_{it}$: monthly trading volume of the individual stock i at t (trillion yen and taking logs). Similarly to $hist_vol_{it}$, it is expected to have a positive parameter value given that firm i , experiencing firm-specific events tends to generate larger trading volumes.
- $sqvol_{it}$: square of the market volume. While the parameter on $volume_{it}$ is expected to be positive, that on $sqvol_{it}$ will be negative if the pace of increase in the stock lending rate is not as high as the pace of increase in the trading volume. This argument is reasonable if the trading volume is a proxy for liquidity

and Dum_{it} includes the following dummy variables and cross terms of the variables:

- $dum - 225_{it}$: a dummy variable equal to 1 if stock i is a component of the Nikkei 225 stock index at t . As the composition of the Nikkei 225 is periodically examined to ensure each component (=stocks) satisfies the criteria and revised, $dum - 225$ is a time-variant variable.

- $dum - QQEINT_t$: QQEINT represents the introduction of the QQE. The QQE was introduced in April 2013 and at the same time, the BOJ decided to increase the purchases of ETF so that its amounts outstanding would increase at an annual pace of 1 trillion yen. This dummy variable equals 1 if t is April 2013 or after, and otherwise 0.
- $dum - QQEEX_t$: a dummy variable equal to 1 if t is November 2014 or after, when the annual increase in the outstanding amount in the ETF purchase program was tripled to 3 trillion yen from 1 trillion yen.
- $dum - 6TRIL_t$: a dummy variable equal to 1 if t is August 2016 or after. At the end of the July MPM, the BOJ decided to double annual ETF purchases to about 6 trillion yen from 3 trillion yen.
- $dum - RATIO_t$: a dummy variable equal to 1 if t is October 2016 or after. At the MPM held in September 2016, the BOJ modified the ratio of purchases of each market-tracking ETF so that the ratio of the TOPIX-tracking ETF is hiked while that of the Nikkei 225-tracking was reduced.
- $RATIO * 225_{it}$: a cross term of $dum - RATIO$ and $dum - 225$.
- $6TRIL * FFW_{it}$: a cross term of $dum - 6TRIL$ and FFW .
- $6TRIL * PBR_{it}$: a cross term of $dum - 6TRIL$ and PBR .
- $RATIO * FFW_{it}$: a cross term of $dum - RATIO$ and FFW .
- $RATIO * PBR_{it}$: a cross term of $dum - RATIO$ and PBR .

The estimation results shown in Fig.12 are broadly consistent with what we obtained using the ETF balance sheet data in the previous section, of which the identification in columns [1] and [2] are most “standard” for different estimation windows. The models for columns [3] and [4] are almost the same as [1] and [2] but different in that $px - tpx$ is chosen instead of PBR . For these models, the estimated parameters on all market and financial variables are statistically significant and of the expected signs, except for valuation (PBR or $px - tpx$). As for the valuation variables, it should be noted that the estimated parameter on PBR is significant when we restrict the sample window to a recent period (2014/09 – 2018/09) and the same tendency can be observed for the variable $px - tpx$, while it lacks statistical significance. We will discuss this issue again later in this section.

In addition to the market and financial variables, columns [1] to [4] contain some dummy variables and all are statistically significant with positive signs. First, the positive sign of

Figure 12: Panel estimation [2]: Determinants of lending ratio

dependent var: lending rate (%)	[1]	[2]	[3]	[4]	[5]	[6]	[7]
sample	2011/01 -2018/09	2014/09 -2018/09	2011/01 -2018/09	2014/09 -2018/09	2011/01 -2018/09	2011/01 -2018/09	2011/01 -2018/09
explanatory variables	Coef. [t-value]	Coef. [t-value]	Coef. [t-value]	Coef. [t-value]	Coef. [t-value]	Coef. [t-value]	Coef. [t-value]
FFW	-0.31*** [-4.12]	-0.24** [-2.16]	-0.27*** [-3.52]	-0.20* [-1.76]	-0.35*** [-4.62]	-0.30*** [-3.84]	-0.37*** [-4.75]
marval	-0.34*** [-17.75]	-0.37*** [-10.90]	-0.34*** [-17.79]	-0.36*** [-10.83]	-0.35*** [-18.37]	-0.35*** [-18.42]	-0.36*** [-18.69]
PBR(-1)	-0.002** [-2.30]	0.003** [2.01]	--	--	-0.002** [-2.14]	-0.01*** [-8.38]	-0.01*** [-8.14]
px-tpx(-1)	--	--	-0.000 [-0.02]	0.001 [1.24]	--	--	--
hist_vol	0.19*** [23.14]	0.17*** [15.01]	0.19*** [22.99]	0.17*** [14.99]	0.19*** [22.64]	0.20*** [23.76]	0.19*** [23.18]
volume	0.36*** [43.16]	0.47*** [29.91]	0.36*** [43.17]	0.47*** [29.90]	0.36*** [42.19]	0.36*** [43.14]	0.36*** [42.39]
sq_vol	-0.06** [-2.10]	-0.06 [-1.52]	-0.06** [-2.10]	-0.06 [-1.55]	-0.06** [-2.06]	-0.06** [-2.07]	-0.06** [-2.06]
dum-225	0.66*** [6.97]	1.06*** [7.38]	0.78*** [8.21]	1.24*** [8.74]	0.77*** [8.07]	0.68*** [7.09]	0.76*** [8.04]
dum-QQEINT	0.08*** [5.23]	--	0.07*** [4.08]	--	0.10*** [6.01]	0.10*** [6.12]	0.11*** [6.63]
dum-QQEEX	0.21*** [13.25]	0.12*** [3.16]	0.21*** [13.17]	0.11*** [3.11]	0.21*** [13.64]	0.21*** [13.58]	0.22*** [13.79]
dum-6TRIL	0.23*** [15.75]	0.16*** [14.04]	0.23*** [15.52]	0.22*** [13.80]	0.12*** [3.60]	0.30*** [6.77]	0.11 [0.86]
dum-RATIO	--	--	--	--	0.17*** [5.14]	--	0.16 [1.19]
RATIO*225	--	--	--	--	-0.25*** [-9.29]	--	-0.23*** [-7.90]
6TRIL*FFW	--	--	--	--	--	-0.20*** [-2.87]	0.02 [0.14]
6TRIL*PBR	--	--	--	--	--	0.02*** [9.95]	-0.003 [-0.24]
RATIO*FFW	--	--	--	--	--	--	-0.07 [-0.33]
RATIO*PBR	--	--	--	--	--	--	0.02* [1.76]
constant term	1.88*** [9.83]	1.29*** [3.72]	1.82*** [9.56]	1.17*** [3.40]	2.09*** [10.83]	2.09*** [10.83]	2.18*** [11.27]
# of obs.	87,487	49,265	86,873	49,348	87,487	87,487	87,487
F-test [Prob>F=]	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Hausman [Prob>chi2=]	0.000	0.000	0.000	0.000	0.000	0.000	0.000
[R2:within]	0.077	0.056	0.077	0.056	0.078	0.079	0.008
[R2:between]	0.355	0.144	0.327	0.116	0.363	0.361	0.362
[R2:overall]	0.198	0.105	0.190	0.089	0.202	0.201	0.203

(Note) 1. ***, ** and * represent statistical significance at the 1%, 5%, and 10% levels, respectively.

(Source) Japan Securities Dealers Association, Bloomberg, EDINET, NEEDS-Financial QUEST.

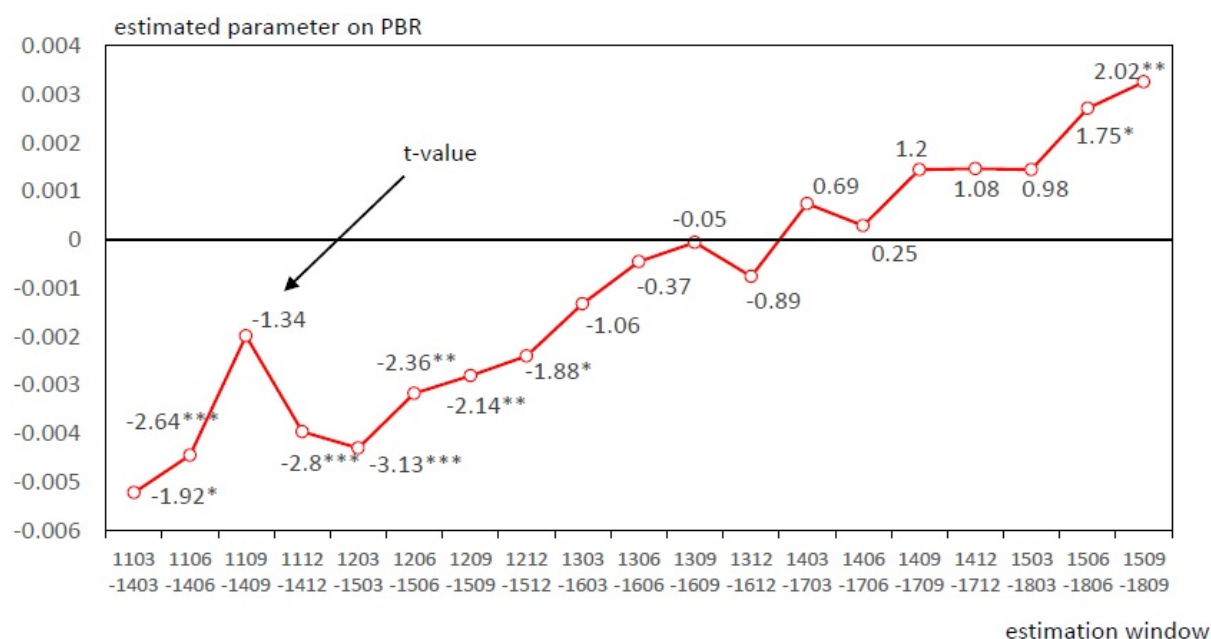
$dum - 225$ is consistent with the view of market participants that the BOJ purchasing program exerts tightening pressures on the demand–supply conditions of stocks constituting the Nikkei 225, rather than those constituting the TOPIX because the ratio of the Nikkei 225 purchasing is “too high” at least until September 2016. Next, all other dummy variables— $dum - QQEINT$, $dum - QQEEX$, $dum - 6TRIL$ —examine whether the stock lending ratio significantly increased at the time of changes in the BOJ’s ETF purchasing policy. The statistical significance and positive signs of these parameters suggest that the changes in the program at (a) the introduction of the QQE in April 2013, (b) the expansion of the QQE in October 2014, and (c) the decision to double the annual purchases to 6 trillion yen in July 2016 have contributed to expanding stock lending trades.

Column [5] is similar to [1] but two variables are added, $dum - RATIO$ and $Ratio * 225$. The term “*Ratio*” represents the timing when the BOJ decided to reduce the purchasing ratio of Nikkei 225-tracking ETF and to increase the ratio of the TOPIX in September 2016. This modification is considered to be made to address the critical views in the market that the program placed too much weight on the Nikkei 225. First, note that the estimated parameter on the cross term $Ratio * 225$ is statistically significant and negative. This suggests that the modification of the purchase succeeded in alleviating market concerns about excessive tightening of demand–supply conditions and in reducing the amount of stock lending trades stemming from such concerns. Next, the dummy variable $dum - RATIO$ is significantly positive. While the sign is counterintuitive, this may be because the time lag between the BOJ’s decisions (1) to double annual purchases to 6 trillion yen (July 2016) and (2) to modify the ratio (September 2016), associated with $dum - 6TRIL$ and $dum - RATIO$ respectively, is very small. Because of such a small time lag, the identified policy effects may be split into the two dummy variables. Indeed, comparing columns [1] and [3], the absolute values of the estimated parameters on $dum - 6TRIL$ (0.12) are half the value in the latter column. The other half of the effects may be absorbed by $dum - RATIO$.

Column [6] focuses on the effects of doubling annual ETF purchases to 6 trillion yen from 3 trillion yen in July 2016. The estimated parameters on the cross terms $6TRIL * FFW$ and $6TRIL * PBR$ in [6] imply that the growing concerns of the market participants that the expansion of the purchases would make the demand–supply conditions in stock markets unnecessarily tight reflected changes in the actual pattern of stock lending: the lending ratio increases more in response to a unit decrease in liquidity and a unit increase in valuation, as seen in the statistically significant and negative coefficient on $6TRIL * FFW$ and the positive coefficient on $6TRIL * PBR$.

Column [7] includes all variables discussed above. Regarding the financial and market

Figure 13: Evolution of the effects of PBR on stock lending



(Note)

1. The red line represents the estimated parameter on PBR for specification [1] in Fig.12 and corresponds to the vertical axis.
2. The number corresponding to each dot on the red line represents a t-value. ***, ** and * indicates statistical significance at the 1%, 5%, and 10% levels, respectively.

(Source) Japan Securities Dealers Association, Bloomberg, EDINET, NEEDS-Financial QUEST.

variables, the estimation results are generally unchanged from the previous specifications. As for the dummy variables and cross terms, while the problem of too-short time lags between “6TRIL” and “RATIO” emerge similarly to [5], it should be noted that the effect of modification of the purchasing ratio of Nikkei 225 and TOPIX in October 2016 is still significant.

Lastly, we reexamine the possible effects of valuations on stock lending trades. A comparison of the estimated parameters on PBR between columns [1] and [2] indicates that the sensitivity of the stock lending rate to valuation has changed. To check this, a rolling panel estimation is implemented and the key observation is shown in Fig.13. The model of column [1] is adopted and estimated for different sample windows. The figure shows the uptrend in the estimated parameter on PBR, and starting with a significantly negative coefficient for the initial window of 2011/03 to 2014/03, it is positive and statistically significant for the final two windows. This suggests that stock lending is more focused on whether a specific stock is overvalued or not. The increased need for equity repo trades for high valuation stocks can directly affect valuations, stock prices and distortions of the prices through investor short selling. Therefore, the change in the sensitivity of stock repo trading to valuation has nonnegligible policy implications.

5 Discussion and topics for further research

In this paper, we first reviewed the recent substantial growth of the Japanese ETF market driven by the BOJ's purchasing program and identified the unique characteristic of the program that ETF managers can lend stocks that constitutes ETFs possibly held by the BOJ. Then, by scrutinizing different micro-datasets for stock lending—ETF balance sheet data and JSDA equity repo trading data—it was clarified that stock lending trades, measured by the stock lending rate, have been activated. Panel regressions suggest that stock lending trades tend to be larger for stocks with (a) lower FFW and (b) smaller market value (both proxies for market liquidity), (c) higher valuation such as PBR, and (d) higher volatility. These estimations also imply that the BOJ purchasing program has contributed significantly to expanding stock lending trades through changes in policy, as well as influencing sensitivities of the trades to market liquidity and valuations.

To conclude this analysis, we point out some policy implications and topics for further research. One typical criticism of the ETF purchasing program is that continuous and massive purchases have unnecessarily tightened the demand–supply conditions of specific firms' stocks. However, if stock lending has expanded especially for stocks with low market liquidity behind the purchasing program, such distortions may eventually disappear. Moreover, the same argument can be applied to valuation. If stock lending helps correct possible distortions of valuations among individual stocks, then a type of “distortion stabilizer” is built into the program. However, this result raises a further issue. If stock lending has the effect of suppressing the valuations or prices of all stocks, then the purchasing program has virtually no policy effects. Thus, future research should examine whether the expansion of stock lending causes changes in valuations, stock prices, their distributions, and most importantly, the risk premiums that the current ETF purchasing program has tried to influence ¹².

¹²In Fig.4, the research plan aims to examine the existence of the left directed arrow from “Equity lending market” to “BOJ's ETF purchases.”

Figure 14: Individual stock lending ratios in ETFs of major AMs (1)

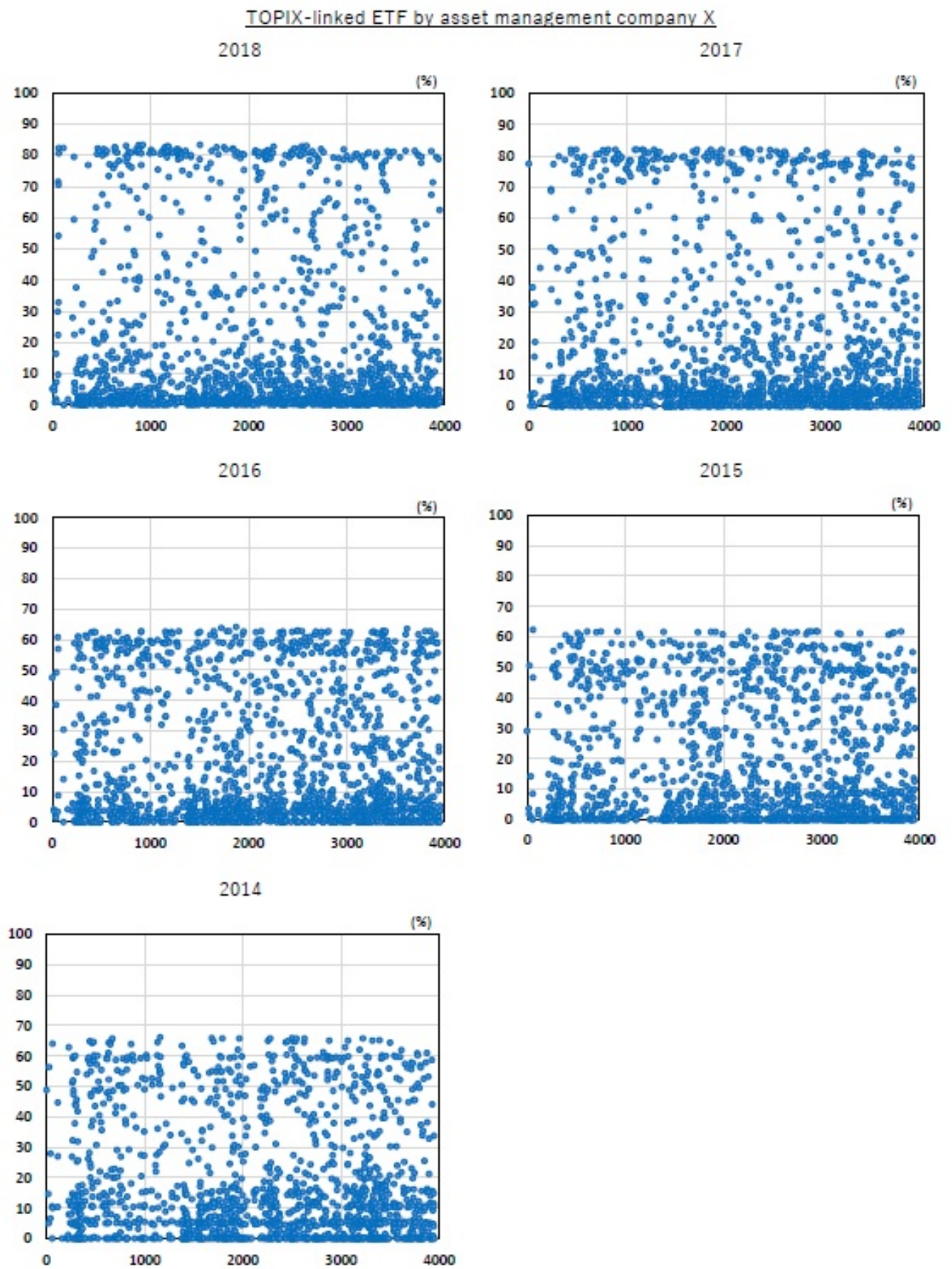


Figure 15: Individual stock lending ratios in ETFs of major AMs (2)

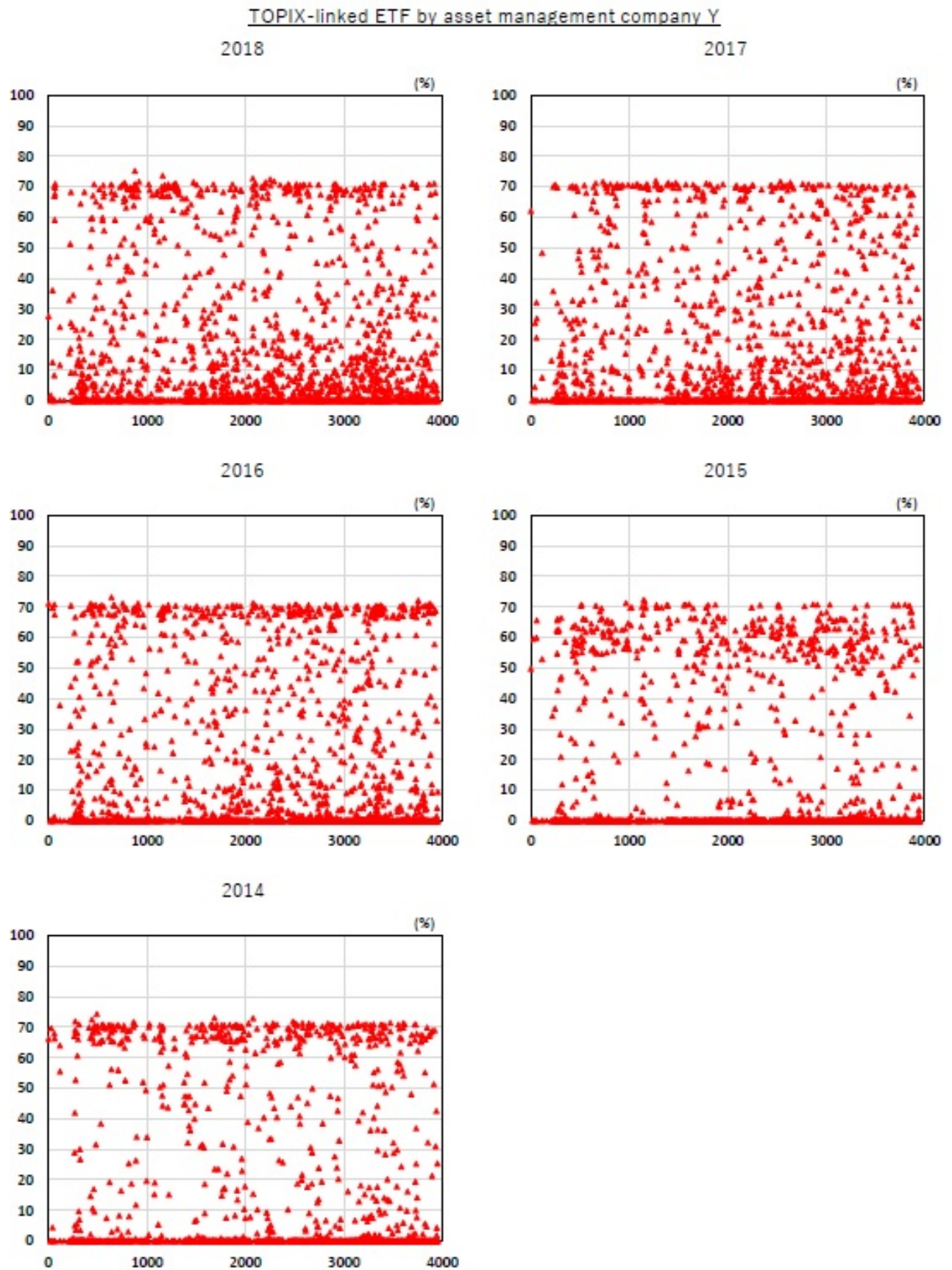


Figure 16: Individual stock lending ratios in ETFs of major AMs (3)

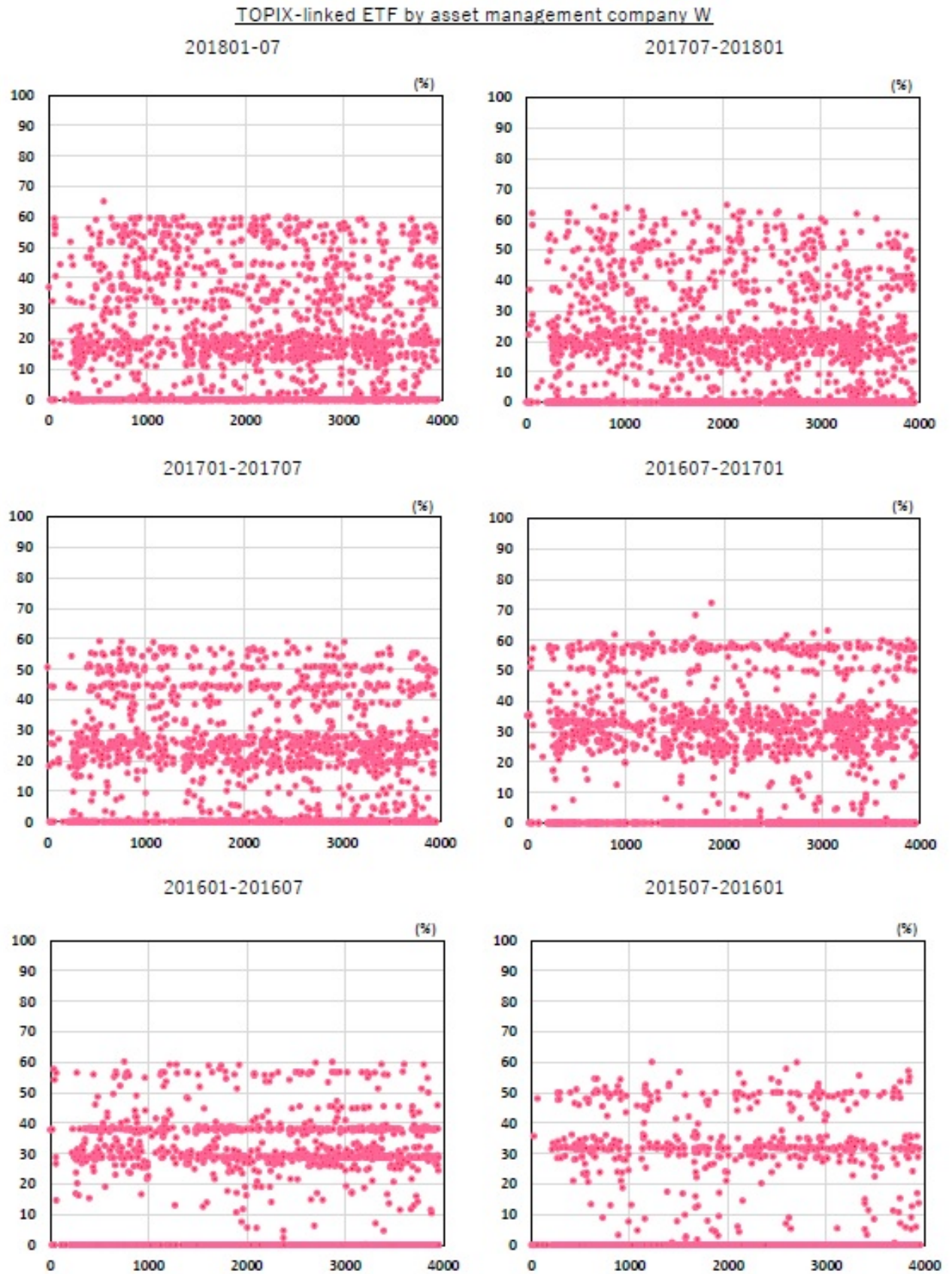


Figure 17: Individual stock lending ratios in ETFs of major AMs (4)

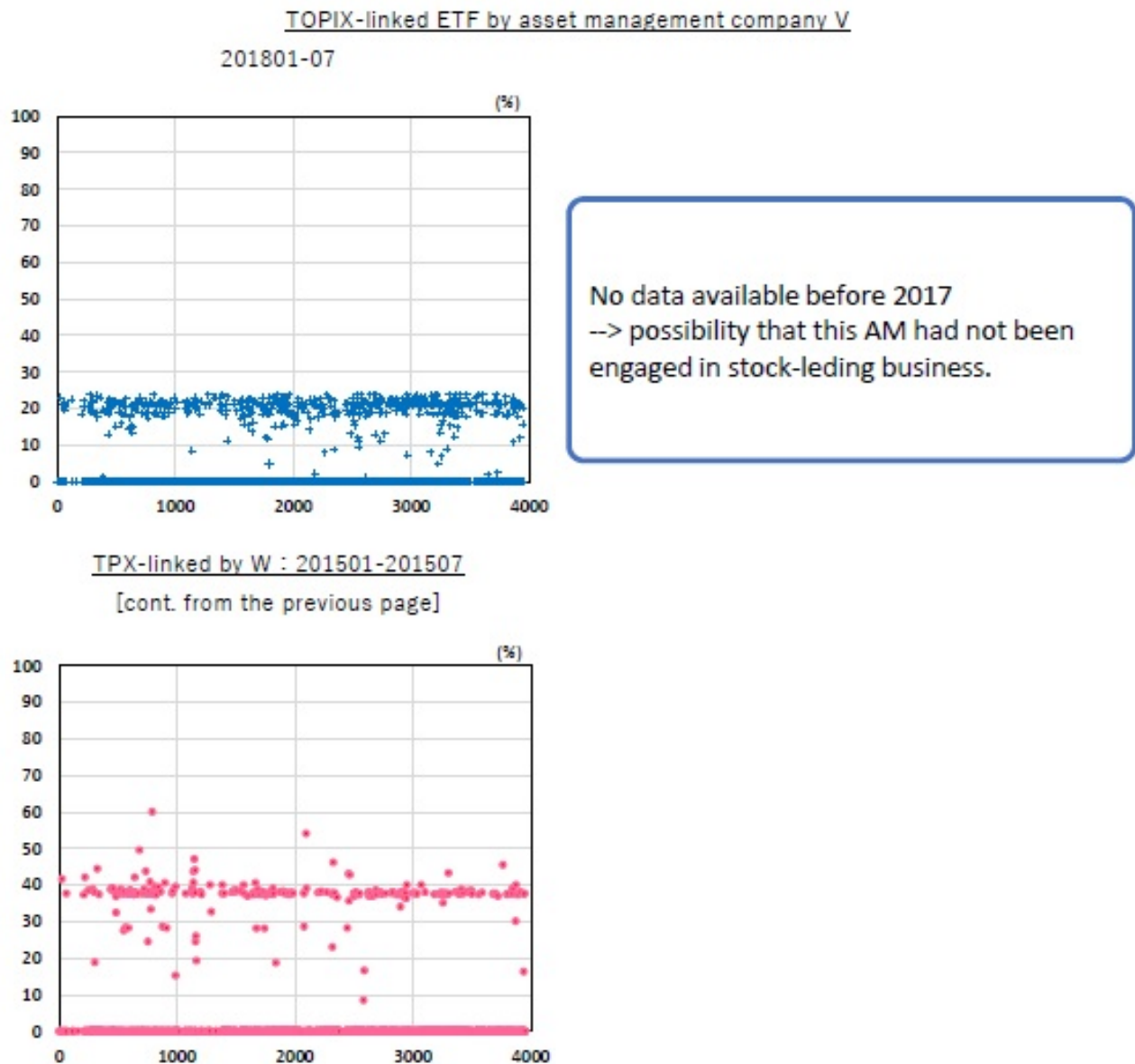


Figure 18: Individual stock lending ratios in ETFs of major AMs (5)

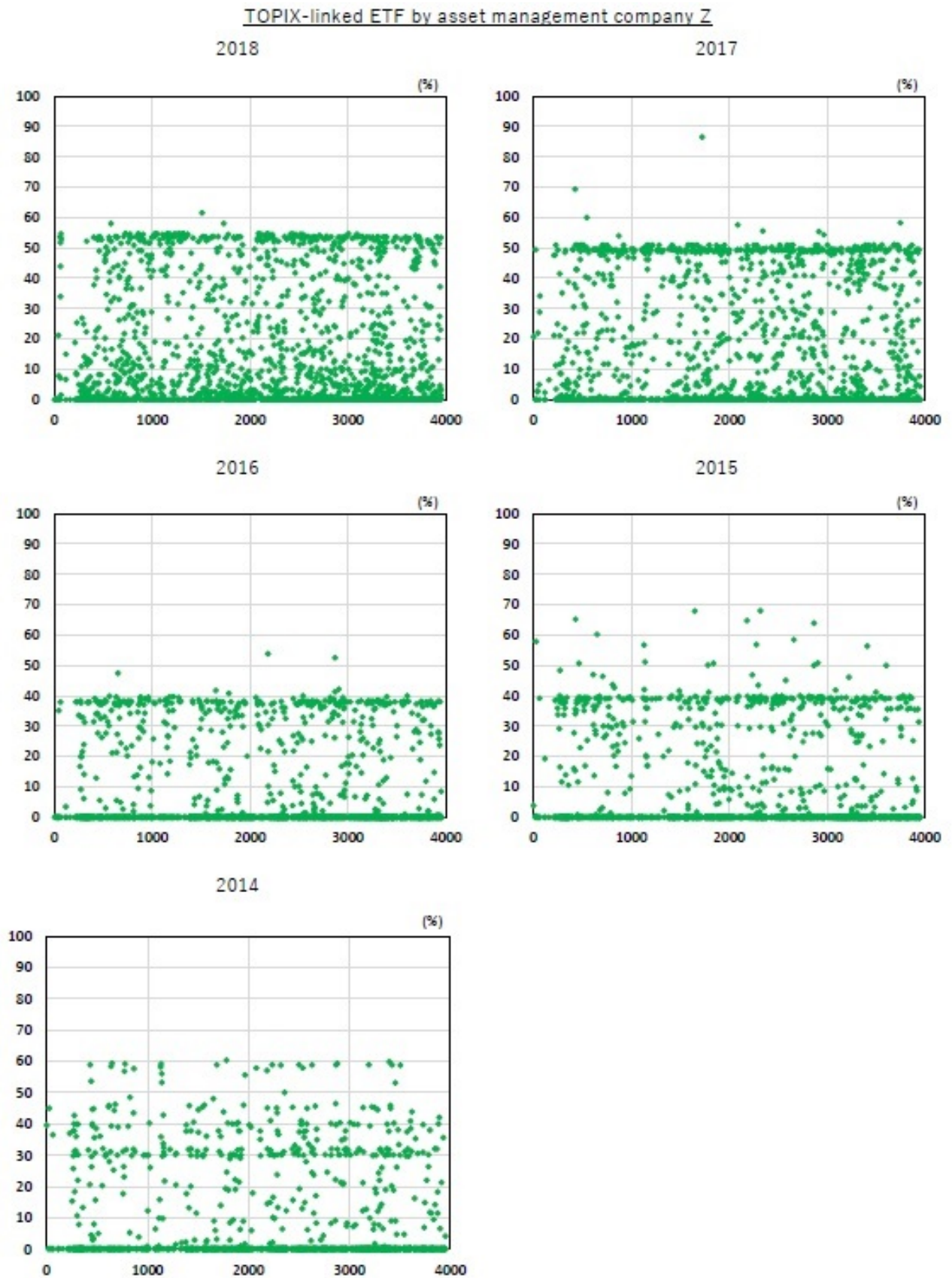


Figure 19: Individual stock lending ratios in ETFs of major AMs (6)

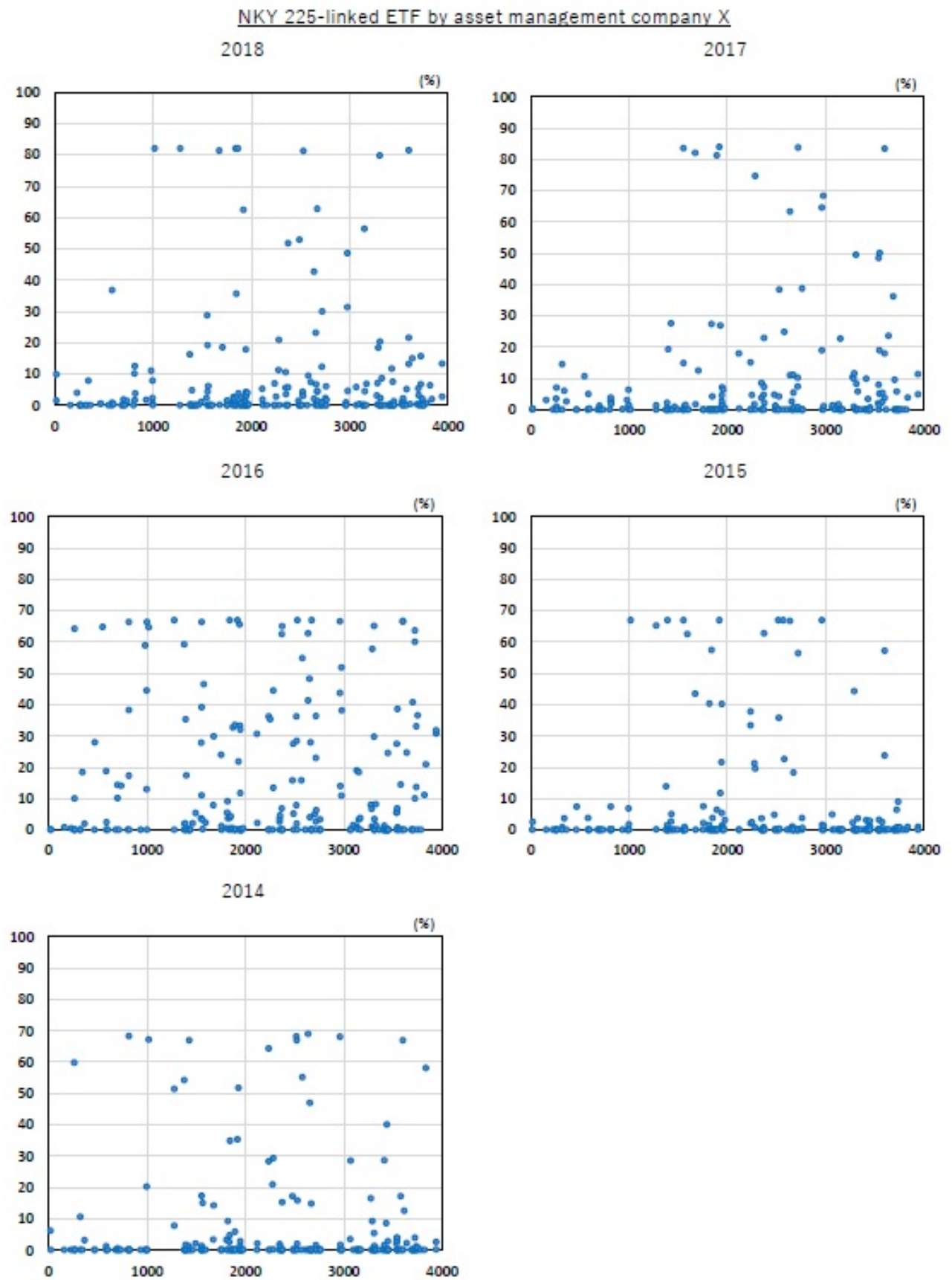


Figure 20: Individual stock lending ratios in ETFs of major AMs (7)



Figure 21: Individual stock lending ratios in ETFs of major AMs (8)

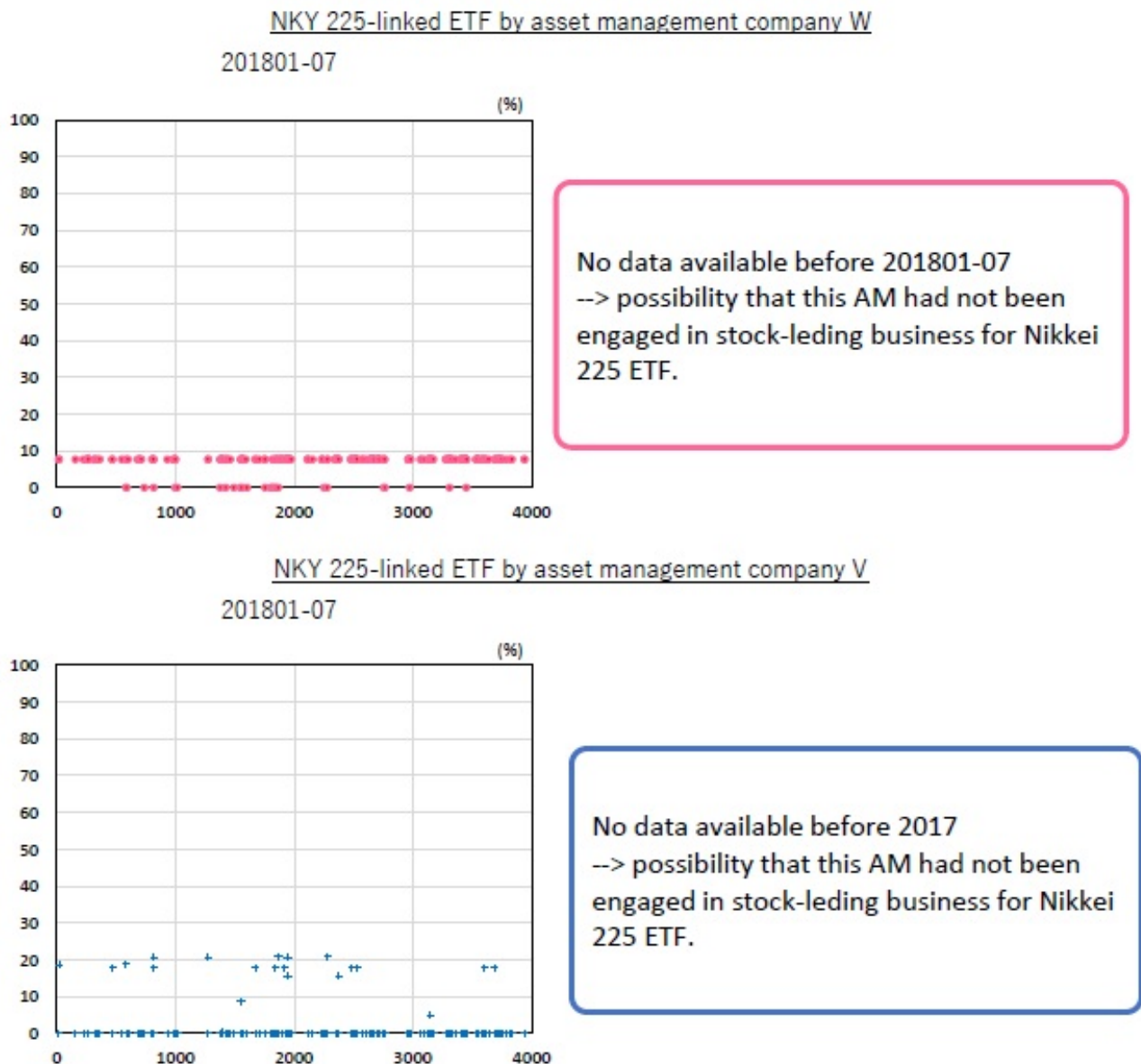
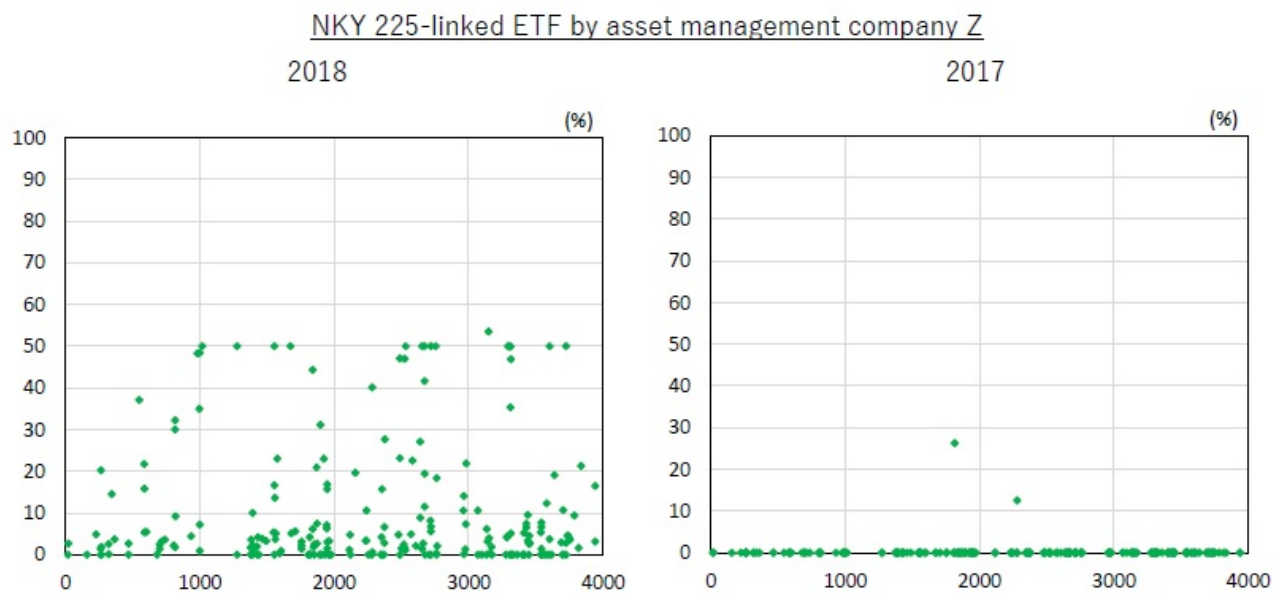


Figure 22: Individual stock lending ratios in ETFs of major AMs (9)



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