

The background image features a low-angle shot of the Bank of Japan building, a grand neoclassical structure with multiple columns and a green-tiled roof. To its right, a tall, modern glass skyscraper rises into a clear blue sky. In the foreground, there are green hedges and a street lamp.

The Bank of Japan as a Real Estate Tycoon: Large-Scale REIT Purchases

ASSA/AREUEA 2021

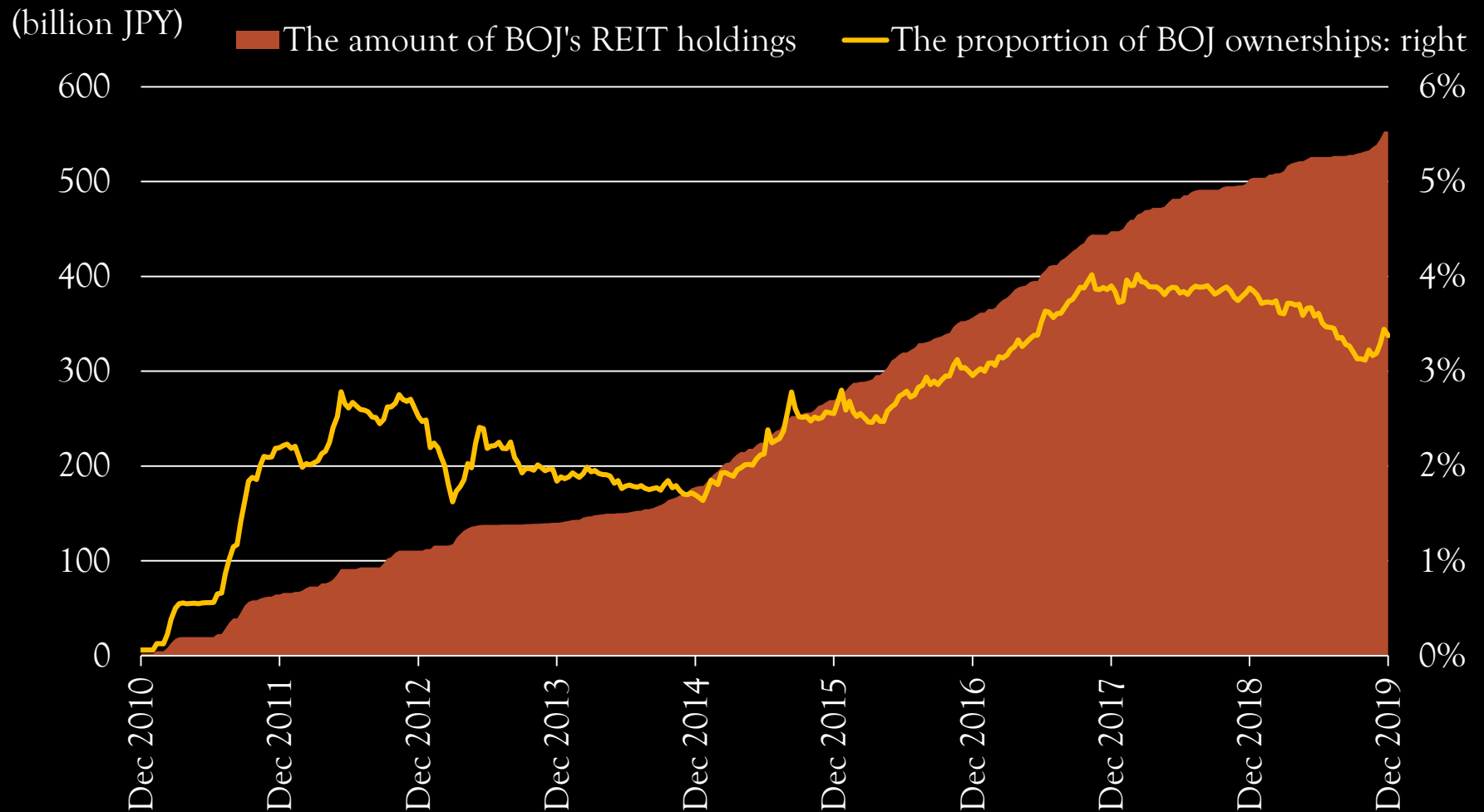
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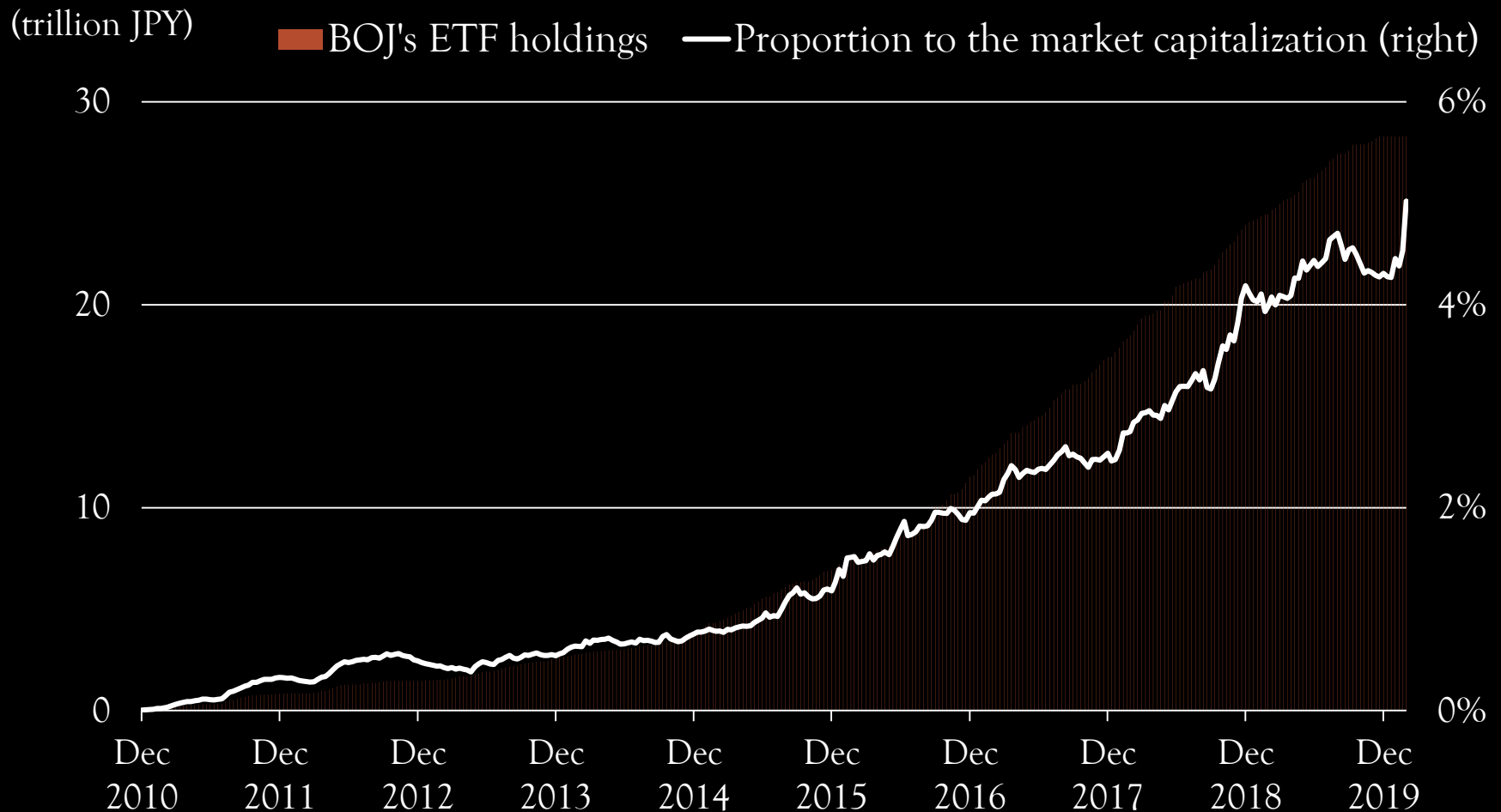
Bank of Japan's REIT purchases

- ◆ In October 2010, Bank of Japan (BOJ) enhanced its unconventional monetary policy by purchasing
 - ◆ equity exchange-traded funds (ETFs)
 - ◆ individual REIT shares
- ◆ Unprecedented in the history of central banking
- ◆ BOJ increased the purchase amount from 2015 (QQE)
- ◆ BOJ has become one of the largest REIT owners
 - ◆ > 5% ownership of 21 REITs

BOJ's REIT holdings



BOJ's ETF holdings



Today's Presentation

- ◆ Analysis of BOJ's REIT purchase behavior
 - ◆ BOJ adopts a counter-cyclical intervention rule
 - ◆ starts purchasing after negative overnight or morning returns
 - ◆ stops purchasing after positive overnight and morning returns
 - ◆ On the day of purchase, lunchtime and afternoon returns are more likely to be positive
- ◆ Analysis of analogous behavior for ETF purchases
- ◆ Preliminary analysis of CAPM and CCAPM betas

BOJ's large-scale asset purchases (LSAPs)

Bond-LSAPs

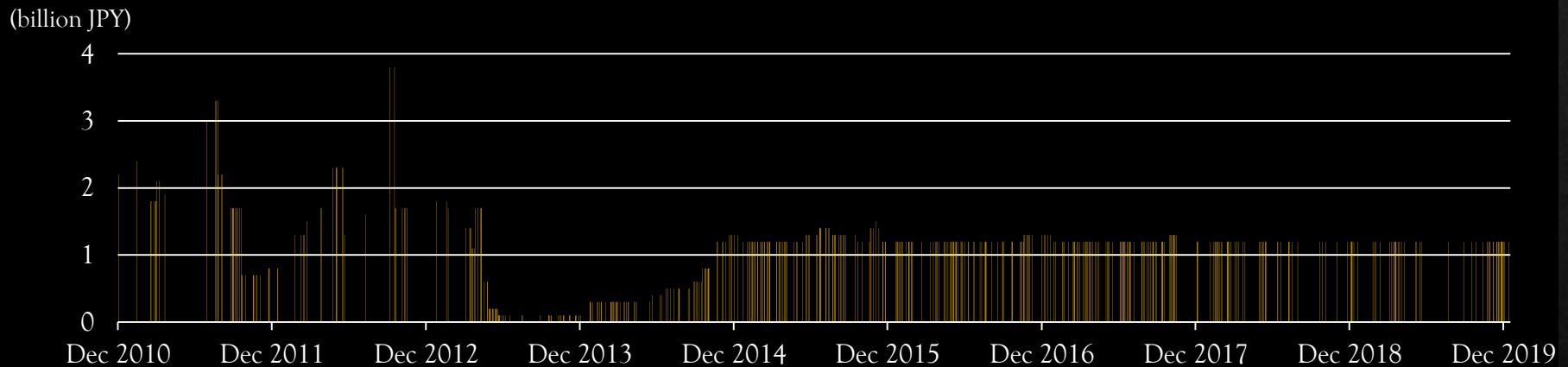
- ◇ BOJ started in 2001
 - ◇ Long-maturity JGBs
- ◇ Objectives
 - ◇ Decrease long rates
 - ◇ Stimulate spending

REIT/ETF-LSAPs

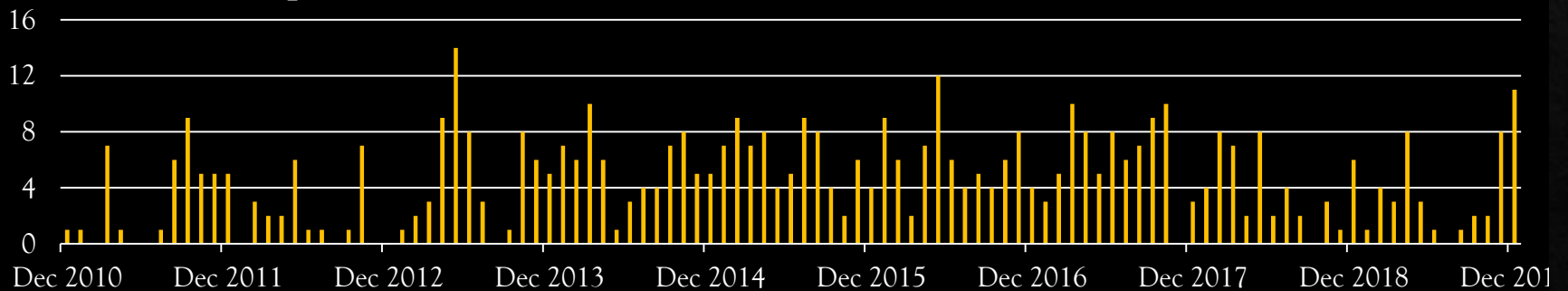
- ◇ BOJ started in 2010
- ◇ Objectives (Shirakawa, 2010)
 - ◇ Decrease risk premia
 - ◇ Stabilize the economy

BOJ's REIT purchase operations

A. The size of daily operation



B. The number of operations for each month



Empirical strategy to analyze $\mathbb{I}_t$ = BOJ purchase dummy for date t

1. Linear probability models

◇ r_t^i = Date- t REIT returns for $i = \{\text{overnight, morning, lunchtime, afternoon}\}$,
 s_t^i = TOPIX stock returns

$$\mathbb{I}_t = \alpha_4 + \sum_i \beta_4^i r_t^i + \gamma_4^i r_{t-1}^i + \delta_4^i s_t^i + \theta_4^i s_{t-1}^i + \varepsilon_{4,t}$$

◇ $\mathbb{I}_t^{i,d}$ = dummy for a subperiod- i return in decile $d = \{1, \dots, 5, 7, \dots, 10\}$.

$$\mathbb{I}_t = \alpha_5^i + \sum_d \beta_5^{i,d} \mathbb{I}_t^{i,d} + \varepsilon_{5,t}^i$$

2. Cox Hazard Model for starting and stopping decisions

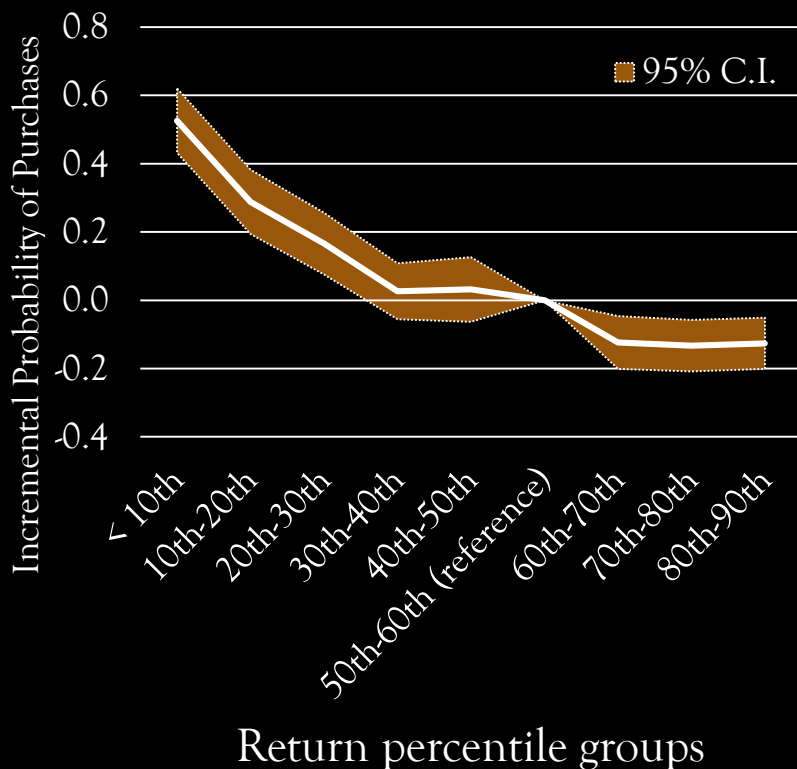
$$\text{Hazard function: } \lambda(t|\mathbf{X}(t)) = \lambda_0(t)e^{\mathbf{X}(t)\boldsymbol{\beta}_6}; \mathbf{X}(t)\boldsymbol{\beta}_6 = \sum_i \beta_6^i r_t^i + \gamma_6^i r_{t-1}^i.$$

Result of linear probability model for the entire sample period

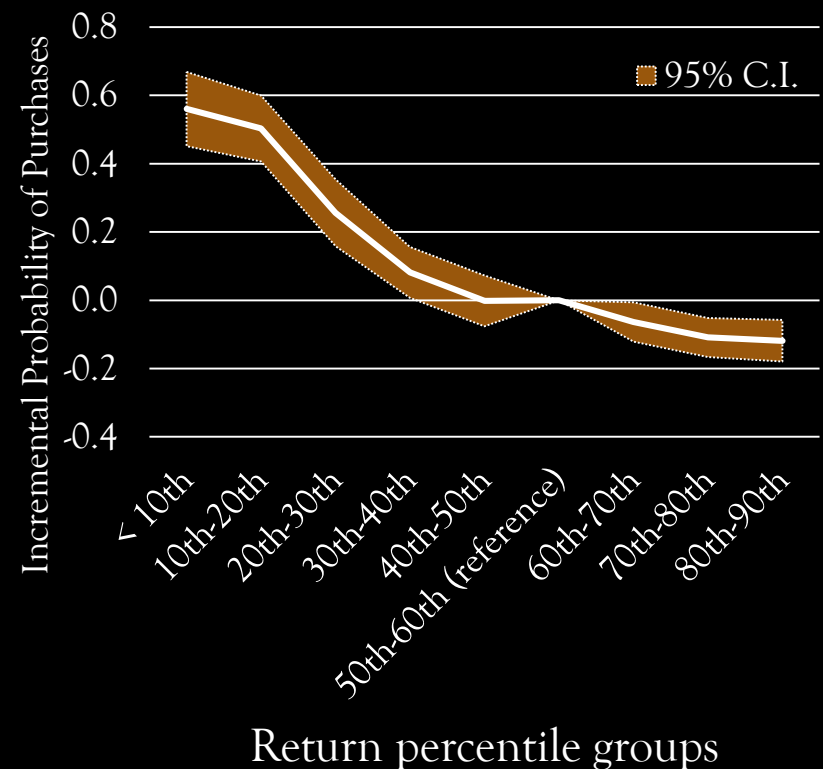
	(1)	(2)	(3)	(4)
TSE REIT Index returns				
Overnight	-39.118***	-38.180***	-40.066***	-38.734***
	(-11.549)	(-11.937)	(-9.957)	(-10.487)
Morning	-30.372***	-30.258***	-30.251***	-30.419***
	(-8.560)	(-8.539)	(-8.986)	(-9.241)
Lunchtime	33.814***	34.318***	37.120***	37.825***
	(3.424)	(3.510)	(3.889)	(4.071)
Afternoon	0.948	1.225	1.115	1.227
	(0.657)	(0.855)	(0.689)	(0.769)
Lagged REIT returns		Yes		Yes
TOPIX returns			Yes	Yes
Lagged TOPIX returns				Yes
N	1654	1654	1654	1654
Adjusted R-squared	0.336	0.341	0.335	0.341

Incremental probability of REIT purchases by return decile groups (base: 5-6th)

A. Overnight returns

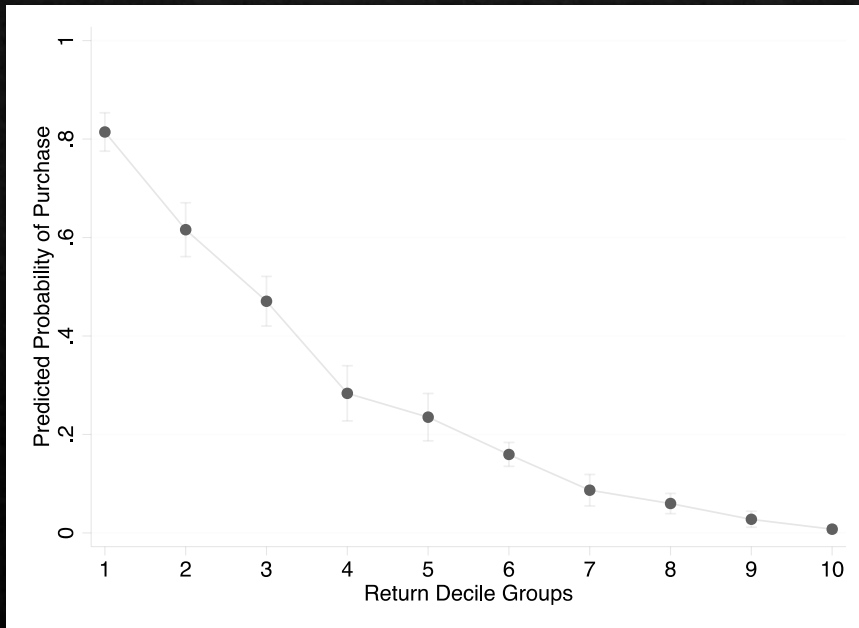


B. Morning returns

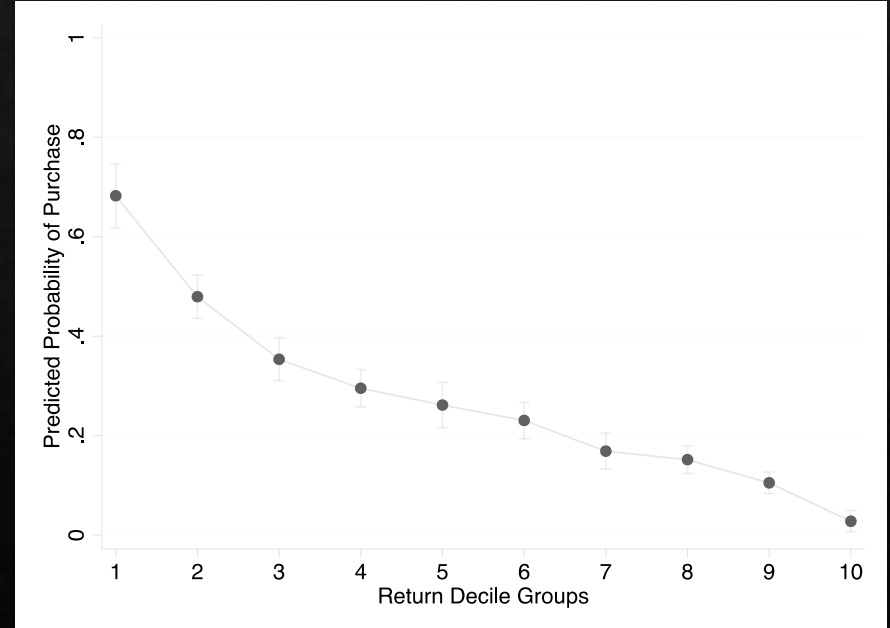


Analogous pattern of predicted probability of ETF purchases

A. Overnight returns



B. Morning returns



Result of conditional hazard models

Starting Decisions

	(1)	(2)
Overnight	-0.018*** (-12.93)	-0.018*** (-12.13)
Morning	-0.011*** (-11.51)	-0.011*** (-11.03)
Lunchtime	0.014 *** (2.48)	0.014 *** (2.39)
Afternoon	-0.001 (-0.83)	-0.001 (-0.79)
Lagged Overnight		-0.002 (-1.34)
Lagged Morning		0.000 (-0.37)
Lagged Lunchtime		0.001 (0.36)
Lagged Afternoon		-0.001 (-1.01)
N	1,222	1,222

Stopping Decisions

	(1)	(2)
Overnight	0.004*** (3.47)	0.005*** (3.81)
Morning	0.004*** (4.81)	0.004*** (5.00)
Lunchtime	-0.001 (-0.12)	-0.002 (-0.28)
Afternoon	0.000 (-0.07)	0.000 (-0.38)
Lagged Overnight		0.003** (1.97)
Lagged Morning		0.002 (1.25)
Lagged Lunchtime		0.006 (1.27)
Lagged Afternoon		-0.001 (-1.50)
N	431	431

(Preliminary) Target REITs appreciate after BOJ's purchase

- ◆ After BOJ purchases REITs in a downturn, target REITs' negative returns are mitigated
 - ◆ Difference-in-differences
 - ◆ Target and non-target REITs
 - ◆ With and without BOJ purchase on the previous day

price_change	Coef.	Robust Std. Err.	t	P> t	[95% Conf. Interval]	
reit1_dummy	-.1654043	.0454797	-3.64	0.000	-.2545475	-.0762612
reit_purchase_dummy	-.8337195	.0205063	-40.66	0.000	-.8739131	-.7935259
intersection	.1059481	.0377361	2.81	0.005	.0319829	.1799133
_cons	.3069252	.0181572	16.90	0.000	.2713358	.3425145

(Preliminary) TOPIX appreciates after BOJ's ETF purchases

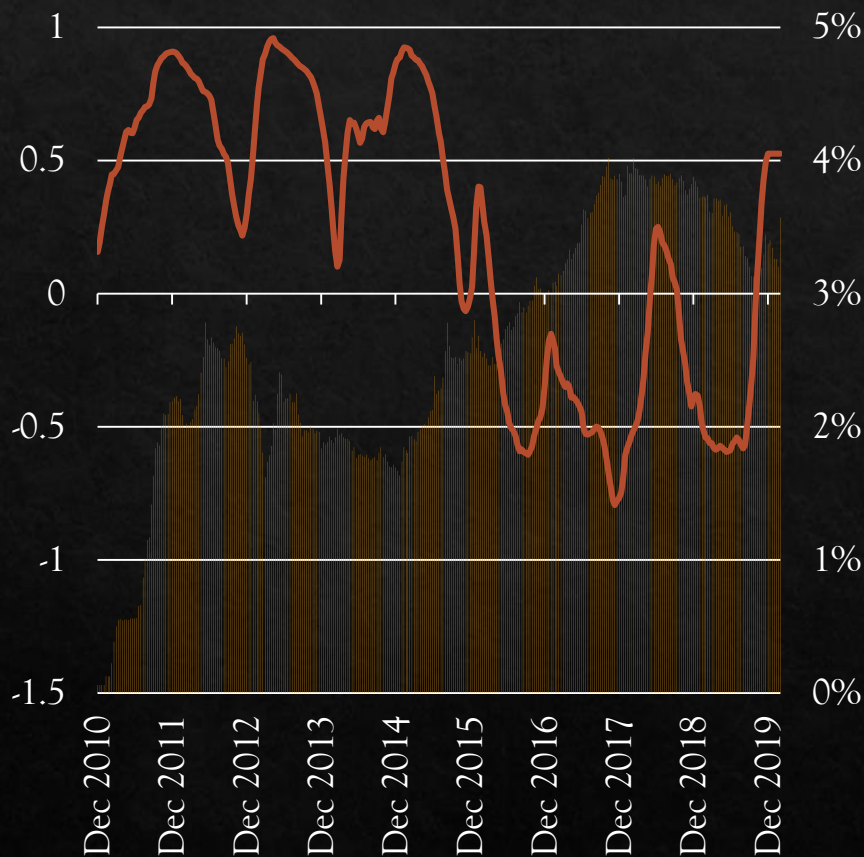
◆ Post-morning TOPIX returns are high on the day of BOJ purchases

change_morning_tpx	Coef.	Robust Std. Err.	t	P> t	[95% Conf. Interval]	
etf_purchase	3.06e-06	5.70e-07	5.37	0.000	1.94e-06	4.18e-06
change_night_tpx	.0678424	.0256224	2.65	0.008	.0175959	.1180888
_cons	-.0003909	.0001489	-2.62	0.009	-.000683	-.0000988

TOPIX and J-REIT Index



(Preliminary) REIT-TOPIX correlations exhibit a structural break in October 2015



■ The share of J-REIT held by the BOJ: right
— correlation

Quandt-Andrews unknown breakpoint test
 Null Hypothesis: No breakpoints within 10% trimmed data
 Varying regressors: All equation variables
 Equation Sample: 4/08/2004 12/31/2019
 Test Sample: 11/04/2005 6/05/2018
 Number of breaks compared: 3283

Statistic	Value	Prob.
Maximum LR F-statistic (10/28/2015)	10274.89	0.0000
Maximum Wald F-statistic (10/28/2015)	10274.89	0.0000
Exp LR F-statistic	5130.469	0.0000
Exp Wald F-statistic	5130.469	0.0000
Ave LR F-statistic	2367.434	0.0000
Ave Wald F-statistic	2367.434	0.0000

Note: probabilities calculated using Hansen's (1997) method

(Preliminary) C-CAPM beta for TOPIX has become insignificant

◆Pre ETF purchase program

er_topix_3m	Coef.	Newey-West Std. Err.	t	P> t	[95% Conf. Interval]	
er_cmp_ur_3m	5.544448	2.092883	2.65	0.009	1.403322	9.685574
_cons	.7229715	.7429324	0.97	0.332	-.7470472	2.19299

◆Post ETF purchase program

er_topix_3m	Coef.	Newey-West Std. Err.	t	P> t	[95% Conf. Interval]	
er_cmp_ur_3m	-4.580374	10.62437	-0.43	0.667	-25.63972	16.47897
_cons	.3898316	.6426233	0.61	0.545	-.8839593	1.663623

Conclusion

- ◆ BOJ operates the innovative program of purchasing individual REIT shares and ETFs to reduce risk premia
- ◆ BOJ endogenizes its operations in response to negative overnight and morning returns
- ◆ REIT purchases positively affect REIT returns, particularly for targeted REITs
- ◆ (Preliminary) BOJ's program has decreased the CAPM beta for REITs and CCAPM beta for stocks