

#### The Changing Role of Foreign Investors in Tokyo Stock Price Formation

Kentaro Iwatsubo<sup>1</sup> and Clinton Watkins<sup>2</sup>

<sup>1</sup>Graduate School of Economics, Kobe University <sup>2</sup>Akita International University

World Finance Conference 2020

September 2020

#### Introduction

- International stock market integration and financial liberalisation have facilitated an increase in **foreign portfolio investment** over recent decades.
- Foreign investors (FIs) are now important participants in most local markets.
  - Real effects (Henry, 2000a; Bekaert et al., 2005; Bekaert et al., 2011).
  - Liquidity (Bekaert et al., 2007; Rhee and Wang, 2009).
  - Volatility (Bae et al., 2004; Li et al., 2011).
  - Cost of capital (Bekaert and Harvey, 2000; Henry, 2000b).
  - Informational efficiency (Bae et al., 2012; He et al., 2013; He and Shen, 2014; Kang et al., 2016; Kacperczyk et al., 2019).
- However, exactly how FIs contribute to the efficiency of local markets is less well understood.
  - 1. What **types of value-relevant information** do Fls contribute to domestic stock prices?
  - 2. Has the information that FIs contribute **changed over time** as stock markets have become more internationally integrated, and if so, **when and how**?

#### Literature

- Fls may trade at an advantage or disadvantage to locals.
  - Fls trade at a disadvantage regarding local information (Kang and Stulz, 1997; Coval and Moskowitz, 1999), but have an advantage in global information (Bae et al., 2012; Kang et al., 2016).
  - Fls outperform locals (Grinblatt and Keloharju, 2000; Karolyi, 2002; Kamesaka et al., 2003; Bae et al., 2006), but also underperform locals (Shukla and Inwegen, 1995; Choe et al., 2005; Timmermann and Blake, 2005).
  - National equity risk premia are internationally determined while the cross-section of stock returns likely is not (Karolyi and Stulz, 2003).
  - International stock market integration has increased local return correlations (Longin and Solnik, 1995; Christoffersen et al., 2012)
- But what is the role of FIs in stock price formation?

#### Why Study the Role of FIs in Japanese Stocks?



- One of the world's **largest** stock markets with primary listings for many globally important corporations.
- Unique for a developed market, **FI share** of ownership and trade has increased substantially since the 1980s.
- Long publicly available time series of transactions classified by investor type.
- **Transactions** are more closely related to efficiency than ownership (Boehmer and Kelley, 2009).
- Provide insight for other **developed** markets and complement the existing evidence on **emerging** markets.

- 1. Fls' trades influence the efficient price of Japanese stocks by contributing global stock price-related information since the 2000s and exchange rate-related information since the 2010s.
- 2. Fls **increasingly influence** Japanese stock prices, coinciding with the **increasing importance of global information** in stock prices.
- 3. Fls have consistently **improved the efficiency** of the Japanese stock market, while domestic investors have not.

#### Contributions

- 1. We show the **types of information** imparted by the trades of FIs.
  - We do this using transactions data which are more aligned with efficiency and impounding of information in prices than the holdings data used previously.
  - Fls' trades have increasingly reflected global stock price and exchange rate information over the past four decades.
- 2. We establish the **timing of changes in the types of information** imparted by Fls' trades, demonstrate that this timing is unique to the Fl group and relate this to the participation of Fls in the Japanese market.
  - As international factors have become more important for Japanese stock returns, FIs have increased their presence.
- 3. We describe the evolution of information imparted by Fls' trades a **long sample** of thirty-nine years spanning 1980 to 2019, using a **consistent set of transactions and returns** data.

### **Modelling Approach**

- We modify Hasbrouck's (1991) *"information content of trade"* approach to identify the influence of foreign and domestic investors' trades on the efficient price, as well as the importance of public information.
  - VAR model of transactions and returns series.
  - Block-recursive identification.
- Benchmark model endogenous variables:
  - Transactions of four investor groups: Fls (*Foreign*), domestic financial institutions (*Financial*), domestic investment trusts (*Trust*), domestic individual investors (*Individual*).
  - Price revisions represented by TOPIX index returns.
- We compare the benchmark model to models including:
  - Global stock price information: S&P 500.
  - Foreign exchange rate information: USD/JPY.
  - Fundamental stock price information: forecast earnings per share (FEPS).

#### Modelling the Efficient Price (Hasbrouck, 1991)

• The price of a security,  $p_t$ , may be decomposed into the efficient price,  $m_t$ , and mispricing,  $s_t$ :

$$p_t = m_t + s_t$$
$$m_t = m_{t-1} + \omega_t$$

where  $m_t$  follows a **random walk** process,  $s_t$  is a mean-zero covariance **stationary** process.

- The shock to the efficient price (ω<sub>t</sub>) has a **permanent** influence on the security's price, while that to mispricing (s<sub>t</sub>) has only a **temporary** effect.
- Investors' transactions affect the permanent component  $(\omega_t)$  and mispricing  $(s_t)$ .
- Investor groups having a **positive long-run price impact** (CIRF) and a **substantial influence on the efficient price** ( $\sigma_{\omega}^2$ , variance decomposition of the efficient price) are considered **informed** traders.

#### **Transactions and Returns Data**

• Sample: Weekly from January 1980 to December 2018, divided into four subsamples for 1980-89, 1990-99, 2000-09 and 2010-18.

#### • Transactions:

- Value of purchases  $(B_{g,t})$  and sales  $(S_{g,t})$  by different investor groups.
- Four investor groups (g = 1, ...4) in our analysis: Foreign, Financial, Trust and Individual.
- For stocks listed on the 1st Section of the Tokyo Stock Exchange.
- Construct a **Trade Ratio**  $(x_{g,t})$  for each investor group:

$$x_{g,t} = \log\left(\frac{B_{g,t}}{S_{g,t}}\right)$$

• Returns:

- Weekly logarithmic return of TOPIX, S&P500 and USD/JPY.
- Percentage change in forecast earnings per share (FEPS) calculated using NIKKEI forecast P/E ratio.

#### Transactions (weekly, yen trillions, sales negative)



#### Equity Index and Exchange Rate Data (weekly)



- In the 1980s (**bubble**) and 1990s (**collapse**) the Japanese stock market appears relatively disconnected from global stocks.
- Substantial financial deregulation occurred during the 1990s.
  - The 1998 Revised Foreign Exchange Law was the final liberalisation of forex and international capital transactions.
  - Coincides with increase in FI participation and unwinding of cross-shareholding among Japanese listed firms.

#### Benchmark Model – Trade-related Component

	1980s	1990s	2000s	2010s	_
(a) Long-Run	Price Impact	of Trade			
Foreign	1.27	1.89	2.07	1.82	ī.
Financial	-0.17	-0.44	0.06	0.04	
Trust	0.27	-0.10	-0.36	-0.17	
Individual	-0.45	-1.05	-1.02	-1.52	U
ΤΟΡΙΧ	1.71	2.39	2.09	1.53	

#### (b) Variance Decomposition of the Efficient Price (%)

Foreign	33.23	33.84	43.74	41.63	1
Financial	0.57	1.83	0.04	0.02	
Trust	1.49	0.09	1.33	0.34	
Individual	4.21	10.45	10.60	28.80	U
ΤΟΡΙΧ	60.49	53.79	44.29	29.20	

(c) Share of the Trade-related Component (%)

Foreign	84.12	73.23	78.52	58.81
Financial	1.45	3.95	0.07	0.03
Trust	3.78	0.20	2.39	0.48
Individual	10.65	22.62	19.02	40.68

Variable order is Foreign, Financial, Trust, Individual, TOPIX.

- The Benchmark model (BM) specification is consistent with Hasbrouck, relevant variables are trades and price revisions.
- Fls have a positive long-run price impact of trade and a large influence on the efficient price (I).
- Domestic investors are not informed (U).
- Fls dominate the trade-related component.(A).
- Individual investors appear to be liquidity suppliers (B).

#### Benchmark Model – Nontrade-related Component

	1980s	1990s	2000s	2010s	_
(a) Long-Run	Price Impact	of Trade			-
Foreign	1.27	1.89	2.07	1.82	
Financial	-0.17	-0.44	0.06	0.04	
Trust	0.27	-0.10	-0.36	-0.17	
Individual	-0.45	-1.05	-1.02	-1.52	
TOPIX	1.71	2.39	2.09	1.53	A
					-

(b) Variance Decomposition of the Efficient Price (%)

Foreign	33.23	33.84	43.74	41.63
Financial	0.57	1.83	0.04	0.02
Trust	1.49	0.09	1.33	0.34
Individual	4.21	10.45	10.60	28.80
TOPIX	60.49	53.79	44.29	29.20

(c) Share of the	Trade-related	Component	(%)
------------------	---------------	-----------	-----

Foreign	84.12	73.23	78.52	58.81
Financial	1.45	3.95	0.07	0.03
Trust	3.78	0.20	2.39	0.48
Individual	10.65	22.62	19.02	40.68

Variable order is Foreign, Financial, Trust, Individual, TOPIX.

- TOPIX innovations have a positive long-run price impact and influence the efficient price (**A**).
- (A) represents the nontrade-related component of the BM.

#### **Benchmark Model – Change Over Four Decades**

	1980s	1990s	2000s	2010s	
(a) Long-Run Price Impact of Trade					
Foreign	1.27	1.89	2.07	1.82	
Financial	-0.17	-0.44	0.06	0.04	
Trust	0.27	-0.10	-0.36	-0.17	
Individual	-0.45	-1.05	-1.02	-1.52	
ΤΟΡΙΧ	1.71	2.39	2.09	1.53	

(b) Variance Decomposition of the Efficient Price (%)

Foreign	33.23	33.84	<b>†</b> 43.74	41.63
Financial	0.57	1.83	0.04	0.02
Trust	1.49	0.09	1.33	0.34
Individual	4.21	10.45	10.60	28.80
TOPIX	60.49	53.79	↓ 44.29	29.20 E
Financial Trust Individual TOPIX	0.57 1.49 4.21 60.49	1.83 0.09 10.45 53.79	0.04 1.33 10.60 ↓ 44.29	0.02 0.34 28.80 29.20

(c) Share of the Trade-related Component (%)

84.12	73.23	78.52	58.81 C
1.45	3.95	0.07	0.03
3.78	0.20	2.39	0.48
10.65	22.62	19.02	40.68
	84.12 1.45 3.78 10.65	84.12 73.23   1.45 3.95   3.78 0.20   10.65 22.62	84.12 73.23 78.52   1.45 3.95 0.07   3.78 0.20 2.39   10.65 22.62 19.02

Variable order is Foreign, Financial, Trust, Individual, TOPIX.

- Fls' information share increases from the 2000s (A).
- The influence of TOPIX on the efficient price decreases in the 2000s (B).
- As a share of the trade-related component, FIs' share is stable through the 2000s, although it is lower in the 2010s (C).
- However, the BM may not tell the full story regarding FIs' information share.

#### **Extended Model – Includes Global Information**

	1980s	1990s	2000s	2010s	
(a) Long-Run	Price Impact	of Trade			
Foreign	0.66	1.60	1.09	0.78	Α
Financial	-0.01	-0.44	0.12	0.15	
Trust	0.18	-0.06	-0.20	-0.18	
Individual	-0.20	-1.15	-0.64	-0.73	
TOPIX	1.47	2.23	1.55	1.21	
S&P 500	0.98	1.45	2.25	1.78	В
USD/JPY	-0.27	-0.52	0.48	1.40	С

(b) Variance Decomposition of the Efficient Price (%)

Foreign	11.81	22.35	12.68	7.83	
Financial	0.00	1.67	0.17	0.30	
Trust	0.92	0.04	0.45	0.40	
Individual	1.08	11.63	4.45	6.91	
TOPIX	58.43	43.64	25.65	18.89	
S&P 500	25.75	18.35	54.16	40.62	
USD/JPY	2.00	2.33	2.44	25.04	
(c) Share of the Trade-related Component (%)					

Foreign	85.50	62.63	71.48	50.71
Financial	0.03	4.69	0.94	1.93
Trust	6.65	0.10	2.53	2.61
Individual	7.83	32.58	25.06	44.75

Variable order is S&P 500, USD/JPY, Foreign, Financial, Trust, Individual, TOPIX.

- Numerous studies have shown global equity price and exchange rate information is important for local risk premia.
- Include returns on the S&P 500 and the USD/JPY representing global stock and exchange rate info.
- Fls' trades still have a positive long-run price impact (A).
- TOPIX and the S&P 500 both have a positive impact (**B**).
- The exchange rate impact is positive in the 2000s and 2010s (C).

#### **Extended Model – Global Information is Important**

	1980s	1990s	2000s	2010s					
(a) Long-Run Price Impact of Trade									
Foreign	0.66	1.60	1.09	0.78					
Financial	-0.01	-0.44	0.12	0.15					
Trust	0.18	-0.06	-0.20	-0.18					
Individual	-0.20	-1.15	-0.64	-0.73					
TOPIX	1.47	2.23	1.55	1.21					
S&P 500	0.98	1.45	2.25	1.78					
USD/JPY	-0.27	-0.52	0.48	1.40					

(b) Variance Decomposition of the Efficient Price (%)

Foreign	11.81	22.35	↓ 12.68	↓ 7.83	Α
Financial	0.00	1.67	0.17	0.30	
Trust	0.92	0.04	0.45	0.40	
Individual	1.08	11.63	4.45	6.91	
TOPIX	58.43	43.64	↓ 25.65	↓ 18.89	В
S&P 500	25.75	18.35	<b>†</b> 54.16	<b>†</b> 40.62	С
USD/JPY	2.00	2.33	2.44	<b>1</b> 25.04	D

(c) Share of the Trade-related Component (%)

Foreign	85.50	62.63	71.48	50.71
Financial	0.03	4.69	0.94	1.93
Trust	6.65	0.10	2.53	2.61
Individual	7.83	32.58	25.06	44.75

Variable order is S&P 500, USD/JPY, Foreign, Financial, Trust, Individual, TOPIX.

- Fls' information share is lower than in the BM, and declines rather than increases in the 2000s and 2010s (A).
- TOPIX information share declines in the 2000s and 2010s (**B**).
- S&P 500 information share rises in the 2000s and 2010s (C).
- USD/JPY has a substantial information share in the 2010s (D).
- Fls' high information share in the 2000s and 2010s under the BM reflects their reliance on global information to trade a more internationalised Japanese market.

#### **Extended Model Plus Forecast Earnings Per Share**

	1990s	2000s	2010s							
(a) Long-Run Pl	(a) Long-Run Price Impact of Trade									
Foreign	1.17	1.08	0.81							
Financial	-0.66	0.15	0.12							
Trust	-0.06	-0.19	0.00							
Individual	-0.81	-0.66	-0.66							
TOPIX	1.57	1.51	1.05							
S&P 500	1.11	2.27	1.93							
USD/JPY	0.04	0.55	1.30							
FEPS	0.08	-0.06	-0.45							

(b) Variance Decomposition of the Efficient Price (%)

Foreign	22.14	12.45	8.37
Financial	6.99	0.25	0.18
Trust	0.05	0.40	0.00
Individual	10.70	4.57	5.58
TOPIX	39.80	24.14	14.14
S&P 500	20.17	54.91	47.57
USD/JPY	0.02	3.24	21.53
FEPS	0.11	0.04	2.64

(c)	) Share	of the	Trade-related	Component	(%)	
-----	---------	--------	---------------	-----------	-----	--

Foreign	55.51	70.45	59.24
Financial	17.53	1.40	1.28
Trust	0.14	2.29	0.00
Individual	26.83	25.86	39.47

Variable order is S&P 500, USD/JPY, FEPS, Foreign, Financial, Trust, Individual, TOPIX.

- Do FIs use fundamental earnings information?
- We calculate FEPS by dividing the Nikkei newspaper forecast price/earnings ratio for TOPIX by the index. The sample for FEPS begins in 1994.
- FEPS has a small or negative long-run price impact (A) and has little influence over the efficient price (B).

### Informational Efficiency Improves Over the Decades

	1980s	1990s	2000s	2010s	-
(a) Benchmark M	lodel				-
$\sigma_s$	2.43	2.67	1.75	0.59	
$\sigma_s/\sigma_w$	1.10	0.82	0.56	0.21	A
$\sigma_s / \sigma_w$ Foreign	1.92	1.41	0.84	0.33	В
$\sigma_s/\sigma_w$ , Financial	14.57	6.08	27.66	14.76	
$\sigma_s/\sigma_w$ , Trust	9.03	26.74	4.84	3.59	
$\sigma_s / \sigma_w$ , Individual	5.38	2.54	1.72	0.39	
$\sigma_s/\sigma_w$ , TOPIX	1.42	1.12	0.84	0.39	
(b) Extended Mod	del				-
$\sigma_s$	1.99	2.67	1.17	0.48	
$\sigma_s/\sigma_w$	1.03	0.79	0.38	0.17	Α
$\sigma_s / \sigma_{w, Eoreign}$	3.00	1.67	1.08	0.61	В
$\sigma_s / \sigma_w$ , Financial	175.20	6.11	9.39	3.15	
$\sigma_s/\sigma_{w, Trust}$	10.76	41.33	5.73	2.71	
$\sigma_s / \sigma_w$ , Individual	9.92	0.34	1.82	0.65	
$\sigma_s/\sigma_w, S\&P 500$	2.03	1.84	0.52	0.27	
$\sigma_s / \sigma_{w, USD/JPY}$	7.29	5.18	2.46	0.34	
$\sigma_s/\sigma_{w, TOPIX}$	1.35	1.20	0.76	0.40	

- Do FIs contribute to the efficiency of the Japanese market?
- Measure of inefficiency,  $\sigma_s$ , is the standard deviation of mispricing,  $s_t$ .
- We express mispricing relative to fundamental information contributed by the trades of each group,  $\sigma_s/\sigma_{w,x_g}$ .
- Inefficiency declines over time under both models, particularly in the 2000s and 2010s (A).
- Fls' trades improve efficiency (B).

We show that FIs' trades:

- 1. **contribute information** to Japanese stock prices, that is, their trades influence the efficient price of Japanese stocks,
- 2. predominantly contain global information related to global stock prices since the 2000s and the exchange rate since the 2010s,
- 3. are **not related to fundamental information** on forecast future earnings of domestic firms,
- 4. **increasingly influence Japanese stock prices** over time. This increase in influence **coincides with the increasing importance of global information** in stock prices, and
- 5. have consistently **contributed to the informational efficiency** of the Japanese stock market even when global stock price and exchange rate information is taken into account.

### **Policy Implications**

- 1. **Fls contribute global information** to, and improve the efficiency of, local markets. Supports policies that provide **access for Fls** to domestic markets.
- Although we are unable to infer causality, Fls trading Japanese stocks using global information coincides with greater comovement between Japanese and U.S. stock market returns. While this has improved the efficiency of the Japanese market, it has been detrimental to diversification opportunities for investors, at least at the country level.
- 3. Japanese domestic investors may be over-relying on local information and under-relying on global information, given the greater importance of global information in the 2000s and 2010s and their relatively poor investment performance.



## Thank you

Clinton Watkins

clinton-watkins@aiu.ac.jp

#### References

Kee Hong Bae, Kalok Chan, and Angela Ng. "Investibility and return volatility". In: Journal of Financial Economics 71.2 (2004), pp. 239–263.

Kee Hong Bae, Takeshi Yamada, and Keiichi Ito. "How do Individual , Institutional , and Foreign Investors Win and Lose in Equity Trades? Evidence from Japan". In: International Review of Finance 6.3-4 (2006), pp. 129–155.

Kee Hong Bae et al. "Do foreigners facilitate information transmission in emerging markets?" In: Journal of Financial Economics 105 (2012), pp. 209–227.

Geert Bekaert and Campbell R. Harvey. "Foreign Speculators and Emerging Equity Markets". In: The Journal of Finance 55.2 (2000), pp. 565–613.

Geert Bekaert, Campbell R. Harvey, and Christian T. Lundblad. "Liquidity and Expected Returns: Lessons from Emerging Markets". In: The Review of Financial Studies 20.6 (2007), pp. 1783–1831.

Geert Bekaert, Campbell R. Harvey, and A. Ng. "Market integration and contagion". In: Journal of Business 78.1 (2005), pp. 39-70.

Geert Bekaert et al. Global Crises and Equity Market Contagion. National Bureau of Economic Research, Working Paper 17121. 2011.

Ekkehart Boehmer and Eric K. Kelley. "Institutional Investors and the Informational Efficiency of Prices". In: Review of Financial Studies 22.9 (2009), pp. 3563–3594.

Hyuk Choe, Bong Chan Kho, and René M. Stulz. "Do domestic investors have an edge? The trading experience of foreign investors in Korea". In: Review of Financial Studies 18.3 (2005), pp. 795–829.

Peter Christoffersen et al. "Is the Potential for International Diversification Disappearing? A Dynamic Copula Approach". In: Review of Financial Studies 25.12 (2012), pp. 3711–3751.

Joshua D. Coval and Tobias J. Moskowitz. "Home Bias at Home: Local Equity Preference in Domestic Portfolios". In: Journal of Finance 54.6 (1999), pp. 2045–2073.

Mark Grinblatt and Matti Keloharju. "The investment behavior and performance of various investor types: a study of Finland' s unique data set". In: Journal of Financial Economics 55.1 (2000), pp. 43–67.

Joel Hasbrouck. "Measuring the Information Content of Stock Trades". In: The Journal of Finance 46.1 (1991), pp. 179-207.

Wen He and Jianfeng Shen. "Do foreign investors improve informational efficiency of stock prices? Evidence from Japan". In: Pacific Basin Finance Journal 27 (2014), pp. 32–48.

Wen He et al. "Large foreign ownership and stock price informativeness around the world". In: Journal of International Money and Finance 36 (2013), pp. 211–230.

#### References (cont.)

Peter Blair Henry. "Do stock market liberalizations cause investment booms?" In: Journal of Financial Economics 58.1-2 (2000), pp. 301–334.

Peter Blair Henry. "Stock Market Liberalization, Economic Reform, and Emerging Market Equity Prices". In: Journal of Finance 55.2 (2000), pp. 529–564.

Marcin T. Kacperczyk, Savitar Sundaresan, and Tianyu Wang. Do Foreign Investors Improve Market Efficiency? Working paper, April 30, 2019. Working Paper. 2019.

Akiko Kamesaka, John R Nofsinger, and Hidetaka Kawakita. "Investment patterns and performance of investor groups in Japan". In: Pacific-Basin Finance Journal 11 (2003), pp. 1–22.

Jangkoo Kang, Kyung Yoon Kwon, and H Park. "Foreign investors and the delay of information dissemination in the Korean stock market". In: *Pacific Basin Finance Journal* 38 (2016), pp. 1–16.

Jun-Koo Kang and René M. Stulz. "Why is there a home bias? An analysis of foreign portfolio equity ownership in Japan". In: Journal of Financial Economics 46.1 (1997), pp. 3–28.

G. Andrew Karolyi. "Did the Asian financial crisis scare foreign investors out of Japan?" In: Pacific-Basin Finance Journal 10 (2002), pp. 411–442.

G. Andrew Karolyi and René M. Stulz. "Are financial assets priced locally or globally?" In: Handbook of the Economics of Finance. Ed. by George M. Constantinides, Milton Harris, and René M. Stulz. Vol. 1. Elsevier B.V., 2003. Chap. 16, pp. 975–1020.

Donghui Li et al. "Large Foreign Ownership and Firm-Level Stock Return Volatility in Emerging Markets". In: Journal of Financial and Quantitative Analysis 46.4 (2011), pp. 1127–1155.

Francois Longin and Bruno Solnik. "Is the correlation in international equity returns constant:1960-1990?" In: Journal of International Money and Finance 14.1 (1995), pp. 3–26.

S. Ghon Rhee and Jianxin Wang. "Foreign institutional ownership and stock market liquidity: Evidence from Indonesia". In: Journal of Banking and Finance 33.7 (2009), pp. 1312–1324.

Ravi K. Shukla and Gregory B. van Inwegen. "Do locals perform better than foreigners? An analysis of UK and US mutual fund managers". In: Journal of Economics and Business 47.3 (1995), pp. 241–254.

Allan Timmermann and David Blake. "International Asset Allocation with Time-Varying Investment Opportunities". In: The Journal of Business 78.1 (2005), pp. 71–98.

# Appendix

#### Summary Statistics for 1980s and 1990s

	Mean	Med	Max	Min	Sum	S.D	Skew	Kurt	$\rho_1$	$\rho_2$	$\rho_3$
1980s Equity Transactions											
Total purchases	2084.85	1050.03	9778.34	46.30	1084.12	2058.27	1.33	3.84	0.88	0.83	0.82
Total sales	2073.33	1040.86	9793.53	43.43	1078.13	2050.81	1.33	3.85	0.89	0.83	0.82
Net purchases	11.52	8.70	109.93	-142.02	5.99	25.47	0.24	7.84	0.43	0.23	0.18
Foreign purchases	189.16	134.97	881.95	3.02	98.36	153.75	1.21	4.10	0.69	0.54	0.51
Foreign sales	224.06	150.78	1226.62	5.09	116.51	196.79	1.20	4.24	0.88	0.82	0.81
Foreign net purchases	-34.90	-11.86	203.05	-1045.39	-18.15	94.21	-4.05	34.84	0.85	0.80	0.77
Financial purchases	358.07	84.20	2087.08	5.03	186.20	468.55	1.39	3.99	0.90	0.86	0.85
Financial sales	326.65	61.77	1969.98	1.88	169.86	443.75	1.46	4.24	0.89	0.85	0.84
Financial net purchases	31.43	12.15	394.24	-182.94	16.34	66.98	1.44	7.59	0.56	0.39	0.38
Trust purchases	142.34	49.28	857.57	3.02	74.02	168.94	1.62	5.02	0.89	0.86	0.86
Trust sales	132.07	48.85	764.97	1.15	68.67	157.57	1.69	5.16	0.89	0.86	0.85
Trust net purchases	10.28	1.73	415.08	-212.28	5.34	49.37	1.87	16.78	0.51	0.19	0.14
Individual purchases	595.13	407.91	2464.17	16.12	309.47	493.63	1.39	4.26	0.84	0.76	0.75
Individual sales	631.47	431.55	2477.82	18.71	328.36	518.85	1.35	4.15	0.84	0.76	0.75
Individual net purchases	-36.34	-19.60	623.10	-434.08	-18.90	65.94	0.55	25.50	0.48	0.28	0.22
1980s Equity and Exchang	e Rate Returi	ns									
TOPIX	0 3497	0.3461	6 9552	-12 1678		1 8468	-0.57	7 77	0.00	0.06	0.07
S&P 500	0.2300	0.4604	8 4617	-13 0071		2 2416	-0.61	6.42	0.01	0.04	-0.04
JPY	-0.0943	0.0373	6.3120	-8.6974		1.5251	-0.64	5.73	0.09	0.09	0.04
1990s Equity Transactions											
Total purchases	1804.39	1584.91	5415.19	125.43	940.09	928.42	1.32	4.78	0.80	0.70	0.64
Total sales	1793.86	1570.32	5405.68	121.51	934.60	929.53	1.33	4.81	0.80	0.70	0.64
Net purchases	10.52	11.37	133.24	-146.73	5.48	20.62	-0.77	16.76	0.43	0.30	0.13
Foreign purchases	422.40	346.24	1860.58	19.42	220.07	266.30	1.95	7.92	0.83	0.75	0.71
Foreign sales	376.88	320.11	1465.84	13.67	196.36	220.95	1.69	6.99	0.87	0.79	0.76
Foreign net purchases	45.52	30.84	719.86	-519.35	23.72	126.99	0.65	6.76	0.62	0.52	0.40
Financial purchases	306.64	285.93	952.35	12.64	159.76	161.18	1.12	4.79	0.75	0.63	0.57
Financial sales	293.38	242.74	1044.81	5.75	152.85	190.53	1.30	4.67	0.77	0.65	0.59
Financial net purchases	13.26	19.23	476.02	-543.45	6.91	109.08	-0.38	5.37	0.63	0.48	0.43
Trust purchases	103.41	70.81	689.14	5.74	53.88	99.26	2.22	8.95	0.86	0.81	0.76
	114 21	83.61	644.84	1.95	59.55	97.45	1.91	6.94	0.86	0.81	0.76
Trust sales	114.31				-5.68	45.00	0.93	10.99	0.59	0.37	0.26
Trust sales Trust net purchases	-10.90	-9.84	280.44	-210.18	5.00	40.00					0.00
Trust sales Trust net purchases Individual purchases	-10.90 325.45	-9.84 220.77	280.44 1629.21	-210.18 21.00	169.56	264.91	1.84	6.38	0.83	0.72	0.05
Trust sales Trust net purchases Individual purchases Individual sales	-10.90 325.45 343.49	-9.84 220.77 246.58	280.44 1629.21 1408.17	-210.18 21.00 24.19	169.56 178.96	264.91 251.76	1.84 1.64	6.38 5.54	0.83	0.72 0.72	0.65
Trust sales Trust net purchases Individual purchases Individual sales Individual net purchases	-10.90 325.45 343.49 -18.04	-9.84 220.77 246.58 -19.29	280.44 1629.21 1408.17 384.58	-210.18 21.00 24.19 -264.93	169.56 178.96 -9.40	264.91 251.76 68.53	1.84 1.64 1.20	6.38 5.54 9.15	0.83 0.82 0.48	0.72 0.72 0.38	0.65
Trust sales Trust net purchases Individual purchases Individual sales Individual net purchases 1990s Equity and Exchang	-10.90 325.45 343.49 -18.04 e Rate Return	-9.84 220.77 246.58 -19.29	280.44 1629.21 1408.17 384.58	-210.18 21.00 24.19 -264.93	169.56 178.96 -9.40	264.91 251.76 68.53	1.84 1.64 1.20	6.38 5.54 9.15	0.83 0.82 0.48	0.72 0.72 0.38	0.66 0.20
Trust sales Trust net purchases Individual purchases Individual sales Individual net purchases 1990s Equity and Exchang TOPIX	-10.90 325.45 343.49 -18.04 re Rate Return	-9.84 220.77 246.58 -19.29	280.44 1629.21 1408.17 384.58	-210.18 21.00 24.19 -264.93	169.56 178.96 -9.40	264.91 251.76 68.53	1.84 1.64 1.20	6.38 5.54 9.15	0.83 0.82 0.48	0.72 0.72 0.38	0.65 0.20
Trust sales Trust net purchases Individual purchases Individual sales Individual net purchases 1990s Equity and Exchang TOPIX S&P 500	-10.90 325.45 343.49 -18.04 e Rate Return -0.0956 0.2741	-9.84 220.77 246.58 -19.29 ns	280.44 1629.21 1408.17 384.58 10.8383 7.0619	-210.18 21.00 24.19 -264.93 -11.9169 -6.8626	169.56 178.96 -9.40	264.91 251.76 68.53 2.7857 1.8624	1.84 1.64 1.20	6.38 5.54 9.15 4.74 3.77	0.83 0.82 0.48 -0.01 -0.12	0.72 0.72 0.38	0.05 0.66 0.20 0.04 0.04

#### Summary Statistics for 2000s and 2010s

	Mean	Med	Max	Min	Sum	S.D.	Skew	Kurt	$\rho_1$	$\rho_2$	$\rho_3$	
2000s Equity Transactions												
Total purchases	6655.49	5507.85	18911.57	170.15	3474.16	3712.40	0.81	2.74	0.88	0.82	0.82	
Total sales	6651.60	5496.66	18907.18	169.55	3472.14	3713.76	0.81	2.75	0.88	0.82	0.82	
Net purchases	3.88	4.15	84.70	-87.00	2.03	20.27	-0.20	4.33	0.20	0.08	0.03	
Foreign purchases	2699.85	2033.32	9921.18	61.52	1409.32	1795.67	0.94	2.93	0.90	0.85	0.85	
Foreign sales	2638.04	1930.63	10122.76	61.90	1377.06	1794.86	1.04	3.26	0.90	0.84	0.83	
Foreign net purchases	61.81	48.65	932.43	-911.73	32.27	224.04	-0.03	4.15	0.39	0.31	0.27	
Financial purchases	504.76	481.61	1341.30	18.86	263.49	185.05	0.78	4.83	0.62	0.48	0.42	
Financial sales	525.80	494.05	1424.84	5.86	274.47	211.07	0.85	4.42	0.64	0.46	0.43	
Financial net purchases	-21.03	-18.64	438.73	-692.50	-10.98	131.90	0.12	4.90	0.62	0.48	0.42	
Trust purchases	130.32	115.94	410.57	2.23	68.03	75.89	0.69	2.72	0.82	0.78	0.76	
Trust sales	120.66	99.21	431.36	1.45	62.98	74.17	0.89	3.32	0.83	0.78	0.77	
Trust net purchases	9.66	6.08	226.39	-197.84	5.04	33.82	0.60	9.25	0.45	0.39	0.26	
Individual purchases	1196.72	1010.39	4859.04	30.65	624.69	825.24	1.31	5.17	0.89	0.84	0.82	
Individual sales	1233.22	1078.94	4534.86	28.43	643.74	831.54	1.16	4.47	0.89	0.85	0.83	
Individual net purchases	-30.51	-32.87	587.79	-691.38	-19.06	173.81	0.03	4.29	0.16	0.10	0.04	
2000s Equity and Exchange	2000s Equity and Exchange Rate Returns											
TOPIX	-0.1227	0.1026	9,2469	-22.0185		2.9393	-0.94	8.72	-0.06	0.04	-0.03	
S&P 500	-0.0528	0.0958	11.3559	-20.0837		2,7847	-0.86	10.07	-0.06	0.06	-0.09	
JPY	-0.0186	0.0208	4.5521	-7.5236		1.4609	-0.37	4.42	-0.07	0.06	-0.03	
2010s Equity Transactions												
Total purchases	10170 40	10462.02	22617 75	2049 70	4790 12	2026 67	0.16	2.42	0.77	0.69	0.69	
Total calos	10167.24	10466.02	23664.20	2040.79	4779.60	2024 44	0.10	2.42	0.77	0.60	0.00	
Not purchases	2 25	2 11	20004.00	2047.50	1.52	17 20	0.10	7.99	0.22	0.05	0.00	
Foreign purchases	5961.64	6160.41	14896 54	1020.23	2801.07	2545.00	0.40	2 20	0.55	0.73	0.00	
Foreign sales	5030 58	6214 47	15535.88	844 97	2787 37	2574 30	0.20	2 33	0.81	0.74	0.72	
Foreign net nurchases	31.06	17.93	1535.62	-1193 50	14 60	289 11	0.23	6.27	0.44	0.30	0.18	
Financial purchases	417 12	402 15	1229.02	50.77	196.05	149 76	1.02	6.05	0.48	0.30	0.27	
Einancial sales	421.62	406.18	1179.05	49.61	198 16	155.32	0.99	5.68	0.47	0.37	0.37	
Financial net purchases	-4.49	-6.39	487.89	-543.13	-2.11	116.46	-0.14	5.15	0.61	0.45	0.37	
Trust purchases	196.11	187.37	527.98	21.28	92.17	88.32	0.56	2.97	0.69	0.62	0.59	
Trust sales	195.97	184.74	537.65	19.70	92.11	91.58	0.71	3.46	0.71	0.61	0.60	
Trust net purchases	0.14	0.74	205.39	-223.45	0.07	51.88	-0.38	6.16	0.40	0.17	0.07	
Individual purchases	1677.21	1660.68	6855.67	351.73	788.29	775.06	1.46	8.95	0.78	0.69	0.66	
Individual sales	1742.05	1699.22	6456.86	303.72	818.76	819.34	1.29	7.37	0.77	0.68	0.65	
Individual net purchases	-64.83	-47.90	746.69	-1124.51	-30.47	237.41	-0.47	5.03	0.31	0.11	0.01	
2010s Equity and Exchange	Rate Returns											
TORIX	0 1029	0 2799	9 4011	12 4942		2 6109	0.62	4.01	0.02	0.00	0.06	
S&P 500	0.1020	0.3700	7 1 284	-13.4642		1 0800	-0.02	4.91	-0.11	0.00	-0.05	
IPY	0.0327	0.0635	4 2261	-4 8477		1 3253	-0.10	3.54	-0.02	-0.01	0.00	
31.1	0.0021	0.0000	2201	4.0411		1.3233	0.10	5.54	0.02	0.01	0.00	

#### Supporting Evidence – Data Correlations

	Foreign	Financial	Trust	Indiv.	ΤΟΡΙΧ	S&P 500	Foreign	Financial	Trust	Indiv.	ΤΟΡΙΧ	S&P 500
	1980s						1990s					
Financial Trust Indiv. TOPIX S&P 500 USD/JPY	-0.24*** -0.37*** -0.43*** 0.33*** 0.25*** -0.10**	0.01 -0.04 -0.21*** -0.15*** 0.12***	-0.20*** 0.01 0.03 -0.04	-0.29*** -0.19*** 0.14***	0.37 <sup>***</sup> -0.16 <sup>***</sup>	-0.04	-0.49**** -0.27*** -0.29*** 0.24*** 0.11*** 0.02	0.15 <sup>***</sup> -0.14 <sup>***</sup> -0.30 <sup>***</sup> -0.13 <sup>***</sup> 0.00	0.06 -0.10** -0.05 -0.04	-0.26*** -0.17*** -0.04	0.33 <sup>****</sup> -0.07	0.11**
	2000s						2010s					
Financial Trust Indiv. TOPIX	-0.55*** -0.25*** -0.56*** 0.48***	0.30*** 0.17*** -0.18***	0.07 <sup>*</sup> -0.03	-0.64***			-0.45*** -0.21*** -0.63*** 0.51***	0.43 <sup>***</sup> 0.16 <sup>***</sup> -0.10 <sup>**</sup>	0.19 <sup>***</sup> -0.11 <sup>**</sup>	-0.75***		
S&P 500 USD/JPY	-0.04	-0.12	-0.02	-0.34 -0.09*	0.52	0.22***	0.28	-0.06 -0.09*	-0.06 -0.12***	-0.49 -0.44 <sup>***</sup>	0.56	0.28***

Note: Significant at 1% shown by \*\*\*, at 5% shown by \*\*, at 10% shown by \*.

- Correlations between FIs' trades and global financial variables have increased over time as the Japanese market has become more internationally integrated (lower correlations highlighted in green, higher correlations highlighted in red).
- Domestic investors' trades have negative or low correlations with global information.

#### Supporting Evidence – Dynamic Residual Corr.





Dynamic conditional correlations between the extended model residuals for relevant equations, estimated using the Diagonal BEKK model.

Correlations between the unanticipated trades of FIs, innovations in TOPIX and global stock and exchange rate information are relatively **high and stable in the 2000s and 2010s**.

#### **Robustness Check Using MSCI Kokusai**

	1990s	2000s	2010s		
(a) Long-Run Price Impact of Trade					
Foreign	1.50	1.02	0.69		
Financial	-0.41	0.14	0.18		
Trust	-0.04	-0.26	-0.19		
Individual	-1.11	-0.64	-0.67		
TOPIX	2.15	1.51	1.20		
Kokusai	1.74	2.33	1.78		
USD/JPY	-0.32	0.51	1.44		

(b) Variance Decomposition of the Efficient Price (%)

Foreign	19.74	10.96	6.14
Financial	1.48	0.22	0.43
Trust	0.02	0.71	0.49
Individual	10.77	4.26	5.85
TOPIX	40.55	23.97	18.88
Kokusai	26.55	57.18	41.43
USD/JPY	0.89	2.71	26.78

(c) Share of the Trade-related Component (%)

Foreign	61.66	67.88	47.57
Financial	4.63	1.37	3.32
Trust	0.05	4.38	3.77
Individual	33.65	26.37	45.34

Variable order is Kokusai, USD/JPY, Foreign, Financial, Trust, Individual, TOPIX.

- The results are similar if the MSCI Kokusai index is used to represent global equity returns rather than S&P 500.
- MSCI Kokusai is the MSCI World index ex Japan. It contains large and mid cap firms in 22 developed markets (Japan is excluded), has 1,326 consituents and covers approximately 85 percent of the free float-adjusted market capitalisation in each country.