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The Presence of Foreign Open-End Funds in Japan's Financial Markets

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The Presence of Foreign Open-End Funds in Japan's Financial Markets*

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Abstract

In recent years, the rising share of NBFIs (Non-Bank Financial Intermediaries) in the global financial system has been accompanied by an increase in the presence of foreign open-end funds in Japan's financial markets. This paper first documents the fund flows into equity, bond, and real estate open-end funds investing in Japanese financial assets, as well as their buying and selling behavior, using granular data sets. Similar to the findings by existing studies, we find there are significant outflows from foreign open-end funds investing in Japanese financial assets occurred during events such as the global financial crisis and the COVID-19 pandemic, as well as during episodes of rising policy interest rates abroad. These funds sell their assets, including their Japanese assets, in response to redemption requests. Next, we estimate the sensitivity of asset prices in Japan's stock and REIT markets to asset sales by market participants to understand the impact of trading by foreign open-end funds on Japan's financial markets. The estimated sensitivity is statistically significantly positive and its magnitude is found to be close to estimates for the United States reported in the literature. These findings together imply that outflows from foreign open-end funds could affect asset prices in Japan's financial markets through asset sales during periods of stress originating abroad or when uncertainty in domestic financial markets rises.

JEL classification: G01, G11, G12, G15, G23.

Keywords: *global investment funds, NBFIs, fund flows, price impact.*

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1. Introduction

In recent years, the presence of Non-Bank Financial Intermediaries (NBFIs) in the global financial system has expanded significantly. This growth has been primarily driven by investment funds, particularly open-end funds, such as U.S. mutual funds, which account for a substantial proportion of the investment funds[1]. In Japan as well, foreign open-end funds have come to hold a significant share of assets in financial markets, with their asset holdings exceeding 10% of the market in the stock and REIT markets[2].

While these open-end funds must always be able to accommodate investors' redemption requests and thus face risks on the liability side, the assets they hold include investments in less liquid assets, which could result in liquidity mismatches[3]. These funds typically hold liquid assets to prepare for redemptions. However, in times of market stress, if large-scale redemption requests are concentrated within a short period due to heightened investor liquidity demands, the funds may be forced to respond not only by using cash on hand but also by selling less liquid assets. Furthermore, if the sale of these less liquid assets leads to further price declines, the losses on the fund's holdings would result in losses for investors who continue to hold their investments without redeeming. In times of stress, this dynamic creates an incentive for investors, anticipating losses, to redeem more quickly. When this mechanism is at work, redemption pressures may be amplified, leading to fire sales of assets and sharp declines in asset prices[4].

As has been pointed out, there have been past cases of foreign crises where the sale of assets by open-end funds are considered to have amplified market fluctuations. In particular, numerous studies have analyzed the trends of open-end funds during the initial phase of the COVID-19 pandemic, when investors became risk-averse and demand for cash surged. For example, FSB (2020) conducts a holistic review of the market turmoil in the aftermath of the COVID-19

[1] FSB (2024b) and Oishi, Kobayashi, and Sugihara (2025) indicate that investment funds, particularly open-end funds, have accounted for a significant portion of the expansion of NBFIs in the global financial system in recent years.

[2] In this paper, open-end funds established overseas are defined as "foreign open-end funds," and open-end funds established in Japan are excluded from the analysis. For information on the presence of foreign open-end funds in Japan's financial markets, refer to BOJ (2025) and Eguchi, Okubo, Yamamoto, and Washimi (2025).

[3] The structural vulnerabilities inherent in open-end funds had been widely pointed out even before the COVID-19 pandemic. In 2017, the Financial Stability Board (FSB) published "Policy Recommendations to Address Structural Vulnerabilities from Asset Management Activities," highlighting the potential mismatch between the liquidity of assets held by funds and the ability of investors to redeem their investments on a daily basis, and proposing measures to address this vulnerability.

[4] Based on a model that takes into account the impact of fire sales, Hogen, Kasai, and Shinozaki (2025) estimate the spillover effects (interconnectedness) between jurisdictions and asset classes. They also point out that, since the global financial crisis, the interconnectedness effects have been amplified significantly, both domestically and internationally.

pandemic and emphasizes that substantial fund redemptions occurred, especially from bond funds and funds investing in emerging markets. Claessens and Lewrick (2021) analyze fund inflows and outflows by fund characteristics and show that, in March 2020, funds with a high proportion of less liquid or relatively high-risk assets, funds with higher institutional investor ownership compared to household investors, and funds primarily investing in emerging markets experienced larger outflows[5]. Similarly, IMF (2022) discusses the unprecedented outflows that occurred during the COVID-19 pandemic, particularly in emerging market funds. Dekker et al. (2024a) analyze fund flows in open-end funds in Europe during the COVID-19 pandemic, highlighting that funds investing in relatively illiquid high-yield bonds experienced larger outflows, and that the reduction in cash buffers prior to the COVID-19 pandemic amplified the crisis.

On the other hand, there is limited prior research on the trends in open-end funds investing in Japanese financial assets and their impact on the financial markets. Hogen and Koide (2022) use high-granularity data on fund location and the asset allocation of investment funds to capture cross-border flows into real estate funds. They estimate the impacts of global financial and economic changes on investment flows and real estate prices in regions that serve as investment destinations, including Japan. Okamoto (2020) and Kankawa (2020) analyze the impact of the trading behavior of foreign investors on Japan's government bond market during the initial phase of the COVID-19 pandemic. In particular, Okamoto (2020) examines the effects of the rapid position adjustment by foreign investors on the government bond market and Kankawa (2020) empirically analyzes the factors determining the investment behavior of foreign investors engaging in arbitrage between Japan's government bonds with currency hedging and U.S. Treasury bonds, using data broken down by investor type. Koide, Hogen, and Sudo (2022) show that the degree of overlap between Japanese regional financial institutions and investment funds, measured by the correlation of returns on securities held, has been trending upwards. Moreover, they point out that the market value of the securities portfolios of financial institutions that have greater overlap with funds tend to respond more strongly during periods of stress in global financial markets, such as when large-scale redemptions occur in foreign funds. In addition, Japan's FSA has recently begun to conduct a monitoring survey of domestic investment funds, organizing data on exposures, liquidity, and leverage (FSA, 2025). However, to the best of the authors' knowledge, there is no comprehensive research that uses high-granularity data to specifically examine fund flows into foreign open-end funds investing in Japan and the impact of subsequent asset sales on Japan's financial markets.

[5] The data used in this study does not include information about fund investors, so the impact of differences in investor composition is not analyzed. In a prior study analyzing the impact of investor composition on fund flows, Allaire et al. (2023) point out that bond and equity funds with high ownership ratios by other funds experienced larger outflows in March 2020 compared to funds with higher household ownership ratios.

This paper examines the impact of stress events abroad on asset prices in Japan's financial markets by conducting an analysis in two stages: 1) an analysis of fund flows into foreign open-end funds and their investment behavior, and 2) an analysis of the impact of fund flows on price determination in the stock and REIT markets. First, in stage 1, we conduct a detailed fact-finding and factor analysis of fund flows into equity, bond, and real estate funds that invest in Japan, as well as the trading behavior related to Japanese financial assets using high-granularity data on foreign open-end funds. The key takeaways are as follows: First, regarding fund flows, during shocks such as the global financial crisis in September 2008 and the initial phase of the COVID-19 pandemic in March 2020, there was an outflow from funds in a number of asset classes. In particular, bond funds saw relatively large outflows. A panel analysis using fund flows as the dependent variable showed that stress originating abroad and deteriorating investor sentiment led to outflows from open-end funds investing in Japan. On the other hand, during the market turmoil in August 2024, no significant outflows were observed, which supports the view of IMF (2024) that the turmoil was largely driven by the position adjustments of hedge funds[6].

Second, regarding the sale of Japanese assets by foreign open-end funds, particularly in the initial phase of the COVID-19 pandemic, we document that asset sales were observed across various financial markets in Japan as a result of fund outflows. In particular, bond funds, such as government bond funds that shifted to U.S. government money market funds and mixed bond funds that invest in various bonds, exhibited significant sales of Japanese assets[7]. A detailed look at the sales of Japanese assets by mixed bond funds reveals that primarily government bonds were sold. This implies that foreign open-end funds respond to redemption requests by selling high-liquid assets.

In stage 2, to examine the impact of asset sales by foreign open-end funds on Japan's financial markets, we estimate the price sensitivity in the stock and REIT markets to the buying and selling behavior of market participants, following the methodologies of previous studies, such as Gabaix and Koijen (2023) and Amihud (2002). While conventional asset pricing theory suggests that price sensitivity should be low, we argue that the price sensitivity of Japan's stock and REIT markets is relatively large. This result is consistent with recent empirical studies, including Gabaix and Koijen (2023).

[6] In early August 2024, weaker-than-expected economic indicators in the U.S. triggered concerns about an economic slowdown, leading to a rapid decline in the dollar and global stock prices. A global depreciation of the dollar and policy changes by the Bank of Japan also led to a reversal of the previously one-sided depreciation of the yen, while domestic financial markets temporarily saw a sharp drop in stock prices. According to IMF (2024) and BOJ (2024), the unwinding of positions by hedge funds, including an increase in short sales of stocks in the futures market, likely had a significant impact on Japan's financial markets and asset prices during this period.

[7] Kawasumi and Kataoka (2020) and FSB (2020) note that, with the onset of risk-off sentiment among investors, there was a shift from bond funds and prime MMFs to government MMFs.

The structure of this paper is as follows: Section 2 outlines the composition of foreign open-end funds investing in Japan and the trends in their fund flows. In Section 3, we analyze the trading activity of these funds in Japanese assets. Section 4 provides estimation results of the price sensitivity in Japan's stock and REIT markets. Section 5 concludes the paper.

2. Fund Flows into Foreign Open-end Funds Investing in Japan

2.1 Composition of Open-end Funds

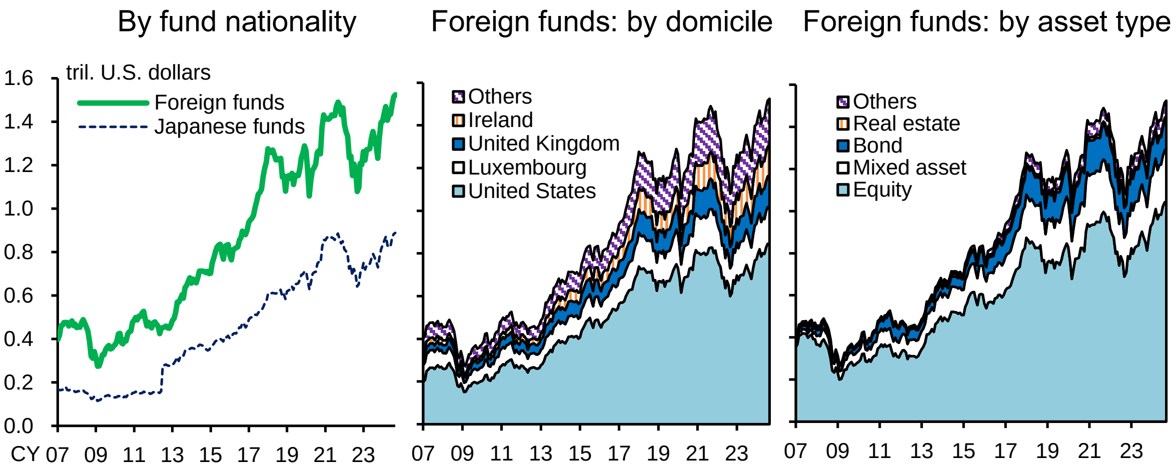
Overview of the data

This paper uses high-granularity data from LSEG Lipper on foreign open-end funds for analysis. This database includes information on approximately 900,000 share classes of domestic and international open-end funds (including merged or redeemed funds), along with attribute information such as asset types and fund domicile. It also contains financial data such as total net assets (TNA) and the cash holding ratio, as well as details on country-level investment allocations and asset holdings. The analysis covers the period from January 2007 to September 2024, using monthly frequency.

Composition of open-end funds

Using the above data, we observe that the amount of Japanese assets held by open-end funds has been trending upwards since the global financial crisis, particularly among foreign-domiciled funds (Figure 1). In terms of fund domicile, U.S.-domiciled funds account for more than half of total assets, with funds domiciled in Luxembourg, the U.K., and Ireland also holding notable shares. Regarding asset types, equity funds account for approximately 70% of the total, while mixed-asset and bond funds also have relatively large shares.

Figure 1: Holdings of Japanese assets by open-end funds



Note: 1. Shows the sum of Japanese asset holdings of individual funds (estimated as total net assets multiplied by the percentage of Japanese asset holdings). Latest data as of September 2024.
2. In the middle chart, domicile refers to the fund's country of establishment. In the right chart, "mixed asset" refers to funds that invest in both stocks and bonds. "Real estate" refers to funds that invest mainly in REITs.

Source: LSEG Lipper.

2.2 Fund Flows into Foreign Open-end Funds

Estimation of fund flows

Next, we analyze the fund flows into foreign open-end funds. The changes in fund assets noted in the previous section can be broken down into two components: 1) changes due to fluctuations in the market value of the assets held, and 2) increases or decreases due to investor fund flows (inflows and outflows).

$$TNA_t - TNA_{t-1} = TNA_{t-1} * (\frac{P_t}{P_{t-1}} - 1) + flow_t$$

Here, TNA_t represents the total net assets of the fund at time t, P_t represents the fund's price (net asset value per share) at time t, and $flow_t$ denotes the inflow of funds from investors from time t-1 to t.

By using the relationship above, we can estimate the fund flows by removing the effects of price fluctuations from the changes in asset values. The following analysis is based on fund flows calculated using the formula below.

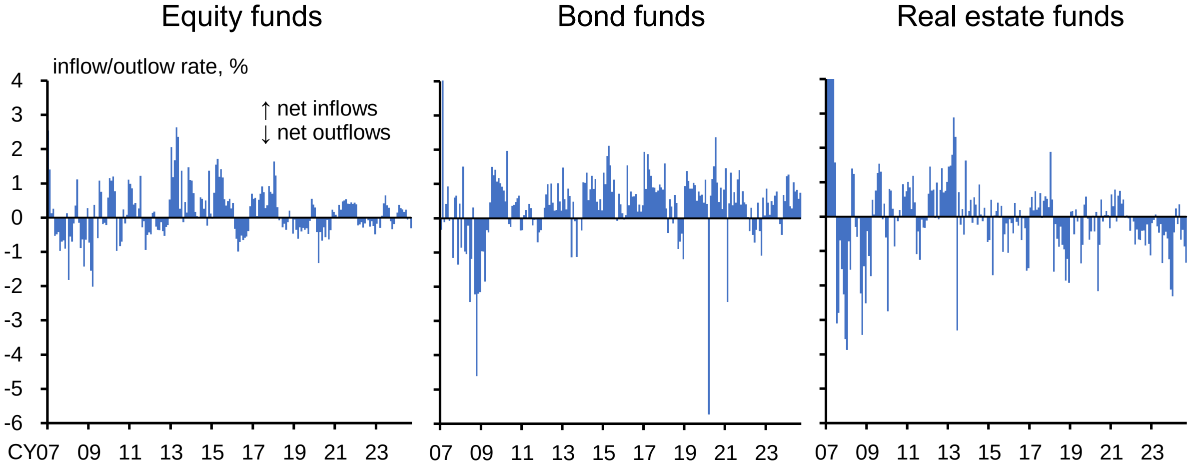
$$flow_t = TNA_t - TNA_{t-1} * \frac{P_t}{P_{t-1}}$$

Fund flows into foreign open-end funds by asset type

We now examine the fund flows into foreign open-end funds investing in Japan, broken down by asset type. We show that, for equity, bond, and real estate funds, fund sizes have been on an upward trend driven by inflows, as calculated using the method above. However, during times of market turmoil, such as the global financial crisis in September 2008, the initial phase of the COVID-19 pandemic in March 2020, and the start of the U.S. interest rate hike cycle in March 2022, there were significant outflows across various asset types (Figures 2 and 3). In particular, bond funds experienced large outflows during the global financial crisis and the initial phase of the COVID-19 pandemic.

On the other hand, during the market turmoil of August 2024, no significant outflows were observed in any asset type. To better understand the movements during early August, we examine the fund flows of the 30 largest funds in the equity, bond, and real estate categories using daily data. While a slight outflow was observed in equity funds during the initial stage of the turmoil, it quickly reversed into inflows. Bond funds consistently showed net inflows during this period (Figure 4)[8]. This suggests that the shock in August 2024 was primarily driven by position adjustments by hedge funds in the futures market, and it appears to be a different type of shock compared to the rapid surge in liquidity demand and the heightened stress in the real economy that occurred during the initial phase of the COVID-19 pandemic in March 2020.

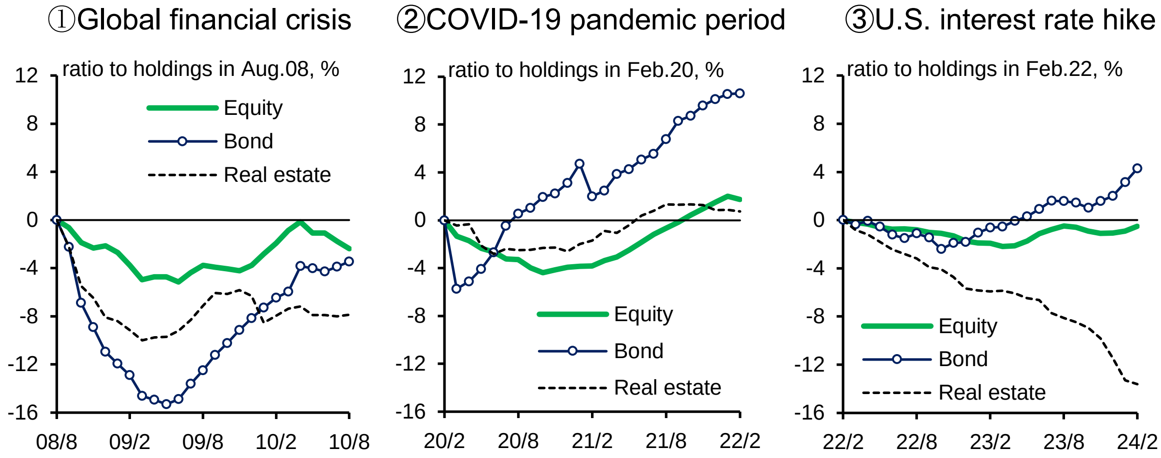
Figure 2: Asset type-based fund flow (1)



Note: 1. Covers foreign funds investing in Japan. Weighted average based on the value of Japanese asset holdings.
2. Latest data as of September 2024.
Source: LSEG Lipper.

[8] The daily data used in this study are from the LSEG Global Fund Flows database, which contains high-frequency data (weekly and daily) on fund flows for each fund.

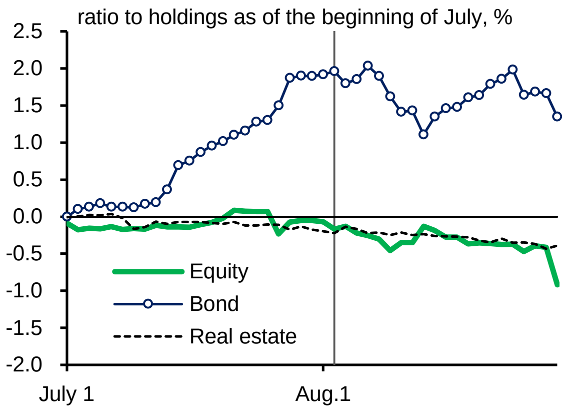
Figure 3: Asset type-based fund flow (2)



Note: 1. Covers foreign funds investing in Japan. Weighted average based on the value of Japanese asset holdings.
2. Cumulative change over a 24-month period following the shock, with the month before the shock as the starting point.

Source: LSEG Lipper.

Figure 4: Foreign fund flows during the market turmoil in August 2024



Note: 1. For foreign funds investing in Japan, the aggregated values are based on the top 30 holdings of Japanese assets, with data available on a daily basis (weighted average by Japanese asset holdings).
2. The cumulative fund flows since July (on a daily basis) are divided by Japanese asset holdings at the beginning of July.
3. The vertical line in the figure represents August 2, 2024 (the day the U.S. employment report for July was released).
4. Latest data as of end-August 2024.

Source: LSEG Lipper.

Fund flows into foreign open-end funds by fund characteristics

In addition to asset types, it has been pointed out that the characteristics of the assets held by funds, such as liquidity, also influence fund flows. Falato et al. (2021) and Jiang et al. (2022) conclude that funds with a higher weight of investments in less liquid assets experienced larger outflows during the initial phase of the COVID-19 pandemic.

Building on these prior studies, in this section we analyze the factors influencing fund inflows and outflows for foreign open-end funds investing in Japan by including the characteristics of each fund as explanatory variables in a panel regression model[9]. Specifically, the ratio of fund flows to total net assets (TNA) at time t-1 is defined as follows, and this ratio is used as the dependent variable in the model below. The regression is estimated for March 2020, when large fund outflows were observed, as well as for other periods.

$$flow\ rate_{i,t} \equiv {flow_{i,t}}/{TNA_{i,t-1}}$$

$$flow\ rate_{i,t} = TimeDummy_t + \alpha + \beta * TNA_{i,t-1} + \gamma * fund\ age_{i,t-1} + \delta * fund\ return_{i,t-1} + \varepsilon * controls_{i,t-1} + \epsilon_{i,t}$$

Following the methodology used by Claessens and Lewrick (2021) and other studies on foreign funds, we include explanatory variables such as the fund's size (log value), years in operation (fund age), and fund return. For equity funds, we also include a "small and mid-cap dummy" for funds primarily investing in small and mid-cap stocks, as well as industry dummies. For bond funds, we include the "Non-IG ratio," which represents the proportion of assets with ratings below BBB. For real estate funds, we include a dummy variable for the fund's domicile (U.S. domicile dummy), among other characteristics. These variables have all been identified in prior research as factors related to fund outflows during times of crisis[10].

The results of the panel regression are shown in Figure 5. Looking at the results for equity funds, we observe that small and mid-cap focused funds, which tend to hold less liquid assets, experienced larger outflows during the initial phase of the COVID-19 pandemic. Additionally, while the fund size typically has a significantly negative effect under normal conditions, this pattern was not observed during the COVID-19 pandemic. It suggests that relatively small funds

[9] The characteristics used as explanatory variables are lagged one-period relative to the dependent variable, which is the fund flow. In other words, the analysis observes how the characteristics of the fund from the previous month affect the fund flows of the current month.

[10] The impact of the COVID-19 pandemic on business performance and stock prices is expected to vary significantly by industry. Therefore, for funds where investments predominantly focus on industries that appear to have benefited from the COVID-19 pandemic, such as Health Care, Consumer Staples, and Communication Services, industry dummy variables are included.

experienced greater capital outflows compared to normal periods.

Similarly for bond funds, the coefficient of the Non-IG ratio expanded significantly in absolute terms in March 2020, suggesting that funds with higher ratios of lower-rated assets (i.e., less liquid assets) experienced larger redemptions compared to normal times.

Furthermore, regarding real estate funds, the U.S. domicile dummy coefficient suggests that U.S.-domiciled funds had larger outflows immediately following the COVID-19 pandemic compared to funds domiciled in Europe or other regions. In this regard, ESMA (2020) shows that the outflows from real estate funds located in Europe were relatively limited. Hogen and Koide (2022) point to institutional factors such as lock-up periods following purchase and advance notice requirements for redemptions as potential reasons for this. Additionally, Grill et al. (2022) suggest that real estate funds in Europe implemented redemption suspensions to a significant extent, which may have helped to mitigate the outflows.

Figure 5: Panel estimation results

Equity funds

		Dependent variable: flow rate		
		Mar. 20	Excluding Mar. 20	Mar. 20 ~ May 20
Explanatory variables	Cash holding ratio	0.011	0.044***	0.033***
	Total Net Assets	0.031	-0.013***	0.092***
	Total return	0.025***	0.045***	0.034***
	Fund age	-0.092***	-0.114***	-0.104***
	Small and mid-cap dummy	-0.340*	-0.188***	-0.564***
	Industry dummy	0.649	0.163***	2.117***
	Constant	0.062	1.986***	-0.043
Time fixed effects		No	Yes	Yes
Adj. R^2		0.008	0.034	0.019
Sample size		17,268	2,803,034	52,542

Bond funds

		Dependent variable: flow rate	
		Mar. 20	Other periods
Explanatory variables	Cash holding ratio	-0.059**	0.007***
	Non-IG ratio	-0.040***	-0.002***
	Total Net Assets	-0.421***	-0.049***
	Distribution yield	-0.187***	0.038***
	Fund age	0.024	-0.133***
	Constant	-1.086***	2.950***
Time fixed effects		No	Yes
Adj. R^2		0.023	0.034
Sample size		8,877	1,341,880

Real estate funds

		Dependent variable: flow rate		
		Mar. 20	Excluding Mar. 20	Mar. 20 ~ May 20
Explanatory variables	Cash holding ratio	-0.325***	-0.016***	-0.127***
	Total Net Assets	0.090	-0.065***	0.084*
	Total return	-0.008	0.031***	-0.016
	Fund age	-0.157***	-0.141***	-0.128***
	U.S. domicile dummy	-0.832*	0.031	-0.850***
	Constant	1.723***	23.738***	0.743*
Time fixed effects		No	Yes	Yes
Adj. R^2		0.054	0.044	0.020
Sample size		817	130,719	2,453

Note: The estimation period is from January 2007 to September 2024. ***, **, and * indicate statistical significance at the 1 percent, 5 percent, and 10 percent levels, respectively.

Source: LSEG Lipper.

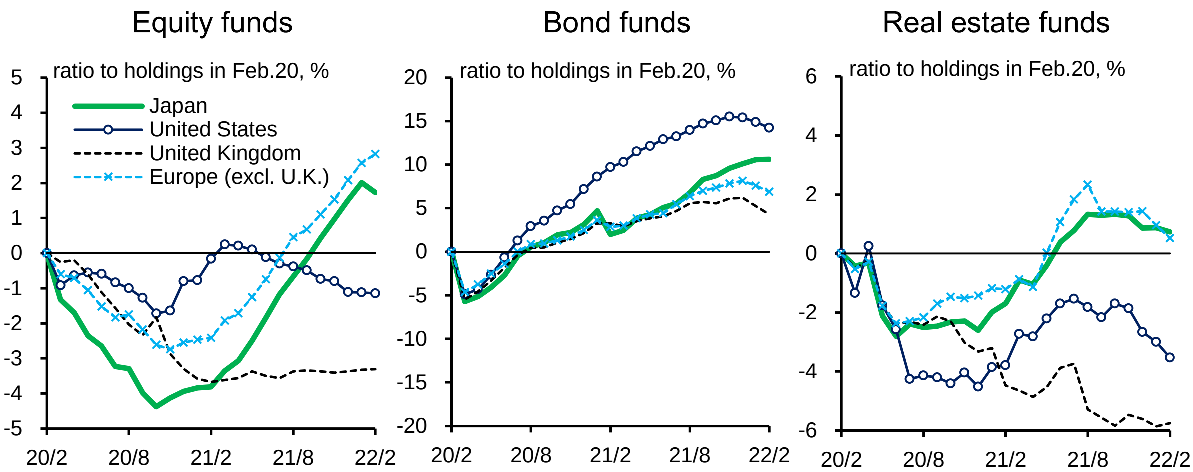
2.3 Impact of Global Financial and Economic Environment on Fund Flows

Impact of the global financial and economic environment

As previously mentioned, we documented that foreign open-end funds investing in Japan faced significant outflows during events such as the global financial crisis and the initial phase of the COVID-19 pandemic. This suggests that global investor sentiment influences the flows of open-end funds investing in Japan. Comparing fund flows into funds investing in Japan with those into funds investing in other jurisdictions, we find that the flows of both follow a generally similar trend, particularly for bond funds, where an outflow occurs immediately after the stress event, followed by a gradual shift towards inflows (Figure 6). Moreover, when comparing the flows into funds investing in Japan and those investing in the U.S., we observe a positive correlation for all asset types, with a particularly high correlation for bond and real estate funds (Figure 7) [11]. Additionally, we find that a principal component analysis of the fund flows into foreign open-end funds investing in Japan, the U.S., the U.K., and Europe shows that, especially during shock events like the initial phase of the COVID-19 pandemic, a common global factor explains most of the fund flows into funds investing in Japan (Figure 8) [12].

This reflects the fact that foreign open-end funds investing in Japan are highly influenced by global investor sentiment. When examining the breakdown of funds investing in Japan by investment region, we find that very few funds focus exclusively on Japan. Instead, global funds that invest across multiple regions, including Japan, hold the largest share (Figure 9). This suggests that when global investor sentiment worsens, fund outflows may occur even in cases where the shock is not directly related to Japan, as global investors adjust their portfolios.

Figure 6: Comparison with fund flows investing in overseas jurisdictions

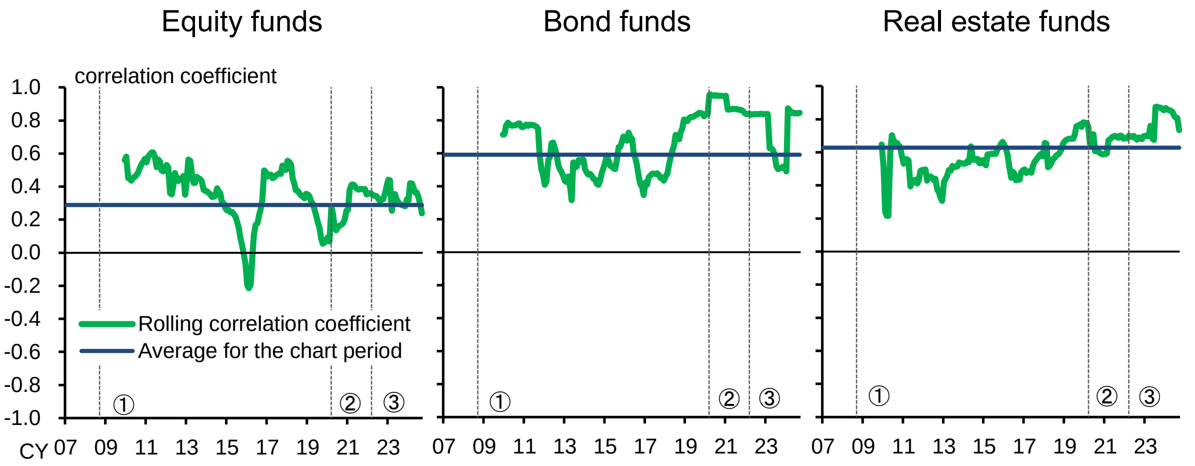


Note: Fund flows into funds investing in "Japan," "United States," "United Kingdom," and "Europe (excl. UK). " Cumulative change from March 2020. Weighted average based on asset holdings in each jurisdiction.
Source: LSEG Lipper.

[11] The strength of these correlations is influenced by global funds that invest in both the U.S. and Japan and account for a large share of the market. The flows from these funds are counted in both the funds investing in Japan and those investing in the U.S.

[12] The number of common factors extracted was determined using the panel criteria of Bai and Ng (2002).

Figure 7: Correlation with fund flows into funds investing in the U.S.



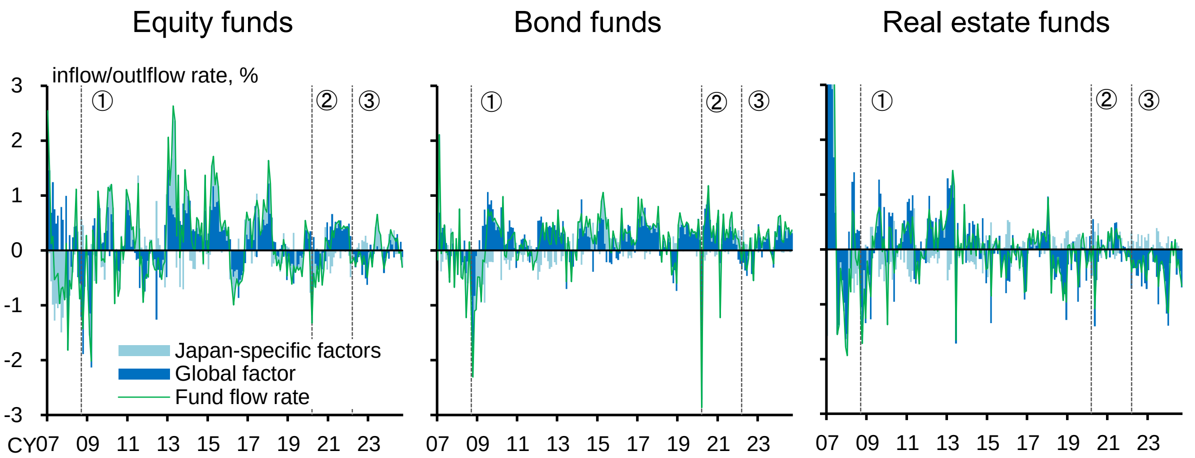
Note: 1. The correlation between the fund flow rates of foreign funds investing in Japan and those investing in the US.

2. The estimation period is from January 2007 to September 2024. "Rolling correlation coefficient" represents the sequentially calculated monthly correlation coefficient, rolling over a 36-month window.

3. Points ①, ②, and ③ in the graph indicate the global financial crisis (September 2008), the COVID-19 Shock (March 2020), and the start of the US interest rate hike cycle (March 2022), respectively.

Source: LSEG Lipper.

Figure 8: Contribution of global factor extracted through principal component analysis

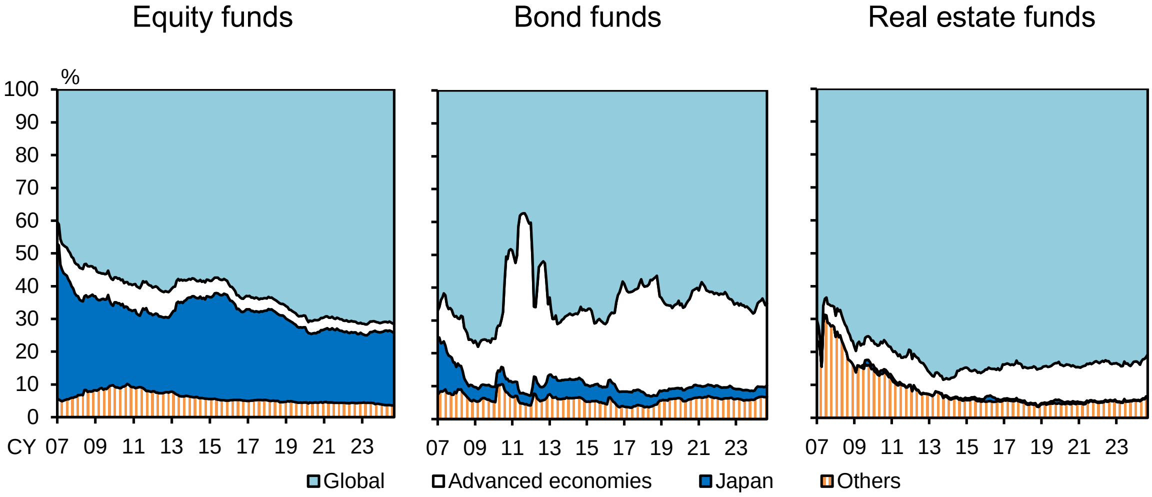


Note: 1. Principal component analysis was performed on the fund flows of foreign funds investing in Japan, US, UK, and Europe (excluding UK). The first principal component is considered the global factor.

2. The vertical axis represents the flow rate of funds investing in Japan. Points ①, ②, and ③ in the graph indicate the global financial crisis (September 2008), the COVID-19 Shock (March 2020), and the start of the US interest rate hike cycle (March 2022), respectively.

Source: LSEG Lipper.

Figure 9: Investment regions of foreign open-end funds



Note: 1. Shows the composition of foreign open-end funds by main investment region (share in the total value of Japanese asset holdings).
2. "Global" and "Advanced economies" are on a reported basis. "Japan" refers to funds that invest 50% or more of their total net assets in Japan.

Source: LSEG Lipper.

Impact of the global financial and economic environment on fund flows

Next, building on the panel estimation from the previous section, we conduct a panel analysis incorporating macro-financial variables to estimate how the global financial and economic environment impacts the fund flows into open-end funds investing in Japan. Specifically, we incorporate U.S. interest rates, the National Financial Conditions Index (NFCI) provided by the Federal Reserve Bank of Chicago, and the U.S. dollar index (Advanced Foreign Economies (AFE) Dollar Index) as variables that are considered to have a significant impact on global investor behavior.

$$flow\ rate_{i,t} = \alpha + \beta * US\ interest\ rate_t + \gamma * NFCI_t + \delta * AFE\ dollar\ index_t$$
$$+\varepsilon * controls_{i,t-1} + \epsilon_{i,t}$$

The estimation results show that changes in external factors such as rising U.S. interest rates, a worsening NFCI, and a stronger U.S. dollar lead to outflows from foreign open-end funds investing in Japan (Figure 10)[13]. By decomposing the factors contributing to past fund flows, we find that the deterioration of the NFCI in March 2020 and the rise in U.S. interest rates since March 2022 were major contributors to outflows (Figure 11). This suggests that even in the

[13] In model 3 for bond funds, the interaction term between the Non-IG ratio and the NFCI is included in the estimation. This variable is significantly negative, suggesting that when the global financial environment deteriorates, funds investing in relatively illiquid assets experience non-linear increases in outflows.

absence of stress originating in the Japanese market, global shocks triggered by external factors can lead to portfolio adjustments by global investors, resulting in fund outflows from open-end funds investing in Japan.

Figure 10: Panel estimation results with macroeconomic financial variables

Equity funds

		Dependent variable: flow rate		
		Model 1	Model 2	Model 3
Explanatory variables	Cash holding ratio	0.049***	0.052***	0.049***
	Total Net Assets	-0.001	0.003*	-0.001
	Total return	0.023***	0.024***	0.023***
	Fund age	-0.116***	-0.118***	-0.116***
	Small and mid-cap dummy	-0.167***	-0.159***	-0.167***
	U.S. federal funds rate (deviation from average)	-0.087***	—	—
	U.S. federal funds rate (deviation from the trend)	—	-0.077***	—
	U.S. federal funds rate (level)	—	—	-0.087***
	AFE dollar index	-0.028***	-0.018***	-0.028***
	NFCI	-0.449***	-0.531***	-0.449***
	Constant	1.155***	1.139***	1.275***
Adj. R^2		0.023	0.022	0.023
Sample size		2,820,302	2,820,302	2,820,302

Bond funds

		Dependent variable: flow rate		
		Model 1	Model 2	Model 3
Explanatory variables	Cash holding ratio	0.012***	0.010***	0.012***
	Non-IG ratio	-0.004***	-0.005***	-0.004***
	Total Net Assets	-0.021***	-0.033***	-0.021***
	Distribution yield	0.047***	0.064***	0.045***
	Fund age	-0.140***	-0.136***	-0.140***
	U.S. federal funds rate (month-to-month diff.)	-0.977***	—	-1.000***
	U.S. federal funds rate (deviation from average)	—	-0.140***	—
	AFE dollar index	-0.061***	-0.107***	-0.059***
	NFCI	-4.355***	-3.688***	-3.028***
	Non-IG ratio × NFCI	—	—	-0.065***
	Constant	1.930***	1.934***	1.936***
Adj. R^2		0.022	0.022	0.023
Sample size		1,350,757	1,350,757	1,350,757

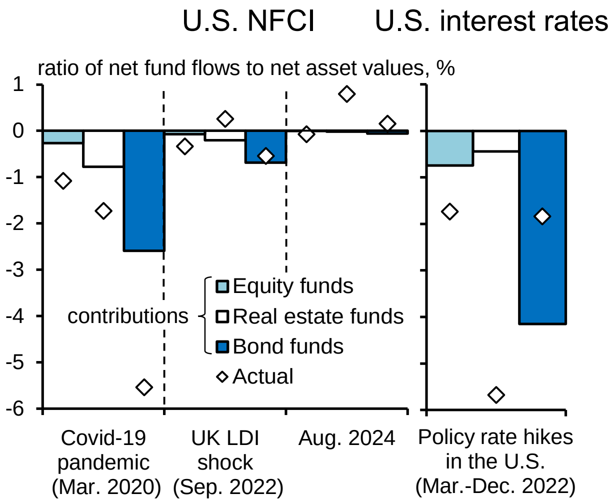
Real estate funds

		Dependent variable: flow rate		
		Model 1	Model 2	model 3
Explanatory variables	Cash holding ratio	-0.004	-0.003	-0.004
	Total Net Assets	-0.039***	-0.034***	-0.039***
	Total return	0.031***	0.032***	0.031***
	Fund age	-0.156***	-0.159***	-0.155***
	U.S. domicile dummy	0.125***	0.140***	0.124***
	U.S. federal funds rate (deviation from average)	-0.051***	—	-0.053***
	U.S. federal funds rate (deviation from the trend)	—	-0.008	—
	AFE dollar index	0.039**	0.045***	0.036**
	VIX	—	—	-0.005***
	NFCI	-1.301***	-1.359***	-0.743***
	Constant	1.268***	1.263***	1.280***
Adj. R^2		0.020	0.020	0.020
Sample size		131,536	131,536	131,536

Note: 1. Covers foreign funds investing in Japan. Total net assets (TNA) is logarithmic value. The Dollar Index is measured as the monthly change (nominal value), and both NFCI and VIX are measured as month-to-month changes. The explanatory variables, excluding macroeconomic variables, are lagged by one period.
2. The estimation period is from January 2007 to September 2024. ***, **, and * indicate statistical significance at the 1 percent, 5 percent, and 10 percent levels, respectively.

Source: Federal Reserve Bank of Chicago; Haver Analytics; LSEG Lipper.

Figure 11: Impact of deterioration in foreign financial conditions on net fund flows to open-end funds investing in Japan



Note: 1. The contribution of each variable to the change in net fund flows from the month preceding each event is calculated based on a panel regression using net fund flows as the dependent variable and fund attributes (return, size, and liquidity ratio) and macroeconomic indicators (U.S. short-term interest rates, U.S. NFCI, and U.S. dollar index) as the independent variables. The estimation period is from January 2007 to September 2024.

2. The left chart shows the flow rates (equity, real estate, and bond funds) and the estimated contributions of NFCI during each crisis period (March 2020, September 2022, and August 2024). Flow rates are measured as the difference from the value in the month prior to each crisis.

3. The right chart shows the fund flow rates (equity, real estate, and bond funds) from March to December 2022 and the contributions of U.S. interest rates (cumulative over the period) derived from the panel estimation.

4. Figures for net asset values are for the month preceding each event. The right-hand chart shows the cumulative values during the period.

Source: Federal Reserve Bank of Chicago; Haver Analytics; LSEG Lipper.

3. Trading Activity of Foreign Open-end Funds in Japanese Assets

3.1 Estimation of Asset Sales and Purchases by Foreign Open-end Funds

When funds flow into and out of foreign open-end funds, the funds buy and sell assets. However, the extent to which funds sell assets in proportion to their holdings, or prioritize certain assets, does not necessarily correspond directly to the inflows or outflows from investors. Therefore, this section analyzes the trading activities of foreign open-end funds in Japanese assets.

In the analysis, we first estimate the trading volumes of Japanese assets by each fund. As mentioned in the previous section, the changes in each fund's asset holdings include both the effect of price changes in the assets and the impact from buying and selling. By decomposing the fund's total net assets (TNA_t) into price (P_t) and quantity (Q_t), and considering the investment ratio in Japanese assets (denoted $JP\ ratio_t$), the change in holdings of Japanese assets ($\Delta JP\ asset\ holdings_t$) from period t-1 to period t can be expressed as follows:

$$\Delta JP\ asset\ holdings_t = TNA_t * JP\ ratio_t - TNA_{t-1} * JP\ ratio_{t-1}$$
$$= P_t * Q_t * JP\ ratio_t - P_{t-1} * Q_{t-1} * JP\ ratio_{t-1}$$
$$= P_{t-1} * (Q_t * JP\ ratio_t - Q_{t-1} * JP\ ratio_{t-1})$$
$$+(P_t - P_{t-1}) * Q_t * JP\ ratio_t,$$

where the first term on the right-hand side represents the change in holdings of Japanese assets excluding the impact of price changes, and the second term reflects the effect of price fluctuations. We extract the first term on the right-hand side as the amount of trading in Japanese assets ($JP\ asset\ trading_t$), as shown below:

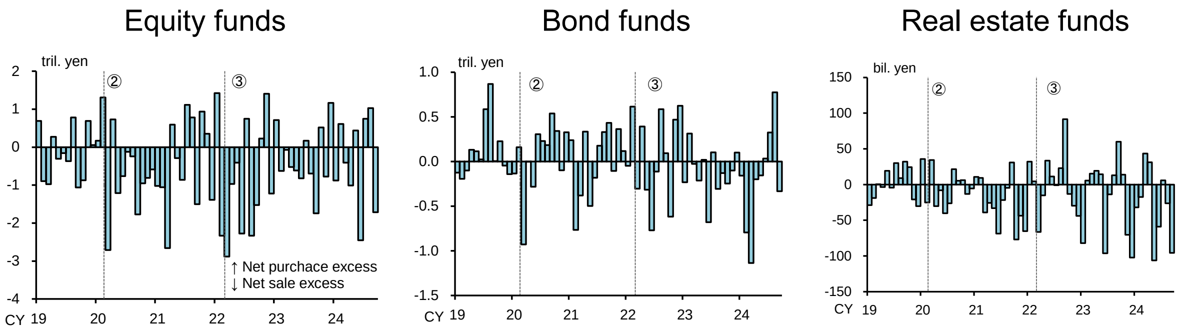
$$JP\ asset\ trading_t = P_{t-1} * Q_t * JP\ ratio_t - P_{t-1} * Q_{t-1} * JP\ ratio_{t-1}$$
$$= \frac{TNA_t}{\Delta P_t} * JP\ ratio_t - TNA_{t-1} * JP\ ratio_{t-1},$$

where $\Delta P_t = P_t / P_{t-1}$ is the price change from period t-1 to period t, and the values used for this calculation are taken from the previous section, which calculated the fund flows. For equity funds, where the price fluctuations can vary significantly across countries, we use the price change of funds with a Japan investment ratio exceeding 80% as a proxy variable.

When we examine the trading activity of foreign funds investing in Japanese financial assets by asset type using the equation above, we find that during times of large fund outflows globally, the funds also sell assets in Japan (Figure 12). Sales of Japanese assets were also large in the initial phase of the COVID-19 pandemic. This was especially true especially for bond funds, which saw the largest fund outflows. When comparing this trading behavior with the spot trading behavior of foreign investors in each market, we find that they generally move in the same direction during times of market shock, suggesting that asset sales by foreign open-end funds influence these movements (Figure 13).

When examining the investment ratio by country, categorized by asset type, we observe that for equity and real estate funds, the investment ratio in the U.S. has increased, while the investment ratios in Europe and Japan have declined. These trends did not change before and after the COVID-19 pandemic (Figure 14). In the case of real estate funds, particularly during the initial phase of the COVID-19 pandemic, while the sales of European assets were significant, the sales of Japanese assets were limited. This may reflect differences in the REIT market conditions across countries (Figure 15).

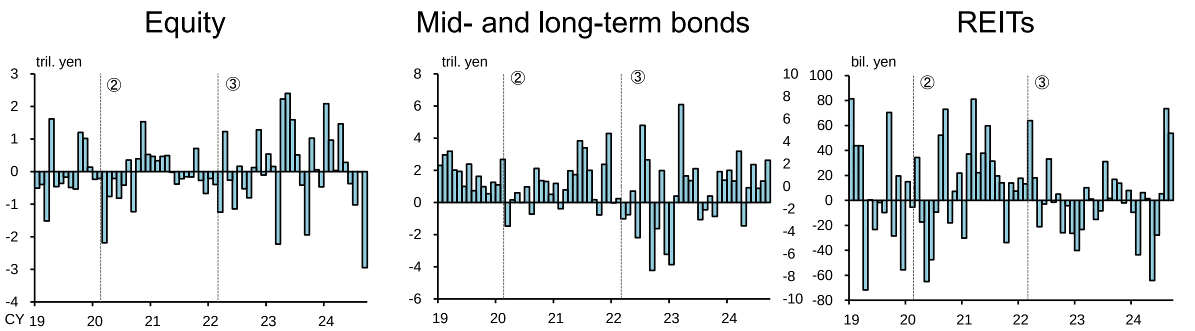
Figure 12: Foreign fund transactions in Japanese assets



Note: Covers foreign funds investing in Japan. Points ② and ③ in the graph indicate the COVID-19 Shock (March 2020), and the start of the US interest rate hike cycle (March 2022), respectively. Latest data as of September 2024.

Source: LSEG Lipper.

Figure 13: Foreign investor spot market transactions by market

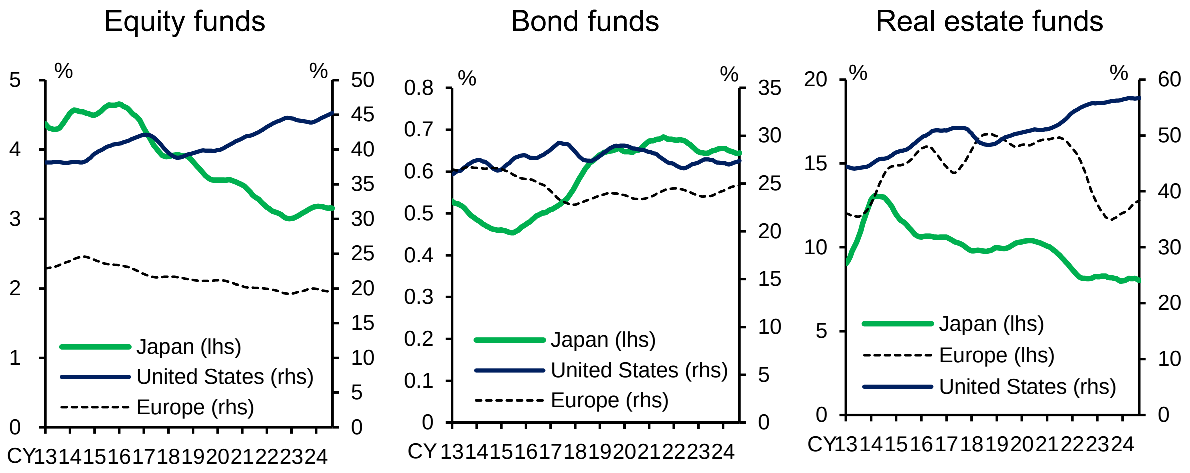


Note: 1. The left chart shows the net trading volume in the Tokyo Stock Exchange Prime Market (the Tokyo Stock Exchange First Section before March 2022).

2. The middle chart shows the net trading volume of coupon-bearing medium- and long-term government bonds.
3. The right chart shows the net trading volume of Real Estate Investment Trusts (REITs) listed on the Tokyo Stock Exchange.
4. The chart indicators ② and ③ correspond to the COVID-19 shock (March 2020) and the beginning of the US interest rate hike cycle (March 2022), respectively. Latest data as of September 2024.

Source: Japan Securities Dealers Association; Tokyo Stock Exchange.

Figure 14: Country-specific investment ratios by asset type

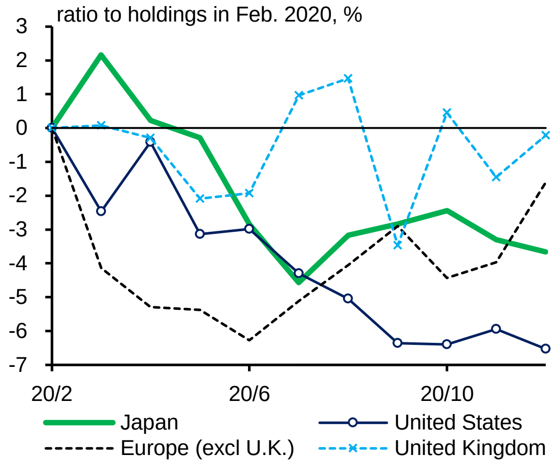


Note: 1. Shows median values. Europe is the combined value of the United Kingdom and Europe (excluding UK).

2. For funds where country-specific investment ratios are unavailable, it is assumed that the entire net asset value is invested in the "focus region" of each fund (the region they primarily invest in). For example, if the investment ratio for Japan is unavailable for funds A and B, and their focus regions are Japan and the US, it is assumed that Fund A invests 100% in Japan (i.e., Japan investment ratio = 100%) and Fund B invests 0% in Japan (i.e., Japan investment ratio = 0%). Covers foreign funds investing in Japan.

Source: LSEG Lipper.

Figure 15: Real estate funds' asset trading by jurisdiction



Note: The cumulative value of asset trading in each country since March 2020, divided by the asset holdings in each country as of February 2020. Latest data as of December 2020.

Source: LSEG Lipper.

3.2 Breakdown of Asset Sales in Bond Funds

In this section, we analyze the asset trading behavior of bond funds, which saw significant Japanese asset sales during the initial phase of the COVID-19 pandemic. First, by examining the asset sales by type of bond fund, we find that particularly funds investing in government bonds and various other bonds, such as mixed bond funds, sold Japanese assets (Figure 16)[14].

For mixed bond funds, an examination of asset sales among the top holders of Japanese assets reveals that, during this period, government bonds accounted for the majority of the asset sales (Figure 17). This suggests that these funds may have sold highly liquid assets to secure liquidity in response to redemption requests from investors. This finding is consistent with prior research on similar trends in other regions. Ma et al. (2022) analyze the trading behavior of U.S. bond funds during the COVID-19 pandemic and conclude that highly liquid assets were sold. Claessens and Lewrick (2021) similarly point out that bond funds, including those outside of the U.S., may have engaged in horizontal slicing, selling highly liquid assets during the COVID-19 pandemic[15].

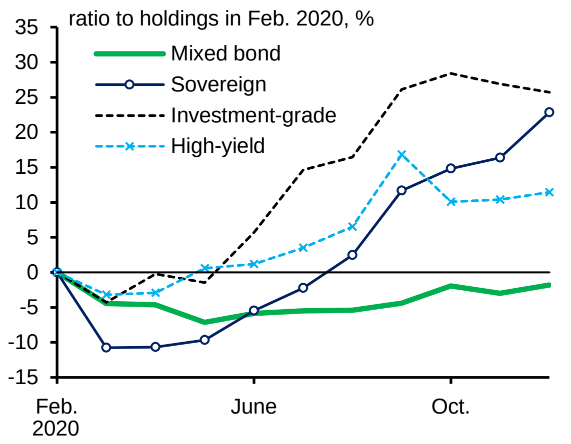
Additionally, when comparing the cash holding ratio of bond funds before and after the COVID-19 pandemic, we find that, particularly among high-yield bond funds, cash holdings increased significantly from January to March 2020 across all types of bond funds (Figure 18)[16]. Similar trends have been suggested in analyses focused on Europe. ECB (2022) indicates that bond funds investing in low-liquidity assets, in particular, increased their cash holdings during the COVID-19 pandemic, resulting in asset sales that exceeded the redemption requests. This suggests that in response to redemption requests, assets sales, including those with precautionary motives, may have amplified the impact on financial markets.

[14] Here, bond funds are categorized by the type of bonds they invest in. "Government bond funds" focus on government bonds, "IG bond funds" invest in investment-grade corporate bonds, "HY bond funds" target high-yield bonds, and "mixed bond funds" invest in a combination of these bonds.

[15] There are two liquidity management methods for open-end funds in response to redemption requests: horizontal slicing and vertical slicing. The former involves selling the most liquid assets first, while the latter involves selling assets in a way that does not alter the asset composition. Dekker et al. (2024b) note that open-end funds located in Europe held a significant amount of ETFs, which, due to their intraday liquidity, were sold to meet redemption requests during the COVID-19 pandemic.

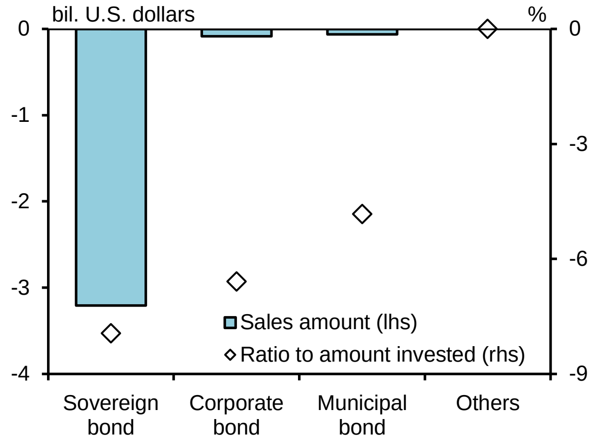
[16] A t-test based on the change in the cash holding ratio from January to March for each fund verifies that the increase in the cash holding ratio from January to March 2020 was significant.

Figure 16: Foreign bond funds' Japanese asset trading



Note: The cumulative value of asset trading in Japan since March 2020, divided by Japanese asset holdings in February 2020. Latest data as of December 2020.
Source: LSEG Lipper.

Figure 17: Foreign mixed bond funds' Japanese asset trading

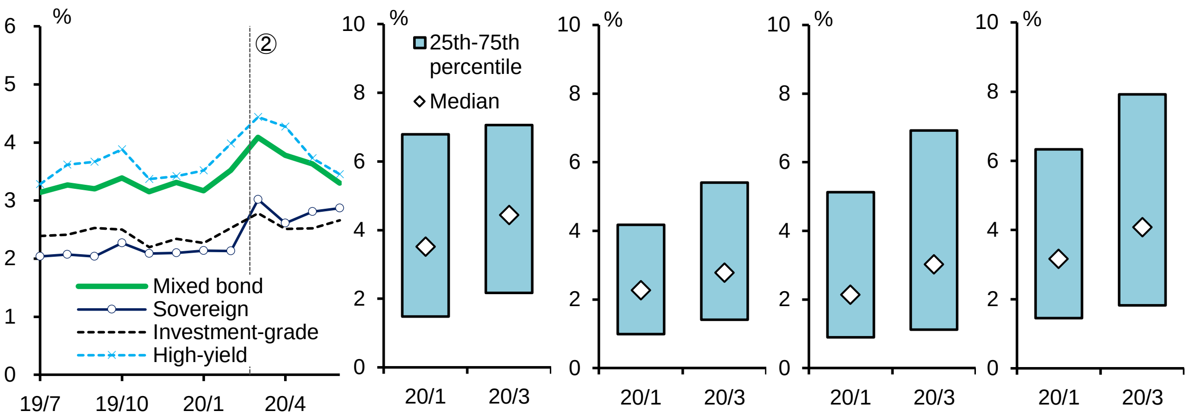


Note: Aggregate figures for the top 10 foreign mixed bond funds investing in Japan (covering approximately 50% of total Japanese asset holdings). For holdings as of the end of February 2020, the asset value as of the end of March 2020 with fixed prices was calculated, and the difference was treated as the amount of trading.
Source: LSEG Lipper.

Figure 18: Cash holding ratio of bond funds before and after the COVID-19 pandemic

(Trends by type) (Distribution)

Median HY bond IG bond Sovereign Mixed bond



Note: Covers foreign bond funds investing in Japan. In the left chart, point ② represents the COVID-19 shock (March 2020). All values are month-end figures. Latest data for the left chart is the end of June 2020.
Source: LSEG Lipper.

4. The Impact of Foreign Open-End Funds on Japan's Financial Markets

In this section, we estimate the "macro multipliers" in Japan's financial markets. These multipliers help quantify the impact of asset trading by foreign open-end funds. The term "macro multipliers" refers to the price change resulting from a one-unit increase in asset demand (i.e., the slope of the demand curve)[17][18]. In other words, it is the reciprocal of the change in demand for the asset when its price changes by one unit. We estimate the macro multipliers in Japan's stock and REIT markets, which we analyze in previous sections.

4.1 Estimation of "Macro Multipliers" for Stock and REIT Markets

Estimation method

We employ the estimation method proposed by Gabaix and Koijen (2023) (hereafter, GK2023) to estimate the macro multipliers. GK2023 argue that the stock market multiplier suggested by traditional financial theory (the Modigliani-Miller theorem), which assumes frictionless financial markets, is smaller than those found in existing empirical studies, such as Hartzmark and Solomon (2021) and Li and Lin (2022). They also present estimation results using the Granular Instrumental Variable (GIV) method developed by Gabaix and Koijen (2024) and propose a theoretical model that is consistent with those results. GIV uses idiosyncratic shocks to micro-level agents (such as individual sectors or companies), which are less correlated with macro variables, as instrumental variables. It helps address the endogeneity issues in the price-quantity relationship that standard regression analysis might encounter[19]. We estimate the macro multipliers for Japan's stock and REIT markets using the method outlined in GK2023.

[17] We discuss the demand and supply curves with quantity on the horizontal axis and price on the vertical axis in the analyses of this section. An inelastic market (i.e., one in which the quantity change is small relative to the price change) corresponds to a steep demand curve and implies a larger macro multiplier. GK2023 show that the stock market's macro multiplier is approximately between 0.05 and 0.1 according to traditional financial theory. In contrast, several empirical studies typically find the range to be between 1 and 5.

[18] When measuring price sensitivity in transactions, liquidity measures, such as the one in Amihud (2002), are often used (we use this measure in the appendix). These indicators reflect concepts such as market depth and elasticity.

[19] Generally, the price of a good is expected to decrease as its quantity increases in order to clear the market, depending on the shape of the demand curve. However, when prices fall, suppliers observing the price decrease may reduce the supply of the good, indicating a causal relationship from price to quantity. Therefore, simply regressing price on quantity introduces endogeneity, which biases the estimation of the macro multiplier. In this context, if we can extract quantity fluctuations that are independent of price changes, the price fluctuations corresponding to these quantity changes can help address the endogeneity issue. GK2023 assume that sector-specific demand shocks are uncorrelated with macroeconomic or supply-side shocks, weights them by sector size, and then constructs the GIV.

Estimation procedure

We follow the estimation procedure outlined in Section 4.2 of GK2023 in this paper. The procedure is as follows: Δq_{it} represents the rate of change in investor i 's holdings (Q_{it}) from time $t-1$ to time t, Δp_t represents the rate of change in the asset price from time $t-1$ to time t, and S_{it} denotes the share of the market held by investor i at time t. η_t represents the macroeconomic factor common to all investors, where η_t^o is observable and η_t^l is unobservable. We assume that Δq_{it} is the sum of the part driven by common factors and the idiosyncratic fluctuations specific to investor i.

Step 1: Calculate the precision weights E_i for Step 2.

$$E_i = \frac{\bar{\sigma}_{\Delta q,i}^{-2}}{\sum_j \bar{\sigma}_{\Delta q,j}^{-2}}.$$

where $\sigma_{\Delta q,i}$ refers to the standard deviation of Δq_{it} and

$\bar{\sigma}_{\Delta q,i} = \max\{\sigma_{\Delta q,i}, \text{median}(\sigma_{\Delta q,i})\}$, respectively.

Step 2: Estimate the following panel regression and obtain the residuals $\Delta \breve{q}_{it}$ using E_i calculated in Step 1 as regression weights.

$$\Delta q_{it} = \alpha_i + \beta_t + \gamma_i' \eta_t^o + \Delta \breve{q}_{it}.$$

Step 3: Extract the principal components η_t^l of $E_i^{0.5} \Delta \breve{q}_{it}$, and estimate the residuals $\breve{u}_{it}$ by regressing $\Delta \breve{q}_{it}$, calculated in Step 2, on η_t^l.

$$\Delta \breve{q}_{it} = \breve{\lambda}_i' \eta_t^l + \breve{u}_{it}.$$

Step 4: Estimate the multiplier M using the GIV z_t[20], which is $\breve{u}_{it}$ weighted by the market share $S_{i,t-1}$.

$$z_t = \sum_{i=1}^{N} S_{i,t-1} \breve{u}_{it}, \quad \Delta p_t = M z_t + \lambda' \eta_t + e_t.$$

We estimate the macro multiplier M following this procedure[21].

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[20] We use robust linear regression to account for outliers when estimating the multipliers.

[21] We omit Step 5 (recalculating the precision weights E_i using $\bar{\sigma}_{\breve{u},i}$ based on the residuals $\breve{u}_{it}$ obtained in Step 3, and then repeating Step 2 to Step 4) in the estimation procedures outlined in GK2023 for simplicity. However, including Step 5 when estimating the multiplier for the stock market does not significantly affect the results.

Data used for estimation

We summarize the data used for estimation in Figure 19. We source data on trade flows and transaction volume (stock) for the stock market from the Bank of Japan's "Flow of Funds" following GK2023. However, for the REIT market, we source trade flow data from the Tokyo Stock Exchange's "Trading by Type of Investors" and transaction volume (stock) from the "REIT Investor Survey," as the "Flow of Funds" data are difficult to obtain. Additionally, we use monthly data to estimate the multiplier for the REIT market, as more frequent data are available.

Figure 19: Data used for estimation

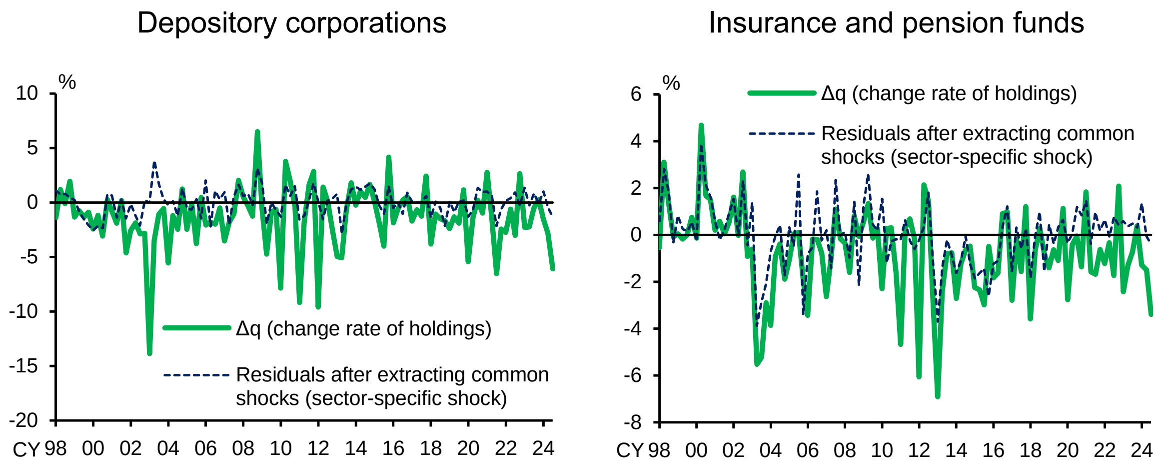
	Stock Market	REIT Market
Price	TOPIX (Tokyo Stock Price Index)	Tokyo Stock Exchange REIT Index
Trade flows	Bank of Japan "Flow of Funds"	Tokyo Stock Exchange "Trading by Type of Investors"
Transaction volume (stock)	Bank of Japan "Flow of Funds"	Tokyo Stock Exchange "REIT Investor Survey"
Period	Apr.-Jun. 1998 to Jul.-Sep. 2024	Sep. 2014 to Aug. 2024
Frequency	Quarterly	Monthly[22]
Investment sectors	Depository corporations Securities investment trusts Insurance and pension funds Other financial intermediaries Financial auxiliaries Public captive financial institutions Nonfinancial corporations General government Households Private nonprofit institutions serving households Overseas Central bank	Individuals Foreigners Securities corporations Investment trusts Business corporations Life and non-life insurance cos. Banks Other financial institutions

[22] We linearly interpolate the original semi-annual data for the transaction volume (stock) from the Tokyo Stock Exchange's "REIT Investor Survey" to convert it into monthly data.

We extract idiosyncratic shocks by dividing each market into approximately 10 sectors. The number of sectors is almost the same as that in GK2023. In addition, we assume that investment behavior varies across sub-sectors within the financial sector. Therefore, we further divide the financial sector into more detailed sub-sectors, such as depository corporations, insurance and pension funds, and other financial intermediaries.

In Figure 20, we show the residuals ($\breve{u}_{it}$ in Step 3), which exclude common shocks and reflect sector-specific shocks, along with the original series (Δq_{it}) for depository corporations, and for insurance and pension funds. In both cases, we observe that the range of fluctuations is generally smaller. In Step 4, we regress the GIV, which represents the weighted sector-specific shocks, on price fluctuations.

Figure 20: Sector-specific shocks (in equity market)



Note: We include an observable macroeconomic variable as a common factor to extract the sector-specific shocks in Step 2.
Source: BOJ.

4.2 Estimation results

We summarize the estimation results using GIV in Figure 21. The multipliers for the stock market are similar to those in GK2023, indicating that the demand curve for Japan's stock market is as steep as that of the U.S. This suggests that prices tend to be sensitive to the volume of assets supplied to the market[23]. Furthermore, the estimated multiplier for the domestic REIT market is similar to that of the stock market[24]. We estimate the multipliers for the period excluding the

[23] GK2023 estimated the macro multiplier for the U.S. stock market to generally range from 4 to 6. Furthermore, Aliyev et al. (2025) show that the liquidity levels in the U.S. and Japanese markets have been roughly the same since the global financial crisis.

[24] In the literature, methods such as that described in Bai and Ng (2002) are often used to determine the number of principal components. However, GK2023 determine the number based on the cumulative contribution of the

COVID-19 pandemic, as in GK2023, as well as for the entire period, and find that the two results are similar.

In Step 2, we use the exchange rate (USD/JPY) for the stock market and the VIX for the REIT market as the common macroeconomic variable (η_t^o) observable to all investors. This is in contrast to GK2023, who use the GDP growth rate as the observable common factor for the U.S. stock market multiplier. We choose to use the change in the USD/JPY exchange rate instead because it has greater explanatory power for Δq_{it}. It should be noted that these results may vary depending on the choice of investment sectors, observable common macroeconomic variables, the number of factors in the principal component analysis (non-observable common macroeconomic variables), and other factors.

Additionally, we compare the estimated macro multipliers with the liquidity indicators based on Amihud (2002) in the appendix. We find that the estimates using GIV are similar to the liquidity indicators during periods of heightened uncertainty, such as the period of volatility in the Chinese stock market in 2015 and the COVID-19 pandemic. These results suggest that, particularly in situations of increased uncertainty, such as when redemption requests for open-end funds trigger the sale of securities, there is a significant potential for financial market prices to fluctuate considerably.

Figure 21: Estimation results

	Stock market			**REIT market**		
	incl. macroeconomic variable		excl. macro val.	incl. macroeconomic variable		excl. macro val.
M	3.46 ** (1.63)	3.43 * (2.05)	2.87 (1.75)	5.20 *** (1.79)	4.26 ** (1.75)	4.79 *** (1.81)
Macroeconomic variables	0.78 *** (0.15)	0.83 *** (0.18)		-0.22 *** (0.05)	-0.17 * (0.09)	
Principal component 1	2.71 *** (0.75)	3.21 *** (0.89)	2.55 *** (0.81)	0.46 (0.53)	0.42 (0.56)	0.26 (0.53)
Principal component 2	-4.17 *** (0.61)	-2.10 *** (0.70)	-2.11 *** (0.66)	-2.81 *** (0.55)	-2.67 *** (0.63)	-3.20 *** (0.53)
# of data	106	87	106	120	64	120
Frequency	Quarterly	Quarterly	Quarterly	Monthly	Monthly	Monthly
Period	1998Q2-2024Q3	1998Q2-2019Q4	1998Q2-2024Q3	2014M9-2024M8	2014M9-2019M12	2014M9-2024M8

Note: 1. We use the month-on-month rate of change in USD/JPY for the stock market and the month-on-month differential in VIX for the REIT market as observable macroeconomic variables, respectively.

2. The values in parentheses are standard errors. ***, **, and * indicate statistical significance at the 1 percent, 5 percent, and 10 percent levels, respectively.

Source: Bloomberg; FRED; Tokyo Stock Exchange; BOJ.

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principal components to explaining the observed variables and the change in estimation results as the number of principal components increases. We employ the same approach and set the number of principal components to two. We verify that the cumulative contribution of principal components for Japan's stock market is higher than that for the U.S. stock market, which we reproduce using the method in GK2023. For more details, refer to Gabaix and Koijen (2024).

5. Conclusion

This paper uses high-granularity data of foreign open-end funds to analyze trends in fund flows from investors and the buying and selling behavior of equity, bond, and real estate funds investing in Japan. Additionally, we examine the impact of these transactions on asset prices in Japan's financial markets. First, when examining the flows into and out of foreign open-end funds investing in Japan, we find that capital outflows tend to occur when financial conditions abroad deteriorate and U.S. interest rates rise. In response to these outflows, foreign open-end funds sell their holdings of securities, including Japanese assets. Notably, during the volatile initial phase of the COVID-19 pandemic in March 2020, there were sales of Japanese assets across asset classes. We find that government bonds accounted for the majority of the securities sold by bond funds, which experienced significant outflows during this period. This implies that bond funds sell highly liquid assets in response to redemption requests from investors.

Next, we examine the impact of asset sales on asset prices by estimating price sensitivity (or "macro multipliers") for the domestic equity and REIT markets. The estimated sensitivity values obtained are similar to those from GK2023, who estimated the macro multiplier for the U.S. stock market. This suggests that, like the U.S., the Japanese equity market is inelastic. Based on our results, we conclude that the trading behavior of foreign open-end funds, which have expanded their presence in Japan's financial markets, could lead to significant price fluctuations in the Japanese market when risk events originating abroad occur.

The vulnerabilities of open-end funds have been pointed out by a number of organizations, including the FSB. In particular, considering that asset sales by open-end funds may have amplified asset price fluctuations during the initial phase of the COVID-19 pandemic in March 2020, various recommendations and proposals pertaining to the activities of open-end funds have been proposed by the FSB and the International Organization of Securities Commissions (IOSCO)[25]. Against this backdrop, discussions and policy responses in each country have progressed. As of now, however, it is difficult to assess yet whether or not these vulnerabilities have been fully eliminated.

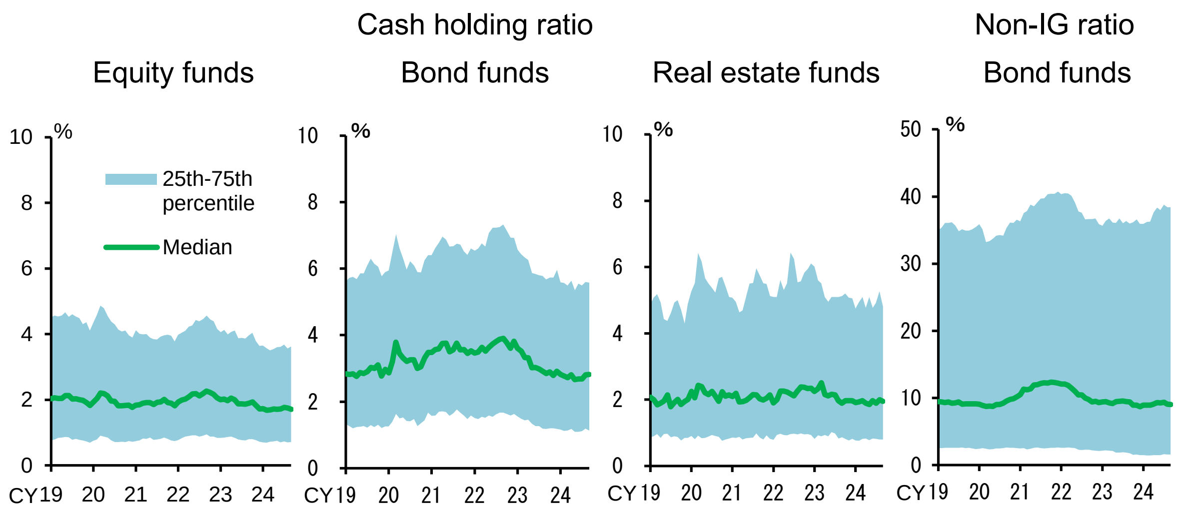
Foreign open-end funds continue to have a significant presence in Japan's financial markets. Furthermore, when examining the asset composition of foreign open-end funds investing in Japan, we find no major change in the proportion of liquid assets, which has returned to approximately

[25] IOSCO (2023) argues that if open-end funds do not use liquidity management tools (LMTs) to address liquidity mismatches, investors redeeming their shares may benefit at the expense of remaining investors. Consequently, IOSCO published guidance on the use of anti-dilution LMTs. FSB (2024a), in its comprehensive review of market disruptions during the COVID-19 pandemic, highlighted the vulnerabilities of NBFIs. In light of this, the FSB and IOSCO have provided reports on the progress of their work, along with policy recommendations and work plans aimed at enhancing the resilience of NBFIs.

the same level as before the COVID-19 pandemic (Figure 22). This suggests that the structural vulnerabilities in foreign open-end funds have yet to be fully addressed. During the market turmoil of August 2024, foreign open-end funds did not experience an outflow of funds or asset sales, and liquidity mismatches did not materialize. However, the risk remains that shocks to foreign funds could impact not only global financial markets but also Japan's financial markets.

Finally, we briefly discuss the impact of the vulnerabilities associated with foreign open-end funds on Japan's financial institutions. Domestic financial institutions in Japan have expanded their exposure to domestic and foreign securities, including bonds, stocks, and various investment trusts amid the prolonged low-interest rate environment. As a result, the similarity in lending and investment portfolios between Japanese financial institutions and foreign investment funds has grown. This suggests that shocks to foreign funds continue to pose a risk to Japan's financial institutions, not only through global financial markets, but also via fluctuations in Japan's financial markets. Financial institutions are required to continuously ensure that they manage market risk appropriately, including the potential financial impact of these channels as well.

Figure 22: Liquidity indicators of foreign open-end funds



Note: Figures are those of foreign funds that invest in Japan. Latest data as of September 2024.
Source: LSEG Lipper.

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Appendix. Comparison of Macro Multipliers and Liquidity Indicators

In the main text, we estimate the macro multipliers using GIV (hereinafter referred to as "Estimation 1"). In the appendix, we estimate liquidity indicators using the method of Amihud (2002) (hereinafter referred to as "Estimation 2") and compare the results of the two estimations[26][27].

The appendix figure shows the time-series results of Estimation 2 alongside those of Estimation 1. For Estimation 1, we perform rolling estimations when regressing the price (Δp_t) on GIV (z_t), as outlined in Step 4, to capture the time-series changes in the equity market[28]. First, we find that the macro multiplier is positive, even when examining the time-series fluctuations from the rolling estimation of Estimation 1. In other words, a decrease in the volume of assets pushes prices down.

Additionally, in Estimation 2, we find that the estimated multipliers increase during periods of turmoil, such as the volatility in the Chinese stock market in 2015 and the COVID-19 pandemic. We can also observe this characteristic in Estimation 1 using rolling estimations, though it is less prominent. This may reflect the fact that, during periods of heightened uncertainty, market liquidity decreases, which leads to an increase in the rate of price change in response to trade flows. In such situations where liquidity is reduced, several factors may explain the observed dynamics, including increased selling pressure in the market by open-end funds, which are susceptible to liquidity constraints, as they respond to redemption requests from investors. Additionally, investors and brokers may also become risk-averse and reduce trading. (Coval and Stafford, 2007).

For both estimation methods caution is required in interpreting the results due to differences in data frequency and model specification. However, the estimation results suggest that, when open-end funds sell securities in response to redemption requests, prices may fluctuate significantly, particularly during periods of heightened uncertainty.

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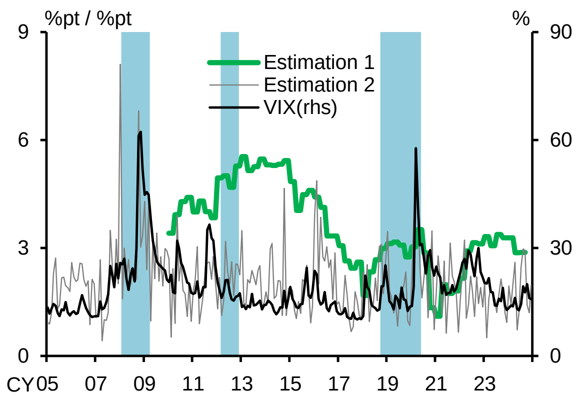
[26] Amihud (2002) calculated an illiquidity indicator for U.S. stock prices based on daily returns and trading volume. It is common to increase the data frequency (i.e., shorten the trading window) to address potential endogeneity in similar analyses. However, we calculate the liquidity indicator using price changes rather than returns. Due to data limitations, we may not have fully addressed the endogeneity concerns.

[27] We generally use the same dataset for estimating the liquidity indicator in "Estimation 2," based on the method outlined in Amihud (2002), as we use in "Estimation 1." However, while "Estimation 1" uses the net trading volume for each investment sector, "Estimation 2" uses the gross trading volume instead.

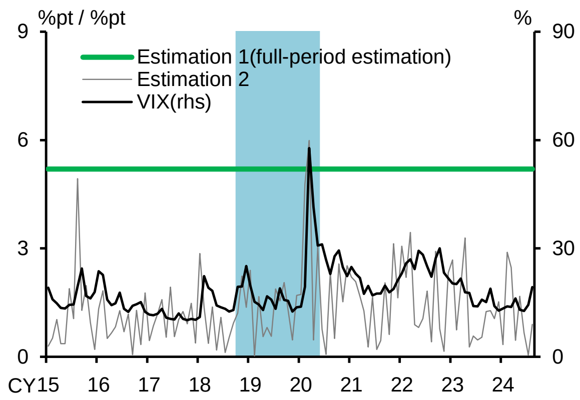
[28] We set the rolling period so that the estimates are generally significant at the 10 percent level. Additionally, for the REIT market, we use the entire period's data for estimation due to insufficient sample size.

Figure Appendix: Comparison of the two estimation results

Stock market



REIT market



Note: 1. We include observable macroeconomic variables as common factors to extract the sector-specific shocks in Estimation 1.

2. Figures in Estimation 1 for the stock market are estimated using a 48-period window.

3. The shadow periods correspond to the periods from February 2008 to March 2009, from March 2012 to November 2012, and from October 2018 to May 2020, respectively.

Source: Bloomberg; FRED; Tokyo Stock Exchange; Cabinet Office; BOJ.