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"Search-for-Yield and Home Bias under Quantitative Easing"

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Search-for-Yield and Home Bias under Quantitative Easing[1]

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Abstract

This study analyzes the impact of investors' search-for-yield behavior on home bias in the bond market. We conduct a regression analysis using data from 27 countries, including both developed and emerging economies, for 2001–2021. We use two types of home bias indicators as dependent variables and the yield on 5-year government bonds denominated in the local currency as independent variables to analyze search-for-yield behavior. Considering that central banks in many countries, including major advanced economies, have made substantial domestic bond purchases over the past 20 years, we examine the effect of excluding central banks' domestic bond holdings from the home bias calculation. The results show that, with a few exceptions, both domestic and foreign investors in advanced and emerging economies tend to increase their demand for higher-yield bonds, which is consistent with the search-for-yield behavior. This trend is further reinforced when the central banks' domestic bond holdings are excluded. Specifically, we found that the significance of bond yields for foreign investors' home bias in emerging economies increased after the global financial crisis. This indicates that emerging economies became more attractive to yield-seeking investors in a post-crisis low-interest-rate environment. In addition, by excluding the domestic bond holdings of central banks from the home bias calculation, we observed a higher coefficient of bond yields for the home bias of domestic investors in advanced economies. This suggests that when excluded, central banks' substantial domestic bond holdings in developed countries allow investors' decisions to be better reflected in the country's overall asset composition.

Keywords: search for yield, monetary policy, home bias, foreign bond investment, portfolio selection
JEL classification codes: E52, G11, G15

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1. Introduction

According to the standard international capital asset pricing model, all investors diversify their investments across domestic and foreign assets and the risky asset portfolios of investors in all countries are identical. However, in reality, the portfolios of investors in each country are biased toward assets in their home country, a phenomenon known as the "home bias puzzle." This puzzle also applies to bonds, as bonds in each country are mainly held by domestic investors, and there is a persistent difference between the market share of each country in the world market and the share held by domestic and foreign investors.

This study examines whether investors' "search-for-yield" behavior helps reduce the home bias puzzle in the bond market. The term "search for yield" does not have a clear definition, but it generally refers to investors taking on more risk to pursue relatively higher yields in a low-interest-rate environment. Various factors have been identified as the causes of home bias, including barriers to foreign investment, information asymmetry, and exchange rate volatility. However, apart from these factors, this study focuses on the impact of investors' search-for-yield behavior on home bias.

The contributions of this study are summarized as follows: First, to the best of our knowledge, this is the first study to explicitly analyze the impact of search-for-yield behavior on home bias in the bond market. Until more than 20 years ago, the impact of search-for-yield behavior on home bias had not been discussed because investing in domestic bonds provided sufficient returns. However, over the past two decades, several central banks have implemented strong monetary easing policies, resulting in a prolonged low-interest-rate environment. This has caused investors to increase their demand for bonds in high-yielding countries such as emerging economies, potentially reducing bond home bias. Second, unlike previous studies, we evaluate home bias by excluding the domestic bond holdings of central banks. Strong monetary easing policies in many countries have caused a rapid increase in central bank holdings of domestic bonds. As central banks are less concerned with the returns and risks of their holdings compared to typical investors, their bond purchases reinforce home bias. Therefore, excluding these holdings provides a more accurate assessment of home bias. After presenting a case study of monetary easing policies and the investment behavior of pension funds in Japan, we analyze how home bias is affected by the level of yields in each country, and discuss the impact of excluding central bank holdings. Third, our analysis covers a broad range of countries for which data are available (27 countries), including G20 members, both advanced and emerging economies. We analyze cases covering all sample countries as well as cases focusing solely on advanced or emerging economies. Additionally, we examine the changes in investor behavior before and after the global financial crisis. Similar to Park et al. (2019), we use a fixed-effects regression model with the two home bias indicators as dependent variables and the yield on 5-year government bonds denominated in the local currency, real exchange rate indicators, and other control variables as independent variables. The analysis period is 2001–2021; however, we also focus on the period following the global financial crisis.

The main findings of our analysis are as follows: Consistent with search-for-yield behavior, we find that, in many cases, with some exceptions, domestic and foreign investors in both advanced and emerging market economies tend to increase their demand for bonds with higher yields. This trend is stronger when the central banks' domestic bond holdings are excluded. Specifically, there are two key points. First, in emerging economies, the significance of bond yields in explaining foreign ownership bias increased after the global financial crisis. This can be interpreted as emerging economies becoming more attractive targets for search-for-yield behavior because of the prolonged low-interest-rate environment globally, which was a result of the monetary easing policies implemented after the financial crisis. Second, by excluding the domestic bond holdings of central banks, the significance of bond yields in explaining home bias in domestic bond holdings by domestic investors in advanced economies improves. This suggests that when excluded, central banks' substantial domestic bond holdings in developed countries allow investors' decisions to be better reflected in the country's overall asset composition.

The main studies on home bias in the bond market include the following: Horioka et al. (2016) analyze the investment behavior of foreign investors in Asian economies' bond markets using a home bias index on foreign investors' holdings. The commonalities between Horioka et al. (2016) and our analysis are that both use a home bias index for foreign investors and perform regression analysis using variables related to bond returns and exchange rate volatility[1]. Park et al. (2019) conduct a regression analysis using two types of home bias indices as dependent variables and bond returns, their standard deviations and skewness, real exchange rate changes and standard deviations, and other control variables as independent variables. Furthermore, they divide the sample countries into developed and emerging economies, showing that emerging economies, respond substantially to bond returns and risks owing to their strong character as risky assets, whereas developed economies do not. We follow the estimation equation used by Park et al. (2019). Fidora et al. (2007) show that home bias occurs because of exchange rate volatility in the optimal portfolios of investors who can invest in both domestic and foreign stocks and bonds. This finding is referenced in Park et al. (2019) and Horioka et al. (2016) as the basis for using exchange rate volatility as an independent variable. It also serves as the theoretical basis for including the exchange rate as an independent variable in the present study.

[1] In the field of international finance, the Feldstein-Horioka puzzle is as important as the home bias puzzle. In a closed economy, domestic savings always equal domestic investment. However, in an open economy, the gap between domestic savings and domestic investment can be freely transferred to foreign markets. Therefore, it can be expected that the correlation between domestic savings and domestic investment decreases as capital mobility increases. In their pioneering work, Feldstein and Horioka (1980) show that, despite the rapid globalization of financial markets, there is a high correlation between domestic savings and domestic investment in each country. The Feldstein-Horioka puzzle has been widely discussed in subsequent research. Horioka (2024) propose two possible causes for this phenomenon. First, financial markets are not sufficiently globalized, leaving transaction costs, capital controls, information asymmetries, and home bias in place. Second, although financial markets may be globalized and capital transfers with foreign countries can be freely implemented, frictions in goods markets prevent countries from effectively transferring capital abroad. These frictions, such as tariffs, non-tariff barriers, transportation costs, and standard certification systems, suppress trade and current account surpluses (deficits), which in turn suppress financial account surpluses (deficits). Horioka (2024) emphasizes that the second cause is more significant. Although most of the explanatory variables in our empirical analysis are related to the capital market, we also employ the real effective exchange rate, which is related to frictions in the goods market, in response to this important point made by Horioka (2024).

Rajan (2005), the earliest study on the search for yield, cites examples of insurance companies, hedge funds, and banks, noting that in a prolonged low-interest-rate environment, many investors increased their risk-taking by expanding positions in lower credit and longer maturity assets. Ammer et al. (2018) analyze the investment behavior of foreign investors in U.S. corporate bonds. They provide evidence of search-for-yield behavior by showing that foreign investors hold riskier U.S. corporate bonds when their home interest rates decline, and this tendency is more pronounced in countries with lower home interest rates. Ogura (2020) explains that, in the Japanese loan market, monetary easing policies increase banks' lending capacity, intensify lending competition, and prompt local banks to take more risk. Although these studies differ from the present study in terms of the countries and methods analyzed, they share the common finding that monetary easing policies and low-interest-rate environments promote search-for-yield behaviors. Martinez-Miera and Repullo (2017) offer a significant theoretical analysis of search-for-yield behavior. In a general equilibrium model with banks, they show that a savings glut lowers the risk-free interest rate and credit spread, reduces monitoring intensity, and increases banks' lending risk. Oshima (2020) presents a model that incorporates the behavior of rational and myopic banks, explicitly integrating the searchforyield into their behavior. This model illustrates how monetary policy affects the term premium and business cycle.

The three key studies on local currency bond markets in emerging markets are Ho (2022) and Hofmann et al. (2020a, 2020b). Ho (2022) finds that when the foreign investor ownership ratio exceeds 10%, the coefficient of exchange rate risk reversal becomes significant, causing yield spreads to widen as emerging market currencies depreciate. Hofmann et al. (2020a) demonstrate that appreciation in emerging market currencies leads to an increase in bond prices by assuming the presence of a foreign exchange trend component and calculating the expected bond price volatility using a mean-variance approach. Following Hofmann et al. (2020a), Hofmann et al. (2020b) noted that during market shocks caused by the spread of COVID-19, emerging market currencies weakened, foreign investors sold bonds, and bond spreads widened. These three studies indicate that, in emerging markets, foreign investor transactions are closely related to trends in exchange rates and bond yields, a point that aligns with the approach considered in this study.

The remainder of this paper is organized as follows. Section 2 introduces examples of Japan's monetary easing policy and instances of investors' search-for-yield behavior. Section 3 reviews the trends in the home bias index and its components, as well as the trends in interest rates and bond spreads, which are used as data in the empirical analysis. Section 4 outlines the model used for the empirical analysis and Section 5 presents the empirical results. Finally, Section 6 provides the summary and conclusions of the paper.

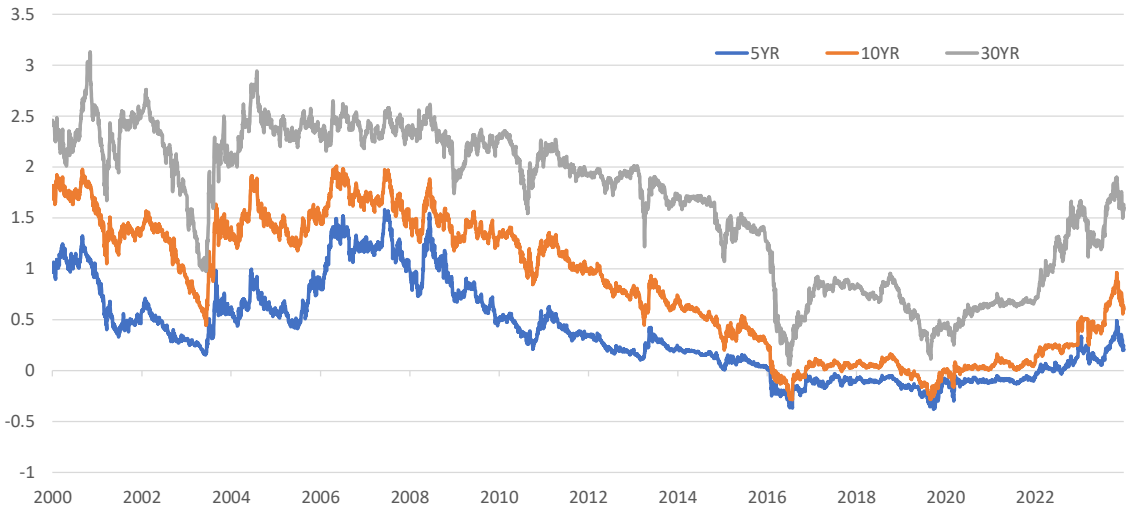
2. Case Analysis: The Bank of Japan's Monetary Easing Policy and Japanese Pension Funds' Search-for-yield Behavior

The Bank of Japan (BOJ) was the first central bank among major industrialized countries to introduce forward guidance and quantitative easing policies in the early 2000s. Consequently, Japan experienced extremely low interest rates in its domestic bond markets for a prolonged period. In this low-interest-rate environment, achieving the target rate of return with a portfolio composed primarily of domestic bonds has become challenging. Consequently, many domestic investors, including pension funds, increased their investment ratios in domestic stocks and foreign securities. These instances provide valuable insights into understanding the motivations and behaviors analyzed in this study's empirical sections.

2.1 Long-lasting Low-Interest-Rate Environment

As shown in Figure 1, the interest rate levels on Japanese government bonds (JGBs) increased from 2003 to 2006 because of the impact of the value at risk (VaR) shock and economic recovery. However, it declined significantly, with fluctuations, from 2007 to 2016. Thereafter, the 5-year and 10-year interest rates remained around 0% until 2021, whereas the 30-year interest rates generally hovered around 1%. After 2022, interest rates began to rise owing to global inflation and monetary tightening. The BOJ's monetary policy is closely related to these trends. We review some of the major policies in the following subsections.

Figure 1: Japanese government bond yields (2000–2023, %)



Source: Bloomberg

2.2 Quantitative Easing Policy (March 2001 to March 2006)

When this policy was introduced, the collapse of the IT bubble, which peaked in March 2000, led to a global decline in stock prices and an economic slowdown. There were concerns that the Japanese economy would deteriorate and prices would fall. Under these circumstances, the BOJ's quantitative easing policy suppressed investors' interest rate expectations because of its massive scale and forward guidance. The forward guidance aimed to lower longer-term interest rates through the "Policy Duration Effect[2]." Additionally, the monetary policy operational target was changed from the "uncollateralized overnight call rate" to the "Bank of Japan current account balance." This target was expanded from an initial ¥5 trillion to a final target of ¥30–35 trillion to lower the unsecured call rate to near 0% through an ample money supply.

During the same period, interest rates on JGBs fell sharply by June 2003 because of domestic and international economic uncertainty, financial system instability, and the quantitative easing policy. Subsequently, they rose by 2006, driven by the VaR shock, economic recovery, and rising stock prices.

The Quantitative Easing policy was lifted in March 2006, as it was determined that the Japanese economy was on a steady recovery path, and that the year-on-year positive CPI and its future positive trends were expected to be firmly established. This policy was an important precursor that enabled more aggressive asset purchases and forward guidance following the global financial crisis.

2.3 Comprehensive Monetary Easing Policy (October 2010 to April 2013)

When this policy was introduced, there were concerns that a slowdown in overseas economies could weaken Japan's economic recovery and exert downward pressure on the CPI. The policy had two main features. First, it aimed to lower long-term market interest rates and reduce various risk premiums. To achieve this, a wide range of assets had to be purchased, including long- and short-term JGBs, commercial paper (CP), corporate bonds, index-linked exchange traded funds (ETFs), and Japan real estate investment trusts (J-REITs). The purchase amount increased nine-fold, with the final announced total reaching 111 trillion yen.

The second point is regarding the forward guidance, which initially set the "understanding of medium- to long-term price stability[3]." The BOJ also stated that it would continue its monetary policy until it judged that price stability was foreseeable. In February 2012, this was changed to the "price stability goal in the medium to long term," and in January 2013, a joint statement with the Japanese government introduced

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[2] The BOJ stated "The new procedures for money market operations continue to be in place until the consumer price index (excluding perishables, on a nationwide statistics) registers stably a zero percent or an increase year on year." thereby clarifying the commitment to the policy's continuation.

[3] In March 2006, the BOJ initially announced that the “price stability” was "an approximate range between zero and two percent in terms of the rate of year-on-year change in the consumer price index " and "Most Board members' median figures fell on both sides of one percent." Subsequently, in December 2009, it announced "On the basis of a year-on-year rate of change in the CPI, each Policy Board member's "understanding" falls in a positive range of 2%or lower, and the midpoints of most Policy Board members' "understanding" are around 1%.”

the "price stability target," setting a 2% year-on-year increase in the CPI as the target. The BOJ committed to pursuing monetary easing under this target and aimed to achieve it as soon as possible. Thus, compared to the initial phase, the BOJ set a higher level of inflation and shifted from an "understanding" to a "target" for price stability. This target has continued into quantitative and qualitative monetary easing policies, significantly impacting the BOJ's monetary policies over the long term.

During the same period, interest rates on JGBs continued to decrease, despite some fluctuations, until April 2013. In April 2013, the BOJ announced its quantitative and qualitative monetary easing policy, abolishing the Asset Purchase Program and integrating all existing balances into the new policy.

2.4 Quantitative and Qualitative Monetary Easing (April 2013 * Most easing measures ended by March 2024).

This policy was introduced at the first Monetary Policy Meeting after Governor Kuroda took office, following a clear commitment to the early realization of the price stability target in the Joint Statement of the Government and the BOJ released in January 2013. This policy has three main features. First, forward guidance, which states that the BOJ will conduct a new phase of monetary easing, both in terms of quantity and quality, to achieve the "price stability target" of a 2% year-on-year increase in the CPI as soon as possible, with a time horizon of approximately two years. In addition to setting a clear time horizon of "about two years," the BOJ also mentioned the possibility of additional measures, stating that "it will examine both upside and downside risks to economic activity and prices, and make adjustments as appropriate." Consequently, the policy target was not achieved within two years, and several rounds of additional easing measures were implemented.

Table 1 Annual Purchases of Each Asset under the Quantitative and Qualitative Monetary Easing (as of March 31, 2024, trillion yen)

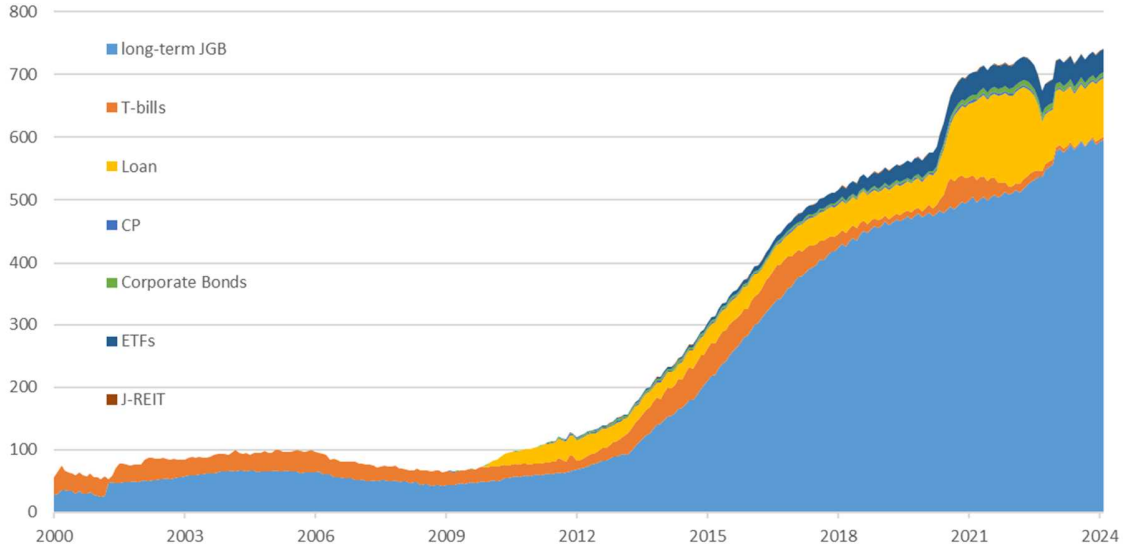
<table>
<tr><th></th><th>Apr-13</th><th>Oct-14</th><th>Mar-16</th><th>Jul-16</th><th>Sep-16</th><th>Mar-20</th><th>Apr-20</th><th>24-Mar</th></tr>
<tr><td>monetary base</td><td>60～70</td><td colspan="4">80</td><td colspan="2">continue expanding the monetary base</td><td>not covered</td></tr>
<tr><td>long-term JGB</td><td>50</td><td colspan="4">80</td><td colspan="2">at about 80 trillion yen</td><td>a necessary amount of JGBs without setting an upper limit</td><td>same amount as before</td></tr>
<tr><td>ETFs</td><td>1</td><td>3</td><td>3.3</td><td colspan="3">6</td><td>increase at annual paces with the upper limit of about 12</td><td>discontinue purchases</td></tr>
<tr><td>J-REIT</td><td>0.03</td><td colspan="5">0.06</td><td>increase at annual paces with the upper limit of about 0.18</td><td>discontinue purchases</td></tr>
<tr><td>CP</td><td colspan="5">continue purchases until its amounts outstanding reach 2.2; thereafter, it will maintain those amounts outstanding</td><td>Upper limit of 3.2</td><td rowspan="2">Upper limit of 20 (CP + Corporate bonds)</td><td rowspan="2">gradually reduce and will discontinue the purchases in about one year</td></tr>
<tr><td>Corporate Bonds</td><td colspan="5">continue purchases until its amounts outstanding reach 3.2; thereafter, it will maintain those amounts outstanding</td><td>Upper limit of 4.2</td></tr>
</table>

Source: Prepared by the authors based on the Bank of Japan's website

Second, the assets purchased are large-scale and high risk. Regarding long-term JGBs, although the purchase pace remains largely unchanged from the comprehensive monetary easing policy, the average

remaining maturity increased from less than three years to about seven years, doubling holdings over two years and encouraging a decline in longer-term interest rates. Furthermore, in October 2014, the BOJ increased its annual purchases of long-term JGBs from ¥50 to ¥80 trillion, rapidly expanding its balance sheets. Additionally, the BOJ intended to achieve significant easing effects "qualitatively" by doubling its holdings of ETFs over two years. As shown in Table 1, the BOJ subsequently decided to further increase its purchases, tripling the amounts in October 2014 and doubling its ETF purchases again in July 2016.

Figure 2: The BOJ's Major Assets (January 2000 to February 2024, trillion yen)



Source: Compiled from the BOJ's website.

Third, the BOJ controls for both long- and short-term interest rates using yield curve control (YCC). The mechanism for controlling short-term interest rates was introduced in January 2016. The BOJ's current account was divided into basic, macro-added, and policy rate balances, with a -0.1% rate applied to the policy rate balance. The control of long-term interest rates was introduced in September of the same year with the decision to purchase long-term JGBs to ensure that the 10-year JGB interest rate (long-term interest rate) generally remains around zero percent.

After the introduction of the YCC, the BOJ shifted from a clearly defined annual increase of ¥80 trillion in long-term JGBs to a target of "about ¥80 trillion," resulting in a slowdown in the rate of increase, as depicted in Figure 2. Furthermore, in July 2018, the BOJ strengthened its stance against adhering to the

pace of the increase[4]. In April 2020, following the spread of COVID-19, the BOJ removed the monetary target of purchasing JGBs[5], which slowed the growth of JGB holdings, as depicted in Figure 2. Similarly, for ETFs and J-REITs, in March 2020, the purchase amount was temporarily doubled and set as "the upper limit," with purchases to be made only when necessary. In March 2021, this change became permanent, resulting in a slowdown in the pace of ETF purchases. These changes were likely prompted by the inability to achieve the target within the two-year timeframe declared when the policy was initiated in 2013 and concerns about the sustainability of asset purchases amid ongoing monetary easing with no end in sight.

Under the large-scale monetary easing policy, interest rates on JGBs remained near 0% for the 5-year and 10-year rates since the introduction of the YCC until 2021, and even the 30-year rate hovered around 1%. Given that the YCC controls long-term interest rates, investors' return expectations for domestic bonds inevitably remained low, leading them to shift their portfolios from domestic bonds to other assets.

In December 2022, amid global high inflation and monetary tightening, the BOJ expanded the fluctuation range of the 10-year JGB rate from "around ±0.25%" to "around ±0.5%." The BOJ decided to offer the purchase of 10-year JGBs at a 0.5% yield every business day through fixed-rate purchase operations, except when no bids were expected. Furthermore, in July 2023, the BOJ changed its guidance to conduct operations with greater flexibility, retaining the range of 10-year JGB yield fluctuations at around ±0.5%, and raised the level for fixed-rate operations to 1.0%. In October 2023, the upper limit for long-term interest rates was changed to "around 1.0%" without specifying the level for fixed-rate operations, indicating a gradual reduction in monetary easing policies.

In March 2024, the BOJ decided to terminate most monetary easing measures. This decision was based on confirming the virtuous cycle between wages and prices and judging that the 2% price stability target would be sustainably and stably achieved by the end of FY2025. Specifically, the YCC framework and negative interest rate policy were terminated as they fulfilled their roles. It was announced that monetary policy would be managed using short-term interest rates, removing long-term interest rates from primary policy tools. Additionally, the monetary base was excluded from the overshooting commitment because it was considered to have met its targets. Long-term JGB purchases continued at roughly the same amount (approximately 6 trillion yen per month) as before; however, in June 2024, the BOJ decided to reduce these purchases. The Bank also decided to terminate new purchases of ETFs and J-REITs and reduce purchases of CP and corporate bonds in stages, ending these purchases by the end of FY2025. To avoid causing market expectations of a rapid tightening of monetary policy, the Bank added the following statement: "Given the current outlook for economic activity and prices, the Bank anticipates that accommodative financial conditions will be maintained for the time being."

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[4] The BOJ stated “the Bank will conduct purchases in a flexible manner so that their amount outstanding will increase at an annual pace of about 80 trillion yen.”

[5] The BOJ stated “The Bank will purchase a necessary amount of JGBs without setting an upper limit so that 10-year JGB yields will remain at around zero percent.”

2.5 Asset Allocation for Public Pensions in a Low-Interest-Rate Environment

Interest rates remained at low levels in Japan for a long period of time, supported by the BOJ's strong monetary easing policy. In this market environment, Japan's public pension funds shifted their portfolio composition from a focus on domestic bonds to a reduced portion of domestic bonds, and significantly increased portions of domestic stocks, foreign bonds, and foreign stocks. The following section describes the portfolio transition of the Government Pension Investment Fund (GPIF) as an example of search-for-yield behavior and the investment objectives behind it. It also explains the trends in other public pension funds following the GPIF's lead.

Figure 3: Trends in GPIF's Asset Holdings (March 2002 to December 2023, trillion yen)

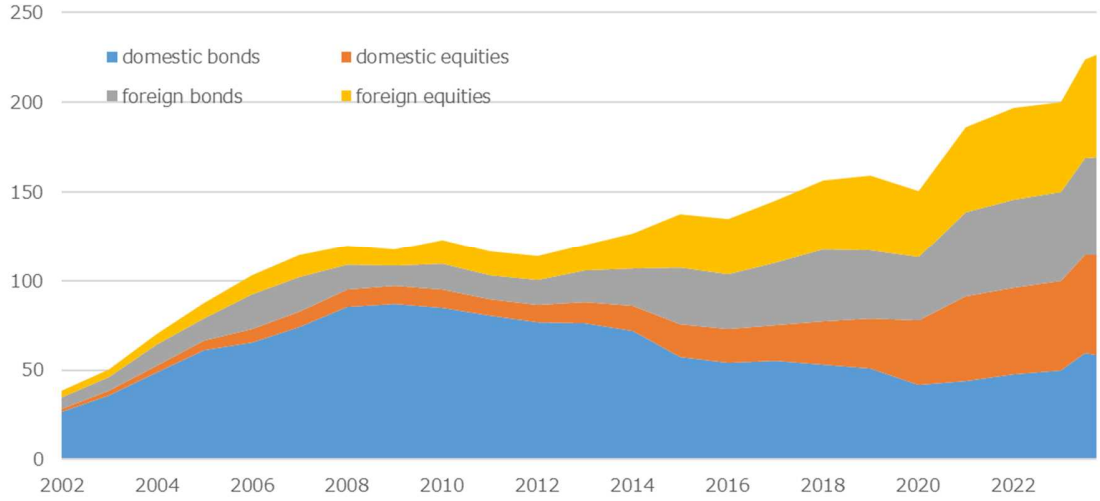
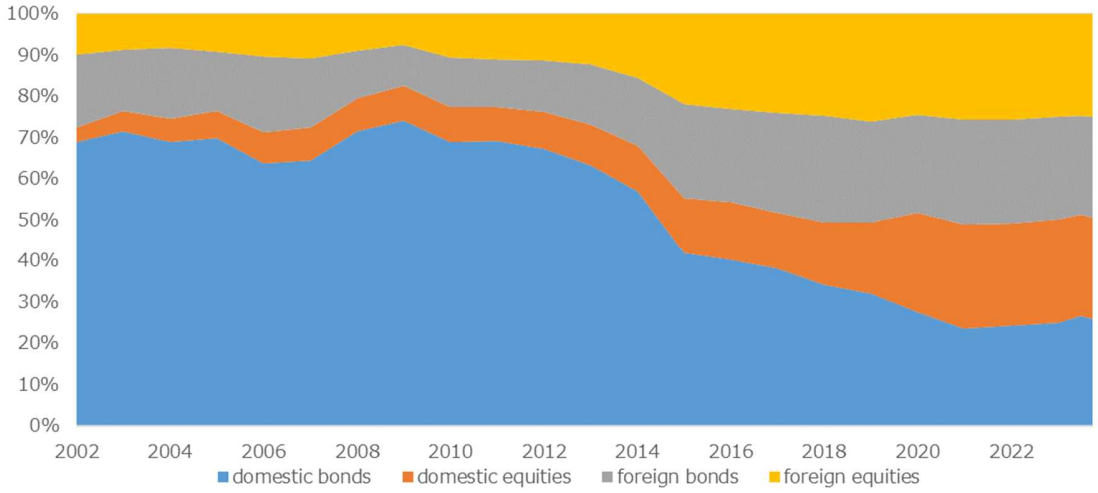


Figure 4: Trends in GPIF's Asset Holding Ratio (March 2002 to December 2023, %)



Source of Figures 3 and 4: Compiled from the GPIF website. Short-term assets are considered as domestic bonds.

Japan's public pensions were deposited with the former Ministry of Finance until FY2000, earning interest income, but were managed by the GPIF from FY2001, following a legal revision. Figure 3 shows the transition of the GPIF's asset holdings from March 2002 to December 2023, significantly increasing from 39 trillion yen to approximately 226 trillion yen. As Figure 4 shows, the proportion of domestic bonds was approximately 70% until 2013, but gradually declined, reaching approximately 25% each for domestic bonds, foreign bonds, domestic equities, and foreign equities by December 2023. From 2013 to the end of 2021, global stock prices rose significantly, and increased allocation to domestic and foreign equities contributed to a substantial increase in asset holdings.

Japan's public pension system adopts a pay-as-you-go method, managing reserves to bridge the gap between decreasing premium revenues and increasing pension benefits alongside government expenditure. This is in response to the expected decline in birthrate and continued aging of the population. The pension financing plan aims to achieve a balance between pension benefits and financial resources (premium revenues, government expenditures, and the use of reserves) over 100 years, with fixed future premium levels. This plan assumes that, through the drawing down of reserves to cover the ever-increasing cost of benefits, only "about one year's worth of benefits" will remain after 100 years. Consequently, the assets held by the GPIF are expected to decline steadily toward the end of the 100-year period.

Under such a pension financing plan, the GPIF's investment targets were specifically defined. The GPIF set medium-term targets for 5-year periods, and the following targets are set from FY2020 to FY2024:
GPIF's investment target (4.0%) = nominal wage growth (2.3%) + long-term real returns (1.7%).
The balance of income and expenditure on public pensions comprises (1) premium income, (2) government expenditures, (3) pension reserves on the income side, and (4) pension benefits on the expenditure side. As (1), (2), and (4) are generally linked to nominal wage growth, the investment target for (3) is also designed to be linked to nominal wage growth. Considering this, the GPIF set a nominal wage growth rate of 2.3%. This figure is based on the government's economic outlook and was significantly higher than the actual rate[6] when the target was set. Although global inflation has led to nominal wage growth exceeding 2% in 2022 and beyond, this figure was not highly probable at the beginning of 2020, when the target was set. It is believed that the reason for setting such a target was that the GPIF had to adopt the outlook owing to its status as a "public" pension plan. The "long-term real return (1.7%)" was requested by the Minister of Health, Labor and Welfare, and is explained to be based on the pension's financial plan. Given this background, the GPIF set an overall investment target of 4.0%, and formulated a portfolio to achieve this target.

In October 2014, when a major portfolio change was implemented before 2020, two investment targets were set: 4.5% (nominal wage growth of 2.8% + long-term real returns of 1.7%) and 3.8%

[6] The actual growth rate of nominal wage from FY2001 to FY2020 was an annual average of -0.13%.

(nominal wage growth of 2.1% + long-term real returns of 1.7%). These targets were considerably higher than the actual nominal wage growth rates and JGB yields at the time. It can be said that these targets were set to promote a shift in allocation to high-risk assets.

Table 2: Changes in the GPIF's policy portfolio

	Before change (by 2013/6)	2013/6 (tentative change)	2014/10	2020/4
Domestic bonds	67% (±8%)	60% (±8%)	35% (±10%)	25% (±7%)
Domestic equities	11% (±6%)	12% (±6%)	25% (±9%)	25% (±6%)
Foreign bond	8% (±5%)	11% (±5%)	15% (±4%)	25% (±8%)
Foreign equity	9% (±5%)	12% (±5%)	25% (±8%)	25% (±7%)
Short-term assets	5% (of the total)	5% (of the total)	-	-

Source: Compiled from the GPIF website.

To secure the high returns described above, the GPIF changed its policy portfolio thrice, as shown in Table 2. Since June 2013, which coincided with the BOJ's quantitative and qualitative monetary easing, this timing was characterized by the expectation that JGB interest rates would remain stable at low levels. In October 2014, in response to the aforementioned investment targets, the GPIF lowered its allocation to domestic bonds to 35% and significantly increased the proportion of other higher-risk assets. Furthermore, in April 2020, considering the low-interest-rate environment in the domestic market, the GPIF reduced the allocation to domestic bonds to 25%, aligning it with allocations to domestic equities, foreign bonds, and foreign equities.

These portfolio changes reflect the pursuit of given investment targets with minimal risk, considering pension benefits, insurance revenue, and government expenditure. This strategy was based on the low-interest-rate environment in the domestic bond market, supported by the BOJ's monetary easing policy and low inflation. Consequently, this approach involved taking higher risks in an environment where overall market yields were declining, representing a typical example of “search-for-yield” behavior.

Actions similar to those of the GPIF can be observed in other public pension funds. The Federation of National Public Service Personnel Mutual Aid Associations, the Pension Fund Association for Local Government Officials, and the Promotion and Mutual Aid Corporation for Private Schools of Japan changed their policy portfolios between 2013 and 2014 by reducing the percentage of domestic bonds held and increasing the allowable deviation range. Furthermore, since 2015, these funds have jointly

developed a model portfolio with the GPIF and determined their policy portfolios in line with this model. Although the allowable deviation ranges differ, they generally hold similar portfolios, effectively following the GPIF's search-for-yield behavior. By the end of December 2023, the total investment balance of these public pension funds amounted to approximately 295 trillion yen, giving them a significant presence in Japan's financial markets.

2.6 Trends in Japanese Investors Other Than Public Pension Funds

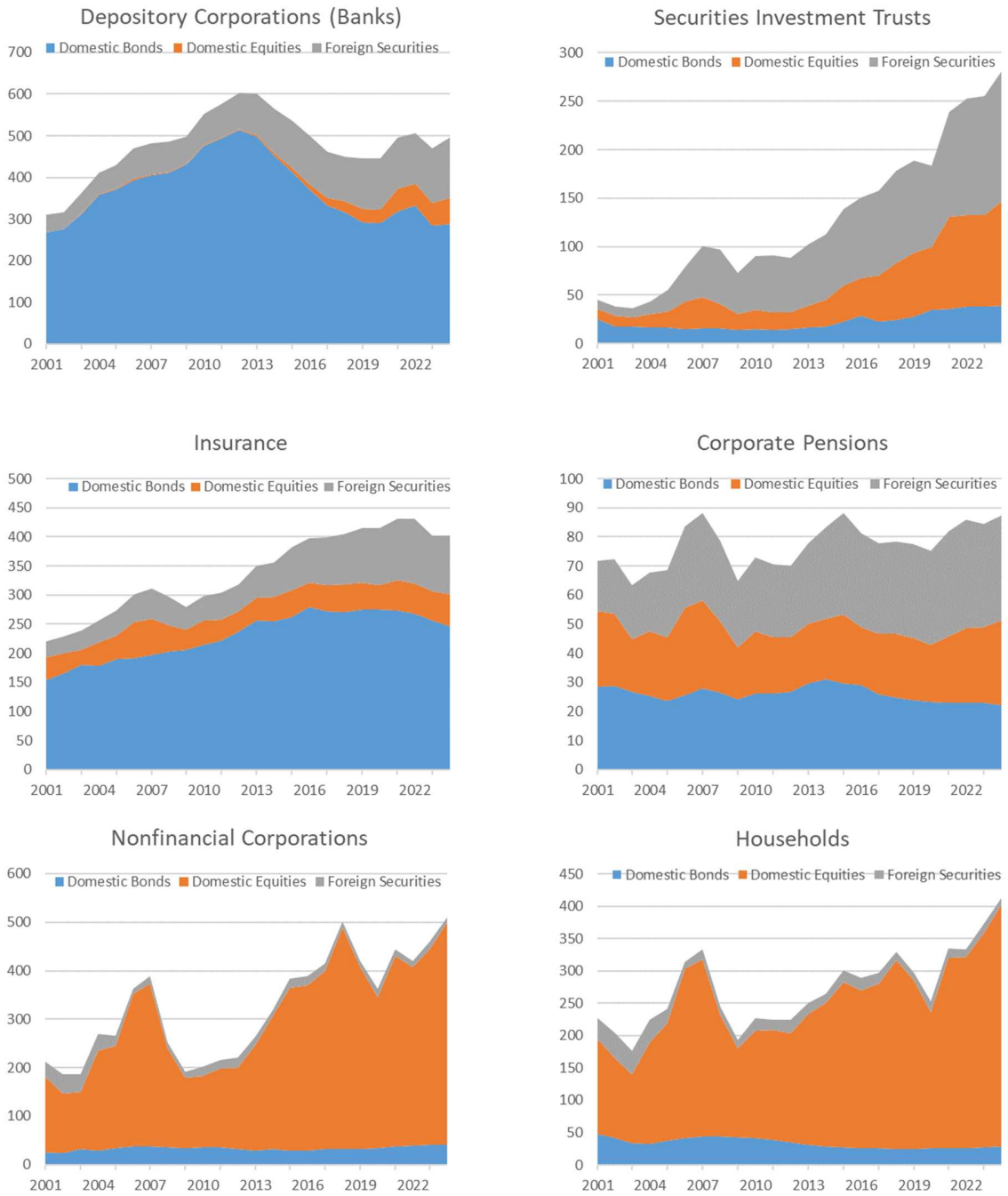
In this subsection, we provide an overview of the asset allocations of domestic investors other than public pension funds, as shown in Figure 5. Although not as clear as public pension funds, we can confirm that banks, insurance companies, and securities investment trusts also engage in search-for-yield behavior.

Banks' holdings of domestic bonds have been declining since their peak in 2012 when they held 42% of the outstanding issues. Their holdings have recently dropped to approximately 20%, making them the second-largest holders after the central bank. Conversely, their holdings of domestic equities and foreign securities increased significantly, indicating a shift to riskier assets owing to the low expected returns from domestic bonds. Since 2011, securities investment trusts have increased the balance of domestic bond holdings. However, growth in domestic equities and foreign securities has been much larger, reducing the share of domestic bonds in total assets from 56% in 2001 to 10%.

Insurance companies' holdings of domestic bonds increased steadily until 2016, when the BOJ's YCC was introduced and remained relatively stable until 2021 before declining. Their holdings of domestic equities fluctuated with stock price movements but have generally remained stable. Foreign securities holdings declined around the global financial crisis but have increased steadily since then. Owing to the relatively long maturity of their liabilities, insurance companies are well suited to hold long-maturity bonds. However, over the past decade, particularly during prolonged periods of low interest rates, they reduced the proportion of domestic bonds in their total assets.

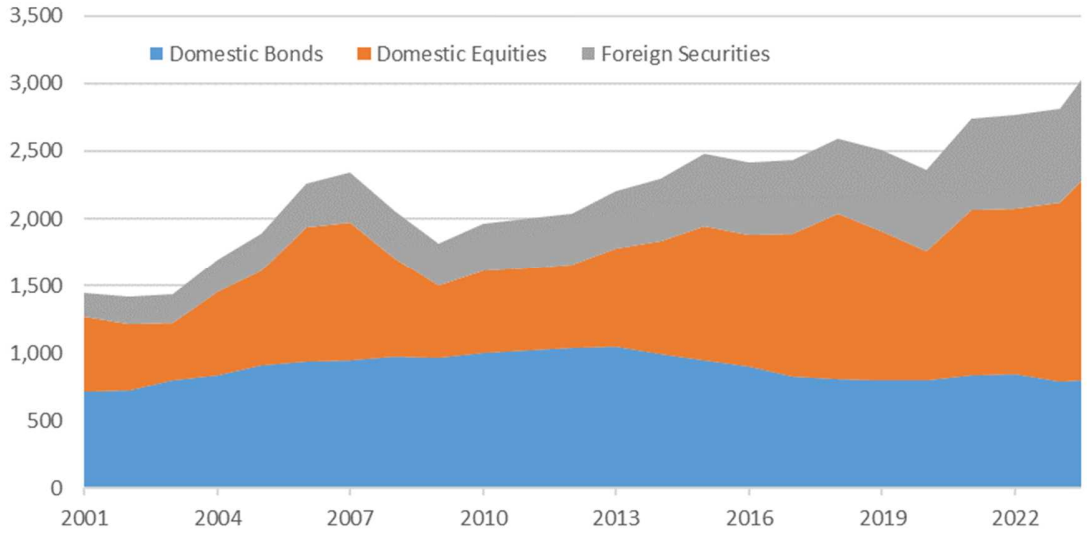
Corporate pensions' portfolios showed a more stable trend than those of other investors, with fewer fluctuations. They increased their holdings of domestic equities and foreign bonds and decreased their holdings of domestic bonds. This stability can be attributed to the fact that, as of 2001, corporate pensions had already diversified their portfolios with 40% in domestic bonds, 36% in domestic equities, and 24% in foreign securities compared to public pension funds. The main characteristic of non-financial corporations and households is that most of their holdings are in equities, and their balances are significantly influenced by the rise and fall of stock prices.

Figure 5: Securities Held by Japanese Investors (March 2001 to September 2023, trillion yen)



Source: Bank of Japan

Figure 6: Securities held by Japanese investors (excl. BOJ) (March 2001 to September 2023, trillion yen)



Source: Bank of Japan. Central banks and foreign countries are excluded from entire entities in Japan's Flow of Funds Accounts.

Figure 6 summarizes these trends and shows the changes in securities held by Japanese investors, excluding the BOJ. Domestic bond holdings have shown a gradual downward trend since the end of March 2013, just before the initiation of quantitative and qualitative monetary easing. Regarding domestic equities, the balance of holdings doubled from 2013 to 2023 despite fluctuations owing to stock price changes. Foreign securities have also increased steadily since 2013, despite being affected by exchange rates, stock prices, and bond prices. These trends confirm that Japanese investors, excluding the BOJ, have decreased their holdings of domestic bonds, while increasing their holdings of domestic equities and foreign securities since 2013, following the initiation of the quantitative and qualitative monetary easing policy. Although there are some differences among the entities involved, this can be interpreted as a "search-for-yield" behavior among Japanese investors overall, who are increasing their holdings of assets other than domestic bonds to secure returns amid the declining profitability of domestic bonds.

3. Data

This section introduces the main data used in the empirical analysis. First, we review the definition of home bias. Next, we present the domestic bond holdings of central banks and their share in the domestic market, demonstrating that the share of central bank holdings is high in many countries, as shown in the BOJ case in the previous section. We then examine the share of each country's bond market in the global bond market, including and excluding central bank holdings of domestic bonds.

We also present the trends in the home bias indicator, which is the dependent variable in our empirical analysis for each country. We also show how these indicators change over time when the central bank's domestic bond holdings are excluded. Finally, we examine the trends in the key independent variables, such as yield and yield spread, for each country.

The empirical analysis in the next section includes 27 countries. We considered the following developed countries: Australia, Austria, Belgium, Canada, Denmark, Finland, France, Germany, Italy, Japan, the Republic of Korea, the Netherlands, Portugal, Singapore, Spain, Sweden, Switzerland, the United Kingdom, and the United States. For clarity, this section focuses on the eight developed countries. The emerging countries analyzed include China (People's Republic of China), India, Indonesia, Malaysia, the Philippines, Poland, South Africa, and Turkey.

3.1 Definition of Home Bias Indicator in this study

The definition of home bias varies depending on the analytical methods used in different studies. Table 3 summarizes the definitions adopted in previous studies. If there is no home bias, the numerator and denominator of equations (1) to (3) are equal, resulting in a value of 1.

Equation (1) shows the bias in domestic investors' holdings of their own country's assets, as in Park et al. (2019).

$$Home\ bias\ of\ i-country\ domestic\ investors\ in\ domestic\ assets = \frac{share\ of\ i\text{–}country\ assets\ in\ i\text{–}country\ domestic\ investors'\ portfolio}{Share\ of\ i\text{–}country\ market\ to\ the\ world\ market} \quad (1)$$

Without home bias, the numerator (share of i-country assets in i-country domestic investors' portfolio) would be equal to the denominator (share of i-country market in the world market), resulting in a value of 1. However, in practice, the numerator is typically larger, leading to values exceeding 1, because investors in almost all countries tend to hold portfolios biased toward their home country assets. Consequently, the bias tends to be larger for countries with smaller market shares in the world market (i.e., smaller denominators).

Table 3 Definition of Home Bias

	Bias in holding i-country assets	Bias in holding foreign assets
Home bias of i-country domestic investors	(1)	(2)
Home bias of foreign investors in the i-country market	(3)	

Source: Authors' own work

Equation (2) is the foreign asset holding bias of domestic investors in i-country, as in Fidora et al. (2007).

$$The\ foreign\ asset\ holding\ bias\ of\ i-country\ domestic\ investors$$

$$= \frac{Share\ of\ non\ i\text{–}country\ assets\ in\ i\text{–}country\ foreign\ investors'\ portfolio}{Share\ of\ non\ i\text{–}countries'\ market\ to\ the\ world\ market} \quad (2)$$

Without home bias, the denominator, the share of the market capitalization of markets other than country-i in the world market, would be equal to that of foreign assets in the portfolios of i-country domestic investors. While this is closely related to the presence of home bias in equation (1), in most countries, the denominator would be larger than the numerator, resulting in a value of less than 100%.

Equation (3) refers to foreign investors' home bias in the i-country market, as in Horioka et al. (2016), Park et al. (2019), and Ho (2022).

$$The\ bias\ of\ foreign\ investors'holdings\ of\ i-country\ assets\ in\ i-country\ markets$$

$$= \frac{share\ of\ i\text{–}country\ assets\ in\ foreign\ investors'\ portfolios}{Share\ of\ i\text{–}country\ market\ to\ the\ world\ market} \quad (3)$$

Unlike equations (1) and (2), which focus on i-country investors, equation (3) explains home bias from the perspective of foreign investors in the i-country market. Again, without home bias, the denominator, the share of the market capitalization of the i-country market relative to the world market, would be equal to the numerator, the share of i-country assets in the portfolios of foreign investors. However, in almost all countries, the denominator exceeds the numerator, indicating the presence of home bias.

This study follows Park et al. (2019) and adopts indicators (1) and (3) of the above-mentioned measures of home bias. Although we do not employ (2), which is closely related to (1), we can comprehensively analyze home bias using (1) and (3).

3.2 The Balance of Domestic Bond Holdings by Central Banks and their Share of the Bond Market

Figure 7 shows the balance of domestic bond holdings by central banks in each country, with advanced economies on the left and emerging economies on the right. The Federal Reserve, BOJ, and European Central Bank (ECB) account for the majority of central bank holdings worldwide. Within the Euro area, particularly large amounts of bonds from Germany, France, and Italy are purchased. Figure 8 shows the percentage of domestic bond holdings of central banks relative to the domestic market, with advanced economies on the left and emerging economies on the right. While advanced economies dominate in terms of the size of their outstanding holdings, emerging economies have a higher share of central bank holdings in their domestic bond markets. Specifically, the central bank of Indonesia, which purchases government bonds, has a remarkably high ratio, and the central bank of India has a high ratio of approximately 10–20%. Among the developed countries, Japan's holdings are remarkably high, primarily because of its policy of quantitative and qualitative monetary easing. In the Euro area, the ECB's quantitative easing policy initially consisted of Longer-Term Refinancing Operations (LTROs), which were loans to banks. However, since the mid-2010s, when the ECB began purchasing government bonds, the ratio has risen at a high pace. Conversely, in the U.S., the market itself is very large, so the central bank's holdings have remained relatively low.

Figure 7: Domestic Bond Holdings by Central Banks (2001 to 2022, $ billion)

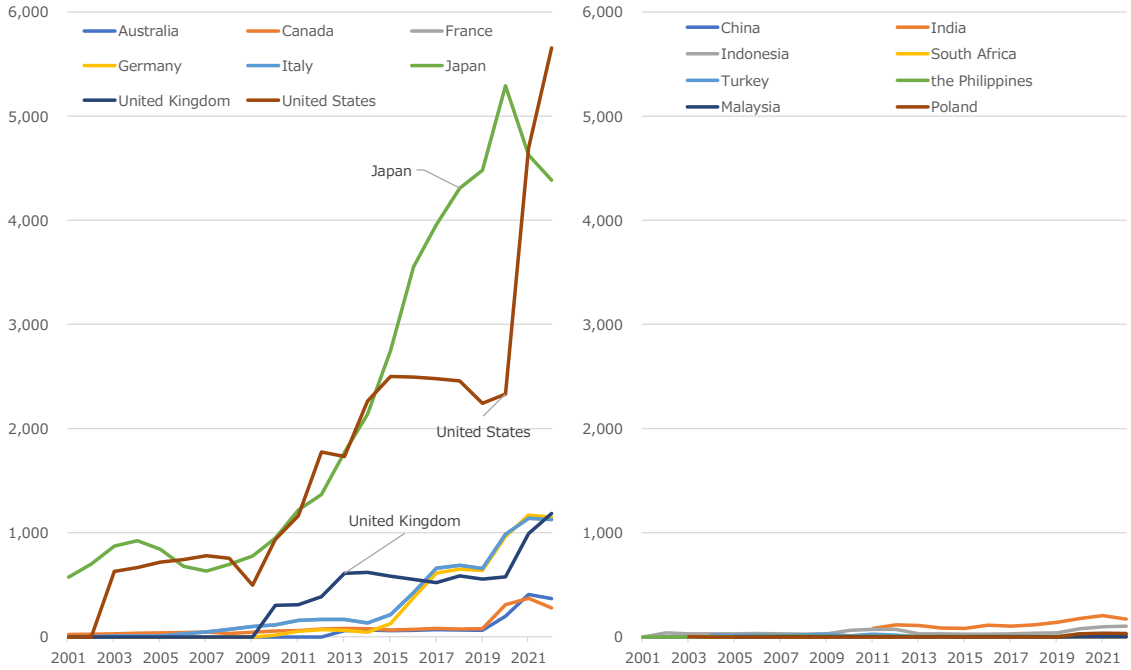
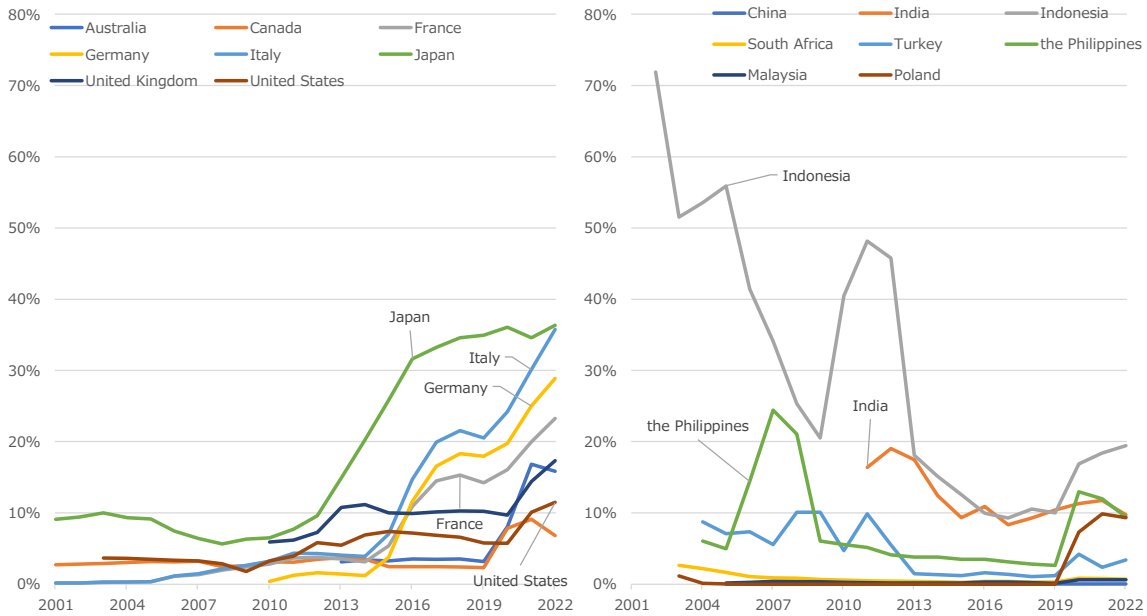


Figure 8: Central Bank Holdings of Domestic Bonds as a Percentage of Outstanding Domestic Bonds (2001 to 2022)



Figures 7 and 8 show the developed countries on the left and emerging countries on the right.

Source: Figures 7 and 8 use the same data sources: central bank holdings are from the websites of central banks in each country and Bloomberg, and bond market balances are from the Bank for International Settlements (BIS).

Figure 9: Share of Developed Countries' Market Balances in the World Market (left) / Same Indices Excluding Central Bank Balances (right) (2001 to 2022)

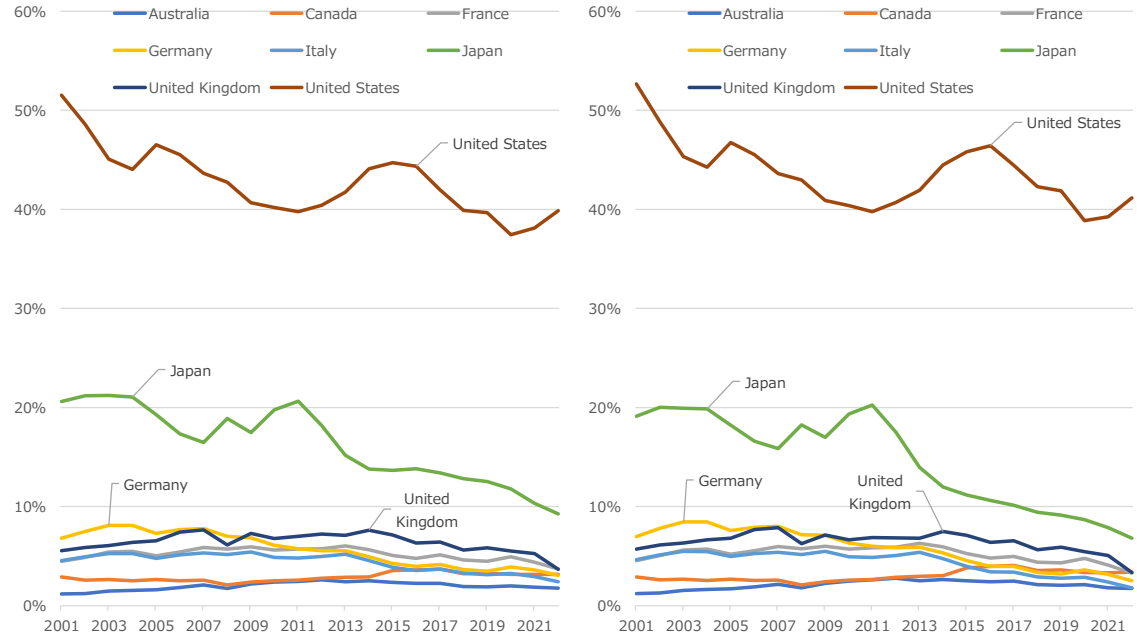
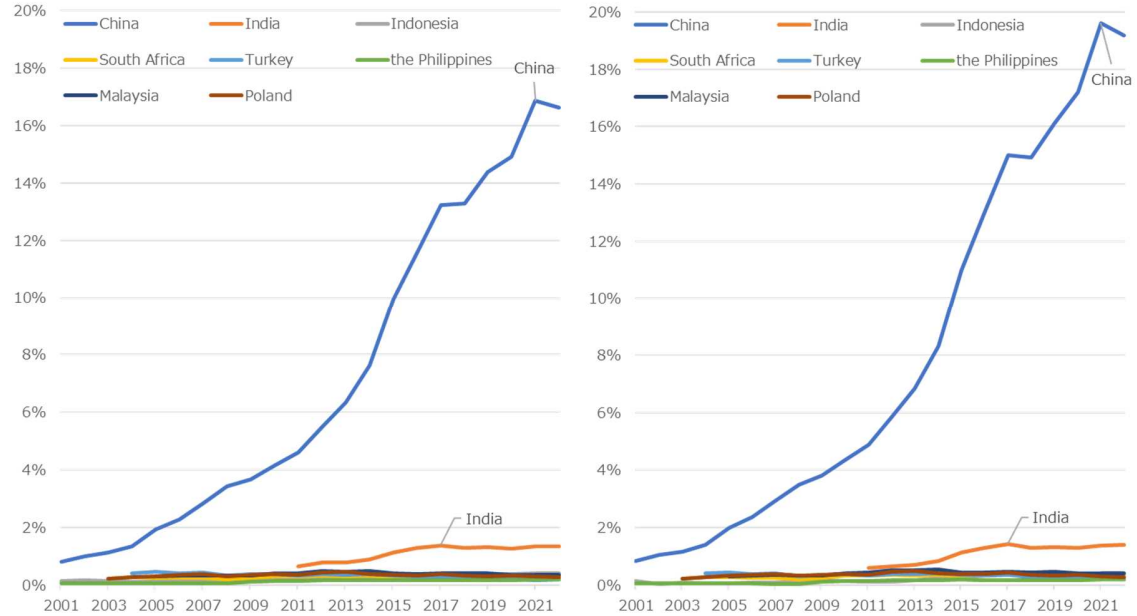


Figure 10: Share of Emerging Markets' Market Balances in the World Market (left) / Same Indices Excluding Central Bank Balances (right) (2001 to 2022)



Source: Figures 9 and 10 use the same data sources: central bank holdings are from the websites of central banks in each country and Bloomberg, and bond market balances are from the BIS.

Figure 9 shows the share of developed countries' bond market balances as a percentage of the global market on the left and the share excluding central bank holdings on the right. Although the U.S. market share has declined compared to 20 years ago, it remains significantly high. The U.S. central bank holds a large amount of domestic bonds, but this does not constitute a large share of the U.S. market, so the market share on the right remains similarly high. Japan's share has decreased significantly because although the outstanding amount of bonds, mainly government bonds, has increased substantially, the growth rate is lower than that of the global market. Furthermore, the BOJ holds a high share of domestic bonds, leading to a more pronounced decline in the share on the right side. For European countries such as the U.K., Germany, France, and Italy, the share on the left side is relatively high but shows a gradual downward trend. When the balances held by central banks are excluded, the share becomes even lower.

Figure 10 shows the same indicators as in Figure 9 but for emerging countries. China has a remarkably high market share that has been steadily increasing with economic growth. As the central bank holdings in China are relatively small, the market share, excluding these holdings, is even higher. When calculating the shares excluding the central bank holdings shown on the right side of Figures 9 and 10, we deduct the central bank's domestic bond holdings not only from each country's bond balance in the numerator but also from the global bond balance in the denominator. The central banks included in the denominator calculation are those of 17 of the 27 countries covered in this report, excluding the 10 Eurozone countries and the ECB. Additionally, although governments and central banks may hold foreign bonds as part of their foreign exchange reserve management, they are not excluded from our calculations because of the difficulty in identifying bond holdings by country and the potential for such reserves to be managed considering return and risk.

3.3 Home Bias Indicators and the Impact of the Central Bank's Holding Balance Deduction

In this subsection, we use the share of each country's bond market and the same share, excluding domestic bonds held by the central bank, to examine the trend of home bias indicators. As home bias indicators, we use (1) and (3) introduced in this section. Indicator (1) represents the bias of i-country investors' holdings of i-country assets, hereafter referred to as "Domestic Bias." Indicator (3) represents the bias of foreign investors' holdings of i-country assets in the i-country market, hereafter referred to as "Foreign Bias." When excluding the central bank's domestic asset holdings, its domestic bond holdings are deducted from both the denominator and numerator of the Domestic Bias and Foreign Bias using the same method, as shown in Figures 9 and 10.

Figure 11 shows the trend in Foreign Bias for each developed country, with the left side showing the trend in (3) and the right side showing the values excluding domestic bond holdings by the central bank. All countries have values below 100%, indicating that their proportion of foreign holdings is underweight. Larger values indicate a lessening of the bias. Germany, France, and Italy have relatively high values, partly because mutual investments between Eurozone countries without exchange rate risks are treated as foreign investments. The U.S. has relatively high values, though not as high as those

in European countries, possibly because of its large bond market share, the use of U.S. bonds for foreign exchange reserves, and its attractiveness as an investment destination. Japan's level is relatively low, but the BOJ's large-scale purchases of JGBs have reduced the numerator and the bias tends to be lower when central bank holdings are excluded.

Figure 12 shows the same indicators as in Figure 11 for emerging countries. China has consistently remained at a low level, possibly owing to strict restrictions on foreign investment. When Foreign Bias excludes central bank holdings, the denominator becomes smaller for countries with larger central bank holdings, thereby increasing the Foreign Bias value. In Indonesia and the Philippines, the right side charts show higher values than the left side charts because of the high ratio of central bank holdings in the domestic market.

Figure 13 shows the changes in Domestic Bias for developed countries, with the left side showing the trend in (1) and the right side showing the values excluding domestic bond holdings by central banks. All countries have values above 1, indicating that they hold disproportionately large amounts of domestic assets. Among developed countries, the U.S. has the smallest bias, followed by Japan, owing to its large market share, which serves as the denominator. However, Australia and Canada, which have relatively small markets, exhibit a large bias.

Figure 14 shows the same indicators as Figure 13 but for emerging countries. In emerging countries, as in developed countries, the bias is relatively small for China and India, which have large markets, whereas it is large for the Philippines and Indonesia, which have relatively small markets.

Figures 13 and 14 show that Domestic Bias, excluding domestic bonds held by the central bank, fluctuates according to changes in the numerator and denominator. For the numerator, in countries such as Germany and France where the share of domestic assets held by non-central bank investors is low, excluding central bank holdings results in a significant decrease. Conversely, in countries such as Japan, where non-central bank investors hold a large proportion of domestic bonds, the numerator's decline is limited, even after excluding central bank holdings. The denominator, which is the ratio of global to domestic bonds outstanding, is lower for countries such as Japan, where the central bank's share of domestic bond holdings is higher than the global average. Conversely, it is higher for countries with a lower ratio of central bank holdings. Consequently, excluding central bank holdings typically decreases Domestic Bias in most countries because of a reduction in the numerator and an increase in the denominator. However, for some data points, such as Japan, Italy from 2021 to 2022, and Indonesia from 2002 to 2010, the Domestic Bias increases when central bank holdings are excluded.

Figure 11: Foreign Bias of Developed Countries (left)/Same Indices Excluding Central Bank Holdings (right) (2001 to 2022)

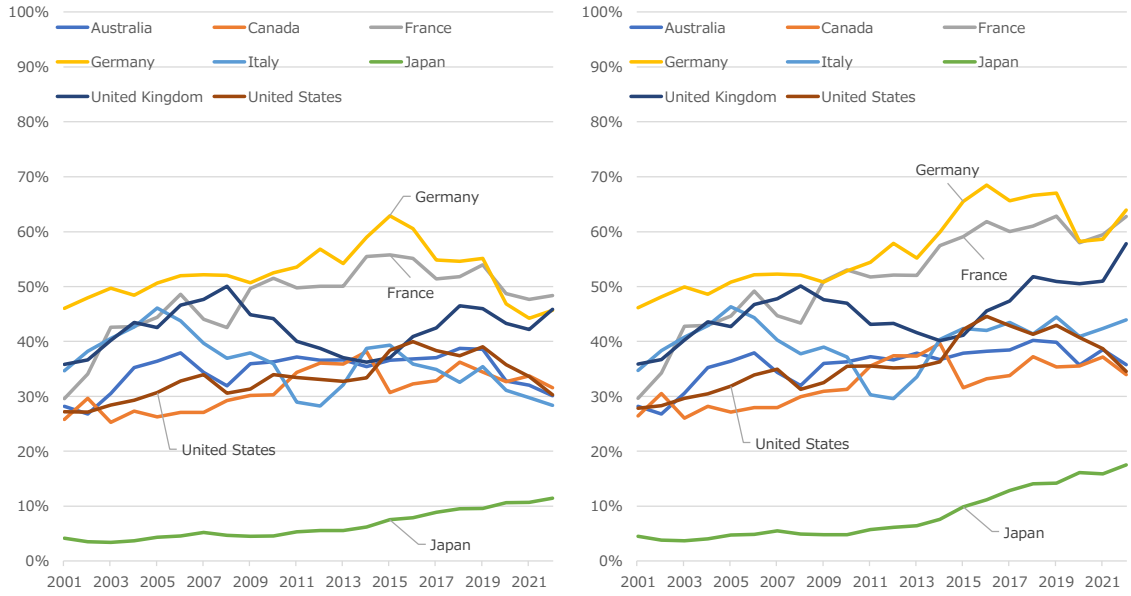
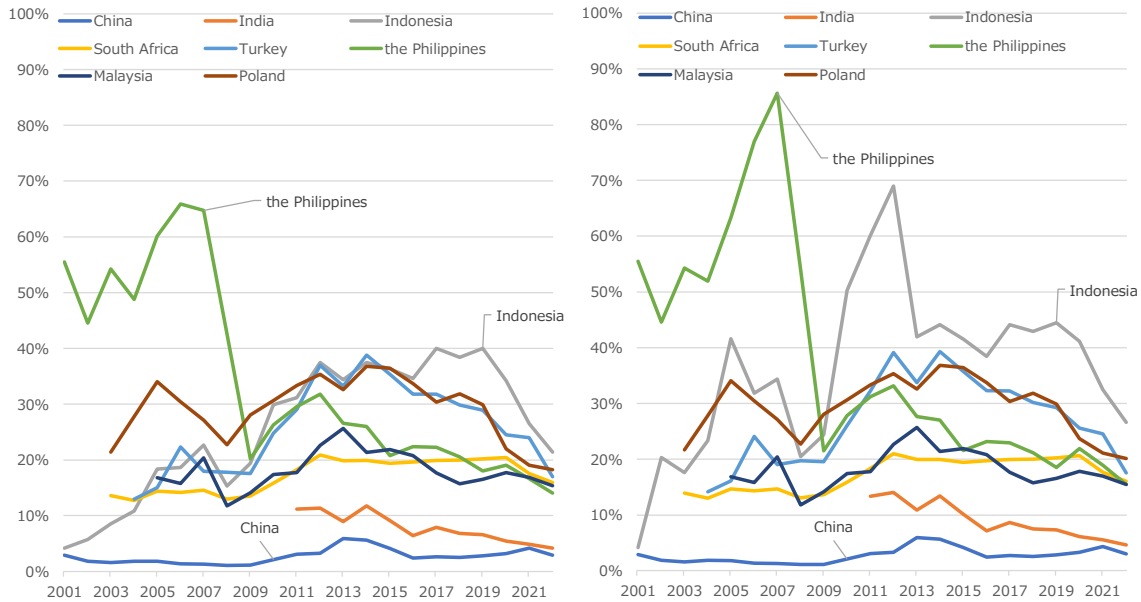


Figure 12: Foreign Bias in Emerging Markets (left)/Same Indices Excluding Central Bank Holdings (right) (2001 to 2022)



Source: Figures 11 and 12; based on central bank websites and Bloomberg for central bank holdings, BIS for bond market balances, and IMF for foreign investors' holdings.

Figure 13: Domestic Bias in Developed Countries (left)/Same Indices Excluding Central Bank Holdings (right) (2001 to 2022)

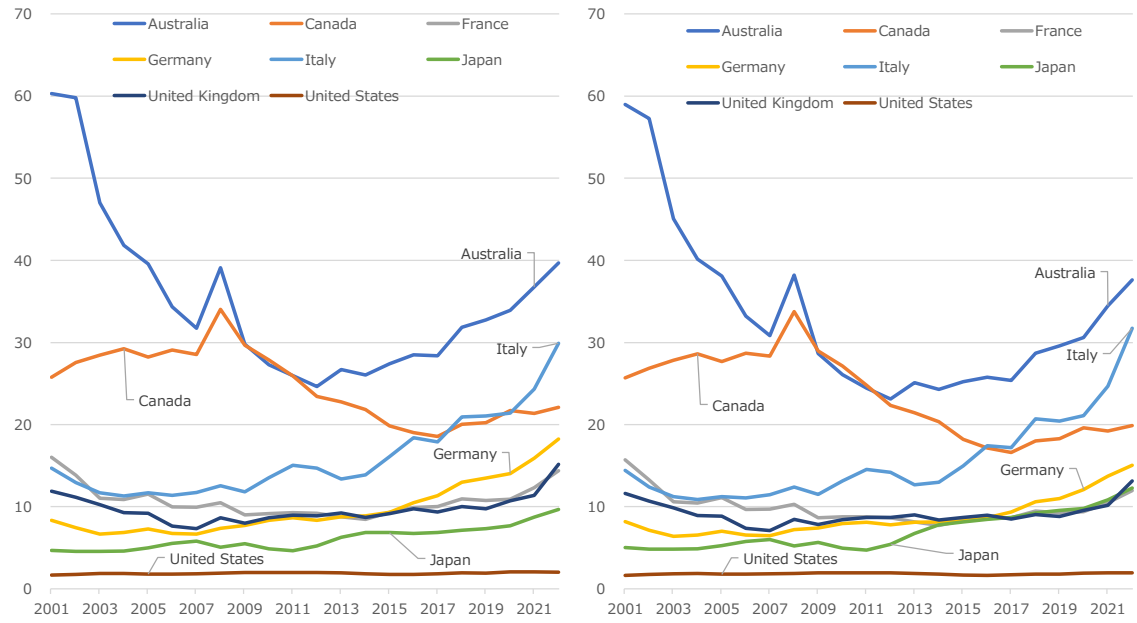
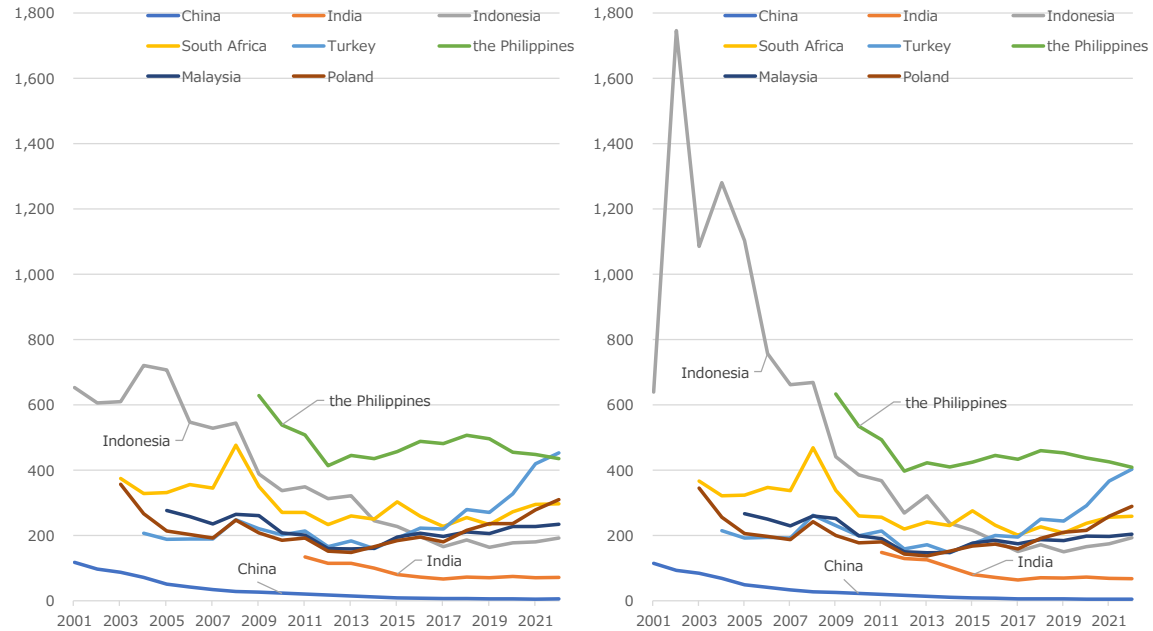


Figure 14: Domestic Bias in Emerging Markets (left)/Same Indices Excluding Central Bank Holdings (right) (2001 to 2022)



Source: Figures 13 and 14; central bank holdings are from the websites of central banks and Bloomberg; bond market balances are from the BIS; and foreign investor holdings are from the IMF.

3.4 Yield and Yield Spread

Figure 15: Yield (left) and Yield Spread (right) for Developed Countries (2001 to 2022)

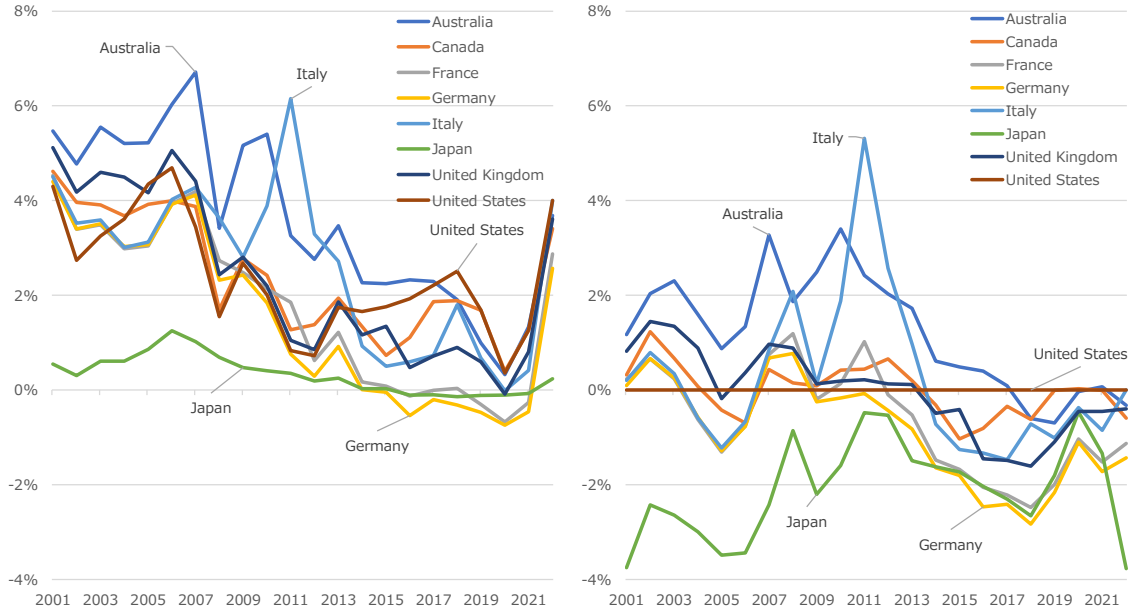
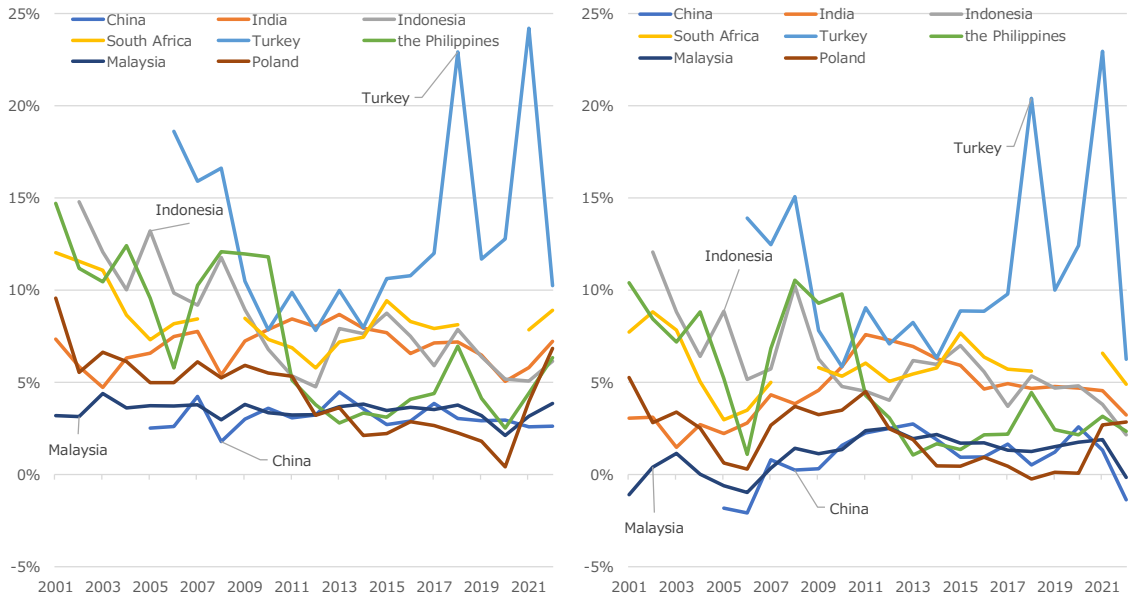


Figure 16: Yield (left) and Yield Spread (right) for Emerging Markets (2001 to 2022)



In Figures 15 and 16, the Yield is the yield on 5-year government bonds denominated in the local currency of each country, and the Yield Spread is the yield on 5-year government bonds denominated in the local currency of each country minus the yield on 5-year US Treasury bonds denominated in U.S. dollars.

Source: Bloomberg

Figure 15 shows the yields of 5-year government bonds denominated in local currencies for developed countries on the left and the yield spreads, which are the yields on these bonds minus the yields on 5-year U.S. Treasury bonds denominated in U.S. dollars on the right. Figure 16 presents the same indicators for the emerging markets. Yield is the most important independent variable in this study's empirical analysis because investors prioritize it over the risk of the investment target in the context of search-for-yield behavior. Many foreign investors finance their investments in foreign bonds in U.S. dollars, and the criterion for investing outside the U.S. includes whether the yield is higher than that of U.S. Treasuries, even if this means taking on additional exchange rate risk. Therefore, the yield spread is used in the robustness checks as an alternative independent variable to yield. Regarding country characteristics, yields tend to be relatively high in emerging economies with high inflation rates, whereas they are relatively low in advanced economies, except for Italy, which experienced credit instability in the 2010s. Yield spreads have remained negative in many countries, including Japan, where yields are lower than those in the U.S.

4. Empirical Framework

We estimate the following equation using a fixed effects model similar to that of Park et al. (2019):

$$bias_{i,t} = \alpha + \beta X_{i,t} + \gamma Dummy + \varepsilon_{i,t} \quad (4)$$

where $bias_{i,t}$ refers to either Foreign Bias or Domestic Bias, and regression analysis is performed for each case. $X_{i,t}$ consists of a vector of variables of market return, risk, and market attributes, while $Dummy$ is a vector of time- and country-fixed effects.

The following market returns and risks are used as independent variables in our empirical analysis. First, to analyze search-for-yield behavior, we use the yield on 5-year government bonds denominated in the local currency (YIELD). The 5-year maturity is selected because it is suitable for investors who prefer both short- and medium-term maturities, as well as those who prefer long-term maturities. Although approaches such as that of Horioka et al. (2016) convert each country's bond return index into U.S. dollar terms, we use local currency yields, considering that most countries' bonds are issued in their local currencies, and cross-currency swaps are illiquid, particularly in emerging markets. As a robustness check, we also use the yield spread (YIELD SPREAD), which is the yield on 5-year government bonds denominated in the local currency minus the yield on 5-year U.S. Treasury bonds denominated in U.S. dollars. Other variables include the 12-month change in the real effective exchange rate (FXCHG) and the 12-month standard deviation of the same variable (FXVOL) following Park et al. (2019). FXVOL accounts for exchange rate risk, using the theoretical background provided by Fidora et al. (2007). FXCHG is a variable set up to observe the trend of exchange rate fluctuations, as mentioned by Hofmann et al. (2020a and 2020b), regarding the influence of exchange rate trends on foreign investors' investment decisions.

In Park et al. (2019), the average monthly return of a local currency bond index over 12 months is used to capture momentum seeking, and the standard deviation and skewness of the same return are

used to consider the Prudent Man Rule in institutional investors' investment decisions. To analyze search-for-yield behavior, we use YIELD as the only indicator of bond risk and return.

We use four market attribute indicators, all of which are the same as those in Park et al. (2019), to represent the degree of financial market development and macroeconomic stability. The first is the natural logarithm of market capitalization of each country's bond market at the end of the year (SIZE). As stated by Park et al. (2019), a larger market size is expected to improve information availability. The second is the natural logarithm of the financial development indicator (FinDev), which ranges from 0 (less developed) to 1 (well developed), created by Svirydzenka (2016). This indicator is a composite measure of the efficiency of financial institutions and financial markets. The efficiency indicators for financial institutions include the ratio of credit to GDP, the ratio of pension fund assets and mutual fund assets to GDP, the number of bank branches per capita, and the margin of the banking sector. The efficiency indicators for financial markets include the stock market capitalization to GDP ratio, stock trading volume, the share of the top 10 companies in the stock market, borrowing amount per capita, and stock market turnover ratio. The third is the natural logarithm of the capital control index (OPENNESS) published by the Economic Freedom Network, which ranges from 0 (fully controlled) to 10 (fully open). Emerging economies often have values close to 0, whereas developed countries have relatively high values. As the index can take a value of 0, we added 1 before taking the natural logarithm. The fourth is the average sovereign bond rating (RATING) for foreign and local currencies issued by the S&P, which converts 23 ratings below AAA into a single number. This measure is used to quantify the macroeconomic stability and outlook.

Additionally, while combining all ratings data into a single indicator has the advantage of reducing the number of variables, it also poses the problem of capturing the relationships between different ratings in a linear manner. Therefore, we also conduct a robustness check by treating the ratings as dummy variables. The lowest rating among the sample countries is B; therefore, we set dummy variables for relatively lower investment-grade ratings A and BBB (RATING_AorBBB) and dummy variables for non-investment-grade ratings BB and B (RATING_BBorB). Note that for relatively high investment-grade ratings for AAA and AA, both dummy variables are set to 0.

We selected 27 target countries, including advanced and emerging economies, as described in the previous section. Park et al. (2019), selected 41 countries from both advanced and emerging economies. However, in the present study, the availability of data on the domestic bond holdings of central banks and yields of 5-year government bonds denominated in local currencies limited the number of countries included.

The period analyzed is from the end of 2001 to the end of 2021, with an additional analysis from the end of 2008 to the end of 2021 to focus on the post-crisis period. While Park et al. (2019) limit the analysis to the period from 2010 to 2015, our study extends the analysis to a longer period, covering the most recent years, by setting the maximum period for which data on dependent and independent variables are available. Descriptive statistics for the variables are presented in Table 4.

Table 4 Descriptive Statistics

	Mean	Median	Maximum	Minimum	Std. Dev.	Observations
Foreign_Bias	-0.6	-0.5	-0.1	-2.0	0.3	505
Foreign_Bias_ExcCB	-0.5	-0.4	-0.0	-2.0	0.3	505
Domestic_Bias	1.6	1.7	2.9	0.2	0.6	505
Domestic_Bias_ExcCB	1.6	1.6	3.1	0.2	0.6	505
YIELD	3.1%	2.8%	24.2%	-0.8%	3.3%	505
YIELD_SPREAD	0.9%	0.1%	22.9%	-3.8%	3.2%	505
FXCHG	0.1%	0.3%	31.7%	-31.1%	6.1%	505
FXVOL	1.2%	1.0%	7.0%	0.2%	0.9%	505
SIZE	12.0	11.9	13.7	10.7	0.6	505
FinDev	-0.1	-0.1	0.6	-0.6	0.2	505
OPENNESS	0.7	0.7	1.0	0.0	0.3	505
RATING	19.9	22.0	23.0	9.5	3.6	505

The countries covered are Australia, Austria, Belgium, Canada, Denmark, Finland, France, Germany, Italy, Japan, Korea (Republic of), Netherlands, Portugal, Singapore, Spain, Sweden, Switzerland, United Kingdom, and United States from the developed countries. From the emerging countries, China (People's Republic of), India, Indonesia, Malaysia, Philippines, Poland, South Africa, and Turkey are included. The variables are Foreign_Bias (the bias of foreign investors' holdings of i-country assets in i-country markets), Foreign_Bias_ExcCB (Foreign Bias net of central bank domestic bond holdings), Domestic_Bias (the bias of i-country domestic investors' holdings of i-country assets), Domestic_Bias_ExcCB (Domestic Bias net of central bank domestic bond holdings), YIELD (yield on 5-year government bonds denominated in the local currency), YIELD_SPREAD (the yield on 5-year government bonds denominated in the local currency of each country minus the yield on 5-year US Treasury bonds denominated in U.S. dollars), FXCHG (12-month change in the real effective exchange rate), FXVOL (standard deviation of the real effective exchange rate), SIZE (natural logarithm of bond market capitalization), FinDev (natural logarithm of the financial development indicator), OPENNESS (natural logarithm of the capital control index), and RATING (S&P's sovereign bond rating).

5. Empirical Results

This section describes the main characteristics of the empirical analysis results obtained using the aforementioned model. For all countries and time periods, Foreign Bias is below 1 indicating underinvestment, whereas Domestic Bias is above 1, indicating overinvestment. Therefore, when the independent variable has a positive coefficient, it tends to reduce Foreign Bias, while strengthening Domestic Bias. First, we explain the Base Case, which involves analyzing the results of adding explanatory variables incrementally for all sample countries. Next, we consider cases where the sample is limited to developed and emerging countries and where the analysis period is restricted to the period after the end of 2008, following the global financial crisis. As a robustness test, we also analyze the case in which the RATING variable is used as a dummy variable. Subsequently, we examine a scenario in which domestic bond holdings by central banks are excluded from the analysis and present the results of replacing YIELD with YIELD SPREAD. This study uses the international capital asset pricing model as its theoretical framework and indicates that eliminating home bias can improve overall welfare. However, the realism of this assumption is debatable and remains an issue to be addressed in future research.

5.1 Base Case (Table 5)

Table 5 presents the stepwise addition of independent variables as the Base Case, with the following main characteristics: First, the coefficient of YIELD is significantly positive for both Foreign Bias and Domestic Bias after adding control variables, which is consistent with search-for-yield behavior. SIZE is significantly negative for Domestic Bias, indicating that larger markets reduce bias by increasing the denominator. FinDev is significantly positive for Foreign Bias and significantly negative for Domestic Bias, indicating that developed financial markets mitigate both biases. Additionally, RATING is significantly positive for Foreign Bias and significantly negative for Domestic Bias, indicating that higher ratings mitigate both biases.

5.2 The Cases for Developed and Emerging Countries Only and Post-Financial Crisis (Table 6)

In Table 6, columns (A) and (B) correspond to columns (G) and (H) of Table 5, which is the Base Case. Additionally, columns (C) to (F) analyze the cases for developed and emerging countries only, while columns (G) to (L) cover the period from 2008 to 2021, the post-global financial crisis period. The main results are presented below, focusing on differences from the Base Case. In cases (C) and (D), which are for developed countries only, YIELD is significantly positive for both Foreign Bias and Domestic Bias, with higher significance, which can be interpreted as consistent with search-for-yield behavior. The importance of search-for-yield behavior in investors' decision-making can be confirmed by the fact that in Park et al. (2019), on which this paper's formulation is based, Foreign Bias in advanced countries was not significantly influenced by independent variables such as bond returns and risks based on past one-year performance. In cases (E) and (F), which are for emerging markets only, SIZE is significantly positive for Foreign Bias, indicating that larger markets attract more demand from foreign investors.

We analyze the period following the global financial crisis in (G) to (L). Cases (G) and (H), which include all countries, show a decrease in the significance and magnitude of the YIELD coefficient compared with the Base Case in (A) and (B). In cases (I) and (J), which focus on developed countries only, the YIELD coefficients decline for both Foreign Bias and Domestic Bias. This may be owing to the impact of large-scale domestic bond purchases by central banks after the global financial crisis. Finally, in cases (K) and (L), which focus on emerging market countries only, the significance and magnitude of the YIELD coefficient for Foreign Bias increases. This can be interpreted as emerging market countries being selected for search-for-yield behavior in a low-interest-rate environment following the global financial crisis.

5.3 Robustness Checks: The Cases with Rating Data as Dummy Variable (Table 7)

Table 7 shows the results of the analysis, where the ratings data in Table 6 are changed to dummy variables. The overall trend is similar to the results presented in Table 6, but there are two main features. First, the explanatory power of YIELD is weaker for Foreign Bias in developed countries, while it is stronger for Domestic Bias. Second, although the rating dummies are significant in some cases,

their signs are mixed, and provide few clear implications. Despite these differences, the overall trend remains largely unchanged; hence, we use the same approach as Park et al. (2019), representing the rating data with a single variable.

5.4 The Cases Excluding Central Bank Domestic Bond Holdings from Foreign Bias and Domestic Bias (Table 8)

Table 8 shows the cases in which domestic bond holdings by central banks are excluded from the Foreign Bias and Domestic Bias in Table 6. The main difference from Table 6 is that in cases (D) and (J), excluding domestic bond holdings by central banks in domestic countries increases the significance of YIELD for the Domestic Bias of advanced economies. This finding suggests that excluding large-scale bond purchases by central banks allows portfolio composition to reflect investors' decisions more accurately.

5.5 Robustness Checks: Case of YIELD Changed to YIELD SPREAD (Tables 9 and 10)

Tables 9 and 10 show the results of the analysis with YIELD changed to YIELD SPREAD in Tables 6 and 8, respectively. Although the values of the coefficients are slightly different, all the coefficients marked as significant are the same, and the results are very similar to those obtained using YIELD.

Table 5 Analysis Result 1 (Base Case)

	Foreign Bias (A)	Domestic Bias (B)	Foreign Bias (C)	Domestic Bias (D)	Foreign Bias (E)	Domestic Bias (F)	Foreign Bias (G)	Domestic Bias (H)
Risk-Return Profile								
YIELD	−0.024	−0.082	0.132	−0.606	−0.155	0.726 ***	0.561 *	0.246 *
	(0.30)	(0.37)	(0.32)	(0.39)	(0.31)	(0.17)	(0.29)	(0.15)
FXCHG			−0.05	0.01	0.00	0.04	0.00	0.04
			(0.07)	(0.09)	(0.07)	(0.04)	(0.07)	(0.03)
FXVOL			−1.27	4.02 ***	−0.42	−0.09	−0.23	−0.22
			(0.91)	(1.08)	(0.88)	(0.47)	(0.80)	(0.40)
Market Attributes								
SIZE					0.03	−0.97 ***	−0.06	−0.92 ***
					(0.05)	(0.02)	(0.04)	(0.02)
FinDev					0.84 ***	−0.32 ***	0.73 ***	−0.24 ***
					(0.18)	(0.09)	(0.16)	(0.08)
OPENNESS					0.19 ***	0.02	0.12 ***	0.07 ***
					(0.05)	(0.03)	(0.05)	(0.02)
Rating							0.03 ***	−0.02 ***
							(0.00)	(0.00)
Constant	−0.553 ***	1.630 ***	−0.542 ***	1.597 ***	−0.868	13.258 ***	−0.46	12.99 ***
	(0.01)	(0.01)	(0.01)	(0.02)	(0.57)	(0.30)	(0.52)	(0.26)
Observations	268	268	268	268	268	268	268	268
Number of Markets	14	14	14	14	14	14	14	14
Adjusted R-squared	0.927979	0.966224	0.92801	0.967083	0.935038	0.9941	0.946477	0.995756
Time-Fixed Effects	YES	YES	YES	YES	YES	YES	YES	YES
Country-Fixed Effects	YES	YES	YES	YES	YES	YES	YES	YES
F Value	138.3	305.9	132.8	301.4	139.7	1,624.4	168.2	2,218.6

Notes: Parentheses indicate standard deviations. ***, **, and * denote 1%, 5%, and 10% significance respectively. A fixed-effects model is used to analyze the period 2001–2021. The sample includes 27 developed and emerging economies. The two dependent variables are Foreign_Bias (the bias of foreign investors' holdings of i-country assets in i-country markets) and Domestic_Bias (the bias of i-country domestic investors' holdings of i-country assets). The independent variables are YIELD (yield on 5-year government bonds denominated in the local currency), FXCHG (12-month change in the real effective exchange rate), FXVOL (standard deviation of the real effective exchange rate), SIZE (natural logarithm of bond market capitalization), FinDev (natural logarithm of the financial development indicator), OPENNESS (natural logarithm of the capital control index), and RATING (S&P's sovereign bond rating).
Source: Author's estimation

Table 6: Analysis Result 2 (Case for Developed and Emerging Markets Only, Post-Financial Crisis Only)

	2001–2021						2008–2021					
	All Samples		Developed Countries		Emerging Countries		All Samples		Developed Countries		Emerging Countries	
	Foreign Bias	Domestic Bias	Foreign Bias	Domestic Bias	Foreign Bias	Domestic Bias	Foreign Bias	Domestic Bias	Foreign Bias	Domestic Bias	Foreign Bias	Domestic Bias
	(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)	(J)	(K)	(L)
Risk–Return Profile												
YIELD	0.561 *	0.246 *	1.103 ***	0.628 **	0.897 *	0.232	0.467	0.188	0.840 *	0.319	1.260 **	0.066
	(0.29)	(0.15)	(0.39)	(0.25)	(0.53)	(0.14)	(0.32)	(0.15)	(0.47)	(0.28)	(0.51)	(0.14)
FXCHG	0.00	0.04 *	−0.10	0.06	0.12	−0.01	−0.06	0.04	−0.15 *	0.04	0.18	−0.01
	(0.07)	(0.03)	(0.07)	(0.05)	(0.12)	(0.03)	(0.08)	(0.04)	(0.08)	(0.05)	(0.13)	(0.03)
FXVOL	−0.23	−0.22	0.39	−0.20	1.46	−0.50	−0.53	−0.26	−0.22	−0.59	0.38	0.00
	(0.80)	(0.40)	(0.97)	(0.62)	(1.48)	(0.40)	(0.92)	(0.42)	(1.16)	(0.69)	(1.42)	(0.39)
Market Attributes												
SIZE	−0.06	−0.92 ***	−0.18 ***	−0.93 ***	0.33 ***	−1.02 ***	0.00	−0.96 ***	−0.04	−0.98 ***	0.28 ***	−1.01 ***
	(0.04)	(0.02)	(0.05)	(0.03)	(0.09)	(0.02)	(0.06)	(0.03)	(0.08)	(0.05)	(0.09)	(0.02)
FinDev	0.73 ***	−0.24 ***	0.90 ***	−0.34 ***	−0.44	0.11	0.17	−0.07	0.69 **	−0.29	−0.15	−0.02
	(0.16)	(0.08)	(0.18)	(0.12)	(0.44)	(0.12)	(0.26)	(0.12)	(0.31)	(0.19)	(0.43)	(0.12)
OPENNESS	0.12 ***	0.07 ***	0.10 **	0.08 ***	0.26 *	0.06	0.27 ***	0.01	0.18 **	0.00	0.38 **	0.08 *
	(0.05)	(0.02)	(0.04)	(0.03)	(0.15)	(0.04)	(0.08)	(0.04)	(0.07)	(0.04)	(0.16)	(0.04)
Rating	0.03 ***	−0.02 ***	0.03 ***	−0.03 ***	0.01	0.00	0.02 ***	−0.01 ***	0.02 ***	−0.02 ***	−0.01	0.00
	(0.00)	(0.00)	(0.00)	(0.00)	(0.01)	(0.00)	(0.08)	(0.00)	(0.00)	(0.00)	(0.01)	(0.00)
Constant	−0.46	12.99 ***	1.06 *	13.22 ***	−5.02 ***	14.01 ***	−1.01	13.45 ***	−0.32	13.77 ***	−4.15 ***	13.89 ***
	(0.52)	(0.26)	(0.61)	(0.40)	(1.01)	(0.27)	(0.74)	(0.34)	(0.97)	(0.58)	(1.12)	(0.30)
Observations	268	268	188	188	80	80	191	191	126	126	65	65
Number of Markets	14	14	9	9	5	5	14	14	9	9	5	5
Adjusted R-squared	0.946477	0.995756	0.951337	0.993455	0.945982	0.997568	0.941721	0.996138	0.939601	0.993902	0.958193	0.998261
Time-Fixed Effects	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Country-Fixed Effects	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
F Value	168.2	2,218.6	163.0	1,259.2	70.5	1,628.9	131.0	2,075.8	109.5	1,137.6	89.3	2,211.8

Notes: Parentheses indicate standard deviations. ***, **, and * denote 1%, 5%, and 10% significance respectively. A fixed-effects model is used to analyze the period from 2001–2021 or 2008–2021. The sample includes 27 developed and emerging economies. The two dependent variables are Foreign_Bias (the bias of foreign investors' holdings of i-country assets in i-country markets) and Domestic_Bias (the bias of i-country domestic investors' holdings of i-country assets). The independent variables are YIELD (yield on 5-year government bonds denominated in the local currency), FXCHG (12-month change in the real effective exchange rate), FXVOL (standard deviation of the real effective exchange rate), SIZE (natural logarithm of bond market capitalization), FinDev (natural logarithm of the financial development indicator), OPENNESS (natural logarithm of the capital control index), and RATING (S&P's sovereign bond rating). Source: Author's estimation

Table 7: Analysis Result 3 (Case with Rating Data from Analysis Result 2 as Dummy Variables)

	2001–2021						2008–2021					
	All Samples		Developed Countries		Emerging Countries		All Samples		Developed Countries		Emerging Countries	
	Foreign Bias	Domestic Bias	Foreign Bias	Domestic Bias	Foreign Bias	Domestic Bias	Foreign Bias	Domestic Bias	Foreign Bias	Domestic Bias	Foreign Bias	Domestic Bias
	(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)	(J)	(K)	(L)
Risk–Return Profile												
YIELD	0.172	0.457 ***	0.290	1.058 ***	0.520	0.185	0.317	0.299 *	0.223	0.666 **	1.260 **	0.023
	(0.32)	(0.16)	(0.46)	(0.30)	(0.53)	(0.14)	(0.33)	(0.16)	(0.46)	(0.30)	(0.51)	(0.14)
FXCHG	0.01	0.03	−0.07	0.03	0.10	−0.02	−0.07	0.04	−0.19 **	0.06	0.17	−0.02
	(0.07)	(0.04)	(0.08)	(0.05)	(0.12)	(0.03)	(0.08)	(0.04)	(0.08)	(0.05)	(0.13)	(0.03)
FXVOL	−0.61	0.08	−0.82	0.69	1.76	−0.49	−0.82	−0.02	−1.35	0.29	0.27	−0.02
	(0.86)	(0.43)	(1.12)	(0.74)	(1.46)	(0.39)	(0.93)	(0.44)	(1.12)	(0.74)	(1.43)	(0.39)
Market Attributes												
SIZE	−0.02	−0.93 ***	−0.15 **	−0.93 ***	0.36 ***	−1.02 ***	0.05	−0.99 ***	0.14 *	−1.08 ***	0.30 ***	−1.00 ***
	(0.05)	(0.02)	(0.06)	(0.04)	(0.08)	(0.02)	(0.06)	(0.03)	(0.08)	(0.05)	(0.10)	(0.03)
FinDev	0.84 ***	−0.32 ***	0.90 ***	−0.35 **	−0.60	0.09	0.08	−0.04	0.39	−0.10	−0.20	−0.05
	(0.17)	(0.09)	(0.21)	(0.14)	(0.44)	(0.12)	(0.26)	(0.12)	(0.31)	(0.20)	(0.44)	(0.12)
OPENNESS	0.17 ***	0.04	0.18 ***	0.01	0.14	0.03	0.30 ***	−0.01	0.12 *	−0.03	0.24	0.03
	(0.05)	(0.02)	(0.05)	(0.03)	(0.16)	(0.04)	(0.08)	(0.04)	(0.08)	(0.05)	(0.21)	(0.06)
RATING_AorBBB	−0.08 ***	0.07 ***	−0.03 *	0.05 ***	−0.09 *	−0.02	0.01	0.02 *	0.08 ***	0.00	−0.06	−0.02
	(0.02)	(0.01)	(0.02)	(0.01)	(0.05)	(0.01)	(0.03)	(0.01)	(0.02)	(0.01)	(0.06)	(0.02)
RATING_BBorB	−0.14 ***	0.12 ***			−0.09	−0.01	0.00	0.04 **			−0.04	−0.02
	(0.03)	(0.01)			(0.06)	(0.02)	(0.03)	(0.02)			(0.06)	(0.02)
Constant	−0.28	12.75 ***	1.29 *	12.71 ***	−5.12 ***	14.04 ***	−1.38 *	13.60 ***	−2.25 **	14.65 ***	−4.42 ***	13.79 ***
	(0.56)	(0.28)	(0.74)	(0.49)	(1.00)	(0.27)	(0.76)	(0.36)	(0.98)	(0.64)	(1.16)	(0.31)
Observations	268	268	188	188	80	80	191	191	126	126	65	65
Number of Markets	14	14	9	9	5	5	14	14	9	9	5	5
Adjusted R-squared	0.94	1.00	0.93	0.99	0.95	1.00	0.94	1.00	0.94	0.99	0.96	1.00
Time-Fixed Effects	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Country-Fixed Effects	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
F Value	142	1,859	118	878	70	1,611	124	1,860	112	972	86	2,155

Notes: Parentheses indicate standard deviations. ***, **, and * denote 1%, 5%, and 10% significance respectively. A fixed-effects model is used to analyze the period from 2001–2021 or 2008–2021. The sample includes 27 developed and emerging economies. The two dependent variables are Foreign_Bias (the bias of foreign investors' holdings of i-country assets in i-country markets) and Domestic_Bias (the bias of i-country domestic investors' holdings of i-country assets). The independent variables are YIELD (yield on 5-year government bonds denominated in the local currency), FXCHG (12-month change in the real effective exchange rate), FXVOL (standard deviation of the real effective exchange rate), SIZE (natural logarithm of bond market capitalization), FinDev (natural logarithm of the financial development indicator), OPENNESS (natural logarithm of the capital control index), RATING_AorBBB (S&P's sovereign bond rating A or BBB dummy) and RATING_BBorB (S&P's sovereign bond rating BB or B dummy). or B dummy). Source: Author's estimation

Table 8: Analysis Result 4 (Case Where Central Bank's Domestic Bond Holdings are Deducted from Foreign and Domestic Bias in Analysis Result 2)

	2001–2021						2008–2021					
	All Samples		Developed Countries		Emerging Countries		All Samples		Developed Countries		Emerging Countries	
	Foreign Bias	Domestic Bias	Foreign Bias	Domestic Bias	Foreign Bias	Domestic Bias	Foreign Bias	Domestic Bias	Foreign Bias	Domestic Bias	Foreign Bias	Domestic Bias
	(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)	(J)	(K)	(L)
YIELD	0.438	0.572 ***	1.051 ***	1.179 ***	0.939 *	0.335	0.144	0.307	0.786 *	0.663	1.031 *	0.028
	(0.30)	(0.21)	(0.39)	(0.36)	(0.51)	(0.30)	(0.34)	(0.21)	(0.46)	(0.40)	(0.54)	(0.21)
FXCHG	0.03	0.05	−0.06	0.08	0.10	−0.02	−0.05	0.04	−0.12	0.05	0.14	0.00
	(0.07)	(0.05)	(0.07)	(0.06)	(0.11)	(0.07)	(0.08)	(0.05)	(0.08)	(0.07)	(0.13)	(0.05)
FXVOL	−0.62	−0.61	0.16	−0.64	0.74	−0.84	−1.14	−0.52	−0.49	−1.17	−0.03	0.26
	(0.83)	(0.58)	(0.98)	(0.88)	(1.40)	(0.85)	(0.97)	(0.61)	(1.14)	(1.01)	(1.49)	(0.59)
SIZE	−0.18 ***	−0.96 ***	−0.31 ***	−1.00 ***	0.29 ***	−1.06 ***	−0.13 **	−0.98 ***	−0.20 **	−1.04 ***	0.25 ***	−1.00 ***
	(0.04)	(0.03)	(0.05)	(0.05)	(0.08)	(0.05)	(0.06)	(0.04)	(0.08)	(0.07)	(0.10)	(0.04)
FinDev	0.65 ***	−0.24 **	1.06 ***	−0.25	−0.31	0.44 *	0.15	0.01	1.02 ***	−0.21	−0.36	−0.09
	(0.17)	(0.12)	(0.18)	(0.17)	(0.42)	(0.25)	(0.27)	(0.17)	(0.31)	(0.27)	(0.46)	(0.18)
OPENNESS	0.15 ***	0.15 ***	0.14 ***	0.18 ***	0.32 **	0.11	0.32 ***	0.14 ***	0.24 ***	0.17 ***	0.40 **	0.09
	(0.05)	(0.03)	(0.04)	(0.04)	(0.14)	(0.08)	(0.08)	(0.05)	(0.07)	(0.06)	(0.17)	(0.07)
Rating	0.03 ***	−0.03 ***	0.03 ***	−0.03 ***	0.00	−0.01 *	0.01 **	−0.02 ***	0.01 ***	−0.02 ***	−0.01	0.00
	(0.00)	(0.00)	(0.00)	(0.00)	(0.01)	(0.00)	(0.08)	(0.00)	(0.00)	(0.00)	(0.01)	(0.00)
Constant	1.16 **	13.56 ***	2.69 ***	14.04 ***	−4.34 ***	14.66 ***	0.64	13.66 ***	1.60 *	14.49 ***	−3.81 ***	13.81 ***
	(0.53)	(0.38)	(0.62)	(0.56)	(0.96)	(0.58)	(0.78)	(0.49)	(0.96)	(0.84)	(1.17)	(0.47)
Observations	268	268	188	188	80	80	191	191	126	126	65	65
Number of Markets	14	14	9	9	5	5	14	14	9	9	5	5
Adjusted R-squared	0.943268	0.990951	0.950458	0.986265	0.954547	0.989869	0.937721	0.992052	0.941419	0.986607	0.956536	0.996033
Time-Fixed Effects	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Country-Fixed Effects	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
F Value	158.2	1,036.2	160.0	596.2	84.3	388.8	122.1	1,005.0	113.1	514.7	85.8	968.2

Notes: Parentheses indicate standard deviations. ***, **, and * denote 1%, 5%, and 10% significance respectively. A fixed-effects model is used to analyze the period from 2001–2021 or 2008–2021. The sample includes 27 developed and emerging economies. The two dependent variables are Foreign_Bias_ExcCB (Foreign Bias net of central bank domestic bond holdings) and Domestic_Bias_ExcCB (Domestic Bias net of central bank domestic bond holdings). The independent variables are YIELD (yield on 5-year government bonds denominated in the local currency), FXCHG (12-month change in the real effective exchange rate), FXVOL (standard deviation of the real effective exchange rate), SIZE (natural logarithm of bond market capitalization), FinDev (natural logarithm of the financial development indicator), OPENNESS (natural logarithm of the capital control index), and RATING (S&P's sovereign bond rating). Source: Author's estimation

Table 9: Analysis Result 5 (Case Where YIELD in Analysis Result 2 is Replaced by YIELD SPREAD)

	2001–2021						2008–2021					
	All Samples		Developed Countries		Emerging Countries		All Samples		Developed Countries		Emerging Countries	
	Foreign Bias	Domestic Bias	Foreign Bias	Domestic Bias	Foreign Bias	Domestic Bias	Foreign Bias	Domestic Bias	Foreign Bias	Domestic Bias	Foreign Bias	Domestic Bias
	(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)	(J)	(K)	(L)
Risk–Return Profile												
YIELD_SPREAD	0.522 *	0.246 *	1.103 ***	0.628 **	0.897 *	0.232	0.467	0.188	0.840 *	0.319	1.260 **	0.066
	(0.30)	(0.15)	(0.39)	(0.25)	(0.53)	(0.14)	(0.32)	(0.15)	(0.47)	(0.28)	(0.51)	(0.14)
FXCHG	0.00	0.04 *	−0.10	0.06	0.12	−0.01	−0.06	0.04	−0.15 *	0.04	0.18	−0.01
	(0.07)	(0.03)	(0.07)	(0.05)	(0.12)	(0.03)	(0.08)	(0.04)	(0.08)	(0.05)	(0.13)	(0.03)
FXVOL	−0.10	−0.22	0.39	−0.20	1.46	−0.50	−0.53	−0.26	−0.22	−0.59	0.38	0.00
	(0.83)	(0.40)	(0.97)	(0.62)	(1.48)	(0.40)	(0.92)	(0.42)	(1.16)	(0.69)	(1.42)	(0.39)
Market Attributes												
SIZE	−0.04	−0.92 ***	−0.18 ***	−0.93 ***	0.33 ***	−1.02 ***	0.00	−0.96 ***	−0.04	−0.98 ***	0.28 ***	−1.01 ***
	(0.05)	(0.02)	(0.05)	(0.03)	(0.09)	(0.02)	(0.06)	(0.03)	(0.08)	(0.05)	(0.09)	(0.02)
FinDev	0.69 ***	−0.24 ***	0.90 ***	−0.34 ***	−0.44	0.11	0.17	−0.07	0.69 **	−0.29	−0.15	−0.02
	(0.18)	(0.08)	(0.18)	(0.12)	(0.44)	(0.12)	(0.26)	(0.12)	(0.31)	(0.19)	(0.43)	(0.12)
OPENNESS	0.13 **	0.07 ***	0.10 **	0.08 ***	0.26 *	0.06	0.27 ***	0.01	0.18 **	0.00	0.38 **	0.08 *
	(0.05)	(0.02)	(0.04)	(0.03)	(0.15)	(0.04)	(0.08)	(0.04)	(0.07)	(0.04)	(0.16)	(0.04)
Rating	0.03 ***	−0.02 ***	0.03 ***	−0.03 ***	0.01	0.00	0.02 ***	−0.01 ***	0.02 ***	−0.02 ***	−0.01	0.00
	(0.00)	(0.00)	(0.00)	(0.00)	(0.01)	(0.00)	(0.08)	(0.00)	(0.00)	(0.00)	(0.01)	(0.00)
Constant	−0.64	12.99 ***	1.09 *	13.23 ***	−5.00 ***	14.02 ***	−1.01	13.46 ***	−0.31	13.78 ***	−4.13 ***	13.89 ***
	(0.57)	(0.26)	(0.62)	(0.40)	(1.01)	(0.27)	(0.74)	(0.34)	(0.97)	(0.58)	(1.12)	(0.30)
Observations	268	268	188	188	80	80	191	191	126	126	65	65
Number of Markets	14	14	9	9	5	5	14	14	9	9	5	5
Adjusted R-squared	0.944918	0.995756	0.951337	0.993455	0.945982	0.997568	0.941721	0.996138	0.939601	0.993902	0.958193	0.998261
Time-Fixed Effects	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Country-Fixed Effects	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
F Value	159.8	2,218.6	163.0	1,259.2	70.5	1,628.9	131.0	2,075.8	109.5	1,137.6	89.3	2,211.8

Notes: Parentheses indicate standard deviations. ***, **, and * denote 1%, 5%, and 10% significance respectively. A fixed-effects model is used to analyze the period from 2001–2021 or 2008–2021. The sample includes 27 developed and emerging economies. The two dependent variables are Foreign_Bias (the bias of foreign investors' holdings of i-country assets in i-country markets) and Domestic_Bias (the bias of i-country domestic investors' holdings of i-country assets). The independent variables are YIELD_SPREAD (yield on 5-year government bonds denominated in the local currency minus yield on 5-year US Treasury bonds denominated in US Dollar), FXCHG (12-month change in the real effective exchange rate), FXVOL (standard deviation of the real effective exchange rate), SIZE (natural logarithm of bond market capitalization), FinDev (natural logarithm of the financial development indicator), OPENNESS (natural logarithm of the capital control index), RATING_AorBBB (S&P's sovereign bond rating A or BBB dummy) and RATING_BBorB (S&P's sovereign bond rating BB or B dummy). or B dummy). Source: Author's estimation

Table 10: Analysis Result 6 (Case Where Central Bank's Domestic Bond Holdings are Deducted from Foreign and Domestic Bias in Analysis Result 5)

	2001–2021						2008–2021					
	All Samples		Developed Countries		Emerging Countries		All Samples		Developed Countries		Emerging Countries	
	Foreign Bias	Domestic Bias	Foreign Bias	Domestic Bias	Foreign Bias	Domestic Bias	Foreign Bias	Domestic Bias	Foreign Bias	Domestic Bias	Foreign Bias	Domestic Bias
	(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)	(J)	(K)	(L)
Risk–Return Profile												
YIELD_SPREAD	0.438	0.572 ***	1.051 ***	1.179 ***	0.939 *	0.335	0.144	0.307	0.786 *	0.663	1.031 *	0.028
	(0.30)	(0.21)	(0.39)	(0.36)	(0.51)	(0.30)	(0.34)	(0.21)	(0.46)	(0.40)	(0.54)	(0.21)
FXCHG	0.03	0.05	−0.06	0.08	0.10	−0.02	−0.05	0.04	−0.12	0.05	0.14	0.00
	(0.07)	(0.05)	(0.07)	(0.06)	(0.11)	(0.07)	(0.08)	(0.05)	(0.08)	(0.07)	(0.13)	(0.05)
FXVOL	−0.62	−0.61	0.16	−0.64	0.74	−0.84	−1.14	−0.52	−0.49	−1.17	−0.03	0.26
	(0.83)	(0.58)	(0.98)	(0.88)	(1.40)	(0.85)	(0.97)	(0.61)	(1.14)	(1.01)	(1.49)	(0.59)
Market Attributes												
SIZE	−0.18 ***	−0.96 ***	−0.31 ***	−1.00 ***	0.29 ***	−1.06 ***	−0.13 **	−0.98 ***	−0.20 **	−1.04 ***	0.25 ***	−1.00 ***
	(0.04)	(0.03)	(0.05)	(0.05)	(0.08)	(0.05)	(0.06)	(0.04)	(0.08)	(0.07)	(0.10)	(0.04)
FinDev	0.65 ***	−0.24 **	1.06 ***	−0.25	−0.31	0.44 *	0.15	0.01	1.02 ***	−0.21	−0.36	−0.09
	(0.17)	(0.12)	(0.18)	(0.17)	(0.42)	(0.25)	(0.27)	(0.17)	(0.31)	(0.27)	(0.46)	(0.18)
OPENNESS	0.15 ***	0.15 ***	0.14 ***	0.18 ***	0.32 **	0.11	0.32 ***	0.14 ***	0.24 ***	0.17 ***	0.40 **	0.09
	(0.05)	(0.03)	(0.04)	(0.04)	(0.14)	(0.08)	(0.08)	(0.05)	(0.07)	(0.06)	(0.17)	(0.07)
Rating	0.03 ***	−0.03 ***	0.03 ***	−0.03 ***	0.00	−0.01 *	0.01 **	−0.02 ***	0.01 ***	−0.02 ***	−0.01	0.00
	(0.00)	(0.00)	(0.00)	(0.00)	(0.01)	(0.00)	(0.08)	(0.00)	(0.00)	(0.00)	(0.01)	(0.00)
Constant	1.17 **	13.56 ***	2.71 ***	14.07 ***	−4.32 ***	14.67 ***	0.64	13.67 ***	1.61 *	14.50 ***	−3.80 ***	13.81 ***
	(0.54)	(0.38)	(0.62)	(0.57)	(0.96)	(0.58)	(0.78)	(0.49)	(0.96)	(0.84)	(1.17)	(0.47)
Observations	268	268	188	188	80	80	191	191	126	126	65	65
Number of Markets	14	14	9	9	5	5	14	14	9	9	5	5
Adjusted R-squared	0.943268	0.990951	0.950458	0.986265	0.954547	0.989869	0.937721	0.992052	0.941419	0.986607	0.956536	0.996033
Time-Fixed Effects	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Country-Fixed Effects	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
F Value	158.2	1,036.2	160.0	596.2	84.3	388.8	122.1	1,005.0	113.1	514.7	85.8	968.2

Notes: Parentheses indicate standard deviations. ***, **, and * denote 1%, 5%, and 10% significance respectively. A fixed-effects model is used to analyze the period from 2001–2021 or 2008–2021. The sample includes 27 developed and emerging economies. The two dependent variables are Foreign_Bias_ExcCB (Foreign Bias net of central bank domestic bond holdings) and Domestic_Bias_ExcCB (Domestic Bias net of central bank domestic bond holdings). The independent variables are YIELD_SPREAD (yield on 5-year government bonds denominated in the local currency minus yield on 5-year US Treasury bonds denominated in USD), FXCHG (12-month change in the real effective exchange rate), FXVOL (standard deviation of the real effective exchange rate), SIZE (natural logarithm of bond market capitalization), FinDev (natural logarithm of the financial development indicator), OPENNESS (natural logarithm of the capital control index), and RATING (S&P's sovereign bond rating). Source: Author's estimation

6. Conclusion.

This study comprehensively analyzes the impact of investors' search-for-yield behavior on home bias in the bond market. This analysis covers 27 developed and emerging economies. The definition of home bias deals with domestic and foreign investors separately, and the analysis period is from 2001 to 2021, the longest period for which data are available. The analysis method uses a fixed-effects model with reference to the estimation equation in Park et al. (2019), employing two types of home bias indicators as dependent variables and 5-year government bond yields denominated in the local currency, real exchange rate-related indicators, and other control variables as independent variables. In addition to the case for all sample countries, the analysis includes separate cases for only developed countries and only emerging countries. We also analyze the case in which central bank holdings of domestic bonds are excluded from the calculation of home bias, which is a unique approach compared to previous studies on home bias.

The analysis indicates that in many cases, with some exceptions, domestic and foreign investors in each country, both developed and emerging, increase their demand for bonds as yields rise, which is consistent with search-for-yield behavior. This tendency strengthens when the central banks' domestic bond holdings are excluded. Specifically, two points can be highlighted: First, the significance of bond yields increased in emerging economies after the global financial crisis, suggesting that these economies became more attractive targets for search-for-yield behavior in the low-interest-rate environment following the global financial crisis. Second, by excluding the domestic bond holdings of central banks, the significance of bond yields for the bias in domestic investors' holdings in advanced economies increased. This finding suggests that when central banks' substantial domestic bond holdings in advanced economies are excluded, investors' decisions are better reflected in the country's overall asset composition.

A future challenge is to analyze the impact of the recent monetary tightening policies of central banks in many countries, including the U.S. Since 2022, central banks in the U.S. and many other countries have been sharply tightening monetary policy to cope with high inflation, creating a situation where investors can secure high yields simply by investing in U.S. Treasuries. Therefore, it would be meaningful to analyze how the home bias of each country has changed because of this search-for-yield behavior once data from the next several years become available.

Data Appendix

This section describes the data sources and definitions of each variable used in the empirical analysis. The data in table below are used to calculate the home bias index.

Variables used for Home bias index calculation

Variavle name	Data source	Definition
Domestic assets held by foreign residents	the International Monetary Fund (IMF)'s the Coordinated Portfolio Investment Survey (CPIS) https://data.imf.org/regular.aspx?key=60587820	Total value of equity or debt investment from source country to world.
Domestic debt market capitalization	Bank for International Settlements' (BIS) Debt Securities Statistics https://stats.bis.org/statx/srs/table/c1	Outstanding debt securities (domestic + international debts) of a country.
Worldwide debt market capitalization	Bank for International Settlements' (BIS) Debt Securities Statistics	Total of the outstanding debt securities (domestic + international debts) of the countries available in the BIS database.

Domestic bond holdings by central banks

Obtained from Bloomberg or the websites of the respective national central banks listed below.

Reserve Bank of Australia
https://www.rba.gov.au/statistics/balance-sheet/
The Oesterreichische Nationalbank
https://www.oenb.at/isawebstat/stabfrage/createReport;jsessionid=4692654826A0DEDEAC81E3AED45D33B9?lang=EN&original=false& report=1.1.1
Denmark NationalBank
https://www.nationalbanken.dk/en
The Bank of Finland
https://www.suomenpankki.fi/en/Statistics/mfi-balance-sheet/tables/rati-taulukot-en/SP_tase_en/
Bank of Korea
https://www.bok.or.kr/eng/main/main.do
Banco de Portugal
https://www.bportugal.pt/en/page/list-publications-banco-de-portugal?search_api_fulltext=annual%20report
Monetary Authority of Singapore
https://www.mas.gov.sg/
The Banco de España
https://www.bde.es/wbe/en/publicaciones/informes-memorias-anuales/informe-anual/?page=1&sort=DESC
The Riksbank
https://www.riksbank.se/en-gb/statistics/riksbanks-balance-sheet/the-riksbanks-assets-and-liabilities-the-weekly-report/
The People's Bank of China
http://www.pbc.gov.cn/en/3688247/3688975/4787948/4787992/index.html
Reserve Bank of India
https://data.rbi.org.in/DBIE/#/dbie/home

Bank Indonesia
https://www.bi.go.id/en/publikasi/laporan/default.aspx?Category=annual%20report&Period=annual
Bank Negara Malaysia
https://www.bnm.gov.my/bnm-annual-report
The Bangko Sentral ng Pilipinas
https://www.bsp.gov.ph/Pages/AboutTheBank/AuditedFinancialStatements/AuditedFinancialStatements.aspx
South African Reserve Bank
https://www.resbank.co.za/en/home/publications/statements/Statement-of-Assets-and-Liabilities?rows=75&year=2021&page=1
The Central Bank of the Republic of Türkiye
https://www.tcmb.gov.tr/wps/wcm/connect/EN/TCMB+EN/Main+Menu/Publications/Reports/Annual+Reports/

YIELD/YIELD SPREAD

YIELD is obtained from Bloomberg as the yield on the 5-year government bond denominated in the local currency, and YIELD SPREAD is calculated by subtracting the yield on 5-year U.S. Treasury bonds denominated in U.S. dollars from YIELD.

Real Effective Exchange Rate

Monthly data for each country are obtained from the BIS website to calculate the 12-month rates of change and 12-month standard deviations.
https://www.bis.org/statistics/eer.htm

Bond Market Capitalization

The data for each country are obtained from the BIS website, and SIZE is calculated by taking the natural logarithm of the end-of-year data.
https://stats.bis.org/statx/srs/table/c1

Financial Development Indicator

An Excel file is obtained from the IMF website and the Financial Development (FD) column is set to FinDev. The values range from 0 (less developed) to 1 (well-developed). The natural logarithms of these values are used.
https://data.imf.org/?sk=f8032e80-b36c-43b1-ac26-493c5b1cd33b

Capital Control Index

The capital control index in Table 4Dii is obtained from an Excel file on the Economic Freedom Network website. This index takes values ranging from 0 (fully controlled) to 10 (fully open). As some values are 0, we add 1 to the index and take the natural logarithm.
https://www.fraserinstitute.org/studies/economic-freedom

Rating Data

The rating data for each country are obtained from Bloomberg using ratings from Standard & Poor's for both local and foreign currencies. For the RATING, the AAA is set as 23, and each one-notch

decrease is converted into a scale of 23 steps. The averages of local and foreign currency ratings are used. For RATING_AorBBB, the average rating is between 14 and 20, whereas for RATING_BBorB, the average rating is between 8 and 14.

References

Ammer, J., Claessens, S., Tabova, A., & Wroblewski, C. (2018). Searching for yield abroad: risk-taking through foreign investment in US bonds. FRB International Finance Discussion Paper, (1224).

Feldstein, M., & Horioka, C. (1980). Domestic saving and international capital flows. The Economic Journal, 90(358), 314-329.

Fidora, M., Fratzscher, M., & Thimann, C. (2007). Home bias in global bond and equity markets: the role of real exchange rate volatility. Journal of International Money and Finance, 26(4), 631-655.

Ho, E. H. C. (2022). Foreign participation in local currency government bond markets in emerging Asia: Benefits and pitfalls to market stability. Journal of International Money and Finance, 128, 102699.

Hofmann, B., Shim, I., & Shin, H. S. (2020a). Bond risk premia and the exchange rate. Journal of Money, Credit and Banking, 52(S2), 497-520.

Hofmann, B., Shim, I., & Shin, H. S. (2020b). Emerging market economic exchange rates and local currency bond markets amid the Covid-19 pandemic. BIS Bulletin No. 5.

Horioka, C. Y. (2024). The Feldstein-Horioka Puzzle or Paradox after 44 years: a fallacy of composition. Japanese Economic Review. https://doi.org/10.1007/s42973-024-00153-w

Horioka, C. Y., Terada-Hagiwara, A., & Nomoto, T. (2016). Explaining Foreign Holdings of Asia's Debt Securities: The Feldstein-Horioka Paradox Revisited. Asian Economic Journal, 30(1), 3-24.

Martinez-Miera, D., & Repullo, R. (2017). Search for yield. Econometrica, 85(2), 351-378.

Ogura, Y. (2020). Intensified lending competition and search-for-yield under prolonged monetary easing. Journal of the Japanese and International Economies, 56, 101076.

Oshima, K. (2020). Search for yield and business cycles. The North American Journal of Economics and Finance, 54, 101275.

Park, D., Taniguchi, K., & Tian, S. (2019). Determinants of foreign and domestic investment bias in global bond markets: Some empirical evidence. The North American Journal of Economics and Finance, 49, 287-303.

Rajan, R. (2005). Has financial development made the world riskier? Proceedings - Economic Policy Symposium - Jackson Hole, Federal Reserve Bank of Kansas City, 313-69.

Svirydzenka, K. (2016). Introducing a new broad-based index of financial development. International Monetary Fund Working Paper 16/5.