



# *Foreign Ownership of Agency MBS*

*September 2023*

Foreign investors have been a consistent source of capital for U.S. Agency mortgage-backed securities (Agency MBS) for as long as foreign investment in government securities has been tracked publicly. One of the drivers of the strong foreign investment demand for Agency MBS is their low-to-no default risk characteristics, although the nature and dependability of the government's role in guaranteeing Agency MBS differs by Agency. Federal support for securities guaranteed by Fannie Mae and Freddie Mac is implicit, whereas securities guaranteed by Ginnie Mae are explicitly backed by the full faith and credit of the United States government and carry the same credit support as U.S. Treasury securities.

All data used in this report is publicly available and is primarily from three sources: US Treasury International Capital (TIC) data, the International Monetary Fund (IMF), and the Sovereign Wealth Funds (SWF) Institute. The TIC data tracks cross-border securities investment flows between U.S. and foreign entities once per year. This data is collected through a survey of U.S.-resident issuers and custodians that issue securities to, or hold them on behalf of, foreign-resident clients. The TIC data covers a broad range of securities in addition to Agency MBS, including U.S. Treasury securities, corporate and municipal debt, equities, and agency debt. The annual TIC data used in this report is as of June 30 of each year, was compiled as of June 30, 2022, and was released on April 28, 2023.<sup>1</sup> IMF data captures current account balance (CAB) data and Foreign Exchange (FOREX) reserve data by nation, and SWF Institute data captures, among other SWF-related statistics, the assets under management (AUM) of the world's SWFs. Both IMF and Sovereign Wealth Funds Institute data is compiled annually.

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<sup>1</sup> <https://home.treasury.gov/data/treasury-international-capital-tic-system/us-liabilities-to-foreigners-from-holdings-of-us-securities>

## Highlights

### Foreign Ownership

- *Foreign holdings of Agency MBS declined by 3.51% from a high of \$1.188 trillion in June 2021 to \$1.146 trillion in June 2022. Over the same period, the foreign share of the outstanding Agency MBS market decreased by 1.87% from 15.50% to 13.63%.*
- *As of June 30, 2022, 85% of foreign Agency MBS holdings were held by 10 countries located in Asia, North America, Europe, and the Caribbean. Japan, China, and Taiwan held roughly 60% of the foreign total and the remaining 7 countries in the top ten held 25%. After entering the top ten for the first time in 2021, Canada remained in the top 10 in June 2022 in 4<sup>th</sup> place.*
- *While overall foreign demand increased consistently since 2003, the foreign share of Agency MBS outstanding decreased slightly during the COVID-19 pandemic. Additionally, we saw a decrease in foreign holdings of Agency MBS in 2022 compared to 2021.*

### Key Drivers of Foreign Demand

- *There are a wide variety of drivers of foreign demand for Agency MBS including disposable foreign wealth, US macroeconomic conditions, foreign economic circumstances, and the investment postures of current and potential foreign investors in Agency MBS.*
- *US macroeconomic conditions, foreign investment postures, and certain other drivers provide explanations for allocations of foreign disposable wealth into or out of Agency MBS that are important to note; however, the fundamental driver of demand is disposable foreign wealth.*
- *Current Account Balances (CABs) and Foreign Exchange (FOREX) reserves are documented proxies for foreign disposable wealth that show evidence of correlation with demand for Agency MBS. (See Appendix B for detailed analysis of these correlations)*
- *Outside of China and Canada, CABs decreased for multiple countries across the world. Europe, as a region, fell into negative territory in 2022, with a CAB of -\$253 billion.*
- *With the exception of Saudi Arabia and Taiwan, FOREX reserves generally declined in 2022, which might explain part of the decline in Agency MBS holdings, given the correlation referenced above.*

### Future Growth of Foreign Holdings of Agency MBS

- *The foreign share of Agency MBS declined after the 2008 global financial crisis but rose from \$657 billion in 2013 to \$1.188 trillion in 2021. Although this share declined to around \$1.146 trillion in June 2022, it still represents the third highest level of foreign holdings of Agency MBS since 2003, and Agency MBS continue to be an important component of foreign investment portfolios.*
- *As of June 30, 2022, official institutions held 55% of all foreign holdings of Agency MBS.*
- *Countries where Agency MBS investments represent a small percentage of FOREX reserves and/or SWF asset allocations, may provide opportunities for future investment in Agency MBS.*
- *SWFs have limited holdings of Agency MBS compared to other portfolio sectors and may provide an opportunity for foreign demand growth.*

### Investment Decision Factors

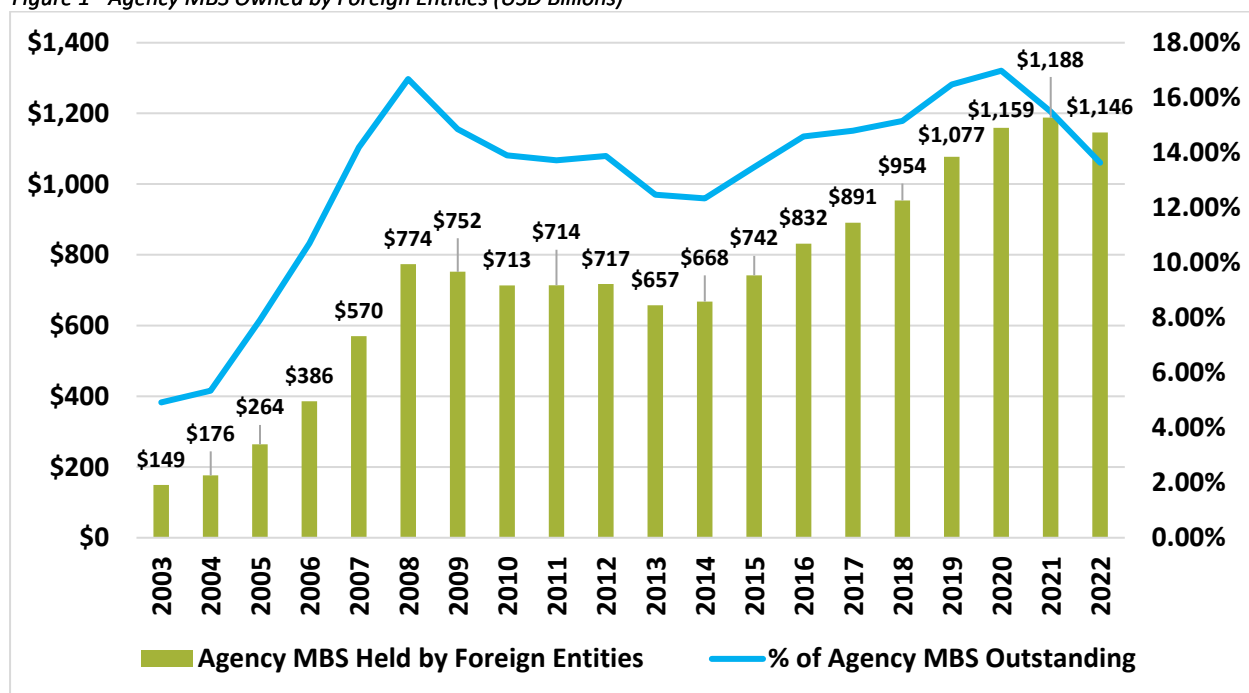
- *Economic factors, principally inflation, caused the Federal Reserve (Fed) to increase its Agency MBS redemption cap to \$35 billion in September 2022 indicating a continuation of the quantitative tightening (QT) process that began earlier in the year. Recent reports on CPI in the US indicate that inflation continues to decline, registering at 3% in June 2023.*
- *Financial factors like current yields and historically high spreads compared to US Treasury securities show the relative attractiveness of the Agency MBS sector.*
- *Agency MBS yields rose sharply from 3.1% in March 2022, when the Fed started raising interest rates to fight inflation, to 5.5% in May 2023.*
- *Recent reports and press releases from both Ginnie Mae and Fannie Mae indicate continued focus on ESG investments. Ginnie Mae's focus on providing disclosures to facilitate social and green impact investing and the recent ESG report from Fannie Mae indicating an increased commitment to Green MBS will provide enhanced ESG investment opportunities to global investors through Agency MBS.*

## Foreign Ownership

### Aggregate Foreign Demand for Agency MBS

The pattern of aggregate foreign agency holdings over the past two decades has been one of consistent growth, with the exception of the economic crisis years. Figure 1 below captures the annual volume of foreign holdings of Agency MBS between June 2003 and June 2022. Between 2003 and 2008, foreign holdings increased sharply from \$149 billion to a peak of \$774 billion in 2008. As the Global Economic Crisis took hold, foreign holdings declined to a low of \$657 billion in 2013 before steadily increasing. Foreign holdings exceeded \$1 trillion for the first time in 2019, and as of 2021, were at an all-time high of \$1.188 trillion. As of June 30, 2022, foreign investors owned 13.6% of all outstanding Agency MBS, a 1.9% decrease from 15.5% in 2021.<sup>2</sup> This drop in share is likely the result of rising inflation and interest rates throughout the globe during the 2021-2022 period. Additionally, the decline in market value for some of the lower coupon securities may have contributed to some of the percentage drop.

Figure 1 - Agency MBS Owned by Foreign Entities (USD Billions)



Sources: TIC and Recursion data. As of June 30, 2022. Note: Data source changed from prior year as SIFMA Agency MBS database is under maintenance.

TIC data does not differentiate between foreign ownership of Fannie Mae, Freddie Mac, and Ginnie Mae MBS. For that reason, it is difficult to determine the composition of Agency MBS in foreign investment portfolios. All three are considered attractive to foreign investors for their unique status, but there are differences in credit support between the three. Fannie Mae and Freddie Mac MBS carry a limited, implicit guaranty of the U.S. government, while Ginnie Mae MBS carry the unlimited, explicit full faith and credit guaranty of the U.S. government.

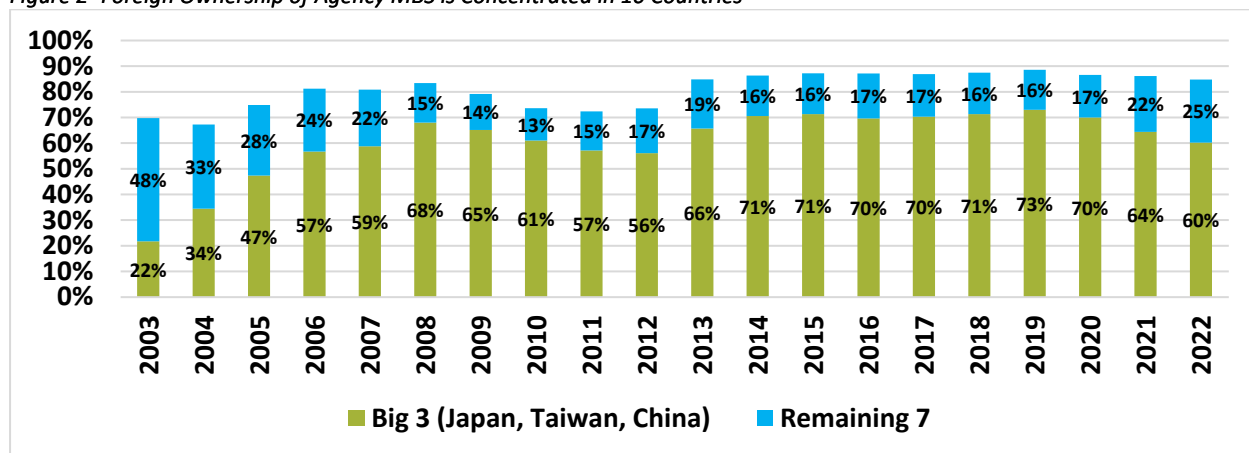
### Top 10 Nations with Foreign Agency MBS Investments

TIC data shows that 10 countries have historically held most of the foreign owned Agency MBS, as seen in Figure 2. As of June 2022, investors in Japan, China, and Taiwan ("Big Three") hold 60% of all foreign-owned Agency MBS, a slight drop from 2021. These three countries increased their share of Agency MBS holdings dramatically from 22%

<sup>2</sup> Note that the source data for this share calculation was changed from SIFMA to Recursion as SIFMA's Agency MBS Outstanding database has been undergoing maintenance since the beginning of 2022.

in 2003 to a peak of 73% by 2019. Since 2019, the top 10 holders' share of total holdings has remained relatively stable, with those countries holding around 85% each year. The share of holdings outside of the Big 3 has increased consistently each year, reaching 25% in June 2022.

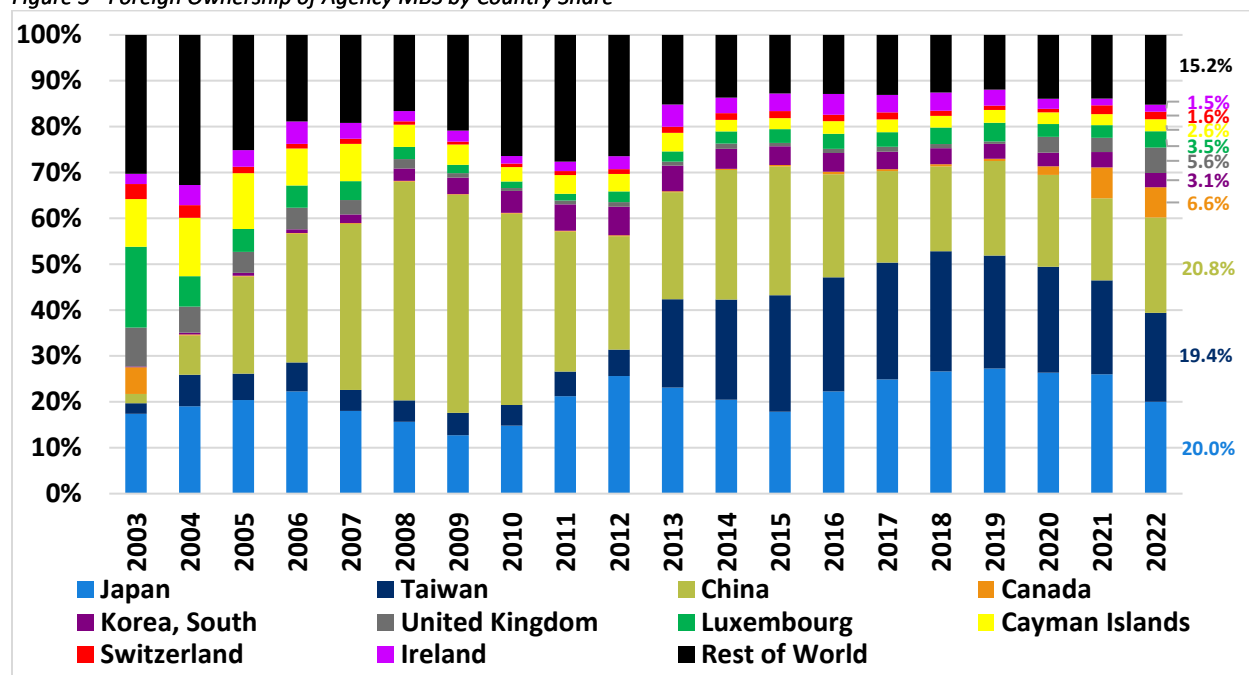
Figure 2- Foreign Ownership of Agency MBS is Concentrated in 10 Countries



Source: TIC data. As of June 30, 2022.

Figure 3 breaks down foreign ownership of Agency MBS by country, revealing trends in ownership amongst top owning countries. Between 2003 and 2021, by far the largest increases in ownership came from China and Taiwan. From 2003 to 2008, China's rapid economic growth is reflected in its Agency MBS portfolio holdings, jumping from 2% to 47.7%. Taiwan's ownership increased by 13.4% from 2012 to 2013 and has consistently held around 20% of foreign Agency MBS holdings since. Japan has maintained a consistent share and place in the top three foreign investing countries. As of June 30, 2022, however, China became the top holder of Agency MBS for the first time since 2016.

Figure 3 - Foreign Ownership of Agency MBS by Country Share



Source: U.S. TIC data. As of June 30, 2022.

## Changes in Foreign Ownership

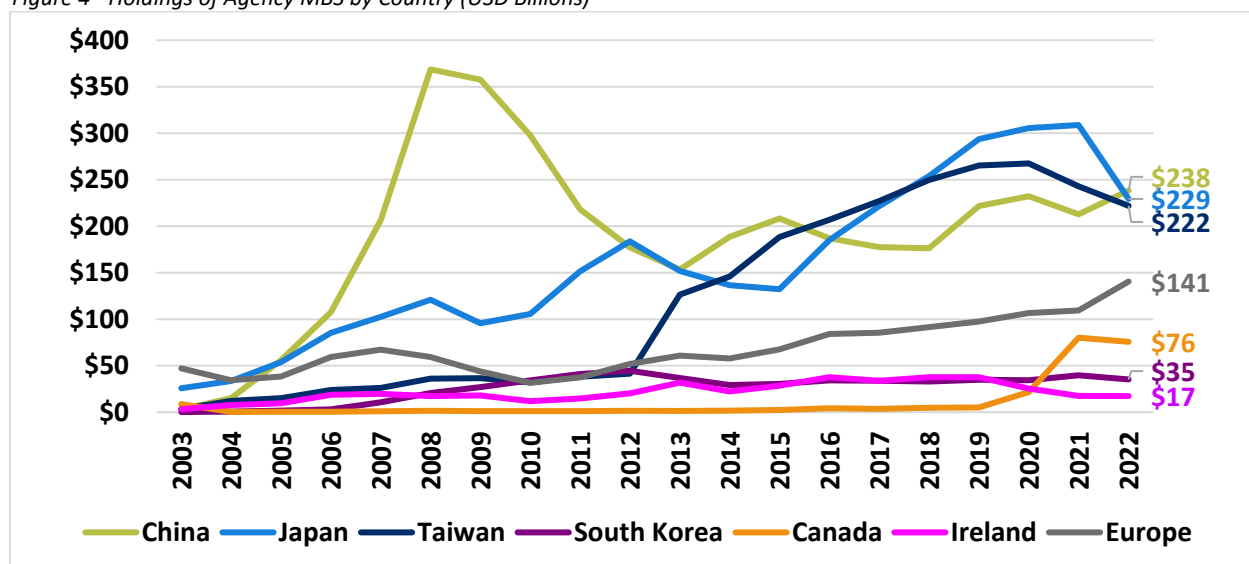
The TIC data captures the aggregate changes in the market value of foreign holdings of Agency MBS arising from price or exchange rate volatility as well as purchases and sales. As a result, changes in holdings are affected by a combination of trading activity and market values; however, the TIC data currently does not break out the specific impacts of these factors on foreign holdings.

The Big Three have emerged as the dominant holders of foreign Agency MBS investments since the global financial crisis, but as recently as 2003, they represented less than a quarter of Agency MBS held by foreign investors. Another significant investor from Asia is South Korea. While it does not hold nearly the same amount of Agency MBS as the Big Three, it still ranks 6<sup>th</sup> in the top 10 in foreign Agency MBS holdings. South Korea held \$35.3 billion in 2022 compared to \$39.8 billion in 2021, a decrease in holdings of 11.3%.

Europe has been the other source of sizeable foreign demand for Agency MBS over the past two decades. Although its share of total foreign Agency MBS holdings has dropped significantly compared to Asia since 2003, the continent still boasts a total of \$123 billion in holdings as of June 2022. Much of this total comes from the United Kingdom, Luxembourg, Switzerland, and Ireland. Each of these nations is ranked in the top 10 foreign holders with the United Kingdom growing the most between 2021 and 2022. Year-over-year, the United Kingdom's holdings increased by over 73%, from \$36.8 billion to \$63.8 billion.

Lastly, countries in the Caribbean and one newcomer from North America round out the remaining top 10 in terms of Agency MBS holdings as of June 30, 2022. Historically, Bermuda and the Cayman Islands have been consistent holders of Agency MBS, driven by their tax haven status. In 2022, the Cayman Islands held \$30.1 billion, and Bermuda held \$16.69 billion, with the Cayman Islands experiencing a 4.2% increase and Bermuda a 22.2% decrease year-over-year. As of June 30, 2022, Canada maintained its 4<sup>th</sup> place rank in the top 10 foreign holders of Agency MBS. Prior to 2021, Canada only cracked the top 10 in 2003 and 2020, ranked at 6<sup>th</sup> and 10<sup>th</sup>, respectively. In 2022, while its holdings dropped year-over-year from a total of \$80.2 billion to \$75.8 billion, Canada continues to rank only behind the Big Three in terms of Agency MBS owned. Figure 4 illustrates the investment trends of the current top holders of Agency MBS.

Figure 4 - Holdings of Agency MBS by Country (USD Billions)

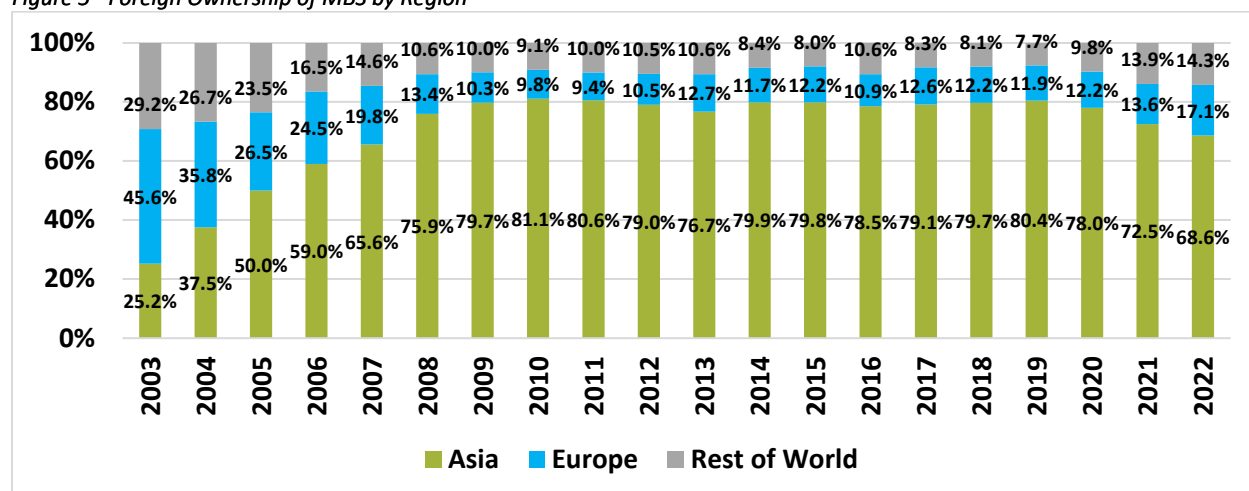


Source: U.S. TIC data. As of June 30, 2022. Note: Europe is comprised of European countries in the current top 10 holders (United Kingdom, Luxembourg, Switzerland, and Ireland)

Since the emergence of the Big Three, all notably in Asia, as the predominant sources of foreign Agency MBS demand in the early to mid-2000s, there was not much variation in the regional share of Agency MBS holdings until 2022.

Figure 5 shows the breakdown of market share between Asia, Europe, and the rest of the world. Regionally, Asia's share dropped for the second straight year to 68.6% in 2022 from 72.5% in 2021. Europe, because of significant growth from the United Kingdom and Luxembourg, grew 3.5% to an overall share of 17.1% in 2022. The rest of the world also saw a slight increase to 14.3% in 2022, due to the increase in holdings from the Cayman Islands and other areas.

Figure 5 - Foreign Ownership of MBS by Region



Source: TIC data. As of June 30, 2022.

### Key Drivers of Foreign Demand

The observations above concerning national and regional trends in foreign Agency MBS investment are impacted by a variety of complex nation-specific demand factors, as well as fluctuations in the market valuations of the securities. Large investors in Ginnie Mae securities include central banks, SWFs, public pension funds, mutual funds, and insurance companies. Some of these, like central banks, are present in all or most foreign nations, while others, like mutual funds and insurance companies, have much more prominent roles and much larger asset pools in the world's most developed economies. Still, among the world's 190+ nations, the structural diversity of economies goes beyond their institutional makeup. Nations' policies regarding private sector foreign investment vary extensively. For instance, in India, regulators have capped foreign investment from the mutual fund sector at \$7 billion with the expressed goal of protecting the Rupee.<sup>33</sup> Every nation has its own set of circumstances impacting the particulars of their official FOREX reserve management system, and all these nation-specific circumstances impact foreign investors' allocations in Agency MBS. While these circumstances are challenging to manage and monitor en masse, truly understanding demand for Agency MBS does require a familiarity with foreign nations' posture on investment allocations, the many macroeconomic considerations and the institutions that regulate them, as well as how US macroeconomic conditions and forecasts might impact foreign demand for MBS. (See Appendix B for a closer look at the demand drivers for foreign Agency MBS investment, including certain US and international macroeconomic conditions)

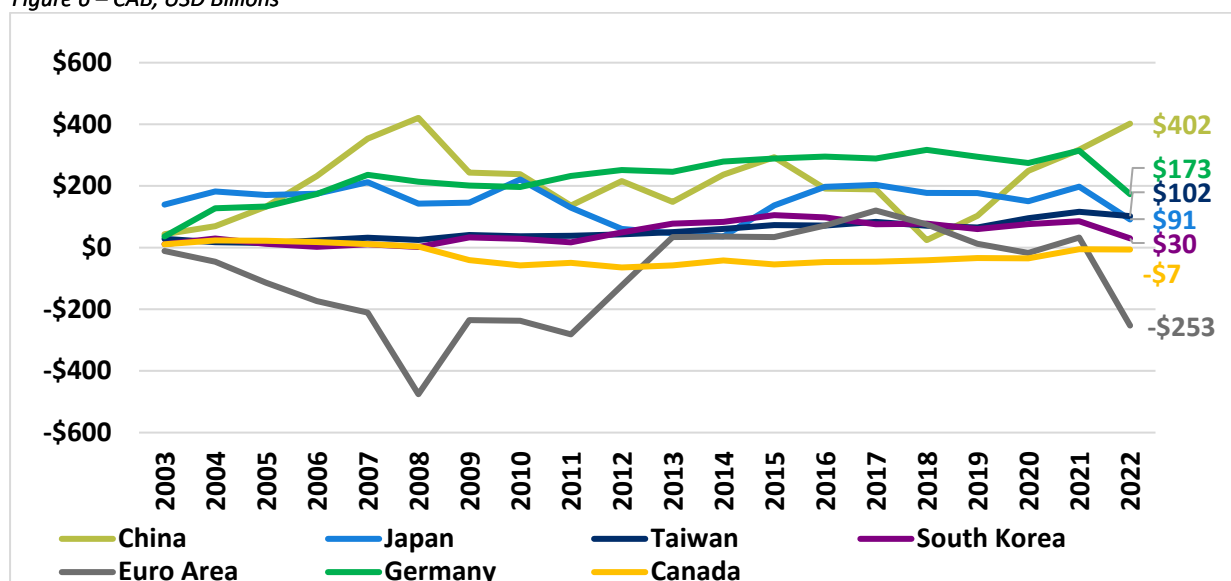
While it may be useful to note that rising interest rates, high current inflation levels, employment forecasts, QT and other Fed policies are likely to impact demand in the future, these demand drivers influence domestic and foreign investors alike in well documented ways. Because the focus of this analysis is on factors unique to the foreign market, this paper ignores these demand drivers. International macroeconomic factors and foreign investment policy are structurally central to the global demand equation. As the agencies work to triage their foreign investor engagement efforts with the goal of efficiently disseminating information about their value proposition to those most likely to appreciate their product offerings, it is vital to establish institutional knowledge regarding the specific economic

<sup>33</sup> [https://www.business-standard.com/article/markets/sebi-allows-mutual-funds-to-resume-investing-in-international-stocks-122062100455\\_1.html](https://www.business-standard.com/article/markets/sebi-allows-mutual-funds-to-resume-investing-in-international-stocks-122062100455_1.html)

circumstances and foreign investment posture of potential sources of foreign investment. Yet, establishing and documenting that requisite knowledge base is an objective beyond the scope of a single paper. U.S. macroeconomic factors and nation-specific policies operate as explanations for allocations of foreign wealth to or from Agency MBS, but fundamentally, all these factors serve to limit the demand ceiling that foreign wealth represents. Thus, the scope of the analysis of drivers of demand is restricted to the most fundamental: disposable foreign wealth, as represented by CABs and FOREX reserves. CABs and FOREX reserves are documented proxies for foreign disposable wealth that show evidence of correlation with demand for Agency MBS. (See Appendix C for an analysis of the strength of these correlations).

The growth of the Asian market is the most significant development in the foreign Agency MBS market over the past two decades. A look at both the CABs and FOREX reserves of these countries provides some insight into why they became such prominent investors over this period. Both CAB and FOREX reserves represent surplus cash, often dollar denominated, available for investment in U.S. assets. The 2000s saw China's CAB and FOREX reserves skyrocket, due to large trade surpluses with the U.S. and relatively small amounts of government spending. As illustrated in Figure 6, China's CAB reached a peak in 2008 with a balance of \$420.6 billion. This balance declined until 2018, where the balance equaled \$352.9 billion. China's CAB appears to be approaching another peak, as its 2022 CAB reached \$401.9 billion. Japan has maintained a stable CAB over the past two decades, with the only significant drop occurring post Global Economic Crisis, between 2010 and 2014. As of 2022, however, Japan's CAB dropped to \$91.0 billion. Finally, South Korea's CAB had been steadily increasing from 2003 to 2021, but dropped year-over-year in 2022 to \$29.8 billion.

Figure 6 – CAB, USD Billions

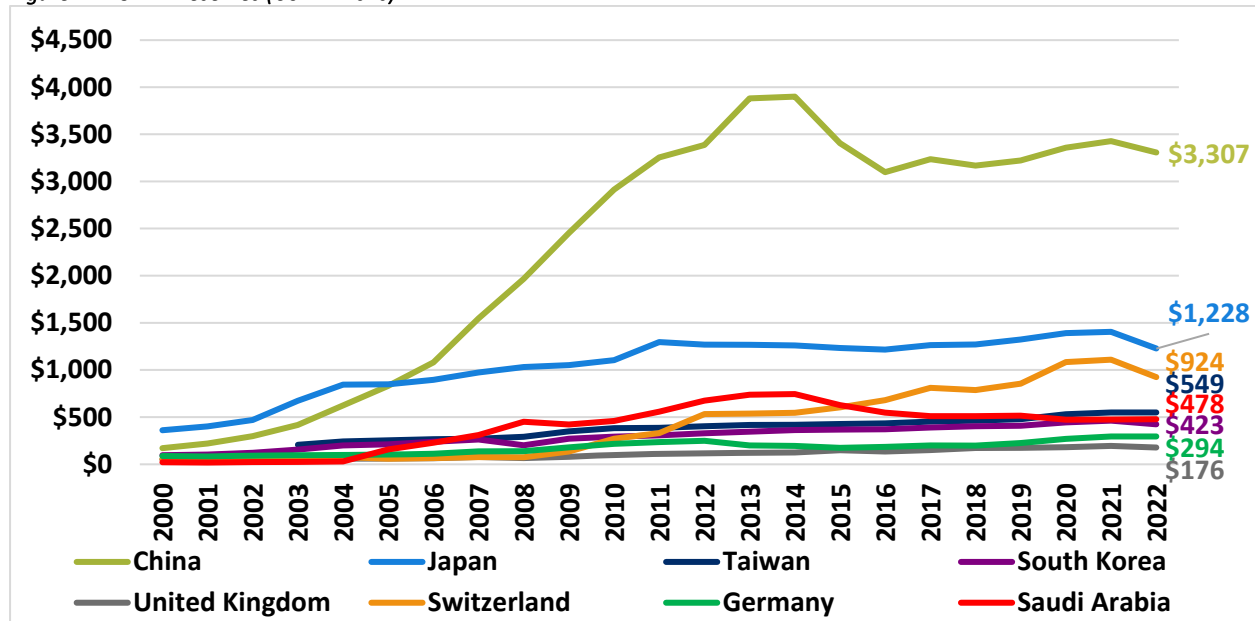


Source: International Monetary Fund. Note: Taiwan's CAB is no longer available from IMF from 2018 onward. CAB for Taiwan from 2019-2022 estimated from GDP and CAB as a % of GDP. This data was pulled from FRED and Statista. As of June 30, 2022.

Europe's CAB suffered the most from the 2008 Global Economic Crisis, with a major decline from 2007 to 2008 of \$265 billion. It has recovered substantially since 2008, reaching positive territory in 2013 and reaching a peak in 2017 as illustrated in Figure 6. However, it began to decline shortly thereafter, and as of 2022, reached significant negative territory with a CAB of -\$253 billion. This is most likely a result of rising interest rates, and increased inflation as well as the ongoing conflict in Ukraine. One of the other reasons why there has not been a significant increase in Agency MBS investment is likely due to the European regulatory climate, which assigns higher solvency capital requirements to Agency MBS, including those guaranteed by Ginnie Mae. European regulators do not give credit for Ginnie Mae's explicit full faith and credit guaranty of the U.S. government, which makes holding the securities more expensive for European investors. This treats Ginnie Mae securities in a different way than the BASEL framework, which assigns Ginnie Mae securities a 0% risk weighting.

FOREX reserves are also a key driver of foreign investment portfolio allocations. Figure 7 shows the trends of FOREX reserve balances. China has the largest FOREX reserves of all countries charted, reaching over \$3.3 trillion in 2022. Japan's reserves have steadily increased since 2003, reaching \$1.2 trillion in 2022. Taiwan's reserve balance has gradually increased as well, reaching \$549 billion in 2022. Note: Saudi Arabia, Switzerland, and Germany are included in the graph as they have sizeable reserves, yet little in terms of investment in Agency MBS, as reflected in Figure 7 below.

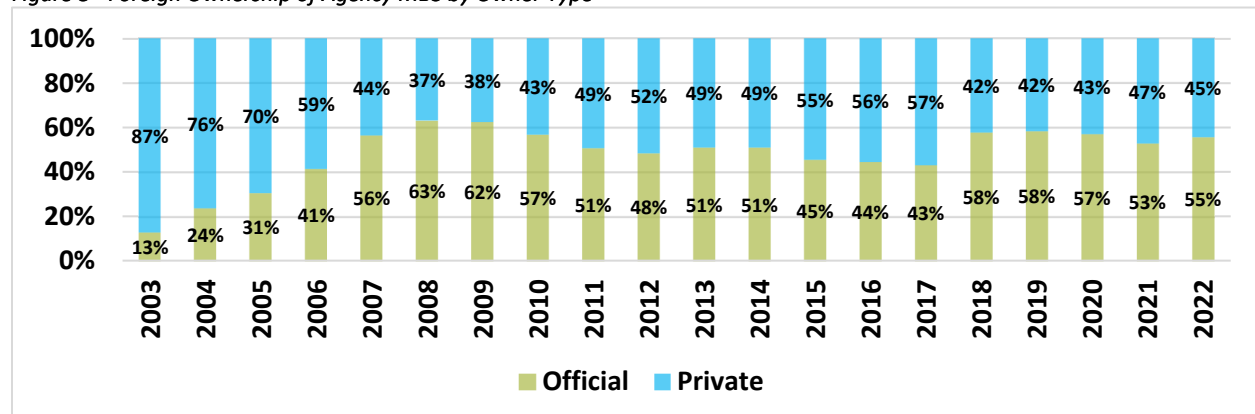
Figure 7 - FOREX Reserves (USD Billions)



Source: International Monetary Fund & Central Bank of The Republic of China (Taiwan). As of June 30, 2022.

Another factor affecting demand can be measured by the change in foreign official holdings compared to private holdings, as shown in Figure 8. Official holdings include entities such as governments, government institutions, foreign central banks and SWFs. In 2003, the vast majority of foreign holdings of Agency MBS were held by private entities. In 2003, for example, these private institutions held around 87% of holdings of Agency MBS while official institutions only held 13%. China's massive growth through the 2000s led to foreign official holdings becoming the majority share from 2007 to 2014, with 2012 as the only year where this did not hold true. After China's 8%+ GDP growth period ended in 2014, the official holdings share dropped below 50% for three years before bouncing back to 58% in 2018. From 2018 to 2022, official institutions accounted for more than 53% of all foreign holdings.

Figure 8 - Foreign Ownership of Agency MBS by Owner Type



Source: TIC data. As of June 30, 2022.



### **Future Growth of Foreign Holdings of Agency MBS**

Prior to the U.S. financial crisis in 2008, the foreign-owned share of Agency MBS had been growing at an average annual rate of 40.4%, outpacing the average 7.3% growth rate of outstanding Agency MBS by 33.1%. From 2009 to 2013, foreign investment in Agency MBS experienced an average growth rate of -3.2% and returned to positive territory in 2014, albeit at much lower growth levels than before the crash. From 2014 to 2022, foreign owned holdings of Agency MBS grew at an average annual rate of 6.5%, although the annual rate post pandemic was substantially lower at -0.5%. With the current trends of rising mortgage interest rates and higher Agency MBS yields, however, there may be attractive opportunities for foreign investors to grow their holdings of low credit risk Agency MBS to generate superior returns.

*Table 1 – Annual Growth Rate of Outstanding Agency MBS and Foreign Owned MBS*

Year	Agency MBS Outstanding	Foreign Owned Agency MBS
2004	2.1%	18.1%
2005	2.5%	49.8%
2006	7.7%	46.2%
2007	10.9%	47.7%
2008	17.0%	35.6%
2009	8.6%	-2.6%
2010	4.7%	-5.2%
2011	1.2%	0.1%
2012	0.2%	0.5%
2013	1.7%	-8.4%
2014	2.4%	1.6%
2015	1.6%	11.1%
2016	3.3%	12.1%
2017	5.2%	7.1%
2018	6.7%	7.1%
2019	4.6%	12.9%
2020	15.4%	7.6%
2021	11.5%	2.5%
2022	9.7%	-3.5%

*Source: TIC data. Note: All calculations based on USD amounts. As of June 30, 2022.*

As discussed above, 69% of foreign-owned Agency MBS is held by Asia, which has been relatively consistent since 2008. The large size of these countries' FOREX reserves will likely mean that Asia will continue to dominate foreign-owned Agency MBS market. With respect to Europe, holdings of Agency MBS can be expected to grow if FOREX reserves also increase in size. However, the current conflict in Ukraine and the pressure on NATO countries to provide defense support, suggest that the growth of European FOREX reserves may be limited. Additionally, as Europe has recently entered a technical recession after two quarters of negative GDP growth, there is potential that the region's investment in Agency MBS will decline as it has in previous periods of economic downturn.

The amount of Agency MBS owned relative to the size of the country's FOREX reserves captures the extent to which Agency MBS fit into the investment strategies of a nation's investors, both official and private. Table 2 lays out this ratio for specific countries.

**Table 2 - Agency MBS Owned as Percentage of FOREX Reserves**

Year	China	Taiwan	Japan	S Korea	UK	Saudi Arabia	Switzerland
2003	0.7%	1.7%	3.9%	0.2%	22.4%		7.0%
2004	2.4%	5.0%	4.0%	0.3%	16.1%		6.5%
2005	6.7%	6.0%	6.4%	0.8%	20.4%		6.3%
2006	9.9%	9.0%	9.5%	1.3%	28.3%		6.1%
2007	13.3%	9.7%	10.5%	4.1%	22.8%		8.6%
2008	18.8%	12.4%	11.7%	10.2%	24.7%		7.4%
2009	14.6%	10.5%	9.1%	10.0%	9.4%		3.6%
2010	10.2%	8.4%	9.6%	11.7%	4.5%		2.0%
2011	6.7%	9.9%	11.7%	13.4%	5.5%		1.9%
2012	5.2%	10.3%	14.5%	13.6%	6.2%		1.4%
2013	4.0%	30.3%	12.0%	10.6%	4.8%		1.6%
2014	4.8%	34.8%	10.8%	8.0%	6.2%		1.8%
2015	6.1%	44.2%	10.7%	8.3%	3.8%	0.9%	1.9%
2016	6.0%	47.7%	15.2%	9.2%	5.6%	1.3%	1.7%
2017	5.5%	50.3%	17.5%	8.7%	6.5%	1.0%	1.7%
2018	5.6%	54.1%	20.0%	8.2%	5.1%	0.6%	1.4%
2019	6.9%	55.5%	22.2%	8.6%	3.3%	1.1%	1.2%
2020	6.9%	50.5%	22.0%	7.7%	22.2%	0.5%	0.8%
2021	6.2%	44.3%	22.0%	8.6%	18.9%	0.2%	2.0%
2022	7.2%	40.4%	18.7%	8.3%	36.2%	0.3%	2.0%

Source: TIC, IMF, Central Bank of the Republic of China (Taiwan) data. Note: Some cells are empty because underlying data are unavailable; All calculations are based on USD amounts. As of June 30, 2022.

What is most important to note are those countries with a relatively low ratio of Agency MBS as a percentage of FOREX reserves. Saudi Arabia and Switzerland have low Agency MBS holdings as a percentage of their FOREX reserves. For 2022, the ratio was 0.3% for Saudi Arabia and 2.0% for Switzerland. China and South Korea, each with under 10% allocations of their FOREX reserves in Agency MBS, may also have capacity to increase their Agency MBS investments.

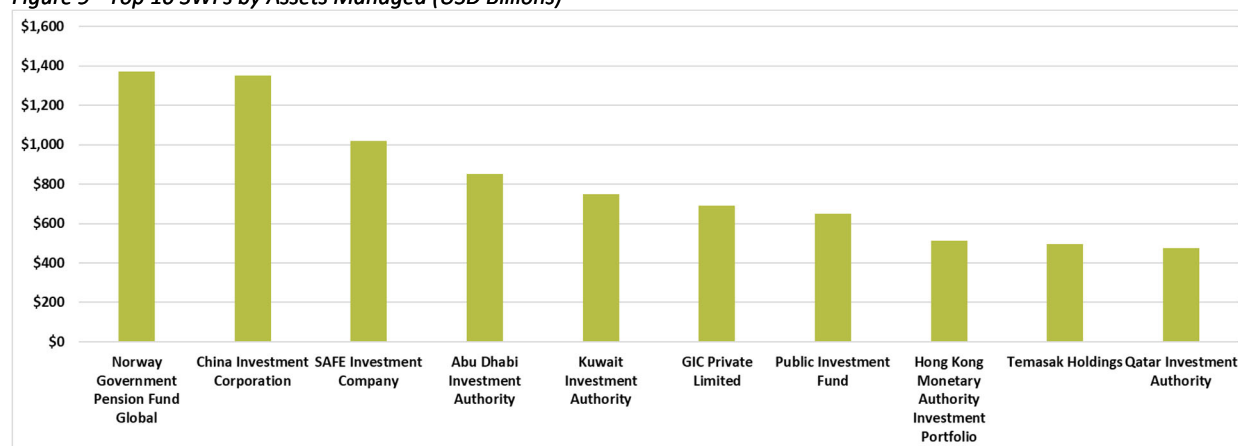
Finally, another potential area of interest lies within SWFs. SWFs are considered official institutions and are included in the foreign official holdings data from TIC. Over the past two decades, the size of SWFs has increased from under \$1 trillion in 2000 to over \$11 trillion in 2022.<sup>4</sup> The top 10 SWFs comprise 71% of global assets under management.

An overview of the breakdown of investments for SWFs show that fixed income makes up a relatively small portion of their investment portfolios. Norway's Government Pension Fund Global (GPFG) in 2022, for example, is the largest fund in the world and is currently funded at \$1.37 trillion. Fixed income investments account for 25.4% of the total fund, and U.S. fixed income investments comprise 10.4% of the total fixed income allocations. Of note, however, is that these investments are mostly U.S. Treasury and corporate bonds<sup>5</sup> with only a minimal portion in U.S. securitized assets. None of these are Agency MBS, but include securities backed by auto loans or other debt obligations.

<sup>4</sup> <https://www.swfinstitute.org/fund-rankings/sovereign-wealth-fund>

<sup>5</sup> <https://www.nbim.no/contentassets/f8c5e301ff804c09881b1beb5299dc30/gpfg-annual-report-2021-web.pdf>

Figure 9 - Top 10 SWFs by Assets Managed (USD Billions)



Source: Sovereign Wealth Fund Institute data. As of June 30, 2023.

The second largest fund, the China Investment Corporation, has \$1.35 trillion in total assets under management with fixed income comprising 15.4% of the investment portfolio.<sup>6</sup> A new entry into the top 10 funds is SAFE Investment Company, which is China's sovereign wealth fund's Hong Kong operations. With \$1.02 trillion in total assets under management, SAFE was ranked third in the top 10 SWFs. When combined with China Investment Corporation, China would have the most assets under management of all countries with SWFs. Abu Dhabi Investment Authority also invests a very small amount in fixed income assets.<sup>7</sup> Overall, most SWFs tend to favor higher risk-higher return investments such as equities.

### Investment Decision Factors

While more fundamental drivers of demand like foreign disposable wealth and foreign investment policies determine whether foreign investments in Agency MBS are made, the magnitude of allocations in Agency MBS at a given time are determined by a shifting set of factors that come to dominate both the perception and the reality of the value of these investments. A discussion of some of these investment allocation decision factors, at present, is featured below:

#### Economic: Dollar Appreciation

The U.S. Dollar (USD) has continued to appreciate relative to foreign currencies except for the Euro. Since January 1, 2023, the USD has depreciated 0.9% relative to the Euro. As of August 25, 2023 the US dollar appreciated 11.6% vs. the Japanese Yen, 4.5% vs. the Chinese Yuan, 5.0% vs. the South Korean Won, and 0.63% vs. the Canadian Dollar.

#### Economic: Federal Reserve Monetary Policy

In March 2022, the Fed began efforts to control rapid inflation. Its primary methods of addressing the issue have been to increase interest rates and reduce the size of the Fed's System Open Market Account (SOMA), which consists primarily of U.S. Treasury securities (UST securities) and Agency MBS holdings<sup>8</sup>. In both June and July 2022, the Fed hiked interest rates by 0.75%, which were the largest monthly rate increases since 1994 and established monthly redemption caps for UST and Agency MBS to reduce the SOMA portfolio. As of the last FOMC meeting in July 2023, the Fed raised interest rates by 0.25% after a pause in June, and indicated that they are monitoring economic conditions in the event that further increases are necessary. Table 3 shows the history of the rate hikes since they began in May 2022. The most recent CPI report showed that July inflation rose by 0.2% to 3.2% after declining for 12 months. This is 1.2% above the Fed's target of 2%. In a speech at the "Structural Shifts in the Global Economy" policy symposium sponsored by the Federal Reserve Bank of Kansas City on August 25, 2023, Fed Chair Jerome Powell stated, "It is the Fed's job to bring inflation down to our 2 percent goal, and we will do so. We have tightened

<sup>6</sup> [http://www.china-inv.cn/chinainven/Investments/Portfolio\\_Management.shtml](http://www.china-inv.cn/chinainven/Investments/Portfolio_Management.shtml)

<sup>7</sup> <https://www.adia.ae/en/investments>

<sup>8</sup> <https://www.federalreserve.gov/newsevents/pressreleases/monetary20220504b.htm>

policy significantly over the past year. Although inflation has moved down from its peak—a welcome development—it remains too high. We are prepared to raise rates further if appropriate and intend to hold policy at a restrictive level until we are confident that inflation is moving sustainably down toward our objective.”

*Table 3 – Federal Reserve Interest Rate Hikes*

Federal Open Market Committee Meeting Date	Change in Basis Points	Federal Funds Rate
March 17, 2022	+25	0.25% - 0.50%
May 5, 2022	+50	0.75% - 1.00%
June 16, 2022	+75	1.50% - 1.75%
July 27, 2022	+75	2.25% - 2.50%
September 21, 2022	+75	3.00% - 3.25%
November 2, 2022	+75	3.75% - 4.00%
December 14, 2022	+50	4.25% - 4.50%
February 1, 2023	+25	4.50% - 4.75%
March 2, 2023	+25	4.75% - 5.00%
May 2, 2023	+25	5.00% - 5.25%
June 13, 2023	+0	5.00% - 5.25%
July 25, 2023	+25	5.25% - 5.50%

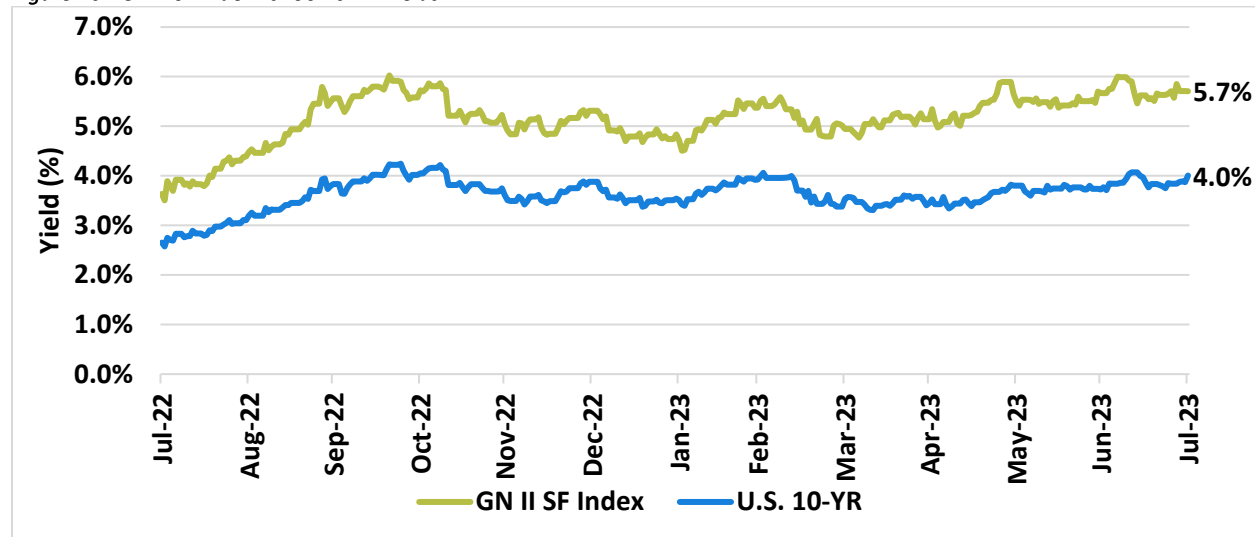
*Source: Federal Reserve. As of July 31, 2023.*

The Fed also plans to continue its quantitative tightening activities to address inflation by reducing its SOMA portfolio. This process began in June of 2022, with monthly caps for reductions initially set at \$30 billion for Treasury securities and \$17.5 billion for Agency Debt and Agency MBS. These monthly caps were adjusted to \$60 billion and \$35 billion, respectively, starting in September 2022. Since June 2022, the Fed has reduced its holdings of US Treasuries from \$5.67 trillion to \$4.90 (~14% reduction), and Agency MBS from \$2.70 trillion to \$2.50 trillion (~7% reduction). As of the publication of this report, the Fed has indicated that it will continue this strategy.

#### *Financial: Yields/OAS*

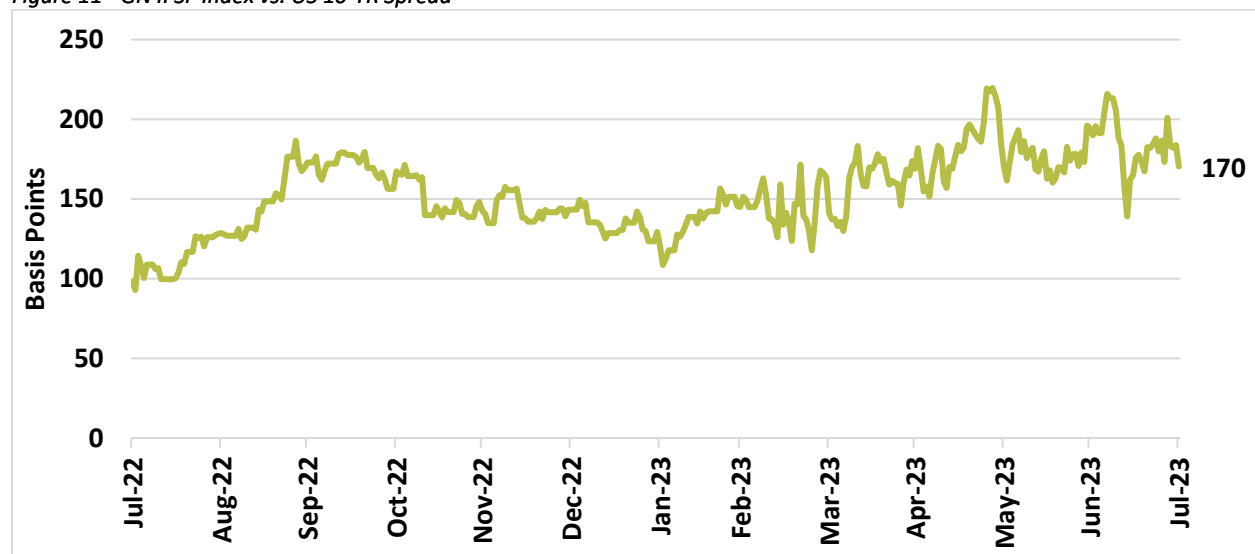
Compared to UST, Agency MBS typically offer higher yields. Figure 10 shows the yields of Ginnie Mae II MBS compared to US 10-YR bonds and Figure 11 shows the nominal spread between the two securities during the same period. Within the past 2 years, the spread has widened to historically high levels reaching a peak of 217 basis points on May 26, 2023 (immediately before the U.S. debt ceiling agreement was announced) and falling to 170 basis points on July 31, 2023. Combined with the current rise in interest rates, investment in Ginnie Mae MBS, specifically, could be considered an attractive investment alternative to UST securities for foreign investors. This may be particularly noteworthy for SWFs, which typically hold more UST securities than Agency MBS. Even a small shift in allocation toward Ginnie Mae MBS would provide higher yields while maintaining the identical credit risk profile of UST securities.

Figure 10 - GN II SF Index vs. US 10-YR Yields



Source: Bloomberg data. As of July 31, 2023.

Figure 11 - GN II SF Index vs. US 10-YR Spread



Source: Bloomberg data. As of July 31, 2023.

### Geopolitical: Ukraine/Russia

In February 2022, Russia launched an invasion of Ukraine, and the conflict continues today. While Ukraine itself is not a significant holder of Agency MBS, the impact of the war on the European Union (EU) may affect foreign investment portfolios. Namely, the conflict has affected the projected growth of the EU. Economic growth forecasts from the European Commission have been adjusted because of the ongoing invasion and its impact on European energy prices. Growth for 2022 changed slightly, decreasing from 2.7% to 2.6%. However, the Commission adjusted 2023's forecast substantially, lowering predicted growth from 2.3% to 1.4%.<sup>9</sup>

The invasion has had a significant effect on inflation in the Euro area, specifically as it relates to food prices. Food inflation has been the largest contributor of inflation in the Euro area, as food prices increased by 14.1% in January 2023 compared to the prior year.<sup>10</sup> This, along with high energy import dependence of the Euro area, has led to

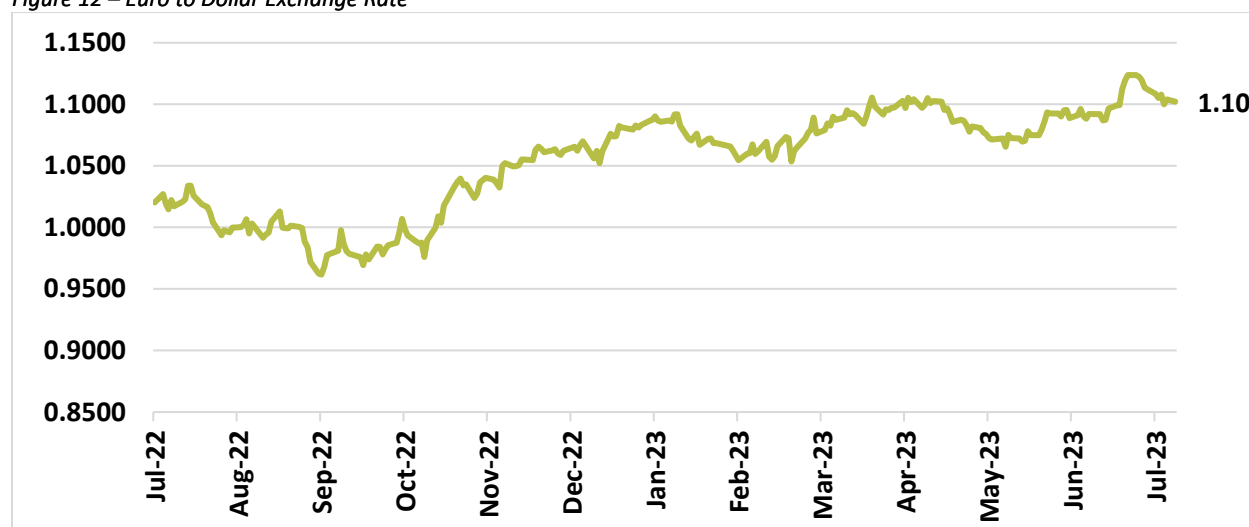
<sup>9</sup> <https://www.reuters.com/markets/europe/eu-cuts-euro-zone-growth-forecasts-revises-up-inflation-outlook-2022-07-14/>

<sup>10</sup> <https://www.ecb.europa.eu/press/blog/date/2023/html/ecb.blog20230224~3b75362af3.en.html>

technical recessions in many European countries. As a result, it is possible that investment in Agency MBS from countries in the Euro area will continue to decline until the war ends.

In addition to the impact the invasion may have on EU growth in the future, the Euro experienced a considerable drop in value in 2022. On July 13, 2022, the Euro reached parity with the US dollar for the first time since 2002.<sup>11</sup> The stronger dollar impacted the cost of U.S. based investments; however, the exchange rate has since shifted back into favoring the Euro. Figure 12 shows the historical exchange rate from July 2022 to July 2023, which indicates that values have normalized and returned to levels prior to the parity point in July 2022.

Figure 12 – Euro to Dollar Exchange Rate



Source: FRED. As of July 31, 2023.

### Social and Sustainability Impact Investing Discussion

Ginnie Mae, Fannie Mae, and Freddie Mac have all recently made efforts to increase transparency with investors in relation to social and sustainability disclosures. This data has become increasingly important to Agency MBS investors, both domestic and foreign. Ginnie Mae President Alanna McCargo, sworn in as the agency's president in December 2021, participated in the Urban Institute Ginnie Mae Presidents event<sup>12</sup> on June 2, 2022. At this event, she spoke of the increased interest in environmental and social investment. McCargo stated, "I had no idea until I began meeting with investors, especially foreign investors and the Asian central banks and SWFs, how much interest there is in ensuring the inherent value of our securities as vessels for environmental and social investment." The interest of Asia in social and environmental investing is of particular note since the main source of demand for Agency MBS comes from that region.

Most recently, Ginnie Mae in its "Ginnie Mae Capital Markets Live Podcast" published in February 2023, provided an update regarding its commitment to social and environmental investors. John Getchis, Senior Vice President of Ginnie Mae's Office of Capital Markets, stated, "As we progress into 2023, Ginnie Mae will amplify engagement with market participants and experts to better understand the criteria ESG investors need, so we can continue to develop additional disclosures that highlight the social impact of an investment in Ginnie Mae securities."<sup>13</sup> In addition to social enhancements, Ginnie Mae, specifically, is seeking to make strides in the green bond market and has issued a total of \$4.2 billion in "Green" multi-family bonds, comprising almost 40% of new issuance.<sup>14</sup> Ginnie Mae's commitment to social and environmental disclosures, will be of particular interest to foreign investors globally.

<sup>11</sup> <https://www.nytimes.com/2022/07/13/business/euro-dollar-parity.html>

<sup>12</sup> Urban Institute Ginnie Mae Presidents Event, June 2, 2022

<sup>13</sup> <https://www.ginniemae.gov/newsroom/Pages/PressReleaseDispPage.aspx?ParamID=269>

<sup>14</sup> Urban Institute Ginnie Mae Presidents Event, June 2, 2022

## ***Institutional Analysts' Corner***

Consideration of industry perspectives can provide additional insight into Agency MBS. For that reason, an interview was conducted with Mr. Mario Ichaso, CFA, a Senior RMBS Strategist from Wells Fargo. Mr. Ichaso has worked with Wells Fargo in this field for 8+ years and contributes regularly to publications on the Agency MBS market. Topics covered include the Fed's monetary policy and US debt ceiling negotiations, recession effects on holdings in Europe, effects of global inflation on Asian holdings, the continued rise of Canada as a holder of Agency MBS, and geographical regions that have the potential to increase their holdings in the future.

With regards to the Fed's monetary policy, Mr. Ichaso mentioned that unpredictability of the tightening cycle has had a great effect on demand overseas. There also seems to be no lasting effects from the US debt ceiling negotiations that occurred in June. Mr. Ichaso stated:

*"One of the biggest challenges for overseas demand has been the unpredictability of the tightening cycle. To put this in perspective, the March 2022 the FOMC plots pointed to a peak federal funds rate of 3.75% compared to the currently priced peak of 5.50%. Greater policy uncertainty and key rate differentials result in greater hedging cost for overseas investors. As a result, we have seen overseas investors be more selective and opportunistic in their MBS allocations. It now seems like the market has formed a consensus of one last hike at the July meeting and holding through 2023. Greater clarity and a less hawkish Fed are positive developments for MBS given that hedging costs are likely to decline and volatility risk to subside.*

*We do not see any lingering impacts post debt ceiling fight."*

While the US recovery from inflation has been incredible, recovery in other regions has been much slower, namely in Europe. The Eurozone fell into a recession in the first quarter of 2023, after two consecutive quarters of shrinking GDP.<sup>15</sup> Mr. Ichaso provided some insight into the European holdings and how the recession may affect global demand. Mr. Ichaso stated:

*"The Euro Area only makes up 11% of total overseas holdings compared to 66% for Asia so the impact from Europe can be more muted in the aggregate. Broadly speaking, a sign of a slowdown could prove to be a positive catalyst for MBS and fixed income securities in general. Agency MBS flight-to-quality characteristics could be at play should economic fundamentals deteriorate further causing broad sector rotations from credit into Agency MBS."*

On the subject of Canada's increased holdings, Ichaso mentioned there is a possibility for it to enter the top 3, but there is uncertainty whether the upward trend will continue. Ichaso stated:

*"Canada has been a steady buyer so there is potential for it to reach the top three holder status whereas Taiwan has steadily reduced their holdings since 2020. It is hard to say one way or another if this trend will hold but it is a development worth tracking."*

When asked about how inflation appeared to not have a significant effect on the Big Three's holdings of Agency MBS, Ichaso provided some insight into how its effects varied. Mr. Ichaso said:

*"We would argue that inflation has played a role in creating greater rate differentials across Asia relative to the US. Initially, this provided an opportunity for overseas to capitalize on higher US yields which resulted in a decoupling of overseas demand from domestic demand. In places like China, we saw some rotational flows moving from treasuries into MBS. In Japan, the cost of hedging the currency component has challenged the demand narrative. The BOJ is now under new*

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<sup>15</sup> <https://www.nytimes.com/2023/06/08/business/eurozone-recession-economy.html>

*leadership which may result in a pivot from their dovish stance. The removal of yield curve controls may result in more attractive domestic yields which could ultimately hurt demand for Agency MBS.”*

Finally, when discussing current potential areas of growth for foreign investment in Agency MBS, Ichaso detailed the areas that his team is tracking. Mr. Ichaso stated:

*“We are tracking domiciled countries<sup>16</sup> with tax advantaged status for hedge funds as a proxy for fast money demand. Last year, these countries were net sellers at the tune of \$4.6 billion. Without Fed participation, we have seen money managers take a bigger role in MBS flows and hedge funds have been an important component of these flows. Earlier this year when basis reach levels not seen since COVID, it was fast money accounts that caused spreads to tighten from ~190 bps vs. the blend to 160 bps today. These countries make up only 13% of overall but their share continues to grow.”*

## **Conclusion**

Foreign entities continue to be consistent sources of demand for Agency MBS. As the Fed continues to address inflation and seeks to reduce its portfolio of Agency MBS, foreign investors may benefit from the increased supply and higher yields. The Fed’s policy continues to be the most important thing to watch going forward. Periods of rising interest rates have shown to be advantageous for Agency MBS investment due to the lower prepayment risk and higher yields. Yield spreads for Ginnie Mae MBS are still near historical highs vs. UST securities and provide the opportunity for foreign investors to generate higher investment returns from these assets without compromising credit quality.

Fundamentally, the capacity to invest in Agency MBS is a matter of wealth. Thus, particular attention should be given to those countries that have net surpluses of CAB and large FOREX reserves as they are indicators of their ability to invest in USD denominated assets.

Regionally, Asia continues to be the primary source of demand. Europe, as of 2022, has regained some share of total foreign holdings compared to prior years; however, with the ongoing conflict in Ukraine and recessions in the region, it is possible that holdings will decline. The emergence of Canada as a major holder of Agency MBS may lead to another source of demand in the coming years should the current trend of increased investment continue. Outside of Canada, Mr. Ichaso sees domiciled countries as places to track, due to their increased presence of hedge fund activity.

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<sup>16</sup> WFS defines domiciled countries as: the Bahamas, Belgium, Bermuda, British Virgin Islands, Cayman Islands, Guernsey, Ireland, Jersey, Luxembourg, Netherlands, Panama, Singapore, and Switzerland.

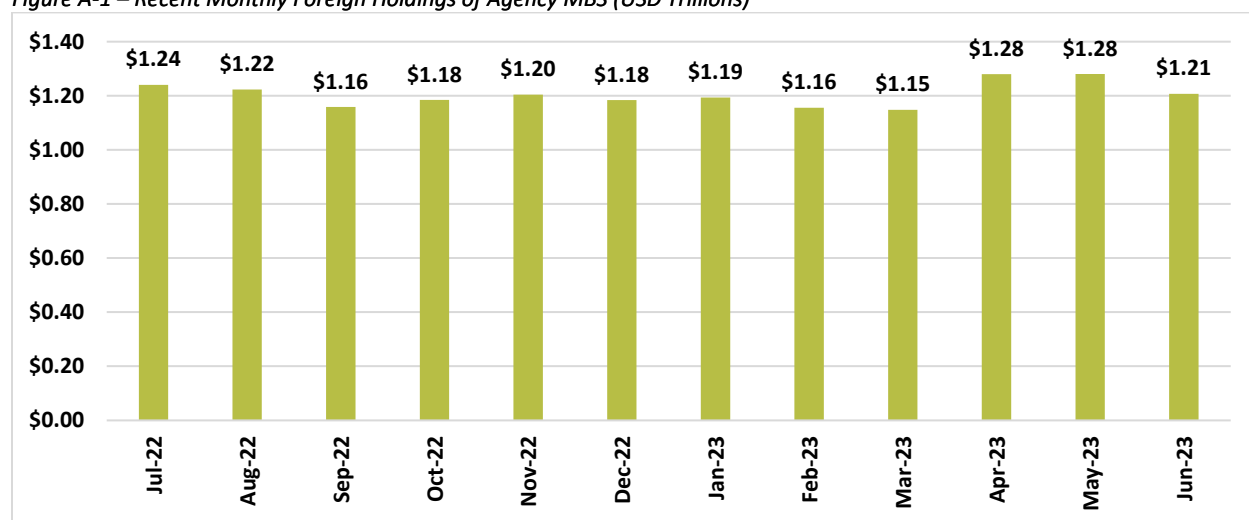


## APPENDIX A: Foreign Ownership - Monthly TIC Data and Asset Allocation Trends

While the purpose of this report is to look at the annual data published by TIC, because of the volatility in the global economy in the past year, we wanted to highlight relevant changes in foreign ownership of U.S. long-term securities from data reported by TIC monthly from June 2022 through April 2023. Since the monthly data does not break out the U.S. Agency MBS from the U.S. Agency bonds, we estimated the breakdown using the April 2023 TIC report that shows that Agency MBS comprised 96.2% of the Agency Bonds in that month. For analysis purposes, we assumed that 96.2% of the total Agency Bonds are Agency MBS to derive the monthly values presented in this appendix.

Figure A-1 illustrates the total foreign holdings of Agency MBS from July 2022 to June 2023. Total foreign holdings of Agency MBS have decreased by 3% to \$1.21 trillion as of June 2023 compared to \$1.24 trillion in July 2022. There was a slight declining trend of holdings from June 2022 to March 2023; however, April saw increases to a peak over the period. During first third of 2023, holdings increased by 7.2% with the largest increase occurring between March and April, where holdings increased by approximately \$132 billion or 11.5% month-over-month.

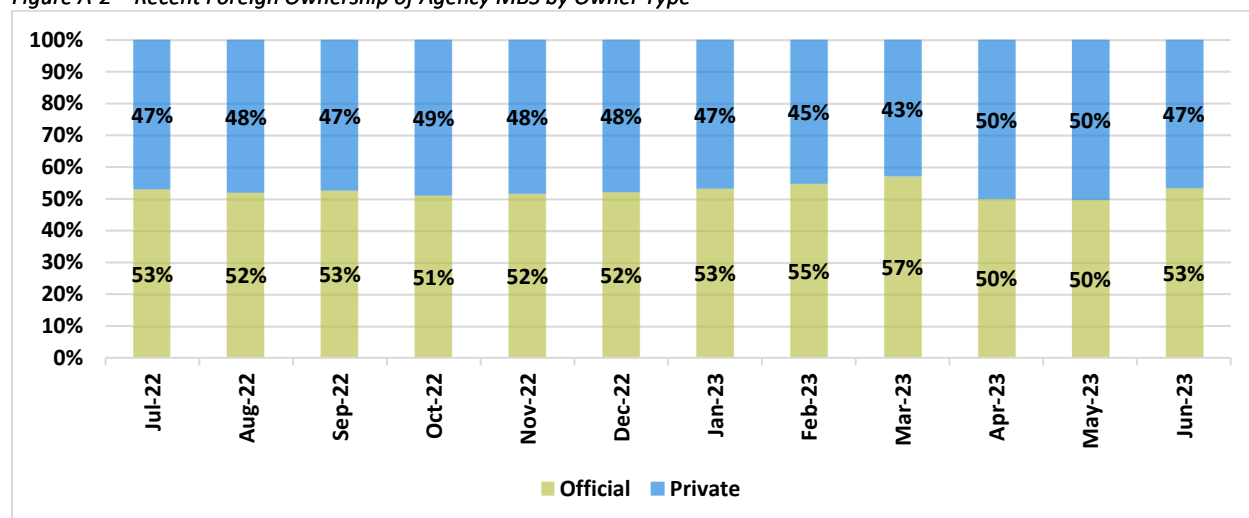
Figure A-1 – Recent Monthly Foreign Holdings of Agency MBS (USD Trillions)



Source: Foreign Holdings - TIC data. As of August 25, 2023.

Another set of monthly TIC data concerns foreign official vs. private holdings of Agency MBS. Figure A-2 shows the percentage of these holdings from July 2022 to June 2023. Over the year, the split between official and private institutions holding Agency MBS has remained fairly steady. In April and May of 2023, share between official and private institutions was evenly split. However, as of June 2023, official institutions held 53% of the total foreign holdings while private institutions made up 47%.

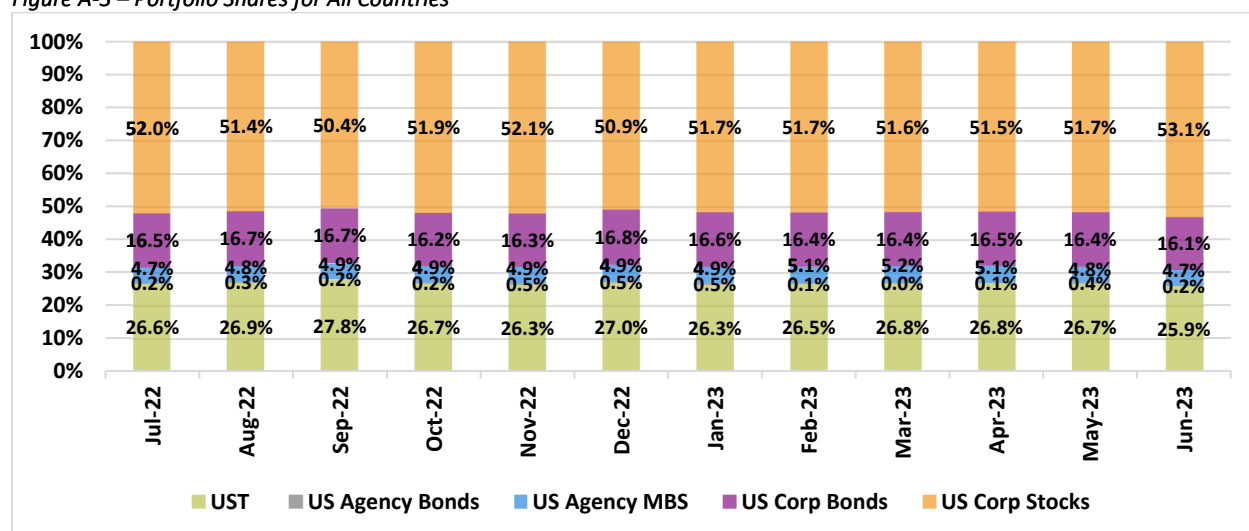
Figure A-2 – Recent Foreign Ownership of Agency MBS by Owner Type



Source: TIC data. As of August 25, 2023.

Further analyses based on estimated total Agency MBS were conducted to look at the breakdown of the foreign holders' U.S. long-term securities portfolios to determine if there were any considerable shifts in asset allocations since June 30, 2022. Figure A-3 shows the portfolio composition of U.S. securities for all foreign holders. Overall, the allocations for each security category remained fairly consistent, with U.S. Agency MBS comprising around 5% of all portfolio holdings during the period from July 2022 to June 2023.

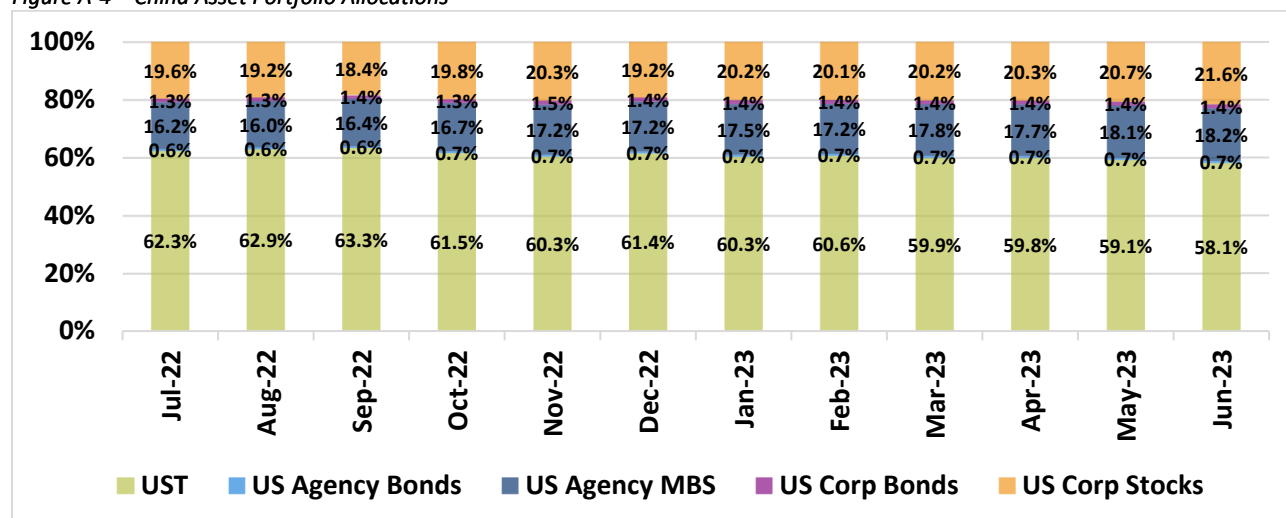
Figure A-3 – Portfolio Shares for All Countries



Source: TIC data. As of August 25, 2023.

For the most part, the top 5 countries did not experience significant changes in their portfolio allocations. For the second year straight, China's investment share in Agency MBS increased. From July 2022 to June 2023, China's investment in Agency MBS increased by 2.2%, from 16.0% to 18.2%. Figures A-4 and A-5 below illustrate China's portfolio asset allocation from July 2022 to June 2023. Based on the monthly TIC data, it appears that the upward shift in Agency MBS was due in part to a decline in U.S. Treasury holdings, which fell by around 4% during the same period. This is the second year in a row that we have seen this trend.

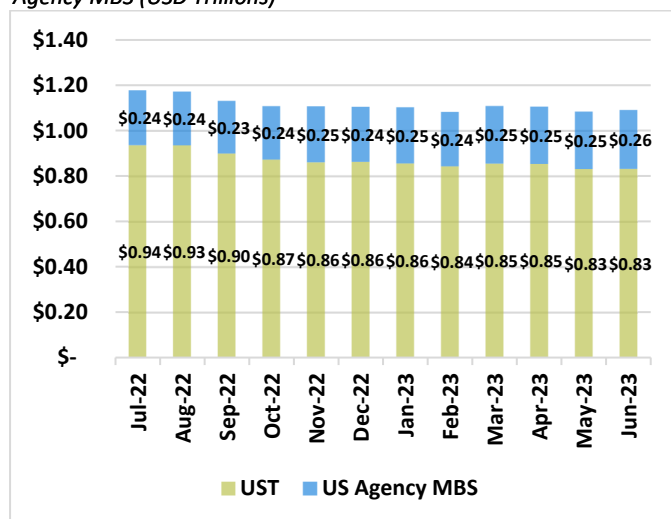
Figure A-4 – China Asset Portfolio Allocations



Source: TIC data. As of August 25, 2023.

Figure A-6 illustrates the spread between the 10-year UST and GN II MBS, which was 98 bps on July 31, 2022, reached a high of 220 bps on May 27, 2023, and declined to 170 bps on July 31, 2023. This significant drop at the end of May is most likely related to the potential US default and subsequent debt ceiling agreement during this period.

Figure A-5 – Comparison of China's Recent Holdings of 10-YR UST vs Agency MBS (USD Trillions)



Source: TIC data. As of August 25, 2023.

UST-GN II Spread: Bloomberg Data. As of July 31, 2023.

Figure A-6 - Spread Between 10-YR UST and GN II MBS (Basis Points)

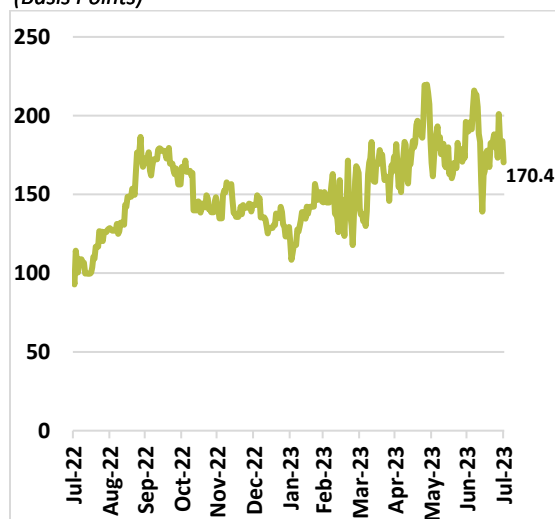
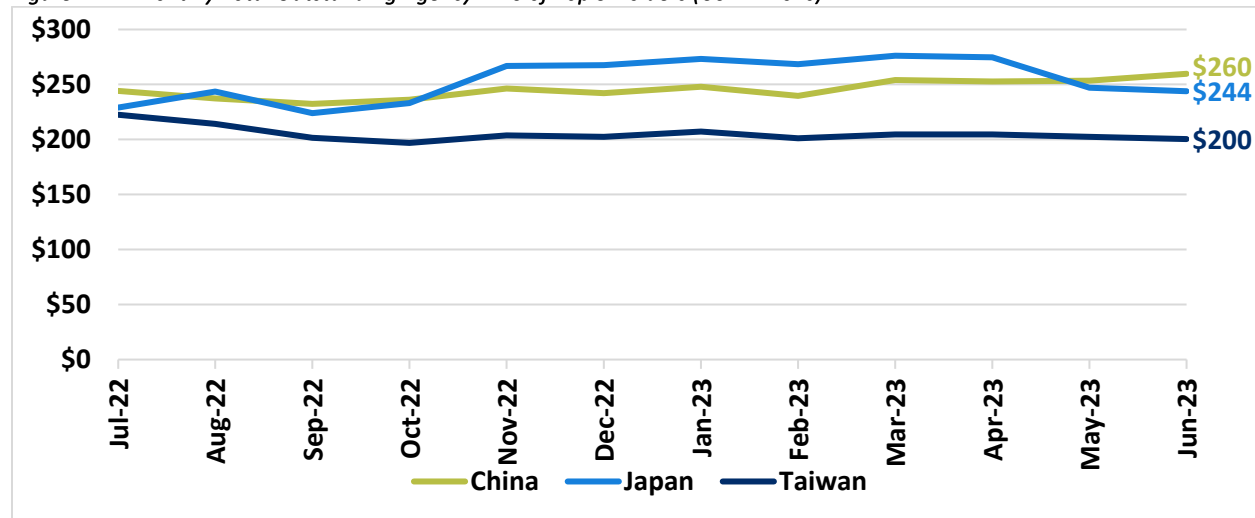


Figure A-7 on the following page compares the Agency MBS holdings for the top 3 holders along with the difference in portfolio share. From July 2022 to June 2023, holdings stayed fairly constant, with some fluctuations in the top holder between the months of August and October. While China was the top holder at the beginning of the period, Japan took over as the top holder in November 2022, and remained in that position through April 2023. In May 2023, China regained the top position and held it through June of 2023. Taiwan did see its holdings decline from July 2022 to October 2022, but stabilized in November. Overall, Japan's holdings increased by 9.6%, China's increased by 9.5%, and Taiwan's fell by 6.4%.

Figure A-7 – Monthly Total Outstanding Agency MBS of Top 3 Holders (USD Billions)



Source: TIC data. As of August 25, 2023.

Figure A-8 below illustrates the top 10 foreign holders of Agency MBS from June 2022 to April 2023 and their movement in the holder rankings on a monthly basis. Colors represent countries, as identified in the “Country” column. The order in which colors appear in a given month represents the ranking of the top ten holders in order of aggregate Agency MBS holdings. Examples: Japan was ranked 1<sup>st</sup> in August 2022 and from November to April 2023. Taiwan was ranked 3<sup>rd</sup> for the entire period and China was ranked 1<sup>st</sup> in July, from September to October, and between May and August 2023.

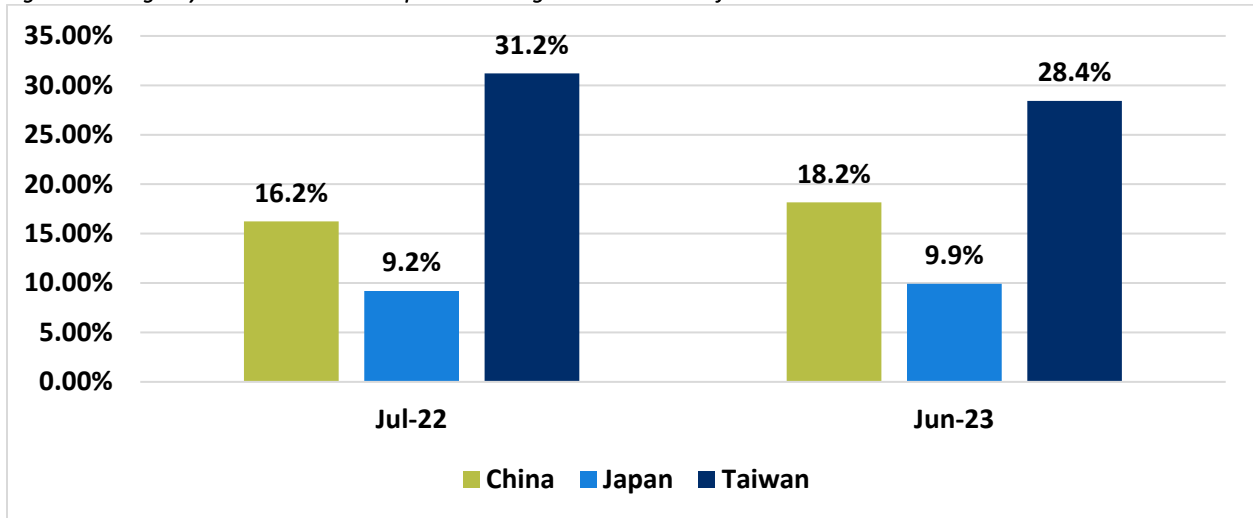
Figure A-8 – Monthly Top Ten Foreign Holders of Agency MBS

Rank	Country	Jul-22	Aug-22	Sep-22	Oct-22	Nov-22	Dec-22	Jan-23	Feb-23	Mar-23	Apr-23	May-23	Jun-23
1	Japan												
	China, Mainland												
2	China, Mainland												
	Japan												
3	Taiwan												
4	Canada												
5	United Kingdom												
	Luxembourg												
6	Luxembourg												
	United Kingdom												
7	Korea, South												
	Ireland												
	Cayman Islands												
8	Ireland												
	Korea, South												
	Ireland												
9	Switzerland												
	France												
	Cayman Islands												
	Switzerland												
10	Bermuda												
	France												
	Ireland												

Source: TIC data. As of August 25, 2023.

Figure A-9 provides a comparison of the Agency MBS allocation percentages in the investment portfolios of the top three foreign holders as of June 2022 and July 2023. Although the Agency MBS holdings in the top three portfolios are of similar dollar volumes (Japan: \$244 billion, China: \$260 billion, Taiwan: \$200 billion) as of June 2023, the Agency MBS portfolio allocation percentages are significantly different. Agency MBS account for around 28% of Taiwan’s total holdings, while China and Japan allocate only 18% and 10%, respectively to the sector.

Figure A-9 – Agency MBS Allocation in Top Three Foreign Investment Portfolios



Source: TIC data. As of August 25, 2023.

## APPENDIX B: Foreign Agency MBS Demand Drivers

Private sector foreign investors in Agency MBS include commercial banks, mutual funds, insurance companies, private pension funds, REITs, and households, among others. Official foreign institutions that might consider investment in Agency MBS include central banks, SWFs, and public pension funds. The most fundamental drivers of demand are common to all foreign Agency MBS investors, but some demand drivers are germane to certain types of entities/institutions:

Table A-1 – Drivers of Foreign Agency MBS Demand

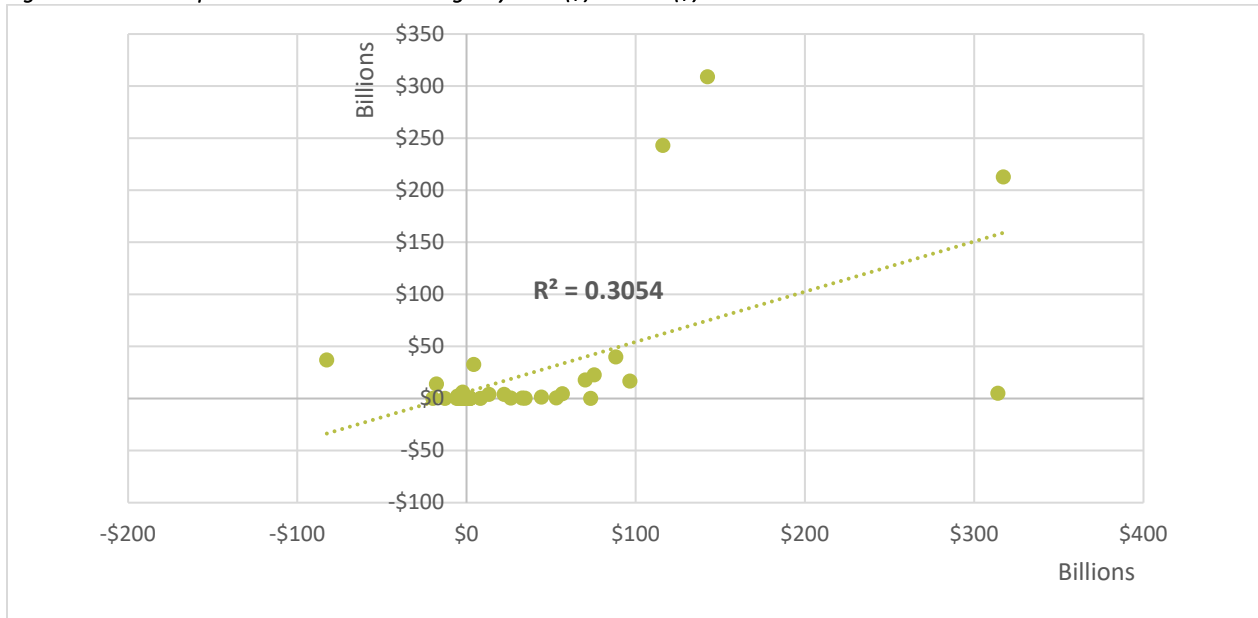
Driver	Discussion	Relevant Data Available	Relevant for Private/Official
<b>Foreign Disposable Wealth</b>	Wealth represents the funds an institution/investor has access to and manages in an attempt to achieve its investment objectives. Wealth is the fundamental demand ceiling.	CABs, FOREX	Private & Official
<b>U.S. Macroeconomic Conditions</b>			
<b>U.S. Mortgage Rates &amp; Mortgage Rate Projections</b>	Given the negative convexity of MBS, investors have limited upside from decreases in interest rates and larger exposures to increases in interest rates than securities with comparable expected maturities. Investors are, thus, incentivized to consider interest rates, present and forecasted, as they consider their levels and approaches to investment in Agency MBS.	30-Year and 15-Year Fixed Mortgage Rates; Mortgage Forecasts	Private & Official
<b>U.S. Inflation</b>	Inflation erodes the value of future coupon income; inflation also creates nominal equity for homeowners, which increases prepayment risk due to increased incentive for cash-out refinances. Thus, MBS investors, foreign and domestic, might consider both general inflation and specifically home price appreciation trends as they consider Agency MBS investments.	CPI, HPI	Private & Official
<b>Employment</b>	High, or increased unemployment increases involuntary prepayment risk.	Unemployment Rates	Private & Official
<b>Federal Reserve Policy</b>	The Fed's policy tools, including Open Market Operations, Quantitative Easing, and Quantitative Tightening impact both supply and demand for MBS.	Federal Funds Target Rate, Net Agency MBS purchases	Private & Official
<b>International Macroeconomic Conditions and Foreign Investment Policy</b>			
<b>Fiscal Policy and Funding Mechanisms for Government Programs</b>	Government spending funded by export revenues rather than direct taxation directly limits funds available for investment in foreign Agency MBS.	N/A	Official
<b>Private Sector Reserve Management Policy</b>	Government foreign investment policy often places explicit caps on foreign private sector investment that artificially limits demand for Agency MBS.	N/A	Private

<b>Official Reserve Management Policy</b>	Central bank reserve management policies, including the institutional structure of a nation's official reserve management can heavily impact a nation's chosen allocations in Agency MBS. Nations relying on SWFs or hybrid SWF/Official Bank fund management, for instance, tend to have very different approaches than traditional central banks.	N/A	Official
<b>Foreign Currency/USD FX Volatility</b>	Foreign investment in Agency MBS exposes foreign investors to the risk of dollar depreciation.	N/A	Private and Official
<b>Geopolitical Events</b>	Events on the global stage can have a profound appetite on the perceived risks associated with foreign investment. These factors may impact foreign investors' willingness to invest internationally.	N/A	Private
<b>Financial Sophistication</b>	Agency MBS investment requires a level of financial sophistication that is not evenly distributed globally.	N/A	Private
<b>Product Awareness</b>	There may be opportunities to expand demand simply by increasing global awareness of both how and why to invest in Agency MBS. ESG data disclosures, and other data disclosures also increase awareness of the value of MBS.	N/A	Private

### APPENDIX C: Assessment of CABs and FOREX Reserves as Explanatory Variables for Foreign Agency MBS Investment Volumes

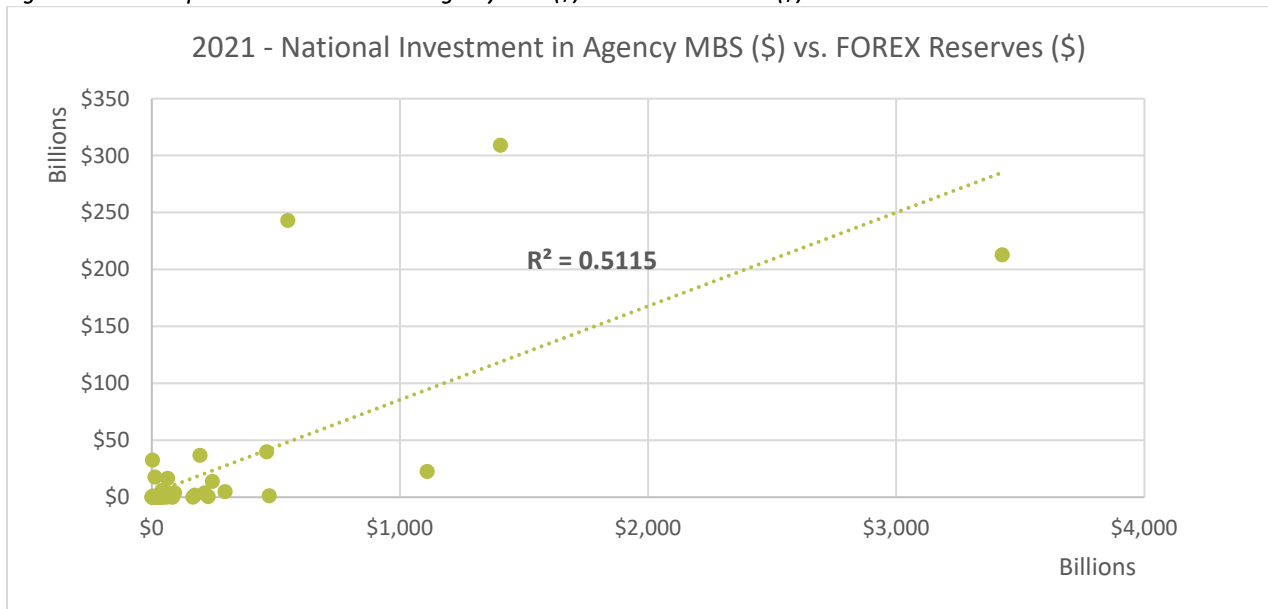
CABs and FOREX reserves are documented proxies for foreign disposable wealth that show evidence of correlation with demand for Agency MBS. As the table below shows, 30.5% of the variability observed in invested dollars in Agency MBS is explained by CABs.

Figure A-10 – 2021 | National Investment in Agency MBS (\$) vs. CAB (\$)



Similarly, FOREX reserves have shown to be quite strongly correlated with dollars invested in Agency MBS. Over 51% of the variability in foreign investment in Agency MBS can be explained by FOREX reserve amounts.

Figure A-11: 2021 | National Investment in Agency MBS (\$) vs. FOREX Reserves (\$)





## **Disclosure**

*All the information contained in this document is as of the dates indicated unless otherwise noted.*

*The information provided does not constitute investment advice and it should not be relied on as such.*

*All information has been obtained from sources believed to be reliable, but its accuracy is not guaranteed.*

*This document contains certain statements that may be deemed forward-looking statements.*

*Please note that any such statements are not guarantees of any future performance and actual results or developments may differ materially from those projected.*

*Investments in mortgage-backed securities are subject to prepayment risk, which can limit the potential for gain during a declining interest rate environment and increases the potential for loss in a rising interest rate environment.*