



Foreign Ownership of Agency MBS

September 2022

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 TIC data used in this report was compiled as of June 30, 2021 and was released on April 29, 2022.¹ 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 Fund Institute data is compiled annually.

¹ <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 reached an all-time high of \$1.188 trillion in June 2021; 12.77% of the Agency MBS market.*
- *The majority of foreign holders of Agency MBS are in Asia, Europe, and the Caribbean, with Japan, China, and Taiwan holding roughly 64% of the foreign total.*
- *In 2021, Canada moved into the top 10, becoming the fourth-place foreign holder of Agency MBS behind Japan, Taiwan, and China.*
- *While overall demand has increased consistently throughout the years, the foreign share of Agency MBS outstanding decreased slightly during the COVID-19 pandemic; foreign investment demand growth was outpaced by the unprecedented growth in Agency MBS issuance that occurred during the pandemic years.*

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 foreign 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.*
- *CABs and 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)*
- *Most Asian investment in Agency MBS comes from official institutions. An increase in CABs/FOREX reserves could increase demand from these entities.*
- *In 2021, official institutions held 53% of all foreign holdings of Agency MBS.*

Future Growth of Foreign Holdings of Agency MBS

- *The foreign share of Agency MBS declined after the 2008 global financial crisis but has risen from around \$800 billion in 2010 to almost \$1.2 trillion in 2021.*
- *Countries where Agency MBS is a small percentage of their FOREX reserves and sovereign wealth fund asset allocations represent opportunities for future growth in foreign holdings of Agency MBS.*
- *SWFs have limited investment in Agency MBS compared to other portfolio sectors and may provide an opportunity for foreign demand growth.*

Investment Decision Factors

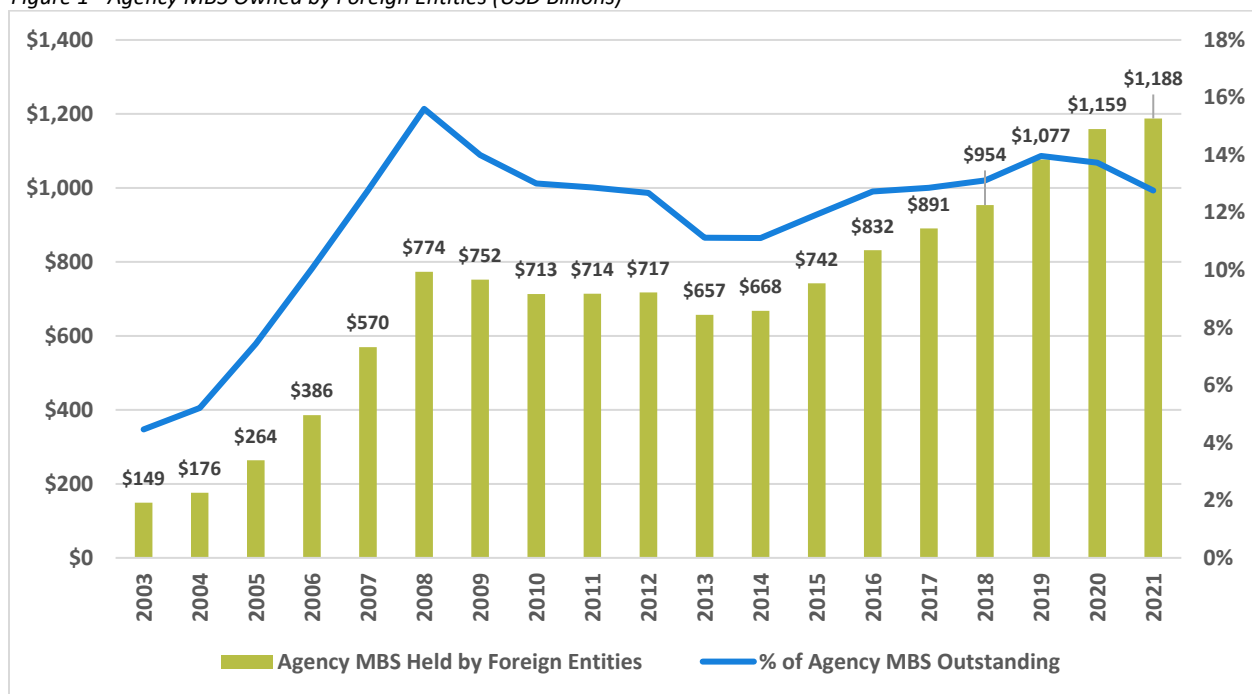
- *Economic factors, principally inflation, caused the Federal Reserve (Fed) to increase its Agency MBS cap to \$35 billion in September 2022 indicating a continuation of the quantitative tightening (QT) process.*
- *Financial factors like the current yields of Agency MBS and their spreads compared to US Treasury securities show the relative advantage of Agency MBS compared to other securities.*
- *Agency MBS yields rose sharply thus far in 2022 and will likely remain high as the Fed continues its QT activities.*
- *Geopolitical factors like the Russian invasion of Ukraine may lead to a decline in Agency MBS investment as countries may remain defensive.*
- *Environmental, Social, and Governance Agency MBS disclosures are growing in importance to foreign investors.*

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 volume of foreign holdings of Agency MBS between 2003 and 2021. 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 holdings that has continued into the present. Foreign holdings grew to exceed \$1 trillion for the first time in 2019 and, as of 2021, sit at an all-time high of \$1.19 trillion. As of June 30, 2021, foreign investors owned 12.8% of all outstanding Agency MBS, a slight decrease from 13.7% in 2020. This drop in share does not indicate that foreign investors are divesting, but rather that the Agency MBS market is growing at a faster pace than foreign demand due to unprecedented refinance activity caused by lower mortgage rates and higher home prices.

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



Source: TIC and SIFMA data. As of June 30, 2021. Note: SIFMA data includes both single and multifamily.

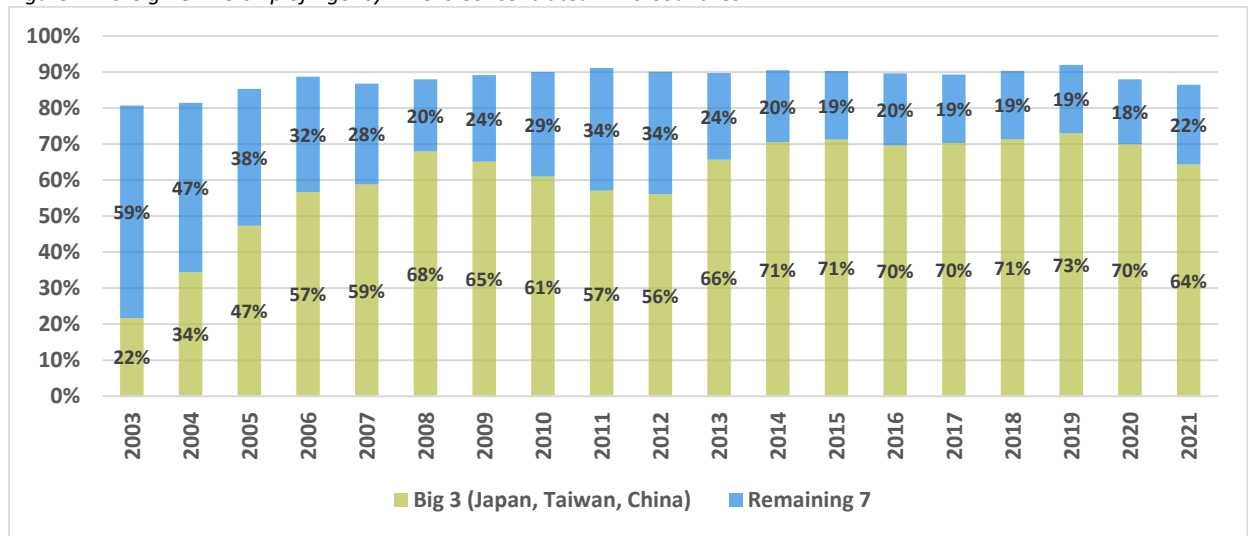
TIC data does not differentiate between foreign ownership of Fannie Mae, Freddie Mac, and Ginnie Mae MBS. For that reason, it is difficult to determine the composition of Agency MBS in foreign investment portfolios. All three are considered attractive to foreign investors for their unique status, but 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 3 Nations for Foreign Agency MBS Investment

TIC data shows that 10 countries have historically held most of the foreign owned Agency MBS, as seen in Figure 2. As of June 2021, investors in Japan, China, and Taiwan hold 64% of all foreign-owned Agency MBS. These three countries have increased their share dramatically from 22% in 2003 to 64% in 2021. These three countries, the “Big Three” of foreign Agency MBS investment, represented as much as 73% of total foreign Agency MBS holdings as recently as 2019. The approximately 9% decline in the share of foreign Agency MBS held by the Big 3 during the pandemic years is as much about the approximately 5% decline in their aggregate Agency MBS holdings between

2020 and 2021 (down to \$765 billion from \$806 billion in 2020) as it is about the reintroduction of Canada into the Agency MBS investment space, discussed further below.

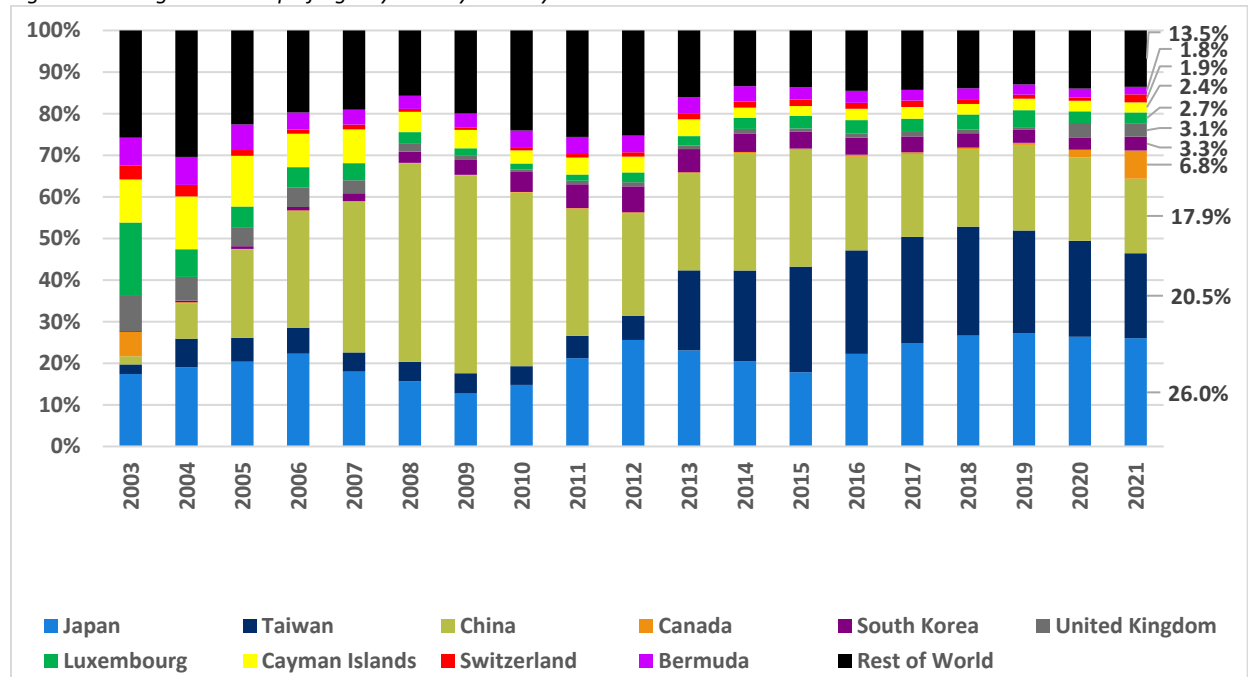
Figure 2 - Foreign Ownership of Agency MBS is Concentrated in 10 Countries



Source: TIC data. As of June 30, 2021.

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 portfolio holdings, jumping from 2% to 47.7%. Taiwan's ownership increased by 13.4% from 2012 to 2013 and has consistently held at least 20% of foreign Agency MBS holdings since. Japan has maintained a consistent share and maintains its place in the top three foreign investing countries.

Figure 3 - Foreign Ownership of Agency MBS by Country Share



Source: U.S. TIC data. As of June 30, 2021.

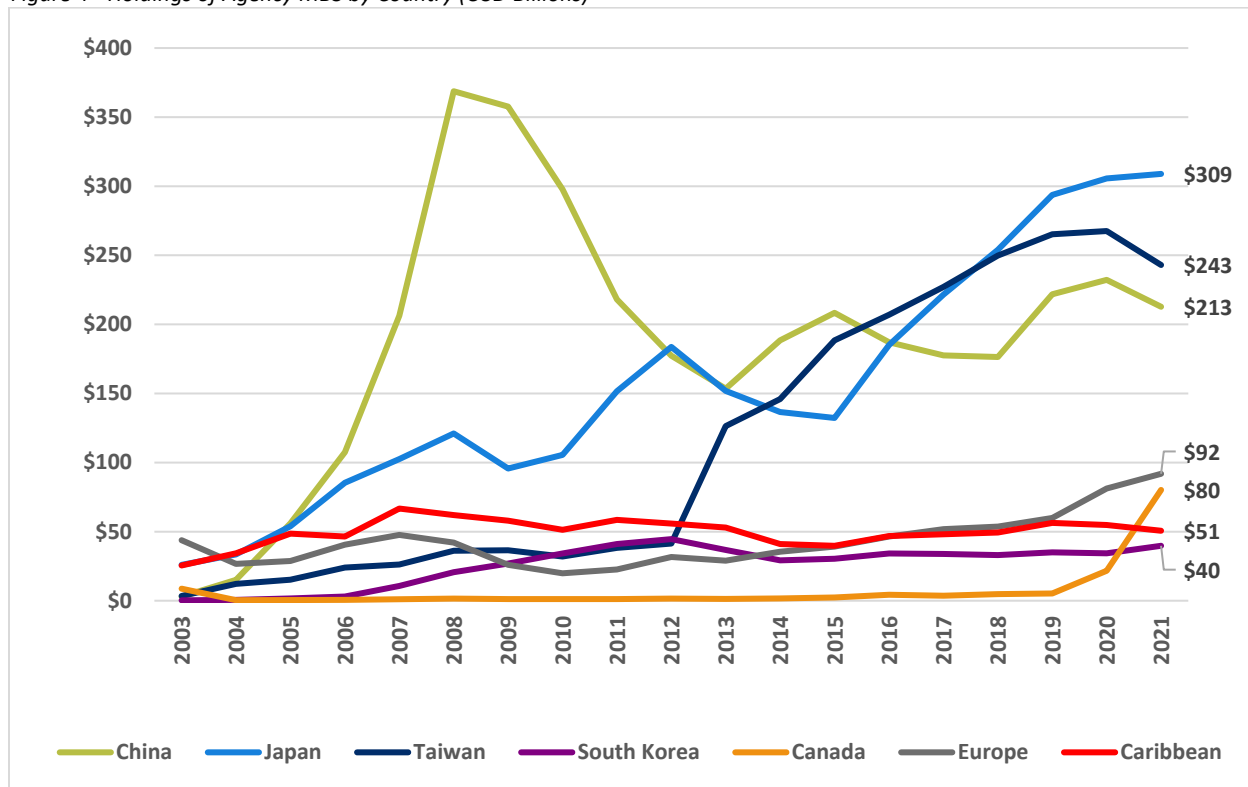
Changes in Foreign Ownership

The Big 3 has emerged as the dominant source for foreign Agency MBS demand, but as recently as 2003, Japan, China and Taiwan represented less than a quarter of foreign Agency MBS holdings. Another significant investor in Asia is South Korea. While it does not hold nearly the same amount of Agency MBS as the Big 3, it still ranks in the top 10. Interestingly, South Korea’s emergence as a significant source of demand began during and directly after the Global Economic Crisis. When many foreign investors were reducing their MBS allocations, South Korean holdings continued to grow. In 2021, South Korea was in 5th place in foreign Agency MBS holdings; South Korea held \$39.7 billion in 2021 compared to \$34.3 billion in 2020, an increase in holdings of 15.7%.

Europe has been the other source of sizeable foreign demand for Agency MBS over the past two decades. Although its share of total foreign holdings has dropped significantly compared to Asia since 2003, the continent still boasts a total of \$92 billion in holdings as of 2021. Much of this total comes from the United Kingdom, Luxembourg, and Switzerland. Each of these nations is part of the top 10 foreign holders with Switzerland growing the most between 2020 and 2021. Year-over-year, Switzerland increased its holdings substantially from \$8.7 billion to \$22.5 billion, an increase of 158.6%.

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. In 2021, the Cayman Islands held \$28.9 billion, and Bermuda held \$21.7 billion, both experiencing a drop since 2020. Canada, as of 2021, has reemerged as another top 10 holder of Agency MBS. Prior to last year, Canada only cracked the top 10 in 2003 and 2020, ranked at 6 and 10, respectively. In 2021, it is only behind the big 3 in terms of volume owned, holding a total of \$80.2 billion in Agency MBS. Figure 4 illustrates the investment trends of the current top holders of Agency MBS.

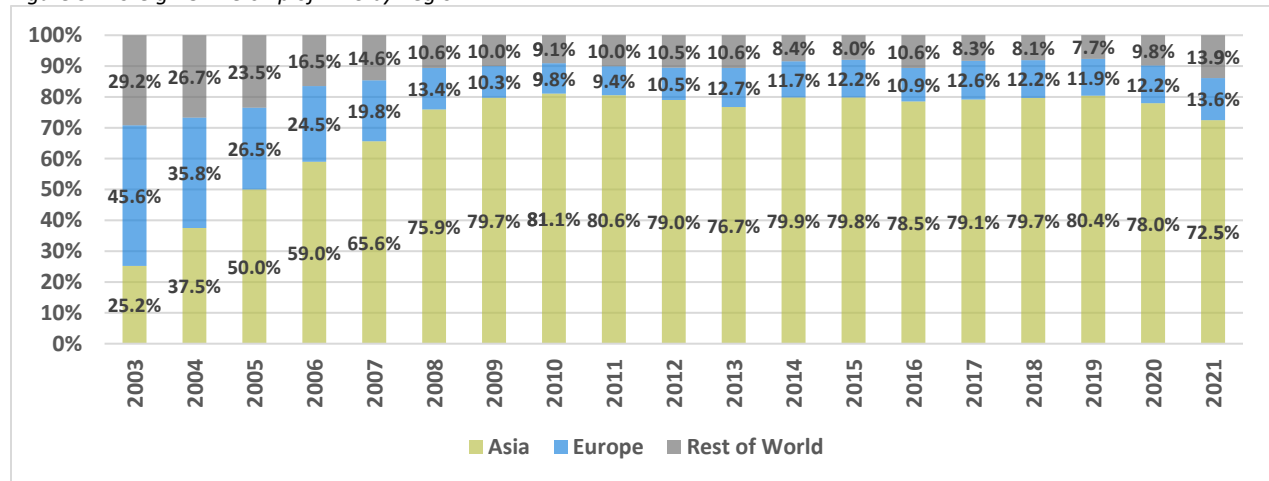
Figure 4 - Holdings of Agency MBS by Country (USD Billions)



Source: U.S. TIC data. As of June 30, 2021. Note: Europe is comprised of European countries in the current top 10 holders (United Kingdom, Luxembourg, and Switzerland)

Since the emergence of the Big 3, all notably in Asia, as the predominant sources of foreign Agency MBS demand in the early to mid-2000s, there has not been much variation in the regional share of Agency MBS holdings. Figure 5 shows the breakdown of market share between Asia, Europe, and the rest of the world. Regionally, Asia's share remains strong at 72.5% in 2021, dropping from 78% in 2020. Europe, because of substantial growth from Switzerland, showed a slight increase of 1.4% to an overall share of 13.6% in 2021. The rest of the world also saw an increase to 13.9% in 2021, almost certainly due to the increase in holdings for Canada.

Figure 5 - Foreign Ownership of MBS by Region



Source: TIC data. As of June 30, 2021.

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 factors. 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 economic structural diversity goes beyond the economies' 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.² Every nation has its own set of circumstances impacting the particulars of their official FOREX reserve management system, and all of 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 in Agency MBS, the many macroeconomic considerations of potential foreign investors 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)

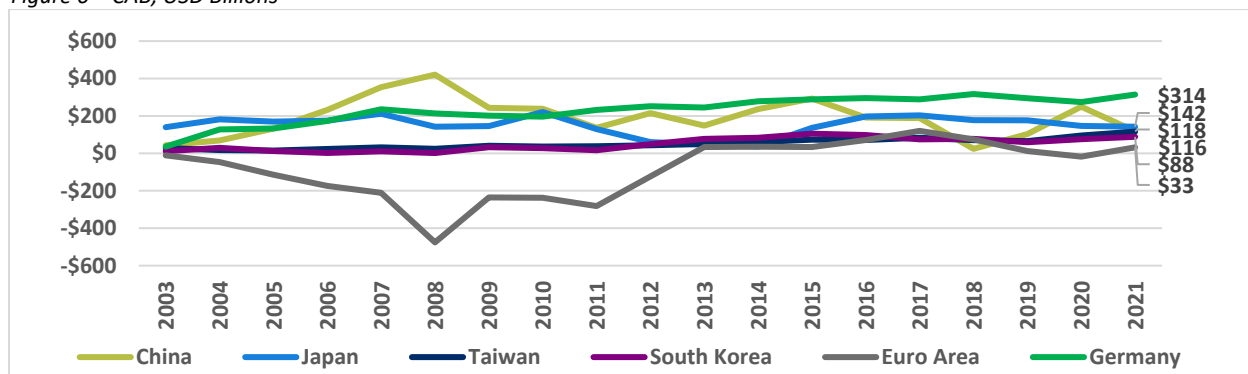
While it may be useful to note that rising interest rates, high current inflation levels, employment forecasts, QT and other Fed policies are likely to impact demand in the near future, these demand drivers influence domestic and foreign investors alike in well documented ways. Because the focus of this 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

²² https://www.business-standard.com/article/markets/sebi-allows-mutual-funds-to-resume-investing-in-international-stocks-122062100455_1.html

economic 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. US Macroeconomic factors and nation-specific policies operate as explanations for allocations of foreign wealth to or from Agency MBS but fundamentally, all of these factors serve to limit the demand ceiling that foreign wealth represents. Thus, the scope of this 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 time period. Both CAB and FOREX reserves represent surplus cash, often dollar denominated, that countries have to invest in US 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 has steadily declined since then, and as of 2021, the balance equaled \$118.4 billion. Japan has maintained a stable CAB over the past two decades, with the only significant drop occurring between 2010 and 2014. As of 2021, the country’s CAB was \$142.5 billion. Finally, South Korea’s CAB has been steadily increasing from less than \$30 billion in 2003 to over \$88 billion in 2021.

Figure 6 – CAB, USD Billions

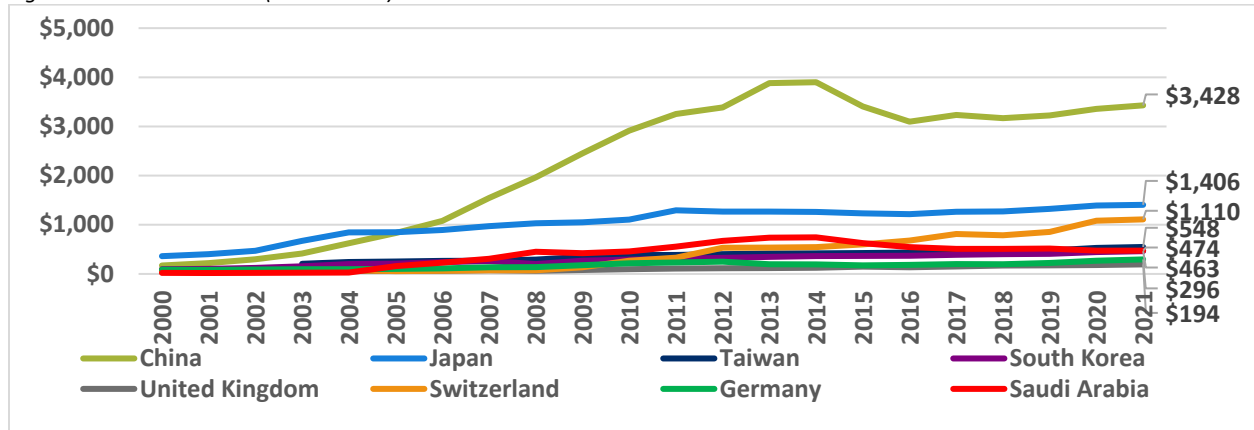


Source: International Monetary Fund. Note: Taiwan’s CAB is no longer available from IMF from 2018 onward. CAB for Taiwan from 2019-2021 estimated from GDP and CAB as a % of GDP. This data was pulled from FRED and Statista. As of June 30, 2021.

Europe’s CAB suffered the most from the 2008 Global Economic Crisis, dropping into negative territory from 2008 to 2011. Since then, it has recovered substantially but this has not led to a significant increase in Agency MBS. One of the 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 zero % 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 \$3.4 trillion in 2021. Japan’s reserves have steadily increased since 2003, reaching \$1.4 trillion in 2021. Taiwan’s reserve balance has gradually increased as well, reaching \$548 billion in 2021. 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 will be seen in Table 2 below.

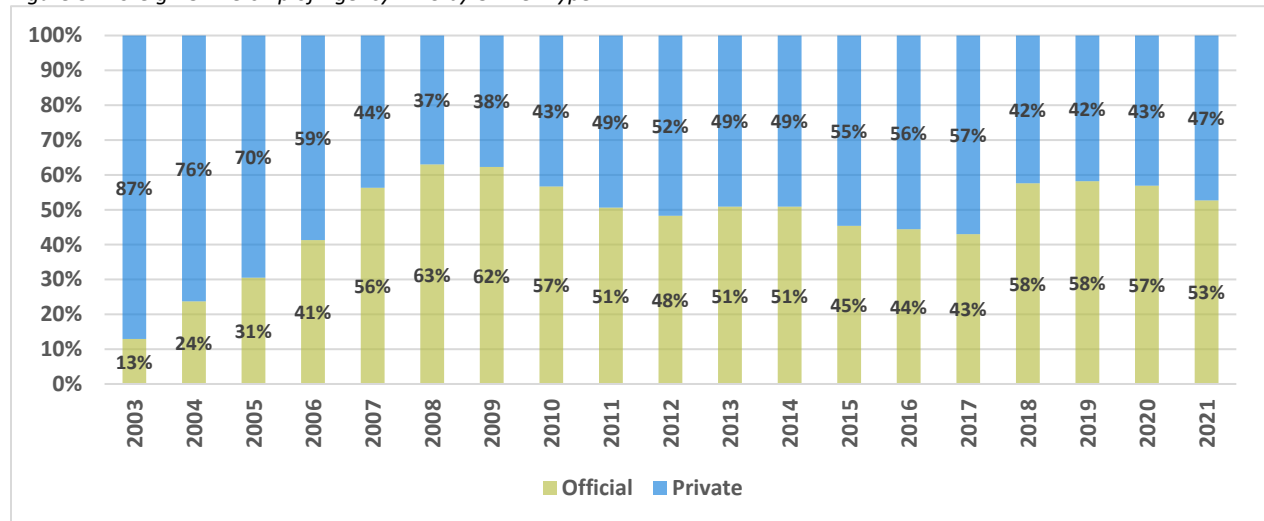
Figure 7 - FOREX Reserves (USD Billions)



Source: International Monetary Fund & Central Bank of The Republic of China (Taiwan). As of June 30, 2021.

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-percent-plus GDP growth period ended in 2014, the official holdings share dropped below 50% for three years before bouncing back to 58% in 2018.

Figure 8 - Foreign Ownership of Agency MBS by Owner Type



Source: TIC data. As of June 30, 2021.

Future Growth of Foreign Holdings of Agency MBS

Prior to the U.S. housing market collapse in 2008, the foreign-owned share of Agency MBS had been growing at an average annual rate of 39.5%, outpacing the average 8.0% growth rate of outstanding Agency MBS by 31.5%. From 2009 to 2013, foreign investment in Agency MBS experienced an average growth rate of -2.3% and only returned to positive territory in 2014, albeit at much lower growth levels than before the crash. From 2014 to 2021, foreign owned holdings of Agency MBS grew at an average annual rate of 7.8%, although the annual rates post pandemic were substantially lower at 7.6% and 2.5%, respectively. With the current trends of rising mortgage interest rates and higher Agency MBS yields, there may be attractive opportunities for foreign investors to grow their holdings of low-risk Agency MBS to generate superior returns over Treasuries.

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%

Source: TIC data. Note: All calculations based on USD amounts. As of June 30, 2021.

As discussed above, 73% of foreign-owned 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 this market. With respect to Europe, holdings of Agency MBS can be expected to grow provided that FOREX reserves also increase in size. However, the current conflict in Ukraine and NATO countries funding defense may limit the growth of European FOREX reserves.

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 3 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%

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, 2021.

What is most important to note are those countries with a relatively low ratio of Agency owned MBS as a percentage of FOREX reserves. Saudi Arabia, Switzerland, and Germany have low Agency MBS holdings as a percentage of their FOREX reserves. For 2021, the ratio was 0.2% for Saudi Arabia, 2.0% for Switzerland, and 1.6% for Germany. Even China and South Korea, each with under 10% allocations of their FOREX reserves in Agency MBS, may all have room to increase their Agency MBS investments.

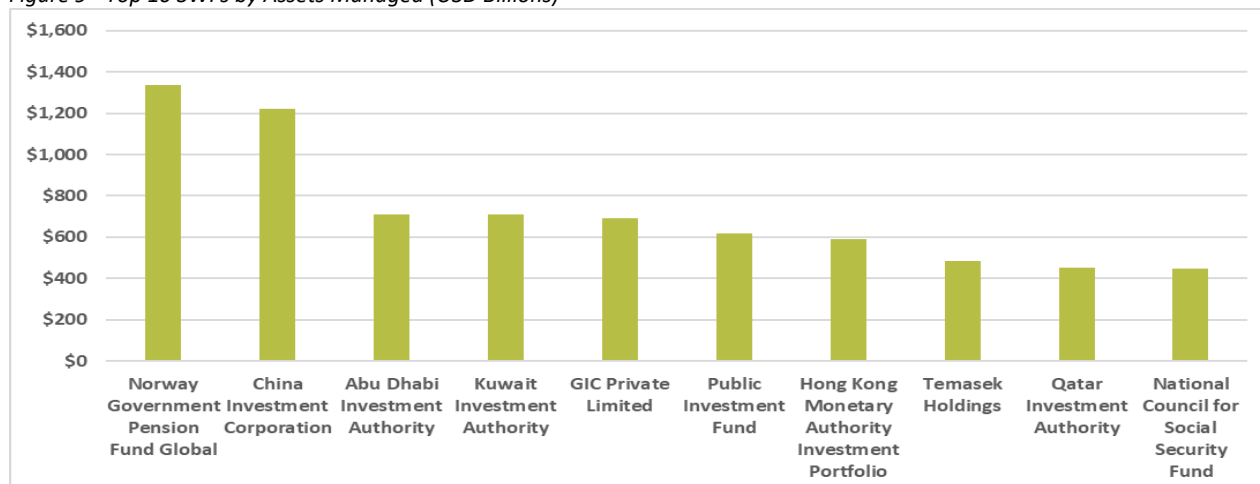
Finally, another potential area of interest lies within SWFs. SWFs are considered official institutions and are included in the foreign official holdings data from TIC. Over the past two decades, the size of SWFs has increased from under \$1 trillion in 2000 to over \$10 trillion in 2022.³ As of 2021, SWFs manage over \$10.5 trillion in assets across equities, fixed income, real estate, and alternative investments. The top 10 SWFs comprise 69% of the global assets managed.

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 (GPF) in 2021, for example, is the largest fund in the world and is currently funded at \$1.34 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 bonds⁴ 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.

³ <https://www.swfinstitute.org/fund-rankings/sovereign-wealth-fund>

⁴ <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, 2022.

The second largest fund, the China Investment Corporation, has \$1.22 trillion in total assets under management with fixed income comprising 17% of the entire investment portfolio.⁵ Abu Dhabi Investment Authority also invests a very small amount in fixed income assets.⁶ As seen in the breakdown of the top 3 SWF portfolios, they 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 US dollar has continued to appreciate relative to foreign currencies. Since January 3, 2022, the dollar has appreciated 11% relative to the Euro, and 24% relative to the Yen (as of September 19, 2022). Similar exchange rate trends are ubiquitous vis-à-vis nations with significant Agency MBS investment volume, as the Yuan has depreciated 8% relative to the dollar YoY, the Won has depreciated 17% YoY, and Canadian dollar has depreciated over 3% relative to the dollar.

Economic: Federal Reserve Monetary Policy

In 2022, the Fed has begun undertaking efforts to control rapid inflation. Its primary method of addressing the issue has been to increase interest rates. In both June and July 2022, the Fed hiked interest rates by 0.75%, which were the largest monthly rate increases since 1994. The Fed has given every indication that they will continue to increase rates as necessary to rein in inflation going forward.⁷

The Fed also plans to continue its QT activities to address inflation by reducing its portfolio of Agency MBS. In May of 2022, the Fed announced plans to significantly reduce its holdings of Treasury and Agency MBS securities.⁸

⁵ http://www.china-inv.cn/chinainven/Investments/Portfolio_Management.shtml

⁶ <https://www.adia.ae/en/investments>

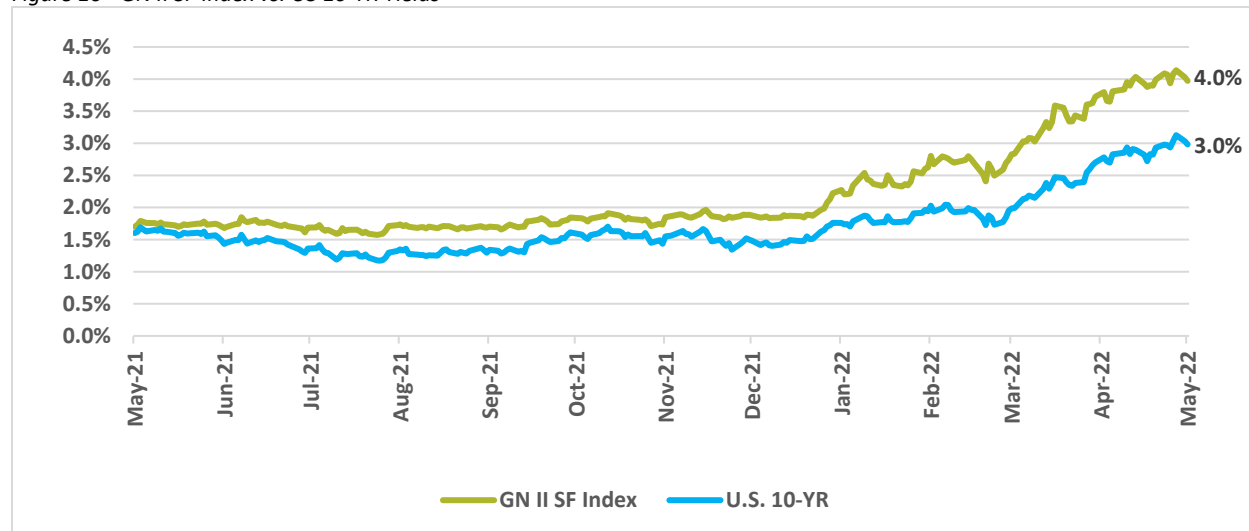
⁷ <https://www.cnn.com/2022/07/13/traders-bet-the-fed-could-raise-interest-rates-by-1percent-this-month.html>

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

Financial: Yields/OAS

Compared to U.S. Treasury securities, Agency MBS typically offer higher yields. Figure 10 shows the yields of Ginnie Mae II MBS compared to US 10-YR bonds. Within the past 2 years, the spread has widened to a full percentage point. Combined with the current rise in interest rates, investment in Ginnie Mae MBS, specifically, could be considered a worthwhile investment alternative to U.S. Treasury securities. This may be particularly noteworthy for SWFs, which typically hold more U.S. Treasury securities than Agency MBS. A shift in allocation toward low-risk Ginnie Mae MBS may provide higher yields for foreign investors while maintaining the credit risk profile of U.S. Treasury securities.

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



Source: Bloomberg data. As of May 10, 2022.

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 impact 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 the 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%.⁹

In addition to the impact the invasion may have on EU growth in the future, the Euro has experienced a considerable drop in value. On July 13, 2022, the Euro reached parity with the US dollar for the first time since 2002.¹⁰ The potential for a stronger dollar will have an impact on the cost of U.S. based investments. These investments, including Agency MBS, may be less attractive to EU investors due to the increased cost. Combined with the fact that EU countries, especially NATO members, are making significant contributions to their defense budgets to aid Ukraine, European investment in U.S. dollar denominated securities may decline over the next few years.

Environmental, Social, and Governance Discussion

Ginnie Mae, Fannie Mae, and Freddie Mac have all recently made efforts to increase transparency with investors in relation to Environmental, Social, and Governance (ESG) 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, recently participated in the Urban Institute Ginnie Mae Presidents event¹¹ on June 2, 2022. At this event, she spoke of the increased interest in environmental and social investment. McCargo

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

¹⁰ <https://www.nytimes.com/2022/07/13/business/euro-dollar-parity.html>

¹¹ Urban Institute Ginnie Mae Presidents Event, June 2, 2022

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 is of particular note since the main source of demand for Agency MBS comes from that region. 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.¹² While the ESG program is still relatively new, it seems that foreign investors are already interested. If the ESG program garners particular interest from investors, perhaps evidenced by premium pricing, it will likely follow that Ginnie Mae issuers will begin factoring the value of significant ESG collateral concentrations in their pooling strategies.

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, a Senior RMBS Strategist from Wells Fargo. Mr. Ichaso has worked with Wells Fargo in this field for 7+ years and contributes regularly to publications on the Agency MBS market. Topics covered include the current state of the market, geopolitical factors and their effects, the rise of Canada as a holder of Agency MBS, geographical regions that have the potential to increase their holdings in the future, China’s recent increase in holdings, and how much of the foreign holdings of Agency MBS are Ginnie Mae MBS.

With regards to current trends, Mr. Ichaso noted that the Fed policy will dictate volatility within the market, and that the most important item to watch is the Fed balance sheet. Mr. Ichaso noted:

“Going into the year, many participants anticipated the Fed to pivot into a more hawkish stance. What surprised many was the velocity in which repricing took place. The Fed has made it clear that monetary policy is most efficient when it “coincides” with market expectations. At times, the Fed will take the option given by market and react more aggressively to inflation. An example of this is what happened in May where inflation figures came in higher than expected. This led the Fed to go beyond their originally telegraphed 50 bps hike in June and July. Other times, the Fed may go out of its way to tame down a shift in the market’s perception. This is what occurred in the prior month when many analysts on the street were calling the start peak inflation and reduced their expectation for future hikes. These dynamics fuel volatility and we think volatility will continue to be the key theme for this year. The magnitude in which volatility will evolve is dependent on what the Fed sees in terms of their reach in containing inflation. So as we look ahead, I think one of the things that remains top of mind is the ultimate size of the Fed’s balance sheet. For years the Fed has been a seller of options through its MBS purchases. With quantitative tightening in full force starting in September, we will see how much volatility will emerge with the Fed’s absence.”

Geopolitical factors can have an influence on the Agency MBS market, mainly with regard to economic conditions. Mr. Ichaso mentioned that the recent conflict in Ukraine introduced a form of inflation that cannot be controlled by the Fed. Mr. Ichaso stated:

“I think Ukraine has added a dose of inflation into the system that is beyond the Fed’s purview. Many of the inflation drivers today are not monetary issues, but rather fiscal issues. We would argue private capital has underinvested in the US for many years prior to COVID because many saw US potential growth at or below two percent. If the Fed moves the federal funds rate up by 200 basis points, does that change how many chips US companies will produce? We think not. Semiconductors are an indispensable part of our economy given their broad use in cars, consumer electronics, aviation, etc... Some inflation drivers, like Russia’s invasion of Ukraine or supply chain issues, are sticky sources of inflation that the Fed may not be able to influence much. This means the Fed may have to reduce wealth/demand in other areas of the economy more aggressively to

¹² Urban Institute Ginnie Mae Presidents Event, June 2, 2022

make up for those areas beyond their reach. The war in Ukraine had an outsized impact on energy markets. There's not much that we can do to address it through monetary policy."

On the subject of Canada's increased holdings, Ichaso mentioned the difficulty in determining the actual reason for the increased holdings, mainly due to the limitations of TIC data. Ichaso stated:

"Not specifically, but I would imagine it has somewhat to do with Canadian banks increasing their presence in the US. Other than that, I wouldn't be able to say one way or the other. We can't see much in the official vs. private holdings on a country level from TIC data, so that makes it tough to determine what is driving shifts in demand. There is a similar unknown factor in the UK data, for example. Demand in the UK can be a source of noise given their large swings in demand month-over-month. This could be indicative of some sort of dollar roll activity, but the data available does not provide a definite answer."

When asked about areas of increased demand for Agency MBS, Mr. Ichaso gave a few areas where we may see increased activity. Mr. Ichaso said:

"I would imagine you would see some growth in the Caribbean due to hedge fund activity... I would also imagine other parts of Asia due to economic ties and increased demand for dollar denominated investments. We have also seen some inquiries in other parts of the world such as the Middle East."

When asked about potential reasons for China's recent shift toward Agency MBS investments, Mr. Ichaso posited the following:

"I would imagine it is partly due to China's slowing economy generating some flight to quality response as well as currency dislocations like the strengthening of the US dollar."

Finally, when discussing the limitations of TIC data regarding the lack of breakdown of holdings by Agency, Mr. Ichaso mentioned that the majority of those securities are Ginnie Mae. Mr. Ichaso stated:

"The majority of our flows in APAC region are Ginnie Mae, by far. I think if you look at it between central bank holdings and private holdings, you see the majority of those are Treasury and Ginnie buyers, given the US government guaranty."

Conclusion

Foreign entities continue to be consistent sources of demand for Agency MBS. As the Fed works to address inflation and seeks to sell more of its portfolio of Agency MBS, foreign investors may benefit from the increased supply and higher yields. As the Fed ramps up its QT efforts, the potential increase in volatility will be a significant factor to monitor. The Fed's policy is 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 near historical highs vs. U.S. Treasury securities and may provide the opportunity for foreign investors to generate higher investment returns from these assets.

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 2021, has regained some share of total foreign holdings compared to prior years; however, with the ongoing conflict in Ukraine and adjustments to growth forecasts, 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.

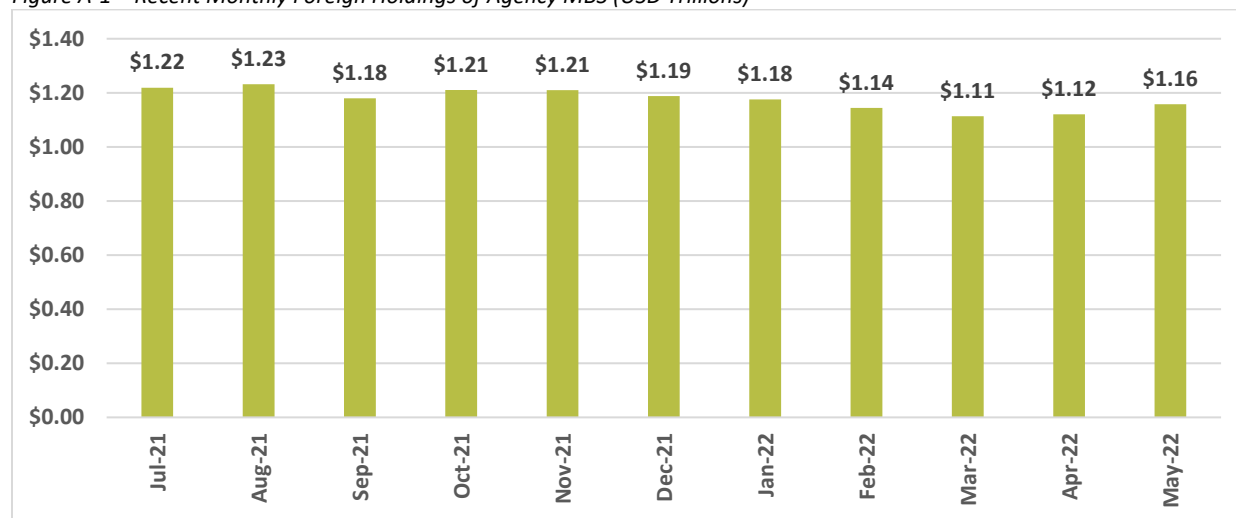
Outside of Canada, Mr. Ichaso sees the Caribbean as a significant future growth area, while other parts of Asia and the Middle East could also be potential sources for growth.

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 on a monthly basis from July 2021 through May 2022. 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 May 2022 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 2021 to May 2022. Thus far in 2022, total foreign holdings of Agency MBS have declined by almost 6% to \$1.16 trillion as of May 2022 compared to the high of \$1.23 trillion in August 2021. There was a general decline of holdings from November of 2021 to March of 2022, however April and May saw increases month-over-month. From March to May 2022, holdings increased by 3.9% with the largest increase occurring between April and May, where holdings increased by approximately \$40 billion or 3.4% month-over-month.

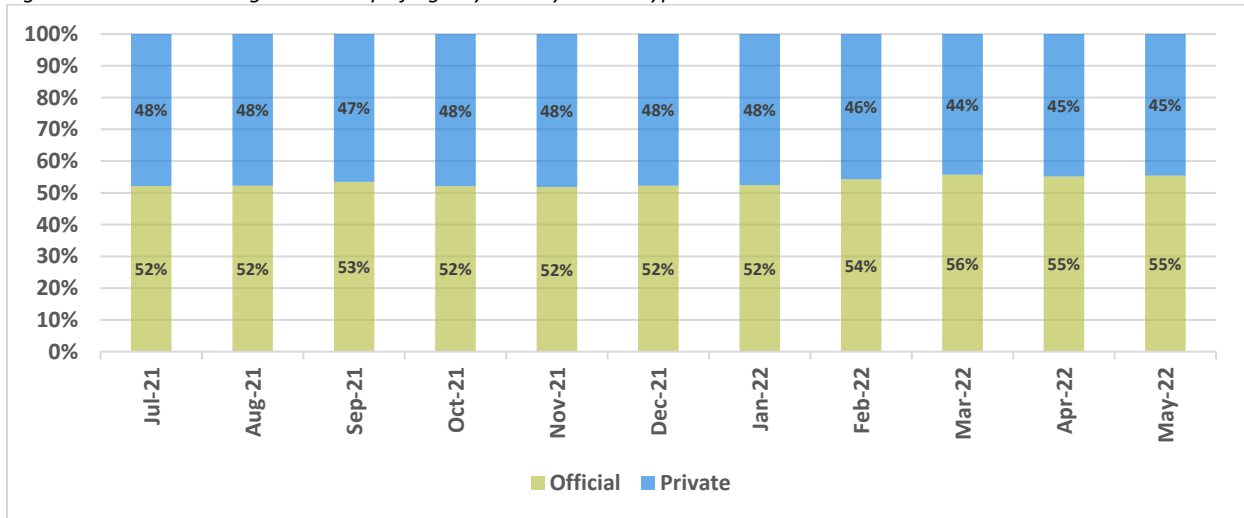
Figure A-1 – Recent Monthly Foreign Holdings of Agency MBS (USD Trillions)



Source: Foreign Holdings - TIC data. As of August 2, 2022.

Another set of monthly TIC data that can be analyzed concerns foreign official vs. private holdings of Agency MBS. Figure A-2 shows the percentage of these holdings from July 2021 to May 2022. Over the year, the split between official and private institutions holding Agency MBS has remained fairly steady, with official holders still claiming the majority. As of May 2022, official institutions held 55% of the total foreign holdings while private institutions make up 45%. Compared to the June 30, 2021 holdings, official institutions increased their total share of Agency MBS by approximately 3%.

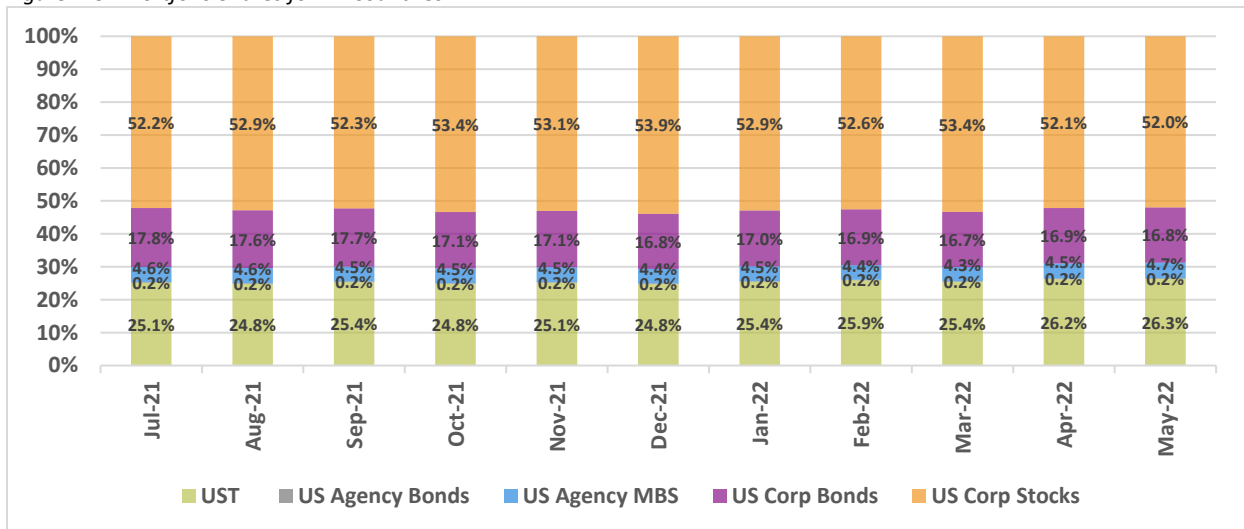
Figure A-2 – Recent Foreign Ownership of Agency MBS by Owner Type



Source: TIC data. As of August 2, 2022.

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, 2021. Figure A-3 shows the portfolio composition of U.S. securities for all foreign holders. Overall, the share for each security category remains consistent, with U.S. Agency Bonds comprising between 4.4% to 4.9% of all holdings during the period from July 2021 to May 2022.

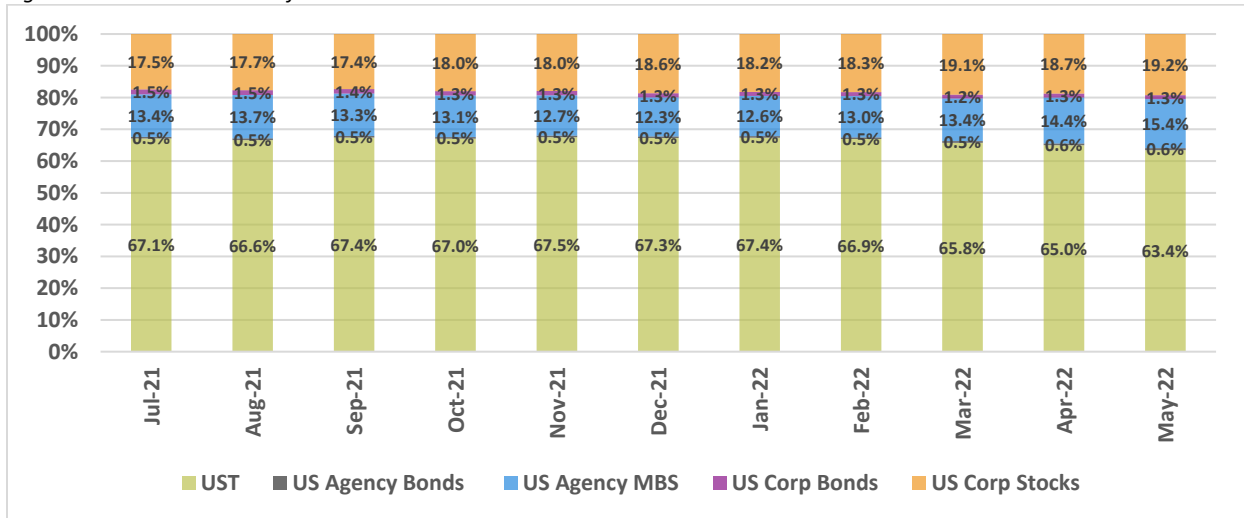
Figure A-3 – Portfolio Shares for All Countries



Source: TIC data. As of August 2, 2022.

For the most part, the top 5 countries did not experience significant changes in their portfolio allocations. One exception to this is China, who increased their investment in Agency MBS by over 2% through May 2022. Figures A-4 and A-5 below illustrate China's portfolio asset allocation from July 2021 to May 2022. 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 almost 4% during the same period.

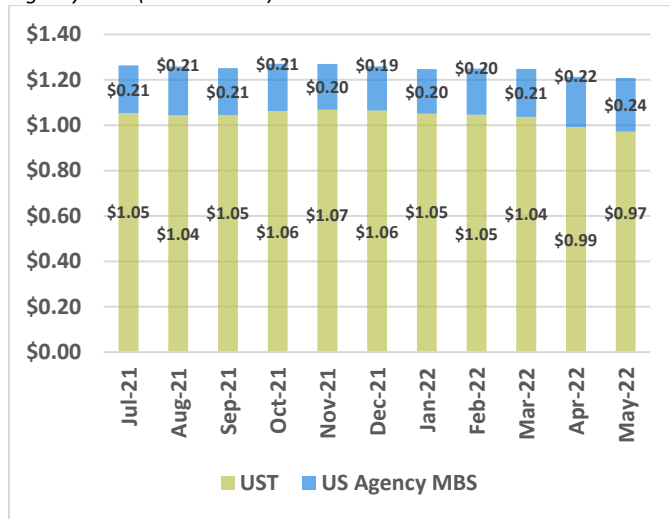
Figure A-4 – China Asset Portfolio Allocations



Source: TIC data. As of August 2, 2022.

Figure A-6 illustrates the spread between the 10-year UST and GN II MBS was 29 bps on July 2, 2021, reached a high of 113 bps in April, and ended May at 99 bps. This significant increase in spread could be a factor in China shifting its holdings.

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



Source: TIC data. As of August 2, 2022.

UST-GN II Spread: Bloomberg Data. As of May 10, 2022.

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

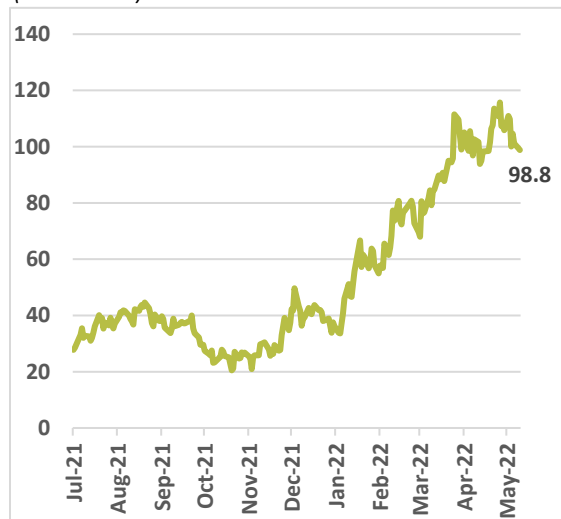
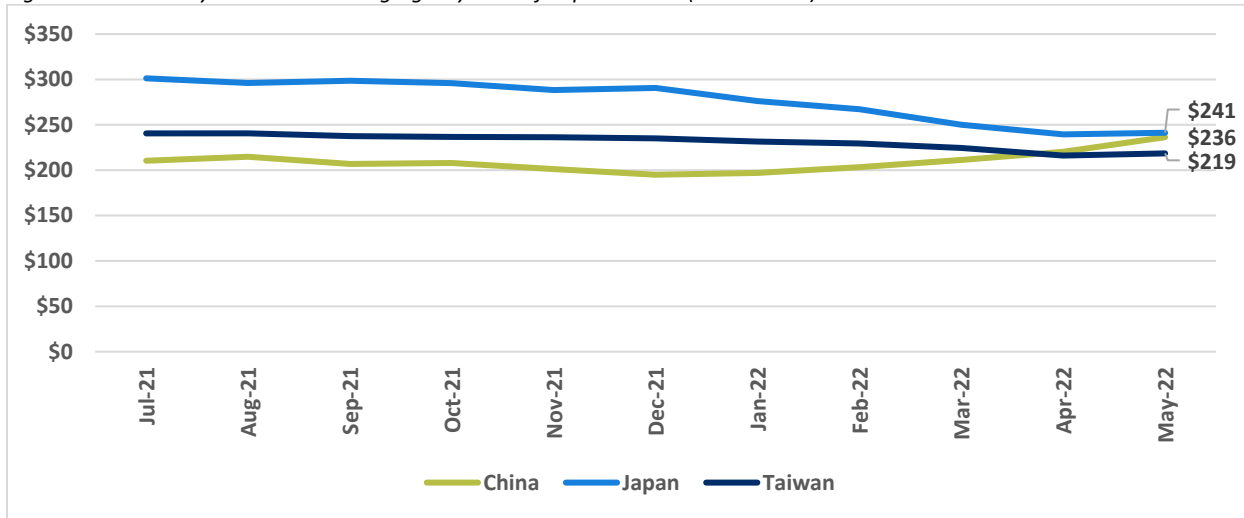


Figure A-7 on the following page compares the Agency MBS holdings for the top 3 holders along with the difference in portfolio share. From July 2021 to December 2021, holdings stayed fairly constant, with Japan ranked first, Taiwan ranked second, and China ranked third by market value. As global markets became more uncertain in 2022 and Agency MBS spreads began to widen, we saw declines in Agency MBS holdings for the eleven-month period in both Japan (-19.9%) and Taiwan (-8.9%). Over the same period, China increased the Agency MBS share of its holdings (+12.4%) and moved up to second place ahead of Taiwan in the foreign holder rankings.

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



Source: TIC data. As of August 2, 2022.

Figure A-8 below illustrates the top 10 foreign holders of Agency MBS from July 2021 to May 2022 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 1st in each month. Taiwan was ranked 2nd from Jul-21 through Mar-22 and China was ranked 3rd. From Apr-22 through May-22 China moved up to 2nd and Taiwan moved down to 3rd.

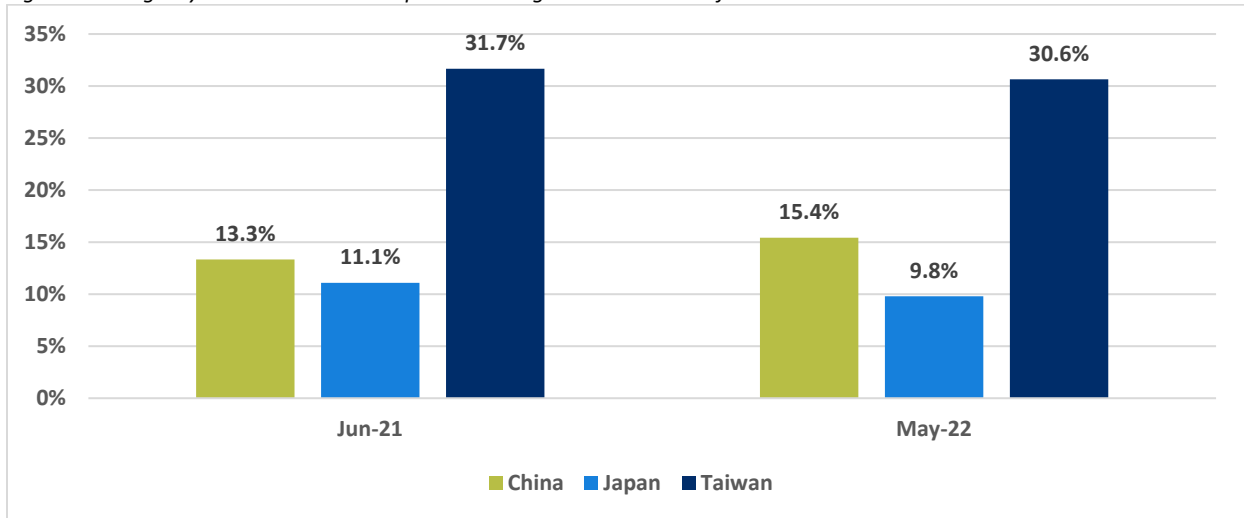
Figure A-8 – Monthly Top Ten Foreign Holders of Agency MBS

Rank	Country	Jul-21	Aug-21	Sep-21	Oct-21	Nov-21	Dec-21	Jan-22	Feb-22	Mar-22	Apr-22	May-22
1	Japan											
2	China, Mainland											
	Taiwan											
3	China, Mainland											
	Taiwan											
4	Canada											
	United Kingdom											
5	Canada											
	United Kingdom											
6	Korea, South											
	Luxembourg											
	Cayman Islands											
7	Korea, South											
	Luxembourg											
	Cayman Islands											
8	Luxembourg											
	Bermuda											
9	Bermuda											
	Switzerland											
	Bermuda											
	Switzerland											
10	France											
	Ireland											

Source: TIC data. As of August 2, 2022.

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 2021 and May 2022. Although the Agency MBS holdings in the top three portfolios are of similar dollar volumes (Japan: \$241 billion, China: \$236 billion, Taiwan: \$219 billion) as of May 2022, the Agency MBS allocation percentages are significantly different. Agency MBS account for over 30% of Japan’s total holdings, while China and Taiwan allocate only 10% to 15% shares to the sector.

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



Source: TIC data. As of August 2, 2022.

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

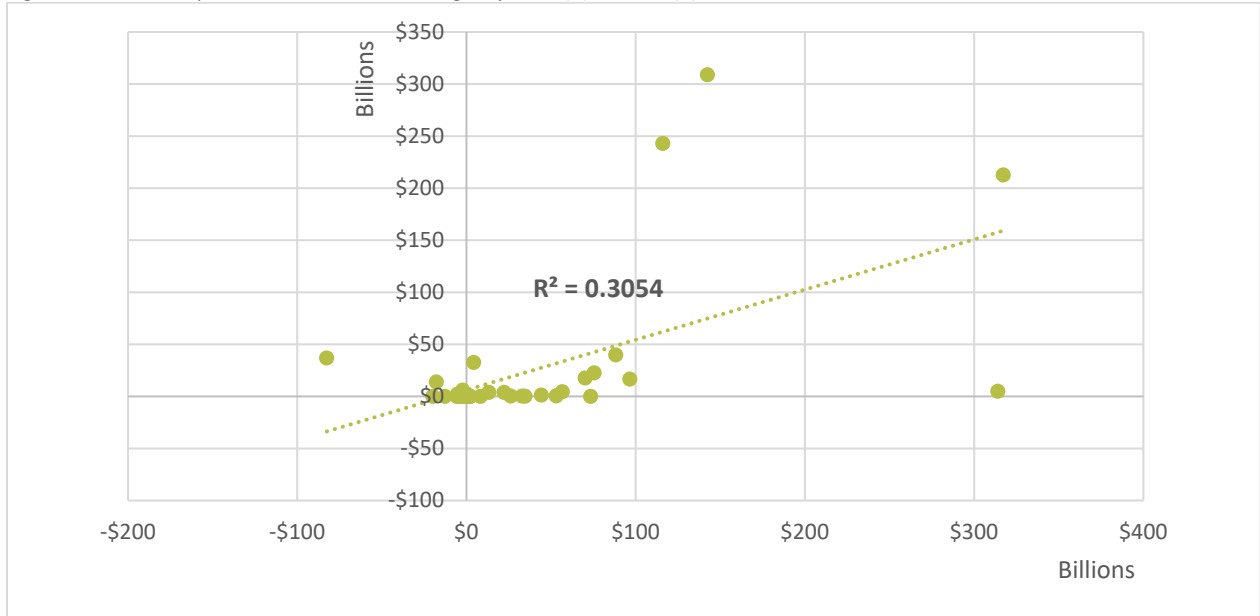
Driver	Discussion	Relevant Data Available	Relevant for Private/Official
Foreign Disposable Wealth	Wealth represents the funds an institution/investor has access to and manages in an attempt to achieve its investment objectives. Wealth is the fundamental demand ceiling.	CABs, FOREX	Private & Official
U.S. Macroeconomic Conditions			
U.S. Mortgage Rates & Mortgage Rate Projections	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
U.S. Inflation	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
Employment	High, or increased unemployment increases involuntary prepayment risk.	Unemployment Rates	Private & Official
Federal Reserve Policy	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
International Macroeconomic Conditions and Foreign Investment Policy			
Fiscal Policy and Funding Mechanisms for Government Programs	Government spending funded by export revenues rather than direct taxation directly limits funds available for investment in foreign Agency MBS.	N/A	Official
Private Sector Reserve Management Policy	Government foreign investment policy often places explicit caps on foreign private sector investment that artificially limits demand for Agency MBS.	N/A	Private

Official Reserve Management Policy	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
Foreign Currency/USD FX Volatility	Foreign investment in Agency MBS exposes foreign investors to the risk of dollar depreciation.	N/A	Private and Official
Geopolitical Events	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
Financial Sophistication	Agency MBS investment requires a level of financial sophistication that is not evenly distributed globally.	N/A	Private
Product Awareness	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

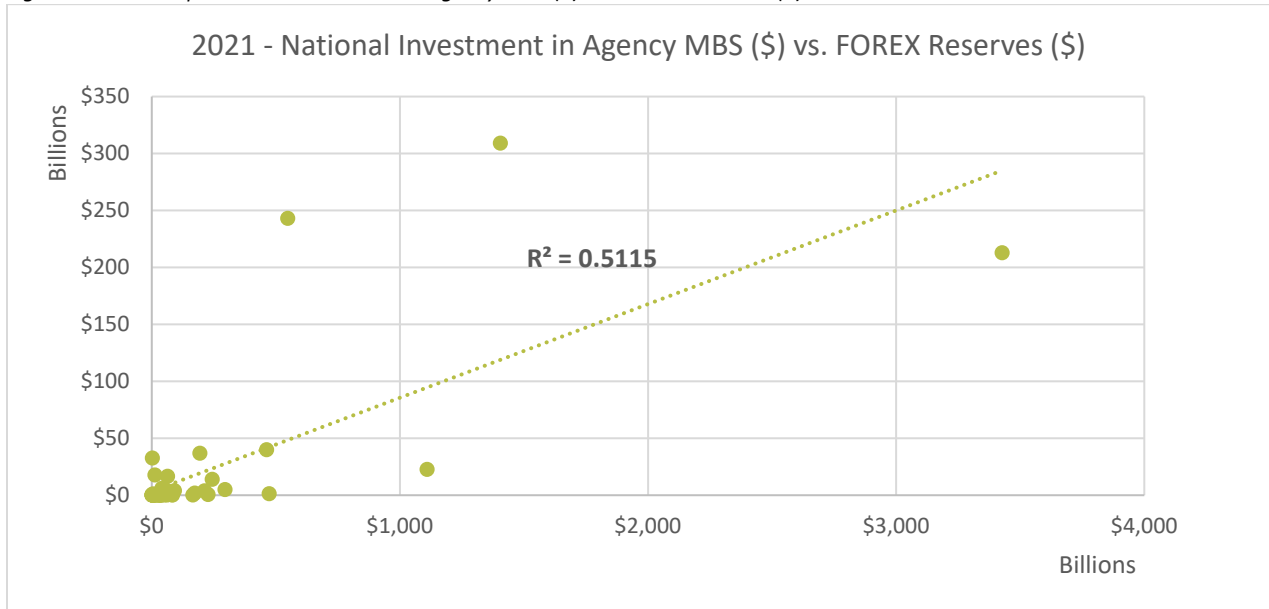
CABs and FOREX reserves are documented proxies for foreign disposable wealth that show evidence of correlation with demand for Agency MBS. As the table below shows, 30.5% of the variability observed in invested dollars in Agency MBS is explained by CABs.

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.