

Minutes of the Study Group on Government Debt Management (1st Round)

1. Date: Monday, June 13, 2022 1: 00 p.m. - 2:00 p.m.

2. Place: International Conference Room at the Ministry of Finance / online

3. List of Proceedings

1. Current Status and Issues Regarding JGB Issuance

First, the Financial Bureau explained "Current Status and Issues Regarding JGB Issuance." After that, the members exchanged opinions freely.

► Below is a summary of the Financial Bureau's presentation:

- The Debt Management Policy is operated based on the basic concept of reliably raising the necessary fiscal funds through smooth and secure issuance of JGBs and ensuring foundations for fiscal management by minimizing medium- to long-term fundraising costs, and in order to achieve these goals, in formulating and managing the JGB Issuance Plan, we have carefully implemented "dialogue with the market" and have endeavored to issue JGBs based fully on market needs.
- On the other hand, excessive responses to temporary or short-term changes in market demand may result in loss of the market's transparency and predictability for market participants, increase risks for JGB investment, and lead to a rise in medium- to long-term fundraising costs, and therefore, in Japan, where a large amount of JGB issuance is expected to continue, it is important to assess medium- to long-term demand trends and to conduct more stable and transparent JGB issuance.
- Regarding the entire current issuance of JGBs, ¥39.6 trillion in Newly-issued Bonds, ¥0.2 trillion in Reconstruction Bonds, and ¥152.9 trillion in Refunding Bonds must be financed based on the current budget framework for FY2022, for a subtotal of ¥192.7 trillion as General Bonds, and when the ¥25 trillion of FILP Bonds required for the FY2022 FILP Plan is added, the total issuance amount is ¥217.7 trillion. ¥198.6 trillion, excluding ¥19.1 trillion for retail investors, etc. from the total amount, will be financed by calendar-base JGB market issuance, and will be issued by allocating it to a wide range of maturities from 40 years to 6 months.
- As for the change in the total amount of JGB issuance, it had been on a downward trend until before COVID-19 and had decreased to around ¥150 trillion, but the amount of

issuance has also increased significantly due to the significant increase in Newly-issued Bonds in FY2020. Since then, JGB issuance has continued at a high level, but it is generally on a downward trend. Looking at the breakdown, Refunding Bonds were around ¥100 trillion until FY2020, but at the beginning of FY2021, they were around ¥147.2 trillion, an increase of about ¥40 trillion.

- An increase in short-term bonds is behind the increase in Refunding Bonds. Regarding the JGB Market Issuance (Calendar Base), in FY2020 (after the third revision), the issuance of medium-term, long-term, and super long-term bonds with maturities of two years or longer increased in line with increased issuance during COVID-19, but overall, the issuance ratio of short-term bonds increased significantly. Since short-term bonds mature in the following fiscal year, it is necessary to issue Refunding Bonds, and this is a factor that keeps the total amount of JGB issuance at a high level, efforts have been made to reduce the ratio of short-term bond issuance over the past two years. After the third revision in FY2020, it was 38.8%, which was a little less than 40%, but now it has decreased to 30.4%, which is still high compared to before COVID-19, but it is progressing step by step toward normalization.
- In the JGB Issuance Plan for FY2022, compared with FY2021 (Supplementary Budget), the issuance of Refunding Bonds, etc. will increase because the 2-Year Bonds issued in FY2020 will mature in FY2022, while the issuance of Newly-issued JGBs will decrease significantly, therefore the total issuance amount will decrease by ¥9.3 trillion, and the JGB Market Issuance (Calendar Base) will decrease by ¥13.6 trillion. Under these circumstances, the JGB Market Issuance (Calendar Base) was heavily dependent on short-term bonds, making the financing structure vulnerable to interest rate volatility, and therefore, the average maturity of JGBs, which had become shorter in response to COVID-19, was to be corrected by reducing the issuance of short-term bonds and by issuing bonds based on market needs, such as by increasing the issuance of 40-Year Bonds, 10-Year Bonds, and Liquidity Enhancement Auctions, for which market needs are strong and by reducing the issuance of 2-Year Bonds considering lower demand and its shorter maturity.
- As a result of these efforts, the average maturity of JGBs on a flow basis has returned by more than 1 year in two years, from 6 years and 8 months in FY2020, when the average maturity was significantly shortened, to 7 years and 9 months. Looking at the stock-basis, the average maturity is 9 years and 3 months, which is the longest in history, due to the increase in the issuance size of super long-term bonds.
- Looking at the flow, the size of JGB issuance is on a downward trend, while the outstanding amount of JGB in stock is increasing, and the outstanding amount of General Bonds is expected to reach ¥1029.2 trillion at the end of the FY2022.

- Long-term interest rates have been stable at a low level in recent years, partly due to the effects of the BOJ's monetary easing, and have recently been around 0.2%, partly due to the effects of rising US long-term interest rates.
- While there are various indicators of liquidity in the JGB market, the turnover ratio, which is the average monthly purchases divided by the outstanding amount, has remained low since around 2016, partly because of the declining volatility of JGB interest rates.
- From the perspective of maintaining and improving JGB market liquidity, the Financial Bureau conducts the Liquidity Enhancement Auctions, a mechanism designed to eliminate the imbalance between supply and demand in the market and improve market functioning by reopening existing JGB issues.
- When the system was first introduced, there was only one zone, but the number of zones has gradually expanded, and now the debt management office issues bonds in three zones: bonds with remaining maturities of 1-5 years, 5-15.5 years, and 15.5-39 years, at an average monthly amount of ¥1 trillion, and ¥12 trillion per year. In FY2022, bonds with a remaining maturity of 1-5 years were increased by ¥100 billion every other month based on market needs.
- Looking at the breakdown by JGB and T-Bill holders, in JGBs, the Bank of Japan (BOJ) holds the largest amount of JGBs at 48.1%, which is about half of the total. In T-Bill, foreign investors account for the largest share at 61.4%, likely due to factors such as currency basis swaps, in which foreign investors can get premiums by converting dollars to yen. In terms of JGBs and T-Bills combined, the BOJ holds 43.4% and foreign investors hold 14.3%.
- A look at the changes in the share of JGB and T-Bill holders shows that while the BOJ has significantly increased its share of holdings in line with its monetary easing, the share held by banks, etc. has declined significantly. In addition, foreign investors are gradually increasing their share of holdings.
- Regarding the status of domestic bond holdings by foreign investors, the investment balance by country or region is disclosed in the balance of payments statistics. However, it should be noted that the domestic bonds include all bonds issued by residents, including municipal bonds and corporate bonds, in addition to JGBs, and that the classification of countries in the balance of payments statistics is based on the nationality of the holders, including custodians, which are financial institutions that take custody of and manage bonds and other securities on behalf of investors, and not necessarily the nationality of the final investors.
- At the 54th Advisory Council on Government Debt Management held last June, it was stated that, as points to keep in mind for a post-COVID-19 Debt Management Policy, in

addition to (1) Correction of the Shortened Average Maturity of JGBs, (2) the Impact of the BOJ's Monetary Policy on the JGB Market, and (3) Maintenance and Improvement of JGB Market Liquidity and Functionality, it is also necessary to consider what should be considered long-term risks in JGB management policy, such as natural disaster risk and geopolitical risk as (4) Necessity of More Multifaceted Discussions.

- Based on of these points, as "1. Quantitative Analysis of Future Interest Payments on JGB (Cost-at-Risk Analysis)," we are currently conducting a Cost-at-Risk Analysis, and we believe that at this study group, it is necessary to consider what tools are needed to analyze various risks, including natural disaster risk and geopolitical risk, based on the situation in other countries.
- Regarding "2. Analysis of JGB Market Liquidity," for the market's stable absorption of JGBs, it is necessary to have a highly liquid JGB market where the buying and selling of JGBs are actively carried out. We think it is necessary to pay close attention to the situation of the JGB market, in cooperation with the BOJ, which have jurisdiction over monetary policy, market participants, etc.
- Regarding "3. Infrastructure Development of the JGB Market (including BCP Action)," in light of the experience of the temporary increase in uncertainty in the market due to restrictions on attendance at work and risk-averse cashing of assets held during the outbreak of COVID-19, we believe that it may be necessary to strengthen the system to steadily issue and digest JGBs even under such circumstances.
- Regarding "4. Analysis of the Demand Trend and the Holding Structure of JGBs," we believe it is necessary to analyze the following. With the holding structure of JGBs having changed significantly over the past 10 years, including a large decrease in the share held by banks, etc., how will demand trend for JGBs change and how will that affect the primary market? With the share held by foreign investors gradually increasing, what are the attributes of foreign investors holding JGBs?
- Regarding "1. Quantitative Analysis of Future Interest Payments on JGB," Japan's Cost-at-Risk Analysis employs a probabilistic interest rate model, which estimates the level and range of future interest rates based on the current yield curve and interest rate fluctuations over the past 20 years, and from this model, 3,000 interest rate paths for the future 10 years are generated, and interest payments are calculated by multiplying the assumed maturity composition ratio of future JGB Issuance Plans by the 3,000 interest rate paths to estimate the average of interest payments (cost) and the degree of their fluctuations between 99th percentile and the average (risk), which is the upward swing.
- For the JGB Issuance Plan for FY2022, in the Cost-at-Risk Analysis, we randomly

generated 2,000 patterns of the maturity composition of coupon-bearing JGB based on the maturity composition for the initial FY2021 JGB Issuance Plan, and analyzed the relationship between cost and risk. Compared to the case where the initial FY2021 JGB Issuance Plan was left unchanged, both cost and risk tended to decrease when the shares of the composition of 20- and 2-Year JGB issues were reduced, and both cost and risk tended to decrease when the share of the composition of 10-Year JGB issues was increased. In light of this, the JGB Issuance Plan for FY2022 calls for a reduction in 2-Year JGB issues and an increase in 10-Year JGB issues.

- The US also conducts cost-at-risk analysis. There, the TBAC (Treasury Borrowing Advisory Committee) provides the U.S. Department of the Treasury with the results of its analysis based on a macro-econometric model, as opposed to a probabilistic interest rate model. Macro-econometric models estimate the level and volatility of future interest rates based on the current yield curve and past interest rate fluctuations, as well as macroeconomic fundamentals.
- The TBAC has also analyzed the cost-risk relationship when changing the maturity composition ratio of the US treasury issuance plan, and for instance, in the example of taking risk as the standard deviation of the National Debt Service-to-GDP ratio, increasing the share of 2- to 5-Year Bonds decreases cost while increasing risk, indicating that there is a tradeoff between cost and risk.
- Cost-at-Risk Analysis in Japan was introduced in 2003, and while some other countries were conducting risk analysis using probabilistic interest rate models at that time, the use of macro-econometric models is currently increasing in major countries, and we would like to examine methods for analyzing medium- to long-term risks related to JGBs that are appropriate for Japan after studying overseas examples.
- We would like to hear your opinions on what kind of discussions should be held at this study group in the future, taking these points into consideration.

► Views expressed by the members have been summarized (by the Financial Bureau) below:

- Regarding "1. Quantitative Analysis of Future Interest Payments on JGB (Cost-at-Risk Analysis)," I believe that there are broad classes with respect to the direction of modeling the mechanism that determines the yield curve. They range from very simple models to those that model only the JGB market by some structure, to those that incorporate other financial markets and the real economy. While these models help us understand the status quo, their effectiveness on the task of prediction is naturally limited. However, even if we focus our efforts on building predictive models, mainly using machine learning methods,

there is still the question of how quickly we can respond to structural changes in the predictive models.

- Therefore, it is important to know what the results of the analysis are intended to be used for. If we wanted to simulate the manifestation of fiscal management problems associated with the manifestation of some serious risk scenario, the most compatible attempt would be the BOJ's financial macro-econometric model, FMM. I understand that this model is intended to simulate the variability of macro variables while representing multiple sectors in a linear model, and I think that such an attempt would be useful in considering the tools that the Ministry of Finance should have in place in the future.
- Regarding "1. Quantitative Analysis of Future Interest Payments on JGB (Cost-at-Risk Analysis)," I understood that perhaps the analysis here is about what is happening when the composition ratio of the issued maturity terms is changed, taking the probabilistic interest rate model as a given. This is very important, but it's worth considering in the long run whether the model could additionally include an analysis of the probability that a significant cost would arise should such a shock arise in the future, i.e., a framework of what would happen when various stresses are applied in the future. This could be one good tool in terms of sustainable fiscal health over the medium to long term.
- As mentioned in the discussion at the Advisory Council on Government Debt Management, the Debt Management Policy is very important. On top of that, all four points of the proposals for the main issues to be examined are very important. In particular, regarding "1. Quantitative Analysis of Future Interest Payments on JGB (Cost-at-Risk Analysis)," I believe that there is meaning in quantifying the trade-off between funding costs and refinancing risk and in incorporating and utilizing this information in the formulation of the JGB Issuance Plan, because these would contribute significantly to improving transparency and accountability.
- In addition to this, it is worthwhile to consider incorporating examples from other countries, mainly developed countries, and related figures in the macroeconomy in line with the current trend, and this would also contribute to the sophistication of our own debt management. With such theory as a base, the better approach is a hybrid one in which the current situation, including sudden events that may occur daily, what is called tail risk, is thoroughly understood, and close communication is maintained with market participants, purchasers of JGBs, and those on the purchasing side of the transaction. In this first part, it is not incongruous to discuss these points as one of the first points to be discussed.
- As a dialogue with the market, the issuance authority publishes a detailed issuance plan every December, including how much bonds of each maturity term will be issued. That is important considering the principle of regular and predictable. On the other hand, I

personally question whether this framework is sustainable going forward, given the increasing holdings of foreign investors and the fact that there is only custodian-based information, making it difficult to know who ultimately holds the bonds.

- Under these circumstances, it is important to deepen the analysis. Speaking of "1. Quantitative Analysis of Future Interest Payments on JGB (Cost-at-Risk Analysis)," for example, the distribution of interest rate paths could be changed when generating them, or the ratio of the stock-based maturity composition could be incorporated into the analysis.
- Also, the term "macro-econometric model" was mentioned, and I understood from the paper that it is the model in which macro conditions have an effect on the National Debt Service through changes in the term premium. As for how the term premium is affected by macro variables, academic studies have accumulated considerably, therefore it is necessary to deepen the analysis by carefully looking at such studies, and it seems that during shocks such as Bankruptcy of Lehman Brothers and the COVID-19 pandemic, the term premium is thought to increase and the composition ratio of maturity terms became shorter, so such a phenomenon must also be analyzed. I believe it is meaningful to deepen such analysis, especially given that Japan is at risk of a negative economic growth rate and a jump in the term premium during a crisis.
- With regard to "1. Quantitative Analysis of Future Interest Payments on JGB (Cost-at-Risk Analysis)," as we enter a new era, the structure of the market will change and the behavior of market participants will also change, therefore we will have to do statistical analysis using past behavior, but as a somewhat discretionary decision, we need to take into account the possibility that behavior will change as we consider the results of the statistical analysis.
- Regarding "2. Analysis of JGB Market Liquidity," for example, previous research has shown that when liquidity is exhausted, credit risk is also affected, therefore it is still an important field.
- Concerning "2. Analysis of JGB Market Liquidity," I believe that the Financial Markets Department of the BOJ has already analyzed the liquidity of JGBs, for example, in terms of volume and tightness, but the issue is how to link the measured results to decision making. Even if a model is meticulously constructed, if it is not useful for decision-making, it is just an inefficient use of resources, therefore it is important to consider what the objective is. For example, if the price is lowered for the purpose of stable issuance of JGBs, it seems insufficient as a setup for optimization problems, although the purpose of digestion of JGBs can be achieved. Personally, I think that there is a wide variety of massive needs, including social security, with regard to government spending, and that the government will implement a plan for issuing JGBs that was formulated based on estimates of tax revenues

in addition to redemption and interest payments on the issue, in the form of tracing a certain track record of outstanding JGBs. Since it will inevitably become a dynamic optimization problem, we need constraints to obtain the solution of it.

- Regarding "2. Analysis of JGB Market Liquidity," one index is given this time, but there are various other indexes such as board thickness and best ask. Various people are analyzing liquidity, and it is not possible to completely measure liquidity only by looking at an index, therefore it is necessary to take a comprehensive look.
- When considering liquidity, there are two types of liquidity, market liquidity and fund liquidity, and I believe that liquidity as seen by so-called market participants is probably market liquidity, i.e., how easy it is to sell when it is possible to sell. On the other hand, market liquidity and fund liquidity are related to each other, and without market liquidity, investors would have a hard time selling and would have nothing to underwrite, therefore the two concepts basically overlap. However, it is very important to think the two concepts separately and to examine what the issuance authority can monitor in terms of funding liquidity when issuing JGBs, taking into account examples from overseas.
- When I think about the era, the post-Cold War era began with the fall of the Berlin Wall in 1989, and now with the recent Russian invasion of Ukraine and the deepening conflict between the US and China, I am aware that we are standing at the threshold of the next new era. From this perspective, it is also important to consider what to do with the JGB market in future.
- Specifically, until now, it has not been easy to internationalize JGBs, or to have foreign investors widely hold yen-denominated JGBs as liquid assets similar to US Treasuries, but that may be possible in the future. Also, perhaps this theme is related to the question of how to develop the infrastructure for foreign investors, which is mentioned in "3. Infrastructure Development of the JGB Market (including BCP Action)." In that sense, it is important to consider and discuss various possibilities.
- Regarding "3. Infrastructure Development of the JGB Market (including BCP Action)," how many personnel in charge of bonds exist at securities firms in the first place? It is obviously not good for the accumulation of human resources to diminish.
- Concerning "3. Infrastructure Development of the JGB Market (including BCP Action)," it can be a deep and long discussion. In the past decade, there was the Great East Japan Earthquake, and most recently, there was the COVID-19 pandemic, which was an emergency situation for Japan itself. The Ministry is working with companies and financial institutions to strengthen the BCP system in response to such things, and it is better to prioritize and carefully respond to each of them one by one. The most important thing for

financial institutions and companies in general is the perspective of each company's cash flow. Based on this, it would be better to carefully discuss what BCP should be from the perspective of infrastructure development in the JGB market.

- As for "3. Infrastructure Development of the JGB Market (including BCP Action)," I have no particular opinion at this time, but I am personally interested in the conceptual arrangement of ex-ante and ex-post risk management as a way of looking at risk management, including BCP. For example, regarding prudential policy, there is talk about how to monitor the financial system properly in advance to reduce the risk as much as possible, and when any risk becomes apparent, how to use the function such as the lender of last resort. Looking at this in the Debt Management Policy, I would like to attend this study session from that perspective, as to what kind of means there are for risk management before and after.
- Looking at the graph of Flow of Funds Accounts again regarding "4. Analysis of the Demand Trend and the Holding Structure of JGBs," only banks, etc. have reduced their holding ratio behind the rise in the holding ratio of the BOJ. I don't know why only the holding ratio of banks, etc. is decreasing, and what kind of model should be used to consider the reason, but it is better to think about whether there is any qualitative change in the demand for JGBs of banks. In other words, if the BOJ's share of JGB holdings were to decline in the long run, it would be significant to exercise one's mind to see possible patterns in the distribution of JGB holders other than the BOJ.
- Regarding "4. Analysis of the Demand Trend and the Holding Structure of JGBs," a recent study has analyzed whether the conventional wisdom that super long-term bonds can be issued stably because they have large investors, such as life insurers and pension funds, is valid or not. The previous research was an analysis of trading behavior, but the impression is that the behavior patterns of each investor changed over a period of time. Therefore, I believe that it will be important in the future to monitor such changes in investor trends over time.
- Regarding "2. Analysis of JGB Market Liquidity" and "4. Analysis of the Demand Trend and the Holding Structure of JGBs," Flow of Funds Accounts shows that since the early 2000s, investment from Japan to foreign countries has increased, and in return, investment from foreign countries to Japan has also increased. If this trend continues, JGBs will be one of the major destinations for funds flowing into Japan from overseas, therefore foreign investors will become more likely to hold long-term JGBs in the future. In other words, as the Japanese have foreign assets, foreign investors will have Japanese assets, and the tendency of foreign investors to have long-term JGBs will increase. Then, there was a panic in the US Treasury market in March 2020, and it is possible that foreign investors will sell

a large amount of JGBs in the market in the wake of some kind of shock. It has been pointed out that one of the reasons for the panic in March 2020 was that dealers of US Treasuries were not able to receive orders from institutional investors due to low capital on their balance sheets, and it is necessary to be aware of whether similar vulnerabilities exist in the JGB market and whether the demand trend, the holding structure, and the intermediary structure of JGBs can withstand similar stress.

- I believe that "2. Analysis of JGB Market Liquidity " and "4. Analysis of the Demand Trend and the Holding Structure of JGBs" are highly related. It might be a good idea to spend time discussing #2 and #4 at the same time. As for liquidity itself, the ultra-low interest policy has continued, and along with this, the price fluctuations in the bond market itself have been extremely small for a long time. We are now in a situation where interest rates are beginning to move a little under the influence of other countries, and it is very important to firmly predict and discuss what will happen thereafter by analyzing liquidity sequentially and properly. I believe that the Ministry of Finance has always worked closely with the market and has been operating with its firm understanding of market demands, for example, in Liquidity Enhancement Auctions, etc., but the low interest rate environment that has continued for a long time will not last forever, and it is good to discuss the issue in light of this.

→ (Explanation provided by the Financial Bureau)

- For example, with regard to the point of incorporating various risks in the analysis, there are many areas where we still lack knowledge in terms of how far the analysis can go with the current model and how to proceed with the analysis of tail risks beyond 99th percentile, therefore we only introduced a few examples from the US this time, but we would like to investigate the situation not only in the US but also in other countries and consult with you on what can be done.
- Today, we have learned about various case studies, and we hope to learn more about them as well. We have received a wide range of suggestions, and we would like to sort them out first.