PSJ Model Guidebook

Prepared: March 2011
Revised: April 2016
Japan Securities Dealers Association
PSJ Calculation Statistics Council

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The amendment in April 2016 is as follows:

Amendment	Original text
30 Deleted	30 With PSJ calculation statistical values, the PSJ calculation values reported by participating JSDA member firms when interest rates change are premised on a parallel shift in the yield curve. As a result, if the interest rate is negative, the calculation is done using 0%.

Forward to the English Language Version

In 2006, the Japan Securities Dealers Association (hereinafter referred to as the “JSDA”) began to operate the Prepayment Standard Japan (PSJ) model created based on discussions by its Working Group on a Japan Version of the PSA Model (hereinafter referred to as the “WG”). In conjunction with that event, JSDA also published the PSJ Model Guidebook.

The introduction of the PSJ Model enabled market participants to enjoy the convenience of using common price levels, spread valuations, and other factors based on the same expected cash flows, which improved pricing transparency in the mortgage backed securities (MBS) market. Currently, use of the PSJ model as a standard measure for the prepayment rates has fully penetrated Japan’s MBS market in both the primary and secondary markets. broker/dealers participate in the PSJ Calculation Statistics Council set up to carry on the work of the WG, continuing to provide PSJ calculation data to the market and endeavoring to maintain and improve the convenience of the PSJ model.

In other related events, the Japanese government introduced a preferential tax treatment for non-resident holders of Japanese municipal and corporate bonds in June 2010. It is hoped that more measures will be introduced in future to increase the participation of foreign investors in the domestically issued MBS market.

As with the Japanese version of this guidebook, we hope that use of the English version by cross border market participants will contribute to the growth of the MBS market in Japan.

March 29, 2011
JSDA
PSJ Calculation Statistics Council

Forward to the Japanese Language Version

In November 2005, after receiving a joint proposal from several broker/dealers handling mortgage backed securities (MBS) regarding introducing a standard measure for market participants to use for prepayment rates, the Japan Securities Dealers Association (JSDA), established a Working Group on a Japan Version of the PSA Model under its Securities Strategy Board and began deliberations.

Over the ensuring period and after a great deal of energetic discussion, the working group came up with the PSJ model. The Securities Strategy Board formally approved the introduction of this model on April 24, 2006.[1]

Put simply, the PSJ model is an easy-to-use mathematical model for expressing MBS prepayment scenarios. The model has been rendered usable for a large range of market participants by greatly simplifying its form. Moreover, because the model was designed to reflect the special characteristics of the prepayment rate of MBS, which are known to move in a specific way over time, it is relatively easy to express a variety of prepayment scenarios over certain timeframes using a standard measure for market participants.

This guidebook was created with those coming into contact with the PSJ model for the first time in mind. It aims to promote the widespread use of the model by providing as simple as possible explanations of the purpose for introducing the model, definitions, practical use of the model, and other points.

It is hoped that growing use of the PSJ model will familiarize many more market participants with the prepayment rates and cash flow analysis of MBS, leading to greater activity in the MBS secondary market and contributing to improved market liquidity.

April 24, 2006
JSDA
Working Group on a Japan Version of the PSA Model

[1] Please refer to Appendix 1: “Measures toward the Establishment of an Infrastructure for the MBS Market in Japan”

Chapter 1 Purpose for Introducing the PSJ Model

In analyzing the investment value of an MBS[2] issue, it is important to be able to project contingent cash flows based on a fixed assumption of the prepayment rate. While a certain portion of market participants can assess the investment value of an MBS issue on their own using complex prepayment models created based on their own analysis to estimate cash flows by projecting a prepayment rate, not all market participants are capable of doing so. Therefore, to pursue the further development of the MBS market, what is needed is a common metric for prepayment rates that can be used in practical terms by a much larger number of market participants to analyze investment value.

To that end, the working group has created the Prepayment Standard Japan model (PSJ model). Produced as part of efforts to develop the market infrastructure from the perspective of the role the securities industry should play in Japan's MBS market, it is meant to serve as a standard measure for the characteristic prepayments of MBS.

The significance of the introduction of the PSJ model produced by the working group is as follows.

1. MBS and prepayments

The major characteristic of MBS financial instruments is that prepayments are made to MBS holders based on the pass-through of the prepayments made to the underlying mortgage pool.

Currently, the most widely used measures for expressing prepayment rates by mortgage pools and prepayment rates on MBS are SMM[3] and CPR[4]. The former expresses the monthly prepayment rate for mortgage pools as a percentage, while the latter expresses it as an annualized prepayment rate in percentage (in terms of actual use, the CPR is the most commonly used measure).

2. Importance of prepayment rate in analysis of investment value of MBS

From the point of view of market participants, the determination of assumptions about the prepayment rate is extremely important. Contrary to the fixed cash flows of a regular bullet bond that is redeemed in a lump sum at maturity, the analysis of the investment value of the MBS depends on the

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[2] Acronym for Mortgage Backed Securities. The term is generally used for housing loan (residential mortgage loan) backed securities or trust beneficiary rights. Housing loan backed securities and trust beneficiary rights are sometimes referred to as RMBS (Residential Mortgage Backed Securities) when it is necessary to distinguish them from CMBS (Commercial Mortgage Backed Securities) which are secured by commercial property loans.

[3] Single Monthly Mortality

[4] Conditional Prepayment Rate or Constant Prepayment Rate

contingent cash flows. Put in another way, if an assumed prepayment rate is not used to project cash flows, the product cannot be priced.
It is possible for market participants to analyze the Japan Housing Finance Agency (JHF)'s publicly announced historical mortgage repayment data and other data and predict the CPR of an MBS issue.

Currently, each market participant must use its own methods based on analysis to build a complex model, estimate future CPR, and use it to calculate and evaluate cash flows. In determining the prepayment rate trend among MBS, it is well known that the CPR will vary in accordance with the interest rate climate. It also has been recognized through experience that the CPR will follow a certain trend over time from the origination of the loan.

3. Necessity of market participants using a common standard in order to confer on a prepayment rate for an MBS issue

As noted in 2. above, each of the market participants will arrive at a different trend for the future prepayment rates of an MBS issue. Since each of the market participants will come up with different evaluations for the cash flows even for the same MBS issue, these variations will result in different prices even if the market participants use the same spread (discount curve)[5]. Of course, these differing views of MBS cash flows by market participants are not a problem in themselves.

Nevertheless, because not all of the market participants are capable of doing these calculations, without a common measure in the MBS market to enable a comparison of these differing views of cash flow, many investors will have difficulties in analyzing the investment value of MBS. This condition could create an obstacle to the future expansion of the investor base in the MBS market.

For that purpose, it is necessary to have a standard prepayment model that includes variations in CPR over time. This model will serve as a simple measure of CPR that can be used practically by many more market participants in their analysis of MBS investment value.

With this thinking in mind, in 1985, the Public Securities Association, currently the Securities Industry and Financial Markets Association (SIFMA) introduced the Prepayment Speed Assumption Model (PSA model) in the United States. The model continues to be widely used by market participants.

4. Significance of the introduction of the PSJ model

Should the PSJ model become widely used by market participants and be commonly recognized by market participants as a standard measure for MBS

[5] The spread is the difference between the yield curve for government bond par yields, or swap rate, or other rate that becomes the standard yield curve and the yield curve of the MBS. In discounting the value of the expected cash flows of the MBS to their present values, it is normal to use a yield curve that includes a certain spread on the standard yield curve (discount curve).

prepayment rates that takes into account the classic behavior of prepayments, which reflect the seasoning factor by month, the working group considers that it would have the following significance from the point of view of development and expansion of the MBS market.

• It would become possible for market participants to confer on the MBS prepayment rate based on a much more detailed set of prerequisites.
• When multiple broker/dealers announced their own projected pre-payment rates, inputting each company's projected prepayment rate into the PSJ model would enable a comparison of the differences in each prepayment rate using a common measure.
• Providing a simple function-based model as a common platform for market participants would facilitate evaluation and understanding of expected cash flows by transaction counterparties, which can be expected to broaden the investment field for market participants.
• In future, when an MBS-secured CMO[6] market emerges in Japan, it would be possible to structure products premised on a common understanding of MBS prepayment rates, which can be expected to allow a wider range of product structures.
• The model would enable simpler and more convenient ways to manage MBS risks using expected prepayment rates.

[6] An acronym for Collateralized Mortgage Obligation. A general term for artificially created multiple class financial products secured by cash flows from residential mortgage pools or MBS (pass-through securities of residential mortgage pools). CMOs can be structured with a wide range of risk profiles.

Chapter 2 MBS Prepayments

In this chapter, we review the fundamental thinking about prepayments, a special and important factor in MBS products.

Section 1 Scheduled Repayments and Prepayments of Mortgages

Principal repayments on MBS occur according to the principal repayments by the underlying mortgage pool. The two major reasons for principal repayments are scheduled repayments and prepayments.

1. Scheduled repayments

Based on the mortgage loan agreement, a monthly or semi-annual repayment schedule is determined for a mortgage loan. While principal and interest equal repayment and principal equal repayment methods are both available, generally borrowers choose the former, in which the amount of monthly or semi-annual repayment is a fixed sum. Since the amount of the repayment and the schedule are based on the mortgage loan agreement, the amount of the loan, the interest rate, and the term of the mortgage vary by individual mortgage loan. The planned repayment determined by the agreement is called the scheduled repayment.

2. Prepayments

Scheduled repayments take place only according to the mortgage loan agreement, but with mortgage loans, the borrower or the subrogation rights holder have the right to make repayments ahead of schedule. For that reason, when considering the cash flows from MBS secured by a mortgage pool, it must be assumed that some principal payments will occur ahead of schedule. These early principal repayments from the mortgage pool and early payments from MBS are termed prepayments. On a mortgage loan level, the following are the two main types of prepayments of principal.

(1) Advance repayment

The following are the two types of advance repayments that a borrower of a mortgage loan may make.

a. Partial advance repayment

In a partial advance repayment the mortgage loan debtor uses surplus funds, etc. to pay back a portion of the loan ahead of schedule. When a partial advance repayment is made on a mortgage loan, the repayment schedule must be recalculated for the remaining principal. There are two ways in which the new schedule can be made: either the monthly or semi-annual repayment amounts are kept the same and the period of the loan is shortened (hereinafter referred to as the “term-reduction type”), or the period of the loan is kept the same and the monthly or semi-annual repayment amounts are reduced (hereinafter referred to as the “payment-reduction type”).

b. Full advance repayment

In a full advance repayment, in addition to using surplus funds, etc., the debtor may refinance the loan or sell the residence and move, resulting in a full advance repayment of the outstanding loan balance in a lump sum.

(2) Subrogation, etc.

When a debtor becomes unable to make scheduled repayments according to schedule, the following types of subrogation may take place. However, because of the impact of payment delinquencies, mortgage loan defaults, subrogation, and other events on the cash flows of MBS differs according to the structure of MBS, the effect must be confirmed for individual products.

a. Subrogation settlement by loan guarantee company

When the debtor is no longer able to pay the loan because he/she has gone bankrupt, etc., the loan guarantee company repays the full amount of the outstanding loan on behalf of the debtor.

b. Settlement with life insurance proceeds

When the debtor dies, the outstanding loan is fully repaid using the proceeds from a group life insurance contract under which the debtor was insured.

* In the case of a JHF MBS
In the case of Japan Housing Finance Agency MBS and Government Housing Loan Corporation (GHLC) MBS (together referred to below as “JHF MBS”)[7], the mortgage loan for which the unforeseen change in the repayment schedule has occurred is removed from the underlying assets and 1) replaced with sound loans held by JHF in the case of monthly MBS issued during the GHLC era and S-series MBS or 2) JHF makes a partial payment of the principal of the MBS in the amount of the removed loan in the case of monthly MBS issued by JHF.

[7] Currently, JHF issues monthly MBS secured by the mortgage pool it purchases monthly and S-series MBS backed by mortgages originated by GHLC.
The Government Housing Loan Corporation (GHLC) is the predecessor of the Japan Housing Finance Agency (JHF).

Section 2 CPR and SMM

The payment of MBS principal occurs in accordance with the repayment of principal by the underlying mortgage pool. As previously mentioned, these loan payments can be roughly divided into scheduled repayments and prepayments.

1. SMM

The Single Monthly Mortality (SMM) indicates the monthly prepayments by the mortgage pool and is the most basic figure for calculating the prepayment rate.

The detailed calculation for SMM is to divide the prepayment amounts incurred for the base month by the scheduled principal balance for the base month (the principal balance for the previous month less the scheduled repayments for the base month).

$$SMM(\%) = \frac{PPT_1}{SOS_1} \times 100 = \frac{PPT_1}{COS_0 - SPP_1} \times 100 \qquad \text{(Formula 2-2-1)}$$

COS_0 : Principal balance of month previous to base month[8]

SPP_1 : Scheduled repayments for base month[9]

PPT_1 : Prepayments for base month[10]

SOS_1 : Scheduled principal balance for the base month[11]($= COS_0 - SPP_1$)

2. CPR

The Conditional/Constant Prepayment Rate is the annualized rate of the monthly calculated SMM. The CPR is calculated using the following formula based on the SMM.

$$CPR(\%) = \left(1 - \left(1 - \frac{SMM}{100}\right)^{12}\right) \times 100 \qquad \text{(Formula 2-2-2)}$$

Conversely, the SMM can be derived from the CPR by reversing the calculation shown in (Formula 2-2-2) above, using the following formula.

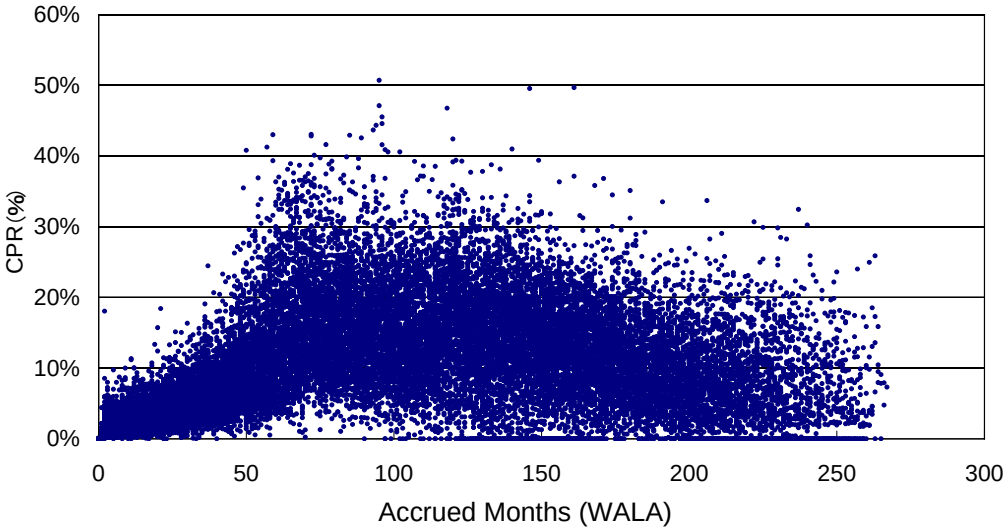
$$SMM(\%) = \left(1 - \sqrt[12]{1 - \frac{CPR}{100}}\right) \times 100 \qquad \text{(Formula 2-2-3)}$$

[8] COS: Current Outstanding
[9] Scheduled Principal Payment
[10] Prepayment
[11] Scheduled Outstanding

3. Long-term CPR

The monthly CPR of mortgage pools differs by pool (sample group). Its term structure is determined based on such factors as the annual seasoning structure and the Weighted Average Loan Age (WALA) from the origination of the loan.

(Chart 2-2-1) Relationship between WALA as derived from publicized data from JHF and CPR



(Source: Produced by WG based on historical data publicized by JHF)

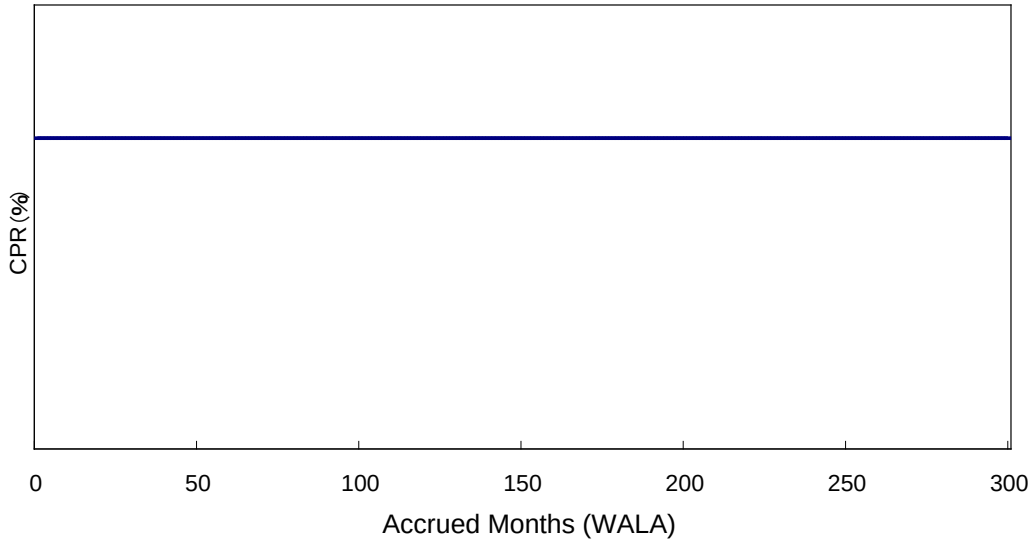
As a result, the monthly CPR of an MBS issue is not actually uniform, it basically varies every month.

In order to express the expected time series of the monthly CPR as a uniform CPR for descriptive purposes, the long term CPR (LTCPR) is used. Ordinarily, when “Expected CPR” is used regarding MBS, it means the LTCPR.

Generally, the LTCPR indicated by broker/dealers is a figure calculated so that the weighted average life (WAL) of the MBS derived using the CPR and the WAL of the MBS derived from the monthly CPR predicted with a time series deduced using a self-developed prepayment model are the same.

If you graph the LTCPR against WALA, it forms a straight line parallel to the X axis. The LTCPR, therefore, can be said to be the simplest prepayment model for creating the expected cash flows of an MBS issue with term structure.

(Chart 2-2-2) Relationship between WALA and LTCPR



Section 3 Example of the Use of CPR and SMM with JHF MBS

In this section, using JHF MBS, we will explain in detail how the CPR and SMM are used in determining the cash flows from the MBS expected prepayment rate.

1. Factor and Scheduled Factor

The factor sets the loan principal balance of the mortgage pool securing the MBS at the point of collection corresponding to issue date of the MBS as 1, with the outstanding loan principal balance at a collection point corresponding to any point of time after issue date being 1 or less. It is calculated using the following formula.

$$F = \frac{COS}{OOS} \qquad \text{(Formula 2-3-1)}$$

F : Factor

COS : Outstanding loan principal balance at collection point corresponding to any given point in time

OOS : Outstanding loan principal balance at collection point corresponding to issue date of MBS[12]

On the other hand, with MBS, the factor sets the original face value of the MBS at issue (hereinafter referred to as “Original Face”) as 1, with the outstanding face values at any given point in time (hereinafter referred to as “Current Face”) being 1 or less. The factor is calculated using the following formula. Most MBS in Japan are structured using the senior portion of the mortgage pool after removing the subordinated portion of loans or the over-collateralization portion. However, it should be pointed out that for MBS that utilize a credit enhancement system with sequential pay[13] for a senior/subordinated structure, the mortgage pool factor and the MBS factor will not be the same.

$$F = \frac{CF}{OF} \qquad \text{(Formula 2-3-2)}$$

F : Factor

CF : Actual face value balance at any given point in time[14]

OF : Face value balance at point of issue of MBS[15]

[12] OOS: Original Outstanding

[13] Sequential pay is a payment system where the underlying assets have been securitized into multiple classes of securities for which the principal payments from the underlying assets are made to each class in a predetermined order. For example, if the securitized product had three senior-sub tranches of A, B, and C, principal payments from the underlying assets would all go to tranche A until its principal was completely returned, with principal payments then shifting to tranche B and finally C. This type of payment system is commonly seen with senior-sub MBS in the private sector.

[14] CF: Current Face

[15] OF: Original Face

The formula can be arranged as follows to derive the current face value balance from the original face value balance by multiplying by the factor.

$$CF = OF \times F \qquad \text{(Formula 2-3-3)}$$

The Scheduled Factor expresses the time series of monthly MBS factors if the underlying mortgage loans in the pool make their principal payments according to the repayment schedule (CPR is 0%). At the very least, for regular MBS, the Scheduled Factor for the pool cut off date[16] is made public at the time of issue.

2. JHF MBS Factor

In the case of JHF MBS, JHF designs its products so that the Factor of the underlying mortgage pool (entrusted mortgage pool) at the end of a collection month is always the same as the Factor of the MBS on the principal and interest payment date of the corresponding collection month. In other words, although there will be a difference in the calculation process of the Scheduled Factor based on loan balance for the entrusted mortgage pool or on the MBS face value balance, since the principal repayments of the mortgage pool and the principal payments of the MBS are always conducted on a pro rata basis, the factors will always be the same.

However, it should be noted that a time lag can occur in either the actual collection of repayments from the mortgage or the principal and interest payments of the MBS.

For example, with the No. 39 GHLC MBS issued on February 8, 2006 (hereinafter referred to as the “No.39 GHLC issue”), while the MBS Factor for the issue date is 1, the Factor for the entrusted mortgage pool is 1 at the end of December 2005. Similarly, the 0.99533 Factor applied on the No. 39 JHF issue principal and interest payment date of March 10, 2006, corresponds to the Factor of the entrusted mortgage pool at the end of January 2006.

In other words, the Factor applied on the monthly principal and interest payment date of a JHF MBS is the entrusted mortgage pool Factor on the last day of the month two months previous to the principal and interest payment date.

3. JHF MBS Scheduled Factor

When issuing JHF MBS, JHF makes public on its Web site the entrusted mortgage pool Scheduled Factor, the Actual Factor for the issued MBS, the Initial Scheduled Factor, and the Rescheduled Factor, which recalculates the impact of prepayments and loan replacements, etc. every six months following the issue.

[16] Date on which the loans to be included in the housing loan pool securing the MBS are determined.

4. Method of calculating the expected principal payment amounts of JHF MBS based on expected CPR

Using the expected CPR of a JHF MBS, the project principal payment amounts can be calculated.
For the purposes of explaining the process using mathematical formula, we have first put together a list of the definitions of the notations used in the following section (Please see Table 2-3-1).

(Table 2-3-1) Definitions Used in this Section

S_0: The base monthly principal and interest (P&I) payment date. The date is the initial calculation date when the initial calculation date is the issue date or P&I payment date. When the initial calculation date is not either of these dates, the date is the P&I payment date immediately previous to the initial calculation date (provided that when the initial calculation date falls before the first P&I payment date, the issue date is used).

a: The number of months that have elapsed since the base monthly P&I payment date (a = 1,2,3,Λ)

S_a: the "a^{th}" P&I payment date following the base monthly P&I payment date.

CPR_a: The expected CPR for P&I payment date "S_a"

SMM_a: The expected SMM for P&I payment date "S_a"

AF_0: The actual factor[17] for a JHF MBS on the base monthly P&I payment date "S_0"

SF_0: The individual figures of the Scheduled Factor corresponding to the base monthly P&I payment date "S_0" (provided, however, that if there is no latest Scheduled Factor equivalent to "SF_0," $SF_0 = AF_0$)[18] among the latest publicly announced JHF scheduled factors (the most recent of either the Initial Scheduled Factor announced at time of issue or the Rescheduled Factor announced periodically after issue).

SF_a: The individual figures of the Scheduled Factor corresponding to the P&I payment date "S_a" among the latest publicly announced JHF scheduled factors (the most recent of either the Initial Scheduled Factor announced at time of issue or the Rescheduled Factor announced periodically after issue).

EF_a: The expected factor corresponding to the P&I payment date "S_a"[19]

OF: Original face value

CF_0: The current face value balance of the base monthly P&I payment date "S_0"

ECF_a: Expected current face value balance corresponding to the P&I payment date "S_a"[20]

EP_a: Expected principal payment amount after considering prepayments corresponding to the P&I payment date "S_a."[21]

C: Coupon rate on JHF MBS

AI_1: Actual interest amount corresponding to the P&I payment date "S_1"[22]

EI_a: Expected interest amount corresponding to the P&I payment date "S_a."[23] ($a \geqq 2$)

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[17] AF: Actual Factor
[18] SF: Scheduled Factor
[19] EF: Expected Factor
[20] ECF: Expected Current Face
[21] EP: Expected Principal
[22] AI: Actual Interest
[23] EI: Expected Interest

(1) Calculation of SMM based on expected CPR

First, using (Formula 2-2-3), the expected SMM for the next month is calculated using the expected CPR for the next month.

$$SMM_1(\%) = \left(1 - \sqrt[12]{1 - \frac{CPR_1}{100}}\right) \times 100 \qquad \text{(Formula 2-3-4)}$$

For example, if the expected CPR for the next month was 6%, the expected SMM for the next month would be calculated in the following way.

$$\begin{aligned} &\textit{Expected SMM(\%) corresponding to expected CPR6\%} \\ &= \left(1 - \sqrt[12]{1 - \frac{6}{100}}\right) \times 100 = 0.5143(\%) \end{aligned} \qquad \text{(Formula 2-3-4')}$$

(2) Important assumptions in deriving MBS cash flows

Here, we will explain important assumptions that are prerequisites to deriving expected cash flows for MBS.

When a prepayment occurs in the mortgage pool (entrusted mortgages) securing the MBS, it is expected to have an impact on the principal balance schedule (Scheduled Factor) based on the initial scheduled repayments due to the reduction of principal resulting from the full advance repayment or partial advance repayment of the individual loans (the same effect occurs with loan replacement).

However, keeping track of the changes in the principal balance schedule of individual loans in a entrusted mortgage pool of multiple loans is impossible in practical terms. Therefore, the following assumptions are generally made regarding the method of describing future principal cash flows (principal payment amounts) taking into consideration prepayments from the entrusted mortgage pool.

Assumptions
• Entrusted mortgage pool comprise innumerable, small mortgages with cash flows based on the same Scheduled Factor.[24]
• All of the debtors of the mortgages belonging to the entrusted mortgage pool will only choose to make full or partial (payment-reduction type) advance repayments on principal (there will be no changes in schedule from term-reduction type partial advance repayments or other reasons).[25]

[24] In fact, the principal amounts and scheduled repayments of individual mortgages in the mortgage pool vary, but this assumption is made for the sake of simplifying the calculation.
[25] In fact, debtors often choose to make term-reduction type partial repayments, but this assumption is made for the sake of simplifying the calculation.

Premised on these assumptions, principal balance without considering prepayment at the next P&I payment date can be calculated from the principal balance at the base point and Scheduled Factor at the next P&I payment date. Reducing this amount by the proportion taking into consideration the expected prepayment to be applied on the next P&I payment date $\left(1-\frac{\text{Expected SMM}}{100}\right)$, gives the expected principal balance (ECF balance) for the next P&I payment date.

When the figure for the Actual or Expected Factor differs from that of the previously announced Scheduled Factor for said month, based on the previously mentioned assumptions, the fact that the ratio of the Scheduled Factors of the base month and the next month will be the same as the ratio of the Actual or Expected Factor for the base month and the Scheduled Factor for the next month that has been adjusted for the previous month's Actual or Expected Factor can be used to calculate the adjusted Scheduled Factor for the next month.

By repeating the process for all following P&I payment dates, the expected principal balances for each future P&I payment date can be calculated.

By describing the expected principal balances for each P&I payment date in a time series, the reduction in the outstanding principal balance from the previous P&I payment date can be calculated for each P&I payment date and used to describe principal cash flow taking into consideration prepayments. The detail process is introduced below.

(3) Calculating the Expected Principal Balance

Now, based on the thinking above in (2), in order to determine the expected principal balance (ECF), we first apply the expected SMM for the next month, the Actual Factor of the base month, the Scheduled Factor of the base month and the next month to determine the Expected Factor for the next month.

$$EF_1 = AF_0 \times \frac{SF_1}{SF_0} \times \left(1-\frac{SMM_1}{100}\right) \qquad \text{(Formula 2-3-5)}$$

* The following calculation method is used to determine the Expected Factor for the second month ahead using the Expected Factor for the first month ahead and the Expected SMM of the second month ahead.

$$EF_2 = EF_1 \times \frac{SF_2}{SF_1} \times \left(1-\frac{SMM_2}{100}\right) \qquad \text{(Formula 2-3-6)}$$

Next, according to (Formula 2-3-3), the expected principal balance for the next month can be determined by multiplying the initial face value balance of the MBS by the Expected Factor for the next month calculated above.

$$ECF_1 = OF \times EF_1 \qquad \text{(Formula 2-3-7)}$$

* When calculating the expected principal balance for two months ahead, the following formula is used.

$$ECF_2 = OF \times EF_2 \qquad \text{(Formula 2-3-8)}$$

(4) Calculating Expected Cash Flows

In addition, by multiplying the initial face value balance by the difference between the Actual Factor of the base month and the Expected Factor of the next month (the same as subtracting the expected face value balance for the next month from the Current Face Value balance of the base month), the Expected Principal Prepayment Amount for the next month can be determined.

$$EP_1 = OF \times (AF_0 - EF_1) \quad \text{(Formula 2-3-9)}$$

* When calculating the Expected Principal Prepayment Amount for two months ahead, the following formula is used.

$$EP_2 = OF \times (EF_1 - EF_2) \quad \text{(Formula 2-3-10)}$$

Finally, using the Current Face Value Balance for the base month as a base, you can determine the interest payment amount for the next month (Since the Current Face Value for the base month is decided, the next month's interest payment is a fixed figure).

$$AI_1 = OF \times AF_0 \times C \times 1/12 \quad \text{(Formula 2-3-11)}$$

* Only in the case of the first interest payment date, the "1/12" in the above formula is the "actual number of days from the issue date to the first interest payment date (Counting only one of start date or end date)/365".
* When determining the Expected Interest Payment amount for two months ahead, the formula becomes the following (the Current Face Value for the next month is an expected figure, therefore, so is the interest rate amount for two months ahead).

$$EI_2 = OF \times EF_1 \times C \times 1/12 \quad \text{(Formula 2-3-12)}$$

In this manner, following (Formula 2-3-5), (Formula 2-3-6), (Formula 2-3-7), and (Formula 2-3-8), the monthly Expected Factor and the Expected Current Face Value balance can be successively determined using the monthly Scheduled Factor. By using (Formula 2-3-9) and (Formula 2-3-10) to calculate monthly expected principal payment amounts and (Formula 2-3-11), and (Formula 2-3-12) to calculate monthly expected interest payment amounts, the expected cash flows can be derived using the Expected CPR for JHF MBS.

An actual example of the time series of the above process is shown in (Chart 2-3-2), while examples of the actual calculations are shown in (Chart 2-3-3) and in (Chart 2-3-4).

(Chart 2-3-2) Process for Deriving JHF MBS Cash Flows Using Expected CPR

P&I Date	Expected CPR	Expected SMM	Expected Factor
S_0	—	—	AF_0 (Actual)
S_1	CPR_1	$SMM_1(\%) = \left(1-\sqrt[12]{1-\frac{CPR_1}{100}}\right)\times 100$	$EF_1 = AF_0 \times \frac{SF_1}{SF_0} \times \left(1-\frac{SMM_1}{100}\right)^*$
S_2	CPR_2	$SMM_2(\%) = \left(1-\sqrt[12]{1-\frac{CPR_2}{100}}\right)\times 100$	$EF_2 = EF_1 \times \frac{SF_2}{SF_1} \times \left(1-\frac{SMM_2}{100}\right)^*$
S_3	CPR_3	$SMM_3(\%) = \left(1-\sqrt[12]{1-\frac{CPR_3}{100}}\right)\times 100$	$EF_3 = EF_2 \times \frac{SF_3}{SF_2} \times \left(1-\frac{SMM_3}{100}\right)^*$
・・・	・・・	・・・	・・・
S_a	CPR_a	$SMM_a(\%) = \left(1-\sqrt[12]{1-\frac{CPR_a}{100}}\right)\times 100$	$EF_a = EF_{a-1} \times \frac{SF_a}{SF_{a-1}} \times \left(1-\frac{SMM_a}{100}\right)^*$

* The formula for determining the Expected Factor does not take into consideration the 10% Clean Up Call[26] attached to JHF MBS. When expressing expected cash flows taking into consideration the 10% Clean Up Call, it must be replaced with the following formula.

$$EF_a = EF_{a-1} \times \frac{SF_a}{SF_{a-1}} \times \left(1-\frac{SMM_a}{100}\right) \quad \left(EF_{a-1} > 0.1\right) \qquad \text{(Formula 2-3-13)}$$

$$EF_a = 0 \qquad \left(EF_{a-1} \leqq 0.1\right)$$

P&I Date	Expected Current Face Value Balance	Expected Principal Payment Amount	Expected Interest Amount
S_0	CF_0 (Actual)	—	—
S_1	$ECF_1 = OF \times EF_1$	$EP_1 = OF \times \left(AF_0 - EF_1\right)$	$AI_1 = OF \times AF_0 \times C \times 1/12$ *(Actual)
S_2	$ECF_2 = OF \times EF_2$	$EP_2 = OF \times \left(EF_1 - EF_2\right)$	$EI_2 = OF \times EF_1 \times C \times 1/12$
S_3	$ECF_3 = OF \times EF_3$	$EP_3 = OF \times \left(EF_2 - EF_3\right)$	$EI_3 = OF \times EF_2 \times C \times 1/12$
・・・	・・・	・・・	・・・
S_a	$ECF_a = OF \times EF_a$	$EP_a = OF \times \left(EF_{a-1} - EF_a\right)$	$EI_a = OF \times EF_{a-1} \times C \times 1/12$

* When "S_0" is the issue date, "1/12"is replaced with the actual number of days from the issue date to the first interest payment date (Counting only one of start date or end date)/365.

[26] When the outstanding balance of a JHF MBS falls below 10% of the issue amount, as the issuer, JHF has the right to make an early redemption in the full amount (10% Clean Up Call). JHF can exercise this right as of the P&I payment date following the P&I payment date on which the Current Face Value Balance of the JHF MBS falls to 10% or less of the Initial Face Value Amount (Factor falls to 0.1 or less)

(Chart 2-3-3) Actual example of derivation of cash flows for No. 39 GHLC MBS (1.84% coupon rate; February 8, 2006 issue date; March 10, 2006 initial P&I payment date; ¥1 billion initial face value amount). Does not take into consideration the 10% Clean Up Call and uses a LTCPR of 5.5% as the Expected CPR. (March 20, 2006 initial calculation date)

	A	B	C	D	E	F	G	H	I	J	K	L	M
1	Description of cash flows for using LTCPR (No. 39 GHLC MBS, no consideration of 10% Clean Up Call.)												
2													
3		Calculation Date:		20-Mar-06						Expected LTCPR:	5.50%	CPR	
4		Coupon rate:		1.84%						10% Clean Up Call (No: 1, Yes: 2)			1
5		Initial value:		¥1,000,000,000						WAL:	10.37	years	
6													
7		P&I Date	Years from cal. date	Initial Scheduled Factor	Factor (Actual)		Expected CPR	Expected SMM	Expected Factor	Expected Current Face Balance	Expected Principal Payment	Expected Interest	Expected Cash Flow Total
8	S_0→	2006/3/10		0.99758	0.99533				0.99533	¥995,330,000			
9		2006/4/10	0.06	0.99576			5.50%	0.47%	0.98884	¥988,841,507	¥6,488,493	¥1,526,173	¥8,014,665
10		2006/5/10	0.14	0.99411			5.50%	0.47%	0.98256	¥982,560,055	¥6,281,452	¥1,516,224	¥7,797,675
11		2006/6/10	0.22	0.99246			5.50%	0.47%	0.97632	¥976,315,816	¥6,244,239	¥1,506,592	¥7,750,832
12		2006/7/10	0.31	0.99081			5.50%	0.47%	0.97011	¥970,108,578	¥6,207,238	¥1,497,018	¥7,704,256
13		2006/8/10	0.39	0.98898			5.50%	0.47%	0.96376	¥963,762,720	¥6,345,857	¥1,487,500	¥7,833,357
14		2006/9/10	0.47	0.98652			5.50%	0.47%	0.95684	¥956,844,047	¥6,918,674	¥1,477,770	¥8,396,443
15		2006/10/10	0.56	0.98469			5.50%	0.47%	0.95058	¥950,577,309	¥6,266,738	¥1,467,161	¥7,733,899
16		2006/11/10	0.64	0.98302			5.50%	0.47%	0.94450	¥944,502,083	¥6,075,226	¥1,457,552	¥7,532,777
17		2006/12/10	0.72	0.98135			5.50%	0.47%	0.93846	¥938,462,976	¥6,039,107	¥1,448,237	¥7,487,343
18		2007/1/10	0.81	0.97968			5.50%	0.47%	0.93246	¥932,459,783	¥6,003,193	¥1,438,977	¥7,442,170
19		2007/2/10	0.89	0.97782			5.50%	0.47%	0.92631	¥926,312,307	¥6,147,476	¥1,429,772	¥7,577,247
20		2007/3/10	0.97	0.97535			5.50%	0.47%	0.91963	¥919,626,881	¥6,685,426	¥1,420,346	¥8,105,772

	A	B	C	D	E	F	G	H	I	J	K	L	M
415		2040/2/10	33.92	0.02697			5.50%	0.47%	0.00395	¥3,950,292	¥352,724	¥6,598	¥359,322
416		2040/3/10	34.00	0.02401			5.50%	0.47%	0.00350	¥3,500,201	¥450,090	¥6,057	¥456,147
417		2040/4/10	34.08	0.02178			5.50%	0.47%	0.00316	¥3,160,177	¥340,024	¥5,367	¥345,391
418		2040/5/10	34.16	0.01974			5.50%	0.47%	0.00285	¥2,850,712	¥309,465	¥4,846	¥314,311
419		2040/6/10	34.25	0.01771			5.50%	0.47%	0.00255	¥2,545,525	¥305,187	¥4,371	¥309,558
420		2040/7/10	34.33	0.01567			5.50%	0.47%	0.00224	¥2,241,715	¥303,810	¥3,903	¥307,713
421		2040/8/10	34.42	0.01329			5.50%	0.47%	0.00189	¥1,892,296	¥349,419	¥3,437	¥352,857
422		2040/9/10	34.50	0.01032			5.50%	0.47%	0.00146	¥1,462,502	¥429,794	¥2,902	¥432,696
423		2040/10/10	34.58	0.00806			5.50%	0.47%	0.00114	¥1,136,853	¥325,649	¥2,243	¥327,891
424		2040/11/10	34.67	0.00601			5.50%	0.47%	0.00084	¥843,716	¥293,137	¥1,743	¥294,880
425		2040/12/10	34.75	0.00389			5.50%	0.47%	0.00054	¥543,531	¥300,185	¥1,294	¥301,479
426		2041/1/10	34.84	0.00117			5.50%	0.47%	0.00016	¥162,710	¥380,821	¥833	¥381,655
427		2041/2/10	34.92	0			5.50%	0.47%	0.00000	¥0	¥162,710	¥249	¥162,959
428													
429													

* The above calculations have not adjusted for fractions and interest payments falling on holidays have not been taken into account.

(Chart 2-3-4) Actual example of derivation of cash flows for No. 39 GHLC MBS (1.84% coupon rate; February 8, 2006 issue date; March 10, 2006 initial P&I payment date; ¥1 billion initial face value amount). Takes into consideration the 10% Clean Up Call and uses a LTCPR of 5.5% as the Expected CPR. (March 20, 2006 initial calculation date)

	A	B	C	D	E	F	G	H	I	J	K	L	M
1	Description of cash flows for using LTCPR (No. 39 GHLC MBS, consideration of 10% Clean Up Call.)												
2													
3		Calculation Date:		20-Mar-06						Expected LTCPR:	5.50%	CPR	
4		Coupon rate:		1.84%						10% Clean Up Call (No: 1, Yes: 2)			2
5		Initial value:		¥1,000,000,000						WAL	9.90	years	
6													
7		P&I Date	Years from cal. date	Initial Scheduled Factor	Factor (Actual)		Expected CPR	Expected SMM	Expected Factor	Expected Current Face Balance	Expected Principal Payment	Expected Interest	Expected Cash Flow Total
8	S_0→	2006/3/10		0.99758	0.99533				0.99533	¥995,330,000			
9		2006/4/10	0.06	0.99576			5.50%	0.47%	0.98884	¥988,841,507	¥6,488,493	¥1,526,173	¥8,014,665
10		2006/5/10	0.14	0.99411			5.50%	0.47%	0.98256	¥982,560,055	¥6,281,452	¥1,516,224	¥7,797,675
11		2006/6/10	0.22	0.99246			5.50%	0.47%	0.97632	¥976,315,816	¥6,244,239	¥1,506,592	¥7,750,832
12		2006/7/10	0.31	0.99081			5.50%	0.47%	0.97011	¥970,108,578	¥6,207,238	¥1,497,018	¥7,704,256
13		2006/8/10	0.39	0.98898			5.50%	0.47%	0.96376	¥963,762,720	¥6,345,857	¥1,487,500	¥7,833,357
14		2006/9/10	0.47	0.98652			5.50%	0.47%	0.95684	¥956,844,047	¥6,918,674	¥1,477,770	¥8,396,443
15		2006/10/10	0.56	0.98469			5.50%	0.47%	0.95058	¥950,577,309	¥6,266,738	¥1,467,161	¥7,733,899
16		2006/11/10	0.64	0.98302			5.50%	0.47%	0.94450	¥944,502,083	¥6,075,226	¥1,457,552	¥7,532,777
17		2006/12/10	0.72	0.98135			5.50%	0.47%	0.93846	¥938,462,976	¥6,039,107	¥1,448,237	¥7,487,343
18		2007/1/10	0.81	0.97968			5.50%	0.47%	0.93246	¥932,459,783	¥6,003,193	¥1,438,977	¥7,442,170
19		2007/2/10	0.89	0.97782			5.50%	0.47%	0.92631	¥926,312,307	¥6,147,476	¥1,429,772	¥7,577,247
20		2007/3/10	0.97	0.97535			5.50%	0.47%	0.91963	¥919,626,881	¥6,685,426	¥1,420,346	¥8,105,772

	A	B	C	D	E	F	G	H	I	J	K	L	M
269		2027/12/10	21.74	0.39855			5.50%	0.47%	0.11618	¥116,183,381	¥1,246,089	¥180,059	¥1,426,147
270		2028/1/10	21.82	0.39615			5.50%	0.47%	0.11494	¥114,940,612	¥1,242,768	¥178,148	¥1,420,916
271		2028/2/10	21.91	0.39349			5.50%	0.47%	0.11363	¥113,631,881	¥1,308,731	¥176,242	¥1,484,973
272		2028/3/10	21.99	0.38994			5.50%	0.47%	0.11208	¥112,077,113	¥1,554,768	¥174,236	¥1,729,004
273		2028/4/10	22.07	0.38731			5.50%	0.47%	0.11080	¥110,797,640	¥1,279,473	¥171,852	¥1,451,325
274		2028/5/10	22.16	0.38491			5.50%	0.47%	0.10959	¥109,593,209	¥1,204,431	¥169,890	¥1,374,320
275		2028/6/10	22.24	0.38253			5.50%	0.47%	0.10840	¥108,403,324	¥1,189,885	¥168,043	¥1,357,928
276		2028/7/10	22.32	0.38013			5.50%	0.47%	0.10722	¥107,216,567	¥1,186,758	¥166,218	¥1,352,976
277		2028/8/10	22.41	0.37747			5.50%	0.47%	0.10597	¥105,965,586	¥1,250,981	¥164,399	¥1,415,380
278		2028/9/10	22.49	0.37388			5.50%	0.47%	0.10446	¥104,464,153	¥1,501,433	¥162,481	¥1,663,913
279		2028/10/10	22.58	0.37121			5.50%	0.47%	0.10323	¥103,230,343	¥1,233,810	¥160,178	¥1,393,988
280		2028/11/10	22.66	0.3688			5.50%	0.47%	0.10208	¥102,077,792	¥1,152,551	¥158,287	¥1,310,838
281		2028/12/10	22.74	0.36638			5.50%	0.47%	0.10093	¥100,931,043	¥1,146,748	¥156,519	¥1,303,268
282		2029/1/10	22.83	0.36395			5.50%	0.47%	0.09979	¥99,790,082	¥1,140,962	¥154,761	¥1,295,722
283		2029/2/10	22.91	0.36127			5.50%	0.47%	0.00000	¥0	¥99,790,082	¥153,011	¥99,943,093
284		2029/3/10	22.99	0.35768			5.50%	0.47%	0.00000	¥0	¥0	¥0	¥0
285		2029/4/10	23.07	0.35502			5.50%	0.47%	0.00000	¥0	¥0	¥0	¥0

* The above calculations have not adjusted for fractions and interest payments falling on holidays have not been taken into account.

Chapter 3 PSJ Model—Standard Model

In this chapter, we cover the development concept, definitions, and method of use for the PSJ model (standard model) created by the JSDA.

Section 1 The Development Concept of the Standard Model

While the use of the standard model is not necessarily limited to JHF MBS, the continuous growth in issuance by the JHS MBS suggests it will become a central product in Japan's MBS market. In addition, given that at this point in time the data provided by JHF is the only data on mortgage loans prepayments that is available to all market participants, the working group decided that it was appropriate to create a standard model with the basic form of the speed of prepayments determined using data made public by JHF because market participants would agree with this method.

The standard model was developed for the purpose of providing a common measure for market participants to be used for determining expected cash flows (premised on expected CPR) of JHF MBS. For the measure to be shared by market participants, the working group decided that its form must be simple (few parameters)—not complicated. Therefore, in deciding the form of the model, the working group used as reference the PSA model introduced to the MBS market in the United States for the same reasons and aging factors (changes in the CPR over the duration of loans), etc., that could be observed from the historical data on prepayment provided by JHF.

Discussion about the form of the standard model in the working group during the process of deciding its form focused on the following three points.

(1) The CPR at zero months (Initial CPR)
(2) The number of months until the CPR became fixed (number of seasoning months)
(3) The level at which the CPR became fixed (flat CPR)[27]

If the above points (1) to (3) were variable for the standard model, premised on use with JHF MBS, it would increase the number of parameters of the model, possibly creating a barrier to its practical use (sharing among market participants or calculation of statistical figures etc.). In consideration of that point, the working group decided to use predetermined (1) initial CPR and (2) seasoning months, giving priority to improving the ease of use of the model by utilizing only the vertical movement of the flat CPR to express the speed of prepayments.

[27] It was decided that introducing burnout would not work well with the PSJ model because a standard form would not be possible since the impact of burnout depends on the path interest rates take. Burnout is a phenomenon where even if interest rates fall providing an incentive for greater prepayments, the CPR does not rise and may fall. One example of this phenomenon is when a mortgage pool that has already experienced a rise in CPR following a reduction in interest rates in the past resists increases in its CPR when experiencing new declines in interest rates.

Details are as follows:

Form of Standard Model

(1) Although the historical data on prepayments provided by JHF suggests a certain initial CPR could be determined, giving priority to setting a speed of payment that is easy to use, the initial CPR has been set at 0%.
(2) The number of seasoning months lies between five to six years according to the historical data. As a result, 5 years (60 months) has been chosen as a round and easy-to-understand number.
(3) As a variable number, the flat CPR as 100% has not been set as in the U.S. PSA model, but allowed to express prepayment rate based on the point at which the CPR becomes level on a graph.

Section 2 Definitions

1. Name of model and overview of functional form

The standard model shall be generally known as the “PSJ model.”

The functional form sets a CPR of 0% for an MBS issue (or mortgage pool) in the loan origination month (WALA is 0 months). After initiation, the CPR rises a fixed ratio monthly, reaching a CPR of *r*% after 60 months, after which the CPR follows a fixed path at *r*%. This form is termed “*r%PSJ*.”

The actual method of expression of the speed of prepayment would be, for example if the flat CPR was 8%, “*8%PSJ*.”

2. Formula definitions

As previously mentioned, the PSJ model has an initial CPR of 0% and a seasoning period of 60 months. Therefore, if the *r%PSJ* has a CPR at an age (WALA) of *m* months *(CPR_m)*, it can be expressed as the following formula.

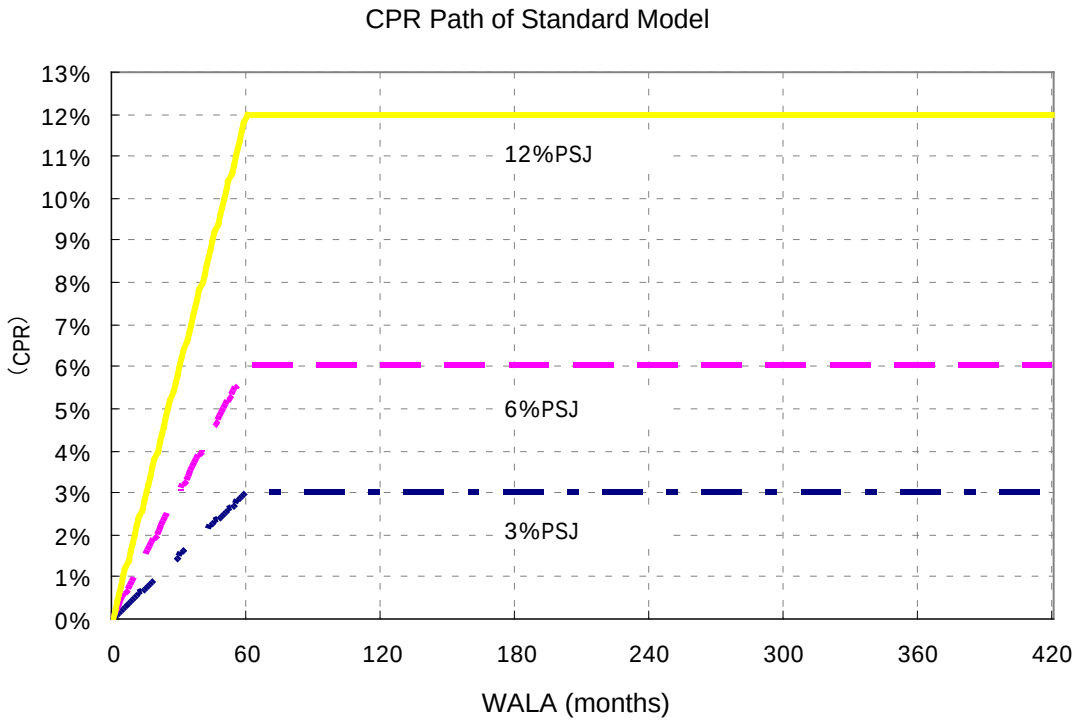
$$CPR_m(\%) = \min\left(\frac{r}{60} \times m, r\right) \qquad (r \geqq 0) \qquad \text{(Formula 3-2-1)}$$

Conversely, based on the PSJ model (Standard Model), the value *PSJm* (%) that gives the instantaneous velocity for the Actual CPR (*R*%) when WALA is *m* months can be expressed as follows.

$$PSJ_m(\%) = R / m \times 60 \qquad (m \leqq 60) \qquad \text{(Formula 3-2-2)}$$
$$PSJ_m(\%) = R \qquad (m > 60)$$

* For the age in months (WALA), *m*, we use the WALA at the point of the monthly payment collection on the mortgage pool underlying the MBS. With JHF MBS, the WALA is listed in the Entrusted Candidate Mortgages Related Data and the Entrusted Mortgages Related Data from the point of issue starting with the issue priced in February 2006 (GHLC Monthly MBS No. 40). In addition, beginning with the publicly reported portion in February 2006, the updated WALA is listed in the Factors and Other Monthly Data. This means that in future, the monthly WALA figures used are one month greater than the publicly announced updated WALA for the application month.

(Chart 3-2-1) PSJ Model (Standard Model)



➢ Case of 12%PSJ

CPR0% at 0 months WALA (weighted average loan age)

→ CRP later rises at the same rate per month to reach 12% at 60 months

→ CPR remains flat at 12% from 60 months onward

➢ Case of 6%PSJ

CPR0% at 0 months WALA

→ CRP later rises at the same rate per month to reach 6% at 60 months

→ CPR remains flat at 6% from 60 months onward

➢ Case of 3%PSJ

CPR0% at 0 months WALA

→ CRP later rises at the same rate per month to reach 3% at 60 months

→ CPR remains flat at 3% from 60 months onward

Section 3 Process of Producing Cash Flows for JHF MBS using the Standard Model

In this section, we introduce the method of producing cash flows using the PSJ model (standard model) introduced in the previous section based on the information on the entrusted mortgage pool provided by JHF.

Fundamentally, as was explained in Section 3, 4. of the previous chapter (chapter 2), the usual method for deriving expected cash flows for a JHF MBS using the expected CPR is to reduce the Expected Principal Balance not taking prepayments into account for each month by the reduction factor after considering the expected prepayment rate $\left(1-\frac{\text{Expected SMM}}{100}\right)$ and take the difference between the previous month's balance and the current month's balance to be the principal cash flow (principal payment amount) after taking into account prepayments.

Here, we will discuss the readjustment of JHF MBS cash flow production process and calculation method for Weighted Average Life (WAL) premised on use of the PSJ model (standard model).

1. Information associated with entrusted mortgages provided by JHF

To begin with, let us confirm the data that can be accessed when deriving future cash flows for a JHF MBS.

As related materials, there is a variety of data available on the Scheduled Factor on issuance of JHF MBS. In addition, starting with the GHLC Monthly MBS No. 40 issue, the weighted average loan age (WALA) based on the loan agreements—very important for the PSJ model—is now available.[28]

At the point of producing this guidebook, even after the issue of a JHF MBS, JHF is continuing to provide the following information in its Factors and Other Monthly Data on the web site.

[28] For the first to the 39th GHLC MBS issues and the first five S-series MBS issues, the definition for the weighted average period was "the difference between the Initial loan period and the remaining period weighted by the remaining balance of each loan," which is different from the WALA used by the PSJ model. In order to use the PSJ model with these issues, it is necessary to apply the WALA reported publicly in Factors and Other Monthly Data. On the other hand, for other issues, the most recent of the WALA given in the Entrusted Mortgage Related Data made public on issuance or the WALA given in the Factors and Other Monthly Data is used.

(Table 3-3-1) Factors and Other Monthly Data

Initial Scheduled Factor	Ratio of each GHLC MBS and JHF MBS on balance scheduled at issuance (calculated based on ratio in the principal balance of underlying mortgages by assuming no prepayment, replacement, nor change in the loan repayment method). More specifically, the ratio is quoted in eight decimals as a result of rounding it off to five decimal places. The issuance amount is assumed to be 1 in the calculation.
Factor (Actual)	Ratio of each GHLC MBS and JHF MBS in terms of actual outstanding balance at each month after monthly repayment (or expected monthly repayment officially announced)
Weighted Average Coupon or WAC (%)	Average coupon rate of underlying mortgage pool backing each GHLC MBS and JHF MBS as weighted by the balance of each loan WAC = Σ [coupon rate x loan balance] / Σ loan balance
Weighted Average Maturity or WAM (years)	Average years to maturity of underlying mortgage pool backing each GHLC MBS and JHF MBS as weighted by the balance of each loan WAM = Σ [years to maturity x loan balance] / Σ loan balance
Conditional Prepayment Rate or CPR (%)	Annualized prepayment rate of each month CPR = 1 - (1 - prepayment amount for each month / loan balance net of scheduled loan principal collection amount for the month) [12]
Rescheduled Factor	Ratio of each GHLC MBS and JHF MBS on balance scheduled after the actual loan collection by then (replacement or partial cancellation)(calculated based on ratio in the principal balance of underlying mortgages by assuming no prepayment , replacement , nor change in the loan repayment method)
Weighted Average Loan Age or WALA (months)	Average loan age for the underlying mortgage pool backing each GHLC MBS and JHF MBS as weighted by the balance of each loan
Replacement or Partial Cancellation Rate (long-term delinquency,%)	Balance of new replaced or partially cancelled loans net of claims in arrears at end of period (loans that are four months in arrears) / balance of loans net of claims in arrears at end of period (monthly rate)
Replacement or Partial Cancellation Rate (other than long-term delinquency,%)	Balance of new replaced or partially cancelled loans net of claims in arrears at end of period (other than loans that are four months in arrears) / balance of loans net of claims in arrears at end of period (monthly rate)

(Source: JHF web site http://www.jhf.go.jp/english/mbs_m_f_monthly.html)

2. Process of producing cash flows using the PSJ model (standard model)

Using the data introduced in 1. above, we will show the calculation method for future cash flows of JHF MBS taking into account prepayments (using PSJ model). First, since the explanation will use equations, we have first put together a list of the definitions of the notations used in the following section (Please see Table 3-3-2).

(Table 3-3-2) Definitions Used in this Section

S_0: The base monthly principal and interest (P&I) date. The date is the initial calculation date when the initial calculation date is the issue date or P&I payment date. When the initial calculation date is not either of these dates, the date is payment the P&I payment date immediately previous to the initial calculation date.(provided that when the initial calculation date falls before the first P&I payment date, the issue date is used).

a: The number of months that have elapsed since the base monthly P&I payment date (*a* = 1,2,3…)

S_a: the "a^{th}" P&I payment date following the base monthly P&I payment date.

L_a: The period from the calculation date to the P&I payment date.

M: The WALA for the base monthly P&I payment date "S_0" (noted in 1. above)

CPR_a: The expected CPR for P&I payment date "S_a"

SMM_a: The expected SMM for P&I payment date "S_a"

AF_0: The actual factor for a JHF MBS on the base monthly P&I payment date "S_0."

SF_0: The individual figures of the Scheduled Factor corresponding to the base monthly P&I payment date "S_0" (provided, however, that if there is no latest Scheduled Factor equivalent to "SF_0," $SF_0 = AF_0$) among the latest publicly announced JHF scheduled factors (the most recent of either the Initial Scheduled Factor announced at time of issue or the Rescheduled Factor announced periodically after issue).

SF_a: The individual figures of the Scheduled Factor corresponding to the P&I payment date "S_a" among the latest publicly announced JHF scheduled factors (the most recent of either the Initial Scheduled Factor announced at time of issue or the Rescheduled Factor announced periodically after issue).

EF_a: The expected factor corresponding to the P&I payment date "S_a"

OF: Original face value

CF_0: The current face value balance of the base monthly P&I payment date "S_0"

ECF_a: Expected current face value balance corresponding to the P&I payment date "S_a"

EP_a: Expected principal payment amount after considering prepayments corresponding to the P&I payment date "S_a."

C: Coupon rate on JHF MBS

AI_1: Actual Interest amount corresponding to the P&I payment date "S_1"

EI_a: Expected interest amount corresponding to the P&I payment date "S_a" ($a \geqq 2$)

(1) Calculation of WALA

In order to describe cash flows using the PSJ model, the first step is to decide the WALA for the future principal and interest (P&I) payment dates of the JHF MBS.

As stated in the definitions above, if the Base Monthly P&I Payment Date is the issuance date, the WALA (months) note in the Entrusted Mortgage Pools Related Data publicly reported at the time of issuance is the WALA "M" for the Base Monthly P&I Payment Date "S_0" for the initial calculation date (the "present" or starting point for the calculation of cash flows to be described). If the Base Monthly P&I Payment Date is some other P&I payment date after the issuance date, the WALA (months) for said P&I payment date listed in Factors and Other Monthly Data is used.

Moreover, as the WALA for the next P&I payment date "S_1" after the Base Monthly P&I Payment Date "S_0" is "M+1" and M+2 for "S_2" and so on, the WALA for the P&I payment date "S_a"(the a^{th} P&I payment date from the Base Monthly P&I payment date) will be "M + a" .

(Table 3-3-3) An example of the calculation of WALA (The shaded portion of Column H in the following table gives the calculated WALA figures) for future P&I payment dates when the Base Monthly P&I Payment Date is March 2006

	A	B	C	H	I	J
1	Issue No.	No.39 GHLC MBS issue				
2	Issue face value	¥148 billion				
3	Coupon rate	1.840%				
4	Issue date	Feb. 8, 2006				
6	Bond Date	Initial factor	Factor (Actual)	WALA (months)		
7	Issuance	1.00000000	1.00000000	-		
8	Mar. 2006	0.99758000	0.99533000	3	← Announced "*M*"	
9	Apr. 2006	0.99576000		4	← Calculated "M+1"	
10	May. 2006	0.99411000		5	← Calculated "M+2"	
11	Jun. 2006	0.99246000		6	← Calculated "M+3"	
12	Jul. 2006	0.99081000		7	← Calculated "M+4"	

(2) The calculation of the respective CPR for each WALA

Next, we will explain how to describe the expected CPR for each month using the PSJ model (standard model) based on the WALA for each future P&I payment date as determined in the above table. For example, in determining the expected CPR from the PSJ model given the WALA figures determined above, for *r%PSJ*, the CPR_a (%) and SMM_a (%) for WALA "M+α" would be determined as follows.

$$CPR_a(\%) = \min\left(\frac{r}{60}\times(M+a), r\right) \qquad \text{(Formula 3-3-1)}$$

$$SMM_a(\%) = \left(1-\sqrt[12]{1-\frac{CPR_a}{100}}\right)\times 100 \qquad \text{(Formula 3-3-2)}$$

(3) Calculating JHF MBS cash flows reflecting CPRs based on the PSJ model

When the expected CPRs for each P&I payment date have been determined as noted in (2) according to the expected PSJ speed (*r*%*PSJ*), the process of producing cash flows is the same as from Section 3, 4. (3) onward in Chapter 2.

An example of the time series of the cash flow calculation process is shown in (Chart 3-3-4), while examples of the actual calculations are shown in (Chart 3-3-5) and in (Chart 3-3-6).

(Chart 3-3-4) Calculation Process for JHF MBS Cash Flows Using Expected PSJ Speed (*r*%*PSJ*)

P&I Date	WALA	Expected CPR	Expected SMM
S_0	M	—	—
S_1	$M+1$	$CPR_1(\%) = \min\left(\frac{r}{60}\times(M+1), r\right)$	$SMM_1(\%) = \left(1-\sqrt[12]{1-\frac{CPR_1}{100}}\right)\times 100$
S_2	$M+2$	$CPR_2(\%) = \min\left(\frac{r}{60}\times(M+2), r\right)$	$SMM_2(\%) = \left(1-\sqrt[12]{1-\frac{CPR_2}{100}}\right)\times 100$
S_3	$M+3$	$CPR_3(\%) = \min\left(\frac{r}{60}\times(M+3), r\right)$	$SMM_3(\%) = \left(1-\sqrt[12]{1-\frac{CPR_3}{100}}\right)\times 100$
・・・		・・・	・・・
S_a	$M+a$	$CPR_a(\%) = \min\left(\frac{r}{60}\times(M+a), r\right)$	$SMM_a(\%) = \left(1-\sqrt[12]{1-\frac{CPR_a}{100}}\right)\times 100$

P&I Date	Expected Factor	Expected Current Face Value Balance
S_0	AF_0 (Actual)	CF_0 (Actual)
S_1	$EF_1 = AF_0 \times \frac{SF_1}{SF_0} \times \left(1-\frac{SMM_1}{100}\right)^*$	$ECF_1 = OF \times EF_1$
S_2	$EF_2 = EF_1 \times \frac{SF_2}{SF_1} \times \left(1-\frac{SMM_2}{100}\right)^*$	$ECF_2 = OF \times EF_2$
S_3	$EF_3 = EF_2 \times \frac{SF_3}{SF_2} \times \left(1-\frac{SMM_3}{100}\right)^*$	$ECF_3 = OF \times EF_3$
・・・	・・・	・・・
S_a	$EF_a = EF_{a-1} \times \frac{SF_a}{SF_{a-1}} \times \left(1-\frac{SMM_a}{100}\right)^*$	$ECF_a = OF \times EF_a$

* When expressing expected cash flows taking into consideration the 10% Clean Up Call, the formula must be replaced with that in (formula 2-3-13).

P&I Date	Expected Principal Payment Amount	Expected Interest Amount
S_0	—	—
S_1	$EP_1 = OF \times (AF_0 - EF_1)$	$AI_1 = OF \times AF_0 \times C \times 1/12$ * (Definite value)
S_2	$EP_2 = OF \times (EF_1 - EF_2)$	$EI_2 = OF \times EF_1 \times C \times 1/12$
S_3	$EP_3 = OF \times (EF_2 - EF_3)$	$EI_3 = OF \times EF_2 \times C \times 1/12$
・・・	・・・	・・・
S_a	$EP_a = OF \times (EF_{a-1} - EF_a)$	$EI_a = OF \times EF_{a-1} \times C \times 1/12$

* When "S_0" is the issue date, "1/12"is replaced with the actual number of days from the issue date to the first interest payment date (Counting only one of start date or end date)/365.

(Chart 3-3-5) Actual example of derivation of cash flows for No. 39 GHLC MBS (1.84% coupon rate; February 8, 2006 issue date; March 10, 2006 initial P&I payment date; ¥1 billion initial face value amount). Does not take into consideration the 10% Clean Up Call and uses an expected PSJ speed (7.0%PSJ). (March 20, 2006 initial calculation date)

	A	B	C	D	E	F	G	H	I	J	K	L	M
1	Description of cash flows using PSJ model (No. 39 GHLC MBS, no consideration of 10% Clean Up Call)												
2													
3		Calculation Date:		20-Mar-06						Expected Speed:	7.00%	PSJ	
4		Coupon rate:		1.84%						10% Clean Up Call (No: 1, Yes: 2)			1
5		Initial value:		¥1,000,000,000						WAL:	10.46	years	
6													
7		P&I Date	Years from cal. date	Initial Scheduled Factor	Factor (Actual)		Expected CPR	Expected SMM	Expected Factor	Expected Current Face Balance	Expected Principal Payment	Expected Interest	Expected Cash Flow Total
8	S_0→	2006/3/10		0.99758	0.99533	3			0.99533	¥995,330,000			
9		2006/4/10	0.06	0.99576		4	0.47%	0.04%	0.99313	¥993,126,909	¥2,203,091	¥1,526,173	¥3,729,263
10		2006/5/10	0.14	0.99411		5	0.58%	0.05%	0.99100	¥990,998,009	¥2,128,900	¥1,522,795	¥3,651,695
11		2006/6/10	0.22	0.99246		6	0.70%	0.06%	0.98877	¥988,774,192	¥2,223,817	¥1,519,530	¥3,743,348
12		2006/7/10	0.31	0.99081		7	0.82%	0.07%	0.98646	¥986,455,995	¥2,318,197	¥1,516,120	¥3,834,317
13		2006/8/10	0.39	0.98898		8	0.93%	0.08%	0.98386	¥983,864,914	¥2,591,080	¥1,512,566	¥4,103,646
14		2006/9/10	0.47	0.98652		9	1.05%	0.09%	0.98055	¥980,554,736	¥3,310,178	¥1,508,593	¥4,818,771
15		2006/10/10	0.56	0.98469		10	1.17%	0.10%	0.97778	¥977,779,127	¥2,775,609	¥1,503,517	¥4,279,127
16		2006/11/10	0.64	0.98302		11	1.28%	0.11%	0.97507	¥975,070,750	¥2,708,377	¥1,499,261	¥4,207,639
17		2006/12/10	0.72	0.98135		12	1.40%	0.12%	0.97227	¥972,271,251	¥2,799,498	¥1,495,108	¥4,294,607
18		2007/1/10	0.81	0.97968		13	1.52%	0.13%	0.96938	¥969,381,338	¥2,889,913	¥1,490,816	¥4,380,729
19		2007/2/10	0.89	0.97782		14	1.63%	0.14%	0.96621	¥966,213,997	¥3,167,341	¥1,486,385	¥4,653,725
20		2007/3/10	0.97	0.97535		15	1.75%	0.15%	0.96236	¥962,356,411	¥3,857,587	¥1,481,528	¥5,339,115

	A	B	C	D	E	F	G	H	I	J	K	L	M
415		2040/2/10	33.92	0.02697		410	7.00%	0.60%	0.00270	¥2,702,424	¥245,229	¥4,520	¥249,749
416		2040/3/10	34.00	0.02401		411	7.00%	0.60%	0.00239	¥2,391,323	¥311,101	¥4,144	¥315,244
417		2040/4/10	34.08	0.02178		412	7.00%	0.60%	0.00216	¥2,156,143	¥235,180	¥3,667	¥238,847
418		2040/5/10	34.16	0.01974		413	7.00%	0.60%	0.00194	¥1,942,408	¥213,735	¥3,306	¥217,041
419		2040/6/10	34.25	0.01771		414	7.00%	0.60%	0.00173	¥1,732,150	¥210,258	¥2,978	¥213,237
420		2040/7/10	34.33	0.01567		415	7.00%	0.60%	0.00152	¥1,523,384	¥208,766	¥2,656	¥211,421
421		2040/8/10	34.42	0.01329		416	7.00%	0.60%	0.00128	¥1,284,219	¥239,165	¥2,336	¥241,501
422		2040/9/10	34.50	0.01032		417	7.00%	0.60%	0.00099	¥991,214	¥293,005	¥1,969	¥294,974
423		2040/10/10	34.58	0.00806		418	7.00%	0.60%	0.00077	¥769,478	¥221,736	¥1,520	¥223,256
424		2040/11/10	34.67	0.00601		419	7.00%	0.60%	0.00057	¥570,308	¥199,170	¥1,180	¥200,350
425		2040/12/10	34.75	0.00389		420	7.00%	0.60%	0.00037	¥366,909	¥203,399	¥874	¥204,274
426		2041/1/10	34.84	0.00117		421	7.00%	0.60%	0.00011	¥109,690	¥257,218	¥563	¥257,781
427		2041/2/10	34.92	0		422	7.00%	0.60%	0.00000	¥0	¥109,690	¥168	¥109,858
428													
429													

* The above calculations have not adjusted for fractions and interest payments falling on holidays have not been taken into account.

Since the (expected) WAL of the JHF MBS based on the principal cash flow (expected principal payment amounts) is the timing (WAL of each P&I payment date from the calculation date to the repayment of principal) arising from principal payments on each P&I date weighted by the principal payment amounts on each P&I date, it is calculated using the following formula.

$$WAL(years) = \frac{(EP_1 \times L_1) + (EP_2 \times L_2) + \ldots + (EP_a \times L_a) + \ldots}{OF \times AF_0} \quad \text{(Formula 3-3-3)}$$

In the case of (Chart 3-3-5) (Initial calculation date: March 20, 2006), *WAL* = 10.46 years.

(Chart 3-3-6) Actual example of derivation of cash flows done for No. 39 GHLC MBS (1.84% coupon rate; February 8, 2006 issue date; March 10, 2006 initial P&I payment date; ¥1 billion initial face value amount). Takes into consideration the 10% Clean Up Call and uses an expected PSJ speed (7.0%PSJ). (March 20, 2006 initial calculation date)

	A	B	C	D	E	F	G	H	I	J	K	L	M
1	Description of cash flows using PSJ model (No. 39 GHLC MBS, consideration of 10% Clean Up Call)												
2													
3		Calculation Date:		20-Mar-06						Expected Speed:	7.00%	PSJ	
4		Coupon rate:		1.84%						10% Clean Up Call (No: 1, Yes: 2)			2
5		Initial value		¥1,000,000,000						WAL	9.99	years	
6													
7		P&I Date	Years from cal. date	Initial Scheduled Factor	Factor (Actual)		Expected CPR	Expected SMM	Expected Factor	Expected Current Face Balance	Expected Principal Payment	Expected Interest	Expected Cash Flow Total
8	S_0→	2006/3/10		0.99758	0.99533	3			0.99533	¥995,330,000			
9		2006/4/10	0.06	0.99576		4	0.47%	0.04%	0.99313	¥993,126,909	¥2,203,091	¥1,526,173	¥3,729,263
10		2006/5/10	0.14	0.99411		5	0.58%	0.05%	0.99100	¥990,998,009	¥2,128,900	¥1,522,795	¥3,651,695
11		2006/6/10	0.22	0.99246		6	0.70%	0.06%	0.98877	¥988,774,192	¥2,223,817	¥1,519,530	¥3,743,348
12		2006/7/10	0.31	0.99081		7	0.82%	0.07%	0.98646	¥986,455,995	¥2,318,197	¥1,516,120	¥3,834,317
13		2006/8/10	0.39	0.98898		8	0.93%	0.08%	0.98386	¥983,864,914	¥2,591,080	¥1,512,566	¥4,103,646
14		2006/9/10	0.47	0.98652		9	1.05%	0.09%	0.98055	¥980,554,736	¥3,310,178	¥1,508,593	¥4,818,771
15		2006/10/10	0.56	0.98469		10	1.17%	0.10%	0.97778	¥977,779,127	¥2,775,609	¥1,503,517	¥4,279,127
16		2006/11/10	0.64	0.98302		11	1.28%	0.11%	0.97507	¥975,070,750	¥2,708,377	¥1,499,261	¥4,207,639
17		2006/12/10	0.72	0.98135		12	1.40%	0.12%	0.97227	¥972,271,251	¥2,799,498	¥1,495,108	¥4,294,607
18		2007/1/10	0.81	0.97968		13	1.52%	0.13%	0.96938	¥969,381,338	¥2,889,913	¥1,490,816	¥4,380,729
19		2007/2/10	0.89	0.97782		14	1.63%	0.14%	0.96621	¥966,213,997	¥3,167,341	¥1,486,385	¥4,653,725
20		2007/3/10	0.97	0.97535		15	1.75%	0.15%	0.96236	¥962,356,411	¥3,857,587	¥1,481,528	¥5,339,115

	A	B	C	D	E	F	G	H	I	J	K	L	M
256		2026/11/10	20.66	0.43268		251	7.00%	0.60%	0.11341	¥113,407,110	¥1,307,594	¥175,896	¥1,483,490
257		2026/12/10	20.74	0.43033		252	7.00%	0.60%	0.11211	¥112,111,113	¥1,295,997	¥173,891	¥1,469,888
258		2027/1/10	20.82	0.42797		253	7.00%	0.60%	0.11082	¥110,824,032	¥1,287,081	¥171,904	¥1,458,985
259		2027/2/10	20.91	0.42535		254	7.00%	0.60%	0.10948	¥109,481,474	¥1,342,558	¥169,930	¥1,512,488
260		2027/3/10	20.99	0.42185		255	7.00%	0.60%	0.10793	¥107,925,938	¥1,555,536	¥167,872	¥1,723,408
261		2027/4/10	21.07	0.41924		256	7.00%	0.60%	0.10661	¥106,611,504	¥1,314,434	¥165,486	¥1,479,921
262		2027/5/10	21.15	0.41688		257	7.00%	0.60%	0.10537	¥105,372,187	¥1,239,316	¥163,471	¥1,402,787
263		2027/6/10	21.24	0.41453		258	7.00%	0.60%	0.10415	¥104,146,452	¥1,225,735	¥161,571	¥1,387,306
264		2027/7/10	21.32	0.41213		259	7.00%	0.60%	0.10292	¥102,919,181	¥1,227,271	¥159,691	¥1,386,962
265		2027/8/10	21.41	0.40949		260	7.00%	0.60%	0.10164	¥101,643,351	¥1,275,831	¥157,809	¥1,433,640
266		2027/9/10	21.49	0.40596		261	7.00%	0.60%	0.10016	¥100,159,580	¥1,483,770	¥155,853	¥1,639,624
267		2027/10/10	21.57	0.40332		262	7.00%	0.60%	0.09891	¥98,908,266	¥1,251,314	¥153,578	¥1,404,892
268		2027/11/10	21.66	0.40093		263	7.00%	0.60%	0.00000	¥0	¥98,908,266	¥151,659	¥99,059,925
269		2027/12/10	21.74	0.39855		264	7.00%	0.60%	0.00000	¥0	¥0	¥0	¥0
270		2028/1/10	21.82	0.39615		265	7.00%	0.60%	0.00000	¥0	¥0	¥0	¥0

* The above calculations have not adjusted for fractions and interest payments falling on holidays have not been taken into account.

When the *WAL* is calculated using (Formula 3-3-3) based on the example of (Chart 3-3-6), *WAL* = 9.99 years, demonstrating that taking the 10% Clean Up Call into account reduces the *WAL*.

Section 4 Example of Application for Risk Management

In this chapter, we explain one example of methods of using the PSJ model to manage risk on JHF MBS.

However, we caution readers that the following explanation is just one example of risk management approaches for reference purposes and JSDA and the WG do not consider it the best method of risk management. We encourage each investor to take responsibility for determining their own method of risk management for JHF MBS.

1. Application of PSJ statistical calculation figures

Along with the introduction of the PSJ model, JSDA has begun:

(1) reporting PSJ calculations by major broker/dealers (In addition to the PSJ calculation figures premised on the current interest rate environment, the PSJ calculation figures for shifts of 50bp, 100bp, 200bp, and 300bp above and below the market interest rate (yield curve) are reported) and

(2) calculating statistical values (median, average, etc.) for the PSJ calculation figures received from broker/dealers and publicly announcing them.

The publicly reported PSJ Calculation Statistical Values[29] are expected to, to a certain extent, remove or average out the differences and individual characteristics of the prepayment models used by each company.

Based on that assumption, JHF MBS have the following special characteristics, based on which it is anticipated that it will be possible to evaluate the sensitivity of JHF MBS prices to market rates while reflecting these and other characteristics under certain assumptions.

(a) Call risk (increased prepayments or shortening of weighted average life when interest rates are falling)
(b) Extension risk (decreased prepayments or lengthening of weighted average life when interest rates are rising)
(c) Negative convexity (feature of average life and duration shortening when interest rates are falling, preventing prices from rising, and average life and duration lengthening when interest rates are rising, accelerating price declines) arising from the effect of (a) and (b) on price changes.

2. Example of calculation of expected JHF MBS prices for yield curve changes

For example, as shown below, when predicting changes in PSJ values based on level changes in the yield curve, the first step is to use the following type of process to calculate the expected price of a JHF MBS when the level of the yield curve changes.

[29] For details on the system for reporting PSJ calculation statistical values, please see Appendix 1; for a view the reporting format, please see Appendix 2.

(Table 3-4-1) Expected PSJ Values and JHF MBS Prices for Level Changes (±α%) in Yield Curve

Yield Curve Level Change[30]	$-\alpha\%$	±0%(No Change)	$+\alpha\%$
Expected PSJ value	$PSJ_{-\alpha}$	PSJ_0	$PSJ_{+\alpha}$
Expected cash flow	$\{CF_{-\alpha}(i)\}_{i=1}^{N}$	$\{CF_0(i)\}_{i=1}^{N}$	$\{CF_{+\alpha}(i)\}_{i=1}^{N}$
Present value of expected cash flow	$PV_{-\alpha}$[31]	PV_0	$PV_{+\alpha}$
JHF MBS accrued interest	ac[32]	ac	ac
Expected price of JHF MBS	$P_{-\alpha}(=PV_{-\alpha}-ac)$	$P_0(=PV_0-ac)$	$P_{+\alpha}(=PV_{+\alpha}-ac)$

$\alpha\%$: Absolute figure indicating degree of change in level of yield curve.

$\{CF_0(i)\}_{i=1}^{N}$: The expected cash flow of the JHF MBS for all P&I payment dates when the yield curve does not change ($CF_0(i)$ is the expected cash flow for the ith P&I payment date after the initial calculation date. $\{CF_0(i)\}_{i=1}^{N}$ is the expected cash flows from the 「$CF_0(1)$、 $CF_0(2)$、 $CF_0(3)$、・・・ $CF_0(N)$」 series of each P&I payment date. N is the last P&I payment date after the initial calculation date).

$\{CF_{-\alpha}(i)\}_{i=1}^{N}$: Expected cash flow of the JHF MBS for all P&I payment dates when the yield curve level shifts $-\alpha\%$.

$\{CF_{+\alpha}(i)\}_{i=1}^{N}$: Expected cash flow of the JHF MBS for all P&I payment dates when the yield curve level shifts $+\alpha\%$.

(1) The expected cash flow for the JHF MBS for the current yield curve $\{CF_0(i)\}_{i=1}^{N}$ is derived from the expected PSJ value, PSJ_0, for the current yield curve (the expected PSJ value when there is no yield curve change).

(2) The spread (Spd) to the benchmark interest rate for the JHF MBS is derived using the cash flow $\{CF_0(i)\}_{i=1}^{N}$ derived in (1), the JHF MBS market price P_0 (and the present value PV_0 of $\{CF_0(i)\}_{i=1}^{N}$ derived using P_0) and the current yield curve.[33]

[30] Deleted

[31] PV: Present Value

[32] Accrued Interest

[33] When the market price for the JHF MBS is available, there are two typical methods of determining the spread on the JHF MBS benchmark interest rate from the expected cash flows for the JHF MBS and the yield curve. They are 1) to determine the IRR from the market value and expected cash flows, and then define the difference between the IRR and the market rate for the specific term of the WAL of the JHF MBS (=benchmark rate) as the spread for the JHF MBS or 2) to determine an interest rate spread for a yield curve that equalizes the market value and the value of the present value of the JHF MBS derived from the expected cash flows for each P&I payment date and the discount factor for each P&I payment date less accrued interest and define the difference between the yield curve and the overall yield curve (benchmark rate) as the spread. (Please note that the implication of the spread will change depending on the benchmark rate chosen).

(3) The expected cash flows for each change in the level of the yield curve $\{CF_{-\alpha}(i)\}_{i=1}^{N}$, $\{CF_{+\alpha}(i)\}_{i=1}^{N}$ are derived based on the expected PSJ values $PSJ_{-\alpha}$, $PSJ_{+\alpha}$ for $\pm\alpha\%$ changes in the yield curve.

(4) From the $\{CF_{-\alpha}(i)\}_{i=1}^{N}$、 $\{CF_{+\alpha}(i)\}_{i=1}^{N}$ derived in (3), produce yield curves for each post level change yield curve by adding the Spd given in (2). Using these yield curves calculate the present values $PV_{-\alpha}$, $PV_{+\alpha}$ for the expected cash flows.[34]

(5) The values give by subtracting the accrued interest ac from the $PV_{-\alpha}$、$PV_{+\alpha}$ calculated in (4) are the expected JHF MBS prices $P_{-\alpha}$, $P_{+\alpha}$ for the $\pm\alpha\%$ degree of level changes in the yield curves.

When calculating the expected price of a JHF MBS after a change in the level of the yield curve based on the above process using the PSJ calculation statistical values of the JSDA, it is important to ensure that the assumption of the change ($\pm\alpha\%$) in the yield curve does not result in a negative interest rate (a negative interest rate is deemed to be 0%). In other words, for a $-\alpha\%$ change in interest rate level, changes in interest rates less than $\alpha\%$ in a yield curve must not reach $-\alpha\%$.

Also be aware that the expected price in the above calculation example is based on the assumption that the spread (Spd) to the JHF MBS benchmark rate will not change even if the yield curve changes.

3. Method of calculation of MBS effective duration and effective convexity

Effective duration ($Eff.Dur_{\pm\alpha}$) and effective convexity ($Eff.Cvx_{\pm\alpha}$) indicate the change in expected cash flows in accordance with the degree of level change ($\pm\alpha\%$) in the market yield curve. They are calculated using the following formulae.

$$Eff.Dur_{\pm\alpha} = \frac{PV_{-\alpha} - PV_{+\alpha}}{2PV_0 \times (\alpha/100)} \qquad \text{(Formula 3-4-1)}$$

$$Eff.Cvx_{\pm\alpha} = \frac{PV_{+\alpha} + PV_{-\alpha} - 2PV_0}{100 \times PV_0 \times (\alpha/100)^2} \qquad \text{(Formula 3-4-2)}$$

[34] When the spread to the JHF MBS benchmark interest rate is available, there are two typical methods of determining the present value of the expected cash flows from the yield curve. They are 1) to determine a present value where the interest rate for the specific term of the WAL of the JHF MBS (=benchmark rate) plus the spread for the JHF MBS will equal the IRR from the market value and expected cash flows, and then define the difference between the IRR of the expected cash flows or 2) to determine the present value of the expected cash flows of a JHF MBS based on the expected cash flows for each P&I payment date and their corresponding discount factors after calculating the discount factor for each P&I payment date based on the yield curve consisting of the overall yield curve (=benchmark interest rate) plus the JHF MBS spread. (Please note that the implication of the spread will change depending on the benchmark rate chosen).

The value of effective duration and effective convexity will fluctuate with the set value for the assumed degree of change ($\pm\alpha\%$) in the yield curve. Therefore, when using these values as risk indicators, it is necessary to determine and confirm the expected degree ($\pm\alpha\%$) of interest rate change.

4. Example of the calculation of effective duration and effective convexity

For reference, we show below an example of the calculation of the effective duration and effective convexity for the calculation of the expected price of a JHF MBS with a degree ($\alpha\% = 0.5\%$) of change in the yield curve of ±50bp(±0.5%). We emphasize that this is only an example, JSDA or the working group do not recommend that the calculation of risk indicators be based on a degree of level change of ±50bp.

(Table 3-4-2) Changes in Expected Price Due to Changes in Yield Curve (example)

Yield curve level change	-0.5%	±0	+0.5%
MBS expected price	102.090	97.781	93.405

$$Eff.Dur_{\pm 50bp} = \frac{102.090 - 93.405}{2 \times 97.781 \times (0.5/100)} \approx 8.88 \qquad \text{(Formula 3-4-3)}$$

$$Eff.Cvx_{\pm 50bp} = \frac{93.405 + 102.090 - 2 \times 97.781}{100 \times 97.781 \times (0.5/100)^2} \approx -0.27 \qquad \text{(Formula 3-4-4)}$$

Chapter 4 PSJ Model—Customized Model

In this chapter, we cover the development concept, definitions, and method of use for the PSJ model (customized model) created by the JSDA.

Section 1 The Development Concept of the Customized Model

The customized model was conceived for use in cases where the standard model could not adequately express the prepayment speed. The model has been designed to allow adjustments to fit the attributes of individual pools.

Specifically, the model is expected to be applied when wanting to express the prepayment speed in a little more advanced form than the standard model or for securitization deals, etc. for highly individualistic private sector mortgage loans.

While the customized model is equivalent to the standard model in that, in covering all MBS (or mortgage loan pools), it uses the basic form of the CPR rising from the loan origination point for a specific number of months (WALA), from which point on the CPR becomes fixed. However, in the attributes of the each MBS (or mortgage loan pool) the 1) initial CPR and 2) number of seasoning months can be adjusted.

It is possible that, when establishing prepayment scenarios for use in pricing MBS other than JHF MBS at the point of issuance, there will be cases where it is inappropriate to use the customized model to express expected prepayment scenarios. The working group has no intention of requiring the use of the customized model in such cases. When use of the customized model is inappropriate, we believe that preparing other prepayment scenarios in accordance with the special attributes of individual MBS and using them to analyze investment value should continue to be allowed.

On the other hand, regarding the form of the prepayment scenarios used to analyze the investment value of individual MBS other than JHF MBS, even though it would only fall within a certain range, we believed that having a uniform measure available for use as a market practice would lend such advantages as avoiding perception disagreements regarding prepayments in individual transactions, etc. and contributing to smooth discussions of prepayment scenarios.

Section 2 Definitions

1. Name of model and overview of functional form

The functional form sets a CPR of i% for MBS (or mortgage pool) in the loan origination month (WALA is 0 months). After initiation, the CPR rises a fixed ratio monthly, reaching a CPR of *r*% after n months, after which the CPR follows a fixed path (i%, n months are fixed numbers). This form is termed "*r%PSJi-n*" and the customized model is known as the "*PSJi-n* model."

More concretely, a CPR path where the CPR for an MBS issue (or mortgage pool) in the loan origination month (WALA is 0 months) was 2%, after which the CPR rose a fixed ratio per month until it reached 8% after 40 months, following which the prepayment rate remained constant at 8% would be expressed as "8%*PSJ2-40*" and the customized model would be known as the "*PSJ2-40* model."

2. Formula definitions

In the customized model, if the *r%PSJi-n* has a CPR at an age (WALA) of *m* months (CPR_m), it can be expressed as the following formula.

$$CPR_m(\%) = \min\left(\frac{(r-i)}{n} \times m + i, r\right) \quad (r \geqq i) \qquad \text{(Formula 4-2-1)}$$

$$CPR_m(\%) = \max\left(\frac{(r-i)}{n} \times m + i, r\right) \quad (r < i) \qquad \text{(Formula 4-2-2)}$$

* When expressing the expected prepayment scenarios in the analysis of the prepayments of MBS, we expect that (Formula 4-2-1) will mainly be used. (Formula 4-2-2) describes the situation where with an initial point of CPR i% when WALA is 0 months, the CPR drops by a fixed ratio monthly until it reaches r% when WALA is n months. While this is a necessary form under the definitions of the customized model, we expect there is little possibility it will be actually used to express expected prepayment scenarios for MBS.

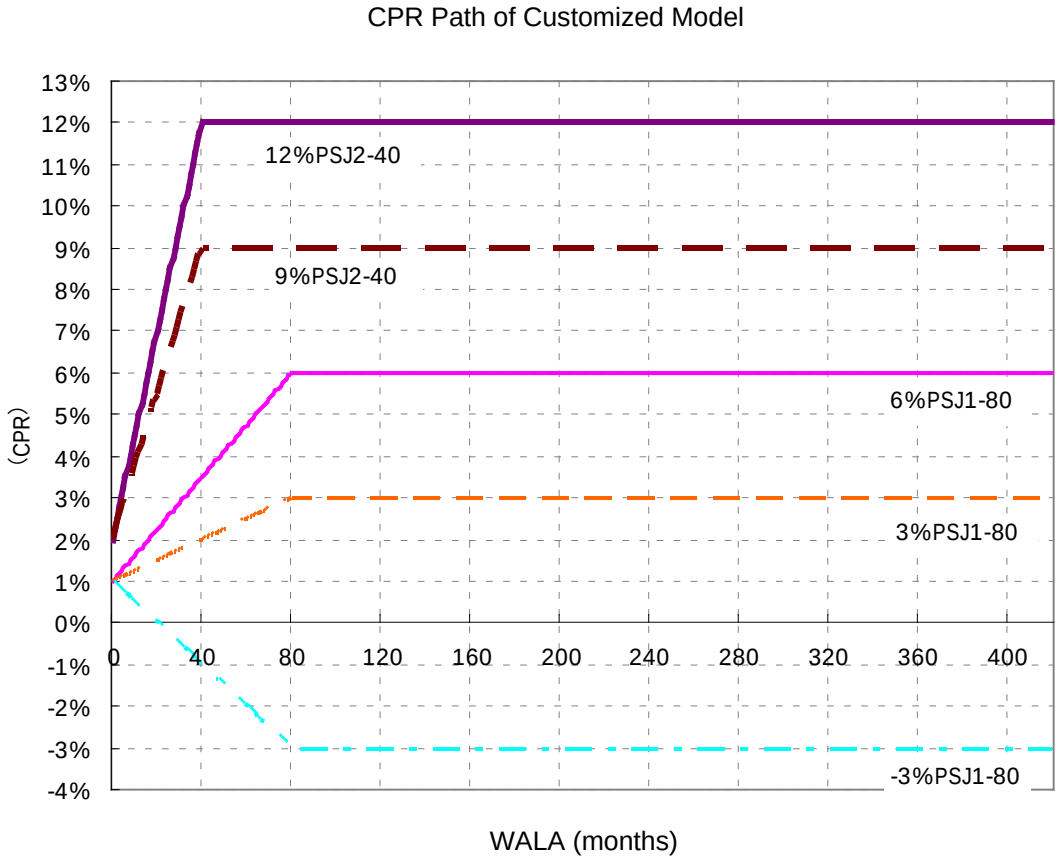
Conversely, based on the *PSJi-n* model, the value *PSJi-n* (*m*) that gives the instantaneous velocity for the Actual CPR (*R*%) when WALA is *m* months can be expressed as follows.

$$PSJi-n(m)(\%) = \frac{(R-i)}{m} \times n + i \quad (m \leqq n) \qquad \text{(Formula 4-2-3)}$$

$$PSJi-n(m)(\%) = R \quad (m > n) \qquad \text{(Formula 4-2-4)}$$

* For example, expressing "instantaneous velocity" on a continuous basis for the monthly Actual CPR of individual MBS after their issue by using the PSJ2-40 model that was used as the pricing model at the time of origination will require the separate use of (Formula 4-2-3) or (Formula 4-2-4) depending on the WALA for the Actual CPR level. Specifically, if the Actual CPR at the WALA 10 month point is 3% and the Actual CPR at the WALA 20 month point is 0.5%, etc., (Formula 4-2-3) is used, with the former giving an instantaneous velocity of 6%PSJ2-40 and the latter one of -1%PSJ2-40 based on the PSJ2-40 model. However, for an Actual CPR at the WALA 50 month point of 6%, (Formula 4-2-4) would be used, giving an instantaneous velocity of 6%PSJ2-40.

(Chart 4-2-1) PSJ Model (Customized Model)



Case of 12%PSJ2-40
(Initial CPR2%/seasoning 40 months)
CPR2% at 0 months WALA (weighted average loan age)
→ CRP later rises at the same rate per month to reach 12% at 40 months
→ CPR remains flat at 12% from 40 months onward

Case of 9%PSJ2-40
(Initial CPR2%/seasoning 40 months)
CPR2% at 0 months WALA
→ CRP later rises at the same rate per month to reach 9% at 40 months
→ CPR remains flat at 9% from 40 months onward

Case of 6%PSJ1-80
(Initial CPR1%/seasoning 80 months)
CPR1% at 0 months WALA
→ CRP later rises at the same rate per month to reach 6% at 80 months
→ CPR remains flat at 6% from 80 months onward

Case of 3%PSJ1-80
(Initial CPR1%/seasoning 80 months)
CPR1% at 0 months WALA
→ CRP later rises at the same rate per month to reach 3% at 80 months
→ CPR remains flat at 3% from 80 months onward

Case of -3%PSJ1-80
(Initial CPR1%/seasoning 80 months)
CPR1% at 0 months WALA
→ CRP later falls at the same rate per month to reach -3% at 80 months
→ CPR remains flat at -3% from 80 months onward

* Please understand that although there is only a small likelihood that a scenario where the PSJ value is minus would have actual use in predicting MBS prepayments, we have gone to the trouble of giving an example 1) to clarify the definition of the customized model and 2) to make clarify the concept that minus values can occur when using the MBS Actual CPR to calculate back to the instantaneous velocity. For example, with an Actual CPR of 0.5% at a WALA of 10 months, the PSJ1-80 model will give instantaneous velocity of -3%PSJ1-80.

Section 3 Process of Producing Cash Flows for JHF MBS using the Customized Model

In this section, we introduce the method of producing cash flows using the customized model based on the information on the Entrusted mortgage pool provided by JHF.

Fundamentally, the basic method for deriving expected cash flows using the customized model is the same as for the standard model as explained in Chapter 3, Section 3, 2. The only difference is that as the prepayment model changes, the calculation process for the prepayment rate for a WALA changes with the customized model.

Therefore, in preparation for the following explanation, we first give the definitions of the notations used in Chapter 3, Section 3, 2. To avoid overlap in the explanation, we ask you to, as necessary, refer to the appropriate portion of Chapter 3, Section 3, 2.

(1) Calculation of WALA

WALA is calculated using the same method as in Chapter 3, Section 3, 2. (1) Calculation of WALA.

(2) The calculation of the respective CPR for each WALA

Next, we will explain how to describe the expected CPR for each month using the previously mentioned customized model based on the WALA for each future P&I payment date as determined in (1) above. For example, in determining the expected CPR from the customized model given the relationship with the described WALA formulas, for *r%PSJi-n*, the CPR_a (%) and SMM_a (%) for WALA "*M*+α" would be determined as follows.

$$CPR_a(\%) = \min\left(\frac{(r-i)}{n} \times (M+a) + i, r\right) \qquad \text{(Formula 4-3-1)}$$

$$SMM_a(\%) = \left(1 - \sqrt[12]{1 - \frac{CPR_a}{100}}\right) \times 100 \qquad \text{(Formula 4-3-2)}$$

(3) Calculating JHF MBS cash flows reflecting CPRs based on the customized model

From here, like the standard model, the process of producing cash flows is the same as from Section 3, 4. (3) onward in Chapter 2.

An example of the time series of the cash flow calculation process is shown in (Chart 4-3-1), while examples of the actual calculations are shown in (Chart 4-3-2) and (Chart 4-3-3).

(Chart 4-3-1) Calculation Process for JHF MBS Cash Flows Using Expected SPJ Speed (*r*%*PSJi-n*)

* With the exception of expected CPR, all calculations are exactly the same as with the standard model.

P&I Date	WALA	Expected CPR	Expected SMM
S_0	M	—	—
S_1	$M+1$	$CPR_1(\%) = \min\left(\frac{(r-i)}{n}\times(M+1)+i, r\right)$	$SMM_1(\%) = \left(1-\sqrt[12]{1-\frac{CPR_1}{100}}\right)\times 100$
S_2	$M+2$	$CPR_2(\%) = \min\left(\frac{(r-i)}{n}\times(M+2)+i, r\right)$	$SMM_2(\%) = \left(1-\sqrt[12]{1-\frac{CPR_2}{100}}\right)\times 100$
S_3	$M+3$	$CPR_3(\%) = \min\left(\frac{(r-i)}{n}\times(M+3)+i, r\right)$	$SMM_3(\%) = \left(1-\sqrt[12]{1-\frac{CPR_3}{100}}\right)\times 100$
・・・		・・・	・・・
S_a	$M+a$	$CPR_a(\%) = \min\left(\frac{(r-i)}{n}\times(M+a)+i, r\right)$	$SMM_a(\%) = \left(1-\sqrt[12]{1-\frac{CPR_a}{100}}\right)\times 100$

P&I Date	Expected Factor	Expected Current Face Value Balance
S_0	AF_0 (Actual)	CF_0 (Actual)
S_1	$EF_1 = AF_0 \times \frac{SF_1}{SF_0} \times \left(1-\frac{SMM_1}{100}\right)^*$	$ECF_1 = OF \times EF_1$
S_2	$EF_2 = EF_1 \times \frac{SF_2}{SF_1} \times \left(1-\frac{SMM_2}{100}\right)^*$	$ECF_2 = OF \times EF_2$
S_3	$EF_3 = EF_2 \times \frac{SF_3}{SF_2} \times \left(1-\frac{SMM_3}{100}\right)^*$	$ECF_3 = OF \times EF_3$
・・・	・・・	・・・
S_a	$EF_a = EF_{a-1} \times \frac{SF_a}{SF_{a-1}} \times \left(1-\frac{SMM_a}{100}\right)^*$	$ECF_a = OF \times EF_a$

* When expressing expected cash flows taking into consideration the 10% Clean Up Call, the formulae must be replaced with those in (formula 2-3-13).

P&I Date	Expected Principal Payment Amount	Expected Interest Amount
S_0	—	—
S_1	$EP_1 = OF \times (AF_0 - EF_1)$	$AI_1 = OF \times AF_0 \times C \times 1/12$ *(Definite value)
S_2	$EP_2 = OF \times (EF_1 - EF_2)$	$EI_2 = OF \times EF_1 \times C \times 1/12$
S_3	$EP_3 = OF \times (EF_2 - EF_3)$	$EI_3 = OF \times EF_2 \times C \times 1/12$
・・・	・・・	・・・
S_a	$EP_a = OF \times (EF_{a-1} - EF_a)$	$EI_a = OF \times EF_{a-1} \times C \times 1/12$

* When "S_0" is the issue date, "1/12" is replaced with the actual number of days from the issue date to the first interest payment date (Counting only one of start date or end date)/365.

(Chart 4-3-2) Actual example of derivation of cash flows for No. 39 GHLC MBS (1.84% coupon rate; February 8, 2006 issue date; March 10, 2006 initial P&I payment date; ¥1 billion initial face value amount). Does not take into consideration the 10% Clean Up Call and uses an expected speed (6.5%PSJ1-50) based on the PSJ1-50 model. (March 20, 2006 initial calculation date)

	A	B	C	D	E	F	G	H	I	J	K	L	M
1	Description of cash flows using customized model (No. 39 GHLC MBS, no consideration of 10% Clean Up Call)												
2													
3		Calculation Date:		20-Mar-06		<Customized Model Definitions>				Expected Speed:	6.50%	PSJ1-50	
4		Coupon rate:		1.84%		Intercept CPR		1.0%		10% Clean Up Call (No: 1, Yes: 2)			1
5		Initial value:		¥1,000,000,000		Seasoning months		50		WAL	10.41	years	
6													
7		P&I Date	Years from cal. date	Initial Scheduled Factor	Factor (Actual)		Expected CPR	Expected SMM	Expected Factor	Expected Current Face Balance	Expected Principal Payment	Expected Interest	Expected Cash Flow Total
8	S_0→	2006/3/10		0.99758	0.99533	3			0.99533	¥995,330,000			
9		2006/4/10	0.06	0.99576		4	1.44%	0.12%	0.99231	¥992,313,946	¥3,016,054	¥1,526,173	¥4,542,226
10		2006/5/10	0.14	0.99411		5	1.55%	0.13%	0.98938	¥989,380,860	¥2,933,086	¥1,521,548	¥4,454,634
11		2006/6/10	0.22	0.99246		6	1.66%	0.14%	0.98636	¥986,361,830	¥3,019,030	¥1,517,051	¥4,536,081
12		2006/7/10	0.31	0.99081		7	1.77%	0.15%	0.98326	¥983,257,585	¥3,104,245	¥1,512,421	¥4,616,666
13		2006/8/10	0.39	0.98898		8	1.88%	0.16%	0.97989	¥979,890,532	¥3,367,053	¥1,507,662	¥4,874,715
14		2006/9/10	0.47	0.98652		9	1.99%	0.17%	0.97582	¥975,817,223	¥4,073,309	¥1,502,499	¥5,575,808
15		2006/10/10	0.56	0.98469		10	2.10%	0.18%	0.97229	¥972,285,935	¥3,531,288	¥1,496,253	¥5,027,541
16		2006/11/10	0.64	0.98302		11	2.21%	0.19%	0.96883	¥968,831,016	¥3,454,920	¥1,490,838	¥4,945,758
17		2006/12/10	0.72	0.98135		12	2.32%	0.20%	0.96530	¥965,295,046	¥3,535,969	¥1,485,541	¥5,021,510
18		2007/1/10	0.81	0.97968		13	2.43%	0.20%	0.96168	¥961,678,894	¥3,616,152	¥1,480,119	¥5,096,271
19		2007/2/10	0.89	0.97782		14	2.54%	0.21%	0.95780	¥957,797,339	¥3,881,556	¥1,474,574	¥5,356,130
20		2007/3/10	0.97	0.97535		15	2.65%	0.22%	0.95324	¥953,242,056	¥4,555,283	¥1,468,623	¥6,023,905

	A	B	C	D	E	F	G	H	I	J	K	L	M
415		2040/2/10	33.92	0.02697		410	6.50%	0.56%	0.00306	¥3,055,885	¥275,814	¥5,109	¥280,923
416		2040/3/10	34.00	0.02401		411	6.50%	0.56%	0.00271	¥2,705,303	¥350,582	¥4,686	¥355,268
417		2040/4/10	34.08	0.02178		412	6.50%	0.56%	0.00244	¥2,440,334	¥264,969	¥4,148	¥269,117
418		2040/5/10	34.16	0.01974		413	6.50%	0.56%	0.00220	¥2,199,410	¥240,924	¥3,742	¥244,666
419		2040/6/10	34.25	0.01771		414	6.50%	0.56%	0.00196	¥1,962,209	¥237,201	¥3,372	¥240,574
420		2040/7/10	34.33	0.01567		415	6.50%	0.56%	0.00173	¥1,726,487	¥235,722	¥3,009	¥238,731
421		2040/8/10	34.42	0.01329		416	6.50%	0.56%	0.00146	¥1,456,086	¥270,401	¥2,647	¥273,049
422		2040/9/10	34.50	0.01032		417	6.50%	0.56%	0.00112	¥1,124,370	¥331,716	¥2,233	¥333,948
423		2040/10/10	34.58	0.00806		418	6.50%	0.56%	0.00087	¥873,237	¥251,133	¥1,724	¥252,857
424		2040/11/10	34.67	0.00601		419	6.50%	0.56%	0.00065	¥647,499	¥225,738	¥1,339	¥227,077
425		2040/12/10	34.75	0.00389		420	6.50%	0.56%	0.00042	¥416,756	¥230,743	¥993	¥231,736
426		2041/1/10	34.84	0.00117		421	6.50%	0.56%	0.00012	¥124,648	¥292,108	¥639	¥292,747
427		2041/2/10	34.92	0		422	6.50%	0.56%	0.00000	¥0	¥124,648	¥191	¥124,839
428													
429													

* The above calculations have not adjusted for fractions and interest payments falling on holidays have not been taken into account.

Weighted Average Life (WAL) Calculation (Initial calculation date March 20, 2006) using (Formula 3-3-3) gives WAL = 10.41 years.

(Chart 4-3-3) Actual example of derivation of cash flows for No. 39 GHLC MBS (1.84% coupon rate; February 8, 2006 issue date; March 10, 2006 initial P&I payment date; ¥1 billion initial face value amount). Takes into consideration the 10% Clean Up Call and uses an expected speed (6.5%PSJ1-50) based on the PSJ1-50 model. (March 20, 2006 initial calculation date)

	A	B	C	D	E	F	G	H	I	J	K	L	M
1	Description of cash flows using customized model (No. 39 GHLC MBS, consideration of 10% Clean Up Call)												
2													
3		Calculation Date:		20-Mar-06		<Customized Model Definitions>				Expected Speed:	6.50%	PSJ1-50	
4		Coupon rate:		1.84%		Intercept CPR		1.0%		10% Clean Up Call (No: 1, Yes: 2)			2
5		Initial value:		¥1,000,000,000		Seasoning months		50		WAL	9.93	years	
6													
7		P&I Date	Years from cal. date	Initial Scheduled Factor	Factor (Actual)		Expected CPR	Expected SMM	Expected Factor	Expected Current Face Balance	Expected Principal Payment	Expected Interest	Expected Cash Flow Total
8	S_0→	2006/3/10		0.99758	0.99533	3			0.99533	¥995,330,000			
9		2006/4/10	0.06	0.99576		4	1.44%	0.12%	0.99231	¥992,313,946	¥3,016,054	¥1,526,173	¥4,542,226
10		2006/5/10	0.14	0.99411		5	1.55%	0.13%	0.98938	¥989,380,860	¥2,933,086	¥1,521,548	¥4,454,634
11		2006/6/10	0.22	0.99246		6	1.66%	0.14%	0.98636	¥986,361,830	¥3,019,030	¥1,517,051	¥4,536,081
12		2006/7/10	0.31	0.99081		7	1.77%	0.15%	0.98326	¥983,257,585	¥3,104,245	¥1,512,421	¥4,616,666
13		2006/8/10	0.39	0.98898		8	1.88%	0.16%	0.97989	¥979,890,532	¥3,367,053	¥1,507,662	¥4,874,715
14		2006/9/10	0.47	0.98652		9	1.99%	0.17%	0.97582	¥975,817,223	¥4,073,309	¥1,502,499	¥5,575,808
15		2006/10/10	0.56	0.98469		10	2.10%	0.18%	0.97229	¥972,285,935	¥3,531,288	¥1,496,253	¥5,027,541
16		2006/11/10	0.64	0.98302		11	2.21%	0.19%	0.96883	¥968,831,016	¥3,454,920	¥1,490,838	¥4,945,758
17		2006/12/10	0.72	0.98135		12	2.32%	0.20%	0.96530	¥965,295,046	¥3,535,969	¥1,485,541	¥5,021,510
18		2007/1/10	0.81	0.97968		13	2.43%	0.20%	0.96168	¥961,678,894	¥3,616,152	¥1,480,119	¥5,096,271
19		2007/2/10	0.89	0.97782		14	2.54%	0.21%	0.95780	¥957,797,339	¥3,881,556	¥1,474,574	¥5,356,130
20		2007/3/10	0.97	0.97535		15	2.65%	0.22%	0.95324	¥953,242,056	¥4,555,283	¥1,468,623	¥6,023,905

	A	B	C	D	E	F	G	H	I	J	K	L	M
260		2027/3/10	20.99	0.42185		255	6.50%	0.56%	0.11388	¥113,875,648	¥1,589,685	¥177,047	¥1,766,731
261		2027/4/10	21.07	0.41924		256	6.50%	0.56%	0.11254	¥112,539,026	¥1,336,621	¥174,609	¥1,511,231
262		2027/5/10	21.15	0.41688		257	6.50%	0.56%	0.11128	¥111,280,517	¥1,258,509	¥172,560	¥1,431,069
263		2027/6/10	21.24	0.41453		258	6.50%	0.56%	0.11004	¥110,035,210	¥1,245,307	¥170,630	¥1,415,937
264		2027/7/10	21.32	0.41213		259	6.50%	0.56%	0.10879	¥108,787,143	¥1,248,066	¥168,721	¥1,416,787
265		2027/8/10	21.41	0.40949		260	6.50%	0.56%	0.10749	¥107,486,588	¥1,300,555	¥166,807	¥1,467,362
266		2027/9/10	21.49	0.40596		261	6.50%	0.56%	0.10596	¥105,964,857	¥1,521,731	¥164,813	¥1,686,544
267		2027/10/10	21.57	0.40332		262	6.50%	0.56%	0.10469	¥104,687,783	¥1,277,073	¥162,479	¥1,439,553
268		2027/11/10	21.66	0.40093		263	6.50%	0.56%	0.10349	¥103,486,199	¥1,201,585	¥160,521	¥1,362,106
269		2027/12/10	21.74	0.39855		264	6.50%	0.56%	0.10230	¥102,297,337	¥1,188,862	¥158,679	¥1,347,541
270		2028/1/10	21.82	0.39615		265	6.50%	0.56%	0.10111	¥101,113,422	¥1,183,915	¥156,856	¥1,340,771
271		2028/2/10	21.91	0.39349		266	6.50%	0.56%	0.09987	¥99,873,549	¥1,239,873	¥155,041	¥1,394,914
272		2028/3/10	21.99	0.38994		267	6.50%	0.56%	0.00000	¥0	¥99,873,549	¥153,139	¥100,026,688
273		2028/4/10	22.07	0.38731		268	6.50%	0.56%	0.00000	¥0	¥0	¥0	¥0
274		2028/5/10	22.16	0.38491		269	6.50%	0.56%	0.00000	¥0	¥0	¥0	¥0

* The above calculations have not adjusted for fractions and interest payments falling on holidays have not been taken into account.

Weighted Average Life (WAL) Calculation (Initial calculation date March 20, 2006) using (Formula 3-3-3) gives WAL = 9.93 years.

Afterword to the Japanese Language Version

Generally, bond investment risk arises from the credit risk of the issuer and the risk of changes in interest rates. The excess return (spread) an investor receives on a bullet (redemption only on maturity) corporate bond in comparison with a credit risk free government bond can be said to mainly be compensation for assuming the issuer's credit risk.

While credit risk is minimized in most cases for MBS by using credit enhancement schemes, they instead present their own unique risk—prepayment risk. In other words, the excess return (spread) an investor receives on MBS in comparison with a bullet government bond is mainly compensation for assuming the prepayment risk.

As a result, it can also be said that MBS are financial instruments that offer a different risk-return profile than bullet bonds.

On the other side of the coin, as a product, MBS are more cumbersome to deal with than bullet bonds. MBS require investment value analysis of uncertain expected cash flows over ultralong periods, administration of monthly principal and interest payments, and, in the case of discounts (under par) or premiums (over par) on purchase costs, special treatment for amortization calculations.[35]

Our introduction of the PSJ model and effort to instill it as a market practice have been aimed at making it easy for many more market participants to conduct risk-return analysis on MBS by offering a simple method for analyzing the prepayment rates and cash flows that form the basis for analyzing MBS investment value.

This work represents the first genuine measure taken regarding MBS by the Japan's securities industry. Accordingly, we hope that many more market participants to make use of the analysis methods provided here.

April 24, 2006
JSDA
Working Group on a Japan Version of the PSA Model

[35] Please refer to Regarding Revisions of the "Q&A on Accounting for Financial Instruments" (March 25, 2003; Accounting Practice Committee; Japanese Institute of Certified Public Accountants)

Appendix 1

Measures toward the Establishment of an Infrastructure for the MBS Market in Japan

April 24, 2006,
JSDA

I. Purpose

To establish the first necessary infrastructure for the mortgage backed securities (MBS) market, the JSDA is implementing measures to introduce the Prepayment Standard Japan model (hereinafter referred to as the “PSJ model”) and to promote the spread of its use in the market. The PSJ model is intended to provide a standard measure among market participants for MBS prepayment rates.

II. Outline

1. Introduction of Prepayment Standard Japan Model (Item I. in next document)

To provide a framework for a standard measure of MBS prepayment speed for market participants, two models—the standard model and the customized model—will be introduced.

(1) Standard Model
This model is designed mainly for use with the Government Housing Loan Corporation Mortgage-backed Securities that are expected to continue being issued in large lots with fixed terms and structures.

(2) Customized Model
This model is expected to be used for cases where the standard model does not adequately express the special characteristics of the prepayment speed or for MBS structured through securitization deals, etc. for highly individualistic mortgage loans. Consequently, the model has been designed to allow adjustments to fit the attributes of individual pools.

2. Measures to promote the spread of the use of the PSJ model

(1) Announcement of PSJ calculation statistical values (Item II. in next document)
To contribute to the participation of a wide range of market participants in the investment value analysis, etc. of MBS, the JSDA will receive reports on PSJ calculations (values calculated using the PSJ model) on a voluntary basis from broker/dealers that meet certain conditions. Calculations will be for what can be described as Japan’s benchmark product in the MBS market, Government Housing Loan Corporation Mortgage-backed Securities. JSDA will periodically report the average and median, etc. of these figures as PSJ Calculation Statistical Values. Details on the individual specific items to be reported on and their frequency will be decided in a separate document “Collection and Reporting Guidelines for PSJ Calculation Statistical Values,” with the final decision made after screening through discussions with the broker/dealers participating in the reporting process.

(2) Measures to promote the spread of the use of the PSJ model
• Production and listing on JSDA Web site of explanatory materials on PSJ model definitions and usage (PSJ Model Guidebook)
• Listing of materials on PSJ model produced by broker/dealers on the JSDA Web site
• Conducting seminars for investors on the PSJ model
• Efforts to get broker/dealers to actively use the PSJ model

Measures toward the Establishment of an Infrastructure for the MBS Market in Japan

April 24, 2006,
JSDA

I. Introduction of the Prepayment Standard Japan Model

1. Purpose of model introduction

In analyzing the investment value of mortgage backed securities (MBS), it is important to be able to project contingent cash flows based on a fixed assumption of the prepayment rate. While a certain portion of market participants can assess the investment value of an MBS issue on their own using complex prepayment models created based on their own analysis to estimate cash flows by projecting a prepayment rate, not all market participants are capable of doing so. Therefore, to pursue the further development of the MBS market, what is needed is a common metric for prepayment rates that can be used in practical terms by a much larger number of market participants to analyze investment value.

To that end, the Japan Securities Dealers Association (hereinafter referred to as the “JSDA”) has created the Prepayment Standard Japan model (PSJ model). Produced as part of efforts to develop the market infrastructure from the perspective of the role the securities industry should play in Japan’s MBS market, it is meant to serve as a standard measure for the characteristic prepayments of MBS. It is hoped that the model will be used by a wide range of market participants, contributing to the sound development of the MBS market.

2. Model definitions

(1) Standard model

The standard model is designed mainly for the Government Housing Loan Corporation Mortgage-backed Securities, a product for which issuance is expected to continue and with fixed structures.

The standard model sets an annualized prepayment rate called a conditional/constant prepayment rate (CPR) of 0% for a mortgage pool with a weighted average loan age (WALA) of 0 months. Following which, the CPR rises a fixed ratio monthly, reaching a CPR of *r*% after a WALA of 60 months, after which the CPR follows a fixed path. This type of CPR path is termed “*r%PSJ*” (See Chart 1).

CPR of *r%PSJ* at an age (WALA) of *m* months (*CPR(m)* (%)) can be calculated using the following formula.

$$\mathbf{CPR(m)(\%) = \min\left(r / 60 \times m,\ r\right) \quad (r \geqq 0) \cdots (a)}$$

Conversely, Actual CPR (R%) expressed as Instantaneous Velocity based on the standard model (*PSJ(m)* (%)) can be calculated using the following formulae.

PSJ(m)(%) = R / m × 60 (When m≦60)・・・(b)
PSJ(m)(%) = R (When m＞60)・・・(c)

(2) Customized model

The customized model was introduced with a view to application in cases where, for some reason, the analyst wants to express the prepayment speed with something other than the standard model or where the MBS is structured through securitization deals, etc. for highly individualistic mortgage loans. Consequently, the model makes it possible to adjust the form of the model for the attributes of individual pools, allowing for more flexible prepayment scenarios.

The customized model sets a CPR of i% for a mortgage pool with a weighted average loan age (WALA) of 0 months. Following which, the CPR rises a fixed ratio monthly, reaching a CPR of *r*% after n months, after which the CPR follows a fixed path (i%, n months are fixed numbers). This type of CPR path is termed "*r%PSJi-n*" (model users can freely set values for i% and n months according to circumstances) (See Chart 2).

CPR of *r%PSJi-n* at an age (WALA) of *m* months (*CPR(m)* (%))can be calculated using the following formula.

CPR(m)(%) = min((r - i) / n×m+i, r) (When r≧i)・・・(d)
CPR(m)(%) = max((r - i) / n×m+i, r) (When r＜i)・・・ (e)

When analyzing MBS prepayment rates, we expect that in usual cases that formula (d) will be used. Formula (e) starts with CPRi% at a WALA of 0 months, then declines by a fixed ratio monthly, reaching a CPR of r% at a WALA of n months, after which the CPR follows a fixed path. Although the form is necessary to the definition of the customized model, we expect that the likelihood of its practical use in expressing MBS prepayment scenarios is small.

Conversely, based on the *PSJi-n* model, the value *PSJi-n* (*m*) that gives the instantaneous velocity for the Actual CPR (*R*%) when WALA is *m* months can be calculated using the following formulae.

PSJ i-n(m)(%) = (R - i)/ m×n + i (When m≦n)・・・(f)
PSJ i-n(m)(%) = R (When m＞n)・・・(g)

* For example, expressing "instantaneous velocity" on a continuous basis for the monthly Actual CPR of individual MBS after their issue by using the PSJ2-40 model that was used as the pricing model at the time of origination will require the separate use of formula (f) or formula (g) depending on the WALA for the Actual CPR level. Specifically, if the Actual CPR at the WALA 10 month point is 3% and the Actual CPR at the WALA 20 month point is 0.5%, etc., formula (f) is used, with the former giving an instantaneous velocity of 6%PSJ2-40 and

the latter one of -1%PSJ2-40 based on the PSJ2-40 model. However, for an Actual CPR at the WALA 50 month point of 6%, formula (g) would be used, giving an instantaneous velocity of 6%PSJ2-40.

If JSDA recognizes a notable gap between the form of the PSJ model and actual market conditions due to changes, etc., in economic or financial conditions in Japan, JSDA will revise the model.

(3) Measures to spread use of the model

JSDA member firms shall make efforts to fully comprehend the purpose and significance of the introduction of the PSJ model. When disclosing projections of prepayment rates based on their own proprietary analysis to market participants, member firms shall endeavor to disclose PSJ model converted figures and make other efforts to spread the use of the PSJ model in the MBS market in Japan.

II. Reporting PSJ Calculation Statistical Values

1. Purpose

Along with the introduction of the PSJ model, the JSDA's collection and statistical processing and announcement of PSJ model converted figures (hereinafter referred to as "PSJ calculations") of MBS prepayment calculations by broker/dealers that act as intermediaries in the MBS market should facilitate discussion and analysis of MBS prepayment rates and the comparison of market participants. Moreover, the reporting process should lead to the provision of simpler and highly convenient investment analysis methods, etc., which should be helpful in popularizing the PSJ model.

Consequently, to provide reference data for the investment value analysis, etc., of MBS by a wide range of investors, including investors who find it difficult to independently create their own prepayment models, the JSDA will receive reports on PSJ calculations (standard model) on a voluntary basis from broker/dealers that meet certain conditions (hereinafter referred to as "Reporting Members") for [Loan Claim Collateralized] Government Housing Loan Corporation Mortgage-backed Securities (hereinafter referred to as "GHLC MBS"), which are expected to continue being issued in large lots with fixed terms and structures and can be described as Japan's benchmark product in the MBS market. JSDA will periodically report the average and median, etc. of figures collected as PSJ Calculation Statistical Values.

2. Reporting Members Conditions

(1) Comprehend the purpose given in 1. above and have the desire to report PSJ calculations for all issues of GHLC MBS (including not as yet issued MBS for which issuing conditions have been decided, the same hereinafter)
(2) Be knowledgeable in MBS OTC transactions, etc.
—provided that, for the time being, having a GHLC MBS underwriting record in the previous fiscal year to the year of reporting participation or having been

a candidate for lead manager of a GHLC MBS issue in the fiscal year of the reporting participation shall be an additional sufficiency condition.
(3) Have the necessary organization and staff to properly execute PSJ calculation reporting operations

3. PSJ Calculation Statistical Values reported by the JSDA

The JSDA shall calculate and list the following values based on PSJ calculations by Reporting Members for GHLC MBS at 3:00 P.M. on the day before public announcement (if that day is a business holiday then the previous business day).
(1) Average value of PSJ calculations by Reporting Members
(2) Median value of PSJ calculations by Reporting Members
(3) Highest value of PSJ calculations by Reporting Members
(4) Lowest value of PSJ calculations by Reporting Members
(5) Values for (1) and (2) assuming parallel shifts of 50bp, 100bp, 200bp, and 300bp above and below the yield curve

4. Reporting method, etc.

JSDA will aim to report the values on its Web site by 4:00 P.M. on the 1st and 15th of each month (if that day is a business holiday then the following business day).
The Reporting Members shall note their company name in the reporting materials.

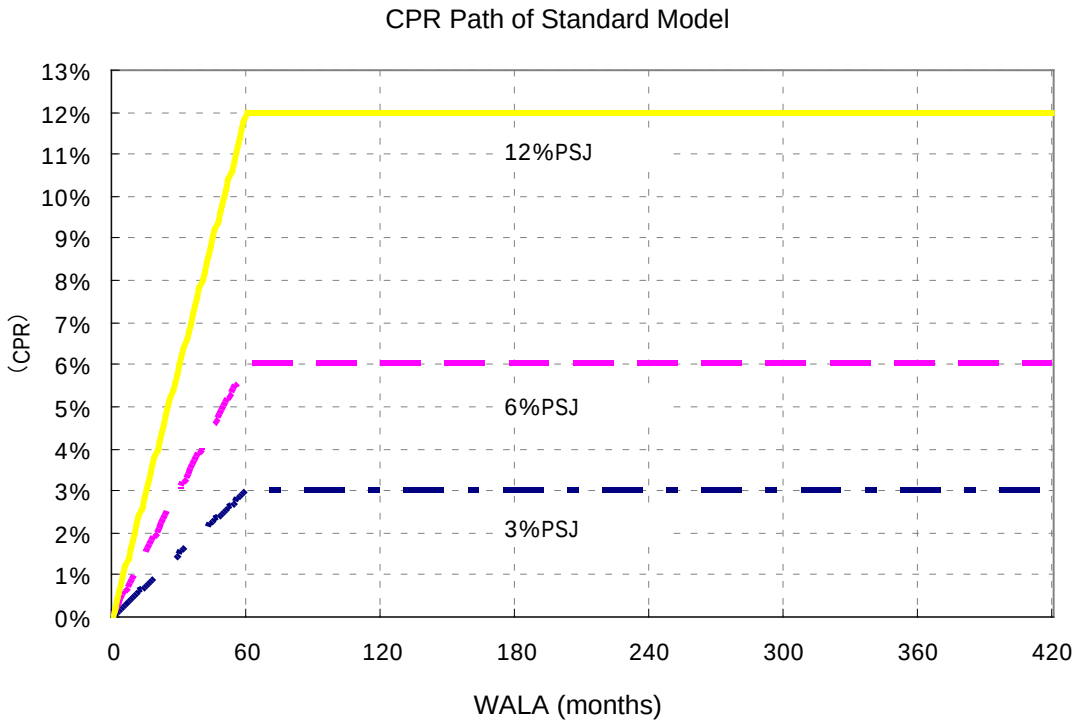
5. Operating methods, etc.

The JSDA will produce the “Collection and Reporting Guidelines for PSJ Calculation Statistical Values” stipulating the following items.
The Reporting Members that comprise the PSJ Calculations Statistics Council will decide on revisions or eliminations of items stipulated in this guidebook.
(1) Designation standards for Reporting Members
(2) Methods, etc., of reporting PSJ Calculation Statistical Values to the JSDA
(3) Types and calculation methods for PSJ Calculation Statistical Values
(4) Announcements, etc., of PSJ Calculation Statistical Values

6. Start of reporting

Collecting and reporting will start as soon as the system and Reporting Members organization are set up.

(Chart 1: Standard Model)

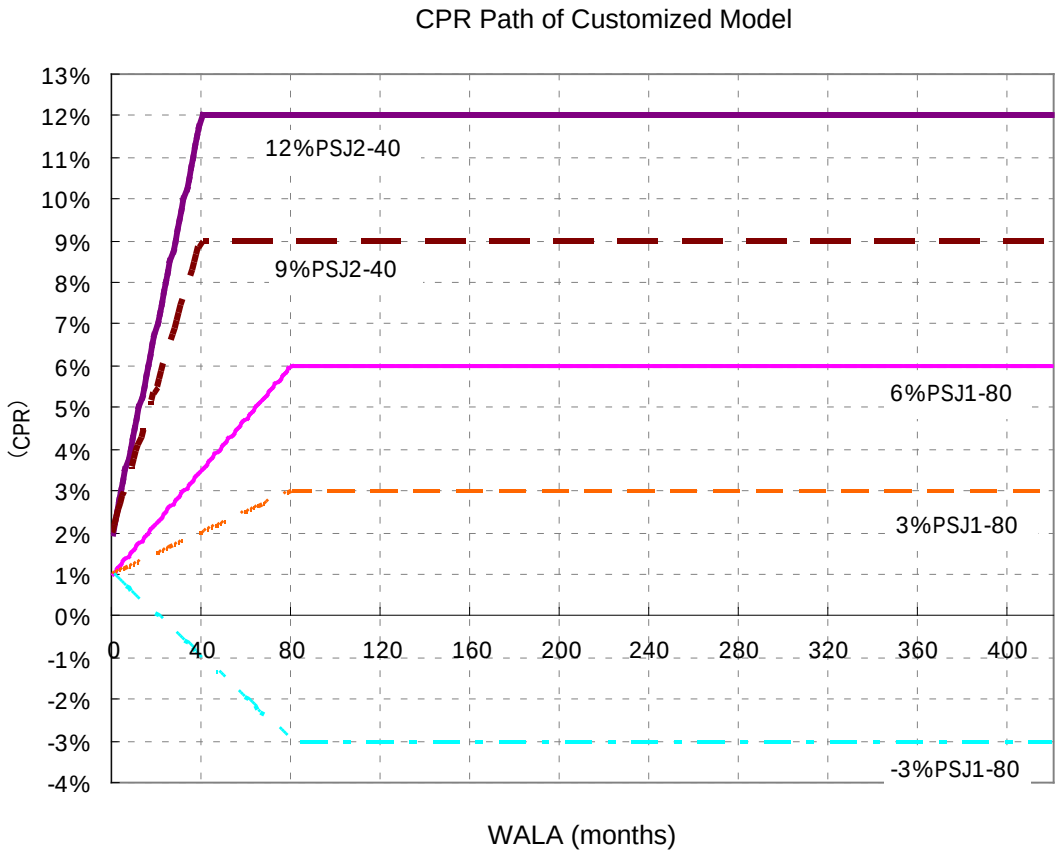


Case of 12%PSJ
CPR0% at 0 months WALA (weighted average loan age)
→ CRP later rises at the same rate per month to reach 12% at 60 months
→ CPR remains flat at 12% from 60 months onward

Case of 6%PSJ
CPR0% at 0 months WALA
→ CRP later rises at the same rate per month to reach 6% at 60 months
→ CPR remains flat at 6% from 60 months onward

Case of 3%PSJ
CPR0% at 0 months WALA
→ CRP later rises at the same rate per month to reach 3% at 60 months
→ CPR remains flat at 3% from 60 months onward

(Chart 2: Customized Model)



Case of 12%PSJ2-40
(Initial CPR2%/seasoning 40 months)
CPR2% at 0 months WALA (weighted average loan age)
→ CRP later rises at the same rate per month to reach 12% at 40 months
→ CPR remains flat at 12% from 40 months onward

Case of 9%PSJ2-40
(Initial CPR2%/seasoning 40 months)
CPR2% at 0 months WALA
→ CRP later rises at the same rate per month to reach 9% at 40 months
→ CPR remains flat at 9% from 40 months onward

Case of 6%PSJ1-80
(Initial CPR1%/seasoning 80 months)
CPR1% at 0 months WALA
→ CRP later rises at the same rate per month to reach 6% at 80 months
→ CPR remains flat at 6% from 80 months onward

Case of 3%PSJ1-80
(Initial CPR1%/seasoning 80 months)
CPR1% at 0 months WALA
→ CRP later rises at the same rate per month to reach 3% at 80 months

→ CPR remains flat at 3% from 80 months onward

Case of -3%PSJ1-80
(Initial CPR1%/seasoning 80 months)
CPR1% at 0 months WALA
→ CRP later falls at the same rate per month to reach -3% at 80 months
→ CPR remains flat at -3% from 80 months onward

* Please understand that although there is only a small likelihood that a scenario where the PSJ value is minus would have actual use in predicting MBS prepayments, we have gone to the trouble of giving an example 1) to clarify the definition of the customized model and 2) to make clarify the concept that minus values can occur when using the MBS Actual CPR to calculate back to the instantaneous velocity. For example, with an Actual CPR of 0.5% at a WALA of 10 months, the PSJ1-80 model will give instantaneous velocity of -3%PSJ1-80.

Appendix 2

Format for PSJ Calculation Statistical Values Report: Average Values

PSJ Calculation Statistical Values (Average Values)

Announced date/month/year

Loan Claim Collateralized Japan Housing Finance Mortgage-backed Securities/
Loan Claim Collateralized Government Housing Loan Corporation Mortgage-backed Securities

Reporting Member:

Issue No.	Yield Curve Scenarios									Low/High (%)
	-300bp	-200bp	-100bp	-50bp	0bp	50bp	100bp	200bp	300bp	
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1. The PSJ Calculation Statistical Values listed in this document are PSJ model converted figures (hereinafter referred to as "PSJ calculations") of MBS prepayment calculations reported to the JSDA by financial instrument businesses (securities companies) that have met certain conditions. The figures are based on prepayment calculations reported as of 3:00 P.M. on the day before monthly public announcements (the 1st and 15th of each month, if that day is a business holiday then the previous business day, the same holds hereafter) and have been compiled and statistically processed by the JSDA.
2. The sole purpose of this document is to provide information on MBS PSJ Calculation Statistical Values as of 3:00 P.M. on the day prior to the announcement day. It does not represent in any way a recommendation or solicitation to invest in the financial instruments listed. Investors are encouraged to take responsibility for their final investment decisions.
3. The PSJ Calculation Statistical Values in this document are calculated from PSJ calculations based on economic and financial conditions and publicly announced data as of 3:00 P.M. on the day prior to the announcement day. As a result, obviously the PSJ Calculation Statistical Values could differ should the conditions on which the figures are premised change following the determination of the PSJ calculations by the financial instruments businesses (securities companies).
4. In calculating the PSJ Calculation Statistical Values listed in this document, the JSDA receives reports of PSJ calculations from financial instrument businesses (securities companies) that have met certain conditions. However, these financial instrument businesses (securities companies) provide no guarantees to the JSDA that the PSJ calculations are correct or complete. Furthermore, the JSDA bears no responsibility for the correctness or completeness of the PSJ Calculation Statistical Values.
5. The JSDA is not able to respond to enquiries about the PSJ calculations made by individual financial instrument businesses (securities companies).
6. The JSDA cannot be held responsible for any errors or omissions, etc., in this document.

Format for PSJ Calculation Statistical Values Report: Median Values

PSJ Calculation Statistical Values
(Median Values)

Announced date/month/year

Loan Claim Collateralized Japan Housing Finance Mortgage-backed Securities/ Loan Claim Collateralized Government Housing Loan Corporation Mortgage-backed Securities
Reporting Member:

Issue No.	Yield Curve Scenarios									Low/High (%)
	-300bp	-200bp	-100bp	-50bp	0bp	50bp	100bp	200bp	300bp	
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1. The PSJ Calculation Statistical Values listed in this document are PSJ model converted figures (hereinafter referred to as “PSJ calculations”) of MBS prepayment calculations reported to the JSDA by financial instrument businesses (securities companies) that have met certain conditions. The figures are based on prepayment calculations reported as of 3:00 P.M. on the day before monthly public announcements (the 1st and 15th of each month, if that day is a business holiday then the previous business day, the same holds hereafter) and have been compiled and statistically processed by the JSDA.
2. The sole purpose of this document is to provide information on MBS PSJ Calculation Statistical Values as of 3:00 P.M. on the day prior to the announcement day. It does not represent in any way a recommendation or solicitation to invest in the financial instruments listed. Investors are encouraged to take responsibility for their final investment decisions.
3. The PSJ Calculation Statistical Values in this document are calculated from PSJ calculations based on economic and financial conditions and publicly announced data as of 3:00 P.M. on the day prior to the announcement day. As a result, obviously the PSJ Calculation Statistical Values could differ should the conditions on which the figures are premised change following the determination of the PSJ calculations by the financial instruments businesses (securities companies).
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