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S&P Global
China Ratings

Commentary: Understanding Our Approach to China Residential Mortgage-Backed Securities

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Introduction

This commentary provides additional insight into how S&P Global (China) Ratings considers residential mortgage-backed securities (RMBS) in China. Our approach to analyzing RMBS is consistent with our general Structured Finance Rating Methodology.

RMBS are typically collateralized by residential mortgage loans originated by banks, housing provident funds, or other lenders that are combined into a pool. We typically assess the creditworthiness of RMBS based on our estimation of the potential losses that may be incurred on a pool of residential mortgages and the impact of structural features on cash flows under various stress scenarios.

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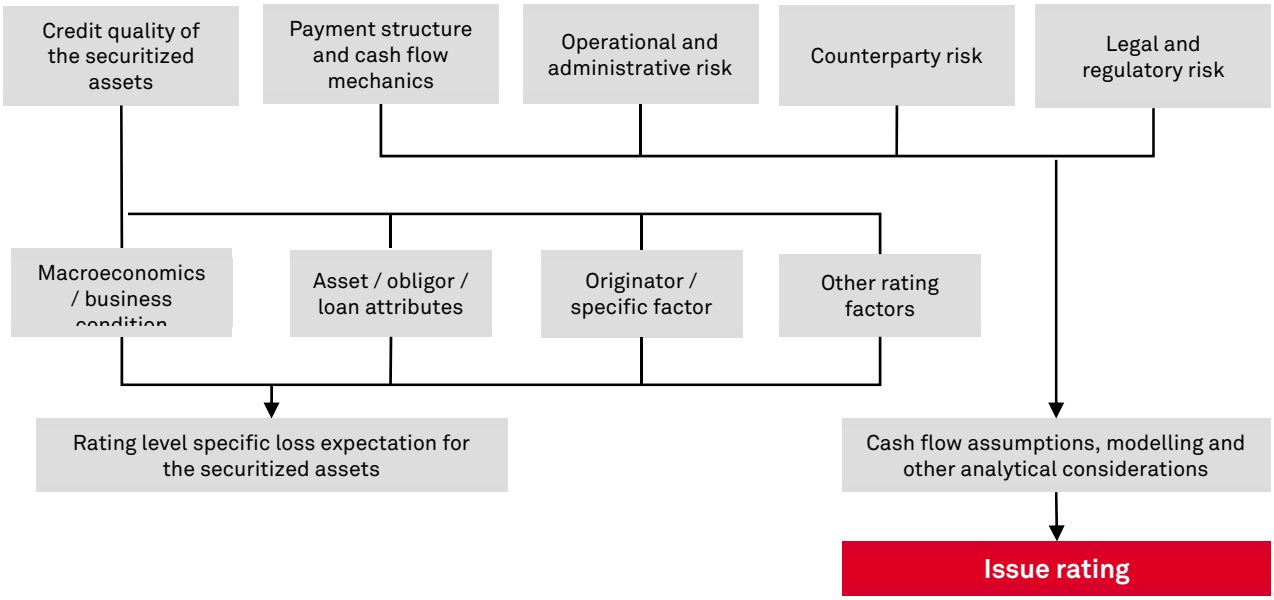
Analytical Approach

Framework

The analytical framework we may use for RMBS ratings is consistent with S&P Global (China) Ratings structured finance analytical framework which typically includes the assessment of the aspects outlined below (see chart 1). These factors tend to be fundamental to most RMBS transactions, while certain transaction types or structures may have features or conditions present that require additional levels of alternative analysis, or may not require a detailed consideration of all of the below areas:

- Credit quality of the securitized assets;
- Payment structure and cash flow mechanics;
- Operational and administrative risks;
- Counterparty risk; and
- Legal and regulatory risks.

Chart 1



Source: S&P Global (China) Ratings.

Fundamentals

Credit Quality of the Securitized Assets

Typically, the initial step in determining the credit support necessary to achieve a given rating level is analyzing the credit quality of the assets to be securitized. To assess the credit quality of the securitized assets, we typically perform a loan-level data analysis to assess the expected losses for a pool of residential mortgage loans under different rating-level stress conditions. Expected losses are typically the product of foreclosure frequency and loss severity:

- Foreclosure frequency considers the likelihood of mortgage loan default. It typically represents the proportion of loans in a pool that is likely to go into foreclosure under different rating stress conditions.
- Loss severity measures loss given default which is typically expressed as a percentage of the loan balance. It refers to the loss on foreclosure (i.e., the amount by which a loan balance and foreclosure costs exceed the property sale proceeds and any other recoveries).

We have established an archetypical residential mortgage loan pool for China. We typically compare actual portfolios with the archetypical pool and apply adjustment factors for variations from the archetype to reflect varying degrees of credit risks in individual portfolios. We may also calculate the rating-specific market value decline likely to be endured when foreclosing on a property and adjust it to determine loss severity assumptions upon default of a mortgage in a pool. The outcomes of these calculations are the stressed foreclosure frequency, loss severity, and loss coverage at each rating level for a pool. The level of credit enhancement to cover the projected losses will accord to these assumptions under stress scenarios commensurate with the relevant rating levels.

The archetypical pool (see table 1) is a reference point against which actual pools are compared and measured in terms of credit risk. Adjustments to credit-enhancement level for the actual pool

reflect the extent to which the underlying loans and the pool have stronger or weaker credit characteristics than the archetypical loan pool.

Table 1

Pool characteristics of archetypical residential mortgage loan pool for China RMBS

A well-diversified mortgage loans' portfolio
Chinese resident
Full-time salaried employees
Credit check obtained and borrower has a clear credit history
Loans are currently performing and not delinquent
Income and affordability fully verified
Deposit money (or savings history) are verified
Fully amortizing 30-year loan with even and regular loan installments
65% loan-to-value (LTV) ratio
Typical People's Bank of China benchmark lending rate plus margin (no interest-only period)
Loans are properly seasoned
Loans secured by properties that are geographically well-diversified
First-registered mortgage with the relevant China registration authority and lender as the only mortgagee
Owner-occupied
Completed residential properties
Maximum property size: 150 square meters
Residential property with common property types (i.e. apartments and units)

Source: S&P Global (China) Ratings.

The 'AAA' credit-enhancement level is a fixed anchor point. The variations from the archetypical pool's characteristics typically cause the credit-enhancement levels for actual pools to vary from the archetypical pool's credit enhancement and its components (see table 2).

Table 2

Key credit enhancement components for the archetypical pool by rating scenario

Rating scenarios	AAA	AA	A	BBB	BB	B
Foreclosure frequency (%)	10.0	7.2	4.4	2.8	2.0	1.2
Market value decline (%)	45.0	43.0	41.0	38.0	34.0	30.0
Loss severity (%)	50.7	48.0	45.3	41.2	35.8	30.4
Credit enhancement for expected losses (%)	5.1	3.5	2.0	1.2	0.7	0.4

*All credit quality levels indicated above are S&P Global (China) Ratings credit opinions.

Source: S&P Global (China) Ratings.

For actual pools' each characteristic and attribute that differ from the archetype at a pool, loan, or borrower level, we would apply a corresponding adjustment to the foreclosure frequency and/or loss severity. Depending on the risk profile of the characteristic or attribute relative to the corresponding archetypical trait, the adjustment will increase, and sometimes decrease, the foreclosure frequency and/or loss severity assumption for the individual loan and/or pool. The typical foreclosure frequency and loss severity adjustments for each of the factors are summarized

in table 3 below. We may vary the adjustments based on the differentiating factors to reflect certain loan's and/or pool's unique characteristics.

Table 3

Typical adjustment factors

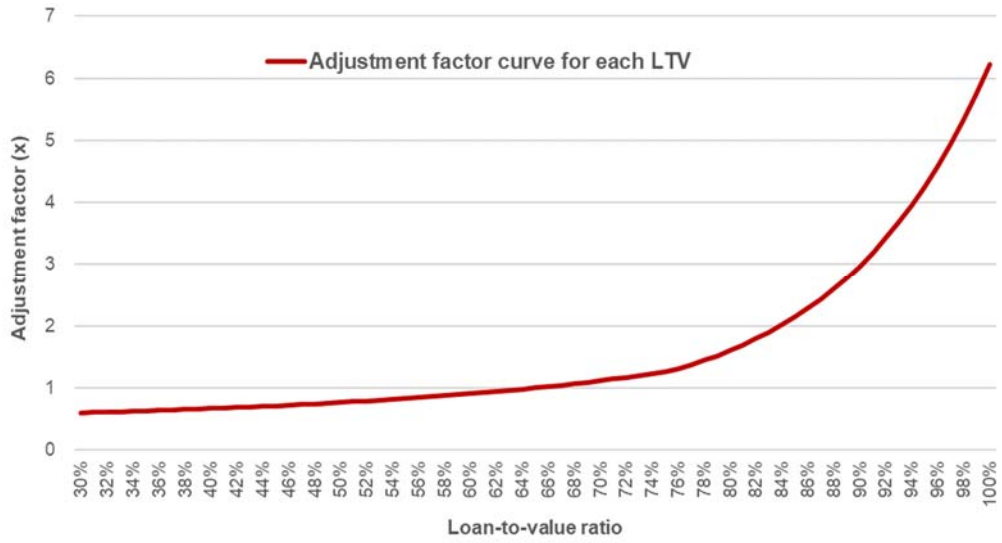
Variable	Range (x)
LTV	LTV Curve
Residency	1 - 1.5
Employment status: self-employed	1 - 1.5
Employment status: pensioner/retired borrower	1 - 1.5
Borrower credit history	1 - 2
Loan arrears history	1 - 1.5
Loan type and repayment method	1 - 3
Loan term	0.4 - 1.2
Loan seasoning	0.5 - 1
Property completion	1 - 1.5
Property size	1 - 1.25
Property insurance	1 - 1.1
Property occupancy	1 - 1.1
Geographical concentration	1 - 2
Regional adjustment	1 - 1.2
Originator adjustment	1 - 1.25

Source: S&P Global (China) Ratings.

We typically view the LTV of a loan as a major factor in predicting future mortgage performance. We may use an LTV curve to make upward or downward adjustment to the foreclosure frequency of a loan, depending on whether its LTV is higher or lower than the LTV of the archetypical loan. We generally view that the LTV of a loan is an indicator of the borrower's willingness to pay back the mortgage, given the equity at stake in the financed property.

A loan's original LTV (OLTV) is calculated as the original balance of a loan divided by the original valuation of the mortgaged property. A loan's current LTV (CLTV) is the current balance of a loan, reflecting the actual (or projected) principal paid down, divided by the indexed initial value or other updated value of the property. In the case where updated property value is not available due to limitations in indices or data collection, the LTV measure used to adjust foreclosure frequency may be based on the current loan balance and the original property value. We typically assume our benchmark loan has an LTV of around 65% (see chart 2).

Chart 2



Source: S&P Global (China) Ratings.

Loss severity typically reflects the unpaid loan balance after applying the liquidation proceeds from a loan's security property, expressed as a percentage of outstanding loan balance. Upon a borrower's default, a loan's loss severity may be affected by the LTV of the loan, the security property value decline at liquidation compared against the original appraisable value, the foreclosure expenses, the liquidation period, and the associated interest costs.

Upon default, several factors may deplete the collateral coverage available to a lender, resulting in the lender suffering from losses. These factors include:

- A possible decrease in collateral liquidation value due to the decline of security property market value (see table 4);
- The need to use property liquidation proceeds to cover liquidation costs; and
- The length of liquidation period and associated loss of interest payments while the borrower is in default.

The foreclosure periods may be varied, based on geographic location, property value, and type. An amount intended to approximate the selling and legal costs equal to RMB 2,000 and 12% of the value of the security property applies after considering S&P Global (China) Ratings' market value-decline assumptions. We also assume that while a loan is in default, accrued interest is typically calculated using an assumed recovery period of 30 months. The interest rate we may apply is typically determined based on S&P Global (China) Ratings' estimation of the expected interest rate under the assumed stress scenario.

Table 4

Archetypical pool market value decline and loss severity by rating scenario

Rating scenarios	AAA	AA	A	BBB	BB	B
Market value decline (%)	45	43	41	38	34	30
Loss severity (%)*	51	48	45	41	36	30

*For illustration purposes, loss severity is calculated assuming 12% variable selling costs, RMB 2,000 fixed selling costs, a property with average value of RMB 2 million, and an interest rate through accrual of 10%.

*All credit quality levels indicated above are S&P Global (China) Ratings credit opinions.

Source: S&P Global (China) Ratings.

As a result of any one or more of these factors, the adjusted liquidation proceeds may not be sufficient to repay the outstanding loan amount. The timing and size of the above-mentioned factors may also affect the availability of cash flow to meet timely payment of the RMBS.

We view that mortgage loan performance may also be influenced by an originator's operational framework, track record, and practices, including how they have changed over time. The strength of mortgage originator and/or originator platforms is typically reviewed based on quantitative and qualitative factors. The primary focus areas are generally management and organization, origination process and underwriting, and internal controls. However, if we deem other areas to be relevant to our analysis, we may also include them in our review.

Payment Structure and Cash Flow Mechanics

We generally perform a cash flow analysis to determine if a transaction has sufficient credit and liquidity enhancement to make timely interest and principal payment by the legal final maturity of the securities being issued. We expect the asset cash flows to be able to withstand stresses commensurate with the ratings assigned to a security, and still meet payment obligations in a timely manner. Asset cash flows are typically generated from a combination of securitized assets, eligible investments, and any support facilities. Payment obligations may include the coupon and principal payments to the rated securities, as well as any fees and expenses of the ongoing management of the securitized assets, and other transaction expenses.

A cash flow analysis typically combines our qualitative and quantitative assessments of the amount and timing of asset cash flows available, as well as factors that may affect the cash flows. We may apply a range of stress scenarios to ascertain the amount of cash flow that is expected to be available to meet all required payment obligations in a timely manner. More specifically, when analyzing cash flow, we typically assess the robustness of structural mechanisms, the level of credit enhancements to absorb losses, the level of collections after stresses to cover expenses and coupon payments, and the amount of liquidity to meet timely payment under the relevant rating scenarios. Where an issuer has an option to redeem notes before the legal maturity date (a clean-up call option), we typically assume the option will not be exercised, and analyze the tail-end risk when the transaction approaches its legal maturity.

For China RMBS, we typically analyze and stress the variables including default or loss rate, default or loss timing, voluntary prepayment speed, recovery rate, and recovery timing if applicable. Wherever relevant, we may also apply cash flow stresses to account for legal, operational, and counterparty risks that are not mitigated by the transaction structure. Examples include set-off losses, commingling losses, and interest rate or basis risk if the assets or liabilities are floating-rate and/or unhedged.

We typically consider cash flow modelling to assess any potential implications of various stress scenarios on cash flows. The stress assumptions for default timing (or “loss curve”) reflect our view on the distribution of loss within the transaction’s lifetime. The curve applied in our cash flow analysis also reflects consideration of the structure of the transaction. Our general view is that a majority of the defaults tend to occur within the first five years while the timing of default for loans originated in different vintages can vary with the timing of economic cycles. The standard curves may include base-case, front-end, and back-end assumptions for default timing. In addition to the standard stress scenarios, we may shift the default timing forward or backward or alter the pattern based on the specific transaction features and test the sensitivity of cash flows. For example, required payments on securities that are subject to pro-rata payment mechanisms may be more exposed when defaults occur later in the life of a rated security.

The amount of time it takes to realize recoveries ("recovery time lag") is, in our view, another important cash flow modelling assumption. After default, an asset generally does not produce interest collections, thus reducing the amount of interest collections available to pay interest on outstanding notes ("negative carry"). In our stressed cash flow modelling analysis, we generally assume that recoveries are received between 24 months and 36 months after default. However, we may alter the assumption if the actual recovery timing observed relating to a particular originator or servicer significantly differs from industry ranges and our standard assumptions.

Our standard annualized constant prepayment rate (CPR) assumptions for China RMBS typically include voluntary early principal repayments and exclude scheduled principal and unpaid principal due to arrears or defaults. CPR assumptions are generally calculated as a percentage of the current total portfolio principal outstanding (including scheduled principal payments for the current period). The standard prepayment rates typically range from 3% to 20%. The timing and magnitude of prepayments may affect the timing of principal repayment as well as the amount of excess yield that is available to cover credit losses and transaction expenses. We may adjust the voluntary prepayment stresses applied in our analysis to account for pool characteristics or structural features that, in our view, make alternative assumptions more appropriate.

While fees and expenses are typically stipulated in transaction documents, we assume that some unexpected costs and expenses may arise during the transaction's life, and that some transaction parties' fees may increase, especially when a replacement party is required. We would expect that free cash flows available, including any reserves, from securitized assets are sufficient to cover necessary costs and expenses and enable transaction parties to perform their responsibilities in managing the transaction and servicing the loan portfolio.

Where portfolios have a wide distribution of loan margins, we may model the asset portfolio’s margin compression in the cash flow analysis based on the portfolio’s yield distribution. The margin compression typically assumes that the loans paying the highest coupons are the first to exit the portfolio. The magnitude of spread compression may also depend on the dispersion of loan margins.

The rated securities should survive a range of scenarios from stress conditions at their rating levels.

Operational and Administrative Risks

The analysis of operational and administrative risks typically focuses on the participants in a transaction, such as the servicer, the trustee, the custodial bank, the paying agent and any other relevant parties, to consider their capability to perform their responsibilities related to a securitization over its life.

The analysis generally considers the possibility that a transaction’ s participants may become unable or unwilling to perform its duties during the transaction's life. We may consider the potential impact of a disruption in the participant’s services on the issuer's cash flows and the ease with which the participant could be replaced if needed. Generally, we would consider the following key performance attributes:

Table 5

Operational and administrative risks key attributes analysis

Key performance attributes	Negative example
Track record in asset class and role	The entity has experienced material performance failures in the past, and we believe there is a risk of an adverse ratings impact due to future nonperformance.
Experience and capacity	The entity has a low level of experience in view of the asset class and the complexity of its role, and we believe its service performance could be affected by the system's capacity or other operational issues brought on by its experience.
Quality of internal controls	We view the entity's ability to perform could be adversely affected because of weak internal controls (e.g., with regard to segregation of duties, review and approval authorizations, accountability of assets, or preventing/detecting errors or fraud).
Regulatory or legal issues	We view the entity's ability to fulfill its performance obligations is likely to be materially and adversely affected by ongoing regulatory, government, or legal actions.

Source: S&P Global (China) Ratings.

The analysis may also consider both the potential for hiring a substitute or successor and any arrangements that provide for a designated backup option. This part of the analysis typically considers whether the fee is sufficient to attract a substitute, its seniority in the payment priorities, and the availability of substitutes. In addition, we may also review the third-party due diligence results (if any) of the loans to assess the data quality.

Counterparty Risk

The analysis of counterparty risk typically focuses on third-party obligations to either hold assets (including cash) or make financial payments that may affect or support the rated securities' creditworthiness. Examples of counterparty risks may include exposure to institutions that maintain key accounts and exposure to the providers of derivative contracts such as interest rate and currency swaps. The counterparty risk analysis generally considers both the type of dependency and the credit quality of counterparties in a transaction.

The foundation of counterparty analysis is typically the assessment of exposure to counterparty risk and any remedies that may mitigate this risk, such as a contractual commitment the counterparty makes to take certain actions upon deteriorating creditworthiness. For example, we would expect counterparties to replace themselves within a reasonable timeframe in the event their credit quality ceases to be eligible.

Typically, the starting point in our analysis is to determine the applicable counterpart's credit quality. If the counterparty is rated by S&P Global (China) Ratings, the applicable counterparty rating would be used to determine the maximum supported rating on the securities. Where a counterparty is not rated by S&P Global (China) Ratings, we may assess its credit quality and consider whether its credit quality is sufficient to mitigate the counterparty risk on the rated notes. We typically expect the minimum eligible counterparty's credit quality (i.e., the level below which a counterparty typically commits to implementing remedies) to be equivalent to a high bbb level or above to be able to support an 'AAA' rating on the securities.

We would separately analyze and apply the maximum supported rating for the derivative obligations from the analysis of other obligations due to the specific considerations applicable to the analysis of derivative agreements (in particular, collateralization and termination events).

In summary, our framework for the analysis of counterparty risk would generally cover three broad fact patterns:

- The rating on the supported securities is not constrained by the credit quality on the counterparty because counterparty risk is mitigated by legal or structural factors. For example, we may consider that commingling risk is fully mitigated if our legal analysis concludes that the issuer would not be exposed to commingling risk upon a counterparty insolvency or if structural mechanisms in the transaction protect the issuer from any loss or delay in receiving funds upon a counterparty insolvency.
- The rating on the supported securities may be higher than the counterparty's credit quality because counterparty risk is mitigated by the counterparty's commitment to taking certain remedial actions if its credit quality falls below a certain level.
- The rating on the supported securities is no higher than the credit quality on the counterparty because the counterparty does not commit to taking any appropriate remedy actions when necessary or because we have determined that the materiality of the counterparty risk is too great to be mitigated by any remedies. We would generally reach this conclusion if the counterparty is substantially the sole source of repayment for the supported security, as in a credit substitution. In determining whether a specific exposure matches this description, we may consider the exposure's nature, size, and duration.

Legal and Regulatory Risks

The analysis of legal and regulatory risks typically focuses on the asset isolation and the insolvency remoteness of special-purpose entities (SPEs) in structured finance transactions. SPEs are entities that are typically used in a securitization transaction to house the assets that support the payment obligations on the securities issued by the SPE. SPEs are typically structured to minimize the risk of their insolvency (voluntary or involuntary). We typically consider related legal issues that may affect insolvency remoteness, including claw-back risk, set-off risk, and tax risk, etc.

We may consider the extent to which a securitization structure isolates the securitized assets from the insolvency risk of the entities that participate in the transaction. Typically, our analysis focuses on isolation from the entity or entities that originated and owned the assets before the securitization transaction. A true sale of assets from the originator/seller to an insolvency-remote issuer is one method commonly used to achieve asset isolation in a securitization. From a legal perspective, a true sale is generally understood to result in the assets ceasing to be part of the seller's bankruptcy or insolvency estate. There might also be other legal mechanisms, apart from true sale, that could achieve analogous isolation.

We may assess various legal risks that we view as relevant to our analysis of creditworthiness based on factors including, but not limited to, the review of information, documentation, and/or legal opinions.

Other Considerations

We may apply additional quantitative and/or qualitative analysis in certain limited circumstances, where a particular transaction or the loans collateralizing a particular transaction have factors or unique features that may affect our rating determination or view of necessary credit enhancement at a given rating level.

Surveillance Considerations for Securitization

Our view on the credit quality of a pool of assets may change over time and reflect performance of the assets and changing market conditions, amongst other things. Through our ongoing

surveillance, we typically consider the portfolio performance on a periodic basis, based on information regarding the observed performance and other factors we deem relevant.