

Rating Methodology

2 August 2022

Chinese Non-Performing Loan Securitizations

Structured finance rating methodology

CCXAP publishes the methodology for Chinese Non-Performing Loan Securitizations.

Summary

China Chengxin (Asia Pacific) Credit Ratings Company Limited (“CCXAP”) publishes the methodology for assessing the credit quality of Chinese non-performing loan (“NPL”) securitizations. The methodology applies to securities backed by NPLs originating in China. NPLs are loans that are delinquent or in default at the time of securitization or there are signs that the borrower cannot repay the loan principal and interest on time in line with the loan agreement, which are substandard, doubtful, and loss according to loan classification.

The methodology introduces the key determinants for rating Chinese NPL securitizations and explains in detail our approach to assessing each key rating determinant. In applying this methodology, the Credit Rating Committee will consider all factors deemed relevant, including not only quantitative analysis such as model outcomes, but also various qualitative and other factors.

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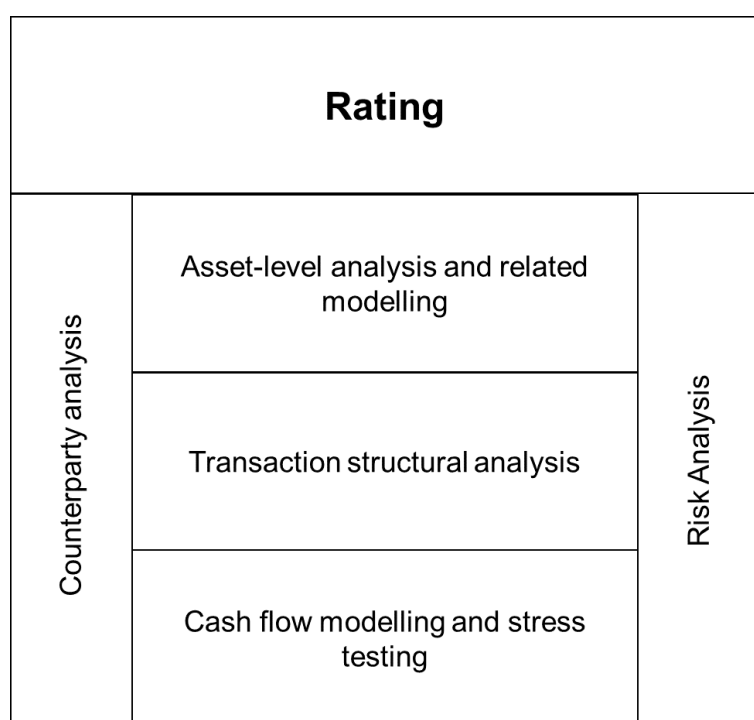
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Introduction of Rating Methodology

Our analysis of NPL securitizations is based on five key factors listed in Exhibit 1 to assess its risks, including (1) asset-level analysis and related modelling; (2) transaction structural analysis; (3) cash flow modelling and stress testing; (4) risk analysis; and (5) counterparty analysis.

We build an asset recovery model or other quantitative analysis model based on the recovery characteristics of the underlying assets, and construct cash flow model based on transaction structures. Our ratings are based on the expected loss and recovery timing of non-performing assets, which are generated by combining recovery and cash flow models. In addition to quantitative analysis including model outcomes, we also consider various qualitative factors, such as different types of risks and counterparty credit quality. Taking these qualitative factors into consideration could cause the committee to adjust the ratings indicated by the model output.

Exhibit 1: Overview of CCXAP's approach to NPL securitizations' rating assessment



Source: CCXAP research

Key Rating Drivers

1. Asset-level Analysis and Related Modelling

Asset-level analysis is a fundamental part of credit analysis of NPL transactions. The underlying assets are mainly overdue loans, and the source of cash flow is the recovery of non-performing loans. Due to the large uncertainty in recovery, we mainly focus on the expected recovery rate and expected recovery timing in order to construct the recovery distribution of the underlying assets.

(1) Product Features

We evaluate the product features based on six aspects: debtor's credit, guarantee, disposal, overdue time, collection policy, as well as economic, legal, and regulatory factors.

- **Debtor's credit:** We consider the debtor's repayment ability and repayment willingness corresponding to NPL transactions by investigating the debtors' business status, shareholder background, asset composition, and debt burden.
- **Guarantee:** We consider whether NPL transactions adopt guarantees, mortgages, and pledges. If the product is guaranteed, the credit quality and guarantee strength of the guarantor should be examined. If the product is secured by a mortgage or pledge, the current status, value and realization of the mortgage and pledge should be reviewed, such as the calculation of the loan-to-value ratio (LTV).
- **Disposal:** The final recovery amount and recovery timing for different disposal methods of NPL transactions, such as the collection, reorganization and transfer of these transactions, will vary. When the resolution involves judicial proceedings, factors such as the validity of the claim and the regional judicial environment will be considered.
- **Overdue time:** The longer the non-performing loans are overdue, the less likely they will be repaid.
- **Collection policies:** After a loan default, the servicer is responsible for collecting recoveries from the borrower. The collection methods, collection frequency, incentive measures, and local judicial environment of the servicer are all key to evaluating the collection policies and their effectiveness.
- **Economic, legal, and regulatory factors:** We analyze the macroeconomic environment, the regional economic development and industrial structure, the development status of the industry, and the regional judicial environment. In our view, all factors are highly correlated to the recovery amount and recovery timing of NPL transactions.

Exhibit 2. Major Considerations of Non-performing Assets

Rating Factors	Sub-factors	Considerations
Debtor's Credit	Operational Conditions	Business as usual, out of business or bankruptcy
	Shareholder Background	State-owned or privately-owned
	Assets and Liabilities	Asset pledge, seizure/freeze, total debt, and repayment rank
Guarantee	Guarantee Method	Guarantee, mortgage, or pledge
	Guarantee Strength	Credit status of the guarantor Validity and evaluation of the collateral
Disposal	Disposal Plan	Liquidation, reorganization, or transfer
	Disposal Stage	Litigation stage
	Disposal Obstacles	Judicial environment, local policies, and government factors
Overdue Time	Overdue Time	Overdue time
Collection Policies	Collection Policies	Collection methods, collection frequency, incentives
Economic, Legal, and Regulatory Factors	Macroeconomic Environment	Macroeconomic cycle, GDP growth rate
	Regional Economy	Economic development and industrial concentration
	Industry Cycle	Expand, stabilize, or shrink
	Judicial Environment	Local court judgments, enforcement efficiency

Source: CCXAP research

(2) Recovery Valuation

The specific approach that we use to analyze asset pools and generate expected recovery amount (distribution) and expected recovery timing (distribution) depends on the types of underlying asset, the quality of data available, and the number of assets in the pool. This section describes our analytic approach to estimating two key drivers of a portfolio's cash flow: recovery amount and recovery timing.

Loan-by-loan analysis: For asset pools with a large proportion of single loans and a small number of transactions, such as secured NPLs, we use the loan-by-loan analysis method. We conduct a detailed assessment loan-by-loan, using the process of due diligence to derive recovery amount and timing for each loan in the portfolio, taking into account the characteristics of the borrower, the loan itself and any underlying property securing the loan, as well as any jurisdiction-specific circumstances. Detailed information on different types of collateral such as residential property, commercial property, plant, machinery, and land will be included in our analysis. We also include reviews of any third-party verification reports, if applicable. For each loan, we estimate the remaining time to recovery based on the recovery procedure in the context of the relevant enforcement framework, which determines its expected recovery timing. The expected recovery amount is based on the following formula:

$$\text{Recovery valuation} = \text{borrower recovery} + \text{guarantor recovery} + \text{collateral recovery} + \text{other recovery}$$

In addition to other considerations, such as asset disposal strategy, current delinquency status, and legal proceedings related to each loan, we also revise the above valuation based on the historical disposal situation of the region, regional economy, industry development, judicial environment, and other external information obtained from other sources. In this way, the recovery amount and recovery timing distribution of the loan can be obtained.

Sample analysis: For asset pools with large transaction volumes and scattered underlying assets but insufficient historical data or lack of good statistical characteristics, we generally use the sample analysis method. We select samples from the asset pools in terms of region, industry, or mortgage and pledge factors, according to the principles of importance and representativeness. We first analyze the sample pools one by one like a loan-by-loan assessment to derive the recovery amount and timing of each sample loan, and then use the sample pool analysis results as the basis for the entire asset pool analysis.

Dynamic analysis of historical data: Dynamic analysis of historical data is adopted for asset pools with large transaction volumes and scattered underlying assets. The premise is that the originators can provide valid historical data. The analysis of the unsecured NPLs such as credit card loans, consumer loans, and car loans are suitable for this method. We apply a statistical approach based on historical data provided by the same or comparable originators. Typically, the older the loan, the lower the expected recovery. After that, we calculate the mean and variance of the recoveries as a function of time since origination. Ideally, the time span of historical data provided by the originators should be more than 5 years, and the recovery of NPL groups with different formation times should be counted at regular intervals (i.e., monthly, quarterly, semi-annually, or annually).

The current recovery rate is based on the time when the NPL assets are formed, and the ratio of the amount recovered in each subsequent period to the outstanding principal balance at the beginning of the current period is calculated.

$$\begin{aligned} \text{Outstanding Balance}_{(t)} &= \text{Outstanding Balance}_{(t-1)} - \text{Recovery}_{(t)} \\ \text{Recovery Rate}_{(t)} &= \text{Recovery}_{(t)} / \text{Outstanding Balance}_{(t-1)} \end{aligned}$$

We can model recoveries as a function of the initial balance of each cohort (a static variable), or as a percentage of the previous period of balance of such cohort (a dynamic variable). For fixed time interval in years, the current recovery rate of the 1st period = the recovery amount of the 1st period / the outstanding balance at the beginning of the 1st period, where the 1st period refers to the recovery amount within 1 year starting from the time when the NPLs are formed. The recovery rate of the 2nd period = the recovery amount of the 2nd period/the balance of the outstanding at the beginning of the 2nd period, where the 2nd period refers to the recovery amount between 1 to 2 years from the time when the NPLs are formed, and so on.

Exhibit 3. Recovery Rates of Current Year Balance (Example)

Recovery Period	Year of Origination						...	Mean	Sd	CV
	2016	2017	2018	2019	2020	2021				
1	7.2%	9.6%	9.7%	7.5%	7.5%	7.8%		7.5%	1.5%	20.0%
2	6.2%	5.0%	5.2%	4.1%	5.0%	4.7%		4.6%	1.2%	26.1%
3	3.2%	3.1%	4.0%	3.2%	2.7%	2.4%		3.1%	1.0%	32.3%
4	4.8%	5.3%	5.6%	3.8%	3.9%	3.7%		4.1%	0.8%	19.5%
5	2.8%	3.0%	2.7%	2.2%	2.5%	2.9%		2.7%	0.6%	22.2%
6	2.2%	2.1%	1.6%	1.5%	1.7%	2.4%		2.0%	0.4%	20.0%
7	2.5%	1.6%	2.0%	1.8%	2.3%	1.8%		2.0%	0.5%	25.0%
...										

Source: CCXAP research

(3) Monte Carlo Simulation

Monte Carlo Simulation is used to generate the recovery distribution of the asset pools, where a Beta distribution is typically chosen. In the simulation, we generally use the estimated recovery rate of each asset or each asset group obtained from the above recovery valuation as a reference for the mean of the recovery distribution of the asset or the asset group. The standard deviation of the recovery distribution of the asset or asset group is derived from practical experience, or the volatility obtained from historical data. However, we will consider other alternatives where the Beta distribution does not seem to fit the data. The estimation of the average recovery and volatility also considers other factors such as macroeconomics, industry policies, and the collection environment. Therefore, appropriate adjustments to the mean and standard deviation of the recovery distribution are required. Additionally, we may consider systemic risk correlations in the simulations.

2. Transaction Structural Analysis

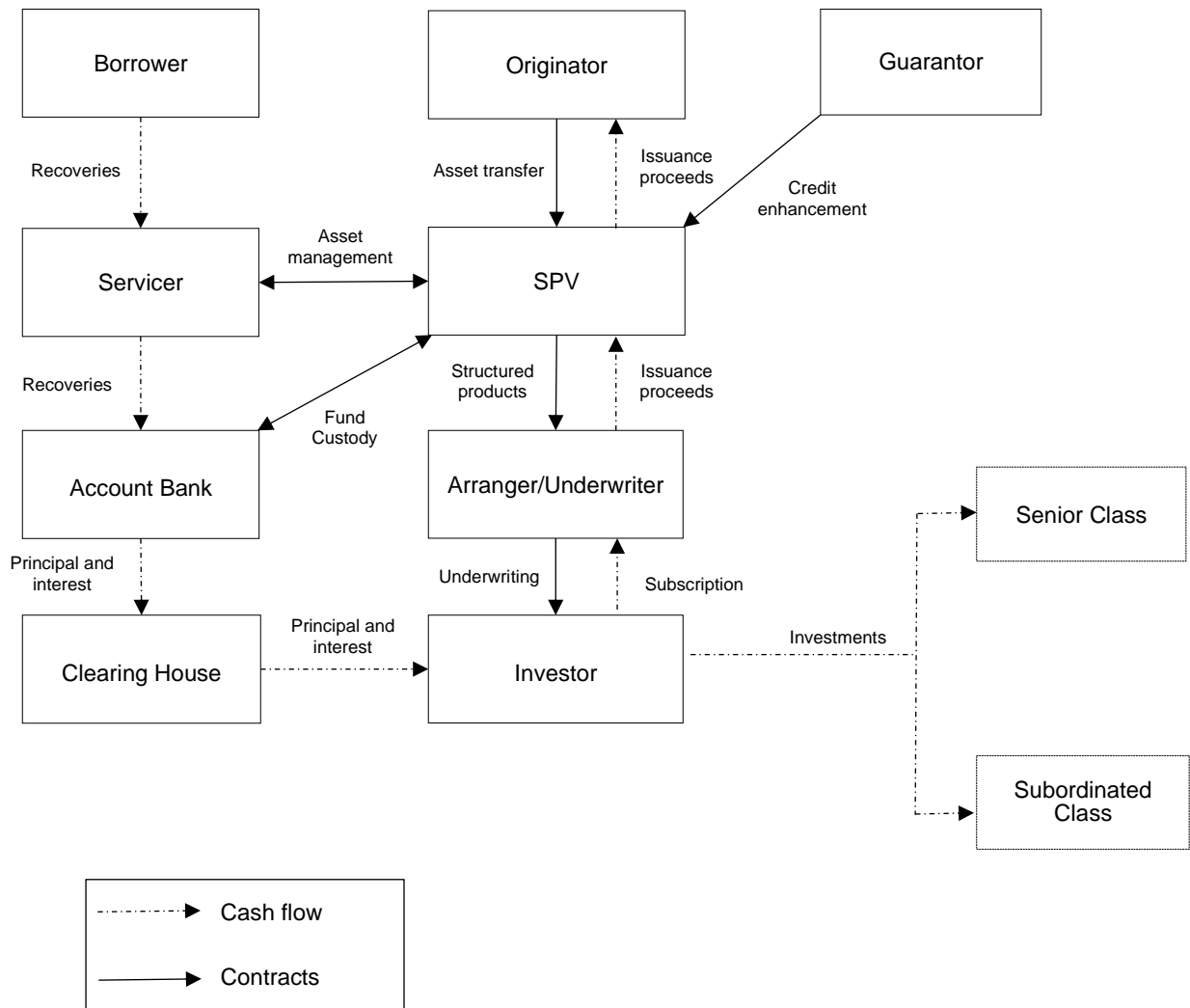
The transaction structure is determined by the counterparties to the transaction in the form of contracts to realize their ultimate interests in the transaction. The transaction structural analysis of NPL transactions is based on transaction documents, which consist of the transaction purpose and applicable conditions. The feasibility of structural design is also considered, including asset entrustment or transfer method, cash flow collection and distribution mechanism, credit enhancement mechanism, and credit trigger mechanism. Generally, NPL transactions are static cash flow structures, and the products do not involve recurring purchases.

(1) Legal Structure

In NPL transactions, the bankruptcy isolation of the underlying asset from the originator is usually achieved by establishing a special purpose vehicle (SPV). We review transaction documents and related legal opinions to determine their impact on the transaction structure and whether collateral pools are isolated from the insolvency risk of entities participating in the securitization.

We evaluate the effectiveness of the asset sale and bankruptcy isolation by analyzing the possible impact of originator bankruptcy on the transaction and examining whether the cash flow of the underlying assets will suffer delays or shortages as a result. The underlying assets are transferred from the originator to the SPV, which acts as the new creditor. Ideally, in the event of insolvency of the originator, the underlying assets transferred to the SPV will not become part of the originator's bankruptcy estate.

Exhibit 4. Transaction Structure of NPL Securitizations



Source: CCXAP research

(2) Collection and Distribution Mechanism

We assess the risk of cash flow mismatches and any collection and distribution mechanisms that can mitigate this risk. Among them, various transaction fees related to the establishment of products are usually paid first; the setting of transaction accounts and the collection and transfer of funds are important in cash flow supervision and prevention of capital mixing risks; the distribution sequence of asset income under different scenarios should match the hierarchical design of product structure.

(3) Credit Enhancement

When the credit of the underlying assets is insufficient to support the credit level required for the issuance of structured products, credit enhancements are often provided through subordination, over-collateralization, reserve funds, as well as third-party guarantees. We review below the effectiveness of the composition of credit enhancement in NPL transactions.

- **Senior/Subordination:** Due to the volatility and uncertainty of cash flows in NPL transactions, a simple sequential structure that allocates principal top-down from the senior to the subordinate classes and provides a form of credit enhancement by amortizing the senior notes at a faster pace.
- **Over-collateralization:** The issued amount of NPL transactions is generally smaller than the principal balance of the underlying assets, and the excess assets are first compensated when losses occur. Since the recovery amount of NPLs is often lower than the principal balance, the issued amount of NPL transactions should be smaller than the principal balance of the underlying assets, thus forming an amount of over-collateralization, which can provide credit support for the senior class.
- **Reserve funds:** The amount of taxes, fees, and interest on the senior class that are paid in the later stage of the transaction is retained in advance, so as to make up for the liquidity risk that may arise in the process of product repayment in the future.
- **Third-party guarantees:** Third-party guarantees refer to the provision of guarantees, shortfall commitments or liquidity support for the repayment of structured products through external institutions. As the recovery of NPLs is uncertain and the cash flow is relatively unstable, liquidity support institutions are often used for NPL transactions to provide guarantees for product interest payments and to alleviate the liquidity risk caused by unstable cash flow. Therefore, third-party guarantees can provide some credit benefits for the transaction.

(4) Trigger Mechanism

The credit trigger mechanism includes changing the cash flow payment sequence, supplementing cash flow, increasing the frequency of cash flow collection, and strengthening the independence of the underlying assets when there is a situation that is not conducive to the repayment of structured products (trigger conditions). It is a way to ensure that the principal and interest of structured products are paid.

- **Changes in operating conditions of counterparties.** Major counterparties include originators, servicers, fund custodians, and credit enhancers. When the operating conditions of counterparties deteriorate, it may affect the recovery and circulation of the cash flow of the underlying assets of the structured products. This triggers the accelerated collection and repayment mechanism of cash flow of structured products, as well as rights improvement events, reducing the possibility of credit risk.
- **Performance of underlying asset.** The setting of trigger conditions is generally based on the quantitative indicators of the asset pool. If the asset pool deteriorates to a designated level (triggering condition), it will trigger the accelerated repayment of structured products to give priority to the repayment of investors in senior class.
- **Repayment of senior class.** The transaction documents stipulate that a credit trigger event will be determined when the payment of principal and interest of the senior class deteriorates. The payment sequence after the occurrence of the credit trigger event will be used to guarantee the payments of the senior class.

3. Cash Flow Modelling and Stress Testing

We incorporate a cash flow model to replicate the transaction's structural features including cash flow distribution, credit enhancement, and trigger mechanisms. The expected loss rate and expected recovery timing

are obtained as model results for mapping the rating of the products. Specifically, we calculate the expected loss rate and expected recovery timing of NPL transactions under each recovery scenario that are derived from the recovery valuation model. The finalized expected loss and expected life are calculated by combining the probabilities of each recovery scenario derived from the recovery valuation model.

$$\text{Expected loss} = \int \text{Loss}(x) * f(x) dx$$

$$\text{Expected Life} = \int \text{Life}(x) * f(x) dx$$

where x is the recovery scenario; f(x) is the probability that the recovery scenario x occurs.

(1) Cash Flow Model

The asset-side cash inflow model is the cash inflow distribution of the underlying assets, that is, the amount and time of inflow. In NPL transactions, the cash inflow model mainly describes the amount and time of recoveries, and the main parameters include the recovery model and the distribution of recovery timing. The product-side cash outflow model is the cash inflow calculated by the asset-side cash inflow model, which is paid to participating institutions and product investors in accordance with the sequential pay structure agreed in the transaction documents. Key parameters include senior/subordinate ratio, over-collateralization ratio, reserve funds, taxes, and thresholds of trigger mechanisms. The expected issuance rate of the product is the main assumption.

(2) Stress Testing

Based on the cash flow model, we adjust the cash flow model parameters and assumptions to evaluate the expected loss rate and expected recovery timing under various stress scenarios. Then, the credit support level required under the corresponding rating of the rated product is obtained. The stress test parameters related to NPL transactions mainly include recovery timing, interest spreads, as well as combinations.

Exhibit 5. Parameters of Stress testing

Stress parameters	Stress range
Recovery timing	Increase recovery time
Asset-side and product-side interest spreads	Reduce interest spreads

Note: The stressed conditions and levels depend on the characteristics of NPL transactions

4. Risk Analysis

(1) Liquidity Risk

Liquidity risk is a major risk in NPL transactions as the cash flows generated by the underlying assets are volatile and difficult to determine with precision, and collections can be delayed for unforeseen reasons. However, the interest and taxes payable on the issued products should be paid regularly. We consider whether cash flows from assets and other sources are sufficient to pay the senior class interest and the various taxes that must be paid before the senior class interest. We mainly focus on the cash flow characteristics of the NPL transactions, the credit enhancement or reserve funds in the transaction structure, the fund transfers from the principal account to the income account, as well as the credit status of the servicers to evaluate the liquidity risk of the transactions.

(2) Legal Risk

The nature of the NPL transaction means that after the originator or seller legally and validly transfers the NPL assets, it can be issued by SPV to form a legal structure that achieves bankruptcy remoteness. Therefore, it is necessary to pay attention to the inherent legal risks of NPL transactions when rating, including the bankruptcy isolation of the underlying assets and the originator, the validity of the transfer of the underlying assets, and the validity and enforceability of the transaction documents between counterparties. We attach great importance to clear and affirmative legal opinions issued by law firms.

(3) Commingling Risk

The default of the transaction servicer would mix up with the recovered amount of the underlying assets with other funds of the servicers. To assess the commingling risk of transactions, we focus on the transaction structure accounts, the commingling reserves, the collection payment transfer/transfer mechanism, as well as the credit quality of the servicer. The frequency of transfers and reserves in the product accounts depends on the entity rating of the servicers.

(4) Set-off Risk

The borrower corresponding to the underlying assets has a deposit in the originator and exercises the right of offset against the underlying asset to the originator. The receivables gross value may be reduced when the originator fails to pay the SPV the amount corresponding to the offset in a timely manner. In order to evaluate the set-off risk of a transaction, we focus on the transaction structure account, the set-off reserves, as well as the credit quality of the originator.

5. Counterparty Analysis

The responsibilities of the counterparties in NPL transactions cover the whole process from the collection and transfer of cash flow of underlying assets, to the disposal and recovery of defaulted assets, the custody and transfer of funds, and the repayment of products. The counterparties are originators, servicers, trustees, fund custodians, and credit enhancers. We evaluate the role and strength of the counterparties by analyzing their development history, shareholder background, operational and financial status, internal control system, governance structure, and risk management. We analyze counterparty risk through reviewing counterparty dependencies and evaluating counterparty creditworthiness. Specifically, we evaluate how risks are linked between the rated instruments and the various transaction parties.

The ability of servicers to extract value by managing enforcement proceedings or out-of-court negotiations is crucial in NPL transactions since impaired and defaulted loans require active management to extract cash flow. We consider the servicer's strategy, resources, incentives, as well as good working knowledge and abilities, which can be assessed from the historical data provided by the servicer.

- **Servicer expertise and track record:** The servicer in NPL transactions typically plays a critical role in determining the cash flow for securitization, as transactions rely on the expertise of the servicers to calculate the defaulted loans and maximize returns on assets. A servicer can have a positive impact on a transaction if it has a good track record of exercising various resolution strategies while providing the right incentives to maximize recoveries.
- **Servicer incentives:** We analyze the alignment of the interests of the servicer and those of the investors as it is highly related to the servicer's incentives. Thus, we evaluate the servicer's staked capital in the transaction, the payment of performance fees, as well as the bonus compensation

schemes. This feature incentivizes the servicer to maximize recoveries and adhere to the initial business plan.

- **Servicer business plan:** The future performance of the NPL transactions will be positive if the servicer's business plan is realistic. We determine the efficiency of the servicer's recovery strategy from work-out costs, work-out timing, and recovery amounts. Common strategies include the traditional legal proceedings to foreclose and disposal of assets backing defaulted loans, and the use of extrajudicial settlements either through discounted payoffs or restructuring of loans. Credit will be given by adjusting the agency's base-case recovery assumptions either on a loan-by-loan or a portfolio basis.

Assumptions and Limitations

The rating assigned is based on CCXAP's forward-looking opinions, in which we assume any changes in the macro-environment are in line with our expectations and do not incorporate any unanticipated changes, such as the outbreak of war and devastating natural disasters.

The structured finance rating assigned is based on our view that the expected losses and the likelihood that interest and principal will be repaid on time for the senior class of structured products. CCXAP's rating on structured products only represents the credit risk associated with the transaction and would not consider other non-credit risks that may affect investment returns. CCXAP's rating of structured products does not have clear one-to-one correspondence and stable base relationship with the default rates or loss rates. The rating symbol mainly reflects the relative ranking of the credit risk level of the rated product, rather than providing an absolute measure of default rates or loss rates.

In addition, some of the information and data in the rating of structured products rely on the information provided by other professional institutions recognized by regulators, and we assume that the data used in the rating is true, legal and does not contain misleading statements.

The structured finance rating incorporates our expectations of the rated security's future performance, which are mainly deduced from the historical information via our forward-looking models. The mathematical methods and quantitative models used are based on theoretical assumptions. Actual situations may differ from these theoretical assumptions, resulting in model risk. Moreover, the parameter assumptions used by the rating model are mainly based on historical data, which is limited and may not have experienced a full product cycle or economic cycle. As such, there is substantial uncertainty in the prediction and the mapped ratings sometimes may not match our final ratings. The ratings may include some qualitative factors. CCXAP will assess these factors in an objective and precise manner, but in some cases, the assessment may inevitably be influenced by subjective opinions.

Furthermore, the ratings rely on public information and information provided by the originators. Despite the fact that CCXAP will ensure the integrity, truthiness, and completeness of the data, due to the delay of information, the ratings may in some cases not reflect the rated security's credit risk in a timely manner.

Apart from that, the ratings are determined by our Credit Rating Committee and may be influenced by their empirical views that may not be incorporated into the rating methodology. As a result, the final rating may vary from the mapped rating from the methodology or quantitative model.

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