

# APAC Residential Mortgage Rating Criteria

## Sector-Specific Criteria

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### Amendment

This report, originally published on 7 July 2017, has been amended to correct the illiquid property adjustment for Australia on page 27 and clarify the thin tranche analysis for Australia and New Zealand on pages 28 and 37.

This report replaces the previous report dated 27 April 2017.

### Related Criteria

- [Global Structured Finance Rating Criteria \(May 2017\)](#)
- [Covered Bonds Rating Criteria \(October 2016\)](#)
- [Structured Finance and Covered Bonds Counterparty Rating Criteria \(May 2017\)](#)

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### Scope

This report specifies Fitch Ratings' methodology for assigning credit ratings to new and existing residential mortgage-backed securities (RMBS) transactions in Asia-Pacific (APAC). The methodology is also applied to asset analysis of APAC covered-bond programmes backed by residential mortgages. The criteria apply to the countries listed in the addenda to this report.

The criteria in this report supplement and are applied in conjunction with the applicable master and cross-sector criteria reports and sector-specific criteria. The key rating drivers below are all equally important to the analysis.

### Key Rating Drivers

**Macroeconomic Factors:** Residential mortgage performance is driven by the macroeconomic environment of the country as well as housing and mortgage market conditions. Fitch assesses these factors when setting assumptions for its asset and cash-flow analysis, reflecting changes in market dynamics over time.

**Asset Analysis:** Fitch's key parameters for assessing mortgage portfolio performance are: (i) foreclosure frequency (FF) rates — determined, where applicable, by the current loan-to-value (CLTV) ratio and borrower and loan characteristics; and (ii) loss severity (LS) rates, derived from either scheduled/current or indexed scheduled/current LVR (SLVR) market value declines (MVD) of foreclosed properties, foreclosure costs and recovery timing.

**Operational Risk:** There is a direct relationship between the quality of the origination and servicing processes and the performance of an associated mortgage portfolio. Fitch therefore reviews the activities of originators and servicers to assess their influence on transaction performance.

**Cash-Flow Analysis:** Fitch tests the issuer's ability to meet its obligations according to the financial structure defined in the transaction documents under various stress scenarios. The key drivers of this analysis are: asset FF and recovery rates (RR); timing of defaults and receipt of recoveries on defaulted loans; prepayment rates; interest rates; transaction and servicing fees; and the transaction's structure.

## Data Adequacy and Quality Review

Fitch relies on the accuracy of the factual information it receives from transaction parties and other sources it considers to be credible in issuing and maintaining its ratings. Fitch conducts a reasonable investigation of the factual information it relies upon in line with its ratings methodology and obtains reasonable verification of that information from independent sources to the extent such sources are available for a given security or in a given jurisdiction.

### Data Adequacy

Fitch expects to receive loan-by-loan collateral information to enable it to assess the credit quality of a mortgage loan portfolio. Although fundamentally uniform across APAC, the collateral information varies depending on the mortgage loans' country of origin. These variations are detailed in the country-specific addenda.

Fitch expects to receive the following historical mortgage performance information from lenders to rate new transactions:

- aggregate level lender arrears data and/or default data;
- prepayment data, for example, dynamic voluntary prepayments; and
- data on loan or aggregate-level recoveries or losses associated with foreclosed properties, including recovery timings.

The agency may use the data to benchmark the lender's performance and underwriting quality with comparable data from other lenders in the same market.

In some jurisdictions Fitch requests loan-by-loan data be provided on a regular basis for all transactions following the transaction closing, including loan-by-loan loss and recovery information for loans with properties taken into possession. Loan-by-loan data are not regularly provided to Fitch after closing in Japan and China, but the agency expects to receive such data, upon request, if pool performance deviates from its expectations or if call option conditions have been met and the transaction remains uncalled. The data are requested for surveillance purposes and criteria development.

The loan-by-loan information provided after closing may contain less detail about the original borrower and property characteristics than that provided prior to the transaction closing. In combination with the latest loan-by-loan information, Fitch, where possible, will use detailed data about the borrower and property characteristics that was provided prior to closing.

Fitch expects to receive detailed asset performance data for each collection period, including the following:

- end-of-period asset balance;
- end-of-period delinquent asset balance by delinquency category;
- principal collections;
- interest collections;
- balance of newly defaulted assets;
- recovery amounts; and
- balance of loans repurchased, if applicable.

In addition, Fitch expects the following data to be reported with respect to each payment date:

- end-of-period note balances;
- principal distributions to noteholders;
- interest distributions to noteholders;
- end-of-period cash account balances;
- cash account draws/deposits;
- period excess spread (ExS); and
- other issuer income and distributions.

A summary of the performance data is regularly reported on Fitch's website at [www.fitchratings.com](http://www.fitchratings.com)

### Quality Review

Fitch expects its initial assessment of portfolio data to be supported by an agreed-upon procedures (AUP) report. AUP reports are prepared by auditing firms typically selected by the arranger or originator to assess the error rate in loan-by-loan collateral data compared with the information in the originator's source documents. In the absence of an AUP report, the agency performs a file review to assess the general reliability of the data provided.

Before its initial analysis, the agency reviews a small targeted sample of origination files to assess whether the information contained in the files is consistent with the originator's policies and practices and the other information provided to the agency about the asset portfolio. In its ongoing surveillance of existing transactions, Fitch does not receive AUP reports or review originator files if new assets cannot be added to the portfolio.

The analysis begins by reviewing the data that will be used, including a comparison of data from multiple sources to identify discrepancies, and of trends over time to identify missing information or unusual movements or figures, which might indicate a reporting error.

Fitch investigates and resolves any identified potential data issues prior to its initial or surveillance analysis of a transaction. Where data does not meet expected standards, the agency may apply conservative adjustments to account for any insufficiencies in the quality or quantity of the data provided – for example, lack of loan-by-loan collateral information on specific product types – if suitable proxy or supplemental information is not available. If data critical to the analysis is determined to be insufficient, Fitch may decline to rate a transaction, implement a rating cap or withdraw the related ratings.

### Criteria Assumptions

Fitch combines data with knowledge and judgment to develop the analytical assumptions utilised within its loan-by-loan asset model.

Fitch uses the following information to derive, monitor and back-test its FF assumptions and base standard loan FF adjustments as well as its LS assumptions, including MVDs, foreclosure timing and foreclosure costs:

- aggregate and/or loan-by-loan issuer/lender information on delinquencies, defaults, foreclosures, arrears and losses for Fitch-rated RMBS transactions;
- aggregate static portfolio performance information by origination vintage from lenders' mortgage insurers, lenders and other Fitch-rated RMBS transactions;
- other economic information, such as GDP growth, unemployment trends and interest rates, reported by government statistics offices, central banks and similar institutions;
- other research studies;

- historical national home-price indices; and
- discussions with arrangers, lawyers and other third parties

### Establishing Rating Stresses

At lower rating levels, Fitch derives expected FF and LS that consider expected economic and housing-market dynamics.

Fitch derives a 'Bsf' FF assumption by adding an appropriate buffer to the expected FF. The buffer depends on various factors, such as: data history, data quality, recent changes in market practices or products or market dislocations; and will vary across jurisdictions. During benign periods, the 'Bsf' FF may be floored at levels above the recent long-term average.

In calculating LS, Fitch's home-price expectation reflects the immediate expectation for a fall in the value of a property in possession and feeds into the MVD assumptions. Home-price decline (HPD) expectations are similarly adjusted, based on Fitch's analysis of home-price trends and market liquidity. The 'Bsf' HPD incorporates Fitch's expectations of HPD plus a buffer. As such, MVDs are dynamically adjusted to take into account the upward or downward movements in the home-price index.

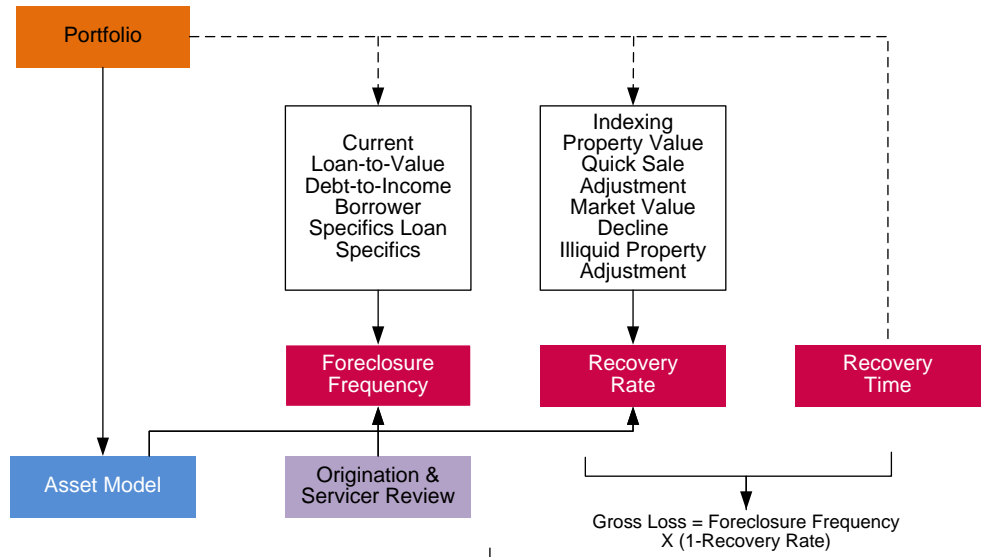
Assumption stresses are defined by rating category rather than at each rating level. For intermediate rating scenarios, Fitch interpolates between the results of the asset model for the adjacent rating categories. For instance, the FF at the 'AA-sf' and 'A+sf' rating levels are derived by interpolating the 'AAsf' and 'Asf' FF.

Fitch may assign ratings higher than the Local-Currency Issuer Default Rating (LC IDR) of the corresponding sovereign if an assessment of the effect of a sovereign default can be made in the corresponding rating scenario. Refer to the report titled [Criteria for Country Risk in Global Structured Finance and Covered Bonds](#).

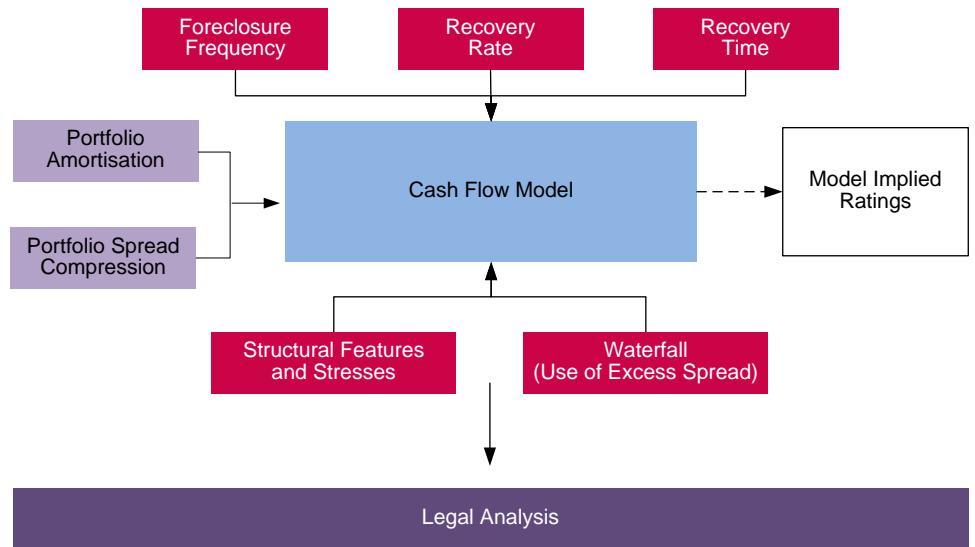
### Rating Approach

An example of Fitch’s rating approach when assigning new ratings is shown below.

#### Asset Analysis



#### Cash Flow Analysis



Source: Fitch

### Asset Analysis: Models

The mortgage pool loss analysis begins by estimating future losses on the mortgage loan pool in the expected case and stressed rating scenarios. In its initial rating analysis, Fitch uses a loan-by-loan asset model to derive key loss indicators. For ongoing surveillance, Fitch uses the same loan-by-loan asset model, except for some Australian transactions, where performance is measured against pre-determined triggers (see below), and Japanese and Chinese transactions, where key performance indicator trends, including arrears and defaults, are compared with Fitch's initial or revised (if any) expectations.

Where ongoing performance deviates from Fitch's expectations to the extent that it cannot be sufficiently offset by mitigating factors, such as credit enhancement (CE) build up, and where loan-by-loan data are provided, the asset model is re-run unless the committee is sure that there would be no rating action if the default model was run. If such loan-by-loan data is not provided, Fitch may withdraw the ratings on the basis that a robust rating opinion cannot be maintained.

The asset model calculates FF, RR and LS for each loan and aggregates these for the pool using the current balance for FF and the scheduled balance (or the current balance if the scheduled balance is unavailable) for RR and LS. The loan's FF is used as the weighting for LS and RR. Fitch uses the latest available loan product, borrower and property characteristics to calculate FF. This usually comes from the loan origination date, unless the original terms have been modified.

After transaction closing, more information is available about the ongoing performance of the underlying loans. To derive appropriate base FF adjustments for surveillance, the analysis combines the latest available loan-by-loan level data with the more detailed data provided prior to closing, where available.

If the portfolio includes flexible mortgage loans, where borrowers can redraw the capital amount already paid down or draw up to a predefined limit, Fitch uses the maximum potential drawn amount to determine LS and RR. Any charge over the property that has priority to the mortgage in the portfolio under analysis is also considered.

Ratings are ultimately assigned by a Fitch credit committee that considers model outputs together with other quantitative and qualitative factors. These include historical data available for the originator and the market in general and Fitch's expectations for the macroeconomic variables affecting portfolio gross loss performance.

The asset model may not be run for Australian conforming transactions without revolving periods if the following conditions are met: the outstanding ratings are either only 'AAAsf' and/or a rated junior note is present with no subordination; and a review of pre-determined performance triggers on measures such as arrears, losses, lenders' mortgage insurance (LMI) payment ratios, CE build-up and draws on any liquidity support facilities indicates the transaction displays stable asset performance.

### Asset Analysis: Foreclosure Frequency

The base FF reflects the risk of a standard mortgage loan defaulting. A standard mortgage loan reflects typical borrower characteristics, including LVR, borrower financial strength and product characteristics, such as interest-rate type and payment frequency.

### Ability/Willingness to Pay

A borrower's ability to meet periodic mortgage payments is dictated by the relationship between their income and the mortgage debt burden, including interest and principal. Fitch uses the LVR as the primary driver of an ability/willingness to pay. Where information on income and the mortgage debt burden is available, Fitch calculates a borrower's stable debt burden-to-



borrower income (DTI) ratio using a stressed interest rate, which is then utilised to adjust the FF (see country addendums). In jurisdictions where DTI is not available, LVR is used as the sole driver of willingness to pay.

For second-charge loans, Fitch uses information on both the first and second charges when calculating DTI. Where this information is unavailable the agency may utilise conservative assumptions or decide not to rate the transaction.

A borrower's willingness to pay is indicated by the amount of equity invested in the property; that is, the borrower's LVR calculated using the latest valuation at or before origination. A borrower's perception of the magnitude of their own equity, or wealth, invested in the property significantly affects the likelihood of default when the borrower is in financial distress.

Where evidence supports use of another indicator, such as original or SLVR, Fitch will use the alternative, as specified in the country-specific addenda.

### Foreclosure Frequency Matrix

Fitch assigns individual borrowers a base FF in APAC jurisdictions, other than China.

### Adjustments to Base Foreclosure Frequency

Fitch adjusts the base FF on a loan-by-loan basis in each rating category to account for individual borrower, loan and property characteristics. These adjustments are derived from analysis of either historic loan-level or aggregate-level performance data. Where available data is limited, Fitch uses judgement and benchmarks to other countries to supplement its derivation of adjustments.

The country-specific criteria addenda provide details on specific adjustments applied in particular jurisdictions.

### *Lender Adjustment*

A lender adjustment is applied on a portfolio-wide basis to reflect variances from the originating practices of an average standard lender. Factors considered in this assessment include: the general robustness or otherwise of underwriting standards; origination practices, such as internal quality controls; appraisal techniques and underwriter's experience and performance record; historical default performance of the lender's mortgage book; and available historical market data. A lender adjustment is not applicable to countries where there is one lender.

Fitch uses data received from lenders, along with information gathered at the onsite review visit, to benchmark the lender against industry peers and determine the appropriate lender adjustment. Lender adjustments are a multiple to the base FF and will not exceed 10%, applied either positively or negatively. Fitch also reviews recent material changes to origination and underwriting practices that apply to vintages specific to the transaction analysed and reflects its views in the lender adjustment.

If Fitch applies a lender adjustment at the initial rating stage it will continue in surveillance, if warranted.

### *Borrower-Specific Adjustments*

Borrower-profile adjustments to base FF vary by country depending on borrower characteristics. Examples of such adjustments include employment type, for example, self-employed, and adverse credit history.

- Fitch sees self-employed borrowers as having a greater probability of default than those paid a salary. A borrower on a fixed monthly salary is more likely to be able to make periodic mortgage payments than a self-employed borrower who generates income from

their own business and is more susceptible to economic cycles and business interruption risk.

- In the non-conforming sector, Fitch adjusts for borrowers with adverse credit history, such as bankruptcies, prior defaults or court judgements. Borrowers who have had payment problems in the past are more likely to default.
- For loans to non-residents, Fitch increases the FF because these borrowers do not have the same motivation and incentive to pay and are more likely to abandon the property. In addition, cross-border credit checks are potentially weaker than for residents and more difficult to perform, especially when the borrower is in arrears.

Where applied, borrower specific adjustments are detailed in the individual country addenda.

The term “non-conforming” has no industry-defined standard. Fitch generally defines non-conforming as a loan that has one or more of the following characteristics: impaired credit loans – loans to borrowers with chequered credit histories; jumbo loans (particularly large loans); low-documentation loans (loans to borrowers who cannot or will not substantiate their incomes) or loans secured by property or income types normally excluded from conforming lending standards.

Fitch determines whether a loan or pool of loans is classed as conforming or non-conforming, and therefore the base FF matrix to be used, based on an assessment of the loans’ performance over a sufficiently long period. Furthermore, to be classified as conforming, loans generally need to have been underwritten using policies and procedures that are typical of the conforming market as a whole. If data cannot be provided that indicates that a loan is conforming, then the non-conforming matrix will be used.

If a jurisdiction does not have a non-conforming matrix any borrower-specific adjustments to differentiate between a conforming and non-conforming loan will be detailed in the individual country addenda.

#### *Loan-Specific Adjustments*

Fitch makes adjustments to the base FF of each loan based on various loan characteristics, including, repayment type (for example, interest-only) and low-documentation loans. The type and size of product-specific adjustments vary across countries and depend on the nature of products available in that specific mortgage market. Detailed examples of typical loan-specific adjustments are set out below.

- The FF for interest-only loans is adjusted because borrowers with potential affordability problems are more likely to select an interest-only loan to lower the size of their monthly instalment. Fitch regards these loans as being more risky than amortising loans because the borrower may incur payment shock when the loan switches from interest-only to interest and principal or may not be able to repay the debt in full at maturity if there is no amortisation.
- Fitch increases the base FF for low-documentation borrowers because they are not required to provide full documentation to verify their income and lenders perform varying degrees of due diligence on the declared income. This leads to the risk that borrowers misrepresent their income and consequently affordability is overstated.

#### *Property-Specific Adjustments*

Fitch adjusts FF for investment properties as a financially distressed borrower is more likely to default on such a mortgage than on a mortgage secured by their primary residence.

If a jurisdiction applies property-specific adjustments differently to that outlined above this will be detailed in the individual country addenda.



**Geographical Concentration**

Fitch assumes the mortgage portfolio is geographically diversified within each country or reflects the average geographic distribution of the country's property stock. The agency adjusts its base FF assumptions to account for portfolios with significantly higher-than-average regional concentration to reflect the greater vulnerability to local economic downturns compared with a diversified portfolio. Where geographical concentration exists, Fitch considers the region's characteristics, including population, area, economy, employment structure, dominant industries and historical macroeconomic volatility, to determine whether to adjust FF.

The magnitude of a FF adjustment depends on the region, since some regions are more or less sensitive to economic downturns or other developments in the property and mortgage markets.

The application of adjustments, if any, is described in each country-specific addenda.

**Loans in Arrears**

Fitch adjusts FF for loans in arrears as disclosed in the country-specific addenda.

**Asset Analysis: Loss Severity**

Fitch's loan-by-loan asset models quantify loan-by-loan LS by evaluating the difference between a) the sum of the loan's balance at the point of default and accrued interest and b) foreclosure proceeds. A minimum loss severity (MLS) is applied.

$$\text{LossSeverity} = \max \left\{ \frac{\max(\text{current balance, scheduled balance}) + \text{accrued interest} - \max(0, \text{distressed property value} - \text{foreclosure costs})}{\max(\text{current balance, scheduled balance})}, \text{MLS} \right\}$$

Where borrowers can prepay part of their loan ahead of the scheduled amortisation balance and then redraw amounts to the scheduled balance, Fitch assumes borrowers draw back to their scheduled balance before defaulting on the loan. In jurisdictions where scheduled balances do not exist it will be assumed that the current balance is equal to the scheduled balance.

Fitch calculates the property value at foreclosure by subtracting an amount derived from the applicable MVD assumptions. For second-charge loans, the distressed property value is further reduced by the amount of prior charges and accrued interest on prior charges. If foreclosure proceeds are not sufficient to cover higher accrued interest, the LS calculated in the asset model may exceed 100%. This calculation forms the basis for Fitch's gross-loss assumptions in its loan-by-loan asset model.

Fitch calculates a RR that is later used in cash-flow modelling as part of its asset analysis. As the cash-flow model explicitly derives carry cost losses, these are removed from LS when calculating the final RR. This calculation may exceed 100% if sufficient foreclosure proceeds are available to cover carry costs in excess of the current balance, as recoveries are applied to carry costs before the current principal balance.

Where an asset model is run, Fitch calculates a RR that refers to the recovery of principal and interest as a percentage of the balance of the loan at default upon foreclosure and excludes accrued interest as a loss component. The RR might exceed 100% if sufficient foreclosure proceeds are available to cover accrued interest in excess of the balance of the loan at default.

$$\text{RecoveryRate}^{\text{without carry losses}} = \left\{ \begin{array}{l} \text{with carry} \\ 1 - \text{LossSeverity}^{\text{losses}} + \frac{\text{carry costs}}{\text{scheduled balance}} \end{array} \right\}$$

The agency calculates RR and loan-by-loan LS based on the scheduled loan balance, or the current loan balance if the scheduled balance is not applicable, at the time of analysis, considering the FF of the individual loans. Property value assessment is key in this analysis.

This is a two-step process: first, evaluating the indexed property value and, second, applying a MVD specific to each rating level.

### Indexing Property Values

The most recent valuation of a property used as collateral for a mortgage loan takes place before Fitch's analysis and is written forward from the date of initial valuation to the date of analysis to better capture the property value. In jurisdictions where indexation data are available and sufficiently reliable, Fitch uses indexation figures derived from publicly available home-price sources to rebase original property valuations to calculate RR and LS. The LVR used to determine FF uses the original property valuation and does not reflect this indexation.

Indexation is calculated by capturing 50% of property-price increases while considering 100% of price decreases. In countries where there is a choice of more than one home-price index, Fitch selects an index based on accuracy, frequency of calculation and market coverage. In countries where indexation data are limited or not sufficiently reliable, Fitch may reduce indexation credit further. In most countries, Fitch distinguishes different regions and property types when indexing property values. Changes in property values from the time of initial analysis to the point of foreclosure are captured in the HPD component of Fitch's MVD.

If a jurisdiction applies indexation differently to that outlined above, this will be detailed in the individual country addenda.

### Market Value Decline

To estimate the property value available for recovery or distressed property value, Fitch stresses the indexed property value by the MVD specific to the region of the country being analysed and to a particular rating level. The MVD represents the likely drop in property value from the point of initial analysis to eventual sale after it has been taken into possession by the lender. The two key components of MVD are: (i) HPD; and (ii) the quick-sale adjustment (QSA).

Fitch's short-term view of HPD takes into account macroeconomic developments likely to affect the property market in the respective jurisdiction and is reflected in its 'Bsf' rating level. HPD assumptions for higher rating levels reflect the agency's view that realisation of these assumptions is sufficiently remote given the rating category under consideration. Stressed HPD assumptions are benchmarked to previous domestic home-price declines and experiences in other countries considering any structural differences in the respective housing markets.

The QSA represents the discount to open-market values that sellers of foreclosed properties must accept to dispose of their properties quickly. The QSA is applied as a further reduction on the post-HPD property value and is determined through qualitative considerations.

### Updating Market Value Declines

Fitch regularly reviews MVDs to reflect its assessment of the housing market. For lower rating categories, Fitch continuously observes the market for the appropriateness of its house-price expectations. MVDs are updated as expectations change. For higher rating categories, MVDs may change over time as the economy evolves through a business cycle. In these scenarios, Fitch determines house-price levels commensurate with a severe economic downturn.

As house prices evolve over time, Fitch reviews the appropriateness of its stressed house-price level. Fitch may conclude that the current level remains appropriate, in which case the MVDs will be updated to reflect house-price movements since the previous update. For example, assuming the stressed house-price level for a 'AAAsf' rating category during the last review was assessed at 50% of the existing house-price level and that house prices had dropped by 5% since the last update, the new assumption for the 'AAAsf' house-price decline would be  $44.4\% = 1 - (1 - 50\%) / (1 - 5\%/50\%)$ . The agency takes general inflation since the last update into account when updating MVDs.

### Illiquid Property Adjustments

Fitch believes that the sale of properties with loans secured on unusually high or low-values are more likely to suffer higher-than-average percentage value declines, even in times of low housing market stress, as they tend to be less liquid. For both extremes, pricing information is imprecise, as the limited liquidity of these niche markets means there is a lack of comparable benchmark housing. This also influences the degree of price volatility during a market downturn.

Fitch defines high and low property value thresholds by considering the distribution of property values in a market and taking values above and below a defined multiple of the region's median home price as high and low value properties. In Japan property value thresholds are used. The specific multiple chosen to define illiquid properties varies by jurisdiction. Fitch's value threshold assumptions are reviewed based on an analysis of recent property values in rated transactions from each jurisdiction. These thresholds may change during downturns and periods of limited financing, when banks tend to exit high property value lending rapidly.

Where a property value is classified as high or low, Fitch will reduce the distressed property value after deduction of MVD by an incremental illiquidity adjustment factor. These factors are derived for each rating scenario, with a larger haircut applied to the distressed property value – that is, after indexation and MVD – in more stressed scenarios.

### Foreclosure Costs, Accrued Interest and Foreclosure Period

Fitch subtracts foreclosure costs from the distressed property value to calculate the loan balance at foreclosure; that is, the maximum amount the lender can recover. The agency considers all foreclosure costs, both fixed and variable. Legal costs are usually fixed, while in most countries estate-agent costs tend to be proportional to the property's sale price. Depending on the country and often determined by legal requirements, variable foreclosure costs are calculated as a percentage of either the distressed or indexed property value.

To calculate accrued interest, Fitch applies a stressed interest rate for carry costs for the duration of the foreclosure period, calculated on a compound basis.

In a stressed environment, Fitch assumes an increase in court/auction house cases and a corresponding rise in forced sales will create a backlog translating into longer foreclosure periods. Changes in government policy encouraging forbearance on the part of lenders is another significant driver of longer foreclosure timing.

Country-specific assumptions are based on various sources of information, including loan-by-loan foreclosure data and information from lenders, lawyers and other relevant third parties.

### Asset Analysis: Gross Loss

In the initial rating analysis, Fitch uses the asset models to estimate the gross loss for each loan in the portfolio. The gross loss measures the expected loss on each loan for the corresponding rating stress scenario and is calculated as  $FF \times LS$ .

For example, if a loan under a particular stress scenario had a FF of 20% and, upon foreclosure, a LS of 30%, the estimated gross loss rate would be 6% (20% x 30%) of the current principal balance. After calculating loan-by-loan gross losses, Fitch aggregates them to arrive at a gross loss for the portfolio.

Loan-by-loan loss data collected by the agency indicate that losses on mortgage loans can arise from random events and in situations where one would not normally expected a loss. Furthermore, Fitch believes borrowers, even with low LVR loans, will default when they are not able to sell the property on their own for more than the loan value. Fitch may apply a minimum loss severity at the individual loan level. See the country-specific criteria addenda for details.

### Portfolios with Low Expected Losses

A portfolio of loans that demonstrates strong credit characteristics may result in low overall FF and/or LS. Where the criteria-implied 'AAAsf' expected loss is less than 4%, or at levels otherwise deemed low comparison with peer transactions, Fitch will apply a simple floor to credit protection to support ratings. Where a country has a minimum 'AAAsf' expected CE level, this is disclosed in the country-specific addenda.

### Structural Features

#### Available Cash Investments

Fitch assumes interest earned on all cash receipts and reserve funds available to the issuer is typically at the relevant reference rate of the notes less 50bp, unless structural features are present, such as a guaranteed investment account with a documented margin. In China and Japan it is assumed that cash investments receive no investment returns.

#### Warehouses and Revolving or Substituting Periods

All else being equal, Fitch believes revolving/substituting transactions, including warehouses, are more risky than static transactions. In revolving/substituting transactions, principal collections from the portfolio are used to purchase new mortgage loans from the originator if certain preconditions are satisfied. Preconditions include the assets meeting individual eligibility criteria and the overall portfolio being within agreed portfolio parameters, and aim to reduce the likelihood of credit quality erosion during the revolving/substitution period. Common portfolio parameters include:

- maximum borrower characteristics. For example, proportion of borrowers with low documentation or adverse credit history, self-employed borrowers and non-residents;
- maximum geographic distribution;
- maximum portfolio weighted-average (WA) current LVR ratios and distributions;
- maximum loan type, loan purpose and product type; and
- maximum property characteristics, for example, investment properties.

Warehouse structures may build an asset portfolio over time or see significant asset reductions from sales to alternative securitisations. In assessing these transactions, Fitch will request that the issuer provide details of assets in the portfolio, both actual and expected. Fitch will rely on the portfolio data provided by the issuer, even if the assets are expected rather than actual. The agency will assume that by the end of the revolving period the notes would be backed by a portfolio that has seen negative migration towards the outer bounds allowed for in the transaction documentation.

Fitch expects to see at least the following asset conditions in transaction documentation:

1. WA current LVR cap: the WA current LVR of the entire portfolio must not exceed a certain threshold. For the avoidance of doubt, this includes new loans assigned to the trust or portfolio.
2. Limits on the maximum proportion of the portfolio in certain LVR buckets. For example, above 100%, 90% to 100%.
3. Limits that prevent concentration.

Fitch also expects transaction documentation to include a notification obligation in case any material changes in relation to the origination and servicing procedures are implemented.

The credit protection levels of revolving/substituting transaction structures will be higher than those of static transactions to mitigate the risk of portfolio deterioration to the maximum

portfolio parameters. On every replenishment or substitution date, Fitch expects to receive the same loan-by-loan information for additional loans as for the loans initially securitised.

Fitch expects the portfolio to have a minimum dollar subordination amount determined by the higher of a) tests 1-3 in *Adverse Selection and Small Loan Count (Tail Risk)* (see below); (b) the test in *Concentration/Thin Tranche Analysis* in the relevant country addenda; and (c) 300 multiplied by the average loan balance and expected loss at the relevant rating level.

Fitch expects revolving periods to be less than or equal to five years and for longer revolving periods to be mitigated by a stable product history, low prepayments and eligibility criteria that maintains the portfolio's characteristics during the revolving period. Fitch expects to be notified of all portfolio changes.

Fitch monitors revolving transactions by reviewing transaction performance data. The surveillance of a revolving transaction during its revolving period requires information regarding the evolution of the portfolio composition. This is due to the replenishment feature and absence of deleveraging, which means the structure does not build up additional CE during the revolving period. Other aspects, such as originator repurchases of delinquent collateral, are also important in assessing the effectiveness of triggers in controlling revolving-period risk.

### Adverse Selection and Small Loan Count (Tail Risk)

Fitch expects transactions to be protected against increasing performance volatility as the portfolio amortises. The agency considers the level of concentration in the transaction's mortgage portfolio to be a key factor in assessing tail risk and will determine whether a minimum amount of credit support is available to cover this risk. This coverage may be in the form of a reserve fund floor in combination with a minimum amount of subordination. Fitch conducts four tail-risk tests for notes rated 'AAAsf', or for notes with the highest achievable rating in countries with a rating cap, and transactions with a considerable element of pro rata amortisation. Minimum credit support is expected to be in line with the following:

1. 'AAAsf' expected losses on the 25 largest loans; that is, 25 largest loans x 'AAAsf' WAFF x 'AAAsf' LS);
2. the loss amount from the default of the five largest loans applying the 'AAAsf' LS;
3. 80bp to 100bp of the initial pool; and
4. 'AAAsf' expected losses of 100 average loans; that is, 100 average loans' current balance x 'AAAsf' WAFF x 'AAAsf' LS.

Transactions with a small number of loans at closing are more constrained by tests 1, 2 and 4, while transactions with a large number of loans are constrained by test 3.

The tests are conducted at the time of new ratings and in the ongoing surveillance analysis where updated loan-by-loan data is available. Fitch expects notes rated 'AAAsf' to pass all the tests. Shortfalls on individual tests will not result in a downgrade if mitigants, such as exceptionally strong performance, and triggers that would cause fully pro rata-paying structures to switch to sequential amortisation are available. and / or additional analysis of larger loans.

## Operational Risk

### Origination Review

There is a direct link between origination practices and the performance of the collateral portfolio. This translates into Fitch's *lender adjustment* described on page 7. For this reason, Fitch reviews the quality of an originator's underwriting process; that is, the way in which loans are sourced (branch network versus intermediaries, such as brokers), the assessment of a borrower's creditworthiness and the technology used to process applications. The agency also

assesses data on staffing. Fitch will seek to understand quality-control processes to assess how well an originator adheres to its own guidelines and procedures.

Fitch reviews the originator's financial condition and collection procedures and completes a targeted review of a sample of originator files to better understand the operational implementation and consistency with the originator's policies and procedures. The agency reviews file data for consistency with its expectations, knowledge of the originator/data provider, knowledge of the market and other sources that it considers meaningful for comparison.

Fitch carries out full originator reviews of repeat issuers at least once every two years.

### Servicer Review

A servicer can influence default and recovery levels, and ultimately losses, through its management of performing and non-performing loans. In rating new transactions and maintaining ratings on existing transactions, Fitch evaluates the capability of the mortgage servicer or administrator over a number of key areas and competencies, including:

- company and management experience;
- financial condition;
- staffing;
- procedures and controls;
- loan administration;
- arrears and defaulted loan management; and
- technology.

If Fitch finds a weakness in one or more of the above areas, it may decline to rate the transaction, apply a rating cap or utilise targeted adjustments in its analysis. Targeted adjustments depend on the nature of the weakness or deficiency and, where made, will be disclosed in transaction-specific reporting.

Fitch reviews the servicing contract into which the RMBS transaction entity has entered. In situations where the terms of the contract do not, in Fitch's opinion, deliver sufficient levels of ongoing service or servicing continuity in case of a change of servicer, the agency may decline to rate the transaction, apply a rating cap or utilise targeted adjustments in its analysis.

Fitch reviews the servicing practices of active servicers at least every two years as part of its ongoing surveillance of existing transactions.

The agency reviews performance data as an early indicator of changes in servicing activity.

Substantial changes in performance and servicing practices applied to the rated portfolio may trigger a more detailed servicer review. As a first step, the agency will request that the servicer provide a description of the changes. If Fitch considers the changes are material, it may organise an onsite servicer review. Any significant findings will be reflected in the analysis of the transactions and described in transaction-specific reporting.

### Cash-Flow Analysis

Fitch's proprietary cash-flow model simulates the cash flows from the mortgage portfolio and other transaction counterparties, such as hedge providers. It determines the allocation of cash flow to pay interest and principal on the notes in accordance with the specific priority of payments (also referred to as "waterfall") set out in the transaction documentation.



Key drivers affecting the cash-flow analysis include the following:

- asset FF and RR derived from the asset analysis;
- timing of defaults and receipt of recoveries;
- prepayment rates;
- hedging structures and interest rates;
- transaction and servicing fees; and
- transaction structural features.

Fitch’s cash-flow analysis determines the amount of credit support provided by ExS, which is driven by prepayments and defaults, as well as the effectiveness of the structure in utilising ExS to mitigate portfolio underperformance. The cash-flow analysis also tests whether liquid forms of CE (for example, the ExS and cash reserve) are sufficient to compensate for temporary liquidity shortfalls caused by factors such as delinquent mortgages or adverse interest-rate movements. Transaction structures may also include external third-party liquidity facilities or internal liquidity by way of borrowing principal funds to pay interest.

When cash flow modelling a revolving/substituting transaction, including warehouses, Fitch focusses on the transaction after the revolving period.

In the initial rating and surveillance analysis, if a cash-flow model is run, the structure is expected to pass each of Fitch’s standard cash-flow scenarios at the respective rating for such ratings to be assigned. If a minority of scenarios fail, Fitch may decide to assign the rating if the circumstance under which the structure fails is considered to be sufficiently remote. If this occurs, it will be disclosed in transaction-specific reporting. If the credit support available to the rated tranche is insufficient to withstand ‘Bsf’ rating stresses, Fitch assigns distressed ratings in line with its rating definitions.

**Standard Cash-Flow Scenarios**

Default distribution	Interest-rate trend	Prepayment rates
Front-loaded	Rising	High
		Low
	Stable	High
		Low
	Decreasing	High
		Low
Back-loaded	Rising	High
		Low
	Stable	High
		Low
	Decreasing	High
		Low

Source: Fitch

If the transaction includes structural features that make one or more of the stress assumptions beneficial to the notes, for example, interest-rate caps that are a significant source of revenue in higher interest-rate scenarios, Fitch may consider alternative stress scenarios. Fitch may also analyse the transaction as if the structural feature was not available. Transaction-specific variations will be disclosed in transaction-specific reports.

Full cash-flow analysis of existing RMBS transactions will only be performed in there are significant changes to the transaction structure, asset performance or where there have been changes to foreign-exchange (FX) swap margins or applicable negative interest rate or FX stresses. Even in these circumstances, the model will only be run if the committee is sure it would change the rating. Examples of significant changes to transaction structure include changes in or removal of hedging arrangements, reduction of reserve funds and note restructuring.

When a full cash-flow analysis is undertaken for existing transactions, the same approach is used as for new transactions, with the model updated to reflect the transaction's prevailing characteristics and performance.

Fitch tests new transactions for the potential impact of any unhedged residual FX exposure that may be present. A potential unhedged FX position may arise due to negative interest rates. Fitch applies currency stresses when the trust has to make additional payments to the currency swap provider in the relevant foreign currency. In the analysis of the foreign-currency exposure, Fitch models cash flow to assess whether it is sufficient to cover all trust obligations in a stressed scenario where negative inter-banking rates are stressed using Fitch's negative interest-rate stresses and any additional foreign currency swap payments are bought on market at spot exchange rates. This analysis is only repeated as part of ongoing surveillance where there have been changes in the applicable negative interest rate or currency stresses since the previous review.

### Portfolio Principal Amortisation Profile

Fitch's cash flow model calculates the amortisation of loans according to their terms, based on the loan-by-loan information. Scheduled principal amortisation is calculated for each loan assuming zero prepayments and no defaults or delinquency. Prepayments and defaults are overlaid on the portfolio's scheduled principal pay-down so that, in higher-rating stress scenarios, the portfolio amortisation is driven more by these factors than by the product amortisation features designed by the originator.

Fitch analyses the amortisation mechanics of all products included in each portfolio and expects originators to provide models showing non-standard amortisation options offered to borrowers.

### Prepayment Rates

Fitch makes jurisdiction-specific assumptions on prepayment rates; that is, voluntary early principal redemptions, excluding scheduled principal and unpaid principal due to arrears or defaults. Fitch expresses its prepayment rate assumptions as a percentage of the current total portfolio principal outstanding (gross of the scheduled principal payments). These assumptions consist of constant annualised rates and are referred to as constant prepayment rates (CPR).

The prepayment rate is a key variable in determining lifetime cash volume and periodic percentage of ExS generated by the structure. High prepayment rates are typically the most stressful for a structure, as they reduce the amount of performing collateral that generates ExS. However, low prepayments negatively affect structures where payments on the most senior notes are pass-through and the senior notes have a legal maturity shorter than that of other notes or where the structure includes an ExS trapping mechanism linked to the level of CPR. To account for the potential variability in prepayment speeds, Fitch models both high and low speed prepayment scenarios.

Fitch models prepayment stresses as shown in each country-specific addenda. Any variations to these stresses will be disclosed in transaction-specific reporting.

#### *Prepayment Assumptions – High Prepayments*

Fitch determines rising prepayment stresses based on evidence in each country, which is detailed in the country-specific addenda.

The prepayment rate is applied to the performing balance before any scheduled principal payment and excluding defaulted loans. The total proportion of the prepaid portfolio in Fitch's modelling scenarios declines as the rate of defaults and delinquencies rises.

High prepayment stress assumptions may be adjusted if an individual lender's prepayment history differs significantly from that analysed by Fitch in the relevant country. Variations are also possible where the transaction documentation includes specific loan repurchase provisions – for example, repurchase of loans if the lender renegotiates the terms of the agreement with the borrower and/or offers further advances – or where specific products offered by a lender have a higher prepayment propensity.

*Prepayment Assumptions – Low Prepayments*

Low prepayment rates pose a risk. For example, bullet notes, which are redeemed in full at maturity and normally have shorter amortisation periods than notes of the underlying portfolio, since it is necessary to accumulate sufficient cash in time to meet the repayment.

Low prepayment scenarios might also be more stressful if the structure includes ExS trapping mechanisms linked to the portfolio CPR to accelerate note paydown or if the most senior notes are pass-through but have a shorter legal maturity than the other notes; that is, the structure relies on the expectation that principal portfolio paydown will be enough to repay the most senior notes before their legal maturity.

For these reasons, Fitch runs low prepayment scenarios based on its expectation of CPR trends and the historical CPR levels for the securitised product types in the relevant jurisdiction. The agency may also model any CPR levels related to triggers in the structure.

**Weighted Average Spread Compression**

Fitch may model the mortgage loan portfolio's WA spread (WAS) compression in the cash flow model by assuming that the loans paying the highest coupons are the first to exit the portfolio. The cash-flow model allocates 80% of prepayments – unless there is evidence to the contrary – and all defaults to the portfolio's highest coupon bucket. Fitch does not model WAS compression where a threshold mechanism exists within a transaction. WAS is not modelled as described in this section for covered bond transactions.

The magnitude of WAS compression also depends on the dispersion of loan margins. A homogenous pool will experience less margin compression than a portfolio with a wide range of margins. WAS compression reduces the ExS percentage unless this is covered by a total return swap.

**WAS Compression Assumptions: Example**

Total portfolio	Total portfolio composition at closing							
	Bucket 1		Bucket 2		Bucket 3		Bucket 4	
	Size	Margin (%)	Size	Margin (%)	Size	Margin (%)	Size	Margin (%)
100	25	1.2	40	1.0	15	0.8	20	0.6

Portfolio WAS at closing =  $(25 * 1.2\% + 40 * 1.0\% + 15 * 0.8\% + 20 * 0.6\%) / 100 = 0.94\%$

**Month 1** Defaults and 80% of prepayments amounting to 30  
 25 allocated to bucket 1  
 5 allocated to bucket 2

Total portfolio	Total portfolio composition after month 1							
	Bucket 1		Bucket 2		Bucket 3		Bucket 4	
	Size	Margin (%)	Size	Margin (%)	Size	Margin (%)	Size	Margin (%)
100 – 30 = 70	0	1.2	35	1.0	15	0.8	20	0.6

Portfolio WAS after month 1 =  $(0 * 1.2\% + 35 * 1.0\% + 15 * 0.8\% + 20 * 0.6\%) / 70 = 0.84\%$

Source: Fitch

**Default Timing Distribution**

Historical observations show that for a given static loan pool, defaults initially ramp-up for several years, gradually increasing before peaking and then tailing off towards the end of the scheduled maturity of the portfolio’s remaining loans. However, the speed of defaults depends on several economic factors, such as the rate of interest and unemployment.

The initial default ramp-up is because it takes some time for the borrower’s personal circumstances to deteriorate to a degree that they can no longer service the loan and for the foreclosure process to proceed. Once the critical phase of a borrower’s vulnerability to economic events has passed, defaults become increasingly dominated by specific personal events, such as illness and divorce, and default rates tend to slowly tail off for a given vintage.

*Front-Loaded Distribution*

Most RMBS structures are more vulnerable to front-loaded defaults due to the depletion of ExS. Therefore, Fitch derives front-loaded stress using default distributions, with defaults starting soon after transaction closing.

*Back-Loaded Default Distribution*

A back-loaded default distribution may be more stressful for transactions where the most senior notes are protected by tight performance triggers linked to defaults. In such instances, modelling back-loaded defaults will create additional stress, as the structure will start protecting the senior notes later in the transaction’s life when a portion of available ExS has already been paid out of the structure. The effects are exacerbated if there is a step-up in the note margin.

If a cash-flow model is run as part of Fitch’s ongoing surveillance, the back-loaded default curve is used to sense check the default pattern seen to date against the pool’s FF expectations. Alternative curves may be used if transaction or market-specific circumstances suggest there is a need to do so.

The following default timing distributions are used when cash-flow modelling APAC RMBS transactions.

**Default Timing Distributions**

WAFF (%)	Months after closing							Total
	1-10	11-23	24-35	36-47	48-59	60-71	72-84	
Front-loaded	2.5	25	30	20	15	5	2.5	100
Back-loaded	2.5	10	12.5	45	20	5	5	100

Source: Fitch

*Portfolio-Specific Distributions*

Portfolio-specific default distributions are developed if asset or originator defaults are distributed differently to the country-specific distributions. These will be disclosed in transaction-specific reporting.

When testing high-prepayment scenarios, Fitch may re-shape the criteria default distributions and change CPR assumptions to avoid situations where the transaction has prepaid the entire capital balance of assets before the assumed WAFF has been applied in its entirety. Such cases will be disclosed in transaction-specific reporting.

*Default Definition*

Fitch’s default definition differs by jurisdiction and determines the point at which non-performing borrowers are recognised as defaulted. Fitch uses this definition to assess the effects of structural features triggered by an increasing volume of defaulted borrowers.

### Recovery Timing

The assumed length of the foreclosure period is based on the empirical evidence available in each country and depends on the regulatory framework governing the foreclosure process. The foreclosure times assumed in each country are detailed in the country-specific addenda.

### *Other Recovery Sources*

Where other sources of recoveries exist, they may be taken into account in loan-level RR. When the timing of these other receipts differs from those of the sales proceeds of the underlying collateral, Fitch will model them as a separate source of recovery in its cash-flow model.

### *Maturity of the Rated Notes*

Fitch tests whether the legal maturity of the notes falls after the latest maturity of the loans included in the portfolio plus the maximum recovery time assumed by Fitch in relation to the specific portfolio. Any principal and interest proceeds scheduled to be received after the legal maturity of the notes are excluded from the agency's analysis.

### Interest Rates

In RMBS hedging arrangements, the notional is based on the performing loan balance and Fitch expects the issuer to make interest payments on the outstanding note balance. To assess cost-of-carry effects of non-performing loans, Fitch tests the structure in rising, stable and decreasing interest-rate scenarios. The stresses consist of vectors of monthly increases and decreases applied to interest rates at closing, with the same frequency as the notes' interest as detailed in the report [Structured Finance and Covered Bonds Interest Rate Stresses Rating Criteria](#).

The effect the transaction's hedging is assessed using the above-described methodology and the hedging is modelled as per the terms described in the transaction documentation. Transaction structures that appear particularly vulnerable to small changes in the interest-rate path are further tested and the analysis is disclosed in transaction-specific reporting.

### Transaction and Servicing Costs

Fitch stresses the portfolio's transaction and servicing costs to the higher of the actual expenses and the agency's expected cost of servicing in a high default and delinquency environment. Fitch's assumptions take into account extraordinary costs, such as those related to the invocation of back-up or stand-by servicing arrangements or the engagement of a replacement servicer following a servicer event of default. For example, where a back-up servicing agreement is not in place for a specific transaction, servicing cost assumptions may be increased to account for the higher expenses associated with locating and engaging a replacement servicer. These assumptions vary by jurisdiction and are partly driven by the country's third-party servicing environment or the sophistication of the national mortgage market. Details of these assumptions are available in country-specific addenda.

### Rating Sensitivity

This section provides greater insight into the performance and ratings sensitivities a transaction faces when applying a set of stressed risk factors, and include defined stresses and sensitivities. The implied rating sensitivities are only indicative of some potential outcomes and do not consider other risk factors to which the transaction is exposed or are considered during the surveillance process.

### Defined Stresses

Defined stresses show the effect of Fitch’s three defined stress assumptions, which are:

- 15% and 30% increase in FF of the mortgage pool derived using standard criteria assumptions;
- 15% and 30% decrease in RR of the mortgage pool derived using standard criteria assumptions; and
- 15% increase in FF and 15% decrease in RR of the mortgage pool derived using standard criteria assumptions; and 30% increase in FF and 30% decrease in RR of the mortgage pool derived using standard criteria assumptions.

The tables below provide examples of the rating impact of the defined stresses to FF and RR.

#### Rating Sensitivity to Increase in Default Rates

Original Rating	15% increase	30% increase
AAA <sub>sf</sub>	AA+ <sub>sf</sub>	AA <sub>sf</sub>
AA <sub>sf</sub>	AA- <sub>sf</sub>	A+ <sub>sf</sub>
A <sub>sf</sub>	A- <sub>sf</sub>	BBB <sub>sf</sub>
BBB <sub>sf</sub>	BBB <sub>sf</sub>	BBB- <sub>sf</sub>
BB <sub>sf</sub>	BB- <sub>sf</sub>	B+ <sub>sf</sub>
B <sub>sf</sub>	NR <sub>sf</sub>	NR <sub>sf</sub>

Source: Fitch

#### Rating Sensitivity to Decrease in Recovery Rates

Original Rating	15% decrease	30% decrease
AAA <sub>sf</sub>	AA+ <sub>sf</sub>	AA- <sub>sf</sub>
AA <sub>sf</sub>	A+ <sub>sf</sub>	A <sub>sf</sub>
A <sub>sf</sub>	BBB+ <sub>sf</sub>	BBB- <sub>sf</sub>
BBB <sub>sf</sub>	BBB <sub>sf</sub>	BB+ <sub>sf</sub>
BB <sub>sf</sub>	BB- <sub>sf</sub>	B <sub>sf</sub>
B <sub>sf</sub>	NR <sub>sf</sub>	NR <sub>sf</sub>

Source: Fitch

#### Rating Sensitivity to Increase in Default Rates and Decrease in Recovery Rates

Original Rating	15% increase and 15% decrease	30% increase and 30% decrease
AAA <sub>sf</sub>	AA <sub>sf</sub>	A+ <sub>sf</sub>
AA <sub>sf</sub>	A <sub>sf</sub>	A- <sub>sf</sub>
A <sub>sf</sub>	BBB <sub>sf</sub>	BB+ <sub>sf</sub>
BBB <sub>sf</sub>	BBB- <sub>sf</sub>	BB <sub>sf</sub>
BB <sub>sf</sub>	B+ <sub>sf</sub>	B- <sub>sf</sub>
B <sub>sf</sub>	NR <sub>sf</sub>	NR <sub>sf</sub>

Source: Fitch



**Defined Sensitivities**

Defined sensitivities describe the stresses to the assumptions required to reduce a rating (i) by one full category, (ii) to non-investment grade and (iii) to ‘CCCs’. The variable being stressed in this analysis is Fitch’s RR. The percentage points shown in the table below reflect the additional reduction in RRs needed to affect ratings for each defined sensitivity for a hypothetical transaction.

**Defined Sensitivities to Recovery Rates**

Original Rating	Reduced Rating		
	One full category (%)	Non-investment grade (%)	To ‘CCCs’ (%)
AAAsf	10	35	75
AAsf	10	30	50
Asf	10	25	40
BBBsf	12	20	35
BBsf	14	-	25
Bsf	16	-	10

Source: Fitch

Rating sensitivity analysis results are disclosed in Fitch’s transaction-specific reporting for each new RMBS rating and surveillance, unless there are no models run. Rating sensitivity analysis as described above will apply to RMBS transactions only and not to covered bond programmes.

**Variations from Criteria**

Fitch’s criteria are designed to be used in conjunction with experienced analytical judgment exercised through a committee process. The combination of transparent criteria, analytical judgment applied on a transaction-by-transaction or issuer-by-issuer basis, and full disclosure via rating commentary strengthens Fitch’s rating process while assisting market participants in understanding the analysis behind our ratings.

A rating committee may adjust the application of these criteria to reflect the risks of a specific transaction or entity. Such adjustments are called variations. All variations will be disclosed in the respective rating action commentaries, including their impact on the rating where appropriate.

A variation can be approved by a ratings committee where the risk, feature, or other factor relevant to the assignment of a rating and the methodology applied to it are both included within the scope of the criteria, but where the analysis described in the criteria requires modification to address factors specific to the particular transaction or entity.

**Limitations**

Rating levels discussed in this report relate to Fitch’s international credit rating scale and reflect standalone creditworthiness without considering external CE or government support. Ratings, including Rating Watches and Outlooks, assigned by Fitch are subject to the limitations specified in Fitch’s ratings definitions, available at [www.fitchratings.com/site/definitions](http://www.fitchratings.com/site/definitions)

Specific asset-level and operational risks may prevent Fitch from rating a transaction or may limit the highest achievable ratings. The core areas where such restrictions may apply are generally those detailed in the report, Global Structured Finance Rating Criteria. Specific examples for APAC RMBS transactions include:

- limited historical performance data;
- reliability of the data used in the analysis;
- loan concentrations due to small pools;
- excessive counterparty exposure; and
- insufficient structural features to mitigate asset credit risk.

### Criteria Disclosures

Fitch expects to disclose the following items in transaction-specific reporting:

- Targeted assumptions made if Fitch considers there are weaknesses or deficiencies in the servicer's operations.
- Alternative stress scenarios for transaction structural features using cash-flow analysis
- Adjustments to prepayment stress assumptions.
- Portfolio-specific default distributions that differ to criteria.
- Additional interest-rate path testing undertaken.
- Threshold margin caps above criteria maximums.
- Minimum dollar value of transaction fees for Australian and New Zealand transactions.
- Cash-flow scenario analysis failures.
- Rating sensitivity analysis results.
- Variations from criteria.

The same disclosures will be made if models are run when surveillance is performed.

**Appendix 1: Loan Level Gross-Loss Calculation – an Example**

This section summarises the gross-loss calculation for a loan in an ‘AAAsf’ scenario.

**(A) Foreclosure Frequency**

**(A) Foreclosure Frequency**

Calculation steps		FF (%)
(1) Base FF from ‘Bsf’ LVR matrix	76% LVR	2.10
(2) Rating scenario multiplier for ‘AAAsf’ scenario	Factor 3.75	8.00
(3) Lender adjustment	Factor 1.00	8.00
(4) Borrower adjustments to base FF		
Employment type: self-employed borrower	Factor 1.25	10.00
(5) Loan adjustments to base FF		
Interest only loan – 25 years remaining term after interest only maturity	Factor 1.10	11.00
Prior bankruptcy – 24 months prior	Factor 1.50	16.50
(6) Property adjustments to base FF		
Property use: investment property	Factor 1.25	20.63
(7) Other adjustments	None	
<b>Resulting FF</b>		<b>20.63</b>

Source: Fitch

**(B) Loss Severity**

**Indexed Property Value**

Property value	100,000
Valuation year	2010
Year of analysis	2016
Valuation adjustment (typically based on property region and property type) (%)	95
<b>Indexed property value</b>	<b>95,000</b>

Source: Fitch

**Distressed Property Value**

Indexed property value	95,000
MVD for ‘AAAsf’ scenario (based on property region) (%)	60
<b>Distressed property value [indexed property value*(1-MVD)]</b>	<b>38,000</b>

Source: Fitch

**Foreclosure Costs**

Distressed property value	38,000
Fixed costs	5,000
Variable costs	6.95% of distressed property value
<b>Foreclosure costs</b>	<b>7,640</b>

Source: Fitch

**Carry Costs (Accrued Interest)**

Greater of scheduled or current balance	60,000
Interest rate of the loan (%)	5
Foreclosure period in ‘AAAsf’ scenario	18 months
<b>Carry costs (60,000 x 5% x 1.5 years)</b>	<b>4,500</b>

Source: Fitch

**Loss Severity for Gross-Loss Calculation**

Current balance	55,000
Scheduled balance	60,000
Carry costs (see page 23)	4,500
Distressed property value (see page 23)	38,000
Foreclosure costs (see page 23)	7,640

$$\text{LossSeverity}_{\text{losses}}^{\text{with carry}} = \max \left\{ \frac{60,000 + 4,500 + 7,640 - 38,000}{60,000}, 25\% \right\} = 56.9\%$$

**LS with carry losses (%)** **56.9**

Source: Fitch

**Recovery Rate for Cash-Flow Model**

Scheduled balance	60,000
Carry costs	4,500
LS (%)	56.9

$$\text{RecoveryRate}_{\text{carry losses}}^{\text{without}} = \left\{ 1 - 56.9\% + \frac{4,500}{60,000} \right\} = 50.6\%$$

**RR without carry losses (%)** **50.6**

Source: Fitch

**(C) Gross Loss**

**Gross Loss (%)**

FF	20.63
LS with carry losses	56.9
<b>Gross loss (20.63% x 56.9%)</b>	<b>11.7</b>

Source: Fitch

Addendum A – Australia

Australian RMBS and Covered Bond Model Assumptions

Foreclosure Frequency<sup>a</sup>

**Willingness to pay** Current LVR is based on the current loan amount advanced to the borrower. Property valuations are based on the latest property valuation amount or purchase price, if lower, and generally on a full internal inspection of the property when the relevant loan was last underwritten. This could be the date of the original loan advance or, in the case of subsequent further advances, the further advance date.

**Base FF**  
In Australia, loan-by-loan DTI is typically collected at origination but is not stored and therefore is not available at the time of securitisation. Consequently, Fitch has developed a base FF matrix based solely on LVR using the methods described in this criteria report. The base FF for each rating scenario for conforming and non-conforming loans are shown in the tables, *Australia Conforming Default Matrix* and *Australia Non-Conforming Default Matrix*, respectively, in *Appendix A*.

**Adjustments to base FF<sup>b</sup>** The following FF adjustments will be applied to the base FF to address the risk profile of a non-standard Australian loan:

**Lender adjustment** Individually determined.

**Borrower-specific adjustments** **DTI** calculation is based on the assumption that the relevant mortgage is a principal and interest mortgage loan. Fitch calculates the DTI ratio for a loan by dividing the monthly scheduled mortgage payment by monthly gross income. The monthly mortgage payment is calculated using a stressed interest rate equal to the higher of a) 5% plus the relevant margin, or b) the current interest rate (whether fixed or variable) charged to the borrower. Monthly gross income is based on the combined gross income of the borrower(s) for a particular loan. The DTIs are then ranked relative to the ability to pay, from class 1 (good affordability), to class 7 (poor affordability) and the FF adjusted as shown in the table, *Fitch Debt Burden-to-Borrower Income Classes*.

**First-time home buyers:** 15% increase to base FF for the first two years of the loan's life. In the absence of first-time home-buyer data, Fitch will assume that 15% of the proportion of the pool with no data consists of first-time home buyers.

**Self-employed:** Fitch will increase the FF for each loan to self-employed borrowers by 25%. If employment data is not provided, Fitch will assume 15% of the proportion of the pool with no data consists of self-employed borrowers.

**Self-managed super funds:** Fitch will increase the FF by 25% where the borrower is a self-managed super fund borrowing to invest in residential property.

**Non-residents:** Fitch will increase the FF by 25%.

**Employee loans:** Where a note is rated above that of the issuer, Fitch will add 25% to the default probability for employee loans from that issuer. If a borrower is more than 24 months ahead of its scheduled repayments, using the same stressed interest rate used in the DTI calculation to calculate a borrower's repayments, Fitch will not apply any adjustment. For notes rated below that of the issuer, Fitch will not apply any adjustment.

**Arrears:** Fitch will increase the FF according to table *Frequency of Foreclosure for Loans in Arrears*. The agency will then use the higher of the adjusted FF and the floor values in the same table.

**Seasoning adjustment:** Fitch will adjust FF as indicated below. No credit for seasoning is given to loans in arrears.

Years since origination	Decrease to default probability (%)
<3	0
>=3 and <4	5
>=4 and <5	10
>=5	20

Foreclosure Frequency<sup>a</sup> (Cont.)

<b>Credit-impaired loans:</b>			
<b>Number of credit bureau entries</b>	<b>Increase to default (%)</b>	<b>Most recent credit bureau default recorded</b>	<b>Increase to default (%)</b>
1-2	10	In last 6 months	75
3-4	50	In past 7-24 months	25
5-9	75	In past 25+ months	0
>=10	90		
<b>Prior bankruptcy</b>		<b>Increase to default (%)</b>	
Discharged 1-11 months	75		
Discharged 12-36 months	50		
Discharged 37-60 months	25		
Discharged > 60 months	0		
<b>Product-specific adjustments</b>	<b>Low documentation:</b> Fitch increases the default probability by 30% for low-documentation mortgages and treats these borrowers as self-employed.		
	<b>Interest-only and line-of-credit loans:</b> FF is increased as set out below. The adjustment is based on the term of the principal and interest period of the loan following the initial interest-only period.		
	<b>Remaining years to maturity</b>	<b>Increase to FF (%)</b>	
<1			300
>=1 and <5			100
>=5 and <10			50
>=10 and <20			25
>=20			10
<b>Property-specific adjustments</b>	<b>Investment property:</b> Increase to the base default probability of 25%.		
	<b>Further cash advances:</b> Fitch increases the FF for pools with this risk profile by 5% across the whole pool.		
<b>Other adjustments</b>	<b>Geographic concentration:</b> Fitch increases default probability if a pool's exposure to any one state exceeds approximately twice the state's share of national population. Fitch also considers geographic concentration by individual postcode (over 2%) and region (over 5%). Regions are defined by Fitch based on Australian Bureau of Statistics sub-divisions. FF is increased by a factor of up to 50% and applied cumulatively. For properties located in the Australian Capital Territory, Northern Territory and Tasmania, only state-based and postcode concentrations are applied. Given the size of the three states/territories, Fitch also defines each of them as a single region.		

<sup>a</sup> Please refer to the section titled *Asset Analysis: Foreclosure Frequency*

<sup>b</sup> For more details on loan, borrower and product-specific adjustments, please refer to the section titled *Adjustments to Base FF*

Source: Fitch



**Loss Severity<sup>a</sup>**

<b>MVD</b>	The table, <i>Market Value Declines by Region</i> , sets out the agency's MVD ratios for houses under each rating scenario. <b>Adjustments to MVD:</b> Fitch applies an additional factor of 1.1x where the security property is an apartment or 1.2x where the loan is secured by residential land. If data is not provided, Fitch will randomly allocate a property type in line with a lender's total loan portfolio. <b>QSA:</b> Fitch's QSA assumption is 20%.			
<b>Illiquid property adjustment</b>	<b>Property value relative to region's median value (%)</b>	<b>&lt;50 or &gt;=200</b>	<b>&gt;=300</b>	<b>&gt;=500</b>
	<b>Illiquid property factor</b>	0.90	0.80	0.60
	<b>Median property values by region - AUD</b>			
	New South Wales	443,000		
	Sydney	1,000,000		
	Victoria	343,000		
	Melbourne	729,000		
	Queensland	363,000		
	Brisbane	500,000		
	Gold Coast	503,000		
	South Australia	292,000		
	Adelaide	471,000		
	Western Australia	372,000		
	Perth	526,000		
	Australian Capital Territory	598,000		
	Northern Territory	470,000		
	Darwin	503,000		
	Tasmania	265,000		
	Hobart	364,000		
<b>Other adjustments</b>	<b>Loan balance:</b> Fitch uses the scheduled loan balance for loans with redraw facilities to calculate the loss amount. For an amortising loan with no other credit or redraw facilities, Fitch uses the current balance.			
<b>Foreclosure and carrying costs</b>	Fitch assumes 5% of the post-MVD property value to estimate foreclosure costs. The agency assumes that the borrower does not pay interest for 15 months and that the interest rate on all delinquent loans during this time is a stressed interest rate of 8% for pools of conforming mortgages and 10% for pools of non-conforming mortgages and a blended rate for blended pools.			
<b>Minimum LS</b>	See table <i>Minimum Loss Severity</i>			

<sup>a</sup> Please refer to the section titled *Asset Analysis: Loss Severity*  
Source: Fitch

**Residential Mortgage Transaction Asset Analysis Data<sup>a</sup>**

<b>Australian conforming and non-conforming</b>
1. Loan product description
2. Historical annual origination volume
3. Historical loan performance data for all originations, including default, loss and arrears data for the past five+ years
4. Historical arrears data for 30+ days past due. Preferably showing 30-59, 60-89 and 90+ days arrears buckets
5. LMI claims data: Total losses, claims submitted and claims paid.
6. Mortgagee in possession report: Current data on properties in possession, including expected losses and historic data on lender-sold repossessions evidencing actual losses.

Note: The above list shows the data Fitch expects to receive at initial rating (items 1-6) and on an ongoing basis (items 4-6)

<sup>a</sup> Please refer to the section titled *Data Adequacy*  
Source: Fitch

Cash Flow Analysis<sup>a</sup>

	CPR (%)
<b>Prepayment rate</b>	Low 8
<b>Assumption</b>	High 33
<b>Default timing distribution</b>	Please refer to the section titled <i>Default Timing Distribution</i>
	In low-prepayment scenarios, an additional default timing distribution is utilised to back-test tail-end defaults. This distribution entails reducing the distribution by 10% and distributing the remaining defaults over a 12-month period commencing when the outstanding notes within a transaction are projected to reach 10% of the then current transaction size. For each default timing period, the sum of prepayments and defaults for any given period will be capped at the maximum high scenario CPR as per the prepayment rate assumptions above. The purpose of the cap is to offset the situation where the fast CPR scenario results in a disproportionately large amount of defaults timed to occur in the back-ended scenario at a time when the majority of the notes have paid down.
<b>Other recoveries</b>	LMI is widely used in Australian conforming RMBS transactions. See <a href="#">RMBS Lenders' Mortgage Insurance Rating Criteria</a> .
<b>Transaction and servicing fees</b>	For pass-through transactions, servicing fees are modelled at the contracted rate, subject to a minimum of 25 bp pa. All other transaction fees are added to the servicing fee. A minimum dollar level of overall transaction fees is factored into Fitch's cash-flow analysis. This amount varies subject to the individual transaction type and parties involved and will be disclosed in the transaction-specific reporting.
<b>Recovery timing</b>	Recoveries of defaulted assets are assumed to occur 15 months after defaults take place in all rating scenarios.
<b>Threshold margin</b>	Many Australian RMBS transactions include a requirement for the servicer to maintain a specified level of earnings within the rated trust to meet the threshold rate, defined as the WA asset margin sufficient to meet all transaction and liability costs. This requirement is either effective from transaction close or on termination of the basis swap (if present). Where asset performance deteriorates, it increases the burden on the remaining performing assets to meet the threshold rate. If interest rates are increased excessively, it may result in additional asset deterioration. Fitch will cap the increases in asset margins as follows, unless the analysis for an individual transaction utilises a multiple above these maximums, in which case this will be disclosed in transaction-specific reporting: <ul style="list-style-type: none"> <li>• Conforming mortgages: 2.0x</li> <li>• Non-conforming mortgages: 1.5x</li> </ul>
<b>Collections timing</b>	Fitch will assume that all collections are received evenly across a collection period, unless advised otherwise by the issuer. Interest earned on collections will be calculated in line with the actual or assumed collection pattern. For loans in arrears, Fitch will assume interest will be capitalised monthly in arrears.
<b>Covered bond asset margins</b>	When modelling cover pool cash flow, Fitch adjusts asset margins over benchmark interest rates to take account of the risk of margin volatility over the life of a covered bond programme. Fitch will model the lower of actual cover pool asset margins and 2.0%, which is a stressed level below cover pool asset margins observed by Fitch in recent years.
<b>Covered bond transaction and servicing fees</b>	Transaction servicing fees are modelled at the contracted rate, subject to a minimum of 25 bp pa. All other quoted transaction fees are added to the servicing fee.
<b>Foreign currency stresses</b>	See <a href="#">Fitch's Foreign-Currency Stress Assumptions for Residual Foreign-Exchange Exposures in Covered Bonds and Structured Finance – Excel File</a>

<sup>a</sup> Please refer to section titled Cash-Flow Analysis  
Source: Fitch

Concentration/Thin Tranche Analysis

<b>Concentration tests</b>	When rating Australian RMBS transactions, Fitch tests for large loan concentrations and thin tranches based on a borrower's scheduled loan exposure on a grouped basis; that is, all loans to a single borrower. In assessing concentration/large single-borrower exposure risk, Fitch considers the following tests: <b>Large Loan-Concentration Test:</b> Fitch tests all rated tranches for borrower concentration risk. This test considers Fitch's calculated 'AAAsf' LS for all borrower exposures and assesses the largest exposures relative to the transaction's capital structure when pro rata paydown ceases, generally at the clean-up call date. The following test at each rating level is undertaken:														
	<table border="1"> <thead> <tr> <th>Rating</th> <th>Concentration test AUD dollar minimum subordination at proposed rating level based on 'AAAsf' losses</th> </tr> </thead> <tbody> <tr> <td>AAAsf</td> <td>Largest 5 'AAAsf' pre LMI losses</td> </tr> <tr> <td>AAsf</td> <td>Largest 4 'AAAsf' pre LMI losses</td> </tr> <tr> <td>Asf</td> <td>largest 3 'AAAsf' pre LMI losses</td> </tr> <tr> <td>BBBsf</td> <td>Largest 2 'AAAsf' pre LMI losses</td> </tr> <tr> <td>BBsf</td> <td>Largest 1 'AAAsf' pre LMI losses</td> </tr> <tr> <td>Bsf</td> <td>Largest 1 'AAAsf' post LMI losses</td> </tr> </tbody> </table>	Rating	Concentration test AUD dollar minimum subordination at proposed rating level based on 'AAAsf' losses	AAAsf	Largest 5 'AAAsf' pre LMI losses	AAsf	Largest 4 'AAAsf' pre LMI losses	Asf	largest 3 'AAAsf' pre LMI losses	BBBsf	Largest 2 'AAAsf' pre LMI losses	BBsf	Largest 1 'AAAsf' pre LMI losses	Bsf	Largest 1 'AAAsf' post LMI losses
Rating	Concentration test AUD dollar minimum subordination at proposed rating level based on 'AAAsf' losses														
AAAsf	Largest 5 'AAAsf' pre LMI losses														
AAsf	Largest 4 'AAAsf' pre LMI losses														
Asf	largest 3 'AAAsf' pre LMI losses														
BBBsf	Largest 2 'AAAsf' pre LMI losses														
BBsf	Largest 1 'AAAsf' pre LMI losses														
Bsf	Largest 1 'AAAsf' post LMI losses														
	If the large loan-concentration test does not pass at the rating, Fitch may consider a lower rating than that proposed. <b>Tranche Thickness Test:</b> The thickness of any tranche, when pro rata pay down of the capital structure ceases, generally at the clean up call date, should be thicker than the size of the largest scheduled initial group loan balance. If the result of this test is negative, Fitch may consider rating the tranche above a thin tranche the same as the thin tranche, as it may not provide enough support in the event of a large single-borrower loss. For revolving portfolios, Fitch will take into account the largest scheduled group loan balance permitted under the eligibility criteria.														

Source: Fitch

**Rating Junior Notes with 100% LMI Cover (Surveillance Only)**

For existing rated notes with no CE other than LMI and excess income, Fitch takes into account the transaction's historical performance, loan seasoning, remaining transaction size, availability of excess income, the sponsor's rating and its history of calling previous transactions.

Fitch uses the following criteria to determine the rating cap of junior notes with no CE other than LMI and excess income instead of using asset and cash flow analysis.

<b>Proposed Rating</b>	<b>Criteria</b>
BBBsf	<p>The transaction is performing well, with low arrears, low losses and deleveraging with at least five years of seasoning. LMI continues to pay a significant portion of submitted claims and/or the sponsor is rated above 'BBB' and has covered, and is expected to cover, LMI reductions/denials due to breaches of representations and warranties.</p> <p>The transaction is expected to be relatively large (at least AUD140 million) and have adequate and stable annualised ExS of at least 0.5% at call to cover expected claims. Net ExS in dollar amounts is expected to be adequate and stable for the life of the transaction and sufficient to cover principal shortfalls from LMI reductions/denials.</p>
BBsf	<p>The transaction is performing well with low arrears, low losses and deleveraging with at least five years of seasoning. In addition, LMI continues to pay a significant portion of submitted claims and/or the sponsor has covered, and is expected to cover, LMI reductions/denials due to breaches of representations and warranties.</p> <p>Net ExS in dollar amounts is considered to be sufficient to cover principal shortfalls from LMI reductions/denials at call.</p>
Bsf	<p>The transaction is performing well with low arrears, low losses and deleveraging with at least five years of seasoning. In addition, LMI continues to pay a significant portion of submitted claims and/or the sponsor has covered, and is expected to cover, LMI reductions/denials due to breaches of representations and warranties.</p> <p>Default risk is present, but a limited safety margin remains. Fitch expects net ExS will be sufficient to cover principal shortfalls and for the notes to be fully repaid. However, the notes are exposed to deterioration in the economic environment.</p>
CCCsf	<p>A possibility of the notes defaulting exists where Fitch does not expect the sponsor to call the transaction, losses are above expectations and the LMI payment ratio has significantly decreased, leading to a reduction in ExS and increasing consequential losses.</p>

Source: Fitch

Appendix A

**Australia Conforming Default Matrix**

Key LVR levels (%)	AAAsf	AAsf	Asf	BBBsf	BBsf	Bsf
<30	1.5	1.2	1.0	0.7	0.6	0.4
>=30 and <40	2.0	1.7	1.3	1.0	0.7	0.5
>=40 and <50	3.0	2.5	2.0	1.4	1.1	0.8
>=50 and <60	4.5	3.7	3.0	2.2	1.7	1.2
>=60 and <65	5.4	4.5	3.6	2.6	2.0	1.4
>=65 and <70	6.3	5.2	4.2	3.0	2.4	1.7
>=70 and <75	7.2	6.0	4.8	3.5	2.7	1.9
>=75 and <80	8.0	6.6	5.3	3.8	3.0	2.1
>=80 and <85	9.8	8.1	6.5	4.7	3.7	2.6
>=85 and <90	15.3	12.6	10.2	7.3	5.7	4.1
>=90 and <95	22.5	18.6	15.0	10.8	8.4	6.0
>=95 and <100	30.0	24.8	20.0	14.4	11.2	8.0
>=100	30.0	24.8	20.0	14.4	11.2	8.0

Notch-specific default rate stresses are derived by linear interpolation between the stresses applicable to adjacent rating categories  
Source: Fitch

**Australia Non-Conforming Default Matrix**

Key LVR levels (%)	AAAsf	AAsf	Asf	BBBsf	BBsf	Bsf
<30	6.0	5.3	4.0	3.0	2.5	2.0
>=30 and <40	7.0	6.2	4.7	3.5	2.9	2.3
>=40 and <50	8.0	7.1	5.3	4.0	3.3	2.7
>=50 and <60	10.0	8.9	6.7	5.0	4.2	3.3
>=60 and <65	11.5	10.2	7.7	5.8	4.8	3.8
>=65 and <70	12.5	11.1	8.3	6.3	5.2	4.2
>=70 and <75	14.0	12.4	9.3	7.0	5.8	4.7
>=75 and <80	17.0	15.1	11.3	8.5	7.1	5.7
>=80 and <85	22.5	20.0	15.0	11.3	9.4	7.5
>=85 and <87.5	30.0	26.6	20.0	15.0	12.5	10.0
>=87.5 and <90	33.0	29.3	22.0	16.5	13.8	11.0
>=90 and <95	40.0	35.5	26.7	20.0	16.7	13.3
>=95	40.0	35.5	26.7	20.0	16.7	13.3

Notch-specific default rate stresses are derived by linear interpolation between the stresses applicable to adjacent rating categories  
Source: Fitch

**Fitch Debt Burden-to-Borrower Income Classes**

Class	DTI band (%)	Adjustment (%)
1	<20	-10
2	>=20 and <25	0
3	>=25 and <30	5
4	>=30 and <35	10
5	>=35 and <40	20
6	>=40 and <50	30
7	>=50	60
No data supplied - full documentation loan		20
No data supplied - low documentation loan		60

Source: Fitch

**Foreclosure Frequency for Loans in Arrears**

	(Days)		
	30-59	60-89	>=90*
FF adjustment (%)	20	50	n.a.
Floor FF (%)	20	66	100

\* FF adjustment for delinquency over 90 days is not applicable as loans are treated as defaulted (100% FF)  
Source: Fitch

**Default Probability Limits**

	<b>AAAsf</b>	<b>AAsf</b>	<b>Asf</b>	<b>BBBsf</b>	<b>BBsf</b>	<b>Bsf</b>
Minimum default probability (%)	1.5	1.2	1.0	0.7	0.6	0.4
Maximum default probability (%)	100.0	90.0	80.0	70.0	60.0	50.0

Source: Fitch

**Market Value Declines by Region**

**Houses**

<b>Region (%)</b>	<b>AAAsf</b>	<b>AAsf</b>	<b>Asf</b>	<b>BBBsf</b>	<b>BBsf</b>	<b>Bsf</b>
Sydney	61.1	54.9	48.7	42.5	36.2	30.0
Other New South Wales	53.5	47.8	42.1	36.4	30.7	25.0
Melbourne	58.7	53.0	47.2	41.5	35.7	30.0
Other Victoria	50.2	45.2	40.1	35.1	30.0	25.0
Brisbane	52.9	47.3	41.7	36.1	30.6	25.0
Gold Coast	55.3	50.2	45.2	40.1	35.1	30.0
Other Queensland	46.0	41.8	37.6	33.4	29.2	25.0
Adelaide	46.4	42.2	37.9	33.6	29.3	25.0
Other South Australia	45.0	41.0	37.0	33.0	29.0	25.0
Perth	48.1	43.4	38.8	34.2	29.6	25.0
Other Western Australia	49.7	44.7	39.8	34.9	29.9	25.0
Australian Capital Territory	53.3	47.6	42.0	36.3	30.7	25.0
Northern Territory	46.9	42.5	38.1	33.8	29.4	25.0
Tasmania	47.8	43.2	38.7	34.1	29.6	25.0

Notch-specific default rate stresses are derived by linear interpolation between the stresses applicable to adjacent rating categories

Source: Fitch

**Minimum Loss Severity**

	<b>AAAsf</b>	<b>AAsf</b>	<b>Asf</b>	<b>BBBsf</b>	<b>BBsf</b>	<b>Bsf</b>
Minimum LS (%)	25	23	21	19	17	15

Notch-specific default rate stresses are derived by linear interpolation between the stresses applicable to adjacent rating categories

Source: Fitch

**Minimum Credit Enhancement**

**AAAsf**

Minimum CE (excluding credit to LMI) (%)	4	This might be increased in specific cases if the agency deems it appropriate. Where the minimum CE has been utilised at 'AAAsf', a proportionate uplift to CE at lower rating levels will also be utilised.
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Source: Fitch

## Data Sources and Models Used to Derive Australian Assumptions

### Conforming

Data provided by the LMI industry with a comprehensive review of the performance of residential LMI claims covering the period 1980 to 2000.

Data provided by an LMI provider for residential loan claims and loss data covering the period 1997 to 2017.

Reported static pool performance data from Australian Fitch-rated pass-through conforming RMBS transactions covering the period 2007-2017.

Loan-by-loan repossession, recovery and LS data provided by conforming lenders covering the period 2007-2017.

### Non-Conforming

Loan-by-loan repossession, recovery and LS data provided by non-conforming lenders with RMBS transactions rated by Fitch.

Aggregate static-pool performance information, including delinquencies, recovery and LS data from Australian non-conforming lenders with RMBS transactions rated by Fitch. Data covers the period from 2002 onwards.

### General

Historical house-price data provided by CoreLogic.

Economic information collected and collated by the Australian Bureau of Statistics and the Reserve Bank of Australia.

Research studies by international organisations and investment banks.

For the definition of conforming and non-conforming, please refer to table, *Foreclosure Frequency*.

Fitch's residential mortgage asset model relies significantly on a loan performance study undertaken by Fitch in 2002, covering loan performance for the 20 years from 1980 to 2000. The underlying data for this study is based on a 2001 study commissioned by the LMI industry. The loan study includes the Australian recessions of the early 1980s and early 1990s. With the Australian economy sustaining 25 years of continuous economic growth since the last recession in 1991, this study remains the best data available on the performance of Australian mortgages under stress.

Findings of the study were published in a Fitch report titled *Australian Residential Mortgage Loan Performance Study*, dated 10 June 2002. The study placed particular weight on the experience of the Australian state of Victoria in the recession of the early 1990s. Victoria's mortgage defaults were the most significant at that time and Fitch's current mortgage asset model is based on the worst historical performance of each individual Australian state over that 20-year period, adjusted upwards for higher rating categories.



Addendum B – New Zealand

New Zealand RMBS and Covered Bond Model Assumptions

Foreclosure Frequency<sup>a</sup>

<b>Willingness to pay</b>	Current LVR is based on the current loan amount advanced to the borrower. Property valuations are based on the latest property valuation amount or purchase price, if lower, and generally on a full internal inspection of the property when the relevant loan was last underwritten. This could be the date of the original loan advance or, in the case of subsequent further advances, the further advance date.										
<b>Base FF</b>	In New Zealand, loan-by-loan DTI is typically collected at origination but is not stored and therefore is not available at the time of securitisation. Consequently, Fitch has developed a base FF matrix based solely on LVR using the methods described in this criteria report. The base FF for each rating scenario for conforming and non-conforming loans are shown in the tables <i>New Zealand Conforming Default Matrix</i> and <i>New Zealand Non-Conforming Default Matrix</i> , respectively, in <i>Appendix B</i> .										
<b>Adjustments to base FF<sup>b</sup></b>	The following FF adjustments will be applied to the base FF to address the risk profile of a non-standard New Zealand loan:										
<b>Lender adjustment</b>	Individually determined.										
<b>Borrower-specific adjustments</b>	<p><b>DTI</b> calculation is based on the assumption that the relevant mortgage is a principal and interest mortgage loan. Fitch calculates the DTI ratio for a loan by dividing the monthly scheduled mortgage payment by monthly gross income. The monthly mortgage payment is calculated using a stressed interest rate equal to the higher of a) 5% plus the relevant margin, or b) the current interest rate (whether fixed or variable) charged to the borrower. Monthly gross income is based on the combined gross income of the borrower(s) for a particular loan. The DTIs are then ranked relative to the ability to pay, from class 1 (good affordability), to class 7 (poor affordability) and the FF is adjusted as shown in table <i>Fitch DTI Classes</i>.</p> <p><b>First-time home buyers:</b> 15% increase to base FF for the first two years of the loan's life. In the absence of first-time home-buyer data, Fitch will assume that 15% of the proportion of the pool with no data consists of first-time home buyers.</p> <p><b>Self-employed:</b> Fitch will increase the FF for each loan to self-employed borrowers by 25%. If employment data is not provided, Fitch will assume that 15% of the proportion of the pool with no data consists of self-employed borrowers.</p> <p><b>Non-residents:</b> Fitch will increase the default probability by 25%.</p> <p><b>Employee loans:</b> Where a note is rated above that of the issuer, Fitch will add 25% to the default probability for employee loans from that issuer. If a borrower is more than 24 months ahead of their scheduled repayments, using the same stressed interest rate used in the DTI calculation to calculate a borrower's repayments, Fitch will not apply any adjustment. For notes rated below that of the issuer, Fitch will not apply any adjustment.</p> <p><b>Arrears:</b> Fitch will increase the default probability according to table <i>Frequency of Foreclosure for Loans in Arrears</i>. The agency will then use the higher of the adjusted default probability and the floor values in the same table.</p> <p><b>Seasoning adjustment:</b> Fitch will adjust probability of default as indicated below. No credit for seasoning is given to loans in arrears.</p> <table border="1"> <thead> <tr> <th>Years since origination</th> <th>Decrease to default probability (%)</th> </tr> </thead> <tbody> <tr> <td>&lt;3</td> <td>0</td> </tr> <tr> <td>&gt;=3 and &lt;4</td> <td>5</td> </tr> <tr> <td>&gt;=4 and &lt;5</td> <td>10</td> </tr> <tr> <td>&gt;=5</td> <td>20</td> </tr> </tbody> </table>	Years since origination	Decrease to default probability (%)	<3	0	>=3 and <4	5	>=4 and <5	10	>=5	20
Years since origination	Decrease to default probability (%)										
<3	0										
>=3 and <4	5										
>=4 and <5	10										
>=5	20										

Foreclosure Frequency (Cont.)

Adjustment to default probability for credit impaired loans		Most recent credit bureau default recorded	Increase to default (%)
<b>Number of credit bureau entries</b>	<b>Increase to default (%)</b>		
1-2	10	In last 6 months	75
3-4	50	In past 7-24 months	25
5-9	75	In past 25+ months	0
>=10	90		
	<b>Increase to default (%)</b>		
<b>Prior bankruptcy</b>	<b>(%)</b>		
Discharged 1-11 months	75		
Discharged 12-36 months	50		
Discharged >37-60 months	25		
Discharged >60 months	0		
<b>Product-specific adjustments</b>	<b>Low documentation:</b> Fitch increases FF by 30% for low-documentation mortgages and treats these borrowers as self-employed.		
	<b>Interest-only and line-of-credit loans:</b> FF is increased as set out below. The adjustment is based on the term of the principal and interest period of the loan following the initial interest-only period.		
	<b>Remaining years to maturity</b>		<b>Increase to FF (%)</b>
	<1		300
	>=1 and <5		100
	>=5 and <10		50
	>=10 and <20		25
	>=20		10
<b>Property-specific adjustments</b>	<b>Overdraft loan:</b> If a borrower has a related overdraft-style loan where the lender has the right to call the loan with immediate repayment that results in a cross default to the securitised loan, Fitch will increase FF by 200%. If the securitised loan is already subject to an increased FF probability of 300% due to it having a remaining maturity of less than one year after the end of the interest-only period, the higher default probability increase only will be applied.		
	<b>Investment property:</b> Increase to base FF of 25%.		
<b>Other adjustments</b>	<b>Country Uplift:</b> Fitch increases FF of all loans by 10% due to the small size of New Zealand's market relative to other RMBS markets.		
	<b>Further cash advances:</b> Fitch increases FF of pools with this risk profile by 5% across the whole pool.		
	<b>Geographic concentration:</b> Fitch increases FF by 50% for the portion of the pool's exposure above the regional limit, defined as approximately twice the region's share of national population.		

<sup>a</sup> Please refer to the section titled *Asset Analysis: Foreclosure Frequency*

<sup>b</sup> For more details on loan, borrower and product-specific adjustments, please refer to the section titled *Adjustments to Base Foreclosure Frequency*

Source: Fitch

Loss Severity<sup>a</sup>

<b>MVD</b>	The table <i>Market Value Declines by Region</i> sets out the agency's MVD ratios for houses under each rating scenario. <b>Adjustments to MVD:</b> Fitch applies an additional factor of 1.1x where the security property is an apartment or 1.2x where the loan is secured by residential land. If data is not provided, Fitch will randomly allocate a property type in line with a lender's total loan portfolio. <b>QSA:</b> Fitch's QSA assumption for New Zealand is 20%. <b>Earthquake adjustment:</b> As much of New Zealand is prone to earthquakes, an additional MVD adjustment is applied for higher-value properties that lie within earthquake zones.			
	<b>Property value relative to region's median value (%)</b>	<b>&gt;=100</b>		<b>&gt;=200</b>
	<b>Earthquake adjustment</b>	10%		20%
<b>Illiquid property adjustment</b>	<b>Property value relative to median value of a region (%)</b>	<b>&lt;50 or &gt;=200</b>	<b>&gt;=300</b>	<b>&gt;=500</b>
	<b>Illiquid property factor</b>	0.90	0.80	0.60
	<b>Median property values by Region - NZD</b>			
	Auckland	825,000		
	Wellington	480,000		
	Christchurch	434,000		
	Rest of New Zealand	380,000		
<b>Other adjustments</b>	<b>Loan balance:</b> Fitch uses the scheduled loan balance for loans with redraw facilities to calculate the loss amount. For an amortising loan with no other credit or redraw facilities, Fitch uses the current balance.			
<b>Foreclosure and carrying costs</b>	Fitch assumes 5% of the post-MVD property value to estimate foreclosure costs. The agency assumes that the borrower does not pay interest for 15 months and that the interest rate on all delinquent loans during this time is a stressed interest rate of 8% for pools of conforming mortgages and 10% for pools of non-conforming mortgages and a blended rate for blended pools.			
<b>Minimum LS</b>	See table <i>Minimum Loss Severity</i>			

<sup>a</sup> Please refer to the section titled *Asset Analysis Loss Severity*  
Source: Fitch

**Residential Mortgage Transaction Asset Analysis Data<sup>a</sup>**

**New Zealand conforming and non-conforming**

1. Loan product description
2. Historical annual origination volumes
3. Historical loan performance data for all originations, including default, loss and arrears data for the past five+ years
4. Historical arrears data for 30+ days past due. Preferably showing 30-59, 60-89 and 90+ days arrears buckets
5. LMI claims data: Total losses, claims submitted and claims paid.
6. Mortgagee in possession report: Current data on properties in possession with expected losses and historic data on lender-sold repossessions evidencing actual losses.

Note: The above list shows the data Fitch expects to receive at initial rating (items 1-6) and on an ongoing basis (items 4-6)

<sup>a</sup> Please refer to the section titled *Data Adequacy*

Source: Fitch

**Cash-Flow Analysis<sup>a</sup>**

Prepayment rate assumptions	CPR (%)	
	Low	8
	High	33
<b>Default timing distribution</b>	Please refer to the section titled <i>Default Timing Distribution</i> . In low-prepayment scenarios, an additional default timing distribution is utilised to back-test tail-end defaults. This distribution entails reducing the distribution by 10% and distributing the remaining defaults over a 12-month period commencing when the outstanding notes within a transaction are projected to reach 10% of the then current transaction size. For each default timing period, the sum of prepayments and defaults, for any given period, will be capped at the maximum high scenario CPR as per the prepayment rate assumptions above. The purpose of the cap is to offset the situation where the fast CPR scenario results in a disproportionately large amount of defaults timed to occur in the back-ended scenario at a time when the majority of the notes have paid down.	
<b>Other recoveries</b>	<b>LMI</b> is occasionally seen in New Zealand conforming RMBS transactions. See <a href="#">RMBS Lenders' Mortgage Insurance Rating Criteria</a> .	
<b>Transaction and servicing fees</b>	For New Zealand, pass-through transaction servicing fees are modelled at the contracted rate, subject to a minimum of 25bp pa. All other transaction fees are added to the servicing fee. A minimum dollar level of overall transaction fees is factored into Fitch's cash-flow analysis. This amount varies subject to the individual transaction type and parties involved and will be disclosed in the transaction-specific reporting.	
<b>Recovery timing</b>	Modelled recoveries of defaulted assets in all rating scenarios are assumed to occur 15 months after the defaults take place.	
<b>Threshold margin</b>	Many New Zealand RMBS transactions require the servicer to maintain a specified level of earnings within the rated trust to meet the threshold rate, defined as the WA asset margin sufficient to meet all transaction and liability costs. This requirement is effective either from transaction close or on termination of the basis swap (if present). Fitch will cash flow model a transaction utilising the following maximum increases in asset margins: <ul style="list-style-type: none"> <li>• Conforming mortgages: 2.0x</li> <li>• Non-conforming mortgages: 1.5x</li> </ul> If analysis of an individual transaction utilises a multiple above these maximums, this will be disclosed in the transaction-specific reporting.	
<b>Collections timing</b>	Fitch will assume that all collections are received evenly across a collection period, unless advised otherwise by the issuer. Interest earned on collections will be calculated in line with the actual or assumed collection pattern. For loans in arrears, Fitch will assume interest will be capitalised monthly in arrears.	
<b>Covered bond asset margins</b>	When modelling cover pool cash flow, Fitch adjusts asset margins over benchmark interest rates to take account of the risk of margin volatility over the life of a covered bond programme. Fitch will model the lower of actual cover pool asset margin and 2.0%, which is a stressed level below cover pool asset margins observed by Fitch in recent years.	
<b>Covered bond transaction and servicing fees</b>	Transaction servicing fees are modelled at the contracted rate, subject to a minimum of 25bp pa. All other quoted transaction fees are added to the servicing fee.	

<sup>a</sup> Please refer to the section titled *Cash-Flow Analysis*

Source: Fitch

**Concentration/Thin Tranche Analysis**

**Concentration tests**

When rating New Zealand RMBS transactions, Fitch tests for large loan concentrations and thin tranches based on a borrower’s scheduled loan exposure on a grouped basis; that is, all loans to a single borrower.

In assessing concentration/large single borrower exposure risk, Fitch considers the following tests:

**Large loan concentration test:** Fitch tests all rated tranches for borrower concentration risk. This test considers Fitch’s calculated ‘AAAsf’ LS for all borrower exposures and assesses the largest exposures relative to the transaction’s capital structure when pro rata paydown ceases, generally at the clean-up call date.

The following test at each rating level is undertaken:

Proposed rating	Concentration test NZD dollar minimum subordination at proposed rating level based on ‘AAAsf’ losses
AAAsf	Largest 5 ‘AAAsf’ pre LMI losses
AAsf	Largest 4 ‘AAAsf’ pre LMI losses
Asf	Largest 3 ‘AAAsf’ pre LMI losses
BBBsf	Largest 2 ‘AAAsf’ pre LMI losses
BBsf	Largest 1 ‘AAAsf’ pre LMI losses
Bsf	Largest 1 ‘AAAsf’ post LMI losses

If the large loan concentration test does not pass at the proposed rating, Fitch may consider a lower rating than that proposed.

**Tranche thickness test:** The thickness of any tranche, when pro rata paydown of the capital structure ceases, generally at the clean-up call date, should be thicker than the size of the largest scheduled initial group loan balance. If the result of this test is negative, Fitch may consider rating the tranche above a thin tranche the same as the thin tranche as it may not provide enough support in the event of a large single-borrower loss. For revolving portfolios, Fitch will take into account the largest scheduled group loan balance permitted under the eligibility criteria.

Source: Fitch

**Rating Junior Notes with 100% LMI Cover (Surveillance Only)**

For existing rated notes with no CE other than LMI and excess income, Fitch takes into account the transaction’s historical performance, loan seasoning, remaining transaction size, availability of excess income, the sponsor’s rating and its history of calling previous transactions.

Fitch uses the following criteria to determine the rating cap of junior notes with no CE other than LMI and excess income instead of using asset and cash flow analysis:

Proposed Rating	Criteria
BBBsf	The transaction is performing well, with low arrears, low losses and deleveraging with at least five years of seasoning. LMI continues to pay a significant portion of submitted claims and/or the sponsor is rated above BBB and has covered, and is expected to cover, LMI reductions/denials due to breaches of representations and warranties.
	The transaction is expected to be relatively large (at least NZD140 million) and have adequate and stable annualised ExS of at least 0.5% at call to cover expected claims. Net ExS in dollar amounts is expected to be adequate and stable for the life of the transaction and sufficient to cover principal shortfalls from LMI reductions/denials.
BBsf	The transaction is performing well with low arrears, low losses and deleveraging with at least five years of seasoning. In addition, LMI continues to pay a significant portion of submitted claims and/or the sponsor has covered, and is expected to cover, LMI reductions/denials due to breaches of representations and warranties.
	Net ExS in dollar amounts is considered to be sufficient to cover principal shortfalls from LMI reductions/denials at call.
Bsf	The transaction is performing well with low arrears, low losses and deleveraging with at least five years of seasoning. In addition, LMI continues to pay a significant portion of submitted claims and/or the sponsor has covered, and is expected to cover, LMI reductions/denials due to breaches of representations and warranties.
	Default risk is present, but a limited safety margin remains. Fitch expects net ExS will be sufficient to cover principal shortfalls and for the notes to be fully repaid. However, the notes are exposed to deterioration in the economic environment.
CCCsf	A possibility of the notes defaulting exists where Fitch does not expect the sponsor to call the transaction, losses are above expectations and the LMI payment ratio has significantly decreased, leading to a reduction in ExS and increasing consequential losses.

Source: Fitch

Appendix B

New Zealand Conforming Default Matrix

Key LVR levels (%)	AAAsf	AAsf	Asf	BBBsf	BBsf	Bsf
<30	1.5	1.2	1.0	0.7	0.6	0.4
>=30 and <40	2.0	1.7	1.3	1.0	0.7	0.5
>=40 and <50	3.0	2.5	2.0	1.4	1.1	0.8
>=50 and <60	4.5	3.7	3.0	2.2	1.7	1.2
>=60 and <65	5.4	4.5	3.6	2.6	2.0	1.4
>=65 and <70	6.3	5.2	4.2	3.0	2.4	1.7
>=70 and <75	7.2	6.0	4.8	3.5	2.7	1.9
>=75 and <80	8.0	6.6	5.3	3.8	3.0	2.1
>=80 and <85	9.8	8.1	6.5	4.7	3.7	2.6
>=85 and <90	15.3	12.6	10.2	7.3	5.7	4.1
>=90 and <95	22.5	18.6	15.0	10.8	8.4	6.0
>=95 and <100	30.0	24.8	20.0	14.4	11.2	8.0
>=100	30.0	24.8	20.0	14.4	11.2	8.0

Notch-specific default rate stresses are derived by linear interpolation between the stresses applicable to adjacent rating categories  
Source: Fitch

New Zealand Non-Conforming Default Matrix

Key LVR levels (%)	AAAsf	AAsf	Asf	BBBsf	BBsf	Bsf
<30	6.0	5.3	4.0	3.0	2.5	2.0
>=30 and <40	7.0	6.2	4.7	3.5	2.9	2.3
>=40 and <50	8.0	7.1	5.3	4.0	3.3	2.7
>=50 and <60	10.0	8.9	6.7	5.0	4.2	3.3
>=60 and <65	11.5	10.2	7.7	5.8	4.8	3.8
>=65 and <70	12.5	11.1	8.3	6.3	5.2	4.2
>=70 and <75	14.0	12.4	9.3	7.0	5.8	4.7
>=75 and <80	17.0	15.1	11.3	8.5	7.1	5.7
>=80 and <85	22.5	20.0	15.0	11.3	9.4	7.5
>=85 and <87.5	30.0	26.6	20.0	15.0	12.5	10.0
>=87.5 and <90	33.0	29.3	22.0	16.5	13.8	11.0
>=90 and <95	40.0	35.5	26.7	20.0	16.7	13.3
>=95	40.0	35.5	26.7	20.0	16.7	13.3

Notch-specific default rate stresses are derived by linear interpolation between the stresses applicable to adjacent rating categories  
Source: Fitch

Fitch Debt Burden-to-Borrower Income Classes

Class	DTI band (%)	Adjustment (%)
1	<20	-10
2	>=20 and <25	0
3	>=25 and <30	5
4	>=30 and <35	10
5	>=35 and <40	20
6	>=40 and <50	30
7	>=50	60
No data supplied - full documentation loan		20
No data supplied - low documentation loan		60

Source: Fitch

Foreclosure Frequency for Loans in Arrears

	(Days)		
	30-59	60-89	>=90*
FF adjustment (%)	20	50	n.a.
Floor FF (%)	20	66	100

\* FF adjustment for delinquency over 90 days is not applicable as loans are treated as defaulted (100% FF)

Source: Fitch

**Default Probability Limits**

	<b>AAAsf</b>	<b>AAsf</b>	<b>Asf</b>	<b>BBBsf</b>	<b>BBsf</b>	<b>Bsf</b>
Minimum default probability (%)	1.5	1.2	1.0	0.7	0.6	0.4
Maximum default probability (%)	100.0	90.0	80.0	70.0	60.0	50.0

Source: Fitch

**Market Value Declines by Region**

**Houses**

<b>Region (%)</b>	<b>AAAsf</b>	<b>AAsf</b>	<b>Asf</b>	<b>BBBsf</b>	<b>BBsf</b>	<b>Bsf</b>
Auckland	62.8	56.2	49.7	43.1	36.6	30.0
Wellington	51.6	46.2	40.9	35.6	30.3	25.0
Christchurch	53.3	48.7	44.0	39.3	34.7	30.0
Remainder of New Zealand	55.6	49.4	43.3	37.2	31.1	25.0

Notch-specific default rate stresses are derived by linear interpolation between the stresses applicable to adjacent rating categories

Source: Fitch

**Minimum Loss Severity**

	<b>AAAsf</b>	<b>AAsf</b>	<b>Asf</b>	<b>BBBsf</b>	<b>BBsf</b>	<b>Bsf</b>
Minimum LS (%)	25	23	21	19	17	15

Source: Fitch

**Minimum Credit Enhancement**

	<b>AAAsf</b>
Minimum CE (excluding credit to LMI) (%)	4 This might be increased in specific cases if the agency deems it appropriate. Where the minimum CE has been utilised at 'AAAsf', a proportionate uplift to CE at lower rating levels will also be utilised.

Source: Fitch



## Data Sources and Models Used to Derive New Zealand Assumptions

### Conforming

- Data provided by the LMI industry, with a comprehensive review of the performance of residential LMI claims spanning 1980 to 2000 for Australia
- Loan-by-loan repossession, recovery and LS data provided by a number of Fitch-rated conforming lenders over the past decade.
- Reported static pool performance data from Australian and New Zealand Fitch-rated pass-through conforming RMBS transactions over the past decade.

### Non-Conforming

- Loan-by-loan repossession, recovery and LS data provided by a number of Australian non-conforming lenders with transactions rated by Fitch.
- Aggregate static-pool performance information, including delinquencies, recovery and LS data from several Australian non-conforming lenders with RMBS transactions rated by Fitch. Data covers the period from 2002 onwards.

### General

- Historical house-price data provided by Quotable Value.
- Economic information collected and collated by the Reserve Bank of New Zealand.

For the definition of “conforming” and “non-conforming”, see table *Foreclosure Frequency*.

The New Zealand mortgage market has many similarities to Australia’s mortgage market in terms of products, underwriting standards, legal environment and performance. These similarities are enhanced through the ownership of New Zealand’s major banks by Australia’s major banks and close economic ties. In light of these factors and the cultural similarities between the two countries, Fitch feels it appropriate to use its Australian RMBS criteria assumptions with some minor adjustments for New Zealand RMBS.

Addendum C – Japan

Japanese Prime RMBS Model Assumptions

Foreclosure Frequency<sup>a</sup>

<b>Ability/willingness to pay</b>	In the Japanese market, FF assumptions are based on both current LVR (more commonly called LTV in the Japanese market) and DTI as shown in the table <i>Base ('Bsf' Scenario) FF Matrix</i> , because the necessary data is provided to Fitch. Property valuations are typically based on the latest property value or purchase price. The base FF rate is multiplied by rating-specific multipliers shown in the table <i>Scenario Multipliers of 'Bsf' FF Matrix</i> .
<b>Adjustments to base FF</b>	The following FF adjustments will be applied to the base FF to address the risk profile of individual loans:
<b>Additional FF stress due to higher CLTV</b>	For this purpose, current LTV is calculated by dividing the current loan balance by the current value, where the original appraisal value is adjusted using house-price indices. If the current LTV exceeds 95%, Fitch will increase FF assumptions, as it will be more difficult for the borrower to sell the collateral to repay the debt. Fitch will increase the default probability as outlined in the table <i>Additional Foreclosure Frequency Stress due to Higher current loan-to-value</i> .
<b>Employment Status</b>	Self-employed borrowers tend to have less stable income; therefore, Fitch will increase the default probability for loans to self-employed borrowers as shown in the table <i>Employment Status</i> . If employment status is unknown, Fitch will apply the same stress to the relevant loans as that for self-employed borrowers.
<b>Adjustment for loans in arrears</b>	<b>Arrears as of cut-off:</b> Fitch will increase the default probability according to the table <i>Adjustment for Loans in Arrears as of Cut-Off</i> . The agency will then use the higher of the adjusted default probability and the floor values in the same table. <b>Previous Delinquency:</b> Fitch will increase the default probability of borrowers with prior delinquency records according to the tables <i>Adjustment for Prior Mortgage Arrears (Second Consecutive Time)</i> and <i>Adjustment for Prior Mortgage Arrears (Third Consecutive Time)</i> .
<b>Adjustment by loan type</b>	<b>Loan Coupon Type:</b> Floating-rate and adjustable interest-rate loans are generally considered more risky than fixed-rate loans, as borrowers are exposed to a potential increase in interest rates; therefore, Fitch will increase the default probability according the table <i>Loan Coupon Type</i> . <b>Loan Purpose:</b> A financially distressed borrower is more likely to default on a loan financing a second home or investment property than on a primary residence. Fitch increases default rates depending on loan purpose shown in the table <i>Loan Purpose</i> . <b>Lenders Focus:</b> In the Japanese RMBS market, the vast majority of transactions have been prime RMBS to date. However, as evidenced in other markets, it should be reasonable to assume that borrowers of non-conforming loans have a greater propensity to default than those of conforming loans, and those of sub-prime loans have a greater propensity to default than those of non-conforming loans. Therefore, Fitch will adjust the default probability of loans classified as other than conforming according to the table <i>Lenders Focus</i> . <b>Adjustment for Refinancing:</b> When refinancing, if no additional money is drawn, the reason for refinancing is most likely to enjoy better interest-rate conditions. Since only creditworthy borrowers can enjoy such conditions, a small credit is given to such borrowers. In contrast, cash out when refinancing or debt consolidation as a reason for refinancing may indicate deterioration of the borrower's creditworthiness and/or increased leverage. Therefore, Fitch will adjust the default probability depending on the type of refinancing according the table <i>Adjustment for Refinancing</i> .
<b>Other adjustments</b>	<b>Credit for Good Payment:</b> A relatively long good payment history may indicate sustainability of debt service. Therefore, depending on the length of good payment, some credit is given to borrowers according to the table <i>Credit for Good Payment</i> . <b>Nationality:</b> Additional stress is applied to non-Japanese borrowers according to the table <i>Nationality</i> , as it would be hard for the servicer to take legal action against defaulted non-Japanese borrowers, especially if they left Japan.
<b>Lender adjustment</b>	<b>Individually determined.</b>

<sup>a</sup> Please refer to the section titled *Asset Analysis: Foreclosure Frequency*  
Source: Fitch

**Loss Severity<sup>a</sup>**

<b>Property price indexing</b>	To estimate the current value of a property, Fitch indexes the property value using the data published by Japan Real Estate Institute (JREI), the property' location on a regional level and the date of the original valuation. Indexation is calculated by capturing 0% of property price increases while considering 100% of price decreases.
<b>MVD</b>	Fitch's MVD ratios reflect the expected erosion of property prices and include a QSA. The latter captures the discount necessary to sell a property under distress, compared with an open-market sale. Fitch's QSA assumption for Japan is 23%. The table <i>Market Value Decline Assumptions</i> sets out the agency's MVD ratios for houses under each rating scenario.
<b>New property stress</b>	Prices of newly constructed properties tend to be set much higher than those of existing properties, but soon after the construction is completed, the new home premium is gradually eroded. MVD is additionally stressed to take into account the higher prices of new properties, according to the table <i>New Property Stress</i> .
<b>Jumbo factor</b>	Homes with high market value are generally subject to higher MVDs in a deteriorating market than those with average or below-average market values due to limited demand for such properties. Imprecise pricing information caused by the lack of comparable benchmark homes also influences the amount of price volatility during a market downturn. Therefore, Fitch will increase base MVD assumptions to account for this increased risk, as detailed in the table <i>Jumbo Factor</i> .
<b>Geographical concentration</b>	Fitch will determine the application of additional stresses to the MVDs of the relevant loan pools according to the table <i>Geographical Concentration</i> , by taking into consideration geographical concentration risk from economic and geographical aspects.
<b>Foreclosure and carrying costs</b>	When calculating recovery value, Fitch's model reduces the property valuation by foreclosure costs and the cost to the servicer of carrying the loan from delinquency through to default. Fitch will deduct variable and fixed foreclosure costs. Fitch assumes 6.9% of the mortgage claim amount as variable costs, including property registration tax, the attorney's fee and the fixed costs based on the prevailing fixed-cost schedule disclosed by courts (JPY604,000 is assumed). As for carrying costs, Fitch assumes 2.6% (Japanese) of the mortgage claim amount and 6.6% (non-Japanese), taking into consideration assumed time for recovery. The assumed RR of principal is capped at 100%.
<b>Partial credit on recovery</b>	If a mortgage guarantor retains security rights, Fitch will give partial credit on its assumed recovery, depending on the target ratings on the notes as shown in the table <i>Partial Credit on Recovery</i> .
<b>Minimum LS</b>	Not applied in this jurisdiction.

**Surveillance Analysis**

In Japan, loan-by-loan data is not provided to Fitch on a regular basis after closing. Therefore, for ongoing surveillance, Fitch assesses the trends in key performance indicators, including dynamic delinquency and default rates as well as cumulative default and net loss rates. In particular, cumulative default and net loss rates are compared with Fitch's initial or revised (if any) expectations.

Where ongoing performance deviates from Fitch's expectations to the extent that it cannot be sufficiently offset by mitigating factors such as CE build up, or where call option conditions have been met and the transaction remains uncalled, Fitch requests loan-by-loan data be provided and the asset model will be re-run.

<sup>a</sup> Please refer to the section titled *Asset Analysis Loss Severity*  
Source: Fitch

**Expected Data for Asset Analysis<sup>a</sup>**

**Japanese prime RMBS**

Loan product descriptions  
 Historical annual origination volumes  
 Historical loan performance data for all originations, including default, loss and arrears data for the past five+ years by product, location and year  
 Historical arrears data for 30+ days past due. Preferably showing 30-59, 60-89 and 90+ days arrears buckets  
 Fitch will verify the source and quality of data provided, subject to satisfactory reasonable investigation, and where data is missing either a conservative assumption should be able to be made or Fitch may decline to rate the transaction

Note: The above list shows the data Fitch expects to receive for its initial rating analysis  
<sup>a</sup> Please refer to the section titled *Data Adequacy*  
 Source: Fitch

**Cash-Flow Analysis**

Not applicable for this jurisdiction

Source: Fitch

Japan Prime Foreclosure Frequency Assumptions

Base ('Bsf' Scenario) FF Matrix (%)

LTV (%) <sup>a</sup>	DTI (%)				
	Class 1 (<20)	Class 2 (>=20 and <29)	Class 3 (>=29 and <39)	Class 4 (>=39 and <49)	Class 5 (>=49)
<30	0.50	0.75	0.75	1.00	1.25
>=30 and <40	0.50	0.75	0.75	1.00	1.25
>=40 and <50	0.75	1.00	1.25	1.50	1.75
>=50 and <60	1.25	1.50	2.00	2.25	2.50
>=60 and <70	2.25	2.50	3.00	3.25	3.75
>=70 and <80	2.75	3.25	3.50	4.00	4.50
>=80 and <85	3.50	3.75	4.25	5.00	5.50
>=85 and <90	4.25	4.75	5.25	6.00	6.75
>=90 and <94	5.00	5.75	6.50	7.50	8.50
>=94 and <98	6.25	7.00	8.00	9.00	10.25
>=98 and <100	7.50	8.50	9.75	11.00	12.50
>=100	8.75	10.00	11.25	12.50	15.00

<sup>a</sup> For this purpose, quasi-original LTV (current outstanding loan balance/property price at loan origination) and DTI ratio are used to calculate base default probability. After closing, if Fitch identifies deterioration in pool performance beyond its expectations, the agency will request updated loan-by-loan data to re-run the model. In such a case, LTV is calculated by using the updated outstanding loan balance divided by the property value adjusted by the relevant land-price index; however, if this updated LTV is significantly better than the LTV used in the initial rating analysis, the rating committee may decide to continue using the latter.  
Source: Fitch

Scenario Multipliers of 'Bsf' FF Matrix

Rating	Multiplier (x)
AAAsf	4.0
AAsf	3.0
Asf	2.5
BBBsf	2.0
BBsf	1.4
Bsf	1.0

Notch-specific default rate stresses are derived by linear interpolation between the stresses applicable to adjacent rating categories  
Source: Fitch

Additional Foreclosure Frequency Stress due to Higher Current Loan-to-Value

CLTV range	Increase to FF (%)
=<95%	0
>95% and =<100%	10
>100% and =<110%	25
>110% and =<120%	35
>120% and =<125%	45
>125% and =<140%	50
>140% and =<150%	55
>150% and =<160%	60
>160% and =<170%	63
>170% and =<180%	67
>180% and =<190%	70
>190% and =<200%	73
>200%	75

Source: Fitch

Employment Status

Status	Increase to FF (%)
Unknown	25
Employed	0
Self employed	25

Source: Fitch

**Adjustment for Loans in Arrears as of Cut-Off**

	Arrears bucket (days)		
	30-59	60-89	>=90
FF adjustment (%)	20	50	n.a. <sup>a</sup>
Floor FF (%)	20	66	100

<sup>a</sup> FF adjustment for delinquency over 90 days is not applicable as loans are treated as defaulted (100% FF)

Source: Fitch

**Adjustment for Prior Mortgage Arrears (Second Consecutive Time)**

Prior delinquency records	Increase to FF (%)
1 late pay 1 to 3 years ago	10
1 late pay less than 1 year ago	40
2 late pays 1 to 3 years ago	30
2 late pays less than 3 years ago and one of them less than 1 year ago	50
3 late pays less than 3 years ago and one of them less than 1 year ago	75
No stress	0

Source: Fitch

**Adjustment for Prior Mortgage Arrears (Third Consecutive Time)**

Prior delinquency records	Increase to FF (%)
1 late pay less than 3 years ago	75
No stress	0

Source: Fitch

**Loan Coupon Type**

Coupon type	Increase to FF (%)
Fixed	0
Floating/adjustable	10

Source: Fitch

**Loan Purpose**

Purpose	Increase to FF (%)
Unknown	5
Owner occupied	0
Investment property	25
Second home	125

Source: Fitch

**Lenders Focus**

Range	Increase to FF (%)
Conforming	0
Non-conforming to prime	20
Non-conforming to sub-prime	50

Source: Fitch

**Adjustment for Refinancing**

Type of refinancing	Increase to FF (%)
No cash out	-10
Cash out	20
Debt consolidation	10
No refinance	0

Source: Fitch

**Credit for Good Payment**

Length of good payment history	Increase to FF (%)
No information	10
0 to < 2 years	0
2 to <3 years	-5
3 to <5 years	-10
>= 5 years	-20

Source: Fitch

**Nationality**

Nationality	Increase to FF (%)
Japanese	0
Other	10

Source: Fitch

**Japan Prime RMBS Market Value Decline Assumptions**

**Market Value Decline Assumptions**

	Rating scenario (%)					
	AAAsf	AAsf	Asf	BBBsf	BBsf	Bsf
Tokyo 23 wards	49	43	36	32	29	27
Tama district of Tokyo	49	43	36	32	29	28
Kanagawa prefecture	49	43	38	34	31	29
Saitama prefecture	48	42	36	32	29	27
Chiba prefecture	63	55	46	40	35	32
Osaka periphery	56	49	40	35	32	29
Osaka prefecture	62	54	46	40	35	32
Nagoya metro	46	41	36	33	30	28
Hokkaido	62	55	47	41	37	33
Tohoku	71	62	52	45	40	35
Chugoku	64	57	49	43	38	35
Shikoku	67	59	50	44	39	35
Kyushu Okinawa	56	50	43	39	35	32
Hokuriku	74	65	55	50	45	42
Other prefecture capitals	65	58	49	43	38	35

The above figures incorporate QSA and are rounded to the nearest integer  
Source: Fitch

**New Property Stress**

Property type	Increase to MVD (%)
New property	20
Not new property	0

Source: Fitch

**Minimum Credit Enhancement**

	AAAsf
Minimum CE (excluding credit to LMI) (%)	4 This might be increased in specific cases if the agency deems it appropriate. Where the minimum CE has been utilised at 'AAAsf', a proportionate uplift to CE at lower rating levels will also be utilised.

Source: Fitch

**Jumbo Factor**

Property value threshold (JPY)	Increase to MVD (%)
<70,000,000	0
>=70,000,000 and <100,000,000	15
>=100,000,000	25

Source: Fitch

**Geographical Concentration**

Concentration	Increase to MVD (%)
Yes	10
No	0

Source: Fitch

**Partial Credit on Recovery Rate**

Rating scenario	Credit (%)
AAAsf	20.20
AAsf	28.15
Asf	36.59
BBBsf	54.65
BBsf	100.00
Bsf	100.00

Source: Fitch

**Data Sources Used to Derive Japanese Assumptions**

Cumulative default rate data disclosed by the Japan Housing Finance Agency from 1996 to 2016.

Property price data from JREI since 2000.

Residential Property Price Monthly Index disclosed by Ministry of Land, Infrastructure, Transport and Tourism.

Macroeconomic data disclosed by Statistics Bureau, the Ministry of Internal Affairs and Communications and the Ministry of Health, Labour and Welfare.

Research studies by international organisations and investment banks.



Addendum D – Korea

Kookmin Bank RMBS and Covered Bond Bespoke Model Assumptions

**Foreclosure Frequency<sup>a</sup>**

<b>Willingness to pay</b>	Current LVR is based on the current loan amount advanced to the borrower. Property valuations are based on the latest property valuation amount or purchase price.
<b>Base FF</b>	Reflects the default expectation of a standard Korean mortgage loan to a full-time employed borrower with full income verification and a fully amortising loan.
<b>Adjustments to base FF</b>	Adjustments to FF will be applied to the base FF to address the risk profile of individual loans, as set out below.
<b>Borrower-specific adjustments</b>	<b>Arrears:</b> Fitch will increase the FF according to the table <i>Adjustments to Base Foreclosure Frequency</i> . The agency will then use the higher of the adjusted default probability and the floor values in the same table.
<b>Product-specific adjustments</b>	<b>Interest-only loans:</b> Fitch adjusts the FF for interest-only loans that include a balloon repayment of principal or have a shortened amortisation period. FFs are increased as set out in the table <i>Adjustments to Base Foreclosure Frequency</i> . The adjustment is based on the term of the principal and interest period of the loan following the initial interest-only period.
<b>Property-specific adjustments</b>	<b>Investment property:</b> Increase base FF by 25%.

<sup>a</sup> Please refer to the section titled *Asset Analysis: Foreclosure Frequency*  
Source: Fitch

**Loss Severity<sup>a</sup>**

<b>Property price indexing</b>	To estimate the current value of a property, Fitch indexes the property value using Kookmin Bank's house-price index data, the property's location and the date of the original valuation. Fitch's methodology assumes indexed property valuations capture 50% of any increased valuation and 100% of any reduced indexed valuation.			
<b>MVD</b>	Fitch's MVD ratios reflect the expected erosion of property prices and include a QSA of 15% under each rating scenario. The table <i>Market Value Declines by Region</i> sets out the agency's MVD ratios for apartments under each rating scenario. <b>Adjustments to MVD:</b> Fitch applies additional adjustments to the MVDs where the security is a detached house or a multifamily dwelling based on the market value volatility and severity seen in the market. See table <i>MVD Adjustments by Property Type</i> .			
<b>Illiquid property adjustment</b>	<b>Property value relative to median value for location (%)</b>	<b>&lt;50 or &gt;=200</b>	<b>&gt;=300</b>	<b>&gt;=500</b>
	<b>Illiquid property factor</b>	0.90	0.80	0.60
<b>Foreclosure and carrying costs</b>	When calculating recovery values, Fitch reduces the property valuation by foreclosure costs and the cost to the administrator of carrying the loan from delinquency through to default. Fitch assumes foreclosure costs of 5.0% and carry costs of 4.5%.			
<b>Minimum LS</b>	See table "Minimum Loss Severity"			

<sup>a</sup> Please refer to the section titled *Asset Analysis: Loss Severity*  
Source: Fitch

**Residential Mortgage Transaction Asset Analysis Data Requirements<sup>a</sup>**

**Korean prime RMBS**

Loan product descriptions

Historical annual origination volumes

Historical loan performance data for all originations, including default, loss and arrears data for the past five+ years by year, preferably by location and product

Historical arrears data for 30+ days past due. Preferably showing 30-59, 60-89, 90-119, 120-149 and 150-179 days arrears buckets

Fitch will verify the source and quality of data provided, subject to satisfactory reasonable investigation, and where data is missing either a conservative assumption should be able to be made or Fitch may decline to rate the transaction

Note: The above list shows the data Fitch expects to receive at initial rating

<sup>a</sup> Please refer to the section titled *Data Adequacy*

Source: Fitch

**Kookmin Bank Cover Pool RMBS Foreclosure Frequency Matrix**

Key LVR levels (%)	Rating stress					
	AAAsf	AAsf	Asf	BBBsf	BBsf	Bsf
<30	3.8	3.2	2.0	1.4	0.9	0.6
>=30 and <40	4.7	4.0	2.5	1.8	1.2	0.8
>=40 and <50	7.6	6.4	4.1	2.8	1.9	1.3
>=50 and <60	11.3	9.6	6.1	4.2	2.8	1.9
>=60 and <65	13.2	11.2	7.1	5.0	3.3	2.2
>=65 and <70	16.1	13.6	8.6	6.0	4.0	2.7

Notch-specific default rate stresses are derived by interpolation between the stresses applicable to adjacent rating categories

Source: Fitch

**Adjustments to Base Foreclosure Frequency (%)**

Characteristic	Adjustment												
Investment property	Increase base FF by 25%												
Interest-only loans													
	<table border="1"> <thead> <tr> <th>Remaining years to maturity</th> <th>Increase to default probability (%)</th> </tr> </thead> <tbody> <tr> <td>&lt;1</td> <td>300</td> </tr> <tr> <td>&gt;=1 and &lt;5</td> <td>100</td> </tr> <tr> <td>&gt;=5 and &lt;10</td> <td>50</td> </tr> <tr> <td>&gt;=10 and &lt;20</td> <td>25</td> </tr> <tr> <td>&gt;=20</td> <td>10</td> </tr> </tbody> </table>	Remaining years to maturity	Increase to default probability (%)	<1	300	>=1 and <5	100	>=5 and <10	50	>=10 and <20	25	>=20	10
Remaining years to maturity	Increase to default probability (%)												
<1	300												
>=1 and <5	100												
>=5 and <10	50												
>=10 and <20	25												
>=20	10												

**Treatment of loans in arrears**

	Days in arrears		
	30-59	60-89	>=90*
FF adjustment	20	50	n.a.
Floor FF	20	66	100

<sup>a</sup> FF adjustment for delinquency over 90 days is not applicable as loans are treated as defaulted (100% FF)

Source: Fitch

**Market Value Declines by Region**

**MVD (%) - apartments**

Region (%)	AAAsf	AAsf	Asf	BBBsf	BBsf	Bsf
Nationwide	50.4	45.3	40.2	35.2	30.1	25.0
North Seoul	51.8	46.4	41.1	35.7	30.4	25.0
South Seoul	65.0	60.0	55.0	46.7	38.3	30.0
Other metro Cities	44.8	40.8	36.9	32.9	29.0	25.0

Notch-specific default rate stresses are derived by interpolation between the stresses applicable to adjacent rating categories

Source: Fitch

**Market Value Decline Adjustments by Property Type**

**(Adjustment)**

Detached house	0.8x
Multi-family dwelling	0.9x

Source: Fitch

**Minimum Loss Severity**

	AAAsf	AAsf	Asf	BBBsf	BBsf	Bsf
Minimum loss severity (%)	25	23	21	19	17	15

Source: Fitch

**Minimum Credit Enhancement**

**AAAsf**

Minimum CE (excluding credit to LMI) (%)	4	This might be increased in specific cases if the agency deems it appropriate. Where the minimum CE has been utilised at 'AAAsf', a proportionate uplift to CE at lower rating levels will also be utilised.
--	---	---

Source: Fitch

**Cash-Flow Analysis<sup>a</sup>**

**Prepayment rate assumptions**

CPR (%)	1	2	3	4+
Low	10	10	12	15
High	35	38	41	45

**Default timing distribution** Please refer to the section titled *Default Timing Distribution*

**Servicing fees** A servicing fee assumption of 0.5% per year is applied in Fitch's cash-flow modelling to reflect transaction expenses and cover the costs of engaging a replacement servicer in the event of a servicer default in a stressed environment.

**Recovery timing** Modelled recoveries of defaulted assets in all rating scenarios are assumed to occur at month 24 after the defaults take place.

**Asset seasoning** When modelling cover pool cash flows, Fitch applies up to an additional year of asset cash flows, when the cover pool is believed to migrate substantially from the initial pool characteristics when recourse switches to the cover pool.

<sup>a</sup> Please refer to the section titled *Cash-Flow Analysis*

Source: Fitch

**Data Sources Used to Derive Korean Assumptions**

Kookmin Bank's mortgage arrears data, restructuring/write-off rate from 2009 to 2016.

Kookmin Bank's cover pool performance from November 2015 to December 2016.

Kookmin Bank's property index from 1989 to 2016.

Korean Economic Statistics System for historic GDP, unemployment rate and base rates from July 2004 to December 2016.

Korea Housing Finance Corporation's Industry Mortgage Arrears Rates from December 2014 to September 2016.

Korea page in Fitch's *Global Housing and Mortgage Outlook - 2017* and Singapore, New Zealand and Australia pages for peer comparison analysis.

**Data Sources for Credit Analysis**

Kookmin Bank's loan by loan data; Kookmin Bank's cash flow data of the mortgage pool.

**Addendum E – China**

**China RMBS – Jiamei 2016-1 Residential Mortgage-Backed Securities Bespoke Assumptions**

Fitch caps the rating of this transaction at 'A+sf'. The cap reflects the limited history for housing loans and RMBS in China and that the data set available for analysis is limited in scope – it only contains data through positive economic periods – and breadth, in that granular data by loan characteristics were not available in sufficient volume for Fitch to identify individual drivers or factors that may affect the performance of individual underlying loans.

**Foreclosure Frequency<sup>a</sup>**

<b>Ability/willingness to pay</b>	Fitch applies an FF assumption at each rating category based on a borrower's current LVR. LVR is based on the current loan amount advanced to the borrower. Property valuations are based on the latest property valuation amount or purchase price. See <i>Base Foreclosure Frequency Matrix</i> .
<b>Adjustments to base FF</b>	The following FF adjustments will be applied to the base FF to address the risk profile of individual loans: The agency will then use the higher of the adjusted default probability and the floor values in the same table.
<b>Loans in arrears</b>	<b>Arrears:</b> Fitch increases the default probability according to the table <i>Adjustment for Loans in Arrears</i> .
<b>Geographical concentration</b>	Geographic concentration is addressed by comparing the proportion of the securitised portfolio in a particular province/state with the proportion of total Chinese GDP derived from that province/state. Where the proportion of the portfolio in a particular state exceeds 3x the share of GDP excess (over and above the 3x proportion), the FF will be increased by 50%.
<b>Property-specific adjustments</b>	Not applied in this jurisdiction.

<sup>a</sup> Please refer to the section titled *Asset Analysis: Foreclosure Frequency*  
Source: Fitch

**Loss Severity<sup>a</sup>**

<b>Property price indexing</b>	To estimate the current value of a property, Fitch indexes the property value using the official data published by National Bureau of Statistics (NBS), the property' location (on a city level) and the date of the original value. The table <i>Property Price Indexation</i> sets out the agency's assumptions for different cities.
<b>MVD</b>	Fitch's MVD ratios reflect the expected erosion of property prices and include a QSA of 35% under each rating scenario. The table <i>Market Value Decline Matrix</i> sets out the agency's MVD ratios for houses under each rating scenario.
<b>Foreclosure costs</b>	Fitch assumes fixed costs of CNY48,000 and assumptions for variable costs are based on court-stipulated cost matrices.
<b>Property size hits</b>	When selling property in China, there are different taxes and transaction fees depending on property size. Such costs are factored into the property sale price and we assume a higher MVD for larger properties as shown in the table <i>Property Size Stress</i> .
<b>Minimum LS</b>	Not applied in this jurisdiction.

<sup>a</sup> Please refer to the section titled *Asset Analysis: Loss Severity*  
Source: Fitch

**Residential Mortgage Transaction Asset Analysis Data Requirements<sup>a</sup>**

<b>China prime RMBS</b>
Loan product descriptions
Historical annual origination volumes
Historical loan performance data for all originations, including default, loss and arrears data for the past five+ years by year, preferably by location and product
Historical arrears data for 30+ days past due. Preferably showing 1-30, 31-60, 61-90, 91-120, 121-150, 151-180 and 180+ days arrears buckets
Fitch will verify the source and quality of data provided, subject to satisfactory reasonable investigation, and where data is missing, either a conservative assumption should be able to be made or Fitch may decline to rate the transaction
Note: The above list shows the data Fitch expects to receive at initial rating
<sup>a</sup> Please refer to the section titled <i>Data Adequacy</i> Source: Fitch

**Base Foreclosure Frequency Matrix**

	Rating scenario (%)				
	A+sf	Asf	BBBsf	BBsf	Bsf
Base FF	15.0	13.8	10.0	6.3	2.5

Source: Fitch

**Adjustment for Loans in Arrears**

	Days in arrears		
	30-59	60-89	>=90*
FF adjustment (%)	20	50	n.a.
Floor FF (%)	20	66	100

\* FF adjustment for delinquency over 90 days is not applicable as loans are treated as defaulted (100% FF)

Source: Fitch

**Base Case Multipliers**

	Rating scenario				
	A+sf	Asf	BBBsf	BBsf	Bsf
Jiamei 2016-1	6.0	5.5	4.0	2.5	1.0

Source: Fitch

**Market Value Decline Matrix**

City tiers	Rating scenario (%)				
	A+sf	Asf	BBBsf	BBsf	Bsf
Tier 1	65.7	63.3	56.0	48.8	41.5
Tier 2	67.6	65.3	58.4	51.6	44.8
Tier 3 and others	72.5	70.1	62.7	55.4	48.0

Source: Fitch

**Property Size Stress**

Property size (square meter)	MVD factor (x)
>144	1.2

Source: Fitch

**Property Price Indexation**

Capturing NBS property-price index movements	NBS property-price index movements (%)	
	Up	Down
70 big/medium cities captured by NBS	50	100
All other cities that fall outside of these 70 cities	0	100

Source: Fitch

**Minimum Credit Enhancement**

	AAAsf
Minimum credit enhancement (excluding credit to mortgage insurance) (%)	4 This might be increased in specific cases if the agency deems it appropriate. Where the minimum credit enhancement has been utilised at 'AAAsf', a proportionate uplift to credit enhancement at lower rating levels will also be utilised.

Source: Fitch

**Cash-Flow Analysis<sup>a</sup>**

<b>Prepayment rate assumptions</b>	
	<b>CPR (%)</b>
	Low 3
	High 20
<b>Default timing distribution</b>	Please refer to the section titled <i>Default Timing Distribution</i> Front-loaded timing only is utilised in Chinese RMBS transactions
<b>Servicing fees</b>	A servicing fee assumption of 0.5% per year is applied.

<sup>a</sup> Please refer to the section titled *Cash-Flow Analysis*  
Source: Fitch

**Recovery Timing**

	<b>A+sf</b>	<b>Asf</b>	<b>BBBsf</b>	<b>BBsf</b>	<b>Bsf</b>
Months	42	42	36	30	30

Source: Fitch

### Data Sources Used to Derive Jiamei 2016-1 Assumptions

China Banking Regulatory Commission commercial bank industry non-performing loan rates from 2007 to 2015.

Bank's disclosure of non-performing loan ratio in residential mortgages, where available.

Public Security Bureau performance data from June 2008 to July 2015.

Public Security Bureau transaction performance data for Public Security Bureau RMBS 2014-1 and Jiamei 2016-1.

Peer comparison in respect of the industry mortgage delinquency rate.

- Bank of China Ltd. 91-120 days past due dynamic and static pool data from January 2011 to April 2015
- China Merchants Bank 91-120 days past due dynamic and static pool data from March 2005 to May 2015
- China Minsheng Banking Corporation 91-120 days past due dynamic and static pool data from March 2005 to May 2015
- China Construction Bank Corporation 91-120 days past due dynamic and static pool data from December 2009 to June 2015
- Industrial and Commercial Bank of China Limited 91-120 days past due dynamic and static pool data from July 2010 to July 2016

RMBS asset performance for China Construction Bank Corporation 2005-1 and 2007-1.

Residential housing price data, including both commodity and social housing, for 70 large/medium cities provided by China's NBS.

Measures on the payment of litigation costs promulgated by the State Council.

The estimation of temporary housing was based on a Fitch's survey on leasing agent websites and news stories.

People's Bank of China quarterly monetary policy report.



Addendum F – Singapore

Singapore RMBS and Covered Bond Model Assumptions

Foreclosure Frequency<sup>a</sup>

<b>Willingness to pay</b>	Current LVR is based on the current loan amount advanced to the borrower. Property valuations are based on the latest property valuation amount or purchase price.
<b>Base FF</b>	Reflects the default expectation of a standard Singaporean mortgage loan to a full-time employed borrower with full income verification and a fully amortising loan
<b>Adjustments to base FF</b>	The following frequency of foreclosure adjustments will be applied to the base FF to address the risk profile of a non-standard Singaporean mortgage loan.
<b>Lender-adjustment</b>	Oversea-Chinese Banking Corporation Limited (OCBC) : Increase the base FF by 25%
<b>Borrower-specific adjustments</b>	<b>Arrears:</b> Fitch increases the foreclosure frequency according to the 'Adjustments to the Base FF' The agency will use the higher of the adjusted foreclosure frequency and the floor values in the same table.
<b>Property-specific adjustments</b>	<b>Investment property:</b> Increase the base foreclosure frequency by 25%.

<sup>a</sup> Please refer to the section titled *Asset Analysis: Foreclosure Frequency*  
Source: Fitch

Loss Severity<sup>a</sup>

<b>Property price indexing</b>	To estimate the current value of a property, Fitch indexes the property value using Urban Redevelopment Authority of Singapore's (URA) house-price index data, the property's location and the date of the original valuation. Fitch's methodology assumes indexed property valuations capture 50% of any increased valuation and 100% of any reduced indexed valuation.								
<b>MVD</b>	Fitch's MVD ratios reflect the expected erosion of property prices and include a QSA of 15% under each rating scenario. The table <i>Market Value Declines</i> sets out the agency's MVD ratios for apartments/condominiums under each rating scenario. <b>Adjustments to MVD:</b> Fitch applies an additional adjustment to the above MVDs where the security property is for the landed property and non-landed properties based on the market value volatility and severity seen in the market. See table <i>Market Value Decline Adjustments by Property Type</i> .								
<b>Illiquid property adjustment</b>	Historical portfolio performance in most countries typically shows that high-value and low-value properties tend to realise higher-than-average relative losses, even in times of low housing market stress. Fitch defines high-property-value and low-property-value thresholds by taking property values above and below a defined multiple of the median home price in the region as high-value and low-value properties, respectively. <b>Property value relative to location's median value (%)</b>								
	<table border="1"> <thead> <tr> <th></th> <th>&lt;50 or &gt;=200</th> <th>&gt;=300</th> <th>&gt;=500</th> </tr> </thead> <tbody> <tr> <td><b>Illiquid property factor</b></td> <td>0.90</td> <td>0.80</td> <td>0.60</td> </tr> </tbody> </table>		<50 or >=200	>=300	>=500	<b>Illiquid property factor</b>	0.90	0.80	0.60
	<50 or >=200	>=300	>=500						
<b>Illiquid property factor</b>	0.90	0.80	0.60						
<b>Foreclosure and carrying costs</b>	When calculating recovery values, Fitch reduces the property valuation by foreclosure costs and the cost to the administrator of carrying the loan from delinquency through to default. Fitch assumes foreclosure costs of 5% and carry costs of 4%.								
<b>Minimum LS</b>	See table "Minimum Loss Severity"								

<sup>a</sup> Please refer to the section titled *Asset Analysis: Loss Severity*  
Source: Fitch

Residential Mortgage Transaction Asset Analysis Data Requirements<sup>a</sup>

<b>Singapore prime RMBS</b>
Loan product descriptions
Historical annual origination volumes
Historical loan performance data for all originations, including default, loss and arrears data for the past five+ years by year, preferably by product
Historical arrears data for 30+ days past due. Preferably showing 30-59, 60-89 and 90+ days arrears buckets
Fitch will verify the source and quality of data provided, subject to satisfactory reasonable investigation, and where data is missing either a conservative assumption should be able to be made or Fitch may decline to rate the transaction.

Note: The above list shows the data Fitch expects to receive at initial rating

<sup>a</sup> Please refer to the section titled *Data Adequacy*  
Source: Fitch

Singapore Cover Pool Foreclosure Frequency Matrix

Key LVR levels (%)	Rating stress					
	AAAsf	AAsf	Asf	BBBsf	BBsf	Bsf
<30	2.3	1.7	1.2	0.9	0.6	0.4
>=30-40	2.9	2.2	1.5	1.1	0.8	0.5
>=40-50	4.7	3.5	2.3	1.7	1.2	0.9
>=50-60	7.0	5.2	3.5	2.6	1.8	1.3
>=60-65	8.2	6.1	4.1	3.0	2.1	1.5
>=65-70	9.9	7.4	5.0	3.7	2.6	1.8
>=70-75	11.1	8.2	5.5	4.1	2.9	2.1
>=75-80	12.3	9.1	6.1	4.6	3.2	2.3
>=80-85	15.2	11.3	7.6	5.6	4.0	2.8
>=85-90	23.9	17.7	12.0	8.9	6.3	4.4

Notch-specific default rate stresses are derived by interpolation between the stresses applicable to adjacent rating categories  
Source: Fitch

Adjustments to Base Foreclosure Frequency (%)

Characteristic	Adjustment	Days in arrears		
		30-59	60-89	>=90*
Lender adjustment	OCBC: Increase the base FF by 25%			
Investment property	Increase the base FF by 25%			
Treatment of loans in arrears				
	FF adjustment	20	50	n.a.
	Floor FF	20	66	100

\* FF adjustment for delinquency over 90 days is not applicable as loans are treated as defaulted (100% FF)

Source: Fitch

Market Value Declines

MVD (%) – apartments

Region (%)	AAAsf	AAsf	Asf	BBBsf	BBsf	Bsf
Singapore	60	55	50	45	40	35

Notch-specific default rate stresses are derived by interpolation between the stresses applicable to adjacent rating categories

Source: Fitch

Market Value Decline Adjustments by Property Type

(Adjustment)

Detached and semi-detached house and terrace (x)	1.1
Apartment and condominium (x)	1.0

Source: Fitch

Minimum Loss Severity

	AAAsf	AAsf	Asf	BBBsf	BBsf	Bsf
Minimum loss severity (%)	25	23	21	19	17	15

Source: Fitch

Minimum Credit Enhancement

	AAAsf
Minimum CE (excluding credit to LMI) (%)	4 This might be increased in specific cases if the agency deems it appropriate. Where the minimum CE has been utilised at 'AAAsf', a proportionate uplift to CE at lower rating levels will also be utilised.

Source: Fitch

**Cash-Flow Analysis<sup>a</sup>**

<b>Prepayment rate assumptions</b>	<b>CPR (%)</b>
	Low 5
	High 30
<b>Default timing distribution</b>	Please refer to the section titled <i>Default Timing Distribution</i>
<b>Servicing fees</b>	A servicing fee assumption of 0.35% per year is applied in Fitch’s cash-flow modelling to reflect the transaction expenses and to cover the costs of engaging a replacement servicer in the event of a servicer default in a stressed environment.
<b>Recovery timing</b>	Modelled recoveries of defaulted assets in all rating scenarios are assumed to occur at month 24 after the defaults take place.
<b>Refinancing spread</b>	An additional 25bp above country-specific refinancing spread assumptions is applied to Central Provident Fund (CPF) linked loans on a pro rata basis based on the proportion of assets linked to CPF and or are non-CPF to reflect a characteristic of CPF loans that can increase the cost to sell due to the requirements in order to obtain consent approval to sell these loans.

<sup>a</sup> Please refer to section titled *Cash-Flow Analysis*  
Source: Fitch

**Data Sources Used to Derive Singaporean Assumptions**

DBS Bank’s mortgage arrears data from 2009 to 2015.

DBS Bank’s mortgage restructuring rate from 1Q 13-1Q16.

OCBC’s mortgage arrears data from 2011 to 2015.

Monetary Authority of Singapore’s Financial Stability Review report’s industry mortgage arrears rates from 2Q04 to 3Q15.

Urban Redevelopment Authority’s property index from 1993 to 2015.

Singapore Statistics’ unemployment rate from 1Q10 to 2Q16.

**Data Sources for Credit Analysis**

DBS Bank loan-by-loan data; DBS Bank’s cash-flow data of the mortgage pool.

OCBC’s loan-by-loan data; OCBC’s cash-flow data of the mortgage pool.

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