Challenging Issues and Alternative Approaches to CRE Credit Risk Modeling
CRE Research Panel Discussion

» Panelists
  – Ron Vulgris (PNC)
  – Kiran Yalavarthy (Wells Fargo)
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» Moderator
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Topics of Discussion

» Data challenges

» Model methodology and implementation
  – Risk identification
  – Modeling techniques
  – Stress testing related
  – Model uncertainty and conservatism buffers

» Model monitoring and validation practice
Data Challenges
Data Challenges

» How do you get historical credit performance data?
  – Internal or external?
  – Loan level or aggregate level?
  – Length of data

» Issues regarding data relevancy for model development
Use of External Datasets – CRE PD and LGD

- **CMBS data limitation and HSBC transformation:**

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<th>Data Limitation</th>
<th>Remediation through Data Construction /Cleaning</th>
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| Default indicator: the CMBS data does not have a default indicator             | The WRRA team used loan status and other parameters to simulate its default definition to align with HBUS. These simulations included:  
  Loan status "90 day + delinquent" or "Foreclosure in Process" or "REO"  
  Loan filed bankruptcy  
  PD external defaults were totalled at an obligor level while LGD external defaults were totalled at the loan level. |
| Deal type:                                                                      | Only loans with CMBS deal types equal to Conduit, Large Loan or Single Asset Borrower were chosen from the external dataset (single borrower transactions are characterized by a single large loan or by multiple cross-collateralized/cross-defaulted loans with common sponsorship; large-loan transactions usually consist of a small number of large loans that are made to multiple unrelated borrowers; while conduit/fusion transactions are normally backed by larger pools of loans that are more diversified by loan count, property type, sponsorship, and geographic location). The loans within these deal types were chosen due to their relevance to the HBUS portfolio.  
  Only deal types categorized as being in the USA were included in the external dataset. Other categories (Europe, Canada, and CDO) were excluded.  
  Only loans that remained within the same CMBS deal type from 1998 through 2014 were included in the external dataset. Any loans with multiple deal types throughout this time period were excluded from the external dataset due to the risk of receiving a biased result. |
| 1) Not all deal types are relevant to the HSBC portfolio                        |                                                                                                               |
| 2) A CMBS deal can have different and changing deal types throughout its history |                                                                                                               |
| Presence of stale or outdated loan to value information                       | For LGD model development, the property value information was updated using the NCREIF Property Value Index information.  
  The NCREIF Property Value Index ("NPI") is a quarterly time series composite total rate of return measure of investment performance of a very large pool of individual commercial real estate properties acquired in the private market for investment purposes only.  
  NCREIF requires that properties be valued at least quarterly, either internally or externally, using standard commercial real estate appraisal methodology. |
Use of External Datasets – CRE PD and LGD

- **CMBS data relevance**
  - The comparison between external and internal data was done along the following dimensions: Distribution by Geographic location, Property type, DSCR and LTV, Historical default rate, and Historical LGD.
  - The property type and location will be used as the segmentation of model development.

![CMBS Exposure by Location and Property Type](image)

- Bank’s corresponding exposures to be compared similarly, and focus on location and property type coverage.

- Methodology such as Bayesian Analysis can be used to combine the internal and external data sets to further improve the model performance.
Use of External Datasets – CRE PD and LGD

- CMBS data relevance, LTV and DSCR comparison
  - CMBS data has more observations than HBUS among all buckets (numbers on top of each bar in each graph).
  - CMBS data covers a broader range of LTVs and DSCRs. This is statistically significant, because adequate observations will ensure that the model is capturing the behaviors among those buckets (such as LTV 120 %+). Under the stress scenario, internal portfolio may move to those higher risk buckets.
Use of External Datasets – CRE PD and LGD

- CMBS data relevance, PD and LGD comparison

### Quarterly Annualized Default Rate for both CMBS and HSBC

- **Graph**
  - X-axis: Date (Sep-98 to Mar-14)
  - Y-axis: Default Rate (%)
  - Legend: Annualized_PD_CMBS, PD_Internal

### Historical LGD Comparison for CMBS and HSBC

- **Graph**
  - X-axis: Year (2004 to 2013)
  - Y-axis: LGD
  - Legend: HSBC, CMBS
Under-explored Territory: Construction Loans

» How do you get historical data for construction loans?

Nonaccrual Rates

- Construction
- CRE (ex-Construction)
Model Methodology and Implementation
Risk Identification

» Do you separate term risks vs. maturity risks?
  – Term risk is a borrower’s probability of default before loan maturity, when the main concern is whether net operating income (NOI) is sufficient to pay mortgage payments – measured by DSCR
  – Maturity risk a borrower’s probability of default at loan maturity, when the main concern is whether a balloon payment can be refinanced in the prevailing market environment – both DSCR and LTV are important refi metrics

» Are you worried about maturity risks in the near future when loans may not qualify for refi?
  – When and if interest rates go up
  – will past experience (declining interest rates for 30 years) be relevant for future?

» What other risks keep you awake?
Model Methodology Questions

» Pool-level model vs loan-level model decision

» Point-in-time vs Through-the-cycle model decision

» Basel models vs CCAR/DFAST models vs underwriting models

» Methodology issues:
  – logistic model vs Cox hazard model vs competing risk model etc
  – Key risk drivers
Wholesale credit model risk drivers in relationship with supervisory macroeconomic factors are summarized as below.
Backtesting, CRE model development as example.
Stress Testing Issues

» How to model location risk in the context of the macroeconomic stress testing?

» How to deal with future originations

» Do you add a conservative buffer on top of model results?
Model Validation Issues

» Model validation practice and issues banks face
Q&A

» Open issues