

Risk management and structured product valuations – lessons learned from the financial crisis

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The unprecedented write-downs in structured credit products exposed widespread weaknesses in risk management practices, governance and supporting analytics and a loose attitude towards the assessment of credit risk. We continue to learn lessons from the crisis. The focus of this paper is on improved risk management techniques and the evolution of supporting analytics for structured credit products, including residential mortgage-backed securities (RMBS), asset-backed securities (ABS), collateralised debt obligations (CDOs) and other bonds collateralised by mortgages, mortgage-backed securities or other consumer debt.

Since the collapse, there have been significant changes and improvements in the following areas:

- the role of risk management in structured credit products
- valuation techniques and data
- risk analysis systems
- managing pricing risk
- advances in transparency

In this article, we discuss the changes made in these functional areas and the impact they have made on the analysis and valuation of structured credit products.

The evolving role of risk management in structured credit products

As the role and authority of the chief risk officer continues to evolve, so do underlying risk management practices, analytics and supporting systems. In particular, there have been significant improvements in the risk management of RMBS. As the non-agency mortgage market grew, many financial institutions did not make a corresponding investment in the resources, analytic tools and systems to fully evaluate the credit risk in their portfolio. Rather, many institutions relied on estimations of credit risk where an implied risk component was simply incorporated into a discount rate or spread. Further, many over-relied on independent ratings without a complete understanding of the risks and limitations of the rating agency process. Thus, many investors saw little need to conduct their own due diligence, risk management, modelling and valuation processes. These simplifying risk assumptions led to a gross underestimate of exposures, particularly when the complexities of different collateral and structures were not incorporated into the risk calculation.

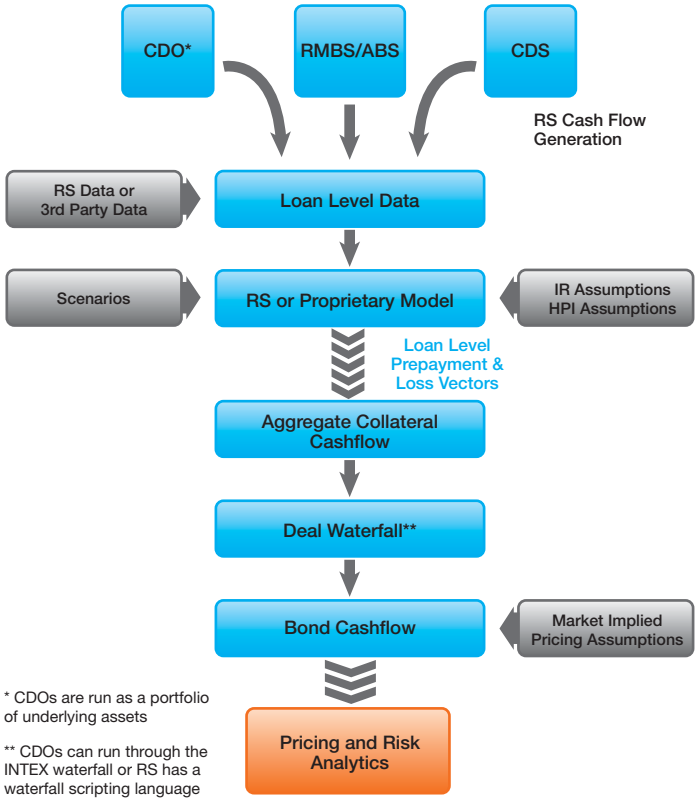
Pre-crisis, many financial institutions relied on internal risk models to measure market / interest rate risk and Value at Risk (VaR) methods based purely on historical interest rate scenarios became the industry standard. VaR's reliance on historical data presented a significant limitation; however, the historical perspective severely underestimated the

probability of "stress" events. Risk modelling of structured products often did not address the impact of severe economic shocks such as housing price depreciation, unemployment rate increases and the correlation of the underlying assets across a portfolio. In addition, analysis of structured products add a significant computation and data burden to the nightly risk process and as a result, most commercial risk systems do not incorporate RMBS or consumer ABS asset classes in their offerings.

Even today, many risk systems lack the ability to run multiple "shock" scenarios or incorporate loan-level data required to model underlying mortgage and other consumer debt. However, proposed regulatory guidance and an increased focus on stress testing have spurred investment in supporting systems. Proper risk assessment requires extensive scenario-based analysis at the loan level. Multi-factor scenarios that are customized dynamically to underlying model parameters are critical in capturing all risk factors. Model parameters and scenarios are also reconciled and specified through macroeconomic inputs. Housing prices, unemployment, loan modifications and foreclosure moratoria are some examples of the types of scenarios utilized in valuation and risk.

Enhanced Valuation Techniques

Proper analysis of complex structures for non-agency RMBS, ABS, CDOs and CDO-squareds require the capability to analyze underlying collateral as well as models to predict the probability of prepayments, probability of defaults and loss given default. As highlighted in the graphic below, the integration of data, models and structured security cash flows (provided by a fragmented set of vendors), combined with the ability to run dynamic scenarios, culminates in a complex valuation process.



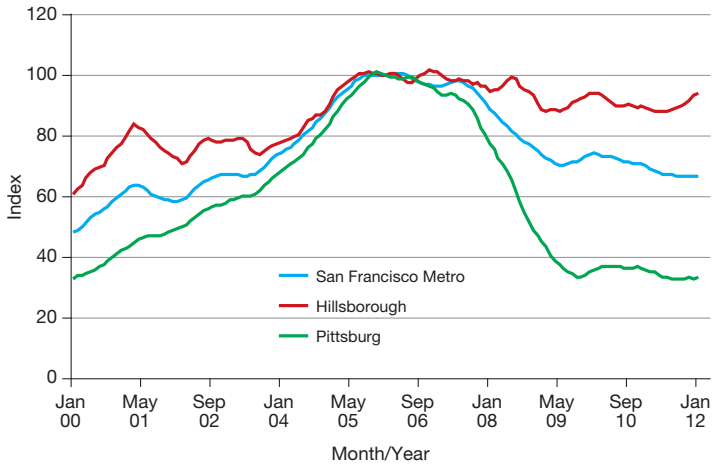
We have seen great strides in the valuation techniques of structured products that focus on three key areas:

1. enhanced loan-level data
   - updated property values
   - borrower credit
   - property details and occupancy status
   - other liens on the property
2. predictive credit and prepayment models
3. improved reporting and transparency of valuation results

A large focus of recent valuation techniques is the incorporation of updated data that is more reliable and more reflective of current loan and deal economics. The addition of updated property values and borrower credit statistics greatly enhances the predictive power of models and provides better insight into the performance of securities. The incorporation of updated property values through an accurate Home Price Index (HPI) with sufficient zip code or neighbourhood level information (zip code + 4 digits) is critical to calculating current combined loan-to-value ratio (Current CLTV). As indicated in **Figure 1** below, updated property data such as zip code/neighbourhood level data can capture significant differences of property values within Metropolitan Statistical Areas (MSA).

Further, the addition of updated consumer credit data into the RMBS analysis provides additional predictive power to modelling capabilities. Techniques developed over the past few years include updates to borrower credit profiles, property values and information on the status of the property. The updated consumer credit data has been made available to the market through collaboration between collateral data providers and consumer credit bureaus to create algorithms that match consumer credit records to loan characteristics on an anonymous basis that meets consumer privacy laws. Although there is a great deal of discussion regarding consumer data that estimates income and asset levels, the

Figure 1: Housing Price Index for Neighbourhoods in San Francisco MSA (Index = 100 in Jan 2006)



Source: RiskSpan

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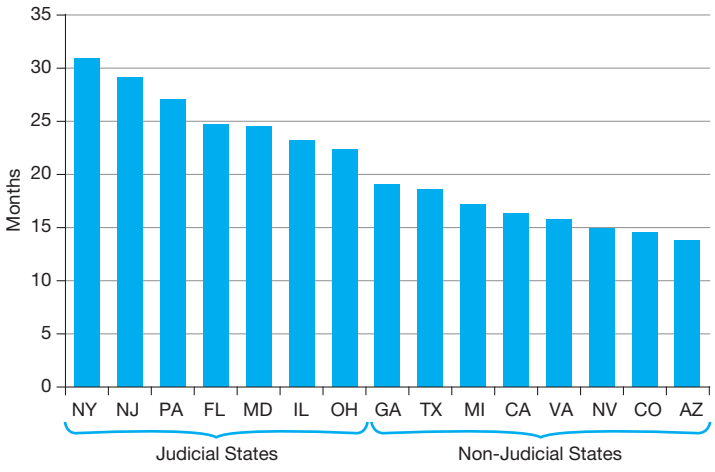
critical data elements being updated for valuation purposes are: CLTV ratio, FICO score, occupancy status, and lien status – all key factors predictive of default.

In addition to updated data fields, advanced techniques in credit modelling include data and analytics for modifications and forbearance plans, as well as reported servicer practices. Although available data regarding modifications is still evolving, data elements focus on loss mitigation activity, such as changes to principal, interest rate, remaining term and total payment. This data enables analysis of home retention activity and analysis on specific government programmes.

Understanding servicer practices and the impact on pool performance is also critical. Although dictated by Pooling and Servicing Agreements, advancing and stop advance practices can be quite diverse (advancing is generally required up to the amount deemed recoverable) and have significant impact of investor yields. Servicer foreclosure practices also impact loan liquidation timing and investor yields.

Figure 2: Average Months to Liquidation: Judicial vs. Non-Judicial Foreclosure States



Source: RiskSpan

Figure 3: Transparent Reporting of Securities Valuation

Security Name: BSAA0701-II1A1
CUSIP: 07386XAH9

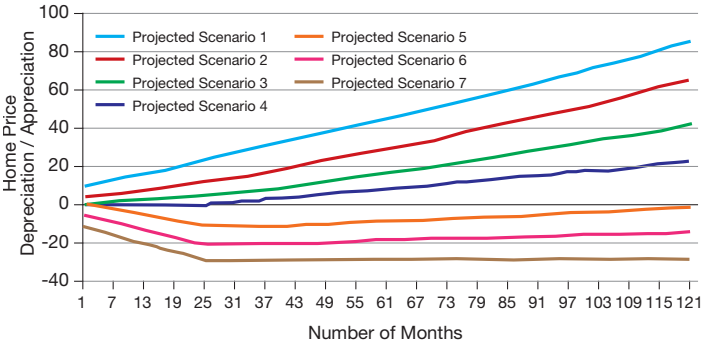
	Projected Scenarios						
	1	2	3	4	5	6	7
Price	64.5	60.4	56.8	54.1	47.8	43.1	38.2
Collateral Loss Pct	31.9	36.7	41.0	44.1	51.8	57.7	63.8

Bond Information	
Factor:	63.9%
Coupon:	2.79
Credit Enhancement:	3.10
Bond Loss Pct:	38.6
Price:	54.1

Collateral Characteristics	
WAC:	3.53
WAM:	299
WALA:	61
Current CLTV Pct:	132
FICO:	694
Average Loan Balance:	437,724
California Pct:	45.8
60+ Days Delq Pct:	48.8
Hist 6 Mth CRR:	3.1
Hist 6 Mth CDR:	10.3
Hist 6 Mth Loss Severity:	70.1

Base Case Scenario Analysis	
Collateral Default Pct:	72.1
Loss Severity Pct:	61.2
Collateral Loss Pct:	44.1
Proj 12 Mth CRR:	3.1
Proj 12 Mth CDR:	17.8
Proj 12 Mth Severity:	62.7

Projected Housing Price Index – 10-Year Cumulative Change



Source: RiskSpan

RiskSpan's credit model incorporates empirical default timelines for liquidated loans and estimates the time remaining for delinquent loans to complete the liquidation process. The liquidation timing is based on: 1) loan servicer, 2) geographic location and 3) judicial versus non-judicial foreclosure process. Monitoring the pipeline of delinquencies is critical, particularly with the looming shadow inventory of loans that will ultimately roll to foreclosure and liquidation at some point in the future. Estimates based solely on realized liquidations will understate the true time to liquidate a mortgage loan in the current market environment. The impact of state variances and time to liquidation from nonperforming (NP) is highlighted in **Figure 2**.

Managing pricing risk

Since the market collapse and resulting decline in liquidity, valuation practices have moved from reliance on trading activities to more reliance on model-based techniques – creating greater pricing risk and the need for new tools. Due to the significant divergence of opinion regarding the valuation of structured credit products, there are new demands and increased scrutiny on accurate and defendable prices and on transparency in both pricing models and pricing methodologies. Virtually all investors are now required by internal control groups or external

regulators to acquire an independent price to verify internally generated prices. We believe a valuation service provider that does not provide transparency on the functionality of models, pricing methodologies and the assumptions utilized to determine the price of a security is not providing the information needed to properly assess the risk of structured credit products. For example, **Figure 3** depicts the type of detailed information that can be provided with different risk scenarios to provide context around the value associated with a structured credit product.

However, valuing illiquid assets to reflect their fair market value is not as impracticable today as it was at the onset of the credit crunch. Many financial institutions engage a combination of methods to demonstrate to regulators independence and transparency in the pricing process. Independent third-party valuation services with access to a rich source of market colour as well as independent models provide yet another degree of separation to improve the price point. Indicative spreads for market segments proved unreliable and their use is no longer considered to be an acceptable practice. Paired with the benefit of skilled judgment acquired through valuation experience, third party vendor evaluations offer a necessary alternative and supplement in-house independent valuations. For any investor, it is critical to understand the benchmark pricing data, methodologies, models and critical assumptions that are used to produce the independent price provided by the valuation service.

Price decisions must be supported with market colour and contextual price information whenever feasible. Market data, however, comes with its own complexities. Different types of market data (bid lists, offers, and trade data) vary in their reliability. Further, sources of market data must be continually evaluated. The need to validate and filter market colour has created a new demand for tools capable of storing and analyzing available market data and comparing securities with similar characteristics.

Enhancements to Risk Analysis Systems

The analysis and risk management of structured credit products has been enhanced since the financial crisis with the increased availability and reduced costs of computing capabilities that allow sophisticated analysis of complicated credit products. A few of the significant changes that have become more affordable and support investors' ability to perform detailed analysis of structured credit products include cloud-enabled grid computing and a reduction in the cost of data storage.

With the development of cloud computing capabilities, analytical tools that stress every aspect of collateral performance and the security structure can be made available to investors with minimal start-up time and costs. Today, we see applications delivered easily to the desktop of an individual while maintaining the critical analytic engines on server farms that can be leveraged and accessed across an organisation.

A critical element of the analysis of structured credit products has been the incorporation of additional data sources that provide more granularity and insight into their performance. Analysis of structured credit products routinely incorporates loan-level data to project the credit and prepayment performance of the securities being analysed. Many risk systems have developed the infrastructure and processing

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capabilities to generate loan-level analysis without the need for simplifying assumptions or reductions in the number of scenarios evaluated.

Incorporation of integrated data and bond cash flows provide an efficient platform to perform data and scenario analysis and run the necessary stress tests. RiskSpan's proprietary analytics software, RS Velocity, offers the infrastructure and architecture that enables institutions to leverage a common platform and provides consistency in models and processes across an institution and among business owners and risk managers. The loan-level data and proprietary models provide transparency into RiskSpan's model assumptions and bond and collateral level detail. Providing users with a deep look into the assumptions driving analysis of structured credit products helps reduce uncertainties in pricing and adds efficiency to verification and challenge processes.

RS Velocity provides a cloud-enabled grid-computing platform that hosts data and models in an integrated way that offers the most efficient means to process complex structured securities. Scalable technology supports the processing of multiple scenarios for over 100,000 securities in less than two hours. RS Velocity incorporates loan-level cash flows generated using proprietary credit and prepayment models. The loan-level collateral data incorporates zip code level data that provides for up-to-date home price values.

Advances in transparency

At the core of transparency for structured credit product investors is availability and access to collateral data. Data elements that are predictive of deal performance must be available and accessible by primary servicers, master servicers and ultimately be made available to investors. Many investors point to the lack of transparency as a key element in the difficulty of managing risk in structured credit products – they did not have access to critical data that would have allowed them to make sound investment decisions. Further complicating the issue of available data is the transfer of collateral prior to the securitisation process.

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Tracking an individual loan in a security presents logistical challenges as each originator has an origination loan number that is unique to the institution while each servicer has its own servicer loan number that is unique to the servicing platform. Once a loan is sold or transferred, it becomes difficult to link loan information across the different platforms to obtain updated information to support credit or prepayment analysis.

With new techniques to obtain updated property and borrower information on the collateral, investors are being provided with improved transparency and can gain a better understanding of the expected performance of the loans underlying their investment. With plans for future transactions to provide linkages to credit bureau data and updated property valuations, the ability to perform analyses based on the current profile of the borrower and the property will be made available at a reduced cost.

Since the financial crisis, there have been several industry initiatives to improve the level of transparency in structured credit through enhanced data availability, data standardisation, data consistency and enhanced disclosures. One of the first initiatives was led by the American Securitization Forum (ASF). The ASF has proposed a disclosure package for use at the time of RMBS issuance that consists of over 100 data fields of pool and loan-level information designed to enable investors to compare data across issuers and perform loan-level analysis. The disclosure recommendations made by the ASF would provide for standardisation of data elements and enable more consistency and comparability of information.

The ASF further proposed a package of data fields to be updated on a monthly basis by RMBS servicers. To monitor the credit quality of collateral underlying securities, it is critical to have access to loan-level information that is updated on a regular basis throughout the life of a transaction and made available to investors and credit rating agencies. These enhancements will allow investors to monitor loan performance regardless of who owns or services it. Highlights of the data recommendations include:

- creation and reporting of a unique loan identifier prior to securitisation
- capture of a property identifier (parcel number) to maintain current CLTV
- transmission of loan data, unique loan identifiers and property identifier to all credit bureaus, and
- requiring securitisers to publish a unique loan identifier for each mortgage within a security

Adoption has been slow, however. Privacy concerns may limit the amount of consumer credit data available to investors, and there are significant costs for managing the required changes to data and process. The recommended changes require significant changes to processes and systems for issuers, primary servicers and master servicers. Coupled with a complete halt in new issuance, the business case for investing in such infrastructure changes is challenging. Making this data available to investors while not overburdening any specific constituents or infringing on consumer privacy remains a challenge.

The Financial Industry Regulatory Authority (FINRA) further enhanced market transparency by expanding the Trade Reporting and Compliance Engine (TRACE) to include securitised products, which added more than 1.2 million asset- and mortgaged-backed securities to the current TRACE-eligible securities. Sell-side participants have raised doubt about the comparability of structured products and contend that publishing details of certain sales (distressed in particular) might result in an increase in volatility. They have also raised concerns about the non-standard, complex and illiquid nature of structured finance products. However, most are supportive of TRACE reporting and increased transparency as it is largely agreed that it will lead to an improvement in price discovery and liquidity.

Next phase of structured credit product risk management

As the market for structured credit products recovers and grows, the changes made to evolve risk management practices, improve valuation techniques and enhance risk analysis systems will improve transparency and enable independent analysis of the risk and opportunities available in these products. The market has responded to the need for increased granularity and updated loan-level information that support the detailed analysis on the underlying collateral. With advances in risk systems, the ability to complete loan-level analysis across multiple scenarios that stress the collateral and structures has led to improved understanding of the performance of credit products. Only when investors can cost-effectively improve their understanding of the risks embedded in these products will the market recover. The continued advancement of these emerging valuation tools and techniques are key to sustaining and accelerating this recovery. SCI

Founded in 2001, RiskSpan provides sophisticated risk management tools and operational excellence advisory services for firms operating in the capital markets for mortgage and structured products.