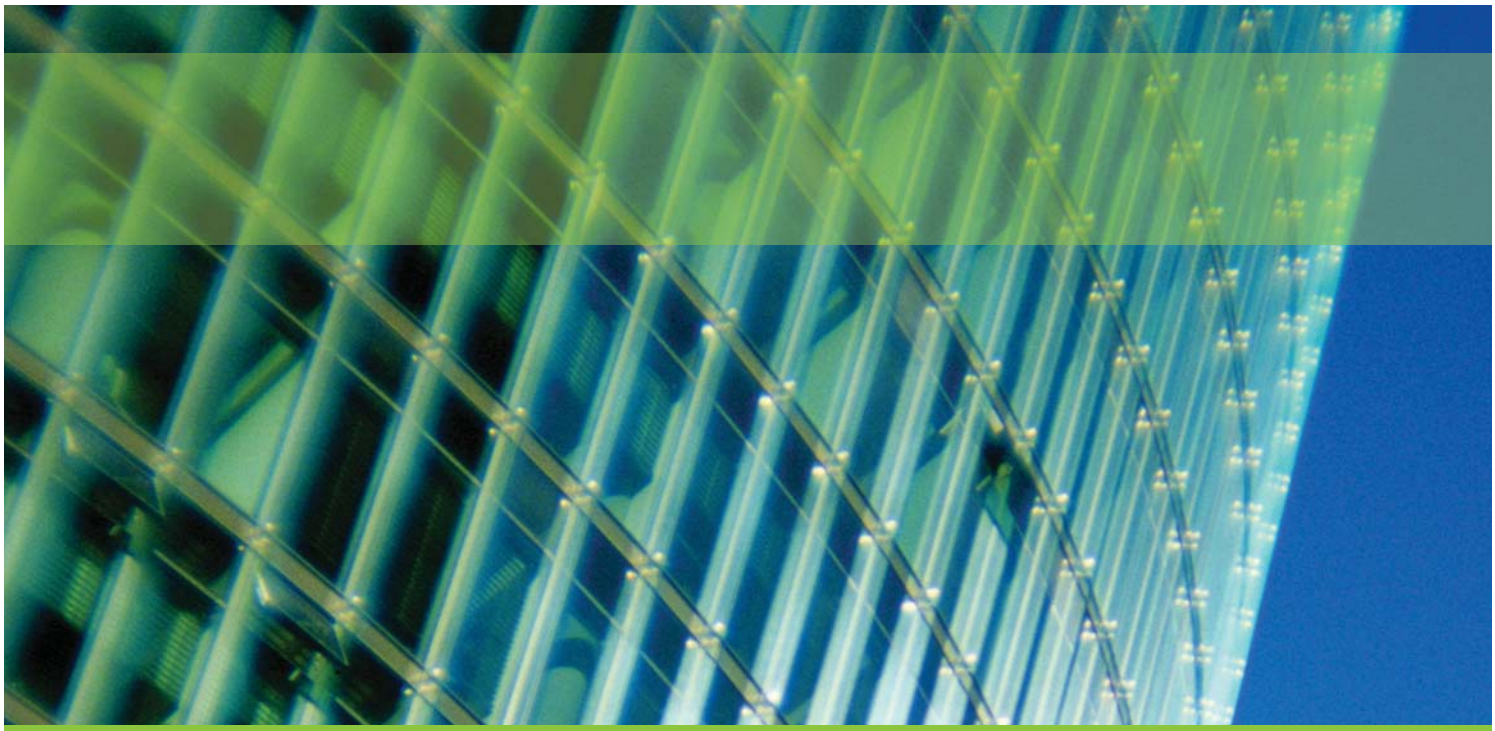

Methodology

Rating Canadian Structured Credit Transactions

NOVEMBER 2008

Appendix summarizing methodology added April 2011

DBRS

Insight beyond the rating.

CONTACT INFORMATION

James Feehely, LL.B.
Managing Director
Canadian Structured Finance
Tel. +1 416 597 7312
jfeehely@dbrs.com

Jiani Xi
Assistant Vice President
Canadian Structured Finance
Tel. +1 416 597 7382
jxi@dbrs.com

DBRS is a full-service credit rating agency established in 1976. Privately owned and operated without affiliation to any financial institution, DBRS is respected for its independent, third-party evaluations of corporate and government issues, spanning North America, Europe and Asia. DBRS's extensive coverage of securitizations and structured finance transactions solidifies our standing as a leading provider of comprehensive, in-depth credit analysis.

All DBRS ratings and research are available in hard-copy format and electronically on Bloomberg and at DBRS.com, our lead delivery tool for organized, Web-based, up-to-the-minute information. We remain committed to continuously refining our expertise in the analysis of credit quality and are dedicated to maintaining objective and credible opinions within the global financial marketplace.

Rating Canadian Structured Credit Transactions

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Introduction

DBRS maintains ratings on a number of structured credit asset classes including collateralized loan obligations (CLOs), collateralized bond obligations (CBOs) and collateralized debt obligations (CDOs). Each of these structured credit products is unique, yet all three share an important characteristic: each of these debt instruments is reliant upon the performance of other referenced debt instruments to meet its obligations to pay principal and interest.

This publication is best seen in the context of a number of other DBRS publications, including *Legal Criteria for Canadian Structured Finance* and the *DBRS CDO Toolbox*. Some of the information that follows that can be found in these other documents. The purpose of this publication is to provide market participants with a comprehensive view of the DBRS rating approach to structured credit products. It should be noted that this publication is intended to address transactions in the Canadian market. The approach taken by DBRS in other markets, while similar, will be adjusted as necessary to reflect the realities of each specific market.

The core of DBRS credit analysis of structured credit products, and the focus of this piece, is the evaluation of the asset pools or reference entities that underlie structured credit products. Regardless of the type of structured credit product, the basics of credit analysis remain the same: 1) default probability, 2) default correlation and 3) recovery given default. Chapter 1 explains DBRS's approach to these credit basics. The chapters that follow address different structured credit product asset classes and should be seen as asset-specific rating considerations in addition to the credit basics discussed in Chapter 1. As structured credit products evolve, the need may arise to supplement this publication to address new products; however, it is expected that the credit basics of default, correlation and recovery will remain the same.

In addition to credit analysis, there are other aspects that are vital in any structured credit transaction, including management and servicing of the assets, hedging strategies and legal considerations. These concerns are addressed herein to the extent that there are material concerns unique to structured credit products that merit mention. Otherwise, the previously referenced DBRS publications should be looked to for guidance in regard to aspects that are not unique to structured credit products.

The methodology described in this publication should not be seen as static. DBRS reviews market, legislative and legal developments on an ongoing basis to ensure that its policies and methodology remain relevant. DBRS also recognizes that each transaction is different and that mitigating factors may lead DBRS to modify some of its requirements in appropriate circumstances.

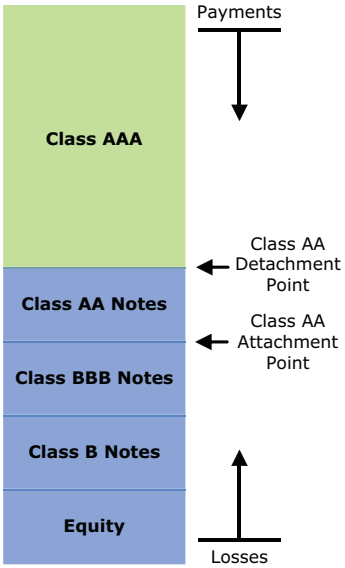
WHAT ARE STRUCTURED CREDIT PRODUCTS?

Structured credit products are also referred to as CDOs. Under the rubric of CDOs there exist a number of unique products, some of which are simple variations of traditional asset-backed securities (ABS), while at the other end of the spectrum lie complex leveraged synthetic structured credit products.

Traditional asset-backed securities (ABS) involve the sale of contractual rights to cash flows arising under, for example, auto loans or mortgages, from the financial institution that originated the assets to a bankruptcy remote special purpose vehicle (SPV) that issues securities backed by the assets. A CLO is an early form of structured credit product that is essentially an asset-backed security with a portfolio of consumer – or more commonly – corporate loans serving as assets. CBOs are built on ABS securitization techniques and entail an SPV issuing securities backed by debt obligations that are held directly by the SPV. Highly rated corporate bonds and ABS are commonly held in these structures. CBOs are often referred to as cash flow CDOs.

Synthetic CDOs were developed to avoid some of the legal, market and liquidity risks associated with cash flow CDOs. Instead of holding corporate debt obligations directly, in a synthetic CDO the SPV – and, ultimately, the CDO noteholders – is exposed to a portfolio of credits by way of a derivatives contract. These transactions may or may not include leverage.

Tranching in a CDO Structure



Regardless of the type of structured credit product and its level of complexity, one feature that they all share is tranching.

Tranching consists of the issuance of a number of series of notes that rank in priority to each other and are typically rated from AAA to the B range with an unrated equity component. Each tranche acts as credit enhancement for any senior ranking tranche, with losses on the portfolio affecting the lowest-rated tranche first and then flowing upwards through the structure to higher-rated tranches. The advantage of tranching for the investor when compared to buying the portfolio of reference obligations directly is that tranches can be customized to the investor's needs and allow investment at the risk/yield level they find desirable. Yield from the reference obligations (or swap premiums in a synthetic CDO) is used to make payments to the tranche investors, while subordination in the structure provides credit enhancement.

APPLICATION OF CANADIAN STRUCTURED CREDIT METHODOLOGY

Fully Funded CDO Transactions

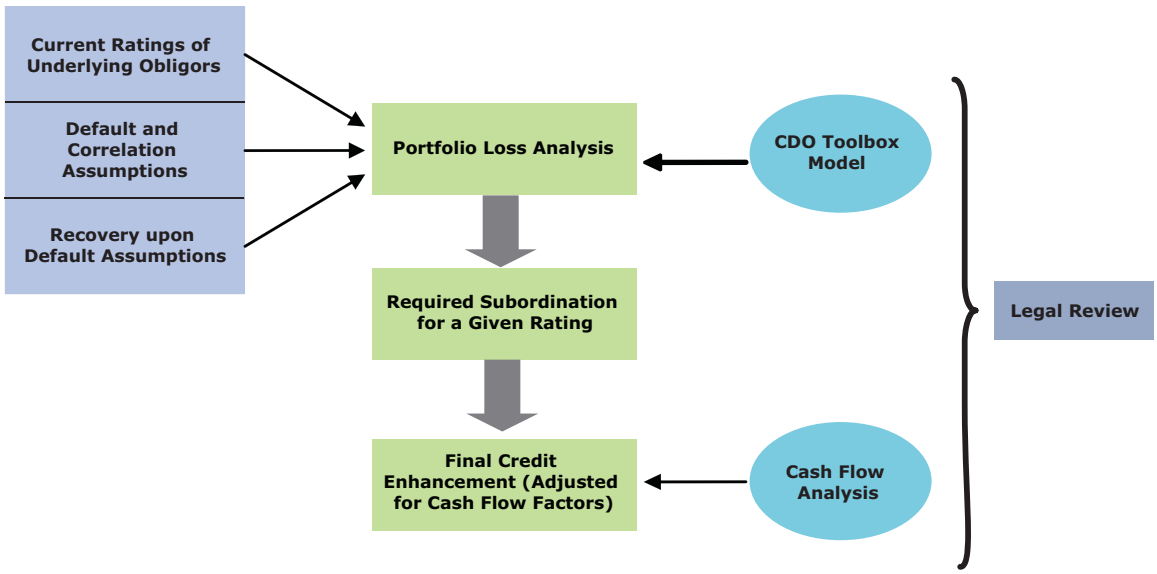
The following diagram describes the process used to analyze a fully funded CDO transaction:

(1) DBRS uses its CDO Toolbox Model to determine a level of portfolio loss that can be equated with a certain credit rating, based on factors such as the credit quality, diversification and term to maturity of the underlying obligors. The model will output a level of loss appropriate for each rating category.

(2) DBRS will perform cash flow analysis based on the output from the CDO Toolbox Model by incorporating assumptions regarding principal amortization, amount of interest generated, timing of defaults and movement in interest rates. DBRS adjusts the subordination from the CDO Toolbox Model to a level that is acceptable from its cash flow model results. Note that this step only applies to cash flow transactions where excess spread and negative carry affect the probability of a class of notes receiving full repayment of principal and interest.

(3) DBRS reviews legal aspects of the transaction to identify legal risks inherent in the transaction and to ensure compliance with DBRS legal criteria.

DBRS Rating Process for Canadian Fully Funded CDO Transactions



The CDO Toolbox Model is a substantial component of the DBRS rating process. A material deviation from the rating implied by the CDO Toolbox Model would be a three-notch rating difference. The quantitative and qualitative factors that could result in a material deviation are included in this methodology.

Leveraged CDO Transactions

The following diagram shows the approach used to analyze a CDO transaction subject to both credit risk and market risk (i.e., levered).

(1) DBRS uses its CDO Toolbox Model to determine a level of portfolio loss that can be equated to a certain credit rating, based on factors such as the credit quality, diversification and term to maturity of the underlying obligors. For certain transactions, this level of portfolio loss may be adjusted based on cash flow modelling that takes into account the asset and liability structure and the CDO transaction's priority of payments.

(2) Using the final level of credit enhancement from the CDO Toolbox Model adjusted for cash flow modelling, DBRS assigns a rating based on credit risk factors.

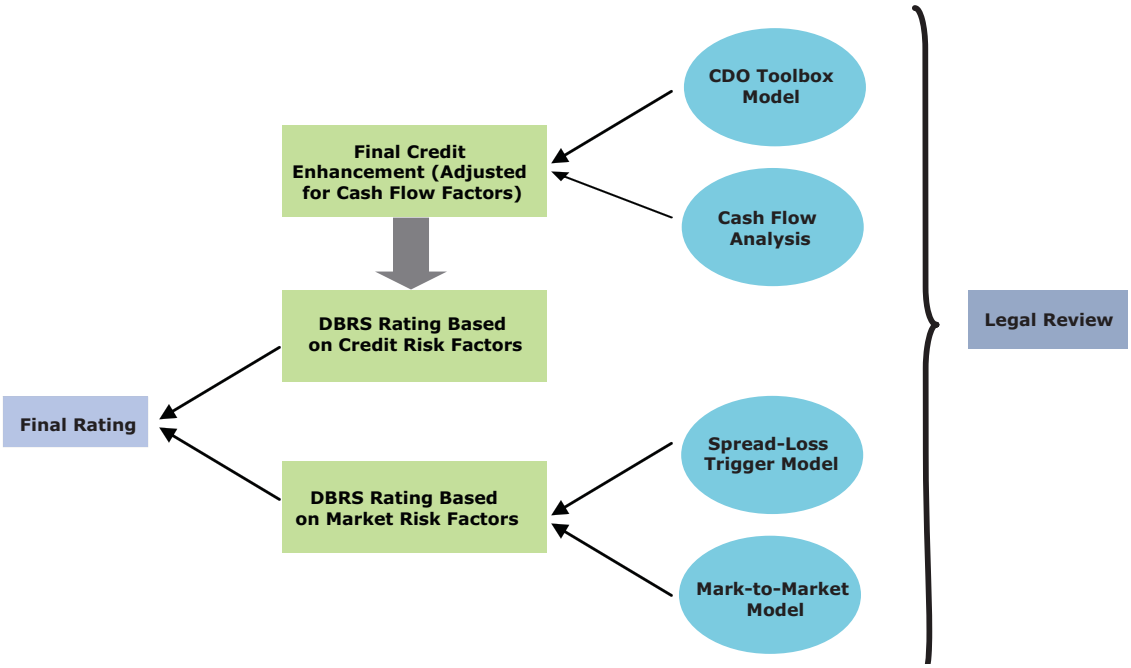
(3) DBRS uses the spread-loss trigger model and/or the mark-to-market model to evaluate the risk of default based on market-related factors. In certain transactions, the posting of additional collateral may be required if certain collateralization triggers are breached. These triggers may be based on (a) realized portfolio losses (neither model is used) (b) a combination of credit default swap (CDS) spreads and realized portfolio losses (spread-loss model is used); (c) the mark-to-market value of the CDO tranche (the mark-to-market model is used); or (d) a combination of spread-loss and mark-to-market (both models are used).

(4) Using the results from the spread-loss and/or mark-to-market model, DBRS assigns a rating based on market risk factors. Since a requirement for additional collateral may result in an unwinding of the transaction, a DBRS rating based on market-related factors sets a ceiling for the overall rating of the transaction, regardless of the quality based on credit analysis.

(5) DBRS applies a final rating to the CDO transaction equal to the lower of the rating implied from credit risk and the rating implied from market risk.

(6) In addition to the quantitative analysis described above, DBRS reviews legal aspects of the transaction to identify legal risks inherent in the transaction and to ensure compliance with DBRS legal criteria. In certain cases, the failure to meet DBRS legal criteria may result in a lower rating than would otherwise be assigned.

DBRS Rating Process for Canadian Leveraged CDO Transactions



The CDO Toolbox Model, the Spread-Loss Trigger Model and the Mark-to-Market Model are substantial components of the DBRS rating process. A material deviation from the rating implied by any one of these models would be a three-notch rating difference. The quantitative and qualitative factors that could result in a material deviation are included in this methodology.

Chapter 1 – Credit Basics

Evaluating and understanding the underlying credit risk is the most important element in rating structured credit products.[1] The credit risk to which a structured credit product noteholder is exposed is the risk of loss on the underlying pool of credit obligations. In a CLO transaction, this is the credit risk of the obligors on the underlying loans held by the SPV, in a cash flow CDO, it is the credit risk of the bonds held by the SPV and in a synthetic CDO, the credit risk on the bonds that the SPV is exposed to by way of a derivatives transaction.

The main objective of credit analysis is to determine a level of portfolio loss that can be equated with a certain credit rating; that is, a loss that DBRS expects, in the long run, to be exceeded with a probability that is less than or equal to the probability of default of an equivalently rated benchmark bond.[2] Over the past several years, rating agencies moved from relatively simple models to more complex Monte Carlo models,[3] which make use of the market standard Gaussian copula method.[4] This was partly a response to the rapid increase in the diversity and complexity of risks and structures in the CDO market, which were a daunting challenge for simpler models.

To evaluate the credit risk of a structured credit product, an understanding of three key aspects is essential: 1) default probability, 2) default correlation and 3) recovery given default in regard to each of the obligations held by or referenced by the SPV.

- Default probability is the likelihood that an underlying obligation will suffer a default. When rated, the rating of the obligation describes its default probability.
- Default correlation describes the relationship between the default probabilities of two obligations. The closer the coefficient of correlation is to 1, the stronger the correlation between default probabilities. If correlation equals 1, default by one obligation would result in the probability of a second obligation defaulting being 100%.
- Recovery given default describes the expected loss on default after considering recovery costs. The primary determinants of loss are the nature and extent of any collateral supporting the obligation, the priority or ranking of claims and the liquidity of the market involved (both for the underlying collateral, if any, and the obligation itself).

Due to the fact that some cash flow CDOs hold both corporate bonds and ABS and that some synthetic CDOs reference both corporate bonds and ABS, it is necessary to consider these three factors in relation to both corporate and structured finance debt obligations.

1. This chapter is based on *DBRS's CDO Toolbox*.
2. The long run normally means a period comparable with a full economic cycle; benchmark bond normally refers to a corporate bond.
3. Monte Carlo simulation is a computational technique that employs a process of repeated random sampling to generate outcomes.
4. Gaussian copula is often used for modelling dependency in structured products. It is a multivariate joint distribution constructed from the bivariate normal distribution.

CORPORATE DEFAULT PROBABILITY

Estimating long-run historical default probabilities is now relatively straightforward, given the large amount of data and research on this subject. Table 1, below, is a blended default table based on research undertaken by the DBRS quantitative group, on academic research and on published historical ratings performance (the full table can be found in Appendix 1). The table represents the expected long-term default behaviour of a diversified pool of corporate ratings, regardless of the rating agency.[5] It can also be used to model the default behaviour of sovereign bonds, CDO tranches and certain structured finance (SF) transactions.

Table 1: Corporate Cumulative Default Probabilities

Maturity (Years)	AAA	AA	A	BBB	BB	B	CCC
1	0.017%	0.047%	0.073%	0.304%	2.206%	5.299%	46.789%
2	0.043%	0.113%	0.172%	0.695%	4.386%	10.554%	60.798%
3	0.078%	0.190%	0.294%	1.145%	6.438%	15.186%	66.091%
4	0.123%	0.277%	0.439%	1.635%	8.341%	19.155%	68.785%
5	0.177%	0.373%	0.607%	2.154%	10.096%	22.540%	70.541%
6	0.241%	0.480%	0.796%	2.693%	11.712%	25.435%	71.861%
7	0.315%	0.597%	1.008%	3.246%	13.198%	27.925%	72.924%
8	0.399%	0.727%	1.240%	3.807%	14.567%	30.080%	73.809%
9	0.493%	0.868%	1.492%	4.374%	15.828%	31.959%	74.561%
10	0.597%	1.022%	1.762%	4.943%	16.994%	33.608%	75.209%

CORPORATE CORRELATION

Experience suggests that companies tend to perform with a higher level of correlation within an industry than with the economy in general, particularly during an economic downturn. DBRS maintains industry diversification requirements that limit exposure to a particular cyclical downturn affecting one industry. As industries may be affected by economic downturns differently, may lead or lag the start and conclusion of the downturn, or may actually be countercyclical, a diversified portfolio is less likely to experience higher default levels than average and is less likely to experience catastrophic spikes in defaults.

There are now several methods in the market for estimating the historical correlation of the asset values of corporates.[6] Some of these make use of indirect proxies for asset correlation, such as the co-movement of equity prices or ratings transitions. Others attempt to link observed default correlation to the level of asset correlation required within the Gaussian copula framework. DBRS prefers the latter approach, as this ensures a stronger link between the data and the effects that are being modelled, namely, joint default events.

5. In practice, this means that differences in rating opinion among agencies are assumed to be small and unsystematic and, therefore, largely cancel each other out in pools that are sufficiently diversified (e.g., more than 50 assets).
6. This correlation is very different from the "base" correlation discussed in Chapter 4 that reflects the current market price of tranched corporate credit risk.

The corporate correlation assumptions shown in Table 2 below are standard assumptions that may be adjusted upward where appropriate. For example, a higher correlation assumption may be used for credits exposed to refinancing risk.

Table 2: Corporate Correlation Assumptions

	Within Sector	Between Sectors
Same region	0.15	0.06
Different regions	0.11	0.02

As can be seen from Table 2, two corporates in the same sector and geographic region will generally be assumed to have the highest asset correlation (0.15), whereas two corporates in different sectors and regions will generally be assumed to have the lowest asset correlation (0.02).

CORPORATE RECOVERIES

Recoveries are the hardest assumption to estimate, as historical data often have wide standard deviations and depend strongly on the level of security and post-default workout time. However, a reasonable assumption for senior unsecured bonds is an average recovery in the 30% to 40% range. Recoveries are generally observed to vary significantly with seniority, with a less pronounced dependence on other factors, such as the insolvency regimes of different countries and business-cycle effects. Given the lack of extensive recovery data, DBRS recovery assumptions are based purely on seniority, with adjustments that may be made if portfolios contain significant concentrations of assets with higher or lower expected recoveries.

Table 3: Corporate Recovery Assumptions

Asset Type	Recovery
Senior secured loans	50%–70%
Senior secured bonds	40%
Senior unsecured	33%
Subordinated	20%

Recovery assumptions for senior secured loans will be discussed further in Chapter 2 in the context of CLOs.

STRUCTURED FINANCE DEFAULT PROBABILITY

Estimating default probabilities for SF securities is difficult because performance data for different asset classes is limited, both in terms of the period covered and the initial ratings (e.g., the data are dominated by AAA securities). Most defaults have occurred in certain sectors of ABS, such as sub-prime RMBS, and CDOs, such as high-yield CBOs.

This begs the question of whether a global set of default assumptions should be determined for all SF assets or a separate set should be estimated for each asset class. DBRS's view is that the historical data is not yet at a level that supports the reliable estimation of default tables for each asset class. In light of this, we feel that the best approach is to use the corporate default assumptions as a proxy for the long-term default rates of SF securities. However, in order to reflect the behaviour of certain asset classes, we have introduced adjustments to the corporate transition matrix that better reflect the expected ratings performance of SF securities. This adjusted default table is shown in Table 4 on the following page, with the full table shown in Appendix 2.[7] For asset classes experiencing significant distress, further adjustments to modelling assumptions may be appropriate and will be made by DBRS.

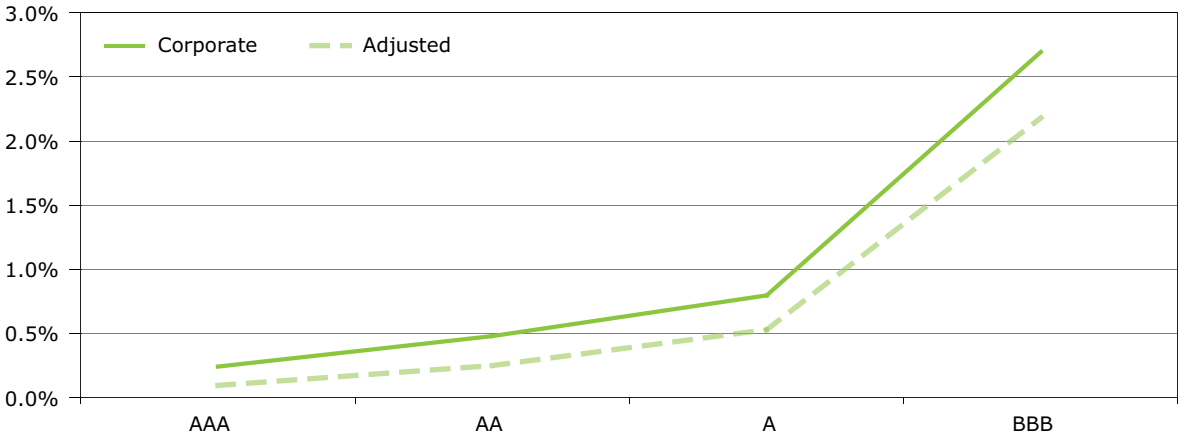
7. Note that default probabilities do not increase for maturities greater than ten years because we believe that the marginal default risk of SF securities is negligible beyond this point.

Table 4: Adjusted Cumulative Default Probabilities

Maturity (years)	AAA	AA	A	BBB	BB	B	CCC
1	0.007%	0.025%	0.051%	0.294%	2.296%	5.295%	46.211%
2	0.017%	0.055%	0.112%	0.603%	4.442%	10.591%	60.393%
3	0.028%	0.089%	0.181%	0.919%	6.402%	15.291%	65.925%
4	0.042%	0.126%	0.258%	1.237%	8.177%	19.319%	68.781%
5	0.058%	0.165%	0.343%	1.554%	9.777%	22.736%	70.631%
6	0.075%	0.206%	0.433%	1.869%	11.214%	25.628%	71.998%
7	0.095%	0.250%	0.529%	2.179%	12.503%	28.083%	73.080%
8	0.117%	0.295%	0.631%	2.485%	13.658%	30.173%	73.965%
9	0.140%	0.343%	0.738%	2.786%	14.693%	31.961%	74.703%
10	0.166%	0.392%	0.849%	3.081%	15.620%	33.498%	75.326%

For investment-grade ratings, Figure 1 below compares the adjusted default table above with the corporate table for seven-year maturities.

Figure 1: Seven-Year Corporate and SF Default Probabilities



STRUCTURED FINANCE CORRELATIONS

Given the relative paucity of historical default data, correlation between different SF securities is very difficult to quantify. Intuitively, the greater degree of systematic (macroeconomic) risk in SF asset pools would suggest that the average correlation of SF securities should be higher than corporate bonds. DBRS has decided to adopt the SF correlation assumptions shown in Table 5. DBRS may adjust these assumptions, depending on the characteristics of a given CDO portfolio.

Table 5: Structured Finance Correlation Assumptions

	Within Sector	Between Sectors
Same region	0.30	0.18
Different regions	0.12	0.03

DBRS also assumes a small positive correlation between SF and corporate obligors, which is 2% within a region and 1% between regions.

STRUCTURED FINANCE RECOVERY ASSUMPTIONS

Recoveries for SF securities are very difficult to estimate. There are several reasons for this, including:

(1) Defaults of SF securities have traditionally been rare, especially for highly rated securities.

(2) Recoveries depend strongly on the level of seniority and thickness of each SF security tranche.

Given the lack of sufficient historical data to estimate SF recoveries in a "bond-equivalent" fashion[8] and the analytical/modelling experience that rating agencies possess through rating these securities, the effectiveness of a bottom-up approach can be investigated. Put another way, the likely distribution of recoveries that a given tranche would experience can be estimated *directly* from the distribution of the underlying pool defaults and losses in different scenarios. For this reason, recovery assumptions used in the CDO analytical process will depend on the diversity and composition of each CDO portfolio.
DBRS research findings suggest that recoveries can vary significantly across the capital structure, with mezzanine tranche recoveries strongly dependent on subordination and thickness. Initial tests show that this is even more pronounced in more heterogeneous commercial mortgage-backed securities (CMBS) pools, with collateral quality and concentration of underlying loans playing a significant role.

8. In other words, ignoring the cash flows of the underlying assets and the capital structure of the transaction.

CDO TRANCHES

In addition to using assumptions appropriate to the asset portfolio, a benchmark CDO default probability needs to be determined, based on the desired rating and target maturity of the CDO tranche. For all ratings and maturities, the corporate table (Appendix 1) will be used as the CDO benchmark.

COMBINING THE ELEMENTS OF THE MODEL

Once default probability, correlation and recovery have been estimated, these elements can then be used within DBRS's propriety algorithm to determine a loss distribution for a variety of portfolios. The simulation essentially involves three steps:

(1) Over a sufficiently large number of simulations, generate a default time for each asset in the portfolio[9] and apply a recovery assumption to determine the associated loss.

(2) Aggregate the above losses to determine the probability distribution of cumulative portfolio loss at a given maturity.

(3) Determine the level of portfolio loss (also known as the minimum Attachment Point) for which the probability of exceeding this level is less than or equal to the required benchmark probability.

COMMITMENT TO CURRENT ASSUMPTIONS

A number of tables in this chapter present assumptions currently employed by DBRS in regard to default, correlation and recovery. DBRS is committed to ongoing monitoring of corporate and structured finance defaults and recoveries across all sectors and assets classes. The assumptions given herein will therefore be updated from time to time as appropriate.

CONCLUSION

The credit basics, default, correlation and recovery discussed above are fundamental to the DBRS credit analysis of any structured credit product. Any new product developed that relies on the performance of underlying debt obligations will continue to be subject to these factors. Asset class-specific considerations, of the kind to be addressed in the following chapters, must be seen as rating considerations in addition to default, correlation and recovery.

9. See the *DBRS CDO Toolbox* for a discussion of estimating default timing.

Chapter 2 – Cash Flow CDOs, CBOs and CLOs

Collateralized bond obligations (CBOs) and collateralized loan obligations (CLOs) are pools of bonds and loans, respectively, that are packaged and tranched for sale to investors. The structure of a CBO or CLO transaction is similar, with the most important difference between the two being the underlying assets that support the transaction. As their names would suggest, CBO and CLO transactions are structured using bonds and loans as underlying assets. These structures are sometimes referred to as cash flow CDOs.

Notwithstanding the similarities between CLOs and CBOs, loan assets have features that, from a rating perspective, make their analysis more complicated and time-consuming than bond assets. Significant differences between loans and bonds include:

- Bonds are typically tradable securities for which there is a well-developed and liquid secondary market. Loans are more difficult to value and liquidate in the Canadian market.
- Evaluating credit risks associated with bank loans is more problematic, as loans are usually not rated prior to the transaction. Lending criteria can also change over time, depending on competitive and strategic considerations at the lending institution. By contrast, many bonds included in CBO transactions are rated by DBRS and almost all bonds referenced would be rated by at least one major rating agency. In many cases, several bond ratings are available.
- Lack of standardization is of significantly greater concern for loan portfolios due to the varying approaches used by lending institutions. In addition, loans are often customized based on the needs and desires of the borrower. Loan terms can vary widely even in a pool originated by the same bank. Variable factors include term, amortization, rate indices, reset dates, payment dates, call features of the loan and a variety of embedded options. Covenant packages may also vary significantly.

The credit basics discussed in the previous chapter remain at the heart of the analysis of CLO and CBO transactions. However, there are some asset class-specific nuances, especially in regard to CLO transactions, that must be addressed. Legal aspects of the transaction will also be considered.

DEFAULT PROBABILITY

The vast majority of loan assets are not rated by DBRS or any other rating agency. As such, differing methodologies can be used to estimate default frequencies for CLO transactions.

DBRS will, on a confidential basis, after review of loan documentation and other pertinent materials related to the obligor, assign a "shadow" rating that is an estimate of the likely rating of an unrated obligor. This rating estimate draws upon the resources of DBRS in evaluating similar companies and industries but is not a definitive rating. This evaluation does not encompass the full amount of work and research that would be incorporated into a definitive rating. For instance, DBRS typically does not meet with the management of the company (obligor) involved.

In certain CLO transactions, especially those involving banks with large loan portfolios, the process of evaluating each loan separately is cumbersome, time-consuming, impractical and expensive. Major banking institutions typically assign internal credit scores to loans in their loan portfolio. A mapping of these internal credit scores to equivalent DBRS ratings may be accomplished, provided a number of conditions are satisfied. A certain level of jointly rated obligors is necessary to determine the level of correlation between the internal rating scale and DBRS's scale. Unless a reasonably high level of correlation is found, no mapping of ratings will be allowed. When mappings are allowed, DBRS does not review individual obligors included in the Asset Pool.

The evaluation of large collateral pools is a daunting task and where appropriate, DBRS will work with the sponsor of the CLO to develop other alternative approaches to produce rating-equivalent evaluations of default frequency. Failing this, DBRS will make the assumption that an obligor will fall into the lowest non-default rating category used for CLO transactions (i.e., CCC (low)). This is a conservative assumption, as it is unlikely that a financial institution would extend credit to an entity with a CCC (low) rating.

Where DBRS does rate the particular instrument (usually a bond), the DBRS rating will be used. In rating CBO (and CDO) transactions, DBRS will rely on ratings of other established rating agencies only to the extent that DBRS has confidence in the rating approach of such agency and only after adjusting to reflect any comparative rating analysis that has been done. For certain asset classes, DBRS will notch other agencies' ratings to reflect its view as to the likely downward migration of the other agencies' ratings. DBRS does not rely on specialized rating agencies (insurance, banking or otherwise) or rating agencies domiciled in only one country due to the inability to do any comparative rating analysis between DBRS and the agency in question, and generally will only utilize ratings of other Nationally Recognized Statistical Ratings Organizations. DBRS reserves the right not to accept any individual rating, notwithstanding its reliance on an agency in other situations/transactions.

AVERAGE RATING

CLO portfolios are dynamic, as balances may be drawn, repaid and redrawn on almost a daily basis.[10] Furthermore, many programs have the right to substitute loans for other loans already in the pool, provided certain conditions are satisfied. One of the most important conditions to be satisfied is that the overall average credit rating of the pool not decline below a certain minimum level as a result of such substitutions or balance changes. The preliminary work done in setting credit enhancement levels must remain valid as the Asset Pool changes. To provide a simple mechanism for determining an average rating for a pool, DBRS has created a numerical scale associated with individual rating categories that ensures a weighted average numerical rating factor will be consistent with the assumed minimum average rating of the portfolio (and thus the expected level of defaults).

RECOVERY GIVEN DEFAULT

DBRS recovery assumptions assume recoveries are higher for secured debt versus unsecured, for senior debt versus subordinated debt and for secured bank loans versus secured publicly issued debt. The first two assumptions are intuitive and well supported by published material. The last conclusion, however, deserves some explanation. Bank loans should obtain higher recover rates than comparable bonds because banks are usually more involved in the credit analysis than a typical bondholder. This close relationship between banker and borrower usually entails a tighter covenant structure, closer monitoring and compliance certificates. The bank has the capability to perform this additional work but a typical bondholder does not. Bank loans also benefit from flexible restructuring that relates to the close working relationship between borrower and bank. Also, because the borrower may benefit from the banking relationship in other ways including other services or credit facilities, the bank may be able to negotiate more effectively than a bondholder. While these benefits are difficult to quantify, DBRS does assume slightly higher recoveries where the loans are managed by an effective servicer. A review of the servicer's performance on past defaults will be the primary determinant of whether such benefit of higher recovery rates, within the specified range, will be given.[11]

Where the benefit of higher recovery rates is demonstrated, a review of recovery periods will also be undertaken. A longer time horizon associated with a workout period may increase recovery rates (on a nominal basis), but carrying costs for the period in question must also be taken into consideration. In modelling a CLO, the higher recovery rate assumption may be offset with a longer recovery period.

Where specialized assets represent security for loans in a CLO transaction, DBRS may conduct a specific review and set recovery rates either higher or lower than the ranges indicated above.

10. As the majority of CLO transactions are structured as revolving asset pools, revolving transactions will be the focus of this publication. Fixed asset pool structures are also possible.
11. Please note that the recovery assumptions described in the DBRS Methodology *Rating Leveraged Finance* are not appropriate in the structured credit context. DBRS's leveraged finance methodology addresses non-investment grade credits, whereas structured credit products are usually investment grade. The higher ratings of structured credit products require more conservative recovery assumptions than those used in leveraged finance.

CORRELATION/DIVERSIFICATION

Concentration limits by obligor are not specified per se, but they do have an impact on enhancement levels where they become significant, particularly for lower-rated obligors. DBRS considers obligor diversification as a strength in a transaction, as loss exposure per obligor is reduced. A single obligor is, for the purposes of assessing concentration, considered to include all related entities within one corporate group. Statistical analysis of sample pools, using Monte Carlo simulations, demonstrate that default frequency increases sharply as the pool size decreases. For this reason, in Canadian CLO transactions, DBRS prefers pools consisting of a minimum of 30 loans. When rating smaller pools, an individual analysis of the impact of the default of particular loans within the portfolio will be performed. The selection of particular credits can have a significant impact on the level of enhancement required.

DBRS has used standard trade receivable concentration parameters for ensuring that enhancement levels adequately cover any obligor concentrations. This is despite the fact that recovery levels for loans (typically near 50% for senior debt) should almost always exceed that of trade receivable creditors who are *usually* unsecured and junior to any loan/bond obligations (recovery levels typically significantly under 50%). There is, therefore, a high level of conservatism in this approach. Trade receivable concentration limits for AAA transactions are typically: 100% of total enhancement for AAA obligors, 50% for AA, 33.3% for "A", 25% for BBB, and 16.7% for BB and unrated.

DETERMINING REQUIRED SUBORDINATION AND RATINGS STABILITY

After DBRS conducts simulations on the portfolio to estimate default frequency, recovery given default and correlation, required minimum subordination levels can be determined. Attachment Points for any given tranche must be set so that the probability of the tranche experiencing a loss is equivalent to the probability of default on a similarily rated corporate obligation. However, in the interest of rating stability, the Attachment Point must be set more remotely than the minimum required subordination. DBRS refers to the value between the required subordination for a given rating and the Attachment Point as a Stability Cushion. DBRS applies stress testing and downwards rating migration to the portfolio to evaluate the sufficiency of the Stability Cushion in protecting the tranche from a rating downgrade.

LEGAL

In any structured financing transaction, the legal structure chosen and the legal consequences that flow from the structure are integral to the rating.

As a general matter, DBRS will require that the legal structure insulate the Asset Pool and related cash flows from the bankruptcy of any entities associated with the transaction. For this purpose, DBRS will review and comment on the transaction documents. Furthermore, DBRS will request legal opinions that provide appropriate assurance that the SPV is bankruptcy remote and that the collateral and related cash flows are insulated from the bankruptcy of certain entities involved in the transaction.

DBRS has published a comprehensive *Legal Criteria for Canadian Structured Finance*. The criteria described in that publication remain applicable to structured credit transactions and readers should refer to it for a more in-depth discussion of the legal considerations addressed below.

TRANSFER, OWNERSHIP AND SECURITY INTERESTS

In structuring CBOs and CLOs, one starts with a Seller/Servicer assigning a portfolio of bonds or loans to an SPV. For both CBOs and CLOs, the transaction should be structured so that the portfolio of bonds or loans is insulated from the bankruptcy or insolvency of the Seller/Servicer. This requires a true sale of the underlying bond or loan portfolio from the Seller/Servicer to the SPV. In the case of a CLO transaction, the borrower's consent to the assignment may be required. Further, given that provincial Personal Property Security Acts apply to the assignment of accounts and securities, the SPV will have to register a security interest against the Seller/Servicer with respect to the portfolio of bonds or loans.

From this point, and in dealing with CLOs, the legal transaction can become more complex. This is due to the number of variations possible for the origination of the loan and its transfer to the SPV: (1) The Seller/Servicer directly originates a loan; (2) A bank originates a loan and assigns the loan to a Seller/Servicer. The loan origination may be by way of a loan syndication or a loan participation. The Seller/Servicer then assigns the loan to the SPV; (3) A lead bank (Bank A) originates a loan and either syndicates or participates the loan to another bank (Bank B). Bank B then assigns the interest to the Seller/Servicer, who then assigns the interest to the SPV.

Case (1) requires a true sale of the loan to the SPV. It may also require the consent of the borrower to the assignment since the Seller/Servicer will no longer have liability to the borrower. The SPV will register a security interest against the Seller/Servicer with respect to the loan. The cash flow from the loan may pass through the Seller/Servicer to the SPV, provided that the Seller/Servicer maintains an investment-grade rating. If the Seller/Servicer does not maintain an investment-grade rating, the cash flow will be redirected around the Seller/Servicer and will be placed into a segregated trust account under the control of the Indenture Trustee for the SPV. This will ensure that the cash flows are bankruptcy remote. With the assignment, DBRS will also want to examine any potential liability that the SPV may have to the borrower and be satisfied that any potential liability is not material to the rating.

Case (2) is somewhat more complex since the structure has to be bankruptcy remote vis-à-vis both the bank and the Seller/Servicer. If the loan has been syndicated to the Seller/Servicer, one has to ensure that there has been a true sale of the loan by the bank to the Seller/Servicer and that the Seller/Servicer has taken a security interest in the loan as against the bank. With a loan syndication, the cash flow from the loan will generally proceed from the borrower to the bank (as agent) and will then be passed on to the Seller/Servicer. In this situation, steps will have to be taken to ensure that the cash flows are insulated from any bankruptcy or insolvency of the bank. As a result, monies should be held in a segregated account in trust by the bank for the Seller/Servicer. Servicing issues also arise in a loan syndication since the servicing of the loan will be performed by the bank. In this sense, both the Seller/Servicer and the SPV will ultimately have to rely on the servicing expertise of the underlying bank. This is particularly the case since the syndication agreement will attempt to relieve the bank from liability to the Seller/Servicer with respect to representations, warranties, the state of the borrower, and the performance of the bank's servicing duties (with the exception of willful default and/or gross negligence). DBRS will closely examine the circumstances under which the bank can be replaced as agent to ensure that the loan can be properly serviced. DBRS will also want to examine the relative priority and rights of the Seller/Servicer and the SPV vis-à-vis the other lenders. If the loan has not been syndicated by the bank to the Seller/Servicer, but instead the bank has sold a participation interest in a loan of the bank to the Seller/Servicer, then one has to ensure that the participation complies with the *Bank Act*, R.S.C. 1985, c. B-1. Furthermore, one has to ensure that the participation is characterized as a sale, rather than a loan, between the bank and the Seller/Servicer to avoid bankruptcy or insolvency risk as it relates to the bank. Since payments flow from the borrower to the bank and a pro rata share of these payments flow to the Seller/Servicer, and since there is no direct contractual relationship between the Seller/Servicer and the borrower, there must be an equitable assignment of the right to receive repayment so that payments do not go to the estate of the bank (if insolvent). In this situation, since the bank holds the repayment in trust for the Seller/Servicer, these funds will not belong to the estate of the bank in bankruptcy. Notwithstanding this, if the bank becomes insolvent, funds belonging to the SPV could be frozen for some time. Loan servicing is even more of an issue in a participating structure since the Seller/Servicer does not have a direct contractual relationship with the borrower. Moreover, and if the participating loan is revolving, attention will also have to be paid to the creditworthiness of the lead bank since if a participating bank fails to advance funds, the lead bank will usually have an obligation to advance those funds to the borrower. With respect to the relationship between the Seller/Servicer and the SPV, and insulating the SPV against the insolvency risk of the Seller/Servicer, the steps provided for above in Case (1) would have to be taken.

The analysis in Case (3) would be a combination of the analysis of cases (1) and (2). As a general matter, however, the transaction would have to protect against the insolvency risk with respect to Bank A, Bank B and the Seller/Servicer.

In general, DBRS will be more comfortable with transactions that have fewer intervening steps. With fewer intervening steps, there is less of a risk to the SPV. With more complicated transactions, and particularly ones that have a number of steps before the involvement of the Seller/Servicer, the Seller/Servicer and the SPV have less control over the servicing of the loan (and less control over both the borrower and the agent bank). Issues where control has importance in this respect include set-off rights, loan enforcement or restructurings, consultation or consent rights, and the benefit of prior legal opinions. If these or other issues are significant, and not addressed to the satisfaction of DBRS, DBRS's rating for the transaction will be adjusted accordingly. In addition, and with more complicated originations, more in-depth analysis will have to be undertaken to ensure that the transaction is properly structured so that the SPV's rights and interests are reflective of the rating assigned to the transaction.

The manner in which rights and obligations for loans are transferred lacks uniformity when compared with the transfer of bonds. As a result, a much higher level of legal due diligence is necessary in CLO transactions to ensure the underlying collateral is not compromised. Furthermore, the manner in which rights are obtained affects how the SPV may pursue remedies should the underlying obligor default on its obligations. A direct relationship between the SPV and the obligor entails the highest flexibility, while a sub-participation in a syndicated facility may entail very little flexibility (primarily relying on the lead manager or agent bank of the syndicated facility to act in the best interests of all participants in the facility).

Chapter 3 – Synthetic CDOs and CDOs Squared

Purchasers of cash flow CDOs are exposed to a number of risks in addition to the credit risk of the underlying securities. These include the risk that the duration of instruments held in the structure may not match the tenure of the transaction, and market risks when the structure is wound down and the assets sold. As the reference obligations are transferred to and held by an SPV, there are also legal risks in the nature of bankruptcy remoteness, true sale and assignment issues similar to those seen in traditional ABS transactions.

Synthetic CDO structures were developed to avoid some of the legal, market and liquidity risks associated with cash flow CDOs. Instead of transferring securities through a true sale, these transactions use credit derivatives to minimize or eliminate legal risks involved in the transfer. If already owned, the reference obligations remain with the credit protection buyer, usually a bank or bank affiliate, while the SPV will enter a credit default swap to provide credit protection on the portfolio of reference obligations. A fixed-swap premium will be paid by the credit protection buyer to the SPV, with the SPV obligated to pay for losses incurred on the portfolio. The SPV will sell notes to investors. The proceeds of the notes will be placed in eligible investments held as collateral for the obligations of the SPV to the credit protection buyer under the credit default swap. The collateral will be reduced by losses on the portfolio of reference entities.

Initially, synthetic CDOs referenced credits to which the credit protection buyer was exposed. Such CDO products are referred to as bespoke trades or Bespoke CDOs, as they are tailored to the unique hedging requirements of the credit protection buyer. As the market has evolved, it has become commonplace to reference one of a number of widely followed indexes of corporate debt. These indexes usually consist of 125 names and provide readily available information as to the market price of credit protection on the index. These products are referred to as index trades or Index CDOs.

A CDO squared (CDO^2) is a type of synthetic CDO. As in other CDO structures, the SPV will enter a credit default swap to provide credit protection on a portfolio of reference obligations. However, in a CDO^2 the underlying obligations are not corporate bonds or asset-backed securities, but rather obligations of another CDO structure. These referenced CDO instruments will in turn reference underlying obligations, usually corporate bonds or ABS, in the manner described above.[12]

It is important to note that unlike the loans in a CLO or the bonds in a CBO, the reference obligations in a synthetic CDO are not assets of the SPV, and that noteholders have no recourse to these obligations. The assets of the SPV are limited to eligible investments held as collateral, and the contractual right to receive swap premiums from the credit protection buyer.

Synthetic CDO structures dominate the Canadian CDO landscape. What follows will therefore focus on synthetic CDOs.

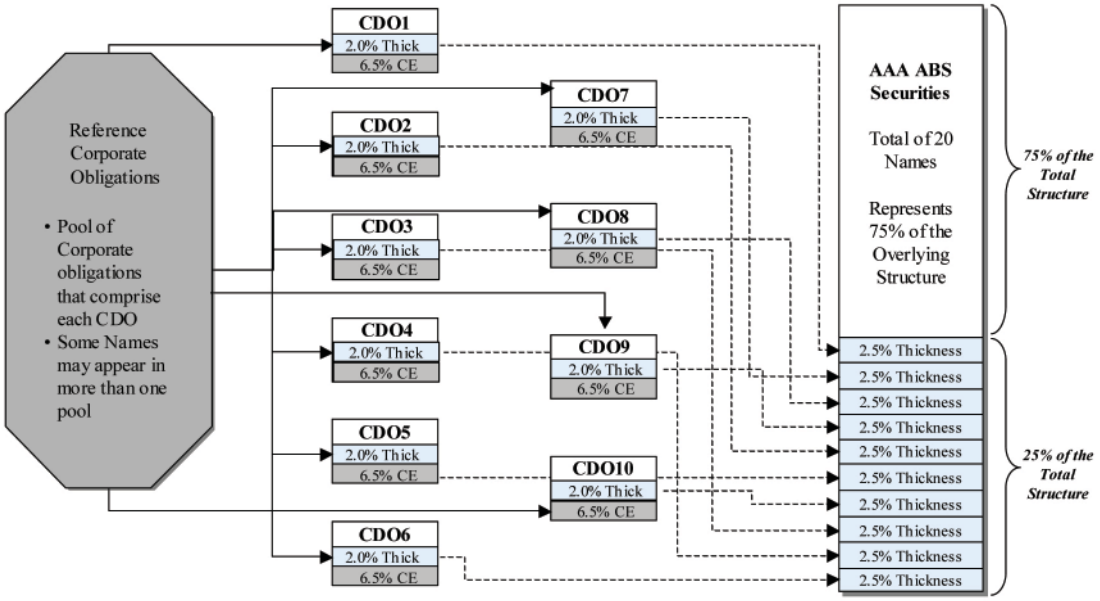
The credit analysis of synthetic CDO products is based on the same three basic pillars as the analysis of other structured credit products, default probability, loss given default[13] and default correlation and is therefore very similar to that of CBO products. In each case the SPV, and by extension noteholders, are exposed to the default risk of a pool of underlying debt obligations. While in a CBO these obligations are held directly by the SPV, in a CDO the underlying debt obligations are referenced through a derivative contract. In each case the credit risk is the same. For this reason, this chapter will not focus on the credit analysis of CDOs, but will rather address credit analysis aspects that are unique to CDO^2 structures.

12. It is also possible that the underlying obligations could be the obligations of a CDO structure, creating a CDO cubed (CDO^3).
13. Loss given default remains relevant despite the fact that the SPV does not hold the referenced obligations. In the event that a reference obligation were to default, the SPV would be obligated to pay the par value of the defaulted security to the credit protection buyer while the credit protection buyer will be obligated to deliver the defaulted security to the SPV. The SPV would then attempt to maximize recovery on the defaulted security.

CREDIT ASPECTS OF CDO^2 TRANSACTIONS

Overlap

A CDO^2 is a multi-level CDO that is essentially a CDO of CDOs. The reference entities are usually some combination of ABS and CDO tranches. Each CDO tranche referenced comprises corporate names or ABS – that is, it is a single level CDO.



The loss outcome for a multi-level CDO is the aggregation of the simulated losses on the underlying instruments. Therefore, to correctly model a CDO^2, each underlying CDO must be modelled separately.

Given that the universe of liquid corporate debt obligations available to serve as references entities is limited, it is likely that certain corporate names will appear in more than one of the underlying CDOs. This is referred to as Name Overlap. The greater the extent of Name Overlap among CDOs referenced by a CDO^2, the more exposed the CDO^2 is to a single corporate name. Name Overlap of lower-rated securities creates significant volatility in the overlying structure.

DBRS uses a "default engine" that houses all corporate names, and those names are then referenced into each of the underlying CDOs. When a default occurs in the default engine, it affects each CDO that references such entity.

UNDERLYING ATTACHMENT/DETACHMENT POINTS

The Attachment Point of the underlying CDO represents the point at which losses begin flowing from the underlying CDO to the overlying CDO^2 structure. A higher Attachment Point means that the probability of losses to the underlying CDO flowing through to the CDO^2 is more remote. In analyzing CDO^2s, DBRS is less concerned with the ratings of the underlying CDO and more interested in the Attachment Point as this indicates the level of risk to which the CDO^2 investor is exposed. The Detachment Point represents the point at which losses stop flowing from the underlying CDO through to the overlying CDO^2 structure. The difference between the Attachment Point and the Detachment Point is referred to as tranche thickness. Tranche thickness plays an important role in CDO^2 transactions as it determines the percentage of losses suffered by the underlying structure that will flow through to the overlying structure.

LEVERAGE IN UNDERLYING CDOs

Leverage in this context refers to the proportional relationship between the tranche size in the underlying CDO and its representation in the overlying CDO^2. If the tranche thickness is the same in both underlying and overlying structures, leverage is 1.0 times (x) (i.e., there is a one-to-one relationship). Depending on how the transaction is structured, leverage could be any value. Leverage greater than 1.0x exacerbates any credit events in the underlying structure. In other words, the greater the leverage, the greater the sensitivity of the overlying structure to adverse events in the underlying CDO.

OVERALL SIZE OF THE CDO PORTION

As mentioned previously, CDO^2 transactions are typically exposed to both underlying ABS and CDOs. As the CDO portion becomes greater, the more sensitive the overlying structure becomes to Name Overlap, Attachment/Detachment Points and leverage. For example, the sensitivity to losses is much smaller when the total CDO portion of the CDO^2 is 10% versus 50%. With a 10% exposure, a 100% loss on the underlying CDO will represent only a 10% loss on the overlying CDO^2. All else being equal, the smaller the CDO portion, the less volatile the overlying structure.

SYNTHETIC CDO-SPECIFIC NON-CREDIT RISKS/CRITERIA

Notwithstanding that the credit analysis is similar, and that by not transferring assets, the legal risks around asset transfer in a CBO/CLO transaction are not relevant in the synthetic CDO context, there do remain aspects of synthetic CDO transactions that subject noteholders to risk and for which DBRS has developed CDO criteria specific to synthetic CDOs. These aspects can be thought of as falling under one of two headings, counterparty risk and collateral risk.

COUNTERPARTY RISK

As there are no assets, underlying chattels or real property securing payment of the SPV's obligations, investors must be comfortable with the fact that cash flows owing to them in a CDO transaction are dependent on the credit protection buyer meeting its obligations under the swap agreement. Receipt of premium payments on the credit default swap is tied directly to the performance of the swap counterparty. Deterioration of the health of the swap counterparty could result in missed payments. The swap counterparty is therefore essential in these structures.

DBRS requires that swap counterparties maintain a rating of at least A (high) or R-1 (middle). If the counterparty is downgraded and fails to maintain a rating of A (high) or R-1 (middle), it must within 30 days:

- Post additional acceptable collateral covering one payment period in advance, to be rebalanced per payment period (for a total return swap, the amount to be posted must be subject to the satisfaction of the Rating Agency Condition), or;
- Provide a guarantee acceptable to DBRS from a guarantor rated A (high) or R-1 (middle) that satisfies the Rating Agency Condition, or;
- Assign its obligations under the swap to a counterparty that holds a rating of A (high) or R-1 (middle) and which satisfies the Rating Agency Condition, or;
- Take such other action agreed to between the parties to the swap that satisfies the Rating Agency Condition.

If the counterparty fails to maintain a rating of BBB (high) or R-2 (high), it must within 30 days:

- Assign its obligations under the swap to a counterparty that holds a rating of A (high) or R-1 (middle) and which satisfies the Rating Agency Condition, or;
- Post additional acceptable collateral covering all future payment obligations under the swap, or;
- Take such other action agreed to between the parties to the swap that satisfies the Rating Agency Condition.

DBRS maintains a schedule of acceptable collateral for posting and the valuation percentages that will be applied.

COLLATERAL RISK

For every rated CDO transaction, DBRS will review the issuance of all notes issued by the SPV to confirm that no downgrade will take place as a result of additional issuance of notes to fund the purchase of collateral. One of the primary aspects of DBRS's process is to review the type of collateral that will be purchased with the proceeds of note issuance. The following, in order of preference, are the features of collateral that DBRS will typically find acceptable for an SPV to acquire in a CDO transaction.

Acceptable CDO collateral includes debt obligations that:

- Are denominated in Canadian dollars.
- Possess a R-1 (high) short-term DBRS rating (or a long-term rating of AAA if the original term to maturity of the collateral was longer than one year).
- Have a term to maturity of less than 35 days.
- Are direct obligations of (or are guaranteed by) the Government of Canada, a Canadian province or a bank governed by the *Bank Act* (Canada).
- Yield a floating rate of interest.

Exceptions to the above will be permitted in the following circumstances:

- Where the term of the collateral is greater than 35 days but shorter than the scheduled term of the CDO transaction, DBRS will require a mechanism to be in place that mitigates the market risk on the collateral and addresses any interest-rate mismatch risk.
- Where the collateral has a term longer than the scheduled term of the CDO transaction, a mechanism to mitigate market risk will be required, and in addition, a par put provided by the swap counterparty on the termination of the transaction (for any reason) will be required to ensure noteholders are not exposed to any collateral unwind costs. Any interest-rate risk will also need to be adequately addressed.
- When U.S.-dollar denominated collateral is proposed, the swap counterparty and the SPV would enter into a currency and interest-rate swap that converts U.S.-dollar denominated LIBOR-based interest payments into Canadian-dollar denominated banker's acceptance (BA) based interest payments to minimize the risk that the LIBOR and BA rates do not move in tandem.

Lastly, acceptable collateral should not include collateral that is itself classified as a CDO or where such collateral's performance is dependent on that of a CDO. DBRS's view is that collateral performance should not be correlated to the risks associated with a CDO transaction.

Chapter 4 – Leveraged Super-Seniors and Funding Risk

Broadly speaking, there are two types of synthetic CDOs, fully funded CDOs and leveraged super-senior (LSS) transactions. In a fully funded CDO transaction, the SPV will sell notes and invest the proceeds in collateral in an amount equal to its potential exposure to the credit protection buyer under the credit default swap. In the event that the SPV must honour its obligations to the credit protection buyer upon the default of reference obligations, funds will be readily available in collateral accounts.

A LSS CDO is a type of synthetic CDO transaction that includes leverage. In an LSS transaction, the collateral held by the swap counterparty will be smaller than the potential maximum exposure of the SPV under the swap. In the event that the swap counterparty's exposure to the SPV on the portfolio of reference entities increases as indicated by changes in the market price of credit protection, the SPV may be required to post additional collateral in respect of such exposure. The requirement to post additional collateral is referred to as a margin call or collateral call. The risk faced by the SPV of being required to post additional collateral is referred to as Funding Risk.

The diagram below illustrates a ten-times-levered LSS transaction that provides credit protection on the 30% to 100% tranche of a CDO. In this example, investors are initially required to collateralize an amount representing 10% of the tranche notional exposure.

LSS Transaction Levered Ten Times

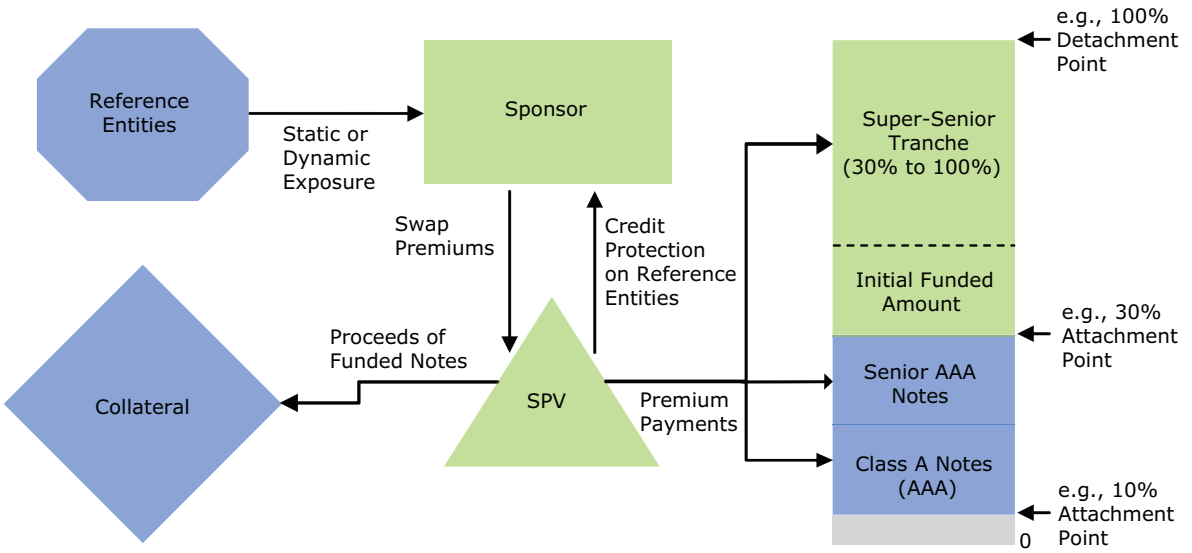


Table 6: Numerical Example

Portfolio notional	$142,857,143
Super-senior tranche	30% to 100%
Super-senior notional	$100,000,000
Initial funded amount (leverage)	$10,000,000 (10x)
Spread on super-senior funded portion	$30,000
Implied return on LSS	30 bps

Margin call funding would usually be met by the SPV in one of the following ways: 1) by issuing additional notes, 2) by negotiating a revised margin call with the swap counterparty, or 3) by using other sources of liquidity, such as advances from the CDO sponsor, or liquidation of other assets of the SPV.

Margin calls occur at specified trigger points that are determined based on how much exposure to the SPV the swap counterparty is willing to accept. Once the specified trigger has been breached, the swap counterparty issues a notice to the SPV requesting additional collateral. Generally, a grace period is given in the notice. Failure to post collateral by the expiration of the grace period will lead to a default in the transaction. Upon default, the transaction is unwound and the SPV will likely realize a loss. Due to the leveraged nature of the exposure, loss severity is expected to be substantial. Losses at unwind would depend on the trigger point as well as on the market conditions upon liquidation and may reach levels as high as 50% to 100%.

DBRS generally rates securities supported by CDO instruments at the level of the lowest-rated CDO transaction funded by the securities. However, the leveraged nature of LSS transactions and their exposure to Funding Risk means that the ratings of LSS transactions are subject not only to credit factors but also to market factors. DBRS ratings of LSS transactions therefore take into account both the credit aspects of the underlying obligations and the probability of the transaction facing a margin call, with the lowest rated of these factors acting as a ceiling for the rating of the transaction. Exposure to Funding Risk and market factors means that the ratings of LSS transactions are more volatile than similar ratings on traditional asset-backed securities and may be subject to more severe rating migration.

There are three main types of regimes under which margin calls can be determined: those based on loss only, those based on spread and loss and those based on true mark-to-market (MTM). Under a loss-based trigger regime, a margin call is determined by the accumulated losses arising from credit events in the reference portfolio, without regard to the market value of the swap. Spread and loss-based triggers generally use a combination of portfolio weighted-average spread and accumulated default losses to determine whether a margin call is required. As opposed to a loss-only trigger, which incorporates only credit risk, spread and loss triggers introduce credit default swap spreads as an element in determining the likelihood of a margin call. MTM triggers are based on the market price of protection on the referenced CDO tranche. In a stressed market, certain tranches may become illiquid, resulting in highly volatile spreads that may not match their actual credit risk. MTM triggers are generally considered more volatile and less transparent than loss-only or spread and loss triggers. The vast majority of LSS transactions rated by DBRS from 2005 to 2007 employed MTM triggers. As credit markets evolve, DBRS expects that the majority of future LSS transactions will be structured using a spread and loss-based margin call regime.

When assigning a rating on a particular collateralization regime, DBRS evaluates the probability of a margin call trigger breach over the life of the transaction in comparison with the default probability of an equivalently rated corporate bond of matching tenure. Methods for determining the probability of a trigger breach differ for each of the three collateralization regimes.

RATING THE PROBABILITY OF FACING A MARGIN CALL – LOSS-BASED TRIGGERS

Under a loss-based trigger regime, the MTM or spreads of the reference portfolio are not directly applicable in determining whether a margin call can be triggered. Only losses from credit events affecting the reference portfolio can cause a margin call to be triggered.

Using the DBRS CDO Toolbox Model, the level of loss commensurate with the assigned rating is calculated.[14] If the amount of loss calculated at the assigned rating level is greater than the level of loss required to breach the trigger, then the rating is no longer appropriate for the LSS transaction, and a downgrade would be necessary. The process of evaluating the probability of breaching a loss-based trigger of X% is essentially the same as determining the likelihood of first-dollar loss to a CDO tranche with X% subordination.

RATING THE PROBABILITY OF FACING A MARGIN CALL – MTM TRIGGERS

In order to quantify the probability that a margin call may occur under a MTM margin call regime, DBRS utilizes a model that considers three main factors: credit spreads, base correlation and portfolio default losses.

There are two parties in each CDO transaction: a credit protection seller and a credit protection buyer. Protection sellers are obliged to pay contingent losses upon the occurrence of Credit Events as specified in standardized International Swaps and Derivatives Association contracts and documentation. In return for taking credit risk, credit protection sellers will receive premiums on the outstanding swap notional amount from the credit protection buyer. The premium, also referred to as the spread, is established at the inception of the transaction such that the present value of expected tranche losses (protection leg) is equal to the present value of total premium payments (premium leg).

In order to calculate expected tranche default losses and the present value of premium payments, a portfolio loss distribution is generated using a Monte Carlo simulation. The Gaussian copula function is employed to estimate the correlation between defaults of reference entities in the portfolio. The method used is similar to the multi-factor Gaussian copula approach described in the DBRS CDO Toolbox Model (see Chapter 1) as a tool to assess credit default risk.

The market value of a CDO tranche is zero (assuming there are no transaction costs) at inception and varies over time as a result of time decay, changes in market conditions and changes in portfolio credit quality. Under the Gaussian copula correlation pricing model, MTM movement can be broadly attributed to changes in the market price of the portfolio of reference entities, portfolio credit default losses and tranche supply and demand.

SPREADS

Credit spreads are an important factor in determining the probability of a margin call. When a protection buyer attempts to quantify its exposure to the protection seller, it must estimate the performance of the LSS transaction. Once a transaction is executed, the weighted-average spread of the reference pool is locked in. Any change to the weighted-average spread on the reference pool thereafter signifies a change in the risk of the transaction as perceived by the market, in favour of either the protection buyer or the protection seller. An increase in the spread levels of the underlying reference entity results in losses in tranche valuation as wider spreads indicate a higher expected default probability on the underlying names and a higher expected tranche loss. Credit protection therefore becomes more expensive and MTM decreases for the protection seller. On the other hand, since the protection seller receives the premium arranged at inception, a decrease in credit default spreads leads to MTM gains for the protection seller. When the calculation agent deter-

14. Refer to Chapter 1 for the details of the modelling approach DBRS uses to determine the probability of portfolio losses.

mines the "value" of the transaction after closing, it will compare the current weighted-average spread on the portfolio with the weighted-average spread on the portfolio at closing. If the spread has moved against the protection seller, it will increase the likelihood that further collateral will need to be posted by the protection seller in order to reduce gap risk of the protection buyer.

In order to address the possibility that changes in credit spreads will require the protection seller to post additional collateral, DBRS employs a rating-based portfolio spread simulation model calibrated to rating-specific, index-level credit spread data. The model simulates the credit spread for different ratings and constructs a portfolio spread according to the initial rating distribution of the portfolio. This approach provides for the differentiation of portfolios of varying credit quality.

DBRS assumes that spreads are mean reverting. Credit spread indices exhibit a natural tendency to revert to an average level over time, known as the long-term spread (LTS). The speed of reaching that level is called the mean reversion speed (MRS). The higher the MRS, the faster the spread will reach its long-term mean. Similar to stock prices, volatility represents the noise around expected spread levels. High volatility indicates that spreads may change rapidly and unpredictably from day to day.

DBRS has chosen to model the logarithm of the spread, $x = \ln(S)$, as an Ornstein-Uhlenbeck process.[15]

$$dx = ß(\Theta - x)dt + \sigma dW,$$

where the long-term mean is given by $\exp(\Theta)$ and MRS and volatility are denoted by ß and σ, respectively.

Rating-Specific Parameters

DBRS's first step in modelling spread movement is to look at LTS, MRS and volatility. These parameters are estimated from historical bond implied CDS data (1994 to 2007) for each rating category. To better capture portfolio characteristics (e.g., non-investment-grade exposure and rating diversification) and to differentiate spread movements between portfolios, spread paths for each rating category are simulated separately. Spread movements within rating classes are observed to be highly correlated, and DBRS assumes a correlation of 80% between investment-grade reference entities and 50% between non-investment-grade reference entities.

MODELLING CONSTANT MATURITY SPREADS

DBRS simulates constant maturity spread paths using parameters calibrated from bond indices with respect to rating and time to maturity. Rating migration and time decay are not modelled explicitly. A comparison with a model that captures migrations and time-decay shows that the DBRS MTM model produces spread levels that are broadly similar. This indicates that the impact of rating migration can be offset by time decay. By using a constant maturity model and not giving effect to time decay, the modelling process can be simplified without significantly compromising results.

STRESSING SHORT-TERM VOLATILITY AND IDIOSYNCRATIC CREDIT EVENTS

The model outlined above may not capture extreme spread movements over short time horizons. For this reason, DBRS applies additional stresses to short-term volatility. In addition, statistical analysis shows that individual reference entities exhibit higher volatility than indices. DBRS therefore applies a further stress on volatility when only a small number of reference entities are present in a given rating class.

15. The Ornstein-Uhlenbeck process is used to model mean reversion. It is a stochastic process governed by the differential equation shown above.

NOTCHING INDIVIDUAL NAMES AND STRESSING LTS IN CERTAIN SECTORS

A credit default swap spread indicates the market price on corporate bond default probability, whereas a credit rating is an opinion on a company's creditworthiness. Despite the focus on different metrics, CDS spreads and credit ratings tend to move in tandem. However, there sometimes exists a lag between the two and at times this discrepancy can be noteworthy.

In order to determine how sensitive a portfolio of reference entities is to a sector-specific or broad-based credit downturn, DBRS reviews the underlying portfolio and may apply notching downgrades on reference entities where deemed appropriate. Additional stress on average LTS may also be applied to industries experiencing stress.

DETERMINING SENSITIVITY TO SPREAD MOVEMENT

In order to determine how sensitive a transaction is to spread movement, the initial spread inputs are calibrated to current market spread levels. This introduces rating volatility, especially in markets where spreads are high and unstable. To enhance rating stability, the average spread for five consecutive days is used as the model initial spread input. Using a five-day average reduces the volatility associated with a short spike in spreads but will not stabilize the ratings if spreads escalate sharply and remain at elevated levels.

BASE CORRELATION

Base correlation plays a central role in CDO tranche pricing. Correlation is difficult to measure in a reference portfolio since it is not clear how the default of one reference entity will affect the default probability of another. In the one-factor Gaussian copula framework, correlation can be derived from the observable tranche price given a portfolio of underlying CDS premiums, recovery rates, maturity, tranche attachment points and detachment points, et cetera. The CDX and iTraxx indices, both of which first started trading in 2003, are the most actively traded indices. Each index has six observable tranches. Below is a sample of index tranche prices and base correlations.[16]

Table 7: CDX and iTraxx Tranche Prices and Correlations

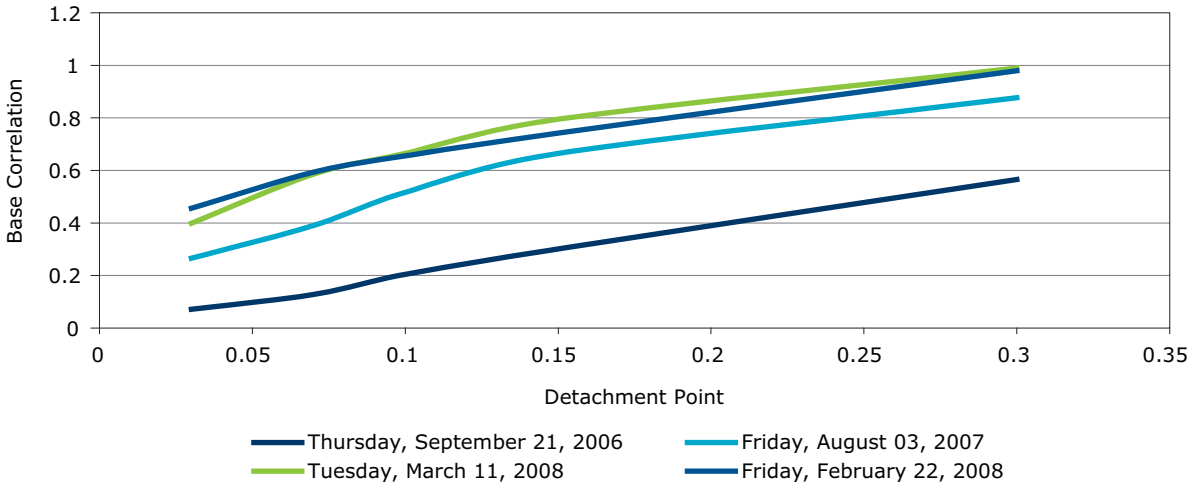
CDX NA IG 9 (Ten-Year)	Mid (bps*)	Correlation	iTraxx 8 (Ten-Year)	Mid (bps*)	Correlation
0% to 3%	60.4%	34.3%	0% to 3%	44.1%	39.7%
3% to 7%	562.3	48.7%	3% to 7%	517.6	48.1%
7% to 10%	326.2	52.7%	7% to 10%	298.8	53.5%
10% to 15%	153.8	63.7%	10% to 15%	191.6	59.5%
15% to 30%	58.6	91.8%	15% to 30%	83.0	77.4%
30% to 100%	n/a	n/a	30% to 100%	n/a	n/a

* All 0% to 3% tranches are quoted as a percentage upfront plus 500 basis points (bps) running premium.

The relative newness of the CDO tranche market means that historical data is limited. Given this limited data set, a specific mechanism to model correlation is not deemed realistic. As historical base correlation does not cover a full credit cycle, the approach used by DBRS is to construct correlation stresses based on periods when the credit market is most illiquid.

16. These closing tranche prices and base correlation figures for April 28, 2008, are quoted from Creditflux.

Base Correlation on Ten-Year On-the-Run CDX



The figure above shows base correlation curve behaviour under a benign market climate and under an illiquid market. From 2006 to August 2007, the base correlation curve shifted upward by more than 20%. The dramatic moves in base correlation over this time period resulted from the significant MTM decline in senior and super-senior tranche values. In terms of stress testing base correlation in future modelling, levels that were previously considered remote have now been observed and DBRS has recalibrated its stress testing accordingly.

PORTFOLIO DEFAULT LOSSES

Similar to credit risk modelling, cumulative credit default losses commensurate with the rating and maturity are modelled via the DBRS CDO Toolbox Model, where credit defaults are simulated under a multi-factor Gaussian copula framework. Intuitively, tranche market values decline as cumulative pool default losses rise. This is simply because the expected loss of the tranche increases due to the resultant lower subordination available to the tranche.

Pricing CDO transactions is more difficult when the portfolio is not a standard index-based portfolio. Mapping correlation from an index tranche to a bespoke portfolio is particularly challenging. There are a number of ways to create the mapping, with the "at-the-money" method being the most common and the method typically used by DBRS.[17] For high-yield or emerging market bespoke trades, more in-depth research on the choice of indices must be conducted.

17. The "at-the-money" method uses expected loss to normalize implied correlations for non-standardized tranches. The at-the-money correlation is therefore the linearly interpolated (or extrapolated) base correlation that matches the current expected loss of the underlying portfolio.

COMBINING THE ELEMENTS OF THE MODEL

DBRS utilizes a scenario-based approach to evaluating MTM exposure for a given CDO tranche. As tranche MTM is a function of model inputs, DBRS stresses spreads, default losses and correlation under certain rating-based scenarios to generate MTM trigger levels commensurate with the rating. The ratings assigned to LSS transactions that use MTM triggers are based in large part on certain assumptions on credit spreads, future credit losses, recoveries and MTM values. In addition, since LSS transactions employ leverage, there is a higher probability that the MTM value of the transaction will be more volatile. With greater sensitivity to MTM changes, there is a greater likelihood of ratings volatility.

Regardless of the accuracy of the assumptions used to run the DBRS model, there does remain a risk that the proprietary pricing models and approximations used by credit protection buyers to establish an MTM value during the life of the transaction will generate different results. Moreover, as the market evolves, new CDO evaluation methods may be developed that lead to different results than those currently obtained.

RATING THE PROBABILITY OF FACING A MARGIN CALL – SPREAD AND LOSS-BASED TRIGGERS

Under a spread and loss-based trigger regime, a combination of portfolio weighted-average spread (market risk) and accumulated default losses (credit risk) is used to determine whether a margin call is triggered. All else equal, if portfolio losses are higher, then the spread required to breach the trigger will be lower. If portfolio losses are held constant, then as the time to maturity decreases, the spread required to breach the trigger will be higher. This is intuitively due to the benefit of time decay. A spread-loss trigger matrix presents the triggering spread value for each level of loss and time to maturity. In most cases, linear interpolation is used to determine the spread trigger level if the exact loss level is not shown on the matrix.

As with the other collateralization regimes, DBRS evaluates the probability of breaching a trigger over the life of the transaction in comparison with the default probability of an equivalently rated corporate bond of matching tenure.

To determine the probability of breaching a trigger, the weighted-average spread of the portfolio and the cumulative losses to the portfolio are simulated for the life of the transaction. The weighted-average spread level is simulated using a mean-reversion model and the portfolio loss is simulated using a ratings-based default framework. A breach is considered to have occurred if at any point in time the simulated spread level with respect to simulated losses is greater than the corresponding trigger level.

In order to calculate expected tranche default losses, a portfolio loss distribution is generated using Monte Carlo simulations. A mean reversion process is used to model credit spreads, based on the observation that credit spreads have a tendency to remain near or tend to return over time to a long-run average value (see the MTM Trigger section on page 24). DBRS models credit spreads using a process that requires the following inputs: LTS levels, initial spread levels, spread volatility and MRS. DBRS's assumptions for these inputs are explained in greater detail below.

(a) Long-Term Spreads

A main input to the mean reversion model is a long-term average spread value for each rating category. These are the average levels that the initial spreads are assumed to revert to over the life of the transaction. DBRS's assumptions for long-term spread are shown below.

Table 8: Long-Term Spread Assumptions

Rating	5y spread (bps)	7y spread (bps)	10y spread (bps)
AAA	7	13	27
AA (high)	15	22	32
AA	20	27	37
AA (low)	25	32	42
A (high)	40	48	57
A	45	53	62
A (low)	50	58	67
BBB (high)	80	87	96
BBB	90	97	104
BBB (low)	120	126	133
BB (high)	330	341	354
BB	330	341	354
BB (low)	330	341	354
B (high)	500	517	536
B	500	517	536
B (low)	500	517	536
CCC (high)	1200	1220	1242
CCC	1200	1220	1242
CCC (low)	1200	1220	1242

(b) Initial Spreads

The mean reversion model requires an initial spread assumption for each rating category. DBRS applies a multiplier (gross-up factor) on the long-term spread assumption for each rating category to make the initial spread input equal to the current weighted-average spread. An example of this is shown below:

Table 9

Rating	Long-Term Spread	Multiplier/Gross-Up	Initial/Current Spread
AAA	7	1.59	11.13
AA (high)	15	1.59	23.85
AA	20	1.59	31.80
AA (low)	25	1.59	39.75
A (high)	40	1.59	63.60
Etc.			

(c) Volatility

Another key input to a credit spread model is the volatility assumption for each rating category. Annualized volatility is the standard deviation of continuously compounded (logarithmic) percentage changes in the simulated credit spreads in a year. Higher volatility assumptions will result in a greater likelihood of breaching a trigger.

(d) Mean Reverting Speed

Mean reverting speed refers to the time it takes for the initial spread level to reach the long-term spread assumption. A faster mean reverting speed will result in a lower probability of breaching a spread-loss trigger if the initial spread input is greater than the LTS. DBRS's assumptions for volatility and mean reverting speed are shown in the table below.

Table 10

Rating	Volatility	Mean Reverting Speed
AAA	70%	60%
AA (high)	50%	55%
AA	50%	55%
AA (low)	50%	55%
A (high)	45%	45%
A	45%	45%
A (low)	45%	45%
BBB (high)	40%	35%
BBB	40%	35%
BBB (low)	40%	35%
BB (high)	35%	25%
BB	35%	25%
BB (low)	35%	25%
B (high)	35%	25%
B	35%	25%
B (low)	35%	25%
CCC (high)	35%	25%
CCC	35%	25%
CCC (low)	35%	25%

Closing Thoughts

Structured credit products experienced tremendous growth in the decade leading up to the onset of the global contraction in credit markets in the summer of 2007. This growth was characterized by innovation as market participants sought new ways to transfer credit risk. The credit aspects of these innovative structured credit products remained rooted in the three credit basics of default, correlation and recovery. As complexity grew, new elements of risk were introduced to structured credit transactions. The funding risk faced by LSS synthetic CDOs is a good example of non-credit risk to which noteholders are exposed.

In light of the current environment in credit markets, DBRS expects structured credit issuance and innovation to remain subdued in the near term. However, once credit markets return to a more normal state, DBRS expects the innovation in structured credit products to continue. As new products are presented to DBRS for rating scrutiny, DBRS will apply the credit basis described herein to address credit risk, and will seek appropriate methods to assess the risks that will be borne by holders of these new products.

Glossary

Asset-backed Security (ABS): Debt securities issued by way of an SPV that utilize a pool of assets as security.

Asset Pool: Pool of assets held by the SPV that act as security for debt securities issued by the SPV.

Attachment Point: In a CDO, the level of loss experienced by the underlying portfolio of reference entities beyond which losses on the portfolio begin to flow through to CDO investors.

Detachment Point: In a CDO, the level of loss experienced by the underlying portfolio of reference entities beyond which losses on the portfolio cease to flow through to CDO investors.

Collateralized Bond Obligation (CBO): A CDO in which the referenced debt instruments that underlie the transaction are a portfolio of bonds.

Collateralized Debt Obligation (CDO): An asset-backed security that is reliant upon the performance of other debt instruments to meet its obligations to pay principal and interest.

Collateralized Loan Obligation (CLO): A CDO in which the referenced debt instruments that underlie the transaction are a portfolio of loans.

Funding Risk: In a leveraged super-senior CDO transaction, the risk faced by the SPV of being required to post additional collateral.

Name Overlap: In a CDO^2 structure, Name Overlap occurs when a single corporate name is referenced by more than one of the underlying CDOs.

Rating Agency Condition: A requirement that DBRS approve of, and confirm, that no negative rating action will result from, a certain action.

Seller: Entity, usually a corporation that securitized assets to raise funds. In a CLO transaction, the Seller is usually a bank or other financial institution.

Servicer: The entity responsible for administering, maintaining and performing collections on the assets that have been transferred to the SPV. It is common in structured credit transactions for the Seller to act as Servicer.

Special-Purpose Vehicle (SPV): Also referred to as a special purpose entity or SPE. An entity created for the purpose of separating asset risk from Seller risk in a structured finance transaction. In a typical Canadian structured finance transaction, the SPV acquires assets from the Seller and advances funds to the Seller in consideration for the assets. The SPV subsequently issues debt securities backed by the transferred assets. The activities, assets and powers of an SPV are carefully circumscribed to those necessary for the structured finance transaction. Trusts are the most common form of SPV in Canada, although corporations or partnerships may also be used.

Stability Cushion: In a synthetic CDO transaction, the value between the required subordination for a given rating and the attachment point.

Appendix 1: Corporate Transition Matrix and Default Table

Corporate One-Year Transition Matrix

	AAA	AA (high)	AA	AA (low)	A (high)	A	A (low)	BBB (high)	BBB	BBB (low)	BB (high)	BB	BB (low)	B (high)	B	B (low)	CCC (high)	CCC	CCC (low)	D
AAA	81.625%	9.820%	5.724%	1.110%	0.583%	0.279%	0.413%	0.095%	0.187%	0.017%	0.059%	0.057%	0.005%	0.003%	0.002%	0.001%	0.000%	0.001%	0.000%	0.017%
AA (high)	0.106%	81.008%	12.026%	4.336%	0.970%	0.773%	0.232%	0.130%	0.186%	0.090%	0.080%	0.011%	0.006%	0.003%	0.003%	0.002%	0.000%	0.002%	0.000%	0.038%
AA	1.162%	1.128%	80.415%	10.375%	3.372%	2.120%	0.542%	0.429%	0.244%	0.026%	0.011%	0.035%	0.031%	0.007%	0.008%	0.025%	0.002%	0.021%	0.001%	0.047%
AA (low)	0.086%	0.198%	1.155%	79.822%	11.086%	5.542%	1.070%	0.361%	0.214%	0.123%	0.075%	0.049%	0.013%	0.043%	0.094%	0.006%	0.004%	0.002%	0.001%	0.055%
A (high)	0.048%	0.199%	1.138%	4.912%	79.229%	9.199%	3.342%	0.882%	0.490%	0.138%	0.048%	0.102%	0.056%	0.057%	0.083%	0.006%	0.004%	0.002%	0.001%	0.064%
A	0.132%	0.181%	0.981%	1.744%	4.266%	78.637%	9.599%	2.588%	0.981%	0.285%	0.157%	0.162%	0.103%	0.068%	0.029%	0.005%	0.002%	0.002%	0.006%	0.073%
A (low)	0.145%	0.055%	0.213%	0.394%	1.193%	2.863%	78.044%	12.725%	3.022%	0.704%	0.191%	0.144%	0.055%	0.104%	0.030%	0.030%	0.003%	0.004%	0.001%	0.081%
BBB (high)	0.076%	0.068%	0.097%	0.210%	0.830%	2.772%	2.170%	77.451%	13.748%	1.525%	0.354%	0.274%	0.076%	0.082%	0.051%	0.016%	0.004%	0.010%	0.001%	0.185%
BBB	0.030%	0.025%	0.140%	0.158%	0.445%	1.083%	2.105%	6.385%	76.858%	10.306%	0.974%	0.649%	0.195%	0.155%	0.136%	0.025%	0.008%	0.016%	0.002%	0.304%
BBB (low)	0.177%	0.013%	0.184%	0.430%	0.581%	1.538%	1.974%	5.892%	19.518%	62.659%	2.042%	2.380%	0.949%	0.482%	0.187%	0.155%	0.038%	0.019%	0.007%	0.776%
BB (high)	0.192%	0.009%	0.020%	0.201%	0.171%	0.479%	1.013%	1.170%	4.891%	11.943%	62.067%	12.713%	1.914%	0.993%	0.414%	0.201%	0.047%	0.047%	0.011%	1.504%
BB	0.011%	0.051%	0.106%	0.072%	0.035%	0.393%	0.303%	0.635%	1.756%	4.928%	16.612%	61.474%	8.202%	2.023%	0.646%	0.281%	0.124%	0.114%	0.028%	2.206%
BB (low)	0.006%	0.009%	0.015%	0.088%	0.157%	0.276%	0.483%	0.666%	1.379%	2.175%	6.603%	16.858%	60.881%	5.597%	0.853%	0.299%	0.123%	0.081%	0.034%	3.417%
B (high)	0.006%	0.091%	0.021%	0.188%	0.084%	0.159%	0.426%	0.576%	0.327%	0.585%	1.302%	4.739%	20.090%	60.288%	5.318%	0.868%	0.330%	0.226%	0.097%	4.280%
B	0.012%	0.006%	0.174%	0.021%	0.084%	0.471%	0.484%	0.389%	0.358%	0.210%	0.926%	1.933%	4.652%	21.315%	57.977%	3.770%	1.069%	0.584%	0.268%	5.299%
B (low)	0.029%	0.002%	0.008%	0.009%	0.230%	0.220%	0.225%	0.437%	0.258%	0.210%	0.477%	0.706%	1.578%	8.163%	18.076%	57.163%	2.250%	0.979%	0.351%	8.628%
CCC (high)	0.030%	0.002%	0.009%	0.029%	1.174%	0.122%	0.103%	0.849%	0.483%	0.065%	0.236%	0.254%	1.648%	4.977%	9.583%	21.323%	33.480%	0.420%	0.170%	25.042%
CCC	0.330%	0.009%	0.010%	0.006%	0.040%	0.344%	0.359%	0.669%	0.391%	0.106%	0.965%	0.992%	0.625%	1.909%	7.382%	6.279%	11.491%	20.911%	0.393%	46.789%
CCC (low)	0.011%	0.010%	0.001%	0.001%	0.002%	0.009%	0.015%	0.019%	0.034%	0.033%	0.054%	0.649%	0.180%	1.905%	2.161%	1.634%	2.479%	1.571%	20.318%	68.913%
D	0.000%	0.000%	0.000%	0.000%	0.000%	0.000%	0.000%	0.000%	0.000%	0.000%	0.000%	0.000%	0.000%	0.000%	0.000%	0.000%	0.000%	0.000%	0.000%	100.0%

Please note that the above assumptions are subject to change and adjustment from time to time as appropriate.

Corporate Cumulative Default Probabilities

Maturity (Years)	AAA	AA (high)	AA	AA (low)	A (high)	A	A (low)	BBB (high)	BBB	BBB (low)	BB (high)	BB	BB (low)	B (high)	B	B (low)	CCC (high)	CCC	CCC (low)
1	0.017%	0.038%	0.047%	0.055%	0.064%	0.073%	0.081%	0.185%	0.304%	0.776%	1.504%	2.206%	3.417%	4.280%	5.299%	8.628%	25.042%	46.789%	68.913%
2	0.043%	0.083%	0.113%	0.127%	0.147%	0.172%	0.206%	0.415%	0.695%	1.518%	3.017%	4.386%	6.394%	8.290%	10.554%	16.211%	36.370%	60.798%	84.629%
3	0.078%	0.136%	0.190%	0.215%	0.248%	0.294%	0.371%	0.686%	1.145%	2.239%	4.493%	6.438%	9.021%	11.867%	15.186%	22.344%	42.632%	66.091%	88.658%
4	0.123%	0.199%	0.277%	0.318%	0.366%	0.439%	0.573%	0.998%	1.635%	2.943%	5.907%	8.341%	11.360%	15.011%	19.155%	27.254%	46.746%	68.785%	90.003%
5	0.177%	0.270%	0.373%	0.435%	0.502%	0.607%	0.808%	1.345%	2.154%	3.634%	7.248%	10.096%	13.456%	17.769%	22.540%	31.221%	49.775%	70.541%	90.664%
6	0.241%	0.352%	0.480%	0.567%	0.655%	0.796%	1.076%	1.722%	2.693%	4.315%	8.510%	11.712%	15.344%	20.193%	25.435%	34.471%	52.155%	71.861%	91.108%
7	0.315%	0.444%	0.597%	0.714%	0.825%	1.008%	1.372%	2.127%	3.246%	4.984%	9.696%	13.198%	17.050%	22.329%	27.925%	37.171%	54.096%	72.924%	91.455%
8	0.399%	0.547%	0.727%	0.875%	1.012%	1.240%	1.695%	2.554%	3.807%	5.642%	10.809%	14.567%	18.597%	24.221%	30.080%	39.443%	55.715%	73.809%	91.743%
9	0.493%	0.661%	0.868%	1.051%	1.214%	1.492%	2.040%	2.999%	4.374%	6.288%	11.853%	15.828%	20.005%	25.904%	31.959%	41.378%	57.088%	74.561%	91.988%
10	0.597%	0.786%	1.022%	1.241%	1.433%	1.762%	2.407%	3.460%	4.943%	6.923%	12.833%	16.994%	21.289%	27.408%	33.608%	43.043%	58.267%	75.209%	92.200%
11	0.712%	0.922%	1.188%	1.445%	1.667%	2.050%	2.792%	3.933%	5.512%	7.547%	13.756%	18.074%	22.466%	28.760%	35.064%	44.489%	59.289%	75.774%	92.385%
12	0.838%	1.071%	1.367%	1.664%	1.917%	2.355%	3.193%	4.415%	6.080%	8.159%	14.625%	19.077%	23.547%	29.981%	36.359%	45.756%	60.184%	76.270%	92.548%
13	0.974%	1.231%	1.559%	1.897%	2.181%	2.675%	3.607%	4.905%	6.645%	8.760%	15.447%	20.011%	24.544%	31.088%	37.517%	46.875%	60.975%	76.710%	92.692%
14	1.122%	1.403%	1.764%	2.144%	2.459%	3.009%	4.034%	5.399%	7.206%	9.350%	16.226%	20.884%	25.467%	32.097%	38.560%	47.870%	61.679%	77.103%	92.822%
15	1.281%	1.587%	1.981%	2.404%	2.750%	3.356%	4.470%	5.898%	7.763%	9.929%	16.966%	21.702%	26.325%	33.021%	39.504%	48.762%	62.309%	77.457%	92.938%
16	1.451%	1.784%	2.211%	2.676%	3.054%	3.715%	4.915%	6.399%	8.315%	10.498%	17.670%	22.472%	27.125%	33.871%	40.363%	49.566%	62.878%	77.777%	93.043%
17	1.633%	1.992%	2.454%	2.962%	3.370%	4.084%	5.367%	6.901%	8.861%	11.058%	18.343%	23.198%	27.874%	34.657%	41.149%	50.295%	63.395%	78.069%	93.139%
18	1.826%	2.213%	2.708%	3.259%	3.697%	4.463%	5.824%	7.404%	9.402%	11.608%	18.988%	23.886%	28.577%	35.387%	41.872%	50.961%	63.867%	78.337%	93.227%
19	2.030%	2.445%	2.974%	3.567%	4.035%	4.851%	6.286%	7.906%	9.937%	12.149%	19.607%	24.539%	29.241%	36.067%	42.541%	51.572%	64.301%	78.584%	93.308%
20	2.246%	2.689%	3.252%	3.887%	4.383%	5.246%	6.751%	8.407%	10.466%	12.681%	20.203%	25.161%	29.869%	36.704%	43.162%	52.135%	64.702%	78.813%	93.382%
21	2.473%	2.944%	3.540%	4.216%	4.740%	5.649%	7.219%	8.907%	10.989%	13.205%	20.778%	25.756%	30.465%	37.302%	43.741%	52.658%	65.075%	79.026%	93.452%
22	2.711%	3.211%	3.840%	4.555%	5.105%	6.057%	7.688%	9.404%	11.507%	13.722%	21.334%	26.326%	31.033%	37.867%	44.284%	53.145%	65.422%	79.226%	93.517%
23	2.959%	3.488%	4.149%	4.904%	5.478%	6.471%	8.159%	9.899%	12.018%	14.231%	21.873%	26.874%	31.576%	38.403%	44.796%	53.600%	65.748%	79.414%	93.578%
24	3.219%	3.775%	4.468%	5.260%	5.858%	6.890%	8.630%	10.391%	12.525%	14.733%	22.396%	27.402%	32.097%	38.912%	45.279%	54.029%	66.055%	79.592%	93.636%
25	3.488%	4.073%	4.796%	5.625%	6.244%	7.313%	9.101%	10.881%	13.025%	15.228%	22.905%	27.913%	32.598%	39.397%	45.738%	54.434%	66.346%	79.761%	93.690%
26	3.768%	4.380%	5.132%	5.996%	6.637%	7.739%	9.572%	11.367%	13.521%	15.717%	23.402%	28.407%	33.080%	39.862%	46.175%	54.817%	66.622%	79.921%	93.742%
27	4.057%	4.697%	5.477%	6.375%	7.034%	8.168%	10.042%	11.850%	14.011%	16.200%	23.887%	28.886%	33.547%	40.309%	46.592%	55.183%	66.885%	80.075%	93.791%
28	4.356%	5.022%	5.830%	6.759%	7.437%	8.600%	10.511%	12.330%	14.496%	16.677%	24.361%	29.353%	33.999%	40.738%	46.993%	55.531%	67.137%	80.222%	93.839%
29	4.663%	5.356%	6.189%	7.149%	7.844%	9.034%	10.979%	12.807%	14.976%	17.148%	24.825%	29.807%	34.438%	41.153%	47.377%	55.866%	67.378%	80.363%	93.884%
30	4.980%	5.697%	6.556%	7.544%	8.254%	9.469%	11.445%	13.281%	15.451%	17.614%	25.280%	30.251%	34.865%	41.555%	47.749%	56.187%	67.611%	80.500%	93.928%

Please note that the above assumptions are subject to change and adjustment from time to time as appropriate.

Appendix 2: Structured Finance Transition Matrix and Default Table

Adjusted Transition Matrix

	AAA	AA (high)	AA	AA (low)	A (high)	A	A (low)	BBB (high)	BBB	BBB (low)	BB (high)	BB	BB (low)	B (high)	B	B (low)	CCC (high)	CCC	CCC (low)	D
AAA	94.087%	3.159%	1.842%	0.357%	0.188%	0.090%	0.133%	0.031%	0.060%	0.005%	0.019%	0.018%	0.002%	0.001%	0.001%	0.000%	0.000%	0.000%	0.000%	0.007%
AA (high)	0.106%	93.494%	4.074%	1.469%	0.328%	0.262%	0.079%	0.044%	0.063%	0.031%	0.027%	0.004%	0.002%	0.001%	0.001%	0.001%	0.000%	0.001%	0.000%	0.016%
AA	0.807%	0.783%	92.901%	3.299%	1.072%	0.674%	0.172%	0.136%	0.078%	0.008%	0.004%	0.011%	0.010%	0.002%	0.003%	0.008%	0.001%	0.007%	0.000%	0.025%
AA (low)	0.190%	0.437%	2.553%	92.308%	2.657%	1.328%	0.256%	0.087%	0.051%	0.029%	0.018%	0.012%	0.003%	0.010%	0.023%	0.001%	0.001%	0.001%	0.000%	0.033%
A (high)	0.018%	0.075%	0.427%	1.845%	91.715%	3.752%	1.363%	0.360%	0.200%	0.056%	0.019%	0.042%	0.023%	0.023%	0.034%	0.003%	0.001%	0.001%	0.001%	0.042%
A	0.062%	0.085%	0.461%	0.820%	2.006%	91.123%	3.700%	0.998%	0.378%	0.110%	0.061%	0.063%	0.040%	0.026%	0.011%	0.002%	0.001%	0.001%	0.002%	0.051%
A (low)	0.090%	0.034%	0.133%	0.246%	0.744%	1.784%	90.530%	4.773%	1.133%	0.264%	0.072%	0.054%	0.020%	0.039%	0.011%	0.011%	0.001%	0.001%	0.000%	0.059%
BBB (high)	0.062%	0.056%	0.079%	0.172%	0.679%	2.267%	1.775%	89.937%	4.071%	0.451%	0.105%	0.081%	0.022%	0.024%	0.015%	0.005%	0.001%	0.003%	0.000%	0.195%
BBB	0.021%	0.018%	0.098%	0.110%	0.312%	0.759%	1.476%	4.476%	89.344%	2.555%	0.241%	0.161%	0.048%	0.038%	0.034%	0.006%	0.002%	0.004%	0.001%	0.294%
BBB (low)	0.232%	0.016%	0.242%	0.564%	0.763%	2.019%	2.592%	7.736%	25.628%	57.909%	0.487%	0.567%	0.226%	0.115%	0.045%	0.037%	0.009%	0.005%	0.002%	0.806%
BB (high)	0.192%	0.009%	0.020%	0.200%	0.170%	0.478%	1.010%	1.166%	4.875%	11.904%	57.317%	16.475%	2.481%	1.286%	0.537%	0.261%	0.060%	0.060%	0.015%	1.484%
BB	0.013%	0.062%	0.130%	0.088%	0.043%	0.480%	0.370%	0.775%	2.144%	6.017%	20.283%	56.724%	7.597%	1.874%	0.599%	0.261%	0.115%	0.105%	0.026%	2.296%
BB (low)	0.008%	0.011%	0.019%	0.109%	0.196%	0.343%	0.601%	0.829%	1.718%	2.710%	8.227%	21.003%	56.131%	3.714%	0.566%	0.199%	0.082%	0.053%	0.022%	3.457%
B (high)	0.006%	0.092%	0.021%	0.190%	0.085%	0.161%	0.432%	0.584%	0.332%	0.593%	1.320%	4.802%	20.361%	55.538%	8.852%	1.444%	0.550%	0.376%	0.161%	4.100%
B	0.013%	0.006%	0.184%	0.022%	0.089%	0.499%	0.513%	0.412%	0.379%	0.223%	0.981%	2.049%	4.930%	22.588%	54.945%	4.553%	1.291%	0.705%	0.324%	5.295%
B (low)	0.030%	0.002%	0.008%	0.010%	0.241%	0.230%	0.236%	0.458%	0.271%	0.219%	0.499%	0.740%	1.652%	8.549%	18.929%	54.353%	3.416%	1.486%	0.533%	8.138%
CCC (high)	0.029%	0.002%	0.009%	0.028%	1.163%	0.121%	0.102%	0.841%	0.478%	0.065%	0.234%	0.252%	1.633%	4.930%	9.492%	21.122%	32.488%	2.440%	0.988%	23.582%
CCC	0.010%	0.009%	0.010%	0.006%	0.040%	0.347%	0.363%	0.676%	0.395%	0.107%	0.975%	1.002%	0.631%	1.928%	7.455%	6.341%	11.605%	20.672%	1.217%	46.211%
CCC (low)	0.011%	0.010%	0.001%	0.001%	0.002%	0.009%	0.016%	0.019%	0.034%	0.033%	0.055%	0.656%	0.182%	1.924%	2.182%	1.650%	2.504%	1.587%	20.079%	69.045%
D	0.000%	0.000%	0.000%	0.000%	0.000%	0.000%	0.000%	0.000%	0.000%	0.000%	0.000%	0.000%	0.000%	0.000%	0.000%	0.000%	0.000%	0.000%	0.000%	100.000%

Please note that the above assumptions are subject to change and adjustment from time to time as appropriate.

Adjusted Cumulative Default Probabilities

Maturity (Years)	AAA	AA (high)	AA	AA (low)	A (high)	A	A (low)	BBB (high)	BBB	BBB (low)	BB (high)	BB	BB (low)	B (high)	B	B (low)	CCC (high)	CCC	CCC (low)
1	0.007%	0.016%	0.025%	0.033%	0.042%	0.051%	0.059%	0.195%	0.294%	0.806%	1.484%	2.296%	3.457%	4.100%	5.295%	8.138%	23.582%	46.211%	69.045%
2	0.017%	0.034%	0.055%	0.070%	0.092%	0.112%	0.136%	0.397%	0.603%	1.410%	3.066%	4.442%	6.289%	8.220%	10.591%	15.860%	35.546%	60.393%	84.583%
3	0.028%	0.055%	0.089%	0.111%	0.148%	0.181%	0.229%	0.604%	0.919%	1.896%	4.607%	6.402%	8.703%	11.939%	15.291%	22.188%	42.329%	65.925%	88.571%
4	0.042%	0.077%	0.126%	0.154%	0.211%	0.258%	0.335%	0.815%	1.237%	2.313%	6.048%	8.177%	10.804%	15.188%	19.319%	27.236%	46.726%	68.781%	89.926%
5	0.058%	0.102%	0.165%	0.201%	0.280%	0.343%	0.452%	1.028%	1.554%	2.687%	7.369%	9.777%	12.654%	17.997%	22.736%	31.278%	49.893%	70.631%	90.604%
6	0.075%	0.129%	0.206%	0.251%	0.353%	0.433%	0.579%	1.244%	1.869%	3.034%	8.568%	11.214%	14.291%	20.419%	25.628%	34.554%	52.332%	71.998%	91.059%
7	0.095%	0.159%	0.250%	0.303%	0.431%	0.529%	0.716%	1.462%	2.179%	3.361%	9.651%	12.503%	15.744%	22.510%	28.083%	37.242%	54.286%	73.080%	91.410%
8	0.117%	0.190%	0.295%	0.358%	0.514%	0.631%	0.859%	1.681%	2.485%	3.674%	10.628%	13.658%	17.035%	24.321%	30.173%	39.473%	55.888%	73.965%	91.697%
9	0.140%	0.223%	0.343%	0.415%	0.600%	0.738%	1.010%	1.900%	2.786%	3.976%	11.509%	14.693%	18.186%	25.892%	31.961%	41.344%	57.224%	74.703%	91.936%
10	0.166%	0.259%	0.392%	0.475%	0.690%	0.849%	1.166%	2.119%	3.081%	4.268%	12.305%	15.620%	19.212%	27.262%	33.498%	42.925%	58.348%	75.326%	92.140%

Please note that the above assumptions are subject to change and adjustment from time to time as appropriate.

Appendix 3: Rating Canadian Structured Credit Transactions Methodology Summary

LIMITATIONS

- Future asset performance may deviate significantly from past performance.
- Actual default frequencies and/or recovery rates may exceed DBRS's stressed performance assumptions and model results are highly dependent on assumed levels of these variables.
- The methodology assumes no significant changes to legal or regulatory framework.

APPLICATION OF RATING METHODOLOGY

Summary of Risk Analysis Process for Canadian Structured Credit Transactions

Input	Details	Key Variables
Analysis of Market Risk	• For fully funded structured credit transactions, no market risk analysis is required. • For leveraged transactions, the analysis will be based on the probability of the special-purpose vehicle (SPV) being required to post additional collateral as determined by the market price of providing credit protection.	• Key variables will vary depending on the regime to determine whether a margin call for collateral will be required (see the Summary of Market Risk Analysis Process for Canadian Structured Credit Transactions table below).
Analysis of Credit Risk	• The DBRS CDO Toolbox will be populated with the ratings of the underlying assets or reference entities. • Each rating level is associated with a probability of default percentage using the DBRS Corporate Cumulative Default Probabilities table.	• DBRS ratings (if available) or ratings from other nationally recognized statistical rating organizations (NRSROs). • Rating Under Review status and trend information (rating may be notched higher or lower). • Term to maturity of the asset or reference entity. • DBRS default probability assumptions (see Table 1 in methodology).
Diversification / Correlation Analysis	• The DBRS CDO Toolbox uses assumptions for correlation among the underlying assets or reference entities.	• Type of each underlying asset. • Industry of each underlying asset. • Region of each underlying asset. • Correlation assumptions (see Table 2 in methodology).
Recovery Rate Analysis	• The DBRS CDO Toolbox uses assumptions for recovery rates upon default for the underlying assets or reference entities.	• Type of each underlying asset. • Seniority of each underlying asset. • Recovery assumptions (see Table 3 in methodology).
Benchmark Corporate Default Probabilities	• The DBRS CDO Toolbox uses a benchmark CDO default probability based on the desired rating and target maturity of the CDO tranche. • For all ratings and maturities, the corporate table is used as the CDO benchmark.	• DBRS default probability assumptions (see Table 1 in methodology).

Summary of Risk Analysis Process for Canadian Structured Credit Transactions

Input	Details	Key Variables
Legal Document Analysis	• Review of transaction structure and underlying documents.	• Review of all legal documents as to their form and content, including true-sale opinions, perfection of security interest in the purchased assets, powers of attorney granted to the trust, priority of cash distributions, legal maturity date and bankruptcy remoteness of the structure. • Document analysis also includes a review of counterparty risk and collateral risk. • Swap counterparties are required to maintain a minimum rating and meet certain conditions if downgraded below the minimum level. • The type of collateral must meet DBRS requirements and potential interest rate or currency mismatches must be addressed.
Output	**Detail**	**Application**
Minimum Required Subordination (from CDO Toolbox)	• After running a large number of simulations, the CDO Toolbox will output a minimum amount of subordination required for each rating category.	• The CDO Toolbox is run using the input assumptions above to determine the minimum required subordination at each rating level. • For synthetic structures, the required subordination levels are taken directly from the CDO Toolbox. • For cash flow structures, the transaction may be run through a cash flow model to determine any adjustments to the required enhancement levels. • Further adjustments may be made to the model results based on the review of the legal documentation of the transaction.

Summary of Process to Evaluate Proposed Enhancement in Canadian Structured Credit Transactions

Input	Process
Proposed Amount of Enhancement	• The estimated credit losses after cash flow modeling (if applicable) are compared with the proposed amount of credit enhancement to determine whether the proposed enhancement is sufficient.
Proposed Form of Enhancement	• In Canadian structured credit transactions, the main form of enhancement is subordination (analogous to the attachment point), which is the level of loss experienced by the underlying portfolio of reference entities beyond which losses on the portfolio begin to flow through to CDO investors. • If a cash flow structure is used, further enhancement may be provided by excess spread trapping, which commences if certain performance triggers of the transaction are breached.
Output	Appropriate credit risk rating level based on the proposed enhancement.

Summary of Market Risk Analysis Process for Canadian Structured Credit Transactions

Input	Details	Key Variables
Loss-Based Risk Analysis	• A margin call will be required once portfolio losses reach a predetermined level.	• The process of evaluating the probability of breaching a loss-based trigger of X% is essentially the same as determining the likelihood of first-dollar loss to a CDO tranche with X% subordination (i.e., default risk, correlation, recoveries, etc., are the key variables).
Spread-Loss Based Risk Analysis	• A margin call will be required for a given level of loss if spreads reach a predetermined level. • All else being equal, if portfolio losses are higher, then the spread required to breach the trigger will be lower. • If portfolio losses are held constant, then as the time to maturity decreases, the spread required to breach the trigger will be higher. • A mean reversion process is used to model credit spreads.	• Weighted-average spread of the portfolio. • Cumulative portfolio loss amount. • Term to maturity of the transaction. • Long-term spread assumptions (see Table 8 in methodology). • Initial spread assumptions for each rating category. • Volatility and mean reverting speed assumptions (see Table 10 in methodology).
Mark-to-Market Based Risk Analysis	• A margin call will be required if the mark-to-market of the CDO tranches drops below a predetermined level.	• Weighted-average spread of the portfolio. • Cumulative portfolio loss amount. • Term to maturity of the transaction. • Base correlation assumptions.
Output		Appropriate rating level based on market risk.

Summary of Final Rating Process for Canadian Structured Credit Transactions

Input	Details	
Rating Based on Credit Risk	• Rating based on credit risk is an output from the process explained above.	
Rating Based on Market Risk (If Applicable)	• Rating based on market risk is an output from the process explained above.	
Output	• For fully funded transactions, the final rating is the credit risk rating (subject to review of legal documentation). • For leveraged transactions, the final rating is the lower of the credit risk rating and market risk rating (subject to review of legal documentation).	Final rating

Summary of Additional Risks for Canadian Structured Credit Transactions

Risk	Description	Methodology[1]
Interest Rate Mismatch	Arises when the interest rates on the securitized assets are based on a different interest rate term than the notes issued. For example, floating-rate notes are secured by a portfolio of fixed-rate mortgages.	Swap Criteria for Canadian Structured Finance Transactions or conservative stress scenario in cash flow model.
Basis Rate Mismatch	Arises when the basis for calculating interest charged on the securitized assets or swap contract is different from the basis for interest on the notes issued. For example, an interest rate hedge referencing banker's acceptance (BA) rates are not on the same basis as asset-backed commercial paper (ABCP) notes (the Canadian Dealer Offered Rate (CDOR)).	*Swap Criteria for Canadian Structured Finance Transactions* or conservative stress scenario in cash flow model.
Currency Mismatch	Arises when the proceeds received from the underlying assets or the collateral are in a different currency from the principal and interest payments required under the note issuance.	*Swap Criteria for Canadian Structured Finance Transactions* or conservative stress scenario in cash flow model.
Bankruptcy Remoteness of SPV	Transactions should be structured to ensure that the assets of the transaction are separate and remote from any claim that secured creditors may have if any of the relevant transaction parties files for bankruptcy. True-sale opinions are expected and are reviewed as to their form and content on a transaction-by-transaction basis.	*Legal Criteria for Canadian Structured Finance*
Transaction Parties	Appropriate remedies should be clearly documented in case the financial strength of key transaction parties is weakened below acceptable levels by DBRS.	*Swap Criteria for Canadian Structured Finance Transactions* and *Legal Criteria for Canadian Structured Finance*
Conduit Liquidity	The funding of any asset by ABCP has inherent asset-liability duration mismatch and risk for ABCP investors. To address the risk that market demand for ABCP may not be sufficient or the ABCP fails to roll over due to unforeseen events, all conduit sponsors should comply with DBRS criteria.	*Rating Canadian ABCP*

1. Methodologies are available at www.dbrs.com.

SUMMARY OF TRANSACTION MONITORING

Summary of Surveillance Reporting for Canadian Structured Credit Transactions

Debt Type	Information Reported	Frequency	Source and Results[1]
ABCP	Asset class, swap counterparty industry, funded amount, attachment point/enhancement, detachment point, required subordination, number of defaults (six months, 12 months, cumulative), cumulative losses, deal rating.	Monthly	*Monthly Canadian ABCP Report*
Structured Notes	Asset class, swap counterparty industry, funded amount, attachment point/enhancement, detachment point, required subordination, number of defaults (six months, 12 months, cumulative), cumulative losses, deal rating.	Monthly	*Monthly Structured Notes Report*

1. Available at www.dbrs.com.

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Corporate Headquarters

DBRS Tower
181 University Avenue
Suite 700
Toronto, ON M5H 3M7
TEL +1 416 593 5577