DerivativeFitch

Structured Credit
Global
Special Report

First Generation CPDO: Case Study on Performance and Ratings

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Introduction

Constant proportion debt obligations (CPDOs) are one of the latest product innovations seen in the structured credit markets. Like other more recent structured credit products, the performance of the issued debt obligations is highly dependent on the mark-to-market (MtM) impact of changes in credit spreads. Credit risk as measured by defaults and recovery rates becomes secondary. The market value of the exposure is typically driven by the credit default swap (CDS) premium to be paid for protection on a portfolio of names with credit risk, or a credit index such as iTraxx or CDX.

However, as opposed to traditional structured credit products such as collateralised debt obligations (CDOs), the term "structured" does not refer to the liability side of the issuer, where debt is structured to allocate risk and proceeds in a senior-sub structure, but rather to the asset side where structuring happens by way of increasing or decreasing the exposure dependent on the spread development of the referenced portfolio. Consequently, in most cases there are no "traditional" equity or mezzanine investors to absorb any losses in the transaction arising from spread widening or actual defaults, but it is the sole and hence senior investor in a CPDO who is exposed to the full leverage of the deal.

Fitch has been asked to rate numerous first generation CPDOs, defined as those utilising 15x initial leverage and referencing "on the run" the investment grade (IG) CDS indices for 10 years. The key performance parameters for these traditional CPDOs are spread volatility, roll-down benefit (RDB), bid/offer levels and, to a lesser degree, default risk. In the context of its rating analysis, Fitch has carried out intensive research into these parameters that can influence the performance and hence the achievable rating of CPDOs. The findings of this research are as follows:

- First generation CPDO transactions' performance and ratings are sensitive to even a minor amendment of the key performance parameters.
- The sensitivity of a CPDO rating towards change in assumptions increases with higher rating levels and easily leads to rating changes of several categories.
- The leverage employed contributes to the sensitivity to key performance parameters and potential ratings instability.
- Comparison to corporate CDOs showed that they are more robustly structured against worst case scenarios than CPDOs at a comparable rating level.
- Changes to the credit markets, new market participants and the rapid growth of the CDS market may lead to greater spread volatility than experienced historically.
- Scenario analysis through historical back testing showed that many of the more common CPDO structures would probably not have been able to withstand high investment grade stresses.
- As opposed to the 10-year tenor of a CPDO, data on the key performance parameters is only available for a little more than four years.
- For these reasons, first generation CPDOs do not achieve high ('AA'/'AAA') investment grade ratings.
- Second generation CPDOs improve on shortcomings of the first.

Although Fitch recognises the concept behind CPDOs, and agrees that they can be a successful investment product, it also stresses the CPDO's dependency on the future development of its key performance parameters. Combined with the very short data history available, which is often only a fraction of the risk horizon of the products to be rated, this highlights the modelling risk when rating these transactions.

The intention of this report is to share Fitch's findings on the impact of changing input parameters to CPDO models on the achievable ratings. After introducing the key performance parameters, the report explains how assumptions on these parameters can be derived. Sections on the rating sensitivity towards changes of these parameters and on benchmarking to other products and history enable investors to understand the risk and performance drivers associated with CPDOs. From its research, Fitch has concluded not to give significant weight in its consideration to recent data, given their short and relatively untested nature, when deriving its input parameters.

The agency is currently reviewing several proposals for next, or second, generation CPDOs that seek to address the shortcomings of the first generation. These second generation CPDOs mitigate the risks of their earlier cousins through some combination of: removal of credits from the portfolio if the ratings drop below some (higher) pre-established threshold; limitation of leverage maximum; introduction of a retained asset manager to manage the reference portfolio credits; and mitigation of reliance on achieving an RDB and executing transactions at approximately current bid/offer spreads.

Mechanics of CPDOs

Initially, the assets of a CPDO are only the proceeds received from the investors. On the liability side, the CPDO has to pay a fixed coupon during the life of the transaction and the principal back at maturity, typically 10 years. Initially, there is a shortfall between the net value of the assets (NAV) and the net present value (PV) of the liabilities.

To cover that shortfall, the CPDO takes leveraged exposure to a CDS index. The exposure is taken in an unfunded format so there are no funding constraints. The leverage is adjusted dynamically so that the total expected returns from the credit index exposure are sufficient to cover the shortfall. Spread tightening on the index leads to MtM gains in a CPDO, thus increasing the NAV and reducing the shortfall. This can lead to lower leverage. Conversely, spread widening on the index leads to higher leverage (subject to a leverage cap). This is a key difference with a CPPI product where the leverage reacts in the opposite way when spreads tighten or widen.

The dynamic leverage in a CPDO is designed to lead to a cash-in event, when the value of the assets as measured by the NAV equals the value of future liabilities. At that point, the leverage exposure is unwound and the assets are kept in cash or low risk collateral until the maturity of the transaction.

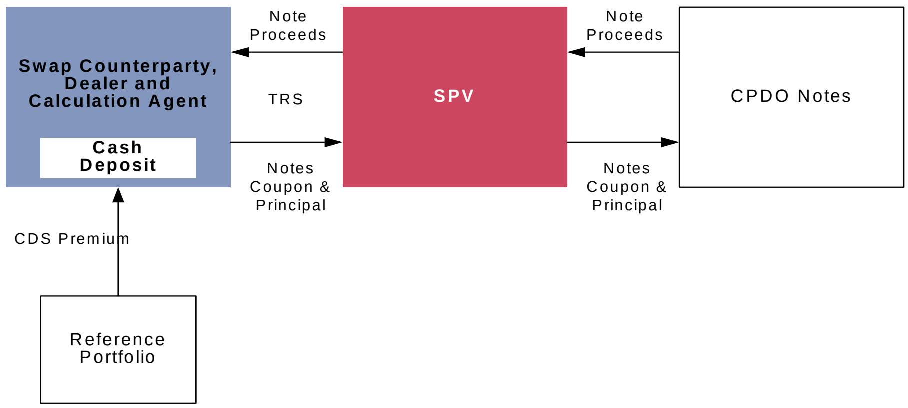
In CPDOs, the notes will default in two cases:

- if, over the tenor of the deal, the NAV falls by a substantial amount and hits the cash-out trigger; typically set at 10% of the initial NAV; or
- If, at maturity, the NAV is not at least equal to the principal due.

Structure

CPDO notes are issued out of a special-purpose vehicle (SPV). The proceeds from the issuance are deposited by the arranging bank in a cash account or equivalent collateral to generate regular returns, e.g. based on Libor or Euribor.

CPDO Structure



Source: Fitch, transaction documents

The arranging bank enters into a credit default swap (CDS) on a risky credit portfolio, typically referencing a credit default swap index. The notional of this CDS is a multiple of the posted collateral, thereby creating leverage. To hedge itself, the arranger also enters into a total return swap (TRS) with the SPV. Under this TRS, the premium as well as any gains and losses from the CDS plus the return on the posted collateral are passed on to investors by paying interest on their investment and adjusting the collateral amount by realised gains or losses. During the term of the transaction, the notional of the CDS exposure is adjusted based on automatic leverage rules as the outstanding collateral amount increases or decreases. The leverage is based on the following formula:

Min ((PV of future liabilities + cushion - NAV) / (PV of premium x multiplier), Maximum Leverage)

Assuming a PV of liabilities of 112%, a cushion of 5%, NAV of 100%, a PV of premium of 1.4% and a multiplier of 0.75, the calculation is:

Target leverage = min ((112% + 5% -100%)/1.4%*0.75, 15) = min (16, 15) = 15

Exposure to default risk is managed through a process of automatically rolling every six months out of the existing index (now off the run) and into the new, on-the-run index. This semi-annual index roll is a critical feature of most first generation CPDOs.

Key Performance Drivers

The key drivers of the performance in a CPDO are the spread development, the RDB that is linked to the term structure of credit spreads, the bid/offer spread between buying and selling protection and the default risk.

Spread Development

CPDOs are very sensitive to spread moves on the reference portfolio due to the high initial leverage in the structure. The spread risk is either due to general market widening despite an unchanged credit quality (systematic risk or general spread widening) or due to negative credit migration of specific individual names (idiosyncratic risk or migration-driven spread widening). Widening credit spreads would lead to the TRS being out of the money with a corresponding MtM loss for the issuer. For instance, let's consider a EUR100m CPDO transaction with 15x initial leverage, referencing a five-year index with 4.3 years of duration and a starting spread of 30bp. Initially, the NAV is EUR100m, ignoring any upfront transaction costs. If the spreads on the index widen by 15bp to 45bp shortly after launch, the MtM impact will be:

(30 - 45) x 4.3 x 15 x EUR100m = -EUR9.67m

As a result, the NAV will reduce to EUR90.33m, a loss of almost 10%.

Dependent on whether systemic risk or idiosyncratic risk caused the change, one can observe two effects on CPDOs referencing rolling indices: If spread widening is caused by systemic risk, the issuer will suffer a NAV loss. However, it will also benefit from the higher spread environment when rolling into the new index. If spread widening is caused by idiosyncratic risk, the issuer will also suffer a NAV loss. However, it will not be able to benefit from higher spreads after the roll, since the names that have migrated to below investment grade are removed at each roll.

Defaults in Reference Portfolio

The impact of any single default in a CPDO structure is magnified through the leverage. For a CPDO referencing 250 equally weighted names with leverage of 15x, a single default would lead to a reduction of the NAV by 3.6% assuming a recovery rate of 40%. For a CPDO referencing only 50 names and leveraged 15x, a single default would result in a NAV reduction of 18%.

In CPDOs, the default risk is often reduced through structural features. For instance, for CPDOs referencing a rolling index, the exposure is taken on the "on the run" index. This means that the default risk is limited to a jump from investment grade to non-investment grade within six months. In other structures, credits may be removed from the portfolio if the ratings drop below some pre-established threshold. While the risk of short-term "jump to default" is probably fairly limited when looking at historical default rates, it should be kept in mind that these default rates are typically a long-term average and defaults tend to be clustered around certain periods. For instance, during the last credit downturn in 2001/2002, several high-grade companies jumped to default within six months, including Enron and Worldcom. Also, as structures evolve to perhaps reference lower quality names, default risk may become a significant factor. The migration process chosen by Fitch (see section *Migration Driven Spread Movements*) takes default risk into account by generating extreme scenarios where several high-grade credits default within the same period.

Term Structure of Spread Curve

A key performance driver for first generation CPDOs is the ability to roll down the credit curve as time passes. At each six-month index roll, the CPDO may be able to benefit from unwinding its current exposure at a lower spread, net of bid/offer costs, and thereby crystallising a gain. This RDB can be significant in CPDOs that reference on-the-run indices as the benefit can be realised on every roll date, i.e. every six months. Assuming an RDB of 2bp every six months in a transaction leveraged 15x on a five-year index with 4.3 years of duration equates to 2 x 2 x 4.3 x 15 = 258bp or 2.58% NAV increase in the first year alone.

However, the benefit is realised only if the term structure of credit spreads is upward sloping. If the credit curve flattens, no benefit will be realised. If it inverts, this will have a negative impact on the NAV. Rolling CPDOs are very sensitive to the assumption taken for the shape of the credit curve. This will be described in more detail in the sensitivity section of this report.

Bid/Offer Spread

In a CPDO, investors are exposed to the level of bid/offer spreads in the market as these costs are deducted from the NAV each time there is a roll date or a leverage event. Assuming a bid/offer spread of 1bp for the same transaction taken in the example above, the impact of the bid/offer on the NAV due to rolling events is a reduction by 1.29% in the first year alone.

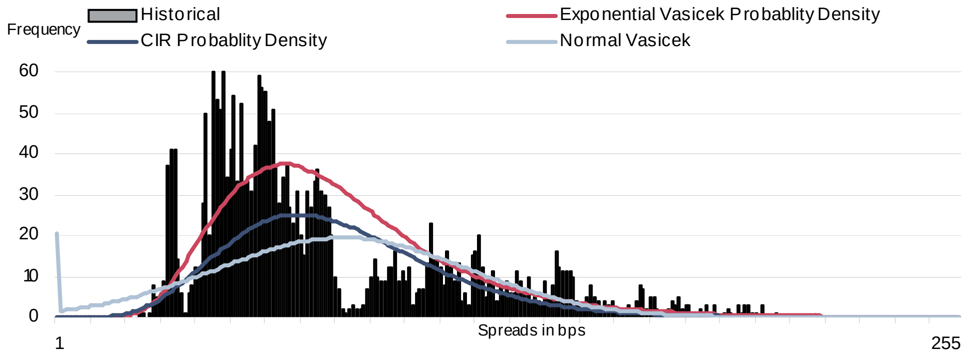
The level of the bid/offer can vary depending on supply and demand factors, the level of spread and spread volatility. The widening of the bid/offer spread is a significant risk for the CPDO structure. In rolling CPDOs, this risk is reduced by referencing the most liquid indices such as iTraxx and CDX. However, as explained later in the report, the history of bid/offer on these indices is limited and they have not been tested in a situation of general market stress as occurred in 2001/2002.

In next generation CPDOs referencing single names, exposure to bid/offer spread is sometimes reduced by referencing a non-rolling portfolio and limiting substitutions to names that are downgraded below 'BBB'.

Determining the Assumption Set for CPDO Modelling

Fitch analyses the spread risk using a similar approach to the one adopted for leveraged super senior (LSS) transactions. The spread paths are simulated stochastically based on a mean reverting process, which is fitted to historical credit spreads. The spread is modelled jointly with credit migration and defaults. The credit spread for the specific portfolio is derived from the systematic driving spread, which is adjusted for other rating categories using deterministic multiples. Rating changes would lead to jumps in the portfolio credit spreads. The systematic spread process is correlated with the asset values that drive the migration process.

Chart 1: Historical Data versus Modelled Data



The normal Vaciseck can produce negative values and therefore has been truncated at 1 on the chart
Source: Fitch

Spread Models

There are a number of different models available, which can be used to model the random behaviour of credit spreads. A good model should have the following properties:

- no negative spreads;
- fit the historical distribution of spreads; and
- mean reversion.

Generally, credit spreads are assumed to be mean reverting. This assumption can be verified by standard economic tests for stationarity.

The most common stochastic models with mean reversion are the Ornstein Uhlenbeck (O-U) process (also known as the Vasicek model), the Cox Ingersoll Ross (CIR) process and the exponential Vasicek model. The standard O-U process allows negative values, which is not a desired property for a good spread model. Moreover, the standard O-U process assumes spreads are normally distributed. Chart 1 shows the historical spread distribution, which clearly is not normal.

The CIR process and the exponential Vasicek model both provide a good fit to the data and ensure spreads are positive. However, the exponential Vasicek model generates slightly fatter tails compared to the CIR model, and hence produces results that are slightly more conservative. Fat tails are key as they have a significant impact on the probability of failure events in the CPDO model.

Fitch chose the exponential Vasicek when modelling the random behaviour of credit spreads. If another model had been chosen, such as the standard O-U process or CIR, then the simulated data would have fewer scenarios with extreme spread values. This would result in fewer failures for the CPDO structure and hence higher ratings.

The three key parameters in the process are the long-term mean (LT mean; theta), the mean reversion speed (alpha) and the volatility (sigma). The formula linking these parameters is:

$$dS/St = \alpha(\theta - \ln(St))dt + \sigma dWt$$

The exponential Vasicek model is a stationary process that converges to a stable long-term distribution, which is log normal, and the process can be calibrated either using a simple least squares regression or the maximum likelihood technique. The estimated parameters are usually very close.

The regression method is very quick, which allows simulated standard errors for each of the three parameters to be derived. The procedure is simply to generate a random path with the best fit parameter and to re-estimate the three parameters based on the simulated path. The procedure is repeated several thousand times, which gives a distribution for the estimated parameters. The standard error for each parameter depends on the length of the data sample. The longer the sample the lower the variation in the estimates will be. To get an idea for the error for a given historical sample one would simulate paths of the same length.

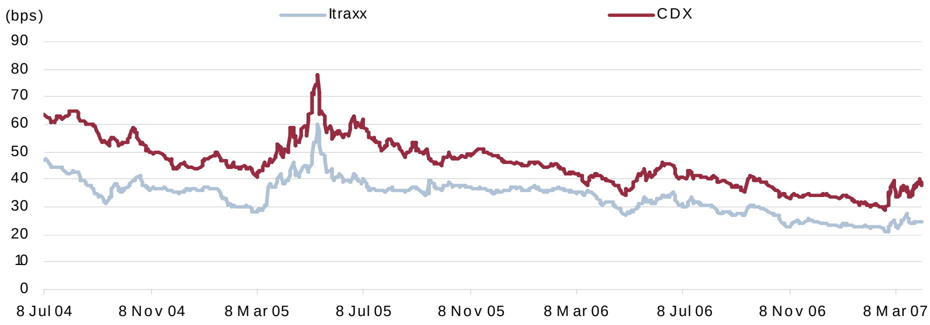
The standard error obtained in this way depends of course on the chosen process. Another way to obtain standard errors is to estimate the parameters for a moving time window on the actual historical data sample. While this approach does not depend on the process, it will overstate the standard error due to the necessarily shorter estimation period.

Spread Path and Underlying Data

General Spread Movement

To derive assumptions on theta, alpha and sigma, Fitch looked first at available historical data on the constituents of GLOBOXX, which are iTraxx EUR IG and CDX NA IG. Although other portfolios of credits are likely to be referenced in CPDOs, GLOBOXX has been the preferred set of exposures for most first generation CPDOs. The maturity of the referenced indices is usually five years, and historical data on them is limited since they have only been in existence for less than four years. The following chart shows the historical iTraxx and CDX index.

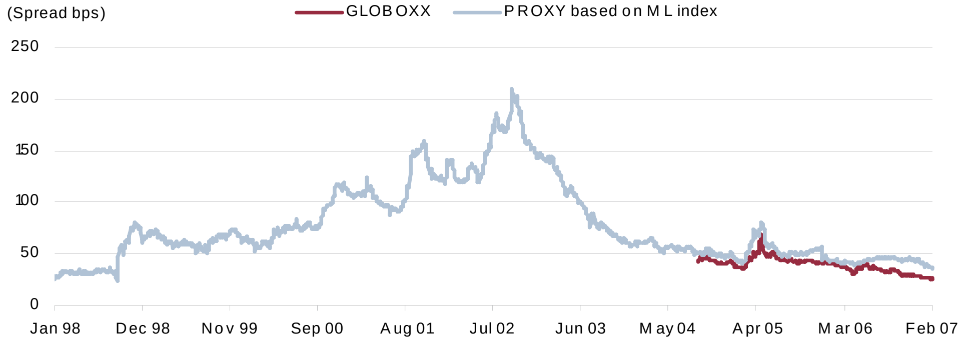
Chart 2: 5 Year iTraxx NA IG and 5 Year CDX EUR IG



Source: Markit

The history of the CDS indices is (a) relatively short and (b) does not include a significant stress. For example, during the spread widening after May 2005 following the downgrade of GM and Ford, the five-year iTraxx did not exceed 60bp and the five-year CDX also remained below 80bp. In contrast, during the stressed environment of 2001-2002, cash bond spreads for indices of a comparable credit quality peaked at levels above 200bp.

Chart 3: Comparison ML Proxy vs GLOBOXX



Source: Bloomberg

Due to the lack of CDS index data for the time prior to 2004, Fitch relied on cash bond indices to derive proxies to construct a retrospective GLOBOXX spread performance. Data on cash indices is available for the past 25 years. It is commonly accepted that there have been three credit cycles during that period, each having the same type of amplitude. The last credit cycle started in 1996.

An important concern in using the cash market as a proxy for the CDS indices is the possibility that CDS can trade at a higher beta; in other words, there is empirical evidence that CDS spreads intrinsically are more volatile than cash market spreads in response to positive and negative events. Given the observed rapid growth of the CDS market and a host of new, non-traditional credit market participants, it is not improbable that CDS spreads in the credit downturn could be materially more volatile than what has been witnessed historically.

To find a good proxy for GLOBOXX, Fitch constructed an index based on the Merrill Lynch corporate indices (referred to as ML Proxy) that match both the average credit quality of GLOBOXX ('A-'/'BBB+'), its duration and its geographical composition (50% Europe and 50% US). This analysis has been done both for asset swap spreads and option adjusted spreads available dating back to December 1996. The asset swap spread data has proven to be a better proxy for GLOBOXX. Chart 3 shows the ML Proxy versus the actual GLOBOXX between 2004 and 2007.

For the three-year overlap period, the proxy index shows a very high correlation with the actual GLOBOXX index. Still there are limitations in using cash data as a proxy for a CDS index. Indeed, there is typically a bias between the cash market and the CDS market. Also, the cash data used is not actual trade data. The Merrill Lynch cash index is also rebalanced every month, and the data shows jumps due to the removal of names. If another index provider is used to calibrate the spread process, for instance MSCI, then the parameters and hence the achievable ratings, may be different.

Based on the proxy index, Fitch found the best fit parameters to be:

Spread Path Parameters for GLOBOXX

	Monthly data	Daily data
Mean reversion speed (alpha)	0.469	0.556
Volatility (sigma) (%)	40.1	40.7
Long-term mean (theta) (bp)	79.87	80.4

Source: Fitch

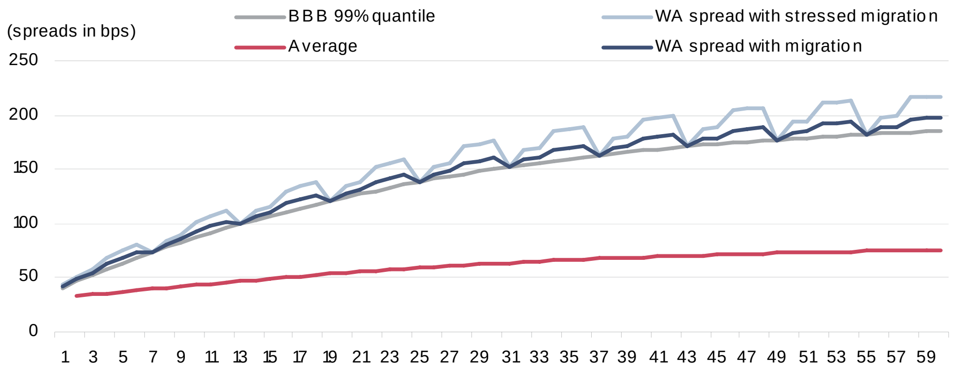
As can be seen, the variations between daily and monthly data are very small and would hardly impact any performance simulation.

Migration Driven Spread Movements

Investment-grade CDS indices such as iTraxx and CDX only replace names that have been downgraded below investment grade and only on a semi-annual basis. For instance, migration in the GLOBOXX portfolio may cause the credit quality of GLOBOXX to fall below 'A-'/'BBB+', reflecting the idiosyncratic risk in the index. Since the cash bond indices replace downgraded names within the month following the downgrade, the migration in the cash bond index is significantly reduced compared to the CDS indices, leading to lower migration driven volatility in the cash index.

The idiosyncratic spread risk in GLOBOXX due to migration can be modelled using a quarterly migration process, typically derived from the historical one-year average migration. This migration historically shows a downward trend for investment grade assets, which means that they are more likely to get downgraded than upgraded. Every quarter, the negative trend in the migration process leads to an increase in the portfolio spread relative to the underlying driving spread. For a CPDO, this idiosyncratic spread widening will cause MtM losses, which are crystallised on each roll date or following a de-leveraging event. The impact on NAV is significant. For instance, a widening of 5bp every six months in a transaction leveraged 15x on a five-year index with 4.3 years of duration equates to 5 x 4.3 x 15 = 322bp or 3.22% NAV decrease.

Chart 4: Exponential Vasicek Systematic Spread and Migration



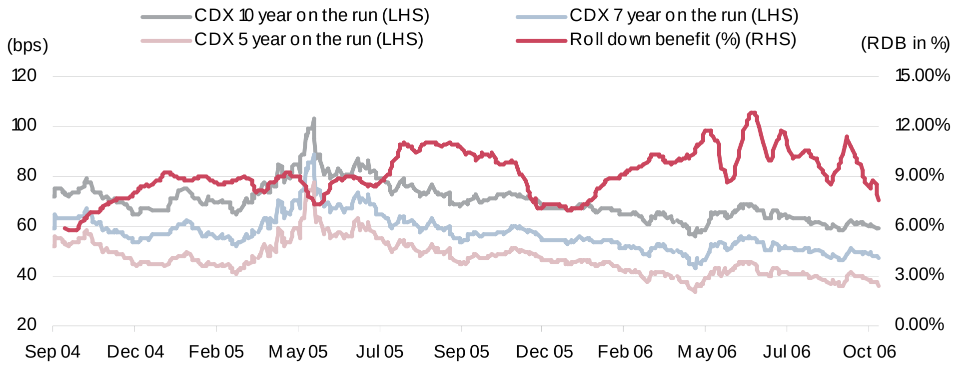
Source: Fitch

Chart 4 shows the average simulated spread for GLOBOXX and the 99 percentile for the driving 'BBB' spread and overlays the average migration. The average migration is shown both for the historical matrix and a stressed matrix. The migration impact shown in the chart is only the average of all scenarios. The average migration causes around 2.4% of spread widening over a six-month period or around 2bp for a spread of 80bp. Fitch's model for migration is not constant but stochastic. It also generates extreme migration scenarios that would cause 20 to 30bp of spread widening over six months. The impact of credit migration is also relative and increases when spreads are high in the model.

Term Structure of Credit Spreads (Roll-Down Benefit)

Credit spreads, like interest rates, show a term structure, which for credit normally is positively sloping, meaning that credit spreads at longer maturities are higher than spreads for shorter maturities. A consistently upward sloping term structure means investors can realise an MtM gain simply by holding credit risky assets over time, assuming credit spreads do not widen due to credit-specific or general market events. This holds true for CPDOs referencing the CDS indices, as the CPDO can "roll down the credit curve" at each six-month roll date. This "roll-down benefit" is an important part of the CPDO strategy. Historically, the index term structure has been upward sloping as shown by the positive RDB for a 26-month period in the following chart:

Chart 5: Interpolated RDB for CDX



Source: Markit

The part of the term structure that is most interesting for the GLOBOXX CPDO structure is the difference between the 5.25 year CDS levels and the 4.75 year CDS levels. However, the liquid maturities are three, five, seven and 10 years. Nevertheless, using linear interpolation between the three, five and seven year maturities, RDBs for GLOBOXX would have ranged between 7% and 10% of the current five-year mid spread (see Chart 5).

RDB for CDX on and Around Actual Roll Dates

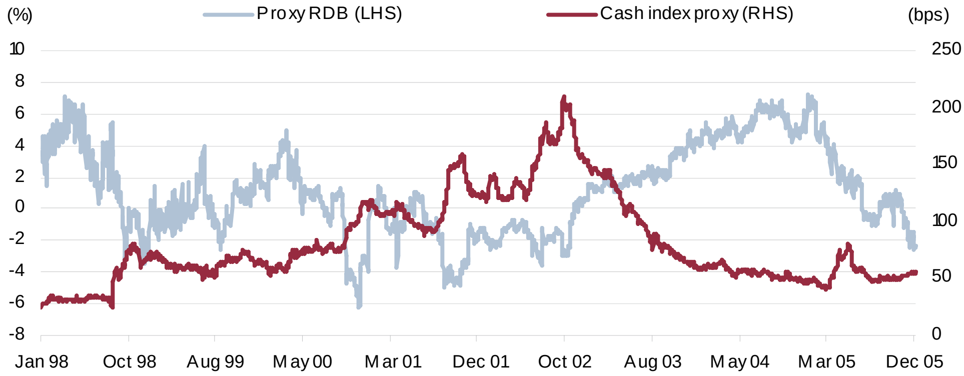
Date	On the run	Off the run	Average in	Average out	Replacement impact	RDB (bp)	RDB (%)
21 Mar 05	45.29	45.5	126.6	292.2	-3.97	3.76	8.3
22 Mar 05	47.23	47.42	140.12	297.79	-3.78	3.6	7.62
23 Mar 05	46.79	46.58	145.93	298.39	-3.66	3.86	8.25
24 Mar 05	46.25	45.75	147.8	295.53	-3.55	4.05	8.75
20 Sep 05	47.28	51.69	85.37	248.66	-11.76	7.35	15.54
22 Sep 05	47.40	52.97	87.6	259.45	-12.37	6.8	14.35
23 Sep 05	46.64	51.63	87.05	253.99	-12.02	7.04	15.09
26 Sep 05	45.98	51.71	86.27	252.65	-11.98	6.26	13.6
20 Mar 06	37.99	37.17	52.93	104.63	-4.14	4.95	13.04
21 Mar 06	38.73	37.5	53.24	101.82	-3.89	5.12	13.22
22 Mar 06	39.52	38.44	53.67	101.08	-3.79	4.87	12.33
23 Mar 06	40.63	39.5	54.12	102.39	-3.86	4.99	12.28
20 Sep 06	40.14	36.88	108.69	103.47	0.29	2.98	7.41
21 Sep 06	40.73	37.56	98.48	110.45	-0.67	3.84	9.42
22 Sep 06	41.30	38.19	100.16	114.67	-0.81	3.93	9.51

Source: Fitch

Another method to estimate the RDB is to calculate the difference between the spread of the on-the-run index and the previous index and adjust for the spread differences due to portfolio composition. This method shows an RDB being on average 12% for the CDX. The same analysis performed on the exact roll dates, shows that the actual roll varies between 7% and 15% and is on average equivalent to 11%.

Since the observation period for the RDB on CDS indices is as limited as the history of iTraxx and CDX, Fitch also analysed the RDB on the above described Merrill Lynch cash indices from 1998 to present. The following chart shows the RDB for the 'A/BBB' proxy cash bond index.

Chart 6: RDB based on ML Bond Indices



Source: Bloomberg

Comparing the finding for the CDS market from the limited data period available with the RDB in the cash market for the longer data period it becomes apparent that the RDB for the cash market is significantly below the RDB observed for the CDS indices. This could be due to any number of factors, including call options in cash bonds, less homogeneity and liquidity compared with the CDS indices and other technical factors. The following table shows the average, median and 95th percentile for the proxy cash index, the CDX and the iTraxx.

RDB Statistics: Cash vs CDS Indices

	BBB+/A- cash index[a] (%)	iTraxx[b] (%)	CDX[b] (%)
Average	2.2	10.6	12.6
95th percentile	-3.1	8.3	6.5
Median	1.7	10.7	12.2

[a] Period: Jan 98–Feb 07
[b] Period: March 05– Feb 07
Source: Fitch

However, the bond market also shows quite a few periods during which the credit curve was actually inverted, meaning the spread for longer maturities was lower than the spread for the short maturities. An inversion tends to occur in more volatile, high spread environments, when there can be significant price dislocations, in particular with many bonds trading on a dollar-price as opposed to a spread basis. Given the relatively benign credit conditions, there has been no inversion in the term structure of the Itraxx and CDX high grade indices to date.

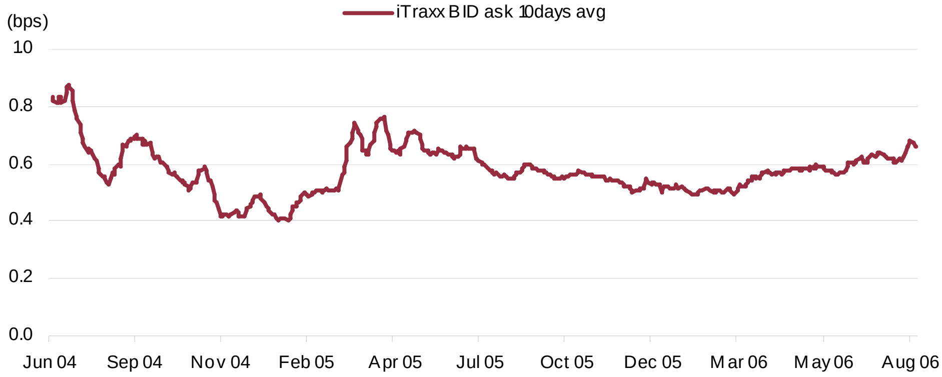
The actual RDB realised in first generation CPDOs referencing GLOBOXX may also be affected by CPDO issuance. As the index CPDOs are "forced rollers" – buying protection on the off-the-run index and selling protection on the new on-the-run index every six months – other market participants may take opposite positions in expectation of the roll date. To address liquidity issues around the roll date, certain static structures allow the arranger to choose a roll date within two weeks of the actual roll date, and more recent structural innovations have sought to address this risk in a number of ways.

Bid/Offer Spread

The bid/offer spread in the CDS market varies significantly between single name CDS and the indices. The latter show much greater liquidity compared to any single name CDS and hence the bid/offer spread is significantly lower. Chart 7 shows the bid/offer spread on the iTraxx EUR five-year maturity index.

The bid/offer spread has been declining steadily as liquidity in the index has increased. However, after the market turmoil in May 2005 that followed the downgrade of Ford and GM, the bid/offer spread increased to 0.8bp. While there is no bid/offer data for the indices available for stressful periods prior to 2004, Fitch observed that credit spreads in the single name CDS market and the cash markets widened materially in 2001/2002.

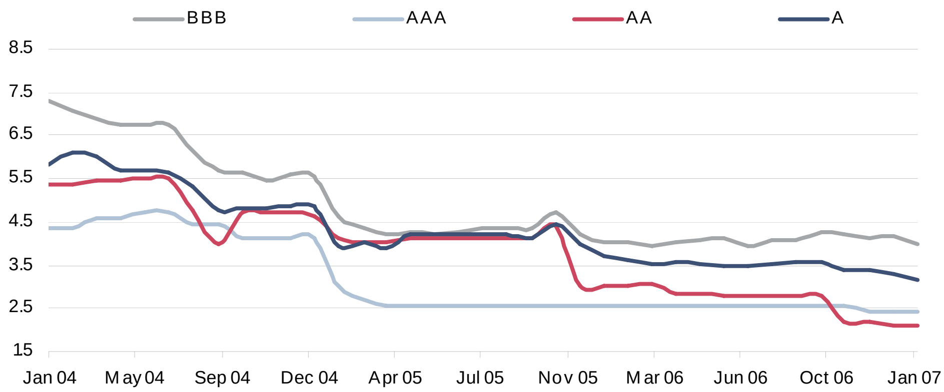
Chart 7: 10 Day iTraxx Moving Average BID-ASK Spread



Source: Fitch

In comparison, the bid/offer spread on single name CDS ranges between 2bp and 5bp depending on the rating, which is shown in the chart below.

Chart 8: Monthly Single Name CDS Bid-Offer by Rating



Source: Fitch

Sensitivity Analysis

Given the limited observation period for the key parameters and the resulting uncertainty on the exact calibration, Fitch has tested the sensitivity of the CPDO model to changes in the key parameters.

The base transaction used for all these sensitivities is a 10-year CPDO referencing the on-the-run GLOBOXX index with a liability coupon of 100bp, a maximum and initial leverage of 15x , a starting spread of 29bp and an arrangement fee of 1%. The data used for calibration is always the composite Merrill Lynch 'A-/BBB+' cash index described above.

Spread Parameters Sensitivity

Spread parameters are the best fit resulting from the exponential Vasicek process, which is based on actual historical data. As such, stressing the spread parameters may not be realistic compared to stressing the input of the Vasicek process, i.e. the historical spread. Fitch would therefore not consider arbitrary stresses on the spread parameters such as, for instance, increasing them by 30%.

However, one method of stress that would yield more realistic results is to consider calibrating the spread process on different historical periods. Indeed, one would not expect the parameters to be the same at all when choosing a benign period such as 2003 to 2007 and a more stressful period such as 1998 to 2002. In fact, the CPDO modelling parameters are very sensitive to the historical period chosen. For example, the average credit spread in the market over the past 10 years is heavily influenced by the systemic widening that occurred in 1998 and again in 2001/2002. To test this sensitivity, Fitch has calculated a standard error for each parameter.

Standard Error on Spread Parameters

	LT mean (bp)	Mean rev speed (%)	LT volatility (bp)
Base	80.4	55.60	32.2
One Standard error	100	22.60	4.2
Base + 1/2 Standard error	130.4	66.90	34.3
Base + 1/4 Standard error	105.4	61.25	33.25
Base - 1/4 Standard error	65.4	49.95	31.15
Base - 1/2 Standard error	30.4	44.30	30.10

Source: Fitch

In the table above, the long-term mean is 80.4bp. It corresponds to the mean toward which the exponential Vasicek process converges. A mean reversion speed of 55.6% signifies that it takes around four years for spreads to revert to the long-term mean in the model. The long-term volatility of 32bp corresponds to the long-term mean of 80.4bp, being 40% of it. As can be seen in the table, the parameter with the largest relative standard error is the long-term mean.

Fitch has then analysed the sensitivity of the CPDO model to spread parameters based on their respective standard error. Only the relevant stresses have been considered. For instance, decreasing the volatility or increasing the mean reversion speed are favourable scenarios, so they have been excluded. This analysis is illustrated in the table below and provides the following insights:

- In general, the ratings are very sensitive to the assumed 10-year RDB with the ratings ranging from 'AA' assuming a 7% average RDB to 'BBB+' assuming a 3% RDB.
- The higher the initial rating achieved by higher RDB assumptions, the higher the rating sensitivities to changes in the spread parameter assumptions.

- The model is sensitive to the standard error stresses on the long-term mean but is less sensitive to the same stresses on the mean reversion speed and the long-term volatility when the initial rating is below 'AA'.
- Stressing the long-term mean up is the most sensitive scenario. However, such a stress could lead to a corresponding spread level that might not be realistic.
- First generation CPDO structures perform at their best in a "mean reverting" spread environment where spreads are neither too high nor too low.

Sensitivity of the Rating to Stresses on Spread Parameters

	No stress	+1/4 standard error	+1/2 standard error	-1/4 standard error	-1/2 standard error
RDB 3%					
LT mean	BBB+	BBB-	BB+	BBB	BBB-
Mean rev speed	BBB+	n.r[a]	n.r[a]	BBB+	BBB+
LT volatility	BBB+	BBB+	BBB+	n.r[a]	n.r[a]
RDB 5%					
LT mean	A-	A-	BBB	A-	A-
Mean rev speed	A-	n.r[a]	n.r[a]	A-	A-
LT volatility	A-	A-	A-	n.r[a]	n.r[a]
RDB 7%					
LT mean	AA	A+	A-	AA	A+
Mean rev speed	AA	n.r[a]	n.r[a]	AA-	A+
LT volatility	AA	AA-	A+	n.r[a]	n.r[a]

[a] Not relevant
Source: Fitch

Roll-Down Benefit Sensitivity

The historical data on RDBs varies greatly between the CDS market and the cash market for which there is a longer history available. A common assumption used in the market is to consider an RDB of 7% compared to the average level of 10% seen on the iTraxx and CDX to date. However, the 7% assumption is arbitrary and is not supported by longer data from the cash markets and, as shown in the RDB Sensitivity table, the model can be quite sensitive to the RDB assumption used. A reduction of the RDB assumption from 7% to 5% results in a lower rating by four notches to 'A-'. However, the sensitivity of the model becomes more in line with what Fitch would expect for an assumption of 5%. Indeed, the reduction of the RDB assumption from 5% to 3% only results in a one-notch lower rating of 'BBB+'. Fitch would therefore consider it prudent to have an RDB assumption in the region of 5% or lower.

Sensitivity to the Roll-Down Benefit

RDB (%)	Rating
RDB 7	AA
RDB 5	A-
RDB 3	BBB+

Source: Fitch

In the cash market, the term structure of credit spreads has been at times flat or inverted. If the spread term structure becomes flat, the RDB will be nil. A way to take this risk into account in the CPDO model is to reduce the RDB to nil once the spread on the underlying portfolio reaches a certain threshold, e.g. 150 bp. The assumption behind this approach is that the term structure is more likely to become flat in an environment where spreads are relatively high. The CPDO model is sensitive to the level of that threshold. For instance, when the threshold is reduced from 150bp to 100bp, the impact is a three-notch downgrade with an RDB of 7% and one notch with an RDB of 5%.

Spread Curve Stress with RDB of 7%

Flattening above … (bps)	Rating
… 200	AA
… 150	AA
… 100	A

Source: Fitch

Spread Curve Stress with RDB of 5%

Flattening above … (bps)	Rating
… 200	A
… 150	A-
… 100	BBB+

Source: Fitch

Bid/Offer Spread Sensitivity

This is the parameter where there is the least historical data available and hence the greatest uncertainty. Again a stress on this parameter is arbitrary and thus Fitch would not expect that a small change to that assumption result in a multi-notch downgrade. As shown in the tables below, when the RDB assumption is 7%, the model becomes much more sensitive to bid/offer stresses compared to an RDB assumption of 5%. For instance, when the bid/offer assumption is increased from 1bp to 1.5bp, there is a two-notch downgrade with the 7% RDB compared to a stable rating with the 5% assumption.

Bid/Offer Stress with RDB of 7%

Bid/offer of 2bp	A
Bid/offer of 1.5bp	A+
Bid/offer of 1bp	AA

Source: Fitch

Bid/Offer Stress with RDB of 5%

Bid/offer of 2bp	BBB+
Bid/offer of 1.5bp	A-
Bid/offer of 1bp	A-

Source: Fitch

To conclude, the sensitivities performed on the key performance drivers show consistently the same pattern: the higher the initial rating, the more sensitive the model becomes to even small changes on the key assumptions. Fitch expects that the rating will not be sensitive to such small changes and will therefore take this into account when assigning the initial rating.

Reality Checks and Benchmarking

In times of increasingly complex products and model driven assessments of credit risk, commonsense reality checks become even more important to benchmark new products with traditional products from a risk and return perspective. The following section highlights some of the reality checks Fitch would like to share with the market.

Worst Case Robustness of CPDO vs. Corporate CDO

In particular, for high target ratings investors expect to enjoy the benefit of being protected even against severe stress scenarios, such as being protected against developments that are multiples worse then what has been observed historically. The ability of a rated note to withstand such stresses can be called the transaction’s robustness.

Corporate CDO Robustness

A reasonable test an investor may want look at is the level of historical defaults a particular CDO tranche might be able to withstand, or the historically observed worst case default rate for a given period the transaction might be able to survive.

Fitch CDO Default Matrix (%)

	Periods (years)									
Rating	1	2	3	4	5	6	7	8	9	10
AAA	0.00	0.00	0.01	0.02	0.03	0.05	0.08	0.11	0.15	0.19
AA	0.01	0.03	0.06	0.12	0.20	0.31	0.43	0.59	0.76	0.89
A	0.03	0.12	0.23	0.38	0.56	0.77	1.00	1.26	1.55	1.85
A-	0.05	0.16	0.33	0.54	0.79	1.08	1.40	1.77	2.16	2.44
BBB+	0.06	0.21	0.42	0.69	1.02	1.39	1.81	2.28	2.79	3.13
BBB	0.18	0.46	0.79	1.17	1.58	2.02	2.49	2.98	3.50	3.74
BB	1.79	3.31	4.75	6.13	7.48	8.79	10.09	11.36	12.62	13.53
B	8.62	12.28	15.11	17.50	19.62	21.53	23.30	24.94	26.49	27.67

Source: Fitch

The table above shows Fitch's CDO Default Matrix, displaying cumulative default rates for various rating categories over a one- to 10-year period. With these default rates being applied to a 10-year CDO transaction, the underlying assets of which are constituents of GLOBOXX constructed from the current iTrax Europe (series 7) and CDX IG (series 8), the expected rating default rate (RDR) for a 'AAA' rated tranche would equate to 8.4%. The RDR for 'AA', 'A' and 'BBB' would equate to 8.0%, 6.8% and 4.8%, respectively.

Portfolio Properties

Transaction name	iTraxx Europe & CDX NA IG
Long notional amount of collateral	250,000,000.00
Initial portfolio WAR	A-/BBB+
WA rating factor	3.0
Initial portfolio max life:(years)	10.00
Portfolio correlation level	0.11

Source: Fitch

Rating Default Rate for GLOBOXX Portfolio (March 2007)

Rating	Rating Default Rate (%)
AAA	8.40
AA	8.00
A	6.80
BBB	4.80
BB	4.00
B	3.60

Source: Fitch

The table above shows that a 'AAA' rated CDO on a GLOBOXX portfolio with a 10-year tenor would be able to withstand more than 150x the historical one-year default rate and 2.8x the historical 10-year default rate observed for such portfolio quality. Comparing it to the worst historically observed corporate default rates as displayed in the table below, it can be found that even then the CDO is able to withstand 26x the worst one-year default rate for such portfolio quality (0.32%) and more than 2x the worst 10-year default rate (4.1%)[1]. For a 'BBB' rated corporate CDO, the average 10-year default rate could be absorbed 1.6x, and the worst case 10-year default rate could be absorbed just 1.2x, while it defaulted with 1.5x the maximum observed default rate.

[1] Worst case default rates for an 'A-/BBB+' portfolio have been derived by linear interpolation between 'A' and 'BBB'.

Worst Global Corporate Default Rates 1987 – 2006 (%)

Years	1	2	3	4	5	6	7	8	9	10
AAA	–	–	–	–	–	–	–	–	0.50	0.60
AA	–	–	0.10	0.15	0.50	0.55	0.55	0.72	0.85	1.00
A	0.16	0.31	0.60	1.14	1.20	1.30	1.50	1.60	1.65	1.70
BBB	0.48	2.80	3.73	4.00	4.75	4.80	5.20	5.80	6.00	6.50
BB	3.30	8.75	11.20	14.27	17.15	18.15	18.85	21.82	25.56	30.00
B	11.23	20.25	26.30	30.63	37.21	39.30	40.14	45.02	49.00	51.00

Source: Fitch

CPDO Robustness

By way of comparison, an investor may want to look at the worst case spread development a CPDO may be able to withstand. Fitch focuses on worst case spread widening rather than defaults, as MtM losses arising from systemic spread widening are a more material risk for this structure, and could lead to a failure to repay principal in full at maturity or, worst case, could lead to a cash out event. Therefore, the agency has calculated the worst historically observed absolute and relative spread widening for a GLOBOXX-like portfolio. The proxy used for GLOBOXX is the same one used for the spread calibration (see previous section).

Maximum Observed Historical Spread Widening

Period (days)	Max absolute spread widening (bp)	When	Correspondin g relative widening (%)	Max relative spread widening (%)	When	Corresponding absolute increase (bp)
30	46.3	August to September 1	48	276	April to May 97	14
90	63.5	August to November 1	69	277	October 97 to January 98	21
180	85.8	April 2 to October 2	71	326	October 97 to April 98	24

Source: Fitch

Fitch has tested the impact of these worst historically observed spread widenings on the performance of a CPDO with the parameters as described above. The agency applied multiples of the historically observed spread widening and calculated the NAV assuming one default occurring over the respective period. As a result, the agency found that the standard CPDO structure would be able to withstand the maximum observed spread widening over a 180-day period, starting at the beginning of the transaction, with a 63% loss of its asset value, but would already default if the experienced stress were 1.5x the worst historically observed level, and would even lose all its money with a 0% recovery rate if the spread widening were twice the historically observed worst case.

Adding more defaults - not an unrealistic assumption in such a spread widening scenario - would logically lead to even worse results for the CPDO and will not be discussed further. Doing the same analysis based on the worst relative spread widening, results in the same cash-out pattern, although with slightly different NAV losses.

180-Day Spread Widening and CPDO Performance

Stress multiple (x)	Period (days)	Spread widening	NAV loss with one default (%)	Cash-out with 10% threshold
1	180	85.8	62	No
1.5	180	129	92	Yes
2	180	172	100	Yes

Source: Fitch

The comparison with a corporate CDO that also fails the “1.5x worst case stress” at ‘BBB’ but withstands a “2x worst case stress” at the ‘AAA’ level can give an indication of what level of robustness an investor might want to expect for a given rating when investing into a CPDO.

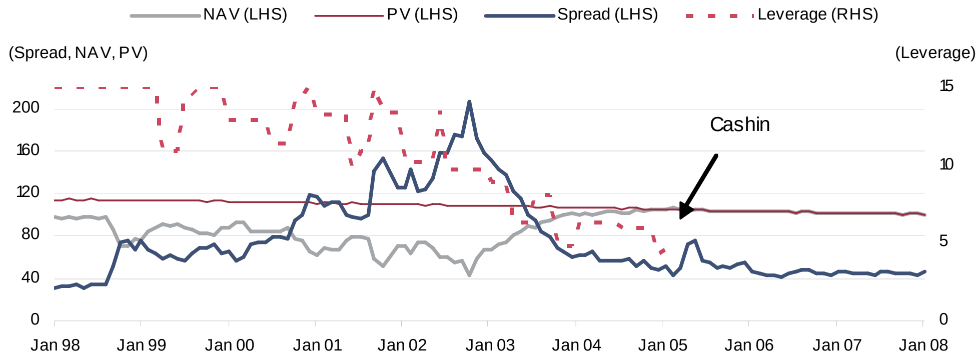
Historical Back-testing

To get a sense for how a CPDO would have performed had it been launched in January 1998, Fitch also conducted back-testing under varying assumptions. January 1998 marked a time where the observed spread environment at just below 30bp was comparable to the first quarter of 2007.

The agency looked at a CPDO referencing a portfolio of ‘A-/BBB+’ average quality and an equal geographical distribution between Europe and North America. The spread on the liability coupon was assumed to be 150bp, the maximum leverage 15x, the bid/offer spread 1% and the spread path was derived from the above described Merrill Lynch corporate index. The assumed number of defaults was three, and the agency tested the performance of the CPDO with an assumed RDB of 7% (Chart 9) and 3% (Chart 10), respectively.

As can be seen from Chart 9, the transaction with 7% RDB assumption would have survived the empirical spread development and would have cashed-in in January 2005, producing an attractive return for investors.

Chart 9: Backtesting with Coupon of 150bps and RDB of 7%



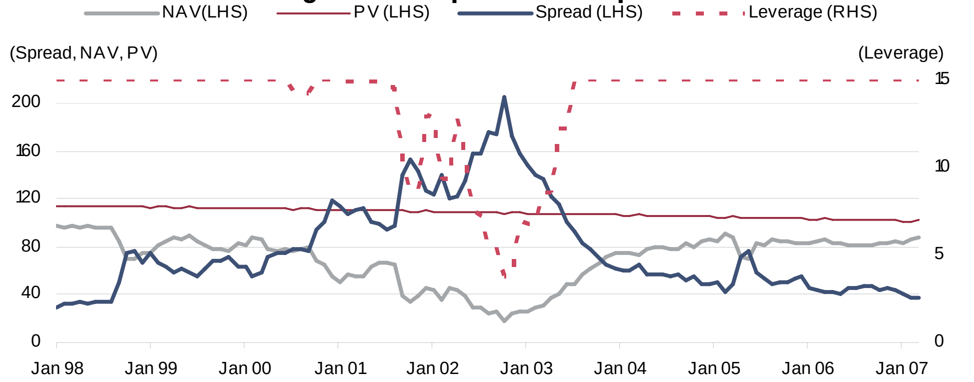
Source: Fitch

However, the transaction with only 3% assumed RDB (Chart 10) would still be short of 15% NAV to the payable principal with less then one year to go, and the non-default of this investment is highly dependent on a favourable spread movement over its remaining tenor.

The development of the NAV over time also reflects a significant reduction in the transactions’ value at some points in time, with the NAV dropping to 43.6% in October 2002 in the deal with a 7% RDB assumption, and even as low as 18.0% in October 2002 for the test with the lower 3% RDB assumption.

Investors may want to form their own view on what stress level the markets saw. However, Fitch is of the opinion that the past 10 years by no means marked a high investment grade stress in the range of ‘AAA’ or ‘AA’.

Chart 10: Backtesting with Coupon of 150bps and RDB of 3%



Source: Fitch

Conclusion

Fitch has analysed the mechanics and risks associated with first generation CPDOs. The agency has developed a robust modelling tool for this purpose but all models are subject to the shortcomings of data used to drive them. It believes these shortcomings are particularly prevalent in data used to model CPDOs. The data in its most accurate, appropriate form only exists for approximately 30 months. Proxy data for spread migration can be constructed from cash indexes, which themselves only contain approximately 10 years of reliable data. Yet the tenor of the typical CPDO is 10 years as well.

Fitch will make appropriate adjustments to CPDO model input parameters to compensate for the lack of confidence that the short, untested performance of these key parameters will persist. The agency will actively monitor the market to observe performance and may revise its assessment in the light of additional data. In addition, it evaluates CPDO proposals on a case-by-case basis and will consider CPDO structures and investment strategies that mitigate their reliance on RDB and bid/offer spread to be a more certain modelling analysis that diminishes the risks described.