Bank Financial Group

Tranched Portfolio Credit Products

A sceptical risk manager's view

Nico Meijer
SVP, Risk Management Strategy
TD Bank Financial Group

PRMIA/Sungard/Fields/Rotman Meeting
February 7, 2005

Introduction

- The risk profile of Tranched Synthetic CDOs is illustrated via two representative transactions, from the point of view of a risk manager exploring the hazards of the Structured Credit Market
- A range of risks are discussed: Model risk; default risk; parameter (credit spread & correlation) risks; liquidity risk; and leverage risk

Typical Product #1. TSAR - single tranche CDO tranche.

- Dealer issues credit-linked note to a client. Notional: CAD 30 mm, maturity - 5 years, coupon L + 200 bps and rating is AAA. The risk profile of this tranche is representative of the instruments a typical Structured Credit book. This note references a large pool of investment grade credits - notional CAD 1 bn: 100 names (CAD 10 mm each) with ratings from BBB to AAA (A on average).

- If losses in this pool exceed 5%, the client will lose part of the principal. Loss is calculated as follows: If 5 credits defaulted with zero recovery, the loss in the pool will be CAD 50 mm; 10 credits - 100 mm; 15 credits - 150 mm, and so forth. The Note specifies that the client is exposed to the losses between 5% and 8% of the reference pool, i.e., after first CAD 50 mm of losses in the pool, investors can lose up to 30 mm (i.e. full principal). In the industry's parlance, 5% is referred to as the 'attachment point' of this tranche and 8% as the 'detachment point.'

- The investor hopes to have no principal losses. Real world default probabilities tell us that a well diversified investment grade pool should not have 5 defaults with zero recovery in 5 years, and is the reason why rating agencies assign a high rating to the tranche - AAA.

- The TSAR is priced using a standard risk-neutral model that tells us that, given underlying credit spreads in the reference pool, default correlations of the assets in the pool and a few other inputs, the fair value coupon for this tranche should be L + 300 bps. This P&L can be realised by selling protection (or buying bonds) to hedge CDO and collecting carry from the long credit assets. The model estimates the coupon as a function of the leverage that is built into the structure - the more assets held as a hedge, the higher the coupon.

- The tranche has a notional of CAD 30 mm but generates model driven credit spread sensitivity equivalent to CAD 90 mm of vanilla bonds of the same maturity. Thus, hedging credit spread of TSAR will require buying CAD 90 mm of bonds (or selling CAD 90 mm of protection). The ratio between the hedge and the tranche provides an estimation of the leverage - 3 in this case – which is typical for TSARs in the market.

Risk Analysis of TSARs

- In theory, the dealer earns 100 bps per year on this trade (300 bps - 200 bps). After discounting the profit equals 4.5 price points of the notional (without discounting it would have been 100 bps * 5 years = 5 points).
- There are several risks in TSARs: credit spread, jump-to-default, liquidity, correlation, and leverage risk being the most important.
- The dealer buys protection via TSARs (short credit position) and, as a hedge, it needs to take a long credit position (sell protection via single name credit default swaps on the underlying or buy bonds). This takes care of credit spread sensitivity on Trade date. However, the TSAR has convexity - as individual and/or overall spreads widen and tighten, credit spread sensitivity changes and the dealer has to rebalance single name hedges. Our benchmark CDO tranche (5 - 8%) is positively convex to portfolio-wide change in spreads. However, it has negative convexity to the change in individual spreads.
- This brings us to the next risk - Jump-to-Default (JTD) that is linked to negative convexity described above. The dealer will lose money on deteriorating individual credits via negative convexity. If the credit actually defaulted, this one-time loss will be referred to as JTD.
- As described before for the benchmark case, the dealer earned 4.5 points selling a single tranche AAA-rated CDO based on given credit spreads in the pool (easy to observe) and historical correlations. Selling single tranche CDO tranche amounts to buying protection from the client at a cost of 200 bps. The profit is based on risk-neutral pricing but may differ from rating agency assessments based on real-world correlations.

Risk Analysis of TSARs

- Let's assume that underlying credit spreads don't move. As witnessed during the last few years, the dealer community continues to sell this product in large size (est. 60BN in 2004 issuance - CreditFlux), and, therefore, cost of this structured protection has declined to 220 bps, and is now widely quoted. The protection which the dealer bought at 200 bps and marked at 300 bps is now worth 220 bps. This will constitute a loss of 80 bps per year until maturity (relative to where it was marked on Trade date).

- As credit spreads are assumed to be unchanged in this example, this cheapening of the AAA-rated structured protection is attributed to a decrease in implied correlations of the AAA tranche, or "base correlation curve steepening". The valuation of the CDO tranches in the model depends on implied correlation, which is really just a proxy for an observable decline in the current yield due to supply/demand and market perception of risk.

- Many dealers moved from historical to market implied correlations during 2004. Most dealers experienced losses - one bulge-bracket dealer is rumoured to have lost up to 200MM USD on the re-mark.

- Negative convexity to individual spreads and JTD are hard to hedge. JTD, convexity, correlation, and credit spread deltas all require dynamic rebalancing of the hedge. Thus, the final profits are uncertain. As correlation changes, credit spread sensitivity of the tranche moves. As credit spreads change, correlation sensitivity moves. Depending on level of credit spreads and number of defaults, correlation sensitivity can change sign. The tranche has several convexities. The interplay of all these factors makes hedging a challenge, and hedges can slip. The risk review above shows that upfront P&L cannot be locked in on Day 1 and that the risks can be hard to hedge.

- Dealers initially buy hedges based on the estimated level of subordination of the tranche, which depends on the attachment points relative to the expected loss of the underlying portfolio. The expected loss is a function of current levels of credit spreads and correlations. If there are defaults in the underlying pool, or as the correlations and spreads change, the leverage can shift dramatically. The dealer then needs to rebalance the portfolio, which consists of a large number of assets. In the scenario when there are many defaults and the expected loss of the portfolio far exceeds the upper attachment point, the leverage goes to zero and all hedges must be liquidated. Single TSARs can generate delta-hedge portfolios of hundreds of millions of dollars of assets, so this may be difficult to unwind in illiquid markets, especially if the de-levering becomes a widespread market trend.

Market Correlations

Example: Jan 18 implied correlations of standard tranches

	Subordination	Correlation
North America (CDX.NA.IG)	0-3%	20
	3-7%	6
	7-10%	18
	10-15%	22
	15-30%	31
Europe (DJ Traxx)	0-3%	20
	3-6%	6
	6-9%	14
	9-12%	20
	12-22%	29
Japan (DJ iTraxx CJ)	0-3%	31
	3-6%	16
	6-9%	27
	9-12%	20
	12-22%	41

Conclusion: Implied correlations depend on supply and demand of the underlying tranches, and do not necessarily reflect the historical correlations of the underlying asset pools

Typical Product #2. CDO of CDOs (CDO-squared)

- The dealer issues a credit-linked note to a client. Notional: CAD 40 mm, maturity - 5 years, coupon L + 250 bps and rating is AAA. This note is referred to as in the industry parlance as a parent CDO tranche and references a pool of 8 TSARs referred to as children CDOs.

- Each child references investment grade credits - notional CAD 1 bn: 100 names (CAD 10 mm each) with ratings from BBB to AAA (A on average). Same name can appear in several children CDOs. Each child has attachment/detachment point of 5%-10% and notional of CAD 50 mm. ((10%-5%)*1bn = 50 mm). Thus, total notional of children CDOs is CAD 400 mm (8 * 50 mm)

- Parent CDO tranche has attachment/detachment points of 10-20%. Therefore, the notional is CAD 40 mm ((20%-10%)*400 mm). Effectively, this structure amount to repackaging of TSARs. Please note that children CDO have not always been sold to external investors, they are often internal deals. The model effectively 'looks through' the two-tiered structure to tell the dealer the hedge ratios in the underlying single names. The investor buys the parent CDO tranche. Why do investors buy this tranche? Rating agency assigns high rating to the tranche based on historical default experience (real world, not risk neutral, model parametrization) so investors would like to have AAA rated asset that pays L + 250 bps.

- On the other hand, the theoretical model tells the dealer that fair value of this tranche is L + 400 bps. As in the case of TSAR, the model-driven, fair value coupon is reflection of the leverage built into the structure. By selling this structure, the business can earn 150 bps per year (400 bps - 250 bps). This P&L can, according to the risk-neutral model, be realised by selling protection (or buying bonds) to hedge CDO of CDOs and collecting carry from the long credit assets.

- This deal has risks similar to the regular TSARs but at a much higher level of complexity both at modelling and model input level. For example, what shall be the appropriate correlation to use in pricing it? Following the move from historical to market-implied correlations, many CDO-squareds lost most of their value. The methodology for deriving CDO^2 correlations from base correlations is not yet fully agreed or standardised in the market, and no 2-way market exists to verify prices objectively.

Typical Product #2. CDO of CDOs (CDO-squared)

- The problem is that fair value of this AAA rated asset may be only L+ 200 bps or L+ 150 bps, i.e., by paying L +250 bps the dealer could potentially lose money on every trade, and this loss may not be realized until market is better developed.

- While common TSARs may have a leverage of around 3 times, on average, CDO of CDOs tranches have much higher leverage typically ranging from 4 to 10 times at inception. The leverage is model-driven and, for CDO^2 deals, is even more sensitive to the correlation and spread assumptions than normal TSARs.

- In order to maximise customer spreads and create optically attractive product, the market has trended toward less transparent and more exotic products. It has been widely reported that one major dealer placed a CDO-cubed with an investor i.e. CDO of CDO of CDOs, that showed large upfront P&L. Competitive pressures appear to be stimulating innovations accompanied by increased exotic risks.

Structured Credit Business: Market Direction

- In 2000-2001 when synthetic CDOs were first introduced, arbitrage opportunities were substantial. Trades had very limited exotic risks as they were CDOs with fully or almost fully sold capital structure. Investors were willing to rely on ratings and did not demand significant premia for structured product, with the result that many dealers were able to source inexpensive portfolio protection for their credit derivative and loan books.

- In the past two years, the market environment has changed significantly. There are a number of dealers that offer similar products, with 4-5 major bulge-bracket dealers dominating the market. TSARs have now become commoditized.

- Profit margins have also tightened drastically. Two years ago a AAA-rated single tranche CDO would have generated 15 points of the notional as upfront P&L. It has since shrunk to 1-3 points of model-based P&L. As margins shrink, the dealers feel pressured to move into more and more leveraged and exotic structures to maintain the revenue stream.

- Previously, all CDO structures were priced to historical correlations. Growing supply of these products have made structured credit products much cheaper than what they used to be. As market has become more transparent, it has become standard practice to mark structured credit products to market-observed implied correlations of the standard CDO tranches.

- The development of the market in standard CDO tranches has also allowed the major dealers to hedge some of their risk by offsetting customised purchased TSAR with short positions in standard tranches. This strategy has allowed them to reduce leverage and correlation risk.

Conclusions

- There is no such thing as 'locked-in' P&L when using assets and single name CDSs to hedge TSARs. Any profits must be realised via dynamic hedging. Inception P&L estimates can be compromised by gapping credit markets (JTD risk), by lack of liquidity, by changing investor appetite as represented by varying implied correlations.

- The market for Structured Credits has created aggregate demand in the capital markets for corporate assets as dealers buy assets to hedge their portfolio trades. This has the potential for exacerbating systemic risk in a widening spread environment if and when dealers have to de-lever their hedge books.

- The demand for Structured Portfolio Credit products is a part of a capital markets-wide search for yield in an environment created by the stimulative global monetary policies of the past 4 years. Current pricing of credit does not seem to compensate for risk by any historical measures.

- Portfolio credit markets will only be sustainable if a real 2-way market develops to mitigate the model dependency and risks from dynamic leverage.