

Correlation Trading: Facts and Challenges



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1. Liquid Correlation Products

- Nth-to-Default Baskets, Index Tranches, Bespoke Tranches

2. Next Generation of Exotic Credit Derivatives

- Exchange-Traded Credit Futures, Fixings of credit derivatives

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- **The world of structured credit is evolving at a breakneck pace: instruments that were considered exotic a few years ago are now regarded as plain vanilla products.**
- **In 2002 it was tradable synthetic indices (iBoxx Diversified index in Europe and Dow Jones CDX index in North America), a product that brought high volume, low-margin trading to credit for the first time and provided a new way to take or hedge exposure to the broad credit market.**
- **A year or so later, tranches of the credit indices revolutionised the structured credit derivatives business, transforming correlation from an exotic product to a flow business and turbo-charging the bespoke synthetic CDO market.**



- **The most traded correlation related products in 2005 are:**
 - ✓ **Nth-to-default basket: Standard, Tailor-made**
 - ✓ **Single-tranche synthetic CDOs**
 - ✓ **CDO-squared**
 - ✓ **Index tranches**
 - ✓ **Leveraged super-senior swaps**
 - ✓ **Constant principal protection insurance**
- **The highlight of 2005 will remain the crisis of correlation in May**



Liquid Correlation Products: FTD

- **The most basic of the correlation-based products are those related to baskets of credits, with the first-to-default (FTD) basket the most familiar of these.**
- **Investors in FTD structures sell protection on a reference portfolio of names and assume exposure to the first default to take place within the pre-defined basket of credits.**
- **On occurrence of a default, the FTD swap functions like an ordinary CDS.**
- **First-to-default baskets typically offer credit exposure to between three and 10 companies.**
- **From the perspective of investors, the principal attraction of an FTD structure is that it offers a higher yield than any of the individual credits within the basket and limits downside risk in the event of default.**
- **An additional attraction for investors is the transparency of FTD swaps, because the credits included within the basket are generally the choice of the investor.**





Liquid Correlation Products: FTD

- **The merger of the two tradable indices iBoxx and Trac-x to create iTraxx in Europe has allowed a range of new standard first-to-default baskets to be traded.**
- **The baskets are built around 11 of iTraxx's sub-indices including sector baskets, and baskets representing high volatility, crossover or diversified high-grade credits.**
- **CLN on FTD: we have traded many CLN on FTD this year. Underlyings were: European names and sovereign.**
- **Synthetic bonds structured as CLN on FTDs can be traded by retail clients. LBBW is one of the German players in this field.**



Liquid Correlation Products: Index Tranches

- **Credit index tranches are undoubtedly the most successful new-generation credit derivative in terms of volumes. They were the first successful spin-off product following the emergence of credit derivative indices in 2003.**
- **According to data compiled by Creditflux, the volume of index tranches grew from \$12.6 billion in the first quarter of 2004 to \$40.6 billion in the last three months of the year. The total volume of trades during the year is put at \$89.1 billion, although this is almost certainly an underestimate since some dealers decline to disclose their trading volumes.**
- **In the inter dealer market, we have seen a dramatic increase in index tranche Volumes.**
- **The volume today is many times what it was last year and we are seeing a term structure developing with the growth of 3, 5, 7, and 10-year tranches.**





Liquid Correlation Products: Index Tranches

- **The most liquid single-tranches are the “standard tranches” or those tranches carved out of**
 - ❖ **the DJ CDX.NA.IG index in North America and**
 - ❖ **the DJ iTraxx Europe index in Europe.**
- **Each of these indices has five liquid tranches.**
- **Each tranche is defined by its**
 - ❖ **attachment point which defines the level of subordination of a tranche, and**
 - ❖ **detachment (or exhaustion) point which defines the maximum loss of the underlying portfolio that would result in a full loss of tranche notional.**



Liquid Correlation Products: Index Tranches

DJ iTraxx Series 3	3Y: Ref 20		5Y: Ref 34		7Y: Ref 44		10Y: Ref 54	
	Bid	Offer	Bid	Offer	Bid	Offer	Bid	Offer
0-3% (+500 bp)	4%	5%	23,20%	24,20%	41%	42%	53,60%	54,60%
3-6% (bp)	9	19	67	72	157	165	420	450
6-9% (bp)	3	9	21	25	42	47	80	88
9-12% (bp)	2	6	9	13	23	27	42	49
12-22% (bp)	1	2,5	5,5	7,5	10	12	17	20

CDX NA IG Series 4	3Y: Ref 30		5Y: Ref 50		7Y: Ref 59		10Y: Ref 72	
	Bid	Offer	Bid	Offer	Bid	Offer	Bid	Offer
0-3% (+500 bp)	12,75%	13,75%	40,50%	41,00%	56,38%	57,13%	63,75%	64,75%
3-7% (bp)	15	21	112,9	117,9	287,9	295,9	637,6	655,6
7-10% (bp)	6	11	26	29	46,5	50,5	121,3	127,3
10-15% (bp)			12,5	14,5	23,5	28,5	60	63
15-30% (bp)			6,1	8,1	11,3	13,3	20,3	23,3

- **Tranche width is the difference between the detachment and attachment points.**
- **The notional amount of the underlying portfolio can be determined by dividing the tranche notional by the tranche width**
- **For example, a €30mn notional of the iTraxx 3-6% tranche implies an underlying DJ iTraxx notional size of €1bn (€30mn/3%).**



Liquid Correlation Products: Index Tranches

- Since the DJ CDX.NA.IG and DJ iTraxx Europe are equally-weighted indices of 125 different credits, the reference weight of each credit is 0.8% (1/125) of the notional of the index portfolio.
- For example, exposure to 30mn notional of the equity (0-3%) tranche implies an exposure to €1bn notional of the underlying index and a €8mn exposure to each of the individual index credits.
- The protection buyer of a tranche makes quarterly payments to the protection seller in return for credit protection on losses in the underlying portfolio.
- Premium payments are made until maturity or until the notional amount of the tranche gets fully written down following credit events.
- The protection seller makes payments to the protection buyer as long as credit losses are more than the attachment point of the tranche and less than the detachment point.
- The 2003 ISDA Credit Derivatives Definitions govern all tranche contracts. The market is also moving towards using standard confirmations to trade tranches. This should lower basis risk as an investor with a tranche exposure to one dealer can offset it via a trade with another dealer.



Liquid Correlation Products: Index Tranches

- One of the key factors that affect the tranche premium is obviously the spreads of the credits in the underlying portfolio.
- We measure the spread sensitivity of each tranche relative to each credit via a measure called 'delta'.
- The spread delta of a credit (for a particular tranche) is defined as the ratio of the tranche MTM to the credit MTM for a 1bp change in the credit spread.
- The riskier a tranche, the greater the sensitivity to individual spread movements, i.e. the equity tranche delta for each credit is greater than the senior tranche for the same credit.
- The underlying portfolio typically has over 100 credits which makes this sort of individual credit delta-hedging extremely cumbersome. A more practical (though less accurate) hedge is to use the underlying index itself to hedge a tranche position.
- For example a long position in the 0-3% DJ CDX tranche can be hedged via a short position in the DJ CDX index based on the tranche leverage.
- The tranche leverage is the relative notional amount of the index required to hedge the MTM in the tranche for a 1bps move in the underlying index



Liquid Correlation Products: Index Tranches

- The advantage of this hedging method is that the standard indices are extremely liquid. An index hedge, however, is an average delta hedge.
- Index tranche trades are usually delta-hedged using the underlying index. The initial delta is conventionally traded at the same time as the index tranche.
- Index tranche can also be traded without delta exchange, but then the price conditions will be bad.

DJ iTraxx Series 3	5Y: Ref 34		Delta	10Y: Ref 54		Delta
	Bid	Offer		Bid	Offer	
0-3% (+500 bp)	23,20%	24,20%	21*	53,60%	54,60%	8*
3-6% (bp)	67	72	5*	420	450	9,5*
6-9% (bp)	21	25	1,75*	80	88	3,75*
9-12% (bp)	9	13	1*	42	49	2,2*
12-22% (bp)	5,5	7,5	0,6*	17	20	1,1*



Liquid Correlation Products: Index Tranches

- **On the-run tranches are the tranches derived from the on-the-run indices.**
- **One of the features of the CDS indices (both DJ CDX and DJ iTraxx) is the concept of an index “roll”. Every six months (20 March and 20 September), credits that have deteriorated in quality are replaced by a new set of credits.**
- **For example, in the next roll on 20 September, four names of the DJ iTraxx will be replaced because they were downgraded to sub-investment grade or not anymore liquid.**
- **Following an index roll, the on-the-run tranches are typically more liquid than the off-the-run tranches and investors may choose to roll into the new tranches.**
- **However, such a tranche roll could be quite expensive. Investors could, on the other hand, ignore the roll and continue to hold the off-the-run tranche.**
- **This investment, however, could be less liquid than on-the-run alternative.**
- **In our experience the off-the-run tranches remain liquid the first months after a new roll.**



Liquid Correlation Products: Bespoke Market

- **The single-tranche synthetic CDO market is divided primarily into the (a) bespokes market and (b) the standard index tranche market.**
- **The standard tranche market initially grew out of dealers' need to hedge out exposure to bespoke single tranche synthetic CDOs which provided investors who sold these tranches with enhanced yield.**
- **The development of the standard tranche market also led to correlation price discovery and an observable market view of correlation for a particular portfolio.**
- **The bespoke market remains the big driver of the index tranches.**
- **The innovations of the last years were the CDO squared and leveraged super-senior trades.**
- **LBBW is also present in this field and has issued 2 CDO structures Schwarzwald1 and 2 (next Schwarzwald 3).**



Liquid Correlation Products: Bespoke Market

- Like conventional synthetic CDOs, CDOs-squared are credit derivatives referenced to a tranche of a portfolio of reference names. However, unlike a straight CDO, a CDO squared has two layers.
- The investor buys a tranche referenced to a portfolio that itself consists of CDOs that in turn reference the ultimate portfolio of credits.
- Typically, synthetic CDOs-squared use mostly high-grade reference assets and are rated at least single A.
- Appetite for features such as CDOs-squared, and complex structures has grown as spreads on investment-grade corporate credit have tightened.
- Several recent trends suggest that investors are becoming nervous about the leverage built into synthetic CDOs-squared.
- One reason a CDO squared can be more risky than it appears is because many reference names appear repeatedly in the different inner CDOs. Investors have become more aware of this overlap risk lately and a number of deals have been marketed as low-overlap – or even no overlap– transactions.
- After May (Correlation Re-pricing) the deals in CDOs-squared have dried up



Liquid Correlation Products: Bespoke Market

- One of the latest innovations in the synthetic CDO market in 2005 has been the emergence of leveraged super-senior (“LSS”) trades, which provide investors with a leveraged exposure to the super senior portion of a CDO capital structure.
- Super-senior tranches are often characterised by attachment points (AP) that significantly exceed a level of losses consistent with an ‘AAA’ rating.
- Owing to their low risk, super-senior CDO tranches offer potential protection sellers a low risk premium when considered on an unleveraged basis.
- The low absolute return of super-senior tranches prevents some protection sellers from participating in the super-senior market.
- Adding leverage to the product makes it possible to achieve a higher coupon on the cash invested, which could encourage a broader participation in the super-senior market by traditional senior and mezzanine investors.



Liquid Correlation Products: Bespoke Market

- The “leverage” in an LSS transaction reflects the fact that the investors’ cash participation (the note par amount) is less than the notional value of the super-senior tranche.
- For example, a EUR10 million investment may be leveraged 10 times into a super senior tranche with a notional of EUR100m.
- In the case of an LSS product, the increase in the value of the purchased protection is capped at the investors’ participation amount.
- If losses on the underlying reference portfolio were subsequently to increase significantly, this could expose the arranger to a situation where losses exceeded the protection provided by the investors participation.
- In a LSS transaction with 10 times leverage, a 5% change in the value of the underlying super senior tranche is equivalent to a 50% change in the market value of the funded investment.



Liquid Correlation Products: Bespoke Market

- **To protect themselves from huge losses the arrangers of LSS have introduced unwind triggers**
- **The presence of unwind triggers enables the arranger to unwind both sides of the trade before the value of the protection bought is exhausted.**
- **If the transaction is unwound, the loss to the investor will be a function of the mark-to-market (“MTM”) position of the tranche and the leverage in the structure. In some circumstances, the loss may be significant.**
- **There are three major types of unwind triggers in LSS products market:**
 - **realised loss thresholds: The trigger type is based on losses in the portfolio**
 - **portfolio weighted average spread (“WAS”) thresholds: It incorporates a set of barrier options that causes the transaction to unwind if an unwind trigger is hit at any point in time.**
 - **threshold market value changes in the super-senior tranche itself.**



Liquid Correlation Products: Bespoke Market

- **Implications of the frenzy in LSS activity in this summer:**
 - **Super-senior tranches have tightened significantly, especially 7- and 10-year Maturities**
 - **Mezzanine and equity tranches have widened.**
 - **The cause of this activity has been the tight levels of mezzanine tranches, particularly those maturing in five years.**
 - **With mezzanine tranches tight, investors had two options: reach for longer maturities or leverage more senior tranches.**
 - **We have seen both 7- and 10-year mezzanine transactions and leveraged super-senior transactions.**
 - **To date, the size and embedded leverage of the super-senior transactions have dominated, the result being tighter senior spreads and wider junior spreads.**

- One of the most frequently discussed ideas in the credit derivatives market is the creation of an exchange-traded credit futures contract.
- Some traders at investment banks are enthusiastic about the idea, believing it would attract vast new trading volumes that would more than make up for the reduction in margins that such a commoditised approach to credit would likely bring.
- Eurex has announced the launch of such futures for the end of 2005. Therefore exchange-traded credit futures are not anymore a distant prospect.
- So far, a futures contract would seem to have little to offer from an end-user perspective, but the idea of managing a single set of collateral and margining requirements is operationally attractive, as would be the minimal trade documentation and rapid confirmation process.
- Whilst the OTC market seems to offer sufficient liquidity, it currently suffers from a frustrating documentation backlog.



Next Generation of Exotic Credit Derivatives

- **One of the biggest transformation in the credit derivatives market is the credit fixings process established by European dealers in March 2005 (New York and Asia are still watching the process from a wary distance)**
- **A dealer's poll establishes the market price for a handful of credit derivative instruments once a week (Fixing). The process is overseen by data specialist Markit and takes place on Creditex's trading platform.**
- **The fixings are done in a reliable and transparent way that does not depend on dealers making up some kind of estimate for the market price.**
- **What makes credit fixings so exciting is that it makes it possible to create a new generation of products with payoffs linked to prices in the flow credit derivatives market.**
- **These derivatives of credit derivatives might include cash-settled options, futures contracts, constant maturity CDS, range accruals and a plethora of other new concepts.**



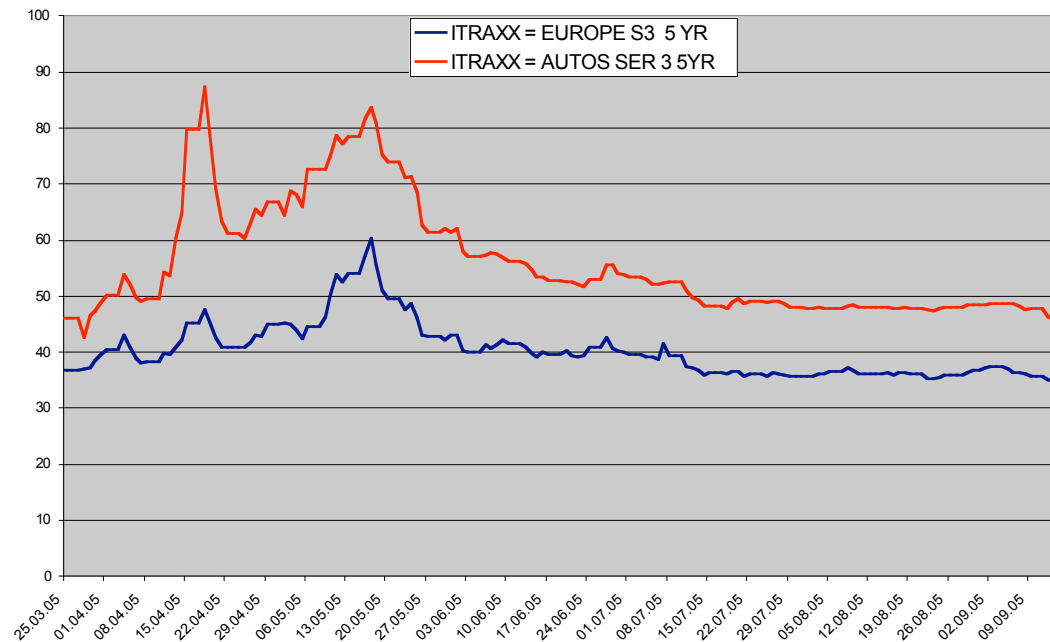
- **For the pricing of a structured product involving several credits, such as a tranche of a synthetic CDO or CDO-squared, or an n-th to default basket, it is not sufficient to have only the spread curves for the individual obligors.**
- **In addition, one has to account for the fact that the patterns of defaults and spread movements of the individual credits are not independent.**
- **Before the advent of standard tranches, dealers looked to historical measures of default correlation. One widespread approach was to proxy the asset return correlation of latent variable models with the correlation of historical equity market returns.**
- **What has changed recently is that by observing the market prices of synthetic CDO tranches, we can begin to extract information about market-implied rather than historical default correlation.**
- **Initially, the market focused on compound correlation as the standard convention. More recently, dealers have begun to use base correlation instead.**



- During April and May, equity index in North America and Europa cheapened considerably, whereas mezzanine tranches tightened.
- Equity tranches have been perceived to be relatively riskier than previously thought.
- Alternatively, the market paid a higher risk premium to bear the risk associated with holding equity, at the expense of the other parts of the capital structure.
- Another way of saying this is that implied correlation dropped and the correlation skew steepened. The implied correlation of the equity tranche of the CDX.4 index dropped from about 20% to as low as 10%. The implied correlation of the iTraxx equity fell from about 21% to as low as 14%.
- In Upfront terms the equity iTraxx 5y reached a high of almost 50%. In contrast the junior mezzanine has richened.
- The moves in the credit market have been dramatic. For example, in the period between April 29 and May 11, the itraxx main index blew out from 29 bp to 53 bp.



- Before analysing the recent correlation re-pricing, we first discuss the positions held by the different players in the CDO market.
- An understanding of these basic positions is key to understanding how technicals can impact the market.





■ Long mezzanine investors:

- Insurance companies, pension funds and commercial banks use CDOs as a yield enhancement strategy (ie, they earn more spread than on a portfolio with a similar rating).
- These trades have been popular over the last few years as the search for yield accelerated in a low interest rates/benign credit environment.
- Mezzanine CDO tranches tend to have a rating in the triple-A to single-A range.
- In exchange for higher yields, these tranches have more mark-to-market volatility (or “leverage”). The volatility relative to the underlying index is measured by delta.
- For example, the 3-6% tranche of the iTraxx pays a spread 2.5x wider than that of the index. However, its delta is 5.8x. CDO tranches also have a higher “idiosyncratic risk exposure” than CDS investments, by which we mean that the impact of uncorrelated credit risk (eg, one name defaulting) has a higher impact in a tranche than in the underlying portfolio.



■ Dealers

- According to different sources, in the past six years, dealers sold approximately \$132bn of rated bespoke mezzanine CDOs to buy-and-hold investors.
- Dealers typically delta-hedge these positions by selling protection in the single-name CDS market by an amount equal to the “delta” of the tranche with respect to that name. In this way, they are protected against (non-idiosyncratic) small changes in spreads.
- This long single-name CDS/short mezzanine portfolio has positive carry and is long “implied” correlation;
- in other words, when market correlation goes up, the position increases in value. If spreads in the underlying portfolio move in a correlated fashion, the position makes money as well.
- The position is long “realised” spread correlation. However, the position loses money if spreads move in an uncorrelated fashion, if a name defaults (which is really the extreme of idiosyncratic volatility), or if implied correlation decreases.



■ Hedge Funds

- **The short mezzanine risk position of CDO dealers is equivalent to a long investment grade equity position of between \$25bn and \$30bn. It is estimated that between one fourth and one-third of these long correlation positions were transferred from dealers to hedge funds. Hedge funds typically sell protection on the equity tranche and either buy protection on the underlying index or on the junior mezzanine tranche as a delta hedge.**
- **The risk profile of these positions is similar to those of dealers: it makes money if spreads move together or if implied correlation increases, and loses money if there is idiosyncratic volatility or implied correlation decreases. In other words, these positions have a relatively larger exposure to idiosyncratic risk than to spread risk.**
- **On a buy-and-hold basis, the performance of these trades depend on the credit and default cycles.**



■ Why did correlation re-price?

- A combination of fundamentals and technicals are responsible for the re-pricing.
- The catalyst was a shift in fundamentals: the spread blow-up in the US auto sector after the downgrade of GM and Ford to junk status by S&P and higher levels of event risk (eg, LBO risk) in the CDX market.
- These events increased credit dispersion, or the tendency of credit to move in an uncorrelated fashion.
- As an increase in dispersion effectively shifts risk away from mezzanine (long correlation) to equity (long correlation) tranches, this caused losses in the long correlation portfolios of dealers and hedge funds.
- These losses prompted dealers to try (for the first time since CDO tranches began trading) to reduce their correlation positions significantly, which they found difficult as few market participants were willing to take the other side of the trade.
- This accelerated the re-pricing of equity and mezzanine risk, as correlation changed as a market clearing mechanism to deal with this imbalance. This portion of the change was technicals.





■ What lessons have been learnt?

- **More of a reminder than a lesson – liquidity is key!**
- **Risk management of correlation positions is a must: The disruption certainly proved that, however good models are, one also needs to take into account several other factors when running correlation trading books. This does not mean that the models were wrong. This means that the full picture has to be looked at: flows, investor base preferences and positions, attitudes to risk and leverage.**
- **Furthermore, the wider credit markets were impacted via the delta-hedging activity of those with correlation exposures, with spreads moving violently wider before rapidly recovering.**
- **Participants in the vanilla credit markets must be more aware in future of developments in the correlation market, and how these may represent a risk to their market positions.**



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