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Correlation Trading Strategies

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Outline

Structured Credit Markets

Investors: Hedge Funds versus Real Money

Correlation Trading

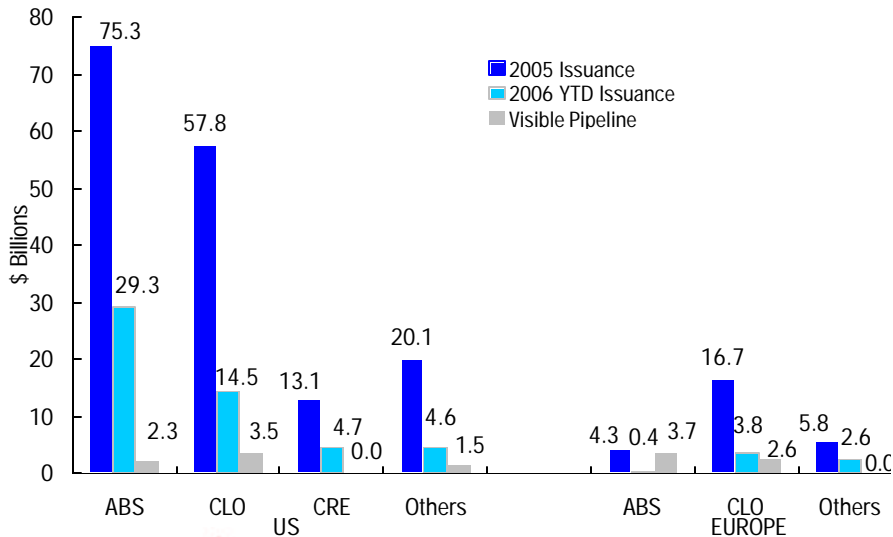
Outlook for Structured Credit Products

Structured Credit Markets are Evolving

Cash markets

- ◆ 2005 global cash CDO issuance was \$202 billion.
- ◆ Cash CDO market has grown by 84% from 2004 to 2005.
- ◆ Strong issuance in 2005 and robust pipeline.

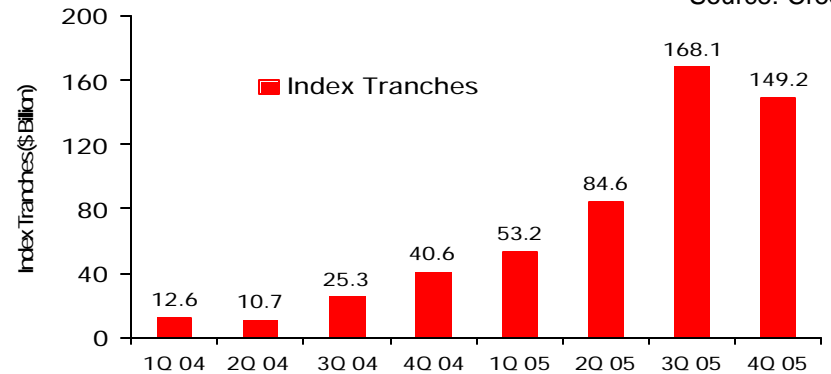
Source: Citigroup Data as of Mar 2006



Synthetic markets

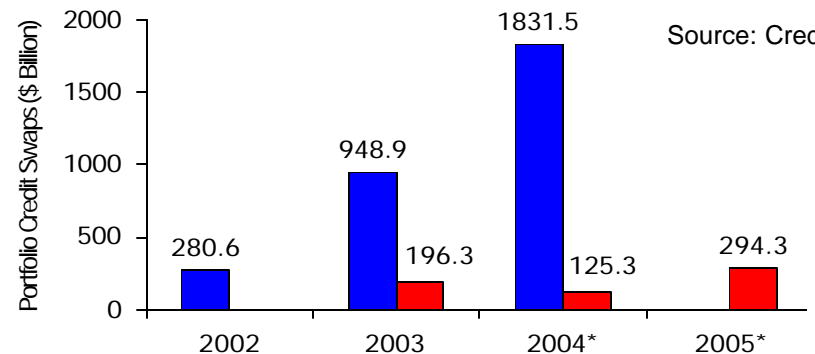
- ◆ Index-linked tranche market is expanding.

Source: CreditFlux



- ◆ Bespoke tranche market is holding steady.

Source: CreditFlux



* doesn't include index tranches

■ Notional ■ Risk distributed

Investors: Hedge Funds versus Real Money

Hedge Funds

Real Money

Hedge Funds

Credit hedge funds are driving the development and growth

- ◆ Credit derivatives products have been primarily in the domain of hedge funds and proprietary desks.
- ◆ Credit hedge funds have been expanding, searching for new relative value opportunities and opportunistic trades.
- ◆ Volatility increase in credit markets is opening the door for new strategies, although credit hedge funds are exposed to margin calls.
- ◆ Standardization and acceptance of credit portfolio models has been one of the main drivers of market growth, although current portfolio models have certain shortfalls.
- ◆ Correlation players are looking for opportunities in cash CDOs and other asset classes.
- ◆ Fundamental credit analysis is becoming important for hedge funds.

Real Money

Real-money investors are entering the credit derivatives markets

- ◆ Real-money investors have started to focus on synthetic structured credit portfolio products.
- ◆ Narrow spreads and low volatility pushed investors to seek alternatives to traditional credit investments and to start focusing on single-tranches, CDO-squareds, and leveraged super-senior structures.
- ◆ Traditional investors started to use tranches to customize their directional views.
- ◆ Real-money accounts have been setting up internal “long/short” funds to explore “hedge fund – like” strategies with credit derivatives.
- ◆ Money managers have started to invest and to manage synthetic transactions.
- ◆ Mark-to-market accounting rules and regulations are one of the main roadblocks for real money investors, although FAS 155 should bring changes.

Correlation Trading

Investment Strategies

The “Famous” Long/Short Tranche Trade

Directional and Relative Value Trades

Investment Strategies

Credit derivatives markets provide variety of investment opportunities

- ◆ Taking long/short market positions:
 - Liquid tools to quickly express long or short macro views in credit markets.
- ◆ Leverage strategies:
 - Enhancing yield through the leverage provided by synthetic tranche products and cash CDOs.
- ◆ **Directional strategies:**
 - **Taking views on different types of risk (defaults, spreads changes, correlation...)**
- ◆ **Relative value strategies:**
 - **Searching for value between different tranches, credit curves, correlation and volatilities.**
- ◆ Hedging strategies:
 - Hedging individual default risk and/or market spread risk, minimize mark-to-market volatility.

The “Famous” Tranche Trade

Long equity tranche, short mezzanine tranche

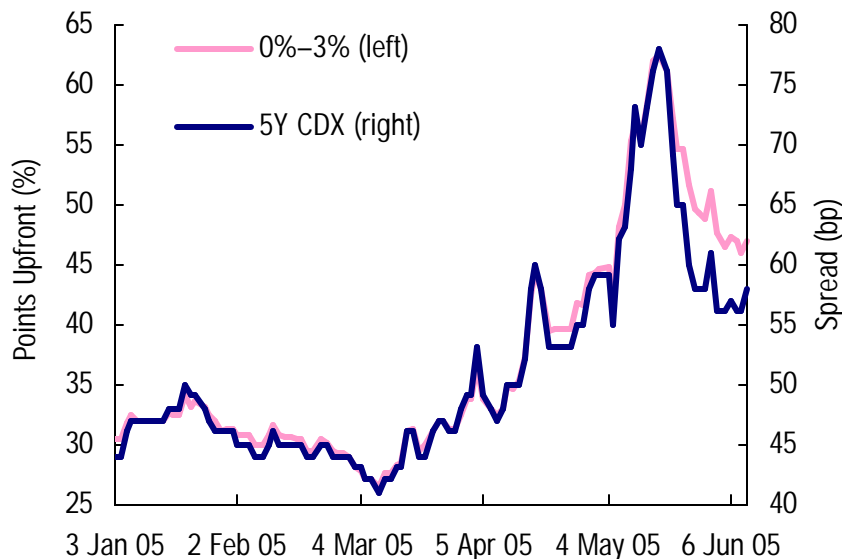
- ◆ With the growth of synthetic tranche markets, hedge funds took large portion of the first-loss tranche risk from dealers.
- ◆ In 2004, many investors were comfortable holding default risk, but nervous about spread sell-off.
- ◆ Common strategy to hedge against the spread risk was to buy the protection on mezzanine/senior tranches (which carry proportionally more spread risk than default risk versus the equity tranches).
- ◆ May 2005 turmoil in the tranche markets sparked by the GM/Ford downgrade was a painful lesson for number of market players that implemented this strategy.

What Went Wrong?

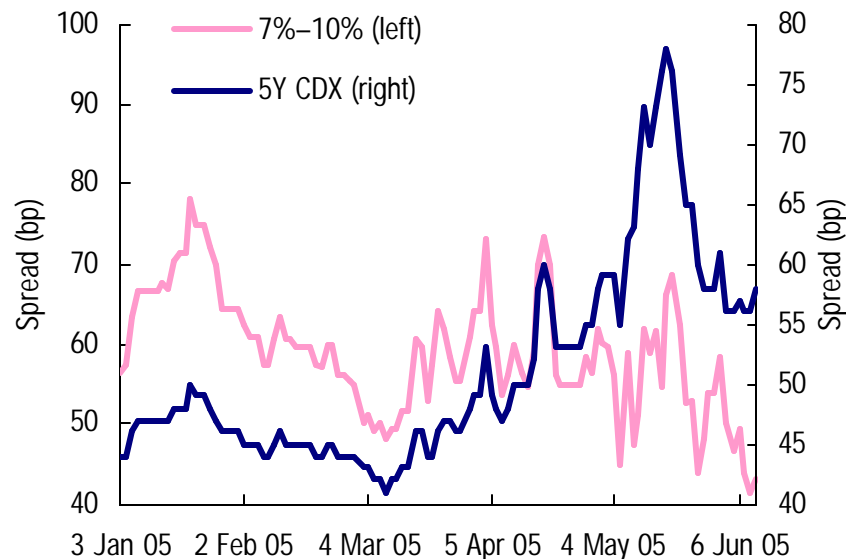
Equity and senior tranches reacted differently to single-name shocks

- ◆ Single-name shocks and the sell-off in the equity part hurt mark-to-market investors.
- ◆ Mezzanine/senior tranche didn't widen as buy-and-hold investors held their positions.

0%-3% Tranche vs. Index



7%-10% Tranche vs. Index



Tranche Strategies

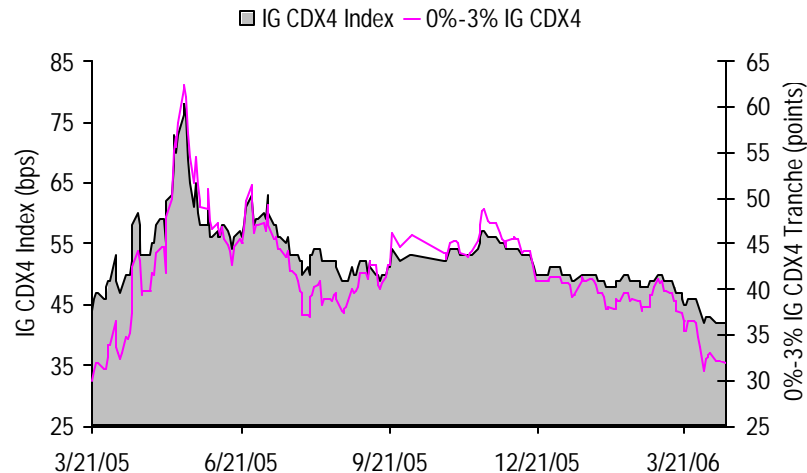
Directional and relative value trades

- ◆ Long the equity risk
- ◆ Dispersion tranche trades
- ◆ Tranche flatteners
- ◆ Tranche steepeners
- ◆ “January effect” trade
- ◆ Directional view on a sector
- ◆ Cost-efficient shorts
- ◆ Relative value between indexes
- ◆ Default-straddle tranche trades
- ◆ Tranches versus swaptions

Aftermath of May 2005

Bottom fishing in trade markets – long equity

- ◆ Effect of GM/Ford downgrade and the turmoil in tranche markets led to new investment opportunities.
- ◆ At the peak, five-year IG CDX equity tranche was cheap on a fundamental basis (trading above 60 points upfront).
- ◆ Bullish investors, who were able to move in quickly, were able to make a significant profit on the back of price adjustment.



Source: Citigroup

Trade recommendation: “*Bottom Fishing in Tranche Markets*,” Arvind Rajan, Jure Skarabot Ji Hoon Ryu, *Leverage*, Citigroup, May 11, 2005.

Trade unwind recommendation: “*Unwind the Long Position in 0%-3% IG CDX Five-Year Tranche*,” Arvind Rajan, Jure Skarabot Ji Hoon Ryu, Citigroup, Jun 22, 2005.

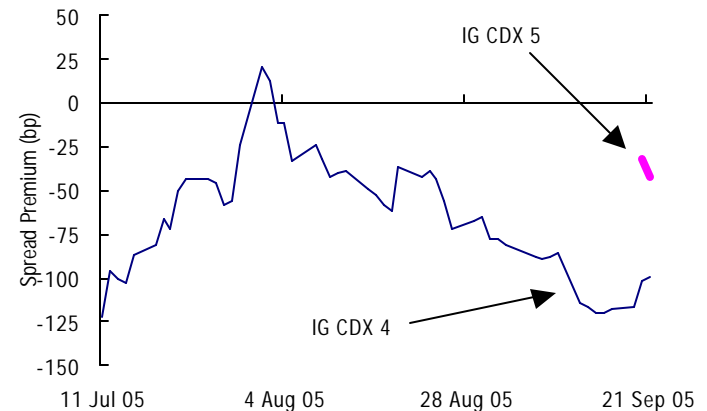
Dispersion Tranche Trades

Directional trade after the index roll

- ◆ At the last index roll we recommended buying protection on the 3%-7% seven-year IG CDX 5 tranche and selling protection on the 10%-15% seven-year IG CDX 5 tranche (delta-neutral position) in addition to neutralizing the spread exposure to two widest credits in IG CDX 5.
- ◆ The Sep 2005 roll improved overall IG CDX credit quality, but blow-up risk has remained as some of the new names in the index appear to have considerable LBO risk.
- ◆ Dispersion trade position with seven-year IG CDX 5 tranches generated substantially smaller cost than the same trade with IG CDX 4 tranches.

Dispersion Trade, Seven-Year IG CDX Series 5

	Notional (\$ Million)	Spread (bp)	Delta/ Hedge Ratio	Carry (\$000)
Buy protection on 3%-7%	10	252	9	(252)
Sell protection on 10%-15%	75	28	1.2	210
Net (tranches)				(42)
Sell protection on American Axle	0.35	365	0.035	12.6
Sell protection on Albertsons	0.28	320	0.028	9.0
Net (tranches and single-name)				(20.4)



Source: Citigroup

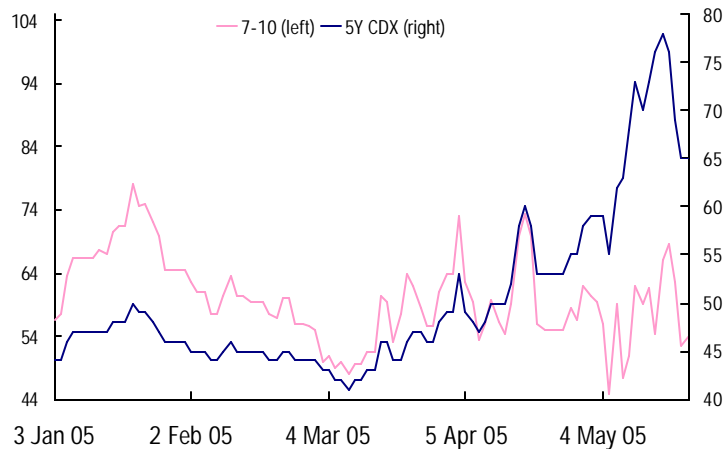


Trade recommendation: 'Dispersion Trades After the Index Roll,' Jure Skarabot Gaurav Bansal, *Leverage*, Citigroup, Sep. 21, 2005.
Trade unwind recommendation: 'Unwind Tranche Dispersion Trade,' Jure Skarabot Gaurav Bansal, Citigroup, Oct 7, 2005.

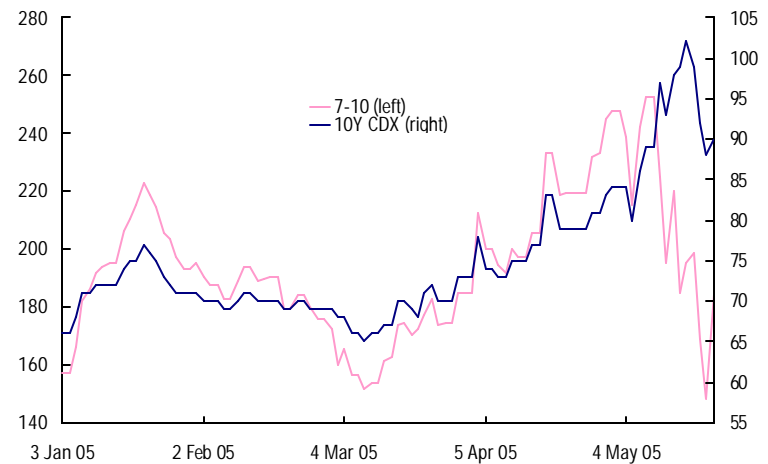
Tranche Flatteners

Go long ten-year mezz, hedge with the five-year

- ◆ Tranche flatteners have been some of the most popular trades in the correlation markets, mostly driven by the technical factors.
- ◆ At the time of trade recommendation, the 5s/10s IG CDX curve stayed unchanged, long-term tranche has initially tightened and later widened, while the five-year has stayed unchanged.
- ◆ Such dislocations are usually associated with variation in the synthetic pipeline across maturities and related dealers hedging needs.



Source: Citigroup

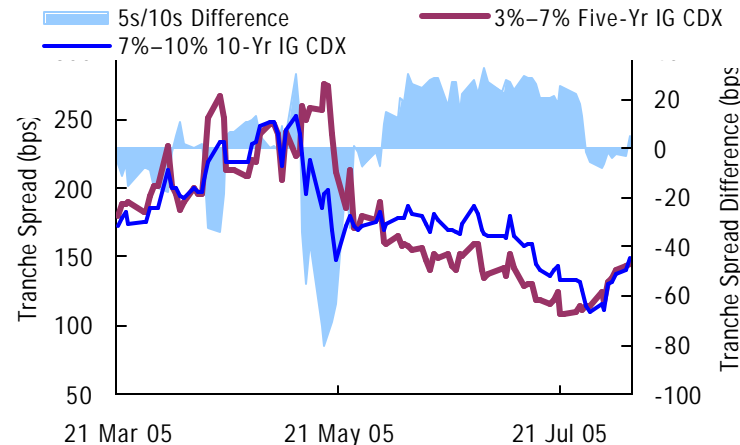


Trade recommendation: “*Sell Protection on the 7%-10% Ten-Year IG CDX, Hedge with the Five-Year,*” Jure Skarabot Ji Hoon Ryu, *Leverage*, Citigroup, May 25, 2005.
Trade unwind recommendation: “*Unwind 5s/10s 7%-10% IG CDX Tranche Trade,*” Jure Skarabot, Ji Hoon Ryu, Citigroup, Oct 7, 2005.

Opposite View: Tranche Steepener

5s/10s mezzanine tranche trade

- ◆ Technicals (anticipated synthetic pipeline and correlation positions of dealers and leveraged accounts) has been one of the the key drivers in index-tranche space in the recent past.
- ◆ Ten-year 7%-10% IG CDX tranche has been trading on top of five-year 3%-7% IG CDX tranche as the market was expecting stronger hedging needs in the longer-term maturity.
- ◆ At the time of trade recommendation, the new synthetic issuance has been less than anticipated and to capture that view we have recommend to sell protection on the five-year 3%-7% IG CDX tranche and buy protection on the same notional of the ten-year 7%-10% IG CDX tranche.



Source: Citigroup



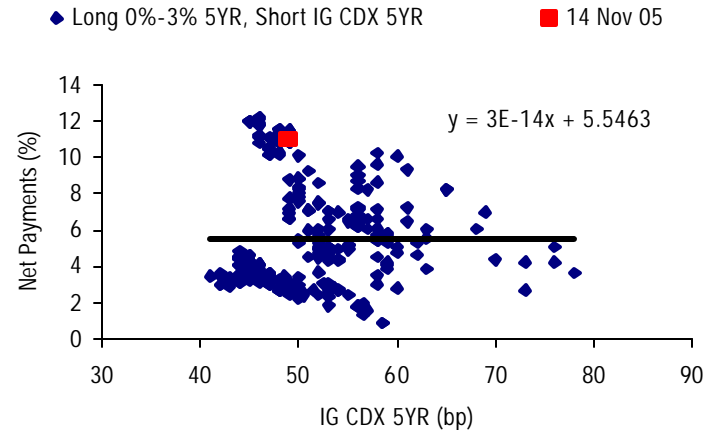
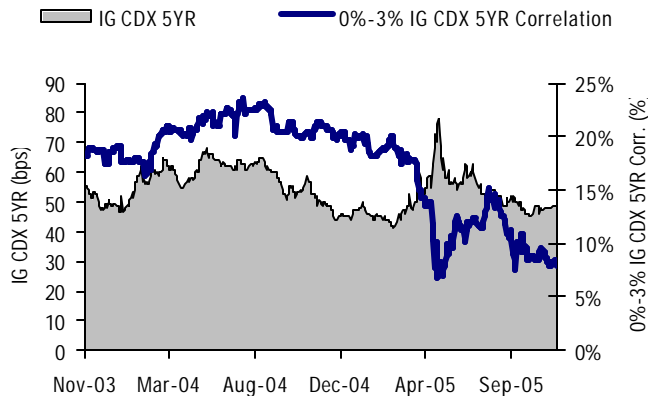
Trade recommendation: "5s/10s Mezzanine Tranche Trade," Jure Skarobot, *Leverage*, Citigroup, Aug. 10, 2005

Trade unwind recommendation: "Unwind 5s/10s Mezzanine Tranche Trade," Jure Skarobot Gaurav Bansal, Citigroup, Aug 30, 2005.

Anticipated Demand For Risk

Position to benefit from the “January effect”

- ◆ In an anticipation of the possible “January effect” in the tranche markets, we recommended to sell protection on equity tranche and delta-hedge it with the index.
- ◆ This trade recommendation was based on the anticipation that after the start of the new year, leveraged accounts in credit space will be looking for positive-carry, high-yield strategies.
- ◆ The equity tranche has moved in direction we predicted, but the negative carry eliminated most of the profits after taking the bid/ask costs into the account.



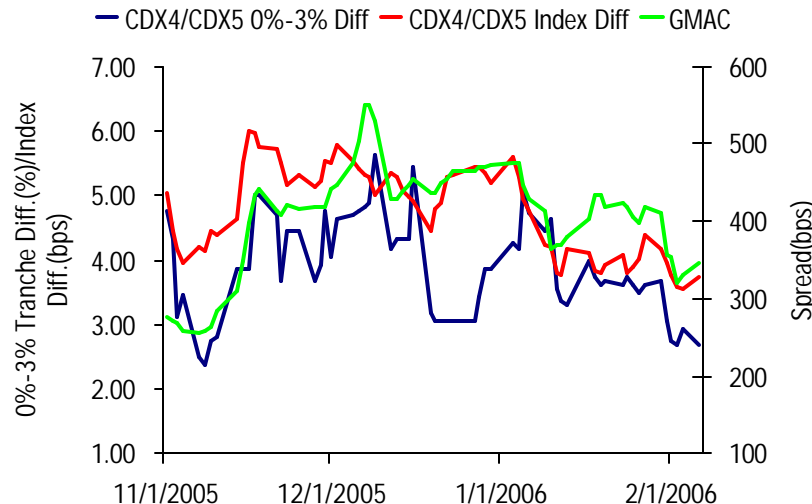
Source: Citigroup

Trade recommendation: “*Position for a January Effect in the Tranche Markets,*” Jure Skarobot, Gaurav Bansal, *Leverage*, Citigroup, Nov. 16, 2005
 Trade unwind recommendation: N/A

Directional View on Auto Sector

Short auto names with zero-carry

- ◆ For investors who want to express bearish views on the auto sector while avoiding the cost of an outright short, we recommended buying protection on IG CDX4 equity tranche and selling protection on IG CDX5 equity tranche.
- ◆ This trade had low exposure to the market-wide spread and correlation risks and it should benefit if auto sector spreads blow up.
- ◆ Soon after the recommendation, IG CDX5 tranches have rallied, but IG CDX4 equity tranche has lagged behind.

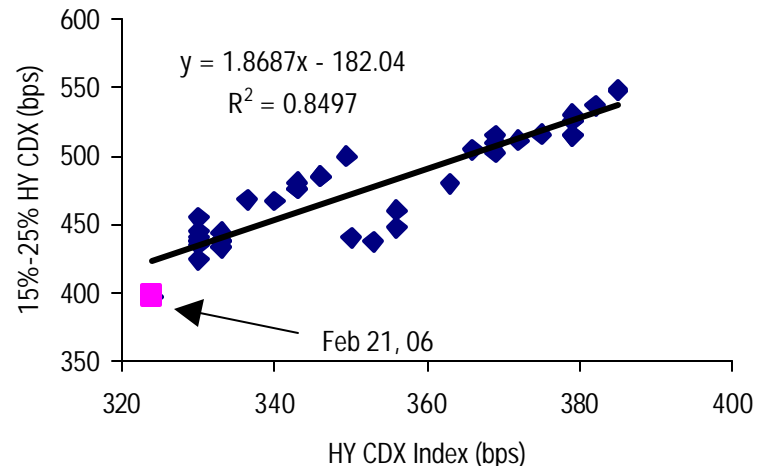
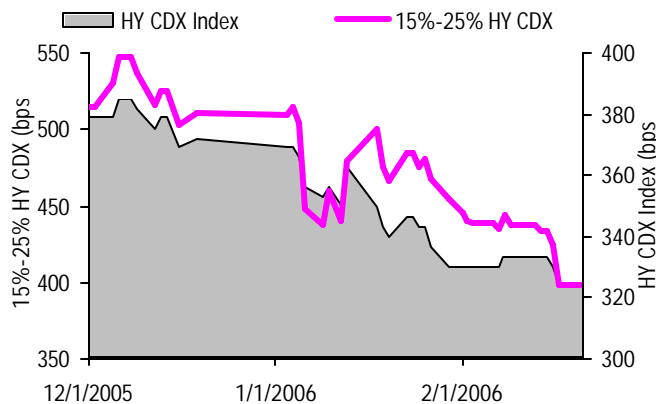


Source: Citigroup

Cost-Efficient Short in HY

Short HY CDX through a carry-neutral trade

- ◆ For investors who are looking for cost-efficient shorting strategies in HY, we recommended buying protection on the HY CDX 15%-25% tranche and selling protection on the HY CDX index in an amount to create a carry-neutral trade.
- ◆ The trade should benefit if high yield spreads widen: The 15%-25% HY CDX tranche has higher sensitivity to the spread moves than the HY CDX index.
- ◆ The key risk in the trade is the exposure to a further rally in high yield. Also, after the roll of-the-run tranches could drop in liquidity.



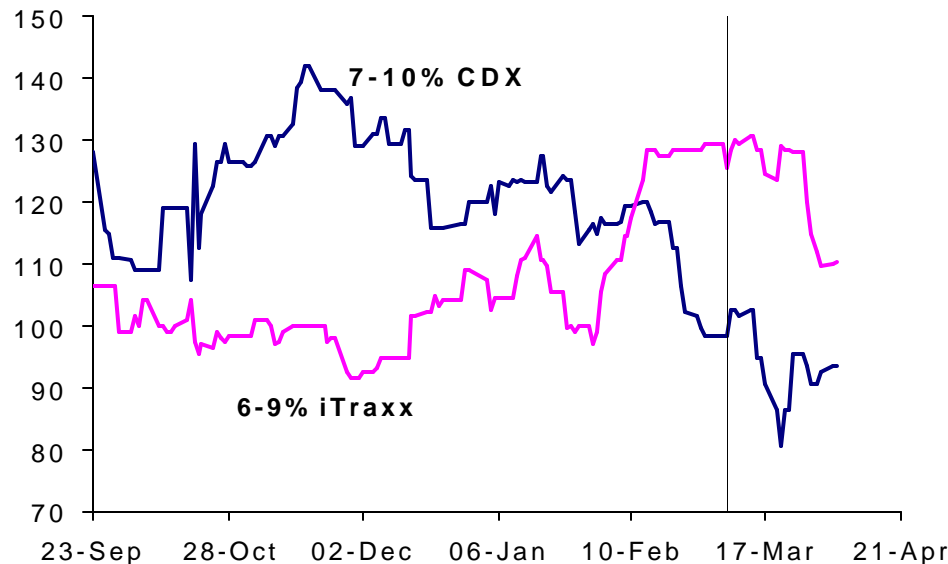
Source: Citigroup

Trade recommendation: "Short HY CDX Through a Carry-Neutral Trade," Jure Skarobot, Gaurav Bansal, Citigroup, Feb 21, 2006
Trade unwind recommendation: N/A

iTraxx Versus CDX Tranches

Relative value between different indexes

- ◆ Hedging activity led ten-year CDX and iTraxx mezz tranches to diverge.
- ◆ We recommended buying protection on ten-year 7%-10% IG CDX and selling protection on ten-year 6%-9% iTraxx.
- ◆ Main risk is the difference in portfolios and the continuation of the technical pressure.



Source: Citigroup

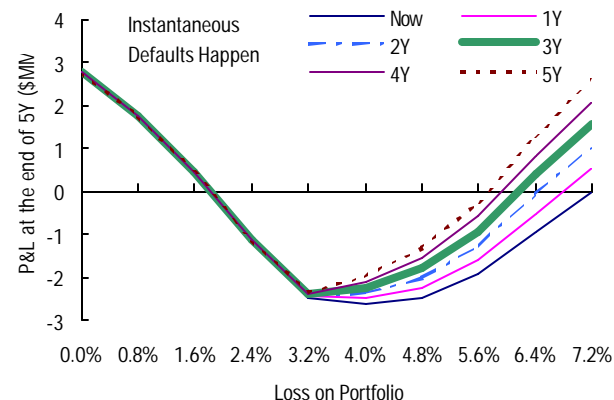
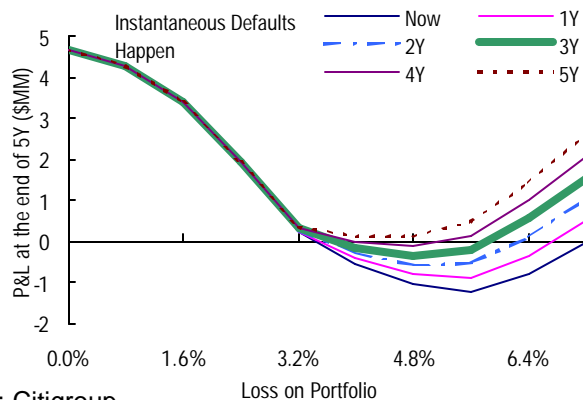
Trade recommendation: "Long/Short iTraxx vs CDX 10yr Mezz Before the Roll," Olivier Renault, Citigroup, Mar. 8, 2006
Trade unwind recommendation: N/A

Default Straddle Tranche Trade

Another take on tranche flatteners

- ◆ A combination of mezzanine tranches creates straddle-like trades on the range of cumulative defaults.
- ◆ Buying protection on the five-year 3%-7% and selling protection on the ten-year 3%-7% IG CDX tranche leads to positive-carry trade with a further payoff if realized default rate falls outside selected range.

Sell Protection on 3%–7% IG CDX Ten-Year, Buy Protection on 3%–7% IG CDX Five-Year on \$10 Million Equal Notional. Spread Unchanged (Left Panel), 50bp Parallel Spread Widening (Right Panel)

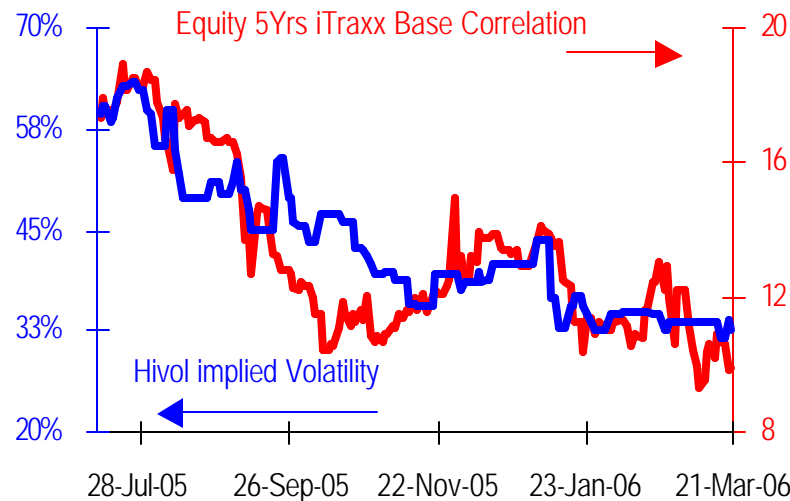


Source: Citigroup

Tranches Versus Swaptions

Buy HiVol payers to hedge equity tranches

- ◆ Equity tranches were relatively cheap (low correlation) and vol is cheap (low vol).
- ◆ We recommended selling protection on the 0%-5% five-year iTraxx tranche and delta-hedge it with three-month HiVol payers.
- ◆ Features of the trade: positive theta, gain in case of spread tightening, profit if default in HiVol. Also, the drop in correlation should be offset by rise in vol.



Source: Citigroup

Outlook and Key Challenges for Structured Credit Markets

Opportunities in Structured Credit Markets

What We Expect In the Future?

Opportunities in Structured Credit Markets

State of the credit markets

- ◆ Tight credit spreads, but increased single-name and sector specific volatility
- ◆ Defaults rates low, but increasing leverage in sub-prime sectors
- ◆ Micro and macro risks
- ◆ Technicals in correlation markets and the role of synthetic pipeline

Convergence of synthetics and cash

- ◆ Synthetic forms of traditional cash products (CLOs, CDOs of ABS)
- ◆ Cash CDO elements in synthetic structures
- ◆ Can you trade correlation in cash CDO markets? Can you hedge cash deals with synthetics?

Looking beyond the primary assets

- ◆ Leveraged loans: CLOs, CDS referencing secured loans
- ◆ CDOs backed by alternative asset classes
- ◆ Single-name CDS, ABX and CMBX indexes

Low-cost market shorts

- ◆ Buying protection on indexes and senior tranches
- ◆ Buying “cheap” mezz protection
- ◆ Zero-carry shorts with tranches
- ◆ Zero-cost shorts with option (buy ATM payer and sell multiple OTM receivers)

What We Expect In the Future?

Development and changes in correlation markets

- ◆ Strong technicals continue.
- ◆ Traditional correlation investors less active, but strong interest from the new type of investors.
- ◆ Relative value trading of correlation skews less common, majority of investors look of opportunistic trades.
- ◆ Did the models fail? What is the future of correlation trading?
- ◆ What trades do we like?

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Disclosure Appendix A1

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