Discussion of:
P. Collin-Dufresne, R. Goldstein, and F. Yang
"CDX Tranche Pricing Using S&P Equity Data"

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Big Picture

... as of 4 years ago.

The **structured finance** landscape in 2006:

- Global collateralized debt obligation (CDO) issuance volumes grew nearly 30% per year between 2000-2006.
- Wall Street banks manufacture $\approx$ \$5 trillion in notional value in AAA-rated assets.

Common features of credit market investors:

1. Significant focus on measures of expected cash flows (losses given default, default probabilities) $\longrightarrow$ **credit ratings.**
2. Search for yield within rating category.

> *"[By investing in triple-A rated structured products] asset managers can represent that they have not only added yield, but also maintained an overall high quality portfolio."*
>
> *– Jack Malvey, Chief Global Fixed Income Strategist at Lehman Brothers (FT, May 17, 2007)*

Big Picture

Predictions

Ratings-reliant investors can be exploited by supplying **economic catastrophe bonds** (Coval, Jurek, and Stafford (AER 2009)), which concentrate losses in the most adverse economic states $\longrightarrow$ digital call option.

- Build a structural model to examine the state-contingent payoffs of corporate bonds (CDX) and their derivatives (tranches).
- Pooling and tranching of economic assets provides a mechanism for manufacturing ECBs. ▸ [7, 10] Tranche
- Properly priced structured finance securities should offer a significant yield premium relative to rating-matched bonds.

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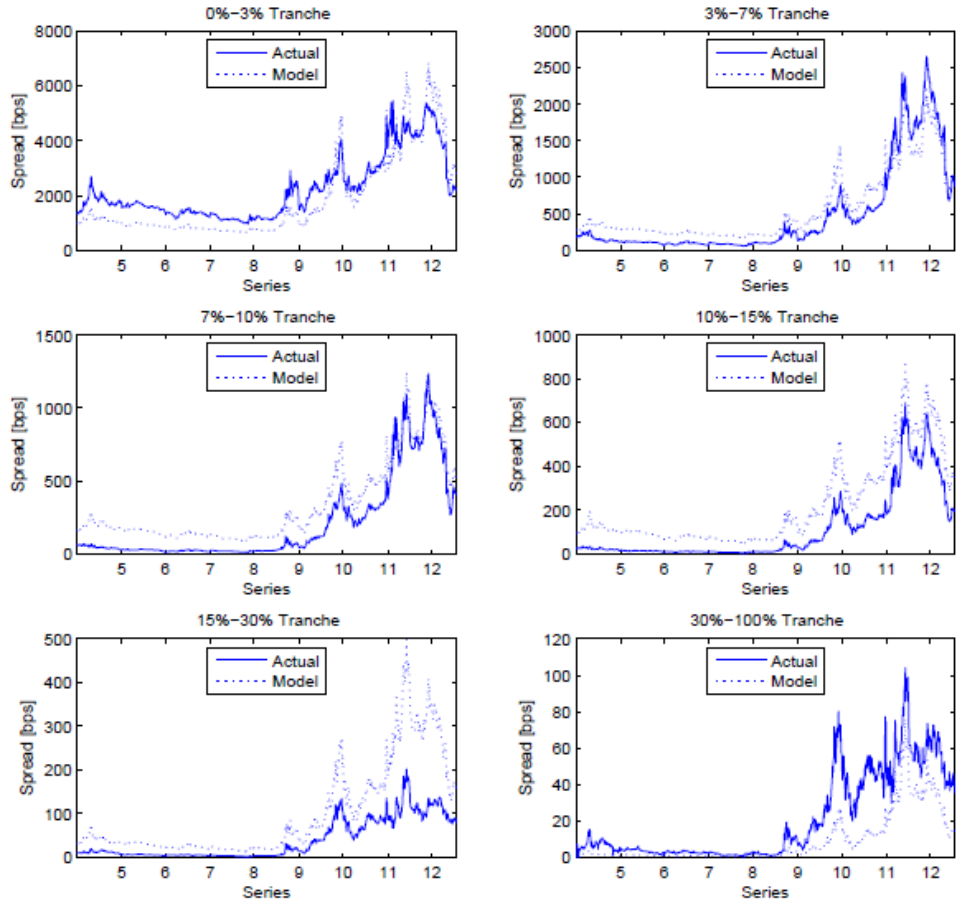
Predictions:

1. Highly-rated senior/mezzanine tranches will be overpriced.
2. Mispricing will eventually be eliminated via a reapportionment of risk from junior to senior tranches.
3. Quantity of structured finance activity will decline in the future, if initial growth based on investor mistakes.

Big Picture

... as of June 2009.

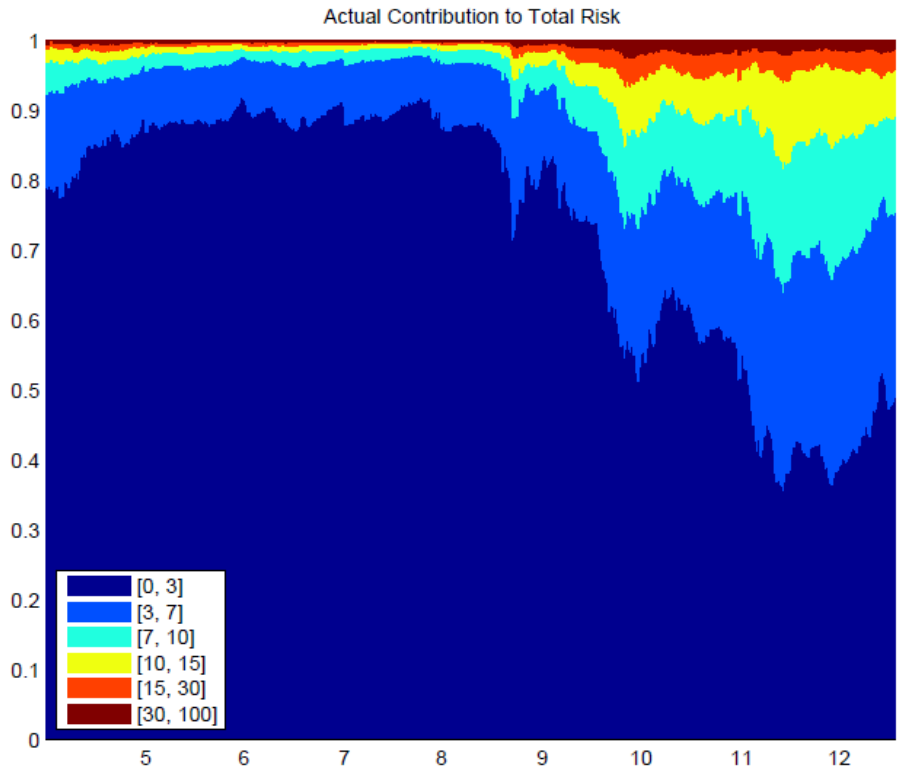
Prediction 1: When the model is calibrated to match the CDX, senior tranches appear to be too expensive (= protection too cheap). Actual tranche spreads have largely converged to the model-predicted spreads.



Big Picture

... as of June 2009.

Prediction 2: Since 2007 there has been a major relative repricing of risk in the CDX.NA.IG tranche market. Junior (senior) tranches now account for a smaller (greater) fraction of the cost of insuring \$1 of exposure to the index.



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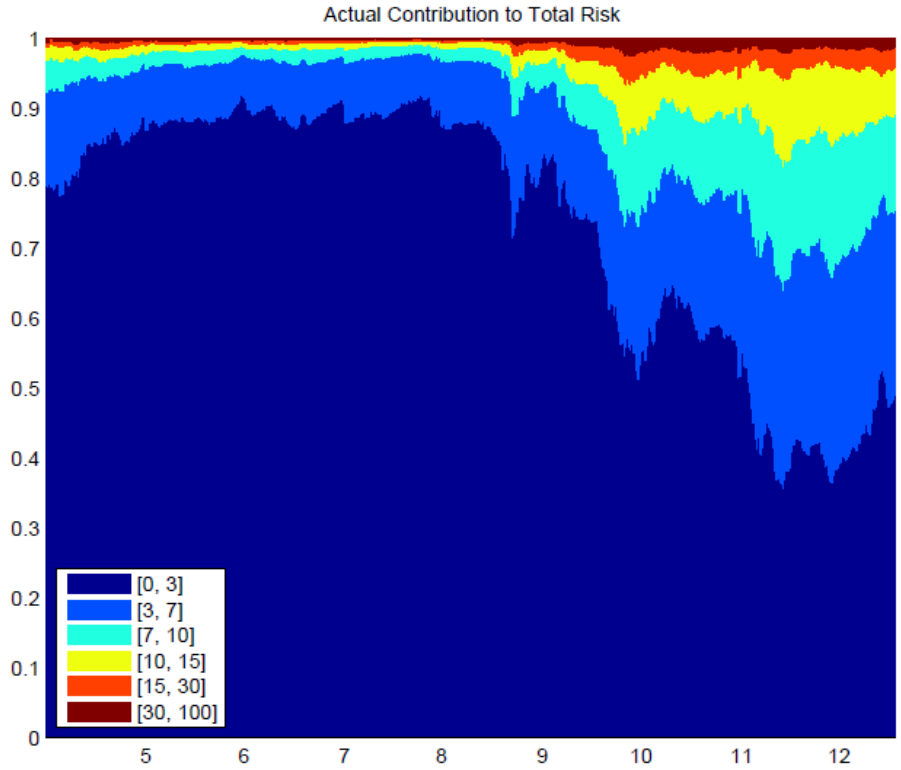

Prediction 3: Securitization essentially shut down (ABS: \$754B (2007) $\rightarrow$ \$150B (2009); CDOs: \$521B (2006) $\rightarrow$ \$4.3B (2009)).

This paper

This paper examines what is necessary to reconcile the pricing of CDX tranches with equity index options:

- Longstaff and Rajan (2008) show that CDX index and tranche prices can be fitted using a three factor model.
- The Collin-Dufresne, et al. (2010) model is (by necessity) more complicated:
  - 21 parameters $\longrightarrow$ no-arbitrage volatility surfaces.
  - Four idiosyncratic jump intensity state variables $\longrightarrow$ CDX term structure.
  - And another three calibrated state variables (default boundary, market variance, market dividend yield).

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Model calibration requires:

- Rising time trend in the implied default boundary.
- Declining time trend in the idiosyncratic volatility.
- Market dividend yield is mean **averting**, averages 4%, and rises at the peak of the crisis.

Collin-Dufresne, et al. (2010) challenge a few features of the CJS valuation approach:

1. Option data is not informative about the state price density at **low moneyness** levels $\longrightarrow$ use the senior tranche in the state-price density calibration.

2. In the Merton (1974) framework defaults can only occur at maturity causing a **"backloading"** of losses $\longrightarrow$ spreads on junior (senior) tranches are biased downward (upward).

3. Structural models are unable to match yield spreads (and loss rates) on **short-dated debt** $\longrightarrow$ need to include jumps (economy-wide + idiosyncratic) in order to match the term-structure of CDX spreads.

Comments

Backloading

Treat index (tranches) as zero-coupon bonds with maturity equal to their market risky duration, rather than actual index maturity, as in CJS.

- Calibrate model to match CDX spread **and** the [30, 100] tranche (AER^*).
- Convert model (upfront) price of protection to running spreads using the quoted risky duration (RPV01).
- Data: March 2005 - June 2009

Tranche	Actual	CJS-AER*	CJS-RPV01
30%-100%	21	21	21
15%-30%	40	132	124
10%-15%	110	226	207
7%-10%	209	302	281
3%-7%	477	439	433
0%-3%	2225	1033	1289

Comments

Idiosyncratic risks

In the model, bonds can default for one of three reasons: (a) asset value *diffuses* below the default threshold (Black-Cox (1976)), λ^{BC}; (b) idiosyncratic jump, λ^{i}; or, (c) catastrophic (market-wide) jump, λ^{c}.

- High short-term credit spreads can also be obtained if asset values are not perfectly observable (Duffie and Lando (2001)).
- What are the testable **predictions** of adding idiosyncratic jump risks?

The goal of the valuation exercise in CJS was to test whether tranche prices are consistent with option prices *after matching the bond portfolio's cash flow risk (ratings).*

- Are the model-implied default intensities in Collin-Dufresne, et al. (2010) consistent with the average rating of A- / BBB+ for the underlying pool of bonds?

Comments

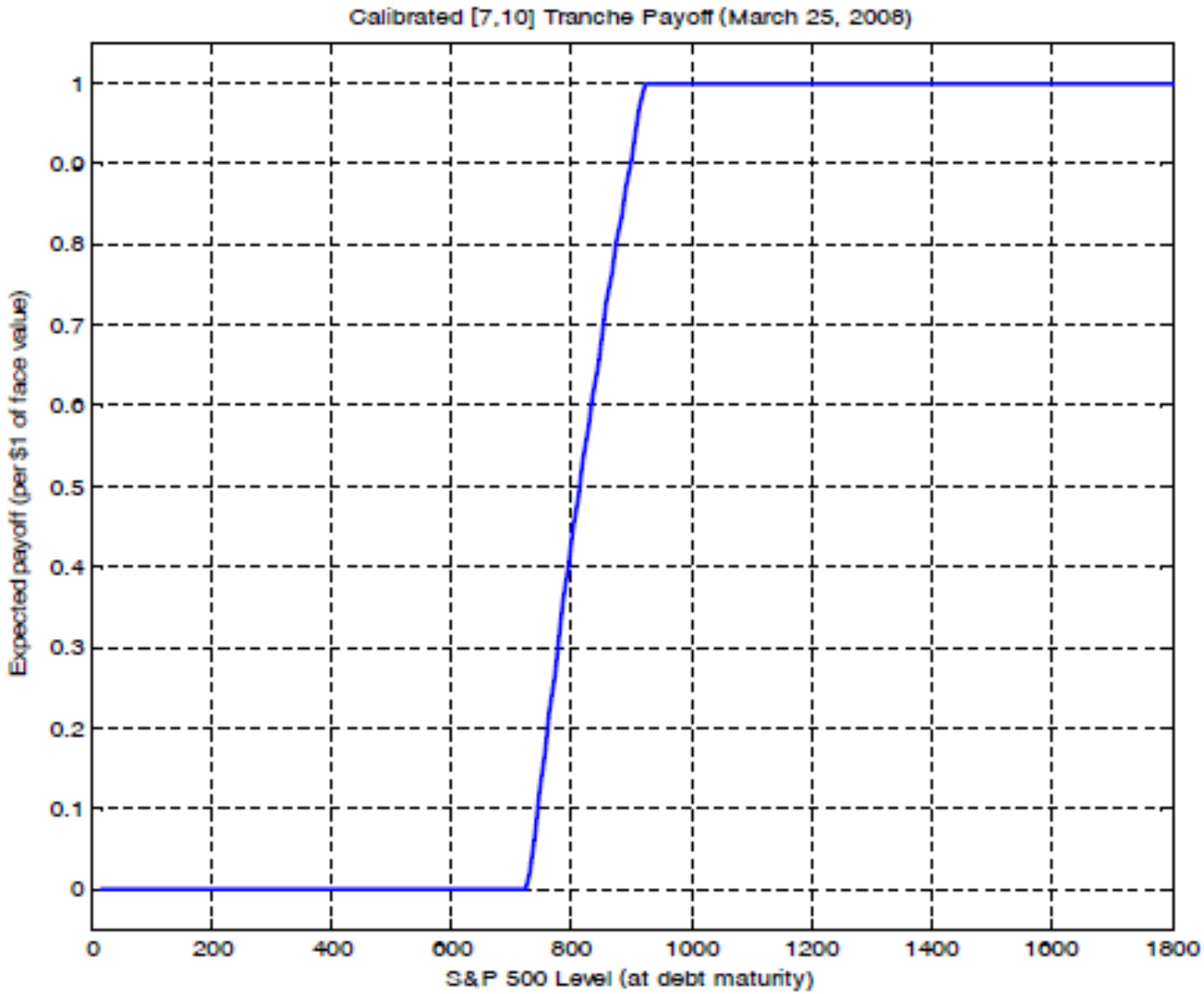
Overfitting

Ideas for allaying overfitting concerns:

1. Does the model predict changes in CDX spreads any better than other models? (Collin-Dufresne, Goldstein, and Martin (2001))
2. Does the model consistently price the *cross-section* of corporate bonds?
3. What are the model-implied asset (equity) return correlations? How do they compare with the CBOE implied correlation index?
4. What are the model's implications for the distribution of default times for the equity tranche ($[0, 3]$)? How do the model RPV01s compare with the market values?

Big Picture

CDX.NA.IG [7, 10] Tranche



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