

INCISIVE TRAINING

Basel 2.5 to Basel III: Challenges and Objectives for Risk Management
New York, February 23, 2012

The process of modeling and validating the CRM Model

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Disclaimer

- My own words, though work done while working at Morgan Stanley on Basel Op Risk/AMA and internal reg model review
- Great, collegial support from M.S. and E & Y
- Morgan engagement ends March 30th
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Outline

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Historical Context

- Great Recession as prelude to regulation
 - Bear Stearns
 - Lehman
 - Shakeups at Merrill, Citi



Historical Context, cont.

- Credit liquidity dried up
- Daily VaR (or 10 day VaR) a bad metric for credit holdings
 - Just a snapshot
 - Ignores large credit events (Lehman, Fannie/Freddie) that are relatively rare
 - Insensitive to long-term changes e.g. slow deterioration in positions over weeks/months

Historical Context, cont.

- CDO history
 - Issuance bubble
 - Increasing amounts of subprime
 - Tranche trading (esp. equity)
 - CDO², CDO³, LSS
- CDO characteristics
 - Rampant speculation
 - Lucrative for IB's, Moody's, S&P... (“issuer pays”)

Historical Context, cont.

- CDO Misunderstandings
 - “high quality”
 - Gaussian copula always applicable
- Main copula deficiencies
 - Static correlation
 - Calibrated to periods of good credit, stable spreads
 - Blindsided by housing bubble

Historical Context, cont.

- Critique of the Gaussian copula
 - Linear correlation between obligors based on assets (equities)
 - Pairwise correlation only – sensitive to multiple defaults
 - No fat tails, could use t-Copula but DOF unknown, harder to compute
 - Known to be problematic in practice: correlation skew

Historical Context, cont.

- Failure to model/hedge
 - Volatility of spreads, correlations, recovery rates
 - Basis
 - Cash/synthetic
 - Index/single name
 - Bespoke/index
 - Between maturities of otherwise same security
 - Correlated defaults

Recipe for Disaster: The Formula That Killed Wall Street

By Felix Salmon 23 February, 2009
Wired Magazine

$$\Pr[T_A < 1, T_B < 1] = \Phi_2(\Phi^{-1}(F_A(1)), \Phi^{-1}(F_B(1)), \gamma)$$

Regulatory Response

- Credit products (CDOs + flow)
 - 1 **year** capital horizon, 99.9%
 - patterned after current treatment of loans in banking book
 - Equates banking book and trading book treatment (closes loopholes)
 - Clearly is more punitive than 99% VaR

Regulatory Response, cont.

- IRC: liquid products (discussed later today)
 - Bonds, CDS (when used for investment/spec.)
 - Migration and default risks
 - Constant level of risk (roll over downgraded posns.)
 - Liquidity horizons, minimum 3 months.
- Weekly computation
- New internal bank models required
- BIS survey estimated impact: IRC reg capital could go up by factor of 2 to 5 (model dependent)

Constant Level of Risk

- Regulatory thinking: mimic bank book, where loans held to maturity
- Constant risk \Leftrightarrow constant credit rating
- Constant rating \Leftrightarrow no migrations or defaults

- Where is the risk realized?

Liquidity Horizons

- Liquidity horizons – min. 3 months (“constant level of risk”)
- LH’s must ...
 - “be set according to the time required to sell the position ... in a stressed market, having particular regard to the size.”
 - “reflect ... experience during periods of both systematic and idiosyncratic stresses.”
 - Be long enough to avoid market impact
 - Be longer for concentrated positions

Liquidity Horizons, cont.

- LH issues
 - What if maturity/expiry occurs before LH?
 - Answer: $LH = \text{MIN}(\text{maturity/expiry}, 3 \text{ months})$
 - CDS's are sometimes more liquid than the bonds they reference.
 - How do you handle the LH of an asset vs. its hedge?

Back to Constant Level of Risk

- Assign a liquidity horizon to a position
- Model the migration and default during the period of length corresponding to the LH (e.g., 3 months)
- Then rebalance: roll the position to another security of the same issuer with pre-event rating, maturity, security type, credit spread, and spread sensitivity.

Scope of CRM

- Correlation products
 - CDO's
 - CDS's used to hedge CDO, CDOⁿ, LSS
 - No product overlap with IRC
 - Measure all price risks, including those in IRC
 - Requires internal models (maybe extension of IRC)
 - Subject to 8% floor of “standardized charge” (SC)

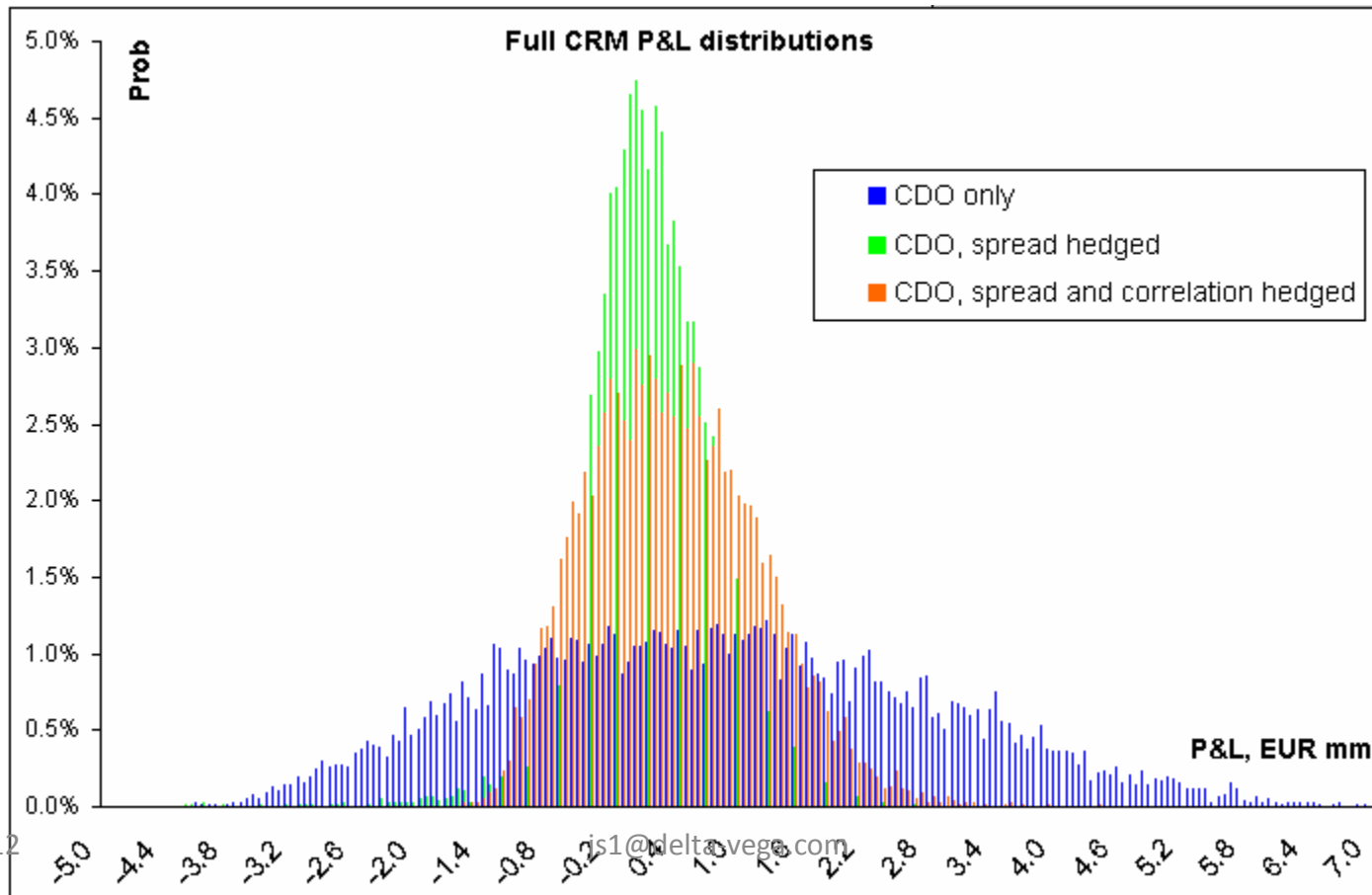
The CRM 8% Floor

- Basel didn't want to rely on bank modeling, so added the 8% floor driven only by the CDO's credit rating (i.e., SC)
- But using SC inconsistent: punitive treatment of unrated tranches because doesn't properly include risk hedges (no netting)
- “Banks would need to plough money into [CRM] model development, just to qualify for a standard 8% floor that is likely to be higher than the figure calculated by the model, dealers say, in which case, the model calculation would be ignored. “

Risk magazine article (Sep. 2010)

Will the floor deflate CRM?

- Example from Brunac presentation: mezz. (3%-7%) tranche, EUR 10 MM



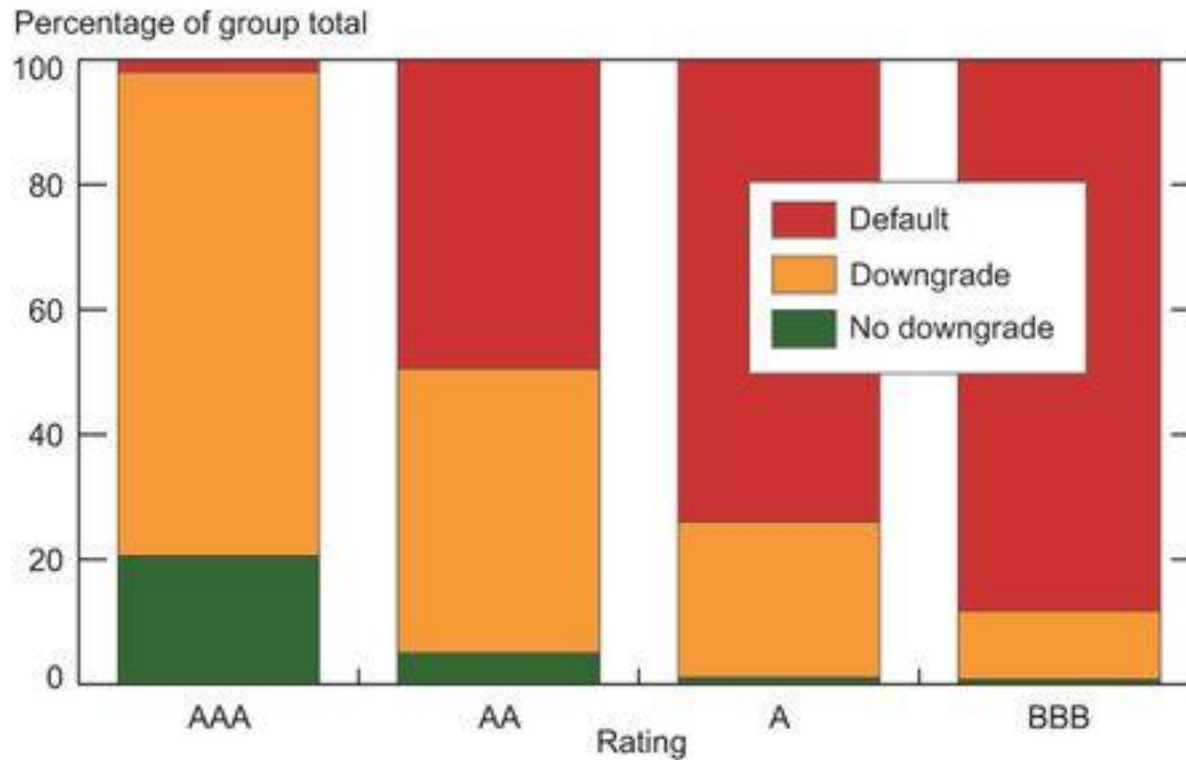
P&L DISTRIBUTION STATISTICS			
(EUR MM)	CDO only	CDO + spread hedge	CDO + spread & corr hedge
Minimum	-4.2	-4.3	-2.1
Maximum	7.0	3.2	4.4
Mean	0.8	0.2	0.4
Std. deviation	2.0	0.6	0.8
CRM charge	3.7	2.9	1.4
Standard charge	1.9	56.0	69.1
Floor	0.2	4.5	5.5

Un-hedged gives most capital relief!

State of IRC/CRM Modeling

- My understanding of where large banks are at
 - Started developing models last year
 - Got approval in some cases from FSA
 - Work for U.S. regulatory approval halted until Dodd-Frank issues resolved, rules issued

Downgrades and Defaults on Investment-Grade Subprime MBS Issued in 2005-07



Source: Author's calculations, based on Intex and ABSNet data.

Source: J. Vickery, blog

Dodd-Frank and Ratings

- Illustration: **half** of subprime CDO's issued 2005-2007, and rated BBB- or above, have defaulted. Many others downgraded (40% of AA).
- Addressed in Subtitle C of DF
 - new Office of Credit Ratings to monitor NRSRO's
 - OCR will be part of the SEC
 - Target conflicts of interest, make more indep.
 - Eliminate “look backs”

Dodd-Frank and Ratings, Cont.

- Annual examinations, or more frequently as needed
- Clear statement of methodologies used
- OCR can suspend or revoke NRSRO's registration

DF and Ratings, cont.

- Main regulatory effects
 - Remove mentions of ratings in Security Exchange Act (of 1934), which created SEC
 - SEC, Fed, etc. must delete all references to ratings of NRSRO's in regulations

DF and Ratings, cont.

- What do we use instead?
 - Credit spreads?
 - Internal bank models?
 - Most important: structured credit prods.
- Very recent NPR from SEC
 - Went into effect Feb. 14th
 - Describes alternative ways to express risk e.g. MBS, ABS

DF and Ratings, cont.

- Main regulatory effects
 - Remove all references to ratings in Security Exchange Act (of 1934), which created SEC
 - SEC, Fed, etc. must remove all references to ratings of NRSRO's in regulations
- What do we use instead?
 - Credit spreads?
 - Internal bank models?



Source: Dave Brown, The Independent (UK)

State of IRC/CRM Modeling

- Discuss non-US IRC/CRM approval
- Ratings accepted in UK and rest of Europe
- What lessons can we draw from modeling that secured FSA approval?

CRM modeling

- Simulate
 - Risk factors
 - Migration (credit ratings matrix?)
 - Recovery rates
 - Index-name basis
 - Bespoke-index correlation mapping
 - Dynamic hedging, if used

Modeling Considerations

- How to simulate stochastic credit?
 - Monte Carlo of hazard rates?
 - Spreads e.g. BK process (exclude arb.)?

$$d \ln S_t = \kappa_S (\theta_S - \beta - \ln S_t) dt + \sigma_S \sqrt{dt} Z_S$$

(per Wilkens et al.)

- Liquidity horizons: time required to sell or hedge
 - Everything at MIN(3 months, maturity) Basel floor?
 - 6 months for less liquid? 1 year?
 - What about dynamic hedging?

Modeling Considerations, cont.

- Recovery
 - Many names marked at 40% with zero vol.
 - Transition matrices can be created for recovery buckets e.g. from MarkIT
 - Dynamics (volatility needs to be modeled):
 - In the absence credit event, and
 - Following a credit event (“default-conditional recovery”)

Modeling Considerations, cont.

- Resource issues
 - 99.9% VaR -> Many simulations (10K – 100K)
 - Can't simulate every CDS -> factor models, bucketing (maturities, etc.)
- Could leverage:
 - Existing internal simulation engines
 - Firm's VaR models and methodologies
 - Firm's IRC models

IRC Modeling useful to CRM

- Use these directly, or extend:
 - Mark-to-market migration losses
 - Bond- CDS basis
 - Maturity basis on migration
 - Default conditional recovery (with volatility)
 - Exposure to sector, industry, region
 - Liquidity horizons

Default-conditional Recovery

- Example of how one might model:
 - Stochastic recovery as modeled in CDO's
 - Used to help explain base correlation skew
 - Produces stylized fact: high recovery rates are accompanied by low default rates.

CRM Model Validation

- Measure sensitivities to inputs
- For example, to default and migration (also useful for IRC):
 - Use Moody's ratings transition matrix from benign period => estimate how much CRM charge goes down relative to base case
 - Create "bad" matrix by reflection => CRM how much up?

Research Areas for CRM Models

- Liquidity
 - On the runs
 - Off the runs
 - Bespoke
 - Lehman-type junk

Research areas for CRM, cont.

- Corporate credit
 - CDS models: currently might be based on cash
 - Better to draw directly from CDS data
 - No need to model cash/synthetic basis
 - Isolate pure CDS effects
 - Other advantages such as constant maturity, standard expiries
 - But have to decide whether to model spreads or hazard rates

The Road Ahead

- Guidance from regulators soon to come?
- Meanwhile:
 - Continue developing the building blocks of IRC and CRM
 - Take advantages of new IT – solid state drives, etc.
 - Think of ways to calibrate and test.

Conclusions

- CRM models in U.S. are not in infancy
- But will remain in childhood until Fed gives clearer picture
- Impact of Dodd Frank yet to be fully felt – what are internally based ratings?
- Job security for regulatory quants!

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