Discussion of "The Bear's lair: Indexed Credit Default Swaps and the Subprime Mortgage Crisis" by Nancy Wallace and Richard Stanton

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- Summary
- Comments on the Analysis
- Crisis for all AAA?
- Final thoughts

Summary

- Investigate pricing of ABX indexes
- Use simple back-of-the envelope calculation to show that spreads on AAA ABX.HEL indexes imply extraordinarily 'impossibly' high expected loss rates (recovery rate $<$ 10% and default rates $>$ 50% not consistent with prices).
- Confirm the results using more sophisticated model solved with Monte-Carlo simulations
- regressions

The back of the envelope calculation

What's the right assumption about prepayment

- Sets prepayments to historically observed 25% value.
- More like zero for subprime, no?

Risk-premia?

- Especially for AAA tranches crash-risk premia are often a major driver of premia.
- What is the process for house prices? Does it allow for large (risk-neutral) jump sizes and jump intensities?
- In a major housing down-turn it would not be completely impossible to expect recovery to be very systematic and therefore to carry a large risk-premium?
- House prices are probably more important a determinant of subprime pre-payment and default than interest rates.
- Is a simple one-factor Vasicek model the best process (no-jumps) to accommodate the current period?
- In general, the analysis needs to be careful in comparing average historical frequencies from price implied frequencies.
- The model (of HPA) needs to be written down more explicitly: would be especially interesting for joint pricing of all tranches (aside from AAA).

Importance of risk-premia: The Credit spread puzzle

- Investment-grade (IG) firms rarely default:

Average Issuer-Weighted Cumulative Default Rates 1970-2004

Exhibit 18 - Moody's 2005 report

Years	1	2	3	4	5	6	7	8	9	10
Aaa	0.00	0.00	0.00	**0.04**	0.12	0.21	0.30	0.41	0.52	**0.63**
Baa	0.19	0.54	0.98	**1.55**	2.08	2.59	3.12	3.65	4.25	**4.89**

- Further, recovery rates are substantial:

Average Recovery Rates by Seniority Class, 1982-2004

Exhibit 27 - Moody's 2005 report

Year	Sr. Sec.	Sr. Unsec.	Sr. Subord.	Jr. Subord.	Subord.	All
Mean	0.574	**0.449**	0.391	0.320	0.289	0.422

- Structural models, when calibrated to match average loss rate, tend to underpredict yield spreads (relative to Treasury)

$\Rightarrow$ Structural models underestimate the risk-premium component of credit spreads, and/or

$\Rightarrow$ Spreads compensate for other factors (i.e, liquidity, taxes) in addition to credit risk

A Simple Calibration Exercise

- Consider simple Merton (1974) model

$$\frac{dV}{V} + \delta\, dt = (r + \theta\sigma)\, dt + \sigma\, dz$$

where θ is the asset value Sharpe ratio.

- Default occurs at T if $V(T)$ falls below B. in that case recover $1 - L$.
- Risky debt payoff is:

$$\min(F, V_T) = F - \max(F - V_T, 0)$$

$\Rightarrow$ risky debt is equal to risk-free debt minus a put option.

- Spread $(y - r)$ on a date-T zero coupon bond is:

$$(y - r) = -\left(\frac{1}{T}\right) \log\left\{1 - L\, N\left[N^{-1}\left(\pi^P\right) + \theta\sqrt{T}\right]\right\}.$$

$\Rightarrow$ Even though the model is specified by 7 parameters $\{r, \mu, \sigma, \delta, V(0), B, L\}$, credit spreads only depend on historical default probability, recovery and asset sharpe ratio $\{\pi^P, L, \theta\}$.

A Simple Calibration Exercise

	T = 4Y			T = 10Y		
Sharpe	Baa	Aaa	Baa-Aaa	Baa	Aaa	Baa-Aaa
0.15	44.0	1.6	42.4	67.7	12.0	55.7
0.20	54.9	2.2	52.7	88.1	17.4	70.7
0.25	68.1	3.0	65.1	112.8	24.6	88.2
0.30	83.7	4.1	79.6	141.7	34.2	107.5
0.35	102.0	5.5	96.5	175.1	46.6	128.5
0.40	123.4	7.4	116.0	212.9	62.2	150.7

Table: (Baa - Aaa) spreads as a function of Sharpe ratio. 4Y Baa default rate = 1.55%. 4Y Aaa default rate = 0.04%. 10Y Baa default rate = 4.89%. 10Y Aaa default rate = 0.63%. Recovery rate = 0.449.

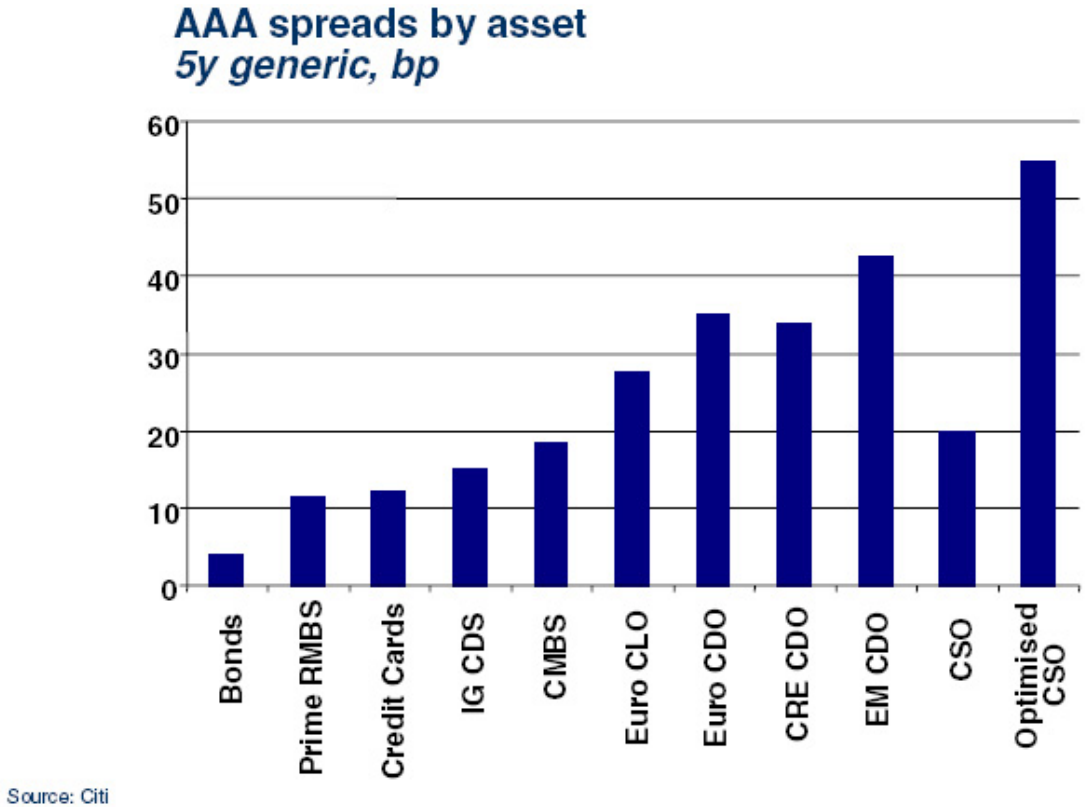
- Typical Baa firm asset value Sharpe ratio estimated around 0.22.

$\Rightarrow$ The credit spread puzzle says that historically, strategy going long corporate bonds seems very appealing (i.e., typical models cannot explain the level of observed spreads) because:

  - (i) historical expected loss rates have been low, **and**
  - (ii) Idiosyncratic (diversifiable!) risk on typical IG bonds is quite high (roughly half of the total risk).

Evidence from other markets: not a subprime specific phenomena.

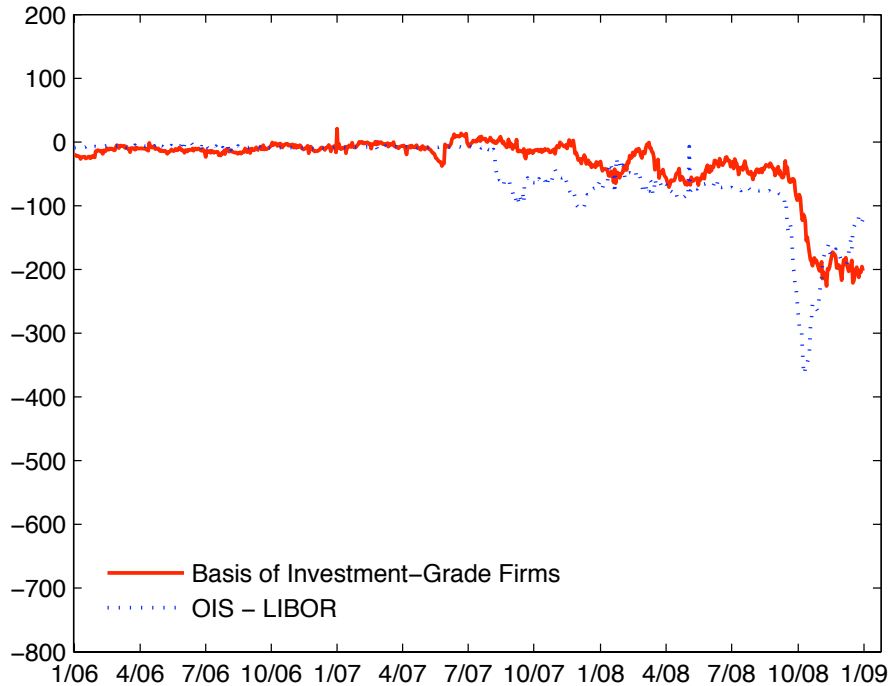
- Some (indirect) evidence that systematic risk-premium priced: cross-sectional variation of AAA spreads even in 'normal' (pre-crisis) times:

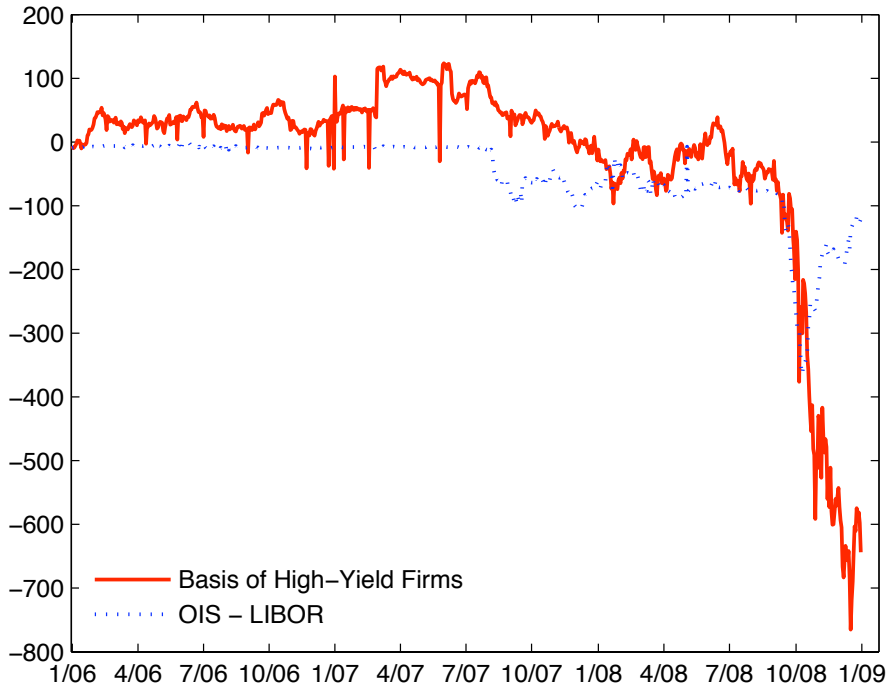


- During the crisis, AAA spread display "too high" a premium not unique to subprime.
- Significant disruptions in all corporate credit markets:
  - Cash-CDS basis **negative** (-200 bps for IG; -700bps for HY)
  - Credit spreads widened (CDX-IG $>$ 200bps)
  - Tranche Spread widened (Super Senior (30-100) $>$ 100bps).

The Cash-Basis during the crisis

- Basis during the crisis became tremendously negative:





- In a frictionless market, negative basis is a free lunch:
  - Borrow at Libor
  - Buy the bond
  - Buy protection

  $\Rightarrow$ Earn the basis **risk-free**! (Basis package $\sim$ 'AAA' asset)

Trading the negative basis in practice

- In practice, a negative 'basis package' typically consists in:
  - Fund the haircut ($h\,B$) at your own funding cost: Libor+x where x reflects your risk
  - Borrow $(1-h)B$ at repo rate to purchase the bond.
  - Buy protection and post initial margin (M) funded at Libor+x
- There are subtleties about how to size the trade (Carry vs. JtD/Recovery risk).
- Return on the basis trade using $\$(hB+m)$ capital is approximately:

$$\sim \text{Duration} \cdot \Delta\text{Basis} - B\left(h(\text{Libor}+x)+(1-h)\text{Repo}\right) - M(\text{Libor}+x)$$

$\Rightarrow$ Exposure to:
  - Basis becoming more negative,
  - Funding/trading cost widening ($Libor+x\uparrow$, $Repo\uparrow$, $M\uparrow$)
  - Collateral quality deteriorating ($h\uparrow$)
  - Counterparty risk (affects the value of insurance purchased)
- There were substantial changes in funding costs during the period:

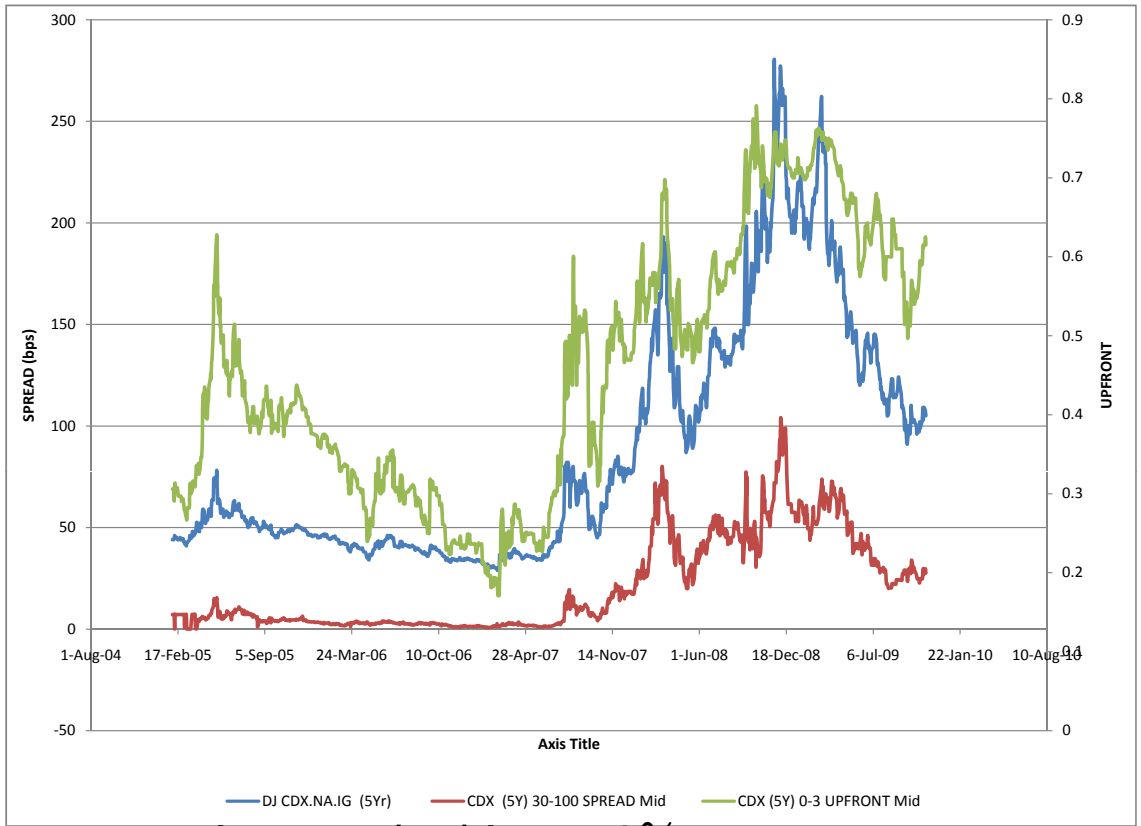
date	07-Jun	07-Dec	08-Jun	08-Sep	09-Feb
haircut (h)	5%	8%	10%	12-15%	20-25%
spread (x)	0	10bps	15-20bps	35-50 bps	100-125bps
Margin	0				2-10%

(source: JP Morgan)

- Exploiting cross-sectional variation can see that all three matter.

Corporate IG CDX Tranche spreads through the crisis

- The impact on tranche prices was dramatic



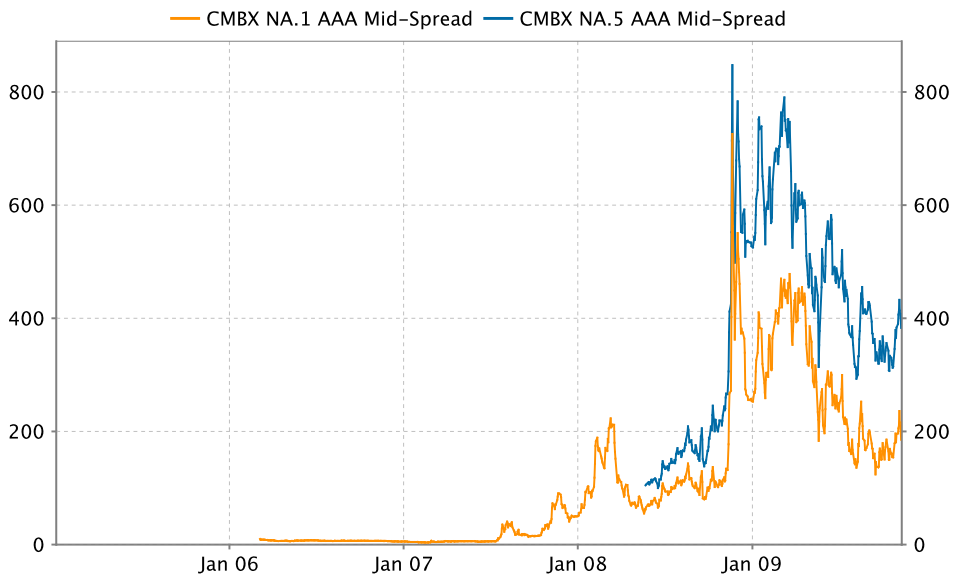
- Implied correlation on equity tranche hit $> 40\%$
- Correlation on Super-Senior tranches > 1(!) with standard recovery assumption
- Relative importance of expected loss in senior tranche versus in equity tranche indicates increased crash risk.

Evidence from CMBX markets

- CMBX AAA spreads

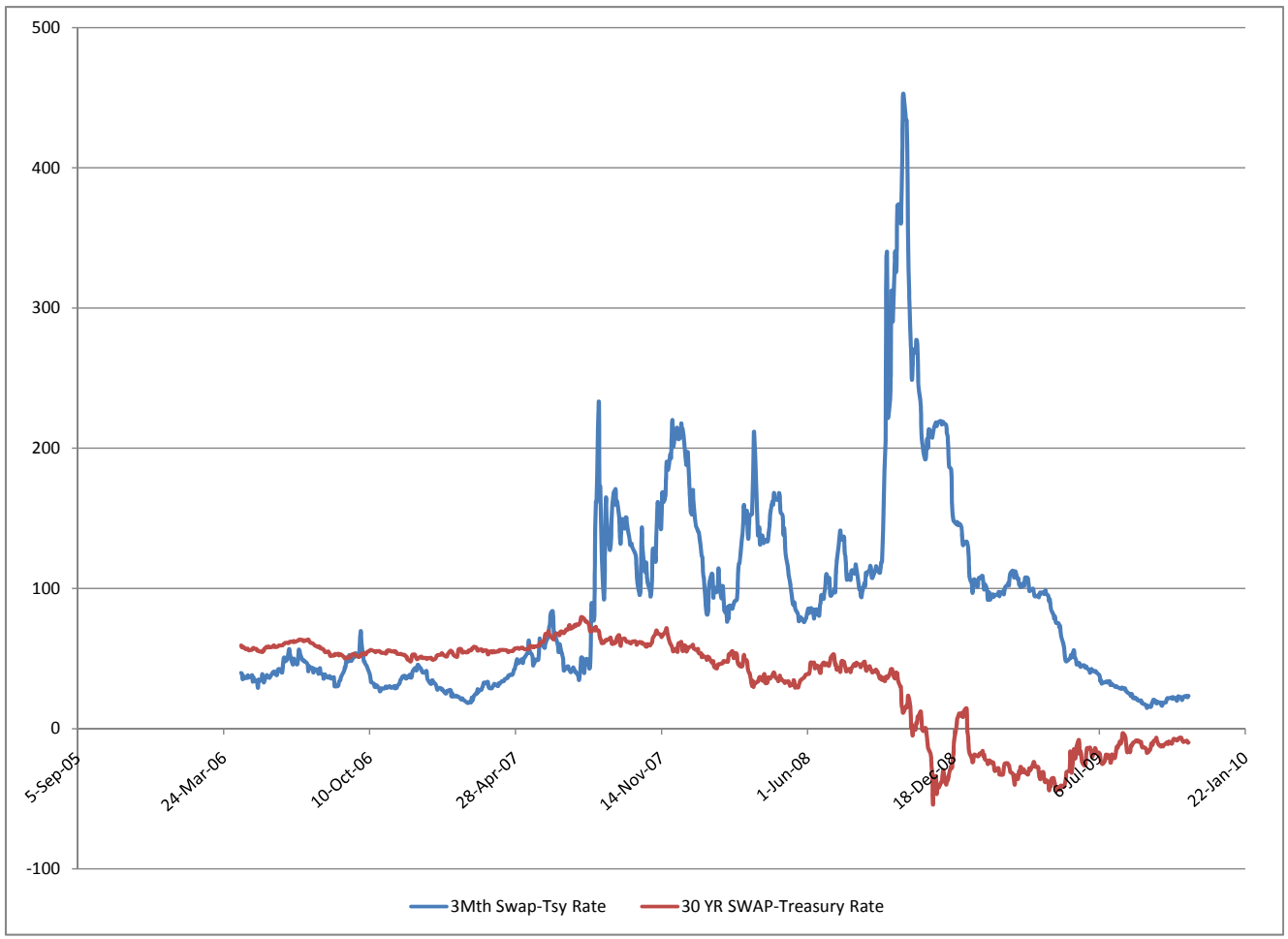
J.P.Morgan DataQuery

J.P.Morgan Inc.



Evidence from LIBOR-Swap markets

- Long term swap spread became negative ($\sim$ funded vs. unfunded spread?)



What does it tell us?

- Counterparty risk seems to be relatively well mitigated by current collateral/ISDA agreements.

- Else, who would want to pay 100bps to buy protection on "end-of-the-world" trade?

- Suggests that these contracts are very much **marking to market** trades:
  - Not clear we actually believe the counterparty will be solvent when/if the event where more than 60% of the IG firms in the US default.
  - But along the paths that lead us closer to that event, we will receive marking to market payments that are guaranteed via collateral agreements and margin calls.

  $\Rightarrow$ We are really contracting on changes in the risk-neutral probability of the remote event.

$\Rightarrow$ The price of the senior tranches intrinsically tied to ISDA/collateral agreements:
  - Under zero counterparty risk mitigation, super senior insurance would be (close to) worthless (moral hazard).

- Alternative (complementary?) stories:
  - Scarcity of capital/insurance providers (require extra-premium to hedge against further adverse MtM move $\sim$ reinsurance).
  - Regulatory requirement to hedge in order to free up balance sheet: hedging via unfunded trades is less costly than selling cash bonds in depressed markets.

Conclusions

- Crisis hit all AAA tranches: spread widened. why?
- Combination of
  - Heightened likelihood of hitting the AAA (history is no guide).
  - Deleveraging of Bank's balance-sheets.
  - Higher risk-aversion to adverse Mark to Market losses.
  - Increased constraints (due to incurred losses).
  - Loss of credibility of 'specialists'.
  - Uncertainty aversion (especially in subprime - recall that BBB tranches were worth par in 2006!).
  - highly non-linear payoff (Hull and White (2009) point to digital nature of BBB tranches).
- Evidence form cash-cds suggests that arbitrageurs put their capital to use in most efficient markets (not clear that ABX.AAA would be the first to invest in....)
- As long as capital is somewhat scarce, needs to maximize return per unit of capital use. (probable that ABX.AAA had highest risk).
- What's the 'right' price? (discussion about whether use of these indices provides inappropriate vehicle to mark-to-market). we have seen that it is not this market per se that is crazy idiosyncratically. Rather across the board valuation of AAA tranches are particularly dislocated, for at leas two reasons:
  - Risk-premia on crash-risk are way up (never a better time to insure against the end of the world than when you think it might happen.... combined with stressed balance sheets/Right Risk constraints)
  - Least capital efficient trade combined with increased collateral requirements and funding costs