



RiskMetrics Group
The Center of the Financial Community

What have Risk Managers learned from the Credit Crisis?
Reactions to the SSG Report, March 2008

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The Senior Supervisors Group (SSG) Report

Ã Released 6 March 2008, a joint report of regulators from entities in France, Germany, Switzerland, United Kingdom and United States

Ã Result of conversations with sixteen internationally active banks

Ã What practices differentiated those institutions that fared best through the recent market turbulence?

Ã Four key practices:

- ◆ Firm-wide risk identification and analysis
- ◆ Consistent, independent and rigorous valuation across the firm
- ◆ Effective management of funding liquidity, capital and balance sheet
- ◆ Informative and responsive risk reporting

Ã <http://www.newyorkfed.org/newsevents/news/banking/2008/rp080306.html>



Three areas to ponder for the risk community

- Ã Liquidity
- Ã Statistical risk measures
- Ã Stress testing

Liquidity

SSG Report, Section IV

Many firms had not expected that asset market liquidity would be impaired.

... had not assumed their balance sheet would increase during a stress event.

... had not expected difficulty in obtaining funding in major currencies.

... had not planned for a funding disruption lasting as long as the current one.



First, distinguish two problems.

Ã Funding liquidity

- ◆ Are my assets and funding arrangements sufficient to meet obligations and to continue normal operations?

Ã Asset liquidity

- ◆ How effectively can I transform an asset I own into cash?
- ◆ Specific components
 - ◆ Size of position, amount desired to trade
 - ◆ How much will I move the market if I trade all at once?
 - ◆ How long do I have to space the trade to not move the market?
- ◆ Market components
 - ◆ Liquidity issues that can hit me even if I don't trade
 - ◆ Other large positions being liquidated?
 - ◆ Reduction in typical volumes?



One interesting proposal – Basel, October 2007

Guidelines for computing capital for incremental default risk in the trading book

- Ã Use internal models to capture default risk that is incremental to what is covered by the VaR model.
- Ã Discussion period now, implementation foreseen for beginning of 2010
- Ã Proposal:
 - ◆ Use risk horizon of one year (!)
 - ◆ Banks would not hold a deteriorating (but liquid) position that long
 - ◆ Constant level of risk: each position is rebalanced at its own liquidity horizon back to a position of similar original riskiness
- Ã Example: BBB bond, one-year risk horizon, one-month liquidity horizon
 - ◆ Start at BBB at par. Simulate for one month.
 - ◆ At one month, realize any P/L, and trade back into a par BBB bond.
 - ◆ Repeat for twelve months.
 - ◆ So exposure is to the convolution of twelve one-month risk periods rather than a single one-year risk period.
 - ◆ Significant difference, particularly with an upward sloping risk profile

Liquidity horizon is a framework to tackle both asset liquidity flavors.



- Ã Proposal: track two statistical risk measures
 - ◆ Mark-to-market risk over a fixed horizon
 - ◆ Full liquidation risk
- Ã Full liquidation risk is defined as potential losses stemming from liquidating the portfolio, assuming we sell each security slowly enough to not materially impact the market.
- Ã Each security needs its own liquidity horizon.
- Ã Questions:
 - ◆ How to estimate liquidity horizon?
 - ◆ How to think about risk with mixed horizons?

The answers are not easy, but we need to start somewhere.



Volume – unused risk information

- Ã If we know volume, we can compute liquidity horizon assuming we can sell a fixed proportion of this volume per day without impacting the market.
- Ã So liquidity horizon is influenced by: our position (specific) and trading volume (market).
- Ã Where can we get volume information?
 - ◆ Exchanges
 - ◆ Market aggregators, e.g. TRACE
 - ◆ ISDA, BIS surveys
 - ◆ Rumors
 - ◆ Clearing institutions, interdealer brokers, etc ... need pressure for transparency



Liquidity VaR – simulate liquidation of all positions

- Ã How to make sense of mixed horizons?
- Ã Purist – correlation applies only for shorter liquidity horizon, after which the liquid market movements do not impact the illiquid ones.
- Ã Pragmatist – just scale volatilities according to liquidity horizons.

- Ã Liquidity VaR will increase relative to standard VaR if
 - ◆ Volumes shrink, or liquidity horizons rise
 - ◆ Asset mix shifts to less liquid securities

The answers are not perfect, but we need to debate them and gain experience with this type of modeling.



Statistical risk measures

SSG Report, Section V

... many firms are planning to change the volatility estimates ... firms may give greater weight to more recent observations, and they may update the volatility estimates more frequently.

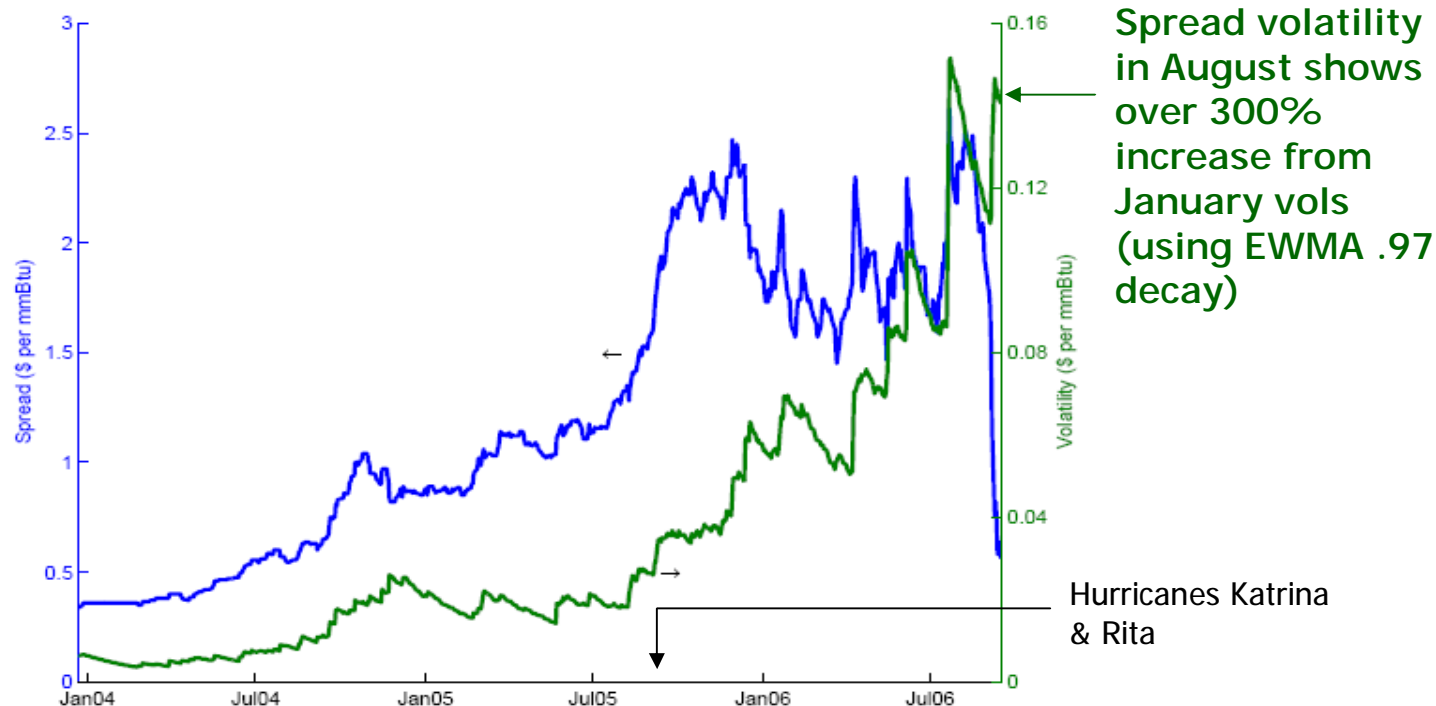
Most firms' VaR measures did not properly capture the basis risk between bonds and credit default swaps.

Simple measures of the sensitivity of super-senior subprime CDO tranches to the AAA spread were not sufficient to capture the credit risk in the product.

Amaranth Case: How Good Were The Risk Models?

Ã Knee jerk reaction was to claim that the 2006 Amaranth Blowup was an exceptional “9 standard deviation event” (Till), and to throw out the models. But in fact, risk models gave plenty of early warning...

Chart of April/March 07 Natural Gas Spreads vs Volatility (EWMA)



Source: Finger (2006) “The Lights Are On”

Amaranth's losses were well within VaR and ES bands



Simple EWMA based risk models performed adequately, and gave early warning

	Residual	<i>p</i> value	Loss/VaR	Loss/ES
September 15				
EWMA, Gaussian	-3.54	0.02%	1.52	1.33
EWMA, <i>t</i>	-3.54	0.30%	1.36	1.03
Equal, Gaussian	-4.63	0.00%	1.99	1.74
Equal, <i>t</i>	-4.63	0.09%	1.78	1.34
September 11–15				
EWMA, Gaussian	-2.93	0.17%	1.26	1.10
EWMA, <i>t</i>	-2.93	0.65%	1.12	0.85
Equal, Gaussian	-8.75	0.00%	3.76	3.28
Equal, <i>t</i>	-8.75	0.00%	3.36	2.54

- Residual—the actual loss divided by the volatility we would have forecast using information available at the time,
- *p* value—the probability, according to our model, of observing a return as bad or worse than what actually occurred,
- Ratio of the actual loss to the VaR (at 99% confidence) forecast, and
- Ratio of the actual loss to the Expected Short-fall (also at 99% confidence) forecast.⁶

Source: Finger (2006) "The Lights Are On"

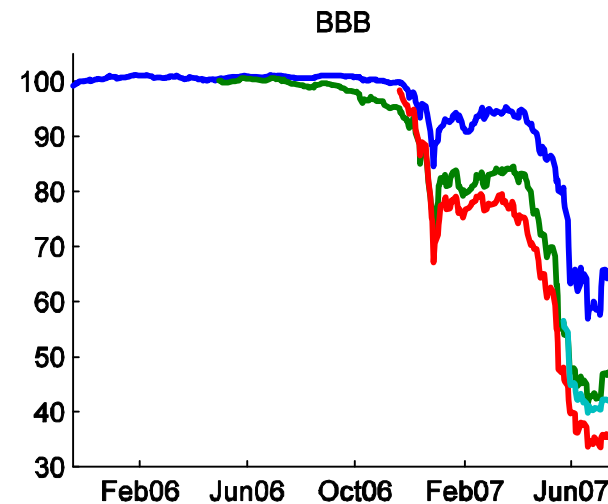
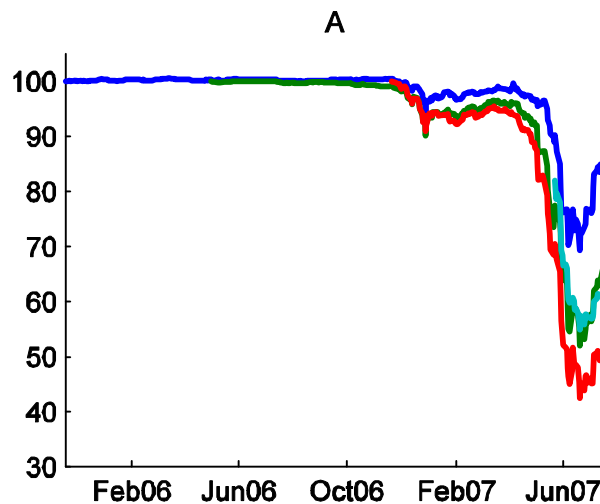
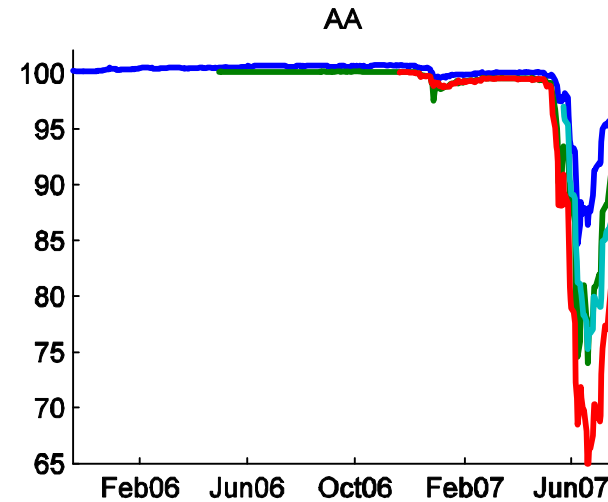
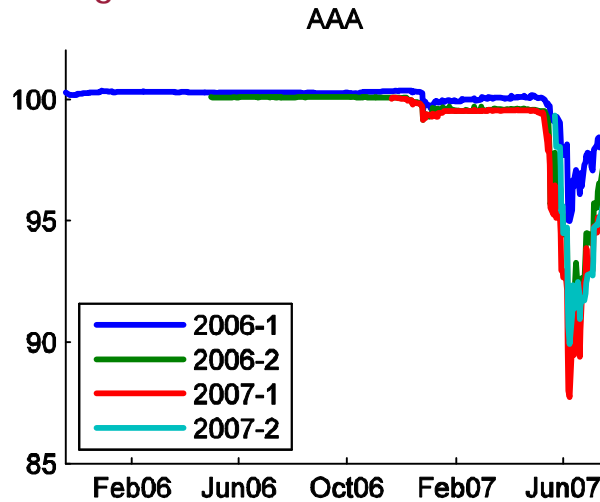
ABX price history

Everyone shows these graphs because it's the only data.



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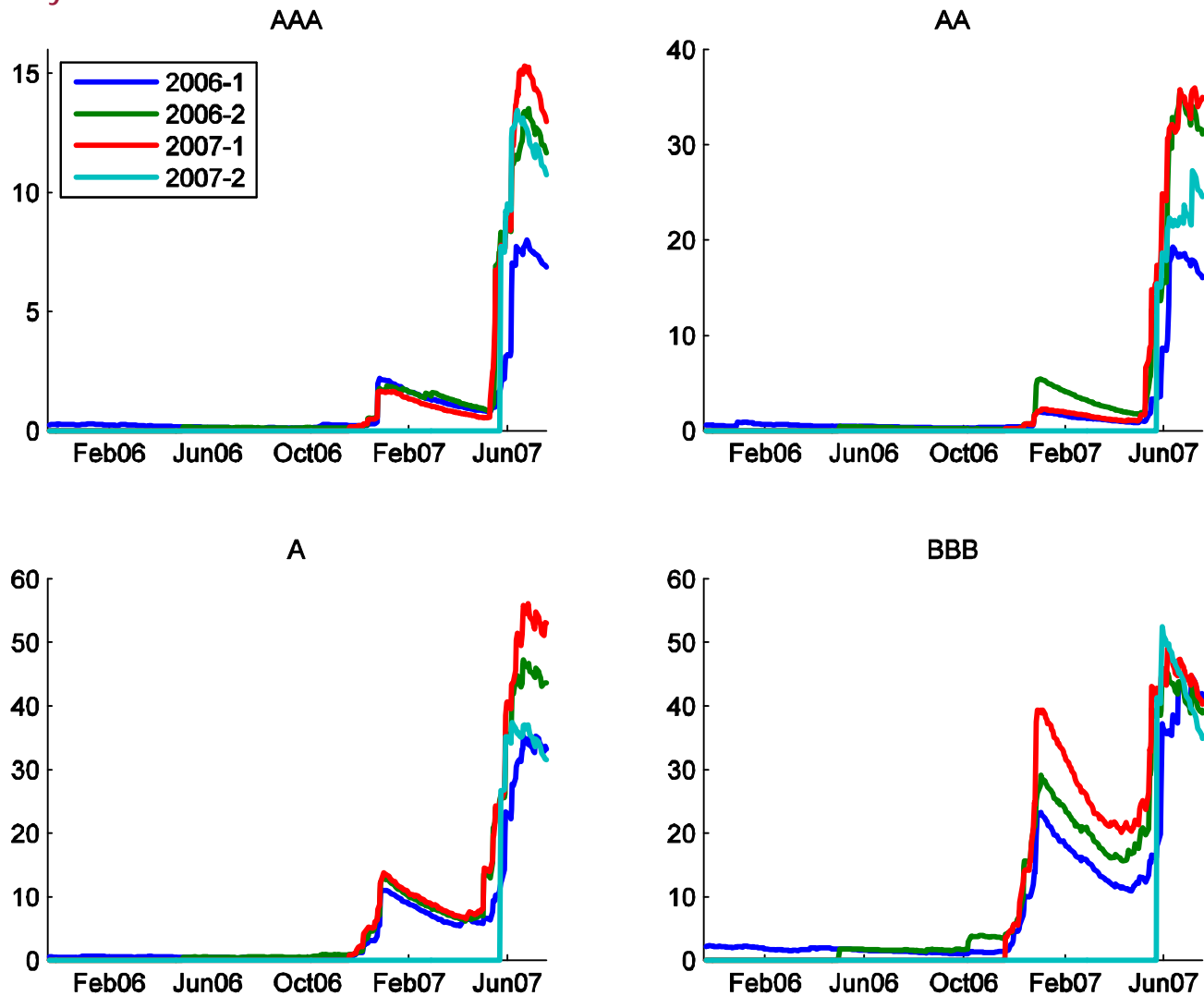
Source: JP Morgan



ABX annualized volatilities show the extent of the market turbulence.



EWMA, decay factor 0.97



R10

Slide 14

R10

Early 2007 ... worries already about BBB attachments. Worries about all tranches in June. Seems like vol today is concentrated more around A (BoA).

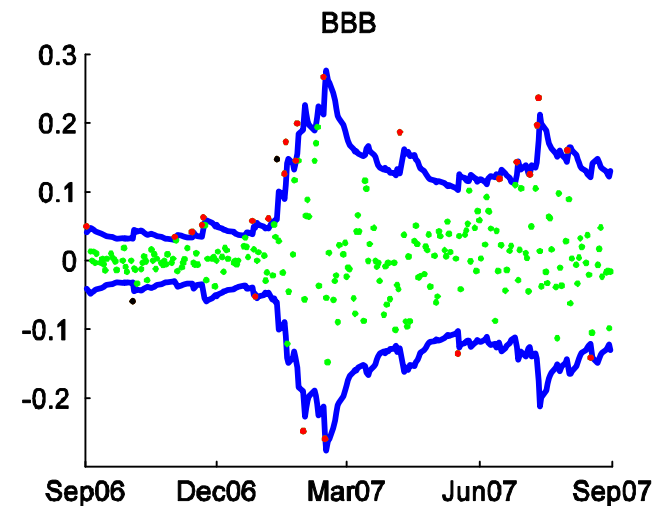
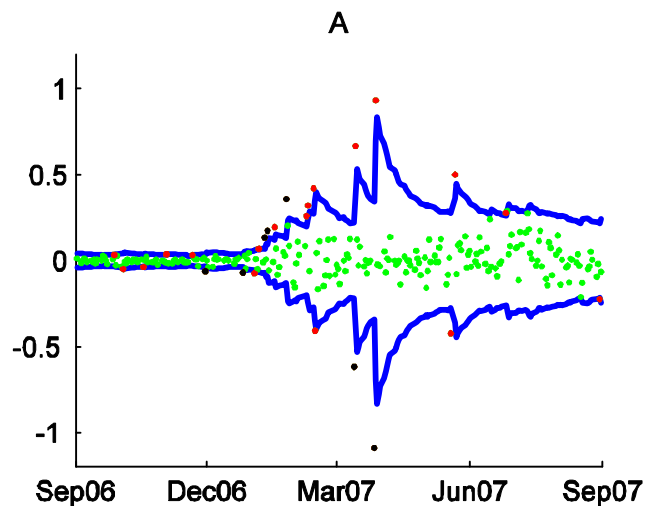
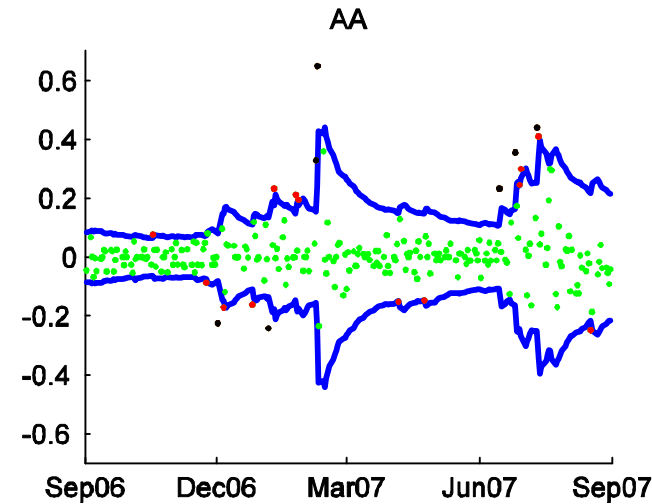
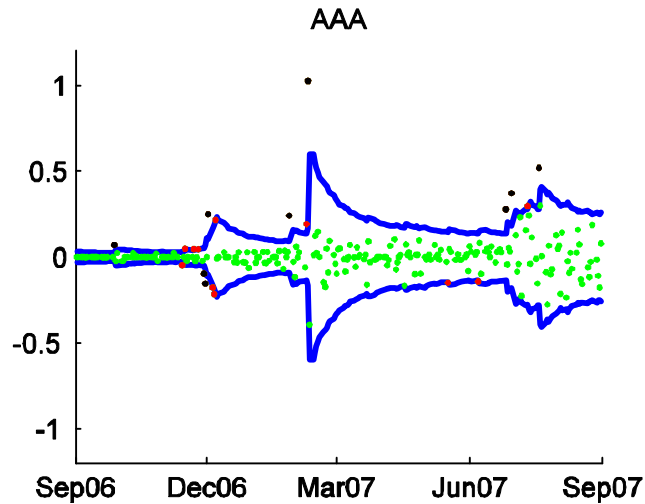
RMG, 2/10/2007

Backtesting: RM06 applied to 2006-1 spreads shows some surprises but satisfactory results overall.



VaR 95, Returns, VaR 95 excessions, VaR 99 excessions

R8



Slide 15

R8

At 99%, AAA and AA fall in BIS yellow zone, others in green.

Worst residual is around 12, on AAA

RMG, 2/10/2007



Signs of a bad model

In the case of UBS, 2007 saw its first exceptions since 1998...In the third quarter of 2007, UBS reported 9 exceedances at 99%. Risk, February 2008.

- Ã Nine years (1998-2007) without an exception, including Sep11 and tech bubble.
- Ã What is a bigger surprise, nine years without an excession or a quarter with nine?
- Ã P-value ($9 \times 250 = 2250$ trading days) = 1.5×10^{-10} ... 6 sigma event ... same as chance of flipping 33 heads in a row
- Ã $P(9 \text{ or more excessions in a quarter}) = 1.5 \times 10^{-8}$
- Ã The period without excessions was 100 times less likely *assuming a good model*.
- Ã In truth, UBS had 16 excessions in 3Q 2007. (My literary license, not Risk's)



Proxies – the bass player in the risk band

Volatility and distributions get the attention, but it all comes down to data.

- Ã Beyond overall model comments, the SSG focused on what data was chosen to model risk in specific cases
 - ◆ CDS-Bond basis ... is there any risk at all?
 - ◆ AAA-rated subprime CDOs ... is there information in other AAA curves?

- Ã When it's not obvious, use proxy data to ...
 - ◆ Perform mark-to-model valuation,
 - ◆ Provide risk sensitivities for a position substitute,
 - ◆ Analyze a basis trade.

- Ã These are all assumptions, though not ones that get as much attention as volatility models.



Bond-CDS basis ... investment grade

Derivatives are a reasonable proxy for valuation and risk for a substitute position...





Bond-CDS basis ... investment grade

... but the basis exists and moves, sometimes wildly.





Bond-CDS basis ... high yield

Relationship is tighter ...





Bond-CDS basis ... high yield

... but basis risks remain.





What is the subprime market?

Poor quality, heterogeneity, and lots of structuring

Ã Subprime mortgages

- ◆ Poor credit, but that is just the beginning.
- ◆ Heterogeneity in mortgage products --- adjustable rates, negative amortization, light (no) documentation, definition of subprime credit

Ã Subprime-backed ABS

- ◆ Assets are a pool of subprime mortgages from a single source.
- ◆ Liabilities are a set of tranches, differentiated by seniority and other structural features.

Ã Subprime ABS-backed CDOs

- ◆ Further structuring, with assets being like rated tranches of ABS deals

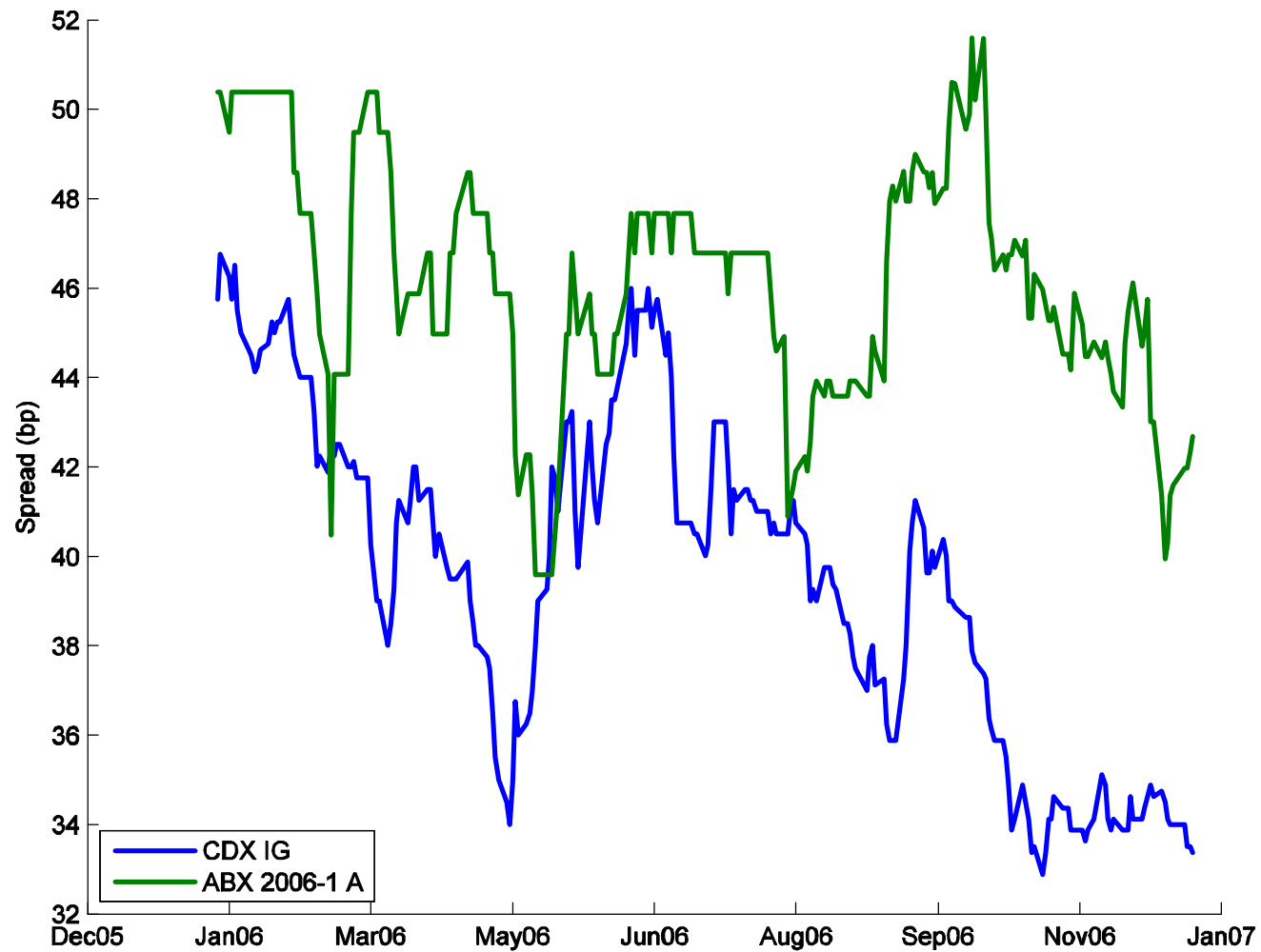
Ã Not surprisingly, the market has little secondary activity and is highly dependent on the rating agencies.

Ã Valuation and risk are thus dependent on proxies to “similar” risks.



Corporate proxy for subprime ... A-rated

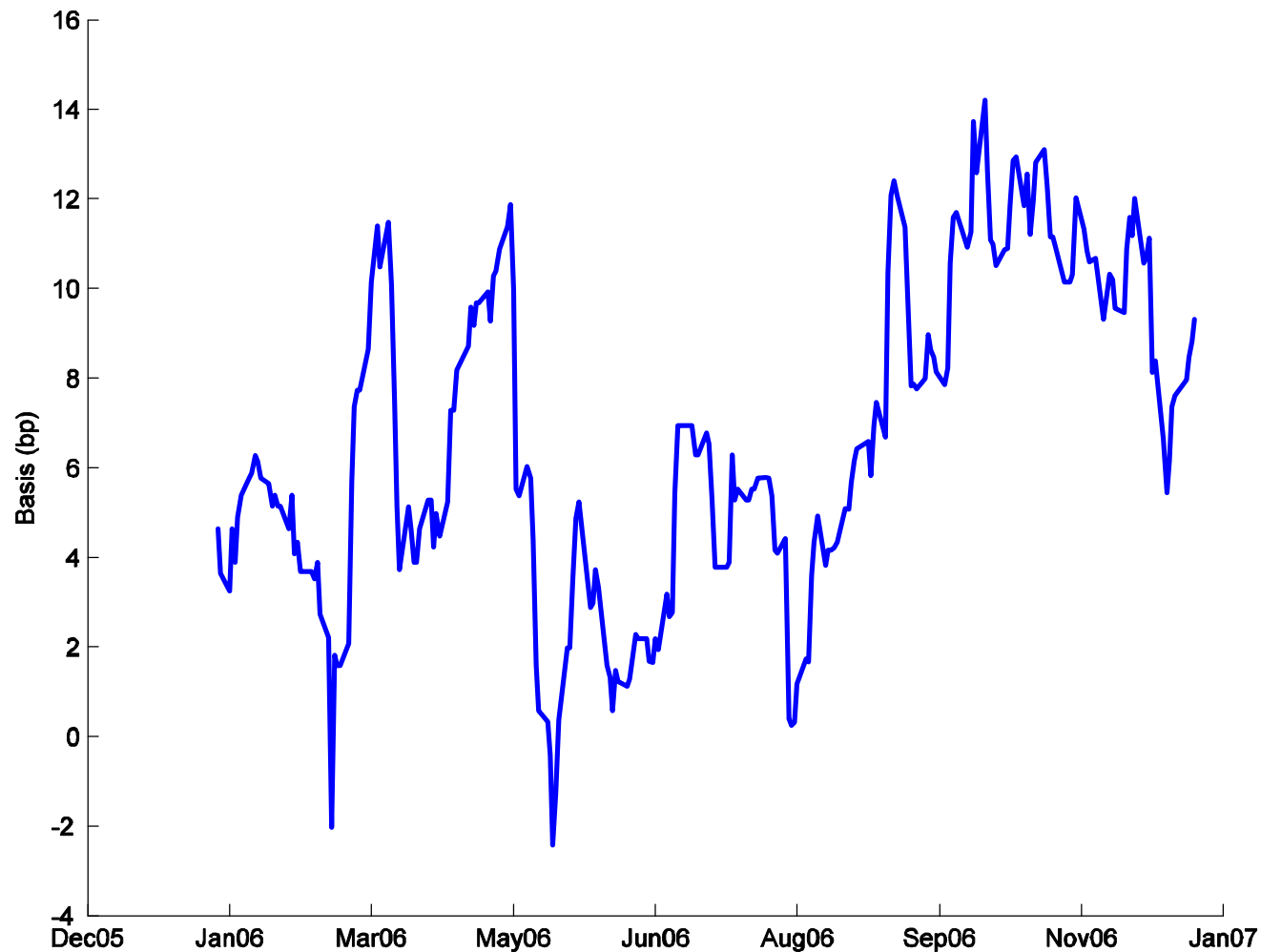
Reasonable match, as long as we aren't trading the basis ...





Corporate proxy for subprime ... A-rated

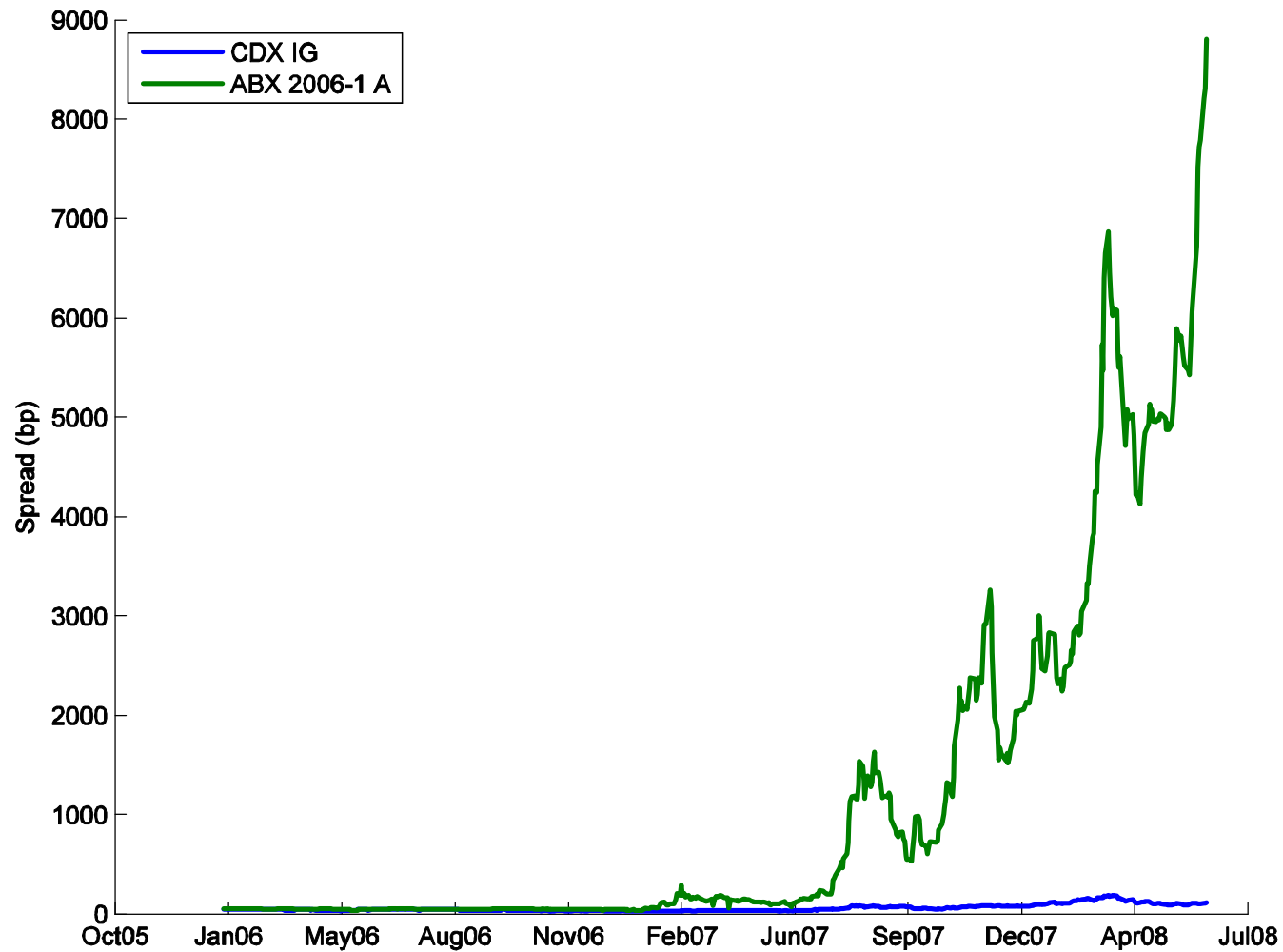
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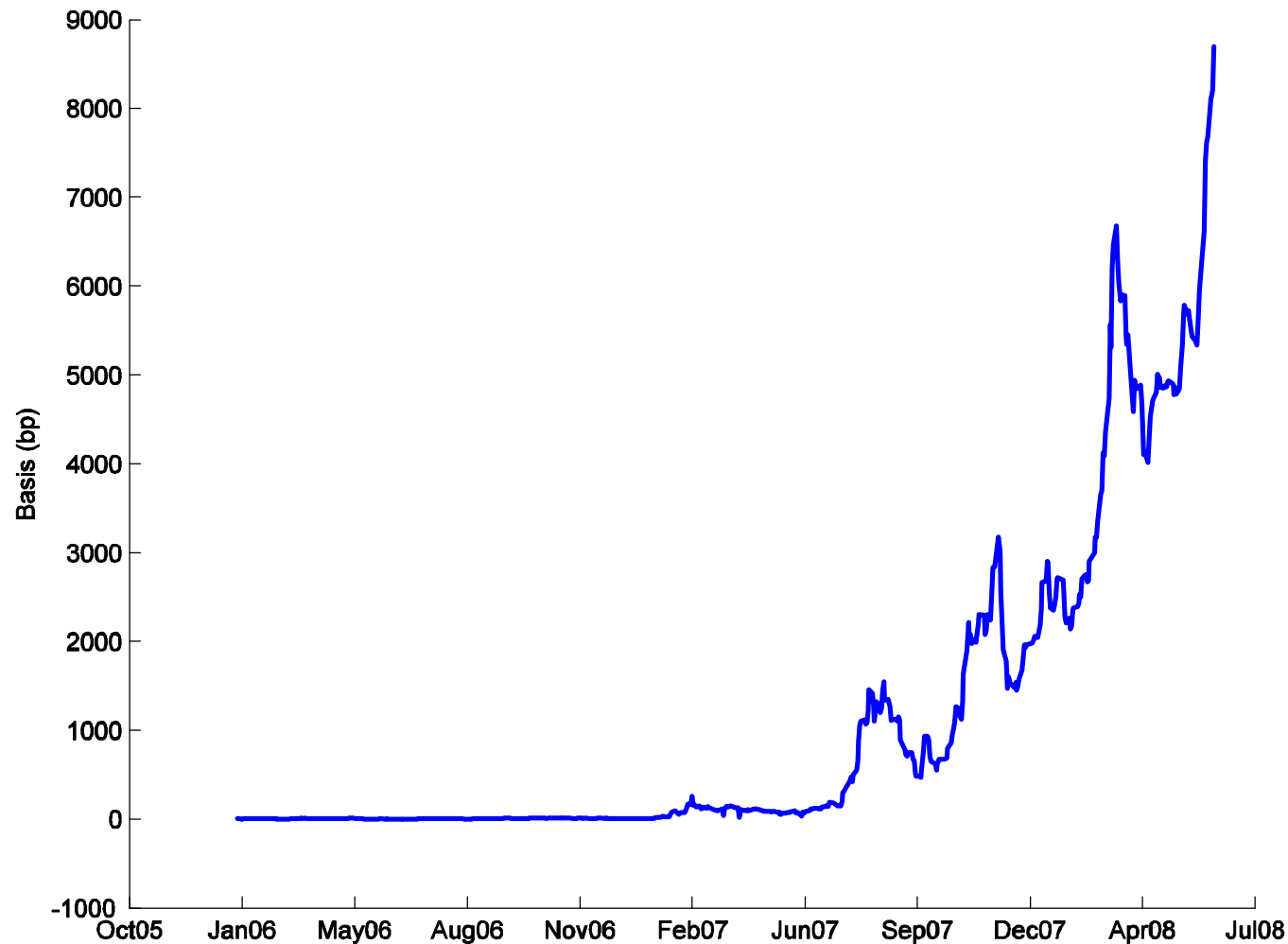
... but things get bad in 2007.





Corporate proxy for subprime ... A-rated

... but things get bad in 2007.





Corporate proxy for subprime ... AA-rated

Corporates look cheap (and uncorrelated) in 2006 ...



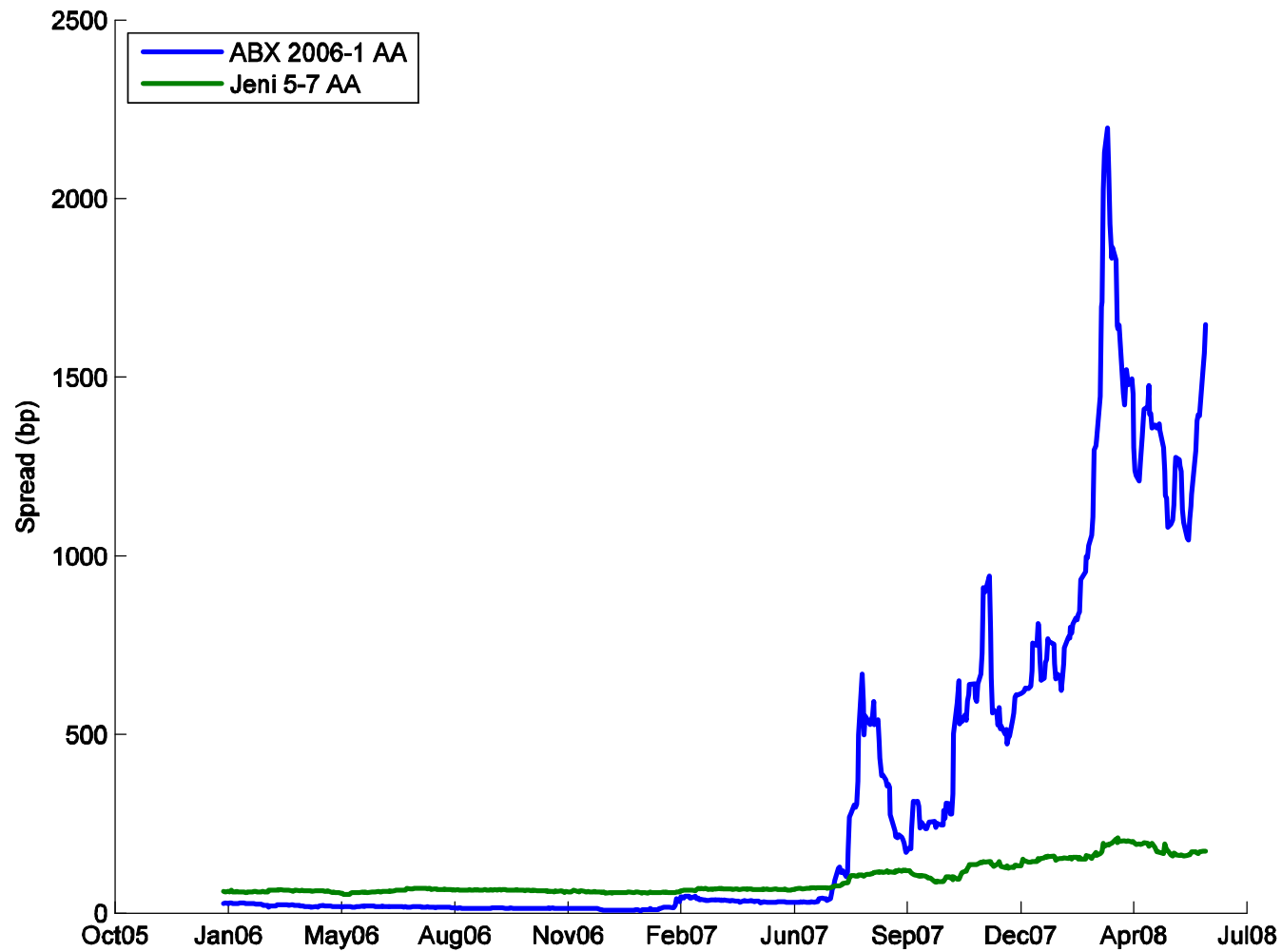


Corporate proxy for subprime ... AA-rated

Corporates look cheap (and uncorrelated) in 2006 ...



Corporate proxy for subprime ... AA-rated



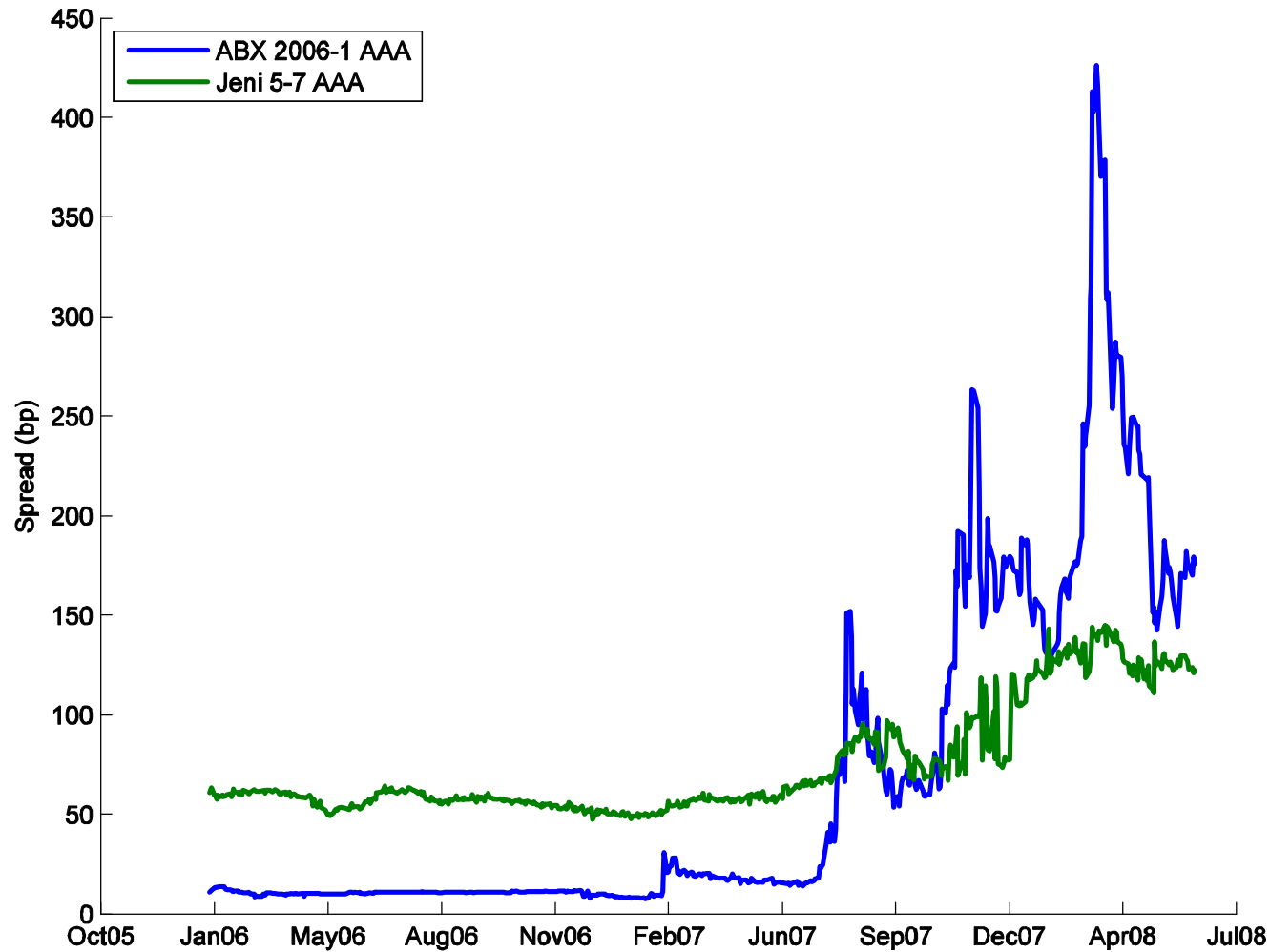
Corporate proxy for subprime ... AA-rated





Corporate proxy for subprime ... AAA-rated

The best of the lot, still poor, and who would have used the valuations in 2006?



Corporate proxy for subprime ... AAA-rated





Subprime proxy

- Ã The subprime proxy relies heavily on consistent ratings.
- Ã How can we compare AAA-rated corporates and AAA-rated structured finance?
 - ◆ Long-term likelihood of full principal and interest repayment,
 - ◆ Mark-to-model valuation,
 - ◆ Short-term price volatility,
 - ◆ Relationship with other asset classes.
- Ã Who is to blame if rely on all of these being comparable?
- Ã Alternate approach for CDOs
 - ◆ Focus on the underlying collateral ... select useful proxies here (e.g. use the ABX).
 - ◆ Approximate the structure, that is, the relationship between collateral and CDO.
 - ◆ A better choice to represent relationships across CDOs and collateral



Statistical measure conclusions

- Ã This was not a crisis of models.
- Ã Bad models produce bad forecasts. Taleb isn't right, but we deserve the criticism anyway.
- Ã You can ignore the basis until you trade it.
- Ã Appreciate the bass player.

Stress testing

SSG Report, Section V

Several firms that experienced losses used VaR and static single-factor stress tests calibrated using the same historical data series. As a result, the stress tests provided no new information.

... a particular challenge was obtaining senior management and business line acceptance of stress tests...

Knowledge of how business areas made money helped risk managers identify relevant stress scenarios ...

... some managers have stressed the importance of considering how market shocks appear to counterparties.

Stress testing should come from the other side of our modeling brain.



- Ã Stress testing should not be an excuse to not fix a bad model. Yes, risk is an art and science, but let's be sure to get the science part right.

- Ã Stress testing should probe the things our model cannot tell us:
 - ◆ Quality of data proxies
 - ◆ Liquidity implications of business surprises (absorbing an SIV)
 - ◆ Changes in funding arrangements with counterparties

- Ã The conversation (not confined to the risk area) is as important as the results.



To read more ...

Ã SSG report

- ◆ Finger (2008). The SSG and My Two Brains. RiskMetrics Research Monthly. March.

Ã Amaranth

- ◆ Finger (2005). The Lights Are On. RiskMetrics Research Monthly. October.

Ã Subprime and ABX

- ◆ Finger (2007). A Subprimer On Risk. RiskMetrics Research Monthly. August.

Ã Liquidity risk

- ◆ Malz (2003). Liquidity Risk: Current Research and Practice. *RiskMetrics Journal*, 4(1): 35-72.

Ã All available at www.riskmetrics.com under Risk Management Publications.