SOCIETY OF ACTUARIES

Article from:

Risk Management

September 2009 – Issue 17

Risk Disclosures and the Credit Crisis

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THE SEC INSTITUTED a requirement for public corporations to provide quantitative information about market risk exposures in January 1997. Since then, major banks have been providing Value-at-Risk (VaR) based risk disclosure in their financial statements in order to satisfy this requirement. Recently, the amount of information provided in these disclosures has increased, with more detail comparing actual daily returns to the daily VaR risk measures for the relevant portion of the company's trading portfolio. However, reconciliation to reported financial results is still lacking.

With the recently published Federal Reserve Supervisory Capital Assessment Program (SCAP) stress test loss estimates, an additional risk disclosure is available for these major banks. Following is a summary of the VaR based risk disclosures provided by J.P. Morgan, Citigroup, and Goldman Sachs in their 2008 year-end annual reports, with a comparison of these disclosures to the Federal Reserve SCAP stress test reported loss estimates released in May of 2009.

2008 VAR DISCLOSURES

Exhibit 1 demonstrates that for all three firms, the reported VaR metrics are up substantially in 2008. In nominal terms the VaR's increased between 82 to 208 percent, and relative to total reported assets on the balance sheet, the increases were 115 to 131 percent.

Using more simplistic risk measures, the year-end 2008 reported asset leverage is down for both Citigroup and Goldman Sachs, and is unchanged for J.P. Morgan relative to year-end 2007. While there are many problems related to this simplistic leverage ratio due to accounting treatment of off-balance sheet structures and derivatives, it does provide a quick estimate for how problematic general asset deflation can be for mark-to-market capitalization levels for banks.

The daily VaR for these companies is also very small compared to the reported assets on the balance sheet. The daily VaR is between 1.5 to 1.6 basis points for J.P. Morgan and Citigroup, and 2.8 basis points for Goldman Sachs. As a comparison, the standard deviation of the 2008 S&P 500 daily returns was 2.6 percent, or 260 basis points.

The daily VaR is also low relative to the credit crisis related losses reported in 2008. According to Bloomberg, the credit crisis related write-downs for 2008 were $41, $102, and $8 billion for J.P. Morgan, Citigroup and Goldman Sachs respectively. If the daily VaR is compared to these write-downs, it would take 204 and 376 consecutive one-in-100 days to achieve the J.P. Morgan and Citigroup losses, respectively, and 44 consecutive one-in-20 days to achieve the Goldman Sachs write-down.

Exhibit 1: Risk Disclosure Comparisons

	JPMorgan			Citigroup			Goldman Sachs		
	2008	**2007**	**Change**	**2008**	**2007**	**Change**	**2008**	**2007**	**Change**
2008 Reported Net Income ($B)	5.6	15.4		-27.7	3.6		2.0	11.4	
Year End Equity ($B)	166.9	123.2	35.4%	142.0	113.0	25.7%	64.4	42.8	50.5%
Year End Total Reported Assets ($B)	2,175.1	1,562.1	39.2%	1,938.5	2,187.0	-11.4%	884.5	1,119.8	-21.0%
Reported Asset Leverage	13	13		14	19		14	26	
Reported VaR Metric	Daily 99%	Daily 99%		Daily 99%	Daily 99%		Daily 95%	Daily 95%	
Year End ($M)	317	103	207.8%	311	163	90.8%	244	134	82.1%
Average ($M)	202	106	90.6%	271	123	120.3%	180	138	30.4%
Year End VaR to Reported Assets	0.015%	0.007%	121.0%	0.016%	0.007%	115.3%	0.028%	0.012%	130.5%
Year End VaR to Reported Equity	0.190%	0.084%	127.2%	0.219%	0.144%	51.8%	0.379%	0.313%	21.0%

" … the reported VaR metrics are up substantially in 2008. In nominal terms, the VaRs increased between 82-208% "

Exhibit 2: VaR Comparison to Writedowns

	JP Morgan	Citigroup	Goldman Sachs
2008 Average Daily VaR ($B)	0.20	0.27	0.18
Credit Crisis Cumulative Writedown to date ($B) *	41.2	101.8	7.9
Cumulative Reported Writedowns to 2008 Average VaR	204	376	44

* Source: Bloomberg Cumulative Credit Crisis Writedown, as of 6/30/2009

Without disclosure regarding what portion of the overall portfolio the VaR metric is supposed to represent, along with reconciliation to the published financial results, the ability to assess these daily VaR disclosures across companies and compare them to other market based risk measures is limited.

OTHER RISK DISCLOSURES

In 2008 each company reported additional information regarding the daily performance of the trading portfolios upon which the VaR metrics are based. Citigroup only showed 2008 results, while J.P. Morgan and Goldman Sachs reported 2007 and 2008 results. The reported number of days with a trading loss was up for both J.P. Morgan and Goldman Sachs, with both reporting 97 trading day losses in 2008, compared to 46 and 52 in 2007 for J.P. Morgan and Goldman Sachs respectively. Citigroup reported 109 trading days with a loss in 2008, but did not report similar performance metrics for 2007.

This daily report provides a measure of the methodology reasonability, as a 99 percent VaR implies one should expect 2.6 days a year in excess the measure, while a 95 percent VaR should result in 13 days in excess of the threshold, just as the JP Morgan and Goldman Sachs disclosures show for 2008. Although the number of trading days with losses were up for both J.P. Morgan and Goldman Sachs, the number of days where there VaR threshold was exceeded was down.

In addition to these summary gain/loss statistics, each company reported information regarding the number of days with gains and losses of certain sizes.
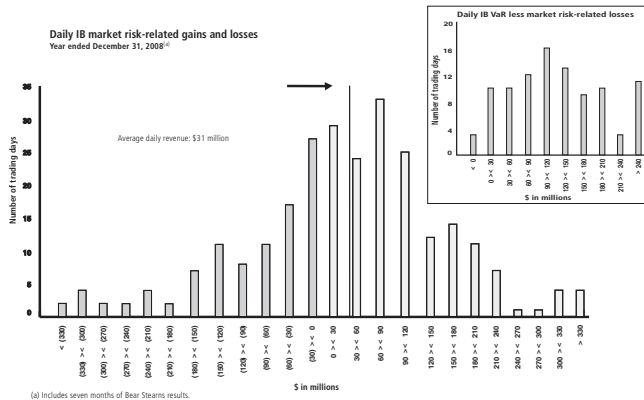
Exhibit 3: Trading Portfolio Daily Results

	JPMorgan		Citigroup		Goldman
	2008	2007	2008	2007	2008
Number of days with gains	165	215	151	*	162
Number of days with losses	97	46	109	*	97
Total	262	261	260	*	259
Number of days > VaR	3	8	*	*	13

* Not Disclosed

JP Morgan daily market risk gains and losses

Daily IB market risk-related gains and losses
Year ended December 31, 2008[a]

Average daily revenue: $31 million

Number of trading days

$ in millions

Daily IB VaR less market risk-related losses

Number of trading days

$ in millions
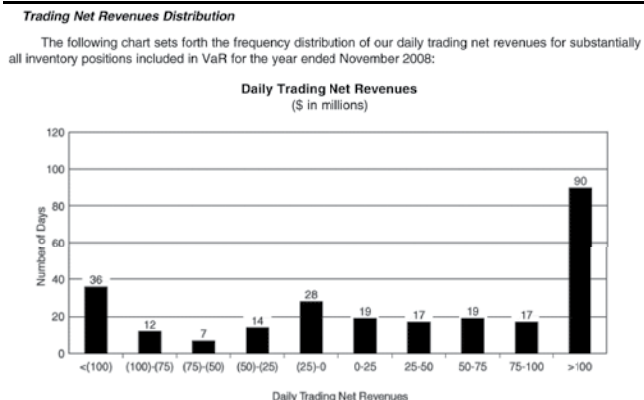
(a) Includes seven months of Bear Stearns results.

J.P. Morgan's histogram shows the number of days that gains and losses fell within a specified range. Average daily revenue for 2008 was $31 million. The embedded second chart demonstrates the amount by which the 99 percent VaR exceeded the actual loss on days where a loss. This embedded chart demonstrates the daily loss exceeded the 99 percent VaR confidence level metric three times during 2008.

Citigroup daily trading related revenue

Histogram of Daily Trading-Related Revenue* — Twelve Months Ended December 31, 2008

Number of Trading Days

Revenue (dollars in millions)

*Includes subprime-related losses on credit positions which were marked intermittently during each month. Most of the loss events in the $800-$4,500 million category are due to cumulative write-downs on these positions.
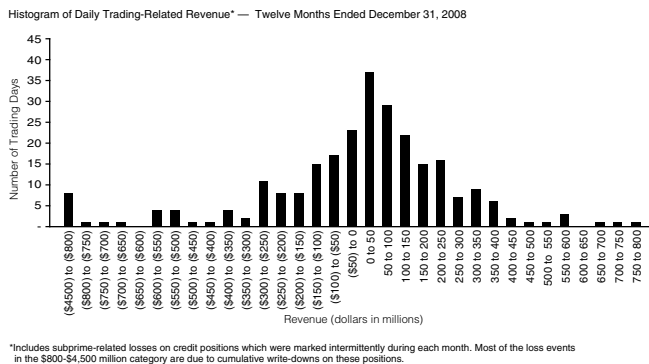
Citigroup's disclosure is similar in format, but demonstrates a wider spread of losses than J.P. Morgan's exhibit. The fact that the left most loss column of the distribution is a $4.5 billion to $800 million loss range highlights why many actuaries advocate Tail Value at Risk (TVaR) over VaR. TVaR is based upon the expected value of events beyond a loss threshold, rather than just the loss at the selected threshold that VaR uses. TVaR would better reflect the loss potential of this thick tailed distribution.

Goldman Sachs daily trading related revenue

Trading Net Revenues Distribution

The following chart sets forth the frequency distribution of our daily trading net revenues for substantially all inventory positions included in VaR for the year ended November 2008:

Daily Trading Net Revenues
($ in millions)

Number of Days

Daily Trading Net Revenues

The Goldman Sachs version of this disclosure contained fewer buckets and less information regarding the tail of the distribution, providing information only around +/- $100M of revenue. However, even this limited information implies that the nature of the trading portfolio for Goldman Sachs is different than that of J.P. Morgan and Citigroup.

With these daily distribution disclosures, even more information is being provided to investors regarding the nature of the daily return distributions, but again, reconciliation to actual annual financial results would increase the usefulness of this disclosure.

"If the daily VaR is compared to these write-downs, it would take 204 and 376 consecutive 1-in-100 loss days to achieve the JP Morgan and Citigroup 2008 write-downs."

COMPARISON OF VaR DISCLOSURE TO SCAP LOSS ESTIMATES

On May 7, 2009, the Board of Governors of the Federal Reserve System released their summary report for The Supervisory Capital Assessment Program (SCAP). This program consisted of an assessment of the capital adequacy of the largest 19 U.S. bank holding companies based on a standardized stress test. The stress test was a two-year prospective loss estimate under a "baseline" and a "more adverse" macro economic scenario. The participating firms were required to estimate their potential losses on loans, securities, and trading positions, which were used with independent benchmarks by the supervisors to develop the bank supervisors' loss estimate. The total two-year loss estimate for these 19 firms under the "more adverse" scenario was $599 billion.

Exhibit 4 compares the published SCAP more adverse scenario loss estimates for these three firms to their corresponding daily VaR disclosure. J.P. Morgan's total SCAP loss estimate is $97.4 billion, while Citigroup and Goldman Sach's loss estimates are $104.7 billion and $17.8 billion respectively. These loss estimates are not directly comparable to most VaR disclosures, as the VaR calculation is typically limited to a firm's trading portfolio.

Luckily, the SCAP loss estimates provided detail that allows the segmentation of the losses into loan exposures vs. trading and securities activities. A more realistic comparison would be to use the portion of the SCAP loss estimate that was attributed to the trading and securities activities. The SCAP trading and securities loss estimates were $17.9, $25.3, and $17.5 billion for J.P. Morgan, Citigroup and Goldman Sachs respectively. From this measure, it is evident that JP Morgan and Citigroup have much larger mortgage and commercial loan exposure, while Goldman Sachs stress test loss estimate is dominated by this trading and securities portion of the stress test.

Exhibit 4: SCAP Stress Test Loss Estimate Comparison to VaR

	JP Morgan	Citigroup	Goldman Sachs
SCAP Loss Estimate ($B)	97.4	104.7	17.8
% of Year End 2008 Assets	4.5%	5.4%	2.0%
% of Year End 2008 Equity	58.4%	73.7%	27.6%
Total Loss Rate on Loans	10.0%	10.9%	0.9%
SCAP Trading + Securities Loss Estimate($B)	17.9	25.3	17.5
Year End 2008 VaR ($B)	0.317	0.311	0.244
Reported VaR Metric	Daily 99%	Daily 99%	Daily 95%
Annualized VaR Estimate ($B)	5.1	5.0	3.9
2 Year VaR Estimate ($B)	7.2	7.1	5.6
2 Year 99.9%VaR Estimate ($B)	9.6	9.4	10.5
SCAP Trading Loss to 2 Yr VaR Estimate	1.9	2.7	1.7
Required daily auto-correlation at VaR(99.9%)	55%	76%	48%

The corresponding reported year end 2008 daily VaR was $317, $311, and $244 million for the three firms. J.P. Morgan and Citigroup report a 99 percent VaR, while Goldman Sachs reports a 95 percent VaR. In order to be put on a similar time horizon as the two-year basis of the SCAP loss estimates, the daily VaR needs to be converted to a two-year measure.

If daily returns are assumed to be independent, then annual VaR can be estimated as the aggregation of daily VaR's. The relationship between daily VaR and an n day VaR can be described as [1]

$$\text{VaR}_{99\%}(D_n) = \text{VaR}_{99\%}(D)\sqrt{n} = 2.326\,\sigma\sqrt{n}$$

For a one-year horizon, assuming 260 trading days in a year, the daily VaR multiplier would be

$$\sqrt{260} = 16.1$$

For a two-year horizon, the daily VaR multiplier would be

$$\sqrt{520} = 22.8$$

The same adjustment can be applied to a 95 percent VaR, as used by Goldman Sachs, with 2.326 replaced by 1.645 in the formula above. An additional adjustment could be to extend the return period to a 99.9% threshold to be more consistent with what firms would use for a Basel II based capital measure.

$$\text{VaR}_{99.9\%}(D) = 3.090\sigma$$

The corresponding estimated two-year VaR$_{99.9\%}$ is then $9.6, $9.4, and $10.5 billion for J.P. Morgan, Citigroup and Goldman Sachs respectively. The SCAP trading loss

estimate is still 1.9, 1.7, and 2.7 times this adjusted VaR measure.

We can relax the independence assumption between days and allow for a one-day lag auto-correlation, where the correlation of loss between one-day and the next subsequent day is ρ, the two-day lag correlation is $\rho 2$, and the N day lag correlation is ρ^N. The 2 year return standard deviation then becomes

$$\sqrt{N + 2\sum_{i=1}^{N-1}(N-i)\,\rho^i}$$

The last row of Exhibit 4 shows the daily auto-correlation (ρ) required enough to reach the SCAP loss estimate is 55 percent, 76 percent, and 48 percent, respectively.

These simplistic conversions of daily VaR are far from ideal. Market volatility is not constant through time, and neither is the composition of the portfolios for these firms. Furthermore, while the normality assumption simplifies the math, it understates the likelihood of extreme daily changes. Finally, reported VaR's have not been stable, potentially limiting their usefulness as the reported information may be dated by the time the disclosure is published. Nevertheless, the SCAP loss estimates appear to be more conservative than these daily VaR metrics would imply.

CONCLUSION

Risk disclosures of the major banks are improving. Disclosure of the daily returns corresponding to the daily VaR reported metrics provides information regarding how often the VaR measurements have been exceeded, and the SCAP loss estimates provide an additional risk estimate

data point. However, without transparency regarding what portion of the portfolio is included in the VaR calculation, or a reconciliation to the internal models used for Basel II regulatory capital requirements, investors and counterparties are still missing critical pieces necessary to use these disclosures to assess the adequacy of a bank's capitalization.

More useful risk disclosures would build upon the example from J.P. Morgan's 2008 annual report, which attempts to reconcile their economic risk capital to their total GAAP equity.

Exhibit 5 - JP Morgan Economic Risk Capital Disclosure

Economic risk capital	Yearly Average	
(in billions)	2008	2007
Credit risk	$37.8	30
Market risk	10.5	9.5
Operational risk	6.3	5.6
Private Equity risk	5.3	3.7
Economic risk capital	59.9	48.8
Goodwill	46.1	45.2
Other (a)	23.1	24.7
Total common stockholder's equity	$129.1	118.7

(a) Reflects additional capital required, in the Firm's view, to meet its regulatory and debt rating objectives.

p. 82 JP Morgan Chase & Co./ 2008 Annual Report

Reconciling the economic risk capital to GAAP equity is a good start towards creating a more useful set of risk disclosures. However, the $10.5 billion economic risk capital measure for market risk should be comparable to the reported VaR, and the lack of reconciliation between the two numbers limits their usefulness. Better reconciliation of VaR to profitability and capital measures is a worthy goal and something more financial firms should pursue in their effort to increase transparency for their investors. ✦

FOOTNOTES:

[1] Assume the daily return (D) is normally distributed with constant volatility, where D~N(0,σ).

For N(0,1)

$Z_{99\%} = \Phi^{-1}(99\%)$ in Excel, NORMINV(0.99,0,1)

For N(0,σ),

$VaR_{99\%} = Z_{99\%}*\sigma$

$VaR_{99\%}(D) = 2.326\sigma$

For a multiple day VaR measure of n days, where volatility is constant and daily returns are independent:

Standard Deviation $(D_n) = \sqrt{\sigma_1^2 + \sigma_2^2 + \sigma_3^2 + ... + \sigma_n^2} = \sigma\sqrt{n}$

$VaR_{99\%}(D_n) = 2.326\,\sigma\sqrt{n}$

$VaR_{99.9\%}(D_n) = 3.09\,\sigma\sqrt{n}$