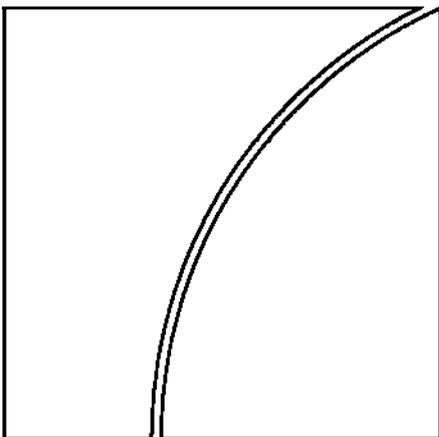


Basel Committee
on Banking Supervision



Analysis of the trading book quantitative impact study

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Analysis of the trading book quantitative impact study

In early 2009, the Basel Committee's Trading Book Group (TBG) conducted a study to assess the quantitative impact of proposed revisions to Basel II's market risk framework. These proposals were published in January 2009¹ and subsequently adopted by the Committee in July 2009. Please refer to the attached Annex and Glossary for further information on the calculation of capital requirements for market risk and a description of certain terms used in this paper.

The scope of the exercise included assessing the impact of:

- the capital charge for incremental risk,²
- the stressed value-at-risk (VaR) capital charge,
- the capital charges for securitisation exposures in the trading book and
- the revised specific risk capital charge for certain equity exposures under the standardised measurement method.

The Committee will conduct an impact study in 2010 which will focus on correlation trading activities. On the basis of the results of that study, the Committee will evaluate a floor for the comprehensive risk capital charge which could be expressed as a percentage of the charge applicable under the standardised measurement method.

Section 1 of this paper provides a brief summary of the key findings. Section 2 discusses the sample of banks used in the study. Section 3 presents the overall results. The paper presents detailed results regarding the incremental risk capital (IRC) charge (Section 4), stressed value-at-risk (Section 5), securitisation (Section 6) and specific risk capital charges for equities subject to the standardised measurement method (Section 7).

Throughout this paper, findings are presented and discussed with summary tables that employ a high degree of aggregation so as not to reveal firm-specific information. Furthermore, the discussion of the results often refers to the *average* capital impact of a given capital proposal. While the average is a useful summary statistic it is important to realise that there is often significant heterogeneity in the results. All tables also present results on the median impact as well as the standard deviation. While these statistics are not always explicitly discussed they should be considered carefully when interpreting the results of this analysis.

1. Summary of key findings

This impact study includes data from 43 banks across 10 countries. Key findings from the study are as follows:

¹ Basel Committee on Banking Supervision, *Revisions to the Basel II market risk framework*, consultative document, January 2009.

² Please see the Glossary for an explanation of technical terms and the Annex for details regarding the calculation of capital requirements for market risk under the new and the previous market risk frameworks.

1. The results of the impact study indicate an average (median) increase of at least 11.5% (3.2%) of overall capital requirements and of 223.7% (102.0%) of market risk capital requirements.³ This excludes any capital charges for securitisation exposures which are not re-securitisations under the standardised measurement method or the comprehensive risk capital charge. The overall average includes banks which did not report data on all aspects of the revisions so that the changes in capital requirements for some items in the calculation of the overall change in capital requirements had to be assumed to be zero. Therefore, the actual change in minimum capital requirements will likely be higher.
2. The incremental risk capital charge results in an average (median) increase of overall capital requirements of 6.2% (3.6%). Expressed in terms of market risk capital requirements, the incremental risk capital charge results in an average (median) increase of 102.7% (60.4%). Relative to the specific risk surcharge, the incremental risk capital charge is on average nine times as high. The results from this impact study are consistent with the results of the second impact study.
3. The introduction of stressed VaR results in an average (median) increase of overall capital requirements of 4.6% (2.7%). Expressed in terms of market risk capital requirements, the increase is 110.8% (63.2%). On average, the stressed VaR was 2.6 times the non-stressed VaR. There is no evidence that the stressed VaR exhibits less diversification benefits than the non-stressed VaR.
4. The introduction of new standardised specific risk capital charges for re-securitisation exposures results in an average (median) increase in overall capital requirements of 5.4% (0.1%). Expressed in terms of market risk capital requirements the average (median) increase will be 92.7% (1.8%).
5. The capital charges for equity specific risk under the standardised measurement method result in an average (median) increase of overall capital requirements of 0.2% (0.1%). Expressed in terms of market risk capital requirements, the average (median) increase is 4.9% (1.9%).

2. Scope of exercise and sample of banks

The scope of the exercise included the capital charge for incremental risk, the stressed VaR capital charge, the capital charge for securitisation exposures in the trading book and the revised specific risk capital charge for certain equity exposures under the standardised measurement method. Due to the timing of the study, it does not yet reflect the changes made in the final *Revisions to the Basel II market risk framework* published in July 2009 regarding the treatment of banks' correlation trading activities. Therefore, the capital charges for securitisation exposures have been excluded in this analysis, although resecuritisation exposures are included. The Committee's impact study in 2010 will focus on correlation trading activities. On the basis of that study, the Committee will evaluate a floor for the comprehensive risk capital charge which could be expressed as a percentage of the charge applicable under the standardised measurement method.

³ The current market risk capital requirements have been calculated based on the data reported for 31 December 2008. However, they have been adjusted by replacing the VaR at the reporting date by the VaR of a more conventional market period such as 31 December 2006 if this was reported by the bank. This better reflects the long-term impact on market risk capital requirements.

Overall, 43 banks contributed data to the impact study. Not all banks provided data on all the aspects covered. While all but five banks provided data on the stressed VaR capital requirement, only 25 banks provided an estimate of the incremental risk capital charge and 28 provided data on the impact of the capital charge for securitisation exposures.

Since national supervisors mainly asked large, internationally active banks to participate in the study, only 12 participating banks calculated the impact of the revised capital charge for certain equity exposures under the standardised measurement method. Most banks in the sample use the internal models approach to market risk, and therefore this change will not be relevant for them or it will apply only to an insignificant part of their exposures. The smaller banks for which this change will be more relevant have not been included in this study.

3. Overview of results

Table 1 and Table 2 show the overall effect of the capital charges introduced with the revisions to the market risk framework. The current capital charges have been calculated based on the capital requirements at 31 December 2008. However, the market risk capital requirements have been adjusted by replacing the VaR at the reporting date by the VaR of a more conventional market period such as 31 December 2006 if this was reported by the bank. This better reflects the long-term impact on market risk capital requirements.

The additional capital requirements have been calculated by adding the new capital requirements for stressed VaR, equity specific risk, the incremental risk capital charge and the capital requirements for securitisation exposures. The previous specific risk capital surcharge, the capital charge for securitisation exposures under the standardised measurement method and the impact (if positive) of including securitisation exposures in the VaR have been removed from the capital requirements.⁴ If a particular bank did not report data on an aspect of the revisions, the change in capital requirements for this item in the calculation of the overall change in capital requirements was assumed to be zero. Therefore, the actual overall impact of the revisions may be underestimated.

The totals in Table 1 and Table 2 approximate the combined effect of all proposed revisions if only re-securitisation exposures were treated under the standardised measurement method. It is important to note that the results on the impact of new standardised capital charges on re-securitisations reported here represent a lower bound for the overall effect of the securitisation capital charges.⁵ Finally, it should be noted that the results in Table 1 and Table 2 do not include the capital requirements for the correlation trading portfolio.

Table 1 shows the change in overall bank-level (ie including market, operational and credit risk) capital requirements which are due to the changes introduced with the revisions to the market risk framework. On average, overall capital requirements would increase by 11.5%

⁴ The quantitative questionnaire used for this impact study did not differentiate between securitisations and re-securitisations when measuring the size of current specific risk capital charges for securitisation and re-securitisation exposures and the impact of securitisation and re-securitisation exposures on VaR. As a result, it was simply assumed that all measurements pertain to re-securitisation exposures which results in a clear overestimate of the size of current specific risk capital charges and the VaR impact of these exposures.

⁵ The total including re-securitisation exposures only represents a lower bound because (i) all specific risk capital charges under the old treatment have been removed; and (ii) some securitisation capital charges will continue to apply.

including re-securitisation exposures only. The largest contribution to the increase can be attributed to the incremental risk capital charge (6.2%), followed by re-securitisation exposures (5.4%), the stressed VaR (4.6%) and the changes in the specific risk capital charges for equity exposures under the standardised measurement method (0.2%).⁶

Table 1
**Effect of capital charges on overall capital requirements,
as a percentage of banks' overall capital requirements**

	Share market risk	Impact of...				Total**
		stressed VaR	equity specific risk	IRC*	re-sec.**	
Mean	7.3	4.6	0.2	6.2	5.4	11.5
Median	3.9	2.7	0.1	3.6	0.1	3.2
StDev	9.9	5.4	0.3	9.5	14.5	18.3
Min	0.3	0.3	0.0	-2.9	-5.2	-0.4
Max	57.1	29.1	0.9	40.8	67.5	85.0

* IRC capital requirements are based on the data provided for a three-month liquidity horizon and a one-year capital horizon. ** Due to data availability constraints, the current capital requirements for *all* securitisation exposures had to be deducted from the new requirement for *re-securitisation* exposures. Therefore, the actual impact will in general be higher.

The same results are reported in Table 2 as a percentage of banks' market risk capital requirements. The largest contribution to the average increase can be attributed to the stressed VaR (110.8%), followed by the incremental risk capital charge (102.7%), re-securitisation exposures (92.7%) and the changes in the specific risk capital charges for equity exposures under the standardised measurement method (4.9%).

⁶ Unlike the results for individual banks, the averages for the individual changes do not add up to the average of the total change in capital requirements since the set of banks providing results for each capital charge differs.

Table 2

**Effect of capital charges on market risk capital requirements,
as a percentage of banks' market risk capital requirements**

	Share market risk	Impact of...				Total**
		stressed VaR	equity specific risk	IRC*	re-sec.**	
Mean	7.3	110.8	4.9	102.7	92.7	223.7
Median	3.9	63.2	1.9	60.4	1.8	102.0
StDev	9.9	125.1	6.7	130.8	205.5	287.7
Min	0.3	7.2	0.1	-38.3	-65.0	-19.5
Max	57.1	694.5	19.9	534.5	904.2	1112.8

* IRC capital requirements are based on the data provided for a three-month liquidity horizon and a one-year capital horizon. ** Due to data availability constraints, the current capital requirements for *all* securitisation exposures had to be deducted from the new requirement for *re-securitisation* exposures. Therefore, the actual impact will in general be higher.

4. Incremental risk capital charge

The estimated size of the incremental risk capital charge is reported in Table 3 as a fraction of market risk capital requirements for liquidity horizons of one month, three months and six months. In total, 25 banks from nine different countries submitted results on the estimated impact of the IRC. Of the 25 banks, three included equity exposures into their IRC model. Since banks that adopt an IRC model will no longer be subject to a specific risk surcharge, the net effect of the IRC must be measured by subtracting the specific risk surcharge, reported in column 2, from the IRC. Using the case of a three-month liquidity horizon as a benchmark, reported in column 4, the net effect of the IRC is estimated to result in an average increase of 103% in market risk capital. This result, however, is affected by a few large outliers as indicated by the significantly lower median of 60%.⁷ The bank-level results indicate that the IRC produces a net increase in market risk capital for all but two banks.⁸

The size of the IRC does depend on the assumed liquidity horizon. These results indicate that increasing the liquidity horizon from one to six months increases the capital charge, on average, by 20% though there is substantial variation in the size of the increase.⁹ Bank-level

⁷ The median increase of 60% differs from the result obtained by taking the difference between column 4 and column 2 of Table 3. The set of banks reporting a three-month IRC differs from that reporting a specific risk surcharge. The median increase is computed by considering only those banks that report both a three-month IRC and a specific risk surcharge.

⁸ The net decrease for two banks is due to a high specific risk surcharge under the current regime for these banks.

⁹ Table 3 suggests that the average IRC actually decreases as the liquidity horizon increases from one month to three months. This result is driven by the fact that the set of banks reporting a one-month IRC differs from that

results indicate that four banks actually report a decrease in IRC as the liquidity horizon lengthens from one month to six months while at the other extreme, two banks report roughly a 200% increase in the IRC.

The current version of the IRC guidelines includes both default and migration risks as well as equity risks which may be included in the model. In the final column of Table 3 the results for the default-only IRC at a liquidity horizon of three months are reported. Comparing these default-only charges with the full IRC charges of the same liquidity horizon indicates that the inclusion of non-default risks in the IRC results in an average increase of roughly 33% over a default-only IRC. Finally, in the case of three banks adding non-default risks to the IRC is estimated to actually reduce the capital requirement. In each of these cases, the bank's credit exposure is net short. Moreover, in one case the bank has confirmed that the methodology used to compute the IRC assumed that credit migrations and defaults were independent rather than mutually exclusive. This assumption tends to overstate the effect of migrations as migrations may occur in the event of default and was employed by the bank in order to comply with the survey deadline; it would not be employed in a more carefully specified IRC model.

Table 3

Incremental risk capital charge for different liquidity horizons compared to the overall market risk capital requirements, in per cent

	Capital charge SMM (fallback option)	Specific risk surcharge	Incremental risk capital charge including default and migration risk for a liquidity horizon of...			Default-only charge, 3m liquidity horizon
			1m	3m	6m	
Mean	422	23	136	126	156	97
Median	181	17	92	84	98	66
StDev	714	20	131	132	159	92
Min	26	1	9	5	5	7
Max	2973	78	522	565	613	375

5. Stressed value-at-risk

Results of the stressed VaR calculations were provided by 38 banks from 10 countries. The data period used to calculate the non-stressed VaR is in most cases the period ending on 31 December 2006. This should represent a VaR number for a non-stressed period in terms of market risk factor movements.

reporting a three-month IRC. Comparing results across banks that report both a one-month and three-month IRC estimate indicates an average increase in IRC of 3%.

The numbers in the first column of Table 4 show the stressed VaR as a percentage of the overall market risk capital requirements. It can be seen that the introduction of the stressed VaR will on average result in an increase in overall market risk capital requirements of 110%.

The second column relates the stressed VaR to the non-stressed VaR, both calculated for the same portfolio. It can be seen that the stressed VaR is on average 2.6 times the non-stressed VaR, with extremes as high as seven times and as low as two-thirds the non-stressed VaR.¹⁰

The last column shows the diversification effect within the stressed VaR relative to the diversification effect within the non-stressed VaR. Diversification effects were estimated by comparing the total VaR number including diversification effects to the sum of the VaR numbers per defined sub-portfolios, which neglects diversification between these sub-portfolios. The results were not conclusive since the non-stressed VaR exhibits sometimes more and sometimes less diversification benefit than the stressed VaR.

In particular, the supposition that the stressed VaR would reflect lower diversification effects than the non-stressed VaR was generally not confirmed, as the average of 99.8% for the last column shows.

Table 4
Stressed value-at-risk, in per cent

	Increase in market risk capital requirements	Ratio stressed versus unstressed value-at-risk	Relative size of diversification effect
Mean	110.8	260.0	99.8
Median	63.2	240.9	96.2
StDev	125.1	125.2	43.6
Min	7.2	68.0	35.6
Max	694.5	700.5	196.8

6. Re-securitisation capital charges

Twenty-eight banks from 10 countries submitted results on the impact of the securitisation charges. Re-securitisations positions accounted for an increase of 118% in market risk capital. The rated re-securitisation positions accounted for 72.7% of the increase and the unrated for 27.3% of the increase. These positions will continue to be capitalised under the standardised method under the Committee's July 2009 revisions. Ten of the 28 banks had significant re-securitisation positions which would result in an increase in market risk capital requirements of over 50%.

¹⁰ For one bank, stress VaR is materially lower than the non-stress value-at-risk because of the specific portfolio composition of that bank.

The incremental modelled specific risk charge from re-securitisations (calculated by excluding them from the internal models) showed that under the current framework re-securitisations accounted for 10.5% of the total market risk capital charge. In some cases removing re-securitisations from the VaR model would increase the capital charge as diversification benefits would be lost. However, for calculating the summary statistics in the table below and the overall results in Section 3 it was assumed that banks would not remove the exposures from their VaR model if this would occur.

Table 5

**Capital charges for re-securitisation exposures,
as a percentage of market risk capital requirements**

	New specific risk charge		Current specific risk charge	
	Rated	Unrated	Models	Standardised measurement method
Mean	85.6	32.1	10.5	10.9
Median	3.6	0.2	0.0	1.1
StDev	154.3	65.1	22.4	18.5
Min	0.0	0.0	0.0	0.0
Max	651.7	252.5	89.0	69.5

7. Equity specific risk

The capital charges resulting from the preferential treatment for liquid and well-diversified equity portfolios under the standardised measurement method to specific risk was reported by 12 banks from eight countries. The preferential treatment differs between those countries with standardised capital charges as low as 1.2% of the exposure amount. The removal of the preferential treatment will result in a uniform standardised specific risk capital charge of 8% of the exposure amount.

The contribution of those equity risk positions which currently receive preferential treatment, to the overall market risk capital requirements will on average increase by roughly 200%. One bank might see an increase of more than 500%.

The effect of the removal of the preferential treatment on overall market risk capital requirements in most cases is very small. For two banks though, the percentage of required market risk capital due to equity position specific risk is significant under the current rules and will double to about 30% under the new rules.

Table 6

Equity specific risk, in per cent

	Capital charge as a percentage of market risk requirements		Increase
	Current	New	
Mean	2.85	7.76	212.28
Median	1.24	3.23	180.39
StDev	4.65	10.90	150.53
Min	0.05	0.13	45.95
Max	15.82	31.63	584.14

Annex

Calculation of capital requirements for market risk

The capital charges according to the market risk framework comprise interest rate related instruments and equities in the trading book as well as foreign exchange risk and commodities risk irrespective of whether the position is held in the banking or in the trading book.

Under the **previous market risk framework**, the capital requirements for market risk are calculated as the sum of the following elements:

- The capital charge according to the standardised measurement method to the extent a bank does not use internal models, covering
 - general and specific interest rate risk;
 - general and specific equity position risk;
 - foreign exchange risk;
 - commodities risk;
- The capital charge according to the internal models approach, which is the higher of (1) its previous day's VaR number; and (2) an average of the daily VaR measures on each of the preceding sixty business days, multiplied by a multiplication factor.

To the extent a banks' internal model does not cover specific risk, the specific risk capital charges of the standardised measurement method apply. Under the **revised market risk framework**, the capital requirements for market risk are calculated as the sum of the following elements:

- The capital charge according to the standardised measurement method to the extent a bank does not use internal models, covering
 - general and specific interest rate risk;
 - general and specific equity position risk;
 - foreign exchange risk;
 - commodities risk;
- The capital charge according to the internal models approach, which is the sum of
 - The higher of (1) its previous day's VaR number; and (2) an average of the daily VaR measures on each of the preceding sixty business days, multiplied by a multiplication factor; plus
 - The higher of (1) its latest available stressed-VaR number; and (2) an average of the stressed VaR numbers over the preceding sixty business days, multiplied by a multiplication factor; plus
 - The incremental or comprehensive risk capital charge as outlined below, where applicable.

The approaches available to calculate the capital charges for specific risk under the new market risk framework are outlined in the table below.

Table 7

New treatment of specific risk

Instrument type	Standardised measurement method	Internal models approach
Unsecuritised credit products which are not included in the correlation trading portfolio	Specific risk capital charges according to the standardised measurement method (unchanged).	99%/10-day VaR specific risk measure times three* plus 99%/10-day stressed VaR specific risk measure times three* plus IRC charge including default and migration risks at a 99.9% confidence level and a one-year capital horizon.
Securitisation products as defined in paragraphs 538 to 542 of the Basel II Framework which are not included in the correlation trading portfolio	New capital charges for securitised products under the standardised measurement approach, independent of whether a bank otherwise uses the standardised measurement method or the internal models approach.	
Products which are included in the correlation trading portfolio (paragraph 689(iv))	New capital charges for securitised products under the standardised measurement approach, calculated as the maximum of (i) the total specific risk capital charges that would apply just to the net long positions from the net long correlation trading exposures combined, and (ii) the total specific risk capital charges that would apply just to the net short positions from the net short correlation trading exposures combined (paragraph 709(ii)).	99%/10-day VaR specific risk measure times three* plus 99%/10-day stressed VaR specific risk measure times three* plus Comprehensive risk capital charge including default and migration risks at a 99.9% confidence level and a one-year capital horizon.**
Equity products	Current specific risk capital charges according to the standardised measurement method. The reduced specific risk capital charge of 4% for equities in liquid and well-diversified portfolios set out in paragraph 718(xxii) has been eliminated, ie an 8% specific risk capital charge applies.	99%/10-day VaR specific risk measure times three* plus 99%/10-day stressed VaR specific risk measure times three.

* The multiplier may be adjusted up to 4 based on backtesting results. Banks may use one VaR model jointly modelling general and specific risk. ** The Committee will evaluate a floor for the comprehensive risk capital charge which could be expressed as a percentage of the charge applicable under the standardised measurement method.

Glossary

Capital charge for incremental risk: The capital charge for incremental risk is calculated based on a risk measure that includes default risk as well as migration risk for unsecuritised credit products held in the trading book at a 99.9% confidence level, a one-year capital horizon, and a minimum liquidity horizon of three months.

Capital charge for comprehensive risks: The capital charge for comprehensive risk is calculated based on a risk measure that can be applied to banks' so-called correlation trading portfolios and captures not only incremental default and migration risks, but all price risks at a 99.9% confidence level and a one-year capital horizon.

Specific risk surcharge: The specific risk surcharge for banks including both general and specific risks in their internal VaR models is defined as the difference between (i) the capital charge for both general and specific risks when applying the higher multiplier of four to the VaR measure for specific risk; and (ii) the capital charge for both general and specific risks applying a uniform multiplier of three.

Stressed value-at-risk: A measure intended to replicate a VaR calculation that would be generated on the bank's current portfolio if the relevant market factors were experiencing a period of stress. Therefore, it should be based on the 10-day, 99th percentile, one-tailed confidence interval VaR measure of the current portfolio, with model inputs calibrated to historical data from a continuous 12-month period of significant financial stress relevant to the bank's portfolio. The period used must be approved by the supervisor and regularly reviewed. As an example, for many portfolios, a 12-month period relating to significant losses in 2007/2008 would adequately reflect a period of such stress; although other periods relevant to the current portfolio must be considered by the bank.