EBA REPORT RESULTS FROM THE 2021 MARKET RISK BENCHMARKING EXERCISE

DE

EBA/REP/2022/03

EUROPEAN BANKING AUTHORITY

EBA



Contents

List o	f figure	s an	id tables						
Abbr	eviatio	ns							
1. Ex	cecutive	e sui	mmary	9					
1.1	Main findings of the benchmarking analysis								
1.2	2 CAs' assessments based on supervisory benchmarks								
1.3	2022 e	xerc	cise – expected changes	15					
2. In	troduc	tion	and legal background	17					
3. N	lain fea	ture	es of the 2020 market risk benchmarking exercise	20					
3.1	Definit	ion	of the market risk hypothetical portfolios	20					
3.2	Data co	ollec	ction process	21					
	3.2.1	IN	٨V	21					
	3.2.2	Ri	isk measures	21					
3.3	Partici	patiı	ng banks	22					
3.4	Data q	ualit	ty issues	22					
4. M	larket r	isk k	penchmarking framework	25					
4.1	Outlier	rana	alysis	26					
4.2	Risk an	nd st	ressed measures assessment	35					
	4.2.1	Li	mitations	37					
5. O	verview	v of	the results obtained	39					
5.1	Analys	is of	VaR and sVaR metrics	39					
5.2	A close	er lo	ok at the VaR and sVaR results	43					
	5.2.1	С	omparison of sVaR and VaR ratios	45					
	5.2.2	D	rivers of variation	47					
	5.2.3	Su	upervisory actions	51					
	5.2.4	Μ	Iodelling differences	52					
	5.2.5	0	ther drivers of variation	53					
		a.	Size of the bank	54					
		b.	Business model	55					
		c.	Level of approval	56					
		d.	Common stress period considered	57					



	5.2.6 Portfolio comparison	59
5.3	8 Analysis of IRC	60
5.4	Analysis of APR	63
5.5	5 P&L analysis	64
5.6	Diversification benefit	65
5.7	Dispersion in capital outcome	67
5.8	8 Present value	67
6.	Competent authorities' assessment	69
7.	Conclusion	72
8.	Annex	74
9.	Annex 2	131



List of figures and tables

Figures

Figure 1: IMV scatter plots – low-IQD instruments
Figure 2: IMV scatter plots – high-IQD instruments
Figure 3: Interquartile dispersion and coefficient of variation for IMV and risk metrics by portfolio
Figure 4: VaR submissions normalised by the median of each portfolio44
Figure 5: sVaR submissions normalised by the median of each portfolio
Figure 6: sVaR–VaR ratio for the average VaR and sVaR by portfolio4
Figure 7: Qualitative data: VaR methodological approaches4
Figure 8: VaR submissions normalised by the median of each portfolio (by methodologica approach)
Figure 9: Qualitative data: VaR time-scaling techniques50
Figure 10: Qualitative data – length of VaR lookback period50
Figure 11: Qualitative data – VaR weighting choices5
Figure 12: Qualitative data: source of LGD for IRC modelling6
Figure 13: Qualitative data – number of modelling factors for IRC
Figure 14: P&L chart example of low IQD64
Figure 15: P&L chart example of high IQD6
Figure 16: CAs' own assessments of the levels of MR own funds requirements 2019
Figure 17: IMV scatter plots (all)
Figure 18: VaR submissions normalised by the median of each portfolio (by asset class)
Figure 19: sVaR submissions normalised by the median of each portfolio (by asset class) 103
Figure 20: sVaR submissions normalised by the median of each portfolio (by methodologica approach)
Figure 21: VaR ratio with median (focus on small banks)108



Figure 22: VaR ratio with median (focus on medium-sized banks)1	.09
Figure 23: VaR ratio with median (focus on large banks)1	.10
Figure 24: Additional P&L charts with examples of low IQD1	.26
Figure 25: Additional P&L charts with examples of high IQD1	.28
Figure 26: Comparison between IMV and truncated STD deviation method to select outliers for r measures	
Figure 27: VIX Index	.34

Tables

Table 1: IMV statistics and extreme values
Table 2: Average IMVs' interquartile dispersion by asset class 29
Table 3: IMV cluster analysis – number of banks by range
Table 4: Interquartile dispersion for IMV and risk metrics by risk factor
Table 5: sVaR–VaR ratio by range (number of banks as a percentage of the total)
Table 6: Coefficient of variation for regulatory VaR (controlling for HS) by modelling choice (%) . 53
Table 7: Average regulatory VaR by modelling choice
Table 8: Asset class comparison for VaR in terms of banks' size 55
Table 9: Asset class comparison for VaR within the same business model (cross-border universal bank)
Table 10: Asset class comparison for VaR in terms of level of approval
Table 11: Asset class comparison for sVaR in terms of the time window applied
Table 12: Portfolio comparison for VaR, sVaR and IRC 59
Table 13: IRC statistics and cluster analysis 62
Table 14: Coefficient of variation for regulatory IRC by modelling choice (%) 63
Table 15: APR statistics and cluster analysis 64
Table 16: Diversification benefit statistics 66
Table 17: Interquartile dispersion for capital proxy67



Table 18: Banks participating in the 2021 EBA MR benchmarking exercise 74
Table 19: Instruments/portfolios underlying the HPE 75
Table 20: VaR cluster analysis – number of banks by range 79
Table 21: VaR statistics
Table 22: sVaR statistics
Table 23: P&L VaR statistics
Table 24: Empirical expected shortfall statistics 83
Table 25: sVaR/VaR statistics
Table 26: P&L VaR/VaR statistics
Table 27: VaR statistics (small banks only)
Table 28: VaR statistics (medium-sized banks only) 109
Table 29: VaR statistics (large banks only) 110
Table 30: VaR statistics (small TB banks only)111
Table 31: VaR statistics (medium TB banks only)
Table 32: VaR statistics (large TB banks only) 113
Table 33: VaR statistics (same business model – cross-border universal bank) 114
Table 34: VaR statistics (low L3 A&L banks only) 115
Table 35: VaR statistics (medium L3 A&L banks only)116
Table 36: VaR statistics (high L3 A&L banks only)117
Table 37: VaR statistics (IR and CS asset classes – only banks with general and specific IR risk approval) 118
Table 38: VaR statistics (IR and CS asset classes – only banks with general IR risk approval) 118
Table 39: VaR statistics (EQ asset class – only banks with general and specific EQ risk approval) 119
Table 40: VaR statistics (EQ asset class – only banks with general EQ risk approval) 119
Table 41: Stress VaR statistics (2008-2009 stress period only) 120
Table 42: PV statistics
Table 43: IRC – modelling choice: source of LGD – market convention



Table 44: IRC – modelling choice: source of LGD – non-market convention	. 123
Table 45: IRC – modelling choice: source of LGD – 1-2 modelling factors	. 124
Table 46: IRC – modelling choice: source of LGD – >2 modelling factors	. 125
Table 47: Comparison VaR 2021 – 2021	. 132
Table 48: Comparison VaR 2021 – 2021 (VaR/PV %)	. 133
Table 49: Comparison SVaR 2021 – 2021	. 135



Abbreviations

APR	all price risk
CA	competent authority
CDS	credit default swap
со	commodities
CRD	Capital Requirements Directive
CRR	Capital Requirements Regulation
CS	credit spread
CS01	credit spread value of 1 basis point changes
СТР	correlation trading portfolio
CV	coefficient of variation
EBA	European Banking Authority
EQ	equity
ES	expected shortfall
EU	European Union
FRTB	fundamental review of the trading book
FX	foreign exchange
HPE	hypothetical portfolio exercise
HS	historical simulation
IMV	initial market valuation
IQD	interquartile dispersion
IR	interest rates
IRC	incremental risk charge
IT	information technology
ITS	implementing technical standards
LGD	loss given default
MC	Monte Carlo
MR	market risk
MRWA	market-risk-weighted asset
P&L	profit and loss
PD	probability of default
Q&A	question and answer
RTS	regulatory technical standards
RWA	risk-weighted asset
sVaR	stressed value at risk
VaR	value at risk



1. Executive summary

- This report presents the results of the 2021 supervisory benchmarking exercise pursuant to Article 78 of the Capital Requirements Directive (CRD) and the related regulatory and implementing technical standards (RTS and ITS) that define the scope, procedures and portfolios for benchmarking internal models for market risk (MR).
- The report summarises the conclusions drawn from a hypothetical portfolio exercise (HPE) conducted by the EBA during 2020/21. The primary objective of the exercise is to assess the level of variability observed in risk-weighted assets (RWA) for market risk produced by banks' internal models.
- 3. The exercise was performed on a sample of 40 European banks from 13 jurisdictions. The relevant institutions submitted data for 73 instruments recombined into 59 market portfolios across all major asset classes, i.e. equity (EQ), interest rates (IR), foreign exchange (FX), commodities (CO) and credit spreads (CS), as well as two correlation trading instruments recombined into four portfolios (CTPs), for a total of 63 benchmark portfolios. Thus, the exercise covers the entire population of EU banks with internal models for MR at the highest level of consolidation.
- 4. The analytical part of the exercise delivered by the EBA, as summarised in this report, provided to the competent authorities (CAs) a list of outliers to be examined in detail. The banks with the most significant number of outliers were also considered for interviews to discuss the assumptions behind banks' models that produced the outliers. In the 2021 exercise, two interviews with banks were carried out by CAs. The interviews helped CAs to better understand the nature of the deviations highlighted to banks, and to provide to the EBA good additional insight into the exercise from the submitters' standpoint. The issues detected in the benchmarking exercise were considered and addressed, where possible, by banks and CAs. Moreover, CAs and the EBA collected feedback on how to improve forthcoming benchmarking exercises.
- 5. Finally, taking into consideration the results of the benchmarking exercise, CAs were asked to provide the EBA with responses to a questionnaire on the actions they plan to take with regard to each participating bank's internal model.



1.1 Main findings of the benchmarking analysis

- 6. The report measures variability in terms of the interquartile dispersion (IQD)¹ and the coefficient of variation (CV)² observed within each benchmark portfolio. The IQD is more robust than the CV when the sample is drawn from an unknown, fat-tailed distribution. As far as the market-risk-weighted asset (MRWA) variability is concerned, the IQD metric suggests a level of dispersion for all the risk measures provided by banks that need to be monitored.
- 7. The primary considerations are that the 2021 results show a reduction in the dispersion of the initial market valuation (IMV) versus the 2020 exercises with regard to the FX and CO asset classes; see, for instance, Table 1. This improvement was expected and reflects the clarifications provided in the 2020 exercise. EQ and CS remained fairly stable versus the 2020 dispersion, as they were also fairly low in the second exercise. Nonetheless, the IR average IQD is high (19%). This is very different from what was observed in the previous two exercises. The reason for this is that three IR instruments (19, 36 and 37) present an IMV that is fairly low and close to zero. This has the unwelcome effect of exacerbating even minor differences in the IMV submission in absolute terms, which translate into a very high percentage difference captured by the IQD metrics. Aside from the high IQD for these three instruments, there is no evidence of a significant misunderstanding of these instruments' features. Excluding them, the average IQD of the IR asset class is 1%, which is in line with the submissions for the previous exercises.
- 8. Based on this submission of IMVs, we can conclude that the quality of the data has improved. Nonetheless, the quality of the data is of paramount importance for this exercise. Some types of errors persist and are sometimes trivial, such as the wrong unit being reported. In order to increase data quality, the EBA notes that several rounds of iteration with submitters will be required, which can be difficult within the short time frame of the exercise. Improving the specification of the details for the instruments is also a possibility that the EBA is exploring. In general, the valuation used therefore is robust, albeit with significant effort needed to be expanded on data quality.
- 9. The majority of the significant dispersions have been examined and justified by the banks and CAs. A minority of the outlier observations remain unexplained and are expected to be part of the ongoing activities of supervisors, who are expected to monitor and investigate the situation (see Section 1.2 and Chapter 6 of this report).
- 10. From a risk factor perspective, equity, interest rate and CO portfolios exhibit a lower level of dispersion than the FX and credit spread asset classes. Except for IMV, in general, variability is substantially higher than in the previous exercise. This is likely to be due to a substantial increase

¹ IQD is defined as the absolute value of the ratio of the interquartile range (Q3 – Q1) divided by the sum of the quartiles (Q3 + Q1). The higher the IQD is, the higher the dispersion in the data.

² CV is computed as the ratio of the standard deviation to the mean.



in market volatility, which impacted the level of the risk measures, increasing the dispersion (see Table 4: Interquartile dispersion for IMV and risk metrics by risk factor, and also Annex 2).

- 11. Regarding the single risk measures, across all asset classes except for CS the overall variability for value at risk (VaR) is lower than the observed variability for stressed VaR (sVaR) (27% and 31% respectively, compared with 18% and 29% in 2020).³ More complex measures such as the incremental risk charge (IRC) show a higher level of dispersion (43% compared with 49% in 2020). We would point out that a direct comparison of the IQD dispersion between 2020 and 2021 IQDs is still possible because the structures of the two exercises and the instruments of which they were composed are the same.
- 12. As for the past exercise, to deepen the analysis of VaR and further investigate the variability drivers, different VaR metrics were computed and compared with the banks' reported VaR, in particular:
 - an alternative estimation of VaR, called profit and loss (P&L) VaR, computed by the EBA using the 1-year daily P&L series submitted by banks using a historical simulation (HS) approach; and
 - a comparable VaR, called HS VaR, which corresponds to the regulatory VaR reported by those banks that use an HS approach (only).
- 13. When comparing the variability between the regulatory VaR and these 'alternative' risk measures, a decrease in the IQD when considering a more homogeneous sample is confirmed (i.e. HS banks only). In fact, for all the risk types, the dispersion observed for the P&L VaR tends to be lower but is still not negligible. This finding suggests that the modelling approach is not the only driver of the observed VaR variability. Other drivers, such as risks not captured in the model or the choice of absolute versus relative returns, offer further explanations for the results' variability (see Table 4: Interquartile dispersion for IMV and risk metrics by risk factor).
- 14. Even so, within the subset of banks using an HS approach, modelling choices (see Table 6: Coefficient of variation for regulatory VaR (controlling for HS) by modelling choice) seem to make a noticeable difference. 1-day VaR and the use of a lookback period of one year tend to produce lower dispersion than the longer lookback period. Other modelling configurations produce mixed results depending on the different asset classes. In terms of conservativeness, the calibration of 1-day and one-year lookback seems to produce more conservative results, at least for EQ, FX and CS (see Table 7: Average regulatory VaR by modelling choice). These observations differ from the findings of the 2020 exercise, which were run across different portfolios. Overall, it is clear that this analysis is extremely sensitive to the different portfolios used to produce the statistic and to the low number of subjects available, so it is difficult to

³ These values are derived as a simple average of the IQD across all non-correlation trading portfolios.



generalise the results and define a general 'less dispersed' and 'more conservative' configuration of modelling choices.

- 15. As mentioned above, the dispersion in sVaR figures is generally higher than the dispersion observed for regulatory VaR (see Table 21 and Table 22). The stressed period used was the one applied by the bank for capital purposes, so it was not harmonised in the sample. Different choices for the stressed period are permitted by the Capital Requirements Regulation (CRR), and these choices are considered and questioned as part of the regulatory approval process. While allowing banks to use their own individual stress periods reduces the comparability of the sVaR results across the sample, doing so facilitates the estimation of implied capital needs from the HPE. Nonetheless, banks in the exercise are asked to report the stressed period applied. As a result, the EBA drew up a subset of homogeneous time windows applied, and ran the benchmark for this subsample. It appears clear that when a homogeneous stress window is applied, the sVaR figures tend to be less dispersed (see Table 41: Stress VaR statistics (2008-2009 stress period only)).
- 16. In addition to carrying out these analyses, the EBA conducted a comparison across banks of the ratio between sVaR and VaR for each of the hypothetical portfolios included in the benchmarking exercise (see Table 5: sVaR–VaR ratio by range (number of banks as a percentage of the total)). The ratio generally varies significantly between the portfolios, especially for instruments subject to credit spread risk (from 0.25 to 13.35). However, on average the ratio comes in at around 1.48 (see Table 25: sVaR/VaR statistics), which is half the value reported for the 2020 exercise. This decrease is due to the substantial increase in VaR figures from the 2020 to 2021 exercise, as shown in Annex 2 of this report.
- 17. As expected, for the larger banks with significant trading activities the benchmarking portfolios are generally relevant to their actual trading book. For smaller banks, this is less the case, and this is why the EBA included simpler and more plain vanilla instruments starting from the 2019 exercise. The challenge remains to design a benchmarking exercise that can fit banks that have a specialised business model. Overall, the portfolios are, however, reflective of the risk factors experienced by most banks. In the 2021 exercise, the EBA noticed a substantial increase in the VaR dispersion, which is in many cases above the 20% IQD, especially for the CS asset class (see Table 21: VaR statistics). This substantial increase in the VaR dispersion is further analysed in Annex 2 of this report, where the VaR figures for the 2021 and 2020 exercises are compared. The aggregate portfolios also feature notably low levels of IQDs.
- 18. Regarding the IRC, the average variability (as measured by the average IQD for this category of portfolios) is higher than that observed for all other metrics considered in the report (43%). This high variability is slightly lower than in the previous exercise the IQD was 49% on average in the 2020 exercise (see Table 13: IRC statistics and cluster analysis). The understanding of the IRC dispersion was further analysed by disaggregating various modelling choices (see Table 14, Table 43, Table 44, Table 45 and Table 46). While the number of risk factors applied does not seem to make a difference in terms of dispersions, applying market conventions to the source of LGD



seems to reduce the dispersion of the IRC. These results are not consistent with what was observed in the previous exercises.

- 19. Regarding the APR, the statistics for this risk measure are no longer reported, because after Brexit the number of the reporting entities for this metric is no longer sufficient to guarantee the anonymity of the statistics computed (see Table 15: APR statistics and cluster analysis).
- 20. An additional metric considered as part of the analysis was the diversification benefits observed for VaR, sVaR and IRC in the aggregated portfolios (see Table 16: Diversification benefit statistics). As expected, there is evidence that larger aggregated portfolios exhibited greater diversification benefits than smaller ones. In general, the level of dispersion observed in diversification benefits tends to be lower than that in the corresponding metrics at the level of the individual portfolios.
- 21. As in the previous exercise, an assessment was also carried out on the variability of the empirical estimates of the expected shortfall (ES) at a 97.5% confidence level. The results indicate that the dispersion in this metric across risk factors is similar to that found for VaR and P&L VaR (see Table 24).

Dispersion in the capital outcome

- 22. Alongside the variability analysis, the EBA also conducted the usual assessment regarding possible underestimations of capital requirements (see Table 17: Interquartile dispersion for capital proxy). As the analysis is based on hypothetical portfolios and the capital requirements were defined using a proxy, the results should be interpreted as approximations of potential capital underestimations. The proxy for the implied capital requirements was defined as the sum of VaR and sVaR across all portfolios. For purposes of comparison, the proxy was computed three times. In one case, the VaR and sVaR figures were multiplied by the banks' total multiplication factor and, in the other, by the regulatory minimum of three only, i.e. ignoring the banks' individual addend(s) set by the CAs. Finally, a subset of banks applying the same stress period was also considered for capital dispersion. This metric enables a comparison of banks and an assessment of their variability in this regard.
- 23. The average variability across the sample as measured by the IQD is significant (around 24%), especially for the most complex portfolios in the credit spread asset class. This dispersion slightly decreases when considering a more homogenous capital proxy (22% applying three as the multiplier, and 20% for banks with the same stress period). Moreover, an analysis of the capital proxy pattern across the HPE's trades suggests that the ranges of capital value dispersion are broadly consistent, irrespective of whether the banks' actual multiplication factors are used or not.

Additional analysis carried out

24. As introduced in the previous exercises, the EBA extended the analysis to other drivers of variation (see Section 5.2.5), such as the size of the bank, the business model of the bank, the



level of approval granted by the CAs and the already mentioned stressed period applied in the sVaR calibration. The size and business model analyses were further analysed as in the 2020 report.

- 25. In a nutshell, based on this additional analysis we can conclude that the size (in terms of RWA for market risk) of the bank has an impact on the figures, since medium-sized banks tend to produce slightly more dispersed results than larger banks (see Table 8: Asset class comparison for VaR in terms of size of the banks). Smaller banks' statistics are affected by the low number of submissions, i.e. CO and CS are not even reported. Consistently, when considering the size in terms of the trading book (as a ratio of total assets), the bigger a bank is in terms of its trading book, the (slightly) smaller the dispersion (on average).
- 26. The discrimination based upon the business model did not deliver strong conclusions. As in past exercises, the EBA applied the internal classification of banks as a discriminant, under which many of them are classified as cross-border universal banks (see Table 9: Asset class comparison for VaR within the same business model (cross-border universal bank)). Applying this definition of the business model, a smaller decrease in the IQD was identified due to a more homogenous sample. The business model analysis was further extended by considering the 'Level 3' assets and liabilities in the bank's books as a proxy for a more sophisticated business model linked to more exotic products (see Table 34, Table 35 and Table 36). This further specification did not prove conclusive since it reveals, first, an increase, and then a decrease of dispersion depending on the 'Level 3' assets and liabilities ratio in the bank's trading book.
- 27. The subsample analysis based upon the level of approval delivered interesting results. A priori, it was expected that having banks with different levels of approval would have increased the dispersion of the results of the risk measures. In line with this assumption, the IQD results seem to fluctuate among the subsamples of different approval levels. This is because more homogeneous subsamples tend to produce smaller dispersions, but this positive effect is counterbalanced by the smaller number of firms in the sample. Basically, the benchmark provided and the 25th and 75th quantiles of the distribution tend to be less dispersed with respect to the whole set of banks. This implies that the different level of approval does indeed have an impact on the dispersion of the benchmarking results, with the more 'complete' (general plus specific approval) model delivering less dispersed results (see Table 10: Asset class comparison for VaR in terms of the level of approval).
- 28. Finally, as already mentioned above, and in line with previous findings, sVaR figures are far less dispersed when the benchmark is computed for a homogeneous subsample of firms that applied a similar time period for the stress window used for calibrating the sVaR (see Table 11: Asset class comparison for sVaR in terms of time window applied).
- 29. As introduced in the 2020 Report, PV statistics are reported (see Table 42). The PVs reported generally have low IQDs, and they were useful in distinguishing true outliers and outliers due to mispricing of the portfolios. Since PVs are computed at the portfolio level, this helped to compare risk measures (VaR) for 2020 to 2021, as detailed in Annex 2 of this report.



1.2 CAs' assessments based on supervisory benchmarks

- 30. CAs shared the outcomes of their assessments at the bank level with the EBA (see Figure 16: CAs' own assessments of the levels of MR own funds requirements). The CAs' assessments confirmed the existence of some areas that require follow-up actions on the part of specific institutions whose internal models were flagged as outliers in this benchmarking exercise.
- 31. Overall, CAs' assessment of the over- and underestimation of RWA was encouraging in the sense that CAs were aware of and able to explain the causes of most deviations. Although the majority of the issues were identified and actions put in place in order to reduce the unwanted variability of the RWA, the effectiveness of these actions can be evaluated only by CAs via constant monitoring of the benchmarking results.
- 32. The CAs are expected to pay close attention to the minority of cases in which the over- and underestimations were unexplained, to closely monitor these institutions and to put in place additional efforts to reduce these cognitional gaps in future exercises.

1.3 2022 exercise – expected changes

- 33. The 2019 exercise represented a significant change from the 2016-2018 exercises in terms of the simplification of the portfolios. This simplification had a positive effect in obtaining less dispersed results than with the previous portfolios. Furthermore, it improved the significant data quality issues relating to some portfolios while focusing on the model risk elements.
- 34. In the 2020 exercise, the data submitted further improved in quality thanks to the clarification of the legal text description of some instruments, and also to the further practice that the banks have gained in conducting the present exercise. This had a positive effect in terms of dispersion in the data provided. Improvements in terms of less dispersed results have also stemmed from the change in the methodology to detect outliers for the risk measures.
- 35. In the 2021 exercise, the data quality of the submissions was acceptable. That said, the variabilities of the risk measures (VaR, PL VaR and ES) were substantially higher than in the previous year. This seems to be linked to the increased volatility of the markets in 2021 due to the Covid outbreak, as captured by the market model, which generally provided higher figures for the risk measures. These higher figures, in absolute terms, seem to exacerbate the differences in modelling outputs, producing higher IQD metrics. As a result, this higher dispersion does not seem to be the outcome of a decrease in the quality of the market model.
- 36. For the 2022 exercise, the set of instruments is mainly similar to the previous exercise, so the EBA expects at least a similar level in terms of the data quality of the submissions.
- 37. The analysis the EBA will run for the 2022 exercise will be the first in which banks are expected to report sensitivities and other figures relating to the sensitivities-based method of the alternative standardised approach (ASA) introduced with the FRTB. This new data submission is expected to result in some cost to banks and competent authorities in terms of the effort



involved in providing and analysing it. Also, the initial submissions tend to be of lower quality and then improve with time. Nonetheless, there is an expectation that additional interesting insights can be provided to competent authorities from the analysis of these additional data.

38. On a medium-term horizon, the EBA will consider reshaping the instruments and the portfolios in the exercise in a way that still keeps the instruments simple to ensure clarity regarding the instruments. This is because the different interpretations of the instruments have been a significant source of variability. Nonetheless, further enrichment of the variety of the instruments monitored could be beneficial. The aim would also be to recombine these instruments in such a way that the different portfolios have meaningful designs when compared with each other. In addition, and very importantly, the fundamental review of the trading book (FRTB) is understood to be of particular significance for the market risk benchmarking exercise. In the future, the exercise will require a major redesign to take into consideration the specific features of the FRTB.



2. Introduction and legal background

- 39. European legislators have acknowledged the need to ensure consistency in the calculation of RWA for equivalent portfolios, and the CRR and CRD include a number of mandates for the EBA to deliver technical standards, guidelines and reports with the aim of reducing uncertainty and differences in the calculation of capital requirements.
- 40. In this regard, Article 78 of the CRD requires the EBA to produce a benchmarking study on both credit and market risk to assist CAs in the assessment of internal models. The study should highlight potential divergences among banks or areas in which internal approaches might have the potential to underestimate their own funds requirements that are not attributable to differences in the underlying risk profiles. CAs are required to share this evidence within colleges of supervisors as appropriate and take appropriate corrective actions to overcome these drawbacks when deemed necessary. Directive (EU) 2019/878⁴ of the European Parliament and of the Council of 20 May 2019 amending Capital Requirements Directive IV (CRD V) has not changed this mandate.
- 41. The EBA has devoted significant effort to the analysis of the consistency of outcomes in RWA, to understand the causes of possible inconsistencies and to inform the regulatory repair process. The EBA's ongoing work on benchmarking, supervisory consistency and transparency is fundamental to restoring trust in internal models and the ways in which banks calculate asset risks.
- 42. The use of internal models gives banks the opportunity to model their risks according to their business models and the risks faced by the bank itself. The introduction of a benchmarking exercise does not change this objective; rather, it helps to identify the non-risk-based variability drivers observed across institutions.
- 43. This MR benchmarking exercise is an MRWA variability assessment performed over a large sample of banks (40 banks at the highest level of consolidation across 13 jurisdictions within the EU). The banks participating in this exercise are those that have been granted permission to calculate their own funds requirements using internal models for one or more of the following risk categories:
 - a) general risk of equity instruments;
 - b) specific risk of equity instruments;

⁴ https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32019L0878&from=EN



- c) general risk of debt instruments;
- d) specific risk of debt instruments;
- e) foreign exchange risk;
- f) commodities risk; and
- g) correlation trading.
- 44. Pursuant to Article 362 of the CRR, the general risk of debt instruments should refer to interest rate risk. Similarly, the general risk of equity instruments refers to the change in the value of indices.
- 45. Banks that have approval only for the general risk of equity or debt instruments (in accordance with Article 363 of the CRR) may use a different definition of general risk (e.g. by including credit spread risk in the interest rate general risk) if they are able to demonstrate that this leads to higher RWA. Separate permission is required for each risk category. Many banks do not have permission for internal models for all risk categories, so the number of contributions for each hypothetical portfolio in this exercise varies across the sample.
- 46. Banks that have permission to use the internal model for calculating MR own funds requirements for one or more but not all of the risk categories in accordance with Article 363(1) of the CRR ('partial use') exclude certain risks or positions from the scope of the internal model approval. In this case, the own funds requirements for the risk categories outside the scope of the internal model are calculated according to the standardised approach.
- 47. In addition, as set out in Article 369(1)(c) of the CRR, banks should conduct validation exercises on hypothetical portfolios to test that the model is able to account for particular structural features. These portfolios should not be limited to the portfolios defined in this exercise; however, this exercise is a useful starting point for banks to meet this legislative requirement.
- 48. The assessed MR results, when provided and where applicable, are VaR, sVaR, IRC and APR figures for specific and aggregated trades. Moreover, a preliminary assessment of IMV was performed, primarily to ensure that the participating banks make uniform assumptions when entering the hypothetical trades.
- 49. In addition to these submissions, banks using an HS approach for VaR were requested to provide one year of P&L data for each of the individual and aggregated portfolios modelled. The objective of collecting this additional information was to employ the data vector to perform alternative calculations for VaR using, where possible, a consistent 1-year lookback period and controlling, as far as possible, for the different options that banks can apply within regulation.



50. Regulation (EU) 2019/876⁵ of the European Parliament and of the Council of 20 May 2019 amending the Capital Requirements Regulation as regards the leverage ratio, the net stable funding ratio, requirements for own funds and eligible liabilities, counterparty credit risk, market risk, exposures to central counterparties, exposures to collective investment undertakings, large exposures, reporting and disclosure requirements (CRR II) will have a significant impact on the market risk benchmarking exercise once it is fully implemented. However, for the time being the CRR framework will be applied for the purpose of the benchmark exercise in accordance with Article 78 of the CRD.

⁵ https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32019R0876&from=EN



3. Main features of the 2020 market risk benchmarking exercise

51. Based on the EBA benchmarking ITS, the MR benchmarking exercise is carried out by following three main steps. First, the EBA defines the hypothetical instruments and portfolios, which are the same for all banks, in order to achieve a homogeneous and comparable outcome across the sample. Second, banks are asked to submit the data accordingly. Third, and finally, the EBA processes and analyses the data, providing feedback to CAs. During the process, the EBA supports CAs' work by providing benchmarking tools to assess banks' results and detect anomalies in their submissions.

3.1 Definition of the market risk hypothetical portfolios

- 52. The MR portfolios have been defined as hypothetical portfolios composed of both non-CTPs and CTPs, as set out in Annex V of the benchmarking ITS. The exercise includes 73 instruments recombined into 59 general portfolios (53 individual and 6 aggregated), capitalised under the VaR, sVaR and IRC models, comprising mainly plain vanilla and some complex financial products in all major asset classes: EQ (18 instruments and 10 individual portfolios), IR (19 instruments and 16 individual portfolios), FX (10 instruments and six individual portfolios), CO (four instruments and three individual portfolios) and CS (22 instruments and 18 individual portfolios). The EBA also designed aggregated portfolios, obtained by combining individual ones, to take into account diversification effects. Each aggregated portfolio has a particular composition: the first (portfolio 57) encompasses all asset classes; the second (portfolio 58) is made up of only EQ portfolios; the third (portfolio 59) is made up of only IR portfolios; the fourth (portfolio 60) is made up of only FX portfolios; the fifth (portfolio 61) is made up of only CO portfolios; and the sixth (portfolio 62) is made up of only CS portfolios.
- 53. In addition, the set of portfolios includes two instruments and four portfolios (three individual and one aggregated) used for correlation trading activities, capitalised under the VaR, sVaR and APR models. These portfolios contain positions in index tranches referencing the iTraxx Europe index on-the-run series. The portfolios are constructed by hedging each index tranche with the iTraxx Europe index on-the-run 5-year series to achieve a zero credit spread value of 1 basis point (CS01) as at the initial valuation date (spread hedged). No further re-hedging is required.



54. A more detailed explanation of the portfolios can be found in the benchmarking ITS on the EBA website.⁶

3.2 Data collection process

55. The data for the supervisory benchmarking exercise were submitted by banks to their respective CAs using the supervisory reporting infrastructure. Banks submitted the specified templates provided in the ITS, where applicable.

3.2.1 IMV

- 56. The reference date for IMV was 24 September 2020, 5.30 p.m. CET. Banks entered all positions on 17 September 2020 ('reset or booking date'), and, once positions had been entered, each instrument aged for the duration of the exercise. Furthermore, banks did not take any action to manage the instruments in any way during the entire exercise period.
- 57. The IMV figure to be reported by the banks for each hypothetical instrument was defined as the mark to market of the instrument on the booking date plus the profit and loss from the booking until the valuation date and time. Therefore, it was the mark to market of the instrument on 24 September 2020, 5:30 p.m. CET.

3.2.2 Risk measures

- 58. Pursuant to the common instructions provided, banks were required to calculate the risks of the positions without taking into account the funding costs associated with the portfolios (i.e. no assumptions were admitted with regard to the means of funding the portfolios). Moreover, banks were required to exclude, as far as possible, counterparty credit risk when valuing the risks of the portfolios.
- 59. Banks were required to calculate the regulatory 10-day 99% VaR on a daily basis. sVaR and IRC could be calculated on a weekly basis. In such cases, sVaR and IRC had to be based on end-of-day prices for each Friday in the time window of the exercise. For the four CTPs (54-56 and 63), APR was also requested.
- 60. For each portfolio, banks were asked to provide results in the base currency, as indicated in Annex V of the benchmarking ITS. The choice of base currency for each trade was made to avoid polluting results with cross-dependencies on risk factors.

⁶ <u>https://eba.europa.eu/regulation-and-policy/supervisory-benchmarking-exercises/its-package-for-2020benchmarking-exercise</u>. Please also refer to Commission Implementing Regulation EU 2016/2070 of 14 September 2016 and Commission Implementing Regulation 2019/439 of 15 February 2019, laying down ITS in accordance with Article 78(2) of Directive 2013/36/EU (<u>https://eur-lex.europa.eu/legal-</u> content/EN/TXT/?qid=1562830373986&uri=CELEX:32019R0439).



61. All collected data underwent a preliminary analysis to spot possible misinterpretations of the common instructions set out in the ITS/RTS on benchmarking and outliers, as defined hereafter.

3.3 Participating banks

- 62. A total of 40 banks representing 13 EU countries participated in the exercise (see Table 18 in the annex). All EU banks with MR internal models approved by CAs were asked to submit data at all levels where own funds requirements are calculated. The EBA collected the results only at the highest level of consolidation.
- 63. CAs are in charge of conducting similar benchmarking investigations for results at a 'solo' level within their own jurisdictions for eligible banks.

3.4 Data quality issues

- 64. The data collection process aims to ensure the reliability and validity of the data obtained. In this regard, it is obvious that an unwanted driver of variability (which would pollute the results) could be misunderstandings vis-à-vis the portfolios and the specific instruments included in them.
- 65. IMV results reached the EBA in November/December 2020, after which the EBA carried out a preliminary IMV analysis and provided CAs with a tool to help them spot likely anomalies or misunderstandings regarding the interpretation of each portfolio. This was done to enhance the quality of all risk measures so that they would be provided in accordance with a correct interpretation of the portfolios. This step was conducted before the computation of the risk measures by the banks. Where the price of an instrument fell outside a certain range,⁷ more investigation had to be undertaken by the CA, which could if necessary ask the banks in its jurisdiction for a repricing and subsequent resubmission. The same process was carried out for the risk measure submission.
- 66. The issue experienced in the previous exercises linked to the aggregated portfolio figures no longer seems to be a major issue. It is worth noting that some banks reported the IMVs and risk measures for the aggregated portfolios without including all the relevant components.⁸ The reason was that the 2018 (and previous) ITS required banks to report the value of aggregated portfolios even if not all individual portfolios are modelled for the benchmarking exercise. As a result, the submissions were not comparable with those valued in full. This issue was addressed in the 2019 exercise, and since then banks have reported the results for the aggregated

⁷ The range means the interval between the first and third quartiles. These quartiles were considered and subsequently updated when resubmissions were received.

⁸ Some banks reported values for aggregated portfolios, taking into account only those components for which they had permission to use an internal model. This is clearly not a data quality issue and it is correct that banks report results only where they have permission to do so for regulatory purposes.



portfolios only if the results of all components have been submitted.⁹ The structure of the 2019-2020 exercise, i.e. a plurality of instruments that are recombined into a plurality of individual portfolios, which are themselves the components of the aggregated portfolios, produced a similar error, i.e. the absence of some instrument components within some of the individual portfolios. Nonetheless, banks should not provide any (aggregated or individual) portfolios where any instrument is missing in order not to distort the risk measures analysis. This specification was further clarified in the ITS 2022, so the possibility that some individual portfolios could have been submitted even when some specific instruments were missing cannot be ruled out. On the other hand, the data submission seems compatible with the correct interpretation of the rule, at least for the majority of submitters.

- 67. In the data analysis, it was clear that minor errors in the interpretation of some instructions and instruments were present, even though the instruments were simplified from the previous exercises and some of the general instructions remain fairly stable. A complete list of the errors in the submitted data is beyond the scope of this report, but the most common and easily avoided mistakes worth mentioning are as follows:
- Equity asset class: use of the wrong notional in the future positions. Luckily, the errors generated were easy to detect and fix by resubmission. The instruction in the 2021 ITS was amended such that this error will no longer present an issue for this exercise.
- Interest rates: good results were obtained, especially where the international securities identification number was available. Minor errors were identified, such as wrong bookings (i.e. long position instead of short, or vice versa). But this was detected in a minority of the submissions. For instruments with very low IMVs, and therefore high IQD (instruments 19, 36 and 37), submission issues were more difficult to detect.
- FX: the same problems are still present for instrument 39. Instrument 39 has been wrongly booked in some cases (i.e. short position instead of long). Instrument 40 was quite problematic in the past, since banks reported the P&L or zero instead of the mark to market of the position. The instructions of the 2021 ITS were amended with the result that this error has almost disappeared in this exercise.
- Credit spread: very good results in terms of CV and IQD, with very sporadic mistakes entailing possible wrong bookings, and no long position instead of a short, or vice versa.
- P&L submission: it has been noted that a few banks still reported the P&L even though they were not required to do so. Only banks with historical simulation models have to report the P&L vectors in order to produce a consistent analysis of the risk measures. Moreover, the P&L series

⁹ Annex 5, Market risk 2021 BM, Section 1 (Common instructions), letter (ee)



sometimes did not respect the parameters requested in the ITS (e.g. excessively short time series, wrong dates), so again these vectors have to be dropped in the analysis.

- 68. Although these mistakes were detected thanks to the EBA data analysis and corrected by resubmission/cleansing of the data from the banks, unnoticed errors in data submissions could still be present in the dataset analysed, and this can potentially drive and pollute the results.
- 69. Data quality for the 2021 exercise has been fairly good. Ensuring data quality is a fundamental step for the benchmarking exercise. However, reporting errors might still occur in future exercises, and the process will allow both regulators and participating banks to learn from it.



4. Market risk benchmarking framework

- 70. The benchmarking exercise aims to assess the variability in banks' MR models and to identify the drivers that account for it. Variability in banks' models can come from three types of drivers.
- 71. First, variability can stem from banks' modelling choices that are explicitly envisaged in the regulation. For example, when modelling VaR institutions can choose to use a lookback period longer than the minimum (i.e. the previous year), use a weighting scheme for the data series, calculate the 10-day VaR directly or, alternatively, obtain a 1-day VaR and rescale it using the square root of time approximation. Likewise, when modelling IRC, banks can choose from several sources of the probability of default (PD) and have a certain degree of freedom when choosing the transition matrices applied, or when deciding on the liquidity horizon applied to a particular instrument. It should be highlighted that all of these possibilities are, in principle, acceptable under the current regulatory framework (the CRR), provided that they have been agreed on with the CA during the approval process. Therefore, given the wide range of approaches that each institution using internal models can choose to implement, some degree of variability is expected.
- 72. Second, there are other modelling choices that are not explicitly envisaged in the regulations, which may cause variability. Examples include differences in simulation engines; differences in pricing model assumptions; the modelling of returns, volatility, correlations and other indirect parameter estimates; additional risk factors considered in the models; different approaches to P&L computation and attribution; and a stochastic framework for the simulated shocks.
- 73. Finally, another source of potential variability originates from supervisory practices. In particular, the use of regulatory add-ons in the form of both VaR and sVaR multipliers and additional capital charges (e.g. to encompass risk not in VaR issues, any information technology (IT) and organisational weaknesses, independent pricing valuations or detected flaws) and, quite significantly, the application of limits to the diversification benefits applied by banks (i.e. not allowing a single calculation at consolidated level and, instead, requesting an aggregation of the capital results at sub-consolidated and/or subsidiary levels) are likely to increase the observed variability in capital. In most cases, these supervisory actions have been established to address known flaws or model limitations, or to add an additional layer of prudence. Therefore, they typically result in higher capital requirements than would otherwise be the case. However, they can also increase the variation in market own funds requirements between banks, particularly across jurisdictions. Although the effects on capital levels of these supervisory actions can be substantial, a benchmarking portfolio exercise is not suitable for assessing some of these supervisory actions. In particular, any constraints on diversification benefits and direct capital add-ons cannot be properly assessed, since these effects are entirely portfolio-dependent. To assess these effects, it would be necessary to use a much more realistic (hypothetical) portfolio,



comprising thousands of instruments and including partial model approval. Nevertheless, some supervisory actions can be assessed and the effects of regulatory add-ons on the VaR and sVaR multipliers will be analysed as part of this assessment.

74. Possible additional drivers of variation include:

- misunderstandings regarding the positions or risk factors involved that could not be resolved during the preliminary assessment (see Section 3.2);
- non-uniform market conventions and practices adopted in the hypothetical portfolio booking;
- incompletely implemented models (e.g. because a pricing module is being tested, or an additional risk factor is being taken into consideration);
- missing risk factors not incorporated into the model;
- differences in calibration or data series used in the modelling simulation;
- additional risk factors incorporated into the model;
- alternative model assumptions applied; and
- differences attributable to the methodology used (i.e. Monte Carlo (MC) versus HS or parametric).

4.1 Outlier analysis

- 75. After the data quality assurance process, the EBA performed an 'extreme value' analysis with the aim of excluding from the computation of the benchmarks those values for which the IMV and risk measures (RMs: VaR, SVaR, P&L VaR and ES) were found to lie outside a certain tolerance range due to misinterpretation of the trade or mistyping of bookings by the banks.
- 76. The presence of clear outliers in the data used to assess variability is deemed inappropriate, since these data points are likely to weigh heavily on the results, distorting the actual level of variability observed.
- 77. Extreme IMVs and RMs are defined as values outside the range of two truncated standard deviations¹⁰ from the median. Since some results exhibited empirical distributions that had fatter tails than expected, outliers were defined as values differing by twice the truncated standard deviation or more from the median.

¹⁰ The truncated standard deviation is computed by excluding the values below the 5th and above the 95th percentile of the data series.



- 78. If a bank's IMV or RM are found to be an extreme value for a particular instrument, then this observation is removed from the computation of the final benchmark statistics. The empirical evidence indicates that excluding the RMs based solely on IMV submissions, as in the previous exercise, implied that some extreme RM submissions are wrongly reflected in the benchmarking computation, while some good observations are removed. Changing this methodology did not influence the benchmarking data point, i.e. the median result. In addition, the overall dispersion of the portfolio was only marginally affected (slightly improved). The significant enhancement is in the communication to the CAs of the significant outliers to be examined with the bank. This approach, which was first adopted for the 2020 market risk benchmarking exercise, increased the overall quality of the benchmark data, providing more consistency for the benchmarks of these metrics.
- 79. The dispersion across the contributions is summarised by the IQD coefficient, which is more robust than the coefficient of variation (CV) for data derived from fat-tailed distributions. The higher the IQD, the more dispersed the data. IQD is defined as:

$$IQD = abs[(Q_{75th} - Q_{25th})/(Q_{75th} + Q_{25th})],$$

where Q_{75th} and Q_{25th} denote the 75th and 25th percentiles, respectively.

80. Another metric used in the variability studies is the CV, which is defined as the ratio between the standard deviation¹¹ and the mean (in absolute values):

$$CV = abs[StD/Mean].$$

81. The analysis reports both metrics because they jointly allow detection of the highest peaks of variability.

¹¹ The standard deviation was considered in order to gain a sense of the entire variability and a harmonised approach across the HPE. Obviously, a truncated standard deviation may appear more consistent for some highly dispersed trades.



Table 1: IMV statistics and extreme values

EU Statistics for IMV by instrument

		Main statistics Percentiles											
	Instr. ID	Min	Мах	Ave.	STDev	STDev_trunc ¹	MAD (median absolute deviation)	Coefficient of variation (STDev/Mean)	Num obs. ²	25th	50th		IQD
	1	3,068,492	3,107,000	3,085,484	7,305	12,737	359	0%	29	3,083,859	3,084,000	3,085,118	0%
	2	543,825 -532,306	545,100 -520,474	544,216 -527,066	335 2,416	782 5,579	0	0% 1%	29 25	544,100 -528,040	544,100 -528.040	544,128 -525.802	0%
	4	-153,689	-150,743	-151,995	752	893	433	1%	26	-152,325	-151,941	-151,459	0%
	5	-1,591,744	-1,568,025	-1,579,583	6,630	16,686	4,553	0%	26	-1,585,385	-1,578,678	-1,574,718	0%
	6	-9,409	-8,888	-9,166	124	183	36	1%	22	-9,199	-9,196	-9,119	0%
	8	-69,719 -72.088	-68,950 -69,729	-69,197 -71.352	159 651	274 869	70 439	0% 1%	27	-69,244 -71.998	-69,205 -71,445	-69,077 -71,115	0%
	9	42,553	48,827	45,431	1,515	1,979	916	3%	27	44,774	45,728	46,229	2%
	10	-56,490	-49,761	-53,628	1,828	2,570	1,142	3%	25	-54,992	-53,851	-52,765	2%
	11 12	13,396 23,973	15,988 27,740	14,694 26,041	518 903	665 1,234	220 442	4% 4%	24 25	14,479	14,696 25,849	14,924 26,433	2% 2%
	12	23,973	36,847	26,041 34,439	903 1,400	2,098	442 932	4% 4%	25	25,598 33,524	25,849 34,756	26,433 35,410	2%
	14	-29,290	-23,786	-26,360	1,203	2,544	842	5%	26	-27,130	-26,500	-25,445	3%
	15	757	1,388	1,081	175	231	115	16%	23	985	1,102	1,220	11%
	16	3,089	4,848	3,964	391	484	253	10%	23	3,762	4,000	4,225	6%
	17 18	-1,146,111,682 1,000,598	-1,132,334,000 1,048,855	-1,138,363,889 1,024,529	3,764,642 14,349	4,310,972 17,162	3,137,218 13,040	0% 1%	26	-1,141,500,000 1,010,297	-1,138,605,316 1,026,221	-1,135,660,506 1,036,377	0% 1%
	19	-3,756	706	-1,698	1,142	1,280	745	67%	35	-2,683	-1,420	-884	50%
	20	-81,470	-68,975	-79,081	2,123	5,606	765	3%	32	-80,055	-79,614	-78,443	1%
	21	-10,568	-3,207	-6,891	1,536	2,240	779	22%	33	-7,981	-6,845	-6,294	12%
	22 23	-10,195 1,079,275	-6,296 1,179,861	-8,608 1,121,326	635 33,781	1,765 33,781	267 25,290	7% 3%	35 14	-8,872 1,084,205	-8,599 1,123,863	-8,337 1,147,374	3% 3%
	24	7,199,342	7,216,459	7,211,240	3,480	15,608	2,595	0%	34	7,209,209	7,211,015	7,213,989	0%
	25	-2,177,558	-2,175,832	-2,176,656	436	3,139	263	0%	33	-2,176,873	-2,176,679	-2,176,374	0%
	26	5,611,540	5,687,076	5,637,539	13,948	116,759	1,189	0%	23	5,637,435	5,637,446	5,640,800	0%
Interest Rate	27 28	1,155,744 7,286,646	1,158,358 7,304,448	1,156,345 7,293,746	452 4,054	986 64,163	109 2,166	0% 0%	33 34	1,156,033 7,291,050	1,156,387 7,293,067	1,156,471 7,295,381	0% 0%
	29	-6.298.419	-6.284.117	-6.292.618	3,187	34.625	1,481	0%	34	-6.294.417	-6,292,483	-6,290,405	0%
	30	-10,710,184	-10,690,099	-10,701,066	3,801	8,197	2,377	0%	34	-10,703,280	-10,700,242	-10,698,828	0%
	31	7,460,078	7,507,386	7,485,904	8,493	26,398	2,339	0%	33	7,483,451	7,485,386	7,488,773	0%
	32 33	5,898,424 -10.945.740	5,911,670 -10.894.601	5,907,703 -10.912.216	2,796 7,209	7,601 21,290	956 869	0%	33 31	5,906,925 -10.912.602	5,908,229 -10,911,773	5,908,968 -10,910,936	0% 0%
	34	-10,945,740	6,431,576	6.390.326	15,000	55.239	6.366	0%	25	-10,912,602	6.389.722	6.396.945	0%
	35	5,506,466	5,552,699	5,521,106	9,916	31,556	4,251	0%	26	5,517,135	5,517,420	5,526,006	0%
	36	-2,743	12,819	4,996	4,001	4,188	1,957	80%	35	2,517	4,593	7,796	51%
	37 38	-2,385 61,757	3,131 85,999	303 76,023	1,339 5,998	1,558 8,870	2,890	442% 8%	34 32	-456 74,259	82	1,079 80,141	246% 4%
	39	3,831	38,968	29.093	9,272	15,610	4.155	32%	29	27,715	31.075	34,593	476
	40	847,673	885,494	858,696	5,606	21,312	351	1%	32	858,351	858,668	859,031	0%
	41	48,101	54,620	52,478	1,672	2,599	851	3%	30	51,862	52,780	53,458	2%
	42 43	995,850 -268,645	1,016,324 -257,080	1,004,649 -263,269	4,339 2,713	6,722 3,193	2,641 1.776	0% 1%	27 28	1,001,506 -264,859	1,004,628 -263,083	1,006,813 -261,482	0% 1%
	44	-208,045	-257,080	-265,269	4,322	10.678	2.132	1%	28	-264,859	-265,085	-261,482	2%
	45	1,056,239	1,083,469	1,071,947	7,526	7,839	4,806	1%	30	1,066,829	1,071,837	1,077,774	1%
	46	-832,373	-806,913	-818,903	6,852	10,812	4,679	1%	28	-823,264	-820,173	-813,123	1%
	47 48	42,887	110,952	76,420	18,086	23,296	8,763	24%	28	65,087	74,079	88,695	15%
	48 49	-300,860 246,595	-247,360 321,739	-277,815 279,143	22,723 24,667	33,959 36,038	5,328 19,514	8% 9%	13 13	-296,239 260,675	-295,560 287,996	-257,181 297,771	7% 7%
	50	105,098	116,742	108,825	3,994	4,858	2,137	4%	10	105,603	108,688	109,876	2%
	51	-179,180	-169,272	-173,030	3,104	4,577	2,535	2%	10	-175,093	-172,457	-170,404	1%
	52 53	-26,765 15,785	-25,575 17,317	-26,176 16,438	362 375	342 581	257 94	1% 2%	20 18	-26,418 16,270	-26,234 16,295	-25,788 16,591	1% 1%
	53 54	15,/85 23,115	23,798	16,438 23,423	3/5	229	94 71	2%	18	23,344	23,392	23,492	1%
	55	30,515	34,471	32,461	1,185	1,185	975	4%	19	31,400	32,621	33,499	3%
	56	71,707	75,812	73,947	1,233	1,847	981	2%	16	73,073	73,891	75,257	1%
	57 58	-42,416 29.241	-41,543 30.185	-42,077 29,599	231 292	365 462	85 127	1% 1%	18 17	-42,208 29.382	-42,118 29,549	-42,038 29.655	0% 0%
	59	-23,831	-23,133	-23,393	161	462	94	1%	17	-23,454	-23,412	-23,255	0%
	60	11,350	12,737	11,671	368	652	132	3%	18	11,438	11,633	11,701	1%
	61	-16,473	-15,855	-16,267	177	267	76	1%	17	-16,401	-16,346	-16,128	1%
	62 63	14,707 -1,460	15,212 129	14,904 -1,147	117 394	569 1,520	36 38	1% 34%	17 17	14,863 -1,324	14,906 -1,281	14,918 -1,195	0% 5%
	64	-1,460 35,477	36,963	-1,147 36,360	489	1,520	234	34% 1%	17	-1,324 36,178	-1,281 36,378	-1,195 36,675	5%
	65	44,954	46,007	45,436	347	424	285	1%	18	45,063	45,445	45,656	1%
	66	-26,946	-23,748	-24,653	835	1,662	157	3%	19	-24,639	-24,425	-24,265	1%
	67 68	-127	3,483	1,837	795	1,120	128	43%	18	1,774	1,922	2,084	8%
	68 69	973,520 200,083	982,119 212,083	977,471 202,505	2,450 2,805	2,837 5,568	611 1,227	0% 1%	18 17	974,979 201,495	978,290 201,810	978,658 203,042	0%
	70	1,014,271	1,026,168	1,019,981	3,702	3,508	1,227	1%	20	1,018,333	1,020,273	1,020,565	0%
	71	1,030,144	1,034,340	1,033,505	1,094	2,848	165	0%	20	1,033,091	1,033,971	1,034,108	0%
	72	-1,005,603	-1,004,570	-1,005,206	254	524	84	0%	19	-1,005,345	-1,005,258	-1,005,028	0%
	73 74	1,066,659	1,068,603	1,067,904	602	3,806	192	0%	19 3	1,067,518	1,068,103	1,068,269	0%
	74								2				
	1.5								-				

¹ STDev trunc is the standard deviation computed excluding values below the 5th and above the 95th percentile ² Refers to the number of banks included in the computation of the statistics



Table 2: Average IMVs' interquartile dispersion by asset class

	Interquartile range 2021 exercise	Interquartile range 2020 exercise	Interquartile range 2019 exercise	Interquartile range 2018 exercise
Equity	2%	1%	2%	2%
IR	19%	2%	3%	8%
FX	4%	16%	15%	6%
Commodity	4%	10%	6%	8%
Credit spreads	1%	1%	3%	6%
СТР		5%	8%	103%

Average Interquartile dispersion by asset class

- 82. Table 1 and Table 2 depict the results at the level of both each individual instrument and each risk type. As shown, the highest dispersion at the level of the individual instruments is detected for IR instrument 37 (5 years IRS) (IQD 256%). This high dispersion is due to the very 'low value' (close to zero) of the instruments. In terms of its construction the IQD is a ratio of two absolute measures (difference of the 25th and 75th quantiles, divided by the sum of the two). Therefore, a difference of a few hundred euros in the IMV generates very high IQD statistics, which is the case for some derivative instruments that exhibit an IMV of close to zero at inception, since they are entered at market rates. The same differences in the case of instruments that are much more valuable generate IQDs close to zero.
- 83. Besides the 5-year IRS Instrument 37, IR instruments 36 and 19 also show an IQD above 50%. The perception with regard to these submissions, besides the minor presence of trivial errors such as inverted bookings (long instead of short), is that minimal changes in the parameter cause a significant change in the IMVs. This exacerbates the issue described for instrument 37, which is linked to the low absolute value of the instruments. This tends to inflate the IQD index of these instruments. A similar issue, though less significant, applies to instrument 21. Excluding these instruments gives us an average IQD for the IR asset class of 0%, which can be interpreted as an extremely low dispersion.
- 84. Besides these IR instruments, FX instrument 47 presents IQDs barely above 15%. The level of dispersion is substantially lower than in the previous exercise.
- 85. Overall, the IQD by asset class for the instruments of the 2021 exercise is significantly lower than in the past exercises for the FX and commodity asset classes. This means that the adjustments to the 2021 instructions have achieved the desired outcome of obtaining a generally low IQD of the instruments in the exercise.
- 86. Comparing the 2021 instruments with the 2020 instruments purely on the basis of the IQD, once the instruments with values of close to zero that skew the average by asset class have been excluded, it would appear that the quality of the data increased.



- 87. From an aggregated risk-type perspective, EQ and CS instruments show the lowest dispersion, with values in line with the 2020 exercise. The FX and CO asset classes are substantially lower than in the previous exercise.
- 88. CTP IMVs are no longer reported since the observations obtained are too few to provide meaningful statistics. Furthermore, the high IQD for the IR class is driven mainly by three instruments (1, 36 and 37). Excluding these anomalously high IQDs would produce an IQD of 1% also for IR.
- 89. A cluster analysis (see Figure 1, Figure 2, Figure 17 and Table 3) was performed to strengthen and deepen the aforementioned descriptive insights. It shows the dispersion of the IMVs by instrument and helps in identifying clusters in the instruments' pricing that could explain the scattering of IMVs for some trades. The results of this analysis suggest that the clusters are observable for IR instruments 19, 36 and 39. These clustered distributions seem to be more closely linked to the extremely low value of the instruments rather than to a misinterpretation of the instruments; this is also confirmed by an analysis of the dispersion of the risk measures relating to these portfolios.



Table 3: IMV cluster analysis – number of banks by range

2020 IMV cluster analysis by instrument: number of banks by range

(X = ratio with the median)

100 Range containing more than 15% of the total obs for that particular portfolio

	Instr. ID	300% < X	300%≥X >200%	200%≥X >150%	150% ≥ X >100%	100% ≥ X >50%	50% ≥ X >0	0 ≥ X ≻- 100%	-100%≧X >-200%	Num obs.
	1				15	16				31
	2				12	20				32
	3				9	20				29
	4				14	15				29
	5 6				13 8	16 20				29
	7				8 14	20				28 29
	8				14	15				29
	9				14	15				29
Equity	10				14	14		1		29
	11				14	14				28
	12				14	14				28
	13			1	13	15				29
	14		1		13	15				29
	15 16			2	11	13	1			27 27
	17				12 14	15 15				29
	18				12	13				25
	19	2	8	4	6	12	3	2	2	39
	20				18	17			1	36
	21	1		3	16	15	3	2		40
	22	2	1		17	19		1		40
	23				7	7				14
	24 25				19	19				38
	25 26				19 17	19 17				38 34
	27				19	19				38
Interest Rate	28				19	19				38
	29				19	19				38
	30				19	19				38
	31				18	19				37
	32				18	19				37
	33				19	19				38
	34 35				14	15				29
	36	3	7	3	15 7	16 11	6	2	1	31 40
	37	19		5	1	1	, v	2		24
	38			2	15	17				34
	39				17	9	3	5		34
	40				17	16	1			34
	41				16	16				32
FX	42 43				16	16				32 32
	43				16 16	16 15		1		32
	45				16	16		-		32
	46				16	15		1		32
	47		2		13	15				30
	48				7	7				14
Commodities	49				7	7				14
	50				5	6				11
	51 52				5	6				11 21
	52 53				10 10	11 11				21 21
	54				10	11				21
	55				9	10				19
	56				9	9				18
	57				10	10				20
	58				10	11				21
	59				10	11				21
	60				10	11				21
	61 62				10 10	11				21 21
Credit Spread	62 63				10 10	11 6		1	1	21 18
	64				9	10		-	1	19
	65				10	10				21
	66				10	11				21
	67			1	9	6		4		21
	68				9	10				19
	69				9	9				18
	70				9	12				21
	71 72				11 11	11 11				22 22
	72				11	11				22 22
	74				.1					0
СТР	75									0



90. In particular, as shown in Table 3 and Figure 2:

- Instrument 15 (EQ) is the only relatively high IQD instrument; for the rest there are generally very few extreme outlier observations, which do not represent a substantial problem for the CAs.
- Instruments 19, 36, 37 (IR): only a few observations are extreme outliers with an IQD above 50%.
- Instruments 39 and 47 (FX): there are few outliers with a relatively high IQD (above 11%).
- Instruments (CO): there are no significant outliers.
- Instrument 67 (CS): in this sovereign CDS short position, the other IMVs are very small and close to zero, which inflates the IQD with respect to the rest of the instruments in the asset class.
- 91. Some of these extreme outlier banks were classified as a high priority for the CAs (see also Chapter 6), so they were followed with greater attention during the exercise in order to specifically define the reason for the extreme result.
- 92. CTPs are no longer reported in the cluster analysis because of the scarcity of contributions.
- 93. Some minor misalignments in the IMV have been detected due to the reporting of the 'clean price' (i.e. the price of a trade excluding the accrued interest) instead of the 'dirty price' (i.e. the price of a trade including any interest), which is what was intended for the mark to market valuation. This has been detected especially in the bond price, as in instruments 24-35. This problem was more frequent in the past, but it is evident that not all the banks follow the instructions in this regard. On the other hand, this mistake does not significantly prejudice the provision of the risk measures.
- 94. In addition, the EBA recommends that banks make better use of the Q&A tool by submitting questions before the start of the exercise to avoid misinterpretations in the future. Banks are kindly invited to provide, using the Q&A tool, their best practice and market standard conventions when further specifications of the hypothetical trades are needed.
- 95. Evidence from a large majority of the banks is that IMV comes from front office systems. This is acknowledged as the best practice for alignment with real market-trading activities.
- 96. Figure 1 and Figure 2 report the clusters found in the IMV results for a sample of low IQD instruments (0% IQD or close to zero) and high IQD (the highest in the asset class) instruments. All the instruments' IMV distributions are available in the annex in Figure 17.



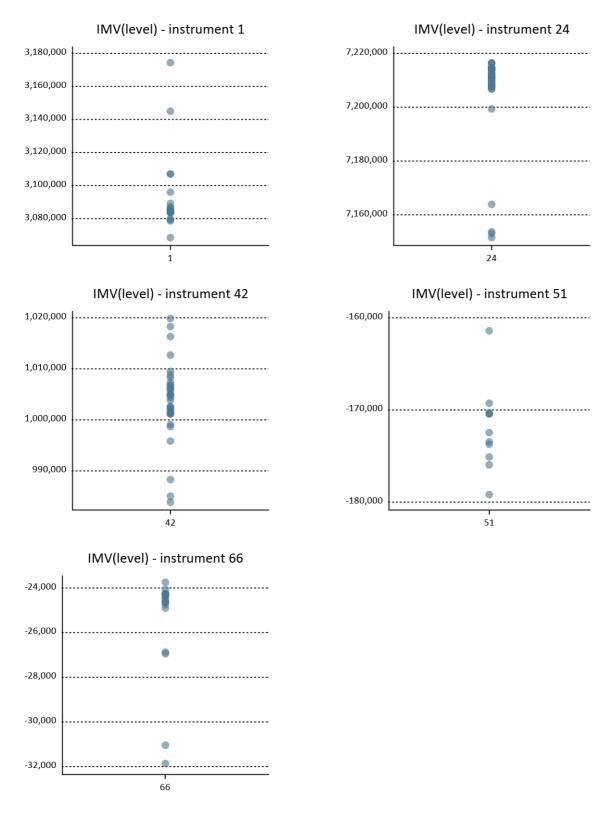


Figure 1: IMV scatter plots – low-IQD instruments



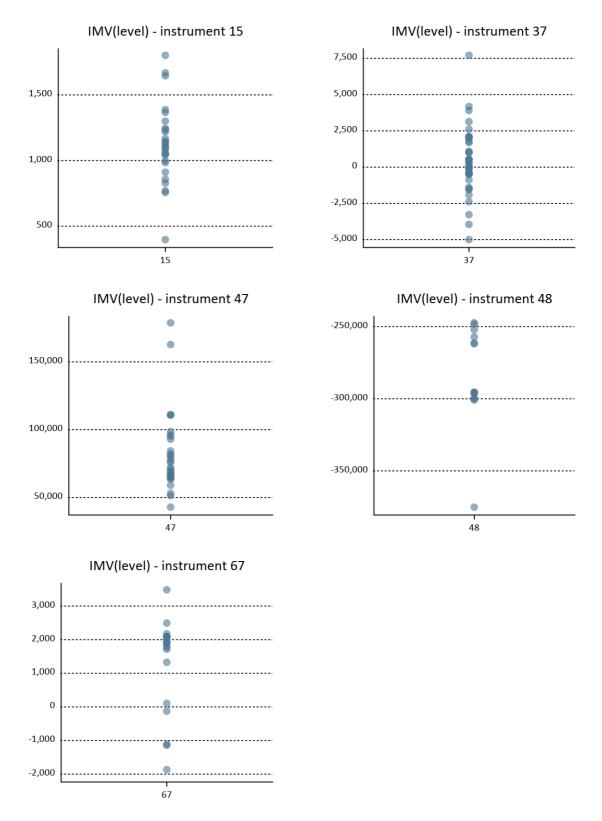


Figure 2: IMV scatter plots – high-IQD instruments

97. The 'concentration index' as per the percentage of values between 50% and 150% of the median value in Table 3 shows that, overall, 97% of the observations lie between those ranges.



- 98. This result is consistent with that reported following last year's MR benchmarking exercise, demonstrating once again that the simplification of the instruments resulted in a decrease in the number of outliers.
- 99. Given the EBA's experience of past benchmarking exercises, values lying in this range might be considered acceptable on the basis of fine-tuning as successive benchmarking exercises are run. Nevertheless, the aim will be to increase this IMV empirical range coverage in subsequent exercises.
- 100. For many hypothetical instruments, the IMV variability is explained by the divergence in terms of both fixings and market practice assumptions by the participating banks. Therefore, the interpretation of the deals and market practices substantially explains the observed variability.

4.2 Risk and stressed measures assessment

- 101. For VaR and sVaR, variability was assessed by using the banks' reported VaR and sVaR over a 2-week period (from 18 January 2021 to 29 January 2021). Banks submitted weekly or daily observations, depending on their models, and the final risk measures by portfolio were obtained by averaging the observations over the 2 weeks.
- 102. In the sample, 13 out of 40 banks calculated weekly sVaR measures. The remaining two thirds of the participating banks computed daily sVaR measures.
- 103. In addition, a P&L VaR measure produced by the EBA using the P&L data provided by banks via an HS approach was analysed. The relevant banks delivered a yearly 1-day P&L vector for each of the individual and aggregated portfolios modelled. These were used to compute the P&L VaR.
- 104. The additional P&L information for non-APR portfolios allowed the EBA to compute the alternative measure for VaR previously defined, and to check the variability of the results across banks by calculating VaR using a 1-year lookback period.
- 105. Additional checks were carried out for the available P&L vectors, such as the 1-day P&L versus the 10-day P&L (either overlapped or not), where applicable. Furthermore, the time series with the wrong time window were dropped. P&L vectors provided by banks with no HS model were also dropped. A final consistency check across the HS banks entailed computing the ratio between P&L VaR and the regulatory VaR provided, which can be expected to be close to 1.¹²

¹² It should be noted that this expectation depends on the lookback period for VaR.



- 106. Clearly, the P&L VaR assessment is possible only for banks applying an HS approach, and with at least 185 days of results submitted. Accordingly, banks applying an MC or parametric approach, or another approach other than HS, cannot be subject to this assessment, and have been dropped from the sample (see also Section 3.4, 'Data quality issues').
- 107. The P&L VaR was computed as the absolute value of the empirical first percentile of the P&L vector rescaled to 10 days by applying the square root of time approximation, without applying any data-weighting scheme:¹³

$$VaR_{99\%}^{10day} = \sqrt{10} * VaR_{99\%}^{1day}$$

- 108. The P&L vector is used to assess the degree of P&L correlation across banks, as well as the level of volatility shown in each bank's vector. This analysis should provide useful insights into the degree of market consensus on the relevant risk factors in terms of both market dynamics and volatility levels. Obviously, this analysis, like most of those discussed here, relies on sufficient data points and portfolios being modelled by banks to ensure robustness and consistency.
- 109. The IRC analysis cannot be deepened in this way for VaR because of the higher level of confidence (99.9%) and longer capital horizon (1 year) applied in these metrics. Nevertheless, a variability analysis was performed. In the paragraph concerning IRC, particular emphasis is reserved for missing, zero or unrealistically low results, which suggest that key underlying risk factors are not efficiently captured by the IRC internal model.
- 110. In the sample, 11 out of 22 banks computed weekly IRC measures.
- 111. It is apparent that more complex risk measures, such as IRC, are computed at a less frequent pace (i.e. a weekly basis instead of a daily basis).
- 112. For APR, only a small number of contributions were submitted because of the scarcity of approved internal models on CTPs and because most institutions consider the CTP business to be declining significantly as a result of the recent financial crisis. Therefore, the sample is quite limited.
- 113. In the sample, all the banks computed weekly APR measures.

¹³ Some banks apply data weightings at a risk factor level and these will be present in the P&L vectors. This is an implicit source of variability that cannot be controlled.



114. The ES, as an alternative risk metric to VaR, has been estimated from the daily P&L series by averaging the P&L observations below the 2.5th percentile converted by the square root of time approximation and taking the absolute value:

$$ES_{97.5\%}^{10day} = \sqrt{10} * ES_{97.5\%}^{1day} = \sqrt{10} \frac{1}{n} \sum_{i=1}^{n} P \& L_{t_i}$$

where n = number of days describing the 2.5th quantile rounded to the highest decimal.

- 115. For the aggregated portfolios, diversification effects were checked with regard to the VaR, sVaR and IRC metrics, regardless of whether they were provided or estimated.
- 116. For the most inclusive portfolios i.e. the aggregate portfolios the implied capital charges were also computed and their variability analysed. Where possible, the idiosyncratic factors that drive variability and the impact of regulatory add-ons (e.g. multipliers) were analysed.
- 117. It is worth noting that, although the effects on capital levels of these supervisory actions can be substantial, an HPE is not suitable for assessing such differences. This is especially the case for diversification benefits since these effects are entirely portfolio-dependent. More on this is included in the following subsection entitled 'Limitations'.
- 118. Finally, to make the analysis more comprehensive, CAs were asked to complete a questionnaire about the takeaways from this benchmarking analysis and the actions they plan to take to overcome potential weaknesses in the banks' MR models (see Section 6 of this report). Thanks to the interview process, the EBA had the opportunity to discuss directly some issues raised by CAs when challenging the models in the ongoing assessment process.

4.2.1 Limitations

- 119. The design of the benchmarking portfolio exercise described in the ITS aims to ensure the quality of the data used in the report to be produced by the EBA and, more importantly, to identify the banks and portfolios that need specific attention on the part of the responsible CAs. Nevertheless, any conclusions regarding the total levels of capital derived from the hypothetical data should be treated with due caution. The hypothetical portfolios are very different from real portfolios in terms of size and structure. What is more, the data cannot reflect all the actions taken by supervisors.
- 120. From a methodological perspective, the sVaR metric variability observed could originate either from differences in modelling or from the different data periods used for sVaR computation. Further variability stems from banks' different stress periods because there is no common benchmarking stress period. To allow more specific analysis of this aspect, since the 2019-2020 benchmarking exercise more information about the stressed VaR time window has been requested from banks by expanding the relative template envisaged in Annex VI of the benchmarking ITS (in this regard, see subsection 5.2.5.d, 'Common stress period considered' below).



- 121. Another limitation that was tackled in this exercise is that of producing a segregated analysis for institutions with partial model approval (e.g. general risk only) in order to split the result for portfolios with specific risk to filter the additional unwarranted dispersion of VaR figures. The benchmark analysis was run by splitting banks with full approval for equity and IR from those with partial approval to filter out the variability of the risk measure introduced by the partially approved banks.
- 122. Banks with partial model approval provided insights into how they approached the benchmarking exercise. It has been found that the differences reported by the banks in respect of the EBA's benchmark measure are almost entirely explained by considering the internal measure of risk, which is not approved for capital purposes but is more complete in terms of risk factor coverage.
- 123. In summary, the reporting of partial use approval results should be continued for the purpose of the exercise. However, it should be considered within the specific sample in order to assess any bias these partial use approval results could introduce into the results for the rest of the sample observed.



5. Overview of the results obtained

5.1 Analysis of VaR and sVaR metrics

- 124. The dataset used to perform the assessment of risk measures for the 2021 exercise was determined on the basis of the actual dispersion of the risk measures analysed. The outcome of the IMV extreme value analysis was used as an early indication of the potential problems to be reported to banks by their CAs. As explained in Section 4.1, banks' data were taken into account only for portfolios for which the RM is between the benchmark (50th percentile) +/- two times the truncated standard deviation in the portfolio analysed. The rest was classified as an outlier. As shown in Figure 26, we can see that this methodology, contrary to what was used until the 2019 exercise, does not exclude RMs that are clearly consistent with the benchmark.
- 125. To check if submissions (by portfolio) were at least approximately symmetrically distributed around the mean and/or the median, the EBA checked for any significant differences between the mean and median values for the truncated sample. Table 20 in the annex reports the banks' VaR results in relation to the median, aggregated into six buckets, to enable the detection of unexpected clusters.
- 126. As Table 20 and Table 21 clearly show, the variability of the VaR (above 20% in IQD) has substantially increased versus the previous year, especially in portfolios 4, 7 and 8 for EQ and 17, 18, 24, 25 and 26 within the IR asset class. The analysis also identifies substantial clusters for portfolios 37 to 42, 44 to 47 and 51-52 (credit spread). It seems clear that substantially increased levels of VaR, likely due to an increase in market volatility in spring 2021, exacerbated the differences in the model outcomes that were already present in the past, triggering higher IQD rations.
- 127. In contrast to the previous exercise, the VaR values for CTPs (portfolios 54 to 56) are not reported because of insufficient numbers of these data submission to guarantee the significance of the statistics provided and the anonymity of the submissions.
- 128. The cluster analysis presented above is superior to a simple outlier analysis that flags submissions more than a designated number of standard deviations from the mean, as this method cannot easily be used for clustered or strongly asymmetric portfolios.

Interquartile dispersion

129. Figure 3 and Table 4 summarise the variability of the results, measured via the IQD and coefficient of variation, for the IMV as well as all three VaR measures (i.e. VaR, VaR for HS banks only and VaR calculated from the 1-year P&L series submitted by HS banks). IQD and CV for IMV, PV, VaR and stress VaR, divided by risk factors, are reported at the bottom of Figure 3. Table 4 also includes the VaR results for MC simulation banks and the expected shortfall.



- 130. In terms of risks across different assets classes, the IQDs for VaR for all the asset classes have increased; while they are barely below 20% for the IR and CO portfolios, they are lower than for the other risk types. The asset class with the highest IQD is CS (37%; it was 23% in 2020). Overall, the IQD is substantially higher than in the 2020 exercise, where there was an average dispersion of the VaR of 17%, whereas this rose to 25% in the 2021 exercise. This substantial increase in the IQD of the VaR is likely to have stemmed from the much higher volatility in the market in 2021.
- 131. As usual, the IQD for sVaR is higher than for VaR (see the bottom panels of Figure 3), with an average IQD of 29% (25% in 2020). The difference between VaR and sVaR in IQD is less significant in this exercise than in the past. The CS asset class features a higher dispersion once again (34%; in 2020 it was also 34%), but the IQD ratios for IR and FX are also above 30%. Higher sVaR dispersion is likely to be due to the differences between banks in their choice of the 1-year stress period used, which is chosen based on each participating bank's actual portfolio. It might therefore be the case that the sVaR is not calculated with respect to the 1-year period that maximises VaR for the given hypothetical portfolio.

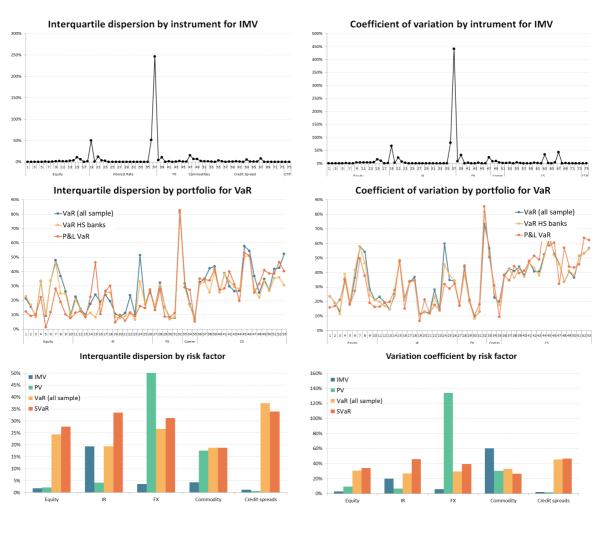


Figure 3: Interquartile dispersion and coefficient of variation for IMV and risk metrics by portfolio



Table 4: Interquartile dispersion for IMV and risk metrics by risk factor

	IMV	VaR (all sample)	SVaR	P&L VaR	VaR HS banks	VaR MC banks	Exp shortfall
Equity	2%	24%	28%	13%	23%	7%	13%
IR	19%	19%	34%	17%	16%	7%	12%
FX	4%	27%	31%	25%	26%	7%	23%
Commodity	4%	19%	19%	21%	17%	0%	19%
Credit spr.	1%	37%	34%	37%	33%	13%	36%

Average Interquartile dispersion by risk factor

- 132. As expected, Table 4 confirms that when a homogeneous subset of banks is considered (i.e. HS or MC banks), the VaR results show less dispersion than the total sample (average 23% vs. 25%). With regard to the P&L VaR, it is evident that the dispersion (22% on average) is slightly lower with respect to both HS VaR and all-sample VaR for all the asset classes. This is consistent with the assumption that fewer differences in the methodology would imply less dispersion among the risk measures.
- 133. When comparing variability for HS VaR and MC VaR, this year's result tells us that the MC VaR values are less dispersed than those of the HS VaR, as in the past exercise. Nonetheless, the analysis needs to take account of the fact that the sample of MC banks is quite small compared with that of HS banks (i.e. 6 MC banks versus 29 HS banks). As far as parametric banks are concerned, a similar analysis is not informative as the total number of parametric banks is very small (i.e. three banks in the sample).
- 134. The ratio between sVaR and VaR was also analysed across the sample (see Table 25 in the annex). Some banks have ratios below 1 for many portfolios, while other banks have extremely high ratios for some portfolios. While it is generally expected that the sVaR is greater than the VaR, the clear disparity between these values is usually a natural indication that something is wrong with the data submitted, and the EBA and CAs have to pay attention to these observations.
- 135. Table 5 shows the distribution of the sVaR–VaR ratio classified into three buckets (i.e. below 1, between 1 and 3, and above 3) for each portfolio. It is worth noting that a significant number of portfolios for EQ, IR and CS have a significant proportion of ratios below 1.



Table 5: sVaR–VaR ratio by range (number of banks as a percentage of the total)

Distribution of sVaR / Var ratio over portfolios

(X = ratio with the median)

	Port. ID	X>3	1 <x≤3< th=""><th>X≤1</th></x≤3<>	X≤1
	1	0.0%	73.1%	26.9%
	2	0.0%	75.0%	25.0%
	3	0.0%	56.0%	44.0%
	4	0.0%	69.6%	30.4%
	5	0.0%	77.3%	22.7%
Equity	6	0.0%	70.8%	29.2%
	7	4.8%	42.9%	52.4%
	8	0.0%	18.2%	81.8%
	9	0.0%	48.3%	51.7%
	10	0.0%	88.0%	12.0%
	11	18.4%	68.4%	13.2%
	12	6.3%	68.8%	25.0%
	13	30.3%	57.6%	12.1%
	14	44.7%	42.1%	13.2%
	15	36.4%	45.5%	18.2%
	16	0.0%	84.8%	15.2%
	17	0.0%	56.7%	43.3%
	18	0.0%	27.6%	72.4%
Interest Rate	19	0.0%	84.8%	15.2%
	20	17.9%	64.3%	17.9%
	21	5.7%	74.3%	20.0%
	22	38.7%	51.6%	9.7%
	23	0.0%	90.9%	9.1%
	24	3.7%	66.7%	29.6%
	25	42.9%	42.9%	14.3%
	26	0.0%	44.4%	55.6%
	27	0.0%	83.3%	16.7%
	28	0.0%	26.9%	73.1%
	29	3.7%	96.3%	0.0%
FX	30	3.7%	96.3%	0.0%
	31	3.7%	88.9%	7.4%
	32	28.6%	67.9%	3.6%
	33	8.3%	41.7%	50.0%
Commodity	34	0.0%	18.2%	81.8%
	35	0.0%	100.0%	0.0%
	36	0.0%	29.4%	70.6%
	37	0.0%	81.3%	18.8%
	38	5.9%	76.5%	17.6%
	39	0.0%	82.4%	17.6%
	40	15.8%	78.9%	5.3%
	41	15.8%	68.4%	15.8%
	42	7.1%	71.4%	21.4%
	43	11.8%	58.8%	29.4%
Credit Spread	44	11.1%	55.6%	33.3%
create spread	45	11.8%	76.5%	11.8%
	46	0.0%	50.0%	50.0%
	47	27.8%	66.7%	5.6%
	48	0.0%	82.4%	17.6%
	49	0.0%	46.7%	53.3%
	50	0.0%	38.9%	61.1%
	51	0.0%	66.7%	33.3%
	52	0.0%	86.7%	13.3%
	53	0.0%	85.7%	14.3%
	54	0.0%	66.7%	33.3%
CTP	55	0.0%	100.0%	0.0%
	56	0.0%	100.0%	0.0%
ALL-IN no-CTP	57	0.0%	100.0%	0.0%
Equity Cumulative	58	0.0%	77.8%	22.2%
IR Cumulative	59	0.0%	56.0%	44.0%
FX Cumulative	60	4.5%	95.5%	0.0%
Commodity Cumulative	61	0.0%	10.0%	90.0%
CS Cumulative	62	6.3%	62.5%	31.3%
CTP Cumulative	63	0.0%	100.0%	0.0%



5.2 A closer look at the VaR and sVaR results

- 136. Figure 4 and Figure 5 give an overview of the VaR and sVaR results for portfolios 1 to 56, i.e. they do not include the aggregated portfolios, where fewer observations were available for the reasons explained above (see Section 3.4).
- 137. Broken down by portfolio, the figures show the average VaR and sVaR over the 10-day submission period for each bank, normalised by the median¹⁴ of the given portfolio.¹⁵
- 138. Comparing Figure 4 and Figure 5, it looks as if the dispersion is higher for sVaR than for VaR (sVaR 31% IQD versus 27% VaR IQD on average). Differences in dispersion between VaR and sVaR seem steady but are more marked for the IR portfolios, in which sVaR shows a higher level of dispersion than in the other asset classes (approximately 34%).
- 139. IR and CO are the asset classes with the lowest levels of dispersion for VaR (19%), while for sVaR it was the CO asset class (19%).

¹⁴ The portfolio median is the median of the average VaR and sVaR over the submission period.

¹⁵ Note that the figures are restricted to VaR–median and sVaR–median ratios below 450%.



VaR: all portfolios (exc. aggregated) (ratio with the median) Equity Interest Rate FX Comm **Credit Spread** СТР 500% 400% 300% 200% 100% 8 0% 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 10 11 12 13 14 15 16 17 21 41 42 45 46 52 53 54 55 56 20 VaR: all portfolios (exc. aggregated) (ratio with the median below 50%) Equity **Interest Rate** FX Comm **Credit Spread** СТР 50% 40% 30% 20% 10% 8 ġ 0%

30

31 32 33 34 35

36 37 38 39

15 16 17 18 19 20 21 22 23 24 25 26 27 28 29

Figure 4: VaR submissions normalised by the median of each portfolio

44

40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56



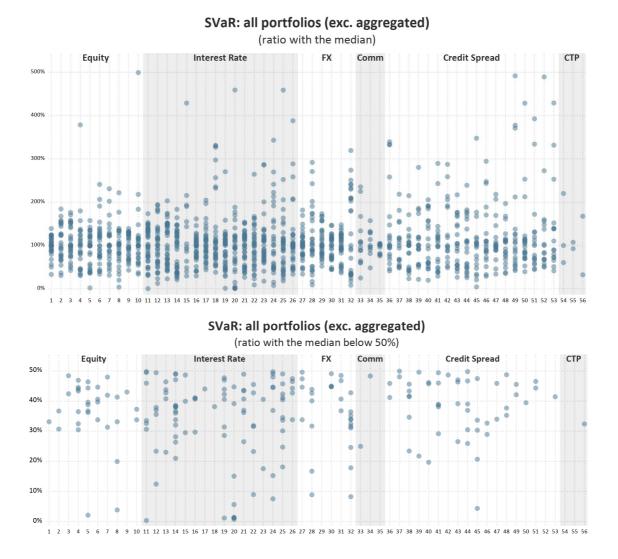


Figure 5: sVaR submissions normalised by the median of each portfolio

140. Table 21 and Table 22 in the annex report all the VaR and sVaR statistics along with EU benchmarks for all HPE portfolios.

5.2.1 Comparison of sVaR and VaR ratios

141. Banks were assessed in relation to the full sample not only by their VaR and sVaR values, but also by their sVaR–VaR ratios. In general, it should be expected that sVaR would be at least as high as VaR, as sVaR is calibrated to a 1-year period of significant stress. This is verified in 73% of cases. This percentage is substantially lower than in the previous exercise. It should be noted that the 2021 VaR statistics submitted in the exercise are substantially higher in absolute terms compared to the past (this percentage was usually above 90%) due to the Covid pandemic and



the higher volatility generated in the market¹⁶. The increased volatility was less evident in the sVaR, reducing the percentage of the sVaR-VaR ratio. Moreover, since the stress period is calibrated on a bank-by-bank basis using the banks' actual portfolios, for the hypothetical portfolios underlying the HPE, the sVaR–VaR ratio could in some instances conceivably be less than 1.

142. Figure 6 shows the ratio of the average sVaR to the average VaR for each bank. The sVaR– VaR ratio varies significantly across the portfolios. Excluding outliers, the average sVaR–VaR ratio per portfolio varies between 0.45 and 3.83 and averages 1.47.¹⁷ These ratios are approximately half those in the previous exercise. The portfolios with the lowest levels of dispersion for the sVaR–VaR ratio (excluding outliers) are portfolios 1, 5 (EQ), 27, 31 (FX), 34, 35 (CO) and 39 (CS).

¹⁶ In this regard it should be borne in mind that the EBA allowed banks to postpone updating the historical period <u>EBA Statement on the application of the prudential framework on targeted aspects in the area of market risk</u> in the COVID-19.pdf (europa.eu).

¹⁷ The minimum among the single asset class portfolios (1-21) between the 25th and 75th percentiles is 0.96; see Table 20.



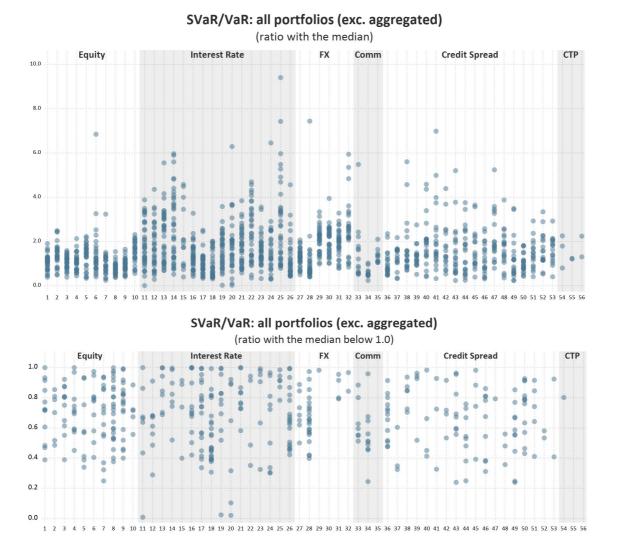


Figure 6: sVaR–VaR ratio for the average VaR and sVaR by portfolio

143. A few banks have a high sVaR–VaR ratio for portfolios in certain asset classes only. This suggests that these asset classes dominate the banks' real trading portfolios and, for that reason, drive the calibration of the sVaR window.

5.2.2 Drivers of variation

144. Based on the qualitative information provided by banks (Figure 7 to Figure 11), the most common methodological approach used by banks to model MR is HS (70%). Although the majority of banks use the same methodological approach, the dispersion of VaR remains significant because other modelling choices play a key role in producing variability of the risk measures (e.g. differences in time scaling and/or weighting scheme choices, absolute versus relative returns for different asset classes).



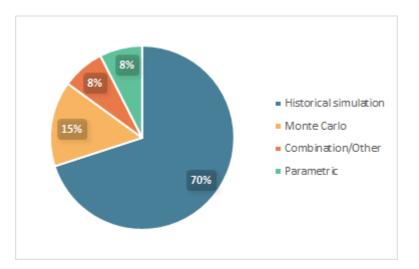


Figure 7: Qualitative data: VaR methodological approaches



VaR: all portfolios (exc. aggregated) (ratio with the median - HS banks in orange) Equity Interest Rate FX Comm **Credit Spread** СТР 500% 400% 300% 200% 1009 09 11 12 13 14 15 16 17 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 10 18 19 38 40 41 42 43 44 45 52 53 54 55 56 VaR: all portfolios (exc. aggregated) (ratio with the median below 50% - HS banks in orange Equity **Interest Rate** FX Comm **Credit Spread** CTP 50% 40% 30% 20% 10%

Figure 8: VaR submissions normalised by the median of each portfolio (by methodological approach)

14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56

0%

12 13

145. With regard to the regulatory 10-day VaR computation, by far the preferred method is rescaling the 1-day VaR to the 10-day VaR using the square root of time approximation.



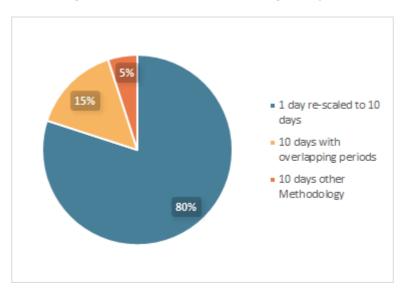
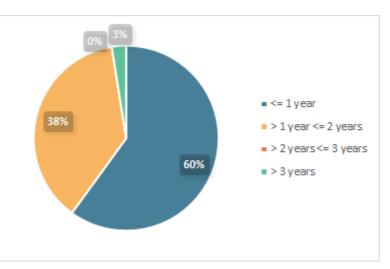


Figure 9: Qualitative data: VaR time-scaling techniques

146. With regard to the historical lookback period used to calibrate banks' VaR models, 60% of the banks use the minimum period of one year, and applying a period longer than 2 years is very unusual.





147. As for the possible use of a data-weighting scheme, the great majority of banks' models use unweighted data in the regulatory VaR computation (83% of respondents).



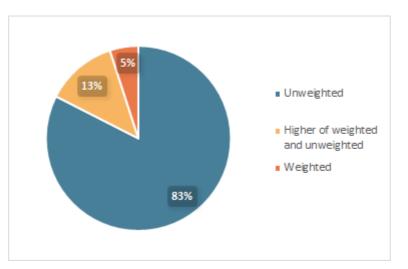


Figure 11: Qualitative data – VaR weighting choices

- 148. Finally, with regard to supervisory actions on regulatory add-ons, 72% of the banks in the sample have a total multiplication factor greater than the minimum of 3, which includes the addend resulting from the number of over-shootings (Table 1 in Article 366 of the CRR) and any supervisory extra charge(s). The average total multiplication factor in this sample is equal to 3.5, with a maximum of 5. As a result, quite a number of banks either have to correct for excessive over-shootings or are subject to supervisory measures. In addition, some banks have been assigned other kinds of added penalties that encompass risk 'not in VaR' and additional charges for IRC and APR. This was apparent from the additional and related information provided by some CAs about their supervised banks, and from discussions with some banks during the interviews.
- 149. These responses suggest that the observed variation may be due to a number of different drivers. The EBA chooses to present the analysis using the following broad headings:
 - supervisory actions;
 - modelling differences; and
 - other drivers of variation.

5.2.3 Supervisory actions

150. Supervisory actions can take different forms and are therefore difficult to capture fully in the analysis. However, the effects of some types of supervisory charges can be approximated. The effect of a higher VaR or sVaR multiplier imposed by a CA because of model weaknesses, for example, can be studied using the following proxy:

Capital proxy =
$$m_{vaR} * VaR + m_{sVaR} * sVaR$$



where m_{vaR} and m_{sVaR} are the total regulatory multipliers given by 3 plus any add-on resulting from excessive backtesting exceptions and other prudential extra charges imposed by the regulator (where appropriate).

- 151. Including the multipliers in the analysis did not significantly change the results in terms of variability across the sample; that is, the positioning across the sample changed, but, on average, the extent of the dispersion did not.
- 152. Other supervisory measures, such as capital add-ons, cannot be easily captured. They are normally calculated at an aggregate level on the basis of the banks' actual portfolios and cannot therefore be readily computed for the hypothetical portfolios used for benchmarking. Moreover, it tends to be the case that these add-ons are intended to capture difficulties in modelling risks associated with more exotic trades not represented well in the HPE.

5.2.4 Modelling differences

- 153. As outlined in Chapter 4, the CRR permits banks to tailor their VaR models to their specific requirements by making different modelling choices. To test the impact of different modelling choices in a controlled manner, four portfolios were selected based on low IQD. Obviously, the average sample size in this analysis is limited.
- 154. The portfolios portfolios 3, 13, 31 and 48 cover the main asset classes (i.e. EQ, IR, FX and CS) and were chosen due to the low variability of the submissions received for them. Six subsets of banks were defined within (and hence controlling for) the sample of banks using historical simulation, distinguishing the following modelling choices:
 - 1-day scaled versus 10-day overlapping returns¹⁸;
 - the length of the historical lookback period (1 year versus > 1 year)¹⁹; and
 - keeping constant the 1-day and unweighted modelling choices and varying the length of the lookback period (1 year versus > 1 year).²⁰
- 155. As shown in Table 6 and Table 7, there seems to be evidence that the modelling choices matter in terms of dispersion and the conservativeness of the VaR. For instance, for the EQ portfolio the 1-day calibration, more than 1 year and unweighted choices produce less dispersed and more conservative results.
- 156. For the IR portfolio the 1-day and more than 1-year calibrations produce less dispersed and more conservative results.

¹⁸ 20 banks adopted 1-day returns, while 7 banks adopted 10-day returns.

¹⁹ 14 banks adopted 1-year, while 13 banks adopted > 1 year.

²⁰ 9 banks adopted 1-day, unweighted & 1-year, while 9 banks adopted 1-day, unweighted & >1 year.



- 157. For the EQ, FX and CS portfolios, the '1 year' calibration produces less dispersed and more conservative results.
- 158. Columns 5 and 6 of Table 6 and Table 7 illustrate the effect of increasing the lookback period (1-year compared to 'more than 1 year') when we keep the other factors (1-day & unweighted shocks) the same. We see the '1 year' calibration tending to produce less dispersed and more conservative results across assets classes (except IR).
- 159. These results cannot be directly matched to the previous year's results because of the difference in the instruments selected. It is also clear that these results depend on the portfolios' selection for this analysis. Therefore, based on this analysis, it is difficult to support the idea that one specific model choice will lead to consistently more conservative and less dispersed risk measures.

	Coefficient of Variation for regulatory VaR (controlling for HS)										
Port.	1-day	1d, 1y, unw	1d, >1y, unw								
EQ 3	9.2%	7.3%	10.9%	10.9%	6.8%	10.2%					
IR 13	12.5%	16.4%	14.8%	13.3%	11.2%	12.9%					
FX 31	13.3%	13.8%	9.0%	16.0%	10.3%	17.1%					
CS 48	35.5%	26.9%	31.5%	44.0%	29.8%	54.4%					
mean	17.6%	16.1%	16.5%	21.1%	14.5%	23.6%					

Table 6: Coefficient of variation for regulatory VaR (controlling for HS) by modelling choice (%)

Table 7: Average regulatory VaR by modelling choice

		Average VaR subsamples								
	1-day	1d, 1y, unw	1d, >1y, unw							
EQ 3	15,075	12,636	14,993	13,664	15,675	14,173				
IR 13	125,591	103,857	115,730	127,548	119,810	132,761				
FX 31	548,956	528,013	563,315	523,881	560,406	547,265				
CS 48	28,688	24,092	28,126	24,489	31,953	22,400				

5.2.5 **Other drivers of variation**

160. In addition to the drivers of variation discussed in the preceding two subsections, there may be other drivers of variation.



- 161. In subsection 5.2.4 'Modelling differences', for instance, only results obtained with HS VaR were discussed, although the methodological aspects considered are expected to be important for other model types (e.g. MC simulation) as well.
- 162. Another driver of variation are the risks not captured in a model. Due to the simplification of the exercise compared to past exercises (2016-2018), the majority of the most exotic instruments were deleted, so most of the possible risk factors not in the models are no longer present in the exercise. Moreover, banks that are not able to model specific trades are allowed by the Benchmarking RTS not to submit the risk measure. This is shown, for example, in instrument 23 (IR 'Cap and Floor' on 10-year note), where only 14 observations (across 40 banks) are available. Nonetheless, for this non-vanilla product the IQD is 24% for the VaR, which is similar to other IR portfolios, which means that the submitting banks presented some consistent risk measures. As a result, it is likely that few risks not in VaR were present.
- 163. The use of proxies probably leads to spurious variability in some of the hypothetical portfolios characterised by less liquid risk factors, for example some credit spreads. This consideration also applies to the sVaR.
- 164. As in the previous exercise, the EBA also presents an analysis of aspects not considered in the past (2016-2018). Four additional drivers of variation will therefore be tested in the following areas: (a) size of the bank, (b) business model, (c) level of approval of model (e.g. general interest risk versus general and specific interest risk approval, or general equity risk versus general and specific equity risk approval) and (d) time window selected for the calibration of the stressed VaR. As for the previous exercise (2020), the EBA also tested different definitions of size and business models.

a. Size of the bank

- 165. The size of the bank could have some impact on the internal model. Larger banks are expected to invest more in internal modelling, and this could have an impact on the quality of the model and the results submitted. The same can be said of banks that invest more in market activities in terms of their whole bank activity. The composition of the bank's trading portfolio could also have some influence on the design and performance of the internal model. Nonetheless, size is not a uniquely definable variable.
- 166. For the scope of the analysis, the size of the banks was selected based on banks' common reporting results concerning the RWA for market risk. The market risk RWA was preferred in selecting the size because a bigger bank in terms of total RWA can have a smaller market risk trading book in relative terms. The market risk RWA variable was therefore preferred. It should be noted that market risk RWA also incorporates the standardised measure, but classifying the bank by the internal model market risk RWA did not change the composition of the sample substantially.



- 167. The banks were divided into three subsamples: large (above the 75th quantile), medium (between the 75th and 25th quantiles) and small (lower than the 25th quantile). Detailed VaR tables are presented in the annex (see Table 27, Table 28 and Table 29).
- 168. Table 8 summarises the effect of the bank's size. Because of the decreased number of submitters, the 'small banks' sample lost a little of its significance. Fewer banks means fewer submissions, and the smaller banks usually report less information. Therefore, it is more interesting to look at the difference in dispersion among medium and large banks. For all asset classes other than CS, it seems that dispersion decreases with the size of the banks. This implies that the banks' size does matter and that variability in size increases the dispersion of the general results submitted.
- 169. Further analysis of this aspect can be carried out in terms of the factors selected to define the size. If we run the same analysis using the size of the trading book²¹ instead of the size of the bank (defined by RWA for market risk), we can see that dispersion varies again across different asset classes and different sizes of banks. The results are reported in Table 30, Table 31 and Table 32. Looking solely at the trading book size, we obtain different results. The average IQD ratio is not monotonic with the size of the trading book. The average IQD is 20% for small TB banks, 24% for medium TB and 19% for large TB banks.
- 170. The results concerning the impact of size on variability are mixed, but interesting, and these results merit investigation in the exercises.

		VaR - Avg. Interquartile Range								
	All Banks	Small Banks	Medium Banks	Large Banks						
Equity	24%	11%	24%	17%						
Interest Rate	19%	20%	19%	15%						
FX	27%	25%	26%	23%						
Commodities	19%		25%	13%						
Credit Spread	37%		25%	27%						
СТР										
All-in	15%	5%	13%	17%						

Table 8: Asset class comparison for VaR in terms of banks' size

b. Business model

171. The business model of the banks in the sample was selected based on a previous analysis run by the EBA (EBA – LCR Report²²). In the sample of 40 banks, 25 were classified as crossborder universal banks, which is by far the most numerous business model in the sample. The

²¹ The size of the trading book was defined as: (assets held for trading + liabilities held for trading) / (total assets * 2). Data source: FINREP data)

²² https://eba.europa.eu/-/eba-reports-on-the-monitoring-of-the-lcr-implementation-in-the-eu



remaining banks were either not classified or had different business models (e.g. local universal banks), but they were too few to use as a subsample for this kind of analysis. As a result, the cross-border universal bank business model was selected.

- 172. Specific VaR results for banks classified as cross-border universal banks are shown in Table 33 of the annex. Table 9 summarises the impact of the business model on different asset classes. It is clear that the business model selected is so predominant in the sample that it does not allow for proper discrimination among the whole sample; therefore, the dispersion of the banks belonging to the same business model is very close to the dispersion of the whole sample for the banks. Judging from the results, there is some weak evidence that the business model has some effect in increasing the dispersion of the VaR submission.
- 173. Further analysis of the business model can be carried out in terms of factors selected to define the business model. If we run the analysis based on the amount of 'Level 3 assets and liabilities' in relation to the size of the trading book²³ (FINREP data), the results are reported in Table 34, Table 35 and Table 36. The average IQD is 19% for the low level of Level 3 A&L banks, 23% for the medium level and 19% for the high level of Level 3 A&L banks. Therefore, it seems that a more exotic composition of the bank's trading book does not affect the variability of the results.

	VaR - Av	g. Interquartile Range
	All Banks	Cross-border Universal bank
Equity	24%	20%
Interest Rate	19%	19%
FX	27%	25%
Commodities	19%	19%
Credit Spread	37%	27%
СТР		
All-in	15%	14%

 Table 9: Asset class comparison for VaR within the same business model (cross-border universal bank)

c. Level of approval

174. Banks can have different levels of approval for equity and interest rate risks. To be more specific, banks can apply to obtain approval for the general equity or interest rate risk or they can apply for approval of the specific equity or interest rate risk as well. See also the discussion in Section 4.2 on this point. In general, having approval for both the general and the specific parts of the equity and interest rate risks allows banks to fully model the instruments in the equity and credit spread sections of the exercise. Nonetheless, banks with only general approval are required to report these instruments as well, but this has been known to generate additional

²³ (Level 3 assets held for trading + level 3 liabilities held for trading) / (assets held for trading+ liabilities held for trading)



dispersion in the risk measures submitted. For this reason, in this exercise the EBA filtered all the results submitted and produced IQD statistics for the banks belonging to the sample of banks with different levels of approval.

- 175. Among the banks that submitted results for interest rate risk, 20 banks in the report have general and specific approval (see Table 31) and 17 banks have only general approval (see Table 32). Among the banks that submitted results for equity asset risk, 24 banks in the report have general and specific approval (see Table 33) and 10 banks have only general approval (see Table 34).
- 176. Table 10 summarises the result of the analysis when the filter for the level of approval is applied. It is clear that the presence of banks with different levels of approval tends to slightly impact the benchmarking results.
- 177. Looking at Table 10, we see that the EQ asset class IQD is smaller when considering only the subsample of firms with the full level of approval with respect to the full sample. The CS asset class also decreases slightly since almost no banks without specific IR approval submitted any CS results. Finally, for the IR asset class splitting the sample between banks with general and specific approval and banks with only general approval produces some marginal changes in the benchmark for this asset class, confirming that the submissions from banks with partial approval tends to increase the IQD of the submissions.

		VaR - Avg. Interquartile Range								
	All Banks IR Gen + Specific IR Gen only Eq Gen + Specific									
Equity	24%			21%						
Interest Rate	19%	16%	20%							
Credit Spread	37%	31%								

Table 10: Asset class comparison for VaR in terms of level of approval

d. Common stress period considered

- 178. The stress window applied by the participating banks has always been understood as one of the main sources of the greater dispersion of the sVaR compared to the VaR, but this hypothesis was tested only from the 2019 exercise onwards due to a lack of information regarding the time window applied by the banks to calibrate the sVaR. This information was collected for the 2020 and 2021 exercises as well and applied to test the impact of the stress time window selected to calibrate the sVaR.
- 179. Generally speaking, in their time window for the sVaR the banks select periods that include either 2008-2009 or 2011 in order to calibrate their sVaR, with a preference for 2008-2009. Because of the higher number of banks selecting 2008-2009, the EBA filtered the sample of the



banks that applied a 2008–2009-time window for sVaR calibration, obtaining a subsample of 30 banks. The benchmark and the related statistics for this subsample of banks are available in Table 35 in the annex, and they are easily comparable with the full sample sVaR statistics in Table 22.

180. Table 11 summarises this stress period filtering analysis. It seems clear that the different time window selected for the bank actually has a significant impact on sVaR statistics. This means that the subsample with the same stress period generally exhibits smaller dispersion results for sVaR than the whole sample.

	SVaR - Avg	. Interquartile
	All Banks	Stressed Period
Equity	28%	18%
Interest Rate	34%	24%
FX	31%	24%
Commodities	19%	17%
Credit Spread	34%	31%
СТР	44%	24%
All-in	16%	14%

Table 11: Asset class comparison for sVaR in terms of the time window applied



5.2.6 Portfolio comparison

- 181. Selective comparison of VaR results across portfolios can be informative in instances where the riskiness of those portfolios may be ranked in a model-independent way. For example, all else being equal, it is expected that a more diversified and hedged portfolio would lead to a lower VaR than a more concentrated and unhedged portfolio.
- 182. This hypothesis can be tested with several portfolios in the 2021 exercise. Use of the following portfolios is suggested:
- portfolio 16, which is composed of instruments 24 (long 5 million German bond 10 years) and 25 (short 2 million German bond – 5 years);
- portfolio 17, which is composed of instruments 24 (long 5 million German bond 10 years), 25 (short 2 million German bond 5 years) and 26 (long 5 million Italian bond 10 years), so it is equal to portfolio 16 plus instrument 26.
- 183. Both of these portfolios comprise sovereign bond instruments, yet portfolio 16 is concentrated on only one issuer and is partially hedged (long and short positions). Portfolio 17 adds a second issuer to this portfolio without any hedge. Against this backdrop and in view of the specific portfolio definitions, we would expect the following result:

 $VaR_{Portfolio 17}$. > 200% × $VaR_{Portfolio 16}$

184. Table 12 reports when this hypothesis holds true.

 Table 12: Portfolio comparison for VaR, sVaR and IRC

	VaR(P17) > VaR(P16)	sVaR(P17) > sVaR(P16)	IRC(P17) > IRC(P16)
Num of banks	33 out of 34	33 out of 34	21 out of 22
	VaR(P17) > 1.5*VaR(P16)	sVaR(P17) > 1.5*sVaR(P16)	IRC(P17) > 1.5*IRC(P16)
Num of banks	33 out of 34	31 out of 34	21 out of 22
	VaR(P17) > 1 75*VaR(P16)	sVaR(P17) > 1.75*sVaR(P16)	IRC(P17) > 1.75*IRC(P16)
Num of banks	32 out of 34	27 out of 34	21 out of 22
	VaR(P17) > 2*VaR(P16)	sVaR(P17) > 2*sVaR(P16)	IRC(P17) > 2*IRC(P16)
Num of banks	29 out of 34	17 out of 34	21 out of 22

185. The comparison between the two portfolios with respect to regulatory VaR shows that only 5 out of 34 banks do not meet the initial expectation. The same comparison based on sVaR yields 17 banks that are not in line with this expectation. With regard to the IRC model, one bank does not meet the a priori expectation.



5.3 Analysis of IRC

- 186. Banks with an approved IRC model constitute a subsample of those with an approved VaR model; only banks using internal models for specific risks of debt instruments are permitted to use IRC models (Article 372 of the CRR).
- 187. The full set of submissions for IRC results for each trade, after the data-cleaning process has been run as previously described, is reported in Table 13.
- 188. In the context of the HP exercise, only a subset of banks made submissions for IRC, and a number of those banks submitted very low figures. This suggests that important risk factors (in the context of the HPE) have not been modelled. While the submission of low figures may be linked to risk factors not modelled, this should not be taken to mean that banks with higher IRC figures included all risk factors from a given portfolio in their model.
- 189. The number of submissions is limited for some of the all-in portfolios. Statistical inferences for these portfolios are thus not appropriate. A prerequisite for consideration of banks' submissions for the all-in portfolios is that a bank needs to be able to model all the corresponding underlying portfolios.
- 190. As in the case of VaR, a selective comparison of IRC results across portfolios can be informative in instances where the riskiness of those portfolios may be ranked in a model-independent way. As shown in subsection 5.2.6, the expected diversification relationship holds true for all but one of the banks that submitted such results.
- 191. It is recommended that CAs assess the extent to which these missing risk factors are important in the context of banks' overall risk, and whether or not they need to be added to the model.
- 192. CAs should devote particular attention to portfolios 15-23, 44-48, 50 and 51, i.e. where IRC shows a higher level of dispersion (above 50%) above the average.
- 193. As is the case for VaR and sVaR, banks can choose from a range of permitted modelling approaches for IRC. For example, banks need to choose:
 - a source of credit risk estimates such as PD and loss given default (LGD);
 - the number of systemic factors used to model the co-movement among obligors in their portfolios;
 - the size and granularity of credit spread shocks to apply to positions with an obligor following a rating transition; and
 - the liquidity horizons to assign to positions with a particular obligor.
- 194. The responses to the qualitative questionnaire relating to the IRC methodological aspects suggest that the use of market LGD predominates among respondents (Figure 12), with 10 out of 22 banks using market convention as the source of LGD. A minority of banks 5 out of 22 –



use their own IRB models as the source of LGD. The rest – 7 banks – use various other sources to obtain the LGD.

195. The PDs are provided by rating agencies in 64% of cases, by the IRB in 27% and by other sources in 9%. The transition matrices are mostly taken from rating agencies (17 respondents out of 22), and the rest of the banks use their IRB, 'market implied transition matrices' and various other sources.

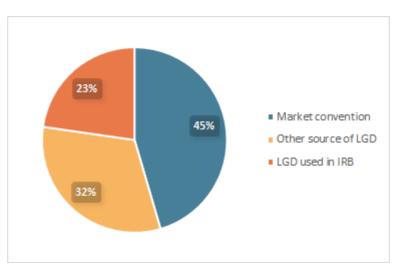


Figure 12: Qualitative data: source of LGD for IRC modelling

- 196. Moreover, a majority of respondents stated that they use more than two systemic modelling factors at the overall IRC model level (Figure 13).
- 197. The liquidity horizon applied at the portfolio level for the IRC model is predominantly between nine and 12 months (17 respondents out of 19).



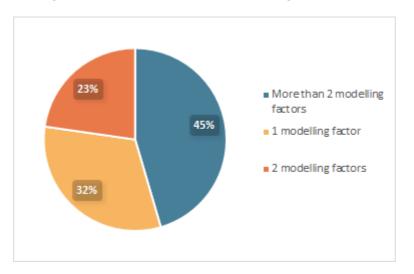


Figure 13: Qualitative data – number of modelling factors for IRC

198. Hence, in the context of IRC the modelling practices across the sample of banks participating in the benchmarking exercise seem to be consistent.

Table 13: IRC statistics and cluster analysis

					Main st	atistics					Percentiles		
	Port. ID	Min	Мах	Ave.	STDev	STDev_trunc ¹	MAD (median absolute deviation)	Coefficient of variation (STDev/Mean)	Num obs. ²	25th	50th	75th	
	15	79,483	350,766	186,942	97,760	141,028	98,987	52%	10	86,506	189,317	284,479	
	16	9,240	400,440	129,391	116,073	269,903	51,389	90%	19	44,029	115,537	187,567	
	17	76,675	3,779,449	1,736,402	1,222,883	1,192,441	891,354	70%	21	641,254	1,547,004	2,822,900	
	18	391,212	5,445,435	2,415,065	1,598,565	1,876,068	960,564	66%	19	1,095,754	2,334,193	3,786,474	
	23	77,713	1,346,554	470,468	374,372	489,694	181,582	80%	19	178,375	385,140	846,083	
	24	3,077,400	6,814,833	5,248,175	1,095,594	1,619,603	770,398	21%	17	4,956,114	5,111,878	6,099,447	
	26	596,874	6,497,426	3,011,123	1,825,019	1,943,768	1,190,590	61%	20	1,472,928	2,943,851	3,848,737	
	36	6,306	261,207	78,577	59,940	107,614	29,138	76%	18	42,988	75,600	94,903	
	37	10,210	116,229	68,195	30,149	47,141	20,415	44%	17	48,509	70,057	90,713	
	38	9,000	88,289	46,760	20,039	23,646	12,199	43%	18	30,384	53,502	60,931	
	39	6,607	347,827	105,022	100,600	169,213	38,019	96%	16	44,410	74,511	120,868	
	40	20,000	88,289	52,472	19,365	21,309	14,016	37%	18	38,380	52,378	66,413	
	41	475,102	1,015,718	683,152	135,486	187,302	80,137	20%	18	623,168	645,803	766,642	
	42	72,200	273,300	161,475	44,478	64,926	18,770	28%	16	149,127	168,465	174,608	
	43	267,003	1,071,295	653,205	200,043	227,380	95,154	31%	18	575,086	636,084	739,571	
Credit Spread	44	192	238,058	115,887	77,528	74,748	57,023	67%	21	49,042	93,504	192,280	
Creait Spread	45	7	68,244	17,237	21,879	37,940	3,086	127%	18	1,302	9,556	27,428	
	46	731	28,408	7,066	6,842	32,491	3,113	97%	16	2,337	7,488	10,017	
	47	14,400	479,559	128,013	111,166	198,359	59,904	87%	17	58,522	113,731	174,089	
	48	2,527	43,197	15,358	12,076	19,016	6,643	79%	18	5,825	13,100	19,112	
	49	6,673	347,827	101,675	98,068	140,906	32,637	97%	17	48,661	74,082	112,898	
	50	1,607	221,665	56,304	75,344	105,683	11,389	134%	18	6,502	45,786	73,725	
	51	2,987	453,471	110,275	127,153	215,561	36,138	115%	16	27,689	79,305	99,475	
	52	156,358	2,449,442	1,337,479	534,193	645,309	69,546	40%	16	1,378,417	1,434,576	1,518,958	
	53	232,768	2,519,254	1,352,175	534,871	645,526	79,754	40%	16	1,379,366	1,434,576	1,536,488	
ALL-IN no-CTP **	57	693,050	6,521,420	3,264,443	2,437,752	3,130,608	1,181,845	75%	12	1,187,899	2,159,849	5,734,216	
CS Cumulative **	62	319.665	1.432.213	772.633	240.638	1.585.719	114.604	31%	18	639,707	776.627	837.022	

EU Statistics for IRC

¹ STDev trunc is the standard deviation computed excluding values below the 5th and above the 95th percentile

Paters to the number of banks included in the computer of the statistics
 ** For the aggregated partfolios (57 to 63), banks that reported at least a missing partfolio IMV among the ones composing the aggregate are not included
 in the computation of the benchmarks for that particular aggregate partfolio.



- 199. Table 13 shows that the average variability of IRC is higher than that observed for VaR. This table presents a summary of the descriptive statistics concerning the IRC values submitted, along with the median, first and third quartiles used to select out-of-range values to be discussed with the banks during the interviews. EBA received on average 18 submissions for IRC in relation to the IR and CS hypothetical trades.
- 200. In this exercise, the EBA also provided a disaggregated analysis of sources of LGD and numbers of modelling factors. It is possible to split the sample between market convention and non-market convention (IRB and other sources) and the number of modelling factors (1-2 vs. more than 2). In Table 14 below, the average interquartile is reported. The full set of results is also reported in Table 43, Table 44, Table 45 and Table 46.
- 201. The IQD dispersion of the subsample is very stable for the CS portfolios among different model choices. Market convention and 1-2 modelling factors seem to produce less dispersed results for IR portfolios.

		Source o	of LGDss	No. modelling factors		
	All Banks	Market	Non-market	1-2 factors	>2 factors	
		Convention	Convention	1-2 juctors	~2 juctors	
Interest Rate	51%	41%	42%	38%	43%	
Credit Spread	39%	30%	45%	37%	34%	
All-in	40%	27%	42%	27%	34%	

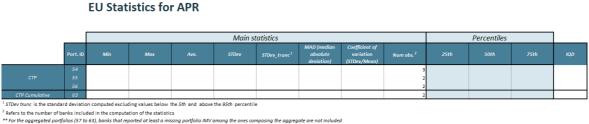
Table 14: Coefficient of variation for regulatory IRC by modelling choice (%)

5.4 Analysis of APR

- 202. This report is no longer reporting the summary of the responses to the qualitative questionnaire relating to the APR methodological aspects, since only 3 responses are available at the overall CTP model level, so no disclosure is possible without disclosing some specific information on the submitters.
- 203. The average variability of the APR charge is also no longer reported, since the limited data available do not allow a meaningful computation of the IQD of each CTP. Therefore, data on Table 15 are no longer reported, not even for referencing.



Table 15: APR statistics and cluster analysis



* For the aggregated portfolios (57 to 63), banks that reported at least a missing portfolio IM in the computation of the benchmarks for that particular aggregate portfolio.

5.5 P&L analysis

- 204. The P&L analysis is complementary to the outcome of the assessment of variability based on VaR modelling. For each individual portfolio, the P&L vectors provided by banks using HS were compared, and a benchmark analysis is provided in the annex (see Table 23).
- 205. A graphic exemplification of low and high IQD portfolios is presented below in Figure 14 and Figure 15. Even though the P&L vectors available are much longer, only 3 months (1 November 2020 to 1 February 2021) are reported to simplify the representation. Additional examples of low and high IQD portfolios can be found in the annex in Figure 24 and Figure 25. It is clear that P&L vector series that perform better tend to be closer to the benchmark. On the other hand, the low absolute value of the P&L, as per the risk measures, tends to provide misleading information if we consider the IQD figures alone.

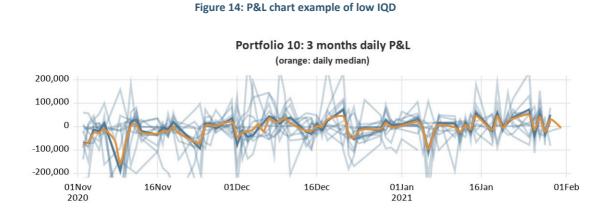
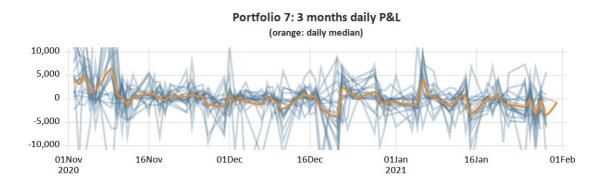




Figure 15: P&L chart example of high IQD



- 206. Another useful check for the P&L results submitted was a comparison of the ratio between the P&L VaR computed by the EBA (see Section 4.2 and Table 26) and the regulatory VaR submitted by the participating banks. A significant deviation of this ratio from 1 indicates an incoherent submission by the bank (see Table 26 in the annex). Moreover, it allows the tightness or the width of the realised P&L distribution for each bank to be checked at each hypothetical trade position. This can be done by referring to the standard deviation of the P&L series.
- 207. Another metric computed by the EBA from the P&L series provided by HS banks is the empirical ES (see Table 24 in the annex). The empirical ES results have approximately the same level of dispersion as the P&L VaR (see Table 4 in Section 5.1).

5.6 Diversification benefit

- 208. An additional metric considered as part of the analysis was the diversification benefit observed for VaR, sVaR and IRC in the aggregated portfolios.
- 209. The diversification benefit of a given metric (e.g. VaR) is computed as the absolute benefit, i.e. the difference between the sum of the single results for each individual position and the result for the aggregated portfolio, divided by the sum of the single results from each individual portfolio. Table 16 summarises the results of the analysis.
- 210. As expected, there is evidence that larger aggregated portfolios exhibited greater diversification benefits than smaller ones. The diversification benefit for all-in portfolio 57 (all-in no-CTP portfolio), for instance, clearly exceeds the benefit for the other risk types, whose all-in portfolios are based on fewer individual instruments. With regard to the dispersion shown by the diversification benefits, it is possible to observe a significantly higher IQD for some portfolios than for others, and in some cases a quite comparable dispersion across VaR, sVaR and IRC (e.g. interest rate and commodity risk categories).



Table 16: Diversification benefit statistics

Diversification benefit statistics

Diversification benefit = (Sum of single portfolios VaR - Aggregated Port. VaR)/Sum of single portfolios VaR

VaR

		0	Other statistics			Percentiles			
	Port.	Ave.	STDev	Num obs. ³	25th	50th	75th	Interquartile dispersion	
ALL-IN no-CTP	57	84%	3%	7	82%	84%	85%	2%	
Equity Cumulative	58	81%	5%	22	78%	80%	83%	3%	
IR Cumulative	59	47%	8%	33	42%	46%	50%	9%	
FX Cumulative	60	41%	6%	26	38%	41%	47%	10%	
Commodity Cumulative	61	2%	2%	9	1%	3%	4%	45%	
Credit spread Cumulative	62	36%	17%	19	22%	34%	45%	34%	

sVaR

		Other statistics			Percentiles			
	Port.	Ave.	STDev	Num obs. ³	25th	50th	75th	Interquartile dispersion
ALL-IN no-CTP	57	76%	3%	7	74%	75%	80%	4%
Equity Cumulative	58	76%	9%	22	71%	74%	80%	6%
IR Cumulative	59	49%	11%	33	44%	51%	58%	14%
FX Cumulative	60	37%	9%	26	30%	34%	41%	15%
Commodity Cumulative	61	5%	4%	8	3%	5%	6%	26%
Credit spread Cumulative	62	29%	23%	18	14%	22%	33%	41%

IRC

		Other statistics		Percentiles				
	Port.	Ave.	STDev	Num obs. ³	25th	50th	75th	Interquartile dispersion
Credit spread (36 to 53)**	27	0%	167%	17	18%	46%	51%	49%



5.7 Dispersion in capital outcome

- 211. As a final means of comparison, for each individual position a variable equating to the sum of the regulatory VaR and sVaR was computed. This variable was used in two ways: using the banks' total multiplication factor, and using only the regulatory multiplication factor, i.e. ignoring the banks' individual addend(s) set by the CAs. The results were averaged across a given risk type, thus arriving at a proxy for the implied capital outcome.
- 212. In addition, the exercise also attempted to isolate the effect of the time windows selected as the stress period. Therefore, the same statistics were reported for banks applying the 2008-9 stress period.

Table 17: Interquartile dispersion for capital proxy

	Capital proxy (banks own mult)	Capital proxy (fixed mult, =3)	Capital proxy Stressed period (fixed mult, =3)
Equity	22%	19%	14%
IR	23%	23%	18%
FX	28%	26%	24%
Commodity	17%	14%	14%
Credit spreads	29%	28%	28%
СТР			

Interquartile dispersion for capital proxy

213. Table 17 suggests that variability is slightly exacerbated by regulatory add-ons. In any case, the ranges of capital value dispersion remain broadly aligned whether or not the banks' actual multiplication factors are used. Moreover, filtering for banks with the same stress window seems to have a further impact in decreasing the variability. Nonetheless, we need to take into consideration the fact that the sample of banks decreases in number when analysing the subsample of banks with the same stress period, which – other things being equal – tends to increase the IQD.

5.8 Present value

214. The 2020 exercise introduced the PV as a statistic to be provided by the banks. The full set of statistics is provided in Table 42 for this year's exercise as well.



- 215. The average IQD of the PV among the single portfolios is 11%. This IQD would be much lower, at 2%, if 2 portfolios with a relatively high IQD (Portfolios 32 and 33) were excluded. By asset class, the IQD is distributed as follows: EQ (2%), IR (4%), FX (70%, but 0% once portfolio 32 has been excluded), CO (18%, but only 2% once portfolio 33 has been excluded) and CS (1%). The extremely high IQD of the FX asset class is driven by Portfolio 32 (IQD 417%), where the highly disperse PV of the portfolio, which ranges from negative to positive PV, signals some errors in a unified understanding of instrument 47 (CCSwap) to produce a very high IQD. The high IQD of the CO asset class is driven by Portfolio 33 (IQD 49%), where the low PV of the portfolio and the 75th quantile being close to zero naturally produce a high IQD measure despite the absolute difference in the PV being very limited.
- 216. PV measures are useful to CAs to verify the RM values. The ratio of RM over PV helps the CAs to quickly verify if the RM outlier comes from a simple mispricing of the portfolio or if it is indeed a true outlier with respect to the RM benchmark. Further analysis of these aspects is expected to be carried out in future.



6. Competent authorities' assessment

- 217. For each participating institution, the CAs provided individual assessments of any potential underestimation of the capital requirement as required by Article 78(4) of the CRD and Articles 9 and 10 of the draft RTS on supervisory benchmarking. This chapter highlights some key information derived from these assessments.
- 218. The EBA designed a questionnaire about this assessment, which asked CAs to provide detailed information concerning the level of priority, based on both judgemental and qualitative/quantitative examination results, the overall assessment concerning the MR capital requirements of the internal models and, finally, the CAs' ongoing monitoring activities.
- 219. A total of 37 questionnaires from 13 jurisdictions, provided by the CAs, have been considered in this assessment of the MR benchmarking exercise.
- 220. Regarding the level of priority of the assessments, six banks (16%) are reported to be high priority for intervention by CAs. CAs gave high priority to those banks that were outliers in the analysis, are particularly significant for the jurisdiction, have a history of incorrect submissions or were identified as potential candidates for the interview process. The criteria for selecting banks as high priority were substantially based on firms' results in terms of the capital requirement proxy (below the 25th percentile or above the 75th percentile) alongside other aspects such as the relative importance of the bank in the jurisdiction and recent changes in the methodology for computing the risk measures.
- 221. Figure 16 reports the CAs' own overall assessments of the levels of own funds requirements. When it comes to benchmark deviations, justified or not, 26 banks were reported by CAs as under- or overestimating MR own funds requirements, of which 22 provided justifications for this. Obviously, 'not justified' implies that further and targeted CA investigation is required. Finally, 11 banks had consistent results (i.e. no benchmark deviations).
- 222. CAs' assessments acknowledge four cases out of 37 of unjustified under- or overestimation of internal model market capital requirements that require further in-depth analysis. Obviously, CAs and the joint supervisory teams, where applicable pay close attention to the potential cases of underestimation, both across the portfolio and across the risk categories.



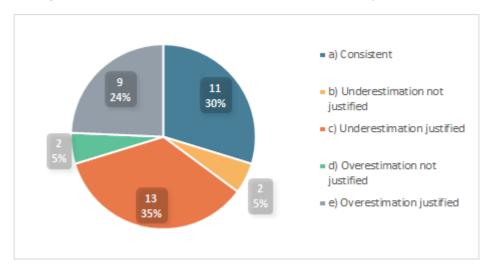


Figure 16: CAs' own assessments of the levels of MR own funds requirements 2019

- 223. The main factors and reasons that may explain possible underestimations are as follows: benchmarking portfolios that do not represent the actual composition of the real trading portfolios of the institutions (4/26); missing risk factors not incorporated into the models (6/26); differences in calibration or data used in modelling estimation and/or simulation (9/26); proxies applied (10/26); and differences attributable to the methodology used (12/26). These explanations, and very often a combination of these explanations, were offered by a large majority of the applicable respondents.
- 224. Two banks were identified as possibly underestimating, without justification, during the banks' internal assessment process run by the CAs. Both cases were classified as 'low priority' by the CA and were not considered as extreme outliers by the EBA. CAs are currently undertaking some monitoring activities (both ongoing and on-site) of the internal models to check all the issues relating to these banks.
- 225. To be more specific, for one bank the internal validation function has identified some sources of improvement to the model, which are being followed up by the CA. In addition, the CAs had additional examinations in place that provided further reassurance as to the quality of the internal model results for the bank.
- 226. For the second subject, the inability to fully justify the underestimation was only partial. In this specific case, the CA accepted that the underestimation was present only for a minority of portfolios, with a specific level of approval that was not sufficient to fully capture the risk of such portfolios compared to peers.
- 227. The two banks identified as possibly overestimating, without justification, are also classified as 'low priority' by the CA. Differences in calibration or data used in modelling estimations and/or simulations were also identified by the CA, which was nonetheless unable to fully explain



and investigate the misalignment; these misalignments did not raise any substantial concerns for CAs.

- 228. Overall, CAs planned some action in respect of 13 banks, such as:
 - a. reviewing the banks' internal VaR and IRC models;
 - b. extra supervisory charges;
 - c. stringent conditions on any extension of the internal model approach;
 - d. further internal model investigations at the peer level.
- 229. Currently, three banks have a due date for making improvements to their MR internal models as already requested by CAs.



7. Conclusion

- 230. This report has presented an analysis of the observed variability across results provided by EU banks that have been granted permission to adopt internal models for MR own funds requirements.
- 231. It must be remembered and emphasised that, as the quantitative analysis is based on hypothetical portfolios, this report focuses solely on potential rather than actual variations. The analysis shows the extent of the variability in these hypothetical portfolios, but this cannot automatically lead to conclusions regarding real under- or overestimations for the MR capital charge.
- 232. However, the analysis might help in determining possible supervisory activities to address uniformity and harmonisation across the Member States, and in promoting in-depth future cross investigations of this matter.
- 233. The objective of the benchmarking exercise was not to reach a final judgement on the key drivers of variation and the calculation of the implied capital charges, but to provide supervisors with insights into how to increase comparability and reduce the variability between banks that is attributable to non-risk-driven behaviours.
- 234. In particular, the report provides inputs for CAs on areas that may require their further investigation, such as IMV variability for some credit spread products. Supervisors should pay attention to the materiality of risk factors not in VaR and, in particular, not encompassed in the IRC models.
- 235. Moreover, the conclusions reached in regular supervisory model monitoring activities will take into account the outcome of the supervisory benchmarking exercises to achieve greater alignment between CAs' targeted internal model reviews and the EU's benchmarking analysis.
- 236. Overall, this exercise exhibits a reduced IMV variability for FX and CO. IR IMV is substantially higher than last year, but this is due to a few instruments with very low IMVs that distort the IQD ratio. Some minor errors in data submission are still present, but this third submission of the same instruments and portfolios is satisfactory overall. The variability of risk measures, especially the VaR, is higher than in the previous exercise, but this is due to the much higher volatility in the market encountered in 2021, which implied an absolute increase in the VaR measures, and an intensification of the dispersion verified in the previous exercises. The variability of the VaR aggregated portfolios is limited: the 'all-in portfolio' IQD is 16%. Aggregated by asset class, the portfolio IQD of the others is 15% on average, and never above 20%, except for CS. This increase in variability is also partially due to a smaller sample in the submission (we remind readers that the number of submitting banks fell from 50 to 40, since UK banks are no longer part of the exercise). Another side-effect of the reduced sample is that same statistics are no longer reported, especially on CTP and APR, due to the insufficiency of the



data available. The analysis carried out in the 2019-2020 exercise – relating to the considerations of the level of approval, size of banks, business model adopted and stress period – was repeated in the 2021 exercise, and should not be considered a consolidated piece of information in the benchmarking report. Two interviews were conducted in the 2021 exercise to allow CAs to conduct closer monitoring of the deviations from the benchmark of the banks flagged as outliers.

237. Finally, this report provides a framework that can be considered useful for the purpose of future benchmarking exercises under Article 78 of the CRD. Therefore, the type of analysis conducted (i.e. the statistical tools provided to CAs, the graphs and tables created and the methodology defined, etc.) offers a clear direction for future investigations into and activities relating to these issues.



8. Annex

Table 18: Banks participating in the 2021 EBA MR benchmarking exercise

Country	Bank name
AT	Erste Group Bank AG
AT	Raiffeisen Bank International AG
BE	Belfius Bank
BE	Dexia
BE	KBC Groep
DE	COMMERZBANK Aktiengesellschaft
DE	DekaBank Deutsche Girozentrale
DE	DEUTSCHE BANK AKTIENGESELLSCHAFT
DE	DZ BANK AG Deutsche Zentral-Genossenschaftsbank, Frankfurt am Main
DE	Landesbank Baden-Württemberg
DE	Landesbank Hessen-Thüringen Girozentrale
DE	Norddeutsche Landesbank - Girozentrale -
DE	HSBC Germany Holdings GmbH
DK	Danske Bank A/S
DK	Nykredit Realkredit A/S
ES	Banco Bilbao Vizcaya Argentaria, S.A.
ES	BFA, TENEDORA DE ACCIONES, S.A.
ES	Banco Santander, S.A.
ES	CaixaBank, S.A.
FI	Nordea Bank Abp
FR	BNP Paribas
FR	Groupe Crédit Agricole
FR	Groupe BPCE
FR	HSBC Continental Europe
FR	Société générale
GR	Alpha Bank S.A.
GR	Eurobank Ergasias Services and Holdings S.A.
GR	National Bank of Greece, S.A.
IE	Barclays Bank Ireland plc
п	BANCO BPM SOCIETA' PER AZIONI
п	Intesa Sanpaolo S.p.A.
п	UNICREDIT, SOCIETA' PER AZIONI
NL	ABN AMRO Bank N.V.
NL	Coöperatieve Rabobank U.A.
NL	ING Groep N.V.
NL	NIBC Holding N.V.
NL	RBS Holdings N.V.
PT	Banco Comercial Português, SA
SE	Skandinaviska Enskilda Banken - group
SE	Swedbank - group
JE	Sweapaur - Riodh
BE	DE DK ES FI FR GR IE IT NL PT



Table 19: Instruments/portfolios underlying the HPE

Instruments

	EQUITY
1	Long EURO STOXX 50 index
2	Long 10,000 BAYER (ticker: BAYN GR) shares
3	Short future, BAYER (ticker: BAYN GR) (1 contract = 100 shares)
4	Short future, PEUGEOT PSA
5	Short future, ALLIANZ
6	Short future, BARCLAYS
7	Short future, DEUTSCHE BANK
8	Short future, CRÉDIT AGRICOLE
9	Long call option, underlying BAYER
10	Short call option, underlying BAYER
11	Long call option, underlying PFIZER
12	Long put option, underlying PFIZER
13	Long call option, underlying BAYER
14	Short call option, underlying BAYER
15	Long call option, underlying AVIVA
16	Long put option, underlying AVIVA
17	Short future NIKKEI 225
18	Autocallable equity product
	IR
19	5-year IRS EUR – receive fixed rate and pay floating rate
20	Two-year EUR swaption on 5-year interest rate swap
21	5-year IRS USD. Receive fixed rate and pay floating rate
22	2-year IRS GBP. Receive fixed rate and pay floating rate
23	Long position on 'cap and floor' 10-year UBS AG (ticker: UBSG VX) notes
24	Long GERMANY GOVT EUR 5 MLN (ISIN DE0001135085)
25	Short GERMANY GOVT EUR 2 MLN (ISIN DE0001102358))
26	Long ITALY GOVT EUR 5 MLN (ISIN IT0005246134)
27	Long ITALY GOVT EUR 1 MLN (ISIN IT0004953417)
28	Long SPAIN GOVT EUR 5 MLN (ISIN ES00000124C5)
29	Short FRANCE GOVT EUR 5 MLN (ISIN FR0011317783)
30	Short GERMANY GOVT EUR 10 MLN (ISIN DE0001102390)
31	Long UNITED KINGDOM GOVT GBP 5 MLN (ISIN GB0002404191)
32	Long PORTUGAL GOVT EUR 5 MLN (ISIN PTOTETOE0012)
33	Short UNITED STATES GOVT USD 10 MLN (ISIN US9128283P31)
34	Long BRAZIL GOVT 5 MLN USD (ISIN US105756BT66)
35	Long MEXICO GOVT 5 MLN USD (ISIN US91086QBC15)
36	10-year IRS EURO – receive floating rate and pay fixed rate
37	5-year IRS EURO – receive floating rate and pay fixed rate
	FX
38	6-month USD/EUR forward contract
39	6-month EUR/GBP forward contract



40 Long 1 MLN USD	cash
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- 41 Long call option, EUR 10 MLN
- 42 Long call option, EUR 10 MLN
- 43 Short call option, EUR 10 MLN
- 44 Short call option, EUR 10 MLN
- 45 Long put option, EUR 10 MLN
- 46 Short put option, EUR 10 MLN
- 47 5-year mark to market (MtM) cross-currency EUR/USD swap

COMMODITIES

- 48 Long 3,500,000 6-month ATM London Gold Forwards
- 49 Short 3,500,000 12-month ATM London Gold Forwards contracts
- **50** Long 30 contracts of 6-month WTI crude oil call option
- 51 Short 30 contracts of 6-month WTI crude oil put option

CREDIT SPREAD

	CREDIT SPREAD
52	Long (i.e. buy protection) USD 1 MLN CDS on PORTUGAL
53	Long (i.e. buy protection) USD 1 MLN CDS on ITALY
54	Short (i.e. sell protection) USD 1 MLN CDS on SPAIN
55	Long (i.e. buy protection) USD 1 MLN CDS on MEXICO
56	Long (i.e. buy protection) USD 1 MLN CDS on BRAZIL
57	Long (i.e. buy protection) USD 1 MLN CDS on UK
58	Short (i.e. sell protection) EUR 1 MLN CDS on AXA (Ticker CS FP)
59	Long (i.e. buy protection) EUR 1 MLN CDS on AXA (Ticker CS FP)
60	Short (i.e. sell protection) EUR 1 MLN CDS on Aviva (Ticker AV LN)
61	Long (i.e. buy protection) EUR 1 MLN CDS on Aviva (Ticker AV LN)
62	Short (i.e. sell protection) EUR 1 MLN CDS on Vodafone (Ticker VOD LN)
63	Short (i.e. sell protection) EUR 1 MLN CDS on ENI SpA (Ticker ENI IM)
64	Short (i.e. sell protection) USD 1 MLN CDS on Eli Lilly (Ticker LLY US)
65	Short (i.e. sell protection) EUR 1 MLN CDS on Unilever (Ticker UNA NA)
66	Long (i.e. buy protection) EUR 1 MLN CDS on Total SA (Ticker FP FP)
67	Long (i.e. buy protection) EUR 1 MLN CDS on Volkswagen Group (Ticker VOW GR)
68	Long position on TURKEY govt. notes USD 1 MLN (ISIN US900123CF53)
69	Long (i.e. buy protection) USD 1 MLN CDS on TURKEY, effective date as per booking date
70	Long position on AXA notes EUR 1 MLN (ISIN FR0011524248)
71	Long position on Volkswagen Group notes EUR 1 MLN (ISIN XS1586555861)
72	Short position Volkswagen Group notes EUR 1 MLN (ISIN XS1586555606)
73	Long position on Total SA notes EUR 1 MLN (ISIN XS0830194501)
	СТР
74	Short position in spread-hedged super senior tranche of iTraxx Europe index on- the-run series
75	Long (i.e. buy protection) USD 1 MLN first to default basket swap on {Brazil, Mexico and Turkey}
Individual portfolio	Combination of instruments:



1	1 1 000 instruments
1 2	1 – 1,000 instruments 3 – 1,000 instruments; 4 – 1,000 instruments; 5 – 1,000 instruments
3	13 - 100 instruments; $10 - 100$ instruments
4	15 - 100 instruments; $16 - 100$ instruments
5	17 - 100 instruments
6	9 - 500 instruments; $10 - 500$ instruments
7	18 – 1 instrument
8	11 - 1000 instruments; $12 - 1000$ instruments
9	2 - 1 instruments; $14 - 100$ instruments
10	6 - 1,000 instruments; $7 - 1,000$ instruments; $8 - 1,000$ instruments
11	19 – 1 instrument
12	20 – 1 instrument
13	21 – 1 instrument
14	22 – 1 instrument
15	23 – 1 instrument
16	24 – 1 instrument; 25 – 1 instrument
17	24 – 1 instrument; 25 – 1 instrument; 26 – 1 instrument
18	24 - 1 instrument ; $25 - 1$ instrument ; $26 - 1$ instrument ; $27 - 1$ instrument ; $28 - 1$
_	1 instrument; 29 – 1 instrument ; 30 – 1 instrument
19	19 – 1 instrument; 36 – 1 instrument
20	19 – 1 instrument; 37 – 1 instrument
21	36 – 1 instrument; 37 – 1 instrument
22	19 – 1 instrument; 20 – 1 instrument
23	31 – 1 instrument
24	33 – 1 instrument; 34 – 1 instrument; 35 – 1 instrument
25	21 – 1 instrument; 33 – 1 instrument
26	26 – 1 instrument; 27 – 1 instrument; 28 – 1 instrument;32 – 1 instrument
27	38 – 1 instrument; 39 – 1 instrument
28	40 – 1 instrument; 41 – 1 instrument
29	41 – 1 instrument; 42 – 1 instrument; 43 – 1 instrument
30	44 – 1 instrument; 45 – 1 instrument
31	46 – 1 instrument
32	47 – 1 instrument
33	48 – 1 instrument; 49 – 1 instrument
34	50 – 1 instrument; 51 – 1 instrument
35	48 – 1 instrument; 51 – 1 instrument
36	52 – 1 instrument; 53 – 1 instrument; 54 – 1 instrument
37	55 – 1 instrument; 56 – 1 instrument
38	58 – 1 instrument; 59 – 1 instrument
39	54 – 1 instrument; 55 – 1 instrument
40	60 – 1 instrument; 61 – 1 instrument
41	62 – 1 instrument ; 63 – 1 instrument ; 65 – 1 instrument ; 66 – 1 instrument ; 67 –
	1 instrument
42	68 – 1 instrument; 69 – 1 instrument
43	70 – 1 instrument; 71 – 1 instrument; 73 – 1 instrument
44	71 – 1 instrument; 72 – 1 instrument
45	70 – 1 instrument; 59 – 1 instrument
46	66 – 1 instrument; 73 – 1 instrument
47	64 – 1 instrument
48	71 – 1 instrument; 72 – 1 instrument; 67 – 1 instrument



49	57 – 1 instrument; 54 – 1 instrument
50	53 – 1 instrument; 27 – 1 instrument
51	55 – 5 instruments; 35 – 1 instrument
52	56 – 5 instruments; 34 – 1 instrument
53	55 – 5 instruments; 35 – 1 instrument; 56 – 5 instruments; 34 – 1 instrument
54	74 – 1 instrument
55	75 – 1 instrument
56	75 – 5 instruments; 68 – 5 instruments; 34 – 1 instrument; 35 – 1 instrument
Aggregated portfolio	Combination of individual portfolios:
57 ALL-IN no- CTP	1, 2, 6, 7, 9, 11, 12, 18, 21, 27, 28, 30, 31, 32, 33, 34, 38, 41, 43
58 EQUITY Cumulative	1, 2, 6, 7, 9
59 IR Cumulative	11, 12, 18, 21
60 FX Cumulative	27, 28, 30, 31, 32

For a detailed description of the portfolios, please refer to the EBA website:

https://www.eba.europa.eu/regulation-and-policy/supervisory-benchmarkingexercises/its-package-2021-benchmarking-exercise

Adopted as:

Commission Implementing Regulation (EU) 2021/1971 of 13 September 2021 amending Implementing Regulation (EU) 2016/2070 laying down implementing technical standards for templates, definitions and IT solutions to be used by institutions when reporting to the European Banking Authority and to competent authorities in accordance with Article 78(2) of Directive 2013/36/EU of the European Parliament and of the Council (text with EEA relevance)

https://eur-lex.europa.eu/legalcontent/EN/TXT/?uri=CELEX%3A32021R1971&qid=1638961385624



Table 20: VaR cluster analysis – number of banks by range

2021 VaR cluster analysis: number of banks by range

		with the r	median)					
	100]						
	Port. ID	300% < X	300%≥X >200%	200%≥X >150%	150% ≥ X >100%	100% ≥ X >50%	50% ≥ X >0	Num obs.
	1				14	16		30
	2				11	14		25
	3 4				13 10	13 10	4	26 24
	4 5				8	10	4	24
Equity	6			1	11	12	3	
	7		3	5	2	9	4	
	8		1	3	7	10	4	25
	9				15	14	1	30
	10 11			2	9	14 19		25 39
	12				16	19		34
	13				17	17		34
	14				20	18		38
	15		1	1	2	7		11
	16				19	19		38
	17 18			7	8	16	1	32
Interest Rate	18 19			6	10 18	13 18	4	33 36
	20				18	18		34
	21				19	17		36
	22			1	13	18		32
	23				16	19		35
	24			7	7	7	8	
	25		1	3	13	19		36
	26 27			5	9 15	15	2	31
	27			3	15	17 12	3	32 29
	20			5	11	12		30
FX	30				15	14		29
	31				13	16		29
	32				14	3	12	29
	33			3	3	4	3	13
Commodity	34				5	6		11
	35 36			1	5	6	2	11 20
	37			5	3	8	1	
	38			4	4	9	2	
	39			4	5	6	3	18
	40			4	4	11		19
	41			6	3	9	2	20
	42			4	3	8	1	16
	43 44		1	3	6 4	9	2	
	44 45		1	2	4	5	5	19
	46		1	4	5	4	6	
	47		1	3	4	10		18
	48			2	8	7	1	18
	49			2	6	9	1	18
	50			2	7	10	1	20
	51 52		1	1	5	6	3 3	16 16
	52		2	2	4	6		15
	54		-	-			-	0
СТР	55							0
	56							0
ALL-IN no-CTP	57				6	6		12
Equity Cumulative	58				10	9		19
IR Cumulative	59 60				15	14		29
FX Cumulative Commodity Cumulative	60 61				12 5	14 5		26 10
Commonity Cumulative CS Cumulative	61 62			2	5	9	1	10 18
CTP Cumulative	63			2	0	9	1	0
Cir cumulative	05							U



Table 21: VaR statistics

EU Statistics for VaR

					Main st	atistics					Percentiles		
	Port. ID	Min	Мах	Ave.	STDev	STDev_trunc ¹	MAD (median absolute deviation)	Coefficient of variation (STDev/Mean)	Num obs. ²	25th	50th	75th	IQD
	1	4,783,699	9,409,963	6,572,694	1,548,434	1,537,866	1,275,803	24%	30	5,137,617	6,451,057	7,941,640	21%
	2	3,940,627	7,869,708	5,880,039	1,114,330	1,136,194	723,791	19%	25	5,025,543	5,646,229	6,891,803	16%
	3	9,896	16,920	14,086	1,837	1,977	1,544	13%	26	13,107	13,819	15,734	9%
	4	984 1,572,817,976	3,734 2,631,068,121	2,220 1,897,707,864	793 337,855,602	1,161 439,704,511	653 94,700,895	36% 18%	24 22	1,413 1,677,097,250	2,590 1,764,735,292	2,818 2,017,231,942	33% 9%
	6	1,5/2,817,976 11,473	2,631,068,121 49,274	27,469	337,855,602 9,973	439,704,511 10,428	7,023	36%	22	1,677,097,250	29,123	2,017,231,942 35,218	34%
	7	21,125	159,339	81,009	46,999	48,504	33,460	58%	23	43,565	70,262	124,015	48%
	8	3,767	256,550	122,178	66,163	69,581	46,123	54%	25	75,670	125,566	164,437	37%
	9	56,465	161,193	113,085	31,913	29,821	29,631	28%	30	83,681	112,969	143,164	26%
	10	406,432	947,372	566,172	119,306	987,875	41,413	21%	25	499,983	535,773	611,751	10%
	11	63,600	132,060	96,046	22,365	21,084	20,187	23%	39	73,067	95,599	115,739	23%
	12 13	39,463	78,115	57,126	11,104	11,479	8,779	19%	34	48,203	57,290	63,921	14%
	13 14	79,011 13.138	157,013 37,435	120,924 26,838	17,802 6.647	20,464 6.404	10,553 5.005	15% 25%	34 38	108,446 22,400	118,748 25.763	132,787 31,988	10% 18%
	15	19,811	72,877	33,115	16,009	57,490	6,598	48%	11	21,519	29,748	35,095	24%
	16	80,991	189,389	137,029	30,887	28,990	27,017	23%	38	108,621	136,677	159,782	19%
	17	155,329	581,027	364,517	121,270	127,275	82,164	33%	32	295,935	327,014	480,817	24%
Interest Rate	18	127,355	782,626	477,929	175,694	166,661	105,319	37%	33	394,230	452,685	583,368	19%
	19	128,815	187,931	158,602	18,271	18,271	19,058	12%	36	140,509	162,135	173,983	11%
	20	4,561	8,678	6,629	849	1,572	615	13%	34	6,023	6,655	7,249	9%
	21 22	245,509 29.217	368,131 94,242	301,209 54,888	37,345 15.504	38,106 18,783	35,741 11.834	12% 28%	36 32	263,283 40,295	307,679 57.969	329,877 65.048	11% 23%
	23	103,400	204,079	150,350	22,666	38,257	14,999	15%	35	134.293	151.827	164,389	10%
	24	27,036	600,230	297,049	177,843	166,493	158,631	60%	29	143,483	309,473	445,913	51%
	25	30,813	127,115	59,613	20,753	52,303	9,147	35%	36	45,599	55,238	64,805	17%
	26	283,526	984,096	626,258	213,585	234,837	129,501	34%	31	500,658	592,171	850,091	26%
	27	436,628	793,595	611,637	106,078	110,521	96,584	17%	32	527,064	601,861	720,739	16%
	28	3,853	53,642	29,338	12,826	14,001	9,695	44%	29	19,533	30,480	38,185	32%
	29 30	72,741 327.093	168,998	122,851	25,877	27,858	20,024	21%	30 29	103,973	122,517 402.131	141,732 444,379	15%
	30 31	443,590	479,518 687,012	406,982 529,495	37,174 68,974	40,000 84,093	29,073	13%	29	381,732 482,969	402,131 525,834	444,379 566,157	8% 8%
	32	23.644	494.617	250.669	184.289	179.731	84,960	74%	29	41.912	374.891	405.302	81%
	33	1,253	54,281	27,539	15,655	24,211	11,005	57%	13	17,319	28,341	33,472	32%
	34	532,160	1,142,147	796,622	180,851	180,851	131,036	23%	11	645,712	815,081	917,568	17%
	35	607,279	1,187,155	908,525	180,005	180,005	64,858	20%	11	859,632	927,136	991,994	7%
	36	14,394	49,466	28,775	11,024	10,779	10,962	38%	20	18,581	30,716	36,636	33%
	37	42,450	162,181	97,444	41,547	41,547	34,113	43%	17	69,318	88,161	144,039	35%
	38 39	4,859 14,867	17,636 65.631	10,867 37,462	4,441 16.453	4,959 16.453	3,377 16.687	41% 44%	19 18	6,280 21,492	10,766 36.823	15,483 54.867	42% 44%
	40	6,177	19,089	37,462	4,470	4,967	3,648	44%	18	8,970	36,823	54,867	26%
	41	5,429	36,639	20,813	9,795	9,351	7,491	47%	20	13,581	19.262	30,884	39%
	42	19,204	79,878	43,799	17,818	20,492	11,463	41%	16	29,335	40,861	54,247	30%
	43	9,102	49,416	29,349	11,910	21,500	10,204	41%	17	20,614	33,626	35,432	26%
Credit Spread	44	4,854	34,024	15,824	8,289	9,688	3,803	52%	19	10,464	16,110	18,075	27%
	45	449	29,201	12,451	7,904	9,249	6,464	64%	18	4,908	13,039	18,330	58%
	46 47	3,832 2,457	31,868 10,244	16,496 5.115	8,735 2,346	8,415 5.806	8,585 1.671	53% 46%	19 18	7,189	16,397 4,661	24,360 6,365	54% 37%
	47 48	2,457	10,244 42,823	5,115 26,692	2,346	5,806 9,125	1,671 7,296	46%	18	2,930	4,661 27.058	6,365 30,754	37%
	40 49	7,734	42,825 32,536	18,084	8,942	9,125	5,508	54% 41%	18	18,274	27,058	24,876	25%
	50	9,843	41,167	22,660	8,234	10,038	5,800	36%	20	15,710	23,382	27,322	27%
	51	53,407	380,961	180,905	93,219	106,157	72,234	52%	16	99,388	171,861	242,432	42%
	52	51,287	378,051	187,421	99,665	156,631	81,196	53%	16	104,959	177,845	261,096	43%
	53	84,986	718,802	332,643	188,512	214,953	129,292	57%	15	154,677	295,230	494,060	52%
	54								3				
Correlation Trading	55								2				
ALL-IN no-CTP **	56 57	1,915,791	3,959,137	2,835,069	587,787	587,787	456,053	21%	2	2.329.791	2.897.392	3.241.084	1.001
Equity Cumulative **	57	2,071,678	3,959,137 3,079,003	2,835,069 2,509,297	587,787	587,787 339,874	456,053 211,447	21%	12	2,329,791 2,240,008	2,897,392 2,485,599	3,241,084 2,701,250	16% 9%
IR Cumulative **	59	321,112	732,294	2,509,297 525,478	292,069	114,700	54,662	12%	29	465,047	2,485,599	2,701,250	9%
FX Cumulative **	60	773,411	1,335,657	1,043,319	165,463	171,608	115,656	16%	25	914,180	1,015,840	1,166,772	12%
	61	545,181	1,137,076	795,875	182,221	287,899	129,786	23%	10	651,805	784,658	914,575	17%
	62	16,567	77,757	43,870	17,510	19,901	11,276	40%	18	30,217	44,536	52,769	27%
CTP Cumulative **	63								2				

CIP Commitative ** 63
 STOPY trunn is the standard deviation computed excluding values below the 5th and above the 95th percentile
 Stopy trunc is the standard deviation computed excluding values below the 5th and above the 95th percentile
 Stopy truncing of the standard deviation of the statistics
 For the aggregated portfolios (57 to 63), banks that reported at least a missing portfolio IMV among the ones composing the aggregate are not included
 in the computation of the benchmarks for that particular aggregate portfolio.



Table 22: sVaR statistics

EU Statistics for SVaR

					Main st	atistics					Percentiles			
	Port. ID	Min	Max	Ave.	STDev	STDev_trunc ¹	MAD (median absolute deviation)	Coefficient of variation (STDev/Mean)	Num obs. ²	25th	50th	75th	IQD	
	1	4,625,369	8,512,575	7,029,897	1,014,528	1,311,749	686,103	14%	27	6,215,008	6,841,100	7,954,286	12%	
	2	2,441,557	13,327,973	8,232,702	3,162,063	2,993,654	2,327,321	38%	26	5,853,941	7,956,103	11,481,081	32%	
	3	5,822	21,732	14,163	4,759	4,780	3,183	34%	27	10,644	13,731	19,356	29%	
	4 5	821 1,035,341,493	4,240 4,506,136,975	2,409 2,712,901,941	1,010 1,058,599,965	1,065 1,017,582,417	714 732,046,946	42% 39%	25 28	1,264 1,586,201,465	2,695 2,859,881,740	3,140 3,502,526,298	43% 38%	
	6	1,035,541,495	4,500,150,975	32,428	1,058,599,905	1,017,582,417	8,857	36%	26	25,672	2,039,081,740 34,164	42,353	25%	
	7	21,096	114,672	65,055	24,227	26,504	16,451	37%	23	46,298	67,354	83,499	29%	
	8	32,476	136,800	92,882	29,705	36,090	20,524	32%	23	74,025	98,048	118,571	23%	
	9	54,667	137,917	101,674	25,925	25,429	22,792	26%	29	79,647	99,098	124,988	22%	
	10	316,736	2,043,826	923,119	386,049	818,618	180,541	42%	26	668,552	937,770	1,084,500	24%	
	11 12	51,099	289,221	174,212	66,936	61,140	52,145	38%	39	123,625	169,200	230,218	30%	
	12 13	12,466 98,404	185,016	94,198 255.571	44,767	45,515	33,300	48%	34 38	59,089 145,319	100,301 269.251	119,126	34%	
	13	98,404	421,383 134,460	255,571 66,205	107,578 34,721	103,649 31,455	95,255 33.151	42% 52%	38 40	28.123	74.888	357,841 94.655	42% 54%	
	15	20,760	151,679	78,894	43,565	72,805	33,535	55%	13	44,811	70,364	109,076	42%	
	16	94,543	269,539	181,463	37,542	46,590	27,745	21%	33	153,969	184,723	206,143	14%	
	17	152,389	561,387	337,913	101,782	113,080	71,321	30%	32	258,499	346,162	401,411	22%	
Interest Rate	18	121,160	814,823	330,000	167,914	254,690	63,701	51%	30	227,290	317,639	359,011	22%	
	19	116,692	455,478	263,194	88,490	86,730	62,025	34%	36	180,905	286,803	326,225	29%	
	20 21	92	58,446	12,352 525.160	10,635 198,725	26,427	3,871	86% 38%	33 39	7,328	13,266	15,313	35% 39%	
	22	200,151 31,929	851,258 229,258	132,123	198,725	184,044 55.995	149,321 41.108	38%	39	303,712 89.835	556,633 137,382	687,340 172,760	39%	
	23	41,843	412,710	225,916	74,889	108,395	55,047	33%	34	173,186	238.431	272,488	22%	
	24	24,765	793,086	338,742	219,075	233,850	127,377	65%	27	161,458	328,636	506,373	52%	
	25	29,474	410,377	153,338	87,952	181,991	58,303	57%	35	74,380	162,668	188,805	43%	
	26	192,500	1,181,839	540,729	232,765	428,632	144,936	43%	31	373,583	569,632	607,249	24%	
	27	357,328	1,195,800	771,619	204,955	226,622	155,264	27%	31	628,769	800,960	879,592	17%	
	28	1,995	45,279	21,865	11,801	15,811	8,776	54%	28	11,524	22,461	27,970	42%	
	29 30	124,735	378,814	243,267	68,940	74,829	49,113	28%	29	194,733	239,365	285,926	19%	
	30 31	432,133 504,292	1,290,809 1,591,664	879,671 1,091,324	224,094 300,694	238,060 308,133	175,689 170,888	26% 28%	29 30	650,911 973,626	880,238 1,078,292	1,028,642 1,337,679	22% 16%	
	32	34.230	1,391,684	513.965	380,595	375.825	313.426	74%	28	140,791	415.140	869.729	72%	
	33	6,868	45,958	25,329	10,282	16,732	6,127	41%	12	17,331	27,513	29,821	26%	
	34	204,201	664,837	451,338	126,306	126,306	78,266	28%	11	380,288	422,751	550,608	18%	
	35	986,869	1,313,046	1,192,482	134,951	147,051	50,796	11%	10	1,024,511	1,255,185	1,288,699	11%	
	36	8,935	56,021	22,686	10,864	18,333	4,728	48%	18	16,214	21,694	25,670	23%	
	37	52,725	198,704	105,998	45,750	54,878	33,787	43%	16	65,973	109,723	128,736	32%	
	38	6,748	33,307	17,371	7,347	7,347	3,556	42%	19	8,888	19,482	21,019	41%	
	39 40	9,699	82,810	44,885	20,981	27,783	8,776	47% 54%	17 21	25,293 12,531	44,629 20,798	53,105	35% 45%	
	40	4,091 11,329	42,750 55,963	23,195 33.652	12,558 14,728	11,563 19,349	10,030 11,345	54% 44%	19	12,551	20,798	32,672 45,739	45%	
	42	26.318	115,566	62 904	30,605	40.245	14,545	49%	15	39,150	54 079	101.862	44%	
	43	12,033	79,953	44,954	22,881	22,119	20,579	51%	20	24,613	45,347	66,280	46%	
Credit Spread	44	6,105	42,940	22,549	12,668	12,409	10,509	56%	21	11,729	23,565	32,487	47%	
Great Spread	45	885	35,924	17,296	9,628	15,416	5,324	56%	18	9,652	20,337	21,744	39%	
	46	4,321	28,169	14,192	6,248	8,978	2,926	44%	17	10,818	14,932	16,442	21%	
	47 48	3,112	19,974	10,060	4,427	10,341	890	44%	18	8,174	9,158	10,858	14%	
	48 49	12,427 6,596	59,053 33,214	33,091 14.649	12,931 6,752	12,269 15,386	7,085	39% 46%	19 17	23,979 9,261	35,242 15.669	39,661 18,109	25% 32%	
	50	8.621	26.677	14,649	5.014	10,408	4,657	26%	19	15.487	21.856	24.341	22%	
	51	95,115	369,338	194,477	79,754	209,396	55,399	41%	15	126,487	214,609	257,125	34%	
	52	112,095	607,276	238,380	132,949	336,924	58,130	56%	15	148,602	222,730	329,676	38%	
	53	163,480	997,836	421,098	216,800	426,310	122,589	52%	14	284,690	394,561	548,182	32%	
	54								3					
	55								2					
	56								2					
	57	4,137,597	6,614,645	5,307,769	658,805	658,805	284,583	12%	12	5,068,003	5,308,371	5,609,074	5%	
Equity Cumulative ** IR Cumulative **	58 59	1,795,455 184,134	5,678,055 804,925	4,192,966 514,884	1,362,178 170,027	1,427,758 251,242	568,036 123,269	33% 33%	20 29	3,207,624 426,682	4,601,705 566,688	5,194,615 644,803	24% 20%	
					485.332	251,242 564,372	439,733	22%	29	426,682	2.196,588	2,655,674	20%	
	60													
	60 61	1,535,293 344,700	3,037,434 640,710	2,229,999 469,425		165.857	83.051		10			548,587		
		1,535,293 344,700 19,523	5,037,434 640,710 89,603	2,229,999 469,425 53,978	465,552 99,810 20,882			21%	10 17	381,274 37,629	420,049 58,026		18% 27%	

CIP Commitative ** 63
 STOPY trunn is the standard deviation computed excluding values below the 5th and above the 95th percentile
 Stopy trunc is the standard deviation computed excluding values below the 5th and above the 95th percentile
 Stopy truncing of the standard deviation of the statistics
 For the aggregated portfolios (57 to 63), banks that reported at least a missing portfolio IMV among the ones composing the aggregate are not included
 in the computation of the benchmarks for that particular aggregate portfolio.



Table 23: P&L VaR statistics

EU Statistics for PnL VaR

	1	Main statistics							Percentiles				
	Port. ID	Min	Мах	Ave.	STDev	STDev_trunc ¹	MAD (median absolute deviation)	Coefficient of variation (STDev/Mean)	Num obs. ²	25th	50th	75th	IQD
	1	4,358,695	7,628,207	6,041,380	951,733	2,183,311	789,086	16%	20	5,241,820	6,243,250	6,692,024	12%
	2	4,121,908	7,216,345	6,235,426	1,055,704	2,115,078	370,424	17%	18	5,846,582	6,801,250	7,007,601	9%
	3	10,383	24,612	14,059	2,974	6,170	1,376	21%	19	12,203	14,075	14,970	10%
	4 5	1,055 1,375,589,424	4,083 2,827,930,328	2,389	836 365,940,260	956 873,041,839	373	35% 18%	19 18	1,783 2 081 972 249	2,245 2 132 379 325	2,802 2 139 387 841	22% 1%
	6	1,375,589,424	2,827,930,328	37,675	10,264	14,793	4,333	27%	18	32,272	38,134	2,139,387,841 40,938	176
	7	38,468	194,165	82,628	41,040	116,004	18,529	50%	18	56,731	76,040	101,196	28%
	8	169	247,145	140,788	52,990	90,664	21,573	38%	18	118,415	144,586	173,511	19%
	9	75,643	164,672	116,048	22,008	36,341	10,215	19%	20	105,702	121,556	129,710	10%
	10	432,109	820,050	554,694	90,034	221,769	29,623	16%	18	496,662	572,646	578,637	8%
	11	63,039	119,351	96,563	15,960	29,516	10,730	17%	26	86,605	99,372	108,931	11%
	12 13	41,097	80,670	56,960	10,836	22,965 35,731	6,361	19% 20%	24 25	49,383 108.711	56,050 121.854	63,476	12%
	15	75,465 13,161	183,349 38,437	123,065 24,311	24,327 6,752	7,408	12,504 5,678	20%	25	108,711 18,189	24,446	128,192 28,713	8% 22%
	15	20,890	78,922	43.549	20,721	20,721	17.930	48%	13	24.090	41.609	65.820	46%
	16	79,537	155,888	130,601	19,537	49,168	18,758	15%	25	119,323	135,873	146,957	10%
	17	146,189	645,500	375,439	127,491	154,571	88,730	34%	23	255,987	394,304	440,420	26%
	18	154,703	742,854	520,221	179,644	213,718	149,979	35%	23	375,078	573,836	699,600	30%
	19	146,094	185,612	167,586	11,120	66,056	7,072	7%	25	160,735	172,683	176,196	5%
	20 21	4,041	11,453	6,943	1,479	2,656	796	21%	25 26	6,012	6,863	7,340	10%
	22	182,305 39,026	375,319 77,628	311,946 54,576	37,036 9,619	107,179 18,715	13,685 6,537	12% 18%	26	300,165 48,707	314,185 53,975	337,358 61,415	6% 12%
	23	118.238	219.357	158.591	22.287	63,603	13.529	14%	24	142,984	163.824	171.617	9%
	24	137,754	651,483	384,984	122,990	161,243	81,928	32%	17	310,672	392,599	429,642	16%
	25	39,254	98,353	61,579	17,707	26,687	7,929	29%	24	50,666	58,455	68,139	15%
	26	270,546	1,074,384	679,385	219,575	238,003	140,327	32%	23	474,582	745,225	835,031	28%
	27	435,556	837,513	627,072	107,106	256,710	81,168	17%	24	534,120	636,886	698,136	13%
	28	3,145	56,987	33,501	15,011	16,498	9,275	45%	22	23,965	35,477	42,122	27%
	29	74,791	185,382	119,372	24,863	40,358	10,434	21%	21	108,514	118,483	129,309	9%
	30 31	326,795 404,033	503,864 802,529	404,711 561,369	42,054 101,454	166,071 198,733	30,527 61,283	10% 18%	22 22	369,581 480,954	408,433 558,136	437,332 603,520	8% 11%
	32	23,925	446,109	216,627	101,454	198,755	160,226	86%	22	37,457	306,125	393,926	83%
	33	1,676	73,013	36,591	18,458	79,283	10,344	50%	11	26,121	37,408	47,526	29%
	34	493,916	1,214,042	895,095	276,372	570,023	245,668	31%	8	659,409	988,251	1,156,329	27%
	35	729,069	998,527	870,246	81,830	922,644	43,317	9%	8	830,077	895,254	921,922	5%
	36	13,047	45,047	24,392	9,259	25,967	4,642	38%	17	14,637	27,058	30,475	35%
	37	43,501	150,166	109,334	37,688	50,692	20,246	35%	14	67,798	129,419	139,121	34%
	38	4,573	20,166	11,185	4,957	11,057	4,307	44%	17	7,179	12,293	14,575	34%
	39 40	17,952	63,938	44,723	17,660	22,544	8,121	40%	15	24,040	54,693	58,518	42%
	40 41	5,092 5,569	18,619 35,901	10,742 19,296	4,421 9,252	12,167 14,785	3,323 5,493	41% 48%	17 17	7,289 12,908	10,887 18.241	12,757 23,116	27% 28%
	41	17.265	89,597	44.227	22.776	32.012	14.572	48% 52%	13	25.187	39,729	58.761	40%
	43	11,334	81,536	33,997	16,576	24,145	10,643	49%	16	22,091	33,924	42,171	31%
	44	5,762	55,796	15,855	12,168	22,180	2,827	77%	17	9,709	13,129	14,433	20%
	45	536	20,947	11,937	6,984	8,840	6,551	59%	16	5,638	12,097	18,477	53%
	46	3,308	34,224	16,277	9,850	11,898	8,671	61%	17	7,842	14,319	24,138	51%
	47	1,673	6,540	3,923	1,259	1,744	592	32%	15	2,713	4,095	4,548	25%
	48	4,797	55,052	23,311	13,259	19,487	8,347	57%	17	14,361	23,875	27,616	32%
	49 50	7,283	30,654 40,408	17,862 22,315	7,859 9.673	21,740 15.277	6,651 7.618	44% 43%	16 17	9,722 13.639	17,432 21.282	23,238 30,920	41% 39%
	50 51	11,628 52,619	40,408 350,621	22,315 206,668	9,673 94,326	15,277 169,178	7,618 76,818	43% 46%	17	13,639 122,844	21,282 221,644	30,920 277,802	39% 39%
	52	52,619	563,498	200,008	94,526	195,430	86,518	40% 64%	14	114,433	205,703	314,466	47%
	53	44,408	947,467	416,243	258,958	309,508	129,853	62%	13	250,955	398,635	590,691	40%
	54	,			,		,		2				
	55 56												
ALL-IN no-CTP **	57	2,092,766	3,589,043	2,824,176	477,685	2,158,176	257,169	17%	10	2,644,404	2,902,433	3,158,742	9%
	58	2,125,310	9,546,354	3,097,226	1,960,959	3,852,709	131,787	63%	17	2,264,220	2,553,179	2,576,374	6%
	59	197,402	904,247	498,131	129,589	204,494	47,390	26%	23	442,456	525,864	550,486	11%
	60	815,985	1,372,451	1,064,586	147,126	205,462	84,032	14%	20	965,900	1,073,754	1,135,928	8%
	61	45,733	1,207,652	802,128	406,020	660,073	295,826	51%	8	561,836	997,702	1,157,904	35%
	62	17,547	69,675	42,906	14,548	14,548	10,684	34%	17	29,797	44,738	51,719	27%
CTP Cumulative **	63												

CTP Cumulative ** 63
 STDev trunc is the standard deviation computed excluding values below the 5th and above the 95th percentile
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 Pacers to the number of banks included in the computation of the statistics
 For the aggregated portfolios (57 to 63), banks that reported of least a missing portfolio IMV among the ones composing the aggregate are not included
 in the computation of the benchmarks for that particular aggregate portfolio.



Table 24: Empirical expected shortfall statistics

EU Statistics for empirical expected shortfall

					Main st	atistics					Percentiles		
	Port. ID	Min	Max	Ave.	STDev	STDev_trunc ¹	MAD (median absolute	Coefficient of variation	Num obs. ²	25th	50th	75th	IQD
	1	4,708,973	7,257,254	6.518.957	658.256	2,526,881	deviation) 220.389	(STDev/Mean) 10%	20	6,182,844	6,853,911	6.973.894	6%
	2	4,708,975	6,698,515	6,052,722	597,464	2,227,336	273.922	10%	18	5,678,392	6,430,144	6,514,895	7%
	3	10,432	19,923	13,102	2,337	5,106	841	18%	19	11,712	12,638	13,420	7%
	4	1,178	4,194	2,515	952	1,063	543	38%	19	1,785	2,405	3,339	30%
	5	1,440,794,919	2,377,741,792	2,020,216,318	247,204,405	875,361,008	31,888,238	12%	18	2,011,335,758	2,122,304,494	2,151,565,792	3%
	6 7	29,958	55,191	42,803	7,920	10,834	7,481	19%	17	36,456	43,937	47,544	13%
	7 8	40,744 170	176,820 238,711	83,832 140,170	40,696 49,662	105,900 86,257	16,372 21,350	49% 35%	18 18	54,325 119,162	66,819 139,489	102,602 176,934	31% 20%
	9	76,025	238,711 135,049	140,170	49,662	46,477	3.822	35%	20	109,810	159,489	176,934	20%
	10	389,763	861.341	543,399	119,664	236,030	14,871	22%	18	477,240	526.088	535,890	6%
	11	60,295	98,214	87,302	7,289	34,100	3,116	8%	26	85,088	89,094	91,463	4%
	12	40,612	71,260	52,690	8,516	21,809	5,589	16%	24	47,090	51,903	57,368	10%
	13	91,959	169,097	122,798	18,264	32,033	8,044	15%	25	110,939	118,435	136,505	10%
	14	16,992	33,485	26,251	4,290	6,261	2,393	16%	25	24,553	26,346	28,792	8%
	15 16	20,554 89,873	69,718 149,958	45,210 134,526	18,565 14,275	27,336 49,576	18,177 6,131	41% 11%	12 25	26,794 127,179	51,648 140,721	61,681 144,685	39% 6%
	10	143,767	526,325	370.594	91,522	49,576	57,468	25%	25	298,774	384,205	436,092	19%
	18	163,206	627,746	471,698	125,440	197,203	59,462	27%	23	433,488	505,315	554,181	12%
Interest Rate	19	139,285	174,014	153,576	8,042	63,229	4,895	5%	25	148,214	155,019	159,030	4%
	20	150	13,047	6,926	2,332	3,810	1,085	34%	25	5,721	7,252	7,719	15%
	21	174,078	345,965	291,541	30,157	97,975	12,650	10%	26	282,277	295,929	306,342	4%
	22	38,955	64,996	53,384	6,412	21,084	3,919	12%	24	48,724	55,864	57,460	8%
	23 24	108,466 150,663	201,060 570,655	160,794 372,219	18,686 114,102	58,630 132,902	5,169 67,918	12% 31%	23 18	156,939 312,145	165,134 375,534	168,162 438,899	3% 17%
	25	43.945	95,079	60.983	13.122	24,149	5.967	22%	24	52.362	58,781	438,899	17%
	26	292,184	882,946	661,898	166,282	261,703	97,887	25%	23	555,035	719,763	791,449	18%
	27	493,558	785,644	595,584	69,557	245,173	26,676	12%	24	548,866	601,236	616,706	6%
	28	6,389	55,765	33,444	12,533	15,223	9,006	38%	21	26,260	34,205	42,889	24%
	29	82,025	167,787	116,384	20,841	37,169	14,390	18%	21	99,126	117,947	125,989	12%
	30	325,146	467,721	392,561	31,985	157,599	18,263	8%	22	375,517	403,602	411,140	5%
	31 32	381,108 26,993	641,121 498,577	538,122 218,550	67,418 185,778	215,825 185,249	40,315 169,772	13% 85%	22 22	493,373 34,815	553,354 335,550	582,375 396,929	8% 84%
	33	1,601	456,574	38,170	22,826	77,660	8,760	60%	11	24,398	36,764	44,310	29%
Commodity	34	468,280	1,147,302	757,456	244,777	582,884	140,187	32%	8	576,389	777,624	929,068	23%
	35	706,040	1,119,058	867,919	121,001	671,482	53,614	14%	8	806,479	850,452	903,131	6%
	36	14,076	62,824	30,005	13,673	24,814	12,381	46%	17	17,218	30,572	38,381	38%
	37	48,917	134,587	103,237	33,028	47,064	11,196	32%	14	63,493	123,917	127,602	34%
	38	5,346	31,524	11,795	6,437	11,016	4,290	55%	17	7,058	12,095	14,103	33%
	39 40	16,898	59,137	42,132	16,737	21,140	6,803	40% 54%	15	22,295	52,829 12,524	55,420	43%
	40	6,494 5,722	32,856 49,670	12,442 20,772	6,705 10,867	12,580 15,308	4,683 6.176	54%	17 17	7,006	12,524 19,952	15,060 25,953	36% 35%
	42	18.251	97.042	44,989	23,446	31.327	14,779	52%	14	24.879	41.800	54,438	37%
	43	10,657	67,779	33,785	15,844	22,457	7,748	47%	16	22,648	32,991	39,618	27%
Credit Spread	44	5,508	28,794	13,184	5,792	18,459	3,100	44%	16	8,673	14,133	15,389	28%
cicon spicoo	45	463	17,436	10,689	5,683	7,644	3,132	53%	16	5,259	13,817	15,001	48%
	46	3,324	29,344	14,751	8,525	14,656	7,196	58%	16	7,584	13,752	23,181	51%
	47 48	2,782	8,881 47,209	4,224	1,747	9,271	379	41% 51%	15 17	3,176 14,951	3,583 25,979	4,544 29,598	18% 33%
	48 49	4,676 8,048	47,209 23,567	22,550 16,139	11,462 5,599	18,190 19,528	9,353 5,102	51% 35%	17	14,951 11,206	25,979 17,088	29,598 21,946	33%
	50	11,523	42,745	23,456	9,301	11,101	6,737	40%	18	15,967	21,579	31,883	33%
	51	58,810	393,992	209,490	100,920	157,734	84,021	48%	14	125,953	223,384	247,106	32%
	52	59,311	570,055	242,398	149,520	177,322	101,525	62%	14	114,403	249,487	325,889	48%
	53	44,655	962,699	462,412	282,330	282,330	205,971	61%	14	257,199	464,100	651,724	43%
	54								2				
Correlation Trading	55 56												
ALL-IN no-CTP **	57	2,039,592	3,161,396	2,728,450	343,267	1,860,913	118,112	13%	10	2,643,650	2,827,899	2,879,873	4%
	58	1,944,264	7,818,749	2,893,573	1,675,505	3,159,754	154,300	58%	17	2,159,025	2,410,551	2,480,514	7%
	59	205,258	724,214	522,137	115,091	219,750	54,781	22%	23	492,632	536,394	591,393	9%
FX Cumulative **	60	853,717	1,338,870	1,051,853	141,920	163,179	64,533	14%	19	963,130	1,031,926	1,153,566	9%
Commodity Cumulative ** CS Cumulative **	61 62	40,671 18,302	1,151,062 73.616	679,054 41,982	355,054 14,891	649,896 17,556	209,986 7,240	52% 36%	8 16	491,226 32,552	768,749 39,875	927,911 47.100	31% 18%

CTP Cumulative ** 63
 STDev trunc is the standard deviation computed excluding values below the 5th and above the 95th percentile
 STDev trunc is the standard deviation computed excluding values below the 5th and above the 95th percentile
 Pacers to the number of banks included in the computation of the statistics
 For the aggregated portfolios (57 to 63), banks that reported of least a missing portfolio IMV among the ones composing the aggregate are not included
 in the computation of the benchmarks for that particular aggregate portfolio.



Table 25: sVaR/VaR statistics

EU Statistics for sVaR/VaR

					Main st	atistics							
	Port. ID	Min	Max	Ave.	STDev	STDev_trunc ¹	MAD (median absolute	Coefficient of variation	Num obs. ²	25th	50th	75th	IQD
							deviation)	(STDev/Mean)					
	1 2	0.61	1.69 2.49	1.12	0.26			24% 40%	26 24	0.95	1.12	1.25 1.65	14% 22%
	3	0.49	1.59	1.03	0.33			30%	24	0.81	1.04	1.05	22%
	4	0.57	2.13	1.08	0.36			33%	23	0.77	1.07	1.22	23%
Equity	5	0.57	2.22	1.49	0.47			32%	22	1.31	1.58	1.80	16%
Eduty	6	0.58	2.53	1.23	0.47			38%	24	0.91	1.11	1.44	22%
	7	0.25	3.24	1.05	0.61			58%	21	0.72	0.94	1.28	28%
	8 9	0.40	1.54	0.78	0.25			32% 31%	22 29	0.59	0.75	0.90 1.14	21% 19%
	10	0.56	2.31	1.55	0.45			29%	25	1.26	1.61	1.14	20%
	11	0.43	3.88	1.92	0.95			49%	38	1.17	1.73	2.77	40%
	12	0.29	3.48	1.65	0.88			53%	32	0.99	1.60	2.33	40%
	13	0.69	3.96	2.21	0.96			43%	33	1.24	2.54	3.07	43%
	14	0.52	5.97	2.75	1.56			57%	38	1.28	2.76	3.88	50%
	15 16	0.74	4.58 2.36	2.45 1.37	1.37 0.44			56% 32%	11 33	1.36	2.06 1.31	3.73 1.72	46% 23%
	10	0.57	2.50	1.37	0.44			52%	33 30	0.75	0.99	1.72	23%
Interest Data	18	0.31	2.02	0.82	0.50			61%	29	0.45	0.63	0.99	38%
Interest Rate	19	0.69	2.90	1.66	0.62			37%	33	1.12	1.76	2.14	31%
	20	0.02	11.63	2.15	2.05			95%	28	1.21	1.88	2.13	28%
	21 22	0.73	3.23	1.74	0.74			42%	35	1.10	1.80	2.35	36%
	22	0.49	4.69 2.62	2.54	1.21 0.51			48% 34%	31 33	1.38 1.19	2.37 1.43	3.47 1.81	43% 20%
	23	0.30	6.45	1.50	1.21			74%	27	0.88	1.45	2.09	41%
	25	0.78	9.41	2.87	2.02			70%	35	1.21	2.26	3.51	49%
	26	0.42	2.79	1.02	0.58			57%	27	0.64	0.87	1.16	29%
	27	0.50	1.96	1.28	0.35			27%	30	1.11	1.30	1.48	14%
	28	0.40	2.24	0.84	0.42			49%	26	0.58	0.70	0.96	25%
FX	29 30	0.98	3.14 3.95	2.01 2.19	0.54			27% 26%	27 27	1.49 1.75	2.13 2.31	2.32 2.54	22% 18%
	31	0.79	3.28	2.19	0.57			20%	27	1.75	2.51	2.34	18%
	32	0.84	12.07	2.91	2.14			74%	28	2.12	2.46	3.21	20%
	33	0.51	5.48	1.49	1.32			89%	12	0.59	1.05	1.70	49%
Commodity	34	0.24	1.03	0.59	0.22			36%	11	0.48	0.51	0.66	16%
	35	1.05	2.10	1.36	0.31			23%	10	1.11	1.33	1.43	13%
	36 37	0.48	1.48 2.18	0.82	0.30			36% 39%	17 16	0.58	0.73	1.00 1.61	26% 20%
	38	0.85	4.57	1.26	0.49			55%	16	1.13	1.31	1.61	17%
	39	0.52	2.75	1.30	0.47			36%	17	1.04	1.18	1.41	15%
	40	0.66	4.58	2.11	1.00			48%	19	1.46	1.95	2.11	18%
	41	0.33	6.99	2.02	1.47			73%	19	1.26	1.50	2.13	26%
	42 43	0.53	4.39	1.68	0.97			58%	14	1.10	1.33	2.23	34%
	43 44	0.56	5.20 3.75	1.74	1.20			69% 59%	17 18	0.82	1.49 1.78	2.12	44% 54%
Credit Spread	45	0.23	13.95	2.31	2.99			129%	18	1.02	1.78	2.49	36%
	46	0.31	2.45	1.19	0.64			54%	16	0.76	0.96	1.71	39%
	47	0.79	5.24	2.22	1.13			51%	18	1.56	1.83	3.14	34%
	48	0.36	2.57	1.51	0.65			43%	17	1.14	1.44	1.94	26%
	49 50	0.45	1.93	0.98	0.41			42%	15	0.63	0.85	1.19	31%
	50 51	0.46	1.82 2.37	0.95	0.31			33% 39%	18 15	0.79	0.91	1.11 1.60	17% 29%
	52	0.53	2.90	1.25	0.51			42%	15	1.16	1.32	2.08	25%
	53	0.41	2.92	1.58	0.61			39%	14	1.17	1.52	2.00	26%
	54								3				
Correlation Trading	55								2				
	56								2				
ALL-IN no-CTP ** Equity Cumulative **	57 58	1.27 0.69	2.92 2.54	1.94 1.63	0.43 0.56			22% 35%	12 18	1.66	1.90 1.84	2.21 1.96	14% 27%
IR Cumulative **	59	0.69	2.54	1.03	0.56			35%	25	0.76	1.84	1.96	27%
FX Cumulative **	60	1.18	3.08	2.18	0.57			26%	22	1.92	2.29	2.55	14%
Commodity Cumulative **	61	0.41	0.98	0.61	0.18			29%	10	0.50	0.54	0.66	14%
CS Cumulative **	62	0.58	5.41	1.46	1.09			75%	16	0.91	1.21	1.62	28%
CTP Cumulative **	63								2				

CTP Cumulative **
 63
 STP cumulative **
 63
 STP cumulative **
 63
 STP cumulative **
 For the aggregated portfolios (57 to 63), bonks that reported at least a missing portfolio IMV among the ones composing the aggregate are not included
 in the computation of the benchmarks for that portfoliolar aggregate portfolio.



Table 26: P&L VaR/VaR statistics

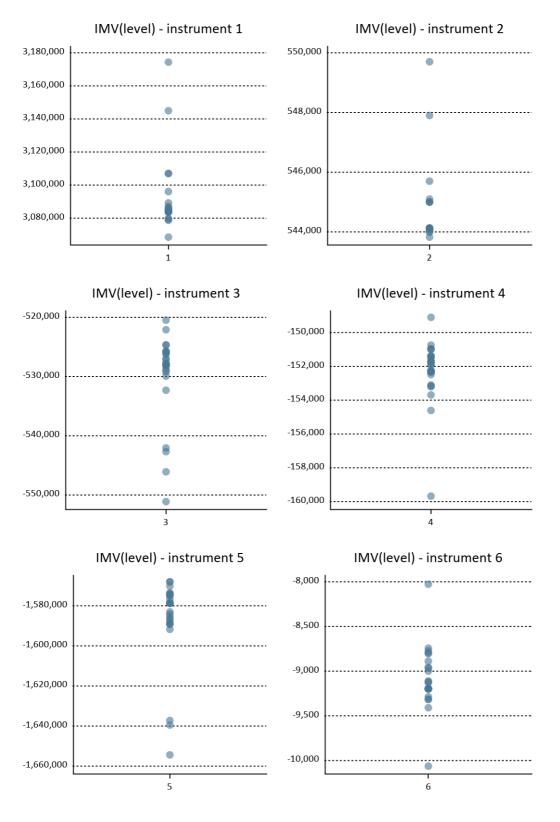
EU Statistics for P&L VaR/VaR

					Main st	atistics					Percentiles	
	Port. ID	Min	Max	Ave.	STDev	STDev_trunc ¹	MAD (median absolute deviation)	Coefficient of variation (STDev/Mean)	Num obs. ²	25th	50th	
	1	0.33	1.73	1.09	0.33		ueviationy	30%	21	0.99	1.12	1.2
	2	0.34	1.66	0.96	0.31			32%	18	0.80	1.06	1.:
	3	0.35	1.34	1.00	0.28			28%	20	0.90	1.09	1.:
	4	0.34	1.84	0.95	0.47			49%	18	0.53	0.90	1.8
	5	0.33	101.26	7.25	24.28			335%	16	0.79	1.05	1.3
	6	0.24	1.17	0.70	0.29			41%	19	0.47	0.75	0.9
	7 8	0.27	2.00	1.02	0.41			41%	17	0.85	1.03	1.1
	9	0.17	22.29 1.38	1.92 1.01	4.81 0.29			250% 29%	19 22	0.61 0.91	0.95	1.0
	10	0.34	1.43	1.01	0.25			25%	20	0.96	1.07	1.0
	11	0.34	1.45	1.00	0.23			23%	28	0.99	1.06	1.1
	12	0.35	1.59	1.04	0.26			25%	24	1.01	1.08	1.1
	13	0.32	1.42	0.97	0.26			27%	23	0.92	1.03	1.0
	14	0.32	2.13	1.19	0.47			39%	26	0.99	1.12	1.5
	15	0.32	1.21	0.96	0.25			26%	9	0.88	1.03	1.1
	16	0.32	1.42	1.05	0.28			27%	27	0.98	1.06	1.2
	17 18	0.32	2.33	1.10	0.41			37%	23	0.92	1.15	1.2
	18 19	0.32	1.47 1.10	1.00 0.93	0.26			26% 21%	24 26	0.96	1.04 1.00	1.1
	20	0.32	1.10	0.93	0.19			21%	25	0.93	1.00	1.0
	20	0.32	1.53	0.97	0.25			26%	25	0.93	1.01	1.0
	22	0.31	1.64	1.07	0.29			27%	23	0.97	1.02	1.2
	23	0.34	1.13	0.95	0.21			22%	25	0.87	1.04	1.0
	24	0.34	1.30	0.95	0.25			26%	21	0.87	1.01	1.0
	25	0.32	1.55	0.96	0.29			30%	26	0.86	1.02	1.1
	26	0.32	1.93	1.03	0.31			30%	22	1.00	1.06	1.1
	27	0.33	1.37	0.98	0.23			24%	25	0.93	1.02	1.1
	28	0.34	1.28	0.87	0.26			30%	21	0.71	0.88	1.0
	29 30	0.35	1.75	1.05	0.34			32%	22	0.99	1.09	1.1
	31	0.33	1.17	0.95	0.22			23% 27%	22 21	0.98	1.02	1.0
	32	0.32	2.26	1.06	0.31			30%	23	0.99	1.05	1.1
	33	0.33	1.58	0.88	0.36			41%	11	0.67	1.00	1.0
	34	0.33	1.09	0.85	0.26			31%	9	0.75	0.96	1.0
	35	0.32	1.36	0.98	0.28			28%	9	1.01	1.04	1.0
	36	0.34	1.68	1.12	0.28			25%	17	1.04	1.07	1.3
	37	0.32	1.13	0.89	0.24			27%	15	0.69	1.02	1.0
	38	0.32	1.59	1.12	0.31			27%	16	1.01	1.18	1.5
	39 40	0.34	1.05	0.85	0.22			26%	16	0.62	1.00	1.0
	40 41	0.32	1.92 1.82	1.20 1.09	0.38			31% 28%	16 17	1.06 1.00	1.19 1.04	1.4
	41 42	0.33	1.82	0.98	0.31			28%	1/	0.98	1.04	
	43	0.33	1.18	1.00	0.21			22%	14	0.98	1.03	1.1
C /# C /	44	0.32	2.96	1.25	0.62			49%	16	1.01	1.11	1.2
	45	0.33	1.65	1.02	0.28			28%	15	1.01	1.01	1.0
	46	0.33	2.18	1.06	0.35			33%	16	0.99	1.02	1.0
	47	0.32	2.38	1.19	0.51			43%	15	1.01	1.05	1.1
	48	0.33	1.89	1.04	0.33			31%	15	1.01	1.05	1.1
	49 50	0.67	1.99	1.15	0.31			27%	15	1.01	1.04	1.2
	50 51	0.32	1.33	0.99	0.27			27%	18 14	0.80	1.05	1.2
	51 52	0.32	1.61	0.92	0.34			37%	14	0.67	1.00	1.:
	53	0.34	2.04	0.93	0.40			43%	14	0.67	0.98	1.0
	55	0.00	16.1	0.27	0.40			+676	2	0.00	0.90	1.
Correlation Trading	55								1			
	56								1			
ALL-IN no-CTP **	57	0.32	1.35	0.96	0.29			30%	10	0.94	1.06	1.
	58	0.32	1.10	0.93	0.24			26%	15	0.98	1.04	1.
	59	0.33	1.45	1.01	0.26			26%	23	0.94	1.02	1.
	60	0.33	1.15	0.96	0.18			19%	20	0.91	1.02	1.
FX Cumulative ** mmodity Cumulative ** CS Cumulative **	61 62	0.32	1.09	0.82	0.26			32%	8	0.69	0.94	1

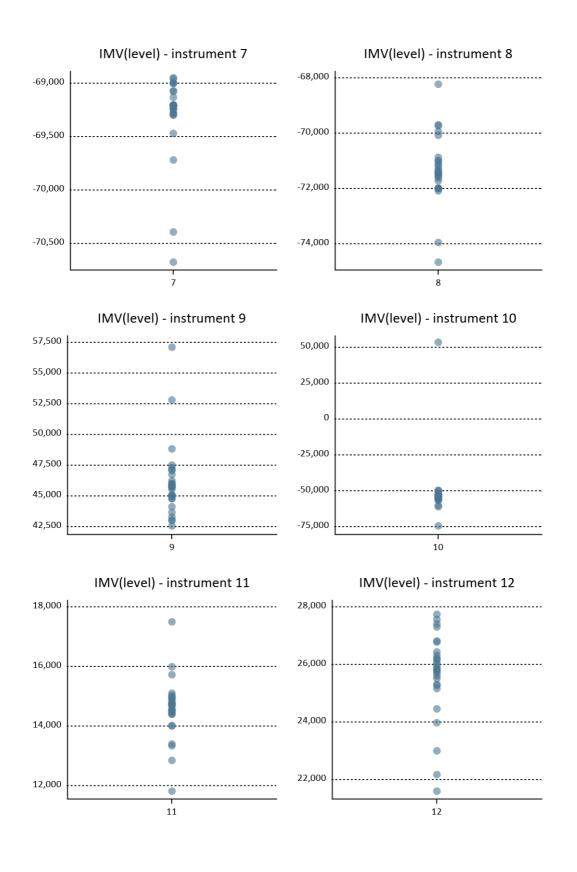
CTP Cumulative ** 63
 STDev trunc is the standard deviation computed excluding values below the 5th and above the 95th percentile
 StDev trunc is the standard deviation computation of the statistics
 For the aggregated portfolios (57 to 63), banks that reported at least a missing portfolio IMV among the ones composing the aggregate are not included
 in the computation of the benchmarks for that particular aggregate portfolio.



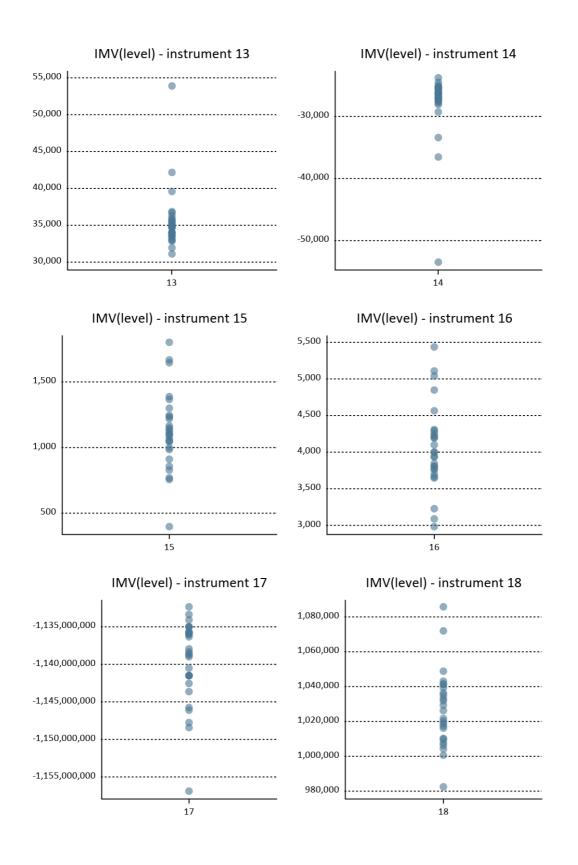




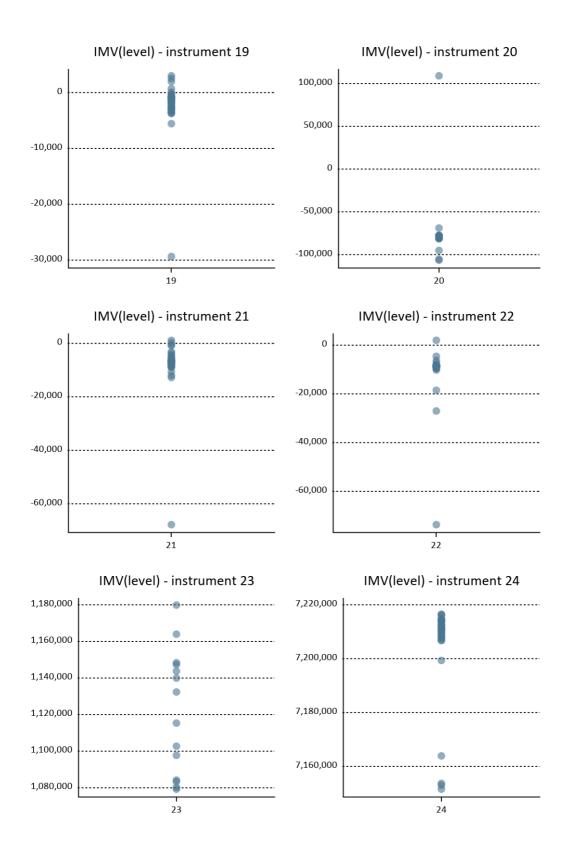




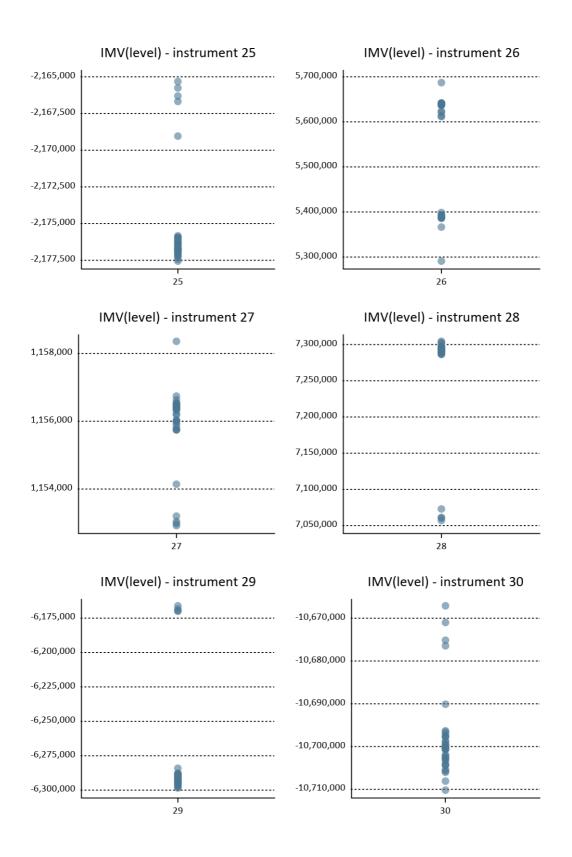




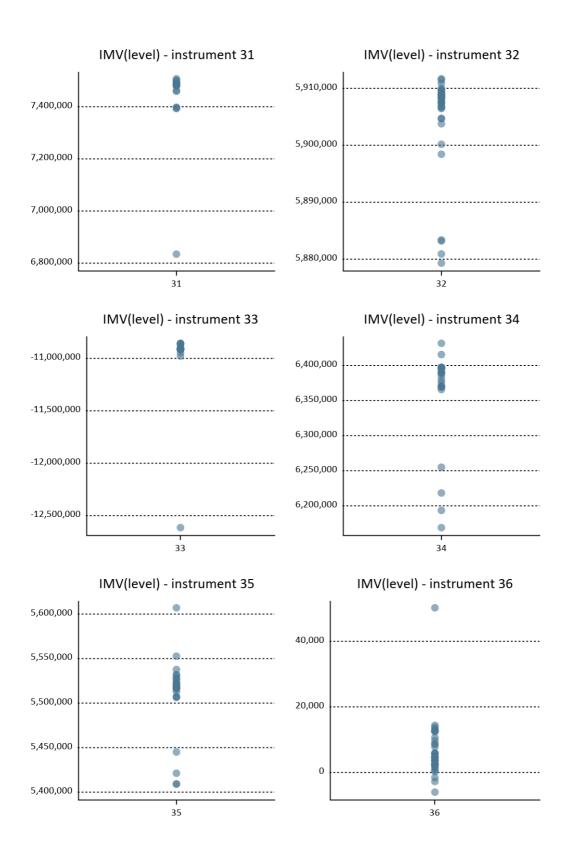




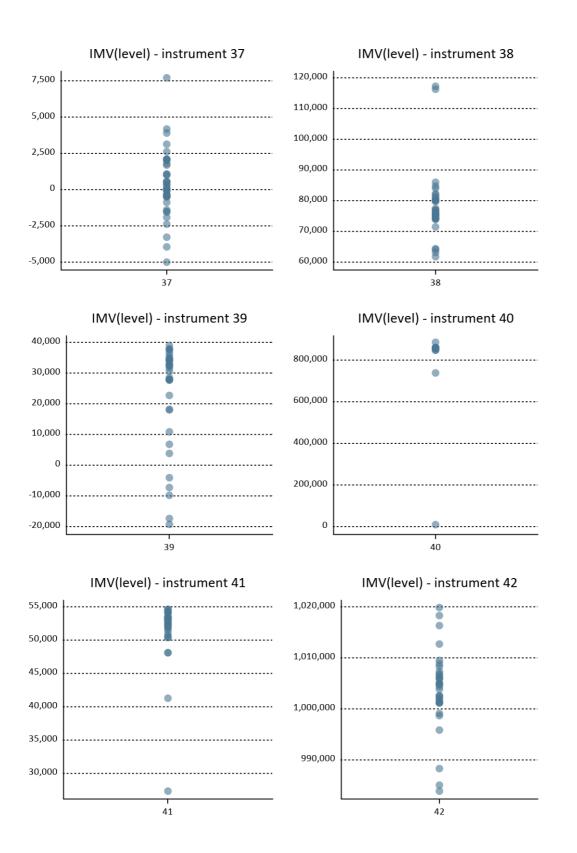




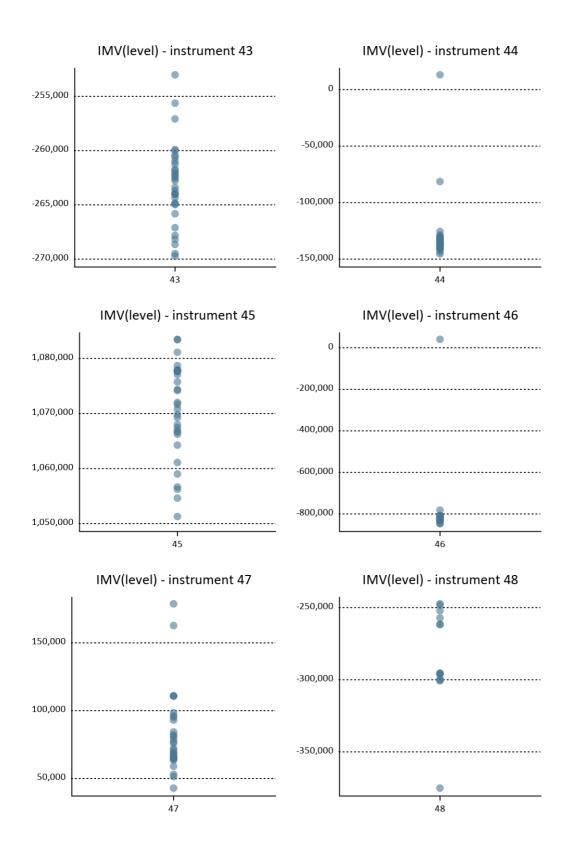




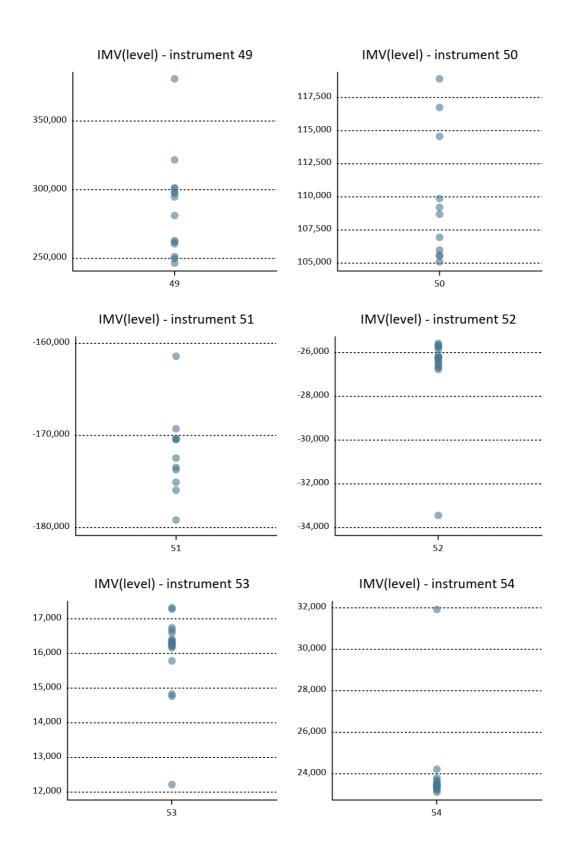




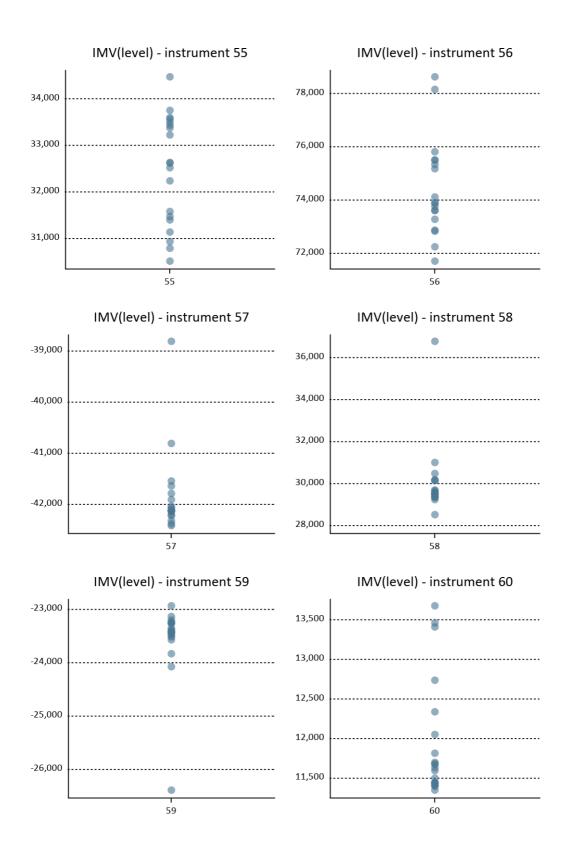




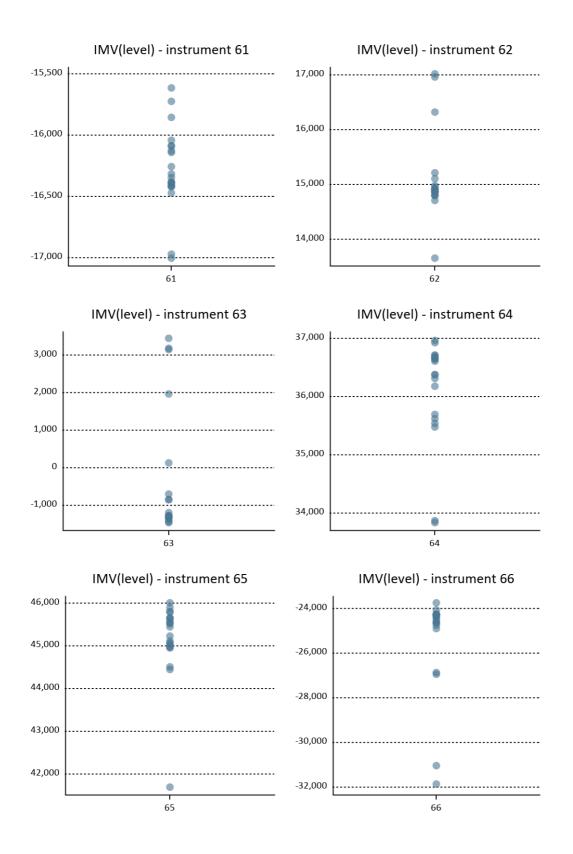




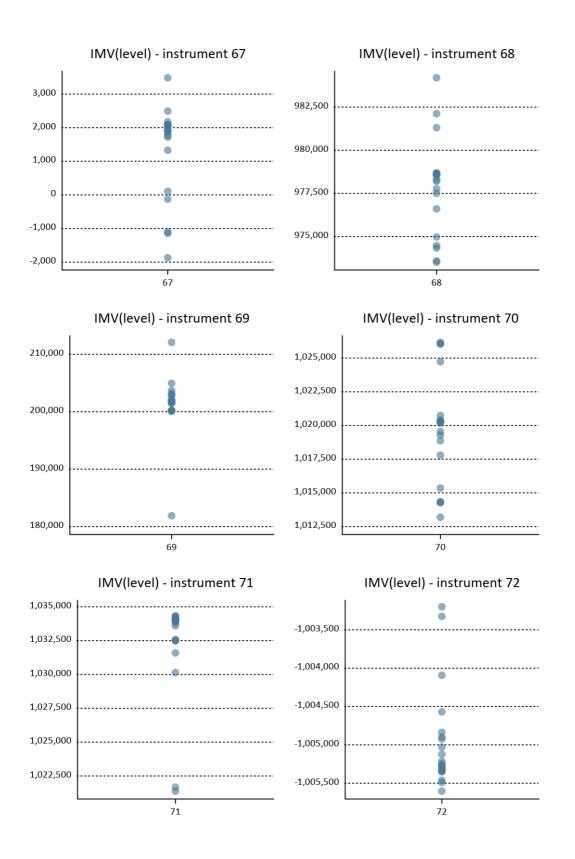




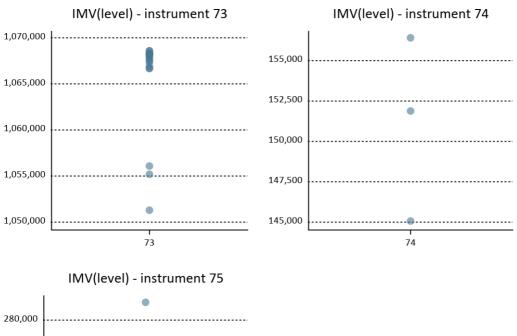












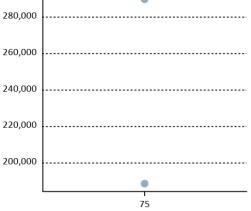




Figure 18: VaR submissions normalised by the median of each portfolio (by asset class)

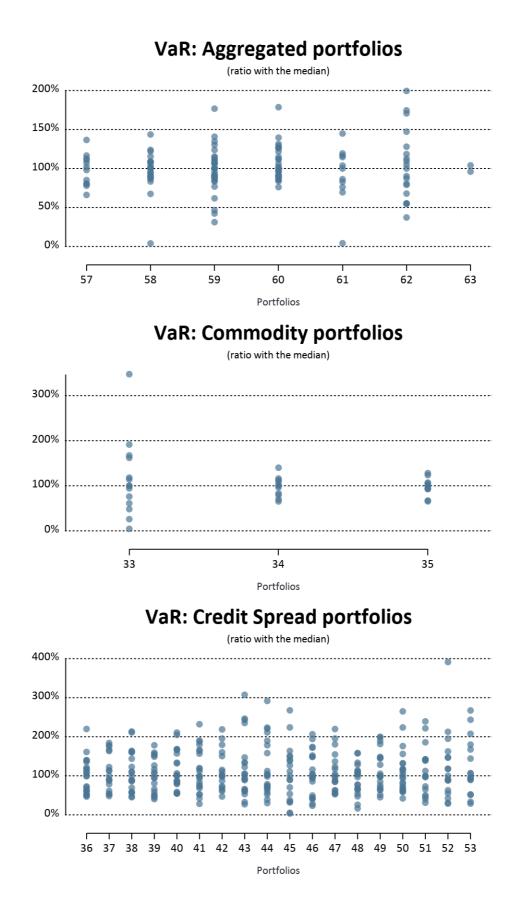
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7		•• •			
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59	0 00 0 0000000000	•			
61	0 (2000) (0 (20) 0 0 (20) (0 (20) 0	•			
63	0 0 0 00 000 0 0 00				

VaR: All portfolios

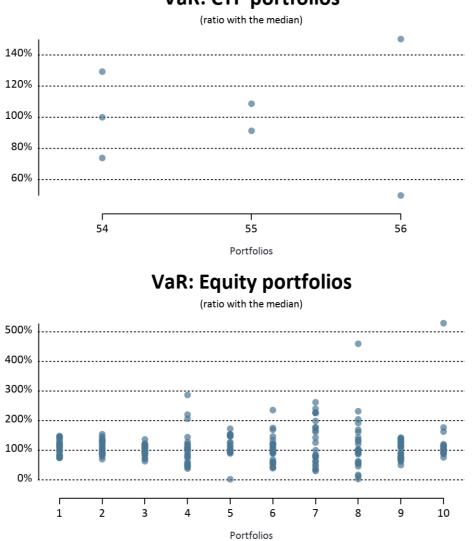
(ratio with the median)

Equity Interest Rate FX Commodity Credit Spread CTP All-in









VaR: CTP portfolios



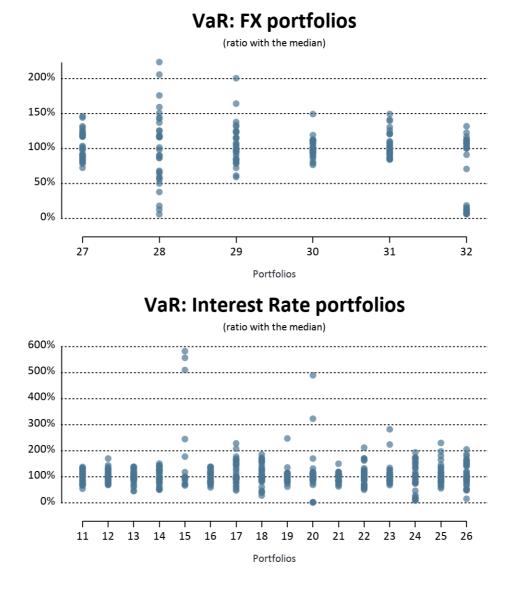




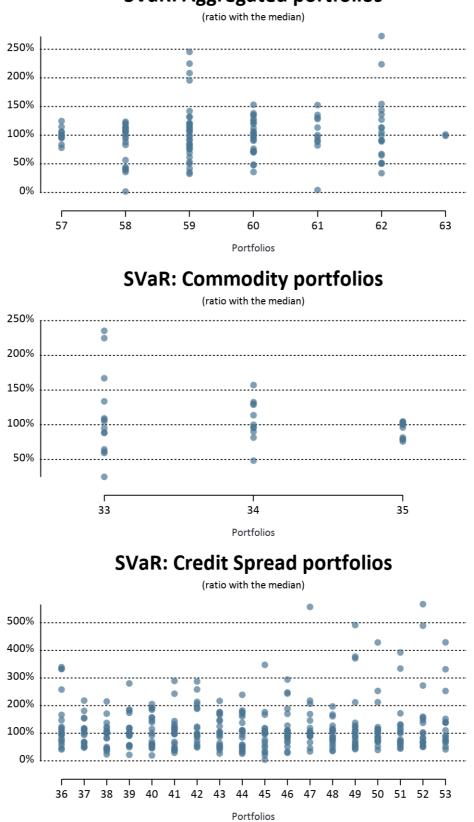
Figure 19: sVaR submissions normalised by the median of each portfolio (by asset class)

	(ra	tio wit	th the medi	an)		
	0% 100% 20	0%	300	%	400%	500%
1						
3				•		
5	• • • • • • • • • • • • • • • • • • •	•	•			
7		• •				
9		•				•
11						
13		•				
15		•			•	
17		•				
19			•			•
21						
23	• • • • • • • • • • • •		•	•		
25	0 00 00 00 00 00 00 00 0 0 0 0 0 0 0 0					•
27	0 00 0000 0000 000 0 0 0	•				
29						
31				•		
33	0 00 00 00 0 0 0 000 0 00 0					
35			•			
37						
39		•	•			
41	0 0 00 00 00 00 0000 0 0	••	• •			
43		•	•			
45				•		
47		• •				
49		•	•	00	•	•
51				•	•	
53			•	•	•	
55						
57	00 000 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0					
59		• •	•			
61	0 080 0 680 0					
63	0 0 0 0000 0000 0	•	•			
			c		CTD	AU :

SVaR: All portfolios

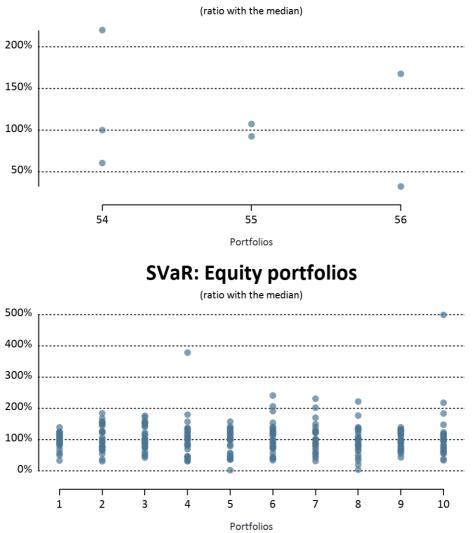
Equity Interest Rate FX Commodity Credit Spread CTP All-in





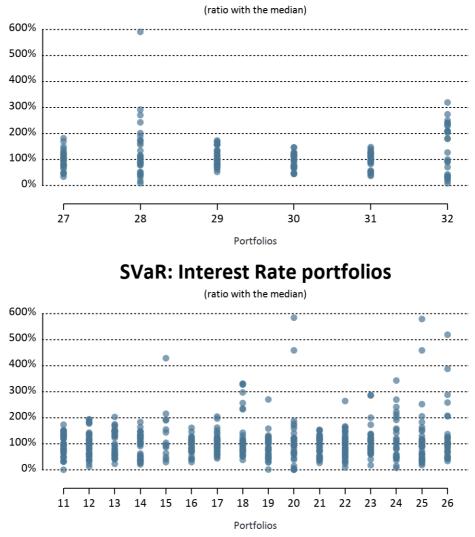
SVaR: Aggregated portfolios





SVaR: CTP portfolios





SVaR: FX portfolios



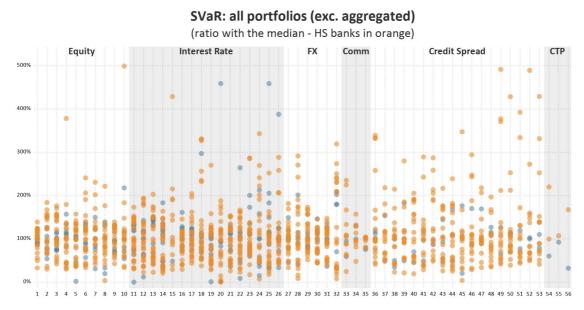


Figure 20: sVaR submissions normalised by the median of each portfolio (by methodological approach)



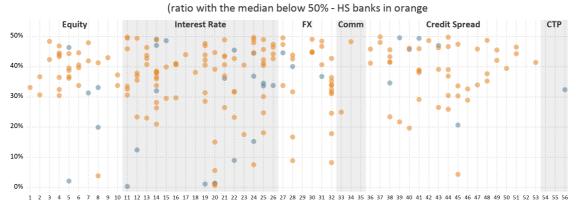




Table 27: VaR statistics (small banks only)

Inter No. No. </th <th></th> <th>I</th> <th colspan="9">Other stats</th> <th colspan="7">Percentiles</th>		I	Other stats									Percentiles						
form 1 14234370 14234370 12787 30 12380 13237 30 12380 13238 30 <th></th> <th>Port. ID</th> <th>Min</th> <th>Max</th> <th>Ave.</th> <th></th> <th></th> <th>absolute</th> <th>variation</th> <th>Num obs.</th> <th>5th</th> <th>10th</th> <th>25th</th> <th></th> <th>75th</th> <th>90th</th> <th>95th</th> <th>Interquantile range</th>		Port. ID	Min	Max	Ave.			absolute	variation	Num obs.	5th	10th	25th		75th	90th	95th	Interquantile range
Sec. 1 <th1< th=""> 1 1 1</th1<>		2 3								4								
1 95,40 157,200 97,31 157,11 158,10 138,0 2 141,0 65,40 17,37 183,0 133,00 <th< td=""><td></td><td>5 6</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>3% 14%</td></th<>		5 6																3% 14%
1/2 1/2 1/2		9								4 6 5								22% 4%
1 10000 10344 1738 <th1< td=""><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>17%</td></th1<>																		17%
Af 1739 1402 2404 540 193 193 1213										8								20% 6%
Interstate 10 153.52 935.72 935.72 935.84 936.84 977.94 156.85 977.94 156.85 977.94 156.85 977.94 156.85 977.94 156.85 977.94 156.85 977.94 156.85 977.94 156.85 977.94 156.85 977.94 156.95<		14 15	17,919	34,052	28,054	5,385			19%	1	19,817	21,715	24,239	29,168	31,988	33,038	33,545	14%
Alter Alobe 45 127.55 778.62 97.79 200.71 145.14 145.28 102.07 108.25 102.07 108.25 102.07 108.25 102.07 108.25 102.07 108.25 102.07 108.25 102.07 108.25 102.07 108.25 102.07<																		19% 13%
interface interface <t< td=""><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>8</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>13%</td></t<>										8								13%
22 224644 35538 25519 25237 25238 25237 25237 25237 25237 25237 2									12%	9								9%
21 2322 73.83 49.44 15.26 13.94 73.36 43.93 13.99 53.99 57.95 69.39 2 22 13.120 13.120 13.120 13.121 13.121 13.124 <td< td=""><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>8</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>11%</td></td<>										8								11%
111.20 104.070 131.470 0.0070 131.470 0.0070 101.471 0.0050 118.21 12.264 131.420 145.40 </td <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td>9</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td>10%</td>										9								10%
1 33.48 43.53.3 13.82.9 17.83 73.85 97.35 97.35 97.35 97.35 97.36 93.02.6 93.02.6 93.03.5 97.04.6 10.30.9 93.02.6										7								21% 12%
1/2 250.517 370.209 647.68 191.49 0 647 792.00 502.00 707.76 620.01 620.00 647.09 723.00 723.00 733.00										6								66%
Alia Sistery Toropse Output P Sistery Sistery Toropse Sistery Sistery<																		22%
28 38.35 38.36 32.70 12.55 33.87 7 75.75 8.835 94.80 193.80 137.87 1 3 7 75.74 10.300 115.8																		26%
X 29 77,74 100,80 105,126 22,135 22,135 22,135 22,135 22,135 22,135 22,135 23,135 147,507 12,135 12,135 147,507 12,135 147,507 12,135 147,507 12,135 147,507 12,135 147,507 12,135 147,507 12,135 147,507 12,135 147,507 12,135 147,507 12,135 145,157 145,157 145,1																		9% 34%
A 0 348.80 450.20 595.80 393.80 10% 17 333.40 57.97 372.81 595.80 505.90 470.20 57.97 372.81 595.90 595.90 470.20 57.97 372.81 595.90 595.90 470.20 57.97 372.81 595.90 470.20										7								17%
120 24,245 393,761 395,709 177,870 1114 6 24,962 25,700 33,831 55,503 295,950 384,326 389,040 7 Commodity 34 4 5 4 5		30							10%	7								6%
Commodiy 33 35 36 37 38 38 37 38 38 37 38 38 38 38 47 47 47 47 47 47 47 47 47 47 47 47 47																		7%
No.		33	24,254	393,761	155,509	177,887			114%	6	24,962	25,670	33,831	56,531	295,916	384,326	389,044	79%
All-March 37 8 3 8 4 8 4 8 4 8 4 8 4 8 4 8 4 8 4 8 4 8 4	Commodity	35								1								
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ALM ND-CTP 57 55 54 54 Commodify Cumulative (Commodify Cumulative Commodify Cumulative Co		48								3								
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ALM (n-CTP) 57 (50) 52 (50) 52 (50) 52 (50) 52 (50) <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td>3</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td>										3								
53 0										1								
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ALLMIND-CTP 57 Spit) Counicitive 58 IR Cumicitive 59 S21,112 521,976 437,631 72,945 IR Cumicitive 60 773,411 1,137,887 990,111 137,354 14% 6 810,984 848,557 936,186 985,675 1,100,165 1,136,102 1,136,994 1	СТР	55																
Equity Commutative 5.8 Section	AllulNippiCTP									1								
PX Cumulative 60 773,411 1,137,887 990,111 137,354 14% 6 810,984 948,557 936,186 985,675 1,100,165 1,136,102 1,136,994 Cammedby Lamilative 61 1										3								
Commodity Cumulative 61 1 CS Cumulative 62 3 4		59									344,047		435,788	452,286	456,994	495,983	508,980	2%
CS Cumulative 62 S			773,411	1,137,887	990,111	137,354			14%	6	810,984	848,557	936,186	985,675	1,100,165	1,136,102	1,136,994	8%
										1								
CTP Cumulative 63	CTP Cumulative	63								3								

EU Statistics for VaR

Figure 21: VaR ratio with median (focus on small banks)

VaR: all portfolios (exc. aggregated) (ratio with the median - Small banks in orange)

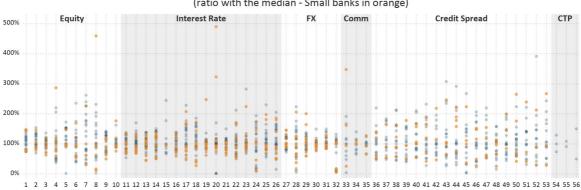




Table 28: VaR statistics (medium-sized banks only)

EU Statistics for VaR

					Other st	ats							Percentiles				
	Port. ID	Min	Max	Ave.	STDev	STDev_trunc ¹	MAD (median absolute deviation)	Coefficient of variation (STDev/Mean)	Num obs.	Sth	10th	25th	50th (Median)	75th	90th	95th	Interquantile range
	1	4,783,699	9,306,031	6,741,109	1,415,812			21%	16	4,813,409	4,980,465	-,,		7,511,205	8,628,170	8,957,522	16%
	2	3,940,627	7,573,480	6,108,209	1,105,349			18%	11	4,483,085	5,025,543		6,419,403	7,026,195	7,187,250	7,380,365	13%
	3 4	11,291	16,518	14,143	1,723			12%	12		12,083		14,261	15,552	16,043	16,260	9%
	4	1,105	3,734	2,233	889			40%	13	1,162	1,208		2,590	2,780	3,211	3,474	36%
Equity	6	1,572,817,976	2,631,068,121 42.632	2,007,105,577	372,438,942 10.719			19% 41%	11	1,606,874,002	1,640,930,027	1,/14,6/2,12/ 17.417	1,990,335,735 26.000	2,218,630,128	2,599,327,809	2,615,197,965	13%
	7	24,529	159,339	87.152	49.636			57%	11	24,612	24,694	42,967	100,022	124,374	139,600	149,470	49%
	8	3,767	256,550	129.081	73.627			57%	13	35,969	59,600			179,734	233,510	247,340	41%
	9	70,059	157,024	117,139	32,005			27%	14	75,586	79,611	86,329		144,238	152,839	155,640	25%
	10	468,567	644,354	536,091	57,563			11%	10	473,893	479,219	491,302	529,874	561,086	615,011	629,683	7%
	11	63,600	128,635	100,175	21,724			22%	19	67,766	70,607	81,069	100,002	119,885	126,008	126,611	19%
	12	39,846	78,115	57,519	10,596			18%	16		42,694			63,890	69,467	72,897	11%
	13	86,840	157,013	121,651	16,430			14%	16		108,150			131,342	139,891	144,846	8%
	14	15,211	35,581	27,326	6,253			23%	20	19,141	19,826	22,395	28,129	32,305	35,327	35,480	18%
	15 16	91,067	189,180	139,413	30,397			22%	4 20	99,933	106,183	112,144	143,152	159,697	179,881	183,576	17%
	10	172,858	542,525	371,976	113,533			31%	20		250,746			477,700	516,325	533,674	22%
	18	172,838	761.908	494,236	162,751			33%	16		319.639	393.092	484.275	590.227	723.140	736.106	22%
Interest Rate	19	134,300	187,931	164,570	17,973			11%	18	137,726	140,065			179,243	184,430	185,474	10%
	20	5,757	8,678	6,879	753			11%	16	5,939	6,071	6,379	6,843	7,268	7,753	8,030	7%
	21	245,509	368,131	311,236	40,332			13%	18	253,916	259,070	272,543	314,143	343,282	361,750	363,120	11%
	22	32,039	94,242	57,172	16,820			29%	18		34,208			65,904	71,181	76,912	24%
	23	103,400	192,025	147,519	24,955			17%	18	111,843	121,446			163,969	180,807	191,639	11%
	24 25	27,036	541,675	275,370	184,591			67% 34%	13	41,363	51,816	68,479 45 599		415,650	497,774	519,785	72%
	25	34,270 283,526	127,115 984,096	58,882 674,009	20,236 215,633			34%	19	37,287 367,168	43,044 431,483	,	56,194 621.382	63,131 879,197	76,418 938.035	85,172 950,689	25%
	20	436,628	793,595	626,330	118.632			3276	10	464,792	483,829			724,253	750.871	765.069	18%
	28	5,500	48,542	28,227	12,664			45%	14	11,841	15,748		28,700	36,186	43,345	45,588	33%
FX	29	75,117	168,998	122,361	25,808			21%	16	91,004	96,637	103,192		140,612	156,823	163,309	15%
~^~	30	327,093	452,964	407,315	38,676			9%	14	346,390	362,601	385,869	403,930	442,239	449,620	451,041	7%
	31	443,590	639,193	531,838	69,860			13%	14		455,527			576,990	635,853	637,270	9%
	32	26,311	494,617	282,942	183,818			65%	15		32,578		384,420	420,459	451,270	470,282	76%
Commodity	33 34	1,253 532,160	54,281 1,142,147	29,745 773.370	20,011 262,261			67% 34%	6	4,352 539,408	7,452 546,656		30,915 678,028	43,959 946.117	50,868 1.063,735	52,574 1,102,941	43% 25%
commonly	35	624,523	991.994	878.213	149.331			17%	5	674.004	723,485			946,117	985.390	988.692	25%
	36	14,394	49,466	29,548	12,618			43%	8	14,839	15,284	17,780		35,554	43,972	46,719	33%
	37	69,318	157,004	116,961	39,820			34%	6	71,283	73,248			152,107	155,900	156,452	30%
	38	6,280	17,636	11,516	4,502			39%	7	6,638	6,996	8,376	10,766	14,590	17,500	17,568	27%
	39	18,701	58,662	40,512	16,722			41%	7	20,352	22,003	26,979		56,125	57,894	58,278	35%
	40	6,177	19,089	11,511	4,300			37%	7	7,015	7,853	9,385		13,335	16,705	17,897	17%
	41	10,071	34,660	21,249	8,626			41%	7	11,257	12,443			25,897	31,981	33,321	22%
	42 43	26,323	79,878	58,112	20,178			35% 43%	6	30,287	34,251			71,379	76,612	78,245	21%
	45	10,942 6,269	44,959 16,458	29,153 11,831	12,627 3,659			43%	, ,	13,785 7,186	16,629 8,103		29,860 11.275	37,847 14,170	44,909 16,426	44,934 16.442	28%
Credit Spread	45	449	21,329	13,642	8,878			65%	6	1,420	2,390	7,753		14,170	20,363	20,846	42%
	46	6,635	31,868	18,760	9,928			53%	7	6,801	6,967	11,442		26,431	29,857	30,862	40%
	47	2,600	10,244	5,657	2,600			46%	6	2,986	3,371	4,323		6,205	8,305	9,274	18%
	48	12,818	42,823	26,492	10,961			41%	7	13,350	13,882	17,634		32,467	37,992	40,408	30%
	49	7,734	32,536	18,975	9,179			48%	9	9,028	10,323			25,161	31,455	31,996	39%
	50	14,337	36,455	24,191	7,291			30%	8	14,987	15,638			27,998	32,557	34,506	16%
	51 52	165,907 209,124	380,961 346,527	257,087 273,332	80,147 50,050			31% 18%	6	172,727 219,404	179,547 229,684	204,456 260,523		300,710 288,817	350,139 323,443	365,550 334,985	19% 5%
	52	209,124 268,921	346,527 718,802	2/3,332 511,325	173,091			18%	5	219,404 300,213	331,505	425,382		288,817 612,651	523,443 676,342	534,985 697,572	18%
	54	200,522	1 10,001					0.110	1	000,010	001,000	120,002	500,001	010,001	010,012	001,012	
СТР	55 56																
ALL-IN no-CTP	57								4								
Equity Cumulative	58	2,156,738	2,868,271	2,498,993	248,940			10%	7	2,178,685	2,200,632			2,633,426	2,768,058	2,818,165	6%
IR Cumulative	59	399,625	732,294	545,414	89,336			16%	14	442,149	467,715		537,373	571,542	670,593	711,903	8%
FX Cumulative	60	867,000	1,285,860	1,053,436	163,182			15%	13	870,674	881,335	921,713	999,846	1,236,518	1,284,412	1,285,514	15%
Commodity Cumulative CS Cumulative	61 62	545,181 35.216	1,137,076	778,669 49.161	250,592 13.978			32%	5	555,588 36.313	565,994 37,410	597,214 39,523	677,150 46,696	936,723 53,566	1,056,935 64.620	1,097,005	22% 15%
CTP Cumulative	63	33,216	70,042	45,101	10,978			28%		30,315	37,410	39,525	40,090	33,300	04,020	70,551	1.576
									_								

Figure 22: VaR ratio with median (focus on medium-sized banks)

VaR: all portfolios (exc. aggregated)

(ratio with the median - Medium banks in orange)

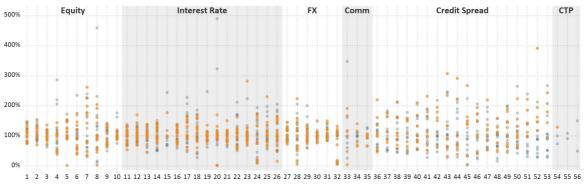




Table 29: VaR statistics (large banks only)

EU Statistics for VaR

					Other st	ats							Percentiles				
	Port. ID	Min	Max	Ave.	STDev		MAD (median absolute deviation)	Coefficient of variation (STDev/Mean)	Num obs.	Sth	10th	25th	50th (Median)	75th	90th	95th	Interquantile range
	1	4,885,258	9,409,963	6,886,203	1,809,590			26%	10	4,948,766	5,012,273	5,099,159	7,040,759	7,995,681	9,233,677	9,321,820	22%
	2	4,778,782	7,869,708	6,028,134	1,180,295			20%	10	4,829,973	4,881,164	5,036,999	5,784,608	7,104,473	7,559,367	7,714,538	17%
	3	12,316	16,920	14,355	1,594			11%	10	12,672	13,028	13,206	13,729	15,570	16,548	16,734	8%
	4	984 1.653.357.909	3,107 1.813.040.859	2,011	771			38%	7	1,118	1,251	1,505	1,945 1.718.196.905	2,515	2,974	3,041	25%
Equity	6	1,653,357,909 12,025	35,363	27,585	56,044,985			3% 29%		14.206	1,669,293,420	26.944	1,/18,196,905 30.251	1,746,339,524 32,484	1,781,667,212 34,924	1,797,354,035 35.143	2% 9%
	7	35,666	158,997	85,510	47,773			56%	9	38,922	42,178	54,359	58,154	113,593	158,774	158,885	35%
	8	69.321	212,264	141.835	42,570			30%	8	85.649	101,976	123.167	139.378	165,419	181,534	196,899	15%
	9	80,111	161,193	117,714	32,434			28%	10	81,587	83,064	85,596	119,208	143,804	157,721	159,457	25%
	10	486,159	872,461	593,772	110,882			19%	10	494,102	502,044	520,716	588,578	616,396	647,161	759,811	8%
	11	67,939	132,060	99,891	24,218			24%	10	68,540	69,141	81,043	100,672	122,126	127,313	129,686	20%
	12	44,696	75,216	57,328	10,421			18%	10	44,837	44,978	49,265	55,840	63,370	70,786	73,001	13%
	13	79,011	143,696	112,736	19,254			17%	9	87,311	95,610	106,588	108,446	120,072	138,010	140,853	6%
	14	13,138	37,435	24,537	8,617			35%	9	13,479	13,820	19,360		31,477	35,401	36,418	24%
	15	19,811	72,877	31,721	20,478			65%	6	20,150		21,255	23,404	28,571	51,271	62,074	15%
	16 17	102,876 246,595	189,389 581,027	141,091 407.021	33,519 118,910			24% 29%	10	105,133 268,791	107,390 290,988	109,634 313,530	138,762 374,713	164,129 504,514	187,257 544,781	188,323 562.904	20% 23%
	18	397,002	765,825	542,433	138,654			25%	, , ,	407,122	417,241	426,014	506,222	652,707	716,865	741,345	23%
Interest Rate	19	138,281	174,150	156,051	16,167			10%	9	138,407	138,533	140,209	162,560	171,786	173,409	173,780	10%
	20	4,561	7,684	6,441	898			14%	10	5,125	5,690	5,950	6,648	6,834	7,444	7,564	7%
	21	251,929	334,246	296,253	33,240			11%	9	256,293	260,656	262,853	306,887	322,981	331,016	332,631	10%
	22	39,373	76,790	54,260	12,575			23%	7	39,926	40,479	46,146	55,430	57,969	66,861	71,825	11%
	23	138,797	173,331	154,376	10,259			7%	10	139,652	140,506	150,885	154,258	158,551	165,228	169,280	2%
	24	89,668	600,230	372,403	160,303			43%	10	158,322	226,977	274,274	346,013	516,968	540,905	570,567	31%
	25	30,813	91,224	57,447	17,690			31%	10	36,581	42,348	45,287	54,197	68,265	76,115	83,669	20%
	26 27	500,658 482,690	975,899	678,258	166,537			25%	8	526,420	552,182	574,755	605,513	753,329	906,869	941,384	13%
	27 28	482,690	718,822 53,642	586,393 36,241	88,676 11,654			15% 32%	8	493,289 21,126	503,889 24,545	524,058 27,563	564,270 36,997	636,350 44,158	711,142 48,266	714,982 50,954	10% 23%
	20	101 827	163 335	131 698	24 797			19%		102 471	24,040	27,505	129.877	152 242	46,200	160 373	16%
FX	30	373,844	479,518	416,045	34,260			8%	8	376,605	379,366	397,621	409,356	431,007	455,668	467,593	4%
	31	459,541	573,314	523,359	38,716			7%	7	467,808		504,588	529,590	545,946	559,886	566,600	4%
	32	23,644	422,155	261,526	188,521			72%	8	29,353	35,062	40,103	379,110	402,873	411,107	416,631	82%
	33	17,319	45,910	29,096	11,057			38%	5	18,172	19,025	21,583	28,325	32,345	40,484	43,197	20%
Commodity	34	645,712	917,568	816,182	108,388			13%	5	673,855	701,997	786,425	834,921	896,285	909,055	913,311	7%
	35 36		10.007		10.001				4	13 500			00.744		10.000	10.040	
	37	16,187 42,450	43,027	29,897 84.587	10,261 37,023			34% 44%	9	17,589 44,461	18,992 46.472	21,666 54,048	30,716 79.669	37,219 100,501	42,900 118,667	42,963 140,424	26% 30%
	38	42,450	17,293	10,941	5.324			49%	3	44,401	40,472	5 889	10,709	15 930	17,276	140,424	46%
	39	14,867	56,310	34,110	14,096			41%	9	15,487	16,106	21,492	34,880	42,851	48,507	52,408	33%
	40	6,244	18,917	11,954	5,079			42%	8	6,385	6,526	8,542	10,403	15,947	18,890	18,904	30%
	41	5,429	36,639	19,840	9,976			50%	9	7,279	9,130	14,684	17,992	23,088	32,923	34,781	22%
	42	24,820	47,030	36,991	7,710			21%	9	26,393	27,966	29,917	39,960	40,861	45,635	46,332	15%
	43	9,102	49,416	29,181	14,120			48%	7	11,740		19,255	30,913	38,165	44,490	46,953	33%
Credit Spread	44	4,854	34,024	16,860	9,746			58%	9	6,260	7,665	10,464	15,815	18,075	31,258	32,641	27%
	45 46	692 3,832	29,201	12,200	8,641			71%	9	2,081	3,470	6,980	11,658	16,525	21,567 21,748	25,384 24,954	41% 18%
	46	3,832	28,159 9,111	15,018 4,776	7,402			49% 50%	8	4,943 2,690	6,054 2,829	12,275 2,930	15,549 3,963	17,515 4,661	21,748 8,556	24,954 8,833	18%
	48	17,381	42,604	27,254	8,837			32%	8	17,497	17.613	2,550	27,219	30,640	38.057	40,330	23%
	49	8,840	25,495	16,467	5,210			32%	7	9,797	10,754	14,384		17,677	21,071	23,283	10%
	50	14,159	30,769	21,673	6,122			28%	9	14,585	15,011	16,760		27,152	28,147	29,458	24%
	51	53,407	242,758	142,476	68,687			48%	9	63,941	74,476	86,448	125,102	171,861	242,236	242,497	33%
	52	51,287	210,030	133,318	51,998			39%	9	60,771	70,254	98,131	156,598	161,591	184,282	197,156	24%
	53	98,238	494,060	260,893	117,460			45%	9	119,366	140,493	154,677	280,322	310,110	351,494	422,777	33%
СТР	54 55 56								2 2 2								
ALL-IN no-CTP	57	1,915,791	3,267,058	2,714,883	525,770			19%	7	2,039,580	2,163,369	2,329,791	2,841,486	3,160,131	3,235,890	3,251,474	15%
Equity Cumulative	58	2,071,678	3,079,003	2,545,973	359,578			14%	9	2,117,407	2,163,136	2,279,339	2,504,512	2,707,149	3,042,020	3,060,511	9%
IR Cumulative	59	435,111	677,810	541,491	82,073			15%	10	446,821	458,531	472,005	539,816	589,603	647,238	662,524	11%
FX Cumulative	60	850,608	1,335,657	1,070,138	202,991			19%	7	863,363	876,117	897,484	1,031,834	1,238,949	1,320,938	1,328,298	16%
Commodity Cumulative CS Cumulative	61 62		77 757					56%	4	19 332		24 479	30 194	49 797	69 233		34%
CS Cumulative CTP Cumulative	62 63	16,567	/1,757	39,222	21,979			56%	8	19,332	22,098	24,479	30,194	49,797	69,233	73,495	34%
CTP Cumulauve	00						1		2								

Figure 23: VaR ratio with median (focus on large banks)

VaR: all portfolios (exc. aggregated)

(ratio with the median - Large banks in orange)

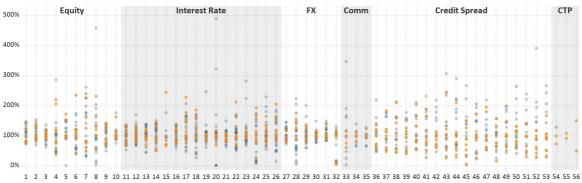




Table 30: VaR statistics (small TB banks only)

				Other sta	ts						Percentiles					Extre	eme Values range (Full S	ample)
	Port. ID					Coefficient of variation No (STDev/Mean)		Sth			50th (Median)				Interquantile range	STDev_trunc ¹		+2*STDev_trunc
	1	4,783,699	8,841,352	6,721,822	1,725,111	26%	6	4,793,602	4,803,506	5,230,248		8,065,372	8,628,170	8,734,761	21%	1,537,866	3,375,325	9,526,789
		3,940,627	6,453,081	5,315,488	924,178	17%	5	4,157,610	4,374,593	5,025,543	5,511,961	5,646,229	6,130,340	6,291,711	6%	1,136,194	3,373,840	7,918,618
							4											
Equity		1,572,817,976	2,196,186,022	1,832,022,999	258,162,268	14%	5	1,586,440,386	1,600,062,796	1,640,930,027	1,759,845,233	1,990,335,735	2,113,845,907	2,155,015,965	10%	439,704,511	885,326,270	2,644,144,314
							3											
		82.057	132.700	109.655	23.856	22%	4	82.813	83.570	85.839	121.181	126.498	130.219	131.460	19%	29.821	53.326	172.611
	10	82,037	132,700	109,033	20,000	2276	3	62,613	83,570	63,635	121,101	120,498	130,215	151,400	15%	29,021	55,520	172,011
		71,674		95,151	17,883	19%	8	74,633	77,593	81,538	96,419 56,354	101,476	112,742	120,689	11%	21,084	53,430	137,768
		39,846 86,840		55,514 123,688	9,095 19,406	16% 16%	9	43,360 96,630	46,874 106,421	54,232 118,727	56,354 123,519	58,512 130,448	63,316 144,035	65,546 150,524	4%	11,479 20,464	34,331 77,820	80,248 159,677
		19,879		27,049	4,616	17%	9	20,475	21,071				31,086	31,935	14%	6,404	12,955	38,571
		91,067	179,503	135,637	30,627	23%	2	96,582	102,098	108,055	142,819	156,063	164,636	172,070	18%	28,990	78,696	194,657
		155,329		266,511	103,198	39%	6	159,711	164,094	181,213	259,904	333,495	375,537	393,230	30%	127,275	72,463	581,565
Interest Rate		189,671		351,481	146,805	42%	6	194,729	199,787	226,241			507,474	525,081	34%	166,661	119,363	786,006
		128,815 6,289		158,289 7,232	19,144 797	12% 11%	8	133,013 6,355	137,210 6,421	143,831 6,722		172,663 7,508	178,242 8,087	181,641 8,383	9% 6%	18,271 1,572	125,594 3,511	198,677 9,799
		245,509		305,066	44,253	15%	8	251,880	258,251	263,909	305,797	345,541	353,615	357,578	13%	38,106	231,466	383,892
		33,993 113,333		56,654 141.098	14,219 24.301	25% 17%	6	37,837	41,681 121,446	50,282 125,936	58,559 137,291	65,216 147,321	69,722 163,886	71,788 177,956	13% 8%	18,783 38,257	20,402 75,313	95,535 228,342
		27,036	468,104	220,072	205,942	94%	5	31,812	36,588	50,915	143,483	410,824	445,192	456,648	78%	166,493	-23,514	642,460
		34,270		61,233	25,417	42% 36%	8	35,443	36,616	43,186			89,105	99,129 681.666	28%	52,303	-49,367	159,844
	26 27	283,526 471,833		472,676 572,204	172,291 105,263	18%	7	290,292	297,057 483,829	331,703 495,650	450,525 549,410	612,507 630,248	670,447 717,073	724,732	30%	234,837 110,521	122,496 380,819	1,051,846 822,903
		16,897	48,542	27,131	11,766	43%	7	17,181	17,465	18,689	20,762	33,170	40,662	44,602	28%	14,001	2,478	58,482
FΧ		75,117 327.093		111,906 402,579	26,205 51.329	23%	6	80,581 338,546	86,045 349,999	97,777 384,358	108,688 401.346	134,475 450.005	140,985 450.058	141,359 450.076	16% 8%	27,858	66,801 322,131	178,234 482.131
		443,590		529,967	86,219	16%	7	448,263	452,937	471,069		582,605	646,217	654,658	11%	84,093	357,648	694,020
	32 33	26,355	459,852	261,430	192,557	74%	6	26,538	26,720	86,705	324,993	400,082	432,577	446,215	64%	179,731	15,429	734,354
Commodity							2											
	35						2											
							1											
							2											
							2											
							2											
Credit Spread							2											
							2											
							2											
							1											
							1											
	52 53																	
СТР	54 55 56																	
ALL-IN no-CTP	57						1											
Equity Cumulative							3											
FX Cumulative		914,180	1,285,860	1,024,510	161,223	16%	5	915,687	917,193	921,713	923,702	1,077,093	1,202,353	1,244,107	8%	171,608	672,624	1,359,056
Commodity Cumulative CS Cumulative							1											
CS Cumulative CTP Cumulative	62 63						2											
							_											



Table 31: VaR statistics (medium TB banks only)

				Other st	ats						Percentiles				[Extreme Values ra	nge (Full Sample)
	Port. ID	Min	Mex	Ave.	STDev	Coefficient of variation / (STDev/Mean)	Num obs.	5th	10th	25th	50th (Median)	75th	90th	95th	Interquantile range	STDev_trunc ¹	-2"STDev_trunc	+2"STDev_trunc
	1	4,885,258	9,306,031	6,601,831	1,541,731	23%	16	4,964,816	5,064,476	5,195,579	6,398,477	7,710,853	8,609,964	9,237,075	19%	1,537,866	3,375,325	9,526,789
		4,440,420	7,869,708	6,140,565	1,241,267	20%	12	4,689,086	4,897,776	4,972,574	6,201,588	7,239,949	7,563,936	7,706,783	19%	1,136,194	3,373,840	7,918,618
		9,896	16,507	14,000	1,901	14%	13	11,194	12,107	13,107	13,989	15,734	16,038	16,232	9%	1,977	9,866	17,773
		1,238 1,647,154,594	3,734 2,631,068,121	2,313 1,911,542,508	771 385,833,518	33% 20%	13	1,334	1,404	1,581	2,394 1,718,196,905	2,739	3,196 2,602,501,840	3,474 2 616 784 981	27%	1,161 439,704,511	268 885,326,270	4,911 2,644,144,314
Equity		1,047,134,334	42,632	28,569	8,545	30%	14	16,868	1,052,757,578	21,517	28,732	35,226	38,125	40,443	24%	10,428	8,266	49,980
		21.125		90.411	56,976	63%	13	23,167	24,562	35,666	113,593	139,600	158,941	159,134	59%	48,504	-26,745	167,269
		15,018	256,550	134,609	69,946	52%	14	18,941	47,253	113,622	125,248	166,550	232,519	246,573	19%	69,581	-13,596	264,728
		56,465	161,193	113,560	38,255	34%	16	66,661	72,206	79,724	112,500	147,171	157,180	158,300	30%	29,821	53,326	172,611
	10	406,432	644,354	550,796	67,502	12%	13	462,618	500,822	519,756	532,174	616,193	620,995	631,018	8%	987,875	-1,439,976	2,511,523
		63,600		96,744	24,641	25%	20	65,572	66,627	69,014	102,939	117,812	125,961	126,406	26%	21,084	53,430	137,768
		39,463		55,524	12,385	22%	18	41,024	42,589	44,774	51,876	63,911	74,206	75,104	18%	11,479	34,331	80,248
		100,098 13,138		118,308 25,867	12,878	11% 25%	16 19	105,970 15,004	107,973 17,377	108,428 22,532	113,123	126,070	133,406	138,014 34,574	8% 17%	20,464	77,820 12,955	159,677 38,571
		15,158	35,311	25,807	6,487	20%	19	15,004	17,577	22,552	24,299	31,612	34,081	04,074	1/76	6,404	12,955	38,571
		80,991	189,180	137,979	34,195	25%	19	98,459	101,126	108,732	137,009	164,786	184,029	187,236	20%	28,990	78,696	194,657
		206,882		403,716	120,158	30%	17	244,103	268,563	307,593	434,548	501,927	538,441	550,225	24%	127,275	72,463	581,565
Interest Rate		127,355		515,099	191,040	37%	17	168,009	289,680	395,606	558,174	652,707	741,266	762,691	25%	166,661	119,363	786,006
Interest Note		134,300		159,638	20,341	13%	18	134,748	136,893	139,163	165,176	179,195	183,499	184,732	13%	18,271	125,594	198,677
		4,561		6,455	940	15%	17	4,933	5,465	6,000	6,156	7,318	7,687	7,716	10%	1,572	3,511	9,799
		251,929		301,515	39,694	13%	18	254,879	257,647	261,428	313,915	330,043	347,497	363,120	12%	38,106	231,466	383,892
		29,217 103.400		55,630 151,739	17,831 21.438	32% 14%	18 18	33,538 124,880	34,818 131.369	39,834 135.719	55,282 151.793	68,981 165.520	73,177 174.190	79,408 178.501	27%	18,783 38,257	20,402 75.313	95,535 228.342
		103,400	541.675	307.143	21,438	14%	18	124,880	47,163	236.884	323.003	448,439	522,665		31%	38,257	-23.514	228,342 642,460
		43,630		59,904	18,939	32%	13	44.285	44,490	50.570	55,544	63,232	71,042	82,338	11%	52,303	-49.367	159.844
		295,313	984,096	691,813	236,342	34%	16	302,533	362,875	564,868	653,383	907,379	957,726	977,948	23%	234,837	122,496	1,061,846
	27	482,690	793,595	653,095	96,464	15%	16	523,269	540,021	580,519	663,927	723,518	763,578	784,146	11%	110,521	380,819	822,903
		3,853	45,962	29,534	13,788	47%	15	5,006	7,914	22,030	35,653	38,263	43,128	44,587	27%	14,001	2,478	58,482
FX		72,741		119,645	28,054	23%	15	83,938	91,762	102,900	115,146	138,458	158,233	163,689	15%	27,858	66,801	178,234
		348,803		404,121	29,924	7%	16	367,584	375,014	385,051	398,783	427,946	446,551	449,783	5%	40,000	322,131	482,131
		446,113 23.644	687,012 494.617	550,052 293,564	72,281 183.682	13% 63%	13 13	466,325 24,010	481,259 27,786	498,273 45,861	550,934 381,336	580,601 417,996	638,601 435,149	658,321 460.886	8% 80%	84,093 179,731	357,648 15,429	694,020 734,354
	33	1,253		31,303	185,682	60%	13	3 388	5,523	23,106	32 909	417,998	433,149 49,502	460,888	33%	24,211	-20,082	76,764
Commodity		532,160		834,963	194,590	23%	7	575,920	619,681	746,555	834,921	921,201	1,024,529	1,083,338	10%	180,851	453,378	1,176,784
	35	607,279	1,187,155	926,830	189,478	20%	6	673,442	739,604	885,731	951,310	987,867	1,089,575	1,138,365	5%	180,005	567,127	1,287,145
		15,665		30,285	9,678	32%	10	15,900	16,135	23,847	31,774	36,298	41,759	42,393	21%	10,779	9,157	52,275
		42,450		104,781	46,208	44%	10	47,669	52,888	71,283	93,399	152,107	157,522	159,851	36%	41,547	5,066	171,255
		5,036		11,765	5,131	44%	8	5,434	5,832	8,502	10,659	17,304	17,478	17,557	34%	4,959	847	20,684
		16,416 6.647	58,662 19.089	39,682 12,364	16,411 4,760	41% 38%	10	18,700 7,460	20,984 8,273	25,592 9.122	38,866 10,519	55,949 16.056	57,510 18,942	58,086 19.016	37% 28%	16,453 4,967	3,917 1,398	69,729 21.267
		5,429		21,081	4,760	53%	°	7,460	9,130	9,122	21 598	30 195	35,056	35,847	28%	9,351	1,598	37,963
		26,323		47.893	18,934	40%	10	27,417	28,510	32,622	43,732	60,868	73,998	76,938	30%	20,492	-124	81,845
		9,102		30,943	14,575	47%	8	12,180	15,257	19,934	30,339	44,897	46,296	47,856	39%	21,500	-9,374	76,626
Credit Spread		4,854		13,921	7,489	54%	9	6,260	7,665	9,326	11,934	16,458	19,645	25,106	28%	9,688	-3,267	35,487
Crean apread		692		13,419	9,622	72%	9	2,081	3,470	4,331	18,017	19,396	21,567	25,384	63%	9,249	-5,459	31,537
		3,832	28,516	16,485	8,772	53%	10	5,260	6,689	8,900	16,385	23,009	28,195	28,355	44%	8,415	-434	33,228
		2,550 14,592		5,306 28,489	2,827 9,519	53% 33%	8	2,683 17,025	2,816 19,458	3,690 20,974	4,402 28,817	5,927 30,162	9,451 42,648	9,847 42,735	23% 18%	5,806 9,125	-6,952 8,807	16,273 45,309
		14,592	42,823	28,489	9,519	35%	9	17,025	19,458	20,974	28,817	30,162	42,648	42,735 31,996	21%	9,125	1,620	45,309 32,766
		12,030		25,234	6,432	25%	10	12,388	16,500	23,042	26,336	25,495	31,444	33,949	21%	10,038	3,305	43,459
		53,407	319,317	186,702	77,861	42%	10	79,922	106,437	135,303	182,524	241,634	252,330		28%	106,157	-40,453	384,175
		51,287	346,527	206,483	85,962	42%	9	93,411	135,536	157,594	209,124	260,523	300,359	323,443	25%	156,631	-135,417	491,106
	53	98,238	718,802	386,403	194,612	50%	9	164,291	230,344	268,921	315,852	494,060	633,881	676,342	30%	214,953	-134,676	725,135
СТР	54 55 56																	
ALL-IN no-CTP	57	1,915,791	3,959,137	2,967,521	742,074	25%	6	2,019,634	2,123,476	2,486,695	3,110,178	3,350,774	3,668,908	3,814,023	15%	587,787	1,721,819	4,072,965
Equity Cumulative		2,186,000	2,707,149	2,464,323	216,809	9%	9	2,203,558	2,221,116	2,240,008	2,495,702	2,698,701	2,702,430	2,704,789	9%	339,874	1,805,851	3,165,348
IR Cumulative		435,788	732,294	554,663	88,924	16%	15	447,337	457,390	473,411	555,425	588,231	678,090	710,334	11%	114,700	290,753	749,552
FX Cumulative		867,000	1,335,657	1,048,363	160,929	15%	12	881,368	893,995	929,122	989,761	1,159,867	1,280,407	1,307,951	11%	171,608	672,624	1,359,056
Commodity Cumulative CS Cumulative		545,181	1,137,076	835,083	207,450	25%	6	578,173	611,166	711,429	857,185	927,569	1,036,900	1,086,988	13%	287,899	208,860	1,360,456
CS Cumulative CTP Cumulative		16,567	77,757	47,407	21,900	46%	10	20,129	23,691	27,256	48,411	63,436	76,214	76,985	40%	19,901	4,734	84,338
CTP Cumulative	63																	



Table 32: VaR statistics (large TB banks only)

				Other st	əts						Percentiles						Extreme Values ra	nge (Full Sample)
	Port. ID					Coefficient of variation (STDev/Mean)	Num obs.				50th (Median)			95th	Interquantile range	STDev_trunc ¹		+2*STDev_trunc
	1	5,026,386	9,409,963	6,599,622	1,655,538	25%	7	5,036,901	5,047,417	5,248,702	6,139,878	7,561,862	8,528,969	8,969,466	18%	1,537,866	3,375,325	9,526,789
	2 3	4,778,782	7,524,885	5,949,009 14,226	1,030,960	17%	7	4,905,928 12,570		5,291,466 13,196	5,616,331 13,469	6,570,067 15,242	7,322,304	7,423,595	11% 7%	1,136,194	3,373,840 9,866	7,918,618
	4	12,316 984	3,107	2,119	1,619	11%	6	12,570		13,196	2,268	2,812	16,011 2,997	3,052	/% 34%	1,977	9,866	4,911
	5		2,241,074,233		225,473,104	12%	5		1,707,251,720				2,069,860,883		2%	439,704,511	885,326,270	2,644,144,314
	6 7	11,473	32,484	21,885	9,301	42%	7	11,639		12,509	26,944	28,640	31,144	31,814	39%	10,428	8,266	49,980
	7 8	32,506 3,767	88,344 168,364	58,263 114,501	19,897 65,279	34% 57%	5	36,877 20,156	41,247 36,544	54,359 84,331	57,952 140,559	58,154 161,267	76,268 166,401	82,306 167,382	3% 31%	48,504 69,581	-26,745 -13,596	167,269 264,728
	9	83,392	148,043	114,159	28,522	25%	7	83,479		90,625	104,757	140,836	147,280	147,661	22%	29,821	53,326	172,611
	10	480,402	872,461	577,108	138,423	24%	7	482,129		493,071	523,597	588,578	715,767	794,114	9%	987,875	-1,439,976	2,511,523
	11 12	67,939	132,060	96,514	25,084	26%	9	69,244	70,549	75,543	95,468	124,869	126,497	129,278	25%	21,084	53,430	137,768
	12 13	47,250 79,011	78,115	61,717 117,401	9,485 23,902	15% 20%	8	49,817 85,236	52,384 91,460	56,467 103,174	61,261 117,175	65,481 137,790	72,640 140,873	75,378 142,285	7% 14%	11,479 20,464	34,331 77,820	80,248 159,677
	14	13,991	37,435	27,447	9,362	34%	8	15,866		19,357	29,193	35,502	36,137	36,786	29%	6,404	12,955	38,571
	15						4											
	16 17	102,876 246,595	189,389 553,767	135,797 362.160	29,309 109,744	22% 30%	9	104,882 263.612		113,324 296,898	127,328 312,508	150,982 407.163	168,594 519,290	178,991 536.528	14% 16%	28,990 127.275	78,696 72,463	194,657 581,565
	18	389,677	704,625	460,761	105,744	23%	8	391,271		396,309	413,167	407,103	565,743	635,184	9%	166,661	119,363	786,006
	19	133,079	173,816	156,463	15,865	10%	9	135,160	137,241	140,209	160,380	171,786	173,342	173,579	10%	18,271	125,594	198,677
	20	5,606	7,249	6,570	523	8%	9	5,729		6,409	6,720	6,835	7,045	7,147	3%	1,572	3,511	9,799
	21 22	246,844 32,039	334,246 61,958	294,532 49,817	30,071 12,251	10% 25%	9	253,242 33,502		272,500 41,188	306,887 53,386	318,179 59,105	324,316 61,100	329,281 61,529	8% 18%	38,106 18,783	231,466 20,402	383,892 95,535
	23	113,730	158,943	147,415	16,348	11%	7	121,250		144,848	155,812	156,861	158,002	158,472	4%	38,257	75,313	228,342
	24	68,479	600,230	307,360	203,897	66%	7	74,836		160,435	270,822	445,559	557,421	578,825	47%	166,493	-23,514	642,460
	25 26	30,813 467,917	91,224 877,284	53,773 625,449	18,478 149.933	34% 24%	8	33,521 479,376	36,228 490,836	43,776 530.431	51,796 578,714	58,220 679.900	72,375 844,274	81,800 860,779	14% 12%	52,303 234.837	-49,367 122,496	159,844 1.061.846
	20	436,628	757,938	572,240	149,955	19%	8	479,378	490,858	511,153	527,064	623,514	730,557	744,247	12%	110,521	380,819	822,903
	28	15,256	53,642	32,925	13,572	41%	6	18,311		27,504	28,811	40,175	48,599	51,121	19%	14,001	2,478	58,482
	29	104,193	163,335	135,714	20,670	15%	7	108,453		124,135	132,377	150,911	155,947	159,641	10%	27,858	66,801	178,234
	30 31	356,780 443.967	479,518 544,838	418,116 499,277	44,704 44.615	11%	6	363,018 446,967		388,649 456 754	422,608 522,079	443,040 535 274	462,483 542,509	471,000	7%	40,000	322,131 357,648	482,131 694,020
	32	26,311		221,428	190,429	86%	8	31,087		40,103	223,306	395,748	408,072	415,497	82%	179,731	15,429	734,354
Commodity	33 34						3											
Commodity	35						3											
	36 37	14,394 47,477	42,868 100,501	24,545 83.047	10,455 21.655	43% 26%	7	15,621 53,915	16,849 60.354	18,582 79,669	19,693 88,161	28,847 99,429	38,374 100.072	40,621 100,287	22% 11%	10,779 41,547	9,157 5.066	52,275 171,255
	38	4,859	17,293	10,871	4,518	42%	7	5,285		7,913	10,766	13,676	16,207	16,750	27%	4,959	847	20,684
	39	14,867	46,556	32,293	12,648	39%	6	15,826	16,784	22,740	36,811	39,701	43,285	44,920	27%	16,453	3,917	69,729
	40 41	6,177 14.025	18,917	11,252	4,574	41% 36%	7	6,197		8,022 15,364	11,322	13,151	16,549	17,733	2.4% 2.8%	4,967	1,398	21,267
	42	24,820	31,994 61,464	21,459 40,532	7,637	33%	5	14,223 26,967		35,555	39,960	27,103 40,861	31,741 53,223	31,868 57,343	28%	9,351 20,492	561 -124	37,963 81,845
	43	20,420	41,206	29,972	8,737	29%	5	20,775		22,197	30,913	35,123	38,773	39,989	23%	21,500	-9,374	76,626
	44	11,147	34,024	17,165	8,696	51%	6	11,179		11,620	14,235	17,510	26,050	30,037	20%	9,688	-3,267	35,487
	45 46	449 6.635	16,525 24,914	9,911 15.933	5,923 6,494	60% 41%	5	2,192 8.373		9,163 15.323	11,658 15,774	11,760 17.020	14,619 21,756	15,572 23.335	12% 5%	9,249 8.415	-5,459 -434	31,537 33,228
	47	2,600	8,417	5,046	2,181	41%	7	2,690		3,431	4,511	6,466	7,692	8,055	31%	5,806	-6,952	16,273
	48	12,818	36,108	23,843	9,152	38%	6	13,959	15,100	17,464	22,997	30,136	33,431	34,770	27%	9,125	8,807	45,309
	49 50	7,734	18,121	12,589	3,981	32%	7	8,066	8,398	9,905	11,053	15,704	17,337	17,729	23%	7,787	1,620	32,766
	50 51	9,843 79,743	30,769 380,961	18,261 191,558	6,214 125,009	34% 65%	8	11,416 81,084		15,002 86,448	17,377 168,534	19,946 242,106	24,528 325,419	27,648 353,190	14% 47%	10,038 106,157	3,305 -40,453	43,459 384,175
	52	74,996	261,669	141,635	74,214	52%	5	79,623	84,250	98,131	111,788	161,591	221,638	241,653	24%	156,631	-135,417	491,106
	53	151,057	530,867	285,407	154,941	54%	5	151,781	152,505	154,677	280,322	310,110	442,564	486,716	33%	214,953	-134,676	725,135
	54 55 56						3											
ALL-IN no-CTP	57						4											
	58	2,071,678	3,079,003	2,593,461	449,330	17%	5	2,113,210	2,154,742	2,279,339	2,504,512	3,032,774	3,060,511	3,069,757	14%	339,874	1,805,851	3,165,348
IR Cumulative EX Cumulative	59 60	435,111	677,810	524,662	75,719	14%	9	445,520	455,929	473,939	521,976	555,870	610,702	644,256	8%	114,700	290,753	749,552
FX Cumulative Commodity Cumulative	60 61	850,608	1,311,126	1,093,183	183,118	17%	7	857,363	864,118	952,479	1,137,887	1,223,850	1,293,007	1,302,067	12%	171,608	672,624	1,359,056
CS Cumulative	62						4											
CTP Cumulative	63						2											



Table 33: VaR statistics (same business model – cross-border universal bank)

	1				Other st	ats							Percentiles				
	Port. ID	Min	Max	Ave.	STDev		MAD (median absolute deviation)	Coefficient of variation (STDev/Mean)	Num obs.	Sth	10th	25th	50th (Median)	75th	90th	95th	Interquantile range
	1	4,783,699	9,409,963	6,663,884	1,560,475			23%	19	4,875,102	4,998,160	5,201,309	6,451,057	7,707,279	9,232,478	9,316,424	19%
	2	3,940,627	7,573,480	5,979,319	1,080,100			18%	15	4,527,336	4,859,988	5,291,466	5,952,884	6,672,442	7,506,147	7,539,464	12%
	3	12,059	16,920	14,386	1,698			12%	17	12,252	12,310	13,198	13,819	16,049	16,511	16,598	10%
	4	984	3,300	2,196	767			35%	15	1,135	1,215	1,490	2,148		3,019	3,165	31%
Equity	6	1,572,817,976 11,473	2,631,068,121 49.274	1,963,362,014 28.674	381,599,278 10.572			19% 37%	14 17	1,645,885,096 11.915	1,686,377,756 15,297	1,710,056,655	1,755,069,399 29.123	2,151,447,502 35.273	2,598,416,368 40.611	2,610,436,918 43.960	11% 28%
	7	24,529	159,339	83.358	49.281			59%	17	24,661	29,381	53,427	58,154	124.732	158,830	159.065	40%
	8	3,767	241,200	130.887	57.926			44%	15	49,655	71,861	110.613	124,929	166,401	193,542	214,284	20%
	9	70,059	161,193	116,727	30,777			26%	20	78,137	79,956	85.300	126,937	143.522	155,108	157,232	25%
	10	468,567	947,372	604,086	136,173			23%	15	480,881	491,689	521,677	565,852	619,296	781,218	894,934	9%
	11	63,600	132,060	100,613	21,603			21%	24	67,983	69,121	82,026	99,970	124,241	126,244	126,725	20%
	12	39,846	78,115	57,734	11,128			19%	23	41,579	44,209	48,834	57,095	63,900	73,295	75,077	13%
	13	79,011	157,013	117,557	17,818			15%	21	86,840	99,760	108,372	117,175	127,611	136,589	143,696	8%
	14	13,138	37,435	25,988	7,253			28%	24	14,174	16,452	20,997	24,182	31,807	34,772	35,248	20%
	15	19,811	72,877	33,615	16,784			50%	10	20,421	21,031	22,462	28,860		54,848	63,863	20%
	16	80,991	189,389	138,079	33,266			24%	25	92,934	101,390	108,621	137,009	159,782	185,524	188,748	19%
	17 18	155,329 178,173	581,027	378,920 513,467	127,693 187,924			34% 37%	21	172,858	246,595 225 314	302,086	340,149 501,256	501,927 691.646	535,719 758,468	542,525 765.629	25% 26%
	18 19	178,173 134,300	187,931	513,467 163,374	187,924 18,194			37%	22	190,683	225,314 138,331	402,529 142,295	501,256 164,790	691,646 180,548	758,468 184,168	765,629 185,040	26%
	20	5,757	7,814	6,732	609			9%	22	5,918	6,002	6,208	6,744	7,132	7,657	7,691	7%
	21	251,929	368.131	308,866	36,930			12%	21	255,400	260,643	272,500	310,107	334,246	361,541	362,236	10%
	22	32,039	94,242	56,305	15,335			27%	21	33,993	34,300	49,369	55,430		71,628	73,854	13%
	23	103,400	204,079	149,842	22,392			15%	25	115,921	127,232	135,311	150,898	162,709	170,357	187,923	9%
	24	27,036	600,230	293,249	186,370			64%	20	32,557	49,108	130,029	277,726	454,742	529,424	537,609	56%
	25	30,813	127,115	62,298	22,657			36%	25	43,784	44,452	45,679	56,032	65,314	96,470	107,317	18%
	26	283,526	984,096	657,374	223,049			34%	20	303,868	310,023	531,766	612,289	874,101	940,454	976,309	24%
	27	471,833	780,996	621,893	103,398			17%	19	481,604	496,116	520,363	612,517	720,740	728,634	749,643	16%
	28	3,853	53,642	31,510	13,865			44%	19	5,335	15,266	23,616	35,409	42,689	46,478	49,052	29%
FX	29	75,117	163,335	124,147	23,047			19%	19	94,182	96,838	112,895	120,352	137,055	154,069	161,605	10%
	30 31	327,093 443.590	479,518 687.012	410,796 545.372	40,384 70.862			10%	20 19	347,718 452.928	355,982 458.426	388,233 497.004	407,913 530.247	449,043 576,958	451,043 643.974	454,292 665.490	7% 7%
	32	23,644	494,617	232,845	186,895			80%	20	452,928 26,178	458,426 26,351	497,004 40,103	303,633		420,036	441,209	82%
	33	1,253	54,281	28,937	15,776			55%	11	7,452	13.650	19,451	28.325	39.691	47,454	50,868	34%
Commodity	34	532,160	1.142.147	794,776	190,525			24%	10	548,468	564,775	653,791	810,673		965,720	1.053.934	17%
	35	624,523	1,187,155	938,650	157,830			17%	10	730,322	836,121	866,140	932,550	987,867	1,150,539	1,168,847	7%
	36	15,665	49,466	32,491	10,358			32%	13	18,082	20,088	22,316	33,533	41,618	42,995	45,603	30%
	37	42,450	162,181	99,285	40,303			41%	13	45,466	51,845	77,178	88,161	144,039	153,137	157,750	30%
	38	4,859	17,636	12,160	4,689			39%	13	4,965	5,524	9,278	11,868		17,387	17,500	30%
	39	14,867	65,631	39,675	16,151			41%	13	15,796	17,974	29,752	38,766	54,867	58,192	61,450	30%
	40	6,244	19,089	13,188	4,616			35%	13	6,486	7,112	9,871	12,043	17,822	18,909	18,986	29%
	41 42	5,429 24,820	36,639 79,878	21,582 44,517	9,892 16,651			46% 37%	13	8,214 25,647	10,684 26,682	14,684 34,146	21,598 40,799		35,301 65,079	36,332 71,960	35% 19%
	43	24,820	49,416	44,517	10,051			39%	12	25,647	12,068	27,944	40,799 32,270	36,876	44,509	46,919	19%
	44	4,854	34,024	16.105	8,604			53%	12	5,774	7,186	11,429	14,235		29,038	40,919	22%
	45	692	29,201	14,584	7,485			51%	13	2,875	5,297	11,658	14,514	19,396	20,995	24,478	25%
	46	3,832	31,868	17,518	8,212			47%	13	5,846	7,370	15,323	17,020	24,345	27,399	29,643	23%
	47	2,550	10,244	5,026	2,319			46%	12	2,742	2,902	3,690	4,327	5,700	8,212	9,239	21%
	48	14,592	42,604	26,483	8,427			32%	13	16,265	17,447	18,274	27,959	30,162	35,841	38,706	25%
	49	8,840	32,536	20,525	7,627			37%	12	10,057	11,240	15,840	20,095		30,616	31,793	23%
	50	15,224	41,167	24,701	7,016			28%	13	16,146	17,120	19,310	24,063	27,152	30,863	34,999	17%
	51	53,407	380,961	191,863	99,297			52%	12	67,892	80,414	115,439	180,861	243,290	311,874	347,057	36%
	52 53	51,287 98,238	378,051 718,802	195,717 360.453	106,210 195,825			54% 54%	12	64,327 127,288	77,310 151,419	108,374 240,360	185,358 295,230	268,456 503,262	340,756 604,473	360,713 660,419	42% 35%
	53 54	98,238	718,802	360,453	195,825			54%	12	127,288	151,419	240,360	295,230	503,262	604,473	660,419	35%
	55 56								2								
ALL-IN no-CTP	57	1,915,791	3,959,137	2,849,481	603,677			21%	10	2,101,475	2,287,158	2,365,014	2,897,392	3,187,621	3,436,725	3,697,931	15%
	58	2,071,678	3,079,003	2,554,261	325,500			13%	13	2,122,714	2,171,369	2,279,339	2,565,601	2,701,250	2,999,873	3,051,266	8%
	59	321,112	732,294	543,333	99,760			18%	19	423,711	455,929	475,271	552,496	584,805	682,433	704,060	10%
	60	850,608	1,335,657	1,055,369	167,306			16%	19	865,361	871,899	917,947	999,846	1,201,645	1,290,913	1,313,579	13%
	61	545,181	1,137,076	793,832	193,153			24%	9	565,994	586,807	651,805	784,658	914,575	976,794	1,056,935	17%
CS Cumulative	62	16,567	77,757	47,696	18,338			38%	13	21,308	26,618	35,786	46,696	57,005	73,950	76,728	23%
CTP Cumulative	63								2								



Table 34: VaR statistics (low L3 A&L banks only)

				Other sta	its					Percentiles						Extreme Values ra	nge (Full Sample)
	Port. ID	Min	Max	Ave.	STDev	Coefficient of variation Num obs. (STDev/Mean)	Sth	10th	25th	50th (Median)	75th	90th	95th	Interquantile range	STDev_trunc ¹	-2"STDev_trunc	+2*STDev_trunc
	1	4,991,335	8,414,987	6,157,600	1,347,360	22% 7	5,037,536	5,083,737	5,223,238	5,435,966	6,907,219	7,941,635	8,178,311	14%	1,537,866	3,375,325	9,526,789
	2	4,440,420		5,565,996	1,022,163	18% 6	4,566,541	4,692,661	4,971,259	5,215,331	6,159,635	6,789,995	6,975,290	11%	1,136,194	3,373,840	7,918,618
	3 4	9,896 1,200	15,993 3,734	13,680	2,340 853	17% 5	10,550	11,203	13,164 2.074	14,644 2,567	14,703 2,770	15,477 3,257	15,735 3,496	6% 14%	1,977	9,866 268	17,773 4,911
	5		2,017,231,942		855 146,418,706	8% 5		1,564						14%	439,704,511	885,326,270	4,911 2,644,144,314
Equity	6	11,473		22,478	9,030	40% 6	12,538	13,604	16,201	21,926	27,818	31,904	33,686	26%	10,428	8,266	49,980
	7					4											
	8	3,767		90,067	97,618	108% 6	6,580	9,393	16,527	69,119	124,420	191,691	224,120	77%	69,581	-13,596	264,728
	9 10	56,465 406.432		88,891 498,951	29,535 47.895	33% 6 10% 6	60,937 429,820	65,409 453,208	75,405 500.006	81,155 510.174	94,114 525.748	120,111 533.473	131,382 536,422	11% 3%	29,821 987.875	53,326 -1.439.976	172,611 2,511,523
	10	65,676		82,939	18,646	22% 8	66,046	66,416	70,084	72,371	101,484	106,920	108,075	18%	21,084	53,430	137,768
	12	39,463		55,105	15,122	27% 8	39,597	39,731	42,317	53,167	62,912	75,993	77,054	20%	11,479	34,331	80,248
	13	86,840		121,551	19,429	16% 9	92,143	97,446	117,175	123,519	132,787	142,629	146,306	6%	20,464	77,820	159,677
	14	17,919	33,978	25,912	5,786	22% 9	18,491	19,062	22,664	24,822	30,513	33,023	33,500	15%	6,404	12,955	38,571
	15 16	91,067	158,265	119,555	23,426	20% 8	94,651	98,236	105,527	113,321	128,929	152,818	155,542	10%	28,990	78,696	194,657
	10	172.858		285,449	23,420 83,789	20% 8	183.065	98,230	242.774	295.214	304,988	361.811	398.179	10%	127,275	78,090	581.565
Interest Pata	18	127,355		366,419	160,204	44% 7	146,050		286,318	389,677	445,948	531,121	557,244	22%	166,661	119,363	786,006
Interest Rate	19	128,815	175,328	154,872	18,731	12% 8	130,919	133,023	137,040	160,197	168,805	175,193	175,260	10%	18,271	125,594	198,677
	20	6,156		7,137	855	12% 7	6,232	6,308	6,588	6,935	7,506	8,087	8,383	7%	1,572	3,511	9,799
	21 22	258,610 29,217		297,089 45,220	35,914 15,737	12% 8 35% 8	259,430	260,250 31,192	263,022 33,505	294,551 38,691	325,814 57,317	335,746 65,860	342,982 67,916	11% 26%	38,106 18,783	231,466 20,402	383,892 95,535
	23	113,333		154,213	27,520	18% 7	119,621		135,618	156,348	173,274	182,526	187,276	12%	38,257	75,313	228,342
	24	41,659	541,675	242,238	187,462	77% 6	43,973	46,287	95,987	240,991	315,593	439,436	490,556	53%	166,493	-23,514	642,460
	25	45,040		56,059	12,444	22% 7	45,183	45,327	47,746	53,595	58,889	70,205	75,359	10%	52,303	-49,367	159,844
	26	283,526		515,856	223,020	43% 7	287,062	290,598	358,062	536,680	567,555	732,674	836,113	23%	234,837	122,496	1,061,846
	27 28	471,833 11,534		610,871 26,051	117,432 11,525	19% 8	483,682	495,532 14,058	533,857 17,844	568,316 26,352	710,786 36,341	750,752 37,447	772,173 37,816	14%	110,521 14,001	380,819 2,478	822,903 58,482
-	29	72,741		108,174	34,343	32% 7	73,454	74,167	81,927	104,102	123,762	147,025	158,012	20%	27,858	66,801	178,234
FX	30	327,093		380,327	35,698	9% 7	335,999	344,905	366,482	381,128	388,363	411,971	428,175	3%	40,000	322,131	482,131
	31	443,590		497,731	66,786	13% 7	444,347	445,104	450,040	498,273	502,972	557,777	597,006	6%	84,093	357,648	694,020
	32 33	24,254	459,852	235,835	204,782	87% 5	24,665	25,077	26,311	265,566	403,192	437,188	448,520	88%	179,731	15,429	734,354
Commodity	34					1											
	35					1											
	36					1											
	37 38					2						_					
	38 39																
	40																
	41					1											
	42					2											
	43 44					2											
Credit Spread	45																
	46					1											
	47																
	48					1											
	49 50					2											
	51																
	52																
	53					1											
СТР	54 55																
CIP	55 56																
ALL-IN no-CTP	57																
Equity Cumulative	58																
IR Cumulative	59	435,788		486,577	65,360	13% 5	439,088	442,387	452,286	465,047	479,942	551,871	575,848	3%	114,700	290,753	749,552
FX Cumulative Commodity Cumulative	60 61	873,124	1,035,236	946,878	61,455	6% 5	881,335	889,546	914,180	938,215	973,637	1,010,596	1,022,916	3%	171,608	672,624	1,359,056
CS Cumulative	62					1											
CTP Cumulative	63																
	_																



Table 35: VaR statistics (medium L3 A&L banks only)

]			Other sta	ts					Percentiles						Extreme Values ra	inge (Full Sample)
	Port. ID	Min	Max	Ave.	STDev	Coefficient of variation Num of (STDev/Mean)	ıs. Sth	10th	25th	50th (Median)	75th	90th	95th	Interquantile range	STDev_trunc ¹	-2"STDev_trunc	+2"STDev_trunc
	1	4,783,699	9,306,031	6,725,038	1,601,756		14 4,849,712		5,156,294	6,529,820	7,959,318	8,851,614	9,246,269	21%	1,537,866	3,375,325	9,526,789
	2	3,940,627	7,869,708	6,228,768	1,279,085		12 4,464,179		5,147,400	6,218,427	7,489,751	7,568,621	7,706,783	19%	1,136,194	3,373,840	7,918,618
	3	12,059	16,920	14,469	1,618		12 12,635		13,221	13,904	15,927	16,517	16,699	9%	1,977	9,866	17,773
	4	1,238 1,572,817,976	3,107 2,599,327,809	2,125	669 329,566,444	31% 18%	11 1,318	1,398 1,637,249,922	1,505	2,144	2,749	2,886	2,997	29% 4%	1,161 439,704,511	268 885,326,270	4,911 2,644,144,314
Equity	6	1,5/2,817,976	42,632	30,957	6,953		12 18.877	20,714	28.578	32,180	35.232	35,354	2,458,071,094 38,634	476	439,704,511	885,526,270 8,266	2,044,144,514 49,980
	7	24,529	158,997	84,133	45,964		13 31,211	37,294	53,427	58,154	117,835	151,921	158,830	38%	48,504	-26,745	167,269
	8	75.670	212.264	140.828	40,168		12 93.664		115.188	126.283	165,419	199,310	207.030	18%	69,581	-13,596	264,728
	9	70,059	161,193	121,229	31,997	26%	15 77,095	81,423	88,591	132,700	145,684	157,211	158,492	24%	29,821	53,326	172,611
	10	468,567	872,461	594,587	106,740	18%	11 486,188	503,809	525,965	611,304	616,329	622,128	747,295	8%	987,875	-1,439,976	2,511,523
	11	68,229	126,785	101,246	21,060	21%	18 69,118	73,663	82,014	102,912	122,587	125,714	126,045	20%	21,084	53,430	137,768
	12	44,087	75,216	55,645	9,258		16 44,544	44,853	47,965	54,563	61,235	67,087	71,525	12%	11,479	34,331	80,248
	13	99,760	157,013	120,354	16,805		13 104,660		108,372		130,448	142,275	149,023	9%	20,464	77,820	159,677
	14	13,138	37,435	26,959	7,294		16 14,693		22,655	26,734	32,331	35,393	35,965	18%	6,404	12,955	38,571
	15 16	19,811 106.825	72,877 189,180	35,351 143,301	18,559 29.111	52% 20%	8 20,286 18 107,731	20,760 108.402	21,431 113.204	29,748 143.603	39,533 163.844	58,855 184,403	65,866 187,344	30% 18%	57,490 28,990	-85,232 78,696	144,727 194,657
	10	105,825	189,180 581,027	143,301 409,412	29,111 126,887		18 107,731 17 228,342		113,204 313,530	143,603 410,924	163,844 530,723	184,403 547,022	187,344	18%	28,990 127,275	78,696	194,657
	18	209.902	765,825	527,504	159.096		17 228,342	383.808	419,108	506.222	652,707	741,266	762.691	20%	166,661	119,363	786,006
Interest Rate	19	133,079	187,931	161,896	18,290		16 137,018		141,937	163,806	173,900	184,604	185,763	10%	18,271	125,594	198,677
	20	4,561	7,691	6,518	855		17 5,397	5,697	5,914	6,575	7,249	7,524	7,685	10%	1,572	3,511	9,799
	21	246,844	343,982	303,424	33,568		16 250,658	256,286	268,508	313,528	330,416	337,713	341,881	10%	38,106	231,466	383,892
	22	37,618	94,242	57,876	15,869		16 37,824		47,331	55,563	67,016	75,322	81,153	17%	18,783	20,402	95,535
	23	113,730	191,571	152,252	18,190		17 123,764		145,819	151,827	164,328	168,871	176,979	6%	38,257	75,313	228,342
	24 25	55,419	600,230	335,701	158,676		13 108,257	161,093	242,233	323,003	481,228	528,489	560,680	33%	166,493	-23,514	642,460
	25 26	38,549 310,588	109,154 984,096	59,636 689,015	16,228 205,016		18 42,868 16 428,585	44,259 484,288	48,761 557,198	56,419 638,917	65,060 882,380	74,724 956,208	80,459 977,948	14% 23%	52,303 234,837	-49,367 122,496	159,844 1,061,846
	20	436,628	723,273	595,638	104,018		16 428,585		516.324	574.656	707.603	721,507	722,873	25%	110,521	380,819	822,903
	28	17,708	53,642	36,519	9,689		14 23,403	26,772	30,255	35,686	43,123	47,768	50,327	18%	14,001	2,478	58,482
-	29	96,973	161,413	130,153	22,952		12 99,643		113,882	127,280	151,324	153,340	157,041	14%	27,858	66,801	178,234
FX	30	373,844	479,518	419,598	30,795	7%	13 378,577	384,315	401,346	409,313	445,447	450,076	461,864	5%	40,000	322,131	482,131
	31	443,967	663,099	552,792	69,821		12 452,533	462,297	518,967	545,946	594,192	638,770	649,951	7%	84,093	357,648	694,020
	32	23,644	438,398	234,332	190,024		15 25,542	26,647	40,054	376,883	405,837	420,491	427,028	82%	179,731	15,429	734,354
Commodity	33 34	1,253 568,399	54,281 1.142.147	28,045 828,647	15,791 188.408	56% 23%	9 6,212 8 595,459		21,583 669.949	28,325 865.603	32,345 924,705	47,584 1.004.926	50,933 1.073.537	20% 16%	24,211 180.851	-20,082 453.378	76,764 1.176,784
commoaity	34	568,399 624,523	1,142,147 1,187,155	828,647 921,012	188,408	23%	8 595,459 8 706,811	622,518 789,099	669,949 863.066	865,603 932,550	924,705	1,004,926	1,073,537 1,118,849	16%	180,851 180,005	453,378 567,127	1,176,784 1,287,145
	36	14.394	49,466	28,540	11,604		14 15.220		18,932	26,516	36,759	42.604	45.281	32%	10,779	9.157	52.275
	37	42,450	162,181	88,377	38,218		11 44,964	47,477	61,683	79.009	104,145	144,039	153,110	26%	41,547	5,066	171,255
	38	4,859	17,636	10,525	4,665		14 4,974		6,579	9,515	14,579	17,368	17,489	38%	4,959	847	20,684
	39	14,867	58,662	33,622	15,206	45%	12 15,719	16,645	20,794	32,316	43,777	55,335	57,368	36%	16,453	3,917	69,729
	40	6,177	19,089	11,380	4,255		14 6,221	6,365	9,021	10,597	14,238	17,750	18,953	22%	4,967	1,398	21,267
	41	5,429	36,639	20,046	9,170		15 8,667	10,061	13,911	18,930	26,642	31,826	33,388	31%	9,351	561	37,963
	42 43	24,820	79,878	40,122	15,293		11 25,572		29,335	40,736 30,913	43,732	47,030	63,454	20% 33%	20,492	-124 -9,374	81,845
	43	9,102 4,854	49,416 34,024	31,035 15,571	13,304 9,065	43% 58%	9 12,619 11 6,611		20,614 9,895	30,913 12,655	41,205	45,784 30,567	47,600 32,296	33%	21,500 9,688	-9,374 -3,267	76,626 35,487
Credit Spread	45	4,634	29.201	12,931	8,389		12 2,602		6.318	12,035	18,662	21.162	24.871	49%	9,088	-5,459	31,537
	46	3,832	31,868	16,687	8,783		13 5,736		8,095	15,774	24,345	27,510	29,643	50%	8,415	-434	33,228
	47	2,550	10,244	5,394	2,481	46%	14 2,583	2,699	3,948	4,586	6,998	8,903	9,508	28%	5,806	-6,952	16,273
	48	14,592	42,604	26,032	8,586		13 16,265		18,274	26,157	30,754	35,841	38,706	25%	9,125	8,807	45,309
	49	7,734	32,536	18,177	7,764		13 8,398	9,478	12,919	16,814	22,068	30,047	31,725	26%	7,787	1,620	32,766
	50 51	9,843	41,167	22,493	8,293		14 12,648		15,608	23,382	27,123	29,786	34,408	27%	10,038	3,305	43,459
	51 52	53,407 51,287	244,887 288.817	149,469 153,621	63,944 71,984		11 66,575 10 61,956	79,743 72,625	99,389 101,545	165,907 157,096	182,524 201,304	242,758 217,909	243,823 253,363	29% 33%	106,157 156.631	-40,453 -135,417	384,175 491,106
	53	98,238	718.802	313,730	177.213		10 81,958		209.024	280,322	370.617	494.050	255,565	28%	214.953	-134.676	725 135
	54	50,200	. 20,004	0.40,1.30	a		2		200,024	200,044	0.0,017		000,704	20/0	22.1,833	204,070	
СТР	55 56						2										
ALL-IN no-CTP	57	1,915,791	3,378,679	2,744,175	507,161	18%	9 2,080,843		2,331,161	2,841,486		3,289,382	3,334,031	16%	587,787	1,721,819	4,072,965
Equity Cumulative	58	2,156,738	3,079,003	2,524,133	307,667		11 2,171,369	2,186,000	2,254,617	2,504,512	2,704,200	2,868,271	2,973,637	9%	339,874	1,805,851	3,165,348
IR Cumulative	59	321,112	732,294	541,492	96,634		17 412,311	456,404	499,087	523,761	576,638	666,674	707,197	7%	114,700	290,753	749,552
FX Cumulative	60 51	850,608	1,335,657	1,073,114	174,593		13 876,117	894,867	921,713	1,031,834	1,236,518	1,285,745	1,305,779	15%	171,608	672,624	1,359,056
Commodity Cumulative CS Cumulative	61 62	597,214	1,137,076	830,664	194,532	23% 41%	7 613,591 12 20.921	629,969	664,478 32,563	900,106	925,649	1,016,864	1,076,970	16%	287,899	208,860 4,734	1,360,456
CS Cumulative	62 63	16,567	77,757	42,988	17,769	41%	12 20,921	24,495	32,563	41,705	50,820	64,723	71,060	22%	19,901	4,734	84,338
CIP Cumulative	63						4										



Table 36: VaR statistics (high L3 A&L banks only)

				Other st	ats					Percentiles						Extreme Values ra	nge (Full Sample)
	Port. ID					Coefficient of variation Num obs. (STDev/Mean)	Sth			50th (Median)				Interquantile range	STDev_trund		+2*STDev_trunc
	1	4,823,312	9,409,963	6,799,583	1,684,569	25% 6	4,882,843	4,942,375	5,550,209	7,099,305	7,273,652	8,357,069	8,883,516	13%	1,537,866	3,375,325	9,526,789
		4,778,782	7,187,250	5,623,973 14,437	939,269 1,519	17%	4,828,134	4,877,486	5,025,543 13,469	5,511,961 14,947	5,616,331 15,405		6,873,066	6%	1,136,194	3,373,840 9,866	7,918,618 17,773
		12,316	16,049	14,437	1,519	11%	12,547	12,///	13,469	14,947	15,405	15,791	15,920	7%	1,977	9,866	17,773
Equity		1,685,228,930	2,631,068,121	2,061,510,450	385,452,532	19%	1,700,152,191	1,715,075,451	1,759,845,233	1,990,335,735		2,475,070,566	2,553,069,343	12%	439,704,511	885,326,270	2,644,144,314
Liquity		12,025	39,264	21,745	11,452	53% 5	12,219	12,412	12,993	17,417	27,028	34,370	36,817	35%	10,428	8,266	49,980
		82,057	154,895	120,715	35,293	29%	82,382	82,707	83,681	134,901	148,043	152,154	153,525	28%	29,821	53,326	172,611
	10	480,402	644,354	540,567	67,842	13%	481,553	482,705	486,159	523,597	568,324	613,942	629,148	8%	987,875	-1,439,976	2,511,523
		67,662 54,584	132,060 73,830	98,505 64,827	24,553 6,604	25% 9 10% 7	67,773 56,410	67,884 58,235	80,129 61,261	95,730 63,921	124,031 69,467	127,521 72,226	129,790 73,028	22% 6%	21,084 11,479	53,430 34,331	137,768 80,248
		79,011	138,991	118,106	19,128	16% 8	88,663	98,315	111,111	122,248	130,344	135,514	137,253	8%	20,464	54,551 77,820	159,677
		13,991	35,581	26,759	7,658	29% 9	16,139		19,879	29,553	31,988		35,145	23%	6,404	12,955	38,571
						1											
		80,991 206.277	189,389 501,927	139,139 343.051	37,705 109.069	27% 8	88,651 220,416	96,311 234,556	107,068	150,138 322,929	161,225 407,366	178,774 485,521	184,081 493,724	20% 19%	28,990 127,275	78,696 72,463	194,657 581,565
(cd		178,173	718,775	431,310	178,089	41% 7	207,299	234,335	334,745	422,301	515,218		670,595	21%	166,661	119,363	786,006
Interest Rate		138,281	183,212	159,947	19,745	12% 9	139,052	139,823	140,808	160,380	180,548	182,146	182,679	12%	18,271	125,594	198,677
		5,026	7,814	6,591	823	12% 8	5,375	5,724	6,223	6,833	6,938	7,240	7,527	5% 15%	1,572	3,511	9,799 383,892
		245,509 55,133	368,131 71,628	307,524 63,617	47,776 5,975	16% 9 9% 5	252,441 56,498	259,372 57,863	268,772 61,958	308,470 63,775	361,541 65,589	363,415 69,212	365,773 70,420	15%	38,106 18,783	231,466 20,402	383,892 95,535
		128,670		142,269	13,023	9% 7	128,919		132,405	138,797	150,447	158,571	160,640	6%	38,257	75,313	228,342
		27,036	528,881	224,769	216,851	96% 7	28,780		50,664	89,668	413,237	460,942	494,912	78%	166,493	-23,514	642,460
		30,813 304.939	127,115 873,040	64,828 610,490	33,533 214,070	52% 7	32,856 331,972	34,898 359,005	45,675 484 984	53,820 582,510	75,351 771,488	105,580 859,271	116,348 866.155	25% 23%	52,303 234 837	-49,367 122,496	159,844 1.061.846
	27	491,827	780,996	663,190	116,106	18% 7	509,102	526,377	570,578	724,253	752,049	767,161	774,079	14%	110,521	380,819	822,903
		3,853	43,998	23,795	13,287	56% 7	7,274	10,695	17,395	20,762	31,581	38,941	41,470	29%	14,001	2,478	58,482
PX		100,190		122,930	22,435	18% 7	101,391	102,592	107,419	120,063	131,042		156,854	10%	27,858	66,801	178,234
		348,803 459,168		413,344	40,860 78,652	10% 6	357,692 468,310	366,581	390,618	422,608 533.459	445,496	450,843 626,585	451,904 656,798	7%	40,000	322,131 357,648	482,131 694,020
	32	41,912		353,412	158,466	45% 6	125,157	208,402	377,273	393,064	417,618		476,693	5%	179,731	15,429	734,354
						2											
Commodity						1											
	36 37																
						2											
						5											
						4											
Credit Spread						4											
						2											
						-											
						3											
СТР	54 55					1											
ALL-IN no-CTP	56																
Equity Cumulative																	
IR Cumulative		399,625	677,810	523,936	99,241	19% 6	415,002	430,379	464,335	514,682	570,619	626,747	652,279	10%	114,700	290,753	749,552
FX Cumulative Commodity Cumulative		999,846	1,311,126	1,160,662	132,894	11% 5	1,015,295	1,030,745	1,077,093	1,134,316	1,280,928	1,299,047	1,305,086	9%	171,608	672,624	1,359,056
Commodity Cumulative CS Cumulative																	
CTP Cumulative	63																



Table 37: VaR statistics (IR and CS asset classes – only banks with general and specific IR risk approval)

				Other st	ats						Percentiles				
	Port. ID	Min	Max	Ave.	STDev	Coefficient of variation (STDev/Mean)	Num obs.	5th	10th	25th	50th (Median)	75th	90th	95th	Interquantile range
	11	66,733	132,060	100,939	21,247	21%	20	69,148	71,008	81,702	102,083	117,812	126,001	127,049	18%
	12	43,141	78,115	57,724	10,616	18%	18	44,463	44,915	49,096	57,061	63,074	72,375	75,651	12%
	13	79,011	143,696	119,712	16,535	14%	17	95,610	104,660	108,446	120,072	132,787	137,550	139,932	10%
	14	13,138	37,435	27,208	8,121	30%	19	13,906	14,967	22,017	30,741	34,472	35,496	35,766	22%
	15	19,811	72,877	32,918	16,861	51%	10	20,421	21,031	22,462	28,086	29,789	54,848	63,863	14%
	16	101,308	189,389	144,145	28,122	20%	20	107,562	108,747	115,922	150,340	160,835	187,236	189,190	16%
	17	246,595	581,027	414,096	105,821	26%	18	287,921	296,223	315,880	422,736	500,148	537,761	548,300	23%
Interest Rate	18	389,677	782,626	566,885	147,494	26%	19	393,775	395,331	415,024	580,952	711,700	762,691	767,505	26%
	19	137,778	187,931	163,242	17,701	11%	18	138,248	138,517	144,355	165,743	174,067	184,430	185,474	9%
	20	4,561	7,814	6,646	826	12%	17	5,564	5,874	6,141	6,591	7,249	7,687	7,716	8%
	21	251,929	362,236	307,703	34,105	11%	18	259,336	260,860	274,124	320,007	330,830	342,021	346,720	9%
	22	32,039	94,242	58,183	16,510	28%	18	34,590	37,036	43,681	61,100	68,606	74,735	79,408	22%
	23	126,273	204,079	161,907	17,969	11%	17	137,811	146,807	152,704	158,943	165,897	182,345	194,073	4%
	24	68,479	600,230	374,123	141,561	38%	18	206,794	231,434	274,274	349,717	499,201	536,522	550,458	29%
	25	30,813	99,968	58,725	15,698	27%	18	41,707	44,259	46,149	57,836	65,060	74,724	79,081	17%
	26	467,917	984,096	721,028	187,140	26%	17	494,110	522,271	574,264	648,009	897,666	954,091	977,538	22%
	36	14,394	49,466	30,084	10,833	36%	18	15,474	16,030	20,186	31,774	36,928	42,916	43,993	29%
	37	42,450	162,181	100,597	40,755	41%	16	46,220	50,763	75,213	93,795	144,655	155,900	158,298	32%
	38	4,859	17,636	11,335	4,655	41%	16	4,992	5,605	7,176	11,268	15,930	17,352	17,467	38%
	39	14,867	65,631	38,600	16,211	42%	17	16,106	17,787	24,205	38,766	54,867	57,894	60,056	39%
	40	6,177	19,089	12,127	4,668	38%	16	6,227	6,446	9,122	10,597	15,792	18,898	18,960	27%
	41	5,429	36,639	21,378	9,623	45%	17	9,130	10,065	14,684	19,262	30,195	35,247	36,230	35%
	42	24,820	79,878	45,439	17,149	38%	15	25,872	27,295	32,736	40,861	54,247	70,199	75,305	25%
	43	9,102	49,416	30,788	11,780	38%	14	14,817	18,653	21,010	30,866	39,685	44,934	46,519	31%
Credit Spread	44	4,854	34,024	15,859	8,013	51%	16	7,490	8,847	10,976	14,235	17,204	28,018	31,431	22%
	45	449	29,201	12,886	8,172	63%	16	631	2,429	6,318	13,137	18,597	20,494	23,297	49%
	46	3,832	31,868	17,239	8,490	49%	16	5,934	6,821	12,321	16,397	24,349	28,338	29,354	33%
	47	2,550	10,244	5,150	2,339	45%	16	2,588	2,750	3,690	4,586	5,884	8,764	9,394	23%
	48	12,818	42,823	26,965	9,204	34%		14,149	15,987	19,935	28,120	31,315	39,356	42,659	22%
	49	7,734	32,536	18,290	7,532	41%		8,619	10,118	12,030	17,153	24,876	27,771	31,455	
	50	14,159	36,455	22,858	6,608	29%	17	14,301	14,869	16,760	22,701	27,152	30,816	32,001	24%
	51	53,407	380,961	188,321	91,476	49%		71,842	82,425	118,716	171,861	242,432	289,545	337,810	
	52	51,287	378,051	196,305	96,382	49%	15	67,883	84,250	134,193	177,845	261,096	323,443	355,984	32%
	53	98,238	718,802	350,333	182,252	52%	14	132,570	152,143	264,759	295,230	476,891	588,116	649,804	29%
	59	435,111	732,294	554,911	86,095	16%	19	450,569	466,937	478,082	552,496	596,875	682,433	704,060	11%
CS Cumulative	62	16,567	77,757	44,417	18,252	41%	16	22,493	24,476	32,563	42,354	53,828	70,811	76,471	25%

EU Statistics for VaR

Table 38: VaR statistics (IR and CS asset classes – only banks with general IR risk approval)

				Other st	ats						Percentiles				
	Port. ID	Min	Max	Ave.	STDev	Coefficient of variation (STDev/Mean)	Num obs.	5th	10th	25th	50th (Median)	75th	90th	95th	Interquantile range
	11	63,600	128,635	90,466	22,859	25%	16	65,157	66,669	68,157	87,313	101,484	126,007	126,948	20%
	12	39,463	75,084	56,309	12,181	22%	14	39,712	40,282	45,392	57,039	63,911	72,014	74,269	17%
	13	86,840	157,013	119,795	18,540	15%	15	96,121	102,694	109,844	117,717	127,443	146,306	152,092	7%
	14 15	17,919	34,492	25,812	4,821	19%	17	19,072	19,671	22,400	24,822	29,553	31,192	32,489	14%
	15 16	80,991		127,571	33,496	26%	1	88,548	95,734	105,838	110,970	156.063	176,864	180,448	19%
	10	80,991 155.329	183,281 501.927	279.335	33,496 92.864	26%	16	88,548 164,970	95,734 176,200	206,731	290.376	156,063 313.372	337,487	180,448 412,949	19%
	18	127,355	558,174	341,290	141,445	41%	12	155,305	179,323	206,751 204,844	373,491	434,791	493,886	524,137	36%
Interest Rate	19	134,300	181,880	156,514	17,640	11%	15	134,669	136,209	141,552	156,882	173,455	178,460	180,948	10%
	20	5,026	8,678	6,659	883	13%	14	5,501	5,830	6,056		7,132	7,322	7,797	8%
	21	245,509	368,131	297,959	40,705	14%	15	252,433	256,684	263,407	302,717	321,147	357,012	363,518	10%
	22	29,217	71,628	50,567	14,053	28%	13	32,083	34,054	37,618	53,020	64,098	65,925	68,257	26%
	23	103,400	192,025	139,369	20,832	15%	16	110,850	119,128	129,292	136,127	146,139	161,090	175,771	6%
	24	27,036	468,104	157,074	163,946	104%	10	29,651	32,267	43,973	72,544	223,955	416,552	442,328	67%
	25	34,270	127,115	62,668	25,996	41%	16	36,784	41,011	48,740	53,981	62,888	100,189	113,644	13%
	26	283,526	850,091	485,087	180,955	37%	12	290,009	296,276	309,176	463,406	592,817	683,072	763,628	31%
	36														
	37														
	38						1								
	39 40														
	40						1								
	42						1								
	43						2								
	44						2								
Credit Spread	45						1								
	46						1								
	47														
	48						1								
	49														
	50						1								
	51														
	52														
	53														
IR Cumulative	59	321,112	575,684	464,574	82,907	18%	8	348,592	376,071	426,747	463,090	514,094	564,085	569,885	9%
CS Cumulative	62						1								



Table 39: VaR statistics (EQ asset class – only banks with general and specific EQ risk approval)

EU Statistics for VaR

				Other sta	ts						Percentiles				
	Port. ID	Min	Max	Ave.	STDev	Coefficient of variation (STDev/Mean)	Num obs.	Sth	10th	25th	50th (Median)	75th	90th	95th	Interquantile range
	1	4,783,699	9,409,963	6,645,280	1,576,152	24%	22	4,826,409	4,895,866	5,162,086	6,529,820	7,862,747	9,093,265	9,301,434	21%
	2	3,940,627	7,869,708	6,058,447	1,174,075	19%	19	4,797,349	4,934,430	5,037,937	5,952,884	7,173,918	7,534,604	7,603,103	17%
	3	9,896	16,920	14,200	1,722	12%	21	12,059	12,300	13,198	13,989	15,405	16,507	16,518	8%
	4	984	3,734	2,197	799	36%	20	1,189	1,234	1,421	2,146	2,768	3,126	3,322	32%
Equity	5	1,572,817,976	2,631,068,121	1,902,518,860	335,086,030	18%	16	1,633,222,926	1,665,227,580	1,688,100,994	1,745,289,735	2,041,798,307	2,420,201,021	2,607,262,887	9%
Equity	6	11,473	42,632	27,579	9,424	34%	20	11,997	12,896	19,386	29,296	35,232	35,848	39,432	29%
	7	21,125	159,339	91,434	47,311	52%	18	30,799	34,718	54,558	94,183	124,553	158,802	159,048	39%
	8	3,767	256,550	132,667	65,257	49%	21	21,053	68,250	108,387	126,831	168,364	212,264	241,200	22%
	9	74,352	161,193	119,168	31,473	26%	22	80,208	82,191	86,329	130,078	146,227	156,811	157,319	26%
	10	468,567	872,461	568,686	91,387	16%	19	479,219	496,067	511,783	532,174	613,972	626,573	667,165	9%
Equity Cumulative	58	2,156,738	3,079,003	2,533,963	303,286	12%	15	2,177,221	2,203,558	2,259,674	2,495,702	2,704,200	2,966,973	3,046,643	9%

Table 40: VaR statistics (EQ asset class - only banks with general EQ risk approval)

				Other sta	ats						Percentiles				
	Port. ID	Min	Max	Ave.	STDev	Coefficient of variation (STDev/Mean)	Num obs.	Sth	10th	25th	50th (Median)	75th	90th	95th	Interquantile range
	1	5,023,255	8,841,352	6,134,072	1,545,748	25%	9	5,038,528	5,053,801	5,137,617	5,265,000	7,016,525	8,500,260	8,670,806	15%
	2	4,440,420	5,646,229	5,086,903	448,950	9%	6	4,525,011	4,609,601	4,846,669	5,072,012	5,407,394	5,579,095	5,612,662	5%
	3	9,896	16,475	12,374	2,205	18%	6	10,245	10,594	11,459	12,132	12,312	14,396	15,435	4%
	4	1,105	3,300	2,522	863	34%	5	1,363	1,621	2,394	2,739	3,071	3,208	3,254	12%
Equity	5	1,640,930,027	2,596,289,673	1,828,189,425	378,906,498	21%	6	1,642,486,169	1,644,042,311	1,647,320,888	1,662,458,510	1,739,158,237	2,178,067,453	2,387,178,563	3%
Lidony	6	15,734	49,274	28,353	10,675	38%	8	15,902	16,071	23,554	27,684	30,619	39,357	44,316	13%
	7	24,529	139,600	66,463	44,138	66%	5	28,336	32,143	43,565	54,359	70,262	111,865	125,732	23%
	8	15,018	241,200	82,703	92,408	112%	5	16,225	17,432	21,053	57,437	78,805	176,242	208,721	58%
	9	56,465	127,376	90,219	24,780	27%	8	61,223	65,981	73,279	85,741	105,925	123,040	125,208	18%
	10	406,432	947,372	551,661	196,749	36%	6	425,203	443,975	482,678	487,284	497,158	723,724	835,548	1%
Equity Cumulative	58						3								



Table 41: Stress VaR statistics (2008-2009 stress period only)

					Other st	ats							Percentiles				
	Port. ID	Min	Max	Ave.	STDev		MAD (median absolute deviation)	Coefficient of variation (STDev/Mean)	Num obs.	Sth	10th	25th	50th (Median)	75th	90th	95th	Interquantile range
	1	5,433,112	8,512,575	7,279,417	848,484			12%	23	6,171,866	6,264,279	6,744,317	7,113,033	7,965,187	8,416,764	8,491,672	8%
	2	5,440,368	13,327,973	9,769,334	2,397,540			25%	18	6,245,432	6,907,735	7,643,973	9,917,573	12,026,938		12,637,895	22%
	3	6,648	21,732	15,212	4,817			32%	20	8,195	9,836	11,328	14,752	20,016	21,148	21,432	28%
	4	821	4,240	2,639	951			36%	18	867	1,093	2,247	2,784	3,287	3,608	3,718	19%
Equity	5	1,108,810,204	4,506,136,975	-,,,	732,388,642			23%	20		******	*****	3,320,354,927		*****	4,087,382,601	13%
	-	13,872	52,592	35,783	10,529 24,642			29%	20 17		23,721	27,136	39,249	43,591	47,009 96,954	48,223 103.734	23%
	8	21,096 32,476	114,672 136,800	68,464 95,901	31,579			36%	17	26,819 38,902	39,079 56,827	55,994 79.562	67,047 98.048	83,499 126,835	132,332	133,646	20% 23%
	4	59,911	131,138	106.813	22.737			21%	23	69.109	70.847	93,549	115,915	126,635	129,461	130,588	15%
	10	510.381	1,722,085	995,894	260.943			26%	19	654,987	733,712	901,608	943,501	1.085,168	1,201,427	1.419.537	9%
	11	54,385	289,221	190,952	63,586			33%	26	78.121	94,250	153,614	215.007	233,019	249.280	253.823	21%
	12	12,466	181,611	97,989	45,365			46%	25	25,876	36,254	62,075	102,693	127,592	141,645	171,246	35%
	13	134,408	421,383	301,812	88,105			29%	25	149,077	168,021	227,932	343,972	361,455	386,761	411,733	23%
	14	19,301	134,460	79,682	28,138			35%	27	35,857	38,476	69,018	85,280	96,038	107,993	116,689	16%
	15	28,090	151,679	83,100	44,855			54%	10	30,851	33,612	48,776	70,365	125,634	137,455	144,567	44%
	16	94,543	269,539	183,268	40,558			22%	24	132,575	134,207	151,179	186,458	206,702	228,898	236,485	16%
	17	173,140	471,850	319,035	83,438			26%	24	197,687	209,079	254,305	318,256	388,446	409,673	430,964	21%
Interest Rate	18	121,160	452,558	277,266	77,497			28%	24	172,301	179,679	225,189	275,215	339,355	355,277	381,839	20%
	19	121,487	455,478	297,675	84,840			29%	23	127,133	142,924	291,807	321,400	348,999	364,158	378,149	9%
	20	146	23,971	12,093	6,625			55%	21	717	1,917	7,999	12,433	15,313	21,617	22,566	31%
	21 22	200,151 43,392	851,258 223,825	569,635 143.699	201,305 51.968			35% 36%	26 25	228,880 59,449	240,743 66,486	405,284 112,682	643,399 144,800	691,195 175,083	789,782	839,814 219,510	26% 22%
	22	43,392 41,843	223,825 412,710	143,699 249,948	51,968			36%	25	59,449	66,486 189,813	205,027	144,800 266,582	285,989	322,638	219,510 328,725	22%
	23	41,843	412,/10 793,086	249,948 378,370	226,375			30% 60%	24	110,090	189,813	184,649	333,805	285,989 520,820	322,638	328,725 731,369	48%
	25	79.742	410.377	191.828	77.364			40%	24	94,595	106.583	149,230	177.126	219.319	288.520	329.066	19%
	26	192,500	714,677	487,341	157,605			32%	25	247,464	266,966	373,583	539,436	585,936	689,103	712,119	22%
	27	619,281	1,195,800	859,499	144.819			17%	23	630,417	666.897	785.044	836,948	952,927	1.036.729	1.114.243	10%
	28	3.753	45,279	22.394	10.973			49%	21	9.000	9.568	17.381	20,338	25,852	39.006	39.039	20%
	29	194,733	378,814	268,295	58,943			22%	22	196,750	199,426	227,293	247,898	309,725	369,799	375,943	15%
FX	30	612,333	1,290,809	934,245	198,745			21%	24	634,986	646,068	775,813	989,921	1,050,945	1,116,331	1,259,401	15%
	31	949,476	1,591,664	1,211,076	186,535			15%	24	973,788	978,972	1,026,890	1,223,838	1,343,677	1,433,772	1,507,341	13%
	32	102,160	1,137,237	545,244	383,785			70%	23	129,204	131,791	143,596	527,020	869,729	999,524	1,036,792	72%
	33	6,868	45,958	25,329	10,282			41%	12	12,073	16,386	17,557	25,244	29,714	36,118	40,918	26%
Commodity	34	344,485	664,837	476,051	101,296			21%	10	360,596	376,708	404,527	451,842	549,209	570,839	617,838	15%
	35	986,869	1,313,046	1,192,482	134,951			11%	10	990,813	994,757	1,069,715	1,260,519	1,286,553	1,309,930	1,311,488	9%
	36	8,935	36,128	21,344	7,100			33%	15	11,474	13,460	16,775	21,191	25,015	29,856	33,213	20%
	37	56,963	198,704	114,277	45,674			40%	13	59,244	62,848	73,839	117,683	129,173	170,397	181,977	27%
	38	6,748	33,307	17,096	7,962			47%	16	7,749	8,094	8,776	19,523	21,355	25,400	28,407	42%
	40	22,131 9,512	82,810 42,750	46,357 26,215	21,680 12,348			47% 47%	13	23,376 11,264	24,322 12,190	25,293 12,538	41,248 29,753	51,283 38,716	80,732 39,808	82,037 40,551	34% 51%
	40	9,512	42,750	35,868	14,370			47%	10	14,964	12,190	21.658	29,755	46,417	59,808	40,551 53,181	36%
	42	26,318	115,566	67,440	31.743			47%	12	29,969	34,365	47,725	53,223	102,350	110,562	113,226	36%
	43	12.033	79,953	49,942	22,988			46%	16	16.319	19,374	35,735	47,418	69,157	78,469	79,849	32%
	44	6,105	42,940	24,467	13,018			53%	15	6,859	7,787	13,521	25,725	36,035	41,589	42,181	45%
Credit Spread	45	885	35,924	16,525	10,425			63%	15	3,210	4,991	8,248	15,451	22,580	30,077	34,590	46%
	46	4,321	28,169	14,701	6,498			44%	15	4,710	5,982	12,633	14,485	16,459	22,886	26,253	13%
	47	6,141	18,953	10,210	3,411			33%	14	7,430	8,139	8,448	9,040	9,787	14,867	16,717	7%
	48	13,280	59,053	35,521	12,584			35%	15	16,007	20,841	28,604	37,907	40,185	51,999	57,500	17%
	49	7,134	33,214	14,979	6,993			47%	14	7,818	8,280	9,517	14,331	17,850	21,059	25,653	30%
	50	8,621	26,677	19,659	5,337			27%	16	10,789	13,328	15,449	20,101	24,349	25,085	25,497	22%
	51	95,115	369,338	198,463	80,014			40%	12	108,999	120,971	138,581	190,456	244,562	277,272	319,933	28%
	52	114,493	607,276	250,462	140,627			56%	12	122,120	130,385	151,868	204,611	334,289	355,129	469,023	38%
	53 54	163,480	997,836	428,535	222,675			52%	12		261,637	286,668	353,077	546,100	594,872	779,059	31%
СТР	54 55	5,360 73,635	19,490 85.425	11,235 79,530	7,360 8.337			66% 10%	3	5,710 74,225	6,059 74,814	7,108 76,583	8,855 79,530	14,173 82.478	17,363 84,246	18,427 84.836	33% 4%
CIP	55	73,635 322,181	85,425	79,530	8,337			10%	2	74,225	74,814 456.616	76,583 658,267	79,530 994.354	82,478	84,246	84,836 1.599,309	4% 34%
ALL-IN no-CTP	50	4,137,597	6,614,645	5,307,769	658.805			96%	12	4,298,512	456,616	5,085,707	5,308,371	1,330,440	6,034,208	1,599,309	5%
Eauity Cumulative	58	2,598,077	5,678,055	4,763,989	780,494			12%	12	4,298,512 3,512,398	4,490,412 3,929,687	4,443,142	4,965,726	5,236,118	5,520,980	5,590,730	5%
IR Cumulative	59	184,134	804,925	516,769	173,708			34%	24	212,088	289,893	417,638	519,034	662,498	727,703	747,870	23%
FX Cumulative	60	1.535.293	3,037,434	2.289.085	462,689			20%	22	1.568.537	1.587.872	2.032.313	2.232.916	2.669.372	2.948.239	2.967.285	14%
Commodity Cumulative	61	344,700	640,710	469,425	99,810			21%	10	357,001	369,302	387,069	447,914	545,975	575,742	608,226	17%
CS Cumulative	62	19,523	89,603	55,167	21,207			38%	15	26,331	29,539	38,293	52,921	69,819	81,669	85,258	29%
CTP Cumulative	63	1,344,348	1,376,298	1,360,323	22,592			2%	2	1,345,946	1,347,543	1,352,336	1,360,323	1,368,311	1,373,103	1,374,701	1%
										-							



Table 42: PV statistics

EU Statistics for PV

					Main st	atistics					Percentiles		1
	Port. ID	Min	Мах	Ave	STDev	STDev_trunc ¹	MAD (median absolute deviation)	Coefficient of variation (STDev/Ave)	Num obs. ²	25th	50th (Median)	75th	Interquantile range
		34,909,244	35,905,074	35,261,048	263,614	11,518,986	27,246	1%	26	35,131,607	35,142,000	1	0%
		-26,867,268	-19,941,313	-25,155,043	1,452,263	6,979,683	521,394	6%	24	-25,929,815	-25,111,408	-24,875,683	2%
		-16,433	-13,702	-14,688	656	1,066	314	5%	24	-14,980	-14,571	-14,261	2%
		3,959 -14,295,319,799	5,906 -14,114,898,156	4,678 -14,162,001,992	510 48,732,057	798 4,151,196,561	312 19,918,923	11% 0%	24 24	4,278 -14,194,000,000	4,513	5,061 -14,127,134,239	8% 0%
		-14,295,319,799 -85,275	-14,114,898,156 -63,430	-14,162,001,992 -75,635	48,/52,057	4,151,196,561 11,159	2,000	7%	24	-14,194,000,000	-14,128,855,405 -76,495	-14,127,134,239 -72,852	3%
		1.010.573	1,064,617	1,032,870	12.541	17,249	8,507	1%	22	1,022,963	1,033,185	1,040,377	1%
		201.512	251.043	223,209	12,578	15,900	6,352	6%	23	215.563	224.404	229,945	3%
		504,577	508,071	506,456	915	1,377	521	0%	26	505,942	506,285	507,147	0%
		-3,339,931	871,704	-1,655,661	919,814	3,280,032	11,791	56%	26	-2,011,096	-2,004,216	-1,974,799	1%
	11	-11,740	-6,100	-8,675	1,263	2,333	668	15%	36	-9,402	-8,576	-8,017	8%
		-54,161	-45,281	-51,447	1,373	5,688	534	3%	31	-52,196	-51,589	-51,081	1%
		-67,245	-57,032	-62,167	2,362	2,907	1,365	4%	33	-63,437	-62,109	-60,604	2%
		-8,488	-3,604	-6,316	959	3,472	306	15%	32	-6,983	-6,036	-5,778	9%
		1,083,053	1,164,709	1,125,680	26,185	26,185	22,944	2%	14	1,099,089	1,129,958	1,143,052	2%
		5,034,152	5,065,169	5,048,305	5,154	12,642	1,245	0%	34	5,046,850	5,049,247	5,050,328	0%
		10,688,299	10,968,318	10,849,370	99,561	165,310	6,728	1%	29	10,779,497	10,921,039	10,924,792	1%
		2,101,085	2,386,114	2,265,946	101,334	165,720	5,654	5%	29	2,199,373	2,337,499	2,341,741	3%
		12,200 -23,929	20,927	16,665	2,343	3,283	1,978 281	14% 5%	34 34	14,662 -23.037	16,762 -22,775	18,708 -22,400	12%
		-23,929 5,378	-18,628 20,606	-22,528 12,331	4,122	2,873 4,875	3.246	33%	34	-23,037 9,503	-22,775 11,798	-22,400	1% 23%
		-77,810	-53,829	-61,377	4,122	4,875	5,240	53% 8%	33	-61.340	-60,110	-59.599	2376
		7,288,880	7,336,084	7,313,752	8,895	20,222	1,205	0%	33	7,311,689	7,312,657	7,313,936	0%
		900,765	1,148,934	1,079,358	61,468	255,984	11,400	6%	27	1,070,620	1,101,953	1,107,252	2%
		-10,854,247	-10,827,683	-10,841,757	5,327	14,645	2,312	0%	35	-10,844,400	-10,842,384	-10,839,225	0%
		19,583,663	20,514,941	20,022,650	168,390	1,019,204	68,321	1%	32	19,888,782	20,114,330	20,121,345	1%
	27	-587,957	-554,206	-579,611	6,688	165,811	2,157	1%	30	-583,637	-581,788	-577,522	1%
		531,654	1,040,995	863,878	76,624	259,531	1,144	9%	28	864,696	865,634	866,912	0%
		929,163	939,206	935,640	2,036	3,399	1,092	0%	29	934,630	935,737	936,703	0%
		751,123	763,375	758,201	3,168	6,655	1,805	0%	29	756,501	758,970	759,781	0%
		-1,298,894	-1,271,774	-1,284,531	5,316	7,236	2,679	O%	29	-1,287,284	-1,284,522	-1,282,555	0%
	32	-132,462	101,982	-5,749	45,581	64,011	15,050	793%	25	-22,209	-18,881	36,208	417%
		882	13,815	5,098	4,369	8,831	523	86%	13	2,553	2,946	7,526	49%
Commodity		259,746	264,966	262,475	1,655	3,139	1,491	1%	10	261,053	262,982	263,587	0%
	35 36	-407,198	-343,764	-363,504	18,254	23,587	9,332	5%	10	-367,500	-364,725	-347,763	3%
		-3,912	-2,920	-3,223 28,215	205	383	81	6% 4%	17	-3,261	-3,224	-3,110	2% 1%
		24,977 8,789	29,311 9,435	28,215	1,190 134	2,520 737	286 28	4%	15	28,167 8.978	28,468 8,999	28,839 9,060	1%
		23,746	25,038	24,750	353	600	76	1%	19	24,730	24,847	24,921	0%
		4,075	4,784	4,360	165	231	35	4%	17	4,302	4,337	4,369	1%
		38,006	39,286	38,336	330	864	127	1%	19	38,157	38,262	38,488	0%
		1,163,580	1,176,117	1,169,502	2,757	4,370	1.125	0%	16	1,167,993	1,169,583	1,170,577	0%
		3,120,311	3,131,513	3,126,846	2,438	4,037	1,073	0%	17	3,125,689	3,127,684	3,128,078	0%
Condita Constant		28,780	30,054	29,666	407	600	86	1%	18	29,517	29,877	29,931	1%
Credit Spread		991,155	1,005,307	997,055	3,609	12,217	879	0%	18	995,406	996,313	997,163	0%
		1,036,946	1,038,689	1,037,951	476	637	295	0%	17	1,037,558	1,038,146	1,038,263	0%
		32,522	34,895	34,041	461	1,792	152	1%	18	33,985	34,040	34,213	0%
		18,498	20,958	19,571	617	664	237	3%	17	19,009	19,744	19,895	2%
		-12,678	-12,000	-12,418	193	215	109	2%	18	-12,558	-12,426	-12,346	1%
		1,161,685	1,163,416	1,162,678	514	3,942	243	0%	19	1,162,201	1,162,970	1,163,027	0%
		5,502,012	5,587,521	5,518,821	20,717	48,696	8,789	0%	16	5,505,639	5,517,332	5,519,888	0%
		6,395,584	6,660,758	6,502,872	55,754	516,639	14,798	1%	16	6,474,683	6,498,353	6,514,043	0%
	53 54	11,193,419	12,072,844	11,957,283	214,133	553,652	24,504	2%	15	11,982,461	12,003,397	12,032,779	0%
									3 2 2				
ALL-IN no-CTP **	56 57	14,012,522	10.051.555	16 401 407	031 034	11 705 711	249.024	6%	2	15.055.000	16 006 000	16 002 505	
ALL-IN NO-CIP ** Equity Cumulative **		14,912,509 5,476,957	18,351,565 16,664,834	16,491,427 11,313,027	931,391 2,038,256	11,705,711 3,210,755	348,024 596,430	6% 18%	11	15,965,892 10,649,963	16,226,600 10,754,577	16,903,595 11,799,005	3%
IR Cumulative **		5,476,957	2,403,785	2,195,824	2,038,256	425,879	596,430 80,214	18%	19 30	2,071,558	2,241,469	2,294,143	5%
FX Cumulative **		-603,780	-143,048	-286,813	137,575	425,879 297,256	80,214 52.834	45%	23	-286,875	-258.075	2,294,143	5%
					129,473	108,935	4,370	43%	9	263,529	263,842	272,492	2%
mmodity Cumulative ** CS Cumulative **		261,896 3,168,356	297,151 3,185,060	270,519 3,175,699	4,148	44,629	1,528	478	18	3,173,843	3,174,862	3,176,713	0%

CTP Cumulative ** 63
 ¹ STDev trunc is the standard deviation computed excluding values below the 5th and above the 95th percentile
 ² STDev trunc is the standard deviation computed excluding values below the 5th and above the 95th percentile
 ² For the aggregated portfolios (57 to 63), banks that reported at least a missing portfolio IMV among the ones composing the aggregate are not included
 in the computation of the benchmarks for that particular aggregate portfolio.



				Other st	ats						Percentiles						Extreme Values ra	inge (Full Sample)
	Port. ID	Min	Max	Ave.	STDev	Coefficient of variation (STDev/Mean)	Num obs.	5th	10th	25th	50th (Median)	75th	90th	95th	Interquantile range	STDev_trunc ¹	-2*STDev_trunc	+2*STDev_trunc
	1					(STDev/mean)				_								
	9 10																	
		86,506	293,640	195,028	84,529	43%		94,178	101,850	134,180	194,176			291,350	33%	141,028		471,37
		9,240 519,483	370,866 3,779,449	124,546 1,621,105	125,295 1,090,610	101% 67%	10	17,316 574,280	25,393 629,077	32,527 884,279	1,185,503		3,036,315	330,175 3,407,882	70% 43%	269,903 1,192,441	-424,269 -837,879	655,34 3,931,88
		576,793	5,311,977	2,189,517	1,557,652	71%	10	799,125	1,021,456	1,170,811	1,618,037	2,483,832	4,616,606	4,964,291	36%	1,876,068	-1,417,942	6,086,32
		77,713 3,493,288	908,357 6,685,107	395,823 5,354,180	314,033 936,009	79%		88,025 4,078,418	98,338 4,663,549	178,375 5,107,610				883,447 6,528,365	55% 9%	489,694 1,619,603	-594,247 1,872,671	1,364,52 8,351,08
		596.874	6,151,539	2,690,598	1,899,729	71%	10	858.603	1,120,333	1.346.421	2.175.945	3.055.514	5,829,412	5,990,475	39%	1.943.768	-943.684	6,831,38
	27 28		.,,		.,,				.,,			.,,.						
	32 33																	
	36	24,345	156,593	65,759	41,353	63%		25,429	26,512	42,988				131,917	33%	107,614	-139,629	290,82
		46,460 19,862	106,218 88,289	73,609 49,186	21,481 19,997	29% 41%		49,334 23,325	52,208 26,788	61,444 40,891	69,557 45,262	82,132 57,475		105,369 77,346	14% 17%	47,141 23,646	-24,224 6,209	
		18,141	128,839	66,080	38,896	59%		19,614	21,088	37,697	72,277	83,956		117,724	38%	169,213	-263,914	412,93
		28,495 623,021	88,289 752,219	59,240 660,252	20,529 51,546	35%		32,449 623,065	36,403 623,109	40,235 623,615	58,735 640,276			84,941 740,518	31% 4%	21,309 187,302		
		149,140	273,300	182,259	42,572	23%		149,902	150,664	160,282	169,809			248,900	6%	64,926	38,614	298,31
		267,003 83.183	1,071,295 238.058	662,961 143.889	193,315 63.713	29% 44%		425,000	582,998 84.359	635,578 88,434	643,561 139.270			921,249 235.939	5% 37%	227,380 74,748	181,323 -55,992	1,090,84
	45	83,183	238,058	143,889	17,702	136%	9	671	84,359	1.839	3.184	20.619		41,362	37%	37,940		
		1,611	12,585	4,954	3,754	76%	7	1,792	1,973	2,337	4,645	5,581		10,640	41%	32,491	-57,495	72,47
		58,522	479,559	189,368	145,569	77%	7	63,511	68,501	81,838	188,646	217,587	335,803	407,681	45%	198,359	-282,987	510,44
		3,928	36,735	15,936	10,220	64%	7	6,201	8,475	11,994	13,100			31,402	17%	19,016		51,13
		14,155	89,469	52,971	27,410	52%		16,824	19,493	35,857	51,243			85,208	34%	140,906	-207,730	355,895
		2,371 17.802	221,665 319,732	44,129 101.477	71,251 110.639	161% 109%		2,837	3,302 25.053	6,502 41,288				162,489 263.392	79% 37%	105,683 215,561	-165,581 -351.817	257,15
		17,802	2,449,442	1,453,143	626,080	43%		587.773	1,019,188	41,288				2,181,501	5%	645,309		
	53	232,768	2,519,254	1,477,849	621,558	43%		637,439	1,042,111	1,417,192				2,231,361	6% 6%	645,526		
	54 55																	
	56																	
ALL-IN no-CTP Equity Cumulative		693,050	5,971,556	2,705,360	2,066,386	76%	7	929,297	1,165,545	1,529,762	1,725,891	3,743,751	5,585,214	5,778,385	42%	3,130,608	-4,101,368	8,421,06
FX Cumulative Commodity Cumulative																		
commodity Cumulative																		
CS Cumulative		627,070	1,432,213	816,290	275,889	34%		632,104	637,137	639,707	663,561		1,161,637	1,296,925	11%	1,585,719	-2,394,812	3,948,06

Table 43: IRC – modelling choice: source of LGD – market convention



				Other sta	ats						Percentiles				1 1		Extreme Values ra	nge (Full Sample)
1						Coefficient of									Internutio			
	Port. ID	Min	Max	Ave.	STDev	variation (STDev/Mean)		5th			50th (Median)		90th		Interquantile range	STDev_trunc ¹	-2*STDev_trunc	+2*STDev_trunc
	1 2																	
	3																	
	4																	
	6																	
	7 8																	
	8 9																	
	10																	
	11 12																	
	13																	
	14 15						4											
	16	18,876	400,440	133,752	113,783	85%		30,195	41,514	60,367		141,195	261,803	331,122	40%	269,903	-424,269	655,342
	17 18	76,675 391,212	3,771,783 5.445.435	1,841,217 2,665,674	1,376,597 1.698,782	75% 64%		245,189 529.493	413,703 667,774	488,451 1,488,752		2,986,884 3,786,474	3,543,523 4.216.127	3,657,653 4.830,781	72% 44%	1,192,441 1.876.068	-837,879 -1.417.942	3,931,887 6.086.329
	19	391,212	3,443,433	2,005,074	1,050,702	0476	,	323,493	007,774	1,400,732	2,907,230	3,780,474	4,210,127	4,030,781	44/6	1,870,008	-1,417,542	0,000,325
	20 21																	
	22																	
	23	100,298	1,346,554	537,649	426,687	79%		123,405	146,512	232,981		787,958		1,233,825	54%	489,694	-594,247	1,364,528
	24 25	3,077,400	6,814,833	5,128,918	1,308,292	26%	8	3,305,332	3,533,263	4,099,196	5,564,349	5,894,690	6,453,899	6,634,366	18%	1,619,603	1,872,671	8,351,084
	26	882,517	6,497,426	3,331,649	1,787,230	54%	10	1,009,780	1,137,042	2,238,189	3,451,760	3,879,869	5,684,008	6,090,717	27%	1,943,768	-943,684	6,831,387
	27 28																	
	29																	
	30 31																	
	31 32																	
	33																	
	34 35																	
	36	6,306	261,207	91,396	74,531	82%		18,310	30,315	51,960		113,144	158,765	209,986	37%	107,614	-139,629	290,829
	37 38	10,210 9,000	116,229 65,971	63,383 44,334	36,863 20,981	58% 47%		13,481 13,400	16,752 17,800	38,400 30,384	66,875 53,502	90,713 61,699	102,495 65,874	109,362 65,923	41% 34%	47,141 23,646	-24,224 6,209	164,339 100,794
	39	6,607	347,827	135,310	124,427	92%		18,708	30,809	51,960		262,748	286,346	317,087	67%	169,213	-263,914	412,937
	40	20,000	74,607	45,703	16,504	36%		24,751	29,502	34,336	41,909	54,052	63,296	68,951	22%	21,309	9,761	94,995
	41 42	475,102 72,200	1,015,718 199,010	697,725 145,309	170,326 40,964	24% 28%		478,453 80,854	481,804 89,507	564,798 127,501		807,679 169,647	837,266 182,345	926,492 190,678	18% 14%	187,302 64,926	271,200 38,614	1,020,407 298,316
	43	373,000	1,028,598	641,009	220,977	34%		386,069	399,137	465,604	657,329	754,631	845,423	937,010	24%	227,380	181,323	1,090,845
	44 45	192	235,307	94,885	82,785 25,142	87% 122%		16,515 233	30,014 459	37,600 1,084	49,046 9,363	159,300	214,873	224,949	62% 93%	74,748 37,940	-55,992 -66,324	242,999 85,436
	45 46	0	68,244 28,408	20,603 7,838	25,142 8,369	122%			459	2,151		30,586 10,364	58,256 12,960	63,250 20,684	93%	32,491	-56,324	85,436
	47	14,400	174,089	85,066	53,531	63%			27,225	40,693	85,891	123,449	140,807	157,448	50%	198,359	-282,987	510,448
	48 49	2,527 6,673	43,197 347,827	14,991 135,767	13,596 116,018	91% 85%			2,530 33,353	4,385 55,801	11,573 92,899	19,288 231,074	35,700 274,054	39,449 310,941	63% 61%	19,016 140,906	-24,932 -207,730	51,131 355,895
	50	1,607	209,699	68,479	81,566	119%		3,545	5,482	8,362	37,600	86,027	200,765	205,232	82%	140,908	-165,581	257,153
	51 52	2,987 307,991	453,471 1,511,344	115,554 1,221,814	141,645 434,668	123%		9,831 481,168	16,675 654,345	29,665 1,227,711	71,207 1,415,017	99,545 1,469,504	294,592 1,496,759	374,032 1,504,051	54% 9%	215,561 645,309	-351,817 143,959	510,426 2,725,194
	52 53	307,991 311,525	1,511,344 1,542,216	1,221,814 1,226,500	434,668 436,588	36%		481,168 483,898	654,345 656,272	1,227,711 1,229,444		1,469,504 1,469,463	1,496,759 1,506,020	1,504,051 1,524,118	9% 9%	645,309 645,526	143,959 143,525	2,725,194 2,725,628
	54																	
	55 56																	
ALL-IN no-CTP	57	829,000	6,521,420	4,047,160	2,936,751	73%	5	842,251	855,502	895,256	5,496,876	6,493,247	6,510,151	6,515,785	76%	3,130,608	-4,101,368	8,421,065
Equity Cumulative IR Cumulative	58 59																	
FX Cumulative	59 60																	
Commodity Cumulative	61																	
	62	319,665	1,023,866	728,976	206,516	28%	9	392,022	464,379	706,041	776,627	837,022	890,220	957,043	8%	1,585,719	-2,394,812	3,948,065

Table 44: IRC – modelling choice: source of LGD – non-market convention



		Other 1841 Mon Max Ave. Main Max Ave. Main Max Ave. James James James James Second James James James James James James James James Second James James James James James James James James James			ats						Percentiles						Extreme Values ra	inge (Full Sample)
	Port. ID	Min				Coefficient of variation (STDev/Mean)					50th (Median)				Interquantile range	STDev_trunc ¹		+2"STDev_trunc
Equity	1 2 3 4 5 6 7 8 9																	
Interest Rate	10 11 12 13 14 15 16 17 18 19 20 21	18,876 76,675	400,440 3,779,449	141,390 1,836,255	121,454 116,968 1,181,074 1,657,528	62% 83% 64% 56%	10	79,523 30,195 296,244 743,483	79,563 41,514 515,812 1,095,754	79,684 66,720 977,269 1,653,343	185,139 108,082 2,003,381 2,907,236	284,479 175,078 2,612,214 3,847,637	324,251 282,268 3,150,867 5,311,977	337,509 341,354 3,465,158 5,378,706	56% 45% 46% 40%	141,028 269,903 1,192,441 1,876,068	-92,740 -424,269 -837,879 -1,417,942	471,374 655,342 3,931,887 6,086,329
	22 23 24 25 26	3,077,400	6,299,213	4,919,008	271,538 1,182,196 1,719,151	59% 24% 49%	9	146,784 3,243,755 1,172,568	193,270 3,410,110 1,299,498	300,394 3,728,633 2,543,958	385,141 5,329,049 3,451,760	581,381 5,591,759 4,331,657	885,036 6,139,400 5,773,621	896,697 6,219,307 6,110,333	32% 20% 26%	489,694 1,619,603 1,943,768	-594,247 1,872,671 -943,684	1,364,528 8,351,084 6,831,387
	27 28 29 30 31 32																	
Commodity	33 34 35																	
Credit Spread	33 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54	10,210 9,000 475,100 72,000 267,003 192 97 0 14,400 2,527 6,673 2,371 2,987 307,991	106,218 65,850 347,827 79,918 1,015,718 273,300 1,028,598 216,475 57,146 28,408 239,965 43,197 347,827 198,532 276,939 1,683,895	73,564 43,049 125,266 45,633 698,148 171,871 609,249 85,875 18,201 7,724 93,487 18,371 121,062 48,977 78,041 1,339,268	73,253 34,266 18,832 17,785 56,452 227,243 60,621 22,691 9,042 77,062 13,291 105,059 65,706 88,397 426,986 414,192	78% 47% 36% 33% 33% 33% 12% 12% 82% 82% 82% 82% 82% 33% 33% 33%	8 10 8 9 11 8 12 9 9 9 9 9 9 9 9 9 8 8 8 8 8 8		41,927 29,943 18,900 38,622 29,502 503,696 126,040 30,854 801 585 25,800 5,165 44,462 5,27 13,358 1,050,945 1,053,334	53,030 59,756 32,113 54,349 34,336 624,981 151,039 428,761 42,323 1,334 2,214 39,282 11,573 67,732 7,884 21,756 1,412,288 1,412,762	75,600 81,977 47,197 82,345 41,699 694,130 168,847 642,586 85,809 3,447 3,000 66,952 14,840 81,185 24,200 57,252 1,452,551	113,144 100,244 56,823 150,361 54,052 783,357 193,727 739,143 110,232 31,638 11,244 113,731 19,464 12,7017 58,910 89,476 1,500,567 1,500,571	158,765 104,521 61,423 288,272 60,548 815,285 221,297 793,087 147,584 51,549 15,750 198,910 37,199 272,555 111,167 156,287 1,576,688 1,541,812	209,986 105,369 63,636 518,049 70,433 915,502 247,299 910,842 21,787 219,437 40,138 310,191 154,850 216,613 1,630,291 1,554,705	36% 25% 22% 22% 12% 27% 45% 67% 45% 67% 30% 76% 35% 35%	107,614 47,141 23,646 169,213 21,309 187,302 64,926 227,380 74,748 37,940 32,491 198,359 19,016 140,906 140,906 140,906 140,906 645,526	-139,629 -24,224 6,209 -263,314 9,761 271,200 33,614 181,323 -55,929 -66,324 -57,499 -28,927 -24,922 -07,730 -165,5817 143,525	290,829 164,339 100,794 412,937 1,020,467 1,969,845 242,999 83,456 72,471 510,448 51,131 355,855 257,153 510,248 2,725,153
СТР	55 56																	
ALL-IN no-CTP Equity Cumulative IR Cumulative FX Cumulative Commodity Cumulative	57 58 59 60 61				2,409,220	59%		1,148,175		2,159,849	5,327,653		6,094,699	6,293,973	44%	3,130,608	-4,101,368	8,421,065
CS Cumulative CTP Cumulative	62 63	500,558	1,023,866	753,472	155,386	21%	8	549,242	597,925	657,584	779,737	811,989	893,075	958,471	11%	1,585,719	-2,394,812	3,948,065

Table 45: IRC – modelling choice: source of LGD – 1-2 modelling factors



	_			Other sta	its						Percentiles						Extreme Values ra	nge (Full Sample)
	Port. ID					Coefficient of variation (STDev/Mean)	Num obs.	5th			50th (Median)		90th	95th	Interquantile range	STDev_trunc ¹		+2*STDev_trunc
Equity	1 2 3 4 5 6 7 8 9 10																	
Interest Rate	11 12 13 14 15 16 17 18 19 20 21 21 22 23	86,506 9,240 413,703 576,793 77,713	293,640 370,866 3,771,783 4,539,342 1,346,554	177,974 116,059 1,626,563 1,672,770 483,089	80,940 120,591 1,322,000 1,248,779 481,723	45% 104% 81% 75%	9 10 8	92,644 17,316 435,027 632,836 88,025	98,781 25,393 456,350 688,878 98,338	117,194 32,527 549,926 987,376 151,647	189,317 54,931 1,109,745 1,442,366 224,978	203,212 142,389 2,650,699 1,662,676 846,083	271,292 3,566,349 2,786,245	275,554 321,079 3,669,066 3,662,793 1,246,350	27% 63% 25% 70%	141,028 269,903 1,192,441 1,876,068 489,694	-92,740 -424,269 -837,879 -1,417,942 -594,247	471,374 655,342 3,931,887 6,086,329 1,364,528
	23 24 25 26	77,713 4,222,717 596,874	1,346,554 6,814,833 6,151,539	483,089 5,618,487 2,211,020	481,723 922,133 1,782,349	100% 16% 81%	8	88,025 4,479,406 696,849	4,736,095	151,647 5,069,736 1,135,565	5,434,130	846,083 6,391,217 2,432,851	6,724,025	1,246,350 6,769,429 5,107,012	70% 12% 36%	489,694 1,619,603 1,943,768	-594,247 1,872,671 -943,684	1,364,528 8,351,084 6,831,387
ĐΧ	27 28 29 30 31 32																	
Commodity	33 34 35																	
Credit Spread	33 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54	24,345 18,387 19,862 18,141 28,495 48,1804 93,834 575,086 31,299 331 1,611 58,522 2,530 14,155 1,607 18,196 156,558 232,768	156.593 116.229 88.289 270.976 88.289 837,266 178,179 1,071,295 238,058 68,244 10,710 479,559 36,735 265,857 221,665 453,471 2,449,442 2,519,254	63,437 63,423 51,399 84,778 59,310 659,587 151,079 708,150 155,503 16,273 5,443 166,273 5,443 166,273 5,443 166,256 12,246 12,256 12,256 12,256 12,256 12,356 12,356 12,356 12,356 12,356 12,356 12,356 12,356 12,356 12,356 12,356 12,356 12,356 12,356 12,356 12,356 12,356 12,356 12,357 14,357 14,35	41,868 27,131 21,795 83,209 19,722 111,650 28,380 156,783 82,590 22,365 3,229 134,918 10,622 86,998 85,317 155,386 655,108 663,213	66% 43% 98% 33% 13% 22% 53% 83% 83% 81% 81% 81% 137% 137% 118% 48%	8 9 7 8 9 9 8 8 8 9 7 7 10 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8	25,429 29,616 22,892 19,860 32,449 524,169 105,617 590,144 38,396 402 1,701 64,343 2,596 16,824 2,475 29,130 382,606 432,706	26,512 40,845 25,922 21,579 36,403 566,534 117,401 605,201 45,493 473 1,791 70,164 2,861 19,493 3,342 40,065 608,855 632,644	36,317 48,509 40,215 33,408 41,909 623,095 143,730 631,530 84,653 1,302 3,632 85,180 3,928 29,685 7,351 57,519 1,241,306 1,241,615	51,960 63,701 51,369 62,119 60,648 640,276 159,567 648,745 192,280 3,062 4,853 131,899 11,506 51,243 13,378 72,326 1,425,5768 1,424,555	85,330 74,912 62,767 89,301 74,667 705,789 170,116 725,086 232,760 24,112 6,908 179,359 12,482 63,613 78,513 150,711 1,515,151 1,580,838	102,995 88,895 72,666 171,480 78,851 786,238 173,180 846,763 235,857 35,991 9,740 280,514 22,514 151,502 210,896 359,854 1,803,433 1,943,468	129,794 102,562 80,478 221,228 83,570 811,752 236,958 51,918 10,225 380,037 29,625 208,679 216,280 466,662 2,126,438 2,231,361	40% 21% 22% 28% 8% 31% 36% 35% 36% 45% 10% 12%	107,614 47,141 23,646 169,213 21,309 187,302 64,926 62,27,380 74,748 37,940 32,491 198,359 19,016 140,906 140,906 140,906 645,309 645,526	-139,629 -24,224 6,209 -268,924 9,761 271,200 38,614 181,323 -55,992 -66,324 -57,495 -282,987 -24,952 -46,525 143,525	290,829 164,339 100,794 412,937 298,316 1,020,407 242,999 85,436 72,471 510,448 51,131 355,895 257,153 510,426 2,725,194 2,725,194
CTP	55 56																	
ALL-IN no-CTP Equity Cumulative IR Cumulative FX Cumulative Commodity Cumulative CS Cumulative	57 58 59 60 61 62	693,050	6,521,420	2,685,777	2,467,321	92%	7	733,835	774,620	1,154,771	1,578,983		6,191,502	6,356,461	54%	3,130,608	-4,101,368 -2,394,812	8,421,065
CS Cumulative CTP Cumulative	62 63	319,665	1,432,213	/8/,962	300,021	38%	10	457,997	596,330	640,083	/31,698	843,996	1,127,815	1,280,014	14%	1,585,719	-2,394,812	3,948,065

Table 46: IRC – modelling choice: source of LGD – >2 modelling factors



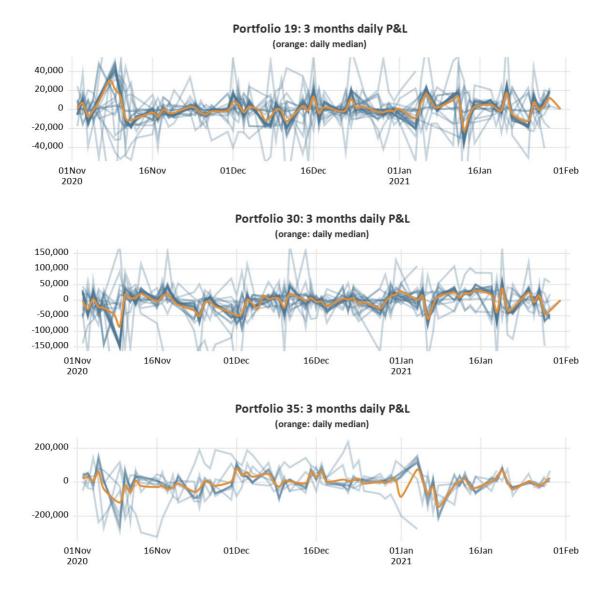
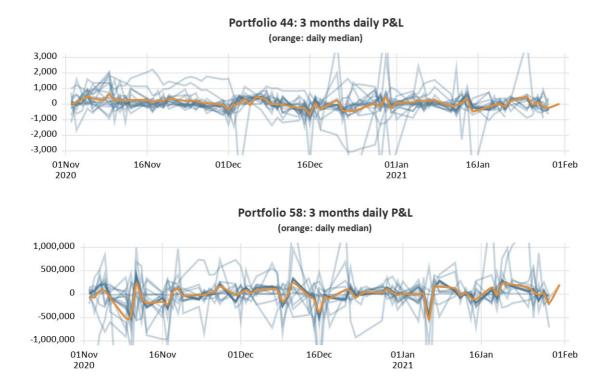


Figure 24: Additional P&L charts with examples of low IQD







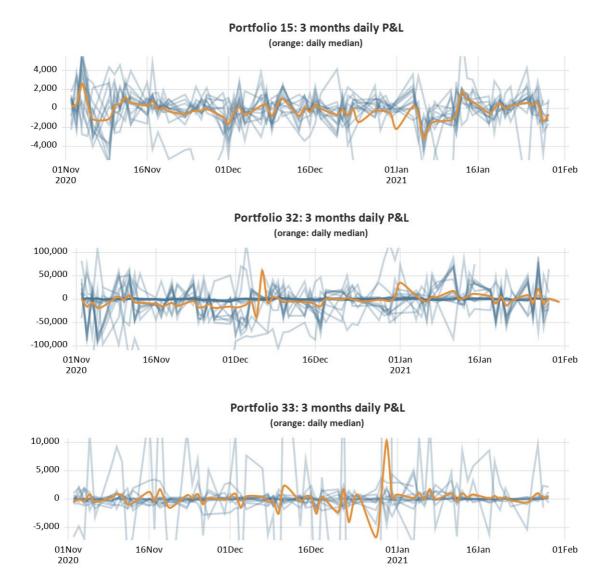
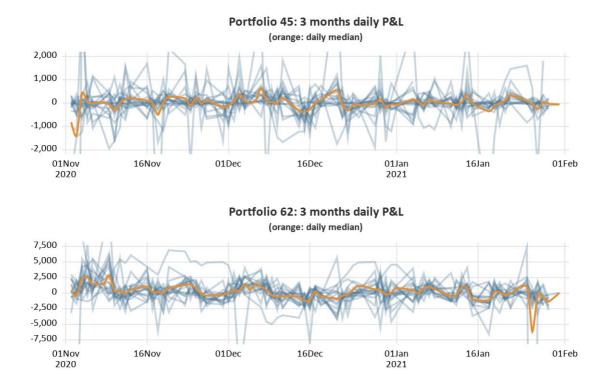


Figure 25: Additional P&L charts with examples of high IQD







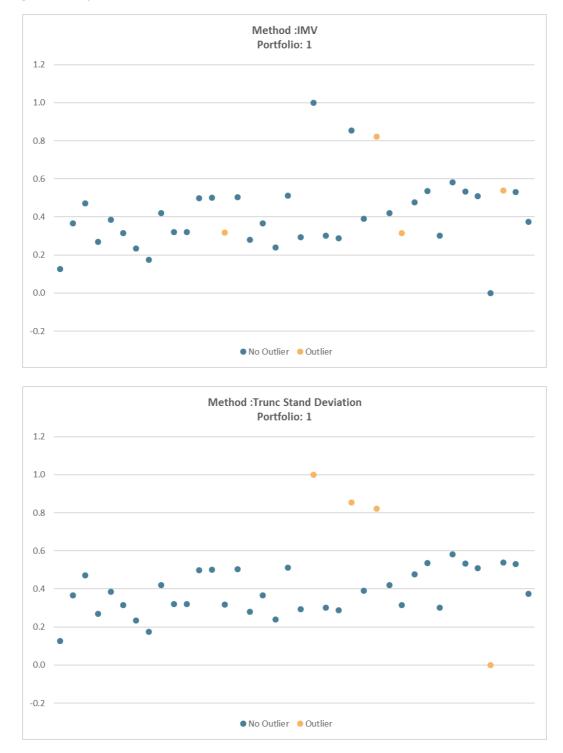


Figure 26: Comparison between IMV and truncated STD deviation method to select outliers for risk measures

Figure 26. Example of dispersion in VaR submission for portfolio 1. Above the chart, marked in yellow: the portfolios which would have been excluded based on the IMV methodology outlier, which was used in 2019 (and before) to detect outliers among risk measures. Below the chart: the same submission, but marked in yellow, indicating the submissions that have been excluded in VaR and benchmarking statistics in the 2020 exercise based on the +/- two times truncated standard deviation of the sample.



9. Annex 2

- 1. In this annex, the difference in VaR figures presented in this 2021 exercise versus the previous one is examined to substantiate the striking increase in the 2021 figures, which present a relatively high dispersion in comparison with the previous exercises.
- 2. Comparing an absolute value of a VaR on the same instruments can be very misleading when the value of that instrument changes substantially over time. In order to mitigate this problem, the PVs of the portfolio for the 2020 and 2021 exercises are compared (see columns PV 2020 and PV 2021 for Table 47). All the PVs on the same portfolios changed from one year to the next. Some moved very little, for example, portfolios 17 and 18 (approximately 0%), while others moved substantially (for example, portfolio 24 +154% in PV).
- 3. All the VaR figures reported increased. The 50th percentile of the VaR (the benchmarking) increased by an average of 147%.
- 4. However, it is sensible to focus on portfolios with very little change in the PV to see what happened to their VaR figures in 2021. Let's take, for example, EQ portfolios 1, 7 and 10. We see an increase in the VaR of +147%, +536%, and +89% for these portfolios.
- 5. Less remarkable, but still quite substantial, are the figures for IR portfolios 17 and 18 (PV +0%), where the VaR increased by 30% and 54%. Many similar examples of the same increase in VaR, with little substantial change in the PV, can be found in the other assets classes, even though this seems more evident for equity portfolios.
- 6. These substantial increases in the VaR figures seem to trigger a higher IDQ index, which is probably more remarkable for directional portfolios, as in most of the portfolios in the benchmarking exercises.
- 7. In Table 48, we see the same data as Table 48 (comparison of VaR figures for the 2020 and 2021 exercise), but now in relative terms (VaR divided by the PV reported).
- 8. This increase in the absolute and relative value of VaR was fully expected since the pandemic outbreak in March 2020.
- 9. Figure 27: VIX Index, for example, report the VIX index of the last four years. We see that for 1/3/2019 28/2/2020, the VIX average was 15.25, with its 99th percentile being 33.17. This period coincides with the VaR window for the 2020 exercise. The same figures for 1/3/2020 28/2/2021 were an average of 30.47, with the 99th percentile coming in at 76.17.
- 10. This substantial jump in volatility is captured by market risk models, which explain the significant increase in the VaR figures submitted. The positive note for the supervisor is that the models respond correctly to more volatile (riskier) situations. The negative aspect of this, which



supervisors should carefully monitor, is that this increased volatility seems to negatively impact the figures' dispersion, making them less precise. Once again, it is worth remembering that these portfolios are mainly directional and that variability would be reduced in the case of hedged portfolios (a situation closer to the reality of the banks' trading books).

11. It is noticeable that this substantial increase in VaR (+147% on average) is not reflected in the stress VaR figures (+5%, on average, from 2020 to 2021). 2021 SVaR figures are remarkably similar to the ones presented in 2020 (see Table 49: Comparison SVaR 2021 – 2021). This was expected because the stress VaR, already reflecting a stressed situation in its figures, is less sensitive to increased market volatility. Indeed, the time windows applied by the majority of the banks reporting the SVaR is still centred around the 2008 economic crisis period. Banks' supervisors endorsed the choice of the same stress period to limit the potential increase in the capital requirement. Therefore, it will be interesting to see in the future exercise if the time window for the stress period will be modified in light of this new stress period, and what impact it will have on the stress VaR figures.

Image: Part Part Part Part Part Part Part Part				PV 2020			PV 2021						VaR 2020				VaR 2021		Ι.				
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1 9.912.00 9.921.00 9.		Port. ID		50th (Median)	75th		50th (Median)			50th (Median)	75th				IQD				IQD	25th	50th (Median)	75th	
1 4 4 5		1	36,431,000	36,431,486	36,463,416	35,131,607	35,142,000	35,204,206	-4%	-4%	-3%	2,242,440	2,606,789	2,901,742	13%	5,137,617	6,451,057	7,941,640	21%	129%	147%	174%	9%
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9 9 99339 99349 99349 99349 91349 </td <td></td> <td>1 - C - C - C - C - C - C - C - C - C -</td> <td>19%</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td>														1 - C - C - C - C - C - C - C - C - C -	19%								
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1 1 12,18 12,28 12,28 12,49 14,29 </td <td></td> <td>11</td> <td></td> <td></td> <td></td> <td></td> <td>-8,576</td> <td></td> <td></td> <td></td> <td>-89%</td> <td>67,286</td> <td>70,167</td> <td>78,717</td> <td>5%</td> <td>73,067</td> <td>95,599</td> <td></td> <td>23%</td> <td>9%</td> <td>36%</td> <td></td> <td></td>		11					-8,576				-89%	67,286	70,167	78,717	5%	73,067	95,599		23%	9%	36%		
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42 10.228 10.0280 10.0			-114,819	-112,579	-111,232	-61,340	-60,110	-59,599				45,947	49,057	54,904	9%	40,295	57,969	65,048					
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Commethy 54 35.725 44.60 9.507 25.003			43,922	52,134			-18,881		-151%	-136%	-45%	16,511	18,449	21,249	13%		374,891	405,302		154%	1932%	1807%	
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1 5.30(3.59) 5.31.216 5.32.3.27 5.05.89 5.51.7.32 5.51.888 4% 4% 48.893 90.015 70.44 1m. 99.38 171.86 24.424 4% 105.91 1.48 10.493 171.86 24.424 4% 105.91 1.48 1.48 10.439 171.86 24.424 4% 105.91 1.48 1.48 10.439 171.86 24.424 4% 105.91 1.48 1.56.97																							
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Commutation Trading 55 71,889 80,936 111,330 Participation 164 162,07,952 162,114-00 15,056,750 162,07,952 162,114-00 15,056,750 162,07,952 162,114-00 15,056,750 162,07,952 162,114-00 15,956,592 16,20,952 162,07,952 162			10,708,803		10,838,600	11,982,461	12,003,397	12,032,779	12%	12%	11%		162,668	209,469	37%	154,677	295,230	494,060	52%	61%		136%	15%
56 16.207952 16.2114/20 16.306.07 22.202 555.25 40.39 20% 74 75 16.306.07 ALH-Inscription 57 14.458.45 14.512.25 15.214.20 15.226.00 16.500.57 11.99 12% 13.04.5 13.237.85 76 2.327.90 12% 2.40.20 12.24.15 3.24.008 2.48.55 1.07.90 11% 12% 1.04.58 1.037.85 78 57.96 11% 1.02.97.92 2.00.08 2.48.55 2.701.26 98 1.075.97.97 11% 1.04.57 1.17.990.07 2.24 44% 45% 1.104.27 1.137.99 11% 2.24.008 2.48.55 2.701.26 98 1.00% 98% 1.05% 1.07% 3.07 3.07.41 1.37.97.09 11% 2.24.008 2.48.55 2.701.26 98 1.00% 98% 1.00% 98% 1.05% 1.05% 1.07% 3.07 1.01% 1.01% 1.01% 1.01% 1.01% 1.01% 1.01%																							
All-MinocCPT ** 57 14,168,845 14,814,243 15,132,655 15,965,892 16,226,600 16,303,595 13% 10% 12% 1,340,285 1,461,3148 1,523,755 7% 2,323,791 2,897,392 2,241,048 16% 7% 9% 11% 12% 1,340,285 1,461,448 1,512,655 7% 2,323,791 2,897,392 2,241,048 16% 7% 9% 11% 12% 1,340,285 1,461,448 1,512,975 7% 2,323,791 2,287,392 2,241,048 16% 7% 5% 3/14 3/74 3	Correlation Trading																						
Combine*** 65 R441.500 R044.008 R122.253 10.074.971 11.799.000 2% 34% 45% 1.014.247 1.124.587 1.377.000 11x 2.44.059 2.44.559 2.012.56 91 105% 105% 95% 34% 45% 1.014.247 1.244.587 1.377.000 11x 2.240.08 2.445.599 2.012.56 91 105% 95% 35%	ALL-IN no-CTP **					15.965.892	16.226.600	16.903.595	13%	10%	12%				7%	2.329.791	2.897.392	3.241.084	16%	74%	98%	112%	148%
PXConnucbute ** 62 1.3462.15 1.402.545 1.478.00 -286.875 -256.075 -1197.146 -112% 556.999 553.993 713.688 125 914.180 1.015.840 1.166.771 128 645 555 655 655 915 914.180 1.015.840 1.166.771 128 645 655 655 915 914.180 1.015.840 1.166.771 128 645 655 655 915 914.180 1.015.840 1.166.771 128 645 655 756 655 655 756 655 756 756 655 756 756 756 756 756 756 756 756 756 756 756 756 756 756 756 756 756 756			8,041,560	8,048,098	8,122,353	10,649,963	10,754,577	11,799,005	32%	34%	45%	1,104,267	1,243,587	1,377,009		2,240,008	2,485,599	2,701,250	9%	103%	100%	96%	-15%
Commodity Canulative ** 61 55,953 59,097 44,103 265,529 263,842 272,423 633% 575% 518% 250,975 257,987 296,651 8% 651,805 784,658 914,573 17% 160% 204% 206% 101% C3 Canulative ** 62 3,198,923 3,206,175 3,207,947 3,173,843 3,174,862 3,176,713 1% 1.1% 1.1% 1.1% 1.1% 1.5698 19,745 17% 30,217 44,556 52,769 27% 1.14% 1.84% 167% 64%																							
CS Cumulative ** 62 3,198,929 3,206,175 3,207,347 3,175,848 3,176,842 3,176,113 -115 -115 -115 -115 -115 -115 -115 -			-,,														-,,						
						2,210,010	2,27 1,002	2,270,720	2.10	2.0						00,017	11,000	52,705			23110		

Table 47: Comparison VaR 2021 – 2021

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		1	1	/aR 2020				VaR 2021		1				ľ
Cho	inge 2021-2	020		Percentiles				Percentiles	5		Cho	inge 20	21-202	20
	50th (Median)	75th	25th	50th	75th	IQD	25th	50th	75th	IQD	25th	50th	75th	
-4%	-4%	-3%	6%	7%	8%	13%	15%	18%	23%	21%	138%	(Median) 157%	183%	9%
-14%	-17%	-17%	7%	8%	9%		19%	22%	28%	16%	178%	192%	221%	
-61%	-62%	-62%	44%	52%	61%	16%	87%	95%	110%	9%	100%	83%	81%	
31% 21%	32% 21%	41% 21%	12% 7%	21% 7%	30% 8%	46% 8%	33%	57%	56% 14%	33% 9%	168% 81%	177% 71%	83% 85%	
57%	58%	58%	54%	72%	88%	20%	12% 22%	12% 38%	48%	34%	-58%	-47%	-45%	
-4%	-3%	-3%	1%	1%	1%	19%	4%	7%	12%	48%	398%	558%	865%	
40%	43%	41%	43%	63%	71%	27%	35%	56%	72%	37%	-19%	-11%	1%	
-28% -7%	-28% -7%	-28% -7%	8% 12%	9% 13%	10% 14%	12% 4%	17% 25%	22%	28% 31%	26% 10%	107% 101%	155% 104%	177% 128%	14% 6%
-88%	-89%	-89%	88%	94%	14%	5%	777%	1115%	1444%	23%	785%	1090%	1347%	
37%	38%	40%	91%	110%	124%	13%	92%	111%	125%	14%	1%	1%	1%	
-187%	-180%	-173%	190%	191%	196%	8%	171%	191%	219%	10%	-10%	0%	12%	
-117% 3%	-115% 3%	-114% 2%	65% 1%	67% 1%	69% 1%	5% 18%	321% 2%	427%	554% 3%	18% 24%	396% 78%	534% 82%	706% 105%	
-2%	-2%	-2%	2%	2%	2%	5%	2%	3%	3%	19%	12%	36%	51%	
0%	0%	0%	2%	2%	2%	9%	3%	3%	4%		34%	29%	81%	
1%	0%	0%	11%	13%	15%	22%	18%	19%	25%	19%	70%	54%	62%	
-70% 59%	-67% 63%	-66% 66%	289%	290%	283%	5%	958%	967%	930%	11%	232% 5%	234% 1%	228% -18%	
-95%	-94%	-92%	25% 148%	29% 151%	40% 162%	19% 7%	26% 2771%	29% 2608%	32% 2175%	9% 11%	1774%	1622%	1239%	-10%
-47%	-47%	-46%	40%	44%	49%	9%	66%	96%	109%	23%	64%	121%	121%	
-2%	-2%	-2%	2%	2%	2%	9%	2%	2%	2%	10%	-10%	-8%	-8%	1%
180%	154%	109%	31%	44%	50%	39%	13%	28%	40%	51%	-56%	-36%	-20%	
5% 0%	5% 0%	5% 0%	0% 2%	0% 2%	1% 2%	30% 11%	0% 3%	1% 3%	1% 4%	17% 26%	45% 47%	29% 58%	10% 101%	
-212%	-210%	-209%	84%	92%	98%	8%	90%	103%	125%	16%	7%	13%	28%	7%
-5%	-5%	-5%	1%	1%	1%	16%	2%	4%	4%	32%	111%	173%	200%	17%
4%	4%	3%	9%	12%	13%	20%	11%	13%	15%	15%	27%	10%	16%	-5%
-13% 36%	-13% 36%	-13% 36%	33% 29%	36% 31%	38% 32%	7% 5%	50% 38%	53% 41%	58% 44%	8% 8%	51% 31%	49% 32%	53% 38%	
-151%	-136%	-45%	38%	35%	32%	13%	189%	1986%	1119%	81%	402%	5511%	3388%	
-202%	-335%	376400%	202%	536%	522500%	35%	678%	962%	445%	32%	235%	79%	-100%	-3%
631%	490%	485%	705%	586%	659%	8%	247%	310%	348%	17%	-65%	-47%	-47%	9%
-391% -174%	-372% -171%	-355% -165%	183% 297%	223% 379%	241% 446%	17% 24%	234% 570%	254% 953%	285% 1178%	7% 33%	28% 92%	14% 152%	19% 164%	-10% 9%
-351%	-365%	-374%	129%	171%	191%	16%	246%	310%	499%	35%	91%	81%	162%	
-9%	-9%	-9%	27%	32%	39%	18%	70%	120%	171%	42%	157%	275%	337%	
28%	27%	26%	48%	52%	55%	8%	87%	148%	220%	44%	82%	183%	303%	
12% -17%	11% -17%	11% -17%	95% 13%	117% 16%	134% 18%	18% 16%	209% 36%	261% 50%	346% 80%	26% 39%	119% 173%	124% 208%	159% 356%	7% 23%
3%	3%	3%	1%	2%	2%	13%	3%	3%	5%	30%	75%	102%	151%	
-1%	-1%	-1%	0%	0%	1%	18%	1%	1%	1%	26%	78%	140%	112%	8%
24%	25%	24%	24%	27%	29%		35%	54%	60%		46%	96%	105%	
0% -1%	0% -1%	0% -1%	0% 0%	1% 1%	1% 1%		0% 1%	1% 2%	2% 2%		33% 61%	134% 186%	128% 204%	
-1%	-2%	-2%	5%	7%	11%		9%	14%	19%		80%	87%	68%	
96%	86%	84%	77%	92%	99%		96%	137%	155%		24%	50%	57%	
20%	19%	22%	32%	37%	70%		96%	138%	201%		196%	271%	186%	
-2% 4%	-2% 4%	-2% 4%	1% 1%	2% 1%	2% 1%		1% 2%	2% 3%	2% 4%		15% 96%	27% 181%	6% 231%	
20%	20%	18%	1%	2%	2%		2%	3%	4%		11%	36%	62%	
12%	12%	11%	1%	2%	2%	37%	1%	2%	4%	52%	44%	63%	112%	15%
			1%	2%	2%									
			7% 2%	20% 2%	20% 3%	64% 20%								
13%	10%	12%	2%	10%	10%	7%	15%	18%	19%	16%	54%	81%	90%	148%
32%	34%	45%	14%	15%	17%		21%	23%	23%	9%	53%	50%		-15%
-4%	-7%	-5%	14%	16%	17%		22%	23%	25%		58%	47%		-32%
-121% 633%	-118% 575%	-113% 518%	41% 698%	47% 660%	48% 673%	12% 8%	-319% 247%	-394% 297%	-592% 336%		-881% -65%	-944% -55%	-1326%	-2% 101%
-1%	-1%	-1%	0%	0%	673%		247%	297%	2%		-05% 115%	-55% 187%	-30% 170%	
			2%	3%	3%									

Table 48: Comparison VaR 2021 – 2021 (VaR/PV %)



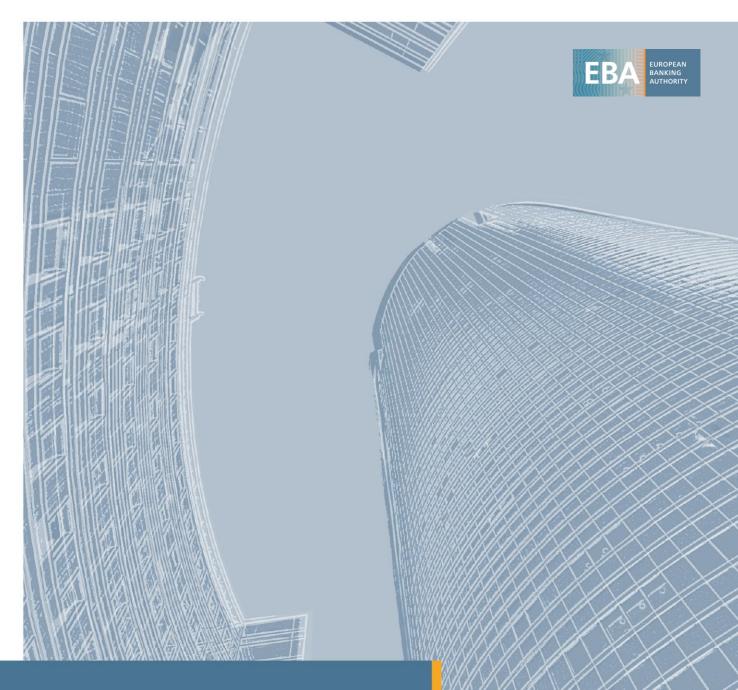
Figure 27: VIX Index





Table 49: Comparison SVaR 2021 – 2021

	- 1		PV 2020			PV 2021		I		1	5	VaR 2020				SVaR 2021		I				ļ
		1	Percentiles			Percentiles		Che	ange 2021-2	020	F	Percentiles				Percentiles			Cha	inge 202	21-202	0
	Port. ID	25th	50th (Median)	75th	25th	50th (Median)		25th	50th (Median)	75th	25th	50th		IQD		50th		IQD	25th	50th (Median)	75th	
	1	36,431,000	36,431,486	36,463,416	35,131,607	35,142,000	35,204,206	-4%	-4%	-3%	6,947,230	7,350,416	8,313,255	9%	6,215,008	6,841,100	7,954,286		-11%	- 7%	-4%	3%
		-30,133,278	-30,076,236	-30,021,066 -37,988	-25,929,815 -14 980	-25,111,408	-24,875,683	-14% -61%	-17% -62%	-17% -62%	8,041,047	9,923,012 31,355	13,473,337	25% 29%	5,853,941 10,644	7,956,103	11,481,081 19,356		-27%	-20%	-15%	7% 0%
		3,267	3,410	3,598	4,278	4,513	5,061	31%	32%	41%	497	815	1,668	54%	1,264	2,695	3,140	43%	154%	231%		-11%
		-11,697,799,988 - -49.850	11,677,500,000 -48,534	-11,662,359,679 -46.073	-14,194,000,000 -78,126	-14,128,853,403 -76,495	-14,127,134,239 -72,852	21% 57%	21% 58%	21% 58%	35,493	53.285	66.808	13% 31%	1,586,201,465	2,859,881,740 34.164	3,502,526,298	38%	-33% -28%	12% -36%	14% -37%	25% -6%
		-49,850	1,068,429	-46,073	-/8,126	1,033,185	-72,852 1,040,377	-4%	-3%	-3%	35,493 27,189	41,222	66,808 71,123	31% 45%	25,672 46,298	34,164 67,354	42,353 83,499	25%	-28%	-30%	-37%	
		153,905	156,839	163,108	215,563	224,404	229,945	40%	43%	41%	90,606	125,258	164,454	29%	74,025	98,048	118,571	23%	-18%	-22%	-28%	-6%
		698,391 -2,171,191	699,838 -2.164.120	700,600	505,942 -2.011.096	506,285 -2.004.216	507,147 -1.974,799	-28% -7%	-28% -7%	-28% -7%	91,600 820,534	121,201 1.018.607	140,212	21%	79,647	99,098 937,770	124,988 1,084,500	22%	-13% -19%	-18%	-11%	1% 8%
	10	-2,171,191	-2,164,120	-2,155,141 -73,892	-2,011,098	-2,004,216	-1,974,799 -8,017	-88%	-89%	-89%	149,362	205,441	246,559	25%	123,625	169,200	230,218	30%	-15%	-18%	-7%	6%
		-38,148	-37,470	-36,592	-52,196	-51,589	-51,081	37%	38%	40%	44,111	79,686	103,057	40%	59,089	100,301	119,126	34%	34%	26%	16%	-6%
		73,186 40,400	77,710 41,342	82,660 41,854	-63,437 -6,983	-62,109 -6,036	-60,604 -5,778	-187% -117%	-180% -115%	-173% -114%	242,695 56,281	309,168 80,747	377,092 102,100	22%	145,319 28,123	269,251 74,888	357,841 94,655	42% 54%	-40%	-13% -7%		21% 25%
		1,064,734	1,097,302	1,118,071	1,099,089	1,129,958	1,143,052	3%	3%	2%	28,193	62,709	98,664	56%	44,811	70,364	109,076	42%	59%	12%	11%	
		5,160,907	5,161,821	5,164,170	5,046,850	5,049,247	5,050,328	-2%	-2%	-2%	151,031	193,890	219,922	19%	153,969	184,723	206,143	14%	2%	-5%	-6%	-4%
		2 181 498	2,336,986	10,879,521 2,340,570	10,779,497 2 199 373	10,921,039 2,337,499	2 341 741	0% 1%	0%	0% 0%	243,025	368,887	419,228	27%	258,499	346,162 317,639	401,411 359,011	22%	6% 0%	-6% -2%	-4% 3%	-5% 2%
		48,089	2,336,986 51,000	2,540,570 54,755	2,199,575	2,557,499	2,541,741 18,708	-70%	-67%	-66%	228,258	293,322	349,151	21%	180,905	286,803	326,225	22%	-20%	-2%	-7%	7%
		-14,508	-13,965	-13,477	-23,037	-22,775	-22,400	59%	63%	66%	8,018	14,728	18,858	40%	7,328	13,266	15,313	35%	-9%	-10%	-19%	-5%
		183,501 -114,819	185,933 -112,579	190,282 -111.232	9,503 -61,340	11,798 -60,110	15,170	-95% -47%	-94% -47%	-92% -46%	545,080 98.117	637,169 155.659	711,042 209,666	13% 36%	303,712 89.835	556,633 137,382	687,340 172,760	39% 32%	-44% -8%	-13% -12%	-3% -18%	25% -5%
		7,428,514	7,431,579	7,432,807	7,311,689	7,312,657	7,313,936	-2%	-2%	-2%	235,634	283,767	322,728	16%	173,186	238,431	272,488	22%	-27%	-16%	-16%	7%
		382,230	434,454	530,285	1,070,620	1,101,953	1,107,252	180%	154%	109%	257,926	536,764	844,886	53%	161,458	328,636	506,373	52%	-37%	-39%	-40%	-2% 4%
		-10,298,401 19,911,090	-10,294,205 20,083,909	-10,290,401 20,087,777	-10,844,400 19,888,782	-10,842,384 20,114,330	-10,839,225 20,121,345	5%	5% 0%	5% 0%	85,993 367,426	164,733 629,736	199,388 702,494	40% 31%	74,380 373,583	162,668 569,632	188,805	43% 24%	-14% 2%	-1%	-5%	4% -7%
	27	520,913	528,610	530,832	-583,637	-581,788	-577,522	-212%	-210%	-209%	1,169,136	1,369,184	1,689,576	18%	628,769	800,960	879,592	17%	-46%	-42%	-48%	-2%
		911,740	912,972	915,083	864,696	865,634	866,912	-5%	-5%	-5%	16,749	29,340	33,382	33%	11,524	22,461	27,970	42%	-31%	-23%	-16%	8%
		901,853 865,999	902,951 872,648	905,434 876,210	934,630 756,501	935,737 758,970	936,703 759,781	4% -13%	4% -13%	3% -13%	343,143 744,213	394,746 951,282	443,121 1.123.236	13% 20%	194,733 650,911	239,365 880,238	285,926	19% 22%	-43% -13%	-39% -7%	-35% -8%	6% 2%
		-947,826	-942,466	-940,506	-1,287,284	-1,284,522	-1,282,555	36%	36%	36%	942,746	1,059,293	1,277,546	15%	973,626	1,078,292	1,337,679	16%	3%	2%	5%	1%
	32 33	43,922	52,134	66,206	-22,209	-18,881	36,208	-151%	-136%	-45% 376400%	112,875	138,100	148,264	14%	140,791	415,140	869,729	72%	25% 26%	201%	487%	59% -7%
		-2,503 35,725	-1,256 44,609	-2 45,027	2,553 261,053	2,946 262,982	7,526 263,587	631%	-335%	485%	13,771 396,164	20,366 437,489	27,357 491,795	33%	17,331 380,288	27,513 422,751	29,821 550,608	26%	-4%	-3%	12%	- 7%
	35	126,296	134,236	136,197	-367,500	-364,725	-347,763	-391%	-372%	-355%	1,018,879	1,066,925	1,154,506	6%	1,024,511	1,255,185	1,288,699	11%	1%	18%	12%	5%
		4,384	4,520	4,756	-3,261	-3,224	-3,110	-174% -351%	-171% -365%	-165% -374%	15,473	22,234	25,915	25%	16,214	21,694	25,670	23% 32%	5% 60%	-2% 108%	-1% 57%	-3% -1%
		-11,231 9,848	-10,748 9,912	-10,541 9,943	28,167 8,978	28,468 8,999	28,839 9,060	-351%	-365%	-374%	41,286 7,448	52,649 16,332	82,188 19,981	33% 46%	65,973 8,888	109,723 19,482	128,736 21,019	32% 41%	19%	108%	57%	-1%
		19,326	19,634	19,739	24,730	24,847	24,921	28%	27%	26%	19,919	31,997	43,284	37%	25,293	44,629	53,105	35%	27%	39%	23%	-1%
		3,851 45,877	3,918 46.148	3,944 46,482	4,302 38,157	4,337 38,262	4,369 38,488	12% -17%	11% -17%	11% -17%	11,345 16.111	16,599 38,463	23,881 43.062	36% 46%	12,531 17,873	20,798 38,859	32,672 45,739	45% 44%	10% 11%	25% 1%	37% 6%	9% -2%
		45,877	40,148	46,482	1,167,993	1,169,583	1,170,577	-1/76	-17%	-1/%	39,210	49,192	45,062 84,781	40% 37%	39,150	54,079	45,759	44%	0%	10%	20%	-276
		3,145,384	3,149,772	3,150,762	3,125,689	3,127,684	3,128,078	-1%	-1%	-1%	36,878	65,329	73,948	33%	24,613	45,347	66,280	46%	-33%	-31%		12%
		23,721 996.625	23,969	24,080 1.001.389	29,517	29,877 996 313	29,931 997.163	24%	25%	24%	14,977	22,059	25,230	26% 38%	11,729	23,565	32,487 21,744	47% 89%	-22% -25%	7% -3%	29% -23%	21% 1%
		1,048,862	1,051,841	1,001,589	1,037,558	1,038,146	1,038,263	-1%	-1%	-1%	12,816	18,881	28,588	23%	9,652	14,932	16,442	21%	-25%	-21%	-23%	-2%
		34,471	34,656	34,832	33,985	34,040	34,213	-1%	-2%	-2%	7,663	9,200	13,016	26%	8,174	9,158	10,858	14%	7%	0%		-12%
		9,718 -10,480	10,596 -10,430	10,806 -10,106	19,009 -12,558	19,744 -12,426	19,895 -12,346	96% 20%	86%	84% 22%	21,591 8,028	30,908 13,452	39,116 16.583	29% 35%	23,979 9,261	35,242 15,669	39,661 18,109	25% 32%	11%	14% 16%	1% 9%	-4% -2%
		1,190,921	1,192,143	1,192,529	1,162,201	1,162,970	1,163,027	-2%	-2%	-2%	24,267	29,355	32,503	15%	15,487	21,856	24,341	22%	-36%	-26%	-25%	8%
		5,308,539	5,317,156	5,323,175	5,505,639	5,517,332	5,519,888	4%	4%	4%	129,378	188,252	243,403	31%	126,487	214,609	257,125	34%	-2%	14%	6%	3%
		5,406,716 10,708,803	5,429,206 10,753,799	5,516,325 10,838,600	6,474,683 11,982,461	6,498,353 12,003,397	6,514,043 12,032,779	20% 12%	20% 12%	18% 11%	166,510 294,170	404,573	588,499 670.692	56% 39%	148,602 284,690	222,730 394,561	329,676 548,182	38% 32%	-11% -3%	-45% -16%	-44% -18%	-18% -7%
	54	10,708,803	164,279	10,838,800	11,902,401	12,003,597	12,052,775	1270	1270	1176	8,278	9,937	13,163	23%	284,090	394,501	546,162	5279	-576	-10%	-10/0	-770
		71,898	80,936	111,330							15,010	44,280	46,496	51%								ļ
ALL-IN no-CTP **	56 57	16,207,952	16,211,420	16,306,076	45.000 000	40.000 000	46.000	1381	1007	1224	753,735	790,287	1,136,244	20%	5 0 C 0 C 2 C	5 000 CT.	C (00		-6%	222	2451	e
ALL-IN no-CTP ** Equity Cumulative **		14,168,843 8,041,560	14,814,243 8,048,098	15,132,655 8,122,353	15,965,892 10,649,963	16,226,600 10,754,577	16,903,595 11,799,005	13% 32%	10% 34%	12% 45%	5,390,844 5,356,707	6,782,089 5,502,078	7,368,934 5,914,045	16% 5%	5,068,003 3,207,624	5,308,371 4,601,705	5,609,074 5,194,615	5% 24%	-6%	-22% -16%	-24% -12%	
		2,168,195	2,406,953	2,414,556	2,071,558	2,241,469	2,294,143	-4%	-7%	-5%	400,218	557,634	568,104	17%	426,682	566,688	644,803	20%	7%	2%	14%	17%
FX Cumulative **		1,364,215	1,402,545	1,478,206	-286,875	-258,075	-197,146	-121%	-118%	-113%	2,260,903	2,588,491	2,911,955	13%	1,830,291	2,196,709	2,655,674	18%	-19%	-15%		46%
Commodity Cumulative ** CS Cumulative **		35,953 3,198,929	39,097 3,206,175	44,103 3,207,347	263,529 3,173,843	263,842 3,174,862	272,492 3,176,713	633% -1%	575% -1%	518% -1%	394,089 45,174	436,287 65,592	500,715 84,678	12% 30%	381,274 37,629	420,049 58,026	548,587 65,861	18% 27%	-3%	-4% -12%	10% -22%	
CTP Cumulative **		14,813,890	14,852,058	14,875,601	.,,	.,,	.,,, xo			210	871,976	1,030,672	1,045,198	9%								



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