EBA REPORT
RESULTS FROM THE 2020 MARKET RISK BENCHMARKING EXERCISE

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EUROPEAN BANKING AUTHORITY

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Abbreviations

APR	all price risk
CA	competent authority
CDS	credit default swap
CO	commodities
CRD	Capital Requirements Directive
CRR	Capital Requirements Regulation
CS	credit spread
CS01	credit spread value of 1 basis point changes
CTP	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

1. This report presents the results of the 2020 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).

2. The report summarises the conclusions drawn from a hypothetical portfolio exercise (HPE) that was conducted by the EBA during 2019/20. 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 54 European banks from 14 jurisdictions. The relevant institutions submitted data for 73 instruments recombined in 59 market portfolios in 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 in 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 2020 exercise, no interviews with banks were carried out. There were several reasons for this, including the following: problematic model in the process of decommissioning, inspection already ongoing, issues already clarified during preceding exercises, limited resources available to banks/CAs due to Covid-19 outbreaks. The issues detected in the benchmarking exercise were nonetheless considered and addressed, where possible, by banks and CAs. Moreover, CAs and the EBA still 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 needs to be monitored.

7. The primary considerations are that the 2020 analysis shows a reduction in the dispersion in the initial market valuation (IMV) with respect to the 2019 exercises with regard to the equity, interest rate and credit spread asset classes; see, for instance, Table 1. This improvement was expected and reflects the instruments' simplification as applied in the 2019 exercise: the instruments in this exercise consist of more plain vanilla instruments than in the previous (2016-2018) exercises. Also, a natural improvement in the understanding of the instruments in the exercise is expected from the first to the second exercise. Nonetheless, some variability in the results – in the FX and commodity asset class – persists despite the simplification; this mainly stems from the fact that a few instruments appear to have been understood differently by a minority of banks, which pushed up the dispersion coefficients. Some of these issues were addressed, where possible, and the quality of the data has improved during the exercise thanks to subsequent resubmissions.

8. As in previous exercises, data quality is still an issue in this exercise. There are a wide variety of reasons for low data quality. Some types of errors are trivial, such as the wrong unit reported, especially in the case of equity instruments. In order to improve 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. Other errors were linked to the misunderstanding of some instruments, such as instruments 38, 39 and 47. The redraft of the legal text of the exercise in time for the next exercise should further improve the data quality in these respects.

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).

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[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.

10. From a risk factor perspective, equity, interest rate and FX portfolios exhibit a lower level of dispersion than the commodity and credit Spread asset classes. This lower level of variability is likely to be due to the use of more consistent practices and assumptions that are more homogeneous across the banks (see Table 4: Interquartile dispersion for IMV and risk metrics by risk factor).

11. Regarding the single risk measures, across all asset classes except for commodity the overall variability for value at risk (VaR) is lower than the observed variability for stressed VaR (sVaR) (18% and 29% respectively, compared with 21% and 30% in 2019).[3] More complex measures such as incremental risk charge (IRC) and all price risk (APR) show a higher level of dispersion (49% and 45% respectively, compared with 54% and 37% in 2019). We would point out that a direct comparison between 2019 and 2020 IQDs is 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, we find a slight decrease in the IQD when considering a more homogeneous sample (i.e. HS banks only). In fact, for all the risk types, the dispersion observed for the P&L VaR tends to be lower. 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. Scaled 10-day VaR and the use of a lookback period greater than one year tend to produce lower dispersion than other modelling configurations for EQ, FX and CS. In terms of conservativeness, the calibration of more than one year seems to produce even more conservative results, at least for EQ, FX and CS (see Table 7: Average regulatory VaR by modelling choice). This observation differs from the finding of the 2019 exercise, which was run

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

over 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 generalise the results.

15. 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 challenged in 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, in 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 0.75 to 8.15). However, on average, the ratio comes in at around 2.9 (see Table 25: sVaR/VaR statistics).

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 in 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 2020 exercise, EBA notices a reduction of the VaR dispersion, which is generally below 20% IQD, except for the CS asset class (see Table 21: VaR statistics). Some single portfolios exhibit a significantly high dispersion, but in many cases this is driven by a substantially low value of the VaR in terms of absolute numbers, which tends to exacerbate the IQD figure. The aggregate portfolios also feature notably low levels of IQDs.

18. Regarding IRC, 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 (49%). This high variability is slightly lower than in the previous exercise – IQD was 54% on average in the 2019 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 non-market conventions to the source of LGD seems to reduce the dispersion of the IRC. In any case, these results need to be further tested in future exercises.

19. Regarding APR, average variability (as measured by the average IQD for this category of portfolios) is noticeably high in relation to the other metrics considered in the report (45%). However, the APR assessment suffers from a chronic lack of contributions – only a few banks are authorised to model this asset class internally and most banks are currently in the process of reducing their exposure to correlation trading portfolios (CTPs), i.e. these portfolios are supposed to be in run-down mode (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 of 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 an 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 21%), especially for the most complex portfolios in the credit spread asset class. This dispersion slightly decreases when considering more a homogenous capital proxy (20% applying 3 as the multiplier, and 17% 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 in the 2020 exercise

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 developed further in comparison with the 2019 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 smaller banks tend to produce slightly more dispersed results (see Table 8: Asset class comparison for VaR in terms of size of the banks). On the other hand, when considering the size in terms of the trading book (as a ratio of total assets), the smaller the trading book, the (slightly) smaller the dispersion (on average).

26. The discrimination based upon the business model did not deliver strong conclusions. As in the last exercise, the EBA applied as a discriminant the internal classification of banks, 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 developed 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' asset and liabilities ratio in the bank's trading book.

27. The subsamples 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 (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 what was expected and reported last year, 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. The 2020 Report also features the introduction of PV statistics (see Table 42). The PVs reported have generally low IQDs, and they were useful in distinguishing true outliers and outliers due to mispricing of the portfolios. Further analysis and application of the PV are expected in the future.

1.2 CAs' assessments based on supervisory benchmarks

30. CAs shared the outcomes of their assessments at 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 great 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 the future exercises.

1.3 2021 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 have 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 from 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 the outliers for the risk measures.

35. For the 2021 exercise, the EBA expects a further improvement in terms of the data quality in the submissions because of the further clarification provided in the 2021 ITS compared to the 2020 ITS. Moreover, the banks participating in the 2021 exercise can benefit from the 2019 benchmarking report that was published at the start of 2020.

36. The analysis run by the EBA for the 2021 exercise is expected to be relatively stable, and the EBA will try to deepen the assessment of the new elements introduced this year, especially the Present Value submission.

37. 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. 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, 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

38. 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 aimed at reducing uncertainty and differences in the calculation of capital requirements.

39. 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 to share this evidence within colleges of supervisors as appropriate and take appropriate corrective actions to overcome these drawbacks when deemed necessary. Directive (EU) 2019/878[4] of the European Parliament and of the Council of 20 May 2019 amending Capital Requirements Directive IV (CRD V) has not changed this mandate.

40. The EBA has devoted significant efforts 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.

41. 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.

42. This MR benchmarking exercise is an MRWA variability assessment performed over a large sample of banks (54 banks at the highest level of consolidation in 14 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.

43. 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 value of indexes.

44. 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 it 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.

45. 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.

46. 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.

47. 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.

48. 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.

49. Regulation (EU) 2019/876[5] 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

50. Based on the EBA Benchmarking ITS, the MR benchmarking exercise is carried out 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

51. 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 in 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 (11 instruments and six individual portfolios), CO (four instruments and three individual portfolios) and CS (21 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.

52. 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 of the initial valuation date (spread hedged). No further re-hedging is required.

53. A more detailed explanation of the portfolios can be found in the Benchmarking ITS on the EBA website.[6]

3.2 Data collection process

54. 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

55. The reference date for IMV was 26 September 2019, 5.30 p.m. CET. Banks entered all positions on 19 September 2019 ('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.

56. The IMV figure to be reported by the banks for each hypothetical instrument was defined as the mark to market of the instrument at 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 26 September 2019, 5:30 p.m. CET.

3.2.2 Risk measures

57. Pursuant to the common instructions provided, banks should calculate the risks of the positions without taking into account the funding costs associated with the portfolios (i.e. no assumptions are admitted with regard to the funding means of the portfolios). Moreover, banks should exclude, as far as possible, counterparty credit risk when valuing the risks of the portfolios.

58. Banks should calculate the regulatory 10-day 99% VaR on a daily basis. sVaR and IRC may be calculated on a weekly basis. sVaR and IRC should 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.

59. 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.

60. 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.

[6] https://eba.europa.eu/regulation-and-policy/supervisory-benchmarking-exercises/its-package-for-2020-benchmarking-exercise. 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 (https://eur-lex.europa.eu/legal-content/EN/TXT/?qid=1562830373986&uri=CELEX:32019R0439).

3.3 Participating banks

61. A total of 54 banks representing 14 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.

62. 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

63. 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.

64. IMV results reached the EBA in November/December 2019, 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.

65. The issue experienced in the previous exercise linked to the aggregated portfolio figures was fixed. It should be recalled that some banks reported the IMVs and risk measures for the aggregated portfolios without including all 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 has been addressed in the 2019 exercise, since banks have reported the results for the aggregated 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 in a plurality of individual portfolios, which are themselves

[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.

[9] Annex 5, Market risk 2020 BM, Section 1 (Common instructions), letter (ee).

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 bias the risk measures analysis.

66. In the data analysis, it was clear that errors in the interpretation of some instructions and instruments are 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: the problems are mainly due to the decision to put in a footnote the fact that the future positions should be multiplied by 100 contracts. Luckily, the errors generated by this drafting decision were easy to detect and fix by resubmission. The instruction in the 2020 ITS was amended such that this error should not be repeated in that exercise.

- Interest rates: good results were obtained, especially where the International Securities Identification Number was available. Minor errors were identified, such as reporting P&L instead of mark to market, or wrong bookings (i.e. long position instead of short, or vice versa).

- FX: the only problematic instruments were 39 and 40, but the errors are quite easy to fix. Instrument 39 has been wrongly booked in many cases (i.e. short position instead of long). Instrument 40 was by far the most misrepresented: 25 out of 40 submissions were wrong. Luckily the error is quite trivial, i.e. banks reported the P&L or zero instead of the mark to market of the position. The instructions of the 2020 ITS were amended such that this error should not be repeated in that exercise.

- Credit spread: good results in terms of CV and IQD, with very few mistakes such as evidently wrong bookings (i.e. IMVs 1,000 times the benchmark) or long position instead of short, or vice versa.

- P&L submission: it has been noted that several banks reported the P&L even though they were not required to do so, while others did not report it even though this was a requirement. Only banks with historical simulation models have to report the P&L vectors in order to produce a consistent analysis of the risk measures. Furthermore, even though it was very well specified, some banks reported a 10-day P&L vector instead of the 1-day P&L. Although easy to spot, this mistake involved resubmissions of the result, and two banks' submissions were excluded because of this. Moreover, the P&L series 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.

67. Although a large number of 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 submission could still be present in the dataset analysed, and this can potentially drive and pollute the results.

68. Ensuring data quality is a fundamental step for this kind of exercise. However, reporting errors might still occur in the running the future exercises, and the process will allow both regulators and participating banks to learn from it.

4. Market risk benchmarking framework

69. 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.

70. 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.

71. 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.

72. 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.

73. Possible additional drivers of variation include:

- misunderstandings regarding the positions or risk factors involved, which 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 under testing, or an additional risk factor is being taken into consideration);
- missing risk factors not incorporated in the model;
- differences in calibration or data series used in the modelling simulation;
- additional risk factors incorporated in 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

74. After the data quality assurance process, the EBA performed an 'extreme value' analysis aimed at excluding from the computation of the benchmarks those values for which the IMV and risk measures (RMs: VaR, SVaR, P&L VaR, ES) were found to lie outside a certain tolerance range, due to misinterpretation of the trade or mistyping of bookings by the banks.

75. 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.

76. Extreme IMVs and RMs are defined as values outside the range of two truncated standard deviations[10] 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.

77. 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 increased the overall quality of the benchmark data, providing more consistency for the benchmarks of these metrics.

78. 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.

79. Another metric used in the variability studies is the CV, which is defined as the ratio between the standard deviation[11] and the mean (in absolute value):

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

80. 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

	Instr. ID	Main statistics: Min	Max	Ave.	STDev	STDev_trunc[1]	MAD (median absolute deviation)	Coefficient of variation (STDev/Mean)	Num obs.[2]	Percentiles: 25th	50th	75th	IQD
Equity	1	3,417,000	3,426,000	3,420,015	2,191	3,835	475	0%	35	3,419,000	3,419,358	3,420,907	0%
	2	645,962	646,900	646,167	187	865	0	0%	37	646,100	646,100	646,134	0%
	3	-628,611	-619,756	-623,431	1,671	4,946	598	0%	35	-623,736	-623,565	-622,624	0%
	4	-221,484	-216,009	-219,040	846	1,732	215	0%	36	-219,215	-219,048	-218,785	0%
	5	-2,031,214	-2,016,671	-2,020,499	3,549	13,880	1,701	0%	37	-2,020,991	-2,020,146	-2,017,960	0%
	6	-14,879	-14,547	-14,645	67	132	25	1%	33	-14,672	-14,633	-14,610	0%
	7	-68,234	-67,405	-67,841	159	255	13	0%	35	-67,825	-67,781	-67,781	0%
	8	-105,266	-103,376	-104,466	508	1,084	233	1%	36	-104,701	-104,436	-104,225	0%
	9	49,755	56,397	52,859	1,561	2,204	1,062	3%	32	51,611	52,524	53,694	2%
	10	-65,545	-57,401	-61,764	1,835	2,161	977	3%	35	-62,854	-61,558	-60,890	2%
	11	6,823	8,399	7,658	389	497	292	5%	34	7,381	7,678	7,942	4%
	12	15,432	17,788	16,698	574	707	420	3%	36	16,300	16,688	17,112	2%
	13	36,363	42,296	39,653	1,396	1,739	781	4%	34	38,858	39,775	41,023	3%
	14	-33,000	-26,748	-30,048	1,355	1,774	489	5%	33	-30,556	-30,214	-29,594	2%
	15	1,385	2,045	1,675	153	230	70	9%	34	1,598	1,671	1,737	4%
	16	2,622	3,642	2,996	245	360	104	8%	33	2,844	2,936	3,051	4%
	17	-1,088,500,000	-1,075,717,439	-1,080,902,937	2,913,102	4,809,483	1,060,463	0%	31	-1,081,589,692	-1,080,324,768	-1,079,000,000	0%
	18	991,598	1,098,000	1,064,747	21,184	45,319	11,345	2%	33	1,055,473	1,066,046	1,076,393	1%
Interest Rate	19	10,493	17,234	14,028	1,649	2,325	1,375	12%	43	12,982	13,977	15,468	9%
	20	-85,914	-74,995	-81,766	1,995	3,490	932	2%	42	-82,782	-81,918	-80,917	1%
	21	30,059	49,558	39,599	4,316	5,258	2,878	11%	45	36,000	39,916	42,035	8%
	22	7,939	14,835	10,053	1,027	2,856	423	10%	48	9,464	10,135	10,484	5%
	23	1,027,972	1,149,311	1,087,992	35,665	38,965	23,811	3%	20	1,056,236	1,100,966	1,115,733	3%
	24	7,495,359	7,507,654	7,503,403	2,480	22,458	1,559	0%	40	7,501,816	7,502,537	7,504,913	0%
	25	-2,229,015	-2,226,664	-2,227,145	401	4,435	252	0%	39	-2,227,357	-2,227,000	-2,226,831	0%
	26	5,625,273	5,824,424	5,772,696	30,324	111,579	2,929	1%	31	5,774,954	5,775,739	5,780,383	0%
	27	1,189,650	1,194,498	1,192,034	628	1,333	176	0%	39	1,191,854	1,191,946	1,192,237	0%
	28	7,528,168	7,547,664	7,533,306	3,809	96,223	2,063	0%	37	7,530,241	7,531,317	7,534,819	0%
	29	-6,446,726	-6,412,948	-6,442,404	5,864	49,711	1,056	0%	38	-6,444,766	-6,443,146	-6,442,644	0%
	30	-10,854,532	-10,846,020	-10,852,298	1,850	11,800	958	0%	38	-10,853,646	-10,852,148	-10,851,731	0%
	31	7,512,575	7,614,553	7,592,499	35,573	131,119	2,279	1%	47	7,604,906	7,609,741	7,610,938	0%
	32	6,019,847	6,032,498	6,022,967	2,695	10,452	735	0%	38	6,021,515	6,021,933	6,023,036	0%
	33	-10,385,050	-10,327,340	-10,374,459	17,506	26,574	1,617	0%	40	-10,382,541	-10,380,435	-10,377,937	0%
	34	4,830,481	6,641,906	5,624,744	276,269	996,015	40,211	5%	35	5,521,781	5,671,625	5,712,730	2%
	35	5,275,000	5,474,598	5,364,573	43,871	52,480	5,807	1%	36	5,358,649	5,379,639	5,382,932	0%
	36	-68,346	-48,898	-59,248	4,063	6,137	2,186	7%	47	-61,706	-58,821	-57,371	4%
	37	-18,598	-12,338	-15,627	1,495	1,819	803	10%	45	-16,592	-15,735	-14,230	8%
FX	38	-31,282	31,000	-11,390	10,687	23,160	4,972	94%	40	-15,655	-11,665	-6,450	42%
	39	-104,130	9,681	-54,889	21,562	29,387	14,350	39%	40	-70,192	-48,413	-44,301	23%
	40	875,872	915,418	910,251	9,113	292,080	585	1%	41	912,407	913,709	914,308	0%
	41	34,965	39,913	37,927	1,390	2,158	1,012	4%	40	36,947	37,850	38,962	3%
	42	1,124,771	1,155,537	1,138,758	7,608	8,506	4,776	1%	40	1,133,781	1,139,510	1,143,731	0%
	43	-321,236	-301,523	-311,649	4,849	5,444	2,782	2%	39	-314,385	-311,659	-307,339	1%
	44	-133,688	-122,472	-127,851	3,132	4,296	2,534	2%	38	-130,397	-127,033	-125,105	2%
	45	1,154,155	1,175,916	1,166,270	5,253	5,529	2,941	1%	40	1,163,567	1,165,195	1,170,171	0%
	46	-978,798	-961,319	-972,291	3,752	6,773	1,739	0%	37	-974,153	-972,732	-970,902	0%
	47	-57,371	113,651	34,444	47,070	47,070	15,056	137%	39	6,676	19,914	86,829	86%
Commodities	48	16,284	36,359	25,156	5,441	7,069	3,837	22%	20	20,352	25,320	29,131	18%
	49	-37,616	-14,849	-25,006	5,985	6,775	3,851	24%	21	-27,979	-24,885	-19,923	17%
	50	133,496	187,116	161,354	11,107	14,839	6,692	7%	18	154,458	160,197	167,739	4%
	51	-151,178	-121,546	-136,509	7,269	8,336	4,245	5%	17	-140,078	-136,458	-131,665	3%
Credit Spread	52	-29,855	-27,426	-28,933	452	1,178	193	2%	30	-29,147	-28,981	-28,739	1%
	53	16,694	18,795	17,917	428	1,029	124	2%	27	17,777	17,849	18,012	1%
	54	28,172	30,365	29,710	544	1,339	184	2%	31	29,609	29,881	29,925	1%
	55	7,077	8,590	7,777	380	641	231	5%	27	7,365	7,858	8,050	4%
	56	16,788	19,480	17,789	771	1,029	266	4%	27	17,402	17,541	17,828	1%
	57	-35,621	-32,929	-34,198	562	721	242	2%	30	-34,554	-34,299	-34,007	1%
	58	31,970	33,056	32,524	208	301	93	1%	29	32,414	32,483	32,655	0%
	59	-27,146	-22,893	-25,056	672	1,999	72	3%	29	-25,161	-25,092	-24,988	0%
	60	13,476	16,947	15,593	798	1,201	365	5%	29	15,309	15,858	15,948	2%
	61	-19,147	-16,305	-18,132	743	1,054	262	4%	27	-18,628	-18,262	-17,988	2%
	62	16,349	17,937	17,102	338	513	124	2%	29	16,939	17,075	17,116	1%
	63	29,707	30,569	30,353	169	336	80	1%	29	30,298	30,346	30,475	0%
	64	33,202	34,569	33,984	344	488	238	1%	26	33,744	34,039	34,268	1%
	65	39,153	42,548	40,821	668	896	238	2%	31	40,646	40,942	41,141	1%
	66	-40,932	-39,373	-40,124	344	451	150	1%	30	-40,297	-40,124	-40,004	0%
	67	-5,153	-3,076	-4,012	447	701	168	11%	30	-4,274	-3,975	-3,830	5%
	68	993,610	998,560	996,346	1,225	1,834	542	0%	28	995,624	996,654	997,044	0%
	69	117,004	124,788	121,059	1,998	2,363	805	2%	29	119,988	120,690	122,205	1%
	70	1,017,780	1,031,106	1,025,663	3,556	4,207	1,313	0%	31	1,024,877	1,025,790	1,027,933	0%
	71	1,025,690	1,038,939	1,035,543	4,790	6,300	752	1%	33	1,036,897	1,037,794	1,038,553	0%
	72	-1,010,623	-1,006,900	-1,009,614	1,023	1,581	279	0%	33	-1,010,254	-1,010,013	-1,009,589	0%
	73	1,087,978	1,091,711	1,090,479	804	4,749	246	0%	28	1,090,032	1,090,487	1,090,982	0%
Correlation Trading	74	134,965	206,607	168,525	23,867	23,867	13,370	14%	8	151,763	165,128	186,423	10%
	75	128,785	166,569	142,552	14,158	14,158	847	10%	5	138,572	139,418	139,418	0%

[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

Average Interquartile dispersion by asset class

	Interquartile range 2020 exercise	*Interquartile range 2019 exercise*	*Interquartile range 2018 exercise*
Equity	1%	2%	2%
IR	2%	3%	8%
FX	16%	15%	6%
Commodity	10%	6%	8%
Credit spreads	1%	3%	6%
CTP	5%	8%	103%

81. 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 FX instrument 47 (CCSwap) (IQD 86%). This high dispersion was due to the flawed submission of the instrument by a large number of banks. It should be recalled that for instrument 47, a substantial amount of additional details was provided in the 2020 ITS. The instructions include the definition of the cash balance of CCSwap. In the ITS 2020 the cash balance was 'included', but a plurality of banks submitted, inconsistently with respect to the instructions, this as 'cash balance excluded', claiming this was the industry practice. This caused a clustered submission for this instrument, as shown in Figure 2. In order to avoid this issue, the ITS 2021 updated the clause as 'cash balance excluded', meeting the industry standard and hopefully lowering the dispersion of this instrument.

82. Besides the CCSwap, also the FX Fwd (instruments 38-39 shown IQD above 15% (42% and 23%). The perception with regard to these submissions, besides some trivial errors such as inverted bookings (long instead of short), is that minimal changes in the parameter cause a significant change in the IMVs. It should be noted also that the absolute difference between the 25th and 75th quantile is stable, or decreased for instrument 38, but also that the absolute value of the instrument is decreased, and tends toward zero. This tends to inflate the IQD index of these instruments. Excluding these instruments gives us an average IQD for the FX asset class of 1%, which can be interpreted as a very low dispersion.

83. Besides these FX instruments, commodity instruments 48 and 49 present IQDs barely above 15%. The level of dispersion is slightly higher than in the previous exercise. As for the FX product, it should also be noted that the absolute difference between the 25th and 75th quantile is stable, so it seems that the quality of the submission is comparable to that of the previous exercise.

84. Overall, the IQD by asset class for the instrument of the 2020 exercise is significantly lower than in the past exercises for the equity, interest rate and credit spread asset classes. This means that the adjustment to the 2020 instructions, together with the simplification of the instrument

already included in the instructions for the 2019 exercise have achieved the desired outcome of obtaining a generally low IQD of the instruments in the exercise.

85. Comparing the 2020 instruments with the 2019 instruments purely on the basis of the IQD, it would appear that the quality of the data increased.

86. From a more aggregated risk-type perspective, EQ, IR and CS instruments show the lowest dispersion, indicating an improvement versus 2019. This was expected for CDS, where additional details were provided in the 2020 instructions to reduce ambiguities in interpretation with regard to booking the instruments.

87. CTP IMVs show a slightly higher dispersion (5%), since there are actual differences in market practices and assumptions/conventions between banks (i.e. choice of on-the-run iTraxx Europe series, choice of coupons and tranching assumptions). Furthermore, the high IQD for the FX class is driven mainly by three instruments (38, 39 and 47). The commodity class shows an aggregated IQD of 10%, which is slightly higher than in the previous exercises.

88. 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. Despite all our data quality assurance efforts, the results of this analysis suggest that the clusters observable for some instruments are brought about by different feasible interpretations of the instruments.

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.
Equity	1				20	22				42
	2				18	25				43
	3				20	20				40
	4				20	20				40
	5				20	20				40
	6	1			18	20				39
	7				19	21				40
	8				19	21				40
	9				20	20				40
	10				20	20				40
	11				19	20				39
	12				19	20				39
	13				20	20				40
	14				20	20				40
	15	1			18	19				38
	16	1			18	18	1			38
	17				20	18	2			40
	18				17	17	1			35
Interest Rate	19	1		1	24	24	1			51
	20			2	22	24				48
	21	1	1		23	26	1			52
	22	1	2		22	26	1			52
	23				11	12				23
	24				25	25				50
	25				24	26				50
	26				22	22				44
	27				24	24				48
	28				24	24				48
	29				24	24				48
	30				23	25				48
	31				25	25				50
	32				23	24				47
	33				25	25				50
	34	1			18	17	2			38
	35				21	22				43
	36	1		2	22	26		1		52
	37	1		1	24	24		1	1	52
FX	38	2	3	6	12	12	4	2		41
	39		1	3	19	15		6	2	46
	40				24	17	1	4		46
	41				22	23				45
	42				22	23				45
	43				22	23				45
	44				22	23				45
	45				22	23				45
	46				22	23				45
	47	13		2	6	7	6	4	2	40
Commodities	48			2	10	10	1	1		24
	49			3	8	11	1		1	24
	50				10	9			1	20
	51				10	9		1		20
Credit Spread	52				16	17				33
	53				16	17				33
	54				16	17				33
	55				15	16				31
	56				15	16				31
	57				16	15		1		32
	58				16	17				33
	59				17	17				34
	60			1	15	17				33
	61				15	18				33
	62				16	17				33
	63				16	17				33
	64				15	16				31
	65				16	17				33
	66				17	17				34
	67	1		1	15	16	1			34
	68				16	17				33
	69				15	16				31
	70				17	17				34
	71				18	18				36
	72				18	18				36
	73				18	18				36
CTP	74				4	4				8
	75				1	4				5

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

- Instruments 6 and 15-18 (EQ): there are generally few extreme outlier observations, compared with a low IQD (4%), which does not represent a substantial problem for the CAs.
- Instruments 19, 21, 37 (IR): only a few observations are extreme outliers with an IQD above 8%.
- Instruments 38-39 and 47 (FX): there are many significant outliers with a high IQD, explained by the misinterpretation of instrument 47 (see also data quality issues in Section 3.4 of the report) and the low absolute value of instrument 38.
- Instruments 48-49 (CO): there are only few significant outliers, which inflate the IQD significantly due to the small number of overall observations.
- 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.

90. 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.

91. Other kinds of difficulties were found for CTPs, principally because of the scarcity of contributions and the complex nature of these trades, along with their spread hedging. However, based on the observed IMV results there is slightly more pricing consistency for the second CTP, instrument 75, which refers to a long-hedged position on an equity tranche of the iTraxx EU index (attachment 0%; detachment 3%). This is due to the more standard market tranching points.

92. One source of variability for these instruments relates to the index hedge practice. Commonly, the index hedge seems to be made at the point of inception of the trade when a CS01 spread hedge tranche is traded. However, a couple of banks did not comply with this market practice. Moreover, variability in the IMV and risk measures results could also occur if the banks calculated different hedge ratios (i.e. the ratio of the change in the mark to market of the tranche to the change in the mark to market of the index for a shift in the credit curve for all underlying names) based on their proprietary pricing models.

93. In the past, some banks erroneously computed the IMV results as a P&L from the booking date to the valuation date. In order to achieve a uniform interpretation, the EBA issued a question and answer (Q&A) tool that defined the IMV as the mark to market at the valuation date and

time for each trade.[12] This has helped in the exercise, and this error seems to be present only in a limited number of cases (few banks reported the P&L for instrument 40).

94. 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, such as instruments 24-35.

95. 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.

96. 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.

97. 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.

[12] See Q&A 2016/2993 published on the EBA website on 2 December 2016.

Figure 1: IMV scatter plots – low-IQD instruments

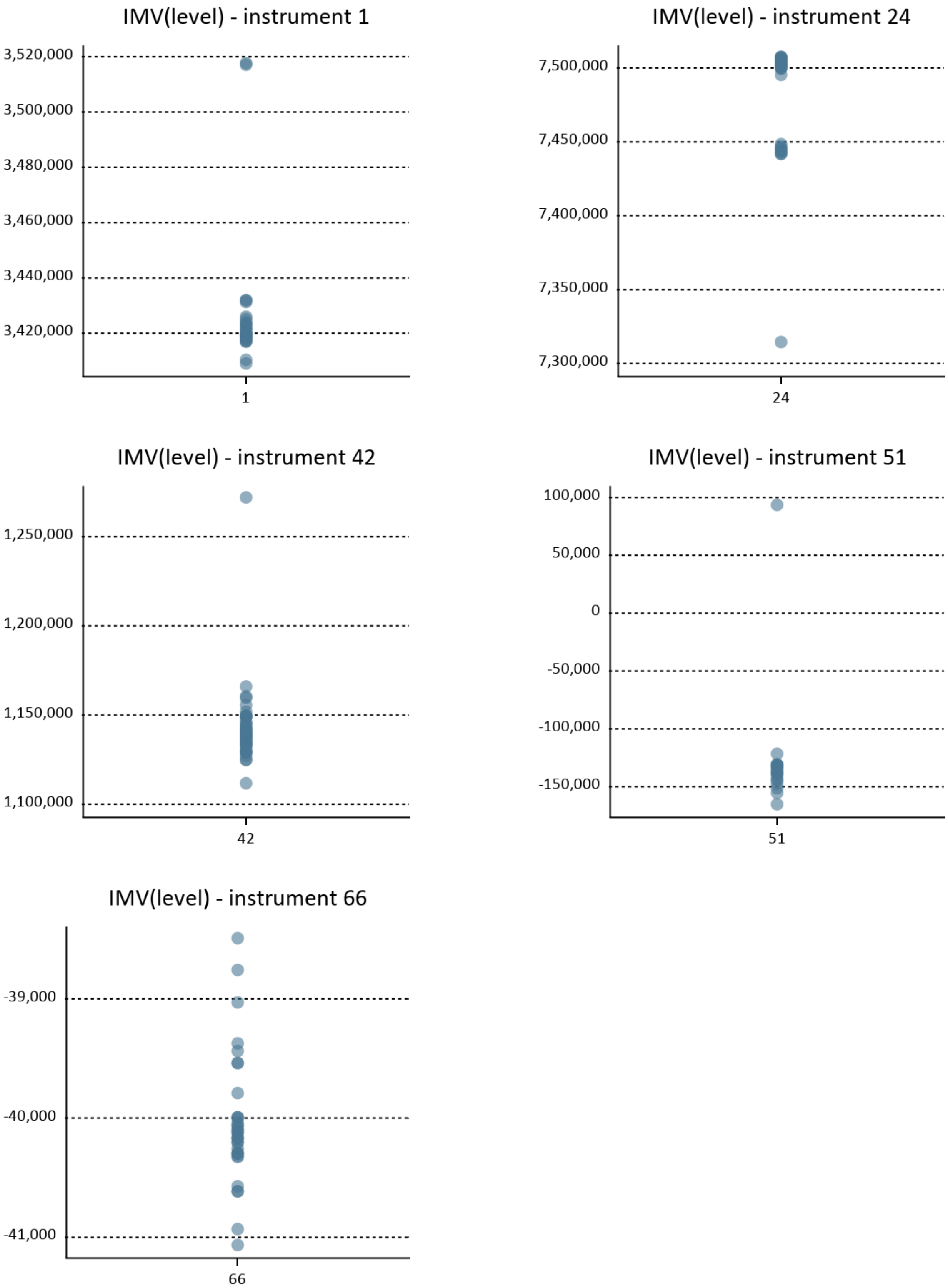
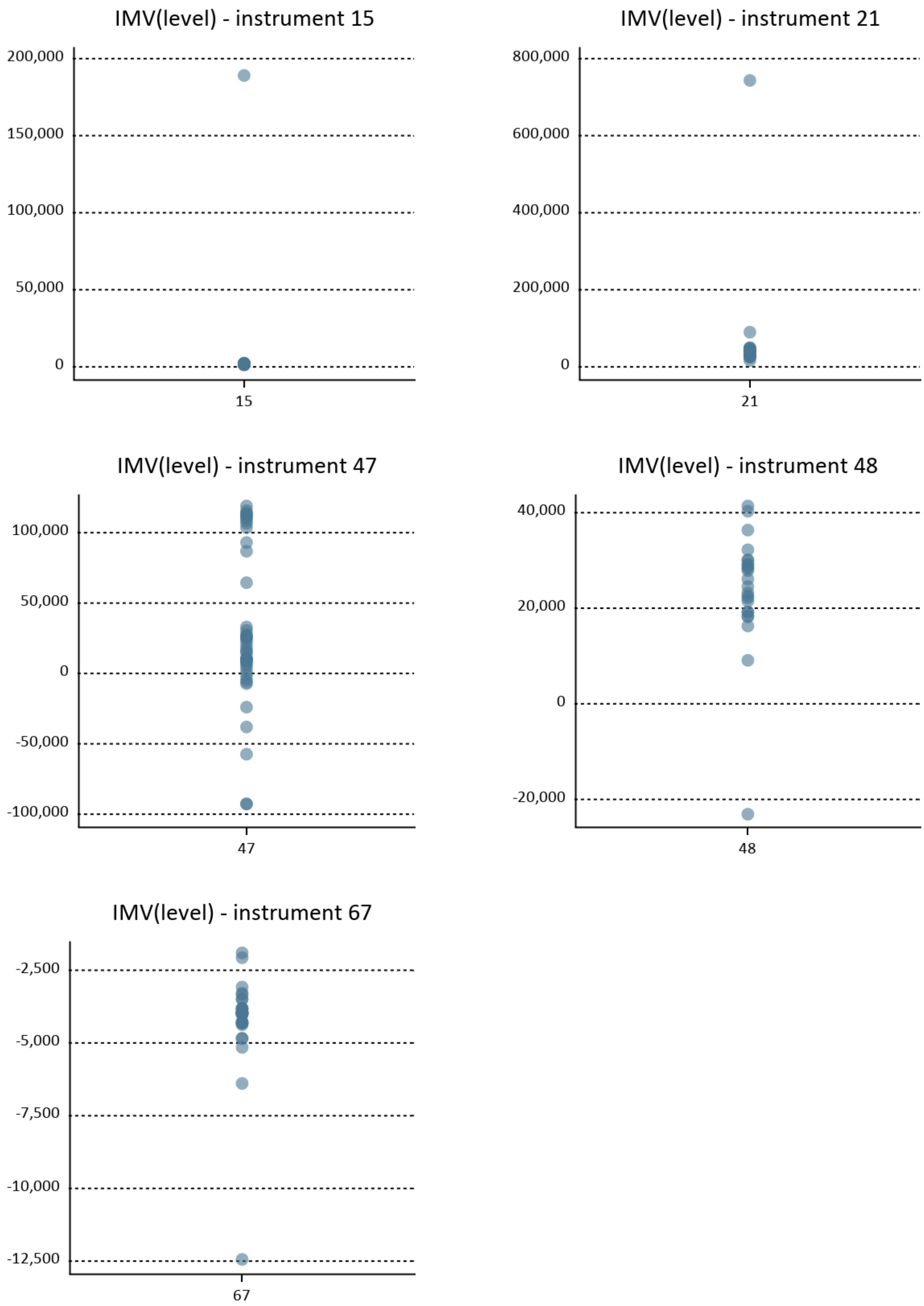


Figure 2: IMV scatter plots – high-IQD instruments



98. 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.

99. 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.

100. Given the EBA's experience with 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 the next exercises.

101. 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 explain the observed variability.

4.2 Risk and stressed measures assessment

102. For VaR and sVaR, variability was assessed by using the banks' reported VaR and sVaR over a 2-week period (from 20 January 2020 to 31 January 2020). 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.

103. In the sample, 16 out of 50 banks calculated weekly sVaR measures. The remaining two thirds of the participating banks computed daily sVaR measures.

104. 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.

105. 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.

106. 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.[13]

[13] It should be noted that this expectation depends on the lookback period for VaR.

107. 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').

108. 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:[14]

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

109. 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.

110. The IRC analysis cannot be deepened like that 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.

111. In the sample, 16 out of 34 banks computed weekly IRC measures.

112. It is apparent that more complex risk measures, such as IRC, are computed at a less frequent pace (i.e. weekly basis instead of daily basis).

113. 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.

114. In the sample, five out of eight banks computed weekly APR measures.

[14] 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.

115. 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.

116. 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.

117. 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.

118. 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'.

119. 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

120. 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 from 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 actions taken by supervisors.

121. 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, in the 2019-2020 benchmarking exercise more information about the stressed VaR time window was 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).

122. Another limitation that was tackled in this exercise is to produce 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 in order to filter out the variability of the risk measure introduced by the partially approved banks.

123. 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.

124. 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

125. In a departure from the previous exercises, the dataset used to perform the assessment of risk measures for the 2020 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 problem 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 is not affected by the issue of excluding RMs that are clearly consistent with the benchmark.

126. 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 detection of unexpected clusters.

127. As Table 20 and Table 21 clearly show, a relatively high variability of the VaR (above 20% in IQD) has been found in portfolios 4 and 7 for EQ, 24 and 25 within the IR asset class, and portfolio 33 for CO. The analysis also identifies clusters for portfolios 36, 45, 46, 47, 49, 50, 52 and 53 (credit spread). With regard to the EQ portfolio 4 (OTM options), the value is very close to zero, and this tends to inflate the IQD. Portfolio 18 features the autocallable instrument, whose exotic nature could increase the VaR. For CO portfolio 33 the high dispersion comes from a VaR of the hedge portfolio that is relatively close to zero. The high dispersion in IR and CS portfolios could be explained by a shared feature: the lack of permission for model-specific IR and the low absolute value of some of the VaR figures that tend to exacerbate the difference in the IQD figures.

128. In contrast to the previous exercise, the VaR values for CTPs (portfolios 54 to 56) are relatively high, except for portfolio 56. The small sample size and scattering of results did not allow a deeper analysis of the CTP portfolios. However, the variability analysis concerning CTPs and the results found are reported since internal models for this risk category are formally authorised and envisaged by the CRR.

129. 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

130. 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.

131. In terms of risk across different assets classes, the IQDs for VaR for all the asset classes except CS are below 20%, while the FX and IR portfolios are lower than for the other risk types. Overall, the IQD is generally slightly lower than in the 2019 exercise, where there was an average dispersion of the VaR of 21%, whereas this comes in at only 17% in the 2020 exercise. This decrease in the IQD of the VaR is likely to have stemmed from both a better understanding of the instruments/portfolio in the exercise compared with the 2019 submission (first submission with the new portfolios), but also as a result of the new methodology applied to exclude outliers in the RM submissions.

132. As expected, the IQD for sVaR is slightly higher than for VaR (see the bottom panels of Figure 3), with an average IQD of 25% (27% in 2019), while the CS asset class features a higher dispersion once again (34%; in 2019 it was 39%). 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

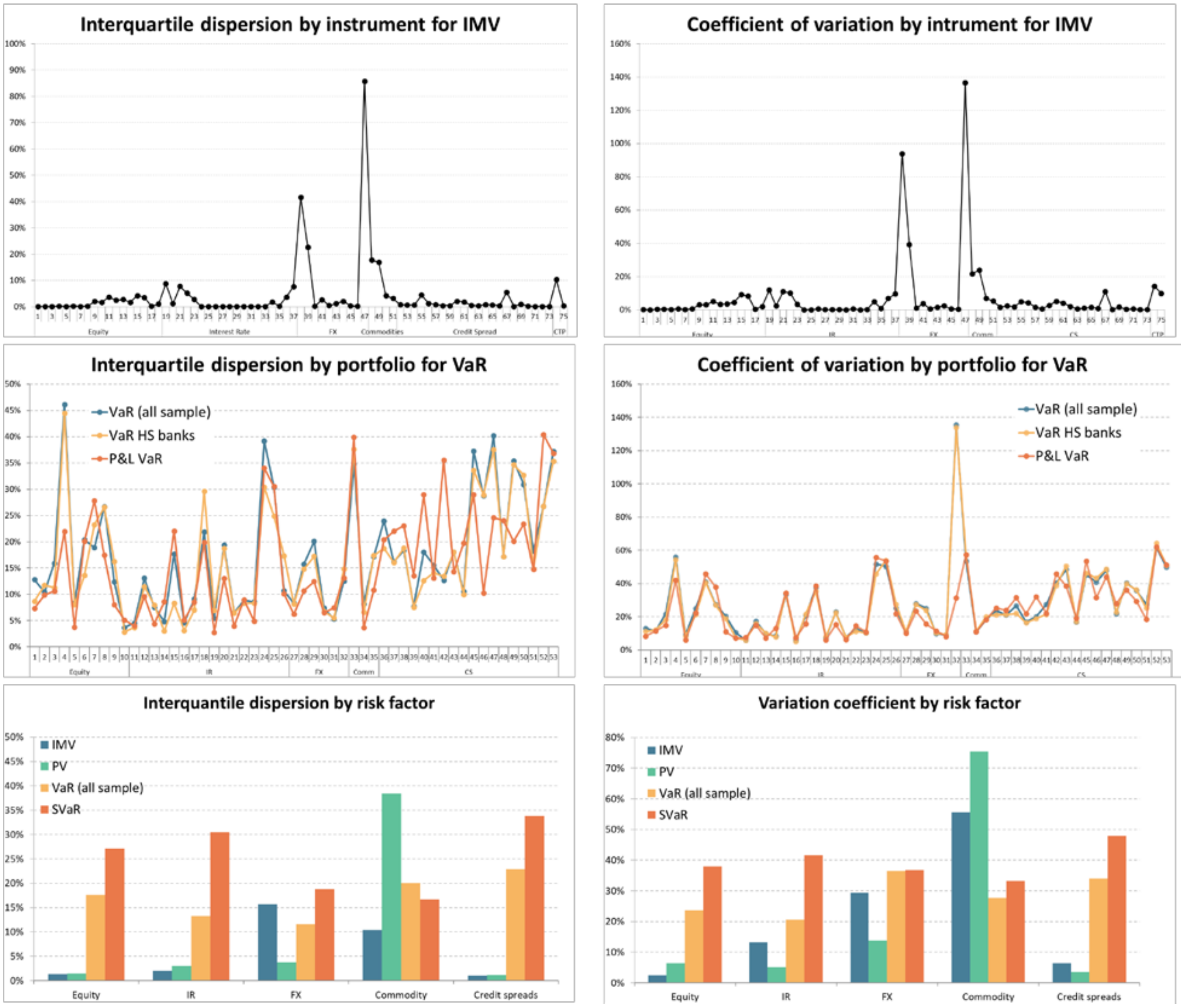


Table 4: Interquartile dispersion for IMV and risk metrics by risk factor

Average Interquartile dispersion by risk factor

	IMV	VaR (all sample)	SVaR	P&L VaR	VaR HS banks	VaR MC banks	Exp shortfall
Equity	1%	18%	27%	13%	18%	11%	11%
IR	2%	13%	31%	12%	14%	8%	11%
FX	16%	12%	19%	9%	14%	10%	9%
Commodity	10%	20%	17%	18%	22%	9%	21%
Credit spr.	1%	23%	34%	23%	24%	23%	24%

133. Table 4 suggests there is evidence 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 16% vs. 17%). With regard to the P&L VaR, it is evident that the dispersion (15% 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.

134. 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 2019 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. 7 MC banks versus 39 HS banks). Regarding parametric banks, a similar analysis is not informative as the total number of parametric banks is very small (i.e. three banks in the sample).

135. 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.

136. Table 5 shows the distribution of the sVaR–VaR ratio classified into three buckets (i.e. below 1, between 1 and 3, above 3) for each portfolio. It is worth noting that a significant number of portfolios for EQ and IR have a significant proportion of ratios below 1. This indicates that the (bank-level) stress period was not appropriate for these particular hypothetical trades.

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	X ≤ 1
Equity	1	47.1%	52.9%	0.0%
	2	83.3%	16.7%	0.0%
	3	0.0%	88.6%	11.4%
	4	16.1%	51.6%	32.3%
	5	87.5%	12.5%	0.0%
	6	5.9%	82.4%	11.8%
	7	59.3%	37.0%	3.7%
	8	3.0%	75.8%	21.2%
	9	0.0%	94.1%	5.9%
	10	79.4%	20.6%	0.0%
Interest Rate	11	52.4%	47.6%	0.0%
	12	12.8%	64.1%	23.1%
	13	0.0%	97.7%	2.3%
	14	51.2%	46.5%	2.3%
	15	44.4%	55.6%	0.0%
	16	0.0%	87.5%	12.5%
	17	0.0%	86.1%	13.9%
	18	2.9%	55.9%	41.2%
	19	2.4%	90.5%	7.1%
	20	68.4%	23.7%	7.9%
	21	2.6%	97.4%	0.0%
	22	53.7%	41.5%	4.9%
	23	0.0%	100.0%	0.0%
	24	50.0%	44.1%	5.9%
	25	67.4%	25.6%	7.0%
	26	5.7%	77.1%	17.1%
FX	27	38.1%	61.9%	0.0%
	28	15.0%	80.0%	5.0%
	29	82.1%	17.9%	0.0%
	30	59.5%	40.5%	0.0%
	31	97.0%	3.0%	0.0%
	32	96.6%	3.4%	0.0%
Commodity	33	52.6%	42.1%	5.3%
	34	0.0%	94.1%	5.9%
	35	75.0%	25.0%	0.0%
Credit Spread	36	7.4%	70.4%	22.2%
	37	72.7%	22.7%	4.5%
	38	72.0%	28.0%	0.0%
	39	60.9%	34.8%	4.3%
	40	77.3%	22.7%	0.0%
	41	61.5%	38.5%	0.0%
	42	39.1%	60.9%	0.0%
	43	64.3%	35.7%	0.0%
	44	51.9%	48.1%	0.0%
	45	62.5%	37.5%	0.0%
	46	42.9%	57.1%	0.0%
	47	73.1%	23.1%	3.8%
	48	63.0%	37.0%	0.0%
	49	41.7%	54.2%	4.2%
	50	3.7%	77.8%	18.5%
	51	42.9%	57.1%	0.0%
	52	34.8%	60.9%	4.3%
	53	33.3%	66.7%	0.0%
CTP	54	75.0%	25.0%	0.0%
	55	40.0%	60.0%	0.0%
	56	0.0%	100.0%	0.0%
ALL-IN no-CTP	57	100.0%	0.0%	0.0%
Equity Cumulative	58	95.7%	4.3%	0.0%
IR Cumulative	59	3.2%	83.9%	12.9%
FX Cumulative	60	97.1%	2.9%	0.0%
Commodity Cumulative	61	0.0%	100.0%	0.0%
CS Cumulative	62	66.7%	33.3%	0.0%
CTP Cumulative	63	0.0%	100.0%	0.0%

5.2 A closer look at the VaR and sVaR results

137. 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).

138. Broken down by portfolio, the figures show the average VaR and sVaR over the 10-day submission period for each bank, normalised by the median[15] of the given portfolio.[16]

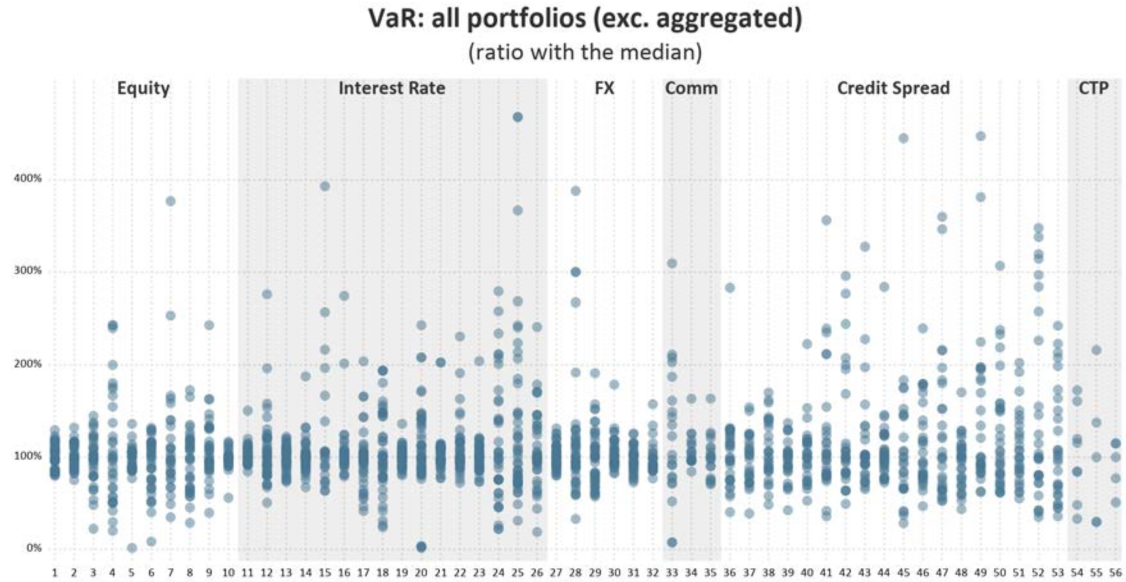
139. Comparing Figure 4 and Figure 5, it looks as if the dispersion is higher for sVaR than for VaR (sVaR 27% IQD versus 18% VaR IQD on average). Differences in dispersion between VaR and sVaR seem steady but are more marked for the credit spread portfolios, in which sVaR shows a higher level of dispersion than in the other asset classes (approximately 34%). This is due to the higher complexity of some of these products compared to other asset classes and to the different banks' choices regarding the stress period.

140. FX and IR are the asset classes with the lowest levels of dispersion for VaR (12% and 13%), while for sVaR it was the CO asset class (17%).

[15] The portfolio median is the median of the average VaR and sVaR over the submission period.

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

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



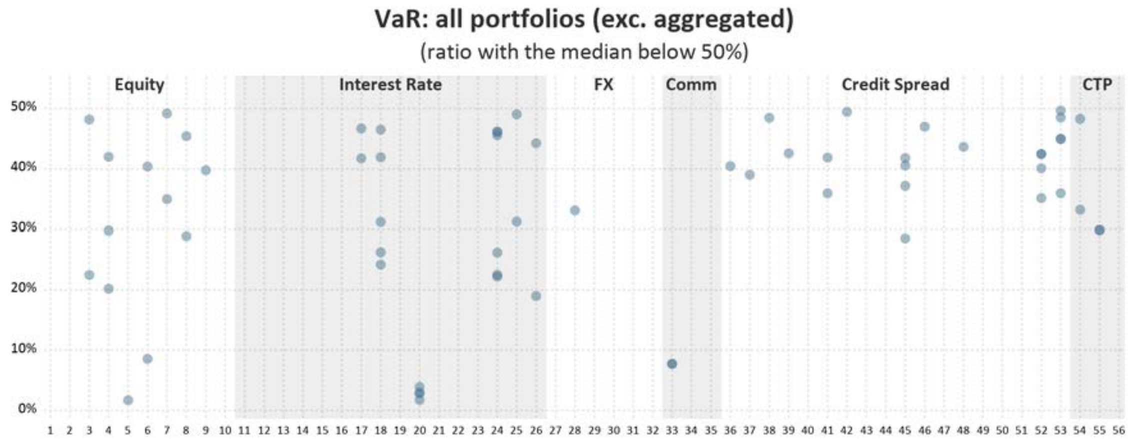
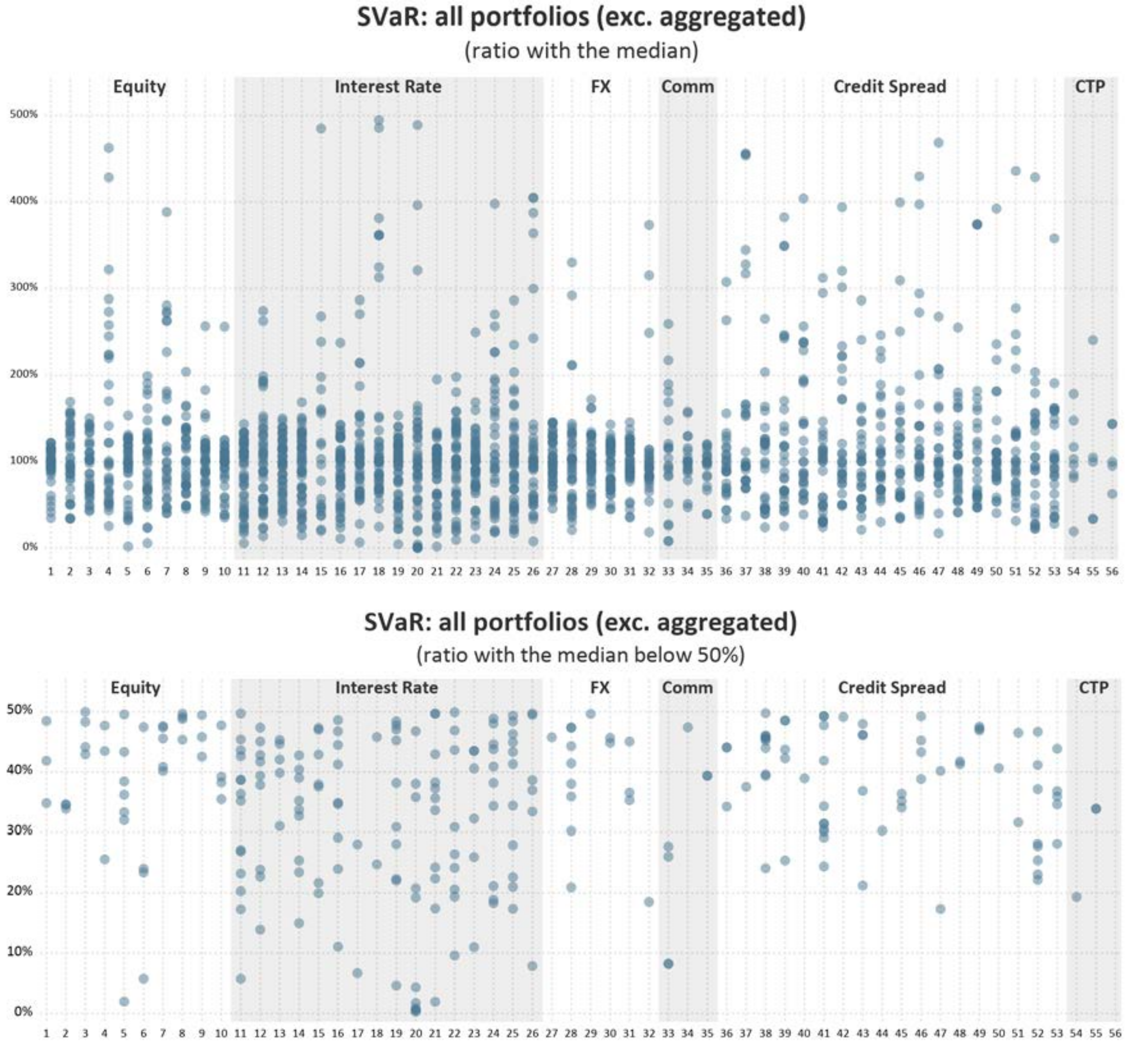


Figure 5: sVaR submissions normalised by the median of each portfolio



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

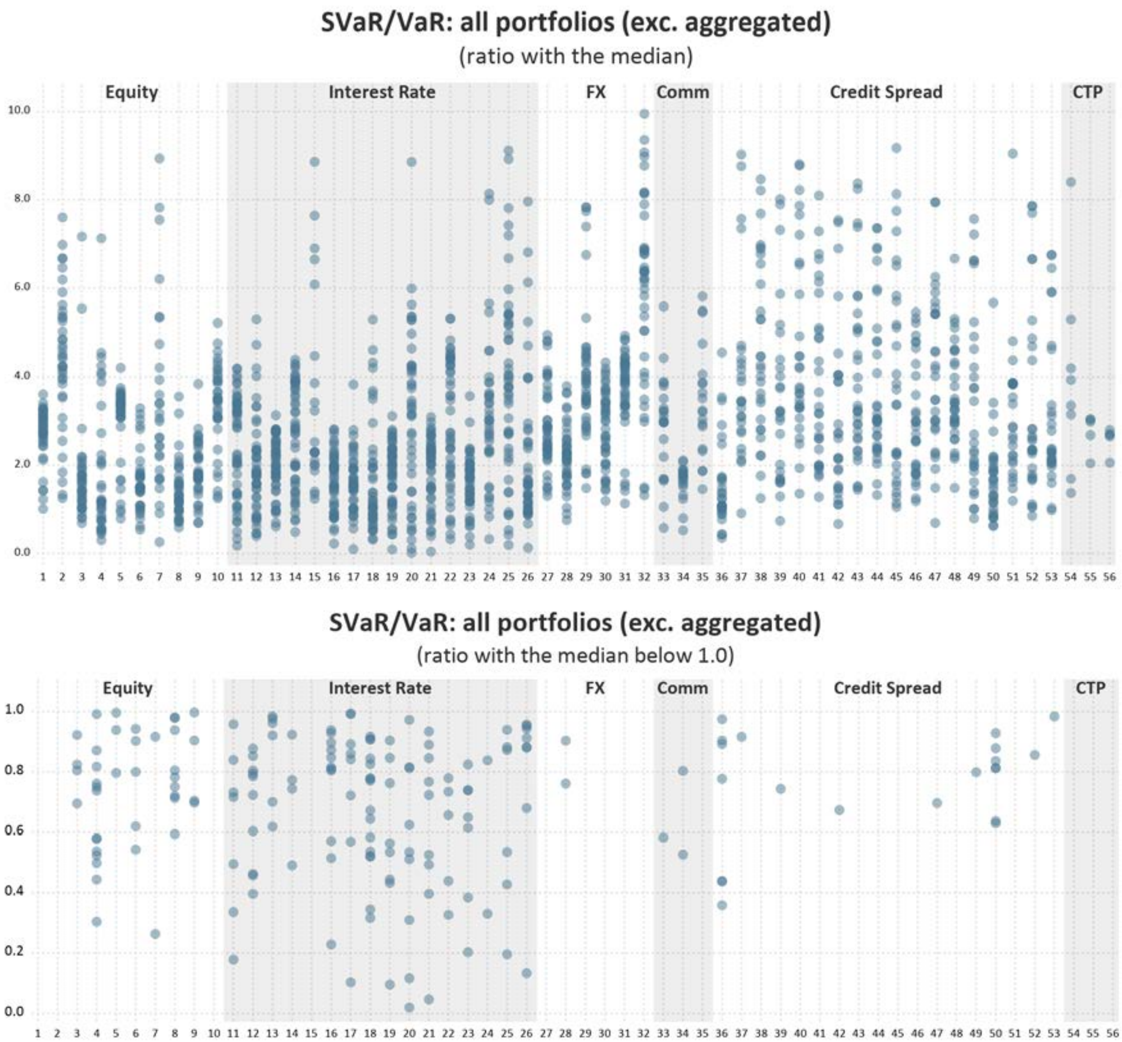
5.2.1 Comparison of sVaR–VaR ratios

142. 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 92% of cases. However, 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 smaller than 1.

143. 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 0.75 and 8.15, and has an average ratio of 2.87.[17] The portfolios with the lowest levels of dispersion for the sVaR–VaR ratio (excluding outliers) are portfolios 1, 5 (EQ) and 31 (FX).

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



144. A few banks have a high sVaR–VaR ratio for portfolios in certain asset classes only. This suggests that this asset class dominates the banks' real trading portfolios and, for that reason, drives the calibration of the sVaR window.

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

145. In line with the higher dispersion observed for the sVaR for this asset class, in terms of the ratio the (average) dispersion for credit spread portfolios is also higher than the dispersion for the other asset classes.

5.2.2 Drivers of variation

146. 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 (72%). 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

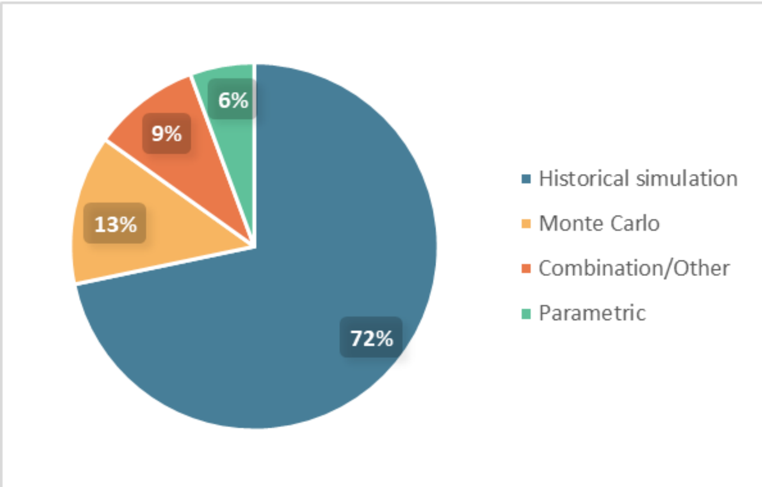
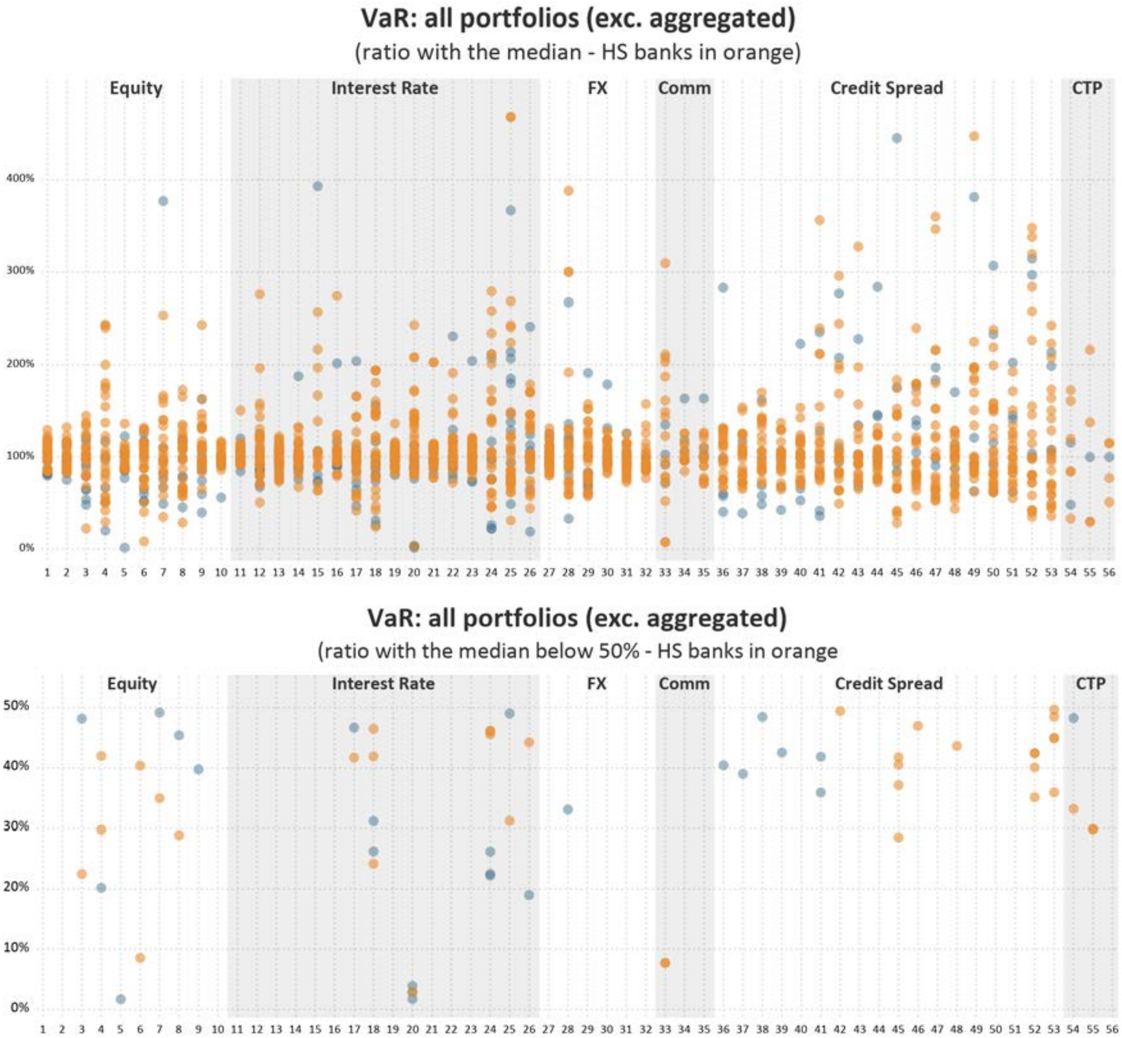
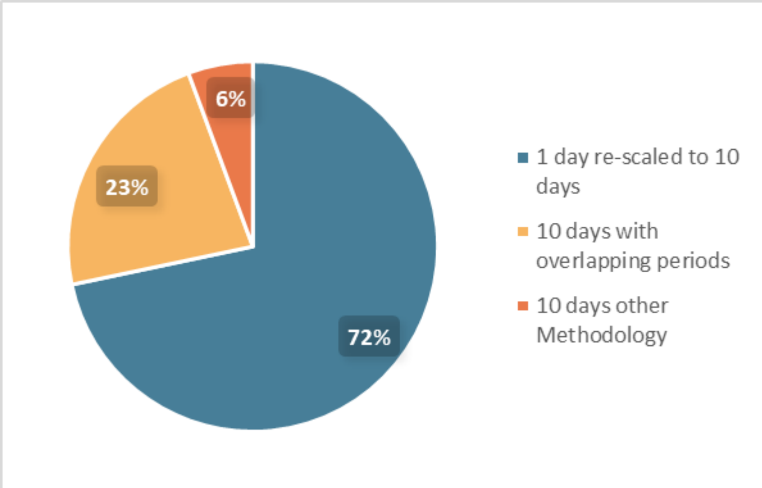


Figure 8: VaR submissions normalised by the median of each portfolio (by methodological approach)



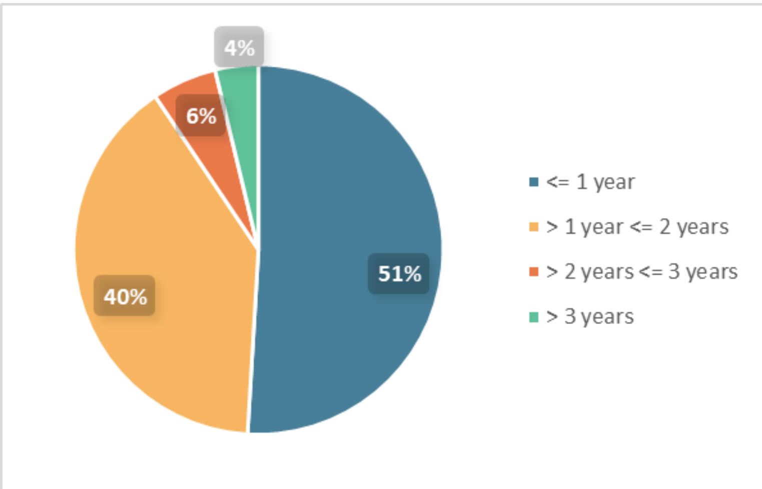
147. With regard to the regulatory 10-day VaR computation, by far the preferred method is rescaling the 1-day VaR to the 10-day VaR using the square root of time approximation.

Figure 9: Qualitative data: VaR time-scaling techniques



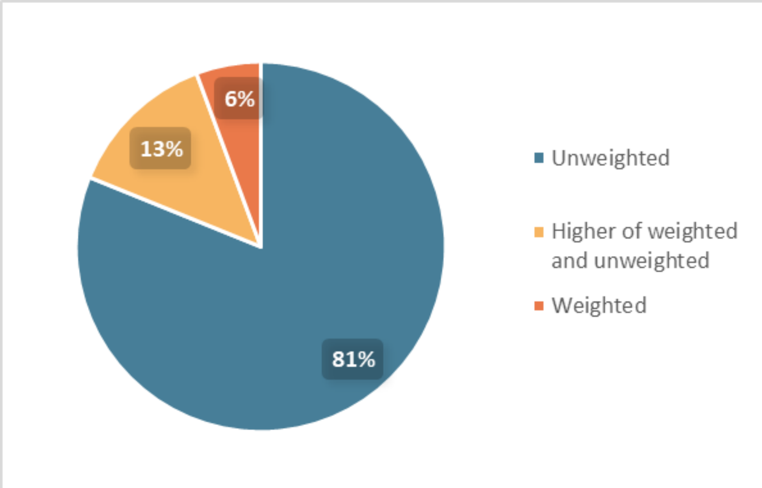
148. Concerning the historical lookback period used to calibrate banks' VaR models, more than half of the banks use the minimum period of one year. Only a minority (5 out of 53) of the banks use a period greater than two years.

Figure 10: Qualitative data – length of VaR lookback period



149. As for the possible use of a data-weighting scheme, the great majority of banks' models use unweighted data in the regulatory VaR computation (43 out of 53 respondents, or 81%).

Figure 11: Qualitative data – VaR weighting choices



150. Finally, with regard to supervisory actions on regulatory add-ons, 77% 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 5.02. 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.

151. 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

152. 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:

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

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).

153. 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.

154. 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, therefore, cannot readily be 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

155. As recalled 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.

156. The portfolios – portfolios 10, 11, 31 and 39 – 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 (25 banks) scaled versus 10-day (13 banks) overlapping returns[18];
- the length of the historical lookback period (1 year versus > 1 year)[19]; and
- keeping constant the 1-day and the unweighted modelling choices, and varying the length of the lookback period (1 year versus > 1 year).[20]

157. 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 10-day calibration and 'more than 1 year' calibration produce less dispersed and more conservative results.

158. For the IR portfolio the 1-day and 1-year calibrations produce less dispersed results, but the 10-day and 1-year calibrations produce more conservative results.

[18] 25 banks adopted 1-day returns, while 13 banks adopted 10-day returns.

[19] 16 banks adopted 1-year, while 22 banks adopted > 1 year.

[20] 10 banks adopted 1-day, unweighted & 1-year, while 13 banks adopted 1-day, unweighted & >1 year.

159. Secularly in IR, for the FX and the CS portfolios the 10-day calibration and ‘more than 1 year’ calibration produce less dispersed results, but in terms of conservativeness the 1-day calibration and ‘more than 1 year’ calibration produce more conservative results.

160. 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 ‘more than 1 year’ calibration tending to produce less dispersed results and the least conservative results for the EQ, FX and CS portfolios.

161. 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 solely 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.

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

	Coefficient of Variation for regulatory VaR (controlling for HS)					
Port.	*1-day*	*10-day*	*1y*	*>1y*	*1d, 1y, unw*	*1d, >1y, unw*
EQ 10	8.9%	2.8%	8.6%	6.2%	10.9%	7.9%
IR 11	5.7%	6.0%	4.0%	6.2%	3.9%	5.2%
FX 31	8.8%	8.5%	12.3%	7.9%	11.9%	6.6%
CS 39	19.3%	10.9%	13.7%	13.1%	17.2%	13.1%
mean	10.7%	7.0%	9.7%	8.3%	11.0%	8.2%

Table 7: Average regulatory VaR by modelling choice

	Average VaR subsamples					
	1-day	*10-day*	*1y*	*>1y*	*1d, 1y, unw*	*1d, >1y, unw*
EQ 10	285,958	286,422	282,319	289,636	280,451	293,274
IR 11	70,531	73,395	73,697	69,747	73,296	68,275
FX 31	299,411	274,009	289,438	293,663	296,647	303,361
CS 39	10,482	9,859	9,181	11,155	9,002	11,878

5.2.5 Other drivers of variation

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

163. 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.

164. Another driver of variation is 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 19 observations (across 54 banks) are available. Nonetheless, for this non-vanilla product the IQD is only 18% for the VaR, 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.

165. 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.

166. As in the previous exercise, the EBA also presents 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. Compared to the previous exercise (2019), the EBA also tested different definitions of size and business models.

a. Size of the bank

167. 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.

168. 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.

169. 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).

170. Table 8 summarises the effect of the size of the bank. For EQ, IR and commodity it seems that dispersion is somewhat proportional to the size of the banks. FX dispersion seems to be less affected by the size, while CS exhibits some proportionality between size and dispersion, even if medium and large banks are generally aligned. This implies that the banks' size does matter and that variability in size increases the dispersion of the general results submitted.

171. 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 book[21] instead of the size of the bank (defined by RWA for market risk), we can see that dispersion varies again across different asset class 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 grows with the size of the trading book. The average IQD is 11% for small TB banks, 14% for medium TB and 15% for large TB banks.

172. The results concerning the impact of size on variability are mixed, and analysis of the impact of size on the risk measure results merits further investigation in future exercises.

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

	VaR - Avg. Interquartile Range			
	All Banks	*Small Banks*	*Medium Banks*	*Large Banks*
Equity	18%	15%	17%	10%
Interest Rate	13%	15%	12%	10%
FX	12%	10%	11%	8%
Commodities	20%	21%	14%	13%
Credit Spread	23%	16%	21%	20%
CTP	40%	0%	18%	19%
All-in	13%	7%	10%	10%

b. Business model

173. The business model of the banks in the sample was selected based on a previous analysis run by the EBA (EBA – LCR Report[22]). In the sample of 54 banks, 27 were classified as cross-border 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. So the cross-border universal bank business model was selected.

174. Specific VaR results for banks classified as cross-border universal banks are shown in Table 30 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.

175. 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 book[23] (FINREP data), the results are reported in Table 34, Table 35 and Table 36. The average IQD is 11% for the low level of Level 3 A&L banks, 15% for the medium level and 11% 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. Further analysis of this aspect is expected to be carried out in the future exercise.

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

	VaR - Avg. Interquartile Range	
	All Banks	*Cross-border Universal bank*
Equity	18%	14%
Interest Rate	13%	12%
FX	12%	11%
Commodities	20%	18%
Credit Spread	23%	20%
CTP	40%	19%
All-in	13%	11%

c. Level of approval

176. 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

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

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 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.

177. Among the banks that submitted results for interest rate risk, 30 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, 29 banks in the report have general and specific approval (see Table 33) and 11 banks have only general approval (see Table 34).

178. 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 bias the benchmarking results.

179. 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.

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

	VaR - Avg. Interquartile Range			
	All Banks	*IR Gen + Specific*	*IR Gen only*	*Eq Gen + Specific*
Equity	18%			15%
Interest Rate	13%	10%	17%	
Credit Spread	23%	21%		

d. Common stress period considered

180. 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 exercise as well and applied to test the impact of the stress time window selected to calibrate the sVaR.

181. 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.

182. 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 – with the exception of the FX asset class – exhibits smaller dispersion results for sVaR than the whole sample.

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

	SVaR - Avg. Interquartile	
	All Banks	*Stressed Period*
Equity	27%	20%
Interest Rate	31%	20%
FX	19%	18%
Commodities	17%	16%
Credit Spread	34%	26%
CTP	31%	13%
All-in	15%	10%

5.2.6 Portfolio comparison

183. 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.

184. This hypothesis can be tested with several portfolios in the 2020 exercises. 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 German bond – 10 years), so it is equal to portfolio 16 plus instrument 26.

185. 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:

$$200\% \times VaR_{Portfolio\ 16} < VaR_{Portfolio\ 17}.$$

186. 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	**39 out of 40**	**39 out of 40**	**29 out of 30**

	*VaR(P17) > 1.5*VaR(P16)*	*sVaR(P17) > 1.5*sVaR(P16)*	*IRC(P17) > 1.5*IRC(P16)*
Num of banks	**36 out of 40**	**38 out of 40**	**29 out of 30**

	*VaR(P17) > 1.8*VaR(P16)*	*sVaR(P17) > 1.8*sVaR(P16)*	*IRC(P17) > 1.8*IRC(P16)*
Num of banks	**33 out of 40**	**32 out of 40**	**29 out of 30**

	*VaR(P17) > 2*VaR(P16)*	*sVaR(P17) > 2*sVaR(P16)*	*IRC(P17) > 2*IRC(P16)*
Num of banks	**32 out of 40**	**23 out of 40**	**29 out of 30**

187. The comparison between the two portfolios with respect to regulatory VaR shows that only 8 out of 40 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

188. Banks with an approved IRC model constitute a subsample of those with an approved VaR model; only banks using internal models for specific risk of debt instruments are permitted to use IRC models (Article 372 of the CRR).

189. 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.

190. 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.

191. 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.

192. 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.

193. 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.

194. CAs should devote particular attention to portfolios 46, 49, 50 and 51. IRC shows a higher level of dispersion (above 70%) for portfolios 46, 49, 50 and 51 than the dispersion observed in other credit spread portfolios, especially the simplest ones.

195. 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:

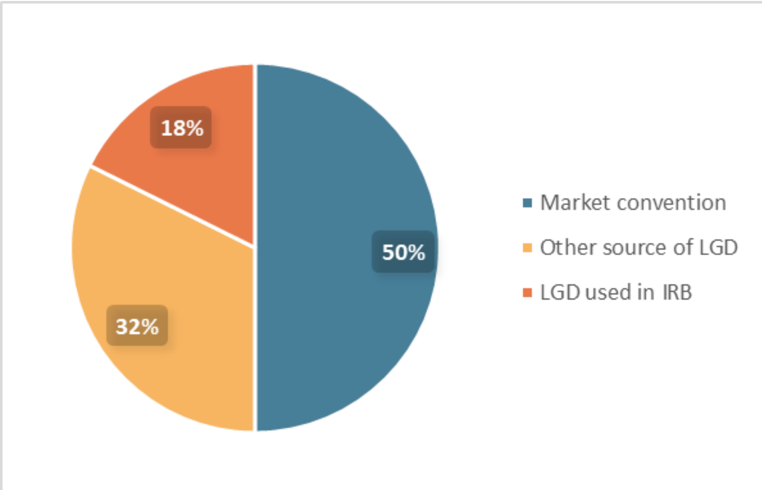
- a source of credit risk estimates such as PD and loss given default (LGD);
- the number of systemic factors used to model the co-movement among obligors in their portfolios;
- the size and granularity of credit spread shocks to apply to positions with an obligor following a rating transition; and
- the liquidity horizons to assign to positions with a particular obligor.

196. 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 17 out

of 34 banks using market convention as the source of LGD. A minority of banks – 6 out of 34 – use their own IRB models as the source of LGD. The rest – 11 banks – use various other sources to obtain the LGD.

197. The PDs are provided by rating agencies in 56% of cases, by the IRB in 28%, by other sources in 9% and in only 3% by market-implied PD. The transition matrices are mostly taken from rating agencies (23 respondents out of 31), while just two banks use their IRB and one uses 'market implied transition matrices'. The rest use various other sources.

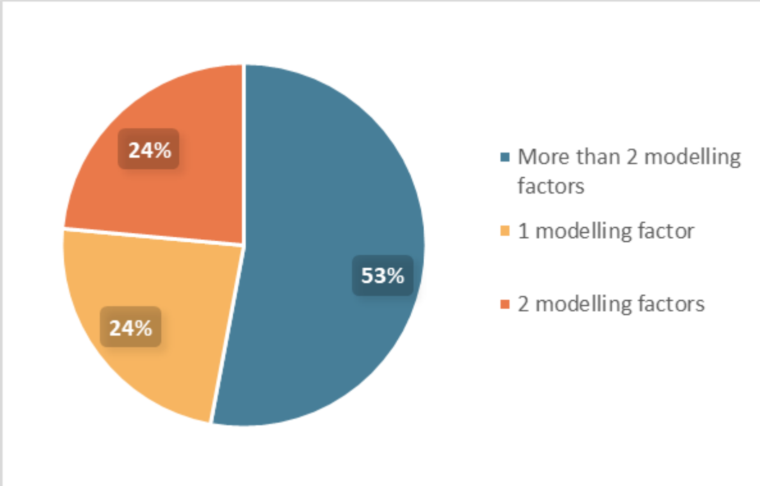
Figure 12: Qualitative data: source of LGD for IRC modelling



198. Moreover, a majority of respondents stated that they use more than two systemic modelling factors at the overall IRC model level (Figure 13).

199. The liquidity horizon applied at the portfolio level for the IRC model is predominantly between nine and 12 months (22 respondents out of 32).

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



200. 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

EU Statistics for IRC

		Main statistics								*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*
Interest Rate	*15*	35,769	344,836	198,948	92,915	92,915	66,938	47%	13	149,091	216,282	226,799	21%
	16	27,779	951,381	226,188	219,328	410,064	75,384	97%	29	109,612	165,545	229,973	35%
	17	129,037	4,071,968	2,148,215	1,239,568	1,169,824	1,105,677	58%	31	811,494	2,309,141	2,992,084	57%
	18	612,311	6,292,933	3,219,631	1,723,287	1,612,903	1,728,850	54%	31	1,566,097	3,465,620	5,194,470	54%
	23	74,840	2,477,710	625,388	571,203	1,106,207	195,488	91%	30	249,600	537,304	788,744	52%
	24	64,540	5,554,470	3,039,303	1,715,658	1,649,747	1,475,735	56%	30	1,211,585	3,081,731	4,464,333	57%
	26	712,043	7,061,213	3,691,880	1,981,578	1,933,605	1,749,894	54%	30	1,902,298	3,675,535	5,402,085	48%
Credit Spread	*36*	7,935	393,638	119,048	105,974	152,386	51,474	89%	28	38,929	104,451	138,020	56%
	37	16,446	89,600	54,043	20,282	20,310	13,245	38%	28	37,706	51,572	71,639	31%
	38	775	101,864	47,432	26,981	29,790	18,841	57%	29	27,212	48,253	64,584	41%
	39	8,630	442,474	169,886	145,493	164,735	72,647	86%	28	56,454	128,399	294,898	68%
	40	181	103,481	53,309	27,840	27,596	18,344	52%	30	35,404	51,027	74,969	36%
	41	426,429	961,146	694,017	140,756	187,882	96,251	20%	28	621,191	660,636	802,147	13%
	42	14,700	309,018	126,931	56,595	238,639	17,749	45%	28	118,370	137,498	141,725	9%
	43	351,300	1,031,117	645,880	198,880	229,540	128,489	31%	28	494,231	637,896	748,032	20%
	44	482	173,743	80,788	40,610	59,029	26,065	50%	29	57,932	83,847	105,438	29%
	45	9	181,858	59,303	48,159	79,621	30,841	81%	30	25,170	57,437	81,317	53%
	46	635	185,697	31,791	50,232	100,863	7,777	158%	32	2,266	11,567	31,692	87%
	47	14,300	280,988	121,765	77,773	88,723	57,643	64%	29	50,520	114,122	165,041	53%
	48	2,299	84,526	26,661	26,414	40,884	7,099	99%	30	8,815	13,047	37,443	62%
	49	8,630	467,773	168,366	155,855	174,644	56,304	93%	28	50,045	120,517	311,621	72%
	50	266	364,595	114,445	102,922	151,076	75,396	90%	30	12,373	120,396	221,212	89%
	51	1,713	440,574	163,920	140,139	171,584	96,332	86%	27	30,662	159,415	285,262	81%
	52	22,679	848,557	310,515	209,375	324,998	156,633	67%	26	164,976	335,191	457,920	47%
	53	57,069	848,293	376,529	225,158	317,745	185,058	60%	26	180,628	412,481	550,745	51%
*ALL-IN no-CTP ***	*57*	704,984	7,421,949	3,651,135	2,057,466	1,994,064	1,649,381	56%	21	2,022,024	3,690,778	5,288,237	45%
*CS Cumulative ***	*62*	299,193	1,092,695	716,836	192,987	402,216	93,015	27%	26	638,452	735,835	833,974	13%

[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

*** 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.*

201. 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 29 submissions for IRC in relation to the IR and CS hypothetical trades.

202. 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.

203. The IQD dispersion of the subsample is very stable for the CS portfolios among different model choices. Non-market convention and 1-2 modelling factors seem to produce the less dispersed results for IR portfolios.

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

	VaR - Avg. Interquartile Range				
		Source of LGDss		No. modelling factors	
	All Banks	*Market Convention*	*Non-market Convention*	*1-2 factors*	*>2 factors*
Interest Rate	46%	52%	34%	33%	55%
Credit Spread	50%	47%	46%	45%	46%
All-in	29%	30%	17%	24%	24%

5.4 Analysis of APR

204. In their responses to the qualitative questionnaire relating to the APR methodological aspects, 6 out of 8 respondents stated that they use more than 2 modelling factors at the overall CTP model level.

205. With regard to the source of LGD estimates at the overall CTP model level, most respondents use market LGD, while a minority of banks use the LGD underlying other sources. No banks reported using IRB sources.

206. As in the case of IRC, the rating agencies are the principal source for PD estimates and transition matrices; only one bank uses its own IRB model for these data. The liquidity horizon applied at the portfolio level for the CTP model is predominantly between nine and 12 months.

207. It should be highlighted that all of these options are, in principle, acceptable under the current regulatory framework and that it is up to banks and CAs to agree on the most appropriate ones to be applied by each bank during the validation process, with particular reference to the banks' individual trading portfolios and trading activities. Thus, given the wide

range of approaches that institutions using an internal model can choose to implement, some degree of variability among the resulting capital requirements is expected.

208. At the same time, these differences in implementation are clearly not the only factors behind variability. There are other modelling choices that are not explicitly envisaged in the regulations such as differences in simulation engines and data sources, differences in the methods used to compute risk factors when data are not directly observable (e.g. all indirect parameters such as volatilities and correlations), the absence of some of the risk factors considered and differences in approximations when repricing positions.

209. The majority of banks with an approved APR model used a one-factor Gaussian copula model, in which the potential loss is estimated by averaging a number of worst-case scenarios corresponding to a 1-year development in the market along with market parameter simulations (i.e. credit spreads, recovery rates, default correlations, CDS/index basis) and transition matrices for rating migrations.

210. The average variability of the APR charge is 45% when computed by averaging the IQD of each CTP. This variability is due to the assumptions and modelling choices made by banks, but it is difficult to arrive at any takeaway because of the very small number of contributions (Table 15). This is also the reason why no further meaningful analysis, for example with respect to VaR, is possible. Table 15 should therefore be used for reference only, since the sample size cannot be considered statistically robust.

Table 15: APR statistics and cluster analysis

EU Statistics for APR

		Main statistics								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*
CTP	*54*	8,686	59,136	33,059	18,056	35,033	15,113	55%	7	15,815	38,213	45,769	49%
CTP	*55*	41,510	109,585	80,398	24,497	24,497	2,701	31%	5	81,832	84,532	84,532	2%
CTP	*56*	208,702	5,208,962	2,434,036	2,556,449	2,556,449	925,696	105%	5	409,158	1,134,398	5,208,962	85%
CTP Cumulative	*63*	377,225	5,254,731	2,711,187	2,371,309	2,371,309	1,354,862	88%	5	937,159	1,732,087	5,254,731	70%

[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

*** 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.*

5.5 P&L analysis

211. 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).

212. A graphic exemplification of low and high IQD portfolios is represented below in Figure 14 and Figure 15. Even though the P&L vectors available are much longer, only 3 months (1 November 2019 to 1 February 2020) 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 14: P&L chart example of low IQD

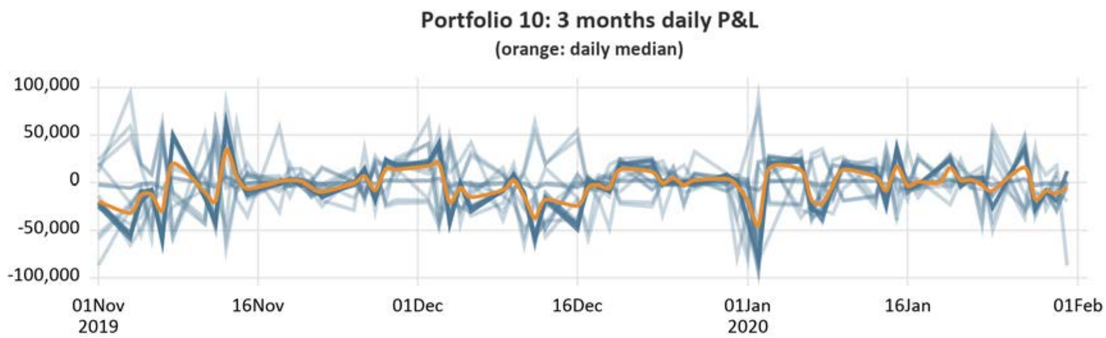
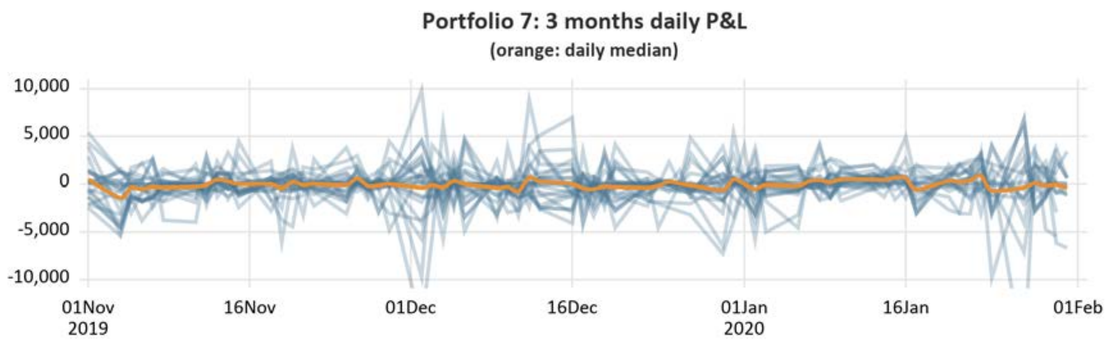


Figure 15: P&L chart example of high IQD



213. 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 from 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.

214. 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

215. An additional metric considered as part of the analysis was the diversification benefit observed for VaR, sVaR and IRC in the aggregated portfolios.

216. 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.

217. 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

		Other statistics			Percentiles			
	Port.	Ave.	STDev	Num obs. [3]	25th	50th	75th	Interquartile dispersion
ALL-IN no-CTP	57	81%	2%	12	80%	82%	83%	1%
Equity Cumulative	58	77%	5%	28	74%	76%	79%	3%
IR Cumulative	59	46%	7%	38	41%	46%	51%	12%
FX Cumulative	60	44%	9%	35	41%	45%	49%	8%
Commodity Cumulative	61	3%	2%	17	2%	3%	5%	46%
Credit spread Cumulative	62	33%	10%	26	28%	33%	41%	18%

sVaR

		Other statistics			Percentiles			
	Port.	Ave.	STDev	Num obs. [3]	25th	50th	75th	Interquartile dispersion
ALL-IN no-CTP	57	75%	5%	12	69%	75%	78%	7%
Equity Cumulative	58	73%	8%	28	68%	73%	77%	6%
IR Cumulative	59	48%	14%	38	38%	52%	58%	21%
FX Cumulative	60	34%	11%	35	29%	35%	37%	12%
Commodity Cumulative	61	2%	1%	11	1%	3%	3%	48%
Credit spread Cumulative	62	9%	4%	19	5%	8%	11%	40%

IRC

		Other statistics			Percentiles			
	Port.	Ave.	STDev	Num obs. [3]	25th	50th	75th	Interquartile dispersion
Credit spread (36 to 53)**	27	37%	18%	28	30%	44%	50%	24%

5.7 Dispersion in capital outcome

218. 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.

219. 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

Interquartile dispersion for capital proxy

	Capital proxy (banks own mult)	*Capital proxy (fixed mult, =3)*	*Capital proxy Stressed period (fixed mult, =3)*
Equity	23%	20%	18%
IR	20%	21%	17%
FX	16%	14%	14%
Commodity	19%	15%	13%
Credit spreads	28%	28%	21%
CTP	31%	30%	12%

220. 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 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

221. The 2020 exercise sees the introduction of the PV as a statistic to be provided by the banks. The full set of statistics is provided in Table 42.

222. The average IQD of the PV among the single portfolios is 4%. This low IQD would be even lower, at 2%, if 3 portfolios with a relatively high IQD (Portfolios 24, 32 and 33) were excluded. By asset class the IQD is distributed as follows: EQ (1%), IR (3%), FX (4%) CO (38%) and CS (1%). The high IQD of the CO asset class is driven by Portfolio 33 (IQD 100%), 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.

223. 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 on in future exercises.

6. Competent authorities' assessment

224. 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.

225. The EBA designed a questionnaire regarding 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.

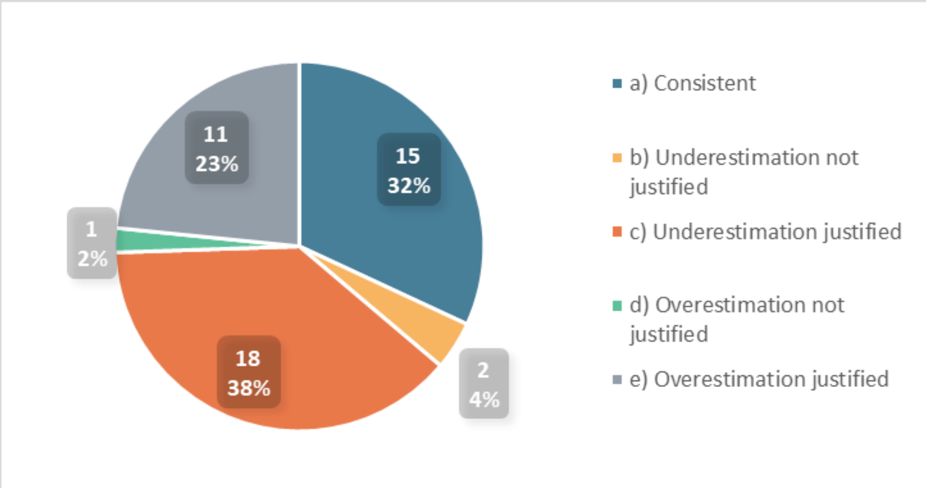
226. A total of 47 questionnaires from 14 jurisdictions, provided by the CAs, have been considered in this assessment of the MR benchmarking exercise.

227. Regarding the level of priority of the assessments, four banks (8.5%) 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 submission 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.

228. Figure 16 reports the CAs' own overall assessments of the levels of own funds requirements. When it comes to benchmark deviations, justified or not, 32 banks were reported by CAs as under- or overestimating MR own funds requirements, of which 29 provided justifications for this. Obviously, 'not justified' implies that further and targeted CA investigation is required. Finally, 15 banks had consistent results (i.e. no benchmark deviations).

229. CAs' assessments acknowledge three cases out of 47 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 great attention to the potential underestimation cases, both across the portfolio and across the risk categories.

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



230. 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 (8/32); missing risk factors not incorporated in the models (9/32); differences in calibration or data used in modelling estimation and/or simulation (10/32); proxies applied (10/32); and differences attributable to the methodology used (13/32). These explanations, and very often a combination of these explanations, were offered by a large majority of the applicable respondents.

231. Two banks were identified as possibly underestimating, without justification, during the banks' internal assessment process run by the CAs. Both cases were classified ad '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 related to these banks.

232. To be more specific, for one bank, the CAs assessed that the underestimation, despite not being fully justified, was focused on a few specific portfolios. In addition, the CAs had additional examinations in place that provided further reassurance of the quality of the internal model results for the bank.

233. For the second subject, the inability to fully justify the underestimation was only partial. In this specific case, the CA nonetheless received a fairly robust explanation of the reason linked to the underestimation. Moreover, there are already substantial model changes due to be applied before the end of this year as requested by the CA. This should improve the quality of the bank's risk measures.

234. The bank identified as possibly overestimating, without justification, is also classified as 'low priority' by the CA. Differences in calibration or data used in modelling estimation and/or

simulation were also identified by the CA, which was nonetheless unable to fully explain and investigate the misalignment.

235. Overall, CAs planned some action in respect of 14 banks, such as:

a. reviewing the banks' internal VaR and IRC models;

b. supervisory extra charge;

c. stringent conditions on any extension of the internal model approach;

d. further internal model investigation at peer level.

236. Currently, six banks have a due date for making improvements to their MR internal models as already requested by CAs.

7. Conclusion

237. 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.

238. It must be recalled and emphasised that, as the quantitative analysis is based on hypothetical portfolios, this report focuses solely on potential variations and not on actual variations. The analysis shows the extent of the variability in these hypothetical portfolios, but that cannot automatically lead to conclusions regarding real under- or overestimations for the MR capital charge.

239. 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.

240. 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.

241. 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.

242. 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.

243. Overall, this exercise exhibits a reduced IMV variability. Some errors in data submission are still present, even though this was the second submission with these portfolios. The variability of risk measures is lower than in the previous exercise, but the positive effect of the different methodology to exclude outliers among the risk measures has to be included in this observation. The variability of the VaR aggregated portfolios is limited: the 'all-in portfolio' IQD is 7%. Aggregated by asset class, the portfolio IQD of the others is 13% on average, and never above 20%, except for CTP. Further improvement in variability should be achieved in future exercises thanks to the clarification provided in the 2021 ITS. The new analysis carried out in the 2019 exercise – the considerations of level of approval, size of the banks, business model adopted and stress period – is interesting and was repeated and extended in the 2020 exercise. No interviews were run in this exercise because CAs privileged different methods to monitor the deviation from the benchmark of the banks flagged as outliers.

244. 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, the methodology defined, etc.) offers a clear direction for future investigations of and activities relating to these issues.

8. Annex

Table 18: Banks participating in the 2019 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 AG
DE	DZ BANK AG Deutsche Zentral-Genossenschaftsbank, Frankfurt am Main
DE	Landesbank Baden-Württemberg
DE	Landesbank Hessen-Thüringen Girozentrale
DE	Norddeutsche Landesbank -Girozentrale-
DK	Danske Bank A/S
DK	Nykredit Realkredit A/S
ES	Banco Bilbao Vizcaya Argentaria, S.A.
ES	Banco Santander, S.A.
ES	BFA Tenedora de Acciones, S.A.
ES	CaixaBank, S.A.
FI	Nordea Bank Abp
FR	BNP Paribas
FR	Groupe BPCE
FR	Groupe Crédit Agricole
FR	HSBC France
FR	Société générale S.A.
GB	Barclays Plc
GB	Citigroup Global Markets Europe Limited
GB	Credit Suisse Investments (UK)
GB	Goldman Sachs Group UK Limited
GB	HSBC Holdings Plc
GB	ICBC Standard Bank Plc (was Standard Bank Plc)
GB	J P Morgan Capital Holdings Limited
GB	Lloyds Banking Group Plc
GB	Merrill Lynch UK Holdings Ltd
GB	Mitsubishi UFJ Securities International PLC
GB	Morgan Stanley International Ltd
GB	Nomura Europe Holdings PLC
GB	Standard Chartered Plc
GB	The Royal Bank of Scotland Group Public Limited Company
GR	Alpha Bank, S.A.
GR	Eurobank Ergasias, S.A.
GR	National Bank of Greece, S.A.
IE	Bank of America Merrill Lynch International Designated Activity Company
IE	Barclays Bank Ireland plc
IT	Banco BPM SpA
IT	Intesa Sanpaolo S.p.A.
IT	UniCredit S.p.A.
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

Country	AT	BE	DE	DK	ES	FI	FR	GB	GR	IE	IT	NL	PT	SE
N.banks	2	3	7	2	4	1	5	14	3	2	3	5	1	2

Table 19: Instruments/portfolios underlying the HPE

	Instruments
	EQUITY
1	Long EURO STOXX 50 index
2	Long 10000 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.
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
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 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)
	CTP
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 – 1000 instruments
2	3 – 1000 instruments; 4 – 1000 instruments; 5 – 1000 instruments
3	13 – 100 instruments; 10 – 100 instruments
4	15 – 100 instruments; 16 – 100 instruments
5	17 – 1000 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 – 1000 instruments; 7 – 1000 instruments; 8 – 1000 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 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://eba.europa.eu/regulation-and-policy/supervisory-benchmarking-exercises/its-package-for-2020-benchmarking-exercise

Please refer also to Commission Implementing Regulation (EU) 2016/2070 of 14 September 2016, laying down ITS in accordance with Article 78(2) of Directive 2013/36/EU, http://data.europa.eu/eli/reg_impl/2016/2070/2018-06-07

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

2020 VaR cluster analysis: number of banks by range

(X = ratio with the median)

100

	Port. ID	300% < X	300% ≥ X >200%	200% ≥ X >150%	150% ≥ X >100%	100% ≥ X >50%	50% ≥ X >0	Num obs.
Equity	1				19	20		39
	2				18	18		36
	3				18	17		35
	4		4	5	7	15	3	34
	5				17	17		34
	6				19	17		36
	7		1	3	8	15	2	29
	8				16	17	1	34
	9				16	19		35
	10				15	19		34
Interest Rate	11				21	25		46
	12				19	23		42
	13				25	22		47
	14				21	25		46
	15			2	6	11		19
	16				20	22		42
	17				18	21		39
	18			3	15	17	5	40
	19				23	24		47
	20			2	20	23		45
	21				24	23		47
	22				19	24		43
	23				23	22		45
	24		4	3	9	13	6	35
	25		6	2	12	24	2	46
	26				17	20	1	38
FX	27				20	23		43
	28			1	17	21	1	40
	29				18	22		40
	30				18	22		40
	31				20	17		37
	32	5		1	6	22		34
Commodity	33		3	2	5	8	2	20
	34				8	10		18
	35				8	10		18
	36				14	15		29
	37				12	13		25
	38				11	14	1	26
	39				13	13		26
	40				12	14		26
	41			1	9	14	2	26
	42		2	2	6	14	1	25
	43	1	1	2	9	16		29
	44				13	17		30
	45			4	6	12	4	26
	46		1	6	7	15	1	30
	47		2	5	4	16		27
	48				15	14		29
	49		1	8	3	15		27
	50			6	6	16		28
	51			1	10	14		25
	52		3	1	5	10	4	23
	53		1	4	6	9	5	25
CTP	54			2	2	2	2	8
	55		1		1	1	2	5
	56				2	3		5
ALL-IN no-CTP	57				9	10		19
Equity Cumulative	58				13	13		26
IR Cumulative	59				15	20	1	36
FX Cumulative	60				17	19		36
Commodity Cumulative	61				8	9		17
CS Cumulative	62			3	8	14		25
CTP Cumulative	63				1	3	1	5

Table 21: VaR statistics

EU Statistics for VaR

		Main statistics								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
Equity	1	2,081,748	3,206,116	2,608,947	341,602	318,014	314,043	13%	39	2,242,440	2,606,789	2,901,742	13%
	2	1,909,923	2,845,713	2,340,147	269,993	269,993	242,972	12%	36	2,102,021	2,316,907	2,592,041	10%
	3	10,670	28,701	20,005	4,348	4,625	3,163	22%	35	16,842	19,832	23,213	16%
	4	143	1,716	778	436	694	293	56%	34	403	706	1,093	46%
	5	727,947,916	973,360,882	833,624,332	76,476,535	87,576,932	65,605,088	9%	34	763,573,830	853,996,540	902,262,743	8%
	6	17,854	46,308	33,762	8,490	8,816	5,194	25%	36	26,812	35,126	40,554	20%
	7	3,862	27,986	11,624	4,787	13,949	2,173	41%	29	9,066	11,039	13,280	19%
	8	44,948	133,753	93,421	25,718	27,972	20,403	28%	34	66,744	98,925	115,331	27%
	9	36,574	89,738	63,447	12,957	15,078	6,372	20%	35	55,754	61,151	71,503	12%
	10	158,743	331,241	279,554	29,367	430,168	8,320	11%	34	268,796	283,265	289,486	4%
Interest Rate	11	64,021	78,221	70,590	4,246	4,681	3,626	6%	46	67,286	70,167	73,717	5%
	12	27,936	54,016	40,616	7,052	8,676	5,246	17%	42	34,800	41,382	45,291	13%
	13	118,767	178,574	150,055	14,830	15,804	11,217	10%	47	139,357	148,407	162,089	8%
	14	22,285	32,700	27,490	2,327	3,072	1,270	9%	46	26,122	27,836	28,766	5%
	15	10,103	31,178	16,070	5,408	8,310	1,529	34%	19	11,728	15,841	16,770	18%
	16	90,921	119,751	103,156	6,149	9,157	4,318	6%	42	98,856	102,776	108,445	5%
	17	138,867	362,697	242,310	50,044	62,050	17,979	21%	39	220,496	252,258	264,847	9%
	18	71,227	472,329	289,111	108,927	111,534	63,382	38%	40	230,004	294,245	358,870	22%
	19	126,580	167,912	147,262	10,887	11,283	7,883	7%	47	139,014	147,805	155,139	5%
	20	3,105	6,996	4,458	1,025	1,551	549	23%	45	3,605	4,059	5,336	19%
	21	243,192	323,341	287,613	22,162	23,481	18,812	8%	47	271,289	281,550	309,019	7%
	22	35,509	63,601	49,492	6,293	8,446	4,325	13%	43	45,947	49,057	54,904	9%
	23	141,780	202,388	168,919	17,562	17,711	15,896	10%	45	152,435	167,115	181,074	9%
	24	42,451	403,906	199,694	103,402	116,207	74,429	52%	35	116,765	190,979	267,160	39%
	25	12,685	109,079	45,932	23,169	39,057	8,027	50%	46	29,856	40,586	55,976	30%
	26	166,144	547,837	378,079	95,439	110,112	40,080	25%	38	341,636	375,364	423,004	11%
FX	27	388,925	588,161	481,330	52,978	52,870	37,969	11%	43	438,613	485,157	517,961	8%
	28	3,899	22,595	11,546	3,249	6,533	1,977	28%	40	9,779	11,776	13,440	16%
	29	61,605	148,573	99,881	25,114	27,148	19,563	25%	40	78,816	107,102	118,428	20%
	30	256,067	370,393	312,223	31,076	33,781	17,495	10%	40	289,822	311,241	335,889	7%
	31	242,625	338,540	290,670	26,101	29,821	20,763	9%	37	271,237	292,615	301,669	5%
	32	14,221	188,211	40,418	54,798	88,682	1,558	136%	34	16,511	18,449	21,249	13%
Commodity	33	520	14,224	7,656	4,099	4,099	2,657	54%	20	5,062	6,735	10,450	35%
	34	220,882	328,788	271,849	29,810	45,917	9,561	11%	18	251,717	261,413	296,736	8%
	35	211,155	378,924	290,252	53,514	69,228	34,519	18%	18	231,625	299,099	327,839	17%
Credit Spread	36	9,872	22,562	17,295	4,113	4,113	4,110	24%	29	13,004	17,114	21,215	24%
	37	11,990	23,048	17,451	3,696	4,133	3,531	21%	25	14,490	18,361	20,097	16%
	38	1,534	4,542	3,193	851	906	495	27%	26	2,678	3,163	3,884	18%
	39	6,926	13,379	10,102	1,705	1,800	984	17%	26	9,231	10,264	10,780	8%
	40	3,003	6,529	4,527	916	1,018	736	20%	26	3,662	4,572	5,274	18%
	41	2,707	11,644	7,101	1,954	3,777	1,043	28%	26	5,973	7,531	8,173	16%
	42	9,704	40,738	20,713	8,365	11,364	2,996	40%	25	16,235	19,615	20,962	13%
	43	9,222	46,279	16,029	7,780	18,829	2,703	49%	29	11,676	14,130	16,812	18%
	44	4,784	8,696	6,544	1,115	1,279	641	17%	30	5,750	6,586	7,102	11%
	45	1,595	10,255	5,530	2,508	7,880	1,551	45%	26	3,699	5,588	8,089	37%
	46	2,733	13,939	6,558	2,681	7,181	1,327	41%	30	4,501	5,814	8,130	29%
	47	1,340	5,477	2,764	1,328	2,047	857	48%	27	1,651	2,536	3,867	40%
	48	5,668	12,492	9,262	2,041	2,140	1,282	22%	29	7,527	9,708	10,648	17%
	49	2,421	8,746	4,815	1,952	2,688	847	41%	27	3,392	3,887	7,110	35%
	50	11,671	37,596	19,887	7,119	9,784	4,645	36%	28	13,952	18,859	26,435	31%
	51	32,646	88,892	58,624	16,126	19,812	12,872	28%	25	48,893	59,015	70,684	18%
	52	38,414	310,499	118,464	73,115	106,320	28,284	62%	23	78,799	109,268	136,370	27%
	53	58,488	338,088	161,500	80,641	91,920	58,912	50%	25	95,937	162,668	209,469	37%
Correlation Trading	54	962	4,997	2,965	1,435	1,435	1,036	48%	8	1,921	2,896	4,064	36%
	55	4,934	35,669	16,948	12,966	12,966	11,565	77%	5	4,934	16,499	22,705	64%
	56	186,900	420,339	335,047	100,282	100,282	54,814	30%	5	282,132	365,525	420,339	20%
ALL-IN no-CTP **	57	1,201,785	1,694,730	1,427,651	138,424	138,424	89,148	10%	19	1,340,236	1,463,148	1,529,765	7%
Equity Cumulative **	58	950,141	1,475,154	1,235,267	147,518	212,755	135,767	12%	26	1,104,267	1,243,587	1,377,009	11%
IR Cumulative **	59	177,258	564,481	373,854	93,933	103,159	59,255	25%	36	307,411	379,424	422,208	16%
FX Cumulative **	60	448,969	850,417	646,661	102,007	112,596	77,173	16%	36	556,959	653,993	713,638	12%
Commodity Cumulative **	61	222,801	331,312	271,902	31,318	77,529	13,504	12%	17	250,975	257,987	296,621	8%
CS Cumulative **	62	10,392	29,923	16,988	5,214	7,606	3,649	31%	25	14,134	15,698	19,745	17%
CTP Cumulative **	63	169,967	428,613	321,758	107,606	107,606	48,702	33%	5	250,386	379,911	379,911	21%

[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

*** 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

	Port. ID	Main statistics: Min	Max	Ave.	STDev	STDev_trunc [1]	MAD (median absolute deviation)	Coefficient of variation (STDev/Mean)	Num obs. [2]	Percentiles: 25th	50th	75th	IQD
Equity	1	5,678,137	8,967,891	7,558,986	825,925	1,222,894	677,109	11%	35	6,947,230	7,350,416	8,313,255	9%
	2	3,365,859	16,815,691	10,290,739	3,807,079	3,568,669	3,079,803	37%	38	8,041,047	9,923,012	13,473,337	25%
	3	13,465	47,205	29,337	10,078	9,853	8,600	34%	37	20,809	31,355	37,438	29%
	4	209	2,624	1,041	694	1,105	358	67%	32	497	815	1,668	54%
	5	1,107,869,600	3,923,350,542	2,660,753,955	613,716,006	775,025,106	367,685,862	23%	33	2,378,851,170	2,555,504,235	3,065,253,770	13%
	6	12,479	97,502	51,458	21,315	22,612	15,665	41%	35	35,493	53,285	66,808	31%
	7	16,562	112,863	50,195	30,695	37,031	17,952	61%	30	27,189	41,222	71,123	45%
	8	56,840	206,730	125,153	43,810	42,832	35,662	35%	36	90,606	125,258	164,454	29%
	9	51,570	188,135	113,668	34,195	36,955	22,790	30%	37	91,600	121,201	140,212	21%
	10	361,618	2,611,019	977,560	385,707	2,116,268	131,420	40%	35	820,534	1,018,607	1,132,628	16%
Interest Rate	11	72,330	295,110	193,541	66,251	73,645	43,387	34%	46	149,362	205,441	246,559	25%
	12	11,089	154,369	76,387	38,135	38,015	31,525	50%	45	44,111	79,686	103,057	40%
	13	138,108	464,215	309,616	89,147	87,994	63,605	29%	49	242,695	309,168	377,092	22%
	14	26,432	136,400	78,963	28,849	28,315	24,249	37%	49	56,281	80,747	102,100	29%
	15	12,523	149,760	62,053	40,949	45,576	29,416	66%	20	28,193	62,709	98,664	56%
	16	80,009	276,954	186,889	54,932	60,109	44,690	29%	44	151,031	193,890	219,922	19%
	17	103,511	569,977	349,777	114,356	149,864	81,109	33%	38	243,025	368,887	419,228	27%
	18	80,636	496,968	299,059	90,649	311,311	62,415	30%	36	228,258	325,705	348,233	21%
	19	112,007	450,642	285,059	86,163	93,088	50,250	30%	47	224,958	293,322	349,151	22%
	20	38	58,358	14,072	11,088	24,429	5,685	79%	45	8,018	14,728	18,858	40%
	21	273,699	857,951	618,078	151,110	195,030	77,887	24%	43	545,080	637,169	711,042	13%
	22	32,078	246,445	151,503	61,918	61,918	55,037	41%	44	98,117	155,659	209,666	36%
	23	179,416	394,565	281,140	59,366	79,031	41,883	21%	40	235,634	283,767	322,728	16%
	24	98,329	1,218,012	558,114	330,098	371,681	270,914	59%	35	257,926	536,764	844,886	53%
	25	28,622	335,649	153,877	75,868	90,831	47,905	49%	46	85,993	164,733	199,388	40%
	26	49,630	1,887,597	599,740	333,028	635,362	153,930	56%	38	367,426	629,736	702,494	31%
FX	27	744,107	1,993,455	1,405,922	356,012	337,831	306,255	25%	45	1,169,136	1,369,184	1,689,576	18%
	28	6,145	42,261	25,878	10,140	12,052	8,636	39%	40	16,749	29,340	33,382	33%
	29	205,155	531,072	387,483	87,614	97,745	47,633	23%	40	343,143	394,746	443,121	13%
	30	586,520	1,362,190	940,107	218,806	215,575	196,039	23%	41	744,213	951,282	1,123,236	20%
	31	820,087	1,455,293	1,109,905	176,723	223,123	154,401	16%	38	942,746	1,059,293	1,277,546	15%
	32	25,576	774,349	187,538	176,592	322,196	17,255	94%	33	112,875	138,100	148,264	14%
Commodity	33	1,679	44,302	20,861	12,105	12,105	6,990	58%	20	13,771	20,366	27,357	33%
	34	207,446	683,834	434,357	112,921	124,657	47,815	26%	18	396,164	437,489	491,795	11%
	35	714,869	1,287,124	1,059,750	166,900	255,782	84,117	16%	17	1,018,879	1,066,925	1,154,506	6%
Credit Spread	36	7,618	68,350	23,335	13,065	51,463	5,340	56%	28	15,473	22,234	25,915	25%
	37	19,766	181,375	69,239	43,565	67,517	13,474	63%	25	41,286	52,649	82,188	33%
	38	3,937	26,788	14,443	6,939	7,506	6,606	48%	27	7,448	16,332	19,981	46%
	39	8,128	78,963	33,816	20,336	28,144	10,770	60%	26	19,919	31,997	43,284	37%
	40	6,467	38,000	17,891	8,664	11,155	4,166	48%	24	11,345	16,599	23,881	36%
	41	9,393	56,432	30,197	15,210	21,202	14,331	50%	29	16,111	38,463	43,062	46%
	42	24,182	115,078	57,803	28,967	37,529	11,471	50%	25	39,210	49,192	84,781	37%
	43	13,879	107,130	58,663	25,386	37,384	18,958	43%	28	36,878	65,329	73,948	33%
	44	6,685	41,719	22,193	8,928	11,802	4,893	40%	29	14,977	22,059	25,230	26%
	45	7,170	52,774	21,453	10,864	17,387	6,050	51%	27	12,816	21,033	28,388	38%
	46	7,332	37,861	18,321	7,319	14,842	3,966	40%	28	13,506	18,881	21,591	23%
	47	1,597	24,650	10,548	5,149	10,254	1,518	49%	27	7,663	9,200	13,016	26%
	48	12,764	54,105	30,981	11,810	12,127	8,603	38%	30	21,591	30,908	39,116	29%
	49	6,310	24,485	12,806	5,928	13,150	3,717	46%	25	8,028	13,452	16,583	35%
	50	11,931	63,989	30,018	11,427	19,870	4,030	38%	29	24,267	29,355	32,503	15%
	51	59,574	391,206	182,037	72,250	114,131	51,882	40%	24	129,378	188,252	243,403	31%
	52	89,769	824,581	403,784	228,173	223,718	204,086	57%	27	166,510	404,573	588,499	56%
	53	132,176	760,896	455,063	206,657	213,134	177,967	45%	26	294,170	469,230	670,692	39%
Correlation Trading	54	1,924	17,752	10,304	4,712	4,712	1,782	46%	8	8,278	9,937	13,163	23%
	55	15,010	106,641	45,488	37,416	37,416	29,270	82%	5	15,010	44,280	46,496	51%
	56	496,338	1,136,259	862,573	274,317	274,317	293,949	32%	5	753,735	790,287	1,136,244	20%
ALL-IN no-CTP **	57	5,088,498	7,790,838	6,607,473	915,874	1,261,282	382,186	14%	19	5,390,844	6,782,089	7,368,934	16%
Equity Cumulative **	58	3,313,371	6,578,703	5,551,200	683,142	1,395,225	285,170	12%	25	5,356,707	5,502,078	5,914,045	5%
IR Cumulative **	59	80,515	828,190	495,223	164,111	335,126	100,743	33%	33	400,218	557,634	568,104	17%
FX Cumulative **	60	1,788,964	3,198,304	2,553,955	414,855	437,887	299,837	16%	35	2,260,903	2,588,491	2,911,955	13%
Commodity Cumulative **	61	224,277	691,123	455,764	111,912	148,203	43,718	25%	18	394,089	436,287	500,715	12%
CS Cumulative **	62	20,895	105,251	62,629	26,107	35,387	19,237	42%	24	45,174	65,592	84,678	30%
CTP Cumulative **	63	713,279	1,059,709	958,587	164,110	268,135	14,518	17%	4	871,976	1,030,672	1,045,198	9%

[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

*** 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

		Main statistics								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
Equity	1	2,467,031	3,153,890	2,873,542	241,103	253,394	154,530	8%	26	2,656,370	2,933,206	3,076,940	7%
	2	1,916,537	2,757,794	2,368,940	269,925	252,418	259,429	11%	26	2,143,949	2,276,603	2,612,667	10%
	3	16,746	31,041	22,556	3,388	4,623	2,123	15%	23	20,150	21,870	24,945	11%
	4	228	1,605	868	364	475	198	42%	24	674	923	1,054	22%
	5	714,345,457	932,267,279	835,194,075	50,943,075	232,167,841	26,775,655	6%	24	801,024,646	830,468,159	863,448,069	4%
	6	14,860	43,133	33,342	7,470	10,671	5,267	22%	23	26,307	34,485	39,532	20%
	7	4,677	26,922	12,768	5,849	7,728	4,253	46%	21	9,205	12,267	16,292	28%
	8	8,841	86,953	46,423	17,624	27,345	5,577	38%	25	36,237	44,418	51,551	17%
	9	45,763	75,779	57,651	6,341	12,590	4,213	11%	23	53,388	57,569	62,686	8%
	10	245,142	313,797	276,301	20,001	24,461	7,520	7%	23	262,472	269,069	290,784	5%
Interest Rate	11	60,916	85,037	69,696	5,278	8,180	2,670	8%	35	66,757	69,956	72,323	4%
	12	38,896	70,077	51,965	7,751	9,942	5,162	15%	32	45,971	53,711	55,699	10%
	13	130,548	169,536	150,868	10,960	13,025	7,403	7%	33	145,813	153,224	159,228	4%
	14	20,621	34,979	28,399	3,747	4,293	2,341	13%	35	26,248	28,121	31,177	9%
	15	4,313	27,774	17,758	6,115	6,115	3,491	34%	16	14,115	16,232	22,107	22%
	16	84,037	117,079	102,661	7,663	25,249	5,484	8%	34	96,603	104,146	107,034	5%
	17	141,808	351,193	247,376	39,280	61,509	19,720	16%	28	223,250	242,515	264,960	9%
	18	74,318	482,554	283,882	109,660	121,226	56,509	39%	29	217,213	278,248	325,231	20%
	19	128,571	169,153	146,832	9,012	11,205	4,523	6%	34	143,235	147,495	151,366	3%
	20	3,466	5,836	4,530	694	1,053	591	15%	33	3,900	4,477	5,072	13%
	21	259,738	347,952	295,811	18,513	76,457	11,573	6%	34	283,327	298,570	306,474	4%
	22	30,770	59,233	42,103	6,142	11,226	3,891	15%	31	37,966	41,196	45,454	9%
	23	125,805	219,579	176,515	19,260	35,843	10,265	11%	33	168,462	178,229	185,800	5%
	24	88,133	598,951	242,546	135,115	305,327	64,196	56%	26	146,176	250,980	297,012	34%
	25	12,640	124,546	47,164	25,287	62,487	7,870	54%	32	31,767	39,988	59,686	31%
	26	164,930	541,470	367,191	80,331	102,217	30,934	22%	27	330,116	368,614	404,289	10%
FX	27	397,391	592,434	484,713	49,127	55,515	28,941	10%	33	442,880	485,460	501,759	6%
	28	7,471	20,775	12,137	2,839	8,101	1,290	23%	29	10,480	11,834	12,986	11%
	29	62,721	125,356	92,878	14,570	16,889	12,011	16%	30	81,245	95,536	104,338	12%
	30	243,614	379,274	311,962	36,100	37,896	12,222	12%	31	291,211	303,538	331,764	7%
	31	220,667	298,214	261,469	21,349	29,267	14,336	8%	30	239,665	267,922	278,230	7%
	32	13,844	43,140	18,799	5,893	94,385	1,447	31%	26	15,735	18,090	20,496	13%
Commodity	33	582	16,588	7,805	4,481	4,481	3,193	57%	16	4,787	7,724	11,143	40%
	34	217,307	329,759	275,545	30,330	36,438	8,062	11%	13	265,232	275,465	285,277	4%
	35	225,389	433,671	321,014	58,600	58,600	37,719	18%	14	285,391	331,344	354,868	11%
Credit Spread	36	9,658	23,893	15,933	4,044	3,902	3,382	25%	24	12,390	16,291	18,730	20%
	37	11,381	22,724	16,012	3,835	5,530	2,165	24%	18	12,886	15,328	20,161	22%
	38	1,744	5,531	2,996	948	3,109	435	32%	22	2,312	2,770	3,697	23%
	39	6,581	13,395	9,457	2,066	2,993	751	22%	21	7,776	9,853	10,211	14%
	40	1,897	5,809	3,910	1,257	2,306	989	32%	22	2,875	3,980	5,221	29%
	41	3,185	9,253	6,344	1,407	4,134	838	22%	23	5,619	6,471	7,318	13%
	42	2,813	38,599	21,903	10,038	11,065	3,747	46%	20	15,356	19,175	32,302	36%
	43	7,234	29,646	12,944	5,000	27,956	1,837	39%	22	10,688	11,360	14,258	14%
	44	4,348	8,266	6,152	1,173	1,358	659	19%	23	4,728	6,170	7,053	20%
	45	1,350	10,151	4,593	2,457	11,589	1,162	54%	20	3,061	4,642	5,555	29%
	46	3,048	9,642	5,132	1,620	4,884	585	32%	23	4,423	4,887	5,436	10%
	47	297	5,221	2,407	1,062	1,624	574	44%	22	1,761	2,433	2,909	25%
	48	3,697	10,472	7,632	2,133	2,258	1,735	28%	24	6,011	7,830	9,822	24%
	49	2,372	7,004	4,011	1,450	2,967	452	36%	20	3,070	3,614	4,615	20%
	50	9,534	27,257	18,533	5,444	7,587	4,081	29%	23	14,875	19,726	23,945	23%
	51	44,111	81,622	60,868	11,212	20,143	7,709	18%	19	51,974	65,173	69,925	15%
	52	37,988	281,408	104,343	64,791	105,274	28,932	62%	19	57,537	95,102	135,459	40%
	53	47,452	260,787	129,277	66,201	109,734	35,642	51%	19	77,970	124,057	168,971	37%
Correlation Trading	54	745	7,030	3,633	2,134	2,134	1,000	59%	6	2,952	3,060	4,952	25%
	55	5,061	34,167	16,180	14,010	14,010	7,685	87%	4	5,061	12,746	27,299	69%
	56	116,360	290,852	173,354	82,289	82,289	26,742	48%	4	116,360	143,102	230,348	33%
ALL-IN no-CTP **	57	1,250,931	1,657,107	1,464,248	117,760	117,760	53,352	8%	16	1,409,650	1,468,713	1,509,931	3%
Equity Cumulative **	58	1,066,653	1,854,907	1,280,247	225,584	272,121	195,335	18%	20	1,080,959	1,319,755	1,361,676	11%
IR Cumulative **	59	218,499	603,529	382,609	95,471	124,998	36,694	25%	28	327,666	361,415	460,132	17%
FX Cumulative **	60	526,214	813,673	646,808	92,636	91,381	78,075	14%	30	561,507	639,002	744,773	14%
Commodity Cumulative **	61	194,386	330,752	271,287	37,747	117,613	11,269	14%	13	263,496	270,980	285,334	4%
CS Cumulative **	62	9,010	28,315	15,063	5,914	8,862	2,004	39%	18	11,299	12,964	15,032	14%
CTP Cumulative **	63	105,724	262,034	156,908	73,708	73,708	24,214	47%	4	105,724	129,938	208,093	33%

[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

*** 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 24: Empirical expected shortfall statistics

EU Statistics for empirical expected shortfall

		Main statistics								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
Equity	1	2,619,931	2,878,661	2,763,472	63,368	83,970	24,337	2%	25	2,738,919	2,757,343	2,797,446	1%
	2	2,008,067	2,672,534	2,284,172	184,607	184,607	159,673	8%	24	2,147,314	2,312,797	2,390,978	5%
	3	17,179	27,999	21,695	2,773	3,215	1,781	13%	24	19,623	21,822	23,189	8%
	4	229	2,128	974	544	633	207	56%	24	680	937	1,044	21%
	5	753,067,235	908,405,677	826,277,992	38,806,877	229,297,553	17,683,948	5%	23	812,279,399	825,968,588	846,576,893	2%
	6	17,751	44,153	34,419	7,728	10,197	6,036	23%	23	29,498	35,860	41,896	17%
	7	4,590	25,395	12,443	5,863	8,165	3,663	47%	21	8,677	12,107	15,182	27%
	8	8,804	86,042	47,237	16,392	24,709	5,666	35%	25	39,077	43,006	51,964	14%
	9	44,363	90,151	69,530	9,704	12,158	5,141	14%	25	63,142	68,234	73,679	8%
	10	246,544	299,919	276,849	14,739	15,864	7,722	5%	23	269,013	275,847	291,943	4%
Interest Rate	11	60,647	82,716	69,012	5,186	7,131	2,544	8%	35	66,292	68,946	71,969	4%
	12	35,303	63,728	49,303	6,130	8,356	2,820	12%	32	46,846	50,900	52,737	6%
	13	130,613	170,021	146,939	8,594	11,076	5,035	6%	33	142,721	149,434	151,639	3%
	14	25,035	34,436	30,295	2,096	3,420	1,253	7%	31	29,017	30,727	31,762	5%
	15	4,954	28,172	17,715	6,201	6,201	2,984	35%	16	13,874	16,014	22,485	24%
	16	86,535	123,566	101,343	8,781	30,738	5,721	9%	34	95,442	102,644	106,885	6%
	17	112,652	350,135	248,346	50,415	65,335	17,695	20%	28	226,392	239,819	281,113	11%
	18	86,958	511,707	297,595	111,185	128,962	42,875	37%	28	244,797	274,174	361,576	19%
	19	131,698	161,928	147,365	8,433	9,780	3,380	6%	34	143,611	148,847	151,062	3%
	20	3,619	6,346	4,567	703	989	374	15%	33	4,131	4,479	4,924	9%
	21	241,076	332,411	288,016	17,840	74,379	10,096	6%	34	274,795	293,771	299,141	4%
	22	28,528	62,077	43,317	7,328	10,100	3,242	17%	32	38,132	42,629	47,502	11%
	23	129,474	219,104	178,316	18,421	39,796	8,435	10%	32	169,585	181,317	184,322	4%
	24	84,898	595,359	245,400	145,247	305,902	66,457	59%	26	141,545	213,862	337,191	41%
	25	12,028	118,895	48,196	24,162	57,672	9,442	50%	32	35,143	42,902	51,639	19%
	26	229,949	559,367	385,962	81,257	102,273	20,747	21%	26	347,598	363,910	405,952	8%
FX	27	423,429	561,519	479,061	42,047	45,344	33,831	9%	33	442,564	477,173	506,613	7%
	28	7,585	20,025	11,967	2,494	7,415	1,207	21%	29	10,398	11,653	12,883	11%
	29	65,147	130,022	93,812	16,998	20,343	15,410	18%	30	78,998	96,198	109,465	16%
	30	281,772	341,495	305,698	16,033	24,558	8,946	5%	27	293,947	302,874	314,883	3%
	31	216,999	329,290	269,466	25,721	29,535	11,736	10%	29	256,262	275,476	281,688	5%
	32	14,081	42,748	19,532	6,825	91,179	2,206	35%	26	15,589	19,395	21,124	15%
Commodity	33	558	13,565	7,564	4,234	6,226	3,159	56%	15	4,709	8,942	11,460	42%
	34	209,780	317,121	269,028	34,188	34,188	28,917	13%	14	234,057	276,621	286,064	10%
	35	255,746	396,379	328,796	43,340	43,340	38,525	13%	14	292,990	338,921	358,166	10%
Credit Spread	36	10,725	24,437	15,947	3,675	4,600	2,180	23%	23	12,575	16,840	17,819	17%
	37	10,825	25,934	17,003	4,773	5,441	2,900	28%	21	13,151	15,138	20,374	22%
	38	1,855	4,767	3,003	846	3,078	525	28%	22	2,295	2,896	3,633	23%
	39	6,424	13,405	9,378	2,055	2,780	1,428	22%	21	7,407	9,503	10,262	16%
	40	1,921	6,213	4,091	1,271	2,400	1,151	31%	22	2,846	4,243	5,147	29%
	41	3,421	9,538	6,232	1,446	3,929	747	23%	23	5,466	6,409	7,138	13%
	42	3,064	39,370	21,533	9,866	12,938	5,230	46%	20	14,770	19,186	31,453	36%
	43	6,654	30,462	13,078	4,897	26,298	1,901	37%	22	10,602	12,345	14,050	14%
	44	3,743	7,922	5,923	1,258	1,258	921	21%	25	4,867	6,119	6,810	17%
	45	-140	8,970	4,390	2,421	12,064	1,562	55%	21	3,038	4,177	5,957	32%
	46	3,063	9,638	5,159	1,569	4,542	524	30%	23	4,322	4,780	5,345	11%
	47	267	4,949	2,308	1,027	1,431	546	45%	22	1,675	2,380	2,420	18%
	48	3,760	11,277	7,656	2,069	2,235	1,478	27%	24	6,378	7,854	9,106	18%
	49	2,652	7,847	3,985	1,561	2,438	389	39%	20	2,993	3,218	4,987	25%
	50	9,787	30,891	19,257	6,529	8,865	5,563	34%	23	14,559	18,132	25,915	28%
	51	18,710	92,016	58,044	14,600	24,328	9,235	25%	20	51,038	63,522	66,193	13%
	52	38,846	303,631	117,071	77,991	109,437	42,943	67%	20	59,457	94,446	170,318	48%
	53	48,794	304,585	133,908	74,541	121,212	32,379	56%	19	75,477	117,943	199,363	45%
Correlation Trading	54	775	7,062	3,699	2,106	2,106	912	57%	6	3,045	3,220	4,869	23%
	55	4,675	30,478	15,303	12,822	12,822	8,355	84%	4	4,675	13,030	25,932	69%
	56	112,788	285,648	164,396	82,370	82,370	16,786	50%	4	112,788	129,574	216,004	31%
ALL-IN no-CTP **	57	1,204,464	1,615,859	1,368,068	99,080	148,138	67,179	7%	14	1,302,661	1,383,323	1,426,597	5%
Equity Cumulative **	58	1,025,346	1,633,596	1,270,385	184,847	245,667	114,826	15%	19	1,131,253	1,288,067	1,396,794	11%
IR Cumulative **	59	216,763	535,299	361,649	83,762	136,981	22,767	23%	25	314,651	335,420	370,983	8%
FX Cumulative **	60	505,649	758,971	620,473	72,926	95,289	39,017	12%	25	581,481	614,531	651,845	6%
Commodity Cumulative **	61	210,246	318,606	271,293	34,324	116,159	24,016	13%	13	254,357	260,703	286,297	6%
CS Cumulative **	62	7,943	30,337	14,954	6,176	9,828	1,658	41%	18	11,770	13,295	14,877	12%
CTP Cumulative **	63	103,009	259,012	149,484	74,366	74,366	14,948	50%	4	103,009	117,957	195,959	31%

[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

*** 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 25: sVaR/VaR statistics

EU Statistics for sVaR/VaR

		Main statistics								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
Equity	1	2.17	3.61	2.95	0.31			11%	31	2.73	2.94	3.18	8%
	2	1.26	7.60	4.48	1.56			35%	33	3.85	4.46	5.37	16%
	3	0.70	2.20	1.47	0.42			28%	34	1.13	1.43	1.78	22%
	4	0.30	4.45	1.65	1.21			73%	30	0.75	1.18	2.10	47%
	5	1.47	4.21	3.24	0.56			17%	31	3.15	3.37	3.54	6%
	6	0.54	3.16	1.58	0.60			38%	32	1.32	1.50	1.76	14%
	7	0.92	14.99	4.63	3.52			76%	26	2.44	3.29	5.36	37%
	8	0.59	3.56	1.38	0.59			42%	32	0.98	1.31	1.60	24%
	9	0.70	2.66	1.81	0.52			29%	32	1.49	1.79	2.18	19%
	10	1.26	4.76	3.32	0.91			27%	33	3.06	3.48	3.93	12%
Interest Rate	11	0.96	4.19	2.77	0.96			35%	38	2.07	3.17	3.43	25%
	12	0.40	4.02	1.83	0.92			50%	36	1.04	1.81	2.34	39%
	13	0.98	2.82	2.14	0.54			25%	40	1.80	2.23	2.57	18%
	14	0.92	4.30	2.98	0.99			33%	39	2.20	3.22	3.89	28%
	15	1.24	10.60	3.62	2.41			67%	18	2.15	2.42	4.32	34%
	16	0.81	2.82	1.83	0.53			29%	37	1.50	1.94	2.19	19%
	17	0.57	2.47	1.49	0.50			34%	34	1.03	1.51	1.70	25%
	18	0.32	2.96	1.20	0.61			51%	32	0.81	1.05	1.46	28%
	19	0.76	3.12	1.98	0.59			30%	38	1.56	2.05	2.36	20%
	20	0.02	16.19	3.83	2.77			72%	35	2.42	3.75	4.46	30%
	21	1.06	3.10	2.24	0.46			21%	35	2.05	2.30	2.54	11%
	22	0.73	5.32	3.12	1.34			43%	38	1.98	3.36	4.37	38%
	23	1.07	2.32	1.70	0.32			19%	32	1.44	1.72	1.94	15%
	24	0.33	8.14	3.02	1.51			50%	31	2.32	2.92	3.56	21%
	25	0.87	9.12	3.94	1.92			49%	40	2.62	3.87	5.20	33%
	26	0.13	5.25	1.71	1.03			60%	34	1.07	1.47	1.93	29%
FX	27	1.49	4.95	2.95	0.89			30%	38	2.36	2.64	3.58	20%
	28	0.76	3.80	2.24	0.73			32%	38	1.80	2.24	2.57	18%
	29	1.81	7.83	4.19	1.55			37%	35	3.38	3.84	4.50	14%
	30	1.68	4.33	3.11	0.68			22%	34	2.56	3.19	3.64	17%
	31	2.99	4.85	3.94	0.51			13%	30	3.52	3.95	4.31	10%
	32	1.32	18.66	7.23	2.85			39%	28	6.19	6.83	8.15	14%
Commodity	33	0.58	5.59	2.98	1.15			39%	18	2.69	3.06	3.46	13%
	34	0.80	2.08	1.66	0.30			18%	16	1.56	1.74	1.84	8%
	35	2.33	5.82	3.87	1.02			26%	15	3.13	3.64	4.41	17%
Credit Spread	36	0.36	4.55	1.45	0.93			64%	27	0.99	1.10	1.67	25%
	37	0.92	9.02	4.02	1.98			49%	22	2.87	3.45	4.38	21%
	38	1.26	8.21	4.47	1.91			43%	24	2.81	4.23	6.20	38%
	39	0.74	8.01	3.53	2.02			57%	23	1.69	3.20	4.30	44%
	40	1.36	7.87	4.03	1.73			43%	21	3.07	3.63	4.47	19%
	41	1.28	12.72	4.21	2.50			59%	26	2.10	3.49	5.10	42%
	42	1.11	7.54	3.07	1.80			58%	22	1.62	2.40	4.04	43%
	43	1.50	8.37	4.10	1.95			48%	27	2.70	3.35	5.10	31%
	44	1.33	6.92	3.46	1.47			42%	25	2.38	3.00	4.51	31%
	45	1.29	11.50	4.47	2.70			60%	24	2.24	3.78	6.00	46%
	46	1.25	5.46	3.10	1.24			40%	27	1.97	2.98	4.16	36%
	47	0.70	7.95	4.18	1.88			45%	25	2.98	4.18	5.56	30%
	48	1.49	5.31	3.40	0.96			28%	26	2.79	3.28	4.15	20%
	49	0.80	7.22	3.06	1.70			56%	24	1.95	2.42	4.05	35%
	50	0.81	3.16	1.58	0.60			38%	26	1.15	1.51	1.92	25%
	51	1.48	4.81	2.90	0.96			33%	20	2.10	2.76	3.84	29%
	52	0.86	7.86	3.41	2.24			66%	22	1.74	2.59	4.75	46%
	53	0.98	6.75	3.05	1.63			53%	23	2.07	2.31	3.17	21%
Correlation Trading	54	1.38	8.40	3.93	2.07			53%	8	2.79	3.64	4.47	23%
	55	2.05	3.04	2.76	0.38			14%	5	2.68	2.99	3.04	6%
	56	2.06	2.80	2.59	0.27			10%	5	2.66	2.70	2.70	1%
ALL-IN no-CTP **	57	3.45	6.13	4.67	0.79			17%	19	4.16	4.64	5.09	10%
Equity Cumulative **	58	2.66	6.60	4.58	0.95			21%	22	4.01	4.54	4.70	8%
IR Cumulative **	59	0.29	3.05	1.36	0.57			42%	29	1.05	1.27	1.53	19%
FX Cumulative **	60	2.36	6.15	4.03	0.78			19%	31	3.54	3.83	4.39	11%
Commodity Cumulative **	61	1.25	2.09	1.73	0.22			13%	16	1.64	1.75	1.82	5%
CS Cumulative **	62	1.92	6.51	3.76	1.33			35%	24	2.40	3.73	4.83	34%
CTP Cumulative **	63	2.47	2.85	2.69	0.14			5%	4	2.65	2.71	2.75	2%

[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

*** 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 26: P&L VaR/VaR statistics

EU Statistics for P&L VaR/VaR

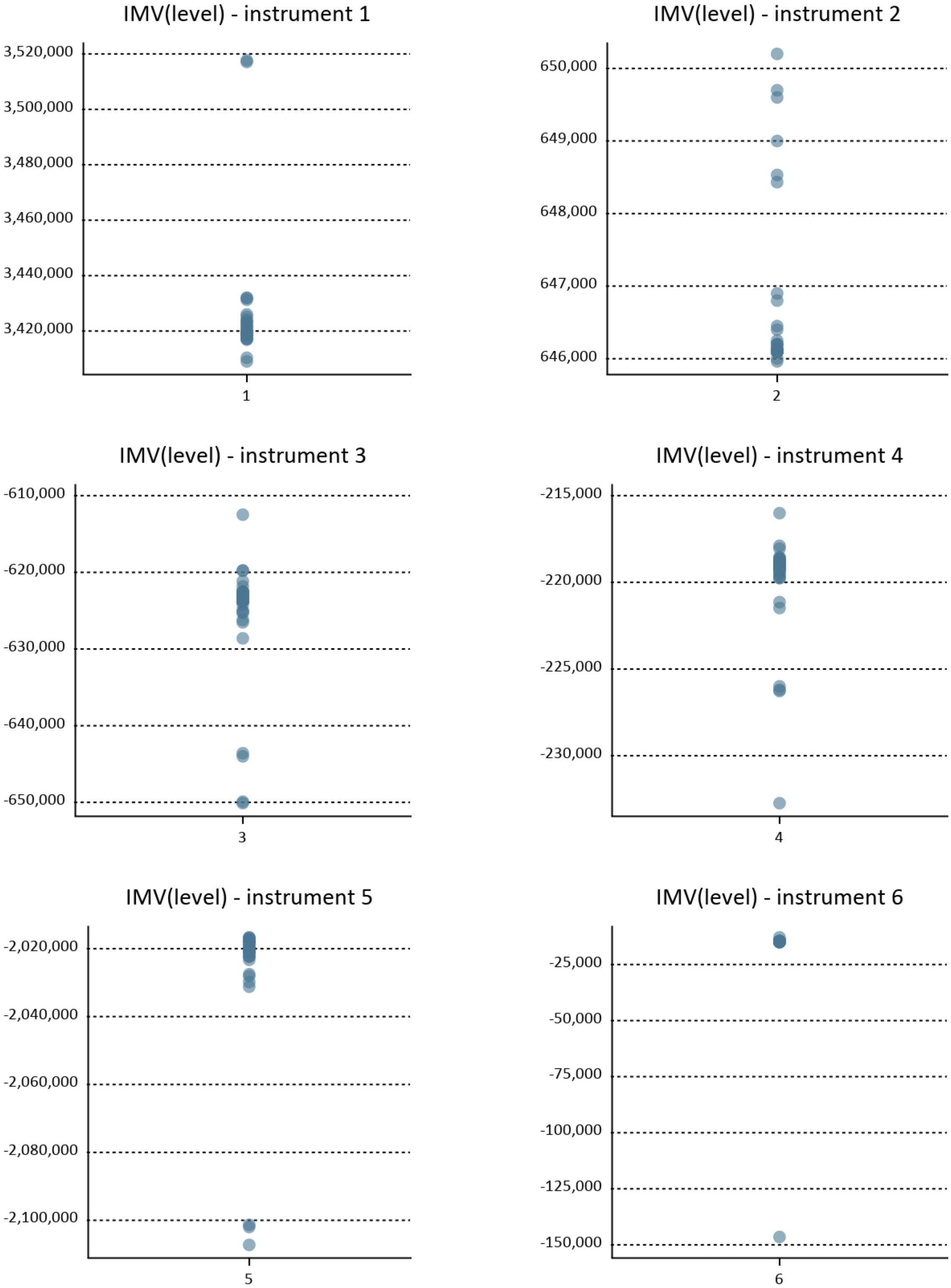
		Main statistics								Percentiles		
	Port. ID	Min	Max	Ave.	STDev	STDev_trunc [1]	MAD (median absolute deviation)	Coefficient of variation (STDev/Mean)	Num obs. [2]	25th	50th	75th
Equity	1	0.71	1.20	0.98	0.10			10%	26	0.96	1.00	1.03
	2	0.81	1.25	1.00	0.09			9%	24	0.96	1.02	1.03
	3	0.56	1.87	0.96	0.24			25%	25	0.83	0.95	1.05
	4	0.00	1.60	0.92	0.39			42%	26	0.60	1.05	1.18
	5	0.82	129.02	10.84	33.34			308%	25	0.96	1.04	1.07
	6	0.57	1.31	1.02	0.18			18%	24	0.98	1.03	1.15
	7	0.58	2.44	0.98	0.38			39%	21	0.79	0.89	1.09
	8	0.54	7.01	2.30	1.30			56%	24	1.58	2.33	2.82
	9	-419.20	1.51	-15.69	82.37			-525%	24	0.94	1.05	1.26
	10	0.82	11.39	1.43	2.03			142%	25	0.99	1.02	1.05
Interest Rate	11	0.34	1.21	0.99	0.14			15%	31	1.00	1.01	1.06
	12	0.60	1.02	0.81	0.09			11%	27	0.75	0.82	0.86
	13	0.32	1.34	0.98	0.17			17%	31	0.97	1.02	1.06
	14	0.32	1.38	0.95	0.18			19%	31	0.87	0.98	1.02
	15	0.60	1.30	0.94	0.20			21%	14	0.77	0.93	1.07
	16	0.84	1.09	1.00	0.06			6%	28	0.99	1.00	1.04
	17	0.63	1.45	1.02	0.17			17%	27	0.98	1.01	1.10
	18	0.86	1.65	1.12	0.22			20%	26	1.00	1.05	1.16
	19	0.74	1.19	1.00	0.10			10%	32	0.96	1.00	1.03
	20	0.32	1.27	1.01	0.18			17%	31	0.99	1.04	1.09
	21	0.34	1.11	0.96	0.13			13%	31	0.95	1.00	1.01
	22	0.74	1.60	1.20	0.18			15%	29	1.14	1.18	1.30
	23	0.44	1.31	0.96	0.16			17%	32	0.83	1.00	1.06
	24	0.31	1.20	0.90	0.27			30%	23	0.93	1.00	1.06
	25	0.18	1.53	0.94	0.29			31%	31	0.85	1.00	1.05
	26	0.69	1.50	1.02	0.15			14%	26	0.96	1.01	1.09
FX	27	0.33	1.21	0.98	0.16			17%	31	0.92	1.02	1.08
	28	0.35	1.27	0.93	0.19			21%	29	0.77	1.00	1.08
	29	0.35	2.17	1.13	0.31			27%	28	1.00	1.07	1.25
	30	0.32	1.16	0.98	0.15			15%	29	0.97	0.99	1.02
	31	0.92	1.30	1.12	0.11			10%	26	1.05	1.11	1.21
	32	0.33	1.33	0.98	0.19			19%	28	0.91	1.03	1.05
Commodity	33	0.58	1.92	1.10	0.32			30%	14	0.93	1.08	1.21
	34	0.88	1.20	1.01	0.11			10%	13	0.90	1.00	1.10
	35	0.60	1.03	0.92	0.14			15%	13	0.89	0.99	1.02
Credit Spread	36	0.33	1.60	1.12	0.25			23%	24	1.04	1.08	1.28
	37	0.32	1.23	1.00	0.18			18%	20	0.97	1.00	1.06
	38	0.32	2.56	1.19	0.48			40%	20	0.98	1.02	1.37
	39	0.32	1.41	1.03	0.22			22%	21	1.00	1.02	1.11
	40	0.32	2.55	1.21	0.48			40%	21	1.00	1.02	1.39
	41	0.32	1.56	1.03	0.21			21%	21	0.97	1.01	1.08
	42	0.33	6.87	1.19	1.32			111%	20	0.72	1.01	1.04
	43	0.32	1.58	1.10	0.26			24%	23	1.01	1.05	1.23
	44	0.33	1.89	1.12	0.33			29%	25	0.97	1.09	1.13
	45	-16.07	2.63	0.42	3.62			870%	21	0.98	1.08	1.34
	46	0.32	2.23	1.08	0.36			33%	24	0.96	1.03	1.12
	47	0.32	5.82	1.34	1.12			84%	20	0.95	1.01	1.04
	48	0.33	2.37	1.11	0.40			36%	23	0.98	1.02	1.06
	49	0.33	2.24	1.21	0.44			36%	21	1.00	1.08	1.47
	50	0.32	1.35	1.05	0.20			19%	23	0.99	1.05	1.18
	51	0.33	1.70	0.97	0.29			30%	20	0.81	1.03	1.11
	52	0.33	1.54	1.05	0.28			27%	19	0.96	1.10	1.12
	53	0.33	1.30	1.05	0.22			21%	20	0.98	1.06	1.23
Correlation Trading	54	0.71	1.29	0.95	0.19			20%	6	0.83	0.88	1.06
	55	0.97	1.11	1.03	0.06			6%	4	0.97	1.01	1.06
	56	0.97	3.61	2.32	1.29			55%	4	1.07	2.36	3.61
ALL-IN no-CTP **	57	0.73	1.12	0.99	0.11			11%	15	0.98	1.03	1.05
Equity Cumulative **	58	0.23	1.29	0.95	0.25			27%	18	0.91	1.04	1.09
IR Cumulative **	59	0.88	1.64	1.11	0.17			15%	23	1.01	1.05	1.15
FX Cumulative **	60	0.66	1.32	1.02	0.15			15%	26	0.95	1.04	1.09
Commodity Cumulative **	61	0.88	1.21	1.01	0.11			11%	12	0.90	1.00	1.09
CS Cumulative **	62	0.78	2.11	1.19	0.30			25%	18	1.01	1.07	1.25
CTP Cumulative **	63	0.96	3.59	2.31	1.28			56%	4	1.07	2.35	3.59

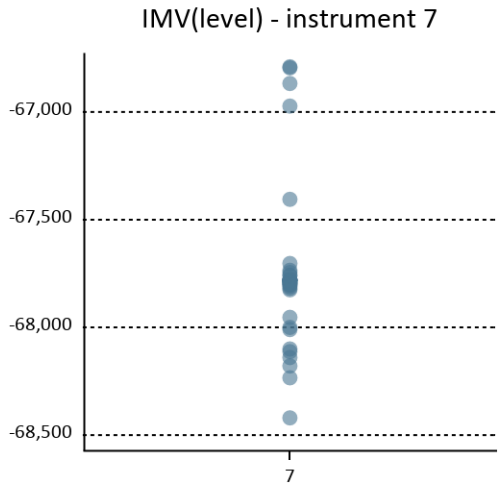
[1] *STDev trunc* is the standard deviation computed excluding values below the *5th* and above the *95th* percentile

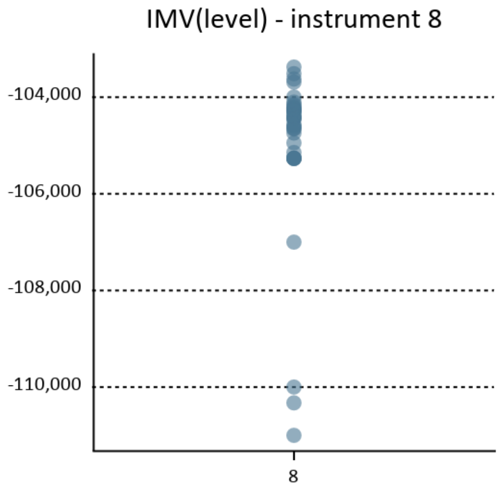
[2] Refers to the number of banks included in the computation of the statistics

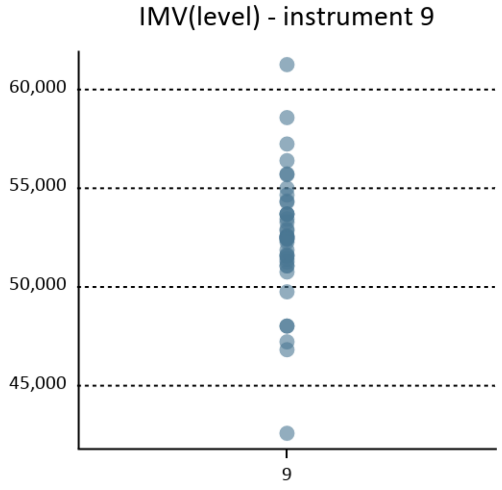
*** For the aggregated portfolios (57 to 63), banks that reported at least a missing portfolio IMV among the ones composing the aggregate are not included in the computation of the benchmarks for that particular aggregate portfolio.*

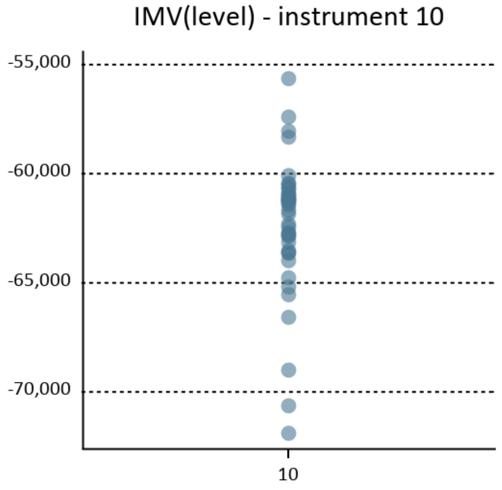
Figure 17: IMV scatter plots (all)

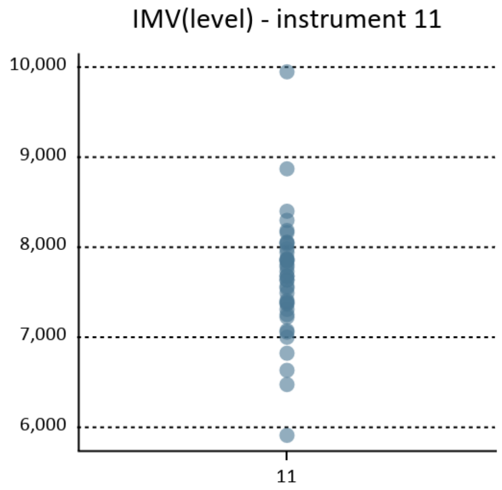


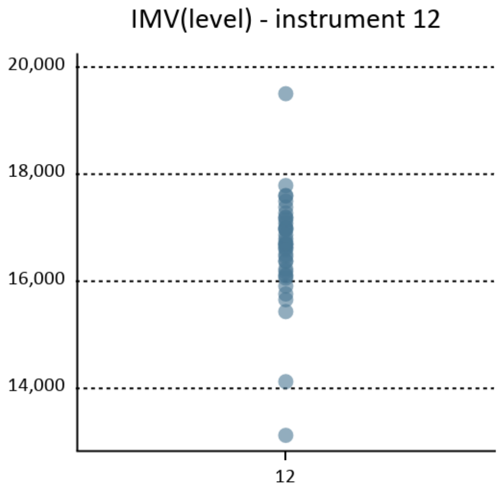

IMV(level) - instrument 7
-67,000
-67,500
-68,000
-68,500
7


IMV(level) - instrument 8
-104,000
-106,000
-108,000
-110,000
8

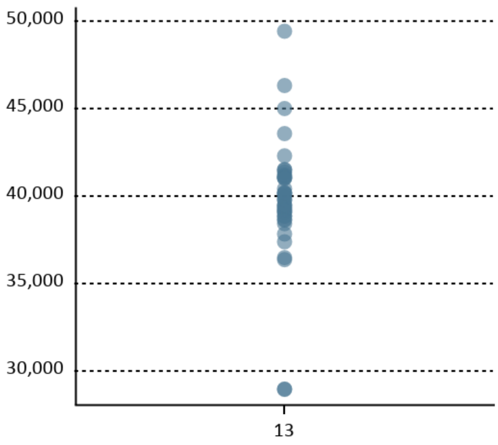

IMV(level) - instrument 9
60,000
55,000
50,000
45,000
9


IMV(level) - instrument 10
-55,000
-60,000
-65,000
-70,000
10

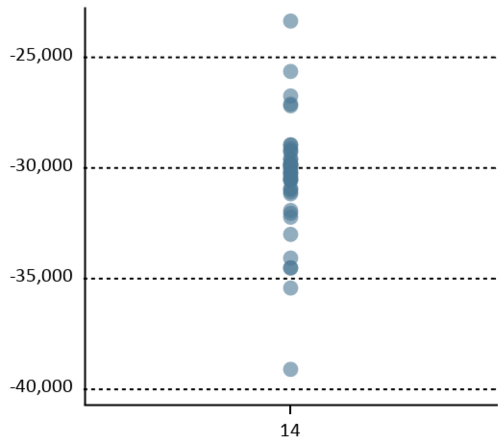

IMV(level) - instrument 11
10,000
9,000
8,000
7,000
6,000
11


IMV(level) - instrument 12
20,000
18,000
16,000
14,000
12

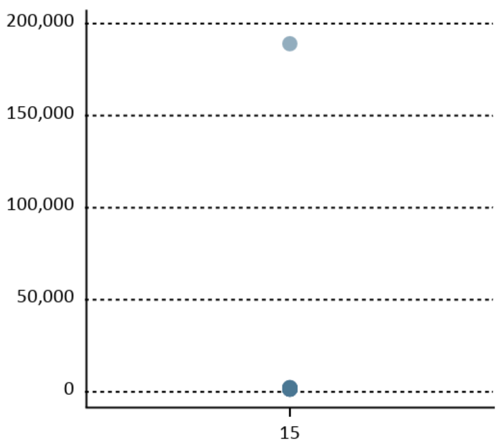
IMV(level) - instrument 13



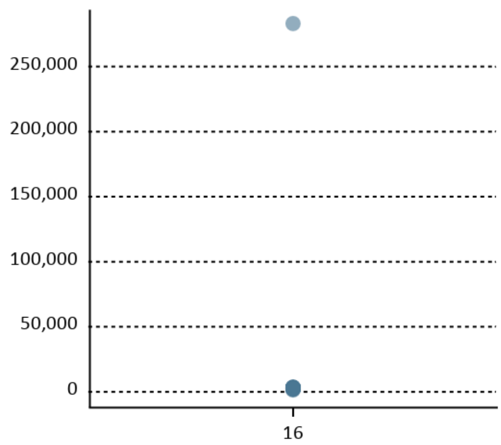
IMV(level) - instrument 14



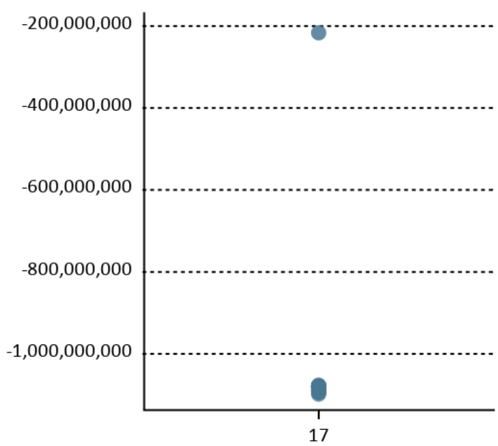
IMV(level) - instrument 15



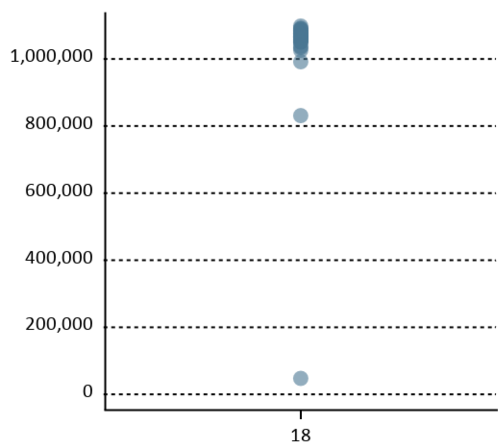
IMV(level) - instrument 16

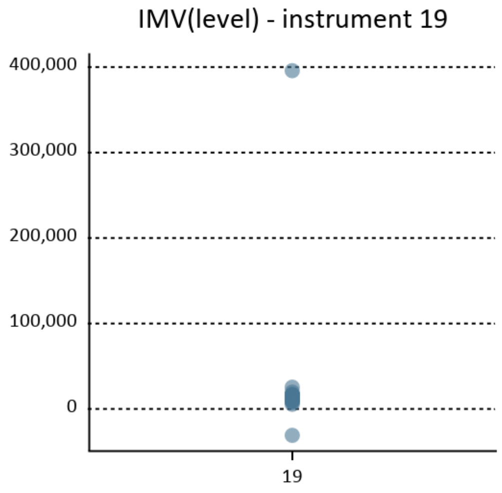


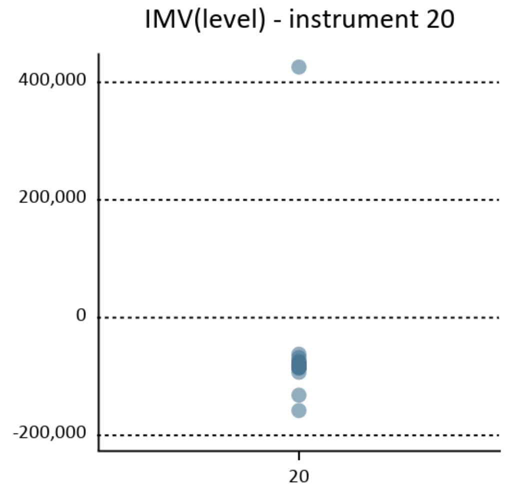
IMV(level) - instrument 17

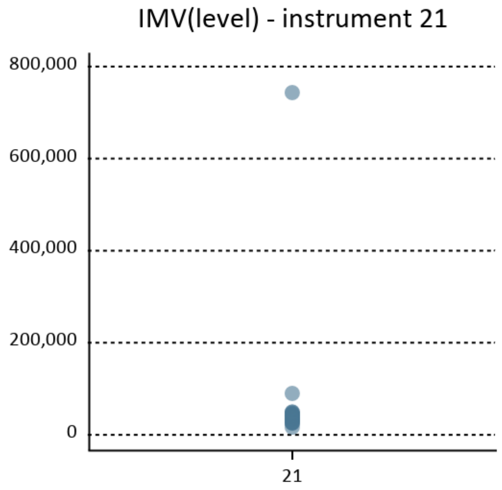


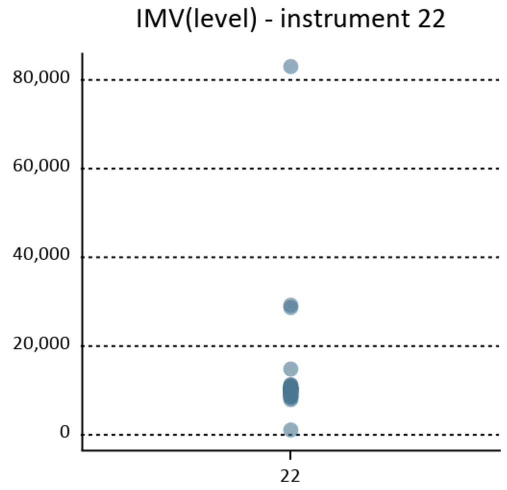
IMV(level) - instrument 18

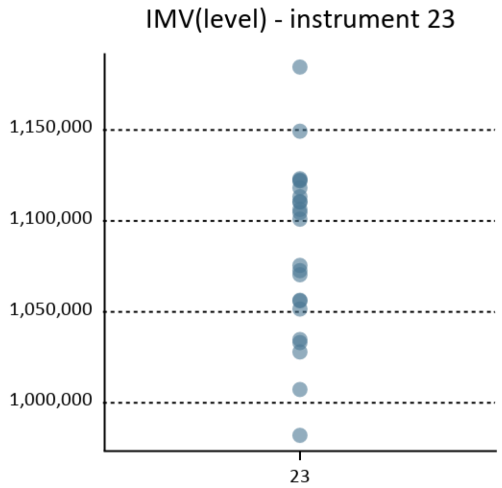


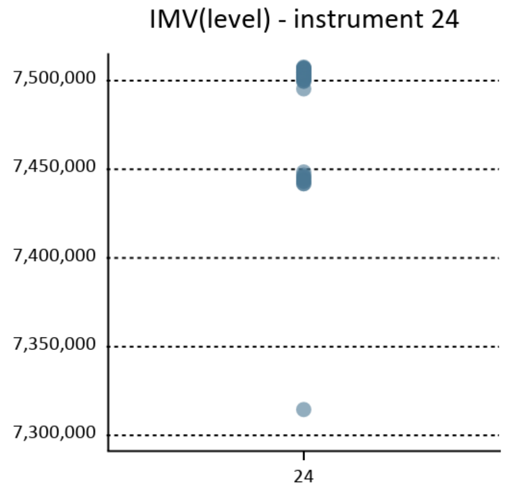

IMV(level) - instrument 19
400,000
300,000
200,000
100,000
0
19


IMV(level) - instrument 20
400,000
200,000
0
-200,000
20

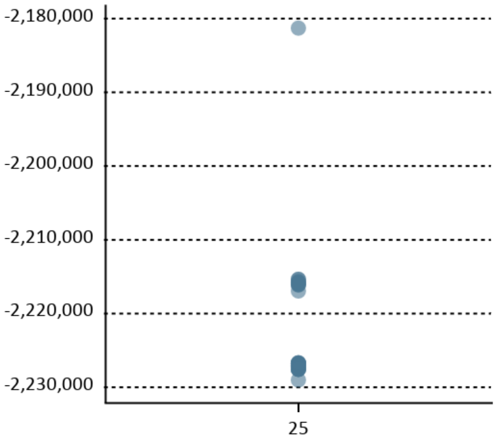

IMV(level) - instrument 21
800,000
600,000
400,000
200,000
0
21


IMV(level) - instrument 22
80,000
60,000
40,000
20,000
0
22

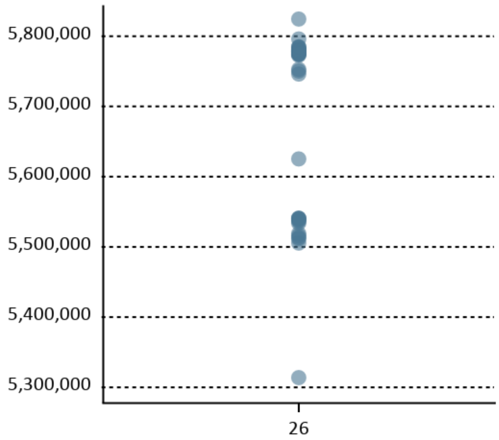

IMV(level) - instrument 23
1,150,000
1,100,000
1,050,000
1,000,000
23


IMV(level) - instrument 24
7,500,000
7,450,000
7,400,000
7,350,000
7,300,000
24

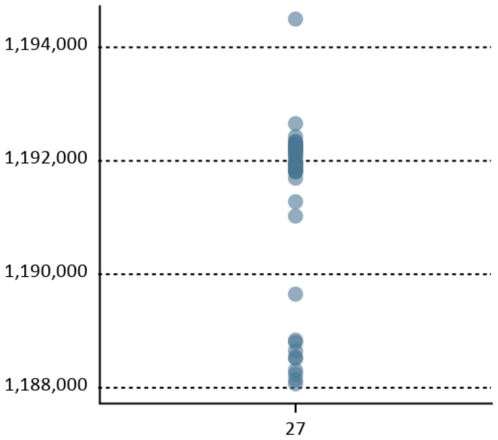
IMV(level) - instrument 25



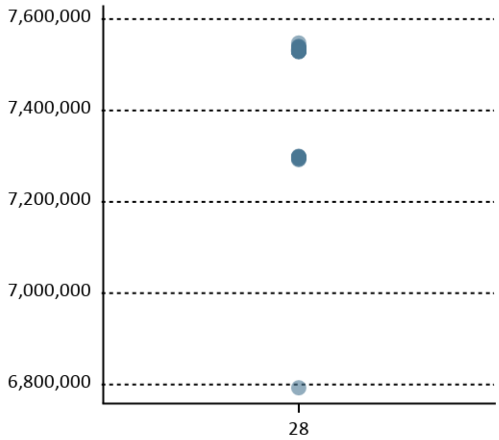
IMV(level) - instrument 26



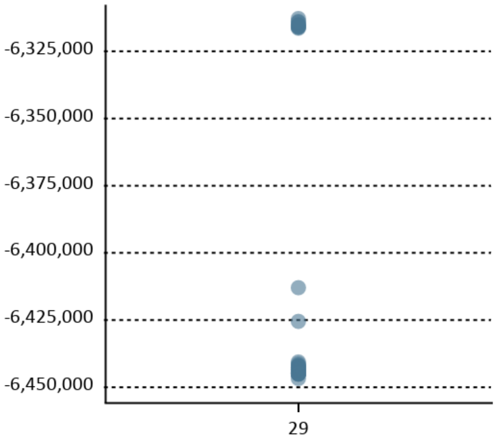
IMV(level) - instrument 27



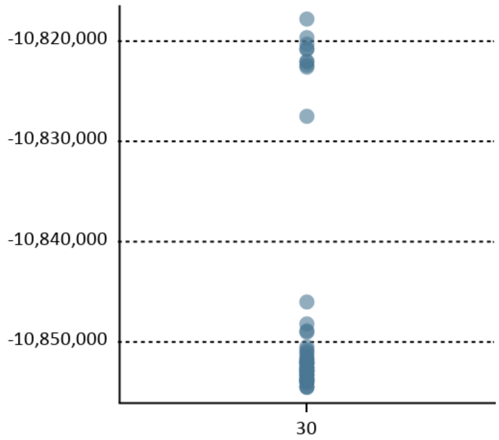
IMV(level) - instrument 28

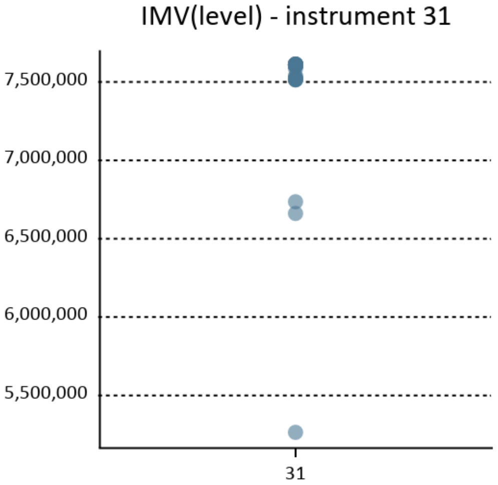


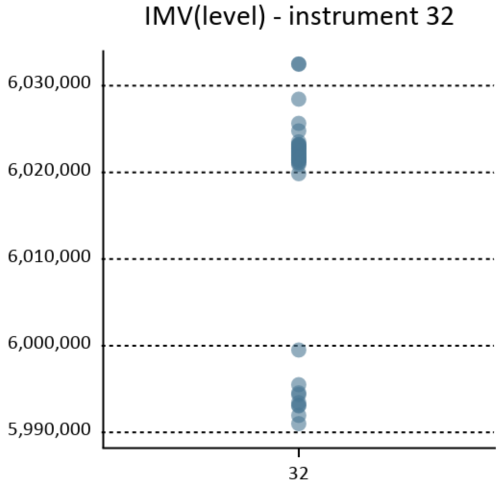
IMV(level) - instrument 29

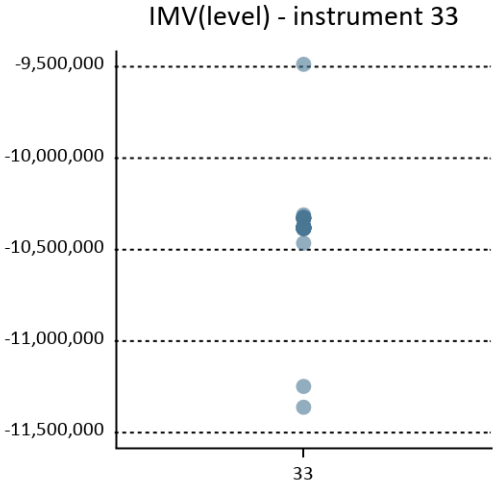


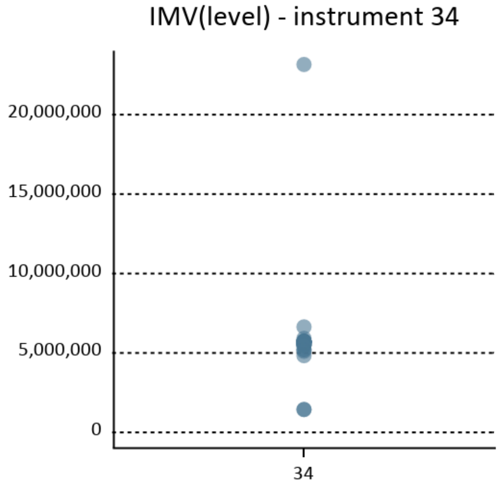
IMV(level) - instrument 30

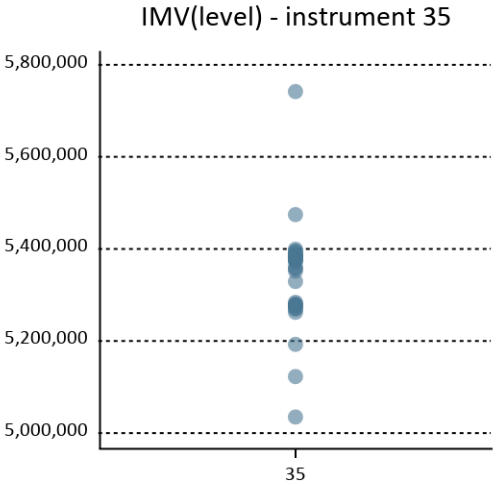


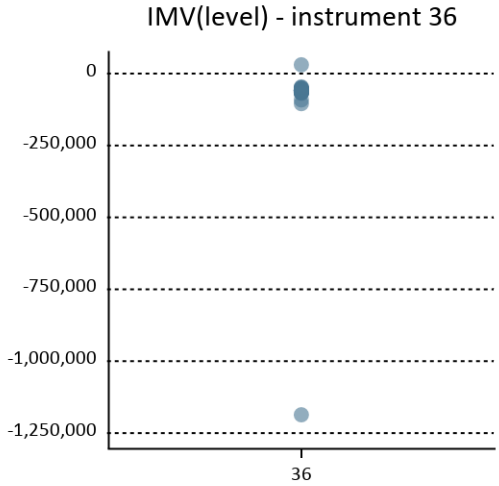

IMV(level) - instrument 31
7,500,000
7,000,000
6,500,000
6,000,000
5,500,000
31


IMV(level) - instrument 32
6,030,000
6,020,000
6,010,000
6,000,000
5,990,000
32

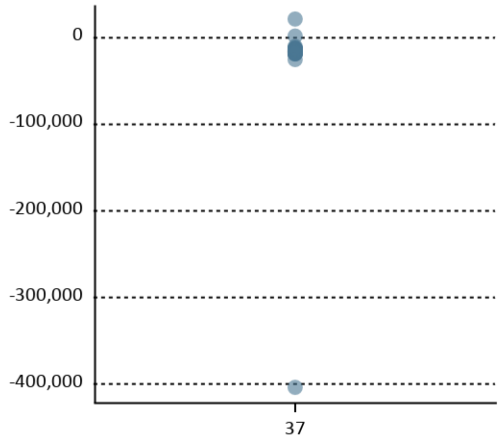

IMV(level) - instrument 33
-9,500,000
-10,000,000
-10,500,000
-11,000,000
-11,500,000
33


IMV(level) - instrument 34
20,000,000
15,000,000
10,000,000
5,000,000
0
34

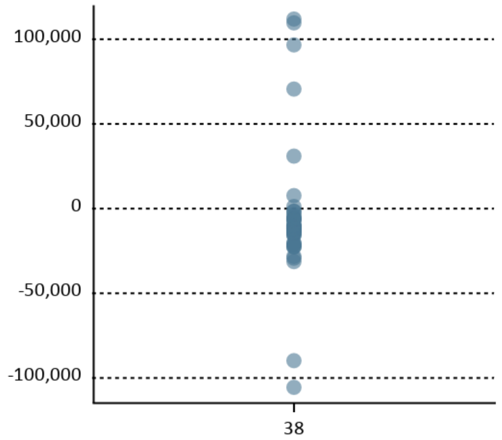

IMV(level) - instrument 35
5,800,000
5,600,000
5,400,000
5,200,000
5,000,000
35


IMV(level) - instrument 36
0
-250,000
-500,000
-750,000
-1,000,000
-1,250,000
36

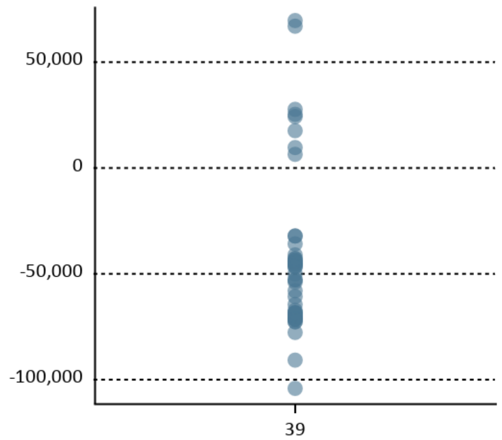
IMV(level) - instrument 37



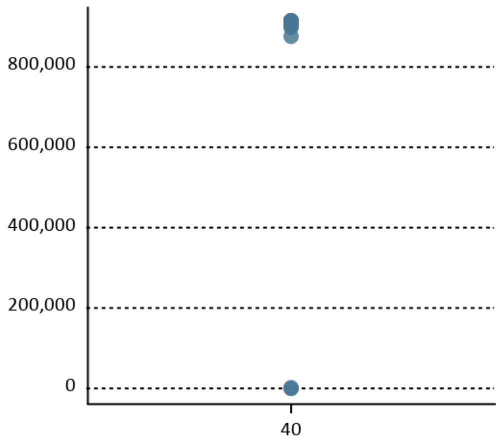
IMV(level) - instrument 38



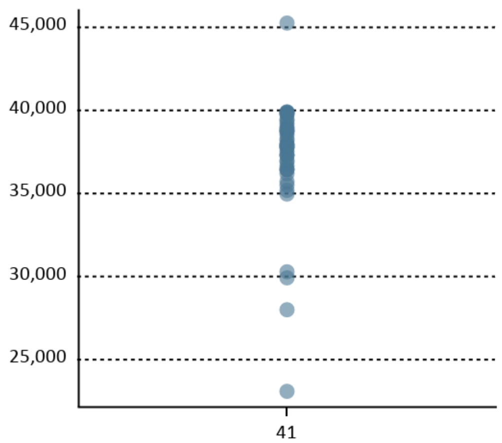
IMV(level) - instrument 39



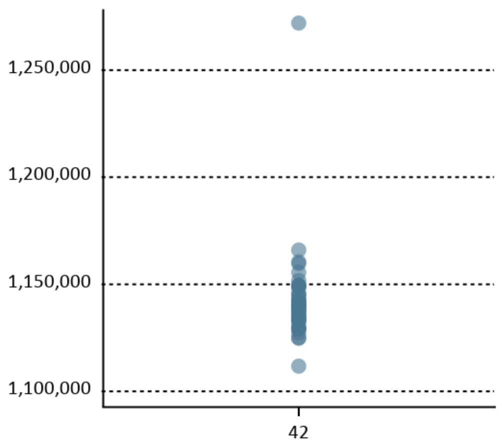
IMV(level) - instrument 40



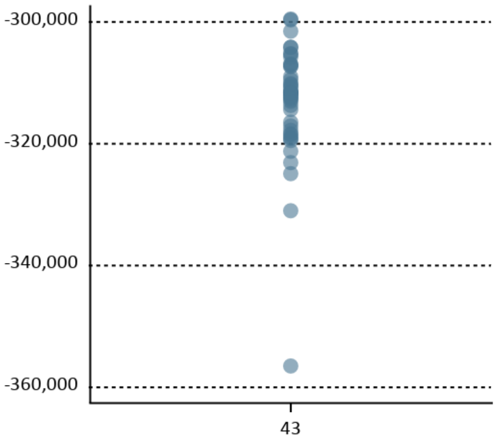
IMV(level) - instrument 41



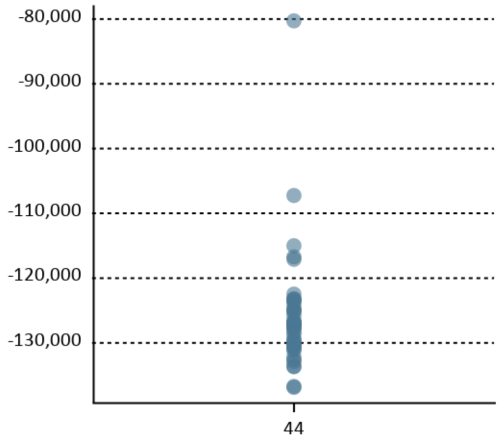
IMV(level) - instrument 42



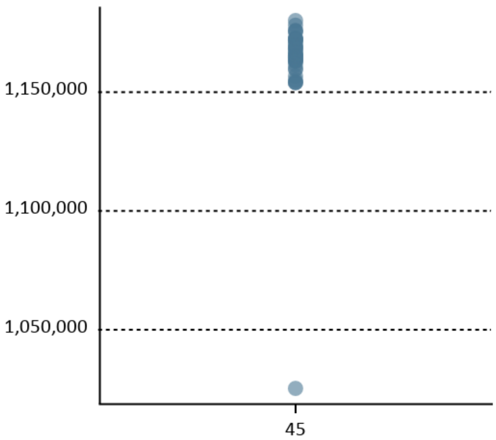
IMV(level) - instrument 43



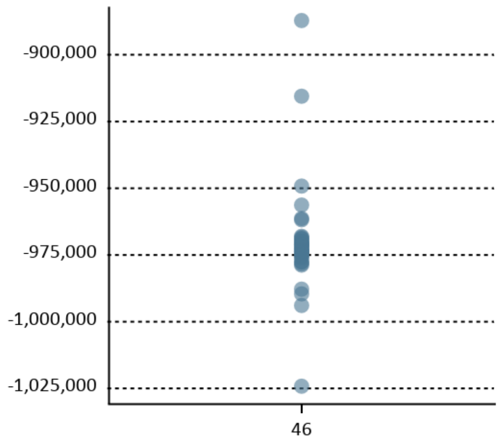
IMV(level) - instrument 44



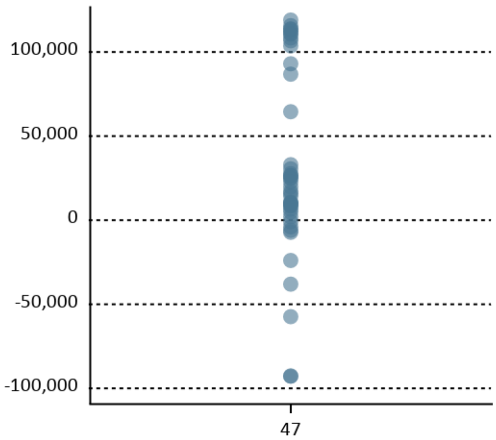
IMV(level) - instrument 45



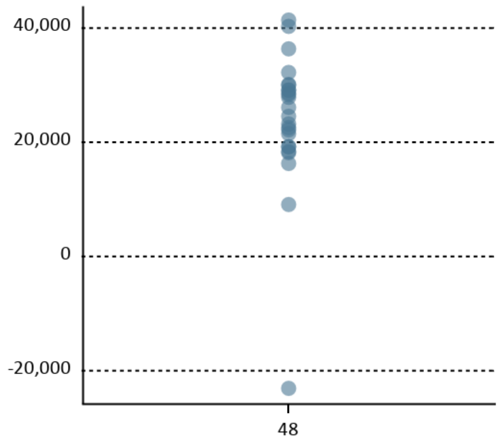
IMV(level) - instrument 46

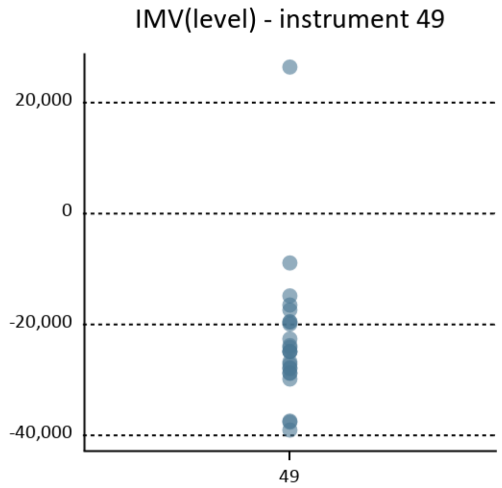


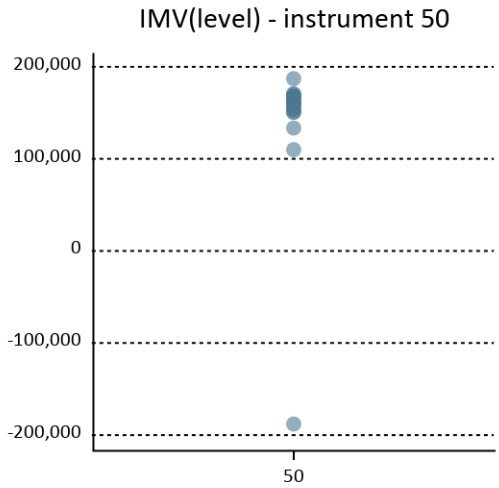
IMV(level) - instrument 47

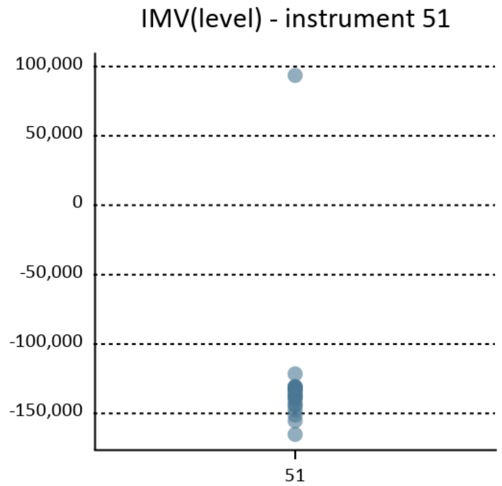


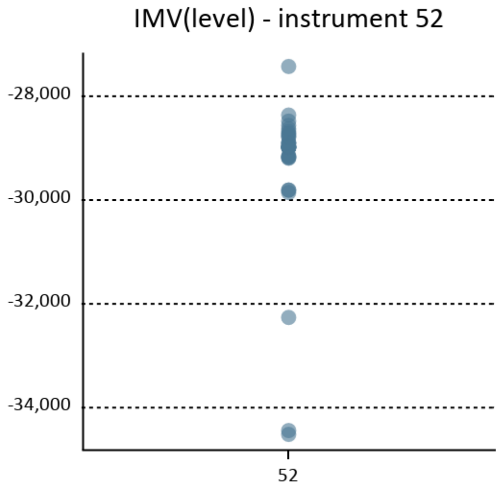
IMV(level) - instrument 48

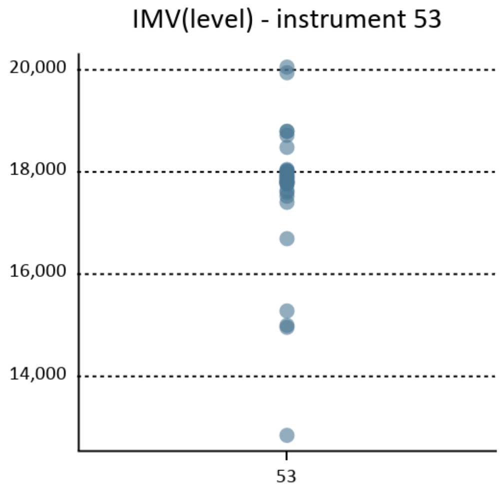


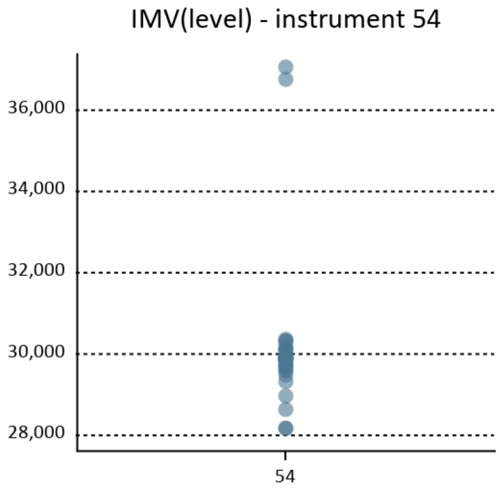

IMV(level) - instrument 49
20,000
0
-20,000
-40,000
49


IMV(level) - instrument 50
200,000
100,000
0
-100,000
-200,000
50

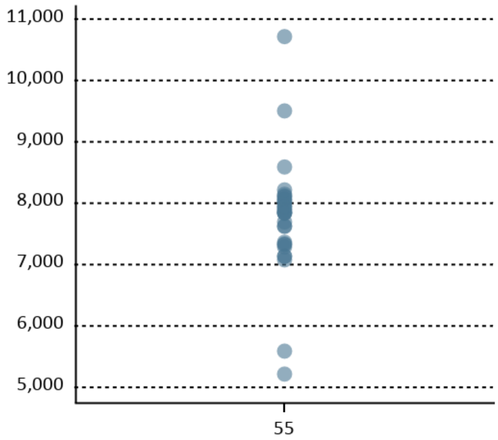

IMV(level) - instrument 51
100,000
50,000
0
-50,000
-100,000
-150,000
51


IMV(level) - instrument 52
-28,000
-30,000
-32,000
-34,000
52

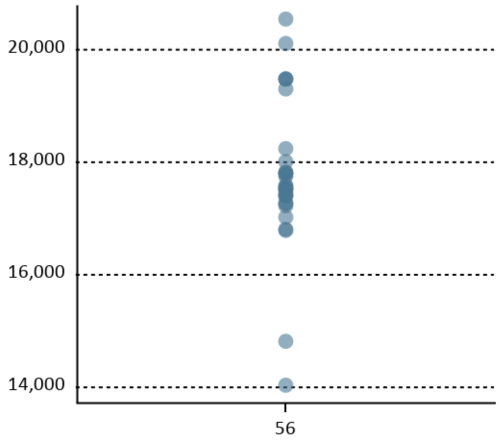

IMV(level) - instrument 53
20,000
18,000
16,000
14,000
53


IMV(level) - instrument 54
36,000
34,000
32,000
30,000
28,000
54

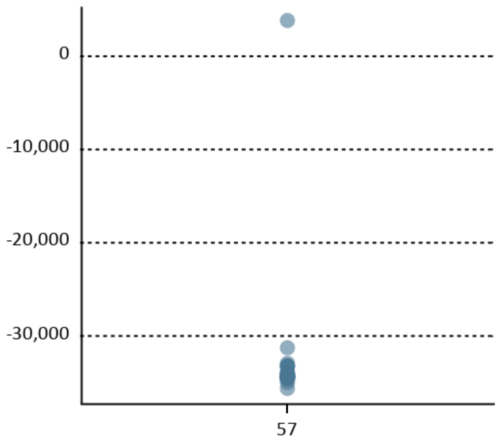
IMV(level) - instrument 55



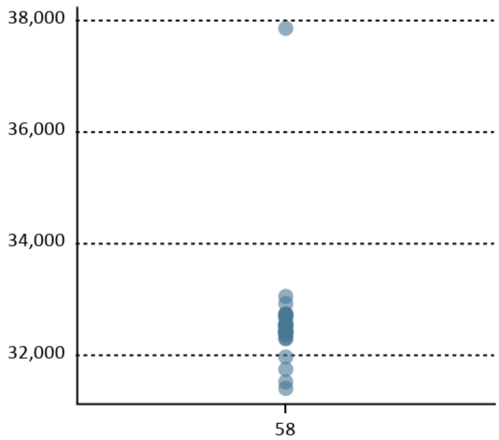
IMV(level) - instrument 56



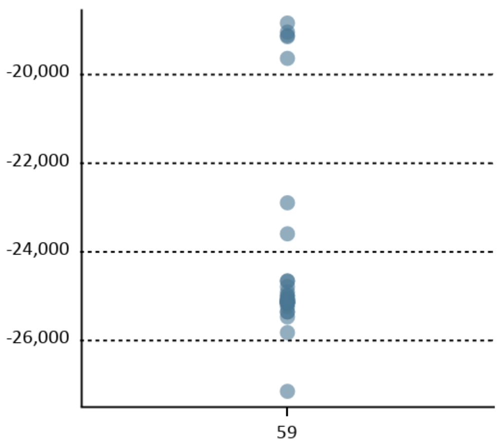
IMV(level) - instrument 57



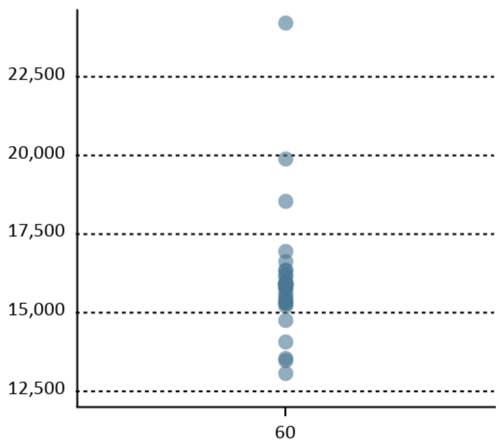
IMV(level) - instrument 58

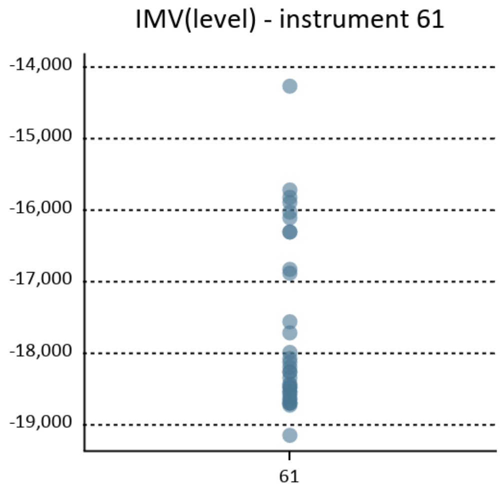


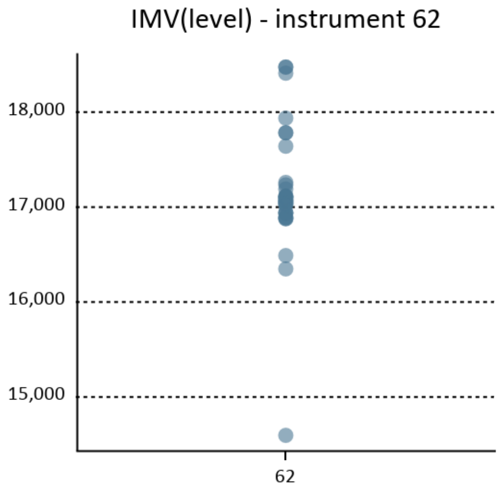
IMV(level) - instrument 59

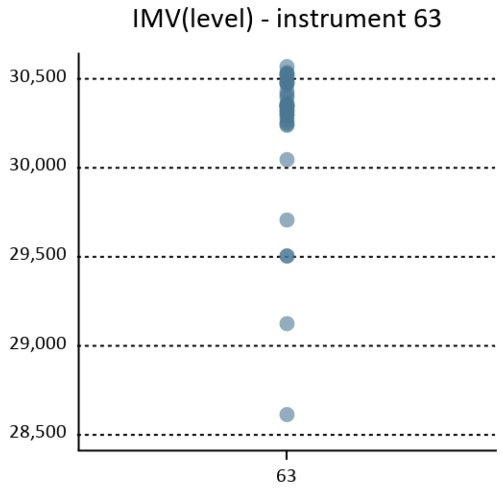


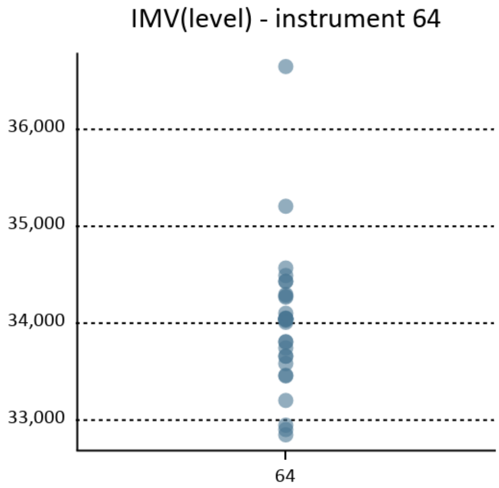
IMV(level) - instrument 60

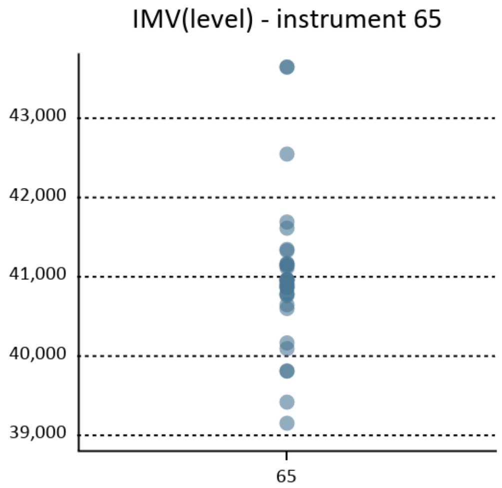


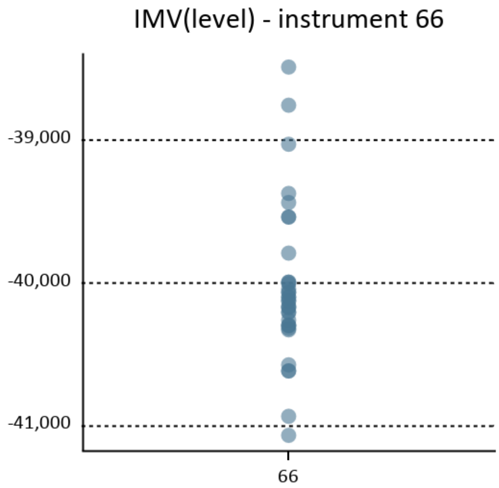

IMV(level) - instrument 61
-14,000
-15,000
-16,000
-17,000
-18,000
-19,000
61

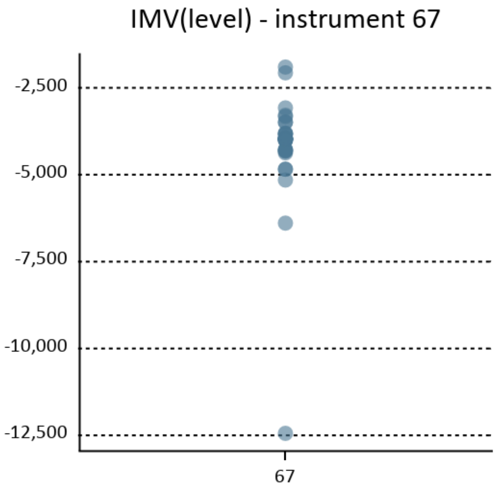

IMV(level) - instrument 62
18,000
17,000
16,000
15,000
62

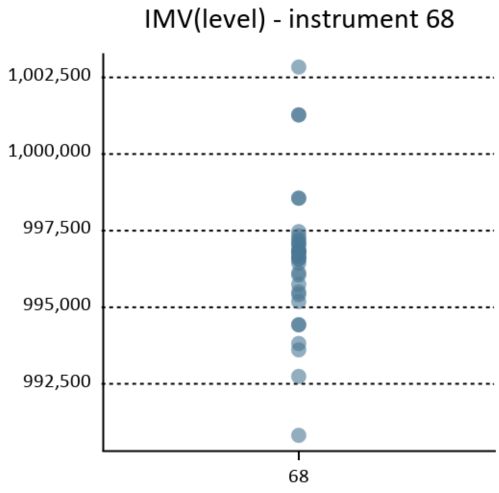

IMV(level) - instrument 63
30,500
30,000
29,500
29,000
28,500
63

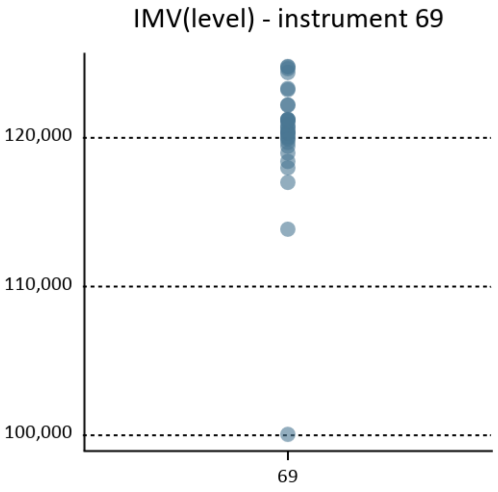

IMV(level) - instrument 64
36,000
35,000
34,000
33,000
64

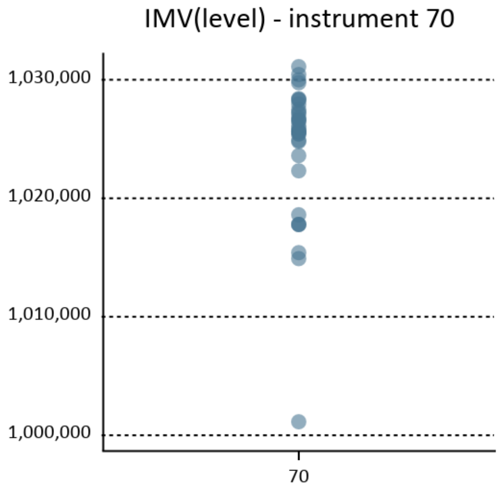

IMV(level) - instrument 65
43,000
42,000
41,000
40,000
39,000
65

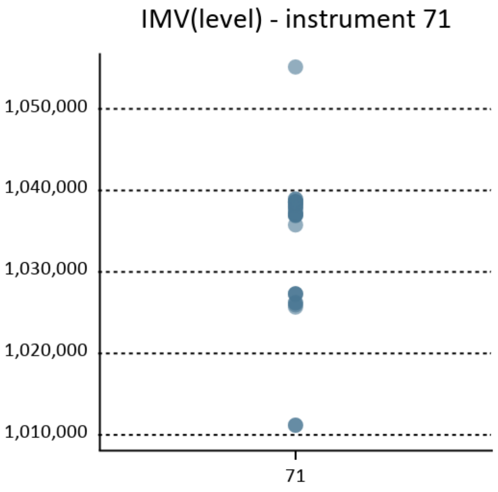

IMV(level) - instrument 66
-39,000
-40,000
-41,000
66

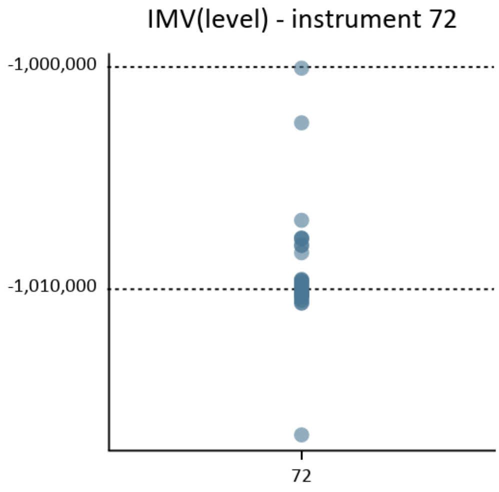

IMV(level) - instrument 67
-2,500
-5,000
-7,500
-10,000
-12,500
67


IMV(level) - instrument 68
1,002,500
1,000,000
997,500
995,000
992,500
68

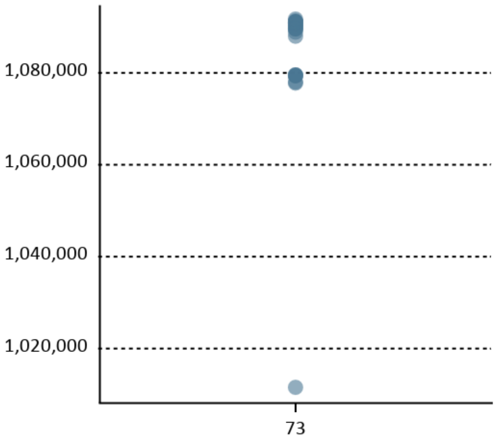

IMV(level) - instrument 69
120,000
110,000
100,000
69


IMV(level) - instrument 70
1,030,000
1,020,000
1,010,000
1,000,000
70

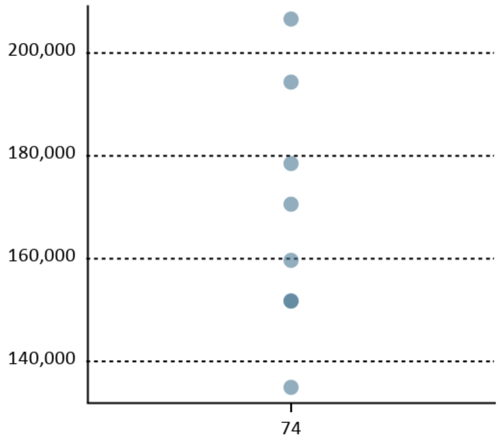

IMV(level) - instrument 71
1,050,000
1,040,000
1,030,000
1,020,000
1,010,000
71


IMV(level) - instrument 72
-1,000,000
-1,010,000
72

IMV(level) - instrument 73



IMV(level) - instrument 74



IMV(level) - instrument 75

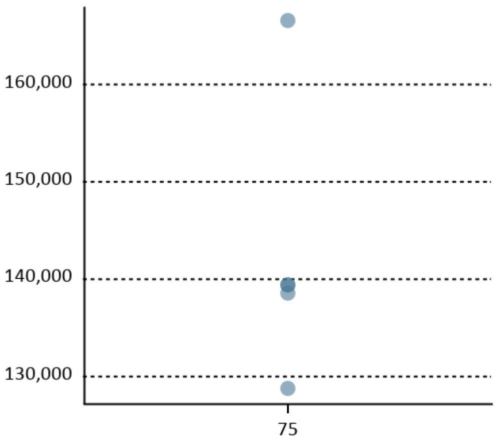
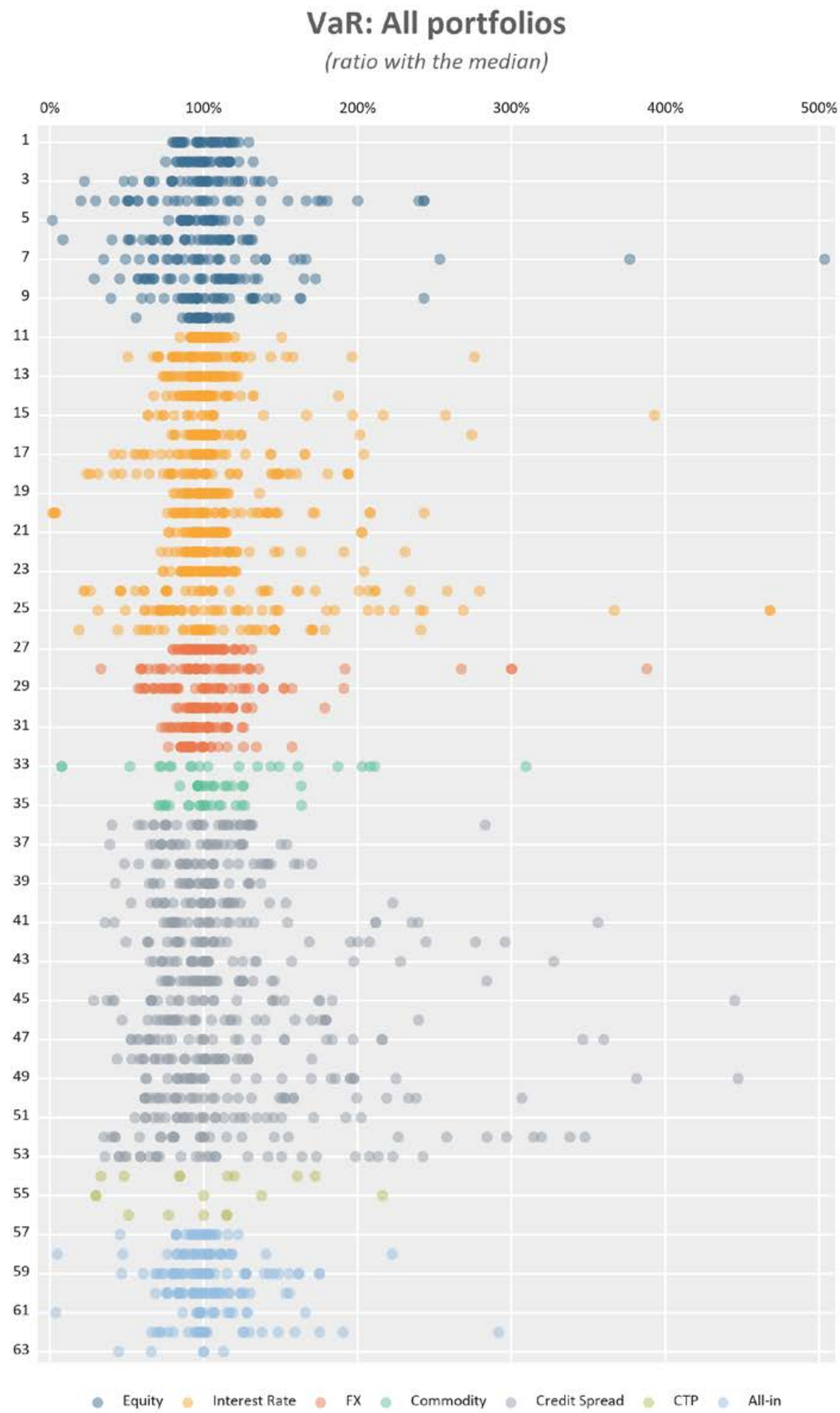
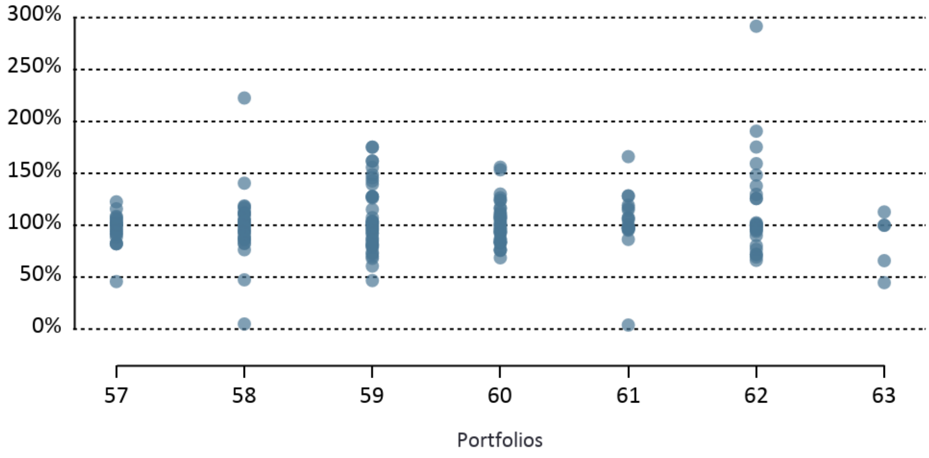


Figure 18: VaR submissions normalised by the median of each portfolio (by asset class)



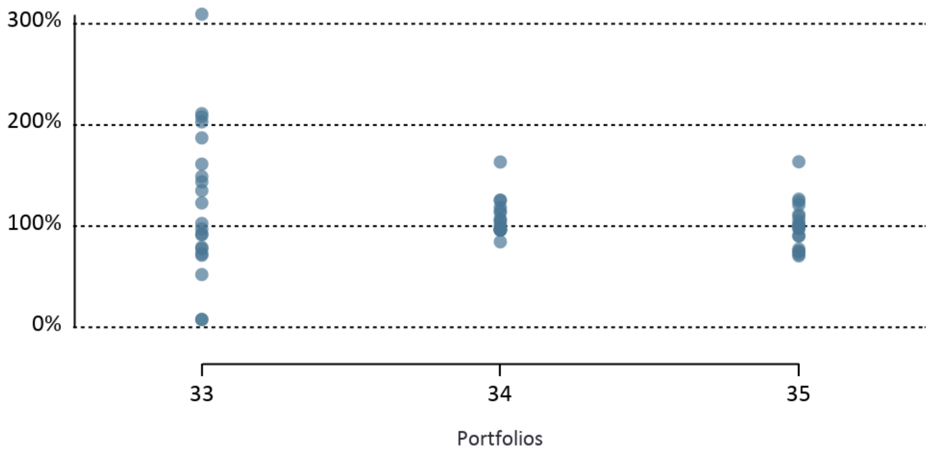
VaR: Aggregated portfolios

(ratio with the median)



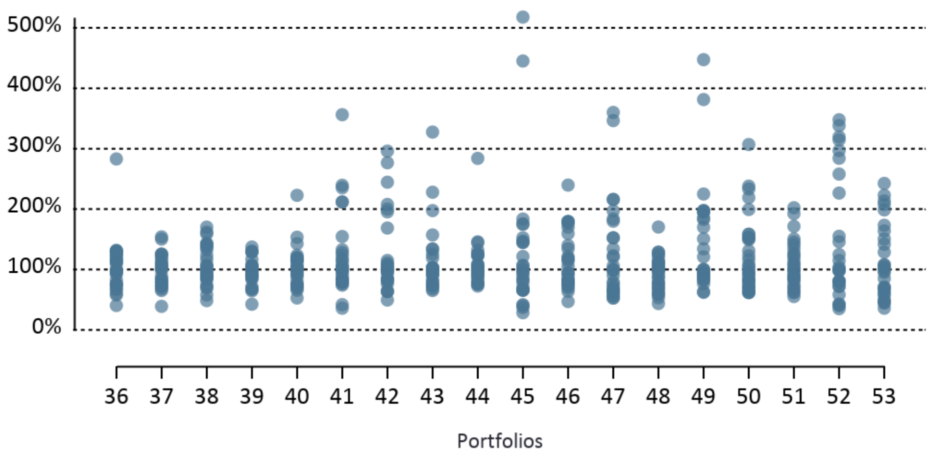
VaR: Commodity portfolios

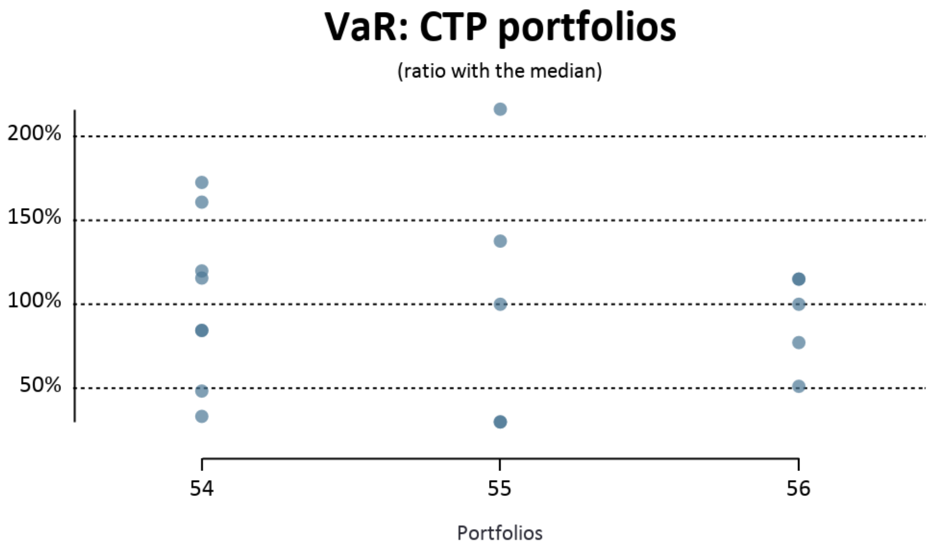
(ratio with the median)

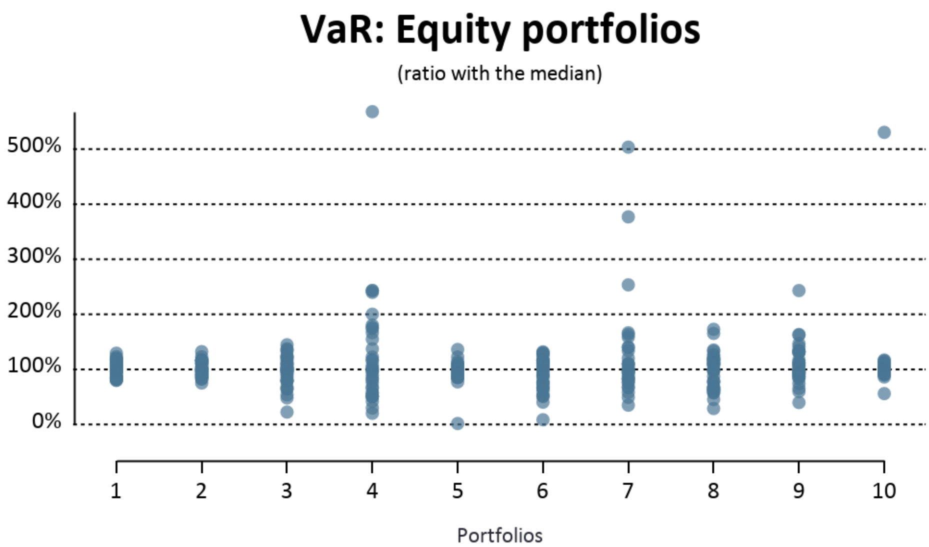


VaR: Credit Spread portfolios

(ratio with the median)

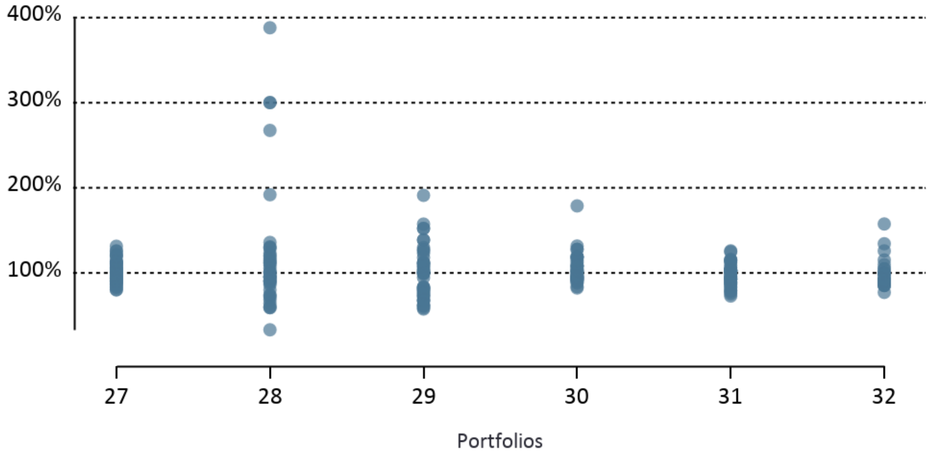



VaR: CTP portfolios
(ratio with the median)
200%
150%
100%
50%
54
55
56
Portfolios


VaR: Equity portfolios
(ratio with the median)
500%
400%
300%
200%
100%
0%
1
2
3
4
5
6
7
8
9
10
Portfolios

VaR: FX portfolios

(ratio with the median)



VaR: Interest Rate portfolios

(ratio with the median)

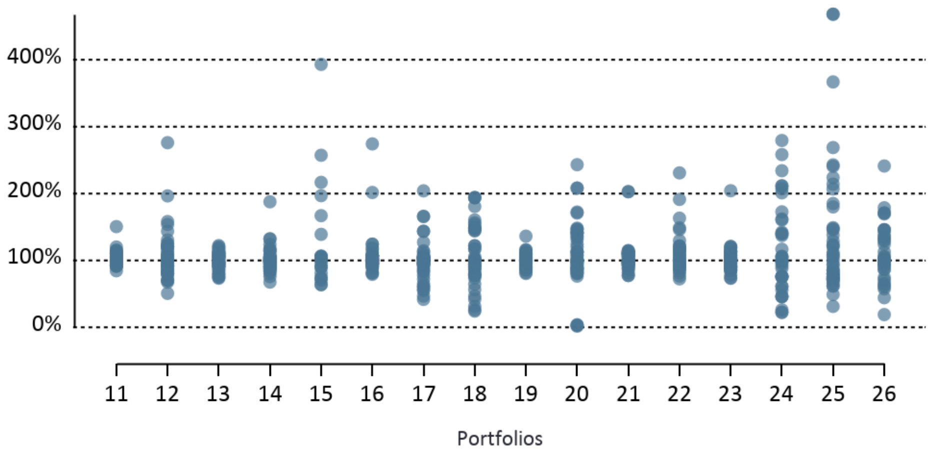
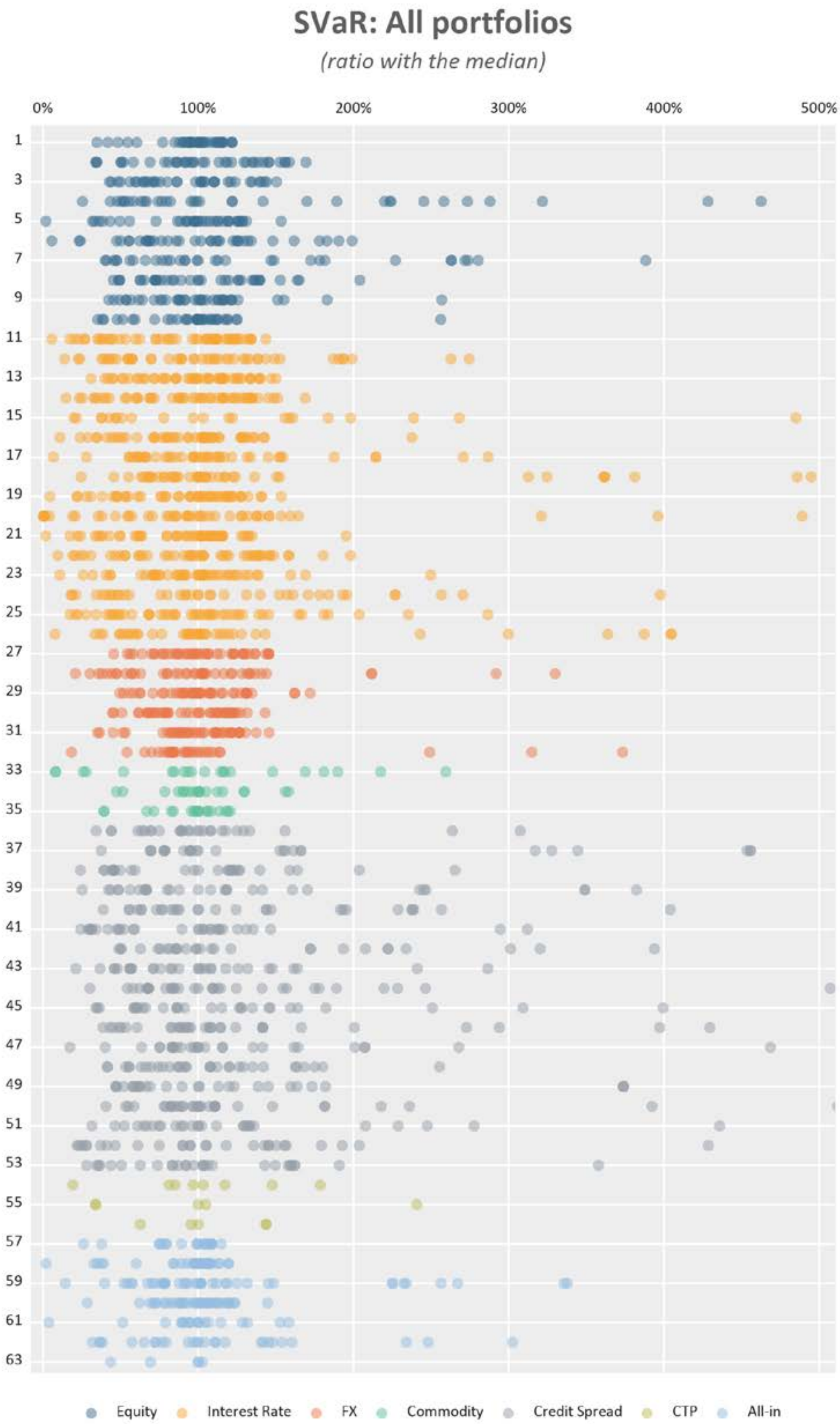
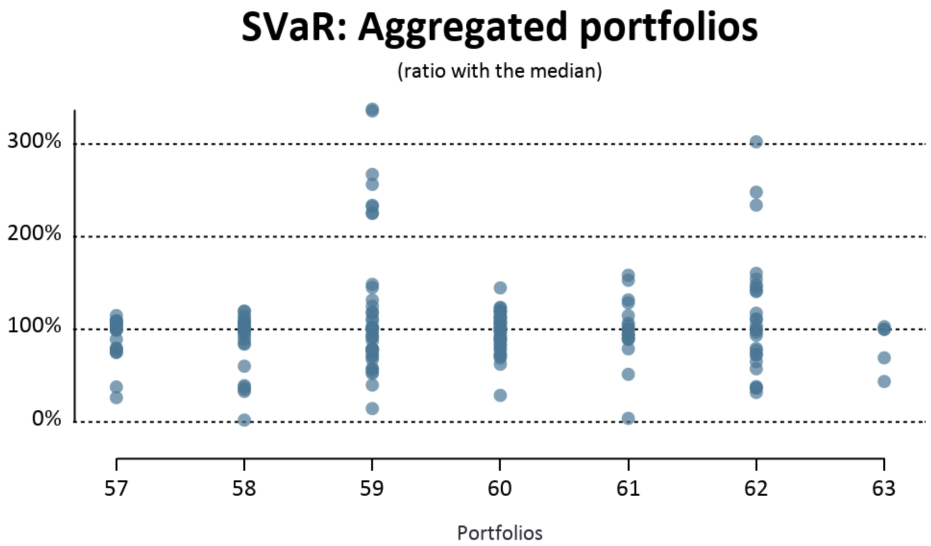
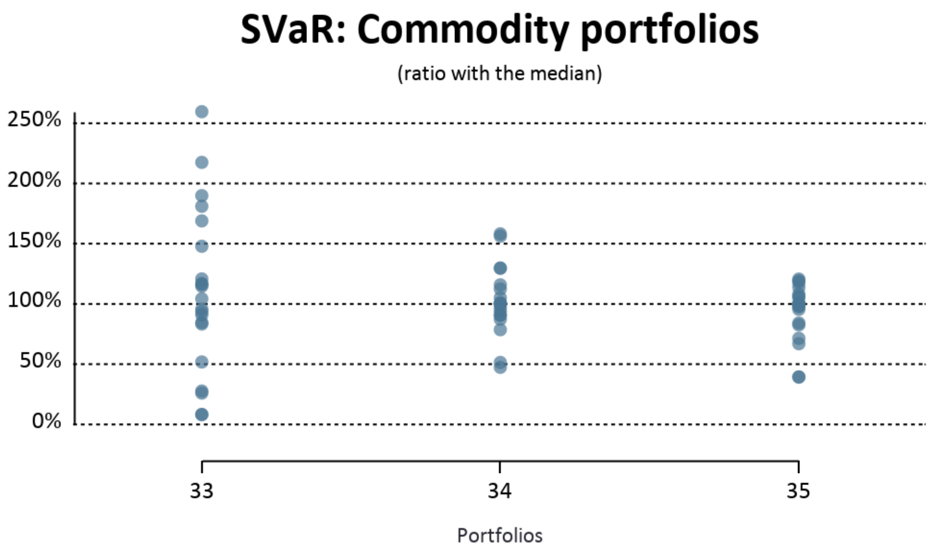


Figure 19: sVaR submissions normalised by the median of each portfolio (by asset class)

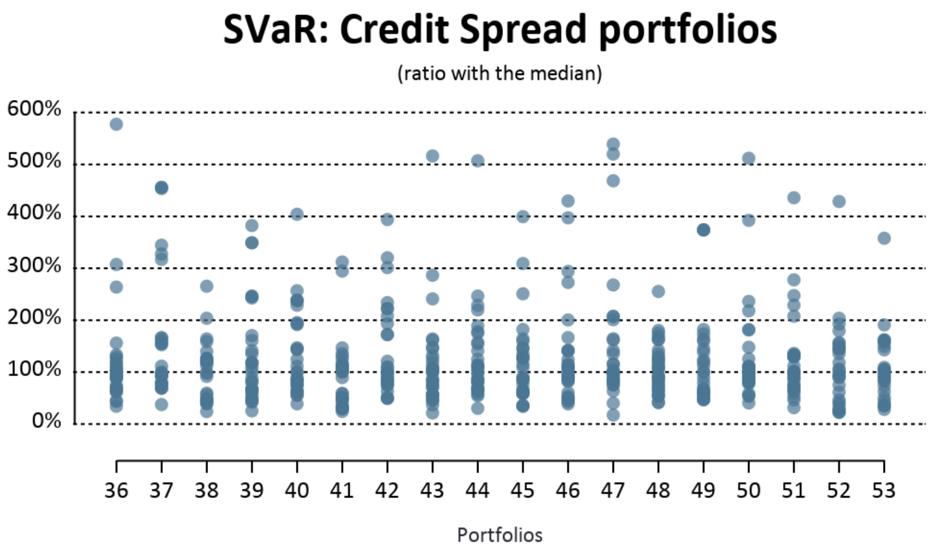




SVaR: Aggregated portfolios
(ratio with the median)
300%
200%
100%
0%
57
58
59
60
61
62
63
Portfolios



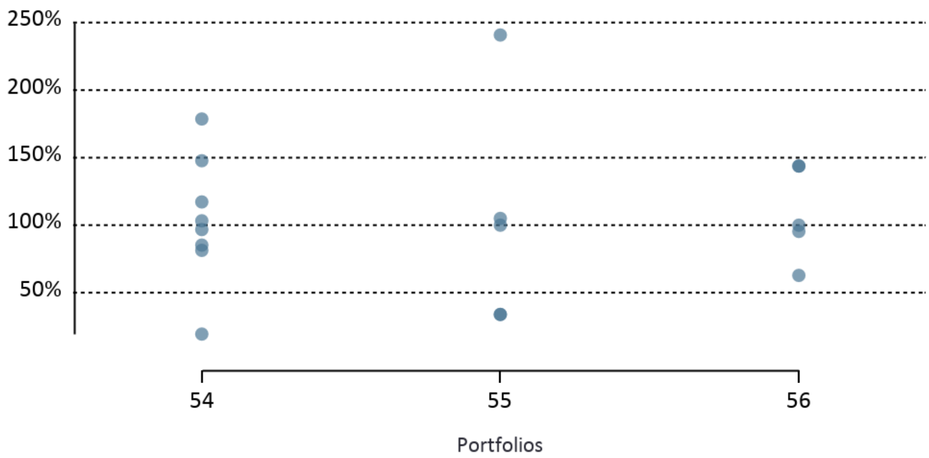
SVaR: Commodity portfolios
(ratio with the median)
250%
200%
150%
100%
50%
0%
33
34
35
Portfolios



SVaR: Credit Spread portfolios
(ratio with the median)
600%
500%
400%
300%
200%
100%
0%
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
Portfolios

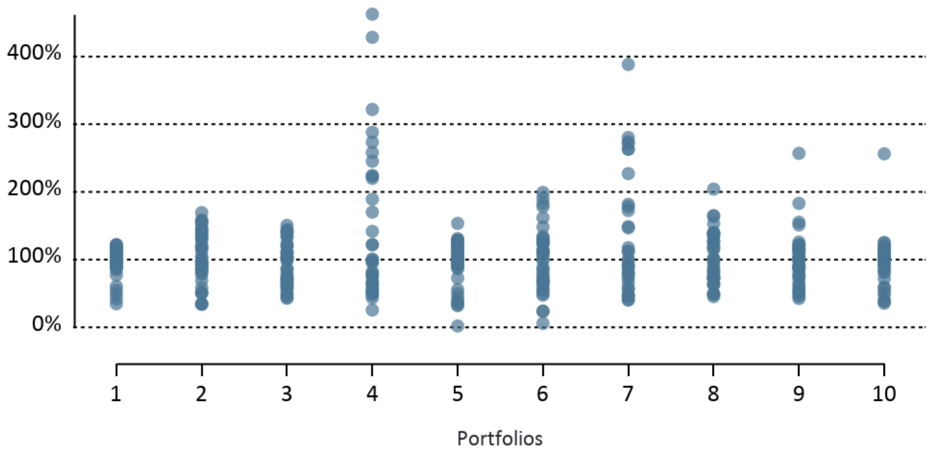
SVaR: CTP portfolios

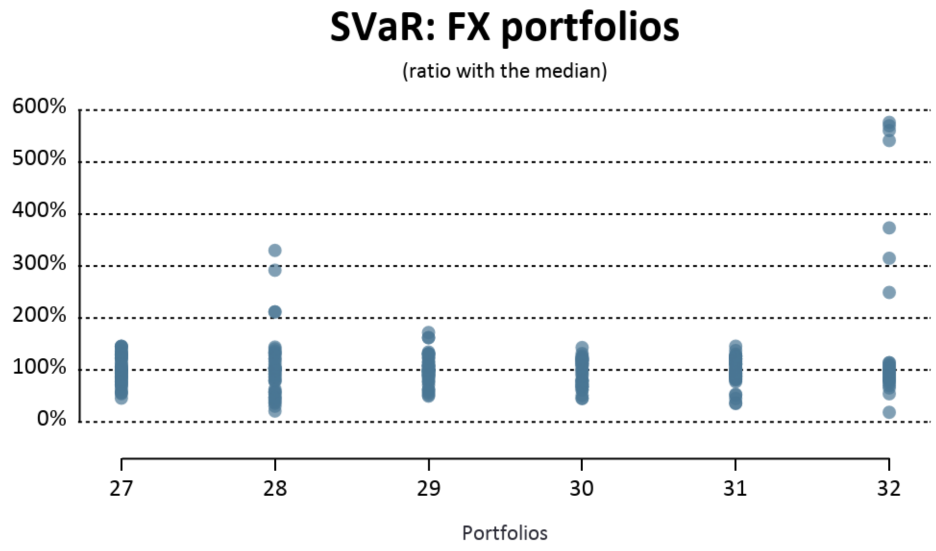
(ratio with the median)



SVaR: Equity portfolios

(ratio with the median)




SVaR: FX portfolios
(ratio with the median)
600%
500%
400%
300%
200%
100%
0%
27
28
29
30
31
32
Portfolios

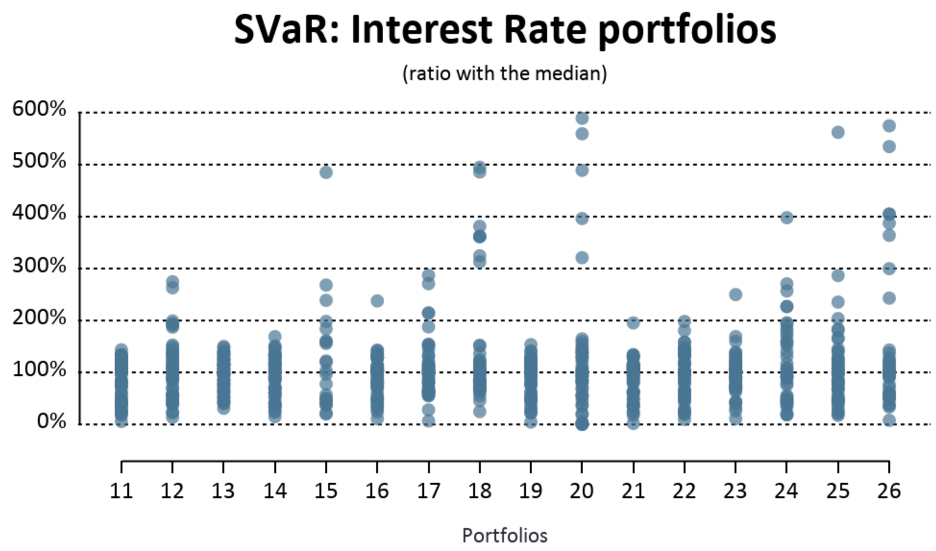

SVaR: Interest Rate portfolios
(ratio with the median)
600%
500%
400%
300%
200%
100%
0%
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
Portfolios

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

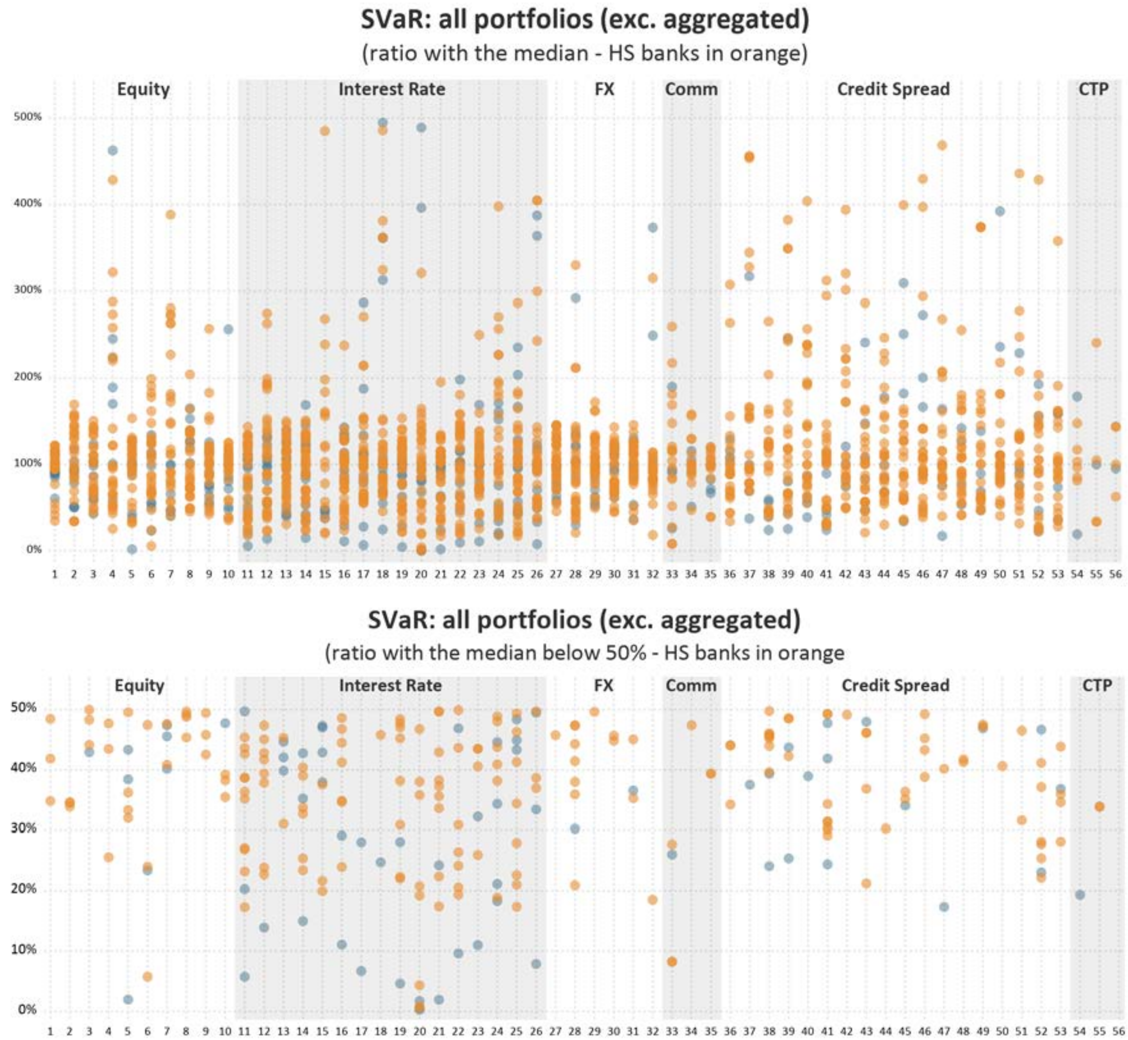


Table 27: VaR statistics (small banks only)

EU Statistics for VaR

		Other stats								Percentiles							
	Port. ID	Min	Max	Ave.	STDev	STDev_trunc[1]	MAD (median absolute deviation)	Coefficient of variation (STDev/Mean)	Num obs.	5th	10th	25th	50th (Median)	75th	90th	95th	Interquantile range
Equity	1	2,148,037	2,736,658	2,403,158	236,731			10%	7	2,150,469	2,152,901	2,171,172	2,495,262	2,549,904	2,631,959	2,684,309	8%
	2	1,984,839	2,355,007	2,232,890	138,071			6%	7	2,025,031	2,065,223	2,161,883	2,312,119	2,327,248	2,341,683	2,348,345	4%
	3	12,800	26,890	16,869	5,524			33%	6	12,808	12,815	12,989	14,633	18,521	23,159	25,025	18%
	4	143	1,716	722	542			75%	6	208	273	437	621	798	1,273	1,495	29%
	5	727,947,916	948,265,719	801,052,469	93,469,995			12%	6	728,093,026	728,238,137	732,970,448	757,396,164	857,209,274	917,523,108	932,894,414	8%
	6	18,544	45,808	31,008	9,891			32%	7	19,867	21,191	23,240	30,851	37,688	41,603	43,706	24%
	7	9,181	15,479	12,330	4,453			36%	2	9,496	9,811	10,756	12,330	13,905	14,849	15,164	13%
	8	44,948	113,825	77,830	28,084			36%	6	47,941	50,934	58,976	71,173	101,008	111,385	112,605	26%
	9	45,420	80,584	62,621	14,367			23%	6	47,315	49,210	54,323	58,567	74,402	80,086	80,335	16%
	10	158,743	290,245	257,552	49,593			19%	6	183,935	209,127	263,178	275,110	283,955	288,419	289,332	4%
Interest Rate	11	65,498	77,076	69,295	3,483			5%	12	65,641	65,783	66,153	69,035	70,476	72,908	74,827	3%
	12	27,936	48,403	33,790	7,629			23%	6	28,207	28,478	29,121	31,290	34,388	41,602	45,002	8%
	13	118,767	169,957	143,346	15,203			11%	11	121,419	124,071	134,031	144,541	152,419	156,862	163,410	6%
	14	23,327	29,502	26,778	2,123			8%	11	23,814	24,300	25,009	27,439	28,199	29,473	29,488	6%
	15	10,103	31,178	20,641	14,902			72%	2	11,157	12,211	15,372	20,641	25,909	29,071	30,124	26%
	16	93,378	110,441	102,031	6,590			6%	9	93,558	93,738	96,600	103,299	106,809	109,897	110,169	5%
	17	143,647	258,130	222,406	43,256			19%	8	150,766	157,884	218,758	239,667	246,725	254,020	256,075	6%
	18	71,227	424,949	226,262	126,041			56%	10	73,915	76,603	103,088	244,956	308,126	365,478	395,213	50%
	19	127,891	160,306	142,882	8,512			6%	11	130,510	133,128	140,065	142,889	145,742	150,767	155,537	2%
	20	3,600	6,935	4,814	1,215			25%	9	3,602	3,604	3,912	4,103	5,726	6,122	6,529	19%
	21	248,923	321,710	281,999	25,704			9%	11	253,738	258,553	264,552	275,179	303,528	319,311	320,511	7%
	22	35,509	57,377	44,844	7,007			16%	8	36,254	36,999	39,409	46,035	47,963	51,035	54,206	10%
	23	141,780	191,324	164,726	19,273			12%	11	142,491	143,202	148,198	167,115	179,845	190,074	190,699	10%
	24	43,007	403,906	194,404	113,758			59%	7	73,375	103,744	145,275	168,658	227,353	321,858	362,882	22%
	25	25,071	98,576	49,782	26,721			54%	10	26,838	28,604	30,550	36,369	60,304	91,634	95,105	33%
	26	166,144	504,299	328,926	103,328			31%	9	186,060	205,975	244,325	358,065	371,190	414,913	459,606	21%
FX	27	405,693	584,323	492,986	55,864			11%	11	422,001	438,309	462,722	488,152	522,276	579,838	582,081	6%
	28	3,899	15,291	10,709	3,539			33%	10	5,278	6,658	8,592	11,492	12,988	14,579	14,935	20%
	29	65,112	131,960	96,563	22,947			24%	10	68,426	71,740	77,203	98,435	113,696	121,351	126,655	19%
	30	261,170	369,840	304,918	33,294			11%	9	267,784	274,397	284,900	295,218	321,786	343,150	356,495	6%
	31	242,625	338,540	290,609	26,107			9%	11	256,408	270,190	274,399	299,275	300,556	318,344	328,442	5%
	32	16,197	23,219	18,295	2,559			14%	6	16,363	16,530	16,866	17,522	18,378	20,834	22,027	4%
Commodity	33	520	13,676	6,362	6,700			105%	3	957	1,394	2,706	4,891	9,284	11,919	12,798	55%
	34	251,518	251,717	251,618	141			0%	2	251,528	251,538	251,568	251,618	251,667	251,697	251,707	0%
	35	224,173	300,145	264,715	38,243			14%	3	228,739	233,304	247,001	269,828	284,987	294,082	297,113	7%
Credit Spread	36	11,549	22,328	18,367	5,930			32%	3	12,517	13,484	16,387	21,224	21,776	22,107	22,218	14%
	37	13,303	20,761	16,185	4,007			25%	3	13,422	13,540	13,897	14,490	17,626	19,507	20,134	12%
	38	2,241	3,884	3,038	725			24%	4	2,307	2,372	2,569	3,014	3,484	3,724	3,804	15%
	39	9,318	13,249	11,184	1,973			18%	3	9,485	9,651	10,151	10,984	12,117	12,796	13,023	9%
	40	3,191	5,475	4,225	1,011			24%	4	3,262	3,332	3,544	4,117	4,798	5,204	5,340	15%
	41	5,969	7,831	6,580	856			13%	4	5,988	6,006	6,062	6,259	6,777	7,409	7,620	6%
	42	19,615	38,345	26,307	10,447			40%	3	19,750	19,884	20,289	20,962	29,654	34,868	36,607	19%
	43	9,602	14,440	12,060	2,038			17%	5	9,737	9,873	10,279	12,987	12,993	13,861	14,151	12%
	44	4,965	8,696	6,385	1,505			24%	5	5,005	5,045	5,165	6,265	6,834	7,951	8,324	14%
	45	5,588	10,255	7,474	2,156			29%	4	5,645	5,701	5,871	7,027	8,631	9,605	9,930	19%
	46	4,482	5,354	4,779	407			9%	4	4,485	4,488	4,496	4,639	4,921	5,181	5,267	5%
	47	1,340	3,408	2,428	1,038			43%	3	1,460	1,579	1,938	2,536	2,972	3,234	3,321	21%
	48	6,622	11,010	9,162	1,848			20%	4	7,016	7,410	8,592	9,509	10,079	10,638	10,824	8%
	49	3,825	7,680	5,753	2,726			47%	2	4,018	4,211	4,789	5,753	6,716	7,295	7,487	17%
	50	15,465	29,872	24,499	7,870			32%	3	16,734	18,004	21,812	28,159	29,016	29,529	29,701	14%
	51	48,893	79,383	59,872	16,941			28%	3	49,138	49,382	50,117	51,340	65,362	73,774	76,579	13%
	52	46,403	281,923	145,136	122,284			84%	3	52,471	58,539	76,743	107,083	194,503	246,955	264,439	43%
	53	73,168	266,558	145,221	105,696			73%	3	75,445	77,722	84,553	95,937	181,248	232,434	249,496	36%
CTP	54	2,444	2,444	2,444	#DIV/0!			#DIV/0!	1	2,444	2,444	2,444	2,444	2,444	2,444	2,444	0%
	55	4,934	4,934	4,934	#DIV/0!			#DIV/0!	1	4,934	4,934	4,934	4,934	4,934	4,934	4,934	0%
	56	420,339	420,339	420,339	#DIV/0!			#DIV/0!	1	420,339	420,339	420,339	420,339	420,339	420,339	420,339	0%
ALL-IN no-CTP	57	1,204,091	1,497,085	1,350,588	207,178			15%	2	1,218,741	1,233,390	1,277,340	1,350,588	1,423,837	1,467,786	1,482,435	5%
Equity Cumulative	58	1,026,896	1,391,385	1,209,141	257,733			21%	2	1,045,120	1,063,345	1,118,018	1,209,141	1,300,263	1,354,936	1,373,161	8%
IR Cumulative	59	177,258	484,144	314,504	96,640			31%	9	198,442	219,626	258,500	280,123	390,032	411,694	447,919	20%
FX Cumulative	60	549,532	811,377	660,764	81,370			12%	8	569,016	588,500	615,474	646,188	688,980	758,003	784,690	6%
Commodity Cumulative	61	251,978	252,006	251,992	20			0%	2	251,979	251,981	251,985	251,992	251,999	252,003	252,005	0%
CS Cumulative	62	11,284	15,698	13,648	2,062			15%	4	11,481	11,679	12,270	13,806	15,184	15,492	15,595	11%
CTP Cumulative	63	379,911	379,911	379,911	#DIV/0!			#DIV/0!	1	379,911	379,911	379,911	379,911	379,911	379,911	379,911	0%

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

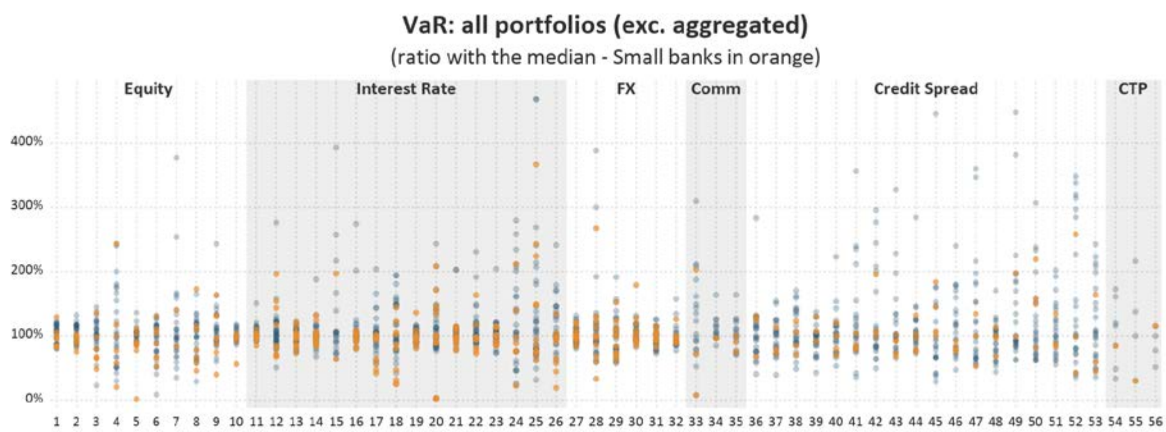


Table 28: VaR statistics (medium-sized banks only)

EU Statistics for VaR

		Other stats								Percentiles							
	Port. ID	Min	Max	Ave.	STDev	STDev_trunc[1]	MAD (median absolute deviation)	Coefficient of variation (STDev/Mean)	Num obs.	5th	10th	25th	50th (Median)	75th	90th	95th	Interquantile range
Equity	1	2,081,748	3,206,116	2,659,786	381,177			14%	22	2,106,493	2,156,980	2,238,128	2,752,425	2,995,397	3,104,841	3,129,183	14%
	2	1,909,923	2,845,713	2,364,727	316,185			13%	19	1,915,249	1,979,120	2,085,002	2,280,357	2,677,014	2,703,144	2,722,632	12%
	3	10,670	27,263	20,820	3,991			19%	19	15,260	16,628	19,259	20,447	24,096	25,129	26,480	11%
	4	210	1,693	794	423			53%	18	283	337	392	738	1,156	1,254	1,336	49%
	5	730,787,866	973,360,882	848,557,540	71,612,204			8%	20	735,196,011	760,759,249	776,161,082	864,153,529	902,750,644	911,677,828	934,286,231	8%
	6	17,854	46,308	34,830	9,064			26%	19	18,078	20,553	28,853	37,871	40,939	45,068	45,412	17%
	7	3,862	27,986	11,710	5,670			48%	17	5,117	6,027	9,066	10,707	13,280	17,713	20,014	19%
	8	60,353	125,490	93,036	23,849			26%	18	60,931	61,719	68,913	98,219	115,003	119,900	122,548	25%
	9	36,574	89,738	63,298	14,456			23%	19	39,620	48,722	55,172	61,151	70,266	82,139	86,807	12%
	10	244,093	331,241	284,697	23,939			8%	18	252,766	263,411	269,622	276,285	298,132	317,799	328,127	5%
Interest Rate	11	64,021	78,221	70,576	4,334			6%	23	64,386	64,936	67,535	70,279	73,445	77,353	78,112	4%
	12	32,826	54,016	42,309	6,186			15%	25	33,605	34,186	37,693	41,877	46,843	50,171	51,489	11%
	13	130,121	178,574	151,806	12,979			9%	24	135,088	135,233	140,661	154,006	160,174	166,980	168,209	6%
	14	22,285	32,700	27,745	2,699			10%	26	23,488	24,386	26,165	27,841	29,029	31,761	32,187	5%
	15	11,177	26,443	16,441	4,901			30%	9	11,397	11,618	14,129	15,658	16,712	22,901	24,672	8%
	16	90,921	119,751	103,326	6,732			7%	24	94,957	96,749	98,748	102,578	108,641	110,215	114,270	5%
	17	153,246	362,697	248,882	53,296			21%	22	155,349	183,258	217,251	257,587	267,332	288,204	358,025	10%
	18	123,379	472,329	300,752	98,716			33%	21	165,983	189,885	235,716	280,375	345,329	438,667	453,468	19%
	19	126,580	167,912	150,277	12,424			8%	25	130,448	131,945	143,239	152,853	160,537	163,464	165,082	6%
	20	3,105	6,996	4,449	1,043			23%	26	3,266	3,323	3,562	4,267	5,220	5,865	6,004	19%
	21	243,192	323,341	287,928	22,231			8%	26	253,246	265,199	272,464	285,814	308,922	315,689	316,482	6%
	22	41,516	63,601	50,764	5,992			12%	25	43,408	43,698	46,491	49,412	54,904	59,208	59,692	8%
	23	142,629	201,294	169,295	18,414			11%	23	145,922	149,134	152,172	165,694	182,995	196,603	198,557	9%
	24	42,451	329,688	172,377	86,767			50%	17	48,505	72,251	106,237	176,750	202,815	286,552	313,295	31%
	25	12,685	109,079	45,742	24,035			53%	25	20,942	25,677	29,856	40,586	52,282	82,156	95,507	27%
	26	227,460	547,837	395,750	88,172			22%	21	265,314	278,725	355,128	377,186	466,698	521,795	546,762	14%
FX	27	388,925	588,161	470,794	50,161			11%	24	404,782	419,677	435,666	456,759	503,834	538,552	549,352	7%
	28	7,126	22,595	11,862	3,298			28%	20	8,372	8,602	10,298	11,200	13,235	14,179	15,532	12%
	29	61,605	148,573	98,912	26,360			27%	21	63,079	66,074	81,317	87,630	114,537	136,271	138,968	17%
	30	256,067	370,393	314,224	31,005			10%	22	282,351	284,326	293,199	304,887	336,579	362,395	369,578	7%
	31	244,661	337,761	286,089	29,454			10%	17	251,294	254,339	262,398	279,566	299,950	334,632	335,547	7%
	32	14,221	188,211	42,122	56,698			135%	19	15,555	15,710	16,495	17,063	23,011	155,973	166,107	16%
Commodity	33	3,512	14,224	9,156	3,675			40%	9	4,200	4,889	6,555	9,684	10,864	14,057	14,140	25%
	34	220,882	328,788	272,297	32,731			12%	9	233,140	245,399	251,551	270,640	296,736	306,550	317,669	8%
	35	211,155	378,924	299,182	55,716			19%	9	219,343	227,531	270,764	299,099	333,085	365,230	372,077	10%
Credit Spread	36	12,745	22,562	17,835	3,448			19%	16	12,848	12,943	15,354	17,943	20,747	21,993	22,169	15%
	37	11,990	23,048	18,081	3,387			19%	12	12,743	13,546	15,962	18,813	19,681	22,530	22,912	10%
	38	2,181	4,542	3,450	815			24%	14	2,300	2,498	2,861	3,268	4,298	4,450	4,497	20%
	39	6,926	13,379	10,032	1,549			15%	14	8,034	8,683	9,067	10,148	10,590	11,610	12,461	8%
	40	3,367	6,529	4,679	960			21%	14	3,382	3,403	4,081	4,652	5,324	5,600	5,960	13%
	41	2,707	11,644	7,437	2,282			31%	13	4,433	5,617	5,973	7,531	8,786	9,859	10,657	19%
	42	9,704	40,738	21,168	10,645			50%	12	11,228	12,490	14,391	16,483	25,182	38,639	39,923	27%
	43	9,222	46,279	18,547	10,036			54%	15	10,041	10,790	12,570	14,156	20,524	30,489	36,429	24%
	44	4,784	8,273	6,615	1,181			18%	16	4,966	5,030	5,846	6,571	7,354	8,244	8,272	11%
	45	1,595	8,526	4,624	2,183			47%	13	1,885	2,130	3,660	4,390	5,291	7,933	8,341	18%
	46	3,707	13,939	7,096	3,000			42%	16	3,931	4,094	4,810	6,365	9,983	10,428	11,309	35%
	47	1,438	5,477	2,808	1,373			49%	14	1,562	1,635	1,746	2,246	3,665	4,868	5,166	35%
	48	5,856	12,492	9,417	2,152			23%	15	5,911	6,511	7,621	9,891	10,684	12,020	12,247	17%
	49	2,421	8,746	4,771	2,039			43%	16	2,839	3,096	3,266	3,618	6,731	7,407	7,884	35%
	50	11,671	37,596	19,177	7,274			38%	16	11,702	12,330	14,045	17,370	21,337	28,689	31,032	21%
	51	36,745	88,892	61,408	17,278			28%	12	38,546	40,205	50,189	60,661	73,553	84,723	87,194	19%
	52	63,751	247,517	121,191	54,099			45%	11	71,275	78,799	83,216	109,395	147,907	169,403	208,460	28%
	53	105,543	338,088	180,509	66,946			37%	12	109,485	113,037	133,054	167,753	214,791	243,655	286,938	23%
CTP	54	962	4,997	3,143	2,037			65%	3	1,213	1,464	2,217	3,471	4,234	4,692	4,844	31%
	55	22,705	35,669	29,187	9,167			31%	2	23,353	24,001	25,946	29,187	32,428	34,373	35,021	11%
	56	186,900	282,132	234,516	67,339			29%	2	191,662	196,423	210,708	234,516	258,324	272,609	277,370	10%
ALL-IN no-CTP	57	1,201,785	1,694,730	1,459,482	140,448			10%	10	1,264,088	1,326,391	1,362,655	1,472,192	1,545,454	1,584,937	1,639,834	6%
Equity Cumulative	58	950,141	1,466,377	1,232,208	143,931			12%	14	1,034,930	1,080,867	1,173,663	1,230,907	1,314,115	1,425,964	1,453,746	6%
IR Cumulative	59	275,264	564,481	380,673	84,873			22%	18	295,419	301,948	314,565	364,268	402,009	501,403	544,947	12%
FX Cumulative	60	448,969	827,112	617,694	100,313			16%	18	490,293	499,999	545,747	615,607	696,275	727,216	769,130	12%
Commodity Cumulative	61	222,801	331,312	271,974	33,406			12%	9	232,763	242,724	250,357	271,490	296,621	307,507	319,410	8%
CS Cumulative	62	10,392	27,527	17,733	5,297			30%	13	10,697	11,547	15,060	15,919	21,646	24,672	26,021	18%
CTP Cumulative	63	169,967	250,386	210,177	56,865			27%	2	173,988	178,009	190,072	210,177	230,281	242,344	246,365	10%

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

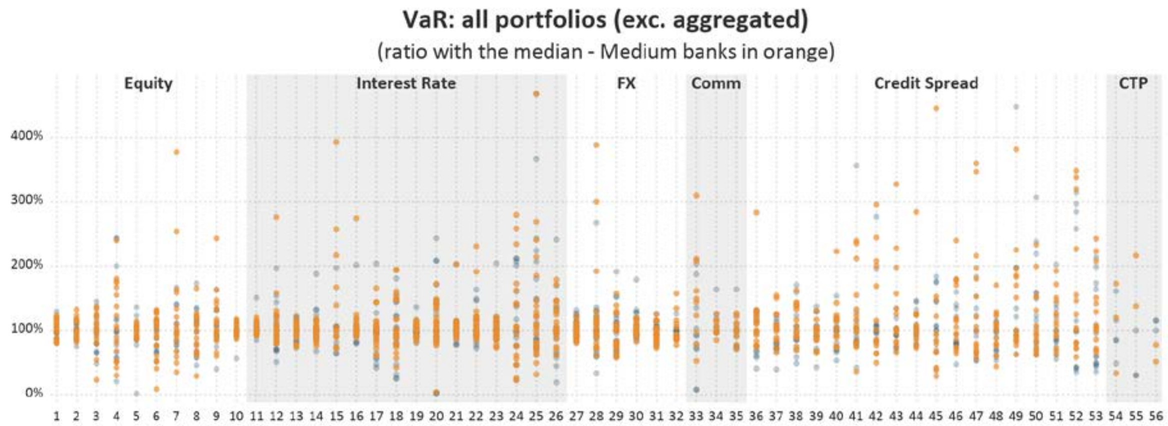


Table 29: VaR statistics (large banks only)

EU Statistics for VaR

		Other stats								Percentiles							
	Port. ID	Min	Max	Ave.	STDev	STDev_trunc[1]	MAD (median absolute deviation)	Coefficient of variation (STDev/Mean)	Num obs.	5th	10th	25th	50th (Median)	75th	90th	95th	Interquantile range
Equity	1	2,242,440	3,056,810	2,641,155	275,511			10%	10	2,262,906	2,283,371	2,491,207	2,637,153	2,785,597	3,009,130	3,032,970	6%
	2	1,984,839	2,713,305	2,368,525	244,361			10%	10	2,003,897	2,022,956	2,240,036	2,383,774	2,563,645	2,585,747	2,649,526	7%
	3	15,634	28,701	20,340	3,809			19%	10	15,708	15,782	18,536	19,754	21,688	23,762	26,231	8%
	4	358	1,716	784	442			56%	10	378	399	499	683	790	1,443	1,580	23%
	5	734,805,122	909,402,735	820,720,210	75,334,536			9%	8	738,827,182	742,849,242	754,470,292	813,593,192	891,109,225	905,687,607	907,545,171	8%
	6	23,525	40,922	33,663	6,517			19%	10	24,542	25,558	27,958	35,126	39,551	40,827	40,874	17%
	7	7,399	18,377	11,336	3,423			30%	10	7,841	8,284	8,696	10,831	12,199	15,769	17,073	17%
	8	56,920	133,753	103,468	25,264			24%	10	61,393	65,866	95,947	110,154	116,901	131,761	132,757	10%
	9	54,595	82,178	64,226	10,022			16%	10	55,117	55,638	56,432	61,617	66,327	80,743	81,461	8%
	10	256,736	322,129	283,497	17,900			6%	10	257,834	258,931	281,595	284,124	287,647	293,433	307,781	1%
Interest Rate	11	64,332	77,344	71,867	4,926			7%	10	64,974	65,615	68,387	72,046	76,306	77,163	77,254	5%
	12	29,019	51,757	40,761	7,227			18%	10	30,878	32,738	36,696	39,460	45,214	50,131	50,944	10%
	13	118,767	175,915	154,307	17,141			11%	11	127,063	135,358	145,171	156,008	164,699	174,191	175,053	6%
	14	25,455	28,924	27,562	1,115			4%	8	25,909	26,363	27,030	27,736	28,267	28,715	28,820	2%
	15	10,103	16,903	14,511	2,667			18%	8	10,650	11,196	12,527	15,537	16,762	16,810	16,856	14%
	16	97,842	110,659	103,825	4,251			4%	9	98,279	98,716	102,384	103,299	105,177	109,755	110,207	1%
	17	138,867	320,653	243,937	47,800			20%	9	171,519	204,170	242,939	247,259	260,754	273,292	296,973	4%
	18	229,162	459,769	331,781	90,921			27%	9	229,836	230,510	265,793	298,410	424,949	442,887	451,328	23%
	19	133,128	154,610	143,754	6,667			5%	10	133,398	133,669	140,283	145,654	146,956	148,980	151,795	2%
	20	3,302	5,764	4,203	793			19%	9	3,381	3,460	3,656	4,013	4,560	5,194	5,479	11%
	21	273,109	311,594	296,422	15,496			5%	9	274,795	276,482	279,784	304,247	308,526	311,403	311,498	5%
	22	43,070	57,377	50,381	5,372			11%	9	44,221	45,372	46,309	49,177	56,735	57,090	57,233	10%
	23	148,953	202,388	171,525	14,910			9%	10	151,849	154,745	166,493	170,305	174,464	187,765	195,076	2%
	24	88,265	403,906	258,128	111,316			43%	10	113,452	138,638	185,657	242,449	364,583	396,414	400,160	33%
	25	28,997	83,951	44,163	19,512			44%	10	29,155	29,312	30,304	34,782	48,455	74,141	79,046	23%
	26	237,602	547,837	386,990	97,969			25%	8	268,201	298,800	350,819	369,949	412,453	517,360	532,599	8%
FX	27	438,613	550,623	512,337	39,528			8%	7	453,483	468,352	497,716	517,093	542,298	548,510	549,567	4%
	28	6,964	15,998	11,753	3,036			26%	10	7,233	7,501	10,467	11,566	13,950	15,449	15,724	14%
	29	67,013	126,464	100,486	22,226			22%	8	69,112	71,212	85,073	104,757	119,009	122,060	124,262	17%
	30	274,079	369,645	314,424	33,773			11%	8	278,530	282,981	291,165	307,030	330,440	360,375	365,010	6%
	31	287,575	328,894	304,397	11,884			4%	8	291,670	295,765	300,347	301,319	306,472	316,500	322,697	1%
	32	15,813	153,066	34,490	47,929			139%	8	15,826	15,838	16,622	18,275	18,665	59,439	106,252	6%
Commodity	33	520	12,610	6,454	3,474			54%	8	2,016	3,513	5,191	6,184	7,461	10,152	11,381	18%
	34	251,717	327,741	277,054	30,348			11%	7	251,760	251,803	255,069	261,413	294,185	317,055	322,398	7%
	35	216,051	372,453	289,625	60,411			21%	6	218,082	220,112	241,326	298,618	321,992	350,146	361,300	14%
Credit Spread	36	9,872	22,328	16,066	5,032			31%	9	10,059	10,246	11,549	16,368	19,806	22,197	22,262	26%
	37	12,490	22,571	16,413	3,856			23%	9	12,792	13,095	13,303	14,710	19,857	21,772	22,171	20%
	38	1,534	3,350	2,584	664			26%	7	1,623	1,712	2,255	2,737	2,978	3,218	3,284	14%
	39	6,930	13,249	9,735	2,021			21%	8	7,074	7,218	8,824	9,797	10,622	11,626	12,437	9%
	40	3,003	5,147	4,277	834			19%	7	3,059	3,116	3,848	4,572	4,763	4,919	5,033	11%
	41	3,154	9,653	6,846	1,858			27%	9	4,280	5,406	6,093	6,762	7,793	8,855	9,254	12%
	42	16,319	21,713	19,156	1,892			10%	9	16,354	16,389	18,522	19,314	20,731	21,112	21,413	6%
	43	10,279	18,991	14,037	2,701			19%	9	10,525	10,771	13,059	14,074	14,584	17,248	18,119	6%
	44	5,131	7,169	6,306	648			10%	8	5,348	5,564	6,042	6,349	6,755	6,935	7,052	6%
	45	2,266	9,813	5,975	2,704			45%	9	2,842	3,417	3,903	5,588	8,089	9,773	9,793	35%
	46	2,733	9,271	5,960	2,165			36%	9	3,440	4,147	4,668	4,777	7,808	8,358	8,815	25%
	47	1,340	4,654	2,504	1,164			46%	9	1,393	1,446	1,608	2,293	3,115	4,024	4,339	32%
	48	5,668	11,061	8,689	1,863			21%	9	6,050	6,431	6,937	9,451	9,871	10,428	10,745	17%
	49	2,451	7,680	4,320	1,593			37%	8	2,796	3,142	3,529	3,754	4,832	5,957	6,819	16%
	50	11,671	29,872	18,456	6,351			34%	8	11,866	12,062	13,275	17,665	22,133	25,142	27,507	25%
	51	32,646	83,147	53,953	16,068			30%	9	34,230	35,814	44,232	51,340	59,258	73,177	78,162	15%
	52	38,414	310,499	108,473	88,248			81%	8	40,306	42,198	45,757	96,993	113,236	181,013	245,756	42%
	53	58,488	323,217	147,002	96,841			66%	9	64,360	70,232	78,937	95,937	175,746	290,115	306,666	38%
CTP	54	1,399	4,657	2,962	1,382			47%	4	1,556	1,713	2,183	2,896	3,675	4,264	4,461	25%
	55	4,934	16,499	10,717	8,178			76%	2	5,512	6,091	7,825	10,717	13,608	15,343	15,921	27%
	56	365,525	420,339	392,932	38,759			10%	2	368,266	371,006	379,229	392,932	406,636	414,858	417,598	3%
ALL-IN no-CTP	57	1,204,091	1,589,024	1,404,197	128,183			9%	7	1,232,138	1,260,184	1,335,790	1,404,452	1,480,117	1,533,861	1,561,442	5%
Equity Cumulative	58	1,026,896	1,475,154	1,244,776	151,254			12%	10	1,047,038	1,067,181	1,113,933	1,279,259	1,360,089	1,399,762	1,437,458	10%
IR Cumulative	59	306,965	553,325	419,566	86,822			21%	9	317,399	327,834	364,374	393,581	484,144	533,943	543,634	14%
FX Cumulative	60	495,292	850,417	684,616	118,657			17%	9	516,988	538,684	607,012	702,483	763,804	819,185	834,801	11%
Commodity Cumulative	61	245,904	330,285	278,430	33,814			12%	6	247,423	248,941	253,480	267,416	299,899	318,935	324,610	8%
CS Cumulative	62	11,284	29,923	17,446	5,971			34%	8	11,552	11,820	14,092	15,724	19,882	23,234	26,578	17%
CTP Cumulative	63	379,911	428,613	404,262	34,438			9%	2	382,346	384,781	392,087	404,262	416,438	423,743	426,178	3%

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

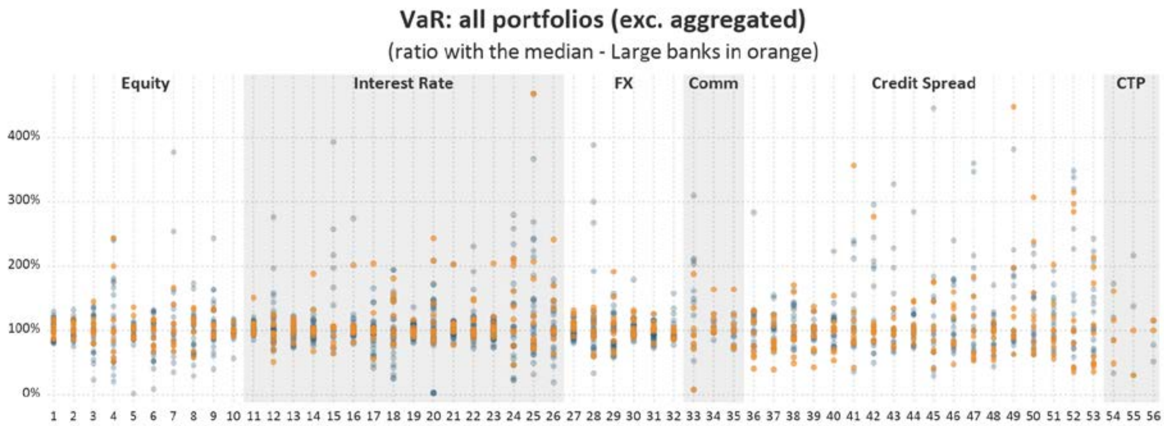


Table 30: VaR statistics (small TB banks only)

EU Statistics for VaR

		Other stats						Percentiles								Extreme Values range (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
Equity	1	2,156,144	2,865,060	2,513,919	270,069	11%	7	2,170,897	2,185,651	2,350,292	2,502,445	2,686,601	2,832,649	2,848,854	7%	318,014	1,970,762	3,242,817
	2	2,118,813	2,674,080	2,343,997	191,395	8%	6	2,140,348	2,161,883	2,231,745	2,333,563	2,388,008	2,536,544	2,605,312	3%	269,993	1,776,922	2,856,893
	3	12,830	26,890	19,199	5,319	28%	6	12,989	13,149	15,015	20,085	21,508	24,365	25,628	18%	4,625	10,582	29,082
	4	476	830	650	129	20%	6	492	508	562	666	718	777	803	12%	694	-682	2,093
	5	727,947,916	973,360,882	850,806,058	97,646,708	11%	7	738,635,690	749,323,464	766,034,718	869,784,105	926,240,033	958,303,784	965,832,333	9%	87,576,932	678,842,676	1,029,150,405
	6	22,955	46,308	38,479	9,550	25%	5	25,679	28,403	36,576	40,749	45,808	46,108	46,208	11%	8,816	17,494	52,757
	7	12,047	18,021	15,859	3,311	21%	3	12,593	13,139	14,778	17,508	17,765	17,918	17,970	9%	13,949	-16,860	38,937
	8	65,145	125,490	101,959	25,413	25%	5	69,386	73,627	86,350	113,825	118,987	122,889	124,189	16%	27,972	42,980	154,870
	9	45,420	89,738	69,020	15,541	23%	6	48,776	52,132	61,390	70,266	77,567	84,663	87,201	12%	15,078	30,994	91,307
	10	254,296	310,170	274,839	21,835	8%	5	255,339	256,382	259,511	274,179	276,041	296,518	303,344	3%	430,168	-577,071	1,143,602
Interest Rate	11	64,021	77,076	69,105	4,356	6%	9	64,360	64,699	66,011	68,362	72,209	73,954	75,515	4%	4,681	60,805	79,528
	12	27,936	48,403	38,537	7,710	20%	7	29,620	31,304	33,690	35,811	45,114	47,467	47,935	14%	8,676	24,029	58,734
	13	142,131	169,957	152,597	11,202	7%	7	142,283	142,436	142,762	149,992	160,287	166,209	168,083	6%	15,804	116,799	180,016
	14	23,957	31,707	27,298	2,292	8%	9	24,225	24,492	26,537	27,439	27,846	29,605	30,656	2%	3,072	21,692	33,980
	15	14,129	31,178	23,917	8,801	37%	3	15,360	16,592	20,286	26,443	28,811	30,231	30,705	17%	8,310	-778	32,461
	16	93,828	110,441	102,691	5,682	6%	10	95,277	96,727	98,877	102,142	107,661	109,829	110,135	4%	9,157	84,462	121,091
	17	153,957	264,847	222,550	35,473	16%	7	170,518	187,078	211,349	237,015	239,667	249,747	257,297	6%	62,050	128,158	376,359
	18	136,877	435,537	261,972	89,460	34%	8	155,430	173,983	224,073	245,080	300,703	347,921	391,729	15%	111,534	71,176	517,313
	19	130,109	167,912	146,887	13,773	9%	8	131,289	132,469	139,207	143,139	154,434	166,179	167,045	5%	11,283	125,240	170,371
	20	3,105	6,996	5,173	1,401	27%	7	3,204	3,302	4,385	5,693	5,823	6,350	6,673	14%	1,551	958	7,161
	21	243,192	321,710	279,614	26,036	9%	10	246,419	249,646	260,122	279,247	297,277	311,551	316,630	7%	23,481	234,588	328,511
	22	45,760	59,726	51,602	5,002	10%	7	46,527	47,294	48,865	49,612	54,193	58,157	58,942	5%	8,446	32,165	65,948
	23	141,780	190,074	165,791	18,509	11%	9	143,294	144,809	151,909	169,019	181,074	189,546	189,810	9%	17,711	131,694	202,537
	24	50,019	267,160	158,512	72,728	46%	7	61,135	72,251	116,693	168,658	195,181	228,553	247,857	25%	116,207	-41,436	423,393
	25	25,048	109,079	52,553	29,421	56%	9	27,215	29,382	30,805	43,469	60,455	94,506	101,793	32%	39,057	-37,527	118,699
	26	166,144	546,762	361,205	115,546	32%	8	200,854	235,563	322,556	364,628	397,050	490,717	518,740	10%	110,112	155,140	595,587
FX	27	405,693	588,161	495,979	70,091	14%	10	411,103	416,514	454,433	468,627	569,203	584,707	586,434	11%	52,870	379,417	590,896
	28	3,899	15,291	11,058	4,212	38%	8	5,028	6,158	7,839	12,421	14,343	15,199	15,245	29%	6,533	-1,290	24,842
	29	66,074	136,271	101,069	26,556	26%	9	68,635	71,196	76,570	107,321	118,236	132,822	134,547	21%	27,148	52,805	161,399
	30	261,170	363,863	310,073	36,271	12%	8	266,957	272,744	286,569	301,332	339,653	353,586	358,724	8%	33,781	243,680	378,803
	31	242,625	334,993	286,976	27,739	10%	8	252,273	261,921	271,741	286,552	300,732	312,246	323,619	5%	29,821	232,974	352,256
	32	16,862	23,219	18,907	2,785	15%	5	16,868	16,874	16,892	17,342	20,222	22,020	22,620	9%	88,682	-158,916	195,813
Commodity	33	3,512	13,676	8,594	7,187	84%	2	4,020	4,528	6,053	8,594	11,135	12,660	13,168	30%	4,099	-1,462	14,932
	34	251,551	300,991	276,271	34,959	13%	2	254,023	256,495	263,911	276,271	288,631	296,047	298,519	4%	45,917	169,578	353,248
	35	269,828	299,099	279,897	16,636	6%	3	269,922	270,015	270,296	270,764	284,932	293,432	296,266	3%	69,228	160,643	437,555
Credit Spread	36	21,224	21,948	21,586	512	2%	2	21,260	21,296	21,405	21,586	21,767	21,876	21,912	1%	4,113	8,889	25,339
	37	18,021	20,761	19,391	1,937	10%	2	18,158	18,295	18,706	19,391	20,076	20,487	20,624	4%	4,133	10,095	26,627
	38	2,241	3,884	3,044	822	27%	3	2,318	2,394	2,624	3,006	3,445	3,708	3,796	14%	906	1,350	4,976
	39	8,631	10,984	9,808	1,664	17%	2	8,749	8,866	9,219	9,808	10,396	10,749	10,866	6%	1,800	6,664	13,863
	40	3,662	5,475	4,645	916	20%	3	3,776	3,889	4,230	4,798	5,137	5,340	5,407	10%	1,018	2,535	6,609
	41	6,425	9,999	8,085	1,800	22%	3	6,566	6,706	7,128	7,831	8,915	9,565	9,782	11%	3,777	-23	15,085
	42	38,345	38,345	38,345			1	38,345	38,345	38,345	38,345	38,345	38,345	38,345	0%	11,364	-3,114	42,343
	43	9,602	17,704	13,322	3,330	25%	4	10,110	10,618	12,141	12,990	14,171	16,291	16,997	8%	18,829	-23,529	51,789
	44	4,965	8,696	6,313	1,715	27%	4	4,995	5,025	5,115	5,795	6,992	8,014	8,355	16%	1,279	4,027	9,145
	45	4,390	10,255	6,870	3,035	44%	3	4,548	4,705	5,178	5,965	8,110	9,397	9,826	22%	7,880	-10,172	21,348
	46	4,482	6,621	5,486	1,076	20%	3	4,569	4,656	4,918	5,354	5,988	6,368	6,494	10%	7,181	-8,547	20,175
	47	1,729	3,408	2,569	1,187	46%	2	1,813	1,897	2,149	2,569	2,988	3,240	3,324	16%	2,047	-1,559	6,631
	48	9,248	12,142	10,800	1,458	14%	3	9,424	9,600	10,129	11,010	11,576	11,916	12,029	7%	2,140	5,428	13,988
	49	2,421	3,825	3,123	993	32%	2	2,491	2,561	2,772	3,123	3,474	3,685	3,755	11%	2,688	-1,488	9,263
	50	14,280	28,159	21,220	9,814	46%	2	14,974	15,668	17,750	21,220	24,689	26,771	27,465	16%	9,784	-710	38,427
	51	79,383	88,892	84,138	6,724	8%	2	79,858	80,334	81,760	84,138	86,515	87,941	88,417	3%	19,812	19,391	98,638
	52	87,506	281,923	184,715	137,474	74%	2	97,227	106,948	136,110	184,715	233,319	262,481	272,202	26%	106,320	-103,372	321,909
	53	174,761	266,558	220,660	64,910	29%	2	179,351	183,941	197,710	220,660	243,609	257,378	261,968	10%	91,920	-21,171	346,507
CTP	54																	
	55																	
	56																	
ALL-IN no-CTP	57	1,529,765	1,529,765	1,529,765			1	1,529,765	1,529,765	1,529,765	1,529,765	1,529,765	1,529,765	1,529,765	0%	138,424	1,186,300	1,739,995
Equity Cumulative	58	1,320,054	1,320,054	1,320,054			1	1,320,054	1,320,054	1,320,054	1,320,054	1,320,054	1,320,054	1,320,054	0%	212,755	818,076	1,669,098
IR Cumulative	59	265,651	541,500	343,405	107,119	31%	6	268,054	270,458	276,479	293,991	369,489	465,766	503,633	14%	103,159	173,105	585,742
FX Cumulative	60	448,969	701,491	618,778	98,173	16%	5	485,841	522,714	633,331	651,057	659,044	684,512	693,002	2%	112,596	428,801	879,184
Commodity Cumulative	61	250,357	301,556	275,957	36,203	13%	2	252,917	255,477	263,157	275,957	288,756	296,436	298,996	5%	77,529	102,929	413,044
CS Cumulative	62	12,599	19,745	15,785	3,635	23%	3	12,840	13,082	13,806	15,012	17,379	18,798	19,272	11%	7,606	485	30,911
CTP Cumulative	63																	

![EBA European Banking Authority]

Table 31: VaR statistics (medium TB banks only)

EU Statistics for VaR

		Other stats						Percentiles									Extreme Values range (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_trunc¹	-2*STDev_trunc	+2*STDev_trunc
Equity	1	2,081,748	3,206,116	2,651,524	417,765	16%	16	2,131,465	2,149,829	2,200,456	2,752,425	3,024,574	3,119,347	3,149,236	16%	318,014	1,970,762	3,242,817
	2	1,909,923	2,708,956	2,357,931	289,314	12%	14	1,965,184	2,019,180	2,100,359	2,306,579	2,653,282	2,689,281	2,698,767	12%	269,993	1,776,922	2,856,893
	3	10,670	26,393	20,072	4,683	23%	14	12,055	13,691	17,507	20,179	24,194	24,662	25,366	16%	4,625	10,582	29,082
	4	143	1,413	808	438	54%	13	183	241	364	864	1,229	1,268	1,329	54%	694	-682	2,093
	5	728,528,357	905,318,662	844,823,946	63,700,173	8%	14	733,013,137	744,801,526	811,590,240	856,943,917	900,877,224	903,545,609	904,523,548	5%	87,576,932	678,842,676	1,029,150,405
	6	17,854	45,312	33,911	9,516	28%	15	18,337	19,592	26,812	36,053	40,745	44,596	45,099	21%	8,816	17,494	52,757
	7	3,862	27,986	11,571	5,655	49%	13	5,400	6,953	9,649	10,707	12,226	14,476	20,059	12%	13,949	-16,860	38,937
	8	44,948	133,753	91,857	28,768	31%	15	55,732	61,017	65,079	97,512	113,542	127,736	132,204	27%	27,972	42,980	154,870
	9	36,574	86,481	57,722	12,490	22%	14	38,774	43,245	52,603	55,820	65,496	68,351	74,959	11%	15,078	30,994	91,307
	10	158,743	331,241	272,876	42,482	16%	13	209,953	246,622	267,983	273,867	286,874	322,264	329,043	3%	430,168	-577,071	1,143,602
Interest Rate	11	65,208	78,221	71,153	4,083	6%	18	65,455	65,989	67,874	71,124	73,990	76,915	78,054	4%	4,681	60,805	79,528
	12	29,428	54,016	42,068	7,057	17%	18	32,316	34,151	37,560	41,382	48,687	50,720	52,096	13%	8,676	24,029	58,734
	13	124,071	168,212	150,665	13,061	9%	20	129,819	134,673	140,922	155,080	160,174	165,659	168,192	6%	15,804	116,799	180,016
	14	23,327	32,311	27,451	2,351	9%	20	23,331	24,203	25,939	27,968	28,718	29,589	30,465	5%	3,072	21,692	33,980
	15	11,177	16,759	14,693	2,374	16%	7	11,342	11,508	12,995	15,841	16,542	16,731	16,745	12%	8,310	-778	32,461
	16	90,921	119,751	103,894	7,501	7%	19	93,132	95,956	98,229	103,969	109,457	111,516	115,427	5%	9,157	84,462	121,091
	17	143,647	320,653	232,220	49,859	21%	17	151,326	159,690	196,324	237,623	266,882	280,218	295,114	15%	62,050	128,158	376,359
	18	71,227	453,468	237,122	104,844	44%	17	76,005	85,975	165,983	255,310	295,319	344,484	366,957	28%	111,534	71,176	517,313
	19	126,580	163,667	149,310	9,398	6%	21	131,803	142,889	145,272	148,766	153,973	160,649	162,234	3%	11,283	125,240	170,371
	20	3,287	6,017	4,390	853	19%	20	3,476	3,547	3,604	4,077	4,916	5,587	5,968	15%	1,551	958	7,161
	21	264,504	323,341	294,379	21,224	7%	21	264,600	268,505	272,469	297,993	313,140	316,681	319,311	7%	23,481	234,588	328,511
	22	35,509	63,601	47,826	7,176	15%	20	37,531	39,764	43,473	47,145	52,728	57,225	59,757	10%	8,446	32,165	65,948
	23	142,629	202,388	169,093	20,221	12%	20	143,173	143,920	149,602	169,661	186,066	198,394	198,768	11%	17,711	131,694	202,537
	24	42,451	267,055	150,744	79,265	53%	11	42,729	43,007	88,141	144,595	200,760	261,975	264,515	39%	116,207	-41,436	423,393
	25	12,685	98,576	47,782	23,897	50%	20	19,554	24,555	31,788	43,404	56,775	87,930	97,717	28%	39,057	-37,527	118,699
	26	215,933	490,830	345,666	74,154	21%	16	224,578	235,893	313,452	356,917	387,378	410,687	439,961	11%	110,112	155,140	595,587
FX	27	402,500	542,148	470,510	37,028	8%	17	419,902	429,983	444,894	468,244	493,625	517,440	522,798	5%	52,870	379,417	590,896
	28	8,438	14,500	11,310	1,941	17%	17	8,584	8,693	10,137	11,189	12,834	13,946	14,271	12%	6,533	-1,290	24,842
	29	61,605	138,968	95,216	22,020	23%	18	64,586	69,824	80,006	88,590	107,466	123,573	135,702	15%	27,148	52,805	161,399
	30	282,270	370,393	314,222	32,440	10%	18	284,506	287,204	293,199	298,952	324,874	369,852	369,956	5%	33,781	243,680	378,803
	31	244,661	338,540	288,861	28,205	10%	16	250,879	254,108	268,769	293,983	301,753	326,368	335,428	6%	29,821	232,974	352,256
	32	15,703	163,651	39,510	53,118	134%	13	15,708	15,732	16,197	16,782	18,449	129,055	157,893	7%	88,682	-158,916	195,813
Commodity	33	4,891	14,224	10,576	3,118	29%	8	6,077	7,263	9,333	10,451	12,961	14,078	14,151	16%	4,099	-1,462	14,932
	34	220,882	296,736	261,096	22,194	9%	8	231,605	242,327	251,526	259,845	272,424	283,464	290,100	4%	45,917	169,578	353,248
	35	231,625	378,924	306,107	44,837	15%	7	249,690	267,756	292,315	300,145	323,713	351,421	365,172	5%	69,228	160,643	437,555
Credit Spread	36	12,745	22,562	18,398	3,423	19%	10	12,862	12,978	16,959	19,548	20,424	22,090	22,326	9%	4,113	8,889	25,339
	37	13,359	22,800	18,439	3,471	19%	8	14,014	14,669	15,414	18,989	20,716	22,640	22,720	15%	4,133	10,095	26,627
	38	2,181	4,542	3,095	869	28%	8	2,245	2,309	2,644	2,819	3,308	4,395	4,469	11%	906	1,350	4,976
	39	6,926	13,379	10,272	1,897	18%	8	7,733	8,540	9,698	10,104	10,952	12,390	12,884	6%	1,800	6,664	13,863
	40	3,367	5,274	4,146	706	17%	8	3,375	3,383	3,422	4,214	4,571	4,919	5,097	14%	1,018	2,535	6,609
	41	2,707	9,301	6,792	2,068	30%	8	3,772	4,837	5,917	7,014	8,041	8,941	9,121	15%	3,777	-23	15,085
	42	14,979	40,738	22,513	10,187	45%	9	15,326	15,673	16,319	16,731	22,548	39,552	40,145	16%	11,364	-3,114	42,343
	43	9,222	32,208	15,578	7,426	48%	11	9,807	10,392	11,141	13,463	14,347	27,911	30,060	13%	18,829	-23,529	51,789
	44	5,027	8,271	6,465	1,083	17%	11	5,079	5,131	5,759	6,556	6,853	8,216	8,244	9%	1,279	4,027	9,145
	45	2,336	8,217	4,686	1,810	39%	9	2,879	3,422	3,699	3,903	5,166	7,079	7,648	17%	7,880	-10,172	21,348
	46	4,005	13,939	7,197	3,337	46%	11	4,094	4,182	4,683	5,519	10,075	10,424	12,182	37%	7,181	-8,547	20,175
	47	1,438	4,998	2,409	1,123	47%	9	1,506	1,574	1,628	1,930	2,684	3,492	4,245	24%	2,047	-1,559	6,631
	48	5,668	11,836	8,855	2,050	23%	11	5,801	5,934	7,546	8,550	10,612	10,719	11,278	17%	2,140	5,428	13,988
	49	3,214	6,605	4,072	1,258	31%	9	3,215	3,216	3,282	3,558	3,903	6,010	6,307	9%	2,688	-1,488	9,263
	50	11,712	28,534	18,324	4,809	26%	9	12,206	12,700	17,209	18,046	19,864	21,876	25,205	7%	9,784	-710	38,427
	51	40,020	85,804	59,374	14,194	24%	9	41,705	43,390	52,962	57,812	66,733	75,618	80,711	12%	19,812	19,391	98,638
	52	43,819	169,403	104,414	45,863	44%	7	54,313	64,807	78,862	86,903	136,523	163,428	166,415	27%	106,320	-103,372	321,909
	53	78,937	338,088	158,043	86,191	55%	8	79,601	80,265	99,366	140,918	179,595	248,055	293,071	29%	91,920	-21,171	346,507
CTP	54																	
	55																	
	56																	
ALL-IN no-CTP	57	1,201,785	1,589,024	1,467,722	133,069	9%	7	1,265,882	1,329,980	1,439,896	1,480,034	1,561,711	1,579,252	1,584,138	4%	138,424	1,186,300	1,739,995
Equity Cumulative	58	950,141	1,446,944	1,222,937	147,762	12%	11	1,015,832	1,081,523	1,138,816	1,220,573	1,336,653	1,381,699	1,414,322	8%	212,755	818,076	1,669,098
IR Cumulative	59	177,258	553,325	349,430	87,803	25%	17	219,626	247,187	312,190	351,027	385,298	437,992	498,040	10%	103,159	173,105	585,742
FX Cumulative	60	497,586	827,112	633,118	96,882	15%	16	500,171	521,094	560,362	615,380	705,091	747,013	775,952	11%	112,596	428,801	879,184
Commodity Cumulative	61	222,801	296,621	260,509	23,444	9%	7	230,272	237,743	249,856	257,987	273,221	283,619	290,120	4%	77,529	102,929	413,044
CS Cumulative	62	10,392	27,527	16,391	5,543	34%	10	10,621	10,849	12,570	15,186	18,671	23,716	25,622	20%	7,606	485	30,911
CTP Cumulative	63																	

Table 32: VaR statistics (large TB banks only)

EU Statistics for VaR

		Other stats						Percentiles									Extreme Values range (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
Equity	1	2,104,118	3,072,659	2,640,536	363,797	14%	8	2,152,531	2,200,943	2,421,086	2,629,792	2,945,236	3,061,565	3,067,112	10%	318,014	1,970,762	3,242,817
	2	2,027,191	2,845,713	2,459,473	268,842	11%	8	2,086,893	2,146,596	2,290,714	2,505,075	2,604,103	2,744,898	2,795,305	6%	269,993	1,776,922	2,856,893
	3	17,765	28,701	22,204	3,958	18%	8	18,204	18,642	19,326	21,123	24,226	27,694	28,198	11%	4,625	10,582	29,082
	4	355	1,716	830	482	58%	7	356	357	517	710	997	1,393	1,554	32%	694	-682	2,093
	5	734,805,122	932,229,670	854,967,855	85,913,299	10%	6	740,402,545	745,999,969	789,591,236	898,087,394	909,400,624	920,816,203	926,522,936	7%	87,576,932	678,842,676	1,029,150,405
	6	18,103	40,922	32,358	8,737	27%	8	20,001	21,898	25,219	35,520	39,210	40,848	40,885	22%	8,816	17,494	52,757
	7	5,431	18,377	11,179	4,445	40%	7	6,316	7,202	8,458	10,622	13,453	16,638	17,508	23%	13,949	-16,860	38,937
	8	66,860	118,023	103,039	19,491	19%	6	74,050	81,240	98,951	110,154	115,909	117,724	117,873	8%	27,972	42,980	154,870
	9	55,754	82,178	62,448	9,290	15%	7	55,783	55,812	57,071	58,734	63,165	71,979	77,078	5%	15,078	30,994	91,307
	10	267,317	322,129	285,404	16,558	6%	8	269,735	272,153	276,657	281,925	288,560	299,810	310,970	2%	430,168	-577,071	1,143,602
Interest Rate	11	64,332	77,344	70,557	4,906	7%	10	64,332	64,332	66,604	69,814	74,064	77,163	77,254	5%	4,681	60,805	79,528
	12	33,151	51,792	41,644	5,974	14%	9	35,013	36,876	38,424	39,790	43,048	50,318	51,055	6%	8,676	24,029	58,734
	13	135,072	178,574	154,837	16,037	10%	10	135,201	135,329	138,224	158,445	163,537	174,629	176,602	8%	15,804	116,799	180,016
	14	24,815	32,700	27,769	2,618	9%	10	25,103	25,391	25,779	27,378	28,037	31,903	32,301	4%	3,072	21,692	33,980
	15	11,665	22,015	16,288	4,356	27%	4	12,121	12,576	13,943	15,736	18,081	20,442	21,228	13%	8,310	-778	32,461
	16	94,658	109,529	101,534	4,240	4%	9	95,932	97,205	98,172	102,384	102,906	104,545	107,037	2%	9,157	84,462	121,091
	17	138,867	283,482	247,218	42,034	17%	9	180,496	222,125	252,652	260,754	261,452	268,887	276,184	2%	62,050	128,158	376,359
	18	230,847	438,667	342,583	88,244	26%	9	244,825	258,804	273,276	298,410	432,259	438,667	438,667	23%	111,534	71,176	517,313
	19	133,729	163,160	147,895	10,900	7%	9	133,729	133,729	139,014	148,354	155,139	159,674	161,417	5%	11,283	125,240	170,371
	20	3,302	5,764	4,350	806	19%	10	3,515	3,728	3,942	4,119	4,368	5,764	5,764	5%	1,551	958	7,161
	21	261,893	311,594	291,183	17,915	6%	8	266,888	271,883	277,035	296,345	304,812	307,033	309,313	5%	23,481	234,588	328,511
	22	45,947	57,018	49,382	4,283	9%	8	45,947	45,947	46,219	47,876	50,609	55,538	56,278	5%	8,446	32,165	65,948
	23	148,953	201,294	173,586	16,968	10%	9	151,527	154,101	161,165	170,334	186,140	190,951	196,122	7%	17,711	131,694	202,537
	24	106,237	395,582	239,297	116,561	49%	8	109,922	113,607	137,368	230,598	325,780	387,464	391,523	41%	116,207	-41,436	423,393
	25	29,856	75,119	45,023	18,558	41%	8	30,673	31,489	32,284	36,138	52,294	73,671	74,395	24%	39,057	-37,527	118,699
	26	237,602	547,837	423,838	103,840	24%	9	286,328	335,053	375,169	381,838	504,299	547,837	547,837	15%	110,112	155,140	595,587
FX	27	388,925	550,623	490,314	61,132	12%	8	405,502	422,078	438,032	509,973	540,776	550,623	550,623	10%	52,870	379,417	590,896
	28	7,561	22,595	13,277	4,738	36%	7	8,625	9,688	11,194	11,850	14,273	18,271	20,433	12%	6,533	-1,290	24,842
	29	67,013	148,573	106,935	26,507	25%	8	72,019	77,026	87,149	111,422	121,745	133,097	140,835	17%	27,148	52,805	161,399
	30	274,079	356,402	318,078	27,040	9%	8	278,530	282,981	308,305	319,062	336,088	343,832	350,117	4%	33,781	243,680	378,803
	31	259,417	337,761	304,018	28,604	9%	6	266,457	273,496	290,500	305,232	324,468	333,328	335,544	6%	29,821	232,974	352,256
	32	15,849	188,211	56,896	70,880	125%	8	16,070	16,290	17,743	19,313	56,846	163,610	175,910	52%	88,682	-158,916	195,813
Commodity	33	4,795	6,555	5,808	725	12%	5	4,901	5,006	5,323	6,149	6,218	6,420	6,488	8%	4,099	-1,462	14,932
	34	251,861	328,788	304,580	36,196	12%	4	260,572	269,282	295,414	318,836	328,003	328,474	328,631	5%	45,917	169,578	353,248
	35	216,051	372,453	319,537	71,566	22%	4	232,819	249,587	299,892	344,823	364,468	369,259	370,856	10%	69,228	160,643	437,555
Credit Spread	36	10,340	22,328	16,835	4,214	25%	9	11,357	12,374	12,882	16,506	19,277	22,197	22,262	20%	4,113	8,889	25,339
	37	12,490	23,048	16,769	4,017	24%	7	12,717	12,944	13,868	14,710	19,700	21,133	22,091	17%	4,133	10,095	26,627
	38	1,534	4,472	3,179	1,117	35%	6	1,820	2,106	2,715	2,995	4,090	4,436	4,454	20%	906	1,350	4,976
	39	6,930	13,249	9,710	2,034	21%	8	7,074	7,218	8,595	9,924	10,584	11,521	12,385	10%	1,800	6,664	13,863
	40	3,003	6,529	4,537	1,251	28%	7	3,059	3,116	3,618	4,504	5,244	5,816	6,173	18%	1,018	2,535	6,609
	41	6,093	11,644	8,034	2,099	26%	7	6,133	6,172	6,225	7,744	9,155	10,449	11,047	19%	3,777	-23	15,085
	42	12,475	20,731	17,959	2,780	15%	7	13,603	14,731	17,379	18,819	19,465	20,061	20,396	6%	11,364	-3,114	42,343
	43	11,676	22,218	15,988	3,635	23%	7	12,132	12,588	13,818	14,584	17,902	20,282	21,250	13%	18,829	-23,529	51,789
	44	5,032	8,273	6,800	1,182	17%	7	5,247	5,463	6,092	6,834	7,640	8,175	8,224	11%	1,279	4,027	9,145
	45	1,595	9,813	5,649	3,673	65%	7	1,740	1,885	2,172	5,938	8,926	9,783	9,798	61%	7,880	-10,172	21,348
	46	2,733	10,432	6,428	2,708	42%	8	3,290	3,847	4,457	6,015	8,415	9,619	10,026	31%	7,181	-8,547	20,175
	47	1,654	5,477	3,803	1,313	35%	7	1,919	2,183	3,202	3,867	4,610	4,983	5,230	18%	2,047	-1,559	6,631
	48	5,856	12,492	9,319	2,110	23%	7	6,357	6,859	8,489	9,769	10,071	11,159	11,825	9%	2,140	5,428	13,988
	49	2,978	7,596	4,668	1,784	38%	8	3,139	3,300	3,529	3,723	5,692	7,256	7,426	23%	2,688	-1,488	9,263
	50	11,671	29,872	20,156	7,118	35%	9	11,671	11,671	13,624	21,805	24,711	29,050	29,461	29%	9,784	-710	38,427
	51	32,646	83,147	61,807	17,017	28%	7	37,520	42,394	53,832	63,510	72,841	78,257	80,702	15%	19,812	19,391	98,638
	52	38,414	310,499	112,163	102,164	91%	6	40,411	42,409	50,740	76,071	116,237	218,009	264,254	39%	106,320	-103,372	321,909
	53	58,488	281,840	136,634	80,160	59%	6	62,158	65,828	83,054	125,731	150,824	218,345	250,092	29%	91,920	-21,171	346,507
CTP	54	962	4,657	2,622	1,743	66%	4	1,028	1,093	1,290	2,435	3,768	4,301	4,479	49%	1,435	27	5,765
	55	16,499	35,669	26,084	13,555	52%	2	17,458	18,416	21,292	26,084	30,877	33,752	34,711	18%	12,966	-9,434	42,431
	56	186,900	365,525	276,213	126,307	46%	2	195,831	204,763	231,556	276,213	320,869	347,663	356,594	16%	100,282	164,961	566,088
ALL-IN no-CTP	57	1,340,236	1,497,085	1,403,997	64,193	5%	6	1,341,442	1,342,648	1,352,294	1,389,226	1,448,474	1,480,117	1,488,601	3%	138,424	1,186,300	1,739,995
Equity Cumulative	58	1,071,657	1,391,385	1,247,767	100,937	8%	7	1,103,053	1,134,449	1,208,776	1,272,122	1,290,826	1,333,708	1,362,547	3%	212,755	818,076	1,669,098
IR Cumulative	59	298,976	484,144	398,022	71,241	18%	7	309,199	319,421	353,684	379,424	458,121	481,058	482,601	13%	103,159	173,105	585,742
FX Cumulative	60	495,292	850,417	679,225	115,358	17%	8	534,394	573,496	616,267	668,356	738,073	823,089	836,753	9%	112,596	428,801	879,184
Commodity Cumulative	61	245,904	331,312	303,771	40,102	13%	4	255,156	264,408	292,164	318,935	330,542	331,004	331,158	6%	77,529	102,929	413,044
CS Cumulative	62	15,698	29,923	20,471	5,907	29%	6	15,711	15,724	15,830	18,218	23,855	27,470	28,697	20%	7,606	485	30,911
CTP Cumulative	63	169,967	428,613	299,290	182,890	61%	2	182,899	195,832	234,629	299,290	363,952	402,748	415,681	22%	107,606	164,699	595,123

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

EU Statistics for VaR

		Other stats								Percentiles							
	Port. ID	Min	Max	Ave.	STDev	STDev_trunc[1]	MAD (median absolute deviation)	Coefficient of variation (STDev/Mean)	Num obs.	5th	10th	25th	50th (Median)	75th	90th	95th	Interquantile range
Equity	1	2,104,118	3,108,417	2,602,389	346,577			13%	21	2,151,621	2,186,200	2,229,372	2,619,578	2,865,060	3,024,754	3,072,659	12%
	2	1,909,923	2,701,691	2,373,857	248,004			10%	20	2,021,328	2,070,885	2,185,105	2,343,904	2,581,808	2,681,280	2,693,702	8%
	3	10,670	27,263	20,481	4,369			21%	20	12,694	15,473	18,705	20,394	23,385	26,443	26,909	11%
	4	210	1,716	797	412			52%	17	326	357	591	710	969	1,329	1,474	24%
	5	734,805,122	948,265,719	848,576,226	63,095,871			7%	17	752,716,876	761,022,224	809,812,192	858,522,952	897,515,084	906,214,961	917,168,576	5%
	6	17,854	46,308	34,003	9,027			27%	20	18,091	20,859	26,527	37,625	40,766	41,517	45,072	21%
	7	3,862	27,986	11,760	5,557			47%	18	5,196	6,127	8,667	10,873	13,017	17,769	19,818	20%
	8	60,353	133,753	98,199	25,548			26%	18	61,764	62,993	69,445	106,546	117,873	127,305	131,872	26%
	9	36,574	89,738	62,371	13,392			21%	20	39,789	51,696	55,537	59,997	67,746	82,608	86,644	10%
	10	244,093	331,241	281,456	22,955			8%	17	252,255	255,760	267,983	281,264	287,998	311,639	328,310	4%
Interest Rate	11	64,021	77,143	70,018	3,715			5%	25	64,439	65,004	67,286	69,912	72,592	74,267	76,016	4%
	12	32,826	51,792	41,730	6,528			16%	24	33,211	33,634	37,089	40,345	48,783	50,197	51,535	14%
	13	130,121	178,574	153,490	13,359			9%	26	135,099	135,269	142,258	155,378	163,639	169,085	173,133	7%
	14	23,331	32,700	27,796	2,221			8%	26	24,429	25,135	26,796	27,598	28,637	30,605	32,160	3%
	15	11,177	31,178	17,262	6,225			36%	12	11,445	11,671	13,529	15,537	18,073	26,000	28,574	14%
	16	90,921	119,751	104,077	6,505			6%	27	95,241	96,632	99,847	103,299	109,380	110,528	113,660	5%
	17	138,867	320,653	232,811	47,112			20%	24	145,087	153,459	218,757	241,297	262,876	267,302	285,542	9%
	18	71,227	453,468	270,037	101,698			38%	25	89,135	148,519	229,162	265,793	310,371	431,302	438,041	15%
	19	126,580	167,912	147,948	10,454			7%	27	130,617	132,810	143,988	148,399	154,507	160,443	162,762	4%
	20	3,105	6,996	4,441	982			22%	26	3,291	3,368	3,644	4,141	5,007	5,745	5,880	16%
	21	250,363	323,341	293,318	21,149			7%	28	262,840	267,334	275,001	299,129	310,655	317,470	320,870	6%
	22	35,509	63,601	49,293	6,636			13%	25	40,303	42,264	45,947	47,914	52,804	58,577	59,692	7%
	23	142,629	202,388	172,005	18,163			11%	27	143,441	146,972	159,463	170,334	188,890	194,144	198,516	8%
	24	42,451	395,582	188,700	106,858			57%	18	48,884	75,956	95,390	172,704	265,864	329,660	385,725	47%
	25	19,915	98,576	50,170	22,800			45%	27	25,536	28,257	33,631	43,469	59,813	88,453	95,629	28%
	26	166,144	547,837	366,504	99,582			27%	24	217,662	230,503	325,575	366,938	400,176	500,258	540,393	10%
FX	27	388,925	588,161	486,388	56,438			12%	24	418,696	427,118	438,537	485,157	522,795	571,074	583,650	9%
	28	7,126	15,388	11,897	2,486			21%	22	7,614	8,632	10,627	11,492	13,995	15,094	15,284	14%
	29	61,605	148,573	100,822	23,807			24%	25	66,262	70,836	81,317	105,651	118,236	131,661	138,200	19%
	30	261,170	370,393	319,284	32,973			10%	24	282,665	285,469	295,034	311,460	342,934	369,782	369,873	8%
	31	242,625	338,540	292,942	29,953			10%	22	245,076	253,183	270,366	299,587	309,616	333,841	337,593	7%
	32	15,712	188,211	40,280	54,280			135%	20	15,808	16,159	16,503	17,203	20,971	153,165	155,762	12%
Commodity	33	3,512	14,224	9,259	3,772			41%	12	4,508	5,406	6,201	8,982	12,877	13,981	14,109	35%
	34	220,882	328,788	273,364	30,578			11%	12	237,737	251,530	251,784	266,027	297,800	309,037	318,417	8%
	35	216,051	378,924	298,999	48,354			16%	12	224,617	235,445	270,530	295,943	329,151	358,934	369,509	10%
Credit Spread	36	10,340	22,562	18,781	3,814			20%	16	12,247	12,943	16,962	19,865	21,971	22,246	22,387	13%
	37	13,246	23,048	18,484	3,335			18%	14	14,055	14,556	15,292	19,234	20,595	22,731	22,887	15%
	38	1,534	4,542	3,144	870			28%	14	1,994	2,372	2,756	2,896	3,704	4,430	4,497	15%
	39	6,930	13,379	10,339	1,751			17%	14	8,036	8,745	9,256	10,392	10,933	12,864	13,295	8%
	40	3,003	5,475	4,316	790			18%	14	3,125	3,264	3,758	4,369	4,790	5,321	5,388	12%
	41	5,750	11,644	8,013	1,737			22%	14	5,973	6,133	6,509	7,812	9,172	9,895	10,575	17%
	42	12,475	39,256	20,605	8,099			39%	14	14,103	15,239	16,256	18,671	19,750	33,606	38,664	10%
	43	9,602	32,208	15,919	6,067			38%	18	10,274	10,743	12,989	13,797	17,481	23,926	28,556	15%
	44	4,965	8,696	6,657	1,232			19%	17	5,098	5,151	5,750	6,433	8,110	8,272	8,358	17%
	45	1,595	10,255	5,697	2,946			52%	15	2,065	2,294	3,700	4,663	8,153	9,793	9,946	38%
	46	2,733	13,939	6,770	3,054			45%	18	3,814	4,129	4,543	5,437	9,451	10,426	10,958	35%
	47	1,608	5,477	2,935	1,356			46%	14	1,621	1,636	1,746	2,610	3,752	4,895	5,166	36%
	48	5,668	12,492	9,545	2,039			21%	16	5,868	6,731	8,341	9,830	10,739	11,989	12,230	13%
	49	2,421	7,596	4,113	1,487			36%	14	2,783	3,049	3,310	3,590	3,899	6,382	6,952	8%
	50	11,671	29,872	20,022	6,196			31%	15	12,564	13,218	15,185	18,859	24,982	28,720	29,152	24%
	51	32,646	88,892	60,805	16,368			27%	15	37,808	41,705	50,928	58,771	74,034	81,641	84,871	18%
	52	38,414	310,499	114,561	91,537			80%	12	41,387	44,077	59,414	82,914	108,643	270,671	294,782	29%
	53	58,488	338,088	156,547	90,692			58%	13	67,296	74,322	80,834	115,967	209,469	278,784	304,339	44%
CTP	54	1,399	3,471	2,435	1,465			60%	2	1,503	1,606	1,917	2,435	2,953	3,264	3,367	21%
	55	16,499	35,669	26,084	13,555			52%	2	17,458	18,416	21,292	26,084	30,877	33,752	34,711	18%
	56	186,900	365,525	276,213	126,307			46%	2	195,831	204,763	231,556	276,213	320,869	347,663	356,594	16%
ALL-IN no-CTP	57	1,201,785	1,589,024	1,445,276	114,757			8%	12	1,277,933	1,340,718	1,366,764	1,463,749	1,534,995	1,570,533	1,580,067	6%
Equity Cumulative	58	950,141	1,446,944	1,237,490	137,338			11%	16	1,041,278	1,076,590	1,156,091	1,256,681	1,334,293	1,386,542	1,405,275	7%
IR Cumulative	59	230,218	553,325	365,176	83,865			23%	24	259,573	268,535	306,699	361,976	387,393	484,197	532,908	12%
FX Cumulative	60	448,969	850,417	660,714	105,069			16%	23	495,521	506,300	608,531	659,044	719,168	800,881	825,539	8%
Commodity Cumulative	61	222,801	331,312	273,479	32,566			12%	11	234,353	245,904	249,031	271,490	299,089	307,584	319,448	9%
CS Cumulative	62	10,392	27,527	17,459	4,977			29%	15	11,552	12,269	14,573	15,698	20,056	24,327	25,770	16%
CTP Cumulative	63	169,967	428,613	299,290	182,890			61%	2	182,899	195,832	234,629	299,290	363,952	402,748	415,681	22%

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

EU Statistics for VaR

		Other stats						Percentiles									Extreme Values range (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
Equity	1	2,148,037	3,206,116	2,589,931	405,092	16%	8	2,150,874	2,153,712	2,192,942	2,600,199	2,850,744	3,064,517	3,135,317	13%	318,014	1,970,762	3,242,817
	2	1,994,940	2,693,281	2,330,898	298,964	13%	7	2,019,180	2,043,420	2,097,277	2,204,953	2,614,279	2,677,436	2,685,359	11%	269,993	1,776,922	2,856,893
	3	12,830	24,813	18,477	5,224	28%	6	12,989	13,149	14,043	17,925	22,946	24,357	24,585	24%	4,625	10,582	29,082
	4	143	1,229	614	373	61%	7	163	183	375	591	791	990	1,109	36%	694	-682	2,093
	5	727,947,916	905,318,662	819,418,662	72,204,439	9%	8	728,151,070	728,354,225	758,503,793	831,220,196	869,916,066	904,462,385	904,890,523	7%	87,576,932	678,842,676	1,029,150,405
	6	18,544	45,808	34,412	11,333	33%	7	19,867	21,191	24,865	40,360	43,221	45,510	45,659	27%	8,816	17,494	52,757
	7	3,862	14,775	9,831	4,530	46%	4	4,730	5,598	8,202	10,344	11,973	13,654	14,215	19%	13,949	-16,860	38,937
	8	44,948	133,753	91,798	33,815	37%	7	50,068	55,187	63,579	106,437	115,144	123,379	128,566	29%	27,972	42,980	154,870
	9	39,958	79,588	58,718	14,409	25%	6	41,324	42,689	48,760	60,317	65,496	73,149	76,369	15%	15,078	30,994	91,307
	10	158,743	286,874	254,375	44,632	18%	7	184,348	209,953	251,802	272,098	279,653	284,709	285,791	5%	430,168	-577,071	1,143,602
Interest Rate	11	64,021	77,076	70,154	5,363	8%	9	64,496	64,971	65,498	68,145	74,667	76,566	76,821	7%	4,681	60,805	79,528
	12	27,936	54,016	40,407	8,639	21%	9	28,533	29,130	35,811	40,899	44,983	50,740	52,378	11%	8,676	24,029	58,734
	13	142,884	168,212	155,936	11,922	8%	7	143,075	143,265	144,030	158,826	166,785	168,199	168,206	7%	15,804	116,799	180,016
	14	23,331	31,707	27,202	2,660	10%	9	23,849	24,367	25,391	27,351	28,147	30,636	31,171	5%	3,072	21,692	33,980
	15	15,841	16,371	16,106	375	2%	2	15,868	15,894	15,974	16,106	16,239	16,318	16,345	1%	8,310	-778	32,461
	16	93,378	119,751	101,830	8,119	8%	10	93,581	93,783	97,204	99,624	104,071	111,568	115,660	3%	9,157	84,462	121,091
	17	163,986	320,653	233,385	46,910	20%	8	175,304	186,623	209,235	233,007	246,481	283,013	301,833	8%	62,050	128,158	376,359
	18	91,825	345,329	237,057	98,514	42%	7	101,291	110,757	179,548	254,443	304,353	344,484	344,906	26%	111,534	71,176	517,313
	19	126,580	152,322	142,644	8,376	6%	10	128,168	129,756	141,263	144,462	148,525	149,764	151,043	3%	11,283	125,240	170,371
	20	3,105	5,965	4,239	931	22%	7	3,219	3,334	3,699	4,050	4,576	5,141	5,553	11%	1,551	958	7,161
	21	250,363	315,886	279,765	23,644	8%	10	254,049	257,734	264,585	271,876	301,418	311,808	313,847	7%	23,481	234,588	328,511
	22	37,637	52,804	46,671	4,634	10%	8	39,649	41,661	45,166	47,145	49,679	50,757	51,781	5%	8,446	32,165	65,948
	23	141,780	202,388	164,563	20,078	12%	9	142,120	142,459	152,395	163,129	174,743	188,410	195,399	7%	17,711	131,694	202,537
	24	43,007	187,546	111,171	58,733	53%	7	45,111	47,214	69,018	88,265	160,673	181,068	184,307	40%	116,207	-41,436	423,393
	25	12,685	86,847	42,976	20,171	47%	10	20,183	27,681	30,550	42,993	48,184	62,549	74,698	22%	39,057	-37,527	118,699
	26	244,325	466,698	360,674	77,614	22%	7	254,645	264,965	316,927	371,190	404,326	440,482	453,590	12%	110,112	155,140	595,587
FX	27	405,693	542,148	477,782	45,523	10%	9	413,117	420,540	455,403	468,360	517,093	522,798	532,473	6%	52,870	379,417	590,896
	28	3,899	14,214	10,875	3,270	30%	10	5,779	7,659	9,128	11,308	13,535	14,084	14,149	19%	6,533	-1,290	24,842
	29	65,112	135,126	98,251	24,574	25%	10	68,426	71,740	80,151	94,395	115,686	132,277	133,701	18%	27,148	52,805	161,399
	30	277,704	369,879	307,795	33,664	11%	10	279,759	281,813	290,804	294,726	305,230	369,668	369,774	2%	33,781	243,680	378,803
	31	255,263	304,900	286,785	16,662	6%	10	262,296	269,329	273,822	292,615	300,096	301,124	303,012	5%	29,821	232,974	352,256
	32	15,813	18,449	17,306	1,003	6%	6	16,055	16,298	16,852	17,203	18,124	18,417	18,433	4%	88,682	-158,916	195,813
Commodity	33	4,891	12,610	9,455	4,048	43%	3	5,488	6,086	7,878	10,864	11,737	12,261	12,435	20%	4,099	-1,462	14,932
	34	251,518	270,640	261,190	9,563	4%	3	252,508	253,497	256,466	261,413	266,027	268,795	269,717	2%	45,917	169,578	353,248
	35	292,786	378,924	323,952	47,749	15%	3	293,522	294,258	296,466	300,145	339,535	363,168	371,046	7%	69,228	160,643	437,555
Credit Spread	36	19,806	22,562	21,184	1,949	9%	2	19,944	20,082	20,495	21,184	21,873	22,286	22,424	3%	4,113	8,889	25,339
	37	15,475	15,475	15,475			1	15,475	15,475	15,475	15,475	15,475	15,475	15,475	0%	4,133	10,095	26,627
	38															906	1,350	4,976
	39	11,966	11,966	11,966			1	11,966	11,966	11,966	11,966	11,966	11,966	11,966	0%	1,800	6,664	13,863
	40															1,018	2,535	6,609
	41	6,762	6,762	6,762			1	6,762	6,762	6,762	6,762	6,762	6,762	6,762	0%	3,777	-23	15,085
	42	16,407	39,256	27,832	16,157	58%	2	17,549	18,692	22,119	27,832	33,544	36,971	38,114	21%	11,364	-3,114	42,343
	43	10,392	32,208	18,553	11,901	64%	3	10,659	10,925	11,726	13,059	22,634	28,378	30,293	32%	18,829	-23,529	51,789
	44	5,131	5,934	5,533	568	10%	2	5,171	5,211	5,332	5,533	5,733	5,854	5,894	4%	1,279	4,027	9,145
	45	3,903	6,795	5,349	2,045	38%	2	4,048	4,192	4,626	5,349	6,072	6,506	6,650	14%	7,880	-10,172	21,348
	46	4,182	10,259	6,370	3,377	53%	3	4,231	4,279	4,425	4,668	7,464	9,141	9,700	26%	7,181	-8,547	20,175
	47	3,115	4,998	4,057	1,331	33%	2	3,209	3,303	3,586	4,057	4,527	4,810	4,904	12%	2,047	-1,559	6,631
	48	5,668	5,934	5,801	188	3%	2	5,681	5,695	5,735	5,801	5,868	5,907	5,921	1%	2,140	5,428	13,988
	49	5,861	5,861	5,861			1	5,861	5,861	5,861	5,861	5,861	5,861	5,861	0%	2,688	-1,488	9,263
	50	18,046	18,046	18,046			1	18,046	18,046	18,046	18,046	18,046	18,046	18,046	0%	9,784	-710	38,427
	51	59,258	73,071	66,165	9,767	15%	2	59,949	60,639	62,711	66,165	69,618	71,690	72,380	5%	19,812	19,391	98,638
	52	43,819	169,403	106,611	88,801	83%	2	50,098	56,377	75,215	106,611	138,007	156,845	163,124	29%	106,320	-103,372	321,909
	53	78,937	209,469	144,203	92,300	64%	2	85,464	91,990	111,570	144,203	176,836	196,416	202,942	23%	91,920	-21,171	346,507
CTP	54															1,435	27	5,765
	55															12,966	-9,434	42,431
	56															100,282	164,961	566,088
ALL-IN no-CTP	57	1,589,024	1,589,024	1,589,024			1	1,589,024	1,589,024	1,589,024	1,589,024	1,589,024	1,589,024	1,589,024	0%	138,424	1,186,300	1,739,995
Equity Cumulative	58	1,081,523	1,381,699	1,212,196	153,809	13%	3	1,090,707	1,099,891	1,127,444	1,173,365	1,277,532	1,340,032	1,360,866	6%	212,755	818,076	1,669,098
IR Cumulative	59	177,258	553,325	339,608	116,164	34%	7	208,118	238,977	291,673	307,858	377,736	453,238	503,281	13%	103,159	173,105	585,742
FX Cumulative	60	564,385	827,112	685,997	89,520	13%	7	580,739	597,093	634,978	656,928	741,798	786,184	806,648	8%	112,596	428,801	879,184
Commodity Cumulative	61	252,006	271,490	260,494	9,981	4%	3	252,604	253,202	254,997	257,987	264,739	268,789	270,140	2%	77,529	102,929	413,044
CS Cumulative	62	10,392	19,720	15,056	6,596	44%	2	10,858	11,325	12,724	15,056	17,388	18,787	19,254	15%	7,606	485	30,911
CTP Cumulative	63															107,606	164,699	595,123

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

EU Statistics for VaR

		Other stats						Percentiles									Extreme Values range (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
Equity	1	2,081,748	3,130,276	2,681,864	362,747	14%	16	2,134,153	2,178,472	2,417,819	2,768,256	3,024,574	3,064,735	3,087,063	11%	318,014	1,970,762	3,242,817
	2	1,909,923	2,845,713	2,427,979	258,887	11%	16	2,041,061	2,115,944	2,275,802	2,422,430	2,629,369	2,705,324	2,743,145	7%	269,993	1,776,922	2,856,893
	3	10,670	28,701	21,968	4,364	20%	17	15,608	18,394	20,005	21,799	24,310	27,039	27,551	10%	4,625	10,582	29,082
	4	355	1,716	883	401	45%	16	361	364	664	770	1,194	1,343	1,489	29%	694	-682	2,093
	5	734,805,122	948,265,719	860,396,071	72,669,273	8%	15	735,241,150	746,686,343	811,018,962	892,463,390	905,828,517	923,098,896	937,040,485	6%	87,576,932	678,842,676	1,029,150,405
	6	17,854	46,308	34,785	8,071	23%	17	20,503	22,581	32,231	36,576	40,749	42,145	44,445	12%	8,816	17,494	52,757
	7	6,425	18,377	11,807	3,240	27%	15	7,901	8,747	10,325	10,758	12,753	16,696	17,769	11%	13,949	-16,860	38,937
	8	60,353	131,540	102,359	23,774	23%	15	62,495	64,745	86,901	110,621	118,505	124,106	127,305	15%	27,972	42,980	154,870
	9	36,574	89,738	60,894	13,209	22%	16	47,328	51,692	54,339	57,668	66,073	78,992	87,295	10%	15,078	30,994	91,307
	10	254,296	327,577	281,831	20,959	7%	15	256,004	261,235	271,332	275,103	286,416	313,683	323,763	3%	430,168	-577,071	1,143,602
Interest Rate	11	64,332	78,024	70,247	4,094	6%	18	64,332	64,707	67,410	70,096	72,496	75,129	77,446	4%	4,681	60,805	79,528
	12	32,826	51,757	39,991	5,822	15%	18	33,102	33,430	35,418	38,424	42,888	48,887	50,276	10%	8,676	24,029	58,734
	13	130,121	178,574	150,919	13,302	9%	21	135,072	135,179	141,096	155,313	159,175	164,019	169,957	6%	15,804	116,799	180,016
	14	25,011	32,700	27,841	1,961	7%	19	25,411	25,455	26,609	27,836	28,633	29,626	31,903	4%	3,072	21,692	33,980
	15	11,177	31,178	17,531	6,468	37%	11	11,421	11,665	12,929	16,712	19,393	26,443	28,811	20%	8,310	-778	32,461
	16	90,921	114,946	103,304	5,724	6%	20	96,670	97,041	99,156	102,841	106,497	109,829	110,667	4%	9,157	84,462	121,091
	17	153,246	288,729	243,973	40,772	17%	18	153,850	173,451	238,496	261,103	265,140	277,225	284,269	5%	62,050	128,158	376,359
	18	136,877	453,468	305,710	102,489	34%	19	163,072	185,105	228,273	293,170	428,604	438,667	440,147	30%	111,534	71,176	517,313
	19	131,803	167,912	148,337	10,774	7%	20	133,397	133,704	142,183	148,377	155,065	163,211	163,879	4%	11,283	125,240	170,371
	20	3,287	6,996	4,706	1,055	22%	20	3,427	3,570	3,917	4,364	5,736	5,929	6,066	19%	1,551	958	7,161
	21	261,893	323,341	297,303	19,095	6%	19	267,844	271,676	280,320	304,247	311,008	317,687	321,873	5%	23,481	234,588	328,511
	22	41,516	63,601	50,496	6,345	13%	19	43,303	43,894	46,128	48,317	55,935	59,589	60,114	10%	8,446	32,165	65,948
	23	149,125	201,294	174,883	16,423	9%	19	149,165	151,361	163,829	174,081	188,890	191,775	198,849	7%	17,711	131,694	202,537
	24	42,451	395,582	198,016	95,630	48%	15	73,686	94,738	130,500	189,740	267,108	292,409	333,139	34%	116,207	-41,436	423,393
	25	19,915	97,672	47,728	21,220	44%	19	25,950	29,209	32,663	40,586	57,574	76,613	91,544	28%	39,057	-37,527	118,699
	26	166,144	547,837	389,717	108,513	28%	19	221,328	257,743	333,697	377,186	487,909	546,977	547,837	19%	110,112	155,140	595,587
FX	27	388,925	588,161	495,266	57,945	12%	17	411,958	428,859	453,050	493,625	537,493	564,103	585,091	9%	52,870	379,417	590,896
	28	7,126	22,595	12,480	3,647	29%	15	8,257	9,013	11,148	11,702	14,159	15,349	17,550	12%	6,533	-1,290	24,842
	29	61,605	148,573	103,408	24,349	24%	17	65,180	75,220	85,560	107,321	118,236	131,466	140,889	16%	27,148	52,805	161,399
	30	261,170	370,393	315,429	31,288	10%	17	271,497	282,547	295,760	315,475	336,477	359,386	365,169	6%	33,781	243,680	378,803
	31	244,661	337,761	286,118	28,264	10%	14	250,050	254,892	264,346	282,058	301,841	323,582	331,997	7%	29,821	232,974	352,256
	32	15,703	188,211	38,146	52,418	137%	16	15,710	15,781	16,503	18,739	23,608	91,556	162,593	18%	88,682	-158,916	195,813
Commodity	33	3,512	14,224	8,804	4,089	46%	10	4,089	4,667	5,547	8,120	12,766	14,036	14,130	39%	4,099	-1,462	14,932
	34	220,882	328,788	282,936	38,382	14%	9	233,140	245,399	251,551	296,736	309,931	327,950	328,369	10%	45,917	169,578	353,248
	35	231,625	372,453	304,400	45,254	15%	9	246,906	262,187	270,764	299,099	327,839	363,935	368,194	10%	69,228	160,643	437,555
Credit Spread	36	10,340	22,328	17,267	3,791	22%	17	12,264	12,827	13,004	17,114	19,924	21,984	22,096	21%	4,113	8,889	25,339
	37	12,490	23,048	17,539	3,563	20%	14	12,981	13,280	14,545	18,473	19,958	22,028	22,738	16%	4,133	10,095	26,627
	38	1,534	4,542	3,054	899	29%	15	1,987	2,205	2,521	2,826	3,524	4,443	4,493	17%	906	1,350	4,976
	39	6,926	13,379	9,838	1,949	20%	15	6,929	7,095	8,822	9,944	10,650	12,343	13,288	9%	1,800	6,664	13,863
	40	3,003	6,529	4,383	1,011	23%	16	3,144	3,279	3,422	4,350	5,179	5,408	5,739	20%	1,018	2,535	6,609
	41	2,707	11,644	7,463	2,129	29%	16	4,989	5,862	6,192	7,505	8,915	9,826	10,410	18%	3,777	-23	15,085
	42	12,475	40,738	20,742	8,662	42%	13	13,977	15,153	16,235	18,522	19,795	34,822	39,302	10%	11,364	-3,114	42,343
	43	9,222	27,911	15,023	4,701	31%	16	10,476	11,141	12,659	13,810	15,364	20,605	23,641	10%	18,829	-23,529	51,789
	44	5,027	8,696	6,711	1,181	18%	16	5,031	5,099	5,973	6,643	7,404	8,272	8,379	11%	1,279	4,027	9,145
	45	1,595	10,255	4,910	2,703	55%	15	1,933	2,153	3,015	4,390	5,952	9,123	9,946	33%	7,880	-10,172	21,348
	46	2,733	13,939	6,498	2,904	45%	17	3,751	4,197	4,501	5,476	8,130	10,107	11,133	29%	7,181	-8,547	20,175
	47	1,438	5,477	2,912	1,307	45%	15	1,557	1,616	1,763	2,536	3,867	4,618	4,901	37%	2,047	-1,559	6,631
	48	5,856	12,492	9,464	1,798	19%	16	6,996	7,452	8,294	9,820	10,594	11,576	12,230	12%	2,140	5,428	13,988
	49	2,421	7,596	4,201	1,559	37%	16	2,839	3,096	3,348	3,559	4,232	6,858	7,232	12%	2,688	-1,488	9,263
	50	11,671	29,872	19,974	6,445	32%	17	11,671	11,696	14,280	19,864	24,711	28,658	29,050	27%	9,784	-710	38,427
	51	32,646	88,892	62,946	17,491	28%	15	37,808	41,705	50,928	63,510	77,190	84,741	86,730	20%	19,812	19,391	98,638
	52	38,414	281,923	106,423	67,752	64%	11	42,409	46,403	71,275	87,506	119,561	159,444	220,684	25%	106,320	-103,372	321,909
	53	58,488	338,088	153,271	81,276	53%	12	66,562	73,935	99,366	146,800	170,918	257,378	298,747	26%	91,920	-21,171	346,507
CTP	54	962	4,657	2,622	1,743	66%	4	1,028	1,093	1,290	2,435	3,768	4,301	4,479	49%	1,435	27	5,765
	55	16,499	35,669	26,084	13,555	52%	2	17,458	18,416	21,292	26,084	30,877	33,752	34,711	18%	12,966	-9,434	42,431
	56	186,900	365,525	276,213	126,307	46%	2	195,831	204,763	231,556	276,213	320,869	347,663	356,594	16%	100,282	164,961	566,088
ALL-IN no-CTP	57	1,201,785	1,572,738	1,436,904	105,482	7%	10	1,264,088	1,326,391	1,407,200	1,463,749	1,492,822	1,534,062	1,553,400	3%	138,424	1,186,300	1,739,995
Equity Cumulative	58	950,141	1,446,944	1,250,842	131,284	10%	13	1,042,617	1,118,325	1,176,311	1,272,122	1,320,054	1,388,510	1,413,609	6%	212,755	818,076	1,669,098
IR Cumulative	59	265,651	541,500	384,530	78,893	21%	17	273,341	297,420	327,361	379,424	437,241	484,174	495,675	14%	103,159	173,105	585,742
FX Cumulative	60	448,969	850,417	639,593	107,233	17%	16	485,432	519,370	561,990	633,780	701,739	762,508	821,137	11%	112,596	428,801	879,184
Commodity Cumulative	61	222,801	331,312	286,028	40,648	14%	8	231,517	240,234	249,694	299,089	313,259	330,593	330,953	11%	77,529	102,929	413,044
CS Cumulative	62	10,900	29,923	17,662	5,726	32%	15	11,704	12,269	14,573	15,522	20,056	26,523	28,246	16%	7,606	485	30,911
CTP Cumulative	63	169,967	428,613	299,290	182,890	61%	2	182,899	195,832	234,629	299,290	363,952	402,748	415,681	22%	107,606	164,699	595,123

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

EU Statistics for VaR

		Other stats						Percentiles									Extreme Values range (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
Equity	1	2,104,118	3,108,417	2,555,104	367,595	14%	6	2,138,699	2,173,279	2,307,441	2,532,303	2,748,821	2,959,729	3,034,073	9%	318,014	1,970,762	3,242,817
	2	2,027,191	2,674,080	2,313,512	275,141	12%	4	2,052,778	2,078,364	2,155,125	2,276,388	2,434,775	2,578,358	2,626,219	6%	269,993	1,776,922	2,856,893
	3	17,765	20,277	19,180	1,074	6%	4	17,953	18,141	18,705	19,339	19,814	20,092	20,184	3%	4,625	10,582	29,082
	4	358	969	601	324	54%	3	370	382	417	476	723	870	920	27%	694	-682	2,093
	5	757,194,815	973,360,882	862,923,606	95,211,734	11%	4	766,154,250	775,113,685	801,991,990	860,569,364	921,500,980	952,616,921	962,988,902	7%	87,576,932	678,842,676	1,029,150,405
	6	18,103	45,007	29,631	13,858	47%	3	18,871	19,639	21,944	25,784	35,396	41,162	43,085	23%	8,816	17,494	52,757
	7	5,431	27,986	14,955	10,216	68%	4	5,874	6,316	7,644	13,202	20,512	24,997	26,491	46%	13,949	-16,860	38,937
	8	66,860	97,512	83,574	15,513	19%	3	68,809	70,758	76,605	86,350	91,931	95,280	96,396	9%	27,972	42,980	154,870
	9	61,151	82,178	69,942	8,836	13%	4	62,090	63,028	65,845	68,219	72,316	78,233	80,206	5%	15,078	30,994	91,307
	10	267,317	331,241	299,182	27,622	9%	4	270,419	273,521	282,828	299,084	315,438	324,920	328,080	5%	430,168	-577,071	1,143,602
Interest Rate	11	66,357	78,221	71,804	3,967	6%	9	67,159	67,961	69,141	70,956	73,173	77,359	77,790	3%	4,681	60,805	79,528
	12	41,225	51,792	47,245	4,207	9%	6	41,765	42,305	44,249	48,397	50,194	51,034	51,413	6%	8,676	24,029	58,734
	13	124,071	174,191	153,574	15,806	10%	8	129,421	134,771	147,333	156,557	163,822	167,166	170,678	5%	15,804	116,799	180,016
	14	23,327	32,311	27,430	2,804	10%	10	23,611	23,894	25,299	27,643	29,325	29,783	31,047	7%	3,072	21,692	33,980
	15	14,702	14,702	14,702			1	14,702	14,702	14,702	14,702	14,702	14,702	14,702	0%	8,310	-778	32,461
	16	94,658	110,441	104,818	5,585	5%	7	96,713	98,767	102,071	106,809	108,838	109,714	110,078	3%	9,157	84,462	121,091
	17	138,867	252,652	210,282	49,345	23%	7	140,301	141,735	176,403	235,734	245,956	252,416	252,534	16%	62,050	128,158	376,359
	18	71,227	301,392	237,857	78,497	33%	7	119,113	166,999	233,158	255,310	285,378	299,045	300,218	10%	111,534	71,176	517,313
	19	146,909	165,436	157,872	6,601	4%	7	148,066	149,224	154,785	160,306	161,442	163,515	164,475	2%	11,283	125,240	170,371
	20	3,302	5,693	4,457	907	20%	9	3,403	3,504	3,605	4,178	5,336	5,515	5,604	19%	1,551	958	7,161
	21	243,192	319,311	288,506	23,794	8%	9	255,987	268,782	276,164	288,313	305,078	316,255	317,783	5%	23,481	234,588	328,511
	22	35,509	57,018	48,570	6,950	14%	7	38,394	41,279	46,486	49,412	52,541	55,092	56,055	6%	8,446	32,165	65,948
	23	143,202	198,374	165,380	20,730	13%	9	144,148	145,093	148,953	161,165	181,074	192,734	195,554	10%	17,711	131,694	202,537
	24	146,314	383,985	233,425	103,718	44%	4	154,455	162,596	187,018	201,701	248,108	329,634	356,810	14%	116,207	-41,436	423,393
	25	25,048	109,079	59,144	35,257	60%	7	25,055	25,062	28,630	48,923	86,848	102,777	105,928	50%	39,057	-37,527	118,699
	26	215,933	392,567	329,356	71,561	22%	7	222,434	228,934	294,768	358,065	374,697	382,362	387,465	12%	110,112	155,140	595,587
FX	27	402,500	579,838	463,027	53,605	12%	8	413,456	424,413	437,183	446,361	473,709	515,658	547,748	4%	52,870	379,417	590,896
	28	7,561	13,357	10,537	2,373	23%	6	7,780	8,000	8,863	10,364	12,502	13,248	13,303	17%	6,533	-1,290	24,842
	29	67,013	136,271	94,206	25,131	27%	7	68,462	69,912	74,207	89,549	109,099	120,831	128,551	19%	27,148	52,805	161,399
	30	286,796	369,840	326,009	29,934	9%	6	291,859	296,922	309,045	321,595	343,924	359,511	364,675	5%	33,781	243,680	378,803
	31	242,625	338,540	313,779	40,533	13%	5	257,769	272,913	318,344	334,391	334,993	337,121	337,831	3%	29,821	232,974	352,256
	32	16,197	163,651	87,293	82,174	94%	4	16,206	16,215	16,241	84,661	155,712	160,476	162,063	81%	88,682	-158,916	195,813
Commodity	33	6,149	8,279	7,214	1,506	21%	2	6,256	6,362	6,682	7,214	7,747	8,066	8,173	7%	4,099	-1,462	14,932
	34	251,861	277,776	264,819	18,325	7%	2	253,157	254,453	258,340	264,819	271,297	275,185	276,480	2%	45,917	169,578	353,248
	35	216,051	333,085	274,568	82,756	30%	2	221,903	227,754	245,310	274,568	303,827	321,382	327,233	11%	69,228	160,643	437,555
Credit Spread	36	20,591	22,164	21,378	1,112	5%	2	20,670	20,748	20,984	21,378	21,771	22,007	22,085	2%	4,113	8,889	25,339
	37	19,857	22,800	21,329	2,081	10%	2	20,004	20,151	20,593	21,329	22,064	22,506	22,653	3%	4,133	10,095	26,627
	38	2,826	4,332	3,579	1,065	30%	2	2,901	2,977	3,203	3,579	3,956	4,181	4,257	11%	906	1,350	4,976
	39	9,329	10,614	9,972	909	9%	2	9,393	9,458	9,650	9,972	10,293	10,486	10,550	3%	1,800	6,664	13,863
	40	4,234	4,504	4,369	191	4%	2	4,248	4,261	4,302	4,369	4,437	4,477	4,491	2%	1,018	2,535	6,609
	41	8,656	8,656	8,656			1	8,656	8,656	8,656	8,656	8,656	8,656	8,656	0%	3,777	-23	15,085
	42	18,819	22,548	20,684	2,637	13%	2	19,005	19,192	19,751	20,684	21,616	22,175	22,362	5%	11,364	-3,114	42,343
	43	9,602	16,812	13,515	3,644	27%	3	10,055	10,508	11,866	14,130	15,471	16,276	16,544	13%	18,829	-23,529	51,789
	44	4,965	8,216	6,379	1,392	22%	4	5,083	5,201	5,554	6,168	6,994	7,727	7,972	11%	1,279	4,027	9,145
	45	8,217	9,763	8,990	1,093	12%	2	8,294	8,372	8,604	8,990	9,377	9,608	9,686	4%	7,880	-10,172	21,348
	46	7,058	10,424	8,741	2,380	27%	2	7,226	7,395	7,900	8,741	9,583	10,087	10,256	10%	7,181	-8,547	20,175
	47	1,654	1,654	1,654			1	1,654	1,654	1,654	1,654	1,654	1,654	1,654	0%	2,047	-1,559	6,631
	48	9,451	11,836	10,669	1,193	11%	3	9,578	9,705	10,085	10,719	11,278	11,613	11,724	6%	2,140	5,428	13,988
	49	3,282	3,887	3,585	428	12%	2	3,312	3,343	3,433	3,585	3,736	3,827	3,857	4%	2,688	-1,488	9,263
	50	13,624	17,530	15,577	2,762	18%	2	13,819	14,015	14,601	15,577	16,554	17,139	17,335	6%	9,784	-710	38,427
	51	58,771	58,771	58,771			1	58,771	58,771	58,771	58,771	58,771	58,771	58,771	0%	19,812	19,391	98,638
	52	78,925	310,499	194,712	163,748	84%	2	90,504	102,082	136,819	194,712	252,606	287,342	298,920	30%	106,320	-103,372	321,909
	53	115,967	281,840	198,904	117,290	59%	2	124,261	132,554	157,435	198,904	240,372	265,253	273,546	21%	91,920	-21,171	346,507
CTP	54															1,435	27	5,765
	55															12,966	-9,434	42,431
	56															100,282	164,961	566,088
ALL-IN no-CTP	57	1,345,059	1,550,684	1,423,247	111,308	8%	3	1,347,953	1,350,847	1,359,529	1,373,999	1,462,342	1,515,347	1,533,016	4%	138,424	1,186,300	1,739,995
Equity Cumulative	58	1,071,657	1,296,296	1,203,064	117,084	10%	3	1,088,615	1,105,574	1,156,449	1,241,240	1,268,768	1,285,285	1,290,790	5%	212,755	818,076	1,669,098
IR Cumulative	59	230,218	374,317	322,823	59,039	18%	5	243,970	257,721	298,976	351,027	359,577	368,421	371,369	9%	103,159	173,105	585,742
FX Cumulative	60	495,292	735,128	603,382	105,496	17%	5	496,440	497,588	501,033	611,861	673,597	710,516	722,822	15%	112,596	428,801	879,184
Commodity Cumulative	61	245,904	274,951	260,428	20,539	8%	2	247,356	248,809	253,166	260,428	267,689	272,046	273,499	3%	77,529	102,929	413,044
CS Cumulative	62	15,750	23,293	19,522	5,334	27%	2	16,127	16,504	17,636	19,522	21,407	22,539	22,916	10%	7,606	485	30,911
CTP Cumulative	63															107,606	164,699	595,123

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

EU Statistics for VaR

		Other stats						Percentiles							
	Port. ID	Min	Max	Ave.	STDev	Coefficient of variation (STDev/Mean)	Num obs.	5th	10th	25th	50th (Median)	75th	90th	95th	Interquantile range
Interest Rate	11	64,332	78,221	71,098	4,323	6%	26	65,346	65,758	67,996	70,167	74,064	77,684	78,098	4%
	12	27,936	51,757	41,416	6,922	17%	26	30,052	33,151	36,542	41,708	47,625	50,005	50,210	13%
	13	118,767	178,574	153,183	13,956	9%	29	135,186	138,448	142,884	155,313	163,172	170,804	175,225	7%
	14	22,285	32,700	27,797	2,403	9%	26	23,655	24,819	27,178	27,838	28,825	30,449	32,187	3%
	15	10,103	31,178	16,432	5,104	31%	14	11,118	12,010	14,162	16,015	16,767	20,481	25,222	8%
	16	93,828	119,751	104,567	5,838	6%	25	96,891	97,974	102,384	103,299	109,230	110,170	114,045	3%
	17	138,867	362,697	252,350	52,295	21%	25	153,388	180,573	237,623	258,130	266,882	305,785	353,468	6%
	18	136,877	472,329	307,560	93,051	30%	25	170,763	204,885	254,443	293,170	358,870	436,104	455,549	17%
	19	132,157	167,912	149,707	9,905	7%	27	133,308	136,900	143,665	148,399	156,825	162,604	163,515	4%
	20	3,259	6,017	4,272	881	21%	27	3,292	3,336	3,527	4,016	4,732	5,741	5,873	15%
	21	261,893	323,341	293,966	19,112	7%	28	266,806	271,046	276,170	299,129	309,189	315,848	319,950	6%
	22	43,070	59,726	50,765	5,345	11%	26	43,908	45,443	46,355	48,905	56,277	58,032	59,338	10%
	23	142,629	201,294	170,743	17,179	10%	28	149,013	149,560	154,889	170,276	186,696	192,564	198,506	9%
	24	87,072	403,906	221,207	92,275	42%	26	92,758	111,501	150,577	196,402	270,381	356,837	392,683	28%
	25	26,621	90,863	44,352	19,111	43%	28	28,499	28,993	30,568	34,782	51,546	76,321	85,833	26%
	26	166,144	547,837	376,201	93,484	25%	24	228,981	245,916	349,360	374,444	404,529	504,299	519,171	7%
Credit Spread	36	9,872	22,562	17,628	4,137	23%	25	10,582	12,027	14,103	18,771	21,224	22,262	22,328	20%
	37	11,990	23,048	17,389	3,563	20%	23	12,566	13,257	14,490	18,021	19,977	22,371	22,777	16%
	38	1,534	4,472	3,072	806	26%	23	1,866	2,193	2,678	2,966	3,520	4,305	4,392	14%
	39	6,926	13,249	9,939	1,692	17%	22	6,951	7,471	9,067	10,104	10,739	11,868	13,185	8%
	40	3,003	6,529	4,457	945	21%	23	3,191	3,226	3,548	4,506	5,210	5,477	5,635	19%
	41	2,707	11,644	7,092	2,007	28%	23	3,397	5,617	6,033	7,266	8,002	9,480	9,964	14%
	42	9,704	40,738	21,060	8,551	41%	23	12,490	13,097	16,277	19,314	21,338	37,292	39,165	13%
	43	9,222	46,279	16,596	8,013	48%	26	10,307	10,643	12,989	14,143	17,481	25,065	31,134	15%
	44	4,784	8,696	6,572	1,110	17%	26	5,028	5,082	5,796	6,571	7,071	8,244	8,273	10%
	45	1,595	10,255	5,564	2,608	47%	24	2,106	2,287	3,698	5,229	8,089	9,392	9,806	37%
	46	2,733	13,939	6,357	2,618	41%	27	3,796	4,111	4,501	5,476	7,433	10,325	10,430	25%
	47	1,340	5,477	2,663	1,261	47%	23	1,442	1,500	1,653	2,293	3,262	4,636	4,964	33%
	48	5,668	12,492	9,186	1,971	21%	26	5,876	6,278	7,574	9,708	10,533	11,449	12,066	16%
	49	2,421	8,746	4,546	1,867	41%	23	2,504	3,025	3,337	3,676	5,540	7,520	7,672	25%
	50	11,671	37,596	19,680	6,995	36%	24	11,790	12,444	14,116	17,788	23,514	29,564	29,872	25%
	51	32,646	88,892	58,990	17,084	29%	22	36,613	37,073	45,397	58,292	72,474	82,771	85,671	23%
	52	38,414	310,499	120,439	76,319	63%	21	43,819	46,403	78,799	107,083	136,370	247,517	281,923	27%
	53	58,488	338,088	166,472	82,248	49%	23	73,168	74,322	100,740	159,469	220,113	278,784	319,079	37%
IR Cumulative	59	265,651	564,481	390,519	84,790	22%	25	276,236	290,860	327,361	379,424	437,241	511,116	548,479	14%
CS Cumulative	62	10,392	29,923	17,319	5,282	30%	23	10,938	11,437	14,454	15,698	20,056	24,672	27,276	16%

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

EU Statistics for VaR

		Other stats								Percentiles							
	Port. ID	Min	Max	Ave.	STDev	STDev_trunc[1]	MAD (median absolute deviation)	Coefficient of variation (STDev/Mean)	Num obs.	5th	10th	25th	50th (Median)	75th	90th	95th	Interquantile range
Interest Rate	11	64,021	77,076	70,469	4,280			6%	14	64,572	65,315	67,458	69,520	74,037	75,907	76,662	5%
	12	32,826	54,016	42,190	7,339			17%	10	33,278	33,731	36,237	42,142	46,378	52,014	53,015	12%
	13	127,662	168,212	152,906	12,938			8%	11	131,421	135,179	146,062	157,761	161,269	165,378	166,795	5%
	14	23,957	31,707	27,795	2,099			8%	14	24,515	25,258	26,634	27,643	29,296	30,108	30,837	5%
	15	11,728	26,443	18,004	7,592			42%	3	12,139	12,551	13,785	15,841	21,142	24,323	25,383	21%
	16	90,921	110,659	102,233	6,418			6%	13	93,163	95,136	98,856	100,754	108,445	110,290	110,528	5%
	17	143,647	264,847	218,228	37,345			17%	10	160,819	177,990	199,533	220,964	249,107	253,872	259,359	11%
	18	71,227	435,537	245,542	99,648			41%	10	94,695	118,164	221,735	250,251	291,429	314,807	375,172	14%
	19	126,580	165,436	145,651	12,361			8%	14	127,432	128,556	135,390	147,838	153,172	159,855	162,102	6%
	20	3,105	6,996	4,998	1,266			25%	12	3,369	3,632	4,090	4,948	5,761	6,838	6,962	17%
	21	243,192	319,311	281,817	25,363			9%	15	247,204	249,499	265,508	276,164	303,995	314,788	316,914	7%
	22	35,509	63,601	48,991	7,269			15%	11	39,447	43,385	45,637	49,412	50,577	57,111	60,356	5%
	23	141,780	202,388	166,886	20,009			12%	12	142,562	143,438	148,268	166,074	182,034	190,683	196,303	10%
	24	42,451	202,815	112,368	62,834			56%	6	44,343	46,235	59,518	116,306	145,884	174,565	188,690	42%
	25	12,685	109,079	47,418	29,889			63%	13	17,023	20,942	25,071	42,516	52,282	93,885	102,777	35%
	26	215,933	546,762	368,903	91,607			25%	10	244,189	272,446	333,100	365,950	388,315	474,704	510,733	8%
Credit Spread	36																
	37																
	38																
	39																
	40																
	41																
	42																
	43	9,602	9,602	9,602					1	9,602	9,602	9,602	9,602	9,602	9,602	9,602	0%
	44	4,965	4,965	4,965					1	4,965	4,965	4,965	4,965	4,965	4,965	4,965	0%
	45																
	46																
	47																
	48																
	49																
	50																
	51																
	52																
	53																
IR Cumulative	59	230,218	541,500	340,315	97,410			29%	7	250,845	271,473	301,099	307,858	350,215	427,216	484,358	8%
CS Cumulative	62																

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

EU Statistics for VaR

		Other stats						Percentiles							
	Port. ID	Min	Max	Ave.	STDev	Coefficient of variation (STDev/Mean)	Num obs.	5th	10th	25th	50th (Median)	75th	90th	95th	Interquantile range
Equity	1	2,081,748	3,206,116	2,684,565	353,408	13%	26	2,205,237	2,217,347	2,336,098	2,771,271	3,019,344	3,090,538	3,124,811	13%
	2	1,915,841	2,845,713	2,395,726	289,867	12%	24	1,986,354	2,004,615	2,131,643	2,422,430	2,675,547	2,706,777	2,712,653	11%
	3	15,634	28,701	21,265	3,528	17%	25	15,776	16,216	19,018	20,510	23,901	25,761	27,089	11%
	4	210	1,693	735	389	53%	25	308	356	403	676	969	1,239	1,380	41%
	5	730,787,866	973,360,882	834,754,480	75,145,045	9%	24	734,898,557	738,688,630	765,898,239	853,996,541	902,720,910	909,400,202	928,805,630	8%
	6	17,854	46,308	36,230	7,066	20%	24	25,944	26,893	31,887	37,498	40,843	44,699	45,266	12%
	7	3,862	27,986	11,796	5,135	44%	22	6,474	7,407	8,696	10,733	12,199	17,970	18,359	17%
	8	56,920	133,753	97,054	24,713	25%	25	60,489	61,425	75,419	98,925	117,424	124,106	130,330	22%
	9	50,913	89,738	66,330	11,658	18%	24	52,636	53,878	56,543	65,061	73,773	81,841	85,836	13%
	10	254,296	331,241	284,596	19,583	7%	24	257,102	261,817	273,425	282,926	289,374	312,577	320,851	3%
Equity Cumulative	58	950,141	1,475,154	1,230,376	146,473	12%	20	1,023,058	1,067,181	1,133,266	1,233,254	1,302,236	1,448,887	1,466,816	7%

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

EU Statistics for VaR

		Other stats						Percentiles							
	Port. ID	Min	Max	Ave.	STDev	Coefficient of variation (STDev/Mean)	Num obs.	5th	10th	25th	50th (Median)	75th	90th	95th	Interquantile range
Equity	1	2,104,118	2,811,041	2,408,790	288,315	12%	10	2,123,882	2,143,645	2,152,752	2,340,731	2,693,034	2,744,096	2,777,569	11%
	2	1,909,923	2,355,007	2,230,531	144,148	6%	9	1,993,479	2,077,035	2,197,769	2,312,119	2,321,696	2,337,241	2,346,124	3%
	3	10,670	26,890	16,660	5,303	32%	8	11,416	12,161	12,823	15,616	19,428	21,667	24,278	20%
	4	143	1,716	941	643	68%	6	242	342	581	766	1,495	1,716	1,716	44%
	5	727,947,916	948,265,719	835,858,991	91,466,039	11%	7	728,122,048	728,296,181	748,511,981	886,780,497	895,497,422	921,834,895	935,050,307	9%
	6	18,103	45,808	27,667	10,037	36%	9	18,279	18,456	21,165	23,525	36,576	40,202	43,005	27%
	7	5,431	15,479	11,364	4,978	44%	4	5,976	6,522	8,157	12,273	15,479	15,479	15,479	31%
	8	44,948	113,825	83,203	27,326	33%	7	50,488	56,027	64,279	77,200	108,944	110,896	112,361	26%
	9	36,574	79,588	56,395	12,527	22%	8	39,670	42,766	51,105	58,291	59,420	66,682	73,135	8%
	10	158,743	290,245	259,469	45,812	18%	7	188,973	219,204	263,414	274,179	283,143	290,245	290,245	4%
Equity Cumulative	58	1,241,240	1,391,385	1,341,337	86,686	6%	3	1,256,255	1,271,269	1,316,313	1,391,385	1,391,385	1,391,385	1,391,385	3%

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

EU Statistics for SVaR

		Other stats								Percentiles							
	Port. ID	Min	Max	Ave.	STDev	STDev_trunc[1]	MAD (median absolute deviation)	Coefficient of variation (STDev/Mean)	Num obs.	5th	10th	25th	50th (Median)	75th	90th	95th	Interquantile range
Equity	1	5,678,137	8,456,509	7,490,880	731,761			10%	21	6,678,100	6,736,024	7,012,906	7,413,133	8,173,504	8,442,716	8,450,346	8%
	2	4,992,883	15,751,620	11,215,044	2,994,222			27%	19	6,659,151	7,801,696	9,139,771	11,641,776	13,617,070	14,578,602	15,224,667	20%
	3	15,670	44,779	31,336	9,243			29%	19	17,385	18,475	25,366	31,959	38,359	43,782	44,147	20%
	4	209	2,624	891	652			73%	17	381	427	515	648	823	1,893	2,125	23%
	5	1,860,241,962	3,288,699,322	2,718,992,047	404,445,424			15%	18	2,200,099,580	2,328,093,445	2,404,135,861	2,711,333,579	3,042,181,472	3,234,314,966	3,284,550,671	12%
	6	26,704	94,924	56,689	17,777			31%	18	34,677	37,531	43,632	55,998	68,412	75,912	87,515	22%
	7	18,786	112,863	49,831	28,366			57%	15	19,312	19,578	27,841	45,788	67,015	86,125	99,385	41%
	8	62,244	206,730	134,320	47,275			35%	18	75,964	78,787	91,120	153,668	171,241	184,280	205,597	31%
	9	51,570	188,135	124,962	33,503			27%	20	67,968	89,323	109,721	123,110	146,525	155,551	183,447	14%
	10	486,431	1,275,453	1,013,908	199,956			20%	18	573,857	794,291	967,935	1,043,676	1,127,522	1,196,303	1,218,829	8%
Interest Rate	11	102,131	295,110	216,824	47,568			22%	27	114,941	150,834	204,011	227,747	247,967	257,223	269,847	10%
	12	18,112	154,369	86,073	36,828			43%	26	23,254	39,702	69,490	86,982	105,290	135,460	151,219	20%
	13	140,153	464,215	331,702	80,617			24%	29	191,514	222,050	293,667	352,116	386,500	430,710	446,513	14%
	14	31,521	136,400	87,055	26,327			30%	29	37,028	52,973	71,173	87,490	106,590	117,964	121,286	20%
	15	23,551	149,760	71,346	43,173			61%	11	25,226	26,901	30,721	60,680	100,270	115,337	132,549	53%
	16	90,693	276,954	197,328	48,529			25%	26	112,613	144,584	158,235	202,817	220,091	256,725	272,259	16%
	17	204,594	569,977	366,817	102,327			28%	23	225,251	236,770	295,210	359,557	425,056	491,702	557,781	18%
	18	179,619	496,968	318,176	81,105			25%	23	206,680	212,607	261,309	325,219	375,267	402,787	440,226	18%
	19	112,007	450,642	320,080	69,176			22%	27	193,065	243,654	293,322	337,004	355,235	380,177	404,577	10%
	20	639	47,265	15,162	9,455			62%	22	2,844	3,571	10,791	14,728	18,851	22,418	24,174	27%
	21	387,208	857,951	673,737	102,276			15%	25	546,635	565,687	644,284	681,107	711,042	820,655	837,435	5%
	22	32,078	231,111	164,852	59,849			36%	27	43,218	63,041	147,058	180,400	214,820	223,657	227,493	19%
	23	199,708	394,565	300,799	57,175			19%	23	206,325	231,563	257,239	295,609	342,421	375,296	389,538	14%
	24	113,532	1,051,258	582,405	296,936			51%	16	204,677	246,492	370,837	545,910	849,777	977,171	1,040,330	39%
	25	46,006	335,649	170,489	75,650			44%	25	58,994	73,388	125,010	166,124	208,031	273,420	293,586	25%
	26	210,600	901,797	580,359	194,013			33%	23	233,928	257,361	507,731	604,857	711,106	767,510	854,489	17%
FX	27	771,218	1,993,455	1,422,623	291,328			20%	26	1,054,835	1,114,262	1,257,808	1,358,471	1,672,025	1,775,240	1,922,016	14%
	28	10,544	41,281	27,758	10,318			37%	24	11,309	12,413	16,935	30,100	36,019	39,176	39,992	36%
	29	219,958	531,072	399,383	81,439			20%	25	258,146	312,220	356,008	385,620	457,593	511,013	518,456	12%
	30	680,770	1,362,190	984,275	206,204			21%	24	685,715	704,476	759,924	1,071,919	1,138,319	1,168,379	1,239,521	20%
	31	820,087	1,455,293	1,120,748	182,337			16%	25	862,081	902,166	971,943	1,166,365	1,277,546	1,342,177	1,374,642	14%
	32	74,876	747,800	165,197	147,217			89%	20	89,743	96,283	114,317	127,814	146,349	175,976	364,354	12%
Commodity	33	10,563	44,302	26,555	9,730			37%	13	14,563	17,490	19,042	23,831	34,408	38,315	40,925	29%
	34	343,950	568,199	448,241	68,742			15%	13	366,841	384,914	396,975	438,633	491,795	554,838	567,382	11%
	35	762,601	1,287,124	1,080,308	155,713			14%	14	839,959	886,539	1,025,422	1,070,781	1,199,556	1,267,488	1,277,342	8%
Credit Spread	36	7,618	58,664	23,538	11,663			50%	15	12,216	14,704	18,162	20,977	24,861	32,663	41,878	16%
	37	36,321	181,375	80,983	46,827			58%	13	36,609	37,739	50,275	80,440	87,498	155,544	176,081	27%
	38	6,426	22,833	15,784	5,784			37%	13	7,000	7,531	9,703	18,437	19,693	20,685	21,552	34%
	39	13,991	78,963	39,790	19,317			49%	14	18,814	22,682	26,658	36,034	44,742	70,738	78,124	25%
	40	9,215	38,000	20,377	10,054			49%	11	9,687	10,158	12,473	18,491	28,241	32,444	35,222	39%
	41	11,218	52,137	33,793	14,798			44%	14	11,455	12,941	18,806	39,835	43,722	48,676	51,015	40%
	42	30,960	115,078	73,044	32,942			45%	11	35,632	40,304	44,011	59,511	105,776	109,460	112,269	41%
	43	24,090	107,130	67,600	25,460			38%	15	33,265	37,284	51,614	66,475	86,149	101,926	106,017	25%
	44	12,000	41,719	25,493	10,623			42%	13	12,458	13,158	17,428	24,872	34,093	39,140	40,249	32%
	45	12,306	38,328	24,247	8,823			36%	13	12,478	12,857	16,327	26,608	30,635	34,347	36,056	30%
	46	9,494	37,861	19,823	7,583			38%	13	10,677	12,496	16,757	17,781	20,381	29,846	34,014	10%
	47	5,859	18,485	9,292	3,418			37%	12	6,442	6,921	7,466	8,444	9,308	12,675	15,477	11%
	48	12,764	54,105	34,022	13,629			40%	14	12,858	15,926	24,207	34,074	43,383	51,493	52,760	28%
	49	6,394	24,485	13,315	5,900			44%	15	7,538	8,137	8,371	12,049	15,674	22,816	23,677	30%
	50	15,668	36,874	27,336	5,667			21%	15	16,750	19,606	24,608	28,535	30,468	32,559	33,858	11%
	51	87,563	391,206	211,635	82,624			39%	10	111,593	135,623	168,461	201,559	250,328	269,541	330,374	20%
	52	102,860	824,581	497,843	216,366			43%	13	189,718	258,751	384,019	477,977	629,238	769,046	797,748	24%
	53	162,544	750,312	546,478	181,207			33%	12	289,180	394,429	464,790	504,868	712,501	747,648	749,232	21%
CTP	54	1,924	17,752	9,838	11,192			114%	2	2,715	3,507	5,881	9,838	13,795	16,169	16,961	40%
	55	44,280	44,280	44,280	#DIV/0!			#DIV/0!	1	44,280	44,280	44,280	44,280	44,280	44,280	44,280	0%
	56	753,735	753,735	753,735	#DIV/0!			#DIV/0!	1	753,735	753,735	753,735	753,735	753,735	753,735	753,735	0%
ALL-IN no-CTP	57	5,088,498	7,790,838	6,543,155	895,236			14%	12	5,167,579	5,247,750	5,886,392	6,767,497	7,112,065	7,361,908	7,558,791	9%
Equity Cumulative	58	4,619,215	6,271,099	5,630,007	460,584			8%	15	4,828,505	4,993,059	5,455,932	5,793,906	5,902,425	6,095,502	6,210,684	4%
IR Cumulative	59	291,685	809,653	530,411	143,158			27%	21	302,348	318,971	421,746	548,184	623,493	696,325	733,890	19%
FX Cumulative	60	1,788,964	3,079,300	2,559,677	352,441			14%	22	2,020,566	2,067,086	2,327,393	2,588,491	2,844,104	2,952,902	3,028,891	10%
Commodity Cumulative	61	344,342	575,046	442,058	68,331			15%	13	371,049	389,461	394,089	415,794	465,177	548,910	566,594	8%
CS Cumulative	62	24,090	101,072	65,505	22,733			35%	13	32,229	38,681	52,025	65,592	72,935	94,807	97,684	17%
CTP Cumulative	63	1,059,709	1,059,709	1,059,709	#DIV/0!			#DIV/0!	1	1,059,709	1,059,709	1,059,709	1,059,709	1,059,709	1,059,709	1,059,709	0%

Table 42: PV statistics

EU Statistics for PV

		Main statistics								Percentiles			
	Port. ID	Min	Max	Ave	STDev	STDev_trunc[1]	MAD (median absolute deviation)	Coefficient of variation (STDev/Ave)	Num obs.[3]	25th	50th (Median)	75th	Interquantile range
Equity	1	34,719,924	38,119,714	36,548,211	540,554	11,162,286	8,700	2%	31	36,431,000	36,431,486	36,463,416	0%
	2	-31,804,002	-28,605,845	-30,246,360	603,531	9,743,864	62,905	2%	29	-30,133,278	-30,076,236	-30,021,066	0%
	3	-40,144	-35,432	-38,097	965	1,501	305	3%	29	-38,550	-38,231	-37,988	1%
	4	3,154	3,909	3,450	220	253	133	6%	29	3,267	3,410	3,598	5%
	5	-11,938,244,471	-11,630,403,454	-11,693,972,380	62,497,781	3,607,325,715	18,349,013	1%	29	-11,697,799,988	-11,677,500,000	-11,662,359,679	0%
	6	-55,120	-39,554	-47,975	3,204	11,702	1,855	7%	28	-49,850	-48,534	-46,073	4%
	7	1,046,305	1,082,159	1,067,872	9,292	11,631	7,006	1%	25	1,061,069	1,068,429	1,075,054	1%
	8	136,037	184,671	158,418	10,784	14,591	5,110	7%	29	153,905	156,839	163,108	3%
	9	688,578	710,763	699,203	4,439	9,161	1,154	1%	32	698,391	699,838	700,600	0%
	10	-2,505,172	-22,152	-1,904,269	683,247	3,774,962	18,207	36%	31	-2,171,191	-2,164,120	-2,133,141	1%
Interest Rate	11	-79,822	-70,270	-75,421	2,227	2,772	1,473	3%	42	-76,586	-74,934	-73,892	2%
	12	-39,632	-36,040	-37,502	979	1,868	744	3%	40	-38,148	-37,470	-36,592	2%
	13	62,662	93,112	77,915	7,361	9,552	4,729	9%	43	73,186	77,710	82,660	6%
	14	34,503	44,546	40,736	1,981	3,548	590	5%	42	40,400	41,342	41,854	2%
	15	1,044,194	1,140,937	1,091,637	31,797	37,100	27,951	3%	18	1,064,734	1,097,302	1,118,071	2%
	16	5,127,090	5,180,221	5,162,431	7,201	34,598	1,353	0%	39	5,160,907	5,161,821	5,164,170	0%
	17	10,618,800	10,931,508	10,816,447	104,003	137,128	4,336	1%	35	10,746,065	10,875,126	10,879,521	1%
	18	2,082,940	2,392,705	2,266,664	106,204	135,407	3,826	5%	35	2,181,498	2,336,986	2,340,570	4%
	19	42,784	59,918	51,295	4,476	4,855	3,298	9%	43	48,089	51,000	54,755	6%
	20	-19,659	-7,899	-14,194	2,130	4,837	475	15%	39	-14,508	-13,965	-13,477	4%
	21	174,715	199,355	186,644	5,713	6,716	2,841	3%	42	183,501	185,933	190,282	2%
	22	-115,922	-110,308	-113,000	1,876	2,725	1,718	2%	38	-114,819	-112,579	-111,232	2%
	23	7,293,445	7,563,054	7,428,106	37,424	135,243	1,895	1%	42	7,428,514	7,431,579	7,432,807	0%
	24	257,895	740,614	459,117	111,852	179,072	77,617	24%	30	382,230	434,454	530,285	16%
	25	-10,307,217	-10,275,195	-10,293,894	7,960	19,942	4,279	0%	38	-10,298,401	-10,294,205	-10,290,401	0%
	26	19,821,327	20,162,804	20,021,915	108,381	142,443	5,173	1%	35	19,911,090	20,083,909	20,087,777	0%
FX	27	484,617	565,494	526,570	15,825	33,848	4,473	3%	35	520,913	528,610	530,832	1%
	28	828,950	919,590	910,139	16,101	314,907	1,454	2%	32	911,740	912,972	915,083	0%
	29	895,858	908,300	903,261	3,036	4,432	1,736	0%	34	901,853	902,951	905,434	0%
	30	859,969	882,464	871,535	6,196	8,701	4,087	1%	34	865,999	872,648	876,210	1%
	31	-956,649	-929,633	-943,017	6,504	8,214	3,958	1%	33	-947,826	-942,466	-940,506	0%
	32	-27,228	152,065	55,845	42,638	52,081	15,150	76%	33	43,922	52,134	66,206	20%
Commodity	33	-7,093	4,242	-1,472	3,014	3,014	1,254	205%	17	-2,503	-1,256	-2	100%
	34	32,736	50,885	41,789	5,746	6,421	1,120	14%	14	35,725	44,609	45,027	12%
	35	110,184	152,022	131,692	10,268	22,140	5,340	8%	14	126,296	134,236	136,197	4%
Credit Spread	36	3,170	5,739	4,469	625	812	237	14%	23	4,384	4,520	4,756	4%
	37	-13,299	-10,215	-11,055	861	1,383	184	8%	20	-11,231	-10,748	-10,541	3%
	38	9,518	12,960	10,031	692	2,164	61	7%	21	9,848	9,912	9,943	0%
	39	18,338	20,303	19,494	479	674	245	3%	21	19,326	19,634	19,739	1%
	40	3,329	4,931	3,965	329	1,634	43	8%	21	3,851	3,918	3,944	1%
	41	45,110	46,554	46,137	416	644	224	1%	23	45,877	46,148	46,482	1%
	42	1,125,587	1,144,079	1,135,732	3,554	7,751	1,513	0%	21	1,134,388	1,135,000	1,137,610	0%
	43	3,134,295	3,153,203	3,147,865	4,837	11,949	1,347	0%	21	3,145,384	3,149,772	3,150,762	0%
	44	22,517	24,958	23,878	513	765	245	2%	25	23,721	23,969	24,080	1%
	45	991,443	1,003,654	998,937	3,543	7,889	1,822	0%	21	996,625	999,828	1,001,389	0%
	46	1,032,993	1,053,331	1,048,702	6,291	10,231	610	1%	25	1,048,862	1,051,841	1,052,145	0%
	47	33,814	35,407	34,685	317	466	166	1%	23	34,471	34,656	34,832	1%
	48	6,616	11,789	10,063	1,179	2,923	618	12%	25	9,718	10,596	10,806	5%
	49	-10,767	-9,388	-10,249	387	2,503	120	4%	23	-10,480	-10,430	-10,106	2%
	50	1,156,942	1,193,570	1,189,074	8,343	32,376	464	1%	25	1,190,921	1,192,143	1,192,529	0%
	51	5,224,968	5,350,906	5,311,266	30,060	51,142	6,033	1%	22	5,308,539	5,317,156	5,323,175	0%
	52	5,363,404	5,669,826	5,465,398	83,015	140,799	62,873	2%	21	5,406,716	5,429,206	5,516,325	1%
	53	10,620,829	11,011,008	10,781,184	97,857	179,424	61,392	1%	20	10,708,803	10,753,799	10,838,600	1%
Correlation Trading	54	149,715	173,734	163,997	10,280	19,966	4,728	6%	4	156,997	164,279	170,997	4%
	55	71,898	111,330	88,055	20,657	20,657	9,038	24%	3	71,898	80,936	111,330	22%
	56	16,207,952	16,306,076	16,241,816	55,678	55,678	3,468	0%	3	16,207,952	16,211,420	16,306,076	0%
ALL-IN no-CTP **	57	9,706,138	15,308,988	14,432,075	1,365,854	10,877,643	249,708	10%	16	14,168,843	14,814,243	15,132,655	3%
Equity Cumulative **	58	6,994,553	9,125,875	8,036,083	353,783	1,931,959	43,742	4%	22	8,041,560	8,048,098	8,122,353	0%
IR Cumulative **	59	1,657,719	2,462,921	2,292,959	176,375	393,597	19,294	8%	35	2,168,195	2,406,953	2,414,556	5%
FX Cumulative **	60	531,753	1,718,544	1,303,572	354,638	501,441	57,015	27%	30	1,364,215	1,402,545	1,478,206	4%
Commodity Cumulative **	61	23,789	44,783	38,779	6,491	17,047	4,361	17%	13	35,953	39,097	44,103	10%
CS Cumulative **	62	3,175,638	3,209,840	3,203,071	8,094	15,935	1,584	0%	18	3,198,929	3,206,175	3,207,347	0%
CTP Cumulative **	63	14,813,890	14,875,601	14,847,183	31,143	31,143	23,543	0%	3	14,813,890	14,852,058	14,875,601	0%

[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

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

EU Statistics for IRC

		Other stats						Percentiles									Extreme Values range (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
Equity	1																	
	2																	
	3																	
	4																	
	5																	
	6																	
	7																	
	8																	
	9																	
	10																	
Interest Rate	11																	
	12																	
	13																	
	14																	
	15	35,769	226,799	162,132	71,769	44%	7	55,833	75,897	125,870	180,844	219,886	224,813	225,806	27%	92,915	30,451	402,113
	16	0	508,326	131,780	129,815	99%	13	16,667	31,690	66,111	109,612	173,646	213,996	337,080	45%	410,064	-654,584	985,673
	17	516,982	4,061,371	1,968,188	1,296,320	66%	15	538,594	562,364	698,009	1,819,377	3,160,032	3,682,739	3,796,329	64%	1,169,824	-30,506	4,648,789
	18	663,947	5,392,385	2,819,825	1,854,022	66%	15	676,921	713,182	1,104,890	2,657,486	4,476,836	5,318,261	5,392,385	60%	1,612,903	239,814	6,691,425
	19																	
	20																	
	21																	
	22																	
	23	0	1,284,956	409,182	398,736	97%	14	48,646	79,741	130,689	325,973	389,148	1,066,259	1,254,636	50%	1,106,207	-1,675,109	2,749,717
	24	557,080	4,577,708	2,862,025	1,640,818	57%	14	557,080	719,407	1,159,035	3,611,878	4,246,614	4,492,518	4,577,708	57%	1,649,747	-217,763	6,381,225
	25																	
	26	723,463	6,729,175	3,427,458	2,226,634	65%	15	886,771	961,540	1,425,535	3,018,594	5,426,062	6,311,400	6,729,175	58%	1,933,605	-191,676	7,542,745
FX	27																	
	28																	
	29																	
	30																	
	31																	
	32																	
Commodity	33																	
	34																	
	35																	
Credit Spread	36	24,679	281,966	90,949	83,101	91%	14	27,060	30,006	36,340	54,656	95,516	218,209	246,092	45%	152,386	-200,322	409,223
	37	26,884	89,600	46,766	18,344	39%	14	27,923	29,508	33,655	44,055	50,135	71,618	83,113	20%	20,310	10,952	92,192
	38	18,460	101,864	52,307	28,192	54%	16	18,460	22,836	29,777	40,923	74,452	91,873	98,941	43%	29,790	-11,328	107,833
	39	13,654	426,860	166,817	158,673	95%	13	17,847	24,449	57,023	77,826	299,447	406,938	426,860	68%	164,735	-201,071	457,868
	40	28,729	103,481	61,008	27,400	45%	16	28,729	29,191	39,527	54,814	84,916	99,285	101,322	36%	27,596	-4,165	106,218
	41	426,429	961,146	703,809	144,918	21%	14	550,771	619,804	631,479	653,135	758,395	930,350	961,146	9%	187,882	284,872	1,036,401
	42	26,006	309,018	147,509	62,517	42%	13	81,903	119,908	132,021	137,498	143,068	198,875	247,415	4%	238,639	-339,781	614,776
	43	356,372	1,031,117	679,994	205,655	30%	17	370,412	388,815	635,557	643,618	711,192	1,009,543	1,031,117	6%	229,540	178,816	1,096,976
	44	25,610	173,743	92,093	42,468	46%	16	33,658	47,136	61,906	82,465	122,800	148,226	164,475	33%	59,029	-34,211	201,904
	45	4,967	159,441	53,961	44,785	83%	15	5,618	8,798	19,594	43,884	73,842	111,724	135,696	58%	79,621	-101,806	216,680
	46	862	185,697	33,822	53,433	158%	15	1,089	1,604	2,266	4,346	38,780	99,269	133,678	89%	100,863	-190,159	213,294
	47	38,679	280,988	136,915	85,825	63%	15	43,916	46,160	50,520	132,871	203,138	256,462	275,521	60%	88,723	-63,325	291,569
	48	7,971	73,023	28,890	25,082	87%	15	7,971	8,309	9,489	11,018	37,127	71,226	71,848	59%	40,884	-68,722	94,816
	49	12,543	429,084	167,485	167,651	100%	13	17,402	23,196	39,679	58,606	325,128	412,647	429,084	78%	174,644	-228,771	469,805
	50	5,817	251,042	101,741	95,866	94%	14	7,761	8,853	9,488	80,689	203,862	224,861	235,041	91%	151,076	-181,756	422,548
	51	14,083	440,574	176,327	155,051	88%	13	18,366	22,950	35,843	110,739	297,482	337,088	380,538	78%	171,584	-183,754	502,583
	52	58,032	648,449	280,165	171,456	61%	15	64,974	76,459	174,473	209,528	412,525	455,068	516,275	41%	324,998	-314,806	985,187
	53	73,691	708,139	375,933	206,277	55%	15	92,287	105,055	231,424	390,165	453,928	684,263	708,139	32%	317,745	-223,010	1,047,972
CTP	54																	
	55																	
	56																	
ALL-IN no-CTP	57	1,093,261	7,421,949	3,480,406	2,341,061	67%	11	1,207,637	1,322,012	1,495,519	3,014,907	4,541,054	7,421,949	7,421,949	50%	1,994,064	-297,350	7,678,907
Equity Cumulative	58																	
IR Cumulative	59																	
FX Cumulative	60																	
Commodity Cumulative	61																	
CS Cumulative	62	398,743	1,092,695	720,457	189,273	26%	14	435,416	510,322	642,080	682,190	783,769	975,765	1,030,804	10%	402,216	-68,597	1,540,267
CTP Cumulative	63																	

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

EU Statistics for IRC

		Other stats						Percentiles									Extreme Values range (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
Equity	1																	
	2																	
	3	23	23	23			1	23	23	23	23	23	23	23	0%	0	0	0
	4																	
	5																	
	6																	
	7																	
	8																	
	9																	
	10																	
Interest Rate	11																	
	12																	
	13																	
	14																	
	15	73,818	344,836	241,900	102,115	42%	6	104,237	134,657	201,125	250,617	322,819	340,428	342,632	23%	92,915	30,451	402,113
	16	37,518	951,381	285,077	252,617	89%	17	71,251	103,154	124,153	165,545	299,941	654,600	749,531	41%	410,064	-654,584	985,673
	17	129,037	4,071,968	2,316,991	1,200,770	52%	16	204,041	437,427	1,528,354	2,649,326	2,954,677	3,591,380	3,807,162	32%	1,169,824	-30,506	4,648,789
	18	612,311	6,292,933	3,594,450	1,556,116	43%	16	1,327,651	1,927,549	2,671,618	3,579,183	4,520,724	5,613,784	5,909,531	26%	1,612,903	239,814	6,691,425
	19																	
	20																	
	21																	
	22																	
	23	131,517	2,477,710	766,652	651,559	85%	17	131,517	183,688	351,721	555,940	1,047,261	1,570,961	2,016,614	50%	1,106,207	-1,675,109	2,749,717
	24	64,540	5,554,470	3,194,422	1,817,256	57%	16	655,570	1,032,083	1,942,509	2,770,091	4,935,365	5,328,187	5,454,482	44%	1,649,747	-217,763	6,381,225
	25																	
	26	712,043	7,061,213	3,956,303	1,739,554	44%	15	1,206,433	1,967,057	3,198,572	3,675,535	4,969,470	6,286,213	6,775,082	22%	1,933,605	-191,676	7,542,745
FX	27																	
	28																	
	29																	
	30																	
	31																	
	32																	
Commodity	33																	
	34																	
	35																	
Credit Spread	36	7,935	393,638	147,148	121,319	82%	14	28,150	40,795	63,578	120,942	139,763	351,983	383,707	37%	152,386	-200,322	409,223
	37	16,446	86,967	61,321	20,094	33%	14	29,123	39,534	50,051	61,636	77,897	83,566	84,994	22%	20,310	10,952	92,192
	38	775	81,821	41,432	25,189	61%	13	6,274	12,992	27,028	29,138	60,067	72,020	77,056	38%	29,790	-11,328	107,833
	39	8,630	442,474	172,546	138,663	80%	15	35,868	48,149	68,093	128,399	241,593	388,646	408,422	56%	164,735	-201,071	457,868
	40	181	92,860	44,512	26,580	60%	14	7,051	12,079	27,751	42,192	63,726	74,535	81,231	39%	27,596	-4,165	106,218
	41	468,324	885,182	684,225	141,212	21%	14	487,801	505,317	582,312	674,126	811,843	850,016	870,257	16%	187,882	284,872	1,036,401
	42	14,700	162,739	109,097	45,750	42%	15	26,589	42,599	85,952	118,741	139,243	152,670	157,808	24%	238,639	-339,781	614,776
	43	351,300	906,720	593,159	184,628	31%	11	363,391	375,481	447,154	609,805	748,032	777,733	842,227	25%	229,540	178,816	1,096,976
	44	482	107,828	66,873	34,836	52%	13	13,897	23,487	50,700	71,215	99,646	105,438	106,394	33%	59,029	-34,211	201,904
	45	9	181,858	64,646	52,319	81%	15	8,053	12,307	33,560	57,437	82,278	140,365	164,835	42%	79,621	-101,806	216,680
	46	635	182,520	29,999	48,818	163%	17	927	1,047	4,744	11,288	22,944	94,097	111,782	66%	100,863	-190,159	213,294
	47	14,300	259,308	105,533	67,429	64%	14	29,385	38,476	53,046	101,770	148,884	169,645	202,310	47%	88,723	-63,325	291,569
	48	0	84,526	22,905	28,090	123%	16	1,724	2,325	4,607	12,170	26,141	68,624	82,562	70%	40,884	-68,722	94,816
	49	8,630	467,773	169,130	150,842	89%	15	34,021	49,143	60,652	127,863	212,657	420,415	450,064	56%	174,644	-228,771	469,805
	50	266	364,595	125,562	110,600	88%	16	2,450	7,776	32,539	111,508	208,162	246,049	286,227	73%	151,076	-181,756	422,548
	51	0	409,228	142,239	130,915	92%	15	1,199	7,736	26,649	113,103	269,513	280,133	318,956	82%	171,584	-183,754	502,583
	52	22,679	848,557	351,902	255,290	73%	11	35,161	47,642	151,562	337,692	508,416	576,281	712,419	54%	324,998	-314,806	985,187
	53	57,069	848,293	377,342	259,170	69%	11	58,056	59,042	168,196	344,208	563,513	616,918	732,606	54%	317,745	-223,010	1,047,972
CTP	54																	
	55																	
	56																	
ALL-IN no-CTP	57	704,984	6,389,873	3,838,938	1,800,752	47%	10	1,297,652	1,890,320	2,592,440	3,690,778	5,324,429	5,556,498	5,973,186	35%	1,994,064	-297,350	7,678,907
Equity Cumulative	58																	
IR Cumulative	59	612,311	612,311	612,311			1	612,311	612,311	612,311	612,311	612,311	612,311	612,311	0%	0	0	0
FX Cumulative	60																	
Commodity Cumulative	61																	
CS Cumulative	62	299,193	1,030,300	712,612	205,601	29%	12	411,595	505,376	603,680	735,836	851,367	910,693	964,953	17%	402,216	-68,597	1,540,267
CTP Cumulative	63																	

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

EU Statistics for IRC

		Other stats						Percentiles									Extreme Values range (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
Equity	1																	
	2																	
	3																	
	4																	
	5																	
	6																	
	7																	
	8																	
	9																	
	10																	
Interest Rate	11																	
	12																	
	13																	
	14																	
	15	73,818	344,836	223,923	105,238	47%	6	92,636	111,455	165,889	219,886	307,887	340,428	342,632	30%	92,915	30,451	402,113
	16	0	951,381	242,343	251,801	104%	15	26,263	69,086	121,477	162,007	228,314	555,325	722,882	31%	410,064	-654,584	985,673
	17	129,037	4,071,968	2,333,721	1,223,076	52%	15	490,780	712,085	1,394,271	2,521,284	2,967,146	3,896,322	4,064,550	36%	1,169,824	-30,506	4,648,789
	18	1,405,673	5,445,837	3,413,235	1,392,036	41%	15	1,514,126	1,562,802	2,607,884	3,579,183	4,467,035	5,268,280	5,350,109	26%	1,612,903	239,814	6,691,425
	19																	
	20																	
	21																	
	22																	
	23	0	2,477,710	653,358	626,490	96%	16	98,638	131,517	301,658	468,936	760,421	1,317,832	1,632,459	43%	1,106,207	-1,675,109	2,749,717
	24	64,540	5,235,222	2,806,386	1,608,967	57%	15	616,168	950,816	1,700,143	2,458,451	4,278,607	4,861,400	5,173,012	43%	1,649,747	-217,763	6,381,225
	25																	
	26	1,418,315	5,736,849	3,685,486	1,435,684	39%	15	1,479,557	1,664,402	3,031,871	3,675,535	4,684,943	5,642,460	5,700,371	21%	1,933,605	-191,676	7,542,745
FX	27																	
	28																	
	29																	
	30																	
	31																	
	32																	
Commodity	33																	
	34																	
	35																	
Credit Spread	36	7,935	393,638	150,389	129,970	86%	12	25,040	40,202	56,631	120,942	171,391	368,721	385,235	50%	152,386	-200,322	409,223
	37	16,446	89,600	58,000	21,337	37%	12	23,066	30,424	48,524	58,819	75,102	79,587	84,111	21%	20,310	10,952	92,192
	38	775	64,584	35,671	19,284	54%	13	6,274	12,992	27,028	30,391	51,962	59,521	61,874	32%	29,790	-11,328	107,833
	39	8,630	442,474	157,223	136,462	87%	12	30,032	48,648	74,877	120,785	170,327	370,556	408,593	39%	164,735	-201,071	457,868
	40	181	81,035	39,390	22,076	56%	13	6,522	13,640	29,652	40,841	43,543	70,096	77,395	19%	27,596	-4,165	106,218
	41	468,324	885,182	704,431	130,584	19%	13	500,360	542,974	631,148	695,114	821,540	851,102	869,169	13%	187,882	284,872	1,036,401
	42	14,700	206,346	117,710	53,460	45%	13	24,890	37,141	118,741	122,869	143,068	161,330	180,182	9%	238,639	-339,781	614,776
	43	351,300	906,720	615,493	172,015	28%	12	377,394	399,741	466,371	640,713	741,713	776,027	835,777	23%	229,540	178,816	1,096,976
	44	482	109,786	75,254	33,457	44%	14	15,015	31,198	59,267	79,290	103,990	107,111	108,513	27%	59,029	-34,211	201,904
	45	9	181,858	65,547	60,879	93%	14	3,836	7,578	17,592	45,152	82,758	158,870	167,287	65%	79,621	-101,806	216,680
	46	862	182,520	36,364	51,256	141%	16	966	1,040	2,186	13,070	44,432	94,097	116,203	91%	100,863	-190,159	213,294
	47	14,300	280,988	110,717	84,511	76%	12	27,064	37,831	47,406	80,769	158,889	226,736	253,708	54%	88,723	-63,325	291,569
	48	0	84,526	29,386	29,312	100%	15	1,609	2,363	7,354	12,568	50,670	72,233	76,474	75%	40,884	-68,722	94,816
	49	8,630	442,474	151,153	136,484	90%	13	31,405	48,372	58,606	113,170	134,533	369,484	409,385	39%	174,644	-228,771	469,805
	50	266	364,595	134,972	114,341	85%	15	4,152	7,013	25,787	150,866	229,539	256,479	291,451	80%	151,076	-181,756	422,548
	51	0	440,574	157,187	148,842	95%	13	1,028	4,187	30,662	110,739	279,931	328,465	380,538	80%	171,584	-183,754	502,583
	52	47,642	576,281	264,757	176,553	67%	10	52,318	56,993	127,731	234,860	381,011	471,294	523,788	50%	324,998	-314,806	985,187
	53	59,042	576,281	293,362	167,138	57%	10	82,987	106,932	155,898	302,200	394,135	471,294	523,788	43%	317,745	-223,010	1,047,972
CTP	54																	
	55																	
	56																	
ALL-IN no-CTP	57	1,560,606	5,463,901	3,753,280	1,513,120	40%	8	1,722,102	1,883,599	2,766,686	3,690,778	5,269,190	5,374,715	5,419,308	31%	1,994,064	-297,350	7,678,907
Equity Cumulative	58																	
IR Cumulative	59																	
FX Cumulative	60																	
Commodity Cumulative	61																	
CS Cumulative	62	398,743	925,102	681,572	171,200	25%	11	451,152	503,560	576,359	655,298	820,211	911,487	918,295	17%	402,216	-68,597	1,540,267
CTP Cumulative	63																	

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

EU Statistics for IRC

		Other stats						Percentiles									Extreme Values range (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
Equity	1																	
	2																	
	3	23	23	23			1	23	23	23	23	23	23	23	0%	0	0	0
	4																	
	5																	
	6																	
	7																	
	8																	
	9																	
	10																	
Interest Rate	11																	
	12																	
	13																	
	14																	
	15	35,769	283,220	177,541	82,940	47%	7	55,833	75,897	141,747	195,495	222,407	249,367	266,294	22%	92,915	30,451	402,113
	16	27,779	699,068	194,954	187,443	96%	15	41,468	54,845	69,341	123,976	226,561	424,972	565,549	53%	410,064	-654,584	985,673
	17	229,042	3,718,893	1,974,303	1,268,935	64%	16	444,997	532,419	584,424	1,899,509	3,052,277	3,682,739	3,691,778	68%	1,169,824	-30,506	4,648,789
	18	612,311	6,292,933	3,038,128	2,014,506	66%	16	651,038	673,214	792,889	3,061,553	4,541,549	5,587,058	5,909,531	70%	1,612,903	239,814	6,691,425
	19																	
	20																	
	21																	
	22																	
	23	74,840	1,901,340	553,860	526,200	95%	15	86,277	99,199	203,768	332,935	666,379	1,239,435	1,438,532	53%	1,106,207	-1,675,109	2,749,717
	24	557,080	5,554,470	3,272,221	1,841,789	56%	15	557,080	797,310	1,394,708	4,161,668	4,577,708	5,198,706	5,461,147	53%	1,649,747	-217,763	6,381,225
	25																	
	26	712,043	7,061,213	3,698,275	2,464,244	67%	15	720,037	816,782	1,156,988	3,333,962	5,962,768	6,729,175	6,828,786	67%	1,933,605	-191,676	7,542,745
FX	27																	
	28																	
	29																	
	30																	
	31																	
	32																	
Commodity	33																	
	34																	
	35																	
Credit Spread	36	24,679	290,437	95,542	80,323	84%	16	27,426	31,116	36,340	60,965	114,325	212,499	242,691	52%	152,386	-200,322	409,223
	37	26,884	86,967	51,076	19,613	38%	16	30,648	32,103	37,267	49,319	57,898	83,323	84,690	22%	20,310	10,952	92,192
	38	18,460	101,864	56,988	29,054	51%	16	18,460	22,836	28,838	59,404	82,594	91,873	98,941	48%	29,790	-11,328	107,833
	39	13,654	426,860	179,384	155,634	87%	16	18,895	30,161	54,179	109,871	306,398	410,344	426,860	70%	164,735	-201,071	457,868
	40	15,179	103,481	63,954	27,595	43%	17	26,019	28,729	42,916	60,966	88,959	99,021	101,178	35%	27,596	-4,165	106,218
	41	426,429	961,146	684,991	152,988	22%	15	476,730	531,142	602,852	653,138	743,578	921,576	961,146	10%	187,882	284,872	1,036,401
	42	26,006	309,018	134,924	59,833	44%	15	50,911	81,078	118,584	136,703	140,141	160,649	211,001	8%	238,639	-339,781	614,776
	43	356,372	1,031,117	668,670	219,555	33%	16	369,535	374,702	583,073	640,732	752,630	1,013,139	1,031,117	13%	229,540	178,816	1,096,976
	44	25,610	173,743	85,952	46,902	55%	15	25,935	30,180	59,919	79,373	122,800	150,858	165,093	34%	59,029	-34,211	201,904
	45	4,967	125,520	53,840	34,693	64%	16	11,104	13,584	33,205	50,661	65,740	102,818	117,333	33%	79,621	-101,806	216,680
	46	635	185,697	27,218	50,427	185%	16	1,048	1,742	3,728	7,534	15,709	78,367	129,962	62%	100,863	-190,159	213,294
	47	38,679	273,178	129,564	74,288	57%	17	44,664	46,160	50,520	132,871	165,041	236,566	262,082	53%	88,723	-63,325	291,569
	48	2,350	81,907	22,440	23,832	106%	16	6,068	7,639	8,604	10,378	34,189	54,394	73,986	60%	40,884	-68,722	94,816
	49	12,543	467,773	183,284	174,258	95%	15	18,212	25,751	42,291	65,418	336,014	429,084	440,691	78%	174,644	-228,771	469,805
	50	3,178	226,425	93,920	89,252	95%	15	7,225	9,038	11,517	64,619	188,566	221,212	222,776	88%	151,076	-181,756	422,548
	51	16,771	409,228	158,827	139,042	88%	15	19,886	21,787	32,854	113,103	291,372	313,024	349,138	80%	171,584	-183,754	502,583
	52	22,679	848,557	339,114	228,237	67%	16	56,632	78,587	179,222	332,690	468,847	581,827	698,476	45%	324,998	-314,806	985,187
	53	57,069	848,293	428,509	245,437	57%	16	69,536	86,974	256,821	438,865	624,801	708,139	743,178	42%	317,745	-223,010	1,047,972
CTP	54																	
	55																	
	56																	
ALL-IN no-CTP	57	704,984	7,421,949	3,588,277	2,389,243	67%	13	937,950	1,139,011	1,430,432	3,518,583	5,288,237	7,215,534	7,421,949	57%	1,994,064	-297,350	7,678,907
Equity Cumulative	58																	
IR Cumulative	59	612,311	612,311	612,311			1	612,311	612,311	612,311	612,311	612,311	612,311	612,311	0%	0	0	0
FX Cumulative	60																	
Commodity Cumulative	61																	
CS Cumulative	62	299,193	1,092,695	742,697	209,472	28%	15	408,372	528,479	640,113	725,200	843,658	1,017,171	1,049,019	14%	402,216	-68,597	1,540,267
CTP Cumulative	63																	

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

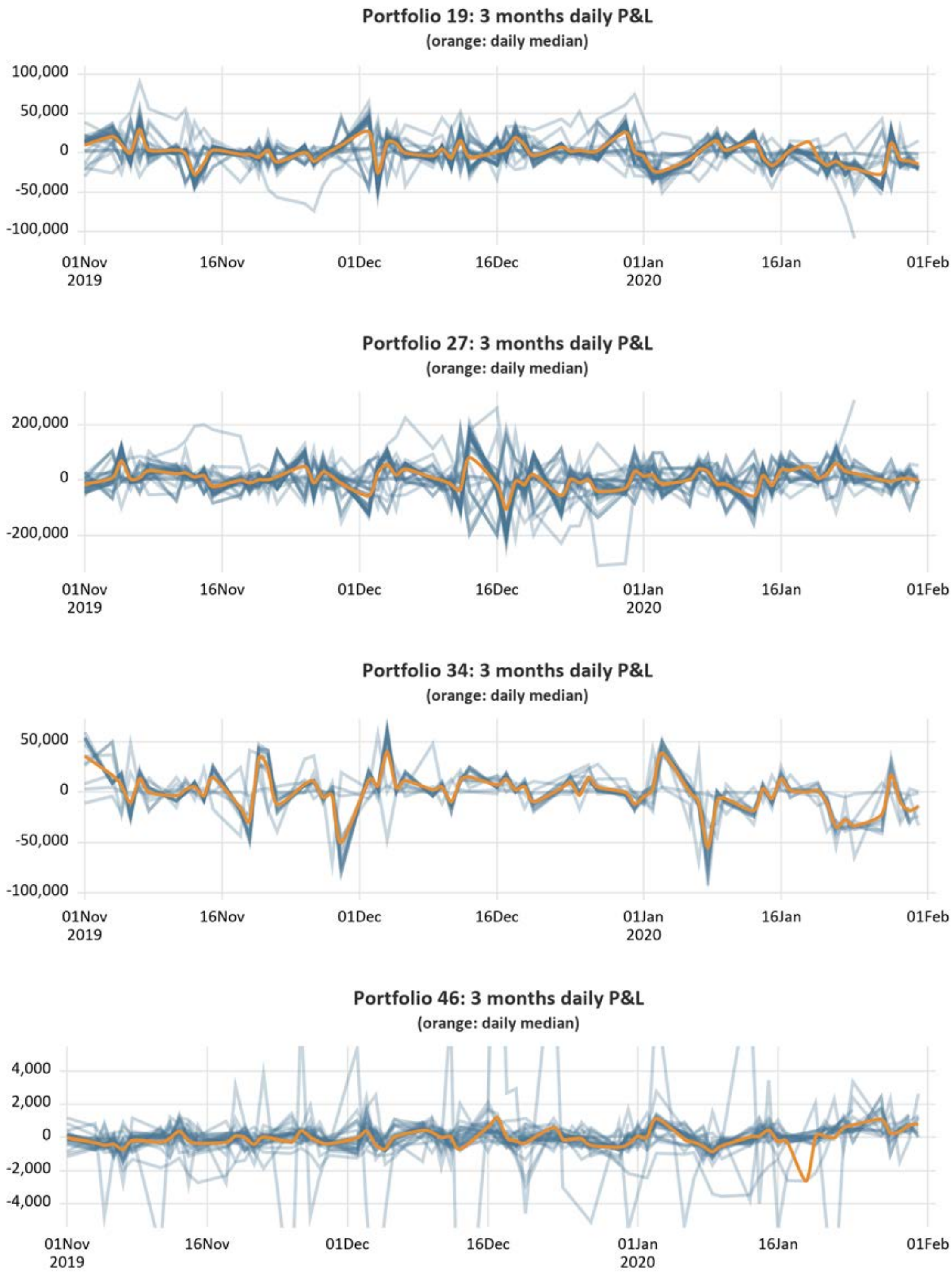


Figure 25: Additional P&L charts with examples of high IQD

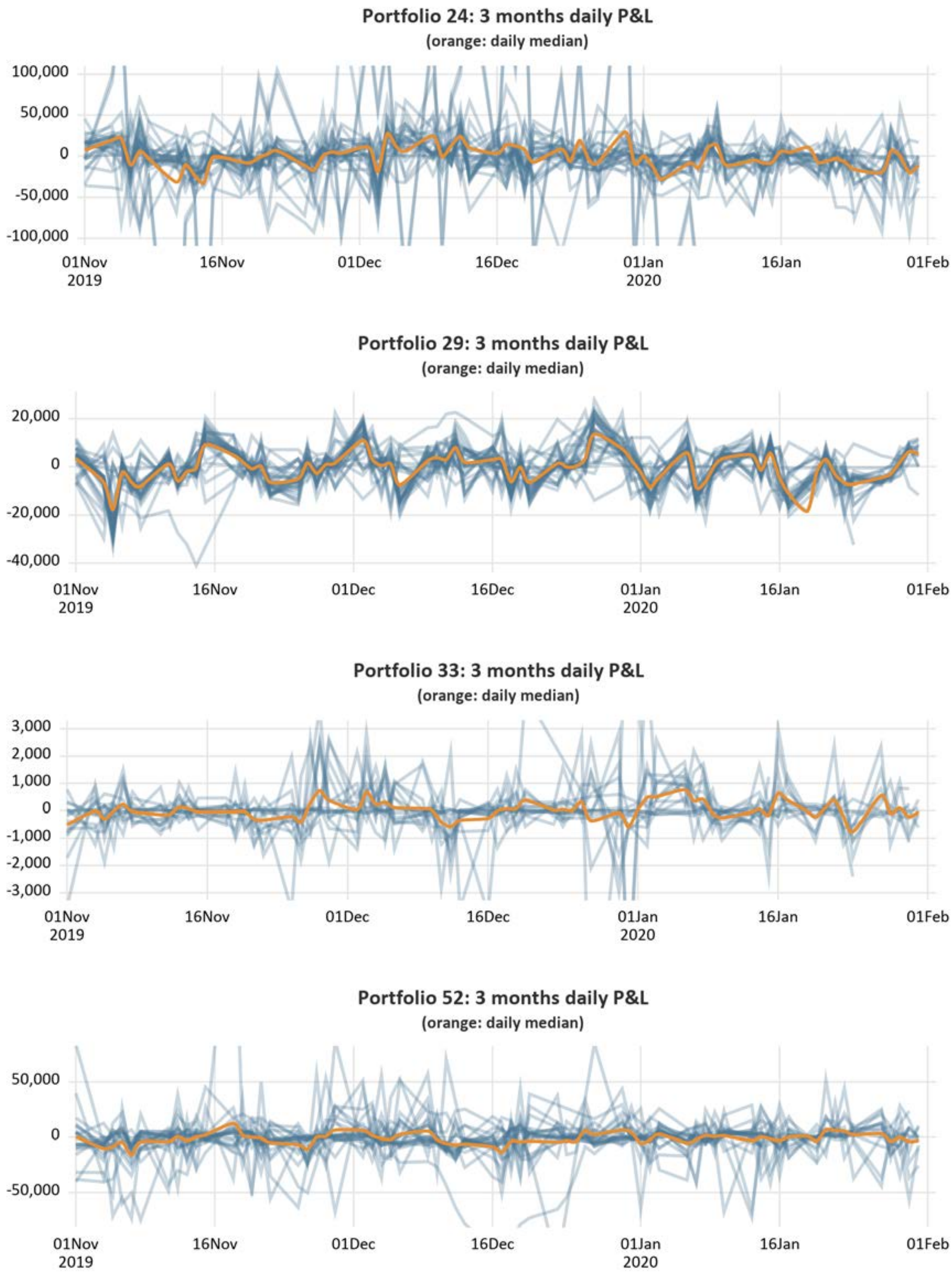
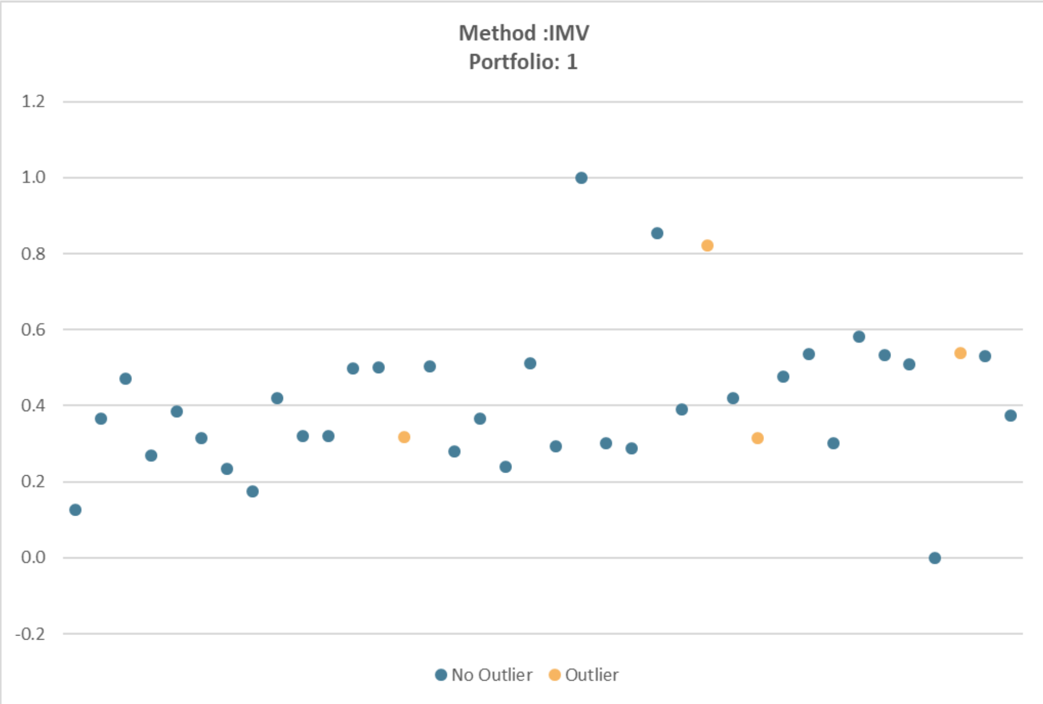


Figure 26: Comparison between IMV and truncated STD deviation method to select outlier for risk measures



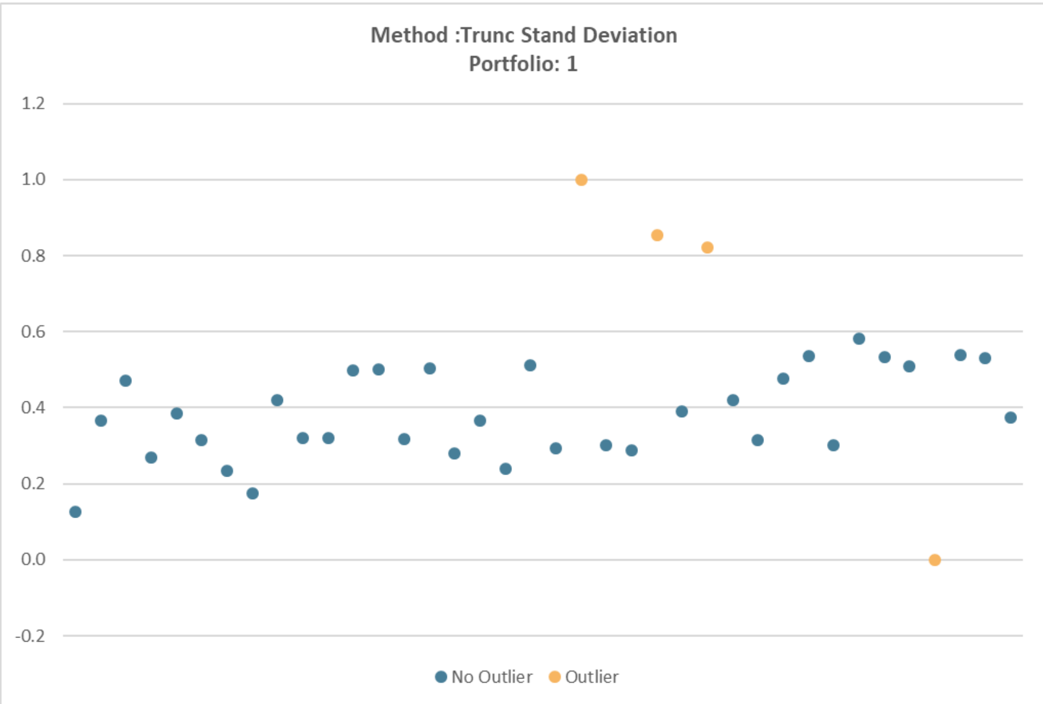


Figure 26. Example of dispersion in VaR submission for Portfolio 1. Above the chart, marked in yellow: the portfolios which would have been excluded based on the IMV methodology outlier, which was used in 2019 (and before) to detect outliers among risk measures. Below the chart: the same submission, 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.

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