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Validation of the CCaR model

Revision history

Date	Version	Description	Author
2014-11-05	1.0 final	Initial document: draft	Michael Georger
2014-11-17	2.0 final	Nasdaq clearing feedback Version	Michael Georger
2014-11-28	3.0	Partner QA	Michael Georger

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Background and validation approach

1.1 Purpose of the annual validation

PwC has been asked to execute an annual independent model validation of the CCaR stress model and scenario. PwC has previously performed CCaR model validations including the CCaR validations in the previous that focused on Power, Fixed Income and Equities markets. The ongoing validation covers the model sufficiency for incorporating historical periods of extreme volatility, the impact from sudden sales of financial resources and rapid reductions in market liquidity. The model validation also covers the effectiveness of the approach and any changes made to the models since the prior validation last year. As the model has been updated over the year and substantial testing was produced on prior years, the focus of the validation will be on the last year's data and the significance of the model changes. However some markets (seafood and freight) will be included in the scope for the first time. For these markets, the validation will consider longer historical periods than the last year (since the last CCaR validation).

The purpose of this independent validation is to:

- Update data history and re-validate the use of CCaR for equities, power and fixed income markets given new history since the last validation
- Incorporate a first run validation for a sampling of seafood and freight markets
- Sample test whether the scenarios consider extreme volatile history or are more conservative than the volatile historical periods
- Review volatile, sudden sales and illiquid historical periods and compare with the CCaR scenarios
- Also review changes to the model (focusing the addition of historical simulation scenarios) since last year per the model policy and instructions Per the Nasdaq Clearing ("NOMX Clearing") Model validation policy, an independent validation shall be conducted at least annually of models and aspects in scope, with the results analyzed by the Clearing Risk Committee and reviewed by the Member Risk Committee. The purpose of the Clearing Capital at Risk ("CCaR") model validation is to evaluate the effectiveness of the CCaR model in deciding on Nasdaq Clearing's regulatory capital level.

The validation has been performed under the Nasdaq Clearing policy framework and this work is an annual validation work following up on the original CCaR model validation delivered in 2013 for the CCaR model. The reporting data used for this validation is up until September 30th 2014 and some limited data available in October 2014.

1.2 Scope of the work

The scope of the independent validation includes both a quantitative and qualitative review of the CCaR model as it stands as of September 30th 2014 with specific attention to the model output with comparison to certain volatile, sell off and illiquid periods. The review primarily covers volatile, sell off and illiquid data history and comparison to CCaR model scenario assumptions.

The products focused in the testing were grouped into 5 product groups:

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- Nordic power products (update to 2013 validation)
- Equity products (update to 2013 validation)
- Interest rate products (update to 2013 validation)
- Seafood products
- Freight products

Each of the 5 groups will utilize an example portfolio of contracts within the product group used in testing. For example, Nordic Power contracts include all materially representative of the individual maturities on the price of power plus the overall index. The results tables in the testing results section 3 of the paper, list the contracts included in the product group used for testing historical data price history versus the CCaR model assumptions.

Nordic power and Freight products are part of the Commodities default fund, Equity and Interest rate products are part of the financial market default fund, while Seafood products constitute its own default fund.

1.3 Validation approach

The independent model validation approach of the CCaR stress model scenario focused on the following:

- **Review of model changes surrounding the use of historical simulation**
- **For previously reviewed product sets, perform similar validation steps as per last year with the focus on the data and events since the last validation**
- **Review the model changes and effectiveness around the use of historic scenarios** employed within the model which is the basis of the model output at September 30th 2014
- **Review of the scenario and review of the most volatile days in our history study period:** price history outliers and extreme price movement returns (4 day returns for seafood, many freight, 2 day for equity and interest rate, 3 day for Power and relatively lower volume freight) for each product group were reviewed and compared with CCaR assumptions
- **Review of the sudden sales periods:** identify sudden sale periods in study period and compare price movements to model assumptions in those periods
- **Review of the incorporation of illiquid periods:** Identify low or no volume trading dates, and compare price change on those days to model assumptions. This shows whether the model is more severe than illiquid periods experienced in the past. In the case of a low volume Nasdaq Clearing secondary market, review the market dynamics of the underlying and other trading markets

The CCaR scenario assumptions were reviewed against historical price movements on stress days. A diversified sample selection of contracts (portfolio within each one of the 5 product groups) was considered to simulate a typical position taken by a large member.

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The assumed price movement of the scenario was examined to see whether it is beyond any particular historical event or date in history. Further, the validation will identify if the model covers identified sudden sale events, and considers the implications of illiquid periods.

The specific approach taken for the model validation scenario is per the following:

- Scenarios reviewed price historical price behavior in extreme events to determine whether significant relationships of price movement exist: i.e. correlation
- For sudden sales, select the worst negative 2, 3 or 4 day price movements for the sample product group portfolios: Compare these to assumption taken in the EVT and historical simulation CCaR model
- For liquidity implications, review volumes for the product groups: Identify low liquidity days and review price implications for these days over 2, 3 or 4 day horizons for the 3 product groups. Compare these to assumption taken in the EVT and historical simulation CCaR model (that already includes correlation impact)
- For liquidity implications on seafood and freight, a review on seafood and freight, the market liquidation plans for the event of a counterpart default were reviewed for Nasdaq Clearing provided explanations, assumptions, market size, legal arrangement and ability to cover the liquidation of the Nasdaq Clearing market

1.3.1 Policies, Documentation, Interviews and Discussions Overview

As previously mentioned, in the September 2013 CCaR model validation, the documentation of the CCaR model is per the following:

- CCaR Parameter Calculation Methodology and Procedure
- CCaR Model Instructions
- CCaR – Risk Valuation Capital at Risk

Furthermore, the following supporting documentation and policies have been taken into account for completing the validation:

- Model Validation Policy
- Risk Parameter Policy
- Sensitivity Testing and Analysis Policy

Per our agreement, we would execute the validation under the Nasdaq Clearing validation framework that is relevant for Nasdaq Clearing.

- Quantitative testing on assumptions and scenarios
- Qualitative assessment of methodology, assumptions and scenarios
- Incorporate validation policy framework from Nasdaq Clearing OMX (Validation policy, Parameter policy, Sensitivity policy)

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The policies were reviewed in the following embedded files:



Policy for the validation of models 2NOMX (130513).docx



Risk Parameter Policy and analysis Policy (1



Sensitivity testing

Additionally, we provide a complete list of documents, statistical analysis, data and notations as separate files to support this document.

2 Model and Scenario Evaluation

2.1 Description and Evaluation

The CCaR model and related stress scenario is used to guide Nasdaq Clearing with the ability to understand its minimum capital requirements. The model scenario takes a historical simulation and also a hypothetical scenario approach. The worst case output of each approach is considered as the stress test output results. It is been observed that there have been only a few product sets have produced historical simulation results that are worse than the hypothetical results.

The historical simulation model is new to the CCaR model process since the last validation. Its purpose is to simulate that the worst historical observance is at least incorporated into the CCaR output. Therefore, if there would be a case where the hypothetical EVT output is less severe than historical simulation represents, the historical results would be applied in the overall output.

The model instructions and stress testing policy available at the time of the testing are found below:



most recent CCaR Model Instructions - 2



Stress Testing Policy NOMX (140228).docx

An excerpt from the model instruction is shown below.

“Two types of stress tests is performed by CCaR:

1. *Data driven stress testing with hypothetical scenarios:*
 - a. *Model parameters (extreme prices and changes in implied volatility) are determined based on statistical estimation of extreme price changes distribution (EVT)*
 - b. *Scenarios are built from the extreme individual instrument price changes across history and assuming they will all occur on the same day (stress scenarios)*
 - c. *All instruments within the same market are considered as totally correlated in case of extreme events on a separated market (equity, fixed income, commodity etc.)*
 - d. *Scenarios cover all possible combinations of up and down movements for all different markets (hypothetical scenarios)*
2. *Historical simulation*
 - a. *Historical extreme events are replicated on current portfolios*

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b. A method for defining historical extreme events is developed and applied, based on the historical volatility in the most important risk factors and the current exposure

c. Historical quantitative data for each risk factor with a minimum look back period of 30 years, or as long as reliable data have been available, shall be considered when defining “historical events” for each risk factor. The events should be defined both on the size of the movement of the individual risk factor as well as the impact of the risk factor on the overall risk of Nasdaq Clearing

d. The historical events per risk factor shall be used as basis for the historical scenarios used by Nasdaq Clearing for historical simulation. Where applicable shall the selected historical scenarios concur with the Swedish Central Bank’s (or other relevant authority) definition of a highly stressed market (Riksbankens Stressindex),.

e. Currently cleared products not existing in a historical scenario, or when the actual price movement of the product is deemed non representative, shall be approximated with the movement of the relevant risk factors of the product

Under both types of stress tests are estimated losses per individual clearing counterparty computed for current portfolios.

The historical simulation model component approach can be summarized by the following:

- *Parameters are stressed per historical observed events by product type*
- *Event severity is judged by crisis, volatility extreme movements*
- *Equity: Underlying price and implied volatility*
- *Fixed income: Principal Components 1 (parallel shift), 2 (slope change) and 3 (twist and bend) and implied volatility*
- *Commodity: Contract price term structure (parallel shift of the CCaR curve) and implied volatility*
- *The parameters are reviewed on annual basis for additional severe events”*

The hypothetical scenario approach can be summarized by the following:

- *Calculates a minimum capital requirement figure for products covered by the CCaR Model*
- *Uses a 99,9% Extreme Value Theory (EVT) approach to cover the individual product markets price volatility*
- *EVT has wider tails which fits market price history better*
- *Data history used is beyond 10 years with 99,9% coverage as noted*
- *The scenario uses an extreme correlation parallel shift up and also a shift down of 1 and or -1 between the product markets which has never come close to happening previously in history*

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- It has been observed that on the most severe price change days, the hypothetical scenario is more conservative (with one exception for Power contracts) than historical simulation results

The conservative points around the model can be described as follows:

- When you apply the extreme -1 negative or +1 positive correlation to 99,9% historical price movement coverage of history under EVT, you create a hypothetical scenario result that is most likely well beyond observed history
- Power, equity, fixed income and product components within those markets never show extreme correlation as +1 or -1 demonstrate in our model
- The scenario result shows extreme historical price movements that present a correlated portfolio price movement that is likely to be more severe than historical price movements in that time horizon
- However, the models are monitored and updated for future scenarios that show greater movements as they happen (as recent history is added to the model very soon after it occurs).
- There is some risk that the top 2 members will have a position that is in only 1 product market. However, that is considered to be unlikely to occur.
- The model output is reviewed against historical simulation results to ensure the output is at least severe as the identified historical stress periods indicate (e.g. 2008, 2009 market crisis, etc.)

2.2 CCaR model update analysis: Historical Simulation and lead days

Two significant model changes have been noted:

- Addition of historical simulation on each Product Group
- A close out change for Power lead days from 4 to 3 days which has relatively lower material CCaR model implications (timeframe for price volatility is shortened from 4 to 3 days).

As discussed, above the CCaR model has been updated to include a historical simulation model alongside the EVT hypothetical model output. The model demonstrates output of both the historical simulated P&L loss as of the severe stress days and as of the hypothetical EVT P&L loss. The historical simulation again can be summarized by the following:

- *Parameters are stressed per historical observed events by product type*
- *Event severity is judged by crisis, volatility extreme movements*
- *Equity: Underlying price and implied volatility*
- *Fixed income: Principal Components 1 (parallel shift), 2 (slope change) and 3 (twist and bend) and implied volatility*
- *Commodity: Contract price term structure (parallel shift of the CCaR curve) and implied volatility*
- *The parameters are reviewed on annual basis for additional severe events"*

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The approach considers the most severe price movements in history. This is mostly done by observing product group severe price movements and also identified stressed market periods for corresponding lead day period time horizons. This is consistent with the model governance and related assumptions around managing a counterparty default event.

In addition, important factors such as principal components, market sector in equities are also considered.

For the markets where there are significant optionality positions (equities only), implied volatility and underlying price movements are also considered in the historical model. This is in line with the materiality of actual option positions that Nasdaq Clearing has or has experienced in the past. There are separate monitoring processes on sensitivities that complement the CCaR model to identify if any other risk factors may become material. As mentioned, the equity market is the only market with material positions in options thereby an appropriate measure of underlying and implied volatility stress movement is employed within the model.

Fixed income incorporates principal components analysis with embedded stress correlations between the components from stress periods. This is appropriate for historical simulation as the model will display exact severities experienced in the market over the appropriately governed lead days.

2.2.1 Historical market scenarios

Nasdaq Clearing's purpose of historical market scenario stress testing is to replicate historical stressful market events on current portfolios. They describe that there are certain difficulties connected with historical simulation as follows:

- it might be not possible to replicate exactly a historical event because instruments or member portfolios that existing today did not exist in the time of historical event
- the event may be not representative for today's markets due to changes in regulation or market players, conditions and activity

Within the available times series data and actual practical existence of the markets traded and reviewed, the historic most severe periods were reviewed. The finding was that for the fixed income, equities, and freight market the most severe stress event periods were model within historical simulation. . For many markets, the hypothetical output overrides the severity of the historic simulation output but this is continually monitored. This represents a very good practice of ensuring extreme historical events are considered as the basis of minimum output from the model.

2.2.1.1 Risk factors

The table below describes the risk factors as defined for all instruments cleared. *The choice of risk factors is primarily risk based, i.e. based on market variables that are significant to the inherent risk in cleared instruments and given the overall risk exposure profile of the CCP. The risk factors are used for selecting historical events and for estimating losses in current portfolios.*

Risk factor	Fixed income	Equity	Commodity
1	PC's	Underlying price	Futures price
2	Currency	Implied volatility	Time to delivery
3	Credit	Market	Implied volatility

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4	Implied volatility		Market
5			Risk group

Risk factors per asset class

The method of evaluating the risk factors significance to value change as to include as a factor in historic simulation is sound. Nasdaq Clearing reports that the continually monitor the materiality of other potential factors and will incorporate these if member portfolio and market concentration become material. This monitoring should continue.

2.2.1.2 Selecting historical events

The selection of historic events is largely based upon severity of movement of the risk factors. This can be considered the best way to objectively determine the impact and most severe historical example on the representative portfolios. Additionally, there is monitoring and expert views being applied on certain crisis periods that we qualitatively recognizable such as the Lehman's event. This process should continue and evolve with particular attention to the evolution of the various product markets.

The weights applied to risk factors are thus an important part of the methodology for historical simulation. The weights for the risk factors are determined by their respective impact on the overall risk for the CCP. How this is done per asset class as described in the model instructions. This method is rationale and will require ongoing review of the weighting significance relevant to member and market position materiality. The details of the risk factor weights are highlighted in the following sections.

2.2.1.2.1 Equity

The weights of the risk factors is set to 1 for the SEK main market index and to 0 for other risk factors. The equity derivatives market is overwhelmingly dominated by SEK index and SEK single stock derivatives in terms of equity risk exposure for the CCP. Of the single stock exposure the main exposure stems from large cap stocks, i.e. index constituents. The risk exposure is fairly evenly distributed between futures and options, but the strong relation between stock price volatility and option implied volatility means that there is no added value in investigating historical volatility in option implied volatilities (e.g. volatility indices). This assumption is rationale and the option risks are continually monitored in additional reporting.

2.2.1.2.2 Fixed income

The weights of the risk factors are quantitatively established through sensitivity analysis per risk factor, by adding 1 bp to each risk factor and analysing the respective risk factor's risk impact. The exposure to F/I options is negligible and this risk factor can be disregarded in the analysis.

2.2.1.2.3 Commodity

The weights of the risk factors are set to 1 for all risk factors on Commodities markets (including Seafood). This method is rationale based upon objective commodities relationships.

2.3 CCaR model conclusion

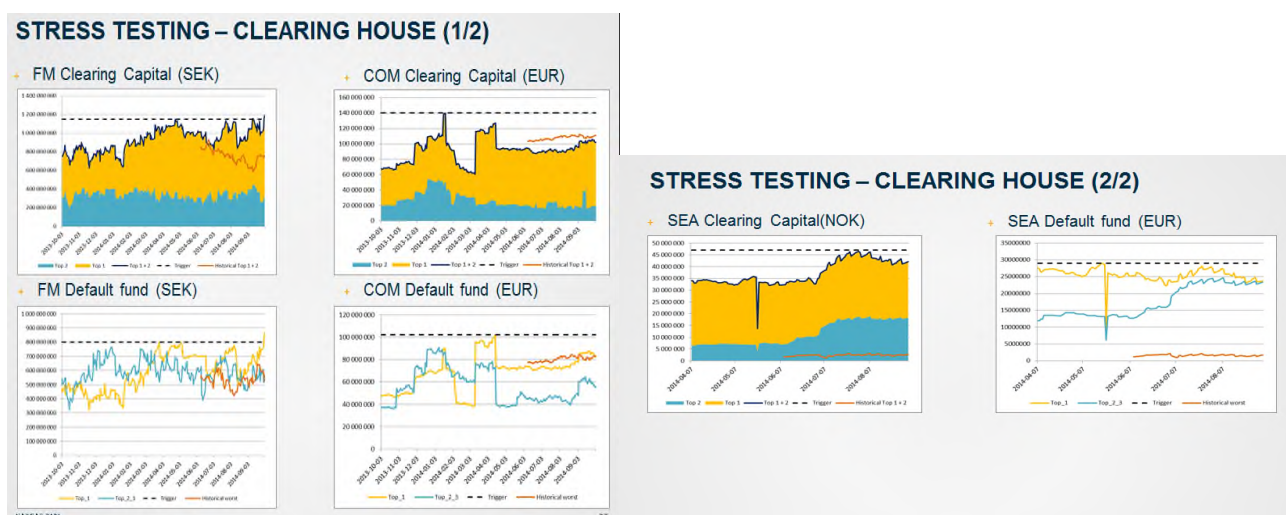
Model update conclusion

As the model update now includes a choice between the most severe output between historically simulated scenarios and EVT parallel correlation scenarios, the model approach is sufficiently constructed to evaluate stress scenarios that ensures the severest historical events are at minimum captured and some potentially more severe hypothetical forward looking scenarios are also considered.

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The charts below show analysis on the performance of the historical simulation since introduction in June 2014. The red line in the charts is the historical simulation that was introduced in June. For different stress events (-87 stock market crash, post Lehmann unrest, etc.) the worst outcome per day is plotted.

The hypothetical scenarios in the chart show higher losses than the historical scenarios in most cases, but for) the historical scenario is the worst for some days. You can also see that Financial Markets has more severity for hypothetical scenarios as compared to historical simulation. However, commodities markets show historical simulation can often produce more extreme scenarios. This impact is likely due to the underlying markets and less defined activity in the specific commodities markets which often show jump rather than diffusive pricing activity.



Concentration risk

As the testing focus on diversified positions within each overall product group, there can also be some concentration risks and the possibility of some factors becoming increasingly more material. Additional reporting and controls are in place to consider member concentration risks within markets or contracts as well as ongoing evaluating of assessment of other factors like implied volatility (embedded within is smile) significance in the current member portfolios.



Sensitivity Report
2014-10-16.pdf



OMXS30 sensitivity
testing to PWC.pptx

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Testing results conclusion

Testing on the Fixed Income, Equity and Power CCaR model output showed no new stress events since the last validation in autumn 2013. There were new examples of single stock where new individual contract severity boundaries were experienced beyond CCaR undiversified values. However, these average diversified portfolio positions demonstrate significantly more CCaR severity than experienced in the market over the last year for these 3 product groups. The stressed CCaR figures for these markets also identified no new stress or liquidity periods. The model test results for Seafood and freight also showed that CCaR output on the diversified portfolio representative of a large member was more severe than historic stress periods of sudden sales and high volatility. One seafood contract had relatively smaller amount of higher severity than history but the difference and the contract exposure is not be considered to be materially significant.

As the model update now includes a choice between the most severe output between historically simulated scenarios and EVT parallel correlation scenarios, the model approach is sufficiently constructed to evaluate stress scenarios that ensure the severest historical events are at minimum captured and some potentially more severe hypothetical forward looking scenarios are considered.

In particular the historical simulation model applied within CCaR, utilizes historical severe stress scenarios. These scenarios are applied to the 2 largest member portfolios to show the potential loss based upon this severe stress event in historic. This historical simulation method is based upon utilizing the most severe stress history observed in each market. The data history shows that the historical stress scenarios applied were the most severe based upon a diversified portfolio. Therefore, the historical simulation approach is sound. However, continual monitoring of the member portfolio compositions and factors that drive risk should continue to ensure the worst historically observed stress periods for each factor are incorporated.

The following summarizes the results:

- We ran the current portfolio to show simulated stress results for worst price movement days for each product market with sample portfolios
- The actual price change results for the example diversified portfolios observed over historical stress periods are lower than CCaR assumptions for fixed income, equities, seafood, freight and power
- If one of the largest members had a position in only one contract within a market, the hypothetical correlation scenario would not be relevant resulting in 99,9% EVT movement
- The likelihood of one of the largest members having very undiversified positions in 1 market is very low but concentrations are monitored and the margining has consideration for this
- Most material members and the CCP as a whole will have a well diversified portfolio
- Therefore, the CCaR correlation assumption when applied to 99,9% EVT distribution returns provides a more conservative result than history indicates (with typical and most likely large member positions with the exchange)

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- The historical simulation component captures the most severe stress periods identified for freight, equities, interest rate (fixed income)
- The power output now captures and includes the historic April 2006 allowances and power market crash stress scenario.
- The CCaR scenario output is conservative for the sample diversified portfolios as compared with the worst historical dates in the data history

The overall conclusion is the CCaR output and scenarios are more severe than historical stress dates given the members hold diversified positions with the exchange.

3 Testing Results: High Volatility, Sudden Sales and Extreme Illiquidity

3.1.1 CCaR Scenarios and Model Output.

The historical data was reviewed for stress dates for consistency of directional price movement between the various contracts. Analysis of extreme stress day price movement and price behavior within the product group portfolio was performed. In some cases, the sudden sales periods are already contained within the high volatility analysis as many high volatility stress periods are also sell-off events.

Please refer to back to section 2 for complimentary qualitative discussion support on the scenarios and model approach.

3.2 Extreme and Volatile Periods

The most extreme periods in the study periods were reviewed for all 5 product groups. The periods were selected by using the most severe price movement days for the sample portfolio groups since the last validation (September 30th 2013 to September 30th 2104). The dates identified in the previous validation as outliers were also used as a volatile stress dates. In this section, the 5 product market validation results for extreme and volatile periods are covered. The sudden sales periods were also captured in the volatile periods however a separate section conveys any additional messages as required.

We generally note that there were no new sudden sales periods or extremely volatile periods identified since the last model validation for the markets covered in the last validation as per the following:

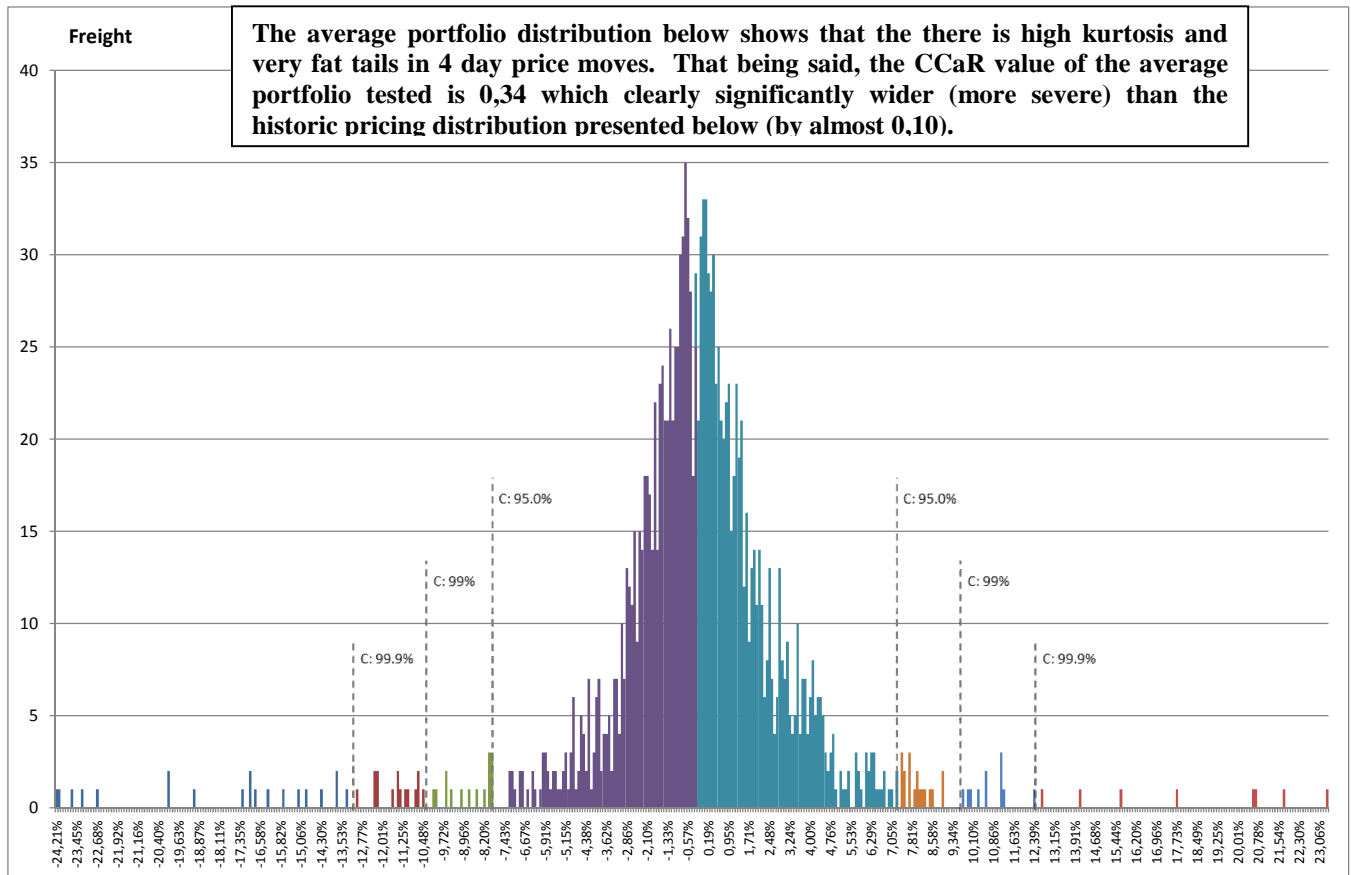
- Equities
- Interest rate (fixed income)
- Power

3.2.1.1 Freight

The initial results from displaying average tiers on Freight showed the CCaR model output fully captured the worst periods in history for the sample average weighted portfolios. Model output on each individual tier of contracts per market also showed that CCaR assumptions were significantly more severe than worst historic period for each market tier. It is worth noting that there are some pricing dynamics within the historic data. The underlying market and the trading market often have distinct time intervals between new price realization and trading activity. The secondary market has frequent occurrences of no daily volumes on specific contracts. However, there are daily, quarterly and monthly hedgers that put transactions on different durations that can create a parallel shift on the different futures

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durations with inactive underlyings as expected with commodity markets. The effect of the market activity is banded and high kurtosis price distributions. When we look at overall markets or destination results rather than specific contracts, there are generally good volumes all the time.



The chart below shows the individual average destination contract tiers 4 day price statistics and the average of the portfolio against CCaR boundaries for the same portfolio. As one can see each of the individual tier averages CCaR boundaries and the average CCaR portfolio boundary are comfortably more severe than historic maximum or minimum movement.

Freight										
	P3A	P2A	SPO380FOSS	RDM35FOSS	C7	C4	CS4TC	PM4TC	H56TC	5M6TC
Max	0,56	0,32	0,07	0,07	0,27	0,15	0,36	0,21	0,16	0,15
Min	-	0,41	-	0,08	-	0,19	-	0,32	-	0,25
CCaR Boundary	0,62	0,37	0,23	0,22	0,30	0,24	0,44	0,34	0,34	0,33
Average										0,23
St deviation	0,08	0,06	0,02	0,02	0,04	0,03	0,06	0,05	0,03	0,04
Kurtosis	7,82	6,63	1,89	1,77	9,94	8,57	5,07	6,45	20,18	9,59

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The chart below shows the distribution of price movement results in normal distribution percentile points and also a comparison of the EVT CCaR model boundary to 100% historic boundary. It's noted that there were no historic outliers beyond the CCaR value.

Freight					
	Entire distribution	Model assumption (Model 99,9 to 100%)	99,9% to 100%	99,2% to 99,9%	95% to 99,2%
Numerical range	-24,209% to 23,446%	-24,209% to -34,269% 34,269% to 23,446%	-24,209% to -12,970% 12,525% to 23,446%	-12,970% to -10,201% 9,756% to 12,525%	-10,201% to -7,815% 7,370% to 9,756%
Observations	1545	0 0	20 8	15 11	15 18
Average	-0,223%	- -	-18,059% 18,378%	-11,450% 10,799%	-8,696% 8,056%
Standard deviation	3,874%	- -	3,676% 3,637%	0,717% 0,720%	0,801% 0,482%
Kurtosis	9,959				
Skewness	-0,785				

The chart below shows that most volatile and sudden sales period results from the time series data for freight. The CCaR values were all more severe than the historic stress periods for highly volatile and sudden sales periods.

Worst 10: Freight									
DATE	P3A	P2A	C7	C4	CS4TC	PM4TC	HS6TC	SM6TC	Average
2009-06-01	0,388	0,315	0,272	0,120	0,281	0,209	0,086	0,073	0,218
2009-02-09	0,481	0,274	0,189	0,119	0,198	0,121	0,145	0,135	0,208
2009-02-06	0,562	0,264	0,172	0,154	0,252	0,160	0,163	0,148	0,234
2009-02-05	0,496	0,233	0,130	0,127	0,230	0,144	0,141	0,151	0,207
2008-10-13	-0,343	-0,286	-0,225	-0,146	-0,220	-0,166	-0,289	-0,135	-0,226
2008-10-10	-0,326	-0,276	-0,197	-0,182	-0,265	-0,223	-0,269	-0,200	-0,242
2008-10-09	-0,291	-0,256	-0,158	-0,165	-0,283	-0,250	-0,284	-0,240	-0,241
2008-09-26	-0,325	-0,302	-0,200	-0,166	-0,219	-0,211	-0,223	-0,215	-0,233
2008-09-25	-0,267	-0,254	-0,194	-0,192	-0,284	-0,255	-0,198	-0,244	-0,236
2008-09-24	-0,174	-0,187	-0,148	-0,166	-0,321	-0,264	-0,127	-0,212	-0,200

CCaR Boundary	0,620	0,366	0,304	0,242	0,442	0,339	0,342	0,330	0,343
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The worst historical stress periods from the Freight market were observed to be the following:

- October 2008 financial unrest

The CCaR historical simulation results capture the most severe period in October 2008.

Additionally, the CCaR hypothetical output severity is well beyond historical events when reviewing a diversified portfolio.

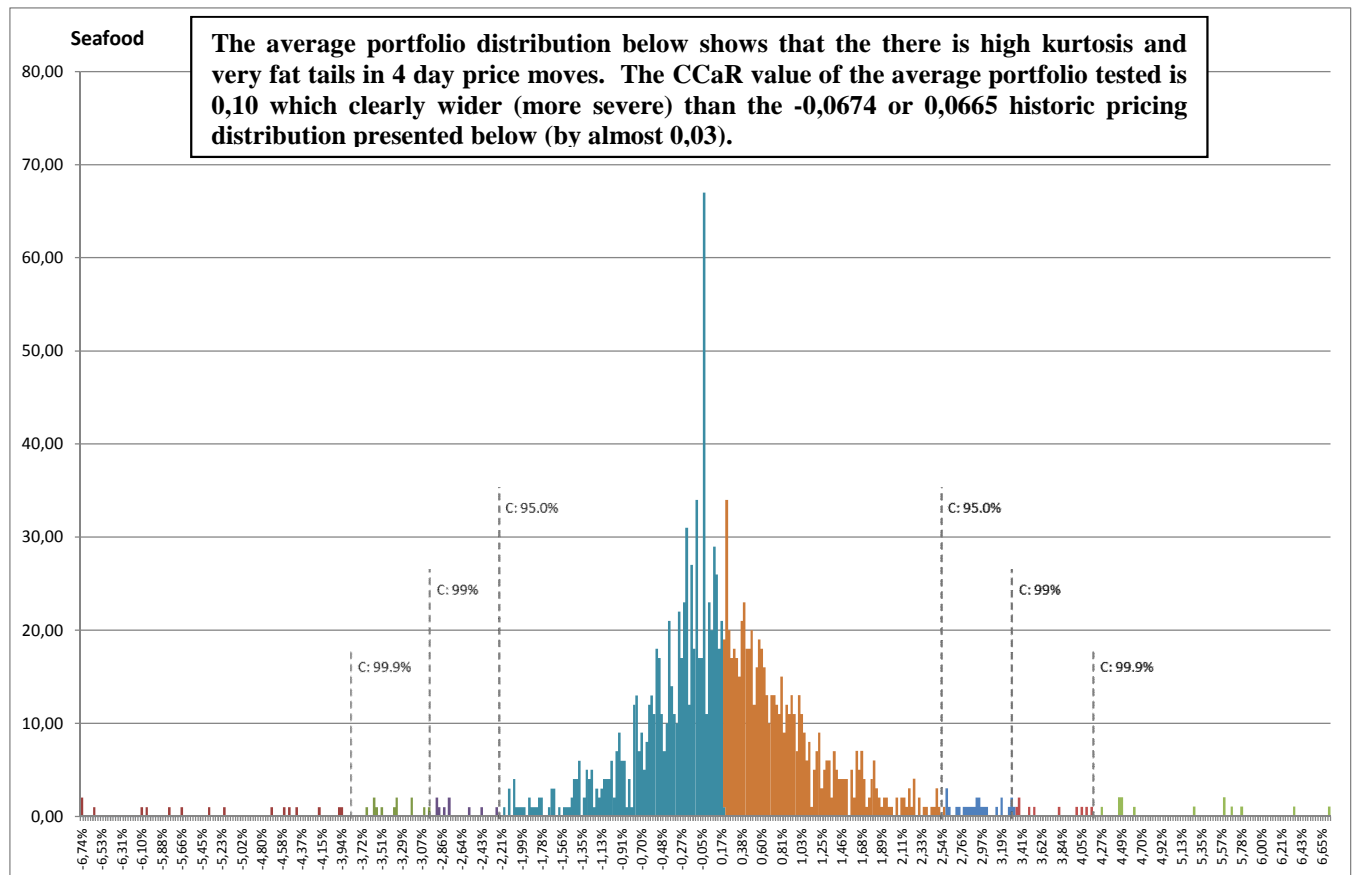
Author	Date	Version	Approved
Michael Georger, PricewaterhouseCoopers AB	2014-11-12	3.0	
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Validation of the CCaR Scenario 2014 Q3	2/Internal		15 (35)

The model soundly captures the most severe historic stress event in October 2008 and also projects more conservative hypothetical CCaR senario results.

3.2.1.2 Seafood

The test results displaying average seafood tiers price moves showed the CCaR model output fully captured the worst periods in history for the sample average weighted portfolio. Model output on each individual tier of contracts per market also showed that CCaR assumptions were more severe than worst historic period for each market tier with the exception of only 1 contract. This contract's CCaR value was less than 0,01 less severe than historic. Therefore the impact is immaterial and from time to time a single contract may exhibit a new extreme which is accordingly considered in the hypothetical model component.

As with freight, it is worth noting that there are some pricing dynamics within the historic data for seafood. The players in this market are often hedgers who prefer to roll monthly or quarterly hedges. The underlying market is quite large as relative to the small secondary cleared market for Nasdaq Clearing. The underlying market has distinct weekly time intervals between new price realization. The secondary market at Nasdaq Clearing often show zero clearing volumes. The price movement distributions exhibit high kurtosis, frequent zero price changes, and occasional parallel shifts of overall price across the seafood sector.



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The chart below shows the individual average destination contract tiers 4 day price statistics and the average of the portfolio against CCaR boundaries for the same portfolio. As you can see almost all of the individual tier averages CCaR boundaries and the average CCaR portfolio boundary are more severe than historic maximum or minimum movement.

Seafood																
	NN50m002	NN50m003	NN50m004	NN50m005	NN50m006	NN50m007	NN50m008	NN50m009	NN50m010	NN50m011	NN50m012	NN50m013	NN50m014	NN50m015	NN50m016	Average
Max	0,11	0,08	0,07	0,08	0,07	0,06	0,06	0,04	0,04	0,05	0,07	0,07	0,07	0,05	0,06	0,07
Min	- 0,15	- 0,10	- 0,11	- 0,10	- 0,08	- 0,09	- 0,07	- 0,06	- 0,07	- 0,07	- 0,07	- 0,07	- 0,07	- 0,07	- 0,07	- 0,07
CCaR Boundary	0,17	0,13	0,13	0,12	0,12	0,08	0,08	0,08	0,08	0,08	0,08	0,08	0,08	0,08	0,08	0,10
St deviation	0,03	0,02	0,02	0,02	0,01	0,01	0,01	0,01	0,01	0,01	0,01	0,01	0,01	0,01	0,01	0,01
Kurtosis	3,98	3,58	5,86	7,18	4,24	4,66	4,89	4,54	4,74	5,16	8,87	9,51	11,25	7,22	7,83	7,16

The chart below shows the distribution of price movement results in normal distribution percentile points and also a comparison of the EVT CCaR model boundary to 100% historic boundary. As with freight, it is noted that there were no historic seafood outliers beyond the CCaR value.

Seafood					
	Entire distribution	Model assumption (Model 99,9 to 100%)	99,9% to 100%	99,2% to 99,9%	95% to 99,2%
Numerical range	-6,745% to 6,753%	-6,745% to -9,939% 9,939% to 6,753%	-6,745% to -3,824% 4,211% to 6,753%	-3,824% to -2,951% 3,338% to 4,211%	-2,951% to -2,199% 2,586% to 3,338%
Observations	1525	0 0	16 0	12 0	9 25
Average	0,193%	- -	-5,271% 5,228%	-3,352% 3,742%	-2,693% 2,954%
Standard deviation	1,221%	- -	0,961% 0,779%	0,216% 0,319%	0,221% 0,226%
Kurtosis	7,162				
Skewness	-0,284				

The chart below shows that most volatile and sudden sales period results from the time series data for seafood. The CCaR values were all more severe than the historic stress periods for highly volatile and sudden sales periods.

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Michael Georger, PricewaterhouseCoopers AB	2014-11-12	3.0	
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Worst 10: Seafood																
DATE	m002	m003	m004	m005	m006	m007	m008	m009	m010	m011	m012	m013	m014	m015	m016	Average
2011-06-29	-0,12	-0,08	-0,11	-0,10	-0,08	-0,09	-0,04	-0,04	-0,04	-0,04	-0,04	-0,04	-0,04	-0,04	-0,04	-0,061
2011-06-27	-0,15	-0,08	-0,10	-0,06	-0,05	-0,05	-0,04	-0,04	-0,04	-0,04	-0,04	-0,04	-0,04	-0,04	-0,04	-0,058
2009-08-05	-0,09	-0,07	-0,04													-0,067
2009-08-04	-0,08	-0,05	-0,05													-0,060
2009-08-03	-0,09	-0,07	-0,04													-0,067
2009-05-29	-0,07	-0,08	-0,06	-0,08	-0,04											-0,066
2009-05-19	0,11	0,08	0,06	0,05	0,05											0,068
2009-05-18	0,11	0,07	0,05	0,04	0,05											0,064
2009-04-30	0,05	0,05	0,06	0,08	0,06	0,04										0,057
2009-04-24	0,09	0,05	0,06	0,05	0,05	0,05										0,058
CCaR Boundary	0,17	0,13	0,13	0,12	0,12	0,08	0,08	0,08	0,08	0,08	0,08	0,08	0,08	0,08	0,08	0,099

The worst historical stress period from the Freight market were observed to be the following:

- June 2011

The CCaR historical simulation results capture the period of June 2011.

Additionally, the CCaR hypothetical output severity is well beyond historical events when reviewing a diversified portfolio.

Overall, the model soundly captures the severe historic stress event in 2011 and also projects more conservative hypothetical CCaR senario results.

3.2.1.3 Power Contract Group

For the power contracts within the time period since the last validation, the price movement for the most extreme price movements in the study period over a 3 day time horizon were compared with the CCaR stress scenario assumptions. The CCaR stress scenario calculates risk over a 3 day time horizon as consistent with the lead day assumptions. Consequently, 3 day price volatilities are the most relevant measure to benchmark Power CCaR model results.

Since the last validation, an average price movement for sample Power portfolio that is based upon equal weightings for all the sample Power portfolio components was measured and is displayed in the table below.

The CCaR average assumption for price movement for the same portfolio was also measured as well as data on kurtosis and standard deviation of the different tiers.

As mentioned previously, the CCaR scenario uses the highest loss result from using a +1 or -1 correlation assumption.

The table below shows the most severe 3 day price movement periods identified in data history available for each Power contract in the Power group. It also shows an average result for an equally weighted portfolio (diversified positions). Additionally, it shows the CCaR model assumptions for each contract and the equally weighted portfolio with kurtosis and standard deviations for each tier.

As we note from above, the average diversified position CCaR results were clearly more severe than the max or min historic observation since September 30 2013. Therefore, the model is producing on an average diversified position more severe results than any time period since September 30 2013. We

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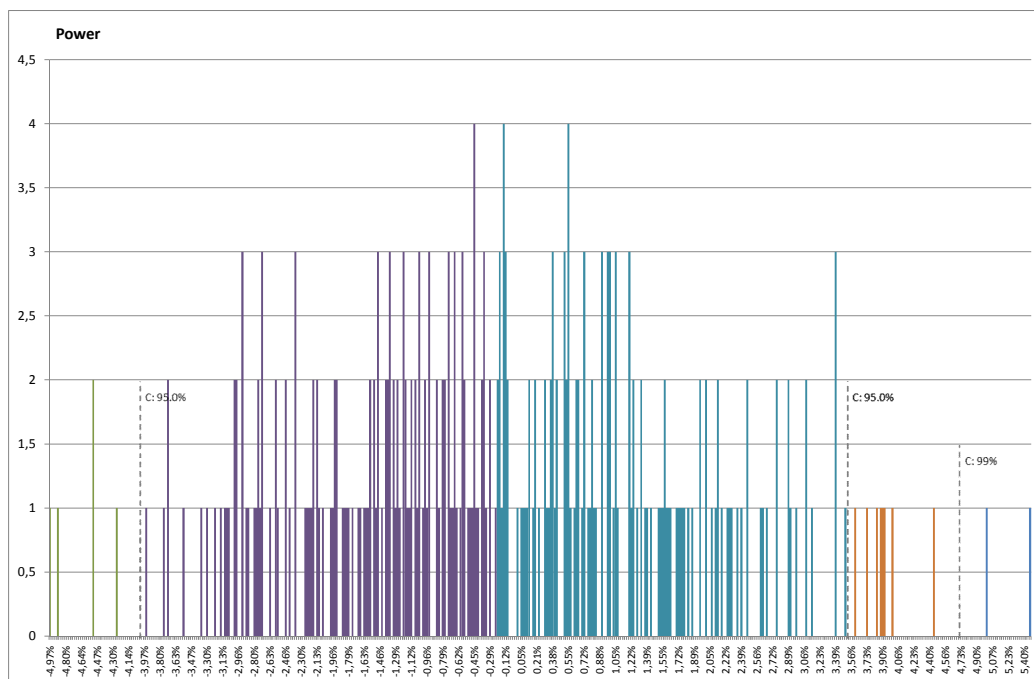
have previously identified volatile stress periods prior to September 30th 2013 in the prior validation. Therefore we can conclude the model is sufficiently covering more than the volatile historic events since the last validation and also in the prior validation.

The results of the prior validation and the annual update tests show the following:

- CCaR assumption were almost always more severe than historic extreme volatile and sudden sales periods in history and are at minimum the same level of severity as historic extreme observations
- There are no examples of individual contracts having more severe historical price movements than CCaR assumptions as with the quarterly contracts since the last validation
- We also note that the most severe historical price movements of each contracts do not occur on the same day in the time period reviewed (since sept 30th 2013)
- Therefore, there is less severe historical correlation than CCaR's scenario +1 or -1 assumption

Since the last validation, we have reviewed the CCaR model output for the now 3 day lead period for 3 day moves. These results show that the CCaR assumptions were more severe than the history represented from September 30th 2013 to September 2014. Please see the 3 day move statistics below on each power contract tier for mean, min, kurtosis and the distributions since the last validation.

	1002	1003	1004	1005	1006	1007	11002	11003	11004	11005	11006	11007	12002	12003	12004	12005	12006	12007	12008	12009	13002	13003	13004	13005	13006	Average
Since last validation																										
Max	0.12	0.23	0.16	0.14	0.12	0.10	0.12	0.09	0.10	0.10	0.09	0.07	0.08	0.10	0.05	0.04	0.04	0.03	0.04	0.03	0.04	0.03	0.03	0.03	0.03	0.05
Min	0.12	-0.14	-0.14	-0.12	-0.09	-0.09	-0.11	-0.09	-0.08	-0.07	-0.07	-0.08	-0.07	-0.07	-0.06	-0.04	-0.04	-0.04	-0.04	-0.04	-0.05	-0.03	-0.03	-0.03	-0.03	-0.05
CCAR Boundary	0.40	0.38	0.31	0.26	0.25	0.25	0.26	0.23	0.22	0.22	0.20	0.19	0.24	0.20	0.17	0.16	0.16	0.16	0.15	0.15	0.19	0.15	0.15	0.11	0.09	0.21
St deviation	0.03	0.05	0.04	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.02	0.02	0.03	0.02	0.02	0.01	0.01	0.01	0.01	0.01	0.02	0.01	0.01	0.01	0.01	0.02
Kurtosis	3.34	3.64	1.98	1.69	0.69	1.17	0.63	0.04	0.64	0.04	0.04	0.02	0.78	0.01	1.52	0.62	0.08	0.01	0.07	0.18	-0.10	-0.15	-0.13	0.38	0.45	1.32



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Michael Georger, PricewaterhouseCoopers AB	2014-11-12	3.0	
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As reported in the prior validation, there is one stress volatile period that is more severe than CCaR in 2006 as shown on the table on the left. However, since the last validation there are no new extreme stress periods. The distribution charts on the left below show the 3 day price move results since the last validation. The most extreme movements for all time periods including the last validation are in the chart on the right below

Please see the distribution results from the last validation on the 3 day movements. We also show the most volatile days in history which were based upon 4 day movements to be consistent with the prior validation. Please note that there were no new stress dates identified as illiquid, volatile or sudden sales since September 30th 2013 (date of the last validation data).

Power					
	Entire distribution	EVT assumption (Model 99,9 to 100%)	99,9% to 100%	99,2% to 99,9%	95% to 99,2%
Numerical range	-4,972% to 5,484%	-4,972% to -20,985% 20,985% to 5,484%	-4,972% to -6,525% 6,104% to 5,484%	-6,525% to -5,153% 4,732% to 6,104%	-5,153% to -3,972% 3,551% to 4,732%
Observations	300	0 0	0 0	0 2	5 8
Average	-0,210%	- -	- -	- 5,249%	-4,621% 3,921%
Standard deviation	1,919%	- -	- -	- 0,235%	0,263% 0,230%
Kurtosis	-0,161				
Skewness	0,193				
Top 10 most extreme movements since Sept 30 2013					
	1	2014-03-24	5,48%		
	2	2014-04-28	5,01%		
	3	2013-12-12	-4,97%		
	4	2014-01-29	-4,87%		
	5	2013-12-13	-4,51%		
	6	2014-06-03	-4,49%		
	7	2014-03-25	4,45%		
	8	2013-12-11	-4,26%		
	9	2014-01-08	4,00%		
	10	2014-01-02	-3,93%		

The worst historical stress period from the Power market was observed to be the following:

- April 2006 allowances and power market crash

The CCaR historical simulation results capture these periods.

The CCaR scenarios include or go beyond historical events as shown by testing a diversified portfolio.

The model soundly captures all other historic stress events and also projects conservative hypothetical results and in particular they were significantly more conservative as compared to the period between September 2013 and 2014.

Conclusion

As reported in the previous year, the most volatile periods in history are less severe than CCaR assumptions on the average sample portfolio. The data history since the prior validation implies no new volatile periods for CCaR. The CCaR hypothetical scenario provides a clearly more severe than

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observed correlations in history and historical simulation. Therefore, when considering the average sample portfolio, the CCaR is more severe than the most volatile price movement days in the sample history.

3.2.1.4 Equity Product Group

For the equity group within the time period since the last validation, the price movement for the most extreme price movements in the study period over a 2 day time horizon were compared with the CCaR stress scenario assumptions. The CCaR stress scenario calculates risk over a 2 day time horizon as consistent with the lead day assumptions. Consequently, 2 day price volatilities are the most relevant measure to benchmark Power CCaR model results.

The CCaR average assumption for price movement for the same portfolio was also measured as well as data on kurtosis and standard deviation of the different tiers.

As mentioned previously, the CCaR scenario uses the highest loss result from using a +1 or -1 correlation assumption.

The table below shows the most severe 2 day price movement periods identified in data history available for each equity contract in the equity group. It also shows an average result for an equally weighted portfolio (diversified positions). Additionally, it shows the CCAR model assumptions for each contract and the equally weighted portfolio with kurtosis and standard deviations for each tier.

Since the last validation, an average price movement for sample equity portfolio that is based upon equal weightings for all the sample equity portfolio components was measured and is displayed in the table below.

	ABB	ALFA	AZN	CARLB	DANSKE	ELXIB	ERICB	HMB	HUSQB	NDA	NOKIA	OMXC0	OMXC30	SCAB	SKAB	TLSN	VOLVB	Average
Max	0,05	0,08	0,13	0,08	0,08	0,13	0,09	0,04	0,12	0,05	0,13	0,04	0,03	0,09	0,05	0,07	0,06	0,03
Min	- 0,07	- 0,06	- 0,10	- 0,05	- 0,04	- 0,11	- 0,07	- 0,06	- 0,13	- 0,04	- 0,12	- 0,03	- 0,03	- 0,06	- 0,05	- 0,08	- 0,11	- 0,03
CCaR Boundary	0,27	0,20	0,13	0,15	0,19	0,18	0,22	0,16	0,15	0,17	0,22	0,09	0,13	0,15	0,17	0,17	0,15	0,17
St deviation	0,02	0,02	0,02	0,02	0,02	0,02	0,02	0,02	0,02	0,02	0,03	0,01	0,01	0,02	0,01	0,02	0,02	0,02
Kurtosis	3,55	2,50	9,71	1,51	2,19	6,56	4,45	1,90	6,98	0,08	3,77	0,68	0,07	6,33	0,72	6,49	3,65	3,60

The CCaR average assumption for price movement for the same portfolio was also measured.

As mentioned previously, the CCaR scenario uses the highest loss result from using either a +1 or -1 correlation assumption.

The table below shows the most volatile price days identified in data history available for each equity or equity index contract in the equity product group. It also shows an average result for an equally weighted portfolio of all the contracts in the equity sample portfolio. Additionally, it shows the CCAR model assumptions for each contract and the equally weighted portfolio.

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Michael Georger, PricewaterhouseCoopers AB	2014-11-12	3.0	
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Most Volatility: Outliers plus Selected Extreme Events: 2 Day Yield Change																			
Date	ABB	ALFA	AZN	CARLB	DANSKE	ELUXB	ERICB	HMB	HUSQB	NDA	NOKIA	OMXC20	OMXS30	SCAB	SKAB	TLN	VOLVB	Average	
1982-11-16								0,14									0,09	0,12	
1987-10-20				-0,07			-0,13	-0,09						-0,12			-0,11	-0,11	
1987-10-29				-0,09			-0,09							-0,13			-0,12	-0,10	
1987-11-13				0,02			0,10	0,00						0,13			0,13	0,10	
1990-10-02				0,02	0,03	0,09	0,19	0,04						0,13	0,16	0,14	0,07	0,10	
1991-01-17				0,06		0,09	0,10	0,12						0,09	0,13	0,09	0,05	0,09	
1992-11-20				-0,02	-0,05	0,18	0,25	-0,01			0,10			0,15	0,30	0,09	0,21	0,12	
1992-11-23				-0,05	-0,03	0,09	0,22	-0,05			0,07			0,13	0,19	0,09	0,13	0,08	
1998-10-12				0,08	-0,01	0,15	0,31	0,23		0,08	0,20	0,03	0,16	0,12	0,17		0,11	0,13	
2002-07-24	-0,28	-0,09	-0,03	-0,07	-0,08	-0,05	-0,15	-0,08		-0,08	-0,12	-0,08	-0,08	-0,06	-0,10	-0,15	-0,04	-0,10	
2002-10-11	0,21	0,09	0,03	-0,01	0,09	0,12	0,22	0,08		0,15	0,09	0,04	0,10	0,07	0,13	0,08	0,05	0,10	
2008-10-07	-0,13	-0,12	-0,04	-0,05	-0,23	-0,08	-0,09	-0,05	-0,09	-0,17	-0,03	-0,12	-0,09	-0,06	-0,08	-0,09	-0,09	-0,09	
2008-10-14	0,17	0,00	0,12	0,02	0,26	0,07	0,10	0,07	0,13	0,09	0,11	0,13	0,10	0,06	0,12	0,10	0,14	0,11	
2008-10-16	-0,12	-0,13	0,00	-0,15	-0,10	-0,16	-0,03	-0,04	-0,10	-0,06	-0,10	-0,10	-0,09	-0,10	-0,12	-0,04	-0,15	-0,09	
2008-10-30	0,13	0,16	0,05	0,28	0,06	0,18	0,05	0,06	0,14	0,09	0,08	0,12	0,11	0,11	0,20	0,06	0,13	0,12	
2008-11-04	0,12	0,23	0,05	0,12	0,11	0,11	0,12	0,07	0,03	0,14	0,07	0,10	0,12	0,14	0,12	0,13	0,17	0,12	
2008-11-25	0,17	0,17	0,03	0,02	0,13	0,11	0,14	0,17	0,12	0,10	0,06	0,08	0,12	0,15	0,14	0,04	0,13	0,11	
2008-12-09	0,15	0,16	0,04	0,11	0,07	0,16	0,12	0,11	0,18	0,20	0,10	0,08	0,13	0,09	0,23	0,09	0,16	0,13	
2009-03-11	0,09	0,06	-0,03	0,12	0,19	0,06	0,03	0,02	0,22	0,23	0,10	0,05	0,08	0,10	0,08	0,07	0,19	0,10	
CCaR Assumption	0,27	0,20	0,13	0,15	0,19	0,18	0,22	0,16	0,15	0,17	0,22	0,09	0,13	0,15	0,17	0,17	0,15	0,17	

The results of the equity product tests show the following:

- There were no new extreme events since the prior validation
- One minor observation is that a stock, AZN, was noted as having more extreme movement than CCaR assumptions since the last validation. This stock is only one component of the sample portfolio and the historic severity difference is rather small. The overall model is performing and any concentration on this stock is actively monitored.
- Concentration reporting provides significantly large positions such as single and margining requirements will expand for any large member taking a concentrated position in this stock
- All volatile price days identified in the historical study period were less severe on the average portfolio than the CCaR assumption
- The worst historical price movements of each of contracts in the sample portfolio do not occur on the same day
- The CCaR model results are more severe than and historical observations

We conclude that the equity product group is sufficiently covered by the output of the CCaR as compared to historical events.

The table below remains unchanged from the last validation to show that all outlier extreme events are covered by the CCaR sample portfolio output. Additionally we show the distribution of the 2 day price movements on the sample portfolios since the last validation. These clearly show lower price movements and no new volatile outliers.

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Michael Georger, PricewaterhouseCoopers AB	2014-11-12	3.0	
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Most Volatility: Outliers plus Selected Extreme Events: 2 Day Price Change Summary		
Date	Average	Average CCaR
1982-11-16	0,12	0,17
1987-10-20	- 0,11	0,17
1987-10-29	- 0,10	0,17
1987-11-13	0,10	0,17
1990-10-02	0,10	0,17
1991-01-17	0,09	0,17
1992-11-20	0,12	0,17
1992-11-23	0,08	0,17
1998-10-12	0,13	0,17
2002-07-24	- 0,10	0,17
2002-10-11	0,10	0,17
2008-10-07	- 0,09	0,17
2008-10-14	0,11	0,17
2008-10-16	- 0,09	0,17
2008-10-30	0,12	0,17
2008-11-04	0,12	0,17
2008-11-25	0,11	0,17
2008-12-09	0,13	0,17
2009-03-11	0,10	0,17

The chart table below shows the 2 day price moves for the sample since the last validation. As you can see the most extreme days are significantly lower than prior data history.

Equity				
Entire distribution	assumption (Model EVT 99,9 to 100%)	99,9% to 100%	99,2% to 99,9%	95% to 99,2%
-2,967% to 2,870%	-2,967% to -17,000% 17,000% to 2,870%	-2,967% to -3,081% 3,270% to 2,870%	-3,081% to -2,392% 2,580% to 3,270%	-2,392% to -1,797% 1,986% to 2,580%
249	0 0	0 0	2 0	5 6
0,094%	- -	- -	-2,708% 2,744%	-1,968% 2,135%
0,965%	- -	- -	0,259% 0,126%	0,079% 0,122%
0,165				
-0,071				
Top 10 most extreme movements since last validation				
1	2014-01-24	-2,97%		
2	2013-12-19	2,87%		
3	2013-12-20	2,62%		
4	2014-08-01	-2,45%		
5	2014-02-06	2,30%		
6	2014-04-22	2,27%		
7	2013-10-11	2,16%		
8	2014-02-07	2,11%		
9	2013-12-04	-2,10%		
10	2014-03-26	1,99%		

The worst historical stress periods from the Equity market were observed to be the following:

- 2008 last quarter (a little into 2009) the post Lehmans unrest
- 1987 stock market crash

Its already noted that there were no new stress events since September 30th 2013.

The CCaR historical simulation results capture the severest stress period scenarios noted above in 2008, the post Lehmans unrest. Therefore, the method is sound based upon the most severe period is captured. The 1987 stock market crash scenario is also captured. The CCaR hypothetical scenarios go beyond historical events when reviewing a diversified portfolio.

Therefore, the model soundly captures historic stress events and also generally projects more conservative hypothetical results of 17%.

Conclusion

The most volatile periods in the historical study period are less severe than CCaR assumptions on the average sample equity portfolio. The correlation assumption is clearly more severe than observed correlations in history. Therefore when considering the average sample portfolio, the CCaR scenario is

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more severe than the most volatile price movement days in the sample history by at least 3% in all history and more than 14% as compared to history since the last validation.

3.2.1.5 Interest Rate Product Group

For the interest rate group within the time period since the last validation, the price movement for the most extreme price movements in the study period over a 2 day time horizon were compared with the CCaR stress scenario assumptions. The CCaR stress scenario calculates risk over a 2 day time horizon as consistent with the lead day assumptions. Consequently, 2 day price volatilities are the most relevant measure to benchmark interest rate CCaR model results.

The CCaR average assumption for price movement for the same portfolio was also measured as well as data on kurtosis and standard deviation of the different tiers.

As mentioned previously, the CCaR scenario uses the highest loss result from using a +1 or -1 correlation assumption.

The table below shows the most severe 2 day price movement periods identified in data history available for each interest rate contract in the interest rate group sample. It also shows an average result for an equally weighted portfolio (diversified positions). Additionally, it shows the CCAR model assumptions for each contract and the equally weighted portfolio with kurtosis and standard deviations.

Since the last validation, an average price movement for sample equity portfolio that is based upon equal weightings for all the sample interest rate portfolio components was measured and is displayed in the table below.

Fixed Income						
	GOVT 10Y	GOVT 2Y	GOVT 5Y	2Y Covered	STIBOR 3M	Average
Max	0,17	0,12	0,25	0,06	0,10	0,08
Min	- 0,11	- 0,14	- 0,16	- 0,18	- 0,23	- 0,11
St deviation	0,05	0,05	0,04	0,03	0,04	0,03
Kurtosis	0,69	0,16	10,63	14,44	5,63	0,49
CCaR Boundary	0,39	0,44	0,40	0,47	0,43	0,43

The CCaR average assumption for price movement for the same portfolio was also measured.

As mentioned previously, the CCaR scenario uses the highest loss result from using either a +1 or -1 correlation assumption.

The table below shows the most volatile price days identified in data history available for each interest rate product group. It also shows an average result for an equally weighted portfolio of all the contracts in the interest rate product portfolio. Additionally, it shows the CCAR model assumptions for each contract and the equally weighted portfolio. Since the last validation, interest rate volatility has been relatively low and there are no new identified extremely volatile periods.

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Most Volatility: 1 Outlier plus Selected Extreme Events: 2 Day Yield Change						
Stress Date End	GOVT 10Y	GOVT 2Y	GOVT 5Y	2Y Covered	STIBOR 3M	Average
1995-03-06	0,43	0,39	0,42		0,34	0,40
1995-03-07	0,42	0,40	0,44		0,40	0,42
1995-09-22	0,48	0,31	0,42		0,07	0,32
1996-02-06	0,44	0,53	0,53		0,01	0,38
1998-08-25	0,30	0,19	0,29	0,37	0,13	0,25
2008-10-23	- 0,15	- 0,24	- 0,22	- 0,26	- 0,49	- 0,27
2008-10-24	- 0,18	- 0,39	- 0,33	- 0,40	- 0,47	- 0,36
2008-12-04	- 0,13	- 0,10	- 0,12	- 0,35	- 1,17	- 0,37
2008-12-05	- 0,06	- 0,02	- 0,06	- 0,25	- 1,02	- 0,28
2009-02-11	- 0,18	- 0,31	- 0,23	- 0,45	- 0,63	- 0,36
2009-02-12	- 0,11	- 0,24	- 0,15	- 0,38	- 0,63	- 0,30
2009-12-11	0,08	1,38	0,42	0,05	-	0,39
2009-12-14	0,05	1,32	0,38	0,02	-	0,35

CCaR Assumption	0,41	0,46	0,46	0,47	0,41	0,44
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The results of the test show the following:

- All volatile price days identified in the full historical study period were less severe on the average portfolio than the CCaR yield change assumption of 0,43 (0,44 per the previous validation)
- Since the last validation, the maximum movement has been 0,11 or less which is significantly lower than prior historical periods
- We conclude there are no updates to extremely volatile periods and the CCaR model output is significantly more severe than history since the last validation
- From prior validation history, there are some examples of individual contracts having more severe historical price movements than CCaR assumptions
- However, the worst historical price movements of each contract do not occur on the same day
- Therefore, there is less severe historical correlation than CCaR scenario's assumption of +1 or -1

Please see the prior validations chart of volatile outliers against the current CCaR assumptions and the statistical distribution results from September 30th 2013 to September 30th 2014.

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Most Volatility: Selected Extreme Events: 2 Day Yield Change Summary				FI				
Stress Date End	Stress Date Average	Average CCaR	Amount CCaR more extreme than stress	Entire distribution	assumption (Model EVT 99,9 to 100%)	99,9% to 100%	99,2% to 99,9%	95% to 99,2%
1995-03-06	0,395	0,43	0,035	-11,180% to 8,172%	-11,180% to -43,000% 43,000% to 8,172%	-11,180% to -10,910% 9,417% to 8,172%	-10,910% to -8,702% 7,210% to 9,417%	-8,702% to -6,800% 5,307% to 7,210%
1995-03-07	0,415	0,43	0,015	260	0	1	2	1
1995-09-22	0,320	0,43	0,110	0	0	0	0	11
1996-02-06	0,378	0,43	0,053	-0,746%	-	-11,180%	-9,499%	-8,185%
1998-08-25	0,253	0,43	0,177	3,089%	-	0,000%	0,283%	6,220%
2008-10-23	- 0,273	0,43	0,703	0,562	-	-	0,000%	0,513%
2008-10-24	- 0,355	0,43	0,785	0,123	-	-	-	-
2008-12-04	- 0,373	0,43	0,803	Top 10 most extreme movements				
2008-12-05	- 0,279	0,43	0,709	1	2014-07-04	-11,18%		
2009-02-11	- 0,361	0,43	0,791	2	2014-04-11	-9,78%		
2009-02-12	- 0,303	0,43	0,733	3	2013-11-13	-9,22%		
2009-12-11	0,386	0,43	0,044	4	2014-02-19	-8,19%		
2009-12-14	0,352	0,43	0,078	5	2013-12-11	8,17%		
				6	2013-12-19	7,04%		
				7	2013-12-02	7,03%		
				8	2014-03-20	6,68%		
				9	2013-11-22	6,67%		
				10	2014-04-10	-6,30%		

The worst historical stress periods from the interest rate market were recognized as:

- March 1995
- 2008 to 2009 Post Lehman's unrest

The CCaR historical simulation results capture beyond the stress events applied on the sample portfolio for stress periods in March 1995 and 2008-2009.

The CCaR hypothetical scenarios go beyond historical events when reviewing a diversified portfolio as you can see from the chart above on the left.

Therefore, the model soundly captures historic stress events and also projects conservative hypothetical results on the sample diversified portfolio.

Conclusion

The most volatile periods in the interest rate product historical study period are less severe than CCaR assumptions on the average sample portfolio. The correlation assumption is clearly more severe than observed correlations in the study period history. Due to the correlation assumption when considering the average sample portfolio, the CCaR scenario is more severe than the most volatile price movement days in the sample history by at least 0,015 and by a massive 0,32 for the period since the last validation.

3.3 Sudden Sales Periods

For sudden sales, we identified sudden sales periods as the most severe price falling dates as they typically signify a significant excess of sellers in the market.

3.3.1 Freight

For freight, sudden sales periods have been incorporated into the extreme volatility analysis as this section incorporates the most severe price decline periods. The same holds for seafood. As concluded

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in the extreme volatility section, the model effectively incorporates sudden sales events for freight in the overall CCaR results.

3.3.2 Seafood

For seafood, sudden sales periods have been incorporated into the extreme volatility analysis as this section incorporates the most severe price decline periods. As concluded in the extreme volatility section, the model effectively incorporates sudden sales events for seafood in the overall CCaR results. However, the historical simulation component could consider adding a 2009 stress scenario as previously discussed.

3.3.3 Power Contract Group

For sudden sales, we reviewed the severest 3 day negative price movements in for the latest historical study period September 30th 2013 to September 30th 2014.

The prior validation shows the table below of the results of the most severe negative price movement periods over all history prior to September 30th 2013.

Sell Off Analysis: 4 Day percent change		
Date	4 Day % change	Volume 4
2006-04-28	-0,15	561 205,93
2006-05-03	-0,19	557 961,47
2006-05-04	-0,19	556 510,06
2008-12-12	-0,14	852 321,71
2009-03-23	-0,12	878 600,61
2010-04-09	-0,13	816 162,77
2010-04-12	-0,14	811 281,20
2010-04-13	-0,12	813 921,56
2011-02-15	-0,13	797 570,78
2011-02-16	-0,19	800 051,98
2011-02-17	-0,16	801 924,82

The lead days have been changed since the last validation from 4 to 3 days in the model. The current test results show that the CCaR model assumption of 17% is more than 11% more severe than the worst date we could identify as a sudden sales date (6%). One should note that the 4 lead day CCaR model assumption from the prior validation portfolio sample was 23%.

Our conclusion is that the CCaR stress scenarios cover the sudden sales period price movements in the history period since our last validation and no new sudden sales periods have been identified.

3.3.4 Equity Product Group

For sudden equity sales, we reviewed the severest 2 day negative price movements since the last validation of September 30th 2013.

The table below shows the results of the most severe negative price movement periods from the prior validation:

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Sell Off Analysis: 2 Day Yield Change																		
Date	ABB	ALFA	AZN	CARLB	DANSKE	ELUXB	ERICB	HMB	HUSQB	NDA	NOKIA	OMXC20	OMXS30	SCAB	SKAB	TLSN	VOLVB	Average
1987-10-20				-0,07			-0,13	-0,09					-0,12				-0,11	-0,11
1987-10-29				-0,09			-0,09						-0,13				-0,12	-0,10
1987-11-10				-0,02			-0,10	-0,03					-0,11				-0,14	-0,08
1992-10-05				-0,03	-0,02	-0,11	-0,11	-0,10			-0,02		-0,09	-0,11	-0,10		-0,13	-0,08
1998-10-08				-0,08	-0,07	-0,06	-0,10	-0,10		-0,07	-0,18	-0,05	-0,09	-0,09	-0,07		-0,08	-0,08
2001-03-12	-0,03		0,03	-0,01	-0,01	0,02	-0,26	-0,04		-0,03	-0,11	-0,02	-0,09	0,01	-0,00	-0,05	-0,01	-0,04
2008-10-07	-0,13	-0,12	-0,04	-0,05	-0,23	-0,08	-0,09	-0,05	-0,09	-0,17	-0,03	-0,12	-0,09	-0,06	-0,08	-0,09	-0,09	-0,09
2008-10-16	-0,12	-0,13	-0,00	-0,15	-0,10	-0,16	-0,03	-0,04	-0,10	-0,06	-0,10	-0,10	-0,09	-0,10	-0,12	-0,04	-0,15	-0,09
2008-10-27	-0,08	-0,08	-0,01	-0,15	-0,15	-0,02	-0,03	-0,07	0,03	-0,14	-0,03	-0,10	-0,09	-0,05	-0,10	-0,08	-0,19	-0,08
CCaR Assumption	0,27	0,20	0,13	0,15	0,19	0,18	0,22	0,16	0,15	0,17	0,22	0,09	0,13	0,15	0,17	0,17	0,15	0,17

The test results show that the equity CCaR model assumption of 17% is still more than 6% more severe than the worst date we could identify as a sudden sales date for our portfolio as no new sudden sales periods being identified between September 30th 2013 to September 30th 2014. The most severe downward price movement 2 day period was less than 3% over this period.

Our conclusion is that the CCaR stress scenarios cover the sudden sales period price movements in the study period history that includes the period since the last validation.

3.3.5 Interest Rate Group

For sudden sales in the interest rate product group, we reviewed the severest 2 day negative price movements in our historical study period.

The table below shows the results of the most severe negative price movement periods:

Sell Off Analysis: 2 Day Yield Change						
Stress Date End	GOVT 10Y	GOVT 2Y	GOVT 5Y	2Y Covered	STIBOR 3M	Average
1995-01-10	0,39	0,27	0,34		0,16	0,29
1995-03-06	0,43	0,39	0,42		0,34	0,40
1995-03-07	0,42	0,40	0,44		0,40	0,42
1995-03-29	0,33	0,30	0,32		0,22	0,29
1995-09-22	0,48	0,31	0,42		0,07	0,32
1996-02-06	0,44	0,53	0,53		0,01	0,38
1997-03-18	0,39	0,29	0,38		0,09	0,29
1998-08-25	0,30	0,19	0,29	0,37	0,13	0,25
2000-01-03	0,20	0,50	0,27	0,17	0,03	0,23
2001-12-06	0,27	0,25	0,33	0,26	0,04	0,23
2009-12-11	0,08	1,38	0,42	0,05	-	0,39
2009-12-14	0,05	1,32	0,38	0,02	-	0,35

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The test results show that the equity CCaR model assumption of 0,43 is still more than 0,02% more severe than the worst date we could identify as a sudden sales date for our portfolio and also 0,32 than the period since the last validation.

Our conclusion is that the CCaR stress scenarios covers the sudden sales period price movements in the study period history and since the last validation.

3.4 Illiquid Periods

For illiquid periods, we selected the historical date with zero or very low volumes of trading relative to other trading days in the study period.

3.4.1 Freight

The freight market has exhibited significant volumes over time when the entire market is analyzed amongst the tiers. However, the market has liquidity issues from time to time given the nature. As a result, we have investigated the liquidation close out procedures to evaluate the risk of illiquid market effects on the freight CCaR output.

Liquidity in freight, the underlying and overall markets appear to have significant volumes. So, considering an illiquid market for these items in history, there are some occurrences of illiquidity. As in all freight markets there may not be ample volumes in the Nasdaq Clearing market to close out a position. Therefore, this market should look at the underlying arrangement to liquidate or stop loss on member positions if a default event occurs.

The result of the review of the illiquid market effects on CCaR output is none as the close out procedures adequately assess and qualitatively address key price movement risks from an illiquid Nasdaq Clearing freight market.

To consider the illiquid periods the scorecard for setting the liquidation and commodities close out procedures were reviewed and these procedures are embedded within the seafood section of the paper 3.4.2 A scorecard approach is used to determine the amount of lead days or liquidation days for a potential defaulted position to be closed and subsequent time period for P&L changes to be stopped. Since the secondary markets are not always liquid for both seafood and freight, we can review the close out plans and assumptions embedded to evaluate the sufficiency of the liquidation capability and assumptions for a counterparty default scenario. It should be mentioned that there are other freight clearinghouses with ample volume and the volumes in the overall freight market have shown significant volumes overall.

It is noted that the other factors that could be incorporated and monitored are:

- The size of Nasdaq Clearing largest member positions relative to the overall secondary market (at Nasdaq Clearing and elsewhere) and the overall underlying market
- The size of the overall Nasdaq Clearing secondary market to the overall size of the underlying market

The capacity of the broker and close out member's ability to handle the size of the largest members positions are tested in the fire drill exercises. Potential price discounts are also discovered as part of the drill.

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The most significant suggestion could be a factor around the size of the underlying market as compared to the positions of the largest members at Nasdaq Clearing in freight or seafood.

The factors in considering management of illiquid periods and a potential default action have been reviewed and presented in the following table:

Principle	Assessment	Comments
Are pricing uncertainties considered and adequately captured?	Daily pricing capabilities are considered as well as duration implications	Discounts are understood via fire drill exercises
Contractual features or complexities on difficulty to price are considered	There is some evaluation on complexity and features.	
Is there an assessment of market concentration to understand diversification and ease of liquidation	Market concentration is considered	
Is the transparency of price and order book considered?	Transparency of price is explicitly covered	
Is leverage factored in?	Margin leverage and churn rate are considered	
Is the overall length of time to hedge out / immunize the risk	A qualitative assumption is in place	Continue to monitor the market changes for hedge periods / close out assumption Tested in fire-drills
Is the close out price arranged or it negotiated, do we have close out arrangements, order books	Loose arrangement about a fair price however there are formal close out agreements	
Do we assess the size of our book or our member positions	Informally, there is an understanding of significance	Continue to monitor size of member positions to the overall underlying and secondary markets

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3.4.2 Seafood

As with freight, the seafood market has liquidity issues given the nature and frequency of the activity. As a result, we have investigated the liquidation close out procedures to evaluate the risk of illiquid market effects on the seafood CCaR output.

Seafood instruments are traded at the Fish Pool exchange. Should Nasdaq Clearing need to close positions in a case of default, there are members who support Nasdaq Clearing in closing out the positions. Nasdaq Clearing also has an agreement with Fish Pool, stating that Fish Pool shall assist in case of a default. When handling defaults in larger portfolios the market support desk at Fish Pool can also act as a broker for Nasdaq Clearing in the market.

The current positions in seafood at the CCP are rather small in comparison to the much larger underlying markets for salmon. Therefore, one can envisage that two defaults on the Nasdaq Clearing markets would most likely not have issues with finding liquidity to close out. It is recommended that the size of the underlying market and the ability of the brokers and close out members be monitored with respect to the positions at Nasdaq Clearing.

It is noted that currently the overall Nasdaq Clearing market is less than 5% of the underlying seafood market which seems to indicate that liquidation of Nasdaq Clearing positions is entirely possible if the price is effective.

The commodity market details about commodity liquidation procedures and scorecards can be found in the following attachments:



88510_default-strat
egy-commodity-deriv



Margin main model
calibration scorecard

The overall results for the qualitative review of ability to handle illiquidity per an illiquid market are summarized in the table below:

Principle	Assessment	Comments
Are pricing uncertainties considered and adequately captured?	Daily pricing capabilities are considered as well as duration implications	Discounts are understood during the fire drills
Contractual features or complexities on difficulty to price are considered	There is some evaluation on complexity and features.	
Is there an assessment of market concentration to understand diversification and ease of liquidation	Market concentration is considered	
Is the transparency of price and order book considered?	Yes, these are considered	
Is leverage factored in?	Margin leverage and churn rate are considered	
Is the overall length of time to hedge	A qualitative assumption is in place	Continue to monitor market

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out / immunize the risk		changes
		Tested in fire-drills
Is the close out price arranged or it negotiated, do we have close out arrangements, order books	Loose arrangement about a fair price however there are formal close out agreements	
Do we assess the size of our book or our member positions to the overall market	Informally, there is an understanding of significance	

Again, it is noted that the other factors that could be incorporated and monitored are:

- The size of Nasdaq Clearing's largest member positions relative to the overall secondary market (at Nasdaq Clearing and elsewhere) and the overall underlying market
- The size of the overall Nasdaq Clearing's secondary market to the overall size of the underlying market

As with freight, the capacity of the broker and close out members and the discount required to handle the size of the largest member's positions is tested in the fire drill exercises.

3.4.3 Power Contract Group

There are no new illiquid periods identified for Power since the last validation. Therefore, the findings are the same as per the last validation.

There are no illiquid periods that show any significant extreme price change. All of the illiquid dates identified, showed lower price changes as compared to the CCaR scenario assumption of 17%.

The conclusion still remains as per the prior validation that the CCaR stress scenarios are more conservative than any of the illiquid dates identified.

In summary, the period between September 30th 2013 and September 30th 2014 was reviewed for illiquid periods and no new significant low volume days were identified for the Power market as volumes were all greater than the prior period's illiquid stress dates.

3.4.4 Equity Product Group

Since the last validation, the equity sample has shown significantly higher volumes than the illiquid dates identified in the prior validation periods. The table below shows the price movements of relative low volume historical dates and there are no new identified illiquid periods.

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Date	Volume	OMXS30 2 day return
2006-06-16	444	1,12%
1997-08-05	6674	0,29%
1998-04-09	7074	0,26%
1994-12-23	7205	0,45%
1998-01-02	7276	1,99%
1996-07-02	7348	0,60%
1997-05-07	7353	0,13%
1998-02-16	7761	1,43%
1996-05-28	7780	-0,88%
1997-07-29	7920	-1,02%

As per the prior validation, none of these dates identified as low volume dates show any significant extreme price change.

All of the illiquid dates identified, showed considerably lower price changes compared to the CCaR scenario assumptions.

The conclusion is still that the CCaR stress scenarios are more conservative than any of the illiquid dates identified in the study period.

3.4.5 Interest Rate Group

Since the last validation, no new illiquid periods have been identified as the overall sample portfolio has exhibited sufficient volume from September 30th 2013 to September 30th 2014. The table below shows the price movements of relative low volume historical dates with no new identified periods since the prior validation.

Illiquid Days: Lowest Volume Days since 1995 on the portfolio: Price Changes						
Date	GOVT 10Y	GOVT 2Y	GOVT 5Y	2Y Covered	STIBOR 3M	Average
1998-07-27	-	- 0,00	-	-	-	- 0,00
2000-07-14	0,01	- 0,00	0,01	- 0,02	0,03	- 0,01
2000-11-27	0,09	- 0,01	- 0,00	0,03	-	- 0,02
2002-07-08	0,05	0,04	0,05	0,04	- 0,01	- 0,03
2003-07-10	- 0,09	- 0,03	- 0,09	- 0,01	-	- 0,04
2003-12-29	0,00	- 0,02	- 0,01	- 0,05	-	- 0,02
2004-07-27	0,04	0,05	0,06	0,05	-	- 0,04
2004-12-27	- 0,01	- 0,03	- 0,03	- 0,04	-	- 0,02
2005-07-25	- 0,08	- 0,03	- 0,05		0,01	- 0,04

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None of the dates identified as low volume dates show any significant extreme price change.

All of the illiquid dates identified, showed lower price changes than the CCaR scenario assumptions of 0,43.

The conclusion is still that the CCaR stress scenario is more conservative than any of the illiquid dates identified in the study period.

3.5 Optionality aspects (Implied Vols and Underlying moves)

The equity positions have the most material options positions at Nasdaq Clearing. The other product areas have very low levels of option positions or have no outstandings. Therefore, CCaR calculations incur very little optionality effects to its results from areas outside of equities trading.

The following page shows testing results of CCaR output for its implied volatility and underlying assumption moves compared to historic move P&L impacts.

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PnL test, actual option prices PnL vs CCaR stress				
1. 2008-10-14 - 2008-10-16 (Vol 2d change > 0,1)				
Date	Average of VOL_MID	Average of VAL_INT_MID	Vol 2d change	Spot 2d change
2008-10-14	0,46296825	686,24	0,10193655	-0,085524015
2008-10-15	0,5180384	647,03		
2008-10-16	0,5649048	627,55		
a. Call				
Series	OMXS308L680			
CCaR stress	-6955			
Actual PnL	-2395			
b. Put				
Series	OMXS308X680			
CCaR stress	-5762			
Actual PnL	4499			
2. 2008-10-15 - 2008-10-17 (Vol 2d change > 0,1)				
Row Labels	Average of VOL_MID	Average of VAL_INT_MID	Vol 2d change	Spot 2d change
2008-10-15	0,5180384	647,03	0,1097331	-0,022703739
2008-10-16	0,5649048	627,55		
2008-10-17	0,6277715	632,34		
a. Call				
Series	OMXS308L680			
CCaR stress	-6881			
Actual PnL	571			
b. Put				
Series	OMXS308X680			
CCaR stress	-5641			
Actual PnL	1545			
3. 2008-10-31 - 2008-11-04 (Vol 2d change > 0,1)				
Row Labels	Average of VOL_MID	Average of VAL_INT_MID	Vol 2d change	Spot 2d change
2008-10-31	0,49630975	638,91	-0,10351775	0,117011786
2008-11-03	0,46670125	667,88		
2008-11-04	0,392792	713,67		
a. Call				
Series	OMXS309A650			
CCaR stress	-6173			
Actual PnL	3985			
b. Put				
Series	OMXS309M650			
CCaR stress	-5690			
Actual PnL	-4489			
4. 2008-12-05 - 2008-12-09 (Spot 2d change > 0,126)				
Row Labels	Average of VOL_MID	Average of VAL_INT_MID	Vol 2d change	Spot 2d change
2008-12-05	0,522478	608,64	-0,056478	0,126150105
2008-12-08	0,495	666,65		
2008-12-09	0,466	685,42		
a. Call				
Series	OMXS309B630			
CCaR stress	-5769			
Actual PnL	3304			
b. Put				
Series	OMXS309N640			
CCaR stress	-5555			
Actual PnL	-3784			

As you can see P&L results on CCaR versus actual stress history show CCaR product a more severe loss profile.

In tests of up and down volatility and up and down underlying quartiles, the results were all significant more severity from CCaR as compared to historical stress simulated P&L.

Therefore, we conclude the testing shows that optionality impacts are greater than historical results in CCaR.

4 Overall Conclusion

The validation has confirmed that CCaR scenario is conservative as it is more severe than sudden sales periods, illiquid periods and volatile periods identified within the study periods and for recent history since the prior validation for the following product groups:

- Equity

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- Interest rate
- Power
- Seafood
- Freight

With a typical portfolio for each individual product group, the CCaR choice of the most extreme of correlation assumption of 1 or -1 applied to 99,9% EVT distributions and historical simulation provides a loss result that is beyond identified historical stress dates.

We also conclude that for all markets there were no historic stress dates identified that were more severe than the stress scenarios selected within the historical simulation model

The model methodology that is applied for historical simulation is appropriate in that it captures hypothetical scenarios and historic simulation of stress events as mentioned in the regulatory requirements. A process of selecting the most severe historical stress against and applying assumptions should continue to monitor member portfolios against severe history. The model does select only a few severe historical events and applies them to the portfolios in the historical simulations. As these severe scenarios have the most significant impact to severity in the calculations to a diversified large member position, the method is sound for defining what historical events that are the worst. The historical stress simulation can be considered to be the minimum boundary for the model output which will always maintain that CCaR captures the most severe highly volatile and sudden sales periods as output.

The summary of results show in the tables below that the CCaR model tests are more severe than period between September 30th 2013 and September 30th 2014

Since Last Validation: Sept 30th 2013 to Sept 30th 2014

Worst 10: Equities			Worst 10: FI			Worst 10: Power 3 day			Worst 10: Seafood			Worst 10: Freight		
Date	Increments	CCaR	Date	Increments	CCaR	Date	Increments	CCaR	Date	Increments	CCaR	Date	Increments	CCaR
2014-08-01	-0,02	0,17	2014-07-04	-0,11	0,43	2014-06-03	-0,04	0,21	2014-08-14	-0,03	0,10	2014-04-03	-0,04	0,34
2014-04-22	0,02	0,17	2014-04-11	-0,10	0,43	2014-04-28	0,05	0,21	2014-08-13	-0,04	0,10	2014-04-02	-0,05	0,34
2014-03-26	0,02	0,17	2014-04-10	-0,07	0,43	2014-03-25	0,04	0,21	2014-08-12	-0,04	0,10	2014-01-16	0,04	0,34
2014-02-07	0,02	0,17	2014-03-26	-0,07	0,43	2014-03-24	0,05	0,21	2014-08-11	-0,03	0,10	2013-12-23	0,06	0,34
2014-02-06	0,02	0,17	2014-02-19	-0,09	0,43	2014-01-29	-0,05	0,21	2014-06-30	0,02	0,10	2013-12-20	0,05	0,34
2014-01-24	-0,03	0,17	2013-12-19	0,07	0,43	2014-01-08	0,04	0,21	2014-06-27	0,03	0,10	2013-11-29	0,04	0,34
2013-12-20	0,03	0,17	2013-12-11	0,07	0,43	2014-01-02	-0,04	0,21	2013-10-04	0,02	0,10	2013-11-28	0,04	0,34
2013-12-19	0,03	0,17	2013-11-22	0,08	0,43	2013-12-13	-0,05	0,21	2013-10-02	0,03	0,10	2013-11-27	0,05	0,34
2013-12-04	-0,02	0,17	2013-11-13	-0,11	0,43	2013-12-12	-0,05	0,21	2013-10-01	0,03	0,10	2013-10-04	0,04	0,34
2013-10-11	0,02	0,17	2013-11-07	-0,08	0,43	2013-12-11	-0,04	0,21	2013-09-30	0,03	0,10	2013-10-03	0,04	0,34

The summary of results show in the tables below that the CCaR model tests are more severe than stress periods for all times series including the prior validation.

All times series data available including data from the prior validation

Worst 10: Equities			Worst 10: FI			Worst 10: Power 4 days			Worst 10: Seafood			Worst 10: Freight		
Date	Increments	CCaR	Date	Increments	CCaR	Date	Increments	CCaR	Date	Increments	CCaR	Date	Increments	CCaR
2008-11-25	0,11	0,17	2009-12-14	0,35	0,43	2011-02-16	-0,19	0,22	2011-06-29	-0,06	0,10	2009-06-01	0,22	0,34
2008-11-04	0,12	0,17	2009-12-11	0,39	0,43	2006-05-04	-0,14	0,22	2011-06-27	-0,06	0,10	2009-02-09	0,21	0,34
2008-10-30	0,12	0,17	2009-02-12	-0,30	0,43	2006-05-03	-0,19	0,22	2009-08-05	-0,07	0,10	2009-02-06	0,23	0,34
2008-10-16	-0,09	0,17	2009-02-11	-0,36	0,43	2006-04-28	-0,24	0,22	2009-08-04	-0,06	0,10	2009-02-05	0,21	0,34
2008-10-14	0,11	0,17	2008-12-04	-0,37	0,43	2010-04-09	-0,13	0,22	2009-08-03	-0,07	0,10	2008-10-13	-0,23	0,34
1998-10-12	0,13	0,17	2008-10-24	-0,36	0,43	2009-03-23	-0,12	0,22	2009-05-29	-0,07	0,10	2008-10-10	-0,24	0,34
1992-11-23	0,08	0,17	1996-02-06	0,38	0,43	2008-12-12	-0,14	0,22	2009-05-19	0,07	0,10	2008-10-09	-0,24	0,34
1992-11-20	0,12	0,17	1995-09-22	0,32	0,43	2006-05-04	-0,19	0,22	2009-05-18	0,06	0,10	2008-09-26	-0,23	0,34
1987-10-29	-0,10	0,17	1995-03-07	0,42	0,43	2006-05-03	-0,19	0,22	2009-04-30	0,06	0,10	2008-09-25	-0,24	0,34
1987-10-20	-0,11	0,17	1995-03-06	0,40	0,43	2006-04-28	-0,15	0,22	2009-04-24	0,06	0,10	2008-09-24	-0,20	0,34