

Memorandum

To: Enterprise Model Risk Committee
Independent Model Validator: Adam Joplin, Model Risk Management
Model Name: Market Risk RWA (CCAR) (2290)
Model Owner: Steve Ahn, Global Markets Risk Management
Date: 10/30/2014

1. Executive Summary

a. Description of the Model

The Market Risk RWA (CCAR) model is developed by the Global Markets Risk Management (“GMRM”) group in order to forecast market risk risk-weighted asset (“RWA”) nine quarters into the future as part of the Comprehensive Capital Analysis and Review (“CCAR”) exercise.

For the 2015 CCAR exercise, a new model is built to replace the regression-based model used for CCAR 2014. The primary determinant of RWA is value at risk (“VaR”) and stressed value at risk (“SVaR”). The model uses macroeconomic forecasts provided by the Federal Reserve and a third-party vendor (i.e. Moody’s) to forecast the risk factors underlying BNY Mellon’s trading portfolio. These values are used to rescale Monte Carlo simulation paths of the risk factors generated for the current portfolio. These paths, along with the current trading portfolio’s sensitivities, are used to calculate a Delta-Gamma approximation of 1-day VaR and SVaR.

Given that the model is entirely different, we performed a full-scope validation on the model. The VaR platform and the underlying pricing functions are all validated. Hence, in the validation, we will focus on the model framework and assumptions specific to the CCAR Market Risk RWA model.

b. Model Purpose

The purpose of the model is to forecast the market risk RWA nine quarters into the future under the Federal Reserve Supervisory Scenarios and the bank holding company (“BHC”) Stress scenario. The model is built for the CCAR exercise.

c. Validation Purpose and Summary

In this validation, we provided effective challenges to ensure the robustness of model framework and integrity of assumptions, inputs, process, and outputs. Because this is a new model with no model results, analysis of past performance was impossible. Our validation largely emphasized an analysis of model framework and assumptions.

We performed the following tasks:

- Description and assessment of conceptual framework
- Analysis of model assumptions
- Identification of model risks, limitations and issues
- Performed a code review
- Tests to further test model assumption appropriateness, including:
 - Delta-Gamma Analysis on Sample Portfolio
 - Comparison of Percent Changes for Risk Factors and Corresponding Core Risk Factors
- Review of model documentation

We will perform a CCAR 2015 implementation review on this model in December 2014. The following is planned to be performed:

- Confirm the usage of 9/30/2014 portfolio;
- Verify the implementation of the CCAR 2015 scenarios;
- Review actions taken to address the validation issues;
- Check the appropriateness of the CCAR scenarios results ordering;
- Confirm whether there will be model overlay

d. Impact of the Model on BNY MELLON Assets/Liabilities

The mark-to-market of the trading book as of 9/30/2014 is approximately \$8.44 billion. The 1-day VaR at this date is -\$3.93 million.

e. Conclusion

We conclude that the model is fit for use with one level-2 and one level-3 issue.

2. Risks and Limitations

a. Standard Risks and Limitations of the Model

The risks and limitation of the Market Risk RWA (CCAR) model largely relate to the model's assumptions. We further analyze the model's assumptions in section 6, but note those that contribute to the largest risks in this section.

First, we note a model risk relating to the methodology used to calculate VaR and SVaR. Namely, the same set of delta and gamma sensitivities (from the current "as-of" date) are used for all four CCAR scenarios, and VaR and SVaR are calculated using the Delta-Gamma. The validation team communicated concerns with these assumptions with the model owner immediately. The first concern related to the use of the same sensitivities under all scenarios, since sensitivities will change under stressed market conditions. The validator have included a test of sample portfolio valuations under stressed scenarios in

Test 1 and found that deltas and gammas are very different under stressed scenarios when the portfolio is static. The model owner provided the justification that the trading portfolio is dynamic and well-hedged, thus sensitivities will stay roughly the same under stressed conditions. This is a large model assumption that we have accepted given its business rationale, but believe it is a model risk. The second concern related to using the Delta-Gamma approximation for VaR and SVaR. The model owner stated that the approximation is used due to the assumption that the trading portfolio is dynamic and well-hedged. While the sensitivities are similar across scenarios, the portfolio is not. The positions under each scenario should be very different for the different hedging purpose. In other words, if full-revaluation method is used, the important model assumption that “the trading portfolio is well-hedged” cannot be realized and the VaR and SVaR results generated will be unrealistic, as it is calculated based on a static portfolio, where all effective portfolio hedges fall apart. Hence, even though the delta-gamma method has the risk to underestimate VaR, this is a model risk that has to be taken. We have not raised an issue relating to this assumption, but have raised a level-2 issue relating to explicit documentation of the assumption and rationale for using Delta-Gamma over full-revaluation.

Secondly, we note a limitation relating to forecasting risk factors. The model owner maps all risk factors underlying the BNY Mellon trading portfolio to a set of “core risk factors”, macroeconomic variables with forecasts for nine quarters ahead provided by the Federal Reserve or a third-party vendor. The model owner assumes that “the forecasted value of a risk factor is calculated so that the change in [risk factor] value is the same as the change in core [risk factor] value” [1]. The change is either multiplicative (for equity prices, volatilities, interest rate curves, and foreign exchange curves), or additive (for spreads). Furthermore, in order to generate a volatility forecast for all BNY Mellon risk factors, the model owner applies the relative change between the forecasted value and “today’s” value of the Chicago Board of Option Exchange Volatility Index (“VIX”), the measure of equity volatility. Using core risk factors as proxies for changes in the levels of corresponding risk factors is a limitation. We have reviewed the model owner’s mapping from risk factors to core risk factors and find the mapping logic to be suitable. Furthermore, in Test 2, we review the assumption and believe that model owner’s choices are reasonable given historical backtesting. Given that forecasts of risk factors are limited, we do not raise an issue explicitly on the model choice, but do raise an issue for future evidence of using core risk factors as proxies for particular risk factors. Furthermore, using VIX as a proxy for volatility for all risk factors is a model limitation. We further discuss this treatment in section 6 in the “Analysis of Model Assumptions” section. Because VIX represents volatility of equity options, which is typically more volatile than other product types, we believe this a conservative approach.

b. Conditions Where Model is “Inappropriate” for Use

This model is inappropriate for use outside of its validated purpose, i.e. to forecast RWA as part of the CCAR exercise.

3. Issues and Enhancements

a. LEVEL 1

None

b. **LEVEL 2**

- 1) **New Issue** - [Model Documentation] Clarification of Model Assumptions and Treatments: There are several key assumptions and treatments in the model that should be more clearly stated in the model document. The model owner should:

- Explicitly specify the rationale for using the Delta-Gamma approximation for VaR and SVaR instead of performing full revaluation of the trading portfolio. This is one of the largest model risks that warrants further discussion in the model.
- Further emphasize the use of the percentage change in VIX for forecasting all risk factor volatility changes. This should be more clearly stated.
- Discuss the process for rescaling Monte Carlo simulation paths according to shifts in risk factor levels and volatilities.
- Explicitly state that this model forecasts 1-day VaR and SVaR.

This should be addressed before the CCAR 2015 submission.

MO Response: We will include the documentation of these assumptions and treatments in the model document.

ETA: 1/5/2015

c. **LEVEL 3**

- 2) **New Issue** - [Risk Factor Mapping] Review of Goodness of Fit: In order to forecast risk factors, the model owner maps all risk factors underlying the BNY Mellon trading portfolio to a set of “core risk factors”, macroeconomic variables with forecasts for nine quarters ahead provided by the Federal Reserve or a third-party vendor. The model owner assumes that “the forecasted value of a risk factor is calculated so that the change in [risk factor] value is the same as the change in core [risk factor] value” [1]. For this year, the model validator performed the test (Test 2) and concluded that the model owner’s mapping is fairly reasonable. However, in the annual review of the model, model owner should review the mapping from risk factors to core risk factors using historical data and ensure that the mapping is sound. Such review should be part of the model documentation.

MO Response: We will review the mapping rules in the annual review of the model.

ETA: 11/30/15

d. **Recommendations and Suggestions:**

None

e. **Closed Issues**

- 1) **Existing Issue (Issue #: 420):** The model applies a regression to aggregated VaR with two macroeconomic variables (risk factors). This is a crude approximation with low R-squared. We recommend that the model being developed approximate VaR at a more granular level.

MV Comments: The new model is no longer regression-based and takes into account many more risk factors to forecast VaR. We consider this issue closed.

- 2) **Existing Issue (Issue #: 421):** The forecasting of SVaR is seriously compromised. It is based on historical worst VaR and is static regardless of how severe the adverse scenarios before the maximum rule applied. We recommend a SVaR forecasting method be developed for the CCAR purpose.

MV Comments: The process to forecast SVaR has changed such that it uses a stressed period historical calibration instead of a historical worst VaR. We consider this issue closed.

- 3) **Existing Issue (Issue #: 422):** The model documentation provided is detailed enough to understand the model inputs and methodology. However, it lacks evidence demonstrating the appropriateness of the regression predictor variables and model performance metrics. The model documentation should be improved to include these elements.

MV Comments: The new model is no longer regression-based, thus a discussion of appropriateness of predictor variables is no longer necessary for the document. We consider this issue closed.

4. Compliance with Applicable Regulatory Requirements

This is a CCAR model; hence it is subject to ‘Comprehensive Capital Analysis and Review Summary Instructions and Guidance’. Overall, we think it satisfy the CCAR requirement related with trading RWA. Its overall documentation is good, except the level-2 issues we raised, in which we ask for an expanded documentation for justification for one model assumption and its impact on the overall model methodology.

5. Review of Model Documentation for Compliance with Guidelines

In general, we believe the model documentation to be fairly comprehensive. It provides an accurate overview of the input data, model process, theoretical framework, and outputs. It highlights key model personnel and includes sections for revision history and model change procedures.

The document is generally complete. However, we have raised a level two issue regarding some aspects of model documentation. Specifically, the model owner should explicitly specify the rationale for using the Delta-Gamma approximation for VaR and SVaR instead of performing revaluation, further emphasize the use of percentage change in VIX for estimating risk factor volatility changes, discuss the process for rescaling Monte Carlo simulation paths according to shifts in risk factor levels and volatilities, and explicitly specify that this model forecasts 1-day VaR and SVaR.

6. Validation Detail

a. Conceptual Framework and Assumptions

The Market Risk RWA (CCAR) model's conceptual framework has been entirely overhauled since the 2014 CCAR exercise. The previous model forecasted VaR and SVaR using a linear regression between two risk factors: 3-month LIBOR and the Dow Jones Total Stock Market index. The current model is far more granular; it takes into account all risk factors present in the BNY Mellon portfolio at the analysis, or "as of", date. Furthermore, the model is no longer regression-based, and instead forecasts VaR and SVaR using re-scaled Monte Carlo simulation paths and Delta-Gamma sensitivities over the next nine quarters. We have broken the model down into four sections: risk factor and core risk factor mapping, calculation of portfolio sensitivities, calculation of VaR and SVaR, and calculation of RWA using VaR and SVaR. After each section, we include a general assessment of the section.

So far, there is no model overlay planned on this model; we will re-confirm this in the CCAR 2015 implementation review of this model.

a.1: Analysis of Model Methodology

I. Risk Factor and Core Risk Factor Mapping

The model owner maps BNY Mellon trading portfolio risk factors to a set of "core risk factors", which are macroeconomic variables with forecasts for nine quarters ahead provided by the Federal Reserve or a third-party vendor. The core risk factors are given below in Table 1. Because the exact list of macroeconomic variables from the Federal Reserve is not finalized as of the date of this validation, the list in Table 1 provided by the model owner is a tentative list of core risk factors. The mapping of risk factors to core risk factors is given in Appendix A. Similarly, the list provided in Appendix A is a tentative mapping from risk factor to core risk factors established for testing prior to actual forecast delivery from the Federal Reserve.

Table 1: Tentative Mapping from Core Risk Factors to Macroeconomic Variables Provided by the Federal Reserve and a Third-Party Vendor

Macroeconomic Variable (Forecast Provided)	Core Risk Factor in Model
US 3-month Treasury Yield	:IRUSD_Treasury
US 5-year Treasury Yield	:IRUSD_Treasury
US 10-year Treasury Yield	:IRUSD_Treasury
USD/EUR Exchange Rate	:FXEUR
USD/GBP Exchange Rate	:FXGBP
USD 3-month LIBOR	:IRUSD_Interbank
US Prime Rate	:IRUSD_Prime
Dow Jones Total Stock Market Index	:C26099405_Index_INDUA_Return
Japan Bilateral Dollar Exchange Rate (JPY/USD)	:FXJPY
UK 3-month Government Rate	:IRGBP_Treasury
UK 10-year Government Rate	:IRGBP_Treasury
Euro Area 3-month Government Rate	:IREUR_Treasury
Euro Area 10-year Government Bond Yield	:IREUR_Treasury
US VIX	:SP500_C00000117_EQTV
US BBB to 10-year Treasury Spread	:IRUSD_INBBBSP
UK Inflation	:IRGBP_RPI

Validator Assessment of Risk Factor and Core Risk Factor Mapping

As part of the validation, we reviewed the conceptual soundness of the mapping of the risk factors to the core risk factors. The model owner maps each risk factor algorithmically based on factor type (equity, interest rate, foreign exchange, credit, etc.) and currency. In general, all equity risk factors are mapped to the S&P 500 core risk factor “:SP500_C00000117_EQTV”. Various interbank rates are mapped to their appropriate world region, i.e. interbank rates for Asian countries are mapped to “:IRJPY_Interbank”, where interbank rates from European countries are mapped to “:IREUR_Interbank”. Similarly, foreign exchange spot rates are mapped to appropriate world region spot rates, where foreign exchange forward curves are mapped to world region forward curves. All risk factors related to credit spreads are denominated in USD and mapped to “:IRUSD_INBBBSP”. We believe that the model owner’s choice of mapping from risk factor to core risk factor is reasonable; however, we have highlighted this as a model risk. Furthermore, we tested the model owner’s assumption that projected values for risk factors are the same as changes in projected core risk factors for a sample of risk factors. This is included in Test 2. We conclude that the assumption is appropriate, but include it as a model risk. Lastly, we have raised a level-3 issue for the model owners to review the risk factor to core risk factor mapping in the model’s annual review using historical data to ensure that the chosen mapping is appropriate.

II. Calculation of Portfolio Sensitivities

The model owner then generates shift scenarios where each risk factor is perturbed slightly. These scenarios include “DeltaUp”, where every risk factor is shifted up by a 0.0001, (including interest rate curves at each tenor point), “DeltaDn” where every risk factor is shifted down by a small factor, and cross gamma factors for interest rate curves and volatility surfaces (“CrossGammaUpUp”, “CrossGammaDnUp”, “CrossGammaUpDn”, “CrossGammaDnDn”), where factors are shifted up or down on different tenor points of the curves or surfaces. These sensitivities are run through the VaR calculation engine RiskWatch, where each position in the trading book is revalued under each scenario.

The model owner then calculates delta, gamma, and cross-gamma sensitivities using these revaluations. Because each position is revalued under all scenarios, each position has a delta, gamma, and cross gamma for each relevant risk factor. Thus, if there are multiple risk factors applicable for a position (i.e. an Interest Rate (“IR”) Swaption, which includes exposure to interest rates and volatility surfaces), each sensitivity calculation is separately included. Therefore, the sensitivity parameters such as “DeltaUp”, “DeltaDn”, etc. do not necessarily reflect only sensitivity to the underlying as is typical in finance, but can reflect sensitivities to many risk factors. For example, “DeltaUp” sensitivity to volatility curves is a sensitivity typically known as “vega” in finance.

Validator Assessment of Calculation of Portfolio Sensitivities

We have reviewed the shift scenarios generated by the model owner in [10] and [11] and believe that it has been implemented correctly. The only concern regarding this step related to inherited issues from the VaR pricing model validation. During the validations, we discovered issues regarding sensitivity calculations, specifically related to the IR Swap and Equity (“EQ”) Forward pricing models (Issue #588, Issue #675). Of primary concern was the treatment of all IR Swap fixed legs as having basis point shift (“BPSUp” and “BPSDown”) values of zero. We communicated these concerns with the model owner. She stated that her shifting scenarios are done completely separate of RiskWatch’s pricing models, thus any issues in sensitivity calculations in existence should not be inherited by this model. Furthermore, the model owner provided evidence that IR Swap fixed legs have “DeltaUp” and “DeltaDn” values that are non-zero by providing a sample file [12], which shows sensitivities for “GenericSwapLegIRD” positions calculated by Algo using sensitivity scenarios.

III. Calculation of VaR and SVaR

Separately, the model owner uses historical data (two years for VaR, one year for SVaR) to calibrate a joint distribution for risk factors. This distribution is then used to generate 1-day Monte Carlo (“MC”) simulation paths for each risk factor using current levels and volatilities. Then, for each quarter in the CCAR forecast period (nine quarters ahead), rescale the Monte Carlo paths for each risk factor based on the shifts in levels and volatilities based on the shifts for that risk factor’s corresponding core risk factor level and volatility changes. For each quarter, the model owner calculates Delta-Gamma VaR using the delta, gamma, and cross-gamma sensitivity parameters calculated above along with the rescaled MC paths for each risk factor.

The Delta-Gamma VaR approach is widely used as an approximation for VaR when full-revaluation of a portfolio to generate a loss distribution is computationally intensive and/or time-consuming. The approach is rooted in the Taylor expansion of a value of a portfolio which has instruments with nonlinear payoffs. In order to capture this nonlinearity, quadratic terms are added to an approximation of the portfolio value. Using the notation of [15], the change in portfolio value, V , can be represented by

$$\Delta V \approx \frac{\partial V}{\partial t} \Delta t + \delta^T \Delta S + \frac{1}{2} \Delta S^T \Gamma \Delta S$$

where $\delta_i = \frac{\partial V}{\partial S_i}$ and $\Gamma_{ij} = \frac{\partial^2 V}{\partial S_i \partial S_j}$ are the deltas and cross-gammas, or the first and second derivatives evaluated at $(S(t), t)$, and ΔS is the change in the underlying.

Validator Assessment of Calculation of VaR and SVaR

There are two items from the current methodology which drew the attention of the validator immediately:

- The same set of delta-gamma (from the current “as-of-date”) is used for all four CCAR scenarios.
- The VaR is calculated using delta-gamma approximation.

We discussed these points with the model owner immediately:

- 1) The same set of deltas and gammas (from the current “as-of-date”) is used for all four CCAR scenarios

As we know, as the underlying market changes, the delta and gamma will change accordingly since they are the first- and second-order derivatives. The validator have included a test of sample portfolio valuations under stressed scenarios in Test 1 and found that deltas and gammas are very different under stressed scenarios when the portfolio is static. This leads to the question whether the model owner’s current method is correct.

The model owner provided the justification: the model has a big assumption that the trading portfolio is dynamic and well-hedged. Hence, it will have similar sensitivities regardless of scenario. We accepted this assumption given its business rationale; all the users and the readers of the model results should be well-aware of this assumption. In other words, the model documentation should state this assumption very explicitly with justification, giving enough importance to it.

- 2) The VaR is calculated using delta-gamma approximation

It is well-noted in financial literature that Delta-Gamma VaR often underestimates the VaR calculation. Even the model owner’s own documentation has a comparison between the full-revaluation VaR and the Delta-gamma VaR which showing that the latter could be underestimated [1].

The model owner stated that this is a must-do because of the assumption that “the trading portfolio is dynamic and well-hedged” [1]. In other words, while the sensitivities are similar across scenarios, the portfolio is not. The positions under each scenario should be very different for the different hedging purpose. In other words, if full-revaluation method is used, the important model assumption that “the trading portfolio is well-hedged” [1] cannot be realized and the VaR results generated will be unrealistic, as it is calculated based on a static portfolio, where all effective portfolio hedges fall apart. Hence, even though the delta-gamma method has the risk to underestimate VaR, this is a model risk that has to be included.

The validator thinks that the justifications the model owner provided for both items are reasonable. However, we think it is necessary that the model owner explicitly stated in the model documentation why

the Delta-Gamma approach has to be used instead of a full-revaluation. This is a level-2 issue of the model.

IV. Calculation of RWA using VaR and SVaR

The model owner enters the forecasted VaR and SVaR figures into the spreadsheet in [3]. Here it is combined with the most recent VaR, SVaR, and market risk standardized charge amounts for Equities, Sovereigns, Government Sponsored Entity (“GSE”) Debt Positions, Depository Institution Debt Positions, Municipal Debt Positions, Corporate Debt Positions, Credit Standardized Charges, and De Minimis Charges. These are retrieved from the spreadsheets “Basel II.5 Market Risk Regulatory Capital” and “Basel II.5 Interest Rate Standardized Charge Calculator” for the most recent filing, obtained from the Risk Monitoring and reporting group. The model owner then normalizes forecasted VaR and SVaR using the most recent regulatory filing VaR and SVaR amounts. Then, using the results obtained from a group calculating trading book changes, projected amounts are combined into RWA projections.

Validator Assessment of Calculation of RWA using VaR and SVaR

We reviewed the calculations as described by the model owner in [1]. We noted some small discrepancies in calculations that have been communicated with the model owner. In particular, we noted a case in which an Excel formula referenced an empty cell, which we believe is done incorrectly. The model owner stated that the cell reference was done erroneously and has been corrected. Overall, we believe the process is complete and performed as described by the model owner.

a.2: Analysis of Model Steps

The model steps, as described by the model owner, are given below. After each step, we describe the model validation (“MV”) team’s response to the step in “MV Comment”.

- 1) Get the forecasts for the levels of major risk factors, described by the model owner as core risk factors (“CRF”), from the Federal Reserve and through a third-party vendor.

MV Comment: The model owner will finalize the mapping from core risk factors to the variables provided by the Federal Reserve and the third-party vendor. We have reviewed the temporary mapping and believe it is reasonable.

- 2) Map all other BNY Mellon risk factors (“RF”) to CRF in order to project RF levels and volatilities over the next nine quarters.

MV Comment: We have reviewed the risk factor to core risk factor mapping and believe it is reasonable. A description of the general process is given above. Furthermore, we have reviewed a sample of the percent changes in Test 2, and believe the mappings are appropriate. We have raised a level three issue to

review the mapping from risk factors to core risk factors in an annual review to ensure that the model's mapping is appropriate.

3) Generate shift scenarios where a particular risk factor or risk factors are perturbed.

MV Comment: The model owner provided the validator with shift scenarios displayed in Excel format [10] and [11]. We believe this is implemented correctly.

4) Using the shift scenarios in step 3, re-value the portfolio in RiskWatch.

MV Comment: This step is performed in the VaR engine, RiskWatch. The VaR engine's data and pricing models have been validated in the past ([13], [14]), thus we believe this is acceptable.

5) Using the results from step 4, calculate delta, gamma, and cross-gamma sensitivities.

MV Comment: We have reviewed the code implemented to calculate the sensitivities [5], and we believe it is implemented correctly.

6) Calibrate a joint distribution for the RF using historical data. Generate Monte Carlo simulations for each RF using the current levels and volatilities for all RF.

MV Comment: The model owner uses historical data to calibrate a joint distribution for risk factors. The methodology for this calibration scheme has been performed in [13] and [14]. Furthermore, the model owner assumes that this joint distribution is applicable for future forecasts. We believe this is a reasonable model assumption.

7) For each projection horizon (1,2,...,9 quarters forward), do the following:

- Calculate shifts between projected and current value for all CRF (a multiplicative or additive change)
- Calculate shifts for levels and volatilities for all RF by applying appropriate shifts for the corresponding CRF.
- Rescale Monte Carlo simulations from step 6 according to the shifts in levels and volatilities to obtain projected simulations.
- Calculated projected Delta-Gamma VaR using the sensitivities in step 5 and the projected simulations.

MV Comment: We have further explored the assumption the percent change of risk factors are the same as percent changes for core risk factors in Test 2; we believe this a model limitation but do not raise an issue on this assumption. Furthermore, we discuss the shifts in risk factor volatility in the assumptions section below; we believe that model owners are using a conservative approach by applying percentage change in VIX to forecast volatility. We note this as a model limitation but do not raise an issue. As part of the level-2 issue on documentation, we believe model owners should further document how Monte Carlo simulation paths are rescaled to make it clear to users of the model. Lastly, we have discussed at length the assumption of using the Delta-Gamma approximation for VaR. We believe it is a model risk,

but better than the alternative of full-revaluation. As part of the level-2 issue on documentation, we believe model owners should clearly state this assumption so that users of the model are aware of this big assumption.

8) Enter the projected VaR (and SVaR, see below) into the “input data” tab in [3].

Repeat steps 1-8 above for the historical data for the stressed period in order to calculate SVaR.

MV Comment: We have replicated this step in [3] as part of the replication of the steps from VaR and SVaR to RWA. We believe this is done correctly.

9) Along with the projections, the most recent VaR, SVaR, and market risk standardized charge amounts for Equities, Sovereigns, GSE Debt Positions, Depository Institution Debt Positions, Municipal Debt Positions, Corporate Debt Positions, Credit Standardized Charges, and De Minimis Charges. These are retrieved from the spreadsheets “Basel II.5 Market Risk Regulatory Capital” and “Basel II.5 Interest Rate Standardized Charge Calculator” for the most recent filing, obtained from the Risk Monitoring and reporting group. Normalize projected VaR and SVaR to the most recent regulatory filing amounts.

MV Comment: We have replicated this step in [3] as part of the replication of the steps from VaR and SVaR to RWA. We believe this is done correctly.

10) Obtain results from the group calculating trading book changes. The “IPAD” files from stress testing are used to project changes for the market risk standardized charges above. This is facilitated using a tab in [3] to approximate value changes for each category, which are in turn applied to the most recently filed standardized charges.

MV Comment: We have replicated this step in [3] as part of the replication of the steps from VaR and SVaR to RWA. We believe this is done correctly.

11) Projected amounts are combined into RWA projections and tabs for FRY-14A forms are populated for each scenario.

MV Comment: We have replicated this step in [3] as part of the replication of the steps from VaR and SVaR to RWA. We believe this is done correctly.

a.3: Analysis of Model Assumptions

The model includes several assumptions. Below, we review the primary model assumptions and limitations and the resulting implications for model outcomes.

1) Assumption: Projected values for risk factors are the same as changes (multiplicative or additive) in projected core risk factors; i.e., the percentage change over two quarters for the interest rate

“IRUSD_MUNT” is the same as the percentage change over two quarters for the core risk factor “IRUSD_Treasury”.

MV Comments: In order to test this assumption, the validation team examined percent changes in various risk factors and their corresponding risk factors. The results are included in Test 2. Though some of the historical backtesting of the percent changes show differences (see Figure 5, Figure 7, and Figure 9), we do not raise an issue regarding the model owner’s methodology. Due to the difficulty of forecasting a variety of risk factors, we believe the model owner’s method is reasonable. We have, however, highlighted this as a model risk.

- 2) **Assumption:** Volatility forecasts for all risk factors can be approximated by a percent change in the volatility index VIX.

MV Comments: The model owner makes this assumption due to a lack of forecasting data for risk factor volatility. We did not explicitly test this assumption, but below show plots of log differences of S&P500 vs. IRUSD_Interbank and the JPY/USD spot curve time series over the last 5 years. These are included in Figure 1 and Figure 2. We include these figures in order to more effectively show periods of high volatility in S&P500. VIX is based on implied volatilities of options on the S&P500, so this provides a measure comparison.

Figure 1: Log Differences in Prices over Five Years, S&P500 vs. USD_Interbank curve

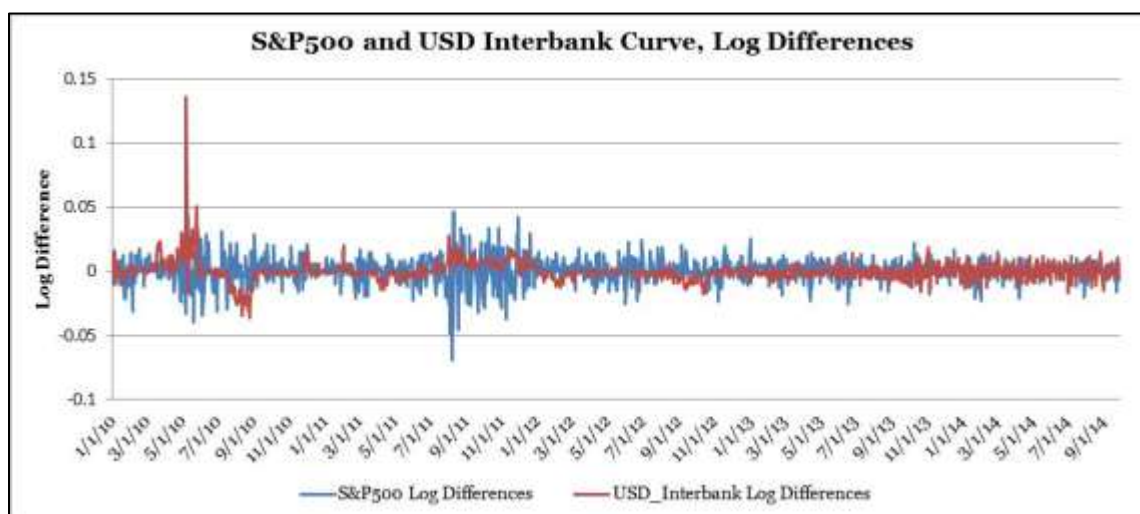
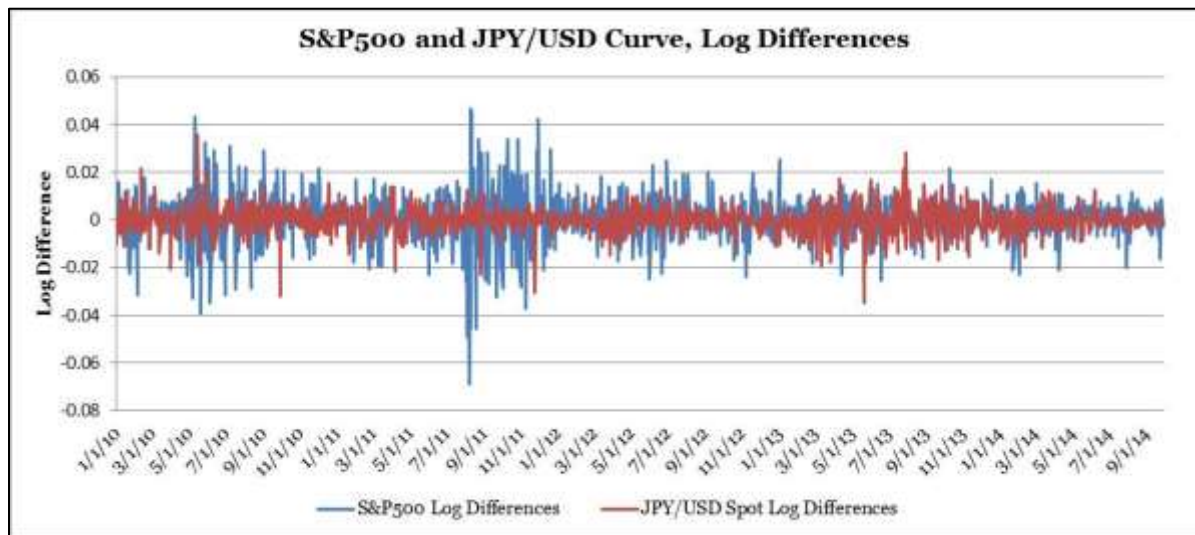


Figure 2: Log Differences in Prices over Five Years, S&P500 vs. JPY/USD spot curve



We note that S&P500 log differences are typically larger than that of the IRUSD_Interbank curve as well as the JPY/USD spot curve. This is generally expected, as equity volatility is typically larger than that of fixed income or foreign exchange volatility. Because we believe model owners are using a more conservative approach by applying a potentially higher volatility change by using VIX, we do not raise an issue for this approach. However, we include this as a model risk.

- 3) Assumption: Portfolio Delta-Gamma sensitivity over the projection horizon is the same as the sensitivities on the analysis date.

MV Comments: We believe this is a reasonable assumption, as the BNY Mellon trading portfolio: (1) does not experience large-scale changes in composition over roughly two years, and (2) remains effectively hedged. Thus, we believe deltas and gammas stay roughly the same over time.

- 4) Assumption: Portfolio Delta-Gamma sensitivity regardless of scenario is the same as the sensitivities of the current portfolio.

MV Comments:: In order to forecast VaR and SVaR, the model owner uses the Delta-Gamma approximation, given that if full-revaluation method is used, the VaR results generated will be unrealistic since all effective portfolio hedges fall apart. In order to use the Delta-Gamma approximation, the model owner must assume that under a dynamic and well-hedged portfolio, the portfolio's sensitivity parameters will remain roughly the same regardless of scenario. We explored the changes in sensitivity parameters using a static sample portfolio in Test 1. We found that, indeed, sensitivity parameters are quite different under stressed scenarios. The validation team accepts the model owner's assumption given its business rationale.

b. Code Review

The model uses a combination of C++ and Excel in order to forecast RWA. For the VaR and SVaR calculations, including the calibration of the joint risk factor distribution, the model owner wrote C++ code implemented on Windows 2010 [reference]. This corresponds to steps 1-7 in the model process described above. The functionality to calculate RWA from VaR and SVaR is performed in Excel [3]. This corresponds to steps 8-12 in the model process described above.

We reviewed the C++ code by ensuring that the implementation matched what was described in the model document [1]. The primary driver for the model is contained within “NewScenGen.cpp” [5]. In this file, the model owner reads risk factors and maps them to core risk factors, calibrates a risk factor joint distribution to historical data, generates Monte Carlo simulations for risk factors using current risk factor levels and volatilities, performs shifts of risk factors (using functionality in the class “CCAR_info” implemented in [6] and [7]), shifts Monte Carlo paths based on volatility forecasts of risk factors (using functionality in the class “FactSet” implemented in [8] and [9]), and finally calculates Delta-Gamma VaR and SVaR using sensitivities (provided exogenously) and projected simulations. Shift scenarios (described in step 3 above) used to generate delta, gamma, and cross-gamma using the VaR calculation engine, RiskWatch, are done separately from code provided. Based on our review, we believe that code to calculate VaR and SVaR is implemented as intended by the model owner.

The VaR and SVaR results generated above for 1-9 quarters ahead are passed to the Excel model [3]. In order to review the process that calculates RWA using VaR and SVaR, we replicated the model as described by the model document [1]. The validation team found slight discrepancies in the Excel implementation that had a small impact on model results. In particular, we noted a case in which an Excel formula referenced an empty cell, which we believe is done incorrectly. The model owner stated that the cell reference was done erroneously and has been corrected.

Based on our review, we believe that the model code is implemented correctly as intended by the model owner.

c. Accuracy and Appropriateness of Input Data, Data Cleaning and Verification

As part of this validation, we did not explicitly review model inputs. The model leverages the framework of the VaR/SVaR platform, which was validated as part of the Market Risk VaR/SVaR comprehensive validation performed in June 2013 ([13], [14]), and VaR pricing models, validated in 2014. The model also utilizes macroeconomic forecasts that are distributed by the Federal Reserve and provided by the third-party vendor Moody’s (model #2399), which will be validated in November 2014. A full description of model inputs and their respective validations are given below.

- Input Data: Forecasts for major macroeconomic factors provided by the Federal Reserve and from a third-party vendor (Moody’s)

Validation: The validation team will validate the macroeconomic variable forecasts when they become available in November 2014 as part of the validation of model #2399. We will also verify the implementation of the CCAR 2015 scenarios;

- Input Data: Historical data for all BNY Mellon risk factors, which is used for risk factor correlation calibration

Validation: The validation team reviewed and benchmarked all historical data in the validation of the VaR model in June 2013 ([13], [14]).

- Input Data: End of day market data for all risk factors

Validation: The validation team reviewed and benchmarked all market data in the validation of the VaR model in June 2013 ([13], [14]).

- Input Data: Sensitivities of the BNY Mellon portfolio to all underlying risk factors calculated by the VaR calculation engine RiskWatch using one-factor shift scenarios

Validation: The validation team validated the eight largest derivative pricing models in 2014. Validation reports are available upon request. For the IR Swap and EQ Forward pricing models, we discovered errors related to basis point shifting within RiskWatch. These are raised as level 3 issues (issue #588, issue #675) in the validations. However, according to the model owner, the risk factor shifting that is performed as part of this model is completely independent of the methodology used in the VaR pricing models. Thus, any errors related to basis point shifting for IR Swap and EQ Forward positions will not be relevant to this model. In particular, the validation team was concerned about IR Swap fixed legs which always receive basis point shift values (“BPSUp”) and (“BPSDown”) values of zero in Reconciliation and Testing (“RAT”) files. We communicated this with the model owner and she has provided evidence that this does not occur as part of this model in [12], which shows non-zero sensitivity values for “GenericSwapLegIRD” positions calculated by Algo using sensitivity scenarios.

d. Tests/Measures Used

1) Delta-Gamma Analysis on Sample Portfolio

In this test, we create a sample portfolio of 1000 positions and measure the impact of stressed scenarios on the positions’ deltas and gammas. Here, deltas and gammas include only the first- and second-order sensitivities to the underlying, not all risk factors. We find that deltas and gammas are very different under stressed scenarios in this static sample portfolio. Though we do not raise an issue as a result of this test, the test illustrates the risk associated with using constant deltas and gammas in stressed scenarios if the portfolio is not well-hedged. The assumption has been highlighted as a model risk.

2) Comparison of Percent Changes for Risk Factors and Corresponding Core Risk Factors

For this test, we compare percent changes of a sample of risk factors and their corresponding core risk factors using historical data. We use the percent change for nine quarters ahead since 2Q12. This is used

to test the assumption that changes in risk factors are the same in percent changes of core risk factors. We do not raise an issue on the assumption as a result of the test, but have highlighted it as a model risk.

For this model, the sensitivity analysis will not apply as the VaR/SVaR method itself is sensitivity based. It is driven by many risk factors and none of them will be the dominating driver. The model owner has stated this in the model document.

e. Test Results

1) Delta-Gamma Analysis on Sample Portfolio

In order to forecast RWA over nine quarters, the model owner uses the Delta-Gamma approximation for VaR and SVaR. The model owner uses the same delta and gamma values for the current portfolio for all four CCAR scenarios. Thus, the model owner assumes that deltas and gammas are the same in the current portfolio as in stressed scenarios.

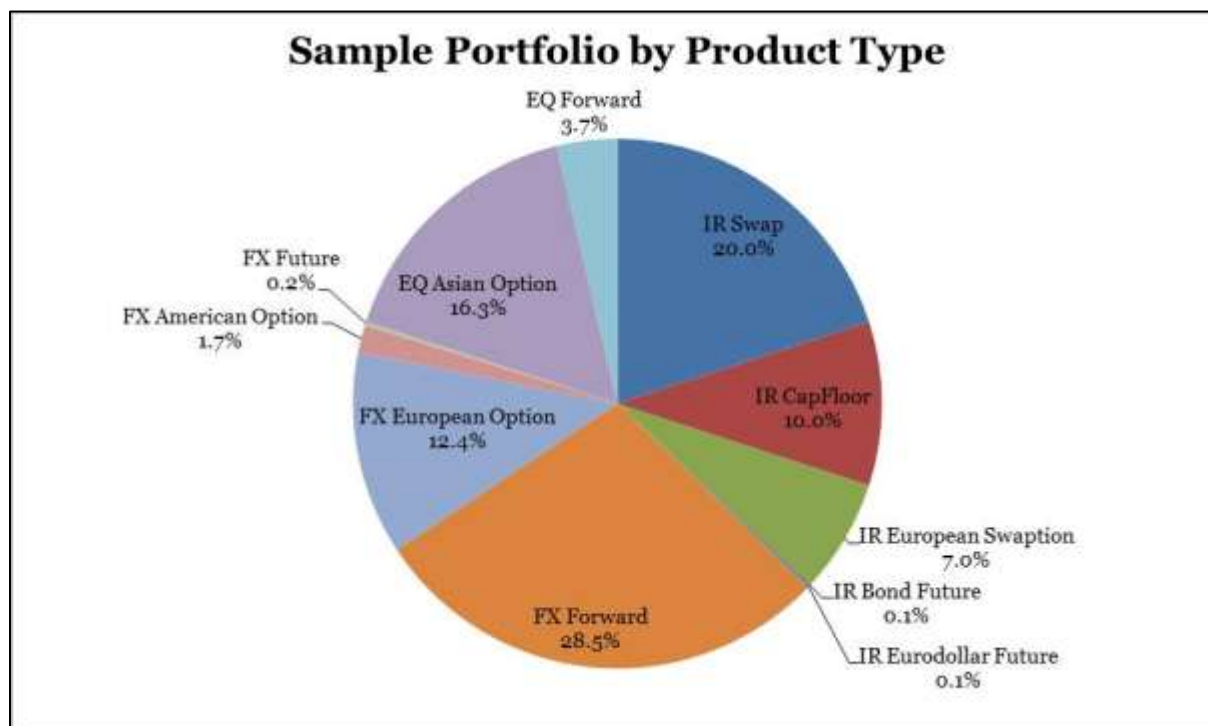
In order to further test this assumption, we built a sample portfolio of 1000 historical positions in the BNY Mellon trading book. In spring and summer 2014, we validated eleven VaR pricing models for various financial derivatives. As part of the validations, we included stress tests of market inputs, including high and low interest rate, equity, and volatility scenarios. Under each stressed scenario, we received derivative prices and sensitivity parameters, including delta (or basis point shifting), gamma, and vega (where appropriate). For our sample portfolio, we included a comparison of sensitivity parameters under “current” market scenarios and stressed scenarios. The analysis dates of our portfolio varied between three different dates: 3/14/14 (IR Swap, IR Cap/Floor), 3/19/14 (Foreign Exchange (“FX”) Forward¹), and 4/30/14 (IR European Swaption, IR Bond Future, IR Eurodollar Future, FX European Option, FX American Option, FX Future, EQ Asian Option, EQ Forward). We constructed the portfolio in such a way to accurately represent the makeup of a typical BNY Mellon trading portfolio and sampled positions randomly in R using [4]. A breakdown of the portfolio structure is given below in Table 2 and Figure 3.

Table 2: Sample BNY Mellon Trading Portfolio Statistics

Type	Product Type	Type In Portfolio	Type Weight	Stress Scenario	Stress Test Date
IR	IR Swap	200	37.2%	IR curves up 150bp	3/14/14
	IR CapFloor	100		IR curves up 150bp	3/14/14
	IR European Swaption	70		IR curves up 150bp	4/30/14
	IR Bond Future	1		IR curves up 150bp	4/30/14
	IR Eurodollar Future	1		IR curves up 150bp	4/30/14
FX	FX Forward	285	42.8%	IR curves up 150bp ¹	3/19/14
	FX European Option	124		IR curves up 150bp	4/30/14
	FX American Option	17		IR curves up 150bp	4/30/14
	FX Future	2		IR curves up 150bp	4/30/14
EQ	EQ Asian Option	163	20.0%	Volatility up 25%	4/30/14
	EQ Forward	37		Volatility up 25%	4/30/14

¹ The 150bp stress test for FX Forwards includes only the FXUSD_Forward curve. Only positions with exposure to this forward curve were sampled.

Figure 3: Breakdown of Sample BNY Mellon Trading Portfolio by Product Type



In [1], the model owner states, “the invariance of the Greeks approach that we chose to employ expresses the view that well hedged [BNY Mellon] portfolio will remain as such under the forecasted scenarios”. It is important to note that in this test, the sample portfolio we generate is static, i.e. not well-hedged in response to a stressed scenario. We include this test as an illustrative example as to the sensitivity of an unhedged sample BNY Mellon portfolio under stressed scenarios. Secondly, it is important to note that the deltas and gammas included in the test include only sensitivities to the underlying. As previously discussed, the model owner’s uses “delta” and “gamma” to approximate VaR, where delta and gamma are actually just first- and second-order sensitivities to all risk factors. That is, the model owner calls a position’s “delta” to the underlying as well as “delta” to a volatility surface (what is typically known as “vega”) separately as delta. In this test, we only include sensitivity to the underlying, as it is sufficient for this example.

Ultimately, we find that deltas and gammas are very different in stressed scenarios compared to current market, or “base”, scenarios. Results are included in Appendix B for IR and FX products (which includes basis point shifting results in place of delta), and Appendix C for EQ products (which includes model delta and gamma calculations). Results such as these are expected given that this is a static portfolio; this test illustrates the risk associated with using constant deltas and gammas in stressed scenarios if the portfolio is not well-hedged. Ultimately, we do not raise an issue regarding the assumption that deltas and gammas are the same in stressed market scenarios as they are today, nor for the use of Delta-Gamma approximation for VaR and SVaR. We have highlighted this as a model risk listed in Section 2.

2) Comparison of Percent Changes for Risk Factors and Corresponding Core Risk Factors

Another assumption included by the model owner regards forecasting risk factors. The model owner maps all risk factors underlying the BNY Mellon trading portfolio to a set of “core risk factors”, macroeconomic variables with forecasts for nine quarters ahead provided by the Federal Reserve or a third-party vendor. The model owner assumes that “the forecasted value of a risk factor is calculated so that the change in [risk factor] value is the same as the change in core [risk factor] value” [1]. The change is either multiplicative (for equity prices, volatilities, interest rate curves, and foreign exchange curves), or additive (for spreads). Thus, a relative change for equity values is a percentage change between a future date and the “analysis date” (for this CCAR exercise, 9/30/14).

Model owners In order to test this assumption, we apply the same methods as the model owner using historical data. In this exercise, we use 6/30/12 as the “analysis date” and analyze the percentage difference for various risk factors and core risk factors nine quarters ahead. We used historical time series from Bloomberg for the following series, given below in Table 3.

Table 3: Sample Risk Factors and Core Risk Factors used for testing historical percent changes

Risk Factor Type	Risk Factor	Core Risk Factor
Equity	:MSFT_C59491810_EQTV	:SP500_C00000117_EQTV
Equity	:SWN_C84546710_EQTV	:SP500_C00000117_EQTV
FX Spot	:FXCZK	:FXEUR
FX Spot	:FXKRW	:FXJPY
IR Curve	:IRUSD_MUNI	:IRUSD_Interbank
IR Curve	:IRJPY_LIB3M	:IRUSD_Interbank

For FX spot curves, we use the rate which converts one unit of a foreign currency to U.S. Dollars, as this is what is used as market data in the VaR calculation. For IR curves, “:IRUSD_MUNI” and “:IRUSD_Interbank” are time series for the yield curve at the five year tenor. Plots for percentage changes over the previous nine quarters is given below in Figure 4, Figure 5, Figure 6, Figure 7, Figure 8, and Figure 9.

Figure 4: Comparison of Percent Changes Since 2Q12, MSFT vs. S&P500

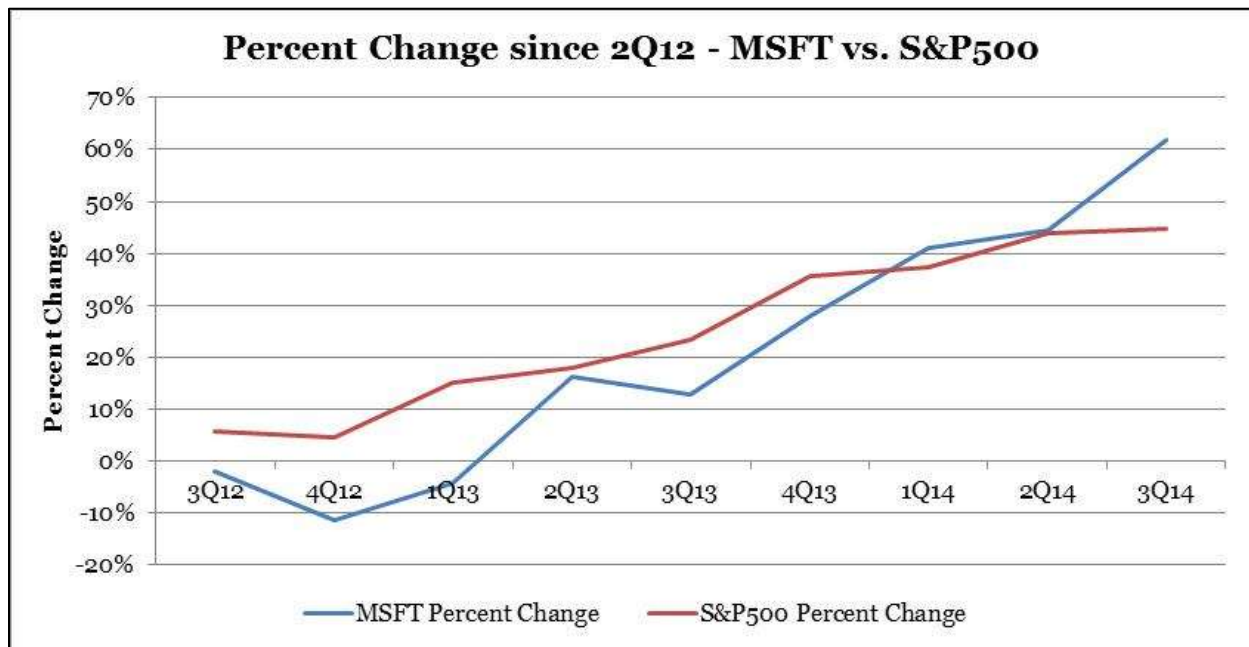


Figure 5: Comparison of Percent Changes Since 2Q12, SWN vs. S&P500

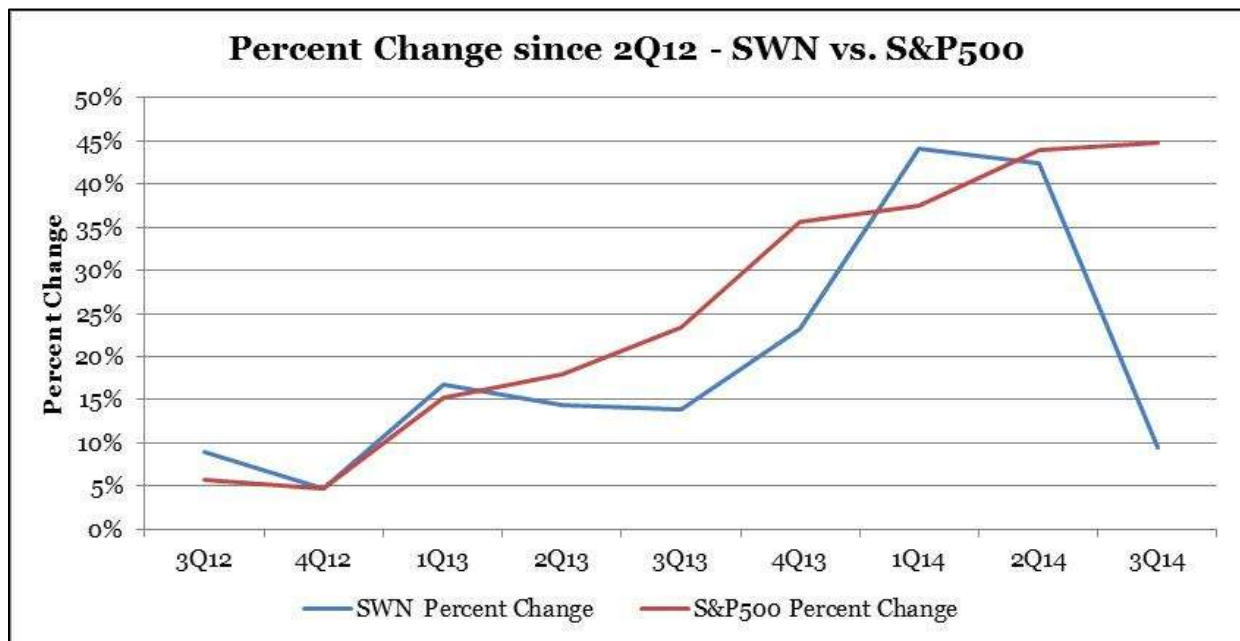


Figure 6: Comparison of Percent Changes Since 2Q12, CZK/USD vs. EUR/USD

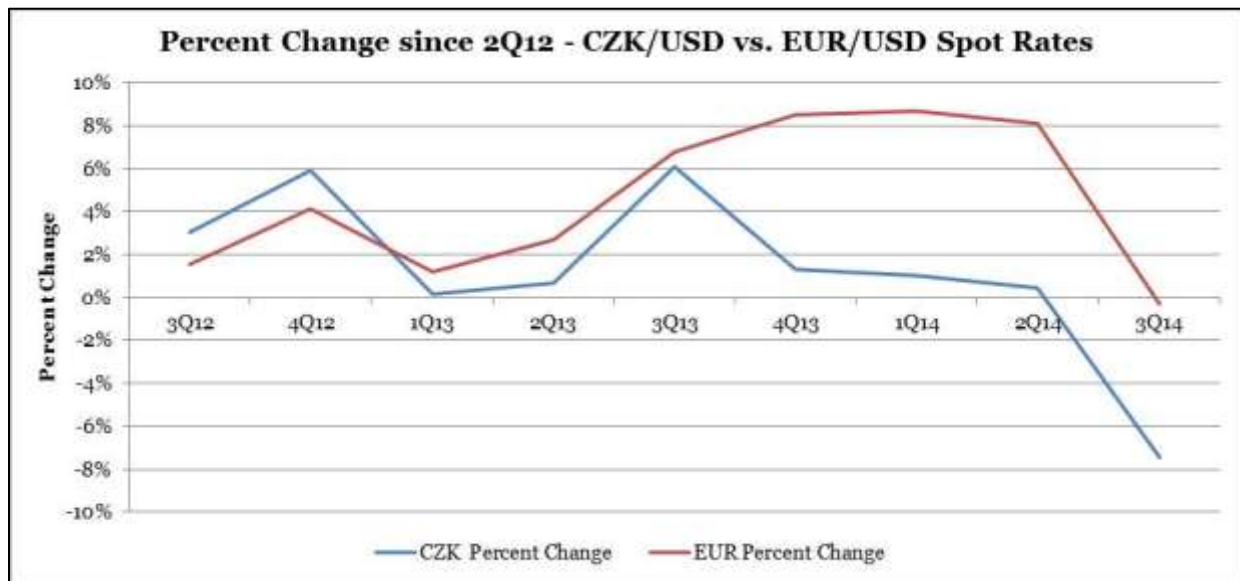


Figure 7: Comparison of Percent Changes Since 2Q12, KRW/USD vs. JPY/USD

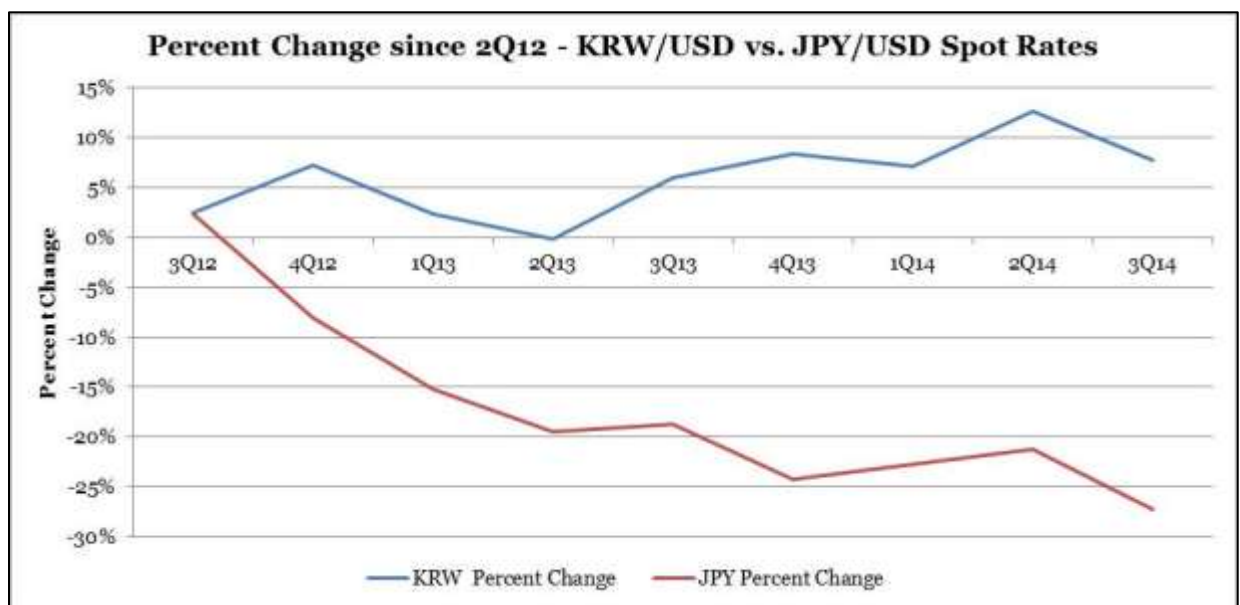


Figure 8: Comparison of Percent Changes since 2Q12, IRUSD_MUNI vs. IRUSD_Interbank

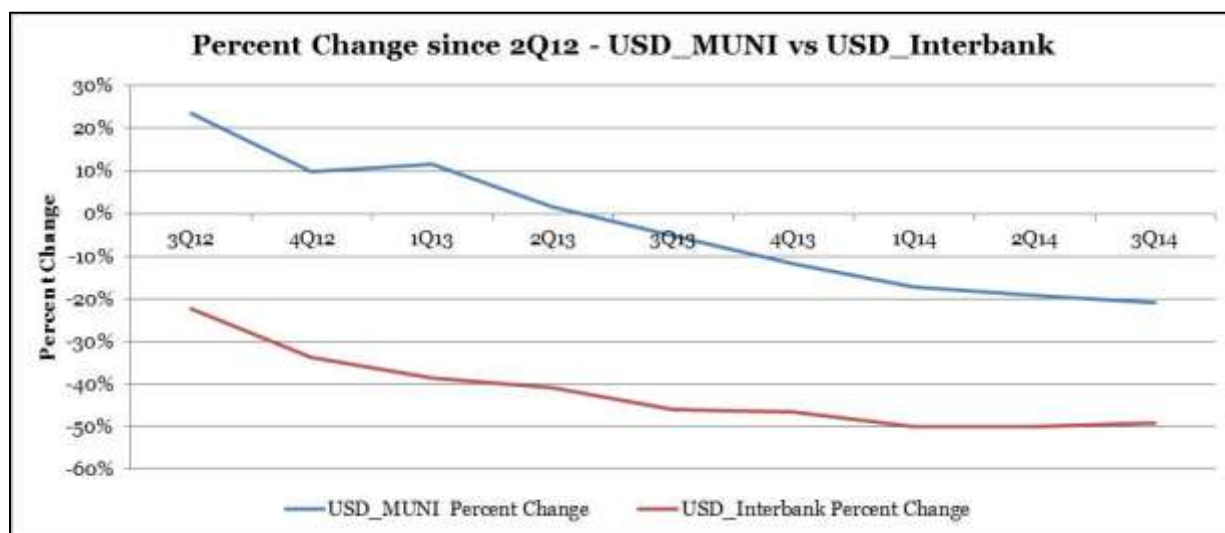
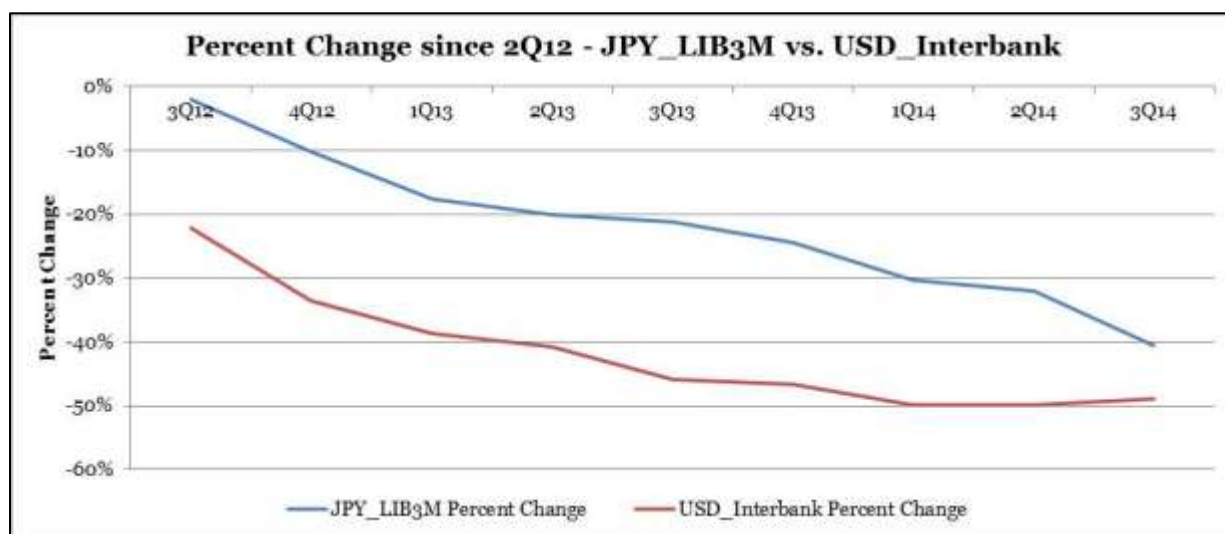


Figure 9: Comparison of Percent Changes since 2Q12, JPY_LIB3M vs. IRUSD_Interbank



We conclude that model owner's choices regarding mappings of risk factors and core risk factors are fairly reasonable. There are particular instances (SWN) where a factor might deviate largely from a core risk factor. In other cases, (KRW), percent change moves in the opposite direction. However, we have raised a level-3 issue urging model owner's to review the mapping using historical backtesting during the model's annual review. Furthermore, we note that large discrepancies between interest rates are not surprising, as percent change is largely inflated due to small rate values. Lastly, the validator notes that while some measure of correlation between core risk factors and risk factors might be observed in historical data, this does not necessarily mean that correlation will hold for the future. This is a crude measure of the model owner's assumptions using historical data.

Because forecasting multiple economic variables is a labor-intensive, we do not raise an issue on this assumption that percent change in risk factors can be mapped to percent change in core risk factors. We have highlighted it as a model risk.

f. References

1. "CCAR Methodology.docx"
2. "Simulation Engine Model.docx"
3. "CCAR_Capital_Projections_Template.xlsx"
4. "SamplePortfolio.R"
5. "NewScenGen.cpp"
6. "CCAR_info.h"
7. "CCAR_info.cpp"
8. "Factor.h"
9. "Factor.cpp"
10. "shifts_ir_info.csv"
11. "shifts_non_ir_info.csv"
12. "sensitivities_GenericSwapLeg_IRD-IRD_Derivative_Trading.csv"
13. "Market Risk VaR SVaR Validation Report 06 27 2013.pdf"
14. "Market Risk VaR SVaR Validation 06 27 2013 – APPENDIX.pdf"
15. Glasserman, Paul. Monte Carlo Methods in Financial Engineering. New York: Springer, 2003. Print.

Appendix A: Complete Risk Factor to Core Risk Factor Mapping

Risk Factor	Core Risk Factor
:IRUSD_INAAASP	:IRUSD_INBBBSP
:IRUSD_INAASP	:IRUSD_INBBBSP
:IRUSD_INASP	:IRUSD_INBBBSP
:IRUSD_INBBBSP	:IRUSD_INBBBSP
:IRUSD_INBBSP	:IRUSD_INBBBSP
:IRUSD_INBSP	:IRUSD_INBBBSP
:IRUSD_INCCCSP	:IRUSD_INBBBSP
:FXAUD_Foward	:IRJPY_Interbank
:FXCAD_Foward	:IRUSD_Interbank
:FXCHF_Foward	:IREUR_Interbank
:FXCZK_Foward	:IREUR_Interbank
:FXDKK_Foward	:IREUR_Interbank
:FXEUR_Foward	:IREUR_Interbank
:FXGBP_Foward	:IRGBP_Foward
:FXHKD_Foward	:IRJPY_Interbank
:FXJPY_Foward	:IRJPY_Interbank
:FXKWD_Foward	:IREUR_Interbank
:FXMYR_Foward	:IRJPY_Interbank
:FXNOK_Foward	:IREUR_Interbank
:FXNZD_Foward	:IRJPY_Interbank
:FXSAR_Foward	:IREUR_Interbank
:FXSEK_Foward	:IREUR_Interbank
:FXSGD_Foward	:IRJPY_Interbank
:FXZAR_Foward	:IREUR_Interbank
:IRAUD_Interbank	:IRJPY_Interbank
:IRCAD_Interbank	:IRUSD_Interbank
:IRCHF_Interbank	:IREUR_Interbank
:IRCZK_Interbank	:IREUR_Interbank
:IREUR_Interbank	:IREUR_Interbank
:IRGBP_Interbank	:IRGBP_Interbank
:IRJPY_Interbank	:IRJPY_Interbank
:IRMXN_Interbank	:IREUR_Interbank
:IRUSD_Interbank	:IRUSD_Interbank
:IRUSD_Prime	:IRUSD_Prime
:IREUR_Mmarket	:IREUR_Interbank
:IRUSD_Mmarket	:IRUSD_Interbank
:IRUSD_Treasury	:IRUSD_Treasury
:IRPLN_Interbank	:IREUR_Interbank
:IRSEK_Interbank	:IREUR_Interbank
:IRDKK_Interbank	:IREUR_Interbank

Risk Factor	Core Risk Factor
:IRZAR_Interbank	:IREUR_Interbank
:IRHKD_Interbank	:IRJPY_Interbank
:FXTRY_Forward	:IREUR_Interbank
:IREUR_EIB3M	:IREUR_Interbank
:IRUSD_MUAAASP	:IRUSD_Interbank
:IRUSD_MUAASP	:IRUSD_Interbank
:IRUSD_MUASP	:IRUSD_Interbank
:IRUSD_MUBBBSP	:IRUSD_Interbank
:IRUSD_MUBBSP	:IRUSD_Interbank
:IRUSD_MUBSP	:IRUSD_Interbank
:IRUSD_MUCCCS	:IRUSD_Interbank
:IRUSD_Interbank1	:IRUSD_Interbank
:IREUR_EIB1M	:IREUR_Interbank
:IRJPY_USDCC	:IRJPY_Interbank
:IRAUD_USDCC	:IRJPY_Interbank
:IREUR_USDCC	:IREUR_Interbank
:IRGBP_LIB3M	:IRGBP_Interbank
:IRGBP_RPI	:IRGBP_RPI
:IREUR_EIB1Y	:IREUR_Interbank
:BMY_C11012210_EQTV	:SP500_C00000117_EQTV
:COF_C14040H10_EQTV	:SP500_C00000117_EQTV
:CSCO_C17275R10_EQTV	:SP500_C00000117_EQTV
:GE_C36960410_EQTV	:SP500_C00000117_EQTV
:GS_C38141G10_EQTV	:SP500_C00000117_EQTV
:HAL_C40621610_EQTV	:SP500_C00000117_EQTV
:HD_C43707610_EQTV	:SP500_C00000117_EQTV
:HPQ_C42823610_EQTV	:SP500_C00000117_EQTV
:IBM_C45920010_EQTV	:SP500_C00000117_EQTV
:INDUA_C26099405_EQTV	:SP500_C00000117_EQTV
:INTC_C45814010_EQTV	:SP500_C00000117_EQTV
:JPM_C46625H10_EQTV	:SP500_C00000117_EQTV
:KO_C19121610_EQTV	:SP500_C00000117_EQTV
:MCD_C58013510_EQTV	:SP500_C00000117_EQTV
:MSFT_C59491810_EQTV	:SP500_C00000117_EQTV
:PFE_C71708110_EQTV	:SP500_C00000117_EQTV
:PG_C74271810_EQTV	:SP500_C00000117_EQTV
:PHM_C74586710_EQTV	:SP500_C00000117_EQTV
:SBUX_C85524410_EQTV	:SP500_C00000117_EQTV
:SP500_C00000117_EQTV	:SP500_C00000117_EQTV
:SPY_C78462F10_EQTV	:SP500_C00000117_EQTV
:TEVA_C88162420_EQTV	:SP500_C00000117_EQTV
:UPS_C91131210_EQTV	:SP500_C00000117_EQTV

Risk Factor	Core Risk Factor
:WMT_C93114210_EQTV	:SP500_C00000117_EQTV
:XOM_C30231G10_EQTV	:SP500_C00000117_EQTV
:EFA_C46428746_EQTV	:SP500_C00000117_EQTV
:EEM_C46428723_EQTV	:SP500_C00000117_EQTV
:WFC_C94974610_EQTV	:SP500_C00000117_EQTV
:MS_C61744644_EQTV	:SP500_C00000117_EQTV
:MRK_C58933Y10_EQTV	:SP500_C00000117_EQTV
:IVZ_CG491BT10_EQTV	:SP500_C00000117_EQTV
:YUM_C98849810_EQTV	:SP500_C00000117_EQTV
:XLF_C81369Y60_EQTV	:SP500_C00000117_EQTV
:ABX_C06790110_EQTV	:SP500_C00000117_EQTV
:F_C34537086_EQTV	:SP500_C00000117_EQTV
:MU_C59511210_EQTV	:SP500_C00000117_EQTV
:BBT_C05493710_EQTV	:SP500_C00000117_EQTV
:GM_C37045V10_EQTV	:SP500_C00000117_EQTV
:C_C17296742_EQTV	:SP500_C00000117_EQTV
:SWN_C84546710_EQTV	:SP500_C00000117_EQTV
:YHOO_C98433210_EQTV	:SP500_C00000117_EQTV
:SJM_C83269640_EQTV	:SP500_C00000117_EQTV
:WAG_C93142210_EQTV	:SP500_C00000117_EQTV
:PEP_C71344810_EQTV	:SP500_C00000117_EQTV
:MET_C59156R10_EQTV	:SP500_C00000117_EQTV
:FCX_C35671D85_EQTV	:SP500_C00000117_EQTV
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:LLY_C53245710_EQTV	:SP500_C00000117_EQTV
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:JNJ_C47816010_EQTV	:SP500_C00000117_EQTV
:DIS_C25468710_EQTV	:SP500_C00000117_EQTV
:CAT_C14912310_EQTV	:SP500_C00000117_EQTV
:HOG_C41282210_EQTV	:SP500_C00000117_EQTV
:ABT_C00282410_EQTV	:SP500_C00000117_EQTV
:ADBE_C00724F10_EQTV	:SP500_C00000117_EQTV
:AIG_C02687478_EQTV	:SP500_C00000117_EQTV
:CE_C15087010_EQTV	:SP500_C00000117_EQTV

Risk Factor	Core Risk Factor
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:CVX_C16676410_EQTV	:SP500_C00000117_EQTV
:DOV_C26000310_EQTV	:SP500_C00000117_EQTV
:ETN_CG2918310_EQTV	:SP500_C00000117_EQTV
:HON_C43851610_EQTV	:SP500_C00000117_EQTV
:JCI_C47836610_EQTV	:SP500_C00000117_EQTV
:LOW_C54866110_EQTV	:SP500_C00000117_EQTV
:LVS_C51783410_EQTV	:SP500_C00000117_EQTV
:PM_C71817210_EQTV	:SP500_C00000117_EQTV
:UNP_C90781810_EQTV	:SP500_C00000117_EQTV
:BRKB_C08467070_EQTV	:SP500_C00000117_EQTV
:QCOM_C74752510_EQTV	:SP500_C00000117_EQTV
:VLO_C91913Y10_EQTV	:SP500_C00000117_EQTV
:ICE_C45866F10_EQTV	:SP500_C00000117_EQTV
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:IM_C45715310_EQTV	:SP500_C00000117_EQTV
:BCR_C06738310_EQTV	:SP500_C00000117_EQTV
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:MO_C02209S10_EQTV	:SP500_C00000117_EQTV
:PCAR_C69371810_EQTV	:SP500_C00000117_EQTV
:XON_C46122T10_EQTV	:SP500_C00000117_EQTV
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:FDX_C31428X10_EQTV	:SP500_C00000117_EQTV
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:HCA_C40412C10_EQTV	:SP500_C00000117_EQTV
:LNKD_C53578A10_EQTV	:SP500_C00000117_EQTV
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:GBP_JPY-Simulation	:SP500_C00000117_EQTV
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:MXN_USD-Simulation	:SP500_C00000117_EQTV
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:EUR_GBP-Simulation	:SP500_C00000117_EQTV
:EUR_JPY-Simulation	:SP500_C00000117_EQTV
:FXAED	:FXEUR
:FXARS	:FXEUR
:FXAUD	:FXJPY

Risk Factor	Core Risk Factor
:FXBBD	:FXEUR
:FXBDT	:FXJPY
:FXBGN	:FXEUR
:FXBHD	:FXEUR
:FXBMD	:FXEUR
:FXBRL	:FXEUR
:FXBWP	:FXEUR
:FXCAD	:FXEUR
:FXCHF	:FXEUR
:FXCLP	:FXEUR
:FXCNY	:FXJPY
:FXCOP	:FXEUR
:FXCRC	:FXEUR
:FXCZK	:FXEUR
:FXDJF	:FXEUR
:FXDKK	:FXEUR
:FXDZD	:FXEUR
:FXEEK	:FXEUR
:FXEGP	:FXEUR
:FXEUR	:FXEUR
:FXFJD	:FXJPY
:FXGBP	:FXGBP
:FXGYD	:FXEUR
:FXHKD	:FXJPY
:FXHNL	:FXEUR
:FXHRK	:FXEUR
:FXHUF	:FXEUR
:FXIDR	:FXJPY
:FXILS	:FXEUR
:FXINR	:FXJPY
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:FXISK	:FXEUR
:FXJMD	:FXEUR
:FXJOD	:FXEUR
:FXJPY	:FXJPY
:FXKES	:FXEUR
:FXKRW	:FXJPY
:FXKWD	:FXEUR
:FXLBP	:FXEUR
:FXLKR	:FXEUR
:FXLTL	:FXEUR
:FXLVL	:FXEUR

Risk Factor	Core Risk Factor
:FXMAD	:FXEUR
:FXMUR	:FXEUR
:FXMWK	:FXEUR
:FXMXN	:FXEUR
:FXMYR	:FXJPY
:FXNAD	:FXEUR
:FXNGN	:FXEUR
:FXNOK	:FXEUR
:FXNZD	:FXJPY
:FXOMR	:FXEUR
:FXPEN	:FXEUR
:FXPHP	:FXJPY
:FXPKR	:FXEUR
:FXPLN	:FXEUR
:FXPYG	:FXEUR
:FXQAR	:FXEUR
:FXRON	:FXEUR
:FXRUB	:FXEUR
:FXSAR	:FXEUR
:FXSEK	:FXEUR
:FXSGD	:FXJPY
:FXSZL	:FXEUR
:FXTHB	:FXJPY
:FXTND	:FXEUR
:FXTRY	:FXEUR
:FXTWD	:FXJPY
:FXUAH	:FXEUR
:FXUGX	:FXEUR
:FXUYU	:FXEUR
:FXXAF	:FXEUR
:FXZAR	:FXEUR
:FXZMK	:FXEUR
:index_euro1	:SP500_C00000117_EQTV
:index_cap1m11	:SP500_C00000117_EQTV
:index_cap1m21	:SP500_C00000117_EQTV
:index_cap3m11	:SP500_C00000117_EQTV
:index_cap3m21	:SP500_C00000117_EQTV
:index_cap6m11	:SP500_C00000117_EQTV
:index_cap6m21	:SP500_C00000117_EQTV
:FXRSD	:FXEUR
:FXGHS	:FXEUR
:FXVEF	:FXEUR

Risk Factor	Core Risk Factor
:FXZMW	:FXEUR
:IRUSD_MBS_CC_OAS	:IRUSD_INBBBSP
:FXAED_Forward	:IRUSD_Interbank
:FXAFN	:FXEUR
:FXAOA	:FXEUR
:FXARS_Forward	:IRUSD_Interbank
:IRARS_Interbank	:IRUSD_Interbank
:IRAUD_BBS3M	:IRUSD_Interbank
:IRAUD_BBSW	:IRUSD_Interbank
:FXBGN_Forward	:IRUSD_Interbank
:FXBHD_Forward	:IRUSD_Interbank
:IRBMD_Interbank	:IRUSD_Interbank
:FXBOB	:FXEUR
:FXBRL_Forward	:IRUSD_Interbank
:IRBRL_Interbank	:IRUSD_Interbank
:FXBWP_Forward	:IRUSD_Interbank
:IRBWP_Interbank	:IRUSD_Interbank
:FXBZD	:FXEUR
:FXCLP_Forward	:IRUSD_Interbank
:FXCNY_Forward	:IRUSD_Interbank
:FXCOP_Forward	:IRUSD_Interbank
:IRCOP_Interbank	:IRUSD_Interbank
:FXCVE	:FXEUR
:FXEGP_Forward	:IRUSD_Interbank
:IREGP_Interbank	:IRUSD_Interbank
:IREUR_CapFloor1M	:IRUSD_Interbank
:IREUR_CapFloor3M	:IRUSD_Interbank
:IREUR_CapFloor6M	:IRUSD_Interbank
:IREUR_EIBOR	:IRUSD_Interbank
:IREUR_EONIA	:IRUSD_Interbank
:IREUR_Swaption	:IRUSD_Interbank
:IRGBP_Deposit	:IRUSD_Interbank
:IRGBP_SONIA	:IRUSD_Interbank
:IRGBP_Swaption	:IRUSD_Interbank
:IRGBP_USDCC	:IRUSD_Interbank
:FXGNF	:FXEUR
:FXGTQ	:FXEUR
:IRHKD_HIBOR	:IRUSD_Interbank
:FXHRK_Forward	:IRUSD_Interbank
:HUBB_C44351020_EQTV	:SP500_C00000117_EQTV
:FXHUF_Forward	:IRUSD_Interbank
:IRHUF_Interbank	:IRUSD_Interbank

Risk Factor	Core Risk Factor
:FXIDR_Forward	:IRUSD_Interbank
:IRIDR_Interbank	:IRUSD_Interbank
:FXILS_Forward	:IRUSD_Interbank
:IRILS_Interbank	:IRUSD_Interbank
:FXINR_Forward	:IRUSD_Interbank
:IRINR_Interbank	:IRUSD_Interbank
:FXISK_Forward	:IRUSD_Interbank
:FXJOD_Forward	:IRUSD_Interbank
:IRJPY_CapFloor6M	:IRUSD_Interbank
:IRJPY_Interbank1	:IRUSD_Interbank
:IRJPY_LIB1Y	:IRUSD_Interbank
:IRJPY_LIB3M	:IRUSD_Interbank
:IRJPY_Swaption	:IRUSD_Interbank
:IRJPY_TIB1M	:IRUSD_Interbank
:IRJPY_TIB3M	:IRUSD_Interbank
:IRJPY_TIBOR	:IRUSD_Interbank
:FXKES_Forward	:IRUSD_Interbank
:IRKES_Interbank	:IRUSD_Interbank
:FXKGS	:FXEUR
:FXKHR	:FXEUR
:FXKRW_Forward	:IRUSD_Interbank
:IRKRW_Interbank	:IRUSD_Interbank
:FXKZT_Forward	:IRUSD_Interbank
:FXKZT	:FXEUR
:FXLKR_Forward	:IRUSD_Interbank
:IRLKR_Interbank	:IRUSD_Interbank
:FXLTL_Forward	:IRUSD_Interbank
:FXMAD_Forward	:IRUSD_Interbank
:IRMAD_Interbank	:IRUSD_Interbank
:FXMUR_Forward	:IRUSD_Interbank
:IRMUR_Interbank	:IRUSD_Interbank
:FXMXN_Forward	:IRUSD_Interbank
:IRMYR_Interbank	:IRUSD_Interbank
:FXMZN	:FXEUR
:FXNAD_Forward	:IRUSD_Interbank
:FXNGN_Forward	:IRUSD_Interbank
:IRNOK_Interbank	:IRUSD_Interbank
:IRNZD_Interbank	:IRUSD_Interbank
:FXOMR_Forward	:IRUSD_Interbank
:FXPAB	:FXEUR
:FXPEN_Forward	:IRUSD_Interbank
:IRPEN_Interbank	:IRUSD_Interbank

Risk Factor	Core Risk Factor
:FXPGK	:FXEUR
:FXPHP_Forward	:IRUSD_Interbank
:IRPHP_Interbank	:IRUSD_Interbank
:FXPKR_Forward	:IRUSD_Interbank
:IRPKR_Interbank	:IRUSD_Interbank
:FXPLN_Forward	:IRUSD_Interbank
:FXQAR_Forward	:IRUSD_Interbank
:FXRON_Forward	:IRUSD_Interbank
:IRRON_Interbank	:IRUSD_Interbank
:FXRSD_Forward	:IRUSD_Interbank
:FXRUB_Forward	:IRUSD_Interbank
:IRSGD_Interbank	:IRUSD_Interbank
:FXSRD	:FXEUR
:FXTHB_Forward	:IRUSD_Interbank
:IRTHB_Interbank	:IRUSD_Interbank
:FXTND_Forward	:IRUSD_Interbank
:IRTRY_Interbank	:IRUSD_Interbank
:FXTTD	:FXEUR
:FXTWD_Forward	:IRUSD_Interbank
:IRTWD_Interbank	:IRUSD_Interbank
:IRUSD_CapFloor1M	:IRUSD_Interbank
:IRUSD_CapFloor3M	:IRUSD_Interbank
:IRUSD_CapFloor6M	:IRUSD_Interbank
:IRUSD_FEDFD	:IRUSD_Interbank
:FXUSD_Forward	:IRUSD_Interbank
:IRUSD_GOAAA	:IRUSD_Interbank
:IRUSD_INAAA	:IRUSD_Interbank
:IRUSD_LIA6M	:IRUSD_Interbank
:IRUSD_LIB1Y	:IRUSD_Interbank
:IRUSD_LIB6M	:IRUSD_Interbank
:IRUSD_MUAAA	:IRUSD_Interbank
:IRUSD_MUNI	:IRUSD_Interbank
:FXUSD	:FXEUR
:IRUSD_Supranational	:IRUSD_Interbank
:IRUSD_Swaption	:IRUSD_Interbank
:IRVEF_Interbank	:IRUSD_Interbank
:FXVND	:FXEUR
:FXXCD	:FXEUR
:FXXOF	:FXEUR
:FXXPF	:FXEUR
:FXYER	:FXEUR

Appendix B: Test 1, BPSUp Values for IR and FX Products

Type	Trade ID	Base BPSUp	Stressed BPSUp	Relative Difference
IR Swap	200026NYP USD 20161001	0	0	
IR Swap	189169NYP USD 20330405	0	0	
IR Swap	184318NYS USD 20191130	0	0	
IR Swap	182229NYP USD 20221009	-42.5338	-39.3086	8%
IR Swap	166758NYP USD 20210628	0	0	
IR Swap	135413NYS USD 20390206	-15613.1447	-10671.5689	46%
IR Swap	199112NYS USD 20240301	0	0	
IR Swap	152213NYS GBP 20200318	1046.945004	984.4430036	6%
IR Swap	176574NYP USD 20160508	0	0	
IR Swap	162720NYP USD 20410131	0	0	
IR Swap	198590NYS USD 20201201	0	0	
IR Swap	167637NYP USD 20170902	0	0	
IR Swap	199007NYP USD 20431227	0	0	
IR Swap	198566NYS USD 20190319	119.3222	113.2709	5%
IR Swap	174740NYS USD 20220308	-32891.4114	-29100.6259	13%
IR Swap	124182NYP USD 20151201	0	0	
IR Swap	138815NYP USD 20390424	0	0	
IR Swap	187864NYS USD 20230312	-17060.4453	-14829.7759	15%
IR Swap	193898NYS JPY 20280731	1483.325836	1285.074693	15%
IR Swap	197637NYS EUR 20201115	-124344.2883	-112156.0131	11%
IR Swap	174220NYS USD 20220221	-15857.7761	-14023.9242	13%
IR Swap	195854NYP USD 20161221	0	0	
IR Swap	180089NYP USD 20220822	0	0	
IR Swap	159522NYP USD 20201008	0	0	
IR Swap	184895NYP USD 20230110	0	0	
IR Swap	125564NYS USD 20180201	-1317.9115	-1243.2094	6%
IR Swap	130678NYP EUR 20231024	0	0	
IR Swap	123424NYS USD 20140701	-9.2033	-9.1554	1%
IR Swap	182325NYS USD 20181018	405.0058	386.0653	5%
IR Swap	125028NYS USD 20170504	-99.5435	-95.6976	4%
IR Swap	149240NYP USD 20150107	0	0	
IR Swap	191916NYS USD 20140420	3.4937	3.4888	0%
IR Swap	160108NYS USD 20151001	-200.8622	-196.2863	2%
IR Swap	166477NYS USD 20410616	-20817.3478	-13641.4681	53%
IR Swap	179839NYS USD 20420814	-14496.6934	-9376.139	55%
IR Swap	200679NYS USD 20190218	-21898.2539	-20272.2075	8%
IR Swap	173740NYS JPY 20160207	27.45027528	26.86925876	2%
IR Swap	170323NYP USD 20411011	0	0	
IR Swap	122420NYP JPY 20330623	0	0	
IR Swap	194165NYS USD 20140918	-5027.8272	-4969.3588	1%

IR Swap	181962NYS USD 20251007	15260.9932	13593.1289	12%
IR Swap	154985NYP USD 20150528	0	0	
IR Swap	172749NYS USD 20161229	-6728.4861	-6447.3014	4%
IR Swap	190652NYP USD 20200514	0	0	
IR Swap	180684NYS USD 20190905	0	0	
IR Swap	164602NYP USD 20410404	0	0	
IR Swap	199227NYS USD 20210319	-836.4973	-752.7111	11%
IR Swap	140905NYP USD 20181203	0	0	
IR Swap	187845NYP USD 20230312	0	0	
IR Swap	167194NYS USD 20180712	-53935.6366	-50472.0165	7%
IR Swap	201323NYP USD 20240305	0	0	
IR Swap	196841NYS USD 20181022	-41977.914	-39102.9493	7%
IR Swap	156814NYP USD 20150720	0	0	
IR Swap	175350NYP USD 20161220	-17.242	-16.7746	3%
IR Swap	131874NYP EUR 20381125	0	0	
IR Swap	151864NYP EUR 20150104	0	0	
IR Swap	192343NYS USD 20190619	0	0	
IR Swap	149170NYS USD 20300105	-13676.2128	-10764.7762	27%
IR Swap	194477NYP USD 20180815	0	0	
IR Swap	189352NYP JPY 20330410	0	0	
IR Swap	149071NYS USD 20290527	-13301.4016	-10525.3692	26%
IR Swap	178474NYP JPY 20150704	0	0	
IR Swap	167547NYS USD 20160130	0	0	
IR Swap	192152NYP USD 20430618	0	0	
IR Swap	198528NYS USD 20181218	-1873.9772	-1736.9521	8%
IR Swap	183977NYS USD 20220301	-60535.1432	-53750.5795	13%
IR Swap	187193NYP USD 20180228	0	0	
IR Swap	142958NYS USD 20290722	-23198.0956	-18468.4004	26%
IR Swap	162115NYP JPY 20160104	0	0	
IR Swap	158027NYP EUR 20190823	0	0	
IR Swap	164298NYS JPY 20160328	30.75489712	30.06080871	2%
IR Swap	198529NYS USD 20181218	-3331.5151	-3087.9149	8%
IR Swap	105773NYP USD 20170615	0	0	
IR Swap	119632NYP JPY 20200303	0	0	
IR Swap	195375NYP JPY 20220912	0	0	
IR Swap	176789NYP JPY 20320515	0	0	
IR Swap	187267NYP USD 20230301	0	0	
IR Swap	141860NYP JPY 20340624	0	0	
IR Swap	185825NYS USD 20170222	140.5093	136.1183	3%
IR Swap	174660NYS EUR 20220308	-19967.77006	-17556.5852	14%
IR Swap	196760NYS USD 20331018	-6318.8524	-4690.6526	35%
IR Swap	137150NYP USD 20160401	0	0	
IR Swap	190644NYP JPY 20150514	0	0	

IR Swap	121756NYS EUR 20180523	-8055.677105	-7541.188	7%
IR Swap	125098NYS USD 20170701	-1181.5222	-1124.4059	5%
IR Swap	164047NYP USD 20140318	0	0	
IR Swap	174514NYS USD 20420302	5951.3386	4649.0755	28%
IR Swap	141004NYP EUR 20270608	0	0	
IR Swap	171839NYP USD 20161212	-85.2701	-82.9426	3%
IR Swap	197305NYS USD 20231104	6754.3478	6139.3609	10%
IR Swap	172434NYS USD 20170521	2268.4872	2194.931	3%
IR Swap	144870NYS USD 20240911	-22447.9734	-19071.6328	18%
IR Swap	183903NYP JPY 20171204	0	0	
IR Swap	182542NYS USD 20221015	0	0	
IR Swap	126299NYP EUR 20180709	0	0	
IR Swap	171657NYP USD 20181201	-83.4481	-79.645	5%
IR Swap	155963NYS JPY 20170629	89.44305208	89.4312587	0%
IR Swap	201462NYP USD 20440307	0	0	
IR Swap	148981NYS USD 20190902	856.5815	809.6035	6%
IR Swap	122799NYS EUR 20180704	5568.985438	5311.678111	5%
IR Swap	179154NYP JPY 20190628	-1.328838663	-1.275763515	4%
IR Swap	176991NYP JPY 20320521	0	0	
IR Swap	171320NYP GBP 20290630	0	0	
IR Swap	195018NYS USD 20430830	21332.3533	16481.6642	29%
IR Swap	185748NYP USD 20140425	0	0	
IR Swap	148573NYP EUR 20391215	0	0	
IR Swap	133793NYP USD 20190112	0	0	
IR Swap	175856NYS USD 20420411	-19534.7353	-12764.1787	53%
IR Swap	178571NYP USD 20420709	0	0	
IR Swap	108843NYP USD 20150401	0	0	
IR Swap	193745NYS JPY 20150729	1246.005847	1243.956207	0%
IR Swap	198237NYP USD 20331205	0	0	
IR Swap	180402NYP USD 20170927	0	0	
IR Swap	167639NYP JPY 20180625	0	0	
IR Swap	140777NYS USD 20140617	-36.1902	-36.0018	1%
IR Swap	188108NYP USD 20430314	0	0	
IR Swap	196272NYP USD 20251004	0	0	
IR Swap	192853NYP USD 20230705	0	0	
IR Swap	179479NYP USD 20220806	0	0	
IR Swap	147965NYS USD 20141127	113.0206	112.013	1%
IR Swap	197435NYS USD 20201107	-14047.0849	-12676.6569	11%
IR Swap	180490NYS JPY 20170904	17.11172367	16.39767123	4%
IR Swap	129466NYS EUR 20380930	28143.10496	22364.29572	26%
IR Swap	159349NYP USD 20170930	0	0	
IR Swap	97064NYS USD 20291015	-19919.9422	-15723.8771	27%
IR Swap	133869NYP USD 20190113	0	0	

IR Swap	157032NYS USD 20200202	-6148.2224	-5614.5191	10%
IR Swap	150777NYP USD 20200218	0	0	
IR Swap	192650NYS USD 20280701	1290.8178	1125.6879	15%
IR Swap	158257NYP USD 20300831	0	0	
IR Swap	172970NYP USD 20170109	0	0	
IR Swap	184475NYP USD 20221224	0	0	
IR Swap	193741NYP JPY 20190729	0	0	
IR Swap	166104NYP USD 20160603	0	0	
IR Swap	125303NYP USD 20140501	0	0	
IR Swap	178878NYS USD 20170717	-12572.7694	-11939.7367	5%
IR Swap	145787NYS USD 20141002	-4554.8846	-4513.6819	1%
IR Swap	198378NYS USD 20231209	-7175.8696	-6167.8864	16%
IR Swap	183112NYP USD 20171107	-49.9181	-48.1181	4%
IR Swap	173237NYS USD 20180824	3734.5623	3564.8463	5%
IR Swap	163230NYP USD 20180216	0	0	
IR Swap	168726NYS USD 20340601	4547.1375	3922.0131	16%
IR Swap	171489NYP USD 20191110	0	0	
IR Swap	200527NYP USD 20340212	0	0	
IR Swap	163923NYS EUR 20210322	-4452.7896	-4006.768218	11%
IR Swap	177063NYP EUR 20200523	0	0	
IR Swap	170849NYP USD 20161026	-6.9324	-6.7536	3%
IR Swap	186559NYS USD 20230215	-17166.0076	-14961.4564	15%
IR Swap	160843NYP EUR 20251123	0	0	
IR Swap	197966NYS USD 20181125	346.086	329.5736	5%
IR Swap	166180NYP USD 20210606	0	0	
IR Swap	160030NYS JPY 20351028	-123012.0162	-87833.46605	40%
IR Swap	161490NYP JPY 20151217	0	0	
IR Swap	198573NYP USD 20190319	0	0	
IR Swap	189086NYS USD 20200404	805.3746	756.9242	6%
IR Swap	132538NYP JPY 20331210	0	0	
IR Swap	170176NYP USD 20141005	0	0	
IR Swap	135265NYS USD 20210204	375.1136	349.7906	7%
IR Swap	176750NYP USD 20320511	0	0	
IR Swap	154348NYS USD 20400515	34775.7168	26977.4012	29%
IR Swap	135560NYS USD 20290209	-56251.3929	-44746.4553	26%
IR Swap	195363NYP USD 20330911	0	0	
IR Swap	189097NYP USD 20230404	0	0	
IR Swap	167266NYP USD 20410714	0	0	
IR Swap	196763NYP USD 20251018	0	0	
IR Swap	124133NYP USD 20151101	0	0	
IR Swap	144974NYS JPY 20140916	-3.651475971	-3.609456624	1%
IR Swap	157057NYS USD 20200421	854.228	802.5526	6%
IR Swap	143899NYS USD 20160817	1669.5201	1625.668	3%

IR Swap	148985NYP USD 20190424	0	0	
IR Swap	195882NYP USD 20230220	0	0	
IR Swap	102458NYP USD 20140315	0	0	
IR Swap	149115NYS GBP 20170424	-5097.398501	-4856.052294	5%
IR Swap	199101NYS USD 20161231	659.2074	639.6132	3%
IR Swap	192613NYS USD 20230628	5412.2843	4935.6442	10%
IR Swap	191531NYS USD 20160615	301.1171	292.5534	3%
IR Swap	173235NYS USD 20140812	3.2945	3.2741	1%
IR Swap	164515NYS EUR 20200623	-42247.07897	-38266.81883	10%
IR Swap	185513NYP EUR 20230125	0	0	
IR Swap	187569NYS JPY 20230307	-8054.144012	-6969.466826	16%
IR Swap	197941NYS USD 20160401	-19833.7113	-19218.085	3%
IR Swap	171661NYP JPY 20160930	-1.926876786	-1.887014884	2%
IR Swap	197623NYP JPY 20231114	0	0	
IR Swap	177387NYS USD 20420601	3484.6405	2717.1856	28%
IR Swap	195910NYP USD 20250926	0	0	
IR Swap	196494NYP USD 20181009	0	0	
IR Swap	102431NYS EUR 20151007	241.0892604	236.4369956	2%
IR Swap	189174NYP USD 20230301	0	0	
IR Swap	192094NYP USD 20230617	0	0	
IR Swap	187836NYS USD 20230312	-27296.7124	-23727.6414	15%
IR Swap	140405NYS USD 20290526	-7448.7834	-5894.2054	26%
IR Swap	199512NYS USD 20170201	0	0	
IR Swap	145656NYS USD 20190929	838.4422	791.9084	6%
IR Swap	83112NYP USD 20321204	0	0	
IR Swap	191230NYP USD 20200530	0	0	
IR Swap	201742NYP USD 20170225	0	0	
IR Swap	191444NYS USD 20280604	-9503.8176	-7629.4547	25%
IR Swap	201032NYP USD 20190227	0	0	
IR Swap	150007NYS GBP 20200125	-9411.229887	-8560.965141	10%
IR Swap	146227NYS USD 20391015	-4906.5585	-3327.531	47%
IR CapFloor	100173NY Caps/Floors_6 USD	87.38683025	341.3239256	-74%
IR CapFloor	122561NY Caps/Floors_6 USD	0	0.001246128	
IR CapFloor	144070NY Caps/Floors_6 USD	-242.6924914	-724.4074169	-66%
IR CapFloor	146401NY Caps/Floors_6 USD	0	-1.546352601	-100%
IR CapFloor	107405NY Caps/Floors_6 USD	-19301.82777	-52020.34729	-63%
IR CapFloor	113536NY Caps/Floors_6 USD	-6.506153505	-208.3521463	-97%
IR CapFloor	115881NY Caps/Floors_6 USD	-367.7305989	-1339.727344	-73%
IR CapFloor	150781NY Caps/Floors_6 USD	10120.34827	6664.697388	52%
IR CapFloor	184039NY Caps/Floors_6 USD	-457.2438966	-960.2715354	-52%
IR CapFloor	101432NY Caps/Floors_6 EUR	7360.635125	6932.924977	6%
IR CapFloor	149785NY Caps/Floors_6 EUR	-513.7744552	-4019.301151	-87%
IR CapFloor	106660NY Caps/Floors_6 USD	-178.4616303	-341.5794525	-48%

IR CapFloor	174482NY Caps/Floors_6 USD	8132.69308	19584.269	-58%
IR CapFloor	79577NY Caps/Floors_6 USD	213.3677161	895.2412976	-76%
IR CapFloor	107403NY Caps/Floors_6 EUR	29316.94683	24989.55588	17%
IR CapFloor	110162NY Caps/Floors_6 USD	0	0.001328538	
IR CapFloor	152918NY Caps/Floors_6 EUR	-2069.113597	-8681.617339	-76%
IR CapFloor	98097NY Caps/Floors_6 USD	479.2021225	1506.590109	-68%
IR CapFloor	130700NY Caps/Floors_6 EUR	1157.458468	6666.683928	-83%
IR CapFloor	116846NY Caps/Floors_6 USD	-0.102892637	-77.01598135	-100%
IR CapFloor	147909NY Caps/Floors_6 USD	-4.557679767	-19.12157925	-76%
IR CapFloor	105704NY Caps/Floors_6 USD	1.338414536	12.22440951	-89%
IR CapFloor	132346NY Caps/Floors_6 EUR	0	-0.177830836	-100%
IR CapFloor	152690NY Caps/Floors_6 EUR	0	0	
IR CapFloor	103312NY Caps/Floors_6 USD	0	0	
IR CapFloor	138061NY Caps/Floors_6 EUR	7207.564693	7739.330007	-7%
IR CapFloor	138923NY Caps/Floors_6 USD	2.299865517	1831.828046	-100%
IR CapFloor	162149NY Caps/Floors_6 USD	-17241.28706	-10488.43995	64%
IR CapFloor	103317NY Caps/Floors_6 USD	0	0	
IR CapFloor	158511NY Caps/Floors_6 USD	-172.0519475	-560.6911535	-69%
IR CapFloor	113537NY Caps/Floors_6 USD	2.809391399	129.0232118	-98%
IR CapFloor	114100NY Caps/Floors_6 USD	-864.2717542	-2256.73584	-62%
IR CapFloor	150758NY Caps/Floors_6 USD	-0.001068546	-116.4774151	-100%
IR CapFloor	160810NY Caps/Floors_6 USD	-54.04444426	-235.7970842	-77%
IR CapFloor	197630NY Caps/Floors_6 USD	-149.963117	-559.3795995	-73%
IR CapFloor	167676NY Caps/Floors_6 USD	0	-0.027571969	-100%
IR CapFloor	106454NY Caps/Floors_6 USD	-448.2676741	-1274.55973	-65%
IR CapFloor	102506NY Caps/Floors_6 EUR	-0.351991519	-374.656534	-100%
IR CapFloor	101685NY Caps/Floors_6 USD	86.81002593	1122.543033	-92%
IR CapFloor	184645NY Caps/Floors_6 USD	-517.1488565	-2225.957763	-77%
IR CapFloor	130133NY Caps/Floors_6 EUR	-697.6731722	-4679.30377	-85%
IR CapFloor	97854NY Caps/Floors_6 EUR	0	-2.05216E-07	-100%
IR CapFloor	134199NY Caps/Floors_6 USD	8283.633778	12816.34761	-35%
IR CapFloor	191702NY Caps/Floors_6 USD	-4408.819349	-15709.62503	-72%
IR CapFloor	97218NY Caps/Floors_6 USD	-403.562282	-1579.271131	-74%
IR CapFloor	173203NY Caps/Floors_6 USD	251.1316495	118.4057011	112%
IR CapFloor	106706NY Caps/Floors_6 USD	63.60198925	126.1521308	-50%
IR CapFloor	138703NY Caps/Floors_6 USD	0	-7.76312E-05	-100%
IR CapFloor	182313NY Caps/Floors_6 USD	-1374.104012	-7517.793845	-82%
IR CapFloor	128995NY Caps/Floors_6 EUR	-0.181352017	-777.7960864	-100%
IR CapFloor	137241NY Caps/Floors_6 USD	907.2681469	4473.656432	-80%
IR CapFloor	119426NY Caps/Floors_6 USD	-1.504E-07	-0.637351302	-100%
IR CapFloor	195461NY Caps/Floors_6 USD	-1565.759733	-3305.110016	-53%
IR CapFloor	194976NY Caps/Floors_6 USD	1643.611613	2922.818444	-44%
IR CapFloor	144530NY Caps/Floors_6 USD	0	-0.305758359	-100%

IR CapFloor	94700NY Caps/Floors_6 USD	0	0	
IR CapFloor	100813NY Caps/Floors_6 USD	-13.17021035	-272.1090369	-95%
IR CapFloor	170683NY Caps/Floors_6 USD	-1.99479E-05	-19.94460891	-100%
IR CapFloor	195899NY Caps/Floors_6 USD	-1418.938574	-3015.498008	-53%
IR CapFloor	141016NY Caps/Floors_6 USD	0	-0.000028627	-100%
IR CapFloor	190358NY Caps/Floors_6 USD	-532.0038378	-1249.87616	-57%
IR CapFloor	148854NY Caps/Floors_6 USD	-2.4159E-06	-9.003921219	-100%
IR CapFloor	197750NY Caps/Floors_6 USD	-251.4351006	-568.5730738	-56%
IR CapFloor	152921NY Caps/Floors_6 EUR	2475.949405	10087.70737	-75%
IR CapFloor	183010NY Caps/Floors_6 USD	-15437.49723	-47836.55753	-68%
IR CapFloor	199003NY Caps/Floors_6 USD	-1570.368842	-4165.090221	-62%
IR CapFloor	120376NY Caps/Floors_6 EUR	82808.00669	63715.57789	30%
IR CapFloor	157463NY Caps/Floors_6 USD	-0.186127237	-66.94038205	-100%
IR CapFloor	179435NY Caps/Floors_6 EUR	18626.14514	2488.33497	649%
IR CapFloor	200632NY Caps/Floors_6 USD	-31797.21819	-64748.24864	-51%
IR CapFloor	164620NY Caps/Floors_6 USD	-137.7660532	-402.8765051	-66%
IR CapFloor	146316NY Caps/Floors_6 USD	0	-0.091265387	-100%
IR CapFloor	126794NY Caps/Floors_6 USD	-22879.77523	-14587.23117	57%
IR CapFloor	97653NY Caps/Floors_6 USD	-846.0184995	-1728.341488	-51%
IR CapFloor	122394NY Caps/Floors_6 EUR	0	0	
IR CapFloor	105701NY Caps/Floors_6 USD	-4.514147272	-31.38125291	-86%
IR CapFloor	200797NY Caps/Floors_6 USD	-1973.987529	-4776.809293	-59%
IR CapFloor	187200NY Caps/Floors_6 USD	-4295.444464	-7415.49226	-42%
IR CapFloor	111231NY Caps/Floors_6 USD	5053.289753	15756.02278	-68%
IR CapFloor	113307NY Caps/Floors_6 USD	-13697.9889	-26562.16591	-48%
IR CapFloor	107234NY Caps/Floors_6 USD	0	-1.138879394	-100%
IR CapFloor	190267NY Caps/Floors_6 USD	-944.8195901	-2186.592221	-57%
IR CapFloor	166067NY Caps/Floors_6 USD	-32.68569255	-359.0160972	-91%
IR CapFloor	193329NY Caps/Floors_6 USD	16357.94578	20366.8874	-20%
IR CapFloor	103847NY Caps/Floors_6 USD	-294.9560854	-908.1952025	-68%
IR CapFloor	197992NY Caps/Floors_6 USD	-0.213760642	-160.001592	-100%
IR CapFloor	160028NY Caps/Floors_6 USD	-0.248274577	-26.96020561	-99%
IR CapFloor	177922NY Caps/Floors_6 USD	-8.33494011	-235.0545629	-96%
IR CapFloor	157688NY Caps/Floors_6 USD	-44.30770522	-305.6058728	-86%
IR CapFloor	160329NY Caps/Floors_6 USD	2465.737645	17289.34352	-86%
IR CapFloor	99668NY Caps/Floors_6 USD	83.90942774	321.5025985	-74%
IR CapFloor	172116NY Caps/Floors_6 USD	-99.4235369	-628.2926755	-84%
IR CapFloor	161257NY Caps/Floors_6 USD	-11.092763	-431.5631844	-97%
IR CapFloor	102473NY Caps/Floors_6 USD	51.72047669	2142.317132	-98%
IR CapFloor	113714NY Caps/Floors_6 USD	-5065.93215	-10557.90574	-52%
IR CapFloor	148826NY Caps/Floors_6 USD	-1.9361E-06	-7.215903729	-100%
IR CapFloor	169548NY Caps/Floors_6 USD	0	-2.266313117	-100%
IR CapFloor	139945NY Caps/Floors_6 USD	-31.77498211	-31.68761243	0%

IR CapFloor	148722NY Caps/Floors_6 USD	-171.2979656	-805.2743709	-79%
IR CapFloor	187209NY Caps/Floors_6 USD	-2316.892134	-3999.794626	-42%
IR European Swaption	194790NY SWAPTIONS_1 USD	49086.54543	-1532.328873	-3303%
IR European Swaption	139815NY SWAPTIONS_1 USD	-102225.2455	0	
IR European Swaption	168643NY SWAPTIONS_1 USD	-6468.153721	48975.04238	-113%
IR European Swaption	170803NY SWAPTIONS_1 USD	-10261.5126	193487.6875	-105%
IR European Swaption	158098NY SWAPTIONS_1 JPY	36.01282416	0	
IR European Swaption	141332NY SWAPTIONS_1 USD	-1.77E-08	0	
IR European Swaption	157864NY SWAPTIONS_1 USD	-6686.78805	84986.02125	-108%
IR European Swaption	160216NY SWAPTIONS_1 USD	17950.7106	-54291.29227	-133%
IR European Swaption	183070NY SWAPTIONS_1 USD	-8361.296261	45150.4834	-119%
IR European Swaption	167173NY SWAPTIONS_1 JPY	119.9089774	0	
IR European Swaption	191595NY SWAPTIONS_1 USD	-2912.107397	12745.62862	-123%
IR European Swaption	138667NY SWAPTIONS_1 EUR	6635.053131	0	
IR European Swaption	179787NY SWAPTIONS_1 USD	-3670.040217	0.00407624	
IR European Swaption	165378NY SWAPTIONS_1 USD	19588.48909	41068.9846	-52%
IR European Swaption	121664NY SWAPTIONS_1 EUR	9198.378629	6896.525669	33%
IR European Swaption	173391NY SWAPTIONS_1 JPY	503.6085865	0	
IR European Swaption	189735NY SWAPTIONS_1 USD	-15091.00191	-60231.79726	-75%
IR European Swaption	185179NY SWAPTIONS_1 USD	-9590.576555	-17398.85054	-45%
IR European Swaption	163772NY SWAPTIONS_1 JPY	-636.2908026	0	
IR European Swaption	148287NY SWAPTIONS_1 USD	-5744.342571	-3794.523481	51%
IR European Swaption	147401NY SWAPTIONS_1 USD	15170.24777	52156.03932	-71%
IR European Swaption	199476NY SWAPTIONS_1 USD	-27649.92056	178.2728579	-15610%
IR European Swaption	99696NY SWAPTIONS_1 USD	42909.56293	-3.7197E-05	- 115357517295 %
IR European Swaption	144685NY SWAPTIONS_1 USD	58163.17967	-11750.50127	-595%
IR European Swaption	143369NY SWAPTIONS_1 USD	41359.07939	0	
IR European Swaption	159986NY SWAPTIONS_1 USD	5820.303327	56207.19306	-90%
IR European Swaption	173243NY SWAPTIONS_1 JPY	402.8868692	0	
IR European Swaption	142495NY SWAPTIONS_1 USD	-48021.50367	0	
IR European Swaption	178041NY SWAPTIONS_1 JPY	293.7312781	0	
IR European Swaption	165639NY SWAPTIONS_1 USD	-34854.60519	106989.1448	-133%
IR European Swaption	142874NY SWAPTIONS_1 USD	39171.24563	0	
IR European Swaption	153795NY SWAPTIONS_1 USD	-1572.349218	-7.973336399	19620%
IR European Swaption	193328NY SWAPTIONS_1 USD	-22672.18684	14777.25259	-253%
IR European Swaption	157375NY SWAPTIONS_1 USD	66664.66239	-185.381956	-36061%
IR European Swaption	148193NY SWAPTIONS_1 USD	-5345.824749	-52670.48183	-90%
IR European Swaption	97537NY SWAPTIONS_1 JPY	21699.92141	0	
IR European Swaption	155868NY SWAPTIONS_1 USD	-84150.54654	171.1319243	-49273%
IR European Swaption	156470NY SWAPTIONS_1 USD	-79363.44626	387.2577718	-20594%
IR European Swaption	192389NY SWAPTIONS_1 USD	2934.108079	-3428.443969	-186%
IR European Swaption	194305NY SWAPTIONS_1 USD	-14671.61706	-0.003748524	391397096%

IR European Swaption	147008NY SWAPTIONS_1 JPY	22210.06674	-2492.930542	-991%
IR European Swaption	176769NY SWAPTIONS_1 USD	1E-10	-0.00081565	-100%
IR European Swaption	121437NY SWAPTIONS_1 USD	-10600.93932	-67017.70121	-84%
IR European Swaption	157683NY SWAPTIONS_1 USD	12400.9883	7950.636075	56%
IR European Swaption	195216NY SWAPTIONS_1 USD	3746.932797	-40264.81489	-109%
IR European Swaption	199399NY SWAPTIONS_1 USD	-11692.55834	0	
IR European Swaption	171558NY SWAPTIONS_1 JPY	189.5263611	0	
IR European Swaption	142469NY SWAPTIONS_1 EUR	37972.90426	0	
IR European Swaption	171086NY SWAPTIONS_1 USD	7549.504403	-41042.23771	-118%
IR European Swaption	158456NY SWAPTIONS_1 USD	-26973.22836	186635.3887	-114%
IR European Swaption	200644NY SWAPTIONS_1 USD	45747.6982	10.80339517	423357%
IR European Swaption	141075NY SWAPTIONS_1 USD	-45833.37229	259466.1305	-118%
IR European Swaption	178168NY SWAPTIONS_1 JPY	440.5969171	0	
IR European Swaption	174032NY SWAPTIONS_1 JPY	619.1914354	0	
IR European Swaption	144372NY SWAPTIONS_1 USD	-10697.00252	-5812.397575	84%
IR European Swaption	197235NY SWAPTIONS_1 USD	5465.048488	4.1839549	130519%
IR European Swaption	187921NY SWAPTIONS_1 USD	-32312.7754	-1.851610195	1745018%
IR European Swaption	176770NY SWAPTIONS_1 USD	2.3E-09	0	
IR European Swaption	156752NY SWAPTIONS_1 USD	-27474.91916	223446.669	-112%
IR European Swaption	121438NY SWAPTIONS_1 USD	19969.78413	-67017.70121	-130%
IR European Swaption	192390NY SWAPTIONS_1 USD	3809.162367	13.13411713	28902%
IR European Swaption	168650NY SWAPTIONS_1 JPY	320.3398797	0	
IR European Swaption	157878NY SWAPTIONS_1 JPY	32.8538045	0	
IR European Swaption	199587NY SWAPTIONS_1 USD	89720.56931	-328.3139151	-27428%
IR European Swaption	195935NY SWAPTIONS_1 USD	-52243.51931	-8871.610882	489%
IR European Swaption	189667NY SWAPTIONS_1 USD	13979.99841	37597.82821	-63%
IR European Swaption	158069NY SWAPTIONS_1 USD	30369.62312	116697.3209	-74%
IR European Swaption	146509NY SWAPTIONS_1 USD	55911.69558	37032.35524	51%
IR European Swaption	172760NY SWAPTIONS_1 JPY	647.4600676	0	
IR European Swaption	116855NY SWAPTIONS_1 JPY	-5252.123465	0	
IR Bond Future	57114 1 TY CBT USD 2014/06/19	-18158.70224	-18196.8008	0%
IR Eurodollar Future	39977 1 ED USD 2014/09/15	-21958.88794	-22040.25613	0%
FX Forward	NYC_P14031802934	0.999994	0	
FX Forward	NYC_P14031908744	0.999994584	0	
FX Forward	NYC_S14031905040	0.999999452	0	
FX Forward	NYC_S14022607777	0.999319999	0	
FX Forward	NYC_S14031809101	0.999994	0	
FX Forward	NYC_P14031000125	0.999849757	0	
FX Forward	NYC_P14031902223	0.999942267	0	
FX Forward	NYC_S14013007369	0.998000321	0	
FX Forward	HON_P14031900817	0.999835	0	
FX Forward	NYC_S14031805896	0.99999	0	
FX Forward	NYC_P14031904006	0.999982	0	

FX Forward	NYC_P14030508061	0.999281946	0	
FX Forward	NYC_S14031904243	0.999951	0	
FX Forward	NYC_P14031908191	0.999945	0	
FX Forward	NYC_P13121009461	0.999361061	0	
FX Forward	NYC_S14020405715	0.999242304	0	
FX Forward	LON_S14030701110	0.99994481	0	
FX Forward	LON_P14031102594	0.99994481	0	
FX Forward	NYC_S14031902851	0.999602385	0	
FX Forward	NYC_S14031802314	0.999922	0	
FX Forward	HON_S14030300663	0.993141287	0	
FX Forward	NYC_P14031900623	0.999602385	0	
FX Forward	NYC_P14031903760	0.999835	0	
FX Forward	LON_S14031400905	0.999995418	0	
FX Forward	HON_S13102300830	0.99994042	0	
FX Forward	NYC_P14031808804	0.999896295	0	
FX Forward	LON_S14031903566	0.999989286	0	
FX Forward	NYC_P14031806547	0.999994	0	
FX Forward	NYC_P14030605738	0.99792886	0	
FX Forward	LON_P14031903184	0.99999863	0	
FX Forward	NYC_S14031701605	0.99999	0	
FX Forward	NYC_P14031902923	0.999999726	0	
FX Forward	NYC_P14011304375	0.999619871	0	
FX Forward	NYC_P14031806506	0.999918	0	
FX Forward	LON_S14021104213	0.999994097	0	
FX Forward	NYC_S14031907457	0.999945	0	
FX Forward	LON_P14031201837	0.999804	0	
FX Forward	NYC_P13121009425	0.999361061	0	
FX Forward	LON_P14031805027	0.999964	0	
FX Forward	NYC_S14031703263	0.99999	0	
FX Forward	NYC_S14031902876	0.999945	0	
FX Forward	NYC_S14031903382	0.997844689	0	
FX Forward	NYC_S14031903025	0.999999452	0	
FX Forward	LON_P14030501419	0.99836688	0	
FX Forward	HON_P14021400592	0.995191773	0	
FX Forward	NYC_S14031703289	0.999997	0	
FX Forward	NYC_P14011704340	0.999596237	0	
FX Forward	NYC_P14031902122	0.999942267	0	
FX Forward	NYC_S14031806347	0.99999	0	
FX Forward	NYC_P14031902144	0.999942267	0	
FX Forward	LON_P14031900127	0.999994584	0	
FX Forward	NYC_S14031900748	0.99999863	0	
FX Forward	NYC_P14031906529	0.998793481	0	
FX Forward	LON_S14031903160	0.999979	0	

FX Forward	NYC_S14031909313	0.999994	0	
FX Forward	NYC_P14012207576	0.995818268	0	
FX Forward	NYC_P14030501473	0.994526881	0	
FX Forward	LON_P14031100313	0.999748078	0	
FX Forward	LON_S14030702826	0.99994481	0	
FX Forward	LON_P14031902175	0.999945	0	
FX Forward	NYC_S14031802594	0.999993816	0	
FX Forward	LON_S14031902830	0.999999452	0	
FX Forward	NYC_P14031802676	0.999979	0	
FX Forward	HON_P14031900130	0.999844	0	
FX Forward	NYC_S14031905677	0.999998356	0	
FX Forward	NYC_S14031406778	0.999994795	0	
FX Forward	SEO_P14031300219	0.995023478	0	
FX Forward	NYC_S14031703291	0.999997	0	
FX Forward	NYC_S14020607173	0.998000321	0	
FX Forward	NYC_P14021400565	0.999186	0	
FX Forward	LON_S14031301482	0.999993699	0	
FX Forward	NYC_S14031870185	0.999918	0	
FX Forward	NYC_P13111908742	0.996969518	0	
FX Forward	NYC_S14021208211	0.999618709	0	
FX Forward	LON_S13121901593	0.99999	0	
FX Forward	SEO_P14012800212	0.981328742	0	
FX Forward	LON_P14031202460	0.999992603	0	
FX Forward	NYC_S14031803587	0.999999726	0	
FX Forward	NYC_S14031902361	0.999945	0	
FX Forward	HON_P13080900324	0.998821747	0	
FX Forward	NYC_P14031805490	0.99999863	0	
FX Forward	LON_S14031902474	0.999997	0	
FX Forward	HON_S13112700309	0.997085986	0	
FX Forward	NYC_P13120209755	0.999351151	0	
FX Forward	NYC_S14022403763	0.999997	0	
FX Forward	NYC_P14031308912	0.999992603	0	
FX Forward	NYC_S14031901531	0.999997	0	
FX Forward	NYC_S14031804728	0.999993816	0	
FX Forward	LON_P14021802791	0.994931638	0	
FX Forward	TOK_P14012700028	0.999999726	0	
FX Forward	NYC_S14031807043	0.99989862	0	
FX Forward	NYC_P13121801197	0.999988191	0	
FX Forward	NYC_P14031208985	0.99989862	0	
FX Forward	NYC_P13123102760	0.99997938	0	
FX Forward	NYC_P14031804515	0.999918	0	
FX Forward	NYC_S14031901047	0.999982	0	
FX Forward	NYC_S14031801304	0.999997	0	

FX Forward	NYC_P14031202543	0.998808999	0	
FX Forward	NYC_P14031706999	0.999825	0	
FX Forward	LON_S14022402171	0.99994481	0	
FX Forward	NYC_P14031304494	0.99999	0	
FX Forward	LON_S14031804212	0.99999	0	
FX Forward	NYC_P14031905921	0.999982	0	
FX Forward	LON_P14031802547	0.999997	0	
FX Forward	BRU_P14030700308	0.998856959	0	
FX Forward	LON_S14031803461	0.99999863	0	
FX Forward	NYC_P13051304763	0.996643999	0	
FX Forward	NYC_P14031904800	0.999998356	0	
FX Forward	NYC_P14031900635	0.999998356	0	
FX Forward	NYC_S14031801018	0.99999	0	
FX Forward	NYC_S14031906856	0.99989862	0	
FX Forward	NYC_S14031808555	0.999994	0	
FX Forward	NYC_P14031905458	0.999792143	0	
FX Forward	HON_P14031900188	0.999999452	0	
FX Forward	NYC_S13121210576	0.999361061	0	
FX Forward	NYC_P14030506111	0.999994795	0	
FX Forward	HON_P14031800424	0.999999726	0	
FX Forward	BRU_P14031900412	0.999913	0	
FX Forward	NYC_S14031803623	0.999997	0	
FX Forward	LON_S14031901633	0.999997	0	
FX Forward	NYC_P14011302502	0.989926498	0	
FX Forward	NYC_S14022607773	0.999963	0	
FX Forward	NYC_P14031211308	0.999849757	0	
FX Forward	NYC_P14031908950	0.999849757	0	
FX Forward	NYC_P14031105032	0.999994795	0	
FX Forward	NYC_P14021100374	0.999999452	0	
FX Forward	NYC_P14031903722	0.99999741	0	
FX Forward	HON_S14011700826	0.999974	0	
FX Forward	NYC_P14031806507	0.999918	0	
FX Forward	NYC_S14031808731	0.999999452	0	
FX Forward	LON_P14021802490	0.994931638	0	
FX Forward	LON_S14031801385	0.999999726	0	
FX Forward	HON_S13071100130	0.999150777	0	
FX Forward	NYC_P14020708593	0.999978708	0	
FX Forward	NYC_S14031803275	0.999999726	0	
FX Forward	NYC_P14031907894	0.999994	0	
FX Forward	NYC_P14030402367	0.999817959	0	
FX Forward	NYC_P14011702608	0.999990137	0	
FX Forward	LON_P14031900807	0.999918	0	
FX Forward	NYC_S14012904525	0.999363574	0	

FX Forward	NYC_S14030306762	0.999351151	0	
FX Forward	NYC_P13120509807	0.999748078	0	
FX Forward	NYC_S14031707749	0.999999726	0	
FX Forward	NYC_P14031302406	0.99930077	0	
FX Forward	NYC_S14022805420	0.991132717	0	
FX Forward	NYC_P14031901175	0.999999726	0	
FX Forward	NYC_S14031806937	0.999999726	0	
FX Forward	NYC_P14031805433	0.999979	0	
FX Forward	LON_S14030600988	0.999880725	0	
FX Forward	LON_S14031803642	0.999999726	0	
FX Forward	NYC_S14030505328	0.999596237	0	
FX Forward	LON_S14031804159	0.999979	0	
FX Forward	NYC_S14031908514	0.999913	0	
FX Forward	NYC_P14031904891	0.999977633	0	
FX Forward	LON_S14031903268	0.99999	0	
FX Forward	NYC_P14031901634	0.999994	0	
FX Forward	HON_P14031200642	0.99989321	0	
FX Forward	NYC_S14031709609	0.999999	0	
FX Forward	NYC_S13121003371	0.999999726	0	
FX Forward	LON_P14031802240	0.999958	0	
FX Forward	NYC_S14012308230	0.999849757	0	
FX Forward	HON_S14031800226	0.999999726	0	
FX Forward	NYC_S14031805857	0.99999	0	
FX Forward	NYC_P14021206565	0.997589202	0	
FX Forward	HON_S14020500625	0.998740823	0	
FX Forward	NYC_S13121604370	0.99998092	0	
FX Forward	NYC_S14031801959	0.999979	0	
FX Forward	HON_S14030400700	0.999074327	0	
FX Forward	LON_P14030301968	0.999261277	0	
FX Forward	NYC_P14031903472	0.999835	0	
FX Forward	NYC_P14031709320	0.999999726	0	
FX Forward	LON_P14031801455	0.99999	0	
FX Forward	NYC_P13041705179	0.999842397	0	
FX Forward	NYC_S14031805755	0.999993816	0	
FX Forward	NYC_S14031802817	0.999835	0	
FX Forward	NYC_S14031802196	0.99999741	0	
FX Forward	NYC_P14021406452	0.998000321	0	
FX Forward	NYC_P14031907304	0.999999726	0	
FX Forward	LON_S14012301448	0.998954997	0	
FX Forward	NYC_P14030605551	0.993312561	0	
FX Forward	NYC_P14031308713	0.999849757	0	
FX Forward	NYC_S14031903240	0.999912	0	
FX Forward	NYC_S14031209844	0.995818268	0	

FX Forward	NYC_S14031309268	0.999849757	0	
FX Forward	NYC_P14031801966	0.999979	0	
FX Forward	LON_S14022502447	0.999866714	0	
FX Forward	NYC_S13100101530	0.997709347	0	
FX Forward	LON_P14031800956	0.999922	0	
FX Forward	NYC_P14031706779	0.999999726	0	
FX Forward	NYC_S14031903282	0.999999452	0	
FX Forward	NYC_P14031211751	0.9996863	0	
FX Forward	NYC_P14031805109	0.999999726	0	
FX Forward	NYC_S14030700940	0.99957261	0	
FX Forward	NYC_S13121604307	0.999998356	0	
FX Forward	NYC_P14031807410	0.999997	0	
FX Forward	NYC_P14031900263	0.999886747	0	
FX Forward	NYC_P14031906706	0.999994	0	
FX Forward	NYC_S14031905975	0.999979	0	
FX Forward	NYC_S14020401126	0.999995616	0	
FX Forward	NYC_P14013006735	0.999705036	0	
FX Forward	LON_P14022604491	0.99969879	0	
FX Forward	NYC_S14031702682	0.999999726	0	
FX Forward	NYC_S14012408190	0.9996863	0	
FX Forward	NYC_P14031808653	0.999849757	0	
FX Forward	SEO_P14031800149	0.999901	0	
FX Forward	LON_P14031704330	0.999866714	0	
FX Forward	HON_P14031800296	0.998289323	0	
FX Forward	NYC_S14031808579	0.999997	0	
FX Forward	HON_P14022000697	0.99998469	0	
FX Forward	LON_S14030302309	0.993605677	0	
FX Forward	SEO_P14031900129	0.999835	0	
FX Forward	NYC_P14022502007	0.999996712	0	
FX Forward	HON_P14021200979	0.999999452	0	
FX Forward	NYC_P14031802685	0.99999741	0	
FX Forward	NYC_S14031800825	0.99999741	0	
FX Forward	IBF_S13110667758	0.997274247	0	
FX Forward	NYC_P14012003435	0.998000321	0	
FX Forward	LON_P14031901621	0.999999726	0	
FX Forward	NYC_P14031004123	0.999099084	0	
FX Forward	HON_S14021200689	0.998509131	0	
FX Forward	HON_S14031300006	0.998803226	0	
FX Forward	NYC_S14031970231	0.999825	0	
FX Forward	LON_S14022002975	0.999874646	0	
FX Forward	LON_P14031901314	0.999979	0	
FX Forward	NYC_P14030309780	0.99989862	0	
FX Forward	NYC_P14031701425	0.999995418	0	

FX Forward	NYC_P14031904081	0.999951	0	
FX Forward	HON_S14030700781	0.99998092	0	
FX Forward	NYC_S13120906143	0.994777074	0	
FX Forward	NYC_P14031709671	0.999992603	0	
FX Forward	HON_S14021700672	0.995671612	0	
FX Forward	NYC_P14031806917	0.999999726	0	
FX Forward	NYC_P14020504827	0.998740823	0	
FX Forward	NYC_P14022105068	0.997167142	0	
FX Forward	NYC_S14031904579	0.999999726	0	
FX Forward	NYC_S14011704085	0.999977633	0	
FX Forward	NYC_P14030605648	0.999700505	0	
FX Forward	NYC_S13123103986	0.999197642	0	
FX Forward	LON_S14012002158	0.99969879	0	
FX Forward	LON_P14022602871	0.999406313	0	
FX Forward	LON_P14031903206	0.999999726	0	
FX Forward	NYC_P14012706900	0.998000321	0	
FX Forward	LON_P14031704324	0.99999	0	
FX Forward	NYC_S14021903788	0.998988287	0	
FX Forward	HON_P13042400337	0.99983808	0	
FX Forward	NYC_P14031408542	0.999849757	0	
FX Forward	NYC_P13013005740	0.999703444	0	
FX Forward	NYC_S14031701498	0.99999	0	
FX Forward	LON_S14031803333	0.999979	0	
FX Forward	TOK_P14022600063	0.999996712	0	
FX Forward	HON_P14012401057	0.999957218	0	
FX Forward	NYC_S14031801189	0.999835	0	
FX Forward	LON_S14031901874	0.999994	0	
FX Forward	NYC_P14031802937	0.999994	0	
FX Forward	HON_S14021200846	0.999992877	0	
FX Forward	NYC_S14021100363	0.999994	0	
FX Forward	LON_S14031801097	0.99999	0	
FX Forward	NYC_P14031807954	0.999999726	0	
FX Forward	NYC_S14012150007	0	0	
FX Forward	NYC_P14031805210	0.999997	0	
FX Forward	NYC_S14031900974	0.999999726	0	
FX Forward	NYC_S14031807307	0.999997	0	
FX Forward	NYC_P14031701217	0.999997	0	
FX Forward	LON_S14030703525	0.99969879	0	
FX Forward	NYC_S14030300486	0.999997808	0	
FX Forward	NYC_P14031106864	0.998000321	0	
FX Forward	NYC_S14031708923	0.999997	0	
FX Forward	NYC_S14031905385	0.999979	0	
FX Forward	NYC_P14031903697	0.999994584	0	

FX Forward	LON_P14030503011	0.99994481	0	
FX Forward	NYC_S14031705773	0.999999726	0	
FX Forward	HON_S14030700196	0.971087905	0	
FX Forward	NYC_S13121604392	0.999887809	0	
FX Forward	NYC_S14031409064	0.999983063	0	
FX Forward	NYC_S14031704087	0.999997	0	
FX Forward	HON_P14021800405	0.996295966	0	
FX Forward	NYC_S14020507571	0.998000321	0	
FX Forward	NYC_S14021806434	0.999977248	0	
FX Forward	BRU_P14031900147	0.999997	0	
FX Forward	NYC_P14022702196	0.996969518	0	
FX Forward	LON_P14031901147	0.99994481	0	
FX Forward	NYC_S14031707723	0.999999726	0	
FX Forward	NYC_P14031008884	0.999992603	0	
FX Forward	LON_P13121701125	0.99999	0	
FX Forward	NYC_S14031906304	0.999849757	0	
FX European Option	COU_PG140417000007-GCOREF	-0.523257617	-0.522677338	0%
FX European Option	COU_PG110114000279-GCOREF	0.028252611	0.027866319	
FX European Option	COU_SG110114000025-GCOREF	-0.594715366	-0.505168044	18%
FX European Option	COU_PG130215000004-GCOREF	-0.343102948	-0.328964009	4%
FX European Option	NYC_PN140403000003-NAMREF	4.3212E-06	4.3208E-06	
FX European Option	COU_SG110114000282-GCOREF	-0.96957864	-0.956321795	1%
FX European Option	COU_PG110114000021-GCOREF	0.393081956	0.333894926	
FX European Option	COU_PG130227000002-GCOREF	0.138094537	0.130378968	
FX European Option	COU_PG110114000341-GCOREF	0.187856055	0.179501373	
FX European Option	COU_PG110114000203-GCOREF	0.149256671	0.148583472	
FX European Option	COU_SG110114000019-GCOREF	-0.78534325	-0.721861442	9%
FX European Option	COU_SG110114000017-GCOREF	-0.403879333	-0.370561811	9%
FX European Option	COU_PG110114000307-GCOREF	0.000000011	1.09E-08	
FX European Option	COU_SG110114000316-GCOREF	-0.852424498	-0.793435548	7%
FX European Option	COU_PG130228000013-GCOREF	0.142479401	0.134507787	
FX European Option	COU_SG110114000284-GCOREF	0.235536212	0.220510841	
FX European Option	COU_SG110114000192-GCOREF	-0.788328021	-0.78287189	1%
FX European Option	COU_PG110114000334-GCOREF	-0.352214711	-0.338241965	4%
FX European Option	COU_SG110114000283-GCOREF	0.028252611	0.027866319	
FX European Option	COU_SG140328000045-GCOREF	0.210755365	0.207873751	
FX European Option	COU_PG120620000022-GCOREF	-0.997680757	-0.995632833	0%
FX European Option	COU_PG110114000287-GCOREF	-0.752745609	-0.704726318	7%
FX European Option	COU_PG140429000002-GCOREF	0.219455561	0.218906108	
FX European Option	COU_SG140424000021-GCOREF	-0.556069518	-0.555452852	0%
FX European Option	COU_PG121214000004-GCOREF	-0.652392912	-0.636634019	2%
FX European Option	COU_PG110114000315-GCOREF	0.134833822	0.125503136	
FX European Option	COU_SG110114000187-GCOREF	-0.896251525	-0.893383209	0%

FX European Option	COU_PG110114000202-GCOREF	0.052197539	0.052092535	
FX European Option	COU_PG110114000311-GCOREF	-0.768387258	-0.716066687	7%
FX European Option	COU_SG110114000010-GCOREF	8.213E-07	8.163E-07	
FX European Option	COU_SG140122000003-GCOREF	-0.275777089	-0.274838027	0%
FX European Option	COU_PG130201000004-GCOREF	-0.414050333	-0.403235916	3%
FX European Option	COU_PG120620000023-GCOREF	0.002078723	0.002074456	
FX European Option	COU_PG110114000011-GCOREF	-0.765860891	-0.705141019	9%
FX European Option	COU_PG110114000278-GCOREF	-0.96957864	-0.956321795	1%
FX European Option	COU_SG110114000013-GCOREF	-0.999736204	-0.993674071	1%
FX European Option	COU_PG110114000204-GCOREF	0.103721677	0.103389732	
FX European Option	COU_SG110114000022-GCOREF	-0.666864945	-0.611852753	9%
FX European Option	COU_SG130201000005-GCOREF	0.066029995	0.064305384	
FX European Option	COU_SG130228000011-GCOREF	-0.328939851	-0.310535917	6%
FX European Option	COU_SG110114000016-GCOREF	0.219476697	0.202075891	
FX European Option	COU_PG120620000021-GCOREF	0.002078723	0.002074456	
FX European Option	COU_SG130228000015-GCOREF	0.142479401	0.134507787	
FX European Option	COU_PG130109000001-GCOREF	0.07850246	0.077856679	
FX European Option	COU_PG120607000001-GCOREF	0.241646865	0.241249964	
FX European Option	COU_SG110114000312-GCOREF	0.134833822	0.125503136	
FX European Option	NYC_PN140416000001-NAMREF	0.021870372	0.021868575	
FX European Option	COU_SG130227000005-GCOREF	0.138094537	0.130378968	
FX European Option	COU_SG130201000001-GCOREF	-0.414050333	-0.403235916	3%
FX European Option	COU_PG110114000007-GCOREF	8.213E-07	8.163E-07	
FX European Option	COU_SG110114000018-GCOREF	0.199697503	0.183555315	
FX European Option	COU_SG110114000180-GCOREF	-0.99933543	-0.998678548	0%
FX European Option	COU_PG140122000002-GCOREF	-0.275777089	-0.274838027	0%
FX European Option	COU_SG110114000030-GCOREF	-0.78297074	-0.754385526	4%
FX European Option	COU_SG130227000001-GCOREF	-0.34003982	-0.321041236	6%
FX European Option	COU_PG121218000038-GCOREF	0.07850246	0.077856679	
FX European Option	COU_PG130215000002-GCOREF	0.103589194	0.099320384	
FX European Option	NYC_PN140411000011-NAMREF	1.1458E-06	1.1457E-06	
FX European Option	COU_PG110114000301-GCOREF	-0.78297074	-0.754385526	4%
FX European Option	COU_PG110114000336-GCOREF	-0.771142716	-0.736847028	5%
FX European Option	COU_SG140122000004-GCOREF	0.724192469	0.721726487	
FX European Option	COU_PG140228000002-GCOREF	0	0	
FX European Option	COU_SG140410000030-GCOREF	0.501252788	0.497906302	
FX European Option	COU_PG140328000042-GCOREF	0.210755365	0.207873751	
FX European Option	COU_SG140425000037-GCOREF	-0.476139993	-0.475611966	0%
FX European Option	COU_PG110114000205-GCOREF	0.211278112	0.209815826	
FX European Option	COU_PG110114000231-GCOREF	0.103660259	0.102803299	
FX European Option	COU_SG110114000308-GCOREF	0.219081483	0.204163916	
FX European Option	COU_PG140424000019-GCOREF	-0.557060572	-0.556442806	0%
FX European Option	COU_PG110114000012-GCOREF	0.219476697	0.202075891	

FX European Option	NYC_SN140131000002-NAMREF	0.009883323	0.009846027	
FX European Option	COU_PG110114000228-GCOREF	2E-10	2E-10	
FX European Option	NYC_PN140422000001-NAMREF	0.059052466	0.0589991	
FX European Option	COU_PG120607000002-GCOREF	-0.757866438	-0.756621654	0%
FX European Option	COU_SG110114000252-GCOREF	-0.990023241	-0.986854823	0%
FX European Option	COU_PG110114000047-GCOREF	-0.304235449	-0.291314851	4%
FX European Option	COU_PG110114000303-GCOREF	0.210400717	0.202719268	
FX European Option	COU_PG130228000014-GCOREF	-0.328939851	-0.310535917	6%
FX European Option	NYC_SN140403000001-NAMREF	4.3212E-06	4.3208E-06	
FX European Option	COU_PG110114000337-GCOREF	0.199697503	0.183555315	
FX European Option	COU_PG140328000041-GCOREF	0.210755365	0.207873751	
FX European Option	COU_PG140424000027-GCOREF	-0.477209701	-0.476680488	0%
FX European Option	COU_SG140429000001-GCOREF	0.219455561	0.218906108	
FX European Option	COU_PG110114000008-GCOREF	-0.999736204	-0.993674071	1%
FX European Option	COU_SG110114000191-GCOREF	-0.814920602	-0.810212182	1%
FX European Option	COU_PG110114000015-GCOREF	-0.666864945	-0.611852753	9%
FX European Option	COU_PG110114000020-GCOREF	-0.594715366	-0.505168044	18%
FX European Option	COU_SG110114000253-GCOREF	-0.944484881	-0.93902787	1%
FX European Option	COU_SG140328000037-GCOREF	-0.339641515	-0.334997668	1%
FX European Option	COU_SG130618000004-GCOREF	-0.997680757	-0.995632833	0%
FX European Option	COU_SG130215000001-GCOREF	-0.343102948	-0.328964009	4%
FX European Option	COU_PG140122000001-GCOREF	0.724192469	0.721726487	
FX European Option	COU_PG110114000201-GCOREF	0.184853958	0.183785916	
FX European Option	COU_PG110114000024-GCOREF	-0.403879333	-0.370561811	9%
FX European Option	COU_SG110114000032-GCOREF	0.210400717	0.202719268	
FX European Option	NYC_PN140131000001-NAMREF	0.009883323	0.009846027	
FX European Option	COU_PG120620000024-GCOREF	-0.997680757	-0.995632833	0%
FX European Option	COU_PG110114000313-GCOREF	-0.852424498	-0.793435548	7%
FX European Option	COU_PG110114000229-GCOREF	0.009949961	0.009918117	
FX European Option	COU_SG110114000189-GCOREF	-0.850655729	-0.846818977	0%
FX European Option	COU_PG130227000004-GCOREF	-0.34003982	-0.321041236	6%
FX European Option	COU_SG110114000254-GCOREF	-0.895693673	-0.888288965	1%
FX European Option	COU_SG130618000007-GCOREF	0.002078723	0.002074456	
FX European Option	COU_SG110114000028-GCOREF	0.393081956	0.333894926	
FX European Option	COU_SG110114000309-GCOREF	-0.768387258	-0.716066687	7%
FX European Option	COU_PG140410000032-GCOREF	0.186315702	0.185071813	
FX European Option	COU_PG110114000335-GCOREF	0.625429003	0.600617545	
FX European Option	COU_SG110114000286-GCOREF	-0.752745609	-0.704726318	7%
FX European Option	COU_PG110114000338-GCOREF	-0.78534325	-0.721861442	9%
FX European Option	COU_SG110114000014-GCOREF	-0.765860891	-0.705141019	9%
FX European Option	COU_PG110114000048-GCOREF	0.669351969	0.64092521	
FX European Option	NYC_PN140429000001-NAMREF	0.165190318	0.165129232	
FX European Option	COU_PG110114000200-GCOREF	0.000660187	0.000659753	

FX European Option	COU_SG130215000005-GCOREF	0.103589194	0.099320384	
FX European Option	COU_PG140417000004-GCOREF	-0.469728182	-0.469207265	0%
FX European Option	COU_PG110114000230-GCOREF	0.055289679	0.054970228	
FX European Option	COU_PG110114000288-GCOREF	0.235536212	0.220510841	
FX European Option	COU_SG110114000251-GCOREF	-0.999995616	-0.999338301	0%
FX European Option	COU_PG140328000044-GCOREF	-0.339641515	-0.334997668	1%
FX European Option	COU_SG110114000183-GCOREF	-0.947789036	-0.945882395	0%
FX European Option	COU_PG110114000310-GCOREF	0.219081483	0.204163916	
FX European Option	COU_PG130201000002-GCOREF	0.066029995	0.064305384	
FX European Option	COU_SG140328000038-GCOREF	-0.339641515	-0.334997668	1%
FX European Option	COU_SG140228000001-GCOREF	0	0	
FX American Option	COU_SG110114000339-GCOREF	0.004663334	0.004469166	
FX American Option	COU_SG110114000081-GCOREF	0	0	
FX American Option	COU_SG110114000042-GCOREF	-0.348699334	-0.334634355	4%
FX American Option	COU_SG110114000029-GCOREF	0.118595353	0.113504509	
FX American Option	COU_SG110114000026-GCOREF	0.060946636	0.058105694	
FX American Option	COU_SG110114000262-GCOREF	0.172252438	0.166917139	
FX American Option	COU_SG110114000027-GCOREF	-0.369543536	-0.348656803	6%
FX American Option	COU_SG110114000046-GCOREF	-1.62934E-05	-1.56548E-05	4%
FX American Option	COU_SG110114000257-GCOREF	9E-10	9E-10	
FX American Option	COU_SG110114000260-GCOREF	4.09E-08	4.05E-08	
FX American Option	COU_SG110114000077-GCOREF	-0.730264039	-0.718864031	2%
FX American Option	COU_SG110114000256-GCOREF	0.076933152	0.076351598	
FX American Option	COU_SG110114000045-GCOREF	-0.14837756	-0.142363749	4%
FX American Option	COU_SG110114000258-GCOREF	0	0	
FX American Option	COU_SG110114000023-GCOREF	-0.566241417	-0.534690816	6%
FX American Option	COU_SG110114000264-GCOREF	0.081196854	0.078457717	
FX American Option	COU_SG110114000075-GCOREF	-0.75701197	-0.747952796	1%
FX Future	NYC_LIMM BP JUN14	0.999621331	0.999621331	
FX Future	NYC_LIMM EC JUN14	0.999897827	0.999897827	

Appendix C: Test 1, Delta and Gamma Values for EQ Products

Type	Trade ID	Base Delta	Stressed Delta	Relative Difference	Base Gamma	Stressed Gamma	Relative Difference
EQ Asian Option	Murex NY NA 117788 S	-916770.575	-465.1246	197002%	-1029.39	-0.4719	218037%
EQ Asian Option	Murex NY NA 124781 S	-1378166.7	-711.5610	193582%	-1308.78	-0.5545	235929%
EQ Asian Option	Murex NY NA 128427 S	-2685749.89	-1,449.2152	185224%	5859.273	-2.4832	235857%
EQ Asian Option	Murex NY NA 126242 S	-630296.196	-341.5196	184456%	924.6427	-0.3855	239755%
EQ Asian Option	Murex NY NA 135469 S	-466056.449	-275.6327	168986%	955.5394	-0.4189	228007%
EQ Asian Option	Murex NY NA 109121 S	-1202415.45	-610.2015	196952%	-459.307	-0.2242	204765%
EQ Asian Option	Murex NY NA 118879 S	-1247240.84	-645.2825	193186%	-2214.96	-0.9574	231252%
EQ Asian Option	Murex NY NA 142854 S	-1512787.36	-826.6198	182909%	10253.77	-4.3688	234605%
EQ Asian Option	Murex NY NA 134211 S	-717538.718	-394.2284	181911%	6432.747	-2.7476	234022%
EQ Asian Option	Murex NY NA 96074 S	-2509230.18	-1,331.8985	188295%	0	-0.0000	0%
EQ Asian Option	Murex NY MAIN 148658 S	-1809897.77	-930.6011	194387%	6358.331	-2.7505	231070%
EQ Asian Option	Murex NY NA 40386 S	-1618294.4	-812.3303	199116%	3144.501	-1.4919	210672%
EQ Asian Option	Murex NY NA 108798 S	-1085900.49	-552.3434	196499%	584.2129	-0.2693	216838%
EQ Asian Option	Murex NY NA 111479 S	-987026.838	-508.6552	193946%	822.3442	-0.3566	230507%
EQ Asian Option	Murex NY NA 122623 S	-441196.41	-234.1501	188325%	0.188395	-0.0016	11675%
EQ Asian Option	Murex NY NA 124976 S	-1518116.49	-779.6266	194624%	1999.248	-0.8785	227475%
EQ Asian Option	Murex NY NA 113623 S	-2539116.97	-1,288.0888	197023%	3513.755	-1.5946	220253%
EQ Asian Option	Murex NY NA 149949 S	-562860.771	-351.2011	160167%	1789.564	-0.8125	220154%
EQ Asian	Murex NY NONMAIN 14554	98595.392	99.7094	98783%	1810.85	1.2570	143961%

Option	6[B	9			3		
EQ Asian Option	Murex NY MAIN 149170 S	- 2621459.7 2	-1,430.9943	183091%	- 4789.00 1	-2.0270	236161%
EQ Asian Option	Murex NY NA 132877 S	- 1852728.6 2	-981.4124	188682%	- 13068.7 7	-5.5548	235170%
EQ Asian Option	Murex NY NA 109711 S	- -1613294.4	-816.2633	197544%	- 844.763 2	-0.4835	174618%
EQ Asian Option	Murex NY NA 96073 S	- 1632430.0 5	-866.4933	188295%	0	-0.0000	0%
EQ Asian Option	Murex NY MAIN 113998 S	- -1913026.7	-1,023.9956	186720%	- 2572.91 1	-1.0826	237560%
EQ Asian Option	Murex NY NA 148434 B	1065.9389 1	1.4156	75199%	22.4190 1	0.0200	0%
EQ Asian Option	Murex NY NA 145289 S	- 4782717.1 7	-2,433.2514	196457%	- 17648.0 9	-7.7566	227424%
EQ Asian Option	Murex NY NA 130504 S	- 2521397.8 6	-1,263.1138	199518%	- 4303.88 4	-2.3156	185765%
EQ Asian Option	Murex NY NA 127521 B	0	0.0007		0	0.0000	0%
EQ Asian Option	Murex NY NA 119145 S	- 1613150.0 9	-830.4303	194155%	- -2601.17	-1.1335	229381%
EQ Asian Option	Murex NY NA 119477 S	- 945441.46 8	-490.7817	192540%	- 946.308 1	-0.4009	235946%
EQ Asian Option	Murex NY NA 119476 S	- 1387094.3 6	-737.0901	188085%	- 1761.11 6	-0.7395	238050%
EQ Asian Option	Murex NY NA 125630 S	- 751546.65 3	-397.2816	189072%	- 13.7528 4	-0.0363	37787%
EQ Asian Option	Murex NY NA 108289 S	- 1780504.9 4	-903.7186	196920%	- 623.775 8	-0.3099	201183%
EQ Asian Option	Murex NY NA 106382 S	- 2483235.2 5	-1,248.1596	198852%	- 2478.52 5	-1.2939	191455%
EQ Asian Option	Murex NY NA 149275 S	- 643030.75 6	-332.9424	193036%	- 692.916 8	-0.2871	241250%
EQ Asian Option	Murex NY NA 135862 S	- 584045.41 2	-310.7648	187838%	- 790.128 6	-0.3262	242122%
EQ Asian Option	Murex NY NA 149271 S	- 638142.84 8	-437.3218	145821%	- 7000.19 3	-3.4427	203234%
EQ Asian Option	Murex NY MAIN 141603 S	- 128238.78 1	-66.5225	192675%	- 575.735 1	-0.2467	233275%
EQ Asian Option	Murex NY NA 138042 S	- 709739.35 3	-365.7016	193976%	- 789.751 8	-0.3232	244254%
EQ Asian Option	Murex NY NA 110302 S	- -1844732	-947.0963	194678%	- 1411.45	-0.6184	228143%

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EQ Asian Option	Murex NY NONMAIN 137576 B	60290.9215	37.9553	158747%	716.0894	0.3303	0%
EQ Asian Option	Murex NY NA 147468 S	1467604.02	-918.7674	159636%	13995.49	-6.4223	217820%
EQ Asian Option	Murex NY NA 128453 S	1318385.38	-668.2922	197177%	1188.961	-0.7862	151129%
EQ Asian Option	Murex NY NA 130648 S	46770.7543	-23.9809	194933%	20.72345	-0.0165	125497%
EQ Asian Option	Murex NY NA 131526 S	-2313416	-1,252.8185	184557%	-4851.36	-2.0556	235907%
EQ Asian Option	Murex NY MAIN 140884 S	172353.731	-89.9397	191533%	859.2696	-0.3669	234097%
EQ Asian Option	Murex NY NA 125308 S	726383.863	-402.8943	180191%	2045.593	-0.8714	234648%
EQ Asian Option	Murex NY NONMAIN 141604 B	16679.7397	14.8254	112408%	294.8382	0.1818	0%
EQ Asian Option	Murex NY NA 130849 S	1198406.97	-638.3904	187623%	2220.047	-0.9415	235699%
EQ Asian Option	Murex NY NA 129274 S	2631721.97	-1,381.6540	190376%	4320.839	-1.8452	234066%
EQ Asian Option	Murex NY MAIN 148666 S	858118.502	-441.2216	194387%	3014.697	-1.3041	231071%
EQ Asian Option	Murex NY NA 123021 S	1388695.53	-733.3180	189272%	48.79431	-0.1146	42478%
EQ Asian Option	Murex NY NA 128287 S	2069406.42	-1,039.9705	198887%	2191.787	-1.1957	183206%
EQ Asian Option	Murex NY NA 135864 S	396040.201	-243.9669	162234%	903.7308	-0.4077	221566%
EQ Asian Option	Murex NY MAIN 114043 S	1160556.34	-604.3004	191950%	1177.092	-0.5003	235177%
EQ Asian Option	Murex NY NA 125311 S	-689376.68	-365.7807	188367%	-0.37679	-0.0038	9816%
EQ Asian Option	Murex NY NA 145599 S	-776726.21	-393.8809	197098%	778.4481	-0.3173	245235%
EQ Asian Option	Murex NY NA 124834 B	23947.642	13.2913	180075%	371.7033	0.1597	0%
EQ Asian Option	Murex NY NA 118598 S	1131658.06	-588.7602	192110%	2198.381	-0.9441	232755%
EQ Asian Option	Murex NY NA 120020 S	978224.459	-536.7523	182149%	1540.318	-0.6495	237054%
EQ Asian Option	Murex NY NA 139353 S	56853.6547	-37.8218	150220%	809.5333	-0.3894	207792%
EQ Asian Option	Murex NY NA 117918 S	614098.55	-327.2564	187551%	814.996	-0.3386	240596%

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EQ Asian Option	Murex NY NA 134150 S	- 1628208.8 7	-828.3050	196471%	- 3615.67 7	-1.6027	225499%
EQ Asian Option	Murex NY MAIN 146328 S	- 1112257.7 1	-718.3401	154737%	- 11029.9 6	-5.1783	212904%
EQ Asian Option	Murex NY NA 129483 S	- 2521167.4 5	-1,278.3414	197122%	- 2210.06 2	-1.4663	150624%
EQ Asian Option	Murex NY NA 112338 S	- 1406328.9 2	-709.0418	198242%	- 1089.48 8	-0.5541	196523%
EQ Asian Option	Murex NY NA 116575 S	- 1749136.0 5	-890.9631	196220%	- 2431.99 1	-1.0882	223388%
EQ Asian Option	Murex NY NA 119380 S	- 1190251.9 2	-604.8078	196698%	- 1350.60 4	-0.6146	219653%
EQ Asian Option	Murex NY NONMAIN 127071 B	- 4277912.5 8	2,141.9928	199616%	- 7458.93 5	3.7671	197902%
EQ Asian Option	Murex NY NA 108640 S	- 2917072.9 5	-1,490.1463	195657%	- 1942.16 4	-0.8680	223652%
EQ Asian Option	Murex NY NA 143016 S	- -1804605 0	-1,004.0591	179631%	- 13107.0 2	-5.6168	233254%
EQ Asian Option	Murex NY NA 127519 S	0	-0.0000		0	-0.0000	0%
EQ Asian Option	Murex NY NA 59113 S	-442035.71	-234.6324	188295%	0	-0.0000	0%
EQ Asian Option	Murex NY NA 137116 S	- 640207.46 9	-331.5905	192972%	- 738.508 4	-0.3026	243954%
EQ Asian Option	Murex NY NA 139622 S	- 439392.71 7	-317.0931	138469%	- 6650.53 2	-3.4168	194542%
EQ Asian Option	Murex NY NA 123020 S	- 195627.29 6	-103.8389	188295%	0	-0.0000	0%
EQ Asian Option	Murex NY NA 103701 S	- 3155162.4 1	-1,589.7689	198367%	- 2671.06 4	-1.5222	175374%
EQ Asian Option	Murex NY NA 141491 S	- 595193.30 9	-308.9769	192534%	- 702.148 2	-0.2874	244210%
EQ Asian Option	Murex NY NA 129806 S	- 1000785.8 9	-546.7479	182943%	- 2326.86 7	-0.9869	235675%
EQ Asian Option	Murex NY NA 40385 S	- 1527285.4 8	-765.4325	199432%	-2562.36	-1.2645	202538%
EQ Asian Option	Murex NY NA 122107 S	- 1609381.4 3	-881.8050	182410%	- 4479.46 8	-1.9015	235475%
EQ Asian Option	Murex NY NA 141746 S	- 470839.42 2	-251.0080	187479%	- 646.006 5	-0.2665	242304%
EQ Asian Option	Murex NY NA 129285 S	- 1652315.1 5	-862.0154	191580%	- 2505.65 4	-1.0757	232832%

EQ Asian Option	Murex NY NA 132051 S	- 809869.78 9	-438.7335	184493%	- 1687.83 1	-0.7151	235927%
EQ Asian Option	Murex NY NA 117968 S	- 1431357.5 8	-753.9601	189745%	- 1762.62 4	-0.7304	241223%
EQ Asian Option	Murex NY NA 149775 S	- 671587.29 3	-406.0162	165309%	- 5453.84 7	-2.4423	223208%
EQ Asian Option	Murex NY NA 128601 S	- -2733419.1	-1,374.1303	198820%	- 3827.43 3	-2.2171	172532%
EQ Asian Option	Murex NY NA 109615 S	- 5244635.7 2	-2,687.7770	195029%	- 3841.75 1	-1.6932	226793%
EQ Asian Option	Murex NY NA 139300 S	- 124904.56 6	-62.6804	199172%	- 103.617 3	-0.0431	240311%
EQ Asian Option	Murex NY NA 116610 S	- 4817606.4 2	-2,471.6531	194814%	- 7900.15 6	-3.4612	228149%
EQ Asian Option	Murex NY NA 136262 S	- 1341175.1 5	-694.6501	192972%	- -3625.85	-1.5597	232371%
EQ Asian Option	Murex NY NA 118885 S	- 2018451.0 3	-1,030.5374	195764%	- 2739.26 3	-1.2186	224688%
EQ Asian Option	Murex NY NA 133702 S	- 967282.66 6	-618.0080	156416%	- 3864.92 3	-1.7865	216241%
EQ Asian Option	Murex NY NA 135474 S	- 562362.84 3	-303.9295	184931%	- 799.925 2	-0.3347	238898%
EQ Asian Option	Murex NY NA 111200 S	- 1775833.6 9	-906.0128	195905%	- 1114.35 6	-0.5003	222638%
EQ Asian Option	Murex NY NA 137121 S	- 742057.00 8	-393.0301	188704%	- 981.161 2	-0.4042	242642%
EQ Asian Option	Murex NY NA 123032 S	- 541074.39 6	-284.5361	190060%	- 667.483 5	-0.2759	241829%
EQ Asian Option	Murex NY NONMAIN 144402 B	- 154963.74 2	168.6178	91802%	- 3184.81 7	2.3665	134479%
EQ Asian Option	Murex NY NA 134151 S	- 1483288.2 8	-804.0284	184382%	- 12717.7 9	-5.4136	234823%
EQ Asian Option	Murex NY NA 147093 S	- 683367.44 4	-492.9581	138526%	- 8630.56 3	-4.4294	194747%
EQ Asian Option	Murex NY NA 123726 S	- 874168.43 7	-451.8230	193376%	- 1343.63 3	-0.5826	230527%
EQ Asian Option	Murex NY NA 124835 S	- 212667.05 8	-112.8836	188295%	0	-0.0000	0%
EQ Asian Option	Murex NY NA 148436 S	- 854923.13 4	-503.1201	169824%	- 6319.33 3	-2.7822	227034%
EQ Asian Option	Murex NY NA 131524 S	- 869534.86	-491.3873	176855%	- 2350.60	-1.0072	233280%

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EQ Asian Option	Murex NY NA 123727 S	- 1993050.4 9	-1,021.6960	194973%	- 945.554 5	-0.7500	125974%
EQ Asian Option	Murex NY MAIN 127070 S	- 4460621.4 4	-2,237.9250	199220%	- 5844.01 3	-3.1445	185749%
EQ Asian Option	Murex NY NA 137115 S	- 928037.53 8	-502.2454	184678%	- 1329.12 7	-0.5561	238909%
EQ Asian Option	Murex NY NONMAIN 145032 B	- 95096.144 2	95.1833	99808%	- 1851.35 8	1.2729	145344%
EQ Asian Option	Murex NY NA 143771 S	- 479412.71 3	-272.4635	175855%	- 853.994 5	-0.3652	233743%
EQ Asian Option	Murex NY NA 149162 S	- 756129.17 3	-523.7722	144262%	- 3083.83 8	-1.5190	202918%
EQ Asian Option	Murex NY NA 132165 S	- 75279.439 3	-37.6696	199741%	- 55.5765 3	-0.0235	236396%
EQ Asian Option	Murex NY NA 120083 S	- 897922.97 4	-467.4140	192004%	- 931.801 7	-0.3939	236458%
EQ Asian Option	Murex NY MAIN 145544 S	- 573584.96 8	-347.6783	164876%	- -5108.33 -2.2925	-2.2925	222728%
EQ Asian Option	Murex NY NA 135470 S	- 497478.66 3	-282.0065	176307%	- 884.702 9	-0.3779	234010%
EQ Asian Option	Murex NY NA 119530 S	- 1741273.1 9	-898.5273	193692%	- 2904.29 7	-1.2606	230290%
EQ Asian Option	Murex NY NA 127663 S	- 615410.91 9	-353.0582	174209%	- 9601.36 3	-4.1848	229334%
EQ Asian Option	Murex NY NA 123856 S	- 750876.53 2	-384.0204	195430%	- -610.965 -0.2626	-0.2626	232560%
EQ Asian Option	Murex NY NA 98755 S	- 4906261.1 5	-2,563.9418	191256%	- 514.506 7	-0.6465	79483%
EQ Asian Option	Murex NY NA 131486 S	- 690148.53 4	-394.1359	175004%	- -1969.67 -0.8480	-0.8480	232172%
EQ Asian Option	Murex NY NA 115302 S	- 1041946.8 1	-558.3403	186515%	- 1414.28 1	-0.5947	237714%
EQ Asian Option	Murex NY NA 124804 S	- 1271367.6 4	-660.9499	192255%	- -1447.25 -0.5975	-0.5975	242118%
EQ Asian Option	Murex NY NA 116609 S	- 1882896.1 2	-954.2517	197217%	- 2136.21 1	-0.9838	217039%
EQ Asian Option	Murex NY NA 128332 S	- -1005672.1	-523.5472	191988%	- 161.831 3	-0.1807	89458%
EQ Asian Option	Murex NY MAIN 131432 S	- 5548075.8 2	-2,814.5051	197024%	- 4787.87 1	-3.2034	149362%
EQ Asian	Murex NY NA 137764 S	-	-880.6990	184084%	-	-4.9426	234889%

Option		1622103.5 6			11614.5 5		
EQ Asian Option	Murex NY NA 96102 S	- 3294895.9 2	-1,748.9296	188295%	0	-0.0000	0%
EQ Asian Option	Murex NY NA 131422 S	- 1845791.9 1	-993.0125	185778%	3691.97 7	-1.5644	235900%
EQ Asian Option	Murex NY NA 133701 S	- 820631.47 6	-498.0010	164685%	2839.11 3	-1.2654	224265%
EQ Asian Option	Murex NY NA 135473 S	- 836925.94 8	-444.7489	188079%	1068.76 5	-0.4457	239695%
EQ Asian Option	Murex NY NA 125552 S	- 1243583.1 5	-651.0899	190900%	162.396 5	-0.2241	72366%
EQ Asian Option	Murex NY NONMAIN 14866 4 B	1156356.2 6	650.2220	177740%	7623.96 9	3.2790	232409%
EQ Asian Option	Murex NY NONMAIN 14917 5 B	1795744.9 7	1,070.0315	167722%	4985.49 7	2.1943	227102%
EQ Asian Option	Murex NY NA 119381 S	- 1807041.3 2	-929.1619	194381%	2832.51 9	-1.2372	228846%
EQ Asian Option	Murex NY NA 40392 S	- 365720.28 7	-237.2679	154038%	-1685.57	-0.7893	213453%
EQ Asian Option	Murex NY NA 134212 S	- 646994.58 7	-324.3064	199401%	1051.05 6	-0.5729	183362%
EQ Asian Option	Murex NY NA 135468 S	- 882049.37 6	-455.1351	193699%	984.740 7	-0.4037	243829%
EQ Asian Option	Murex NY NA 118125 S	- 3798427.1 5	-1,967.4227	192966%	-6948.95	-2.9989	231617%
EQ Asian Option	Murex NY NA 119810 S	- 1115752.4 3	-589.2478	189252%	2475.13 4	-1.0526	235045%
EQ Asian Option	Murex NY NA 126681 S	- 1970019.5 8	-986.1559	199668%	4301.05 8	-2.3408	183643%
EQ Asian Option	Murex NY NA 115561 S	- -880852.88	-448.7195	196204%	591.183 5	-0.2616	225888%
EQ Asian Option	Murex NY NONMAIN 14088 6 B	18055.211 6	17.3280	104097%	355.313	0.2350	0%
EQ Asian Option	Murex NY NA 119379 S	- 1107638.6 4	-564.9884	195946%	1440.46 8	-0.6433	223819%
EQ Asian Option	Murex NY NA 124836 S	- 813233.95 8	-431.6488	188302%	0	-0.0003	-100%
EQ Asian Option	Murex NY NA 119144 S	- 871334.41 1	-449.9511	193551%	808.779 7	-0.3447	234533%
EQ Asian Option	Murex NY NA 126245 S	- 2290585.9 1	-1,152.6043	198631%	-2514.32	-1.4469	173673%
EQ Asian Option	Murex NY NA 117790 S	- 1010641.7	-514.9760	196150%	711.379	-0.3123	227687%

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EQ Asian Option	Murex NY NA 135154 S	707943.94 9	-365.3466	193673%	790.128 6	-0.3239	243842%
EQ Asian Option	Murex NY NA 138507 S	544441.01 5	-345.2699	157586%	2016.20 3	-0.9261	217609%
EQ Asian Option	Murex NY NA 127061 S	2174892.1 7	-1,147.8698	189372%	4062.17 3	-1.7286	234898%
EQ Asian Option	Murex NY NA 145024 S	1166560.1 1	-709.9440	164217%	3689.15 1	-1.6463	223987%
EQ Asian Option	Murex NY NA 120082 S	-1342977.9	-718.4604	186824%	1796.91 2	-0.7542	238154%
EQ Asian Option	Murex NY NA 118126 S	1575075.2 7	-811.7990	193923%	2672.94 8	-1.1618	229970%
EQ Asian Option	Murex NY NA 59112 S	354252.87 1	-188.0373	188295%	0	-0.0000	0%
EQ Asian Option	Murex NY NA 134678 S	786442.30 5	-426.1429	184449%	6487.00 5	-2.7608	234868%
EQ Asian Option	Murex NY NA 145545 S	848256.77 7	-430.8534	196778%	860.588 4	-0.3509	245152%
EQ Asian Option	Murex NY NA 103726 S	-2393326	-1,201.5270	199090%	2769.40 7	-1.4645	189003%
EQ Asian Option	Murex NY NA 127525 S	-315718.37	-243.4540	129583%	9419.18 5	-5.1185	183922%
EQ Asian Option	Murex NY NA 98754 S	2510090.5 8	-1,304.1638	192367%	465.900 8	-0.4919	94615%
EQ Asian Option	Murex NY NA 124613 S	1505101.4 1	-798.8998	188297%	0	-0.0002	-100%
EQ Asian Option	Murex NY NA 111201 S	3423767.5 2	-1,756.6567	194802%	2575.54 8	-1.1301	227804%
EQ Asian Option	Murex NY MAIN 144401 S	-1093846.8	-670.1806	163117%	10635.6 5	-4.8092	221052%
EQ Asian Option	Murex NY NA 133704 S	768404.23 7	-458.6812	167425%	2508.66 8	-1.1063	226662%
EQ Asian Option	Murex NY NA 138508 S	996156.08 3	-685.6451	145187%	14587.0 5	-7.2083	202265%
EQ Forward	Murex NY NA 149393 B	4449120	124,000.00 00	3488%	0	0.0000	0%
EQ Forward	Murex NY NA 149374 B	1543808.7 6	43,027.000 0	3488%	0	0.0000	0%
EQ Forward	Murex NY NA 149373 B	43056	1,200.0000	3488%	0	0.0000	0%
EQ Forward	Murex NY NA 149392 B	2669472	74,400.000 0	3488%	0	0.0000	0%
EQ Forward	Murex NY NA 149397 B	2691000	75,000.000 0	3488%	0	0.0000	0%

EQ Forward	Murex NY NA 149399 B	17940	500.0000	3488%	0	0.0000	0%
EQ Forward	Murex NY NA 149366 B	2504424	69,800.000 0	3488%	0	0.0000	0%
EQ Forward	Murex NY NA 149370 B	585382.2	16,315.000 0	3488%	0	0.0000	0%
EQ Forward	Murex NY NA 149388 B	1777925.7 6	49,552.000 0	3488%	0	0.0000	0%
EQ Forward	Murex NY NA 149385 B	4493288.2 8	125,231.00 00	3488%	0	0.0000	0%
EQ Forward	Murex NY NA 149381 B	6255103.9 2	174,334.00 00	3488%	0	0.0000	0%
EQ Forward	Murex NY NA 149384 B	6298805.7 6	175,552.00 00	3488%	0	0.0000	0%
EQ Forward	Murex NY NA 149391 B	2494987.5 6	69,537.000 0	3488%	0	0.0000	0%
EQ Forward	Murex NY NA 149375 B	2368187.6 4	66,003.000 0	3488%	0	0.0000	0%
EQ Forward	Murex NY NA 149395 B	1014758.1 6	28,282.000 0	3488%	0	0.0000	0%
EQ Forward	Murex NY NA 149376 B	2152800	60,000.000 0	3488%	0	0.0000	0%
EQ Forward	Murex NY NA 149398 B	1614600	45,000.000 0	3488%	0	0.0000	0%
EQ Forward	Murex NY NA 149367 B	6841993.0 8	190,691.00 00	3488%	0	0.0000	0%
EQ Forward	Murex NY NA 149386 B	2537038.9 2	70,709.000 0	3488%	0	0.0000	0%
EQ Forward	Murex NY NA 149368 B	2152800	60,000.000 0	3488%	0	0.0000	0%
EQ Forward	Murex NY NA 149371 B	2870400	80,000.000 0	3488%	0	0.0000	0%
EQ Forward	Murex NY NA 149390 B	4473661.9 2	124,684.00 00	3488%	0	0.0000	0%
EQ Forward	Murex NY NA 149394 B	3181479.6	88,670.000 0	3488%	0	0.0000	0%
EQ Forward	Murex NY NA 149387 B	2224560	62,000.000 0	3488%	0	0.0000	0%
EQ Forward	Murex NY NA 149365 B	3102256.5 6	86,462.000 0	3488%	0	0.0000	0%
EQ Forward	Murex NY NA 149380 B	1406496	39,200.000 0	3488%	0	0.0000	0%
EQ Forward	Murex NY NA 149396 B	2191406.8 8	61,076.000 0	3488%	0	0.0000	0%
EQ Forward	Murex NY NA 149378 B	3067740	85,500.000 0	3488%	0	0.0000	0%
EQ Forward	Murex NY NA 149400 B	4807920	134,000.00 00	3488%	0	0.0000	0%
EQ Forward	Murex NY NA 149389 B	1992667.5 6	55,537.000 0	3488%	0	0.0000	0%
EQ Forward	Murex NY NA 149369 B	2944743.3 6	82,072.000 0	3488%	0	0.0000	0%
EQ Forward	Murex NY NA 149383 B	2097831.8 4	58,468.000 0	3488%	0	0.0000	0%
EQ Forward	Murex NY NA 149377 B	2066688	57,600.000 0	3488%	0	0.0000	0%
EQ Forward	Murex NY NA 149372 B	1322716.2	36,865.000 0	3488%	0	0.0000	0%
EQ Forward	Murex NY NA 149379 B	1506960	42,000.000 0	3488%	0	0.0000	0%
EQ Forward	Murex NY NA 149401 B	2332200	65,000.000	3488%	0	0.0000	0%

			0				
EQ Forward	Murex NY NA 149382 B	4458341.1 6	124,257.00 00	3488%	0	0.0000	0%

Addendum – CCAR Implementation Review

To: Model Validation Review Committee

Independent Model Validator: Adam Joplin, Model Risk Management

Model Name and ID: Market Risk RWA (CCAR) (2290)

Model Owner: Stephen Ahn, Global Markets Risk Management

Date: 12/18/14

Validation Date in 2014: 10/30/14 [4]

1. Executive Summary

a. Description of the Model

Since BNY Mellon holds a trading book, it must forecast the risk weightings for assets under different economic scenarios as part of the firm's 2015 CCAR submission. The Market Risk RWA (CCAR) model serves this purpose by calculating market risk risk-weighted asset ("RWA") capital requirements nine quarters into the future under the Federal Reserve Supervisory Scenarios as well as the bank holding company ("BHC") Stress scenario.

b. Scope of Review

In this review, we analyzed model changes since the validation on 10/30/14 [4].

Furthermore, in the validation we listed several items to be included as part of this CCAR implementation review. These items are as follows:

- Confirm the usage of 9/30/14 portfolio;
- Verify the implementation of the CCAR 2015 scenarios;
- Review actions taken to address the validation issues;
- Check the appropriateness of the CCAR scenarios results ordering;
- Confirm whether there will be model overlay

The review of actions taken to address validation issues is included in section 2. The other items are fully described in section 3.

c. Newly Identified Issues

LEVEL 2

- 1) [Methodology] Approximation for Bank Portfolio: The model owner was made aware of the requirement to forecast RWA figures for the Bank portfolio in addition to those of the Company

portfolio. This requirement required more time and resources than available, thus a temporary approach is used for the 2015 CCAR submission. Namely, the percentage changes (for each quarter and scenario) in VaR, SVaR, and Equity standardized charges forecasted for the Company level are used for the Bank level. Such approximation is justified due to the high correlations between the changes from the Company and the Bank portfolios. However, this approximation should only be used for the 2015 CCAR submission. The validated methodology used for the Company portfolio should be applied to the Bank portfolio, as it is more accurate. Also, in order to reduce overall model risk for the company, it is preferable that the calculation be consistent. The same methodology for forecasting RWA for the Company portfolio should be used for the Bank portfolio in 2016 CCAR submission.

MO Response: We will calculate Bank VaR, SVaR, and charges for the Bank portfolio in the same way that we do for the Company portfolio for the 2016 CCAR submission.

ETA: 11/30/15

LEVEL 3

None

d. Conclusion

We concluded that the model's result could be used for CCAR 2015 submission.

The approximation used on the bank portfolio could only be used once for this year. The same methodology for forecasting RWA for the Company portfolio should be used for the Bank portfolio in 2016 CCAR submission.

2. Model Change since 2014 Validation

a. Actions to Close Validation Issues

As a result of the 10/30/14 validation, we raised one level-2 issue and one level-3 issue. The level-3 issue relates to a regular review of the goodness of fit of the risk factor mapping by model owner, and is required to be addressed later in 2015 after this year's CCAR exercise. The level-2 issue relates to model documentation, and was required to be addressed before the CCAR submission. It is described in more detail below.

1) Level 2 Issue (#837): Model Documentation

Description: The model includes several key assumptions and treatments that were not explicitly described in the original model document [1]. The issue required that such assumptions be more clearly stated in the document. Specific assumptions that needed be expanded upon included:

- the use of the Delta-Gamma approximation for VaR and SVaR instead of full revaluation of the portfolio
- the use of percentage change in VIX for forecasting all risk factor volatility changes
- the process for rescaling Monte Carlo simulation paths according to shifts in risk factor levels and volatilities
- the model forecasts 1-day VaR and SVaR.

Actions Taken to Address Issue: The model owner provided the validation team with an updated model document [2].

MV Comment: The validation team has reviewed the updated document and finds that the assumptions that were raised in the issue have been further clarified in the document. We consider this issue closed.

Issue Status: Closed

b. Other Model Changes

The model owner has included several changes to the model since the 10/30/14 validation. These are described below.

i. Modeling Approach for Bank Portfolio

The original purpose of the model, as validated in October 2014, was to project RWA for the Company (i.e. the Non-Bank component of BNY Mellon) level portfolio. However, the model owners were made aware of an additional requirement late in 2014 that the model also needed to project RWA for the Bank level portfolio. Though VaR and SVaR values for the Bank portfolio are calculated within the same system (RiskWatch) as the Company portfolio, the Bank portfolio includes a different set of risk factors, and thus requires a different risk factor to core risk factor mapping, as well as shift scenarios, sensitivity calculations, calibration of joint distribution of risk factors, and Monte Carlo simulations. Including these components for the 2015 CCAR exercise would require a considerable amount of time and computational effort. Thus, the model owner is using an alternative approach for the 2015 CCAR submission only.

The approach is that the same percentage changes (from 3Q2014 to each quarter and scenario) for VaR, SVaR, and Equity standardized charges forecasted for the Company level is used for the Bank level as well. In doing this, the model owner assumes that the Bank and Company portfolios' capital charges and their components are closely related. For this method to be accepted, the validation team required that the model owner detail this approach in an addendum. The validation team stated that the addendum should clearly state the purpose for the change, methodology, assumptions, evaluation of approach, and results, and in doing so should fully justify the usage of this method. The model owner provided the validation team with the addendum to detail this model change in [3].

Because forecasted values for VaR and SVaR are scaled according to the most recent regulatory filings, it was necessary that the model owner show that percentage changes in VaR and SVaR over time for the Bank and Company portfolio be strongly related. The model owner showed that relative differences between VaR and SVaR at several lags had high correlation for the Bank and Company portfolios. This is shown in [3] and in Table 1 and Table 2 below.

Table 1: Correlation Coefficients for Bank and Company VaR Values at Various Lags

Correlation in VaR Relative Differences at Several Lags - Company and Bank Portfolios									
Over period (days)	30	60	91	121	151	182	212	242	273
Company/Bank changes correlations	87.0%	91.0%	93.8%	92.5%	92.6%	93.1%	96.0%	95.0%	94.1%

Table 2: Correlation Coefficients for Bank and Company SVaR Values at Various Lags

Correlation in SVaR Relative Differences at Several Lags - Company and Bank Portfolios										
Over period (days)	28	56	84	112	140	168	196	224	252	280
Company/Bank changes correlations	92.4%	92.1%	92.0%	92.8%	89.0%	84.2%	84.3%	86.0%	87.8%	94.2%

Furthermore, the model owner showed that VaR, SVaR, and Equity standardized charges moved in tandem over the last seven quarters. Because these charge amounts are only reported on a quarterly basis, it is not reasonable to report correlation values here. However, the model owner shows that the charge amounts tend to move together. This is shown in [3] and in Figure 1, Figure 2, and Figure 3 below.

Figure 1: VaR Standardized Charges for Bank and Company Portfolios -- 1Q13-3Q14

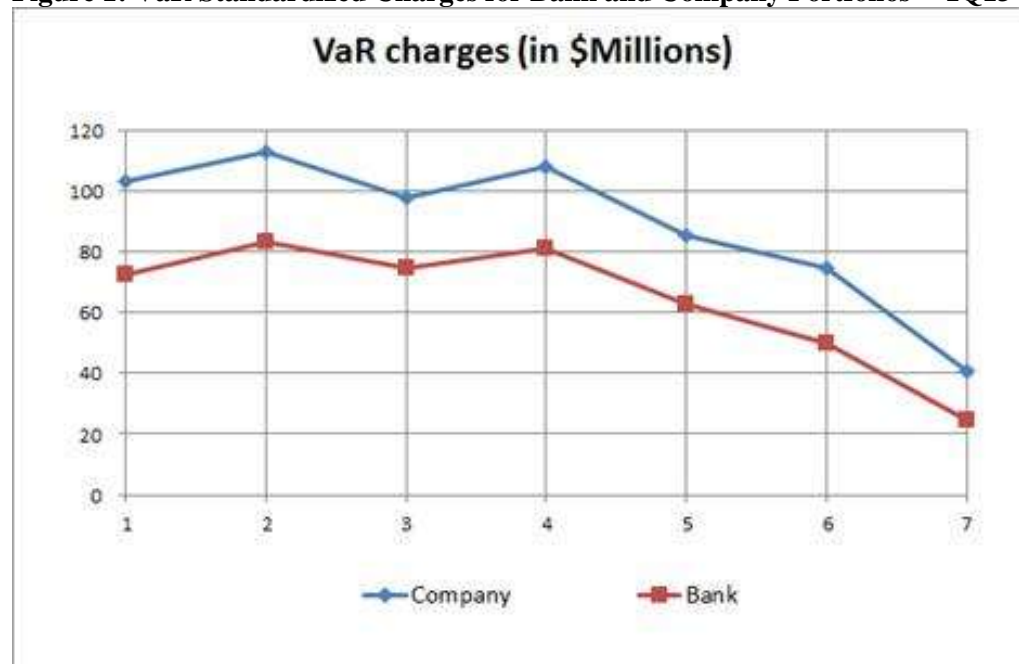


Figure 2: SVaR Standardized Charges for Bank and Company Portfolios -- 1Q13-3Q14

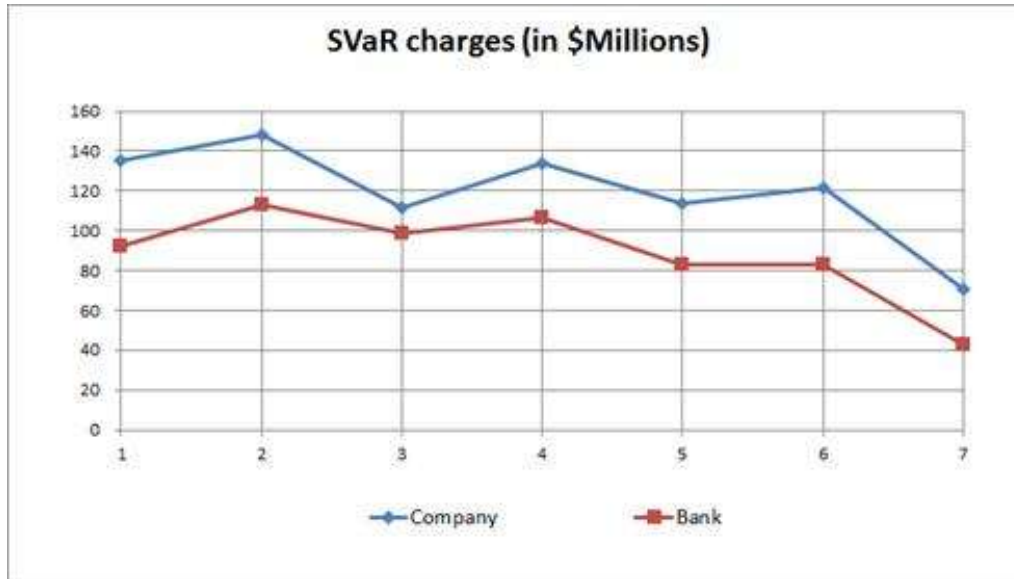
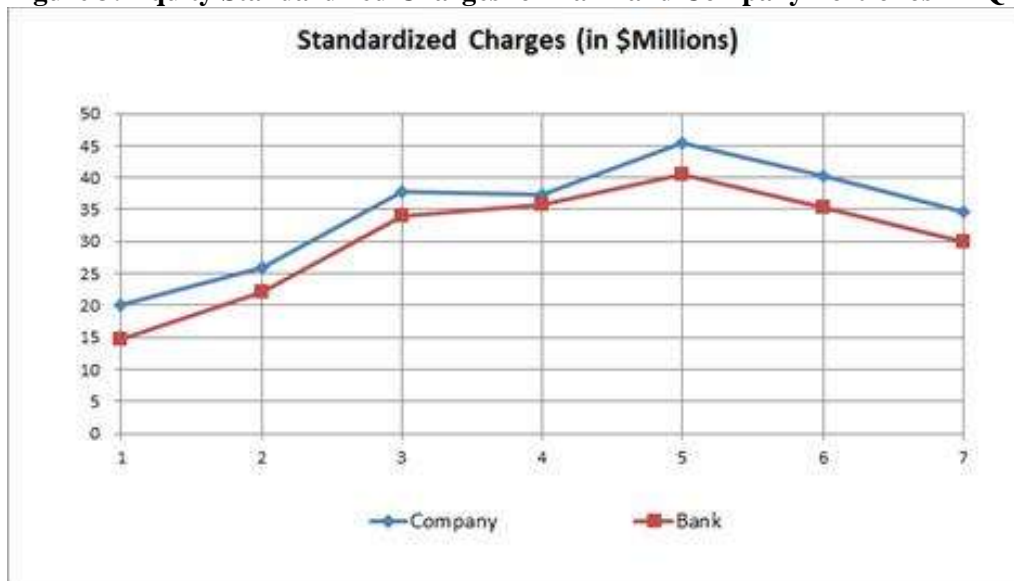


Figure 3: Equity Standardized Charges for Bank and Company Portfolios -- 1Q13-3Q14



We conclude that the model owner's approximation is acceptable for the 2015 CCAR submission only. We have raised a level-2 issue stating that model owners only use the approximation for this year's CCAR submission and that the methodology for forecasting RWA for the Company portfolio be used for the Bank portfolio in 2016 CCAR.

ii. Equity and Interest Rate Charges Forecast

At the time of the 2014 validation, the model owner used the equity and interest rate charge amounts at the “as-of” date (for this CCAR submission, 9/30/14) for the future nine quarters and for all supervisory scenarios. The model owner stated to the validation team that this method was temporary and would likely change before the CCAR exercise. The model now uses another approach: the equity and interest rate charges used in the model are now forecasted for the next nine quarters under each CCAR scenario. The model owner has described this change in [2].

For equity charges, the model owner uses the percentage change for each quarter from the “as-of” date of the Dow Jones Total Stock Market Index (“DJI”) under each supervisory scenario. The DJI was the primary core risk factor used for modeling levels of all equity risk factors, thus it is the risk factor used to forecast equity charges under each scenario.

For interest rate charges, the model owner calculates the total change in interest rate portfolio value when interest rate risk factors are perturbed by one basis point at each tenor. Separately, the model owner finds the forecasted end of day value according to each risk factor’s core risk factor change under each scenario. These values are multiplied together to get a change in interest rate portfolio value due to each supervisory scenario. Then, these values are summed across portfolios to get a total change in interest rate portfolio value. The relative change compared to the 9/30/14 interest rate portfolio value is the interest charge for a particular quarter and particular scenario. This process is repeated to find interest rate charges for all scenarios and all quarters. We have validated that this calculation is performed correctly in [7]. We believe that the calculation is reasonable given the purpose.

Ultimately, we conclude that using this method to forecast for equity and interest rate charges is sound. Furthermore, it is a model enhancement from what was temporarily used during the 10/30/14 validation.

iii. Finalized risk factor to core risk factor mapping

At the time of the full validation, the risk factor to core risk factor mapping was not yet finalized. Instead, the model owner provided a possible mapping based on macroeconomic forecasts provided by the Federal Reserve and a third-party vendor in years past. In the validation report [4], we included a general review of risk factor to core risk factor mapping and stated that the mapping was reasonable. Furthermore, we raised a level-3 issue in the validation stating that model owners should review the risk factor mapping in the model’s annual review. This issue still stands.

We have re-visited the final mapping provided in [5]; the major change is the bullet point #iv below. We believe that the mapping choices are reasonable, and that risk factor dynamics can be modeled appropriately for this purpose with the core risk factors given. The complete list is given in Appendix A.

iv. Use of Swaption Volatility for Non-Equity Risk Factor Volatility

As previously mentioned, trading portfolio risk factors are mapped to core risk factors for which forecasts are provided. The mapping involves two components: the core risk factor level, or the value at a particular point in time, and volatility. The model owner states that “For each risk factor its level will be shocked (in relative or absolute terms) by the same amount as the corresponding ‘Core (or major) Risk Factor’ it is mapped to. The volatility of each factor will also be shocked by the same amount as the Core risk Factor this volatility is mapped to” [2]. The original model document [1] stated that all risk factor volatilities will be mapped to the S&P 500 volatility index VIX. In the 2014 validation, we noted in the analysis of model assumptions that S&P 500 log differences are typically larger than that of fixed income or foreign exchange volatility. We believed model owners used conservative approach by applying a potentially higher volatility change given the lack of volatility data. Thus, we did not raise an issue for the approach, but did include this as a model risk.

However, instead of only using VIX for calculating changes in risk factor volatility, the updated model uses USD swaption volatility as well. Specifically, the volatilities for all equity risk factors are mapped to S&P 500 volatility, and the volatility for all remaining risk factors are mapped to a USD swaption volatility. We believe that this is a more appropriate modeling choice, given that non-equity products are more likely to have volatility consistent with USD swaption volatility than that of the S&P 500. We believe this change is a model enhancement.

3. Review Details

a. Confirmation of the Usage of the 9/30/14 Portfolio

The model owner provided the validation team with shift and valuation results for each portfolio in the trading book on the date of analysis used by the model [8], [9]. We compared valuation results according to shift scenarios with portfolio theoretical values given in the VaR/SVaR report on the 9/30/14 date. Based on this, the validation team can confirm that the 9/30/14 portfolio was used as the valuation date for the model.

b. Verification of the Implementation of the 2015 CCAR Scenarios

The model owner uses a subset of the macroeconomic forecasts provided by the Federal Reserve and Moody’s under the three Federal Reserve Supervisory Scenarios and BHC Stress scenarios. These are deemed “core risk factors” in the model, and changes in levels and volatilities of these values are mapped to core risk factors. The model owner provided two files that show implementation of the four CCAR scenarios [6] and [7]. The validation team has replicated the calculations in the file and has verified that the scenarios have been implemented correctly.

c. Check of the Appropriateness of the CCAR Scenarios Results Ordering

The validation team has reviewed both intermediate and final model results to confirm that CCAR scenario results are ordered properly. Initially, we expected that results generally become more severe as

scenario severity increases, thus confirming what should logically occur under stressed scenarios. However, we noted that in some cases, severely adverse VaR and SVaR are as low as or lower than adverse VaR and SVaR. We communicated with the model owner immediately. The model owner stated that this is as expected. Due to the nature of CCAR scenarios provided by the Federal Reserve, in particular, Supervisory Baseline and Supervisory Adverse Scenarios have higher USD and EUR Interbank rates at the end of the projections horizon, which is more punitive to BNY Mellon's trading book. Thus, we accepted the model owner's explanation and agreed that the current CCAR ordering is correct. Below, we show 1-day VaR and SVaR, two important intermediate calculations in the model, as well as final market risk RWA capital requirements under each supervisory scenario as well as BHC stress scenario.

Figure 4: 1-day 99% VaR under Supervisory Scenarios

Forecasted 1-day 99% VaR under Supervisory Scenarios				
Quarter	Baseline	Adverse	Severely Adverse	BHC Stress
Q4 2014	-3,104,870	-3,641,270	-6,661,610	-4,770,910
Q1 2015	-2,862,330	-4,290,420	-6,336,740	-5,799,240
Q2 2015	-2,730,710	-4,467,910	-8,274,090	-6,872,740
Q3 2015	-2,732,260	-4,610,720	-8,776,060	-7,519,030
Q4 2015	-2,736,370	-4,402,840	-8,314,780	-7,764,700
Q1 2016	-2,513,510	-4,583,020	-6,360,130	-7,235,750
Q2 2016	-2,426,130	-4,540,340	-5,134,390	-6,670,840
Q3 2016	-2,485,660	-4,405,600	-4,517,210	-5,779,090
Q4 2016	-2,440,930	-4,374,190	-3,930,220	-5,126,890

Figure 5: 1-day 99% SVaR under Supervisory Scenarios

Forecasted 1-day 99% SVaR under Supervisory Scenarios				
Quarter	Baseline	Adverse	Severely Adverse	BHC Stress
Q4 2014	-5,094,000	-7,074,360	-11,352,200	-9,814,980
Q1 2015	-4,870,070	-7,895,910	-9,876,720	-13,500,400
Q2 2015	-5,096,140	-8,917,100	-11,763,100	-15,698,600
Q3 2015	-5,458,090	-9,387,040	-12,235,000	-17,212,700
Q4 2015	-5,674,720	-9,768,680	-10,746,700	-17,126,400
Q1 2016	-6,090,550	-9,735,100	-8,393,350	-15,378,600
Q2 2016	-6,254,800	-9,222,010	-6,710,130	-11,792,300
Q3 2016	-6,609,490	-9,108,650	-5,526,660	-9,529,530
Q4 2016	-6,812,640	-8,971,870	-4,962,230	-8,091,000

Figure 6: Final Model Results -- Market Risk RWA Capital Requirements under Supervisory Scenarios

Market Risk RWA Capital Requirements (\$ Millions) under Supervisory Scenarios				
Quarter	Baseline	Adverse	Severely Adverse	BHC Stress
Q4 2014	3,631	4,020	5,478	4,691
Q1 2015	3,529	4,225	4,923	5,509
Q2 2015	3,539	4,401	5,585	6,083
Q3 2015	3,594	4,469	5,735	6,461
Q4 2015	3,621	4,456	5,372	6,470
Q1 2016	3,646	4,448	4,582	6,039
Q2 2016	3,652	4,314	4,059	5,267
Q3 2016	3,716	4,242	3,749	4,688
Q4 2016	3,741	4,185	3,561	4,309

d. Confirmation of Model Overlay

The model owner has stated that there is no overlay associated with the model.

4. References

1. "CCAR Methodology.docx"
2. "CCAR Methodology 20140930.docx"
3. "Addendum3.docx"
4. "2290 - Market Risk RWA (CCAR) - Validation - 2014.docx"
5. "ccar_rf_2_crf.csv"
6. "CRF projections.xlsx"
7. "Standardized Charges Scalers Calc.xlsx"
8. "clean_val_ir.csv"
9. "clean_val_non_ir.csv"

Appendix A: Risk Factor to Core Risk Factor Mapping

Risk Factor	Core Risk Factor Level	Core Risk Factor Volatility
:AAPL_C03783310_EQTV	:SP500_C00000117_EQTV	:SP500_C00000117_EQTV
:ABT_C00282410_EQTV	:SP500_C00000117_EQTV	:SP500_C00000117_EQTV
:ABX_C06790110_EQTV	:SP500_C00000117_EQTV	:SP500_C00000117_EQTV
:ADBE_C00724F10_EQTV	:SP500_C00000117_EQTV	:SP500_C00000117_EQTV
:AFL_C00105510_EQTV	:SP500_C00000117_EQTV	:SP500_C00000117_EQTV
:AIG_C02687478_EQTV	:SP500_C00000117_EQTV	:SP500_C00000117_EQTV
:APC_C03251110_EQTV	:SP500_C00000117_EQTV	:SP500_C00000117_EQTV
:AVGO_CY0486S10_EQTV	:SP500_C00000117_EQTV	:SP500_C00000117_EQTV
:AXP_C02581610_EQTV	:SP500_C00000117_EQTV	:SP500_C00000117_EQTV
:AZN_C04635310_EQTV	:SP500_C00000117_EQTV	:SP500_C00000117_EQTV
:BAC_C06050510_EQTV	:SP500_C00000117_EQTV	:SP500_C00000117_EQTV
:BBT_C05493710_EQTV	:SP500_C00000117_EQTV	:SP500_C00000117_EQTV
:BCR_C06738310_EQTV	:SP500_C00000117_EQTV	:SP500_C00000117_EQTV
:BMJ_C11012210_EQTV	:SP500_C00000117_EQTV	:SP500_C00000117_EQTV
:BRKB_C08467070_EQTV	:SP500_C00000117_EQTV	:SP500_C00000117_EQTV
:C_C17296742_EQTV	:SP500_C00000117_EQTV	:SP500_C00000117_EQTV
:CAT_C14912310_EQTV	:SP500_C00000117_EQTV	:SP500_C00000117_EQTV
:CBRL_C22410J10_EQTV	:SP500_C00000117_EQTV	:SP500_C00000117_EQTV
:CE_C15087010_EQTV	:SP500_C00000117_EQTV	:SP500_C00000117_EQTV
:CMCSA_C20030N10_EQTV	:SP500_C00000117_EQTV	:SP500_C00000117_EQTV
:COF_C14040H10_EQTV	:SP500_C00000117_EQTV	:SP500_C00000117_EQTV
:COST_C22160K10_EQTV	:SP500_C00000117_EQTV	:SP500_C00000117_EQTV
:CRM_C79466L30_EQTV	:SP500_C00000117_EQTV	:SP500_C00000117_EQTV
:CSCO_C17275R10_EQTV	:SP500_C00000117_EQTV	:SP500_C00000117_EQTV
:CVX_C16676410_EQTV	:SP500_C00000117_EQTV	:SP500_C00000117_EQTV
:DIS_C25468710_EQTV	:SP500_C00000117_EQTV	:SP500_C00000117_EQTV
:DOV_C26000310_EQTV	:SP500_C00000117_EQTV	:SP500_C00000117_EQTV
:DOW_C26054310_EQTV	:SP500_C00000117_EQTV	:SP500_C00000117_EQTV
:DVN_C25179M10_EQTV	:SP500_C00000117_EQTV	:SP500_C00000117_EQTV
:EEM_C46428723_EQTV	:SP500_C00000117_EQTV	:SP500_C00000117_EQTV
:EFA_C46428746_EQTV	:SP500_C00000117_EQTV	:SP500_C00000117_EQTV
:ETN_CG2918310_EQTV	:SP500_C00000117_EQTV	:SP500_C00000117_EQTV
:F_C34537086_EQTV	:SP500_C00000117_EQTV	:SP500_C00000117_EQTV
:FCX_C35671D85_EQTV	:SP500_C00000117_EQTV	:SP500_C00000117_EQTV
:FDX_C31428X10_EQTV	:SP500_C00000117_EQTV	:SP500_C00000117_EQTV
:GE_C36960410_EQTV	:SP500_C00000117_EQTV	:SP500_C00000117_EQTV
:GM_C37045V10_EQTV	:SP500_C00000117_EQTV	:SP500_C00000117_EQTV

Risk Factor	Core Risk Factor Level	Core Risk Factor Volatility
:GS_C38141G10_EQTV	:SP500_C00000117_EQTV	:SP500_C00000117_EQTV
:HAL_C40621610_EQTV	:SP500_C00000117_EQTV	:SP500_C00000117_EQTV
:HCA_C40412C10_EQTV	:SP500_C00000117_EQTV	:SP500_C00000117_EQTV
:HD_C43707610_EQTV	:SP500_C00000117_EQTV	:SP500_C00000117_EQTV
:HOG_C41282210_EQTV	:SP500_C00000117_EQTV	:SP500_C00000117_EQTV
:HON_C43851610_EQTV	:SP500_C00000117_EQTV	:SP500_C00000117_EQTV
:HPQ_C42823610_EQTV	:SP500_C00000117_EQTV	:SP500_C00000117_EQTV
:HUBB_C44351020_EQTV	:SP500_C00000117_EQTV	:SP500_C00000117_EQTV
:IBM_C45920010_EQTV	:SP500_C00000117_EQTV	:SP500_C00000117_EQTV
:ICE_C45866F10_EQTV	:SP500_C00000117_EQTV	:SP500_C00000117_EQTV
:IJR_C46428780_EQTV	:SP500_C00000117_EQTV	:SP500_C00000117_EQTV
:IM_C45715310_EQTV	:SP500_C00000117_EQTV	:SP500_C00000117_EQTV
:INDUA_C26099405_EQTV	:SP500_C00000117_EQTV	:SP500_C00000117_EQTV
:INTC_C45814010_EQTV	:SP500_C00000117_EQTV	:SP500_C00000117_EQTV
:IVZ_CG491BT10_EQTV	:SP500_C00000117_EQTV	:SP500_C00000117_EQTV
:JCI_C47836610_EQTV	:SP500_C00000117_EQTV	:SP500_C00000117_EQTV
:JNJ_C47816010_EQTV	:SP500_C00000117_EQTV	:SP500_C00000117_EQTV
:JPM_C46625H10_EQTV	:SP500_C00000117_EQTV	:SP500_C00000117_EQTV
:KO_C19121610_EQTV	:SP500_C00000117_EQTV	:SP500_C00000117_EQTV
:LLY_C53245710_EQTV	:SP500_C00000117_EQTV	:SP500_C00000117_EQTV
:LNKD_C53578A10_EQTV	:SP500_C00000117_EQTV	:SP500_C00000117_EQTV
:LOW_C54866110_EQTV	:SP500_C00000117_EQTV	:SP500_C00000117_EQTV
:LVS_C51783410_EQTV	:SP500_C00000117_EQTV	:SP500_C00000117_EQTV
:MCD_C58013510_EQTV	:SP500_C00000117_EQTV	:SP500_C00000117_EQTV
:MET_C59156R10_EQTV	:SP500_C00000117_EQTV	:SP500_C00000117_EQTV
:MO_C02209S10_EQTV	:SP500_C00000117_EQTV	:SP500_C00000117_EQTV
:MRK_C58933Y10_EQTV	:SP500_C00000117_EQTV	:SP500_C00000117_EQTV
:MS_C61744644_EQTV	:SP500_C00000117_EQTV	:SP500_C00000117_EQTV
:MSFT_C59491810_EQTV	:SP500_C00000117_EQTV	:SP500_C00000117_EQTV
:MU_C59511210_EQTV	:SP500_C00000117_EQTV	:SP500_C00000117_EQTV
:NBR_CG6359F10_EQTV	:SP500_C00000117_EQTV	:SP500_C00000117_EQTV
:NFLX_C64110L10_EQTV	:SP500_C00000117_EQTV	:SP500_C00000117_EQTV
:OSK_C68823920_EQTV	:SP500_C00000117_EQTV	:SP500_C00000117_EQTV
:PCAR_C69371810_EQTV	:SP500_C00000117_EQTV	:SP500_C00000117_EQTV
:PEP_C71344810_EQTV	:SP500_C00000117_EQTV	:SP500_C00000117_EQTV
:PFE_C71708110_EQTV	:SP500_C00000117_EQTV	:SP500_C00000117_EQTV
:PG_C74271810_EQTV	:SP500_C00000117_EQTV	:SP500_C00000117_EQTV
:PHM_C74586710_EQTV	:SP500_C00000117_EQTV	:SP500_C00000117_EQTV
:PM_C71817210_EQTV	:SP500_C00000117_EQTV	:SP500_C00000117_EQTV

Risk Factor	Core Risk Factor Level	Core Risk Factor Volatility
:POT_C73755L10_EQTV	:SP500_C00000117_EQTV	:SP500_C00000117_EQTV
:QCOM_C74752510_EQTV	:SP500_C00000117_EQTV	:SP500_C00000117_EQTV
:SBUX_C85524410_EQTV	:SP500_C00000117_EQTV	:SP500_C00000117_EQTV
:SJM_C83269640_EQTV	:SP500_C00000117_EQTV	:SP500_C00000117_EQTV
:SP500_C00000117_EQTV	:SP500_C00000117_EQTV	:SP500_C00000117_EQTV
:SPY_C78462F10_EQTV	:SP500_C00000117_EQTV	:SP500_C00000117_EQTV
:SWN_C84546710_EQTV	:SP500_C00000117_EQTV	:SP500_C00000117_EQTV
:T_C00206R10_EQTV	:SP500_C00000117_EQTV	:SP500_C00000117_EQTV
:TEVA_C88162420_EQTV	:SP500_C00000117_EQTV	:SP500_C00000117_EQTV
:TGT_C87612E10_EQTV	:SP500_C00000117_EQTV	:SP500_C00000117_EQTV
:UNP_C90781810_EQTV	:SP500_C00000117_EQTV	:SP500_C00000117_EQTV
:UPS_C91131210_EQTV	:SP500_C00000117_EQTV	:SP500_C00000117_EQTV
:USB_C90297330_EQTV	:SP500_C00000117_EQTV	:SP500_C00000117_EQTV
:VLO_C91913Y10_EQTV	:SP500_C00000117_EQTV	:SP500_C00000117_EQTV
:WAG_C93142210_EQTV	:SP500_C00000117_EQTV	:SP500_C00000117_EQTV
:WFC_C94974610_EQTV	:SP500_C00000117_EQTV	:SP500_C00000117_EQTV
:WMT_C93114210_EQTV	:SP500_C00000117_EQTV	:SP500_C00000117_EQTV
:XLF_C81369Y60_EQTV	:SP500_C00000117_EQTV	:SP500_C00000117_EQTV
:XOM_C30231G10_EQTV	:SP500_C00000117_EQTV	:SP500_C00000117_EQTV
:XON_C46122T10_EQTV	:SP500_C00000117_EQTV	:SP500_C00000117_EQTV
:YHOO_C98433210_EQTV	:SP500_C00000117_EQTV	:SP500_C00000117_EQTV
:YUM_C98849810_EQTV	:SP500_C00000117_EQTV	:SP500_C00000117_EQTV
:factorGB	:C26099405_Index_INDUA_Return	:SP500_C00000117_EQTV
:FXAED_Forward	:IRAUD_Interbank	:index_euro1
:FXARS_Forward	:IRMXN_Interbank	:index_euro1
:FXAUD_Forward	:IRAUD_Interbank	:index_euro1
:FXBGN_Forward	:IRZAR_Interbank	:index_euro1
:FXBHD_Forward	:IRZAR_Interbank	:index_euro1
:FXBRL_Forward	:IRZAR_Interbank	:index_euro1
:FXBWP_Forward	:IRZAR_Interbank	:index_euro1
:FXCAD_Forward	:IRCAD_Interbank	:index_euro1
:FXCHF_Forward	:IRCHF_Interbank	:index_euro1
:FXCLP_Forward	:IRDKK_Interbank	:index_euro1
:FXCNY_Forward	:IRSGD_Interbank	:index_euro1
:FXCOP_Forward	:IRDKK_Interbank	:index_euro1
:FXCZK_Forward	:IRSEK_Interbank	:index_euro1
:FXDKK_Forward	:IRDKK_Interbank	:index_euro1
:FXEGP_Forward	:IRSGD_Interbank	:index_euro1
:FXEUR_Forward	:IREUR_Interbank	:index_euro1

Risk Factor	Core Risk Factor Level	Core Risk Factor Volatility
:FXGBP_Forward	:IRGBP_Interbank	:index_euro1
:FXHKD_Forward	:IRHKD_Interbank	:index_euro1
:FXHRK_Forward	:IREUR_Interbank	:index_euro1
:FXHUF_Forward	:IRHUF_Interbank	:index_euro1
:FXIDR_Forward	:IRHKD_Interbank	:index_euro1
:FXILS_Forward	:IRHKD_Interbank	:index_euro1
:FXINR_Forward	:IRHKD_Interbank	:index_euro1
:FXISK_Forward	:IRZAR_Interbank	:index_euro1
:FXJOD_Forward	:IRZAR_Interbank	:index_euro1
:FXJPY_Forward	:IRJPY_Interbank	:index_euro1
:FXKES_Forward	:IRDKK_Interbank	:index_euro1
:FXKRW_Forward	:IRHKD_Interbank	:index_euro1
:FXKWD_Forward	:IRHKD_Interbank	:index_euro1
:FXKZT_Forward	:IRZAR_Interbank	:index_euro1
:FXLKR_Forward	:IRZAR_Interbank	:index_euro1
:FXLTL_Forward	:IRZAR_Interbank	:index_euro1
:FXMAD_Forward	:IRZAR_Interbank	:index_euro1
:FXMUR_Forward	:IRZAR_Interbank	:index_euro1
:FXMXN_Forward	:IRMXN_Interbank	:index_euro1
:FXMYR_Forward	:IRZAR_Interbank	:index_euro1
:FXNAD_Forward	:IRDKK_Interbank	:index_euro1
:FXNGN_Forward	:IRSEK_Interbank	:index_euro1
:FXNOK_Forward	:IRNOK_Interbank	:index_euro1
:FXNZD_Forward	:IRJPY_Interbank	:index_euro1
:FXOMR_Forward	:IRUSD_Interbank	:index_euro1
:FXPEN_Forward	:IRUSD_Interbank	:index_euro1
:FXPHP_Forward	:IRUSD_Interbank	:index_euro1
:FXPKR_Forward	:IRUSD_Interbank	:index_euro1
:FXPLN_Forward	:IRUSD_Interbank	:index_euro1
:FXQAR_Forward	:IRUSD_Interbank	:index_euro1
:FXRON_Forward	:IRDKK_Interbank	:index_euro1
:FXRSD_Forward	:IRDKK_Interbank	:index_euro1
:FXRUB_Forward	:IRZAR_Interbank	:index_euro1
:FXSAR_Forward	:IRZAR_Interbank	:index_euro1
:FXSEK_Forward	:IRSEK_Interbank	:index_euro1
:FXSGD_Forward	:IRSGD_Interbank	:index_euro1
:FXTHB_Forward	:IRSGD_Interbank	:index_euro1
:FXTND_Forward	:IRSGD_Interbank	:index_euro1
:FXTRY_Forward	:IRSGD_Interbank	:index_euro1

Risk Factor	Core Risk Factor Level	Core Risk Factor Volatility
:FXTWD_Forward	:IRHKD_Interbank	:index_euro1
:FXUSD_Forward	:IRUSD_Interbank	:index_euro1
:FXZAR_Forward	:IRZAR_Interbank	:index_euro1
:EUR_GBP-Simulation	:index_euro1	:index_euro1
:EUR_JPY-Simulation	:index_euro1	:index_euro1
:EUR_USD-Simulation	:index_euro1	:index_euro1
:GBP_JPY-Simulation	:index_euro1	:index_euro1
:GBP_USD-Simulation	:index_euro1	:index_euro1
:JPY_USD-Simulation	:index_euro1	:index_euro1
:MXN_USD-Simulation	:index_euro1	:index_euro1
:FXAED	:FXCNY	:index_euro1
:FXAFN	:FXCNY	:index_euro1
:FXAOA	:FXCNY	:index_euro1
:FXARS	:FXCNY	:index_euro1
:FXAUD	:FXJPY	:index_euro1
:FXBBD	:FXCNY	:index_euro1
:FXBDT	:FXCNY	:index_euro1
:FXBGN	:FXCNY	:index_euro1
:FXBHD	:FXCNY	:index_euro1
:FXBMD	:FXCNY	:index_euro1
:FXBOB	:FXCNY	:index_euro1
:FXBRL	:FXCNY	:index_euro1
:FXBWP	:FXCNY	:index_euro1
:FXBZD	:FXCNY	:index_euro1
:FXCAD	:FXEUR	:index_euro1
:FXCHF	:FXEUR	:index_euro1
:FXCLP	:FXEUR	:index_euro1
:FXCNY	:FXCNY	:index_euro1
:FXCOP	:FXEUR	:index_euro1
:FXCRC	:FXEUR	:index_euro1
:FXCVE	:FXEUR	:index_euro1
:FXCZK	:FXEUR	:index_euro1
:FXDJF	:FXEUR	:index_euro1
:FXDKK	:FXEUR	:index_euro1
:FXDZD	:FXEUR	:index_euro1
:FXEEK	:FXEUR	:index_euro1
:FXEGP	:FXEUR	:index_euro1
:FXEUR	:FXEUR	:index_euro1
:FXFJD	:FXEUR	:index_euro1

Risk Factor	Core Risk Factor Level	Core Risk Factor Volatility
:FXGBP	:FXGBP	:index_euro1
:FXGHS	:FXEUR	:index_euro1
:FXGNF	:FXEUR	:index_euro1
:FXGTQ	:FXEUR	:index_euro1
:FXGYD	:FXEUR	:index_euro1
:FXHKD	:FXJPY	:index_euro1
:FXHNL	:FXJPY	:index_euro1
:FXHRK	:FXJPY	:index_euro1
:FXHUF	:FXJPY	:index_euro1
:FXIDR	:FXJPY	:index_euro1
:FXILS	:FXJPY	:index_euro1
:FXINR	:FXJPY	:index_euro1
:FXIRR	:FXJPY	:index_euro1
:FXISK	:FXEUR	:index_euro1
:FXJMD	:FXJPY	:index_euro1
:FXJOD	:FXJPY	:index_euro1
:FXJPY	:FXJPY	:index_euro1
:FXKES	:FXJPY	:index_euro1
:FXKGS	:FXJPY	:index_euro1
:FXKHR	:FXJPY	:index_euro1
:FXKRW	:FXCNY	:index_euro1
:FXKWD	:FXCNY	:index_euro1
:FXKZT	:FXCNY	:index_euro1
:FXLBP	:FXCNY	:index_euro1
:FXLKR	:FXCNY	:index_euro1
:FXLTL	:FXCNY	:index_euro1
:FXLVL	:FXCNY	:index_euro1
:FXMAD	:FXCNY	:index_euro1
:FXMUR	:FXCNY	:index_euro1
:FXMWK	:FXCNY	:index_euro1
:FXMXN	:FXCNY	:index_euro1
:FXMYR	:FXCNY	:index_euro1
:FXMZN	:FXCNY	:index_euro1
:FXNAD	:FXCNY	:index_euro1
:FXNGN	:FXCNY	:index_euro1
:FXNOK	:FXEUR	:index_euro1
:FXNZD	:FXEUR	:index_euro1
:FXOMR	:FXCNY	:index_euro1
:FXPAB	:FXCNY	:index_euro1

Risk Factor	Core Risk Factor Level	Core Risk Factor Volatility
:FXPEN	:FXCNY	:index_euro1
:FXPGK	:FXCNY	:index_euro1
:FXPHP	:FXCNY	:index_euro1
:FXPKR	:FXCNY	:index_euro1
:FXPLN	:FXEUR	:index_euro1
:FXPYG	:FXJPY	:index_euro1
:FXQAR	:FXCNY	:index_euro1
:FXRON	:FXCNY	:index_euro1
:FXRSD	:FXCNY	:index_euro1
:FXRUB	:FXCNY	:index_euro1
:FXSAR	:FXCNY	:index_euro1
:FXSEK	:FXEUR	:index_euro1
:FXSGD	:FXCNY	:index_euro1
:FXSRD	:FXCNY	:index_euro1
:FXSZL	:FXCNY	:index_euro1
:FXTHB	:FXCNY	:index_euro1
:FXTND	:FXCNY	:index_euro1
:FXTRY	:FXCNY	:index_euro1
:FXTTD	:FXCNY	:index_euro1
:FXTWD	:FXCNY	:index_euro1
:FXUAH	:FXCNY	:index_euro1
:FXUGX	:FXCNY	:index_euro1
:FXUYU	:FXJPY	:index_euro1
:FXVEF	:FXJPY	:index_euro1
:FXVND	:FXJPY	:index_euro1
:FXXAF	:FXJPY	:index_euro1
:FXXCD	:FXJPY	:index_euro1
:FXXOF	:FXJPY	:index_euro1
:FXXPF	:FXCNY	:index_euro1
:FXYER	:FXCNY	:index_euro1
:FXZAR	:FXCNY	:index_euro1
:FXZMK	:FXCNY	:index_euro1
:FXZMW	:FXCNY	:index_euro1
:IRARS_Interbank	:IRMXN_Interbank	:index_euro1
:IRAUD_BBS3M	:IRAUD_Interbank	:index_euro1
:IRAUD_BBSW	:IRAUD_Interbank	:index_euro1
:IRAUD_Interbank	:IRAUD_Interbank	:index_euro1
:IRAUD_USDCC	:IRAUD_Interbank	:index_euro1
:IRBMD_Interbank	:IRMXN_Interbank	:index_euro1

Risk Factor	Core Risk Factor Level	Core Risk Factor Volatility
:IRBRL_Interbank	:IRMXN_Interbank	:index_euro1
:IRBWP_Interbank	:IRZAR_Interbank	:index_euro1
:IRCAD_Interbank	:IRCAD_Interbank	:index_euro1
:IRCHF_Interbank	:IRCHF_Interbank	:index_euro1
:IRCOP_Interbank	:IRCHF_Interbank	:index_euro1
:IRCZK_Interbank	:IRCHF_Interbank	:index_euro1
:IRDKK_Interbank	:IRDKK_Interbank	:index_euro1
:IREGP_Interbank	:IRDKK_Interbank	:index_euro1
:IREUR_EIB1M	:IREUR_Interbank	:index_euro1
:IREUR_EIB1Y	:IREUR_Interbank	:index_euro1
:IREUR_EIB3M	:IREUR_Interbank	:index_euro1
:IREUR_EIBOR	:IREUR_Interbank	:index_euro1
:IREUR_EONIA	:IREUR_Interbank	:index_euro1
:IREUR_Interbank	:IREUR_Interbank	:index_euro1
:IREUR_Mmarket	:IREUR_Interbank	:index_euro1
:IREUR_Swaption	:IRUSD_Interbank	:index_euro1
:IREUR_USDCC	:IREUR_Interbank	:index_euro1
:IRGBP_Deposit	:IRGBP_Interbank	:index_euro1
:IRGBP_Interbank	:IRGBP_Interbank	:index_euro1
:IRGBP_LIB3M	:IRGBP_Interbank	:index_euro1
:IRGBP_RPI	:IRGBP_RPI	:index_euro1
:IRGBP_SONIA	:IRGBP_Interbank	:index_euro1
:IRGBP_Swaption	:IRGBP_Interbank	:index_euro1
:IRGBP_USDCC	:IRGBP_Interbank	:index_euro1
:IRHKD_HIBOR	:IRHKD_Interbank	:index_euro1
:IRHKD_Interbank	:IRHKD_Interbank	:index_euro1
:IRHUF_Interbank	:IRHUF_Interbank	:index_euro1
:IRIDR_Interbank	:IRUSD_Interbank	:index_euro1
:IRILS_Interbank	:IRUSD_Interbank	:index_euro1
:IRINR_Interbank	:IRSGD_Interbank	:index_euro1
:IRJPY_CapFloor6M	:IRJPY_Interbank	:index_euro1
:IRJPY_Interbank	:IRJPY_Interbank	:index_euro1
:IRJPY_Interbank1	:IRJPY_Interbank	:index_euro1
:IRJPY_LIB1Y	:IRJPY_Interbank	:index_euro1
:IRJPY_LIB3M	:IRJPY_Interbank	:index_euro1
:IRJPY_Swaption	:IRJPY_Interbank	:index_euro1
:IRJPY_TIB1M	:IRJPY_Interbank	:index_euro1
:IRJPY_TIB3M	:IRJPY_Interbank	:index_euro1
:IRJPY_TIBOR	:IRJPY_Interbank	:index_euro1

Risk Factor	Core Risk Factor Level	Core Risk Factor Volatility
:IRJPY_USDCC	:IRJPY_Interbank	:index_euro1
:IRKES_Interbank	:IRSGD_Interbank	:index_euro1
:IRKRW_Interbank	:IRSGD_Interbank	:index_euro1
:IRLKR_Interbank	:IRZAR_Interbank	:index_euro1
:IRMAD_Interbank	:IRZAR_Interbank	:index_euro1
:IRMUR_Interbank	:IRZAR_Interbank	:index_euro1
:IRMXN_Interbank	:IRMXN_Interbank	:index_euro1
:IRMYR_Interbank	:IRZAR_Interbank	:index_euro1
:IRNOK_Interbank	:IRNOK_Interbank	:index_euro1
:IRNZD_Interbank	:IRDKK_Interbank	:index_euro1
:IRPEN_Interbank	:IRPLN_Interbank	:index_euro1
:IRPHP_Interbank	:IRZAR_Interbank	:index_euro1
:IRPKR_Interbank	:IRZAR_Interbank	:index_euro1
:IRPLN_Interbank	:IRPLN_Interbank	:index_euro1
:IRRON_Interbank	:IRPLN_Interbank	:index_euro1
:IRSEK_Interbank	:IRSEK_Interbank	:index_euro1
:IRSGD_Interbank	:IRSGD_Interbank	:index_euro1
:IRTHB_Interbank	:IRSGD_Interbank	:index_euro1
:IRTRY_Interbank	:IRSGD_Interbank	:index_euro1
:IRTWD_Interbank	:IRSGD_Interbank	:index_euro1
:IRUSD_CapFloor1M	:IRUSD_Interbank	:index_euro1
:IRUSD_CapFloor3M	:IRUSD_Interbank	:index_euro1
:IRUSD_CapFloor6M	:IRUSD_Interbank	:index_euro1
:IRUSD_FEDFD	:IRUSD_Treasury	:index_euro1
:IRUSD_GOAAA	:IRUSD_MUAAA	:index_euro1
:IRUSD_INAAA	:IRUSD_MUAAA	:index_euro1
:IRUSD_INAAASP	:IRUSD_INBBBSP	:index_euro1
:IRUSD_INAASP	:IRUSD_INAASP	:index_euro1
:IRUSD_INASP	:IRUSD_INASP	:index_euro1
:IRUSD_INBBBSP	:IRUSD_INBBBSP	:index_euro1
:IRUSD_INBBSP	:IRUSD_INBBSP	:index_euro1
:IRUSD_INBSP	:IRUSD_INBSP	:index_euro1
:IRUSD_INCCCSP	:IRUSD_INBSP	:index_euro1
:IRUSD_Interbank	:IRUSD_Interbank	:index_euro1
:IRUSD_Interbank1	:IRUSD_Interbank	:index_euro1
:IRUSD_LIA6M	:IRUSD_Interbank	:index_euro1
:IRUSD_LIB1Y	:IRUSD_Interbank	:index_euro1
:IRUSD_LIB6M	:IRUSD_Interbank	:index_euro1
:IRUSD_Mmarket	:IRUSD_Interbank	:index_euro1

Risk Factor	Core Risk Factor Level	Core Risk Factor Volatility
:IRUSD_MUAAA	:IRUSD_MUAAA	:index_euro1
:IRUSD_MUAAASP	:IRUSD_INBBBSP	:index_euro1
:IRUSD_MUAASP	:IRUSD_MUAASP	:index_euro1
:IRUSD_MUASP	:IRUSD_MUASP	:index_euro1
:IRUSD_MUBBBSP	:IRUSD_MUBBBSP	:index_euro1
:IRUSD_MUBBSP	:IRUSD_INBBSP	:index_euro1
:IRUSD_MUBSP	:IRUSD_INBSP	:index_euro1
:IRUSD_MUCCCSP	:IRUSD_INBSP	:index_euro1
:IRUSD_MUNI	:IRUSD_MUAAA	:index_euro1
:IRUSD_Prime	:IRUSD_Prime	:index_euro1
:IRUSD_Supranational	:IRUSD_Interbank	:index_euro1
:IRUSD_Swaption	:IRUSD_Interbank	:index_euro1
:IRUSD_Treasury	:IRUSD_Treasury	:index_euro1
:IRVEF_Interbank	:IRMXN_Interbank	:index_euro1
:IRZAR_Interbank	:IRZAR_Interbank	:index_euro1
:index_cap1m11	:index_euro1	:index_euro1
:index_cap1m21	:index_euro1	:index_euro1
:index_cap3m11	:index_euro1	:index_euro1
:index_cap3m21	:index_euro1	:index_euro1
:index_cap6m11	:index_euro1	:index_euro1
:index_cap6m21	:index_euro1	:index_euro1
:index_euro1	:index_euro1	:index_euro1
:IRUSD_MBS_CC_OAS	:IRUSD_MBS_CC_OAS	:index_euro1