



# MEMORANDUM

Comptroller of the Currency  
Administrator of National Banks

880 Third Avenue, Fifth Floor  
New York, New York 10022  
212-527-1020

**To:** Ronald H. Frake, National Bank Examiner

**From:** Daniel C. Staehle, National Bank Examiner

**Date:** March 29, 2004

**Subject:** Fixed Income Derivatives Examination

## Scope and Objectives

The OCC performed a three-week review of the GCIB Fixed Income Derivatives (FID) business in New York commencing January 26, 2004. Our objective was to review and assess the level of risk and the quality of management over price and transaction risks for the Interest Rate Options (IRO), Swaps, and Hybrids desks. During the examination, we conducted numerous meetings with staff from the Front Office, Market Risk Management, Product Control, Technology, Fixed Income Derivative Research (FIDR), Model Validation (MVU), Audit, Sales and Compliance. For transaction risk, we directed most of our efforts to Product Control, conducting only a few meetings with the back office given that ARR was conducting an audit of derivative operations.

## Conclusions

- Price risk is high, primarily due to the size and complexity of the Interest Rate Option book.
- The quality of risk management is less than satisfactory. Several important deficiencies relating to risk measurement, reporting, and control are detailed in this report. Some issues are repeat criticisms.
- Transaction risk for the business remains high, due to the presence of continuing technology and system issues. //

This is the property of the OCC and is furnished to the bank examined for its confidential use. Under no circumstances shall the bank, or any of its directors, officers or employees disclose in any manner the document or any portion thereof to any person or organization not officially connected to the bank as officer, director, employee, attorney, or auditor. Any other disclosure or use of this document may be subject to the penalties provided in Section 641 of Title 18, US Code.

- The quality of transaction risk management is less than satisfactory. Ongoing weaknesses are noted in the price verification process, Market Value Adjustment (MVA) calculations and revaluation independence, P&L attribution, and systems.
- The Appendix of this report contains numerous exceptions that require management's prompt attention. A common element is the need to provide clear and transparent risk information to all appropriate parties.

## Summary of Findings

### Price Risk

Price risk within the Fixed Income Derivatives business is high. This rating reflects the high-risk attributes of the IRO desk, including increasing volumes, high limit utilization, complex volatility risk between option products and tenors, P&L volatility driven largely by an "unverified" volatility skew, substantial MVAs, exposure to non-parallel rate curve movements (de-correlated forward rates) in the long volatility book, and significant exposure to large market stresses. Activity is largely customer driven across the three desks, and limits have been designed to accommodate this flow. Although explicit proprietary trading is not the goal of the desks, there is considerable ability within the limit structure for traders to take market views, especially in the IRO book. Further, flow in the American swaptions product is largely one way. The short volatility book, meanwhile, is managed to keep delta and gamma risk low. Price risk of the hybrid and swaps desks is low, in the former case due to the small book size and in the latter due to the plain vanilla nature and minimal open positions.

Price risk management is less than satisfactory. Many of the items identified during the examination and detailed in this report represent fundamental control and communication issues. In particular, management needs to develop better MIS to report risk, review stress tests on a routine basis, improve P&L attribution analyses, enhance control functions, and provide independent MRM full access to desk information. A common theme is that the desk's activities are not fully transparent to control functions, which ultimately affects the effectiveness of associated control processes. Some of these exceptions have been outstanding despite global policy requirements and regulatory criticisms. In one instance, the business made commitments to correct deficiencies related to MVA calculations issues when requesting a limit increase in 2001, but failed to complete corrective action. We also noted an exception to the GCIB's new product policy, which is covered under our Formal Agreement with Citibank, N.A. A full list of issues is contained in the Appendix. Overall, a stronger control culture needs to be fostered.

Notwithstanding these comments, the overall quality of personnel is good, and management has recommitted to resolving these issues. Highly trained individuals with extensive market experience staff both the front office and market risk management. The FIDR staff is also a very capable group that is integrated with the desk and provides significant support. Management needs to ensure that sufficient resources are provided to the front office and control functions to ensure a high level of interaction and control over the business. The desk's limit structure is appropriate and limit monitoring is effective.

The following highlights some of the complexities noted in FID. Analytics produced for the desk by research are extensive, but due to the complexity of the products and calculation process, risk reports often require the assistance of research or desk quants to properly understand. The IRO desk uses the IRMA models, which have both a 1-factor version and a "2+" factor version. The former is for books and records and official limit monitoring, the latter for hedging. The sensitivities and P&L produced by the two model versions are quite different, although it appears that use of the 1-factor model for official P&L is conservative. The IRMA models have a limited ability to fit market skews and can be slow to run (computationally expensive), but give useful risk insights. Additionally, IRMA for caps is problematic. The quality and speed of the fit to market quotes through its time dependent volatility formulation limits the ability to break down exposure into constituent caplet Vega and volatility moves.

Management commenced a new derivatives initiative to upgrade systems and controls and elevate desk performance. A task force is in place to dimension risk and corrective action specifications and requirements. Management expects that many of the issues in our report will be addressed by this initiative. We believe that the issues should be resolved prior to any further increase in business risks. Thus, we concur with MRM's denial of an increase in underlying limits.

Price risk management for the Swaps Desk is satisfactory, and related risk management systems and controls are commensurate with current activities. Risk management over the hybrids desk, however, is less than satisfactory. This conclusion is mitigated by the small size of the business. The Epsilon system platform is recognized as inadequate and efforts have been underway for some time to find a replacement. Further, a number of processes are manually initiated with attendant oversight by MRM and Product Control. This business should also not grow significantly until systems and processing issues are resolved.

### Transaction Risk

Transaction risk is high. The business lacks robust independent valuations for option positions, resulting in an ongoing high level of unverified positions, as well as a continuing over-reliance on the front office in the process. The persistence of system and transparency issues calls into question whether adequate resources are being appropriated for necessary remedial actions and development projects.

Transaction risk management is less than satisfactory. Options and hybrid books rely substantially on trader input for the revaluation process, placing very high importance on the quality of the monthly price verification function. As such, price verification practices need improvement. These processes lack of sufficient coverage in testing volatility skew inputs for options. There is a recognized over-reliance on the front office to provide the skew adjustments (MVAs). The lack of sufficient independent analysis using robust external data to determine how IRMA skew relates to market skew results in significant valuation amounts for swaptions, caps/floors and digitals being reported as unverified. Efforts are needed to reduce the volume of unverified inventory.

Overall controls over the daily production of FID P&L are satisfactory, particularly given the good focus on trade position reconciliation between systems. The FID Product Control team is capable and experienced. However, staffing is notably stretched. Staffing levels are unchanged since March 2003 but the workload is increasing for a variety of reasons, including continued growth in volumes on both the IRO and hybrids desks, additional trade monitoring responsibilities associated with Structured Finance trades, and new responsibilities associated with EITF 02-03. Hybrids have been particularly challenging given weaknesses in the Epsilon technology infrastructure and the lack of automated tools to complete the P&L and monthly price verification work.

**Appendix**  
**Fixed Income Derivatives**  
**OCC Examination Recommendations**

**Price Risk Management**

**1. Stress Tests and Scenario Analysis**

Management needs to review stress and scenario analyses for non-parallel rate moves on a regular basis to remain appropriately informed of risk exposures. One of the key risks to the desk is the potential for decorrelation of forward interest rates. Products most impacted by this risk are caps and American swaptions. The desk has a stress test to measure the impact of non-parallel rate scenarios ("Twist Scenarios Diff" Report). However, this report has not been regularly produced since October 2003, primarily due to its extensive run time. While the desk does not need the report to manage its risks, it fosters risk transparency to relevant management. The desk has requested limit increases for both products due to the expected increase in demand as interest rates increase. Stress and scenario analyses should become routine risk management reports prior to approving any limit increases.

**2. P&L Attribution**

Management needs to improve its P&L attribution process to enhance the transparency of risk-taking. P&L attribution is an important device for providing risk information for any trading business. The desk has made significant progress in developing this capability since our last examination, but the unexplained P&L can be large for caps and related products, particularly on days with large non-parallel moves and with options near exercise. These differences are not always properly analyzed, reported, and explained. Management needs to establish materiality thresholds for residual unexplained P&L, and require formal reviews of breaches. Management also needs to improve P&L attribution for cap-related products. We note the desk is near final testing of an improved cap attribution method.

**3. Independent Risk Management and Access to the Desk**

An experienced independent market risk manager should be dedicated specifically to the IRO desk and given full and timely access to desk information. The current risk manager, who is well qualified for the job, also has responsibilities for covering the mortgage business. Maintaining a full understanding of the specific calculations and assumptions embedded in the IRO risk reports generated by research (e.g., how curves are shifted, whether full revaluation or approximations are used, the degree to which higher-order greeks and cross-partial derivatives are calculated, skew P&L effects, etc.) requires significant time. The independent risk managers also need direct access to and timely responses from the desk to fully understand risk exposures and trends. The independent risk managers currently work through in-business risk management to assess risks; a requirement that we believe can impede transparency and timeliness. Business management should ensure adequate resources within the front office to allow for direct and comprehensive interaction with MRM. In-business risk management can certainly be kept apprised of the dialogue or participate where deemed appropriate.

#### 4. Risk Reporting and Analysis

Management needs to develop MIS to better report desk risk taking and improve transparency. This is a consistent finding from the majority of our business examinations and ongoing supervision, and GCIB management has been slow to react to this recommendation. Especially for businesses like the IRO desk, transparency can be significantly enhanced through comprehensive analytical reports that communicate risk trends and issues in the business. Market Risk Management committed to develop additional MIS in 2003, and a prototype is expected soon. In conjunction with item three above, risk must be transparent to the independent risk manager to foster the development of meaningful MIS.

#### 5. CMAC Process and Market Risk Management Involvement

Management needs to fully embed the new complex structured product programs into business processes and involve market risk management in testing and verifying implementation. We tested various transactions to determine whether they met the criteria for either the GCIB *Structured Finance Policy* or *The Policy on New Products, New Activities and Complex Transactions*. We sampled the former by screening for deals with large EV and the latter by reviewing the approved products list, the model validation inventory and technology change control logs. We did not identify any transactions that would have met the definitions in the *Structured Finance Policy*. However, we did come across one new product, Accrual Cap Inverse Floaters, which did not appear to receive timely CMAC consideration, despite having triggered at least 5 criteria in the policy. This product was not on the approved product list provided to us, although a model for this product was validated in August 2003. Approximately 40 deals were booked in Asia between late-June and early-September 2003. However, a CMAC review was not initiated until February 2004. MRM learned of the trades in an untimely fashion from the MVU, rather than directly from the desk as required by policy. There are EITF (P&L holdback) issues with these trades, despite being categorized as "inputs verified" for price verification purposes. CMAC review should have occurred prior to executing any trades; further, the business should have engaged the Market Risk Manager in initial deliberations to determine whether the product met the screening criteria in the new products policy. A better screening process is needed to ensure that transactions meeting the complex transaction requirements are appropriately identified and vetted.

Torresca  
Zarclia  
Model validation  
Inventory  
Technology change control logs

new product

#### 6. Compliance Program

The corporate compliance program needs improvement. We met with a number of people to understand the compliance infrastructure surrounding key business policies and regulations. Formal compliance functions were primarily advisory in nature. Surveillance and testing roles were uncoordinated and performed by a variety of functions including Product Control, In-Business Risk Management, Audit, and Front Office staff. We recommend that compliance develop an inventory of all significant broker-dealer, bank and corporate regulations and policies applicable to the business, detailing the compliance and surveillance process for each. The inventory should describe the monitoring process for each policy or regulatory requirement, the frequency of such monitoring and the details of associated reporting. This recommendation was made recently in an interagency review of the GCIB Compliance Function.

mine

## **7. Intercompany Trades**

Management needs to improve processes for approving, monitoring, and controlling intercompany trades in order to ensure the integrity of risk and regulatory reporting. Prior to – and in conjunction with – this examination, we noted significant option transactions being executed between Citibank, N.A. and Citigroup Global Markets, Inc. We met with the desk to determine the reason for these transactions. Following a number of meetings on the topic, we were able to verify that the trades were mainly executed to balance risk between legal vehicles. However, these deals raise compliance, regulatory reporting, and safety and soundness considerations. The desk should formalize its rationale for such trades, and establish documentation procedures and MIS to report these positions. We also recommend that legal vehicle thresholds be established for both DV01 and Vega that will serve as triggers for these rebalancing trades.

## **8. Research Project Documentation**

Management needs to ensure that research project documentation is provided to the Model Validation Unit (MVU) and other interested parties for them to perform their jobs, and to establish project documentation standards. We reviewed the MVU last fall by sampling approximately 50 validation reports. We found that model documentation provided by research functions to be inconsistent and, in general, not in compliance with the standards delineated in the appendix of the Model Control Policy. In the current examination, we reviewed several models that recently went through the model validation process, with particular attention to the documentation provided by FIDR to MVU. We found documentation of model specification brief, but adequate. However, there was limited or no documentation of model testing available, despite substantial testing having been done.

- The MVU should receive testing results and analysis from FIDR as part of any validation exercise. Such information may also be useful to MRM and Product Control. FIDR should consider how best to make model testing results and analysis available for new models, changes to existing models, and ongoing evaluations of existing models.
- GCIB should develop a policy regarding the documentation requirements of research projects, including model specification and testing as well as ongoing evaluations of the performance of models in use. This should be done to preserve mission-critical research for future use as well as to inform independent control and support functions. At a minimum, the policy should indicate what kinds of projects should be documented, the manner of documentation, and for those projects that are relevant to the responsibilities of support and control functions, the access/distribution should be provided.

## **Transaction Risk Management**

### **9. Revaluations/Price Verification**

Management needs to improve coverage of volatility inputs for options revaluations to help ensure the propriety of risk and financial reports. Better independent volatility surface construction is necessary to reduce the level of unverified positions on the IRO desk. This involves greater use of broker prices and very likely subscription to outside pricing services. We note that other institutions do not have significant price verification issues with similar products.

These activities should be done independently of the front office. Additional staffing and technology resources may be required to accomplish this objective.

#### **10. MVA Calculations, Documentation, and Independence**

Management should automate MVA calculations and ensure that the process is appropriately independent. The business committed to address MVA deficiencies as part of its December 2001 request for a limit increase from \$40MM to \$60MM per volatility point on the American swaption desk. The issue remains outstanding. Recommendations 8 and 9 should be addressed in a detailed, written action plan from Product Control to improve the independent verification of option and hybrid products and reduce the level of unverified positions.

#### **11. Price Verification Procedures**

Management has not adopted written pricing and price verification procedures for US FID as required by GCIB Pricing Policy. This issue has been outstanding since the GCIB pricing policy was issued, and was cited as an exception in the March 2003 Federal Reserve Bank of New York (FRBNY) examination. Although Product Control has made good faith efforts here, the strain on staffing resources has adversely impacted results. A key observation here is that Product Control does not have well-established processes to ensure that reserving practices between books are consistent, and that methodologies are periodically revisited. In addition, procedures should establish thresholds for unverified positions as well as define the remedial process once these thresholds are reached (as required by the *Citigroup Pricing and Price Verification Policy*).

#### **12. P&L Attribution**

Management needs to improve its P&L attribution analyses. This exception relates closely to issue #2 above. While the OasysFN system is capable of providing a delta-gamma-vega risk based attribution for the option books, the attribution process is more oriented towards comments about specific trades or market trends. This process in Product Control does not match the sophistication of the book. Product Control should be able to explain P&L movements to at least second order effects (gamma), in addition to develop a skew P&L attribution. Further, as encouraged by the FRBNY, Product Control should make use of thresholds to track the difference between accounting based P&L and Risk-based P&L (i.e., unexplained residual P&L). This is a strong risk management practice.

#### **13. Mapping Products to Price Verification Categories**

Management needs to ensure that Price Verification categories are consistent with EITF standards, and that an appropriate and transparent mapping of products to these categories is maintained. We had difficulty mapping certain products into the Price Verification categories used by Product Control. This makes it difficult to determine whether the price verification policy is being applied appropriately. In some cases, the model validation status differed between Product Control and Model Validation. In other cases, products attracted EITF reserves but were mapped to the "input verified" category. Internal use of a sixth bucket not defined in policy, called "interim," was also confusing. This may be due to some confusion about the new level 1 / level 2 model validation classifications (i.e., "interim" is no longer used). In general, the products we cite as having mapping inconsistencies include inflation swaps, accrual cap inverse floaters, libor digitals, CYCA options, the Constellation-Solar trade on the hybrids desk, and off system hybrid trades generally.



We recommend that all price verification category mappings be reassessed and confirmed against Model Validation records. In addition to using the Model Validation Inventory for this purpose, Product Control should review individual model validation reports to verify the proper assignment of models to price verification reporting categories. Further, efforts to relate the extent of unverified positions to EITF 02-03 classifications are also recommended.