RISK ADVISORS INC.

MARKET RISK ACROSS INVESTMENT STRATEGIES

DESIGN AN EFFECTIVE RISK MANAGEMENT PROCESS ACROSS INVESTMENT STRATEGIES AND ASSET CLASSES

Managing market risk at a firm that trades across investment strategies and asset classes presents several challenges. Each investment strategy has specific market risk management nuances and combines securities and contracts of different asset classes. Further, each asset class has distinct exposures and risk metrics which make it difficult to apply a uniform set of measures across the portfolio. Lastly, managing risk at the firm level requires consolidating risks across investment strategies through appropriate summary risk measures.

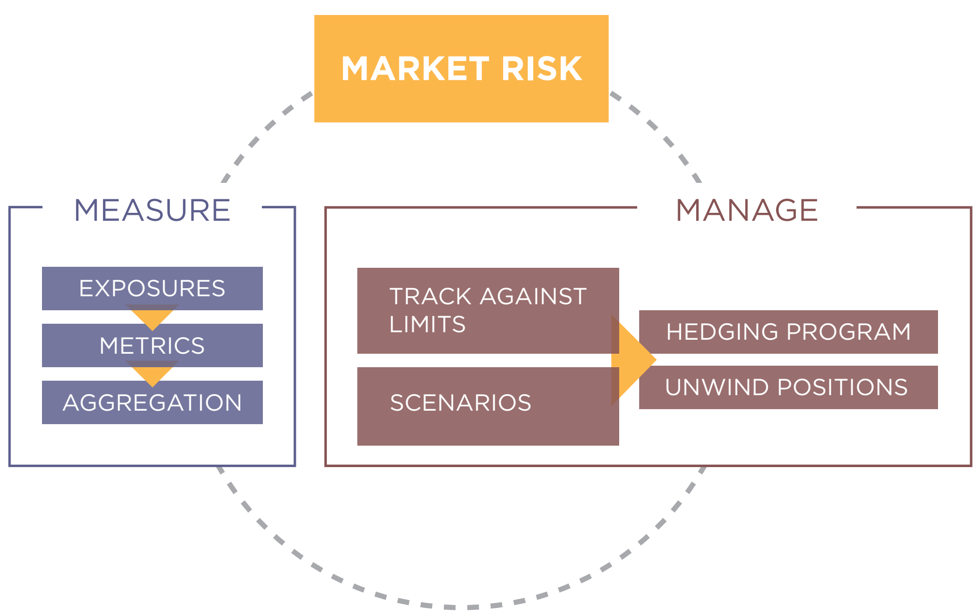
We create effective risk management processes by understanding the investment strategies of the firm and then identifying the applicable exposures and metrics. We organize the problem into a simple framework and ascertain the relevant risk of each investment strategy by understanding the securities, derivative contracts, and other exposures that make up the portfolio. Our services include derivatives valuation, market risk modeling, quantitative strategies development, data management, and market risk technology advice.

RISK ADVISORS DELIVERS:

- **Market Risk Measures** – Determine market risk measures for specific asset classes and select appropriate metrics to summarize exposures at the portfolio and at the firm level
- **Risk Limits and Procedures** – Framework to define risk limits and develop policies and procedures to ensure portfolios remain within these parameters
- **Valuation** – Apply and back test valuation models for derivative contracts
- **Modeling** – Create risk models, scenario analysis, stress testing, proprietary risk analytics, and quantitative strategies
- **Market Risk Technology** – Recommend technology solutions and appropriate architecture for timely management of market risk

OUR APPROACH

Our framework broadly divides the management of market risk into two distinct areas: Measure and Manage. While distinct activities, there is significant interaction and feedback between the practices of measuring risk and managing risk, especially in a dynamic trading environment.



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MARKET RISK ACROSS INVESTMENT STRATEGIES

DEVELOPING A MARKET RISK MANAGEMENT PROCESS

The first step to developing a cohesive and robust market risk process is to understand the firm's investment strategies along with the expected return profile, market drivers and risk factors.

INVESTMENT STRATEGIES

DIRECTIONAL

- Equity Long/Short
- Systematic Trading
- Fixed Income
- Emerging Markets

RELATIVE VALUE

- Global Macro
- Equity Market Neutral
- Convertible Arbitrage
- Fixed Income Arbitrage
- Credit Long/Short

EVENT DRIVEN

- Merger Arbitrage
- Distressed Securities
- Special Situations

Source: Adapted and modified from AIMA's Road Map to Hedge Funds (2012 Edition)

Typically, a firm will have separate processes for the production of risk exposures and metrics by asset class. For example, disparate processes and systems exist for Equities investments versus Fixed Income activity. However, managing market risk cohesively requires consolidating exposures and metrics across portfolios and asset classes.

ACROSS ASSET CLASSES

EQUITIES	COMMODITIES	FOREIGN EXCHANGE	FIXED INCOME	CREDIT

OUR PROCESS

1. MARKET RISK DIAGNOSTIC
2. FRAMEWORK DESIGN
3. QUANTITATIVE EVALUATION
4. STRESS TESTING
5. SCENARIO MODELS

Our process develops an integrated market risk environment across all investment strategies and asset classes. We cover a broad range of asset classes, including derivatives on each of them. We incorporate the risk factors influencing these asset classes, including common risk factors such as price risk and volatility risk, as well as other asset class specific factors. Further, we analyze and recommend the appropriate firm-wide summary risk measures across portfolios and asset classes, as risk metrics and factors cannot simply be added together.

We perform a market risk diagnostic on existing processes and systems, and then provide a framework for improvements including quantitative modeling, stress testing, and scenario generation. The result is a market risk management process that is cohesive and scalable, which efficiently delivers risk analytics across the enterprise.

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MARKET RISK ACROSS INVESTMENT STRATEGIES

OUR SERVICES

VALUATION AND PRICING

- Develop an accurate, unbiased and effective portfolio valuation and a mark-to-market process as a pre-cursor to the risk management process.
- Provide valuation model validation and testing, along with recommendations for alternative methodology or approximation models where applicable.
- Apply and back test valuation models for specific standard and non-standard derivative contracts including volatility surface modeling.

MARKET RISK MODELING

- Review and test risk management methodology and provide specific recommendations.
- Create risk models, scenario analysis, stress testing, and proprietary risk analytics.
- Advise on appropriate value-at-risk (VaR) models and parameters, including development of various scenarios to stress test portfolios.

QUANTITATIVE STRATEGIES

- Develop quantitative strategies for creating a hedging program or a systematic investment process.
- Strategies for allocation of capital based on market risk exposures, volatility, and margin utilization. Implement strategies through review, analysis, design, development, and back testing of models.

DATA ANALYSIS AND MANAGEMENT

- Historical data capture, quality control, and analysis to feed the mark-to-market and risk management processes.
- Collect and organize data from disparate structured or unstructured market data sources, and capture internal proprietary data to perform further analysis.

MARKET RISK TECHNOLOGY

- Advice and guidance to develop a robust market risk technology platform, which is critical to the market risk management process.
- Review and recommendations for market risk technology including data warehousing across the organization, integration with external trading systems, evaluation of vendor systems and architecture for real time market risk delivery.

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CASE STUDY 1: *IMPROVING MARKET RISK MANAGEMENT PROCESSES AND TECHNOLOGY FOR A LARGE GLOBAL BANK*

A large global bank with $2.5 trillion in total assets and a leader in derivatives trading was having difficulty with its market risk management process. Their portfolios consisted of a diverse set of asset classes, and thus a broad range of exposures. The bank's market risk processes were fragmented across portfolios, resulting in VaR and stress test production taking until late morning of the next business day to complete. In addition, VaR on MBS products was not being calculated accurately, which was identified as a major gap. The team was struggling to find a solution that will enable them to deliver the information requested by the risk managers in a timely manner, largely due to the poor communication and lack of collaboration between the market risk management and market risk technology teams. The client's mandate was to transform its existing processes to reduce processing time to complete VaR calculations by end-of-day, and enhance the calculations to include MBS products.

SOLUTION

- Reviewed entire market risk technology architecture, data flow, risk systems used and hardware resources.
- Reviewed the scenario generation process for complex credit derivatives and developed revised methodology in collaboration with the market risk management team.
- Researched and made recommendations on the use of approximation techniques for calculating VaR on complex mortgage-backed and asset-backed derivatives and structured products (MBS/ABS).
- Proposed a data warehouse solution for collaboration between global centers to ensure consistency in scenarios used for VaR production.
- Managed an effort between the business, programming team and IT staff to optimize the platform, including optimizing the VaR calculations and re-engineer hardware infrastructure.
- Worked with the IT staff to successfully implement proposed solutions.

BENEFITS

- Stabilized scenario generation process resulting in accurate and reliable VaR calculations.
- Market risk VaR measures now included entire portfolio including complex MBS/ABS derivatives and structured products.
- Produced VaR for credit derivatives in a timely manner, reducing calculation time by over 40% as a result of implementing the recommended approximations and optimization.

CASE STUDY 2: *MARKET RISK MANAGEMENT IN REAL-TIME ACROSS THREE DISTINCT INVESTMENT STRATEGIES*

A multi-strategy hedge fund manager with $3.2 billion in assets under management with three distinct investment strategies - global macro, US equity long/short, and high-yield corporate debt – felt their existing end-of-day risk reporting was inadequate to accurately monitor their risk exposures. The firm's portfolio included positions in multiple asset classes, which in-turn resulted in a broad range of exposures including equity, interest rate, credit, currency, and commodity. Recent market volatility had exposed the limits of end-of-day reporting as a risk management discipline. The client's mandate was to transform its existing end-of-day risk reporting process into a proactive intra-day risk management program. The idea was that monitoring risks in close to real-time would allow the firm to proactively hedge its exposures or unwind positions and to reduce risk as necessary.

SOLUTION

- Reviewed and tested valuation models for all traded asset classes and ensure accuracy in an intra-day setting, including a review of market data sources, valuation models, and calculation infrastructure.
- Selected portfolio level summary risk measures for each investment strategy and identified appropriate measures to aggregate risk across the three investment strategies.
- Advised on real-time market risk management information technology system choices and assisted vendor selection process.
- Developed and performed scenario analysis tests for a range of market conditions to test responsiveness of the portfolio.
- Implemented an exposure monitoring and limit-tracking program with an organizational process to manage exceptions and reduce risk.
- Created explanatory materials to share features of new risk management process with investors and regulators.

BENEFITS

- Transitioned from an end-of-day risk reporting process to a real-time risk management program allowing the risk manager to hedge and, if necessary, unwind risks throughout the trading day.
- Developed a comprehensive market risk strategy that included data, information systems, risk measures, a hedging program, and organizational structure necessary to track and manage market risk in real-time.
- Consolidated risk data eased the regulatory reporting process for Form PF risk sections (i.e. Section 2b).
- Investors and prospective investors recognized the change to a dynamic intra-day risk management system as a major improvement in the firm's operating environment.

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TEAM

SANJAY R. BHARWANI

Sanjay founded Risk Advisors Inc. to bring together markets professionals, risk management experts, and technologists to serve clients in financial markets. He actively consults with clients on risk management and technology related projects, and advises startup ventures focused on new ideas for the financial services industry. Previously, Sanjay was the Chief Information Officer at M. Safra & Co., a multi-strategy hedge fund focused on global macro and systematic trading strategies. Earlier in his career he focused on emerging markets debt at EXIS Consulting, a boutique financial markets advisory firm, and derivative valuations at Reval, a risk solutions provider. Sanjay received his MBA from the Wharton School at the University of Pennsylvania, and a Bachelors of Commerce from the University of Mumbai.

RAVI K. JAIN

Ravi is a Senior Advisor at Risk Advisors Inc. and specializes in market risk, derivatives valuation, volatility modeling, and trading/risk technology. Recently, he was COO of a quantitative trading shop where he oversaw trading risk and technology architecture. He has been an entrepreneur in the financial technology and data space with IVolatility.com and Egar Technology. Earlier in his career, he was global head of options trading in FX and precious metals for Republic National Bank. Ravi holds an MS in Operations Research from Baruch and a Bachelors of Technology from the Indian Institute of Technology, New Delhi.

LAURIE YEH

Laurie leads the Operational Risk and Compliance practice. She is experienced in delivering business process and technology solutions for financial institutions. Before joining Risk Advisors, she was with Gottex Fund Management, a Swiss based fund of hedge funds, where she managed the product enhancements to the fund’s portfolio analysis system. Prior to Gottex, she was at EXIS Consulting, a boutique financial markets trading systems and advisory firm, where she directed the delivery of client projects. Laurie holds an MBA from NYU Stern School of Business, and a BA from Cornell University.

ABOUT RISK ADVISORS

Risk Advisors Inc. is a consulting firm that understands the dynamics of financial markets and the inherent challenges in implementing a cohesive investing and risk management program across the enterprise. We offer deep industry knowledge, a rigorous process framework, and technology expertise to provide practical solutions for financial institutions and asset managers.