Martingale Risk

Mathematical and IT Solutions for Finance

Martingale Risk Ltd

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"It's not that I am smart, it's just that I stay with problems longer."

Albert Einstein

Who is Martingale Risk?

"Financial Engineering from the Market Practicioners"

Martingale Risk started in London as a partnership of quantitative analysts and front-office professionals who previously worked for international investment banks, both in Fixed Income and Equity departments. Our firm is particularly oriented towards those companies requiring specialized mathematical and IT solutions for finance. Martingale Risk is committed to deliver rigorous quantitative solutions to investment firms while managing the trade-off between mathematical sophistication and systems flexibility. We design, develop and implement models and tools for portfolio allocation, derivatives pricing and risk management following a strict code of business which relies on two core principles:

Independence: Martingale Risk is a team of independent consultants. Our company is not owned by or linked to any private or public financial institution. We do not have any business connection with banks or financial intermediaries and, as such, we do not have any incentive in suggesting our clients to buy or sell whatever type of product. This puts us in a better position as advisors compared to the quant/structuring departments of the investment banks.

Scientific approach: "Scientific" is, first of all, the application of quantitative techniques to solve pricing and risk management problems in a pragmatic and efficient way. We believe that any good pricing or risk management system, beside being theoretically sound, should always be delivered in a well engineered IT framework. "Scientific" therefore is also the process we follow to build the software that implements our solutions. Our software is test-driven, developed in an agile iterative way and follows the most recommended design patterns in terms of market standards and regulatory requirements. "Scientific" is, above all, the way we closely interact with our clients to understand and fullfill their business needs. No technology can replace a constructive dialogue and a positive synergy with the final users of our work.

Modern finance decisions have to face fast pace changing markets with return opportunities that last for a short time before being taken over from competition and innovation. From the small firm that needs to address a specific risk management issue to the larger organiztion that plans to validate a new model or to highlight the risk profile of an exotic trade, Martingale Risk is able to provide a cost effective alternative to the consultancies operating in the industry, based on the sophistication and the accuracy of its models and IT procedures.

Our Clients and Services

"Your Risk: Understood, Optimised and Controlled"

Who are typically our clients? Pensions Funds usually ask us to select among different investments, to control their risk and to assess their performance. Portfolio Managers ask us to advise them on the management of their equity/bonds and derivatives portfolios, seeking the best return for the risk they are prepared to bear. Banks generally ask for risk management tools such as front office scenario analysis and Value-at-Risk applications. Sometimes, mainly for compliance purposes, they require complex middle/back office systems for VaR and data analysis.

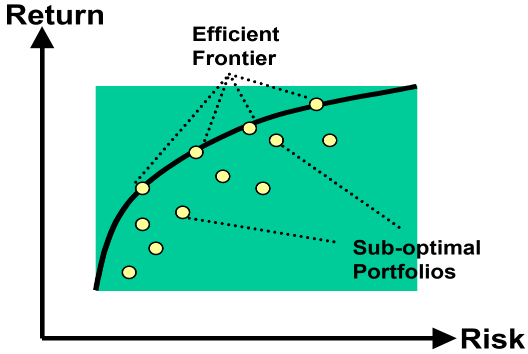
Portfolio Allocation. We deliver quantitative methodologies and tools to manage the wealth of institutional investors such as Asset Managers, Pension Funds and Banks. Our solutions rely on a proprietary portfolio optimization model designed to handle both cash and derivatives. We help our clients with asset allocation, fund managers selection, performance assessment and trading strategies validation.

Risk Management Tools. We provide client specific pricing and risk management products for plain vanilla and exotic derivatives across all the main asset classes. We compute VaR according to different methodologies, perform bespoke stress test scenarios and ad-hoc what-if analysis. We believe that a sound risk management process becomes a competitive advantage over the competitors in terms of cost reduction and quality of the service provided.

Derivatives Advisory. Our experience as quants and structurers and the technology of our proprietary pricing platform is our most competitive edge. For example, we are able to assist a client willing to trade an exotic derivative by computing its fair value and looking for the best deal available on the market.

Portfolio Allocation

"Portfolio diversification is the only real free-lunch in financial markets"



Asset allocation is the process whereby an investor decides how to invest money achieving the right balance between risk and return. Relying on our proprietary technology we find the minimum risk portfolio under a set of flexible constraints given a target return demanded by our client. Our asset allocation methodology can handle different risk measures such as portfolio return volatility, Value-at-Risk, expected shortfall, portfolio convexity and negative skewness.

Consider the following example: one of our clients asked us to find the optimal allocation for our £200 mln portfolio, under the constraints that all the securities be AA-BBB rated, 50% of them be ECB eligible and the portfolio duration be less than 5 years. We delivered the optimal portfolio weights and performed stress test analysis to make our clients aware about possible risks they did not think of.

We use our proprietary and internally developed multi-factor model to identify and measure the sources of risk affecting a portfolio of securities. First of all, we use statistical analysis to identify the main sources of uncertainty for a given set of financial variables. Then, we estimate the correlations among these factors and calculate the portfolio sensitivities to them. Finally we stress the portfolio returns by bumping the relevant risk factors according to historical and what-if scenarios.

Some typical Portfolio Allocation services we provide:

Portfolio management and asset allocation. Under a wide set of flexible constraints matching the portfolio managers' investment needs, we deliver sophisticated analytics to solve virtually any investment decision problem. We manage portfolios that mix cash, vanilla and exotic derivatives.

Performance assessment and monitoring. Although it is possible to find good performers for specific asset classes, few investment firms show high level of proficiency across all financial markets. The purpose of the manager selection process is to identify those investment houses most likely to excel **for a given mandate.**

Portfolio risk management. Macroeconomic scenario analysis, stress testing, Value at Risk, marginal asset performance and volatility contribution, portfolio return skewness and kurtosis analysis.

Trade ideas. As independent consultants we help our clients detecting and taking advantage of trade opportunities in both cash and derivatives markets. We also help clients using derivatives instruments to protect portfolio returns against unexpected negative performances.

Risk Management Tools

"How we can help small firms to get close to excellence"

In-House solutions. Our experience as derivatives specialists shows that when it comes to portfolio management, risk analysis and operations, the main players in the market tend to build their own in house solutions which are regarded as their most important industrial assets. We aim at giving our clients a competitive edge among their peers by bringing business knowledge and systems know-how directly derived from our investment banking experience.

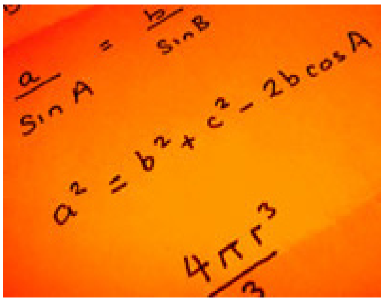
Full comprehension of any risk involved.

Highest possible reward for each risk profile.

Optimal management of the risk exposures.

Tailor-made solutions. Our aim is to provide our clients with specific solutions that go beyond any off-the-shelf risk management product. Today's scalability of IT technology and the increased standardization of derivatives mathematics allow to deliver most of the solutions implemented by the big investment houses to smaller institutions. Financial engineering, applied mathematics and derivatives dynamic hedging are all examples where systems implementation plays the most relevant role. We believe that the key point in developing and delivering on-site solutions is their adaptability to the client specific environment and business needs. Finally, we believe that knowledge just as technology can be delivered to our clients through a rigorous and collaborative working stile.

SmallVsBig. We aim at providing our clients with all the relevant tools to match the quality standards of the top firms without bearing the cost of building up unnecessary infrastructure. Small organizations, equipped with the right technology and business ideas, can achieve efficiency and profitability levels comparable to those of the top banks.

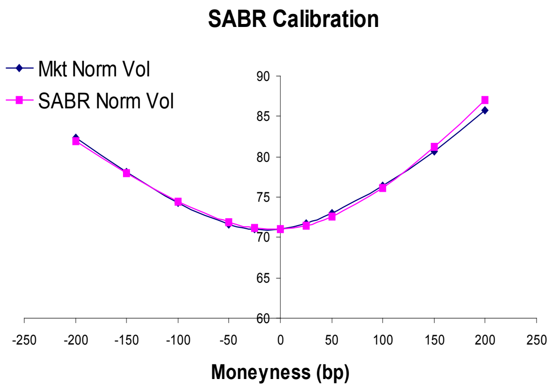


Risk Management Tools. The systems we develop are aimed at making our clients able to "read the risk" of their books, i.e. understanding what are the main factors that drive the P&L. In this context, it is often the case that standard measures such as VaR might not be sufficient to capture the real risk exposure and further measures, such as Expected Shortfall or ad-hoc scenario analysis, are required. Exotic instruments, given the heavy non-linearity of their payoff and their sensitivity to higher order greeks, are examples of instrument that need a "special treatment" in terms of risk management measures. Our platform has been developed to reprice vanilla and exotic portfolios in many market conditions and to be flexible in the production of the most appropriate risk indicators.

Pricing and Hedging Exotic Derivatives

"Bringing the Excellence of the Big Banks to the Smaller Players"

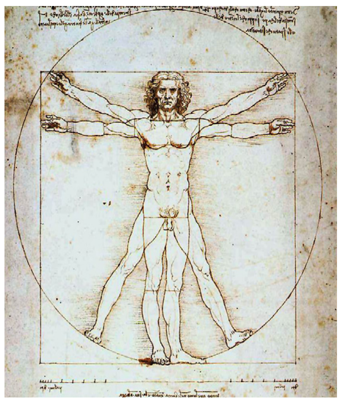
Pricing. Our proprietary pricing technology allows us to price virtually every path-dependent and/or callable structured note (or swap) in all the major currencies. We also develop and implement tools specifically designed to calculate risk sensitivities and perform scenario analysis for derivatives portfolios. A typical client request might be an asset manager asking for the "fair evaluation" of a Callable 10Y EUR CMS Steepener before executing a transaction with an investment bank.



Buy-side consultancy. Investment Banks often tend to push their clients toward high margin exotic products even if this is not strictly necessary for the client's investment objectives. On the other hand, our remuneration is not related to any transaction the client might do indeed we are in the position to always suggest the most appropriate solution in terms of available products.

Hidden risks. Often the price is not the only variable of interest when it comes to choose among different products. Many of the cheapest alternatives available to manage interest rate or exchange rate exposure will embed hidden risk. Products such as Zero-Cost Collars or CMS Steepeners are clear examples of cheap solutions that caused relevant losses in the past to those investors that were not fully aware of the risks they were bearing. One of the key aspects of our job is to make our clients aware of all the subtle dangers that can lurk in the financial products they manage, putting them in a position to choose the most appropriate risk profile for their specific needs.

Our proprietary pricing technology. Depending on the derivatives underlying assets and payoff, we select the most appropriate model for the underlying dynamic. We use a modified version of the Libor Market model for fixed income products and a SABR based stochastic volatility model for equity products. All our models are calibrated regularly on available market data in order to match the prices of liquid traded instruments. We constantly work on our analytics to keep them theoretically up-to-date and bug free. We want to stick to a business model where our clients are never left alone dealing with modeling issues or results interpretation.



Products and Services

What follows is a detailed overview of the main products and services we provide at Martingale Risk. We look after those sophisticated clients asking for products tailored around their specific business needs. These requests cannot usually be satisfied either by expensive off-the-shelf products vendors neither by general consultants.

Design and development of **Pricing and Risk Management in-house solutions:**

- Computation of intra-day P&L and risk sensitivities.
- Generation of overnight scenarios for historical VaR.
- What-if and stress test analysis for highly non-linear products.
- Bucketing of interest rate and volatility exposures through benchmark nodes bumping and full revaluation.
- Development and implementation of Monte-Carlo based methodology to estimate the hedging error distribution of exotic options.
- Evaluation of cash reserves for trading desks on specific exotic products.
- Assessment of "model risk" through testing of different model assumptions.
- Testing of higher-order greeks accuracy and stability.
- Design of risk reporting engines for regulatory and product control purposes.
- C++ analytics for the computation of prices and greeks.

Trading strategies:

- Relative value analysis and statistical arbitrage models:
  - . Design and development of multi-factor econometric models to forecast assets returns and/or volatility levels on both equities and fixed income.
  - . Volatility skew, volgamma and vanna trading on different currencies.
  - . Cross currency CMS spread positioning.
- In-house implementation of systems for pricing and hedging Capital Guaranteed structures.
- Constant Proportion Portfolio Insurance (CPPI) strategies implemented through C++ based Excel add-ins.
- Set up and management of risk-hedged portfolios with vanilla call and put options.

Model Validation and Auditing:

- Theoretical validation of pricing model for exotic derivatives.
- Comparison of the main model assumptions such as underlying stochastic process dynamics, recovery rates distributions, stochastic volatility dynamics and skewness dynamic.
- Assessment of the “candidate” model suitability to price specific products.
- Model calibration and assessment of its ability to correctly re-price vanilla instruments used for complex payoffs hedging.
- Historical back-testing of model hedging performances.
- Independent review of pay-off scripts used to price exotic deals on clients’ own pricing systems.

Portfolio optimization, erformance and risk attribution:

- Portfolio optimization including complex structured derivatives under flexible user-defined constraints.
- Portfolio performance valuation: price, yield, total rate of return and benchmarking.
- Assessment of investment managers’ performances: evaluation of realized return vs. realized risk.
- Principal Components Analysis of equity returns, yield curves and volatilities.
- Stress analysis of portfolios under a variety of market conditions.
- Accurate cash-flows and book value projections for income reporting.