Energy and Commodity Trading, Analytics and Risk Management

QR ETRM® QR CTRM® high-performance platform

President and COO of a Utility Conglomerate

“The system was configured to handle wholesale trading, billing, invoicing and reporting for the market.......as well as our power procurements and sample retail contracts. QuantRisk Platform delivered outstanding performance in all areas of functionality. The advanced analytics offered very impressive precisions in forecasting load, and the dispatch optimization module was able to recommend very valuable trading strategies that we found to be possible to implement over time.”

Why is QuantRisk the best solution?

You'll benefit from Rapid Deployment. Unlike other ETRM providers, QuantRisk delivers a working optimization system within days and configures 1 asset in the optimization model every 3 days. QR Optimization is up and running and calibrated within a week or so, and will start generating profits for you.

You'll Receive Ultimate Flexibility. Time is money. That's why we completely changed how ETRM solutions and optimization are being delivered. Our unique solutions can be rapidly implemented in-house or on our QR Elastic Supercomputing Cloud Servers. Our commercially ready optimization solutions require no custom development or coding. It is ready for use.

You'll Experience Unprecedented Speed and Efficiency. This is the one and only, first real-time optimization system, capable of a run-time of just a few minutes to handle multiple assets over short trading / dispatch horizon to really make profits. It's fully automated and runs at 1/2 or 1 hourly timescales, 24x7, with real-time outputs to support a live trading operation.

Next-Generation ETRM / CTRM Solutions

Unique high-performance web platform, for in -house implementation or a cloud service

Target Clients

Power and gas producers, generators, utilities, municipal utilities and cooperatives, energy retailers and marketing companies of all sizes, involved in generation, production, distribution, buying and selling of physical and financial energy, and hedges.

Energy and commodity producers, generators, aggregators, refineries, processors, distributors, traders, marketers, trading desks in banks, asset management firms, and hedge funds.

Transportation, shipping and airlines.

Market Coverage

Electricity and gas wholesales, physical and financial trading. Retail electricity, gas and fuel. ISO or power pool energy and ancillary transactions. Seamless interfacing with the ISOs or market operators to fetch data, manage and submit bids and offers.

Energy markets worldwide: crude oil, natural gas, LNG, fuel, biofuel, refined products and derivatives, coal, chemicals, emission, weather. Commodity markets worldwide: agricultural products, livestock, metals, chemicals, food and beverages, manufactured goods and products.

VP of IT & Systems of a Utility Conglomerate

"QuantRisk's single platform provides our companies with a highly adaptable enterprise web-system, excellent business modeling capability, internal controls and audit, advanced analytics tools, all of which will enhance the overall performance of our daily operations, as well as long term strategic decision making."

THE VALUE OF QR SYSTEM

An investment in QR Trading, Analytics and Risk management system, is an investment in **real-time business intelligence**, optimal decision making, and **enterprise-wide visibility**. It will generate returns unmatched by nearly any other technology investment for your business, with a **compelling ROI**. Leverage the latest real-time high-performance enterprise web technologies.

Can your company keep up? QR System **integrates** within one **single high-performance web-platform, front**, **middle**, and **back offices** with logistics, data, analytics and risk. Real-time enterprise-wide **visibility and business intelligence**: market discovery, deal pricing, portfolio P&L management, revenue increase, cost reduction, risk management, **internal & regulatory risk compliance.**

SOLUTION COVERAGE

QR Trading®

Comprehensive, flexible, **configurable end-to-end trading solutions** for **physical**, **wholesale**, **retail**, and **financial transactions** and **hedges**, for all asset classes: power, gas, LNG, crude, derivatives, refined products, coal, renewables, fuel, FX, emissions, weather, and all commodity types. Complete retail electricity and gas trading solutions, including a CRM.

QR Assets® and QR Logistics®

Endless **flexibility** to faithfully model all energy and commodity logistics and assets: thermal and hydro power generation, LNG, refineries, processing plants, pipelines, distribution & transmission, storage etc. Each module has its own comprehensive dashboard **seamlessly integrated** with QR Trading®. These **automate complex operational workflow** for input and output management, **scheduling to ISOs** / power pools / RTOs, **nomination to suppliers**, pipelines, and transportation systems.

QR Analytics®

Integrated advanced energy and commodity analytics solutions, comprising models, calibration and computational technology: Spot and **forward curve building and forecasting.** Monte Carlo simulation, **volatility of spot and forward term structure**. Real-time **load and price forecasting**. Index making as proxy curves,. Volume / load and **price analysis**, option pricing.

QR Risk®

Extensive robust **high-performance risk and portfolio analysis** to **manage and mitigate risk**, and support internal and regulatory risk **assessment and reporting**. Coverage includes: market risk, credit and exposure, operational risk, liquidity, earning and P&L. Seamless integration with QR Analytics® automatically builds forward and spot curve forecasts, and **Monte Carlo simulations** for term **structure volatility**. Risk is evaluated on volatility basis via Monte Carlo, or via what-if-scenario stress basis.

TRADING | ANALYTICS | RISK MANAGEMENT | OPTIMIZATION | CLOUD SERVICES

QuantRisk
QUANTRISK SYSTEMS

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Flexible Comprehensive Trading Solutions

FRONT OFFICE

The most comprehensive and versatile physical and financial trading platform

- **Rapid configuration** and creation from scratch of trading templates to accommodate any physical and financial trades: **custom required fields**, physical characteristics, constraints, multiple volume and price curves.
- **Flexible cash flow mapping and valuation engine** to create and manage multi-tier complex, settlement, risk valuation, and pre-trade pricing rules. These can be on multiple timescales: hourly for **real-time optimization**, daily for **live P&L and performance analysis**, monthly for **settlement and risk**. **Pre-trade deal pricing**.
- Seamless integration of physical contracts with the **optimization module** for optimal dispatch and nomination.
- Transaction life **cycle management**, confirmation, affirmation, and **actualization**. Memos and reports.
- **Retail Trading. Comprehensive solutions** to **fully manage retail gas and electricity trading**, with the large transaction volume, complex contracts details, and pricing / settlement plans, multiple load profile and charges. This includes two integrated **Customer Relation Management** (CRM). CRM for traders to manage **retail clients**, **pricing plans**, **meter quantities** and sales process. **CRM web-portal** for retail clients, to access account, meter, and billing data.
- **Fully integrated front**, **middle**, and **back office** functionality, along with **data, logistics**, **analytics** and web-reporting, **trading** and **data panels**.
- **Comprehensive Hedging**. Create and **manage multiple interlinked hedging programs**. Relationships can be **many to many and sequential**. E.g., different wholesale and retail energy to multiple fuel, and fuel to multiple FX. **Dynamically manage** "over" and "under" covered / hedged positions. **Optimize hedging portfolio** by user defined objective functions: **minimize cost**, minimize a given risk indicator, or **maximize coverage** by volumes. Visualize entire hedging relations as networks.
- **Physical energy trading** is seamlessly integrated with **specialized scheduling and nomination dashboards** offering full interfacing with electricity system operators or pipelines. These **automate electronic submission of bids**, **offers and nominations** and retrieval of all data from the **system operators**.
- Powerful **analytics** and **risk solutions** are integrated with **front office trading** for business intelligence.

BACK OFFICE

- **Dynamic valuation engine** easily creates and manages **multi-tier complex settlement rules**. Multiple valuation rules, currencies, and units can be embedded in one single transaction. Settle, bill, invoice and clear: physical wholesale with ISOs and suppliers, retail trades with end clients, margin accounts with exchanges for hedges.
- Meter, price and charges **data management**, data fetching, validation, repairs. Settlement, cross referencing, validation, billing, invoicing, and clearing. P&L and position monitoring and reporting.

MIDDLE OFFICE RISK SOLUTIONS

- **End-of-day risk valuation**, internal and regulatory risk valuation and reporting. Any risk indicator and / metrics can be defined. E.g., **market risk**: mark to market, VaR. **Corporate and treasury risk**: earnings, P&L, liquidity risk. **Counterparty exposure** and credit risk. **Hedge accounting** and **regulatory risk reporting**.
- Forward curves, volatility, correlation matrix, market price of risk, and Monte Carlo simulation of price curves are seamlessly computed by **QR Analytics®** and passed on to **QR Risk®**.
- **Automated risk valuation** on site, or on QR Cloud. Your transactions can be in another trading system, and you can use **QR Risk®** to perform risk valuation.
- Risk valuation can be automated. It can be executed in real time, along with corresponding risk reports.

UNRIVALED FLEXIBILITY

Unique **ready-to-use platform** out-of-the-box. Utmost simplicity and flexibility to **configure any energy and commodity trading operation worldwide**. Full integration of **front to back office**, with data, analytics, risk, logistics, optimization & web-reporting. More information:

- Power & Gas [here]
- Crude, Gas and other Energy [here]
- Commodity [here]

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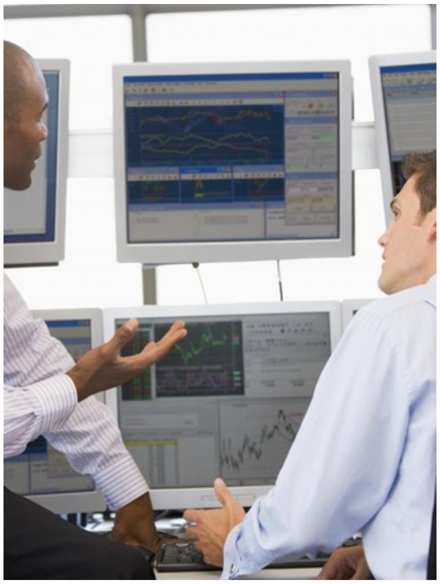


High-Performance Analytics

QR Curve Manager®

- A dynamic data architecture for all data types in a single web dashboard integrating data, reporting, and analytics. Data can be prices, volume / load, computed and simulated data, e.g., settlement, or risk.
- Data is defined by any desired attributes: time frequency (market tick, to monthly and yearly), volume rate, published source or phase, and per business objective. Attributes can be added or deleted as desired. The database tables and dashboard are automatically adjusted to accommodate a new data.
- Integrated advanced energy and commodity data analytics, comprising spot and forward curve modeling and Monte Carlo simulation, load and price forecasting, all needed for market analysis, optimization (generation, bids & offers, storage, pipeline), risk valuation and business intelligence.
- Flexible data validation filters can be implemented by creating rules, such as max, min, multiples of standard deviation, trends, etc. Flexible data repair filters can be defined by rules.
- Flexible and automated services to manage, data versioning, archiving, deletion and audit trail.
- Database tables are optimized, self-archiving and can be used concurrently for live operation & warehousing.
- **Flexible Data Connectivity Bridge** can be **configured within minutes** to connect to data repository of flat files, databases or external data source / provider to fetch, parse, and save data. Connectivity can be **automated on schedules**, or be event triggered.

QR Forward Curves®

- One single **powerful environment** to **model and forecast** daily expected spot, and **monthly forward curves** (energy, commodity, equity, FX, interest rate, etc.). This can be also used for meter and load data.
- **Multi-frequency Fourier polynomial** models can be configured to capture multiple seasonal shapes and trend. Models are **calibrated or fitted automatically** on base market data.
- **Interpolation routines** fill in missing quotes or gaps in forward data. Extrapolation is used to **go beyond the range** of the initial data provided for calibration. Build complete forward curves in illiquid / thinly traded markets.
- **Define proxy curves** via any desired mathematics formulas involving other base curves. **Multiple forward curve models** can be maintained. Models used for forward curve building and estimated parameters are visible and auditable.

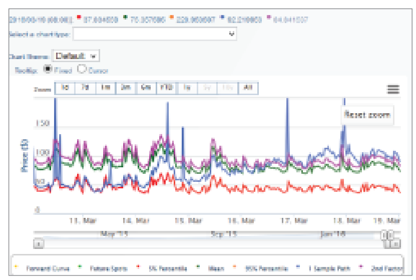
QR Load Forecaster®

- **No simplistic parametric statistical methods** such as regression, ARMA, ARIMA, GARCH. We let the data configure its own model by using **Artificial Intelligence** (**Bagging Trees** and ANN). Precision guidance is provided via external data in **real-time, e.g., SCADA** or weather, and forward indicators.
- **Load forecasting** can be performed on an individual meter or node, or on aggregated totals based on business rules such as, per client type, region, or zone. **Run time is in seconds for short term intraday forecasts**.

QR Price Forecaster®

- **Price forecasting** on any market timescale, e.g., half hourly or hourly, going **days**, **months**, and **years forward**. No simplistic ARMA, ARIMA, GARCH methods are imposed on the data. Instead we let the data configure its own model by using AI (**Bagging Trees and ANN**).
- Very well-suited model for **high-frequency data** such as FX, financial indices and nodal or zonal (LWAP) electricity spot prices. For electricity prices the model is **calibrated** purely on **ISO published data**, including external data, e.g., total system load, nodal or zonal LWAP prices, congestion, and generators' availability, or weather. Selected forward indictors are used.
- **Live web data panels** to display and analyze **actual** and forecasted spot prices and load. **Run time is in seconds** for short term intraday forecasts.

QR Monte Carlo®



QR Monte Carlo® applies to the price and volume / load of any security type: equity, FX, interest rates, energy, commodity or any data type.

Range of advanced 1 and 2-factor **stochastic differential equation** models capturing mean reversion, trend, seasonality, and stochastic volatility. Jump processes can be turned on/off. These are far **more powerful** than volatility time series models & correlation matrix.

Simulate very realistic (non-flat) term structure of **forward markets**. The Monte Carlo engine **automatically calibrates**, then builds or simulates the spot and forward curves together in a **coherent term structure**. A Market Price of Risk is estimated for every forward position.

Execute **thousands of simulation scenarios in seconds**. Full statistics with visual display of simulation paths and the full risk cone, expanding in time.

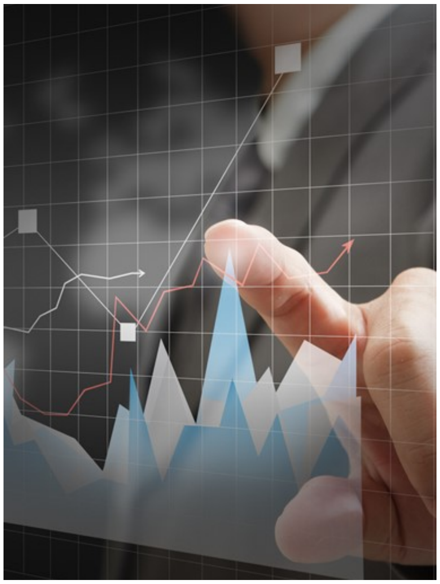
Benefits

Ready-to-use out-of-the-box. No custom programming or development is required. We offer a wide range of **sophisticated models** designed, **fine-tuned**, and **calibrated** for **energy**, **commodity** and **financial** applications. Each module has its own web-dashboard. All models come with automatic calibration.

Ultimate System Integration. QR Analytics® is seamlessly **integrated** with QR Risk® and QR Trading and Reporting®. This eliminates the need for costly and lengthy system integration, and data migration.

High-performance Computing. QR Analytics® is imbedded in QR proprietary **parallel processing computing** architecture, achieving **super-computing performance** on cheap off-the-shelve servers. Typical runtime of most jobs are under a minute. Management and automatic execution of millions of computations.

- Find out more information here.



High-Performance Extensive Risk Functionality

The only comprehensive, versatile and robust risk platform

MARKET, CREDIT, AND LIQUIDITY RISK

Calibrate, back-test, and execute risk valuation via Monte Carlo simulation, with real-time display of results in a web risk dashboard. The valuation covers:

- **All risk indicators**: market risk (positions, MTM and value at Risk (VaR)), counterparty exposure and credit risk, earnings at risk, liquidity ratios and custom defined risk indicators.
- **Internal and regulatory risk valuation** and reporting: hedge accounting, **hedge effectiveness** and reporting, fair value accounting, **Dodd-Frank derivative** reporting.
- All asset classes, **energy**, **commodities**, **FX**, **interest rates**; **all trade types**: spot, forwards, futures, swaps, full range of options, wholesale and retail physical transactions.

OPERATIONAL RISK

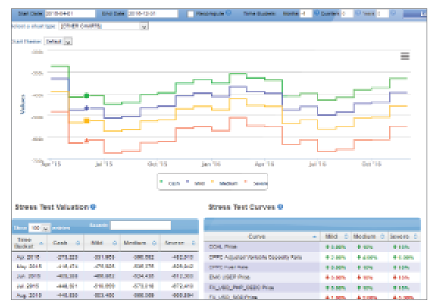
- QR System® is built in its entirety, on **operational risk management concepts**. Audit, control and **role-based security** access are embedded in every page, and every interaction of users with the system.
- **Trading control via max and min enforcement** on value, volume, duration of transactions by asset class, trader, or trading strategy. Similarly, max and min limits can be defined on **counterparty exposure**, along with **collateral management**.
- Multiple risk control reports **monitor live, users' compliance and violations**.

PORTFOLIO ANALYSIS, WHAT-IF-SCENARIOS & STRESS TESTING

- **Real-time risk valuation** and display are integrated in a **visual web dashboard** for business intelligence and **optimal decision making**. Organize your trades into any desired portfolio structure across assets, operations and books, from downstream to upstream, in order to create detailed **cash flow and P&L analysis** encompassing all commodities, energy and FX transaction types, charges, losses, and operational costs.
- Valuation of any risk indicator or P&L can selectively undergo any desired **what-if scenario or stress** on volumes, all price curves, or **external factors** such as weather, growth, market shifts, CPI, FX, etc.
- This is a perfect tool for **short and long term portfolio management and optimization**, as well as long term planning in buying and selling, hedging corporate earnings, and risk and P&L valuation.

ULTIMATE FLEXIBILITY

- QR Risk® is seamlessly integrated with QR Analytics® **for all the curves** needed for risk valuation. Namely, building forward curves, and Monte Carlo simulated scenarios of spot and the term structure of forward curves. Risk valuation is **fully automated** and users have **full control** of **scheduling** and **execution**.
- QR Risk® is integrated within QR **proprietary high-performance parallel processing** architecture. Computing various risk indicators on large portfolios only takes minutes, delivering risk results in real time.
- QR Risk® is compatible with **any trading or transaction repository system**. It can be used with QR Trading®, or as a stand-alone service next to any in-house system.



Manage and Mitigate Risk Exposures

Create an **integrated risk model** for your enterprise. Gain **real-time visibility** into the most intricate risk landscape, with a very **comprehensive risk metrics** via Monte Carlo simulation: market risk, counterparty exposure, P&L, earnings, cash and liquidity risk, and any desired custom risk indicator.

Dynamically manage and mitigate risk, and optimize tactical and strategic decision making with **accurate**, **real-time** information.

Find out more information here.

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