REAL TIME
RISK SYSTEMS

Protozoa™

Real-time Risk for the Trading Desk

Derivatives across all markets with custom development

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Founder & CEO

Executive Summary

RTRS is the most cost-effective solution in the marketplace if you need all three of the following

- Real-time risk analytics.
- Equity-, credit-, rates-, volatility- and FX derivatives
- Client-directed cost-effective development.

RTRS has 19 years of excellence

- Driven by the vision of Dr. Navin following co-founding a 1bn multi-strategy hedge fund.
- Training programmers to be industry leading quants.
- Patented real-time ticking design.
- Provided this service to industry leaders, e.g., Och-Ziff.

Real Time Risk Systems LLC (RTRS)

has developed, since 2004, an extensive proprietary derivatives-risk-analytics code-base offering your firm market-leading risk tools.

A Unique Offering

Cost-effective alternative to in-house development

Get a multi-strategy hedge fund live with real-time analytics in a matter of weeks and avoid integrating together multiple vendors' risk offerings or developing in-house from scratch.

On-demand bespoke programming

The client chooses the budget and the deliverables for development on this thoroughly automatically tested Agile code-base 17 years in production ensuring a top-quality product.

A unique offering for the derivatives vendor market

Custom evolution is part of the DNA of Protozoa while it is outside the business model of software vendors who charge high consultancy fees for development.

Real-time

01. All models run each theoretical value on the 10-100 micro-second timescale

- A patented design allows this speed for any model.
- Extensive calculations are performed over-night.
- 10-1000 times speed up, depending on how slow the original models are.

02. Pitch point to investors

Real-time risk on the entire book is a market differentiator. Reduce the risk of markets moving against you too fast.

03. Risk analysis becomes a trading tool

Real-time functionality allows for on-the-fly risk modeling and scenario-analysis design, with results viewable in minutes. Book-wide hedges can be adjusted live.

04. Real-time means a fast GUI: see your book tick live

Book-wide sub-second modelling allows split-screens, refresh and multiple risk views of the whole book to work smoothly and not freeze re-calculating.

REAL TIME RISK SYSTEMS

Models

Many valuation algorithms
Equity-, interest rate-, credit-, volatility- and FX derivatives Including convertible bonds.

	Security Type	Model
Basic Securities	Equity	None
	Bond	• Discount Model Callable and Putable Bonds use Finite Difference Grid Hull-White Model
	Preferred Stock	• Same as Bond Model choices
	Equity Index	• Basket Model
	Volatility Index	None
	Interest Rate Index	None
	Price Index	None
Swaps	Interest Rate Swap	• Discount Model • Hull-White Model with Cap and Floor
	Overnight Indexed Swap	• Discount Model
	Price Indexed Swap	• Discount Model
	Credit Default Swap	• Market Standard Unwind Model (Jump to Default Credit Model with Recovery)
	Credit Default Swap Index	• 100 minus Market Standard CDS Unwind Model
	FX Volatility Swap	• Lognormal FX Model using Stationary Point Method
	Volatility Swap	• Lognormal Equity Model using Stationary Point Method
Bonds	Convertible Bond	• Finite Difference Grid Model of One Factor Lognormal Stock plus Jump to Default Credit Model (with Recovery)
	Convertible Preferred	• Same as Convertible Bond Model
	Asset Swap Convertible Bond	• Simple Parity Model, Max(CB-strike,0)
Futures	Eurodollar Future	• Discount Model (no convexity correction)
	Treasury Future	• Discount Model (Martingale = cheapest to deliver bond/forward price model)
	Equity Index Future	None
	Volatility Index Future	None
	Fed Fund Future	• Discount Model (includes daily re-fixing)
	FX Future	• Discount Model
Forwards	FX Forward	• Discount Model
	OTC FX Forward Swap	• Discount Model
	Synthetic Stock Forward	• Discount Model
Options	Equity/Index Option	• Black-Scholes Formula (European and no underlying dividends) • Black-Scholes Formula plus Stub Model (European with vol input and underlying price adjusted for dividends) • Finite Difference Grid Model (American with underlying dividends)
	Bond Option	• Hull-White Model • Black Model
	Swaption	• Black Model (lognormal forward rate) • Bachelier Model (normal forward rate) • SABR Model • Hull-White Model
	Credit Default Swaption	• Black Model (log normal forward rate)
	Volatility Index Option	• Black-Scholes Formula (European options) • Finite Difference Grid Model (American options)
	FX Option	• Black-Scholes Formula (European options) • Finite Difference Grid Model (American options)
Forwards on Options	Forward Swaption	• Black Model (lognormal forward rate) • Bachelier Model (normal forward rate)
Option on Futures	Equity Index Future Option	• Black-Scholes Formula (European options) • Finite Difference Grid Model (American options)
	Volatility Index Future Option	• Black-Scholes Formula (European options) • Finite Difference Grid Model (American options)
	Treasury Future Option	• Black-Scholes Formula (European options) • Finite Difference Grid Model (American options)

01

Wide array of pre-built models

Options and derivatives models covering many markets.

02

Immediate real-time risk modeling

Use our pre-built models to measure book-risk before customization.

03

Custom-built models

We have the capability to build any model with a minimum of client description.

Development

Agile practices are exploited to best effect

- Continual client feedback via frequent builds
- Iterative development
- Test-driven development
- Story boards and task breakdowns
- Judicial use of pair programming

Agile development enables Real Time Risk Systems to offer a cost-effective way to model very diverse books. We simply may have to build a few new things for the client.

Development allows us to fine-tune models for individual clients and add new ones to keep up with markets: new risks, new products, new paradigms.

Portfolio managers add value by analyzing derivatives and this necessarily includes development. There is no "software solution" to this value-add requirement.

Eclipse GUI

01. Very powerful real-time GUI

Black panes display a portfolio view and two scenario child-views.

02. Configurable scenario analysis views

"SPX 2.5%" shows changes as the S&P Index is bumped.

03. 2D scenario views

"SPX vs Vol" shows exposure to changes of SPX and VIX indexes.

04. Database tools and diagnostics

Yellow and white panes.

Agile Development

Lead by company founder Robert L. Navin

Client-directed development roadmap

Two decades of Agile planning allows us to give meaningful estimates for units of work for deliverables.

Agile literally means adaptive to changing priorities

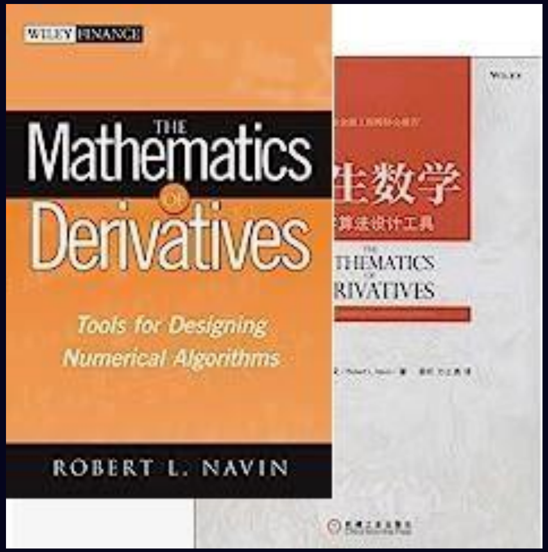
Our clients hold all deliverable decision-making power.

Excellence in derivatives modeling

- Any model can be implemented based on a minimum of guidance from the client.
- Company founder Robert L. Navin (PhD, Caltech, theoretical particle physics) began his career in quantitative finance in 1995 and has published the textbook, "The Mathematics of Derivatives", Wiley (2006).

Scale-able development team

Dr. Navin has a proven track-record of leading training and coaching of top-notch Java programmers to be excellent derivatives quantitative programmers.



The Bottom Line

If you are managing a multi-strategy hedge fund

RTRS can replace a large in-house team of quantitative programmers and immediately deliver a $35mm build-cost real-time Agile code-base.

If you trade derivatives and want to save on development costs

Protozoa will jump you forward many "development years" and halve the budget of an in-house team maintaining excellent productivity.

Let RTRS manage the derivatives developer team

RTRS has over two decades of experience hiring, training and motivating cohesive teams of quantitative programmers.

Thank You

Contact Real Time Risk Systems
to learn more

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