Structured Products

Risk Management and Structuring

Due to fast and unpredictably changing markets, customer needs and regulatory requirements quantitative analysts structuring new products face more challenges than ever before. Meeting diverse customer needs while realizing an optimal risk and reward structure for your institution under these circumstances requires highest accuracy, flexibility, model maintainability and speed in time-to-market.

Today, risk management is more time-critical than it has ever been before. In order to keep market risk on the books as low as possible, the quant in risk management has to evaluate the risks associated with many different complex financial products his company plans to sell or buy. Therefor risk management has to inspect the models of the structurers or build own models based on term sheets. Errors are not allowed, since they can be expensive. Model quality is everything in this field.

Computer Aided Finance

Theta Suite is an integrated tool set for Computer Aided Engineering in Finance. Like software tools used by industrial engineers to design airplanes, Computer Aided Finance supports quantitative analysts to reach optimal outcomes. Theta Suite combines state-of-the-art mathematics, engineering and informatics.

Theta Suite´s power is its focus

With Theta Suite you can structure and evaluate any financial product or trading strategy faster and more accurate than ever before. Thus any exotic product or complex hedging strategy looses it´s magic.

How is this possible? The coding language ThetaML serves only one goal: optimally define financial products, trading strategies and evaluation models (e.g. stochastic models). It does nothing else but that! The power of this language lies in the fact that the description of the product (payoff structure), the stochastic model and the numerical implementation are separated. Each individual component is much easier to understand than a complex numerical algorithm containing all three aspects in one piece of low level computer code.

THETARIS
Engineering in Finance

Benefits

Your models are your asset - so is your time!

Theta Suite doesn´t come with a set of pre-defined standard products and models. Theta Suite is standard software that enables you to easily build your own model library and to focus on model quality. Thanks to the optimized coding language used, the models are easily maintainable. Thus you are less dependent on consultancies and aggregate the know-how in-house.

Transparency

Easy understandable descriptions of products and evaluation models and full traceability during every step of the calculation process - that´s what we call transparency.

Speed

Besides making the development and maintenance of structured product portfolios more efficient, Theta Suite also better utilizes the technical infrastructure: The evaluation of ThetaML is conducted in a highly optimized way. The run-time of the Monte-Carlo valuations is blazing fast and even large portfolios with millions of products could be run on desktop machines.

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This screenshot shows the Theta Suite from Thetaris .

The five pillars of efficiency

Expressiveness: All features of any financial product can be represented in a precise and compact manner, due to the power of the coding language ThetaML.

Modularity: The product structure is separated from model stochastics and numerical details.

Transparency: It is easily comprehensible and allows for concise communication and documentation of financial product details. This enhances communication with risk management, sales/underwriters and higher corporate management.

Integrability and Maintainability: Easy integration of existing code allows to build upon previous work. New employees are able to start working immediately with existing models.

Simplicity and ease of use: Little learning effort is required for a computer literate
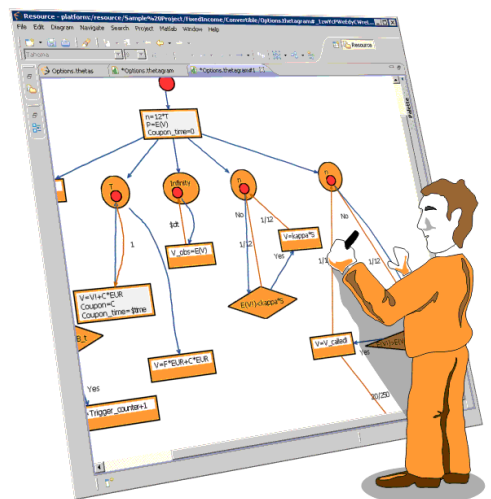
Applications

Use Cases: Implemented Examples

Options on Single Assets
- European
- American
- Asian
- Look Back
- Parisian
- Cliquet
- Convertible Bond

Interest-Rate Options
- Bond
- Future
- Swap
- Caplet
- Knock-out Swap

Basket Options
- Asian Basket
- Cliquet Basket
- Rainbow

Credit Derivatives
- Credit Default Swap (CDS)
- Credit Default Option (CDO)
- CDO-Square
- Mortgage-Backed Security (MBS)

Trading Strategies
- Variance optimal hedging of any option portfolio
- Portfolio insurance strategies e.g. CPPI
- Dynamic strategies which act based on scenario-dependent expectations

Risk- and Asset-Liability Management
- Computation of Value at Risk and Conditional Value at Risk of Portfolios
- Utility optimization of dynamic trading strategies

Stochastic Models (risk-neutral)
- Black-Scholes
- Black-Scholes with local volatility
- Merton Jump-Diffusion
- Heston Volatility
- Libor Market Model
- Short-rate models (Vasiczek, Hull-White, …)
- Schoebel-Zhu Hull White

Stochastic Models (physical)
- Black-Scholes with excess return
- GARCH
- Jump-Diffusion

Arithmetic Asian Option in ThetaML

This example shows how the payoff description is sepatated from the valuation algorithm. The pricing model is a separate ThetaML which consists out of a behaviour model for the risk-neutral optimal exercise and a model simulating S, e.g. Heston or Black-Scholes.

```
model AsianArithmetic
    import T "Maturity"
    import N "Number of Observations"
    import K "Strike"
    import S "Stock price"
    import CUR
    export ExcerciseValue_CUR "Excercise value discounted"

    ExcerciseValue_CUR = 0
    A = 0
    loop N
        Theta T/N
        A = A + S
    end
    Average = A/N
    ExcerciseValue_CUR = max(Average-K,0) * CUR
    % rigtht after Maturity, exercise value is 0
    theta @dt
    ExcerciseValue_CUR = 0
end
```

The perfect component to complete your infrastructure

Theta Suite integrates with:

- Risk Management Systems based on Potential Future Exposure, e.g. Algorithmics RiskWatch

- High-Speed Potential Future Exposure computing engine Theta Proxy RM

- Front Office Systems, e.g. Calypso

- Custom components like in-house pricing libraries, Data Warehouse Solutions etc.

- developments in Matlab, Java, C#, C++, etc.
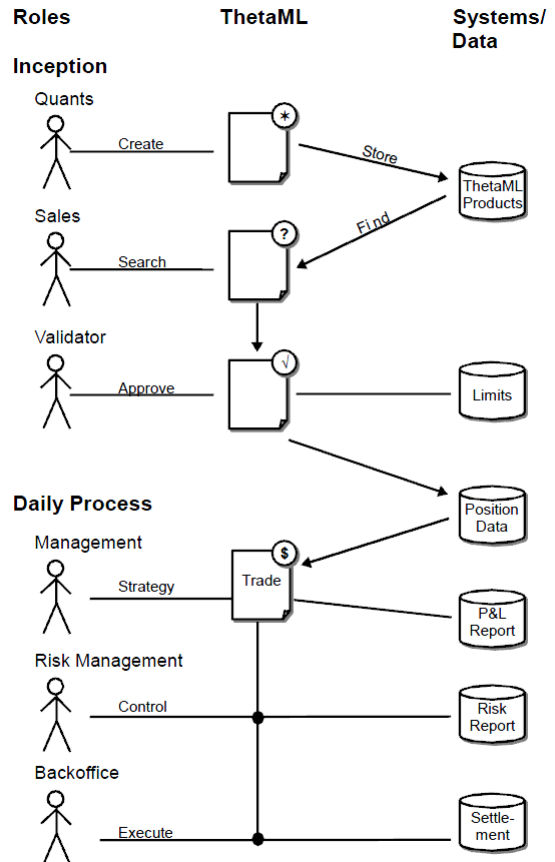
What can Theta Suite do for you? Contact Thetaris today for a presentation.

Thetaris is a solution provider for the financial industry. Combining state-of-the art financial mathematics with modern informatics, we serve the community by providing tools to enable Computer Aided Finance.

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