Theta Suite

Computer Aided Finance

The Challenge in Financial Engineering

The financial industry today faces a growing number and complexity of financial products. Established financial engineering processes are challenged by the rapid pace of change. To keep development cycles short, solutions are needed to make this process more effective. Necessary steps include automation of manual tasks and clear separation of concerns, which also results in better maintainability, transparency and communication of models.

About Thetaris

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.

A New Approach

Computer Aided Finance (CAF) is a new approach to modelling and design in financial engineering that offers advances equivalent to those that revolutionized traditional engineering.

Computer Aided Design (CAD) led to a quantum leap in traditional engineering, moving from manual blueprint processing towards powerful software tools and automated production processes.

Our Solution

Theta Suite is a modelling and analysis environment for financial engineers. It leverages ThetaML, a simple domain-specific language that can be used to represent any financial product or strategy.

The software automatically generates code for evaluating models written in ThetaML. Its powerful analysis capabilities enable rapid prototyping of new products and testing of strategies.

Theta Suite distinguishes between the payoff structure and stochastic model of a financial product. This separation allows for testing of products under different models and improves transparency and maintainability.

THETARIS
Engineering in Finance

Theta Suite

Today's financial industry is faced with an increased complexity of investment decisions and a growing variety of products traded in the capital market. Thetaris has developed the Theta Suite software to enable financial engineers to tackle these challenges, keeping productivity up and time-to-market down.
The Theta Suite software is applicable in various fields of financial engineering.

All Complex Structured Derivatives

The Theta Suite supports the definition of models in ThetaML, a language with unprecedented expressive power and straightforwardness. Whether the option is path-dependent, has early exercise or redemption features, cliquet structure and knock-in, knock-out barriers, all features can be represented concisely in ThetaML.

Firm Modelling

Risks and rewards inherent in a financial derivative cannot always be determined by looking at the product alone. The portfolio context and overall business development often affect the suitability of an investment.
The Theta Suite can be used for the evaluation of real options, asset-liability studies and risk management. It supports top-down modelling where various business areas are approximated, as well as the bottom-up approach, modelling each individual financial product and aggregating the risks and returns.

Hedging Strategies

A number of hedging strategies can be expressed in ThetaML with unmatched ease. For instance, a fully dynamic variance-optimal strategy in complete and incomplete market models can be expressed with only one extra line of code. Another group of representable strategies are dynamic delta, gamma and vega hedges. Static optimization can be evaluated against arbitrary cost functions.

Dynamic Investment Strategies

The Theta Suite allows the rapid implementation and back testing of complex trading strategies like CPPI and index replication. The strategies may depend not only on observable parameters, but also on conditional product prices and conditional expectations.

ThetaML

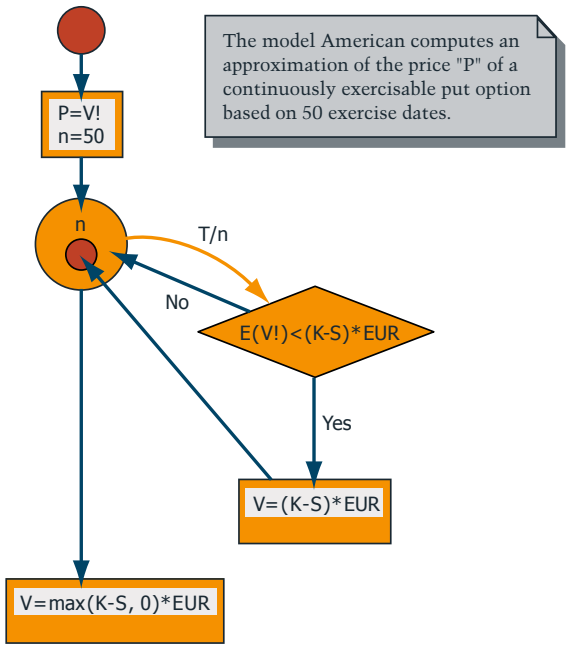
ThetaML is the domain-specific language (DSL) we propose for describing the structural features of models in financial engineering. ThetaML is designed to express derivatives and dynamic investment strategies, for the use in pricing, risk management and optimization. Defining and reading financial products in ThetaML is of unprecedented ease and significantly faster than doing the same thing with conventional term sheets.

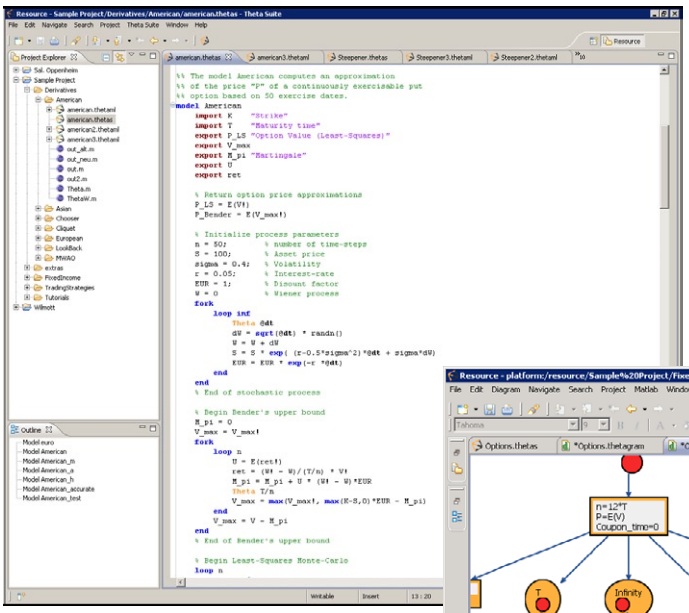
Complex term sheets are currently the only way to express and communicate the contents of a financial product. The process of turning a term sheet into an evaluating algorithm to get a price is long and error prone.

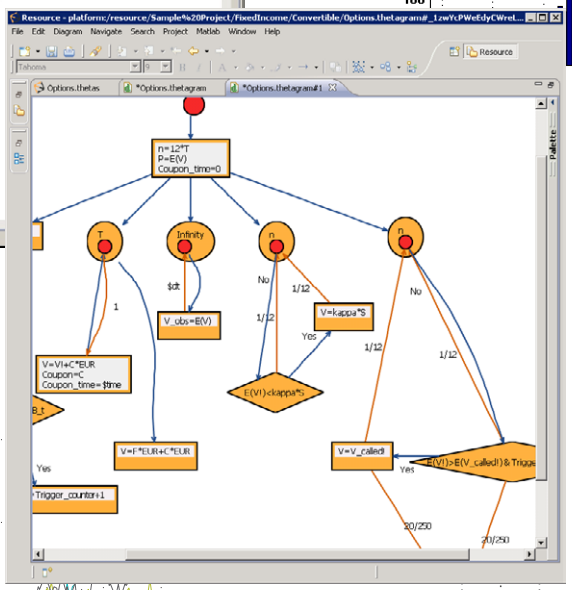
So far, there exists no adequate standard for specifying the structural model of arbitrary financial derivatives. Therefore, Thetaris introduces the definition language ThetaML that allows the specification of strategies in a way that is both intuitive and precise. The language provides access to conditional statistical properties while remaining simple and computable.

A model defined in ThetaML is independent of its algorithmic implementation. Whether an evaluation uses Monte-Carlo, PDE methods or even computer algebra does not affect the structural model in ThetaML. The Theta Suite supports two representations of ThetaML: either text-based as ThetaScript or graphically as a flowchart-like Thetagram.

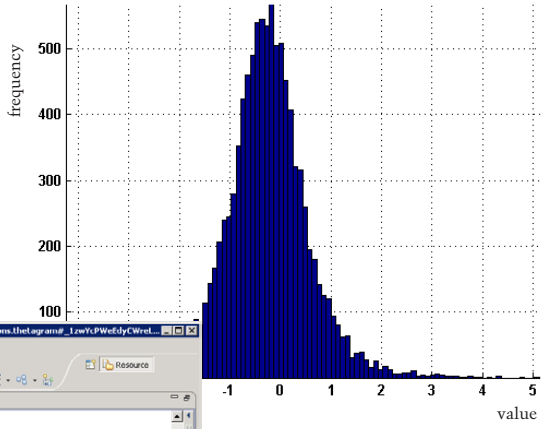
```
%% The model American computes an approximation
%% of the price "P" of a continuously exercisable put
%% option based on 50 exercise dates.
model American
    import S    "Stock"
    import K    "Strike"
    import EUR  "Numeraire"
    import T    "Maturity time"
    export P    "Option Value"

    P = V!

    n = 50
    loop n
        Theta T/n
        if E(V!) < (K-S)*EUR
            V = (K-S)*EUR
        end
    end

    V = max(K-S,0)*EUR
end
```



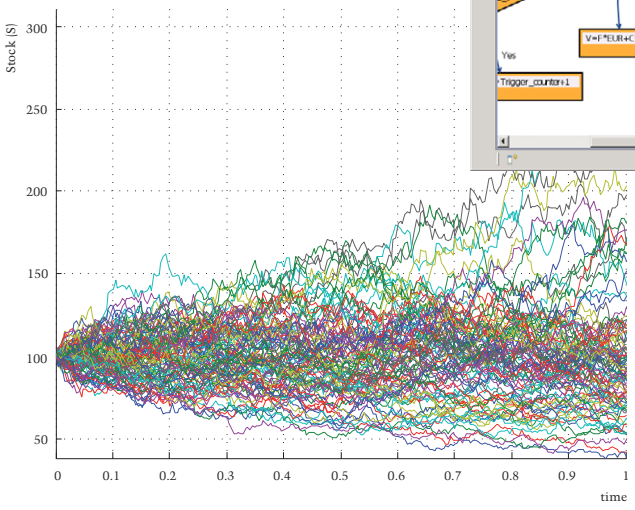




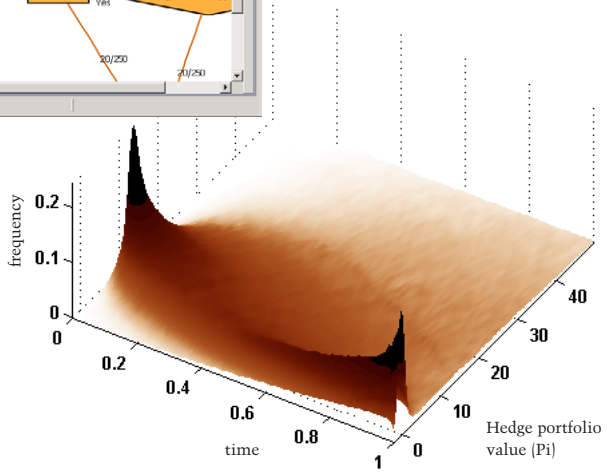
Histogram of Hedging error (error)



Time–series plot of Stock (S)



Probability density plot of Hedge portfolio value (Pi)



Theta Suite. Tools financial engineers really need.

- All financial products
- Every market model
- Dynamic hedges
- Optimal investments

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