When upstream is faster

Armed with eight years of research, Thetaris packs a punch with its new weapon – Theta Suite, loaded with ThetaML as ammunition

While the world is head over heels with high-performance computing (HPC), the new kid on the block, Thetaris, chose to cook up a new dish in developing ThetaML, a domain specific language which makes modelling of financial instruments easier, faster, and more powerful. Instead of just evaluating existing models quicker, Thetaris focuses on providing more efficient tools and processes, achieving speed gains by eliminating redundancy and wasted code.

With the aim of raising the standard in financial engineering, Thetaris developed Theta Suite — a complete toolkit for financial engineers, designed for modelling and pricing derivatives, optimization of dynamic investment strategies, and risk management.

Although the German company launched in October 2007, its founding members: Andreas Grau, Chief Executive Officer, Stefan Dirnstorfer, Technical Architect, and Norbert Schöpke, Platform and Interface Designer, have close to a decade of research in financial engineering under their belts.

We speak to the three founding members and Daniel Burns (see image), the Sales and Marketing Manager, to find out how and why this company went against the current.

Daniel Burns

First, tell me what Thetaris is all about, what are its objectives and focuses?

Burns: Thetaris is a solution provider for the finance industry. After having experienced the industry first-hand we were looking for ways to improve the process of financial engineering. We saw a lot of redundant code implemented; there were various inconsistent models and many communication barriers. Reuse of existing solutions was very difficult. Therefore we focused on creating a toolkit that supports the complete financial engineering process, automating as much as possible.

Fully operational demo version of our product available online

Our goal is to empower financial engineers by bringing them the tools needed to develop financial instruments and manage risk in the most effective way possible.

Dirnstorfer: We invested a lot of research in developing new modelling techniques. As a result we came up with a toolkit which enables what we call Computer Aided Finance (CAF). With this financial engineers can now focus on analysing financial products and trading strategies, rather than wasting time on writing another piece of redundant, nonstandard, error-prone pricing code... yet again.

Our long-term vision is to redefine the art of financial engineering. This domain has suffered from a lack of standards. We believe that the introduction of ThetaML is a big step towards achieving this goal.

We have also focused our solutions on trying to demystify financial modelling, pricing, and risk management through the improvement of the overall standard and quality of the financial models. This makes it much easier for institutions to take a closer look at the mechanics of their complex financial products.

What are the different offerings Thetaris has developed for the quantitative finance community?

Burns: Our flagship product is Theta Suite, a complete toolkit for financial modelling. The IDE is very intuitive and you can use a model editor to quickly model a financial product with domain specific keywords by using ThetaML. From this description you can create a flowchart-like graphical representation to provide an overview of your model that is easy to understand and communicate. The IDE has a comfortable interface for configuring and analysing the models. In a few simple steps you can supply input parameters, connect to data sources and launch interactive analysis sessions. This leads to a better understanding of the behaviour of your product and detection of flaws in the model. Histograms, quantile plots and many other reports are accessible via single mouse clicks. Theta Suite emphasises interactive model analysis and enables an efficient iterative development process. Another key feature supporting this is that the numerical code needed for analysis is automatically generated.

Our solution is scalable and very flexible. It can be used as standalone software or it can be integrated into larger solutions, as we have done at Münchener Rück, the largest Re-Insurer globally. Theta Suite is ideal for enhancing existing frameworks or driving a new solution.

Grau: ThetaML has a clear focus on modularization. It makes it easy to define any option and then use this as the underlying of a compound option. With this modular approach it becomes possible to model any quantitative trading or investment strategy. This includes optimal dynamic hedging strategies in arbitrary market models. We have invested significant amounts of research in factoring out the errors typically experienced when generating hedging strategies in incomplete markets.

Besides the Theta Suite, we also offer a solution for integrating complex products in time critical environments, in particular in the context of risk management. We call this solution Theta

Proxy. It allows the power of Monte Carlo simulations to be used efficiently in such applications by removing the need for nested simulations.

In addition to these products, we provide services across all fields of financial engineering, in particular financial modelling, product development and evaluation.

Dirnstorfer: We have a very open philosophy, something that distinguishes us from our competitors. The content of our technology is completely accessible by the public. We have a freely downloadable and fully operational demo version of our product available online. Our interactive Wiki encourages open debate about best practices and approaches to financial modelling and we welcome all contributions by the community.

How does the company address the issue of speed and accuracy, which is critical in quantitative finance?

Dirnstorfer: Look at the example of how risk management tries to cope with complex products today. For accurate risk estimates, only Monte Carlo simulation is an adequate pricing method. Millions of valuations have to be performed every day which requires significant amounts of HPC power. Even using HPC these computations are sometimes prohibitively expensive.

To address this issue we have developed a technology that executes these simulations far more efficiently. We exploit the fact that the price function of derivatives is usually very smooth. As a result we avoid the need for nested simulations, so the calculation which previously took CPU days can now be completed in a matter of minutes. These gains are additional and independent to any improvements generated by HPC.

For many institutions other requirements are more pressing than evaluation speed alone. For example, the fact that you can quickly model any financial product – no matter how complex – is important too. A shorter time-to-market gives a significant competitive advantage. Regarding accuracy, it is also critical that the model itself correctly represents the features of a financial product. Often errors creep in because of misunderstandings and lack of transparency. A descriptive and intuitive modelling language like ThetaML helps to avoid such problems.

With the current market conditions increasing the need for risk management and transparency, how would this relate to Thetaris' solution?

Grau: Theta Suite allows users to analyse specific models in more detail, for instance, they can analyse a model's risk/reward profile, sensitivities, Value at Risk, and so on. Essentially, this addresses the requirements for market risk analysis imposed by Basel II, Solvency II, and other legal obligations.

Dirnstorfer: Another problem is the general trend towards more complicated financial products, i.e., complex products based on equally complex underlyings. These products are becoming increasingly complicated to communicate, let alone model, evaluate, and price quickly. Hence, our goal was to make it easier to express these products in simple terms. Several models can be assembled into a bigger model and the overall structure can be visualized in a flowchart. Together with Theta Suite's numerical analysis capabilities, this makes it easy to see what really drives complex structured products.

We also separate the product models from the stochastic models and numerical implementation. This means that it is possible to assess the robustness of product model prices by re-evaluating it with different stochastic models.

When the models themselves are easy to understand, it's a lot easier for financial engineers to discuss specific models. This helps to demystify pricing and trading models and also leads to better documentation.

What in your opinion is the 'next big thing' in technology for quantitative finance?

Dirnstorfer: Two major trends are emerging in Financial Engineering. Firstly, as I already mentioned, a trend towards increasingly complicated financial instruments, and secondly, a need for greater transparency. The current crisis in banking shows that solving these problems will be critical over the next few years.

The next big thing will be the emergence of tools that can handle this rising complexity. Domain-specific languages and automated code generation will be significant drivers. We think that our solution is well positioned in that area.

We also believe that the financial industry as a whole can greatly benefit from a higher level of standardisation. ThetaML raises the bar for product definition standards and we believe that it will play a major role in the future.

Is there a motto that the company operates by?

Dirnstorfer: Engineering in Finance. We want to equip financial engineers with the type of tools that are commonplace in every other sphere of engineering. We are talking about Computer Aided Design (CAD) and Computer Aided Engineering (CAE). We think financial engineers deserve that the tried and tested best practices of engineering are also brought to finance. This is why we introduce Computer Aided Finance (CAF).

We support CAF with ThetaML, making it very easy to express complex products, investment strategies, or hedging strategies. With our Theta Suite the financial engineer can focus on modelling and leave the numerical details to the computer.

Thetaris empowers financial engineers by bringing them the tools needed to develop financial instruments and manage risk

What are the company's plans for the future?

Burns: Our goal is to raise the standard of financial modelling and improve the transparency of financial engineering. We have the technology to enable this and we want ThetaML to drive a movement towards better standards in the industry. We will continually strive to provide innovative tools and best-of-class consulting.

We want Thetaris to be foremost in the minds of financial engineers when it comes to financial modelling.