

# QUANTS

## Convertible Bonds

Convertible bonds are hybrids which are both action and credit derivatives.

QUANTS provides a specific expertise in underlying risks modeling for both action and credit derivatives and for the links between equity and credit.

QUANTS is also able to provide advice on complex clauses of convertible bonds such as soft calls, dividend protections and exchangeables.

### Pricing and hedging

Convertible bonds are debts issued by companies in the form of convertible bonds which can be converted into shares of the same company (simple convertible bonds) or in shares of another company (exchangeables).

The complexity of convertible bonds comes from the modeling of underlying processes (equity, interest rates, credits) and from the specific clauses.

### Modeling of underlying processes

The specific clauses of convertible bonds are constantly changing in order to meet the needs of issuers and investors. The issuer tries to minimize his costs of finance charges while minimizing the holder's share of capital in case of a conversion. On the contrary, the investor requires protection mechanisms for the different events of the life cycle of the issuing company (dividend, public take-over bids, etc.) on which the price of convertible bonds strongly depends.

### Clause modeling

The specific clauses of convertible bonds are constantly changing in order to meet the needs of issuers and investors. The issuer tries to minimize his costs of finance charges while minimizing the holder's share of capital in case of a conversion. On the contrary, the investor requires protection mechanisms for the different events of the life cycle of the issuing company (dividend, public take-over bids, etc.) on which the price of convertible bonds strongly depends.

These clauses are described in the leaflets with the help of a complex and rarely harmonized terminology. Their qualitative effects are often simple to approximately comprehend while the rigorous consideration and encryption of these effects are very difficult to evaluate and sometimes need to be developed.

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### Applications

#### Market-Making

The market-making of convertible bonds necessitates a perfect command of pricing models and hedging. QUANTS supports its clients in their development projects of market making activities in bringing its know-how of underlying risk factor models, allowing the implementation of systematic hedging strategies.

#### Arbitrage

QUANTS' expertise in arbitrage has been built up in assisting its clients in their development projects of systematic and discretionary strategies for derivatives (proprietary trading, hedge fund). Today, QUANTS is able to provide to its clients this unique know-how.

#### Structuration

Structuring of complex derivatives requires a perfect command of pricing and of the chosen vanilla hedging products. The complexity of the clauses of convertible bonds makes the replication more difficult. QUANTS supports its clients in their needs of modeling of new risk factors and brings its expertise for the implementation of optimal hedging strategies.

#### Long-Only

Long-Only investors used to base their approach on qualitative analysis of companies. But the convertible bonds, because of the complexity of the dynamic of underlying processes and the diversity of the clauses, make the security selection more difficult. QUANTS offers its clients systematic tools of security selection and is able to lead back-testing of quantitative strategies.

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### Examples of client projects

#### Convertible Bonds Arbitrage

The project "convertible bonds arbitrage" consisted of the implementation of systematic detection tools for arbitrage of opportunities over 800 convertibles bonds.

Thanks to its competence, QUANTS has made a systematic process of convertible bonds from the pricing process in implied volatility and implied credit spread while respecting the constraints of calculation time and data updating.

The developed tools allow traders to improve and rationalize their investment approaches.

#### Model validation of convertible bonds

The project "model validation" consisted of the testing of a pricing model of convertible bonds, describing a new dynamic of the underlying shares and credits with a link between equity and credit.

Thanks to its competences in modeling and back-testing, QUANTS has tested the model on a universe of convertible bonds and verified the hedge ratios to the market reality.

The survey allows the client to prove the suitability of the new modeling under all market conditions.

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## Convertible Bonds

### Training in pricing and clause management of convertible bonds

Level: Expertise

Duration: 2 days

From one to 8 participants

### Objectives of the training

Acquire a clear vision of the modeling tools of the clauses of convertible bonds.

Comprehend the impact of clause modeling on the price behavior and on Greeks of convertible bonds.

Comprehend the importance of clauses in the arbitrage strategies, of market making and long-only.

### Training program

#### Simple pricing of vanilla convertible bonds

Diffusion model of underlying processes for action and credit

Model calibration based on market data

Pricing of convertible bonds and analysis of Greek sensitivities

Delta, gamma, vega, theta, rho, ksi, cs01, fugit

Volatility impact

Credit impact

Calibration of credit/volatility

Introduction of dividends

#### Pricing of vanilla distressed (busted) convertible bonds

#### Simple pricing of vanilla convertible bonds

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Volatility impact

Credit impact

Calibration of credit/volatility

### **Vanilla convertible bonds hedging**

Hedging with shares

Hedging with CDS

Hedging with interest rates

Hedging with options

### **Modeling of common clauses**

Put

Hard call

Soft call

### **Convertible bonds structure: conversion**

Cross-currency

Exchangeable

Attached warrant

OCEANE

Mandatory

Reset

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Contingent Conversion (Coco)

### Protection clauses

Dividend retention

Take-over protection

### About the consultant

Alain OUZOU is a quantitative analyst specialized in convertible bonds. He has acquired his competences in pricing applied to trading and to convertible bonds management through his successive experiences within an own-account trading team, within a quantitative research team of a major player of hedge fund and within the quantitative research team for convertible bonds of a publisher of pricing solutions. Alain graduated from Telecom ParisTech, one of France's top five graduate engineering schools located in Paris.