CHEME 133 Module 4: Analysis of American-Style Composite Options Contracts at Expiration

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Introduction

Composite options contracts are financial instruments that are composed of two or more individual options contracts. The payoff and profite of a composite contract at expiration is the sum of the values of the individual contracts. The advantage of constructing composite contracts is that they can be used to construct complex payoffs and profits startegies from simple contract components. In this module, we will analyze composite contracts at expiration, where the composite contract is composed of two or more American-style options.

General Formulation

Call and put contracts can be combined to develop composite contract structures with interesting payoff diagrams. Let $\mathcal{C}$ be a composite contract with d legs (individual contracts) where each leg is written with respect to the same underlying asset `XYZ` and same expiration date. Then, the payoff of the composite contract $\hat{V}(S(T), K_1, \ldots, K_d)$ at time T (expiration) is given by:

$$\hat{V}(S(T), K_1, \ldots, K_d) = \sum_{i \in \mathcal{C}} \theta_i \cdot n_i \cdot V_i(S(T), K_i) \tag{1}$$

where K_i denotes the strike price of contract i, θ_i denotes the contract orientation i: $\theta_i = -1$ if contract i is short (sold), otherwise $\theta_i = 1$, and the quantity n_i denotes the copy number of contract i. The profit of the composite contract $\hat{P}$ at time T (expiration) is given by:

$$\hat{P}(S(T), K_1, \ldots, K_d) = \sum_{i \in \mathcal{C}} \theta_i \cdot n_i \cdot P_i(S(T), K_i) \tag{2}$$

where $P_i(S(T), K_i)$ denotes the profit of contract i. The profit of a contract is the payoff minus the initial cost of the contract, i.e., the premium paid to purchase the contract:

$$P_i(S(T), K_i) = V_i(S(T), K_i) - \theta_i \cdot \mathcal{P}_i \tag{3}$$

where $\mathcal{P}_i$ denotes the premium paid to purchase contract i.

Directional Composite Contracts

Fill me in.

Neutral Composite Contracts

Fill me in.

Summary

Fill me in.

References