

The Fundamentals of Derivatives

$$= 8 \left(y^3 + 3xy^2 \cdot \frac{dy}{dx} \right) = 3y^2 \cdot \frac{dy}{dx} \cdot x$$

move X to here

$$6 \frac{d}{dx} (xy) \Rightarrow 6 \left(\frac{d}{dx} (x) \cdot y + \frac{d}{dx} (y) \cdot x \right)$$

Put the parts (red + blue)

back together

$$\Rightarrow 8 \left(y^3 + 3xy^2 \cdot \frac{dy}{dx} \right) + 6 \left(y + \frac{dy}{dx} \cdot x \right) = 0$$

the next step is isolate $\frac{dy}{dx}$

$$\Rightarrow 8y^3 + 24xy^2 \cdot \frac{dy}{dx} + 6y + 6x \cdot \frac{dy}{dx} = 0$$

$$-8y^3 \quad -6y$$

$$24xy^2 \cdot \frac{dy}{dx} + 6x \cdot \frac{dy}{dx} = -8y^3 - 6y$$

$$\frac{dy}{dx} = \frac{-8y^3 - 6y}{24xy^2 + 6x}$$

now we can use

Derivatives serve various purposes in financial markets, including speculation, hedging, and arbitrage. Speculation involves taking on risk with the goal of profiting from anticipated price movements in the underlying asset. For example, a trader may use options to speculate on future stock prices. Hedging aims to mitigate risk from adverse price changes by using derivatives to offset potential losses. A farmer could hedge against falling crop prices by using futures to lock in a selling price. Arbitrage seeks to exploit temporary price discrepancies between assets or markets to lock in risk-free profits

Forwards and Futures Contracts

Forwards and futures are contractual agreements to buy or sell an asset at a predefined price on a specified future date. Forwards are customized, over-the-counter contracts between two parties that provide flexibility but also counterparty risk. Futures are standardized contracts traded on exchanges that offer transparency and regulation but obligate traders to fulfill the terms.

Options Contracts

Options contracts give buyers the right, but not the obligation, to trade an underlying asset at a preset strike price by the expiration date. Calls allow buying the asset while puts allow selling. The versatile payoff diagrams of options make them useful for speculators, hedgers, and arbitrageurs in financial calculus.

Swap Contracts

Swap contracts are bilateral agreements that exchange cash flows between two parties, providing a flexible tool for managing financial risk. The most common types are interest rate swaps, currency swaps, and credit default swaps.

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