Stochastic methods for finance, Report 1

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March 2024

1 Company overview, Coinbase Global Inc.

Coinbase, founded in June 2012 by Brian Armstrong and Fred Ehrsam, is a leading cryptocurrency exchange platform based in Wilmington, Delaware, USA. As a publicly traded company on the NASDAQ under the ticker symbol "COIN," Coinbase has established itself as a pivotal platform in the digital currency space, offering a range of products and services for individuals, merchants, and institutional clients across more than 100 countries.

At its core, Coinbase enables users to buy, sell, and store cryptocurrencies such as Bitcoin, Ethereum, and many others. The platform is renowned for its user-friendly interface, making it an accessible entry point for individuals new to cryptocurrencies. In addition to its primary exchange services, Coinbase also provides a professional trading platform called Coinbase Pro, a cryptocurrency wallet service, and a platform for institutional investors.

From a financial perspective, Coinbase has shown significant growth since it's recent IPO, underpinned by the increasing interest and adoption of cryptocurrencies. The company has also made strategic acquisitions to expand its service offerings and enhance its technological capabilities.

Regarding its shareholder structure, Coinbase boasts a mix of individual and institutional holders, with notable names including venture capital firms and technology-focused investors who were early believers in the potential of blockchain technology and cryptocurrencies.

The biggest institutional investors in percentage of total stock supply are:

- 7.30% Vanguard Group Inc.
- 4.40% Ark Investment Management, LLC
- 4.36% Blackrock Inc.

2 Call Option Pricing

With the static binomial model we compute the price of an European call option as the discounted expected value of the payoff at maturity T under the risk neutral probability measure $\mathbb{Q}$.

$$C = \frac{1}{1+rT}\ \mathbb{E}^{\mathbb{Q}}\left[(S_T - K)^+\right] \tag{1}$$

Where K is the strike price, and S_T the price at maturity. The measure $\mathbb{Q}$ only depend on the binomial model parameters u, d and risk free interest rates r (LIBOR):

$$q = \frac{a-d}{u-d} \quad \text{with} \quad d < a < u \tag{2}$$

Where we assumed no arbitrage opportunities. u and d are estimated from historical data (3 and 6 months) Since \$COIN does not pay dividends $a = 1+rT$ (assuming simple compounding).

$$\mathbb{E}^{\mathbb{Q}}\left[(S_T - K)^+\right] = q(S_0 u - K)^+ + (1-q)(S_0 d - K)^+ \tag{3}$$

3 Results

	3 months	6 months
expire date	21/6/2024	20/9/2024
strike price	270	270
binomial estimate	53.17	56.49
relative error	6.29%	−8.77%
σ	0.0568	0.0417
annual volatility	0.9030	0.6619
u	403.48	410.19
d	163.54	160.86
risk free rates	0.055825	0.056999
capitalization factor	1.013956	1.028499