PRICING ASIAN OPTION USING BLACK-SCHOLES MODEL AND MONTE CARLO SIMULATION

UNDERGRADUATE THESIS

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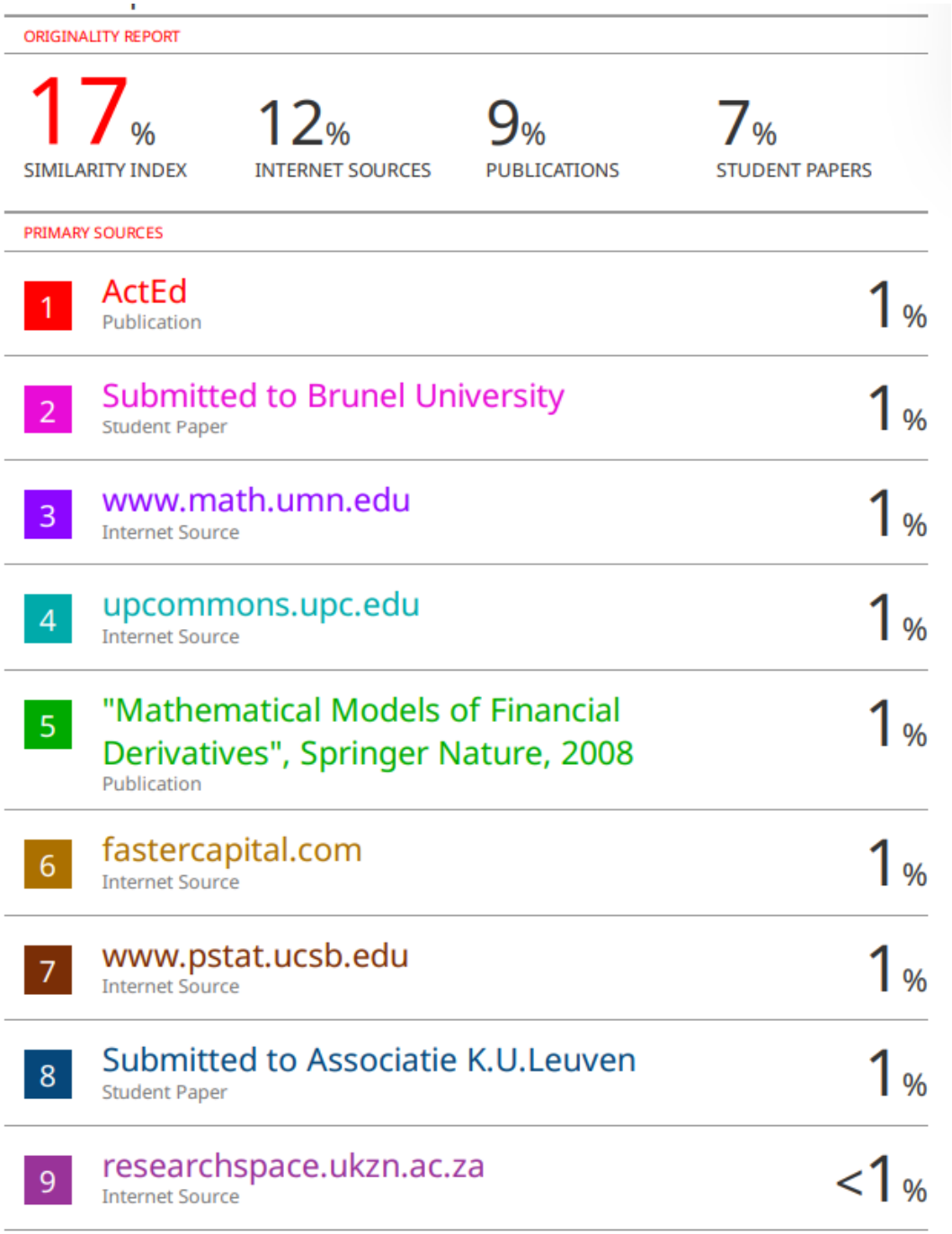

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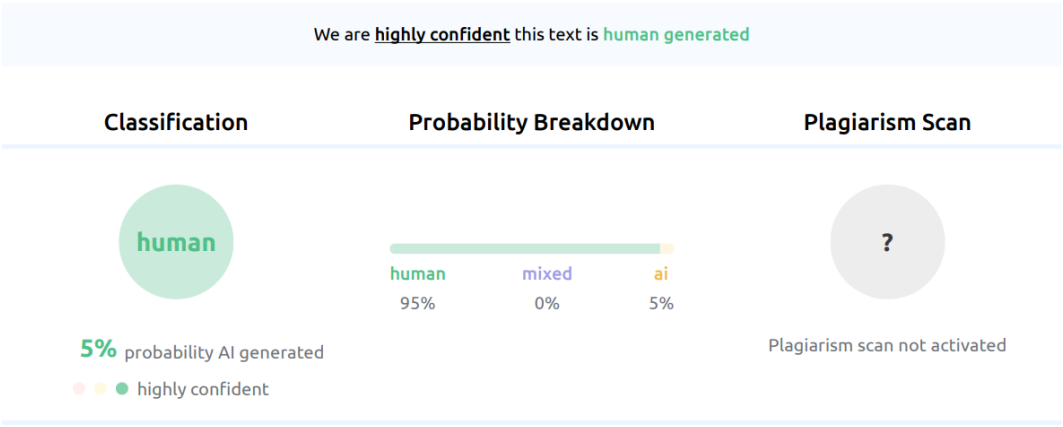

ABSTRACT

Investment has been among the choices chosen to earn side income or profit. Investing is appealing because of its potential for significant gains but potential comes with risks. Netflix (NFLX), is a prime example of an asset that carries significant investment risk. NFLX has a volatility measurement Beta of 1.26 indicating a more volatile stock. This indicates that the stock price has fluctuated significantly over the past year. To handle the volatility, one of the most well-liked exotic options that depends on a path, Asian option, can reduce exposure to investment risk due to the way to exercise the option at the average price instead of the price during the maturity date. There are several methods used in pricing Asian option, such as Black Scholes Model and Monte Carlo Simulation. Black Scholes model is chosen because it has an analytical solution that can result in a theoretical price, and is widely used to price options. The second method used, Monte Carlo simulation is more versatile so it can handle the path-dependent nature of Asian options. This study examines the performance of the Monte Carlo simulation to the results of the Black Scholes model. The comparison is done by using MAPE, resulting in a discrepancy of 0% for the call option and 20.075366%, 19.833543%, and 19.484776% for put option of Monte Carlo simulation with number of simulations of 1000, 10,000, and 100,000 respectively.

***Keywords**: Pricing, Asian Option, Black Scholes Model, Monte Carlo Simulation*

ABSTRACT

Investasi telah menjadi salah satu pilihan untuk mendapatkan penghasilan tambahan. Investasi menarik karena potensinya untuk menghasilkan keuntungan yang signifikan, tetapi potensi tersebut selalu disertai dengan risiko. Netflix (NFLX) adalah contoh utama dari aset yang memiliki risiko investasi yang signifikan. NFLX memiliki nilai volatilitas Beta sebesar 1.26 yang menunjukkan saham yang lebih fluktuatif. Ini menunjukkan bahwa harga saham telah berfluktuasi secara signifikan selama setahun terakhir. Untuk mengatasi volatilitas tersebut, salah satu opsi eksotis yang paling digemari dan bergantung pada jalur historis (*path-dependent*), yaitu opsi Asia, dapat mengurangi eksposur terhadap risiko investasi karena opsi ini dieksekusi pada harga rata-rata alih-alih harga pada tanggal jatuh tempo. Ada beberapa metode yang digunakan dalam penetapan harga opsi Asia, seperti *Black Scholes Model* dan Simulasi Monte Carlo. *Black Scholes Model* dipilih karena memiliki solusi analitik yang dapat memberikan hasil yang teoritis, dan banyak digunakan untuk menentukan harga opsi. Metode kedua yang digunakan, Simulasi Monte Carlo lebih fleksibel sehingga dapat menangani sifat opsi Asia yang bergantung pada jalur historis. Penelitian ini mengkaji kinerja simulasi Monte Carlo dibandingkan dengan hasil *Black Scholes Model*. Perbandingan dilakukan dengan menggunakan MAPE, menghasilkan perbedaan 0% untuk opsi beli dan and 20.075366%, 19.833543%, dan 19.484776% untuk opsi jual simulasi Monte Carlo dengan jumlah simulasi masing-masing 1000, 10.000, dan 100.000.

***Kata Kunci**: Penetapan Harga Opsi, Opsi Asia, Black-Scholes Model, Simulasi Monte Carlo*

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