

## ABSTRAK

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### **PERBANDINGAN PERHITUNGAN HARGA OPSI BELI INDEKS S&P 500 MENGGUNAKAN MODEL *BLACK-SCHOLES* DAN *ARTIFICIAL NEURAL NETWORK***

Skripsi, Fakultas Sains dan Teknologi (2019)

(xv + 73 halaman, 33 tabel, 14 gambar, 1 lampiran)

Opsi mengalami perkembangan yang signifikan dalam perdagangan derivatif belakangan ini. Terdapat berbagai metode untuk perhitungan harga opsi, yakni metode tradisional yang masih bergantung pada batasan dan asumsi, serta metode *machine learning* yang sedang dikembangkan. Penelitian ini bertujuan membandingkan metode *Black-Scholes* dan *artificial neural network* dalam *option pricing*. Data yang digunakan merupakan data opsi beli untuk indeks saham *Standard and Poor 500* dengan lima maturitas yang berbeda. Data kemudian dipartisi berdasarkan *moneyness* (*in-the-money* dan *out-of-the-money*) dan waktu menuju maturitas (pendek, menengah, panjang). Penerapan *homogeneity hint* juga digunakan pada metode *artificial neural network*. Perhitungan harga opsi dengan *artificial neural network* dilakukan menggunakan algoritma *backpropagation*. Galat dan akurasi selanjutnya dicari untuk setiap perhitungan harga opsi oleh kedua metode. Hasil dari penelitian ini menyatakan bahwa metode *artificial neural network* secara umum lebih unggul daripada *Black-Scholes*. Selain itu, partisi data berdasarkan *moneyness* tidak meningkatkan performa dari jaringan, sedangkan partisi data berdasarkan maturitas menghasilkan galat yang lebih kecil dan akurasi yang lebih tinggi. Penambahan variabel *homogeneity hint* sebagai *input* meningkatkan performa jaringan pada data *out-of-the-money*, maturitas menengah, dan maturitas panjang. Akan tetapi, penggunaan *homogeneity hint* tanpa *stock price* dan *strike* justru menurunkan kinerja dari *neural network*, sekalipun mengurangi durasi dari *training*.

Kata Kunci: *artificial neural network*, *Black-Scholes*, *backpropagation*, opsi, *moneyness*, *homogeneity hint*

Referensi: 19 (1976-2018)

## ABSTRACT

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### **COMPARISON OF PRICING CALL OPTIONS OF S&P 500 INDEX FUNDS USING *BLACK-SCHOLES* AND *ARTIFICIAL NEURAL NETWORK***

Thesis, Faculty of Science and Technology (2019)

(xv + 73 pages, 33 tables, 14 figures, 1 appendix)

The exchange-traded of options has significantly increased in derivative trading lately. There are various methods for calculating option prices, namely traditional methods that are dependant to restrictive assumptions, and the machine learning method that is currently being developed. This study aims to compare the method of Black-Scholes and artificial neural network in pricing call options. The data used in this research is the call options for the Standard and Poor 500 with five different maturities. The data is then partitioned based on its moneyness (*in-the-money* and *out-of-the-money*) and time to maturity (short, medium, long). The homogeneity hint is also applied in the artificial neural network. Calculation of option prices with artificial neural network is carried out using the backpropagation algorithm. Further errors and accuracy are calculated for each option prices generated by both methods. The results of this study state that the artificial neural network is generally superior to Black-Scholes in pricing the call options. In addition, partitioning data based on moneyness does not improve the network's performances, whereas partitioning data based on maturity results in smaller errors and higher accuracies. The use of homogeneity hint as additional input increases the network's performance in *out-of-the-money* data, medium and long time to maturity data. However, *neural network* model with five input variables is found to be time-inefficient while training the network, albeit decreasing in performance.

Keywords: *artificial neural network*, *Black-Scholes*, *backpropagation*, *opsi*, *moneyness*, *homogeneity hint*

References: 19 (1976-2018)