

**SCALED CONJUGATE GRADIENT USING STRONG WOLFE
LINE SEARCH FOR PORTFOLIO SELECTION**

NURFATIAH BINTI ANIZAN

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**College of Computing, Informatics and Mathematics
Universiti Teknologi MARA**

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ABSTRACT

Optimization problems always arise in daily life and in fields such as economics, management science, and engineering, where design and performance optimization are common objectives. Industrial applications also focus on maximizing efficiency and minimizing costs. This research explores the application of the Scaled Conjugate Gradient (SCG) method, utilizing a strong Wolfe line search, in the context of portfolio selection. The study systematically compares four SCG methods which are RMIL, AMRI, NMR, and LAMR, to identify the most effective approach. These methods are tested using 20 test functions with different variables also with four initial points have been for each variable. In order to find the best method, the iteration number (NOI) and CPU time are computed. Numerically, SLAMR outperforms others by solving all the test functions, followed by SAMRI (99.06%), SRMIL (91.25%), and SNMR (81.56%). LAMR is the most effective algorithm among those compared, balancing quick problem-solving and solving a larger number of problems. Based on the results, the Scaled LAMR method is the most robust method among others as it can solve 100% of the test functions. Then, the scaled LAMR method is applied in portfolio selection problems, to determine the more suitable investment between CIMB Bank and Maybank. The results showed that CIMB Bank has a lower risk than Maybank, making it the better investment. This study demonstrates the SLAMR method's effectiveness in solving portfolio selection problems.

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