CHARLES UNIVERSITY
Faculty of mathematics
and physics

# Miroslav Svoboda, M.S. Thesis
# Asian Perpetuities

## Supervisor Report

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This thesis studies financial contracts based on various averages (arithmetic, geometric and harmonic) in the situation of infinite time horizon. This problem itself is interesting as these contracts are dynamically evolving in terms of hedging portfolios in contrast to being static which is the case in traditional European option contracts. Moreover, these contracts admit analytical solutions, which is not the case in finite time horizon.

The core results of the author are the pricing formulas for all types of these options, namely Theorem 19 for arithmetic average, Theorem 23 for geometric average and Theorem 27 for harmonic average. Moreover, these solutions (except for the harmonic average) satisfy pricing partial differential equations that are needed for construction of the hedging portfolios. This part has been verified explicitly in Mathematica as the partial derivatives become too complicated to put them in a text. These results are completely original and they have a potential to be published in a respected journal.

The exposition itself has objectively some weaknesses. The author tries to prove the pricing partial differential equation theorems using a more general theory and this requires a higher level of rigor above the level expected in a master thesis. The publication standard would require more detailed proofs with a non-trivial degree of scrutiny. However, the results presented in the thesis seem to be all correct, subject to some technical details. For the case of the Asian option problem, the validity of the statements can be immediately checked since we have analytical solutions and the verification of pricing theorems can be and has been done explicitly.

Another problem with the exposition is that it is not efficiently working with the literature, so a reader can get confused about the original contribution of the author. It would be easier to read if the thesis clearly indicates what parts are original and

what parts are adapted from the existing literature. The references show a room for an improvement. The thesis has also a number of trivial typos and misprints that could have been caught by any text editor spellcheck.

Despite some of the above weaknesses, the thesis delivers some interesting original results that qualify this thesis as a good quality work.

**Summary:** The thesis satisfies conditions of a master thesis and I recommend that it is **accepted as such.**

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