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What kind of financial mathematics should be taught in math classes?

TSG 23: Mathematical literacy

Christian Dorner[*]

Abstract

A qualitative approach via fundamental ideas yields an argumentation for establishing financial mathematical topics in math classes. Such ideas and their relevance for classes will be discussed in advanced.

Keywords:
Financial mathematics
Fundamental ideas
Qualitative research

1 Main Section

There are a few publications in the field of math education and financial mathematics. All of them suggest enthusiastically financial mathematical topics for math classes, e.g.: option pricing in the binomial model, stock price statistics, modeling of the stock price, portfolio theory; those topics are in a certain way uncorrelated and unfounded, except for the standard argument: "Financial literacy is very important nowadays." The study of LUSARDI and MITCHELL points out how little people typically know in the field of financial literacy and the bad consequences for society. However, this is not a justification for teaching one of the mentioned topics. Hence BRUNER's approach to solve such issues via fundamental ideas is a proper way for giving a founded answer of the opening question. We speak of central ideas of financial mathematics instead of fundamental ideas, because financial mathematics is a subdomain of mathematics. How can one find central ideas? BRUNER himself has given the answer: "It is a task that cannot be carried out without the active participation of the ablest scholars and scientists." (BRUNER, 1960, S. 19)

Up to now there exists no list of central ideas of financial mathematics. We set up a qualitative research design in which we have interviewed six financial mathematicians to gain a catalog of central ideas. The interpretation of data leads us to five central ideas: *use of stochastics in a financial mathematics context*, *management of risk*, *no arbitrage principle*, *replication* and *time value of money*. Of course such ideas cannot be taught as a whole in school. One needs some further criteria for good applications in math classes. With respect to BLUM in 1978 we set up four normative criterions: *formal aspects* (e.g. bounded time in class), *suitability for students* (relevant for students either now or later on in life), *authenticity* and *mathematical aspects* (not too trivial and not too difficult). KAISER 2015 confirms the actuality of these criterions.

Thereof one is able to deduce topics for math classes. *No arbitrage principle* and *replication* are too specific, they are neither relevant in their everyday life nor later on. *Use of stochastics in a financial mathematics context* is significant for life to understand that some processes in the financial world have to be considered as random. *Management of risk* is important to realize that many actions in the financial market are risky (consider the change of the interest rate while having a loan). *Time value of money*, the principle "one dollar today is worth more than tomorrow" is the basis for almost every process in the financial world (consider savings, credits, portfolios). We think math classes can/should contribute in this way, concepts as chance and probability which are a vital part of mathematical literacy can be taught in a financial context.

[*] Universität Wien, Fakultät für Mathematik, Oskar-Morgenstern-Platz 1, 1090 Wien.
E-mail: christian.dorner@univie.ac.at

References

Bruner, J. (1960). *The process of education.* Harvard University Press, Cambridge (Mass.), USA.

Kaiser, G. (2015). Werner Blum und sein Beitrag zum Lehren und Lernen mathematischen Modellierens. In: *W. Blum und seine Beiträge zum Modellieren im MU.* (pp. 1-24). Springer, Wiesbaden, Germany.

Lusardi A. & Mitchell O. (2014). The economic importance of financial literacy: Theory of evidence. In: *Journal of economic literature.* Vol. 52(1) (pp. 5-44). Pittsburgh, USA.