REVIEW
by Professor Nikolay M. Yanev, Dr.Sci.
Institute of Mathematics and Informatics, BAS,
member of a scientific jury in an announced competition
for "Associate Professor" at IMI-BAS
according to 4.5. Mathematics, PT and MS

I. Documents and requirements for the candidate

The competition refers to the academic position of "Associate Professor" in the scientific field 4. Natural Sciences, Mathematics and Informatics, professional field 4.5. Mathematics, scientific specialty "Probability Theory and Mathematical Statistics" (Stochastic models in finance), announced in SG no. 108 of 22.12.2020 for the needs of IMI at BAS, with a term of two months. The only candidate in the announced competition is **Assistant Dr. Tsvetelin Stefanov Zaevski**, who currently holds this position in the section "Operations Research, Probabilities and Statistics" (ORPS) at IMI-BAS. For evaluation in the competition I received 17 documents, which are described in detail in the application for participation in the competition. Here are some of the more important ones: CV, diplomas, list of publications and copies of them on paper and electronic media, reference for contributions and citations, reference for fulfillment of the minimum national requirements and the additional requirements under the LRA, etc., all duly formed, which gives me grounds to accept them for consideration and to establish that all formal requirements of the procedure have been met. The CV of the candidate is prepared in accordance with the requirements of the European model and contains the necessary data. Here are some of them. Tsvetelin Zaevski was born on November 27, 1974 in the city of Pleven, where in 1988-1993 he studied at the mathematical high school "Geo Milev". During the period 1993-1999 Ts. Zaevski was a student at FMI-Sofia University, where he graduated in Applied Mathematics. In 2013 at the FMI of Sofia University he acquired the scientific and educational degree "Doctor" at 4.5. Mathematics, defending a dissertation on "Combined processes of Ito and Levi" with Prof. Dr. Racho Denchev as a Supervisor. Since 2014 he has been an assistant in the department of ORPS at IMI-BAS. The autobiography also mentions participation in 3 scientific projects (2015-2022) at the NSF. Ts. Zaevski's scientific interests are generally in the field of PT and MS, as well as their applications in the field of financial mathematics. The general list of publications contains 13 titles, of which 10 are presented in the

competition, which in turn are after obtaining the scientific degree "Doctor" and were published in the period 2014-2020 in renowned journals with impact factor (total IF = 21.059). Five of the articles are in Q1 and four are in Q4. Detailed summaries of the contributions of the scientific papers in Bulgarian and English are presented. A separate reference is given to the scientific contributions of scientific publications, which are divided into 5 sub-areas. A separate reference for 28 citations is attached, of which 15 relate directly to the competition. The report on the educational activity of Ts. Zaevsi in the FMI of Sofia University was signed by the dean of the faculty and shows that he has taught exercises in Theory of Finance 2, and since 2019 he has been lecturing on "Mathematical Theory of the Financial Market".

From the inspection there is no finding for absence or presence of violations in the procedure and for inadmissibility of the candidate to the competition. On the contrary, the high quality of the submitted materials for the competition and the full satisfaction of all formal regulatory requirements are obvious. All this gives me a reason to proceed to the next sections, according to the LRA and the relevant regulations.

II. Analysis of research, education and scientific and applied activity

The 10 articles presented in the competition have been published in a number of renowned international journals with an impact factor: 4 articles in *Chaos, Solitons and Fractals* (Elsevier), IF = 3.764, Q1; one article in *Commun.NonlinearSci.Numer.Simulat* (Elsevier), IF = 4.115, Q1; one article in *Inter.ReviewFin.Anal*. (Elsevier), IF = 0.881, Q3. Three papers were published in *CRABS*, IF = 0.343, Q4, one in the *Annual of SU*. All 10 works are in English with a total IF = 21.059. The articles are distributed as follows: 6 - independent, 1 - with one co-author, 2 - with two co-authors, 1 - with three co-authors. There are 6 co-authors in total, of which 2 are foreigners. Due to the lack of other grounds, I accept as natural at least the equal co-authorship of Ts. Zaevski in the joint works. These data well illustrate the possibilities of Ts. Zaevski to work with different authors in different topics. In the attached report on scientific contributions, the main results obtained are given, which are divided into 5 areas of research. The basic apparatus is actually stochastic differential equations (SDE), which are used as models in financial mathematics. Thus, in article [1] of the list of publications, we start from the famous model of Black and Scholes and some of its summaries, and finally come to another one, in which the Poisson component is replaced by a class of Levy processes. Empirical data presented in relevant tables, model calibration, statistical tests (goodness-of-fit)

and graphs are used, ultimately showing the advantage of the new model. Articles [3] and [4] are devoted to default derivatives, for which two theorems have been conducted in [3], and in [4] - six theorems and one example with interesting graphs. The models are also related to Brownian motion in SDE, using stopping time and various methods of stochastic analysis. A similar technique is used in articles [5] and [6], where the subject of the study is American-type derivatives. In [5] a theorem was proved, which shows in particular the connection with the European type of derivatives. In [6], a theorem was proved that gives the basic representation and an interesting example was constructed using the Monte Carlo method to simulate Brownian motion. The articles [7], [8] and [9] examine the so-called game options. The characteristic of these works is that optimal stopping times are sought. The results are presented in the corresponding Propositions or Theorems. All three articles give numerical examples, provided with illustrative graphs. Article [2] at first glance stands apart from the general issue because it is interested in gene expression, but as successfully noted in the report, if the concept of genes is replaced by assets in the financial market, it naturally leads to the problem of spectral clustering, for which in the article is introduced and studied a new algorithm. Article [10] explores a problem related to the Brownian motion, which in turn is interesting in relation to various applications in financial mathematics. It is about the stopping time to first reach a given function, in this case it is a class of piecewise linear functions. Representations for the corresponding Laplace transforms are found (Theorem 4.1 and 4.2).

In general, all the results obtained undoubtedly fully cover the standards that can be applied to a habilitated person. The same applies to the scientific and applied production analyzed above, as evidenced by the three projects of the NSF, the latter of which is still in force. And the attached reference to the minimum scientific requirements shows that they are undoubtedly exceeded. He deserves admiration and his teaching and educational activities at the FMI of Sofia University, where Ts. Zaevski has given exercises and now lectures on financial mathematics. As required, I must explicitly state that I do not see any grounds for plagiarism or anything like that in the peer-reviewed works.

III. Opinions, recommendations and notes

I would like to make a remark to the candidate that he did not attach to the materials of the competition an abstract from his dissertation. This always gives a greater completeness of presentation, although this document is not required by the relevant laws and regulations (strange why ?!).

As a recommendation, I would like to draw his attention to the possible defense of a dissertation for a "Doctor of Science", for which there is undoubtedly potential.

Conclusion

The inspection of the submitted materials for the competition did not reveal any violations in the procedure, as all the above-mentioned requirements were met. Any suspicion of possible plagiarism must be categorically ruled out; on the contrary, the original contribution is not in doubt.

As already emphasized in the previous sections, the scientific production of Ts. Zaevski is at a high scientific level, as well as his scientific-metric indicators in the field of Stochastics (and in particular in the field of stochastic models in financial mathematics) with publications in renowned journals with impact factor and citation rate. He is a "doctor" in the field of the competition and lectures on financial mathematics at the FMI of the Sofia University. In addition, he has worked on 3 projects, and is currently actively working on a project at the NSF, whose basic organization is at IMI-BAS.

Everything presented so far gives me a definite reason to conclude that the only candidate **assistant Dr. Tsvetelin Stefanov Zaevski** undoubtedly satisfies all the conditions of the announced competition for the academic position of "Associate Professor" at IMI-BAS and I call on the scientific jury and the Scientific Council to vote convincingly and positive for his choice.

Date: April 14, 2021.

REVIEWER:

/ Professor Nikolay M. Yanev, Dr.Sci. /