# REVIEW

for Assoc. Prof. Tsvetelin Stefanov Zaevski, D.Sc.
competition for the academic position of **"Professor"**
in Professional Field **4.5 Mathematics**
Scientific Specialty **"Operations Research" (Financial Mathematics)**

**Reviewer: Academician Ivan Petkov Popchev – Bulgarian Academy of Sciences (BAS)**

Pursuant to Article 29a, Paragraph 1 of the Act for the Development of Academic Staff in the Republic of Bulgaria (ADASRB), Article 12, Paragraph 4 of the Regulations for the Conditions and Procedure for the Acquiring of Academic Degrees and the Occupation of Academic Positions at BAS, and by the Decision of the Scientific Council of the Institute of Mathematics and Informatics (IMI-BAS) (Protocol No. 7 / 10.07.2026), by Order No. 73 / 23.07.2026 of the Director of the Institute of Mathematics and Informatics, Corresponding Member Prof. P. Boyvalenkov, D.Sc., I was appointed as an external member of the Scientific Jury for the competition for the academic position of **"Professor"** in the professional field **4.5 Mathematics**, scientific specialty **"Operations Research" (Financial Mathematics)**, published in the State Gazette No. 63 / 10.07.2026.

As a reviewer, I have received all 19 documents for participation in the competition.

According to the Act for the Development of Academic Staff in the Republic of Bulgaria (ADASRB), the Regulations for its Implementation (RIADASRB), and the Regulations for the Conditions and Procedures for the Acquisition of Academic Degrees and the Occupation of Academic Positions at the Institute of Mathematics and Informatics, BAS, a candidate for the academic position of **"Professor"** must satisfy a number of statutory requirements.

**Article 29 (1)**, Candidates for the academic position of "Professor" must meet the following conditions:

1. To have acquired the educational and scientific degree of "Doctor" (PhD);
2. To have held the academic position of "Associate Professor" at the same or another higher education institution or research organization for not less than two academic years;
3. To have presented a published monograph or equivalent publications in specialized scientific journals, which do not duplicate those submitted for the acquisition of the educational and scientific degree "Doctor" (PhD), the scientific degree of "Doctor of Sciences" (D.Sc.), or for the appointment to the academic position of "Associate Professor";
4. To have presented other original scientific research works, publications, inventions, scientific and applied developments, or artistic achievements, to be evaluated as a whole;
5. To meet the minimum national requirements under Article 2b, Paragraphs 2 and 3, respectively the requirements under Article 2b, Paragraph 5;
6. To have no plagiarism in scientific works established under the procedure prescribed by the law.

**Article 29 (3)** Candidates shall submit a report on the fulfillment of the minimum national requirements under **Article 2b, Paragraphs 2 and 3**, respectively the requirements under Article 2b, Paragraph 5, together with a report on the original scientific contributions, to which the relevant supporting evidence specified in this Act, the Regulations for its implementation,

and the regulations of the higher education institutions and scientific organizations shall be attached.

According to the Regulations for the Implementation of the **ADASRB at IMI-BAS, Article 3 (1) Item 4**, the publications submitted for participation in a competition for the academic position of "Professor" must include at least **12 publications** in scientific journals indexed with an Impact Factor (IF) or a Scimago Journal Rank (SJR). For professional field 4.5 Mathematics, it is required that at least 6 of these publications be in journals with an IF.

**Assoc. Prof. Tsvetelin Zaevski, D.Sc. satisfies the requirements of Article 29, Paragraph 1**, since he has submitted diploma No. SU 2013-119 / 15.10.2013, issued by Sofia University "St. Kliment Ohridski".

**Assoc. Prof. Tsvetelin Zaevski, D.Sc. satisfies the requirements of Article 29, Paragraph 1, Item 2** according to Official Certificate No. 509 / 12.08.2026 issued by the Director of IMI, Cor. Memb. Prof. P. Boyvalenkov, D.Sc. As of August 1, 2026, Tsvetelin Zaevski has a total of 12 (twelve) years, 6 (six) months, and 16 (sixteen) days of professional experience, including 5 (five) years and 2 (two) months as an "Associate Professor" at the Institute of Mathematics and Informatics – BAS.

**Assoc. Prof. Tsvetelin Zaevski, D.Sc. satisfies the requirements of Article 29, Paragraph 1, Item 3,** as he has submitted equivalent publications in specialized scientific journals which do not reproduce those presented for "Doctor", "Doctor of Sciences", and "Associate Professor".

**Assoc. Prof. Tsvetelin Zaevski, D.Sc. satisfies the requirements of Article 29, Paragraph 1, Item 4,** as he has submitted 18 scientific publications.

**Assoc. Prof. Tsvetelin Zaevski, D.Sc. satisfies the requirements of Article 29, Paragraph 1, Item 5**, according to the submitted **"Report on Compliance with the Minimum National Requirements for Candidates in a Competition for the Academic Position of Professor at IMI-BAS"** in the professional field 4.5 Mathematics, achieving 1381 points across all five groups, with a minimum requirement of 660 points.

**Assoc. Prof. Tsvetelin Zaevski, D.Sc. satisfies the requirements of Article 29, Paragraph 1, Item 6**, since there is no legally established plagiarism in his scientific publications.

Item 6 presents a **"General List of Publications"**, which includes **63 publications** in English published in the period **2007-2026**. This list includes publications 54 and 42. These publications are included in the attached documents as workbooks: 1 and 2. They are presented with their initial 6 pages each.

Item 7 of the attached documents contains the **"List of Publications for Participation in the Competition"**, which includes 16 publications. The analysis of these 16 publications shows the following:

- 5 publications are in journals with SJR, IF, Q1 (7, 11, 12, 15, 16);
- 5 publications are in journals with SJR, IF, Q2 (2, 3, 4, 13, 14);
- 3 publications are in journals with SJR, IF, Q3 (1, 8, 10);
- 1 publication is in a journal with IF, Q2 (6);
- 1 publication is in a journal with SJR, Q1 (9);
- 1 publication is in a journal with SJR, Q3 (5);

- Six publications (10, 12, 13, 14, 15, 16) are sole-authored.

The publications are written in English and were published in the period **2022-2026**.

Item 11, **"General List of Citations"**, contains **221 citations**, 166 of which are in WoS/Scopus, across 47 publications.

Item 12, **"List of Citations for Participation in the Competition"**, contains **99 citations** of 30 publications. This list includes **10 publications for participation in the competition with 48 citations**. Specifically, formatted as **"publication number/citations"**, it can be presented as follows: 1/1, 2/10, 3/2, 4/5, 5/1, 7/20, 9/2, 10/2, 11/3, 12/2.

A report on the **"Scientific Contributions of the Publications for Participation in the Competition for the Academic Position of Professor"** of 26 pages has been submitted. In this report, according to the author, "the scientific contributions are in several directions and can be systematized as follows":

1. Investigation of various modifications of the Kies distribution (publications 1, 2, 3, 4, 5).
2. Identification of chaos in perturbed dynamic systems (publication 6).
3. Financial mathematics:
   (a) Risk analysis and management (publications 7, 8, 9).
   (b) American-style derivatives (publications 10, 11, 12, 13, 14, 15).
   (c) Yield curve (publication 16).

Pursuant to Article 29, Paragraph 3, "relevant evidence must be attached" to the report. The reviewer systematizes the **contributions** as follows:

a) Scientific Contributions

   1. Formulas for the moments and the mean residual life function for the four-parameter Kies distribution have been derived – Proposition 3.2 in [1].
   2. Modifications of the Kies distribution have been defined and investigated: nested distributions [2], min and max distributions [3], mixtures [4], as well as certain trigonometric compositions [5].
   3. Semi-explicit formulas have been derived for the so-called saturation in the Hausdorff sense – Theorem 4.4 in [2], Theorems 5.5 and 6.6 in [3], Theorem 4.4 in [4], Propositions 4.1-3, 5.1, 5.2, and 5.4 in [5].
   4. In [6], a specific differential system is generalized by adding a multi-frequency perturbation, which is subsequently generalized into a characteristic function of a probability distribution. In Theorem 1, the homoclinic orbit is derived, and the potential emergence of chaotic behavior is investigated using Melnikov's criterion.
   5. In Theorem 3.2 of [7] and in Section 3 of [9], formulas for the risk measures ES (expected shortfall), ERM (expectile risk measure), and EVaR (Entropic VaR) are derived for the most popular financial models – Black-Scholes, Heston, Bates, Exponential Tempered Stable model, and a model with stochastic volatility and tempered stable jumps.
   6. In Theorems 3.1-4 of [8], the abscissas of convergence of the moment-generating function for the averaged log-returns in the Heston model are derived, along with their positions relative to the abscissas of the original returns.

7. In [12], a sub-optimal exercise strip for an American option is defined, its behavior is characterized in Propositions 3.1-3, and closed-form formulas are derived in Section 3.3 for the case without maturity restrictions.
8. In Theorems 4.16 and 5.4 of [14], necessary and sufficient conditions are derived to determine the type of a cancellable American option – a real cancellable option, a specific American-style derivative, or a classical American option.
9. In Theorems 1 and 2 of [15], polynomial-form formulas are derived for the optimal boundaries of cancellable American options in the case without maturity restrictions. Based on these results, a put-call duality is proven in Theorems 3 and 4 in the presence or absence of maturity.

b) Applied Contributions

1. The differential system with multi-frequency perturbation defined in [6] is applied to an SIQR epidemiological model.
2. The risk measures ES, ERM, and EVaR are applied to a time series of the S&P 500 financial index in [7,9].
3. A method for approximating the optimal boundaries of American-style derivatives is developed – futures [10], power options [11], sub-optimal American options [12], and cancellable American call options [13]. An algorithm for their pricing is also constructed.
4. A method for extracting the yield curve under insufficient information is designed according to the market specifics of the Bulgarian government securities (Government Bonds)[16].

An official **"Certificate"** (Ref. No. 66 / 5.8.2026) signed by Prof. M. Stoyanova, PhD – Dean of the Faculty of Mathematics and Informatics (FMI) at Sofia University "St. Kliment Ohridski" – confirms that **Tsvetelin Stefanov Zaevski** was a **part-time lecturer** at the Departments of "Probability, Operations Research, and Statistics" and "Complex Analysis and Topology" at FMI, Sofia University. He has taught Bachelor's and Master's students in the courses "Theory of Finance 2" and "Mathematical Theory of the Financial Market" during semesters spanning from the 2004/2005 academic year to the 2025/2026 academic year.

According to the three attached certificates (No. 272 / 04.08.2026 from Sofia University, and No. 348 / 03.08.2026 and No. 510 / 12.08.2026 from IMI-BAS), the candidate in the competition has participated in the following four projects:

1. BG-RRP-2.011-0049 (2024-2026)
2. BG05M2OP001-1.001-0003 (2018-2023)
3. BG-RRP-2.0004-0008 (2023-2026)
4. Big Data Analysis in Astrophysics, Earth Observations and Applications, EBR-SERBIA (2020-2022).

Assoc. Prof. Tsvetelin Zaevski, D.Sc. served as the scientific supervisor of Dragomir Nedelchev, who successfully defended his PhD degree in 2026 at IMI-BAS.

The global databases provide a summarized **"Scientometric Profile"** of the candidate:

– **Web of Science:** 49 total publications, 280 citations, h-index 9;

– **Scopus:** 51 documents, 305 citations, h-index 10;

– **Google Scholar:** 424 citations, h-index 11; i10-index 14;

– **ResearchGate:** 1816 Research interest score, 391 citations, h-index 12;

– **zbMATH Open:** 23 publications since 2007;

– **MathSciNet (AMS):** 27 total publications, total citations 12 in 3 publications;

– **ORCID:** 46 works.

**The summarized scientometric profile** indicates successful research activity. It should be the subject of mandatory critical self-analysis of all elements to stimulate sustainable publication activity in established journals with an IF (Q1). Convinced of the theoretical and applied value of the scientific results in financial mathematics obtained by the candidate, the reviewer takes the liberty of recommending that he author and publish a monograph titled **"Mathematical models in finance: Problems and Decisions"** with a reputable international publishing house in English.

# Conclusion

All conditions according to ADASRB, Regulations for application of ADASRB, and the Regulations for application of ADASRB in IMI-BAS are met and I give a definite **positive conclusion** for the election of Assoc. Prof. Tsvetelin Stefanov Zaevski in the competition for the academic position of "Professor" in Professional Field 4.5 Mathematics, Scientific Specialty "Operations Research" (Financial Mathematics).

**I propose that the Scientific Jury unanimously vote on the proposal to the Scientific Council of IMI-BAS to elect Assoc. Prof. Tsvetelin Stefanov Zaevski, D.Sc. to the academic position of "Professor" in professional Field 4.5 Mathematics, Scientific Specialty "Operations Research" (Financial Mathematics).**

Sofia, 20.10.2026

**Reviewer:**

**/acad. Ivan P. Popchev/**