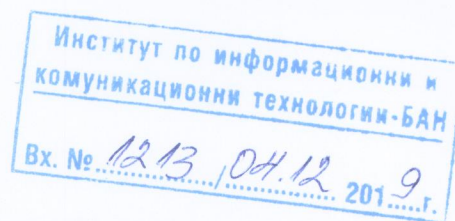


OPINION
on PhD thesis



Author of the thesis: **Veselin Lazarov Shahpsov**

Dissertation thesis: **Research on neural networks based capital markets forecasting models**

Member of the Scientific Jury: Assoc. Prof. PhD Vera Angelova Angelova - IICT - BAS

1. Actuality of the problem - degree and level of the actuality of the problem and the specific tasks developed in the thesis.

A characteristic of the human being is his striving to control and subordinate the objects and persons surrounding him and to achieve an increase in his well-being, whatever that means for the concrete individual. Information and money are two tools for success in this direction. Stock exchanges are the place where much of the world's wealth is redistributed. An information about the direction of movement of the capital market is of utmost importance and an accurate forecasting increases the opportunities for successful investment. The development of information technologies, computer science and computing allow analysis of voluminous data sets, solution of increasingly complex problems. In this sense, the objective of the thesis: Research on neural networks based capital markets forecasting models, is undoubtedly up-to-date.

The formulated 6 tasks:

- Research of the formation, development and ability of neural networks to forecast the capital market.
 - Analysis of the methods for forecasting capital markets with neural networks.
 - Researching the Bulgarian stock market as a subject of forecasting.
 - Formulating a hybrid model for capital market forecasting.
 - Carrying out experiments with the hybrid model in the real life conditions on the Bulgarian capital market.
 - Summary of the achieved results and future development of the model.
- are adequately subordinated to the objective and contribute to its development.

2. Level of knowledge of the state of the art of the problem and creative interpretation of the literature.

The author reviews 122 literature sources, 11 sites, and 1 normative document related to capital markets forecasting, artificial intelligence and the Bulgarian Stock Exchange. The analysis of the methods for forecasting capital markets, the characteristics of neural networks and their application for forecasting capital markets, as well as the analysis of the characteristics of the Bulgarian Stock Exchange, show a very good knowledge of both current trends and achievements, as well as important specificities related to the capital markets and the condition and forecasting possibilities with neural networks.

points with minimum requirements 0, including: $D11 = 5 * 6 (2 - 6) = 30$. The indicators exceed the minimum specific requirements of IICT - BAS for the acquisition of a scientific and educational degree PhD.

6. Comments, recommendations and remarks

The material contains the required for PhD degree thesis original scientific and applied results. The thesis shows that the candidate possesses a profound theoretical knowledge of the relevant specialty and the abilities for independent scientific researches. I have remarks on the layout and structure of the text. Some grammatical norms have been violated, presence of matching texts /p. 10 and page 13/, incomplete bibliographic data. On page 110 in the formulas for A '(k) and B' (k), two of lines refer to A 'and B'.

7. Conclusion

The thesis complies the requirements of the Law on the Development of the Academic Staff in the Republic of Bulgaria, the Regulations for its implementation and the Regulations for the Terms and Procedure for Acquisition of Scientific Degrees at IICT - BAS for PhD degree in scientific area 4. Natural sciences, "Mathematics and Informatics", professional field 4.6. Computer Science, Doctoral Program in Computer Science. **I give a positive evaluation.**

Date: 4/12/2019

Member of the Jury:

**NOT FOR
PUBLIC RELEASE**

/V. Angelova /