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OPINION

by Prof. Dr. Veselin Ivanov Hadjiev

for Anton Antonov Gerunov's dissertation to confer the scientific degree "Doctor of Science" on the topic "Automated Approaches to Operational Risk Management"

The opinion is prepared on the basis of № RD 38-232 / 24.06.2020 of the "St. Kliment Ohridski" Sofia University's Rector. The opinion is given by Prof. Dr. Veselin Ivanov Hadjiev from the University of Economics-Varna. The author of the dissertation is Assoc. Prof. Dr. Anton Antonov Gerunov, who is awarded to confer the scientific degree "Doctor of Science" from the Faculty of Economics at Sofia University "St. Kliment Ohridski", Sofia. The topic of the dissertation is "Automated Approaches to Operational Risk Management".

1. Overall Assessment

According to the presented reference, Assoc. Prof. Dr. A. Gerunov meets the minimum of the national requirements to confer the scientific degree "Doctor of Science" in category 3 "Social and Economic Sciences and Law". The presented manuscript of dissertation does not repeat and does not overlap the author's defended PhD thesis.

The Faculty of Economics at Sofia University "St. Kliment Ohridski " has an accredited doctoral program in the professional field 3.8 "Economics", specialty "Economics and Management (Industry)".

The submitted dissertation is in the form of a monographic manuscript. It corresponds to the scientometric requirements for concept, volume, structure, sources of information, etc. for conferring a scientific degree. The dissertation consists of 357 pages and appendices, structured in five chapters, introduction, conclusion and bibliography. The bibliography includes 410 sources from both Bulgarian and foreign authors.

This contemporary research contributes to the development of research systems. The author aims to justify the possibility and propose an algorithm for operational risk management, quantitative assessment methods and technological architecture that will successfully integrate within a special information system to generalize predictive patterns of operational risk. A correspondence between the research goals and the obtained results is established.

The author presents the logical structure - algorithm, tools, system. He correctly uses the variety of statistical and econometric techniques in Chapter Three "Automated Application of Classification Algorithms for Operational Risk Management" and Chapter Four "Automated Application of Regression Algorithms for Operational Risk Management".

To estimate the operational risk, author uses both standard econometric methods (Correlation, Linear regression, Logistic regressions, etc.) and advanced models in the field of machine learning (Neural networks, Reinforcement learning, Bayesian networks, Support vector machine , etc.). All computations are done using the statistical package R and R programming language.

The dissertation uses three types of data: primary, secondary and self generated. Base on Appendix 3 we can make a decision that there are sufficient amount of data to make statistical inferences and obtain statistically significance results.

The results of the dissertation are shared with the scientific community through 3 scientific studies, 5 articles, a monograph chapter, and a monographic textbook. One of the author's peer-review articles was published in a journal indexed in Scopus.

The author's summary consists of 66 pages. It correctly and synthesized presents the content and the most important parts of the dissertation.

2. Evaluation of Contributions

The dissertation presented for defense has a conceptual character. It can be considered as a foundation for building specific business information systems for assessment and optimization of operational risks. In general, contributions can be summarized as follows:

- The author presents and systematizes the various aspects of the approaches to operational risk management in depth and details;
- The author derives a general algorithm for automated management of operational risks through analysis and synthesis of the existing literature and author's extensions by the method of design science;
- The author proposes a reference architecture of a management information system, which fully automates the activities of the derived general algorithm for information risk management;
- The author estimates and evaluates a large number of classification and regression algorithms.

3. Notes and Recommendations

The submitted manuscript of dissertation is conceptual, presents the author's point of view and does not exclude other solutions. There are some minor problems needing clarification:

- How does the system react of the shocks?

Although the limitations of the dissertation include a "limited set of situations involving operational risk", shocks are inherent in the economic reality and cannot be excluded as a circumstance. Automatic control systems, even artificial intelligence in certain situations, are compromised in shock. In this sense, I would recommend the mechanisms to shut down the system in the event of abnormal situations.

- What is provided against noise?

Not all of information is valuable. It is necessary to provide procedures and measures for cleaning inappropriate or inherent information. There is always a danger of processing too much noise, processing of inherent information, respectively making irrational decisions.

- Under what circumstances is the automated operational risk management system applicable?

The developed system suggests that there are available resources of information, computing resources, organization, and other resources, typical for large companies and institutions. How to apply this system to smaller companies?

4. Conclusion

The presented manuscript of dissertation “Automated Approaches for Operational Risk Management” by Assoc. Prof. Dr. Anton Antonov Gerunov, has all necessary features to be defended for conferring the scientific degree “Doctor of Sciences” in category 3 “Social and Economic Sciences and Law”. For this reason, I suggest to the members of the honorable jury to vote positively for conferring the scientific degree "Doctor of Science" to Assoc. Prof. Dr. Anton Gerunov.

14 August, 2020

Varna Prof. Dr. V. Hadjiev