

Report on Master Thesis

Institute of Economic Studies, Faculty of Social Sciences, Charles University

Student:	Michal Spišiak
Advisor:	Petr Teplý
Title of the thesis:	Cyber risk modelling using copulas

OVERALL ASSESSMENT *(provided in English, Czech, or Slovak):*

Contribution

The thesis is focused on modeling of cyber risk, or data breach risk as a new type of operational risk. Using large dataset and extreme value theory, author models aggregate losses in three different industries and finds that potential global losses due to data breach risk are significant. Since author argues that global cyber risk is often underestimated, he also discusses policy recommendations. While the topic is potentially interesting, it reduces to a statistical description of number of breaches.

Methods

Author uses advanced techniques of copulas that are well mastered together with appropriate testing procedures and interpretations. On the other hand, analysis reduces to a comparison of number of data breaches multiplied by some estimated cost of a breach with GDP levels which reduces to a simple descriptive comparison of two (possibly unrelated) figures. Much deeper analysis would be required to state how cyber risk is important. I am not sure I understand how author estimated the value of cyber risk.

Literature

Author discusses the literature in detail, and shows deep understanding of the problem as well as provides a nicely written discussion how literature deals with cyber risks.

Manuscript form

Although the text has good structure and form in general, and the text is logically organized, the presentation sometimes lacks clarity. Most crucial, number of important details are not discussed well and make it very hard for reader to understand what author tries to show. In my view motivation could be bit sharper since it is not clear if authors intend to estimate the cyber risk, or wants to estimate impact of cyber risk on society, or both. From the point of view of the story, it is bit difficult to catch up with author. In many parts quite vague and slang language is used making it even more difficult to follow. Methodology section contains formally definitions but many formulas and methods lack intuitive and simple descriptions for a general interest reader (we have to keep in mind that this text is intended to be a general interest text). Lastly, results are described at its very technical detail, but again a big picture and interpretation of the partial results is often not clear. Apart from harder readability form is proper.

Summary and suggested questions for the discussion during the defense

In conclusion, the thesis is solid piece of work which deserves to be defended. Although the author does a nice job introducing and discussing the problem of cyber risk, the empirical exercise and contribution itself is not so deep and hence I have few questions for the defence:

1/ Please state clearly economic contribution of the work. The conclusion mentions 4 contributions as use of unique dataset, use of some specific tests, and reporting % CVaR of global GDP, but these are

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too specific for a general interest reader. Could author simply state what do we learn from the analysis as economists?

2/ It is not very clear how reliable quantification of potential losses is. Author describes three variables, date, number of breach records and industry. This means that author models number of breach records in industries as losses and then uses some US estimate of 150USD per breach together with copula fits to state that there is no significant difference between loss from data breach and Czech GDP per year. Can author elaborate how reliable this comparison is? To me this seems quite arbitrary.

3/ I would like the author to discuss the main reasoning of the work. Why modeling dependence between the number of breaches is important to an economy?

4/ Lastly, it seems to me that by comparison of number of breaches at some estimated cost with GDP level does not tell us much. It would be more interesting to see how and if cyber risk influences GDP. Please provide proper economic reasoning why the result is interesting.

In addition, the results from Urkund analysis do not indicate any significant text similarity with other available sources. In case author is confident in presenting the details of the work during the defense, and especially providing sound answers to the four points raised, I suggest to award the work with grade „C“.

SUMMARY OF POINTS AWARDED (for details, see below):

CATEGORY	POINTS
<i>Contribution</i> (max. 30 points)	21
<i>Methods</i> (max. 30 points)	21
<i>Literature</i> (max. 20 points)	20
<i>Manuscript Form</i> (max. 20 points)	11
TOTAL POINTS (max. 100 points)	73
GRADE (A – B – C – D – E – F)	C

NAME OF THE REFEREE: Jozef Barunik

DATE OF EVALUATION: 19.8.2020

Referee Signature

EXPLANATION OF CATEGORIES AND SCALE:

CONTRIBUTION: *The author presents original ideas on the topic demonstrating critical thinking and ability to draw conclusions based on the knowledge of relevant theory and empirics. There is a distinct value added of the thesis.*

METHODS: *The tools used are relevant to the research question being investigated, and adequate to the author's level of studies. The thesis topic is comprehensively analyzed.*

LITERATURE REVIEW: *The thesis demonstrates author's full understanding and command of recent literature. The author quotes relevant literature in a proper way.*

MANUSCRIPT FORM: *The thesis is well structured. The student uses appropriate language and style, including academic format for graphs and tables. The text effectively refers to graphs and tables and disposes with a complete bibliography.*

Overall grading:

TOTAL	GRADE
91 – 100	A
81 - 90	B
71 - 80	C
61 – 70	D
51 – 60	E
0 – 50	F