Opponent's Report on Dissertation Thesis

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Title of the Thesis:	Three Essays on Bank-Sourced Credit Risk Estimates
Type of Defense:	**DEFENSE**
Date of Pre-Defense	February 17, 2021
Opponent**:**	Hsin-Vonn Seow Ph.D.

Address the following questions in your report, please:

a) Can you recognize an original contribution of the author?
b) Is the thesis based on relevant references?
c) Is the thesis defendable at your home institution or another respected institution where you gave lectures?
d) Do the results of the thesis allow their publication in a respected economic journal?
e) Are there any additional major comments on what should be improved?
f) What is your overall assessment of the thesis? (a) I recommend the thesis for defense without substantial changes, (b) the thesis can be defended after revision indicated in my comments, (c) not-defendable in this form.

(Note: The report should be at least 2 pages long.)

I can confirm that I standby the original pre-defense comments as follows:

"I had the pleasure to read the doctoral thesis written by Barbora Štěpánková titled "Three Essays on Bank-Sourced Credit Risk Estimates". The candidate writes that the aim of the thesis is to bring new insights into banks' internal credit risk estimates and their application in estimation of credit transition matrices which I find refreshing and original, making it a valuable addition to the body of current literature on this matter. This opens access to alternative data source for a crucial part of credit risk modelling which has run into many issues stemming from the problem of limited publicly available sources. This research provides strong evidence at the benefits of using the banks' internal credit risk estimates in the estimation of credit transition matrices compared to relying on the Credit Rating Agencies. It is noted that this research benefits from access to the dataset from Credit Benchmark to navigate through the research design for this objective.

The content of this doctoral thesis consists of three essays that jointly analyse features of bank-sourced credit risk data and practicalities of transition matrices estimation:

Essay 1

In the first essay, two widely used assumptions used for the estimation of transition matrices are tested empirically: Markovian property and time homogeneity. The candidate obtained results that indicate that internal credit risk estimates do not satisfy the two assumptions, showing evidence of both path-dependency and time heterogeneity, even within a period of economic expansion, which is what the dataset for the period covers. This paper concludes that contradicting previous findings based on data from credit rating agencies, banks tend to revert to their past rating actions.

Essay 2
The second essay investigates and analyses the extent to which transition matrices depend on the characteristics of the underlying overlapping bank sourced credit risk datasets and the aggregation method. In this paper, it is shown that the choice of aggregation approach is having a substantial effect on the credit risk model's results. The results obtained show that bank-sourced transition matrices are more dynamic than those produced by credit rating agencies. Furthermore, the results show the existence of industry- specific business cycle via the introduction of industry-specific transition matrices. This is a new and exciting addition to the existing literature of credit risk modelling.

Essay 3
The third and final essay focuses on dispersion in banks' internal credit risk estimates. The results in the paper support the conclusion that there is a substantial variance in the estimates and that the variance decreases with the amount of information available about the assessed entity. In addition, the candidate showed that the level of variance is highly dependent on the entity type, the industry and locations of both the entity and the contributing banks. The result also show that the variance is generally systematic. Finally, the candidate presents the massive impact that the COVID 19 pandemic has had on dispersion of credit estimates which makes this piece of research current and relevant to the times.

The flow and presentation of these three essays is essential to the reading of the results. Firstly, from the validation (or dis-validation) of the assumptions usually taken to estimate the transition matrices empirically, with a detailed analysis and write up on these interpretations. This was then followed by, given the results of Essay 1, to what extent the effect on the transition matrices will the overlapped bank-sourced data and aggregation approach has on the model. Then finally on the dispersion of the banks' internal credit risk estimates.

The findings from these three essays are significant contributions to the literature of credit risk modelling. Particularly the introduction of banks' internal credit risk estimates and their application in estimation of credit transition matrices as an alternative of those from the Credit Rating Agencies. The candidate meticulously worked at validating the use of banks' internal risk estimates in credit transition matrices in the first essay, followed by designing a comparison between the results of the said CTM and that from the Credit Rating Agencies in the second essay. The finding of industry -specific transition matrices allow for better estimates. Finally, the candidate presents insights into factors that influence the dispersion of banks' internal credit risk estimates.

Throughout the doctoral thesis, the candidate has referenced the appropriate and seminal papers in credit risk modelling that support the essays and doctoral thesis. The doctoral thesis

is appropriately targeted for a PhD, with new significant contributions to the existing literature of credit risk modelling. However, I am acutely aware that these results are based on the access to the required dataset for the estimated. Hence this research is limited by the access to data like that was available to the candidate through Credit Benchmark and Anacredit efforts. However, as these findings are meant for the regulators, this should negate the concern of the access to the required database.

I can see at least another paper being submitted for publication in Q1 ranked Economics journals (https://www.scimagojr.com/journalrank.php?category=2002) like Quantitative Economics or Annual Review of Economics. I congratulate the candidate for having a recent paper published in the European Journal of Operational Research.

The doctoral thesis has been well constructed in its research design, and written in detail within the three essays presented. The writing flow is good and sensible allowing the reader to follow a well-though out research design."

Since the pre-defense, Barbora has addressed my concerns as per the pre-defense report.

Based on these points, I strongly recommend this thesis for defense without substantial revision.

Date:	April 21, 2021
Opponent's Signature:	
Opponent's Affiliation:	Hsin-Vonn Seow Ph.D. University of Nottingham Malaysia