

Opponent's Report on Dissertation Thesis

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Title of the Thesis:	Credit Derivatives Market during Recent Financial Crisis
Type of Defense:	DEFENSE
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Opponent:	prof. RNDr. Jiří Witzany, 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 defensible 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-defensible in this form.

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

Content of the Report:

The Dissertation Thesis is based on three empirical research papers focusing on the market of collateralized debt obligations (CDO) and credit default swaps during and after the financial crisis. The first paper implements the standard one-factor Gaussian copula CDO valuation model and investigates its weaknesses that might have contributed to the crisis. The remaining two papers perform advanced time series analysis of CDS prices and study their relationship to the underlying reference entity credit or liquidity risks.

The answer to questions a), b) and d) above is positive: The first two papers have been already published in impacted journals and the third also allows publication in a respected economic journal. Therefore, the thesis contains an overview of the current state of knowledge, it is based on relevant references, and there are original contributions of the author. Regarding question e), I have only minor remarks, questions, and recommendations given in the more detailed discussion of the three papers below.

It should be noted that the remarks of this final report have not changed too much compared to the pre-defense report since I have not found changes of the text related to the remarks with the exception of a newly added Chapter 4 dealing with the issue of endogeneity of explanatory variables.

The first paper investigates five clearly stated hypotheses related to the standard CDO valuation model, the key correlation and hazard rate input parameters, and the valuation output in terms of the tranche premium and market values. Due to lack of data on funded CDOs, the author uses CDX index tranche data, implements the valuation model, analyzes and confirms the research hypothesis. I have the following discussion comments:

- The author uses the IMF (2008) definitions of a CDO: "A structured credit security backed by a pool of securities, loans, or credit default swaps, where securitized interests in the security are divided into tranches with differing repayment and interest earning streams." This brief definition does not emphasize the key property of funded CDOs that are usually based already on structured bonds like mezzanine MBS tranches which make the valuation extremely complex. In my opinion, the discussion in the paper neglects this important aspect of CDOs. It should be also noted that the empirical study focuses on the CDX tranches with 125 underlying credit entities where the analysis is much simpler than in case of structured finance CDOs. Some conclusions may also differ if the empirical analysis was done on a "typical" CDO backed by "recycled" MBs tranches.
- The focus of the empirical study on CDX tranches causes that the conclusions emphasize the impact of defaults of the companies listed in the CDX index (Lehman Brothers, Fannie Mae, Freddie Mac, etc.). Unfortunately, the study does not say too much about the link between the mortgage market, MBS market, the CDO market, and finally the CDX tranche market of course impacted by defaults of the large financial institutions. Could the author discuss more these relationships?

The second paper analyzes reliability of the CDS market during the Eurozone crisis in particular in relation to problematic recognition and loss calculation of the Greek debt. The author uses firstly a single equation model where changes of market CDS spreads are regressed on changes of model CDS spreads derived from bond prices, changes of counterparty risk proxy, and of a liquidity measure. The goal is to identify possible breakpoints related to the Greek debt restructuring events. The second approach based on the seemingly unrelated regression (SUR) technique uses the same target and explanatory variables and leads to similar conclusions. I have the following minor remarks:

- The study uses the German government bond yields as a proxy of risk-free rates. This would be a standard choice before the financial crisis but during and after the crisis this proxy has become problematic as even German government went up to 100 bps and recently have stayed stay at about 20-40 bps. The choice of the risk-free proxy implies that the model premium for Germany is 0. This is why Germany is not included in the analysis but the same problem appears for other low risk Eurozone countries maybe causing the different conclusions for the lower and higher risk groups of the investigated countries. I would recommend OIS rates that have become a standard proxy of risk-free rates and should be already available in the periods under investigation.
- The counterparty credit risk is approximated by the average CDS premium of top global investment banks. This indicator is related to the counterparty credit risk but it also represents a global credit risk level factor which explains a significant part of individual CDS movements as noted in the second paper. Therefore, the two factors, i.e. the model CDS spread and the "counterparty" credit risk, may be quite correlated causing problems in the regression and interpretation of the results. Did the author investigate this issue?

- Exogeneity of the explanatory variables is tested calculating the correlation between residuals and the variables. Especially in case of the single equation model estimated by OLS, the correlation must be zero by definition. The issue insufficient exogeneity testing mentioned by reviewers during the pre-defense is now sufficiently dealt with in newly added Chapter 4 that uses the technique of instrumental variables and 2SLS/3SLS alternative models confirming the conclusions of Chapter 2 and 3.

The third paper uses similar techniques as the second one but focuses on the time series regression breakpoints related to issuance of the new ISDA (2014) Credit Derivatives Definitions. Besides the single equation regression models and the SUR regression with similar target and explanatory variables as above, the autoregressive fractionally integrated moving average model combined with fractionally integrated generalized autoregressive conditional heteroscedasticity model (ARFIMA-FIGARCH) is applied to the CDS market prices in order to test for long memory in CDS returns and volatilities. Regarding the regression study I have only a few minor remarks as above:

- In this case the author uses the simple government bond yield spread with respect to the mid IRS rates as the main explanatory variable. The IRS rates present a better risk-free proxy, compared to German yield used in the second paper, but still contain significant interbank market credit risk of the IBOR rates that may cause the spreads (government yields minus market IRS rates) being negative for shorter maturities. Again, OIS rates would be a better choice.
- The regression and the time series models are based on daily differences. Would the author expect the results to change, especially the fundamental relationship between the bond spreads and CDS premiums, if weekly or monthly changes (presumably containing less market noise) were used?

Overall, answering the questions c) and f), in my opinion, **the thesis would be clearly defendable at my home institution and I recommend the thesis for defense without substantial changes.**

Date:	11.9.2018
Opponent's Signature:	
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