THE UNIVERSITY OF CHICAGO

Physical Sciences Division

SCHOOL OR DIVISION

# REPORT OF FINAL EXAMINATION FOR THE

# DEGREE OF S.M.

The Chairman of the Examining Committee is asked to report the result to the

Office of the Dean of the Division or School without delay

Examination of: Steven Moen UCID: 12208767

Department: Statistics

Thesis Subject:\* Multivariate CAViaR: An Insightful Approach to Risk Modeling

This thesis builds upon previous literature for modeling value-at-risk (defined as an x% quantile of an asset's daily returns) using non-linear ARMA terms by adding exchange-traded funds (ETFs) as explanatory variables that are combined into principal component vectors at the forecast origin. Combining these principal component vectors with transformations of lagged autoregressive response variables results in a model that produces similar predictive accuracy during periods of relatively low volatility along with more insight into the drivers of the changes in the response variable. In fact, one insight gained from the new model is a method of detecting changepoints in the economy by measuring the angle between resultant vectors calculated from the combination of principal component vectors during different time periods. This method, along with analysis of the statistical significance of the lagged ETFs, allows for insight into changes in the underlying economy.

Examining Committee: Dr. Wei Biao Wu, Dr. Mei Wang

Date of Examination: Wednesday, May 13th, 2020

Committee, Messrs:- Dr. Wei Biao Wu, Dr. Mei Wang

The S.M. candidate is recommended for degree.

Chairman