

EUROPEAN BANKS SYSTEMIC RISK BETWEEN 2021 AND 2023: AN ANALYSIS THROUGH BAYESIAN NETWORKS

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OBJECTIVE OF THE THESIS

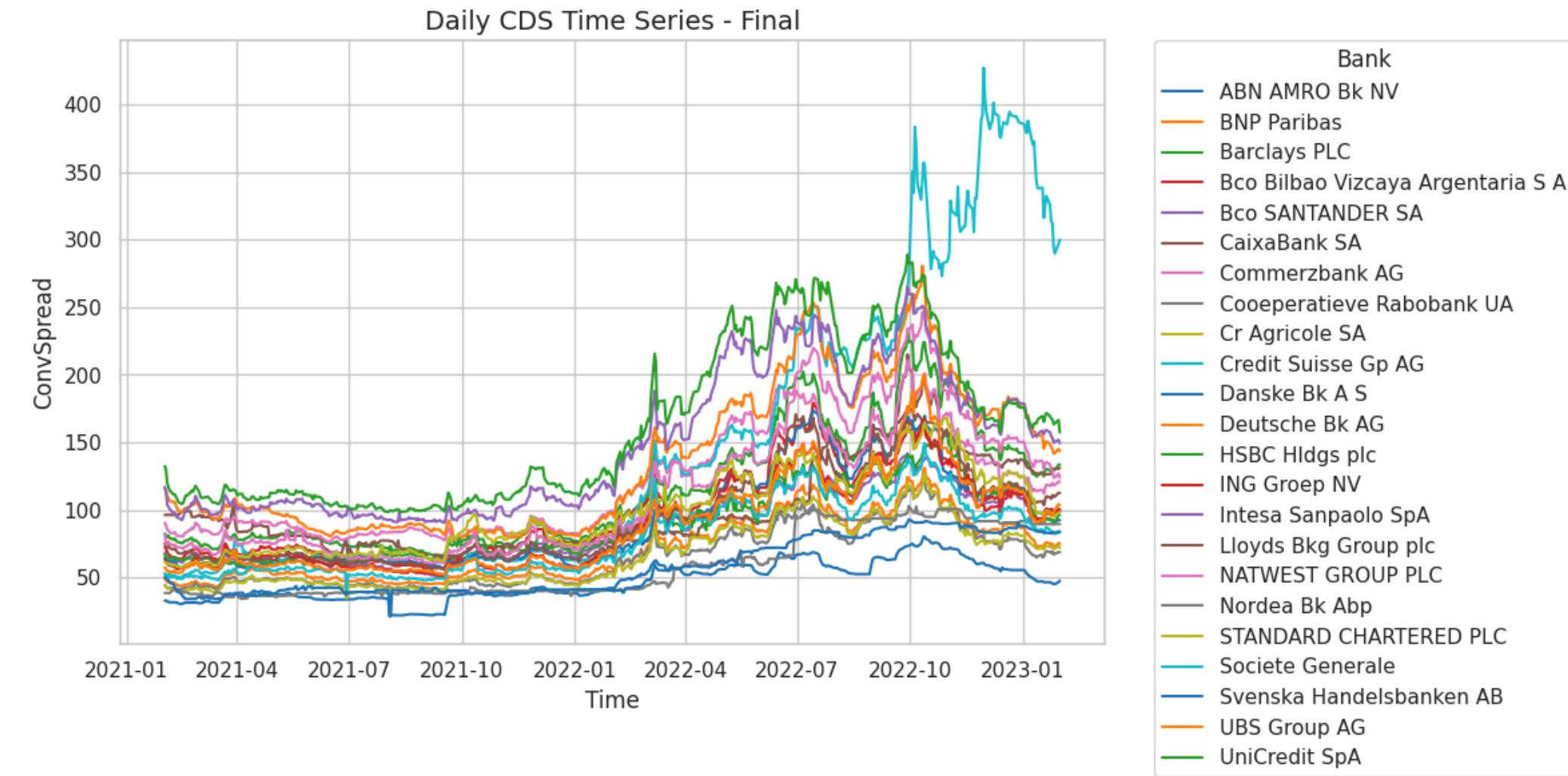
- Different crises have recently hit the world economy
- Search for models able to predict these events and their effects
- The aim of this thesis is to analyse the evolution of the systemic risk of the European banks between 2021 and 2023
- The model selected is the Bayesian Network

OBJECTIVE OF THE THESIS

- What is the systemic risk? The risk of distress in a large proportion of entities. Different from systematic, related to the concept of dependence
- Why banks? Instability often originates in the financial sector and spreads in the real economy from banks through a domino effect
- Which banks played a greater role in the propagation of stress?

DATA

The data are the Credit Default Swap spreads



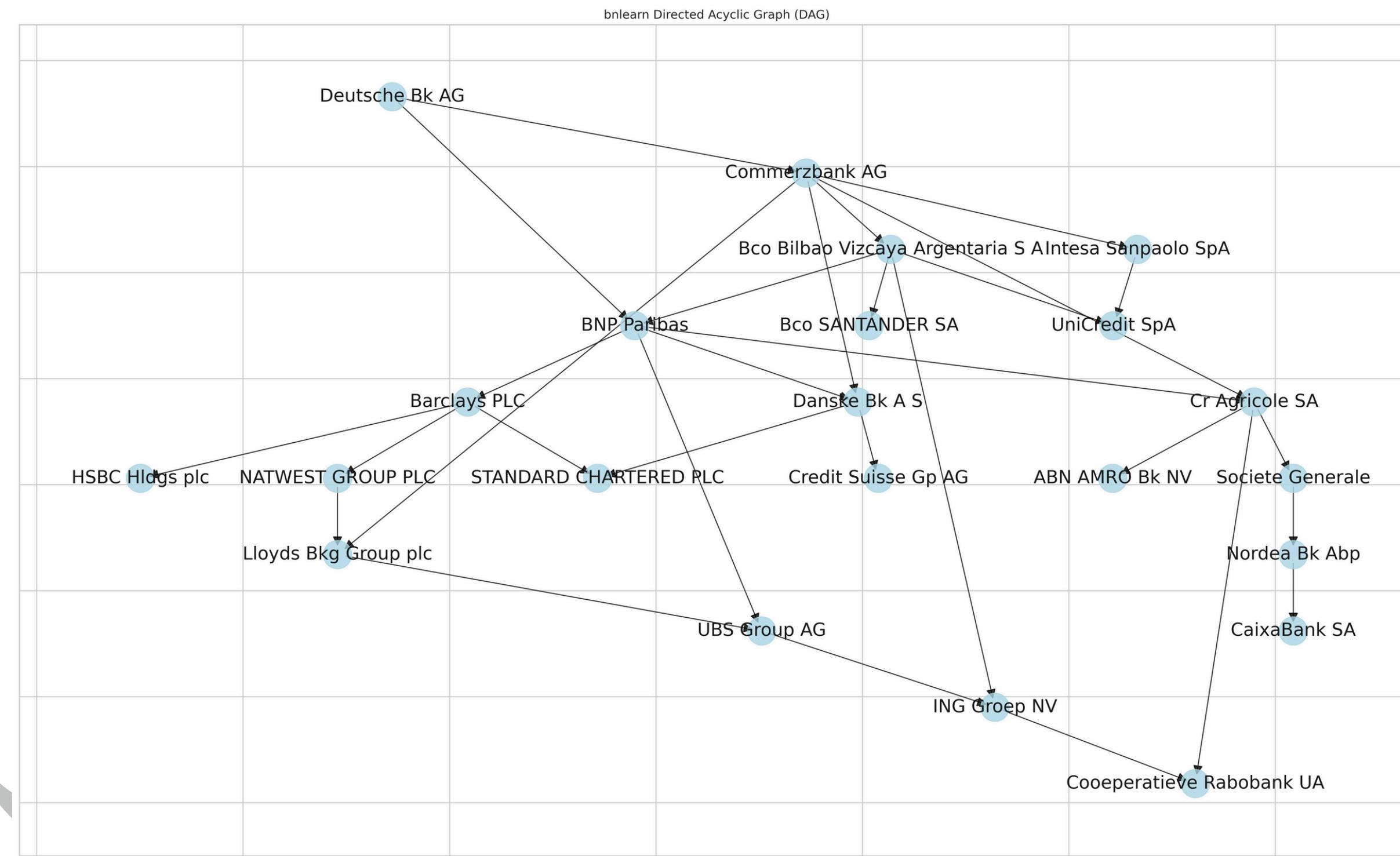
CDS: OTC derivative that allows to perform credit risk management

DATA

- An entity (Protection Buyer) lent money to a third party (Reference Entity) and wants to be insured against loss due to its default
- The credit risk is transferred to the Protection Seller in return for a monetary compensation and the cost of this insurance is the CDS spread
- If the reference entity does not pay back, the Protection Seller covers the loss

THE MODEL

The Bayesian Network estimated on the whole period:



THE MODEL

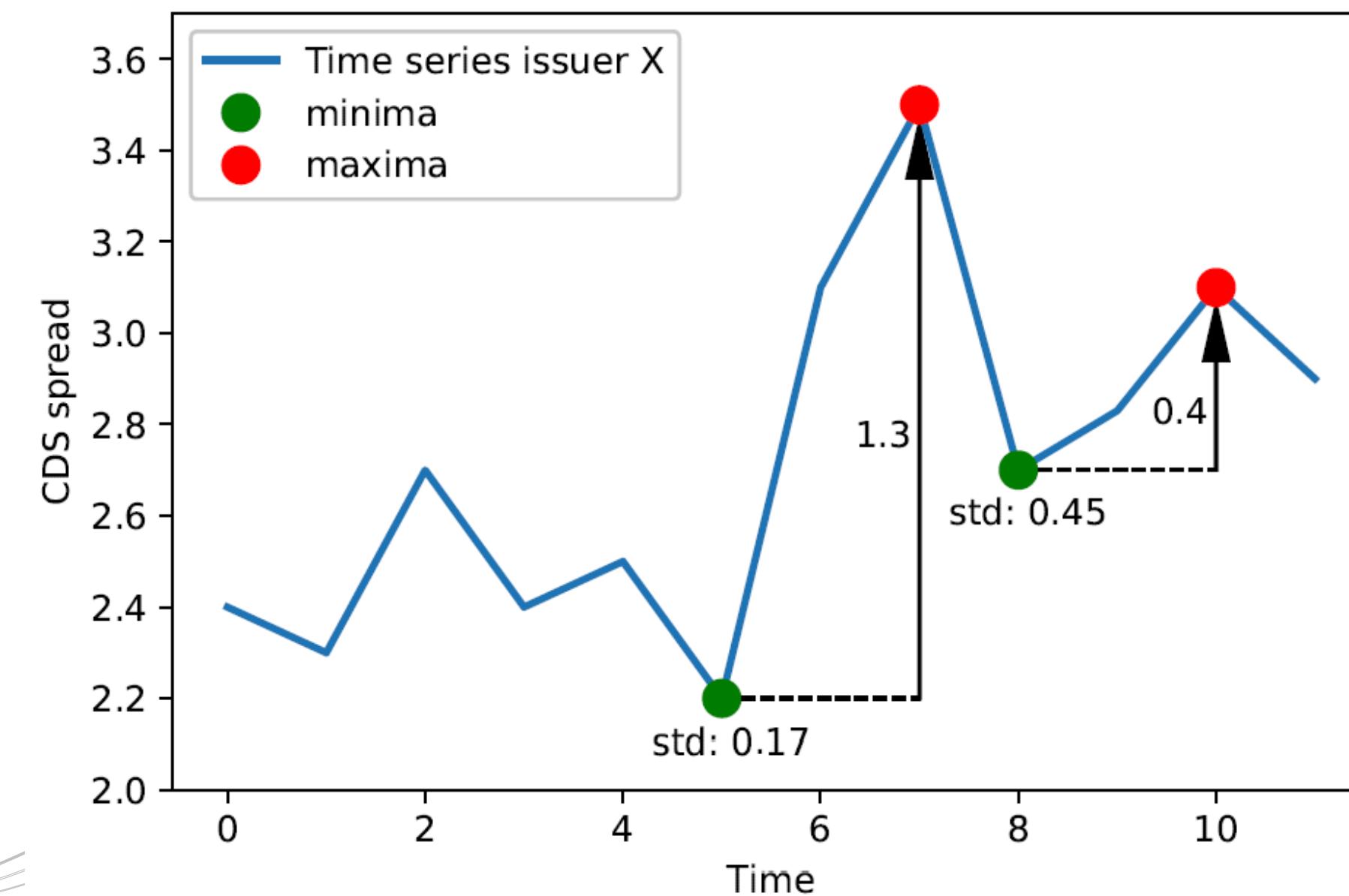
Advantages:

- with the estimated structure, some information can be derived about the relationships between the variables
- embeds the probability distribution in a tractable way even when the number of variables is large (factorization)
- purely data-driven approach
- easy to perform inference

The restrictive assumption of conditional independence must hold

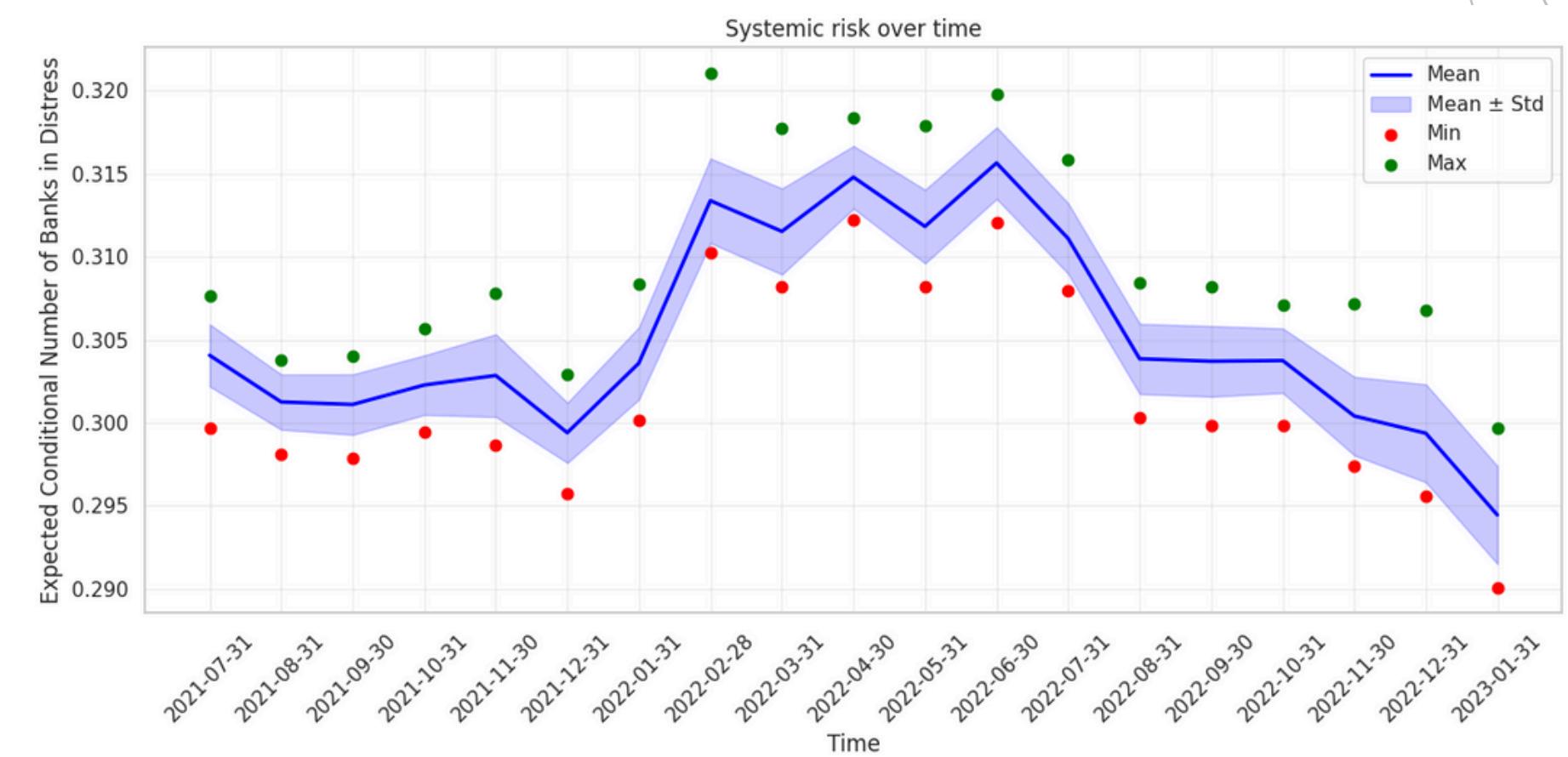
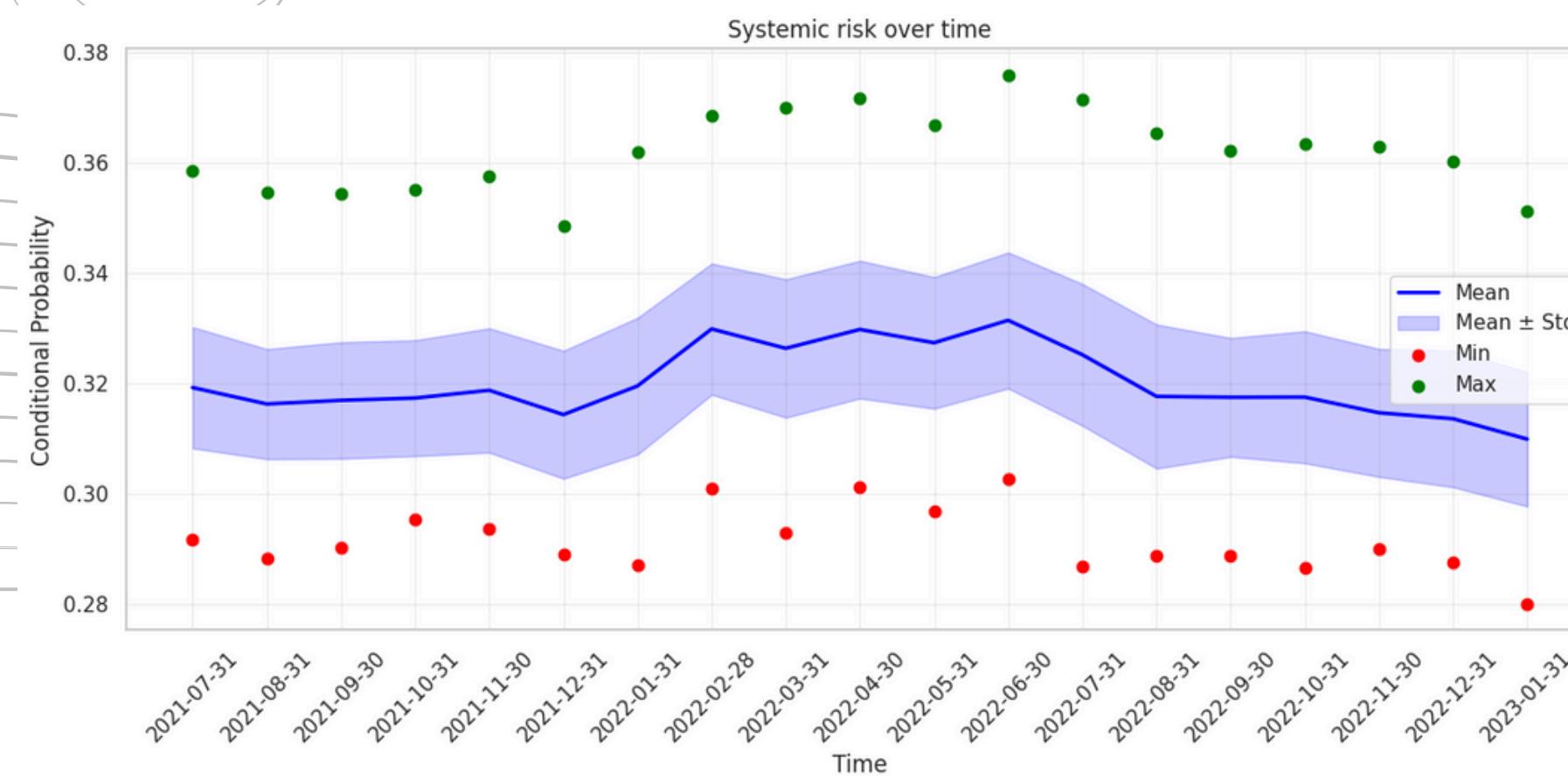
METHODOLOGY

To preprocess the data, the modified ϵ -drawup algorithm was applied



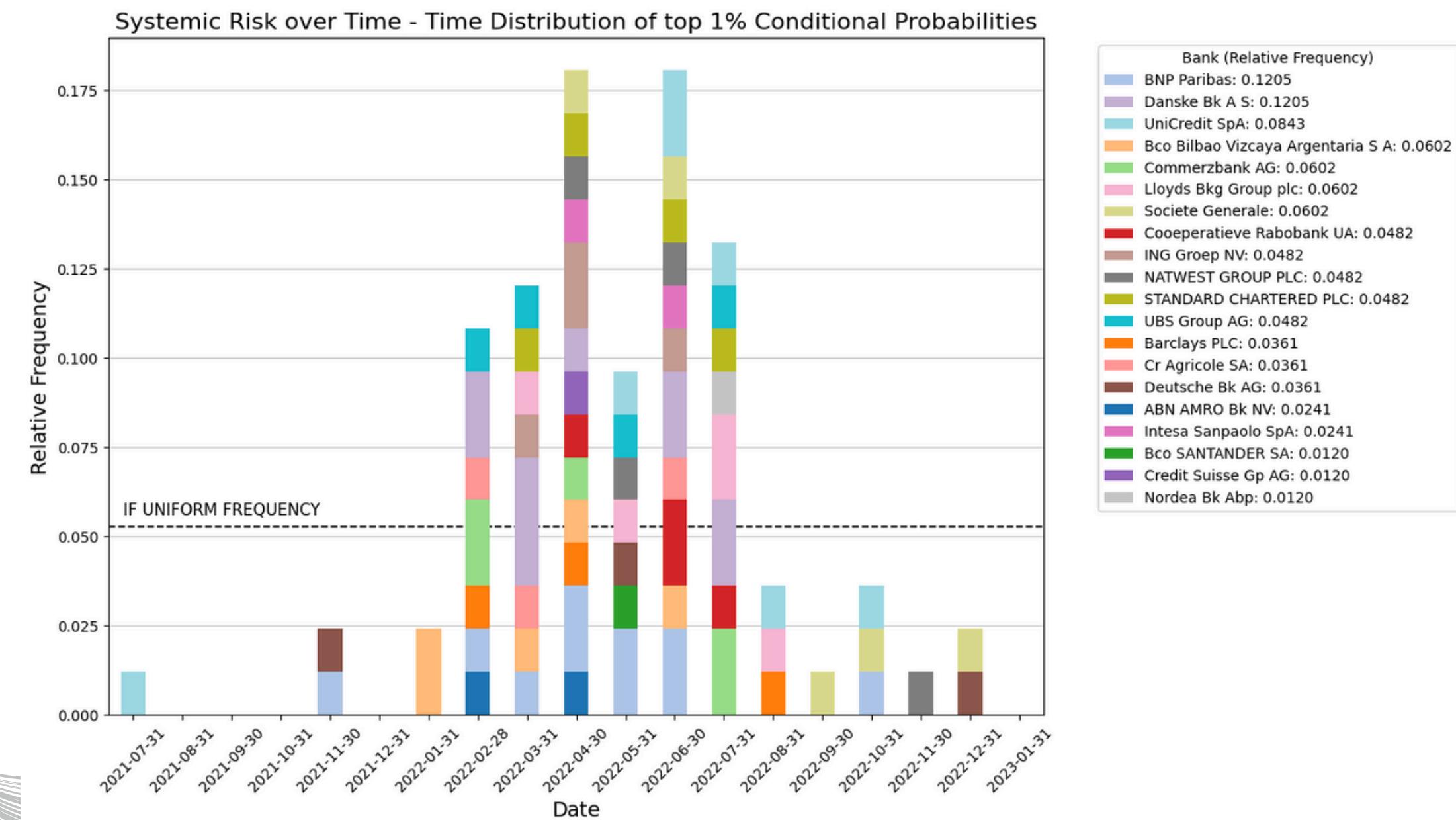
KEY RESULTS

1) Sharp increase of systemic risk in February 2022, quickly reabsorbed



KEY RESULTS

2) BNP Paribas and Danske Bank A S were the banks most responsible for the propagation of the stress



CONTRIBUTIONS AND IMPLICATIONS

- a bank's contribution to the sector's systemic risk is not necessarily correlated to its size
- Bayesian Networks “self-select” important variables
- no benchmark: was the risk high or not?
- no previous loss of resilience apparently

Thank you for the attention!

Any questions?

APPENDIX

Regarding the definition of conditional independence among two variables, let define 3 random variables, X, Y and Z.

A random variable X is conditionally independent of Y given Z if Z contains all the information needed to describe the distribution of X. Therefore, observing the realization of Y adds no information to the model's estimate.