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# STOCHASTIC OPTIMIZATION SYSTEM FROM BANK REVERSE STRESS TESTING

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- Introduction
- Logic of reverse stress test analysis
- A few remarks

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# INTRODUCTION

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## Starting point of the paper

- Stress tests necessary for
  - ICAAP/ILAAP
  - Recovery plans
- Therefore – new issues for risk managers of banks and supervisors regarding
  - Methodological and
  - Operational aspects

# INTRODUCTION

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## Requirements for stress tests

- Considering adverse scenarios (rather than one), to cover
  - Effects of different combinations of risk factors
  - Different degrees of severity (also losses related to rare events) and adopt a high degree of severity
  - Impact of risks that are difficult to quantify, like reputational and strategic risks
- Addressing vulnerabilities of a bank
- Capturing tail events in the medium-long term
  - like non-linearity, second round and feedback effects
- Interaction among risk factors  
(in particular in relation to solvency-liquidity interlinkage)

# INTRODUCTION

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## Aim of reverse stress test (1)

- Contribution to understand
  - Bank's vulnerabilities
  - Degree of sustainability of the business model
  - Conditions of default or near default
  - Critical risk drivers
- Output
  - Detection of the reverse stress test scenario  
(also representing the starting point of the recovery plan scenario)

# INTRODUCTION

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## Aim of reverse stress test (2)

- Advantage
  - By comparing the reverse stress test scenario with the bank's stress test
    - Possibility to challenge assumptions and degree of severity of the bank's stress test
    - Possibility to assess plausibility that the event of default or near default associated with the reverse stress test scenario may occur
    - Estimation and quantifyability of a bank – without identifying the exact adverse event and risk factor magnitude that causes the default

# INTRODUCTION

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## Aim of the article itself

- Presentation – Reverse stress test methodology
- Basis – Optimization system
- Application – within a stochastic simulation framework for stress testing
- Model – Providing a quantitative procedure which allows to derive the combination of risk factors that – by triggering a key indicator threshold (like CET1 ratio) – causes the bank's default (with a certain degree of approximation)
- Usefulness – for bank risk managers and supervisors in risk assessment processes that require a reverse stress test (RAF, ICAAP Recovery and Resolution Plan, SREP)



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# LOGIC OF REVERSE STRESS TESTING ANALYSIS

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## Technically

- Detecting scenarios between condition of viability and default
  - Finding exact conditions in a small set of risk drivers that trigger a bank's default
- Method
  - Reduced and simplified modelling framework
  - Here – RoE and RoA

# LOGIC OF REVERSE STRESS TESTING ANALYSIS

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## Reflecting bank's business model

- Illustration of the bank's business model by four variables
  - Business growth – financial assets
  - Risk absorption – RWA
  - Profitability – RoE
  - Capital regulatory constraint – CET1 ratio
- Note – the greater the number of risk drivers, the greater the number of possible solutions (in the above model – just one solution)
- Purpose of the paper
  - Presenting a technique to determine the reverse breaking points and suggest a criterion for selecting one breaking point among all those determined and the corresponding set of risk factor assumptions which define the reverse stress test scenario

# LOGIC OF REVERSE STRESS TESTING ANALYSIS

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## Problems included

- Reverse stress testing involves two types of problems
  - Computational issue related to the technique used to derive the reverse solutions – which means to find the reverse breaking points
    - Resolved through quantitative methods
  - Choise of a criterion to select the reverse stress test scenario from among all the solutions obtained
    - Not to be resolved through quantitative methods only – subjective decisional criteria in addition necessary

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## A FEW REMARKS

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## Just a few comments (1)

- Stochastic reverse stress testing – modelling and framework
  - Limitations – limited data set available for the case study
  - Strong focus on mathematical description – more economic background or linkage to be given (non mathematics will have difficulties to understand the technical language)
  - However – well description of the stochastic simulation framework for reverse stress testing – also illustrated in a separate figure
- Optimization system for reverse stress test
  - Getting even more statistical
  - However – well founded by both, underlying literature and well taken argumentation
- Reverse break-even point
  - Clear argumentation, further illustration by a figure

# A FEW REMARKS

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## Just a few comments (2)

- Italian bank case study
  - Very nice that a case study is included
  - Time horizon – 2019 – 2021, considering 2018 financial statement data as the starting point of the analysis
    - First time application might influence the quality of the analysis
- However – it is shown how the theoretical model can work in practice
- Nice description of the reverse stress results and scenario selection
- Conclusion – detailed paper on a possible model with regard to a bank's reverse stress testing – to be tested (and back tested) by using a larger sample

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Thank you very much for your attention