Default Propagation in Financial Networks

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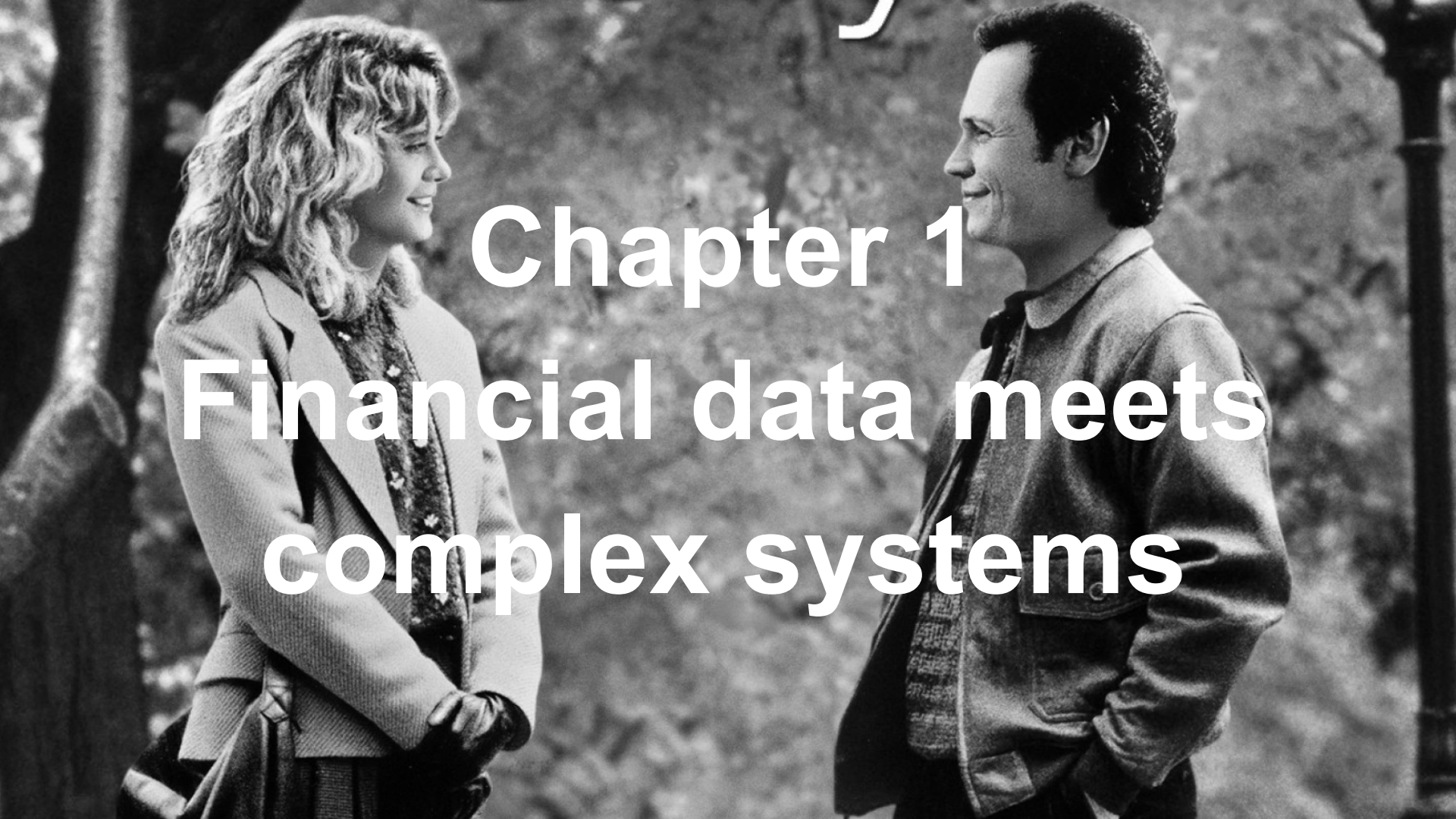
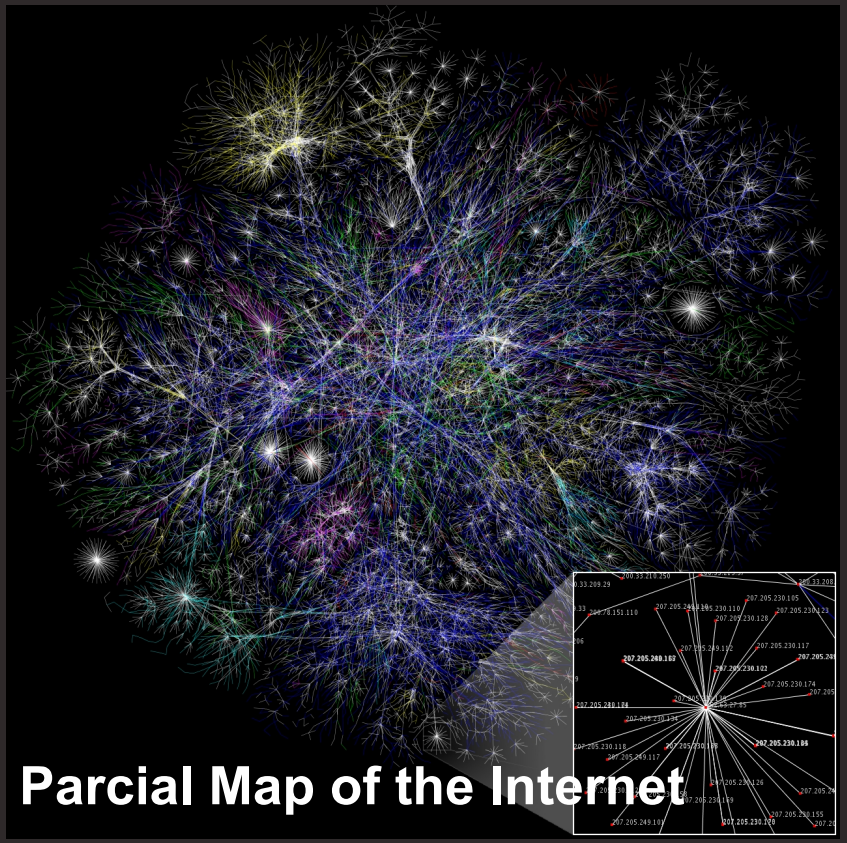


Chapter 1
Financial data meets complex systems

Complex Systems

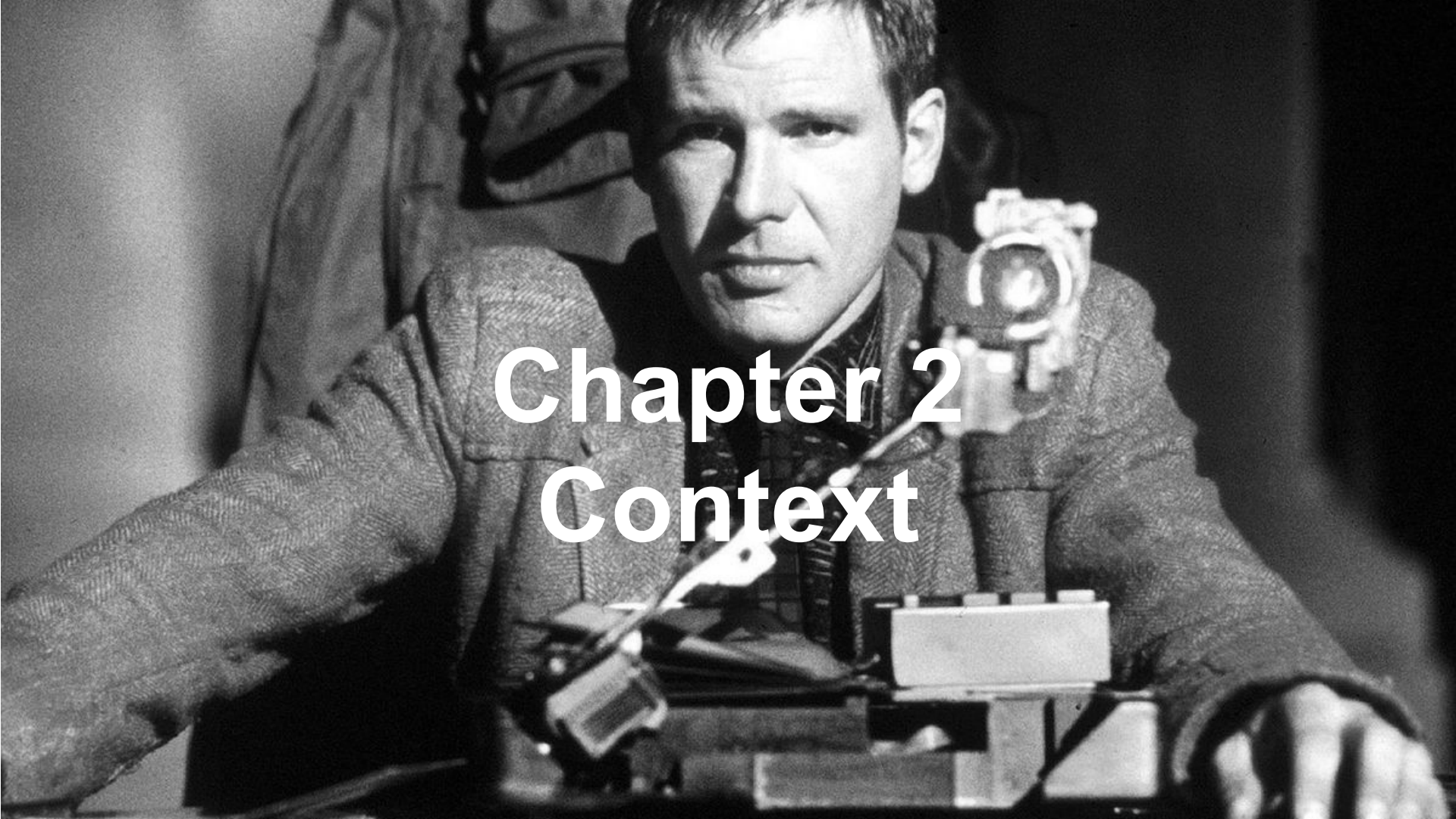


Parcial Map of the Internet

Goal

Find inside the complex topology, simple structures to partially understand some order within apparently chaotic systems

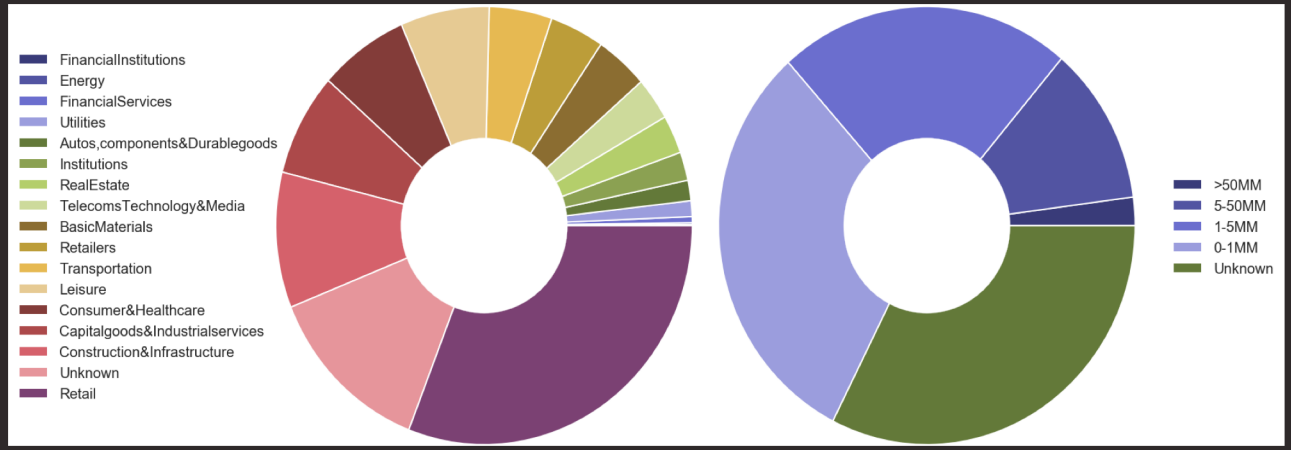
Micro - Meso - Macro



Chapter 2
Context

Financial Networks

- Payments from company A to B
- 347 info year 2016: 142,477 companies 255,509 relations



Default Propagation

- When a company defaults its providers are in troubles

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- β: infectivity rate
- μ: recovery rate

Default Propagation

$$q_i = \prod_{j=1}^{N} (1 - \beta r_{ij} p_j(t)) : Infection\ Probability$$

$$p_i(t+1) = \underbrace{(1 - q_i(t))\,(1 - p_i(t))}_{P(S \cap I)} + \underbrace{(1-\mu)p_i(t)}_{P(I \cap R^c)} + \underbrace{\mu\,(1 - q_i(t))\,p_i(t)}_{P(R \cap I)}$$

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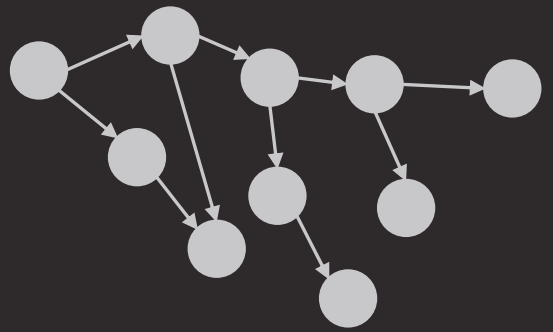
Why?

- Typical risk model assessment: Isolated data in “normal” situations
- We want relational data
- We look for exceptional scenarios (Default cascades)



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Chapter 3
Business Relations

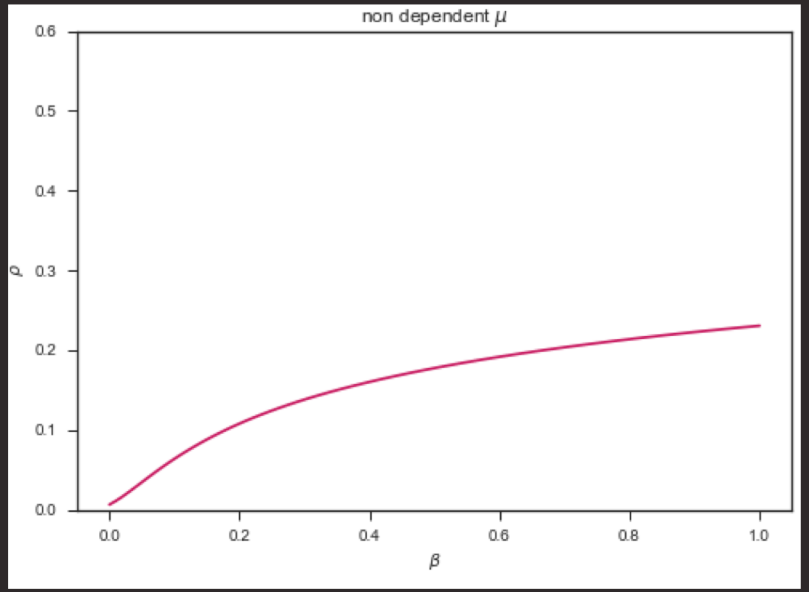
Failure / Success

Network Construction

- W: 347 information
- X_i : Default labels
- SIS Model

Simple Default Propagation

$$\rho = \frac{\sum_{i=1}^{N} p_i^{ss}}{N}$$



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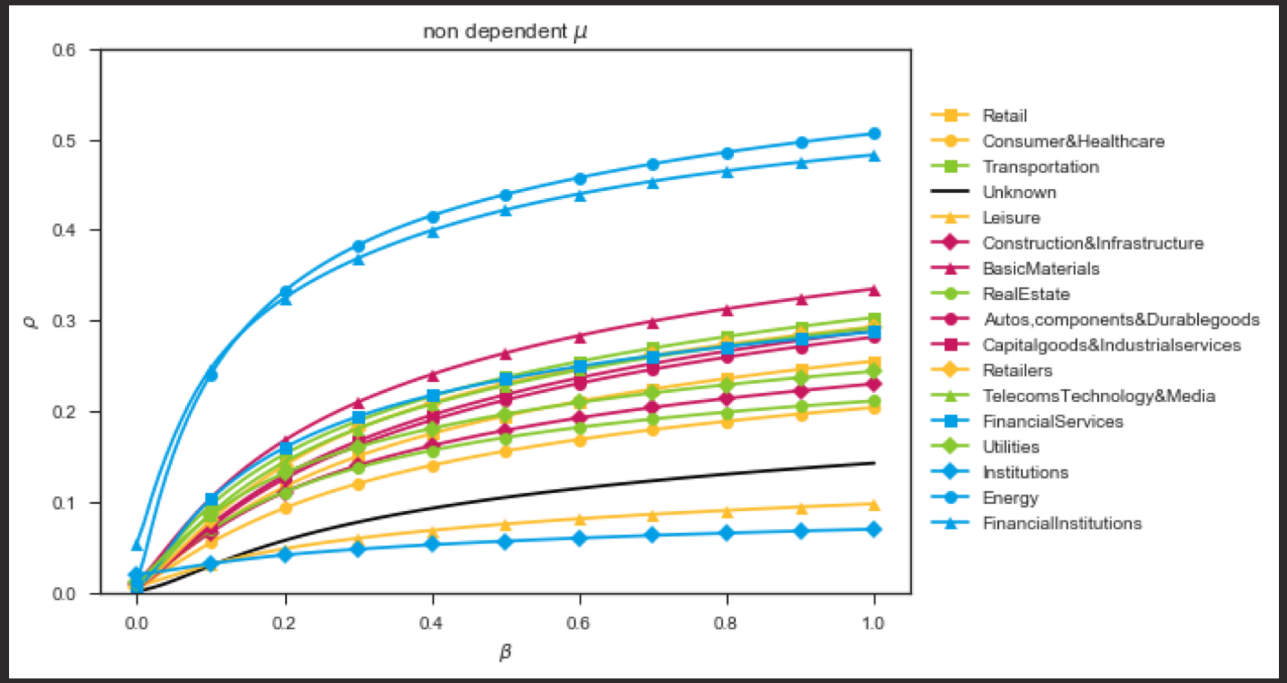
Sector Default Propagation



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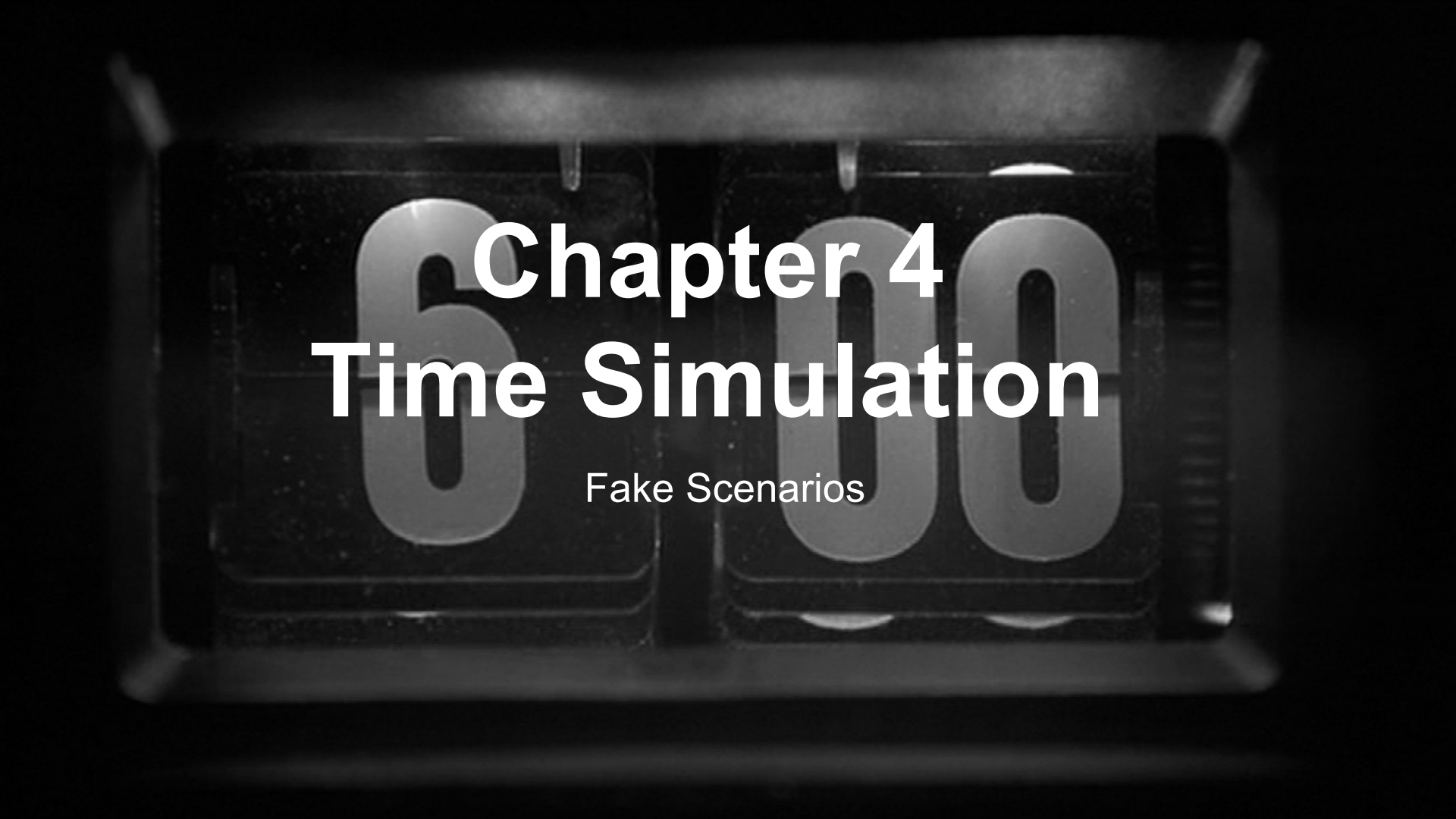


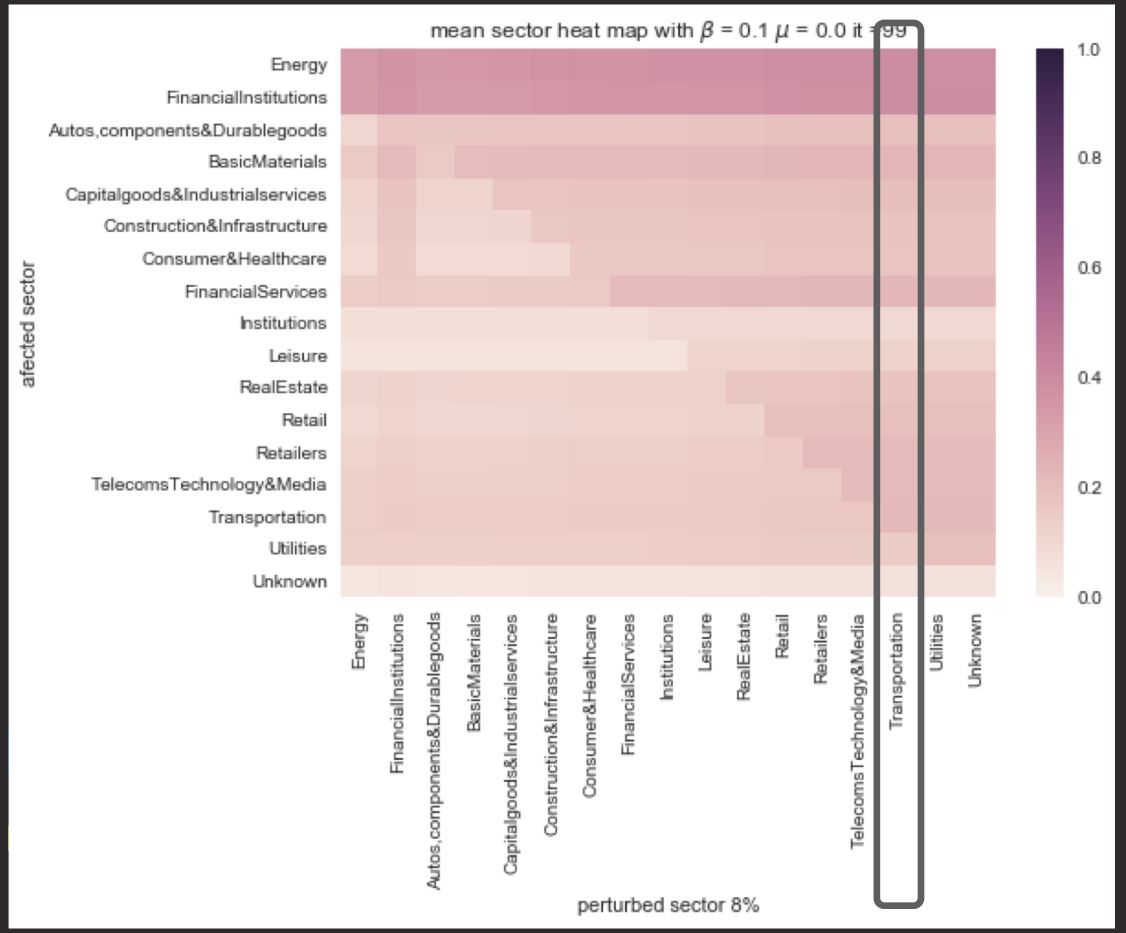
Chapter 4
Time Simulation

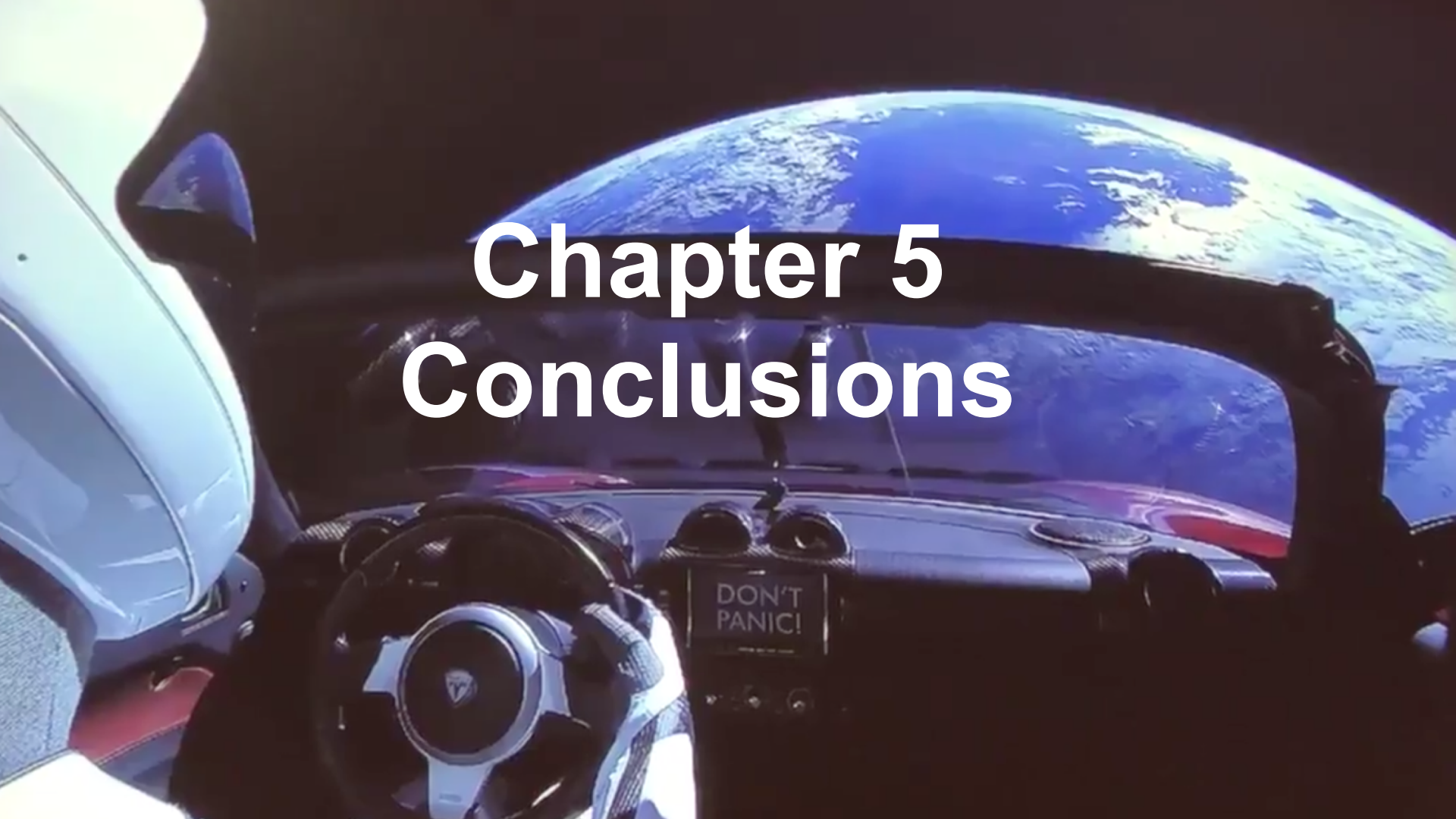
Fake Scenarios

Petrol Crisis

Default concentration in concrete economic sectors

Economical Crisis Simulations





Chapter 5
Conclusions

Conclusions

- You can **lie** with data but you cannot tell the **truth** without it
- **Isolated** versus **relational** analysis
- **Simulations** to study **exceptional** scenarios
- **Individual** assessment is not possible

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