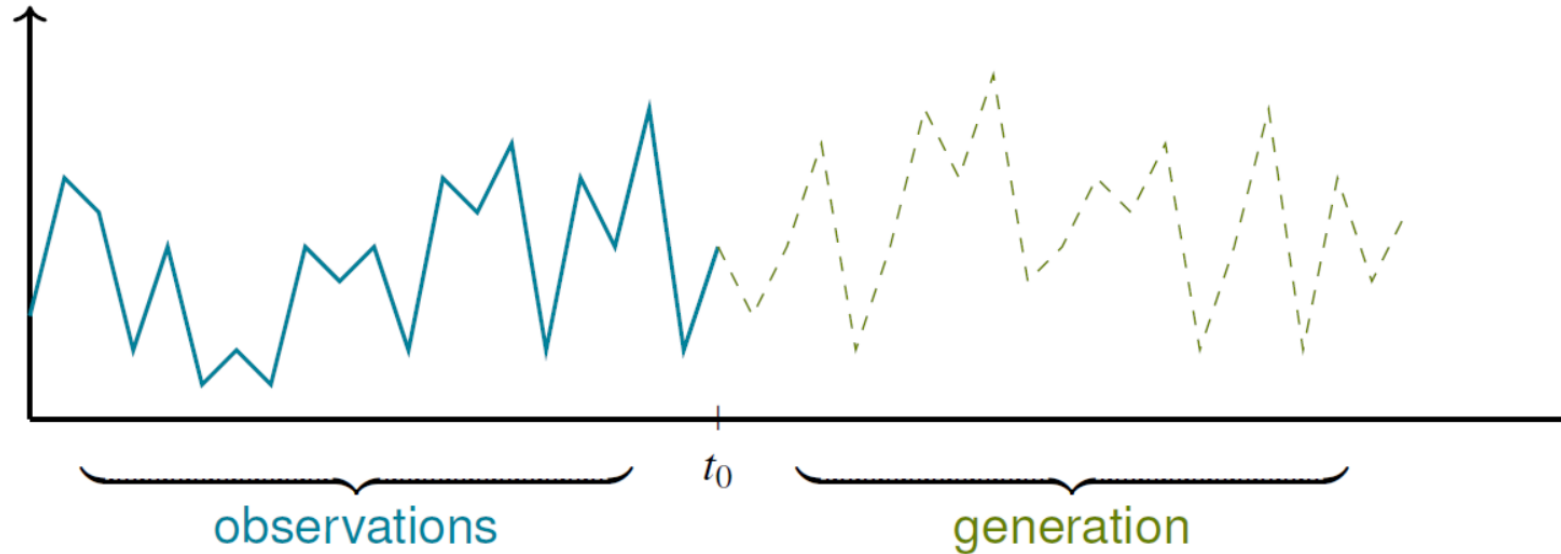# Optimal transport for market generation

Prof. Beatrice Acciaio
Department of Mathematics

Market generation: central question

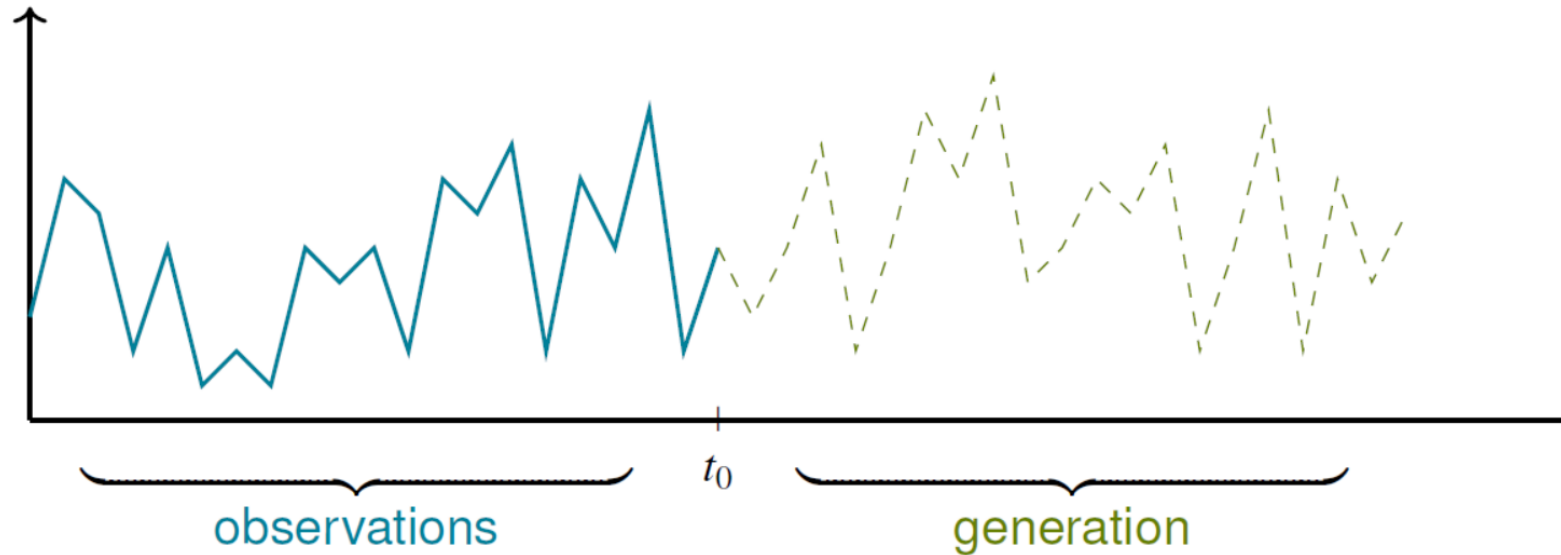Given market observations, generate possible market evolution:

1. How to learn generating new data?

2. How to evaluate the goodness of our doing?

Market generation: central question

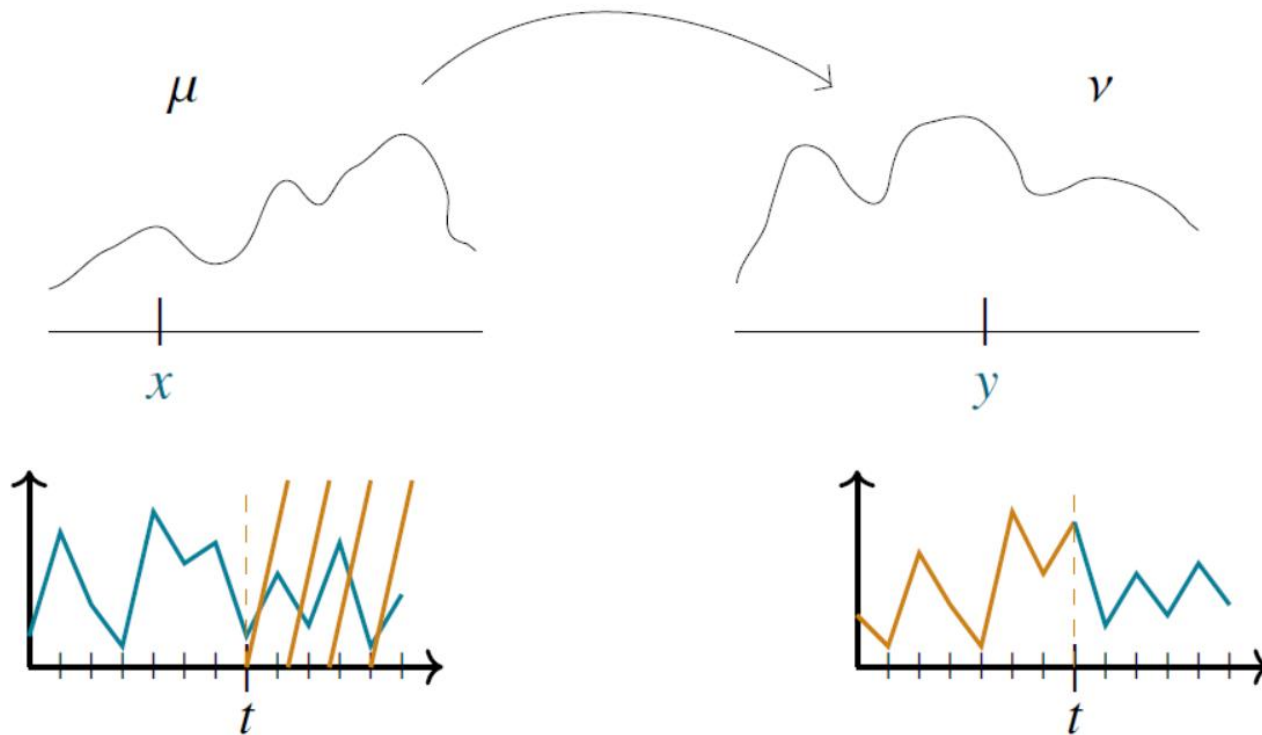Given market observations, generate possible market evolution:

1. How to learn generating new data?

2. How to evaluate the goodness of our doing?

➡️ In which way generation **"close"** to (consistent with) observations? - **robust distance**
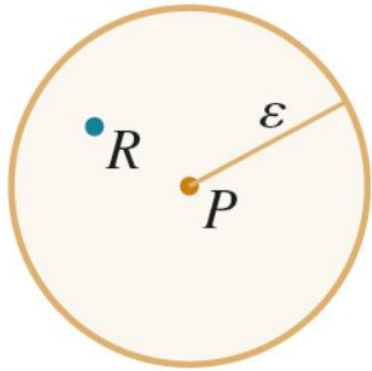
Robust distance from Optimal Transport

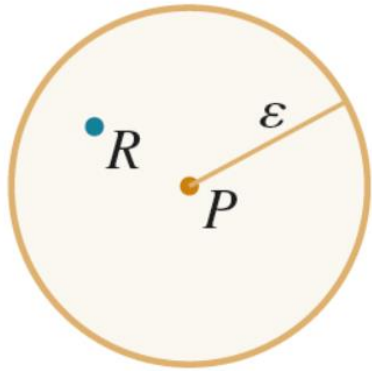**Adapted** **Optimal Transport** to gauge distance between financial models μ and ν :

➡️ distance that takes into account the **flow of information** in time

Adapted Wasserstein distance

$\mathcal{AW}$-ball around model P: $\mathcal{AW}(P,R) \leq \varepsilon$
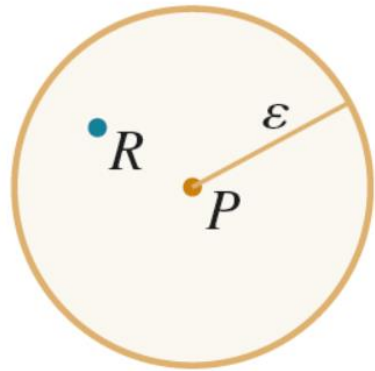
Adapted Wasserstein distance

$\mathcal{AW}$-ball around model P: $\mathcal{AW}(P,R) \leq \varepsilon$

$\mathcal{AW}$ is **robust** w.r. optimization:
- $\rightarrow$ optimal stopping
- $\rightarrow$ hedging error
- $\rightarrow$ utility maximization
- $\rightarrow$ indifference pricing
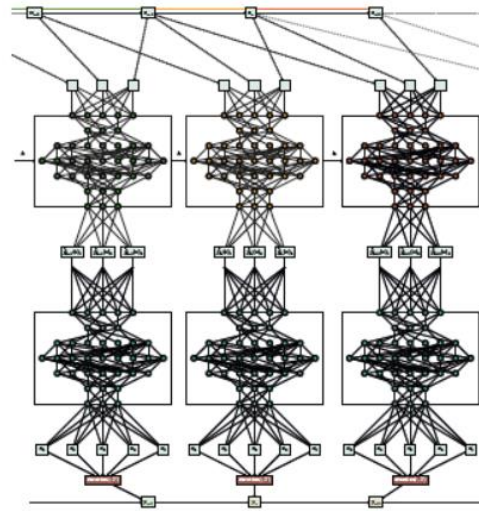- $\rightarrow$ risk measures evaluation

Adapted Wasserstein distance

$\mathcal{AW}$-ball around model P: $\mathcal{AW}(P,R) \leq \varepsilon$

$\mathcal{AW}$ is **robust** w.r. optimization:

→ optimal stopping

→ hedging error

→ utility maximization

→ indifference pricing

→ risk measures evaluation

ETH *zürich*
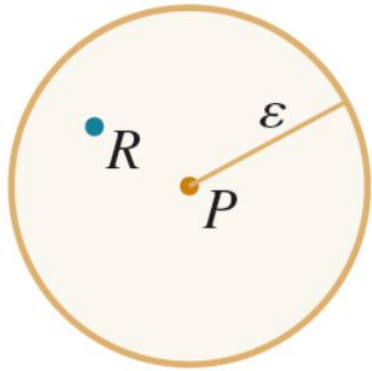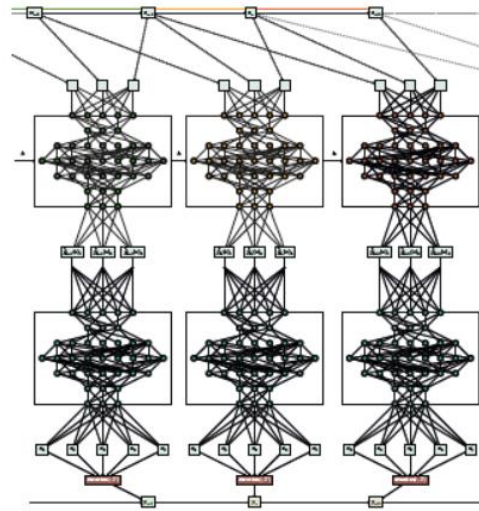
Adapted Wasserstein distance

$\mathcal{AW}$-ball around model P: $\quad \mathcal{AW}(P,R) \leq \varepsilon$

$\mathcal{AW}$ is **robust** w.r. optimization:
- → optimal stopping
- → hedging error
- → utility maximization
- → indifference pricing
- → risk measures evaluation

Generate paths:

- Generative Adversarial NN
- Entropic penalization
- Adapted Sinkhorn algo
- ⇒ **Robust** path generation

ETH *zürich*

Thank you for your attention!

Prof. Beatrice Acciaio
Department of Mathematics
https://people.math.ethz.ch/~beacciaio/

ETH Zurich
Department of Mathematics
HG G 54.3
Rämistrasse 101
8092 Zurich