Weekly presentation SCM research

Modelizing disruption risk in the Supply Chain

Project

Implement risk management in the model developed so far

How to calculate the disruption probability

Extend it systemwide

Single sourcing/ Dual sourcing

How to select the options just based on the disruption rates

Papers

- *The effects of supply disruptions on supply chain design decisions, Qi, MaxShen, Snyder, 2009*
- *A continuous review-inventory model with disruptions at both supplier and retailer*
- *Single or dual sourcing: decision-making in the presence of supply chain disruption risks, Yu, Zheng, Zhao*

Exponential distribution

- *Family of continuous probability distributions*
- *Describes the time between events in a Poisson process*

$$f(x;\lambda) = \begin{cases} \lambda e^{-\lambda x}, & x \ge 0, \\ 0, & x < 0. \end{cases}$$

$$\mathrm{E}[X] = \frac{1}{\lambda}.$$

$$\mathrm{Var}[X] = \frac{1}{\lambda^2}.$$

$$\Pr(T > s + t \mid T > s) = \Pr(T > t) \text{ for all } s, t \ge 0.$$

Model

- *ON/OFF cycles*
- *Duration of the ON cycle given by an exponential distribution with disruption rates λij*
- *Expected duration of a ON cycle is $1/\lambda$*
- *Exponential distributions are often used to model the time between independent events that happen at a constant average rate*
- *Various mathematical properties that facilitate the analysis*

Model

- *Let Xi be the exponentially distributed variable that represents the ON cycle duration of node I*

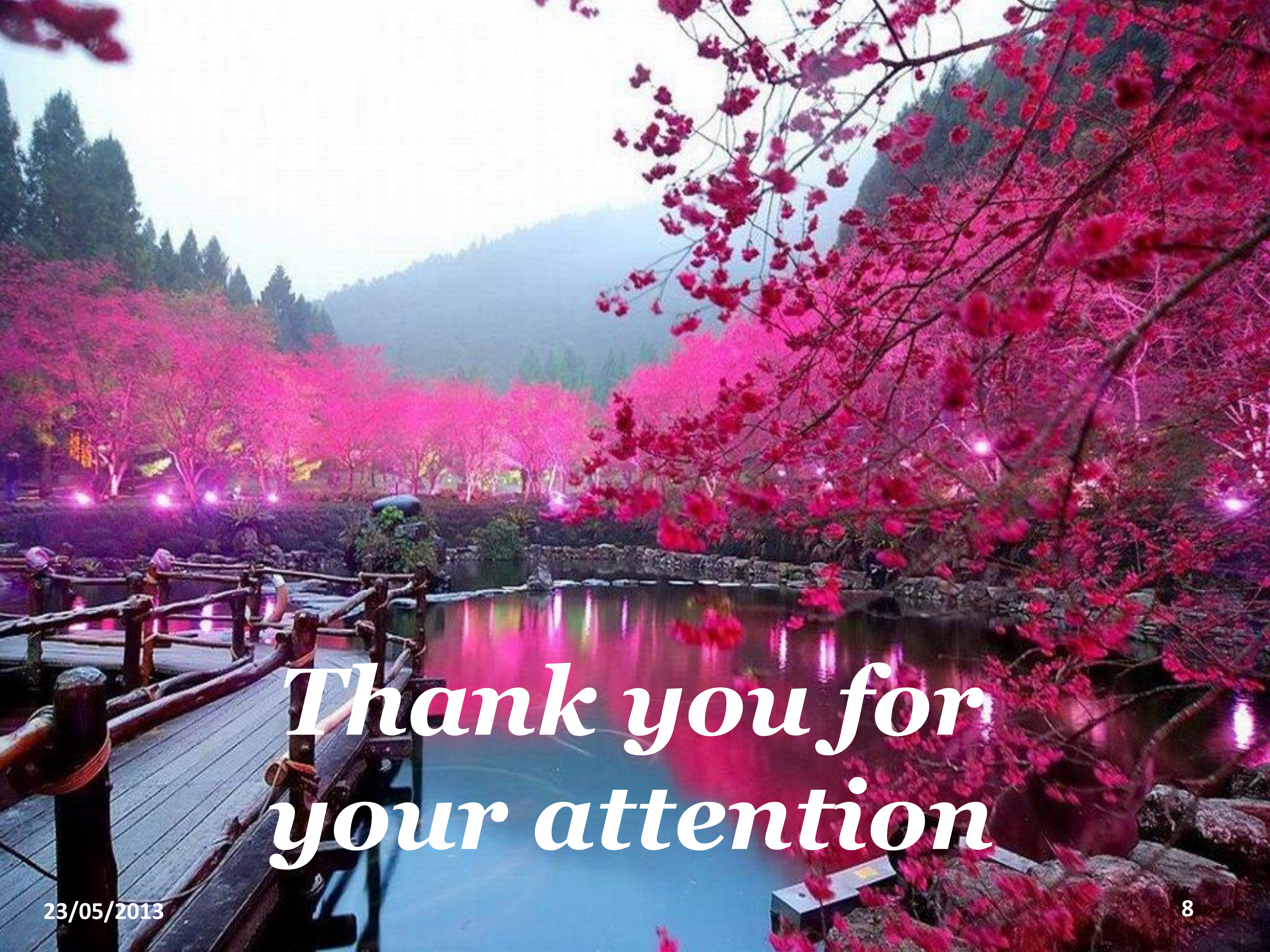
- *Then the duration of the ON cycle of the total supply chain is also exponentially distributed with rate*

  $\lambda = \lambda_1 + \cdots + \lambda_n.$

$$\begin{aligned}\Pr\left(\min\{X_1,\ldots,X_n\} > x\right) &= \Pr\left(X_1 > x \text{ and } \ldots \text{ and } X_n > x\right) \\ &= \prod_{i=1}^{n} \Pr(X_i > x) = \prod_{i=1}^{n} \exp(-x\lambda_i) = \exp\left(-x\sum_{i=1}^{n}\lambda_i\right).\end{aligned}$$

Next steps

- *Compute the decision model using gurobi and disruption times*
- *Go further in the model*


Thank you for
your attention