Quantitative finance

Lecture 13

Connectivity Models

- Focus on cause rather than effect.
- Fishbone analysis to determine impact of a failure in the procedure on the entire process.
- Fault tree assesses weak points in process, but must assign (subjective) probabilities.

Figure 5.5 Example of a fishbone diagram for errors in a settlement instruction

Source: Marshall (2001), p. 252.

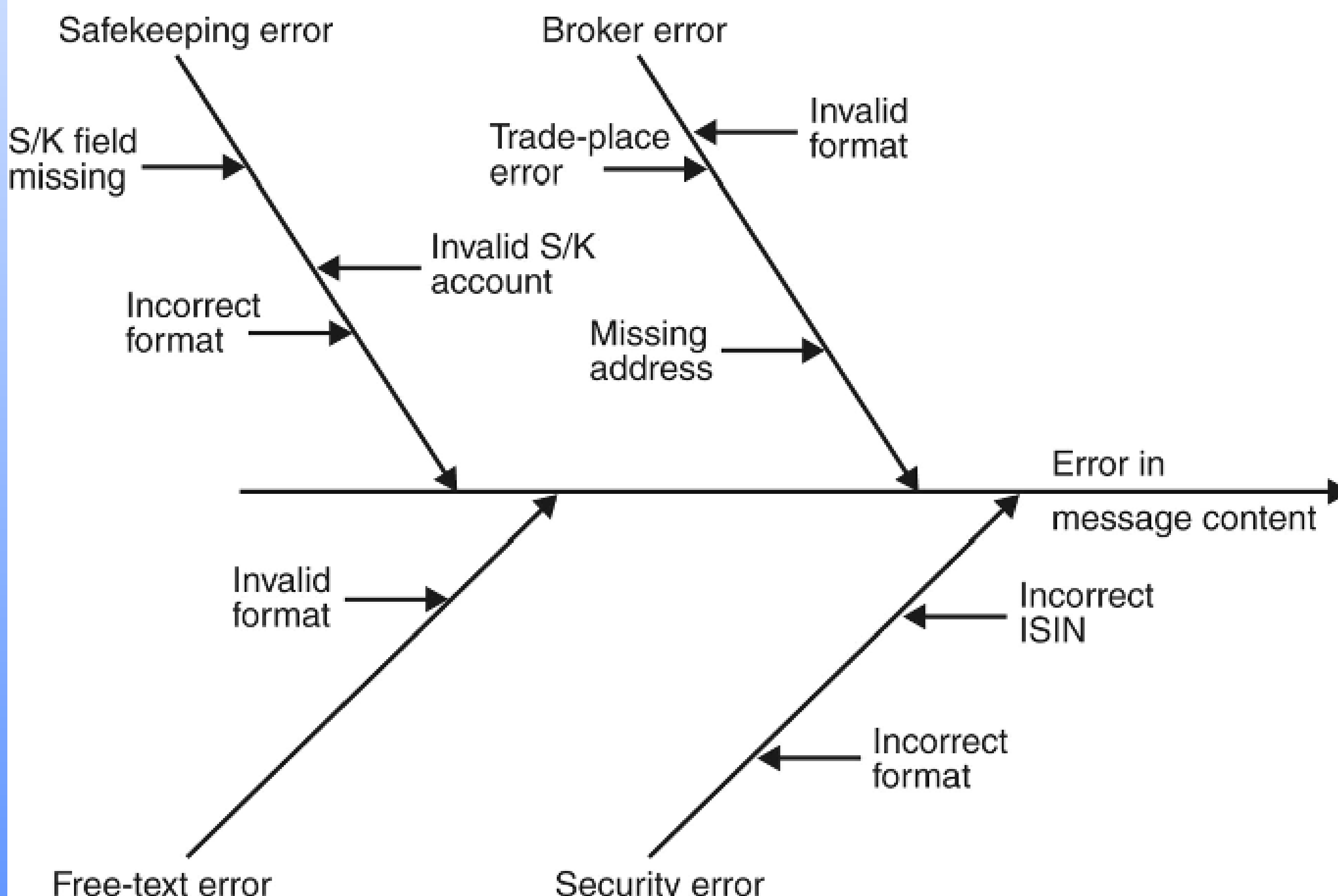
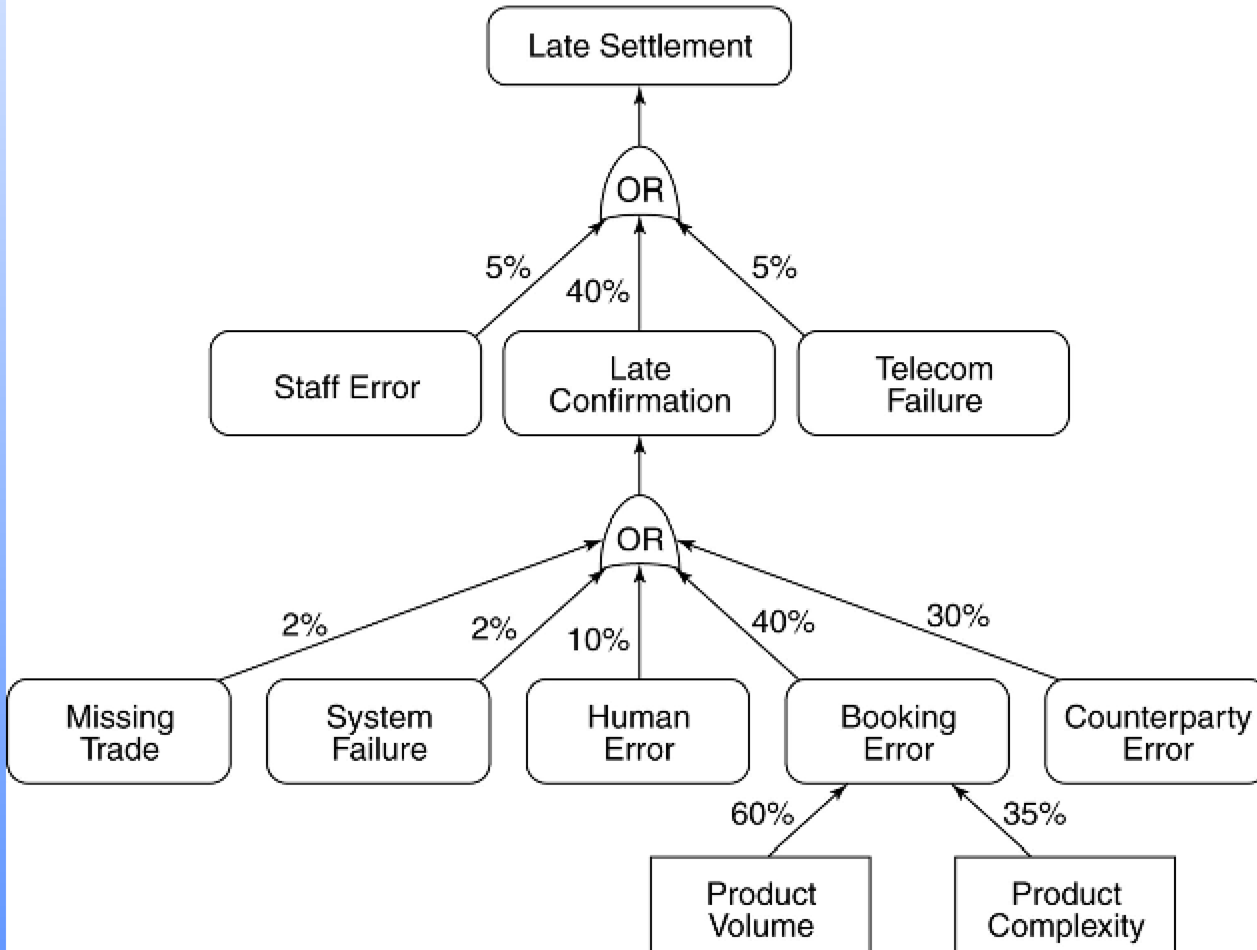


Figure 5.6 Causal structure of late settlement losses

Source: Marshall (2001), p. 95.



Reliability Models

- Estimates hazard rate of arrival of failure (operational risk event).
- Can estimate separate intensity functions for HFLS and LFHS events.
- Data requirements are very high.

Loss Distributions

- Empirical (see Figure 5.1)
- Parametric
  - Exs: exponential, Weibull or beta distributions.
  - Separate distributions for HFLS and LFHS events.
  - Onerous data requirements.
  - Figures 5.7 a, b, c

Figure 5.7 Panel A   Distribution of mishandling events per day

Source: Laycock (1998), p.138.

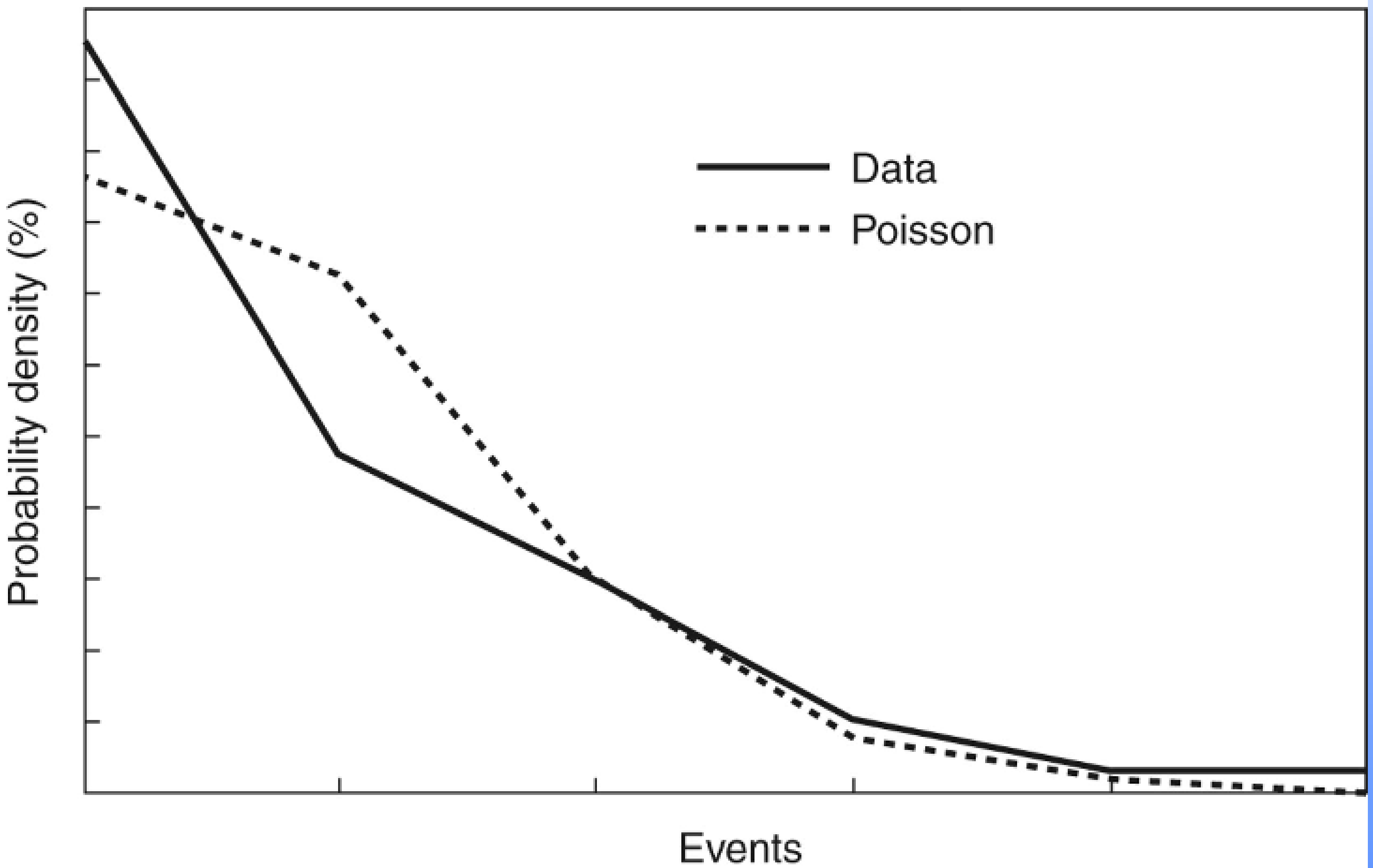


Figure 5.7 Panel B Mishandling loss severity distribution

Source: Laycock (1998), p.139.

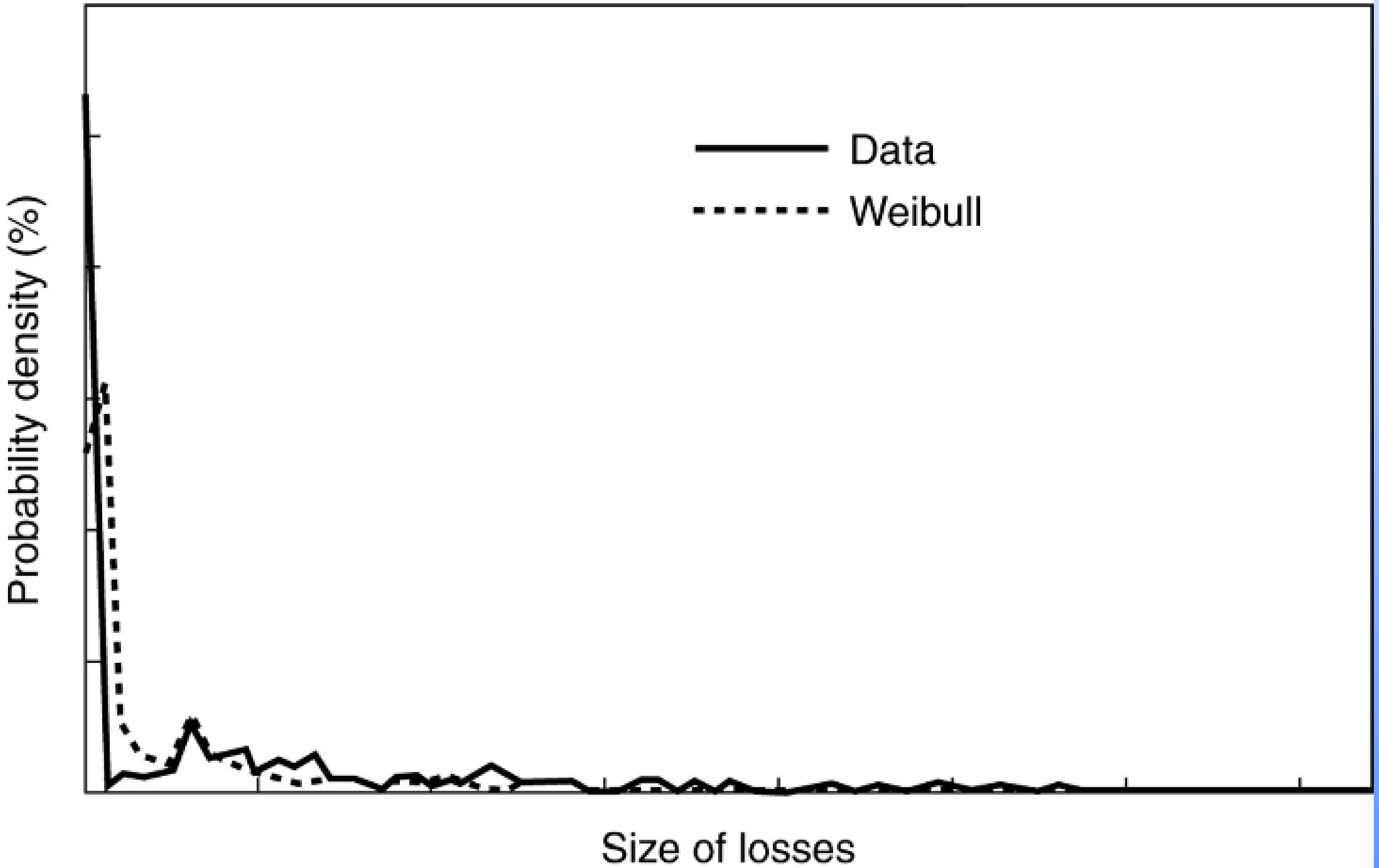
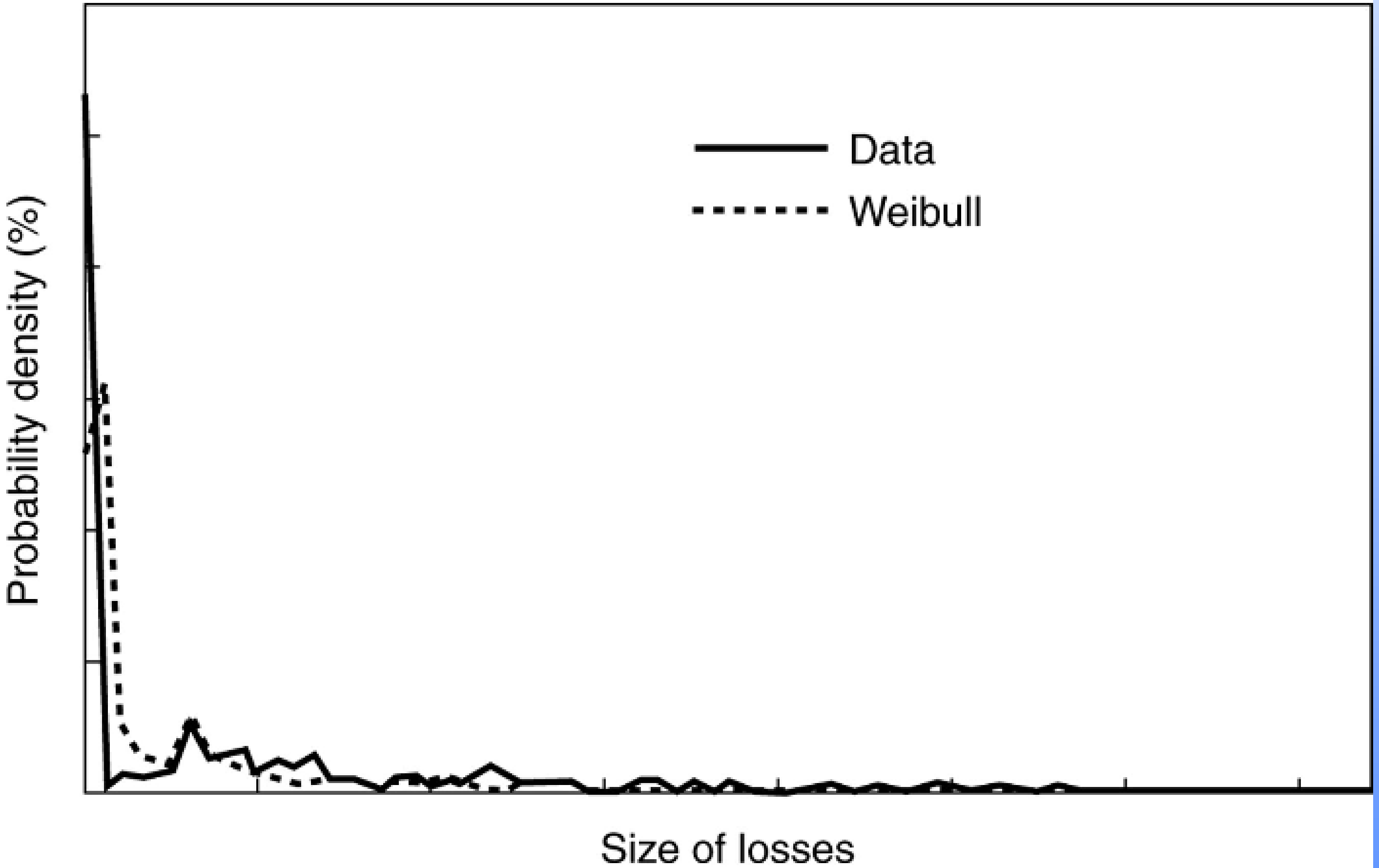


Figure 5.7 Panel C Distribution of daily mishandling operational losses

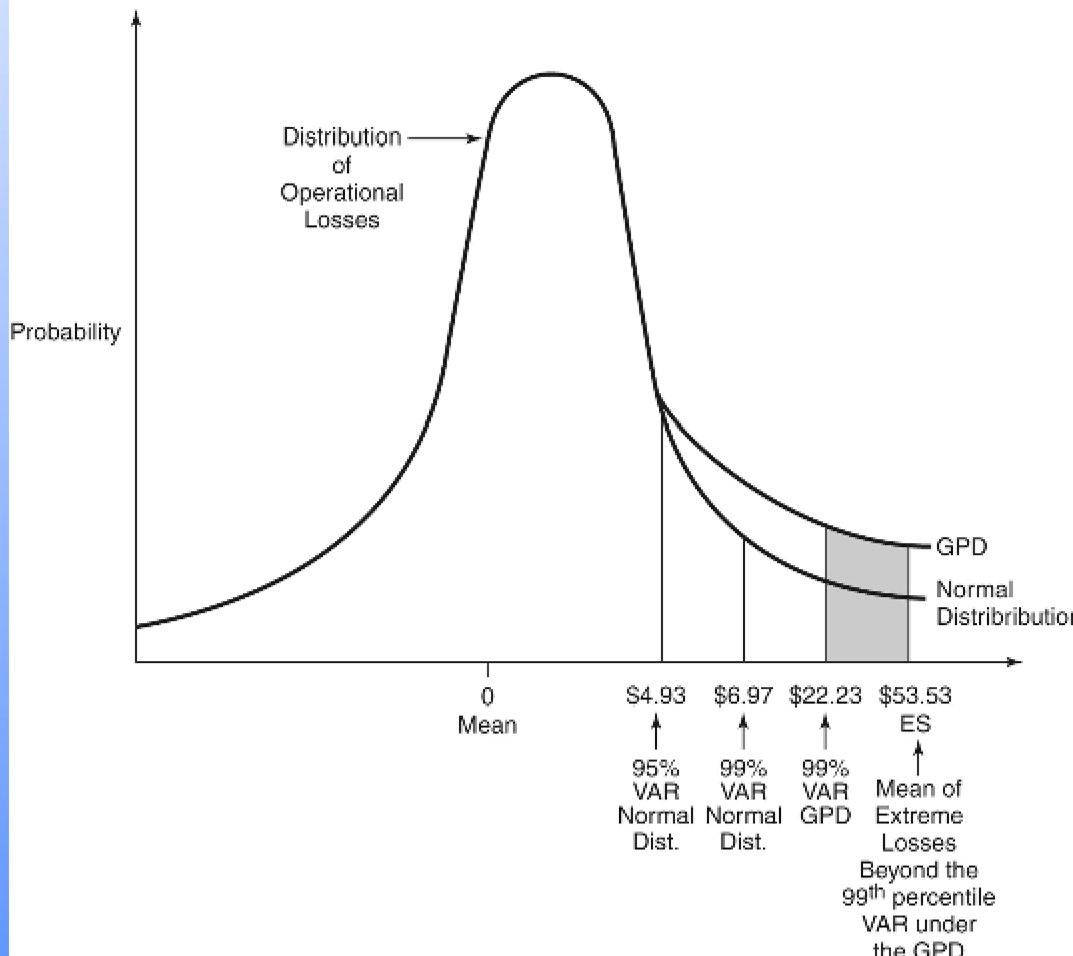
Source: Laycock (1998), p.140.



Extreme Value Theory

- The tails may have different distributions than the area around the mean.
- Can define the Expected Shortfall = mean of the tail of the distribution.
- Use Generalized Pareto Distribution.

Figure 5.8 Estimating operational losses using extreme value theory.
(ES = the expected shortfall assuming a Generalized Pareto Distribution (GPD) with fat tails.)



Proprietary Database: OpVar

- Contains >7,000 publicly revealed operational risk events.
- Total of US$272 billion in operational risk losses across different firms and industries.
- 10 years with semiannual updates.
- Strategic alliance between NetRisk and PwC.

Figure 5.9 Panel A Total operational losses by cause amount

Source: http://www.opvantage.com/

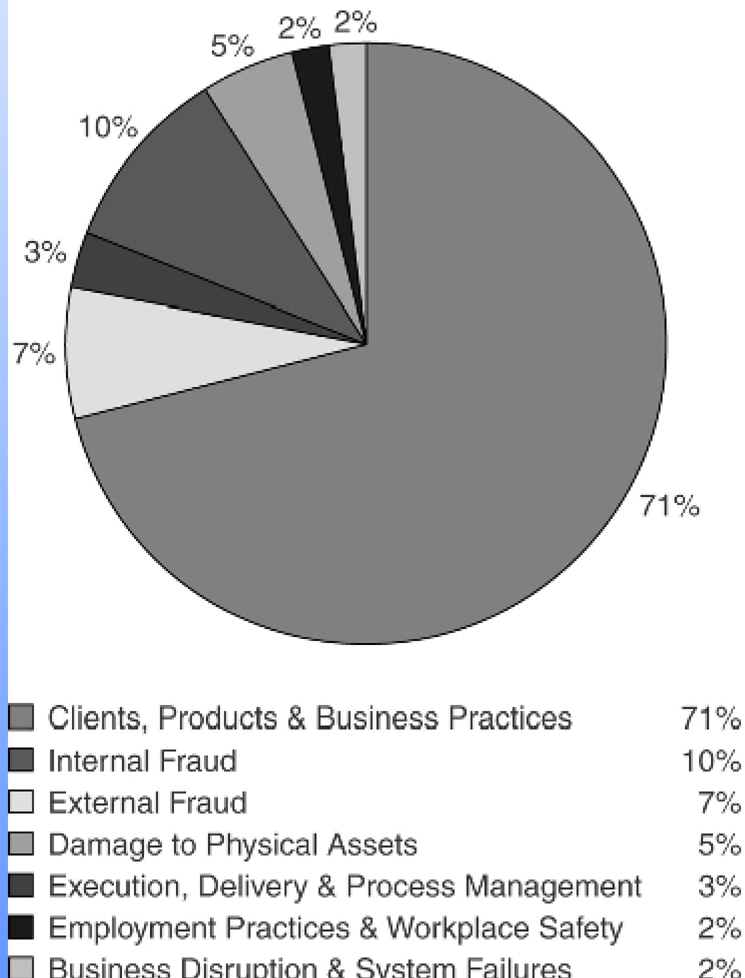
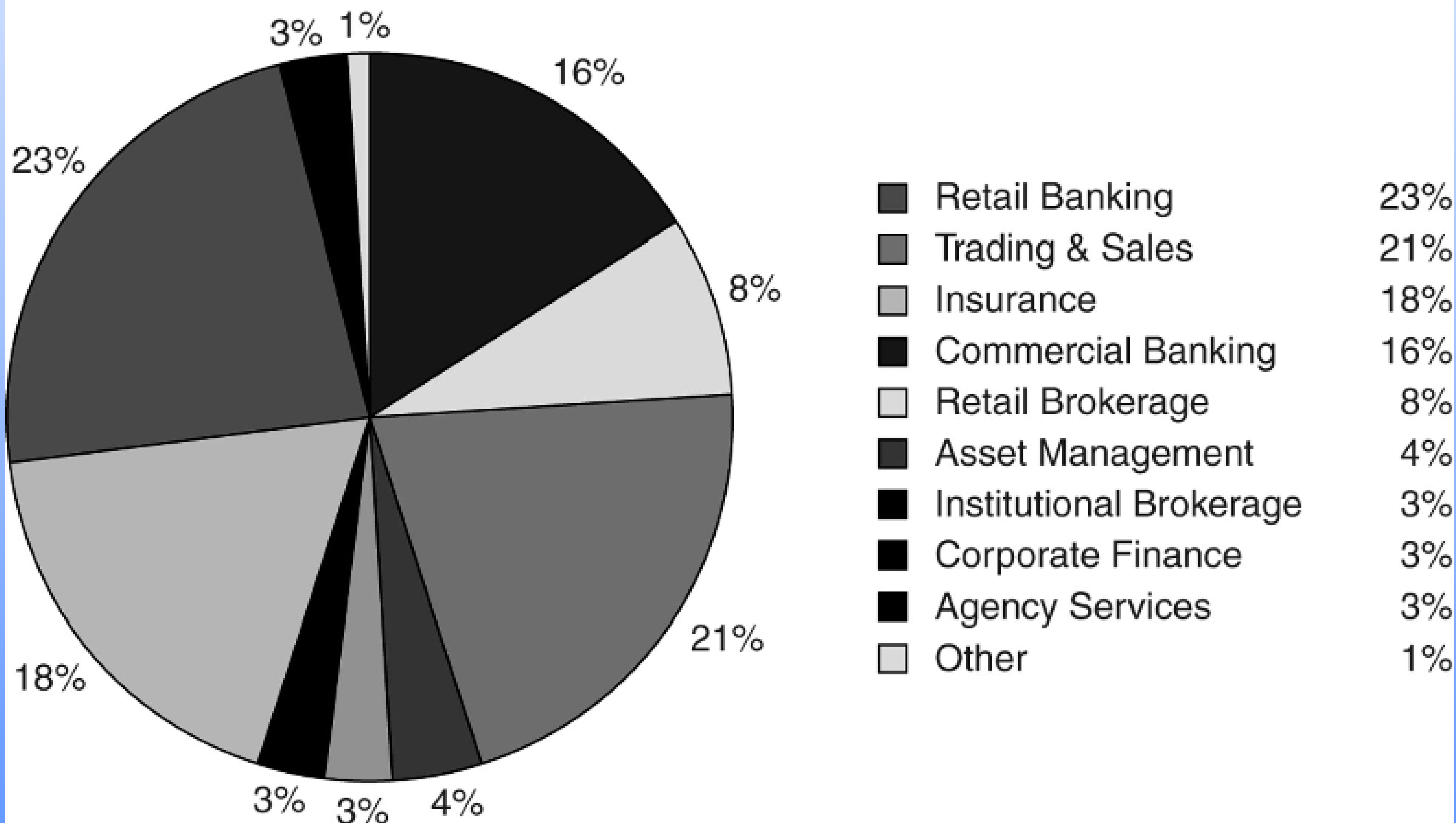


Figure 5.9 Panel B Total operational losses by business unit type

Source: http://www.opvantage.com/



Operational Risk Measurement is becoming more important as:

- Move to T+1 settlement in June 2005
- Adopt BIS New Capital Accord in 2006
- As market risk is transformed into credit risk which is transformed into operational risk.
- But: Use of similar models and pooled databases may encourage mediocrity as “best practices.”
- Possible procyclical or counter cyclical effects.