REGRET ANALYSIS AND BOUNDING

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CHE 4273
Motivating Example

- Traditional way
  Maximize Average… select A

- Optimistic decision maker
  MaxiMax … select C

- Pessimistic decision maker
  MaxiMmin … select D
**Motivating Example**

- **Calculate regret:**
  - find maximum regret

- **A** … regret = 8  @ low market
- **C** … regret = 9  @ low market
- **D** … regret = 10  @ high market
- **B** … regret = 7  @ medium market

- **MINIMAX ⇒ B**

- In general, gives *conservative* decision  
  but not pessimistic.
Two-Stage Stochastic Programming Using Regret Theory

### NPV

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<th>s1</th>
<th>s2</th>
<th>s3</th>
<th>s4</th>
<th>s5</th>
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### Regret

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SAMPLING ALGORITHM

This generates several solutions
This is very useful because it allows nice decomposition,
That is, there is no need to solve the full stochastic problem
Example: Gas Commercialization in Asia
UPSIDE POTENTIAL

Point measure for the upside

![Graph showing the relationship between profit and risk with points for E(Profit) and VaR calculations.]
Comparison measure

\[ \text{Risk}(x_1, \text{NPV}) \]
\[ \text{Risk}(x_2, \text{NPV}) \]

\[ \text{O}_\text{Area} \]
\[ \text{R}_\text{Area} \]

\[ \text{ENPV}_1 \quad \text{ENPV}_2 \]
Utility Functions

Money does not always have the same value for a company

- A Risk Averse Decision Maker values more low profits than large ones

- A Risk Taker values more high profits
Use Utility Value instead of real profit for evaluation

Effect on Risk Curves

[Graph showing Risk Averse Utility and Risk Taker's Utility]
**CONCLUSIONS**

- Regret Analysis can help in identifying good solutions (It can also fail)
- The sampling Algorithm is an important tool to identify upper bounds and good solutions.
- The upper potential is important to be considered.

**References**