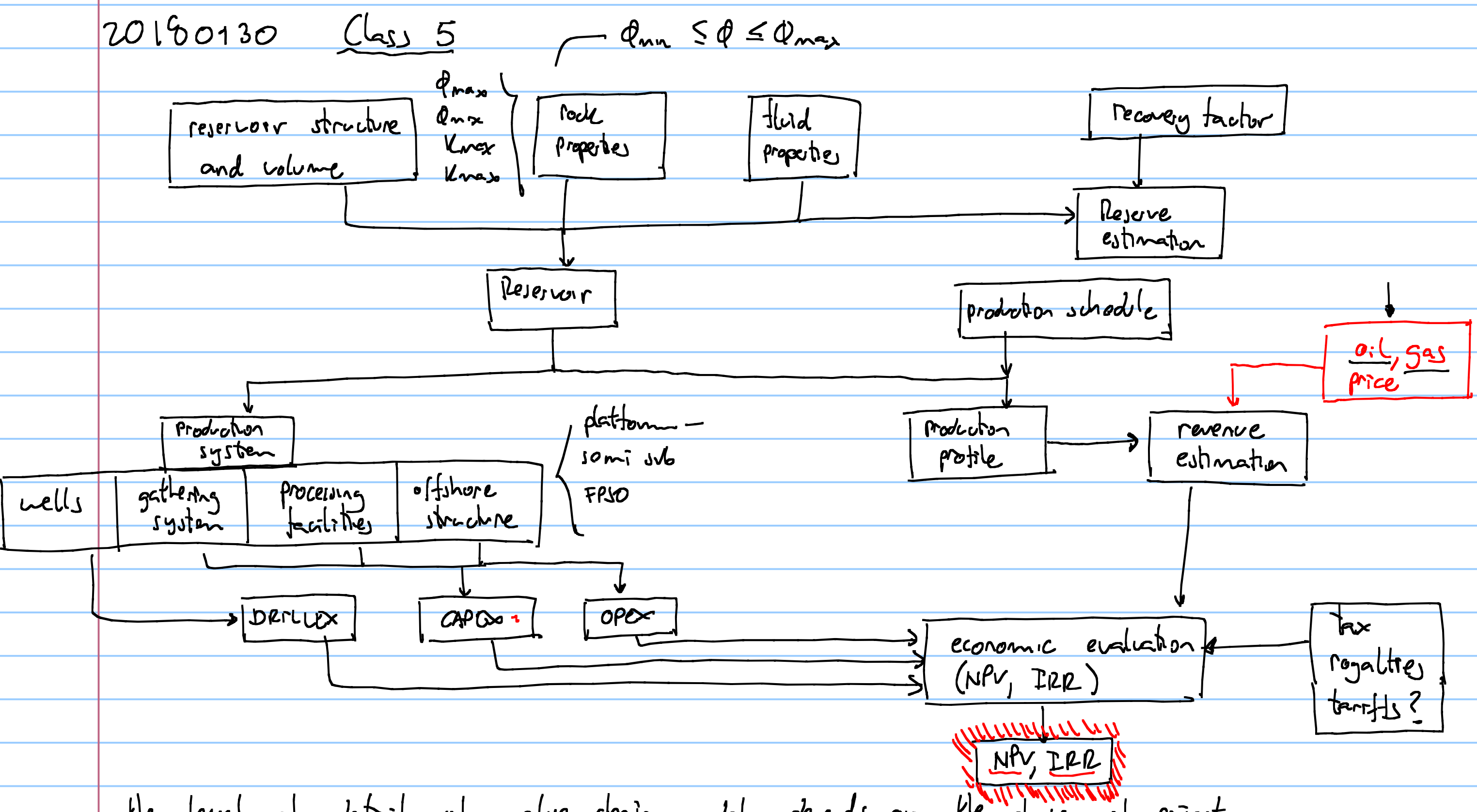
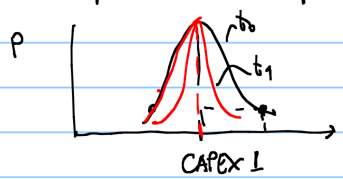
20180130 Class 5



- the level of detail of value chain model depends on the phase of project
- CAPEX usually look like this



at initial stage CAPEX ± 60%
40%

at later stage CAPEX ±20%

Field concept evaluation process

- Identify development scenarios and alternatives for each box
- Perform a pre-design of each scenario
- study and compute the economic value of each scenario
- Compare each scenario and choose the best option
  1. sensitivity analysis → "ceteris paribus" all other the same

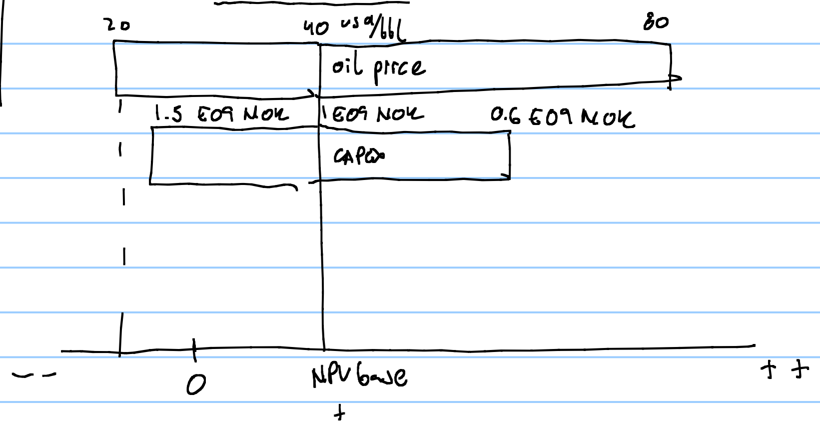
$CAPEX_{min} \le CAPEX\,1 < CAPEX_{max}$

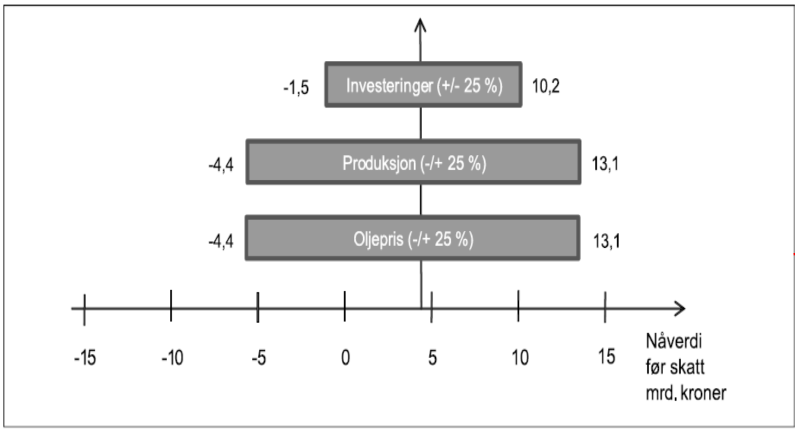
oil price min $\le$ oil price 1 $\le$ oil price max

$Q_{max} \le Q \le Q_{max}$

	NPV_{min}	NPV_{base}	NPV_{max}
oil price ±20%			
CAPEX ±20%			
IRR ±20%			

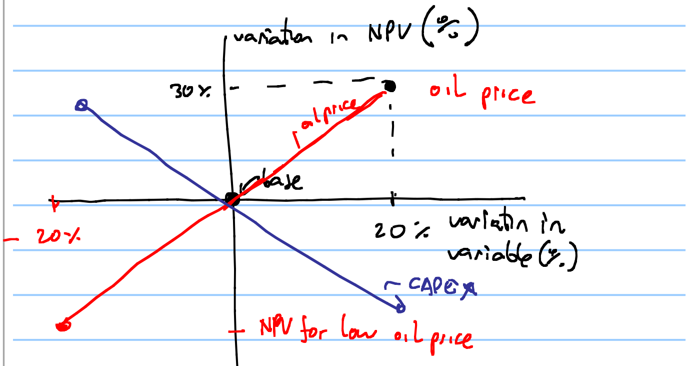
tornado chart





Figur 4.1 Sensitivitetsanalyse for prosjektet.

spider plot



$$\text{variation } [\%] = \left(\frac{\text{value} - \text{value}_{\text{base case}}}{\text{value}_{\text{base case}}}\right) 100$$

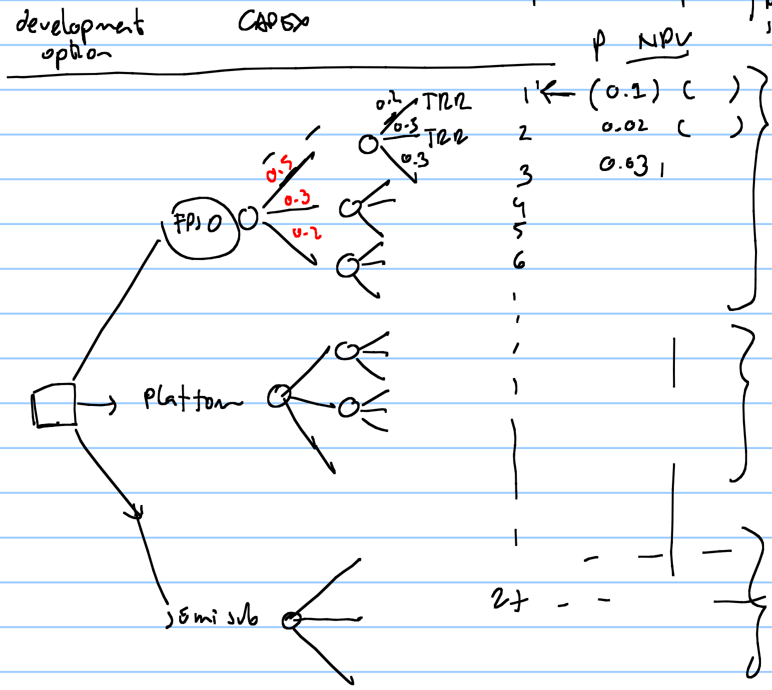
② to study the effect of non-continuous variables — different options

Decision trees

TRR — TRR 1 — 30%, TRR 2 — 50%, TRR 3 — 20%

CAPEX — CAPEX 1 — 20%, CAPEX 2 — 60%, CAPEX 3 — 70%

development concept — FPSO, platform, semi-sub



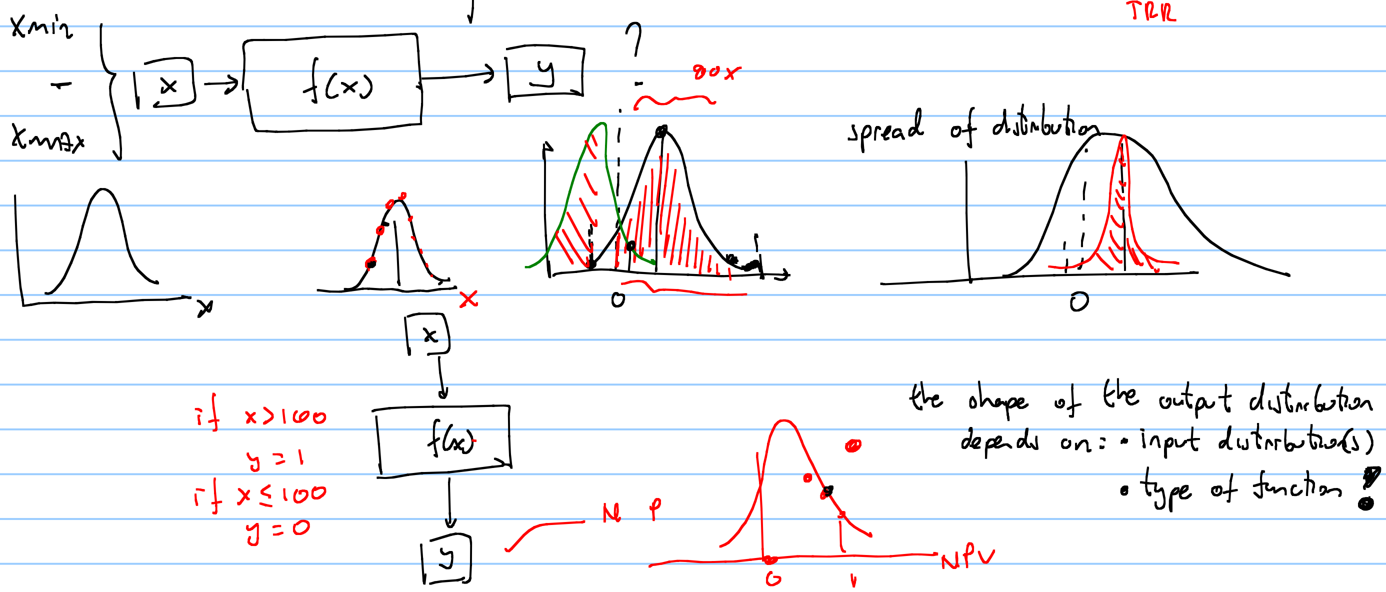
$\Sigma P_i \, NPV_i$ = compound NPV_{FPSO}

(3^{10})

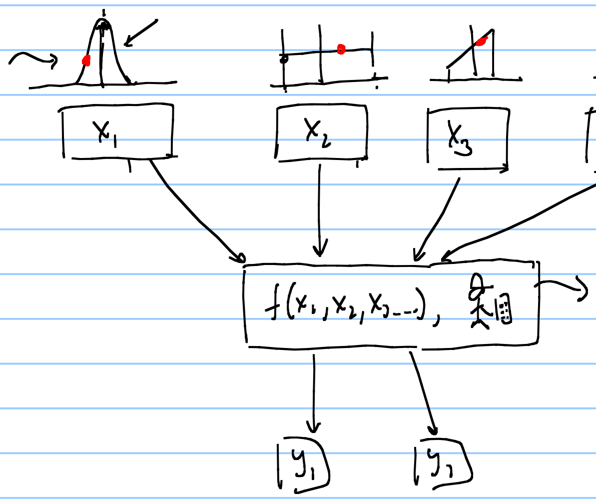
$\Sigma P_i \, NPV_i$ = compound NPV_{plat}

$\Sigma P_i \, NPV_i$ = compound $NPV_{semisub}$

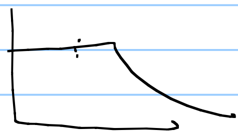
③ probabilistic analysis — monte Carlo method — Stanislaw Ulam — Los Alamos lab

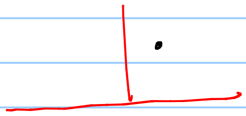


the shape of the output distribution depends on: • input distribution(s)
• type of function



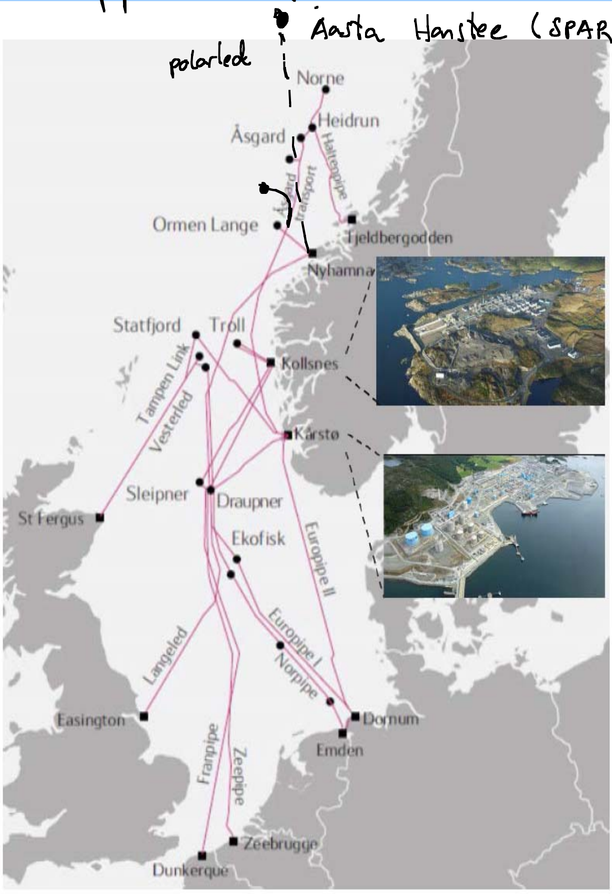
to perform monte carlo this process (function) has to run: automatically — fast



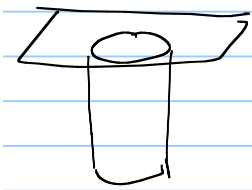


- opex has two parts: - fixed with production rate
  - variable with production rate

In gas transportation (and sometimes when transporting oil) one has to include a pipeline tariff



the gas transportation system from Norway to EU/UK is managed GASSCO

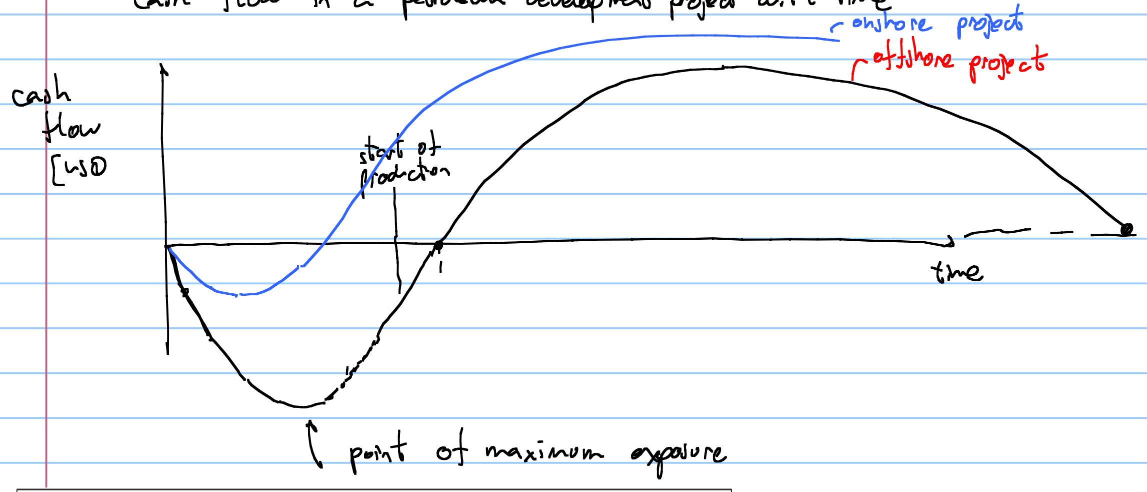


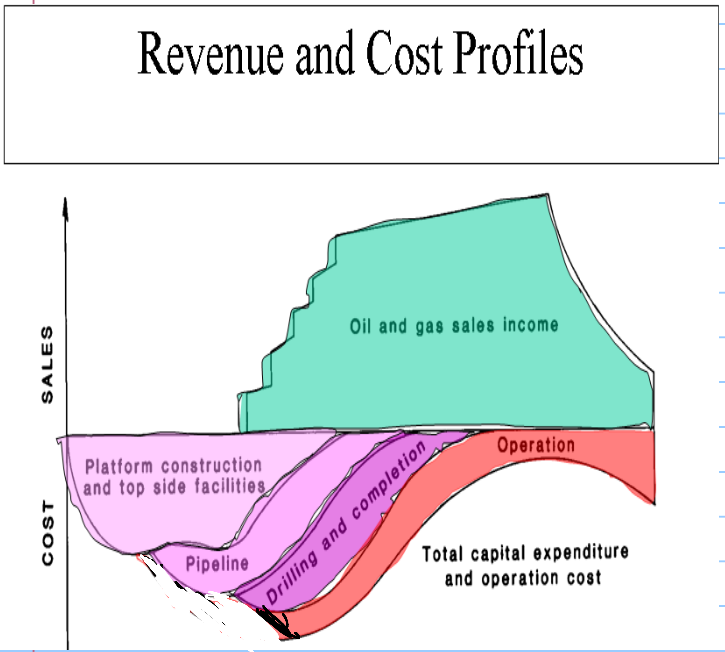
- to estimate cost / calculate NPV

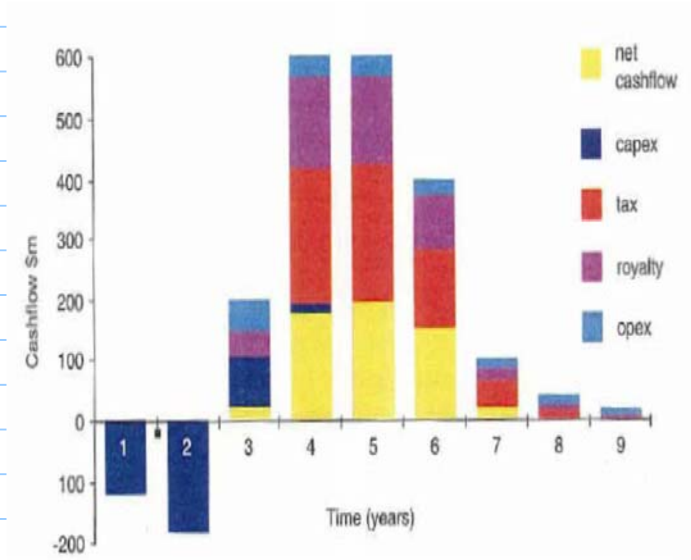
- internal utilities developed by companies (based on previous projects)
- commercial tools
  - QUESTOR
  - ACES (Acona)
  - Siemens (oil and gas manager)

Petroleum economics Trygve Strøm (TPG5190) for more detailed information about NPV calculations

Cash flow in a petroleum development project with time







Petroleum fiscal systems { In almost any country the owner of the mineral resources is government except in onshore USA

royalty based system

contractual system

- the company get the mineral rights for a period of time 30 years
- full decision power on development of asset
- UK, France, Norway, Russia, Australia New Zealand, Colombia, Argentina

- A Royalty must be payed to government

Total oil and gas sales

→ Royalties % –

Net sales

- opex
- depreciaton, amortization ←
- ? dividends / financing to shareholders and financial institution

} deductible

TAXABLE INCOME

→ TAX
- country
- regional
-

for Norway
- 78% total
- payed 1rst april, 1rst october

NET INCOME