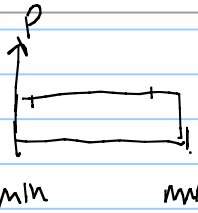
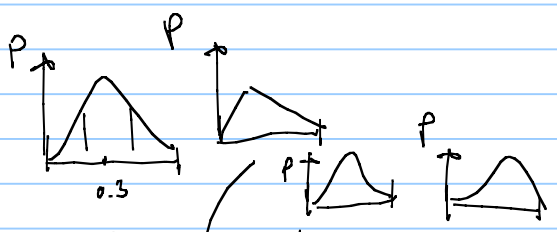
Note Title 01.02.2016

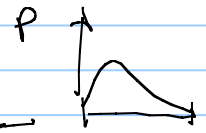
Last week





with uncertainty we want to move from deterministic to ⇝ probabilistic

$$TRR = \frac{V_R \cdot \Phi \cdot (1-S_W) \cdot N_{TG} \cdot F_{RU}}{B_O}$$

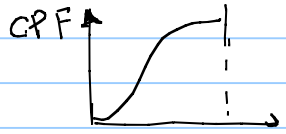


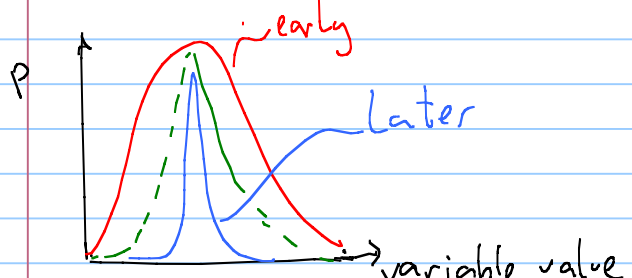
Monte carlo simulation

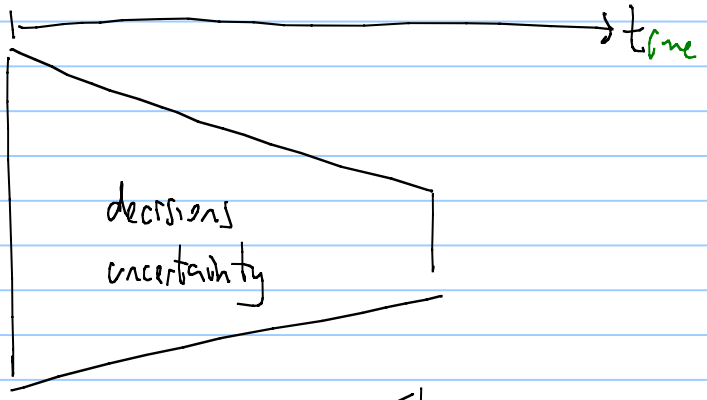
maximum number of iterations.

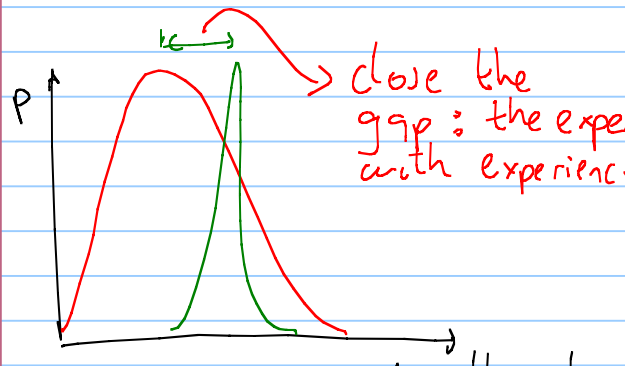
N_{PU}, G_{PU}, Q_{PU}

allows to make better plans and decitions.

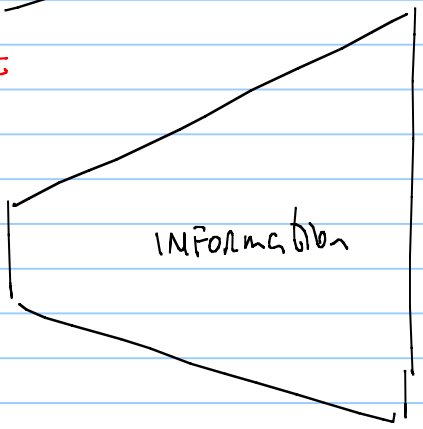








close the gap: the expert with experience



Determining the number of iterations

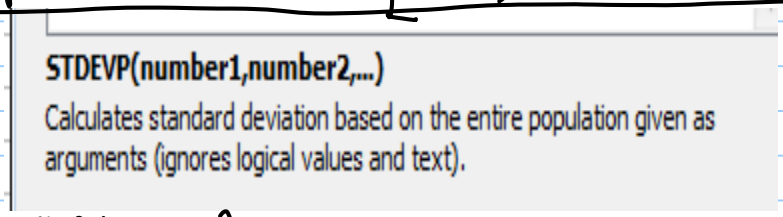
The total error (absolute) $= \frac{3\sigma}{\sqrt{N}} = \varepsilon$

ε = total error.
N = number of iterations
σ = The standard deviation of the random variable that is simulated

Thus $N = \left(\frac{3\sigma}{\varepsilon}\right)^2$

Estimate the upper bound on σ to use in the formula

$\sigma_{upper} = STDEVP[MAX, MIN, AVERAGE]$



MAX
MIN
AVERAGE } of the entire population of the random variable

Estimate the total error ε, given minimum error %.

$\varepsilon = AVERAG(all\ population) \cdot \frac{Error\ \%}{100}$

{e.g. error % = 2% $\varepsilon = AVERAGE \cdot \frac{1}{50}$}

Example 2% error = 0.02 Average = $\frac{Average}{50}$

$N = \left(\frac{3\sigma}{(AVERAGE)/50}\right)^2$

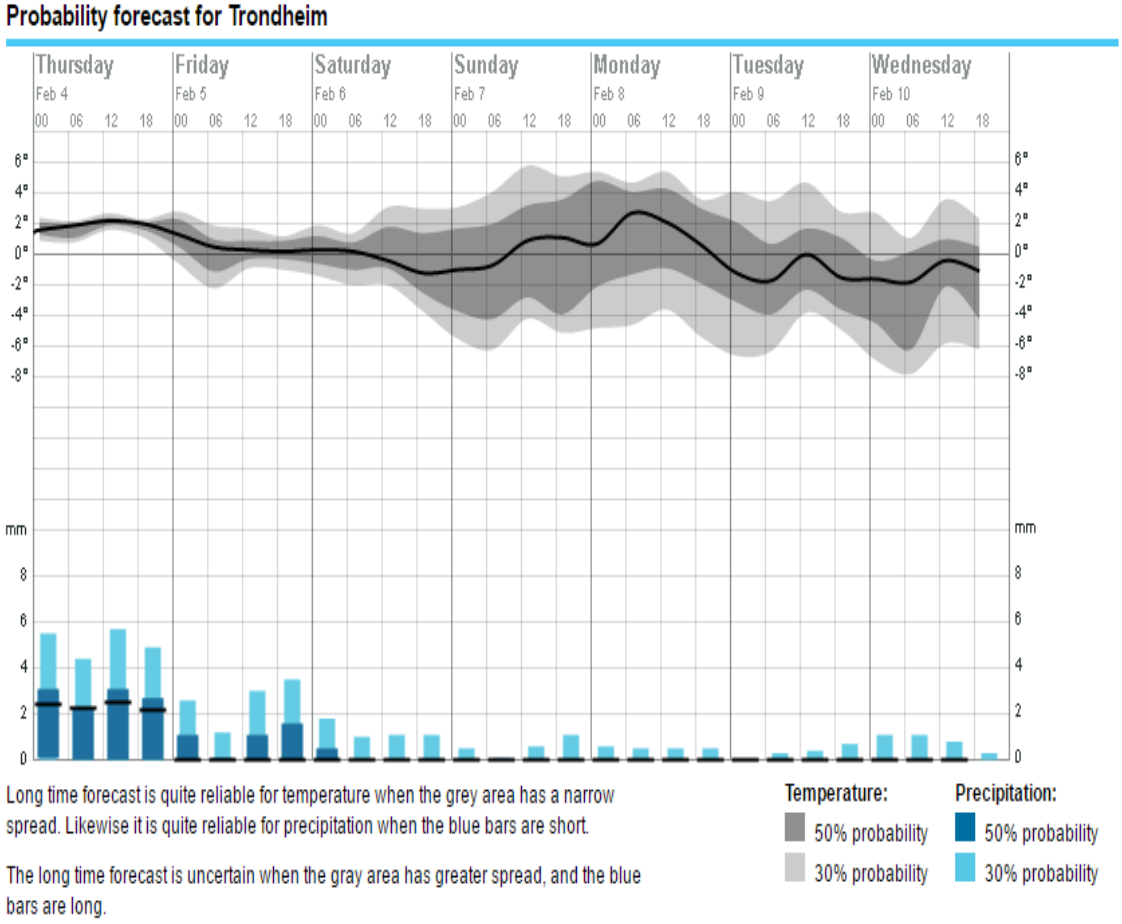
Approach
Mean → Average

Attribute level. How to assign a quantitative value to an attribute

Table 6. Attributes weights.

	Attribute Weighting				
Attribute Weighting:	1. Operability	2. Fabrication and Installation	3. Time to First Production and Cost	4. Reliability	
1. Operability	1	5.000	1.000	3.000	
2. Fabrication and Instalation	0.200	1	0.200	0.143	
3. Time to First Production and Cost	1.000	5.000	1	1.000	
4. Reliability	0.333	7.000	1.000	1	
Summation:	2.533	18.000	3.200	5.143	
Normalization:					**Weights**
1. Operability	0.395	0.278	0.313	0.583	**0.3921**
2. Fabrication and Installation	0.079	0.056	0.063	0.028	**0.0562**
3. Time to First Production and Cost	0.395	0.278	0.313	0.194	**0.2949**
4. Reliability	0.132	0.389	0.313	0.194	**0.2569**
Summation:	1.000	1.000	1.000	1.000	1.000

evolution of uncertainty with time



Comments about the exercise set 1:

3.3

how to find fields rate to maximize plateau length

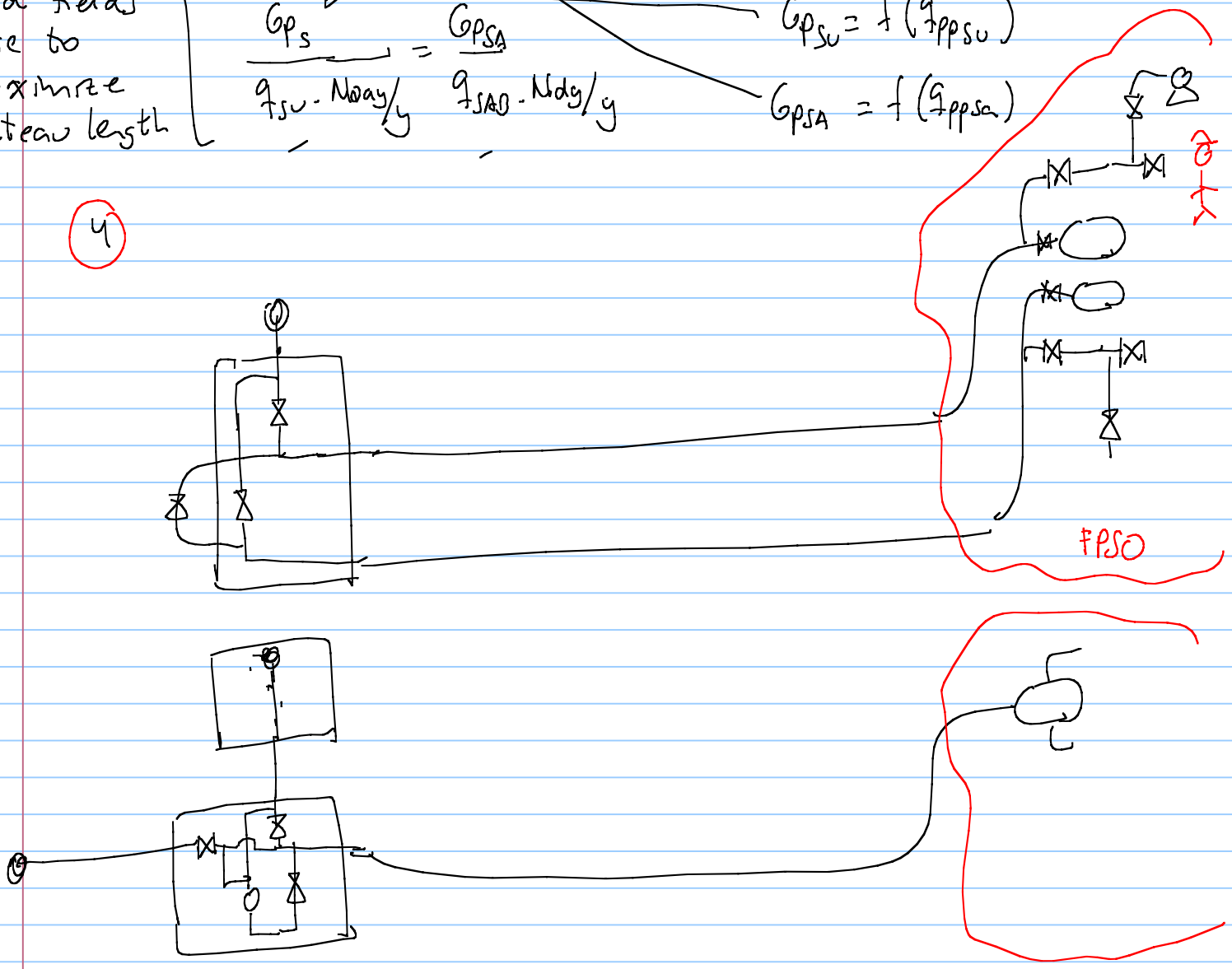
$q_{SU} + q_{SA} = 170\,000$ stb/d ←

$\frac{Gp_S}{q_{SU} \cdot N_{day}/y} = \frac{Gp_{SA}}{q_{SAB} \cdot N_{dg}/y}$

$Gp_{SU} = f(q_{ppSU})$

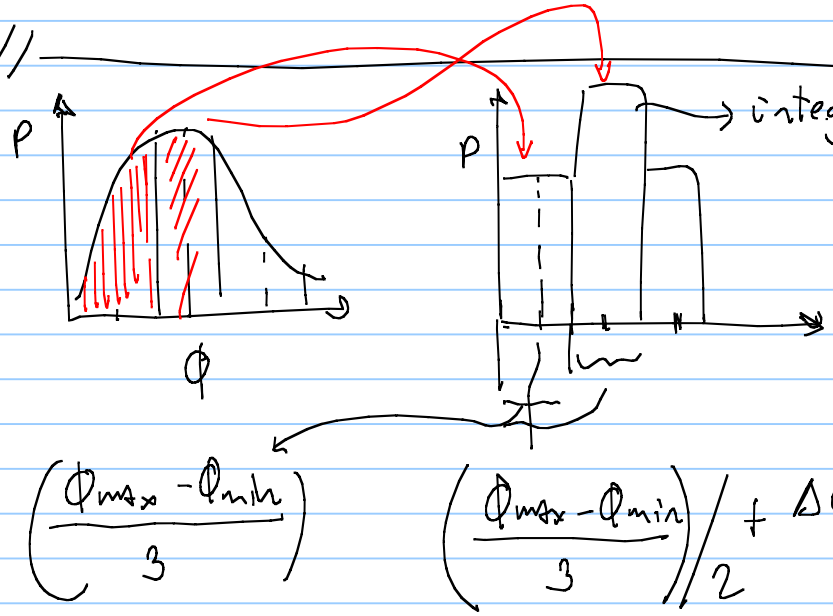
$Gp_{SA} = f(q_{ppSA})$

4



Probabilistic distribution

how to convert a continuous distribution to a discrete? Q_{max}

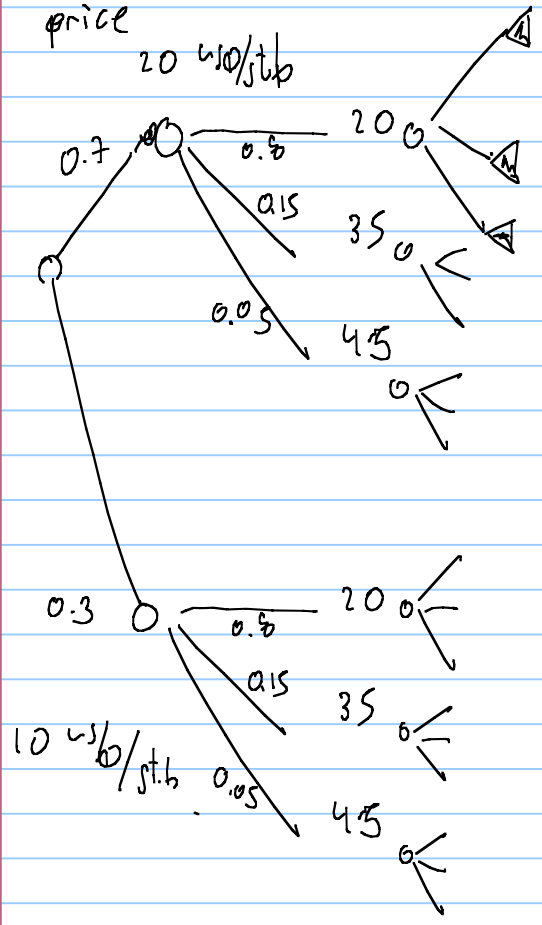


Q_{min} $\left(\frac{Q_{max} - Q_{min}}{3}\right)$ $\left(\frac{Q_{max} - Q_{min}}{3}\right)/2 + \Delta\phi$

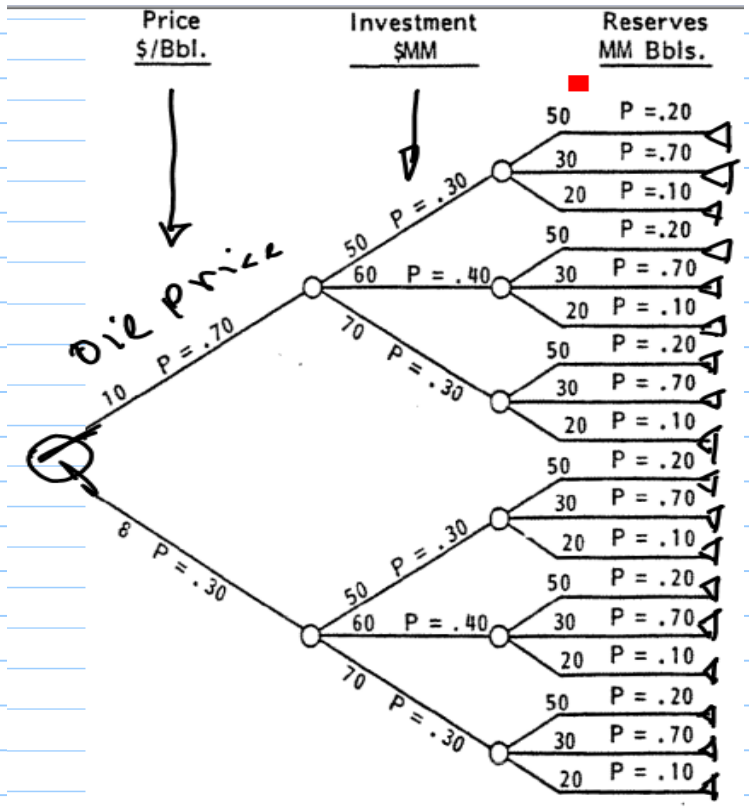
Decision tree for probabilistic analysis:

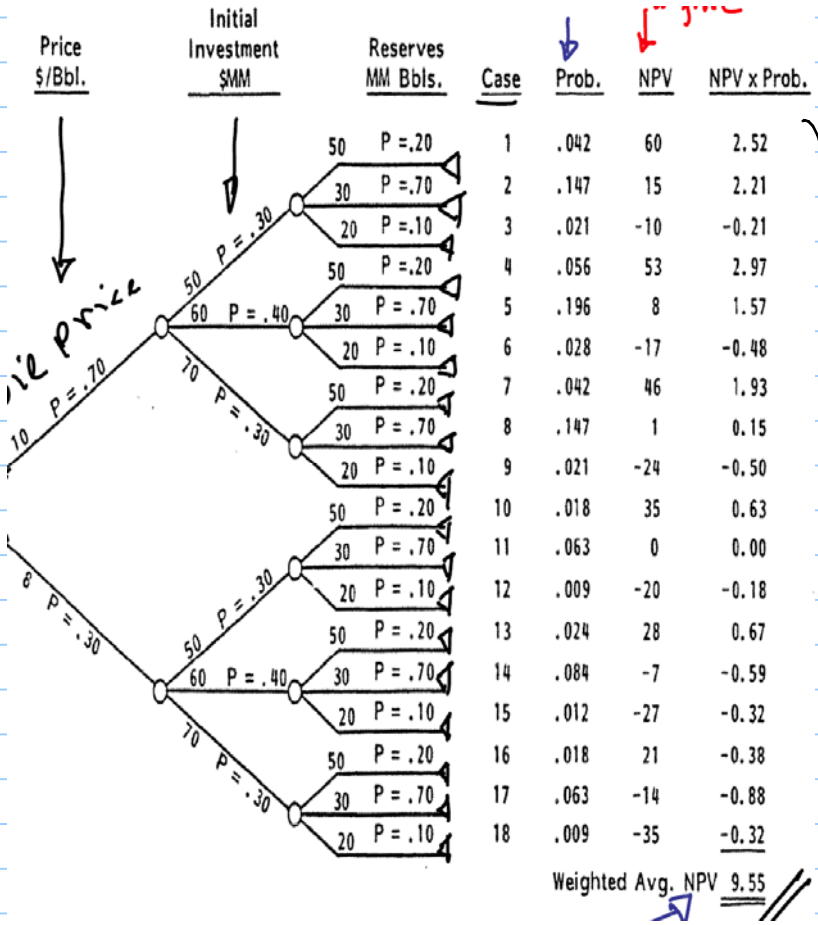
oil prices		Cost of facilities		TRR		
value	probability				stb	
20	0.7	20 E9 USD	0.8	20 E6	0.2	example
10	0.3	35 E9 USD	0.15	50 E6	0.5	
		45 E9 USD	0.05	60 E6	0.3	

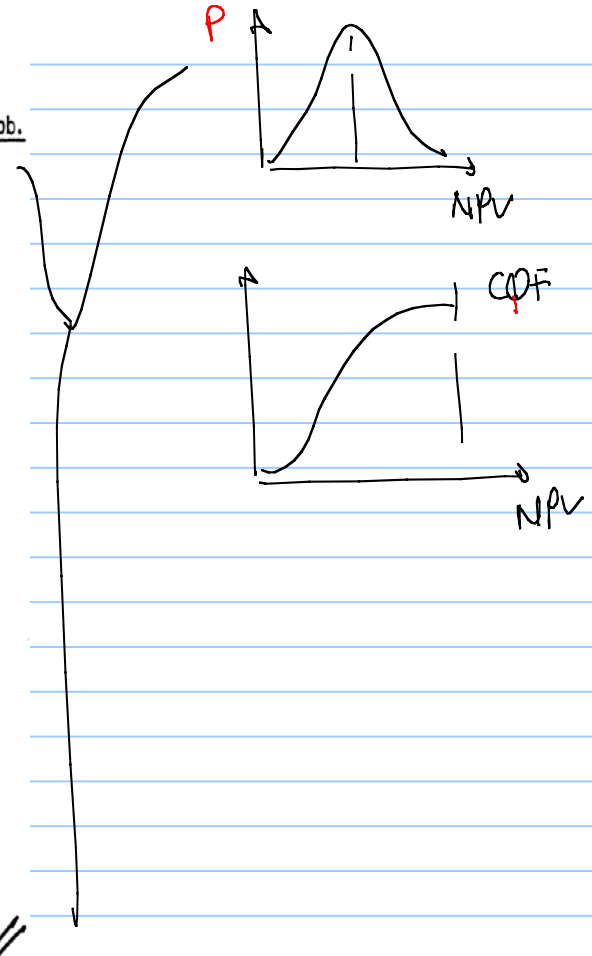
- ○ chance node
- □ decision node
- ◁ end node



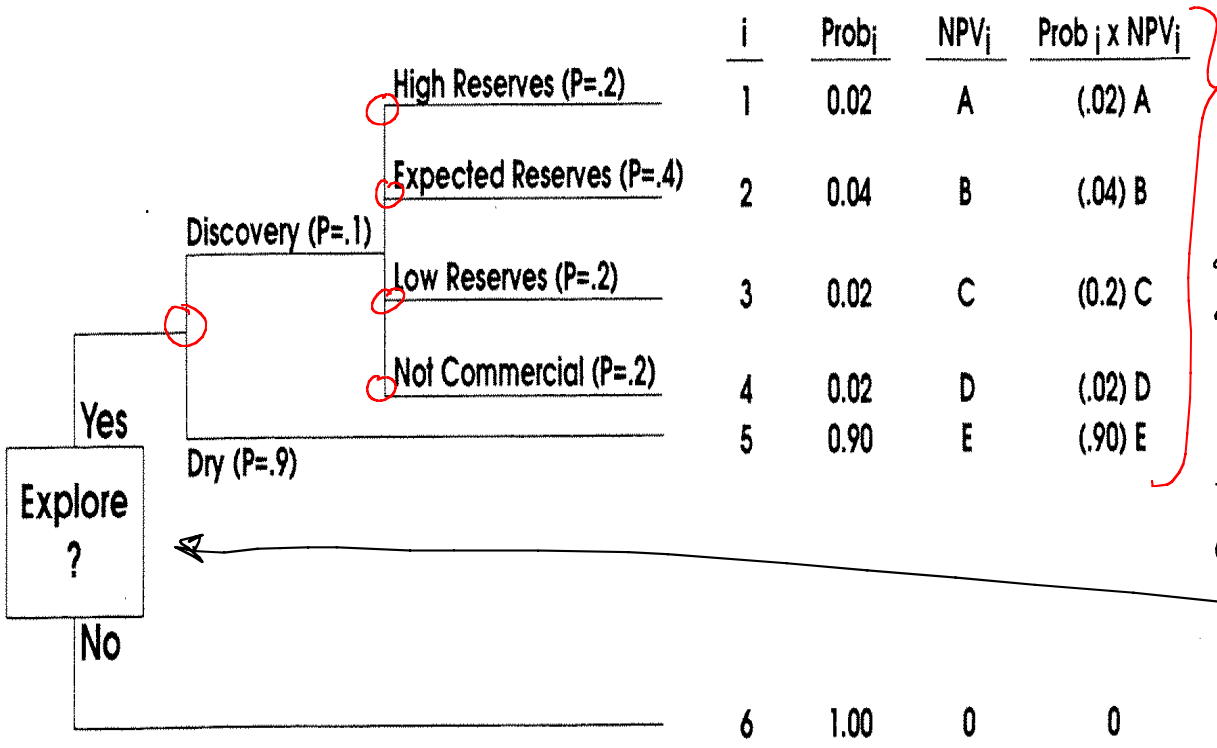
all chance nodes, no decisions.







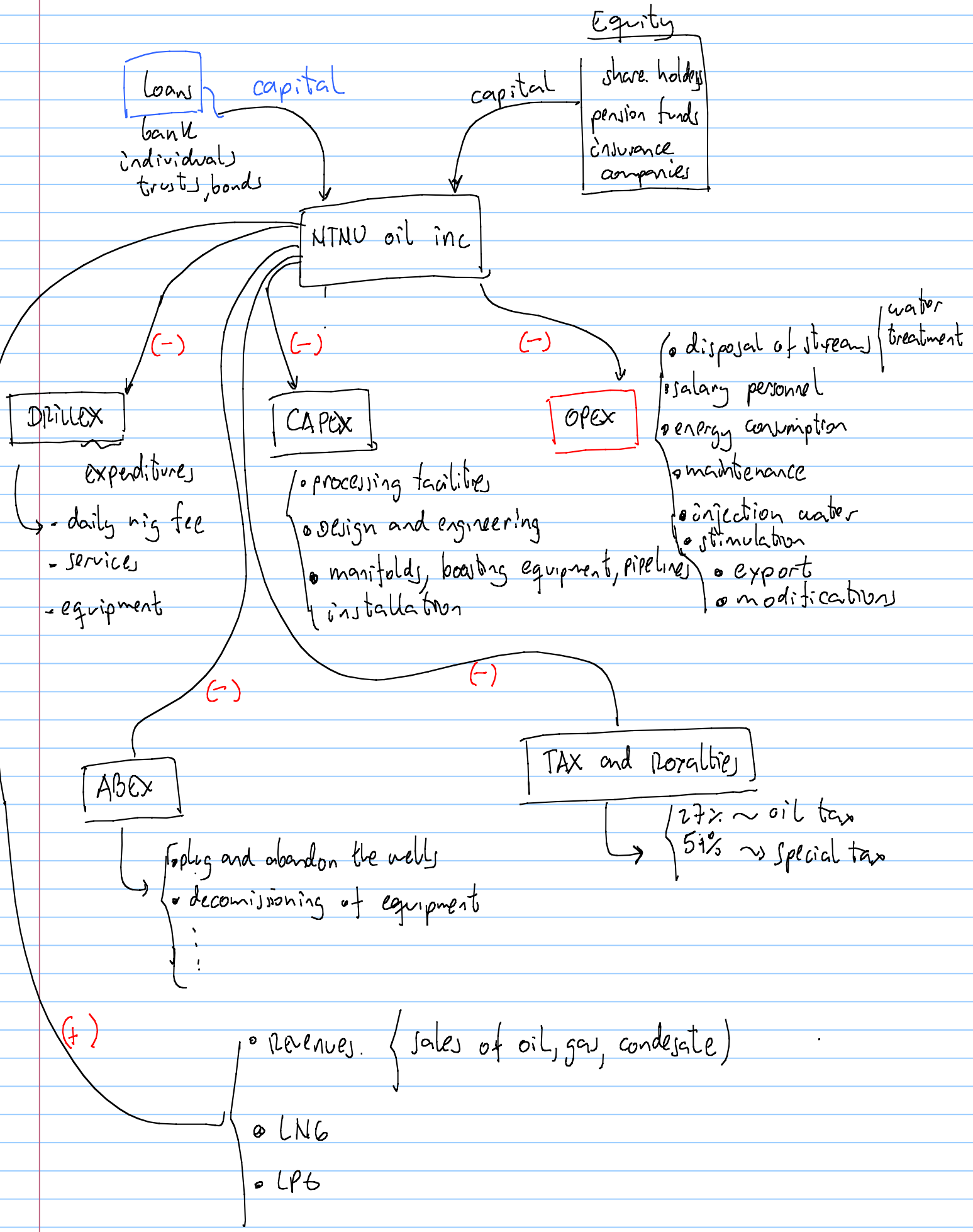
Used often when deciding if to drill further or not.



it is possible to compute a weigth average NPV for this branch. to take this decision

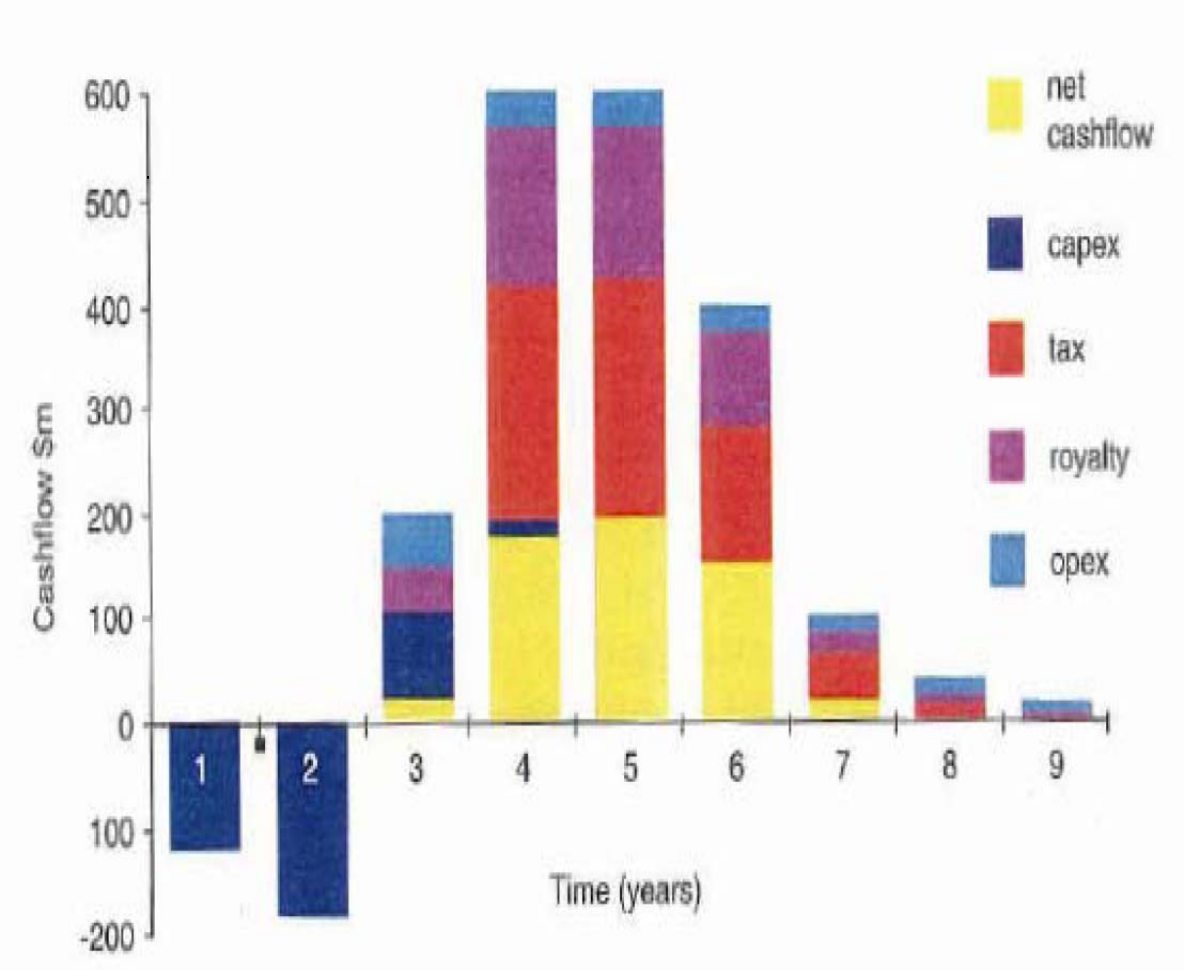
- Weighted AVG. NPV ('Yes-Branch') $= \sum_{i=1}^{5} (\text{Prob}_i) \times \text{NPV}_i) = G$
- NPV ('No-Branch') =0
- IF G>O, Explore !
- A-E; Shows the spread in NPV-Outcome for this venture

Economic calculations



cash flow = Revenues - expenses

= (revenues - DRILLEX - CAPEX - OPEX - TAX)

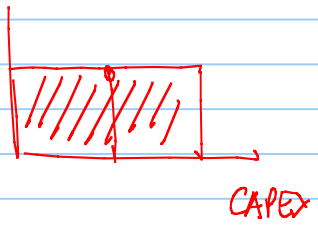


when (+) the cash flow goes to ~> { pay back financial obligations (loan, interest)
pay shareholders (dividends)
reinvestment at NTNU oil

Economical calculations are usually performed by the end of the year

DEFINITION of 'Present Value - PV'

The current worth of a future sum of money or stream of cash flows given a specified rate of return. Future cash flows are discounted at the discount rate, and the higher the discount rate, the lower the present value of the future cash flows. Determining the appropriate discount rate is the key to properly valuing future cash flows, whether they be earnings or obligations.



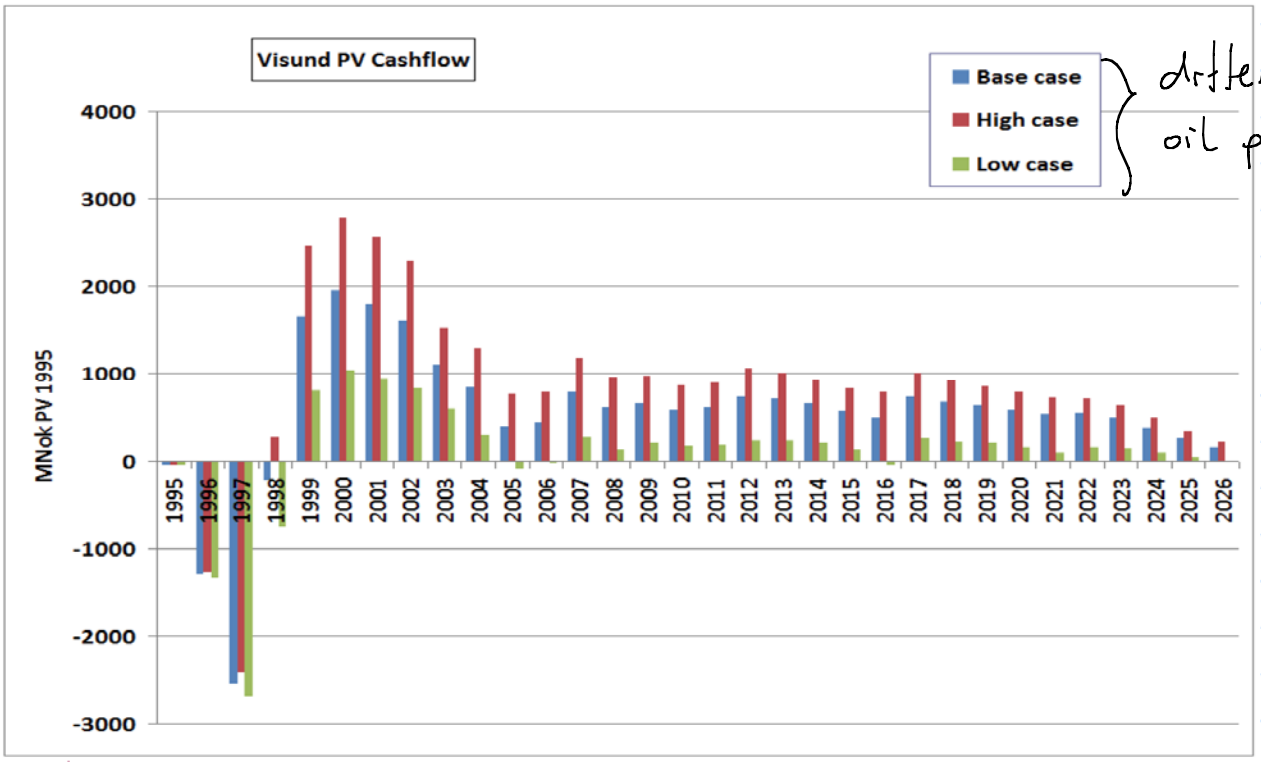
present value

Future value

$$PV = \frac{FV}{(1+i)^n}$$

nº years in the future

yearly interest rate



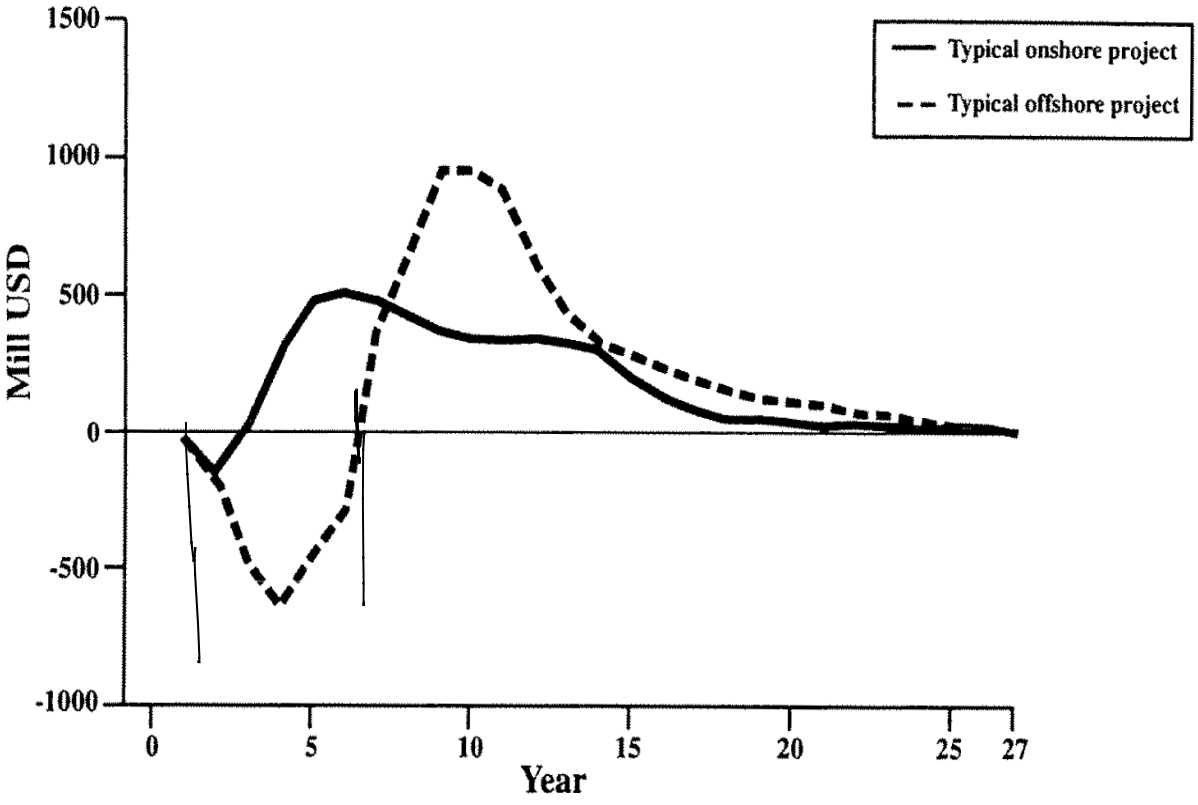
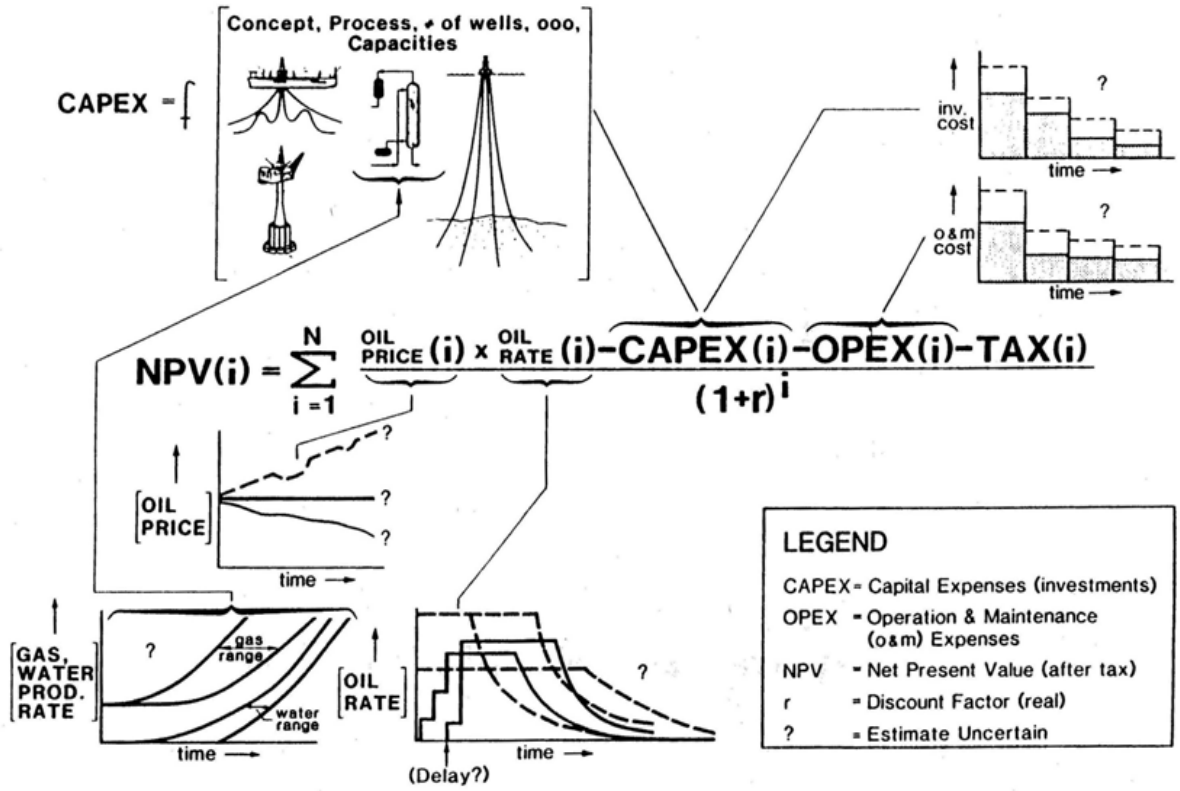


Fig. 9. Typical before tax cash flow profiles for offshore and onshore projects.

What can we control?

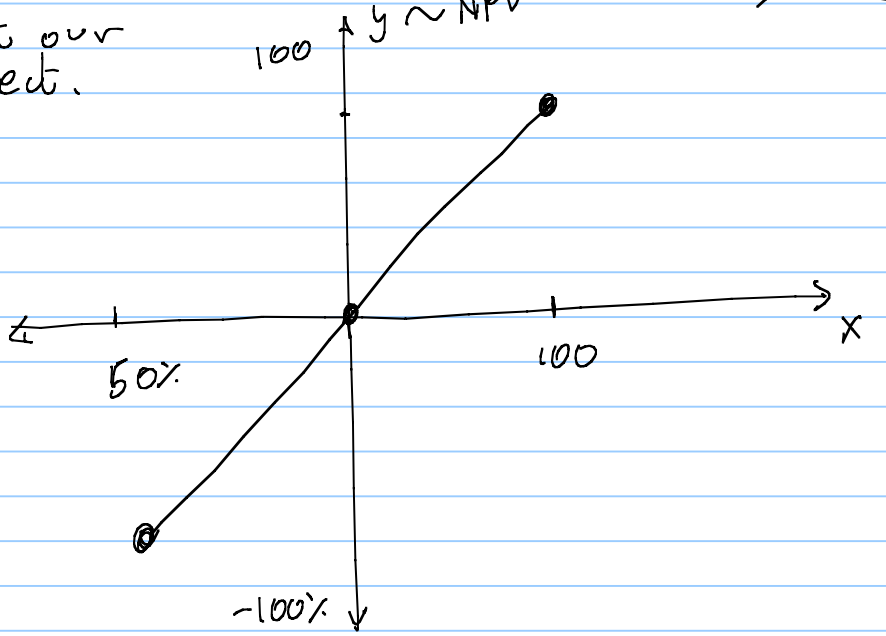


spider plot → ceteris paribus

a simplistic tool to see which parameter affects most our project.

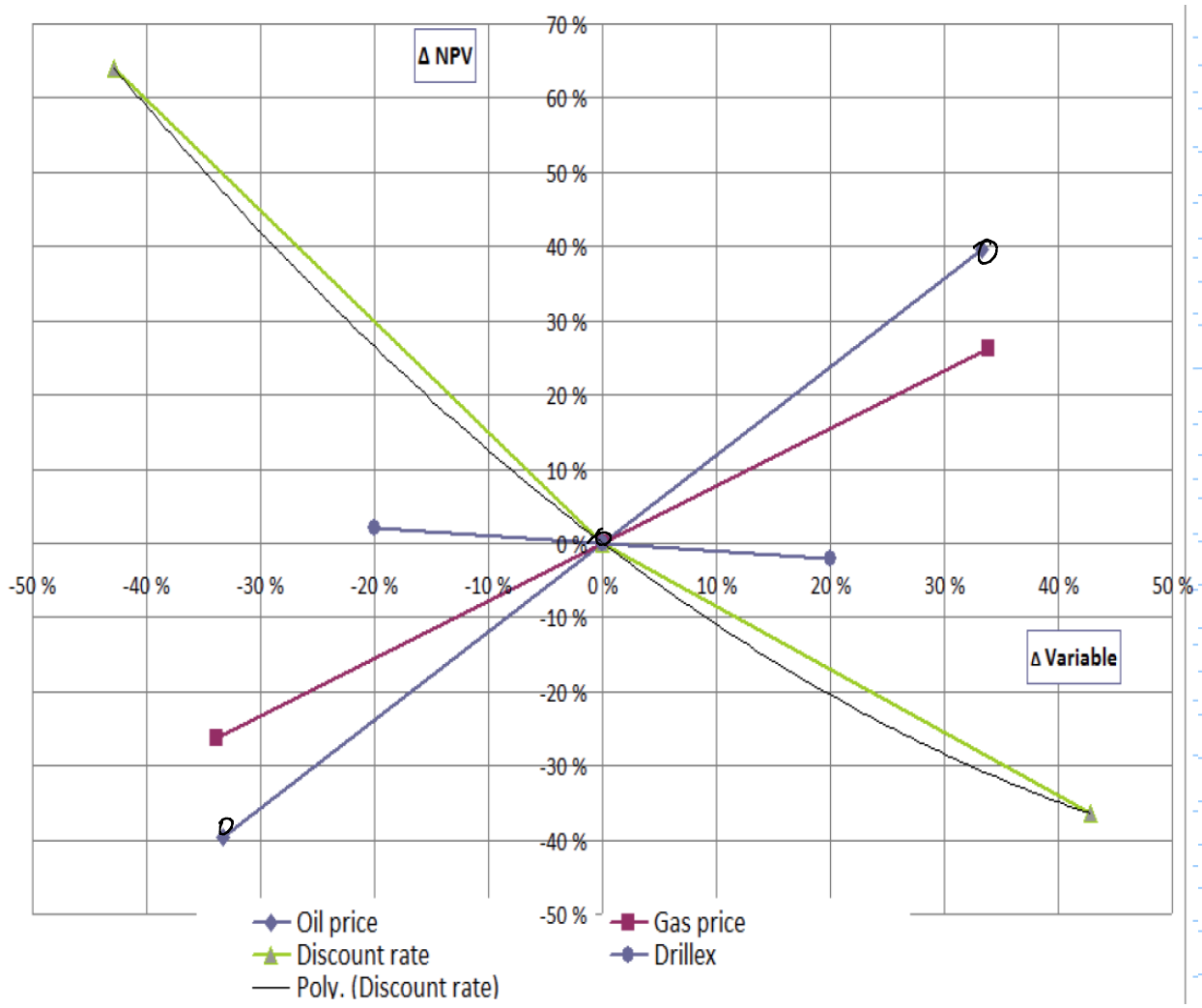
$$\frac{y - y_{base}}{y_{base}} \times 100$$

e.g. 30 usd/stb



parameter that we want to change

$$\frac{X - X_{base}}{X_{base}} 100$$



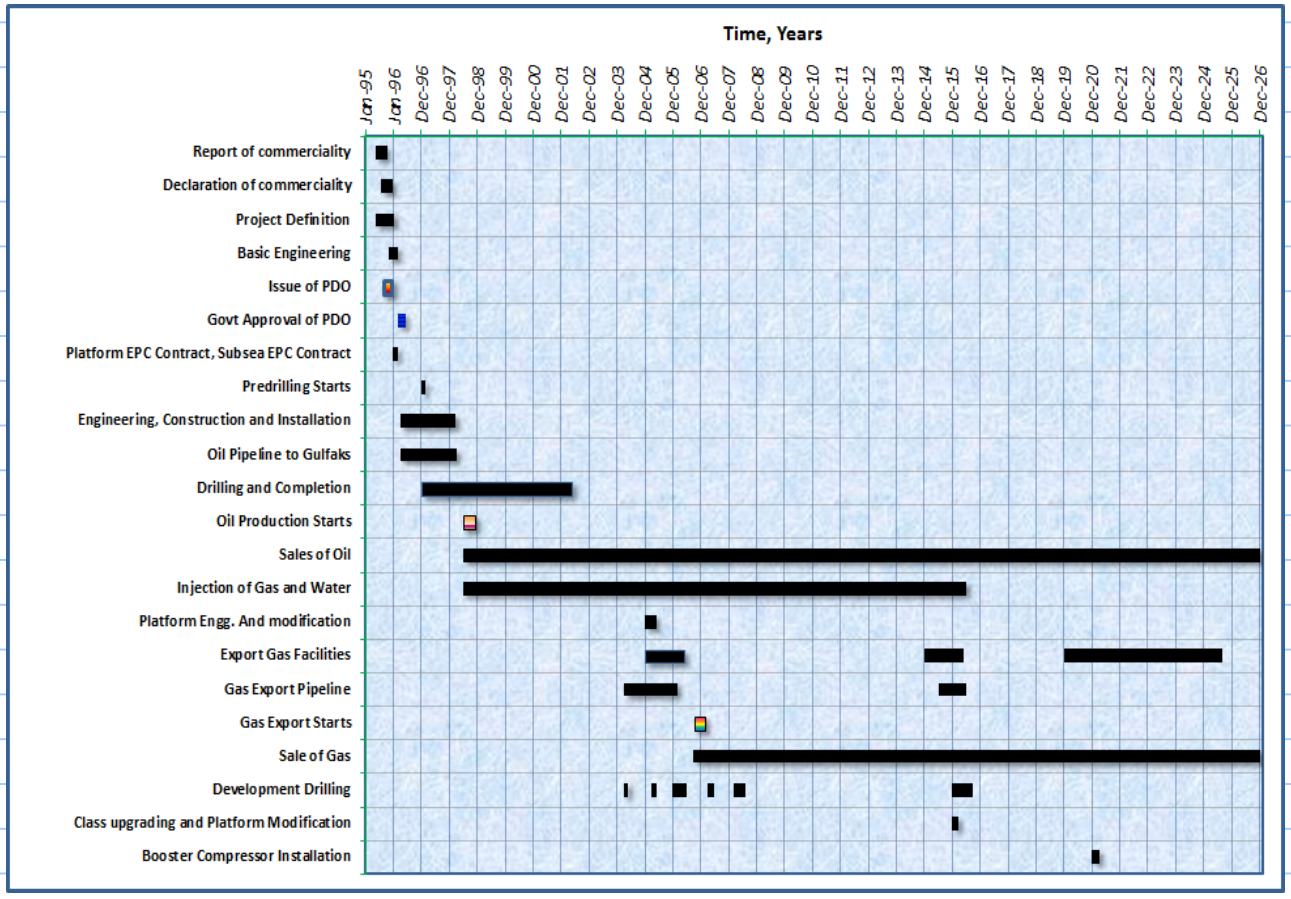
oil price | gas price

X_1	X_2	X_3	NPV	$X_{normalize}$	$y_{normalized}$
X_{min}	$X_{2\,base}$		NPV_{min}		
X_{base}	$X_{2\,base}$		NPV_{base}		
X_{max}	$X_{2\,base}$		NPV_{max}		
X_{base}	$X_{2\,max}$		NPV_{max}		
X_{base}	$X_{2\,base}$		NPV_{base}		
X_{base}	$X_{2\,min}$		NPV_{min}		

plot series "oil price"

plot series "gas price"

Gantt chart : a very important tool for Project management



Henry Gantt (1861-1919), a mechanical engineer, management consultant, and industrial advisor developed Gantt charts in the 1910's. Not as commonplace as they are today, Gantt charts were innovative and new during the 1920's, where Gant charts were used on large construction projects like the Hoover Dam started in 1931 and the Eisenhower National Defense Interstate Highway System started in 1956.

Henry Gantt

Every time we, in our project management careers, go through the rigmarole of our projects, trying to meet and beat our own-set goals, a silent word of gratitude goes to the heavens for Henry Gantt for conceiving this intuitive diagram for charting project timelines, for the Gannt Diagram allows us to excel in this chosen career.

https://www.smartsheet.com/blog/gantt-chart-excel

ACTIVITY CODE	NAME	START	DURATION	END
A		1	2	3
B		2	5	7