Note Title 11/24/2016

Send me your .phz file(s) for the class project, and any work files (e.g. xls for data entry) in a single .zip file ~ e.g.

Bilal-phz-Class-Project.zip

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Use ✓

Ackerman Sample Compositions: Reliable Lab Data

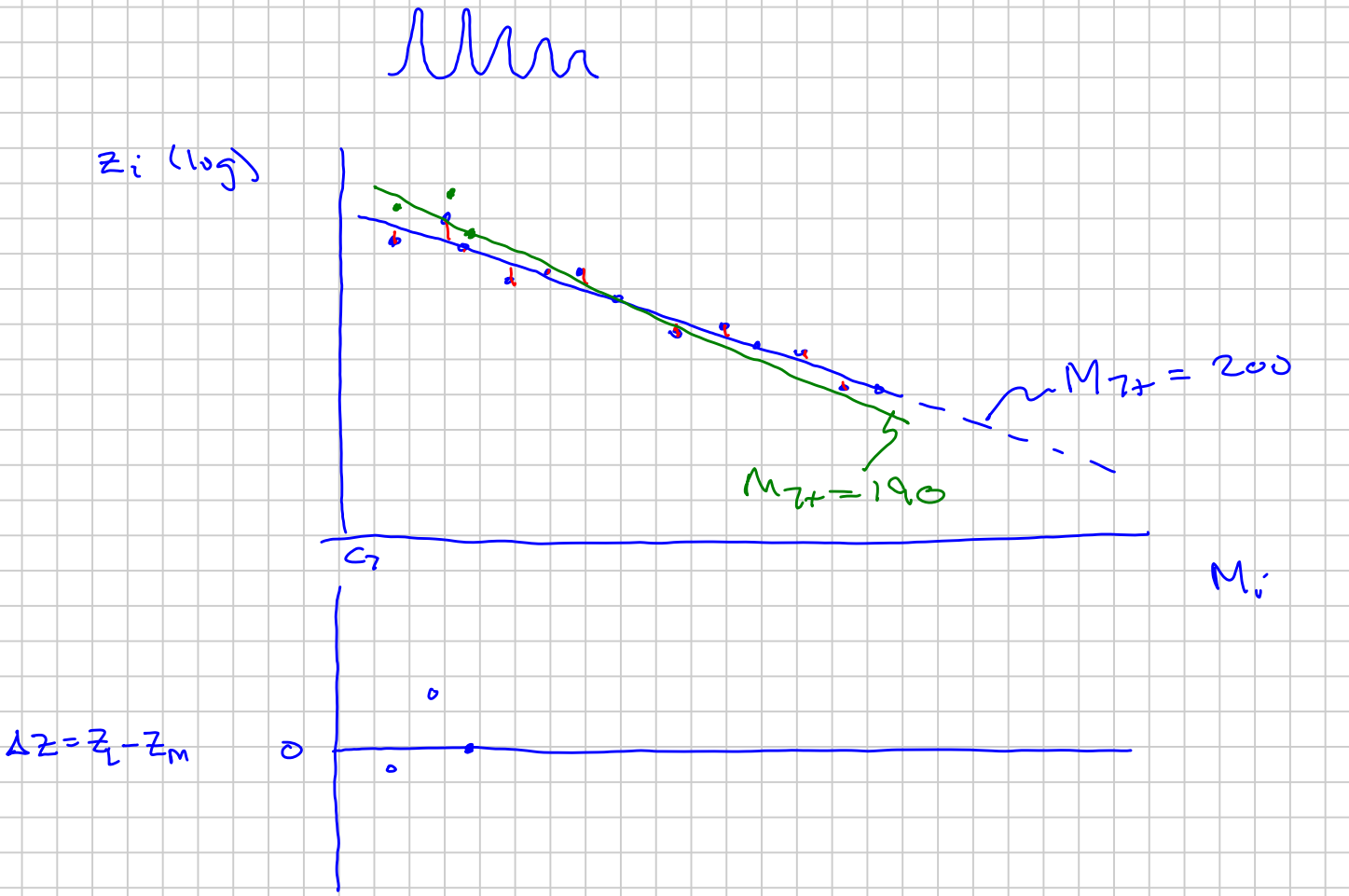
Sep Oil ... C_{7+} & ... C_7 C_8 C_9 C_{10} C_{11+}

Sep Gas ... C_{7+} $M_{7+} = 102$

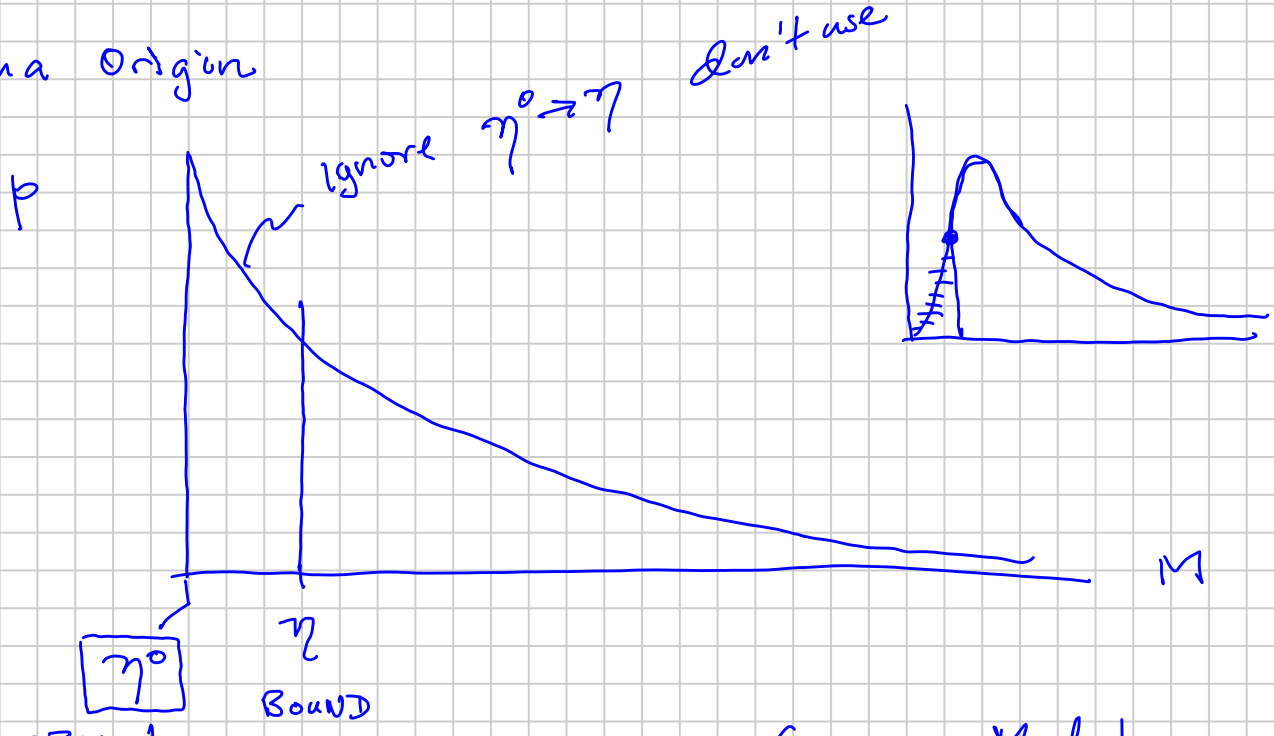
Exp Split AVG = 102 =>

C_7 C_8 C_9 C_{10} C_{11+}

Gamma Fit C_{7+} $\bar{M}_{7+}$ η α_{7+}



Gamma Origin



$$\frac{\eta^0}{\eta}$$

Gamma Model

AVERAGE SHAPE

$$\eta^0 = (\text{ORIGIN} * \underset{\eta}{\text{BOUND}})$$

PhazeComp SCN MW "method"

NAME MW

CI $I = 6 \quad 7 \quad 8 \ldots$

Two Correlations:

n-Paraffin Correlations $M_p(T_b)$ ↙

$T_{cp}(T_b)$

$p_{cp}(T_b)$

Fraction (SCN) w/ non-Paraffins

$M(T_b, \sim\Delta\gamma)$

$T_c(T_b, \sim\Delta\gamma)$

$p_c(T_b, \sim\Delta\gamma)$

$\Delta\gamma = \gamma(T_b) - \gamma_p(T_b)$

Soreide $\gamma(\underline{M}, C_f)$ $\gamma(\underline{M}, a_0\ a_1\ a_2\ c_3)$

CI:

① $T_{bp}(M_{pI} = 14.I + 2)$

② $\gamma_p(T_{bp})$

③ $\gamma(M_{pI}, C_f)$ ← Soreide

④ $\Delta\gamma = \gamma - \gamma_p$ }

⑤ Fractional (effective) SCN $i \le I$

Ⓧ $i = I - 3\Delta\gamma$

e.g. $I = 7$ $i = 6.7$ (default Soreide)

⑥ $M_{Pi} = 14\,i + 2$ $\quad \gamma_{Pi}(T_{bi})$

Phz TB ⑦ $T_{bi} = T_{bP}(M_{Pi})$

TwuMW = 1 (default) ⑧a M_i ← (M_{Pi}, $\Delta\gamma$) Twu

γ_i ← (M_i, cf) Sorelde

} Solve for M_i

TwuMW = 0 (often best) ⑧b $M_i = M_{Pi}$, i.e. $\Delta\gamma = 0$

Any TwuMW

⑨ T_{ci} (T_{bi}, $\Delta\gamma$)

⑩ p_{ci} (T_{bi}, $\Delta\gamma$)

Any experiment defined in Phz (XXX = CCE SEP..)

MIX FEED {what you want the cell filled with initially}
TEMP 212 F
{ PRES 6000 PSIA }
PSAT

} Used to define PVT properties called "Relative"

XXX

BASIS {vol, mass, mole}
1 gmol - default

Vref = Flash calc from EOS w/ ref. amount at Pref Tref
Total Volume

LRVOL
GRVOL
RVOL
↑ Relative

LRMASS LRMa
GRMASS GRMOL

Defining Mismatch

i	d_{mi}	d_{ci}	Types	Individual (Groups) of Weight Factors: Importance	Accuracy
			p_s	H	H
			ρ	A	A
			V_r	L	L
			y_i		
			x_i		
			⋮		

N

Difference $\delta_i = d_{ci} - d_{mi}$ units

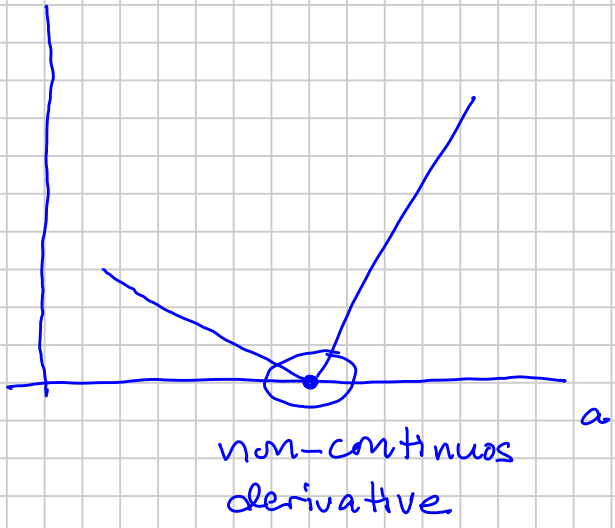
δ_i^2 units^2

Deviation $\Delta_i = \dfrac{d_{ci} - d_{mi}}{d_{mi}}$ $\pm$

$MM_1 = \dfrac{1}{N} \sum_{i=1}^{N} \Delta_i = 0$ could still be a bad model

$MM_2 = \dfrac{1}{N} \sum_{i=1}^{N} |\Delta_i|$

Model $y = ax$



$$MM_3 = \left(\frac{1}{N} \cdot \sum \Delta_i^2 \right)^{1/2}$$

Data Types:

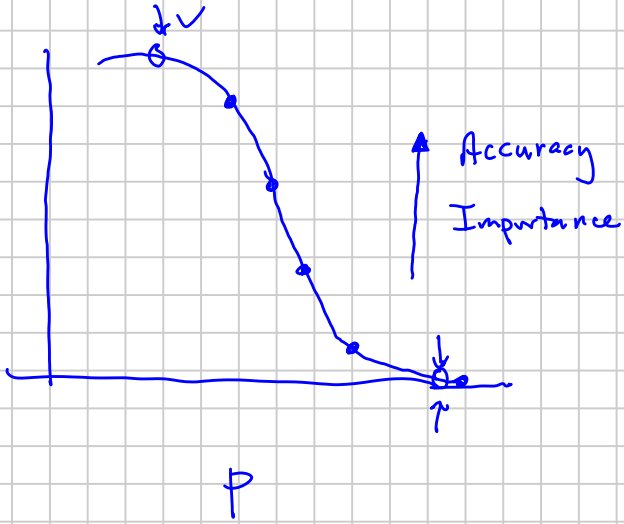
$$\frac{d_{T1\ max}}{d_{T1\ min}} = 1.5 \qquad \rho_0$$

$$100 \qquad \rho_g$$

$$\frac{d_{T4\ max}}{d_{T4\ min}} = 10^6 \qquad K_i \quad y_i \quad x_i \quad V_{ro}$$

$$y_{C_1} \quad y_{C_{3O+}} \quad 10^{-3}$$

$$\sim 1 \quad 10^{-6} \quad 0.5$$



5 error-% in C_1 vs C_{60}

5 error% in C_{3O+}

T4(a) C_1

T4(x) C_{3O+}

Residual: $r_i = \dfrac{d_{ci} - d_{mi}}{d_{ref,i}}$

built-in weighting of "Larger" data of a given type

$$d_{ref,i} = \max \{ d_{i \in T4(a)} \}$$

e.g.

Each XXX

Each Property Column finds $d_{ref,i}$

$$MM(Phz) \sim \sum_{i=1}^{N} (r_i \cdot w_i)^2$$

Main Regression

r_i: Program Controlled

w_i: User specified

Lab V_{ro}

(1) $\left(\frac{V_o}{V_s}\right)_{\text{Input PVT}}$ @ $P_{min} \sim 1500$ psia

(2) $\left(\frac{V_o}{V_t}\right)_{lab}$ $\times \left(\frac{x}{4}\right)$

* Due Diligence on data entry *]

* Ranking data • Quality (Accuracy) *
• Importance

k_{ij} T_c P_c C_{70} ... 5-20

min RMS (EOS Model Parameters | Individual Sample Compositions)

2-5%

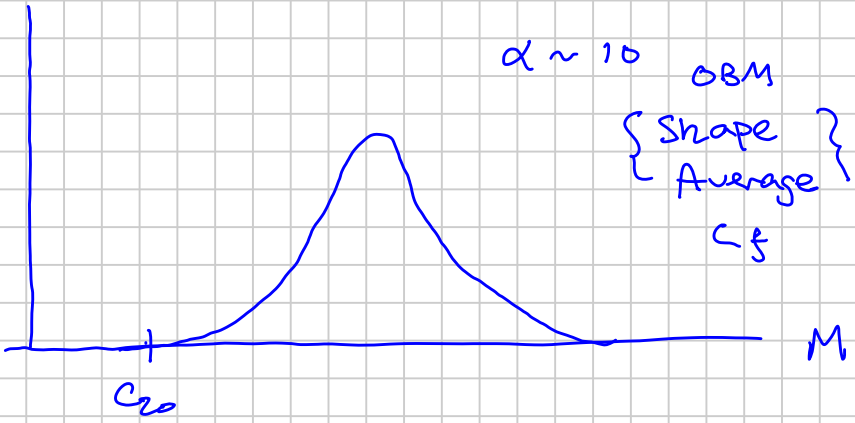
V_{c1} V_{c2} V_{c3}

M_{7+} GOR Z_{30+}

Pick Variables (EOS | Sample-Comp):

V_i : starting value, min bound, max bound

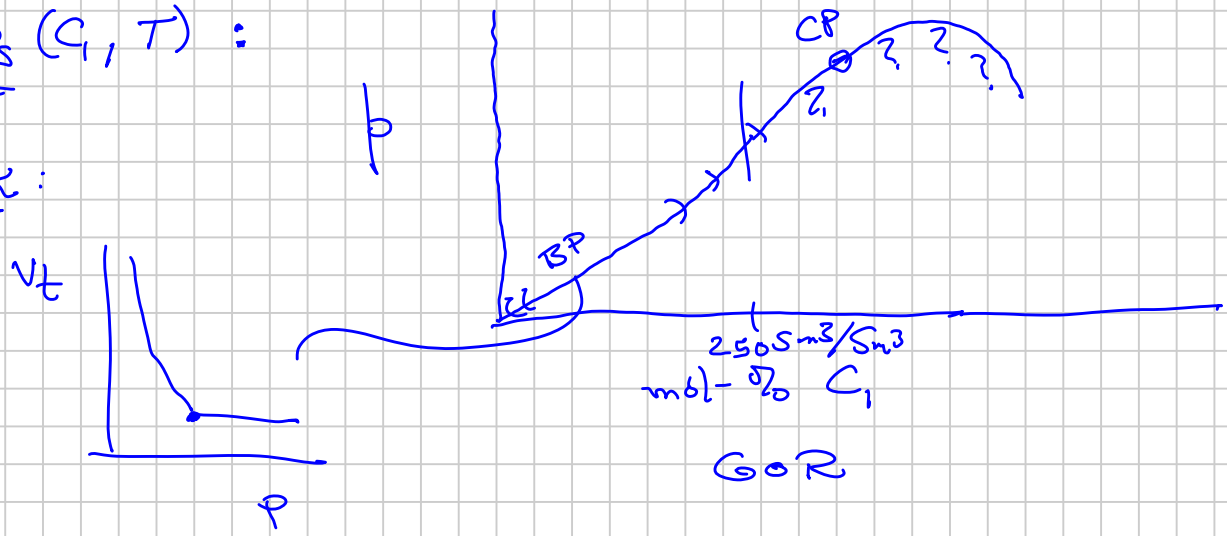
OBM :



OBM + C_1 $\quad (T, p)$ $\quad \rho(p, T)$

$p_s(C_1, T)$:

SRK :



Regression Variables

① EOS Properties 3-7 Variables

- C_{7+} T_c p_c $\{T_b \mid \omega\}$
- C_{N+} T_c p_c $\{T_b \mid \omega\}$

Ramping C_7 ↕ ① C_{N-1} ↕

(C_7-C_{10}) $(C_{11}-C_{20})$ $(C_{21}-C_{29})$ ③

(2-3)

- {Soreide Model parameter (C_i)} ⇒ S_i (①) (C_{7+})
- BIPs : $C_1 - C_{7+}$ ①
  $C_1 - C_{N+}$ ①
  {HC-HC} including $C_{7+}-C_{7+}$ BEWARE!
  {nm-HC − HC} only if "gas inj" PVT w/ nm-HCs

* Affect all samples in a 'SIMILAR' way ↑↑↑↑↑↑↑↑↑

P_b ↕

② Sample Compositions (1-3)/sample

Sep Gas . V + Sep Oil (1-V)

(a) Test samples
(b) Flashed from wellstreams

- GOR recombination
- M_{N+} ↕ ± 5-10% mass-to-mole conversion & amount of C_{N+}
- Z_{N+} ↕

* Impact only the particular sample quality match

- Any composition change should improve most/all PVT predictions
- max mol% (C_1, C_{7+}) ↕ ± 0.5-1.5 (2)