

Q4 - 3 alternatives

1. fixed price tender offer for 140 million shares at 26 per share
2. open market repurchase program for 182 million shares at an average price of 20
3. if someone makes a bid for the company it will be at a 40% premium above the market price

In [1]:

```
import pandas as pd
import numpy as np
import scipy
import math
import seaborn as sns
import matplotlib.pyplot as plt
```

Measuring gains properly - Theo slide 17

Total wealth created for all shareholders is best measured by the total *abnormal* return $Total_R$

$$Total_R = F_p * repurchasePremium + (1 - F_p) * CAR$$

CAR is the abnormal return to *remaining* non-selling shareholders

Case Page number 5

Tender offers which predicted that the total abnormal return to all shareholders could be predicted by the following regression:

$$Total_R = 0.6 * Premium + 0.25 * PercOfSharesRepurchased$$

In [18]:

```
def total_r_calc(offer_price, current_price, num_repurchased, total_shares):
    premium = (offer_price-current_price)/current_price
    perc_repurchase = num_repurchased/total_shares

    return 0.6 * premium + 0.25 * perc_repurchase
```

In [20]:

```
# scenario 1

total_shares = 640
repurchase_shares = 140

perc_repurchase = repurchase_shares / total_shares
```

In [34]:

```
140 * 26
```

Out[34]:

3640

In [21]:

```
round(perc_repurchase, 2)
```

Out[21]:

0.22

In [25]:

```
Total_R = 0.6 * ((26-16.97)/16.97) + 0.25*perc_repurchase
```

In [26]:

```
round(Total_R, 4)
```

Out[26]:

0.374

In [27]:

```
# test the function
```

```
total_r_calc(26, 16.97, 140, 640)
```

Out[27]:

0.3739567987625222

Remember that abnormal return to total shareholders is a function of the remaining CAR to remaining shareholders

In other words:

$$CAR = \frac{(Total_R - F_p * repurchasePremium)}{(1 - F_p)}$$

In [32]:

```
CAR1 = (total_r_calc(26, 16.97, 140, 640) - (140/640)*((26-16.97)/16.97)) / (1 - (140/640))
```

In [33]:

```
CAR1
```

Out[33]:

0.32967236299351804

In [37]:

```
16.97 * 1.374
```

Out[37]:

23.31678

In []:

In []:

In [29]:

```
# scenario 2
```

```
total_r_calc(20, 16.97, 182, 640)
```

Out[29]:

0.17822397981732474

In [35]:

```
CAR2 = (total_r_calc(20, 16.97, 182, 640) - (182/640)*(3.03/16.97)) / (1 - (182/640))
```

In [36]:

```
CAR2
```

Out[36]:

0.17809427373762596

In []:

In [30]:

```
# scenario 3
```

```
16.97*1.4
```

Out[30]:

23.757999999999996

In []:

In []:

Theo Slide number 38

You should buy back stock when you are undervalued and you can afford it

If you care about correcting undervaluation NOW, choose the tender offer route

If you don't care about the short-run, choose the open market mechanism

In []: