In [1]:
```
import numpy as np
import pandas as pd
from pandas_datareader import data as wb
```

In [2]:
```
tickers = ['GOOG', '^GSPC']
data = pd.DataFrame()
for t in tickers:
    data[t] = wb.DataReader(t, data_source='yahoo', start='2016-12-31', end='2019-07-30')['Adj Close']
```

In [3]:
```
sec_returns = np.log(data / data.shift(1))
```

In [4]:
```
cov = sec_returns.cov() * 250
cov
```

Out[4]:

	GOOG	^GSPC
GOOG	0.056652	0.021935
^GSPC	0.021935	0.016184

In [5]:
```
cov_with_market = cov.iloc[0,1]
cov_with_market
```

Out[5]:
```
0.021935258426864213
```

In [6]:
```
market_var = sec_returns['^GSPC'].var()*250
market_var
```

Out[6]:
```
0.016183540070460148
```

In [7]:
```
# Calculate Beta
GOOG_beta = cov_with_market / market_var
GOOG_beta
```

Out[7]:
```
1.3554054509311402
```

In [12]:
```
#Calculate the expected return of GOOG (CAPM)
# 10 year US bond yield is 3% average S&P 5.5%

GOOG_ern = 0.03 + GOOG_beta * 0.055
GOOG_ern
```

Out[12]:
```
0.1045472998012127
```

In [ ]: