

WORLDQUANT UNIVERSITY
MScFE 640: PORTFOLIO THEORY AND ASSET PRICING

Group Members

Moses E. Tommie (tommiemoses1988@gmail.com)

Kwadwo Amo-Addai (kwadwoamoad@gmail.com)

Daniel Morales (danielmoralesx@hotmail.com)

Brandon Spiteri (brand.spiteri@gmail.com)

Overview

The main objective of the Assignment is to measure the performance of the large-Cap US equity market. Where 500 Companies are classified in 11 sectors such as Energy, Material, Industrials, Consumer discretionary, Consumer staples, Health Care, Financials, Information Technology, Communication services, Utilities, and Real estates. The performance of the S&P 500 index in a period will be equal to the weighted-average of each sectors.

For this assignment we are to use the data that is provided, “GWP_PTAP_Data.xlsx”. to solve the assignment given.

Calculating the Expected Return

We need to calculate the expected return of the portfolio for Energy (XLE) and Industrial (XLI) and the formula to use to calculate the expected return is given as

$$E[R_P] = R_f + \beta(R_m - R_f)$$

For **XLE** stock, we have $\beta = 1.07$.

Hence the expected return on this stock is

$$E[R_{XLE}] = 0.0225 + 1.07(0.09 - 0.0225) = 0.0947 = \mathbf{9.47\%}.$$

For **XLI** stock, we have $\beta = 1.06$.

Hence the expected return on this stock is

$$E[R_{XLI}] = 0.0225 + 1.06(0.09 - 0.0225) = 0.09405 = \mathbf{9.41\%}.$$

Calculating the Daily and Annual Standard Deviations

The first step in approaching this problem is by firstly computing the daily log return, which is given by the following equation:

$$\text{Daily Log Return} = \ln\left(\frac{\text{Current Closing Price}}{\text{Previous Closing Price}}\right)$$

This yielded the results shown in excel tabs 'XLE' and 'XLI' respectively using the formula shown in the screenshot below.

SUM		=LN(B4/B3)	
	A	B	C
1	DAILY CLOSING PRICE DATA FOR XLE FOR THE PERIOD 27-11-2017 TO 23-11-2018		
2	Date	Closing price	Log Return
3	27/11/2017	\$67.19	
4	28/11/2017	\$67.71	=LN(B4/B3)
5	29/11/2017	\$68.08	(LN(number)

The Daily standard deviation was calculated using excel's STDEVP function over the 'Log Return' column values. 'STDEVP' calculates the standard deviation over the entire population.

The formula used is shown in screenshot below.

=STDEVP(C5:C254)									
	A	B	C	D	E	F	G	H	
1	DAILY CLOSING PRICE DATA FOR XLE FOR THE PERIOD 27-11-2017 TO 23-11-2018								
2	Date	Closing price	Log Return						The information is th
3		27/11/2017	\$67.19						
4		28/11/2017	\$67.71	0.0077094					
5		29/11/2017	\$68.08	0.0054496					
6		30/11/2017	\$69.10	0.0148712	STD Dev from Log Return			0.012790258	
7		01/12/2017	\$69.60	0.0092508					

A daily standard deviation of **0.01279 or 1.279%** was achieved for 'XLE', and a daily standard deviation of **0.01074 or 1.074%** was achieved for 'XLI'.

The annualized standard deviation was calculated by taking the square root of 252 (the amount of trading days in a year) multiplied by the daily standard deviation.

The formula used is shown in screenshot below.

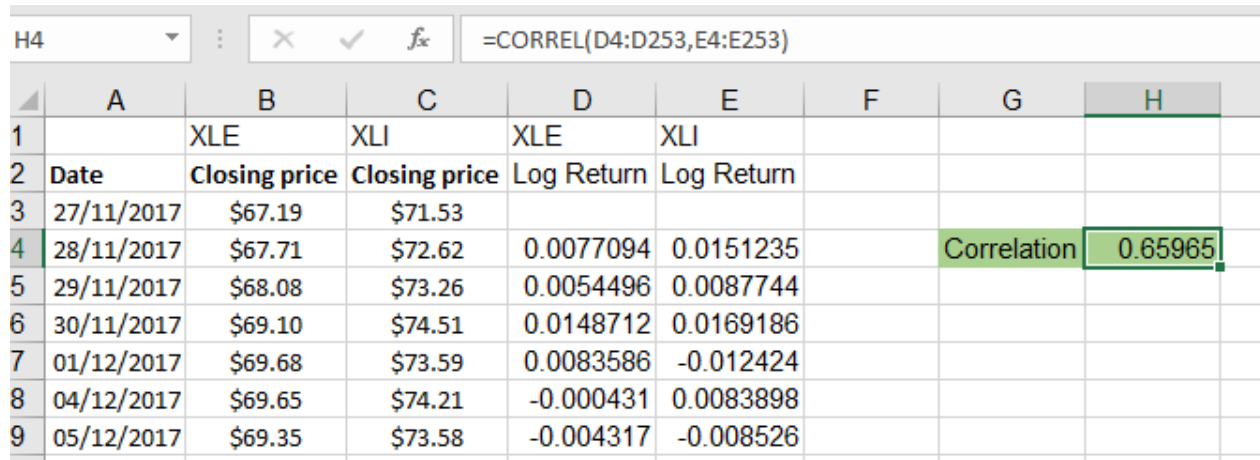
H8	=SQRT(252)*H6									
	A			B	C	D	E	F	G	H
1	DAILY CLOSING PRICE DATA FOR XLE FOR THE PERIOD 27-11-2017 TO 23-11-2018									
2	Date		Closing price	Log Return						The information is th
3		27/11/2017	\$67.19							
4		28/11/2017	\$67.71	0.0077094						
5		29/11/2017	\$68.08	0.0054496						
6		30/11/2017	\$69.10	0.0148712			STD Dev from Log Return		0.012790258	
7		01/12/2017	\$69.68	0.0083586						
8		04/12/2017	\$69.65	-0.000431			Annualized Standard Deviation		0.203039048	

This gave an annual standard deviation of **0.2030 or 20.30% for ‘XLE’** and **0.1705 or 17.05% for ‘XLI’**.

Calculating the Correlation between the Two Sectors

An excel sheet 'Combined – Correlation' was created in which both sector's log returns were inserted in the same excel tab sheet for the corresponding same dates. The correlation gives a measurement between -1 and 1, as described in the Collaborative Review Task M2.

Correlation was calculated using the 'CORREL' excel function as shown in the screenshot below.



	A	B	C	D	E	F	G	H
1		XLE	XLI	XLE	XLI			
2	Date	Closing price	Closing price	Log Return	Log Return			
3	27/11/2017	\$67.19	\$71.53					
4	28/11/2017	\$67.71	\$72.62	0.0077094	0.0151235		Correlation	0.65965
5	29/11/2017	\$68.08	\$73.26	0.0054496	0.0087744			
6	30/11/2017	\$69.10	\$74.51	0.0148712	0.0169186			
7	01/12/2017	\$69.68	\$73.59	0.0083586	-0.012424			
8	04/12/2017	\$69.65	\$74.21	-0.000431	0.0083898			
9	05/12/2017	\$69.35	\$73.58	-0.004317	-0.008526			

A correlation of 0.6596 was obtained, showing that both stocks are positively correlated, and that if one stock goes up, the other will follow and the same is achieved were one stock goes down.

References:

<https://www.portfoliovisualizer.com/efficient-frontier>

<https://courses.lumenlearning.com/boundless-finance/chapter/implications-across-portfolios/>

<https://www.finra.org/investors/learn-to-invest/key-investing-concepts/evaluating-investment-performance>