Data Analysis

Name:

Institution:

Instructor:

Course Code:

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Introduction

A stock market is one of the channels through which an investor can invest their funds in addition to money markets, bonds markets, futures markets, among others (Sigauke, 2016). Bansal, Connolly and Stivers (2014) noted that stock markets tend to have higher returns although they are also highly risky and volatile as compared to a lower risk market such as a bond market. Different stock markets around the world have market indices that are reflective and representative of the stocks within the market. For instance, New York Stock Exchange (NYSE) index in the US, FTSE100 in the UK, NIKKEI in Japan, and the DAX in Germany. This report presents a statistical analysis of the returns of the four market indices, NYSE, FTSE100, DAX, and NIKKEI, between June 2015 and June 2016. The focus is analyzing descriptive statistics, distribution, correlation, time series, and regression among the returns of the market indices.

Findings

Extreme Values, Descriptive Statistics, and Time Series

Extreme Values

Analysis of the returns data indicated that that the 95th percentile for FTSE100 returns was 0.0245 such that 95% of the FTSE100 returns were less than or equal 0.0245, while for DAX returns it was 0.0266. The 95th percentile for the NYSE returns was 0.0157 and for the NIKKEI returns, it was 0.0267. Notably, this finding indicated that at the 95th percentile, NIKKEI index had higher level of returns, as compared to the other indices. This is also notable from the analysis of the five highest returns for each market index. As noted in Table 1 below, Nikkei has higher returns, followed by DAX, FTSE100, and finally, NYSE.

Table 1: Extreme Values

Extreme Values

			Case Number	Value
FTSE100_Returns	Highest	1	117	.037349977494415
		2	2	.035154245250487
		3	194	.034971323925386
		4	196	.030452580608581
		5	9	.029924262157118
DAX_Returns	Highest	1	196	.048520549747602
		2	240	.037372276989790
		3	117	.034795919152932
		4	70	.034456785906624
		5	9	.033755337475920
NYSE_Returns	Highest	1	195	.036710218644539
		2	98	.024870350527626
		3	187	.023732111481949
		4	194	.023648235391005
		5	78	.021415839490852
NIKKIE_Returns	Highest	1	186	.074261686059009
		2	88	.071098914438982
		3	103	.057104034427167
		4	77	.040273461343629
		5	46	.036111448499249

Descriptive Statistics and Risk Profiles

From the descriptive statistics analysis of the data, it was notable that over the one year period June 2015 to June 2016, the mean returns for all the four market indices were

negative. These were -0.000263 for FTSE100, -0.000656 for DAX, -0.000027 for NYSE, and -0.00109 for NIKKEI as shown in Table 2. Of all of these NYSE had the lowest mean loss, followed by FTSE100, DAX and finally NIKKEI which had the highest mean loss. Notably, NIKKEI was the most risky index over this time as it had the highest standard deviation at 0.01865, while NYSE had the lowest risk at a standard deviation of 0.01045. On the other hand, the standard deviation for FTSE100 and DAX were 0.0132 and 0.0168 respectively. The risk profiles of these market returns may explain the large loss in NIKKEI since a higher standard deviation shows that the market is highly volatile, as compared to a low standard deviation low risk index like the NYSE which is less volatile and thus less likely to experience highly volatile returns. This is noted by the tighter box and fewer large outliers in Figure 1 below.

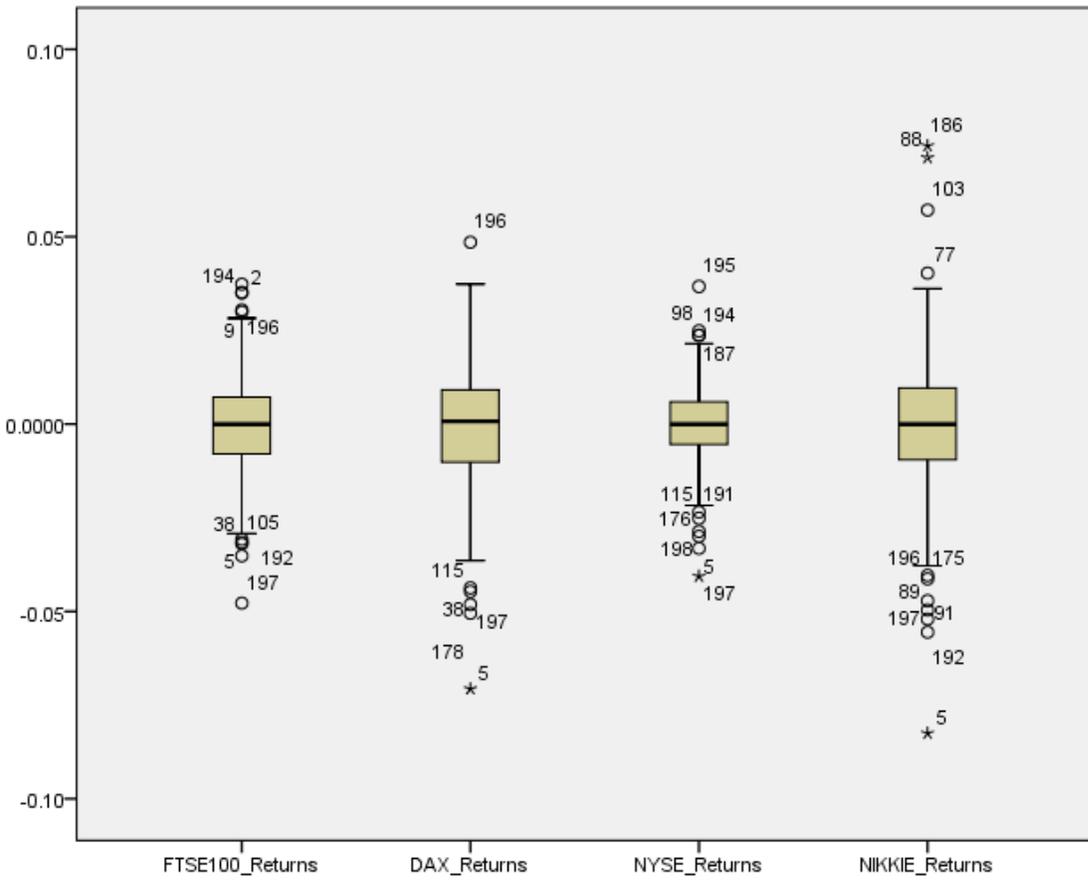**Table 2: Descriptive Statistics**

Descriptives

		Statistic	Std. Error
FTSE100_Returns	Mean	-.000262976608409	.000827924697693
	Median	-.000029797624439	
	Variance	.000	
	Std. Deviation	.013194948406246	
	Minimum	-.047797605880763	
	Maximum	.037349977494415	
	Range	.085147583375078	
	Interquartile Range	.015184690557214	
	Skewness	-.077	.153
	Kurtosis	.809	.304
DAX_Returns	Mean	-.000656297035166	.001056410419267
	Median	.000718743584006	
	Variance	.000	

	Std. Deviation	.016836411593020	
	Minimum	-.070672722646736	
	Maximum	.048520549747602	
	Range	.119193272394238	
	Interquartile Range	.019349776282130	
	Skewness	-.436	.153
	Kurtosis	1.150	.304
NYSE_Returns	Mean	-.000027021155016	.000655893512845
	Median	-.000039718756750	
	Variance	.000	
	Std. Deviation	.010453222480055	
	Minimum	-.040634367787115	
	Maximum	.036710218644539	
	Range	.077344586431553	
	Interquartile Range	.011357809434551	
	Skewness	-.335	.153
	Kurtosis	1.378	.304
NIKKIE_Returns	Mean	-.001094886673562	.001170257333514
	Median	-.000046318263420	
	Variance	.000	
	Std. Deviation	.018650832836946	
	Minimum	-.082529328108815	
	Maximum	.074261686059009	
	Range	.156791014167724	
	Interquartile Range	.019235274440713	
	Skewness	-.131	.153
	Kurtosis	3.044	.304

Figure 1: Box plot of the Returns

Time Series of Market Returns

FTSE100_Returns vs Date time series plot

DAX_Returns vs Date time series plot. R^2 Linear = 2.517E-4
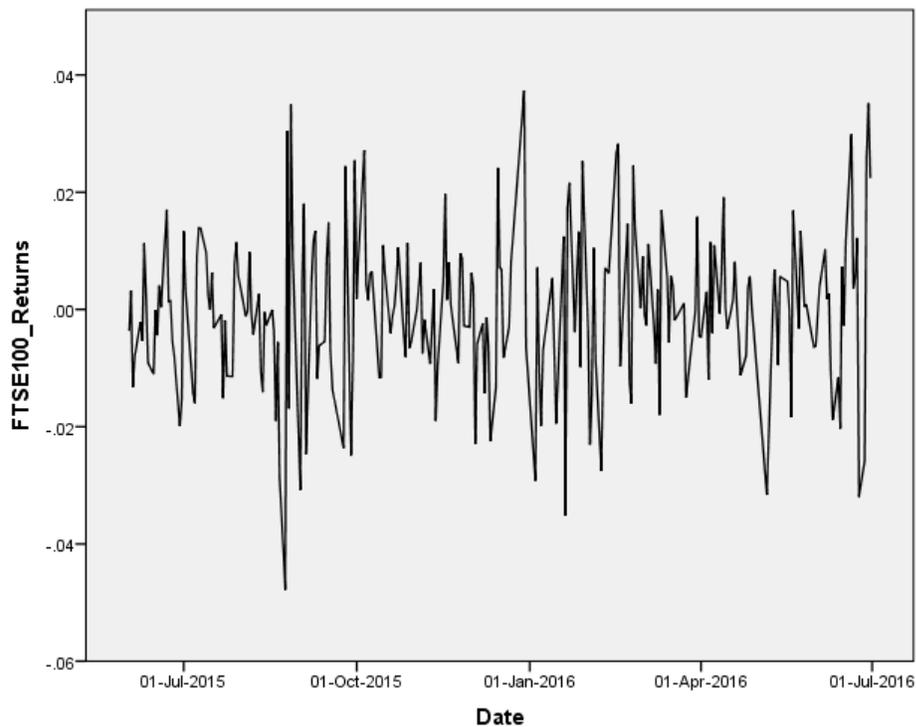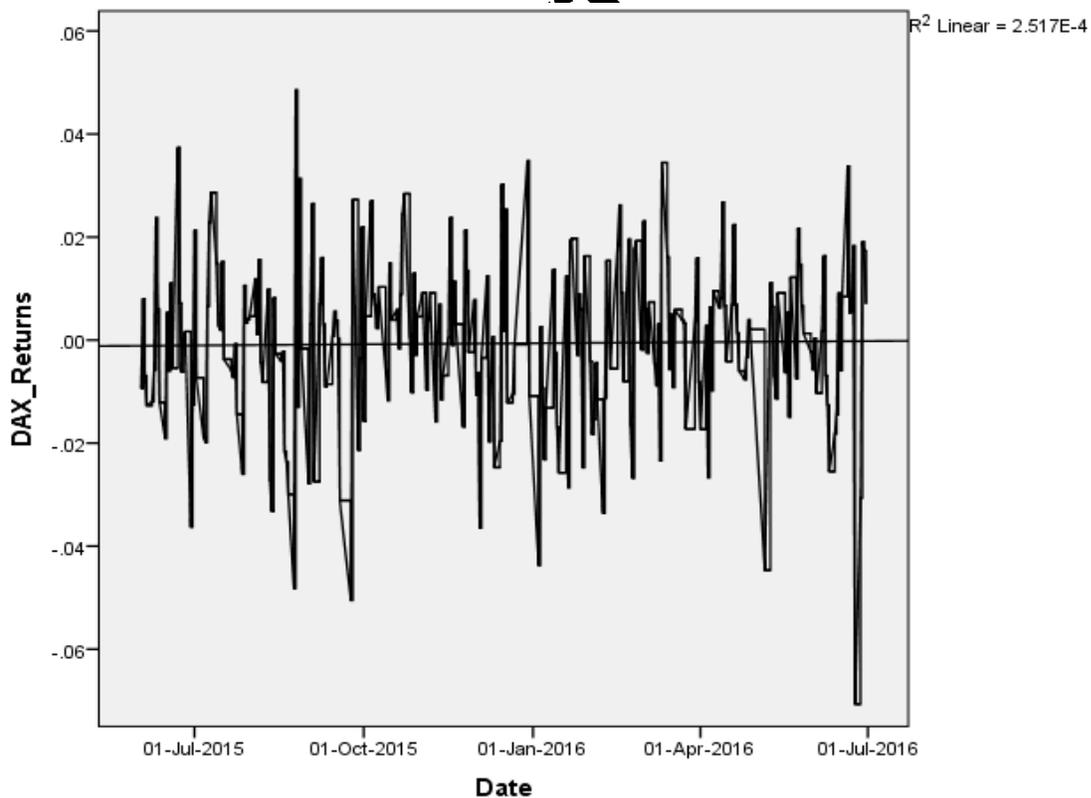
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Pear Correlation and Scatter Graphs

The results from the correlation analysis of the four market index returns indicated that all the returns from different markets were positively correlated as noted in the table below. All these were statistically significant at 0.01 level of significance. Notably, FTSE100 returns and DAX returns were strongly correlated with a correlation coefficient of 0.871. Similarly, correlation between NYSE returns and FTSE100 returns was strong at 0.598, as was that between NYSE returns and DAX returns at 0.567. However, the correlation between NIKKEI and the other markets was weak. For instance correlation between NIKKEI returns and FTSE100 returns was 0.424, while that between NIKKEI returns and DAX returns was 0.413, with the weakest being between NIKKEI and NYSE at 0.276. This is also notable in the scatter plots below where the correlation among FTSE100, DAX, and NYSE returns is strong and positive, as compared to those between NIKKEI returns and other indices.

Table 3: Correlation Analysis

Correlations

		FTSE100_Returns	DAX_Returns	NYSE_Returns	NIKKIE_Returns
FTSE100_Returns	Pearson Correlation	1	.871[**]	.598[**]	.424[**]
	Sig. (2-tailed)		.000	.000	.000
	N	254	254	254	254
DAX_Returns	Pearson Correlation	.871[**]	1	.567[**]	.413[**]
	Sig. (2-tailed)	.000		.000	.000
	N	254	254	254	254
NYSE_Returns	Pearson Correlation	.598[**]	.567[**]	1	.276[**]
	Sig. (2-tailed)	.000	.000		.000

	N	254	254	254	254
NIKKIE_Returns	Pearson Correlation	.424**	.413**	.276**	1
	Sig. (2-tailed)	.000	.000	.000	
	N	254	254	254	254

**. Correlation is significant at the 0.01 level (2-tailed).
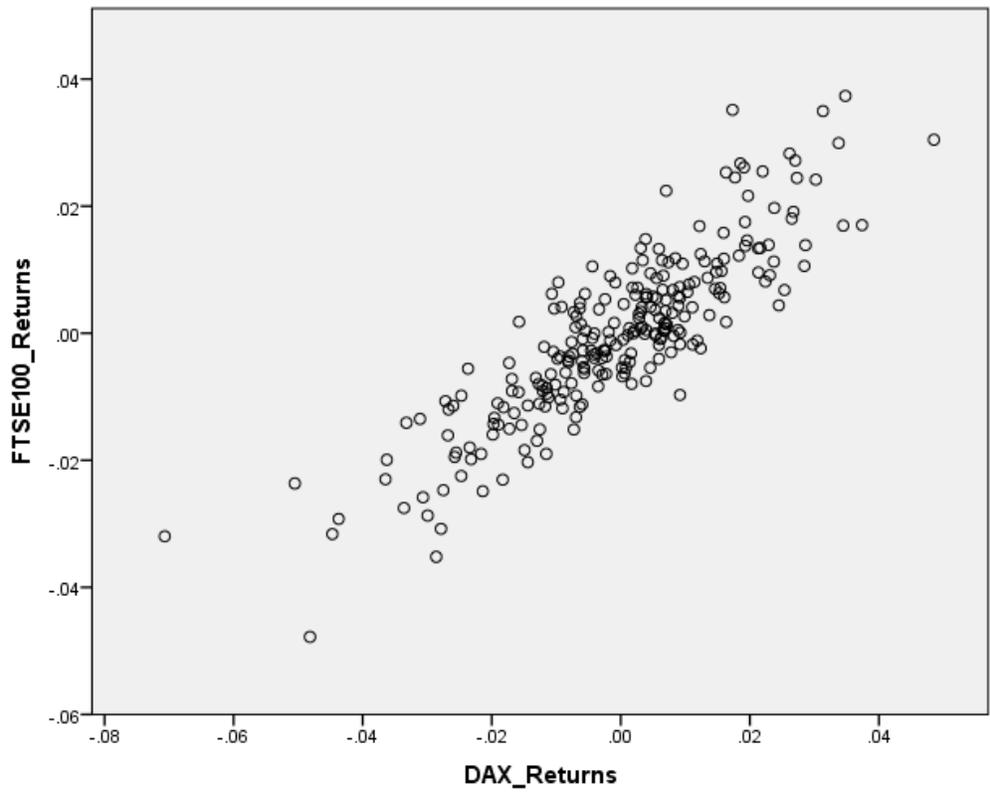
DAX_Returns

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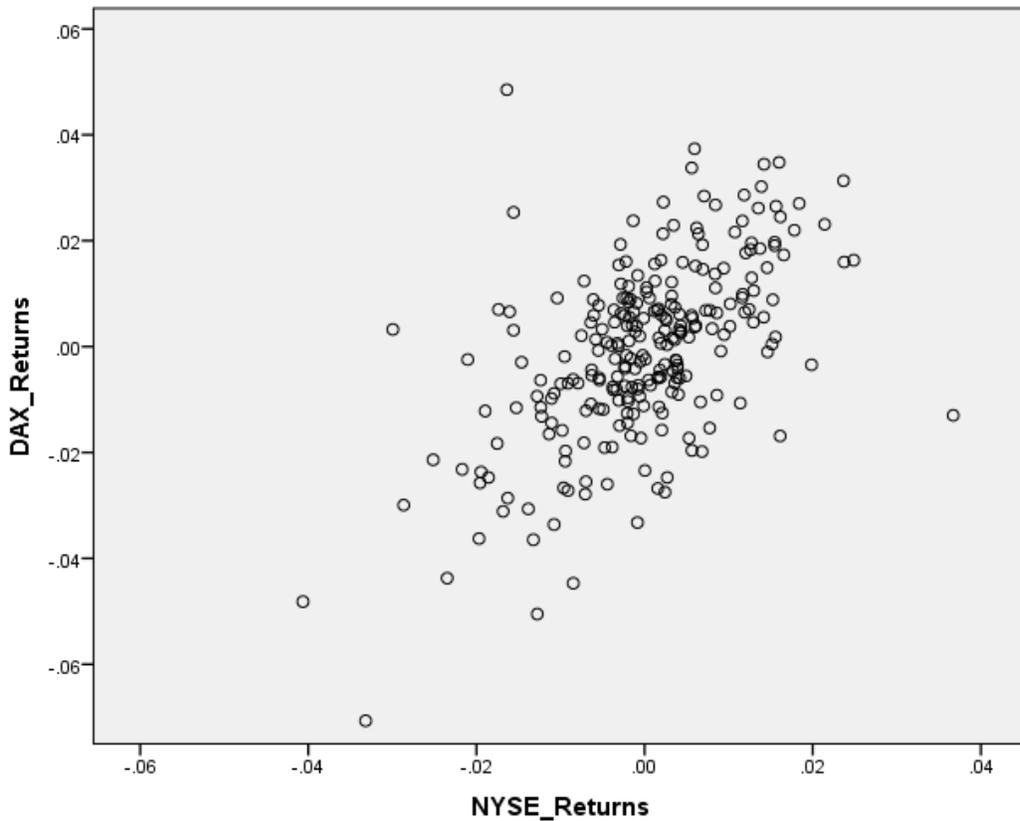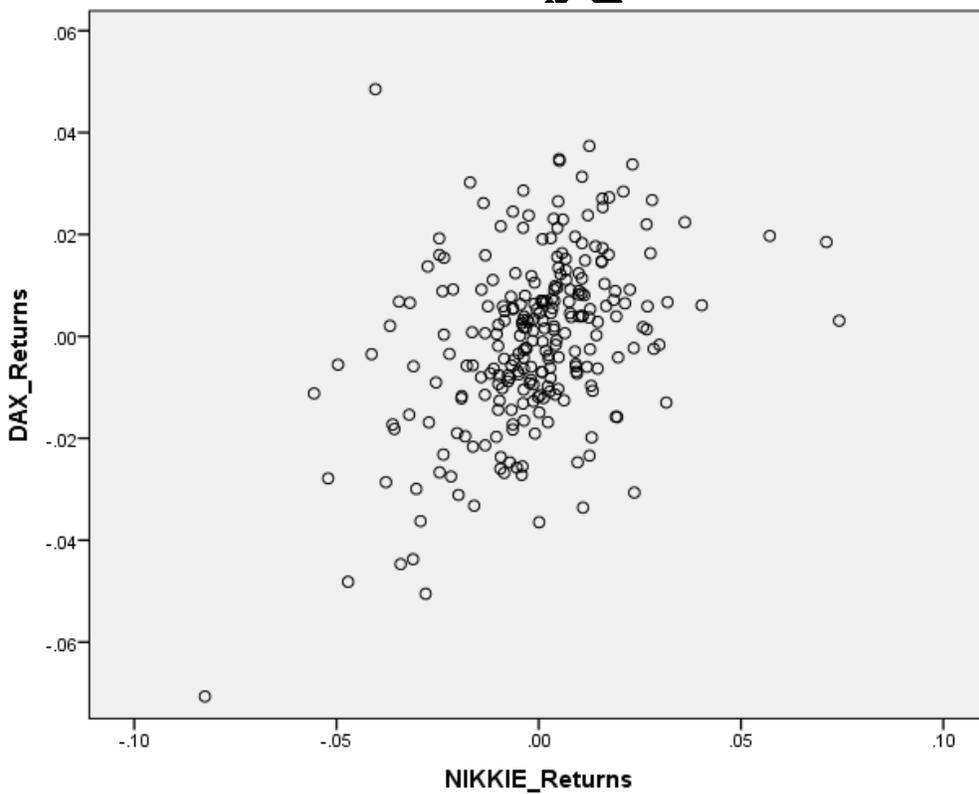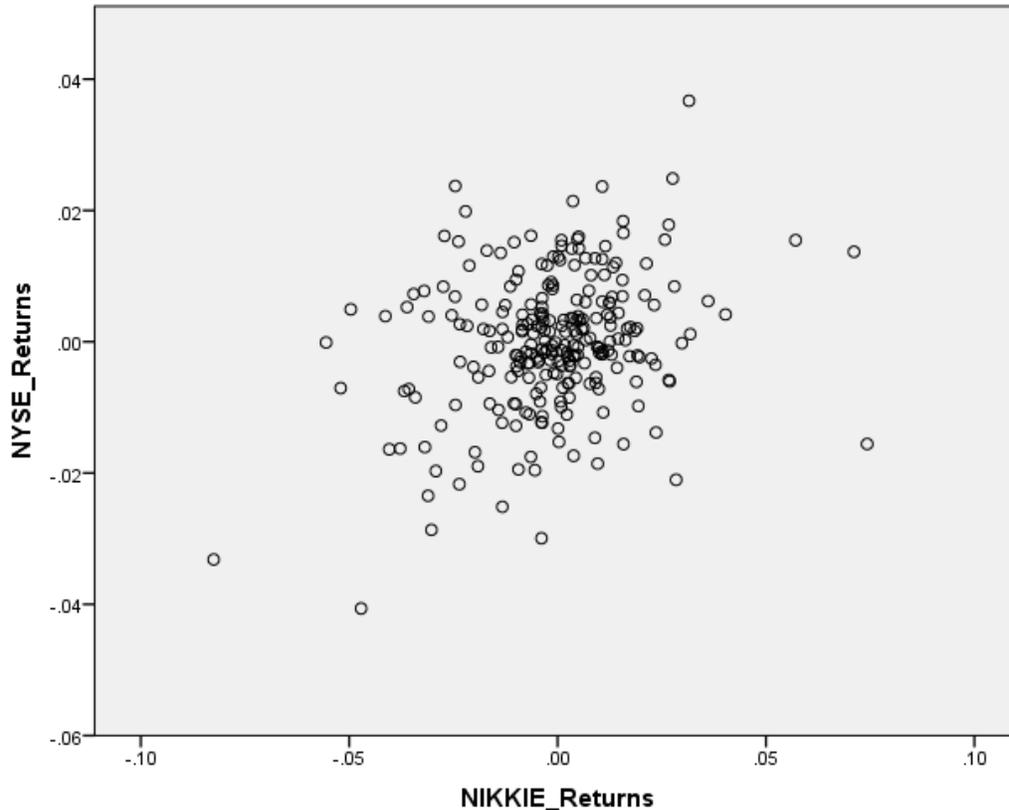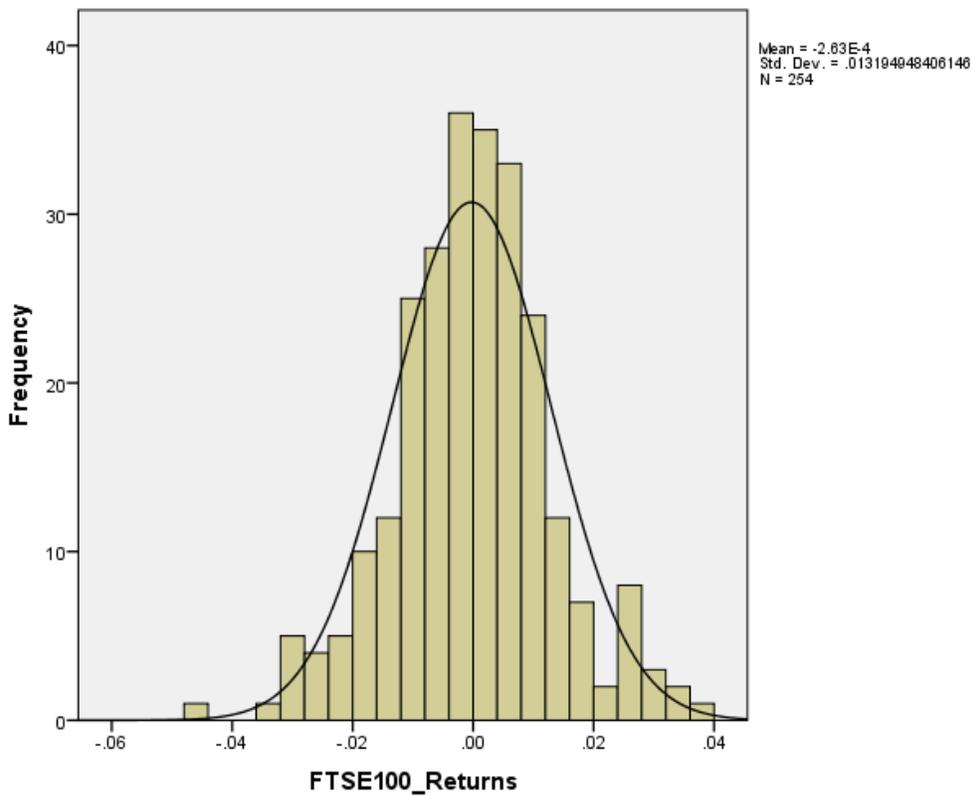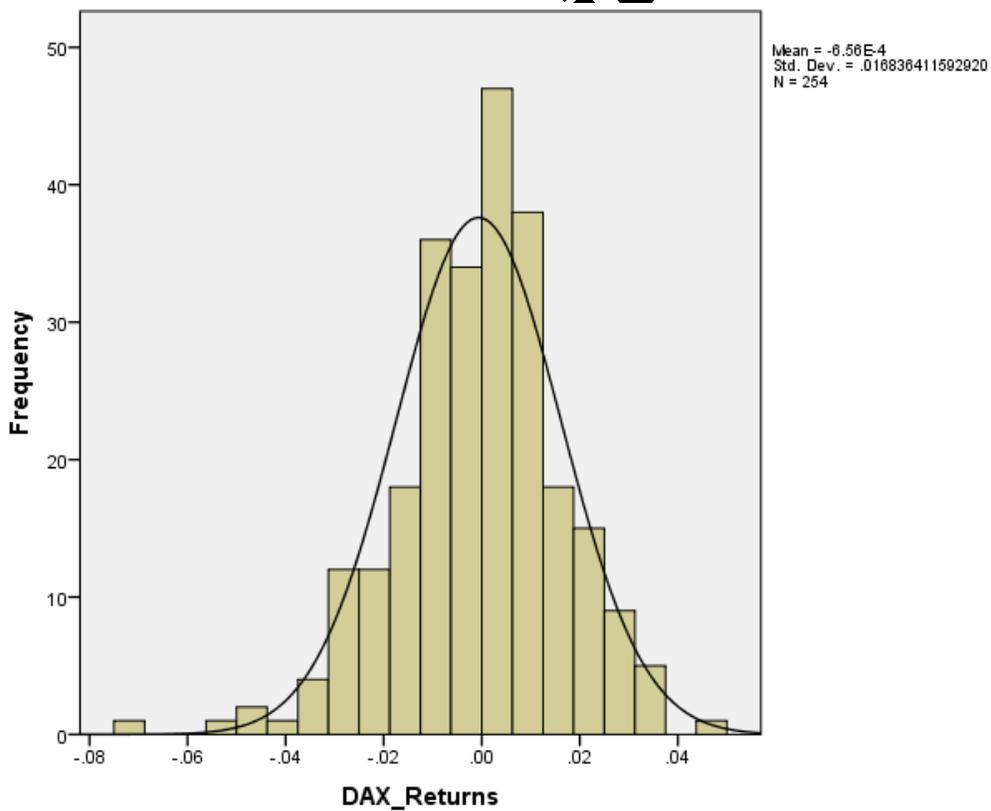
Histogram and Frequency Polygons

From the shapes of the histograms below for each of the market index returns, it can be concluded that the market returns for the four indices are normally distributed. This is because large portions of the data are distributed around the mean of the data, with only there being a few outlier data points in the extremities. This is also noted in the normal distribution curves on the histogram for each of the four market index returns where the normal curves are relatively symmetrical rather than being asymmetrical or strongly skewed to one side.

Mean = -2.63E-4
Std. Dev. = .013194948406146
N = 254

FTSE100_Returns

Mean = -6.56E-4
Std. Dev. = .016836411592920
N = 254

DAX_Returns

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Mean = -.0002629766083092
Std. Dev. = .0131949484061463
N = 254

FTSE100_Returns

Mean = -.0006562970350865
Std. Dev. = .016836411592920
N = 254

DAX_Returns
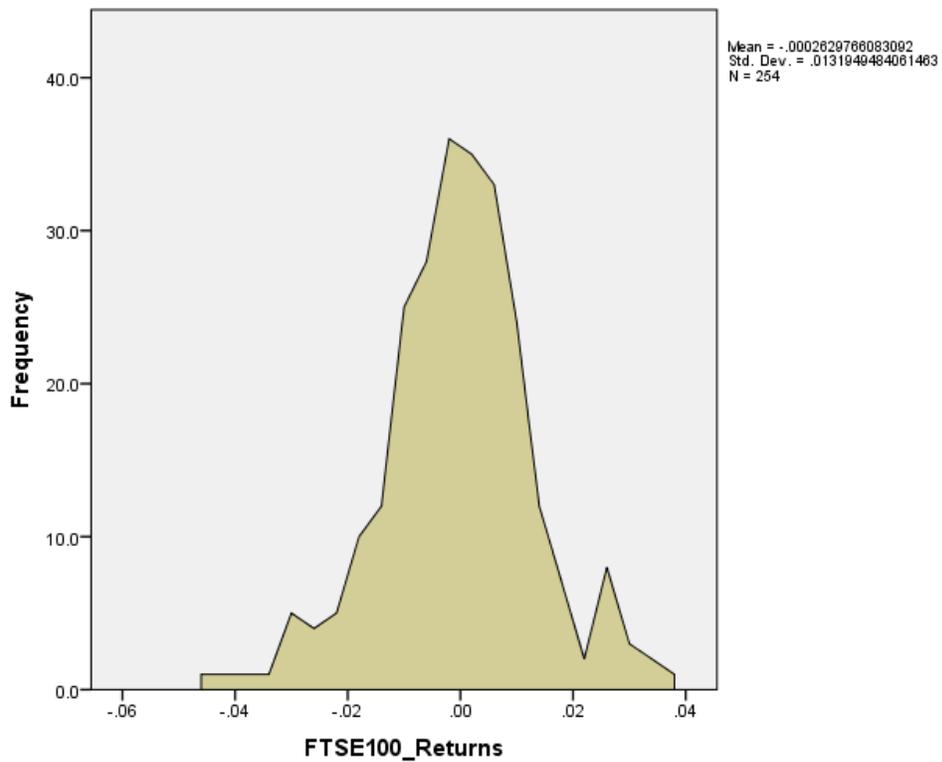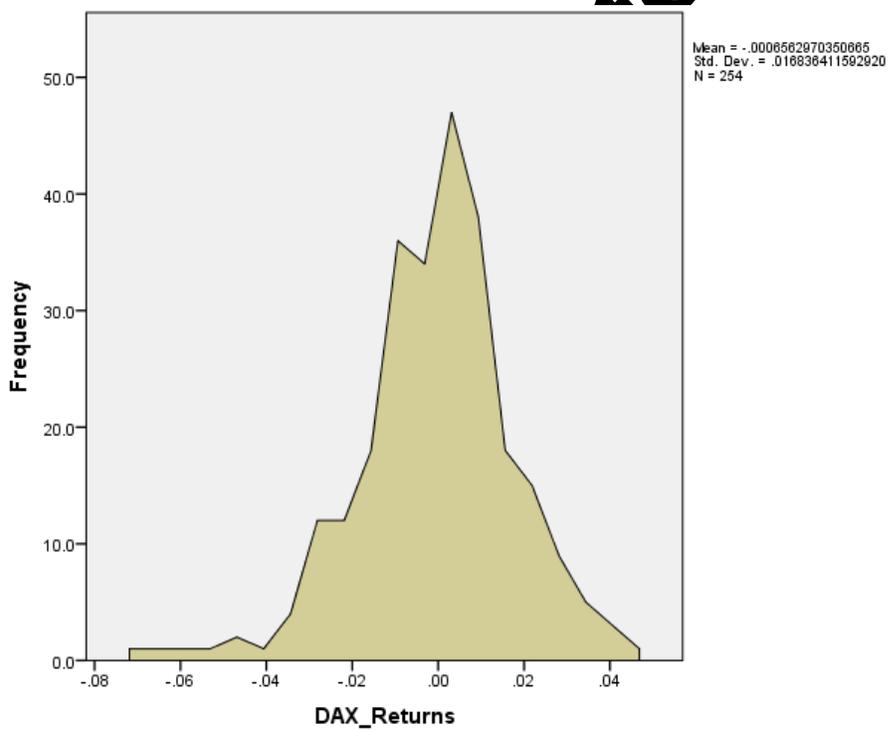
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Regression Analysis

The regression analysis between the variables NYSE (x) and FTSE100 (y), indicated that there was a statistically significant causal relationship between NYSE and FTSE100, where with an R-square of 0.357, then 35.7% of changes in FTSE100 was as a result of the impact of NYSE returns. As noted from the coefficients table below, such changes in FTSE100 were in such a way that 1 unit change in NYSE returns resulted in an increase in FTSE100 by 0.755 (p<0.05).

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.598[a]	.357	.355	.010597907024367

a. Predictors: (Constant), NYSE_Returns

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	95.0% Confidence Interval for B	
		B	Std. Error	Beta			Lower Bound	Upper Bound
1	(Constant)	.000	.001		-.365	.716	-.002	.001
	NYSE_Returns	.755	.064	.598	11.840	.000	.629	.880

a. Dependent Variable: FTSE100_Returns

Similarly results are notable in the relationship between FTSE100 (y) and DAX (x) returns. From the model summary it can be noted that the causal effect relationship

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Notably, a one unit change in NIKKEI returns resulted in an increase in NYSE by 0.155 units, which was statistically significant.

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.276[a]	.076	.073	.010065867209160

a. Predictors: (Constant), NIKKIE_Returns

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	95.0% Confidence Interval for B	
		B	Std. Error	Beta			Lower Bound	Upper Bound
1	(Constant)	.000	.001		.225	.822	-.001	.001
	NIKKIE_Returns	.155	.034	.276	4.566	.000	.088	.222

a. Dependent Variable: NYSE_Returns

Conclusion

In conclusion, NIKKEI returns were a lot more volatile thus explaining its high risk while, its high returns at the 95th percentile, and low mean returns given that the one year period experienced a market decline as all other market indices also had negative returns. NYSE was less risky and thus less volatile, explaining the lower decline in returns as compared to other indices. All the returns from different markets were positively correlated although the correlation between NIKKEI and the other three

markets was weak, while those between the three markets, FTSE100, DAX, and NYSE were strongly correlated. All the market returns were however, normally distributed. The causal relationship indicated that FTSE100 and DAX had a stronger causal link, followed by FTSE and NYSE, and finally NYSE and NIKKEI returns all which were statistically significant.

Word Count: 1006 words

References

Bansal, N., Connolly, R. A., & Stivers, C. (2014), 'The Stock-Bond Return Relation, the Term Structure's Slope, and Asset-Class Risk Dynamics.' *Journal of Financial & Quantitative Analysis*, *49*(3): 699-724.

Sigauke, C. (2016), 'Volatility Modeling Of The JSE All Share Index And Risk Estimation Using The Bayesian And Frequentist Approaches.' *Economics, Management & Financial Markets*, *11*(4): 33-48.