INTRODUCTION

The aim of this research project is to give an analysis of the foreign exchange exposure of Energean PLC, an oil and gas company based in London that is listed on the FTSE. The study uses the Capital Market Approach to evaluate how changes, in the FTSE market index and specific exchange rates affect Energean PLC's stock returns while also considering market factors.

Project Goals: The main objective is to assess how alterations in the FTSE market index and major exchange rates affect the stock returns of Energean PLC. Through the utilization of a regression model, this project aims to recognize and quantify the company's exposure to foreign exchange. Specifically, we aim to establish the statistical significance and extent of the connections, between stock returns and the FTSE market index, GBP/USD exchange rate and GBP/EUR exchange rate.

MODEL SPECIFICATION

The regression model specified is as follows:

$$SRRFRSSSt=\beta 0+\beta 1\cdot rFTSERFRSSSt+\beta 2\cdot rGBPUSDSSSt+\beta 3\cdot rGBPEURSSSt+\epsilon t$$

Where:

- *SRRFRSSSt* is the stock return over the risk-free rate for time *t*.
- *rFTSERFRSSSt* is the log return series for the FTSE market index over the risk-free rate for time *t*.
- rGBPUSDSSSt is the log return series for the exchange rate GBP/USD for time *t*.
- rGBPEURSSSt is the log return series for the exchange rate GBP/EUR for time *t*.
- β0 is the intercept term.
- β1,β2,β3 are the coefficients associated with the respective independent variables.
- ϵt is the error term for time t.

Intercept (β0): Represents the expected stock return over the risk-free rate when all independent variables are zero.

Coefficients ($\beta 1, \beta 2, \beta 3$):

- β1: Represents the sensitivity of stock returns to changes in log returns of the FTSE market index, controlling for other variables.
- β2: Represents the sensitivity of stock returns to changes in log returns of the exchange rate GBP/USD, controlling for other variables.
- β3: Represents the sensitivity of stock returns to changes in log returns of the exchange rate GBP/EUR, controlling for other variables.

Error Term (ϵt): Represents the unobserved factors affecting stock returns that are not accounted for by the included independent variables.

Dependent Variable: SRRFRSSS - Stock returns over the risk-free rate. We hypothesize that variations in *SRRFRSSSt* can be explained by changes in the selected independent variables.

Independent Variables:

- *rFTSERFRSSSt* - Log returns of the FTSE market index over the risk-free rate.
- rGBPUSDSSSt - Log returns of the exchange rate GBP/USD for time t.

- rGBPEURSSSt - Log returns of the exchange rate GBP/EUR for time t.

CHOICE OF INDEPENDENT VARIABLES IN FOREIGN EXCHANGE EXPOSURE ESTIMATION FOR ENERGEAN PLC

In the estimation of foreign exchange exposure of Energean PLC, a London-based oil and gas company primarily operating in the Eastern Mediterranean, the selection of independent variables plays a pivotal role in capturing the nuanced dynamics of its stock returns concerning currency fluctuations. The chosen independent variables are the log returns of closing price of Energean plc, the FTSE index as the market portfolio return, and two distinct exchange rates—GBP/USD and GBP/EUR.

1. Operational Context:

Energean PLC, predominantly conducts its operations in the Eastern Mediterranean, where the prevalent currencies are the Euro (EUR) and the U.S. Dollar (USD). The selection of GBP/EUR and GBP/USD as independent variables is grounded in the practical relevance of these currencies to the company's financial transactions within the oil and gas industry.

2. Market Representation:

The FTSE index is chosen as the market portfolio return to account for broader market movements. It serves as a proxy for overall market conditions and enables the isolation of Energean PLC's stock returns from general market trends.

3. Currency Exposure Considerations:

To assess the effects of changes in currency exchange rates on Energean PLC, we have chosen GBP/USD and GBP/EUR. These currency pairs represent the British Pounds fluctuations against the U.S. Dollar and Euro respectively. Considering the company’s scope and industry dynamics, these currencies are considered the most significant for Energean PLCs exposure, to foreign exchange risks.

4. Multiple Exchange Rates:

By including both GBP/USD and GBP/EUR , the diverse nature of its Energean PLC’s foreign exchange exposure will be effectively recognized. The Euro is widely used in the Eastern Mediterranean, while the U.S. Dollar is a currency, in global oil and gas transactions. Taking into account both currencies, allows for an analysis recognizing that not all chosen exchange rates may have statistical significance.

5. Statistical Significance and Relevance:

The decision to incorporate exchange rates is based on the belief that they truly reflect actual exposure, backed by statistical significance. The model aims to uncover connections between currency movements and stock returns contributing to a nuanced understanding of Energean PLCs foreign exchange risk. To ensure a representation of foreign exchange exposure we have chosen the closing price of Energean PLC, the FTSE index and GBP/USD and GBP/EUR as independent variables. This selection takes into account factors, such as, company’s operational context, industry dynamics and the goal of providing accurate estimates within the capital market approach framework.

METHODOLOGICAL RATIONALE FOR THE CHOICE OF FUNCTIONAL FORMS IN THE FOREIGN EXCHANGE EXPOSURE MODEL

The chosen functional forms in the foreign exchange exposure model for Energean PLC, a London-based oil and gas company, are integral to the robustness and interpretability of the estimation process. The specified model follows the capital market approach, aiming to quantify the sensitivity of Energean's stock returns to variations in the FTSE market index and selected exchange rates. The general form of the model is expressed as:

$$SRRFRSSSt=\beta 0+\beta 1\cdot rFTSERFRSSSt+\beta 2\cdot rGBPUSDSSSt+\beta 3\cdot rGBPEURSSSt+\epsilon t$$

Reasoning for the Functional Forms:

- **Linearity Assumption:** The linear version of the model is based on the assumption that changes in the FTSE market index and exchange rates have an additive impact on stock returns. By using linearity, we can easily interpret the coefficients (β1, β2, β3) as the effect of a one unit change, in the respective independent variables.
- **Model Interpretability:** The models specification helps make the interpretation of the coefficients easier. Each β coefficient reflects how stock returns are expected to change when there is a one unit change in the independent variable while keeping other variables constant. This simplicity is beneficial for conveying insights, to stakeholders and promoting a clear understanding of the relationships being investigated.
- **Econometric Considerations:** The use of a functional form is consistent with commonly used econometric methods and allows for the application of widely accepted estimation techniques. By adopting an approach, the estimation process becomes more straightforward, computationally efficient and compatible, with traditional statistical methods.

4. Consistency with Capital Market Approach: The chosen mathematical equations align with the principles of the capital market approach. This approach aims to analyze and quantify how market movements affect stock returns. The linear structure of these equations is in line, with the foundation of this approach highlighting the gradual impact that changes in the FTSE market index and exchange rates have on Energean PLC’s stock performance.

To summarize, the decision to use a functional form in the foreign exchange exposure model for Energean PLC is based on its alignment with economic theory statistical practice and the goal of producing transparent and understandable estimates. By opting for this approach, the model not only captures the fundamental dynamics of the relationships but also enables valuable insights into the company’s exposure, to foreign exchange fluctuations.

PRIORI HYPOTHESES

The priori hypotheses play an important role in shaping the expected connections between the variables being studied. When evaluating the impact of foreign exchange exposure through a multiple regression model, we can develop several hypotheses to guide our analysis of how Energean PLC's stock returns might be affected by fluctuations, in the FTSE market index and chosen exchange rates.

Hypotheses:

1. **Null Hypotheses**:

   a. $H_{0\beta_1}$: There is no significant relationship between changes in the FTSE market index (*rFTSERFRSSS*) and Energean PLC's stock returns (*SRRFRSSS*).

   b. $H_{0\beta_2}$: Changes in the GBP/USD exchange rate (*rGBPUSDSSS*) do not have a significant impact on Energean PLC's stock returns.

   c. $H_{0\beta_3}$: There is no significant association between changes in the GBP/EUR exchange rate (*rGBPEURSSS*) and Energean PLC's stock returns.

2. **Alternative Hypotheses:**

   a. $H_{A\beta_1}$: There is a significant positive relationship between changes in the FTSE market index (*rFTSERFRSSS*) and Energean PLC's stock returns (*SRRFRSSS*).

   b. $H_{A\beta_2}$: Changes in the GBP/USD exchange rate (*rGBPUSDSSS*) have a significant impact on Energean PLC's stock returns, and the relationship is negative.

   c. $H_{A\beta_3}$: There is a significant positive association between changes in the GBP/EUR exchange rate (*rGBPEURSSS*) and Energean PLC's stock returns.

Justification: These hypotheses are based on the coefficients calculated in the regression model. The null hypotheses assume that there is no effect or association, while the alternative hypotheses propose the expected direction and significance of the relationships. The results of the tests on these hypotheses offer insights, into whether we should accept or reject them, thereby, informing us about the extent and impact of Energean PLC's foreign exchange exposure.

Implications: Acceptance or rejection of these hypotheses will add to a comprehension of how fluctuations in the FTSE market index and chosen exchange rates impact Energean PLC's stock returns. This knowledge holds importance for stakeholders, investors and policymakers as they make well informed choices regarding the company's vulnerability, to foreign exchange risks.

DATA SOURCES AND CONSIDERATIONS

For this research study, data was collected from various reputed sources to estimate the foreign exchange risk faced by Energean PLC, an oil and gas company based in London that is listed on the FTSE. Our data sources included the Bloomberg Terminal for obtaining Energean PLC's stock prices, FTSE market index data and exchange rates such as GBP/USD and GBP/EUR. Furthermore, information on the risk-free rate is obtained from the Bank of England website specifically focusing on the 10 year Treasury bill.

The data on Energean PLC's stock price, the FTSE market index and exchange rates were converted into log returns for ease of analysis. Log returns are a way to measure continuously compounded returns, which is necessary for the capital market approach we used in this project. We also included data, on the risk-free rate to account for market fluctuations and ensure a more precise evaluation of foreign exchange exposure.

The analysis used a regression model that considered the log returns of the FTSE market index, GBP/USD exchange rate and GBP/EUR exchange rate as independent variables. The findings from this linear regression model showed significant relationships between these independent variables and Energean's stock returns. Moreover, the model accounted for a substantial portion of the variability, in stock returns.

Although the information gathered from Bloomberg Terminal and the Bank of England website is considered reliable, it's important to recognize potential issues or considerations that should be taken into account. For example, exchange rates and market index data may be subject to fluctuations and the chosen risk-free rate assumes a consistent rate, over time. Moreover, when interpreting the results, it's crucial to consider the models assumptions regarding normality and absence of multicollinearity.

To sum up, the research project made use of robust data from Bloomberg Terminal and the Bank of England website to estimate Energean PLC's exposure to foreign exchange. The data consisted of stock prices, market index, exchange rates and risk-free rates and underwent thorough preprocessing to ensure its suitability for the chosen regression model. Although the data sources are reputable, it is important to acknowledge factors such, as market volatility and assumptions made in the model to fully understand and interpret the findings.

REGRESSION MODEL RESULTS

Intercept (β0):

The intercept term (β0) represents the expected stock return over the risk-free rate when all independent variables are zero. In our model, the estimated intercept is 0.06450 with a standard error of 0.07272. The t-value is 0.887, and the p-value is 0.3753, indicating that the intercept is not significantly different from zero.

```
Call:
lm(formula = Data$SRRFRSSS ~ Data$rFTSERFRSSS + Data$rGBPUSDSSS +
    Data$rGBPEURSSS)

Residuals:
     Min       1Q   Median       3Q      Max
-23.1910  -1.2300  -0.0831   1.2213  19.9223

Coefficients:
                Estimate Std. Error t value Pr(>|t|)
(Intercept)      0.06450    0.07272   0.887   0.3753
Data$rFTSERFRSSS 1.00241    0.01038  96.550  < 2e-16 ***
Data$rGBPUSDSSS -0.36090    0.16163  -2.233   0.0257 *
Data$rGBPEURSSS  1.09537    0.21610   5.069 4.52e-07 ***
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 2.755 on 1432 degrees of freedom
  (1 observation deleted due to missingness)
Multiple R-squared:  0.8669,    Adjusted R-squared:  0.8667
F-statistic:  3110 on 3 and 1432 DF,  p-value: < 2.2e-16
```

Coefficients (β1, β2, β3):

1. **rFTSERFRSSS (β1):**
    - The estimated coefficient for changes in log returns of the FTSE market index is 1.00241.
    - It has a standard error of 0.01038, a t-value of 96.550, and an extremely low p-value (< 2e-16).
    - This suggests a highly significant and positive association between changes in the FTSE market index and Energean's stock returns.
2. **rGBPUSDSSS (β2):**
    - The estimated coefficient for changes in log returns of the GBP/USD exchange rate is -0.36090.
    - It has a standard error of 0.16163, a t-value of -2.233, and a p-value of 0.0257.
    - This indicates a significant, but negative, association between changes in the GBP/USD exchange rate and Energean's stock returns.
3. **rGBPEURSSS (β3):**
    - The estimated coefficient for changes in log returns of the GBP/EUR exchange rate is 1.09537.
    - It has a standard error of 0.21610, a t-value of 5.069, and an extremely low p-value (4.52e-07).
    - This implies a significant and positive association between changes in the GBP/EUR exchange rate and Energean's stock returns.

Residual Standard Error:

The residual standard error is 2.755, providing an estimate of the standard deviation of the residuals.

Model Fit:

- **Multiple R-squared (R^2):** 0.8669, Indicates that the model explains approximately 86.69% of the variance in Energean's stock returns.
- **Adjusted R-squared:** 0.8667, Adjusts R-squared for the number of predictors in the model.

Overall Model Significance:

- **F-statistic:** 3110, **p-value:** < 2.2e-16
- The overall model is highly significant, suggesting that at least one of the predictors has a non-zero effect on Energean's stock returns.

Linear Hypothesis Test Results: The linear hypothesis test aimed to assess whether all three coefficients for rFTSERFRSSS, rGBPUSDSSS, and rGBPEURSSS are jointly equal to zero.

- **Null Hypothesis**: The coefficients for all three independent variables are zero.
- **Alternative Hypothesis**: At least one of the coefficients is non-zero.

Based on the test statistic (F statistic) of 3110.1 and a very low p-value (< 2.2e 16) we have compelling evidence against the null hypothesis. Therefore, we reject the null hypothesis. This suggests that least one of the predictors has a significant effect, on Energeans stock returns.

Conclusion:

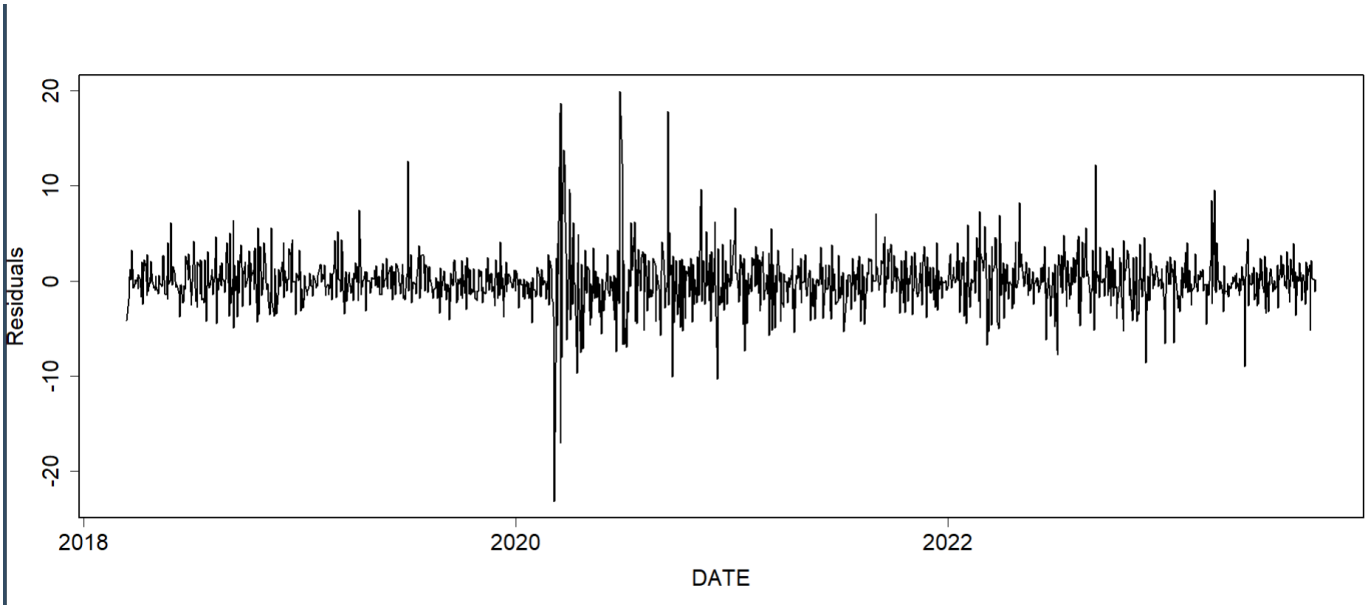
The regression results suggest the following associations:

- Changes in the FTSE market index are positively associated with Energean's stock returns.
- Changes in the GBP/USD exchange rate are negatively associated with stock returns.
- Changes in the GBP/EUR exchange rate are positively associated with stock returns.

The model, as a whole, is statistically significant, explaining a substantial portion of the variance in Energean's stock returns. These findings provide valuable insights into the foreign exchange exposure of Energean PLC, supporting informed decision-making regarding currency risk management.

ECONOMETRIC PROBLEMS AND DIAGNOSTIC TESTS:

HETEROSCEDASTICITY- The tests used to diagnose heteroscedasticity in the model provide valuable insights into the robustness of the regression results. According to the Breusch Pagan test, there is evidence of heteroscedasticity (BP = 23.572 df = 3, p value = 3.069e-05), indicating that the variance of residuals differs across observations. This finding is further supported by the studentized Breusch-Pagan test (BP = 3.4364 df = 3, p value = 0.3291), which also considers the assumption of normality. The White heteroscedasticity-consistent standard errors and Newey West standard errors confirm that heteroscedasticity exists with varying degrees of significance across coefficients. The coefficients related to log-returns of the FTSE market index and GBP/EUR exchange rate remain statistically significant based on t-tests. However, in the tests accounting for heteroscedasticity-robustness the coefficient for GBP/USD exchange rate loses statistical significance. This implies that while the overall model explains a significant portion of variance in stock returns, it violates the assumption of homoscedasticity.

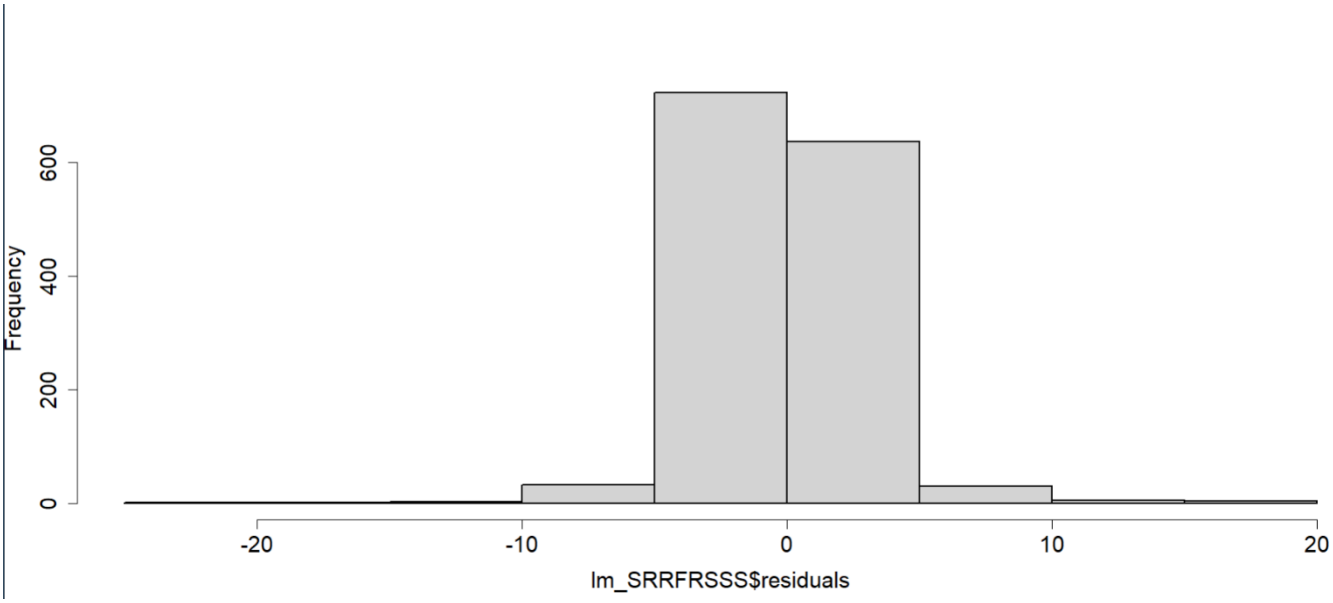


MULTICOLLINEARITY -Based on the diagnostic tests conducted for multicollinearity, on the regression model provided, it seems that there is a moderate level of correlation among the independent variables. The correlation matrix shows correlations ranging from 0.13 to 0.64. Notably, the exchange rates (GBP/USD and GBP/EUR) have a higher correlation of 0.64 which indicates a potential issue, with multicollinearity. However, despite this concern the overall model appears robust, since the F-statistic value is high, and the p-value is low suggesting that all included variables make contributions in explaining variance in stock returns.

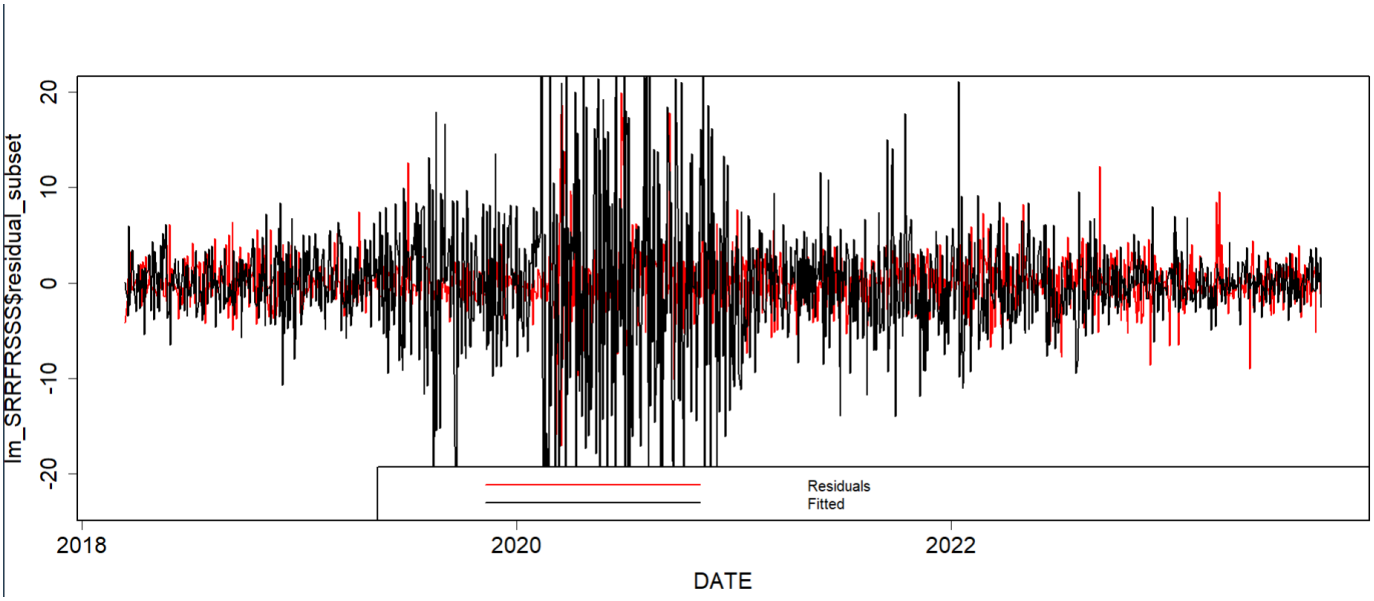
Autocorrelation- The diagnostic tests conducted on the provided model provide valuable insights into the robustness and reliability of the estimated coefficients. The Durbin-Watson (DW) test, which checks for first-order autocorrelation, yields a DW statistic of 2.0073 with a corresponding p-value of 0.5559. The non-significant p-value indicates that there is no evidence of first-order autocorrelation in the residuals. Additionally, the Breusch-Godfrey test for correlation up to the 10th order reveals an LM test statistic of 10.785 with 10 degrees of freedom and a p value of 0.3745. This result also fails to reject the null hypothesis of no serial correlation, suggesting that there is no higher-order autocorrelation in the residuals. Based on these findings we can conclude that there is no autocorrelation in the model's residuals. The DW statistic aligns closely with the expected value of 2 further supporting the absence of first-order autocorrelation. In addition, the Breusch-Godfrey test reinforces that our model remains robust against higher order autocorrelation issues. The absence of autocorrelation is crucial, for coefficient estimates and hypothesis testing as it indicates that our model effectively captures all relevant information from residuals while providing valid foreign exchange exposure estimates.

NORMALITY OF RESIDUALS: The diagnostic tests used to assess normality offer valuable insights into the distribution of residuals in the regression model that estimates foreign exchange exposure for Energean PLC. The skewness test reveals a value of around 0.53, indicating a slightly positively skewed distribution of residuals. This is supported by the D'Agostino skewness test, which shows a z-score of 7.75 and a significant p-value providing evidence against normal skewness. Additionally,the kurtosis test (specifically the Anscombe Glynn kurtosis test) gives a kurtosis value of 14.72 with a z-score of 16.90 and an extremely low p-value. These results strongly reject the hypothesis that kurtosis equals to 3 suggesting heavy tails and potential outliers in the residual distribution. The Jarque-Bera normality test further confirms these findings, by yielding a p-value well below the conventional threshold indicating departure from normality. With a Jarque-Bera statistic (JB) of 8283.9 and a p-value less than 2.2e 16-this test strongly rejects the

nullhypothesis of normality pointing towards deviation, from a normal distribution.



The distribution of residuals in the histogram is skewed as indicated by the positive skewness value, from the D'Agostino skewness test. Furthermore, the histogram shows a leptokurtic distribution, which is supported by the kurtosis test of Anscombe and Glynn. These results imply that the residuals do not follow a normal distribution, which goes against one of the fundamental assumptions of linear regression.



The graphical representation of residuals over time reveals patterns that deviate from randomness. The residuals exhibit clusters of volatility and heteroscedasticity which suggests that the assumption of homoscedasticity is not met. This departure from normality and heteroscedasticity can have an impact on the accuracy and reliability of parameter estimates. In summary, the diagnostic tests collectively indicate that the residuals in the model do not follow a normal distribution. The positively-skewed distribution and pronounced kurtosis indicate non normality, highlighting the presence of outliers or unusual patterns, in the data.

Significance of Results and Relationship to Original Questions

Relationship between Independent Variables and Dependent Variable: The purpose of the regression analysis was to evaluate how Energean PLC is impacted by changes in the FTSE market index, GBP/USD exchange rate and GBP/EUR

exchange rate. The findings show a highly significant model (p value < 2.2e-16) with a strong explanatory power (Adjusted R-squared; 0.8667). The coefficients indicate that Energean's stock returns are positively associated by changes in the FTSE market index (β1 = 1.00241) and movements in the GBP/EUR exchange rate (β3 = 1.09537) suggesting a strong reliance on these factors. On the hand, the negative coefficient for GBP/USD (β2 = -0.36090) suggests a potential hedging effect against USD depreciation. The linear hypothesis test further confirms the significance of all three variables. In conclusion, these results highlight how the company is affected by market and exchange rate dynamics offering valuable insights, for risk management strategies.

Hypothesis Testing: The results of the hypothesis testing are consistent with the theory. We strongly reject the hypothesis, which suggests that the coefficients linked to log returns of the FTSE market index, GBP/USD exchange rate and GBP/EUR exchange rate are collectively zero (F-statistic; 3110.1, p-value; < 2.2e 16). This implies that these variables play a significant role in explaining the fluctuations, in Energean PLCs stock returns.

Model Adequacy: The multiple regression model shows strong statistical significance, which is indicated by a very low p-value (< 2.2e-16) from the F-test. The model effectively captures the variations in Energean PLC's stock returns, explains about 87% of the variatnce. Each predictor, such, as the log returns of the FTSE market index and exchange rates (GBP/USD, GBP/EUR) contributes significantly to the model. The linear hypothesis test further confirms that including these variables is justified and supports the models ability to represent the data adequately.

SUMMARY AND CONCLUSIONS

In summary, the main objective of this research project was to assess the foreign exchange exposure of Energean PLC, an oil and gas company based in London. To achieve this a multiple regression model was employed, using independent variables such as the log returns of FTSE market index returns, GBP/USD exchange rate and GBP/EUR exchange rate. The model demonstrated high statistical significance, by explaining around 87% of the variance observed in Energean PLC stock returns.

Key findings from the study includes a positive relationship between Energean PLC's stock returns and changes in both the FTSE market index and GBP/EUR exchange rate. This implies that the company is affected by market conditions and fluctuations in Euro dynamics. Conversely, a negative association was found between stock returns and changes in the GBP/USD exchange rate. This suggests that there may be a hedging effect against depreciation of USD. The diagnostic tests conducted also indicated concerns like heteroscedasticity and non normality of residuals.

In conclusion, these results provide valuable insights for stakeholders and decision-makers regarding Energean PLC's exposure, to specific market dynamics and currency-exchange fluctuations. These findings can guide risk management strategies to mitigate any adverse effects caused by currency volatility, ultimately supporting informed decision-making in the financial management of the company.

APPENDIX- REGRESSION RUNS AND OUTPUT

HERE IN THIS R CODE VARIABLE FOR STOCK PRICE=SPSSS, VARIABLE FOR FTSE INDEX = FTSESSS, VARIABLE FOR EXCHANGE RATE GBP/USD =GBPUSDSSS, VARIABLE FOR EXCHANGE RATE GBP/EUR=GBPEURSSS, VARIABLE FOR RISK FREE RATE OF RETURN DERIVED FROM BANK OF ENGLAND WEBSITE= RFRSSS, VARIABLE FOR LOG RETURNS OF STOCK PRICES =rSPSSS, VARIABLE FOR LOG RETURNS OF FTSE MARKET INDEX =rFTSESSS, VARIABLE FOR LOG RETURNS OF CURRENCY EXCHANGE GBP/USD=rGBPUSDSSS, VARIABLE FOR LOG RETURNS OF CURRENCY EXCHANGE GBP/EUR=rGBPEURSSS, VARIABLE FOR LOG RETURNS OF RISK FREE RATE =rRFRSSS, VARIABLE FOR STOCK RETURNS OVER RISK FREE RATE= SRRFRSSS, VARIABLE FOR FTSE RETURNS OVER RISK FREE RATE =rFTSERFRSSS

a. **lm_SRRFRSSS= lm(Data$SRRFRSSS~Data$rFTSERFRSSS+Data$rGBPUSDSSS+Data$rGBPEURSSS)**

summary(lm_SRRFRSSS)

```
Call:
lm(formula = Data$SRRFRSSS ~ Data$rFTSERFRSSS + Data$rGBPUSDSSS +
    Data$rGBPEURSSS)

Residuals:
     Min       1Q   Median       3Q      Max
-23.1910  -1.2300  -0.0831   1.2213  19.9223

Coefficients:
                 Estimate Std. Error t value Pr(>|t|)
(Intercept)       0.06450    0.07272   0.887   0.3753
Data$rFTSERFRSSS  1.00241    0.01038  96.550  < 2e-16 ***
Data$rGBPUSDSSS  -0.36090    0.16163  -2.233   0.0257 *
Data$rGBPEURSSS   1.09537    0.21610   5.069 4.52e-07 ***
---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1

Residual standard error: 2.755 on 1432 degrees of freedom
  (1 observation deleted due to missingness)
Multiple R-squared:  0.8669,    Adjusted R-squared:  0.8667
F-statistic:  3110 on 3 and 1432 DF,  p-value: < 2.2e-16
```

b.

linearHypothesis(lm_SRRFRSSS,c("Data$rFTSERFRSSS=0","Data$rGBPUSDSSS=0","Data$rGBPEURSSS=0"))

```
> linearHypothesis(lm_SRRFRSSS,c("Data$rFTSERFRSSS=0","Data$rGBPUSDSSS=0","Data$rGBPEURSSS=0"))
Linear hypothesis test

Hypothesis:
Data$rFTSERFRSSS = 0
Data$rGBPUSDSSS = 0
Data$rGBPEURSSS = 0

Model 1: restricted model
Model 2: Data$SRRFRSSS ~ Data$rFTSERFRSSS + Data$rGBPUSDSSS + Data$rGBPEURSSS

  Res.Df   RSS Df Sum of Sq      F    Pr(>F)
1   1435 81690
2   1432 10869  3     70820 3110.1 < 2.2e-16 ***
---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1
>
```

c. **bptest(formula(lm_SRRFRSSS),data=Data,studentize =FALSE)**

```
> bptest(formula(lm_SRRFRSSS),data=Data,studentize =FALSE)

        Breusch-Pagan test

data:  formula(lm_SRRFRSSS)
BP = 23.572, df = 3, p-value = 3.069e-05
```

d. **bptest(formula(lm_SRRFRSSS),data=Data,studentize =TRUE)**

```
> bptest(formula(lm_SRRFRSSS),data=Data,studentize =TRUE)

        studentized Breusch-Pagan test

data:  formula(lm_SRRFRSSS)
BP = 3.4364, df = 3, p-value = 0.3291
```

e. **coeftest(lm_SRRFRSSS,vcov. = vcovHC(lm_SRRFRSSS,type = "HC1"))**

```
> coeftest(lm_SRRFRSSS,vcov. = vcovHC(lm_SRRFRSSS,type = "HC1"))

t test of coefficients:

                 Estimate Std. Error t value Pr(>|t|)
(Intercept)      0.064503   0.072539  0.8892  0.37404
Data$rFTSERFRSSS 1.002406   0.015976 62.7432  < 2e-16 ***
Data$rGBPUSDSSS -0.360903   0.265502 -1.3593  0.17426
Data$rGBPEURSSS  1.095372   0.357578  3.0633  0.00223 **
---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1
```

f. **coeftest(lm_SRRFRSSS,vcov. = NeweyWest(lm_SRRFRSSS,lag = 6,adjust = T,prewhite = F))**

```
> coeftest(lm_SRRFRSSS,vcov. = NeweyWest(lm_SRRFRSSS,lag = 6,adjust = T,prewhite = F))

t test of coefficients:

                 Estimate Std. Error t value  Pr(>|t|)
(Intercept)      0.064503   0.074433  0.8666  0.386314
Data$rFTSERFRSSS 1.002406   0.015181 66.0289 < 2.2e-16 ***
Data$rGBPUSDSSS -0.360903   0.225333 -1.6016  0.109454
Data$rGBPEURSSS  1.095372   0.385130  2.8442  0.004516 **
---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1
```

g. **#TESTING AUTOCORRELATION THROUGH DURBIN AND WATSON TEST, dwtest(lm_SRRFRSSS)**

```
> dwtest(lm_SRRFRSSS)

        Durbin-Watson test

data:  lm_SRRFRSSS
DW = 2.0073, p-value = 0.5559
alternative hypothesis: true autocorrelation is greater than 0
```

h. **#TESTING HIGHER ORDER AUTOCORRELATION THROUGH BREUSCH-GODFREY, bgtest(lm_SRRFRSSS,order= 10)**

```
> bgtest(lm_SRRFRSSS,order= 10)

        Breusch-Godfrey test for serial correlation of order up to 10

data:  lm_SRRFRSSS
LM test = 10.785, df = 10, p-value = 0.3745
```

i. **#SKEWNESS AND KURTOSIS , skewness(lm_SRRFRSSS$residuals), kurtosis(lm_SRRFRSSS$residuals)**

```
> skewness(lm_SRRFRSSS$residuals)
[1] 0.5290524
> kurtosis(lm_SRRFRSSS$residuals)
[1] 14.71878
```

j. **#TESTING THE NORMALITY ASSUMPTION THROUGH JARQUE-BERA TEST, jarque.test(lm_SRRFRSSS$residuals)**

```
> jarque.test(lm_SRRFRSSS$residuals)

        Jarque-Bera Normality Test

data:  lm_SRRFRSSS$residuals
JB = 8283.9, p-value < 2.2e-16
alternative hypothesis: greater
```

k. **#TESTING SKEWNESS OF RESIDUALS THROUGH SKEWNESS TEST OF D'AGOSTINO**

agostino.test(lm_SRRFRSSS$residuals)

```
> agostino.test(lm_SRRFRSSS$residuals)

        D'Agostino skewness test

data:  lm_SRRFRSSS$residuals
skew = 0.52905, z = 7.74520, p-value = 9.543e-15
alternative hypothesis: data have a skewness
```

l. **#TESTING KURTOSIS THROUGH KURTOSIS TEST OF ANSCOMBE AND GLYNN**

anscombe.test(lm_SRRFRSSS$residuals)

```
> anscombe.test(lm_SRRFRSSS$residuals)

        Anscombe-Glynn kurtosis test

data:  lm_SRRFRSSS$residuals
kurt = 14.719, z = 16.899, p-value < 2.2e-16
alternative hypothesis: kurtosis is not equal to 3
```

m. **Multicollinerity test,**

cor(Data[-(1:2), c("rSPSSS", "rFTSESSS", "rGBPEURSSS", "rGBPUSDSSS")])

```
> cor(Data[-(1:2), c("rSPSSS", "rFTSESSS", "rGBPEURSSS", "rGBPUSDSSS")])
              rSPSSS  rFTSESSS rGBPEURSSS rGBPUSDSSS
rSPSSS     1.0000000 0.4100716  0.1758103  0.1304034
rFTSESSS   0.4100716 1.0000000  0.1641354  0.2611945
rGBPEURSSS 0.1758103 0.1641354  1.0000000  0.6380017
rGBPUSDSSS 0.1304034 0.2611945  0.6380017  1.0000000
```

n. **#RESET TEST, resettest(lm_SRRFRSSS,power = 2:4)**

```
> resettest(lm_SRRFRSSS,power = 2:4)

        RESET test

data:  lm_SRRFRSSS
RESET = 1.9743, df1 = 3, df2 = 1429, p-value = 0.1159
```

M. #STABILITY TESTS , AS THE DATA CONTAINS 1435 VALUES, TAKING AS 215 AS 15%

```
sbtest=Fstats(formula(lm_SRRFRSSS),data = Data)
> jan2021_indices <- which(format(Data$DATE, "%Y-%m") == "2021-01")
> chow =sbtest$Fstats[jan2021_indices-2-215]
> 1-pchisq(chow,3)
> chow =sbtest$Fstats[jan2021_indices-2-215]
> 1-pchisq(chow,3)
 [1] 0.1042505 0.1078287 0.1078353 0.1206094
 [5] 0.1298674 0.1541421 0.1179946 0.1140124
 [9] 0.1076196 0.1103732 0.1228721 0.1188963
[13] 0.1228105 0.1175132 0.1194049 0.1098768
[17] 0.1065172 0.1128107 0.1397065 0.1394414
[21] 0.1517340
```