LAB 4

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```r
library(data.table)

file_path <- "C:/Users/valen/Downloads/^IXIC.csv"
risk_free_rate_file_path <- "C:/Users/valen/Downloads/^IRX.csv"

ixic_data <- fread(file_path)
irx_data <- fread(risk_free_rate_file_path)
```

```r
head(ixic_data)
```

```
##          Date     Open     High      Low    Close Adj Close     Volume
##        <IDat>    <num>    <num>    <num>    <num>     <num>      <i64>
## 1: 2023-06-07 13295.26 13361.90 13089.48 13104.90  13104.90 5270600000
## 2: 2023-06-08 13113.27 13248.60 13101.18 13238.52  13238.52 4280160000
## 3: 2023-06-09 13312.39 13385.95 13229.33 13259.14  13259.14 4412710000
## 4: 2023-06-12 13326.37 13465.91 13302.58 13461.92  13461.92 4722680000
## 5: 2023-06-13 13566.53 13594.40 13473.19 13573.32  13573.32 5522100000
## 6: 2023-06-14 13570.56 13661.74 13455.99 13626.48  13626.48 5772550000
```

```r
names(ixic_data)
```

```
## [1] "Date"      "Open"      "High"      "Low"       "Close"     "Adj Close"
## [7] "Volume"
```

```r
head(irx_data)
```

```
##          Date     Open     High      Low     Close Adj Close Volume
##        <IDat>   <char>   <char>   <char>    <char>    <char> <char>
## 1: 2023-07-01 5.138000 5.278000 5.100000  5.248000  5.248000      0
## 2: 2023-08-01 5.270000 5.340000 5.100000  5.298000  5.298000      0
## 3: 2023-09-01 5.288000 5.333000 5.200000  5.300000  5.300000      0
## 4: 2023-10-01 5.310000 5.348000 5.200000  5.320000  5.320000      0
## 5: 2023-11-01 5.318000 5.323000 5.100000  5.238000  5.238000      0
## 6: 2023-12-01 5.230000 5.260000 5.100000  5.180000  5.180000      0
```

```r
names(irx_data)
```

```
## [1] "Date"      "Open"      "High"      "Low"       "Close"     "Adj Close"
## [7] "Volume"
```

```r
ixic_data[, Date := as.Date(Date, format="%Y-%m-%d")]
irx_data[, Date := as.Date(Date, format="%Y-%m-%d")]


setnames(irx_data, old = c("Close"), new = c("Risk_Free_Rate"))
```

```r
irx_data[, Risk_Free_Rate := as.numeric(Risk_Free_Rate)]
```

```
## Warning in eval(jsub, SDenv, parent.frame()): NAs introduced by coercion
```

```r
merged_data <- merge(ixic_data, irx_data[, .(Date, Risk_Free_Rate)], by = "Date")

merged_data[, Return := (shift(`Adj Close`, type = "lag") - `Adj Close`) / shift(`Adj Close`, type = "la

# Calculate excess returns
merged_data[, Excess_Stock_Return := Return - Risk_Free_Rate / 100]  # Convert percentage to decimal

# Assuming Market_Return is given or needs to be calculated similarly
# Example: Calculate market excess returns if Market_Return column is present
# merged_data[, Excess_Market_Return := Market_Return - Risk_Free_Rate / 100]

# For demonstration, assuming Market_Return is the same as Stock_Return (replace with actual Market_Ret
merged_data[, Excess_Market_Return := Excess_Stock_Return]

# Perform linear regression to estimate beta
model <- lm(Excess_Stock_Return ~ Excess_Market_Return, data = merged_data)

# Summary of the regression model
summary(model)
```

```
## Warning in summary.lm(model): essentially perfect fit: summary may be
## unreliable
```

```
##
## Call:
## lm(formula = Excess_Stock_Return ~ Excess_Market_Return, data = merged_data)
##
## Residuals:
##        Min         1Q     Median         3Q        Max
## -5.980e-18 -1.456e-18 -7.091e-19  1.070e-18  6.092e-18
##
## Coefficients:
##                        Estimate Std. Error   t value Pr(>|t|)
## (Intercept)           0.000e+00  2.279e-18 0.000e+00        1
## Excess_Market_Return 1.000e+00  2.315e-17 4.319e+16   <2e-16 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 4.006e-18 on 6 degrees of freedom
##   (1 observation deleted due to missingness)
## Multiple R-squared:      1,  Adjusted R-squared:      1
## F-statistic: 1.865e+33 on 1 and 6 DF,  p-value: < 2.2e-16
```

```r
# Extract the beta coefficient
beta <- coef(model)["Excess_Market_Return"]
cat("Estimated Beta:", beta, "\n")
```

```
## Estimated Beta: 1
```

```r
# Plot the data and the regression line using base R plotting functions
plot(merged_data$Excess_Market_Return, merged_data$Excess_Stock_Return,
     main = "Beta Estimation",
```

```
      xlab = "Market Excess Return",
      ylab = "Stock Excess Return",
      pch = 19, col = "blue")
abline(model, col = "red")
```

Beta Estimation