analysis

February 18, 2024

0.0.1 Load modules libraries

[ ]:
```python
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
import seaborn as sns
import statsmodels.api as sm
```

0.0.2 Load the data

[ ]:
```python
xls = pd.ExcelFile('Data.xlsx')

data = {}
for sheet_name in xls.sheet_names:
    data[sheet_name] = pd.read_excel(xls, sheet_name)

# Perform analysis for each sheet
for sheet_name, df in data.items():
    print("Sheet Name:", sheet_name)
    print("Shape:", df.shape)

    # Step 3: Descriptive and summary statistics
    summary_stats = df.head()
    print(summary_stats)
```

```
Sheet Name: Convertible bond Data
Shape: (207, 24)
      Bond ISIN Company ISIN  Ticker           Issuer  \
0  US88160RAG65       69568X    TSLA            Tesla
1  US021369AA17       9211QT    ALTR       Altair Eng
2  US049164BJ49       29301P  RANPTA      Atlas Air WW
3  US92336XAA72       9307U8  SSWPTA    Arriver Holdco
4  US92886TAJ16       902179      VG  Vonage Holdings

   Amount Issued (USD)/ Proceeds  Issue Price  Number of Issues  Coupon  \
0                     1840000000        100.0        18400000.0   2.000
1                      230000000        100.0         2300000.0   0.250
2                      289000000        100.0         2890000.0   1.875
3                      207000000        100.0         2070000.0   4.000
```

```
4                     345000000       100.0        3450000.0   1.750

    Maturity  No of years until final maturity  … Country of Issue  \
0 2024-05-15                          5.022810  …    United States
1 2024-06-01                          4.976277  …    United States
2 2024-06-01                          7.025325  …    United States
3 2024-06-01                          5.011861  …    United States
4 2024-06-01                          4.965328  …    United States

   Issuer Type Instrument Type Bond Grade                 Coupon Type  \
0    Corporate            Bond        NaN  Plain Vanilla Fixed Coupon
1    Corporate            Bond        NaN  Plain Vanilla Fixed Coupon
2    Corporate            Bond        NaN  Plain Vanilla Fixed Coupon
3    Corporate            Bond        NaN  Plain Vanilla Fixed Coupon
4    Corporate            Bond        NaN  Plain Vanilla Fixed Coupon

                Convertible Bond Type Country of Incorporation  \
0  Convertible into Listed Securities            United States
1  Convertible into Listed Securities            United States
2  Convertible into Listed Securities            United States
3  Convertible into Listed Securities            United States
4  Convertible into Listed Securities            United States

                            TRBC Sector  Use of Proceeds  \
0       Electric (Alternative) Vehicles  General Purpose
1        IT Services & Consulting (NEC)              NaN
2                           Air Freight              NaN
3  Auto, Truck & Motorcycle Parts (NEC)              NaN
4   Wireless Telecoms Service Providers              NaN

  Placement Type/ Private Placement
0                                 0
1                                 0
2                                 0
3                                 0
4                                 0

[5 rows x 24 columns]
Sheet Name: Firm Data
Shape: (196, 14)
   Issue Year Company ISIN  Placement Type           Issuer Name   Issue Size  \
0      2020.0       134966             1.0    VEECO INSTRUMENTS   125000000.0
1      2019.0       151828             1.0  INSIGHT ENTERPRISES   350000000.0
2      2014.0       152632             1.0         SUNEDISON INC  910000000.0
3      2016.0       152632             1.0         SUNEDISON INC  225000000.0
4      2019.0       152849             1.0        HARMONIC INC.   115500000.0

   Log (Issue Size)  Total Assets Prior to Issue (USD)  \
```

```
0         8.096910                             816539
1         8.544068                            2767980
2         8.959041                            6680500
3         8.352183                           11499800
4         8.062582                             510835

   Market Capitalization Prior to Issue (USD)  Log (Total Assets)  \
0                                      719482            5.911977
1                                     1445892            6.442163
2                                     3481740            6.824809
3                                     5308671            7.060690
4                                      410909            5.708281

   Log (Market Cap)  Market to Book Prior to Issue (USD)  \
0          5.857020                                 1.82
1          6.160136                                 1.54
2          6.541796                                13.17
3          6.724986                                16.28
4          5.613746                                 2.06

   FCF Per Share Prior to Issue (USD)  Altman Z Score  Debt ratio
0                              -0.032        0.513836    0.367488
1                               6.028        2.570023    0.072197
2                              -3.144        0.302060    0.594387
3                              -9.522        0.214342    0.626046
4                               0.264        0.742330    0.263621
Sheet Name: Private Firm data
Shape: (158, 14)
   Issue Year Company ISIN  Placement Type           Issuer Name   Issue Size  \
0      2020.0       134966             1.0    VEECO INSTRUMENTS   125000000.0
1      2019.0       151828             1.0  INSIGHT ENTERPRISES   350000000.0
2      2014.0       152632             1.0         SUNEDISON INC  910000000.0
3      2016.0       152632             1.0         SUNEDISON INC  225000000.0
4      2019.0       152849             1.0        HARMONIC INC.   115500000.0

   Log (Issue Size)  Total Assets Prior to Issue (USD)  \
0          8.096910                             816539
1          8.544068                            2767980
2          8.959041                            6680500
3          8.352183                           11499800
4          8.062582                             510835

   Market Capitalization Prior to Issue (USD)  Log (Total Assets)  \
0                                      719482            5.911977
1                                     1445892            6.442163
2                                     3481740            6.824809
3                                     5308671            7.060690
4                                      410909            5.708281
```

```
   Log (Market Cap)  Market to Book Prior to Issue (USD)  \
0          5.857020                                 1.82
1          6.160136                                 1.54
2          6.541796                                13.17
3          6.724986                                16.28
4          5.613746                                 2.06

   FCF Per Share Prior to Issue (USD)  Altman Z Score  Debt ratio
0                              -0.032        0.513836    0.367488
1                               6.028        2.570023    0.072197
2                              -3.144        0.302060    0.594387
3                              -9.522        0.214342    0.626046
4                               0.264        0.742330    0.263621
Sheet Name: Public Firm data
Shape: (39, 14)
   Issue Year Company ISIN  Placement Type         Issuer Name   Issue Size  \
0      2020.0       131745             0.0     PENN ENTERTAIN   330495000.0
1      2020.0       134966             0.0  VEECO INSTRUMENTS   132500000.0
2      2017.0       271153             0.0    BIOMARIN PHARMA   495000000.0
3      2020.0       277428             0.0    NEOGENOMICS INC   201250000.0
4      2020.0       286085             0.0       INSEEGO CORP   100000000.0

   Log (Issue Size)  Total Assets Prior to Issue (USD)  \
0          8.519165                         14194500.0
1          8.122216                           816539.0
2          8.694605                          3576904.0
3          8.303736                           709506.0
4          8.000000                           161373.0

   Market Capitalization Prior to Issue (USD)  Log (Total Assets)  \
0                                     2963893            7.152120
1                                      719482            5.911977
2                                    14302126            6.553507
3                                     3064851            5.850956
4                                      600870            5.207831

   Log (Market Cap)  Market to Book Prior to Issue (USD)  \
0          6.471863                                 1.56
1          5.857020                                 1.82
2          7.155401                                 5.10
3          6.486409                                 5.48
4          5.778781                               -16.06

   FCF Per Share Prior to Issue (USD)  Altman Z Score  Debt ratio
0                               4.899        0.375867    0.475797
1                              -0.032        0.513836    0.367488
2                              -1.301        0.407779    0.191014
```

```
3                             0.345        0.670587    0.148639
4                            -1.187        1.320851    1.213394
Sheet Name: Convertible bond - Public
Shape: (40, 24)
      Bond ISIN Company ISIN  Ticker           Issuer  \
0  US88160RAG65       69568X    TSLA            Tesla
1  US021369AA17       9211QT    ALTR       Altair Eng
2  US049164BJ49       29301P  RANPTA     Atlas Air WW
3  US92336XAA72       9307U8  SSWPTA   Arriver Holdco
4  US92886TAJ16       902179      VG  Vonage Holdings

   Amount Issued (USD)/ Proceeds  Issue Price  Number of Issues  Coupon  \
0                   1.840000e+09        100.0        18400000.0   2.000
1                   2.300000e+08        100.0         2300000.0   0.250
2                   2.890000e+08        100.0         2890000.0   1.875
3                   2.070000e+08        100.0         2070000.0   4.000
4                   3.450000e+08        100.0         3450000.0   1.750

    Maturity  No of years until final maturity  … Country of Issue  \
0 2024-05-15                          5.022810  …    United States
1 2024-06-01                          4.976277  …    United States
2 2024-06-01                          7.025325  …    United States
3 2024-06-01                          5.011861  …    United States
4 2024-06-01                          4.965328  …    United States

   Issuer Type Instrument Type Bond Grade                 Coupon Type  \
0    Corporate            Bond        NaN  Plain Vanilla Fixed Coupon
1    Corporate            Bond        NaN  Plain Vanilla Fixed Coupon
2    Corporate            Bond        NaN  Plain Vanilla Fixed Coupon
3    Corporate            Bond        NaN  Plain Vanilla Fixed Coupon
4    Corporate            Bond        NaN  Plain Vanilla Fixed Coupon

                Convertible Bond Type Country of Incorporation  \
0  Convertible into Listed Securities            United States
1  Convertible into Listed Securities            United States
2  Convertible into Listed Securities            United States
3  Convertible into Listed Securities            United States
4  Convertible into Listed Securities            United States

                            TRBC Sector  Use of Proceeds  \
0      Electric (Alternative) Vehicles  General Purpose
1        IT Services & Consulting (NEC)              NaN
2                           Air Freight              NaN
3  Auto, Truck & Motorcycle Parts (NEC)              NaN
4   Wireless Telecoms Service Providers              NaN

  Placement Type/ Private Placement
0                               0.0
```

```
1                              0.0
2                              0.0
3                              0.0
4                              0.0

[5 rows x 24 columns]
Sheet Name: Convertible bond private
Shape: (169, 24)
      Bond ISIN Company ISIN Ticker           Issuer  \
0  US72941BAA44       9301L2  PLURS      Pluralsight
1  US925550AA34       357344  VIAVX  Viavi Solutions
2  US25470MAC38       51486H   DISH     DISH Network
3  US03823UAA07       89716W   AAOI              AOI
4  US401617AC92       883119    GES           Guess?

   Amount Issued (USD)/ Proceeds  Issue Price  Number of Issues  Coupon  \
0                   6.335000e+08        100.0         6335000.0   0.375
1                   4.600000e+08        100.0         4600000.0   1.000
2                   1.000000e+09        100.0        10000000.0   2.375
3                   8.050000e+07        100.0          805000.0   5.000
4                   3.000000e+08        100.0         3000000.0   2.000

    Maturity  No of years until final maturity  … Country of Issue  \
0 2024-03-01                          4.973540  …    United States
1 2024-03-01                          6.995209  …    United States
2 2024-03-15                          6.995209  …    United States
3 2024-03-15                          5.028285  …    United States
4 2024-04-15                          4.970803  …    United States

   Issuer Type Instrument Type  Bond Grade                 Coupon Type  \
0    Corporate            Bond         NaN  Plain Vanilla Fixed Coupon
1    Corporate            Bond         NaN  Plain Vanilla Fixed Coupon
2    Corporate            Bond  High Yield  Plain Vanilla Fixed Coupon
3    Corporate            Bond         NaN  Plain Vanilla Fixed Coupon
4    Corporate            Bond         NaN  Plain Vanilla Fixed Coupon

                Convertible Bond Type Country of Incorporation  \
0  Convertible into Listed Securities            United States
1  Convertible into Listed Securities            United States
2  Convertible into Listed Securities            United States
3  Convertible into Listed Securities            United States
4  Convertible into Listed Securities            United States

                             TRBC Sector Use of Proceeds  \
0         IT Services & Consulting (NEC)             NaN
1      Communications & Networking (NEC)             NaN
2                Cable Service Providers             NaN
3                  Electronic Components             NaN
```

```
4  Apparel & Accessories Retailers (NEC)             NaN

  Placement Type/ Private Placement
0                              1.0
1                              1.0
2                              1.0
3                              1.0
4                              1.0

[5 rows x 24 columns]
Sheet Name: Regression
Shape: (195, 19)
   Issue Year Company ISIN  Placement Type           Issuer Name  Industry  \
0        2020       134966               1    VEECO INSTRUMENTS        NaN
1        2019       151828               1  INSIGHT ENTERPRISES        NaN
2        2014       152632               1         SUNEDISON INC       NaN
3        2016       152632               1         SUNEDISON INC       NaN
4        2019       152849               1        HARMONIC INC.        NaN

   Proceeds (USD)  Issue Size  Ln (Issue Size)  Log (Proceeds)  Ln (Proceeds)  \
0       125000000  153.085156         5.030994        8.096910      18.643824
1       350000000  126.446000         4.839815        8.544068      19.673444
2       910000000  136.217349         4.914252        8.959041      20.628955
3       225000000   19.565558         2.973771        8.352183      19.231611
4       115500000  226.100404         5.420979        8.062582      18.564781

   Ln (Total Assets)  Total Assets Prior to Issue (USD)  \
0          13.612830                             816539
1          14.833628                            2767980
2          15.714703                            6680500
3          16.257840                           11499800
4          13.143802                             510835

   Market Capitalization Prior to Issue (USD)  Log (Total Assets)  \
0                                      719482            5.911977
1                                     1445892            6.442163
2                                     3481740            6.824809
3                                     5308671            7.060690
4                                      410909            5.708281

   Log (Market Cap)  Market to Book Prior to Issue (USD)  \
0          5.857020                                 1.82
1          6.160136                                 1.54
2          6.541796                                13.17
3          6.724986                                16.28
4          5.613746                                 2.06

   FCF Per Share Prior to Issue (USD)  Altman Z Score  Debt ratio
```

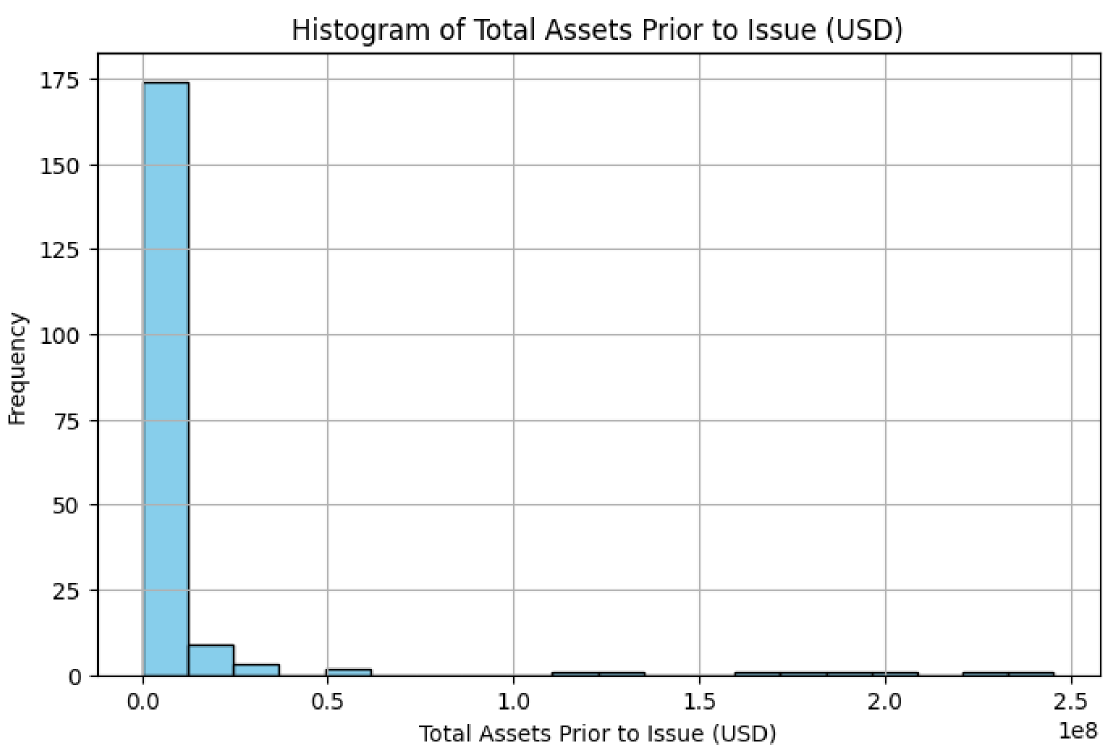
```
0                              -0.032        0.513836    0.367488
1                               6.028        2.570023    0.072197
2                              -3.144        0.302060    0.594387
3                              -9.522        0.214342    0.626046
4                               0.264        0.742330    0.263621
```

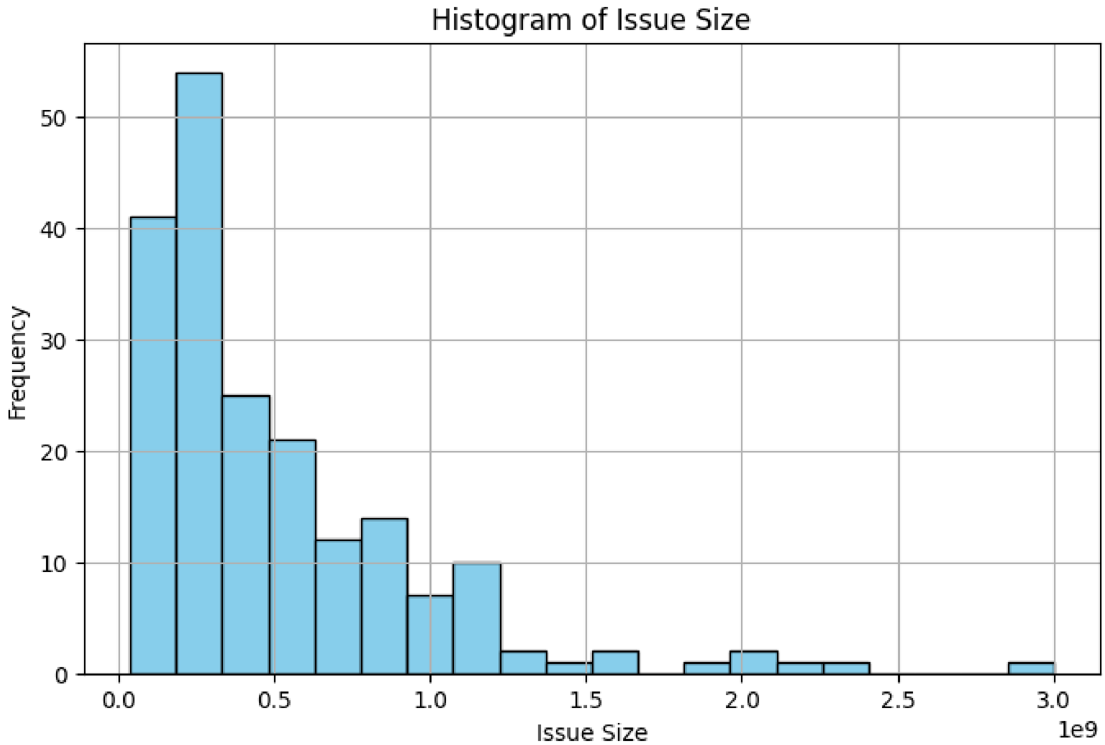
[ ]:
```python
# Descriptive statistics for total assets, issue size, Altman's Z score, and
 ↪market-to-book ratio
variables_of_interest = ["Total Assets Prior to Issue (USD)", "Issue Size",
 ↪"Altman Z Score", "Market to Book Prior to Issue (USD)"]

for variable in variables_of_interest:
    print("Descriptive Statistics for", variable)
    print(data["Firm Data"][variable].describe())
    print()
```

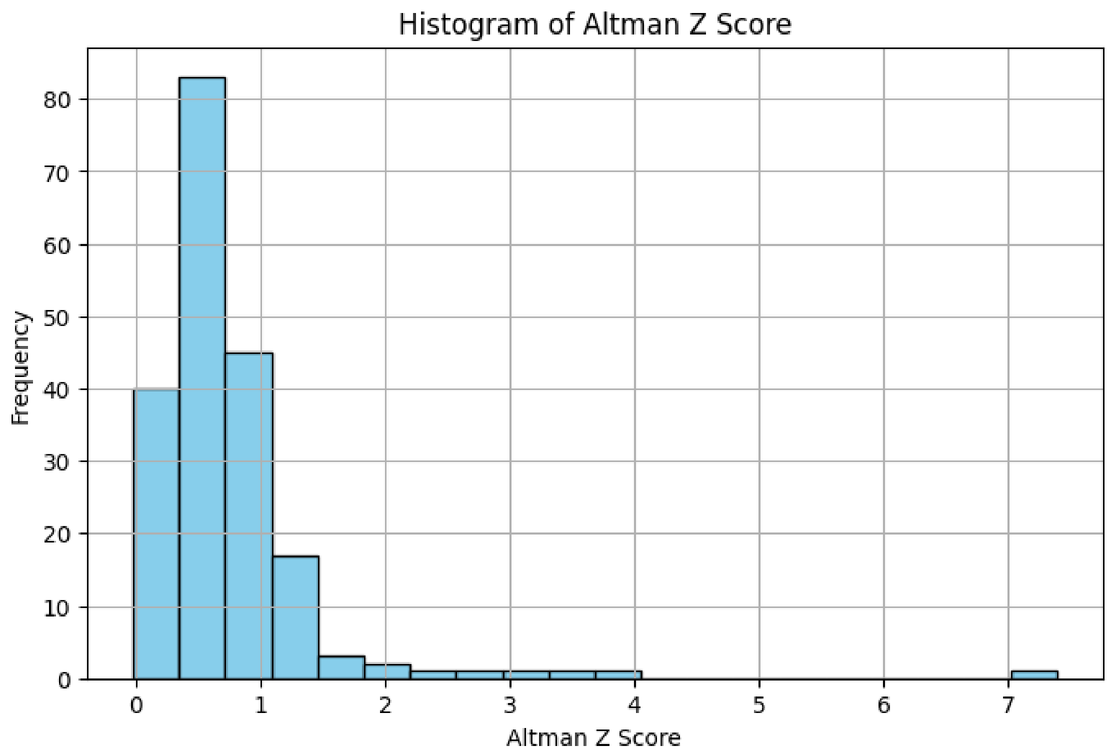
```
Descriptive Statistics for Total Assets Prior to Issue (USD)
count    1.960000e+02
mean     1.126371e+07
std      3.694185e+07
min      1.089870e+05
25%      5.670785e+05
50%      1.478326e+06
75%      4.457372e+06
max      2.456090e+08
Name: Total Assets Prior to Issue (USD), dtype: float64

Descriptive Statistics for Issue Size
count    1.950000e+02
mean     5.071033e+08
std      4.629155e+08
min      3.784875e+07
25%      2.012500e+08
50%      3.450000e+08
75%      6.633820e+08
max      3.000000e+09
Name: Issue Size, dtype: float64

Descriptive Statistics for Altman Z Score
count    196.000000
mean       0.730181
std        0.722560
min       -0.023878
25%        0.354975
50%        0.558901
75%        0.880198
max        7.386298
Name: Altman Z Score, dtype: float64
```

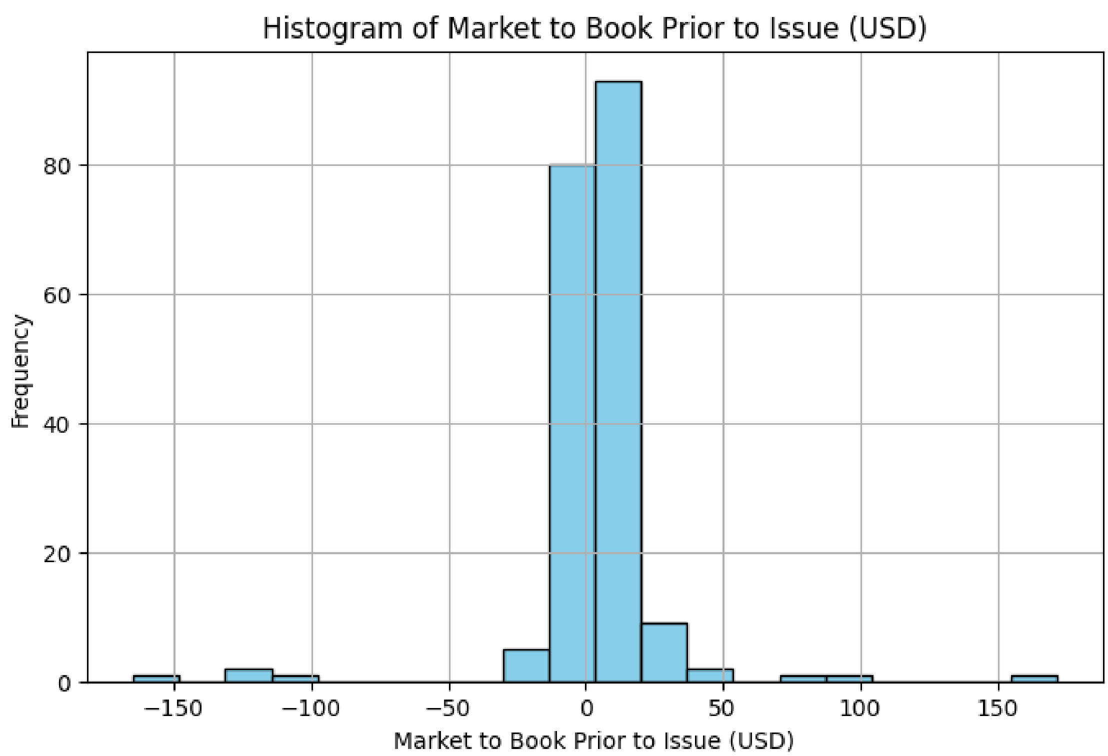
```
Descriptive Statistics for Market to Book Prior to Issue (USD)
count    196.000000
mean       4.326888
std       26.024605
min     -164.890000
25%        1.455000
50%        3.690000
75%        8.157500
max      171.600000
Name: Market to Book Prior to Issue (USD), dtype: float64
```

[ ]:
```
import matplotlib.pyplot as plt

# Univariate analysis: histograms for continuous variables
for variable in variables_of_interest:
    plt.figure(figsize=(8, 5))
    plt.hist(data["Firm Data"][variable], bins=20, color='skyblue',␣
 ↪edgecolor='black')
    plt.title("Histogram of " + variable)
    plt.xlabel(variable)
    plt.ylabel("Frequency")
    plt.grid(True)
    plt.show()
```




Histogram of Issue Size
Frequency
0
10
20
30
40
50
0.0
0.5
1.0
1.5
2.0
2.5
3.0
1e9
Issue Size


Histogram of Altman Z Score
Frequency
0
10
20
30
40
50
60
70
80
0
1
2
3
4
5
6
7
Altman Z Score


Histogram of Market to Book Prior to Issue (USD)
Frequency
0
20
40
60
80
−150
−100
−50
0
50
100
150
Market to Book Prior to Issue (USD)

```python
import statsmodels.api as sm

# Define independent variables and dependent variable
X = data["Firm Data"][["Total Assets Prior to Issue (USD)", "Issue Size",␣
↪"Altman Z Score", "Market to Book Prior to Issue (USD)"]]
# Drop rows with NaN or inf values in the "Placement Type" column
data["Firm Data"] = data["Firm Data"][~data["Firm Data"]["Placement Type"].
↪isna() & ~data["Firm Data"]["Placement Type"].isin([np.inf, -np.inf])]

# Convert "Placement Type" column to integers
y = data["Firm Data"]["Placement Type"].astype(int)


# Identify rows with non-finite values in the exog variables
rows_with_nans = np.isnan(X).any(axis=1) | np.isinf(X).any(axis=1)

# Remove rows with non-finite values
X_cleaned = X[~rows_with_nans]
y_cleaned = y[~rows_with_nans]

# Fit logistic regression model with cleaned data
logit_model = sm.Logit(y_cleaned, X_cleaned)
result = logit_model.fit()
print(result.summary())
```

```
Optimization terminated successfully.
         Current function value: 0.500178
         Iterations 6
                           Logit Regression Results
==============================================================================
Dep. Variable:         Placement Type   No. Observations:                  195
Model:                          Logit   Df Residuals:                      191
Method:                           MLE   Df Model:                            3
Date:                Sun, 18 Feb 2024   Pseudo R-squ.:                -0.01413
Time:                        11:28:05   Log-Likelihood:                -97.535
converged:                       True   LL-Null:                       -96.176
Covariance Type:            nonrobust   LLR p-value:                     1.000
================================================================================
=======================
                                          coef    std err          z      P>|z|
[0.025      0.975]
--------------------------------------------------------------------------------
-----------------------
Total Assets Prior to Issue (USD)    3.126e-10   4.88e-09      0.064      0.949
-9.26e-09    9.89e-09
Issue Size                           1.016e-09   4.38e-10      2.320      0.020
```

```
1.58e-10    1.87e-09
Altman Z Score                          1.2148      0.345      3.526      0.000
0.540       1.890
Market to Book Prior to Issue (USD)     0.0034      0.008      0.452      0.651
-0.011       0.018
================================================================================
=======================
```

0.0.3 Assess model performance using confusion matrix and ROC curve

[ ]:
```python
import statsmodels.api as sm

# Define independent variables and dependent variable
X = data["Firm Data"][["Total Assets Prior to Issue (USD)", "Issue Size",␣
 ↪"Altman Z Score", "Market to Book Prior to Issue (USD)"]]
y = data["Firm Data"]["Placement Type"]

# Add intercept term
X = sm.add_constant(X)

# Fit logistic regression model
logit_model = sm.Logit(y, X)
result = logit_model.fit()

# Print the summary of the logistic regression model
print(result.summary())
```

```
Optimization terminated successfully.
         Current function value: 0.486423
         Iterations 6
                           Logit Regression Results
==============================================================================
Dep. Variable:         Placement Type   No. Observations:                  195
Model:                          Logit   Df Residuals:                      190
Method:                           MLE   Df Model:                            4
Date:                Sun, 18 Feb 2024   Pseudo R-squ.:                 0.01376
Time:                        11:28:05   Log-Likelihood:                -94.852
converged:                       True   LL-Null:                       -96.176
Covariance Type:            nonrobust   LLR p-value:                    0.6185
================================================================================
=======================
                                          coef    std err          z      P>|z|
[0.025      0.975]
--------------------------------------------------------------------------------
-----------------------
const                                   0.9213      0.387      2.379      0.017
0.162       1.680
Total Assets Prior to Issue (USD)   -7.314e-10   4.74e-09     -0.154      0.877
```

```
-1e-08    8.55e-09
Issue Size                             4.266e-10   4.53e-10      0.942      0.346
-4.61e-10    1.31e-09
Altman Z Score                            0.4479      0.407      1.101      0.271
-0.349      1.245
Market to Book Prior to Issue (USD)    -0.0002      0.008     -0.029      0.977
-0.015      0.015
================================================================================
=======================
```

0.0.4 calculate the AIC and BIC values

[ ]:
```python
import numpy as np

# Log-likelihood values for the models
log_likelihood_current = -94.852
log_likelihood_previous = -97.535

# Number of parameters for each model
num_params_current = 5  # Including the intercept
num_params_previous = 4  # Including the intercept

# Number of observations
n = 195

# Calculate AIC for the current model
aic_current = -2 * log_likelihood_current + 2 * num_params_current

# Calculate BIC for the current model
bic_current = -2 * log_likelihood_current + num_params_current * np.log(n)

# Calculate AIC for the previous model
aic_previous = -2 * log_likelihood_previous + 2 * num_params_previous

# Calculate BIC for the previous model
bic_previous = -2 * log_likelihood_previous + num_params_previous * np.log(n)

print("AIC for current model:", aic_current)
print("BIC for current model:", bic_current)
print("AIC for previous model:", aic_previous)
print("BIC for previous model:", bic_previous)
```

```
AIC for current model: 199.704
BIC for current model: 216.06899779281875
AIC for previous model: 203.07
BIC for previous model: 216.16199823425498
```

0.0.5 Stochastic Gradient Descent (SGD) - Model

[ ]:
```
from sklearn.linear_model import SGDClassifier
from sklearn.preprocessing import StandardScaler
from sklearn.model_selection import train_test_split
from sklearn.metrics import accuracy_score

# Split the data into train and test sets
X_train, X_test, y_train, y_test = train_test_split(X, y, test_size=0.2,␣
 ↪random_state=42)

# Feature scaling (optional but recommended for SGD)
scaler = StandardScaler()
X_train_scaled = scaler.fit_transform(X_train)
X_test_scaled = scaler.transform(X_test)

# Initialize the SGDClassifier
sgd_clf = SGDClassifier(loss='log_loss', max_iter=1000, random_state=42)

# Train the model
sgd_clf.fit(X_train_scaled, y_train)

# Predictions on the test set
y_pred = sgd_clf.predict(X_test_scaled)

# Evaluate the model
accuracy = accuracy_score(y_test, y_pred)
print("Accuracy:", accuracy)
```

```
Accuracy: 0.6666666666666666
```

0.0.6 Model comparison

[ ]:
```
# Extracting the intercept from the logistic regression results
logit_intercept = result.params[0]

# Using the coefficients and intercept to calculate the predicted probabilities␣
 ↪for logistic regression
logit_probs = 1 / (1 + np.exp(-(np.dot(X_test_scaled, logit_coefs) +␣
 ↪logit_intercept)))

# Converting probabilities to binary predictions for logistic regression
logit_pred = (logit_probs >= 0.5).astype(int)

# Calculating accuracy for logistic regression
logit_accuracy = accuracy_score(y_test, logit_pred)

# Printing the accuracy of both models
```

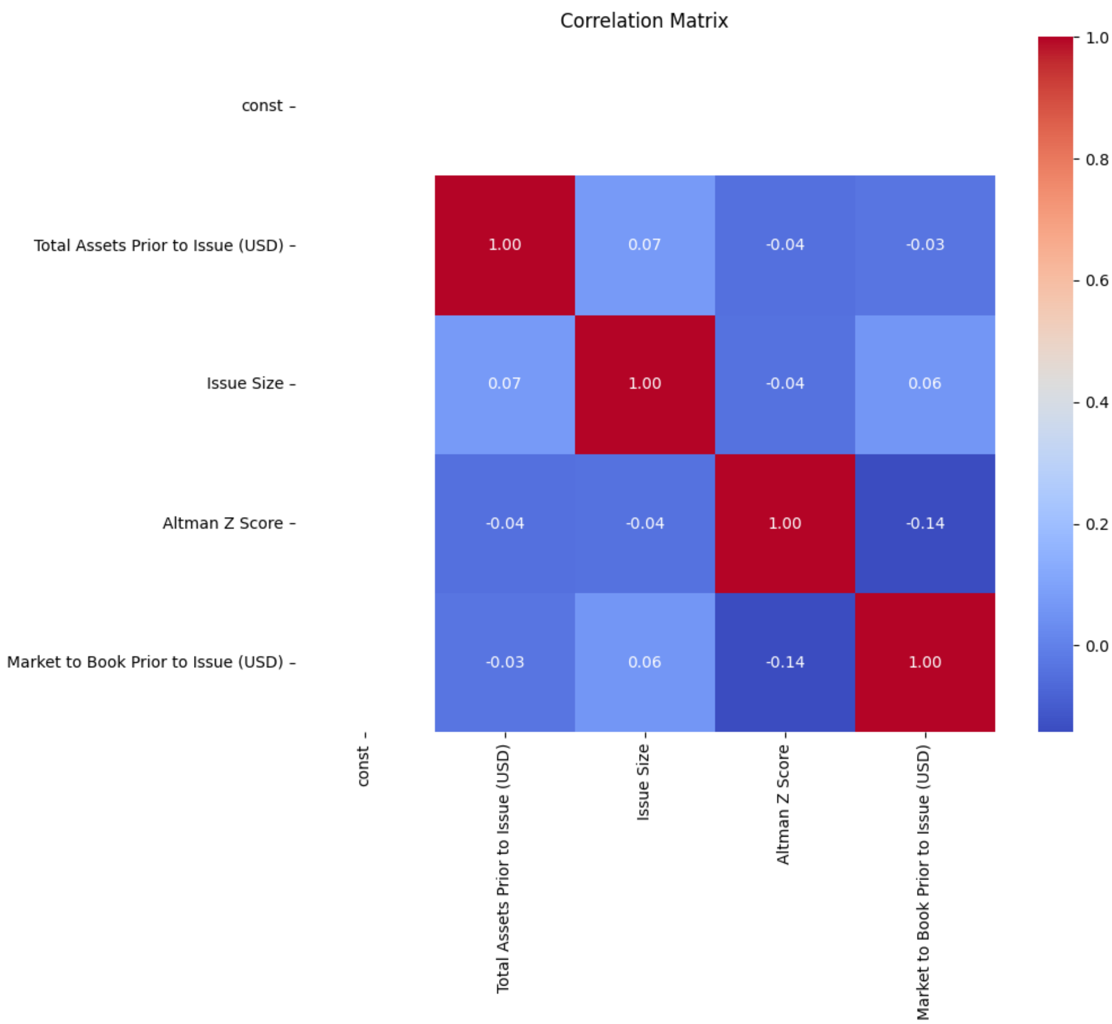
```python
print("Logistic Regression Accuracy:", logit_accuracy)
print("SGDClassifier Accuracy:", accuracy)
```

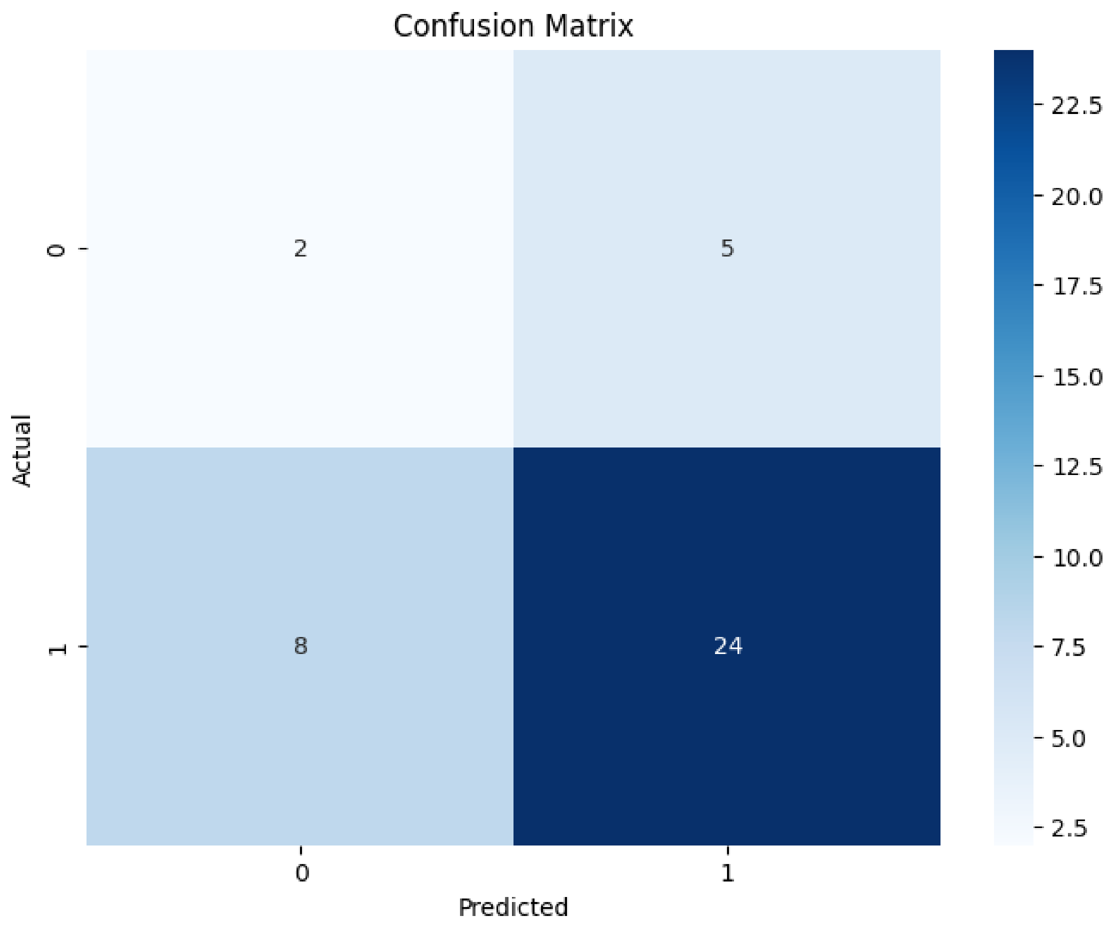
```
Logistic Regression Accuracy: 0.8205128205128205
SGDClassifier Accuracy: 0.6666666666666666
```

```
/tmp/ipykernel_94736/1329026504.py:2: FutureWarning: Series.__getitem__ treating
keys as positions is deprecated. In a future version, integer keys will always
be treated as labels (consistent with DataFrame behavior). To access a value by
position, use `ser.iloc[pos]`
  logit_intercept = result.params[0]
```

[ ]:

```python
import numpy as np
import matplotlib.pyplot as plt
import seaborn as sns
from sklearn.metrics import roc_curve, precision_recall_curve, confusion_matrix



# Correlation Matrix
def plot_correlation_matrix(data):
    corr = data.corr()
    plt.figure(figsize=(10, 8))
    sns.heatmap(corr, annot=True, cmap='coolwarm', fmt=".2f")
    plt.title('Correlation Matrix')
    plt.show()

# Confusion Matrix
def plot_confusion_matrix(y_true, y_pred):
    cm = confusion_matrix(y_true, y_pred)
    plt.figure(figsize=(8, 6))
    sns.heatmap(cm, annot=True, cmap='Blues', fmt='g')
    plt.xlabel('Predicted')
    plt.ylabel('Actual')
    plt.title('Confusion Matrix')
    plt.show()

# Call the functions with appropriate data
plot_correlation_matrix(X_train)

plot_confusion_matrix(y_test, y_pred)
```


Correlation Matrix
const
Total Assets Prior to Issue (USD)
Issue Size
Altman Z Score
Market to Book Prior to Issue (USD)
1.00
0.07
-0.04
-0.03
0.07
1.00
-0.04
0.06
-0.04
-0.04
1.00
-0.14
-0.03
0.06
-0.14
1.00
const
Total Assets Prior to Issue (USD)
Issue Size
Altman Z Score
Market to Book Prior to Issue (USD)
1.0
0.8
0.6
0.4
0.2
0.0



[ ]:

```

```

[ ]:

```
import numpy as np
import matplotlib.pyplot as plt
import seaborn as sns

def plot_feature_distribution(data):
    num_features = len(data.columns)
    num_rows = (num_features + 1) // 2
    plt.figure(figsize=(12, 6))
    for i, feature in enumerate(data.columns):
        plt.subplot(num_rows, 2, i+1)
        sns.histplot(data[feature], kde=True)
        plt.title(f'Distribution of {feature}')
    plt.tight_layout()
    plt.show()

# Call the function with appropriate data
```

```python
# For example:
plot_feature_distribution(X_train)
```