Predict the stock price using Ridge Regression

In [2]:
```
# Import libraries

import yfinance as yf
```

In [4]:
```
# Download the data from Yahoo Finance

tickers = ['AAPL', 'AMZN', 'MSFT', 'QQQ', '^GSPC']
df = yf.download(tickers, start = '2020-01-01', end = '2025-04-01')['Close']
df.head()
```

```
C:\Users\sahil\AppData\Local\Temp\ipykernel_13596\178316247.py:4: FutureWarning: YF.
download() has changed argument auto_adjust default to True
  df = yf.download(tickers, start = '2020-01-01', end = '2025-04-01')['Close']
[*********************100%***********************]  5 of 5 completed
```

Out[4]:

Ticker	AAPL	AMZN	MSFT	QQQ	^GSPC
Date					
2020-01-02	72.538521	94.900497	152.791107	208.848953	3257.850098
2020-01-03	71.833282	93.748497	150.888580	206.935867	3234.850098
2020-01-06	72.405685	95.143997	151.278595	208.269241	3246.280029
2020-01-07	72.065147	95.343002	149.899307	208.240280	3237.179932
2020-01-08	73.224419	94.598503	152.286972	209.805435	3253.050049

In [6]:
```
# Feature Engineering

df['AAPL(t-1)'] = df['AAPL'].shift(1)
df['AMZN(t-1)'] = df['AMZN'].shift(1)
df['MSFT(t-1)'] = df['MSFT'].shift(1)
df['QQQ(t-1)'] = df['QQQ'].shift(1)
df['^GSPC(t-1)'] = df['^GSPC'].shift(1)
```

In [8]:
```
df['AAPL(MA_5)'] = df['AAPL'].rolling(window=5).mean()
df['AMZN(MA_5)'] = df['AMZN'].rolling(window=5).mean()
df['MSFT(MA_5)'] = df['MSFT'].rolling(window=5).mean()
df['QQQ(MA_5)'] = df['QQQ'].rolling(window=5).mean()
df['^GSPC(MA_5)'] = df['^GSPC'].rolling(window=5).mean()
```

In [10]:
```
df['Target'] = df['AAPL'].shift(-1)
df.head()
```

Out[10]:

Ticker	AAPL	AMZN	MSFT	QQQ	^GSPC	AAPL(t-1)	AMZN(t-1)	M
Date								
2020-01-02	72.538521	94.900497	152.791107	208.848953	3257.850098	NaN	NaN	
2020-01-03	71.833282	93.748497	150.888580	206.935867	3234.850098	72.538521	94.900497	15
2020-01-06	72.405685	95.143997	151.278595	208.269241	3246.280029	71.833282	93.748497	15
2020-01-07	72.065147	95.343002	149.899307	208.240280	3237.179932	72.405685	95.143997	15
2020-01-08	73.224419	94.598503	152.286972	209.805435	3253.050049	72.065147	95.343002	14

In [16]:
```
df = df.dropna()
```

In [18]:
```
# Steps for Ridge Regression

# 1. Import libraries
# 2. Define features and Target variables
# 3. Train Test split data
# 4. Apply Ridge Regression
# 5. Get Intercept & co-eff for Ridge Regression
# 6. Predict using Ridge Regression
# 7. Create a dataframe with Actual and Predicted values
# 8. Plot the graph between Actual and Predicted Prices
# 9. Evaluate the model - R Square, Mse, RMSE
```

In [44]:
```
# 1. Import libraries

import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
from sklearn.linear_model import Ridge
from sklearn.model_selection import train_test_split
from sklearn.metrics import r2_score, mean_squared_error
```

In [24]:
```
# 2. Define features and Target variables

X = df[ ['AAPL(t-1)', 'AMZN(t-1)',
       'MSFT(t-1)', 'QQQ(t-1)', '^GSPC(t-1)', 'AAPL(MA_5)', 'AMZN(MA_5)',
       'MSFT(MA_5)', 'QQQ(MA_5)', '^GSPC(MA_5)' ] ]

Y = df['Target']
```

In [30]:
```
# 3. Train Test split data
```

```
X_train, X_test, Y_train, Y_test = train_test_split(X, Y, test_size = 0.05, shuffle
```

In [32]:
```
# 4. Apply Ridge Regression

ridge = Ridge(alpha = 0.5)
ridge.fit(X_train, Y_train)
```

Out[32]:
```
Ridge
Ridge(alpha=0.5)
```

In [38]:
```
# 5. Get Intercept & co-eff for Ridge Regression

co_eff = ridge.coef_
intercept = ridge.intercept_

co_effi = pd.DataFrame( { 'Features': X.columns, 'Co_eff': co_eff} )
co_effi
```

Out[38]:

	Features	Co_eff
0	AAPL(t-1)	0.450365
1	AMZN(t-1)	0.054400
2	MSFT(t-1)	-0.017516
3	QQQ(t-1)	0.035222
4	^GSPC(t-1)	0.004564
5	AAPL(MA_5)	0.532897
6	AMZN(MA_5)	-0.049548
7	MSFT(MA_5)	0.029370
8	QQQ(MA_5)	-0.036270
9	^GSPC(MA_5)	-0.004901

In [40]:
```
# 6. Predict using Ridge Regression

y_pred = ridge.predict(X_test)
y_pred
```

Out[40]:
```
array([249.04995684, 252.33779992, 253.57329366, 256.42553244,
       257.08727718, 254.7121957 , 252.25686756, 249.89590668,
       245.40056971, 244.7465633 , 244.86724186, 241.88592235,
       241.44807514, 237.31460458, 235.25660148, 234.25481749,
       235.80775644, 230.18296903, 230.08707544, 225.98332197,
       225.05763514, 224.29296338, 223.69256372, 227.81718351,
       233.76441298, 235.537924  , 236.63006208, 235.54894389,
       230.85271776, 232.6926387 , 231.83905871, 231.64787499,
       228.10859952, 228.84996976, 231.5816331 , 234.1472344 ,
       238.47850505, 241.58202614, 242.72828603, 243.81938212,
       244.53267412, 243.99850047, 244.90923673, 244.55977225,
       241.27131632, 238.55375375, 240.72638581, 237.0553016 ,
       235.44169594, 236.01233662, 234.63587542, 235.90997693,
       228.09154345, 223.39651794, 219.63975888, 212.99236015,
       214.16016504, 213.66671768, 212.2166871 , 214.22393536,
       214.08767265, 216.54298102, 219.64208501, 221.79500154,
       220.96875286, 221.91786882])
```

In [42]:
```
# 7. Create a dataframe with Actual and Predicted values

last = pd.DataFrame( { 'Actual': Y_test, 'Predict': y_pred } )
last
```

Out[42]:

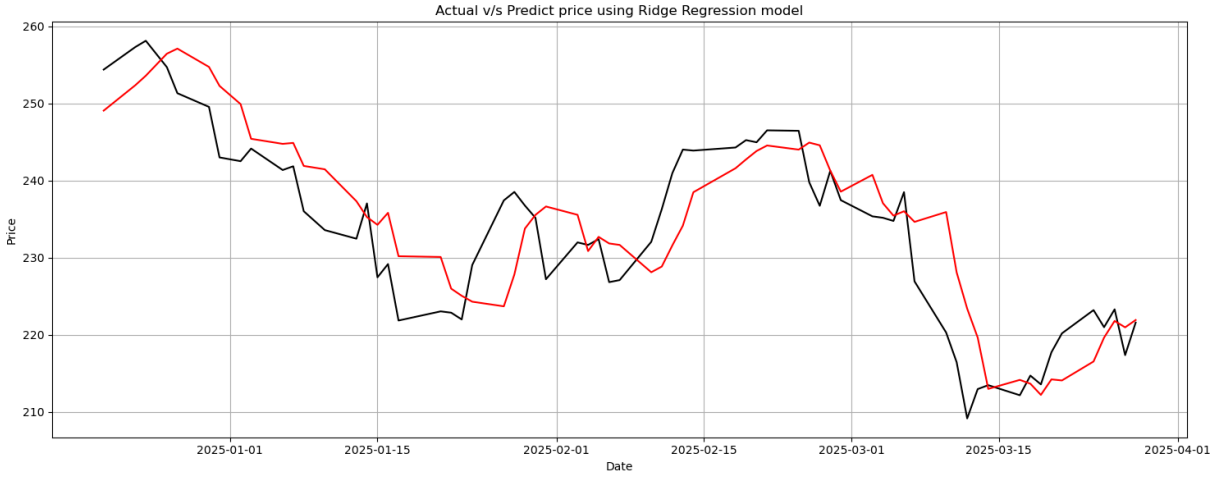
Date	Actual	Predict
2024-12-20	254.367035	249.049957
2024-12-23	257.286652	252.337800
2024-12-24	258.103729	253.573294
2024-12-26	254.685883	256.425532
2024-12-27	251.307877	257.087277
...	...	...
2025-03-24	223.203659	216.542981
2025-03-25	220.989075	219.642085
2025-03-26	223.303421	221.795002
2025-03-27	217.367935	220.968753
2025-03-28	221.587616	221.917869

66 rows × 2 columns

In [54]:
```
# 8. Plot the graph between Actual and Predicted Prices

plt.figure(figsize = (15,6))
plt.plot(last.index, last['Actual'], label = 'Actual', color = 'Black')
plt.plot(last.index, last['Predict'], label = 'Predict', color = 'Red')
plt.title('Actual v/s Predict price using Ridge Regression model')
```

```
plt.xlabel('Date')
plt.ylabel('Price')
plt.grid(True)
plt.tight_layout()
plt.show()
```



In [58]:
```
# 9. Evaluate the model - R Square, Mse, RMSE

r2 = r2_score(Y_test, y_pred)
print('R2 =', r2)

mse = mean_squared_error(Y_test, y_pred)
print('MSE =', mse)

rmse = np.sqrt(mse)
print('RMSE =', rmse)
```

```
R2 = 0.744335577696486
MSE = 35.98799363531089
RMSE = 5.998999386173572
```