In [1]:

```
import pandas as pd
import numpy as np
from sklearn.preprocessing import MinMaxScaler
from sklearn.metrics import mean_squared_error
from keras.models import Sequential
from keras.layers import LSTM,Dense, Dropout, Input
import matplotlib.pyplot as plt
```

```
2023-11-27 23:08:01.228188: I tensorflow/core/platform/cpu_featu
re_guard.cc:182] This TensorFlow binary is optimized to use avai
lable CPU instructions in performance-critical operations.
To enable the following instructions: SSE4.1 SSE4.2 AVX AVX2 AVX
_VNNI FMA, in other operations, rebuild TensorFlow with the appr
opriate compiler flags.
```

In [2]:

```
data = pd.read_csv('aadr.us.txt')

data['Date'] = pd.to_datetime(data['Date'])
data.set_index('Date', inplace=True)

data = data[['Close']]
```

In [3]:

```
scaler = MinMaxScaler(feature_range=(0,1))
data_scaled = scaler.fit_transform(data)
```

In [4]:

```
def create_sequences(data, sequence_length):
    sequences = []
    target = []
    for i in range(len(data) - sequence_length):
        seq = data[i:i+sequence_length]
        label = data[i+sequence_length:i+sequence_length+1]
        sequences.append(seq)
        target.append(label)
    return np.array(sequences), np.array(target)
```

In [5]:

```
sequence_length = 10
x,y = create_sequences(data_scaled, sequence_length)
```

In [6]:

```
split = int(0.7 * len(data))
x_train, x_test, y_train, y_test = x[:split], x[split:], y[:split
```

In [7]:

```
model = Sequential()
model.add(Input((x.shape[1], x.shape[2])))
model.add(LSTM(64))
model.add(Dropout(0.2))
model.add(Dense(32, activation='relu'))
model.add(Dense(32, activation='relu'))
model.add(Dense(1))
model.compile(optimizer='adam', loss='mse')
history = model.fit(x_train, y_train[:, 0], epochs=50, batch_size
```

```
2023-11-27 23:08:15.319286: I tensorflow/core/common_runtim
e/process_util.cc:146] Creating new thread pool with default
inter op setting: 2. Tune using inter_op_parallelism_threads
for best performance.
2023-11-27 23:08:15.503811: I tensorflow/core/common_runtim
e/executor.cc:1197] [/device:CPU:0] (DEBUG INFO) Executor st
art aborting (this does not indicate an error and you can ig
nore this message): INVALID_ARGUMENT: You must feed a value
for placeholder tensor 'gradients/split_2_grad/concat/split_
2/split_dim' with dtype int32
         [[{{node gradients/split_2_grad/concat/split_2/spli
t_dim}}]]
2023-11-27 23:08:15.504490: I tensorflow/core/common_runtim
e/executor.cc:1197] [/device:CPU:0] (DEBUG INFO) Executor st
art aborting (this does not indicate an error and you can ig
nore this message): INVALID_ARGUMENT: You must feed a value
for placeholder tensor 'gradients/split_grad/concat/split/sp
lit_dim' with dtype int32
         [[{{node gradients/split_grad/concat/split/split_di
m}}]]
```

In [8]:

```
predictions = model.predict(x_test)
```

```
15/15 [==============================] - 0s 4ms/step

2023-11-27 23:11:33.473629: I tensorflow/core/common_runtime/exe
cutor.cc:1197] [/device:CPU:0] (DEBUG INFO) Executor start abort
ing (this does not indicate an error and you can ignore this mes
sage): INVALID_ARGUMENT: You must feed a value for placeholder t
ensor 'gradients/split_2_grad/concat/split_2/split_dim' with dty
pe int32
         [[{{node gradients/split_2_grad/concat/split_2/split_di
m}}]]
2023-11-27 23:11:33.474547: I tensorflow/core/common_runtime/exe
cutor.cc:1197] [/device:CPU:0] (DEBUG INFO) Executor start abort
ing (this does not indicate an error and you can ignore this mes
sage): INVALID_ARGUMENT: You must feed a value for placeholder t
ensor 'gradients/split_grad/concat/split/split_dim' with dtype i
nt32
         [[{{node gradients/split_grad/concat/split/split_di
m}}]]
2023-11-27 23:11:33.475476: I tensorflow/core/common_runtime/exe
cutor.cc:1197] [/device:CPU:0] (DEBUG INFO) Executor start abort
ing (this does not indicate an error and you can ignore this mes
sage): INVALID_ARGUMENT: You must feed a value for placeholder t
ensor 'gradients/split_1_grad/concat/split_1/split_dim' with dty
pe int32
         [[{{node gradients/split_1_grad/concat/split_1/split_di
m}}]]
```

In [9]:

```
predictions_inv = scaler.inverse_transform(predictions.reshape(-1
y_test_inv = scaler.inverse_transform(y_test[:, 0])


print("y_test shape:", y_test_inv.shape)
print("predictions shape:",predictions_inv.shape)
mse = mean_squared_error(y_test_inv, predictions_inv)
mse
```

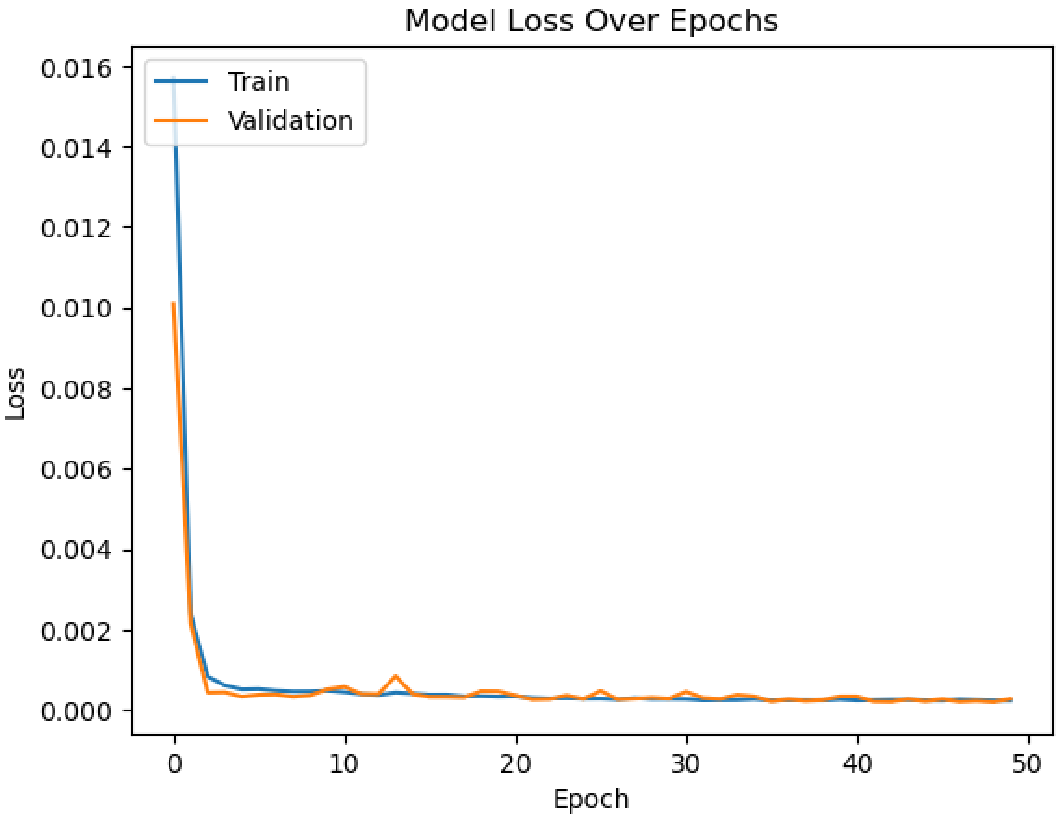
```
y_test shape: (460, 1)
predictions shape: (460, 1)
```

Out[9]:

```
1.4433406316215007
```

In [10]:

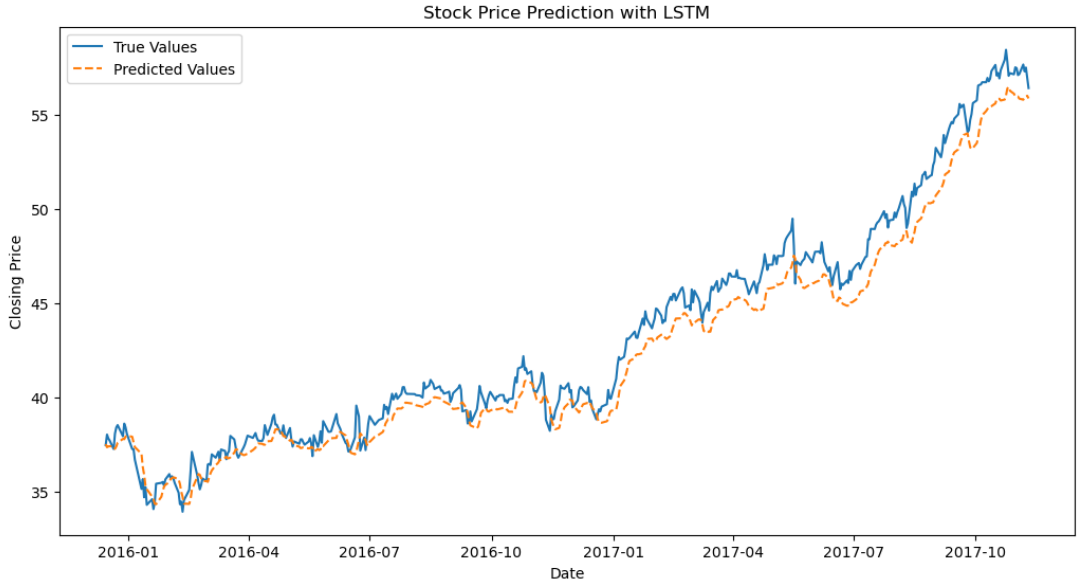
```
plt.plot(history.history['loss'])
plt.plot(history.history['val_loss'])
plt.title('Model Loss Over Epochs')
plt.ylabel('Loss')
plt.xlabel('Epoch')
plt.legend(['Train', 'Validation'], loc='upper left')
plt.show()
```



In [17]:

```
fig = plt.figure(figsize=(12,6))
axes1 = fig.add_axes((0.1, 0.1, 0.8,0.8))
axes1.plot(data.index[-len(y_test_inv):], y_test_inv, label='True
axes1.plot(data.index[-len(predictions_inv):], predictions_inv, l
axes1.set_xlabel('Date')
axes1.set_ylabel("Closing Price")
fig.tight_layout()
plt.title('Stock Price Prediction with LSTM')
axes1.legend()
plt.show()
```

```
/tmp/ipykernel_125109/3691660273.py:7: UserWarning: This figure
includes Axes that are not compatible with tight_layout, so resu
lts might be incorrect.
  fig.tight_layout()
```



In [13]:

```
future_sequence = data_scaled[-sequence_length:].reshape(1, seque
future_predictions = []
future_sequence

future_days = 5

# model.predict(future_sequence)

for _ in range(future_days):
    future_prediction = model.predict(future_sequence)
    future_predictions.append(future_prediction[0,0])
    future_sequence = np.append(future_sequence[:, 1:, :], [futur
```

```
1/1 [==============================] - 0s 14ms/step
1/1 [==============================] - 0s 29ms/step
1/1 [==============================] - 0s 55ms/step
1/1 [==============================] - 0s 51ms/step
1/1 [==============================] - 0s 28ms/step
```

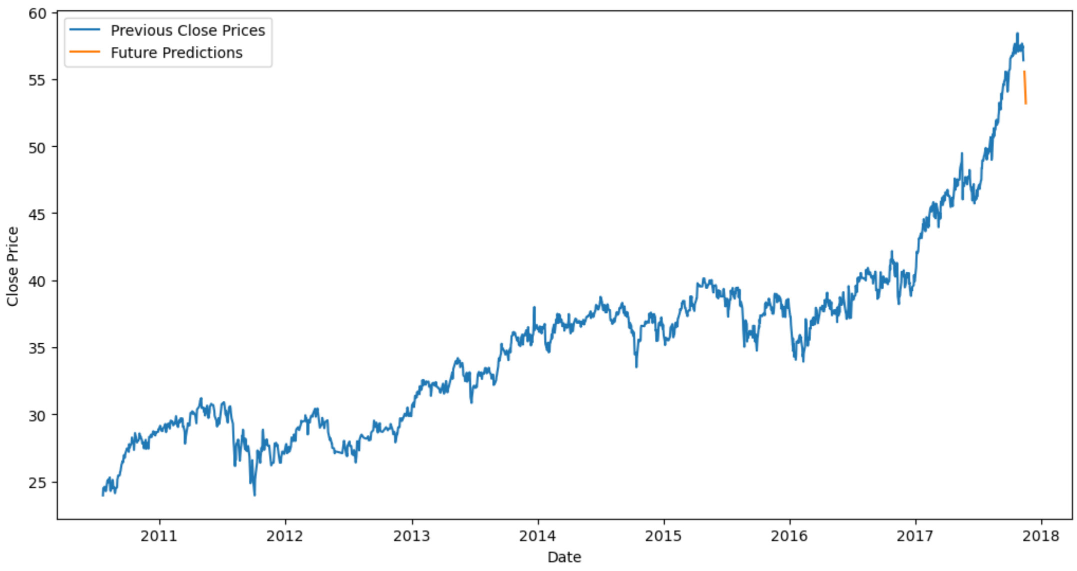
In [14]:

```
future_predictions_inv = scaler.inverse_transform(np.array(future_
```

In [15]:

```
fig2 = plt.figure(figsize=(12,6))
fig2ax1 = fig2.add_axes((0.1, 0.1, 0.8, 0.8))
fig2ax1.plot(data.index, data['Close'], label='Previous Close Pri
future_dates = pd.date_range(data.index[-1], periods=future_days+
fig2ax1.plot(future_dates, future_predictions_inv, label='Future
fig2ax1.set_xlabel('Date')
fig2ax1.set_ylabel('Close Price')
fig2ax1.legend()
fig2.show()
```

```
/tmp/ipykernel_125109/3267495841.py:9: UserWarning: Matplotlib i
s currently using module://matplotlib_inline.backend_inline, whi
ch is a non-GUI backend, so cannot show the figure.
  fig2.show()
```


Previous Close Prices
Future Predictions
Close Price
Date