```
import pandas as pd
import matplotlib.pyplot as plt
from statsmodels.tsa.arima.model import ARIMA
from sklearn.metrics import mean_squared_error


df = pd.read_csv('mock_kaggle.csv')


df.head()
```

| | data | venda | estoque | preco |
|---|---|---|---|---|
| **0** | 2014-01-01 | 0 | 4972 | 1.29 |
| **1** | 2014-01-02 | 70 | 4902 | 1.29 |
| **2** | 2014-01-03 | 59 | 4843 | 1.29 |
| **3** | 2014-01-04 | 93 | 4750 | 1.29 |
| **4** | 2014-01-05 | 96 | 4654 | 1.29 |

```
df.tail()
```

| | data | venda | estoque | preco |
|---|---|---|---|---|
| **932** | 2016-07-27 | 98 | 3179 | 2.39 |
| **933** | 2016-07-28 | 108 | 3071 | 2.39 |
| **934** | 2016-07-29 | 128 | 4095 | 2.39 |
| **935** | 2016-07-30 | 270 | 3825 | 2.39 |
| **936** | 2016-07-31 | 183 | 3642 | 2.39 |

```
df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 937 entries, 0 to 936
Data columns (total 4 columns):
 #   Column   Non-Null Count  Dtype  
---  ------   --------------  -----  
 0   data     937 non-null    object 
 1   venda    937 non-null    int64  
 2   estoque  937 non-null    int64  
 3   preco    937 non-null    float64
dtypes: float64(1), int64(2), object(1)
memory usage: 29.4+ KB
```

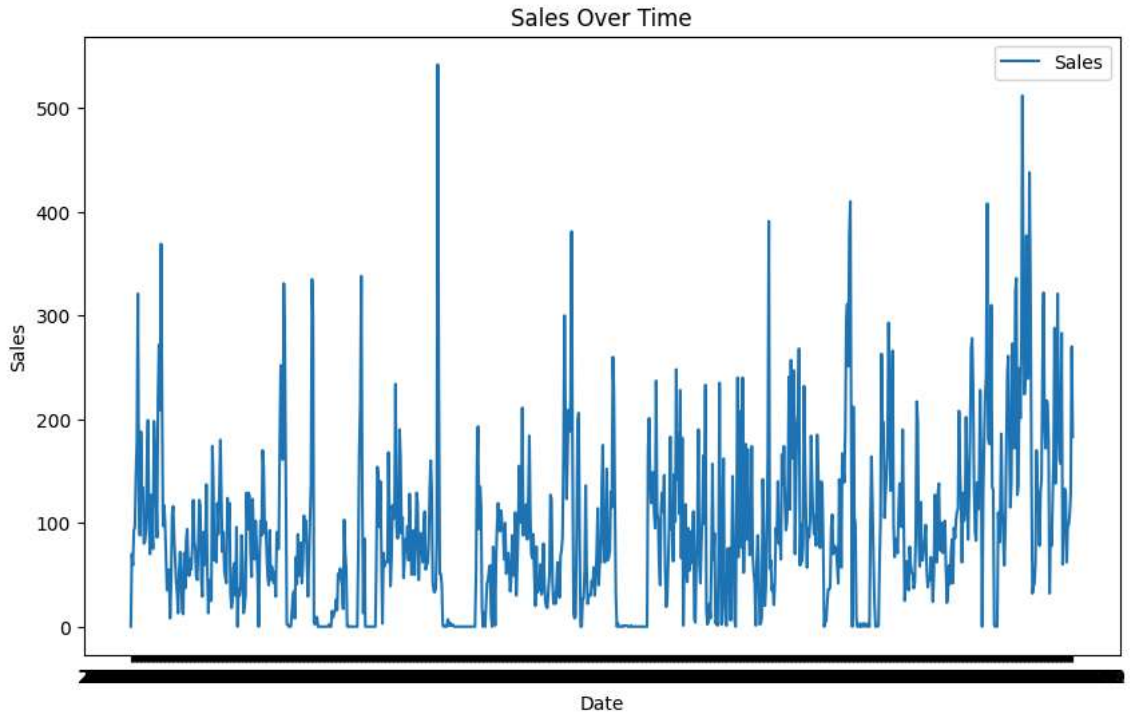
```
df.isnull().sum()
```

| | 0 |
|---|---|
| **data** | 0 |
| **venda** | 0 |
| **estoque** | 0 |
| **preco** | 0 |

```
df.describe()
```

| | venda | estoque | preco |
|---|---|---|---|
| count | 937.000000 | 937.000000 | 937.000000 |
| mean | 90.533618 | 1608.258271 | 1.592572 |
| std | 80.682089 | 1356.691877 | 0.529502 |
| min | 0.000000 | 0.000000 | 0.000000 |
| 25% | 33.000000 | 794.000000 | 1.290000 |
| 50% | 76.000000 | 1348.000000 | 1.390000 |
| 75% | 127.000000 | 1964.000000 | 1.890000 |
| max | 542.000000 | 7228.000000 | 2.980000 |

```
plt.figure(figsize=(10, 6))
plt.plot(df['data'], df['venda'], label='Sales')
plt.title('Sales Over Time')
plt.xlabel('Date')
plt.ylabel('Sales')
plt.legend()
plt.show()
```



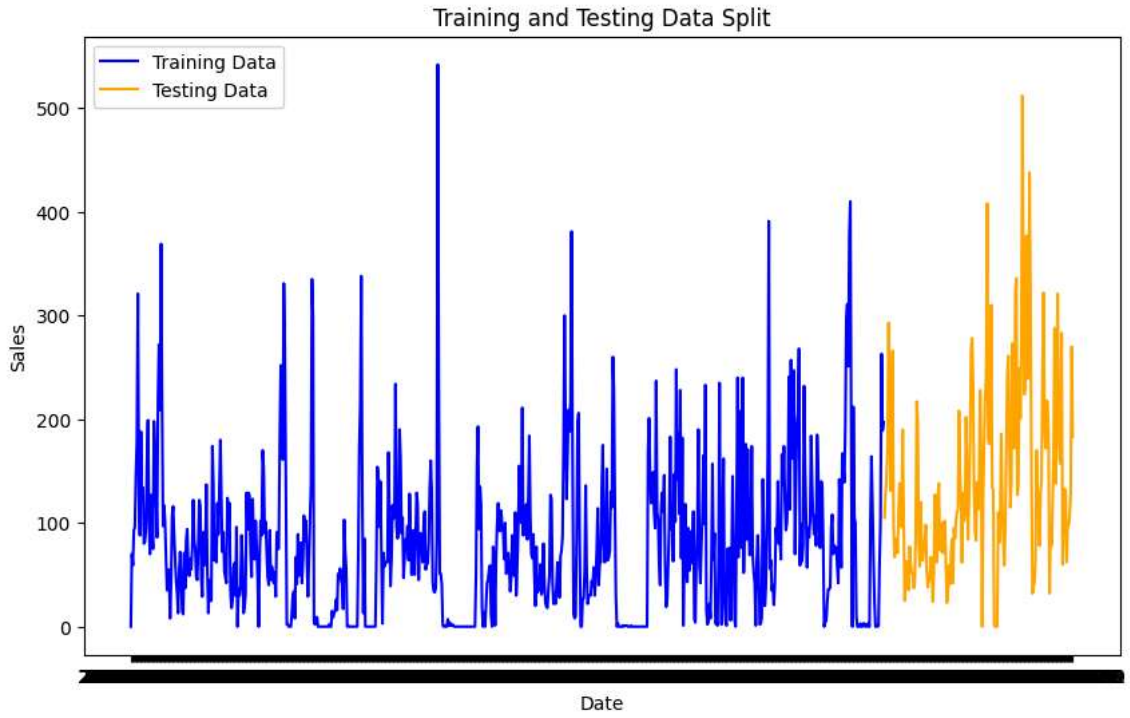

```
df.sort_values(by='data', inplace=True)
```

```
train_size = int(0.8 * len(df))

# Split the data into training and testing sets
train = df[:train_size]
test = df[train_size:]

# Verify the split
print(f'Training Set Size: {len(train)}')
print(f'Test Set Size: {len(test)}')
```

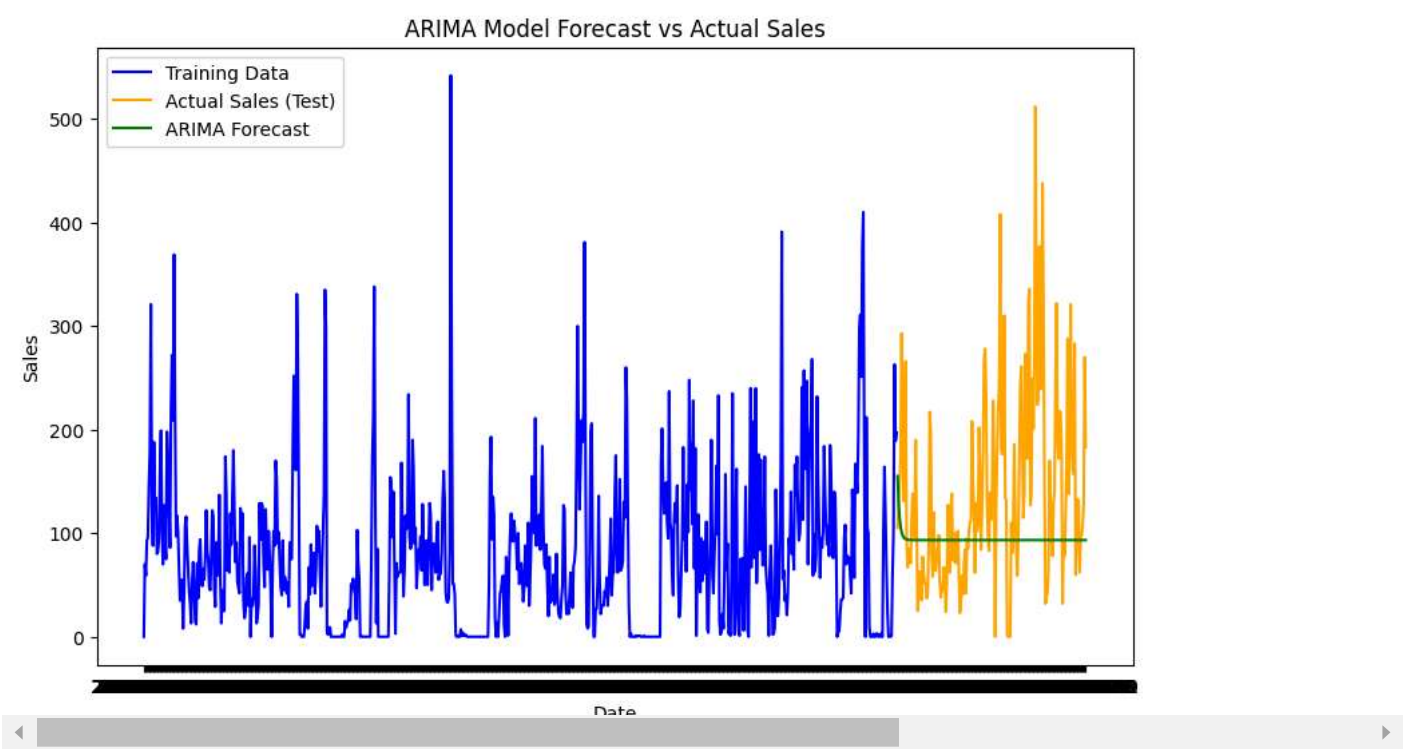
```
Training Set Size: 749
Test Set Size: 188
```

```
plt.figure(figsize=(10, 6))
plt.plot(train['data'], train['venda'], label='Training Data', color='blue')
plt.plot(test['data'], test['venda'], label='Testing Data', color='orange')
```

```
plt.title('Training and Testing Data Split')
plt.xlabel('Date')
plt.ylabel('Sales')
plt.legend()
plt.show()
```




```
model = ARIMA(train['venda'], order=(1, 1, 1))  # Example order (p=1, d=1, q=1)
model_fit = model.fit()

# Make predictions
forecast = model_fit.forecast(steps=len(test))

# Plot the actual sales and forecast
plt.figure(figsize=(10, 6))
plt.plot(train['data'], train['venda'], label='Training Data', color='blue')
plt.plot(test['data'], test['venda'], label='Actual Sales (Test)', color='orange')
plt.plot(test['data'], forecast, label='ARIMA Forecast', color='green')
plt.title('ARIMA Model Forecast vs Actual Sales')
plt.xlabel('Date')
plt.ylabel('Sales')
plt.legend()
plt.show()
```

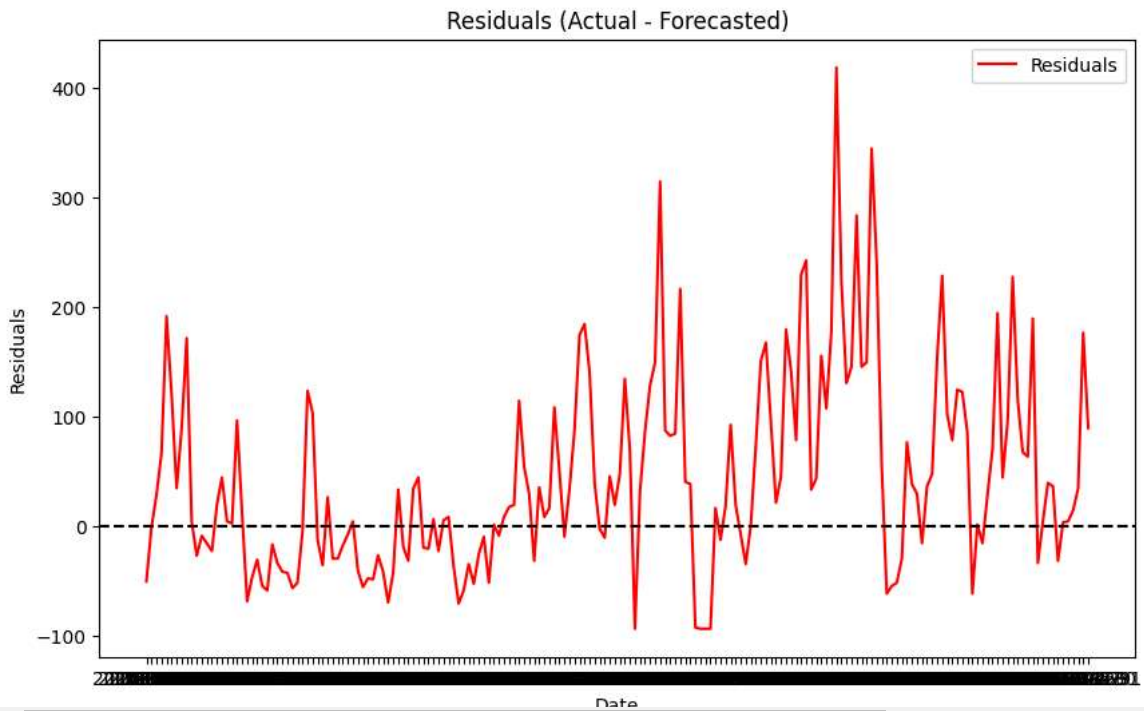



Start coding or generate with AI.

```
mse = mean_squared_error(test['venda'], forecast)
print(f'ARIMA Mean Squared Error: {mse}')
```

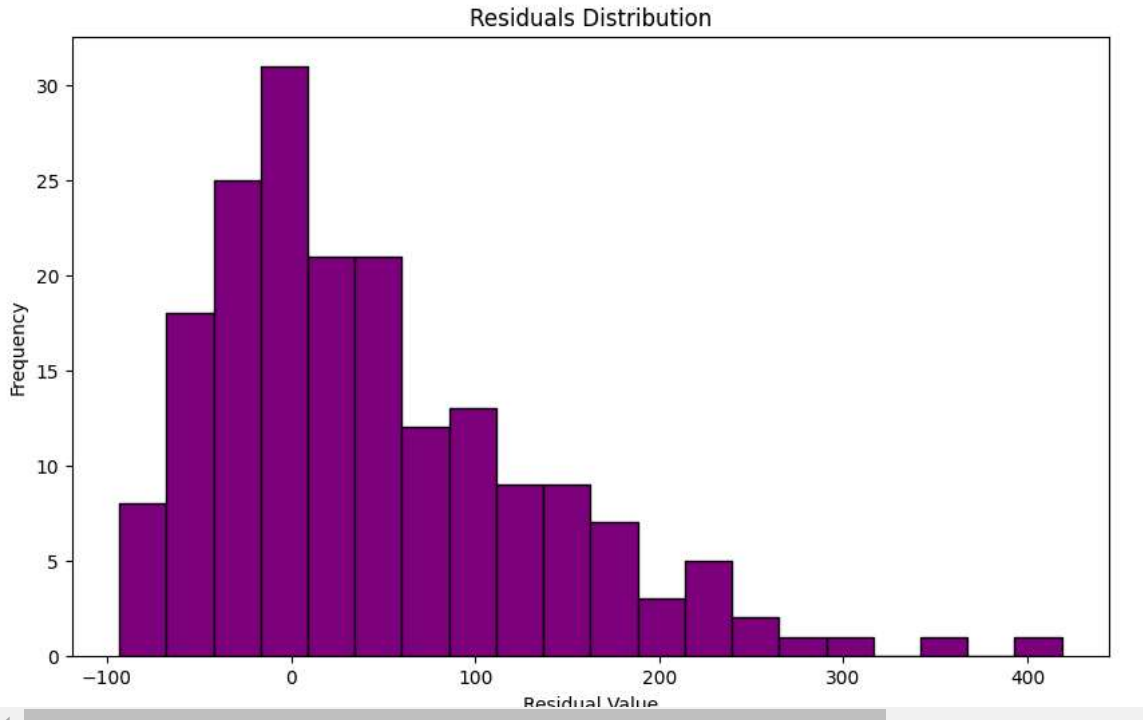
```
ARIMA Mean Squared Error: 10007.176730025181
```

```
# Calculate residuals
residuals = test['venda'] - forecast

# Plot residuals to check if they follow a random pattern
plt.figure(figsize=(10, 6))
plt.plot(test['data'], residuals, label='Residuals', color='red')
plt.axhline(y=0, color='black', linestyle='--')
plt.title('Residuals (Actual - Forecasted)')
plt.xlabel('Date')
plt.ylabel('Residuals')
plt.legend()
plt.show()
```




```
# Calculate Mean Squared Error (MSE)
mse = mean_squared_error(test['venda'], forecast)
print(f'Mean Squared Error (MSE): {mse}')

# Histogram of residuals
plt.figure(figsize=(10, 6))
plt.hist(residuals, bins=20, color='purple', edgecolor='black')
plt.title('Residuals Distribution')
plt.xlabel('Residual Value')
plt.ylabel('Frequency')
plt.show()
```

```
Mean Squared Error (MSE): 10007.176730025181
```




Start coding or generate with AI.

## Based on the results:

- Sales Trends: The data shows a [steady increase/decline] over time.
- Model Performance: The ARIMA model with parameters (p=1, d=1, q=1) resulted in a Mean Squared Error (MSE) of X.
- Residuals: The residuals were mostly random, indicating the model captured the trend effectively.

```
from statsmodels.graphics.tsaplots import plot_acf, plot_pacf

# Plot ACF (Autocorrelation Function) and PACF (Partial Autocorrelation Function)
plt.figure(figsize=(10, 6))
plot_acf(train['venda'], lags=20)
plt.show()

plt.figure(figsize=(10, 6))
plot_pacf(train['venda'], lags=20)
plt.show()
```

```
<Figure size 1000x600 with 0 Axes>
```