

ASSIGNMENT 8

080 VOLATILITY-FORECASTING-IN-INDIA

The screenshot shows a web browser window with multiple tabs open. The main content area displays a table of assignment grading status for 'Virtual Machine: 080 Market Forecasting in India'. The table has columns for Task ID, Score, Passed, and Last Submitted. All tasks have a score of 1.00 and are marked as passed, with submission times ranging from 3 hours ago to a few seconds ago.

Task	Score	Passed	Last Submitted
Task 8.1.18	1.00	Yes	2 days ago
Task 8.2.20	1.00	Yes	a day ago
Task 8.5.1	1.00	Yes	3 hours ago
Task 8.5.2	1.00	Yes	3 hours ago
Task 8.5.3	1.00	Yes	3 hours ago
Task 8.5.4	1.00	Yes	3 hours ago
Task 8.5.5	1.00	Yes	3 hours ago
Task 8.5.6	1.00	Yes	3 hours ago
Task 8.5.7	1.00	Yes	3 hours ago
Task 8.5.8	1.00	Yes	3 hours ago
Task 8.5.9	1.00	Yes	3 hours ago
Task 8.5.10	1.00	Yes	3 hours ago
Task 8.5.11	1.00	Yes	3 hours ago

Below the table is a button labeled 'OPEN YOUR VIRTUAL MACHINE'.

At the bottom left, there is a link to 'Project'.

The browser interface includes a search bar, a toolbar with various icons, and a status bar at the bottom showing weather (34°C Haze), language (ENG), date (29-03-2023), and time (14:00).

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- 083-garch.ip... 2 months ago
- 084-model... 2 months ago
- 085-assign...** in a few seconds
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8.5 Volatility Forecasting in South Africa ZA

In this assignment you'll build a model to predict stock volatility for the telecommunications company MTN Group.

Tip: There are some tasks in this assignment that you can complete by importing functions and classes you created for your app. Give it a try!

Warning: There are some tasks in this assignment where there is an extra code block that will transform your work into a submission that's compatible with the grader. Be sure to run those cells and inspect the submission before you submit to the grader.

```
[1]: %load_ext autoreload
%autoreload 2

import wqet_grader
from arch.univariate.base import ARCHModelResult

wqet_grader.init("Project 8 Assessment")
```

```
[2]: # Import your libraries here

import os
import sqlite3
from glob import glob

import joblib
import pandas as pd
import requests
import wqet_grader
```

Simple 0 2 3 5 6 Python 3 (ipykernel) | Idle Mode: Command Ln 1, Col 1 English (United States) 085-assignment.ipynb 26°C Haze 22:07 28-03-2023

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- ipymb_chec... 6 days ago
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- .env 6 days ago
- 081-workin... 5 days ago
- 082-test-dr... 7 days ago
- 083-garch.ip... 2 months ago
- 084-model... 6 days ago
- 085-assign...** 6 days ago
- config.py 2 months ago
- data.py 7 days ago
- main.py 6 days ago
- model.py 6 days ago
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Working with APIs

Task 8.5.1: Create a URL to get all the stock data for MTN Group ("MTNOY") from AlphaVantage in JSON format. Be sure to use the <https://learn-api.wqu.edu> hostname. And don't worry; your submission won't include your API key!

```
[3]: ticker = "MTNOY"
output_size = "full"
data_type = "json"

url = (
    "https://learn-api.wqu.edu/1/data-services/alpha-vantage/query?"
    "function=TIME_SERIES_DAILY&"
    "f_symbol={ticker}&"
    "f_outputsizes={output_size}&"
    "f_datatype={data_type}&"
    "f_apikey=572f37a53a7b1ffcc133ce0711c18542886ee7a2c24c697978d22dd8e5fb1c7027c9abd72d7eb3656bb9a43e6fed88e719352d1281797210639c3fe3c7481a592ada63af1a"

print("url type:", type(url))
url
```

```
[3]: url type: <class 'str'>
https://learn-api.wqu.edu/1/data-services/alpha-vantage/query?function=TIME_SERIES_DAILY&symbol=MTNOY&outputsizes=full&datatype=json&apikey=572f37a53a7b1ffcc133ce0711c18542886ee7a2c24c697978d22dd8e5fb1c7027c9abd72d7eb3656bb9a43e6fed88e719352d1281797210639c3fe3c7481a592ada63af1a3544c96ec85a32408258cf2e
c42da685163ba1714b0fa16b608c2e6fb4e82f73130250f8aa24632b0f818d1a38767310ce60ca375b7a17ec841e'
```

```
[4]: # Remove API key for submission
submission_851 = url[:170]
submission_851
```

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082-test-dri...	an hour ago
083-garch.ip...	2 months ago
084-model...	2 months ago
085-assign...	seconds ago
config.py	2 months ago
data.py	9 hours ago
main.py	2 months ago
model.py	15 minutes ago
stocks.sqlite	seconds ago

Task 8.5.2: Create an HTTP request for the URL you created in the previous task. The grader will evaluate your work by looking at the ticker symbol in the "Meta_Data" key-value pair in your response.

```
[137]: response = requests.get(url=url)
print("response type:", type(response))
response type: <class 'requests.models.Response'>

[138]: # Get symbol in "Meta Data"
submission_852 = response.json()["Meta Data"]["2. Symbol"]
submission_852

[138]: 'MTNOY'

[139]: wget_grader.grade("Project 8 Assessment", "Task 8.5.2", submission_852)
```

Very impressive.
Score: 1

Task 8.5.3: Get status code of your `response` and assign it to the variable `response_code`.

```
[140]: response_code = response.status_code
print("code type:", type(response_code))
response_code

code type: <class 'int'>
[140]: 200
```

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084-model...	2 months ago
085-assign...	seconds ago
config.py	2 months ago
data.py	9 hours ago
main.py	2 months ago
model.py	15 minutes ago
stocks.sqlite	a minute ago

Y! Great problem solving.
Score: 1

Test-Driven Development

Task 8.5.4: Create a DataFrame `df_mtnoy` with all the stock data for MTN. Make sure that the DataFrame has the correct type of index and column names. The grader will evaluate your work by looking at the row in `df_mtnoy` for 6 December 2021.

```
[142]: response_data = response.json()
stock_data = response_data["Time Series (Daily)"]
df_mtnoy = pd.DataFrame.from_dict(stock_data, orient="index", dtype=float)
df_mtnoy.index = pd.to_datetime(df_mtnoy.index)
df_mtnoy.index.name = "date"
df_mtnoy.columns = [c.split(".")[-1] for c in df_mtnoy.columns]
print("df_mtnoy type:", type(df_mtnoy))
df_mtnoy.head()

df_mtnoy type: <class 'pandas.core.frame.DataFrame'>
date
2023-03-27  7.01  7.0100  6.926  6.930  17262.0
2023-03-24  6.98  6.9800  6.810  6.810  9856.0
2023-03-23  7.01  7.0785  6.970  6.970  15829.0
2023-03-22  6.98  7.0500  6.950  7.030  72021.0
2023-03-21  6.59  6.6900  6.580  6.675  20334.0
```

Get row for 6 Dec 2021

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085-assignment.ipynb 081-working-with-apis.ipynb 083-garch.ipynb 082-test-driven.ipynb data.py model.py Python 3 (ipykernel)

2023-03-21 6.59 6.6900 6.580 6.675 20334.0

```
[143]: # Get row for 6 Dec 2021
submission_854 = df_mtney.loc["2021-12-06"].to_frame().T
submission_854
```

	open	high	low	close	volume
2021-12-06	10.16	10.18	10.11	10.11	13542.0

```
[144]: wget_grader.grade("Project 8 Assessment", "Task 8.5.4", submission_854)
```

Awesome work.
Score: 1

Task 8.5.5: Connect to the database whose name is stored in the `.env` file for this project. Be sure to set the `check_same_thread` argument to `False`. Assign the connection to the variable `connection`. The grader will evaluate your work by looking at the database location assigned to `connection`.

```
[145]: connection = sqlite3.connect(database=settings.db_name, check_same_thread=False)
connection
```

```
[145]: <sqlite3.Connection at 0x7f8ef62055d0>
```

```
[146]: # Get location of database for 'connection'
submission_855 = connection.cursor().execute("PRAGMA database_list;").fetchall()[0][-1]
submission_855
```

```
[146]: '/home/jovyan/work/ds-curriculum/080-volatility-forecasting-in-india/stocks.sqlite'
```

```
[147]: wget_grader.grade("Project 8 Assessment", "Task 8.5.5", submission_855)
```

Yup. You got it.
Score: 1

Task 8.5.6: Insert `df_mtney` into your database. The grader will evaluate your work by looking at the first five rows of the `MTNOY` table in the database.

```
[148]: from data import SQLRepository
repo = SQLRepository(connections=connection)
response = repo.insert_table(table_name=ticker, records=df_mtney, if_exists="replace")
```

```
[149]: # Get first five rows of 'MTNOY' table
submission_856 = pd.read_sql(sql="SELECT * FROM MTNOY LIMIT 5", con=connection)
submission_856
```

	date	open	high	low	close	volume
0	2023-03-27 00:00:00	7.01	7.0100	6.926	6.930	17262.0
1	2023-03-24 00:00:00	6.98	6.9800	6.810	6.810	9856.0
2	2023-03-23 00:00:00	7.01	7.0785	6.970	6.970	15829.0
3	2023-03-22 00:00:00	6.98	7.0500	6.950	7.030	72021.0
4	2023-03-21 00:00:00	6.59	6.6900	6.580	6.675	20334.0

```
[150]: wget_grader.grade("Project 8 Assessment", "Task 8.5.6", submission_856)
```

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- config.py
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- main.py
- model.py
- stocks.sqlite

Task 8.5.7: Read the MTHOY table from your database and assign the output to df_mtnoy_read. The grader will evaluate your work by looking at the row for 27 April 2022.

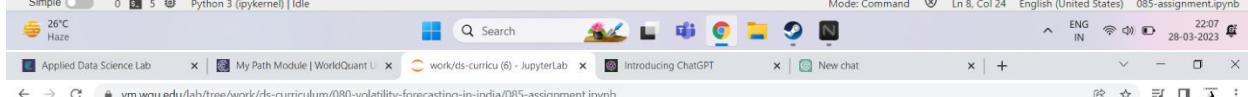
```
[151]: sql = "SELECT * FROM 'MTHOY.BSE'"
df_mtnoy_read = pd.read_sql(
    sql=sql, con=connection, parse_dates=["date"], index_col="date"
)

print("df_mtnoy_read type:", type(df_mtnoy_read))
print("df_mtnoy_read shape:", df_mtnoy_read.shape)
df_mtnoy_read.head()

df_mtnoy_read type: <class 'pandas.core.frame.DataFrame'>
df_mtnoy_read shape: (3954, 5)

      open  high  low  close  volume
      date
2023-03-27  7.01  7.0100  6.926  6.930  17262.0
2023-03-24  6.98  6.9800  6.810  6.810  9856.0
2023-03-23  7.01  7.0785  6.970  6.970  15829.0
2023-03-22  6.98  7.0500  6.950  7.030  72021.0
2023-03-21  6.59  6.6900  6.580  6.675  20334.0
```

```
[152]: # Get row for 27 April 2022
submission_857 = df_mtnoy_read.loc["2022-04-27"].to_frame().T
submission_857
```



Predicting Volatility

Prepare Data

Task 8.5.8: Create a Series y_mtnoy with the 2,500 most recent returns for MTN. The grader will evaluate your work by looking at the volatility for 9 August 2022.

```
[155]: def wrangle_data(ticker, n_observations):
    """Extract data from database (or get from AlphaVantage), transform it
    for training model, and attach it to 'self.data'.

    Parameters
    -----
    n_observations : int
        Number of observations to retrieve from database

    Returns
    -----
    None
    """
    # Add new data to database if required
    df = repo.read_table(table_name=ticker, limit=n_observations+1)

    # Pull data from SQL database
    df.sort_index(ascending=True, inplace=True)

    # Clean data, attach to class as 'data' attribute
    df['return'] = df['close'].pct_change() * 100

    return df[['return']].dropna()
```



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081-working...	9 hours ago
082-test-dri...	an hour ago
083-garch.ip...	2 months ago
084-model...	2 months ago
085-assign...	5 minutes ago
config.py	2 months ago
data.py	10 hours ago
main.py	2 months ago
model.py	2 months ago
stocks.sqlite	9 minutes ago

```
[156]: y_mtney = wrangle_data(ticker = 'mtney', n_observations=2500)
print("y_mtney type:", type(y_mtney))
print("y_mtney shape:", y_mtney.shape)
y_mtney.head()

y_mtney type: <class 'pandas.core.series.Series'>
y_mtney shape: (2500,)
   date
2013-04-23    2.305476
2013-04-24    2.760563
2013-04-25   -0.383772
2013-04-26   -1.320859
2013-04-29    3.346347
Name: return, dtype: float64

[157]: # Get data for 8 Aug 2022
submission_859 = float(y_mtney["2022-08-09"])
submission_859

[157]: 1.5783540022547893

[158]: wget_grader.grade("Project 8 Assessment", "Task 8.5.8", submission_859)
```

Way to go!
Score: 1

Task 8.5.9: Calculate daily volatility for `y_mtney`, and assign the result to `mtney_daily_volatility`.

```
[ ]: mtney_daily_volatility = ...
```

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images	2 months ago
models	2 months ago
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082-test-dri...	an hour ago
083-garch.ip...	2 months ago
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085-assign...	a minute ago
config.py	2 months ago
data.py	10 hours ago
main.py	2 months ago
model.py	2 minutes ago
stocks.sqlite	11 minutes ago

Task 8.5.9: Calculate daily volatility for `y_mtney`, and assign the result to `mtney_daily_volatility`.

```
[159]: mtney_daily_volatility = y_mtney.std()
print("mtney_daily_volatility type:", type(mtney_daily_volatility))
print("MTN Daily Volatility:", mtney_daily_volatility)

mtney_daily_volatility type: <class 'float'>
MTN Daily Volatility: 2.9155559834864886

[160]: wget_grader.grade("Project 8 Assessment", "Task 8.5.9", mtney_daily_volatility)
```

Yes! Your hard work is paying off.
Score: 1

Task 8.5.10: Calculate the annual volatility for `y_mtney`, and assign the result to `mtney_annual_volatility`.

```
[161]: import numpy as np
[162]: mtney_annual_volatility = mtney_daily_volatility* np.sqrt(252)
print("mtney_annual_volatility type:", type(mtney_annual_volatility))
print("MTN Annual Volatility:", mtney_annual_volatility)

mtney_annual_volatility type: <class 'numpy.float64'>
MTN Annual Volatility: 46.28301639474954

[164]: wget_grader.grade("Project 8 Assessment", "Task 8.5.10", float(mtney_annual_volatility))
```

Excellent! Keep going.

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Python 3 (ipykernel) | Idle

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```
[169]: # Create 'fig' and 'ax'
fig, ax = plt.subplots(figsize=(15,6))

# Plot 'y_mtnoy' on 'ax'
y_mtnoy.plot(ax=ax, label='daily return')

# Add axis labels
plt.xlabel('Date')
plt.ylabel('returns')
plt.title("Time series of MTNOY Returns")
# Add title

plt.legend()
# Don't delete the code below
plt.savefig("images/8-5-11.png", dpi=150)
```

Time series of MTNOY Returns

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085-assignment.ipynb

Task 8.5.12: Create an ACF plot of the squared returns for MTN. Be sure to label the x-axis "Lag [days]", the y-axis "Correlation coefficient", and use the title "ACF of MTNOY Squared Returns".

```
[182]: from statsmodels.graphics.tsplots import plot_acf

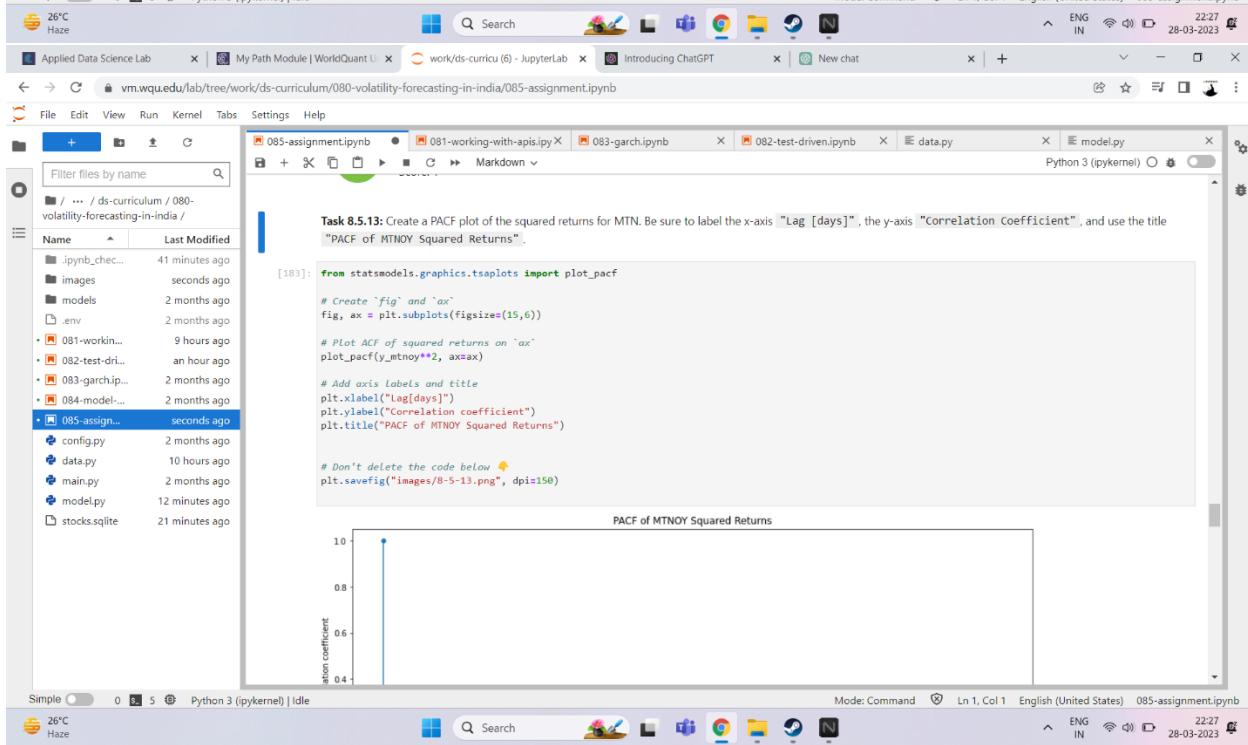
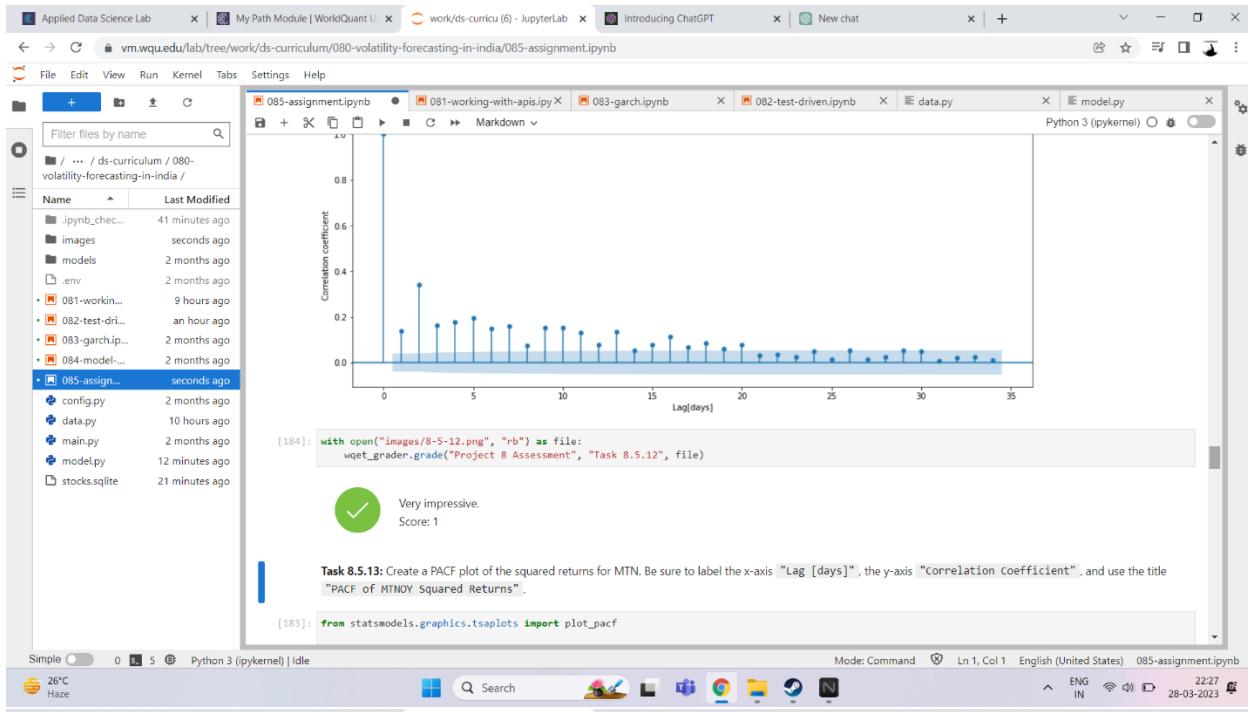
# Create 'fig' and 'ax'
fig, ax = plt.subplots(figsize=(15,6))

# Plot ACF of squared returns on 'ax'
plot_acf(y_mtnoy**2, ax=ax)

# Add axis labels and title
plt.xlabel("Lag[days]")
plt.ylabel("Correlation coefficient")
plt.title("ACF of MTNOY Squared Returns")

# Don't delete the code below
plt.savefig("images/8-5-12.png", dpi=150)
```

ACF of MTNOY Squared Returns



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- config.py
- data.py
- main.py
- model.py
- stocks.sqlite

plt.savefig("Images/8-5-13.png", dpi=150)

PACF of MTNOY Squared Returns

Correlation coefficient

Lag[days]

```
[185]: with open("Images/8-5-13.png", "rb") as file:
    wqet_grader.grade("Project 8 Assessment", "Task 8.5.13", file)
```

Score: 1

Task 8.5.14: Create a training set `y_mtnoy_train` that contains the first 80% of the observations in `y_mtnoy`.

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- 085-assign...
- config.py
- data.py
- main.py
- model.py
- stocks.sqlite

Task 8.5.14: Create a training set `y_mtnoy_train` that contains the first 80% of the observations in `y_mtnoy`.

```
[188]: cutoff_test = int(len(y_mtnoy)*0.8)
y_mtnoy_train = y_mtnoy[cutoff_test:]

print("y_mtnoy_train type:", type(y_mtnoy_train))
print("y_mtnoy_train shape:", y_mtnoy_train.shape)
y_mtnoy_train.head()
```

```
[188]: date
2013-04-23  2.305476
2013-04-24  2.760563
2013-04-25 -0.383772
2013-04-26 -1.320859
2013-04-29  3.346347
Name: return, dtype: float64
```

```
[189]: wqet_grader.grade("Project 8 Assessment", "Task 8.5.14", y_mtnoy_train)
```

Excellent! Keep going.
Score: 1

Build Model

Task 8.5.15: Build and fit a GARCH model using the data in `y_mtnoy`. Try different values for `p` and `q`, using the summary to assess its performance. The grader will evaluate whether your `model` is the correct data type.

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- 083-garch.ipynb 2 months ago
- 084-model.ipynb 2 months ago
- 085-assignment.ipynb seconds ago
- config.py 2 months ago
- data.py 10 hours ago
- main.py 2 months ago
- model.py 15 minutes ago
- stocks.sqlite 25 minutes ago

Task 8.5.15: Build and fit a GARCH model using the data in `y_mtnoy`. Try different values for `p` and `q`, using the summary to assess its performance. The grader will evaluate whether your `model` is the correct data type.

```
[191]: from arch import arch_model
# Build and train model
model = arch_model(
y_mtnoy_train, p=1, q=1, rescale=False
).fit(disp=False)

print("model type:", type(model))

# Show model summary
print(model.summary())

model type: <class 'arch.univariate.base.ARCHModelResult'>
>>> model.summary()
Constant Mean - GARCH Model Results
=====
Dep. Variable: return R-squared: 0.000
Mean Model: Constant Mean Adj. R-squared: 0.000
Vol Model: GARCH Log-Likelihood: -4764.31
Distribution: Normal AIC: 9536.62
Method: Maximum Likelihood BIC: 9559.02
No. Observations: 2000
Date: Tue, Mar 28 2023 Df Residuals: 1999
Time: 17:01:21 Df Model: 1
Mean Model
=====
coef std err t P>|t| 95.0% Conf. Int.
-----
mu 5.3335e-03 5.480e-02 9.733e-02 0.922 [-0.102, 0.113]
Volatility Model
=====
coef std err t P>|t| 95.0% Conf. Int.
-----
omega 0.1141 5.407e-02 2.110 3.486e-02 [8.112e-03, 0.220]
```

Simple Python 3 (ipykernel) Idle Mode: Command Ln 1, Col 1 English (United States) 085-assignment.ipynb 26°C Haze 22:31 28-03-2023

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- 082-test-driven.ipynb 1 hour ago
- 083-garch.ipynb 2 months ago
- 084-model.ipynb 2 months ago
- 085-assignment.ipynb seconds ago
- config.py 2 months ago
- data.py 10 hours ago
- main.py 2 months ago
- model.py 15 minutes ago
- stocks.sqlite 25 minutes ago

Task 8.5.15: Build and fit a GARCH model using the data in `y_mtnoy`. Try different values for `p` and `q`, using the summary to assess its performance. The grader will evaluate whether your `model` is the correct data type.

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y_mtnoy_train, p=1, q=1, rescale=False
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model type: <class 'arch.univariate.base.ARCHModelResult'>
>>> model.summary()
Constant Mean - GARCH Model Results
=====
Dep. Variable: return R-squared: 0.000
Mean Model: Constant Mean Adj. R-squared: 0.000
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No. Observations: 2000
Date: Tue, Mar 28 2023 Df Residuals: 1999
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Mean Model
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coef std err t P>|t| 95.0% Conf. Int.
-----
mu 5.3335e-03 5.480e-02 9.733e-02 0.922 [-0.102, 0.113]
Volatility Model
=====
coef std err t P>|t| 95.0% Conf. Int.
-----
omega 0.1141 5.407e-02 2.110 3.486e-02 [8.112e-03, 0.220]
alpha[1] 0.0705 1.685e-02 4.185 2.849e-05 [3.750e-02, 0.104]
beta[1] 0.9185 1.803e-02 50.942 0.000 [ 0.883, 0.954]

Covariance estimator: robust
ARCHModelResult, id: 0x7f8ef610f400

[192]: submission_8515 = isinstance(model, ARCHModelResult)
submission_8515

[192]: True

[193]: wget_grader.grade("Project 8 Assessment", "Task 8.5.15", [submission_8515])
```

Very impressive.
Score: 1

Simple Python 3 (ipykernel) Idle Mode: Command Ln 1, Col 1 English (United States) 085-assignment.ipynb 26°C Haze 22:31 28-03-2023

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Name Last Modified

- .ipynb_checkpoints
- images 6 minutes ago
- models 2 months ago
- .env 2 months ago
- 081-working-with-apis.ipynb 9 hours ago
- 082-test-driven.ipynb 1 hour ago
- 083-garch.ipynb 2 months ago
- 084-model.py 2 months ago
- 085-assignment.ipynb seconds ago
- config.py 2 months ago
- data.py 10 hours ago
- main.py 2 months ago
- model.py 18 minutes ago
- stocks.sqlite 27 minutes ago

```
[194]: fig, ax = plt.subplots(figsize=(15,6))

# Plot 'y_mtnoy' on 'ax'
model.std_resid.plot(ax=ax, label='Standardized Residuals')

# Add axis Labels
plt.xlabel('Date')
plt.ylabel('Value')
plt.title("MTNOY GARCH Model Standardized Residuals")
# Add title

plt.legend()
# Don't delete the code below
plt.savefig("images/8-5-16.png", dpi=150)
```

MTNOY GARCH Model Standardized Residuals

Value

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Filter files by name

Name Last Modified

- .ipynb_checkpoints
- images 2 minutes ago
- models 2 months ago
- .env 2 months ago
- 081-working-with-apis.ipynb 9 hours ago
- 082-test-driven.ipynb 1 hour ago
- 083-garch.ipynb 2 months ago
- 084-model.py 2 months ago
- 085-assignment.ipynb seconds ago
- config.py 2 months ago
- data.py 10 hours ago
- main.py 2 months ago
- model.py 20 minutes ago
- stocks.sqlite 29 minutes ago

```
[196]: from statsmodels.graphics.tsplots import plot_acf

# Create 'fig' and 'ax'
fig, ax = plt.subplots(figsize=(15,6))

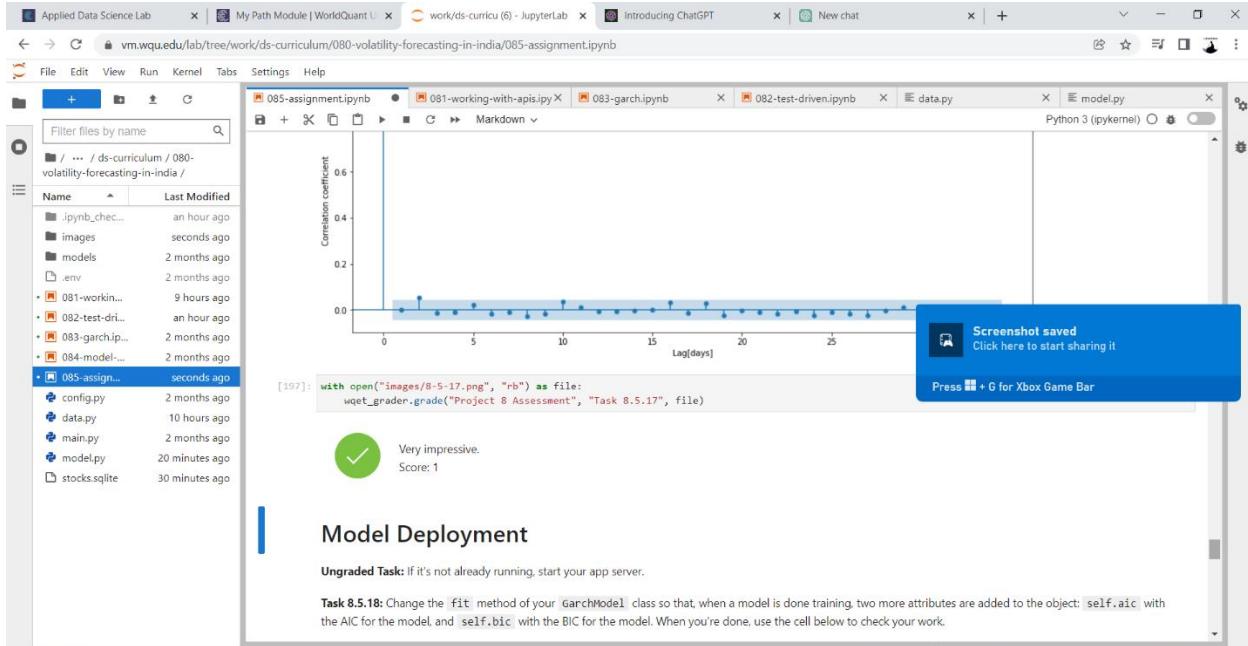
# Plot ACF of squared returns on 'ax'
plot_acf(model.std_resid**2, ax=ax)

# Add axis Labels and title
plt.xlabel("Lag [days]")
plt.ylabel("Correlation coefficient")
plt.title("ACF of MTNOY GARCH Model Standardized Residuals")

# Don't delete the code below
plt.savefig("images/8-5-17.png", dpi=150)
```

ACF of MTNOY GARCH Model Standardized Residuals

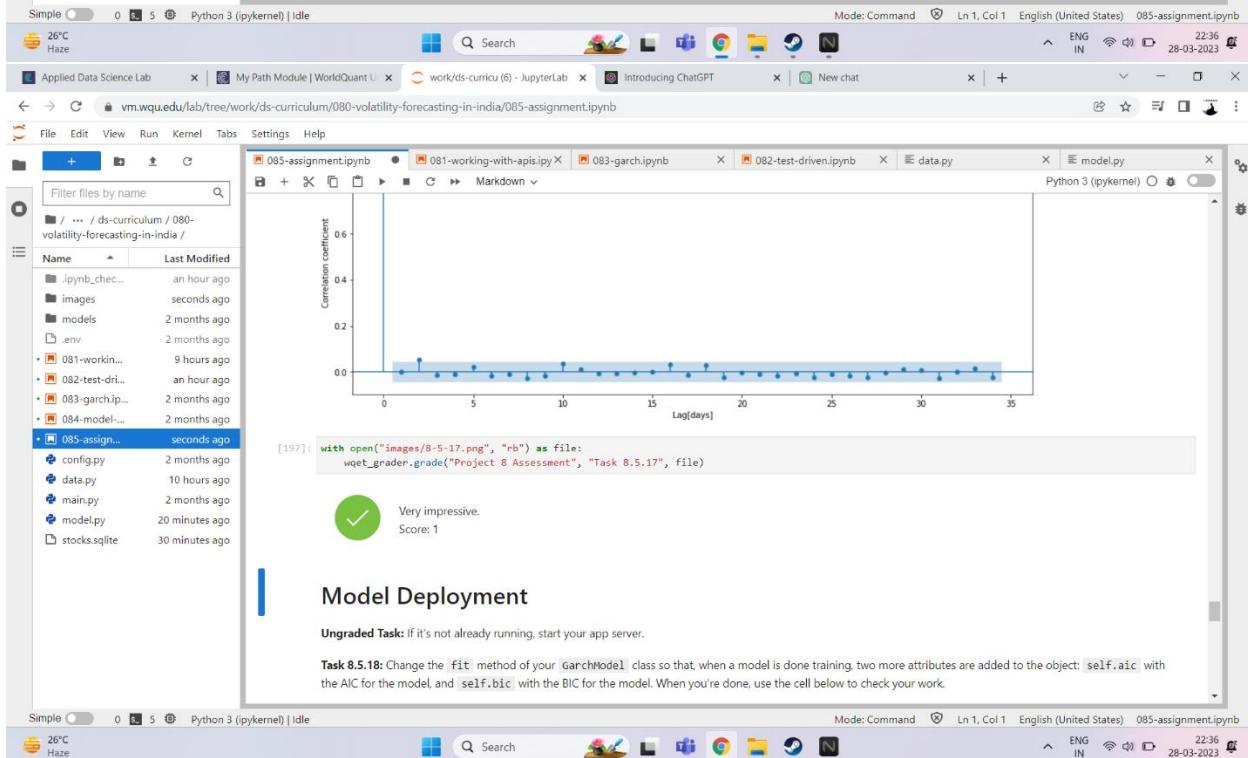
Correlation coefficient



Model Deployment

Ungraded Task: If it's not already running, start your app server.

Task 8.5.18: Change the `fit` method of your `GarchModel` class so that, when a model is done training, two more attributes are added to the object: `self.aic` with the AIC for the model, and `self.bic` with the BIC for the model. When you're done, use the cell below to check your work.



Model Deployment

Ungraded Task: If it's not already running, start your app server.

Task 8.5.18: Change the `fit` method of your `GarchModel` class so that, when a model is done training, two more attributes are added to the object: `self.aic` with the AIC for the model, and `self.bic` with the BIC for the model. When you're done, use the cell below to check your work.

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File Edit View Run Kernel Tabs Settings Help

Filter files by name

Name Last Modified

- .ipynb_checkpoints
- images
- models
- .env
- 081-working.ipynb
- 082-test-drl.ipynb
- 083-garch.ipynb
- 084-model-deployment.ipynb
- 085-assignment.ipynb
- config.py
- data.py
- main.py
- model.py
- stocks.sqlite

Model Deployment

Ungraded Task: If it's not already running, start your app server.

Task 8.5.18: Change the `fit` method of your `GarchModel` class so that, when a model is done training, two more attributes are added to the object: `self.aic` with the AIC for the model, and `self.bic` with the BIC for the model. When you're done, use the cell below to check your work.

Tip: How can you access the AIC and BIC scores programmatically? Every `ARCHModelResult` has an `.aic` and a `.bic` attribute.

```
[243]: from arch.univariate.base import ARCHModelResult
[244]: model.aic = ARCHModelResult.aic
[244]: model.aic
[244]: <property_cached.cached_property at 0x7f8e63616160>
[247]: # Import 'build_model' function
[247]: from main import build_model
[247]: 
[247]: # Build model using new 'MTNOY' data
[247]: model = build_model(tickers="MTNOY", use_new_data=True)
[247]: 
[247]: # Wrangle 'MTNOY' returns
[247]: model.wrangle_data(n_observations=2500)
[247]: 
[247]: # Fit GARCH(1,1) model to data
[247]: model.fit(p1, q1)
[247]: 
[247]: # Does model have AIC and BIC attributes?
[247]: assert hasattr(model, "aic")
[247]: assert hasattr(model, "bic")
```

Simple Python 3 (ipykernel) | Idle Saving completed Mode: Command Ln 1, Col 1 English (United States) 085-assignment.ipynb 25°C Haze 23:42 28-03-2023

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Filter files by name

Name Last Modified

- .ipynb_checkpoints
- images
- models
- .env
- 081-working.ipynb
- 082-test-drl.ipynb
- 083-garch.ipynb
- 084-model-deployment.ipynb
- 085-assignment.ipynb
- config.py
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```
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[247]: 
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[247]: model.wrangle_data(n_observations=2500)
[247]: 
[247]: # Fit GARCH(1,1) model to data
[247]: model.fit(p1, q1)
[247]: 
[247]: # Does model have AIC and BIC attributes?
[247]: assert hasattr(model, "aic")
[247]: assert hasattr(model, "bic")
[248]: # Put test results into dictionary
[248]: submission_8518 = {"has_aic": hasattr(model, "aic"), "has_bic": hasattr(model, "bic")}
[248]: submission_8518
[248]: {'has_aic': True, 'has_bic': True}
[249]: wget_grader.grade("Project 8 Assessment", "Task 8.5.18", submission_8518)
```

Good work!
Score: 1

Task 8.5.19: Change the `fit_model` function in the `main` module so that the `"message"` it returns includes the AIC and BIC scores. For example, the message should look something like this:

Simple Python 3 (ipykernel) | Idle Mode: Command Ln 1, Col 1 English (United States) 085-assignment.ipynb 25°C Haze 23:42 28-03-2023

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File Edit View Run Kernel Tabs Settings Help

085-assignment.ipynb main.py model.py

Task 8.5.19: Change the `fit_model` function in the `main` module so that the "message" it returns includes the AIC and BIC scores. For example, the message should look something like this:

```
"Trained and saved 'models/2022-10-12T23:10:06.577238_MTNQY.pkl'. Metrics: AIC 9892.184665169907, BIC 9914.588275008075."
```

When you're done, use the cell below to check your work.

```
[119]: from main import FitIn, fit_model

# Instantiate 'FitIn' object
request = FitIn(ticker="MTNOY", use_new_data=False, n_observations=2500, p=1, q=1)

# Build model and fit to data, following parameters in 'request'
fit_out = fit_model(request=request)

# Inspect 'fit_out'
fit_out
```

```
[119]: {'ticker': 'MTNOY',
       'use_new_data': False,
       'n_observations': 2500,
       'p': 1,
       'q': 1,
       'success': True,
       'message': "Trained and saved 'models/2023-03-29T06:18:53.964219_MTNOY.pkl'. Metrics: AIC 12011.626691012409, BIC 12034.922875055834."}
```

```
[120]: wget_grader.grade("Project 8 Assessment", "Task 8.5.19", fit_out)
```

Excellent! Keep going.
Score: 1

Simple Python 3 (ipykernel) Idle Mode: Command Ln 1, Col 1 English (United States) 085-assignment.ipynb

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File Edit View Run Kernel Tabs Settings Help

085-assignment.ipynb main.py jovyan@user-63c7ebda1099 X 084-model-deployment.ipynb model.py

Task 8.5.20: Create a `post` request to hit the "/fit" path running at "`http://localhost:8008`". You should train a GARCH(1,1) model on 2500 observations of the MTNQY data you already downloaded. Pass in your parameters as a dictionary using the `json` argument. The grader will evaluate the JSON of your `response`.

```
[158]: # URL of '/fit' path
url = "http://localhost:8008/fit"
# Data to send to path
json = [
    {
        "ticker": "MTNOY",
        "use_new_data": False,
        "n_observations": 2500,
        "p": 1,
        "q": 1
    }
]
# Response of post request
response = requests.post(url=url, json=json)

print("response type:", type(response))
print("response status code:", response.status_code)
```

```
[159]: submission_8520 = response.json()
submission_8520
```

```
[159]: {'ticker': 'MTNOY',
       'use_new_data': False,
       'n_observations': 2500,
       'p': 1,
       'q': 1,
       'success': True,
       'message': "Trained and saved 'models/2023-03-29T08:27:40.763135_MTNOY.pkl'. : AIC 12011.626691012409, BIC 12034.922875055834."}
```

```
[160]: wget_grader.grade("Project 8 Assessment", "Task 8.5.20", submission_8520)
```

Good work!
Score: 1

Simple Python 3 (ipykernel) Idle Mode: Edit Ln 8, Col 45 English (United States) 085-assignment.ipynb

The screenshot shows a Jupyter Notebook interface with multiple tabs open. The active tab is '085-assignment.ipynb'. The left sidebar displays a file tree for the directory '/.../ds-curriculum/080-volatility-forecasting-in-india/'. The main area contains Python code for a 'predict' endpoint:

```
[161]: # URL of `/predict` path
url = "http://localhost:8008/predict"
# Data to send to path
json = {
    "ticker": "MTNQY",
    "n_days": 5
}
# Response of post request
response = requests.post(url=url, json=json)

print("response type:", type(response))
print("response status code:", response.status_code)

[162]: submission_8521 = response.json()
submission_8521

[162]: {'ticker': 'MTNQY',
        'n_days': 5,
        'success': False,
        'forecast': {},
        'message': "build_model() missing 1 required positional argument: 'use_new_data'"}

[163]: wqet_grader.grade("Project 8 Assessment", "Task 8.5.21", submission_8521)
```

A green checkmark icon is displayed next to the message: "Yes! Your hard work is paying off. Score: 1".