**DESCRIPTIVE AND PREDICTIVE ANALYSIS ON SHIBA INU (Cryptocurrency)**

**MAJOR PROJECT REPORT**

**Submitted in partial fulfilment of the requirement for the degree of**

**B.TECH (CSE)**

**BY**

**Ritwik Bahukhandi (2018-310-116)**

Under the Supervision of

**Mr. Piyush Kumar Gupta**

****

**JAMIA HAMDARD UNIVERSITY**

**HAMDARD NAGAR , NEW DELHI - 110062**

**(Deemed to be University)**

**MAY , 2022**

**ACKNOWLEDGEMENT**

I express my deep gratitude to **Mr. Piyush Kumar Gupta**, Assistant Professor, Department of Computer Science and Engineering for his valuable guidance and suggestion throughout my project work.

I would like to extend our sincere thanks to **Dr. Farheen Siddiqui, HOD, Computer Science & Engineering,** for his time to suggestions to complete our project work.

**CANDIDATE’S DECLARATION**

It is hereby certified that the work which is being presented in the B. Tech Minor Project Report entitled "**DESCRIPTIVE AND PREDICTIVE ANALYSIS ON SHIBA INU (Cryptocurrency)**" in partial fulfilment of the requirements for the award of the degree of Bachelor of Technology and submitted in the Department of Computer Science & Engineering of JAMIA HAMDARD UNIVERSITY, New Delhi (AFFILIATED TO AICTE) is an authentic record of our own work carried out during a period from March 2022 to May 2022 under the guidance of Mr. Piyush Kumar Gupta. The matter presented in the B.Tech Major Project Report has not been submitted by us for the award of any other degree of this or any other Institute.

**Ritwik Bahukhandi (2018-310-116)**

Phone : 011-2605 9588 (12 lines)

Fax : 00-91-11-26059663

Website :www.jamiahamdard.edu

*(Declared as Deemed-to-be University under Section 3 of*

*the UGC Act, 1956 vide Notification No. F.9-18/85-U.3*

*dated 10.05.1989 of the Government of India)*

**Accredited by NAAC in ‘A’ Category**

**CERTIFICATE**

On the basis of the declaration submitted by **Mr. Ritwik Bahukhandi (Enrolment No: 2018-310-116)** a student of **B. Tech (Computer Science & Engineering)**, I hereby certify that the dissertation entitled **“Descriptive and Predictive Analysis on Shiba-Inu (Cryptocurrency)”** being submitted to the Department of Computer Science & Engineering,  Jamia Hamdard, New Delhi is partial fulfillment of the requirement for the award of the degree of **B.Tech** (**Computer Science and Engineering)** is carried out by him under my supervision.

**MR. PIYUSH KUMAR GUPTA**

**(Assistant Professor)**

**Department of Computer Science & Engineering**

**DR. FARHEEN SIDDIQUI**

**Head of Department,**

**Computer Science & Engineering,**

**Jamia Hamdard University (SEST)**

# **TABLE OF CONTENTS**

**Topic Page no.**

Acknowledgement ……………………………….………………….…….II

Declaration…………………………………………………………................III

Certificate……………………………………………………….….…IV

Table of Contents………………………………………….……………..V – VI

List of Figures…………………………………………………………VII – VIII

Abstract……………………………………………………...………………..IX

Chapter-1. Introduction……………………………………………………1 – 6

Chapter-2. Literature Review…………………………………..…………7– 11

Chapter-3. Proposed Solution……………………………………..............12-28

3.1Problem Statement…………………………………...…………12

3.2 Methodology…………………………………………...………12

3.2.1 Dataset…………………………………………............12

3.2.2 Describing Dataset………………………...................13 – 14

3.2.3 Descriptive Analysis…………………………............15 – 18

3.2.4 Moving Averages…………………………………….19 – 22

3.2.5 Correlation Analysis…………………………………21 - 25

3.2.6 Seasonal Analysis……………………………………26

3.2.7 Predictive Analysis…………………………………..27-28

Chapter-4. Results………………………………………………………..29 – 30

4.1 Forecasting Graph…………………………………………….29

5.2 Evaluation…………………………………………………….30

Chapter-5 Observations…………………………………………………31

Chapter-6. Conclusion………………………………………………….32

Reference...………………………………………………….…………….33 - 34

**List of Figures**

|  |  |
| --- | --- |
| **S NO**. | **FIGURES** |
| 1.1 | Shiba Inu Logo |
| 1.2 | Compoment of Time Series |
| 1.3 | Applications of Time Series Analysis |
| 2.1 | Additive Seasonality |
| 2.2 | Multiplicative Seasonality |
| 3.1 | Workflow of the Project |
| 3.2. | .describe() (Python) |
| 3.3 | Volatility of Asset |
| 3.4 | Probability Distribution of Close and Volume |
| 3.5 | Line Graph (Close and Adj Close) |
| 3.6 | Augmented Dickey Fuller Test Result |
| 3.7 | Simple Moving Average (SMA 21) |
| 3.8 | Exponential Moving Average (EMA 21) |
| 3.9 | Cummulative Moving Average (CMA) |
| 3.10 | Pearson Correlation |
| 3.11 | Spearman Correlation |
| 3.12 | Kendall Correlation |
| 3.13 | Seasonal Decompose of Closing Price1 |
| 3.14 | Residual Plot (ARIMA Model) |
| 4.1 | Forecasting on Test Data (ARIMA Model) |

**ABSTRACT**

Cryptocurrency and Blockchain is one of the most trending technologies out there , Just like Stock Market which is actually Centralised , these Cryptocurrency market (Decentralised) has also gained popularity and plays an important role in Economy. This project is proposed to give insights and visualizations on how **Shiba-Inu** has performed in past and how will it going to perform in future by analysing it’s time series components .

**AIM**

This project aims to give **Historical (Descriptive)** and **Future (Predictive)** using Statistics , Time Series Analysis , computational models of machine learning models using Python. The extraction of insights from the Shiba-Inu dataset is done by Statistical Analysis Various algorithms like ARIMA , AUTO – ARIMA , EXPONENTIAL SMOOTHENING , AD FULLER TEST etc. is used to visualize the predictive and Descriptive insights

**Chapter-1**

**INTRODUCTION**

**1.1BLOCKCHAIN and CRYTOCURRENCY**

Blockchain is a revolutionary technology that allows people to record transactions on a digital, **decentralised,** distributed ledger, without any central authority. Some consider this technology as “the trust machine” and cryptocurrency is without doubt the most notable by-product of the blockchain revolution. Initial Coin Offering (ICO) is a new way to raise entrepreneurial finance, newly created cryptocurrencies are being sold to the public by startups in exchange of capital. This book chapter intends to clarify this phenomenon by explaining the concepts of blockchain technology, cryptocurrency and ICO, in order to provide valuable insights into this new trend of entrepreneurial finance.

A **cryptocurrency** is a digital or virtual currency that is secured by cryptography, which makes it nearly impossible to counterfeit or double-spend. Many cryptocurrencies are decentralized networks based on blockchain technology—a distributed ledger enforced by a disparate network of computers. A defining feature of cryptocurrencies is that they are generally not issued by any central authority, rendering them theoretically immune to government interference or manipulation.

A cryptocurrency is a form of digital asset based on a network that is distributed across a large number of computers. This decentralized structure allows them to exist outside the control of governments and central authorities.

Experts believe that blockchain and related technology will disrupt many industries, including finance and law.

The advantages of cryptocurrencies include cheaper and faster money transfers and decentralized systems that do not collapse at a single point of failure.

The disadvantages of cryptocurrencies include their price **volatility, high energy consumption for mining activities, and use in criminal activities**.

**SHIBA INU (MEME COIN)**

The Shiba Inu coin launched on August 1, 2020 and at the time was priced at less than $0.00000001. With 1 quadrillion tokens minted it remained at that level for some time, but more recently thanks to the increasing interest in Dogecoin, Shiba Inu has also come to life. Created by an anonymous developer going by the name Ryoshi, the Woofpaper for Shiba Inu says the project was begun from the simple question of:

“What would happen is a cryptocurrency project was 100% run by its community?”



Fig 1.1 SHIBA-INU (A meme Coin)

While there are certainly proponents of the Shiba Inu coin, there are just as many who call the coin a joke. Which might seem cruel or unjust, but as a direct competitor of Dogecoin, which was openly called a joke by its creator, it’s actually very accurate. And yet even as a joke it seems to have massive potential for gains as people have poured massive amounts of capital into the token, hoping for it to continue building on the more than 1 million percent gains already delivered. The Shiba Inu coin uses the ticker symbol SHIB and is an ERC-20 token that runs on the Ethereum blockchain. Interestingly, the creators of the Shiba Inu coin sent half the total coin supply to Ethereum’s founder Vitalik Buterin, while the other half was locked on Uniswap, with the key thrown away. Or so the Shiba Inu woofpaper claims.

**TIME SERIES ANALYSIS (SHIBA-INU)**

A time series analysis is a method of analysing a series of data points gathered over a period of time. Analysts use time series analysis to record data points at consistent intervals over a set period of time rather than intermittently or randomly. However, this type of analysis is more than just collecting data over time.

The ability to show how variables change over time distinguishes time series data from other types of data. In other words, time is an important variable because it shows how the data adjusts over time as well as the final results. It adds another source of information as well as a predetermined order of data dependencies.

Time series analysis normally necessitates a large number of data points to attain consistency and reliability. A large sample size ensures that your sample is representative, and your analysis can cut through noisy data. It also ensures that any trends or patterns detected are not outliers, and that seasonal fluctuation is taken into consideration. Forecasting, which is the process of projecting future data based on past data, may also be done with time series data.

**Why organizations use time series data analysis ?**

Time series analysis helps organizations understand the underlying causes of trends or systemic patterns over time. Using data visualizations, business users can see seasonal trends and dig deeper into why these trends occur. With modern analytics platforms, these visualizations can go far beyond line graphs.

Organizations can use time series analysis to find out what's causing trends or systemic patterns across time. Enterprise customers can use visualisations to identify seasonal trends and learn more about why they occur. These visuals can now go much beyond line graphs thanks to new analytics technologies.

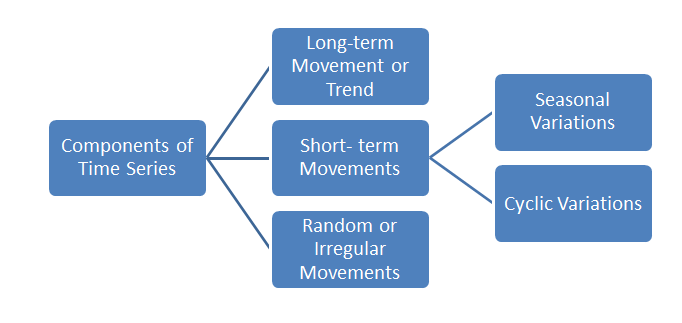


Fig 1.2 Component of Time Series Analysis

**Time Series Analysis Types**

Because time series analysis involves many different types of data, analysts must sometimes create complex models. Analysts, but at the other hand, cannot account for all variations, nor can they apply a single model to every sample. The lack of fit could be produced by models that are too complex or try to do too much. Because of a fit or overfitting, models are unable to discern between random error and true relationships, going to skew analysis and forecasts.

**Models of time series analysis include:**

* **Classification:** Categorize the Data
* **Descriptive analysis:** Time series analysis identifies patterns such as patterns, periods, and seasonal fluctuations. Patterns in time series data, such as trends, cycles, or seasonal variation, are discovered.
* **Exploratory analysis:**Showcase the main characteristics of the time series data, usually in a visual format in the form of graph
* **Forecasting:** It foresees data in the future. This classification is based on historical patterns. It forecasts events that could occur along upcoming plot points utilizing past data as a model.

### **Data classification**

Further, classfied into two types:

* **Stock time series data refers to a snapshot of information at a specific point in time.**
* **Flow time series data** includes determining the activities of the attributes over a duration of time, which is typically a part of an overall picture and responsible for a portion of the outcomes.

### **Data variations**

In time series data, variations can occur sporadically throughout the data:

* **Trend analysis** implies determining a constant movement in a specific direction. There are 2 kinds of trends: deterministic, wherein the underlying cause can be identified, and stochastic, in which the cause is unclear.
* **Seasonal variation occurrences that happen at specific and regular intervals over the course of a year Data points that are close in time tend to be connected, which is known as serial dependence.**

### *The sorts of data essential to resolving the business question must be defined in time series analysis and forecasting models. Analysts determine what types of analysis and techniques are best for such data they want to analyze when they've selected the relevant information*

### **Important Considerations for Time Series Analysis**

While time series is data collected over time, there are several forms of information that describe how and when that information was collected. Consider scenario:

* **Time series data** is data collected at fixed intervals of time.
* **Cross-sectional data** is made up of many different variables that have been recorded at the same time.
* **Pooled data** is a blend of cross-sectional and time series data.

**Applications of Time Series Analysis**



Fig 1.3 Applications of Time Series Analysis

There are many applications of Time Series Analysis, among which Crypto/Stock Analysis is one of them, which is used in this project to the Future forecast of a particular Cryptocurrency.

*I’ve used the Python library PANDAS, STATSMODEL, SCIKIT LEARN, PMD-ARIMA, PLOTLY. MATPLOTLIB Library in Python since it has built-in methods that implement different statistical and Data oriented methodologies*.

**NOTE : *Time Series Analysis of Shiba Inu can be done through various Mathematical and Statistical Analysis but there are many more things which can effect the prediction so we can’t directly say its 100% accurate to perform time series analysis on cryptocurrency***

**Chapter-2**

**LITERATURE REVIEW**

According to Trautman (2014), cryptocurrencies are a subset of digital currencies that may have either centralized institutions or are based on a decentralized network. In simple terms, cryptocurrencies are a new type of currency (Duque, 2020; Hudson & Urquhart, 2019) that is digital and produced from cryptographic algorithms, exchanged across the Internet using protocols such as peer-to-peer networking (Nakamoto, 2008). Another way to define cryptocurrencies is the fact that they are based on the use of complex cryptographic techniques to provide users with a secure and safe medium of exchange (Bulut, 2018). The creation of value (or money) and the triggering of transactions are governed by the mining process, which is a set of mathematical algorithms that are implemented within the underlying protocol (Adhami et al., 2018; Cennamo et al., 2020). Most cryptocurrencies are created to introduce new units of currency with a limited total amount (Baur et al., 2015). Unlike state-issued currencies, cryptocurrencies are not governed by established laws, but by technology (Dodd, 2018). Accordingly, this makes cryptocurrencies a new invention that is different from traditional currencies. In the field of finance, the advent of cryptocurrencies represents a new area that requires additional public and academic attention

In paper [1] In an open-ended analysis where there are many options and avenues for the investigator to explore, we have found a method that helps to keep a common thread throughout. Multiple iterations of creating a story that accurately portrays a metaphor for a bitcoin transaction involve a deep learning of the details by the investigator. We discovered new meanings and details in the process, perhaps more than our traditional research would have provided. We presented our exploratory analysis of bitcoin data to an audience of 8, many of who were unfamiliar with technical bitcoin terminology. We received positive feedback from the audience that our method of telling a story, and revisiting that story throughout the presentation of data helped the overall understanding of the new topics. We received great feedback, suggestions and additional questions about the technical aspects of the analysis. Without a control group its unclear whether we succeeded at improving communication of our analysis.

In paper [2] The stock market is very unpredictable, any geopolitical change can impact the share trend of stocks in the share market, recently we have seen how covid-19 has impacted the stock prices, which is why on financial data doing a  reliable trend analysis is very difficult. The most efficient way to solve this kind of issue is with the help of Machine learning and Deep learning. For time series forecasting, the ARIMA model is a well-known and frequently used statistical technique. This is one of the most commonly used models for predicting linear time series data. Since it was discovered to be dependable, efficient, and capable of predicting short-term share market changes, this model has been frequently used in banking and economics. Exponential smoothing and ARIMA models are the two most commonly used approaches to time series forecasting, and they are complementary approaches to the problem. ARIMA models attempt to describe the autocorrelation, whereas exponential smoothing techniques attempt to reflect the trend and seasonality in the data (autocorrelation is the degree of resemblance between a given time series and a lagged version of itself over subsequent time periods)..

In paper [3] The Author approach was

2. Dataset Quick Overview & Pre-Processing

3. Features generation

4. Distribution of Features

5. Correlation Analysis

6. Candle stick chart on Bitcoin historical data

7. Time series analysis and prediction using prophet

8. Regression analysis using pycaret

In Paper [4] , The author proposed the idea of unit root or AD-Fuller test A unit root test tests whether a time series is not stationary and consists of a unit root in time series analysis. The presence of a unit root in time series defines the null hypothesis, and the alternative hypothesis defines time series as stationary.

There are various tests which include unit root tests.

* Augmented Dickey-Fuller test.
* Phillips-perron test.
* KPSS test.
* ADF-GLS test
* Breusch-godfrey test.
* Ljung-Box test.
* Durbin-watson test.

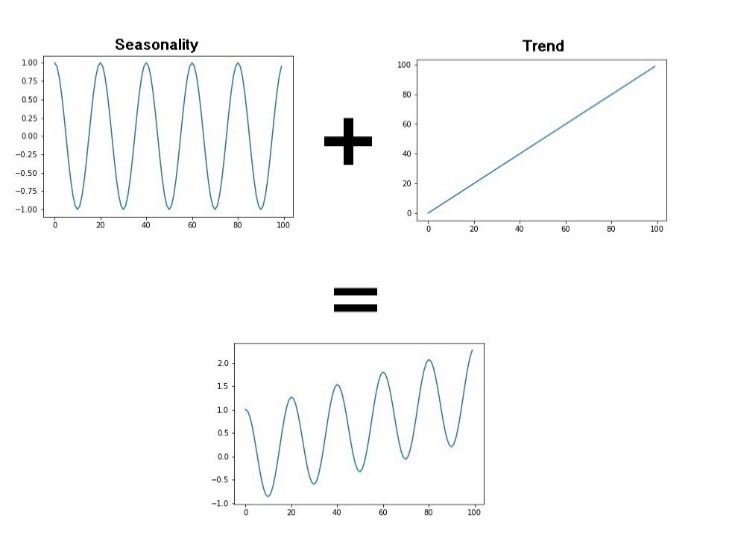
The augmented dickey- fuller test is an extension of the dickey-fuller test, which removes autocorrelation from the series and then tests similar to the procedure of the dickey-fuller test. The augmented dickey fuller test works on the statistic, which gives a negative number and rejection of the hypothesis depends on that negative number; the more negative magnitude of the number represents the confidence of presence of unit root at some level in the time series.



In Paper[5] In time-series data, seasonality refers to a pattern that occurs at periodic intervals. This is different from regular cyclic trends, such as stock price rise or fall, that take place but do not have a set period. Understanding seasonality trends in your data can provide a great deal of information, and you can even use it as a benchmark upon which to compare your time-series machine learning algorithm..

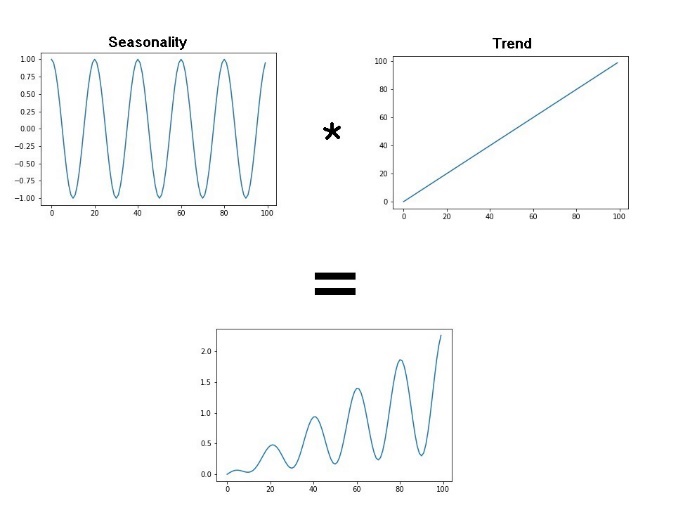
**Additive Seasonality**

Actual time series rarely have consistent crest and trough values; instead, we typically see some form of general trend throughout time, such as an increase or decrease. The median price in our sales price plot, for example, tends to rise over time. When the magnitude of our seasonally tends to remain the same, we have what is called as additive seasonality. An example of additive seasonality is below..



**Multiplicative Seasonality**

Multiplicative seasonality is another sort of seasonality that you could see in your time-series data. In this case, the intensity of our seasonality increases and decreases in response to the trend. The following is an illustration of multiplicative seasonality.



[5] Exponential smoothing (Brown, 1959; Holt, 1957; Winters, 1960) was suggested in the late 1950s and has influenced some of the most effective prediction approaches. Exponential smoothing forecasts are weighted averages of previous observations, with the weights decreasing exponential as the observations get older. In other words, the larger the related weight, more the recent the observation. This framework produces trustworthy forecasts fast and for a wide range of time series, which is a significant benefit for industrial applications.

**Chapter – 3**

**PROPOSED SOLUTION**

**3.1 PROBLEM STATEMENT**

To perform Time Series Analysis on Shiba Inu historical data to gain descriptive and Predictive insights on Closing Price of Shiba Inu using Statistical and Machine Learning Models

**3.2. METHODOLOGY**

**3.2.1 DATASET**

The dataset was taken from Yahoo Finance (https://finance.yahoo.com/quote/SHIB-INR/history/) It’s often considered to be the ﬁrst step towards analysis . The Data is decribed in a such way that it has record of more that 600 days of daily shiba inu price since August 2020.

**ATTRIBUTES:**

1. **Date**
2. **Open**
3. **High**
4. **Low**
5. **Close**
6. **Adjacent Close**
7. **Volume**

NOTE : The most important Attribute is Closing Price cause we have to predict the future values of the Closing Price.

**3.2.2 DESCRIBING THE DATA SET**

is a mandatory step when we are working with Time Series Data.  Changing the Data Types of Attribute for e.g. changing the Date attribute to Date Time Signature , Summarising the complete Data Set for further Descrictive analysis comes under this part

****

Fig. 3.1 Workflow of Project

**A) .info()**

The info() method prints information about the DataFrame. The information contains the number of columns, column labels, column data types, memory usage, range index, and the number of cells in each column (non-null values).

**B) .desctibe()**

The describe() method is used for calculating some statistical data like percentile, mean and std of the numerical values of the Series or DataFrame. It analyzes both numeric and object series and also the DataFrame column sets of mixed data types.

include: It is also an optional parameter that includes the list of the data types while describing the DataFrame. Its default value is None.

exclude: It is also an optional parameter that exclude the list of data types while describing DataFrame. Its default value is None.

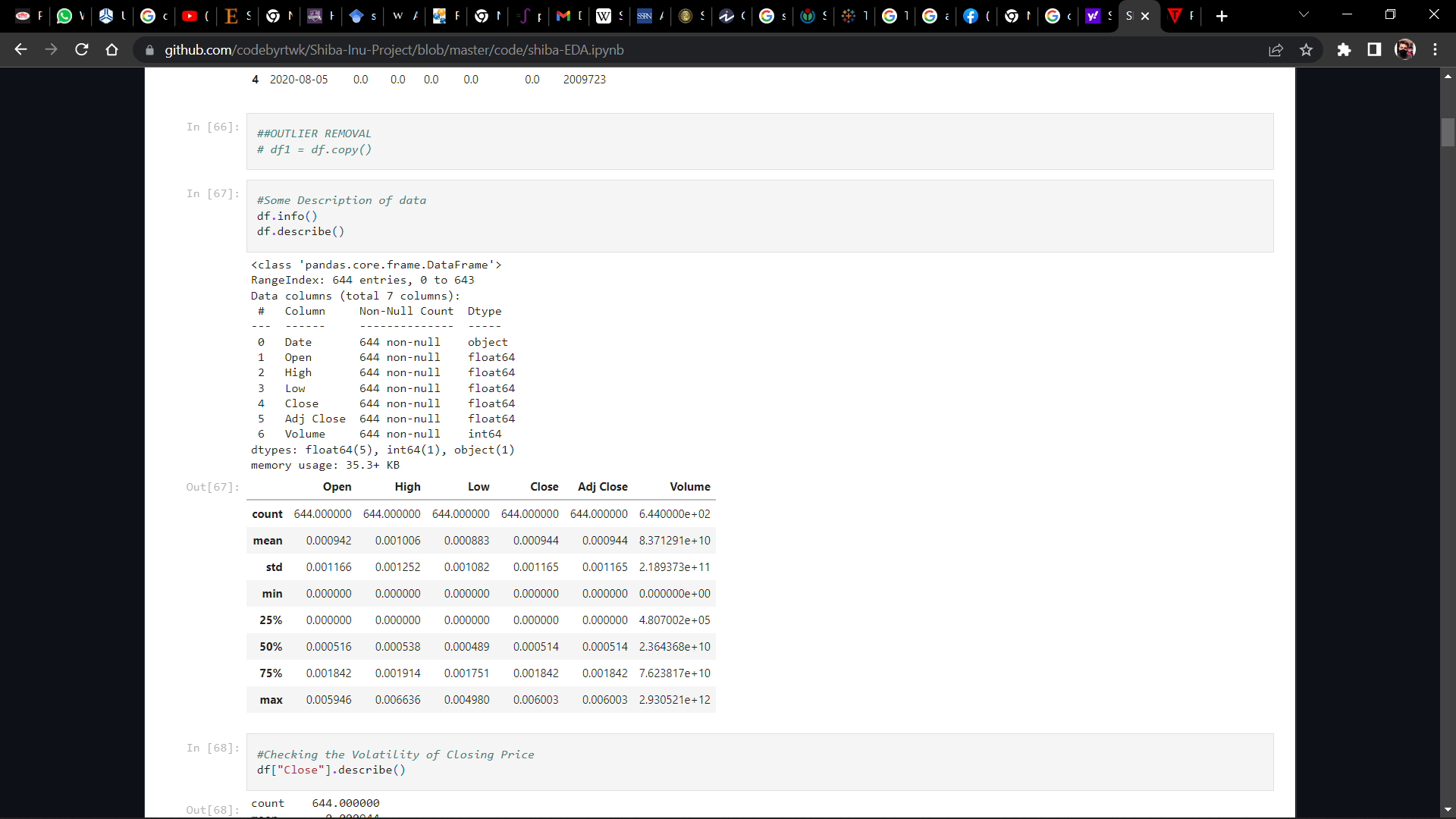


Fig. 3.2 .describe() (python3)

**C) Volatility of Closing Price (.describe())**

Volatility is a statistical measure of the dispersion of returns for a given security or market index. In most cases, the higher the volatility, the riskier the security. Volatility is often measured as either the standard deviation or variance between returns from that same security or market index.

In the securities markets, volatility is often associated with big swings in either direction. For example, when the stock market rises and falls more than one percent over a sustained period of time, it is called a "volatile" market. An asset's volatility is a key factor when pricing options contracts.

**After Analysis it turned out to be Quite a Volatile Asset but not much (Standard Deviation > 0)**

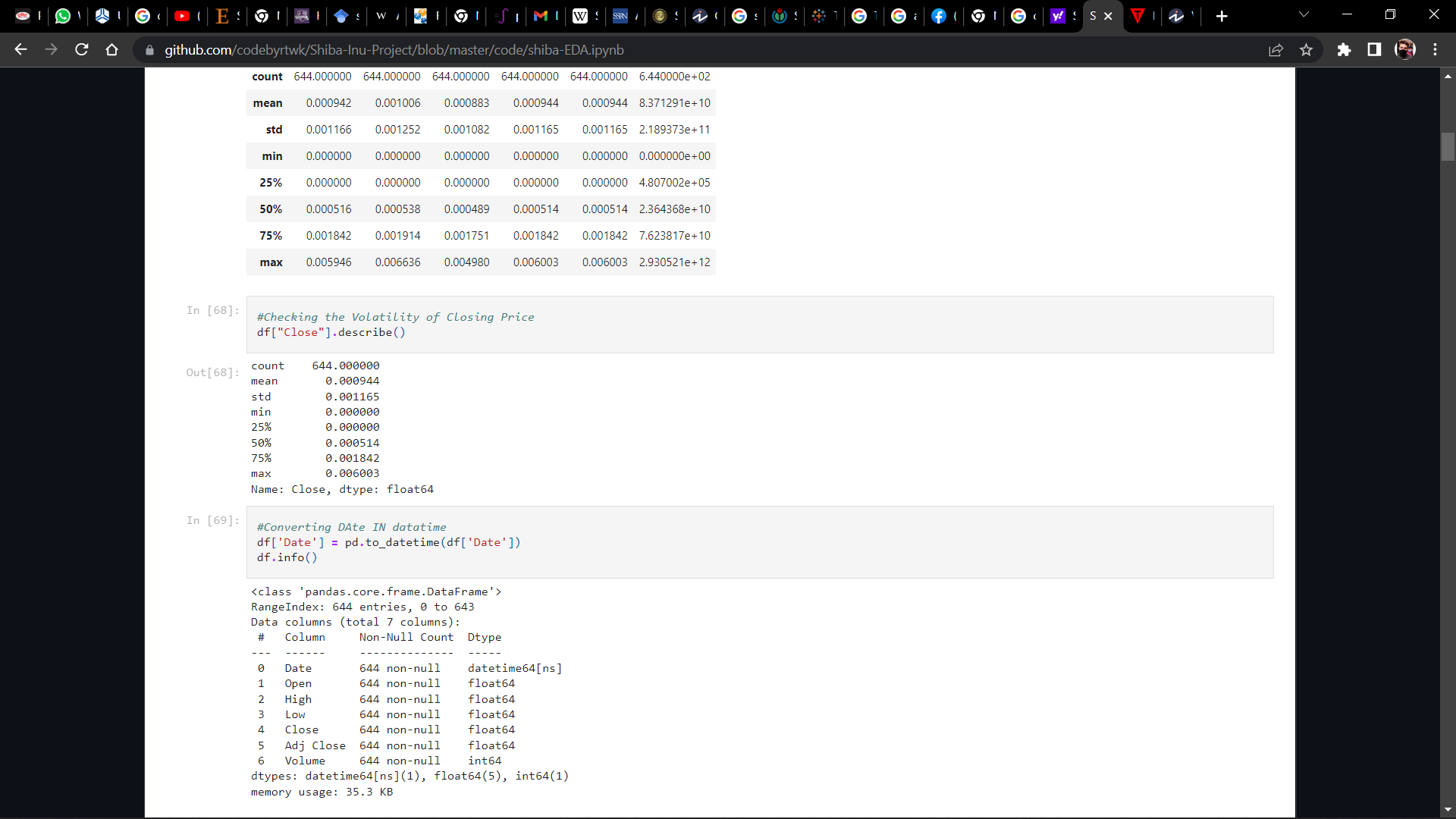
****

Fig. 3.3 Volatility

**3.2.3** **DESCRIPTIVE VISUALIZATION / ANALYSIS**

­­­­­it summarizes and organizes all of the collected data into something manageable and simple to understand. The descriptions can include the entire data set or just a part of the data set.

One of the most important things to know about descriptive data analysis is that it focuses on the data instead of on the implication that can be far reaching and go beyond the represented data.

This is the main difference between inferential statistics and descriptive statistics. Inferential statistics uses complicated calculations to make predictions while descriptive statistics does not.

High degree of objectivity and neutrality of the researchers are one of the main advantages of Descriptive Analysis. The reason why researchers need to be extra vigilant is because descriptive analysis shows different characteristics of the data extracted and if the data doesn’t match with the trends then it will lead to major dumping of data.

Descriptive analysis is considered to be more vast than other quantitative methods and provide a broader picture of an event or phenomenon. It can use any number of variables or even a single number of variables to conduct a descriptive research.

**A) Probability Distribution**

A probability distribution is a statistical function that describes all the possible values and likelihoods that a [random variable](https://www.investopedia.com/terms/r/random-variable.asp) can take within a given range. This range will be bounded between the minimum and maximum possible values, but precisely where the possible value is likely to be plotted on the probability distribution depends on a number of factors. These factors include the distribution's mean (average), [standard deviation](https://www.investopedia.com/terms/s/standarddeviation.asp)

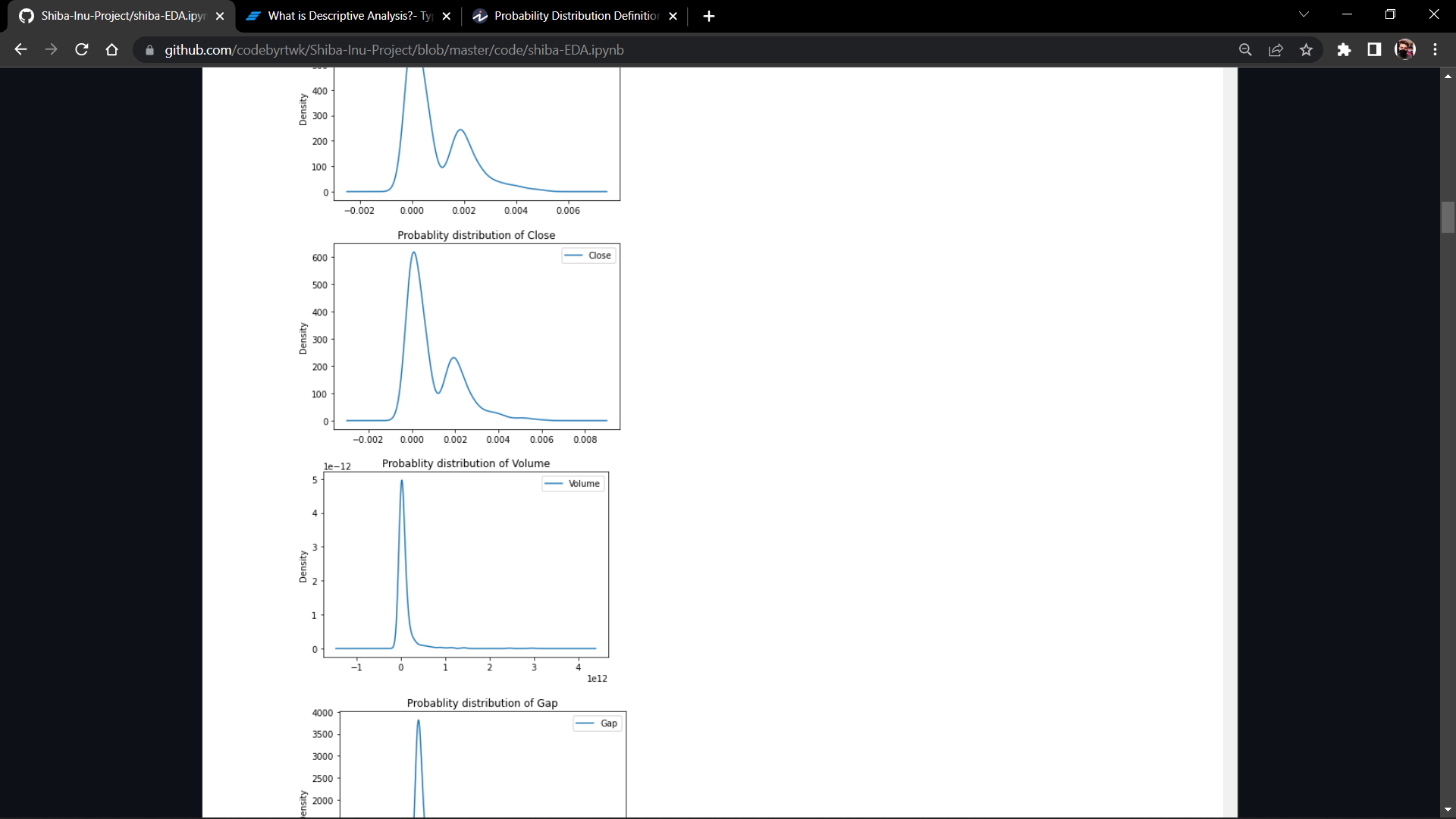


Fig. 3.4 Probability Distribution of Close and Volume

**B)** **Line Graph vs Time**

The closing price is the raw price or cash value of the last transacted price in a security before the market officially closes for normal trading. It is often the reference point used by investors to compare a stock's performance since the previous day—and closing prices are frequently used to construct line graphs depicting historical price changes over time.The adjusted closing price factors in anything that might affect the stock price after the market closes, such as dividends or splits. Most stocks and other financial instruments are traded after-hours, although in far smaller volumes. Therefore, the closing price of any security is often different from its after-hours trading price.

NOTE : LINE GRAPH IS USED .

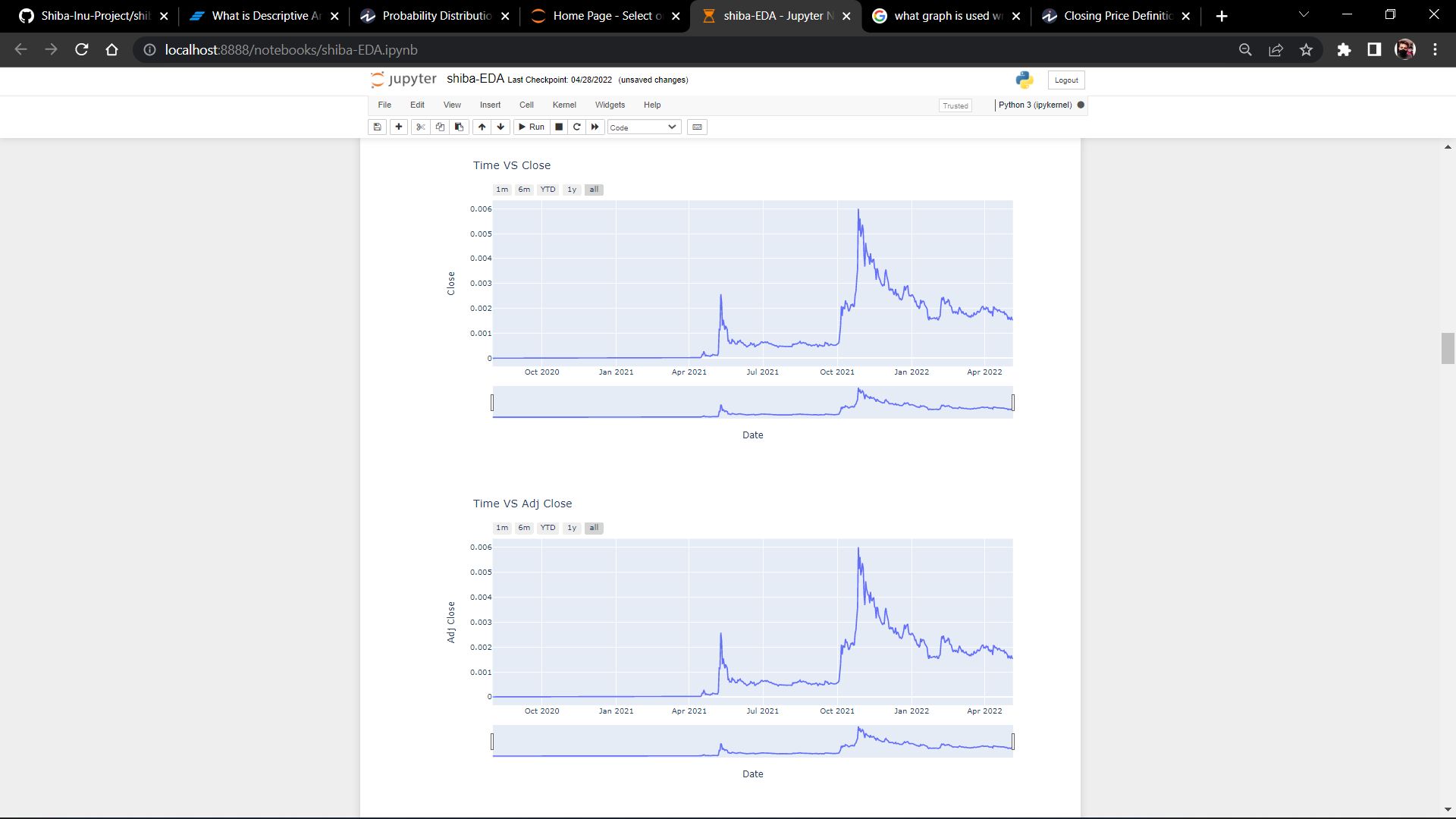


Fig. 3.5 Line Graph (Close and Adj Close)

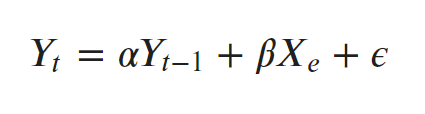
**C) Hypothesis Testing (AD-Fuller Test)**

The ADF Test (Augmented Dickey Fuller Test) is a typical statistical test used to determine whether or not a time series is stationary. When it comes to analysing the stability of a series, it is one of the most widely employed statistical tests.

Since testing the stationarity of a time series is a frequently performed activity in autoregressive models, the ADF test along with KPSS test is something that you need to be fluent in when performing time series analysis.

This approach is used in ARIMA

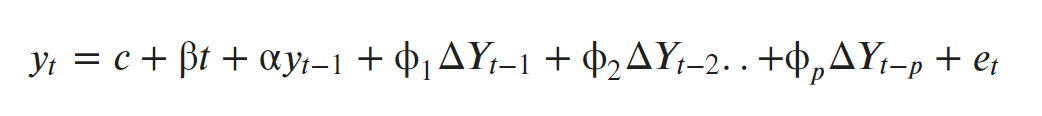
The ADF test relates to the 'Unit Root Test' group of tests, which is the proper method for evaluating a time series' stationarity. A time series' unit root is a feature that renders it non-stationary. A unit root is claimed to exist in a time series of the value of alpha = 1 in the equation below..



where, Yt is the value of the time series at time ‘t’ and Xe is an exogenous variable (a separate explanatory variable, which is also a time series).

As the name suggest, the ADF test is an ‘augmented’ version of the Dickey Fuller test.

The ADF test expands the Dickey-Fuller test equation to include high order regressive process in the model.



The p-value obtained should be less than the significance level (say 0.05) in order to reject the null hypothesis, because the null hypothesis assumes the presence of unit root, that really is, 1. As an outcome, the series is also said to be stationary.

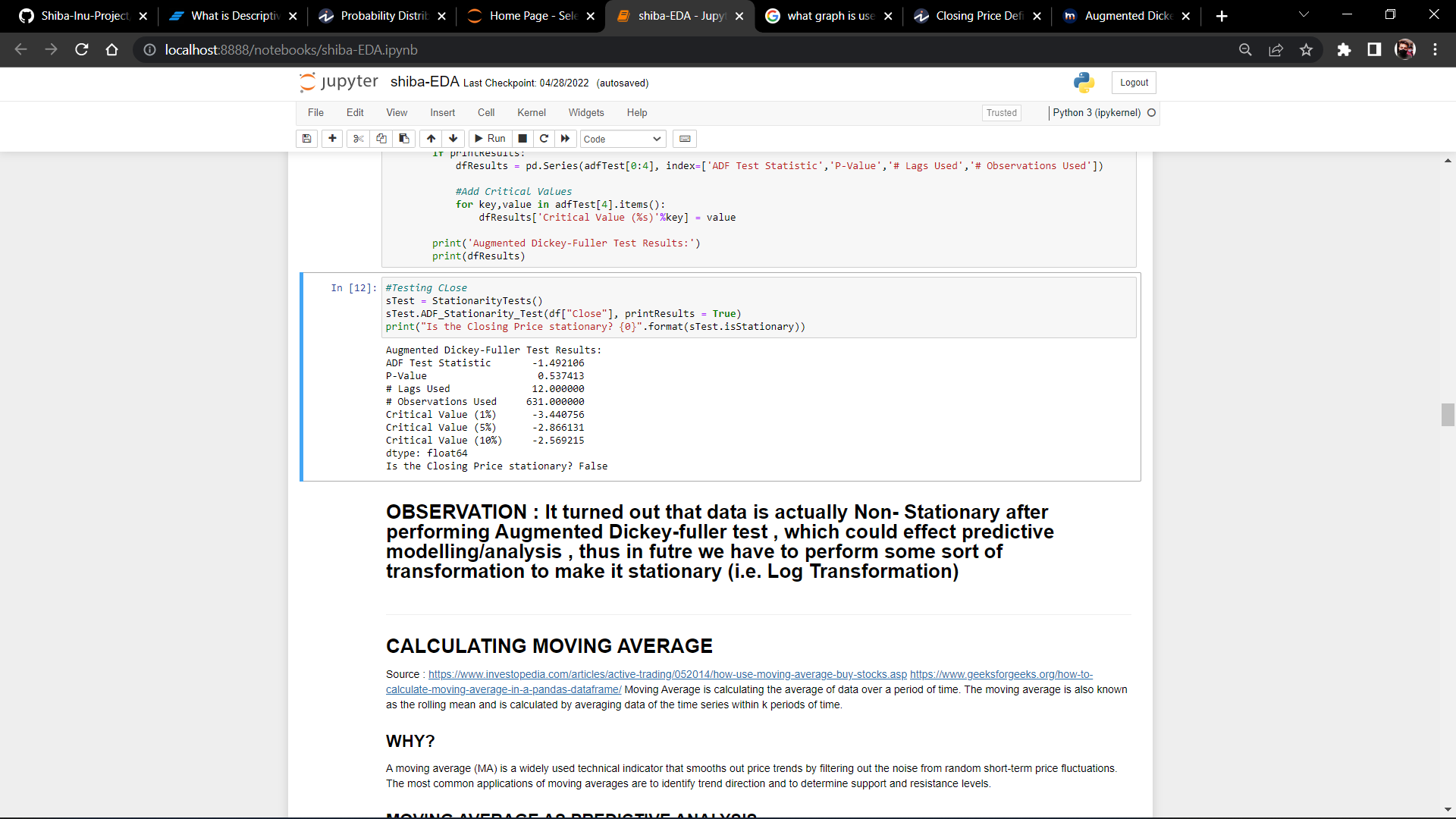


Fig. 3.6 Augmented Dickey Fuller Test Result (Close Price)

**3.2.4 MOVING AVERAGE (Trend Analysis)**

Moving Average is calculating the average of data over a period of time. The moving average is also known as the rolling mean and is calculated by averaging data of the time series within k periods of time

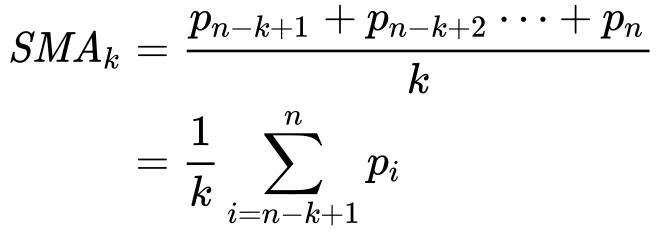
A moving average (MA) is a widely used technical indicator that smooths out price trends by filtering out the noise from random short-term price fluctuations. The most common applications of moving averages are to identify trend direction and to determine support and resistance levels

The concept of a moving average is straightforward. You generally apply a moving average to a series of observations taken over time. The average moves forward with the data series. So, the first moving average might include Days 1 through 3, the second moving average might include Days 2 through 4, and so on. This chapter discusses some of the reasons why you might want to make those calculations.

It is the first step towards the predictive/Inferential Analysis

**A) Simple Moving Average (SMA)**

A simple moving average tells us the unweighted mean of the previous K data points. The more the value of K the more smooth is the curve, but increasing K decreases accuracy. If the data points are p1, p2, . . . , pn then we calculate the simple moving average.



In Python, we can calculate the moving average using .rolling() method. This method provides rolling windows over the data, and we can use the mean function over these windows to calculate moving averages. The size of the window is passed as a parameter in the function .rolling(window)

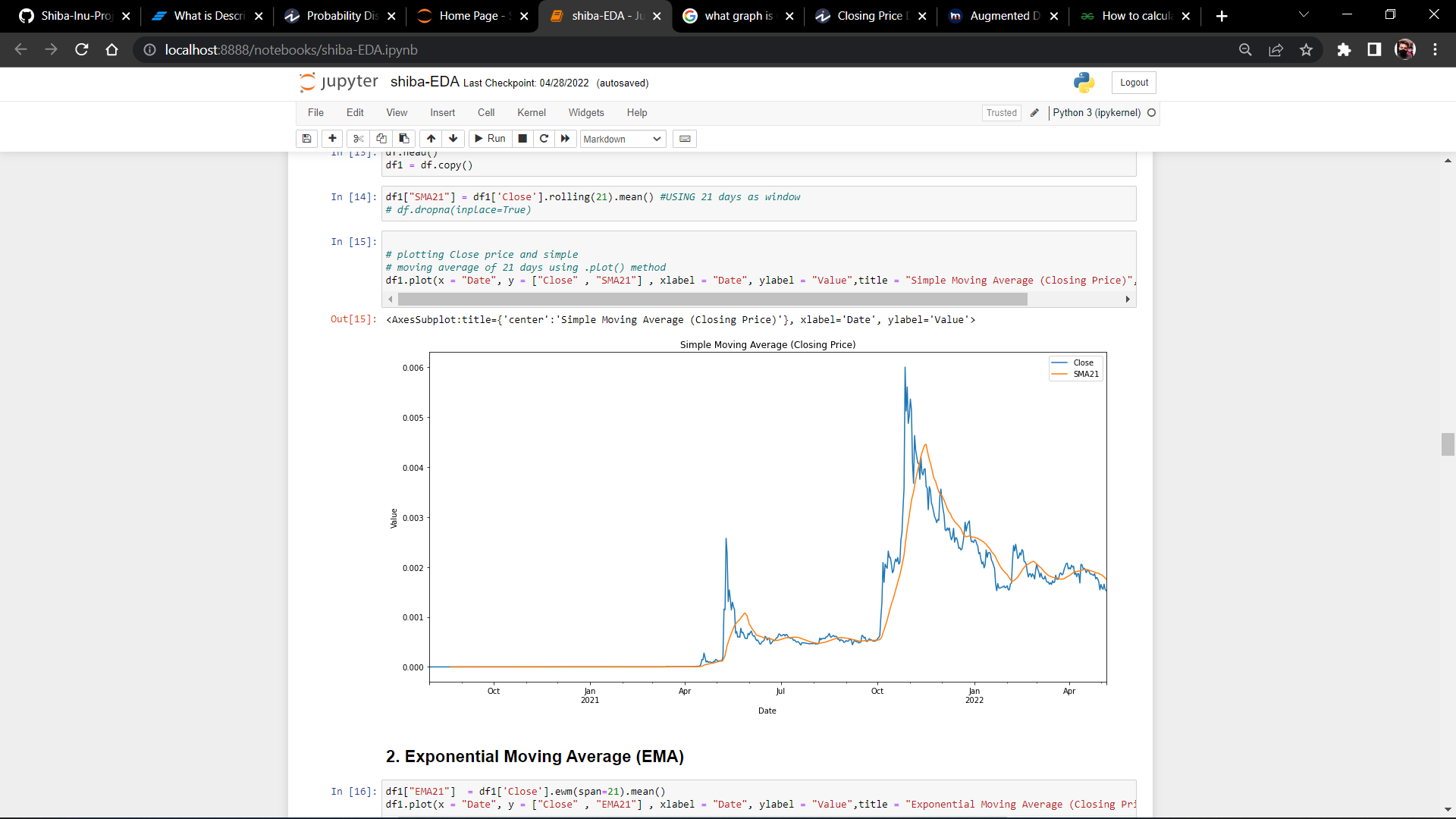
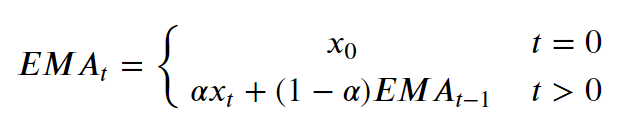


Fig. 3.7 Simple Moving Average ( SMA21)

**B) Exponential Moving Average (EMA)**

Exponential moving average (EMA) tells us the weighted mean of the previous K data points. EMA places a greater weight and significance on the most recent data points. The formula to calculate EMA at the time period t is:



where xt is the value of observation at time t & α is the smoothing factor. In Python, EMA is calculated using .ewm() method. We can pass span or window as a parameter to .ewm(span = ) method.

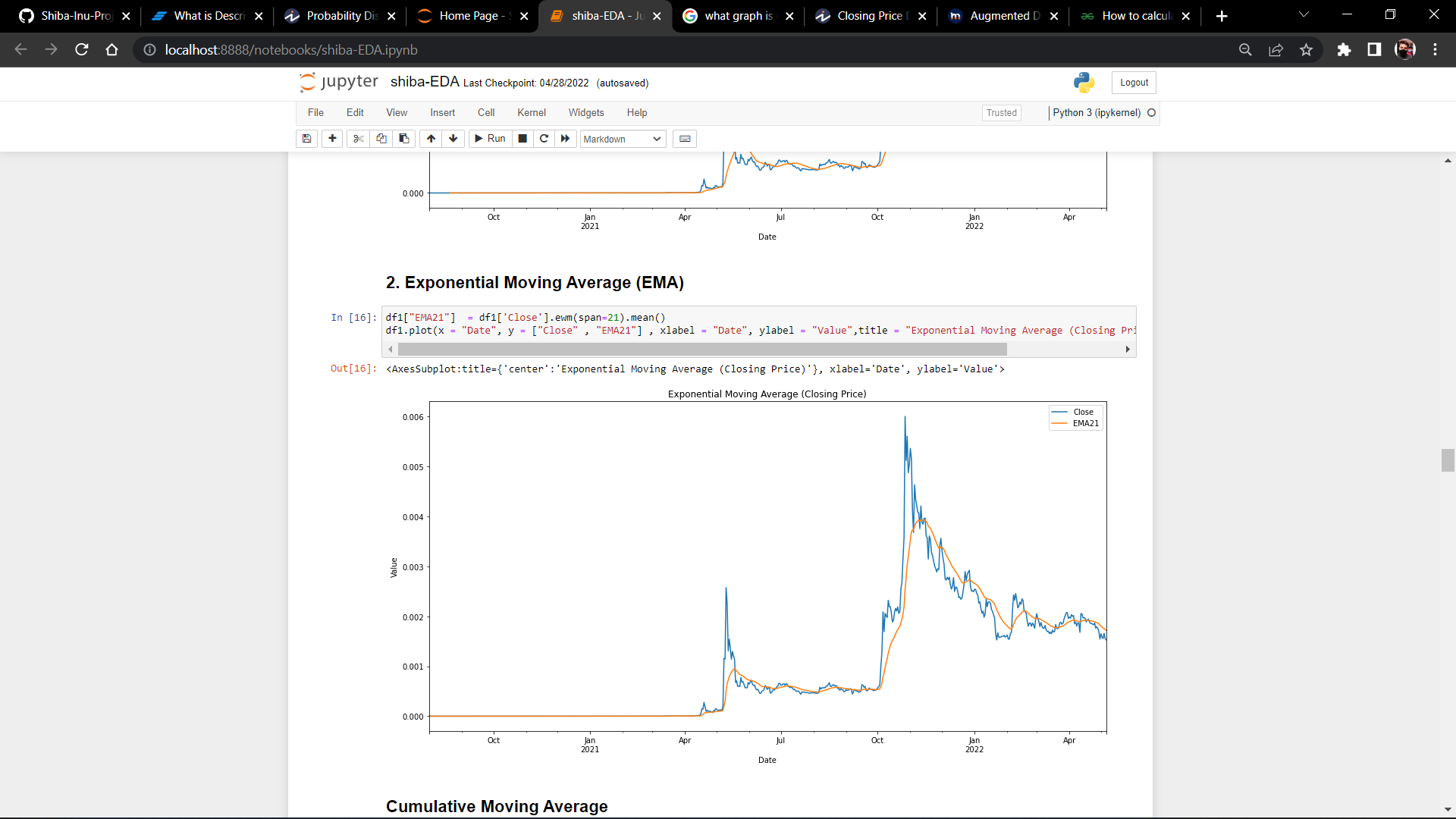
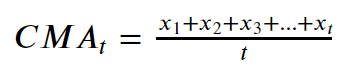


Fig 3.8 Exponential Moving Average (EMA21)

## C) Cummulative Moving Average

The Cumulative Moving Average is the mean of all the previous values up to the current value. CMA of dataPoints x1, x2 ….. at time t can be calculated as,



While calculating CMA we don’t have any fixed size of the window. The size of the window keeps on increasing as time passes. In Python, we can calculate CMA using .expanding() method.

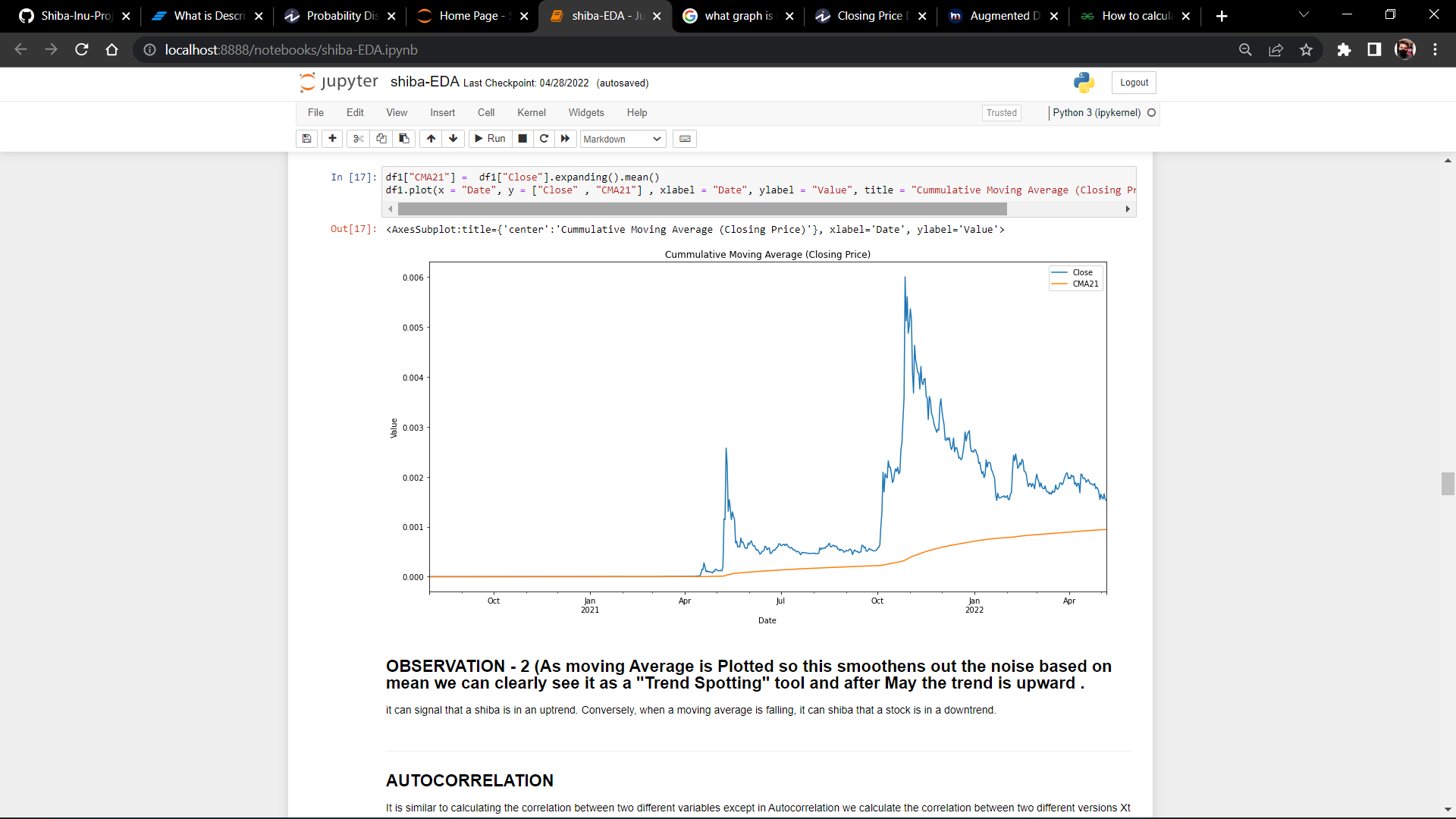
.

Fig. 3.9 Cummulative Moving Average (CMA)

**3.2.4 CORRELATION ANALYSIS**

In statistics, correlation or dependence is any statistical relationship, whether causal or not, between two random variables or bivariate data. In the broadest sense correlation is any statistical association, though it commonly refers to the degree to which a pair of variables are linearly related.

**The Correlation Coefficient**

One of the statistical concepts that is most related to this type of analysis is the correlation coefficient.The correlation coefficient is the unit of measurement used to calculate the intensity in the linear relationship between the variables involved in a correlation analysis, this is easily identifiable since it is represented with the symbol r and is usually a value without units which is located between 1 and -1.

**Advantages of correlation analysis**

In statistics, correlation refers to the fact that there is a link between various events. One of the tools to infer whether such a link exists is correlation analysis. Practical simplicity is undoubtedly one of its main advantages.

To perform reliable correlation analysis, it is essential to make in-depth observations of two variables, which gives us an advantage in obtaining results. Some of the most notorious benefits of correlation analysis are:

Awareness of the behavior between two variables: A correlation helps to identify the absence or presence of a relationship between two variables. It tends to be more relevant to everyday life.

A good starting point for research: It proves to be a good starting point when a researcher starts investigating relationships for the first time.

Uses for further studies: Researchers can identify the direction and strength of the relationship between two variables and later narrow the findings down in later studies.

Simple metrics: Research findings are simple to classify. The findings can range from -1.00 to 1.00.

1. **Pearson Correlation**

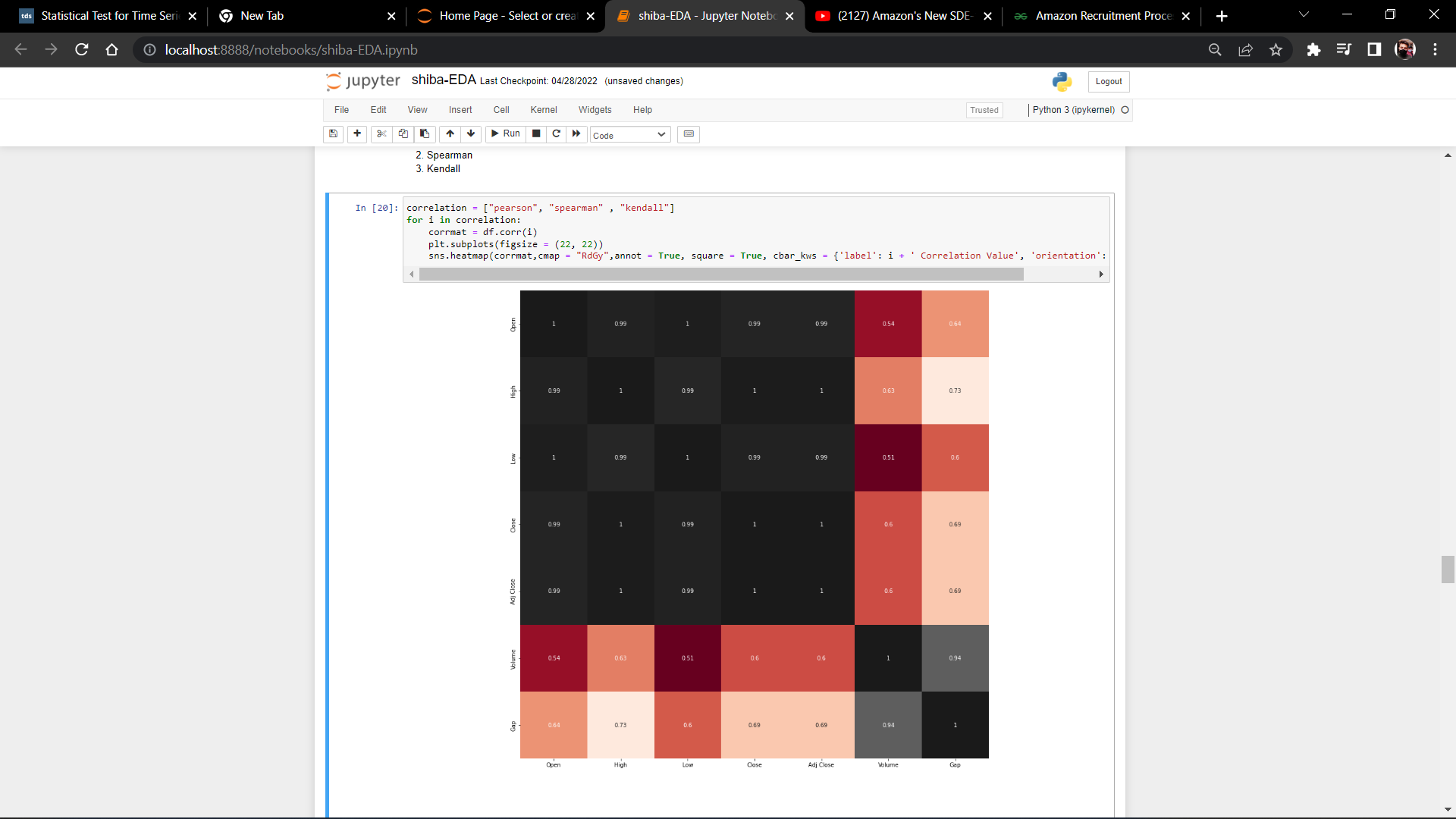


Fig. 3.10 Pearson Correlation

B**) Spearman Correlation**

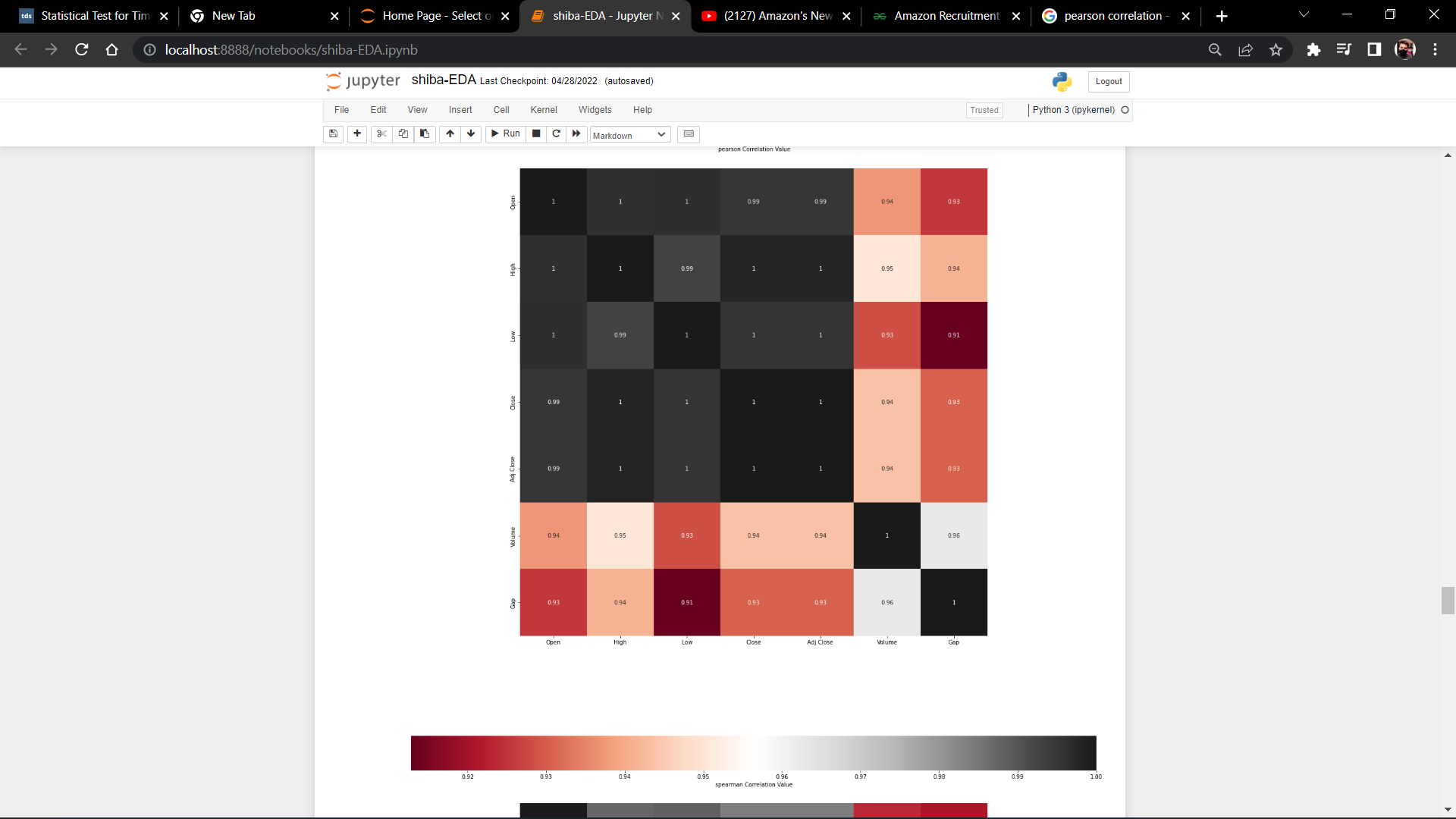


Fig. 3.11 Spearman Correlation

C**) Kendall Correlation**

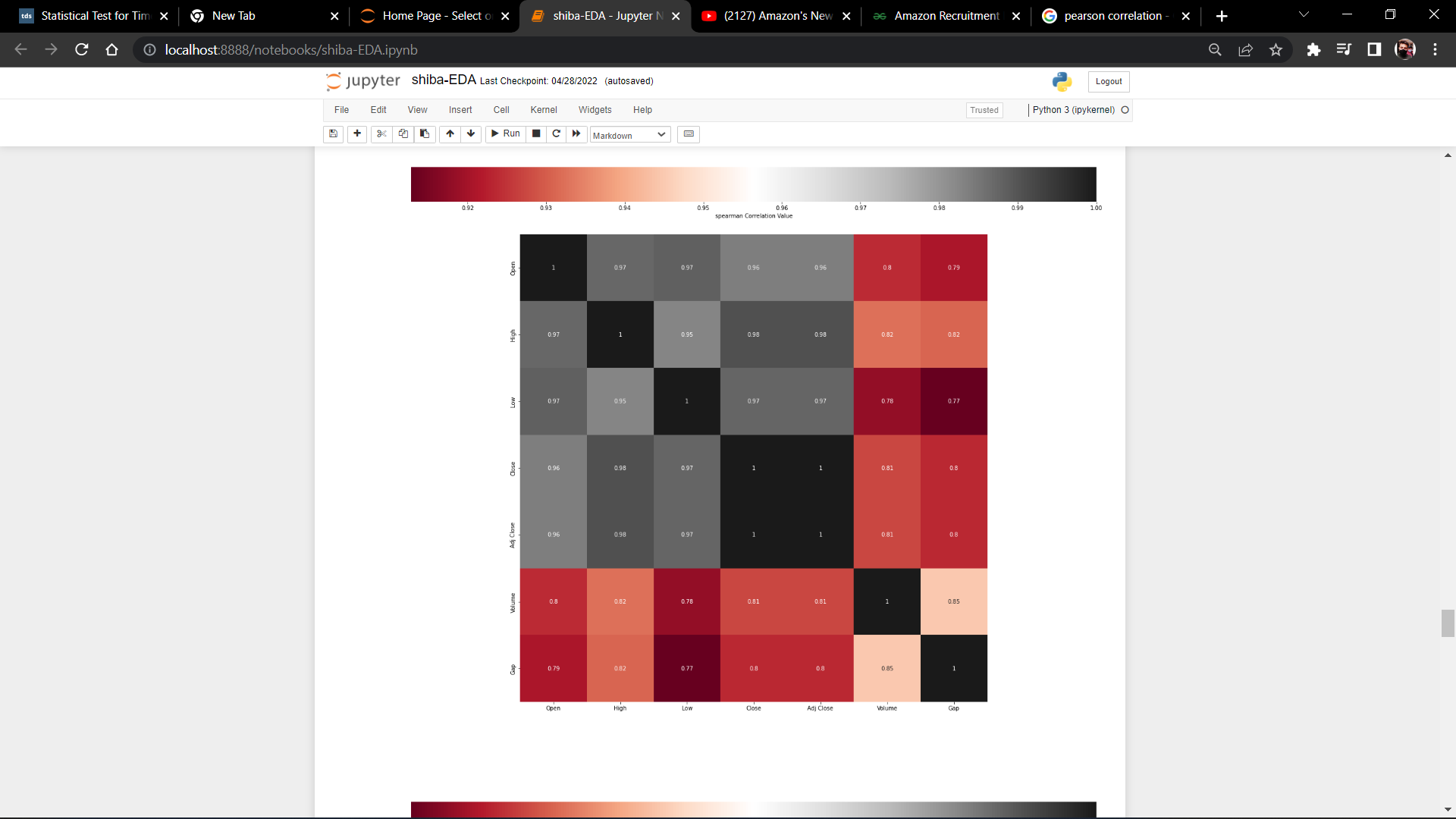


Fig. 3.12 Kendall Correlation

*We can see pearson and spearman are roughly the same, but kendall is very much different. That’s because Kendall is a test of strength of dependece (one could be written as a linear function of the other), whereas Pearson and Spearman are nearly equivalent in the way they correlate normally distributed data. All of these correlations are correct in their result, it’s just that Pearson/Spearman are looking at the data in one way, and Kendall in another.*

**3.2.5 Seasonal Analysis**

Time series decomposition involves thinking of a series as a combination of level, trend, seasonality, and noise components.

Decomposition provides a useful abstract model for thinking about time series generally and for better understanding problems during time series analysis and forecasting.

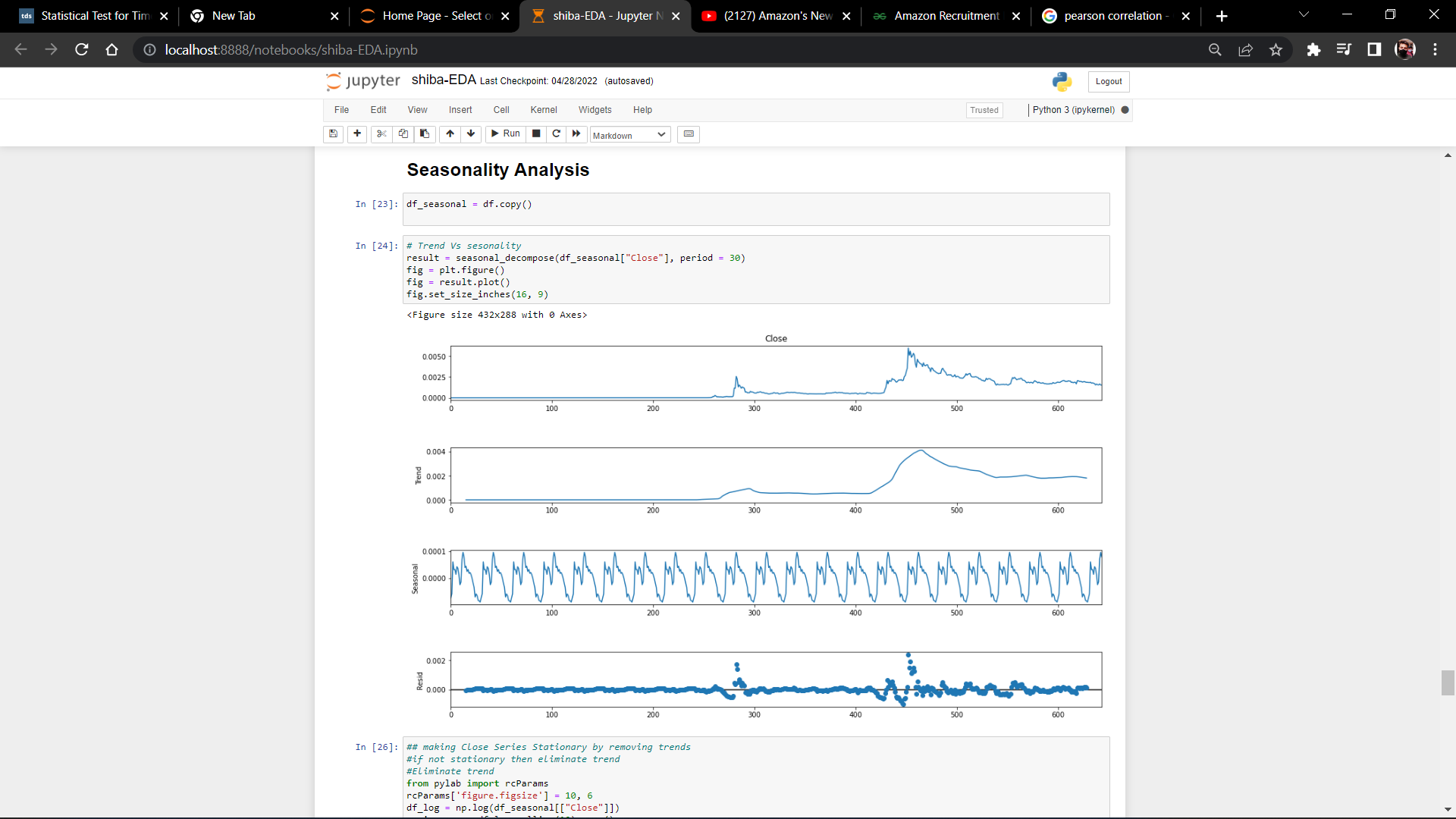


Fig 3.13 Seasonal Decompose of Closing Price

**3.2.5 Predictive Analysis**

Predictive Analysis/Modeling is a common statistical technique for predicting future behaviour . Predictive solutions are a form of data technology that analyses historical and current data to build a model which can be used to forecast future results.

**ARIMA MODEL**

An autoregressive integrated moving average(ARIMA), is a statistical analysis model/tool that uses [time series data](https://www.investopedia.com/terms/t/timeseries.asp) to either better understand the data set or to predict future trends.

A statistical model is autoregressive if it predicts future values based on past values. For example, an ARIMA model might seek to predict a crypto's future closing prices based on its past performance or forecast a company's earnings based on past periods.

An ARIMA model can be understood by outlining each of its components as follows:

* [***Autoregression (AR****)*](https://www.investopedia.com/terms/a/autoregressive.asp): is a model in which a changing variable regresses on its own lagged, or previous, value.
* ***Integrated (I):****denotes the separating of raw observations in order for the time series to become stationary (i.e., data values are replaced by the difference between the data values and the previous values).*
* [***Moving average (MA)***](https://www.investopedia.com/terms/m/movingaverage.asp): *a rolling average model applied to delayed observations that considers the reliance between an observation and a leftover error*. ARIMA treats each component as a parameter with a consistent nomenclature. ARIMA with p, d, and q is a standard protocol for ARIMA models, where integer values substitute the parameters to indicate the type of ARIMA model used. The parameters are as continues to follow:

Each component in ARIMA functions as a parameter with a standard notation. For ARIMA models, a standard notation would be ARIMA with p, d, and q, where integer values substitute for the parameters to indicate the type of ARIMA model used. The parameters can be defined as:

* p: the number of lag observations in the model; also known as the lag order.
* d: the number of times that the raw observations are differenced; also known as the degree of differencing.
* q: the size of the moving average window; also known as the order of the moving average.

**[Seasonality](https://www.investopedia.com/terms/s/seasonality.asp)**, or when data show regular and predictable patterns that repeat over a calendar year, could negatively affect the regression model. If a trend appears and stationarity is not evident, many of the computations throughout the process cannot be made with great efficacy.

****

**Residual Plot :**

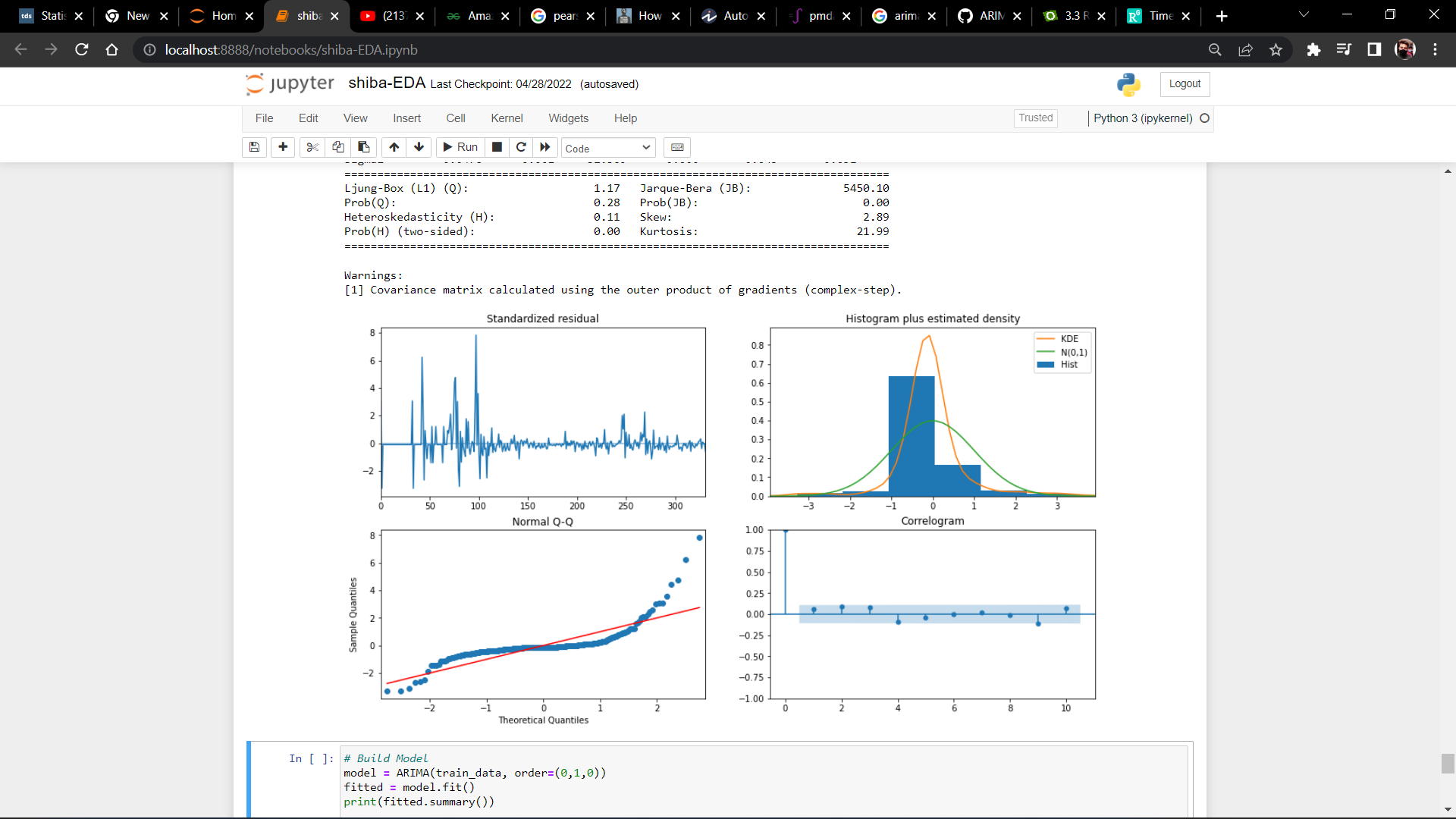


Fig 3.14 Residual Plot (Arima)

**Chapter – 4**

**RESULT**

After Performing bunch of predictive Analysis The Predictions are as follow (**ARIMA MODEL**)

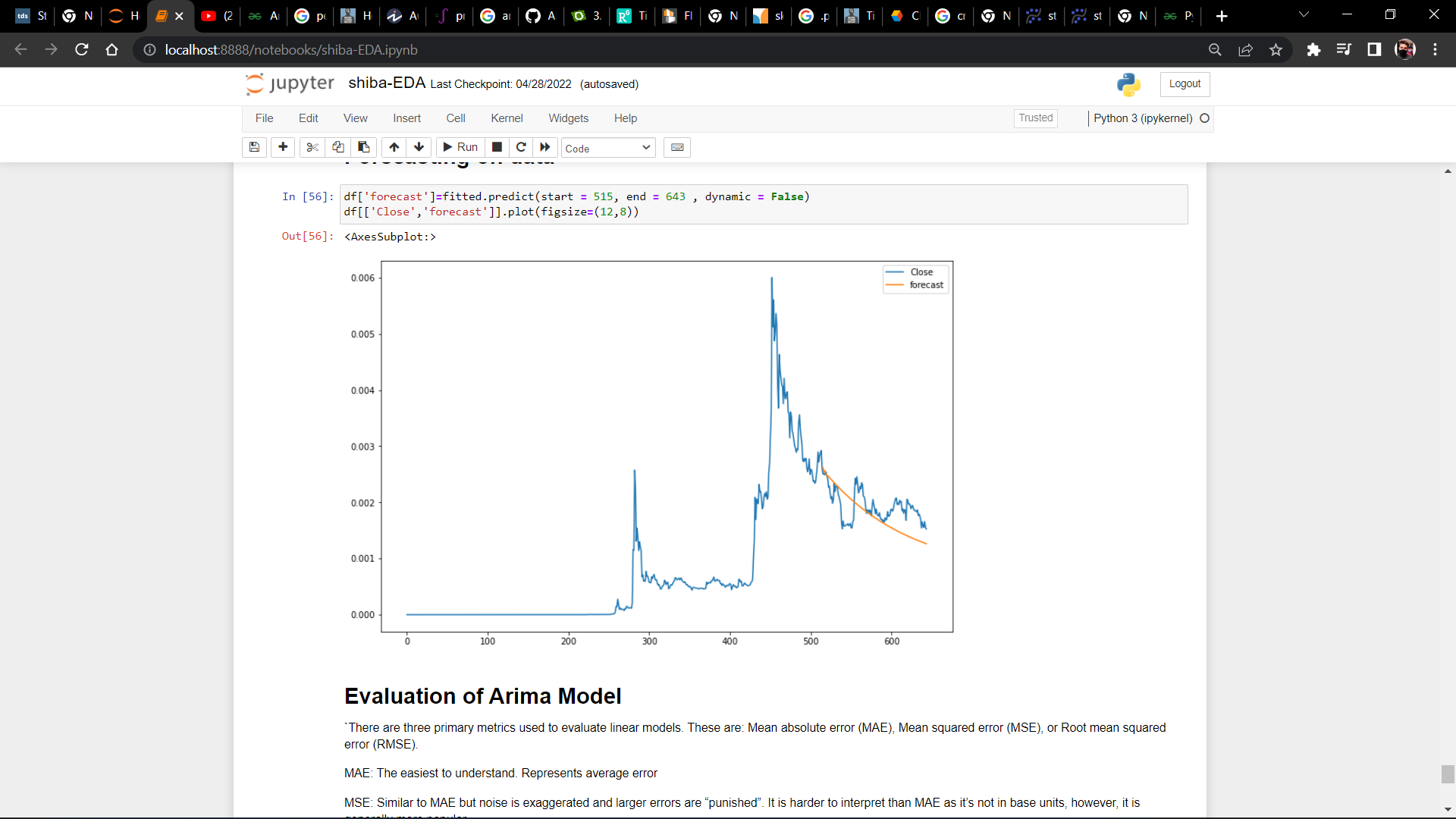


Fig 4.1 Forecast on Test Data (ARIMA)

***NOTE : The optimal p,d,q = (8,0,0)***

**MODEL EVALUATION**

## TABLE : COMPARISON BETWEEN MAE , MSE AND RMSE

|  |  |  |  |
| --- | --- | --- | --- |
| Model Used | MAE | MSE | RMSE |
| ARIMA | 0.000308 | 0.000000 | 0.000364 |

## With the ARIMA , I was able to minimize the Error and MSE has showed 0 (Zero)

**Chapter – 5**

**OBSERVATIONS**

**OBSERVATION1 - The historical trend of Shiba inu before April2021 is kind of constant and quite dead in case of growth , Since this series contain Lots of zero value it might affect the predictive analysis hence we have to perform some Preprocessing further**

**OBSERVATION 2 : It turned out that data is actually Non- Stationary after performing Augmented Dickey-fuller test , which could effect predictive modelling/analysis , thus in future we have to perform some sort of transformation to make it stationary (i.e. Log Transformation)**

**OBSERVATION - 3 (As moving Average is Plotted so this smoothens out the noise based on mean we can clearly see it as a "Trend Spotting" tool and after May the trend is upward .**

**OBSERVATION - 4 : Here, we can see that Durbin-Watson statistics are closer to 0 (0.05). Hence, there is some positive autocorrelation to the linear model of Closing Values**

**OBSERVATION - 5 - We can see pearson and spearman are roughly the same, but kendall is very much different. That’s because Kendall is a test of strength of dependece (one could be written as a linear function of the other), whereas Pearson and Spearman are nearly equivalent in the way they correlate normally distributed data. All of these correlations are correct in their result, it’s just that Pearson/Spearman are looking at the data in one way, and Kendall in another.**

**Chapter – 6**

**CONCLUSION**

In this report we evaluated the insights gained from the Shiba Inu Historical Data, we come to an understanding that how the it is mathematically and statistically possible to make sense out of Time Series Data. We came up with lots of Observations to justify whether it’s a good asset or not, In particular the ARIMA and Auto-Arima has given good results on test data. However, comparing these mathematical approach to more general approach we can conclude that Shiba Inu Is not just about getting good prediction using machine learning , It’s a quite Volatile market and investing is quite risky because there are many more technical factor that effects the price of Shiba Inu . Considering it as a meme-coin we can also conclude that the Community and Social Media has also effect this market .

**REFERENCES**

[1] Aslan & Sensoy, 2020; Baumöhl, 2019; Cerqueti et al., 2020; Corbet et al., 2019; Platanakis et al., 2018; Vidal-Tomás et al., 2019

[2] *Bitcoin prices : Eda and prediction (R2~0.99) | kaggle*. Bitcoin Analysis . (n.d.). Retrieved May 19, 2022, from https://www.kaggle.com/kaushiksuresh147/bitcoin-prices-eda-and-prediction-r2-0-99

[3] Sveneschlbeck. (2021, October 28). *Time Series visuals*. Kaggle., from https://www.kaggle.com/code/sveneschlbeck/time-series-visuals

[4] Hayes, S. (2021, June 8). *Finding seasonal trends in time-series data with python*. Medium., from https://towardsdatascience.com/finding-seasonal-trends-in-time-series-data-with-python-ce10c37aa861

[5] *Forecasting: Principles and practice (2nd ed)*. 2.8 Autocorrelation. (n.d.). Retrieved from https://otexts.com/fpp2/autocorrelation.html

[6] *How to calculate autocorrelation in python?* GeeksforGeeks. (2022, January 17). Retrieved from https://www.geeksforgeeks.org/how-to-calculate-autocorrelation-in-python/#:~:text=A%20plot%20of%20the%20autocorrelation,can%20be%20considered%20for%20modeling.

[7] *Augmented dickey-fuller test in python*. HackDeploy. from https://www.hackdeploy.com/augmented-dickey-fuller-test-in-python/

[8] Majumder, S. (2020, May 3). *Time series analysis - stationarity check using statistical test*. Medium. Retrieved from https://medium.com/analytics-vidhya/time-series-analysis-stationarity-check-using-statistical-test-f106e9045370#:~:text=them%2C%20if%20any.-,Augmented%20Dickey%20Fuller%20Test,in%20a%20time%20series%20sample.

[9] Portilla, J. M. (2018, June 10). *Using python and auto arima to forecast seasonal time series*. Medium. Retrieved from https://medium.com/@josemarcialportilla/using-python-and-auto-arima-to-forecast-seasonal-time-series

[10] Khalid, I. A. (2020, May 27). *Statistical test for time series*. Medium. Retrieved from https://towardsdatascience.com/statistical-test-for-time-series-a57d9155d09b

[11A. A. Bajaj, Aayush Bajaj, Aayush Bajaj, Aayush Bajaj, Aayush Bajaj, Aayush Bajaj, Aayush Bajaj, Aayush Bajaj, Aayush Bajaj, Aayush Bajaj, Aay You'll find a lot of conceptual blogs and framework-related lessons here, all of which are taught in the most graphical way possible. St, A. Bajaj, NatWest Group Data Scientist A data head who enjoys addressing data challenges in engineering and science. You'll find a lot of conceptual blogs and framework-related lessons here, all of which are taught in the most graphical way possible. If you want to fi, & on, F. me, stay tuned (2022, May 6). neptune.ai, Arima & Sarima: Real-world time series forecasting. http://neptune.ai/blog/arima-sarima-real-world-time-series-forecasting-guide/

[12] *Recurrent neural networks models¶*. Recurrent Neural Networks Models - darts documentation. (n.d.). Retrieved from <https://unit8co.github.io/darts/examples/04-RNN-examples.html>

[13] **Citation** I Djakaria and S E Saleh 2021 *J. Phys.: Conf. Ser.* **1882** 012033

[14] Vimal, M. R., & Naseem, S. M. B. (n.d.). *Time Series Analysis: Forecasting with SARIMAX model and stationarity concept*. JETIR. Retrieved from https://www.jetir.org/view?paper=JETIREJ06034

**PLAGIARISM REPORT**

