

Using the nonlinear regression to predict the prices of stocks and its impact on the investor decisions in the financial market

¹Emad kendorry, ²Nazar Abdul Kareem, ³Saleh Mahdi Humadi

ABSTRACT

Investing in stock is full of long risks which make it difficult to manage stock. Because of these the different choices, investors can afford losses that it maybe accumulate, then it causes bankruptcy. Investors use the different approaches to predict the future prices of stocks. The non-linear regression is vital method to do that. The non-linear regression depends upon the historical data of stocks to expect the prices of the next period. For purposes of this topic, the research divided this study into four sections. The first section included the methodology of research and some of previous studies, the second section targeted on the theoretical framework of the research, the third section show the application of research, while the fourth section was devoted to the foremost vital conclusions and recommendations reached by the researcher. The study concludes that the equation of the non-linear regression passed through the data point, in others words the non-linear regression equation is the best fit for the data of study sample.

Keyword: *nonlinear regression, predict, prices, investor decisions and financial market.*

JEL classification: **Financial Economics**

I. INTRODUCTION

The process of buying or selling shares within the stock market has relied on several factors.

Providing information emphasizes the strength of the company's position within the market. Because the value of the stock changes with the change within the time, time is another factor that will contribute to the success of the stock purchase process. So, the investor needs a mathematical methodology to predict the share price within the market and nonlinear regression is one of this technique. **This study aims to** predict the stock price within the coming

¹ Faculty of Administration and Economics, Mustansiriyah University, Iraq

² Faculty of Administration and Economics, Diyala University, Iraq

³ Faculty of Education for Humanities, Diyala University, Iraq

period by using the nonlinear regression, to determine the minimum and maximum of stock price within this period, try to determine an appropriate strategy to buy and sell of the stock within the coming period and how this predication can effect on investors decisions. **The main contribution** of this study is to predict the stock price of apple inc..by using the nonlinear regression that represents a type of multivariate analysis that produce an accurate approximations of these prices. It is considered one of the few studies that show a distinct strategy of how to buy or sell stocks in the financial markets. **This study has two hypotheses:**

H0: There is not a statistical indication of the possibility of using the nonlinear Regression as an efficient method of predicting stock value in stock markets.

H1: There is a statistical indication of the possibility of using the nonlinear Regression as an efficient method of predicting stock value in financial markets. **The study used** a nonlinear regression model that represents the relationship between a continuous response variable and one or more predictor variables in the form. **Study Sample** is the financial data of Apple Inc. closing prices of Apple Inc. were selected for the period from 10/01/2019 up to 07/08/2019.

II. LITERATURE REVIEW

Several theoretical studies have predicted the stock price. (Narayan, 2015) discuss the role of oil prices in predicting stock returns. This study takes into consideration the monthly time-series historical data that extent over 150 years. Three key findings are: firstly, the oil price help to predict the return of stock. Secondly, oil prices change whether or not the positive and negative, with negative changes comparatively of the pivotal predictors of the stock returns. Our results are strong for the use of various estimators and the selection of sample periods. (S.Chitradevi&K.Kuppusamy 2016) Companies estimate their economic growth through the value of stock. Industrialists analyze the current value of the product and predict the long term growth. There are many financial analysis methodology for predicting the future value of the stock. The Linear regressions one of the common models for forecasting this value, however, this model has the Limitation of the link of the nonlinear relationship among the variables. For overcoming this limitation, this paper applies to the nonlinear regression model for increasing the accuracy of the prediction. The results show that the prediction value better than the linear regression model.

(Salisu,2017) Examine the connection between oil prices and stock prices in oil exports and oil import countries. Firstly, the research examines “possible nonlinearities in the relationship” to measure the asymmetric reaction to positive and negative changes in oil prices of stock prices. Second, intragroup variations, the research aims to allow for nonuniformity effects within cross-sections by sub-editing the nonlinear “panel ARDL model”, which is a panel data representation of the “Shin et al. (2014) model”and is additionally similar to the non-

stationary heterogeneous panel data model. Third, the Joseph Campbell and Thompson (2008) test analyze relative predictability of the ARDL Panel (Mokni & Youssef2019) models in linear (symmetric) and nonlinear (asymmetric) versions. The results show that the stock prices of each oil export and import groups respond to changes in the oil price unevenly, although the effect within the latter is stronger than the previous ones.

(Cai&Gao, 2017) In this paper suggest an easy method to modeling nonlinear predictability of stock returns by using the Hermite Functions. This approach suggests that there exists a form of nonlinear predictability for the dividend yield. Moreover, the sample analysis results counsel the dividend yield has nonlinear predictive power for stock returns whereas the book-to-market ratio and earning-price ratio have very little predictive power.

(Chou & Nguyen,2018). The future prices of stock has been calculated by using the Time series forecasting. In making the decisions and trades, the investors can use this analysis. The efficacy of stock price predicts affecting the nonlinearity of the time series in a dynamic environment. The purpose of predicting the stock prices of Taiwan construction companies, this paper suggests uses metaheuristic optimization as an intelligent time series prediction system. This system may be a great interest to people who do not have adequate knowledge to invest in such companies. The system represents the application that has a function. Patterns are difficult to capture by traditional models, the proposed model is a predictive technique for highly nonlinear time series. Also, improves overall earnings for investment performance.(Moukalled &etal. 2019) Investors used stock price statistics and stock indices as well as news on stocks for the purpose of predicting market movement. Hence ostracized the importance of news on stock price movement. Either they called the published news (positive, negative and fair) on the market or they showed their effects on stock prices or historical shifts in prices and analyzed their movements for the future. This work incorporates market knowledge and stock prices in a single model in order to achieve greater precision in stock forecasts.We suggest developing an automated framework using math, machine learning and other external variables including news emotions for profitable trading. Specifically, the goal at the end of the day after the first hours of the day is to set a particular market price or path. In order to achieve this, we trained traditional algorithms for machine learning and created several profound learning models which take account of how important news is. Specific experiments were carried out using AAPL's SVM share with the highest precision (82.91%).(Yang &etal.2020) Highfrequency data have provided a vast number of information, perceptions and a detailed understanding of financial market behaviour. The problems in the search for high-frequency data are greater than the solved problems. After addressing such issues, the research interest of high frequency data would diminish significantly. Volatility is a crucial market risk factor, research. Research. For investors, government regulators and capital markets, forecasting highfrequency data volatility is critical. To that end, it is expected to predict simulations of strong fluctuations in "high-frequency data" volatility.a lot of material, expectations, and in-depth understanding of financial market behavior have provided by the High-frequency data. The problems encountered in the search for high-frequency data are greater than the problems solved. The research value of high-frequency data will be significantly reduced without solving these problems. Volatility is an important measure of market risk, research. Forecasting of high-frequency data volatility is important for investors, government regulators,

and capital markets. To this end, the modeling of the rapid fluctuations in high-frequency data, high-frequency data volatility is expected to be predictable

III. STOCK MARKET

Stocks are a share of the Company's capital that are individually or collectively owned (Ireland, 1999). Stocks also are defined as a sort of securities issued by governments or firms (Suto, 2003), based on a fixed rate of interest. Other definitions of shares are securities of equal nominal value that is utilized in trading, either directly or through financial markets.

IV. CONS OF FINANCIAL MARKETS

THEORETICAL ANALYSIS OF SPECULATION

It is necessary to distinguish between investments in firms directly and investment through the financial market, which is helpful to those firms and contributes to economic activity. Investment within the financial markets is the main incentive for investors because of the speculation. By speculating in financial markets, theoretically, each profit by speculating within the financial market should be offset by another party's loss. The financial market is not producing the wealth but the market is solely arena for the exchange of wealth. (Stäheli, 2013) The study of (Koziol & Treuter 2019) shows the effect of speculative trade in agricultural commodity markets on the main economic quantities. Here we study the relationship of the theoretical model to production shocks, as the farmer interacts with the retailer. The study is twofold. Firstly: We make it clear that the current forward price pays agricultural production decisions. Since speculators pre-trade affects the forward price, they indirectly influence production decisions. Secondly: Variables that determine whether speculative trading is beneficial or dangerous, such as the correlation between the speculator's portfolio and product gains.

LACK OF LIQUIDITY FOR THE "REAL" ECONOMY

The financial market contributes to the absence of cash from the economy (Mishkin, 2007). The injection of liquidity into the financial market in certain periods can moving off the market and rising prices. Also, it can encourage individuals to take a position of their savings, income, and capital to speculate within the financial market. As a result of that, we notice a slowdown in their economic activity throughout these periods.

MARKETS ARE DISCONNECTED FROM REALITY

British economist John Maynard Keynes said in his book *Theory of Operation, Interest, and money*, that the stock market is sort of Gamal game on the stock market, the customer should not focus on the company's most profitable shares (Miles & Scott, 2008), in other words, the shares of the company that everybody thinks are creating more profits. This gentle distinction leads to excessive use of advertising and media because the company does not need to be a winner. Rather, the majority of the players believe that it is a winner. This can increase shareholders' confidence in their shares. As a result of speculations and other cons within the market, investors are searching for mathematical methods to estimate the stock market worth to minimize the risk to gain a lot of profit. One of these strategies is to use nonlinear regression to predict the price of the stock within the coming period.

CAUSES OF CHANGE IN THE STOCK PRICES

Stock prices change every day by the economic process. This means, because of supply and demand, share prices is change. If people wish to buy a stock (demand) than sell it (supply), then the value of shares moves up. Conversely, if people needed to sell a stock than buy it, there would be a larger supply than demand, and therefore the price would fall. It is the rationale for choosing the news for an individual and the press (Yermack, 1997). The key idea is that the stock value shows what investors think about the value of a company because they do not compare the value of a company with the stock price. The value of an organization is its capitalization that is the stock price increased by the number of shares outstanding. The most vital issue that the value of an organization affects its earnings. Earnings are the profits that the organization makes it, and in the long run, no company will survive without making profits. They are not to keep in business. The analysts are focused on their profits in the future.

If the results of a company is shock (they are better than anticipated), the price will increase.

If the results of an enterprise are deceptive, price will decrease.

Previous factors play a significant role in determining the price of a stock and predicting its future market conditions, but it is certainly not enough. This leads many people wishing to invest in stocks to see the ratio of price-to-earnings growth. This ratio combines the historical growth ratios of the company with the dividends. This ratio is calculated by multiplying the price-earnings ratio by the rate of profit growth for each year. The low ratio will be the better it is to invest, especially concerning estimating future earnings.

Another factor in determining stock price is indicator of investment. It represents the value of the company that the investor will buy its shares. It can be calculated directly by multiplying the share price by the number of shares traded on the stock exchanges of this company.

It is also turning into increasingly difficult for traders to guess the price in the market because of the increase of “Algo trading”(Harris, 2013) (the use of computer algorithms), a technique that virtually eliminates any likelihood for mere mortals to make money trading on a short basis.

Because the price of a stock reflects individuals' predictions of how much the value of the company that issued the stock, it will be hard to know the price in the future, both short-run and long-term. Because human beings have different opinions concerning what something is value, so buyers and sellers are operating on their agenda. That makes predicting the prices extraordinarily hard, however not impossible with a group of given historical data to figure the prices moving in the stock market. As a result of all the above, the process of the prediction of the prices within the stock market is so hard for the reasons mentioned above. However, investors try to use many models and strategies to estimate the stock prices.

V. METHODS OF PRICES PREDICTION IN STOCK MARKET

There are many ways of predicting the future value of a company stock:

FUNDAMENTAL ANALYSIS

It seeks to define the real value of a stock, which can be compared to that of a stock which is listed on stock markets (Summers, 1986). To determine whether or not the stock is inflated on the market. Real worth of the same definition can be found in several ways. The idea is that all potential benefits that a company may bring are worth. Such projected earnings must be limited to their current value. The long-lasting policy and belief that human society requires

resources, in order to make change, are called fundamental analyzes. When an company is performing well, new resources will be compensated and stock values increase. The top-down analysis from the initial analysis of the global economy and the country analysis as well as the analysis of the sector and finally the analysis at corporate level are often referred to as the fundamental analytical concept. Various performance indicators, such as Warren Buffett, are established that will help a simple analyst determine the value of a stock, which is perhaps the most popular of all fundamental analysts.

TECHNICAL ANALYSIS

Technical analysts are looking at evaluating an stock's potential value based solely on past market movements (Edwards, Magee & Bassetti, 2018). Many patterns are used for guessing the price, such as the head and shoulders or cup and saucer. Technographics are used alongside the trends such as exponential moving average (Freeman an

d Tse), oscillators, resistance and support rates and momentum and demand volume indicators. Candlesticks are generally commonly used by technological experts, believes to have been first produced by Japanese rice merchants.

For short and then long-term approaches, technological analyzes are often common.

So it is more prevalent everywhere traders concentrate on short price fluctuations in commodities and Forex markets. Two fundamental assumptions used in this study is that the business was already listed on the stock, the second was that the price fluctuations in trends are usually the historic prices that are primarily attributed to the psychology of the market.

MACHINE LEARNING

Machine learning (ML) Systems are using to perform a particular task effectively depend on patterns without using specific instructions through the algorithms and statistical models.

(Alcalá-Fdez et al., 2009). It is seen as a set of artificial intelligence. these Machine learning algorithms create predictions or decisions without being explicitly programmed to perform the task by building a mathematical model which support the sample data, referred to as "training data",

Machine learning algorithms are used to build the algorithm of such instructions for carrying out a job in a wide variety of applications, including email filters or laptop vision. Machine learning is closely related to computer statistics that concentrate on computer-based predictions. The area of machine learning is the study of mathematical optimization, theory and implementation. Data processing could be a field of study in machine learning and concentrates on data analyzes that uncontrolled learning. Machine learning is also described as predictive analytics in its application in business issues. The most distinguished technique involves the use of: "artificial neural networks (ANNs) and Genetic Algorithms" (Alcalá-Fdez et al. 2009). So, recently many investors are looking for a suitable method to predict the price of stocks, one of them is the nonlinear regression.

NONLINEAR REGRESSION

Regression analysis could be a statistical tool to review the relationship between variables. These variables are the result variable and one or more exposure variables. In other words, regression analysis (multivariate analysis) is an equation that predicts a response from the value of a definite predictor. Linear regression may represent an approach to modeling the relationship between one or more independent variables in a dependent variable. A simple linear regression is the case of one explicative variable. The approach is called multiple linear regression for over one explanatory variable. The relationships are modeled in linear regression using the linear predictor functions, the unknown model parameters being estimated from the data. Linear regres

sion attempts by adjusting an equation to observe data to model the relationship between two variables. An equation of the linear regression line has the following form:

$$Y = b_0 + b_1X_1 + b_2X_2 + \dots + b_kX_k, \text{ where}$$

X is the explanatory variable.

Y is the dependent variable.

$b_0, b_1, b_2, \dots, b_k$ are parameter of regression.

Nonlinear regression can be a regression in which dependent or criterion parameters and one or more independent variables model non-linear. Also, nonlinear regression defines a form of multivariate analysis that observational data are modeled by a function which may be a nonlinear combination of the model parameters and rely on one or more independent variables (Motulsky & Brown, 2006). The observational data are fitted by a method of successive approximations.

In addition, nonlinear regression may be a multivariate analytical form in which data is model-fitting and then represented as a mathematical function. Simple linear regression refers to two variables (X and Y) with a line ($y = MX+b$), while a line (typically a curve) is to be generated as if each y value was a random variable. The goal of the model is to generate as little as possible the sum of the squares. The number of the quadrats can be a tracking tool. What are the various measurements of the mean of the data set? The difference between the mean and each data point

within the set is first determined, then It is estimated. Every differential is square, then.

Finally, together are added all the squared numbers. The smaller the number, the more the

function matches the data points in the set. Nonlinear regression uses different types of functions such as logarithmic, trigonometric, exponential, momentum, gaussian, and alternative modes of fitting, such that nonlinear equations take several forms.

The simplest way of checking the nonlinearity of an equation is to focus on the term "nonlinear."

It's not simple. If the equation for a linear equation does not meet the above conditions, it is not linear. Therefore, nonlinear regression provides the most flexible curves change features in several different ways. We focus on the following form in the paper.

“ $y = f(a + b/x + c \cdot \ln(x) + e)$, where”

“Y is an n by-1 represent the observations of the response variable”.

“X is an n-by-p design matrix determined by the predictors”.

“ β (a, b and c) is a p-by-1 vector of unknown parameters to be estimated”.

“f is any function of X and β (a, b and c)”.

“e is an n-by-1 vector of independent, identically distributed random disturbances”.

INVESTMENT DECISIONS

Investing in the stock market can be profitable and unprofitable, so an investor can earn a huge income or incur huge losses in these investments. Therefore, the investor should understand the different functions in the stock market. Moreover, he gets all the information and also different concepts of the stock market such as tables and charts in the stock market. The investor will be able to make a good income from the investments made in the stock market if you know all the stock market performance. So, the investor tries to gain knowledge if wants to make a mark in the stock market. The investor should be able to know the advantages and disadvantages of investing in the stock market. That is why the investment decision is important in the stock market. The investor can always get good profits if he can make the right decision. The investor may have to lose some money invested in the market but his confidence in the investment should remain. The investor should know the following:

MAKE GOOD RESEARCH

For people who want to get good profits from the stock market, the search is very important for them. The investor cannot get good profits from the market if he is not able to research and determine the right time to invest in the market. There is a big mistake that has a negative impact on investments many investors will find them very impatient, and they do not want to wait any longer to invest their money. The investor should only invest his money in those stocks that he is sure reaping great benefits from the market. However, the investor should conduct a good search of the market. And get some tips on how to make profits in the stock market.

The results indicate that investors in Malaysia decide that their investment decisions are based on a sense of comfort or tradition rather than quantitative analysis. The views of third parties are not important in making investment decisions, but rather they depend a lot on their findings. They are influenced by psychological biases. These investors believe that making investment decisions and solving challenges is better through their experience. Investing decisions

can be promoted through a correct understanding of the country's financial and economic conditions. (Jaiyeoba & Haron 2016).

KNOW THE PAST PERFORMANCES OF THE COMPANIES

The investor tries to know the past performance of different stocks and can have a good look at them. But he will not be able to get an accurate idea of whether the particular stock would make good profits. Stock market forecasting is very difficult and shares showing good performance today may not be the same tomorrow. As an investor, you can visit different websites where you can get some useful tips. These tips help the investor get good profits from the market. Experts try to predict the market with the help of technical and basic analysis, but they cannot always predict the market correctly. The process of forecast stock market is very complex and needs to be informed of mathematical models, such as the non-linear regression.(Mahina &etal.2018) Demonstrate that this study's main aim is to demonstrate the impact of self-bias on Rwandan stock exchange investment. In the analysis, the effect of behavioral biases on

investment at the Ruanda Exchange was verified using a questionnaire. The survey contains 374 investors on the Stock markets in Rwanda. The linear regression model is used to estimate

the likelihood for dependent variables with various probabilities results.The findings showed that the relationship between self-bias and participation in the stock market was strongly positive. The report concluded that most investors have self-determination when they invest in capital markets.

In order to rationality in stock trading, the study advises investors should be keen to recognise such biases.

INVESTMENTS WOULD BE THE BEST

The investor needs to determine the type of investment that is best for him, whether the choice is from short or long term investments according to his requirements. Daily trading you can also choose if you are looking to get short-term investments. But in this case, you should have a good study of this type of trading. The investor is taking precise steps that make a profit and avoid you loss because every step you take in the market is very important.

THE PRACTICAL STUDY IN AMERICAN STOCK EXCHANGE (APPLE INC. AS SAMPLE)

'AAPL' is the stock symbol under which Inc. Trades on the NASDAQ stock exchange.

NASDAQ is the world's second biggest trade by capitalization and only the exchange in New York is situated in the same area.At first NASDAQ was a type for the National Association of Automated Quotes for Securities Dealers. The National Securities Dealers Association (NASD) endorsed it in 1971.The NASDAQ stock exchange is o

owned and run under its own securities exchange, NASDAQ, Inc., which was listed on its own stock on 2 July 2002. The NASDAQ began trading under the ticker symbol on February 8, 1971. It was the first stock electronic exchange in the world. Over the years, the NASDAQ stock exchange became more of a stock market by adding trade and volume reporting and automatic systems.

In 1992, the NASDAQ stock exchange agreed to join with the London stock exchange to begin making the first intercontinental connection of securities markets.

The American stock market (AMEX) was once the third-largest stock market within the United States, as measured by trading volume. The exchange, at its height, handled about 100% of all securities traded within the U.S. Today, the American Stock Exchange is known as the New York Stock Exchange American. In 2008, the New York Stock Exchange Euronext acquired the American Stock Exchange. Within the subsequent years, it also became called New York Stock Exchange AMEX Equities and New York Stock Exchange MKT. Apple Inc. is an international corporation that registered its shares with the American stock market and creates many consumer electronics, personal computers, servers, and computer package, and maybe a digital distributor of media content. Also, the corporate has a chain of retail stores. Apple's core product lines are the iPhone smartphone, iPad computer, portable media players.

Founders Steve Jobs and Steve Wozniaks founded Apple Computer on Apr. 1, 1976 [1] and incorporated the Company in Cupertino, California on January 3, 1977 (Finkle and Mallin, 2010).

For more than 3 decades Apple Inc. has mostly faced turbulent sales and weak market shares in the 1990s as well as in the Apple II, Macintosh and Mac lines. Jobs that were expelled from the company in 1985 returned to Apple in 1996 after Apple purchased its business NeXT.

The following year Jobs became the interim management officer of the company, which became permanent afterwards. Jobs then implemented a new market model, beginning with the original iMac in 1998, with recognisable product and clear design.

After the introduction many of the successful products from 2001 to 2015.

As a result, Apple was by capitalisation the world's largest publicly traded firm.

The AN estimated value as at 2 August 2018 is \$1 trillion. In 2010 Apple's inc. annual sales totaled 65 trillion on dollars, rising to 127.8 trillion dollars in 2011 and 156 billion dollars in 2012.

The official launch of Apple was 12 December 1980 and we got \$22 per share from the initial public. On 15 June 1987, 21 June 2000 and 28 February 2005 the stock split by two for one three entirely different times. Since June 1987 to December 1995, Apple Inc. paid dividends.

On 19 March 2012, Apple reported a new start on its dividend of \$2.65 per quarter (starting in the quarter from July 2012) from its acquisition of 10 billion shares at the beginning of its fiscal year 2013, which will start on 30 September 2012. The most analysts who watch Apple stocks are

Gene Munster and Michael Olson from Piper Jaffray. Piper Jaffray regularly forecasts and does so for several years, Apple's potential production and sales.

NONLINEAR REGRESSION ANALYSIS

This section explains the application of a nonlinear regression test through an apple Inc. Suppose that in the sample dataset there is an independent variable prices, and variable y is dependent Variable time.

The equation of the nonlinear function is

“ $y = f(a + b/x + c \cdot \ln(x)) + e$,” where

“X is an n-by-1 vector of observations of the response variable”.

“Y is an n-by-p design matrix determined by the predictors”.

“ β (a, b and c) is a p-by-1 vector of unknown parameters to be estimated”.

“F is any function of X and β (a, b and c)”.

“e is an n-by-1 vector of independent, identically distributed random disturbances”.

Here in this equation, the independent variable is x. The letters a, b, c, are coefficients—their presence in the equation modifies the shape and location of the parabola.

Let's start with the following figure that showing the stock price of Inc. for the period from (10/01/2019) to (08/07/2019). (As in the Supplementary information)

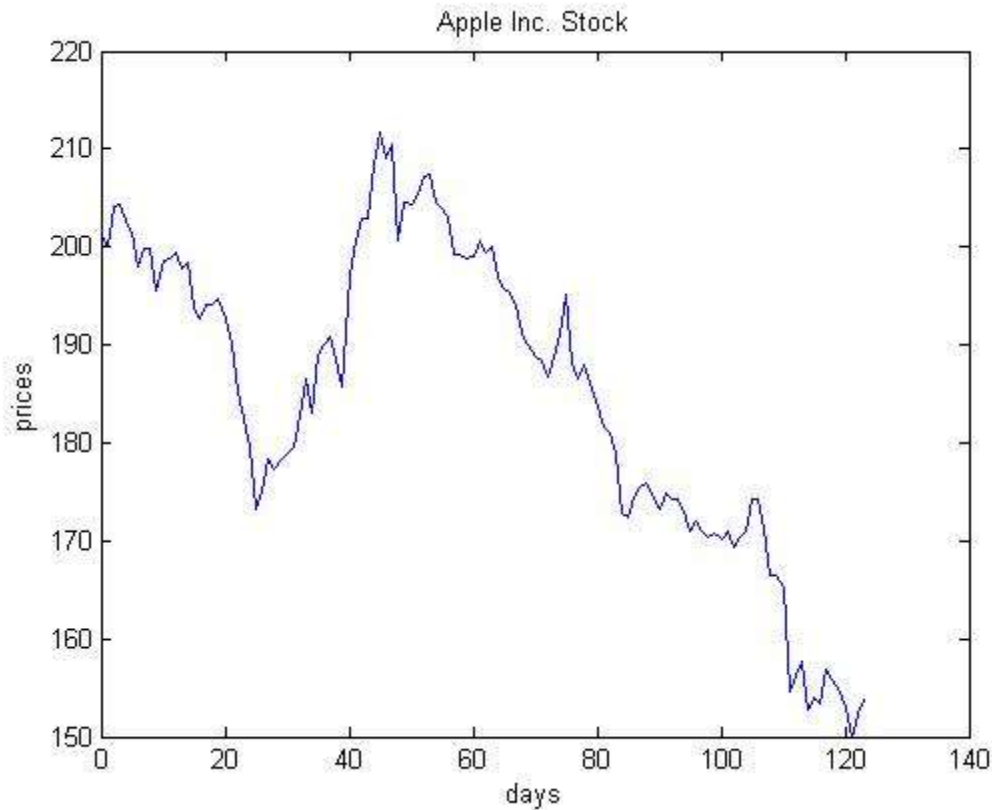


Figure 1. illustrate the prices of Apple Inc share for the period from (10/01/2019)to (08/07/2019).

The figure above shows that the current share price of Apple Inc. in July /08/2019 is close to (\$200.02). Therefore, by using the Spss program, the researchers attempt to forecast the price for the next day. The analysis here uses SPSS tools to check for the nonlinear regression of the sample dataset of Apple Inc. The data set consists of price data that are dependent on the variable x and $\ln y$, while the variables x and \ln are independent. The goal is to research the effect of x and \ln on y . The effect of every independent variable is evaluated by regression coefficients. The first step is to compile the data for these initial assumptions. Therefore, during the study period, the following figure is the daily return per share in order to determine the initial model values.

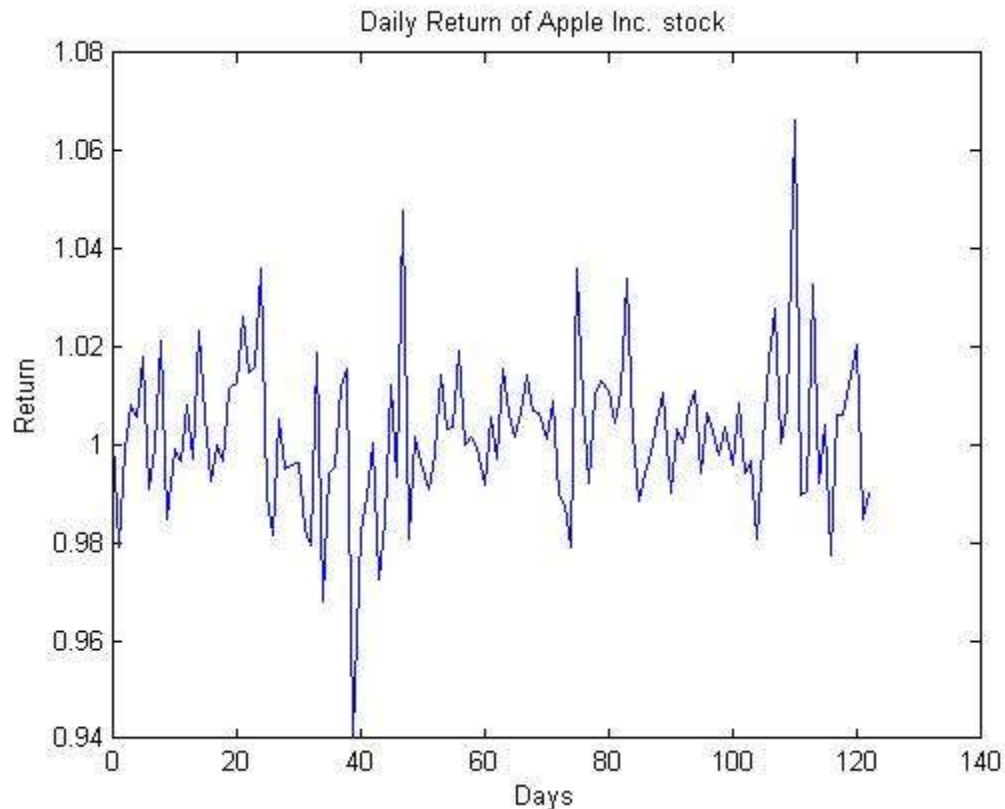


Figure 2. illustrate the daily Returns of Apple Inc share for the period from (10/01/2019) to (08/07/2019).

Via the figures no. 2 the regular return per share for the period between (June 10, 2019) to (July 9, 2019) will be between (\$1,06- 0,94). The iteration history is shown in Table (1). Here, the history of the iteration shows the progress of the clustering process at each stage and the nonlinear regression also estimates summary statistics. It means that the history of iteration goes to 14 steps from the original value a to 0.05, b to 0.05 and c to 0.05. It means that the best match outcomes would be obtained with the a value (-0.002), b equal (1.002) and c equal (2.003)..The output of results as the following:

CLOSING PRICES

The researcher forecasts the closing prices of next day. The statistical results of the SPSS program is as follows:

Model Program a = 0.002 b = 1.002 c = 2.003
 *Nonlinear Regression
 CRITERIA: SUCCESSFUL BEHAVIOR: 47.48 PAGES: 47.48
 Table (2) shows the Parameter Estimation

Parameter Estimation				
Parameter	Estimate	Std. Error	Lower Bound	Upper Bound
a	-.002	.003	-.008	.003
b	1.002	.003	.997	1.008
c	2.003	.003	1.998	2.008

The average, the bottom, and the highest returns with standard errors are shown in Table (2).

This means that the price will be 95% confidential between the lower and the upper limit.

Table (2) shows the parameter estimates.

Parameter Estimates				
Parameter	Estimate	Std. Error	95% Confidence Interval	
			Lower Bound	Upper Bound
a	-.002	.003	-.008	.003
b	1.002	.003	.997	1.008
c	2.003	.003	1.998	2.008

Table No 2. suggests that the next equation is probably the most suitable interpretation of the trends of the data observed.

$$Y = - 0.002 + 1.002 /x + 2.003 \ln$$

The fitting value of a, b and c is shown in table (2) to be A = 0.002, B= 1.002 and C = standard error (0.003). In addition to that, table (2) shows that the price will be between the lower and upper bound with confidence at 95 %. In other words, statistics indicate the use of nonlinear regression as an efficient method of forecasting stocks. This means that each tail has p-value

of 0.025, therefore the H0 is not supported.

In Table (4), the coefficients required to prediction price from historical prices are given and the

Value of R square in Table (4) determines whether historical prices contribute statistically considerably to the model. In addition, we can minimize the amount of the sum of square mean

So that the model is more suitable for the observed data.

Table (3) shows the Correlations of Parameter Estimates

Correlations of Parameter Estimates			
	a	b	c
a	1.000	-1.000	-1.000
b	-1.000	1.000	1.000
c	-1.000	1.000	1.000

Table 3. show that the correlation among parameter is verystrong, it means theses parameter fit for this model. The next table is the ANOVA table, which shows how well the regression equation matches the observed data is shown below:

Table (4) show regression and R square

ANOVA ^a			
Source	Sum of Squares	df	Mean Squares
Regression	123.569	3	41.190
Residual	.000	120	.000
Uncorrected Total	123.569	123	
Corrected Total	.030	122	
F Value	2.991		
a. R squared = 1 - (Residual Sum of Squares) / (Corrected Sum of Squares) = 1.000.			

This table contains the R and R2 values. The R-value reflects the simple correlation and is

1 which implies a high degree of correlation. The value of R2 indicates the amount of the cumulative difference in price of the dependent variable, the independent time variable. 100 percent, which is very that, can be clarified in this situation. The results show that the price would be (\$203.430 per share) with a standard error of 0.003 and 95 percent with confidence. In addition, both a residual and correlation of these parameters (a, b, and c) is zero with square R equal to 1. This model therefore matches perfectly. For testing, by finding the value of F, this model leads to a value of 2,991 (123,569/41,190) meaning that the data do not support the null hypothesis.

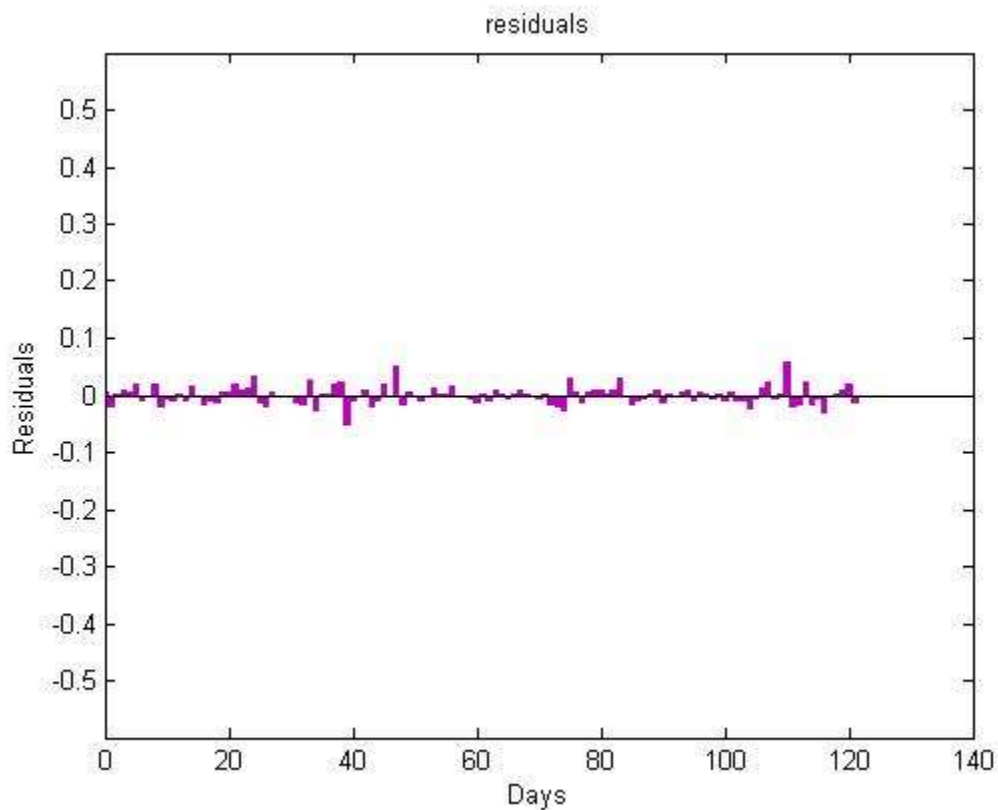


Figure 3. show the Residuals (Observed value – Predicated value)

Since the nonlinear regression residual is zero, i.e. the nonlinear regression equation passed through the data point is the best fit for this data equation ($Y = -0.002 + 1.002 / x + 2.003 \ln(x)$).

We will do the same to estimate the highest prices so that we can see the highest price is (\$201.430), With 95 percent confidence and a standard error of 0.002. In addition, both a residual and correlation of these parameters (a, b, and c) is zero with square R equal to 1. In addition, in the same procedures, the results that we can observe are (\$198,430), with 95 percent confidence and standardized error 0.002, to forecast low

prices, . The correlation between these parameters (a, b, and c) is 1, and the remaining one is zero and r is equal to 1. This model

therefore matches perfectly. In other terms, we are going to sell APPELS ' shares if they are of value ((\$201,430), while we prefer to purchase Apple shares when they are of price (\$198,430) and in both cases (buying or selling), we are going to exit the market if they have a value (\$200,02).

We compare this predicted price to the actual prices as in table (5) at 09 Jul 2019

Table 5. show actual price and predicted price

Date	type	Closing price	High price	Low price
Jul 09, 2019	Actual price	201.240	201.510	199.200
Jul 09, 2019	Predication	201.240	201.430	\$198.430

We consider this prediction approach to be reliable.

VI. CONCLUSION

As the process of estimating the share value is related to many variables like business valuation, stock price, and news, the share value process can be highly complex. Nonetheless, many mathematical techniques make the process simpler to estimate the stock value of the next period.

The nonlinear regression is one of these approaches. Nonlinear regression results, Concluded with confidence 95% that Apple shares might be bought during a day 09/07/2019 when the stock value is almost (\$198.430 per share), while Apple shares sell when the share value is (\$201.430 per share). In both cases the sale or purchase of the stock, investors can exit out of the market when the value is (\$201.240).

Findings from the nonlinear regression are 95% confidence that Apple's shares will be purchased on the 09/7/2019 day, when the value of the share is close to (\$198,430) when the share of

Apple is priced at share (\$201,430 per share). In both cases, sales or purchases of stocks will exit from the market at the value of the share (\$201,240). The findings were focused on nonlinear regression.

REFERENCE

1. Alcalá-Fdez, J., Sanchez, L., Garcia, S., del Jesus, M. J., Ventura, S., Garrell, J. M., . . . Rivas, V. M. (2009). KEEL: a software tool to assess evolutionary algorithms for data mining problems. *Soft Computing*, 13(3), 307-318.
2. Edwards, R. D., Magee, J., & Bassetti, W. C. (2018). *Technical analysis of stock trends*: CRC press.
3. Finkle, T. A., & Mallin, M. L. (2010). Steve Jobs and Apple, Inc. *Journal of the International Academy for Case Studies*, 16(7), 31.
4. Freeman, R. N., & Tse, S. Y. (1992). A nonlinear model of security price responses to unexpected earnings. *Journal of Accounting research*, 30(2), 185-209.
5. Harris, L. (2013). *What to do about high-frequency trading*: Taylor & Francis.
6. Ince, H., & Trafalis, T. B. (2008). Short term forecasting with support vector machines and application to stock price prediction. *International Journal of General Systems*, 37(6), 677-687.
7. Inchausti, B. G. (1997). The influence of company characteristics and accounting regulation on information disclosed by Spanish firms. *European Accounting Review*, 6(1), 45-68.
8. Ireland, P. (1999). Company law and the myth of shareholder ownership. *Mod. L. Rev.*, 62, 32.
9. Miles, D., & Scott, A. (2008). *Macroeconomics: understanding the wealth of nations*: John Wiley & Sons.
10. Mishkin, F. S. (2007). *The economics of money, banking, and financial markets*: Pearson education.
11. Motulsky, H. J., & Brown, R. E. (2006). Detecting outliers when fitting data with nonlinear regression—a new method based on robust nonlinear regression and the false discovery rate. *BMC bioinformatics*, 7(1), 123.
12. Stäheli, U. (2013). *Spectacular speculation: Thrills, the economy, and popular discourse*: Stanford University Press.
13. Summers, L. H. (1986). Does the stock market rationally reflect fundamental values? *The journal of Finance*, 41(3), 591-601.
14. Suto, M. (2003). Capital structure and investment behaviour of Malaysian firms in the 1990s: a study of corporate governance before the crisis. *Corporate Governance: An International Review*, 11(1), 25-39.
15. Yermack, D. (1997). Good timing: CEO stock option awards and company news announcements. *The journal of Finance*, 52(2), 449-476.

16. Narayan, P. K., & Gupta, R. (2015). Has oil price predicted stock returns for over a century? *Energy Economics*, 48,18-23
17. Salisu, A. A., & Isah, K. O. (2017). Revisiting the oil price and stock market nexus: A nonlinear Panel ARDL approach. *Economic Modelling*, 66, 258-271.
18. S.Chitradevi&K.Kuppusamy (2016).Stock market Price Prediction Using Non linear Regression Model.International Journal of Advanced Research Trends in Engineering and Technology,Vol. 3, Special Issue 20, April
19. Cai, biqing&Gao,jiti. 2017.A Simple Nonlinear Predictive Model for Stock Returns,Monash University, Australia.
20. Chou, J. S., & Nguyen, T. K. (2018). Forward forecast of stock price using sliding-window metaheuristic-optimized machine-learning regression. *IEEE Transactions on Industrial Informatics*, 14(7), 3132-3142.
21. Moukalled, M., El-Hajj, W., & Jaber, M. (2019, September). Automated Stock Price Prediction Using Machine Learning. In *Proceedings of the Second Financial Narrative Processing Workshop (FNP 2019)*, September 30, Turku Finland (No. 165, pp. 16-24). Linköping University Electronic Press.
22. Mokni, K., & Youssef, M. (2019). Measuring persistence of dependence between crude oil prices and GCC stock markets: A copula approach. *The Quarterly Review of Economics and Finance*, 72, 14-33.
23. Yang, R., Yu, L., Zhao, Y., Yu, H., Xu, G., Wu, Y., & Liu, Z. (2020). Big data analytics for financial Market volatility forecast based on support vector machine. *International Journal of Information Management*, 50, 452-462.
24. Jaiyeoba, H. B., & Haron, R. (2016). A qualitative inquiry into the investment decision behaviour of the Malaysian stock market investors. *Qualitative Research in Financial Markets*.
25. Mahina, J. N., Willy, M., & Florence, M. (2018). Effect of Self-Attribution Bias on Investment in the Rwandan Stock Market. *Global Journal of Management and Business Research*.
26. Koziol, C., & Treuter, T. (2019). How do speculators in agricultural commodity markets impact production decisions and commodity prices? A theoretical analysis. *European Financial Management*, 25(3), 718-7