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Forecasting Share Prices of Axis and ICICI Banks by Econometric Modeling

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Abstract

The objective of the paper is to forecast the closing stock prices of two private commercial banks, ICICI and Axis. As the movement of stock prices is quite volatile in nature, therefore to predict it accurately is a great challenge. The prediction is been done by studying the past behavior of these stock prices. For forecasting the stock prices of these two banks, auto regressive integrated moving average model is being used.

Keywords: Stock prices, Forecasting, ARIMA, Stationary, Banks, Axis, ICICI.

I. INTRODUCTION

For economic growth banks play a major factor specifically in the developing economies. Therefore banking development and stock market liquidity both predict growth, capital accumulation and productivity in the service sector. Joseph A. Schumpeter (1912) highlighted the importance of banking system in the growth of the economy through innovation and funding investments (Schompeter, 1912). Robert G. King and Levine growth. (1993a) focussed on financial intermediation and emphasised that it is a good predictor of long-run rates of economic growth, capital accumulation and productivity improvements. (King, 1993).

Axis Bank Limited (formerly UTI Bank) is the third largest private sector bank in India. It offers financial services to customer segments covering Large and Mid-Sized Corporate, MSME, Agriculture and Retail Businesses. As on 31-Mar-2014, the Bank had a network of 2402 branches and extension counters and 12922 ATMs. (Report, 2014) The Bank has several international offices with branches at Singapore, Hong Kong, and several countries which focus on investment banking and liability business. Axis Bank operates in four segments which are Treasury operations, Retail banking, Corporate/Wholesale banking and other banking business. (Reuters, 2014) .

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Axis Bank has been growing over the years. Axis Banks' equity shares are listed on the Bombay Stock Exchange and National Stock Exchange of India (Economic Times, 2014). The company's global depository receipts (GDRs) are listed on the London Stock Exchange (London Stock Exchange, 2014).As on 31 December 2013, the promoters UTI, LIC and GIC held approx. 34% of the shares in Axis Bank. Foreign Institutional investors (FII) held approx. 43% of the shares. Remaining 23% of the shares are held by others. The bank aims to increase its share in the financial services sector by continuing to build a strong retail franchise. The segment continues to be one of the key drivers of the Bank's growth strategy, encompassing a wide range of products delivered through multiple channels to customers. It offers a complete suite of products across deposits, loans, investment solutions, payments and cards (Religaire Securities, 2014).

ICICI Bank is an Indian multinational banking and financial services company. It is the second largest bank in India in terms of assets and market capitalization. It offers a wide range of banking products and financial services for corporate and retail customers through a variety of delivery channels and specialized subsidiaries in the areas of investment banking, life, non-life insurance, venture capital and asset management. The Bank has a network of 4,050 branches and 12,269. ATMs in India, and has a presence in 19 countries. (icici.com, 2013) The bank has several subsidiaries in the United Kingdom, Russia, and Canada.

II. Objective of the study

To predict the share prices of the banks is of great interest to the investors. One of the objective of the study is to determine the fluctuations in the closing stock prices of the two Private banks such as ICICI Bank & Axis Bank by studying the past 60 months closing prices of the 2 stocks. Next is to predict the future movement of the 2 stocks by studying past fluctuations & closing prices of the 2 stocks for the next 6 months. Also the predicted prices are being evaluated and checked through graphical analysis (King, 1993).

III. Scope of the Study

This study would be very beneficial for the investors which help them to know which stock is the best investment opportunity for short term investment horizon. It will help the investors to take decisions timely. In case the value of the stock prices goes down, they can take the decision to take out their investment. It would also be helpful to make handy profit for the investors by knowing the future movement of these stocks.

IV. Data Collection Methods

The data collection method used for this study is Secondary Data Collection Method. We have taken the historical closing prices of last 60 months of the 2 stocks i.e., ICICI Bank & Axis Bank. The secondary data have been taken from the National Stock Exchange (NSE) website in order to have the authenticity in the prediction of the closing prices of the 2 stocks.

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V. Research Methodology

In financial time series data the first thing which we need to check is the stationarity issue. Stationary time series will tend to return to its mean (called mean reversion) and fluctuations around this mean (measured by its variance) will have broadly constant amplitude. If a time series is not stationary, it is called a non-stationary time series. A non-stationary time series will have a time varying mean or a time-varying variance or both. In case the time series is not stationary, we need to make it stationary by applying econometric tools.

The model applied in order to conduct the study is Auto Regressive Integrated Moving Average (ARIMA) Model to predict the future closing prices of the 2 stocks i.e., Axis Bank & ICICI Bank. The model will be useful to know the regression line i.e., forecasted line which best fits the original line of the prices of the 2 stocks.

Box and Jenkins developed an iterative method which identifies the forecast model to be used, estimates the parameters, performs a diagnostic check and then uses the model to develop a forecast. This system uses auto-correlation (whereas others ignore it) to improve accuracy.The whole Box-Jenkins approach revolves around three basic models Auto-regressive (AR), Moving Average (MA) and mixed ARMA models. The auto-regressive model of order p written as AR (p) is defined as :

$$zt = \Phi 1zt\text{-}1 + \Phi 2zt\text{-}2 + \text{—} + \Phi pzt\text{-}p + \varepsilon t \qquad (1)$$

where $\sum_t$ is the sequence of random or white noise and is assumed that it follows a normal distribution. The moving average model of order q denoted as MA (q) is defined as :

$$zt = \varepsilon t + \Phi 1\varepsilon t\text{-}1 + \Phi 2\varepsilon t\text{-}2 + \text{—} + \Phi p\varepsilon t\text{-}p \qquad (2)$$

The mixed auto-regressive model of order (p, q) denoted as ARMA (p, q) is defined as :

$$zt = \Phi 1zt\text{-}1 + \Phi 2zt\text{-}2 + \text{————} + \Phi pzt\text{-}p + \varepsilon t + \Phi 1\varepsilon t\text{-}1 + \Phi 2\varepsilon t\text{-}2 + \text{———} \text{—} + \Phi p\varepsilon t\text{-}p \qquad (3)$$

A stationary series has a constant mean and variance and a covariance structure which depends only on the difference between two time points. However, there are some time series which are non-stationary. It has been found that if the series is non-stationary and the series is a differenced one then the model corresponding to the original series has to be differenced once to obtain a stationary, then the model corresponding to the original series is called an integrated ARMA model of order p, l, q or an ARIMA (p, 1, q). If differencing has to be performed *d* times to obtain the stationary, the model is called an ARIMA (p,d,q) model. ARMA process shows a combination of the characteristics of AR and MA process. AR process has a geometrically declining ACF (Auto Correlation Function) and a number of non-zero points of PACF (Partial Auto Correlation Function) while MA process has a number of non-zero points of ACF and

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geometrically declining PACF. ARMA process will be having both geometrically declining ACF and PACF.

One very essential condition of time series analysis is that the underlying series must be stationary. So for the stationary conversion of the series, one more letter is added in the ARMA process, i.e., 'I' which shows the number of time underlying series needed to differentiate and to make it stationary. On account of this transformation, ARMA process is referred as ARIMA process.

To build an ARIMA model, one essentially uses Box-Jenkins methodology (1976) which is an iterative process and involves four stages : Identification, Estimation, Diagnostic Checking and Forecasting. The whole process starts with the checking of stationarity and seasonality in the series. Non-stationary in the series is indicated by slowly decaying ACF and PACF. If the underlying series is non-stationary, then first it is converted into a stationary series either by using differencing approach or taking logarithms or regressing the original series against time and taking the error terms of this regression. Once stationarity and seasonality have been addressed, the next step is to identify the order (i.e., the p and q) of the AR and MA terms.

The primary tools for doing this are the auto-correlation plot and the partial auto-correlation plot. Sample auto-correlation plot and the sample partial auto-correlation plot are compared with theoretical plots. But in real life, one will hardly get the patterns similar to the theoretical one, so one has to use iterative methods and select the best model on the basis of the following criteria : relatively small AIC (Akaike's Information Criteria) or SBIC (Schwarz's Information Criteria), relatively small of Standard Estimated Error (SEE), relatively high adjust R_2 and white noise residuals of the model (which shows that there is no significant pattern left in the ACFs and PACFs of the residuals). After identifying the lags of AR and MA, the parameters are estimated and their significance is tested with the help of t-statistic. Finally, the validity of the model is verified with F-statistic. At the same time, Durbin-Watson (DW) test should be conducted. This test is utilized to ensure that the model does not have significant degrees of serial correlation or underestimated variances. The DW statistic should be close to 2.00 to minimize serial correlation. And, finally, forecast the future value of the variable based on the model.

Close prices chart

The tests indicated that the data is not stationary.

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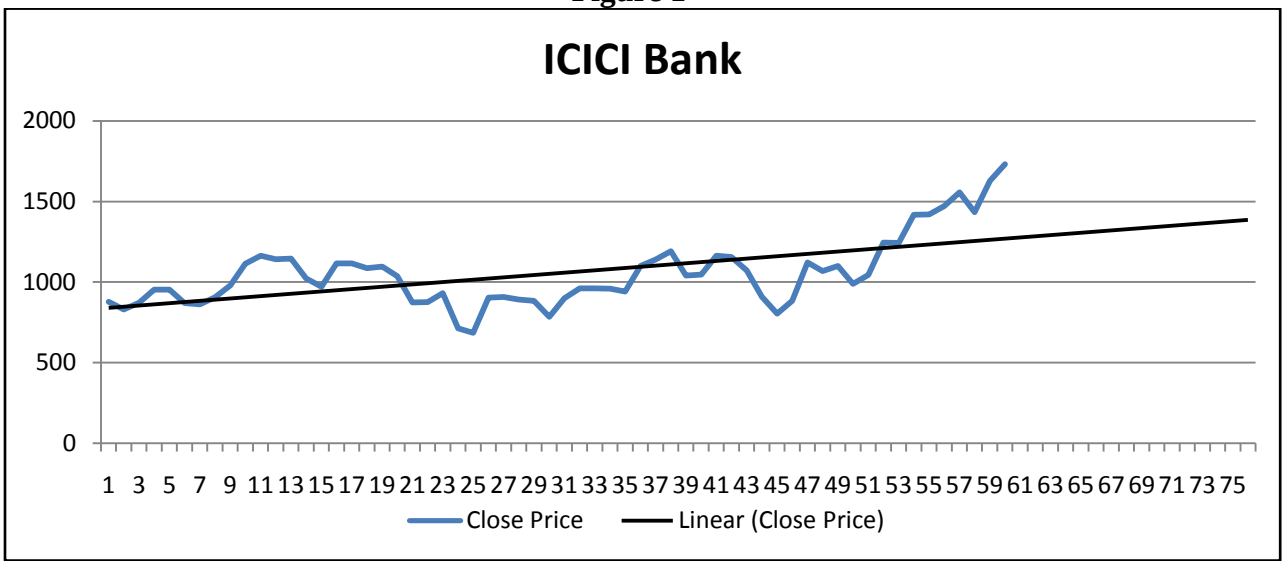
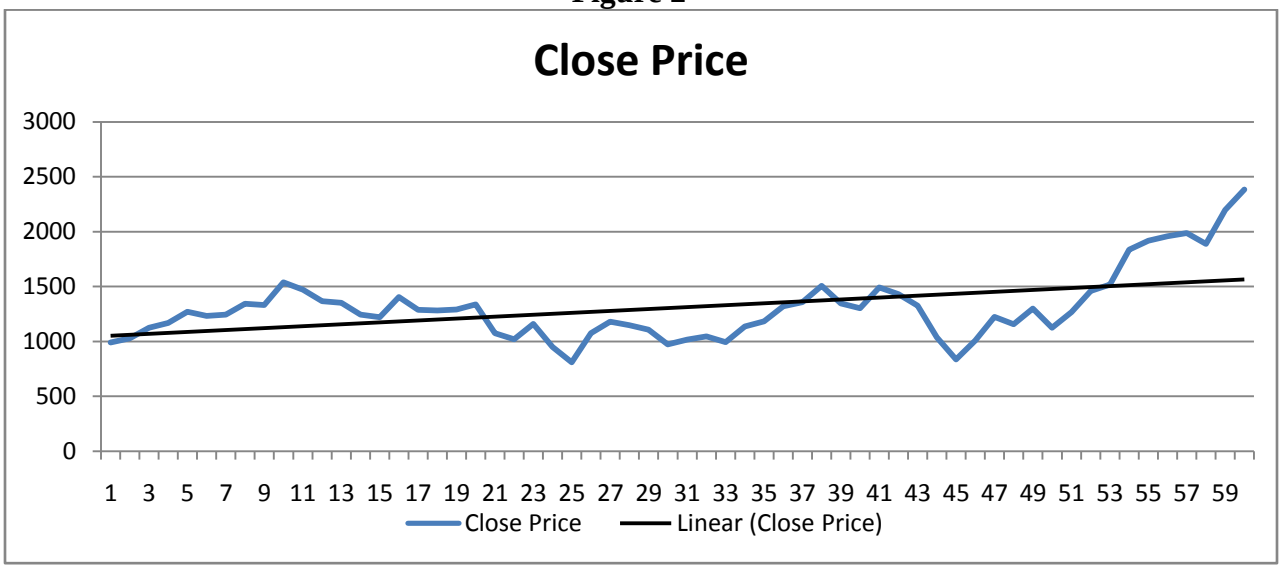
Figure 1



From the above graph, It is observed that price movement of the ICICI Bank stock is not stationary & have a trend as shown by the Trend Line.

Figure 2



From the above graph, It is observed that price movement of the Axis Bank stock is not stationary & have a trend which is shown by the Trend Line.

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Analysis: After taking the first difference , both the series have been made stationary. Correlogram is being checked once we enter the series into the EVIEWS software. We get the following ACF and PACF table.

Estimates above the limit line founded out are:

Table 1

ICICI Bank		**Axis Bank**	
Autocorrelation (ma)	Partial Correlation (ar)	Autocorrelation (ma)	Partial Correlation (ar)
5	5	0	0

Once we obtain the Actual, Fitted, Residual values, we can get the forecasted value .We can obtain the forecasted close price by the formula : C + AR(5)*(P_{t-5} Actual Line) for ICICI Bank & For Axis Bank formula used is: C. After that forecasted close price would be $P_{t-1}$of **"Forecasted Close Price"** +P_t**"Forecasted Δ Close Price"**. When plotted on the graph, **"Forecasted Close Price"**&**"Close Prices"** with reference to the time period is shown below.

Figure 3

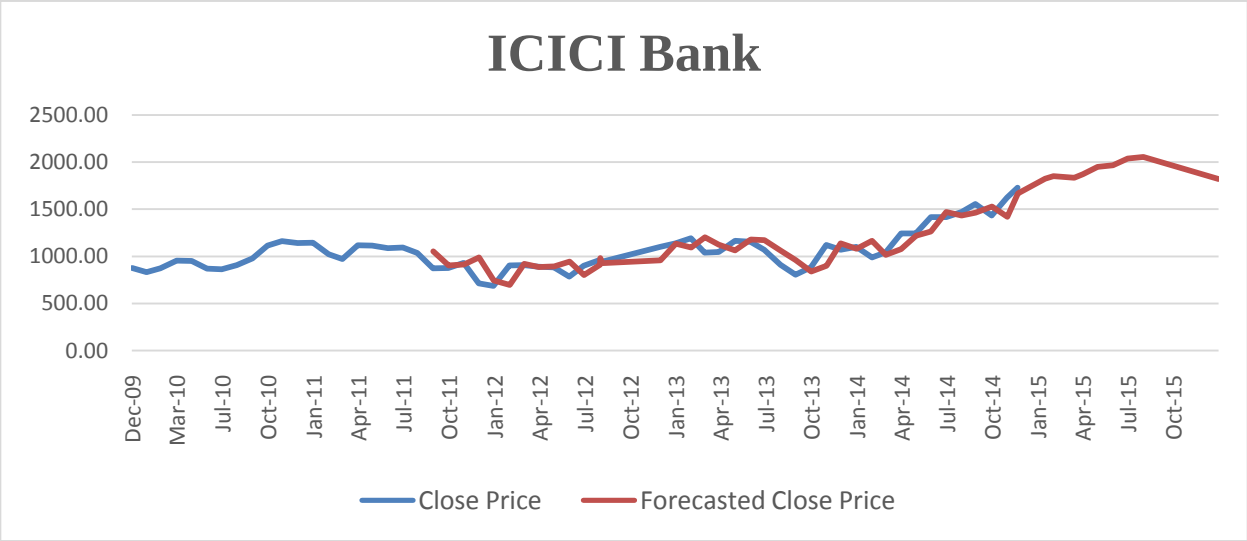

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Table 2

ICICI Bank	
Month/Year	**Forecasted Close Price**
Dec-14	1819.04
Jan-15	1822.09
Feb-15	1849.41
Mar-15	1835.16
Apr-15	1870.15
May-15	1947.86
June-15	1983.32
July-15	2012.27

Table 3

Axis Bank	
Month/Year	**Forecasted Close Price**
Dec-14	2376.07
Jan-15	2367.39
Feb-15	2358.70
Mar-15	2350.02
Apr-15	2341.34
May-15	2332.66
June-15	2329.68
July-15	2327.35

VI. Analysis

The Durbin-Watson stat for ICICI Bank stands out to be 1.924 which is close to 2 stating that the data for the ICICI Bank is authentic i.e., genuine. Similarly, for the Axis Bank, Durbin-Watson stat is 2.054 which is too close to 2, stating the authenticity of the data of the Axis Bank.The forecasting of the close prices is up to the mark for the both of the stocks i.e., ICICI Bank & Axis Bank. From the pattern of actual movement of the stocks are closely interlinked with the forecasted prices. The actual *Close Prices* line is followed in the same way by the *Forecasted Close Prices* line in both the stocks representing that the forecasting is genuine i.e., authentic,

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under the used Auto Regressive Integrated Moving Average (ARIMA) Model. Thus from the graphs itself it is clearly evident that actual and forecasted value almost overlap each other , thus authenticating the model and its usefulness.

However since this methodology is based on the time series data, therefore to get more appropriate results the data series should be long ones. In less data points this model doesn't give robust results.

VII. Conclusion

1. Forecasting of financial data has always being a challenging task as the movement of stock prices is quite volatile in nature.
2. The objective of this paper here is to forecast the closing stock prices of two private commercial banks, ICICI and Axis till July 2015.
3. For forecasting the stock prices of these two banks, auto regressive integrated moving average model is being used.
4. The secondary data have been taken from the National Stock Exchange (NSE) website in order to have the authenticity in the prediction of the closing prices of the 2 stocks.
5. In financial time series data the first thing which we need to check is the stationarity issue.
6. If the series is non-stationary and the series is a differenced one then the model corresponding to the original series has to be differenced once to obtain a stationary, then the model corresponding to the original series is called an integrated ARMA model of order p, l, q or an ARIMA (p, 1, q).
7. Thus from the graphs itself it is clearly evident that actual and forecasted value almost overlap each other, thus authenticating the model and its usefulness.
8. We have seen that the share prices of both the banks have been rising steadily.

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