

## BTP Report

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# LSTM with Volatile stocks



## Overview

Stock market is full of volatility. Different stocks shows different degree of volatility. To measure volatility, a metric 'Beta' is used. Beta is a measure of a stock's volatility in relation to the overall market. In India, the National Stock Exchange (NSE) has NIFTY 50 as a benchmark index which was used as a relative point.

Beta has a numerical value which shows a story of the stock. In this project, different stocks with different Beta value ranges were picked and were compared.

## Volatility measure - Beta.

A Beta is a numerical figure that measures how sensitive it is to changes (volatile) in the general stock market.

When the benchmark index, such as the NSE Nifty, is compared to the returns of a specific stock, a pattern emerges that reveals the stock's openness to market risk. This allows the investor to choose between a riskier stock that is highly associated with the market (beta above 1) and a less volatile one (beta below 1).

If a stock's beta value is 1.5, it suggests that the stock is 50% more volatile than the market. Likewise, a stock's beta value of 0.7 suggests that the stock is 30% less volatile than the market.

## Calculation of Beta

The beta calculation is used by investors to determine if a stock moves in lockstep with the rest of the market. The market that is utilised as a benchmark must be relevant to the stock in order for beta to provide any useful information. Calculating the beta of a bond ETF using the NIFTY 50 as a benchmark, for example, would not provide much useful information to an investor because bonds and stocks are too distinct.

Beta can be calculated using the below formula:

$$\beta_s = \frac{E(r_s) - r_f}{E(r_m) - r_f}$$

$\beta_s$  = Beta for your investment  
 $E(r_s)$  = Expected Return from your investment  
 $E(r_m)$  = Expected Return from the Market  
 $r_f$  = Risk-Free Return

## Different ranges of Beta

- **Beta Value Equal to 1.0:** If a stock has a beta of 1.0, it indicates that its price activity is strongly correlated with the market.
- **Beta Value less than 1.0:** A beta value that is less than 1.0 means that the security is theoretically less volatile than the market
- **Beta Value more than 1.0:** A beta that is greater than 1.0 indicates that the security's price is theoretically more volatile than the market.
- **Negative Beta Value:** A beta of -1.0 means that the stock is inversely correlated to the market benchmark.

## Stocks taken and their beta value

In this project, we picked stock from all ranges of Beta. The stock's price were compared monthly for 10 years which gives enough time for a stock to show it's true characteristics. The stocks picked were:

- 1. Reliance Industries:** The petrochemical company had the Beta Value of 1.04 (Approximately equal to 1)
- 2. ITC:** The FMCG company had the Beta Value of 0.64 (Less than 1)
- 3. Tata Motors:** This Automobile company had the Beta Value of 1.81 (More than 1)

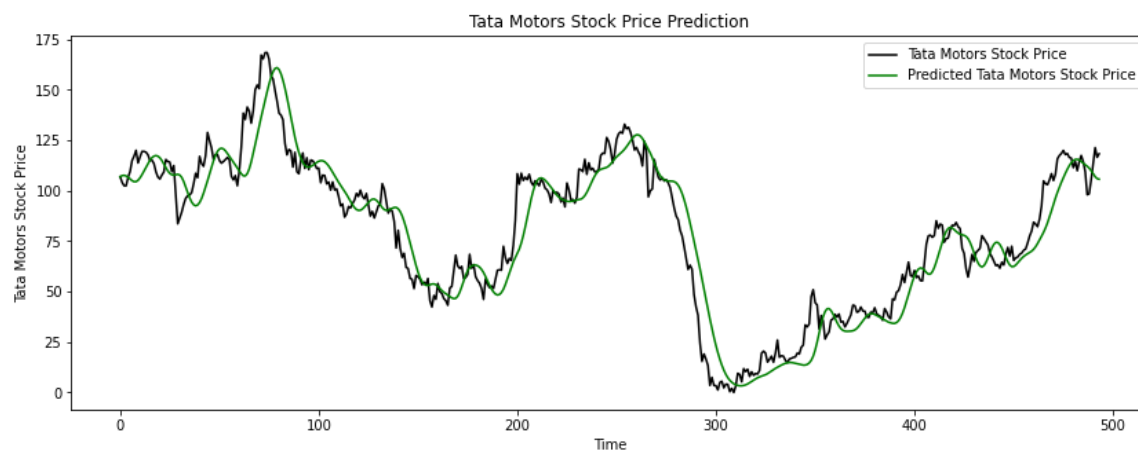
No stocks in the Indian Stock Market had negative Beta value. Negative beta values are for options and debt instruments and out of scope of this project.

## Prediction of price using LSTM

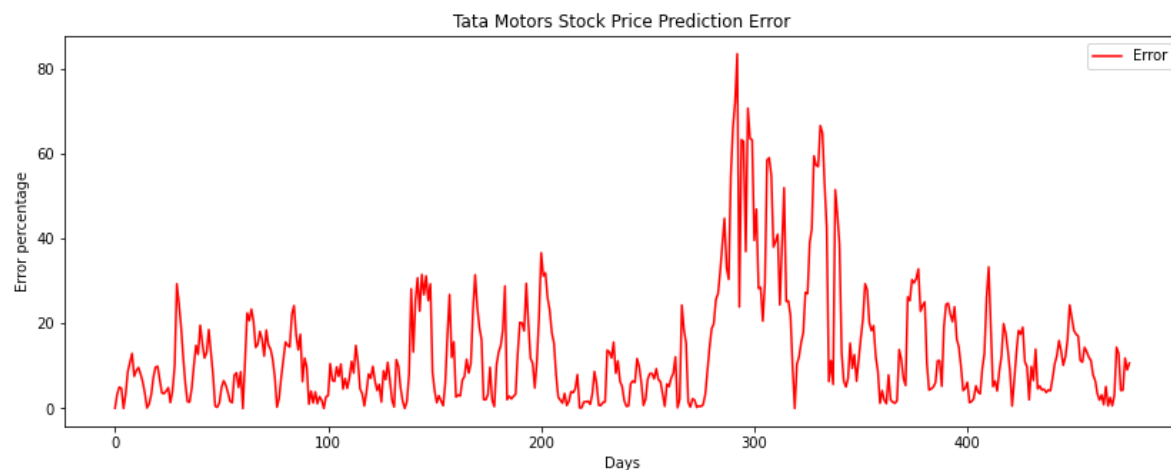
Just like in the first part of the project, we predict the stock prices using the same technique over 10 years and compare the error % (inversely proportional to the accuracy of the method) between all the chosen stocks

## Findings of LSTM

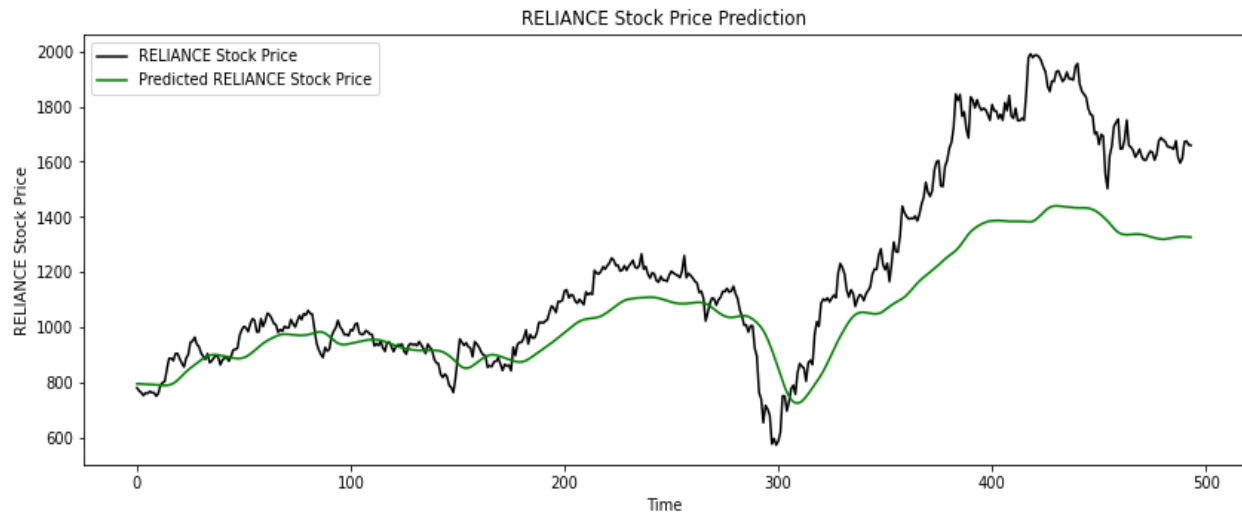
- Tata Motors (Beta > 1)



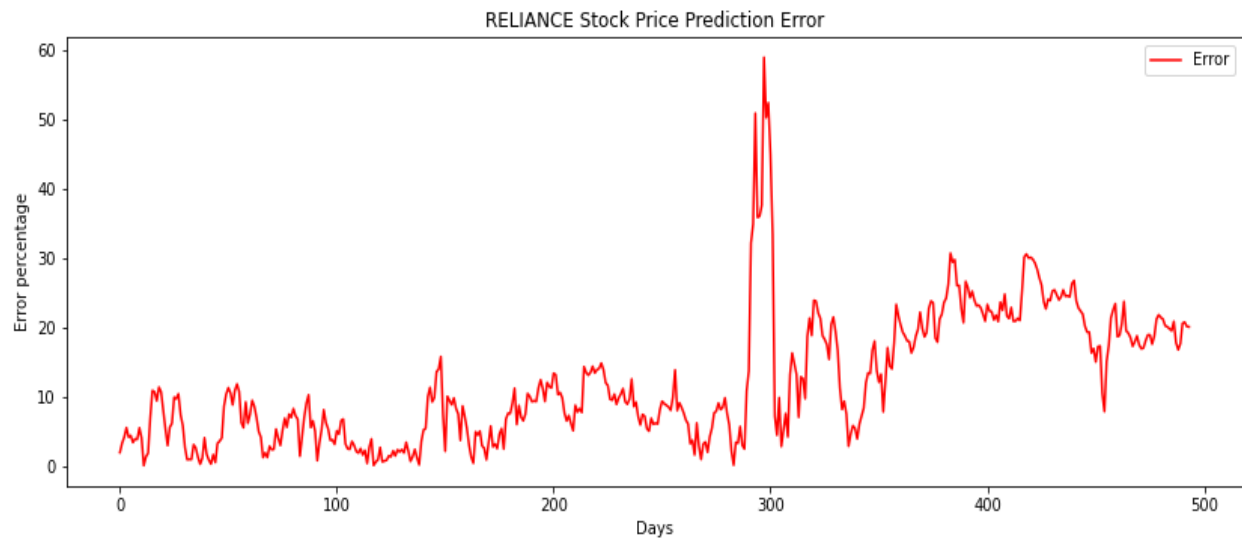
**Error Percentage: 13.59%**



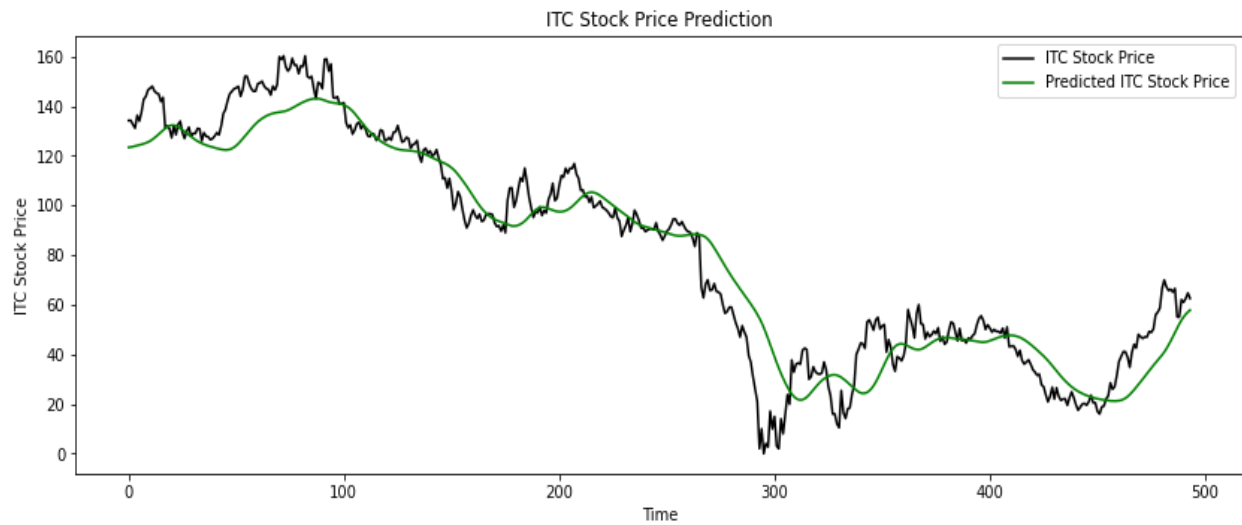
- Reliance Industries (Beta = 1)



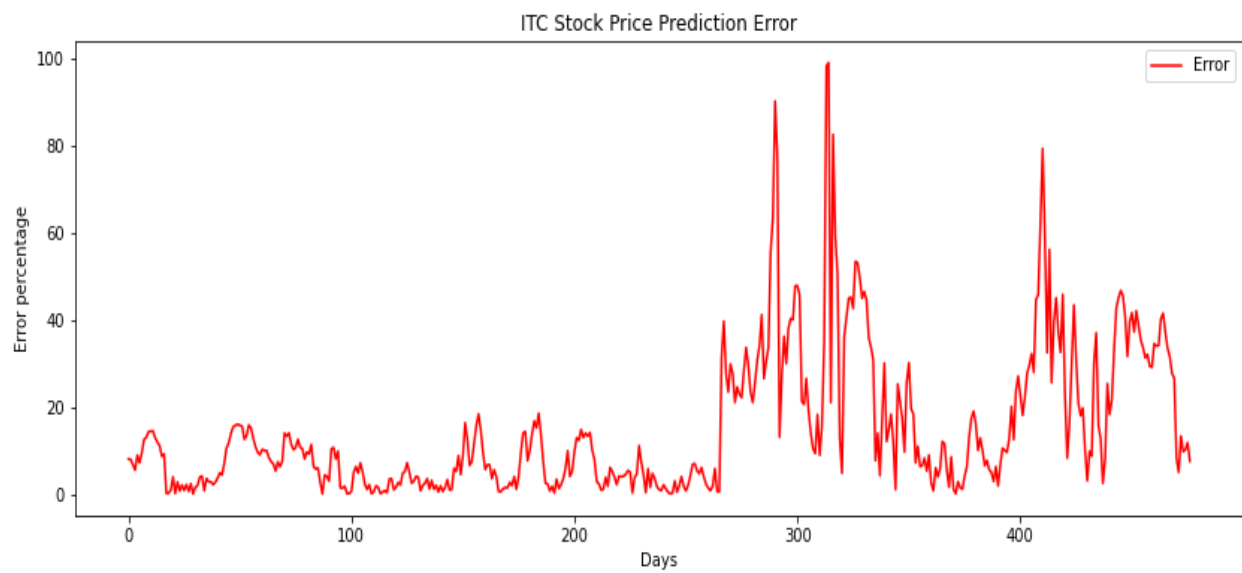
Error percentage: 12.01%



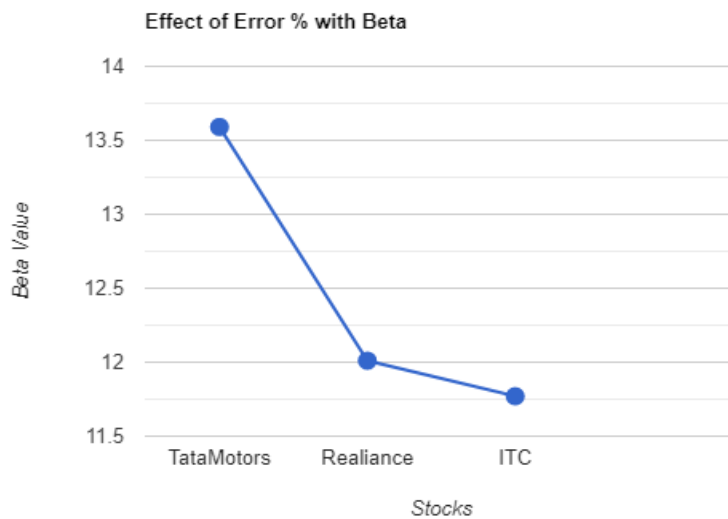
- ITC (Beta < 1)



Error percentage: 11.77



## Conclusion



We see a linear correlation between Error % and Beta Values. Higher the Beta value (More volatile), Higher the error percentage.

Error % in prediction using LSTM  $\propto$  Beta of that stock

## References

- <https://www.investopedia.com/terms/b/beta.asp>
- <https://machinelearningmastery.com/gentle-introduction-long-short-term-memory-networks-experts/>
- <https://finance.yahoo.com/>