FINANCIAL TIME SERIES ANALYSIS WITH MACHINE LEARNING

SIT 723 Research Project A

Video Link: https://youtu.be/AZwjSyoi0Hk

ABOUT FINANCIAL TIME SERIES

Time Series can be defined as the study of dynamic consequences over a period of time. This presentation focuses on the financial time series, where the study is more concerned with the financial assets like stocks, shares, currency evaluation, et cetera. it is highly logical area, where the uncertainty is extremely high. Financial time series has always been of interest of business and financial analysts because of addition of uncertainty, statistical theory, methods and high volatile market making financial time series analysis different from regular time series analysis.

OBJECTIVES OF THE PROJECT

FINDING PATTERNS

Finding patterns in different algorithms and different stocks and finding out the similarities and differences in working of each algorithm

HYBRIDIZATION

Possibility of hybridizing the current algorithms to work optimally.

PORTFOLIOS

Creating long term, mid term, and short term investment portfolios based on the current machine learning and choosing the algorithms that work the best
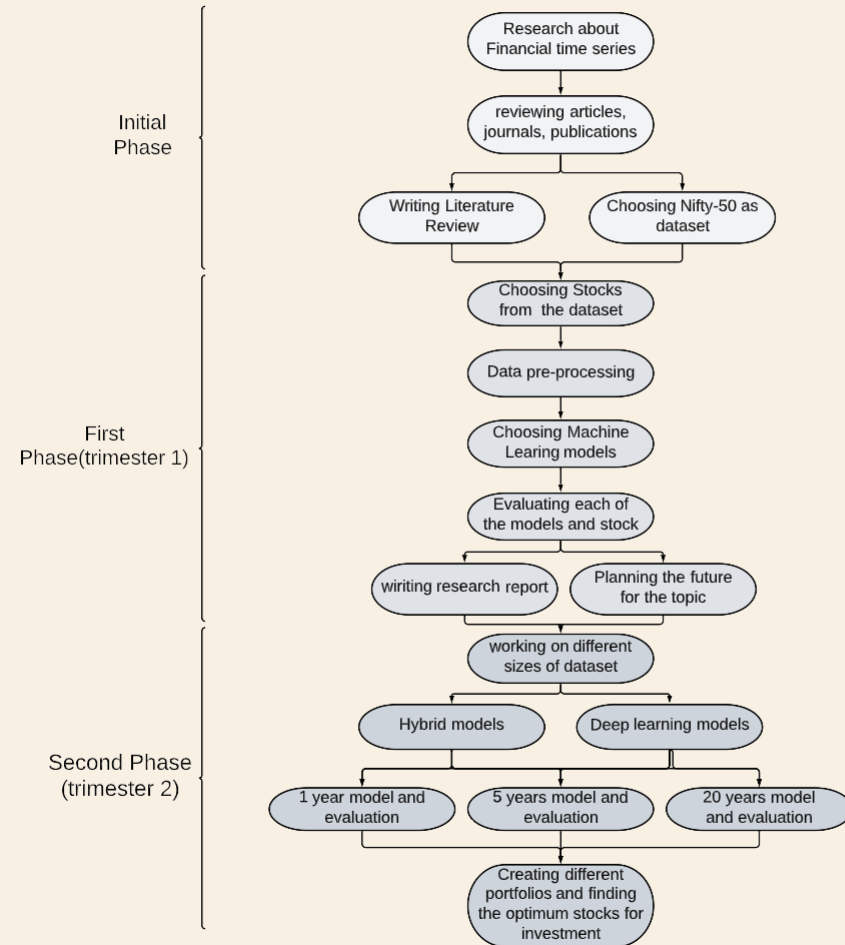
FUTURE WORK

Finding what can be done in the future in the field of financial time series.

RESEARCH DESIGN

Initial Phase
- Research about Financial time series
- reviewing articles, journals, publications
- Writing Literature Review
- Choosing Nifty-50 as dataset

First Phase(trimester 1)
- Choosing Stocks from the dataset
- Data pre-processing
- Choosing Machine Learing models
- Evaluating each of the models and stock
- wiriting research report
- Planning the future for the topic

Second Phase (trimester 2)
- working on different sizes of dataset
- Hybrid models
- Deep learning models
- 1 year model and evaluation
- 5 years model and evaluation
- 20 years model and evaluation
- Creating different portfolios and finding the optimum stocks for investment

ML MODELS, STOCKS AND EVALUATION METHODS USED

- **AUTO REGRESSION**
- **ARIMA**
- **ARIMAX**
- **SARIMA**
- **SARIMAX**
- **HOLT WINTER'S EXPONENTIAL SMOOTHING**

- **HDFC**
- **INFOSYS**
- **ICICI BANK**
- **HINDUSTAN UNILEVER**
- **TCS**

- **MEAN ABSOLUTE ERROR**
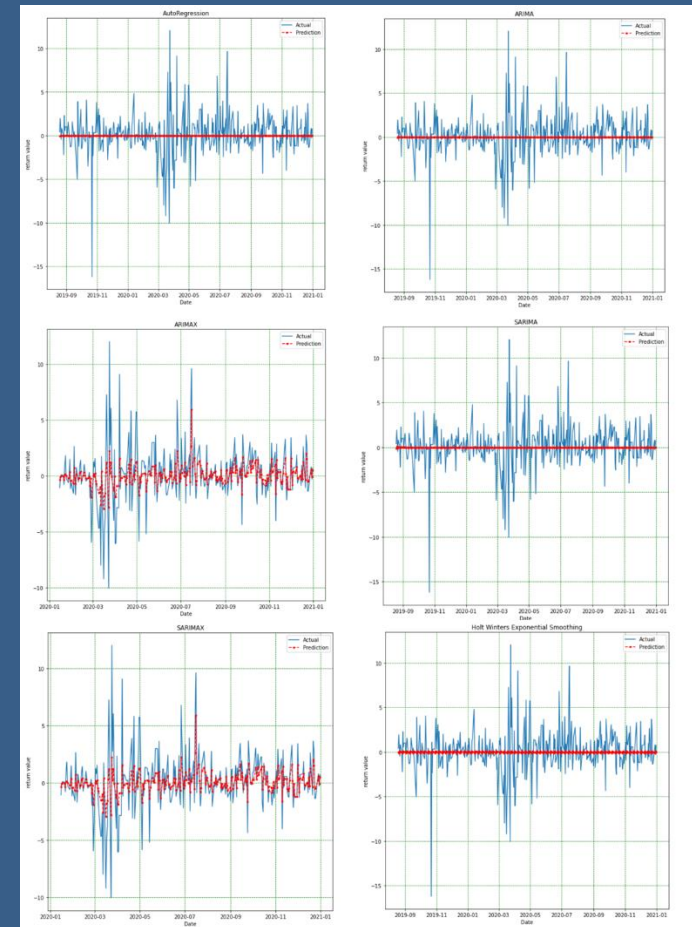- **ROOT MEAN SQUARED ERROR**
- **R^2 SCORE**

RESULTS AND EVALUATION FOR HDFC STOCK

	Mean Absolute Error	Root Mean Squared Error	R² score
Auto Regression	1.8387	2.7466	Negative value
ARIMA	1.8383	2.7465	Negative value
SARIMA	1.8398	2.7484	Negative value
ARIMAX	0.7387	1.0684	88.29%
SARIMAX	1.0687	0.7388	88.28%
Holt Winter's Exponential smoothing	1.8409	2.7436	0.2%
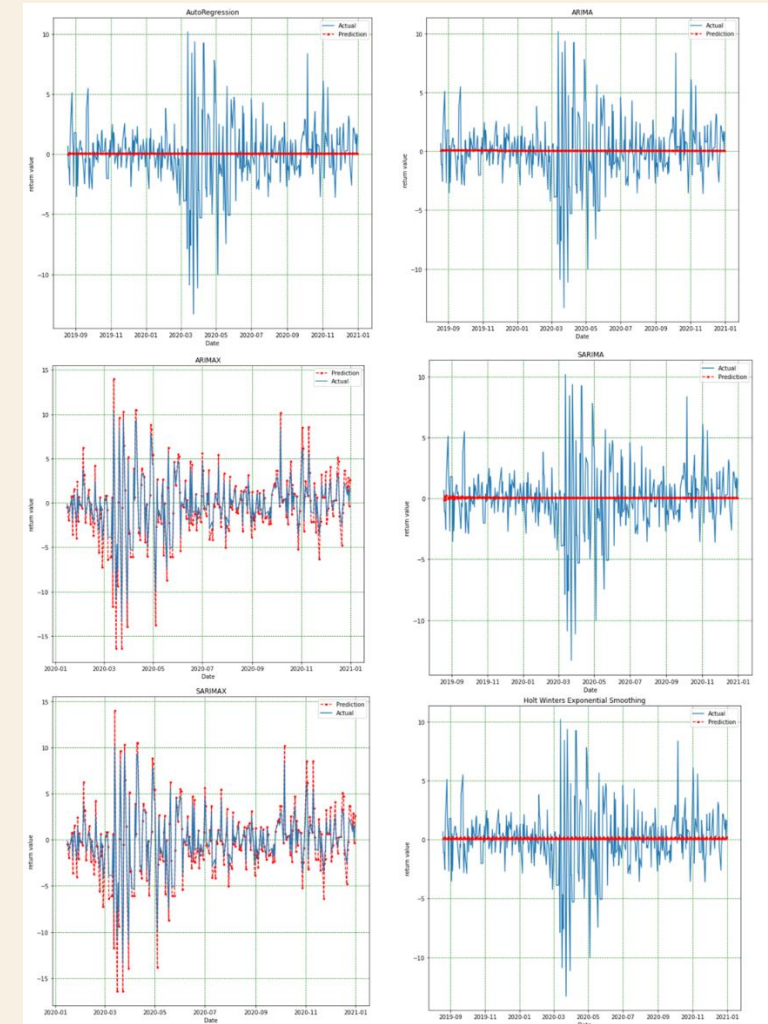
RESULTS AND EVALUATION FOR INFOSYS STOCK

	Mean Absolute Error	Root Mean Squared Error	R² score
Auto Regression	1.6024	2.4718	Negative value
ARIMA	1.6020	2.4717	Negative value
SARIMA	2.4712	1.6016	Negative value
ARIMAX	1.1471	1.7900	51.67%
SARIMAX	1.1472	1.7902	51.66%
Holt Winter's Exponential smoothing	1.6017	2.4719	Negative value

RESULTS AND EVALUATION FOR ICICI BANK STOCK

	Mean Absolute Error	Root Mean Squared Error	R^2 score
Auto Regression	2.1700	3.1046	Negative value
ARIMA	2.1703	3.1047	Negative value
SARIMA	2.1726	3.1056	Negative value
ARIMAX	1.9182	2.8441	32.53%
SARIMAX	1.9182	2.8441	32.53%
Holt Winter's Exponential smoothing	2.1619	3.0994	0.25%
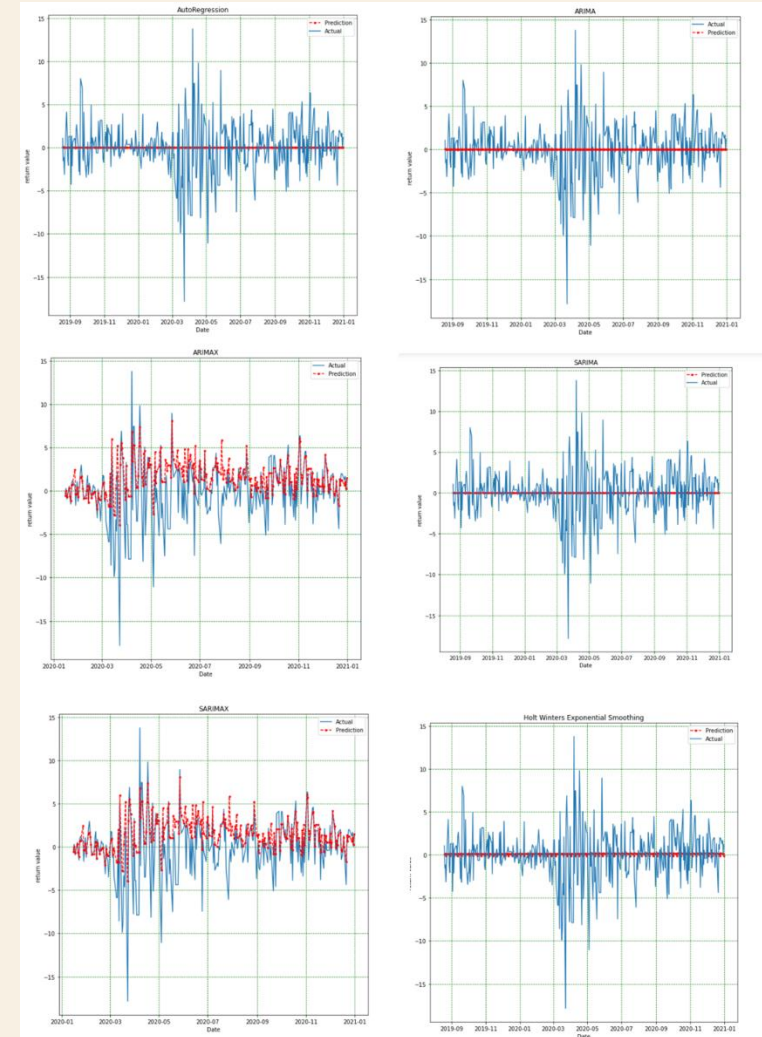
RESULTS AND EVALUATION FOR HINDUSTAN UNILEVER STOCK

	Mean Absolute Error	Root Mean Squared Error	R² score
Auto Regression	1.2637	1.9784	Negative value
ARIMA	1.2640	1.9786	Negative value
SARIMA	1.2554	1.9788	Negative value
ARIMAX	1.5563	3.4731	Negative value
SARIMAX	1.4158	2.2328	Negative value
Holt Winter's Exponential smoothing	1.2542	1.9776	0.01%
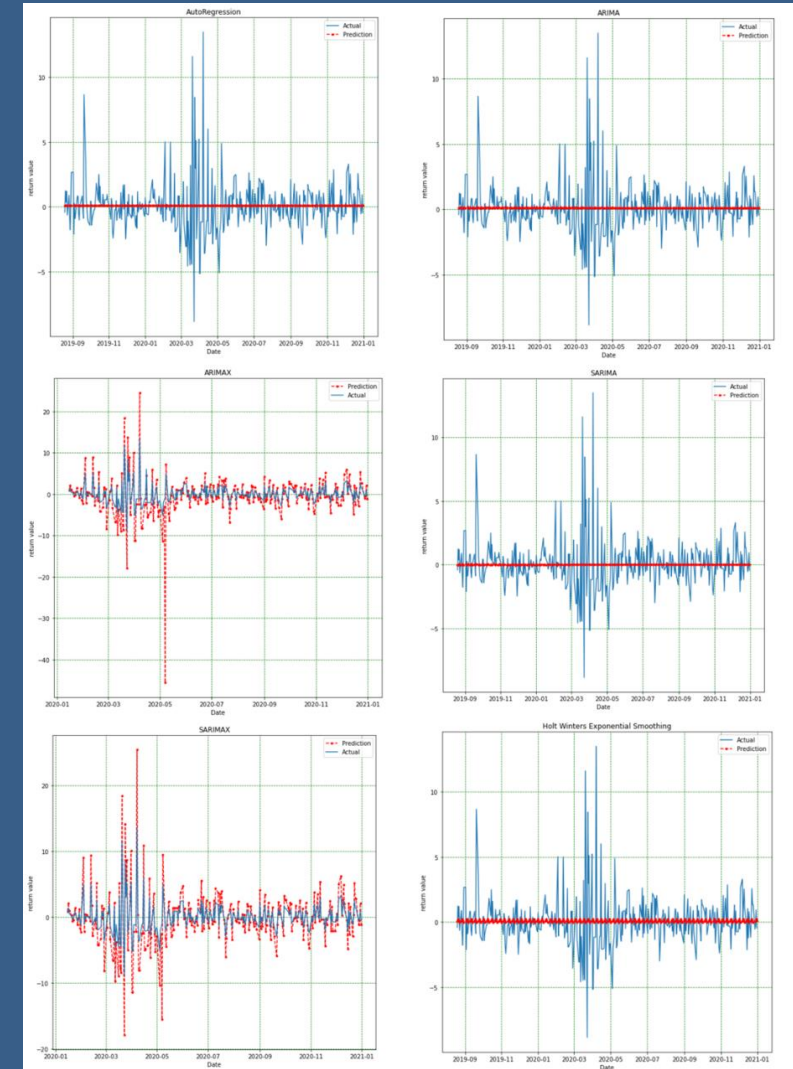
RESULTS AND EVALUATION FOR TCS STOCK

	Mean Absolute Error	Root Mean Squared Error	R² score
Auto Regression	1.4590	2.1002	Too big value
ARIMA	1.4587	2.1001	Too big value
SARIMA	1.4586	2.1009	Negative value
ARIMAX	0.3425	0.5925	93.4738%
SARIMAX	0.3424	0.5936	93.4749%
Holt Winter's Exponential smoothing	1.4554	2.1009	Negative value
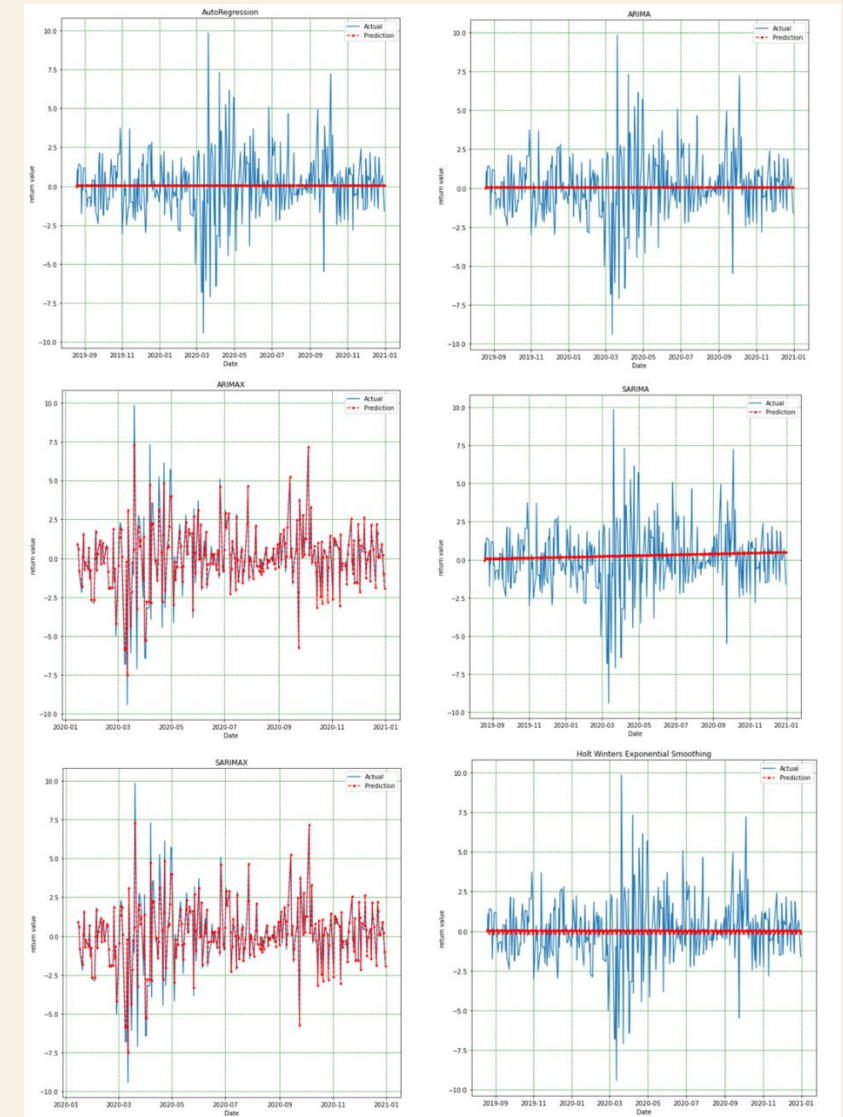
CONCLUSION

- Overall the best working model is ARIMAX.
- The worst model that correlates least is SARIMA.
- The best results can be seen for the stock TCS.
- The worst results can be seen for Hindustan Unilever.

FUTURE WORK

- Working on different sizes of dataset.
- Working on hybrid and deep learning models.
- Working on short –term, mid-term and long-term investment portfolios

THANK YOU

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