Predicting Stocks' Performance

Machine Learning & Python

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Agenda

- Introduction
- Methodology
- Results
- Analysis
- Key Takeaways

Introduction

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Our Team

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Mentor
Amazon
Sr. Big Data/ML Solutions Architect
Boise State University (BS)

Past Experiences: DataRobot, SimCorp, Bank of America

Benny Chen (He/Him)
Mentee
UBS
Investment Banking Summer Analyst
University of Michigan (BBA)

Past Experiences: BBB, NYS Assembly, Bank of America

Our Project

- Price dips are a good chance to increase your positions

"Whether we're talking about socks or stocks, I like buying quality merchandise when it is marked down."
- Warren Buffett (2009)

- Due to the impacts the coronavirus, stock market volatility has spiked and stock prices have plummeted
- Efficient deployment of capital
- Understand the companies' competitive positions in the market

Overall Market Performance (S&P 500)

Market Volatility (VIX)

Source: Google Finance (2020)

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About The Project

Mission: Present knowledge and skills gained during the mentorship around data engineering and artificial intelligence that apply to a business scenario. Integrate and apply the skills and knowledge gained through taking online courses and getting hands on with code.

Purpose: Predict companies' financial performance in the telecommunications industry segment using machine learning and Python in comparison to their peers.

Methodology

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Technical Details

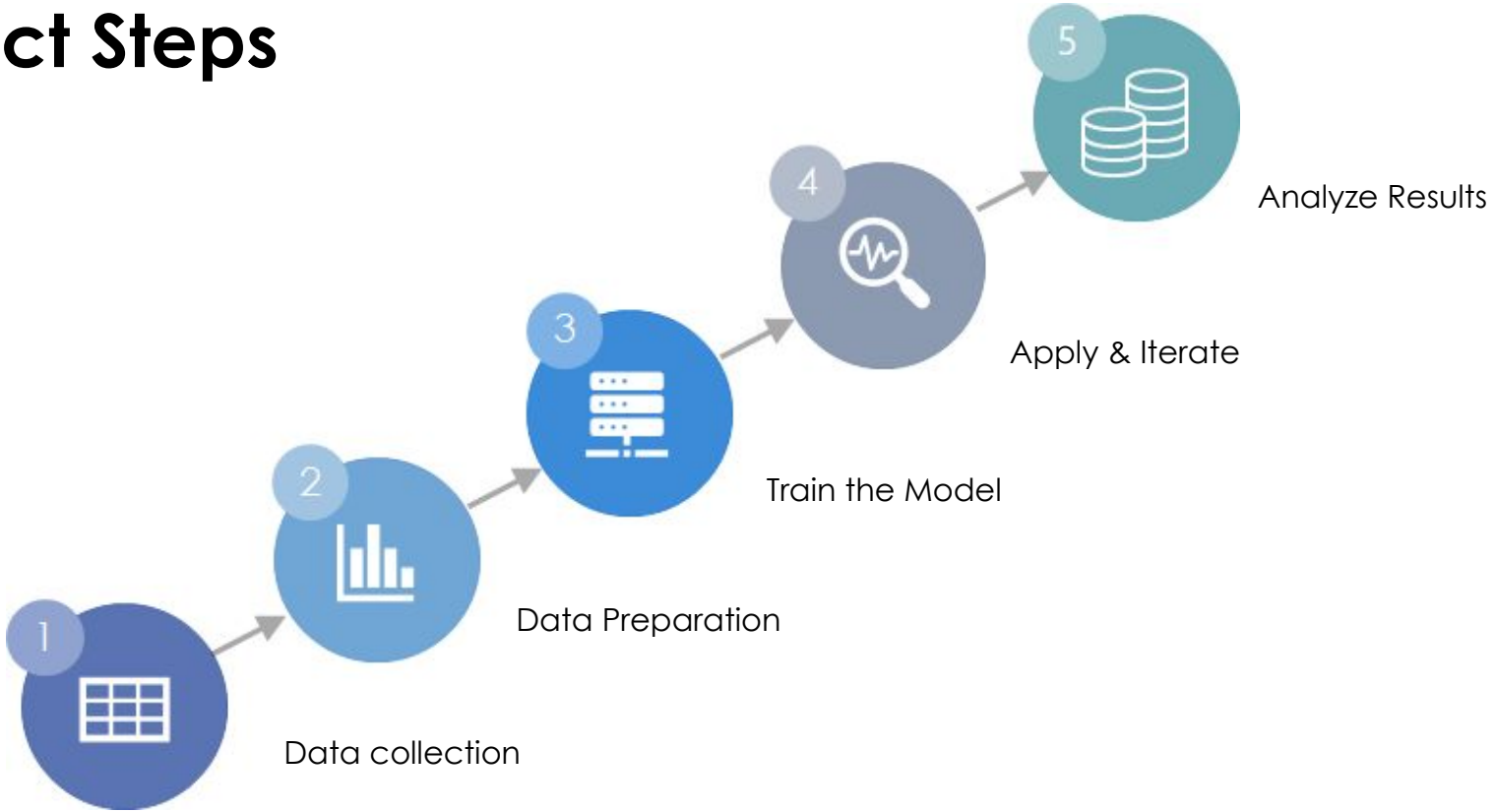
Technological Applications

Python was the sole programming language used in this project. Python was used from the data preparation to creation of the predictive algorithm.

The predictive algorithm used training sets that include 9 major telecommunications companies as listed below. The algorithm used 7 features that include major financial metrics that drive the stocks' performance - EPS, P/E Ratio, P/B Ratio, D/E Ratio, FCF, ROE, and ROA.

Training Set

Project Steps



Results & Analysis

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Method of Evaluation

- Predicting the price of a stock is extremely difficult, so we decided to predict how it performs against similar companies
- We took two approaches here to measure accuracy:
    - We took the top 2 companies we predicted to perform well and confirmed if they were in the top 2
    - We took the top (#1) company we predicted to perform well and confirmed it was in the top 3

Analysis & Implications

- In ranking based accuracy, our top ranked stock outperformed the peers 100% of the time
- For the top 2 stocks, for the 2019 year we missed only 25% of the time

2019 Q3	**3%** Average Error	**3%** Median of Error	**1%** Lowest Error	**9%** Highest Error
2019 Q4	**2%** Average Error	**2%** Median of Error	**0%** Lowest Error	**4%** Highest Error

Limitations

Limitations	Mitigant
• Missing data for some features on certain companies	• Pay to get access and spend more time on data collection
• Tested with only one model	• Test with multiple models
• May not have chosen the best features - lack telecommunication industry expertise	• Bring in a telecommunications industry Subject Matter Expert (SME)
• Interval of time assessed (Quarterly basis) vs. Precision of data	• Look at more granular data - week to week or month to month
• Black Swan Theory: Stock market is impacted by unpredictable events	• Consider and acknowledge the shortcomings

Key Takeaways

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Project Takeaways

- Scoping of the business problem is vital for a successful model
- Accuracy and scope trade-off
- Importance of understanding the shortfalls of the model
- Valuableness of quality data that is unbiased, accurate, and consistent

Personal Takeaways

- Expanded knowledge base through interactive learning of the project and Coursera classes
- Real life application of Python and Machine Learning
- Understand the power of Machine Learning
- Long-term positive impact on my career
- Using my knowledge to create positive change


Thank You!

Appendix A: Features Used

Financial Metric	Formula	Description
Earnings Per Share (EPS)	Net Income / Outstanding # common shares	Earning per each outstanding common share
Price-to-Earnings Ratio (P/E Ratio)	Price per share / EPS	Determine the market value of a stock compared to the company's earnings. Higher P/E ratio means stock is overvalued..
Price-to-Book Ratio (P/B Ratio)	Price per share / Book value per share	Compare net assets (Asset - Liab) to its market cap. P/B Ratio less than 1 is more attractive.
Debt-to-Equity Ratio (D/E)	Total Liab / Total Shareholders Equity	Help investors determine how a company finances its assets. Too much debt can be risky
Free Cash Flow (FCF)	EBIT * (1 - tax rate) + (Non-cash expense) - Change in NWC - Capex	Cash left over after a company pays for its operating expenses and capital expenditures (Capex).
Return on equity (ROE) / Return on net asset	Net Income / Avg Shareholders Equity	Measure of how effectively management is using a company's net assets (asset - debt) to create profits
Return on asset (ROA)	Net Income / Avg Assets	How efficient a company's management is at using its assets to generate earnings

Appendix B: Results

	2019 Q3			2019 Q4			2020 Q1		
	Predicted %Change	*Actual* %Change	*% Error & Ranking**	*Predicted* %Change	*Actual* %Change	*% Error & Ranking**	*Predicted* %Change	*Actual* %Change	*% Error & Ranking**
AT&T	18% ***1st***	21% ***1st***	3% ***Yes***	16% ***2nd***	17% ***3rd***	1% ***No***	3% ***3rd***	-23% ***5th***	-26% ***Yes***
CenturyLink	4% ***5th***	4% ***5th***	0% ***Yes***	11% ***4th***	12% ***4th***	1% ***Yes***	5% ***2nd***	-24% ***7th***	-29% ***No***
Cincinnati Bell	-48% ***9th***	-47% ***9th***	1% ***Yes***	108% ***1st***	112% ***1st***	9% ***Yes***	3% ***4th***	6% ***3rd***	3% ***Yes***
Charter	16% ***2nd***	19% ***2nd***	3% ***Yes***	14% ***3rd***	23% ***2nd***	4% ***No***	99% ***1st***	189% ***1st***	90% ***Yes***
Comcast	9% ***4th***	13% ***4th***	4% ***Yes***	3% ***6th***	6% ***6th***	3% ***Yes***	-21% ***9th***	-24% ***6th***	-3% ***Yes***
TDS	-17% ***8th***	-16% ***8th***	1% ***Yes***	-17% ***9th***	-16% ***9th***	1% ***Yes***	-1% ***5th***	-35% ***8th***	-34% ***Yes***
T-Mobile	10% ***3rd***	14% ***3rd***	4% ***Yes***	3% ***7th***	6% ***7th***	3% ***Yes***	-3% ***7th***	7% ***2nd***	10% ***No***
ViaSat	-4% ***7th***	-3% ***7th***	1% ***Yes***	3% ***5th***	7% ***5th***	4% ***Yes***	-2% ***6th***	-11% ***4th***	-9% ***Yes***
Verizon	0% ***6th***	2% ***6th***	2% ***Yes***	-10% ***8th***	-9% ***8th***	1% ***Yes***	-7% ***8th***	-52% ***9th***	-45% ***Yes***

*Green if *predicted* to be top 2 and was *actual* was in top 2
*Bright Green indicates top company performance

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