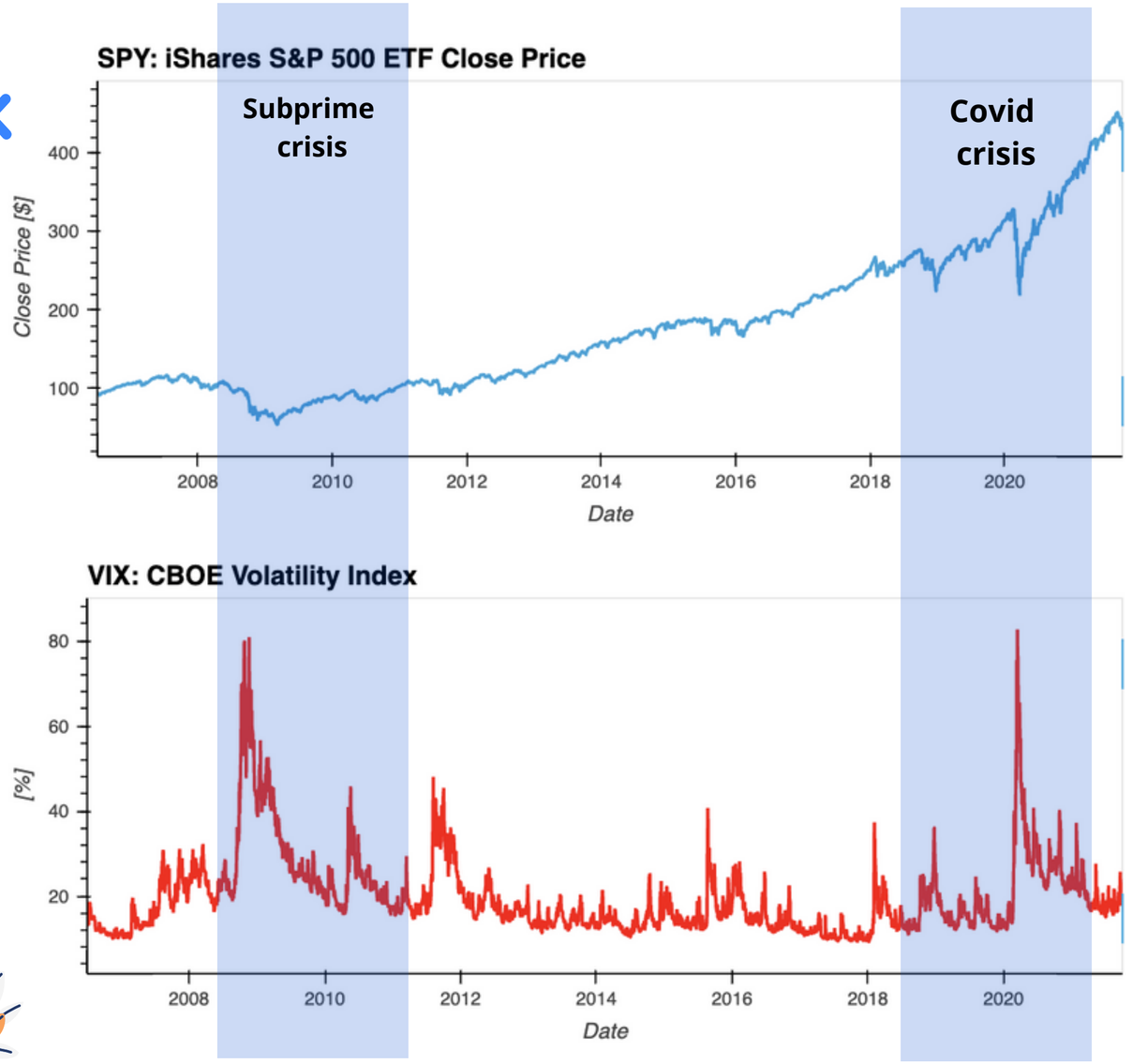
"It is far better to do the right thing wrong than to do the wrong thing right"

VIX Predictor

VIX: the Fear Index

5%
Average Daily Change



What is the VIX?

Forward indicator of the expected volatility of the S&P500.

Why?

It moves fast and have large daily changes.

What you are going to listen?

How we construct a tool to predict the VIX for daily trades using ML

Meet the Team

PAOLA CARVAJAL

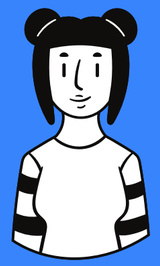
Project Lead/ Model Design

AHMED MOHAMED

Data Analysis / Coding

SANGRAM SINGH

Data Collection/ Model Design



DOREEN NGO

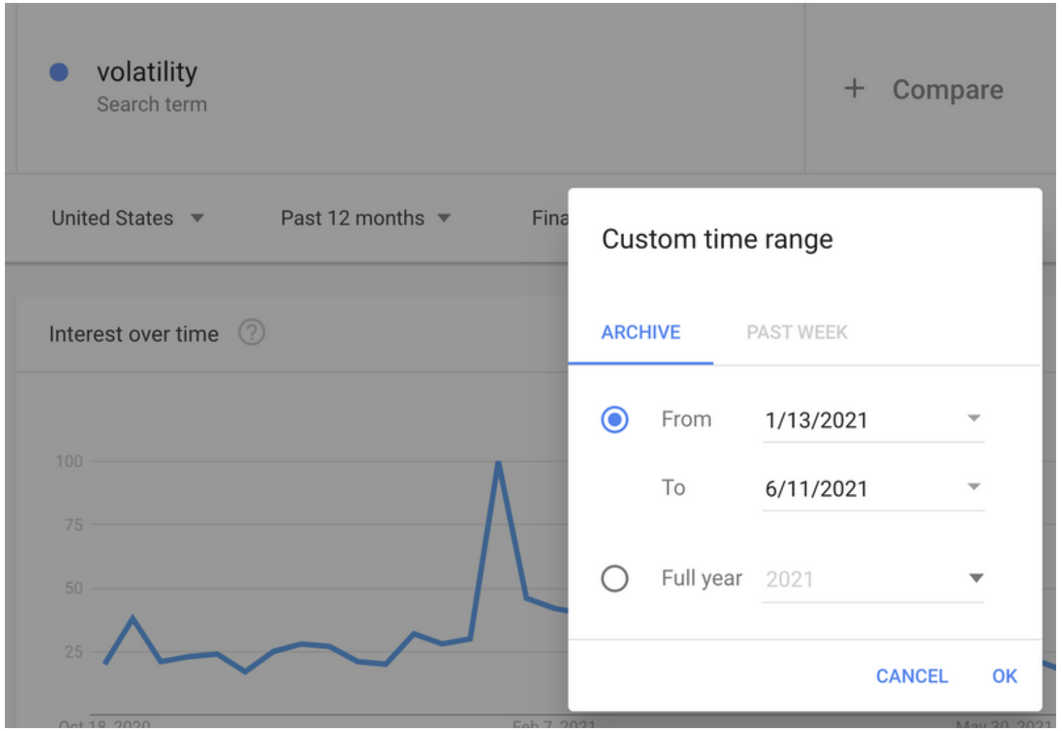
Data Collection / Marketing Strategy

Data Collection:

Google Trends

- data exploration tool that lets scholars, marketers, etc better understand what audiences are interested in and curious about, in real-time
- We used words that would affect the VIX, past and future
- the website uses graphs to display the volume of the words popularity

banking	Oct 10, 2021 at 2:18 PM	97 KB	CSV Document
CCI	Oct 9, 2021 at 8:14 PM	92 KB	CSV Document
consumer	Oct 10, 2021 at 2:51 PM	97 KB	CSV Document
covid	Oct 10, 2021 at 8:17 AM	10 KB	CSV Document
covid_mutation	Oct 10, 2021 at 9:21 AM	8 KB	CSV Document
depression	Oct 10, 2021 at 3:20 PM	94 KB	CSV Document
GDP	Oct 9, 2021 at 8:15 PM	94 KB	CSV Document
INFLATION	Oct 9, 2021 at 8:13 PM	99 KB	CSV Document
jobless_claims	Oct 11, 2021 at 8:12 PM	92 KB	CSV Document
liquidity	Oct 10, 2021 at 9:57 AM	95 KB	CSV Document
pandemic	Oct 10, 2021 at 9:14 AM	15 KB	CSV Document
unemployment	Oct 10, 2021 at 8:17 AM	96 KB	CSV Document
virus	Oct 10, 2021 at 8:57 AM	99 KB	CSV Document
VIX	Oct 8, 2021 at 6:41 PM	94 KB	CSV Document

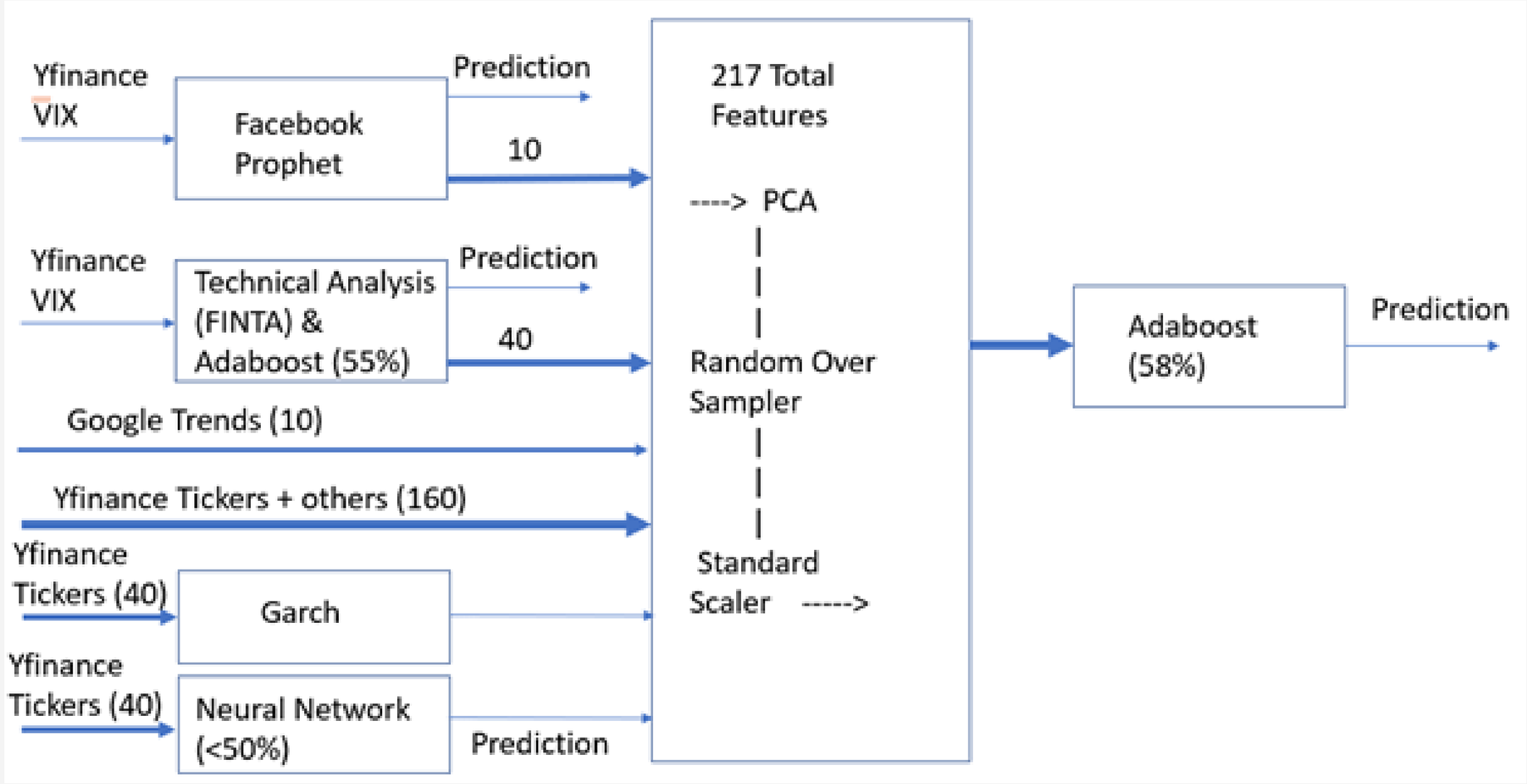


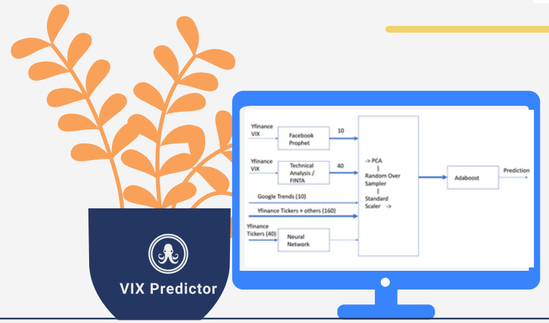
Time Series

Feature Name 217 total	Asset Class / Exposure							Geographic Location				
								Developed			Emerging	Global
	Currency Exchange Rate	Stock	Index/ETF Equity	Index/ETF Fixed Income	Index/ETF Commodities	Real Estate	Futures	Euro Zone	U.S.A.	Japan	Brazil	Global
Brazilian Real USD exchange rate	Brazil/US										Brazil	
Five-Year US Treasury Note Future				Treasury 5Y			Treasury 5Y		Treasury 5Y			
Nasdaq 100 Futures							Nsdq 100		Nasdaq 100			
Nikkei/USD Futures			Nikkei				Nikkei			Japan		
iShares Inv. Grade Corporate Bond ETF				Corp Bonds					Corp Bonds			
SPDR EURO STOXX 50 ETF			STOXX 50									
iShares S&P500 ETF			S&P 500									
Great Britain Pound USD exchange rate	GBP/US											
Nasdaq 100 Futures			Nsdq 100				Nsdq 100					
Apple Inc common stock		APPL							APPL			
Micron Technology, Inc.		MU							MU			
Bristol-Myers Squibb Company - Farmaceuticals		BMY							BMY			
iShares MSCI Eurozone ETF			MSCI EZ									
SPDR Gold Shares					GOLD							GOLD
iShares Silver Trust					SILVER							SILVER
Treasury Yield 10 Years				Treasury 10Y			Treasury 10Y		Treasury 10Y			
Prologis, Inc.						PLD			PLD			PLD
SPDR EURO STOXX 50 ETF			STOXX 50									
CAC 40 - France Index			CAC 40									
Apple Inc common stock		APPL							US			
FTSE 100 - London Stock Exchange			FTSE 100									

- yahoo!finance
- Economic and Financial Series
- Neural Network

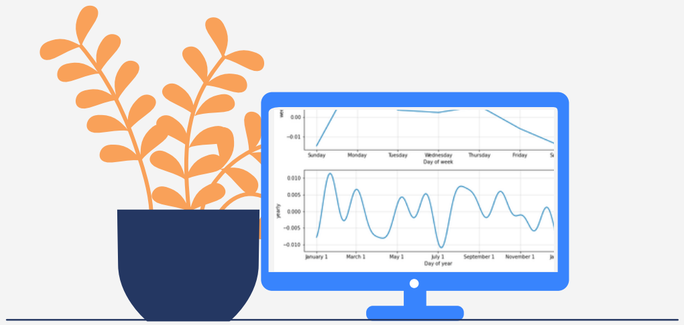
Our Machine Learning Model

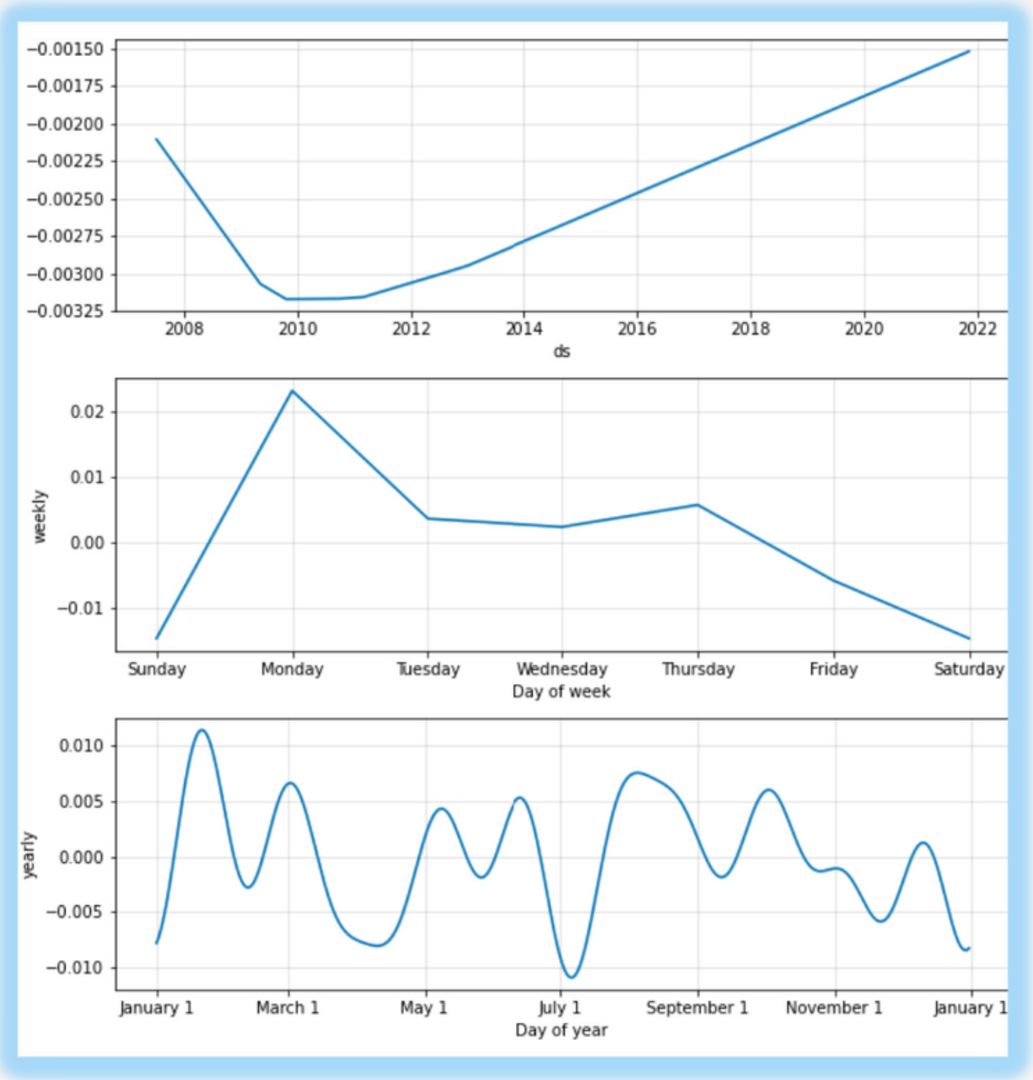




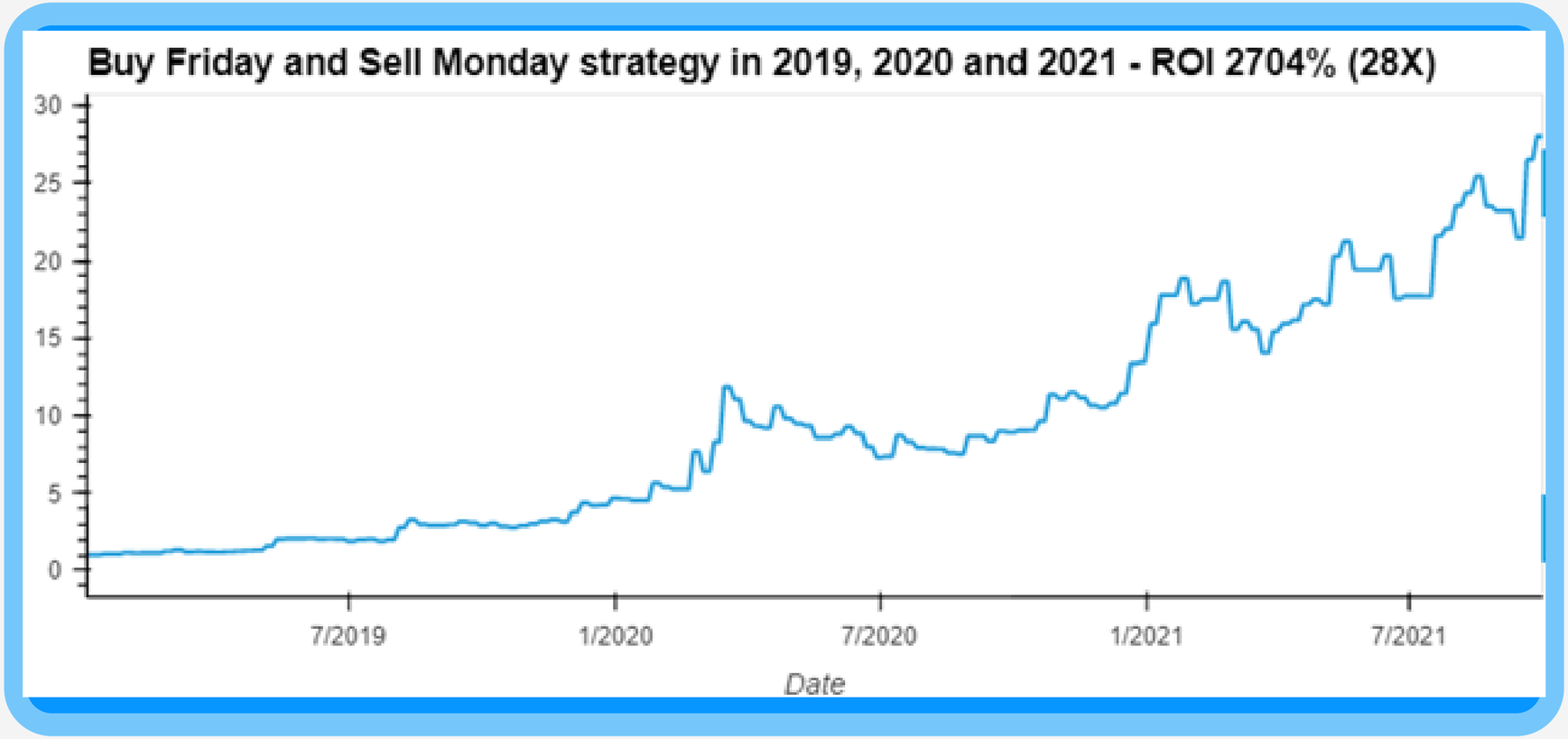
Sangram

Seasonality in VIX returns using Prophet





ROI on BUY on Friday SELL on Monday

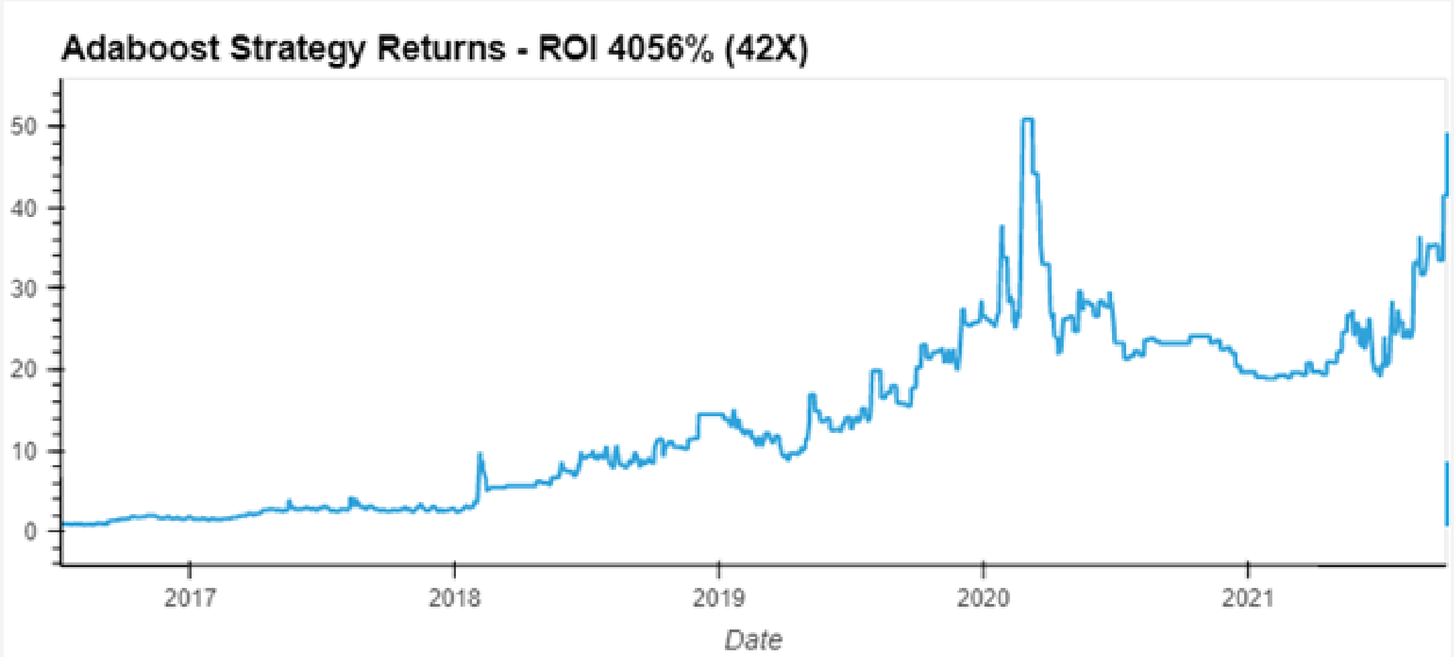


Sangram

Technical Analysis

SMA10
SMA15
SMA20
SMA50
SMA100
SMA150
SMA200
SMA250

BOLLINGER BANDS



AdaBoost Classification Report

	precision	recall	f1-score	support
0.0	0.59	0.50	0.54	713
1.0	0.51	0.60	0.55	608
accuracy			0.55	1321
macro avg	0.55	0.55	0.55	1321
weighted avg	0.55	0.55	0.55	1321

adaBoost Demo

In [40]:
```
for num_estimators in range (20,200, 2):
    for num_components in range (4, 90, 2):
        adaboost_model = AdaBoostClassifier(n_estimators=num_estimators)
        pca = PCA(n_components=num_components)
        pca.fit(X_train_scaled)
        principal_train_components = pca.transform(X_train_scaled)
        principal_test_components = pca.transform(X_test_scaled)

        # Fit the model
        adaboost_model = adaboost_model.fit(principal_train_components, y_train)
        pred_adaboost = adaboost_model.predict(principal_test_components)
        # Use a classification report to evaluate the model using the predictions and testing data
        adaboost_report=classification_report(y_test, pred_adaboost)

        #if num_estimators % 10 == 0 and num_components == 88:
        #    print(f"components {num_components} esimators {num_estimators}")
        #    print(f"f1 score 0 {f1_score(y_test, pred_adaboost, pos_label=0)} f1 score 1 {f1_score(y_test, pred_adaboost, pos
_label=1)}")
        #    print(f"accuracy {accuracy_score(y_test, pred_adaboost)}")
        #    print(adaboost_report)
        if accuracy_score(y_test, pred_adaboost) >= .50 and f1_score(y_test, pred_adaboost, pos_label=1) >= .50:
            print(f"components {num_components} esimators {num_estimators}")
            print(f"variance explained {sum(pca.explained_variance_ratio_)}")
            # Print the classification report
            print("         AdaBoost Classification Report")
            print(adaboost_report)
```

```
components 4 esimators 20
variance explained 0.5296849957698202
         AdaBoost Classification Report
              precision    recall  f1-score   support

         0.0       0.60      0.65      0.62       748
         1.0       0.54      0.48      0.51       631

    accuracy                           0.57      1379
   macro avg       0.57      0.57      0.57      1379
weighted avg       0.57      0.57      0.57      1379

components 6 esimators 20
variance explained 0.5928873314630516
         AdaBoost Classification Report
              precision    recall  f1-score   support

         0.0       0.59      0.74      0.66       748
         1.0       0.56      0.39      0.46       631

    accuracy                           0.58      1379
   macro avg       0.57      0.56      0.56      1379
weighted avg       0.58      0.58      0.57      1379

components 8 esimators 20
variance explained 0.6294543823723278
         AdaBoost Classification Report
```

AdaBoost Vix Predictor Model: Features Importance

X Feature Type	Security Name	Asset Class / Exposure							Geographic Location				
									Developed			Emerging	Global
		Currency Exchange Rate	Stock	Index/ETF Equity	Index/ETF Fixed Income	Index/ETF Commodities	Real Estate	Futures	Euro Zone	U.S.A.	Japan	Brazil	Global
GARCH MODELS	Brazilian Real USD exchange rate	Brazil/US										Brazil	
	Five-Year US Treasury Note Future				Treasury 5Y			Treasury 5Y		Treasury 5Y			
	Nasdaq 100 Futures							Nsdq 100		Nasdaq 100			
	Nikkei/USD Futures			Nikkei				Nikkei			Japan		
	iShares Inv. Grade Corporate Bond ETF				Corp Bonds					Corp Bonds			
	SPDR EURO STOXX 50 ETF			STOXX 50									
SQUARED RETURNS	iShares S&P500 ETF			S&P 500									
	Great Britain Pound USD exchange rate	GBP/US											
	Nasdaq 100 Futures			Nsdq 100				Nsdq 100					
	Apple Inc common stock		APPL							APPL			
	Micron Technology, Inc.		MU							MU			
	Bristol-Myers Squibb Company - Farmaceuticals		BMY							BMY			
	iShares MSCI Eurozone ETF			MSCI EZ									
	SPDR Gold Shares					GOLD							GOLD
	iShares Silver Trust					SILVER							SILVER
RETURNS	Treasury Yield 10 Years				Treasury 10Y			Treasury 10Y		Treasury 10Y			
	Prologis, Inc.						PLD			PLD			PLD
	SPDR EURO STOXX 50 ETF			STOXX 50									
	CAC 40 - France Index			CAC 40									
VOLUME	Apple Inc common stock		APPL							US			
	FTSE 100 - London Stock Exchange			FTSE 100									
WEEKLY SEASONALITY : Friday effect													

Our Business Model

These are the packages we offer to customers

Basic Plan

Prophet based strategy
"Buy Friday, Sell Monday"

Premium Plan

Includes the Basic Plan. Added with the Technical Indicator Model with 55% accuracy.

Business Plan

Includes everything from Basic and Premium plans. Added, we offer to Hedgefunds a 58% accurate super model, to manage their funds and to provide a buy signal API

Future Roadmap

Where VIX predictions can lead....

In future we plan to provide MVP (minimal viable product) to early adopters...

...& World Domination

Contact Us

github.com/sangramsinghg/vix_predictor

bootcamp.berkeley.edu/fintech/.com

candersh@bootcampspot.com

Thank You

- Resources:
  - Osterrieder, J., Kucharczyk, D., Rudolf, S. et al. Neural networks and arbitrage in the VIX. Digit Finance 2, 97–115 (2020). https://doi.org/10.1007/s42521-020-00026-y
  - Yunfei Bai* and Charlie X. Cai** (2021). Predicting VIX with Adaptive Machine Learning. University of Liverpool Management School https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3866415
  - Investipedia: 'Tracking Volatility With the VIX'
  - VIX Volatility Index Suite, Cboe Global Markets, Inc. https://www.cboe.com/tradable_products/vix/vix_futures/
  - SKLearn documentation
  - Kevin Sheppard: "Introduction to ARCH Models", Revision 318309ac, https://arch.readthedocs.io/en/latest/univariate/introduction.html
  - Yahoo Finance

- Technologies:
  - Jupyter Notebook/Lab
  - Google Trends
  - Python
  - SKLearn Machine Learning Package

VIX Predictor