G2 Presentation

Determine the relationship between VN-Index and VCB on VN stock exchange

INSTRUCTORS: NGUYEN VAN SANG

Member

BUI THI ANH

NGUYEN TAT DAT

HOANG ANH MINH

LE HUU PHUOC

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Introduction

-In the process of assessing, implementing, and planning economic policies, stock market information is a crucial channel. It helps managers analyze the "health" of the economy, allowing them to take appropriate macroeconomic management actions.
-R is a free, open-source program used for statistical and graph analysis that can be downloaded at r-project.org. R supports the great majority of business analytical approaches, including statistics, machine learning, and optimization techniques.

Project Goals

PRODUCT

- Develop a predictive model to determine The relationship between VN-Index and VCB on VN stock exchange

SERVICE

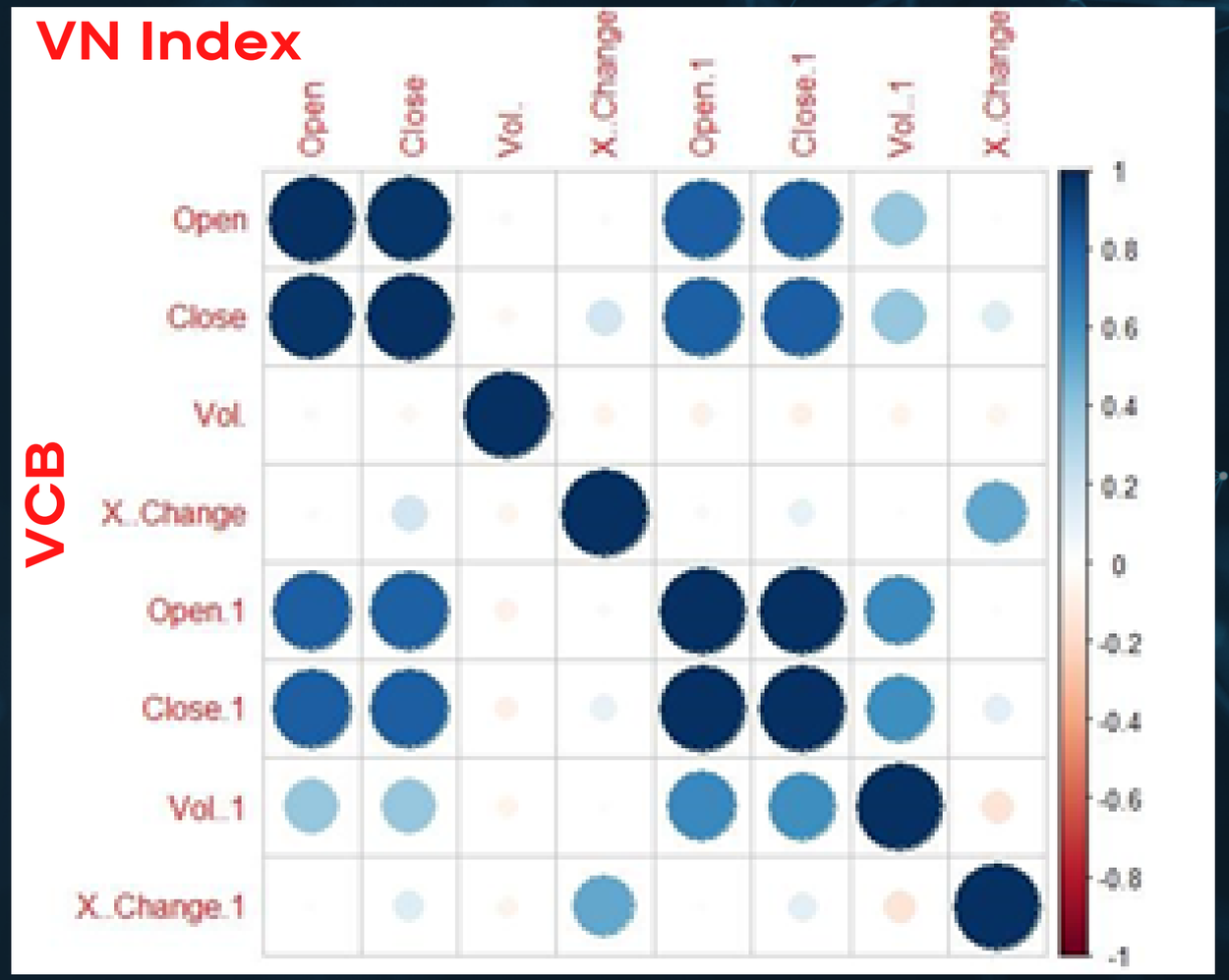
Model’s predictive power should be at least as good as customer retention

METHOD

Models should scale to run on a data set in production environment on monthly basi

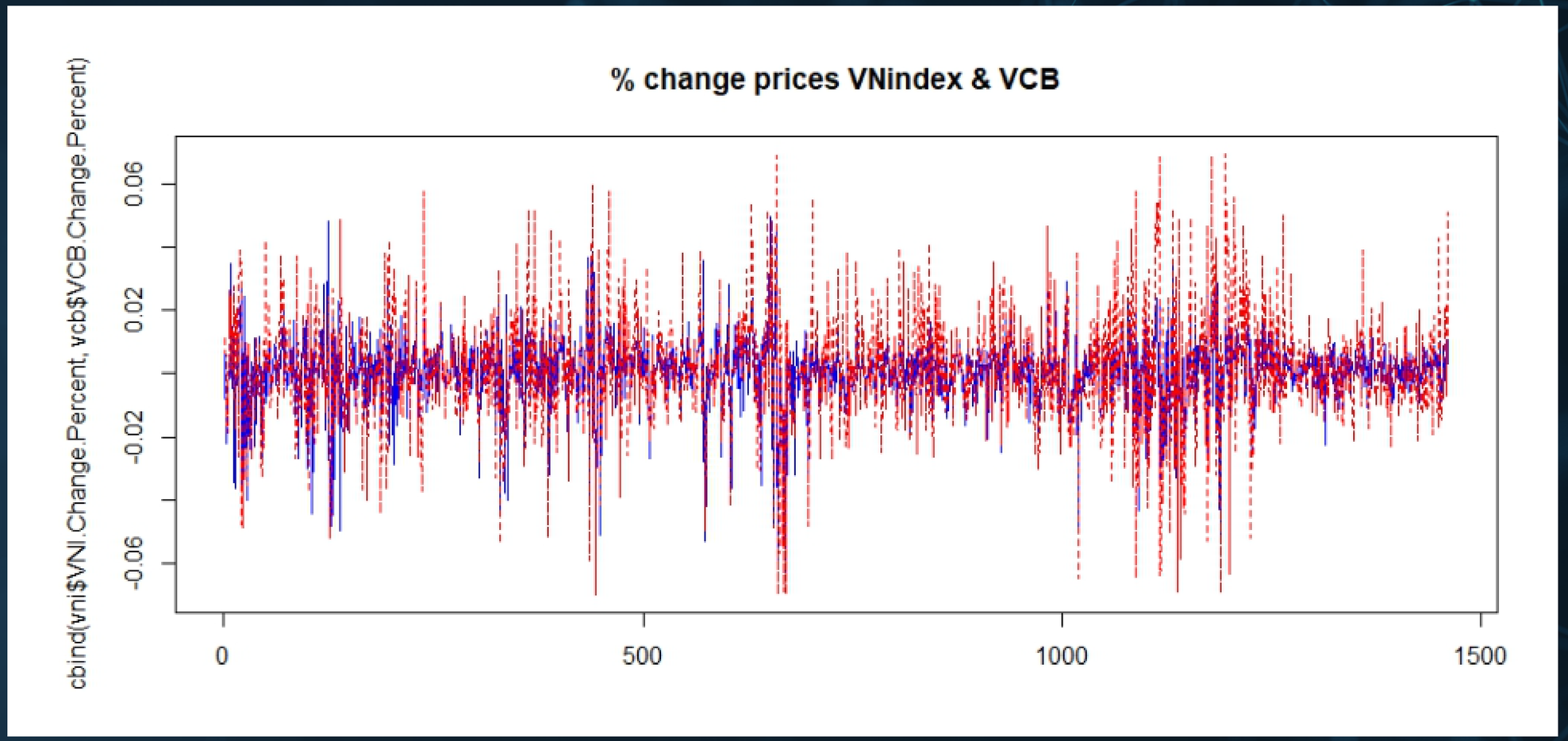
Main Finding

- Understand the relationship between 2 stocks
- Determine when to buy and sell stocks (for reference only), price prediction



Main Finding

VNI and VCB stock percentage change show that VCB stock have a certain impact into VNI stocks which mean if VCB stock declines then it's not 100% that in the exact same time the VNI stock will decline as well but it will have some decline in the line.



Approach

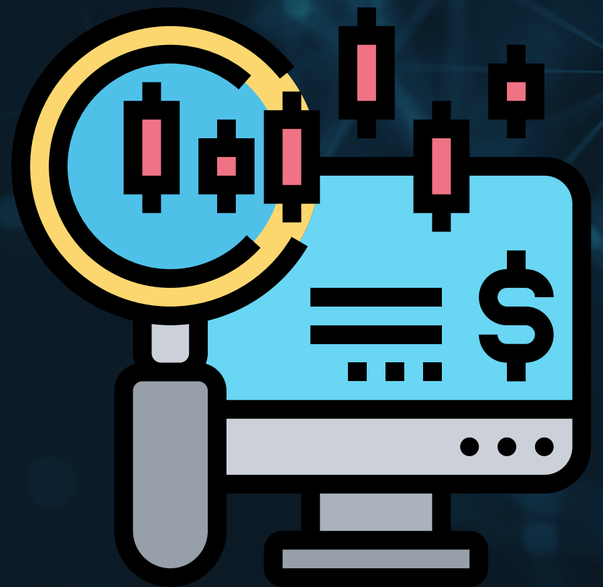
- Interviewed a professional in stocks field
- Predictive model to determine the relationship between VN-Index and VCB on VN stock exchange
- Consult some source about rpubs to have more knowledgeable about how to use R in analysis
- Summarize and take data from websites like investing.com,...
- Collaborated with IT to identify relevant datasets and assess data quality and availability

Model Description

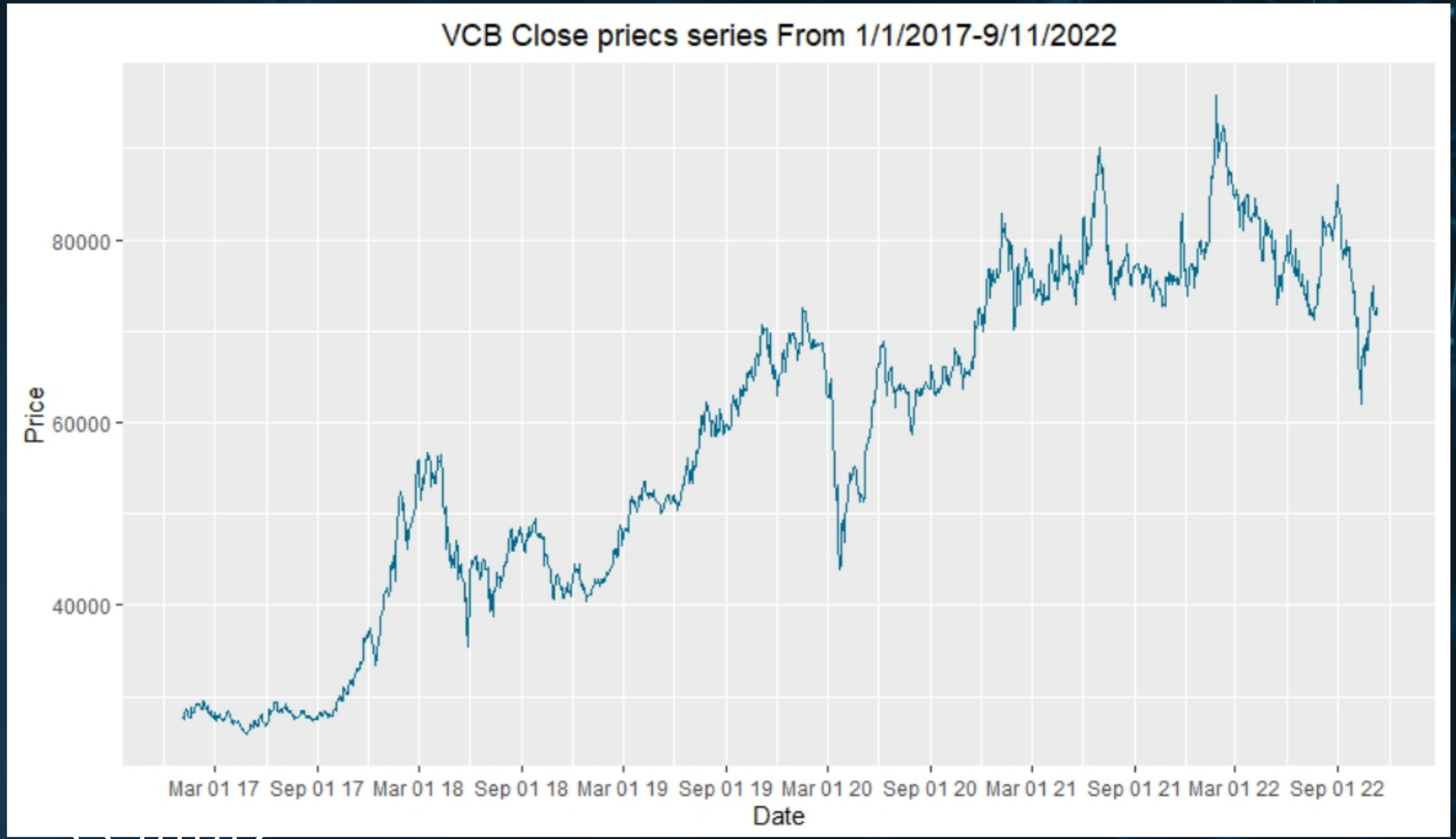
- Overview of Basic methodology: find the correlation from the data of the ticker VCB with the ticker of VN Index. Determine it is a strong correlation, covariate and compare with reality
- Model: Linear Regression Model
- Dependent variable: numberic variances, churn
- Scope:
  - 1461 days of VCB's History Prices from 1/1/2017 to 9/11/2022
  - 1461 days of VNI's History Prices from 1/1/2017 to 9/11/2022
  - Compare the attributes of two data sets taken over the same time period: opening price, closing price, %change
- Sampling:
  - Training: 4383 records
  - Testing: 1461 records

Vietcombank

Vietnam Index

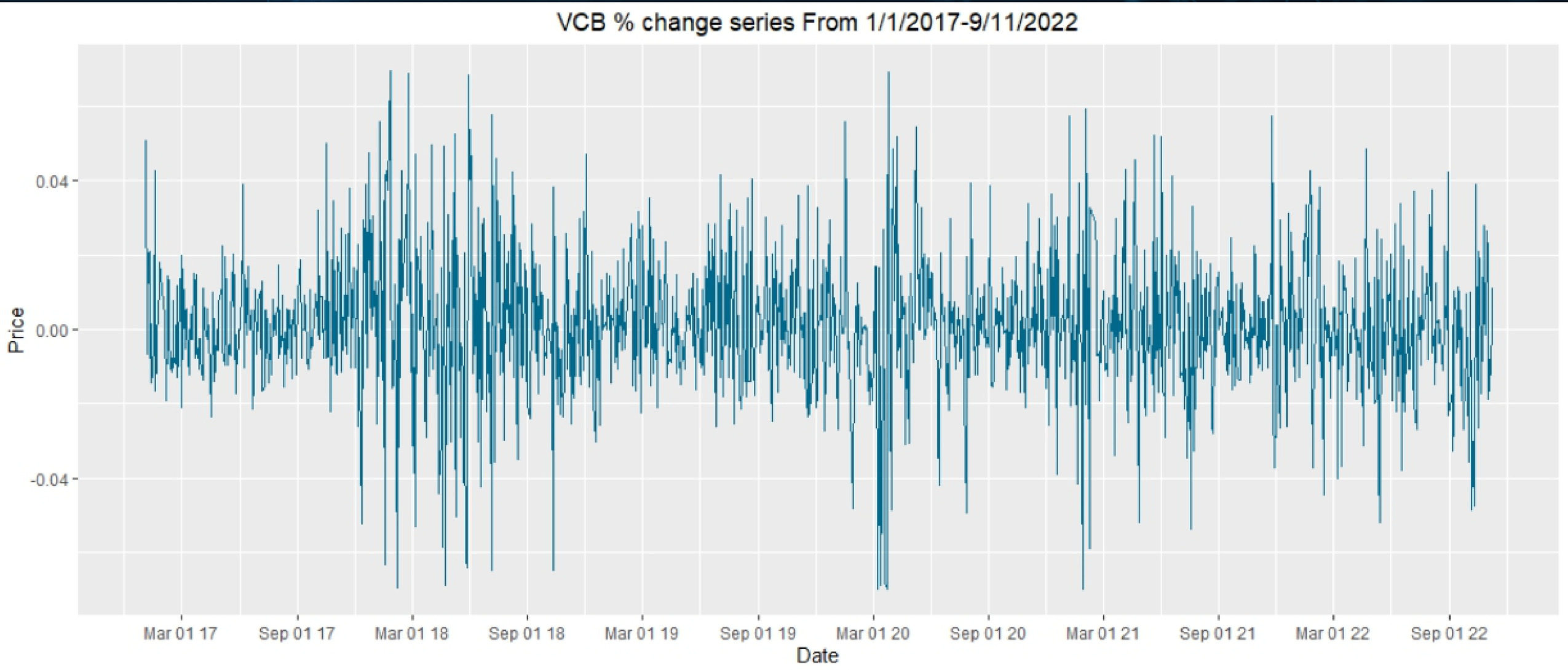


Key Points Supported with Data



Vietcom Bank Close Prices

Key Points Supported with Data



Vietcom Bank % change series

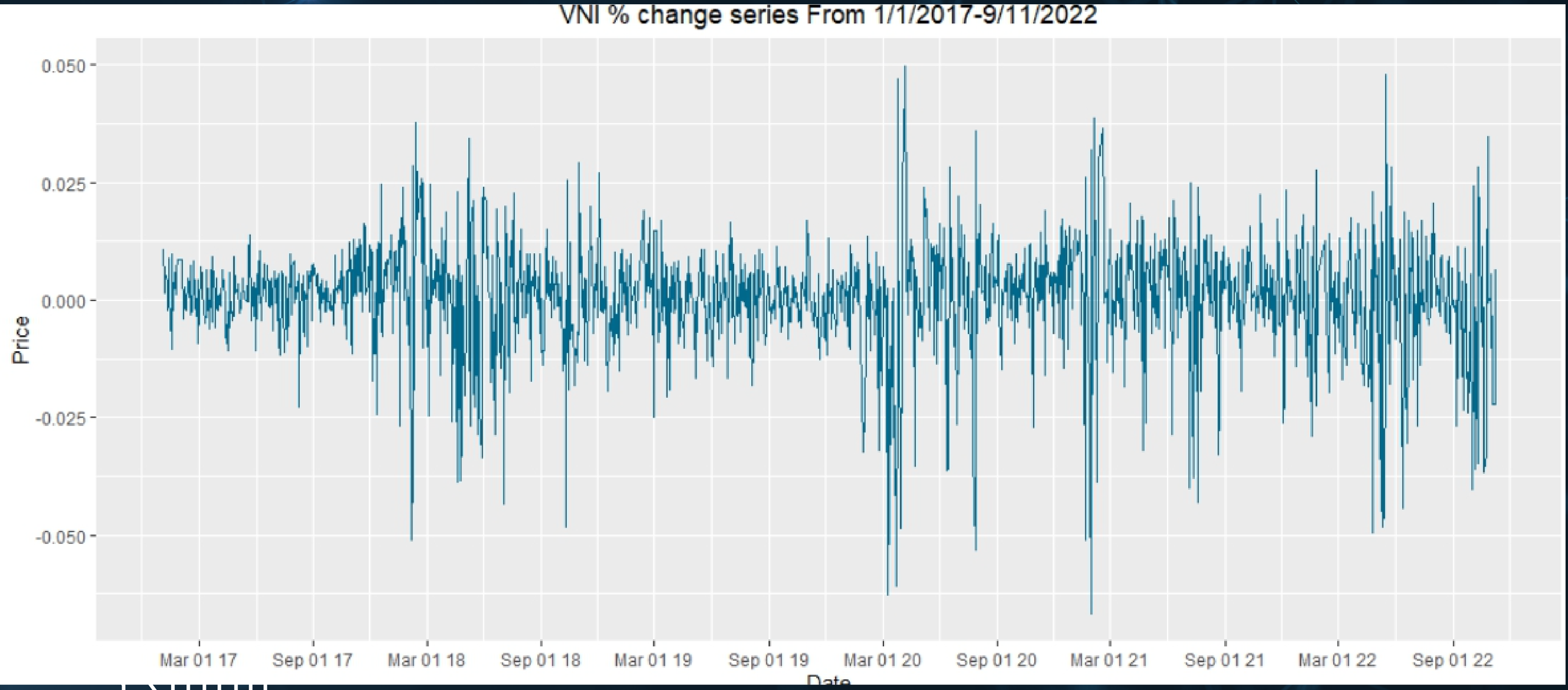
Key Points Supported with Data

VN-Index

VN-Index Close Prices

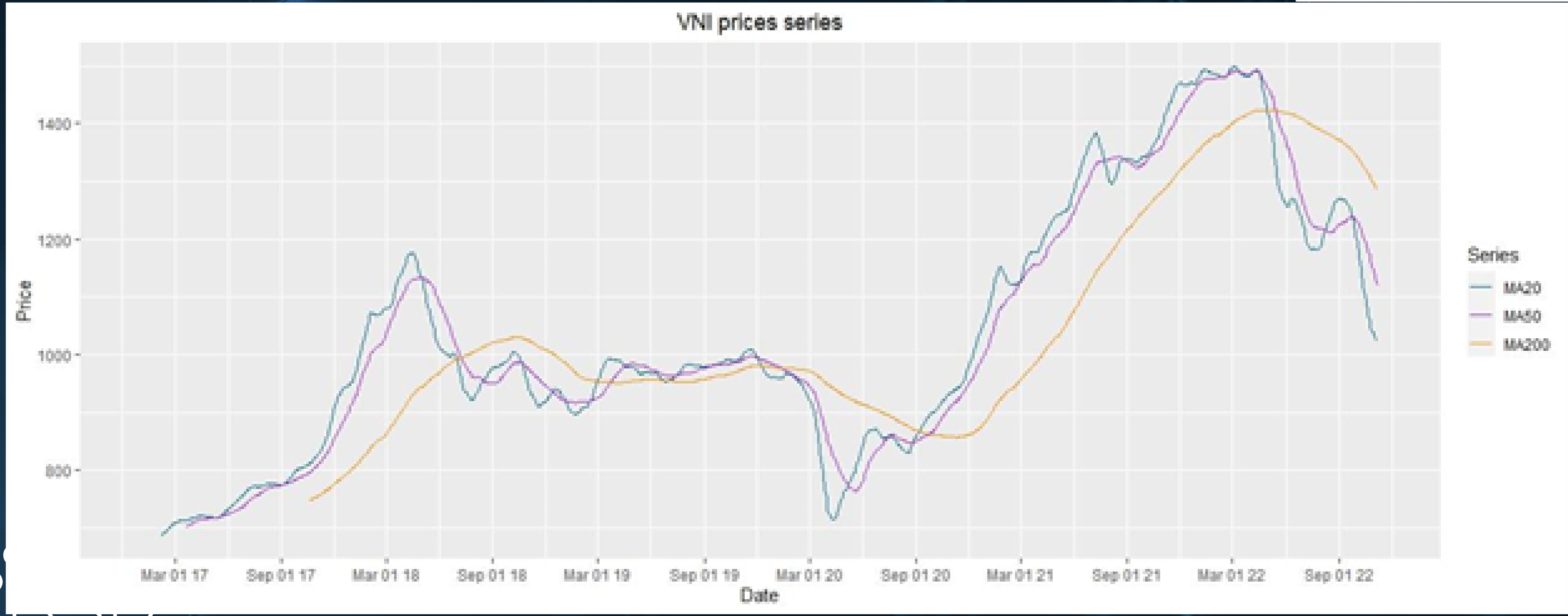
Key Points Supported with Data

VN-Index



VN-Index % Change Series

Key Points Supported with Data



Vietcom Bank Moving Average

Key Points Supported with Data

VN-Index

VN Index Moving Average

Model Details

```
>
> # create lags of closing price
> vcb$lvcb.Close <- lag(vcb$VCB.Close, 1)
> vni$lvni.Close <- lag(vni$VNI.Close, 1)
>
>
> # merge both dataframe to data
>
> data <- merge(vcb, vni)
>
> # show the first few rows of stocks to make sure you have:
> head(data)
        Date VCB.Close VCB.Open VCB.High VCB.Low VCB.Vol. VCB.Change.Percent
1 2017-01-03     27643    26418    27828   26418    2.58M              0.0508
2 2017-01-04     27457    27828    27903   27309    1.71M             -0.0067
3 2017-01-05     27569    27383    27680   27346    1.09M              0.0041
4 2017-01-06     28125    27606    28496   27531    3.18M              0.0202
5 2017-01-09     28719    28348    28904   28274    3.04M              0.0211
6 2017-01-10     28496    28496    28682   28459    1.57M             -0.0078
  lvcb.Close VNI.Close VNI.Open VNI.High VNI.Low VNI.Vol VNI.Change.Percent lvni.Close
1      27457    672.01   665.92   672.34  665.43  84.66K              0.0107     674.70
2      27569    674.70   672.58   675.93  672.21 110.03K              0.0040     675.81
3      28125    675.81   674.82   675.92  673.31 102.17K              0.0016     679.80
4      28719    679.80   675.35   683.76  675.22 127.41K              0.0059     682.57
5      28496    682.57   681.74   684.88  681.74 101.40K              0.0041     681.07
6      28533    681.07   682.77   683.02  680.76  87.80K             -0.0022     687.16
> cor(data$lvni.Close, data$lvcb.Close, use="complete.obs")
[1] 0.8088766
> cor(data$VNI.Close, data$lvni.Close, use="complete.obs")
[1] 0.9982375
```

Linear Regression Model

Model Details

```
> # run a linear model and summarize
> mod1 <- lm(VCB.Close ~ lvcb.Close + VNI.Close + lvni.Close, data=data)
> summary(mod1)

Call:
lm(formula = VCB.Close ~ lvcb.Close + VNI.Close + lvni.Close,
    data = data)

Residuals:
    Min      1Q  Median      3Q     Max
-5629.6  -352.2    53.5   418.9  3467.9

Coefficients:
              Estimate Std. Error t value Pr(>|t|)
(Intercept) -61.190836 106.840647  -0.573    0.567
lvcb.Close    0.996433   0.002026 491.753   <2e-16 ***
VNI.Close    56.543879   1.659930  34.064   <2e-16 ***
lvni.Close  -56.303276   1.663787 -33.840   <2e-16 ***
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 824.1 on 1456 degrees of freedom
  (1 observation deleted due to missingness)
Multiple R-squared:  0.9979,    Adjusted R-squared:  0.9979
F-statistic: 2.348e+05 on 3 and 1456 DF,  p-value: < 2.2e-16

>
> mod2 <- lm(VNI.Close ~ lvcb.Close + VCB.Close + lvni.Close, data=data)
> summary(mod2)
```

Linear Regression Model

```
> mod2 <- lm(VNI.Close ~ lvcb.Close + VCB.Close + lvni.Close, data=data)
> summary(mod2)

Call:
lm(formula = VNI.Close ~ lvcb.Close + VCB.Close + lvni.Close,
    data = data)

Residuals:
    Min      1Q  Median      3Q     Max
-42.471  -4.867  -0.804   3.614  65.292

Coefficients:
              Estimate Std. Error t value Pr(>|t|)
(Intercept)  1.0241630  1.2581962   0.814    0.416
lvcb.Close  -0.0077993  0.0002311 -33.756   <2e-16 ***
VCB.Close    0.0078435  0.0002303  34.064   <2e-16 ***
lvni.Close   0.9965671  0.0019746 504.690   <2e-16 ***
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 9.706 on 1456 degrees of freedom
  (1 observation deleted due to missingness)
Multiple R-squared:  0.998,     Adjusted R-squared:  0.998
F-statistic: 2.473e+05 on 3 and 1456 DF,  p-value: < 2.2e-16

> # make a model forecast
> predicted1 <- predict(mod1, newdata=data)
> predicted2 <- predict(mod2, newdata=data)
>
```

Model Details

```
> # make a model forecast
> predicted1 <- predict(mod1, newdata=data)
> predicted2 <- predict(mod2, newdata=data)
>
```

```
> # calculate correlation
> cor(data$VCB.Close, predicted1, use="complete.obs")
[1] 0.9989683
> cor(data$VNI.Close, predicted2, use="complete.obs")
[1] 0.9990201
> # calculate MAE
> mean(abs(data$VCB.Close - predicted1), na.rm=T)
[1] 573.6474
> mean(abs(data$VNI.Close - predicted2), na.rm=T)
[1] 6.608349
>
```

The mean absolute error shows that even though there is a strong correlation between the predicted stock price and the true stock price, there is still variability. The MAE of VNI is 6.608 shows that on average the predicted stock price will be off by 6.608 VND. The MAE of VCB is 573.648 shows that on average the predicted stock price will be off by 573.648 VND

Model Details

Investing.com

Search the website...

Vietcombank 74,300 -1,200 (-1.62%)

Overview | Profile | Historical Data | Index Component

VCB Historical Data

Time Frame:

Daily

Download Data

10/11/2022 - 11/11/2022

Date	Price	Open	High	Low	Vol.	Change %
11/10/2022	74,300	73,700	74,300	71,600		
11/09/2022	74,000	73,000	75,000	72,500		
11/08/2022	72,600	72,000	75,000	71,600		

VNI 947.24 -38.35 (-3.89%)

Overview | Components | Historical Data

VN Index Historical Data

Time Frame:

Daily

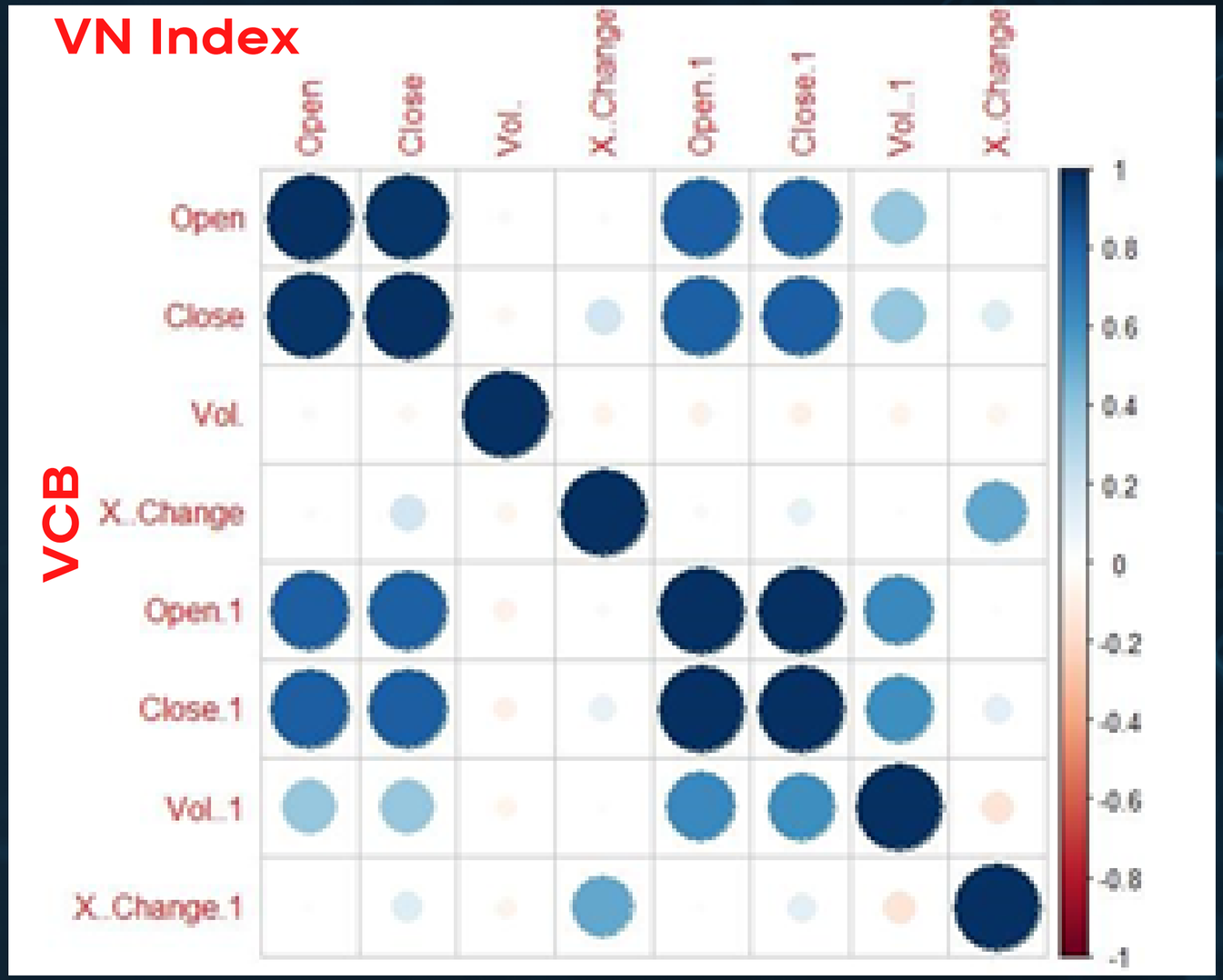
Download Data

10/11/2022 - 11/11/2022

Date	Price	Open	High	Low	Vol.	Change %
11/10/2022	947.24	975.97	976.31	935.78	698.76K	-3.89%
11/09/2022	985.59	981.65	994.79	977.93	583.06K	+0.40%

Model Details

Correlation method



Model Details

```
> cor.test(data$VCB.Close, data$VNI.Close)

        Pearson's product-moment correlation

data:  data$VCB.Close and data$VNI.Close
t = 52.61, df = 1459, p-value < 2.2e-16
alternative hypothesis: true correlation is not equal to 0
95 percent confidence interval:
 0.7907425 0.8262082
sample estimates:
      cor
0.8092113
```

Correlation method

```
> cor(data$VCB.Close, data$VNI.Close, method = "spearman")
[1] 0.8167266
> cor(data$VCB.Close, data$VNI.Close, method = "kendall")
[1] 0.6332884
> cor(data$VCB.Close, data$VNI.Close, use = "complete.obs")
[1] 0.8092113
```

Model Details

Open Price

```
> cor.test(data$VCB.Open, data$VNI.Open)

        Pearson's product-moment correlation

data:  data$VCB.Open and data$VNI.Open
t = 53.048, df = 1459, p-value < 2.2e-16
alternative hypothesis: true correlation is not equal to 0
95 percent confidence interval:
 0.7932483 0.8283300
sample estimates:
      cor
0.8115192
```

```
> cor(data$VCB.Open, data$VNI.Open, method = "spearman")
[1] 0.8193877
> cor(data$VCB.Open, data$VNI.Open, method = "kendall")
[1] 0.6374092
> cor(data$VCB.Open, data$VNI.Open, use = "complete.obs")
[1] 0.8115192
```

Correlation method

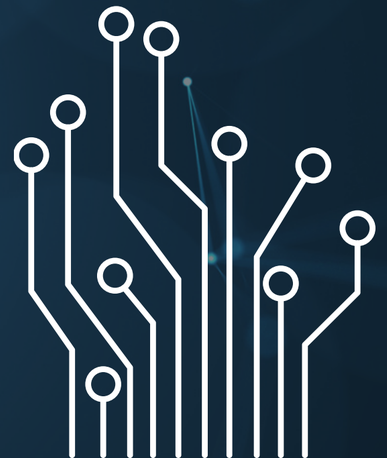
% Change

```
> cor.test(data$VCB.Change.Percent, data$VNI.Change.Percent)

        Pearson's product-moment correlation

data:  data$VCB.Change.Percent and data$VNI.Change.Percent
t = 37.488, df = 1459, p-value < 2.2e-16
alternative hypothesis: true correlation is not equal to 0
95 percent confidence interval:
 0.6733605 0.7256729
sample estimates:
      cor
0.7004563
```

```
> cor(data$VCB.Change.Percent, data$VNI.Change.Percent, method = "spearman")
[1] 0.6645898
> cor(data$VCB.Change.Percent, data$VNI.Change.Percent, method = "kendall")
[1] 0.487313
> cor(data$VCB.Change.Percent, data$VNI.Change.Percent, use = "complete.obs")
[1] 0.7004563
```

Recommendations

Vietcombank itself is implementing many projects such as real estate, corporate financial consulting, securities depository, currency brokerage, guarantee, etc. Each field has been reaping the benefits. good value for the organization.



Thank You!

Scan me may you
need fully document