(Team CAN)
Jonathan Jandel Cancio
Ethan Tan
Reyster Fresco
Troy Valdez
Marc Teves
Yna Ojeda
Oliver Atienza
Justin Balderas

CS 131 MP2: Analysis of Stock Market Prices As a Function of Previous Price, Volume and Momentum

Introduction

- Stock market prices tend to fluctuate at unpredictable rates due to a variety of factors
- Our project aims to simplify this and curve fit the current stock market price (P_{today}) based only on 4 most crucial factors:
  - Previous price (P_{prev}) - last recorded stock price
  - Previous volume (V_{prev}) - last recorded total number of transactions
  - 22-day momentum (m_{22}) - derivative of stock price at delta t = 22 days
  - 7-day momentum (m_7) - derivative of stock price at delta t = 7 days
- The rationale behind this is to achieve reasonable stock market predictions despite having limited data

Methodology

- We got the data from Kaggle
- A sample of 7 companies were chosen due to their relative volatility and influence to the stock market as a whole, namely:
 - AP
  - CEB
  - CHIB
  - GTCAP -

- ○ MBT - Metropolitan Bank and Trust Company
  - ○ MEG - Megaworld Corporation
  - ○ RLC - Robinsons Land Corporation
- The team used Java for the processing and Python for the graphing of the data.
- As our data was divided into dates with varying and often inconsistent intervals,
  - ○ Previous price and volume were taken from the most recent recorded date in the data set
  - ○ Momentum, the derivative of price, was calculated using backward/central/forward difference with the delta used being 22 days and 7 days
- What concepts did the team apply?
  - ○ The 4 independent factors used were tabulated into column vectors and concatenated side by side to form Matrix A
  - ○ The closing prices were tabulated into a column vector to form Vector B
  - ○ We constructed a program to find the Curve-Fitted equation:
  $$P_{today} = \alpha P_{prev} + \beta V_{prev} + \gamma m_{22} + \delta m_7$$
    - ■ The coefficients $\alpha, \beta, \gamma, \delta$ are found in the solution X, in the Equation :
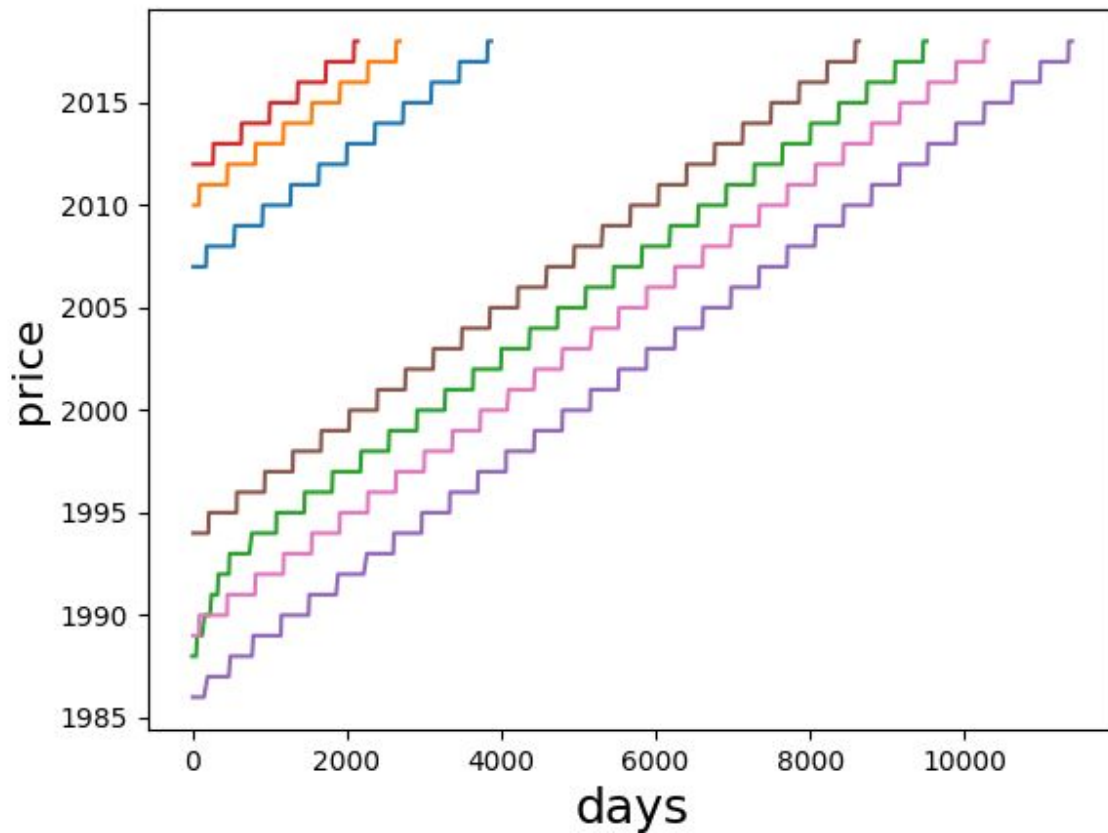 $$AX = B$$
    - ■ Solved using Least Squares

Results and Analysis

Closing Price against time
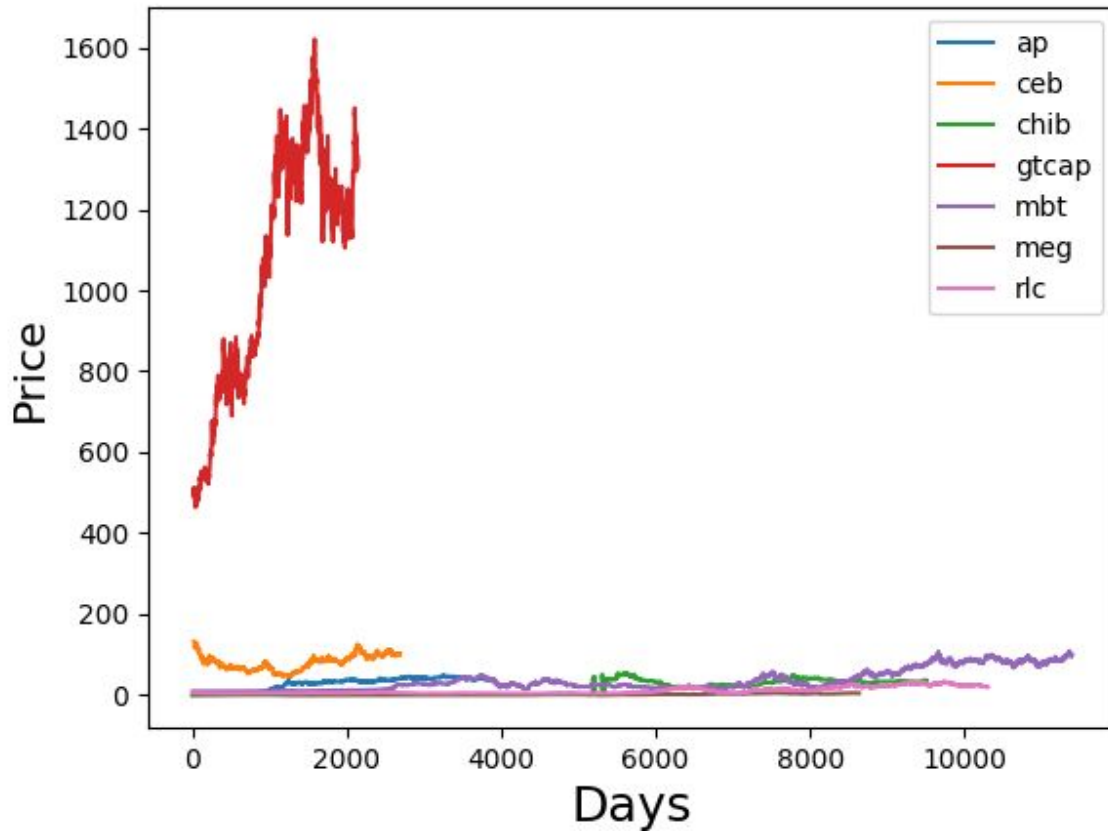
The random and unpredictable pattern of the closing price graph is to be expected as this is what our project is trying to decipher. It's worth noting though how among the other companies GTCAP boasts the highest price range.
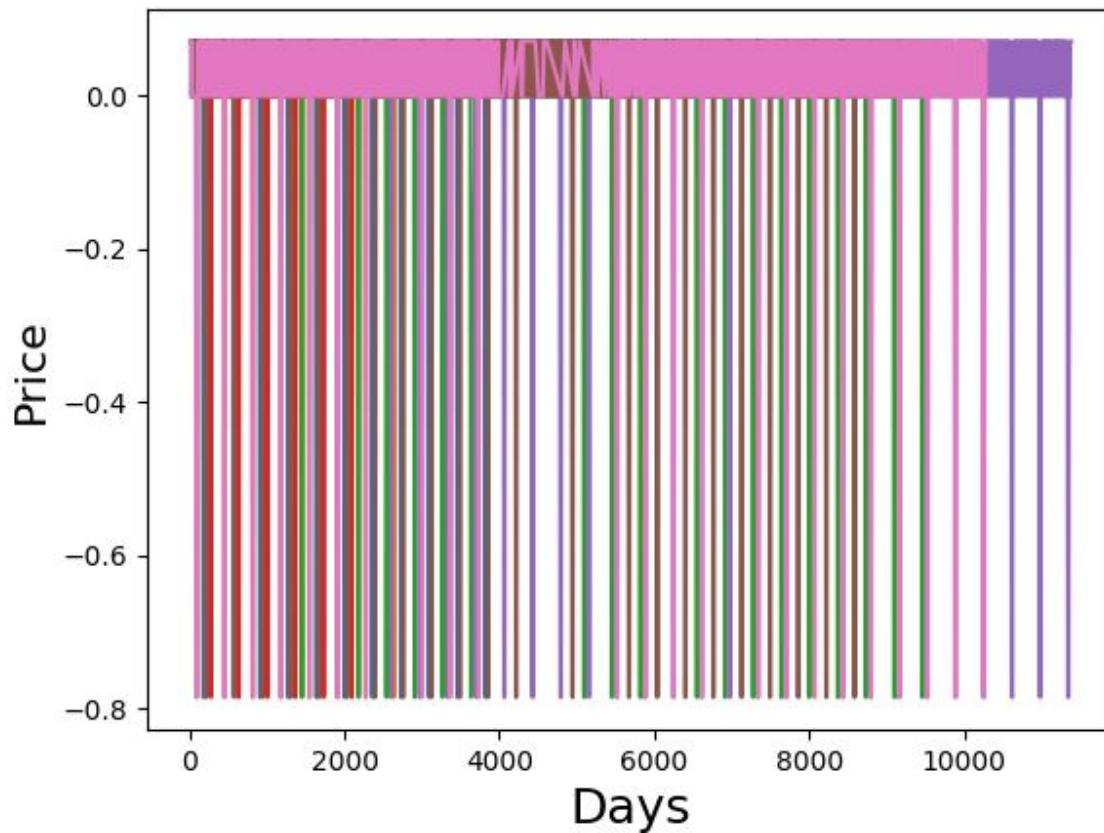
Closing Volume against time

The volume is the amount of transactions(buying/selling) the stock company underwent. All companies exhibited a fixed rising pattern similar to stairs. This is due to people buying in bulk whenever the stock price dips down.

Momentum of Price variable against time

Step size: 22 days
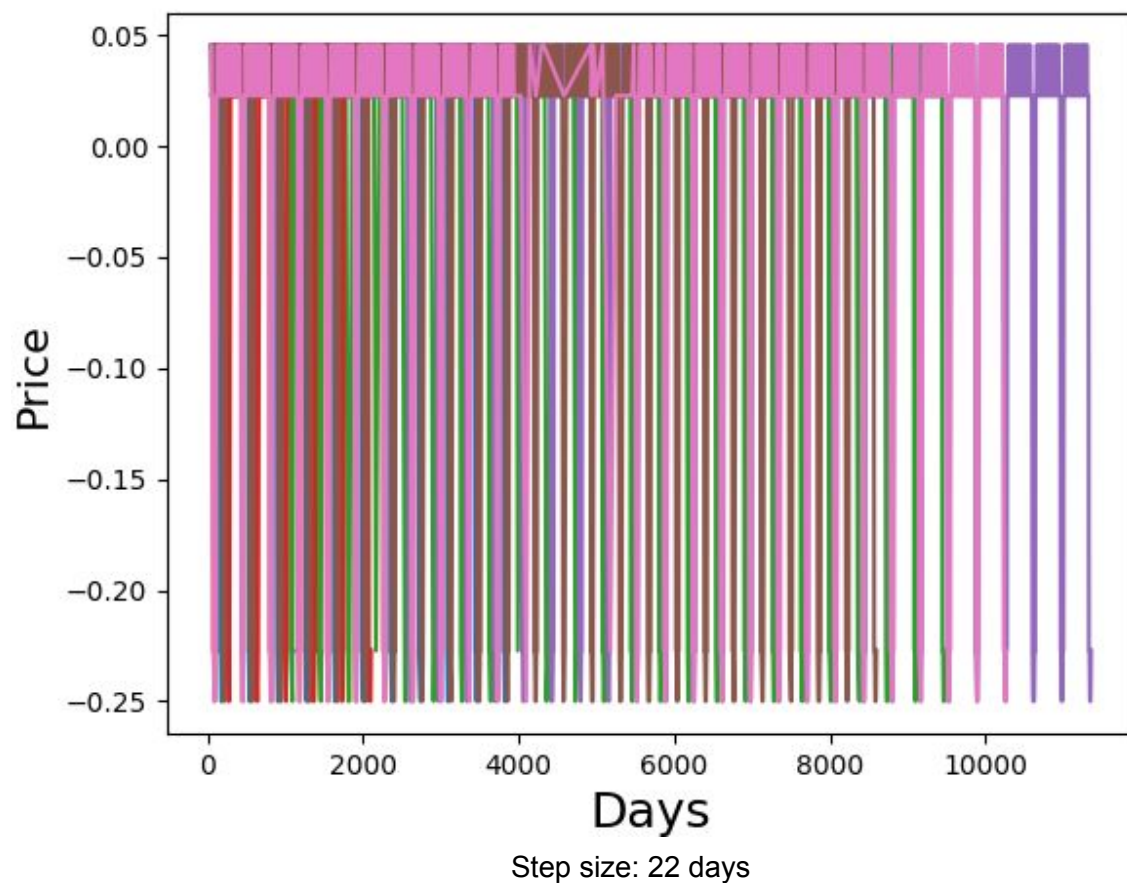
Momentum of Price variable against time

Step Size: 7 days

Although the momentum at a smaller delta time is assumed to be more accurate, the result is less stable. Greater price fluctuations are evident in the 7 day momentum with price range of -0.8 to 0.05. Whereas in the 22-day momentum, the price range only reaches from -0.25 to 0.05. Therefore, with regards to stock price momentum, decreasing the delta time means trading off stability for accuracy

Average

Table 1: Linear Combination Coefficients of each company

Company	Coefficients ($P\_now = \alpha P\_prev + \beta V\_prev + \gamma m\_22 + \delta m\_7$)			
	Pprev(α)	Vprev(β)	m22(γ)	m7(δ)

AP	0.999909308676	0.000000000893	-0.002057696004	1.223340993478
CEB	0.999762276704	0.000000014819	0.040550002555	1.378957068841
CHIB	0.998817540958	0.000000000015	0.134914332815	1.571397313188
GTCAP	0.999805323406	0.000000601056	0.430392355966	1.158406101105
MBT	0.999110807743	0.000000017390	0.089714560749	1.419385112693
MEG	0.999526525917	0.000000000024	-0.035912901006	1.501996489010
RLC	0.999311080033	0.000000003205	0.115358802114	1.392324898465
Average	0.999463266205	0.000000091058	0.110422779598	1.378286853826

Table 1: Linear Combination Coefficients of each company

$$P_{now} = 0.999463266205 P_{prev} + 0.000000091058 V_{prev} + 0.110422779598 m_{22} + 1.378286853826 m_{7}$$
Figure 1: Average Least Squares Equation

Conclusion:
        From the above equation, we can conclude that the 7-day momentum has more influence than the 22-day momentum with regards to stock market price. We also conclude that volume plays a relatively miniscule role in affecting stock price, since the V_{prev} coefficient falls within the 10^{-8} zone, despite the volume graphs only reaching the 10^{3} zone. Since our data assumes stock market price to be a function dependent only on 4 factors, discrepancies are to be expected. Accuracy of the equation can be further improved by adding more independent variables such as stock index, option availability, average income per capita, etc. For simplicity's sake, our research will end here.