Analysis of Stock Market Prices As a Function of Previous Price, Volume, and Momentum

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INTRODUCTION

This project aims to simplify the trend of stock market prices and fit current stock market prices into a curve. Stock market prices tend to fluctuate at unpredictable rates due to a variety of factors. The factors that we will consider to fit these unpredictable rates are:

- Previous Price (P_{prev})
- Previous Volume (V_{prev})
- 22-Day Momentum (m_{22})
- 7-day Momentum (m_7)

where the previous prices are the last recorded stock price, the previous volume are the last recorded total number of transactions, and the momentum is the derivative stock price at delta t = 22 and t =7.

In doing so, the project aims to produce reasonable market predictions despite having limited data.

METHODOLOGY

DATA

A sample of 7 companies were chosen due to their relative volatility and influence on stock market as a whole. These companies are as follows: Aboitiz Power Corporation (AP), Cebu Air Inc., China Banking Corporation (CEB), GT Capital Holdings, Inc. (GTCAP), Metropolitan Bank and Trust Company (MBT), Megaworld Corporation (MEG), Robinsons Land Corporation (RLC).

TOOLS

The team used Java for the processing and Python for the graphing of the data.

METHODS & CONCEPTS

As our data was divided into dates with varying and often inconsistent intervals, P_{prev} and V_{prev} were taken from the most recent recorded date in the data set, and m_{22}, and m_7 the momentum, was calculated using backward/central/forward difference with the delta used being 22 days and 7 days.

The four independent factors used were tabulated into column vectors and concatenated side by side to form a matrix A. The closing prices were tabulated into a column vector to form B.

A program was constructed to find the Curve-Fitted equation:

$$P_{now} = \alpha P_{prev} + \beta V_{prev} + \gamma m_{22} + \delta m_7$$

where the coefficients α, β, γ, and δ are found in the solution X, in the equation:

$$AX = B$$

which was solved using least squares.

CURRENT PRICE FOUND

$$P_{today} = 0.999463266205 P_{prev} + 0.000000091058 V_{prev} + 0.110422779598 m_{22} + 1.378286853826 m_7$$

The equation for predicted current stock prices that was computed for can be seen above.

CONCLUSION

From the obtained P_{now} 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.

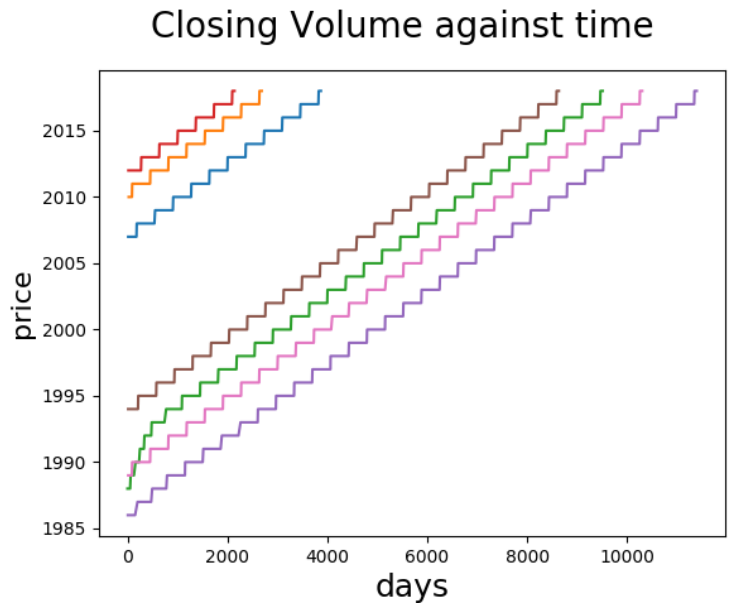
The accuracy of the equation can be further improved by adding more independent variables such as stock index, option availability, average income per capita, etc. For simplicity's sake, our research will end here.

RESULTS & ANALYSIS

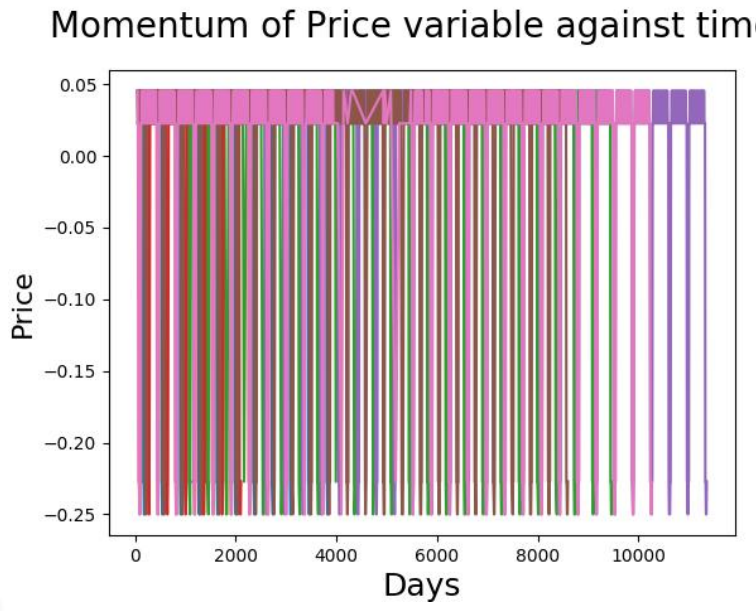
The linear combination coefficients of each company as well as the coefficients of the average equation are tabulated below.

COMPANY	α	β	γ	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

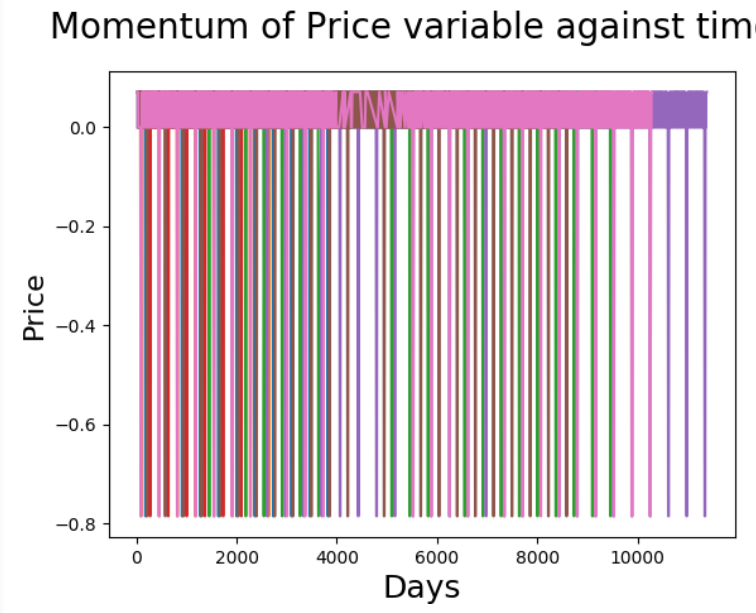
The random and unpredictable pattern of the closing price graph is to be expected as this is what our project is trying to decipher. It's worth noting though how among the other companies GTCAP boasts the highest price range.



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.



Step size 22. Each abrupt spike/drop in price gets converted into an impulse in momentum that shoots upward/downward. It's also worth noting how rise in stock prices can be correlated to small concentrated positive values in momentum, while falls in stock prices to sudden dives to the negative values in momentum.



Step size 7. 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.