Regression Analysis of Stock Returns By Filtering with Simple Moving Averages

Ahmet Sekreter[1]

[1]Faculty of Administrative Sciences and Economics, Ishik University, Iraq
Correspondence: Ahmet Sekreter, Ishik University, Iraq. Email: ahmet.sekreter@ishik.edu.iq

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Abstract: Stock market prices are affected by industry performance, company news, and world news, political and economic changes. News from company and news about world events play an important role in the direction of stock markets. The analysts have different opinions about estimation of stock prices and stock returns. Some techniques have been used for filtering series in time series analysis, using these methods can give more accurate estimations of stock returns before using regression methods to predict stock returns.

Keywords: Stock Prices, Regression Analysis, Filtering, Simple Moving Averages
JEL Classification: G17, C13

1. Introduction

Prediction of stock prices is not entirely data driven of company's earnings, P/E ratios, amount of dividends etc. Some people believe that it is not possible to predict how stock prices will change and some people believe that by looking at past prices and movements, by analyzing them it can be predicted. There is no certain way to predict the future stock prices so the best we can do is a filter that can give the more accurate results with minimal residuals. There are millions of data in financial market entering analyzing process of prediction of stock returns. These data are often added to data bases with some outlier prices. Pre-filtered data causes less accurate prediction of future stock prices' movement. Filtering stock prices help to get smooth price action and filter out the noise.

Figure 1: Comparison of Google Inc. and S&P500 as an example of some outlier price movements

2. Analysis

Simple moving average (SMA) is the unweighted mean of the past n data. SMA can be used in order to smooth out local fluctuations. For example x1, x2…, xn,xn+1, xn+2,… are data of previous prices of a stock. By applying SMA the new series can be obtained as follow:

$$X_{n+1}=\frac{1}{n}\sum_{1}^{n} x_i$$

$$X_{n+2}=\frac{1}{n}\sum_{2}^{n+1} x_i$$

$$X_{n+k}=\frac{1}{n}\sum_{k}^{n+k} x_i$$

Figure 2 shows the daily stock price movements of Google Inc. between 2009 and 2012. To remove the noise SMA is applied. In figure 3 easily can be seen that outlier price movements are cleaned in the data set.

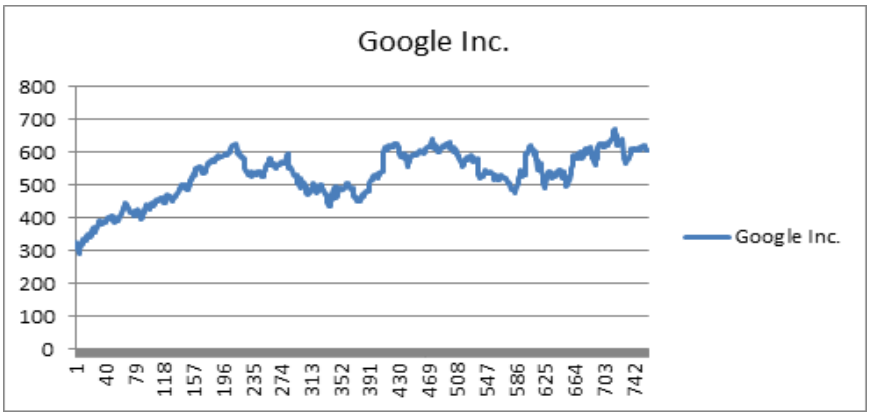

Figure 2: Daily stock prices of Goggle Inc. between 2009 and 2012

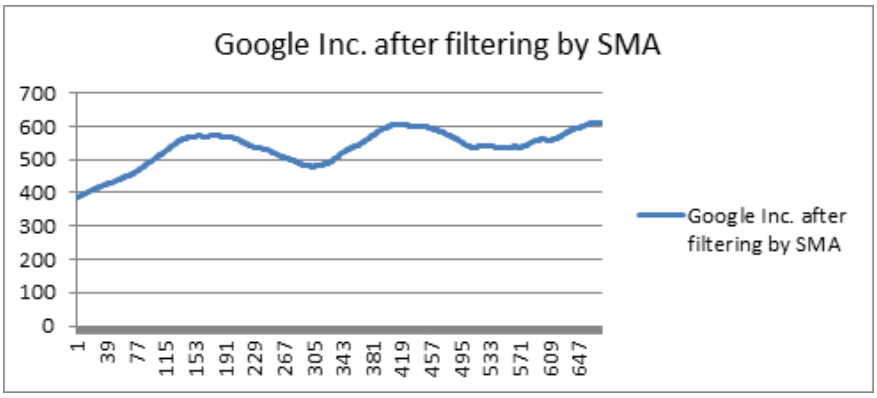

Figure 3: Daily stock prices of Google between 2009 and 2012 after filtering

In the following steps data of the daily S&P500 indexes between the same time interval as Google Inc. To understand whether is there real-world relation between the S&P500 index and Google Inc. stock prices the regression analysis will be used. By using the regression the daily data will be taken and the last 30 days observed stock prices and estimated stock prices will be compared without filtering.

In the second phase the average of Google Inc. daily stock prices and S&P500 indexes will be calculated for 86 data points and SMA method will applied in the time interval between 2009 and 2012. After that the last observed Google Inc. stock prices and estimated prices by using regression analysis with filtering will be compared.

Table 1: Shows the observed Google Inc. daily stock prices and estimated by regression analysis without filtering.

Google Inc. observed stock prices	Estimated prices
568.1	605.91391
579.98	604.99621
577.69	603.54537
580.11	603.28317
580.83	608.38733
585.11	609.02098
596.33	617.4813
609.09	617.23221
606.77	618.42085
609.85	619.69252
611.46	620.56215
605.91	616.49368
612.2	620.48349
609.76	619.9285
605.56	616.75151
606.52	623.22348
604.64	624.61751
614	625.04577
607.94	623.05742
606.11	625.59202
609.9	626.58838
609.31	627.39683
618.39	629.40266
618.25	626.56216
622.4	630.23733
621.25	628.28831
614.25	625.97221
604.96	616.80832
606.8	620.85931
607.14	626.66267

Figure 4: Regression Analysis of Google Inc. daily stock prices and S&P500 daily indexes without filtering

To analyze the accuracy of the estimation and to figure out which estimation method gives better result, they will be compared on the same graph.

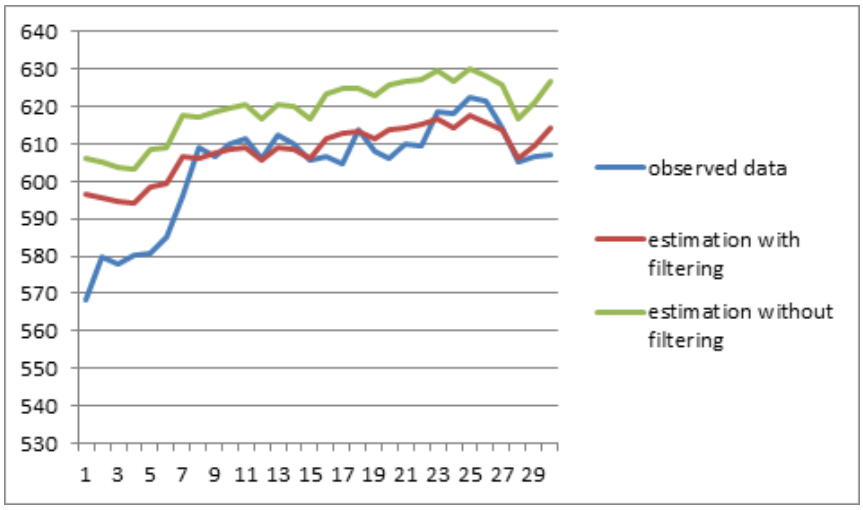

Figure 6: Comparison of observed data, estimation with filtering and without filtering

Table 2: Observed daily Google Inc. stock prices and estimated stock prices by using SMA

Google Inc. observed stock prices	Estimated prices
568.1	596.55654
579.98	595.76274
577.69	594.50778
580.11	594.28098
580.83	598.69602
585.11	599.24412
596.33	606.5622
609.09	606.34674
606.77	607.3749
609.85	608.47488
611.46	609.2271
605.91	605.70792
612.2	609.15906
609.76	608.679
605.56	605.93094
606.52	611.52912
604.64	612.73494
614	613.10538
607.94	611.38548
606.11	613.57788
609.9	614.43972
609.31	615.13902
618.39	616.87404
618.25	614.41704
622.4	617.59602
621.25	615.91014
614.25	613.90674
604.96	605.98008
606.8	609.48414
607.14	614.50398

3. Conclusion

The works in this article show that there is a real-world connection between stock prices and S&P500 index. There are many theories about predicting stock prices, stock returns and possible future price movements. Without mentioning about these theories the relation between stock prices and S&P500 index has been showed. Linear regression analysis is used to show possible relations. In the first phase estimation is done with raw data. In the second phase Simple Moving Average (SMA) is used to filter out noise from the data and estimations are calculated after this filtering by using linear regression analysis. The result shows that filtering with SMA gives better and more accurate estimations.

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