

Computation Physics Problem Set 8

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1 Problem 1

The maximum likelihood value for $\beta_0 = -5.62007738$, and $\beta_1 = 0.10956021$.

The covariance matrix is given by:

$1.11636794e00$	$-2.10263357e-02$
$-2.10263357e-02$	$4.25900684e-04$

The formal error is given by the sqrt of the sum of the diagonal of the inverse hessian matrix:
1.0567846

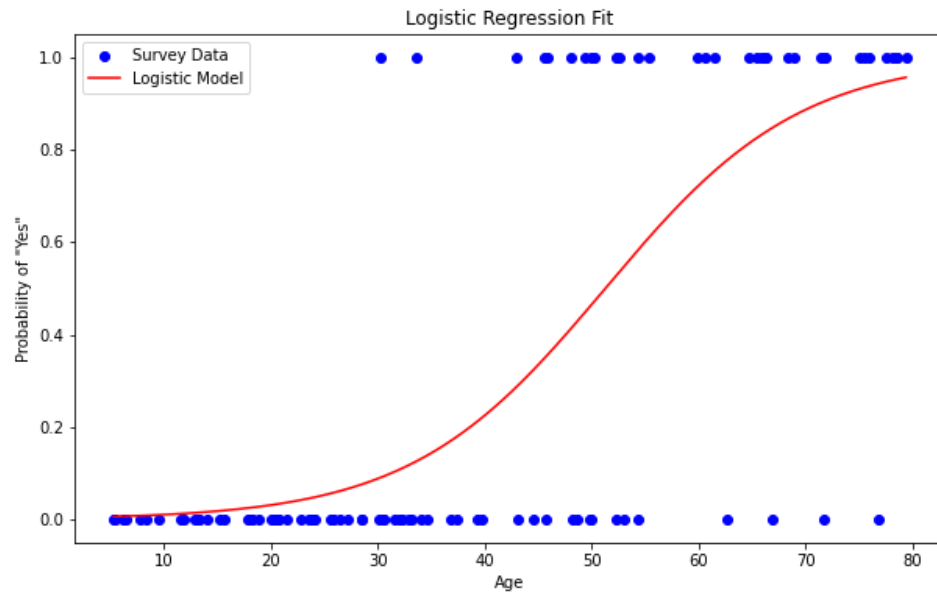


Figure 1: Fitted results to a logistic regression model with the parameters defined above.

2 Problem 2

2.1 a

The plots for this problem are shown as figures 2 - 5.

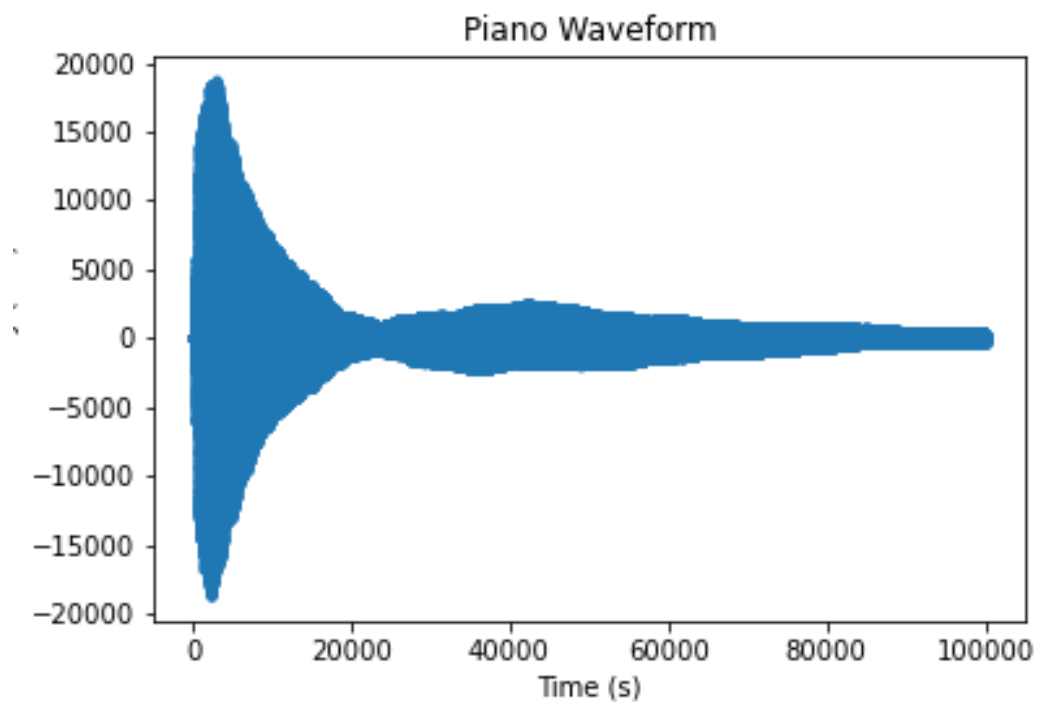


Figure 2: Plotted piano Waveform sampled at $\text{Hz} = 44100$

With these frequency spectra, you can see that the piano shows more emphasis/intensity of one certain frequency corresponding to the note. At the same time, the trumpet also includes more octave versions of the note simultaneously.

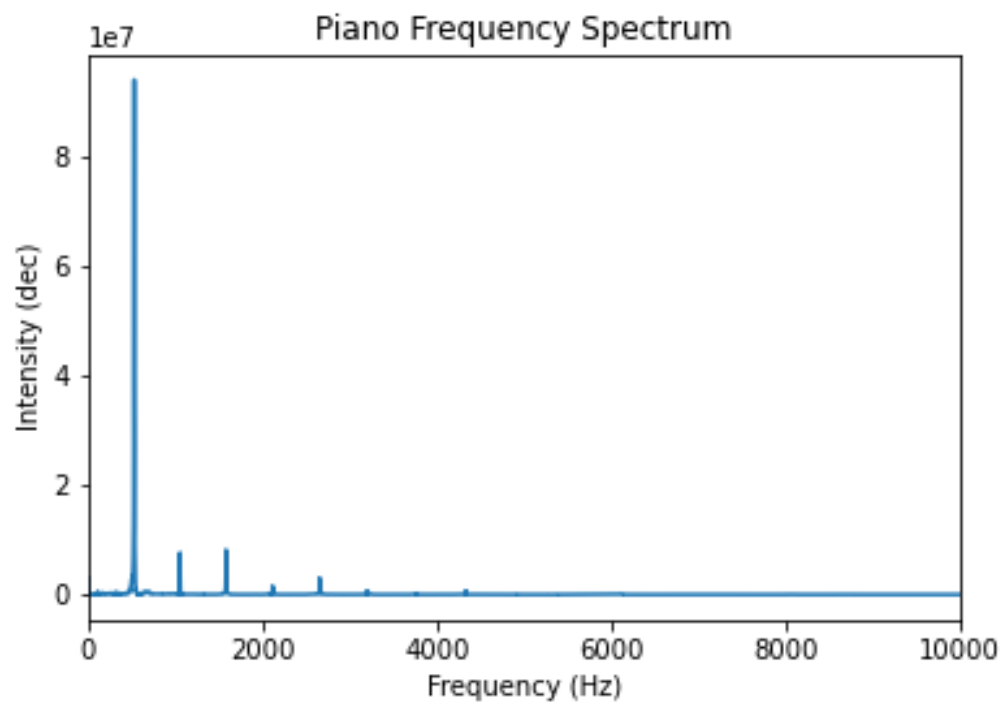


Figure 3: Plotted piano frequency spectrum sampled at $\text{Hz} = 44100$

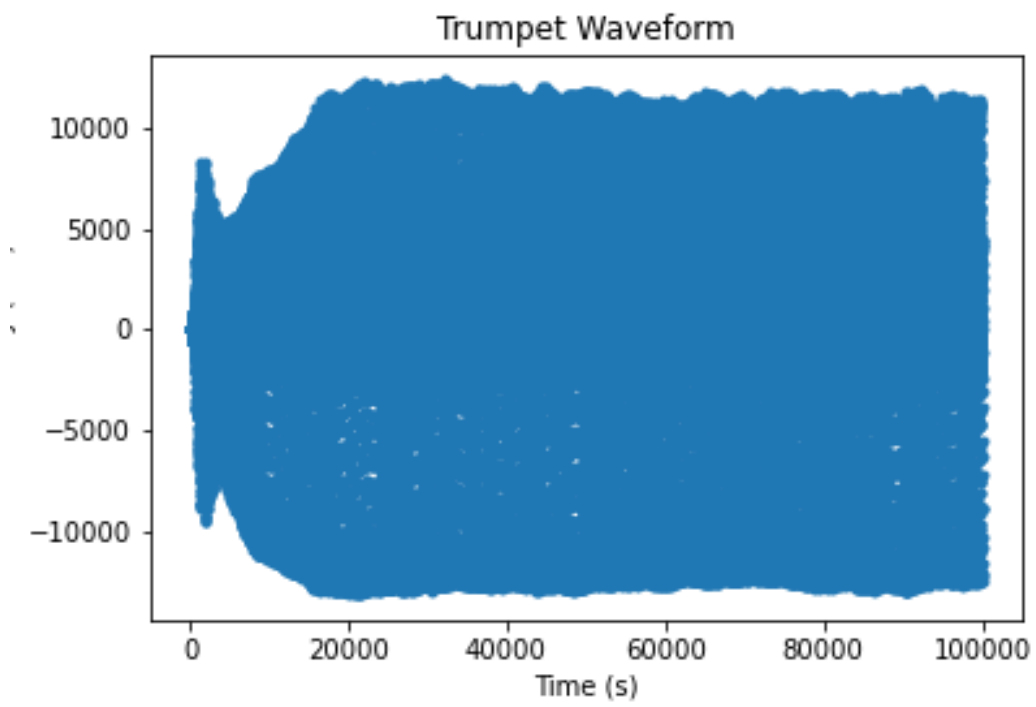


Figure 4: Plotted trumpet Waveform sampled at $\text{Hz} = 44100$

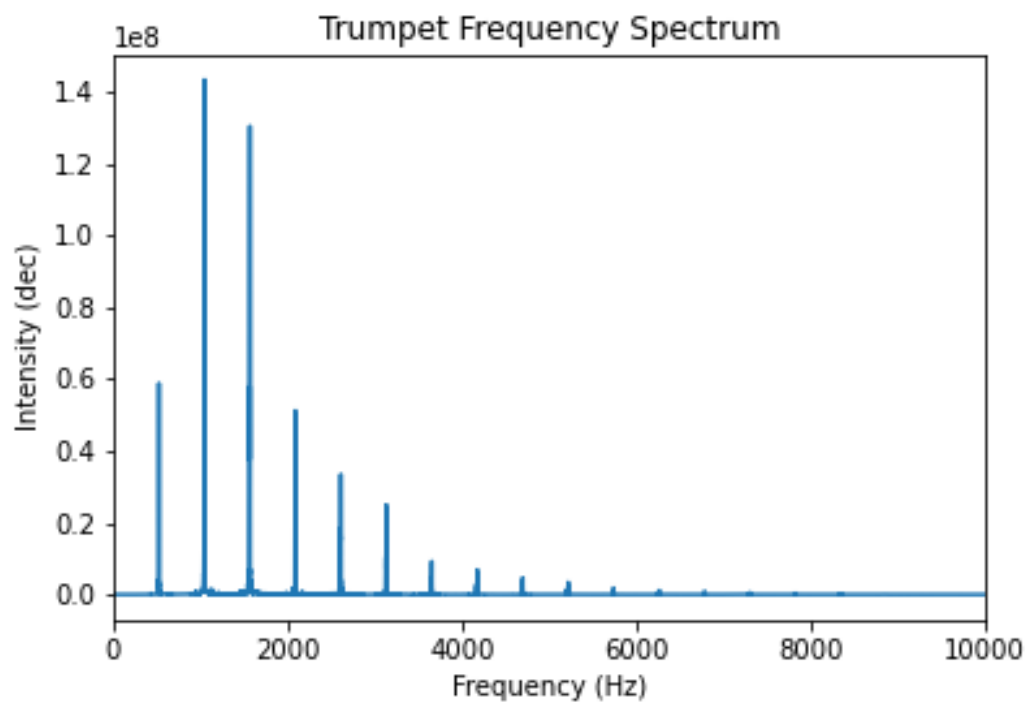


Figure 5: Plotted trumpet frequency spectrum sampled at $\text{Hz} = 44100$

2.2 b

The zoomed versions of the previous plots labeled as figures 6 & 7 show the largest intensity at approximately $261 \times 2 = 513$ Hz, corresponding to the note C, one octave above middle C.

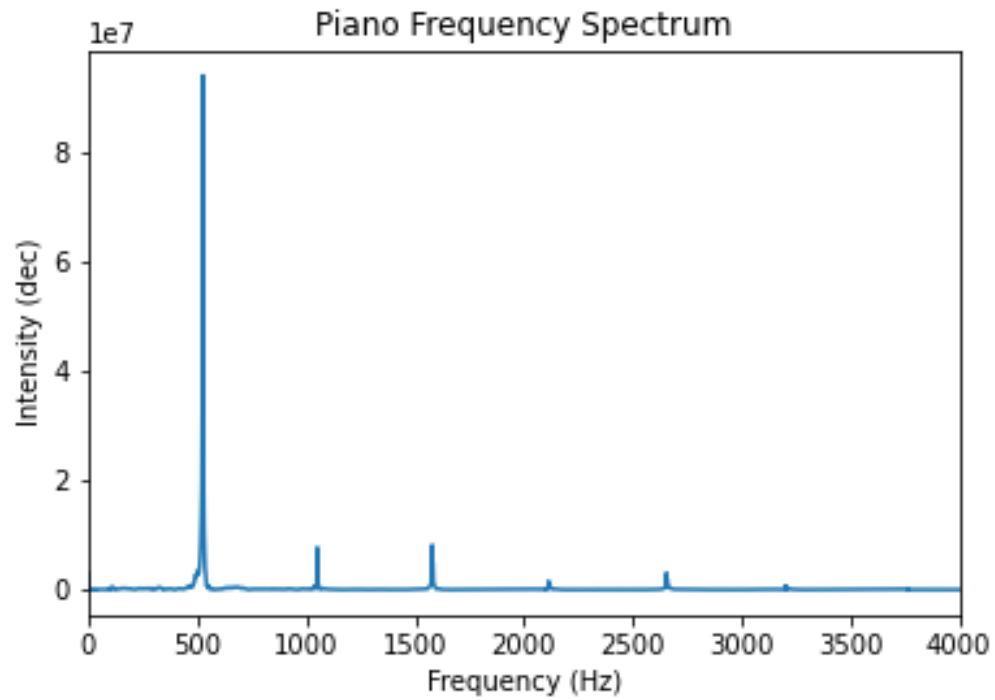


Figure 6: Zoomed in version of the plotted piano frequency spectrum sampled at $\text{Hz} = 44100$

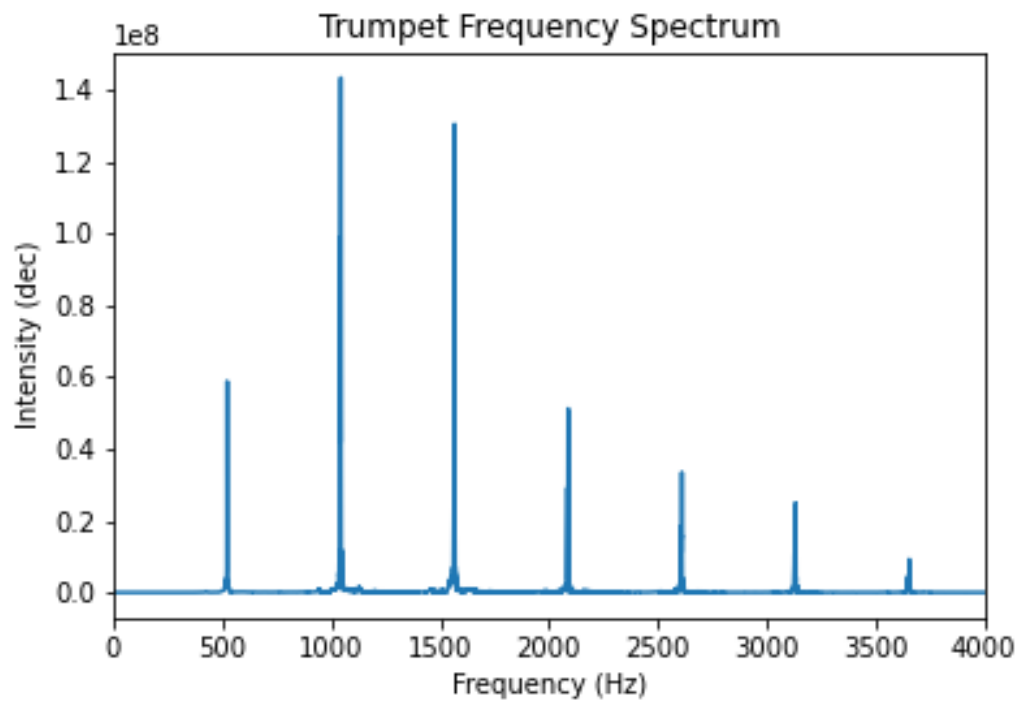


Figure 7: Zoomed in version of the plotted trumpet frequency spectrum sampled at $\text{Hz} = 44100$

3 Problem 3

3.1 a

The first plot is shown in figure 8.

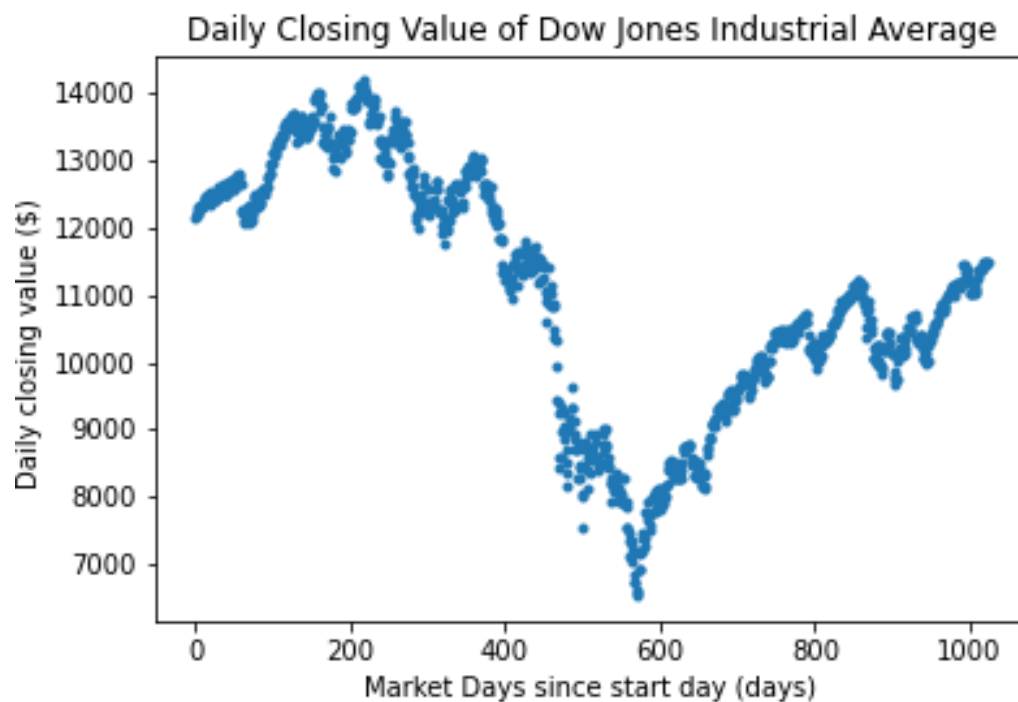


Figure 8: Daily closing value of the Dow Jones Industrial Average for the years 2006 - 2010

3.2 b

The coefficients are stored in array `shiftDowOriginal`.

3.3 c&d

Keeping only the first 10% of the coefficients leads to the plot shown in figure 9. You can see that the transform is showing more of the general shape of the data and removes some of the noisiness.

3.4 e

Keeping only the first 2% of the coefficients leads to the plot shown in figure 10.

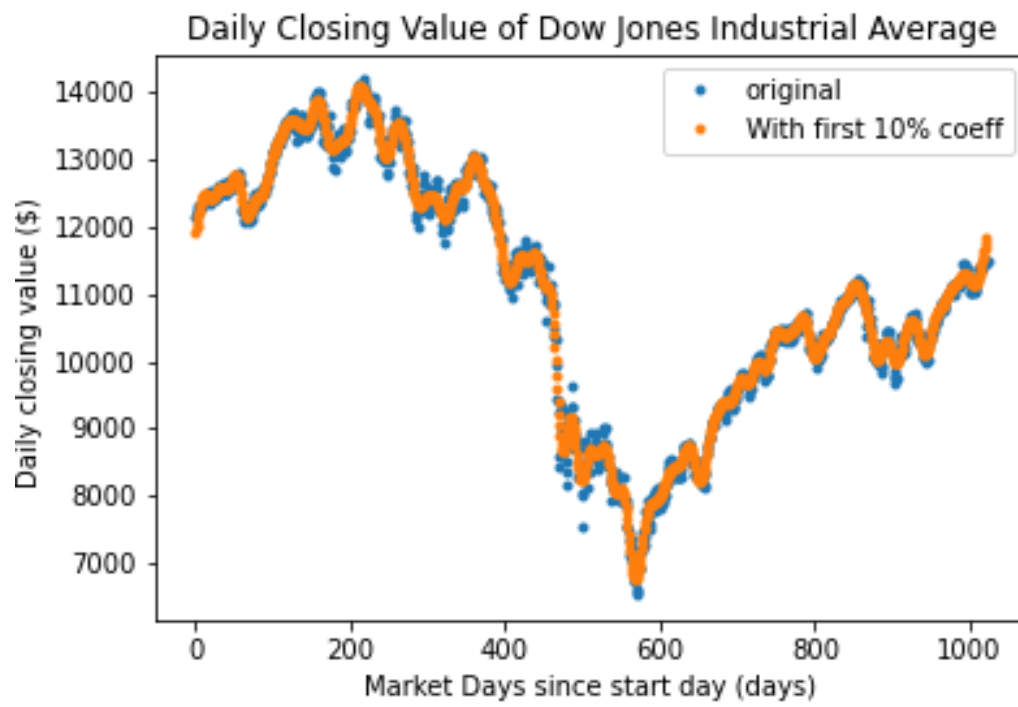


Figure 9: Daily closing value of the Dow Jones Industrial Average for the years 2006 - 2010

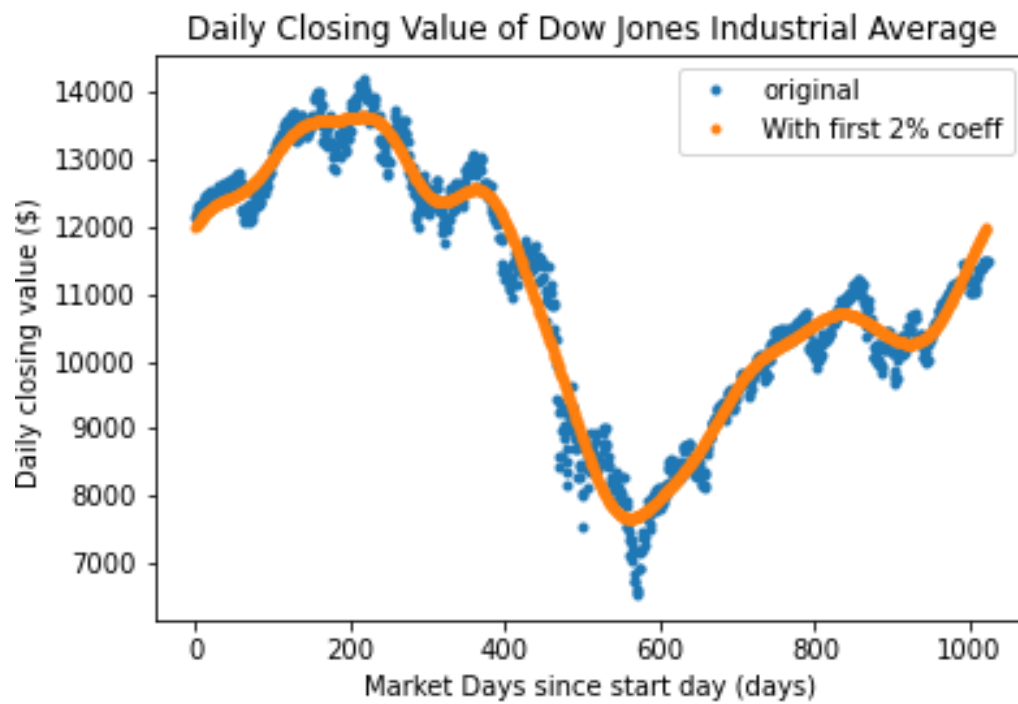


Figure 10: Daily closing value of the Dow Jones Industrial Average for the years 2006 - 2010