Exercise 3

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In this exercise the we did an analysis on the index of OMX Helsinki 25 stock market. The data consited of prices sampled every 5th day for 17 years. To analyse the data we used H-P and l1 trend filtering. This would give a smooth estimate of the original signal. H-P filtering finds the smoothest possible signal describing the data while l1 trend filtering finds the signal that changes the direction as few times as possible. One difference between the implementation of these filters is that H-P filter expects data in l2 norm, and l1 trend filter expects data in l1 norm.

The original data is a very noisy signal that contains a lot of frequency components, as seen in figure 1. In figure 2 we see that the signal has lost all the high frequency components but still manages to follow the shape of the original. In figure 3 we see a much sharper result. It reminds of the result from the H-P filter with a smaller resolution. The difference in error variance between the two methods is about 0.0002. This difference can be seen at sample 600 where the H-P filter makes a small curve to follow the original signal, but the l1 filter skips right trough it, presumably averaging the curve.

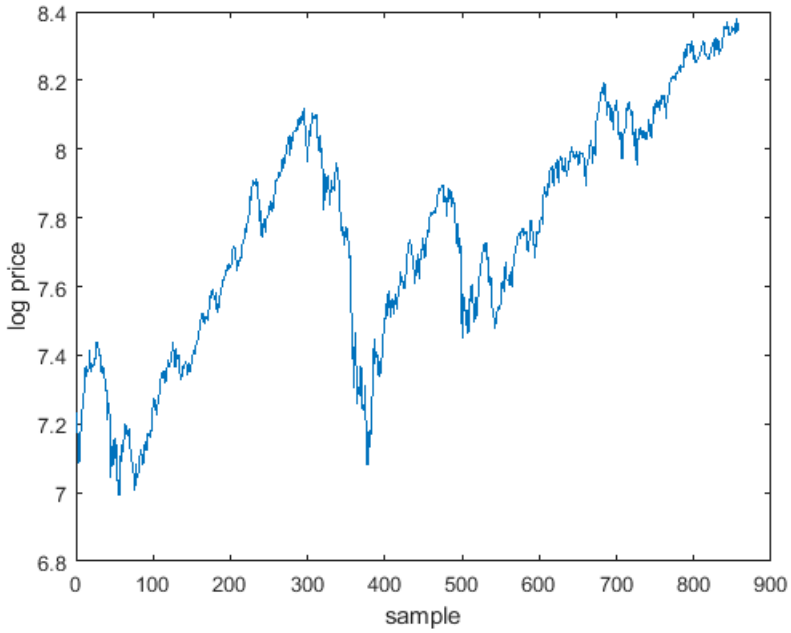

Figure 1: OMX Helsinki 25 stock market index across 17 years sampled every 5th day.

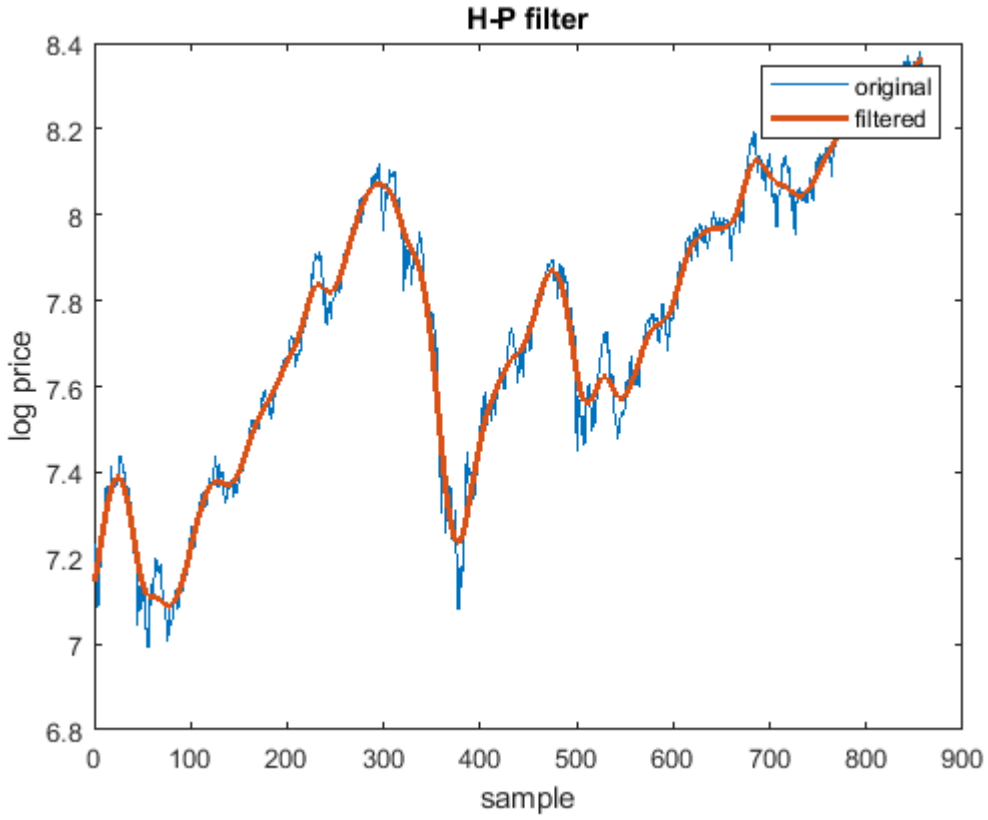

Figure 2: A λ value of 100 was used in the filter which gave an error variance of 0.0015.

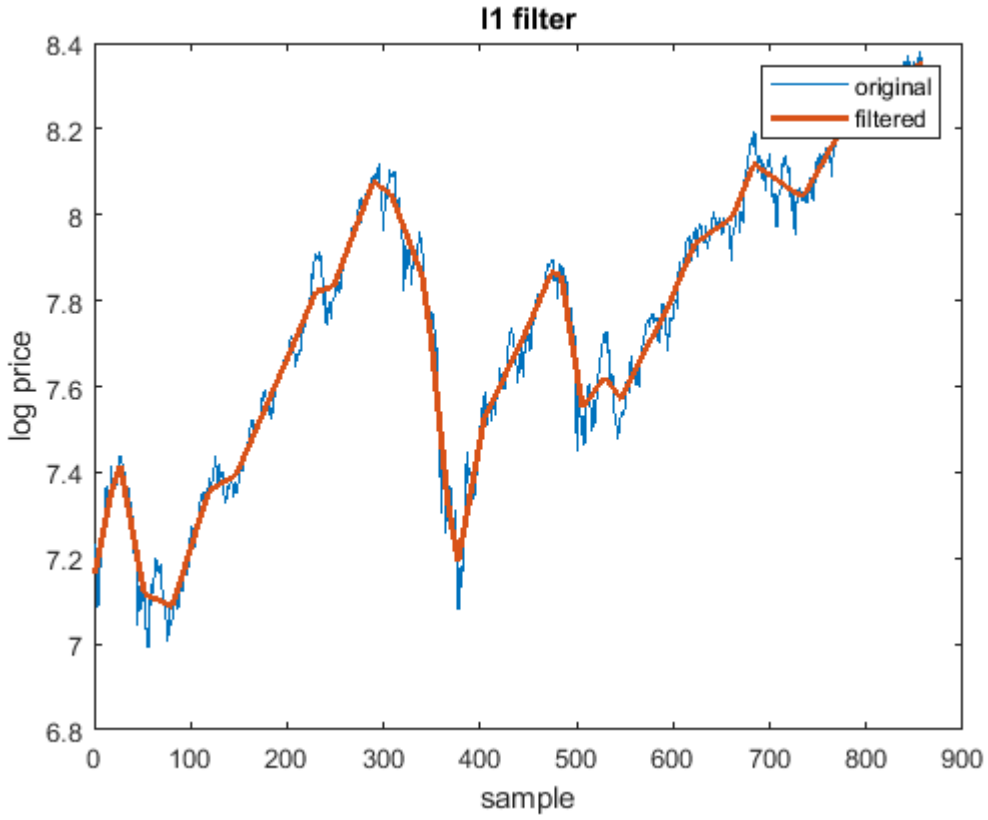

Figure 3: A λ value of 5 was used in the filter which gave an error variance of 0.0017.