Assignment-5

Group 22

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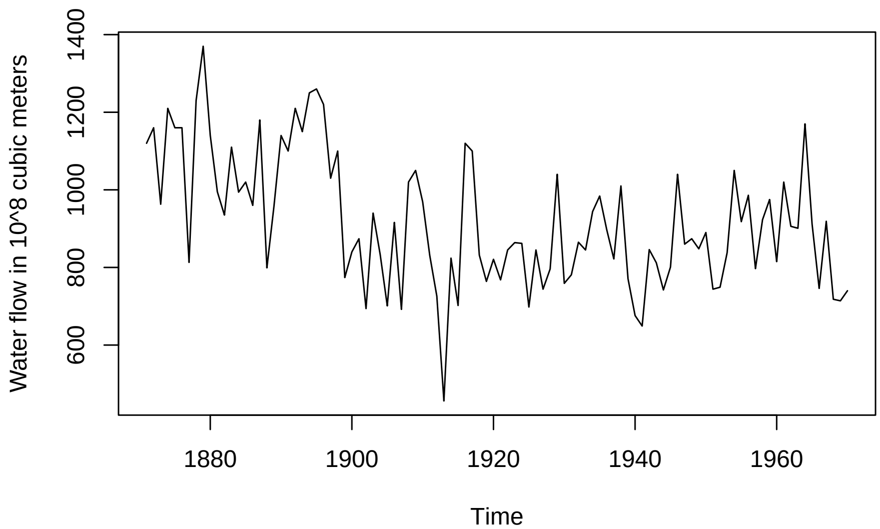
Graph 1: River Nile annual flow in 10^8 cubic meters (1871−1970)



Let us consider the following random walk plus noise model to be applied to the Nile data:

$$
\begin{aligned}
Y_t &= \theta_t + v_t \qquad v_t \overset{i.i.d.}{\sim} N(0, V) \\
\theta_t &= \theta_{t-1} + w_t \qquad v_t \overset{i.i.d.}{\sim} N(0, W)
\end{aligned}
$$

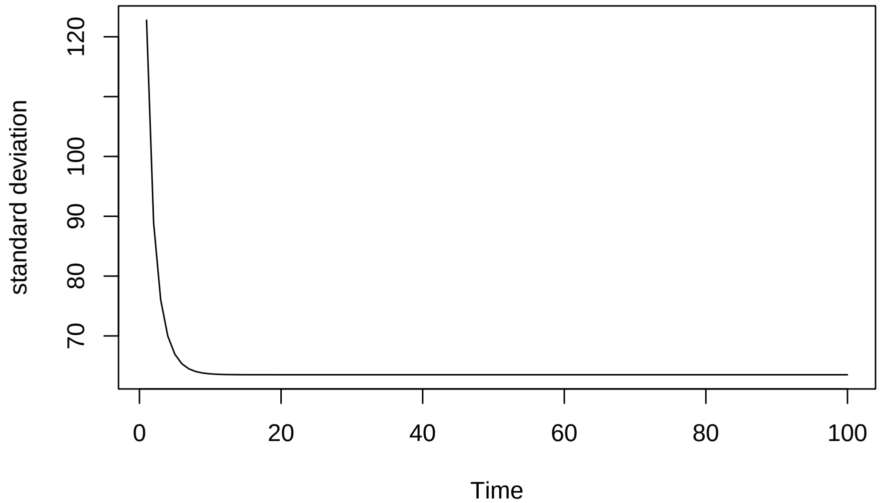
We will set V = 15100 and W = 1470 and the initial distribution $\theta_0 \sim N(1000, 1000)$ for our model

Plotting the filtered estimates we get

i'm doing this because i don't know if there's any hidden function in this second method

```
## [1] "y"   "mod" "m"   "U.C" "D.C" "a"   "U.R" "D.R" "f"
```

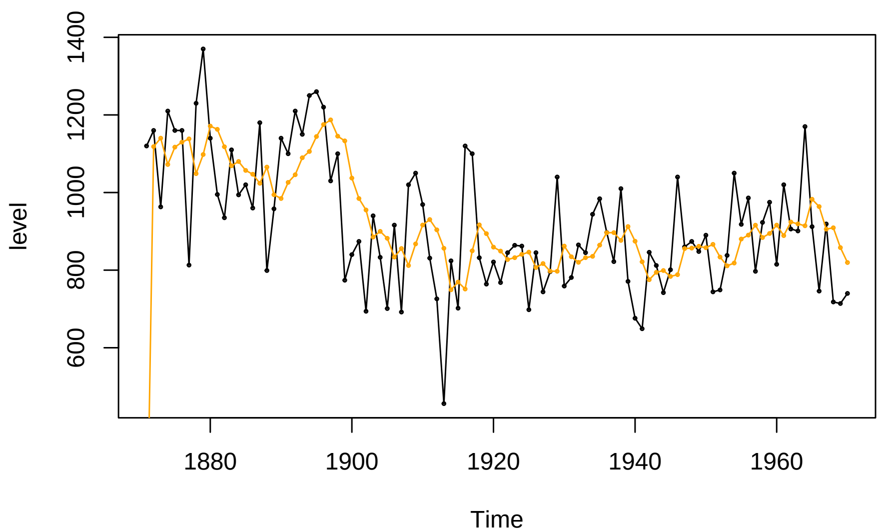
computing the variance



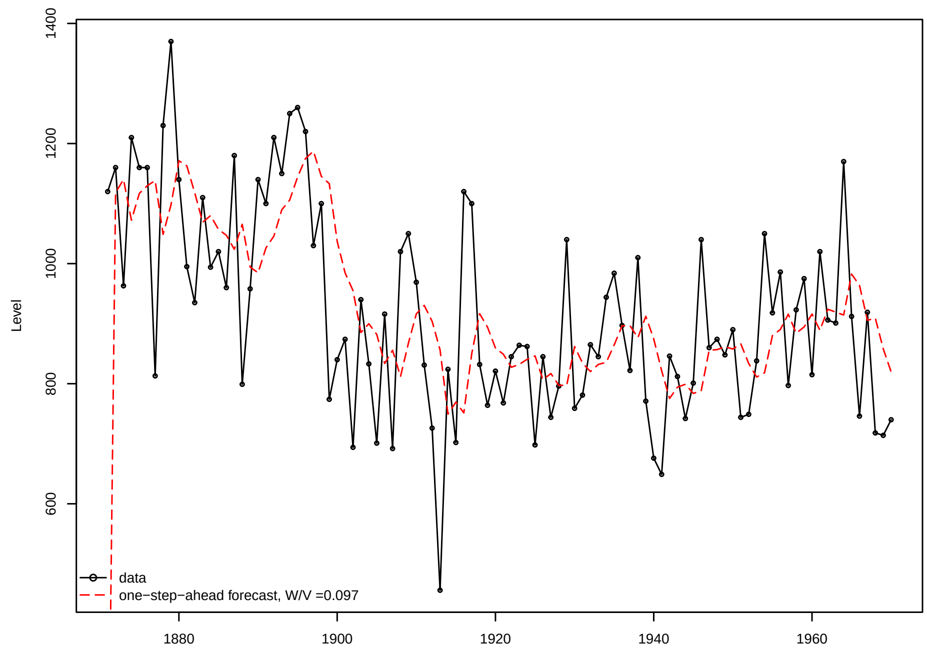
As we can see from the graph above, the standard deviations of the filtering state reach their maximal values at the beginning of the time series, while sharply decreasing as time pass by. This reflect the fact that we have less information about the initial state of the system. As new observations arrive the filtering state estimates become more and more accurate, hence the decrease in the standard deviations over time.

FORECASTING

i've made a few graph honestly i prefer the second one , in the final version you can delete the first



also here dropping the first observation would not be a bad idea i post the command here below: lines(dropFirst(outFilt$m), lty = "longdash", col='darkorange') instead of lines



variances here are random numbers i've choosen. As i said i'm not very fond of this part of theory so if you have better guesses on what values may be of interest feel free to change them

```
##        [,1]
## [1,] 0.013
```

```
##           [,1]
## [1,] 333.3333
```

just the graph