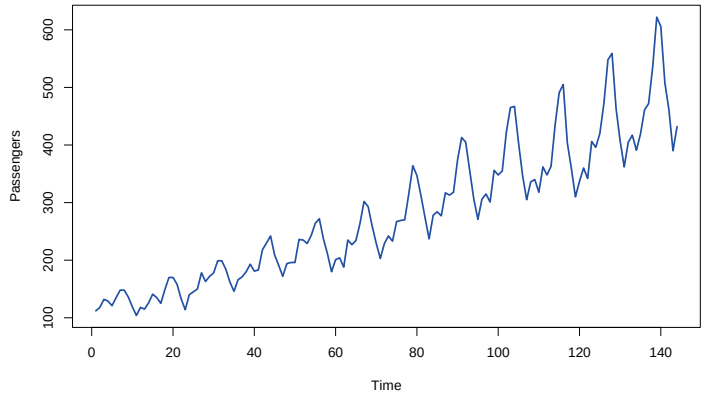
Airline Data

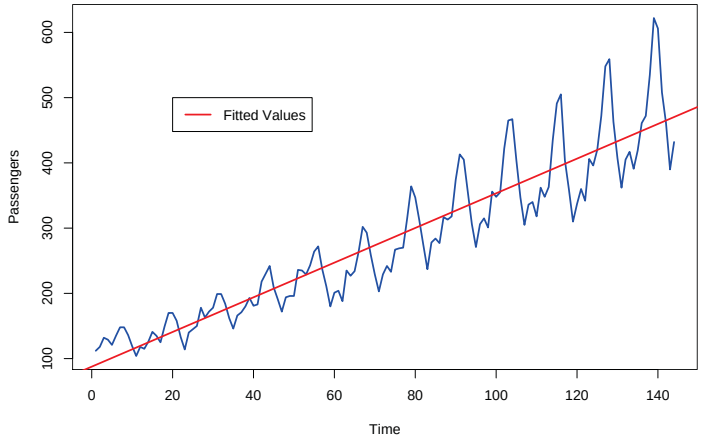
Monthly passengers in the U.S. airline industry (in 1,000 of passengers) from 1949 to 1960... we need to predict the number of passengers in the next couple of months.



Any ideas?

Airline Data

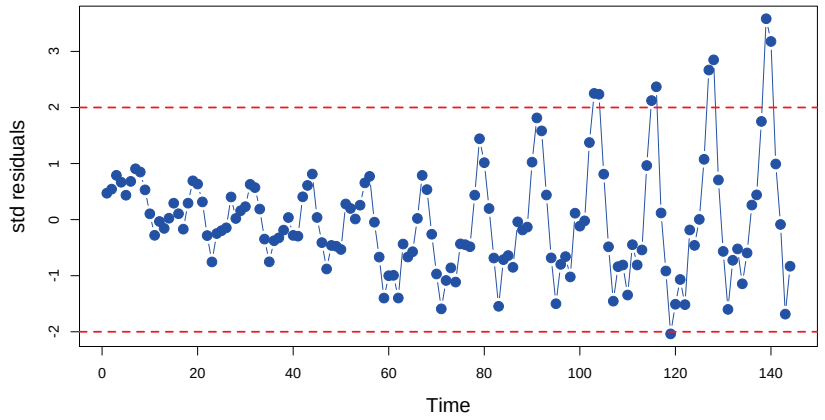
How about a "trend model"? $Y_t = \beta_0 + \beta_1 t + \epsilon_t$



What do you think?

Airline Data

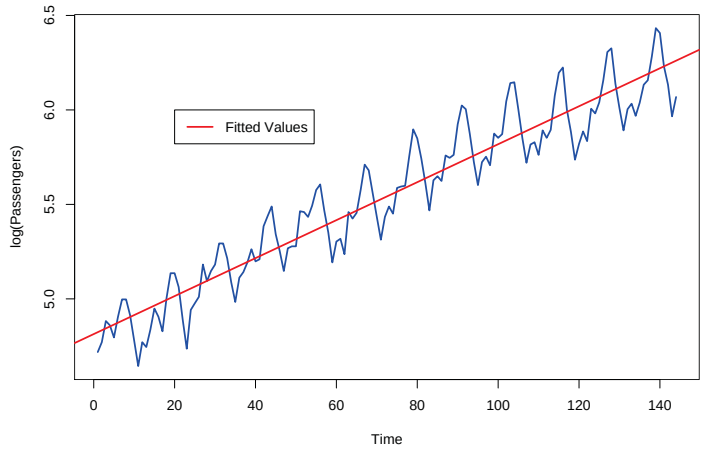
Let's look at the residuals...



Is there any obvious pattern here? YES!!

Airline Data

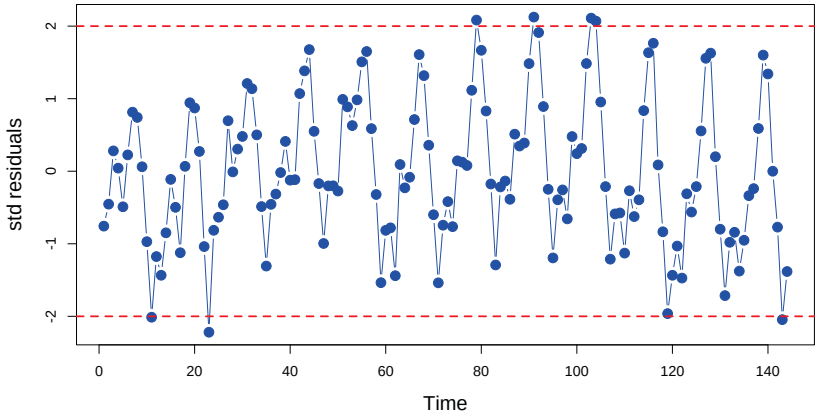
The variance of the residuals seems to be growing in time... Let's try taking the log. $\log(Y_t) = \beta_0 + \beta_1 t + \epsilon_t$



Any better?

Airline Data

Residuals...

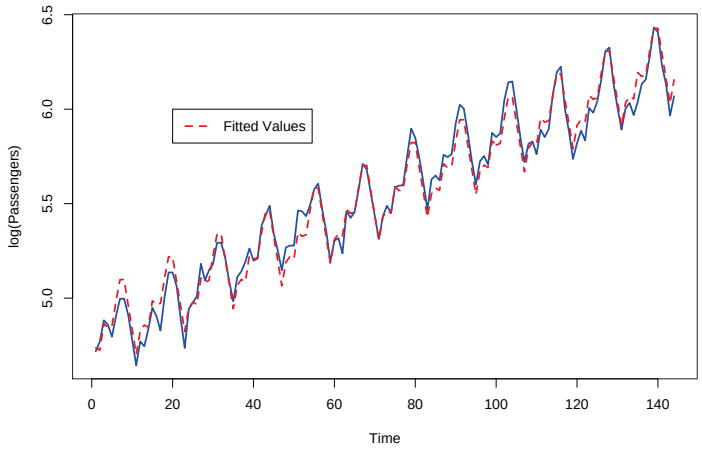


Still we can see some obvious temporal/seasonal pattern....

Airline Data

Okay, let's add dummy variables for months (only 11 dummies)...

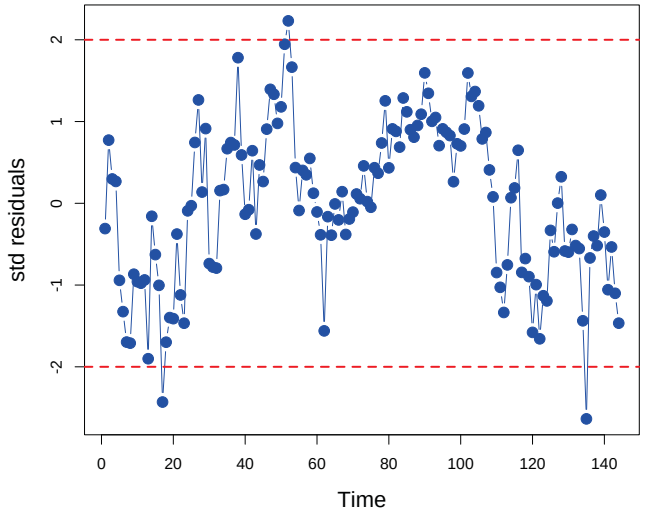
$\log(Y_t) = \beta_0 + \beta_1 t + \beta_2 Jan + ...\beta_{12} Dec + \epsilon_t$



Much better!!

Airline Data

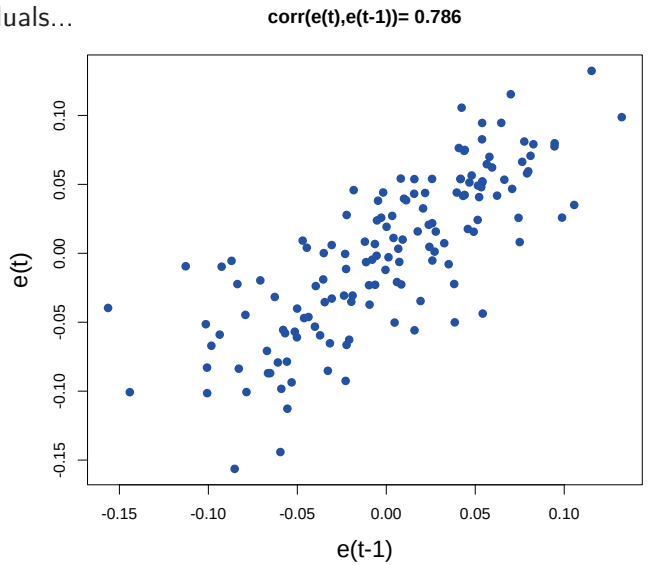
Residuals...



I am still not happy... it doesn't look normal iid to me...

Airline Data

Residuals...

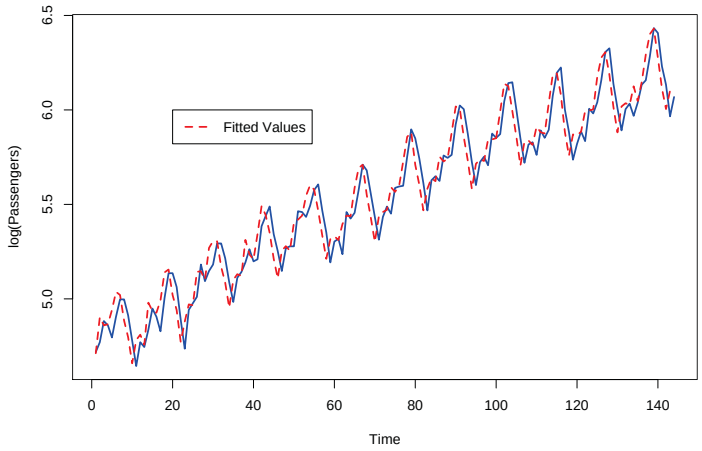


I was right! The residuals are dependent on time...

Airline Data

We have one more tool... let's add one legged term.

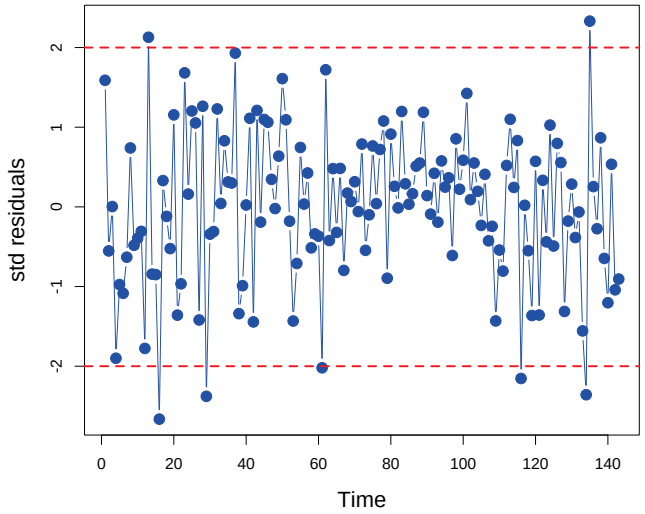
$$\log(Y_t) = \beta_0 + \beta_1 t + \beta_2 Jan + ...\beta_{12} Dec + \beta_{13} \log(Y_{t-1}) + \epsilon_t$$



Okay, good...

Airline Data

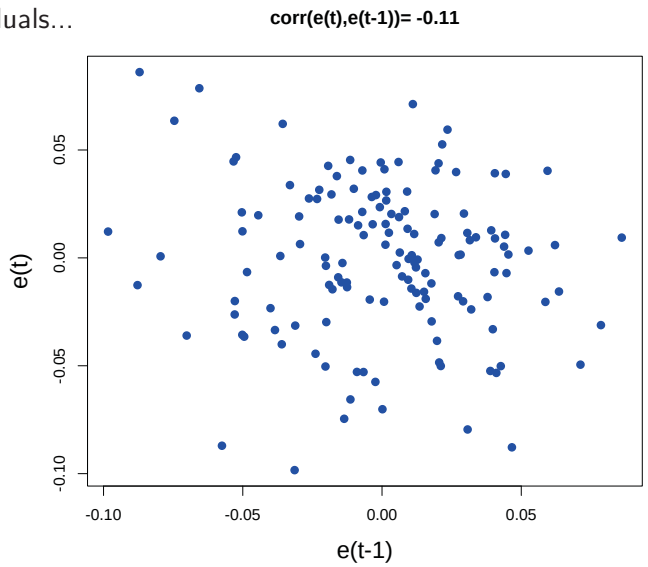
Residuals...



Much better!!

Airline Data

Residuals...



Much better indeed!!