Live Session 6

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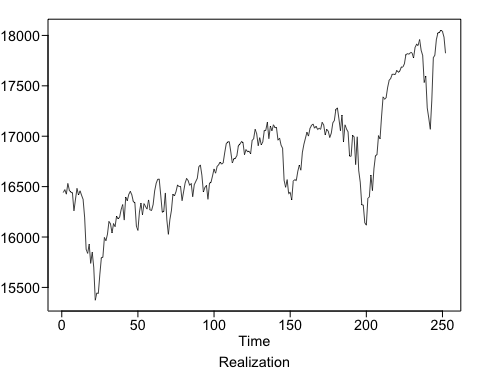
10/8/2019

## Question 1

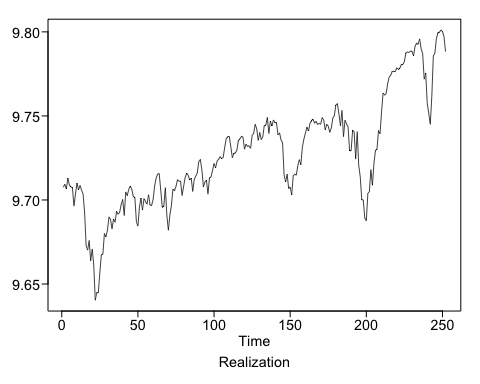
#### Which model do you think is appropriate to use to forecast your time series? Why? Add this to the Google Doc as well as to your PowerPoint deck.

The model that seems most appropriate would be an airline model, with a 1-B trend component if the appropriate phi values can be found.

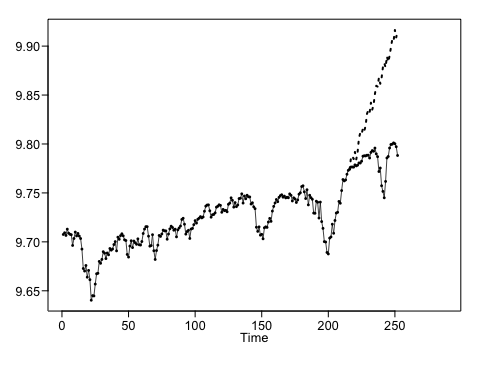
library(tswge)  
data(dowjones2014)  
  
plotts.wge(dowjones2014)



dlog = log(dowjones2014)  
plotts.wge(dlog)



fore.aruma.wge(dlog,s=12,phi=c(-.36,-.05,-.14-.11,.04,.09,-.02,.02,.17,.03,-.1,-.38),d=1,n.ahead=36,lastn = TRUE,plot=TRUE,limits = FALSE)



## $f  
## [1] 9.785805 9.787895 9.784569 9.791877 9.784300 9.791738 9.805887  
## [8] 9.811533 9.809866 9.816210 9.813367 9.818444 9.830627 9.834547  
## [15] 9.831852 9.842193 9.835122 9.840198 9.851118 9.859501 9.858598  
## [22] 9.867769 9.861494 9.867493 9.878521 9.882802 9.878139 9.889557  
## [29] 9.883702 9.890058 9.898567 9.906767 9.905023 9.916447 9.908905  
## [36] 9.915759  
##   
## $ll  
## [1] 9.762495 9.760220 9.752208 9.757794 9.746722 9.751059 9.762253  
## [8] 9.765393 9.760063 9.763498 9.758478 9.763200 9.764110 9.762678  
## [15] 9.752768 9.760310 9.748340 9.749143 9.755662 9.760969 9.755353  
## [22] 9.760154 9.749259 9.753933 9.754518 9.753069 9.739802 9.747297  
## [29] 9.735312 9.736339 9.738746 9.742797 9.735443 9.741881 9.728220  
## [36] 9.732592  
##   
## $ul  
## [1] 9.809115 9.815570 9.816931 9.825961 9.821877 9.832417 9.849520  
## [8] 9.857672 9.859669 9.868922 9.868256 9.873687 9.897143 9.906416  
## [15] 9.910936 9.924075 9.921904 9.931252 9.946574 9.958033 9.961844  
## [22] 9.975385 9.973728 9.981052 10.002525 10.012534 10.016475 10.031818  
## [29] 10.032091 10.043776 10.058388 10.070736 10.074603 10.091013 10.089591  
## [36] 10.098925  
##   
## $resid  
## [1] 0.000000e+00 0.000000e+00 0.000000e+00 0.000000e+00 0.000000e+00  
## [6] 0.000000e+00 0.000000e+00 0.000000e+00 0.000000e+00 0.000000e+00  
## [11] 0.000000e+00 0.000000e+00 0.000000e+00 0.000000e+00 0.000000e+00  
## [16] 0.000000e+00 0.000000e+00 0.000000e+00 0.000000e+00 0.000000e+00  
## [21] 0.000000e+00 0.000000e+00 0.000000e+00 0.000000e+00 4.110947e-03  
## [26] 1.668044e-02 9.388776e-03 3.808201e-02 2.011613e-02 3.448954e-03  
## [31] 3.050181e-02 -1.237681e-02 -1.355047e-02 3.346216e-02 -2.022890e-03  
## [36] 6.362482e-03 1.019217e-03 -9.879197e-03 8.702175e-03 -9.883880e-03  
## [41] -1.276086e-02 1.179419e-02 -1.134756e-02 3.542955e-03 2.439914e-02  
## [46] -7.193222e-03 -3.088190e-03 -1.016390e-02 -1.995746e-02 -1.017320e-02  
## [51] 9.022213e-04 -7.497513e-04 5.337938e-03 -5.635627e-03 1.883296e-03  
## [56] -2.151409e-03 -9.875969e-04 -3.361799e-03 -3.104568e-03 6.066832e-04  
## [61] 2.240547e-02 2.014202e-02 -2.289762e-03 -2.246307e-03 -7.625460e-03  
## [66] -2.244937e-02 -7.361313e-03 1.288373e-02 -2.630638e-02 -8.569712e-03  
## [71] 1.707518e-02 9.096031e-03 4.769566e-03 -1.116297e-03 -4.456313e-03  
## [76] -1.332401e-03 6.141431e-03 1.686437e-02 -2.441860e-03 -1.585505e-02  
## [81] 2.055487e-02 2.038080e-02 -5.987006e-03 -5.548840e-03 -1.392252e-02  
## [86] -1.702068e-02 3.243030e-03 3.865043e-03 6.438169e-04 3.212345e-03  
## [91] 1.361101e-02 3.916328e-03 -1.185803e-02 -7.717909e-03 -6.588416e-03  
## [96] -1.269740e-02 5.838693e-03 1.323184e-02 -3.761933e-03 7.224855e-03  
## [101] 4.948019e-03 -3.395470e-03 -7.431168e-03 1.611688e-03 9.590832e-03  
## [106] 1.096930e-03 5.510439e-03 2.094339e-02 -1.266954e-03 -2.677942e-03  
## [111] -6.554350e-03 -2.085916e-02 -2.992408e-03 -3.072979e-03 -1.351795e-04  
## [116] 7.713109e-03 4.195639e-03 4.848181e-03 1.549811e-03 -1.560171e-02  
## [121] -4.841827e-03 -7.498533e-03 -4.990409e-04 9.564566e-03 6.034337e-03  
## [126] 4.823926e-03 8.663208e-03 -3.389933e-03 -1.128790e-02 -3.159792e-03  
## [131] -1.069315e-02 5.083650e-03 7.580708e-03 5.383525e-03 8.769331e-03  
## [136] -1.900536e-03 -1.465912e-03 -3.380726e-03 -9.121410e-03 -4.074061e-03  
## [141] 6.777141e-03 -1.076794e-02 5.280621e-03 1.990829e-05 -1.224230e-02  
## [146] -1.981994e-02 -1.926364e-02 6.511315e-03 -1.758791e-02 -9.180217e-04  
## [151] -1.618637e-03 8.380895e-03 3.481014e-03 1.241354e-02 8.268248e-03  
## [156] 3.339689e-03 -3.838271e-03 2.845688e-02 2.558241e-02 -4.772009e-03  
## [161] 1.873974e-02 -5.603258e-04 9.124940e-03 -3.957686e-03 -1.706334e-03  
## [166] -3.913520e-03 -6.831883e-03 -5.519801e-03 1.217050e-02 -7.863359e-03  
## [171] -6.094794e-03 1.228756e-03 -1.354370e-02 4.560638e-03 -6.966701e-03  
## [176] -8.584587e-03 2.318736e-04 7.392067e-03 4.986681e-04 1.129475e-02  
## [181] 2.870490e-03 -7.100169e-03 -1.347424e-02 4.269027e-03 -7.443855e-03  
## [186] -2.843128e-03 1.828086e-03 -1.127331e-04 -1.205909e-02 -9.386472e-03  
## [191] 1.251380e-02 -9.536756e-03 -2.218119e-02 1.669376e-02 -4.884876e-03  
## [196] -2.757457e-02 7.975689e-03 -1.206803e-02 -2.007592e-02 -6.258760e-03  
## [201] 2.987822e-02 1.049855e-02 1.389758e-03 -9.481539e-04 3.287679e-02  
## [206] -5.903159e-03 1.321823e-02 3.196837e-02 6.790249e-03 1.686503e-02  
## [211] 3.548235e-02 2.130936e-02 -1.634666e-02 3.032546e-03 -1.377197e-02  
## [216] 8.173255e-03 -9.370630e-03 -5.397606e-03 1.975485e-03 -6.307814e-03  
## [221] 4.779702e-03 -2.873783e-03 -1.534885e-02 -8.675985e-03 1.087055e-03  
## [226] -3.060439e-03 1.475085e-03 -5.207892e-03 -5.264150e-03 -5.638847e-04  
## [231] -4.317408e-03 1.575746e-03 -1.635846e-03 -3.941147e-03 2.800593e-03  
## [236] -4.085868e-03 -7.941379e-03 -2.355150e-02 -5.937529e-03 -2.003498e-02  
## [241] -1.800954e-02 -8.452812e-03 1.564637e-02 2.535185e-02 8.429350e-03  
## [246] 1.885878e-02 5.645901e-03 3.389121e-03 1.937016e-03 1.656242e-02  
## [251] -1.155856e-02 1.612098e-03  
##   
## $wnv  
## [1] 0.000141438  
##   
## $se  
## [1] 0.01189277 0.01411988 0.01651094 0.01738971 0.01917218 0.02075471  
## [7] 0.02226208 0.02354060 0.02540963 0.02689387 0.02800456 0.02818537  
## [13] 0.03393681 0.03666787 0.04034897 0.04177697 0.04427659 0.04645640  
## [19] 0.04870209 0.05027131 0.05267620 0.05490584 0.05726258 0.05793865  
## [25] 0.06326733 0.06619002 0.07057978 0.07258191 0.07570885 0.07842782  
## [31] 0.08154142 0.08365792 0.08652035 0.08906437 0.09218654 0.09345224  
##   
## $psi  
## [1] 0.6400000 0.7196000 0.4589440 0.6788002 0.6683847 0.6770895 0.6434503  
## [8] 0.8042722 0.7408576 0.6565882 0.2680102 1.5893842 1.1676127 1.4157900  
## [15] 0.9105873 1.2332122 1.1825223 1.2291812 1.0478958 1.3230366 1.3022820  
## [22] 1.3671249 0.7420640 2.1369210 1.6355806 2.0603086 1.4235634 1.8106488  
## [29] 1.7213590 1.8765805 1.5722805 1.8558212 1.7771353 2.0002574 1.2888916  
## [36] 2.7273017  
##   
## $ptot  
## [1] 24  
##   
## $phitot  
## [1] 0.64 0.31 -0.20 0.29 0.05 -0.11 0.04 0.15 -0.14 -0.13 -0.28  
## [12] 1.38 -0.64 -0.31 0.20 -0.29 -0.05 0.11 -0.04 -0.15 0.14 0.13  
## [23] 0.28 -0.38

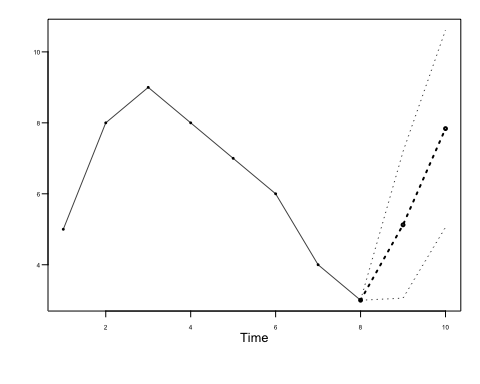
## Question 2

#### Find the first 5 psi weights for the model below, and use them to find the half-width of the 95 percentile probability interval for the third forecast (Xhat(3)). Please show your work as well as a plot of the series and the first eight forecasts with probability intervals.

w = psi.weights.wge(phi=c(.9,-.8),lag.max=5)

psi weights = 0.9, 0.01, -0.711, -0.6479, -0.01431

data = c(5,8,9,8,7,6,4,3)  
fore.arma.wge(data,phi=c(.9,-.8),plot=TRUE,limits = TRUE)



## $f  
## [1] 5.1250 7.8375  
##   
## $ll  
## [1] 3.059431 5.058561  
##   
## $ul  
## [1] 7.190569 10.616439  
##   
## $resid  
## [1] 0.000 0.000 0.175 0.675 1.375 0.475 -1.425 -1.425  
##   
## $wnv  
## [1] 1.110625  
##   
## $se  
## [1] 1.053862 1.417826  
##   
## $psi  
## [1] 0.90 0.01

## Question 3

Using the three models below and the Amtrak ridership data, which model has the smallest ASE in forecasting the next year (12 months)?  Show your code in forecasting the 12 observations as well as in calculating the ASE.

m1 = gen.arma.wge(n=12,phi=c(0.5511, 0.1680, -0.0145, 0.0651, 0.1388, -0.2966, 0.1539, 0.1270, -0.1815, 0.0364, 0.1456, 0.6287, -0.3832, -0.0199, -0.1679) , sn=24)  
m2 = gen.aruma.wge(n=12,phi=c(-0.02709541, 0.74213105) , theta=c(-0.5844596, 0.3836931), sn = 24)  
m3 = gen.aruma.wge(n=12,phi=0.306943,theta=0.7431719,s=12,d=1, sn = 24)  
  
f1 = fore.arma.wge(m1,phi=c(0.5511, 0.1680, -0.0145, 0.0651, 0.1388, -0.2966, 0.1539, 0.1270, -0.1815, 0.0364, 0.1456, 0.6287, -0.3832, -0.0199, -0.1679),n.ahead=12,lastn = TRUE,plot=TRUE,limits = FALSE)  
  
f2 =fore.aruma.wge(m2,phi=c(-0.02709541, 0.74213105) , theta=c(-0.5844596, 0.3836931),n.ahead=12,lastn = TRUE,plot=TRUE,limits = FALSE)  
  
f3 =fore.aruma.wge(m3,s=12,d=1,phi=0.306943,theta=0.7431719,n.ahead=12,lastn = TRUE,plot=TRUE,limits = FALSE)