

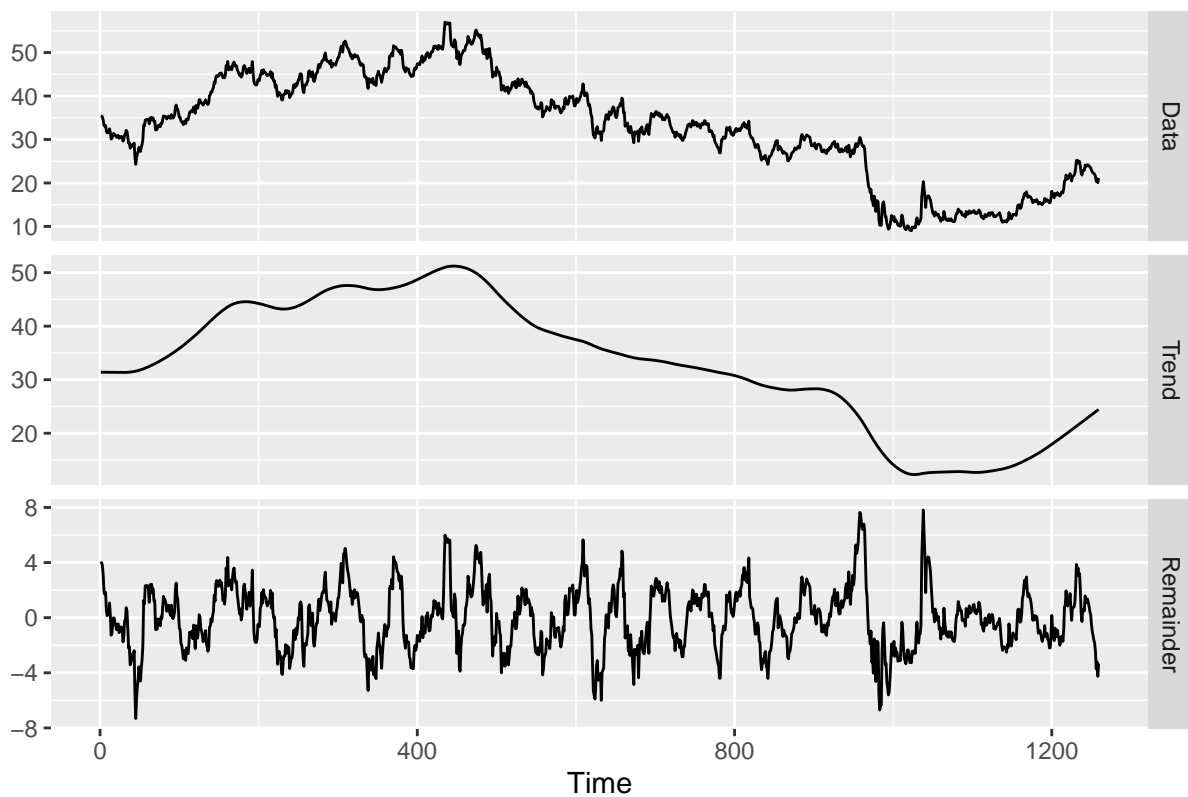
Airline Stock Forecast with Neural Network

```
summary(airline)
```

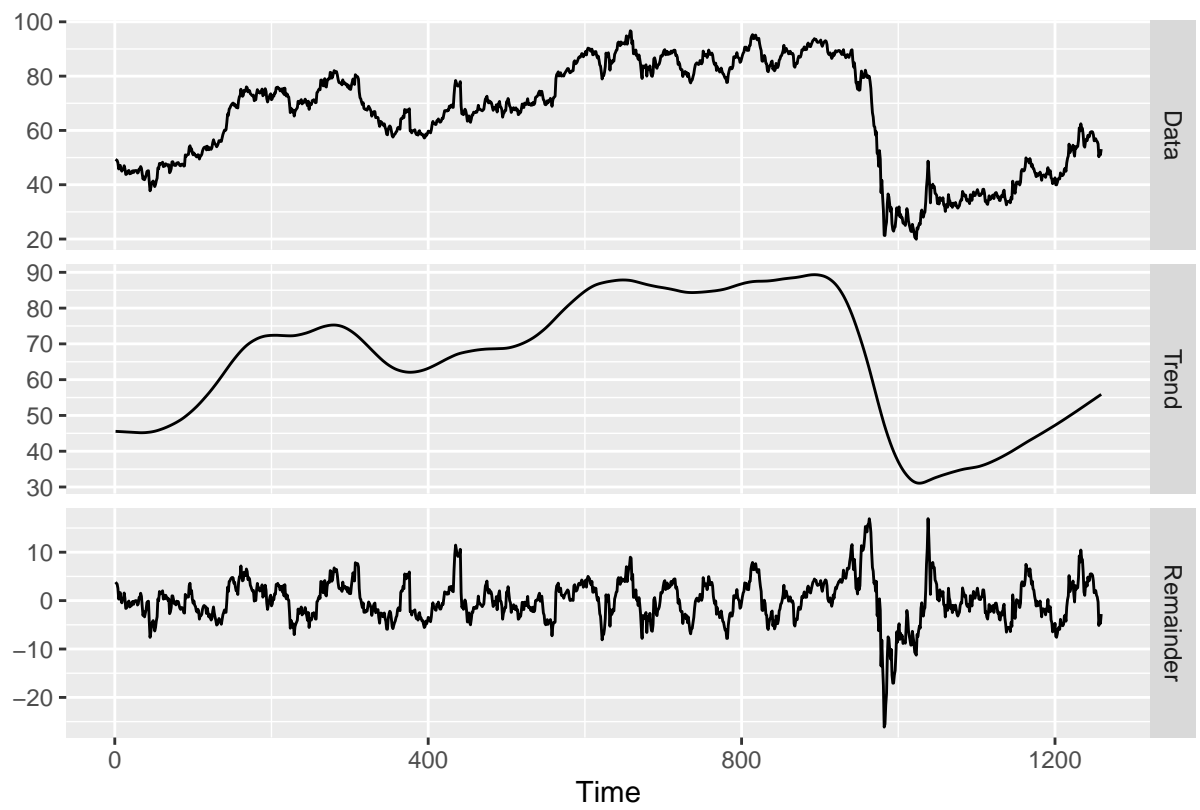
```
##      Date           AAL           UAL           DAL
## Length:1259      Min.    : 9.04    Min.    :19.92   Min.    :19.19
## Class :character  1st Qu.:26.19   1st Qu.:48.24   1st Qu.:39.44
## Mode  :character  Median :33.52   Median :69.07   Median :47.59
##                               Mean  :32.95   Mean   :65.56   Mean   :45.60
##                               3rd Qu.:43.30   3rd Qu.:82.38   3rd Qu.:52.61
##                               Max.   :56.99   Max.   :96.70   Max.   :62.26
```

```
airline2 <- read.csv(file = 'C:/Users/Steve/Documents/Santa Clara University Classes/Spring 2021/Time S
AAL.ts <- ts(airline2$AAL)
UAL.ts <- ts(airline2$UAL)
DAL.ts<- ts(airline2$DAL)

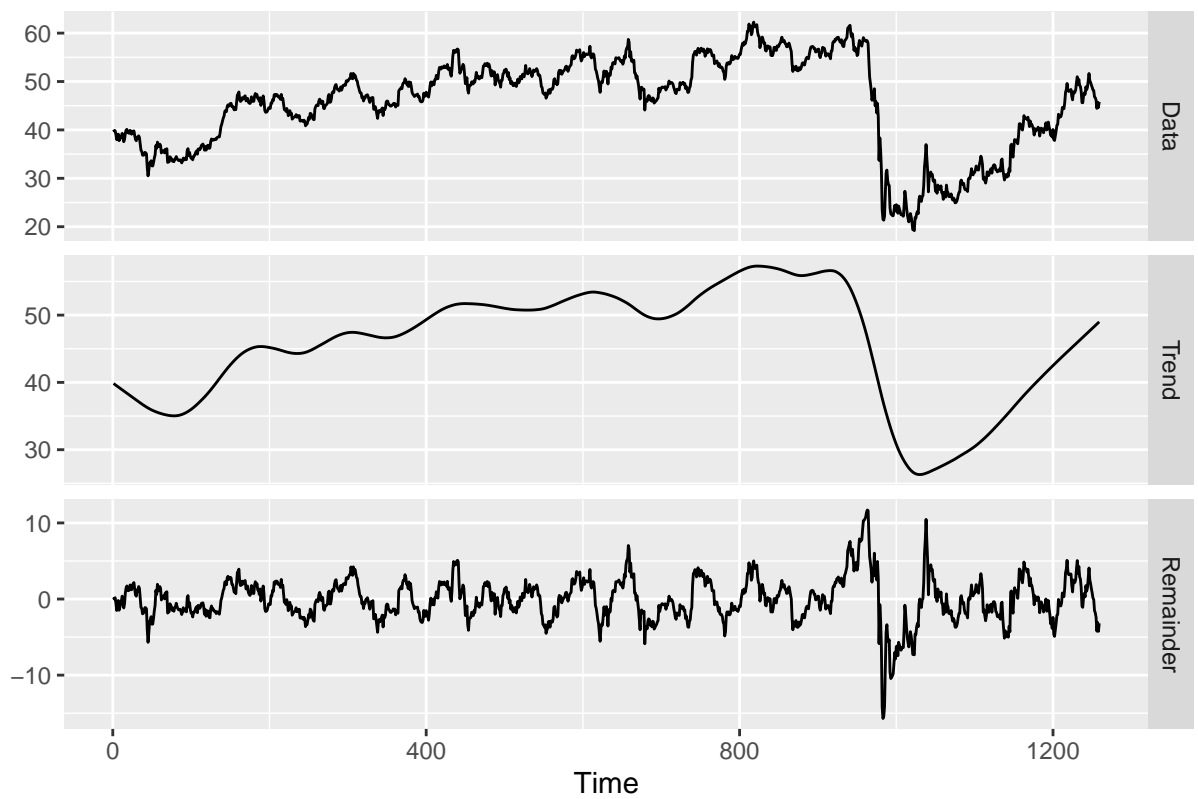
autoplot(mstl(AAL.ts))
```



```
autoplot(mstl(UAL.ts))
```

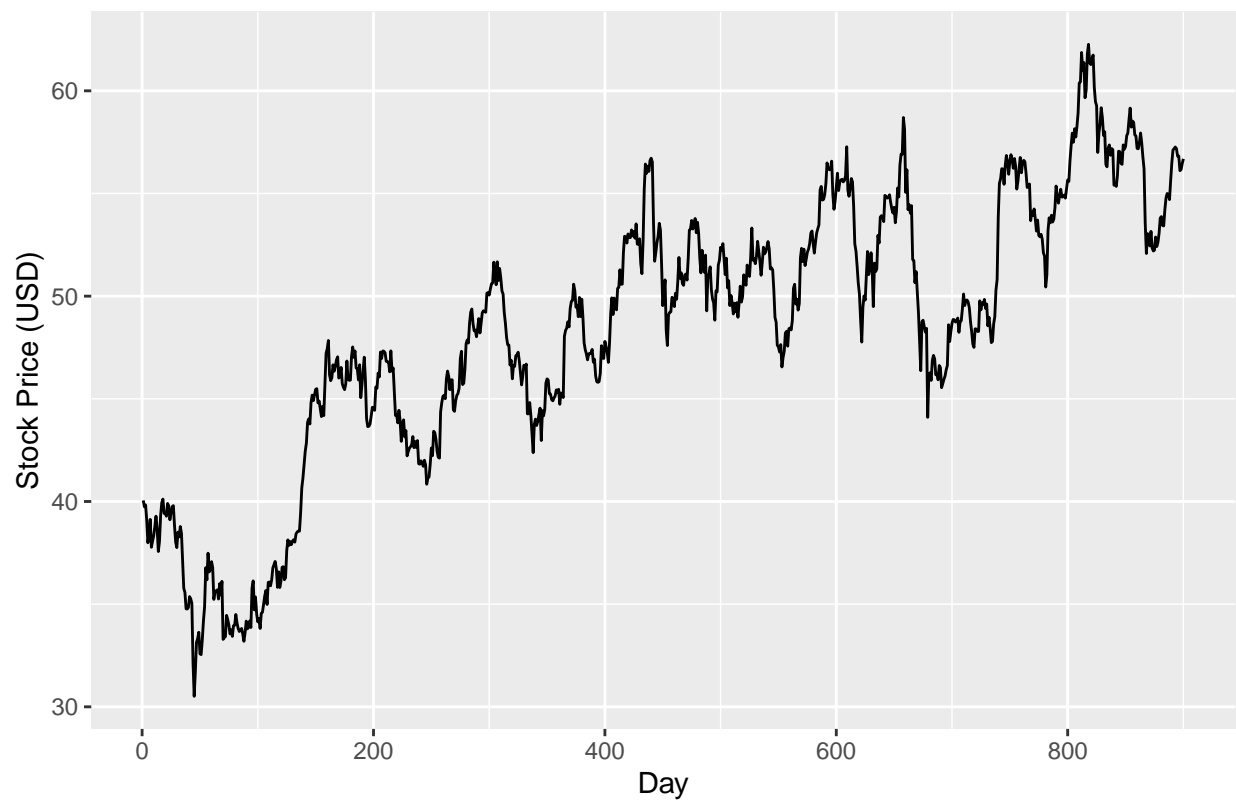


```
autoplot(mstl(DAL.ts))
```



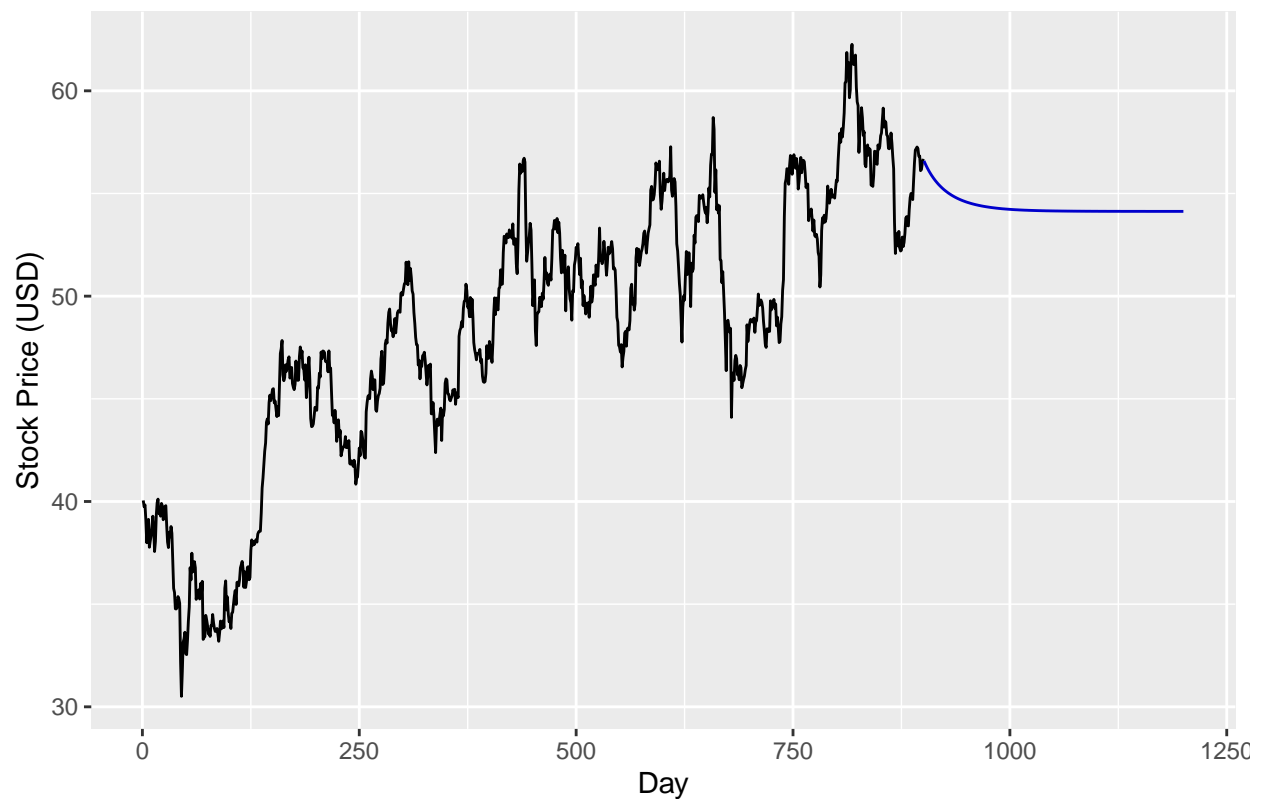
#Ideal Neural Network
#Our data disadvantage because at Q1 2020, there was a huge dip in the stock price.
#This example is ideal without taking into account the stock dip.

```
exset <- window(DAL.ts, end=c(900))
autoplot(exset)+xlab("Day")+ylab("Stock Price (USD)")
```



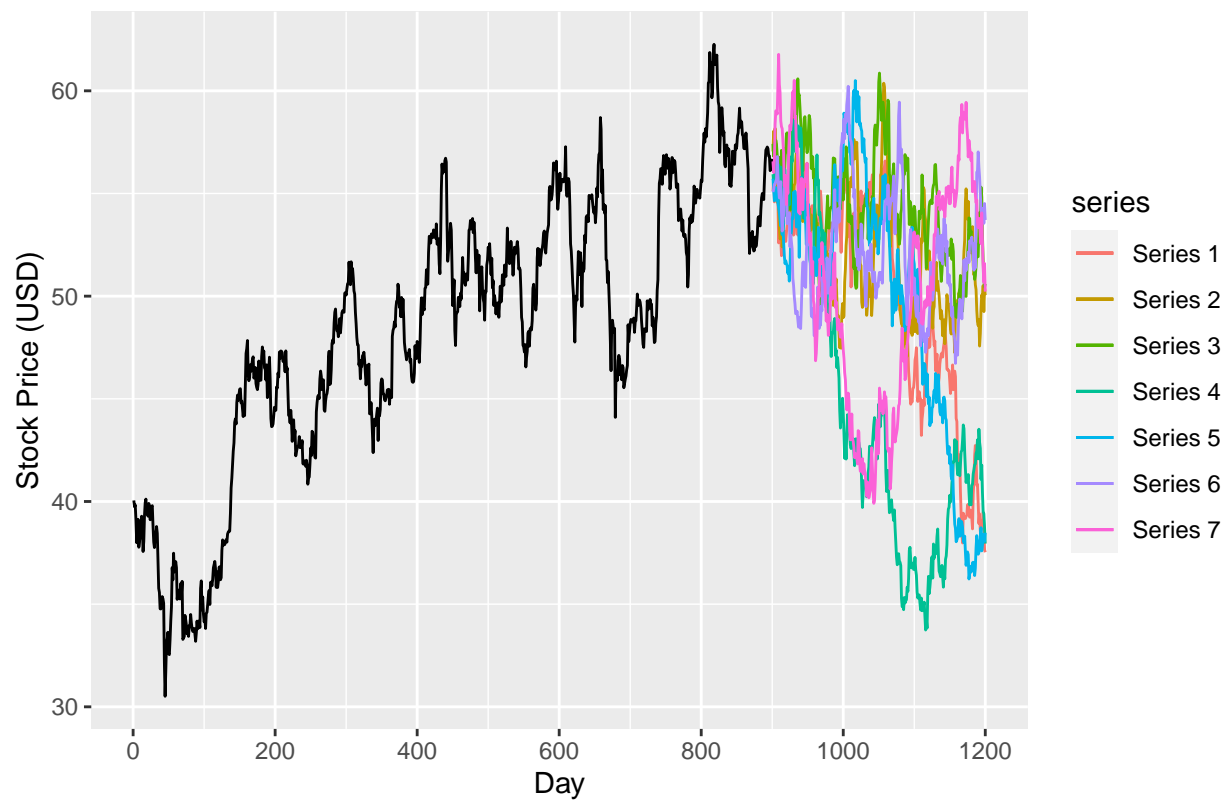
```
fitex <- nnetar(exset, lambda=0)
autoplot(forecast(fitex,h=300))+ xlab("Day")+ylab("Stock Price (USD)")
```

Forecasts from NNAR(1,1)



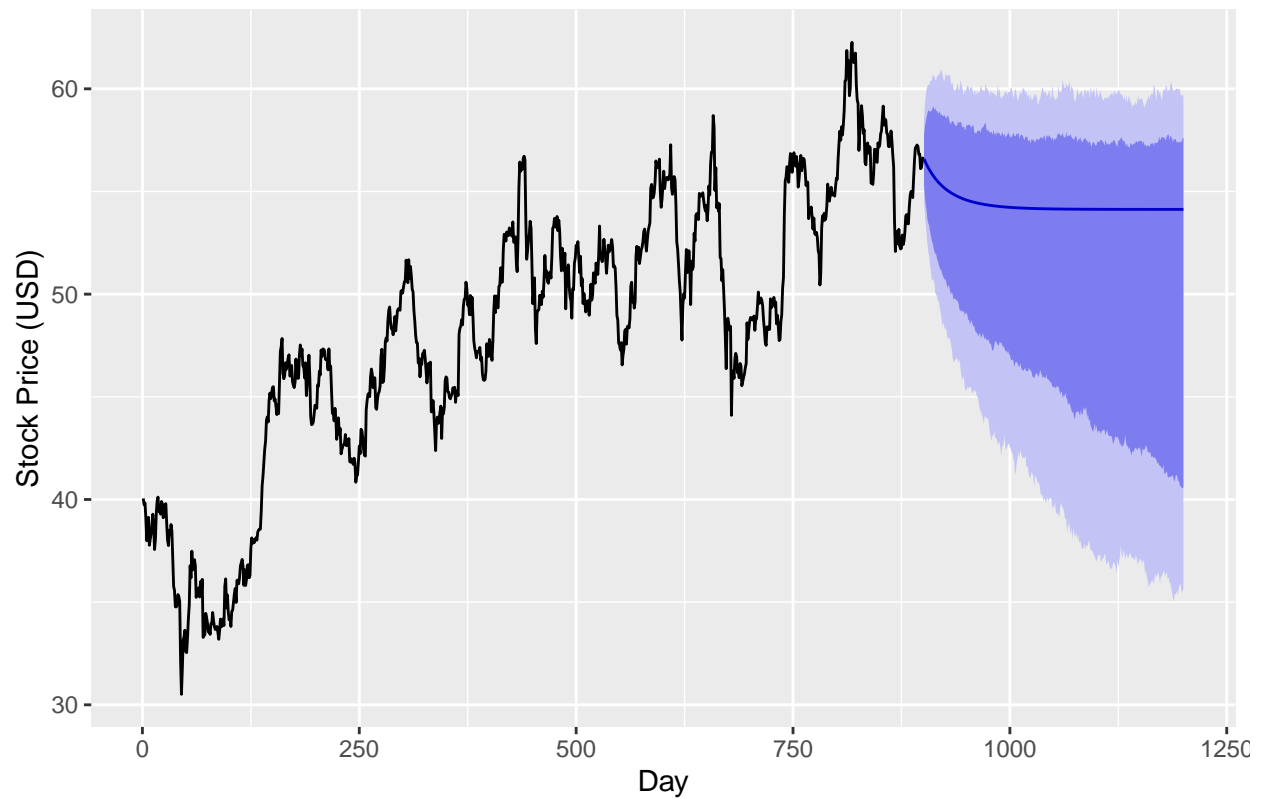
```
simex <- ts(matrix(0, nrow=300L, ncol=7L),  
  start=end(exset)[1L]+1L)  
for(i in seq(7))  
  simex[,i] <- simulate(fitex, nsim=300L)  
autoplot(exset) + autolayer(simex) + xlab("Day") + ylab("Stock Price (USD)")
```

For a multivariate timeseries, specify a seriesname for each timeseries. Defaulting to column names.



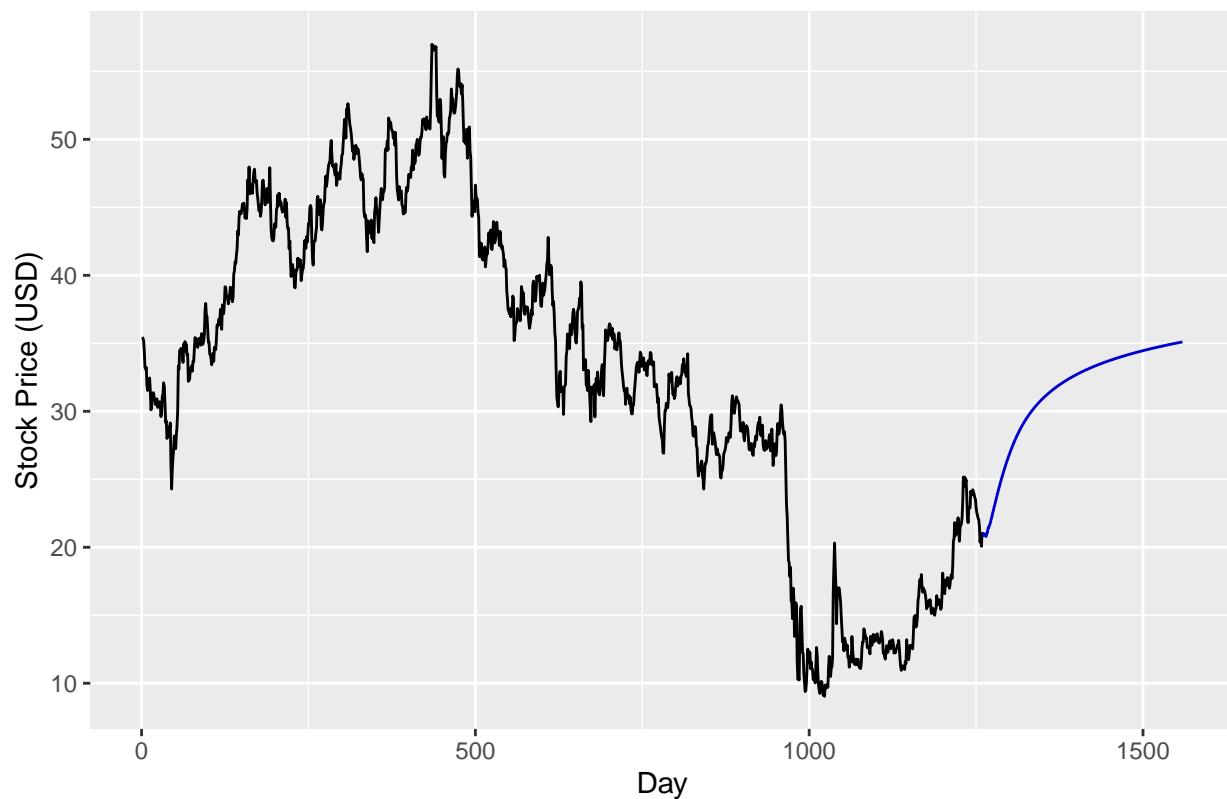
```
fcastex <- forecast(fitex, PI=TRUE, h=300)
autoplot(fcastex) +xlab("Day")+ylab("Stock Price (USD)")
```

Forecasts from NNAR(1,1)



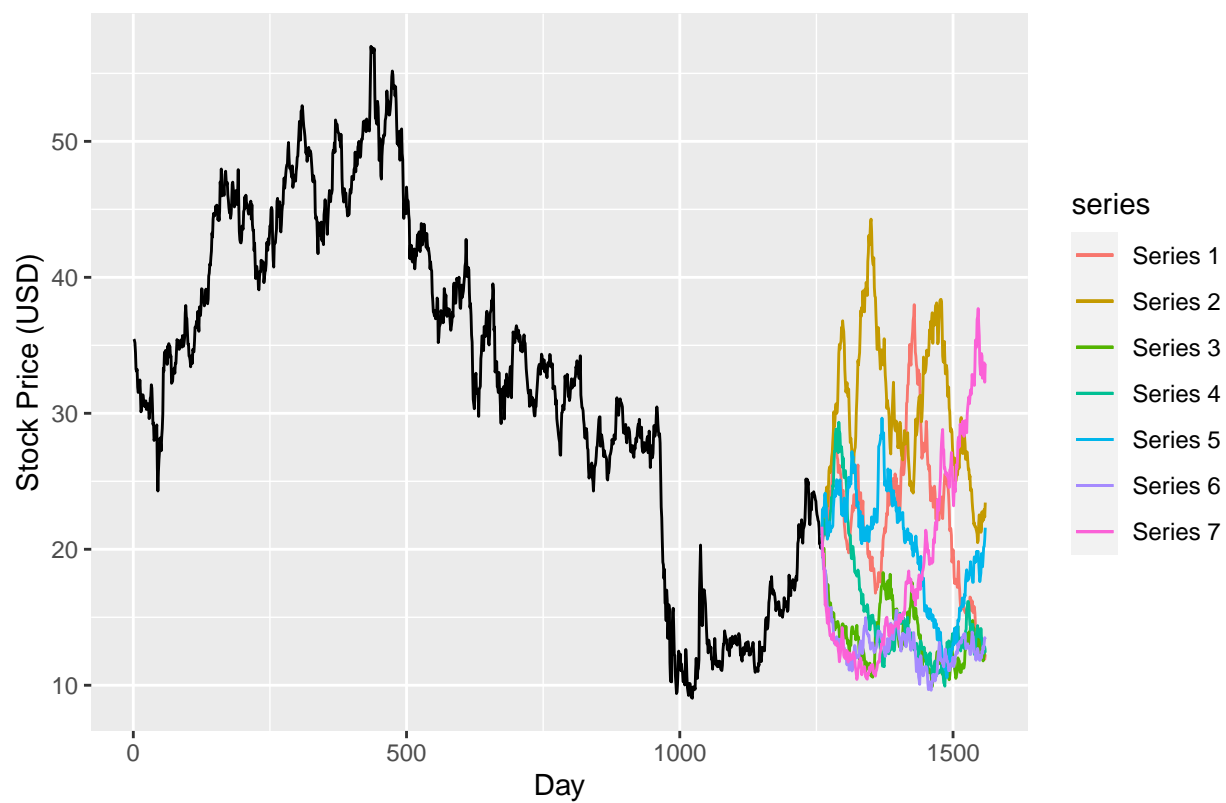
```
fit1 <- nnetar(AAL.ts, lambda=0)
autoplot(forecast(fit1,h=300))+ xlab("Day")+ylab("Stock Price (USD)")
```

Forecasts from NNAR(11,6)



```
sim <- ts(matrix(0, nrow=300L, ncol=7L),
  start=end(AAL.ts)[1L]+1L)
for(i in seq(7))
  sim[,i] <- simulate(fit1, nsim=300L)
autoplot(AAL.ts) + autolayer(sim)+xlab("Day")+ylab("Stock Price (USD)")
```

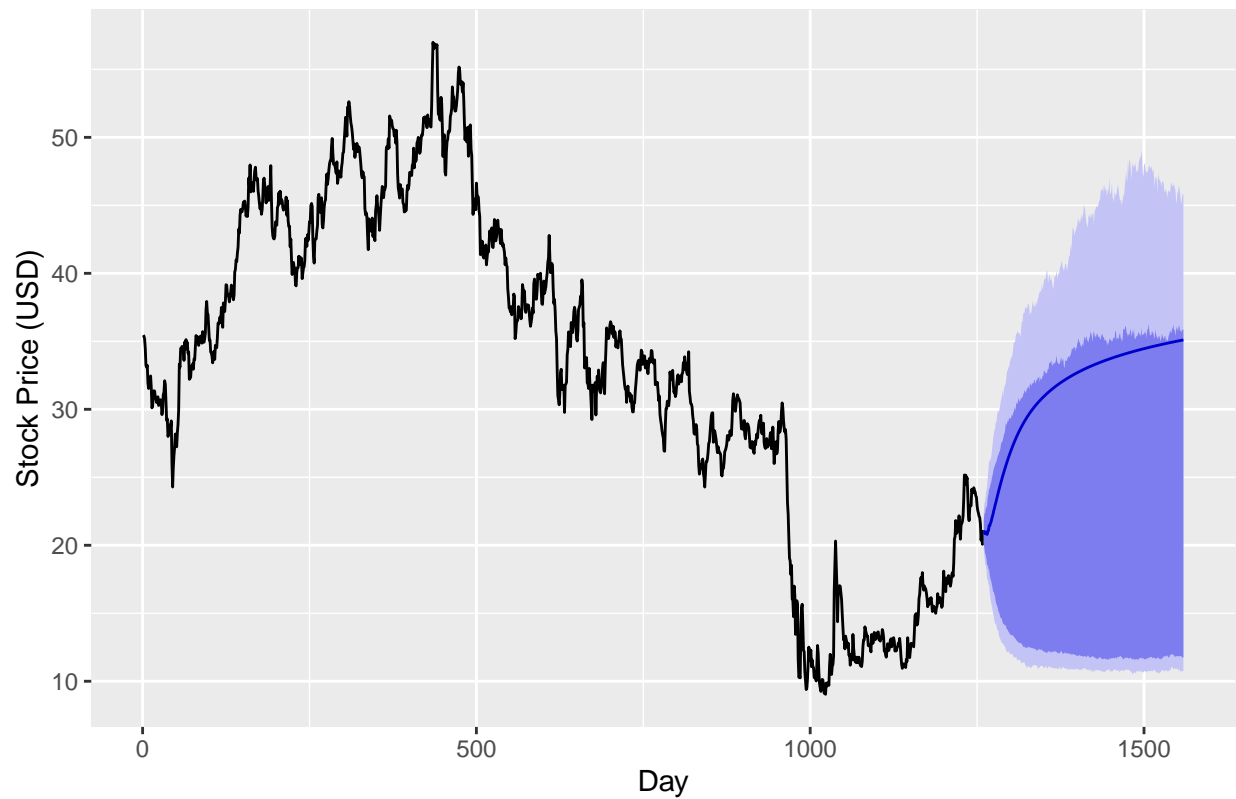
For a multivariate timeseries, specify a seriesname for each timeseries. Defaulting to column names.



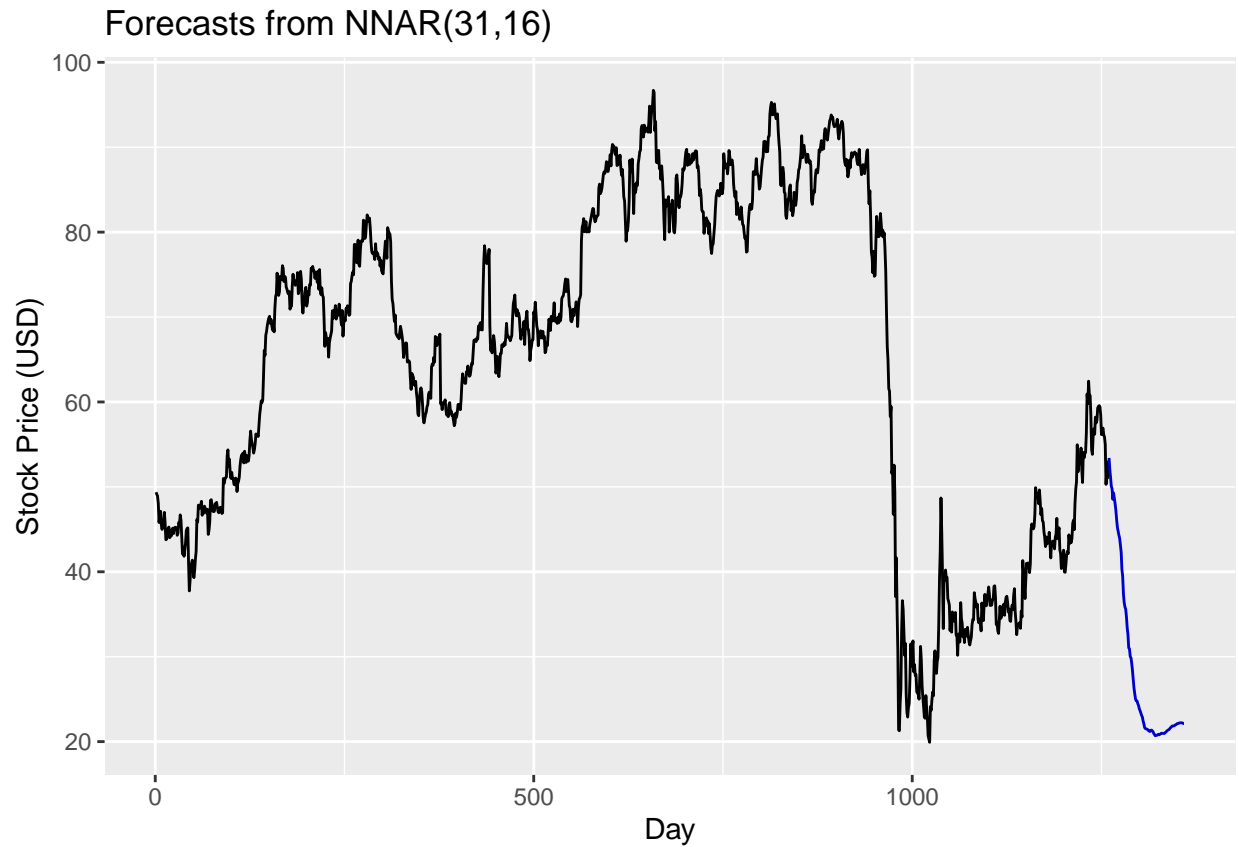
#Please note, running these 2 below takes a very long time. Example $h=30$ takes 1 min, so 365 takes a wh

```
fcast1 <- forecast(fit1, PI=TRUE, h=300)
autoplot(fcast1)+xlab("Day")+ylab("Stock Price (USD)")
```

Forecasts from NNAR(11,6)

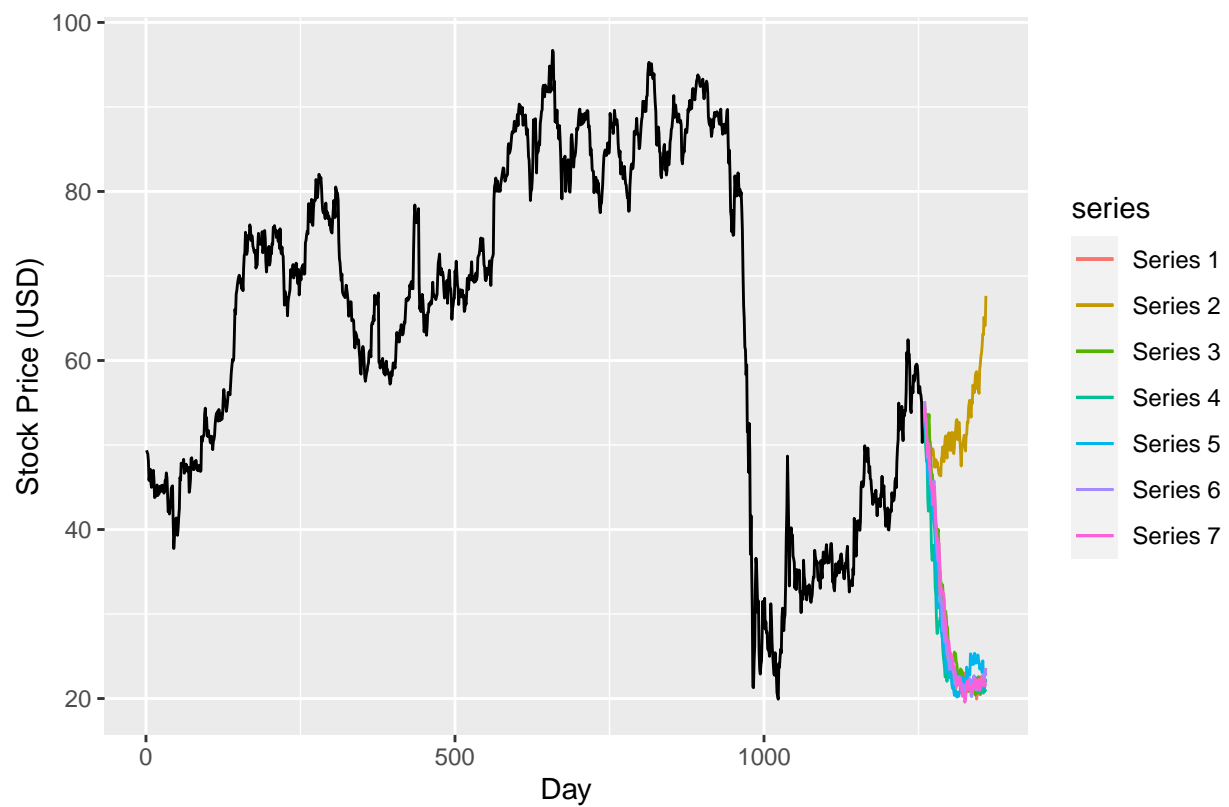


```
fit2 <- nnetar(UAL.ts, lambda=0)
autoplot(forecast(fit2,h=100))+xlab("Day")+ylab("Stock Price (USD)")
```

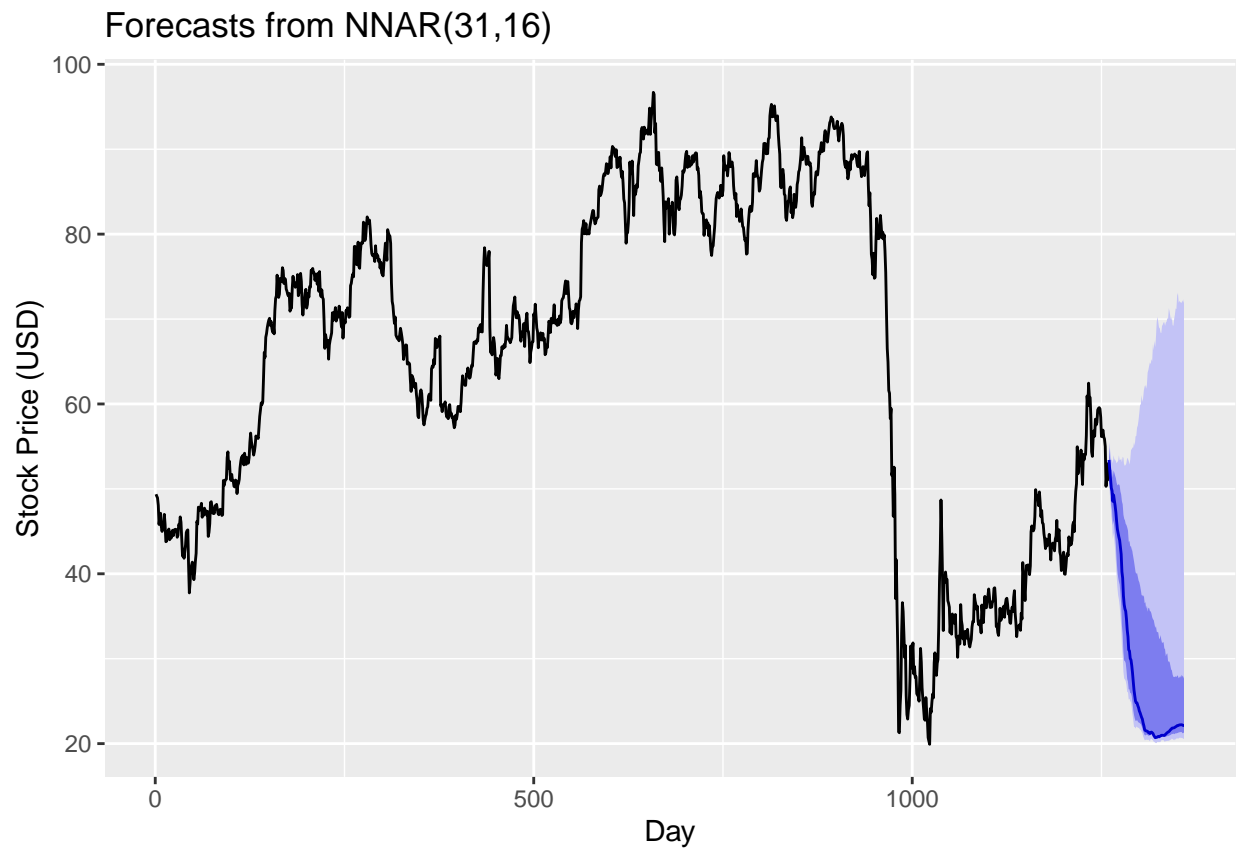


```
sim2 <- ts(matrix(0, nrow=100L, ncol=7L),
  start=end(UAL.ts)[1L]+1L)
for(i in seq(7))
  sim2[,i] <- simulate(fit2, nsim=100L)
autoplot(UAL.ts) + autolayer(sim2)+xlab("Day")+ylab("Stock Price (USD)")
```

For a multivariate timeseries, specify a seriesname for each timeseries. Defaulting to column names.

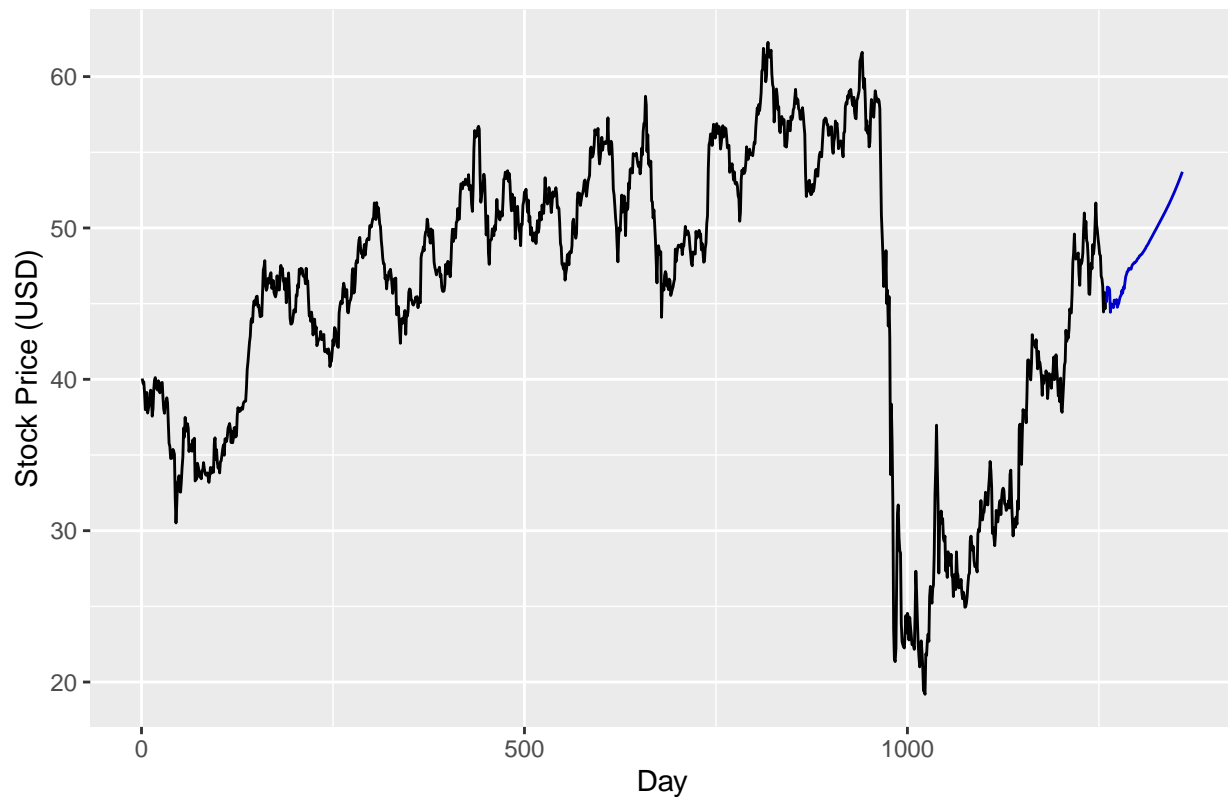


```
fcast2 <- forecast(fit2, PI=TRUE, h=100)
autoplot(fcast2)+xlab("Day")+ylab("Stock Price (USD)")
```



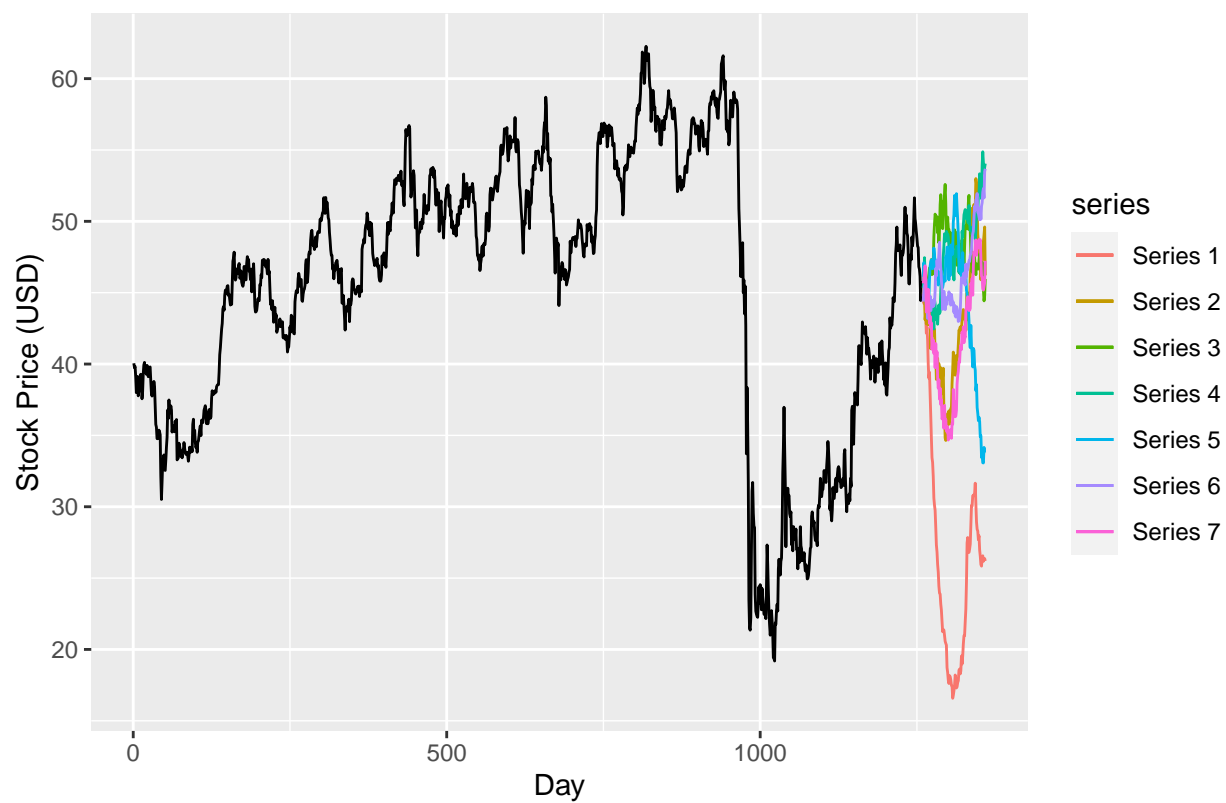
```
fit3 <- nnetar(DAL.ts, lambda=0)
autoplot(forecast(fit3,h=100))+xlab("Day")+ylab("Stock Price (USD)")
```

Forecasts from NNAR(30,16)



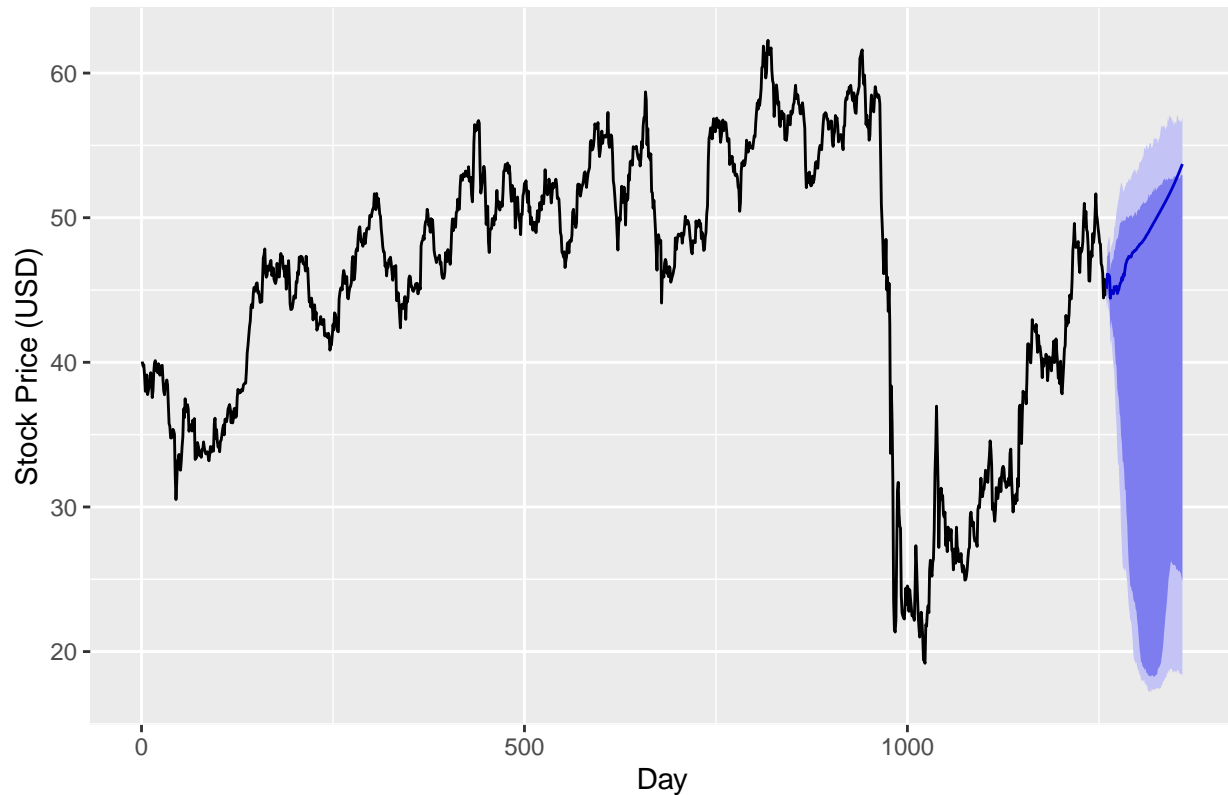
```
sim3 <- ts(matrix(0, nrow=100L, ncol=7L),
  start=end(DAL.ts)[1L]+1L)
for(i in seq(7))
  sim3[,i] <- simulate(fit3, nsim=100L)
autoplot(DAL.ts) + autolayer(sim3)+xlab("Day")+ylab("Stock Price (USD)")
```

For a multivariate timeseries, specify a seriesname for each timeseries. Defaulting to column names.



```
fcast3 <- forecast(fit3, PI=TRUE, h=100)
autoplot(fcast3)+xlab("Day")+ylab("Stock Price (USD)")
```

Forecasts from NNAR(30,16)



```
sweep::sw_glance(fit1)
```

```
## # A tibble: 1 x 12
##   model.desc sigma logLik AIC   BIC      ME RMSE  MAE      MPE MAPE  MASE
##   <chr>      <dbl> <lgl> <lgl> <lgl> <dbl> <dbl> <dbl> <dbl> <dbl> <dbl>
## 1 NNAR(11,6) 0.796 NA     NA     NA    0.0153 0.796 0.589 -0.0371 2.05 0.959
## # ... with 1 more variable: ACF1 <dbl>
```

```
sweep::sw_glance(fit2)
```

```
## # A tibble: 1 x 12
##   model.desc sigma logLik AIC   BIC      ME RMSE  MAE      MPE MAPE  MASE
##   <chr>      <dbl> <lgl> <lgl> <lgl> <dbl> <dbl> <dbl> <dbl> <dbl> <dbl>
## 1 NNAR(31,16) 1.19 NA     NA     NA    0.00769 1.19 0.847 -0.0280 1.30 0.761
## # ... with 1 more variable: ACF1 <dbl>
```

```
sweep::sw_glance(fit3)
```

```
## # A tibble: 1 x 12
##   model.desc sigma logLik AIC   BIC      ME RMSE  MAE      MPE MAPE  MASE
##   <chr>      <dbl> <lgl> <lgl> <lgl> <dbl> <dbl> <dbl> <dbl> <dbl> <dbl>
## 1 NNAR(30,16) 0.693 NA     NA     NA    0.00878 0.693 0.508 -0.00865 1.10 0.741
## # ... with 1 more variable: ACF1 <dbl>
```