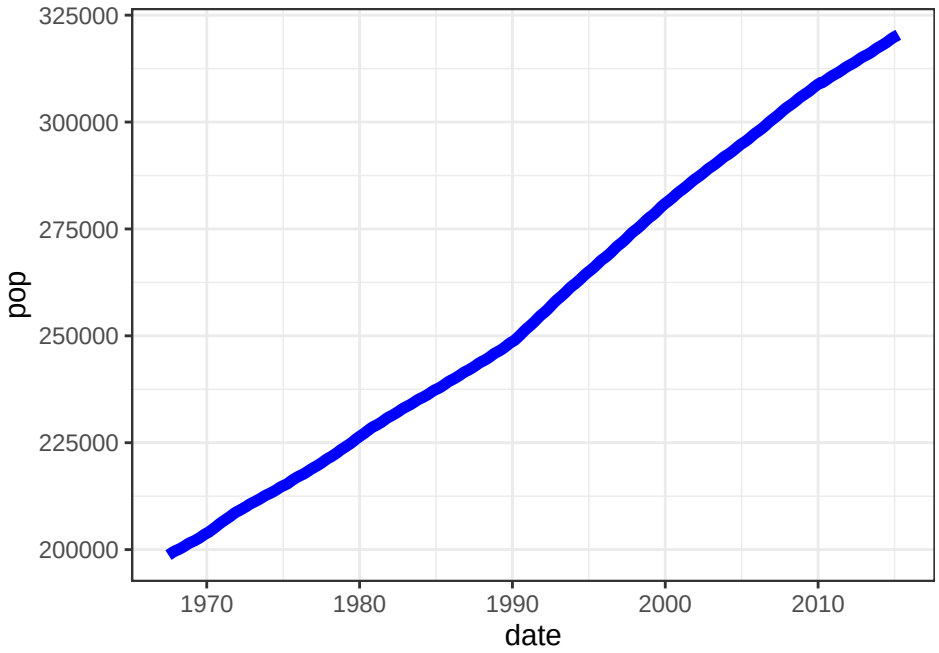
```r
# ggts2.r

library(ggplot2)
theme_set(theme_bw())

# dataset from ggplot2
data(package='ggplot2')
?economics
head(economics)
```

```
## # A tibble: 6 x 6
##   date         pce    pop psavert uempmed unemploy
##   <date>     <dbl>  <dbl>   <dbl>   <dbl>    <dbl>
## 1 1967-07-01  507. 198712    12.6     4.5     2944
## 2 1967-08-01  510. 198911    12.6     4.7     2945
## 3 1967-09-01  516. 199113    11.9     4.6     2958
## 4 1967-10-01  512. 199311    12.9     4.9     3143
## 5 1967-11-01  517. 199498    12.8     4.7     3066
## 6 1967-12-01  525. 199657    11.8     4.8     3018
```

```r
dim(economics)
```

```
## [1] 574   6
```

```r
# Basic line plot
ggplot(data = economics, aes(x = date, y = pop)) +
  geom_line(color = "blue", size = 2)
```




```r
# Plot a subset of the data
ss <- subset(economics, date > as.Date("2006-1-1"))
head(ss)
```

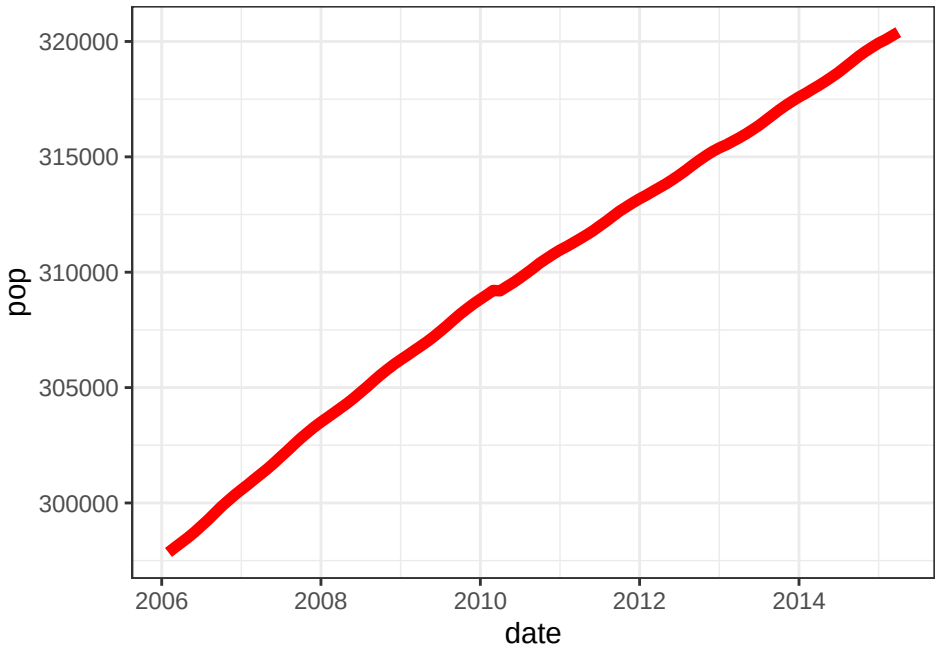
```
## # A tibble: 6 x 6
##   date         pce    pop psavert uempmed unemploy
##   <date>     <dbl>  <dbl>   <dbl>   <dbl>    <dbl>
```

```
## 1 2006-02-01 9090. 297854     4.2     9.1     7184
## 2 2006-03-01 9122. 298060     4.2     8.7     7072
## 3 2006-04-01 9175. 298281     4       8.4     7120
## 4 2006-05-01 9215. 298496     3.8     8.5     6980
## 5 2006-06-01 9241. 298739     4       7.3     7001
## 6 2006-07-01 9323. 298996     3.4     8       7175
```

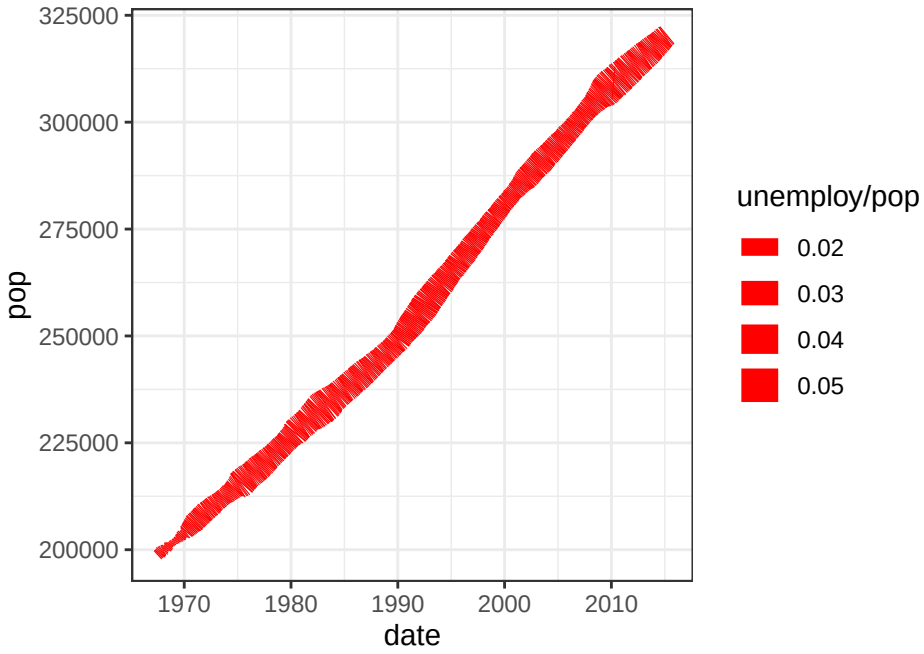
```
dim(ss)
```

```
## [1] 111   6
```

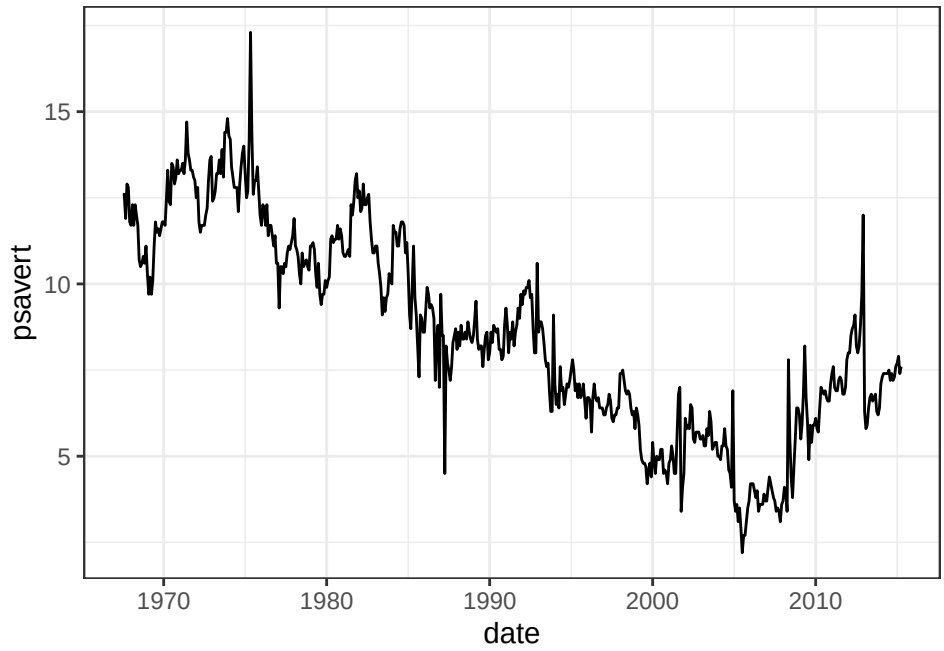
```
ggplot(data = ss, aes(x = date, y = pop)) +
  geom_line(color = "red", size = 2)
```




```
ggplot(data = economics, aes(x = date, y = pop)) +
  geom_line(aes(size = unemploy/pop), color = "red")
```

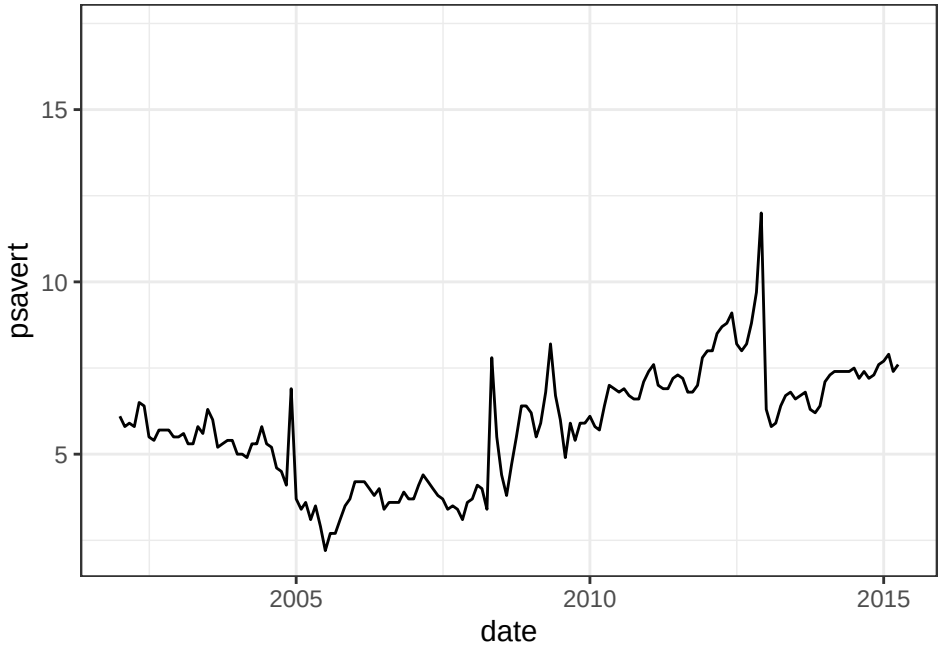



```
# plot multiple series
library(tidyr)    # gather()
library(dplyr)

# Base plot with date axis
p <- ggplot(data = economics, aes(x = date, y = psavert)) +
  geom_line()
p
```

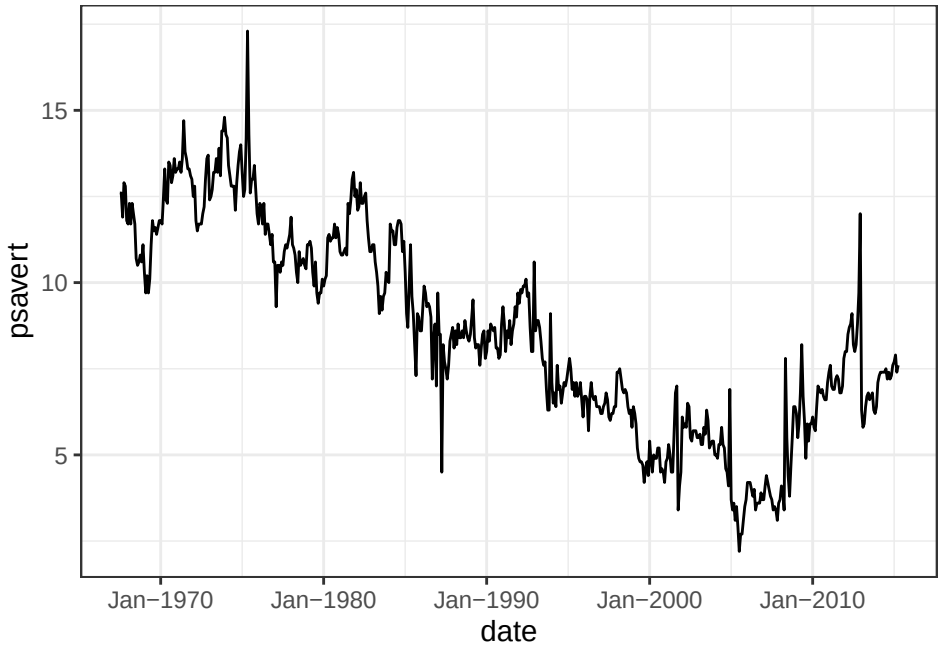



```
# Set x-axis limits c(min, max)
min <- as.Date("2002-1-1")
p + scale_x_date(limits = c(min, NA))
```

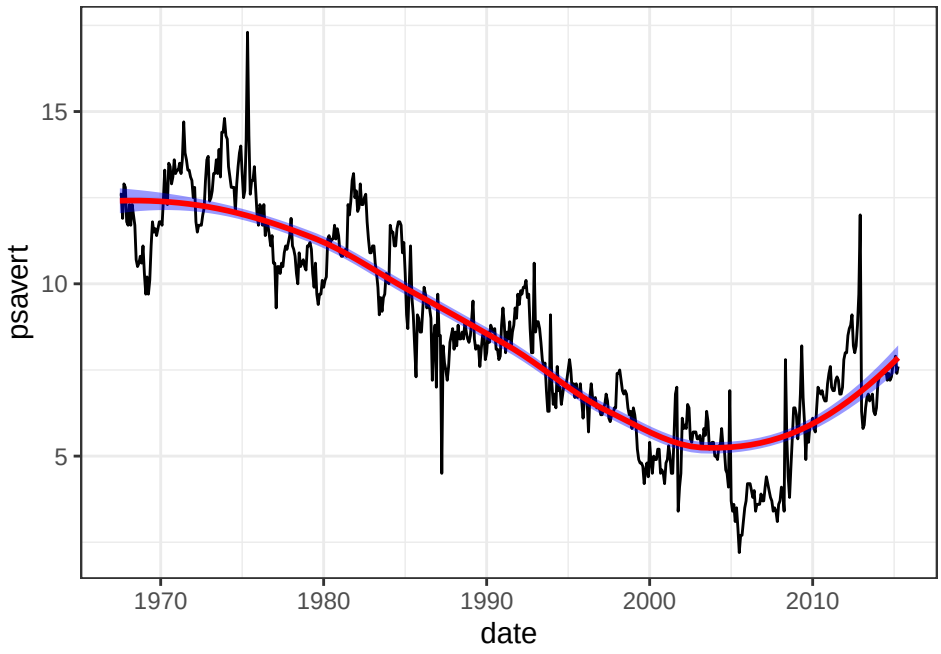
```
## Warning: Removed 414 rows containing missing values (geom_path).
```



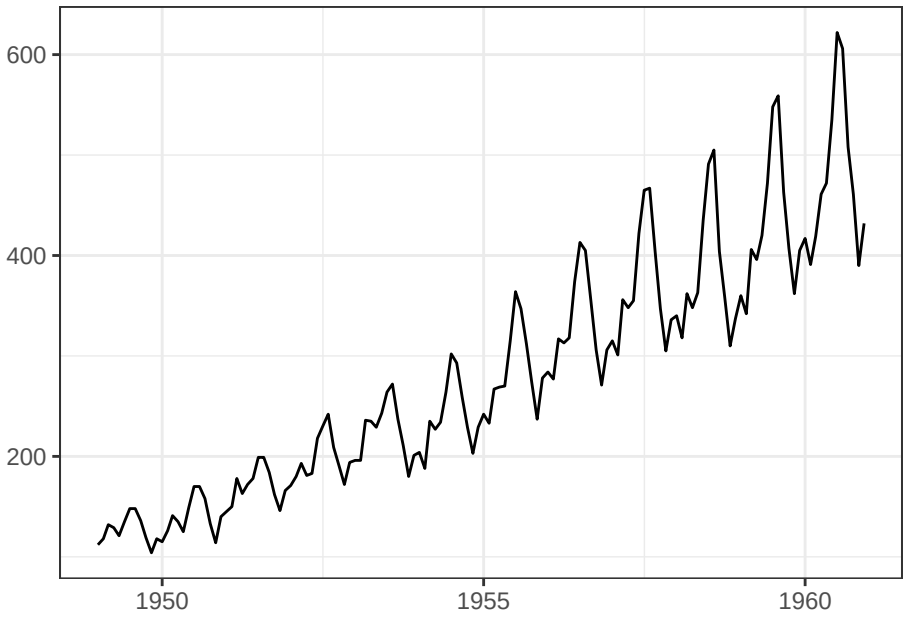

```
# Format : month/year
p + scale_x_date(date_labels = "%b-%Y")
```




```
# add trend curve
p + stat_smooth(color = "red",fill = 'blue')
```

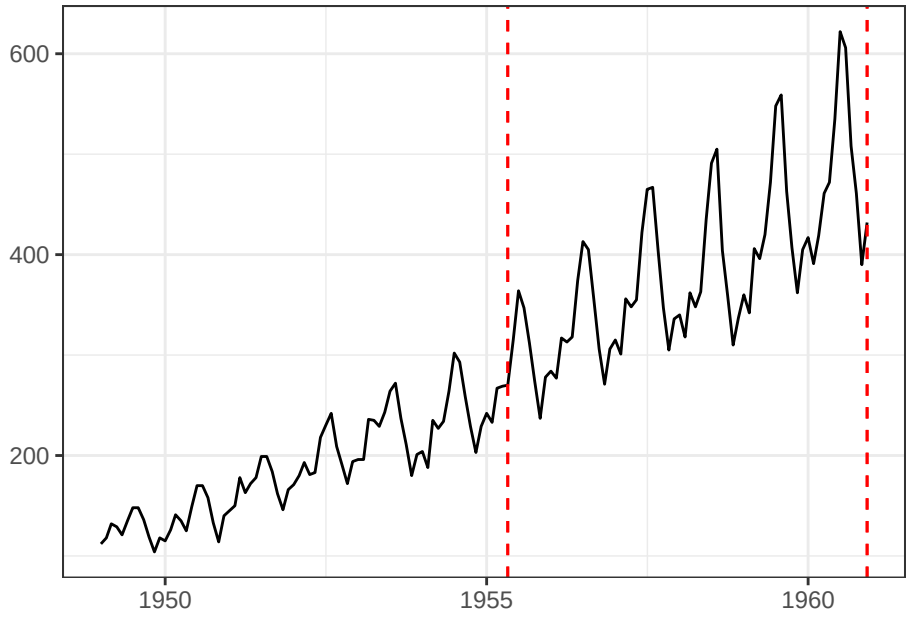



```
# ggplot EXTENSIONS
#
# install.packages(c("ggfortify","changepoint","strucchange","ggpmisc"))

library(magrittr) # for piping %>%

library(ggfortify) # for autoplot()

# Plot ts objects
autoplot(AirPassengers)
```

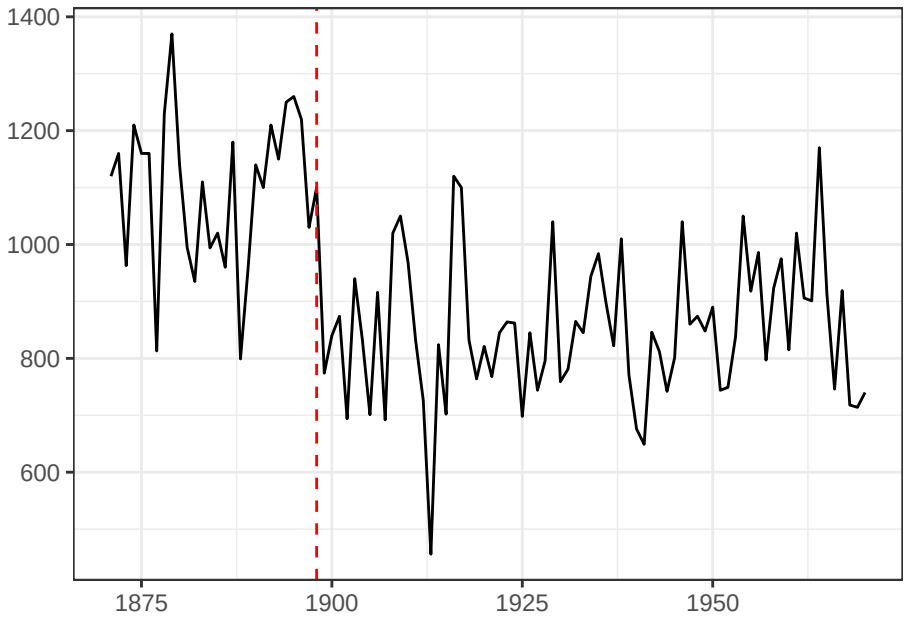



```
# Identify change points in mean and variance
AirPassengers %>%
  changepoint:: cpt.meanvar() %>%
```

```
  autoplot()
```




```
# Detect jump in a data
strucchange::breakpoints(Nile ~ 1) %>%
  autoplot()
```




```
# peaks and valleys

# linx data from R base
lynx
```

```
## Time Series:
## Start = 1821
## End = 1934
## Frequency = 1
```

```
##   [1]  269  321  585  871 1475 2821 3928 5943 4950 2577  523   98  184  279  409
##  [16] 2285 2685 3409 1824  409  151   45   68  213  546 1033 2129 2536  957  361
##  [31]  377  225  360  731 1638 2725 2871 2119  684  299  236  245  552 1623 3311
##  [46] 6721 4254  687  255  473  358  784 1594 1676 2251 1426  756  299  201  229
##  [61]  469  736 2042 2811 4431 2511  389   73   39   49   59  188  377 1292 4031
##  [76] 3495  587  105  153  387  758 1307 3465 6991 6313 3794 1836  345  382  808
##  [91] 1388 2713 3800 3091 2985 3790  674   81   80  108  229  399 1132 2432 3574
## [106] 2935 1537  529  485  662 1000 1590 2657 3396
```

```
class(lynx)
```

```
## [1] "ts"
```

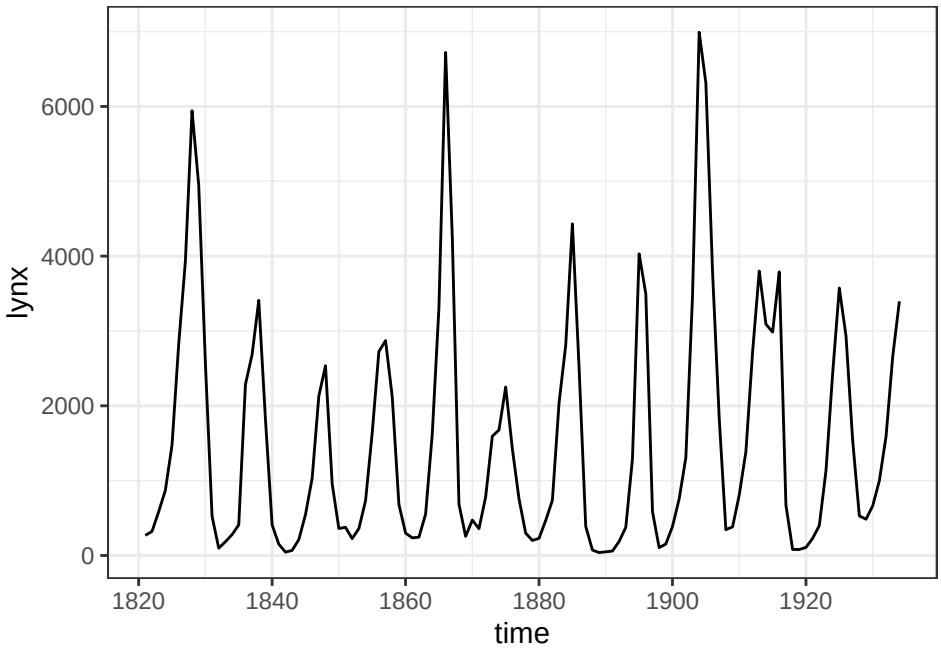
```
time(lynx)
```

```
## Time Series:
## Start = 1821
## End = 1934
## Frequency = 1
##   [1] 1821 1822 1823 1824 1825 1826 1827 1828 1829 1830 1831 1832 1833 1834 1835
##  [16] 1836 1837 1838 1839 1840 1841 1842 1843 1844 1845 1846 1847 1848 1849 1850
##  [31] 1851 1852 1853 1854 1855 1856 1857 1858 1859 1860 1861 1862 1863 1864 1865
##  [46] 1866 1867 1868 1869 1870 1871 1872 1873 1874 1875 1876 1877 1878 1879 1880
##  [61] 1881 1882 1883 1884 1885 1886 1887 1888 1889 1890 1891 1892 1893 1894 1895
##  [76] 1896 1897 1898 1899 1900 1901 1902 1903 1904 1905 1906 1907 1908 1909 1910
##  [91] 1911 1912 1913 1914 1915 1916 1917 1918 1919 1920 1921 1922 1923 1924 1925
## [106] 1926 1927 1928 1929 1930 1931 1932 1933 1934
```

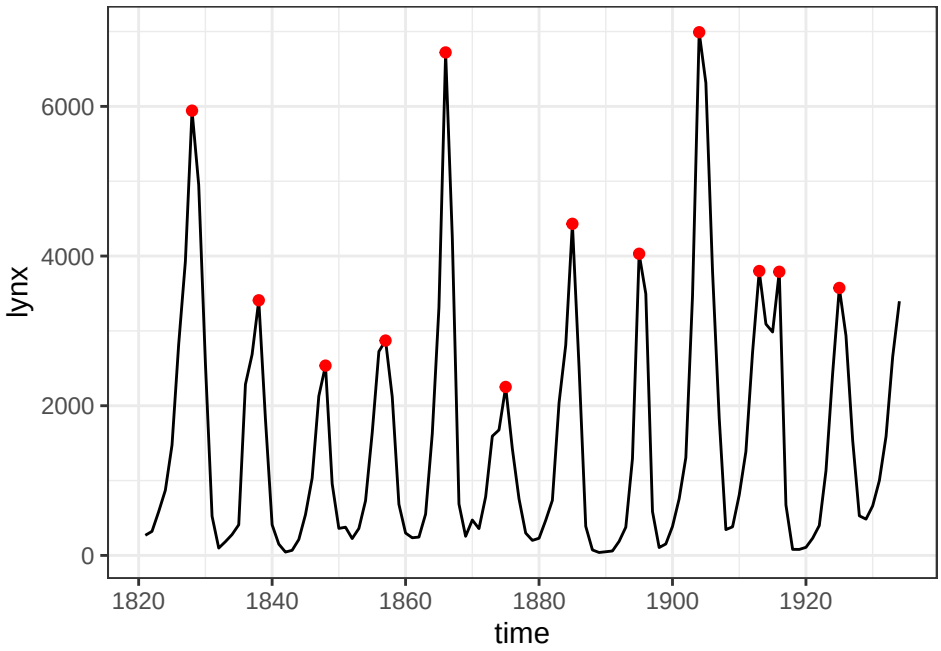
```
dlynx = data.frame('year'=time(lynx),'value'=lynx)
head(dlynx)
```

```
##   year value
## 1 1821   269
## 2 1822   321
## 3 1823   585
## 4 1824   871
## 5 1825  1475
## 6 1826  2821
```

```
library(ggpmisc)
ggplot(lynx) + geom_line()
```

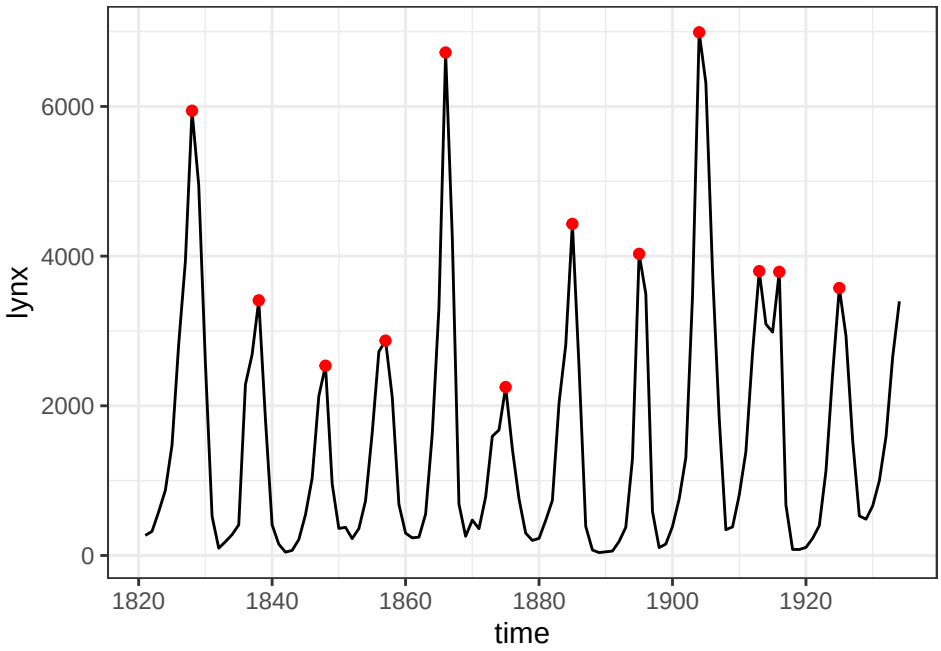



```
# display peak values
ggplot(lynx) + geom_line() +
  stat_peaks(colour = "red")
```

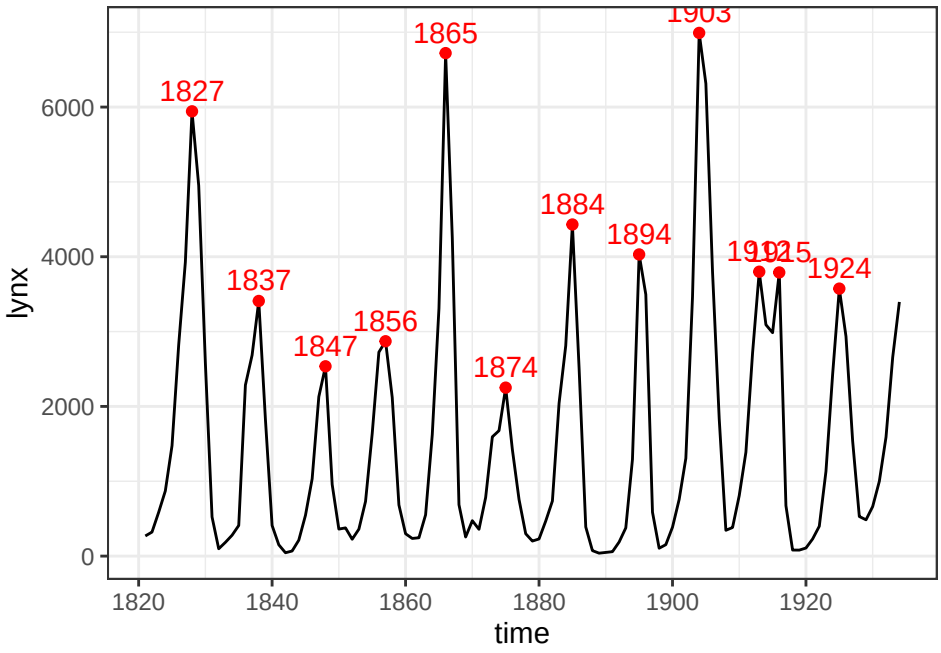



```
# add date to peaks
ggplot(lynx) + geom_line() +
  stat_peaks(colour = "red") +
  stat_peaks(geom = "text", colour = "red",vjust = -0.5, x.label.fmt = "%Y")
```

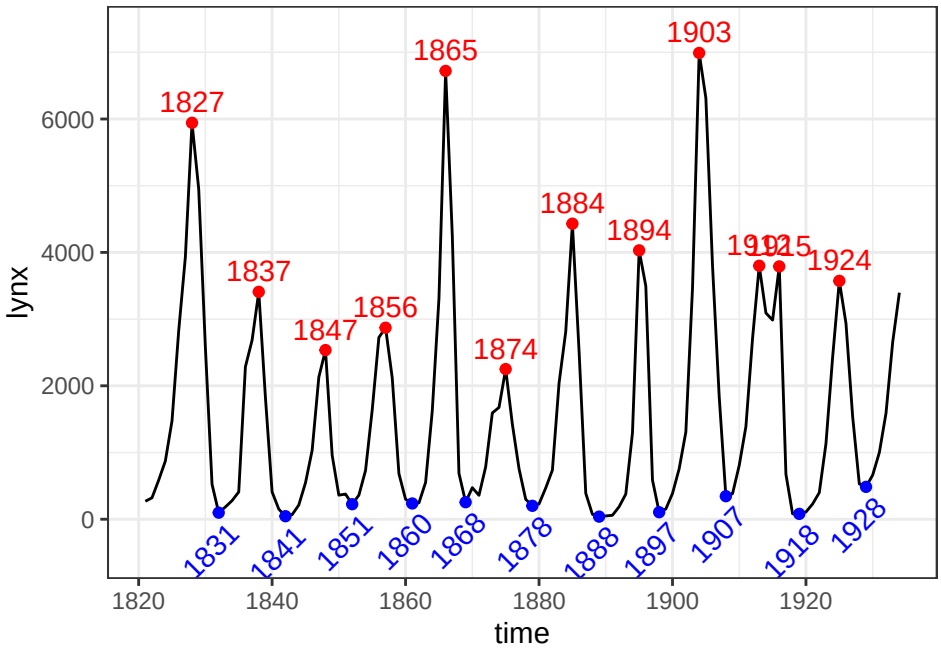
```
## Warning: Computation failed in `stat_peaks()`:
## unrecognised format specification '%Y'
```




```
ggplot(lynx, as.numeric = FALSE) + geom_line() +
  stat_peaks(colour = "red") +
  stat_peaks(geom = "text", colour = "red",vjust = -0.5, x.label.fmt = "%Y")
```




```
#
ggplot(lynx, as.numeric = FALSE) + geom_line() +
  stat_peaks(colour = "red") +
  stat_peaks(geom = "text", colour = "red",vjust = -0.5, x.label.fmt = "%Y") +
  stat_valleys(colour = "blue") +
  stat_valleys(geom = "text", colour = "blue", angle = 45,
               vjust = 1.5, hjust = 1,  x.label.fmt = "%Y") + ylim(-500, 7300)
```


lynx
6000
4000
2000
0
1820
1840
1860
1880
1900
1920
time
1827
1837
1847
1856
1865
1874
1884
1894
1903
1924
1831
1841
1851
1860
1868
1878
1888
1897
1907
1918
1928