Time Series Analysis

Lecture 5

Vector Autoregressive (VAR) Models

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Correlation of Time Series With Trends

Stochastic Trends of Two Independent Series

- Stochastic trends are an important feature of ARIMA process with unit root.
- We can use two independent random walk series, whose correlation is -0.88, to illustrate the concept of spurious regression.

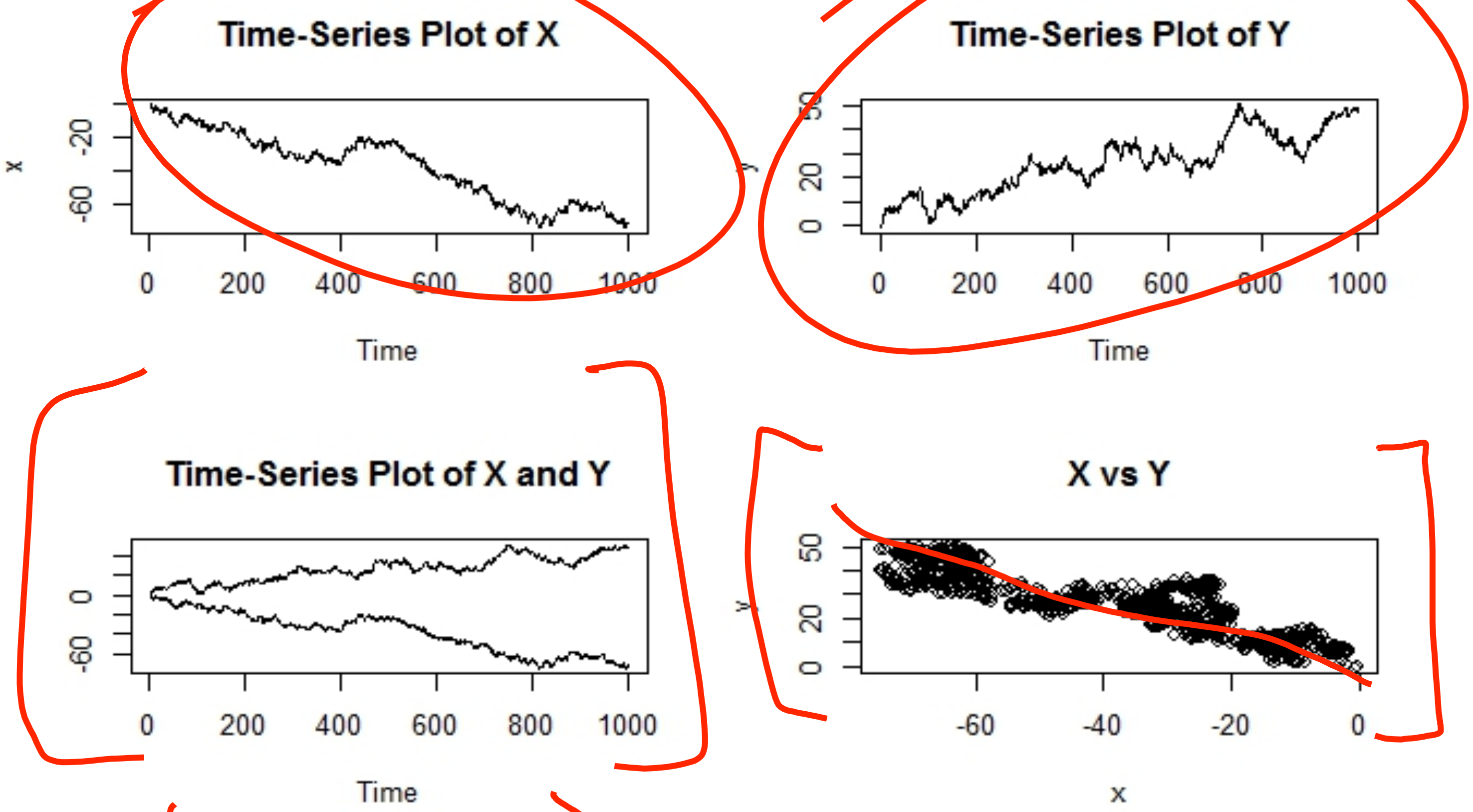
```
set.seed(14) # this seed is chosen (by trial and error) to produce
             # a high dependence between the two spurious regression
  #Create two independent white noise series
  x <- y <- rnorm(1000)
    cor(x,y)
    head(cbind(x,y))
    mean(x-y)
    sd(x-y)
  y <- rnorm(1000)

  # Create two independent random walks
  for (i in 2:1000) {
    x[i] <- x[i-1] + rnorm(1)
    y[i] <- y[i-1] + rnorm(1)
  }
```

Stochastic Trends of Two Independent Series

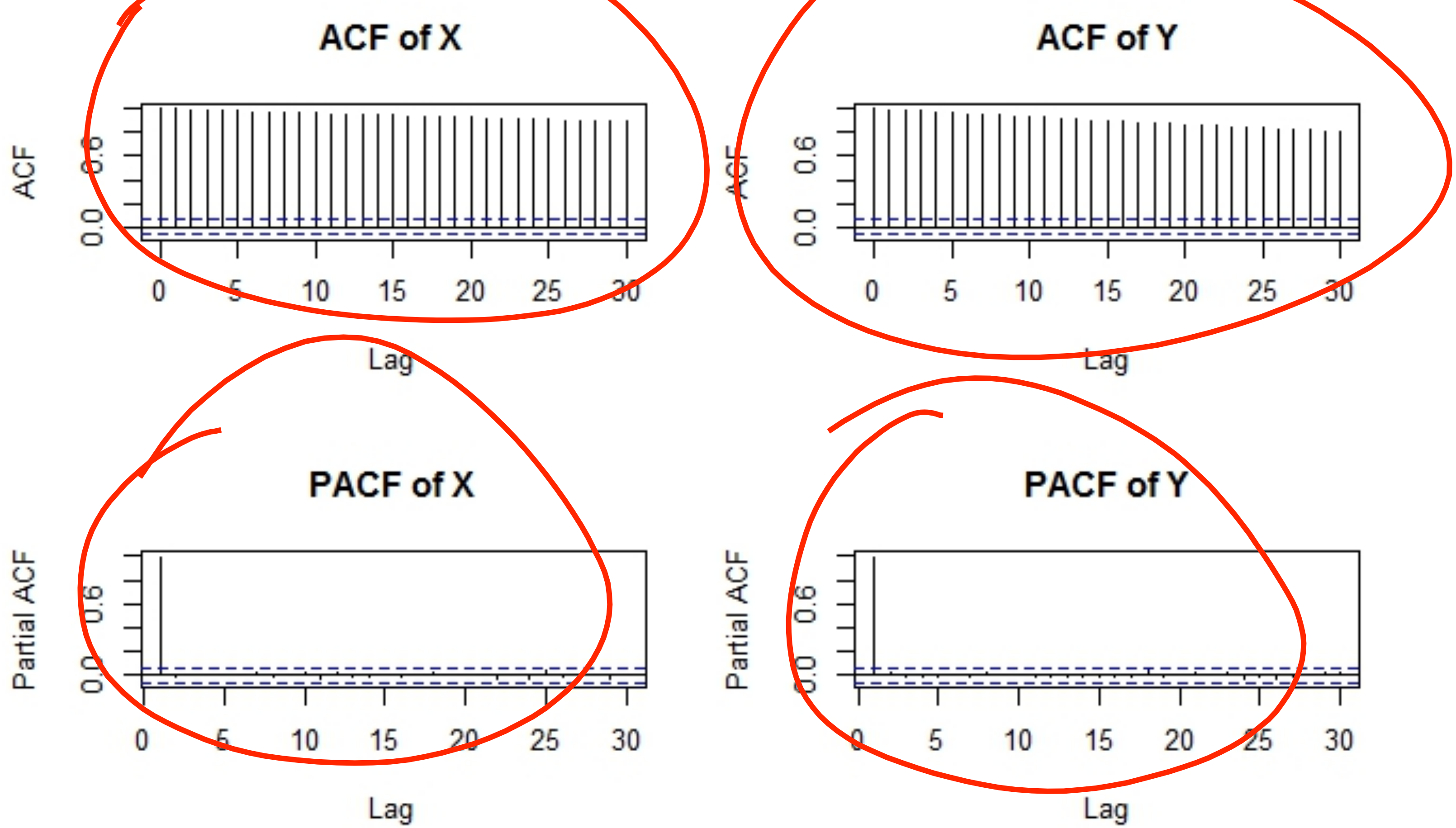
- Stochastic trends are an important feature of ARIMA process with unit root.

```
> cor(x,y)
[1] -0.88
> head(cbind(x,y), 10)
          x     y
 [1,] -0.66 -0.95
 [2,] -0.33 -0.24
 [3,] -2.09  0.77
 [4,] -3.00  0.80
 [5,] -2.96  2.46
 [6,] -3.40  4.75
 [7,] -5.52  4.24
 [8,] -4.61  4.87
 [9,] -3.21  5.96
[10,] -3.26  6.96
```



ACF of the Two Independent Series

- The ACF of the two series confirmed that both of the series have a strong trend.



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