Test 13: Z-test of a Correlation Coefficient

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# Load Required Packages:  
library(package = dplyr)  
library(package = ggplot2)  
library(package = miscor)  
library(package = psych)  
library(package = PerformanceAnalytics)  
  
# Load Required Data:  
data <- read.csv(file = "data/Data\_Test\_13.csv", header = TRUE)  
  
# Prepare Data:  
data\_1959\_2003 <- data %>% filter(Year <= 2003)  
data\_2004\_2018 <- data %>% filter(Year > 2003)  
  
# Show Data:  
headTail(x = data)

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| --- | --- | --- | --- | --- |
| ## |  | Year | Mashhad | Torbat |
| ## | 1 | 1959 | 234.5 | 258.7 |
| ## | 2 | 1960 | 174.5 | 263.7 |
| ## | 3 | 1961 | 254.5 | 270 |
| ## | 4 | 1962 | 196.8 | 198.4 |
| ## | ... | ... | ... | ... |
| ## | 57 | 2015 | 207.6 | 227.2 |
| ## | 58 | 2016 | 246.2 | 208.5 |
| ## | 59 | 2017 | 238.1 | 180.9 |
| ## | 60 | 2018 | 237.4 | 197.3 |

# Assumption Checking:  
# 1. The x and y values originate from normal distributions.  
# 1.1. Precipitation Mashhad  
shapiro.test(data\_2004\_2018$Mashhad)

## Shapiro-Wilk normality test  
## data: data\_2004\_2018$Mashhad  
## W = 0.978, p-value = 0.953

# 1.2. Precipitation Torbat Heydariyeh  
shapiro.test(data\_2004\_2018$Torbat)

## Shapiro-Wilk normality test  
## data: data\_2004\_2018$Torbat  
## W = 0.941, p-value = 0.394

# 2. The relationship is linear.  
# 2.1. Correlation Matrix Chart  
chart.Correlation(data\_2004\_2018[, c("Mashhad", "Torbat")])  
  
# 2.2. Plot a Smooth Line  
ggplot(data\_2004\_2018, aes(Torbat, Mashhad)) + geom\_point() +   
 geom\_smooth(method=lm) + xlim(50, 400) + ylim(50, 400)

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# setting initial parameter values:  
r = cor(x = data\_2004\_2018$Torbat, y = data\_2004\_2018$Mashhad)  
rho0 = cor(x = data\_1959\_2003$Torbat, y = data\_1959\_2003$Mashhad)  
n = nrow(x = data\_2004\_2018)  
  
# use test.core function:  
test.cor(r = r, n = n, rho0 = rho0, conf.level = 0.95, reduced = TRUE)

## Statistical test for the product-moment correlation coefficient  
## H0: rho == 0.690 versus H1: rho != 0.690   
## z = 1.890, p-value = 0.059  
## Sample estimate r: 0.884   
## Two-sided 90% CI: [0.726, 0.953]