27.02.2022

$R^2 = 0.743$

Gold + Dollar

$p > 0.05$

$\Rightarrow$ No association

$$VIF = \frac{1}{1-R^2}$$

$VIF > 2 \Rightarrow$ MC occurs.

Five variables.

$a + b + c + d + e = 0$

Inputs

output

Regression.

Failed.

$a + d + e = 0$

We consider only inputs.

$a + b + c + d + e$. 5 variables

2 Groups.

abc + de.

G1

a
b
c

G2

d
e

a, b, c are highly correlated

ac

bc

a & b.

de

PCA.

+ Factor Analysis

Senfon = Dr. Parameter

{ 9 macro economic which are Dr.

Due to large MC VIF > 2.

PCA & Factor Analysis Based on concept of mathematics.

① Square matrix

② Symmetric

value of the determinant

③ Identity matrix.

④ orthogonal matrix

⑤ no of rows = no of Col.

	X_1	X_2	X_3
1	✓	✓	.
2	✓	✓	✓
.	✓	✓	
.			✓
.	✓		
100	✓	.	.

100 × 3.

100 = no of rows

3 = no of Col.

3 × 3 Covariance matrix | 3×3 Correlation matrix.

② S

$$A = \begin{pmatrix} v(x_1) & C_{12} & C_{13} \\ C_{21} & v(x_2) & C_{23} \\ C_{31} & C_{32} & v(x_3) \end{pmatrix}_{3\times 3}$$

$$B = \begin{pmatrix} 1 & r_{12} & r_{13} \\ r_{21} & 1 & r_{23} \\ r_{31} & r_{32} & 1 \end{pmatrix}_{3\times 3}$$

$C_{12} = C_{21}$. $C_{13} = C_{31}$

$C_{23} = C_{32}$

$r_{12} = r_{21}$ r_{23}

$r_{13} = r_{31}$ $= r_{32}$

We can find the value of the determinant of a square matrix.

a_{11} = Element of 1st row & 1st col.

a_{12} = Element of

a_{ij} = Element of i^{th} row & j^{th} col.

$i = 1, 2, 3$. $j = 1, 2, 3$

$$A = \begin{pmatrix} a_{11} & a_{12} & a_{13} \\ a_{21} & a_{22} & a_{23} \\ a_{31} & a_{32} & a_{33} \end{pmatrix}_{3\times 3}$$

$$|A| = a_{11}(a_{22}a_{33} - a_{23}a_{32}) - a_{12}(a_{21}a_{33} - a_{23}a_{31}) + a_{13}(a_{21}a_{32} - a_{22}a_{31})$$

Identity matrix

$$\begin{array}{cccc} & x_1 & x_2 & x_3 \\ x_1 & 1 & 0 & 0 \\ x_2 & 0 & 1 & 0 \\ x_3 & 0 & 0 & 1 \end{array} = I$$

x_1, x_2 & x_3 are independent

x_1 x_2 — $r_{12} = 0$

x_1 x_3 — $r_{13} = 0$

x_2 x_3 — $r_{23} = 0$

$$|I| = 1$$

$$x^2 - 5x + 6 = 0$$

2nd degree Quadratic equation

$\Rightarrow$ $x = 2$ or 3.

Roots of the equation

$x^3 + 9x^2 +$

$x^2 - 5x + 6 = 0$ 2nd degree.

$x^3 - 3x^2 + 5x - 6 = 0$ 3rd.

When 2nd degree it must have two roots

and no. of roots depending on degree.

$$x^2 - 5x + 6 = 0$$

$$x^2 - 2x - 3x + 6 = 0$$

$$x(x-2) - 3(x-2) = 0$$

$$(x-2)(x-3) = 0$$

$$x = 2 \ \& \ 3$$

Eigen value or latent roots.

$$A = \begin{pmatrix} 1 & 2 \\ 3 & 4 \end{pmatrix}_{2\times 2} = \begin{matrix}(1\times 4) \\ -(2\times 3)\end{matrix} \quad |A| = 4 - 6 = -2$$

$$A = \begin{vmatrix} 1-x & 2 \\ 3 & 4-x \end{vmatrix}$$

$|A|$

$= (1-x)(4-x) - 6$

$= 4 - x - 4x + x^2 - 6$

$= x^2 - 5x - 2$

$$x^2 - 5x - 2 = 0$$

$ax^2 + bx + c = 0$

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$x = \frac{-(-5) \pm \sqrt{25 + 4\cdot 1\cdot 2}}{2\cdot 1}$$

$$= \frac{5 \pm \sqrt{33}}{2}$$

Let x_1 be one root
x_2 be the root.

$$x_1 = \frac{5 + \sqrt{33}}{2}$$

$$x_2 = \frac{5 - \sqrt{33}}{2}$$

$\lambda_1 + \lambda_2 = 5$

$\lambda_1 \lambda_2 = -2$

$$\begin{pmatrix} 1 & 3 & 4 \\ 5 & 6 & 7 \\ 8 & 9 & 10 \end{pmatrix}$$

$\lambda_1 + \lambda_2 + \lambda_3 = 17$

$-1 \le r \le +1$

$$\begin{pmatrix} 1 & 0.9 & 0.2 \\ 0.9 & 1 & 0.3 \\ 0.2 & 0.3 & 1 \end{pmatrix}$$

$\lambda_1 + \lambda_2 + \lambda_3 = 3$

$$\begin{pmatrix} \underline{1 \; (x_1)} & -2 & 0 \\ -2 & 5 \; (x_2) & 0 \\ 0 & 0 & 2 \; (x_3) \end{pmatrix}$$

$\lambda_1 + \lambda_2 + \lambda_3 = 8$

$Cov(x_1, x_2) = -2$

$-1 \le r \le +1$

For PCA (Principle Component Analysis). We need the concept of Eigen values & Eigen vector.

Application of PCA.

Using PCA. We can determine no. of groups.

$$
\begin{array}{c|ccccccccc}
 & x_1 & x_2 & x_3 & x_4 & x_5 & x_6 & x_7 & x_8 & x_9 \\
\hline
x_1 & 1 & & & & & & & & \\
x_2 & 0 & 1 & & & & & & & \\
1 & 0 & 0 & 1 & & & & & & \\
 & 0 & 0 & & & 1 & & & & \\
1 & & & & & & & & & \\
 & 6 & 0 & & & & & 1 & & \\
x_9 & & & & & & & & & 1
\end{array}
$$

$r(x_1 \; x_2) = 0.7$ ✓

$r(x_1, x_2) = -0.7$ ✓

$r \geq 0.7 \Rightarrow$ High

$r \geq -0.7 \Rightarrow$ High

$-0.7 < r < 0.7$

Low co

How much we can explain 1st by eigen value

$\lambda_1 = 3.896 > 1$

$\lambda_2 = 1.784 > 1$

$\frac{1.784}{7} = 26\%$

$\lambda_3, \lambda_4, \lambda_5, \lambda_6, \lambda_7 \; \Big\} < 1$

$= \frac{3.896}{7} = \cancel{54}\,55\%$

$\lambda_1 + \lambda_2 + \lambda_3 + \lambda_4 + \lambda_5 + \lambda_6 + \lambda_7 = 7$

In Total (cumulative). how much we can explain $= 81\%$ ✓

unexplained $= 19\%$

Initially there are 9 variables

i) On the basis corr. matrix
using Conditional formatting
or uniqueness concept in
Jamovi, we are able to
arrive at 3 variables.

On the basis of eigen values,
2 groups created.

With the help of two eigen
values (>1), we can
explain approx 81%.

Question 10.

Members of the group.

G1 G2

G1

Gold
FPI
Dollar
Forex
foreign

G2

Oil
CRR
Dollar

Dollar

Score

Factor Score of group.

G1

Gold
FPI
Forex
foreign

G2

Oil
CRR

factor score of G1 G2

Gold FPI G =

FG:

oil CRR

FS 2

F1 → 4 variables

F2 → 2 variable

Dollar

CMR

FDI

9 variables

objective to fit a model with Sensex

$$\text{Sensex} = f(F_1, F_2, \text{Dollar}, \text{CMR}, \text{FDI})$$

⇓ Regression