

# MS\_2\_chapter\_3\_

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## Distribuzione di Gauss Bivariata

### Generazione di determinazioni dalla Normale Bivariata

- $N(0,0,3,3,2)$
- $\rho_{12} = 0.67$

```
require(mvtnorm)
```

```
## Loading required package: mvtnorm
```

```
set.seed(1234)
sigma1 <- matrix(c(3,2,2,3), ncol=2);
sigma1
```

```
##      [,1] [,2]
## [1,]    3    2
## [2,]    2    3
```

```
n <- 10
x <- rmvnorm(n,
             mean=c(0,0),
             sigma=sigma1
            )
x
```

```
##      [,1]      [,2]
## [1,] -1.7816127 -0.2971177
## [2,]  0.3049418 -3.1251971
## [3,]  1.0070981  1.0840293
## [4,] -1.2677859 -1.2396778
## [5,] -1.4633761 -1.7889620
## [6,] -1.3891508 -1.9103445
## [7,] -1.2161674 -0.3754547
## [8,]  1.4843338  0.4145543
## [9,] -1.3899805 -1.7901664
## [10,]  0.1384960  3.3915029
```

```
cov(x)
```

```
##           [,1]      [,2]
## [1,] 1.3874831 0.9333147
## [2,] 0.9333147 3.4732530
```

```
var(x)
```

```
##           [,1]      [,2]
## [1,] 1.3874831 0.9333147
## [2,] 0.9333147 3.4732530
```

```
require(skimr)
```

```
## Loading required package: skimr
```

```
skim_without_charts(x)
```

Table 1: Data summary

Name	x
Number of rows	10
Number of columns	2
Column type frequency:	
numeric	2
Group variables	None

**Variable type: numeric**

skim_variable	n_missing	complete_rate	mean	sd	p0	p25	p50	p75	p100
V1	0	1	-0.56	1.18	-1.78	-1.39	-1.24	0.26	1.48
V2	0	1	-0.56	1.86	-3.13	-1.79	-0.81	0.24	3.39

```
sd(x[,1])
```

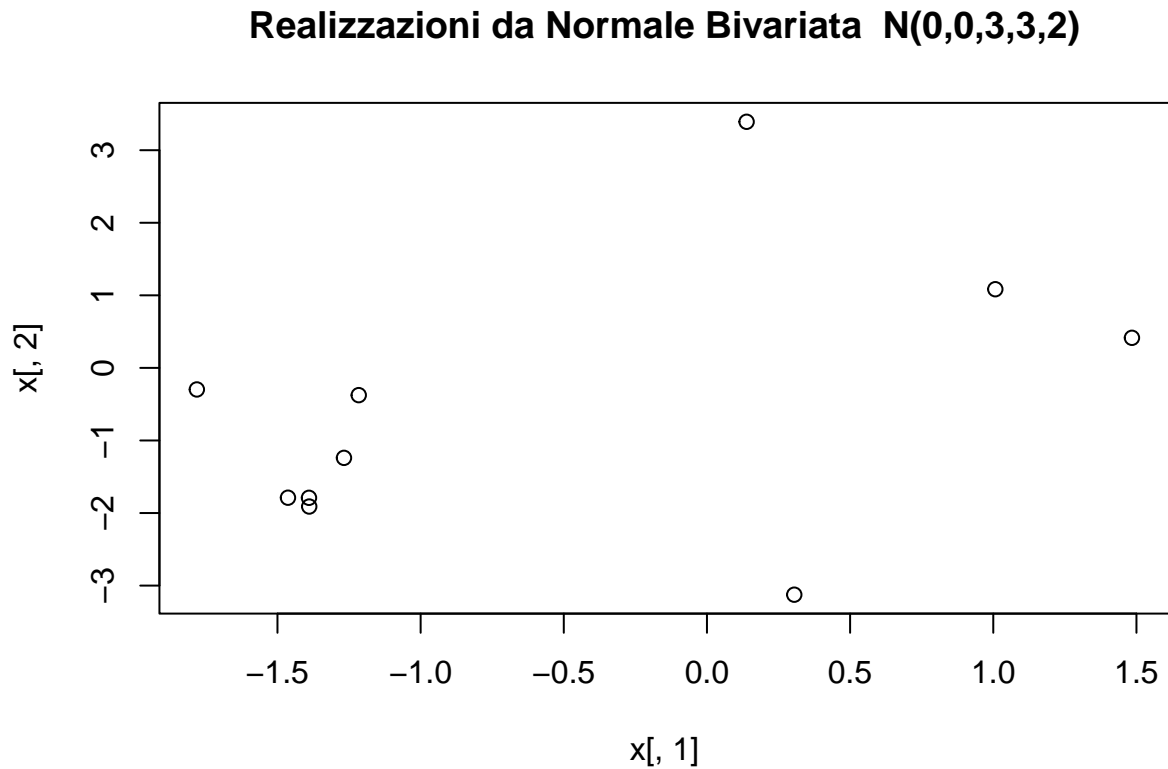
```
## [1] 1.177915
```

```
sd(x[,2])
```

```
## [1] 1.863667
```

- Diagramma a dispersione dei valori ottenuti

```
plot(x[,1],
x[,2], main = "Realizzazioni da Normale Bivariata N(0,0,3,3,2)")
```



### Curve di livello

```
x1 <- x2 <- seq(-10, 10, length = 51)
dens <- matrix(dmvnorm(expand.grid(x1, x2),
sigma = sigma1),
ncol = length(x1))
contour(x1,
x2,
dens,
main = "Livelli della dist. N(0,0,3,3,2)",
col="blue",
xlab = "x1",
ylab = "x2")
```

**Livelli della dist.  $N(0,0,3,3,2)$**

