

RStudio interface showing a script editor with R code, a console window, and an environment window.

**Script Editor:**

```
1 #non vectorized
2 set.seed(123)
3 N=10
4 M=10
5 matrix =replicate(N,rmnorm(M))
6 df=data.frame(matrix)
7
8 system.time(
9   for (i in 1:N)
10     {
11       for (j in 1:M)
12         df[i,j]=df[i,j]+(10^5*sin(0.75*pi))
13     }
14 )
15
16 print(df)
```

**Console:**

```
> df
      X1      X2      X3      X4      X5      X6      X7      X8      X9      X10
1 -0.56047565 1.2240818 -1.0678237 0.42646422 -0.69470698 0.25331851 0.37963948 -0.4910312 0.005764186 0.9935039
2 -0.2301749 0.3598138 -0.2178749 -0.29507148 -0.20781728 -0.02854476 -0.50232345 -2.3091689 0.385280401 0.5483970
3 1.55870831 0.4007715 -1.0260044 0.89512566 -1.26539635 -0.04287046 -0.33320738 1.0057385 -0.370660032 0.2387317
4 0.07050839 0.1106827 -0.7288912 0.87813349 2.16895597 1.36860228 -1.01857538 -0.7092008 0.644376549 -0.6279061
5 0.1328774 -0.5358411 -0.6250393 0.82138108 1.20796200 -0.22577099 -1.07179123 -0.6880086 -0.220466562 1.3606524
6 1.71506499 1.7869131 -1.6866933 0.68864025 -1.12310858 1.51647060 0.3032864 1.0255714 0.331781964 -0.6002596
7 0.46061621 0.4976595 0.8377670 0.5539165 -0.40288484 -1.54875280 0.44820978 -0.2847730 1.09639013 2.1873330
8 -1.26506123 -1.9666172 0.1533731 -0.0619171 -0.4666535 0.58461375 0.0530423 -1.2207177 0.435181491 1.5326106
9 -0.68683285 0.7013559 -1.181369 -0.30596266 0.77996512 0.12385424 0.92226747 0.1813035 -0.325931586 -0.2357004
10 -0.44560197 -0.4727914 1.2538149 -0.38047100 -0.08336907 0.21594157 2.05008469 -0.1388914 1.148807618 -1.0264209

> system.time(
+   for (i in 1:N)
+     {
+       for (j in 1:M)
+         df[i,j]=df[i,j]+(10^5*sin(0.75*pi))
+     }
+ )
user system elapsed
0.01 0.00 0.01

> print(df)
```

**Environment:**

```
set.seed(123)
N=10
M=10
matrix =replicate(N,rmnorm(M))
df= data.frame(matrix)
df=data.frame(matrix)
df
system.time(df<-df + 10^5*sin(0.75*pi))
print(df)
set.seed(123)
N=10
M=10
matrix =replicate(N,rmnorm(M))
df= data.frame(matrix)
system.time(df<-df + 10^5*sin(0.75*pi))
print(df)
```

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**Script Editor:**

```
14 }
15 }
16 }
17 }
18 print(df)
19
20 #vectorized
21
22 set.seed(123)
23 N=10
24 M=10
25 matrix =replicate(N,rmnorm(M))
26 df= data.frame(matrix)
27 system.time(df<-df + 10^5*sin(0.75*pi))
28 print(df)
29
30 #non vectorized takes longer than vectorized
31
32
```

**Console:**

```
> set.seed(123)
> N=10
> M=10
> matrix =replicate(N,rmnorm(M))
> df= data.frame(matrix)
> system.time(df<-df + 10^5*sin(0.75*pi))
user system elapsed
0 0 0

> print(df)
```

**Environment:**

```
set.seed(123)
N=10
M=10
matrix =replicate(N,rmnorm(M))
df= data.frame(matrix)
system.time(df<-df + 10^5*sin(0.75*pi))
print(df)
```