Nested apply as an alternative to double for loops

MA Alicja Fraś

Poznan University of Economics and Business

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Need to go through columns and apply some specific function on each of them

Feature 1	Feature 2	A	B	C	…
X	1				
Y	2				
Z	2				
⋮	⋮				

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Mean rate of return within each week of the year for each fund

Date	Week n0	Fund A	Fund B	Fund C	…
2015-01-02	1	0.035	0.034	0.024	
2015-01-05	2	0.013	0.034	-0.012	
2015-01-07	2	-0.012	0.036	0.020	
⋮					

The first solution that came to my mind was…

```
r <- matrix(NA, 105, 1)
for (i in 2:(ncol(data)-1)) {
    r <- cbind(r, as.matrix(aggregate(data[, i], by =
list(data$week.no), FUN = mean)[,2]))
}
```

…but the smarter way would be:

```
apply(data[, 3:ncol(data)], 2, function(x) tapply(x,
data$week.no, FUN = mean))
```

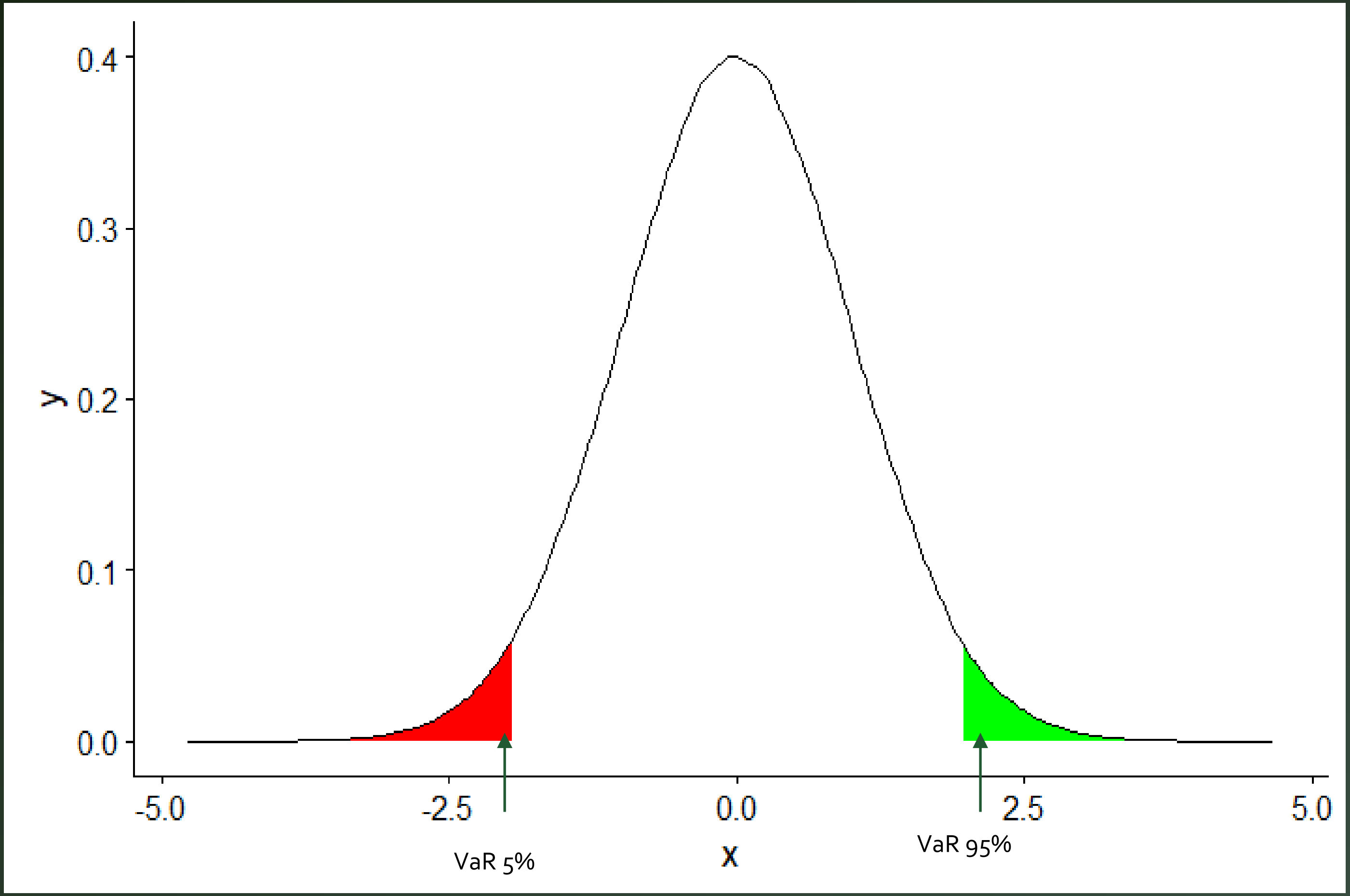
Result

Week no.	Fund A	Fund B	Fund C	…
1	0.019	0.0340	0.024	
2	0.018	0.0338	0.021	
3	0.012	0.0367	0.022	
…				

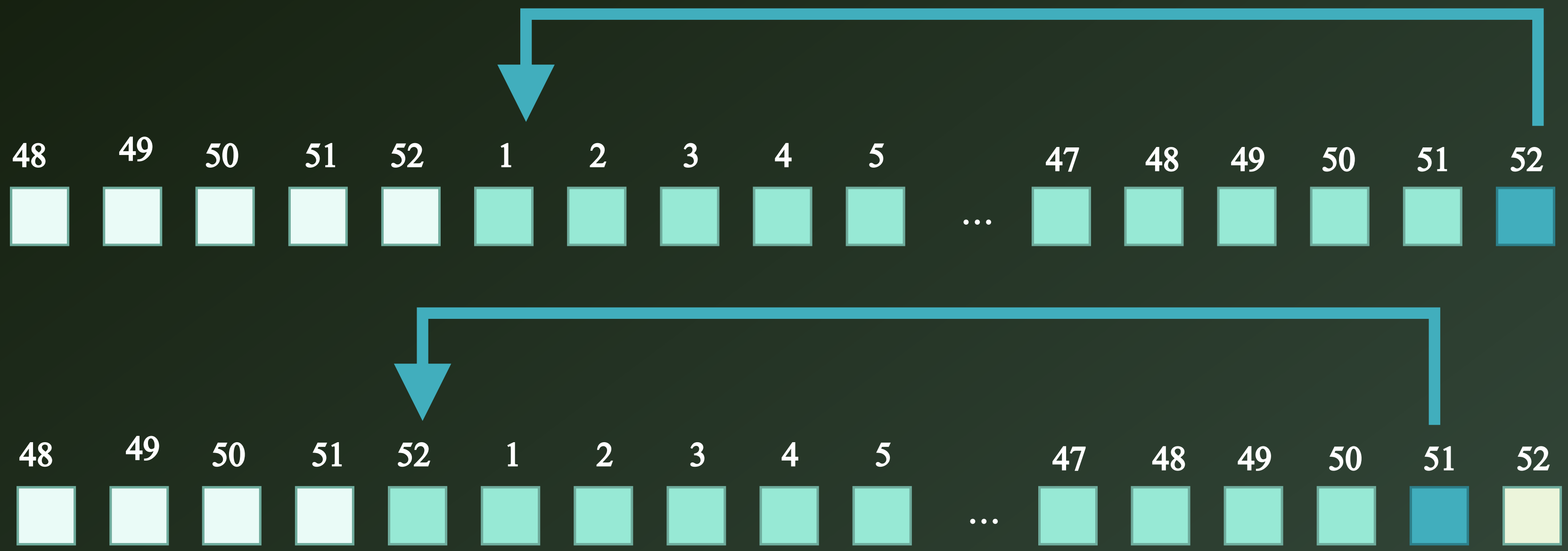
Execution time in seconds (*microbenchmark)*

	Minimum	Mean	Maximum	# of simulations
Double for loop	4.8	5.2	5.7	10
Nested apply	1.8	2.0	2.3	10
Ratio	2.7	2.6	2.5	-

Value at Risk at q% level – boarderline level of loss for given probability (q).



Moving window



Value at Risk with moving time-window: for loop solution…

```
p <- data.frame()
for (i in 1:ncol(data_w)) {
  for (j in 1:52) {
    p[j, i] <- sd(data_w[j:(j+51), i], na.rm = T) *
qnorm(0.05)
  }
}
```

…and nested apply:

```
apply(data_w, 2, function(x)
  sapply(1:52, function(y)
    sd(x[y:(y+51)], na.rm = T) * qnorm(0.05))
```

Execution time measured with *microbenchmark* function [in seconds]

	Minimum	Mean	Maximum	# of simulations
Double for loop	10.4	11.3	12.6	10
Nested apply	2.6	3.4	3.9	10
Ratio	4.0	3.3	3.2	-

Is the fund evaluated daily?

Does it have more than one non-zero rate of return in a week?

Double for loop solution

```
s <- data.frame(rep(NA, 105))
for (i in 2:(ncol(v)-1)) {
  s[,i-1] <- (aggregate(v[,i], by = list(v$week.no.year),
FUN = function(x) sum(!(x == 0))== 1))[,2]
}
```

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Double apply solution

```
apply(v[,2:(ncol(v)-1)], 2, function(x)
  tapply(x, v$week.no.year, function(y) sum(!(y == 0)) == 1))
```

Execution time measured with *microbenchmark* function [in seconds]

	Minimum	Mean	Maximum	# of simulations
Double for loop	4.0	5.2	8.4	10
Nested apply	1.1	1.6	2.6	10
Ratio	3.6	3.2	3.2	-