
Value at Risk Historical Approach Using R

By : Wahyu Antoro

Value at Risk With Historical Approach

Background :

Var adalah teknik statistik yang digunakan untuk mengukur jumlah potensi kerugian yang dapat terjadi dalam portofolio investasi .

Objective :

R dapat menghitung Value at Risk suatu portofolio dengan pendekatan historis dengan kondisi data historis lebih banyak sehingga dapat memperhitungkan VaR lebih tepat.

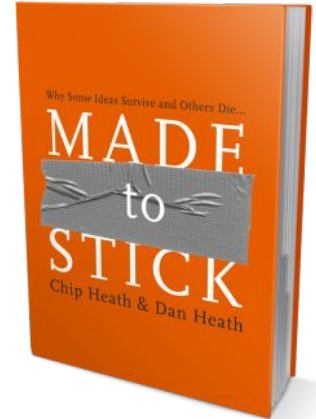
Results Summary :

Bahwa sebesar 95% Probabilitas kerugian maksimum yang akan di dapatkan dari VaR sebesar 0,0217 atau terdapat 5% kemungkinan kerugian melebihi 0,0217

Value at Risk Historical Approach

Benefit

- Menghitung VaR dengan pendekatan historis dapat digunakan untuk memprediksi pola data di masa mendatang
- Data historis yang digunakan menggunakan R bisa sangat banyak lebih dari 5 tahun maupun 10 tahun kebelakang dan mudah menghitung VaR data tersebut



Value at Risk Historical Approach

Data Introduction

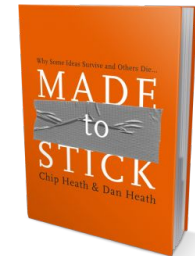
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2015-01-05	13150	13200	13125	13200	5086900	12035.97
2015-01-06	13000	13000	13100	13100	9736300	11944.79
2015-01-07	13050	13200	13050	13125	8066800	11967.59
2015-01-08	13125	13150	12975	12975	10891400	11830.82
2015-01-09	13025	13075	12925	12925	21791500	11785.23
2015-01-12	12925	13000	12800	13000	16330200	11853.61
2015-01-13	13050	13050	12975	13000	7204800	11853.61
2015-01-14	13025	13025	12925	12925	5945600	11785.23
2015-01-15	12950	13050	12950	12950	5516100	11808.02
2015-01-16	13025	13025	12950	12950	9270900	11808.02
2015-01-19	12975	13025	12975	13000	5226900	11853.61
2015-01-20	12975	13050	12925	13025	7257100	11876.41
2015-01-21	13050	13200	13025	13075	14651600	11922.00
2015-01-22	13050	13225	13050	13200	11730800	12035.97
2015-01-23	13225	13400	13225	13325	24202200	12149.95
2015-01-26	13325	13400	13025	13150	20617800	11990.38
2015-01-27	13150	13225	13125	13200	9997700	12035.97
2015-01-28	13175	13325	13150	13275	9646000	12104.36
2015-01-29	13250	13325	13200	13325	8319900	12149.95
2015-01-30	13400	13425	13325	13375	18828500	12195.54
2015-02-02	13350	13375	13250	13350	7763300	12172.75
2015-02-03	13375	13500	13350	13500	13409300	12309.52
2015-02-04	13525	14000	13475	13900	27261200	12674.25
2015-02-05	13900	13925	13375	13700	16784700	12491.88
2015-02-06	13775	13800	13650	13700	10812100	12491.88
2015-02-09	13500	13900	13500	13800	13721800	12583.06
2015-02-10	13875	13900	13650	13750	10108100	12537.47
2015-02-11	13775	13925	13700	13925	9294300	12697.04
2015-02-12	13925	13950	13850	13900	11691100	12674.25
2015-02-13	14000	14250	13975	14025	18130700	12788.22
2015-02-16	14050	14175	14000	14000	6100200	12765.43
2015-02-17	14000	14125	14000	14075	9589000	12833.81
2015-02-18	14200	14550	14000	14075	11556400	12833.81
2015-02-20	14300	14325	14050	14050	5032400	12811.02
2015-02-23	14075	14225	13975	14025	11174300	12788.22
2015-02-24	14050	14075	13925	14050	9296400	12811.02
2015-02-25	14000	14175	14000	14100	7914600	12856.61
2015-02-26	13975	14175	13975	14075	12680100	12833.81
2015-02-27	14000	14150	14000	14000	68251500	12856.61

Content :

- 1.654 data harga saham harian BCA
- Data harian Saham BCA dari Tahun 2015 - 2021

Condition :

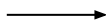
- Kolom date belum menjadi kolom dalam data set
- Belum terdapat perhitungan return saham BCA harian



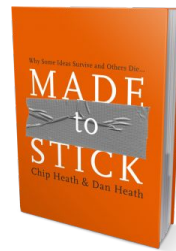
Exploratory Data Analysis

1. Membuat data frame, memasukan "date" menjadi bagian dari kolom data set

	BBCA.JK.Open	BBCA.JK.High	BBCA.JK.Low	BBCA.JK.Close	BBCA.JK.Volume	BBCA.JK.Adjusted
2015-01-02	13275	13275	13150	13225	5860500	12058.77
2015-01-05	13150	13200	13125	13200	5086900	12035.97
2015-01-06	13000	13200	13000	13100	9736300	11944.79
2015-01-07	13050	13200	13050	13125	8066800	11967.59
2015-01-08	13125	13150	12975	12975	10891400	11830.82
2015-01-09	13025	13075	12925	12925	21791500	11785.23
2015-01-12	12925	13000	12800	13000	16330200	11853.61
2015-01-13	13050	13050	12975	13000	7204800	11853.61
2015-01-14	13025	13025	12925	12925	5945600	11785.23
2015-01-15	12950	13050	12950	12950	5516100	11808.02
2015-01-16	13025	13025	12950	12950	9270900	11808.02
2015-01-19	12975	13025	12975	13000	5226900	11853.61
2015-01-20	12975	13050	12925	13025	7257100	11876.41
2015-01-21	13050	13200	13025	13075	14651600	11922.00
2015-01-22	13050	13225	13050	13200	11730800	12035.97
2015-01-23	13225	13400	13225	13325	24202200	12149.95
2015-01-26	13325	13400	13025	13150	20617800	11990.38
2015-01-27	13150	13225	13125	13200	9997700	12035.97
2015-01-28	13175	13325	13150	13275	9646000	12104.36
2015-01-29	13250	13325	13200	13325	8319900	12149.95
2015-01-30	13400	13425	13325	13375	18828500	12195.54
2015-02-02	13350	13375	13250	13350	7763300	12172.75
2015-02-03	13375	13500	13350	13500	13409300	12309.52
2015-02-04	13525	14000	13475	13900	27261200	12674.23
2015-02-05	13900	13925	13375	13700	16784700	12491.88
2015-02-06	13775	13800	13650	13700	10812100	12491.88
2015-02-09	13500	13900	13500	13800	13721800	12583.06
2015-02-10	13875	13900	13650	13750	10108100	12537.47
2015-02-11	13775	13925	13700	13925	9264300	12697.04
2015-02-12	13925	13950	13850	13900	11691100	12674.23
2015-02-13	14000	14250	13975	14025	18130700	12788.22
2015-02-16	14050	14175	14000	14000	6100200	12765.43
2015-02-17	14000	14125	14000	14075	9589000	12833.81
2015-02-18	14200	14550	14000	14075	11556400	12833.81
2015-02-20	14300	14325	14050	14050	5032400	12811.02
2015-02-23	14075	13975	14025	14025	11174300	12788.22
2015-02-24	14050	14075	13925	14050	9266400	12811.02
2015-02-25	14000	14175	14000	14100	7914600	12856.61
2015-02-26	13975	14175	13975	14075	12680100	12833.81



	BBCA.JK.Open	BBCA.JK.High	BBCA.JK.Low	BBCA.JK.Close	BBCA.JK.Volume	BBCA.JK.Adjusted	date
2015-01-02	13275	13275	13150	13225	5860500	12058.77	2015-01-02
2015-01-05	13150	13200	13125	13200	5086900	12035.97	2015-01-05
2015-01-06	13000	13200	13000	13100	9736300	11944.79	2015-01-06
2015-01-07	13050	13200	13050	13125	8066800	11967.59	2015-01-07
2015-01-08	13125	13150	12975	12975	10891400	11830.82	2015-01-08
2015-01-09	13025	13075	12925	12925	21791500	11785.23	2015-01-09
2015-01-12	12925	13000	12800	13000	16330200	11853.61	2015-01-12
2015-01-13	13050	13050	12975	13000	7204800	11853.61	2015-01-13
2015-01-14	13025	13025	12925	12925	5945600	11785.23	2015-01-14
2015-01-15	12950	13050	12950	12950	5516100	11808.02	2015-01-15
2015-01-16	13025	13025	12950	12950	9270900	11808.02	2015-01-16
2015-01-19	12975	13025	12975	13000	5226900	11853.61	2015-01-19
2015-01-20	12975	13050	12925	13025	7257100	11876.41	2015-01-20
2015-01-21	13050	13200	13025	13075	14651600	11922.00	2015-01-21
2015-01-22	13050	13225	13050	13200	11730800	12035.97	2015-01-22
2015-01-23	13225	13400	13225	13325	24202200	12149.95	2015-01-23
2015-01-26	13325	13400	13025	13150	20617800	11990.38	2015-01-26
2015-01-27	13150	13225	13125	13200	9997700	12035.97	2015-01-27
2015-01-28	13175	13325	13150	13275	9646000	12104.36	2015-01-28
2015-01-29	13250	13325	13200	13325	8319900	12149.95	2015-01-29
2015-01-30	13400	13425	13325	13375	18828500	12195.54	2015-01-30
2015-02-02	13350	13375	13250	13350	7763300	12172.75	2015-02-02
2015-02-03	13375	13500	13350	13500	13409300	12309.52	2015-02-03
2015-02-04	13525	14000	13475	13900	27261200	12674.23	2015-02-04
2015-02-05	13900	13925	13375	13700	16784700	12491.88	2015-02-05
2015-02-06	13775	13800	13650	13700	10812100	12491.88	2015-02-06
2015-02-09	13500	13900	13500	13800	13721800	12583.06	2015-02-09
2015-02-10	13875	13900	13650	13750	10108100	12537.47	2015-02-10
2015-02-11	13775	13925	13700	13925	9264300	12697.04	2015-02-11
2015-02-12	13925	13950	13850	13900	11691100	12674.23	2015-02-12
2015-02-13	14000	14250	13975	14025	18130700	12788.22	2015-02-13
2015-02-16	14050	14175	14000	14000	6100200	12765.43	2015-02-16
2015-02-17	14000	14125	14000	14075	9589000	12833.81	2015-02-17
2015-02-18	14200	14550	14000	14075	11556400	12833.81	2015-02-18
2015-02-20	14300	14325	14050	14050	5032400	12811.02	2015-02-20
2015-02-23	14075	13975	14025	14025	11174300	12788.22	2015-02-23
2015-02-24	14050	14075	13925	14050	9266400	12811.02	2015-02-24
2015-02-25	14000	14175	14000	14100	7914600	12856.61	2015-02-25
2015-02-26	13975	14175	13975	14075	12680100	12833.81	2015-02-26



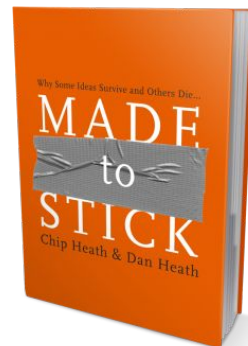
Exploratory Data Analysis

2. Filtering dan menambahkan Return harian saham BCA

	BBCA.JK.Open	BBCA.JK.High	BBCA.JK.Low	BBCA.JK.Close	BBCA.JK.Volume	BBCA.JK.Adjusted	date
2015-01-02	13275	13275	13150	13225	5860900	12058.77	2015-01-02
2015-01-05	13150	13200	13125	13200	5086900	12035.97	2015-01-05
2015-01-06	13000	13200	13000	13100	9736300	11944.79	2015-01-06
2015-01-07	13050	13200	13050	13125	8066800	11967.59	2015-01-07
2015-01-08	13125	13150	12975	12975	10891400	11830.82	2015-01-08
2015-01-09	13025	13075	12925	12925	21791500	11785.23	2015-01-09
2015-01-12	12925	13000	12800	13000	16330200	11853.61	2015-01-12
2015-01-13	13050	13050	12975	13000	7204800	11853.61	2015-01-13
2015-01-14	13025	13025	12925	12925	5945600	11785.23	2015-01-14
2015-01-15	12950	13050	12950	12950	5516100	11808.02	2015-01-15
2015-01-16	13025	13025	12950	12950	9270900	11808.02	2015-01-16
2015-01-19	12975	13025	12975	13000	5226900	11853.61	2015-01-19
2015-01-20	12975	13050	12925	13025	7257100	11876.41	2015-01-20
2015-01-21	13050	13200	13025	13075	14651600	11922.00	2015-01-21
2015-01-22	13050	13225	13050	13200	11730800	12035.97	2015-01-22
2015-01-23	13225	13400	13225	13325	24202200	12149.95	2015-01-23
2015-01-26	13325	13400	13025	13150	20617800	11990.38	2015-01-26
2015-01-27	13150	13225	13125	13200	9997700	12035.97	2015-01-27
2015-01-28	13175	13325	13150	13275	9646000	12104.36	2015-01-28
2015-01-29	13250	13325	13200	13325	8319900	12149.95	2015-01-29
2015-01-30	13400	13425	13325	13375	18828500	12195.54	2015-01-30
2015-02-02	13350	13375	13350	13350	7763300	12172.75	2015-02-02
2015-02-03	13375	13500	13350	13500	13409900	12309.52	2015-02-03
2015-02-04	13525	14000	13475	13900	27261200	12674.25	2015-02-04
2015-02-05	13900	13925	13375	13700	16784700	12491.88	2015-02-05
2015-02-06	13775	13800	13650	13700	10812100	12491.88	2015-02-06
2015-02-09	13500	13900	13500	13800	13721800	12583.06	2015-02-09
2015-02-10	13875	13900	13650	13750	10108100	12537.47	2015-02-10
2015-02-11	13775	13925	13700	13925	9284300	12697.04	2015-02-11
2015-02-12	13925	13950	13850	13900	11691100	12674.25	2015-02-12
2015-02-13	14000	14250	13975	14025	18130700	12788.22	2015-02-13
2015-02-16	14050	14175	14000	14000	6100200	12765.43	2015-02-16
2015-02-17	14000	14125	14000	14075	9589000	12833.81	2015-02-17
2015-02-18	14200	14550	14000	14075	11556400	12833.81	2015-02-18
2015-02-20	14300	14325	14050	14050	5032400	12811.02	2015-02-20
2015-02-23	14075	14225	13975	14025	11174300	12788.22	2015-02-23
2015-02-24	14050	14075	13925	14050	9296400	12811.02	2015-02-24
2015-02-25	14000	14175	14000	14100	7914600	12856.61	2015-02-25
2015-02-26	13975	14175	13975	14075	12680100	12833.81	2015-02-26

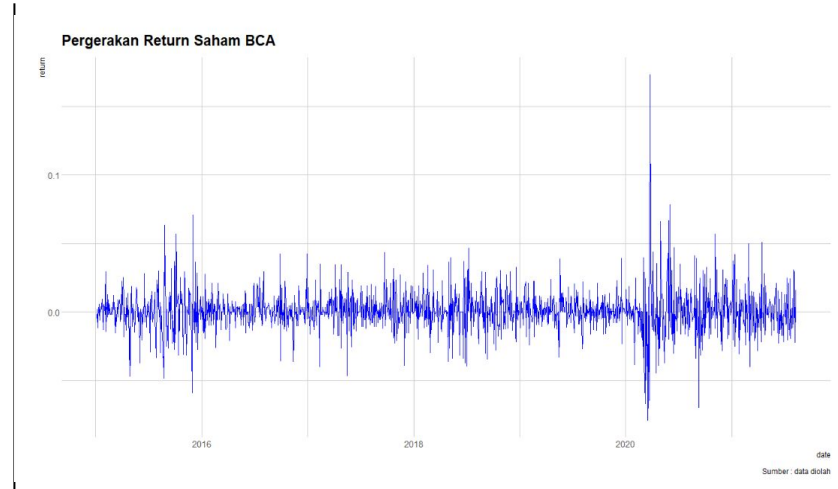
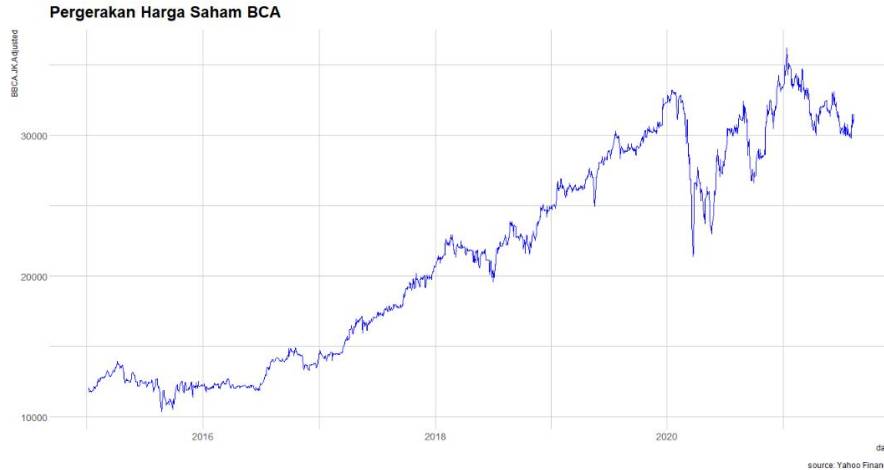


	date	BBCA.JK.Adjusted	return
2015-01-05	2015-01-05	12035.97	-0.001890238
2015-01-06	2015-01-06	11944.79	-0.007575759
2015-01-07	2015-01-07	11967.59	0.001908356
2015-01-08	2015-01-08	11830.82	-0.011428574
2015-01-09	2015-01-09	11785.23	-0.003853483
2015-01-12	2015-01-12	11853.61	0.005802667
2015-01-13	2015-01-13	11853.61	0.000000000
2015-01-14	2015-01-14	11785.23	-0.005769191
2015-01-15	2015-01-15	11808.02	0.001934278
2015-01-16	2015-01-16	11808.02	0.000000000
2015-01-19	2015-01-19	11853.61	0.003860921
2015-01-20	2015-01-20	11876.41	0.001923118
2015-01-21	2015-01-21	11922.00	0.003838854
2015-01-22	2015-01-22	12035.97	0.009560107
2015-01-23	2015-01-23	12149.95	0.009469739
2015-01-26	2015-01-26	11990.38	-0.013133250
2015-01-27	2015-01-27	12035.97	0.003802282
2015-01-28	2015-01-28	12104.36	0.005681941
2015-01-29	2015-01-29	12149.95	0.003766398
2015-01-30	2015-01-30	12195.54	0.003752265
2015-02-02	2015-02-02	12172.75	-0.001869199
2015-02-03	2015-02-03	12309.52	0.011235958
2015-02-04	2015-02-04	12674.25	0.029629795
2015-02-05	2015-02-05	12491.88	-0.014388567
2015-02-06	2015-02-06	12491.88	0.000000000
2015-02-09	2015-02-09	12583.06	0.007299271
2015-02-10	2015-02-10	12537.47	-0.003623267
2015-02-11	2015-02-11	12697.04	0.012727393
2015-02-12	2015-02-12	12674.25	-0.001795294
2015-02-13	2015-02-13	12788.22	0.008992691
2015-02-16	2015-02-16	12765.43	-0.001782493
2015-02-17	2015-02-17	12833.81	0.005357182
2015-02-18	2015-02-18	12833.81	0.000000000
2015-02-20	2015-02-20	12811.02	-0.001776237



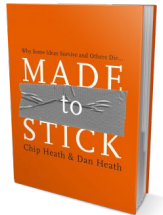
Exploratory Data Analysis

3. Pergerakan Harga Saham dan Return Saham Harian BCA



Insights :

- Pergerakan harga saham BCA dari tahun 2015 - 2021 konsisten bertumbuh
- Pergerakan return saham BCA dari tahun 2015 - 2021 dengan volatilitas tertinggi dan terendah di tahun 2020



Modelling

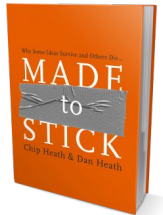
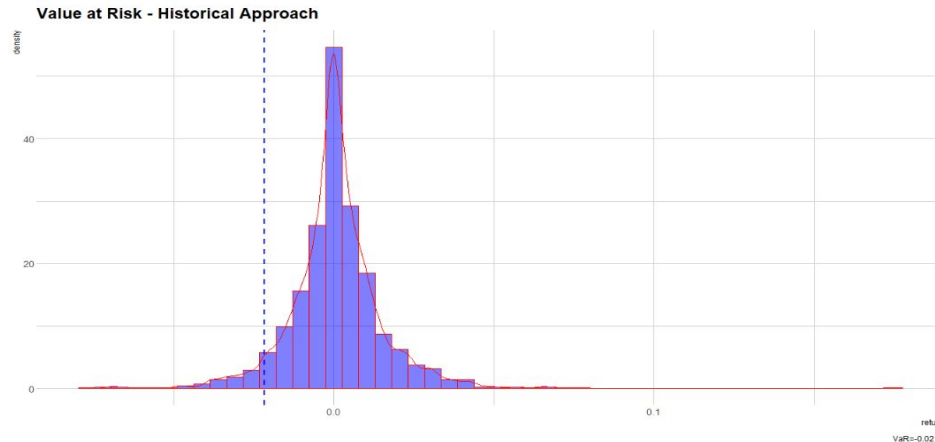
1. Hitung return harian dari Saham BCA

```
Rows: 1,651
Columns: 3
$ date      <date> 2015-01-05, 2015-01-06, 2015-01-07, 2015-01-08, 2015-01-09, 2015-01-12, 2015-01-13, 20~
$ BBCA.JK.Adjusted <dbl> 12035.97, 11944.79, 11967.59, 11830.82, 11785.23, 11853.61, 11853.61, 11785.23, 11808.0~
$ return     <dbl> -0.001890238, -0.007575759, 0.001908356, -0.011428574, -0.003853483, 0.005802667, 0.000~
>
```

2. Hitung VaR saham BCA, didapat VaR sebesar -0.0217

```
> var_value=quantile(BCA.filtered$return,probs=c(0.05))
There were 25 warnings (use warnings() to see them)
> var_value
5%
-0.02169038
```

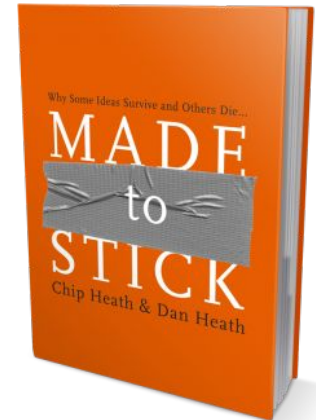
3. Tampilkan perhitungan VaR dalam grafik



Value at Risk Historical Approach

Conclusion & Recommendation :

- Bahwa sebesar 95 % probabilitas kerugian maksimum yang didapatkan dari VaR sebesar 0.0217 atau terdapat sebesar 5% kemungkinan kerugian melebihi 0.0217
- Jika seorang investor memiliki investasi di saham BCA sebesar Rp. 1M maka terdapat kemungkinan investor mengalami kerugian sebesar Rp. 21.700.000 ($0.0217 \times \text{Rp. } 1\text{M}$)
- Dari perhitungan VaR didapat suatu angka yang menunjukkan besarnya jumlah dana potensial (capital reserve) yang harus dicadangkan untuk mengantisipasi resiko yang terjadi.



[illegible]