DAFTAR PUSTAKA

Cont, R., & Tankov, P. (2004). *Financial Modelling with Jump Processes.* London: CRC Press LLC.

Danielsson, J. (2011). *Financial Risk Forecasting.* West Sussex: Wiley.

Hin, L. T. (2008). *Panduan Berinvestasi Saham.* Jakarta: PT. Elex Media Komputindo.

Liu, L.-M., & Wan, M.-R. (2018). ParameterEstimation of Lognormal Jump Diffusion Model Based on LM Method. *International Journal of Contemporary Mathematical Sciences, XIII*(4), 191-198.

Margaretha, F. (2008). Peran Kecerdasan Finansial dalam Meningkatkan Kesejahteraan dan Ekonomi Rakyat Indonesia. *Jurnal Ilmiah Manajemen Bisnis*, 131-144.

Maruddani, D. A., & Purbowati, A. (2009). Pengukuran Value at Risk pada Aset Tunggal dan Portofolio dengan Simulasi Monte Carlo. *Media Statistika , II*(2), 93-104.

Matsuda, K. (2004). Introduction to Merton Jump Diffusion Model. *The City University of New York Working Paper*.

Merton, R. C. (1976). Option Pricing Ehen Underlying Stock Returns are Discontinuous. *Journal of Financial Economics 3*, 125-144.

Miller, M. B. (2014). *Mathematics and Statistics for Financial Risk Management.* Canada: Wiley.

Navidi, W. C. (2008). *Statistics for Enginers and Scientists.* New York: McGraw-Hill.

Nikasari, N., Dharmawan, K., & Srinadi , I. (2017). Estimasi Nilai Average at Risk pada Saham Portofolio dengan Menggunakan Metode Analisis Komponen Utama. *E-Jurnal Matematika, VI*(1), 56-64.

Pratama, I., Dharmawan, K., & Harini, L. (2015). Penentuan Nilai Value at Risk pada Saham IHSG Menggunakan Model Geometric Brownian Motion dengan Lompatan. *E-jurnal Matematika, IV*(2), 67-73.

Ross, S. M. (2014). *Introduction to Probability Models Eleventh Edition.* Los Angeles: Elsevier Inc.

Sari, I. M., & Rosha, M. (2019). Pemodelan Indeks Harga Saham pada Jakarta Islamic Index Menggunakan Generilisasi Proses Wiener. *UNPjoMath, II*(3), 27-32.

Siegel, S. (1985). *Statistik Nonparametrik untuk Ilmi-Ilmu Sosial.* Jakarta: Gramedia.

Tang, F. (2018). *Merton Jump-Diffusion Modeling of Stock Price Data.* Sweden: Linnaeus University.

Telkom. (2020). *Tentang Telkomgroup*. Retrieved April 1, 2021, from www.telkom.co.id: https://www.telkom.co.id/sites/about-telkom/id_ID/page/profil-dan-riwayat-singkat-22

Trimono, & Maruddani, D. (2017). Valuasi Harga Saham PT Aneka Tambang Tbk sebagai Peraih IDX Best Blue 2016. *Statistika, XVII*(1), 33-43.

Trimono, Maruddani, D., & Ispriyanti, D. (2017). Pemodelan Harga Saham dengan Geometric Brownian Motion dan Value at Risk PT Ciputra Development Tbk. *Jurnal Gaussian, VI*(2), 261-270.

Zulfikar. (2016). *Pengantar Pasar Modal dengan Pendekatan Statistika.* Yogyakarta: Deepublish.

LAMPIRAN

Lampiran 1: Data Harga Penutupan Saham Harian PT. Telkom Indonesia Tbk Periode 2 Januari 2020 – 30 Desember 2020 (Rupiah)

t	Tanggal	Close Price	t	Tanggal	Close Price
0	1/2/2020	3910	41	2/28/2020	3490
1	1/3/2020	3980	42	3/2/2020	3440
2	1/6/2020	3960	43	3/3/2020	3620
3	1/7/2020	3940	44	3/4/2020	3830
4	1/8/2020	3900	45	3/5/2020	3830
5	1/9/2020	3960	46	3/6/2020	3750
6	1/10/2020	3980	47	3/9/2020	3500
7	1/13/2020	4030	48	3/10/2020	3490
8	1/14/2020	3950	49	3/11/2020	3400
9	1/15/2020	3880	50	3/12/2020	3310
10	1/16/2020	3850	51	3/13/2020	3310
11	1/17/2020	3810	52	3/16/2020	3160
12	1/20/2020	3810	53	3/17/2020	2940
13	1/21/2020	3890	54	3/18/2020	2810
14	1/22/2020	3860	55	3/19/2020	2620
15	1/23/2020	3880	56	3/20/2020	2880
16	1/24/2020	3920	57	3/23/2020	2680
17	1/27/2020	3840	58	3/24/2020	2620
18	1/28/2020	3830	59	3/26/2020	2980
19	1/29/2020	3900	60	3/27/2020	3090
20	1/30/2020	3860	61	3/30/2020	3140
21	1/31/2020	3800	62	3/31/2020	3160
22	2/3/2020	3740	63	4/1/2020	3100
23	2/4/2020	3760	64	4/2/2020	3130
24	2/5/2020	3770	65	4/3/2020	3200
25	2/6/2020	3760	66	4/6/2020	3330
26	2/7/2020	3790	67	4/7/2020	3220
27	2/10/2020	3810	68	4/8/2020	3110
28	2/11/2020	3790	69	4/9/2020	3120
29	2/12/2020	3820	70	4/13/2020	3180
30	2/13/2020	3730	71	4/14/2020	3240
31	2/14/2020	3640	72	4/15/2020	3110
32	2/17/2020	3610	73	4/16/2020	3000
33	2/18/2020	3620	74	4/17/2020	3230
34	2/19/2020	3620	75	4/20/2020	3120
35	2/20/2020	3630	76	4/21/2020	3070
36	2/21/2020	3690	77	4/22/2020	3160
37	2/24/2020	3640	78	4/23/2020	3070
38	2/25/2020	3590	79	4/24/2020	3090
39	2/26/2020	3510	80	4/27/2020	3150
40	2/27/2020	3470	81	4/28/2020	3160

t	Tanggal	Close Price	t	Tanggal	Close Price
82	4/29/2020	3350	126	7/8/2020	3150
83	4/30/2020	3500	127	7/9/2020	3110
84	5/4/2020	3320	128	7/10/2020	3110
85	5/5/2020	3320	129	7/13/2020	3090
86	5/6/2020	3240	130	7/14/2020	3080
87	5/8/2020	3190	131	7/15/2020	3090
88	5/11/2020	3220	132	7/16/2020	3100
89	5/12/2020	3150	133	7/17/2020	3060
90	5/13/2020	3160	134	7/20/2020	3060
91	5/14/2020	3070	135	7/21/2020	3060
92	5/15/2020	3100	136	7/22/2020	3070
93	5/18/2020	3220	137	7/23/2020	3070
94	5/19/2020	3270	138	7/24/2020	3020
95	5/20/2020	3180	139	7/27/2020	3040
96	5/26/2020	3250	140	7/28/2020	3020
97	5/27/2020	3170	141	7/29/2020	3000
98	5/28/2020	3130	142	7/30/2020	3050
99	5/29/2020	3150	143	8/3/2020	2920
100	6/2/2020	3250	144	8/4/2020	2950
101	6/3/2020	3290	145	8/5/2020	3020
102	6/4/2020	3300	146	8/6/2020	3020
103	6/5/2020	3230	147	8/7/2020	2980
104	6/8/2020	3230	148	8/10/2020	2970
105	6/9/2020	3140	149	8/11/2020	2930
106	6/10/2020	3110	150	8/12/2020	2950
107	6/11/2020	3080	151	8/13/2020	3010
108	6/12/2020	3030	152	8/14/2020	3030
109	6/15/2020	3090	153	8/18/2020	3050
110	6/16/2020	3200	154	8/19/2020	3000
111	6/17/2020	3210	155	8/24/2020	3000
112	6/18/2020	3280	156	8/25/2020	2980
113	6/19/2020	3280	157	8/26/2020	3020
114	6/22/2020	3200	158	8/27/2020	2990
115	6/23/2020	3130	159	8/28/2020	2960
116	6/24/2020	3180	160	8/31/2020	2860
117	6/25/2020	3160	161	9/1/2020	2900
118	6/26/2020	3190	162	9/2/2020	2950
119	6/29/2020	3180	163	9/3/2020	2900
120	6/30/2020	3050	164	9/4/2020	2860
121	7/1/2020	3040	165	9/7/2020	2900
122	7/2/2020	3140	166	9/8/2020	2860
123	7/3/2020	3120	167	9/9/2020	2800
124	7/6/2020	3050	168	9/10/2020	2700
125	7/7/2020	3120	169	9/11/2020	2810

t	Tanggal	Close Price	t	Tanggal	Close Price
170	9/14/2020	2890	211	11/13/2020	2990
171	9/15/2020	2830	212	11/16/2020	3070
172	9/16/2020	2790	213	11/17/2020	3220
173	9/17/2020	2820	214	11/18/2020	3180
174	9/18/2020	2890	215	11/19/2020	3170
175	9/21/2020	2810	216	11/20/2020	3220
176	9/22/2020	2780	217	11/23/2020	3320
177	9/23/2020	2800	218	11/24/2020	3350
178	9/24/2020	2730	219	11/25/2020	3280
179	9/25/2020	2690	220	11/26/2020	3470
180	9/28/2020	2660	221	11/27/2020	3460
181	9/29/2020	2630	222	11/30/2020	3230
182	9/30/2020	2560	223	12/1/2020	3240
183	10/1/2020	2750	224	12/2/2020	3330
184	10/2/2020	2680	225	12/3/2020	3300
185	10/5/2020	2650	226	12/4/2020	3250
186	10/6/2020	2650	227	12/7/2020	3330
187	10/7/2020	2660	228	12/8/2020	3300
188	10/8/2020	2700	229	12/10/2020	3260
189	10/9/2020	2730	230	12/11/2020	3280
190	10/12/2020	2730	231	12/14/2020	3320
191	10/13/2020	2730	232	12/15/2020	3450
192	10/14/2020	2810	233	12/16/2020	3610
193	10/15/2020	2780	234	12/17/2020	3540
194	10/16/2020	2750	235	12/18/2020	3510
195	10/19/2020	2710	236	12/21/2020	3520
196	10/20/2020	2670	237	12/22/2020	3360
197	10/21/2020	2680	238	12/23/2020	3320
198	10/22/2020	2700	239	12/28/2020	3430
199	10/23/2020	2630	240	12/29/2020	3420
200	10/26/2020	2650	241	12/30/2020	3310
201	10/27/2020	2620	228	12/8/2020	3300
202	11/2/2020	2560	229	12/10/2020	3260
203	11/3/2020	2580	230	12/11/2020	3280
204	11/4/2020	2580	231	12/14/2020	3320
205	11/5/2020	2770	232	12/15/2020	3450
206	11/6/2020	2830	233	12/16/2020	3610
207	11/9/2020	2880	234	12/17/2020	3540
208	11/10/2020	2860	239	12/28/2020	3430
209	11/11/2020	3080	240	12/29/2020	3420
210	11/12/2020	3040	241	12/30/2020	3310

Sumber: Data sekunder, *Yahoo Finance*

Lampiran 2: Data *Return* Saham PT. Telkom Indonesia Tbk Periode 2020

T	Return	t	Return	t	Return
1	0.017744	43	0.051003	85	0
2	-0.00504	44	0.056391	86	-0.02439
3	-0.00506	45	0	87	-0.01555
4	-0.0102	46	-0.02111	88	0.00936
5	0.015267	47	-0.06899	89	-0.02198
6	0.005038	48	-0.00286	90	0.00317
7	0.012485	49	-0.02613	91	-0.02889
8	-0.02005	50	-0.02683	92	0.009725
9	-0.01788	51	0	93	0.037979
10	-0.00776	52	-0.04638	94	0.015409
11	-0.01044	53	-0.07216	95	-0.02791
12	0	54	-0.04523	96	0.021774
13	0.02078	55	-0.07001	97	-0.02492
14	-0.00774	56	0.094616	98	-0.0127
15	0.005168	57	-0.07197	99	0.006369
16	0.010257	58	-0.02264	100	0.031253
17	-0.02062	59	0.128749	101	0.012233
18	-0.00261	60	0.036248	102	0.003035
19	0.018112	61	0.016052	103	-0.02144
20	-0.01031	62	0.006349	104	0
21	-0.01567	63	-0.01917	105	-0.02826
22	-0.01592	64	0.009631	106	-0.0096
23	0.005333	65	0.022118	107	-0.00969
24	0.002656	66	0.039821	108	-0.01637
25	-0.00266	67	-0.03359	109	0.019608
26	0.007947	68	-0.03476	110	0.03498
27	0.005263	69	0.00321	111	0.00312
28	-0.00526	70	0.019048	112	0.021572
29	0.007884	71	0.018692	113	0
30	-0.02384	72	-0.04095	114	-0.02469
31	-0.02442	73	-0.03601	115	-0.02212
32	-0.00828	74	0.07387	116	0.015848
33	0.002766	75	-0.03465	117	-0.00631
34	0	76	-0.01616	118	0.009449
35	0.002759	77	0.028894	119	-0.00314
36	0.016394	78	-0.02889	120	-0.04174
37	-0.01364	79	0.006494	121	-0.00328
38	-0.01383	80	0.019231	122	0.032365
39	-0.02254	81	0.00317	123	-0.00639
40	-0.01146	82	0.058388	124	-0.02269
41	0.005747	83	0.043803	125	0.022691
42	-0.01443	84	-0.0528	126	0.009569

t	Return	t	Return	t	Return
127	-0.01278	168	-0.03637	209	0.074108
128	0	169	0.039933	210	-0.01307
129	-0.00645	170	0.028072	211	-0.01658
130	-0.00324	171	-0.02098	212	0.026404
131	0.003241	172	-0.01424	213	0.047704
132	0.003231	173	0.010695	214	-0.0125
133	-0.01299	174	0.02452	215	-0.00315
134	0	175	-0.02807	216	0.01565
135	0	176	-0.01073	217	0.030583
136	0.003263	177	0.007168	218	0.008996
137	0	178	-0.02532	219	-0.02112
138	-0.01642	179	-0.01476	220	0.056311
139	0.006601	180	-0.01122	221	-0.00289
140	-0.0066	181	-0.01134	222	-0.06879
141	-0.00664	182	-0.02698	223	0.003091
142	0.016529	183	0.071594	224	0.027399
143	-0.04356	184	-0.02578	225	-0.00905
144	0.010222	185	-0.01126	226	-0.01527
145	0.023452	186	0	227	0.024317
146	0	187	0.003766	228	-0.00905
147	-0.01333	188	0.014926	229	-0.0122
148	-0.00336	189	0.01105	230	0.006116
149	-0.01356	190	0	231	0.012121
150	0.006803	191	0	232	0.038409
151	0.020135	192	0.028883	233	0.045334
152	0.006623	193	-0.01073	234	-0.01958
153	0.006579	194	-0.01085	235	-0.00851
154	-0.01653	195	-0.01465	236	0.002845
155	0	196	-0.01487	237	-0.04652
156	-0.00669	197	0.003738	238	-0.01198
157	0.013334	198	0.007435	239	0.032595
158	-0.00998	199	-0.02627	240	-0.00292
159	-0.01008	200	0.007576	241	-0.03269
160	-0.03437	201	-0.01139	235	-0.00851
161	0.013889	202	-0.02317	236	0.002845
162	0.017094	203	0.007782	237	-0.04652
163	-0.01709	204	0	238	-0.01198
164	-0.01389	205	0.071058	239	0.032595
165	0.013889	206	0.021429	240	-0.00292
166	-0.01389	207	0.017514	241	-0.03269
167	-0.0212	208	-0.00697		

Sumber: Data diolah, 2021

Lampiran 3 : Data *Return* Kontinu untuk $\boldsymbol{\varepsilon = 0.03}$

No	*Return* Kontinu	No	*Return* Kontinu	No	*Return* Kontinu
1	0.017744	42	-0.01443	83	-0.0096
2	-0.00504	43	0	84	-0.00969
3	-0.00506	44	-0.02111	85	-0.01637
4	-0.0102	45	-0.00286	86	0.019608
5	0.015267	46	-0.02613	87	0.00312
6	0.005038	47	-0.02683	88	0.021572
7	0.012485	48	0	89	0
8	-0.02005	49	-0.02264	90	-0.02469
9	-0.01788	50	0.016052	91	-0.02212
10	-0.00776	51	0.006349	92	0.015848
11	-0.01044	52	-0.01917	93	-0.00631
12	0	53	0.009631	94	0.009449
13	0.02078	54	0.022118	95	-0.00314
14	-0.00774	55	0.00321	96	-0.00328
15	0.005168	56	0.019048	97	-0.00639
16	0.010257	57	0.018692	98	-0.02269
17	-0.02062	58	-0.01616	99	0.022691
18	-0.00261	59	0.028894	100	0.009569
19	0.018112	60	-0.02889	101	-0.01278
20	-0.01031	61	0.006494	102	0
21	-0.01567	62	0.019231	103	-0.00645
22	-0.01592	63	0.00317	104	-0.00324
23	0.005333	64	0	105	0.003241
24	0.002656	65	-0.02439	106	0.003231
25	-0.00266	66	-0.01555	107	-0.01299
26	0.007947	67	0.00936	108	0
27	0.005263	68	-0.02198	109	0
28	-0.00526	69	0.00317	110	0.003263
29	0.007884	70	-0.02889	111	0
30	-0.02384	71	0.009725	112	-0.01642
31	-0.02442	72	0.015409	113	0.006601
32	-0.00828	73	-0.02791	114	-0.0066
33	0.002766	74	0.021774	115	-0.00664
34	0	75	-0.02492	116	0.016529
35	0.002759	76	-0.0127	117	0.010222
36	0.016394	77	0.006369	118	0.023452
37	-0.01364	78	0.012233	119	0
38	-0.01383	79	0.003035	120	-0.01333
39	-0.02254	80	-0.02144	121	-0.00336
40	-0.01146	81	0	122	-0.01356
41	0.005747	82	-0.02826	123	0.006803

No	*Return* Kontinu	No	*Return* Kontinu	No	*Return* Kontinu
124	0.020135	150	-0.01122	176	-0.00697
125	0.006623	151	-0.01134	177	-0.01307
126	0.006579	152	-0.02698	178	-0.01658
127	-0.01653	153	-0.02578	179	0.026404
128	0	154	-0.01126	180	-0.0125
129	-0.00669	155	0	181	-0.00315
130	0.013334	156	0.003766	182	0.01565
131	-0.00998	157	0.014926	183	0.008996
132	-0.01008	158	0.01105	184	-0.02112
133	0.013889	159	0	185	-0.00289
134	0.017094	160	0	186	0.003091
135	-0.01709	161	0.028883	187	0.027399
136	-0.01389	162	-0.01073	188	-0.00905
137	0.013889	163	-0.01085	189	-0.01527
138	-0.01389	164	-0.01465	190	0.024317
139	-0.0212	165	-0.01487	191	-0.00905
140	0.028072	166	0.003738	192	-0.0122
141	-0.02098	167	0.007435	193	0.006116
142	-0.01424	168	-0.02627	194	0.012121
143	0.010695	169	0.007576	195	-0.01958
144	0.02452	170	-0.01139	196	-0.00851
145	-0.02807	171	-0.02317	197	0.002845
146	-0.01073	172	0.007782	198	-0.01198
147	0.007168	173	0	199	-0.00292
148	-0.02532	174	0.021429		
149	-0.01476	175	0.017514		

Sumber: Data diolah, 2021

Lampiran 4 : Data *Jump* untuk $\boldsymbol{\varepsilon = 0.03}$

No	*Jump*	No	*Jump*	No	*Jump*
1	0.051003	15	-0.04095	29	-0.03637
2	0.056391	16	-0.03601	30	0.039933
3	-0.06899	17	0.07387	31	0.071594
4	-0.04638	18	-0.03465	32	0.071058
5	-0.07216	19	0.058388	33	0.074108
6	-0.04523	20	0.043803	34	0.047704
7	-0.07001	21	-0.0528	35	0.030583
8	0.094616	22	0.037979	36	0.056311
9	-0.07197	23	0.031253	37	-0.06879
10	0.128749	24	0.03498	38	0.038409
11	0.036248	25	-0.04174	39	0.045334
12	0.039821	26	0.032365	40	-0.04652
13	-0.03359	27	-0.04356	41	0.032595
14	-0.03476	28	-0.03437	42	-0.03269

Sumber: Data diolah, 2021

Lampiran 5 : Program Olah Data dan Simulasi Menggunakan Python 3.4.3

```
import pandas as pd, numpy as np, matplotlib.pyplot as plt
from scipy.stats import skew, kurtosis

def Kontinu(array): #Mendefinisikan fungsi mengidentifikasi return Kontinu
  for i in range (len(array)):
    if array[i] > 0.03 or array[i] < -0.03:
      array[i] = "NaN"
  return array

def Jump(array): #Mendefinisikan fungsi mengidentifikasi Jump
  for i in range (len(array)):
        if array[i] < 0.03 and array[i] > -0.03:
      array[i] = "NaN"
  return array

data = pd.read_csv("TLKM.csv")
data['Return'] = np.log(data['Close Price']/data['Close Price'].shift(+1))
data['Kontinu'] = (data['Return'])
data['Kontinu'] = Kontinu(data['Kontinu'])
data['Jump'] = (data['Return'])
data['Jump'] = Jump(data['Jump'])
data.to_csv("Data Telkom 1.csv")

#Estimasi Parameter Model Jump Diffusion
dt = 1
lambdahat = data['Jump'].count()/((len(data['Return'])-1)*dt)
muhat = (2*np.mean(data['Kontinu'])+np.var(data['Kontinu'])*dt)/2*dt
sigmahat = np.sqrt(np.var(data['Kontinu'])/(dt))
mu_jhat = np.mean(data['Jump'])-(muhat-sigmahat**2/2)*dt
sigma_jhat = np.sqrt(np.var(data['Jump'])-sigmahat**2*dt)

M = 241
I = 1
R = np.zeros((M+1,I))
R[0] = 0

dN = np.random.poisson(lambdahat*dt, (M+1, I))
Y = mu_jhat*dN +
sigma_jhat*np.sqrt(dN)*np.random.standard_normal((M+1,I))
dW = np.sqrt(dt)*np.random.standard_normal((M+1,I))

for t in range (1, M+1,1):
  R[t] = (muhat-sigmahat**2/2)*dt+sigmahat*dW[t]+Y[t]
```

```
retur = pd.DataFrame(R)
plt.figure(figsize= (15,10))
plt.plot(data['Return'][1:242], lw = 3, label = "Return Data In Sample")
plt.plot(R, lw = 0.5, label = "Return Model")
plt.legend(loc = "upper right")
plt.title('Perbandingan Return Harga Saham Data In Sample dan Model Jump Diffusion')
plt.xlabel('Waktu')
plt.ylabel('Return Saham')

print("_____________________________________________________________")
print("            |     Mean     |  Volatilitas  |  Intensitas  |")
print("_____________________________________________________________")
print("Data Kontinu  |  ",f'{muhat:.5f}'," |  ",f'{sigmahat:.5f}'," |     0     |")
print("Data Jump     |  ",f'{mu_jhat:.5f}'," |  ",f'{sigma_jhat:.5f}'," |
",f'{lambdahat:.5f}'," |")

#Membandingkan Parameter Model Jump Diffusion dengan Parameter Return In Sample

xd = np.mean(data['Return'][1:242])
yd = np.var(data['Return'][1:242])
xm = (muhat-sigmahat**2/2)*dt+mu_jhat*lambdahat*dt
ym = sigmahat**2*dt+(sigma_jhat**2+mu_jhat**2) *lambdahat*dt
skewd = skew(data['Return'][1:242])
skewm = (3*sigma_jhat**2+mu_jhat**2) * mu_jhat * lambdahat * dt /(sigmah
** 2 * dt + (sigma_jhat** 2 + mu_jhat ** 2) * lambdahat * dt) * * (1.5)
kurtd = kurtosis(data['Return'][1:242])
kurtm = (3* sigma_jhat ** 4 + 6 * mu_jhat ** 2 * sigma_jhat ** 2 + mu_jhat **
4) * lambdahat * dt+ (3* lambdahat **2* (sigma_jhat**2 + mu_jhat**2) **2 +
6 * lambdahat * sigmahat**2 * (sigma_jhat**2 + mu_jhat**2)+3*
sigmahat**4) * dt**2 / (sigmahat**2 *dt + (sigma_jhat**2 + mu_jhat**2) *
lambdahat*dt) **2

print("_____________________________________________________________"
)
print("            |     Mean     |  Variansi  |  Skewness  |  Kurtosis  |")
print("_____________________________________________________________"
)
print("Data In Sample |  ",f'{xd:.5f}'," |  ",f'{yd:.5f}'," |  ",f'{skewd:.5f}'," |
", f'{kurtd:.6f}'," |")
print("Jump Diffusion |  ",f'{xm:.5f}'," |  ",f'{ym:.5f}'," |  ",f'{skewm:.5f}'," |
", f'{kurtm:.6f}'," |")


#Simulasi Monte Carlo
```

```
M = 19
I = 1000
R = np.zeros((M+1,I))
R[0] = 0

dN = np.random.poisson(lambdahat*dt, (M+1, I))
Y = mu_jhat*dN +
sigma_jhat*np.sqrt(dN)*np.random.standard_normal((M+1,I))
dW = np.sqrt(dt)*np.random.standard_normal((M+1,I))

for t in range (1, M+1,1):
   R[t] = (muhat-sigmahat**2/2)*dt+sigmahat*dW[t]+Y[t]

retur = pd.DataFrame(R)
retur.to_csv("Return Saham Telkom (1000).csv")
```