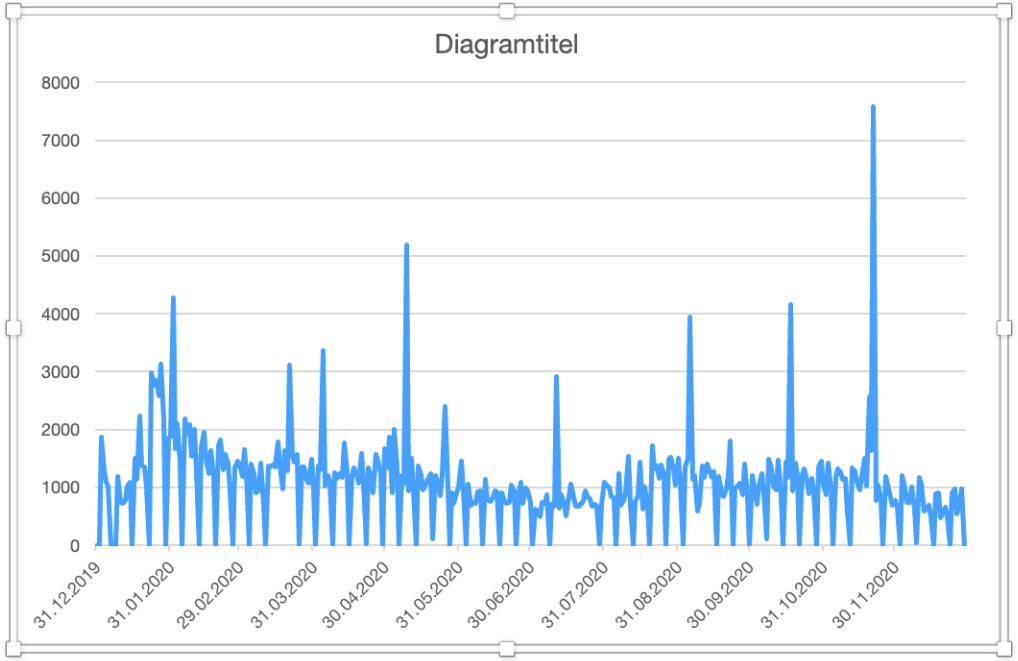
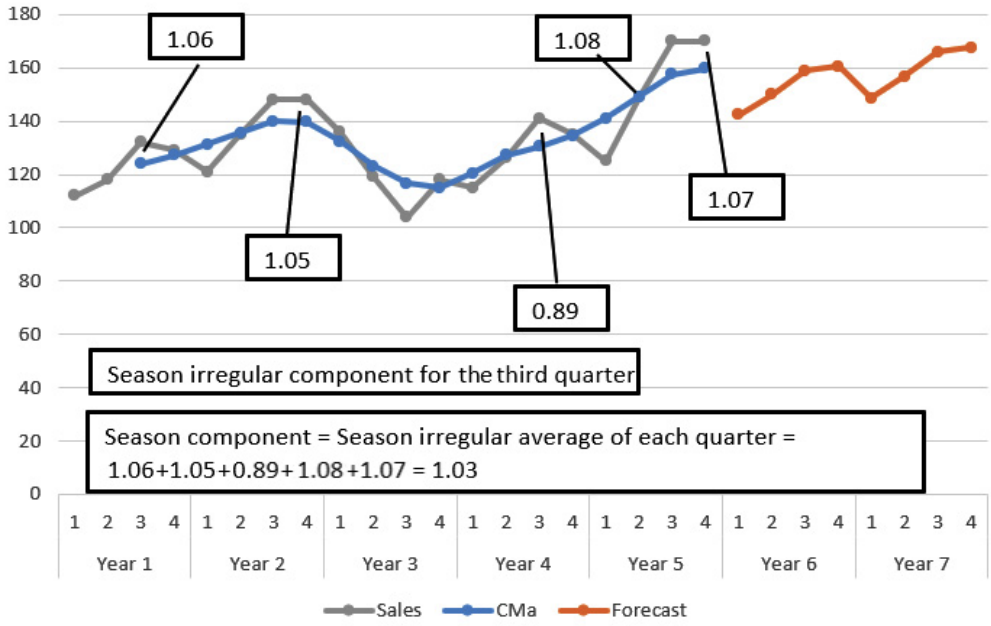
VCM F25 W8


Diagramtitel
8000
7000
6000
5000
4000
3000
2000
1000
0
31.12.2019
31.01.2020
29.02.2020
31.03.2020
30.04.2020
31.05.2020
30.06.2020
31.07.2020
31.08.2020
30.09.2020
31.10.2020
30.11.2020


180
160
140
120
100
80
60
40
20
0
1.06
1.05
0.89
1.08
1.07
Season irregular component for the third quarter
Season component = Season irregular average of each quarter =
1.06+1.05+0.89+1.08+1.07 = 1.03
1 2 3 4 1 2 3 4 1 2 3 4 1 2 3 4 1 2 3 4 1 2 3 4 1 2 3 4
Year 1
Year 2
Year 3
Year 4
Year 5
Year 6
Year 7
Sales
CMa
Forecast

- Emne:
  - Tidsserieanalyse

Læringsmål:

- Forstå og beregne et centeret gennemsnit. Udarbejde et forecast på data

Forberedelse:

- Læs kapitel 12 i "Data Forecasting and Segmentation Using Microsoft Excel"

Estimeret forberedelsestid:

- 3 timer

Øvelser i klassen:

- Øvelser i Excel vedrørende tidsserier

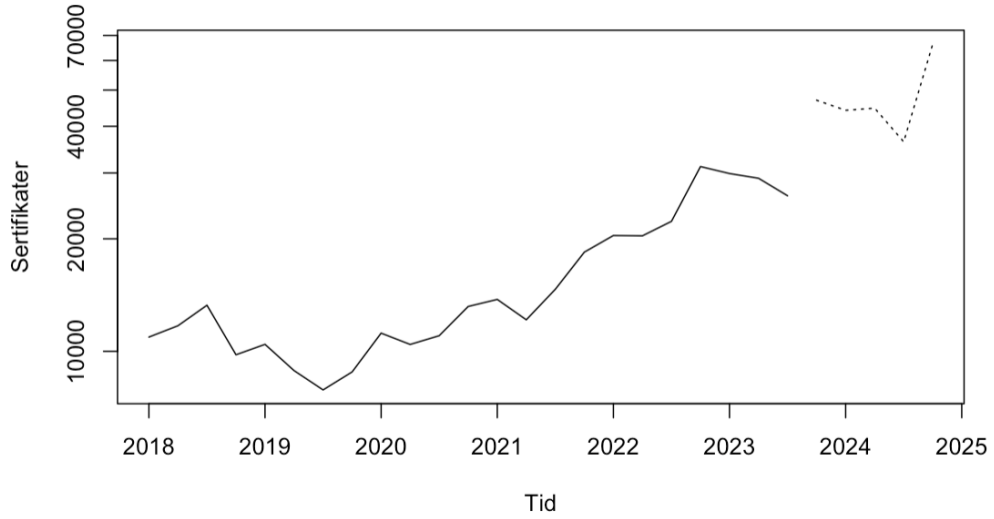
- Introduktion til TS
  - Forecasting
- Kan Schulstad bruges?
  - Løvbjerg vs REMA
    - MinMax
  - Øvelse
- Trending Component
  - Eksemplet fra bogen
  - Eksempel med SMK
  - Eksempel med APPL

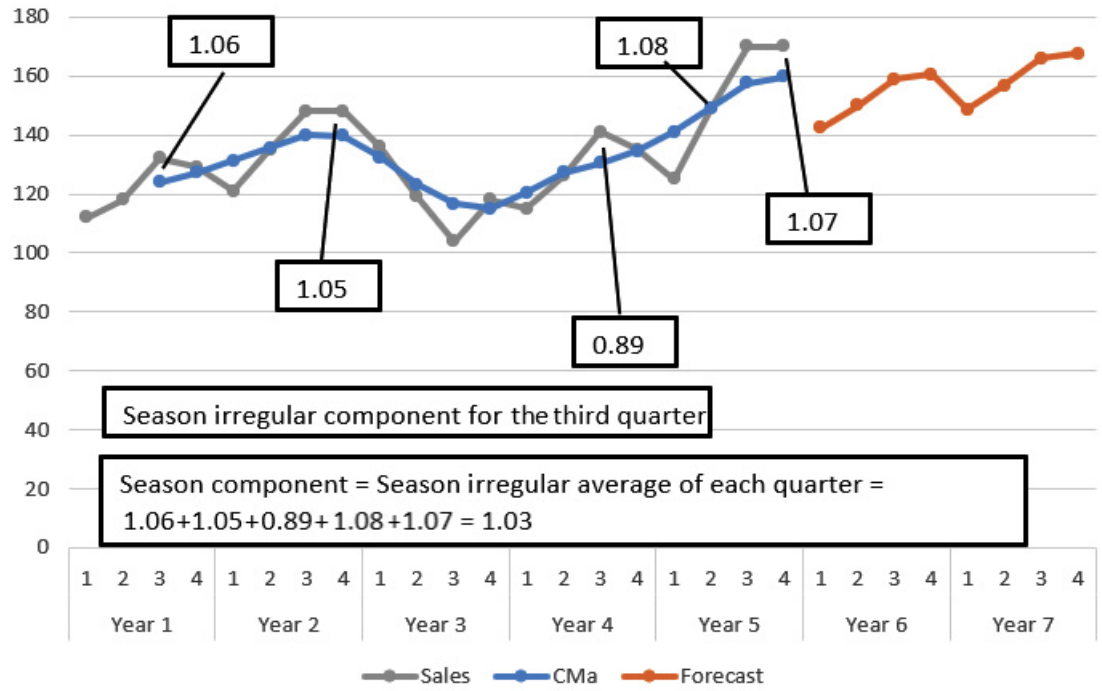
Predicting values with a **time series** requires that we have **historical** data to analyze whether past values have a **relationship** with present ones and whether this relationship can be useful to predict future values.

To validate this, we have to test the **autocorrelation** of the data.

1. **Visualizing** seasonal trends
2. Researching **autocorrelation** – past values' influence over presentvalues
3. Performing the **Durbin-Watson** autocorrelation test
4. Go On with

Resultatet fra ARIMA modellen forutsier en vekst i 4. kvartal 2023 før et fall i de neste tre kvartalene før det igjen har en stor vekst i 4. kvartal 2024.

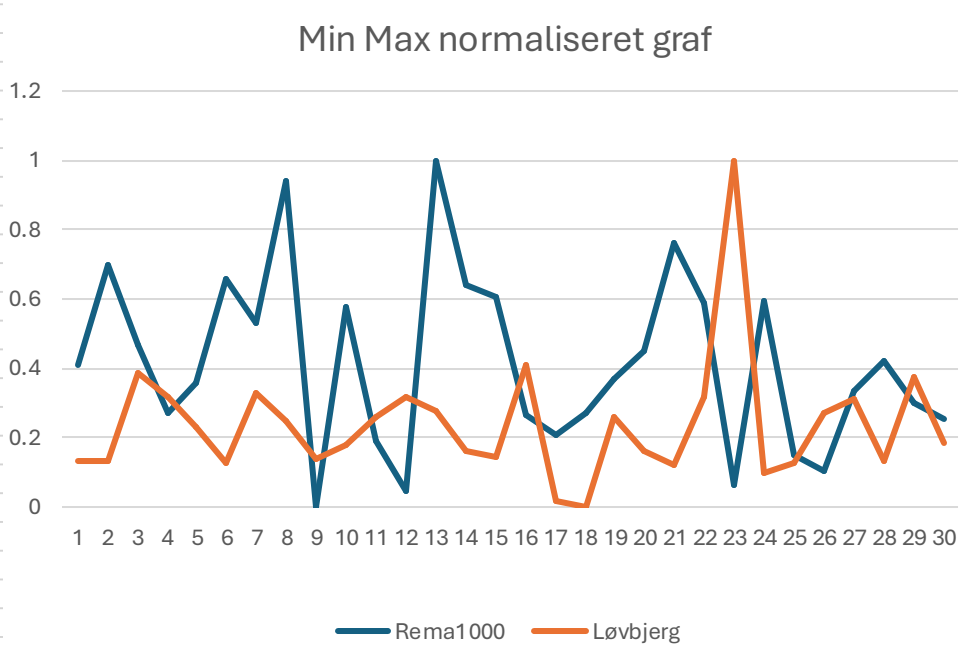




Min-max-skalering for Schulstad

Sum af time_diff	Kolonnemærkater			
Rækkemærkater	Rema 1000	Løvbjerg	Rema1000	Løvbjerg
07.09.2024	4946	0	0,408862796	0,134168686
08.09.2024	493654	0	0,697979764	0,134168686
09.09.2024	99714	8557	0,464927024	0,387050062
10.09.2024	-228082	6193	0,271004711	0,317187777
11.09.2024	-82457	3205	0,357155661	0,228884686
12.09.2024	428814	-215	0,659620776	0,127814883
13.09.2024	207240	6550	0,528538815	0,327738046
14.09.2024	907621	3869	0,942880367	0,248507595
15.09.2024	-686174	48	0	0,13558721
16.09.2024	286092	1542	0,575187225	0,179738755
17.09.2024	-369965	4289	0,187067507	0,260919676
18.09.2024	-609880	6239	0,045135111	0,318547195
19.09.2024	1004173	4835	1	0,277055382
20.09.2024	392266	917	0,63799918	0,161268396
21.09.2024	334075	294	0,603573704	0,142857143
22.09.2024	-240827	9280	0,263464839	0,408416573
23.09.2024	-334456	-3924	0,208074437	0,018204386
24.09.2024	-232582	-4540	0,268342536	0
25.09.2024	-60630	4283	0,370068394	0,260742361
26.09.2024	78231	852	0,452217799	0,159347479
27.09.2024	604398	-526	0,763495306	0,118624032
28.09.2024	309069	6236	0,588780292	0,318458538
29.09.2024	-583365	29298	0,06082124	1
30.09.2024	317410	-1213	0,593714782	0,098321414
01.10.2024	-437689	-329	0,147002361	0,124445889
02.10.2024	-513265	4589	0,102292015	0,269785448
03.10.2024	-117866	6013	0,336207891	0,311868314
04.10.2024	20354	0	0,417978084	0,134168686
05.10.2024	-181501	8082	0,298561775	0,373012589
06.10.2024	-254710	1732	0,255251732	0,185353744

$$x_{scaled} = \frac{x - x_{min}}{x_{max} - x_{min}}$$



Øvelse: Find to andre kæder og lav en min-max-normaliseret graf

OPSKRIFTEN I

1. Calculating the **moving average** for the given period of time
2. Getting the **CMA** of your data. This is the middle of the calculating period.
3. Dividing the data by the CMA to get the **seasonal irregular** component. This is the distance from the data to the moving average line.
4. Calculating **the seasonal component** by getting the average of all the periods of the season irregular data acquired in the last step.
5. Getting the regression line of the data or **the trend line**
6. Multiplying the season component by the regression line to produce **the forecast**. The season component helps with the time-series peakscaused by the changing seasonal sales demand.

OPSKRIFTEN II

DATA → Moving Average → Centered MA → Season irregular component

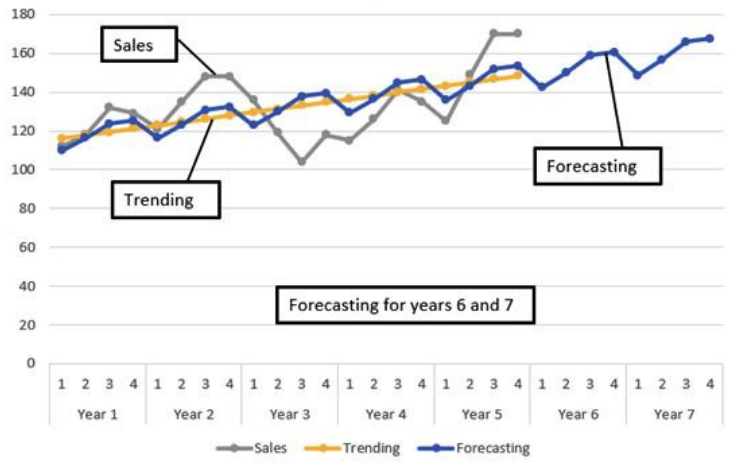
t	Year	Quarterly	Sales
1	Year 1	1	112
2		2	118
3		3	132
4		4	129
5	Year 2	1	121
6		2	135
7		3	148
8		4	148
9	Year 3	1	136

D	E	F
	MA	CMA
112		
118		
132	122,75	123
129	125	127
121	129,25	13
135	133,25	135
148	138	139
148	141,75	13
136	137,75	13
119	126,75	

	F	G
	CMA	SIT
75	123,875	1,065
25	127,125	1,014
25	131,25	0,921
25	135,625	0,995
38	139,875	1,058
75	139,75	1,059
75	132,25	1,028

	G	
	SIT	Tre
		11
		11
75	1,06559031	11
25	1,01474926	11
25	0,92190476	11
25	0,99539171	
75	1,05808758	12
75	1,05903399	12

The seasonal Trend



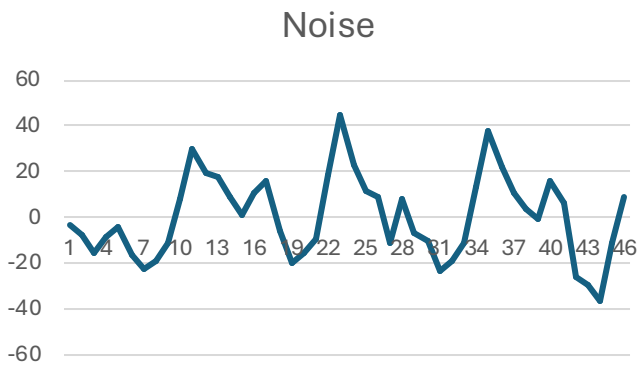
	I	J
	Seasonal Trend	
8	108,300589	
6	110,55116	Season
5	116,618974	
3	120,076504	
2	116,389021	
7	118,656341	
8	125,015131	
7	128,568738	
5	124,477452	

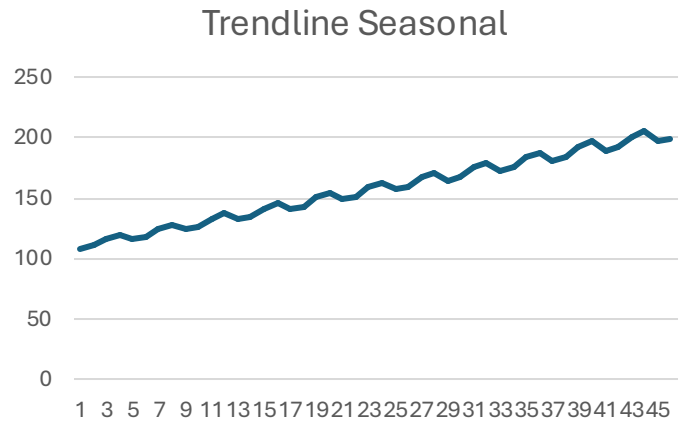
The season Component

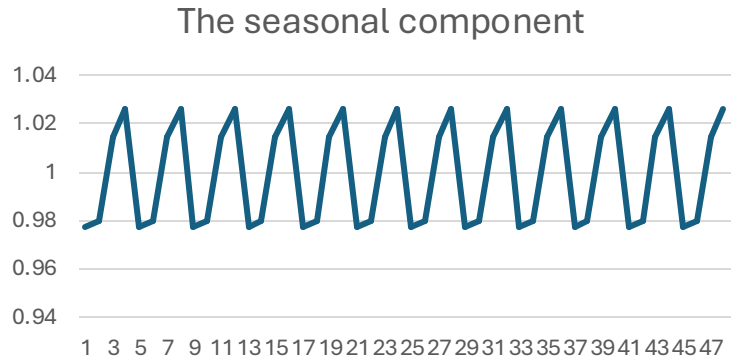
Season	Seasonal Component
1	0,97770989
2	0,97973458
3	1,01490695
4	1,02652054

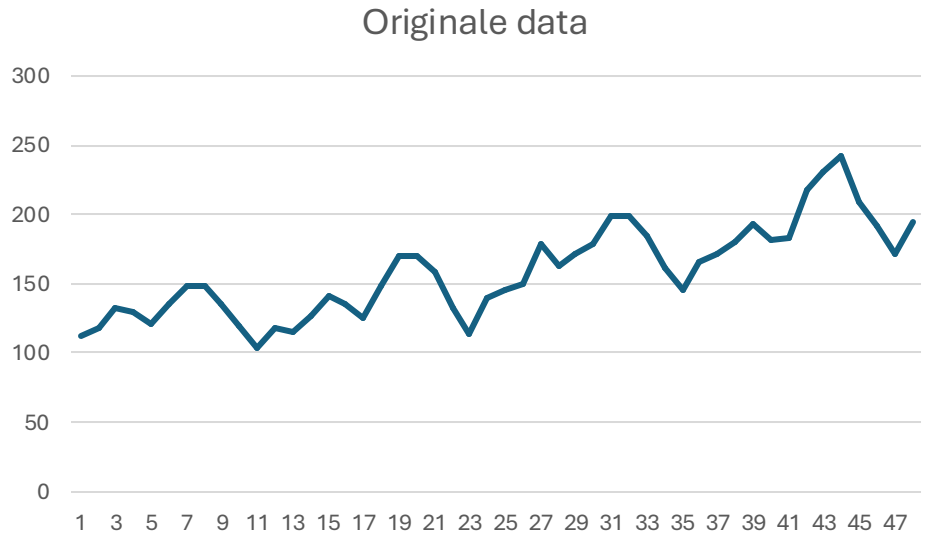
The Trendline

	Trend t	
	110,769658	10
	112,837866	1
31	114,906075	11
26	116,974283	12
76	119,042492	11
71	121,1107	11
58	123,178908	12
99	125,247117	12
39	127,315325	12
57	129,383534	12


Noise
60
40
20
0
-20
-40
-60
1 4 7 10 13 16 19 22 25 28 31 34 37 40 43 46

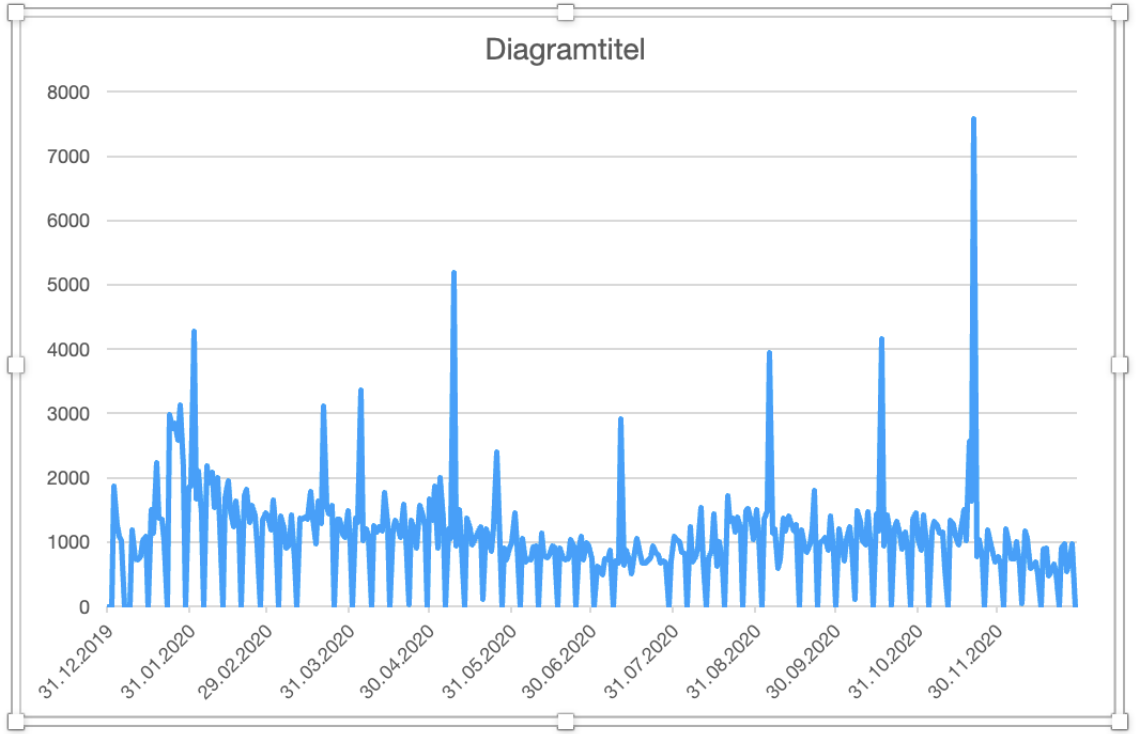

Trendline Seasonal
250
200
150
100
50
0
1 3 5 7 9 11 13 15 17 19 21 23 25 27 29 31 33 35 37 39 41 43 45


The seasonal component
1.04
1.02
1
0.98
0.96
0.94
1 3 5 7 9 11 13 15 17 19 21 23 25 27 29 31 33 35 37 39 41 43 45 47


Originale data
300
250
200
150
100
50
0
1 3 5 7 9 11 13 15 17 19 21 23 25 27 29 31 33 35 37 39 41 43 45 47

Eksemplet med SMK

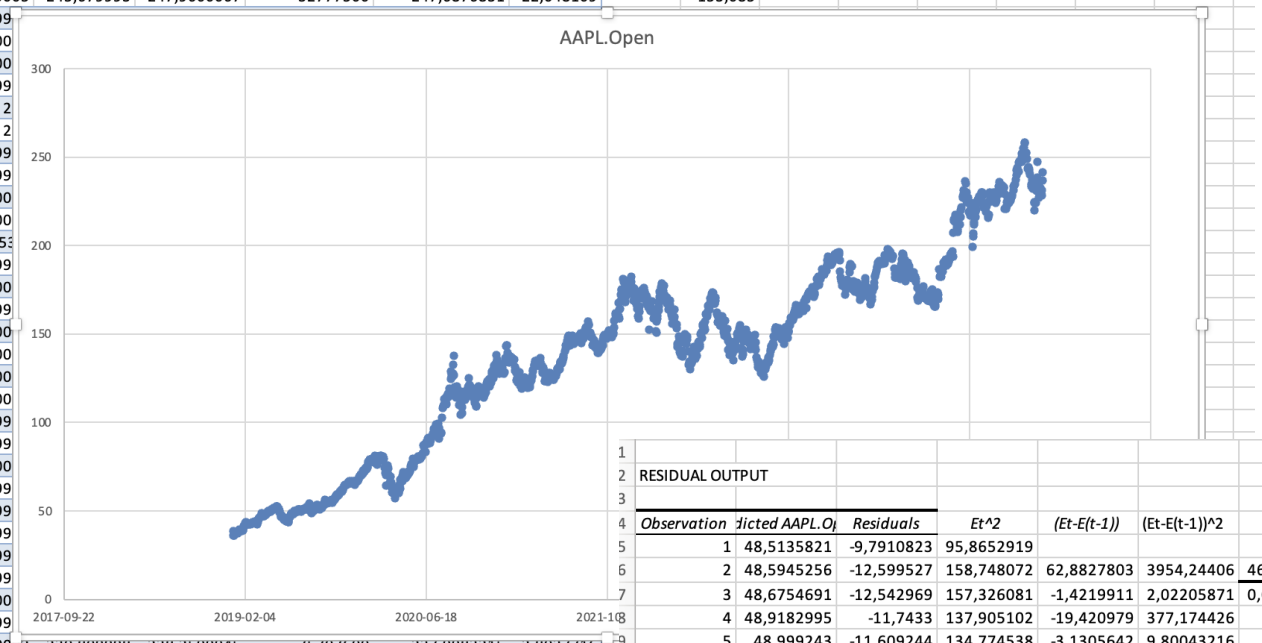
1. Hent data fra github.com/cphstud/VCMF25W8
2. Visualiser besøg pr dag
3. Kør regression på besøg ~ Date
4. Fortsæt med Observation, Predicted og Residuals (Et)
    1. Lav Et^2, Et-E(t-1), Et-E(t-1)^2
    2. Lav sum(Et-E(t-1)^2, sum(Et^2) og divider
    3. Slå op i en tabel for at tjekke DW
5. Fortsæt med MA,CMA,SIT,SC og Trend med SC



	A	B	C	D	E	F	G	H	I	J	K	L
	Column1	Column2	Column3	Column4	idx	MA	CMA	SIT	Trend lin	Trend Sea	Noise	Seasonal
	2019.01.01	0	74	tirsdag	1							
	2019.01.02	972	37	onsdag	2							
	2019.01.03	718	41	torsdag	3							
	2019.01.04	539	64	fredag	4							
	2019.01.05	965	63	lørdag	5							
	2019.01.06	908	38	søndag	6							
	2019.01.08	527	62	tirsdag	8							
	2019.01.09	654	28	onsdag	9							
	2019.01.10	528	14	torsdag	10							
	2019.01.11	476	76	fredag	11							
	2019.01.12	908	58	lørdag	12							
	2019.01.13	895	82	søndag	13							
	2019.01.15	498	73	tirsdag	15							

Durbin-Watson for AAPL

Date	AAPL.Open	AAPL.High	AAPL.Low	AAPL.Close	AAPL.Volume	AAPL.Adjusted	residuals
2024-12-04	242,8699951	244,110001	241,25	243,0099945	44383900	242,743103	19,275652
2024-12-05	243,9900055	244,539993	242,130005	243,0399933	40033900	242,7730713	20,314719
2024-12-06	242,9100037	244,630005	242,080002	242,8399963	36870600	242,573288	19,153774
2024-12-09	241,8300018	247,240005	241,75	246,75	44649200	246,4790039	17,830942
2024-12-10	246,8899994	248,210007	245,339996	247,7700043	36914800	247,497879	22,809996
2024-12-11	247,9600067	250,800003	246,259995	246,4900055	45205800	246,2192841	23,79906
2024-12-12	246,8899994	248,740005	245,679993	247,9600067	32777500	247,6876831	22,648109
2024-12-13	247,8200073	249,2899					
2024-12-16	247,9900055	251,3800					
2024-12-17	250,0800018	253,8300					
2024-12-18	252,1600037	254,2799					
2024-12-19	247,5	2					
2024-12-20	248,0399933	2					
2024-12-23	254,7700043	255,6499					
2024-12-24	255,4900055	258,2099					
2024-12-26	258,1900024	260,1000					
2024-12-27	257,8299866	258,7000					
2024-12-30	252,2299957	253					
2024-12-31	252,4400024	253,2799					
2025-01-02	248,9299927	249,1000					
2025-01-03	243,3600006	244,1799					
2025-01-06	244,3099976	247,3300					
2025-01-07	242,9799957	245,5500					
2025-01-08	241,9199982	243,7100					
2025-01-10	240,0099945	240,1600					
2025-01-13	233,5299988	234,6699					
2025-01-14	234,75	236,1199					
2025-01-15	234,6399994	238,9600					
2025-01-16	237,3500061	238,0099					
2025-01-17	232,1199951	232,2899					
2025-01-21	224	224,4199					
2025-01-22	219,7899933	224,1199					
2025-01-23	224,7400055	227,0299					
2025-01-24	224,7799988	225,6300					
2025-01-27	224,0200043	232,1499					
2025-01-28	230,8500061	240,190002	230,809998	238,2599945	75707600	237,9983215	2,8037716
2025-01-29	234,1199951	239,860001	234,009995	239,3600006	45486100	239,0971222	5,9928171
2025-01-30	238,6699982	240,789993	237,210007	237,5899963	55658300	237,3290558	10,461877
2025-01-31	247,1900024	247,190002	233,440002	236	101075100	235,7408142	18,900937



RESIDUAL OUTPUT

Observation	*dicted AAPL.O*	*Residuals*	*Et^2*	*(Et-E(t-1))*	(Et-E(t-1))^2		
1	48,5135821	-9,7910823	95,8652919				
2	48,5945256	-12,599527	158,748072	62,8827803	3954,24406	4642372,33	14710,6177
3	48,6754691	-12,542969	157,326081	-1,4219911	2,02205871	0,00316877	
4	48,9182995	-11,7433	137,905102	-19,420979	377,174426		
5	48,999243	-11,609244	134,774538	-3,1305642	9,80043216		
6	49,0801865	-11,257688	126,735543	-8,0389944	64,6254311		
7	49,16113	-11,03613	121,796165	-4,9393781	24,3974556		
8	49,2420735	-11,022072	121,486077	-0,3100884	0,09615479		
9	49,4849039	-11,772402	138,589459	17,1033817	292,525665		
10	49,5658474	-11,998346	143,960315	5,37085673	28,846102		
11	49,6467909	-11,37679	129,431361	-14,528954	211,090513		
12	49,7277344	-11,177735	124,941763	-4,4895977	20,1564876		
13	49,8086779	-10,433678	108,861634	-16,080129	258,570553		
14	50,1324518	-11,029951	121,659817	12,798183	163,793487		
15	50,2133953	-11,675897	136,326567	14,6667499	215,113553		
16	50,2943388	-11,766839	138,458492	2,13192474	4,54510312		
17	50,3752823	-11,505283	132,371545	-6,0869467	37,0509201		
18	50,6181128	-11,670614	136,203241	3,83169596	14,6818939		
19	50,6990562	-11,636556	135,409441	-0,7938001	0,6301186		
20	50,7799997	-9,9674997	99,3510507	-36,05839	1300,20751		
21	50,8609432	-9,3334431	87,1131593	-12,237891	149,765987		
22	50,9418867	-9,201885	84,6746879	-2,4384714	5,9461429		
23	51,1847172	-9,3322162	87,0902599	2,41557206	5,83498836		
24	51,2656606	-8,0506605	64,8131343	-22,277126	496,270327