

BAB V

KESIMPULAN, SARAN DAN KETERBATASAN PENELITIAN

5.1. Kesimpulan

Berdasarkan hasil dari pengolahan data dan analisis, peneliti mengambil kesimpulan sebagai berikut:

1.1. Metode forecasting terbaik untuk unit Holo 1x3 CA untuk tahun 2017 sampai dengan 2019 adalah *Exponential smoothing*

Tahun Data	Pengukuran	<i>Moving average</i>	<i>Exponential smoothing</i>
2016 -> 2017	MAD	37,074	27,693
	MSE	2146,407	1814,706
	MAPE	10,347%	7,98%
2017-> 2018	MAD	76,704	63,138
	MSE	8638,58	6035,163
	MAPE	25,158%	20,516%
2018-> 2019	MAD	74,852	64,842
	MSE	6494,728	5144,628
	MAPE	21,53%	18,21%

Hasil forecasting untuk bulan desember 2019

		<i>Moving average</i>	<i>Exponential smoothing</i>
Des-19	MAD	47,333	50,306
	MSE	3797,528	3599,337
	MAPE	12,567%	12,707%

1.2. Metode forecasting terbaik untuk unit Holo 9055 pada tahun 2017 adalah *exponential smoothing*, pada tahun 2018 sampai dengan 2019 metode terbaik adalah *moving average*.

Tahun Data	Pengukuran	<i>Moving average</i>	<i>Exponential smoothing</i>
2016 -> 2017	MAD	25,407	19,733
	MSE	1109,407	700,293
	MAPE	13,93%	10,67%
2017-> 2018	MAD	12	40,942
	MSE	248,741	2343,73
	MAPE	10,92%	35,92%
2018-> 2019	MAD	10,407	12,674
	MSE	165,198	261,298
	MAPE	8,21%	10,02%

Hasil *Forecasting result* untuk desember 2019

		<i>Moving average</i>	<i>Exponential smoothing</i>
Des-19	MAD	19,083	18,029
	MSE	503,611	403,731
	MAPE	15,815%	15,015%

1.3. Metode terbaik untuk unit Holo 1x1/2 CA pada tahun 2017 dan 2019 adalah *exponential smoothing*, metode terbaik pada tahun 2018 adalah *moving average*.

Tahun Data	Pengukuran	<i>Moving average</i>	<i>Exponential smoothing</i>
2016->2017	MAD	48,63	47,661
	MSE	3349,691	3162,513
	MAPE	11,879%	11,397%
2017->2018	MAD	61,704	72,094
	MSE	5954,914	7767,442
	MAPE	14,52%	16,90%
2018 ->2019	MAD	39,259	37,451
	MSE	2113,604	2298,987
	MAPE	9,58%	9,06%

Hasil *forecasting result* untuk desember 2019

Des-19		<i>Moving average</i>	<i>Exponential smoothing</i>
	MAD	81,917	88,24
MSE	8901	10311,63	
MAPE	16,505%	17,166%	

2. Jumlah Unit yang harus disediakan oleh perusahaan pada bulan desember tahun 2019 adalah : untuk unit Holo 1x3 CA sejumlah 439 unit ; untuk unit Holo 1x1/2 CA sejumlah 29 unit ; untuk unit Holo 9055 sejumlah 124 unit.

5.2. Saran

Berdasarkan hasil analisis dari peneliti, maka peneliti ingin memberikan saran pada Toko Sentral yang nantinya berguna untuk meningkatkan efisiensi persediaan dari Toko Sentral. Saran dari peneliti, Toko Sentral menggunakan metode forecasting *exponential smoothing* untuk melakukan peramalan pada unit Holo 1x3 CA, untuk unit Holo 9055 peneliti menyarankan Toko Sentral untuk menggunakan metode *moving average*, dan untuk unit Holo 1x1/2 CA peneliti menyarankan Toko Sentral untuk menggunakan metode *exponential smoothing*.

5.3. Keterbatasan Penelitian.

Penelitian ini sendiri masih memiliki banyak keterbatasan. Beberapa keterbatasan itu antara lain:

1. Data yang digunakan hanya mencakup empat tahun sebelumnya.
2. Kurangnya pengalaman dan pengetahuan peneliti.

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LAMPIRAN

Forecasting Moving Average 2016 untuk 2017 Holo 1x3 CA

	Demand(y)	Forecast	Error	Error	Error^2	Pct Error
January	399					
February	402					
March	411					
April	392	404	-12	12	144	3,06%
May	377	401,667	-24,667	24,667	608,445	6,54%
June	391	393,333	-2,333	2,333	5,444	0,60%
July	415	386,667	28,333	28,333	802,778	6,83%
August	291	394,333	103,333	103,333	10677,77	35,51%
September	419	365,667	53,333	53,333	2844,446	12,73%
October	423	375	48	48	2304	11,35%
November	343	377,667	-34,667	34,667	1201,777	10,11%
December	422	395	27	27	729	6,40%
TOTALS	4685		-20,333	333,667	19317,66	93,12%
AVERAGE	390,417		-2,259	37,074	2146,407	10,35%
Next period forecast		396	(Bias)	(MAD)	(MSE)	(MAPE)
				Std err	52,533	

	Demand(y)	Forecast	Error	Cum error	Cum abs error	Cum Abs	MAD	Track Signal
January	399							
February	402							
March	411							
April	392	404	-12	-12	12	12	12	-1
May	377	401,667	-24,667	-36,667	24,667	36,667	18,333	-2
June	391	393,333	-2,333	-39	2,333	39	13	-3
July	415	386,667	28,333	-10,667	28,333	67,333	16,833	-0,634
August	291	394,333	103,333	-114	103,333	170,667	34,133	-3,34
September	419	365,667	53,333	-60,667	53,333	224	37,333	-1,625
October	423	375	48	-12,667	48	272	38,857	-0,326
November	343	377,667	-34,667	-47,333	34,667	306,667	38,333	-1,235
December	422	395	27	-20,333	27	333,667	37,074	-0,548

Forecasting Exponential Smoothing 2016 untuk 2017 Holo 1x3 CA

	Demand(y)	Forecast	Error	Error	Error^2	Pct Error
January	399					
February	402	399	3	3	9	0,75%
March	411	399,06	11,94	11,94	142,564	2,91%
April	392	399,299	-7,299	7,299	53,272	1,86%
May	377	399,153	-22,153	22,153	490,748	5,88%
June	391	398,71	-7,71	7,71	59,441	1,97%
July	415	398,556	16,444	16,444	270,419	3,96%
August	291	398,885	107,885	107,885	11639,06	37,07%
September	419	396,727	22,273	22,273	496,097	5,32%
October	423	397,172	25,828	25,828	667,073	6,11%
November	343	397,689	-54,689	54,689	2990,863	15,94%
December	422	396,595	25,405	25,405	645,414	6,02%
TOTALS	4685		-94,844	304,625	17463,95	87,78%
AVERAGE	390,417		-8,622	27,693	1587,632	7,98%
Next period forecast		397,103	(Bias)	(MAD)	(MSE)	(MAPE)
				Std err	44,05	

	Demand(y)	Forecast	Error	Cum error	Cum abs error	Cum Abs	MAD	Track Signal
January	399							
February	402	399	3	3	3	3	3	1
March	411	399,06	11,94	14,94	11,94	14,94	7,47	2
April	392	399,299	-7,299	7,641	7,299	22,239	7,413	1,031
May	377	399,153	-22,153	-14,512	22,153	44,392	11,098	-1,308
June	391	398,71	-7,71	-22,221	7,71	52,101	10,42	-2,133
July	415	398,556	16,444	-5,777	16,444	68,546	11,424	-0,506
August	291	398,885	107,885	113,661	107,885	176,43	25,204	-4,51
September	419	396,727	22,273	-91,388	22,273	198,704	24,838	-3,679
October	423	397,172	25,828	-65,56	25,828	224,531	24,948	-2,628
November	343	397,689	-54,689	120,249	54,689	279,22	27,922	-4,307
December	422	396,595	25,405	-94,844	25,405	304,625	27,693	-3,425

Forecasting Moving Average 2016 untuk 2017 Holo 9055

	Demand(y)	Forecast	Error	Error	Error^2	Pct Error
January	204					
February	202					
March	217					
April	217	207,667	9,333	9,333	87,111	4,30%
May	223	212	11	11	121	4,93%
June	215	219	-4	4	16	1,86%
July	227	218,333	8,667	8,667	75,111	3,82%
August	153	221,667	-68,667	68,667	4715,11	44,88%
September	217	198,333	18,667	18,667	348,445	8,60%
October	231	199	32	32	1024	13,85%
November	220	200,333	19,667	19,667	386,778	8,94%
December	166	222,667	-56,667	56,667	3211,112	34,14%
TOTALS	2492		-30	228,667	9984,666	125,32%
AVERAGE	207,667		-3,333	25,407	1109,407	13,93%
Next period forecast		205,667	(Bias)	(MAD)	(MSE)	(MAPE)
				Std err	37,767	

	Demand(y)	Forecast	Error	Cum error	Cum abs error	Cum Abs	MAD	Track Signal
January	204							
February	202							
March	217							
April	217	207,667	9,333	9,333	9,333	9,333	9,333	1
May	223	212	11	20,333	11	20,333	10,167	2
June	215	219	-4	16,333	4	24,333	8,111	2,014
July	227	218,333	8,667	25	8,667	33	8,25	3,03
August	153	221,667	-68,667	-43,667	68,667	101,667	20,333	-2,148
September	217	198,333	18,667	-25	18,667	120,333	20,056	-1,247
October	231	199	32	7	32	152,333	21,762	0,322
November	220	200,333	19,667	26,667	19,667	172	21,5	1,24
December	166	222,667	-56,667	-30	56,667	228,667	25,407	-1,181

Forecasting Exponential Smoothing 2016 untuk 2017 Holo 9055

	Demand(y)	Forecast	Error	Error	Error^2	Pct Error
January	204					
February	202	204	-2	2	4	0,99%
March	217	203,6	13,4	13,4	179,56	6,18%
April	217	206,28	10,72	10,72	114,918	4,94%
May	223	208,424	14,576	14,576	212,46	6,54%
June	215	211,339	3,661	3,661	13,401	1,70%
July	227	212,071	14,929	14,929	222,864	6,58%
August	153	215,057	-62,057	62,057	3851,083	40,56%
September	217	202,646	14,354	14,354	206,047	6,62%
October	231	205,517	25,483	25,483	649,407	11,03%
November	220	210,613	9,387	9,387	88,111	4,27%
December	166	212,491	-46,491	46,491	2161,375	28,01%
TOTALS	2492		-4,038	217,058	7703,227	117,40%
AVERAGE	207,667		-0,367	19,733	700,293	10,67%
Next period forecast		203,193	(Bias)	(MAD)	(MSE)	(MAPE)
				Std err	29,256	

	Demand(y)	Forecast	Error	Cum error	Cum abs error	Cum Abs	MAD	Track Signal
January	204							
February	202	204	-2	-2	2	2	2	-1
March	217	203,6	13,4	11,4	13,4	15,4	7,7	1,481
April	217	206,28	10,72	22,12	10,72	26,12	8,707	2,541
May	223	208,424	14,576	36,696	14,576	40,696	10,174	3,607
June	215	211,339	3,661	40,357	3,661	44,357	8,871	4,549
July	227	212,071	14,929	55,285	14,929	59,285	9,881	5,595
August	153	215,057	-62,057	-6,772	62,057	121,343	17,335	-0,391
September	217	202,646	14,354	7,583	14,354	135,697	16,962	0,447
October	231	205,517	25,483	33,066	25,483	161,18	17,909	1,846
November	220	210,613	9,387	42,453	9,387	170,567	17,057	2,489
December	166	212,491	-46,491	-4,038	46,491	217,058	19,733	-0,205

Forecasting Moving Average 2016 untuk 2017 Holo 1x1/2 CA

	Demand(y)	Forecast	Error	Error	Error^2	Pct Error
January	389					
February	366					
March	401					
April	409	385,333	23,667	23,667	560,111	5,79%
May	430	392	38	38	1444	8,84%
June	477	413,333	63,667	63,667	4053,447	13,35%
July	503	438,667	64,333	64,333	4138,775	12,79%
August	452	470	-18	18	324,001	3,98%
September	456	477,333	-21,333	21,333	455,112	4,68%
October	490	470,333	19,667	19,667	386,779	4,01%
November	350	466	-116	116	13455,99	33,14%
December	359	432	-73	73	5329	20,33%
TOTALS	5082		-19	437,667	30147,22	106,91%
AVERAGE	423,5		-2,111	48,63	3349,691	11,88%
Next period forecast		399,667	(Bias)	(MAD)	(MSE)	(MAPE)
				Std err	65,626	

	Demand(y)	Forecast	Error	Cum error	Cum abs error	Cum Abs	MAD	Track Signal
January	389							
February	366							
March	401							
April	409	385,333	23,667	23,667	23,667	23,667	23,667	1
May	430	392	38	61,667	38	61,667	30,833	2
June	477	413,333	63,667	125,333	63,667	125,333	41,778	3
July	503	438,667	64,333	189,667	64,333	189,667	47,417	4
August	452	470	-18	171,667	18	207,667	41,533	4,133
September	456	477,333	-21,333	150,333	21,333	229	38,167	3,939
October	490	470,333	19,667	170	19,667	248,667	35,524	4,786
November	350	466	-116	54	116	364,667	45,583	1,185
December	359	432	-73	-19	73	437,667	48,63	-0,391

Forecasting Exponential Smoothing 2016 untuk 2017 Holo 1x1/2 CA

	Demand(y)	Forecast	Error	Error	Error^2	Pct Error
January	389					
February	366	389	-23	23	529	6,28%
March	401	384,4	16,6	16,6	275,56	4,14%
April	409	387,72	21,28	21,28	452,838	5,20%
May	430	391,976	38,024	38,024	1445,824	8,84%
June	477	399,581	77,419	77,419	5993,731	16,23%
July	503	415,065	87,935	87,935	7732,628	17,48%
August	452	432,652	19,348	19,348	374,357	4,28%
September	456	436,521	19,479	19,479	379,417	4,27%
October	490	440,417	49,583	49,583	2458,466	10,12%
November	350	450,334	-100,334	100,334	10066,85	28,67%
December	359	430,267	-71,267	71,267	5078,977	19,85%
TOTALS	5082		135,068	524,269	34787,65	125,37%
AVERAGE	423,5		12,279	47,661	3162,513	11,40%
Next period forecast		416,014	(Bias)	(MAD)	(MSE)	(MAPE)
				Std err	62,171	

	Demand(y)	Forecast	Error	Cum error	Cum abs error	Cum Abs	MAD	Track Signal
January	389							
February	366	389	-23	-23	23	23	23	-1
March	401	384,4	16,6	-6,4	16,6	39,6	19,8	-0,323
April	409	387,72	21,28	14,88	21,28	60,88	20,293	0,733
May	430	391,976	38,024	52,904	38,024	98,904	24,726	2,14
June	477	399,581	77,419	130,323	77,419	176,323	35,265	3,696
July	503	415,065	87,935	218,259	87,935	264,259	44,043	4,956
August	452	432,652	19,348	237,607	19,348	283,607	40,515	5,865
September	456	436,521	19,479	257,086	19,479	303,086	37,886	6,786
October	490	440,417	49,583	306,668	49,583	352,668	39,185	7,826
November	350	450,334	-100,334	206,335	100,334	453,002	45,3	4,555
December	359	430,267	-71,267	135,068	71,267	524,269	47,661	2,834

Forecasting Moving Average 2017 untuk 2018 Holo 1x3 CA

	Demand(y)	Forecast	Error	Error	Error^2	Pct Error
January	413					
February	363					
March	441					
April	348	405,667	-57,667	57,667	3325,443	16,57%
May	382	384	-2	2	4	0,52%
June	204	390,333	-186,333	186,333	34720,11	91,34%
July	399	311,333	87,667	87,667	7685,448	21,97%
August	389	328,333	60,667	60,667	3680,443	15,60%
September	423	330,667	92,333	92,333	8525,44	21,83%
October	446	403,667	42,333	42,333	1792,112	9,49%
November	450	419,333	30,667	30,667	940,444	6,82%
December	309	439,667	-130,667	130,667	17073,78	42,29%
TOTALS	4567		-63	690,333	77747,22	226,42%
AVERAGE	380,583		-7	76,704	8638,58	25,16%
Next period forecast		401,667	(Bias)	(MAD)	(MSE)	(MAPE)
				Std err	105,389	

	Demand(y)	Forecast	Error	Cum error	Cum abs error	Cum Abs	MAD	Track Signal
January	413							
February	363							
March	441							
April	348	405,667	-57,667	-57,667	57,667	57,667	57,667	-1
May	382	384	-2	-59,667	2	59,667	29,833	-2
June	204	390,333	-186,333	-246	186,333	246	82	-3
July	399	311,333	87,667	-158,333	87,667	333,667	83,417	-1,898
August	389	328,333	60,667	-97,667	60,667	394,333	78,867	-1,238
September	423	330,667	92,333	-5,333	92,333	486,667	81,111	-0,066
October	446	403,667	42,333	37	42,333	529	75,571	0,49
November	450	419,333	30,667	67,667	30,667	559,667	69,958	0,967
December	309	439,667	-130,667	-63	130,667	690,333	76,704	-0,821

Forecasting Exponential Smoothing 2017 untuk 2018 Holo 1x3 CA

	Demand(y)	Forecast	Error	Error	Error^2	Pct Error
January	413					
February	363	413	-50	50	2500	13,77%
March	441	403	38	38	1444	8,62%
April	348	410,6	-62,6	62,6	3918,761	17,99%
May	382	398,08	-16,08	16,08	258,567	4,21%
June	204	394,864	-190,864	190,864	36429,07	93,56%
July	399	356,691	42,309	42,309	1790,033	10,60%
August	389	365,153	23,847	23,847	568,68	6,13%
September	423	369,922	53,078	53,078	2817,232	12,55%
October	446	380,538	65,462	65,462	4285,286	14,68%
November	450	393,63	56,37	56,37	3177,542	12,53%
December	309	404,904	-95,904	95,904	9197,622	31,04%
TOTALS	4567		-136,383	694,513	66386,79	225,67%
AVERAGE	380,583		-12,398	63,138	6035,163	20,52%
Next period forecast		385,723	(Bias)	(MAD)	(MSE)	(MAPE)
				Std err	85,885	

	Demand(y)	Forecast	Error	Cum error	Cum abs error	Cum Abs	MAD	Track Signal
January	413							
February	363	413	-50	-50	50	50	50	-1
March	441	403	38	-12	38	88	44	-0,273
April	348	410,6	-62,6	-74,6	62,6	150,6	50,2	-1,486
May	382	398,08	-16,08	-90,68	16,08	166,68	41,67	-2,176
June	204	394,864	-190,864	-281,544	190,864	357,544	71,509	-3,937
July	399	356,691	42,309	-239,235	42,309	399,853	66,642	-3,59
August	389	365,153	23,847	-215,388	23,847	423,7	60,529	-3,558
September	423	369,922	53,078	-162,311	53,078	476,777	59,597	-2,723
October	446	380,538	65,462	-96,849	65,462	542,24	60,249	-1,607
November	450	393,63	56,37	-40,479	56,37	598,609	59,861	-0,676
December	309	404,904	-95,904	-136,383	95,904	694,513	63,138	-2,16

Forecasting Moving Average 2017 untuk 2018 Holo 9055

	Demand(y)	Forecast	Error	Error	Error^2	Pct Error
January	212					
February	132					
March	109					
April	122	151	-29	29	841	23,77%
May	117	121	-4	4	16	3,42%
June	126	116	10	10	100	7,94%
July	91	121,667	-30,667	30,667	940,444	33,70%
August	123	111,333	11,667	11,667	136,111	9,49%
September	122	113,333	8,667	8,667	75,111	7,10%
October	112	112	0	0	0	0%
November	108	119	-11	11	121	10,19%
December	111	114	-3	3	9	2,70%
TOTALS	1485		-47,333	108	2238,667	98,30%
AVERAGE	123,75		-5,259	12	248,741	10,92%
Next period forecast		110,333	(Bias)	(MAD)	(MSE)	(MAPE)
				Std err	17,883	

	Demand(y)	Forecast	Error	Cum error	Cum abs error	Cum Abs	MAD	Track Signal
January	212							
February	132							
March	109							
April	122	151	-29	-29	29	29	29	-1
May	117	121	-4	-33	4	33	16,5	-2
June	126	116	10	-23	10	43	14,333	-1,605
July	91	121,667	-30,667	-53,667	30,667	73,667	18,417	-2,914
August	123	111,333	11,667	-42	11,667	85,333	17,067	-2,461
September	122	113,333	8,667	-33,333	8,667	94	15,667	-2,128
October	112	112	0	-33,333	0	94	13,429	-2,482
November	108	119	-11	-44,333	11	105	13,125	-3,378
December	111	114	-3	-47,333	3	108	12	-3,944

Forecasting Exponential Smoothing 2017 untuk 2018 Holo 9055

	Demand(y)	Forecast	Error	Error	Error^2	Pct Error
January	212					
February	132	212	-80	80	6400	60,61%
March	109	196	-87	87	7569	79,82%
April	122	178,6	-56,6	56,6	3203,561	46,39%
May	117	167,28	-50,28	50,28	2528,078	42,97%
June	126	157,224	-31,224	31,224	974,938	24,78%
July	91	150,979	-59,979	59,979	3597,505	65,91%
August	123	138,983	-15,983	15,983	255,468	13,00%
September	122	135,787	-13,787	13,787	190,073	11,30%
October	112	133,029	-21,029	21,029	442,234	18,78%
November	108	128,824	-20,823	20,823	433,618	19,28%
December	111	124,659	-13,659	13,659	186,563	12,31%
TOTALS	1485		450,365	450,365	25781,04	395,14%
AVERAGE	123,75		-40,942	40,942	2343,73	35,92%
Next period forecast		121,927	(Bias)	(MAD)	(MSE)	(MAPE)
				Std err	53,522	

	Demand(y)	Forecast	Error	Cum error	Cum abs error	Cum Abs	MAD	Track Signal
January	212							
February	132	212	-80	-80	80	80	80	-1
March	109	196	-87	-167	87	167	83,5	-2
April	122	178,6	-56,6	-223,6	56,6	223,6	74,533	-3
May	117	167,28	-50,28	-273,88	50,28	273,88	68,47	-4
June	126	157,224	-31,224	-305,104	31,224	305,104	61,021	-5
July	91	150,979	-59,979	-365,083	59,979	365,083	60,847	-6
August	123	138,983	-15,983	-381,067	15,983	381,067	54,438	-7
September	122	135,787	-13,787	-394,853	13,787	394,853	49,357	-8
October	112	133,029	-21,029	-415,883	21,029	415,883	46,209	-9
November	108	128,824	-20,823	-436,706	20,823	436,706	43,671	-10
December	111	124,659	-13,659	-450,365	13,659	450,365	40,942	-11

Forecasting Moving Average 2017 untuk 2018 Holo 1x1/2 CA

	Demand(y)	Forecast	Error	Error	Error^2	Pct Error
January	287					
February	360					
March	276					
April	277	307,667	-30,667	30,667	940,444	11,07%
May	312	304,333	7,667	7,667	58,778	2,46%
June	453	288,333	164,667	164,667	27115,12	36,35%
July	379	347,333	31,667	31,667	1002,777	8,36%
August	442	381,333	60,667	60,667	3680,443	13,73%
September	491	424,667	66,333	66,333	4400,112	13,51%
October	353	437,333	-84,333	84,333	7112,113	23,89%
November	524	428,667	95,333	95,333	9088,44	18,19%
December	442	456	-14	14	196	3,17%
TOTALS	4596		297,333	555,333	53594,23	130,72%
AVERAGE	383		33,037	61,704	5954,914	14,52%
Next period forecast		439,667	(Bias)	(MAD)	(MSE)	(MAPE)
				Std err	87,5	

	Demand(y)	Forecast	Error	Cum error	Cum abs error	Cum Abs	MAD	Track Signal
January	287							
February	360							
March	276							
April	277	307,667	-30,667	-30,667	30,667	30,667	30,667	-1
May	312	304,333	7,667	-23	7,667	38,333	19,167	-1,2
June	453	288,333	164,667	141,667	164,667	203	67,667	2,094
July	379	347,333	31,667	173,333	31,667	234,667	58,667	2,955
August	442	381,333	60,667	234	60,667	295,333	59,067	3,962
September	491	424,667	66,333	300,333	66,333	361,667	60,278	4,982
October	353	437,333	-84,333	216	84,333	446	63,714	3,39
November	524	428,667	95,333	311,333	95,333	541,333	67,667	4,601
December	442	456	-14	297,333	14	555,333	61,704	4,819

Forecasting Exponential Smoothing 2017 untuk 2018 Holo 1x1/2 CA

	Demand(y)	Forecast	Error	Error	Error^2	Pct Error
January	287					
February	360	287	73	73	5329	20,28%
March	276	301,6	-25,6	25,6	655,36	9,28%
April	277	296,48	-19,48	19,48	379,471	7,03%
May	312	292,584	19,416	19,416	376,981	6,22%
June	453	296,467	156,533	156,533	24502,51	34,56%
July	379	327,774	51,226	51,226	2624,126	13,52%
August	442	338,019	103,981	103,981	10812,05	23,53%
September	491	358,815	132,185	132,185	17472,82	26,92%
October	353	385,252	-32,252	32,252	1040,202	9,14%
November	524	378,802	145,198	145,198	21082,54	27,71%
December	442	407,841	34,159	34,159	1166,812	7,73%
TOTALS	4596		638,366	793,03	85441,86	185,90%
AVERAGE	383		58,033	72,094	7767,442	16,90%
Next period forecast		414,673	(Bias)	(MAD)	(MSE)	(MAPE)
				Std err	97,435	

	Demand(y)	Forecast	Error	Cum error	Cum abs error	Cum Abs	MAD	Track Signal
January	287							
February	360	287	73	73	73	73	73	1
March	276	301,6	-25,6	47,4	25,6	98,6	49,3	0,961
April	277	296,48	-19,48	27,92	19,48	118,08	39,36	0,709
May	312	292,584	19,416	47,336	19,416	137,496	34,374	1,377
June	453	296,467	156,533	203,869	156,533	294,029	58,806	3,467
July	379	327,774	51,226	255,095	51,226	345,255	57,543	4,433
August	442	338,019	103,981	359,076	103,981	449,236	64,177	5,595
September	491	358,815	132,185	491,261	132,185	581,421	72,678	6,759
October	353	385,252	-32,252	459,009	32,252	613,673	68,186	6,732
November	524	378,802	145,198	604,207	145,198	758,871	75,887	7,962
December	442	407,841	34,159	638,366	34,159	793,03	72,094	8,855

Forecasting Moving Average 2018 untuk 2019 Holo 1x3 CA

	Demand(y)	Forecast	Error	Error	Error^2	Pct Error
January	367					
February	345					
March	358					
April	272	356,667	-84,667	84,667	7168,448	31,13%
May	391	325	66	66	4356	16,88%
June	268	340,333	-72,333	72,333	5232,113	26,99%
July	403	310,333	92,667	92,667	8587,109	22,99%
August	418	354	64	64	4096	15,31%
September	408	363	45	45	2025	11,03%
October	476	409,667	66,333	66,333	4400,108	13,94%
November	471	434	37	37	1368,998	7,86%
December	306	451,667	145,667	145,667	21218,78	47,60%
TOTALS	4483		68,333	673,667	58452,55	193,73%
AVERAGE	373,583		7,593	74,852	6494,728	21,53%
Next period forecast		417,667	(Bias)	(MAD)	(MSE)	(MAPE)
				Std err	91,38	

	Demand(y)	Forecast	Error	Cum error	Cum abs error	Cum Abs	MAD	Track Signal
January	367							
February	345							
March	358							
April	272	356,667	-84,667	-84,667	84,667	84,667	84,667	-1
May	391	325	66	-18,667	66	150,667	75,333	-0,248
June	268	340,333	-72,333	-91	72,333	223	74,333	-1,224
July	403	310,333	92,667	1,667	92,667	315,667	78,917	0,021
August	418	354	64	65,667	64	379,667	75,933	0,865
September	408	363	45	110,667	45	424,667	70,778	1,564
October	476	409,667	66,333	177	66,333	491	70,143	2,523
November	471	434	37	214	37	528	66	3,242
December	306	451,667	145,667	68,333	145,667	673,667	74,852	0,913

Forecasting Exponential Smoothing 2018 untuk 2019 Holo 1x3 CA

	Demand(y)	Forecast	Error	Error	Error^2	Pct Error
January	367					
February	345	367	-22	22	484	6,38%
March	358	362,6	-4,6	4,6	21,16	1,29%
April	272	361,68	-89,68	89,68	8042,501	32,97%
May	391	343,744	47,256	47,256	2233,131	12,09%
June	268	353,195	-85,195	85,195	7258,221	31,79%
July	403	336,156	66,844	66,844	4468,099	16,59%
August	418	349,525	68,475	68,475	4688,835	16,38%
September	408	363,22	44,78	44,78	2005,254	10,98%
October	476	372,176	103,824	103,824	10779,43	21,81%
November	471	392,941	78,059	78,059	6093,244	16,57%
December	306	408,553	-102,553	102,553	10517,04	33,51%
TOTALS	4483		105,21	713,266	56590,91	200,35%
AVERAGE	373,583		9,565	64,842	5144,628	18,21%
Next period forecast		388,042	(Bias)	(MAD)	(MSE)	(MAPE)
				Std err	79,296	

	Demand(y)	Forecast	Error	Cum error	Cum abs error	Cum Abs	MAD	Track Signal
January	367							
February	345	367	-22	-22	22	22	22	-1
March	358	362,6	-4,6	-26,6	4,6	26,6	13,3	-2
April	272	361,68	-89,68	-116,28	89,68	116,28	38,76	-3
May	391	343,744	47,256	-69,024	47,256	163,536	40,884	-1,688
June	268	353,195	-85,195	-154,219	85,195	248,731	49,746	-3,1
July	403	336,156	66,844	-87,375	66,844	315,575	52,596	-1,661
August	418	349,525	68,475	-18,9	68,475	384,05	54,864	-0,344
September	408	363,22	44,78	25,88	44,78	428,83	53,604	0,483
October	476	372,176	103,824	129,704	103,824	532,654	59,184	2,192
November	471	392,941	78,059	207,763	78,059	610,713	61,071	3,402
December	306	408,553	102,553	105,21	102,553	713,266	64,842	1,623

Forecasting Moving Average 2018 untuk 2019 Holo 9055

	Demand(y)	Forecast	Error	Error	Error^2	Pct Error
January	95					
February	102					
March	97					
April	101	98	3	3	9	2,97%
May	123	100	23	23	529	18,70%
June	107	107	0	0	0	0%
July	124	110,333	13,667	13,667	186,778	11,02%
August	134	118	16	16	256	11,94%
September	139	121,667	17,333	17,333	300,445	12,47%
October	119	132,333	-13,333	13,333	177,778	11,20%
November	135	130,667	4,333	4,333	18,778	3,21%
December	128	131	-3	3	9	2,34%
TOTALS	1404		61	93,667	1486,778	73,86%
AVERAGE	117		6,778	10,407	165,198	8,21%
Next period forecast		127,333	(Bias)	(MAD)	(MSE)	(MAPE)
				Std err	14,574	

	Demand(y)	Forecast	Error	Cum error	Cum abs error	Cum Abs	MAD	Track Signal
January	95							
February	102							
March	97							
April	101	98	3	3	3	3	3	1
May	123	100	23	26	23	26	13	2
June	107	107	0	26	0	26	8,667	3
July	124	110,333	13,667	39,667	13,667	39,667	9,917	4
August	134	118	16	55,667	16	55,667	11,133	5
September	139	121,667	17,333	73	17,333	73	12,167	6
October	119	132,333	-13,333	59,667	13,333	86,333	12,333	4,838
November	135	130,667	4,333	64	4,333	90,667	11,333	5,647
December	128	131	-3	61	3	93,667	10,407	5,861

Forecasting Exponential Smoothing 2018 untuk 2019 Holo 9055

	Demand(y)	Forecast	Error	Error	Error^2	Pct Error
January	95					
February	102	95	7	7	49	6,86%
March	97	96,4	0,6	0,6	0,36	0,62%
April	101	96,52	4,48	4,48	20,07	4,44%
May	123	97,416	25,584	25,584	654,541	20,80%
June	107	102,533	4,467	4,467	19,956	4,18%
July	124	103,426	20,574	20,574	423,28	16,59%
August	134	107,541	26,459	26,459	700,079	19,75%
September	139	112,833	26,167	26,167	684,723	18,83%
October	119	118,066	0,934	0,934	0,872	0,79%
November	135	118,253	16,747	16,747	280,462	12,41%
December	128	121,602	6,398	6,398	40,929	5,00%
TOTALS	1404		139,41	139,41	2874,272	110,24%
AVERAGE	117		12,674	12,674	261,298	10,02%
Next period forecast		122,882	(Bias)	(MAD)	(MSE)	(MAPE)
				Std err	17,871	

	Demand(y)	Forecast	Error	Cum error	Cum abs error	Cum Abs	MAD	Track Signal
January	95							
February	102	95	7	7	7	7	7	1
March	97	96,4	0,6	7,6	0,6	7,6	3,8	2
April	101	96,52	4,48	12,08	4,48	12,08	4,027	3
May	123	97,416	25,584	37,664	25,584	37,664	9,416	4
June	107	102,533	4,467	42,131	4,467	42,131	8,426	5
July	124	103,426	20,574	62,705	20,574	62,705	10,451	6
August	134	107,541	26,459	89,164	26,459	89,164	12,738	7
September	139	112,833	26,167	115,331	26,167	115,331	14,416	8
October	119	118,066	0,934	116,265	0,934	116,265	12,918	9
November	135	118,253	16,747	133,012	16,747	133,012	13,301	10
December	128	121,602	6,398	139,41	6,398	139,41	12,674	11

Forecasting Moving Average 2018 untuk 2019 Holo 1x1/2 CA

	Demand(y)	Forecast	Error	Error	Error^2	Pct Error
January	344					
February	358					
March	387					
April	318	363	-45	45	2025	14,15%
May	370	354,333	15,667	15,667	245,444	4,23%
June	364	358,333	5,667	5,667	32,111	1,56%
July	376	350,667	25,333	25,333	641,777	6,74%
August	427	370	57	57	3249	13,35%
September	422	389	33	33	1089	7,82%
October	498	408,333	89,667	89,667	8040,109	18,01%
November	421	449	-28	28	784	6,65%
December	393	447	-54	54	2915,997	13,74%
TOTALS	4678		99,333	353,333	19022,44	86,25%
AVERAGE	389,833		11,037	39,259	2113,604	9,58%
Next period forecast		437,333	(Bias)	(MAD)	(MSE)	(MAPE)
				Std err	52,13	

	Demand(y)	Forecast	Error	Cum error	Cum abs error	Cum Abs	MAD	Track Signal
January	344							
February	358							
March	387							
April	318	363	-45	-45	45	45	45	-1
May	370	354,333	15,667	-29,333	15,667	60,667	30,333	-0,967
June	364	358,333	5,667	-23,667	5,667	66,333	22,111	-1,07
July	376	350,667	25,333	1,667	25,333	91,667	22,917	0,073
August	427	370	57	58,667	57	148,667	29,733	1,973
September	422	389	33	91,667	33	181,667	30,278	3,028
October	498	408,333	89,667	181,333	89,667	271,333	38,762	4,678
November	421	449	-28	153,333	28	299,333	37,417	4,098
December	393	447	-54	99,333	54	353,333	39,259	2,53

Forecasting Exponential Smoothing 2018 untuk 2019 Holo 1x1/2 CA

	Demand(y)	Forecast	Error	Error	Error^2	Pct Error
January	344					
February	358	344	14	14	196	3,91%
March	387	346,8	40,2	40,2	1616,041	10,39%
April	318	354,84	-36,84	36,84	1357,185	11,59%
May	370	347,472	22,528	22,528	507,512	6,09%
June	364	351,978	12,022	12,022	144,538	3,30%
July	376	354,382	21,618	21,618	467,335	5,75%
August	427	358,706	68,294	68,294	4664,117	15,99%
September	422	372,365	49,635	49,635	2463,68	11,76%
October	498	382,292	115,708	115,708	13388,43	23,24%
November	421	405,433	15,567	15,567	242,323	3,70%
December	393	408,547	-15,547	15,547	241,698	3,96%
TOTALS	4678		307,187	411,96	25288,86	99,67%
AVERAGE	389,833		27,926	37,451	2298,987	9,06%
Next period forecast		405,437	(Bias)	(MAD)	(MSE)	(MAPE)
				Std err	53,008	

	Demand(y)	Forecast	Error	Cum error	Cum abs error	Cum Abs	MAD	Track Signal
January	344							
February	358	344	14	14	14	14	14	1
March	387	346,8	40,2	54,2	40,2	54,2	27,1	2
April	318	354,84	-36,84	17,36	36,84	91,04	30,347	0,572
May	370	347,472	22,528	39,888	22,528	113,568	28,392	1,405
June	364	351,978	12,022	51,91	12,022	125,59	25,118	2,067
July	376	354,382	21,618	73,528	21,618	147,208	24,535	2,997
August	427	358,706	68,294	141,823	68,294	215,503	30,786	4,607
September	422	372,365	49,635	191,458	49,635	265,138	33,142	5,777
October	498	382,292	115,708	307,167	115,708	380,847	42,316	7,259
November	421	405,433	15,567	322,733	15,567	396,413	39,641	8,141
December	393	408,547	-15,547	307,187	15,547	411,96	37,451	8,202

Forecasting Exponential Smoothing untuk desember 2019 unit Holo 1x3 CA

	Demand(y)	Forecast	Error	Error	Error^2	Pct Error
January	355					
February	349	355	-6	6	36	1,72%
March	394	353,8	40,2	40,2	1616,041	10,20%
April	368	361,84	6,16	6,16	37,946	1,67%
May	438	363,072	74,928	74,928	5614,207	17,11%
June	282	378,058	-96,058	96,058	9227,06	34,06%
July	450	358,846	91,154	91,154	8309,039	20,26%
August	443	377,077	65,923	65,923	4345,863	14,88%
September	407	390,262	16,739	16,739	280,178	4,11%
October	468	393,609	74,391	74,391	5533,992	15,90%
November	440	408,487	31,513	31,513	993,046	7,16%
TOTALS	4394		298,95	503,065	35993,38	127,07%
AVERAGE	399,455		29,895	50,306	3599,337	12,71%
Next period forecast		414,79	(Bias)	(MAD)	(MSE)	(MAPE)
				Std err	67,076	

	Demand(y)	Forecast	Error	Cum error	Cum abs error	Cum Abs	MAD	Track Signal
January	355							
February	349	355	-6	-6	6	6	6	-1
March	394	353,8	40,2	34,2	40,2	46,2	23,1	1,481
April	368	361,84	6,16	40,36	6,16	52,36	17,453	2,312
May	438	363,072	74,928	115,288	74,928	127,288	31,822	3,623
June	282	378,058	-96,058	19,23	96,058	223,346	44,669	0,431
July	450	358,846	91,154	110,384	91,154	314,5	52,417	2,106
August	443	377,077	65,923	176,308	65,923	380,423	54,346	3,244
September	407	390,262	16,739	193,046	16,739	397,161	49,645	3,889
October	468	393,609	74,391	267,437	74,391	471,552	52,395	5,104
November	440	408,487	31,513	298,95	31,513	503,065	50,306	5,943

Forecasting Moving Average untuk desember 2019 unit Holo 9055

	Demand(y)	Forecast	Error	Error	Error^2	Pct Error
January	122					
February	97					
March	143					
April	115	120,667	-5,667	5,667	32,111	4,93%
May	150	118,333	31,667	31,667	1002,778	21,11%
June	97	136	-39	39	1521	40,21%
July	124	120,667	3,333	3,333	11,111	2,69%
August	109	123,667	-14,667	14,667	215,111	13,46%
September	138	110	28	28	784	20,29%
October	140	123,667	16,333	16,333	266,778	11,67%
November	115	129	-14	14	196	12,17%
TOTALS	1350		6	152,667	4028,888	126,52%
AVERAGE	122,727		0,75	19,083	503,611	15,82%
Next period forecast		131	(Bias)	(MAD)	(MSE)	(MAPE)
				Std err	25,913	

	Demand(y)	Forecast	Error	Cum error	Cum abs error	Cum Abs	MAD	Track Signal
January	122							
February	97							
March	143							
April	115	120,667	-5,667	-5,667	5,667	5,667	5,667	-1
May	150	118,333	31,667	26	31,667	37,333	18,667	1,393
June	97	136	-39	-13	39	76,333	25,444	-0,511
July	124	120,667	3,333	-9,667	3,333	79,667	19,917	-0,485
August	109	123,667	-14,667	-24,333	14,667	94,333	18,867	-1,29
September	138	110	28	3,667	28	122,333	20,389	0,18
October	140	123,667	16,333	20	16,333	138,667	19,81	1,01
November	115	129	-14	6	14	152,667	19,083	0,314

Forecasting Exponential untuk desember 2019 unit Holo 1x1 CA

	Demand(y)	Forecast	Error	Error	Error^2	Pct Error
January	367					
February	414	367	47	47	2209	11,35%
March	437	376,4	60,6	60,6	3672,361	13,87%
April	345	388,52	-43,52	43,52	1893,99	12,61%
May	427	379,816	47,184	47,184	2226,332	11,05%
June	485	389,253	95,747	95,747	9167,53	19,74%
July	544	408,402	135,598	135,598	18386,76	24,93%
August	628	435,522	192,478	192,478	37047,86	30,65%
September	421	474,017	-53,017	53,017	2810,847	12,59%
October	613	463,414	149,586	149,586	22375,99	24,40%
November	551	493,331	57,669	57,669	3325,697	10,47%
TOTALS	5232		689,325	882,4	103116,4	171,66%
AVERAGE	475,636		68,932	88,24	10311,63	17,17%
Next period forecast		504,865	(Bias)	(MAD)	(MSE)	(MAPE)
				Std err	113,532	

	Demand(y)	Forecast	Error	Cum error	Cum abs error	Cum Abs	MAD	Track Signal
January	367							
February	414	367	47	47	47	47	47	1
March	437	376,4	60,6	107,6	60,6	107,6	53,8	2
April	345	388,52	-43,52	64,08	43,52	151,12	50,373	1,272
May	427	379,816	47,184	111,264	47,184	198,304	49,576	2,244
June	485	389,253	95,747	207,011	95,747	294,051	58,81	3,52
July	544	408,402	135,598	342,609	135,598	429,649	71,608	4,784
August	628	435,522	192,478	535,087	192,478	622,127	88,875	6,021
September	421	474,017	-53,017	482,07	53,017	675,145	84,393	5,712
October	613	463,414	149,586	631,656	149,586	824,731	91,637	6,893
November	551	493,331	57,669	689,325	57,669	882,4	88,24	7,812

SENTRAL

Surat Keterangan Riset

Yang bertanda tangan di bawah ini :

Nama : Busaman Azali
Jabatan : Manajer Toko Sentral
Alamat : Jln. Jendral sudirman Km1. Kota Bangko, Kabupaten Merangin, Jambi

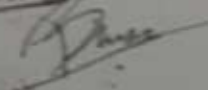
Dengan ini menerangkan bahwa mahasiswa yang berindetitas :

Nama : Hansen Marcelino Azali
NPM : 2203
Jurusan : Manajemen
Universitas : Atma Jaya Yogyakarta

Telah selesai melakukan penelitian di Toko Sentral Bangko, dengan menerima data penjualan mulai tahun 2015 sampai november 2019. Dalam rangka penyelesaian skripsi yang berjudul " Analisis Forecasting Time Series Menggunakan metode Moving Average dan Exponential Smoothing Pada Permintaan Untuk Persediaan (Studi Pada Toko Sentral Bangko)"

Demikian surat keterangan ini dibuat dan diberikan kepada yang bersangkutan untuk dipergunakan sebagaimana mestinya

Bangko, 5 Desember 2019
Pimpinan Toko Sentral Bangko


TOKO KACA & ALUMINUM
(Busaman Azali)