

Designing and Making forecast Application to determine rate of Purchase In "X" construction store with ARIMA Method



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Background



- Out of stock for particular item.

Main Goal



- Make application sales forecasting with ARIMA method.
- Help owner to determine the purchase item quantity.

Problem Statement



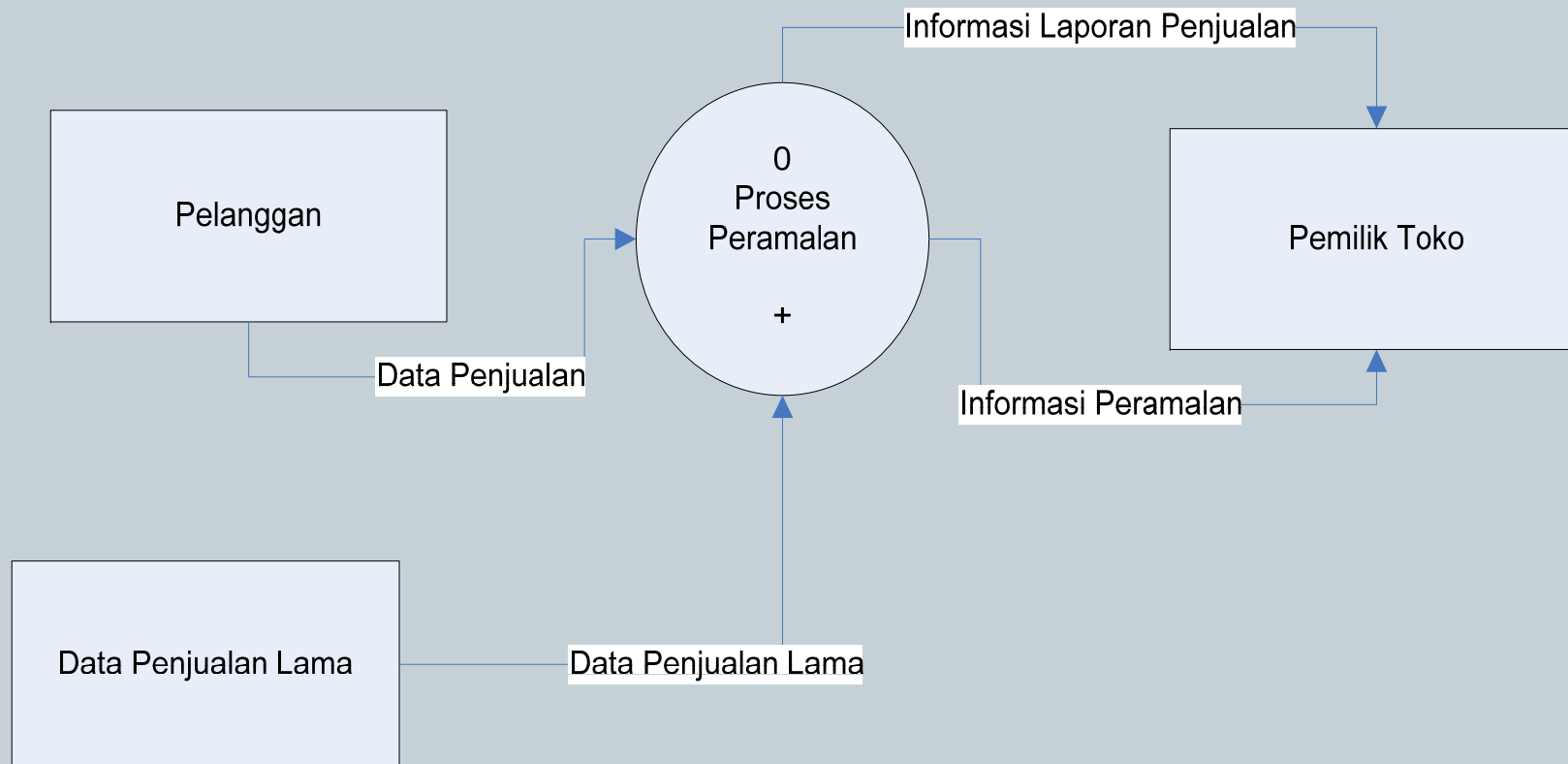
- How to make a system with ARIMA method.
- How to determine purchase items from forecast result

ARIMA

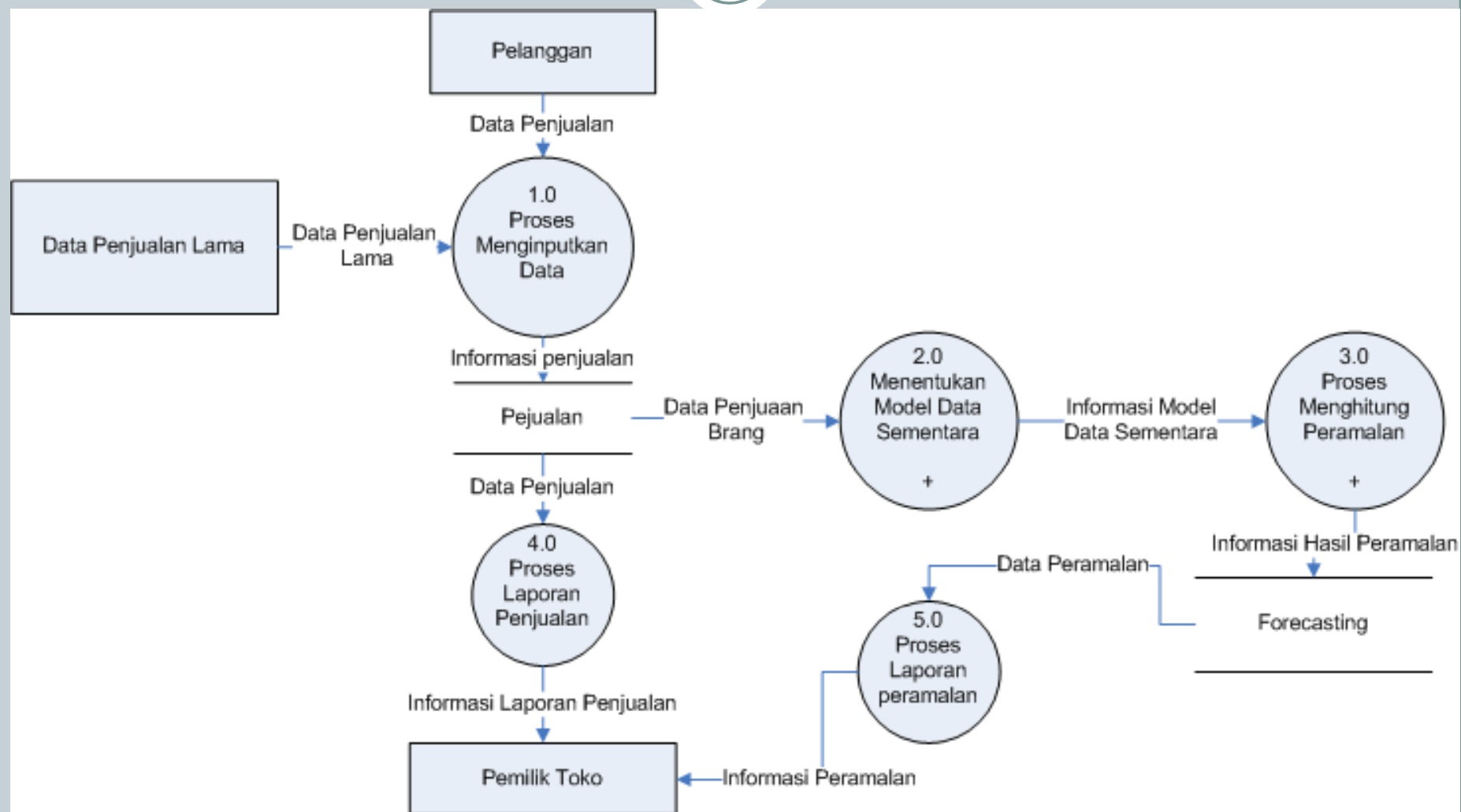


- ARIMA models are, in theory, the most general class of models for forecasting a time series which can be stationarized by differencing.
- Step forecasting with ARIMA
 - Identification temporary model using past data to obtain the ARIMA model.
 - Estimation parameters of ARIMA models using past data.
 - Diagnostic check to examine feasibility of the model.
 - Implementation.

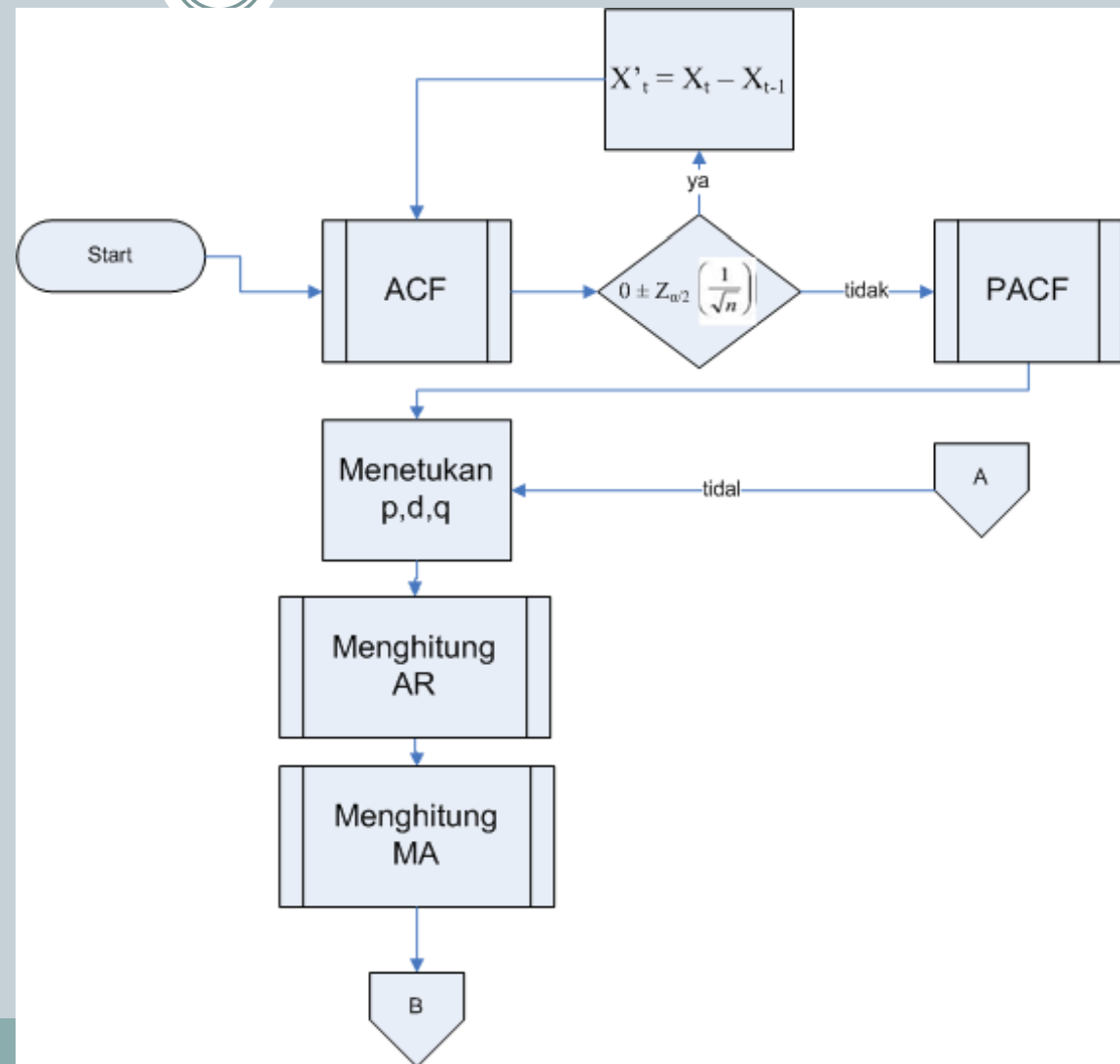
DFD (Context Diagram)



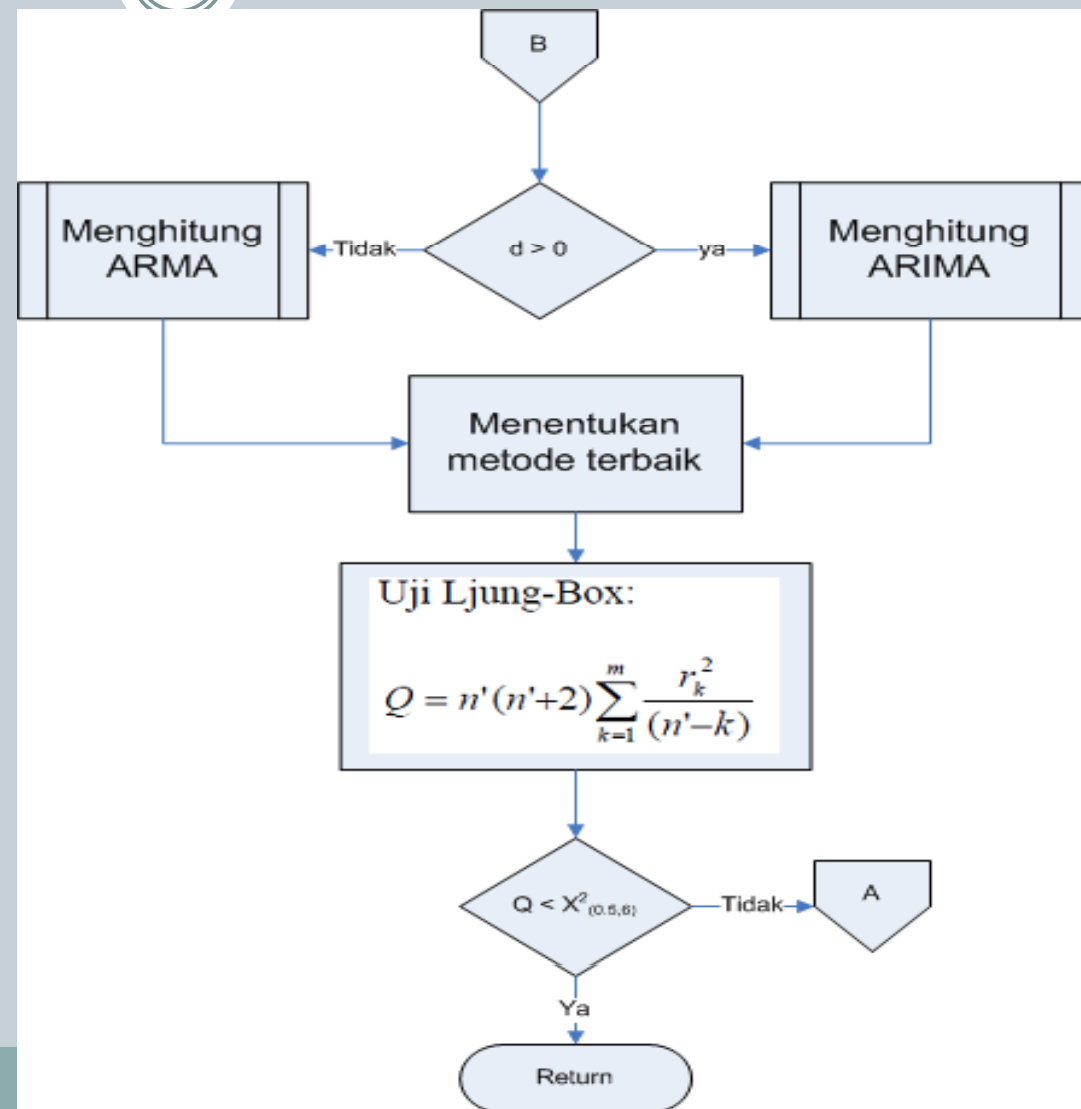
DFD (Level 0)



Flowchart Forecasting



Flowchart Forecasting(cont.)



ACF



Start

$$\hat{r}_k = \frac{\sum_{t=b}^{n-k} (X_t - \bar{X})(X_{t+k} - \bar{X})}{\sum_{t=b}^n (X_t - \bar{X})^2}$$

$$s_{rk} = \frac{\left(1 + 2 \sum_{j=1}^{k-1} \hat{r}_j^2\right)^{1/2}}{(n-b+1)^{1/2}}$$

$$t_{rk} = \frac{\hat{r}_k}{s_{rk}}$$

Return

PACF



Start

$$r_{kk} = \begin{cases} r_1 & \text{if } k=1 \\ \frac{rk - \sum_{j=1}^{k-1} r_{k,j} r_{k,j}}{1 - \sum_{j=1}^{k-1} r_{k-1,j} r_{k,j}} & \text{if } k=2,3,\dots \end{cases}$$

$$s_{rkk} = \frac{1}{(n-b+1)^{1/2}}$$

$$t_{rkk} = \frac{r_{kk}}{s_{rkk}}$$

Return

AR



Start

Menghitung Parameter
Menggunakan Metode
Carmer

$$X_t = \mu + \phi_1 X_{t-1} + \phi_2 X_{t-2} + \dots + \phi_p X_{t-p} + e_t [0]$$

$$MSE = \frac{1}{n} \sum_{i=1}^n e_i^2$$

Return

MA



Start

Menghitung Parameter MA

$$X_t = \mu + e_t - \theta_1 e_{t-1} - \theta_2 e_{t-2} - \dots - \theta_q e_{t-k}$$

$$MSE = \frac{1}{n} \sum_{i=1}^n e_i^2$$

Return

ARMA



Start

$$X_t = \mu + \phi_1 X_{t-1} + e_t - \theta_1 e_{t-1}$$

$$MSE = \frac{1}{n} \sum_{i=1}^n e_i^2$$

Return

ARIMA



Start

Menghitung Parameter AR

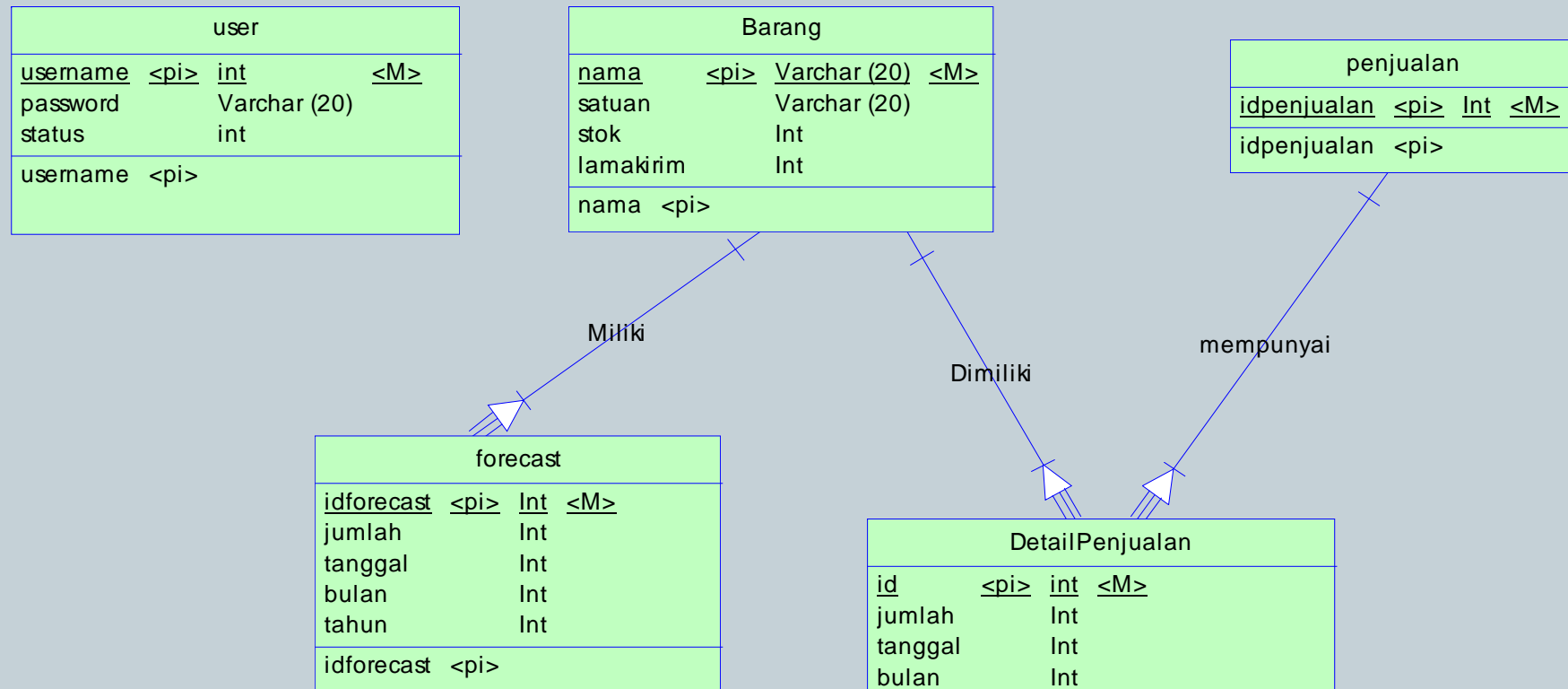
Menghitung Parameter MA

$$(1 - B)(1 - \phi_1 B)X_t = \mu + (1 - \theta_1 B)e_t$$

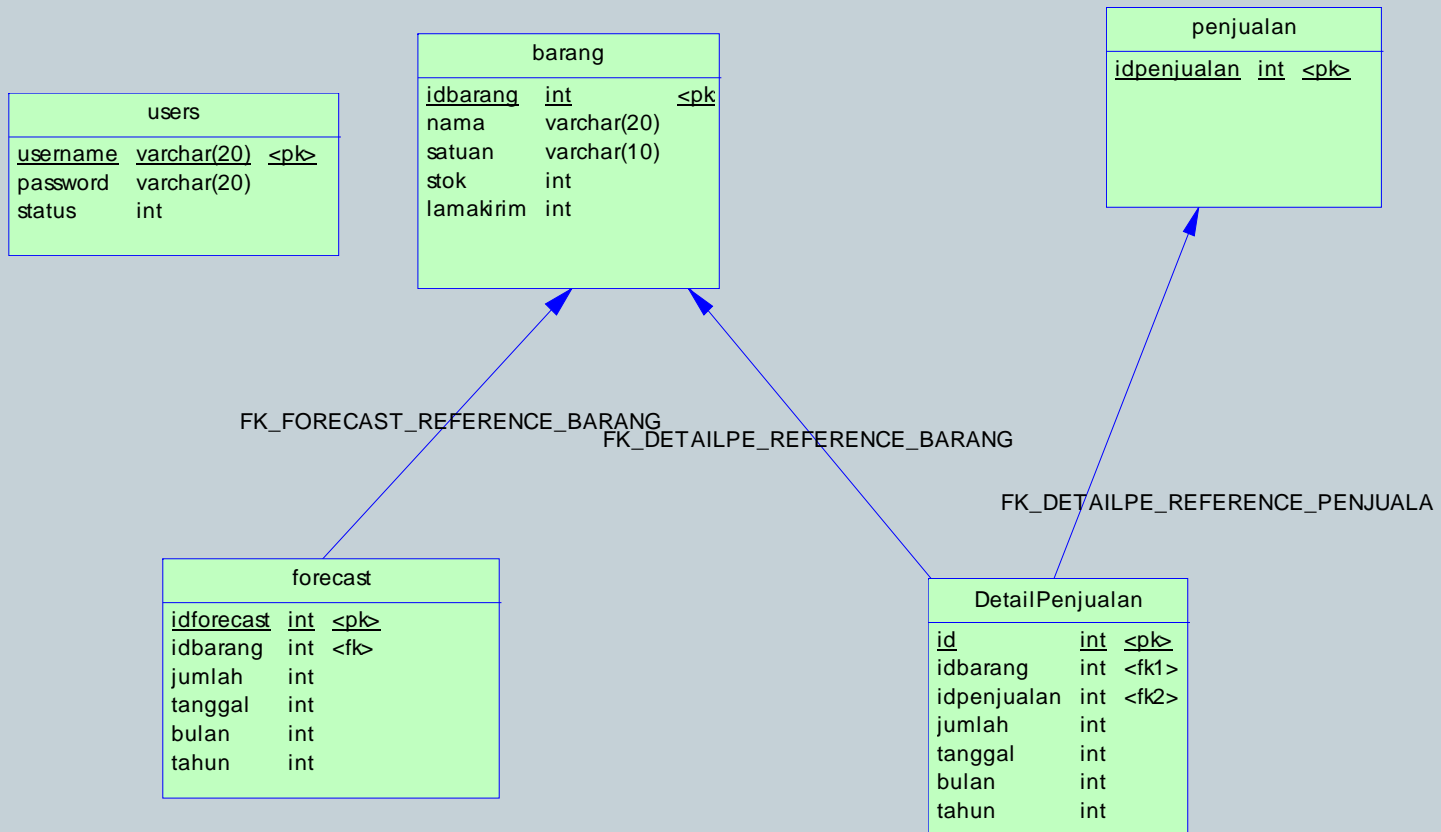
$$MSE = \frac{1}{n} \sum_{i=1}^n e_i^2$$

End

ERD (Conceptual Data Model)



ERD (Physical Data Model)



EXPERIMENTAL RESULT



- Program Validation

Data used to test program validation is:

Periode	Jumlah Penjualan
1	2
2	2
3	3
4	2
5	3
6	5

Determine Model

- ACF

lag	ACF	SACF	TACF
1	0.093	0.408	0.228
2	-0.178	0.411	-0.433
3	0.134	0.424	0.316
4	-0.284	0.431	-0.659
5	-0.026	0.461	-0.057
6	0.000	0.486	0.000

$$\text{Interval} = \pm(1,96 * (1/ (6)^{1/2})) = \pm 0,799$$

Determine Model

- PACF

ordo	PACF	SPACF	TPACF
1	0.093	0.408	0.228
2	-0.189	0.408	-0.463
3	-0.179	0.408	-0.439
4	-0.363	0.408	-0.890
5	-0.150	0.408	-0.368
6	-0.174	0.408	-0.426

$$P = 1, d = 0, q = 1$$

Forecasting

- AR

$$X_t = 1 + \varepsilon_t + 0,833 * X_{t-1}$$

data	<i>Forecast</i>	<i>error</i>
2	1	1
2	3	-1
3	3	0
2	4	-2
3	3	0
5	4	1

$$\text{MSE} = 1,167$$

Forecasting

- MA

$$X_t = 2,423 + \varepsilon_t - 0,961^* \varepsilon_{t-1}$$

data	Forecast	error
2	3	-1
2	2	0
3	3	0
2	3	-1
3	2	1
5	4	1

$$\text{MSE} = 0,667$$

Forecasting



- ARMA

$$X_t = 1 + \varepsilon_t + 0,833^* X_{t-1} - 0,961^* \varepsilon_{t-1}$$

data	Forecast	error
2	1	1
2	4	-2
3	1	2
2	6	-4
3	-1	4
5	8	-3

$$\text{MSE} = 8,33$$

Diagnostic Check



<i>data</i>	<i>error</i>	<i>ACF(error)</i>
2	-1	0.024
2	0	0.069
3	0	0.146
2	-1	-0.082
3	1	0.033
5	1	-0.318

$$Q = 0,658$$

$$\chi^2_{(0.5,4)} = 9.48773$$

$$Q < \chi^2_{(0.5,4)}$$

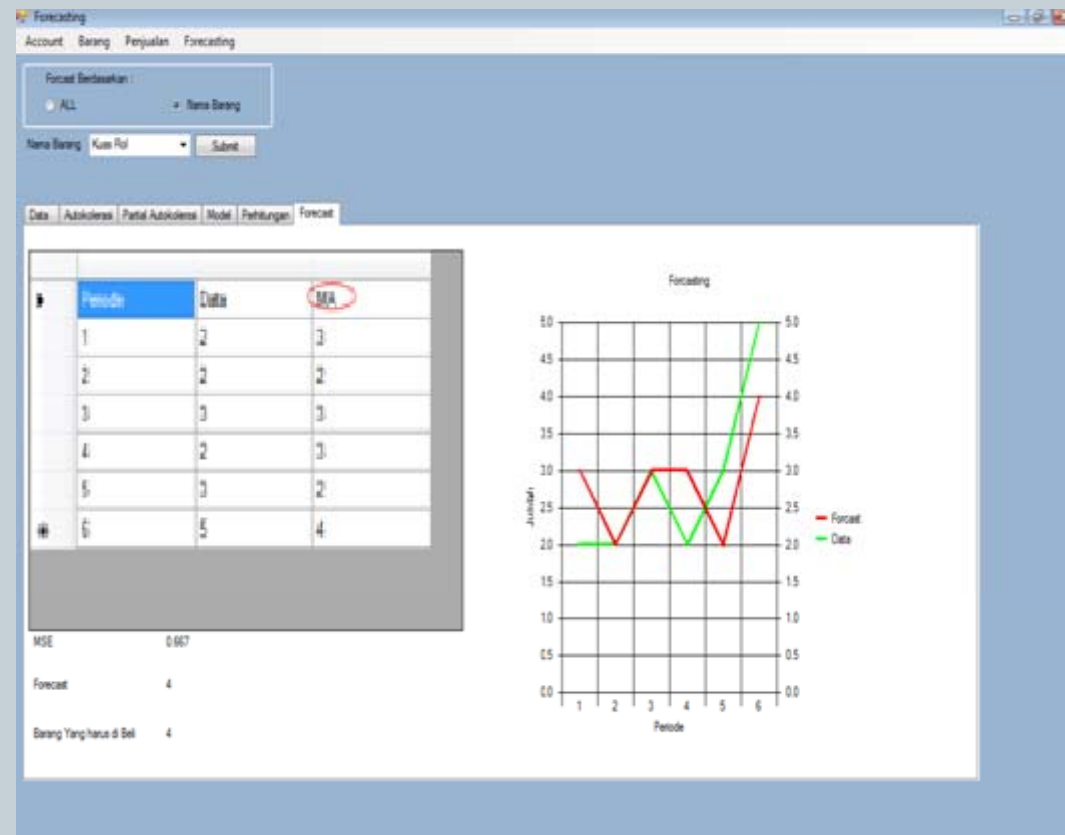
EXPERIMENTAL RESULT

Result with manual calculation

MA

data	Forecast	error
2	3	-1
2	2	0
3	3	0
2	3	-1
3	2	1
5	4	1

Result with Program



EXPERIMENTAL RESULT



- Experimental for kind of Data

This Experimental use 2 type data. First is roller brush and secondary is paint brush.

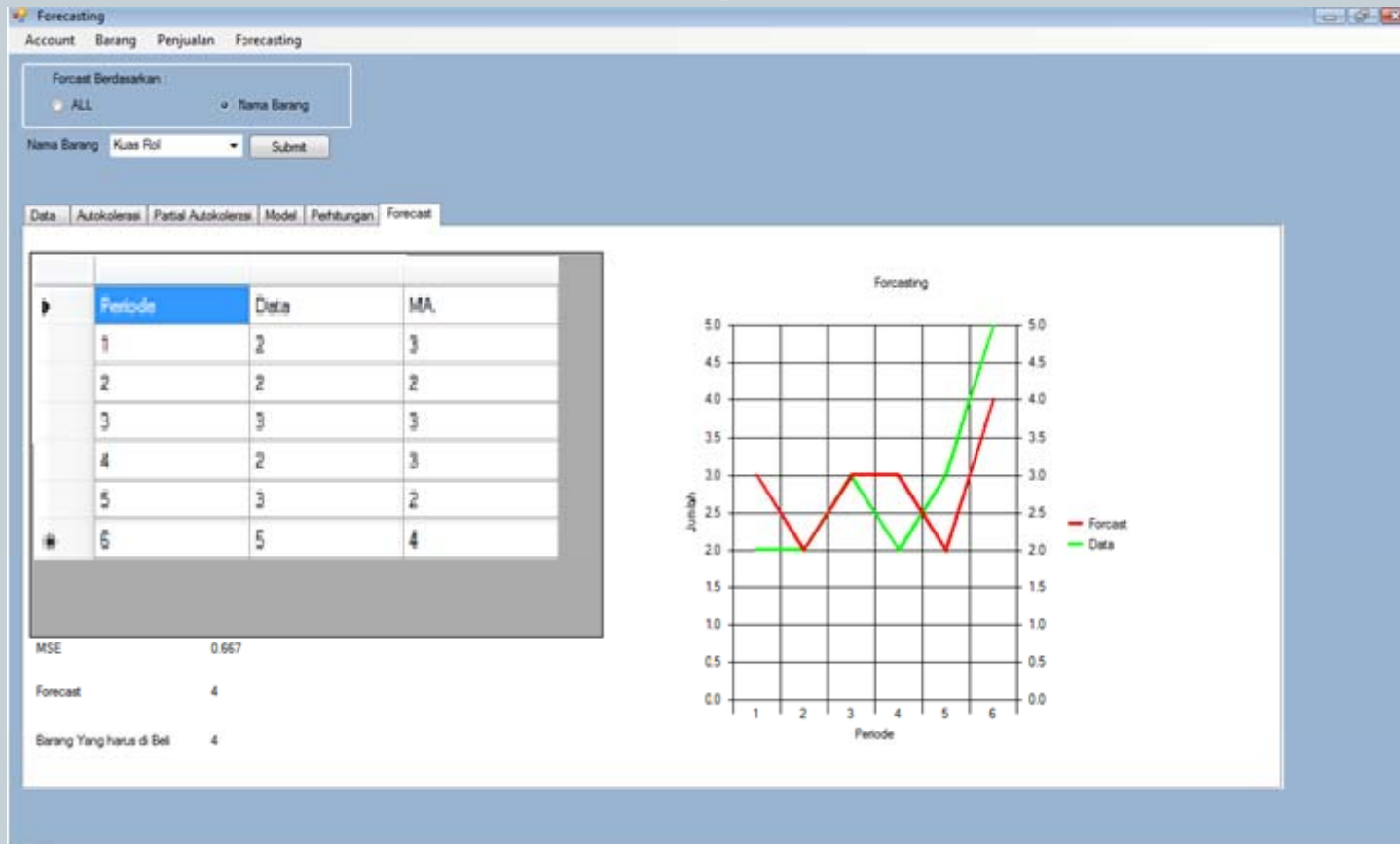
Periode	Jumlah Penjualan
1	2
2	2
3	3
4	2
5	3
6	5

Data of roller brush.

Periode	Jumlah Penjualan
1	5
2	7
3	4
4	9
5	7
6	12

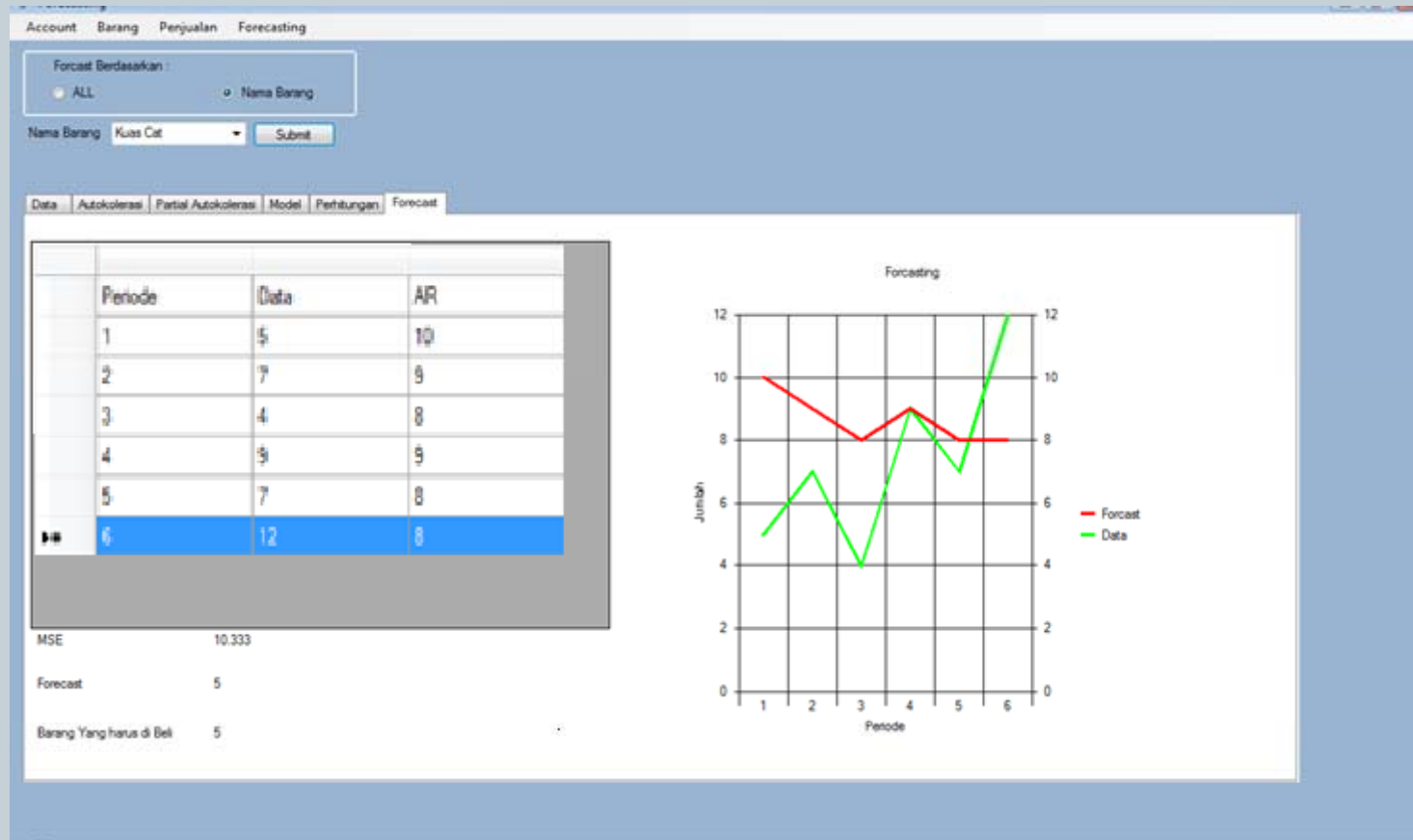
Data of paint brush.

EXPERIMENTAL RESULT



Result from Data of roller brush.

EXPERIMENTAL RESULT



Result from Data of paint brush.

Conclusion



Applications tested on users in design, completeness of features, ease of use of the application, the accuracy of forecasting, and the overall program.

- Aspects of the application design, 50% user answered fairly, 33.3% said both, and 16.7% said less.
- Aspects of the completeness of features, 50% user said good, and 50% said enough.
- Aspect easy to use program, users answered 50% moderate, and 50% say unfavorable.
- Aspect of program correctness, the user answered 73.3% moderate and 16.7% unfavorable.
- Overall assessment of the program, users answered 73.3% moderate, and 16.7% is good.

Sugestion



- Need a development with Hybrid method



**THANKS FOR YOUR
ATTENTION**

EXPERIMENTAL RESULT



- Experimental for Data

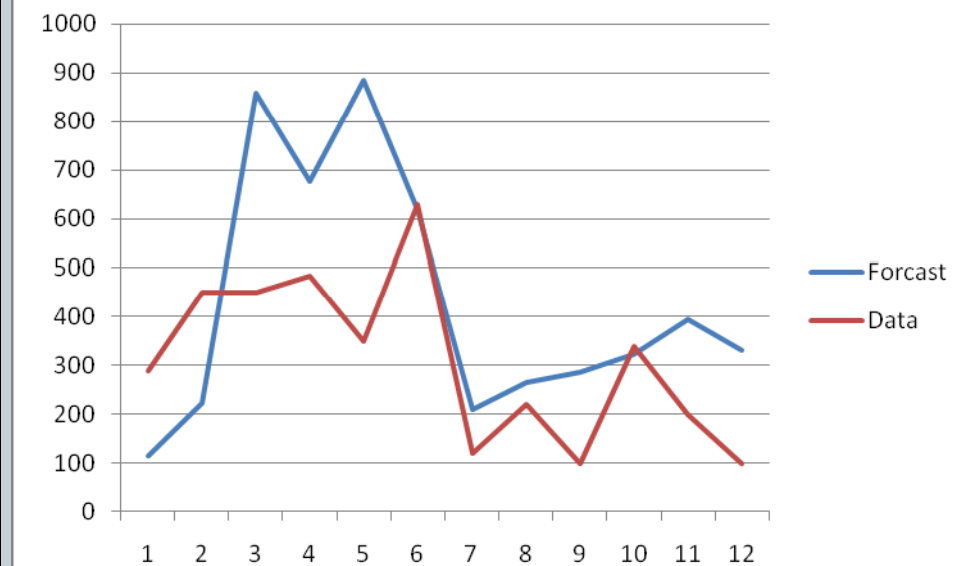
This experimental using data of Metrolite 3lt

Periode	Data Penjualan	Periode	Data Penjualan
1	120	20	140
2	137	21	220
3	188	22	240
4	116	23	253
5	180	24	130
6	120	25	260
7	100	26	97
8	290	27	78
9	450	28	75
10	450	29	126
11	485	30	100
12	350	31	100
13	630	32	120
14	176	33	220
15	150	34	100
16	130	35	340
17	100	36	200
18	320	37	100
19	84		

EXPERIMENTAL RESULT



Periode	Hasil Peramalan	Data Penjualan Sebenarnya
8	116	290
9	224	450
10	857	450
11	677	485
12	884	350
13	618	630
32	210	120
33	266	220
34	288	100
35	325	340
36	395	200
37	332	100



Result forecasting in random period