ISSN 2286-4822
www.euacademic.org

EUROPEAN ACADEMIC RESEARCH
Vol. III, Issue 3/ June 2015

Impact Factor: 3.4546 (UIF)
DRJI Value: 5.9 (B+)

Short Term Sale Modeling using Box and Jenkins Methodology case study of the Algerian industrial firm DENITEX: Realities and Challenges

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Abstract:

This study aims at applying Box – Jenkins analysis for time series to forecast sales in short term, which is considered as one of fundamental indicators necessary for taking important and strategic decisions for the Algerian industrial firm Denitex. This is in addition to its use in guiding the exploitation of the scare sources within the factory after analysing the previous sailings. The proposed model is characterized by many features; the most important one is the realism of its assumptions that make forecasts more reliable and accurate than any other forecasting models.

Key words: forecasting sales, BOX and JENKINS, taking decisions

Introduction

One of the most confusing imbalances in the Algerian sectors seems to be at the textile sector, which appears to suffer from the consequences of economic liberalization and the entry of foreign competition, in addition to the absolute dependence of the global market on importing raw materials.

Under a number of circumstances created by the new economic changes in the Algerian sectors; and due to the invasion of Chinese, Turkish and other acceptable products in terms of quality and affordable prices that fit the purchasing power of consumers, the Algerian company DENITEX faced major problems to establish a balance between the high levels of competition, the required quality and time.

The company is based on previous studies which date back to the seventies, and was namely related to the technical studies for fabrics and production requirements in addition to other studies concerning the internal arrangement of workshops and special studies and other supply.

Thus, this paper aims to prepare for each type of fabrics produced by this institution and that takes into account the internal and external variables that affect the sales forecasting models, in an attempt to rationalize what rationalization and uses this institution and look to the future sales. Therefore, the following problematic will be raised: How may the Algerian Industrial Foundation DENITEX forecast using BOX and JENKINS methods in order to rationalize the use?

1. DENITEX Foundation: General Overview:

The emergence of industrial company dates back to 1974, it was considered as an important industrial unit of the National Foundation SONITEX in Algeria. After the restructuring of the institution in 1982 in accordance with decision N ° 82- 399, dated in December 4, 1982. This industrial complex became part of the COTITEX national economic company and launched in the practice of productive activities in accordance with the theory of production capacity estimated at:

- 2 million tons per year for spinning
- 6 million linear meters per year for weaving.
- 6 million linear meters for finishing.

Its main activity is the basic production and marketing of textile products (100%) in addition to cotton and blended cotton and polyester.

2. DENITEX Basic Industrial Products Unit:

The main activity of this unity in the production of cotton products or blended between cotton and polyester, and this topic is the core products are as follows

	Jeans Products	Gabardine Product	Satin Products	Tarpaulin Products
Cotton	599.64 G / m	113.86G/M	300G	401.90 G/M
Polyester	00	231.18 G/M	168 G/M	00
The cost of labor	11.60 AD	10.90 D/G	11.93 AD	11.06 AD/G
The cost of colored materials and chemicals	61.60 AD	15.33 AD	43.97 AD	68.12 AD/G
Energy	2.50AD	2.03 AD/G	2.23 AD	2.50 AD/G
Product cost	153.80/M	141.62 AD/G	220.80 AD	176.00 AD
Profit margin	66.20 AD	58.38 AD	39.20 AD	24.00 AD

Table 1. Various Consumables Products

3. DENITEX: forecasting Realities:

The commercial department is the first responsible of preparing the prediction of sales at this institution, it is based on the use of the past sales of the previous years as well as on the assumption that the future is an extension of the past. Therefore, this research will try, based on mathematical and statistical methods of the past sales, to apply a prediction of future sales at this institution in order to rationalise the use of raw materials and energy.

4. Modelling Sales:

4.1. The time series of the Tarpaulin sales analysis and forecasting:

Before addressing the process to forecast sales of this product, we should draw the curve graph of monthly time series for this product, based on an accounting information provided by the managers of this institution and described in the table below. These data are taken during the period from 2003 to 2007 and EVIEWS program version 5.1 was used as a means as follows:

Tarpaulin	**January**	**February**	**March**	**April**	**May**	**June**	**July**	**August**	**September**	**October**	**November**	**December**
2003	848	2036	2994	2298	5570	9777	1576	889	840	1554	1146	1247
2004	1118	4020	1435	3840	300	2785	625	2220	1140	1146	846	1990
2005	1680	1986	1095	1471	5040	244	36	82	22	635	720	11772
2006	1216	6922	2131	2106	5152	5540	6397	1849	1650	120	354	3365
2007	6590	2058	618	5640	1589	720	916	1219	0	2220	540	128

Table 2. Tarpaulin Monthly sales data (Unit: meter linear)

Based on this table, the following graph is adopted using Eviews 5.1 to represent monthly sales program:

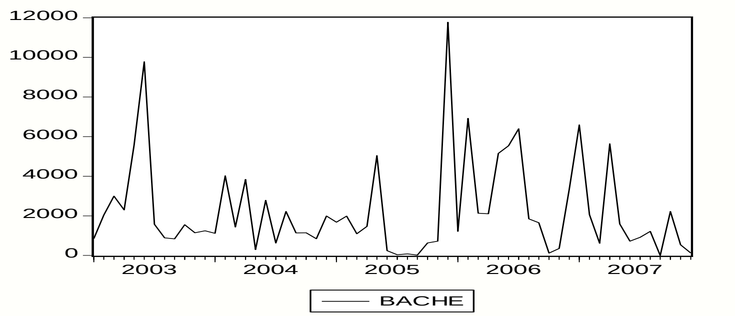

Chart 1. Tarpaulin evolution of the sales 2003 to 2007

Throughout this chart, it is clearly noted that the volatility may be due to the presence of seasonality and random changes so we will analyze the time series to determine the real causes of this volatility. Thud, we draw the autocorrelation and partial correlation statement to identify the type of model adopted:

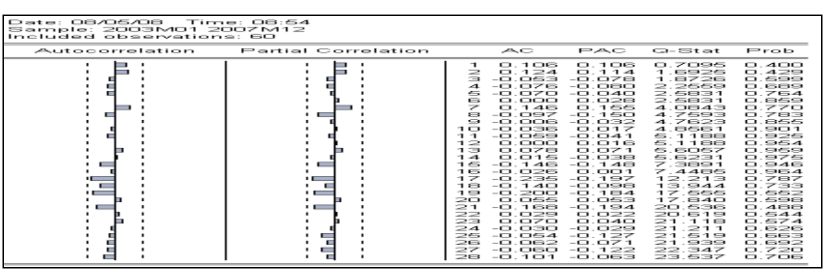

Figure 2: Autocorrelation and partial correlation statement of Tarpaulin

We note that some of the autocorrelation coefficients seem to be outside the limits of critical region and this means that there is a seasonal effect, that needs to be removed before forecasting. Then we need to study the stationary of these time series to be able to apply the method of Box Jenkins that require the presence of a stable time series.

4.1.1. Removing the seasonal component from the time series of Tarpaulin:

Using Eviews 5.1 program we remove seasonal component using moving averages, that will allows us to study the time series independently of the seasonal component .we symbolize the adjusted series as Tarpaulin CVS and the seasonal coefficients as CS.

Ratio to Moving Average
Original Series: BACHE
Adjusted Series: BACHESA

Scaling Factors:	
1	1.460715
2	1.968213
3	0.745794
4	1.992115
5	1.884029
6	1.110869
7	0.872631
8	0.656646
9	0.464438
10	0.481517
11	0.407045
12	2.144543

Table 3: Seasonal coefficients of the Time Series of Tarpaulin Sales

The following graph represents the autocorrelation and partial correlation of Tarpaulin CVS as demonstrated below:

Date: 08/12/08 Time: 14:03
Sample: 2003M01 2007M12
Included observations: 60

Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob
		1	0.135	0.135	1.1527	0.283
		2	0.027	0.008	1.1981	0.549
		3	0.064	0.060	1.4613	0.691
		4	0.005	-0.012	1.4630	0.833
		5	-0.038	-0.040	1.5606	0.906
		6	0.060	0.068	1.8097	0.936
		7	0.144	0.132	3.2696	0.859
		8	-0.141	-0.182	4.6886	0.790
		9	0.014	0.050	4.7021	0.859
		10	-0.187	-0.225	7.3133	0.696
		11	-0.244	-0.178	11.834	0.376
		12	-0.241	-0.206	16.327	0.177
		13	-0.010	0.040	16.335	0.232
		14	0.002	0.016	16.335	0.293
		15	0.024	0.101	16.382	0.357
		16	0.054	0.019	16.626	0.410
		17	-0.131	-0.064	18.114	0.382
		18	-0.099	-0.081	18.991	0.392
		19	-0.125	-0.128	20.416	0.370
		20	0.066	0.008	20.823	0.408
		21	-0.073	-0.167	21.331	0.439
		22	0.049	-0.061	21.563	0.486
		23	0.080	-0.003	22.209	0.508
		24	-0.108	-0.124	23.405	0.496
		25	-0.079	-0.037	24.066	0.516
		26	-0.104	-0.075	25.248	0.505
		27	-0.053	-0.088	25.561	0.543
		28	-0.048	-0.054	25.826	0.583

Table 4. Autocorrelation of the series of Tarpaulin CVS

Stationary study: We conduct Phillips Perron test (1988) and with the help of this program Eviews 5.1 we specify the number of delays to 3, and this test is done through, estimate three models for Dickey -Fuller as follows known as unit root tests:

- **The first model: This model is as follows:**

$$[1]BacheCVS_t = \phi_1 BacheCVS_{t-1} + \varepsilon_t$$

As it is shown in the following table:

Null Hypothesis: BACHESA has a unit root
Exogenous: None
Bandwidth: 3 (Newey-West using Bartlett kernel)

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-3.445984	0.0009
Test critical values:	1% level	-2.604746	
	5% level	-1.946447	
	10% level	-1.613238	

*MacKinnon (1996) one-sided p-values.

Residual variance (no correction)	4231262.
HAC corrected variance (Bartlett kernel)	3650507.

Phillips-Perron Test Equation
Dependent Variable: D(BACHESA)
Method: Least Squares
Date: 08/12/08 Time: 14:43
Sample (adjusted): 2003M02 2007M12
Included observations: 59 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
BACHESA(-1)	-0.366247	0.101502	-3.608256	0.0006

R-squared	0.183311	Mean dependent var	-8.827988
Adjusted R-squared	0.183311	S.D. dependent var	2295.718
S.E. of regression	2074.660	Akaike info criterion	18.12979
Sum squared resid	2.50E+08	Schwarz criterion	18.16500
Log likelihood	-533.8287	Durbin-Watson stat	2.388434

Table 6. Philips-Perron Test Model of the first series CVS

Through the previous table we note that the value of PP cal is equal to -3.44 and comparing them with the tabular value of these statistical PP tab at the degree of freedom of 5%, which is equal to -1.94 note that PPcal >PPtabl and therefore we reject the null hypothesis, that means that the time series of Tarpaulin is stable.

- **The second model: This model is as follows***:*

$$[2]BacheCVS_t = \phi_1 BacheCVS_{t-1} + B + \varepsilon_t$$

Null Hypothesis: BACHESA has a unit root
Exogenous: Constant
Bandwidth: 2 (Newey-West using Bartlett kernel)

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-6.539558	0.0000
Test critical values:	1% level	-3.546099	
	5% level	-2.911730	
	10% level	-2.593551	

*MacKinnon (1996) one-sided p-values.

Residual variance (no correction)	2960546.
HAC corrected variance (Bartlett kernel)	2966702.

Phillips-Perron Test Equation
Dependent Variable: D(BACHESA)
Method: Least Squares
Date: 08/12/08 Time: 14:36
Sample (adjusted): 2003M02 2007M12
Included observations: 59 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
BACHESA(-1)	-0.862142	0.131858	-6.538404	0.0000
C	1735.612	350.8746	4.946246	0.0000

R-squared	0.428576	Mean dependent var	-8.827988
Adjusted R-squared	0.418551	S.D. dependent var	2295.718
S.E. of regression	1750.550	Akaike info criterion	17.80656
Sum squared resid	1.75E+08	Schwarz criterion	17.87698
Log likelihood	-523.2935	F-statistic	42.75072
Durbin-Watson stat	1.991972	Prob(F-statistic)	0.000000

Table (6) Philips-Perron test model for the second model CVS Tarpaulin

From the previous table we note that the value of PPcal is equal to -6.53 and comparing them with the tabular value of these statistical PP tab at the degree of freedom of 5%, which is equal to -2.91. Note that PPcal> PPtabl and therefore, we reject the null hypothesis , that means that the time series of Tarpaulin is stable.

- **The third model: This model is as follows:**

$$[3] BacheCVS_t = \phi_1 BacheCVS_{t-1} + Bt + C + \varepsilon_t$$

Null Hypothesis: BACHESA has a unit root
Exogenous: Constant, Linear Trend
Bandwidth: 1 (Newey-West using Bartlett kernel)

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-6.516286	0.0000
Test critical values:	1% level	-4.121303	
	5% level	-3.487845	
	10% level	-3.172314	

*MacKinnon (1996) one-sided p-values.

Residual variance (no correction)	2938659.
HAC corrected variance (Bartlett kernel)	2905914.

Phillips-Perron Test Equation
Dependent Variable: D(BACHESA)
Method: Least Squares
Date: 08/12/08 Time: 14:40
Sample (adjusted): 2003M02 2007M12
Included observations: 59 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
BACHESA(-1)	-0.864907	0.132607	-6.522346	0.0000
C	2001.868	542.6621	3.688976	0.0005
@TREND(2003M01)	-8.692049	13.45885	-0.645824	0.5210

R-squared	0.432800	Mean dependent var	-8.827988
Adjusted R-squared	0.412543	S.D. dependent var	2295.718
S.E. of regression	1759.570	Akaike info criterion	17.83304
Sum squared resid	1.73E+08	Schwarz criterion	17.93867
Log likelihood	-523.0746	F-statistic	21.36531
Durbin-Watson stat	2.001158	Prob(F-statistic)	0.000000

Table 7. **Philips-Perron test model for the third model CVS Tarpaulin**

From the previous table we note that the value of PPcal is equal to -6.51 and comparing them with the tabular value of these statistical PP tab at a degree of freedom of 5%, which is equal to 3.48- . Note that PPcal >PPtabl and therefore we reject the hypothesis nihilism roots and say that the sales chain for stable of Tarpaulin. We conclude that through previous statistical tests we say that the time series of Tarpaulin product is stable.

4.1.2. Model Identification

In order to identify the type model, we draw the simple and partial autocorrelation of the series CVS of sales as follows:

Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob
		1	0.135	0.135	1.1527	0.283
		2	0.027	0.008	1.1981	0.549
		3	0.064	0.060	1.4613	0.691
		4	0.005	-0.012	1.4630	0.833
		5	-0.038	-0.040	1.5606	0.906
		6	0.060	0.068	1.8097	0.936
		7	0.144	0.132	3.2696	0.859
		8	-0.141	-0.182	4.6886	0.790
		9	0.014	0.050	4.7021	0.859
		10	-0.187	-0.225	7.3133	0.696
		11	-0.244	-0.178	11.834	0.376
		12	-0.241	-0.206	16.327	0.177
		13	-0.010	0.040	16.335	0.232
		14	0.002	0.016	16.335	0.293
		15	0.024	0.101	16.382	0.357
		16	0.054	0.019	16.626	0.410
		17	-0.131	-0.064	18.114	0.382
		18	-0.099	-0.081	18.991	0.392
		19	-0.125	-0.128	20.416	0.370
		20	0.066	0.008	20.823	0.408
		21	-0.073	-0.167	21.331	0.439
		22	0.049	-0.061	21.563	0.486
		23	0.080	-0.003	22.209	0.508
		24	-0.108	-0.124	23.405	0.496
		25	-0.079	-0.037	24.066	0.516
		26	-0.104	-0.075	25.248	0.505
		27	-0.053	-0.088	25.561	0.543
		28	-0.048	-0.054	25.826	0.583

Table 8. Autocorrelation series CVS

We note that all autocorrelation located within the confidence intervals in addition to that the values of the coefficients is close to 0 so We're going to estimate the model using EVIEWS program, which minimize the Akaike and Schwarz standard. The form is as follows:

$$ARMA(2,1) = \phi_1 y_{t-1} + \phi_2 y_{t-2} + \varepsilon_t - \alpha_1 \varepsilon_{t-1}$$

Dependent Variable: BACHESA
Method: Least Squares
Date: 08/12/08 Time: 18:53
Sample (adjusted): 2003M03 2007M12
Included observations: 58 after adjustments
Convergence achieved after 35 iterations
Backcast: 2003M02

Variable	Coefficient	Std. Error	t-Statistic	Prob.
AR(1)	1.115650	0.138341	8.064472	0.0000
AR(2)	-0.124171	0.137253	-2.904687	0.3696
MA(1)	-0.965845	0.033438	-28.88491	0.0000

Table (7): Estimation of ARMA model (2.1)

According to the previous table the appropriate model for this product, which is:

$$YBACHECVS = 1.11 yB\hat{a}che_{t-1} - 0.124 yB\hat{a}che_{t-2} + \varepsilon_t + 0.965\varepsilon_{t-1}$$

Where: Tarpaulin CVS: adjusted series from seasonal component.

4.1.3-model diagnostic:

Through the same previous table we test:

- *First coeficiences test :*

For the model AR (1) (t student = 8.06> 1.96) and therefore it differs from 0, and also this is the case for the model AR (2) (t student = 2.90> 1.96). Besides, for the Form MA (1) (t student = 28.88> 1.96). the standard Akaike and Schwarz Akunan is in their minimum values.

- *Residual test*:

Throughout this test, we will know whether residuals are a white noise, this is through the chart of the partial correlation function of the residuals ARMA model (2.1). Then we test the detection of knowing whether these residuals follow a normal distribution and that by drawing the histogram of the residuals and use of Jaque-Bera test:

Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob
		1	0.011	0.011	0.0079	
		2	-0.057	-0.057	0.2072	
		3	-0.031	-0.030	0.2670	
		4	-0.038	-0.041	0.3608	0.548
		5	-0.039	-0.042	0.4612	0.794
		6	0.106	0.102	1.2190	0.748
		7	0.119	0.112	2.1888	0.701
		8	-0.089	-0.085	2.7414	0.740
		9	-0.054	-0.039	2.9495	0.815
		10	-0.066	-0.064	3.2640	0.860
		11	-0.015	-0.007	3.2804	0.916
		12	-0.056	-0.074	3.5176	0.940
		13	-0.005	-0.044	3.5194	0.966
		14	-0.037	-0.050	3.6306	0.980
		15	0.010	0.030	3.6384	0.989
		16	-0.048	-0.045	3.8278	0.993
		17	-0.076	-0.077	4.3126	0.993
		18	-0.054	-0.064	4.5620	0.995
		19	-0.040	-0.043	4.7013	0.997
		20	-0.064	-0.085	5.0775	0.998
		21	-0.066	-0.099	5.4887	0.998
		22	-0.009	-0.053	5.4964	0.999
		23	-0.039	-0.049	5.6464	0.999
		24	-0.007	-0.021	5.6514	1.000

Table (8) Autocorrelation Of Residuals Statement

Note that all borders are located in the critical region, which shows a lack of autocorrelation of the residuals, in addition to this, all the possibilities for statistical Ljung -Box (Q, stat) is greater than 5%, which leads us to accept the hypothesis that the residuals follow the process white noise.the following histogram of the residuals and use Jaque-Bera test explains this result:

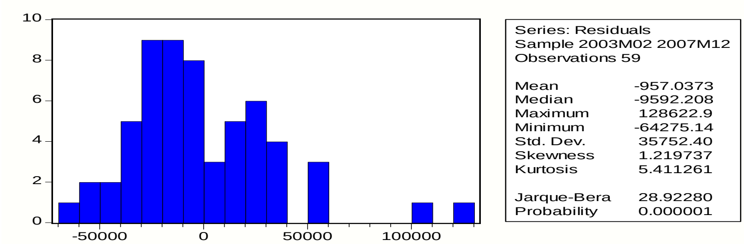

Figure 7: Histogram of the residuals

It is noticed through the histogram of the residuals that it is symmetrical for the zero to some extent, when statistically test Jaque- Bera, we notice that JB = 28.92>. But in spite of that, we say that the model remains statistically acceptable.

4.1.4.Tarpaulin Future Prediction Sales (2008)

$$YBACHECVS = 1.11 yB\hat{a}che_{t-1} - 0.124 yB\hat{a}che_{t-2} + \varepsilon_t + 0.965\varepsilon_{t-1}$$

Where: Tarpaulin CVS: adjusted series from seasonal component .

Months	Tarpaulin	CV	Predictions
January	1493.87	1.64	2449.94
February	3849.39	1.96	7544.81
March	615.50	0.74	455.47
April	6580.52	1.99	13095.24

Table (9) Tarpaulin Prediction of sales (2008)

Unit: linear meter

4.2 The time series of the satin sales analysis and forecasting:

These data are taken during the period from 2003 to 2007 :

satin	January	February	March	April	May	June	Jully	August	September	October	November	December
2003	52036	75819	106265	123787	71482	89103	96017	55695	135617	98272	72308	112366
2004	56092	56681	67325	39334	49716	43759	7049	16736	17603	172606	121066	48272
2005	68059	62176	90604	68448	30378	60000	13998	7346	82581	78384	50031	75604
2006	53618	37039	65285	43537	20592	34660	69053	18269	20154	34724	22541	23896
2007	99993	33208	30420	71314	82821	29660	22014	7305	40009	66824	64567	77183

Table 10: **Monthly sales data for the Satin**

Based on these data, the following curve using EVIEWS program will explain better:

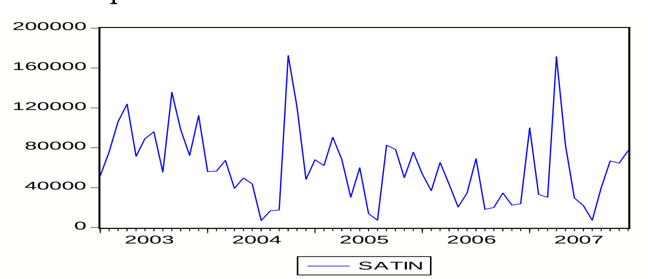

Diagram 4. Curve for Satin production from 2003 to 2007

Throughout this chart, it is clearly noted that the volatility may be due to the presence of seasonality and random changes so we will analyze the time series to determine the real causes of this volatility. Thud, we draw the autocorrelation and partial correlation statement to identify the type of model adopted: we will start first removing seasonal component using the method of moving averages, then we study if the serie is stationary using Phillips Perron Test (1988) and this test is done by estimating the three models for Dickey -Fuller to identify the model and estimate the model ARIMA (1,1,2).

$$D(satin\ \ CVS)_t = -0.277 satin_{t-1} + 0.137\varepsilon_{t-1} + 0.655\varepsilon_{t-2}$$

Following the same methodology we tested the previous model quality through two phases:

First coefficient test

Second residals test

This is done to predict future sales for the year 2008 of Satin product.

$$D(satin\ \ CVS)_t = -0.277 satin_{t-1} + 0.137\varepsilon_{t-1} + 0.655\varepsilon_{t-2}$$

Months	**CV**	**Satin CVS**	**Predictions**
January	77849.27	1.28	68059.55
February	39128.17	0.84	33208.30
March	26090.89	1.16	90604.42
April	108167.80	1.58	98448.89

Table 11. **Expected Sales of the Satin for the year 2008 Unit: linear meter**

4.5. Analysis of Time Series of Sales and Predict OF the Gabardine:

The following table presents the sales achieved during the period from 2003 to 2007 of Gabardine products. These data are gathered from the financial management of the institution.

satin	January	February	March	April	May	June	Jully	August	September	October	November	December
2003	111462	90781	189135	141515	190396	203953	153494	65748	107149	86738	78135	165177
2004	164516	158665	221869	169791	151346	110206	121013	39738	99989	134969	85121	100744
2005	120980	124052	120316	158842	111660	128545	116553	58813	61967	76986	121394	136702
2006	90297	133416	104487	106133	114237	91927	151103	75378	65840	59985	48752	127941
2007	90329	122417	95019	86920	40556	34619	86230	40050	39733	76630	43791	74992

Table (12) achieved sales data of Gabardine

Based on these information, the following diagram better explains the findings:

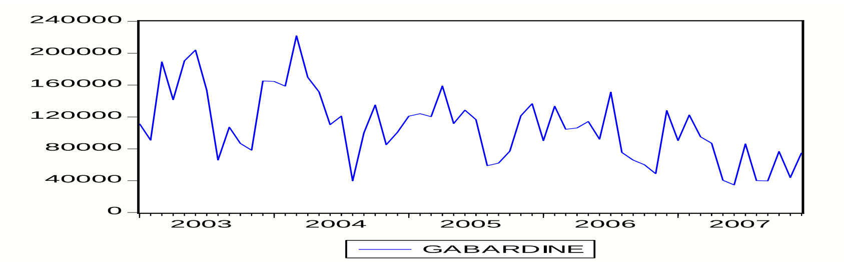

Figure 9: Sales curve for Gabardine production from 2003 to 2007

Based on the previous curve, we note and large seasonal presence, which requires us to remove seasonal variations from gabardine series, then we study if the serie is stationary using Phillips Perron Test (1988) and this test is done by estimating the three models for Dickey -Fuller to identify the model and estimate the models of ARIMA (1,1,2), AR (1), MA (1), MA (2) using EVIEWS 5.1 program and choose the model that the minimization standard Akaike and Schwarz will be adopted. This is done as follows:

- Estimate model ARIMA (1,1,2) through the following equation

$$D(gabardineCVS)_t = \phi_1 D(Gabardine)_{t-1} - \alpha_1 \varepsilon_{t-1} - \alpha_2 \varepsilon_{t-2}$$

$$D(gabardine\ CVS)_t = -0.56 D(Gabardine\ )_{t-1} + 0.053\varepsilon_{t-1} + 0.68\varepsilon_{t-2}$$

Following the same methodology, we test the previous model quality through two phases:

First coefficient test

Second residals test

Then forecasting Gabardine product sales for the year 2008:
Through the previous model the results obtained are displayed as follows:

$$D(gabardine\ CVS)_t = -0.56YGabardine_{t-1} + 0.053\varepsilon_{t-1} + 0.68\varepsilon_{t-2}$$

Months	CV	Satin CVS	Predictions
January	80075.78	1.128	96325.47
February	90165.58	1.357	122354.69
March	71791.64	1.323	94980.39
April	66997.08	1.297	86895.21

Table 11. Expected Sales of the Gabardine for the year 2008 Unit: linear meter

4.6. Analysis of Time Series of Sales and Predict OF the Jeans production:

The following table presents the sales achieved during the period from 2003 to 2007 of jeans products. These data are gathered from the financial management of the institution.

satin	January	February	March	April	May	June	Jully	August	September	October	November	December
2003	93166	64647	100237	82863	98227	82220	110299	42537	85444	94941	124337	63999
2004	60539	68876	84422	52667	42660	43074	83035	39626	54300	55517	35928	54596
2005	188371	82691	68284	86204	108711	79173	40357	64341	80494	94064	278808	21247
2006	32254	79490	94207	53163	68118	64130	40619	16954	10245	89477	11548	121729
2007	88250	18400	96650	62810	63411	51297	34380	17184	28305	72189	40789	23991

Table (12) achieved sales data of Jeans

Based on these information, the following diagram better explains the findings:

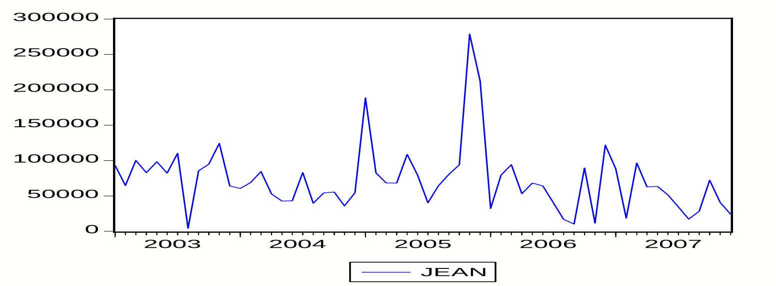

Figure 10: sales curve for product development Jean from 2003 to 2007

Based on the previous curve, we note and large seasonal presence, which requires us to remove seasonal variations from gabardine series, then we study if the serie is stationary using Phillips Perron Test (1988) and this test is done by estimating the three models for Dickey -Fuller to identify the model and estimate .

$$Yjean = 0.992 yjean_{t-1} + \varepsilon_t + 0.969\varepsilon_{t-1}$$

Following the same methodology, we test the previous model quality through two phases:

First coefficient test

Second residals test

Then we may forecast the future of Jeans product sales for the year 2008. We are forecasting sales for jeans as shown in the following table:

Months	JEAN prediction sales for the year 2008
January	96325.47
February	122354.69
March	94980.39
April	86895.21

Table 14. Expected Sales of the Gabardine for the year 2008
Unit: linear meter

Results and Recommendations:

Throughout the above study, we have tried to develop statistical models for modeling achieved sales of each product which are deemed acceptable statistically. This does not prevent the existence of errors in the estimates or expectations which require audits and improvements because these models remain a support helping managers through decision-making. Therefore, one can suggest some recommendations and suggestions on this institution as follows:

- The institution needs to establish a system to predict the level of sales to avoid dangers caused by high competition in the Algerian market and unexpected changes.

- Relying on statistical and mathematical methods to help them make the best decision at the right time in order to maintain good relations with customers and gain their loyalty.
- The need for the introduction of analytical accounting in the organizational structure of the institution to be able to analyze the costs which lead to reduce the loss of scarce resources and thus maintaining production costs at a lower level.
- Organising the sale prices of products and access to gain consumers' satisfaction
- Employ experts and competent decision makers in the standard analysis and operations research to carry out the prediction based on statistical models.
- The use of modern software used in the sales modeling and forecasting.

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