Predicting the Market Potential Using Time Series Analysis

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Abstract: The aim of this analysis is to forecast a mini-market sales volume for the period of twelve months starting August 2015 to August 2016. The study is based on the monthly sales in Iraqi Dinar for a private local mini-market for the month of April 2014 to July 2015. As revealed on the graph and of course if the stagnant economic condition continues, the trend of future sales is down-warding. Based on time series analysis, the business may continue to operate and generate small revenues until August 2016. However, due to low sales volume, low profit margin and operating expenses, the revenues may not be adequate enough to produce positive net income and the business may not be able to operate afterward. The principal question rose from this is the forecasting sales in the region will be difficult where the business cycle so dynamic and revolutionary due to systematic risks and unforeseeable future.

Keywords: Time Series, Mini Store, Forecasting, Business, Prediction

1. Introduction

Before the year of 2014, Kurdistan region, especially the capital Erbil was the most flourishing city in the Middle East economically. Investment reached tenth of billions of dollars. Construction, five star hotels and skyscrapers began loomed around the city. The economic struggle started when the Iraqi government cut KRG budget share in January 2014. Civil servants weren't getting paid on time, projects ostensibly slowed down. The same year in the month of August, ISIS (Islamic State of Iraq and Syria) attacked KRG. Then, the low oil price hit the region and the economy crippled. Even top Iraqi economist stated that it's too difficult to predict what the economy does next. The systematic risk is always at the corner and it's revolutionary. As of now, the economy of KRG is still crawling. Those risks were affecting all segment of business and they are unavoidable and undiversifiable. According to investment union of Kurdistan, more than 700 companies are already bankrupt, more than 90% of companies halted their projects and unemployment rate is above 25%. For example, computer retail business has lost more than 70%, while grocery stores have lost 50% of the sales. Presumably 2016 doesn't look bright enough from business and economic point of view.

2. Literature Review

According to Armstrong (1983), many organizations and entities have used planning and forecasting as a

starting point. Forecasting is an esthetic expectation regarding future actions and trends. It's a complicated activity due to the factors like cultural changes, innovation, new products, tougher participants and unstable economic condition and changes in government policies (David, 2011). McCullough and Waldon (1998) stated that sales forecast is a proposed marketing plan in the future for a specific period and unit sales volume is estimated.

Time series modeling technique can be utilized to model a series of sales data in which seasonality may cause drastic swing in sales. The examination of genuine sales data depict that the seasonality in the data can be estimated by a deterministic function and the stochastic component is a sixth-order autoregressive moving average model. Use of the both deterministic and stochastic models to develop the minimum mean squared forecast cultivate dependable results.

Doyle and Saunders (1985) specified that product quality, pricing, advertising, distribution and service practices could affect the sales of internal marketing or business methods. Franses (1991) indicated that once the sales forecast is prepared, all significant operational planning process across the enterprise becomes an important factor. Based on forecasted unit sales, the financial planning, working capital, and other essential operational needs can be tailored to that projection. Successful enterprises seem to execute well-versed decisions with excellent short term and long term projection. On the other hand, unsuccessful enterprises seem involve in activities that are limited in projections (Bass & Pilon, 1980). It is useful to measure the efficiency of sales management. Those who occupy the top hierarchal positions in the field of sales management believe that reliable sales forecast is essential in firm's strategy (Jacobson & Nicosia 1981).

3. Research Problem and Objectives

One of the obvious indicators affecting sales is current environment including current political climate, economic conditions and competition. The economic and political prospective are negatively impacting sales. Future government policy may also affect the sales. Hopefully the government will be able to contain the inflation and purchasing power remains consistence. In recent months Iraqi central bank has been pouring US dollar to the market in fear of dinar deflation. If Iraqi dinar loses its power against dollar, the inflation may hit the region because above 90% of goods are imported and paid in foreign currency. In this analysis we use financial units rather than physical units due to the impact of monetary value. One of the biggest issues with forecasting is the accuracy of future sales (Chowdhury, 1994). If forecast is accurate, less capital needed for inventory and operating cost may tailor the outcome. Management will be able to revise plan to reach anticipated outcomes. Once the management discovered the future sales volume, he/she can reduce purchasing goods and lower the cost of operation.

The principal question rose from this is the forecasting sales in the region will be difficult where the business cycle is so dynamic and revolutionary due to systematic risks and unforeseeable future. On the basis of the problem cited, it got necessary to set some objectives to complete the research process and following objectives set to overcome the problem. So objectives are:

- To analyze the past performance of the small store business.
- To predict or forecast the future sales.

- To know the relationship in between past performance and future performance of the small store business.

4. Research Methodology

The study conducted is a conclusive descriptive statistical study; the research comes to the decision which is rational. For the successful research, we adopted the extensive review to draw the base for concept. The design of our research is statistical as it concerns the items are to be observed and how the information and data gathered are to be analyzed. Data is taken for this study is secondary data and its available with the store manager. For the study purpose, we have taken the monthly sales in Iraqi Dinar for a private local mini-market for the month of April 2014 to July 2015. In this study the secondary data is collected from the following sources: discussion with different person, books on marketing and research methodology, authorized retailer, magazine, internet, pamphlets, etc.

5. Data Analysis

The table below shows the monthly sales figures in Iraqi Dinar for a private local mini-market for the month of April 2014 to July 2015. We specifically are measuring sales to project future sales. The first column represents incremental numbers, also called subscript ($_t$), the second column is the actual months in a year, and third column is the number that represents a month, for instance number four represents April or eleven represents November. The forth columns are the monthly sales. In the fifth column we are using moving average to smooth out the data. Even though the sales are not seasonal, yet we have used 4 periods. The sixth column called CMA (Centered Moving Average) or based line, to get rid of irregularity and seasonality and smooth out time series data, we have centered the moving average column by averaging out only two periods. The seventh column is called (S_t, I_t) which used classical multiplicative time-series model ($Y_t = S_t \times I_t \times T_t$) to divide each actual monthly sales by CMA. For example for the month of June 2014, the (St, It) is 1.01, which means 1% above the baseline or February 2015 is 0.86 which means 14% below the baseline. The eighth column (S_t) we are getting rid of the irregularity in the previous column by using Average IF function so that each month has its number compared to baseline. For example, for April, we have 1.03, which translates to 3% above the baseline. The ninth column is having de-seasonal data by dividing the sales to (S_t) column. The tenth column called Trend component (T_t), we need to figure the Trend component which we didn't factor in when we calculated classical multiplicative model in seventh column. To calculate the Trend component, we need to get ***coefficient*** for ***Y intercept*** and ***Slope*** by running a *Simple Linear Regression* using de-seasonal column (ninth column) as Y variable and t column (first column)) variable as X. As it is visible from the summary out put that the ***P-value***, especially the ***Slope*** is ***significantly*** not different from Zero. To get the Trend component we simply add intercept to Slope times ($_t$). The final column which is column eleventh is ***Forecast*** column. To get forecast for the next year, we simple need increase the incremental numbers in the first column ($_t$) to as many months as we want, then we need multiply (S_t) column to (T_t) column. For example to forecast March 2016, we need to multiply 1.04 by $61,306,415 to get $ 63,568,803.

Table 1: Monthly Sales, Moving Average and Forecasting

T	Months	Sales / Yt	MovingAvg /	Center MA Baseline	St It	St	De seasonal	Tt	Forecast
1	Apr-14	114,646,000				1.03	110,869,365	117,717,221	121,727,121
2	May-14	114,646,000				1.00	115,079,674	115,264,578	114,830,207
3	Jun-14	114,195,000	113,149,000	113,027,625	1.01	1.01	113,027,625	112,811,934	113,977,081
4	Jul-14	109,109,000	112,906,250	112,409,750	0.97	0.97	112,409,750	110,359,290	107,118,749
5	Aug-14	113,675,000	111,913,250	111,473,125	1.02	1.02	111,473,125	107,906,646	110,038,074
6	Sep-14	110,674,000	111,033,000	109,709,000	1.01	1.01	109,709,000	105,454,003	106,381,576
7	Oct-14	110,674,000	108,385,000	106,396,125	1.04	1.04	106,396,125	103,001,359	107,142,740
8	Nov-14	98,517,000	104,407,250	102,250,250	0.96	0.96	102,250,250	100,548,715	96,877,590
9	Dec-14	97,764,000	100,093,250	95,807,750	1.02	1.02	95,807,750	98,096,071	100,099,045
10	Jan-15	93,418,000	91,522,250	90,449,500	1.03	1.03	90,449,500	95,643,428	98,782,389
11	Feb-15	76,390,000	89,376,750	88,431,375	0.86	0.86	88,431,375	93,190,784	80,501,338
12	Mar-15	89,935,000	87,486,000	86,734,250	1.04	1.04	86,734,250	90,738,140	94,086,645
13	Apr-15	90,201,000	85,982,500	87,229,625	1.03	1.03	87,229,625	88,285,496	91,292,838

14	May-15	87,404,000	88,476,750	87,734,625	1.00	1.00	87,734,625	85,832,853	85,509,394
15	Jun-15	86,367,000	86,992,500			1.01	85,484,101	83,380,209	84,241,379
16	Jul-15	83,998,000				0.97	86,539,096	80,927,565	78,551,244
17	Aug-15					1.02		78,474,921	80,024,999
18	Sep-15					1.01		76,022,278	76,690,969
19	Oct-15					1.04		73,569,634	76,527,652
20	Nov-15					0.96		71,116,990	68,520,444
21	Dec-15					1.02		68,664,346	70,066,369
22	Jan-16					1.03		66,211,703	68,384,732
23	Feb-16					0.86		63,759,059	55,077,222
24	Mar-16					1.04		61,306,415	63,568,803
25	Apr-16					1.03		58,853,771	60,858,556
26	May-16					1.00		56,401,128	56,188,582
27	Jun-16					1.01		53,948,484	54,505,676
2	Jul-16					0.97			

8								51,495,840	49,983,739
29	Aug-16					1.02		49,043,196	50,011,923
30	Sep-16					1.01			47,000,363
31	Oct-16					1.04		44,137,909	45,912,564

Table 2: Months with Baseline

Months	**St**
4	1.03
5	1.00
6	1.01
7	0.97
8	1.02
9	1.01
10	1.04
11	0.96
12	1.02
1	1.03
2	0.86
3	1.04
4	1.03
5	1.00
6	1.01
7	0.97
8	1.02
9	1.01
10	1.04
11	0.96
12	1.02

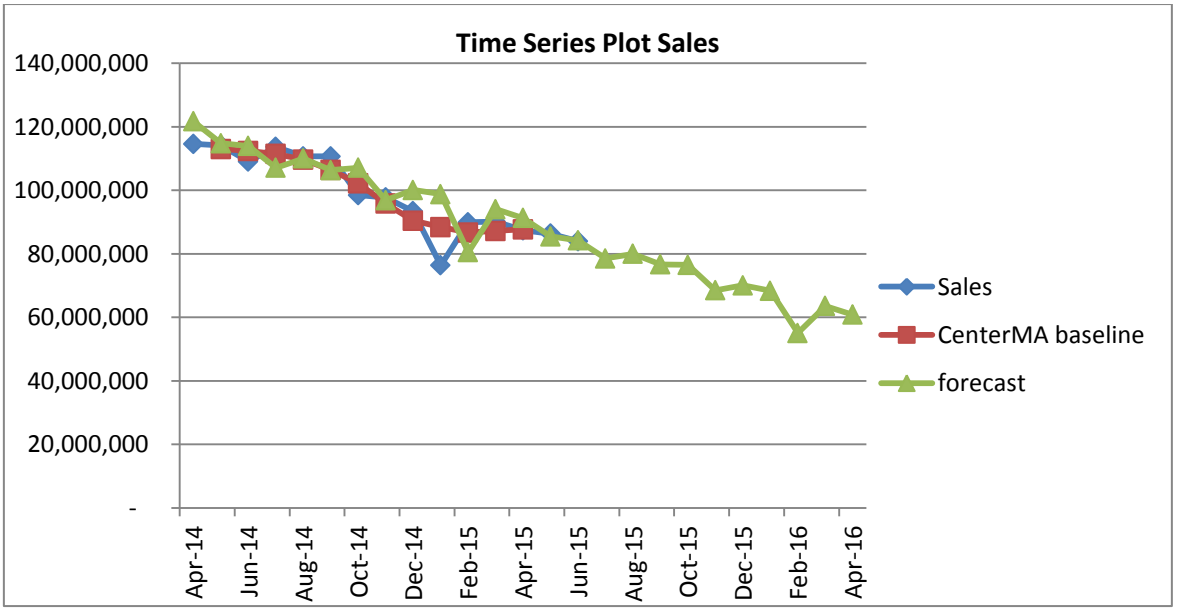
Table 3: Regression Statistics

Regression Statistics	
Multiple R	0.898373826
R Square	0.807075531
Adjusted R Square	0.793295212
Standard Error	5785943.444
Observations	16

Table 4: Analysis of Variance t Statistics and P- Value

ANOVA					
	df	***SS***	***MS***	***F***	***Significance F***
Regression	1	1.96066E+15	1.96066E+15	58.5672596	2.29E-06
Residual	14	4.6868E+14	3.34771E+13		
Total	15	2.42934E+15			
	Coefficients	**Standard Error**	**t Stat**	**P-value**	
Intercept	120169865.1	3066661.495	39.18589165	1.03357E-15	
T	-2452643.751	320484.492	-7.652924905	2.28608E-06	
				0.0000000	
				0.0000023	

Graph 1: Monthly Sales, Center MA Baseline and Forecast



On the graph, the horizontal axis represents the months, while the vertical axis represents the amount of sales in Iraqi dinar. The graph has three lines, sales, CMA and the forecast. The actual value starts from April 2015 to July 2015. However, the forecast line start from April 2015 ends April 2016. In other words, we are forecasting the monthly sales from August 2015 to April 2016. We can see the sales declining month after month. In this analysis, we have used quantities forecasting methods, specifically Time Series model to forecast next twelve monthly sales, which start from August 2015 to August 2016. The past pattern or the actual data start from April 2014 to August 2015. If the economic conditions continue to decline, as we can see the trend of the data exhibits a slow decline in sales over time.

6. Managerial Implication

The reason for forecasting is to maximize profit and identifying problems (Hill & Kendall, 1953). If a forecasted sale is declining as in our case study, then its management's responsibility to make adequate decision and find the viable solution to upward the sales volume (Leeflang & Witt, 2000). Even though we believe that the risk is systematic to some degree, we suggest that the management can do the following to improve the sales. Customer service should be a priority. Give extra attention to customers and improve customer relation. If a customer needs help, drop everything and go help the customer. Improve employees' expertise on products. Respond to customer's complaint should be quick, calm and positive. Improve the relationship among the employees. Treating employees with respect and caring manner, which may transfer to the customers? Happy employees make happy customer, improve the quality of product, the elegancy and neatness of the market. Make the premises more pleasant, competitive pricing, not lower than the competitor, Improve credit policy, product display. Operating hours should be more than the competitors.

7. Conclusion

Based on the analysis the direction should gravitate toward the restricted area of assessment and of course the knowledge and the judgment of forecaster will play an important role. The location of the premises should carefully be assessed to adopt the turnover expectation. Supermarket and grocery stores cover wide range of area from residential area to town center and to off the road gas station. It's possible that inconsistency of those convenience stores make projection a bit challenging when comes to compering one another. Therefore, it gives an opportunity for management to distinguish those factors and techniques that drive business success. Management forecasts sales based on consumer's demand, availability of goods, price and service. In our case, there's another external factor such as migration plays a role in forecasting error. In other words, the city may get inflated with sudden wave of refugees from neighboring cities. Other variables such as income and employment may lead in forecasting error as well. We have taken the most crucial and fundamental segment of small business activities related to food and household goods in Erbil city to analysis and forecast. Unlike other retail stores, we believe foods and groceries are essential and people consume them on a daily basis. As a result, a private market, located in a saturated residential area, selling groceries, meat, dairy products and fresh produce, was taken as a sample to study the past performance and project future sales. The market performance was astonishing during the pre-2014 years. Nowadays sales has dropped by 50% and gross profit margin is also down to around 10% from 20%. As revealed on the graph and of course if the stagnant economic condition continues, the trend of future sales is down-warding. Based on time series analysis, the

business may continue to operate and generate small revenues until August 2016. However, due to low sales volume, low profit margin and operating expenses, the revenues may not be adequate enough to produce positive net income and the business may not be able to operate afterward.

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