Anticipated series average monthly price of gold in using the time series of software minitab

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Abstract

We can study the statistics, basic research to get the needs arising in different fields got considered. After knowing the statistics obtained from the trust issue is investigated, which is considered to be important, procedures because it is true that the correct result is achieved. and concluded with a detailed study on the mode of research is to identify the needs of current and non-current sources can be required by a suitable method found. the problem considered in this study in relation to the expected range of average monthly price of gold on the London market in terms of dollars. we are gathered here with the predicted theoretical and practical knowledge to study, and time series methods described above.

Keywords: Forecasting; Time Series; Trend Fitting; Always Making.

1. Introduction

The future of those who plan appropriately for it. merchants, institution or organization should be given to successful planning necessary to predict the future position to do it. there are several ways to do this. these methods can turn the past experience to predict future events. statistics relating to a variable that is expected to be available in the last period time series statistics say so. the purpose of a time series, a collection of statistical data that are collected at regular intervals equal, these data and the statistical methods used to analyze the time series is called. forecasting is an important element in management decisions, because any decision on the nature of the final performance of a sequence of events that occur subsequent decision. because management systems for planning and controlling the operations of an organization typically enjoy a forecast function. because the predicted never quite does not eliminate a risk, it is necessary that the decision-making process immediately following the forecast uncertainty is left to consider (Frankfurter et al. 1996), to measure the accuracy of the model was fitted to a series of three criteria, namely MAPE, MSD, MAD is used to measure them carefully or call measures of accuracy.

2. Anticipated series of the average monthly price of gold:

Monthly data relating to the supply price of one ounce of gold in dollar terms during the London Metal Market 1968 - 2007 AD, the site has been kitco.com as follows.

| Row | year | month | gold  | Row | year | month | gold  |
|-----|------|-------|-------|-----|------|-------|-------|
| 1   | 1968 | Jan   | 35.20 | 241 | 1988 | Jan   | 476.58 |
| 2   | 1968 | Feb   | 35.20 | 242 | 1988 | Feb   | 442.07 |
| 3   | 1968 | Mar   | 35.20 | 243 | 1988 | Mar   | 443.61 |
| 4   | 1968 | Apr   | 37.90 | 244 | 1988 | Apr   | 451.55 |
| 5   | 1968 | May   | 40.70 | 245 | 1988 | May   | 451.01 |
| 6   | 1968 | Jun   | 41.10 | 246 | 1988 | Jun   | 451.33 |
| 7   | 1968 | Jul   | 39.50 | 247 | 1988 | Jul   | 437.63 |
| 8   | 1968 | Aug   | 39.20 | 248 | 1988 | Aug   | 431.31 |
| 9   | 1968 | Sep   | 40.20 | 249 | 1988 | Sep   | 412.79 |
| 10  | 1968 | Oct   | 39.20 | 250 | 1988 | Oct   | 406.78 |
| 11  | 1969 | Jan   | 42.30 | 253 | 1989 | Jan   | 404.01 |
| 12  | 1969 | Feb   | 42.60 | 254 | 1989 | Feb   | 387.78 |
| 13  | 1969 | Mar   | 43.20 | 255 | 1989 | Mar   | 390.15 |
| 14  | 1969 | Apr   | 43.30 | 256 | 1989 | Apr   | 384.06 |
| 15  | 1969 | May   | 43.46 | 257 | 1989 | May   | 371.00 |
| 16  | 1969 | Jun   | 41.44 | 258 | 1989 | Jun   | 367.60 |
| 17  | 1969 | Jul   | 41.76 | 259 | 1989 | Jul   | 375.04 |
| 18  | 1969 | Aug   | 41.09 | 260 | 1989 | Aug   | 365.037|
| 19  | 1969 | Sep   | 40.87 | 261 | 1989 | Sep   | 361.75 |
| 20  | 1969 | Oct   | 40.44 | 262 | 1989 | Oct   | 366.88 |
| 21  | 1969 | Nov   | 37.40 | 263 | 1989 | Nov   | 394.26 |
| 22  | 1969 | Dec   | 35.17 | 264 | 1989 | Dec   | 409.39 |
| 23  | 1970 | Jan   | 34.94 | 265 | 1989 | Jan   | 410.11 |
| 24  | 1970 | Feb   | 34.99 | 266 | 1990 | Feb   | 416.83 |
| 25  | 1970 | Mar   | 35.09 | 267 | 1990 | Mar   | 393.07 |
| 26  | 1970 | Apr   | 35.62 | 268 | 1990 | Apr   | 374.27 |
| 27  | 1970 | May   | 35.95 | 269 | 1990 | May   | 369.19 |
| 28  | 1970 | Jun   | 35.44 | 270 | 1990 | Jun   | 352.33 |
| 29  | 1970 | Jul   | 35.32 | 271 | 1990 | Jul   | 362.53 |
| 30  | 1970 | Aug   | 35.38 | 272 | 1990 | Aug   | 394.73 |
| 31  | 1970 | Sep   | 36.19 | 273 | 1990 | Sep   | 388.41 |
| 32  | 1970 | Oct   | 37.52 | 274 | 1990 | Oct   | 380.74 |
| 33  | 1970 | Nov   | 37.44 | 275 | 1990 | Nov   | 381.73 |
| 34  | 1970 | Dec   | 37.44 | 276 | 1990 | Dec   | 378.16 |
| 35  | 1971 | Jan   | 37.87 | 277 | 1991 | Jan   | 383.64 |
| 36  | 1971 | Feb   | 38.74 | 278 | 1991 | Feb   | 363.83 |
| 37  | 1971 | Mar   | 38.87 | 279 | 1991 | Mar   | 363.33 |
To recognize changes in time series graph for this data series are plotted, chart data series to be as follows.

![Time Series Plot of gold](image1)

Monthly time series chart of gold price from 1968 to 2007.

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Preliminary results can be seen in the following diagram realized. The diagram shows that during 1968 and 1972, significant changes occurred in the gold price. During 1973 to 1975, we see the growth of a few tens of dollars. During the years 1976 to 1981, we see the growth of a few hundred dollars. It seems that in both 1982 and 1983, about three hundred dollars suddenly confronted with negative growth and decline. During 1984 the growth and decline during 1987 and 1993, the increase from 1993 to 1996 and 1996 to 2002, faced with declining gold prices. However, between 2002 and 2007 AD by the unprecedented growth of more than 1980 to 1996 have been met. There are certain trends in the data, we are trying to investigate, therefore, the linear model (linear) degree (quadratic) exponential (exponential growth) to fit our data. We have the following three forms. (Jose et al. 1996).

![Graph the quadratic model for the monthly price of gold](image2)

Graph the quadratic model for the monthly price of gold.

![Trend analysis plot for gold](image3)

Trend analysis plot for gold.

View the data model diagram for a monthly price of gold. In the table below we compare the standards of accuracy.

| Model             | MAPE | MAD  | MSD   |
|-------------------|------|------|-------|
| Linear            | 55.2 | 91.3 | 13712.9 |
| Quadratic         | 32.8 | 76.5 | 11718.6 |
| Exponential growth| 47.4 | 110.4 | 20868.5 |

According to the results of the standards and precision fitted trend lines, it can be seen that the quadratic model fit the data better. Is. Therefore, this model is as follows.
Using the model predictions for the next twelve months will be as follows:

\[ y_{t} = 22.8106 + 2.03631t - 0.00260043t^2 \]

To better understand the seasonal changes of charts we use data analysis.

3. Always the moving average method

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4. Method always making view only

One way is always and only looks like the models and linear fit to the data, we can according to precise criteria and the diagram is a good way to check whether or not anticipated.

5. The method has the double exponential the data are plotted below.

6. Winters smoothing data method is as follows

Below are benchmarks to compare the accuracy of the four methods described above.
This indicates that the method gives a better fit to the data is unique. the predicted values for the following twelve months.

| Method  | MAPE  | MAD   | MSD   |
|---------|-------|-------|-------|
| Single  | 3.597 | 11.192| 418.172|
| Double  | 3.830 | 11.523| 430.713|
| Winters | 5.602 | 17.397| 938.805|

7. Diagnostic test model (ARIMA)

As the plot of this series is the series at an average is specified. ACF sample survey also confirms the non-stationary series. As you can see the values of the autocorrelation function are very slow to zero.

Autocorrelation function for gold.

however, with the implementation of the Box-Cox procedure to examine the stability of the variance.

Cox Baks- chart data monthly price for gold.

As number one in the band is not so stable variance to the Box-Cox transformation of the stationary variance was 7.1. after the conversion, for \( \lambda = 1 \) \( \ln (\omega_a) \) we use to do this conversion does not work.

Store results in variable: new data from the conversion are included in this column. expression: change we want to write mathematically by the following box. then click on ok to do the necessary conversions and new data are entered in column C5. Box-Cox plots to ensure the data is plotted to C5.

Box-cox plot for gold monthly price data after conversion (after stabilization of variance).

as can be seen, the number one in the band is sure to become the choice is indicated. To solve the problem of non-stationary, the differential time series are given. differential series with C4 show. However, time series graphs are plotted for a series of difference.

Time-series data monthly price chart for gold after stabilize the variance and differential.

as you can see, the series is the result of a series of stationary time series ARIMA models fitted to a suitable model of these families did.
8. Sample PACF, ACF

To plot the differential series of PACF, ACF important tool in determining the autocorrelation function, partial autocorrelation function is, draw a diagram of the process is helpful in determining the type and level, to identify the best model is recommended that a sample size of at least 50 APCF, ACF delayed at least $K = n / 4$ are calculated and graphed.

| ACF     | PACF                        |
|---------|-----------------------------|
| AR(p)   | As an exponential decay to zero or a sine wave | After a delay of $p$ is disconnected |
| MA(q)   | Q will be cut off after a delay | As an exponential decay to zero or a sine wave |
| ARMA(p,q) | After the delay $(qp)$ to zero | After the delay $(pq)$ to zero |

9. Autocorrelation plot of static data ACF

An experimental method for determining the degree of MA recognize that given the lags of the autocorrelation curve $q = 2$ is observed. (lag = 1.8).

ACF chart data monthly price for gold after stabilize the variance and differential.

10. Partial autocorrelation plot of the static data PACF

An experimental method for determining the degree of AR diagnosis of the partial autocorrelation plot is due to lags $P = 2$ is observed. (Lag lag = 1.7)

Pacf chart for gold after fixing the variance of monthly price data.

11. There is a definite trend in the model test

However, given the above steps and diagrams acf, pacf that goes to zero, the test model ARIMA assume and we argued about it properly.

12. Investigation and analysis on the residuals

If the ARIMA, model are diagnosed, then the residuals of the fit of the model to be approximately has the properties of a normal random variable with mean zero and variance are fixed independently distributed. if no model is appropriate to the remaining structure, this means that should any other variables such as command data collection or estimated values are irrelevant. any structure in these graphs showed the effect on the response variable is. one way to analyze charts of the remaining residues are examined. ARIMA for the main window by selecting the desired graphs can offer.

thus, under the assumption of normality of the residuals charts to confirm.

Histograms of the residuals for the monthly price of gold.
Linden possibility remained normal for the monthly price of gold. Graphs ACF, PACF below do not show specific plans and delays are not significantly different from zero. Thus, assuming independence of residuals will be accepted.

ACF remaining data monthly price chart for gold.

Residual versus the order of the data.

Residuals vs time data monthly price chart for gold.

Based on the above information, we fit the ARIMA model.

13. ARIMA model

So far we have q and p degrees from the ACF and PACF plot recognize that it is not necessarily a reason Just estimated. you can select the best type of trial and error. note that for the the time difference \( d = 1 \) we take it in the ARIMA model under review: ARIMA \((p, d, q) = ARIMA (2,1,2)\) To fit this model ARIMA window will fill in the form below.

As you can see from the output port mantoux test is as follows.
As you can see the amount of P-Value is greater than 0.05 for all the delays, also we see the P-Value for delays of 12, 24, 36, and 48 more. so it can be drefragmented hypothesis remains closed to admit, so it can be confirmed on the model.

14. Conclusion

Now, using the Box-Jencks, ARIMA modeling strategies to identify, we can make it on the Sri projectted average monthly price of gold on the London market in 1968, and 2007 put. In this issue, we set the values for twelve months. we expect the average monthly price of gold, to do this, open another window and ARIMA model, ARIMA (3, 1) it will fit. then click on the option forecasts at the bottom of the window and the window opened at a number of 12, we entered the lead, origin box to specify the starting point forecast. if this is something to write predictions of the end of the series will be produced. storage can be predicted values and the predictions of the store. the forecast for the next twelve months will be using this model as follows:

| Period | Forecast | Lower | Upper | Actual |
|--------|----------|-------|-------|--------|
| 1969   | 797.476  | 757.875 | 837.080 |
| 1970   | 802.641  | 762.016 | 843.280 |
| 1971   | 805.868  | 765.282 | 847.154 |
| 1972   | 806.476  | 767.830 | 849.121 |
| 1973   | 807.873  | 769.219 | 850.557 |
| 1974   | 809.755  | 771.163 | 851.347 |
| 1975   | 811.360  | 772.715 | 852.093 |
| 1976   | 812.859  | 774.394 | 853.084 |
| 1977   | 814.505  | 775.983 | 853.508 |
| 1978   | 816.108  | 777.579 | 854.138 |
| 1979   | 817.701  | 779.180 | 854.716 |
| 1980   | 815.295  | 780.771 | 856.217 |

To view the predicted values in the graph in the main, window ARIMA time series is adequate on option’s graphs button and the window was opened, which is the first option time series plot (including optional forecasts) choose. and so the plot time series forecasting in the following twelve months.

Figure 1: Time series plot for gold.

Series of monthly gold price forecast based on ARIMA (3, 1, and 0).

In the diagram above and below the center line of the predicted values and the upper limit and lower limit of the confidence interval 0.05 CI 0.05 to predict anticipated shows.

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