

[Frequently Asked Questions]

Time Series Models

Subject:

Business Economics

Course:

Paper No. & Title:

B. A. (Hons.), 5th Semester, Undergraduate

Paper - 531 Elective Paper Q1 _ Advanced Econometrics

Unit No. & Title:

Unit – 3 **Time Series Models**

Lecture No. & Title:

Lecture – 2 **Time Series Models**

Frequently Asked Questions

Q1. what is meant by additive and multiplicative models of time series?

A1. Additive model $Y_t = T + S + C + R$

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T = Trend, S = Seasonal, C = Cyclic, R = Random Y_t = given time
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series.

Multiplicative Model

In a long time series when we find that the series has variational pattern which is exponential type, we use multiplicative model

 $Y_t = T.C.S.R$

Here if a component is absent, we denote it by 1

(e.g. If cyclic component is absent, we put c = 1 etc)

Q2. What is Moving Average Method for separating trend component?

A2. First we plot the time series. Then find periods between successive peaks or troughs in the series and find average period, which is periodicity for the given time series.

Then we find average of successive observations taken one by one as per periodicity (2 or 3 or 4 or 5 etc) and compute the average which will give trend component of the series.

Q3. What is iterated average method?

A3. In a way it is a weighted moving average. There are formulae known as Spensor's 15 points, 21 points etc. which determine such an iterated average

Q4. What is variate difference Method?

A4. It is a method to determine the degree of the polynomial trend in the given time series. A systematic test procedure is useful for determining the polynomial trend.

Q5. What is the method of seasonal Index for separating seasonal component?

A5. First we compute monthly average, then grand or overall mean. We obtain seasonal index by dividing individual monthly average in relation to overall mean expressed in percentage. If we divide the given series by this seasonal index , then seasonal component is eliminated.

Q6. What is a stationary time series?

A6. It is a time series which does not have components like trend or seasonal or cyclic factors. It is based upon the stationary stochastic process. A stationary time series is time invariant in the sense that its mean , variance and auto covariance remains the same no matter at what point we measure them.

Q7. What is a Random or White noise process?

A7. We call a stochastic process purely random if it has zero mean, constant variance and it is serially uncorrelated. It is also called Gaussian White Noise Process.

Q8. What is the meaning of Random walk with and without drift?

A8. RW without drift

 $y_t = y_{t-1} + U_t$

This is also called AR (1) model. It does not have an intercept term. In practice, stock price today is the sum of stock price yesterday plus a random shock.

Here $E(Y_t) = Y_0$ and $V(Y_t) = t\sigma^2$ and $\Delta Y_t = U_t$

RW with drift

 $Y_t = \delta + Y_{t-1} + U_t$

It contains the intercept term δ .

Here $E(Y_t) = Y_0 + t. \delta, V(Y_t) = t\sigma^2 and \Delta Y_t = \delta + U_t$

Which shows that Y_t drifts upwards or downwards depending upon δ being positive or negative. This model is also called AR (7) model.

Q9. What is correlogram analysis?

A9. We compute sample autocorrelation function r_k by the formula

$$r_{k} = \frac{\sum (y_{t} - \bar{y})(y_{t+k} - \bar{y})}{\sum (y_{t} - \bar{y})^{2}}$$

 r_k is the estimate of ρ_k .

If we plot r_k against k, we get correlogram. It is useful to decide whether the given timeseries is stationary or non-stationary.

Q10. What is unit root test?

A10. If we write the given time series as $Y_t = \rho Y_{t-1} + U_t (-1 \le \rho \le 1)$ Where U_t is the white noise error term then from the above equation

 $\Delta Y_t = Y_t - Y_{t-1} = \delta Y_{t-1} + U_t$

Where $\delta = \rho - 1$.

Here $\delta = 0$ if $\rho = 1$ and hence given time series is non stationary.

To test null hypothesis $H_0: \delta = 0$, we may use DF test or ADF test etc.

Q11. What is the concept of Cointegration?

A11. In macro-economic theory there is a relation between real personal consumption expenditure expressed in terms of real disposable personal income.

These variables are taken in their logarithmic values. Two variables will be cointegrated if they have a long term or equilibrium relationship between them.

The relationship expressed in such case is called Cointegrating equation and the Beta Coefficient is called cointegration parameter. There are different tests to examine if two or more series are cointegrated.