

Time Series - Assignment 1

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The series represents the *Indice General* of consumer prices (P_t). This series does not appear to be stationary, as there is an obvious upward trend and a non-constant mean.

The test of *Jaque-Bera* give as a statistic of 2.67 and a p_value of 0.26 and this tell us that the data is distributed normal and the ADF test give a statistic of 0.24 and a 0.97 and this indicates that the data is not stationary and need work.

From the ACF graph we can the that there is a very slowly decay in the lags indicating us that there's a trend component to the serie and needs a transformation reinforcing that is not stationary.

To do a stationary transformation of P_t we need to see how can it be write as a deterministic.

If the serie is considered with a deterministic approach it can be write as the following. $P_t = \alpha + \beta_t + \epsilon_t$.

With this we can see that to eliminate the trend we need to re-write the serie as: $P_t^{tr} = P_t - (\alpha + \beta_t)$.

The linear model that we obtain give us the next fit.

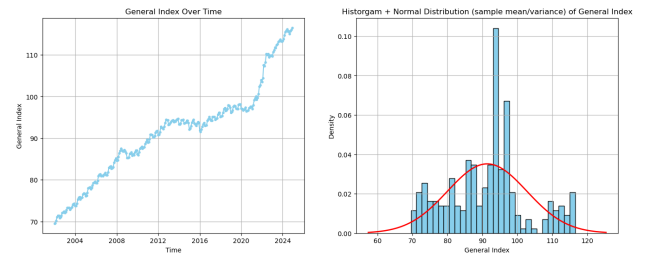


Figure 1: Indice General Time series

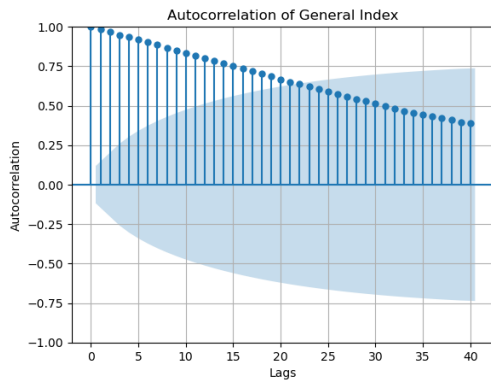


Figure 2: ACF of original Time Serie

This transformation gives as the following graph.

In this graph you can see that the means still are not constant, and it looks like this. After the deterministic transformation the *ADF* still tell that the time serie is not stationary.

And if we check the ACF graph we can see an improvement. The lag decay a little faster but the trend is not remove yet.

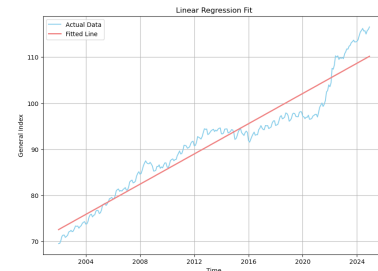


Figure 3: Linear model

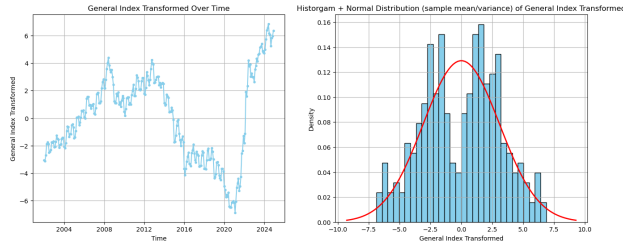


Figure 4: Transformation of P_t with deterministic approach

For the Stochastic approach you can difference converting the series to $\Delta P_t = P_t - P_{t-1}$ and you get the following.

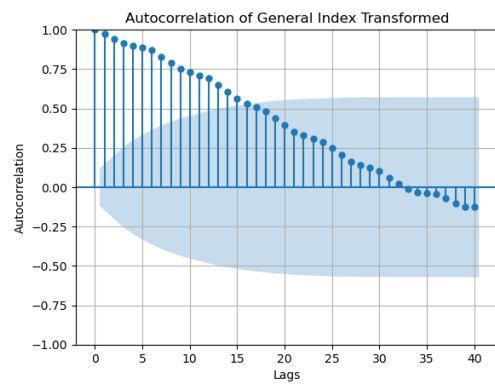


Figure 5: ACF Deterministic Time series

The data looks stationary and the ADF test gives as a p_value of 0.015 meaning that this is a stationary time series.

The serie shows some picks in the data and this can be seen in the ACF graph. First you can see that the trend has been removed and for the test this tell that differencing was successful for this time series. The graph also shows a potential seasonal part of the serie that is repiting itself every 3 lags (in this case months).

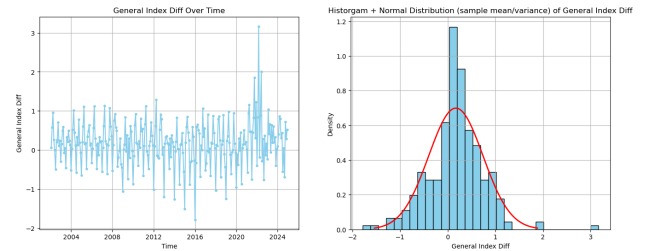


Figure 6: Transformation of P_t with stochastic approach

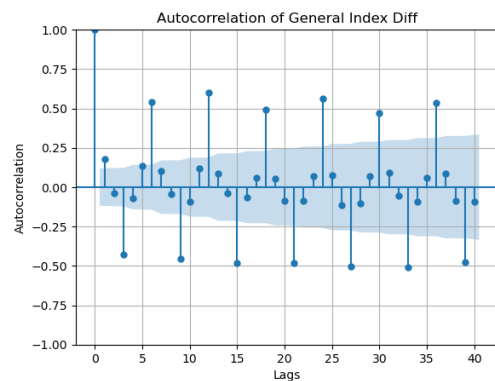


Figure 7: AFC Difference Time serie