

# Time Series Analysis

## Lecture 3

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Autoregressive Models and Moving Average Models

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# Autoregressive Models

Model Diagnostics and Assumption Testing

# Estimation

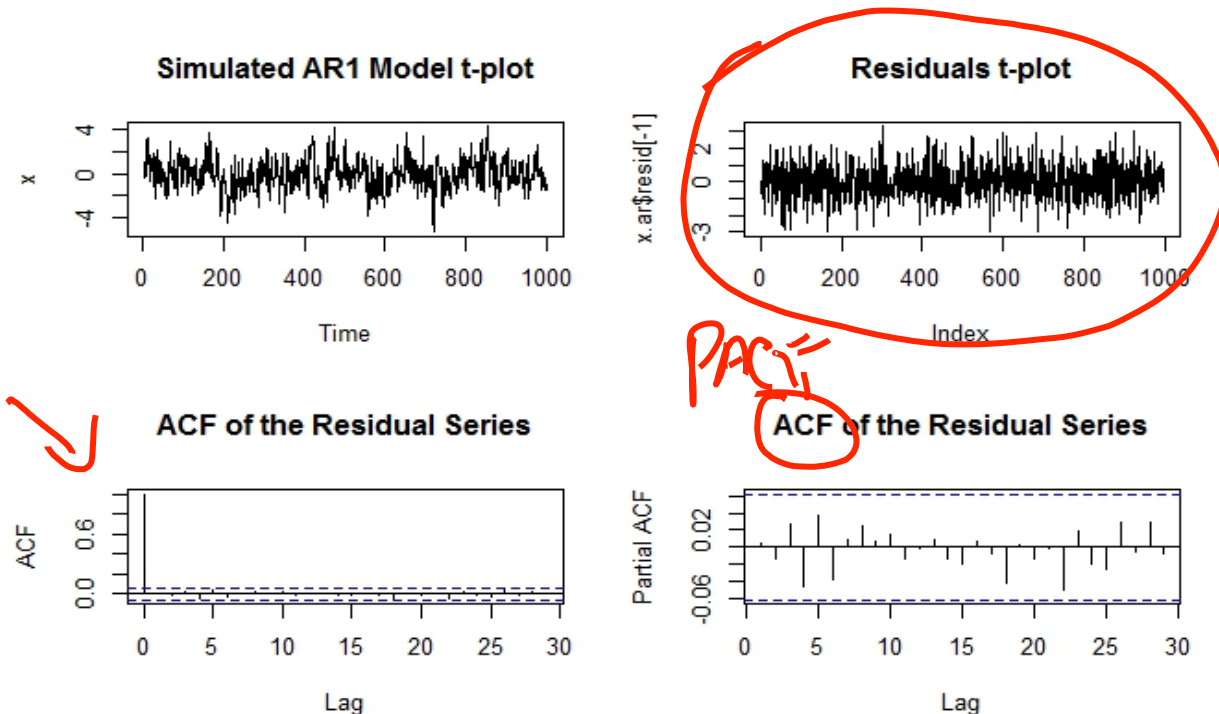
Model assumption diagnosis and testing:

1. AR models have random components resembling that of white noise. **Question: Do the estimated residuals look like the realizations generated by a white noise process?**
2. We are interested in stationary AR models. **Question: Is our estimated AR model stationary (at least statistically)?**

# Model Assumption Diagnosis and Testing:

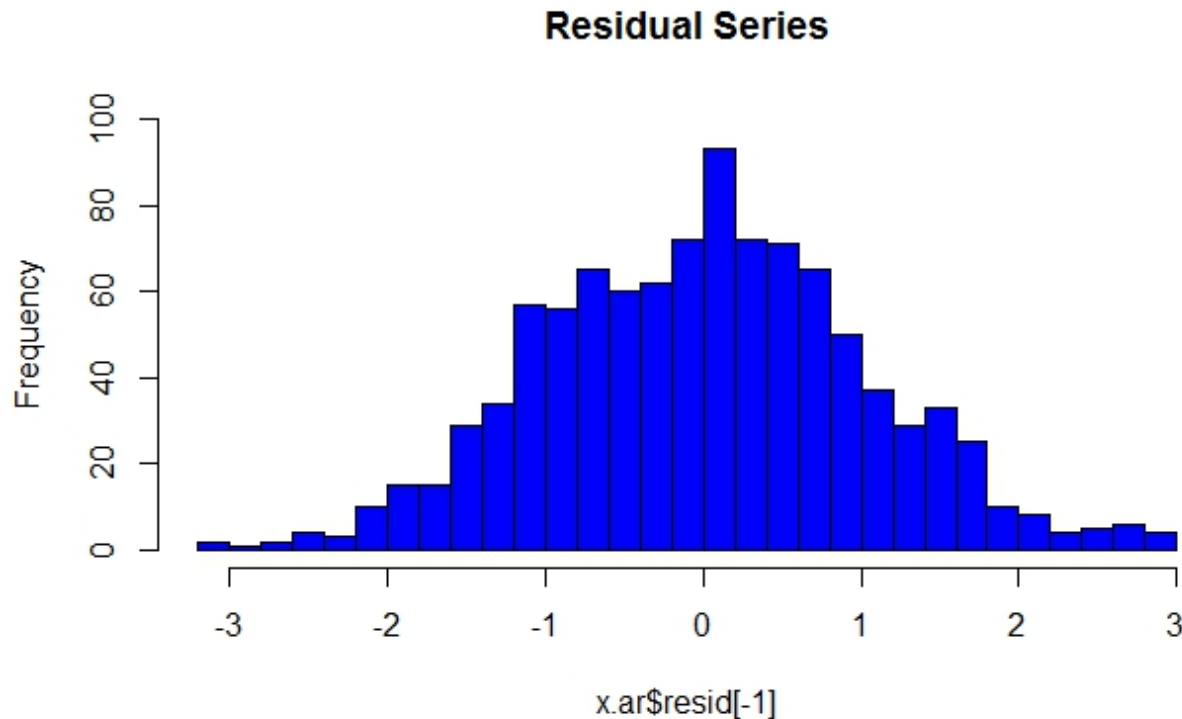
1. Does the residual series look like the realizations generated by a white noise process? The t-plot, correlogram, and PACF plots of the residuals are similar to those of a white noise process.

```
> head(x.ar$resid)
[1]      NA  0.04078616 -0.73661043 -0.26731725  0.24702927 -0.27750065
```



## Model Assumption Diagnosis and Testing:

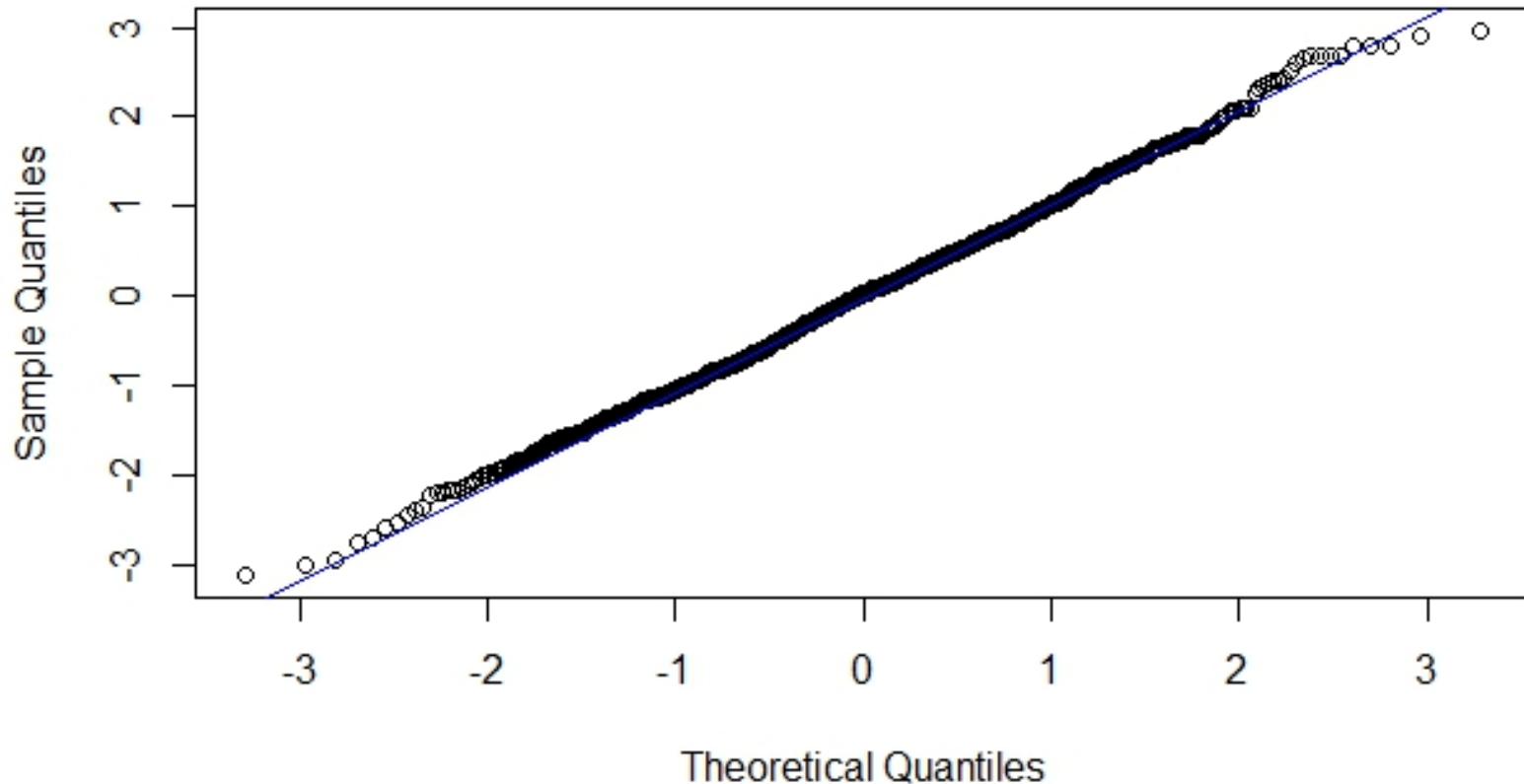
We can also examine the distribution of the residuals. The histogram shows a fairly symmetric distribution.



## Model Assumption Diagnosis and Testing:

And, the qqplot against the theoretical normal also provides preliminary evidence that the residuals follow a normal distribution.

**Normal Q-Q Plot of the Residuals**



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