

A MATHEMATICAL THEORY OF SEASONALS

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The graph of any time series may be assumed to be a compound curve which is dependent upon the following factors:

| | |
|------------------|--------------|
| Secular trend, | $f(x)$ |
| Cycle, | $c(x)$ |
| Seasonal | $s(x)$, and |
| Residual errors, | ϵ_x |

If we designate the x th term of the observed time series by y_x , we have that

$$(1) \quad y_x = f(x) \cdot c(x) \cdot s(x) + \epsilon_x$$

It also follows that the standard error, based on our hypothesis, is

$$(2) \quad \sigma_\epsilon = \sqrt{\frac{\sum \epsilon_x^2}{N}}$$

In making predictions, we desire that the standard error of estimate be a minimum, and this requires that $\sum \epsilon^2$ be also a minimum.

In dealing with data covering a period of years, i. e. 12 n months, we observe that