

Fast Fourier Transform

FAST FOURIER TRANSFORM commands compute the discrete Fourier transform (DFT) and its inverse using a fast Fourier transform (FFT) algorithm. Direct discrete Fourier transform converts a set of time samples to coefficients of a finite combination of complex sinusoids, ordered by their frequencies. It can be said that data in the *time domain* is converted to data in the *frequency domain*. Fourier transform is an important tool in many areas of science and engineering.

How To

✓ **DIRECT TRANSFORM:**

Run: **STATISTICS->TIME SERIES ->FAST FOURIER TRANSFORM - DIRECT...**

INVERSE TRANSFORM:

Run: **STATISTICS->TIME SERIES ->FAST FOURIER TRANSFORM - INVERSE...**

- ✓ Select variables containing the real and imaginary values of time series. Variable with imaginary values is optional; when omitted, imaginary values are assumed to be zero.

Results

DIRECT TRANSFORM:

Discrete Fourier transform is computed as:

$$X(k) = \frac{1}{\sqrt{N}} \sum_{n=0}^{N-1} x(n) e^{-i 2\pi kn/N}, \text{ where } x(n) \text{ is discrete Fourier series.}$$

INVERSE TRANSFORM:

Inverse discrete Fourier transform is computed as

$$x(n) = \frac{1}{\sqrt{N}} \sum_{k=0}^{N-1} X(k) e^{+i 2\pi nk/N}, \text{ where } X(k) \text{ is sampled spectrum.}$$

References

Brigham, E. (1988), The Fast Fourier Transform And Its Applications. Englewood Cliffs, Prentice-Hall, NJ. Burg J.P. (1975)