NDK_WNTEST

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- C/C++
- .Net

```
int __stdcall NDK_WNTEST(double * X,
                         size_t   N,
                         size_t   K,
                         double   alpha,
                         WORD     method,
                         WORD     retType,
                         double * retVal
                        )
```

Computes the p-value of the statistical portmanteau test (i.e. whether any of a group of autocorrelations of a time series are different from zero).

Returns

status code of the operation

Return values

NDK_SUCCESS Operation successful
NDK_FAILED Operation unsuccessful. See **Macros** for full list.

Parameters

[in] **X** is the univariate time series data (a one dimensional array).
[in] **N** is the number of observations in X.
[in] **K** is the lag order (e.g. k=0 (no lag), k=1 (1st lag), etc.).
[in] **alpha** is the statistical significance level. If missing, a default of 5% is assumed.
[in] **method** is the statistical test to perform (1=Ljung-Box).
[in] **retType** is a switch to select the return output:

Method	Value	Description
TEST_PVALUE	1	P-Value
TEST_SCORE	2	Test statistics (aka score)
TEST_CRITICALVALUE	3	Critical value.

[out] **retVal** is the calculated test statistics.

Remarks

1. The time series is homogeneous or equally spaced.
2. The time series may include missing values (NaN) at either end.
3. The test hypothesis for white-noise: \[H_{o}: \rho_{1}=\rho_{2}=...=\rho_{m}=0\] \[H_{1}: \exists \rho_{k}\neq 0\] \[1\leq k \leq m\] Where:
   - \(H_{o}\) is the null hypothesis.

- H_{1} is the alternate hypothesis.
- ρ_k is the population autocorrelation function for lag k
- m is the maximum number of lags included in the white-noise test.

4. The **Ljung Box test** modified $Q^*(m)$ statistic is computed as: $$Q^* =T(T+2)\sum_{j=1}^{m}\frac{\hat\rho_{j}^2}{T-l}$$ Where:
   - m is the maximum number of lags included in the test.
   - $\hat\rho_j$ is the sample autocorrelation at lag j.
   - T is the number of non-missing values in the data sample.
5. The **Ljung Box test** modified Q^* statistic has an asymptotic chi-square distribution with m degrees of freedom and can be used to test the null hypothesis that the time series is not serially correlated. $$Q^*(m) \sim \chi_{\nu=m}^2()$$ Where:
   - $\chi_{\nu}^2()$ is the Chi-square probability distribution function.
   - ν is the degrees of freedom for the Chi-square distribution.
6. The **Ljung Box test** is a suitable test for all sample sizes including small ones.
7. This is one-side (i.e. one-tail) test, so the computed p-value should be compared with the whole significance level (α).
8. In practice, the selection of m may affect the performance of the $Q(m)$ statistic. Several values of m are often used. Simulation studies suggest that the choice of $m\approx \ln(T)$ provides better power performance.

Requirements

Header	SFSDK.H
Library	SFSDK.LIB
DLL	SFSDK.DLL

Examples

```
int NDK_WNTEST(double[]   pData,
               UIntPtr    nSize,
               int        nLag,
               double     alpha,
               UInt16     argMethod,
               UInt16     retType,
```

Namespace: NumXLAPI
Class: SFSDK
Scope: Public
Lifetime: Static

```
                out double retVal
            )
```

Computes the p-value of the statistical portmanteau test (i.e. whether any of a group of autocorrelations of a time series are different from zero).

Returns

status code of the operation

Return values

NDK_SUCCESS Operation successful
NDK_FAILED Operation unsuccessful. See Macros for full list.

Parameters

[in] **pData** is the univariate time series data (a one dimensional array).
[in] **nSize** is the number of observations in pData.
[in] **nLag** is the lag order (e.g. k=0 (no lag), k=1 (1st lag), etc.).
[in] **alpha** is the statistical significance level. If missing, a default of 5% is assumed.
[in] **argMethod** is the statistical test to perform (1=Ljung-Box).
[in] **retType** is a switch to select the return output:

Method	Value	Description
TEST_PVALUE	1	P-Value
TEST_SCORE	2	Test statistics (aka score)
TEST_CRITICALVALUE	3	Critical value.

[out] **retVal** is the calculated test statistics.

Remarks

1. The time series is homogeneous or equally spaced.
2. The time series may include missing values (NaN) at either end.
3. The test hypothesis for white-noise: \[H_{o}: \rho_{1}=\rho_{2}=...=\rho_{m}=0\] \[H_{1}: \exists \rho_{k}\neq 0\] \[1\leq k \leq m\] Where:
   - \(H_{o}\) is the null hypothesis.
   - \(H_{1}\) is the alternate hypothesis.
   - \(\rho_k\) is the population autocorrelation function for lag k
   - \(m\) is the maximum number of lags included in the white-noise test.
4. The **Ljung Box test** modified \(Q^*(m)\) statistic is computed as: \[Q^* =T(T+2)\sum_{j=1}^{m}\frac{\hat\rho_{j}^2}{T-l}\] Where:
   - \(m\) is the maximum number of lags included in the test.
   - \(\hat\rho_j\) is the sample autocorrelation at lag j.
   - \(T\) is the number of non-missing values in the data sample.
5. The **Ljung Box test** modified \(Q^*\) statistic has an asymptotic chi-square distribution with \(m\) degrees of freedom and can be used to test the null hypothesis that the time series is not serially correlated. \[Q^*(m) \sim \chi_{\nu=m}^2()\] Where:

- $\chi_{\nu}^2()$ is the Chi-square probability distribution function.
- ν is the degrees of freedom for the Chi-square distribution.

6. The **Ljung Box test** is a suitable test for all sample sizes including small ones.
7. This is one-side (i.e. one-tail) test, so the computed p-value should be compared with the whole significance level (α).
8. In practice, the selection of m may affect the performance of the $Q(m)$ statistic. Several values of m are often used. Simulation studies suggest that the choice of $m\approx \ln(T)$ provides better power performance.

6. Special cases: By definition, $\hat{\rho}(0) \equiv 1.0$

Exceptions

Exception Type	Condition
None	N/A

Requirements

Namespace	NumXLAPI
Class	SFSDK
Scope	Public
Lifetime	Static
Package	NumXLAPI.DLL

Examples

References

Hull, John C.; Options, Futures and Other DerivativesFinancial Times/ Prentice Hall (2011), ISBN 978-0132777421

Hans-Peter Deutsch; , Derivatives and Internal Models, Palgrave Macmillan (2002), ISBN 0333977068

Hamilton, J .D.; Time Series Analysis , Princeton University Press (1994), ISBN 0-691-04289-6

Tsay, Ruey S.; Analysis of Financial Time Series John Wiley & SONS. (2005), ISBN 0-471-690740

See Also

[template("related")]