Package ‘InterNL’

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Type Package

Title Time Series Intervention Model Using Non-Linear Function

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Description Intervention analysis is used to investigate structural changes in data resulting from external events. Traditional time series intervention models, viz. Autoregressive Integrated Moving Average model with exogeneous variables (ARIMA-X) and Artificial Neural Networks with exogeneous variables (ANN-X), rely on linear intervention functions such as step or ramp functions, or their combinations. In this package, the Gompertz, Logistic, Monomolecular, Richard and Hoerl function have been used as non-linear intervention function. The equation of the above models are represented as: Gompertz: A * exp(-B * exp(-k * t)); Logistic: K / (1 + ((K - N0) / N0) * exp(-r * t)); Monomolecular: A * exp(-k * t); Richard: A + (K - A) / (1 + exp(-B * (C - t)))^(1/beta) and Hoerl: a*(b^t)*(t^c).This package introduced algorithm for time series intervention analysis employing ARIMA and ANN models with a non-linear intervention function. This package has been developed using algorithm of Yeasin et al. <doi:10.1016/j.hazadv.2023.100325> and Paul and Yeasin <doi:10.1371/journal.pone.0272999>.

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`InterNL` *Time Series Intervention Model Using Non-linear Function*

Description

Time Series Intervention Model Using Non-linear Function

Usage

```
InterNL(Data, Time, TSModel, TSOrder = NULL, NLModel, InitialNLM)
```

Arguments

`Data`	Time series data
`Time`	Point of intervention
`TSModel`	Time series model ("arima" or "ann")
`TSOrder`	If model is ANN, then order is lag of the model
`NLModel`	Non-linear models ("gompertz","logistic", "monomolecular", "richard", "hoerl")
`InitialNLM`	Initial value for parameters of non-linear model

Value

- Accuracy: Accuracy metric of the proposed model
- PreFitted: Fitted values for the pre intervention series
- PostFitted: Prediction for the post intervention series
- NLM: Details of fitted non-linear model

References

- Paul, R.K. and Yeasin, M., 2022. COVID-19 and prices of pulses in Major markets of India: Impact of nationwide lockdown. Plos one, 17(8), p.e0272999.
- Yeasin, M., Paul, R.K., Das, S., Deka, D. and Karak, T., 2023. Change in the air due to the coronavirus outbreak in four major cities of India: What do the statistics say?. Journal of Hazardous Materials Advances, 10, p.100325.

Examples

```
library("InterNL")
data<- as.ts(rnorm(120,100,50))
Result <- InterNL(Data = data,Time = 90, TSModel = "arima",
TSOrder=NULL, NLModel=NULL, InitialNLM=NULL )
```

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