

時間間隔對迴歸及相關分析之影響


研究生：賈容

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摘要



在進行時間數列分析前，研究人員常常需要決定應該使用何種資料頻率較為適當。為了能夠擁有較多的樣本觀測值，通常試著使用頻率較高的時間數列資料來作分析。然而，所獲得的研究資料其期間範圍和頻率經常是不相同的。常用的作法是將各資料的時間間隔依照其資料的特性（流量或存量變數）分別利用加總或採系統抽樣的方式轉換成相同頻率的資料。這樣一來，不僅會損失資料的某些訊息，也會影響到統計資料分析的決策與預測。

一般而言，一個時間數列不是流量變數就是存量變數。流量變數通常是由相同時間間隔的資料加總而得的，而存量變數則是藉由多期資料的平均或是來自於系統抽樣。另一方面，也考慮了多期資料相乘積所得的乘法型變數。本研究主要目的是研究時間間隔對於這四種不同型態的資料：加法型、乘法型、系統抽樣或多期平均，兩兩變數間相關性的影響；同時，也將此議題用在迴歸係數或偏迴歸係數的影響效果上。

本研究發現即使具有獨立且相同分配的隨機變數，其大部分相關係數的平方會隨著時間間隔的增加而降低，另外迴歸係數和偏迴歸係數亦受其影響。在迴歸

分析中，較長的時間間隔將會降低變數之間的相關性，特別是當被解釋變數為乘法型的時候。在作實証分析時，不應該忽略這些現象，否則所得的結果可能會導致偏誤的決策進而誤導其行為。這些結果可以廣泛地應用在迴歸及相關分析的多種領域中。

關鍵詞：時間間隔、相關係數、迴歸係數、偏迴歸係數



The Time Interval Effect on Regression and Correlation Analysis

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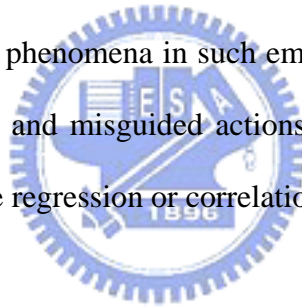
Abstract

In time series analysis of a given set of variables, practitioners often have to decide whether to use monthly, quarterly, or annual data. They usually try to use the time series data of the higher frequency in order to increase the number of observations. However, the data for such analyses are sometimes limited and available for different periodicities and different time spans. The standard approach is to change them to a common time interval through aggregation or systematic sampling, depending on whether the variables are flow variables or stock variables respectively. This approach, apart from losing information, may defeat the purpose of using the association between variables so as to make a correct decision or to forecast a key variable of interest.

Generally speaking, a time series variable is either a flow variable or a stock variable. The values of a flow variable are usually obtained through aggregation over equal time intervals. The data of stock variables are employed by aggregation to transfer various time intervals. Time aggregation involves either temporal aggregation or systematic sampling. On the other hand, we also consider the multiplicative variables that the series consists of products of the n one-period

variables. The objective of this work is to investigate the problem of the time interval effect of the association between two variables that are additive, multiplicative, systematically sampled or temporal aggregated. This study also discusses the time interval impact on the partial regression and correlation coefficients in multiple-regression models.

This dissertation considers the impact of such analyses even if they are independent, identically distributed (i.i.d.) variables over time. We find that most the squared correlation coefficients are decreasing as time interval increases. It can be also shown that regression coefficients and partial regression coefficients are affected by the selected time interval. The longer time intervals will decrease the relevant association between variables, particularly for the multiplicative dependent variable. We should not overlook these phenomena in such empirical analyses or it might lead to making incorrect decisions and misguided actions. These results can be widely applied in various fields where regression or correlation analyses are employed.



Keywords: time interval, correlation coefficient, regression coefficient, partial regression coefficient

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