

## SUMMARY OF Ph.D. DISSERTATION

School Fundamental Science and Technology	Student Identification Number	SURNAME, First name  BABA Kunihiro
Title Partial, Conditional and Multiplicative Correlation Coefficients		
Abstract  <p>In this thesis, we develop several theorems around the second moments of multivariate distribution. Equivalence between partial and conditional correlations and properties of multiplicative correlations are investigated.</p> <p>In Chapter 2, we investigate equivalence between partial and conditional correlation coefficients. The both correlation coefficients are measures of conditional dependence among variables, differently defined. However, those two measures become the same and the zero correlation coefficient is equivalent to the conditional independence of variables as far as the joint distribution is assumed to be a multivariate normal distribution. We derive a simple sufficient condition (Condition C) of the first and second conditional moments for the equivalence of partial and conditional correlations. An example of distribution for which the condition holds true is elliptical distribution. However such distributions are not restricted to a neighbor of multivariate normal distribution. It is shown that a semi group property of the family of distributions is a key to the equivalence. The Condition C is satisfied for the conditional distribution given the sum of independent samples.</p> <p>In Chapter 3, we investigate multiplicative correlation matrix like <math>diag(1 - \delta^2) \pm \delta\delta^T</math>, which is parameterized by a vector <math>\delta</math>. Necessary and sufficient conditions for feasible values of the parameter <math>\delta</math> are derived for positive and negative multiplicative correlation matrices. Implications of such type of correlation matrix for the second moment modeling are shown in two ways, factorization of random variables for positive multiplicative correlation and a sum constraint distribution for the negative multiplicative correlation. Several invariance properties of the multiplicative correlation are also shown.</p> <p>In Chapter 4, we investigate a family of multivariate distributions generated from natural exponential family. For two types of the generation, conditional distribution given the sum of independent samples and mixed natural exponential family with quadratic variance by the natural conjugate prior distribution, it is shown that the conditional correlation is multiplicative and the Condition C is satisfied as well.</p>		