III. Probability distribution

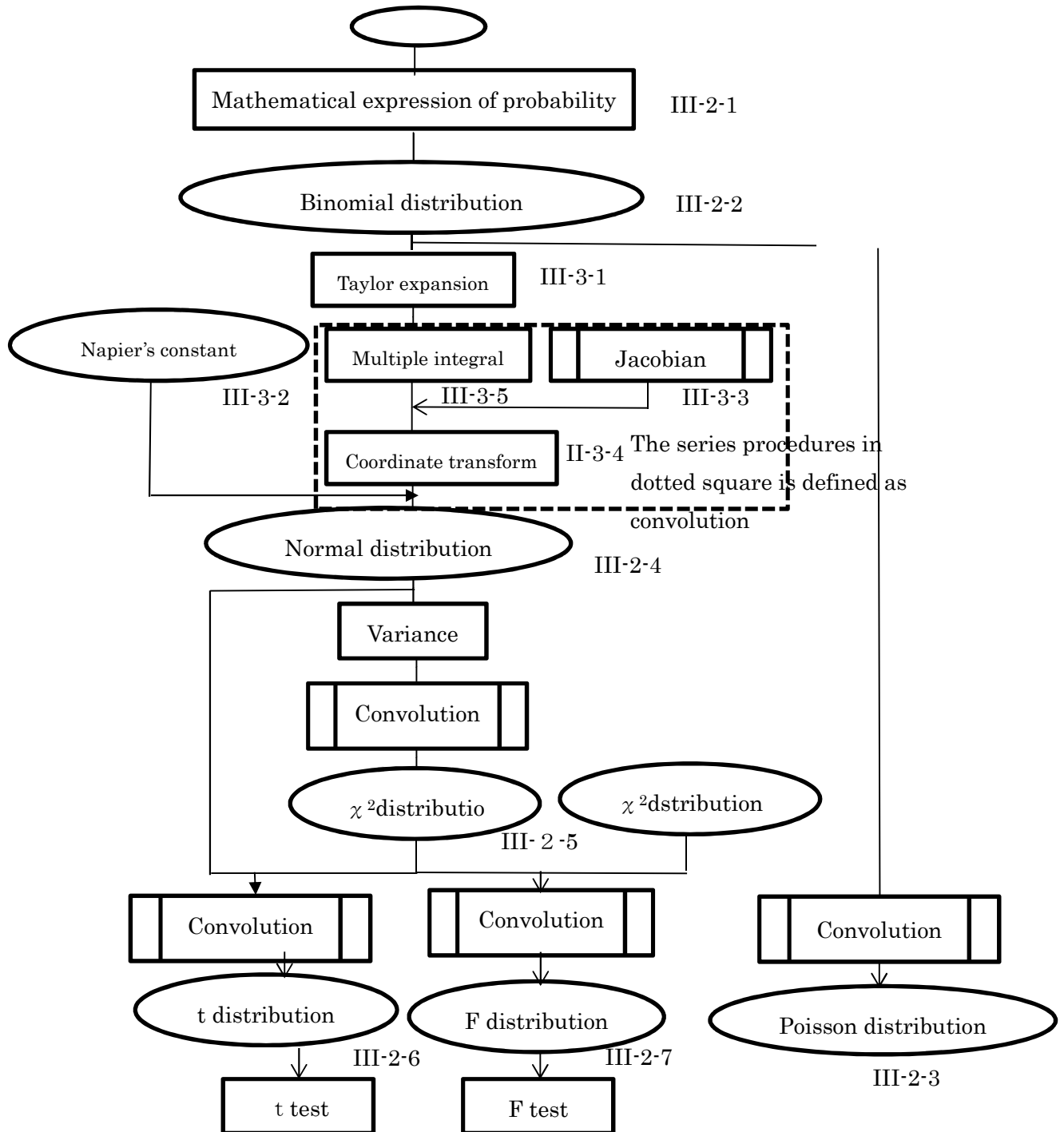## III-1. Relation among distribution models used in significant tests

Fig. 4. Relationship among several probability models

In section III-2, the author will explain the several typical probability models by deriving equations from definition of the model. Reading the processes, readers can understand the character of the models.

At first step, we will learn arithmetic operation of probability, then binomial distribution will be explained using the operations.   Following the first step, binomial distribution, a discontinuity function, will be expand to normal distribution and Poisson distribution, continuity functions. We need a model to express the probability of variance in normal distribution in order to enable analysis of variance. The model is chai square distribution. And then t distribution will be made combining chi square distribution and normal distribution, and F distribution will be made as a probability distribution of the ratio of two chi square distributions. In the process of transformation of equations, the author will use technique for simplification of long complicated equation using calculus (Taylor expansion), base of natural logarithm (Napier's constant), integration of function made by multiplication of two functions (multiple integral) and transformation of a integration to other integration (coordinate transform and Jacobian). The author compiles those mathematical techniques in section III-3. These mathematical techniques are taught in the lectures of mathematics in general education curriculum in universities (several simplified form of these mathematical topics are introduced in high school). For readers who did not learn these mathematical techniques before, sometimes it is difficult to understand all of them at once. The author recommends those readers to learn slowly and step by step. Slow and steady is most important in the learning of mathematics. If you cannot understand, it enough to accept only the results. You shall understand suddenly in some day in future.