# Note on the Moments of the Transformed Correlation

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Let $r$ be the correlation coefficient in the sample of size $n$ taken out of the bivariate normal population with the parent correlation $\rho$. R. A. Fisher*) has pointed out that the correlation may be transformed by the formulae,

$$z = \frac{1}{2}\log\frac{1+r}{1-r}, \qquad \zeta = \frac{1}{2}\log\frac{1+\rho}{1-\rho},$$

with some advantages, and has given the sampling moments for $x$, putting $z = \zeta + x$. But we are doubtful of some of his formulae for the sampling moments. Therefore, in the following we shall give the results of our calculation for these.

$$\mu_1' = \frac{\rho}{2(n-1)}\left\{1 + \frac{5+\rho^2}{4(n-1)} + \cdots\cdots\right\},$$

$$\mu_2' = \frac{1}{n-1}\left\{1 + \frac{8-\rho^2}{4(n-1)} + \frac{88-9\rho^2-9\rho^4}{24(n-1)^2} + \cdots\cdots\right\},$$

$$\mu_3' = \frac{3\rho}{2(n-1)^2}\left\{1 + \frac{13+2\rho^2}{4(n-1)} + \cdots\cdots\right\},$$

$$\mu_4' = \frac{3}{(n-1)^2}\left\{1 + \frac{28-3\rho^2}{6(n-1)} + \frac{736-84\rho^2-51\rho^4}{48(n-1)^2} + \cdots\cdots\right\};$$

$$\mu_2 = \frac{1}{n-1}\left\{1 + \frac{4-\rho^2}{2(n-1)} + \frac{22-6\rho^2-3\rho^4}{6(n-1)^2} + \cdots\cdots\right\},$$

$$\mu_3 = \frac{\rho^3}{(n-1)^3} + \cdots\cdots,$$

$$\mu_4 = \frac{3}{(n-1)^2}\left\{1 + \frac{14-3\rho^2}{3(n-1)} + \frac{184-48\rho^2-21\rho^4}{12(n-1)^2} + \cdots\cdots\right\};$$

$$\beta_1 = \frac{\rho^6}{(n-1)^3} + \cdots\cdots,$$

$$\beta_2 = 3 + \frac{2}{n-1} + \frac{4+2\rho^2-3\rho^4}{(n-1)^2} + \cdots\cdots.$$

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## REFERENCE

R. A. Fisher: On the "probable error" of a coefficient of correlation deduced from a small sample. Metron 1 (1921).