Numerator Relationship Matrix A

☐ Computation

- diagonal elements: $(A)_{ii} = (1+F_i) = 1 + \frac{1}{2}(A)_{sd}$

where s and d are known parents of i

and $(A)_{sd}$ stands for element in row s and column d of matrix A

- offdiagonal: $(A)_{ji} = \frac{1}{2}(A)_{js} + \frac{1}{2}(A)_{jd}$

where s and d are parents of i

$$cov(u_j, u_i) = (A)_{ji} \cdot \sigma_u^2 \; ; \; u_i = \frac{1}{2}u_s + \frac{1}{2}u_d + m_i$$

$$cov(u_j, u_i) = cov\left(u_j, \frac{1}{2}u_s + \frac{1}{2}u_d + m_i\right)$$

$$= cov\left(u_j, \frac{1}{2}u_s\right) + cov\left(u_j, \frac{1}{2}u_d\right)$$

$$= \frac{1}{2}(A)_{js} \cdot \sigma_u^2 + \frac{1}{2}(A)_{jd} \cdot \sigma_u^2$$

$$= \underbrace{\left[\frac{1}{2}(A)_{js} + \frac{1}{2}(A)_{jd}\right]}_{(A)_{ji}} \cdot \sigma_u^2$$