

1 Bivariate Populations

- Economists use pairs of random variates: (X, Y) , which take on distinct pairs: (X_j, Y_k) . So that:

$$p_{jk} = \Pr(X = X_j, Y = Y_k)$$

$$j = 1 \dots J, k = 1 \dots K.$$

- Summing over all element: $\sum_j \sum_k p_{jk} = 1$
- Look at 2 examples: bond yields & returns to education.
- Calculate probabilities according to each j and k .
- Calculate expected values:

$$E(Z) = \sum_j \sum_k h(X_j, Y_k) p_{jk}$$

- Direct relationship between the bivariate and the univariate PDF's:
- Marginal PDF:

$$\Pr(X = X_j) = p_{1j} + p_{2j} + \dots + p_{Kj} = \sum_k p_{jk}$$

- Conditional PDF:

$$f(Y|X) = P(Y = y|X = x) = \frac{f(X, Y)}{f(X)}$$

- Conditional PDF is crucial for understanding the regression technique. Explored in spreadsheet: L5_1.xls.
- Important point to take away from today's lecture: although OLS is an averaging technique, in terms of probability it is asking a conditioning statement of the data. This different from the conditional mean calculation from Lecture 1.