

## Probability Review

$$E(M) = (0 \times 0.8) + (1 \times 0.1) + \dots + (4 \times 0.01)$$

Probability, expected value, and variance

|      | M (# comp. crash) |     |      |      |      |
|------|-------------------|-----|------|------|------|
|      | M=0               | M=1 | M=2  | M=3  | M=4  |
| P(M) | 0.8               | 0.1 | 0.06 | 0.03 | 0.01 |

$$= 0.35$$

$$v(M) = [(0 - 0.35)^2 \times 0.8] + \dots + [(4 - 0.35)^2 \times 0.01] = 0.6475$$

# Probability Review (cont.)

$$P(A=0, M=0) = 0.35 \text{ (joint prob.)}$$

$$P(A=0) = P(A=0, M=0) + \dots + P(A=0, M=4)$$

*margin. prob.*

Joint, marginal, and conditional probabilities

|           | M (# comp. crash) |       |      |       |      | Total |
|-----------|-------------------|-------|------|-------|------|-------|
|           | M=0               | M=1   | M=2  | M=3   | M=4  |       |
| Old (A=0) | 0.35              | 0.065 | 0.05 | 0.025 | 0.01 | 0.5   |
| New (A=1) | 0.45              | 0.035 | 0.01 | 0.005 | 0.00 | 0.5   |
| Total     | 0.8               | 0.1   | 0.06 | 0.03  | 0.01 | 1     |

$$= 0.5$$

$$P(M=0 | A=0) = \frac{P(M=0, A=0)}{P(A=0)} = \frac{0.35}{0.5} = 0.7$$

## Probability Review (cont.)

$$E(M | A=0) = [0 \times P(M=0 | A=0)] + \dots + [4 \times P(M=4 | A=0)]$$

Conditional expectation

|           | M (# comp. crash) |       |      |       |      |       |
|-----------|-------------------|-------|------|-------|------|-------|
|           | M=0               | M=1   | M=2  | M=3   | M=4  | Total |
| Old (A=0) | 0.35              | 0.065 | 0.05 | 0.025 | 0.01 | 0.5   |
| New (A=1) | 0.45              | 0.035 | 0.01 | 0.005 | 0.00 | 0.5   |
| Total     | 0.8               | 0.1   | 0.06 | 0.03  | 0.01 | 1     |

= 0.56

$$E(M | A=1) = [0 \times P(M=0 | A=1)] + \dots +$$

$$E(M | A) \quad [4 \times P(M=4 | A=1)] = 0.14$$

depends on A .

# Probability Review (cont.)

$$V(M | A=0) = \left[ (0 - E(M | A=0))^2 \times P(M=0 | A=0) \right]$$

$V(M | A=1)$   
 Conditional variance = 0.22

|           | M (# comp. crash) |       |      |       |      |       |
|-----------|-------------------|-------|------|-------|------|-------|
|           | M=0               | M=1   | M=2  | M=3   | M=4  | Total |
| Old (A=0) | 0.35              | 0.065 | 0.05 | 0.025 | 0.01 | 0.5   |
| New (A=1) | 0.45              | 0.035 | 0.01 | 0.005 | 0.00 | 0.5   |
| Total     | 0.8               | 0.1   | 0.06 | 0.03  | 0.01 | 1     |

$$+ \dots + \left[ (4 - E(M | A=0))^2 \times P(M=4 | A=0) \right]$$

$= 0.99$   $V(M | A)$  depends on  $A$ .

# Econometrics and the Notion of Ceteris Paribus

↳ statistical methods for  
estimating econ. rel'n.  
testing " theories

- Econometrics
- Econometrics: The Path from Cause to Effect
  - ▶ <https://www.youtube.com/watch?v=WwW8y5dZs80>
- Ceteris Paribus: Public vs. Private University
  - ▶ [https://www.youtube.com/watch?v=iPBV3B1V7jk&list=PL-uRhZ\\_p-BM5ovNRg-G6hDib270CvcyW8&index=2](https://www.youtube.com/watch?v=iPBV3B1V7jk&list=PL-uRhZ_p-BM5ovNRg-G6hDib270CvcyW8&index=2)
- Data

evaluating policies

Econometrics

→ analyzing cause & effect

→ forecasting