Elasticity

Econ 50 | Lecture 3 | January 12, 2013


95 mg/dL
400
350
300
250
200
150
100
50
11:00 AM
12:00 PM
12:15 PM
Dexcom

What is elasticity?

What is elasticity?

a **measure** of the **responsiveness**

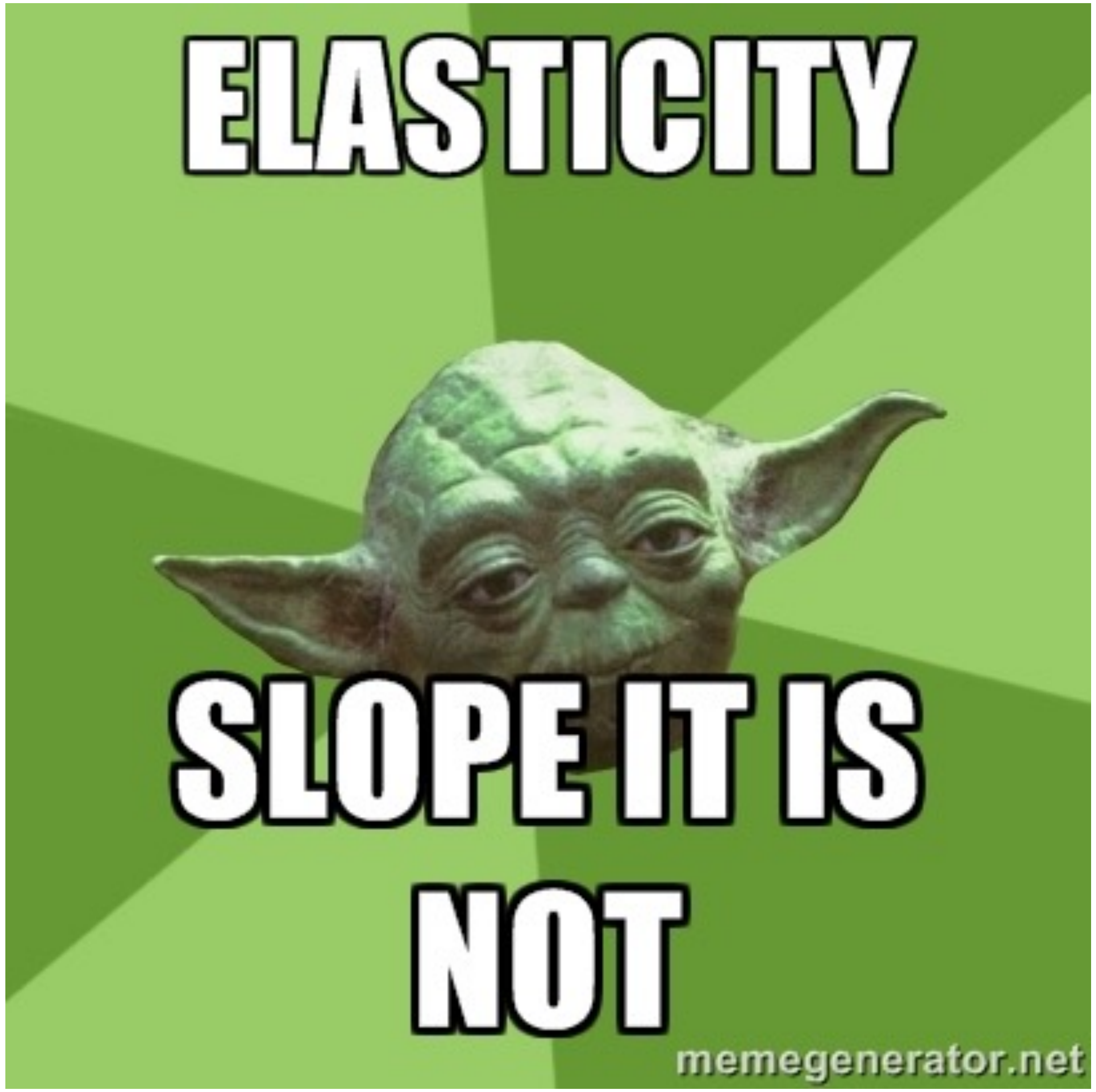
of an **endogenous variable**

to a change in an **exogenous variable**.

What is elasticity not?

What is elasticity not?

ELASTICITY IS NOT SLOPE


ELASTICITY
SLOPE IT IS NOT
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Comparative Statics

change in **exogenous variable**

$$\downarrow$$

change in **endogenous variables**

Comparative Statics: Examples

- An **increase in price** leads to a **decrease in quantity demanded**
- An **increase in price** leads to an **increase in quantity supplied**
- If X and Y are complements, an **increase in the price of good X** leads to a **decrease in quantity demanded of good Y**
- If X and Y are substitutes, an **increase in the price of good X** leads to an **increase in quantity demanded of good Y**

Comparative Statics: Demand

$$\frac{\partial Q_X^D(P_X, P_Y, I, \ldots)}{\partial P_Y} > 0$$

$$\frac{\partial Q_X^D(P_X, P_Y, I, \ldots)}{\partial I} < 0$$

$$\frac{\partial Q_X^D(P_X, P_Y, I, \ldots)}{\partial P_Y} < 0$$

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Comparative Statics: Demand

SUBSTITUTES

$$\frac{\partial Q_X^D(P_X, P_Y, I, \dots)}{\partial P_Y} > 0$$

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Comparative Statics: Demand

SUBSTITUTES

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$$\frac{\partial Q_X^D(P_X, P_Y, I, \ldots)}{\partial I} < 0$$

COMPLEMENTS

$$\frac{\partial Q_X^D(P_X, P_Y, I, \ldots)}{\partial P_Y} < 0$$

$$\frac{\partial Q_X^D(P_X, P_Y, I, \ldots)}{\partial I} > 0$$

Comparative Statics: Demand

SUBSTITUTES

$$\frac{\partial Q_X^D(P_X, P_Y, I, \ldots)}{\partial P_Y} > 0$$

INFERIOR

$$\frac{\partial Q_X^D(P_X, P_Y, I, \ldots)}{\partial I} < 0$$

COMPLEMENTS

$$\frac{\partial Q_X^D(P_X, P_Y, I, \ldots)}{\partial P_Y} < 0$$

$$\frac{\partial Q_X^D(P_X, P_Y, I, \ldots)}{\partial I} > 0$$

Comparative Statics: Demand

SUBSTITUTES

$$\frac{\partial Q_X^D(P_X, P_Y, I, \dots)}{\partial P_Y} > 0$$

INFERIOR

$$\frac{\partial Q_X^D(P_X, P_Y, I, \dots)}{\partial I} < 0$$

COMPLEMENTS

$$\frac{\partial Q_X^D(P_X, P_Y, I, \dots)}{\partial P_Y} < 0$$

NORMAL

$$\frac{\partial Q_X^D(P_X, P_Y, I, \dots)}{\partial I} > 0$$

Elasticity

$$\frac{\text{\% change in some } \textbf{endogenous variable}}{\text{\% change in some } \textbf{exogenous variable}}$$

Price Elasticity of Demand

$$\frac{\%\ \text{change in } \textbf{quantity demanded}}{\%\ \text{change in } \textbf{price}}$$

Cross-Price Elasticity of Demand

$$\frac{\%\text{ change in }\textbf{quantity demanded of X}}{\%\text{ change in }\textbf{price of Y}}$$

Income Elasticity of Demand

$$\frac{\text{\% change in } \textbf{quantity demanded}}{\text{\% change in } \textbf{income}}$$

Price Elasticity of Supply

$$\frac{\%\ \text{change in } \textbf{quantity supplied}}{\%\ \text{change in } \textbf{price}}$$


I DON'T ALWAYS CALCULATE ELASTICITIES
BUT WHEN I DO, I KNOW THEY'RE NOT SLOPE
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Calculating Elasticities

- Midpoint method
- Point method
- Log-log method

Midpoint Method

$$\frac{\%\Delta Y}{\%\Delta X} = \frac{\frac{\Delta Y}{Y_M}}{\frac{\Delta X}{X_M}} = \frac{\frac{Y_1 - Y_0}{\frac{1}{2}(Y_0 + Y_1)}}{\frac{X_1 - X_0}{\frac{1}{2}(X_0 + X_1)}}$$

Point Method

$$\frac{\%\Delta Y}{\%\Delta X} = \frac{\frac{dY}{Y}}{\frac{dX}{X}} = \frac{dY}{dX} \times \frac{X}{Y}$$

Point Method

SLOPE

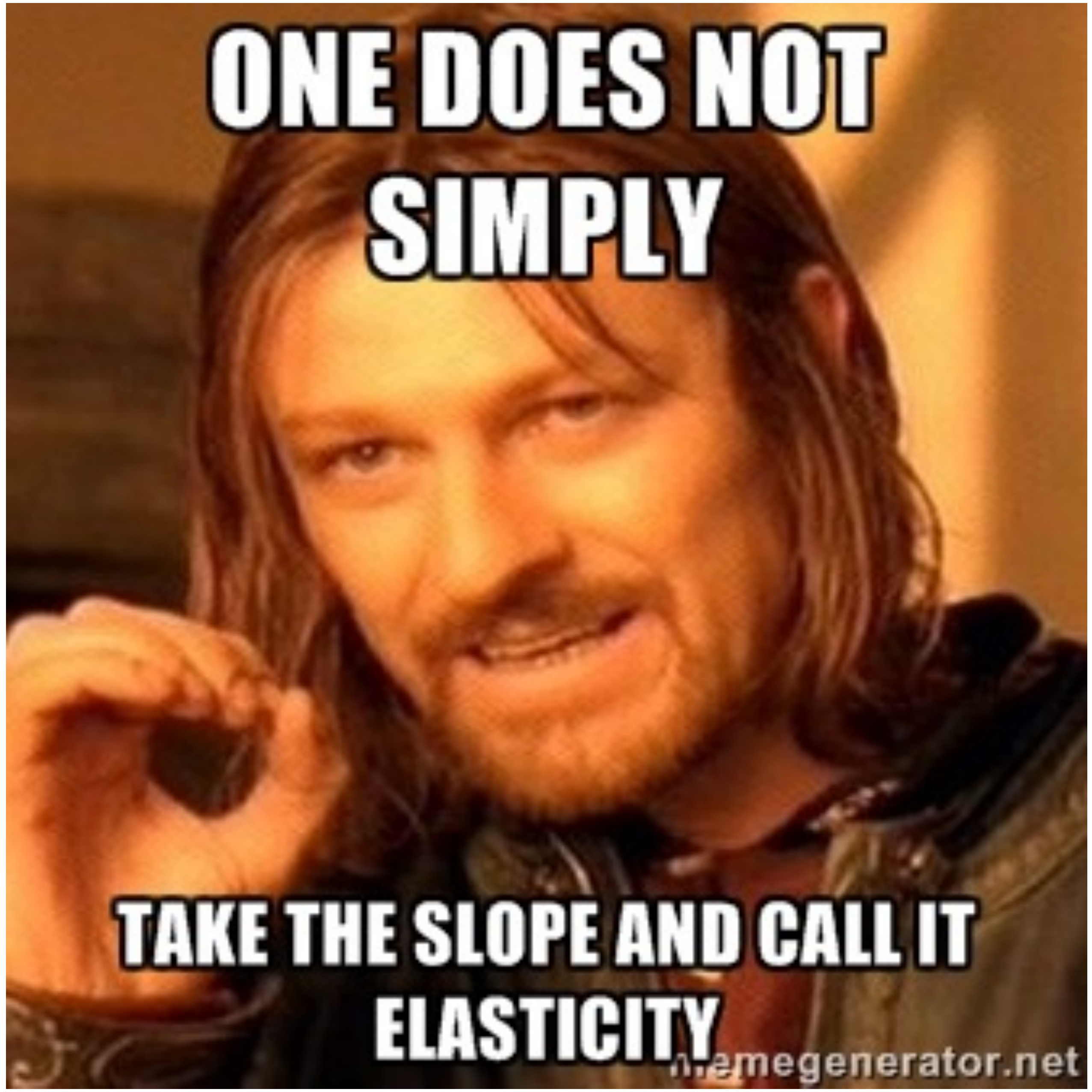
$$\frac{\%\Delta Y}{\%\Delta X} = \frac{\frac{dY}{Y}}{\frac{dX}{X}} = \frac{dY}{dX} \times \frac{X}{Y}$$

Point Method

SLOPE

$$\frac{\%\Delta Y}{\%\Delta X} = \frac{\frac{dY}{Y}}{\frac{dX}{X}} = \frac{dY}{dX} \times \frac{X}{Y}$$

ELASTICITY


ONE DOES NOT SIMPLY
TAKE THE SLOPE AND CALL IT ELASTICITY
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Log-Log Method

$$\frac{\%\Delta Y}{\%\Delta X} = \frac{d\ln Y}{d\ln X}$$

$$Q_x = aP_x^2 I^{\frac{3}{2}} w^{-\frac{1}{3}} N_C^{\frac{1}{2}} N_F^{\frac{1}{2}}$$

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$$\ln Q_x = \ln a + 2\ln P_x + \frac{3}{2}\ln I - \frac{1}{3}\ln w + \frac{1}{2}\ln N_C + \frac{1}{2}\ln N_F$$

$$Q_x = aP_x^2 I^{\frac{3}{2}} w^{-\frac{1}{3}} N_C^{\frac{1}{2}} N_F^{\frac{1}{2}}$$

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$$Q_x = aP_x^{2} I^{\frac{3}{2}} w^{-\frac{1}{3}} N_C^{\frac{1}{2}} N_F^{\frac{1}{2}}$$

$$\ln Q_x = \ln a + 2 \ln P_x + \frac{3}{2} \ln I - \frac{1}{3} \ln w + \frac{1}{2} \ln N_C + \frac{1}{2} \ln N_F$$

$$\frac{\partial \ln Q_x}{\partial \ln P_x} = 2 \qquad \frac{\partial \ln Q_x}{\partial \ln w} = -\frac{1}{3}$$