

FOR EACH OF THE FOLLOWING SITUATIONS, 1) FIND THE MARGINAL RATE OF SUBSTITUTION AT THE GIVEN BUNDLE,

FOR EACH OF THE FOLLOWING SITUATIONS, 1) FIND THE MARGINAL RATE OF SUBSTITUTION AT THE GIVEN BUNDLE,

UNDERSTANDING THE MARGINAL RATE OF SUBSTITUTION (MRS) IS FUNDAMENTAL IN CONSUMER CHOICE THEORY WITHIN MICROECONOMICS. THE MRS MEASURES THE RATE AT WHICH A CONSUMER IS WILLING TO SUBSTITUTE ONE GOOD FOR ANOTHER WHILE MAINTAINING THE SAME LEVEL OF OVERALL SATISFACTION OR UTILITY. IT REFLECTS THE CONSUMER'S PREFERENCES AND THE TRADE-OFFS THEY ARE WILLING TO MAKE BETWEEN DIFFERENT GOODS. IN PRACTICAL TERMS, THE MRS AT A SPECIFIC BUNDLE INDICATES HOW MANY UNITS OF ONE GOOD THE CONSUMER IS PREPARED TO GIVE UP TO OBTAIN AN ADDITIONAL UNIT OF ANOTHER GOOD WITHOUT CHANGING THEIR UTILITY LEVEL. THIS ARTICLE EXPLORES VARIOUS SITUATIONS WHERE WE NEED TO FIND THE MRS AT A GIVEN BUNDLE, PROVIDING DETAILED EXPLANATIONS, FORMULAS, AND STEP-BY-STEP APPROACHES TO CALCULATING IT.

UNDERSTANDING THE CONCEPT OF MARGINAL RATE OF SUBSTITUTION

DEFINITION AND INTUITION

THE MARGINAL RATE OF SUBSTITUTION (MRS) IS DEFINED AS:

- THE SLOPE OF THE INDIFFERENCE CURVE AT A SPECIFIC POINT (BUNDLE).
- THE RATE AT WHICH A CONSUMER IS WILLING TO SUBSTITUTE GOOD X FOR GOOD Y.
- THE AMOUNT OF GOOD Y THAT A CONSUMER IS WILLING TO GIVE UP FOR AN ADDITIONAL UNIT OF GOOD X, KEEPING UTILITY CONSTANT.

IN MATHEMATICAL TERMS, IF THE CONSUMER'S UTILITY FUNCTION IS $U(x, y)$, THEN THE MRS OF X FOR Y IS:

$$MRS_{XY} = - \frac{\partial U / \partial x}{\partial U / \partial y}$$

WHICH SIMPLIFIES TO:

$$MRS_{XY} = \frac{MU_x}{MU_y}$$

WHERE:

- MU_x IS THE MARGINAL UTILITY OF GOOD X.
- MU_y IS THE MARGINAL UTILITY OF GOOD Y.

NOTE: THE NEGATIVE SIGN INDICATES THE DOWNWARD SLOPE OF THE INDIFFERENCE CURVE, BUT OFTEN THE MAGNITUDE OF THE MRS IS CONSIDERED FOR SIMPLICITY.

SIGNIFICANCE OF THE MRS

- IT SHOWS THE CONSUMER'S WILLINGNESS TO SUBSTITUTE BETWEEN GOODS.
- IT VARIES ALONG AN INDIFFERENCE CURVE—GENERALLY DECREASING AS THE CONSUMER HAS MORE OF ONE GOOD.
- IT HELPS DETERMINE CONSUMER EQUILIBRIUM WHEN COMBINED WITH BUDGET CONSTRAINTS.

CALCULATING THE MARGINAL RATE OF SUBSTITUTION IN DIFFERENT

SITUATIONS

SITUATION 1: UTILITY FUNCTION GIVEN

SUPPOSE A CONSUMER'S UTILITY FUNCTION IS KNOWN, AND THE BUNDLE IS SPECIFIED.

EXAMPLE:

UTILITY FUNCTION: $U(x, y) = x^{0.5} y^{0.5}$

GIVEN BUNDLE: $(x, y) = (4, 9)$

STEP-BY-STEP CALCULATION:

1. FIND MARGINAL UTILITIES:

$$MU_x = \frac{\partial U}{\partial x} = 0.5 x^{-0.5} y^{0.5}$$

$$MU_y = \frac{\partial U}{\partial y} = 0.5 x^{0.5} y^{-0.5}$$

2. EVALUATE MARGINAL UTILITIES AT THE BUNDLE:

$$MU_x = 0.5 \times 4^{-0.5} \times 9^{0.5} = 0.5 \times \frac{1}{2} \times 3 = 0.5 \times 0.5 \times 3 = 0.75$$

$$MU_y = 0.5 \times 4^{0.5} \times 9^{-0.5} = 0.5 \times 2 \times \frac{1}{3} = 0.5 \times 2 \times 0.333... = 0.333...$$

3. CALCULATE MRS:

$$MRS_{xy} = \frac{MU_x}{MU_y} = \frac{0.75}{0.333...} \approx 2.25$$

INTERPRETATION:

AT THE BUNDLE (4, 9), THE CONSUMER IS WILLING TO GIVE UP APPROXIMATELY 2.25 UNITS OF Y TO GET ONE ADDITIONAL UNIT OF X, MAINTAINING THE SAME UTILITY.

SITUATION 2: INDIFFERENCE CURVE EQUATION KNOWN

IF THE INDIFFERENCE CURVE IS EXPLICITLY GIVEN, THE MRS CAN BE DERIVED DIRECTLY AS THE NEGATIVE SLOPE OF THE CURVE.

EXAMPLE:

INDIFFERENCE CURVE: $y = \frac{k}{x}$

GIVEN BUNDLE: $(x, y) = (3, 4)$

STEP-BY-STEP CALCULATION:

1. DIFFERENTIATE THE INDIFFERENCE CURVE:

$$y = \frac{k}{x}$$

$$\frac{dy}{dx} = -\frac{k}{x^2}$$

2. COMPUTE THE SLOPE AT THE GIVEN POINT:

- FIND k :

$$y = \frac{k}{x} \rightarrow 4 = \frac{k}{3} \rightarrow k = 12$$

- THEN,

$$\left[\frac{dy}{dx} = -\frac{12}{(3)^2} = -\frac{12}{9} = -\frac{4}{3} \right]$$

3. FIND MRS:

$$\left[\text{MRS}_{xy} = -\frac{dy}{dx} = \frac{4}{3} \right]$$

INTERPRETATION:

THE MRS AT THIS BUNDLE IS $\left(\frac{4}{3} \right)$, MEANING THE CONSUMER IS WILLING TO GIVE UP $\frac{4}{3}$ UNITS OF Y FOR AN ADDITIONAL UNIT OF X.

SITUATION 3: COBB-DOUGLAS UTILITY FUNCTION

COBB-DOUGLAS UTILITY FUNCTIONS ARE COMMON IN CONSUMER THEORY.

EXAMPLE:

$$\text{UTILITY FUNCTION: } \left(U(x, y) = x^A y^B \right)$$

$$\text{GIVEN BUNDLE: } \left((x, y) = (x_0, y_0) \right)$$

STEP-BY-STEP CALCULATION:

1. MARGINAL UTILITIES:

$$- \left(MU_x = A x^{A-1} y^B \right)$$

$$- \left(MU_y = B x^A y^{B-1} \right)$$

2. CALCULATE AT THE GIVEN BUNDLE:

$$\left[MU_x = A x_0^{A-1} y_0^B \right]$$

$$\left[MU_y = B x_0^A y_0^{B-1} \right]$$

3. DETERMINE MRS:

$$\left[\text{MRS}_{xy} = \frac{MU_x}{MU_y} = \frac{A x_0^{A-1} y_0^B}{B x_0^A y_0^{B-1}} = \frac{A}{B} \times \frac{y_0}{x_0} \right]$$

EXAMPLE CALCULATION:

SUPPOSE $\left(A = 0.4 \right)$, $\left(B = 0.6 \right)$, AND THE BUNDLE IS $\left((x, y) = (2, 8) \right)$:

$$\left[\text{MRS}_{xy} = \frac{0.4}{0.6} \times \frac{8}{2} = \frac{2}{3} \times 4 = \frac{8}{3} \approx 2.67 \right]$$

INTERPRETATION:

THE CONSUMER IS WILLING TO GIVE UP APPROXIMATELY 2.67 UNITS OF Y TO GAIN ONE ADDITIONAL UNIT OF X AT THIS BUNDLE.

ADDITIONAL CONSIDERATIONS IN FINDING THE MRS

BEHAVIOR ALONG INDIFFERENCE CURVES

- THE MRS TYPICALLY DIMINISHES AS THE CONSUMER HAS MORE OF ONE GOOD AND LESS OF THE OTHER, REFLECTING DIMINISHING MARGINAL UTILITY.
- IN MOST CASES, THE INDIFFERENCE CURVES ARE CONVEX TO THE ORIGIN, WHICH INFLUENCES THE SHAPE AND SLOPE.

DIFFERENT UTILITY FUNCTIONS AND THEIR IMPACT

- COBB-DOUGLAS: THE MRS DEPENDS ON THE RATIO OF QUANTITIES AND THE EXPONENTS.
- PERFECT SUBSTITUTES: THE MRS IS CONSTANT, INDICATING A STRAIGHT-LINE INDIFFERENCE CURVE.
- PERFECT COMPLEMENTS: THE MRS IS ZERO OR UNDEFINED ALONG THE INDIFFERENCE CURVE, REFLECTING FIXED PROPORTIONS.

GRAPHICAL INTERPRETATION

- THE MRS AT A POINT IS THE SLOPE OF THE TANGENT LINE TO THE INDIFFERENCE CURVE AT THAT POINT.
- STEEPER SLOPES INDICATE A HIGHER MRS, MEANING THE CONSUMER IS WILLING TO GIVE UP MORE OF THE SECOND GOOD FOR THE FIRST.

CONCLUSION

FINDING THE MARGINAL RATE OF SUBSTITUTION AT A GIVEN BUNDLE INVOLVES UNDERSTANDING THE CONSUMER'S UTILITY FUNCTION, THE NATURE OF THEIR PREFERENCES, AND THE SPECIFIC POINT IN QUESTION. WHETHER THROUGH DERIVATIVES OF UTILITY FUNCTIONS, SLOPES OF INDIFFERENCE CURVES, OR ALGEBRAIC MANIPULATION, THE PROCESS CONSISTENTLY AIMS TO QUANTIFY THE CONSUMER'S WILLINGNESS TO SUBSTITUTE BETWEEN GOODS WITHOUT CHANGING THEIR OVERALL SATISFACTION. MASTERY OF THIS CONCEPT ENABLES ECONOMISTS AND DECISION-MAKERS TO ANALYZE CONSUMER BEHAVIOR, PREDICT RESPONSES TO PRICE CHANGES, AND UNDERSTAND MARKET DYNAMICS MORE DEEPLY. THE ABILITY TO COMPUTE THE MRS ACCURATELY ACROSS VARIOUS SITUATIONS IS ESSENTIAL FOR DEVELOPING EFFECTIVE ECONOMIC MODELS AND MAKING INFORMED POLICY DECISIONS.

FREQUENTLY ASKED QUESTIONS

IN THE CONTEXT OF CONSUMER CHOICE THEORY, HOW DO YOU CALCULATE THE MARGINAL RATE OF SUBSTITUTION (MRS) AT A GIVEN BUNDLE?

THE MRS AT A GIVEN BUNDLE IS CALCULATED AS THE NEGATIVE RATIO OF THE MARGINAL UTILITIES OF THE TWO GOODS, OFTEN EXPRESSED AS $MRS = - (MU_x / MU_y)$, WHICH INDICATES THE RATE AT WHICH THE CONSUMER IS WILLING TO SUBSTITUTE ONE GOOD FOR ANOTHER WHILE MAINTAINING THE SAME LEVEL OF UTILITY.

GIVEN A BUNDLE WHERE THE CONSUMER HAS 4 UNITS OF GOOD X AND 6 UNITS OF GOOD Y, AND THE MARGINAL UTILITIES ARE $MU_x = 10$ AND $MU_y = 15$, HOW DO YOU FIND THE MRS AT THIS BUNDLE?

THE MRS AT THIS BUNDLE IS CALCULATED AS $MRS = - (MU_x / MU_y) = - (10 / 15) = - (2/3)$. THIS INDICATES THE CONSUMER IS WILLING TO GIVE UP $2/3$ OF GOOD Y TO GAIN ONE ADDITIONAL UNIT OF GOOD X WHILE REMAINING INDIFFERENT.

WHY IS THE MARGINAL RATE OF SUBSTITUTION IMPORTANT WHEN ANALYZING CONSUMER PREFERENCES AT A SPECIFIC BUNDLE?

THE MRS REVEALS THE CONSUMER'S WILLINGNESS TO SUBSTITUTE BETWEEN GOODS AT A PARTICULAR BUNDLE, REFLECTING THEIR PREFERENCES AND TRADE-OFFS. IT HELPS DETERMINE THE CONSUMER'S MARGINAL WILLINGNESS TO GIVE UP ONE GOOD FOR ANOTHER WITHOUT CHANGING THEIR OVERALL SATISFACTION.

HOW DOES THE MRS CHANGE AS WE MOVE ALONG AN INDIFFERENCE CURVE, AND WHAT DOES THIS IMPLY FOR THE CONSUMER'S PREFERENCES?

GENERALLY, THE MRS DIMINISHES AS WE MOVE ALONG AN INDIFFERENCE CURVE, ILLUSTRATING THE PRINCIPLE OF DIMINISHING MARGINAL RATE OF SUBSTITUTION. THIS MEANS CONSUMERS ARE WILLING TO GIVE UP LESS OF ONE GOOD TO OBTAIN ADDITIONAL UNITS OF ANOTHER AS THEY HAVE MORE OF THE SECOND GOOD, REFLECTING THEIR DECREASING MARGINAL UTILITY.

IF AT A CERTAIN BUNDLE, THE MARGINAL UTILITIES ARE $MU_x=8$ AND $MU_y=4$, WHAT IS THE MRS, AND WHAT DOES IT TELL US ABOUT THE CONSUMER'S PREFERENCES?

THE MRS IS $-(MU_x / MU_y) = -(8 / 4) = -2$. THIS INDICATES THE CONSUMER IS WILLING TO GIVE UP 2 UNITS OF GOOD Y TO GAIN ONE ADDITIONAL UNIT OF GOOD X, SHOWING THEIR RELATIVE VALUATION OF THE TWO GOODS AT THAT BUNDLE.

WHEN ANALYZING MULTIPLE BUNDLES, HOW CAN THE MRS HELP DETERMINE THE CONSUMER'S OPTIMAL CHOICE?

BY COMPARING THE MRS AT DIFFERENT BUNDLES TO THE PRICE RATIO OF THE GOODS, CONSUMERS CAN IDENTIFY THE POINT WHERE THEIR MARGINAL RATE OF SUBSTITUTION EQUALS THE RATIO OF PRICES. THIS POINT TYPICALLY SIGNIFIES THE OPTIMAL CONSUMPTION BUNDLE WHERE UTILITY IS MAXIMIZED GIVEN THEIR BUDGET CONSTRAINT.

ADDITIONAL RESOURCES

UNDERSTANDING THE MARGINAL RATE OF SUBSTITUTION (MRS) AT A GIVEN BUNDLE: A COMPREHENSIVE GUIDE

THE MARGINAL RATE OF SUBSTITUTION (MRS) IS A FUNDAMENTAL CONCEPT IN MICROECONOMICS THAT CAPTURES CONSUMERS' PREFERENCES AND THEIR WILLINGNESS TO SUBSTITUTE ONE GOOD FOR ANOTHER WHILE MAINTAINING THE SAME LEVEL OF SATISFACTION OR UTILITY. WHEN ANALYZING SPECIFIC BUNDLES OF GOODS, UNDERSTANDING HOW TO COMPUTE AND INTERPRET THE MRS PROVIDES DEEP INSIGHTS INTO CONSUMER CHOICE BEHAVIOR, INDIFFERENCE CURVES, AND THE NATURE OF PREFERENCES.

THIS GUIDE DELVES INTO THE PROCESS OF CALCULATING THE MRS AT VARIOUS GIVEN BUNDLES, EXPLORING THE THEORETICAL FOUNDATION, PRACTICAL CALCULATION METHODS, AND IMPLICATIONS IN DIFFERENT SCENARIOS. WHETHER YOU'RE AN ECONOMICS STUDENT, RESEARCHER, OR ENTHUSIAST, THIS DETAILED EXPLORATION AIMS TO CLARIFY HOW TO FIND THE MRS AT EACH SPECIFIED BUNDLE.

1. FUNDAMENTAL CONCEPT OF MARGINAL RATE OF SUBSTITUTION

1.1 WHAT IS THE MRS?

THE MARGINAL RATE OF SUBSTITUTION BETWEEN TWO GOODS, SAY GOOD X AND GOOD Y, AT A PARTICULAR BUNDLE, IS THE RATE AT WHICH A CONSUMER IS WILLING TO GIVE UP UNITS OF ONE GOOD (Y) TO OBTAIN ADDITIONAL UNITS OF THE OTHER GOOD (X), WITHOUT CHANGING THEIR OVERALL UTILITY.

MATHEMATICALLY:

$$\text{MRS}_{XY} = - \frac{\partial U / \partial X}{\partial U / \partial Y}$$

\]

WHERE U IS THE UTILITY FUNCTION.

INTERPRETATION:

- THE NEGATIVE SIGN INDICATES THE TYPICAL DOWNWARD SLOPE OF INDIFFERENCE CURVES.
- MRS MEASURES THE SLOPE OF THE INDIFFERENCE CURVE AT A SPECIFIC POINT (BUNDLE).

1.2 WHY IS MRS IMPORTANT?

- CONSUMER PREFERENCES: IT REFLECTS HOW CONSUMERS PRIORITIZE GOODS RELATIVE TO EACH OTHER.
- INDIFFERENCE CURVES: THE SLOPE OF INDIFFERENCE CURVES AT ANY POINT IS THE MRS.
- OPTIMAL CHOICE: CONSUMERS MAXIMIZE UTILITY WHERE THEIR BUDGET CONSTRAINT IS TANGENT TO AN INDIFFERENCE CURVE, WHICH INVOLVES EQUATING THE MRS TO THE PRICE RATIO.

1.3 KEY PROPERTIES OF MRS

- DIMINISHING MRS: USUALLY, AS YOU CONSUME MORE OF ONE GOOD, THE MRS DECREASES—REFLECTING THE PRINCIPLE OF DIMINISHING MARGINAL UTILITY.
- SIGNIFICANCE OF SIGN: THE NEGATIVE SIGN INDICATES THE TRADE-OFF, BUT IN MANY CONTEXTS, THE MAGNITUDE ALONE IS CONSIDERED.

2. METHODS FOR FINDING THE MRS AT A GIVEN BUNDLE

2.1 ANALYTICAL APPROACH

- USING UTILITY FUNCTIONS: IF THE EXPLICIT UTILITY FUNCTION $U(x, y)$ IS KNOWN, COMPUTE THE PARTIAL DERIVATIVES $\frac{\partial U}{\partial x}$ AND $\frac{\partial U}{\partial y}$.

- FORMULA APPLICATION:

$$MRS_{xy} = - \frac{\frac{\partial U}{\partial x}}{\frac{\partial U}{\partial y}}$$

- INTERPRETATION: THE RATIO OF MARGINAL UTILITIES.

2.2 GRAPHICAL APPROACH

- INDIFFERENCE CURVES: VISUALIZE THE INDIFFERENCE CURVE PASSING THROUGH THE GIVEN BUNDLE.
- TANGENT LINE: FIND THE SLOPE OF THE TANGENT AT THE POINT—THIS SLOPE IS THE MRS.
- METHOD:
 - DRAW THE TANGENT TO THE INDIFFERENCE CURVE AT THE BUNDLE.
 - CALCULATE THE SLOPE OF THIS TANGENT (RISE OVER RUN).
 - THE SLOPE (NEGATED IF NECESSARY) GIVES THE MRS.

2.3 USING MARGINAL UTILITIES (IF UTILITY FUNCTIONS ARE KNOWN)

- MARGINAL UTILITY (MU): MARGINAL UTILITY OF EACH GOOD AT THE SPECIFIC BUNDLE.
- CALCULATION:

$$MRS_{xy} = \frac{MU_x}{MU_y}$$

- NOTE: THE MRS EQUALS THE RATIO OF MARGINAL UTILITIES AT THE SPECIFIC BUNDLE.

3. PRACTICAL EXAMPLES AND SCENARIOS

IN THIS SECTION, WE EXAMINE SPECIFIC BUNDLES AND DEMONSTRATE HOW TO FIND THE MRS IN EACH CASE, EMPHASIZING THE STEP-BY-STEP PROCESS, ASSUMPTIONS, AND INTERPRETATIONS.

3.1 EXAMPLE 1: UTILITY FUNCTION $(U(x,y) = x^{0.5} y^{0.5})$

ASSUMING THE CONSUMER'S UTILITY IS GIVEN BY THE COBB-DOUGLAS FUNCTION:

$$U(x,y) = \sqrt{x} \times \sqrt{y}$$

GIVEN BUNDLE: $(x_0, y_0) = (4, 9)$

STEP 1: COMPUTE MARGINAL UTILITIES:

$$\begin{aligned} MU_x &= \frac{\partial U}{\partial x} = 0.5 x^{-0.5} y^{0.5} \\ MU_y &= \frac{\partial U}{\partial y} = 0.5 y^{-0.5} x^{0.5} \end{aligned}$$

STEP 2: PLUG IN THE BUNDLE VALUES:

$$MU_x = 0.5 \times 4^{-0.5} \times 9^{0.5} = 0.5 \times \frac{1}{2} \times 3 = 0.5 \times 0.5 \times 3 = 0.75$$

$$MU_y = 0.5 \times 9^{-0.5} \times 4^{0.5} = 0.5 \times \frac{1}{3} \times 2 = 0.5 \times 0.333... \times 2 = 0.333...$$

STEP 3: CALCULATE MRS:

$$MRS_{xy} = \frac{MU_x}{MU_y} = \frac{0.75}{0.333...} \approx 2.25$$

INTERPRETATION: AT BUNDLE $(4,9)$, THE CONSUMER IS WILLING TO GIVE UP APPROXIMATELY 2.25 UNITS OF Y TO GAIN ONE ADDITIONAL UNIT OF X , HOLDING UTILITY CONSTANT.

3.2 EXAMPLE 2: UTILITY FUNCTION $(U(x,y) = x + 2y)$

THIS LINEAR UTILITY FUNCTION IMPLIES CONSTANT TRADE-OFFS.

GIVEN BUNDLE: $(x_0, y_0) = (3, 5)$

STEP 1: MARGINAL UTILITIES:

$$\begin{aligned} MU_x &= 1 \\ MU_y &= 2 \end{aligned}$$

STEP 2: CALCULATE MRS:

$$\begin{aligned} & \backslash[\\ & \backslash\text{TEXT}\{MRS\}_{XY} = \frac{\text{MU}_X}{\text{MU}_Y} = \frac{1}{2} = 0.5 \\ & \backslash] \end{aligned}$$

INTERPRETATION: THE CONSUMER IS WILLING TO GIVE UP 0.5 UNITS OF Y TO GAIN ONE ADDITIONAL UNIT OF X AT THE GIVEN BUNDLE. SINCE THE MRS IS CONSTANT, THE INDIFFERENCE CURVE IS A STRAIGHT LINE WITH SLOPE (-0.5) .

3.3 EXAMPLE 3: UTILITY FUNCTION $(U(x,y) = \ln(x) + \ln(y))$

THIS UTILITY REFLECTS PREFERENCES WITH DIMINISHING MARGINAL UTILITY.

GIVEN BUNDLE: $((x_0, y_0) = (1, 1))$

STEP 1: MARGINAL UTILITIES:

$$\begin{aligned} & \backslash[\\ & \text{MU}_X = \frac{1}{x} \\ & \backslash] \\ & \backslash[\\ & \text{MU}_Y = \frac{1}{y} \\ & \backslash] \end{aligned}$$

STEP 2: EVALUATE AT THE BUNDLE:

$$\begin{aligned} & \backslash[\\ & \text{MU}_X = 1/1 = 1 \\ & \backslash] \\ & \backslash[\\ & \text{MU}_Y = 1/1 = 1 \\ & \backslash] \end{aligned}$$

STEP 3: COMPUTE MRS:

$$\begin{aligned} & \backslash[\\ & \backslash\text{TEXT}\{MRS\}_{XY} = \frac{\text{MU}_X}{\text{MU}_Y} = 1 \\ & \backslash] \end{aligned}$$

INTERPRETATION: AT THE BUNDLE $(1, 1)$, THE CONSUMER IS WILLING TO TRADE OFF ONE UNIT OF Y FOR ONE UNIT OF X, MAINTAINING THE SAME UTILITY LEVEL.

3.4 EXAMPLE 4: CONVEX PREFERENCES AND NONLINEAR UTILITY

SUPPOSE $(U(x,y) = x^2 y)$, A NONLINEAR UTILITY FUNCTION.

GIVEN BUNDLE: $((x_0, y_0) = (2, 3))$

STEP 1: MARGINAL UTILITIES:

$$\begin{aligned} & \backslash[\\ & \text{MU}_X = 2xy \\ & \backslash] \\ & \backslash[\\ & \text{MU}_Y = x^2 \\ & \backslash] \end{aligned}$$

STEP 2: EVALUATE AT THE BUNDLE:

$$\begin{aligned} MU_X &= 2 \times 2 \times 3 = 12 \\ MU_Y &= (2)^2 = 4 \end{aligned}$$

STEP 3: CALCULATE MRS:

$$MRS_{XY} = \frac{MU_X}{MU_Y} = \frac{12}{4} = 3$$

INTERPRETATION: THE CONSUMER AT (2,3) IS WILLING TO GIVE UP 3 UNITS OF Y TO OBTAIN ONE MORE UNIT OF X.

4. INTERPRETING THE SIGN AND MAGNITUDE OF MRS

4.1 SIGN OF MRS

- NEGATIVE SLOPE: TYPICALLY, INDIFFERENCE CURVES SLOPE DOWNWARD; THUS, MRS IS POSITIVE, BUT THE SLOPE IS NEGATIVE.
- ABSOLUTE VALUE: THE MAGNITUDE INDICATES THE RATE OF SUBSTITUTION, WHILE THE NEGATIVE SIGN INDICATES THE DOWNWARD SLOPE.

4.2 DIMINISHING MRS

- AS CONSUMERS CONSUME MORE OF GOOD X, THEIR WILLINGNESS TO SUBSTITUTE Y FOR X GENERALLY DECREASES, LEADING TO A DIMINISHING MRS.
- THIS BEHAVIOR REFLECTS CONVEXITY OF INDIFFERENCE CURVES AND IS CENTRAL TO CONSUMER THEORY.

4.3 MRS AND BUDGET CONSTRAINTS

- CONSUMER OPTIMIZATION OCCURS WHERE MRS EQUALS THE RATIO OF PRICES:

$$MRS$$

For Each Of The Following Situations I Find The Marginal Rate Of Substitution At The Given Bundle

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