



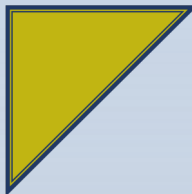
RUBIDOUX RESEARCH LLC

THE HOWS & WHYS OF ESTIMATING RETURN ON INVESTMENT (ROI) OF HEOR TO THE BIOPHARMACEUTICAL INDUSTRY

METHODOLOGICAL APPROACH (AKA, “THE HOWS”)

ISPOR 2026
18 MAY 2026





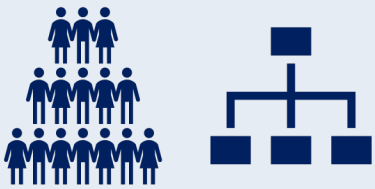
ASSESSING RETURN ON INVESTMENT: THE FUNDAMENTALS

$$\text{ROI} = \frac{\text{Investment Returns}}{\text{Investment Costs}} \cdot 100\%$$

So, for example, if as an investment cost \$100 and returned \$10, it would have an ROI of 10%



ASSESSING ROI OF HEOR TO BIOPHARMA INDUSTRY: CONCEPTUALLY, MACRO-LEVEL APPROACH IS EASY



HEOR Personnel



HEOR Resources



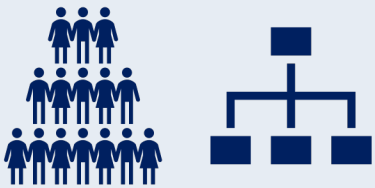
HEOR Outsourcing Budgets

$$\text{ROI} = \frac{\text{Investment Returns}}{\text{Investment Costs}} \cdot 100\%$$



HEOR Returns

ASSESSING ROI OF HEOR TO BIOPHARMA INDUSTRY: PRACTICALLY, MACRO-LEVEL APPROACH IS INFEASIBLE



HEOR Personnel



HEOR Resources



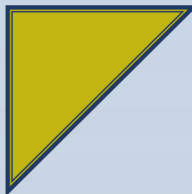
HEOR Outsourcing Budgets

HEOR investment costs are knowable at the company level; potentially estimable at the industry level

HEOR investment returns (ie, impact on company or industry revenues) are unknown & arguably unknowable



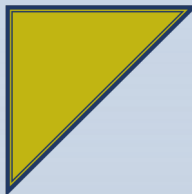
HEOR Returns



ASSESSING ROI OF HEOR TO BIOPHARMA INDUSTRY: WHAT ABOUT A MICRO-LEVEL APPROACH?

- MICRO-LEVEL APPROACH WOULD ASSESS THE VALUE OF HEOR ON A PROJECT-BY-PROJECT BASIS
- WOULD IT BE FEASIBLE TO DEMONSTRATE THAT INDIVIDUAL HEOR PROJECTS YIELD A POSITIVE ROI TO THE BIOPHARMA COMPANIES THAT SPONSOR THEM?
- IF SO, HOW WOULD WE GO ABOUT IT?



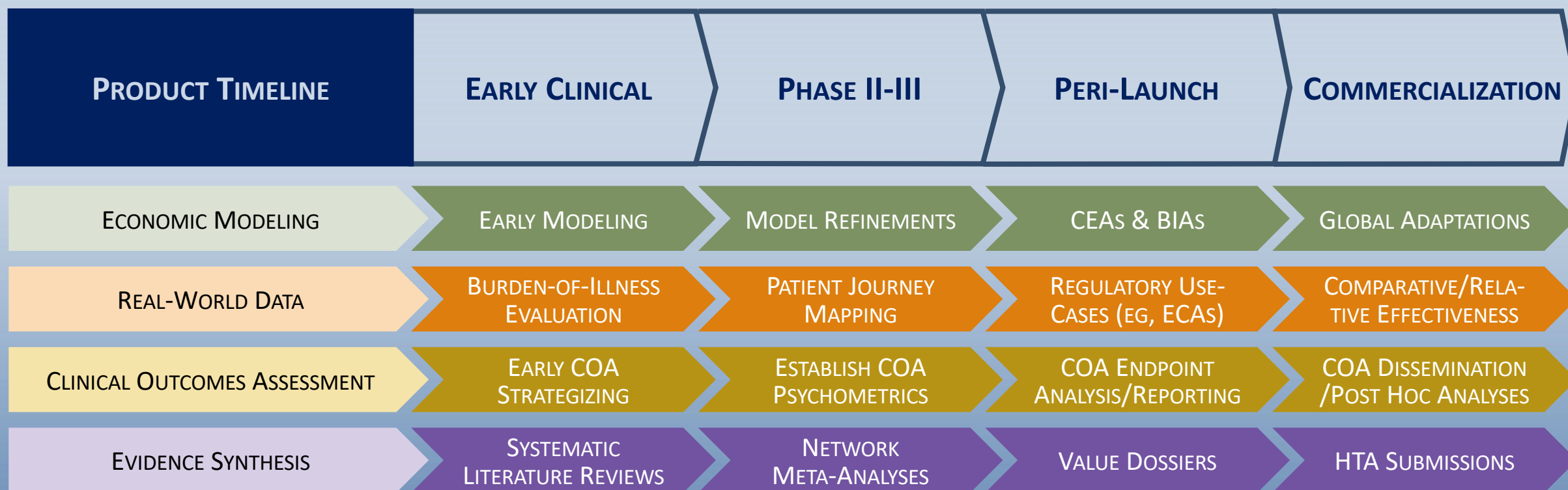


BLUEPRINT FOR A MICRO-LEVEL APPROACH

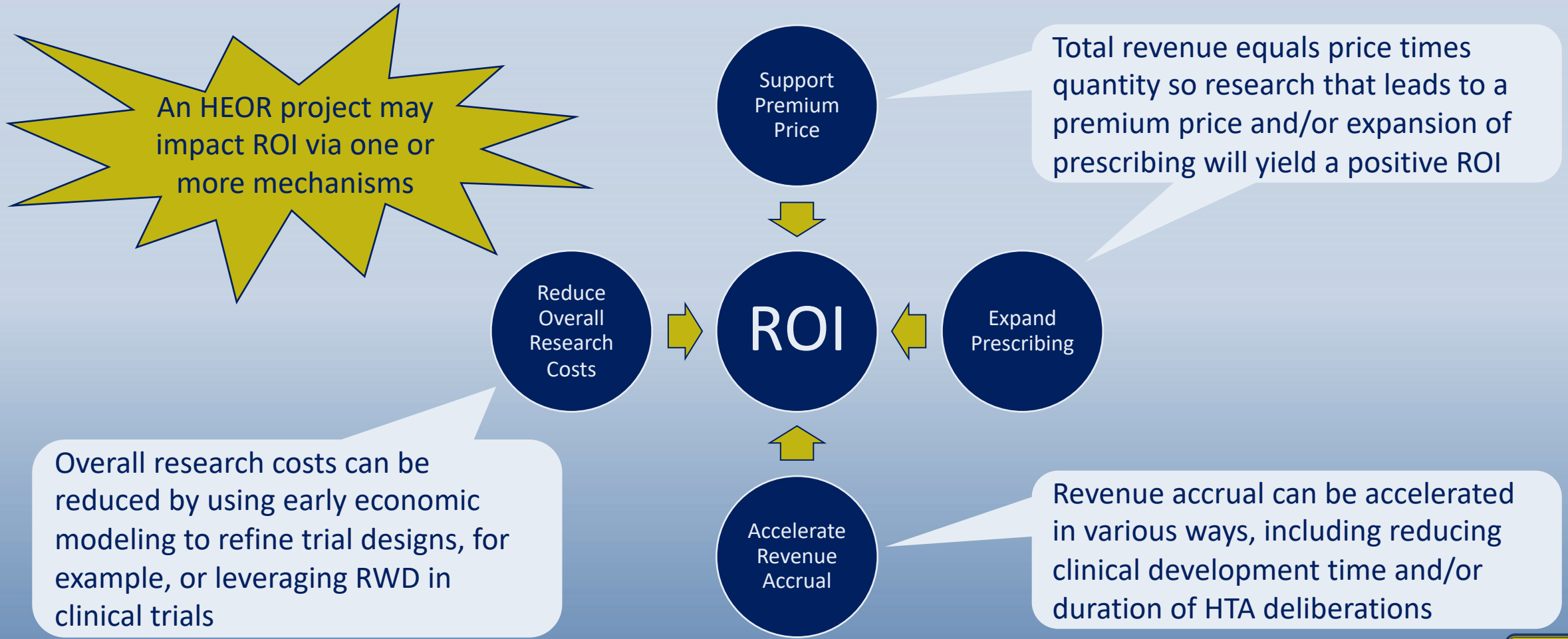
- DEVELOP & IMPLEMENT CRITERIA FOR CHOOSING THE HEOR PROJECTS
- FIGURE OUT MECHANISMS BY WHICH THE CHOSEN PROJECTS YIELD POSITIVE ROI (WHEN STUDY OUTCOMES ARE FAVORABLE) AND NEGATIVE ROI (WHEN NOT)
- QUANTIFY LIKELIHOODS & MAGNITUDES OF THESE BENEFITS & RISKS

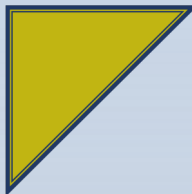


PLENTY OF HEOR PROJECTS TO CHOOSE FROM ... BUT WHAT CRITERIA SHOULD BE APPLIED?



MECHANISMS BY WHICH HEOR PROJECTS YIELD ROI





QUANTIFICATION OF COST & REVENUE IMPACTS: KEY QUESTIONS

- WHAT IS THE LIKELIHOOD THAT AN HEOR PROJECT IMPACTS PEAK REVENUE POTENTIAL? AND BY HOW MUCH?
- WHAT IS THE LIKELIHOOD THAT AN HEOR PROJECT IMPACTS PACE OF REVENUE ACCRUAL? AND BY HOW MANY MONTHS ARE REVENUES SHIFTED?
- IF HEOR PROJECT EFFECTS CHANGES IN OVERALL RESEARCH COSTS, HOW MUCH?





WE INTERRUPT THE
REGULARLY SCHEDULED
PROGRAM TO BRING YOU
THIS IMPORTANT MESSAGE

QUICK CLARIFICATION FOR COMPLIANCE PURPOSES

- NOT SAYING THAT AN HEOR OR RWE PROJECT IS PERFORMED FOR THE PURPOSE OF INCREASING PRODUCT REVENUES
- AS ALWAYS, STATED INTENT OF HEOR/RWE IS TO GENERATE RIGOROUS SCIENTIFICALLY-CREDIBLE EVIDENCE THAT ANSWERS VALID TREATMENT OR POLICY QUESTIONS
- FAVORABLE STUDY RESULTS CAN BE SUPPORTIVE OF COMMERCIALIZATION EFFORTS IN APPROPRIATE WAYS (eg, SHARING OF PEER-REVIEWED ARTICLES)
- SUCH COMMERCIALIZATION EFFORTS MAY IMPACT PRODUCT REVENUES, WHICH CAN BE QUANTIFIED IN ROI CALCULATIONS



MICRO-LEVEL APPROACH TO ROI ASSESSMENT COMBINES TWO FAMILIAR ANALYTIC METHODS

Decision Analysis

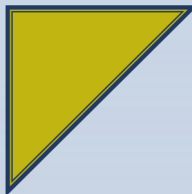
+

Discounting

=

Expected Net
Present Value
(eNPV) Modeling





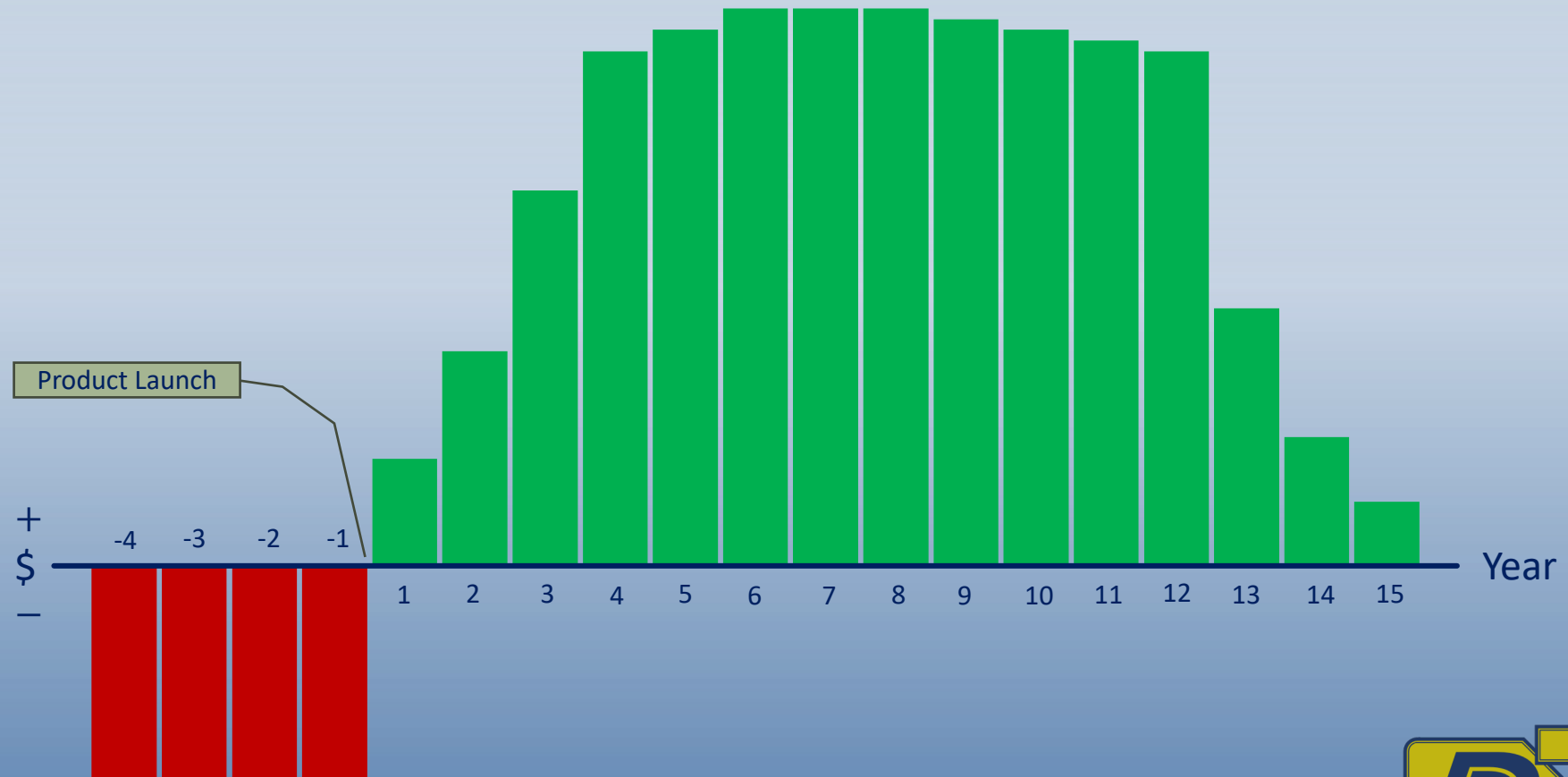
EXPECTED NET PRESENT VALUE (eNPV) MODELING: THREE-STEP PROCESS

- CHARACTERIZE RESEARCH COST & PRODUCT REVENUE FLOWS OVER TIME
- DISCOUNT FUTURE COSTS & REVENUES TO CALCULATE PRESENT VALUES
- USE DECISION-ANALYTIC MODELING TO INCORPORATE RISK INTO THE COST & REVENUE FLOWS TO FRAME AS EXPECTED VALUES



CLINICAL TRIAL EXAMPLE TO ILLUSTRATE: SIMPLIFIED DEPICTION OF COST & REVENUE FLOWS

- IN THIS CLINICAL TRIAL EXAMPLE, ALL INVESTMENTS OCCUR PRIOR TO LAUNCH, WHILE REVENUES ACCRUE AFTER
- BASIC ROI QUESTION IS WHETHER TOTAL REVENUE STREAM (GREEN) IS WORTH TOTAL INVESTMENT (RED)
- TEMPTING TO TALLY UP THE NET TOTAL VALUE AS GREEN MINUS RED AND BE HAPPY THAT IT'S POSITIVE, BUT THINGS AREN'T THAT SIMPLE
- FIRST, REVENUE REALIZATION OCCURS DOWNSTREAM WHILE COSTS BEGIN ACCRUING IMMEDIATELY
- SECOND, COSTS & (ESPECIALLY) REVENUES ARE NOT A SURE THING



CLINICAL TRIAL EXAMPLE TO ILLUSTRATE : DISCOUNTING FUTURE COSTS & REVENUES

- FUTURE DOLLARS ARE WORTH LESS THAN CURRENT DOLLARS—DISCOUNTING IS USED TO RECONCILE THESE TIME DIFFERENCES AND EXPRESS ALL AMOUNTS IN PRESENT VALUES

- CLOCK STARTS TICKING NOT AT PRODUCT LAUNCH, BUT AT TIME OF TRIAL INVESTMENT DECISION (YEAR 0)

- NPV CALCULATION INVOLVES SUBTRACTING COSTS FROM REVENUES IN EACH YEAR AND DISCOUNTING BACK TO YEAR 0:

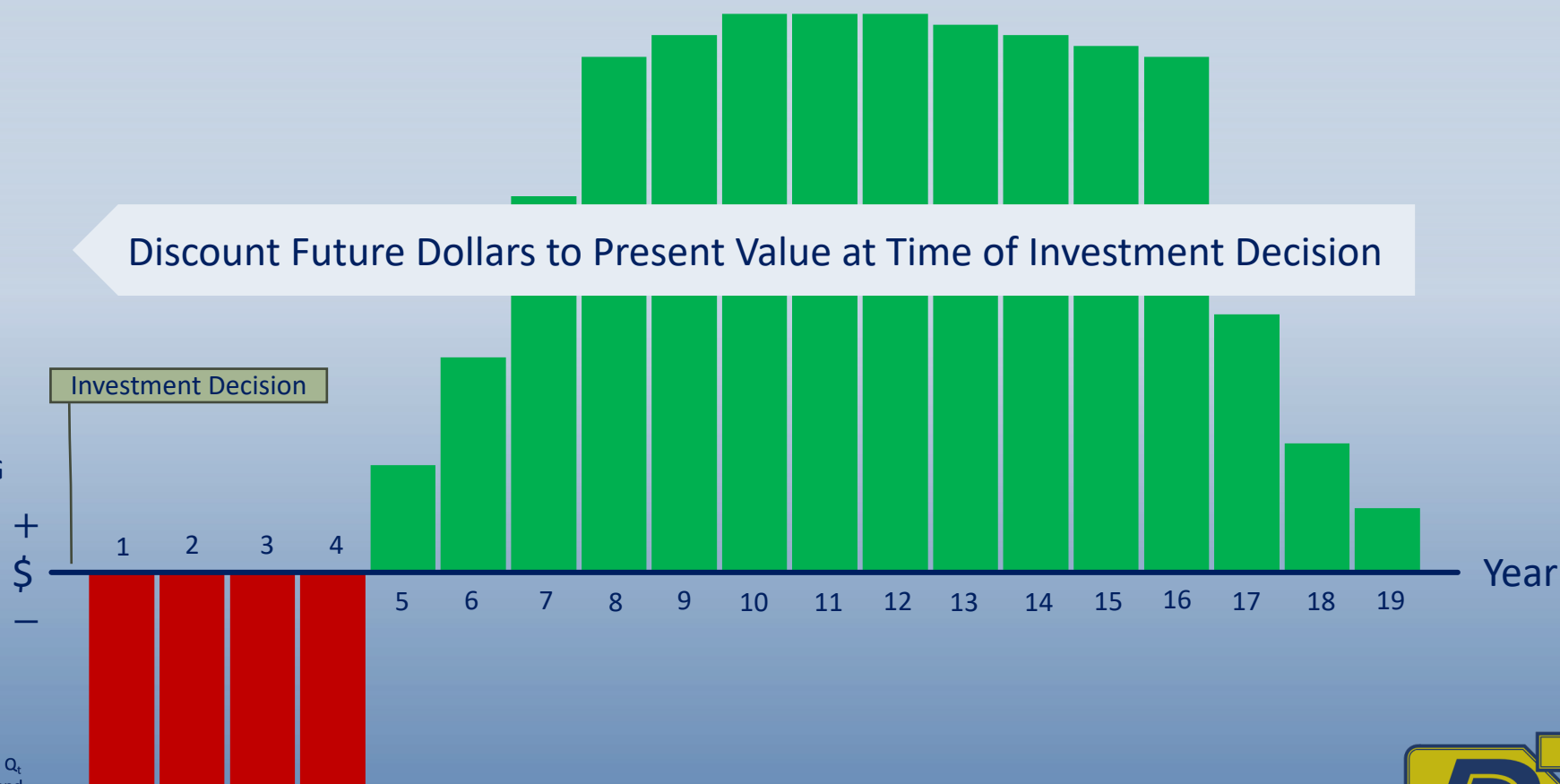
$$NPV_i = \sum_{t=1}^T \frac{R_t - C_t}{(1+r)^t}$$

Where,

NPV_i is net present value for outcome i;

R_t is revenue in time period t, which is the product of price, P_v, and sales volume, Q_t
C_t is cost in time period t, reflecting clinical R&D, regulatory & HTA submissions, and HEOR; and

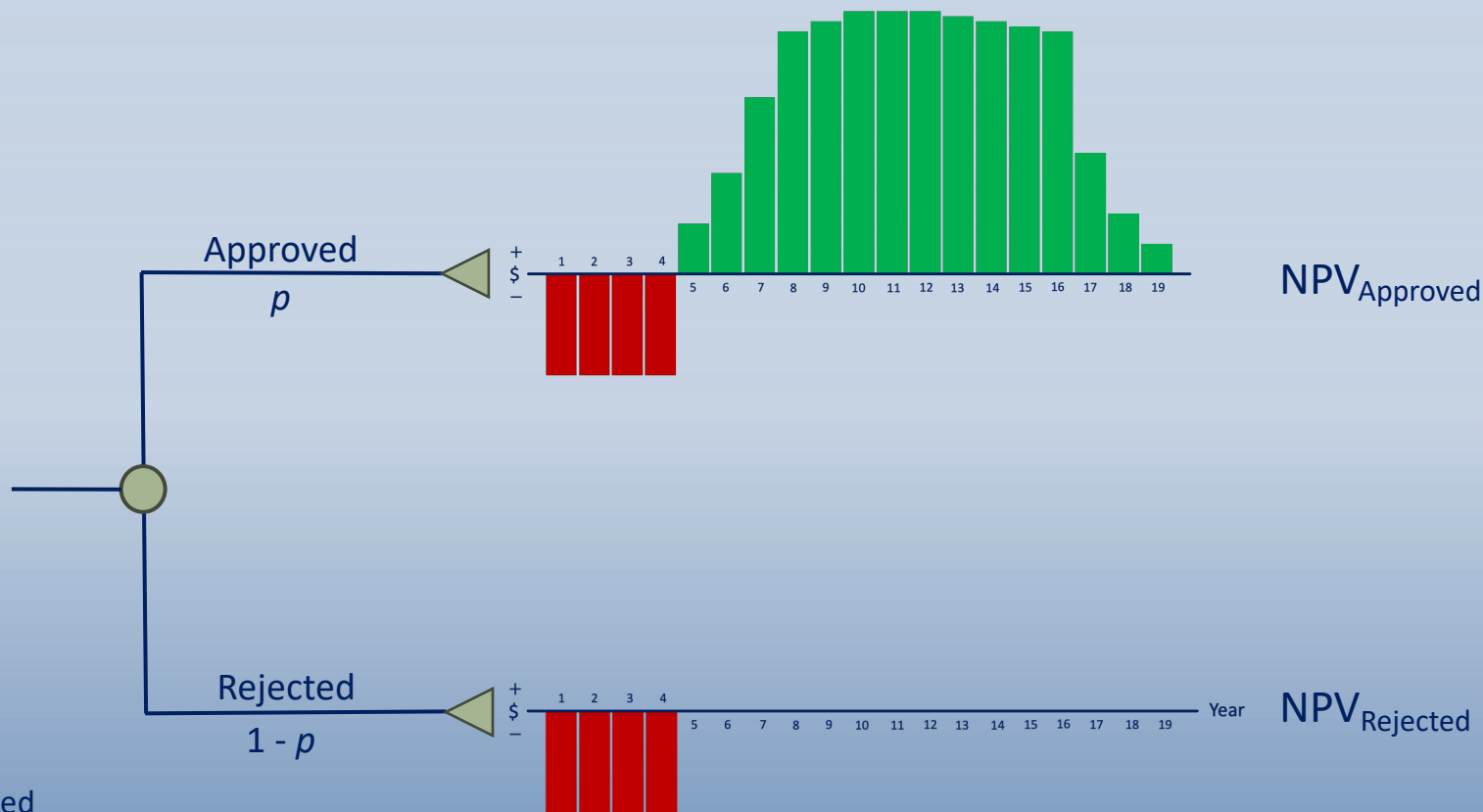
r is the discount rate / cost of capital

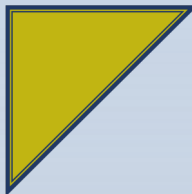


CLINICAL TRIAL EXAMPLE TO ILLUSTRATE : INCORPORATING RISKS TO FRAME AS EXPECTED VALUES

- IN DRUG DEVELOPMENT, NO APPROVAL MEANS NO REVENUES, WHICH MEANS THAT INVESTMENT IN TRIAL COULD YIELD NOTHING
- TWO POTENTIAL NPVs MUST BE CONSIDERED, ONE BASED ON TRIAL SUCCESS & PRODUCT APPROVAL (WITH PROBABILITY p) AND ANOTHER BASED ON REJECTION ($1-p$)
- EXPECTED NET PRESENT VALUE (eNPV) IS CALCULATED AS THE WEIGHED SUM OF THESE TWO NPVs:

$$\text{eNPV} = p \cdot \text{NPV}_{\text{Approved}} + (1 - p) \cdot \text{NPV}_{\text{Rejected}}$$





MICRO-LEVEL APPROACH TO ROI ASSESSMENT: ROI CALCULATION

$$\text{ROI} = \frac{\text{eNPV}}{I} \cdot 100\%$$

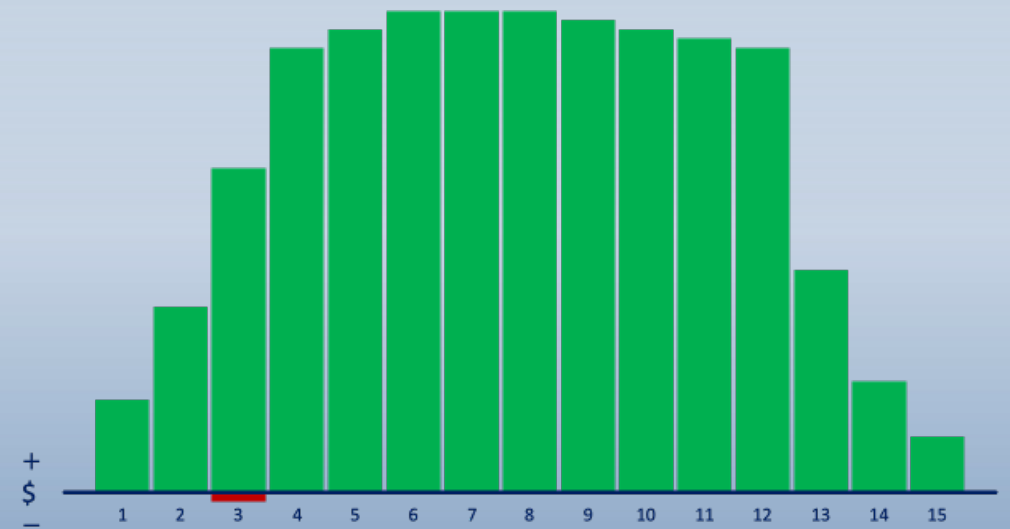
Where,

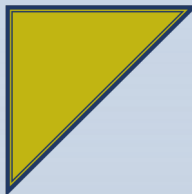
eNPV is the expected net present value of the HEOR project; and
I is the total monetary value of the investment in the HEOR project



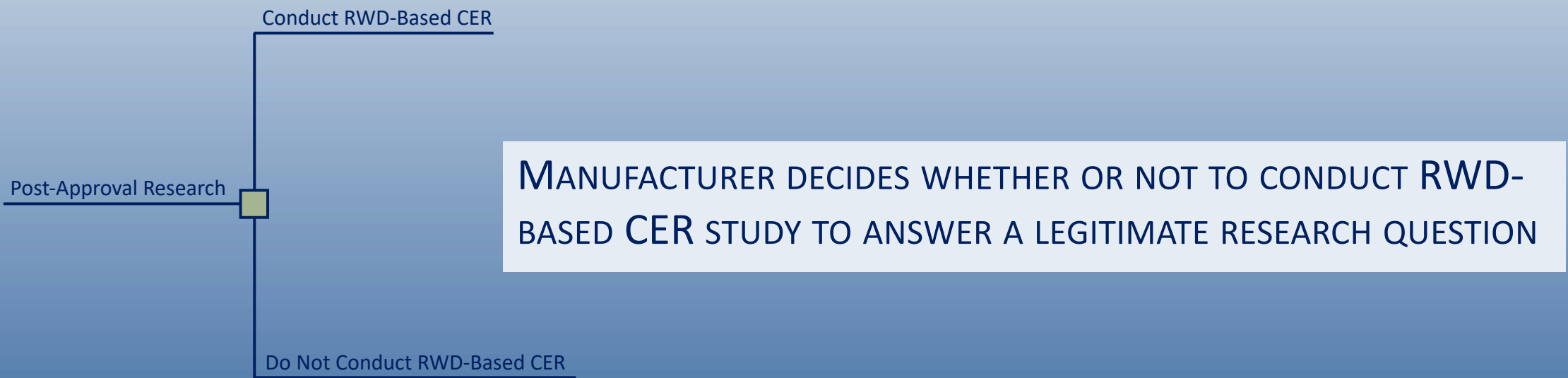
EXAMPLE MODEL BUILD: RWD-BASED COMPARATIVE EFFECTIVENESS RESEARCH

- WITH ADEQUATE TIME FOR DATA BUILD-UP POST-LAUNCH, A CER STUDY USING SECONDARY RWD SOURCES IS POSSIBLE
- ASSESSING ITS ROI REQUIRES STRUCTURING AND QUANTIFYING POTENTIAL STUDY OUTCOMES AND IMPACTS ON REVENUE STREAM
- ASSUMPTIONS REGARDING THE TIMING OF THE STUDY (START & COMPLETION) AND LATENCY OF REVENUE IMPACTS NEED TO BE MADE
- GRAPHIC SHOWS CER STUDY PERFORMED IN YEAR 3, WHICH MEANS THAT REVENUE IMPACTS WOULD BEGIN AT SOONEST IN YEAR 4

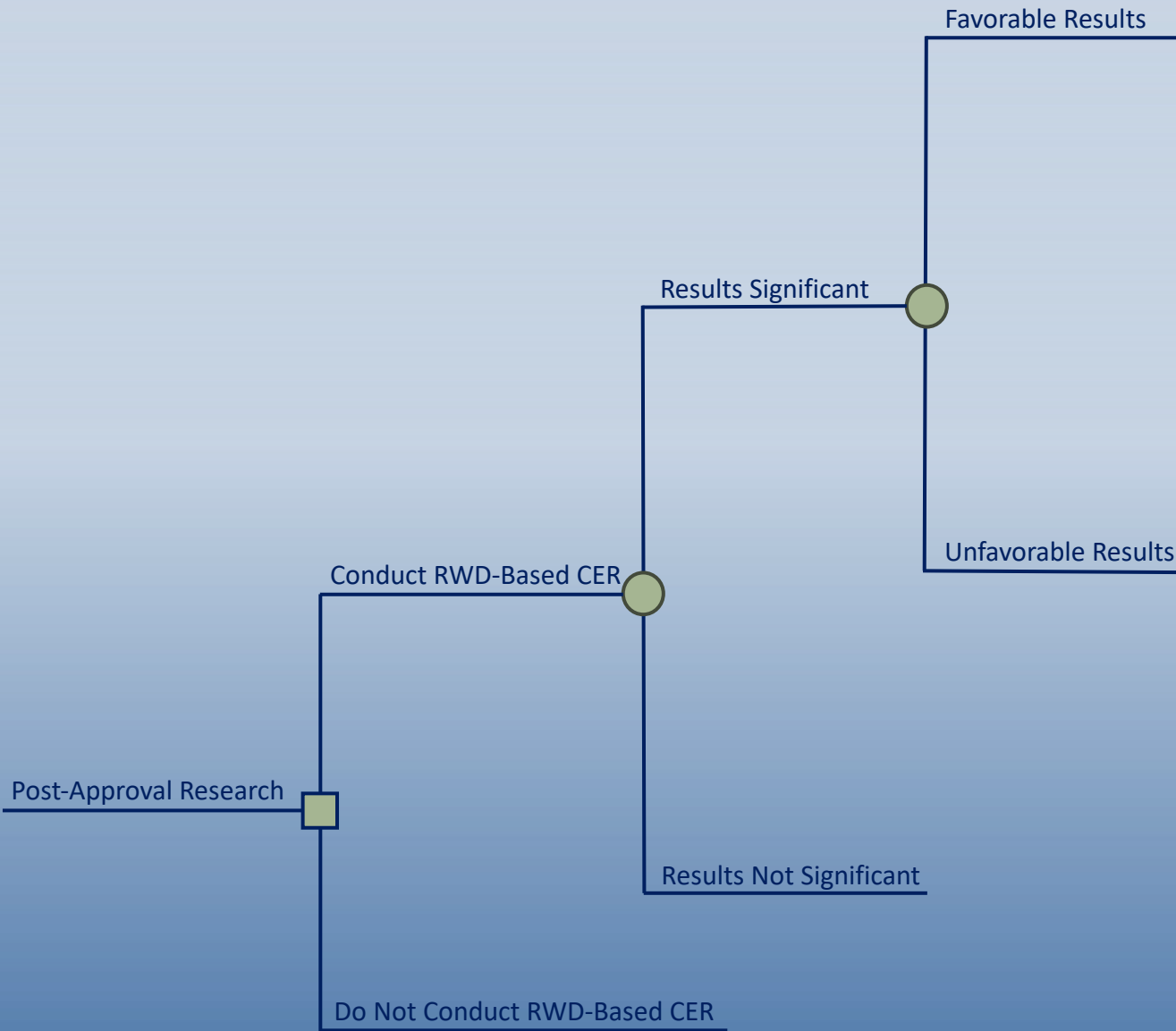




CER MODEL BUILD



CER MODEL BUILD (CONT)

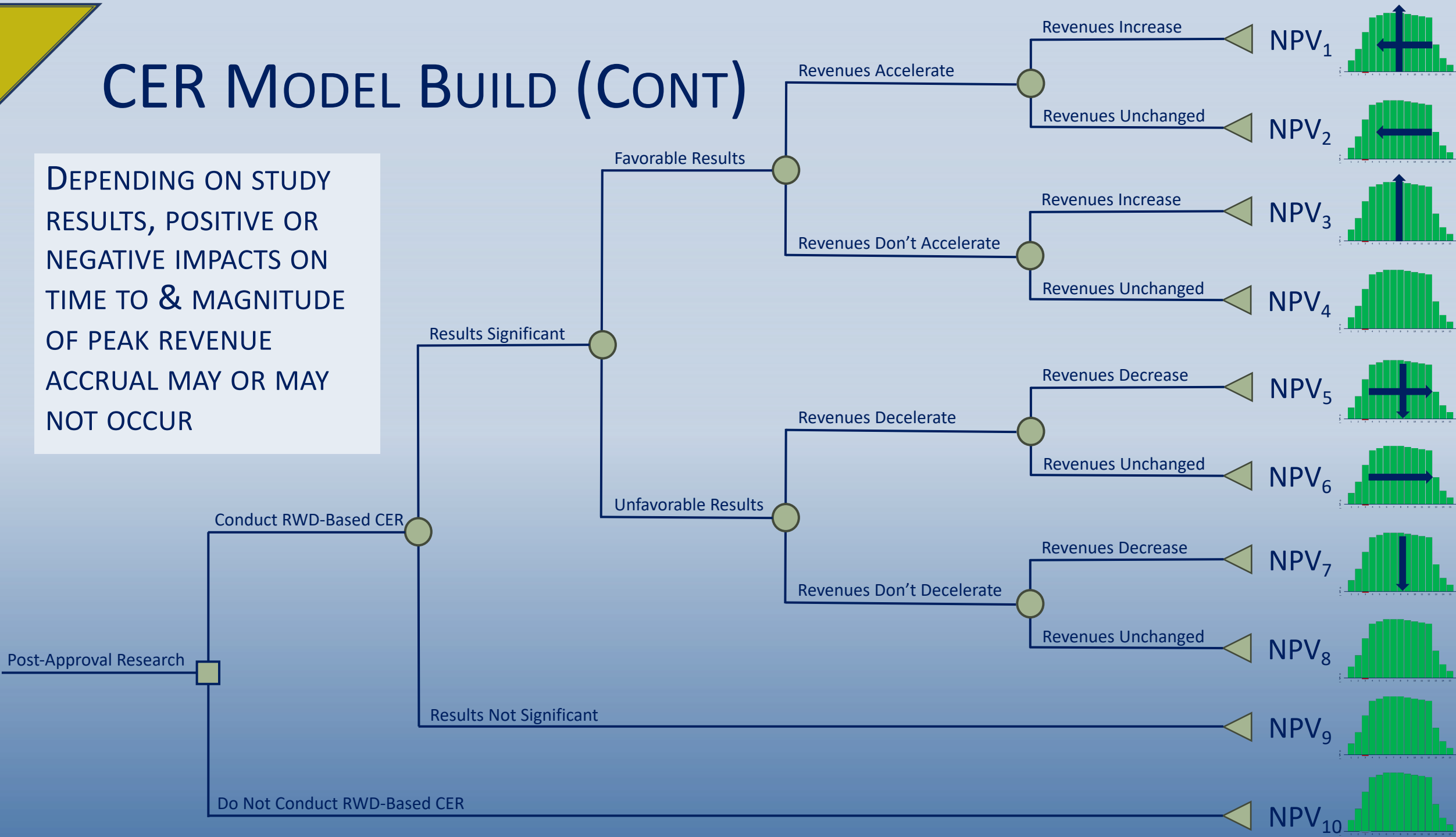


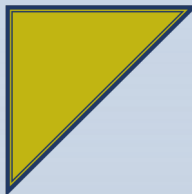
STUDY FINDINGS MAY OR MAY NOT BE STATISTICALLY SIGNIFICANT; IF SIGNIFICANT, THE RESULTS MAY OR MAY NOT BE FAVORABLE



CER MODEL BUILD (CONT)

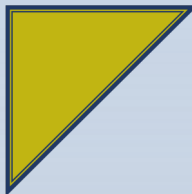
DEPENDING ON STUDY RESULTS, POSITIVE OR NEGATIVE IMPACTS ON TIME TO & MAGNITUDE OF PEAK REVENUE ACCRUAL MAY OR MAY NOT OCCUR





LESSONS FROM THE CER MODEL BUILD

- MODEL STRUCTURE NEEDS TO REFLECT THE FULL RANGE OF POTENTIAL STUDY OUTCOMES (INSIGNIFICANT, FAVORABLE, UNFAVORABLE) & REVENUE IMPACTS (ACCELERATE, DECELERATE, INCREASE, DECREASE, NEUTRAL)
- FULLY DEVELOPED MODEL STRUCTURE LAYS BARE DATA REQUIREMENTS FOR TREE PROBABILITY ESTIMATION
- ADDITIONAL PARAMETER REQUIREMENTS FOR TERMINAL NODE NPVs INCLUDE RESEARCH COSTS, REVENUE ACCRUAL, EFFECT MAGNITUDES, TIMING OF EFFECTS



TAKE HOME POINTS

- MICRO-LEVEL APPROACH TO ASSESSING THE ROI OF HEOR CAN BE FEASIBLE
- APPROACH COMBINES TWO METHODS ALL HEALTH ECONOMISTS ARE FAMILIAR WITH—DECISION ANALYSIS AND DISCOUNTING
- eNPV MODELING STRUCTURES VARIOUS HEOR PROJECT RISKS, OUTCOMES, AND REVENUE IMPACTS TO ALLOW COMPUTATION OF ROI
- IF FRAMED APPROPRIATELY, ROI ASSESSMENT OF HEOR PROJECTS WILL NOT RUN AFOUL OF COMPANY COMPLIANCE REQUIREMENTS





RUBIDOUX RESEARCH LLC

DAVID THOMPSON, PhD
PRINCIPAL CONSULTANT

DAVE@RUBIDOUXRESEARCH.COM

THANK YOU!