MAUT Decisions
Stochastic MAU: Introductory Product,8 attributes

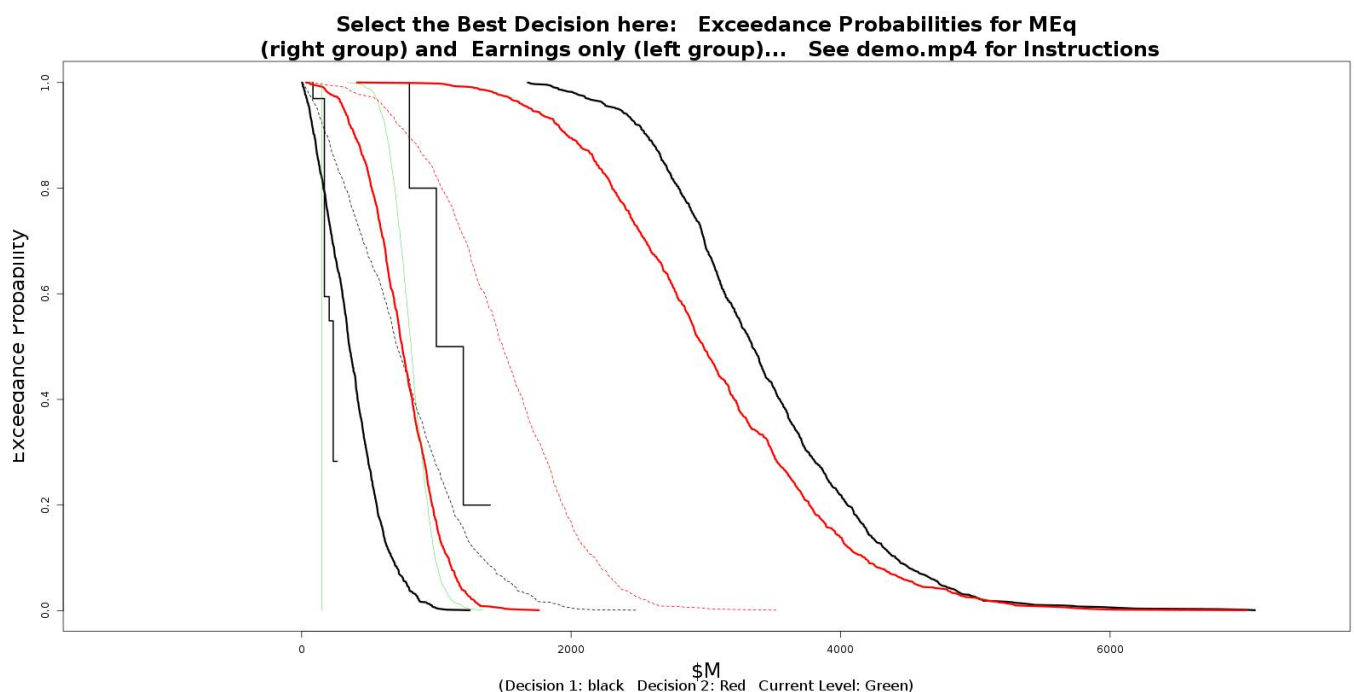## Stochastic MultiAttribute Utility: What's It For? Decisionmaking.

In particular, for making the Best Adjustments in Organization, Product Line, Product Design, Marketing Channels, Supply Chain array, etc.

• Applicable to Lower Level (eg. departmental) decisions, as well as to Top-Level Organizational decisions

• Decisions may be over a continuum of levels (eg. product design/engineering parameters), instead of discrete disjoint ones

• Current attributes' performances are also assessed (baseline MEq curve) - if adjustments or prospective decisions don't perform well enough, best decision is status quo (no action).

Introductory Application for your Corporation - Full Analysis of Small Framework ($9.9K):

- 8 Attributes (all in the same category)
- 2 Competing Decisions
- MEq curve also Evaluated at Current Attribute levels
- Formulation of Decision Performance Requirements
- 1 Decisionmaker
- 1 Expert
- Comprehensive Report with Decision Recommendations
- Utilize as Introduction and Preparation for full Phase 1/Phase 2 project, pricing credit applied toward full project
- Acceptable as a Complete Study for small decision settings (8 attributes) such as those at the Departmental level. Pricing results in extremely high economy for this depth of a Decision Analysis.


Select the Best Decision here: Exceedance Probabilities for MEq (right group) and Earnings only (left group)...   See demo.mp4 for Instructions

$M
(Decision 1: black   Decision 2: Red   Current Level: Green)

MEq – Monetized Equivalent of Total Net Utility ($M here)
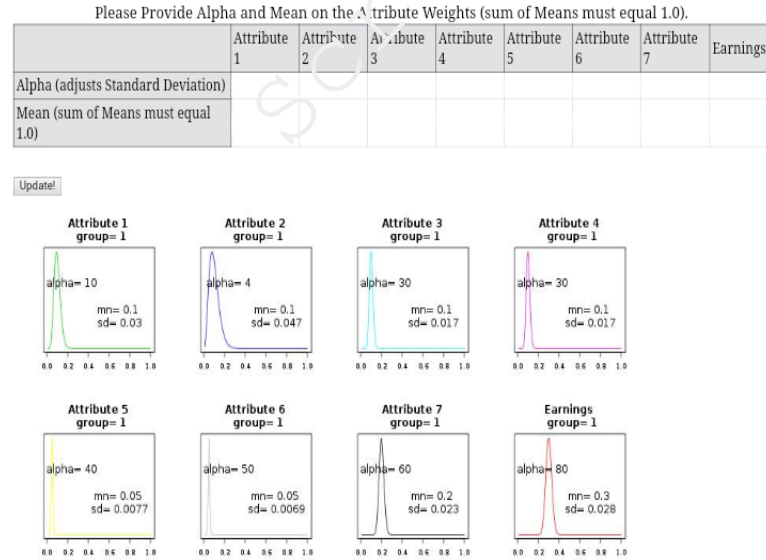
MAUT Decisions

Stochastic MAU: Introductory Product,8 attributes

Stochastic MultiAttribute Utility Decisionmaking :

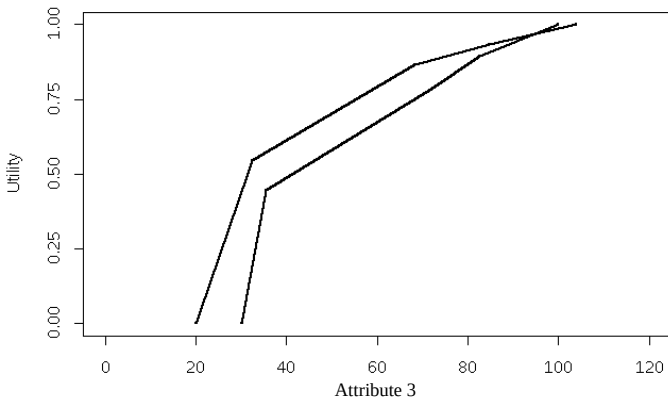#### Elicit Attribute Utilities for Function Estimation
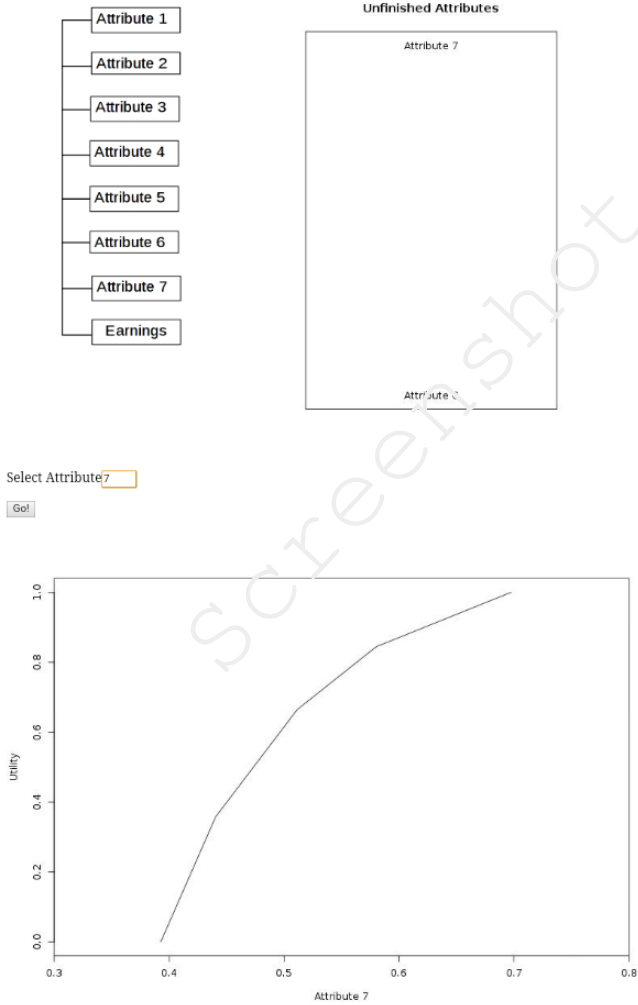
Stochastic MultiAttribute Utility Decisionmaking :

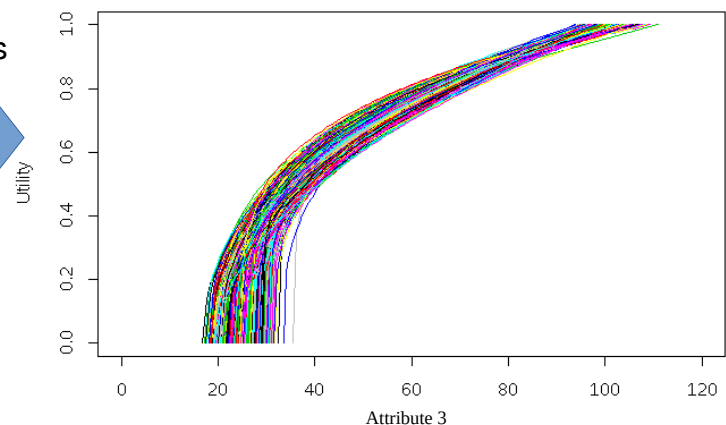### Elicit Distributions for Weights on Category Members

Please Provide Alpha and Mean on the Attribute Weights (sum of Means must equal 1.0).

	Attribute 1	Attribute 2	Attribute 3	Attribute 4	Attribute 5	Attribute 6	Attribute 7	Earnings
Alpha (adjusts Standard Deviation)								
Mean (sum of Means must equal 1.0)								

Estimate Function's Variation →

Contract Terms and Conditions for Introductory Application

Enviro-Sci Consulting, provider of SMAU consulting products and services, is also referred to as ***Consultant***. ***Client*** is the organization purchasing the consulting services, and also is the responsible individual(s) within that organization acting as technical contact for Consultant.

Value-Based Pricing with Significant Discount

Regular Phase 1/Phase 2 pricing is value-based, typically under-priced relative to the probablistic added value of using SMAU and MEq. However, Pricing on this Introductory 8-Attribute Application derives from full-value price, but incorporates a heavy discount as an introductory incentive for the full project followup (Phases 1 and 2) while also providing departments and smaller organizations access to a complete decision consulting product, with report, at an extraordinary price. Nevertheless if your organization recognizes only a cost-based pricing method (eg. as with many U.S. FAR contracts) a MAU or other decision algorithm is your only option, from another provider.

Contract Duration

Unless otherwise negotiated, Contract Duration for Introductory Application is 45 days. A formal Purchase Order (PO) shall initiate the work, and payment, according to the terms below, shall be made.
Client shall use due diligence in providing all information to Consultant and ensuring timely availability of appropriate staff for elicitations. In particular, Client shall complete all elicitations (utility functions, importance weight distributions, decision impact distributions, and decision impact correlations) within 20 days of project start.

Payment Terms

A Nonrefundable Payment of 60% of project price is required to initiate the work, and payment of the remaining 40% is due, terms N/15, upon completion of final deliverable (report).

Disclaimer and Release of Liability

No Warranty on Consulting Services nor Guarantees on Decision Outcomes

While every reasonable effort has been and shall be made to assure theoretical and computational correctness of framework, web apps, databases, etc., Enviro-Sci Consulting provides no warranty on any aspect of services, method, databases, computations, or reports. However, if during the Contract Period, Client finds specific errors, actual or apparent, Client shall notify Consultant of such, and allow Consultant time to investigate, and where applicable, provide updated results to Client. Furthermore, SMAU, like any Decision Framework, is a decision selection algorithm – a posture - based on provided information and uncertain outcomes: therefore no guarantee is made by Consultant regarding accuracy of attribute outcomes or suitability of any decision recommendations, advice, failure to recommend, etc.

Legal Compliance and Release of Liability

It is the Client's responsibility to ensure Client's compliance with all applicable laws and regulations, regarding both its current and future prospective activities and decisions. Client shall comply with all such requirements, and Consultant shall act under the assumption that Client is in said compliance. Client holds harmless and releases Consultant from all liability, including that arising from contemplating, implementing, or operating under a selected decision. **(continued on next page)**

MAUT Decisions
Stochastic MAU: Introductory Product,8 attributes

Contract Terms and Conditions for Introductory Application (Cont'd)

Web Apps, Computational Engines, Databases

Ownership and Intellectual Property Rights

All Intellectual Property and computer implementations, including but not limited to current, corrected, or future modifications of SMAU mathematical Decision Framework, Monetized Equivalent of Net Total Utility Concept aka MEq, computational engines, and web interfaces, remain the property of Enviro-Sci Consulting, including versions reflecting improvements suggested by Client or others. In addition, all report materials, plotting and graphics approaches, and report templates remain the property of the Consultant: while client-specific data and graphical renderings of client data and results are the property of the Client, Consultant reserves the right to use the same rendering approaches and generic report content in reports to other clients.

However, databases containing only Client-specific information (attribute topology, elicitation results, decision performance frontiers, etc.) are the property of the Client. All official versions, original and revised, of these databases shall be provided to Client during the Contract Period. After Contract completion, Consultant shall attempt to retain archives of all such information, but formal archival of these Client-owned databases remains the responsibility of the Client.

Access to Web Interface Apps

Our Web Interface Apps are Client-specific html pages and supporting scripts that facilitate access to generalized elicitation and computational engines that are executed on the Consultant's websites. During Contract Period, Client shall have free, unlimited access to various Web Interface Apps, commensurate with the completed and current work modules. Formal elicitations and production runs of SMAU system will be made by Consultant and scrutinized by same, but informal elicitations and SMAU runs may be made by client,for familiarization, insight, goal setting, and examining "what if" scenarios by selected tweaking.

MAUT Decisions

Stochastic MAU: Introductory Product,8 attributes

Corporate Confidentiality: Client Nondiscloses Actual Attribute and Decision Identities

To protect the confidentially of Client's Decisionmaking and Business Intelligence and to prevent conflicts of interest on the part of the Consultant, with the exception of the attribute Earnings (used in calculating Monetary Equivalent) ***all Attribute, Category, and Decision names shall be generically relabeled for Consultant: Client shall make every reasonable effort to ensure that Consultant will at no time have knowledge of their actual names or functions.*** Pursuant to maintaining this confidentiality, Consultant shall conduct all elicitation sessions remotely, providing guidance in the use of elicitation Web Apps to client's designees via telephone.

Latin Hypercube Sampling Results, with Correlations Induced

Thank you for your consideration! To get started, or for further information, you may reach me at 1.907.764.5428 or
project@maut-decisions.com

PJ Chamberlain, Ph.D., Statistician, Economist
Principal & Owner
MAUT Decisions

Learn about *Optimized Marketing Strategies*, *Estimation of Missing Data*, and other Consulting Products at
www.LinkedIn.com/in/pj-chamberlain-phd-b7a68bb1

(screenshot of "Run SMAU" web interface next page)

Stochastic MultiAttribute Utility Decisionmaking: Interface for Running SMAU System

(See demo.mp4 below for definitions & decision selection.)

Why put probability distributions on Weights?

Your attributes' importances may depend upon uncertain outcomes such as upcoming Political/Regulatory/Trade environment or Financial Markets. Or there may merely be fuzziness in your valuation of attribute importances. Currently, importance weights are only distributed over a possible continuum. If you feel strongly that your weights should be distributed only over a few specific values (eg. because of possible governmental policy outcomes), this representation may be possible at a modest additional cost: please inquire. And in this case, you should carefully document for every attribute, each possible weight value and its relation to eg. the policy outcomes

Why Include Attribute Correlations for Each Decision?

If attribute outcomes are correlated for a given decision, it's important to incorporate their correlations so that impossible combinations are not included in the Uncertainty Analysis of MEq, which would bias its exceedance curve from the true one.

Checklist Before Running the System

Did you complete the Elicitations?:
•Attribute Utility Functions
•Distributions on Category and Attribute Importance Weights?
•Distributions on Attribute outcomes, for each decision?
•Correlations between Attribute outcomes, for each decision?
•Review "demo.mp4" ?

Scale on Attribute Means: Decision 1
[1]
Standard Deviation Scale for Attributes: Decision 1
[1]
Scale on Attribute Means: Decision 2
[1]
Standard Deviation Scale for Attributes: Decision 2
[1]
Variation Scale on all Importance Weights
[1]
Variation Scale on all Utility Functions.
[1]

[Submit]

[Run_SMAU!]
[Display MEq and Earnings Results]
[MEq-Earnings Ratio: NonEarnings Attributes -how much they're contributing to MEq]
[Display Attribute Monetary Equivalents]

[Attribute Scatterplots: Decision 1]
[Attribute Scatterplots: Decision 2]

Guidance for Tweaking Scale Factors

The scaling adjustments serve to impart a deeper understanding of your results and of Uncertainty Analysis in general, but as important they could be invaluable toward modifying a decision to optimality or bringing it to admissability.

•Please remember that very large adjustments in any scale factor - increasing or decreasing - could place the distributions outside of the weight limits or feasible attribute limits you initially provided, causing the system to return an error.

•Your attributes' importances may depend upon uncertain outcomes such as upcoming Political/Regulatory/Trade environment or Financial Markets. Or there may merely be fuzziness in your valuation of attribute importances.

•Decision Impacts' Uncertainties are also scalable here, but as Variation Scales on Weights and Utility Functions both become negligible, MEq curves steepen, reflect only Impact Variability, and are more distinct by decision.... Try it.

•Alternatively, as these Scales on Decisionmaker Valuations are increased greatly, MEq curves for decisions will tend to widen and overlap because the majority of variation is due to Decisionmaker uncertainty.... Try it.

• Increasing the scale of variation on a Decision's Impacts causes only that Decision's MEq Curve to widen..... Try it! Alternatively, adjusting mean Impacts of a decision tends to only shift its MEq curve, so...

the ancient tradeoff - a profitable compromise between mean and variation - is also evident here if a decision can be conceived that achieves that balance eg. its MEq curve though wide is far enough rightward to exceed performance frontiers eg. its MEq curve disappointly doesn't lie very far rightward, but is steep enough to result in that decision's being selected.

•In addition to the Decision Admissability and Selection Criteria discussed in the video "demo.mp4", the ratio of MEq to Earnings is an even better way to assess the value contributed by non-Earnings attributes: if larger contributions are desirable, the exceedance curve for this ratio should lie entirely to the right of 2 or 3 (ie. probability of the ratio's exceeding those values equals 1). See the exceedance curve for this ratio, for your decisions by clicking below the MEq result (results figures below, lower left)

Useful References

SMAU - What's It For?

Decisionmaking.... making the Best Adjustments in Organization, Product Line, Product Design, Marketing Channels, Supply Chain array, etc.
• Also applicable to Lower Level (Departmental) decisions, as well as to Top-Level organizational decisions
• Decisions may also be over a continuum of levels or amounts (eg. product design/engineering parameters), instead of discrete disjoint ones
• Current attributes' performances (baseline MEq curve) are also assessed as a benchmark for comparison - if prospective adjustments or decisions don't perform well enough (their MEq curves), best decision is status quo ie. no action.

SMAU Consulting Products and Pricing

Introductory Application for your Corporation - Full Analysis of Small Framework: 8 Attributes (all in the same category), 2 Competing Decisions plus MEq Evaluation at Current Attribute levels, formulation of Decision Performance Requirements, 1 Decisionmaker, 1 Expert, Comprehensive Report with Decision Recommendations. Especially suited to lower organizational (eg. departmental) decisionmaking.

Phase I, Bespoke SMAU Decision System, Unlimited Attributes over Several Categories/Subcategories, Multiple Decisionmakers

Phase II, SMAU in Action: Actual Decision Selection/New Decision Formulation Support. Compositing of Multiple Decision Impact Experts per Attribute

Please Note: To protect the confidentially of your Decisionmaking and Business Intelligence, to prevent conflicts of interest on the part of the Consultant, and to increase your confidence in the Consultant and freedom in the valuation process, (with the exception of earnings, used in calculating Monetary Equivalent) all Attribute, Category, and Decision names shall be generically relabeled for Consultant, who will at no time have knowledge of their actual names or functions.

Stochastic MAU Videos

demo.mp4 - Monte Carlo based SMAU with Decision Selection: 20 attributes, 10 categories, 2 decisions => 50 random variables & 20 random functions determine each Decision's MEq outcome in a Monte Carlo iteration (3 min)
MAU vs. SMAU - differences between them (1 min)

SMAU with Multiple Experts and Multiple Decisionmakers. Comprehensive & Detailed Instructional Video, Compositing Experts' Attribute Impact Distributions for Each Decision (4 experts/attribute per decision) and Compositing 4 Decisionmakers' Total Utility Results in Decision Selection. Although acceptable to evaluate here, MEq is not used, and decision selection is also otherwise less sophisticated than in demo.mp4 (17 min)