ISE 562

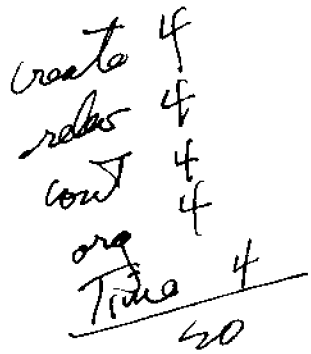
MiniProject – When to stop dating

In deciding what decision to analyze for this project, the very first thing that popped into my head was my fiancé. Like in any long-term relationship, we have our fair share of problems, but on the whole we usually end up figuring them out, and have had a long and satisfying relationship so far because of that. However, when we are talking casually, often we pose the philosophical question to each other, How do you know when it is time to stop dating? Since we are already engaged, this question is more of a thought exercise than a real question, but I thought I'd put the techniques in this class to the task of trying to answer it. In other words, I'd like to test the following question, from my fiancé's perspective: Should she stop dating, and marry me?

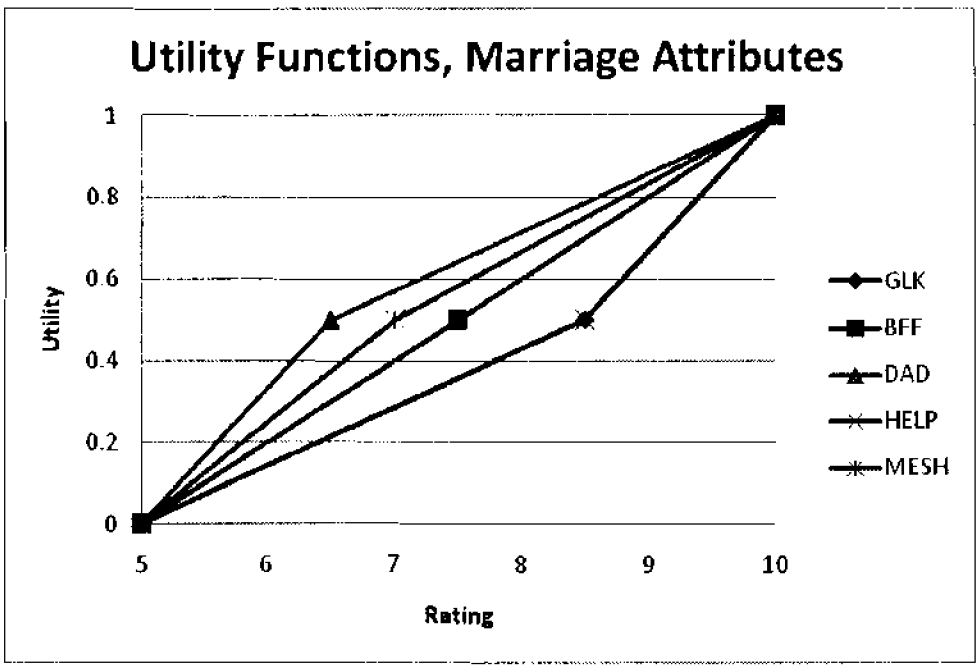
I interviewed my fiancé for this project, and asked her to make a list of attributes by which she thought her decision to marry someone should be based on. From that list, I asked her to come up with the five most important attributes, so as to simplify the calculations in the project. Her five most important attributes were: likely chance of having good-looking children (GLC), quality of friendship (BFF), likely quality as a father (DAD), ability to support her emotionally/financially/structurally/etc (HELP), and the degree of agreement on major life issues such as religion, kids, careers, and so on (MESH).

I then did a formal utility interview with her, to try and determine her utility function for each attribute. We first agreed that we would use a rating scale (from 0 to 10) to measure each attribute. We then determined that my fiancé, having dated a lot, had fairly high standards for all of these things, and would probably not marry a man that had below a 5 on any attribute, regardless of what that man was rated in the other attributes. Hence, we decided that the scale for each attribute would go from 5 to 10, with 5 having a utility of 0, and 10 having a utility of 1. I then attempted to determine the equivalence point for each attribute, using the utility function assessment. After first checking her rationality for each attribute, I eventually came up with the following equivalence points:

	Equiv. Point
GLK	8.5
BFF	7.5
DAD	6.5
HELP	8.5
MESH	7.0



And their corresponding utility functions were:



GLK: $U(X1) = .143(X1 - 5)$ if $5 \le X1 \le 8.5$

$.333(X1 - 10) + 1$ if $8.5 \le X1 \le 10$

BFF: $U(X2) = .2(X2 - 5)$ if $5 \le X2 \le 10$

DAD: $U(X3) = .333(X3 - 5)$ if $5 \le X3 \le 6.5$

$.143(X3 - 10) + 1$ if $6.5 \le X3 \le 10$

HELP: $U(X4) = .143(X4 - 5)$ if $5 \le X4 \le 8.5$

$.333(X4 - 10) + 1$ if $8.5 \le X4 \le 10$

MESH: $U(X5) = .250(X5 - 5)$ if $5 \le X5 \le 7$

$.167(X5 - 10) + 1$ if $7 \le X5 \le 10$

I then asked her to imagine, for each attribute, whether if every other attribute were either a 5 or a 10, if that would affect how much she cared about that particular attribute (i.e., if it would affect the equivalence point). According to her, it would not for any attribute; in other words, how much she cared about a particular attribute did not depend on the value of the other attributes, thus, each attribute was utility independent.

Then I asked her to subjectively rate each attribute, according to its importance to her. I also proceeded to try and check this with an attribute tradeoff scaling constant test. The results are below.

	Rank	K_i
GLK	1	0.60
BFF	4	0.10
DAD	3	0.20
HELP	3	0.20
MESH	2	0.40

(I just wanted to point out, in case you're in disbelief, that yes, having good-looking children is that important to her, and no, this did not surprise me).

I then calculated the master scaling constant, using Newton's method, since sum(K_i) = 1.5, which is greater than 1, and there were 5 K_i values. My functions for Newton's method were:

$$f(K) = 0.5K + 0.82K^2 + 0.204K^3 + 0.0232K^4 + 0.00096K^5$$

$$f'(K) = 0.5 + 1.64K + 0.612K^2 + 0.0928K^3 + 0.0048K^4$$

It took 5 iterations, to arrive at a K value below:

iteration	f(x)	f'(x)	x(n+1)
0			-1.000000
1	0.138240	-0.616000	-0.775584
2	0.018415	-0.445379	-0.734238
3	0.000785	-0.409536	-0.732442
4	0.000001	-0.407967	-0.732438
5	0.000000	-0.407964	**-0.732438**

Now time to compare alternatives. The two alternatives I need to compare in this project are 1. myself, and 2. a likely future boyfriend. If it turns out that I am better than a likely future boyfriend, then she should stay with me and marry me. If a likely future boyfriend would be better, then she should keep dating. In order to do this comparison, I had her not only rate me according to each of the attributes, but to rate her past boyfriends as well. This data is below:

	Past Boyfriends							
	A	B	C	D	E	F	Average	StDev
GLK	7	5	7	6	9	9	7.17	1.60
BFF	6	9	7	9	6	7	7.33	1.37
DAD	6	6	6	8	7	8	6.83	0.98
HELP	7	7	7	9	6	7	7.17	0.98
MESH	6	7	9	7	6	8	7.17	1.17

I have given each boyfriend a letter to protect his privacy, but I included my own rating data in the last column, as boyfriend F. I will use this data to come up with a distribution for each attribute of what a future likely boyfriend would have. Thus, I am assuming that the ratings of her past boyfriends will be indicative of what kind of future boyfriend she would be likely to get. I will assume that the distribution for each of the attributes of a likely future boyfriend is normal with the mean and standard deviation shown above.

I used Monte Carlo simulation (200 values) in excel to come up with a set of ratings for each attribute of a likely future boyfriend. I then calculated the utility of each rating, the mean and standard deviation of these utilities, as well as the mean and standard deviation of the multi-attribute utility function, using the K value I calculated above. For the Monte Carlo simulation, the excel function I used to generate values was NORMINV(r_i, mean, stdev). The means and standard deviations are shown below:

	u(GLK)	u(BFF)	u(DAD)	u(HELP)	u(MESH)	U(X)
Average	0.346	0.477	0.495	0.317	0.496	**0.521**
StDev	0.285	0.274	0.232	0.151	0.233	**0.150**

The utility for each of my attributes, as well as my multi-attribute utility function, is below:

	u(GLK)	u(BFF)	u(DAD)	u(HELP)	u(MESH)	U(X)
Me	0.667	0.400	0.714	0.286	0.667	**0.718**

Thus, a future boyfriend is likely to have a multi-attribute utility of 0.521 ± 0.150, while I have a utility of 0.718. This means that I am the likely winner, as my utility is much higher than the mean of the utilities of a possible future boyfriend, and is outside the range of such a future boyfriend's possible utilities. However, since the future boyfriend utilities I calculated are normally distributed, it is still possible that she could find a future boyfriend with a higher utility. I can calculate that chance by calculating the cumulative probability of her finding a boyfriend with a utility higher than 0.718. In excel, this is done with the equation: **1 – NORMDIST(0.718, 0.521, 0.150, TRUE) = 0.094.**

In other words, if she decided to keep dating, she would have a **9.4% chance** of finding a boyfriend with a higher utility than mine. I'll admit that my fiancé pondered that one for a moment, until I pointed out to her that a 9.4% chance means that, on average, it would take her another (1/0.094) = **10.7 boyfriends** before she would find one that was better than me. With that news she gave in. So the next time anyone tells you that women are never satisfied, tell them about multi-attribute utility functions...

References

The data for this project was done from a personal interview with my fiancé, and was calculated using excel. I did not edit the excel file to be presentable, but if you would still like to see it, send me an email at