GRANT-FUNDING EXPECTATIONS: INSIGHTS FROM THE IIRA METRICS

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INTRODUCTION

Expectations play a salient role in almost every economic activity (Friedman, 1953). However, these are latent or unobservable, mental constructs of the decision maker or the decision making unit (Rossiter, 1997); for example, think of the different motives of grant writers – continuing employment, additional pay, prestige, promotion, etc. In this paper, an attempt is made to relate the "unobservable" expectations for IIRA grant funding to observable variables. The results should provide insights about the drivers of grant applications in IIRA.

THEORY

As mentioned earlier, there are two levels to studying economic expectations: the aggregate or group level, and the individual level (Newell and Simon, 1972). Individual level analysis is ideal to generate news or current-interest items (cf, the quality of life predictions obtained using the Illinois Rural Life Poll of the IIRA). However, when it comes to empirical assessments of expectations and behavior, individual expectations are of little or no use: many people will state their expectations but will seldom act on their stated opinions.

In contrast, the "validity" issue is of little or no concern in the aggregate approach. Here, we take some objective measure which reflects a sort of consensus of expectations and use it to explain and predict economic behavior. As applied to IIRA, the amount of grant funding applied for and received in any year is a reflection of expected number of MAPPING and training programs to be implemented. To elaborate, consider a model of the following form:

$$y_t = \alpha + \beta x^*_{t+1} + u_t \qquad (1)$$

Where, y_t = Grant dollars at time *t*
x^*_{t+1} = Expected number of MAPPING and training programs during period *t+1*
u_t = Stochastic error term

If expectations regarding IIRA activities were influenced by previous years' activities, then:

$$x^*_{t+1} = \sum_{i=0}^{\infty} \beta_i x_{t-1} + u_t \qquad (2)$$

Furthermore, if β_i decline geometrically, then

$$\beta_i = \beta_0 \lambda^i \qquad 0 < \lambda < 1$$

Utilizing the sum of the infinite series, we write EQ 2 as:

$$x^*_{t+1} = \sum_{i=0}^{\infty} (1-\lambda)\lambda^i x_{t-i} \qquad (3)$$

In addition, we lag EQ 3 by one time period and multiply by λ:

$$\lambda x_t^* = \sum_{i=0}^{\infty}(1-\lambda)\lambda^{i+1}x_{t-i-1} \quad (4)$$

Substituting $j = i + 1$, and subtracting EQ 4 from EQ 3 results in:

$$x_{t+1}^* - \lambda x_t^* = (1-\lambda)x_t, \text{ or} \quad (5)$$

$$x_{t+1}^* - x_t^* = (1-\lambda)x_t - x_t^* \quad (6)$$

In summary, EQs 4 to 6 demonstrate that expectations are revised upward or downward based on the most recent error.

MODEL ESTIMATION

As discussed in the theory section, the model to be estimated is:

$$y_t = \beta(1-\lambda)\sum \lambda^i x_{t-i} + u_t$$

In terms of a backward-shift operator L, we write this as:

$$y_t = \beta(1-\lambda)\sum \lambda^i L^i x_t + u_t$$

$$= \frac{\beta(1-\lambda)}{1-\lambda L} x_t + u_t \quad (7)$$

To estimate this model, we employ the methodology suggested by Klien (1958). Specifically, we write EQ 7 as:

$$y_t = \beta(1-\lambda)\sum_{i=0}^{t-1}\lambda^i x_{t-i} + \beta(1-\lambda)\sum_{i=t}^{\infty}\lambda^i x_{t-i} + u_t \quad (8)$$

The first term in EQ 8 is easy to compute for any given value of λ with observed data. But the second term cannot be computed because we don't observe x_0, x_{-1}, x_{-2}, etc. We surpass this limitation by equating

$$\beta(1-\lambda)\sum_{i=t}^{\infty}\lambda^i x_{t-i} = \lambda^t \eta_0$$

Thus EQ 8 is written as:

$$y_t = \beta z_{1t} + \eta_0 z_{2t} + u_t \quad (9)$$

Where, $z_{1t} = (1-\lambda)\sum \lambda^i x_{t-i}$, and $z_{2t} = \lambda^t$

We obtained the maximum-likelihood estimates of λ and β by searching over λ. Specifically, EQ 9 was calibrated for different λs and the estimates that had the minimum residual sum of squares were chosen. Data used in model calibration are given in Appendix 1.

RESULTS

Table 1 highlights our expectations about MAPPING / training programs. Briefly, we expect to offer 13 to 16 programs in a year. This is the predominant reason for seeking grant funding; it explains 90% of the variability in IIRA's grant-funding request over the last 20 years. Figure 1 is a diagnostic for model calibration.

Table 1: ANOVA Table and Parameter Estimates:($y_t = \frac{\beta(1-\lambda)}{1-\lambda L} x_t + u_t$); R^2 = 0.90

	DF	SS	MS	F- Statistic	P- Value
β_{z1}	1	9137685.254029276	9137685.254029276	164.33347122322192	$3.640197346451899 \times 10^{-10}$
β_{z2}	1	24231.743740348145	24231.743740348145	0.4357872318798771	0.5180080241625902
Error	17	945276.991730377	55604.52892531629		
Total	19	$1.01071939895 \times 10^7$			

	Estimate	Standard Error	t- Statistic	P- Value
α	135.2087320814152	112.77515171986752	1.1989230785277283	0.24700359517145953
β_{z1}	13.100271860685806	1.0798140815196078	12.131969831556532	$8.51040872107697 \times 10^{-10}$
β_{z2}	901.3710415449175	1365.4202847771676	0.6601418270946652	0.518008024162588

Figure 1: Model Diagnostics; Model Fit

DISCUSSION

This paper is third in the series exploring the relevance of IIRA metrics (Appendix 1). The first one derived marketing implications from the metrics (Athiyaman, 2011a), and the second one assessed the implications of the "miles-and-programs" metrics (Athiyaman 2011b).

This paper shows that IIRA meets the needs of rural communities that private industries most often cannot meet. Specifically, the paper demonstrates how IIRA's grant program is driven by rural, community-economic-development motives.

A benefit of this empirical analysis is the identification of a performance metric: number of MAPPING / training programs that IIRA expects to implement every year. The baseline for the programs is 13 to 16 per year.

The paper also helps broadcast to stakeholders how IIRA's activities are integrated to facilitate community-economic development; how grant funding is driven by the need to implement at least 13 to 16 MAPPING programs every year. It is hoped that the IIRA management takes into account findings from these three papers to (re) design the IIRA metrics.

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Appendix 1: IIRA Metrics

INSTITUTE MANAGEMENT INDICATORS

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	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	1990-2009
INPUTS																					
Faculty & Staff:																					
Full-Time	9	11	11	12	13	17	17	18	17	20	21	21	22	26	27	28	29	34	36	37	-
Part-Time	-	-	-	1	3	3	3	2	3	4	4	4	6	2	1	1	1	0	1	1	-
Peace Corps Fellows	-	-	-	-	3	4	7	9	7	19	17	14	20	20	25	20	16	11	13	18	205
Student Workers	5	7	15	11	16	17	8	7	8	15	13	3	3	4	4	2	0	2	2	9	-
Grants	5	3	4	6	8	10	12	11	12	20	26	35	37	36	44	46	46	31	43	48	483
Indirect Cost Dollars (000's)																		180.2	192.2	174.2	547
Appropriated Dollars (000's)	250.0	229.7	226.4	226.2	256.3	330.6	440.9	535.2	569.6	885.3	942.7	1,008.6	1,092.6	1,117.3	1,140.7	1,123.8	1,379.7	1,411.2	1,643.8	1,615.1	16,426
Grant Dollars (000's)	479.6	497.6	498.0	569.3	634.9	652.8	763.4	694.1	731.8	1,046.2	1,227.2	1,163.0	1,791.0	1,953.0	1,636.0	1,974.0	1,873.1	2,959.5	2,280.8	1,952.6	25,378
Total Dollars (000's)	729.6	727.3	724.4	795.5	891.2	983.4	1,204.3	1,229.3	1,301.4	1,931.5	2,169.9	2,171.6	2,883.6	3,070.3	2,776.7	3,097.8	3,252.8	4,370.7	3,924.6	3,567.7	41,804
Calls to the Toll Free Number	601	1,287	1,932	3,282	3,653	3,649	4,164	3,786	3,388	3,255	3,484	2,467	3,595	2,538	2,766	2,560	2,440	2,345	2,288	1,633	55,113
Hits to Web Pages (000's)	-	-	-	-	-	-	-	-	-	-	-	-	37	130.5	266.4	160.5	540.8	594.1	938.0	2,050.5	4,718
Miles Traveled (000's)	31.3	51.1	52.8	75.4	84.6	105.2	92.5	99.4	116.8	193.1	135.7	138.5	157.6	175.0	205.5	215.7	166.3	184.0	188.9	203.5	2,673
ACTIVITIES																					
Conference Presentations	15	26	25	27	26	17	31	37	39	33	41	33	31	27	28	42	50	44	44	19	635
MAPPING Programs	-	-	5	10	20	21	18	16	10	12	11	12	10	9	7	5	8	6	7	5	192
Mailings (000's)	10.4	9.5	10.6	21.9	41.4	48.3	53.2	39.8	40.8	44.3	40.3	29.2	26.2	34.0	20.1	23.2	25.7	25.8	25.7	19.2	590
Service on Boards/Committees																					
Surveys	2	1	7	5	7	6	16	9	12	27	9	11	11	19	10	8	11	18	49	45	283
Teaching - No. of Students	260	205	185	175	140	236	352	271	274	378	273	547	576	454	786	719	521	156	139	130	6,777
Training Programs	-	7	13	7	10	16	17	18	13	54	26	45	98	95	125	92	97	130	156	90	1,109

PRODUCTS																					
Books (hard bound)	-	1	1	-	-	1	2	-	1	-	2	-	2	0	3	0	0	1	1	1	16
Book Chapters, Monographs and Articles	24	20	21	18	10	15	22	15	16	20	22	18	17	12	10	11	14	28	32	20	365
Rural Research Reports	3	10	10	8	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	6	187
Professional / Trade Publications	-	10	13	12	8	7	10	12	15	16	8	11	9	5	5	7	22	9	2	11	192
OUTCOMES																					
Conference/Training Participants	1,383	1,508	2,487	4,956	3,809	4,388	4,039	4,479	4,252	3,341	2,697	4,275	4,414	4,347	6,540	5,879	7,473	7,728	6,452	2,665	87,112
Faculty/Staff Awards	1	1	1	5	1	3	3	3	3	2	5	5	4	2	2	5	7	7	5	1	66
Trained ED Practitioners (Peace Corps Fellows)	-	-	-	-	-	-	2	2	1	5	8	4	3	6	5	3	5	5	1	2	52
% of Grants Received	100%	100%	80%	100%	91%	100%	91%	100%	89%	100%	94%	87%	96%	94%	95%	94%	86%	97%	68%	86%	92%