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RURAL OUT MIGRATION AT THE HOUSEHOLD LEVEL

Raj Kumar Yadav*and Upendra Kumar

Department of Statistics,UdaiPratap Autonomous College, Varanasi,Uttar Pradesh,India

ABSTRACT:

Migration, conventionally, being an important part of demography, is least studied as compared to fertility and mortality. Due to decreasing birth and death rate, migration (internal or international) has become a more important concern for demographers and other social scientists.Since probability models provide concise and clear representations of extensive data sets in a better way (Aryal, 2010),in recent years increased attention has been paid to the proposition and derivation of probability models for the movement of human population at micro level. The aim of the paper is to study the pattern of rural out migration with the help of a probability model. The data for the study have taken from two different places. The study shows that the logarithmic series distribution is a well approximation for the rural out migration in the given area.

Key-Words: Rural out migration, logarithmic series distribution, maximum likelihood estimation.

INTRODUCTION:

Migration, conventionally, being an important part of demography, is least studied as compared to fertility and mortality. Due to decreasing birth and death rate, migration (internal or international) has become a more important concern for demographers and other social scientists. Most of the studies in past (Greenwood 1971; Isbell 1944; Lee 1966; Singh et.al., 2012; Singh 1986; Stouffer 1940,1960 and Ziff 1946), depending upon the conceptualization of migration process and the scale of investigations, used macro approach by operating on highly aggregate data for countries, districts, states and the nation as a whole. These types of studies are unable to provide sufficient explanation for the tremendous regional and local heterogeneity. They also ignore the decision making process of migrating individuals (Singh and Yadava 1981). Thus a study of environment in which migration takes place and the migration decision process at the micro-level is more important. Studies of migration at the micro-level i.e. at the levels of individuals, families or householdshave important implications for housing policies and also for the development of other sociological models related to familiesandcommunities(Pryor,1975;Rossi,1955).

It is seen that a migrant household (with one or more persons involved in the process of migration in relation to do some job outside the village) may have different socio-economic and cultural characteristics through remittances besides ideas, awareness and environments than a non-migrant household. It is worth mentioning here that rural-urban migration in India is of chain type at least in the beginning of the migration process before finally they settled in the urban areas or returned back to the villages.

A useful way of addressing the diversity of migration system is to treat the major contemporary cases in a general comparative frame work (Simmons &Piche, 2002). There is need to put more emphasis on using models to analyse and explain important demographic issues and to predict demographic futures (Singh et. al., 2016). One of the important property of micro level models is that a researcher can introduce individual heterogeneity- measured (accounting different rates for individual with different characteristics such as age, sex, social class, cohort, etc.) and unmeasured (choosing for each individual an adjusting factor each being the transition rate).

Many Studies have been done to apply and/or formulate probability models in natural as well as social sciences (Afsar, 1995; Aryal, 2003; Wintle, 1992).Since probability models provide concise and clear representations of extensive data sets in a better way,in recent years increased attention has been paid to the proposition and derivation of probability models for the movement of human population at micro level (Yadava, 1977). Singh and yadava (1981) have introduced the negative binomial distribution to study the pattern of rural-out migration at household level. Sharma (1984) applied this model on a different data set and found that this model is not suitable for the total number of migrants (including females and children) from a household. Since migrated females are more likely to affect the socio-cultural characteristics of households in comparison to other females of household, it is important to study the pattern of total number of migrants from a household.

Sharma (1984) proposed a probability model under the assumption that (i) the number of male migrants aged 15 years and above follows negative binomial distribution and (ii) the distribution of alive children to a couple be known. However, the distribution of alive children to a couple has not yet been derived theoretically; the prior knowledge about these two distributions is difficult.

Singh (1985) proposed a probability model under the assumption that there are two types of households – first in which only male aged 15 years and above migrate and second – in which the male migrate with their wives and children. Several authors have proposed models in the same line to describe the distribution of household according to the total number of migrants including wife and children (Singh et. al., 2014, 2015; Yadava and Yadava, 1988; Yadava et. al., 1989, 1991).

The aim of the paper is to study trends in rural-out migration at the household level through some probabilistic models and also to do some modification in the exiting estimation procedure.

DATA:

The above discussed model is verified by the data set collected in a primary survey entitled“Migration and its Impact in Rural Varanasi” has been conducted during September -October 2015 in four villages of two blocks of Varanasi District by the Department ofStatistics, U. P. Autonomous College, Varanasi. Apart from this the data set collected during October 2009 to June 2010 in Northeastern Bihar.

A PROBABILITY MODELS FOR RURAL OUT MIGRANTS

A probability model for describing the variation in the number of rural out-migrant households has been derived on the basis of following assumptions:

(i) At the survey point, the household is either exposed to the risk of migration or it is not exposed to the migration risk. Let α and (1-α) be the respective probabilities.

(ii) The probability of migrating one male from a household is greater than the probability of migrating two males, and probability of two males migrating is greater than that of three males from a household and so on. Thus, the pattern of migration from a household is a decreasing function and follows a logarithmic series distribution with parameterλ.

Let x represent the number of rural out-migrants from a household, then under the assumptions (i) and (ii), the probability function of x is given by

$$\left.\begin{aligned} P(\mathbf{x}=\mathbf{k}) &= 1-\alpha, \qquad \textbf{for } \mathbf{k}=\mathbf{0} \\ &= \alpha\left[\frac{-\lambda^{\mathbf{k}}}{\mathbf{k}\ln(\mathbf{1}-\lambda)}\right] \textbf{for } \mathbf{k}=\mathbf{1,2,3,...;\ 0}<\lambda<\mathbf{1;\ 0}<\alpha<\mathbf{1} \end{aligned}\right\} \quad ..... \qquad (1.1)$$

The log-series distribution has a long positive tail and the shape of the tail is similar to that of geometric distribution for large values of k. However, the log-series distribution has the advantage that it has only one parameter instead of two parameters of Negative Binomial Distribution.

Estimation

Consider a sample consisting of n observations of the random variable x with probability function given by expression (1.1). Suppose that n_k (k = 0, 1, 2,…, m) represents the number of observations of k'th cell and $\sum_{k=0}^{m} n_k = n.$ The likelihood function for the given sample (x_1, x_2, …, x_n) can be expressed as :

$$L[\alpha,\lambda \mid (x_1, x_2,\ldots,x_n)] = (1-\alpha)^{n_0} \prod_{k=1}^{m} \left[\alpha\left(\frac{-\lambda^k}{k\log(1-\lambda)}\right)\right]^{n_k} \quad ..... \quad (1.2)$$

$$= \frac{(1-\alpha)^{n_0}(-\alpha)^{n-n_0}\lambda^{\sum_{k=1}^{m} n_k x_k}}{\left(\prod_{k=1}^{m} x_k^{n_k}\right)[\log(1-\lambda)]^{n-n_0}} \quad .... \quad (1.3)$$

where x_k represents the value of k.

Taking logarithms of (1.3) and differentiating with respect to α and λ respectively and equating to zero gives the following equations:

$$\frac{\partial \log L}{\partial\alpha} = -\frac{n_o}{1-\alpha} + \frac{n-n_o}{\alpha} = 0 \quad .... \quad (1.4)$$

$$\frac{\partial \log L}{\partial\lambda} = \frac{\sum_{k=1}^{m} n_k x_k}{\lambda} + \frac{n-n_0}{(1-\lambda)\log(1-\lambda)} = 0 \quad .... \quad (1.5)$$

The equation (1.4) yields the estimator of α as

$$\hat{\alpha} = \frac{n-n_0}{n}$$

The estimating equation for λ is obtained by solving equation (1.5) as:

$$(1-\lambda)\log(1-\lambda)\sum_{k=1}^{m} n_k x_k + (n-n_0)\lambda = 0 \quad .... \quad (1.6)$$

This equation can be solved numerically and the numerical solution of (1.6) is the desired maximum likelihood estimate for λ.

Using the fact that E (n_0) = n (1-α), E($n-n_0$) = nα

$$E(x_k) = \frac{-\alpha\lambda}{(1-\lambda)\log(1-\lambda)} \text{ and } E\left(\sum_{k=1}^{m} n_k x_k\right) = -\frac{n\alpha\lambda}{(1-\lambda)\log(1-\lambda)}$$

The expected values of second partial derivatives are obtained as

$$-E\left(\frac{\partial^2 \log L}{\partial\alpha^2}\right) = -\frac{E(n_0)}{(1-\alpha)^2} - \frac{E(n-n_0)}{\alpha^2} = \frac{n}{\alpha(1-\alpha)} = \varphi_{11} \text{ (say)} \quad .... \quad (1.7)$$

$$-E\left(\frac{\partial^2 \log L}{\partial \lambda^2}\right) = -\frac{E\left(\sum_{k=1}^{m} n_k x_k\right)}{\lambda^2} + \frac{[1+\log(1-\lambda)]E(n-n_0)}{[(1-\lambda)\log(1-\lambda)]^2}$$

$$= -n\,\alpha\left[\frac{1}{\lambda(1-\lambda)\log(1-\lambda)} + \frac{1+\log(1-\lambda)}{[(1-\lambda)\log(1-\lambda)]^2}\right] = \phi_{22}\ \text{(say)} \ldots. \quad (1.8)$$

The covariance between α and λ is zero since E $\left(\frac{\partial^2 \log L}{\partial\alpha\partial\lambda}\right)$ = 0 and hence the variance of α and λ can be obtained as

$$v(\hat{\alpha}) = \frac{1}{\phi_{11}} \qquad \text{and} \qquad v(\hat{\lambda}) = \frac{1}{\phi_{22}}$$

Conclusion:

The Study indicates that the present model is a reasonable approximation to describe the distribution of households for the rural out migrants and at least at the micro-level. Both the data set shows that the model used describes the phenomenon satisfactorily well. The exact variance and covariance of the estimator for the modelhave also been computed.

Table-1. Distribution of observed and expected frequency of number of households according to the number of rural out migrants (Varanasi district data 2015)

Number of Migration	observed	Expected	$\chi^2_{0.05}$ (d.f. =3)
0	395	395	1.1112
1	141	149.5	
2	54	53.1	
3	27	23.7	
4	15	11.72	
5	7	5.61	
6	7	10.4	
7	3		
8	0		
Total	649		
α	0.39		
p	0.53		
λ	0.6		
var(α)	0.00034		
Var(l)	0.00074		

Fig.1. Expected and Observed Frequency of Number of Migrants (Varanasi district data 2015)

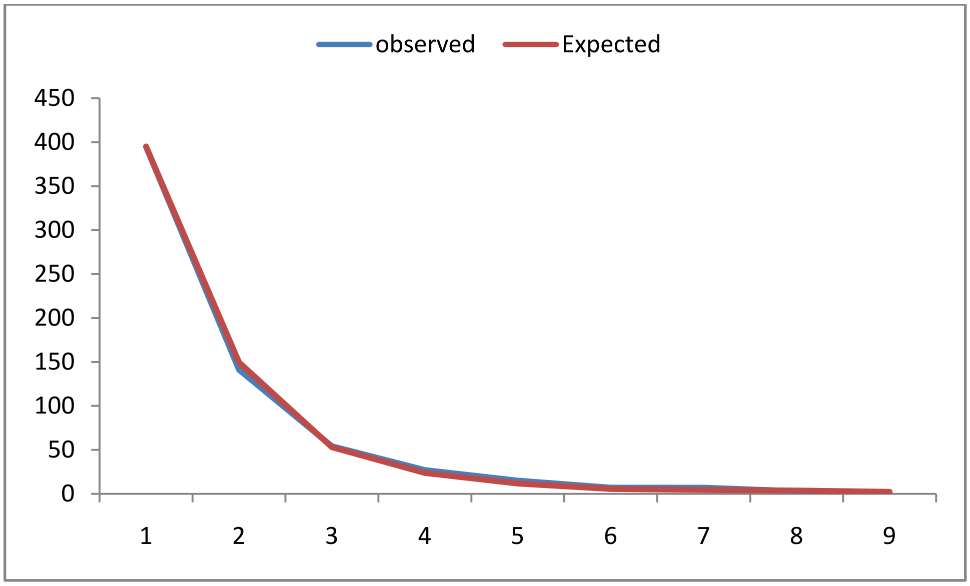
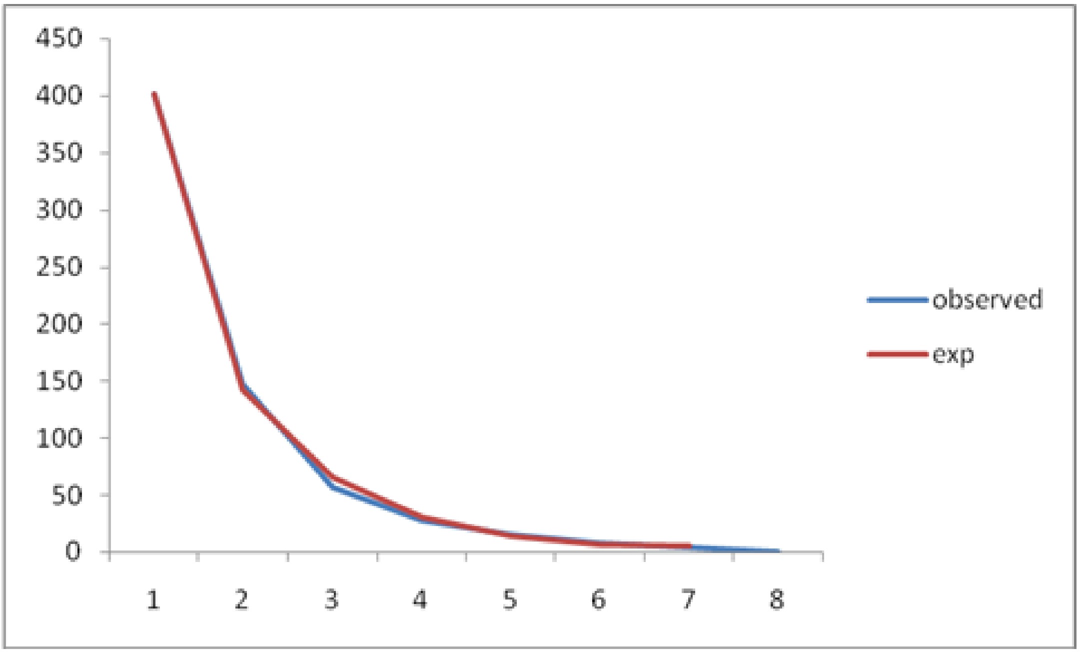


Table-2. Distribution of observed and expected frequencyof number of households according to the number of rural out migrants (Data set of Northeastern Bihar)

No of Migrants	observed	Expected(Model I)	$\chi^2_{0.05}$
0	401	401	4.67
1	147	157.50	
2	57	53.33	
3	29	24.08	
4	16	12.23	
5	8	6.63	
6	5	9.22	
7	1		
8	0		
	664	664	
α	0.396084		
p	0.537832		
λ	0.677246		
var(α)	0.00036		

var(λ)	0.000756

Fig.2. Expected and Observed Frequency of Number of Migrants(Data set of Northeastern Bihar)



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