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An inflated probability models for adult out-migration

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Abstract
In this paper an inflated probability model developed under the certain assumption for the adult male migrants, from the households. The parameters involve in the model have been estimated and suitability of the model has been carried out by the adult male migration data.

Keywords: Adult migration, inflated model, sized biased probability distribution, estimation techniques

Introduction
Adult migration is a function of certain objectives social conditions operating at the rural sources and at the urban destination. Those conditions are generally referred to as rural push and urban pull factors of an adult migration. The interplay of those push-pull factors plays an important role in determining the flow of adult migration which one is good indicator of the growth of society in respect of social, economic and cultural behavior of the people. In micro level, adult migration is a decision that impacts the welfare of the household and the home community. Several attempts have been made to study the pattern of rural out migration through probability model (Iwunor, 1995; Sharma, 1985; Pandey and Dubey, 2016) [4, 7, 5] Some mixture of were studied by Borah and Deka (2001) [2].
This paper is an attempt to propose an inflated Probability model to describe the pattern of adult migrants and applied to the survey data.

Probability Model
Under the situation some household have varying number of adult migrants and some households have no adult migrants becomes in form of inflated nature. Keeping this fact into consideration and under the following assumptions:

1. Due to establishment by migrants in the village at the origin. Let α be the probability that a household in exposed to risk of migration at the time of survey and $(1-\alpha)$be the probability that a household is not exposed to risk of migration.
2. Let the number of adult migrants from a household follows a Poisson distribution and the parameters of this distribution varies according to Garima distribution, Sanker and Shukla (2017) [6] because there is large disparity in terms of social, economic and culture of households.
3. Present in the society which affects the intensity of migration. Therefore, finally we get the inflated type probability model of adult migrants which behave as a random variable.

Model-I
Therefore, Under the above assumptions the adult migrants who behave as a random variable and follow an inflated type probability model in form of Poisson Garima distribution

$$P(X=k)=\begin{cases} 1-\alpha+\alpha\left[\left(\frac{\beta}{\beta+2}\right)\left(\frac{\beta^2+2\beta+1}{(\beta+1)^2}\right)\right]; k=0 \\ \alpha\left[\left(\frac{\beta}{\beta+2}\right)\left(\frac{\beta k+(\beta^2+3\beta+1)}{(\beta+1)^{k+2}}\right)\right]; k=1,2,\ldots. \\ \beta>0 \end{cases} \quad (1)$$

Model-II

Therefore, the adult migrants who behave as a random variable and follow a Sized biased probability model in form of Poisson Garima distribution (Sankar and Shukla, 2017) [6]. Then from above assumption (1) and (2) the inflated type sized biased probability model take following form:

$$P(X=k)=\begin{cases}1-\alpha\,;\ k=0\\ \alpha\left[\left(\frac{\beta^2}{\beta+3}\right)\left(\frac{k^2\beta+k(\beta^2+3\beta+1)}{(\beta+1)^{k+2}}\right)\right]\ ;\ k=1,2,3,....\end{cases}$$

$$\beta>0 \qquad (2)$$

Estimation Techniques

Method of Moment

Model-I,this model contains two parameters α and β. These two parameters estimated by this technique and zero[th] and first cell frequencies which takes the following forms of equation:

$$\left.\begin{aligned}\frac{f_0}{f}&=1-\alpha+\alpha\left[\left(\frac{(\beta)}{(\beta+2)}\right)\left(\frac{(\beta^2+3\beta+1)}{(\beta+1)^2}\right)\right]\\ \text{And } E(X)&=Mean=\alpha\left[\frac{(\beta+3)}{\beta(\beta+2)}\right]\end{aligned}\right\} \qquad (3)$$

Where f_0, f_1, f, and E(X) denotes the zero[th] cell frequency, first cell frequency, total observation and mean value respectively.

Model-II, this model contains two parameters α and β. These two parameters estimated by this technique and zero[th] and first cell frequencies which takes the following forms of equation:

$$\left.\begin{aligned}\frac{f_0}{f}&=1-\alpha\\ \text{And } E(X)&=Mean=\alpha\left[\frac{(\beta^2+5\beta+8)}{\beta(\beta+3)}\right]\end{aligned}\right\} \qquad (4)$$

Where f_0, f_1, f, and E(X) denotes the zero[th] cell frequency, first cell frequency total observation and mean value respectively

Application

The model has been applied to the primary data taken from a survey entitled "migration and related characteristics-a case study of North-Eastern Bihar" conducted during October 2009 to June 2010. This analysis is based on the information collected from 664households.Further, the models proposed have also been applied to other three data set of different time and space to check its suitability. The Varanasi data was collected under a sample survey "Rural development and population growth (RDPG) survey" conducted in1978 in Varanasi district and used by Sharma (1985) [7] and Iwunor (1995) [4]. The Nepal data is taken from a sample survey of the Rupandhi and Palpa districts in Nepal and used by Aryal (2011) [1]. The Bangladesh data was collected under a sample survey "Impact of Migration on Fertility in Bangladesh: A study of Comilla district" conducted in 1997 and used by Hossain (2000) [3].

Table 1: Observation and expected frequency of the number of households according to the North-Eastern Bihar

Number of Migrants	Observed number of households	Expected number of households	
		Model I	Model II
0	401	401.05	401
1	147	139.97	128.21
2	57	66.4	78.04
3	29	30.88	35.08
4	16	14.14	13.85
5	8		
6	5	11.61	7.82
7	1		
Total	664		
Mean = 0.7365		χ^2=2.5347	χ^2=14.4532
		d.f. =3	d.f.=3
Estimated value of parameters		α=0.8286	α=0.3960
		β=1.4513	β=2.7476

Table 2: Observation and expected frequency of the number of households according to the migrants in Varanasi District

Number of Migrants	Observed number of households	Expected number of households	
		Model I	Model II
0	1032	1031.89	1032
1	95	88.29	85.33
2	19	28.03	31.95
3	10		
4	2	12.79	11.72
5	2		
6	0		
7	1		
Total	1161		
Mean = 0.1619		χ^2=3.4189	χ^2=7.2728
		d.f. = 1	d.f. = 1
Estimated value of parameters		α= 0.3457	α= 0.1111
		β= 2.5999	β= 4.9258

Table 3: Observation and expected frequency of the number of households according to the migrants in Nepal

Number of Migrants	Observed number of households	Expected number of households	
		Model I	Model II
0	623	622.92	623
1	126	125.42	120.60
2	42	42.06	48.18
3	13	13.87	14.28
4	4		
5	2	6.72	4.94
6	1		
Total	811		
Mean = 0.3465		χ^2= 0.0687	χ^2= 3.4862
		d.f. = 2	d.f. = 2
Estimated value of parameters		α= 0.6831	α= 0.2318
		β= 2.4180	β= 4.5754

Table 4: Observation and expected frequency of the number of households according to the migrants in Comilla District of Bangladesh:

Number of Migrants	Observed number of households	Expected number of households	
		Model I	Model II
0	1941	1940.92	1941.13
1	542	528.49	515.17
2	124	147.65	166.50
3	48	40.66	39.94
4	13		
5	4	15.28	10.39
6	1		
Total	2673		
Mean = 0.3786		χ^2= 2.7646	χ^2= 19.4459
		d.f. =2	d.f. =2
Estimated value of parameters		α= 0.9686	α= 0.2738
		β= 3.0636	β= 5.8177

Conclusion

The estimated value of the parameters is given in the end of tables. The value of $\chi^2$with degree of freedom clearly indicate that the proposed model fit the survey data and describe the distribution of the number of adult migrants from a household. The fitting result of model I and model II provide that the sized biased model is less efficient and fitting poorer than the inflated model. Thus, the inflated model is better than sized biased model. The Proposed model and its finding may help Demographers, planners and policy makers for designing more effective and reasonable policies for the good health and environment of the society, especially for country-India, Nepal and Bangladesh.

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