A NEUTROSOPHIC FUZZY ACCEPTANCE SAMPLING PLAN BASED ON NEGATIVE BINOMIAL DISTRIBUTION

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Abstract

This paper suggests a novel method for acceptance sampling that integrates neutrosophical fuzzy logic with the negative binomial distribution. The complexity and ambiguity that characterize real-world circumstances are typically overlooked by traditional acceptance sampling methodologies. The neutrosophic Fuzzy Acceptance Sampling Plan (NFASP) incorporates the negative binomial distribution, which is particularly well-suited for count data, to account for circumstances where defect occurrences are important. The efficacy of the methodology is demonstrated by theoretical study and simulations. This innovative method lifts acceptance sampling to a more accurate and sophisticated procedure by dealing with ambiguity and indeterminacy.

Keywords: Neutrosophic fuzzy acceptance sampling, Negative Binomial distribution, Indeterminacy.

I. Introduction

Acceptance sampling is a statistical technique that assess whether a large number of products confirm to particular standards. The goal of acceptance sampling is to minimize both the cost of the inspection and likelihood of approving a deficient batch. By inspecting the sample of the product deciding whether to accept or reject entire lot based on the inspection sample. In this paper our study focusses on a new attribute sampling plan by using a new fuzzy technique neutrosophic concepts. With a help of neutrosophic fuzzy acceptance sampling plan, we demonstrate that our traditional plan is sometimes inadequate when the situations are indeterminacy. We think that this research will significantly add to the body of knowledge on neutrosophic fuzzy acceptance sampling plan.

Acceptance sampling is a crucial quality control method that is applied in a variety of sectors to determine whether to accept or reject a batch of goods after inspecting a sample. Although traditional acceptance sampling plans have been widely used, academics have begun to investigate novel approaches, such as neutrosophic fuzzy acceptance sampling plans, in order to address uncertainty and ambiguity in real-world industrial processes. The purpose of this review of the literature is to examine the material that has been done on the design of fuzzy acceptance sampling plan based on the negative binomial distribution.

According to the neutrosophic statistical interval method, Aslam (2018) [1] suggested a novel acceptance sampling plan for the exponential distribution. The neutrosophic non-linear problem was used to determine the neutrosophic plan parameters of the proposed design. further usage in industry, tables with different risk values were supplied. The acceptance sampling plan for the binomial distribution based on neutrosophic fuzzy sets was developed by Aslam & Aslam (2020) [2]. Regarding both producer risk and consumer risk, the proposed plan was found to be more effective than conditional acceptance sampling plan. Simulated analysis of the plan's performance revealed that it is a promising plan for addressing product quality uncertainty. A novel approach of acceptance sampling plan based on neutrosophic fuzzy sets was proposed by Aslam and Aslam (2021) [3]. Regarding both producer risk and consumer risk, the proposed plan was found to be more effective than conditional acceptance sampling plans. Simulated data was used to evaluate the same plan. A variable sampling plan for the Poisson distribution based on neutrosophic fuzzy sets was proposed by Aslam et al. in 2021 [4]. Regarding both the risk to the producer and the risk to the consumer, the proposed plans was shown to be more successful than conditional variable sampling plans. Simulated analysis of the plan's performance revealed that it is a promising plan for addressing product quality uncertainty. For the binomial distribution with unknown probability of defect, Divya P et al. (2012) [5] suggested a novel type of acceptance sampling plan based on neutrosophic fuzzy sets. The proposed plan was found to be more effective than conditional acceptance sampling plans. For the Poisson distribution with unknown parameters, Aslam et al. (2021) [6] developed a novel acceptance sampling method based on neutrosophic fuzzy sets. Regarding both producer risk and consumer risk, the proposed plan was found to be more effective than conditional acceptance sampling plans. Simulated analysis of the plan's performance revealed that it is a promising plan for addressing product quality uncertainty.

For the Weibull distribution with unknown parameters, Aslam et al. (2021) [7] developed a novel acceptance sampling method based on neutrosophic fuzzy sets. Regarding both producer risk and consumer risk, the proposed approach was found to be more successful than conditional acceptance sampling plans. Simulated analysis of the plan's performance revealed that it is a promising plan for addressing product quality uncertainty. For the binomial distribution with unknown parameters, Aslam et al. (2021) [8] developed a novel acceptance sampling method based on neutrosophic fuzzy sets. Regarding both producer risk and consumer risk, the proposed approach was found to be more successful than conditional acceptance sampling plans. Simulated analysis of the plan's performance revealed that it is a promising plan for addressing product quality uncertainty. A novel kind of double sampling plan based on neutrosophic fuzzy sets was developed by Aslam et al. in 2021 [9] for the Poisson distribution with unknown parameters. Regarding both the risk to the producer and the risk to the consumer, the proposed plans was found to be more successful than conditional double sampling plans. Simulated analysis of the plan's performance revealed that it is a promising plan for addressing product quality uncertainty. For the Weibull distribution with unknown parameters, Aslam et al. (2021) [10] developed a novel sort of variable sampling plans based on neutrosophic fuzzy sets. Regarding both the risk to the producer and the risk to the consumer, the suggested plans was shown to be more successful than conditional variable sampling plans. Simulated analysis of the plan's performance revealed that it is a promising plan for addressing product quality uncertainty.

A novel sort of acceptance sampling plan based on intuitionistic fuzzy linguistic concepts was presented by Isik and Kaya in 2022 [11]. Simulated analysis of the plan's performance revealed that it is a promising plan for addressing product quality uncertainty. The effect of neutrosophic statistics on acceptance sampling plans was studied by Raza et al. in 2022 [12]. The study demonstrated several ways in which neutrosophic statistics can be used to enhance the design and analysis of acceptance sampling plans, including addressing product quality uncertainty, enhancing producer and consumer risk, and enhancing the effectiveness of acceptance sampling plans. Furthermore, an acceptance sampling plan for the Weibull distribution based on neutrosophic fuzzy sets was developed by Raza et al. in 2022 [13]. The proposed approach was found to be more successful than conditional acceptance sampling plans. Simulated analysis of the plan's performance revealed that it is a promising plan for addressing product quality uncertainty. An innovative acceptance sampling approach for attribute data based on neutrosophic fuzzy sets was developed by Raza et al. in 2022 [14]. A kind of double sampling plans for the negative binomial distribution based on neutrosophic fuzzy sets was developed by Sadeghpour Gildeh B et al. in 2022 [15]. For the Weibull distribution with an unknown shape parameter, Aslam et al. (2022) [16] suggested a acceptance sampling plan based on neutrosophic fuzzy sets.

II. Neutrosophic Negative Binomial Distribution (NNBD)

The neutrosophic negative binomial distribution is an extension of the negative binomial distribution that incorporates neutrosophic uncertainty. In this distribution, the parameters of the negative binomial distribution are described with the help of neutrosophic membership degrees, which represent the degree of truth, indeterminacy, and falsity associated with each parameter. The neutrosophic negative binomial distribution allows for modeling uncertainty in the parameter values and is especially useful when dealing with imprecise or incomplete information. The Cumulative Density Function (CDF) is given below:

$$F(x) = 1 - (p_r(S))^{\delta}(p_r(U))^{x-\delta+1}\sum_{m=1}^{\infty}\binom{x-s+m}{m-1}(p_r(I))^{m-1} \tag{1}$$

The Probability Mass Function (PMF) NNBD is given below

$$T_x = (p_r(S))^{s}\sum_{t=0}^{th}\binom{x-s}{t}(p_r(I))^{t}(p_r(U))^{x-s-t} \tag{2}$$

$$U_x = \sum_{\substack{y=s\\ y\neq x}}^{\infty} T_y = (p_r(S))^{s}\sum_{\substack{y=s\\ y\neq x}}^{\infty}\sum^{th}\binom{y-s}{t}(p_r(I))^{t}(p_r(U))^{x-s-t} \tag{3}$$

$$I_x = (p_r(S))^{s}\sum_{z=th+1}^{x-\delta}\binom{x-s}{z}(p_r(I))^{z}\sum_{x-s}^{\infty}\sum_{t=0}^{x-s-z}\binom{x-s-z}{t}(p_r(U))^{x-s-z-t} \tag{4}$$

The mentioned equations namely (1), (2), (3) and (4) gives cumulative density function, probability mass functions of negative binomial distribution. Additionally, Tx provides probability of success, Ux provides probability of failures and Ix provides probability of indeterminacy values.

III. Operating Procedure

The following stages make up the operational method for the neutrosophic negative binomial distribution:

Step 1: Establish the neutrosophic negative binomial distribution's parameters. r: The number of successes (failures before the procedure is stopped), p: The likelihood that each trial will be successful, P(S): The degree of success with uncertainty (degree of success with neutral membership). P(U) is the level of uncertainty for the unknown (neutrosophic membership level), and P(I) is the level of uncertainty for the failure (neutrosophic membership level).

Step 2: Determine the neutrosophic negative binomial distribution's probability mass function (PMF) for a given success rate x. PMF is provided by:

$$T_x = (p_r(S))^s \sum_{t=0}^{th} \binom{x-s}{t} (p_r(I))^t (p_r(U))^{x-s-t} \tag{5}$$

$$U_x = \sum_{\substack{y=s \\ y\neq x}}^{\infty} T_y = (p_r(S))^s \sum_{\substack{y=s \\ y\neq x}}^{\infty} \sum^{th} \binom{y-s}{t} (p_r(I))^t (p_r(U))^{x-s-t} \tag{6}$$

$$I_x = (p_r(S))^s \sum_{z=th+1}^{x-\delta} \binom{x-s}{z} (p_r(I))^z \sum_{x-s}^{\infty} \sum_{t=0}^{x-s-z} \binom{x-s-z}{t} (p_r(U))^{x-s-z-t} \tag{7}$$

Step 3: Determine the Level of Belongingness in the degree of truth, indeterminacy, and falsehood related to each parameter is represented by the neutrosophic membership degrees P(S), P(U), and P(I). The following criteria should be met by these membership degrees: Tx + Ux + Ix = 1.

Step 4: Making Decisions to make judgments in the face of uncertainty, use the neutrosophic negative binomial distribution. You can calculate the likelihood of various outcomes and evaluate the risk involved with certain situations or events.

IV. The Average Outgoing Quality (AOQ)

In order to evaluate the quality of items or services leaving a manufacturing or service process, the Average Outgoing Quality (AOQ) is a crucial metric used in acceptance sampling plans. The predicted quality of the goods or services under the suggested acceptance sampling plans is best understood in the context of the neutrosophic negative binomial distribution. Consider the situation where a random sample of goods or services is chosen for inspection, and a decision is made based on whether the number of successes (k) (e.g., defect-free units, satisfied consumers) in the sample meets a given criterion before a certain number of failures (r) (e.g., defective units, dissatisfied consumers) occur. This will help you understand AOQ in the context of the neutrosophic negative binomial distribution. We seek to ascertain the typical proportion of non-conforming items (defective goods or disgruntled consumers) that will be approved by the acceptance sampling plan across a large number of inspection instances in the context of AOQ for the neutrosophic negative binomial distribution. The formula below can be used to determine

$$AOQ = \frac{k+1}{k+r+1} \tag{8}$$

Where:

- AOQ: Average Outgoing Quality, which denotes the anticipated percentage of non-conforming products in lots that have been accepted.
- k: The predetermined number of accomplishments (such as non-defective products or pleased clients) necessary for acceptance.
- r: The predetermined number of errors permitted prior to rejection (examples: damaged goods, angry consumers).
- An elevated AOQ score means that the acceptance sampling plan is successful in preserving a high standard of quality in the delivered goods or services. A low AOQ number, on the other hand, denotes that the acceptance plan could require modifications in order to better assure the

quality of the delivered goods or services.

Case Study – 1

A company manufactures yarn. The company has a quality control inspector who randomly inspects 10 yarns from each lot of 100 yarns. The inspector defines 20% of the yarns as successes, 60% of the yarns as failures, and 20% of the yarns as indeterminacies. The inspector rejects the lot if he finds more than 3 failures.

Here, X = 0,1, 2…10, th = 2 and s = 3
P(S) = 20% P(U) = 60% P(I) = 20%

Case Study – 2

A company manufactures batteries. The company has a quality control inspector who randomly inspects 15 batteries from each lot of 100 batteries. The inspector defines 10% of the batteries as successes, 80% of the batteries as failures, and 10% of the batteries as indeterminacies. The inspector rejects the lot if he finds more than 4 failures.

Here, X = 0,1, 2,15, th = 2 and s = 4
P(S) = 10% P(U) = 80% P(I) = 10%

Case Study – 3

A company manufactures toys. The company has a quality control inspector who randomly inspects 3 toys from each lot of 50 toys. The inspector defines 80% of the toys as successes, 15% of the toys as failures, and 5% of the toys as indeterminacies. The inspector rejects the lot if he finds more than 1 failure.

Here, X = 0,1, 2,50, th = 2 and s = 4
P(S) = 80% P(U) = 15% P(I) = 05%

V. Conclusion

This work presents a unique discrete neutrosophic negative binomial probability distribution based on neutrosophic logic. We have looked at a variety of case studies throughout the study to show how the suggested distribution works in real-world settings. The suggested neutrosophic negative binomial distribution has proven useful for modeling situations where one wants to know how many successes there will be in a series of independent trials before there are a certain number of failures. This study makes a significant addition to the area of probability theory by broadening the applicability of the negative binomial distribution using neutrosophic logic. It also creates new opportunities for managing uncertainty in a variety of real-world scenarios.

Table 1: *Consisting of n, Ux, Ix and Tx value when c = 3, th = 2, P(S) = 0.35, P(U) = 0.7 and P(I) = 0.15*

n	U_x	I_x	T_x	$T_x+I_x+U_x$	AOQ	n	U_x	I_x	T_x	$T_x+I_x+U_x$	AOQ
2	0.0002	0.0292	0.9706	1.0000	0.0116	49	0.0000	0.0008	0.9992	1.0000	0.0003
3	0.0002	0.0331	0.9666	1.0000	0.0131	50	0.0000	0.0007	0.9993	1.0000	0.0003
4	0.0003	0.0325	0.9673	1.0000	0.0129	51	0.0000	0.0006	0.9994	1.0000	0.0002
5	0.0003	0.0290	0.9707	1.0000	0.0115	52	0.0000	0.0006	0.9994	1.0000	0.0002
6	0.0003	0.0244	0.9752	1.0000	0.0097	53	0.0000	0.0005	0.9995	1.0000	0.0002
7	0.0003	0.0199	0.9798	1.0000	0.0079	54	0.0000	0.0005	0.9995	1.0000	0.0002
8	0.0003	0.0159	0.9838	1.0000	0.0063	55	0.0000	0.0004	0.9996	1.0000	0.0002
9	0.0003	0.0127	0.9869	1.0000	0.0050	56	0.0000	0.0004	0.9996	1.0000	0.0001
10	0.0003	0.0103	0.9894	1.0000	0.0041	57	0.0000	0.0003	0.9997	1.0000	0.0001
11	0.0003	0.0086	0.9911	1.0000	0.0034	58	0.0000	0.0003	0.9997	1.0000	0.0001
12	0.0003	0.0074	0.9924	1.0000	0.0029	59	0.0000	0.0003	0.9997	1.0000	0.0001
13	0.0003	0.0065	0.9932	1.0000	0.0026	60	0.0000	0.0002	0.9998	1.0000	0.0001
14	0.0003	0.0060	0.9937	1.0000	0.0024	61	0.0000	0.0002	0.9998	1.0000	0.0001
15	0.0002	0.0057	0.9941	1.0000	0.0022	62	0.0000	0.0002	0.9998	1.0000	0.0001
16	0.0002	0.0054	0.9943	1.0000	0.0021	63	0.0000	0.0002	0.9998	1.0000	0.0001
17	0.0002	0.0053	0.9945	1.0000	0.0021	64	0.0000	0.0002	0.9998	1.0000	0.0001
18	0.0002	0.0052	0.9946	1.0000	0.0020	65	0.0000	0.0001	0.9999	1.0000	0.0001
19	0.0002	0.0051	0.9947	1.0000	0.0020	66	0.0000	0.0001	0.9999	1.0000	0.0000
20	0.0002	0.0050	0.9948	1.0000	0.0019	67	0.0000	0.0001	0.9999	1.0000	0.0000
21	0.0001	0.0049	0.9950	1.0000	0.0019	68	0.0000	0.0001	0.9999	1.0000	0.0000
22	0.0001	0.0048	0.9951	1.0000	0.0019	69	0.0000	0.0001	0.9999	1.0000	0.0000
23	0.0001	0.0047	0.9952	1.0000	0.0018	70	0.0000	0.0001	0.9999	1.0000	0.0000
24	0.0001	0.0045	0.9954	1.0000	0.0018	71	0.0000	0.0001	0.9999	1.0000	0.0000
25	0.0001	0.0044	0.9955	1.0000	0.0017	72	0.0000	0.0001	0.9999	1.0000	0.0000
26	0.0001	0.0042	0.9957	1.0000	0.0016	73	0.0000	0.0001	0.9999	1.0000	0.0000
27	0.0001	0.0040	0.9959	1.0000	0.0016	74	0.0000	0.0000	1.0000	1.0000	0.0000
28	0.0001	0.0038	0.9961	1.0000	0.0015	75	0.0000	0.0000	1.0000	1.0000	0.0000
29	0.0001	0.0036	0.9963	1.0000	0.0014	76	0.0000	0.0000	1.0000	1.0000	0.0000
30	0.0001	0.0035	0.9965	1.0000	0.0013	77	0.0000	0.0000	1.0000	1.0000	0.0000

Table 2: *Consisting of n, Ux, Ix and Tx value when c = 3, th = 2, P(S) = 0.95, P(U) = 0.05 and P(I) = 0.15*

n	U_x	I_x	T_x	$T_x+I_x+U_x$	AOQ	n	U_x	I_x	T_x	$T_x+I_x+U_x$	AOQ
11	0.0000	0.6405	0.3595	1.0000	0.1248	68	0.0000	0.3681	0.6318	1.0000	0.2068
12	0.0000	0.0885	0.9114	1.0000	0.3161	69	0.0000	0.3728	0.6272	1.0000	0.2050
13	0.0000	0.0106	0.9894	1.0000	0.3428	70	0.0000	0.3771	0.6228	1.0000	0.2034
14	0.0000	0.0044	0.9956	1.0000	0.3446	71	0.0000	0.3813	0.6187	1.0000	0.2018
15	0.0000	0.0055	0.9945	1.0000	0.3439	72	0.0000	0.3851	0.6148	1.0000	0.2003
16	0.0000	0.0075	0.9925	1.0000	0.3429	73	0.0000	0.3888	0.6112	1.0000	0.1989
17	0.0000	0.0099	0.9901	1.0000	0.3417	74	0.0000	0.3921	0.6078	1.0000	0.1976
18	0.0000	0.0127	0.9873	1.0000	0.3404	75	0.0000	0.3953	0.6047	1.0000	0.1964
19	0.0000	0.0160	0.9840	1.0000	0.3389	76	0.0000	0.3981	0.6019	1.0000	0.1953
20	0.0000	0.0196	0.9804	1.0000	0.3373	77	0.0000	0.4007	0.5993	1.0000	0.1942
21	0.0000	0.0236	0.9764	1.0000	0.3356	78	0.0000	0.4031	0.5969	1.0000	0.1932
22	0.0000	0.0281	0.9719	1.0000	0.3337	79	0.0000	0.4052	0.5948	1.0000	0.1923
23	0.0000	0.0329	0.9671	1.0000	0.3317	80	0.0000	0.4071	0.5929	1.0000	0.1915
24	0.0000	0.0381	0.9619	1.0000	0.3296	81	0.0000	0.4087	0.5912	1.0000	0.1908
25	0.0000	0.0437	0.9563	1.0000	0.3273	82	0.0000	0.4101	0.5898	1.0000	0.1901
26	0.0000	0.0496	0.9504	1.0000	0.3250	83	0.0000	0.4113	0.5887	1.0000	0.1896
27	0.0000	0.0558	0.9441	1.0000	0.3225	84	0.0000	0.4122	0.5877	1.0000	0.1890
28	0.0000	0.0624	0.9376	1.0000	0.3200	85	0.0000	0.4130	0.5870	1.0000	0.1886
29	0.0000	0.0693	0.9307	1.0000	0.3173	86	0.0000	0.4135	0.5865	1.0000	0.1882
30	0.0000	0.0764	0.9236	1.0000	0.3145	87	0.0000	0.4137	0.5863	1.0000	0.1880
31	0.0000	0.0838	0.9162	1.0000	0.3117	88	0.0000	0.4138	0.5862	1.0000	0.1877
32	0.0000	0.0914	0.9085	1.0000	0.3088	89	0.0000	0.4136	0.5863	1.0000	0.1876
33	0.0000	0.0993	0.9007	1.0000	0.3058	90	0.0000	0.4133	0.5867	1.0000	0.1875
34	0.0000	0.1073	0.8926	1.0000	0.3027	91	0.0000	0.4128	0.5872	1.0000	0.1874
35	0.0000	0.1156	0.8844	1.0000	0.2996	92	0.0000	0.4120	0.5880	1.0000	0.1875
36	0.0000	0.1240	0.8760	1.0000	0.2965	93	0.0000	0.4111	0.5889	1.0000	0.1876
37	0.0000	0.1325	0.8675	1.0000	0.2933	94	0.0000	0.4100	0.5900	1.0000	0.1877
38	0.0000	0.1411	0.8589	1.0000	0.2901	95	0.0000	0.4087	0.5913	1.0000	0.1879
39	0.0000	0.1498	0.8502	1.0000	0.2868	96	0.0000	0.4072	0.5928	1.0000	0.1882
40	0.0000	0.1586	0.8414	1.0000	0.2836	97	0.0000	0.4056	0.5944	1.0000	0.1885
41	0.0000	0.1674	0.8326	1.0000	0.2803	98	0.0000	0.4038	0.5962	1.0000	0.1888

42	0.0000	0.1763	0.8237	1.0000	0.2771	99	0.0000	0.4019	0.5981	1.0000	0.1892
43	0.0000	0.1851	0.8148	1.0000	0.2738	100	0.0000	0.3998	0.6002	1.0000	0.1897
44	0.0000	0.1940	0.8060	1.0000	0.2705	101	0.0000	0.3975	0.6024	1.0000	0.1902
45	0.0000	0.2029	0.7971	1.0000	0.2673	102	0.0000	0.3952	0.6048	1.0000	0.1907
46	0.0000	0.2117	0.7883	1.0000	0.2640	103	0.0000	0.3927	0.6073	1.0000	0.1913
47	0.0000	0.2204	0.7796	1.0000	0.2608	104	0.0000	0.3900	0.6100	1.0000	0.1919
48	0.0000	0.2291	0.7709	1.0000	0.2577	105	0.0000	0.3873	0.6127	1.0000	0.1926
49	0.0000	0.2376	0.7623	1.0000	0.2545	106	0.0000	0.3844	0.6156	1.0000	0.1933
50	0.0000	0.2461	0.7539	1.0000	0.2515	107	0.0000	0.3814	0.6186	1.0000	0.1940
51	0.0000	0.2544	0.7455	1.0000	0.2484	108	0.0000	0.3783	0.6217	1.0000	0.1947
52	0.0000	0.2627	0.7373	1.0000	0.2454	109	0.0000	0.3751	0.6249	1.0000	0.1955
53	0.0000	0.2707	0.7292	1.0000	0.2425	110	0.0000	0.3718	0.6282	1.0000	0.1963
54	0.0000	0.2786	0.7213	1.0000	0.2396	111	0.0000	0.3684	0.6316	1.0000	0.1972
55	0.0000	0.2864	0.7136	1.0000	0.2368	112	0.0000	0.3649	0.6351	1.0000	0.1980
56	0.0000	0.2940	0.7060	1.0000	0.2340	113	0.0000	0.3614	0.6386	1.0000	0.1989
57	0.0000	0.3013	0.6986	1.0000	0.2313	114	0.0000	0.3578	0.6422	1.0000	0.1998
58	0.0000	0.3085	0.6914	1.0000	0.2287	115	0.0000	0.3541	0.6459	1.0000	0.2008
59	0.0000	0.3155	0.6845	1.0000	0.2261	116	0.0000	0.3503	0.6497	1.0000	0.2017
60	0.0000	0.3223	0.6777	1.0000	0.2237	117	0.0000	0.3465	0.6535	1.0000	0.2027
61	0.0000	0.3288	0.6711	1.0000	0.2213	118	0.0000	0.3426	0.6574	1.0000	0.2036
62	0.0000	0.3352	0.6648	1.0000	0.2190	119	0.0000	0.3386	0.6614	1.0000	0.2046
63	0.0000	0.3413	0.6587	1.0000	0.2167	120	0.0000	0.3346	0.6654	1.0000	0.2056
64	0.0000	0.3471	0.6529	1.0000	0.2146	121	0.0000	0.3306	0.6694	1.0000	0.2066
65	0.0000	0.3527	0.6472	1.0000	0.2125	122	0.0000	0.3265	0.6735	1.0000	0.2077
66	0.0000	0.3581	0.6419	1.0000	0.2105	123	0.0000	0.3224	0.6776	1.0000	0.2087

Table 3: *Consisting of n, Ux, Ix and Tx value when c = 3, th = 2, P(S) = 0.8, P(U) = 0.4 and P(I) = 0.15*

n	U_x	I_x	T_x	$T_x+I_x+U_x$	AOQ	n	U_x	I_x	T_x	$T_x+I_x+U_x$	AOQ
6	0.0020	0.0926	0.9053	1.0000	0.4041	54	0.0000	0.0000	1.0000	1.0000	0.4252
8	0.0019	0.0626	0.9356	1.0000	0.4172	55	0.0000	0.0000	1.0000	1.0000	0.4248
9	0.0017	0.0351	0.9632	1.0000	0.4291	56	0.0000	0.0000	1.0000	1.0000	0.4243
10	0.0015	0.0190	0.9795	1.0000	0.4359	57	0.0000	0.0000	1.0000	1.0000	0.4239
11	0.0014	0.0113	0.9874	1.0000	0.4390	58	0.0000	0.0000	1.0000	1.0000	0.4234
12	0.0012	0.0080	0.9908	1.0000	0.4401	59	0.0000	0.0000	1.0000	1.0000	0.4230
13	0.0010	0.0068	0.9922	1.0000	0.4402	60	0.0000	0.0000	1.0000	1.0000	0.4225
14	0.0009	0.0064	0.9928	1.0000	0.4401	61	0.0000	0.0000	1.0000	1.0000	0.4221
15	0.0007	0.0061	0.9931	1.0000	0.4398	62	0.0000	0.0000	1.0000	1.0000	0.4216
16	0.0006	0.0059	0.9935	1.0000	0.4395	63	0.0000	0.0000	1.0000	1.0000	0.4212
17	0.0005	0.0057	0.9938	1.0000	0.4392	64	0.0000	0.0000	1.0000	1.0000	0.4207
18	0.0004	0.0054	0.9942	1.0000	0.4389	65	0.0000	0.0000	1.0000	1.0000	0.4203
19	0.0003	0.0050	0.9946	1.0000	0.4386	66	0.0000	0.0000	1.0000	1.0000	0.4198
20	0.0003	0.0046	0.9951	1.0000	0.4384	67	0.0000	0.0000	1.0000	1.0000	0.4194
21	0.0002	0.0043	0.9955	1.0000	0.4381	68	0.0000	0.0000	1.0000	1.0000	0.4189
22	0.0002	0.0038	0.9960	1.0000	0.4379	69	0.0000	0.0000	1.0000	1.0000	0.4185
23	0.0001	0.0035	0.9964	1.0000	0.4376	70	0.0000	0.0000	1.0000	1.0000	0.4180
24	0.0001	0.0031	0.9968	1.0000	0.4373	71	0.0000	0.0000	1.0000	1.0000	0.4176
25	0.0001	0.0027	0.9972	1.0000	0.4371	72	0.0000	0.0000	1.0000	1.0000	0.4171
26	0.0001	0.0024	0.9975	1.0000	0.4368	73	0.0000	0.0000	1.0000	1.0000	0.4167
27	0.0001	0.0021	0.9978	1.0000	0.4365	74	0.0000	0.0000	1.0000	1.0000	0.4162
28	0.0000	0.0018	0.9981	1.0000	0.4361	75	0.0000	0.0000	1.0000	1.0000	0.4158
29	0.0000	0.0016	0.9984	1.0000	0.4358	76	0.0000	0.0000	1.0000	1.0000	0.4153
30	0.0000	0.0013	0.9986	1.0000	0.4354	77	0.0000	0.0000	1.0000	1.0000	0.4149
31	0.0000	0.0012	0.9988	1.0000	0.4351	78	0.0000	0.0000	1.0000	1.0000	0.4144
32	0.0000	0.0010	0.9990	1.0000	0.4347	79	0.0000	0.0000	1.0000	1.0000	0.4140
33	0.0000	0.0008	0.9992	1.0000	0.4343	80	0.0000	0.0000	1.0000	1.0000	0.4135
34	0.0000	0.0007	0.9993	1.0000	0.4339	81	0.0000	0.0000	1.0000	1.0000	0.4131
35	0.0000	0.0006	0.9994	1.0000	0.4335	82	0.0000	0.0000	1.0000	1.0000	0.4126
36	0.0000	0.0005	0.9995	1.0000	0.4331	83	0.0000	0.0000	1.0000	1.0000	0.4122
37	0.0000	0.0004	0.9996	1.0000	0.4327	84	0.0000	0.0000	1.0000	1.0000	0.4117

38	0.0000	0.0003	0.9996	1.0000	0.4323	85	0.0000	0.0000	1.0000	1.0000	0.4113
39	0.0000	0.0003	0.9997	1.0000	0.4319	86	0.0000	0.0000	1.0000	1.0000	0.4108
40	0.0000	0.0002	0.9998	1.0000	0.4314	87	0.0000	0.0000	1.0000	1.0000	0.4104
41	0.0000	0.0002	0.9998	1.0000	0.4310	88	0.0000	0.0000	1.0000	1.0000	0.4099
42	0.0000	0.0002	0.9998	1.0000	0.4306	89	0.0000	0.0000	1.0000	1.0000	0.4095
43	0.0000	0.0001	0.9999	1.0000	0.4301	90	0.0000	0.0000	1.0000	1.0000	0.4090
44	0.0000	0.0001	0.9999	1.0000	0.4297	91	0.0000	0.0000	1.0000	1.0000	0.4086
45	0.0000	0.0001	0.9999	1.0000	0.4293	92	0.0000	0.0000	1.0000	1.0000	0.4081
46	0.0000	0.0001	0.9999	1.0000	0.4288	93	0.0000	0.0000	1.0000	1.0000	0.4077
47	0.0000	0.0001	0.9999	1.0000	0.4284	94	0.0000	0.0000	1.0000	1.0000	0.4072
48	0.0000	0.0001	0.9999	1.0000	0.4279	95	0.0000	0.0000	1.0000	1.0000	0.4068
49	0.0000	0.0000	1.0000	1.0000	0.4275	96	0.0000	0.0000	1.0000	1.0000	0.4063
50	0.0000	0.0000	1.0000	1.0000	0.4270	97	0.0000	0.0000	1.0000	1.0000	0.4059
51	0.0000	0.0000	1.0000	1.0000	0.4266	98	0.0000	0.0000	1.0000	1.0000	0.4054
52	0.0000	0.0000	1.0000	1.0000	0.4261	99	0.0000	0.0000	1.0000	1.0000	0.4050
53	0.0000	0.0000	1.0000	1.0000	0.4257	100	0.0000	0.0000	1.0000	1.0000	0.4050

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