International Journal of Science and Research (IJSR)
ISSN: 2319-7064
SJIF (2022): 7.942

Selection of Quick Switching Double Sampling System with MAPD AND MAAOQ Using *Weighted Poisson Distribution*

Uma G

Abstract: ***Romboski (1969) investigated the QSS with a single sampling plan as a reference plan. The construction and selection of the Quick Switching Double Sampling System (QSDSS) was designed and constructed by Devaraj Arumainayagam S and Soundararajan V (1994). The modified QSDSS was developed by Devaraj Arumainayagam and Uma (2010) was constructed and selected according to the indexed parameters MAPD and MAAOQ. A sampling system is a grouping of two or more sampling plans with specified rules for switching between the plans for sentencing many finished products. In this paper, QSDSS using a weighted Poisson distribution as a baseline distribution is introduced. The measures of performance of the system are presented with its operating procedure. Tables are constructed for the design of the system which are indexed by various combinations of parameters (AOQL, MAPD and MAAOQ). Tables are provided for the easy selection of the system.***

Keywords: QSS, QSDSS, DSP, MAAOQ, MAPD, AOQL

1. Introduction and Review of Literature

Dodge (1967) proposed a new sampling inspection system consisting of pairs of normal and tightened plans. The highlight of the system is an immediate switch from a normal plan to a tightened plan when rejection of the lot arises during normal inspection and a switch to normal inspection when a lot is accepted during tightened inspection. Due to instantaneous switching between normal and tightened plans, this system is termed the 'Quick Switching System' (QSS). Romboski (1969) investigated the QSS with a single sampling plan as a reference plan and two systems were introduced namely QSS (n; c_N, c_T), $c_T < c_N$ and QSS (n; kn; c_0), k >1. Romboski (1969) analyzed QSS (n, kn; c_0) and provided necessary tables for the selection of the system. Arumainayagam (1991) provided tables for the selection of this system under binomial conditions. Govindaraju (1984, 1991), also Soundararajan and Arumainayagam (1990, 1992) have introduced and designed a system named modified Quick Switching System as QSS-r (n; kn; 0) with r = 1, 2, 3 useful for costly and destructive testing.

Radhakrishna Rao (1977) suggested a weighted binomial distribution, as the basic distribution in designing sampling plans. Later Sudeswari (2002) constructed sampling plans using a weighted Poisson distribution. Radhakrishnan and Mohana Priya (2008) constructed procedures and tables for the selection of single sampling plan using a conditional weighted Poisson distribution. The construction and selection of a Quick Switching Double Sampling System for acceptance number tightening and sample size tightening was designed by Devaraj Arumainayagam S and Soundararajan V(1994). The Quick switching double sampling system was indexed by the crossover point which was developed by Devaraj Arumainayagam S and Soundararajan V (1995).

The MAPD is a key measure for assessing to what degree the inflection point empowers the OC curve to discriminate between good and bad lots. Mayer (1956) introduced the concept of MAPD in an SSP using Poisson model. The MAPD located at the point at which the descent of the OC curve is steepest. It is defined as the proportion of defective products beyond which the consumer will not be willing to accept the lot. Mandelson (1962) explained the desirability of developing a system of sampling plans indexed by MAPD and suggested a relation $p_* = c/n$. Soundararajan (1975) indexed the SSP through the MAPD and K(p_T /p_*). Muthuraj and Soundararajan (1989) studied the selection of a single sampling plan indexed by p_* with its relative slope. Ramkumar (2002) developed a selection procedure for SSP involving the AQL and tangent intercept in the p axis. Ramkumar (2002) developed a set of sampling plans indexed through MAAOQ and MAPD explaining the adequacy of MAPD as quality.

Contributions to the Selection of quick switching system with special type double sampling plans through MAPD and MAAOQ developed by Suresh K.K and Jayalakshmi (2008).Construction and selection of quick switching systems: acceptance number tightening using Weighted Poisson distribution as the baseline distribution is made by Devaraj Arumainayagam and Uma. G (2010). A study on modified quick switching double sampling system-sample size tightening was developed by Uma and Chitra Devi (2010). The modified QSDSS which was developed by Devaraj Arumainayagam and Uma (2010) was constructed and selected according to the MAPD and MAAOQ. In the study by K. Subramani and V Haridoss (2013), tables and procedures for the QSS-m(n; C_N, C_T) system involved the minimum sum of risks for the given AQL and LQL without fixing producer's and consumer's risk using weighted Poisson distribution.

Most of the design procedures in the references cited are based on either Poisson or binomial models. In this paper, the QSS is studied with double sampling plan as a reference plan using weighted Poisson distribution as a baseline distribution. The weighted Poisson distribution plays an important role in the acceptance sampling, mainly in the construction of sampling plans and systems. It is used under the assumptions that (i) each outcome (number of defects) is specific but can be assigned with different weights based on its importance or usage and (ii) there should be atleast one defective in the lot. The necessary procedures and tables are provided for designing the system, which are indexed by various combinations of parameters. Advantages are highlighted with suitable illustrations, which are useful for shop floor situations.

Weighted Poisson Distribution

The Poisson distribution is known to be the limiting form of the binomial distribution and is defined as

$$p(x;\lambda)=\frac{e^{-\lambda}\lambda^{x}}{x!},\ x=0,1,2,\ldots\ldots \text{ where } \lambda = np$$

The weighted Poisson distribution can also be obtained and is given by

$$p(x,\lambda,\alpha)=\frac{x^{\alpha}p(x,\lambda)}{\sum_{x=0}^{\alpha} x^{\alpha}p(x,\lambda)}\ ;\ x=0,1,2,\ldots\ldots;\ where\ \lambda=np$$

where x^{α} is the weight assigned to each outcome and may be termed as the weighting factor with 'α' being the constant ($\alpha \geq 0$). The Poisson distribution can be seen as the particular case of the weighted Poisson distribution when $\alpha = 0$.

The probability mass function of the conditional weighted Poisson distribution is given by

$$P(x;\lambda)=P(x;\lambda,\alpha),\ \ \alpha=1$$

$$=\frac{e^{-\lambda}\lambda^{x-1}}{(x-1)!}\ ;\ \ x=0,1,2,\ldots\ldots\ldots$$

Quick Switching Double Sampling System (QSDSS)

This system is designated as the Quick Switching Double Sampling System (QSDSS). The following two systems were introduced and designed.

i) QSDSS – r (n_1, n_2; a_1, a_2; b_1, b_2), r = 1,2 and 3 [(n_1,n_2;a_1,a_2)], $a_1<a_2$ and (n_1,n_2;b_1 ,b_2),$b_1\leq a_1$ and $b_2< a_2$ are normal , tightened double sampling plans respectively]. Regarding sample size two cases are considered namely, $n_1=n_2$; and $n_2 = 2n_1$, when $n_1 = n_2$, this system may be referred as QSDSS- r (n, a_1, a_2, b_1, b_2), where r = 1, 2 and 3.
ii) QSDSS – r (n, k; a_1, a_2), r = 1, 2 and 3 [(n ; a_1, a_2) and(kn ; a_1,a_2),k>1 are the normal and tightened double sampling plans respectively where $n_1=n_2=n$ and $kn_1=kn_2=kn$]

Conditions for Application

The conditions under which this system may be applied (in an industry) are as follows:

- Production is steady, so the results of past, present and future lots are broadly indicative of a continuing process.
- Lots are submitted sequentially in the order of their production.
- Inspection is by attributes, with the lot quality defined as the production defective.
- Lots have atleast one defective unit.

Operating Procedure - QSDSS (n; k; a_1, a_2)

Step 1: From a lot, take a random sample of size 'n'(normal plan) and count the number of non-conforming units (d_1).

a) If $d_1 \leq a_1$, accept the lot and repeat step 1 for the next lot.
b) If $d_1> a_2$, reject the lot and go to step 2.
c) If $a_1<d_1\leq a_2$, take a second random sample of size n, from the same lot and count the number of non-conforming units (X_2)
d) If $d_1+d_2 \leq a_2$, accept the lot and repeat step 1.
e) If $d_1+d_2> a_2$, reject the lot and go to step 2.

Step 2: From the next lots, take a random sample of size 'kn' (Tightened plan) and count the number of non – conforming unit (d_1)

a) If $d_1\leq a_1$, accept the lot and go to step 1 for the next lot.
b) If $d_1> a_2$, reject the lot and repeat step 2 for the next lot.
c) If $a_1<d_1\leq a_2$, take another random sample of size 'kn', from the same lot and count the number of non-conforming units (X_2)
d) If $d_1+ d_2\leq a_2$, accept the lot and use step 1 for the next lot.

Performance Measures of the QSDSS - 1(n, k; a_1, a_2)

Under the assumption of Poisson model the OC function of QSDSS (n; k; a_1, a_2), is given by Romboski

$$P_a(p)=\frac{P_T}{1-P_N+P_T}$$

where the values of P_N and P_T are defined below:
P_N : Proportion of lots expected to be accepted when using the normal double sampling plans. (n; a_1, a_2)
P_T: Proportion of lots expected to be accepted when using the tightened double sampling plans. (kn; a_1, a_2)

Under the assumption of the Poisson models Hald (1981) and Schilling (1982), the values of P_N and P_T are respectively given as 1.1 with $\upsilon_1=np$ and $\upsilon_2=knp$

$$P_N=G(a_1,n_1)+\left[\sum_{x_1=a_1+1}^{a_2} g(x_1,\nu_1)G(a_2-x_1;\nu_1)\right]$$

$$P_T=G(a_1,\nu_2)+\left[\sum_{x_1=a_1+1}^{a_2} g(x_1,\nu_2)G(a_2-x_1;\nu_1)\right]$$

where $g(x,\upsilon)=\frac{e^{-\upsilon}\upsilon^{x-1}}{x-1!}\ ;G(a,\upsilon)=\sum_{x=0}^{a}g(x,\upsilon);$ and

$$\upsilon_1=np \text{ and } \upsilon_2=knp$$

Selection of the QSDSS (n, k; a_1, a_2) for the specified MAAOQ and MAPD

Table 1 is used to construct the system when MAPD and MAAOQ are specified. For any given values of MAPD (p^*) and MAAOQ (p^{MAQ}), the ratio R = (p^{MAQ}) / (p^*) can be obtained from column R which is equal to or less than the specified ratio. The corresponding values of the acceptance numbers are noted, hence the parameters n = np* / p* and 'kn' for Quick Switching Double Sampling System (n, kn; a_1, a_2) can be determined.

Example

Given that MAAOQ (p^{MAQ}) = 0.029 and MAPD (p^*) = 0.036, compute the ratio R = (p^{MAQ}) / (p^*) = 0.80556 and select the value of R =(p^{MAQ}) / (p^*), which is equal to or less than the specified ratio using Table 1. Thus, the corresponding value R = 0.80591 which is associated with acceptance numbers 1, 4 and k = 1.50. Therefore, the sample size for the normal plan n = 0.7231 / 0.036 = 20.09 ≈ 20 and the sample size for the tightened plan is nk = 20 X 1.5 = 30 and a_1=1, a_2= 4; Hence QSDSS (20, 30; 1, 3) are the parameters selected for the Quick Switching System with Double Sampling plan as reference plan for which MAAOQ is 0.029 and MAPD is 0.036 defectives.

Selection of the QSDSS using the MAPD and P_T

For the given values of MAPD and P_T, one can find the ratio $R_3 = P_T / p^*$ and locate the nearest value from the column headed by np* in Table 1. The corresponding values of a_1, a_2, and k are noted, and the parameters for Quick Switching Double Sampling System (n, kn; a_1, a_2) can be determined.

Example

For the QSDSS with fixed values of MAPD = 0.03 and P_T = 0.048, the ratio $R_3 = P_T / p^*$ = 1.6 and the nearest value is located in column R_3 in Table 1. The corresponding a_1, a_2, k and nMAPD values are 4, 8, 2 and 1.60946 respectively and the sample size n is determined to be n = np*/ p* =2.5208 / 0.02 ≈ 84. For the given MAPD = 0.03 and P_T = 0.048 the suitable QSDSS is (n =84; k = 2.00; a_1= 4, a_2= 8)

For specified n, AOQL and MAAOQ

Table 1 is used to construct a plan when the sample size n and AOQL and MAAOQ are specified. The values of nMAAOQ and nAOQL, which are monotonic increasing functions in C_N and C_T respectively, are obtained. Table 1, shows the nMAAOQ and nAOQL values which are equal to or less than the calculated values. Then, the corresponding value of a_1, a_2 and k is noted. The parameters for Quick Switching Double Sampling System can be determined as follows: QSDSS (n, k ; a_1, a_2)

Example

For n = 75, MAAOQ (p^{MAQ}) = 0.008 and AOQL = 0.009. The values of nMAAOQ and nAOQL are computed. The respective values are selected from Table 1.2. The nearest values are nMAAOQ = 0.60098 and nAOQL = 0.66529 with associated a_1= 1, a_2 =4, k = 1.25 and a_1 = 1 a_2 = 4, k = 1.25.Thus the sampling system QSDSS (75, 1.25; 1, 3) has MAAOQ = 0.8% and AOQL = 0.9%.

Selection of QSDSS through the specified MAPD and AOQL

Table 1 is used to construct the plans when MAPD and AOQL are specified. For any given values of AOQL and MAPD, obtain the value of the ratio $R_4 = \frac{nAOQL}{nMAPD}$ which is equal to

or just less than the specified ratio. Then the corresponding acceptance number values are determined. This system is designed as QSDSS (n, k ; a_1, a_2).

Example

Given AOQL = 0.025 and MAPD = 0.029, the ratio R_4 = 0.8621 is computed. The value of R_4 which is nearest to the specified ratio is selected from the Table 1. The corresponding value of R_4 is 0.85472 which is associated with a_1=1, a_2 = 4 and k =1.50. The sample size was n=0.7231 / 0.029 = 24.93 ≈ 25. Hence (25, 1.5; 1, 4) are the parameters for the QSDSS for which the AOQL is 0.025 and the MAPD is 0.029. The sample size of the normal plan is 25 and tightened plan is 38.

2. Illustration

The textile manufacturing company fixes the maximum allowable percent defective at 0.0142 (142 defectives out of 10000) and the maximum allowable average outgoing quality at 0.0196 (196 defectives out of 10000). Suppose that 13 randomly selected items are verified and counted for the number of defectives if the number of defectives is less than or equal to 1 accept the lot, and if it is greater than 4 then reject the lot. If the number of defectives is greater than 1 and less than or equal to 4 then combine the number of defectives, in the previous, succeeding and current lots. If the value is 3 or less than 3 the lot is accepted; otherwise, the lot is rejected and the management is informed of further improvement of the product in the process.

3. Conclusion

In this paper, QSDSS with (reference to) Double Sampling Plan as the reference plan using weighted Poisson distribution is presented. This type of sampling system is also much essential to floor engineers to accept or reject lots with a minimum sample size especially for second highest quality lots. To facilitate the user-friendly attitude of the engineers, the constructed tables are used for the selection of the system based on the specific parameters. This system has wide application in industry when atleast one defective occurs in the majority of the manufactured products. To ensure the attainment of a standard quality in second quality lots and to overcome the loss, the system developed using the weighted Poisson distribution is highly applicable with easy switching rules.

Construction of Tables

Under the assumption of the weighted Poisson model, equation (1) is solved for 'np' using computer programming in C++ for various values of acceptance numbers (a_1, a_2), k(k>1), and parameters. Table 1 provides such as nMAPD, nMAAOQ and other parameteric values for given values of a_1, a_2, k and Pa(p). For given combinations of α and β, the values of the Operating Ratio, R, are calculated and presented in Table

References

[1] **Arumainayagam S.D and Soundararajan V (1994):** Quick Switching Double Sampling System – Acceptance Number Tightening; Communication in Statistics- Theory and Methods, Vol. 23, No.7, pp. 2079-2100.

[2] **Arumainayagam S.D and Soundararajan V (1995b):** Construction and Selection of Quick

Switching Double Sampling System – Sample Size Tightening; Journal of Applied Statistics, Vol. 22, No.1, pp. 105-119.

[3] **Arumainayagam S.D and Soundararajan V (1996b):** Quick Switching Double Sampling System Indexed by the Crossover Point, Communications in Statistics-Simulation and Computation, Vol. 24, No. 3, pp. 765-773.

[4] **Arumainayagam S.D and Soundararajan V, (1994):** Quick Switching Double Sampling System (QSDSS) – Acceptance Number, Tightening-Communication Statistics-Theory and Methods, 23 (7), 2079-2100.

[5] **Arumainayagam S.D and Uma G (2009):** Construction and Selection of Quick Switching System using Weighted Poisson Distribution, International Journal of Statistics and Systems, ISSN 0973-2675, Vol. 4, No. 2, pp.127-136. Research India Publications.

[6] **Arumainayangam, S.D and Soundarajan. V. (1995):** Construction and Selection of Quick Switching Double-Sampling System; sample size tightening Journal of Applied statistics, Vol.22, No.1, pp.105-119.

[7] **Cameroson, J.M. (1952):** Tables for constructing and for computing the Operating Characteristics of Single sampling Plan, Industrial Quality Control, 9(1), 37-39.

[8] **Dodge H.F. (1963):** A General Procedure for Sampling Inspection-Based on the AQL Concept, American Society for Quality Control Convention Transactions, pp. 7-8.

[9] **Dodge H.F. (1965):** Evaluation of a Sampling Inspection System having Rules for Switching between Normal and Tightened Inspection, Technical Report, No.14, The Statistics Centre, Rutgers-The State University, New Brunswick, New Jersey.

[10] **Dodge H.F. (1973):** Keep it Simple, Quality Progress, Vol.6, No.8, pp.11-12.

[11] **Dodge H.F. and Romig H.G. (1959):** Sampling Inspection Tables – Single and Double Sampling, 2nd Edition, John Wiley and Sons, New York.

[12] **Kirkpatrick R.L. (1965):** Binomial Sampling Plan Indexed by AQL and LTPD, Industrial Quality Control, Vol.22, No. 6, pp.290-292.

[13] **Palaniswamy R.(2008**): Contributions to the Study of Designing of Certain Continuous, Chain Sampling Plans and Inspection Error, Ph. D., Thesis, Department of Statistics, PSG College of Arts and Science, Coimbatore, Tamil Nadu, India.

[14] **Palanivel (1999):** Results and Tables relating to QSVSS- Acceptanec Criterion Tightening, Sample size Tightening – Ph.D. Thesis Bharathiar University, Coimbatore.

[15] **Radhakrishnan R (2002):** Contribution to the Study of Selection of Certain Acceptance Sampling Plans, Ph. D., Dissertation, Bharathiar University, Coimbatore.

[16] **Radhakrishnan R. and Mohana Priya L. (2008):**Selection of Single Sampling Plan Using Conditional Weighted Poisson Distribution, International Journal of Statistics and Systems (IJSS), ISSN 0973-2675 Volume 3, N0. 1, pp. 91-98.

[17] **Radhakrishnan R. and Sambath Kumar R. (2007):**Construction and Comparison of Mixed Sampling Plans having Double Sampling Plan as Attribute Plan, International Journal of Statistics and Systems, Vol. 2, No. 2, pp. 33-39.

[18] **Radhakrishnan R. and Mohana Priya L. (2008):** Comparison of CRGS Plans Using Poisson and Weighted Poisson Distributions, ProbStat Forum, Vol. 1, No.10, pp.50-61.

[19] **Radhakrishnan Rao, C. (1977):** A Natural Example of a Weighted Binomial Distribution, The American Statistician, Vol.31, No.1.

[20] **Ramkumar T.B. and Divya A.K. (2010):**Double Sampling Plan ($n_2 = n_1$) on the Discriminant Tangential Distance at MAPD, National Conference on Recent Advances in Statistics and Computer Applications, RASCA 2010, Dec 21-23, Department of Statistics, Bharathiar University.

[21] **Romboski L.D. (1969):** An Investigation of Quick Switching Acceptance Sampling System, Ph.D. Thesis, Rutgers-The State University, New Brunswick, New Jersey.

[22] **Schiling E.G. (1982):** Acceptance Sampling in Quality Control, Statistics: Text Books and Monographs, Vol.42 Marcel Dekker, INC. New Yark and Basel.

[23] **Schilling E.G. (1982):** Acceptance Sampling in Quality Control, Marcel Dekker, Inc., New York.

[24] **Subramani K and Haridoss V(2013)**: Selection of modified Quick Switching System for given acceptable and limiting quality levels with minimum risks using Weighted Poisson Distribution, Economic Quality Control; Vol. 28(2); P.No. 135-149; DOI|10.1515/eqc-2013-0021.

[25] **Sudeswari (2002)**: Designing of sampling plan using Weighted Poisson distribution, *M.Phil., Thesis*, Department of Statistics, PSG College of Arts and Science, Coimbatore, Tamil Nadu, India.

[26] **Suresh K.K. and Sangeetha V. (2009):** Selection of One Plan Suspension System with Special Type of Double Sampling Plan Through Minimum Angle Method, Quality Improvement Concepts and their Implementations in Higher Educational Institutions(QICIHEI-2009), ISBN: 978-81-907870-4-8, pp. 94-102.

[27] **Suresh K.K (1993)**: A Study on Acceptance Sampling using Acceptable and Limiting Quality Levels, *Ph.D., Dissertation*, Department of Statistics, Bharathiar University, Coimbatore, Tamil Nadu, India.

[28] **Vijayaraghavan R., Rajagopal K. and Loganathan A. (2008):** A Procedure for Selection of a Gamma Poisson Single Sampling Plan by Attributes, Journal of Applied Statistics, Vol. 35, No. 2, pp. 149-160.

Table 1: Parametric Values of Quick Switching Double Sampling System using WPD

a_1	a_2	k	nMAPD	nMAAOQ	R	h*	np_t	np_m	nAOQL	h_m	R_3	R_4
1	3	1.00	0.4204	0.35235	0.83813	0.29499	1.84552	1.00010	0.50322	1.00013	4.38992	1.19699
1	3	1.25	0.4125	0.34337	0.83241	0.31118	1.73810	0.82960	0.45156	0.90477	4.21358	1.09469
1	3	1.50	0.4047	0.33432	0.82609	0.32750	1.64042	0.72220	0.41421	0.84310	4.05342	1.02350
1	3	2.00	0.3885	0.31595	0.81325	0.35846	1.47229	0.58950	0.36165	0.76311	3.78968	0.93088
1	3	2.25	0.3802	0.30686	0.80711	0.37268	1.40037	0.54450	0.34194	0.73470	3.68325	0.89936
1	4	1.00	0.7409	0.61653	0.83214	0.40538	2.56856	1.21670	0.72732	1.00011	3.46681	0.98167
1	4	1.25	0.7329	0.60098	0.82001	0.45096	2.35809	1.03830	0.66529	0.92020	3.21748	0.90775
1	4	1.50	0.7231	0.58275	0.80591	0.50060	2.16756	0.92250	0.61820	0.86460	2.99760	0.85492
1	4	2.00	0.696	0.54061	0.77674	0.59976	1.85647	0.77350	0.54845	0.78690	2.66734	0.78800
2	4	1.00	1.1066	0.84496	0.76357	0.54902	3.12218	1.59580	0.92338	1.00008	2.82142	0.83443
2	4	1.25	1.0624	0.80258	0.75544	0.58987	2.86346	1.35140	0.84180	0.91791	2.69528	0.79235
2	4	1.50	1.0219	0.76252	0.74618	0.62890	2.64681	1.19580	0.78101	0.86270	2.59008	0.76427
2	4	1.75	0.9837	0.72494	0.73696	0.66473	2.46355	1.08440	0.73259	0.82089	2.50437	0.74473
2	4	2.00	0.9478	0.69011	0.72812	0.69740	2.30685	0.99910	0.69248	0.78741	2.43390	0.73061
2	4	2.25	0.9144	0.65807	0.71967	0.72751	2.17129	0.93080	0.65835	0.75960	2.37455	0.71997
2	4	2.50	0.8833	0.62865	0.71171	0.75520	2.05293	0.87440	0.62875	0.73600	2.32416	0.71182
4	8	1.00	3.051	2.22309	0.72864	1.01350	6.06137	3.03520	2.22317	1.00008	1.98668	0.72867
4	8	1.25	2.9232	2.06486	0.70637	1.20385	5.35141	2.70190	2.08823	0.94104	1.83067	0.71436
4	8	1.50	2.7813	1.91105	0.68711	1.36826	4.81402	2.47080	1.97405	0.89292	1.73085	0.70976
4	8	1.75	2.6448	1.77220	0.67007	1.51112	4.39503	2.29380	1.87516	0.85232	1.66176	0.70900
4	8	2.00	2.5208	1.64859	0.65399	1.64081	4.05712	2.15110	1.78842	0.81792	1.60946	0.70946
4	8	2.25	2.4103	1.53798	0.63809	1.76354	3.77704	2.03210	1.71158	0.78837	1.56704	0.71011
4	8	2.50	2.3119	1.43833	0.62214	1.88213	3.54024	1.93060	1.64295	0.76289	1.53131	0.71065