

Cover –Proceeding Sciomas 2022

Atlantis Press

ABOUT NEWS PRODUCTS & SERVICES POLICIES INDUSTRY AFFILIATIONS CONTACT

Part of **SPRINGER NATURE** PROCEEDINGS JOURNALS BOOKS Search

Series: **Advances in Physics Research**

Proceedings of the Soedirman International Conference on Mathematics and Applied Sciences (SICOMAS 2021)

91 authors

Aboul-Enein, Hassan Y Prediction of Enantioseparation of Econazole on the Cyclodextrin Derivatives as Chiral Selectors by Molecular Docking Approach

Aboul-Enein, Hassan Y Development of Ketorolac Analysis in Water Samples using Micellar Electrokinetic Chromatography

HOME
PREFACE
ARTICLES
AUTHORS
SESSIONS

Atlantis Press

HOME PREFACE ARTICLES AUTHORS SESSIONS ORGANIZERS PUBLISHING INFORMATION

Akbar, Zulkaida Application of the Conjugate-Gradient Method for Analysing the Optimum Thrust Force for the Pico-Hydropower

Al Farizi, Salman Hadamard Matrix on Cryptographic Problems

Aminuddin, Jamrud Development and Testing of Artificial Neural Network with Backpropagation Algorithm to Predict the Power Ratio of Savonius Wind Turbine

Aminuddin, Jamrud Application of the Conjugate-Gradient Method for Analysing the Optimum Thrust Force for the Pico-Hydropower

Amruhasanah, Alfalfa The Properties of the R^* Module over the Matrix Ring $M_{n \times n}(R)$

Anggraeni, Mekar Dwi Estimation of Neonatal Jaundice from the Chest Images Captured with a Smartphone

Ariska, Laila Power Spectrum Analysis of the Satellite Gravity Anomalies Data to Estimate the Thickness of Sediment Deposits in the Purwokerto-Purbalingga Groundwater Basin

Asih, Ni Made Coefficient Estimates in the Class of Bazilevic Functions $\mathcal{B}_1(\alpha)$ Related to the Lemniscate Bernoulli

Bilalodin, Bilalodin Development and Testing of Artificial Neural Network with Backpropagation Algorithm to Predict the Power Ratio of Savonius Wind Turbine

<https://www.atlantis-press.com/proceedings/sicomas-21/125074523>

Pushpa Publishing House X JOS | Universitas Jenderal Soed... X Proceedings of the Soedirman II X

atlantis-press.com/proceedings/sicomas-21/authors

HOME
 PREFACE
 ARTICLES
AUTHORS
 SESSIONS
 ORGANIZERS
 PUBLISHING INFORMATION

Cyclodextrin Derivatives as Chiral Selectors by Molecular Docking Approach

Cacu, Cacu Development of Ketorolac Analysis in Water Samples using Micellar Electrokinetic Chromatography

Cahyanto, Wahyu Tri Calculations of the Potential Energy Surface for a Water Molecule Dissociation on the Pt (111) Surface

Cahyarini, Indriani Eko The Dengue Hemorrhagic Fever Modeling in Banyumas Regency by Using CAR-BYM, Generalized Poisson, and Negative Binomial

Dewi, Maria Leonids Berlian Candra Solution Formula of the Half-Space Model Problem for Incompressible Fluid Flow

Dinasty, Diska Nirmala Wahyu Calculations of the Potential Energy Surface for a Water Molecule Dissociation on the Pt (111) Surface

E.W, Ratno Bagus Coefficient Estimates in the Class of Bazilevic Functions $\mathcal{B}_1(\alpha)$ Related to the Lemniscate Bernoulli

Ermawan, Hendri Design of Radiography Film Dryer Machine Using Timer

F, Erlangga Ibrahim Identification of the Existence of Inferred Menanga Fault based on Gravity Anomaly, Pesawaran, Lampung

www.atlantis-press.com/proceedings/sicomas-21/125074526 i, Amin Development of Ketorolac Analysis in Water Samples using

20:32 04/08/2022

Atlantis Publishing House | JOS | Universitas Jenderal Soediro | Proceedings of the Soedirman | +

atlantis-press.com/proceedings/sicomas-21/authors

HOME
PREFACE
ARTICLES
AUTHORS
SESSIONS
ORGANIZERS
PUBLISHING INFORMATION

Ferdiyan, Akmal	Application of the Conjugate-Gradient Method for Analysing the Optimum Thrust Force for the Pico-Hydropower
Fitri, Sa'adatul	Coefficient Estimates in the Class of Bazilevic Functions $\mathcal{B}_1(\alpha)$ Related to the Lemniscate Bernoulli
Gnanasangeetha, G	Design of Corrugated Diaphragm-Based MEMS Pressure Sensor for Biomedical Applications
Guswanto, Bambang Hendriya	Solution Formula of the Half-Space Model Problem for Incompressible Fluid Flow
Guswanto, Bambang Hendriya	Hadamard Matrix on Cryptographic Problems
Hermawan, Dadan	Prediction of Enantioseparation of Econazole on the Cyclodextrin Derivatives as Chiral Selectors by Molecular Docking Approach
Hermawan, Dadan	Development of Ketorolac Analysis in Water Samples using Micellar Electrokinetic Chromatography
Ibrahim, Wan Aini Wan	Development of Ketorolac Analysis in Water Samples using Micellar Electrokinetic Chromatography
Islami, Mia Nur	Stability Analysis of Biological Wastewater Treatment in Facultative Stabilization Ponds: Mathematical Model

20:32 04/08/2022

Atlantis Publishing House | JOS | Universitas Jenderal Soediro | Proceedings of the Soedirman | +

atlantis-press.com/proceedings/sicomas-21/authors

HOME
PREFACE
ARTICLES
AUTHORS
SESSIONS
ORGANIZERS
PUBLISHING INFORMATION

Istikaanah, Najmah	The Existence of the Moore-Penrose Inverse in Symmetrized Max-Plus Algebraic Matrix
Iswanto, Ponco	Prediction of Enantioseparation of Econazole on the Cyclodextrin Derivatives as Chiral Selectors by Molecular Docking Approach
Jajang, Jajang	The Graphs of the CDF, Power and Its Interpretation on Several Types of Binomial Probability Distribution
Jajang, Jajang	The Dengue Hemorrhagic Fever Modeling in Banyumas Regency by Using CAR-BYM, Generalized Poisson, and Negative Binomial
Kartika, Dwi	Reducing Levels of Methyl Orange Dye using Crosslinked Chitosan-Tripolyphosphate
Kurniasih, Mardiyah	Reducing Levels of Methyl Orange Dye using Crosslinked Chitosan-Tripolyphosphate
Lestari, Lilik	Detection and Characterization of Lung Cancer using CT Scan Technology
Manan, Abdul	A Short Note on the Complex Conjugate for Derivatives
Marjono, Marjono	Coefficient Estimates in the Class of Bazilevic Functions $\mathcal{B}_1(\alpha)$ Related to the Lemniscate Bernoulli

20:33 04/08/2022

Atlantis Publishing House | IOS | Universitas Jenderal Soediro | Proceedings of the Soedirman ...

atlantis-press.com/proceedings/sicomas-21/authors

HOME
PREFACE
ARTICLES
AUTHORS
SESSIONS
ORGANIZERS
PUBLISHING INFORMATION

Maryani, Sri	Solution Formula of the Half-Space Model Problem for Incompressible Fluid Flow
Mashuri, Mashuri	The Graphs of the CDF, Power and Its Interpretation on Several Types of Binomial Probability Distribution
Mashuri, Mashuri	The Dengue Hemorrhagic Fever Modeling in Banyumas Regency by Using CAR-BYM, Generalized Poisson, and Negative Binomial
Mashuri, Mashuri	Hadamard Matrix on Cryptographic Problems
Massinai, Muhammad Altin	Characteristics of Rock Minerals of the Camba Formation
Massinai, Muhammad Fawzy Ismullah	Characteristics of Rock Minerals of the Camba Formation
Mayani, Anita Nur	Design of Radiography Film Dryer Machine Using Timer
Nartiningsih, Ismei	Estimation of Neonatal Jaundice from the Chest Images Captured with a Smartphone
Nugraha, Purwaditya	Identification of the Existence of Inferred Menanga Fault based on Gravity Anomaly, Pesawaran, Lampung

Windows | 20:33 | 04/08/2022

Atlantis Publishing House | IOS | Universitas Jenderal Soediro | Proceedings of the Soedirman ...

atlantis-press.com/proceedings/sicomas-21/authors

HOME
PREFACE
ARTICLES
AUTHORS
SESSIONS
ORGANIZERS
PUBLISHING INFORMATION

Nugraha, Purwaditya	Identification of the Existence of Inferred Menanga Fault based on Gravity Anomaly, Pesawaran, Lampung
Nurfitriana, Izaina	Identification of the Existence of Inferred Menanga Fault based on Gravity Anomaly, Pesawaran, Lampung
Nurfitriana, Izaina	Was the Pesawaran Swarm Induced by Magmatic Fluids? Insight from Magnetic Method Analysis
Nurhudha, Ririn Adi	Analysis of Mathematical Connection Abilities in the Seventh Grade Students of SMP Muhammadiyah Pakem in Solving Line and Angle Question
Padama, Allan Abraham Bustria	Calculations of the Potential Energy Surface for a Water Molecule Dissociation on the Pt (111) Surface
Prabowo, Urip Nurwijayanto	Power Spectrum Analysis of the Satellite Gravity Anomalies Data to Estimate the Thickness of Sediment Deposits in the Purwokerto-Purbalingga Groundwater Basin
Prabowo, Urip Nurwijayanto	Application of the Conjugate-Gradient Method for Analysing the Optimum Thrust Force for the Pico-Hydropower
Pratikno, Budi	The Graphs of the CDF, Power and Its Interpretation on Several Types of Binomial Probability Distribution
Pratikno, Budi	The Dengue Hemorrhagic Fever Modeling in Banyumas

Windows | 20:34 | 04/08/2022

Atlantis Publishing House | IOS | Universitas Jenderal Soediro | Proceedings of the Soedirman ...

atlantis-press.com/proceedings/sicomas-21/authors

HOME
PREFACE
ARTICLES
AUTHORS
SESSIONS
ORGANIZERS
PUBLISHING INFORMATION

	Pratikno, Budi	Types of Binomial Probability Distribution The Dengue Hemorrhagic Fever Modeling in Banyumas Regency by Using CAR-BYM, Generalized Poisson, and Negative Binomial
	Raharjo, Sukmaji Anom	Power Spectrum Analysis of the Satellite Gravity Anomalies Data to Estimate the Thickness of Sediment Deposits in the Purwokerto-Purbalingga Groundwater Basin
	Rahmawati, Eni	Estimation of Neonatal Jaundice from the Chest Images Captured with a Smartphone
	Renny, Renny	The Existence of the Moore-Penrose Inverse in Symmetrized Max-Plus Algebraic Matrix
	Riapanitra, Anung	Photocatalytic and Kinetics Study of Copper Oxide on the Degradation of Methylene Blue Dye
	Riapanitra, Anung	Reducing Levels of Methyl Orange Dye using Crosslinked Chitosan-Tripolyphosphate
	Riyadi, Riyadi	Analysis of Mathematical Connection Abilities in the Seventh Grade Students of SMP Muhammadiyah Pakem in Solving Line and Angle Question
	Riyani, Kapti	Photocatalytic and Kinetics Study of Copper Oxide on the Degradation of Methylene Blue Dye

20:34 04/08/2022

Atlantis Publishing House | IOS | Universitas Jenderal Soediro | Proceedings of the Soedirman ...

atlantis-press.com/proceedings/sicomas-21/authors

HOME
PREFACE
ARTICLES
AUTHORS
SESSIONS
ORGANIZERS
PUBLISHING INFORMATION

	Sibishree, P Rinihaa	Design of Corrugated Diaphragm-Based MEMS Pressure Sensor for Biomedical Applications
	Sidik, Wuryatmo Akhmad	Application of the Conjugate-Gradient Method for Analysing the Optimum Thrust Force for the Pico-Hydropower
	Styawan, Yudha	Was the Pesawaran Swarm Induced by Magmatic Fluids? Insight from Magnetic Method Analysis
	Subanti, Sri	Analysis of Mathematical Connection Abilities in the Seventh Grade Students of SMP Muhammadiyah Pakem in Solving Line and Angle Question
	Sulaeman, Uyi	Prediction of Enantioseparation of Econazole on the Cyclodextrin Derivatives as Chiral Selectors by Molecular Docking Approach
	Sunardi, Sunardi	Application of the Conjugate-Gradient Method for Analysing the Optimum Thrust Force for the Pico-Hydropower
	Sunarsih, Sunarsih	Stability Analysis of Biological Wastewater Treatment in Facultative Stabilization Ponds: Mathematical Model
	Suroto, Suroto	The Existence of the Moore-Penrose Inverse in Symmetrized Max-Plus Algebraic Matrix
	Susilo, Susilo	Detection and Characterization of Lung Cancer using CT Scan

20:34 04/08/2022

Atlantis Press Publishing House | IOS | Universitas Jendral Soed- | Proceedings of the Soedirman |

atlantis-press.com/proceedings/sicomas-21/authors

HOME

PREFACE

ARTICLES

AUTHORS

SESSIONS

ORGANIZERS

PUBLISHING INFORMATION

Suroto, Suroto	Facultative Stabilization Ponds: Mathematical Model
Susilo, Susilo	The Existence of the Moore-Penrose Inverse in Symmetrized Max-Plus Algebraic Matrix
Suwandri	Detection and Characterization of Lung Cancer using CT Scan Technology
Syam, Muh. Remy	Development of Ketorolac Analysis in Water Samples using Micellar Electrokinetic Chromatography
Tjahjana, R Heru	Characteristics of Rock Minerals of the Camba Formation
Triyani, Triyani	Stability Analysis of Biological Wastewater Treatment in Facultative Stabilization Ponds: Mathematical Model
Wardayani, Ari	The Properties of the R^* Module over the Matrix Ring $M_n(R)$
Wardayani, Ari	Solution Formula of the Half-Space Model Problem for Incompressible Fluid Flow
Wibowo, Adhi	The Properties of the R^* Module over the Matrix Ring $M_n(R)$
Wulandari, Evita Luaria	Identification of the Existence of Inferred Menanga Fault based on Gravity Anomaly, Pesawaran, Lampung
Wulandari, Evita Luaria	The Graphs of the CDF, Power and Its Interpretation on Several Types of Binomial Probability Distribution

20:35 04/08/2022

Atlantis Press Publishing House | IOS | Universitas Jendral Soed- | Proceedings of the Soedirman |

atlantis-press.com/proceedings/sicomas-21/authors

HOME

PREFACE

ARTICLES

AUTHORS

SESSIONS

ORGANIZERS

PUBLISHING INFORMATION

Wulandari, Evita Luaria	The Graphs of the CDF, Power and Its Interpretation on Several Types of Binomial Probability Distribution
Wulandari, Rizki	Identification of the Existence of Inferred Menanga Fault based on Gravity Anomaly, Pesawaran, Lampung
Wulandari, Rizky	Was the Pesawaran Swarm Induced by Magmatic Fluids? Insight from Magnetic Method Analysis
Zulaehah, Siti	Calculations of the Potential Energy Surface for a Water Molecule Dissociation on the Pt (111) Surface

1

Atlantis Press

Atlantis Press – now part of Springer Nature – is a professional publisher of scientific, technical & medical (STM) proceedings, journals and books. We offer world-class services, fast turnaround times and personalised communication. The proceedings and journals on our platform are Open Access and generate millions of downloads every month.

For more information, please contact us at: contact@atlantis-press.com

20:35 04/08/2022

The Graphs of the CDF, Power and Its Interpretation on Several Types of Binomial Probability Distribution

Budi Pratikno^{1*}, Evita Luaria Wulandari¹, Jajang Jajang¹, Junita Sage Sianipar¹, and Mashuri Mashuri¹

¹Department of Mathematics, Faculty of Mathematics and Natural Sciences, Universitas Jenderal Soedirman, Purwokerto, Indonesia

*Corresponding author. Email: budi.pratikno@unsoed.ac.id

ABSTRACT

The research discussed the graphically analyzed of the cumulative distribution function (cdf), and the power function of hypothesis testing on the binomial distribution. In this research, we also showed (derived) the formula of the power function on special case of binomial such as Negative Binomial and the Geometric distribution. The result showed that the degree of freedom, bound of the rejection area, and parameter shape significantly affect to the curves of the power function. The curves of the power are sigmoid and they increase quickly to be one on the small parameter shape and large degree of freedom.

Keywords: Binomial distribution, the power function of hypothesis testing, R-code

1. INTRODUCTION

Here, we interested to study the use of the power and size in testing the hypothesis parameter and their graphically analyse for improving the inference population (Pratikno, [2]). Following, Wackerly, et. al. [5], we note that there are three definitions related to the hypothesis testing, namely a probability error type I (α), a probability error type II (β) and a **power function**. In addition, the power is defined as a probability to reject H_0 under H_1 in testing hypothesis, $H_0: \theta = \theta_0$ versus $H_1: \theta \neq \theta_0$, for parameter θ , as a statistical technique to investigate the population inference. Moreover, the size is then defined as the probability to reject H_0 under H_0 . We then choose the maximum power and minimum sizes as the theoretical concept to compare the testing.

Many authors such as, Pratikno [2], Khan [12-14], Khan and Saleh [15,16,17, 20, 21], Khan and Hoque [19], Saleh [1], Yunus [6], and Yunus and Khan [7-10], already studied the power and size of the tests on the hypothesis testing. Furthermore, we noted from the previous research some authors studied the power in testing intercept with non-sample prior information (NSPI), such as Pratikno [2], Khan and Pratikno [20] and Khan [12]. They used the probability integral of the cumulative distribution function (cdf) to compute the power and size. Moreover, Pratikno [2] and Khan et al. [9] used the formula of the power to compute the cdf of the bivariate noncentral F (BNCF) distribution in

regression models. Others authors have also contributed to the research of the power in the context of the hypothesis testing, such as Khan [12-14], Khan and Saleh [15,16,17, 20, 21], Khan and Hoque [17], Saleh [1], Yunus [6], and Yunus and Khan [7-10]. Due to the complicated and hard computational, Pratikno [2] and Khan et al. [9] used the BNCF distribution to compute the power using *R-code* (see Pratikno [2] and Khan et.al. [18]).

The research methodology for investigating the power and size as follows: (1) we have to determine the sufficiently statistics, (2) we then create the rejection area using uniformly most powerful test (UMPT) to derive the formula of the power of the geometric distribution, and (3) we finally compute and figure the graphs using *R-code*.

In this paper, Section 1 presented the introduction. The graphically analyzed of the cdf of the Binomial, Negative Binomial and Geometric distributions, and the power function are given in Section 2. The conclusion is given in Section 3.

2. THE GRAPHICALLY ANALYZED OF THE PDF, CDF, AND THE POWER-SIZE OF THE BINOMIAL AND GEOMETRIC DISTRIBUTION

2.1. The cdf Graphs of the Binomial, Negative Binomial and Geometric Distributions

Following Pratikno et al. [4], the general probability mass function (*pmf*) of the **Binomial** distribution with X_i Bernoulli trials with parameter p , and number of trial n , is given as

$$p(x) = P(X = x) = \binom{n}{x} p^x (1-p)^{n-x}; \quad (1)$$

$$\text{with } \binom{n}{x} = \frac{n!}{x!(n-x)!}$$

Similarly, the probability mass function of X as random variable of the **Negative Binomial** distribution of success on n Bernoulli trials, with r success on x , $X \sim BN(r, p)$, is then presented as

$$p(x) = P(X = x) = \binom{x-1}{r-1} p^r (1-p)^{x-r}, \quad x = r, r+1, \quad (2)$$

For $r=1$, the distribution of the random variable X will be Geometric distribution, $X \sim BN(1, p) = \text{Geo}(r=1, p)$, with *pmf* is given as

$$p(x) = P(X = x) = p(1-p)^{x-1}, \quad x = 1, 2, 3, \quad (3)$$

Using the equation (1), (2) and (3), we presented the graphs (curves) of the cdf of the three distributions, $P(X \leq x)$ at Figures 1, 2, and 3, respectively.

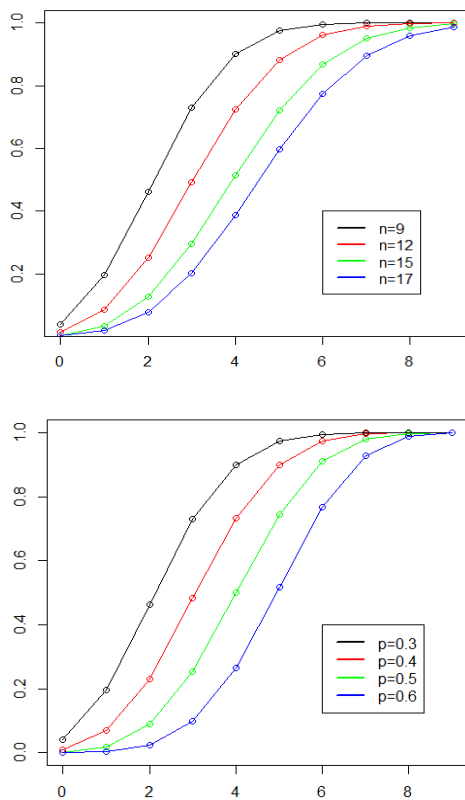


Figure 1. The graphs of the cdf of the binomial distribution on several n and p .

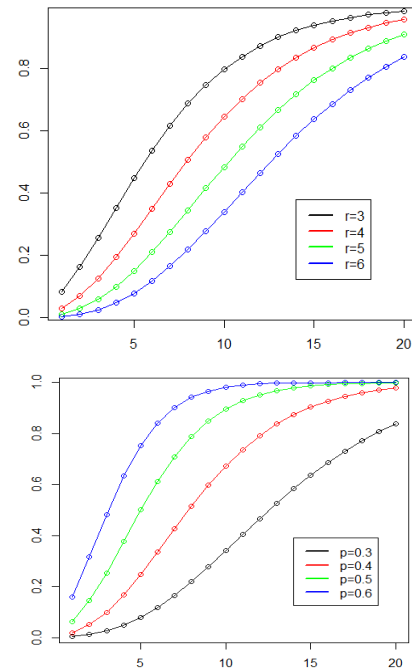


Figure 2. The graphs of the cdf of the Negative binomial distribution on several n and p .

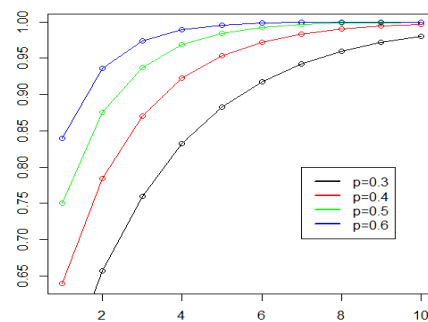


Figure 3. The graphs of the cdf of the Geometric distribution on several p .

From Figure 1, 2, and 3, we see that the all the curves are nonlinear (sigmoid). They increase as for small n and they increase as the p increase. They are going to be one (quickly) for large p (p increases). It means that both n and p really significant affect to the skew-ness of their curves.

2.2. The Graphs of the Power Functions

To derive the formula of the power function, we set the join distribution of the random variable, X_1, \dots, X_n . Furthermore, we find sufficiency statistics and rejection area to define the power and size. Here, we then got the sufficiency statistics $S = \sum_{i=1}^m x_i$ that follows to specified distribution. In this case, we then find the rejection area using *most powerful* (MP) test. Due to the similarity of the distribution among Binomial, Negative Binomial and Geometric distribution, we then obtained the general

power function of the Binomial distribution to testing $H_0 : p = p_0$ versus $H_1 : p > p_0$ as

$$\begin{aligned}\pi(p) &= P(\text{reject } H_0 | \text{under } H_1 : p) \\ &= P\left(\sum_{i=1}^m X_i \geq k | p\right) = 1 - P(S \leq k-1 | p)\end{aligned}\quad (4)$$

Using the equation (4), we then produce the graphs of the power and size function on Binomial, Negative Binomial and Geometric distribution at the Picture of the bottom.

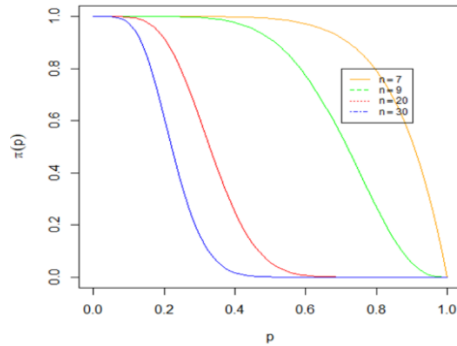


Figure 4. The power of the Binomial distribution with the rejection area 4 on several n

We see from Figure 4., the curves are sigmoid and tend to be quickly to be one for large n and small p .

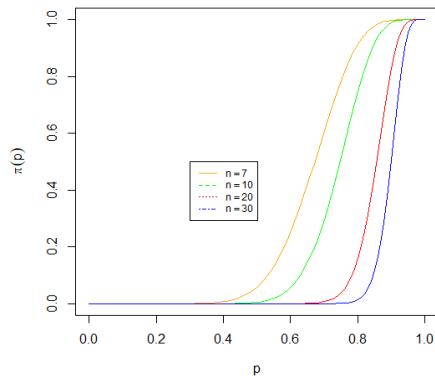


Figure 5. The power of the Negative Binomial distribution with the rejection area 6 on several n

From Figure 5., we see that the curves of the power are also sigmoid, and they are quickly to be zero for small n and p .

Furthermore, we noted that the graphs on Figure 6 are produced using the formula of the power

$$\pi(p) = \sum_{s=3}^6 \binom{s-1}{3-1} p^3 (1-p)^{s-3}$$

in testing $H_0 : p = 0.3$ versus $H_1 : p > 0.3$ with the m values are 3 and 4.

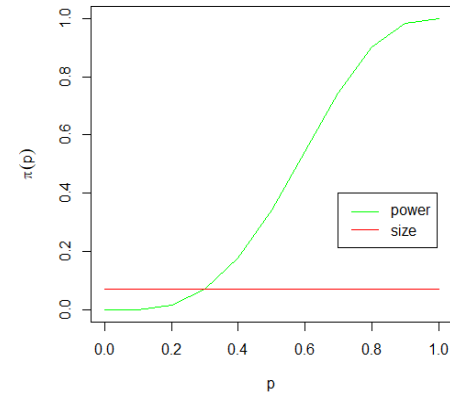
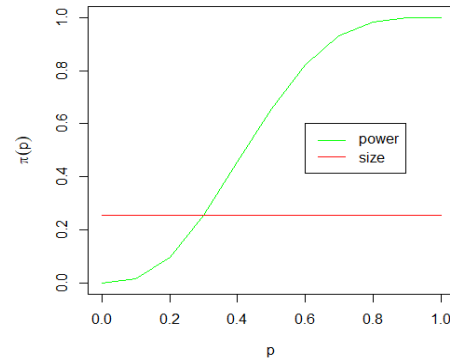


Figure 6. The power and size of the Geometric distribution with $RR = \{(x_1, x_2, \dots, x_m) | s \geq 6\}$

We see from Figure 6., it is clear that the power and size increase for small (lower) m and they decrease as the m increase. Note that the curve of the power function is sigmoid, but the size is constant. To evaluate the values of the size, we presented the manually computation form the power function

$$\pi(p) = 1 - \left[\sum_{s=0}^5 \binom{9}{s} p^s (1-p)^{9-s} \right]$$

under H_0 when $p_0=0.3$ and $m=3$,

$$\alpha = \pi(0.3) = 1 - \left[(0.7)^9 + \dots + 126(0.3)^5 (0.7)^4 \right] = 0.026$$

$p_0 = 0.3$ and $m = 4$, $\alpha = \pi(0.3) = 0.07$, respectively.

3. CONCLUSION

There several steps to derive the power function on distributions. The important step is finding the rejection area using UMPT test. The result showed that the power function is depended n and p , and they tend to be sigmoid and quickly to be one for large p (except on Binomial distribution)

AUTHORS' CONTRIBUTIONS

All authors, BP, ELW, JSS, JJ, and MM, have contributions about CONCEPT, METHOD, EDITING, and ANALYSIS. The first author BP provided feedback, discussed result and contributed to the final manuscript.

ACKNOWLEDGMENTS

We thankfully to the LPPM UNSOED for providing us granting of research of the BLU UNSOED, 2021.

REFERENCES

- [1] A. K. Md. E. Saleh. Theory of preliminary test and Stein-type estimation with applications. John Wiley and Sons, Inc., New Jersey, 2006.
- [2] B. Pratikno. Test of Hypothesis for Linear Models with Non-Sample Prior Information. Unpublished PhD Thesis, University of Southern Queensland, Australia, 2012.
- [3] B. Pratikno. The noncentral t distribution and its application on the power of the tests. *Far East Journal of Mathematical Science (FJMS)*, vol. 106, no. 2, 2018, pp. 463-474.
- [4] B. Pratikno, Power of hypothesis testing parameters shape of the distributions. *Far East Journal of Mathematical Science (FJMS)*, 2019, vol. 110, no. 1, pp.15-22.
- [5] D. D. Wackerly, W.Mendenhall III, and R. L.Scheaffer. Mathematical statistics with application, 7th Ed. Thomson Learning, Inc., Belmont, CA, USA, 2008.
- [6] R. M. Yunus. Increasing power of M-test through pre-testing. Unpublished PhD Thesis, University of Southern Queensland, Australia, 2010.
- [7] R. M. Yunus, S. Khan. Test for intercept after pre-testing on slope a robust method. In:9th Islamic Countries Conference on Statistical Sciences (ICCS-IX): Statistics in the Contemporary World-Theories, Methods and Applications, 2007.
- [8] R. M. Yunus, S. Khan. Increasing power of the test through pre-test a robust method. *Communications in Statistics-Theory and Methods*, vol. 40, 2011a, pp. 581-597.
- [9] R.M.Yunus, S. Khan. M-tests for multivariate regression model. *Journal of Nonparametric Statistics*, vol. 23, 2011b, pp. 201-218.
- [10] R. M. Yunus, S. Khan. The bivariate noncentral chi-square distribution - Acompound distribution approach. *Applied Mathematics and Computation*, vol. 217, 2011c, pp. 6237-6247.
- [11] S. Khan, B. Pratikno, A.I.N. Ibrahim, R.M Yunus, The correlated bivariate noncentral F distribution and Its application. *Communications in Statistics—Simulation and Computation*, vol. 45, 2016, pp. 3491–3507.
- [12] S. Khan. Estimation of the Parameters of two Parallel Regression Lines Under Uncertain Prior Information. *Biometrical Journal*, vol. 44, 2003, pp. 73-90.
- [13] S. Khan. Estimation of parameters of the multivariate regression model with uncertain prior information and Student-t errors. *Journal of Statistical Research*, vol. 39, no. 2, 2005, pp. 79-94.
- [14] S. Khan. Shrinkage estimators of intercept parameters of two simple regression models with suspected equal slopes. *Communications in Statistics - Theory and Methods*, vol. 37, 2008, pp. 247-260.
- [15] S. Khan, A. K. Md. E. Saleh. Preliminary test estimators of the mean based on p-samples from multivariate Student-t populations. *Bulletin of the International Statistical Institute. 50th Session of ISI, Beijing*, 1995, pp. 599-600.
- [16] S. Khan, A. K. Md. E. Saleh. Shrinkage pre-test estimator of the intercept parameter for a regression model with multivariate Student-t errors. *Biometrical Journal*, vol. 39, 1997, pp. 1-17.
- [17] S. Khan, A. K. Md. E. Saleh. On the comparison of the pre-test and shrinkage estimators for the univariate normal mean. *Statistical Papers*, vol. 42, no. 42001, 2020 , pp. 451-473.
- [18] S. Khan., Z. Hoque and A. K. Md. E. Saleh. Improved estimation of the slope parameter for linear regression model with normal errors and uncertain prior information. *Journal of Statistical Research*, vol. 31, no. 1, 2022, pp. 51-72.
- [19] S. Khan, Z. Hoque. Preliminary test estimators for the multivariate normal mean based on the modified W, LR and LM tests. *Journal of Statistical Research*, vol. 37, 2003, pp. 43-55.
- [20] S. Khan, A. K. Md. E. Saleh. Estimation of intercept parameter for linear regression with uncertain non-sample prior information. *Statistical Papers*. Vol. 46, 2005, pp. 379-394.
- [21] S. Khan, A. K. Md. E. Saleh. Estimation of slope for linear regression model with uncertain prior information and Student- t error. *Communications in Statistics - Theory and Methods*, vol. 37, no. 16, 2008, pp. 2564-258.
- [22] S. Khan, B. Pratikno, Testing Base Load with Non-Sample Prior Information on Process Load. *Statistical Papers*, vol. 54, no. 3, 2013, pp. 605-617.