



**A SKEW-NORMAL APPROXIMATION FOR POISSON-  
GAMMA CLAIM DISTRIBUTION**

**UNDERGRADUATE THESIS**

**Submitted as one of the requirements to obtain  
Sarjana Aktuaria (S.Aktr.)**

**By:**

**Naomi Indramitha Putri Giay**

**021201800001**

**FACULTY OF BUSINESS**

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**2023**

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### Panel of Examiner



**Dr. Edwin Setiawan Nugraha, S.Si, M.Sc.**

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**Maria Yus Trinity Irsan, S.Si., M.Si.**

### Examiner I

Promoted by,



**Dr. Dadang Amir Hamzah, S.Si., M.Si**

**Thesis Advisor**

Recommended by,



**Maria Yus Trinity Irsan, S.Si., M.Si.**

**Head, Actuarial Science Study Program**

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Advisor's Name : Dr. Dadang Amir Hamzah, M.Si

NIDN : 0405108602

Study program : Actuarial Science

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## ABSTRACT

The Normal approximation is a commonly used method by insurance companies to estimate the distribution of claims. However, the distribution of insurance claims often exhibits significant skewness, which cannot be adequately accommodated by the Normal approximation. This study aims to propose an alternative approximation method that performs better than the Normal approximation. Built upon the presumption that the actual distribution of claims follows the Poisson-Gamma distribution, this research investigates the effectiveness of two approximation approaches. The comparison is conducted using mean-squared error (MSE) analysis, which assesses the extent to which these approaches approximate the actual distribution of claims in a simulation scenario. The results show that the Skew-Normal approximation outperforms the Normal approximation in terms of estimating the distribution of claims. Finally, the Skew-Normal distribution was developed as a solution to the problem of skewness in insurance claim distributions and to improve estimation accuracy.

**Keywords:** Claim distribution, Normal approximation, Skew-Normal approximation, Poisson-Gamma distribution.

## ABSTRAK

Aproksimasi Normal adalah metode yang biasa digunakan oleh perusahaan asuransi untuk memperkirakan distribusi klaim. Namun, distribusi klaim asuransi seringkali menunjukkan



kemiringan (skewness) yang signifikan, yang tidak dapat diakomodasi secara memadai oleh pendekatan Normal. Penelitian ini bertujuan untuk mengusulkan alternatif metode pendekatan yang lebih baik daripada pendekatan Normal. Berdasarkan asumsi bahwa distribusi klaim yang sebenarnya mengikuti distribusi Poisson-Gamma, penelitian ini menyelidiki keefektifan dari dua pendekatan-pendekatan tersebut. Perbandingan dilakukan dengan menggunakan analisis mean-squared error (MSE), yang menilai sejauh mana pendekatan tersebut mendekati distribusi aktual klaim dalam skenario simulasi Hasilnya menunjukkan bahwa pendekatan Skew-Normal mengungguli pendekatan Normal dalam hal memperkirakan distribusi klaim. Akhirnya, dikembangkanlah distribusi Skew-Normal sebagai solusi dari permasalahan skewness pada distribusi klaim asuransi dan untuk meningkatkan akurasi estimasi.

**Kata Kunci:** Distribusi klaim, Aproksimasi Normal, Aproksimasi Skew-Normal, Distribusi Poisson-Gamma

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The author recognizes that this thesis is still far from perfection. Therefore, the author looks forward to receive constructive feedback and suggestions for future improvements. Hopefully, this thesis will be beneficial to a diverse group of people and can be served as a source of idea for future thesis writing.

Cikarang, September 5<sup>th</sup> 2023



Naomi Indramitha Putri Giay

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