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Title

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ABSTRACT

Example: Gold has a long history in trading over the past decades until its role in trading was replaced by the introduction of banknotes and coins. Gold is undeniably one of the prime commodities in investments and as well as a hedging tool. Thus, it is important to study the fluctuation in monthly gold price in Malaysia to extract useful information that could benefit investors and the government.

Keywords: Example: Gold, Malaysian gold price range and Box-Cox transformation.

1. Section 1: Introduction

Example: Gold has a long history in trading over the past decades. In Malaysia, gold was one of the natural resources and besides trading, gold mining was also active back then. Gold was one of the important mediums of trading utilised until the development of banknotes and coins took over its role.

Gold is a good investment that is neither short-term nor long-term and one of the privileges of gold is that it is considered valuable by the entire human race, [1]. It is also a great asset that can be converted into paper money. No other assets can match the liquidity of gold. Gold is a valuable item that is easy to handle and is a tangible value item. Gold has attracted people since thousands of years ago until recent because unlike most other commodities, gold is a metal that is durable, easy to carry, as well as universally accepted and validated, [2].

2. Section 2

Range is a measure of data dispersion or spread besides variance, standard deviation and interquartile range. Range is used in this study to describe the monthly MGP fluctuation. Range is defined as the difference between maximum and minimum values. Although range uses only extreme values, it still preserves the metric as the original data unlike in the variance computation.

2.1 Section 2.1

The power transformation introduced by Tukey in 1977, see [3] can be very effective when the relationship between independent and dependent variable is simple monotone i.e. either strictly increasing or strictly decreasing with no inflection point. This data transformation technique is useful to reduce anomalies such as non-linearity, heteroscedasticity (stabilizing variance) and non-normality as well as skewness. Following [4, 5], the power transformation with the power parameter λ is defined in Equation (1).

$$y_i^{(\lambda)} = \begin{cases} y_i^{\lambda} & \lambda \neq 0 \\ \log y_i & \lambda = 0 \end{cases} \tag{1}$$

The simple power transformation has a discontinuity problem at $\lambda = 0$. This gives rise to the Box-Cox transformation as defined in Equation (2).

$$y_i^{(\lambda)} = \begin{cases} \dfrac{y_i^{\lambda} - 1}{\lambda} & \lambda \neq 0 \\ \log y_i & \lambda = 0 \end{cases} \tag{2}$$

3. Section 3

Example: When transforming the dependent variable and trying to find the best value of λ in the Box-Cox transformation, there is an additional problem. After transforming the dependent variable, the scores are no longer in their original metric, see [4]. Consequently the residual sum of squares no longer has the same statistical meaning as it did prior to transformation. As a result, we cannot find the best λ by comparing the residual variance or residual sum of squares for several competing values of λ. Sakia [4] further stated that a solution to this problem is introduced by Box and Cox through the Standardized Box-Cox Transformation which incorporates the geometric mean of the dependent variable say Y, denoted as $\bar{g}_Y$ to simplify the derivation of a maximum-likelihood method as given in Equation (3).

$$y_i^{(\lambda)} = \begin{cases} \dfrac{y_i^{\lambda} - 1}{\lambda \bar{g}_Y^{\lambda-1}} & \lambda \neq 0 \\ \bar{g}_Y \log y_i & \lambda = 0 \end{cases} \tag{3}$$

where $\bar{g}_Y = (\prod_{i=1}^{n} y_i)^{\frac{1}{n}}$ and it follows that $\log \bar{g}_Y = \dfrac{1}{n} \sum_{i=1}^{n} \log y_i$.

4. Section 4

Figure 1 (Top left) shows the scatterplot of monthly MGP range for the period of 120 months depicting the non-constant fluctuation pattern or inconsistent variation in the monthly MGP range indicating presence of heteroscedasticity; Figure 1 (Top right) is the Normal Q-Q plot that clearly shows the depart from normality for monthly MGP range indicating uneven or asymmetrical distribution of the fluctuations; Figure 1 (Bottom left) is the histogram showing that the distribution of monthly MGP range is rather skewed to the right and Figure 1 (Bottom right) is the boxplot displaying the existence of outliers which are extreme fluctuations of monthly MGP range.

Example of figures: *The journal prefers high quality resolution picture where the original type of picture when first being created are either eps, pdf, ps or pdf forms.*

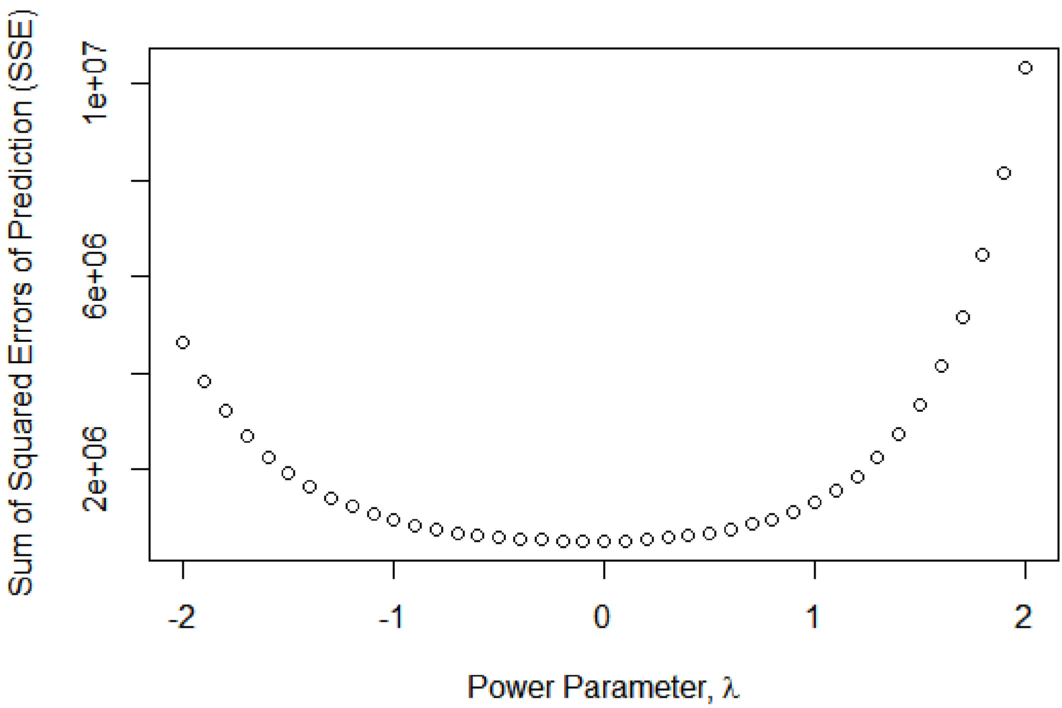

Figure 1: Plot of Sum of Squared Errors of Prediction (SSE) against the possible values of λ.

Example: Table 1 displays the p-values obtained for the normality and heteroscedasticity tests respectively. At $\alpha = 0.05$ level of significance, we can conclude that the transformed monthly MGP range is normally distributed based on the p-values of the Shapiro-Wilk and Robust Jarque Bera tests. On the other hand, based on the p-values for the studentized Breusch-Pagan and Non-constant Variance Score tests, we can affirm that the transformed monthly MGP range is free from heteroscedasticity effect at the same significance level.

Example of table:

Table 1: The p-values of statistical tests conducted in this study.

Test	p-value
Shapiro-Wilk	0.6592*
Robust Jarque Bera	0.4751*
Studentized Breusch-Pagan	0.0989*
Non-constant Variance Score	0.1109*

*significant at $\alpha = 5\%$ level

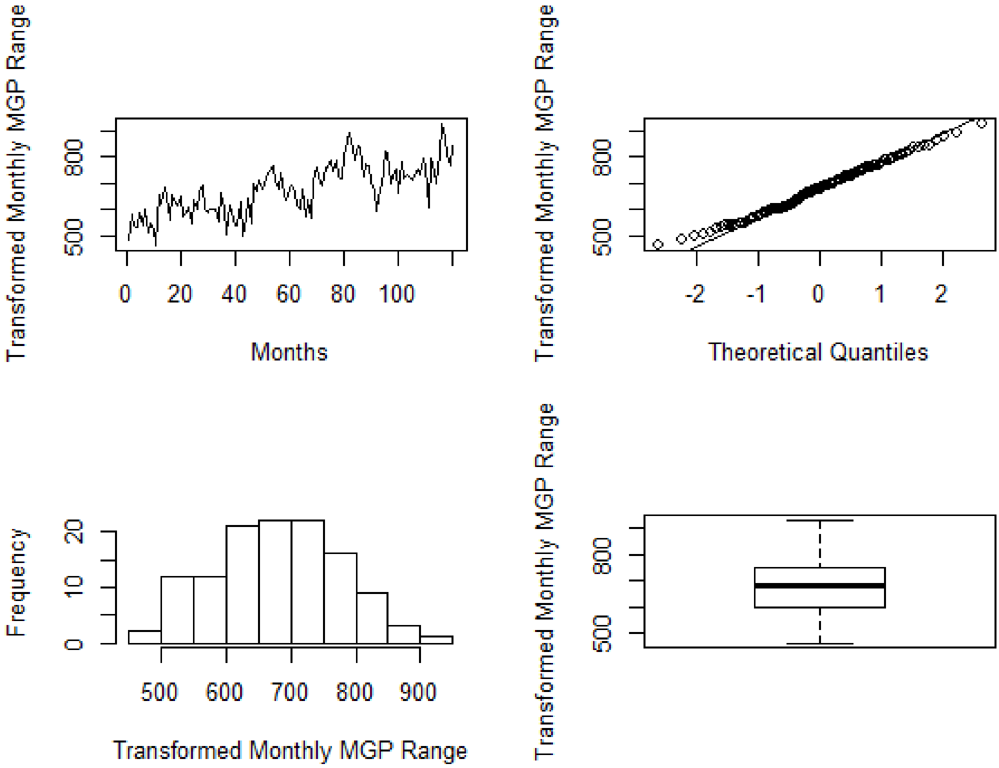

Figure 2: Top Left: Scatterplot of transformed monthly MGP range from January 2002 to December 2012; Top Right: Normal Q-Q plot of transformed monthly MGP range; Bottom Left: Histogram of transformed monthly MGP range; Bottom Right: Boxplot of transformed monthly MGP range.

5. Conclusions

Example: The use of range as a measure of dispersion depicts the variation in monthly gold price fluctuations i.e. showing how high or low the gold price can vary during a month in Malaysia. The original Malaysian gold price range data exhibited heteroscedasticity (inconsistent variation or non-constant fluctuations); non-normality (uneven distribution of fluctuation) and outliers (extreme fluctuations).

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