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Analyzing the Impact: The Role of MSME Growth in Reducing Unemployment Amidst High Levels of Poverty

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A B S T R A C T

This study employs a quantitative research method to examine the impact of the number of MSMEs and poverty rates on unemployment rates in Indonesia from 2011 to 2022, utilizing data from the Central Bureau of Statistics (BPS Indonesia) and Bank Indonesia. The analysis reveals a significant relationship between the increase in MSMEs, fluctuations in the poverty index, and changes in unemployment rates during this period. The findings demonstrate a strong correlation between the growth of MSMEs and a reduction in unemployment, whereas the relationship between poverty levels and unemployment rates is weak. This suggests that the expansion of MSMEs is an effective strategy for reducing unemployment and improving economic conditions. The study aims to enhance understanding of the factors influencing unemployment and the challenges policymakers face, providing valuable insights for efforts to combat unemployment. Additionally, the dataset used may benefit other studies addressing unemployment issues in Indonesia and similar regions. The results confirm the crucial role of MSME development in lowering unemployment rates, highlighting its potential as a viable policy approach for economic improvement.

1. INTRODUCTION

1.1. Research Background

Entrepreneurs who operate business ventures that have fewer than 250 employees and an annual turnover of less than €50m are commonly referred to as Micro, Small, and Medium Enterprises (MSMEs); they have helped in poverty elimination and have also assisted in the reduction of unemployment. Previous works indicate that MSMEs play an important role in providing employmentand income in the targeted economies, particularly the developing world [1]. The statutes identify MSMEs as the new face of the private sector in the least developed countries being a cornerstone of the private sector development strategy [2]. This is why the development of SME clusters as a concept has been considered as one of the important strategies for micro-entrepreneurial development in countries such as Bangladesh due to its impacts on poverty reduction and job creation [3]. To some extent, MSMEs hold the key to the creation of employment and subsequently the fight against poverty among the economic agents [4].

Consequently, understanding the growth and development of Micro Small and Medium sized enterprises (MSMEs) is relevant as they are an integral part of the economy in Indonesia. They contribute to 99. percent of workplace areas, 95 percent of all new commercial construction and renovation projects, and over 40,000 homes each year engage in green building practices.[5]. The emulator employs the equivalent of 51 percent of the Gross Domestic Product (GDP), and contributes to 96 percent of the tax revenue. The use and adoption of social media platforms have rocketed within the last decade and are primarily being used for employment purposes with 92% of employment opportunities. The role of these MSMEs as a strategic player in the Indonesian economy is attributed to their contribution to the production of GDP and employment quota [6]. Research has revealed that the

Indonesian MSMEs are indeed the engine of the economy as indicated below [7]. Technology finance also as Crowdfunding and microfinance instruments, can also help MSMEs to overcome the problem of difficulty in getting financing, which in turn can increase economic growth expected the reduction in the unemployment rate [8].

Some studies have attributed the creation of employment and poverty decrease to MSMEs since most of these companies operate at the grassroots level, where they buy raw materials from local people and sell their products to those same people [9]. However, the result of its influence on poverty reduction may also differ according to the factors:- Availability of capital resources - Fluctuations in markets- Government assistance.

However, employing people is not the only benefit of the companies as MSMEs also have other contributions to the economy. The following enterprises have been discovered to play a role in enhancing the key indicators of sustainable development goals; living standards; and poverty reduction [10]. In areas such as Assam, India, the MSMEs have been acknowledged for the employment opportunities that they have been proactively generating, especially in the development areas [11]. The statistics show that in Egypt, the MSMEs contribute to a major employment offering aspect and are found to be a significant percent of total organizations in many economies [12]. More so, the findings from the survey conducted in Indonesia reveal that MSMEs play a vital role in the creation of additional employment opportunities and economic growth and development of the country hence; improving the lives of all those involved in MSMSE-related activities [13].

Also, the latest technologies especially social media and financial technology have been tagged as crucial in the growth of MSMEs. Research has also indicated that the increased use of social media might greatly change the sustainability of most of the existing MSMEs [14]. The current technologies in the financial sector, especially financial technology, have also ensured that the financial literacy among the actors in the MSME has been boosted and, for that matter, has enhanced the GDP of countries like Indonesia [15] [16][17]. Furthermore, there is literature focusing on the importance of ICT adoption in MSMEs with respect to poverty rates in the local setting, outlining the relevance of technological advancement for the growth and poverty decreasing of MSMEs.

This paper examines the correlation between the growth of MSMEs and poverty as a mutually complementary element that creates a complex picture of the economic landscape affecting unemployment. This research seeks to unpack these complex dynamics with reference to the mutually influencing elements and factors identified through a statistical analysis of data collected from 2011 to 2022 from the Indonesian Central Bureau of Statistics (BPS) and Bank Indonesia. Thus, with the help of such rigorous and quantitative approaches, it is possible to identify and explain the relationships between these variables and consequences in terms of unemployment. As an expectation, the findings shall help the policymakers and enhance the existing poverty reduction policies' discussions [18] [19].

In conclusion, MSMEs are significant elements of every economy globally and have roles in boosting the economy, eradicating poverty, and creating employment opportunities. The research background highlights the need for knowledge of the function of MSMEs in relation to unemployment and poverty inhibition in view of the prevailing economic conditions. From this perspective, the analysis of the extent of participation of MSMEs in different aspects of socioeconomic development can help policymakers as well as other stakeholders to find out how best to work towards the improvement of the fortunes of these companies in the interest of the greater good.

1.2. Literature Review

1.2.1. MSMEs and poverty reduction

MSMEs are a force that is instrumental towards the goal of poverty alleviation, primarily in developing nations such as Indonesia. Various authors have indicated that MSMEs play both a direct, as well as indirect, role in poverty reduction [12]. The extent of the use of ICTs among the MSMEs has also been associated with poverty reduction at the local level, thus categorizing ICT as a technology that positively affects the performance of the business and their economic returns [15]. Furthermore, prior research has also highlighted the impact of FDI as primarily having a poverty-reducing effect in ASEAN, once again highlighting the importance of external investment in promoting growth and poverty reduction across the region [20].

In addition, the proper governing of the MSMEs to enable them to fully participate in the eradication of poverty is important. Formulating indicators for best MSME governance practice can be useful to different authorities, especially governments, and practitioners, in the achievement of greater MSME growth, therefore poverty diminution [21] Among the subsectors examined in Ethiopia, MSMEs have been employed in ways indicated to enhance sustainable development by creating employment opportunities, improving life standards, and eradicating poverty in the sub-Saharan Africa region. [1]. Furthermore, there is an indication that SME use of information and communication technologies could also be a viable poverty-relieving mechanism, pointing to the fact that business adoption of ICTs is an important social and economic engagement that can spur development [22].

The literature also notes that ESMEs' access to credit is critical to improving their performance and hence underpinning the MSMEs' local economic development and poverty reduction agenda [23]. Lastly, the ability of SMEs, especially in the tourism industry, has been applauded for fostering tourism destinations and business initiatives that can help handle push factors that cause tours to decline, and such factors can bring about poverty alleviation in various communities [24]. In reviewing these studies, it becomes apparent that the growth of MSMEs is a key conduit to poverty reduction through the facets of technology embracing, governance improvement, financial access, and sector-wise resilience activities.

1.2.2. MSMe and Unemployment

MSMEs ought to be complementary to Indonesia's employment needs, particularly in the context of unemployment because the growth of such enterprises will significantly enable the development of the nation's economy. In Indonesia, policies to promote the development of MSMEs are crucial since they are great potential tools that can help decrease unemployment and poverty [25]. Analysis conducted on unemployment and the growth of Indonesia's economy has indicated that the growth of MSMEs is positive and significant to unemployment in the country [26]. In emphasizing the open unemployment rate as a critical variable in the analysis of MSME growth to increase the

rate of employment, studies that test a specific region during the period under consideration, such as West Java Province, hold high value [27].

Additionally, the role of MSMEs in Indonesia is essential since it is engaged in creating employment opportunities thus eradicating unemployment. It has been established that they are some of the principal causes to address the issue of unemployment since they provide their part of the employees, especially the private sector [28]. ever, the affirmative relationship between the presence and growth of the MSMEs and the Indonesian economy and the well-being of the population has been identified [29]. Hence supporting the growth of the MSME pushes the growth of the economy and the increasing employment opportunities to create a positive impact on unemployment [30].

Lastly, the literature review reveals the importance of MSMEs in contributing to the Indonesian economy since they can improve the economy, start new businesses, fight unemployment, and create employment opportunities for the unemployed in the country. In relation to this, the development of MSMEs will greatly help Indonesia in its process of economic development and issues like poverty and unemployment rate can be addressed easily. Feasibly censuring the correlation between MSME development and joblessness is pivotal for creating the necessary policies and strategies that would enable Indonesia to maximize the potential of the enterprises, thereby advancing the socio-economic status of the country.

1.2.3. Poverty and Unemployment

There is always a concern about the employment status of the people, especially in corrective and developmental Micro, Small, and Medium Enterprises growth. Some of the literature covered a survey that revealed that the expansion of the MSME sector is capable of decreasing the open unemployment rate across various regions. Research that has examined the impact of MSME development on employment concerns, especially in provinces such as West Java Province in Indonesia, has considered the important role that these enterprises employment unemployment holders [27]. In addition, the promotion of MSMEs has also been highlighted as an imperative approach to the poverty and unemployment agenda since the development of MSMEs is crucial for economic development and employment opportunities [26]. MSMEs also add their own resources to the economic development of a country and also help in providing employment opportunities thus depressing the unemployment level in the world, such as in Indonesia [31].

Besides, there is a need to embrace the role of MSMEs in terms of the development of employment chances for the masses. It is noteworthy that these enterprises possess the considerable abilities inherent in their capacity to absorb a good deal of the personnel thus playing their role in stabilizing the unemployment rate. Research has found that MSMEs offer employment to more than 70% of the private sector labor force and its the critical supplier of livelihoods [32]. Further, the increase in the expansion of MSMEs has been linked to the overall increase welfare of workers in the relevant enterprises and therefore underlines their influence on eradicating high unemployment rates [33]. Adequate initiatives to foster and enhance the development of the MSME sector have been underlined as critical not only in absorbing the available workforce but also in proactively working towards improving working conditions, which will translate to reductions in unemployment levels [25].

Finally, the analysis of MSME growth and unemployment from the current literature highlights a vital positive correlation between the growth of these enterprises and levels of unemployment. The research works under review indicated that MSME development has the potential to alleviate the unemployment problems, and create employment opportunities especially when income is grown through the support of MSME development for enhanced general welfare. The different strategies provided above will be of great help to overcome the issue of unemployment to the extent possible with a view of stimulating the growth of MSMEs for their sustainable development with international support from stakeholders.

1.2.4. MSME Growth, Poverty and Unemployment

MSMEs remain important in economies, including the Indonesian economy, as they help to diversify the economy and bring stability to economic development. Many scholars have pointed out the vital role of MSMEs in fitting several important socio-economic questions including poverty and unemployment. Research by Ref. [9] goes further in exploring the prospect of the Indonesian MSMEs, with a focus on their evolution. Additionally, Ref. [12] gives a real-life experience that gives a direct Indication of the causal relationship between MSMEs and poverty reduction in Indonesia. Furthermore, [34] This paper overviews the correlation between the extent of MSMEs' usage of Information and Communication Technology (ICT) and poverty rates at Indonesia's regional level.

Moreover, Ref. [35] In this regard, contrary to the assertion of Ner.two, Santoso has highlighted the ways in which IFIs can assist poor enterprises, which the MSMEs here encompass, towards the accomplishment of the internationally prescribed sustainable development goals such as the eradication of poverty [4] Valle also highlighted how organizations, including the MSMEs create employment opportunities in order to address issues of poverty. Evidence also supporting these findings, the following are some of the evidence [36]Reflecting on the situation in Indonesia, explain how empowering MSMEs through Indonesian Islamic Microfinance Institutions can help promote the well-being of sidelined communities and free them from poverty.

Moreover, the things that can be taken from this study and similar studies like the one conducted by Ref. [37] showcases new strategies that are based on economic stimulus measures to reinforce countries containing affected MSMEs due to crises, as for COVID-19 to eradicate poverty [38] Handayati noted the necessity of MSMEs within the Indonesian economy before highlighting just how crucial they are for further, socio-economic advancement. In addition, Ref. [8] It also outlines tactics, such as the Canvas Business Model and financial technologies, for promoting the sustainability and performance of MSMEs, accelerating economic development, and eradicating poverty.

In sum, the literature study done on MSMEs shows that they can be hugely beneficial in enhancing the economy, providing employment, and helping in eradicating poverty across the various parts of the world including Indonesia. Only through the understanding of and contribution towards the growth of MSMEs will the policy maker and other stakeholders be in a position to deal with the issues of poverty and unemployment, which are sometimes attributed to the growth of MSMEs as a harbinger of sustainable socio-economic development.

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1.3. Research Objective

Specifically, it presents the analysis of the relationship between the key economic indicators, namely, the level of development of micro, small, and medium-sized enterprises (MSMEs), and poverty unemployment within Indonesia for the period between 2011 and 2022. Using comprehensive data from the Indonesian Central Bureau of Statistics (BPS) and Bank Indonesia as the unemployment determinants, this study has a purpose to help elaborate on the role and connection of these economic factors. The paper makes a positive contribution to poverty reduction endeavors by employing valid quantitative methodologies to establish the intensity and direction of the outlined relationships.

Furthermore, it is expected that this research will help policymakers get important insights that can be useful in the fight against unemployment. In this regard, by presenting a study on the relationship between MSME development and poverty reduction, the goal is to bring together targeted policy components that augment the development of policies in the sector. These insights are expected to support targeted interventions that address the root causes of unemployment, promote sustainable economic growth, and enhance the well-being of vulnerable populations in Indonesia. The ultimate goal is to equip policymakers with evidence-based recommendations that can lead to more impactful and enduring efforts to reduce unemployment.

2. METHODS

2.1. Population and Sample

The literature review technique applied in this research is analytical which focuses on quantitative research in order to analyse the correlation between – MSME growth and the growth of Indonesia's population living in poverty and unemployment level between the years 2011 and 2022. The data employed is secondary data collected from Bank Indonesia, Central Statistics Agency of Indonesia, and the World Bank incorporating time series and indicators on MSME growth, poverty, and unemployment levels during the relevant period. Every paper has its independent and dependent variables; in this case, the number of people living in poverty and the growth of MSME are independent variables, while the level of unemployment is the dependent variable. Multiple linear regression analysis is used to analyze the effects of the different independent variables on the dependent variable. Data processing involves pre-processing that consists of estimating the model, testing hypotheses and their outcomes as well as the interpretation.

This research aims to give perceived results on the correlation between the growth of MSMEs and the number of individuals living in poverty and the employment rate in Indonesia. Besides, it is useful for the development of further work in the field of economics and for the promotion of legislation on the development of MSMEs.

2.2. Operationalization and Measurement Variable

Secondary data for this analysis was collected on an annual basis from 2011 to 2022, a total of 12 years. This dataset was compiled from data obtained from different sites and indices like the Central Statistic Body of Indonesia (BPS), Indonesia's central Bank of Bank Indonesia, the Ministry of Cooperatives and Small and Medium Enterprises (Kemenkop UKM), and global institutions like the World Bank. Many of the statistics in the dataset pertain to key concerns for MSME growth as well as the poverty rate and unemployment rate in Indonesia. Ideally, using this broad data set, the analysis will shed more light on the potentially existent economic factors that support the growth and development of MSMEs as well as the poverty and unemployment rate within Indonesia. The following table shows details of measurement in terms of the type of data collected, description, and data source that has been used in this analysis.

Table. 1 Measurement Variables, Data Sources and Descriptions

Variabel	Measurement	Description	Source
Number of MSMEs	Annual count	The total number of Micro, Small, and Medium Enterprises (MSMEs) each year	BPS, Kemenkop UKM
Number of Poverty	Annual percentage	The percentage of the population living below the poverty line each year	BPS, World Bank
Number of Unemployment	Annual percentage	The percentage of the labor force that is unemployed each year	BPS, Bank Indonesia

Source: Author (2024)

The analysis table above sums up the variables, measurements, descriptions, and sources of this research. The "Number of MSMEs" that indicates the annual figure on the Micro, Small, and Medium Enterprises (MSMEs) that take place in Indonesia is obtained from the Central Statistics Agency or Badan Pusat Statistik (BPS) and Ministry of Cooperatives and Small and Medium Enterprises or Kemenkop UKM. The "Gini Ratio" is obtained from the World Bank and it depicts the annual percentage of the poverty level identified from BPS. Thus, the 'Number of Unemployment' appropriates the annual unemployment rate, representing the unemployment rate in terms of the proportion of the labor force, obtained from BPS and Bank Indonesia. These variables offer a perceivable outlook of the Indonesian economy to allow for a proper assessment of how the growth of MSMEs affects the poverty levels and the unemployment rates in the country. These data sources talk to the credibility and validity of the study outcomes.

2.3. Analytical methods

However, as a way of having a clear understanding of the basic variables and the relationships in this conceptual framework, it is necessary to define and explain these variables. The analysis will seek to estimate the interconnection between the factors of the development of MSMEs, poverty and unemployment in maintaining the progress of Indonesia within the given period of twelve years. In light of the discussion in the preceding sections, the scope of this research is to unveil the existence of strong and meaningful associations between these variables obtained from the national data providers, including BPS, Bank Indonesia, Kemenkop UKM, and the World Bank, besides investigating how these variables interact with each other. The following conceptual framework illustrates these relationships and forms the basis for the subsequent analysis.

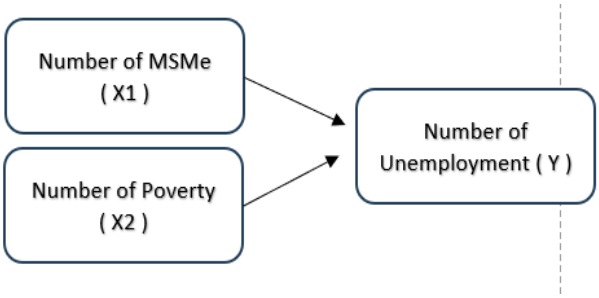

Fig. 1 Conceptual Framework

Ref. [7] clearly states that the two variables, namely the Number of MSMe and the Number of Poverty, have a significant influence together on the number of Unemployment. In this framework, it can be illustrated through an equation that illustrates the complex correlation between MSMe, Poverty, and Number of Unemployment, as follows:

$$Yi=\beta0+\beta1X1i+\beta2X2i+\varepsilon i \qquad (1)$$

Description :

- ✓ Yi is the dependent variable (number of Unemployment),
- ✓ X1i, and X2i are the independent variables (MSMe Growth and Poverty Number),
- ✓ β0 is a constant,
- ✓ β1, β2, and β3 are coefficients value of regression,
- ✓ εi is the random error.

This equation has β0, which acts as an intercept term, for it is the value of the dependent variable Y whenever the independent variable X is zero. Value of β1, and β2 are measures of regression coefficients that show a change in the value of the dependent variable Y as a result of one unit change in the value of the independent variable X while holding the value of the other independent variables at a constant.

Based on the conducted multiple linear regression analysis test to determine the predictiveness of the Number of MSMe and Number of Poverty towards the Number of Unemployment in Indonesia. Multiple linear regression approach was deemed suitable since it enables the evaluation of the effects of several predictors on one outcome which can be controlled by the others while at the same time considering how these predictors interact [39]. In the following model the dependent variable is the number of firms from the MSME sector the independent variables are the BI Rate, the inflation rate, and the currency rate.

The coefficient of multiple determination along with the regression equation will reveal details on the means by which each independent factor affects changes in the number of MSMEs, inclusive of statistical measures, significance, direction, and magnitude [40][41]. The proceeding analysis steps will encompass the estimation of the regression model, the test of significance of the regression coefficient, the test for regression assumption, and the analysis of results [42]. This analysis will help to generalize the key factors that may influence the growth of MSMEs in Indonesia. [43].

3. RESULT AND DISCUSSION

3.1. Data Trend Analysis

It is also relevant to note that the data set applied in the present study consists of annual time series data gathered from 2011 to 2022, which has been collected with considerable care to provide a thorough overview of the trends prior to the estimation. It is on this strong socio-development base built over eleven years that this specifically assembled dataset brings out the socio-historical and structural factors. Before the estimation process, it will be useful to identify the trends and oscillations of the analyzed variables in the given temporal data set in more detail, which will make it possible to provide an appropriate Overview of long-term changes (Figure 2).

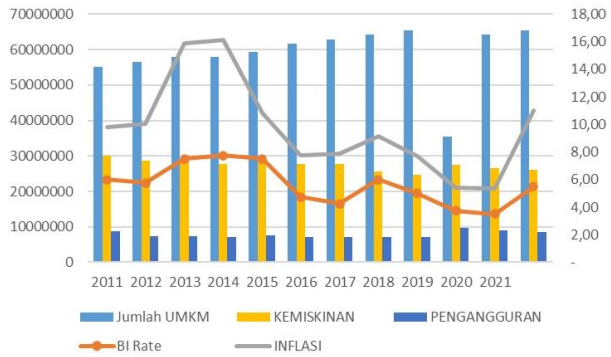

Fig. 2. Data Trend and Analysis

In the next section, I use graphical evidence to analyze MSME growth, poverty, and unemployment levels in Indonesia using data from 2011 to 2022 as shown in Figure 2. This was evident in the case of the number of MSMEs, which went on rising during this period, an indication that there could have been enhanced entrepreneurial activities or even economic diversification. Nonetheless, the changes in the BI rate and inflation have had some significant and mixed consequences on the stability of the economy. For example, moderate, though quite high inflation rates in 2013 (8. 38 %) and 2014 (8. 36 %) were leaving the poverty reduction rates rather stable, which may show that certain stability exists in the economic environment. However, in 2020 unemployment rose substantially to 9,767,750, and poverty levels also followed the trend and rose up to 27,549,690 by the same year due to the Economic impacts of the COVID-19 pandemic.

A general prevalence of poverty was witnessed in the decade but every year it reduced and it was in 2019 when the number of people in poverty reached 24,785,870. Another bright feature of this period was relatively high inflation and a decrease in BI rate providing favorable conditions for economic development and poverty reduction. It is however significant to note that in 2020, the outbreak of the Covid-19 pandemic which impacted the global economy, saw some of these gains erode revealing the dynamism of the global economy and the vulnerability of the structure of the Ugandan economy. Nevertheless, the statistics of 2021 and 2022 reveal only a partial positive shift, regarding poverty and unemployment rates: we marked a decline in comparison to the rate that was seen at the height of the pandemic but still above the 2019 indicators. In light of these findings, this analysis reveals that economic factors have interactive relationships with MSME

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growth, macroeconomic environment, and social welfare indicators and that sound economic buffers that can strive for shocks are crucial for the future.

3.2. Descriptive Statistics

For this analysis, we will consider data from year 2011 through year 2022 to capture time series data. This period allows one to simultaneously capture a broad time frame in which changes in important variables such as the Number of Poverty and the number of MSMEs took place. Therefore, with such a timeframe, we can look at its results collectively and assess structural shifts, policy effects, and trends with an extended timeframe. It also avails an opportunity to establish the fluctuations or trends that exist within such variables within a given period of time, this is because analyzing data over such a period also assists in the identification of seasonal aspects within the variables in question. Thus, this vast period will be used to better appreciate the various factors that (((Elements that determine the development of MSMEs require a comprehensive analysis, so it is necessary to understand the underlying factors and dynamics.

Table. 2 Descriptive Statistics

	UNEMPLOY	MSME	POVERTY
Mean	7815713.	58847174	27467703
Median	7377900.	60456975	27746050
Maximum	9767750.	65477937	30018930
Minimum	7031780.	35465497	24785870
Std. Dev.	935947.2	8183732.	1456857.
Skewness	0.967297	-2.056045	-0.234843
Kurtosis	2.512752	6.741672	2.475189
Jarque-Bera	1.990030	15.45470	0.248016
Probability	0.369718	0.000441	0.883373
Sum	93788560	7.06E+08	3.30E+08
Sum Sq. Dev.	9.64E+12	7.37E+14	2.33E+13
Observations	12	12	12

The first figures presented in the tables are the descriptive statistics for the distributions and variability of the unemployment, MSME, and poverty data series. The unemployment series has a mean of approximately 7 for the given countries and period. Therefore it is crucial to determine the nature of unemployment in the respective countries. 8 million and its variance was moderately high with a standard deviation of 935,947. The results in the mean measure of 2 suggest that the data points are largely identical and hover around the mean. This recorded positive skewness means that its distribution is slightly to the right, and the value of kurtosis equals 2. 512752, which is very close to 3, indicating that the distribution of the current dataset is near normal. At 0.00, the Jarque-Bera test confirms normal distributions therefore meeting the final hypothesis. The calculated Z-score equaled 369718, meaning that the data collected regarding unemployment adheres to the normal distribution of Music, rendering it reliable for further statistical analysis.

Conversely, the MSME series displays a higher mean of 58.8 million and a standard deviation of 8,183,732, reflecting more variability. The significant negative skewness (-2.056045) and high kurtosis (6.741672) indicate a distribution with a long left tail and heavy tails, confirmed by the Jarque-Bera test, which rejects normality with a p-value of 0.000441. The poverty series, with a mean of 27.4 million and a high standard deviation of 24,785,870, shows slight negative skewness (-0.234843) and a kurtosis value close to normal (2.475189). The Jarque-Bera test p-value of 0.883373 suggests normal distribution for the poverty data. These insights highlight the need for different analytical approaches for each series, considering their unique statistical properties and distribution patterns. Hence, VFAs play an important role in sustaining efficient anaerobic digestion as well as affecting the pH value, alkalinity, and activity of methanogens.

3.3. Classical Assumption Tests

The understanding of regression analysis generally depends on the seven principles of its accurate interpretation, also referred to as the classical assumptions. To test these basic assumptions of regression analysis of model-based studies, the assumption tests of normality, homoscedasticity, multicollinearity, and linearity tests were conducted in this study [44][40]. Before we delve deeper into the importance of the regression analysis, it is crucial to present fundamental guidelines known as classical assumptions that encompass its precise interpretation. In this study, components residual plots as well as cartoon plots were generated for the following reasons: The assessment of basic assumptions in data and model which includes normality, homoscedasticity, multicollinearity, and linearity was carried out by conducting the following assumption tests.

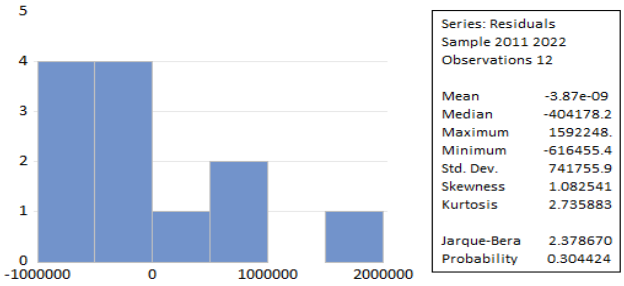

Fig. 3 The Jarque-Bera Result

The analysis of our regression model with the help of Jarque-Bera test results also enables us to determine whether the residuals are normally distributed or not. The mean of the residuals, 3. 87e-09, close to zero, supports the idea of a good model fit, as does the small standard deviation, 1. 50E+07. However, the median equals -404178. 2, which is a negative value and suggests some asymmetry. The asymmetry is further confirmed by means of the use of a skewness value that was 1. Interestingly, the p 081802 was 0.082541, indicating a skewed right probability density function where more large positive residuals are observed than negative ones. Based on the kurtosis statistic, it has a value of 2. 735883 ≈ 3, Around 3 means that it is somewhere between normal and skewed but with fewer outliers.

Regarding the Jarque-Bera statistic, it was equal to 2. 378670 as part of the test, and the p-value of 0 was reached. From the analysis of the model illustrated by 304424, we cannot reject the null hypothesis of Normal dist. residuals. This is to say that our residuals do not violate the normality assumption hence reassuring validity on projections of the model and hypothesis tests. Although the skewness coefficient equals 0.193, which indicates that the distribution of residuals is slightly positively skewed, the remainder of the statistics does not give grounds to start diagnosing the distribution as non-normal, which validates the results of the regression analysis. This means that the data is

non-normal with a high level of skewness and kurtosis which go against the [45] Jarque and Bera norm. Thus, it means that the data may not even approximate normality as would be expected for the many statistical analyses that make this assumption for the so-called normal data. More research or other methods of data analysis may need to be conducted to more adequately examine the data.

Table. 3 Heteroskedastisidas Test: Gleiser

F-statistic	0.535607	Prob. F(2,9)	0.6029
Obs*R-squared	1.276367	Prob. Chi-Square(2)	0.5283
Scaled explained SS	0.623144	Prob. Chi-Square(2)	0.7323

Source : Author (2024)

Turning to the analysis of residuals, we apply the Gleiser Heteroskedasticity Test in a bid to understand the variance's behavior in the regression model. A: The F-statistic in the beginning is equal to 0. 535607, and a p-value of 0 represents that the results obtained were statistically significant. 6029, we can infer that we cannot reject such a null hypothesis of homoskedasticity of the people involved in the observation. For all intents and purposes, this translates to the fact that the spread of the residuals in the calibration of the equation does not change much at different levels of the independent variables, meaning that the problem of heteroskedasticity should not really be much of a concern.

This study also confirms the previous research result that the time test model shows a rigorous Obs*R-squared value of 1 and is statistically significant. Therefore, the research results hold a significance level of 276367, with a p-value of 0. Error variances are equal According to Angles 5283, supports the view that error variances are equal. The above is advantageous in that it helps reduce the variability of our regression estimates and thus helps the model not to be deceived by unequal standards of variance.

Finally, we have the Scaled Explained Sum of Squares (SS) statistic equal to 0. 098, the result was statistically significant at 623144 with a p-value of 0. The following control tally was also noted down at; Http://www. It became 7323, which enhances the reliability yet again. This is the Durbin-Watson d statistic which, used as another check for heteroskedasticity, is also in line with the earlier findings, suggesting that the residual tests do not provide any solid indication of heteroskedasticity. Combined with the test above, all these give us confidence that the error terms of our regression models are consistent and homoskedastic and, therefore, we can rely on the model's findings and forecasts with reasonable certainty. presents, thus supporting the null hypothesis that asserts the failure to establish the existence of heteroscedasticity in the regression model. Therefore, the lack of a systematic increase or decrease in the size of the residuals with changes in the size of the predictor variables leads to the conclusion that the model is also exempt from heteroscedasticity with a 0. 05 significance level

Table 4 Breusch-Godfrey Serial Correlation LM Test:

F-statistic	1.098085	Prob. F(2,7)	0.3848
Obs*R-squared	2.865762	Prob. Chi-Square(2)	0.2386

Having run the Breusch-Godfrey Serial Correlation LM Test we can see in the depths of our regression model certain sins possible to commit. The F-statistic comes to 1, which appears to be a rounded-off result a bit to make it more precise. The significance here is noted as 098085 as expected, and the associated probability or p-value is also expected at 0. 7 'H use 3848 indicates that the means are too close to infer that there is enough evidence to reject the null hypothesis, therefore. This means, and in a more understandable manner, this implies that a problem of serial correlation in the residuals of our model would not appear to be a major issue. The model, it seems, has not been brought to _life_ by the spirits of autocorrelation resurfacing from what was little more than our collective unconscious and reminding us of the systematic errors that the model's predictions might contain.

Similarly, the Obs*R-squared statistic, based on the results of the study, reached 2. Orthopedic Pain N=17, 1 = 865.762, p ≤ 0. 2386, reinforces this narrative. The chi-square distribution speaking through these numbers is that data does not contain evidence of autocorrelation's chilling heartbeat. With these comforting observations, our model should not worry about serial correlation, meaning that our variables do not march in lockstep and are perfectly fine with 241 individual dancers. This autonomy is quite essential since our regression model is best placed to give accurate and unbiases insights about the interrelationships we are interested in.. This implies that the residuals of the regression model do not exhibit any systematic pattern over time, indicating that the model adequately captures the temporal relationships among the variables [39].

3.4. Multiple Linear Regression Analysis

Multiple linear regression analysis is a type of linear regression that seeks to present a relationship between at least two independent variables. Therefore, in this case, it was analyzed using EViews 12 software. According to the mentioned testing methodology, three independent variables have been identified and one dependent variable has been analyzed until significant variables are found. Therefore, the results are as follows: Therefore, the results are as follows:

Table 5. Output Estimation Analysis:

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	14960531	6176474.	2.422180	0.0385
MSME	-0.075102	0.033125	-2.267238	0.0496
POVERTY	-0.099217	0.186076	-0.533209	0.6068

Source : Author (2024)

The output estimation analysis provides valuable insights into the relationships between the dependent variable and the independent variables, MSME and poverty, in the context of the model. The constant term (C) has a coefficient of 14,960,531 with a standard error of 6,176,474, yielding a t-statistic of 2.422180 and a p-value of 0.0385. This suggests that the constant term is statistically significant at the 5% level, indicating that when MSME and poverty are zero, the expected value of the dependent variable is 14,960,531. The significance of this constant term implies a notable baseline level of the dependent variable.

Turning to the independent variables, the MSME coefficient is -0.075102 with a standard error of 0.033125, resulting in a t-statistic of -2.267238 and a p-value of 0.0496. This indicates that MSME is statistically significant at the 5% level, and the negative coefficient suggests that as MSME increases, the dependent variable decreases, all else being equal. This inverse relationship

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might reflect the impact of MSME changes on the economic indicator represented by the dependent variable. On the other hand, the poverty variable has a coefficient of -0.099217 with a standard error of 0.186076, leading to a t-statistic of -0.533209 and a p-value of 0.6068. This high p-value indicates that poverty is not statistically significant, implying that changes in poverty do not have a statistically meaningful impact on the dependent variable within this model. The lack of significance might suggest that other factors or variables could be influencing the dependent variable more directly than poverty in this context..

Table 6 Output Regression Results:

R-squared	0.371914	Mean dependent var	7815713.
Adjusted R-squared	0.232339	S.D. dependent var	935947.2
S.E. of regression	820042.0	Akaike info criterion	30.28442
Sum squared resid	6.05E+12	Schwarz criterion	30.40564
Log likelihood	-178.7065	Hannan-Quinn criter.	30.23953
F-statistic	2.664620	Durbin-Watson stat	0.859907
Prob(F-statistic)	0.123335		

Source : Author (2024)

The regression results provide a comprehensive overview of the model's performance and its statistical significance. The R-squared value of 0.371914 suggests that approximately 37.19% of the variability in the dependent variable can be explained by the independent variables MSME and poverty. While this indicates that the model has some explanatory power, it also leaves a considerable portion of the variability unexplained. The adjusted R-squared, which accounts for the number of predictors in the model, is slightly lower at 0.232339, reflecting a modest fit after adjusting for the degrees of freedom.

The standard error of the regression (S.E. of regression) is 820,042, which provides an estimate of the average distance that the observed values fall from the regression line. The sum of squared residuals, at 6.05E+12, indicates the total deviation of the observed values from the predicted values, which further suggests the overall fit of the model. The Akaike information criterion (AIC) and Schwarz criterion (SC) values, at 30.28442 and 30.40564, respectively, offer measures for model comparison, with lower values generally indicating a better fit. The log-likelihood value of -178.7065 provides another metric for model evaluation, with higher values suggesting a better fit.

The F-statistic of 2.664620, with a corresponding p-value of 0.123335, indicates that the overall model is not statistically significant at the 5% level. This implies that the independent variables, collectively, do not significantly explain the variation in the dependent variable. Durbin Watson's ratio of 0 indicates that, overall, this particular characteristic has a first-order autoregressive characteristic. The value 859907 is close to zero, meaning that there is no autocorrelation of any kind, and the residuals should be stationary. If the value were significantly below 2, the residuals would be positively serially correlated. This positive serial correlation means that the residuals are auto-correlated or dependent in the analyses, which could present problems with standard errors and regression coefficients.

However, judging by the significance level of 0.000 and the R-squared measure of 0.37, it could be said that the model offers some measure of explanation. 19 There is evidence that there may be limitations in the model and some potential internal inconsistencies because although 50% of the independent variables are significant as a group at the 5% level of significance, the overall F statistic is only significant at the 19% level, therefore There is positive serial correlation that may indicate positive self selecting sampling.in addition There are indications that the model requires further refinement possibly by the addition of other variables in order to satisfy

In fact, this analysis is to display the interaction between dependent variable and independent variable and do the regression equation. This equation will help you imagine how independent variables for the MSMe and Poverty level influence the dependent variable.. Using the coefficients generated from regression analysis, these equations will provide a deeper understanding of the dynamics of relationships between variables in the context of our study. The equation is as follows :

$$Y=14960531-0.075102\cdot X1+-0.099217\cdot X2 \quad (2)$$

Poverty provides insights into how MSME and poverty influence the dependent variable. The constant term of 14,960,531 represents the baseline level of the dependent variable when both MSME and poverty are zero. The coefficient for MSME is -0.075102, indicating a negative relationship between MSME and the dependent variable; for each unit increase in MSME, the dependent variable decreases by approximately 0.075 units, holding other factors constant. This statistically significant negative coefficient (p-value = 0.0496) suggests that higher levels of MSME are associated with lower values of the dependent variable, which could imply that as MSMEs grow, certain economic or social outcomes captured by the dependent variable improve or reduce in magnitude.

In contrast, the coefficient for poverty is -0.099217, which also indicates a negative relationship with the dependent variable; however, this effect is not statistically significant (p-value = 0.6068). This lack of significance suggests that changes in poverty levels do not have a meaningful impact on the dependent variable within this model's context. The moderate R-squared value of 0.371914 implies that around 37.19% of the variation in the dependent variable is explained by the independent variables MSME and poverty, leaving a significant portion unexplained. Furthermore, the Durbin-Watson statistic of 0.859907 points to positive serial correlation in the residuals, indicating potential issues with model assumptions and suggesting the need for further model refinement or the inclusion of additional explanatory variables to better capture the dynamics affecting the dependent variable.

3.5. Discussion

Using the regression analysis, several connections with the dependent variable, MSME, and poverty are identified by the study, providing insight into the interactions between them. The negative value of the coefficient for MSME shows that as the level of activity of firms classified under MSMEs rises, the dependent variable falls, pointing to a positive effect of MSMEs on the dependent variable, which refers to an increase in the economic or social value of the subject matter under study. From this finding, it can be agreed that MSMEs can contribute their quota towards boosting the economic status and improving the economic status of a country. However, the results further suggest that poverty does not predict PUFAs significantly within this model. It could be that other variables exclusion in the model could significantly explain the dependent variable rather than the poverty status, or it might imply the flexibility of poverty on the economic variables.

Despite these insights, however, the model seems to explain just about 37 percent of the variance, an R-squared statistic that is moderate at best. The coefficient of determination, also referred to as 'R-squared,' ranges from 0 % to 100 %, meaning that the closer to 100 % the value of 'R-squared' is, the smaller the proportion of the total variance in the dependent variable that is not explained by the independent variable(s), According to the OLS regression model obtained above, the value of 'R-squared' is equal to 19 % which shows that Namely, the issue of positive serial correlation, which might have been identified on the basis of the Durbin-Watson statistic equal to 0. In the same respect, with reference to figure 859907, it is also discovered that there are other factors, antecedent conditions, or variables that the existing model fails to model. Therefore, there is a need to establish a clearer model that will include other necessary variables for the related works or use a model that can eliminate the possibilities of autocorrelation on the variables being studied to enhance the understanding of the factors constituting the dependent variable. These variables would be other factors that require research to determine; the model can also be developed to increase its validity and usability.

4. CONCLUSION

This paper focuses on analyzing the regression model and the relationship between MSME and poverty level on the unemployment rate, which is the dependent variable. The findings also show that there is a significant negative correlation between the level of MSME activity and the level of unemployment. The MSME coefficient is then - 0. 075102 at the coefficient level, and p-value 0. 0496 can also indicate that the rise in the level of MSME activity is proportional to the level of economic development, by one unit where for each unit rise in the level of the activity. 5, there would be a reduction in the unemployment rate by 075102 units. This finding highlights the crucial role MSMEs play in reducing unemployment, likely through job creation and economic growth stimulation.

On the other hand, the relationship between poverty and the unemployment rate is not statistically significant, with a poverty coefficient of -0.099217 and a p-value of 0.6068. This implies that changes in poverty levels do not have a meaningful impact on the unemployment rate within this model. The model's R-squared value of 0.371914 indicates that approximately 37.19% of the variability in the unemployment rate can be explained by MSME and poverty, leaving about 62.81% unexplained by the model. Additionally, the Durbin-Watson statistic of 0.859907 suggests a positive serial correlation in the residuals, indicating patterns in the data not captured by the current model.

Thus, while MSME activity significantly contributes to reducing unemployment, the model demonstrates limitations in explaining the overall variability in the unemployment rate. Further research is needed to identify additional factors that may influence unemployment and to address autocorrelation issues to enhance the model's accuracy and reliability. Future studies should aim to develop more comprehensive models to better understand the dynamics affecting unemployment and to provide more effective policy recommendations..

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REFERENCE

[1] Endris E, Kassegn A, "The Role Of Micro, Small and Medium Enterprises (MSMEs) to the Sustainable Development of Sub-Saharan Africa and Its Challenges: A Systematic Review of Evidence From Ethiopia," J Innov Entrep. 2022;11(1).

[2] Beck T, Demirgüç-Kunt A, "Small and Medium-Size Enterprises: Access to Finance as a Growth Constraint," J Bank Financ. 2006;30(11):2931–43.

[3] Manzoor F, Wei L, Nurunnabi M, Subhan QA, "Role of SME in Poverty Alleviation in SAARC Region via Panel Data Analysis," Sustainability. 2019;11(22):6480.

[4] Valle L, Costan E, Costan F, General E, Alcantara G, Kilat RV, et al., "Community Extension MSME's Entrepreneurial Activities in Relation to Poverty Reduction," Front Sociol. 2022;7.

[5] Gunadi AD, Lesmana H, Fachrizah H, Revindo MD, Daniswara RV, "COVID-19 Pandemic and MSMEs in Indonesia: Impact and Policy Responses," J Ekon Indones. 2021;10(2):143–71.

[6] Murdiono A, . S, Siswanto E, Asandimitra N, Abd Aziz N, "Design and Build the Social Security Equity Crowdfunding Application as Funding Optimization for MSMEs," Kne Soc Sci. 2024;

[7] Andika A, Jennifer J, Huang JC, Sebastian JC, "Analysis of Digital Marketing Adoption in Indonesian Micro, Small, and Medium Enterprises," J Manaj Bisnis. 2021;18(3):308–28.

[8] Hadi DP, Adi PH, Ahmad AA, "The Impact of the Omnibus Low Cipta Kerja on the Sustainability of MSMEs and Economic Growth by Applying the Canvas Model Business Method and the Use of Financial Technology, Especially Crowdfunding and Microfinance.," Int J Sustain Dev Plan. 2023;18(2).

[9] Tambunan T, "Recent Evidence of the Development of Micro, Small and Medium Enterprises in Indonesia," J Glob Entrep Res. 2019;9(1).

[10] Sarmah A, Saikia B, Tripathi D, "Can Unemployment Be Answered by Micro Small and Medium Enterprises? Evidences From Assam," Indian Growth Dev Rev. 2021;14(2):199–222.

[11] Saadallah EM, Youssef A, Ragab AA, Salah A, "The Impact of Capital Structure on Profitability of Egyptian MSMEs in the Period From 2016 to 2019," Int J Account Financ Report. 2021;11(1):24.

[12] Nursini N, "Micro, Small, and Medium Enterprises (MSMEs) and Poverty Reduction: Empirical Evidence From Indonesia," Dev Stud Res. 2020;7(1):153–66.

[13] Chinyuku M, Karim AM, Dikito AR, Mugodza A, Mavani B, "Conceptual Framework of the Impact of Social Media Adoption by Selected MSMEs in Zimbabwe," Int J Acad Res Bus Soc Sci. 2022;12(11).

[14] Zaky M, Hamidi DZ, "The Role of Financial Technology in Improving Financial Literacy for MSME Actors," Kne Soc Sci. 2022;

 https://doi.org/10.29165/ajarcde.v8i2.417

[15] Hanggraeni D, "Information and Communication Technologies (ICTs) Adoption by MSMEs and Local Poverty: An Empirical Evidence From Indonesia," J Keuang Dan Perbank. 2021;25(2).
[16] Sunaryono S, "KONTRIBUSI DAN PELUANG FINTECH LENDING SYARIAH DI INDONESIA," J Ekon STIEP. 2022;7(2):83–96.
[17] Sunaryono, "PERAN DIGITAL MARKETING DALAM PERSPEKTIF EKONOMI ISLAM DI INDONESIA Sunaryono," 2023;8(2):154–61.
[18] Bank Indonesia https://www.bi.go.id/en/statistik/ekonomi-keuangan/sulni/Documents/SULNI-August-2023.pdf. 2023. External Debt Statistics of Indonesia.
[19] www.bps.go.id https://www.bps.go.id/indicator/11/65/1/-seri-2010-pdb-seri-2010.html. 2022. PDB Seri 2010 (Milyar Rupiah), 2022.
[20] Liu N, Wang P, Zhang M, "Singapore's Poverty Reduction Effectiveness Assessment for ASEAN," 2021;
[21] Rinaldo D, Sari PA, Sari WP, Miharja R, "The Development of Good Micro, Small and Medium Enterprises Governance Indicators," Etikonomi. 2023;22(1):93–118.
[22] Mbuyisa B, Leonard A, "The Role of ICT Use in SMEs Towards Poverty Reduction: A Systematic Literature Review," J Int Dev. 2016;29(2):159–97.
[23] Fomum NTA, Opperman P, "Financial Inclusion and Performance of MSMEs in Eswatini," Int J Soc Econ. 2023;50(11):1551–67.
[24] Badoc-Gonzales BP, Mandigma MBS, Tan J, "SME Resilience as a Catalyst for Tourism Destinations: A Literature Review," J Glob Entrep Res. 2022;12(1):23–44.
[25] Austin T, Lisdiana L, Ardiansyah A, "Assistance for Logo Rebranding and Packaging "Dodol Lima Pandawa" to Improve Product Quality," Abdimas J Pengabdi Masy Univ Merdeka Malang. 2023;8(1):165–76.
[26] Reza Juanda N, Mity Risky N, Rico Nur Ilham N, "The Influence of Growth of Micro Small and Medium Enterprises (Umkm) and Unemployment on Growth Indonesian Economy," Int J Econ Bus Account Agric Manag Sharia Adm. 2023;3(1):188–202.
[27] Supandi A, Astuty P, Murti W, "The Effect of MSMEs Growth on the Open Unemployment Rate in West Java Province," 2022;
[28] Fatah MA, Aryani YA, "Big Data Adoption: Does It Have a Big Impact on Crowdfunding Success in SMEs?," Proyecciones. 2023;(17):27.
[29] Satria H, Chartady R, Indra I, "Innovation and Financial Performance: Study of Tourism SMEs," 2023;
[30] Trihudiyatmanto M, "The Implementation of PSBB on the Development of Retail MSMEs With the COVID-19 Pandemic as a Moderating Variable," J Islam Econ Manag Bus. 2020;2(2):91–108.
[31] Fanggidae HC, Sutrisno S, Fanggidae FO, Permana RM, "Effects of Social Capital, Financial Access, Innovation, Socioeconomic Status and Market Competition on the Growth of Small and Medium Enterprises in West Java Province," Es Account Financ. 2023;1(02):104–12.
[32] Sulila, I., & Usman SD, "Factors Determining the Policy Implementation for Micro, Small, and Medium Enterprises (MSMES) Empowerment in Indonesia," 2022;370–9.
[33] Ramadani AT, Eliza Z, "Pengaruh pertumbuhan UMKM, inflasi, dan tingkat pengangguran terhadap pertumbuhan ekonomi di Indonesia," J Investasi Islam. 2020;5(2):153–73.
[34] Sinamo TM, Hanggraeni D, "Demand or supply shock during the COVID-19 crisis: empirical evidence from public firms in Indonesia," J Asia Bus Stud [Internet]. 2022 Jan 1;16(5):747–67. Available from: https://doi.org/10.1108/JABS-01-2021-0030
[35] Santoso B, "The Role of Micro, Small, and Medium Enterprises Toward Sustainable Development Goals Through Islamic Financial Institutions," 2020;
[36] Kurniati E, Pramono SE, Anwar S, "Reaksi Pasar Atas Pengungkapan Kepatuhan Syariah Terhadap Saham Perusahaan Pada Indeks Saham Syariah Indonesia," I-Finance a Res J Islam Financ. 2022;
[37] Yohanitas WA, Ramadhan A, Pribadi MA, Andreany S, "Innovation of Community Assistance Information System (SIBAMAS) as an Economic Stimulus for SMEs Affected by Covid in Tangerang Regency," KnE Soc Sci. 2023;57–79.
[38] Handayati P, Tham YH, Yuningsih Y, Rochayatun S, Meldona, "Audit quality, corporate governance, firm characteristics and CSR disclosures—Evidence from Indonesia," J Corp Account Finance. 2022;33(3):65–78.
[39] Gujarati DN, Porter DC, "Basic econometrics," McGraw-Hill; 2009.
[40] Hair JF, "Multivariate data analysis," 2009;
[41] Hair JF, Gabriel M, Patel V, "AMOS covariance-based structural equation modeling (CB-SEM): Guidelines on its application as a marketing research tool," Brazilian J Mark. 2014;13(2).
[42] Kennedy P, "A guide to econometrics," John Wiley & Sons; 2008.
[43] Wooldridge JM, Wadud M, Lye J, "Introductory econometrics: Asia Pacific edition with online study tools 12 months," Cengage AU; 2016.
[44] Black W, Babin BJ, "Multivariate data analysis: Its approach, evolution, and impact," In The great facilitator: Reflections on the contributions of Joseph F Hair, Jr to marketing and business research. Springer; 2019. p. 121–30.
[45] Jarque CM, Bera AK, "A test for normality of observations and regression residuals," Int Stat Rev Int Stat. 1987;163–72.