International Journal of Entrepreneurship and Management Practices
IJEMP
EISSN : 2600-8750
Volume 9 Issue 35 (September 2026) PP. 1102-1128



INTERNATIONAL JOURNAL OF ENTREPRENEURSHIP AND MANAGEMENT PRACTICES (IJEMP)
www.gaexcellence.com/ijemp

FIRM PERFORMANCE OF MALAYSIAN TELECOMMUNICATION SECTOR IN AI ERA: ALIGNING WITH THE SDGS

Nurin Zahira Mohd Zaid[1], Ani Asmaa Asli[2], Imratul Najwa Abdul Latif[3], Mohd Samsuri Ghazali*[4], Nur Azwani Mohamad Azmin[5], Wan Nursyamimi Wan Mohd Zafry[6], Nurbahyah Suhaimi[7]

[1]Faculty of Business and Management. Universiti Teknologi MARA. Terengganu, Malaysia
2023268848@student.uitm.edu.my https://orcid.org/0009-0001-2069-6944
[2]Faculty of Business and Management. Universiti Teknologi MARA. Terengganu, Malaysia
aniasmaa@uitm.edu.my https://orcid.org/0009-0001-9885-2548
[3]Pusat Asasi, Universiti Teknologi MARA. Dengkil, Malaysia
imranajwa@uitm.edu.my https://orcid.org/0009-0006-4109-7621
*[4]Faculty of Business and Management, Universiti Teknologi MARA, Pahang, Malaysia
mohdsamsuri@uitm.edu.my https://orcid.org/0000-0003-0309-4594
[5]Faculty of Business and Management. Universiti Teknologi MARA. Terengganu, Malaysia
nurazwani@uitm.edu.my https://orcid.org/0000-0002-4467-3501
[6]Faculty of Business and Management. Universiti Teknologi MARA. Terengganu, Malaysia
2023644316@student.uitm.edu.my https://orcid.org/0009-0008-5239-6912
[7]Faculty of Business and Management. Universiti Teknologi MARA. Terengganu, Malaysia
2023820174@student.uitm.edu.my https://orcid.org/0009-0003-2970-1759
*Corresponding Author

Article Info:

Article history:
Received date: 30.07.2026
Revised date: 18.08.2026
Accepted date: 21.09.2026
Published date: 30.09.2026

Abstract:

The study examines the determinants of firm performance of Malaysian telecommunications services companies. Thus, the study aims to examine the impact of four independent variables that include leverage, firm size, firm age and tangibility on firm performance. Other than that, the performance of Malaysian telecommunication companies remains

International Journal of Entrepreneurship and Management Practices
IJEMP
EISSN : 2600-8750
Volume 9 Issue 35 (September 2026) PP. 1102-1128

To cite this document:

Zaid, N. Z. M., Asli, A. A., Latif, I. N. A., Ghazali, M. S., Azmin, N. A. M., Zafry, W. N. W. M., & Suhaimi, N. (2026). Firm Performance of Malaysian Telecommunication Sector in Ai Era: Aligning with The SDGs. *International Journal of Entrepreneurship and Management Practices, 9*(35), 1102-1128.

DOI: 10.35631/IJEMP.935061

inconsistent with the fact that large expenditure on infrastructure and the growing digital demand raise questions about their capability to transform assets into profit. Telecommunication service companies are significant in Malaysia as these companies greatly impact the affected parties in the economy. In this study, the regression model was estimated using pooled ordinary least squares (POLS), random effect model (REM) and Fixed Effects Model (FEM) for the five major telecommunications service companies of the LSEG Data Stream in the years 2015 through 2024 using secondary panel data. The study discovered that leverage is important and shows a positive correlation. Meanwhile, firm size is negatively and significantly related to firm's performance. Then, firm age and tangibility are not correlated with firm performance. This study provides sector-specific data regarding the relationship between firm performance of Malaysian telecommunications services companies.

Keyword:

Firm Age, Firm Performance, Firm Size, Leverage, Return on Assets (ROA), Tangibility, Telecommunications Services Firm

© The authors (2026). This is an Open Access article distributed under the terms of the Creative Commons Attribution (CC BY NC) (http://creativecommons.org/licenses/by-nc/4.0/), which permits non-commercial re-use, distribution, and reproduction in any medium, provided the original work is properly cited. For commercial re-use, please contact ijemp@gaexcllence.com.

Introduction

Firm performance reflects a firm's capacity to achieve efficient use of its resources and provide long-term financial results. In Malaysia, the economy generated RM714.7 billion in revenue in 2026. Meanwhile, telecommunications services expanded by 11.2% every year (DOSM, 2026). The information and communication subsector recorded strong growth of 8.3% showing an increase in digital connectivity and technology-driven business activities in Malaysia. Telecommunication service companies operate in a highly competitive and capital-intensive environment and continue to invest in network infrastructure and digital technology. The issue is whether firms can efficiently transform their assets and financial resources into profitability. In fact, the Malaysian digital economy contributed RM415.3 billion or 23.4% from national economy in 2024 (Seraj & Mohamad Al As, 2026). According to OECD (2023), successful firms contribute to social and economic progress in developed countries. Similarly, Nagara and Arya (2025) stated that firms operating under performance-based conditions had a higher chance of staying competitive in a fast-paced business environment.

Artificial Intelligence (AI) has transformed the operating environment of service and telecommunications firms. AI can support customer services, network optimisation, predictive maintenance and analysis (Kassa & Worku, 2025). In compliance with government directives, Malaysia has also identified AI adoption as an important national development priority in the Thirteenth Malaysia Plan (2026-2030) (Digital News Asia, 2026). Therefore, telecommunications firms need to manage financial resources while investing in advanced technology such as AI may be important in determining their long-term performance. This issue

relates to Sustainable Development Goals (SDGs) including SDG 8 (decent work and economic growth) and SDG 9 (industry, innovation, and infrastructure). The telecommunications services sector contributes to these goals by providing digital infrastructure and supports economic activities. Based on Azimi et al. (2025), SDG 8 is expanded on by the study's analysis of factors which impact firm performance and economic growth. Meanwhile, SDG 9 is reflected by a focus on industrial development, innovation and sustainable business practices. However, firms must make sure that all investments in infrastructure and technological innovation are supported by effective financial management and sustainable business outcomes.

In this study, firm performance is measured using Return on Assets (ROA) which indicates how a company uses all its assets to generate profit. ROA is widely accepted as a comprehensive measure of financial performance as it incorporates managerial efficiency and enables comparison between the study firms and time period. It is commonly regarded as a comprehensive measure of financial performance. According to Tamplin (2023), firms will utilise their asset base to generate profit. In the global context, firm performance is so important in achieving its financial and strategic goals by measuring market shares, sales growth, shareholder value and profitability. As compared with other profitability ratios, ROA gives a full measure that makes it possible to compare firms and time periods. Previous studies have also shown that external factors like the COVID-19 pandemic which had a major impact on firms' operations and profitability on firm performance (Putra, 2024). In the Malaysian context, the services sector, which includes telecommunications, is known as a contributor to the economic growth and national development. As stated by DOSM (2023), over half of Malaysia's GDP, accounting for 59.4%, is derived from the services sector which becomes the major source of employment.

The telecommunications sector is important in supporting digital connectivity, business operations and economic resilience. However, this study focuses on the inconsistency in firm performance among Malaysian telecommunication companies, despite strong demand for digital services and significant investments in network infrastructure. In this study, concerns about businesses' ability to effectively turn assets into earnings have been raised by high capital expenditure, increasing operating costs and financial debt. The issue of firm performance has been an ongoing challenge for Malaysian service firms in the telecommunications sector although the country is experiencing high rates of digital adoption and market demand. According to New Straits Times Press (M) Bhd. (2025), about 49.2% of the population in the country already spends more than five hours daily online, which underscores the status of the demand that is more than digital-based and is driving the revenue in the sector. Financial analyst research also reports that Malaysian telecommunication companies are likely to experience profitability pressure associated with high infrastructure and network upgrade expenditures and lack of growth in average revenue per user (ARPU) coupled with aggressive pricing competition.

The determinants at firm level, including leverage, firm size, firm age and asset tangibility, impact performance results like Return on Assets. When leverage is high it raises the financial risk and when physical assets are heavily invested then profitability can be reduced due to the underutilisation of the assets particularly in service sectors where the amount of digital and intangible assets are on the rise. Nevertheless, scanty empirical research exists on the interaction of these two firm attributes on the return on assets in the Malaysian telecommunications service firms. Thus, the research question asks how leverage, firm size,

International Journal of Entrepreneurship and Management Practices
IJEMP
EISSN : 2600-8750
Volume 9 Issue 35 (September 2026) PP. 1102-1128
firm age and tangibility have a relationship with firm performance within the Malaysian telecommunications industry. This discussion will give us an insight into the financial decision making and resources management techniques that will enable firms to enhance their profitability in a highly competitive and capital-intensive service industry.

Literature Review

Firm Performance as Dependent Variable

Firm performance refers to a company's ability to generate profits and efficiently utilise its available resources. It is usually an indicator o the financial stability and sustainability of a firm. Previous research usually quantifies firm performance in terms of accounting-based measures of Return on Assets (ROA), Return on Equity (ROE) and Return on Sales (ROS) (Shingiro & Awolusi, 2023). The most used of these measures is ROA since it is used in determining the effectiveness of a given firm in utilising its total assets to generate profits. ROA is a valid proxy of firm performance especially when conducting firm-level and industry research. Consequently, this study uses ROA as the dependent variable to determine the performance of firms in the Malaysian telecommunications services industry.

Firm Size as Independent Variable

Firm size is commonly calculated as total assets or revenue. Major companies can be seen as more reliable, which can have a beneficial impact on customer and investor trust (Ozili,2023). In Malaysia, the communication service industry could play a performance-determining role through economies of scale, ease of access to financing as well as more bargaining power with suppliers and regulators (Shahrun et al., 2023). Studies conducted on European service companies have established that larger organisations were more profitable given the efficiencies in their operations and the market influence of their organisation (Kędzior & Kędzior, 2023). Likewise, studies also reported in the emerging Asian economies found that larger firms could better utilise financial resources and technological investments to increase ROA.

However, the relationship is not always positive. Kurniawan et al. (2022), found that smaller service firms in the Czech Republic tended to perform better than bigger ones and benefited from better organisational agility, reduced overheads and responsiveness to market changes. These studies have observed that in industries that are dynamic and heavily reliant on innovations such as digital communications, smaller firms can better adapt to the changes in technology and evolving consumer interests. Moreover, the effect of firm performance might change based on its measurement. As a result, variables like firm age, leverage and tangibility are expected to have an impact on the relationship between firm size and firm performance.
Firm Age as Independent Variable

As stated by Mansikkamäki (2023), firm age is usually considered to represent the number of years since a company began operating, which is one of the factors acting as a determinant of success. In the Malaysian telecommunications services industry, firm age contributes significantly to the performance of the firm. Firm age tends to mean customer trust, organisational growth and general knowledge, all of which could improve performance. Larger companies can benefit from established working processes, organisational development and a strong market reputation. Age of firms has little or contrary influence on performance as in

technologically advanced service industries. According to Bittar and Di (2023), the bigger companies would be less capable of adapting to the fluctuating market conditions due to control mechanisms, bureaucratic inefficiency, and barriers to innovation.

Smaller companies might do better than older ones in Malaysia's quickly changing services industry because of their higher ability to adapt, creative business strategies and stronger use of digital technology. Based on Asimakopoulos et al. (2022), smaller businesses often gain more from foreign expertise and research and development sourcing since their improved flexibility and learning advantage of fresh ideas. But the study had discovered the age-performance relationship of a firm is not consistent in that the relationship is higher in the early years but declines as firm ages. In conclusion, the age of the firm will influence performance depending on the market conditions and the sector where the firm operates.

Leverage as Independent Variable

Leverage refers to the degree of a firm's reliance on debt financing in its capital structure, calculated as the ratio of total debt and total assets (Agyei et al., 2020). The firms' capital structure or financial structure is used to gain the benefit from interest tax shields; larger firms are expected to employ lower levels of leverage due to their less reliance on external sources of finance because they prefer to finance their operations using internal funds before going to debt. The pecking order theory shows an inverse relationship between leverage and firm performance if firms with lower debt levels are more likely to achieve better profitability when other factors are held constant (Agyei et al., 2020). In contrast, trade-off theory argues firms aim to determine an optimal leverage level by weighing the benefits of tax shields against the potential costs of financial distress. Firms can use more debt while smaller and riskier firms use less debt because taking on excessive debt can increase the probability of bankruptcy and reduce profitability while debt financing can enhance firm value from interest tax shields. To conclude, previous studies show mixed findings on the leverage-performance relationship.

Tangibility as Independent Variable

Tangibility means the proportion of a company's assets including assets in physical form that can be seen and touched, such as property, plant, vehicles, equipment, and cash (Yousaf, 2024). Firms with higher asset tangibility are considered favourably when a company can secure external financing because tangible assets reduce information asymmetry as well as agency costs. Yousaf (2024) also highlights a positive relationship between asset tangibility and firm performance where firms with higher levels of tangible assets are better than firms with lower levels at securing external financing at lower cost. Thus, optimal capital structure decisions can improve financial performance as these assets enhance the firm's ability to access capital, invest in growth opportunities and sustain operations during financial difficulties (Agyei et al., 2020). While tangibility is generally associated with improved firm performance due to enhanced access to external financing, its impact is context-dependent where firms must strategically manage tangible assets to maximize performance without compromising flexibility and long-term competitiveness.

International Journal of Entrepreneurship and Management Practices
IJEMP
EISSN : 2600-8750
Volume 9 Issue 35 (September 2026) PP. 1102-1128

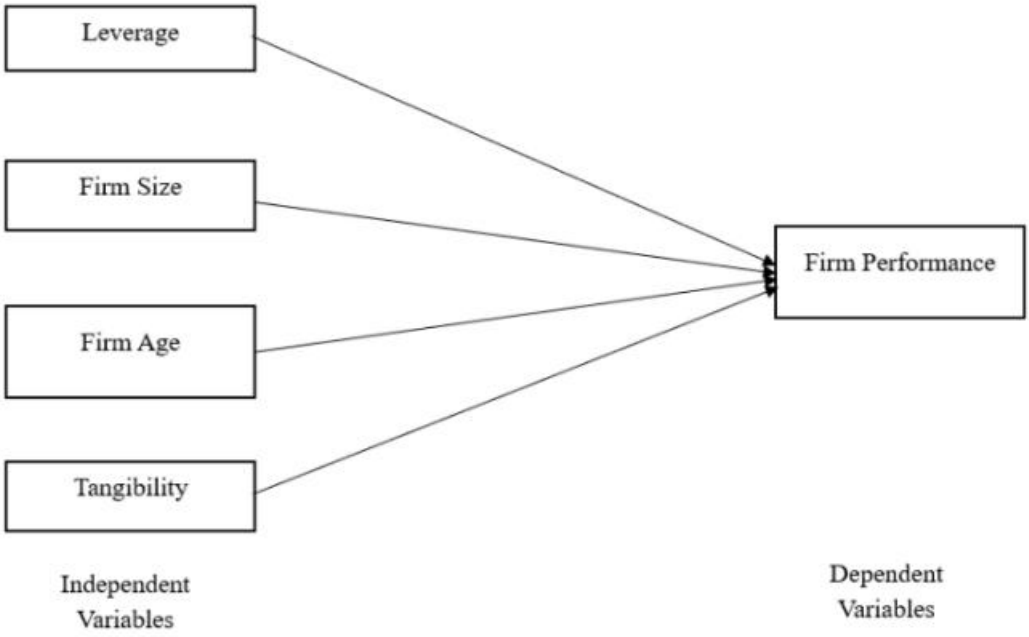


Figure 1: Research Framework

Methodology

This study uses a quantitative research design based on secondary panel data to determine the relationship between leverage, asset tangibility, firm size, firm age and firm performance in Malaysia's telecommunication service sector. The study focuses on five company bases on same industry which are Telekom Malaysia Berhad, Maxis Berhad, TIME dotCom Berhad, Axiata Group Berhad and CelcomDigi Berhad over the period 2015 to 2024. The companies are chosen by considering them utilises publicly accessible financial data from LSEG Workspace and their listing as listed telecommunications related companies on Bursa Malaysia. The study applies an exploratory study which helps in investigating and understanding background of problem which increasing understanding of how leverage, tangibility, firm size and firm age are related to the firm. Panel data provides for comparisons between combinations from cross-sectional and time-series observations.

Data and Source

A panel data approach is used to analyse firm performance over the 10 years from 2015 to 2024 using DataStream, which is suitable for analysing changes in firm performance over time and inter-firm differences using secondary data from publicly available financial information through LSEG. The years from 2015 to 2024 are selected because it provides a reliable 10-year observation period for analysing changes in firm performance and firm-specific across time. The five selected companies like Telekom Malaysia Berhad, Maxis Berhad, TIME dotCom Berhad, Axiata Group Berhad, and CelcomDigi Berhad are chosen since they are publicly listed on Bursa Malaysia Market.The study proposes data and sources from these types of variables as in Figure 2 below:

International Journal of Entrepreneurship and Management Practices
IJEMP
EISSN : 2600-8750
Volume 9 Issue 35 (September 2026) PP. 1102-1128

Types of Variables	Variable	Based On	Measurement	Sources of Data
Dependent	Firm Performance	Return on Asset (ROA)	Percentage (%)	Data Stream
Independent	Leverage	Total Debt / Total Asset	Percentage (%)	Data Stream
Independent	Firm Size	Log (Total assets)	Percentage (%)	Data Stream
Independent	Firm Age	Log (age of firms)	Years	Data Stream
Independent	Tangibility	Net Fixed Assets / Total Assets	Percentage (%)	Data Stream

Figure 2: Data and Sources from these types of variables

Figure 2 above shows dependent variable (DV) and the independent variables (IV) are important in the study of effects with a focus on leverage, firm size, firm age and tangibility that influence firm performance in Malaysia's telecommunications services. Return on Assets (ROA) is usually a measure of firm performance. The first independent variable is leverage measured by the percentage of the amount of financing required by a business contributed by debt which is calculated as the ratio of total debt to total assets. Firm size indicators such as the logarithm of total assets are related to the performance of the firm positively in terms of operational size, market position and resource access. The logarithm of the age of the firm in years (firm age) is a measure of stability in the firm, skills and reputation in the market. For example, older firms may have the advantage of current ties and experience. These companies tend to have a consistent performance output and additional leverage to finance. Finally, all these dependent variables and independent variables are taken from DataStream in LSEG Workspace.

Theoretical Framework

Figure 3 presents the theoretical structure that demonstrates the direct correlation between the dependent variable, Firm Performance (ROA) and four independent variables, including leverage (LEV), firm size (SIZE), firm age (AGE), and Tangibility (TANG). The framework illustrates the relationship between dependent variables and independent variables. The measure is one of the major indicators of operational efficiency and operations in the communication service sector in Malaysia. The theoretical framework is mainly anchored on the Resource-Based View (RBV) which is backed by capital structure theories that include pecking order theory and trade-off theory (Mardani et al., 2023). All these theories indicate that internal financial and structural elements have a direct effect on determining the capability of a firm to attain and maintain high performance. In service-sector settings in which digital transformation is being experienced by emerging economies, recent empirical studies support the applicability of these determinants of transformations.

International Journal of Entrepreneurship and Management Practices
IJEMP
EISSN : 2600-8750
Volume 9 Issue 35 (September 2026) PP. 1102-1128

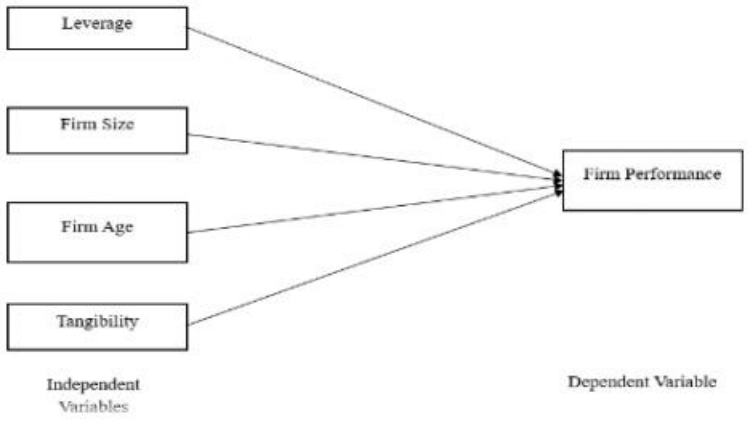


Figure 3: Theoretical Framework – Direct Determinants Of Firm Performance

Type Of Research

This research applies an explanatory research design based on a quantitative approach. The explanatory design suits the study since the study would seek to test and describe the relationships among the firm-specific variables and firm performance. The quantitative approach is used because the study uses numerical financial data gathered through secondary sources and uses statistical analysis methods to compare the relationships between the study's independent and dependent variables (Kotronoulas et al., 2023). . The panel data facilitates observing the changes at the firm and over time, which would give a more holistic picture of the firm performance dynamics in the Malaysian telecommunications services industry (Sithamparam & Thangavel, 2025).

Unit Root

Diagnostic tests in unit root testing determine if variables are stable or include a unit root over time and are essential in panel data analysis to ensure the validity of estimation results (Omay & Ucar, 2023). P-value of the unit root test is below 0.05, and the null hypothesis is rejected. The unit root test of regression data helps eliminate inaccurate regression problems and incorrect coefficient estimates, such as fixed-effects or random-effects models that are used in panel data regression. Based on Jahangir et al. (2025), used panel unit root tests like Levin, Lin & Chu (LLC), Im, Pesaran & Shin (IPS), and Fisher-type ADF or PP tests are commonly used in panel data analysis to study the linear features of macro-financial variables across countries. Data unit root testing in panel data necessitates the consideration of individual heterogeneity that does not exist in cross-sectional analysis does not necessitate unit root testing of data.

Normality Test

A statistical technique called normality testing which helps to choose the right statistical tests while ensuring the validity of the findings (Mohd Ibrahim, 2024) that is used to determine if a given sample of data is taken from a population with a normal distribution. In determining whether it has a normal distribution or not, this type of summary statistic is used in outlining the study variable. Researchers commonly use the Jarque-Bera statistical test to assess normality. This method evaluates whether sample data matches the skewness and kurtosis of a normal distribution. It is particularly effective for large datasets, where evaluating these two

International Journal of Entrepreneurship and Management Practices
IJEMP
EISSN : 2600-8750
Volume 9 Issue 35 (September 2026) PP. 1102-1128

properties serves as a fundamental first step. The alternative hypothesis asserts that the data are not normally distributed. However, the null hypothesis claims that the data are normally distributed. To determine whether the data have a normal distribution or not, the p-value is measured. For instance, if the p-value is less than 0.05, the study must reject the null hypothesis meaning that the data does not have a normal distribution and otherwise if the p-value is greater than 0.05

.

Heteroscedasticity (Wald-Test)

Heteroscedasticity in a panel data analysis is non-constant error variances over time across cross-sectional units. The study may contain errors, resulting in incorrect standard errors and poor estimates. It is a general assumption that, when the data comprise entities of very different sizes, such as varying firm sizes, and when the residuals are increasing or decreasing in their trend of observation and when statistically significant results are obtained and change following the use standard errors, then it is presumed that the heteroscedasticity is in play.The Wald test analyses whether the estimated effects of an independent variable on a dependent variable are significantly different from each other or from a hypothesised result (Sarto et al., 2024). In this study, the Wald test for heterogeneity is applied after estimating the Pooled OLS, Fixed Effects (FEM), or Random Effects (REM) models.

Multicollinearity

Multicollinearity is a regression model where the degree of correlation between two or more independent variables is high. Due to the association of the variables when there is multicollinearity, it is difficult to find out the influence of each independent variable on the dependent variable. The fact that the estimated coefficients are not biased by the issue does not mean that the standard errors are not inflated. As a result, coefficients are statistically insignificant and reduce the validity of hypothesis testing. Multicollinearity can be found using the Variance Inflation Factor (VIF) test. The VIF is a measure that assists in determining the extent to which collinearity explains more variance in an estimated regression coefficient (Huseynli, 2022). A high multicollinearity problem is signalled by a VIF value above 10 and a value approaching 1 above means a weak or no relationship between the independent variables. The findings of the VIF test reveal that the VIF for all independent variables is less than 10. Leverage (LEV), firm size (SIZE), firm age (AGE), and tangibility (TANG) are able to record VIFs that are near to 1. This implies that there are no independent variables that are strongly correlated. Thus, it can be assumed that there is no issue of multicollinearity in the present study, and all the independent variables could be included in the regression model to be further analysed with the panel data

Type Of Analysis

Pooled Ordinary Least Squares (POLS)

Pooled Ordinary Least Squares (POLS) integrates cross-sectional and time-series data and assumes that all observations should be considered as one large dataset without taking effects specific to everyone. There are no special features between entities, which would contaminate the estimates. In POLS, the model approximates the average relationship between the dependent and independent variables across all units and time periods. In terms of the study of firm performance, POLS is frequently taken as a point of departure to estimate a relationship,

International Journal of Entrepreneurship and Management Practices
IJEMP
EISSN : 2600-8750
Volume 9 Issue 35 (September 2026) PP. 1102-1128

like that between the study's Return on Assets and leverage, firm size, tangibility orfirm age (Mwenda et al., 2023). The only drawback though is that it can also give biased estimates when the unobserved firm-specific effects correlate with the explanatory variables. Further and more advanced techniques such as Fixed Effects and Random Effects are desirable in a case where there are such effects.

Random Effect Model (REM)

According to McKenzie & Areti Angeliki Veroniki (2024), the random effects model is one of the methods used to analyse panel data where it involves several entities such as businesses observed over time. This method is focused on the concept that every entity has specific characteristics which include cultural, environmental or structural elements that could affect the result under investigation. These random effects model is beneficial because it accounts for these unknown individual-specific effects without requiring a different variable for each entity, which would otherwise complicate the study. However, it must be assumed that these individual-specific traits are uncorrelated with the model's independent variables for the random effects model to be viable. The outcomes could be biased or inaccurate if this assumption is violated. Thus, it is so important to check whether it is appropriate or not and not fully depend on the findings of the random effects technique.

Fixed Effect Model (FEM)

The fixed effect model (FEM) applied in determining the adjustment of all correlations between the study variables that lead to results and other unknown and time constant variables of every cross-sectional unit. Based on Ji et al. (2022), Fixed Effects Model improves the common panel data analysis that presents independent and dependent variables as intervals rather than values. For example, firms, nation and others. The main objective of FEM is to emphasize internal variance over time. Usually, FEM is preferred when the focus is on examining changes within entities over time; unknown individual effects are thought to be connected with regression coefficients, and Hausman test rejects the Random Effects Model which shows that FEM is more consistent.

Descriptive Analysis

Table 1: Descriptive Analysis Table

	ROA	LEV	SIZE	AGE	TANG
Mean	0.079680	0.335648	0.097372	3.166400	0.647900
Median	0.060500	0.376250	0.100100	3.330000	0.654000
Maximum	0.384000	0.666000	0.113100	3.690000	0.837400
Minimum	-0.074000	0.014400	0.078700	1.950000	0.411200
Std. Dev	0.085611	0.165442	0.010541	0.472275	0.110891
Skewness	1.578877	-0.533268	-0.256587	-1.274319	-0.524950
Kurtosis	5.962937	2.758184	1.903583	3.564040	2.890488
Jarque-Bera	39.06333	2.491612	3.053080	14.19519	2.321420
Probability	0.000000	0.287709	0.217286	0.000827	0.313264
Sum	3.984000	16.78240	4.868600	158.3200	32.39500
Sum Sq. Dev	0.359125	1.341188	0.005444	10.92915	0.602545
Observations	50	50	50	50	50

International Journal of Entrepreneurship and Management Practices
IJEMP
EISSN : 2600-8750
Volume 9 Issue 35 (September 2026) PP. 1102-1128

Table 1 above presents the summary statistics and normality.This test includes 50 observations of ROA, LEV, SIZE, AGE and TANG. The results above prove that the null hypothesis is rejected because the probability values of ROA and AGE are respectively 0.0000 and 0.000827 which are below the 5% significance level that the variables are not normally distributed. However, LEV, SIZE and TANG probabilities are greater than 0.05 and are 0.2877, 0.2173 and 0.3133 respectively. However, the extremely high skewness and kurtosis values of ROA and AGE demonstrated asymmetry instead from normal distribution provide additional proof of their non-normality. To conclude, these regression results demonstrate that some variables are normally distributed while others are not normally distributed is a common issue in financial panels where the given adequate sample size and panel estimation procedures do not provide a significant problem for regression analysis.

Root-test

Table 2: Root-test Table

	LLC		IPS		ADF		PP	
	Level	**1st diff**	**Level**	**1st diff**	**Level**	**1st diff**	**Level**	**1st diff**
ROA	-3.4231*** (0.0003)	-7.5358 (0.0000)	-1.4635 (0.0717)	-3.2523 (0.0006)	20.6889 (0.0234)	31.0262 (0.0006)	31.2442 (0.0005)	39.0063 (0.0000)
LEV	-4.9890 (0.0000)	-9.0961 (0.0000)	-1.1890 (0.1170)	-3.7231 (0.0001)	18.9286 (0.0412)	35.0108 (0.0001)	13.6554 (0.1893)	30.3984 (0.0007)
SIZE	0.6065 (0.7279)	-3.6747 (0.0001)	1.9999 (0.9772)	-2.1297 (0.0166)	1.8606 (0.9973)	23.7638(0.0083)	7.1513 (0.7111)	50.5453 (0.0000)
AGE	-12.9414 0.0000	1.8593 (0.9685)	-3.2957 (0.0005)	0.3055 (0.6200)	29.5818 (0.0010)	7.5640 (0.6713)	54.5079 (0.0000)	33.004 (0.0003)
TANG	-2.3696 (0.0089)	-5.1898 (0.0000)	-0.2083 (0.4175)	-1.4405 (0.0749)	12.3953 (0.2595)	18.3500 (0.0493)	6.20889 (0.7974)	22.5022 (0.0127)

Panel unit root tests establish the stationarity of the variables to avoid inaccurate regression results. From the regression result above, the null hypothesis (H0) states that the variables contain a unit root and are non-stationary. However, the alternative hypothesis (H1) states opposite where the variables are stationary which tests at level show mixed significance across LLC, IPS, ADF and PP. This is because stationarity cannot be clearly confirmed at level but both the LLC and PP tests are statistically significant with probability values below the 5% (0.05) significance level at the first difference (Laurent and Shi, 2021). Hence, the null hypothesis is rejected at first difference where it explains that the variables become stationary after differencing once. Thus, the significance of LLC and PP first-difference outcomes are highlighted because they provide more reliable and consistent evidence despite the inconsistent results of IPS and ADF where the variables are constant at first difference but non-stationary at level is determined suggesting that they are integrated of order one or I(1).

International Journal of Entrepreneurship and Management Practices
IJEMP
EISSN : 2600-8750
Volume 9 Issue 35 (September 2026) PP. 1102-1128

ROA

Panel unit root test: Summary
Series: ROA
Date: 12/25/25 Time: 23:30
Sample: 2015 2024
Exogenous variables: Individual effects
User-specified lags: 1
Newey-West automatic bandwidth selection and Bartlett kernel
Balanced observations for each test

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	-3.42305	0.0003	5	40
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	-1.46353	0.0717	5	40
ADF - Fisher Chi-square	20.6889	0.0234	5	40
PP - Fisher Chi-square	31.2442	0.0005	5	45

** Probabilities for Fisher tests are computed using an asymptotic Chi -square distribution. All other tests assume asymptotic normality.

Figure 2: Root Test ROA

Panel unit root test: Summary
Series: D(ROA)
Date: 12/25/25 Time: 23:32
Sample: 2015 2024
Exogenous variables: Individual effects
User-specified lags: 1
Newey-West automatic bandwidth selection and Bartlett kernel
Balanced observations for each test

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	-7.53580	0.0000	5	35
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	-3.25233	0.0006	5	35
ADF - Fisher Chi-square	31.0262	0.0006	5	35
PP - Fisher Chi-square	39.0063	0.0000	5	40

** Probabilities for Fisher tests are computed using an asymptotic Chi -square distribution. All other tests assume asymptotic normality.

Figure 3: 1st Differences ROA

According to Budiono and Purba (2022), the research unit root test is used to measure whether a time series variable is non-stationary or stationary for ROA as dependent. According to the result above, we must reject the null hypothesis as the ROA is stationary at level where the null hypothesis (H0) explains that the data contain a unit root are considered as non-stationary while the alternative hypothesis (H1) explains that the data do not contain a unit root and are considered as stationary. Thus, the results above explains that the Levin, Lin and Chu (LLC) test shows a probability value of 0.0000 while the individual unit root tests such as the Im, Pesaran and ShinW-stat, ADF - Fisher Chi-square and PP - Fisher Chi-square tests report probability values of 0.0006 for both Im and ADF-Fisher Chi-Square and 0.0000 for Fisher Chi-Square and all are less than the 5% or 0.005 significance level. However, the test is carried out at first differences to further confirm the results' robustness where all test statistics show probability values of 0.0000 at first differences and once again, the result shows below the 5% significance level. Hence, the null hypothesis is rejected as the ROA series is stationary and

International Journal of Entrepreneurship and Management Practices
IJEMP
EISSN : 2600-8750
Volume 9 Issue 35 (September 2026) PP. 1102-1128

lacks a unit root. Thus, the results are unlikely to be inaccurate meaning that the ROA data are stable over time and appropriate for regression analysis.

Leverage

Panel unit root test: Summary
Series: LEV
Date: 12/29/25 Time: 11:22
Sample: 2015 2024
Exogenous variables: Individual effects
User-specified lags: 1
Newey-West automatic bandwidth selection and Bartlett kernel
Balanced observations for each test

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	-4.98998	0.0000	5	40
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	-1.18995	0.1170	5	40
ADF - Fisher Chi-square	18.9286	0.0412	5	40
PP - Fisher Chi-square	13.6554	0.1893	5	45

** Probabilities for Fisher tests are computed using an asymptotic Chi -square distribution. All other tests assume asymptotic normality.

Figure 4: Root Test Leverage

Panel unit root test: Summary
Series: D(LEV)
Date: 12/29/25 Time: 11:23
Sample: 2015 2024
Exogenous variables: Individual effects
User-specified lags: 1
Newey-West automatic bandwidth selection and Bartlett kernel
Balanced observations for each test

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	-9.09614	0.0000	5	35
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	-3.72313	0.0001	5	35
ADF - Fisher Chi-square	35.0108	0.0001	5	35
PP - Fisher Chi-square	30.3984	0.0007	5	40

** Probabilities for Fisher tests are computed using an asymptotic Chi -square distribution. All other tests assume asymptotic normality.

Figure 5: 1st differences Leverage

Leverage is non-stationary at first level but becomes stationary after first differencing based on unit root test. The Levin, Lin & Chu (LLC) test is significant probability of 0.0000. However, the Im, Pesaran and Shin W-stat test is 0.1170 and PP-Fisher Chi-Square is 0.1893 is failing to reject the null of a unit root. Meanwhile, ADF-Fisher is only marginally significant at 0.0412. Since most of the individual unit root tests show non-stationarity, leverage is considered non-stationary at first level. All tests like LLC, IPS, ADF-Fisher and PP-Fisher are significant because p-value below 0.05 highlighting that first differencing which reject the null hypothesis of a unit root.

International Journal of Entrepreneurship and Management Practices
IJEMP
EISSN : 2600-8750
Volume 9 Issue 35 (September 2026) PP. 1102-1128

Firm Size

Panel unit root test: Summary
Series: SIZE
Date: 12/29/25 Time: 11:59
Sample: 2015 2024
Exogenous variables: Individual effects
User-specified lags: 1
Newey-West automatic bandwidth selection and Bartlett kernel
Balanced observations for each test

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	0.60653	0.7279	5	40
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	1.99988	0.9772	5	40
ADF - Fisher Chi-square	1.86059	0.9973	5	40
PP - Fisher Chi-square	7.15133	0.7111	5	45

** Probabilities for Fisher tests are computed using an asymptotic Chi -square distribution. All other tests assume asymptotic normality.

Figure 6: Root Test Firm Size

Panel unit root test: Summary
Series: D(SIZE)
Date: 12/29/25 Time: 12:00
Sample: 2015 2024
Exogenous variables: Individual effects
User-specified lags: 1
Newey-West automatic bandwidth selection and Bartlett kernel
Balanced observations for each test

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	-3.67466	0.0001	5	35
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	-2.12972	0.0166	5	35
ADF - Fisher Chi-square	23.7638	0.0083	5	35
PP - Fisher Chi-square	50.5453	0.0000	5	40

** Probabilities for Fisher tests are computed using an asymptotic Chi -square distribution. All other tests assume asymptotic normality.

Figure 7: 1st differences Firm Size

The study shows that firm size is non-stationary at its first level but becomes stationary after the first difference. All four test like Levin, Lin & Chu, Im, Pesaran and Shin, ADF-Fisher and PP-Fisher give p-values greater than 0.05. The null hypothesis may be rejected because the first differences for firm size are below 0.05. For instance, Im, Pesaran and Shin, ADF-Fisher and PP-Fisher give p-values all of this their probability is below 0.05 and significant.

International Journal of Entrepreneurship and Management Practices
IJEMP
EISSN : 2600-8750
Volume 9 Issue 35 (September 2026) PP. 1102-1128

Firm Age

Panel unit root test: Summary
Series: SIZE
Date: 12/29/25 Time: 11:59
Sample: 2015 2024
Exogenous variables: Individual effects
User-specified lags: 1
Newey-West automatic bandwidth selection and Bartlett kernel
Balanced observations for each test

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	0.60653	0.7279	5	40
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	1.99988	0.9772	5	40
ADF - Fisher Chi-square	1.86059	0.9973	5	40
PP - Fisher Chi-square	7.15133	0.7111	5	45

** Probabilities for Fisher tests are computed using an asymptotic Chi -square distribution. All other tests assume asymptotic normality.

Figure 8: Root Test Firm Age

Panel unit root test: Summary
Series: D(SIZE)
Date: 12/29/25 Time: 12:00
Sample: 2015 2024
Exogenous variables: Individual effects
User-specified lags: 1
Newey-West automatic bandwidth selection and Bartlett kernel
Balanced observations for each test

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	-3.67466	0.0001	5	35
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	-2.12972	0.0166	5	35
ADF - Fisher Chi-square	23.7638	0.0083	5	35
PP - Fisher Chi-square	50.5453	0.0000	5	40

** Probabilities for Fisher tests are computed using an asymptotic Chi -square distribution. All other tests assume asymptotic normality.

Figure 9: 1st differences Firm Age

The results indicate that the firm age variable is stationary at the first level. P-values are shown by the Levin, Lin & Chu (LLC), Im, Pesaran and Shin (IPS), ADF-Fisher and PP-Fisher tests. the majority of tests like LLC, IPS and ADF-Fisher fail to reject the null hypothesis when AGE is first differenced firm age is non-stationary except for the PP-Fisher test, which demonstrates significance, the test of LLC, IPS and ADF-Fisher fail to reject the null hypothesis. Overall, firm age in the panel regression is not significant in the analysis because it is already stationary at the first level and it does not require first difference.

TANGIBILITY

International Journal of Entrepreneurship and Management Practices
IJEMP
EISSN : 2600-8750
Volume 9 Issue 35 (September 2026) PP. 1102-1128

Panel unit root test: Summary
Series: TANG
Date: 12/29/25 Time: 12:01
Sample: 2015 2024
Exogenous variables: Individual effects
User-specified lags: 1
Newey-West automatic bandwidth selection and Bartlett kernel
Balanced observations for each test

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	-2.36955	0.0089	5	40
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	-0.20830	0.4175	5	40
ADF - Fisher Chi-square	12.3953	0.2595	5	40
PP - Fisher Chi-square	6.20887	0.7974	5	45

** Probabilities for Fisher tests are computed using an asymptotic Chi -square distribution. All other tests assume asymptotic normality.

Figure 10: Root Test Tangibility

Panel unit root test: Summary
Series: D(TANG)
Date: 12/29/25 Time: 12:02
Sample: 2015 2024
Exogenous variables: Individual effects
User-specified lags: 1
Newey-West automatic bandwidth selection and Bartlett kernel
Balanced observations for each test

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	-5.18984	0.0000	5	35
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	-1.44049	0.0749	5	35
ADF - Fisher Chi-square	18.3500	0.0493	5	35
PP - Fisher Chi-square	22.5022	0.0127	5	40

** Probabilities for Fisher tests are computed using an asymptotic Chi -square distribution. All other tests assume asymptotic normality.

Figure 11: 1st differences Tangibility

Panel unit root test for tangibility to determine whether it is non-stationary or stationary (Fowler et al., 2024). The analysis above is conducted at two levels which are level form and first difference where the Levin, Lin & Chu (LLC) test shows a probability value of 0.0089 at the level form which is below 0.05 hence the null hypothesis is rejected. While both ADF–Fisher has a p-value of 0.2595 and PP–Fisher of 0.7974. The probability values are greater than 0.05 meaning that we fail to reject the null hypothesis because tangibility is not consistently stationary at level. However, only one out of three tests indicate stationarity. Next, at the first differences, LLC, ADF and PP tests show probability values below 0.05 which are 0.0000, 0.0493 and 0.0127. This regression result shows that tangibility becomes stationary after first differencing and provides solid proof to reject the null hypothesis across all tests. Therefore, it could be stated that tangibility is integrated of order one I(1), meaning that it is stationary at first difference but non-stationary at level. In short, tangibility is only suitable for regression analysis following first differences and its use in level form may produce inaccurate regression findings.

International Journal of Entrepreneurship and Management Practices
IJEMP
EISSN : 2600-8750
Volume 9 Issue 35 (September 2026) PP. 1102-1128

Variance Inflation factor (VIF)

Variance Inflation Factors
Date: 12/25/25 Time: 16:35
Sample: 2015 2024
Included observations: 50

Variable	Coefficient Variance	Uncentered VIF	Centered VIF
C	0.012806	212.9830	NA
LEV	0.003313	7.685543	1.477991
SIZE	0.787978	125.6808	1.426977
AGE	0.000296	50.39603	1.075263
TANG	0.005622	40.37666	1.126786

Figure 12: Variance Inflation Figure (VIF)

The Variance Inflation Factor (VIF) analysis is applied to find out whether multicollinearity happens among the independent variables in the regression model (Ahmad et al., 2021). Multicollinearity may arise when there are high correlations among the independent variables and may cause standard errors to increase and sometimes the coefficient estimates may not be accurate. The VIF results show that all values are below 10. In general, LEV had a centred VIF of 1.48, SIZE of 1.43, AGE of 1.08 and TANG of 1.13. The fact that these numbers are close to 1 suggests that there is a correlation between the variables. This can be proof that there is no multicollinearity problem since the independent variables do not strongly correlate with each other.

Heterogeneity – Wald Test

Wald Test:
Equation: POLS

Test Statistic	Value	df	Probability
F-statistic	36.00912	(5, 45)	0.0000
Chi-square	180.0456	5	0.0000

Figure 13: Wald Test

H0: The independent variables do not affect the dependent variable
H1: At least one independent variable affects the dependent variable.

Null Hypothesis: C(1)=0,C(2)=0,C(3)=0,C(4)=0,C(5)=0
Null Hypothesis Summary:

Normalized Restriction (= 0)	Value	Std. Err.
C(1)	0.682966	0.113164
C(2)	0.257844	0.057559
C(3)	-7.520246	0.887681
C(4)	0.011914	0.017198
C(5)	0.007264	0.074980

Restrictions are linear in coefficients.

Figure 14: Null Hypothesis summary

International Journal of Entrepreneurship and Management Practices
IJEMP
EISSN : 2600-8750
Volume 9 Issue 35 (September 2026) PP. 1102-1128

Wald test is used to determine the presence of heterogeneity which statistically means the populations and samples or even the results are not standardized with each other or simply means the unit of analysis has its own specific effects or characteristics. The null hypothesis (HO) had no heterogeneity or individual-specific effects in the model and that the data are homogeneous while the alternative hypothesis (H1) states that at least one of the coefficients not equal to zero. So, the null hypothesis is rejected as the results clearly show a test statistic namely an F-statistic of 36.00912 and a Chi-square statistic of 180.0456 with probability values of 0.0000. The significance level is below 5% and it indicates that there is heterogeneity exists in the model the pooled OLS model may not be appropriate. Instead, a panel data model like Fixed Effects or Random Effects should be considered.

Jarque-Bera Prob

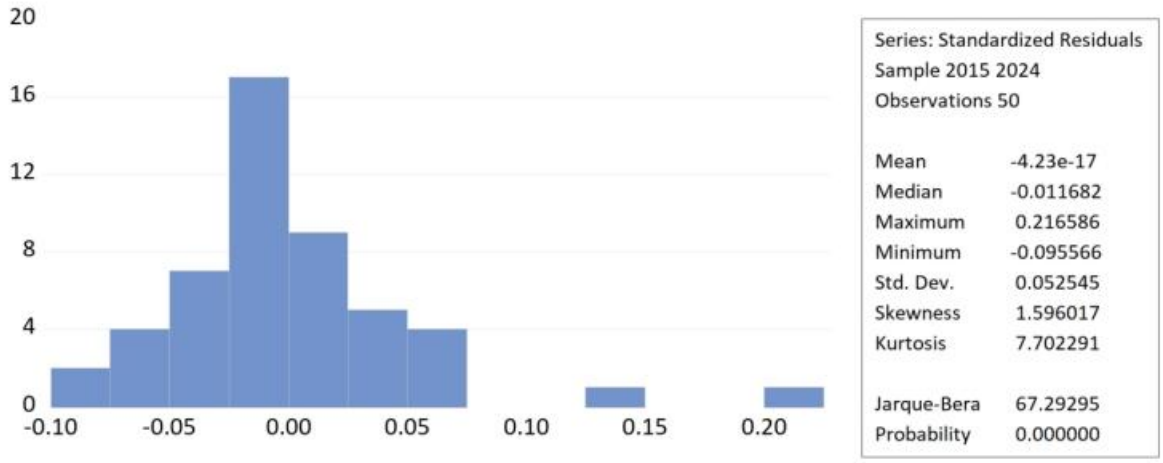


Figure 15: Jarque-Bera graph

According to Glinskiy et al. (2024), the Jarque-Bera test examines whether the residuals are normally distributed or not. The null hypothesis (H0) states that the residuals are normally distributed. The graph above has shifted to the right. However, the alternative hypothesis (H1) states the opposite when the residuals are not normally distributed. The Jarque-Bera statistic shows result of 67.29295 with a probability value of 0.0000 meaning that the probability is less than the 5% or 0.05 significance level. Hence, the null hypothesis is rejected because the residuals are not normally distributed and this is a very common issue in panel data studies. However, it is not significantly affecting the dependency of the estimation especially when using a large sample size. Thus, the skewness value of 1.596017 explains an asymmetry in the distribution as well as the kurtosis value of 7.702291 that explains the heavy tails of a distribution. Even though the residuals are not normally distributed since it is very common in panel data studies where they do not affect the reliability and consistency of the regression assumptions especially when a large sample size is used.

International Journal of Entrepreneurship and Management Practices
IJEMP
EISSN : 2600-8750
Volume 9 Issue 35 (September 2026) PP. 1102-1128

Estimation Equation

Pooled Ordinary Least Squares (POLS)

Dependent Variable: ROA
Method: Panel Least Squares
Date: 12/25/25 Time: 14:45
Sample: 2015 2024
Periods included: 10
Cross-sections included: 5
Total panel (balanced) observations: 50

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.682966	0.113164	6.035185	0.0000
LEV	0.257844	0.057559	4.479662	0.0001
SIZE	-7.520246	0.887681	-8.471788	0.0000
AGE	0.011914	0.017198	0.692734	0.4920
TANG	0.007264	0.074980	0.096880	0.9233

R-squared	0.623288	Mean dependent var	0.079680
Adjusted R-squared	0.589803	S.D. dependent var	0.085610
S.E. of regression	0.054830	Akaike info criterion	-2.874506
Sum squared resid	0.135287	Schwarz criterion	-2.683304
Log likelihood	76.86265	Hannan-Quinn criter.	-2.801695
F-statistic	18.61368	Durbin-Watson stat	0.612922
Prob(F-statistic)	0.000000		

Figure 16: Estimation POLS

Equation model: $ROA_{it} = \alpha + \beta_1 LEV_{it} + \beta_2 SIZE_{it} + \beta_3 AGE_{it} + \beta_4 TANG_{it} + \varepsilon_{it}$

- i = firm
- t = time (annual)
- α = constant term
- ROA = Return on Assets (dependent variable)
- LEV = Leverage
- SIZE = Firm Size
- Age = Firm Age
- Tang = Tangibility
- ε = error term

The regression of Equation can be written as:

Equation model: $ROA_{it} = 0.6830 + 0.2578 LEV_{it} - 7.5202 SIZE_{it} + 0.0119 AGE_{it} + 0.0073 TANG_{it} + \varepsilon_{it}$

Pooled Ordinary Least Squares (POLS) models are analysed to examine the relationship between leverage (LEV), firm size (SIZE), firm age (AGE), tangibility (TANG), and firm performance measured by return on asset (ROA). According to the findings of the Pooled Ordinary Least Squares (POLS) estimation, leverage and size of a firm are statistically significant at the 1 percent level of significance (Fachriyyah et al., 2025). Meanwhile, firm age and tangibility are not significant. The whole model is statistically significant with an F-statistic

of 18.61368 and a probability value of 0.0000. As a result, the POLS model shows that firm size and leverage are significant factors influencing firm performance in telecommunications services firms in Malaysia.

Durbin-Watson

In regression analysis, the Durbin–Watson test is a common diagnostic method to find residual autocorrelation happens when error terms are correlated rather than independent over observations (Kumar, 2023). The Durbin-Watson statistic (d = 0.6129) in this panel data is below the upper bound (dU = 1.537) and the lower bound critical value (dL = 1.206). The result clearly shows that there is positive autocorrelation in the residuals since the test statistic is below the lower bound, rejecting the null hypothesis that there is no autocorrelation. This result is less than 2 because it is between the lower bound and upper bound. There's positive autocorrelation because the errors tend to move in the same direction over time or across units. This problem is most common in panel data analysis, when observations are obtained over time and among individuals increasing correlation in residuals. we always take corrective steps for panel models when positive autocorrelation is found to maintain the validity and reliability of the results.

Hausman Test

The Hausman Test and Redundant Fixed Effects Test are use systematically to selection the panel data model. The Hauman Test is used to decide if FEM or REM is more appropriate and Redundant Fixed Effects Test us used to compare FEM with POLS.

International Journal of Entrepreneurship and Management Practices
IJEMP
EISSN : 2600-8750
Volume 9 Issue 35 (September 2026) PP. 1102-1128

Random Effect Model (REM)

Dependent Variable: ROA
Method: Panel EGLS (Cross-section random effects)
Date: 12/25/25 Time: 16:25
Sample: 2015 2024
Periods included: 10
Cross-sections included: 5
Total panel (balanced) observations: 50
Swamy and Arora estimator of component variances

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.682966	0.052577	12.98977	0.0000
LEV	0.257844	0.026742	9.641751	0.0000
SIZE	-7.520246	0.412426	-18.23416	0.0000
AGE	0.011914	0.007991	1.490997	0.1429
TANG	0.007264	0.034837	0.208519	0.8358

Effects Specification	S.D.	Rho
Cross-section random	3.54E-08	0.0000
Idiosyncratic random	0.025475	1.0000

Weighted Statistics			
R-squared	0.623288	Mean dependent var	0.079680
Adjusted R-squared	0.589803	S.D. dependent var	0.085610
S.E. of regression	0.054830	Sum squared resid	0.135287
F-statistic	18.61368	Durbin-Watson stat	0.612922
Prob(F-statistic)	0.000000		

Unweighted Statistics			
R-squared	0.623288	Mean dependent var	0.079680
Sum squared resid	0.135287	Durbin-Watson stat	0.612922

Figure 17:REM

Correlated Random Effects - Hausman Test
Equation: REM2
Test cross-section random effects

Test Summary	Chi-Sq. Statistic	Chi-Sq. d.f.	Prob.
Cross-section random	167.465362	4	0.0000

Figure 18: Correlated REM

Based on random effect model (REM) above, leverage (LEV) and firm size (SIZE) are significant factors of return on assets (ROA). At the 1% significance level, LEV and SIZE are positively correlated with ROA but SIZE is not correlated with ROA. However, ROA is not significantly affected by Firm Age (AGE) or Tangibility (TANG) because their p-values are greater than 0.05. Overall, this model is significant F-statistic and R-squared value of 0.623. The probability results for the Random Effect Model are 0.0000. The study should reject the null hypothesis in which the Random Effect Model is not to determinants of firm performance in the Malaysian services sector.

International Journal of Entrepreneurship and Management Practices
IJEMP
EISSN : 2600-8750
Volume 9 Issue 35 (September 2026) PP. 1102-1128

Fixed Effect Model (FEM)

Dependent Variable: ROA
Method: Panel Least Squares
Date: 12/25/25 Time: 23:14
Sample: 2015 2024
Periods included: 10
Cross-sections included: 5
Total panel (balanced) observations: 50

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	1.393035	0.156558	8.897879	0.0000
LEV	-0.315190	0.060841	-5.180550	0.0000
SIZE	-13.32098	1.078137	-12.35555	0.0000
AGE	0.011191	0.033580	0.333258	0.7406
TANG	0.083490	0.051894	1.608842	0.1153

Effects Specification

Cross-section fixed (dummy variables)

R-squared	0.925910	Mean dependent var	0.079680
Adjusted R-squared	0.911454	S.D. dependent var	0.085610
S.E. of regression	0.025475	Akaike info criterion	-4.340707
Sum squared resid	0.026608	Schwarz criterion	-3.996543
Log likelihood	117.5177	Hannan-Quinn criter.	-4.209647
F-statistic	64.04770	Durbin-Watson stat	1.804308
Prob(F-statistic)	0.000000		

Figure 19: FEM

Model Selection Test

Redundant Fixed Effect

Redundant Fixed Effects Tests
Equation: FEM
Test cross-section fixed effects

Effects Test	Statistic	d.f.	Prob.
Cross-section F	41.866340	(4,41)	0.0000
Cross-section Chi-square	81.310041	4	0.0000

Figure 20: Redundant FEM

The Fixed Effects Model results show that Leverage (LEV) and firm size (SIZE) are statistically significant factors of return on assets (ROA). Meanwhile, Firm Age (AGE) and Tangibility (TANG) are not significant with ROA because it below 0.05. Especially, leverage has a coefficient of -0.31519. The fixed effects panel regression model results had great overall fit due to their negative t-statistics, suggesting that the selected firm-level factors together well determine ROA over time with an R-squared of 0.926 and a very significant F-statistic. Higher debt levels and larger firm size may lower profitability since they exert significant negative effects on ROA as shown by leverage (LEV) and firm size (SIZE) because the negative t-statistics. Overall, the probability results of the Redundant Fixed Effect-Likelihood Ratio show

the F-probability is below 0.05 since we got 0.000. Hence, it means that we reject the null hypothesis that the Fixed Effect Model is appropriate rather than model POLS for the determinants of firm performance in the Malaysian services sector.

International Journal of Entrepreneurship and Management Practices
IJEMP
EISSN : 2600-8750
Volume 9 Issue 35 (September 2026) PP. 1102-1128

Hausman Test (Choose between REM or FEM)

Correlated Random Effects - Hausman Test
Equation: REM
Test cross-section random effects

Test Summary	Chi-Sq. Statistic	Chi-Sq. d.f.	Prob.
Cross-section random	167.465362	4	0.0000

Figure 21: Correlated Random Effects

H0: REM is appropriate
H1: FEM is appropriate

Hausman Test is used to decide whether REM or FEM is suitable in this test (Ratnasari et al., 2023). The test shows a probability value results 0.00000 and Chi-Square value of 167.465362. The probability is below the significance level 5%. After looking at the Hausman test, we rejected REM and accepted FEM because FEM is appropriate to explain the firm performance in the Malaysian services sector. In conclusion, the FEM is the best and most valid model after evaluating various estimation models.

Summary Of The Result

Table 3: Summary Results Table

Dependent Variable: Return on Asset (ROA)			
Independent variables:	**POLS**	**FEM**	**REM**
Leverage (LEV)	0.2578	-0.3152	0.2578
Firm Size (SIZE)	-7.5202	-13.3210	-7.5202
Firm Age (AGE)	0.0119	0.0112	0.0119
Tangibility (TANG)	0.0073	0.0835	0.0073
Adjusted R-Squared	0.5898	0.91145	0.5898
F-Statistics	18.6137	64.0477	18.6137
Redundant Fixed-Effect Likelihood	0.0000		
Hausman Test		0.0000	

This study compares the Pooled Ordinary Least Squares (POLS) and fixed effect model (FEM) and random effect model (REM). The results indicate that leverage and firm size have a consistent effect on firm performance in all the estimation methods, though the direction and the strength vary. In the POLS and the REM model, leverage is positively related to ROA, and firm size is negatively related to ROA and larger firms are less likely to be profitable. It has been established that firm age and tangibility are statistically non-significant in most of the models supporting the evidence that these two factors are not significant in the determination of firm performance in the Malaysian services industry (Yadav et al., 2021). A high adjusted R-squared value is observed with the Fixed Effects Model, which implies greater explanatory

International Journal of Entrepreneurship and Management Practices
EISSN : 2600-8750
Volume 9 Issue 35 (September 2026) PP. 1102-1128

power when the firm-specific heterogeneity is taken into consideration. Test of model selection, such as Redundant Fixed Effect Likelihood Test and Hausman Test, are used to prove that the Fixed Effects Model is an appropriate model to use in this study. In general, the findings indicate that capital structure and firm size are influential factors that determine the performance of firms.

Determine best model (POLS, REM or FEM)

The Redundant Fixed Effect test reports a p-value less than 0.05 significance level. However, the study preferred FEM over POLS confirming that FEM is preferred over POLS. The Hausman Test also indicates that the p-value is lower than the value of 0.05, which indicates that REM is rejected and FEM is preferred over REM. Based on both tests, this study selected the Fixed Effects Model is selected as the final data model.

Table 4: Best Model Table

Test Applied	Null Hypothesis	p-value	Decision	Conclusion
Redundant Fixed Effect Likelihood Test	FEM is not required	<0.05	Fail to reject H0	FEM preferred over POLS
Hausman Test	REM is appropriate	< 0.05	Reject H0	FEM preferred over REM
Final Model Selection	—	—	—	FEM is the best model

Conclusion

This study examined firm performance among five Malaysian telecommunications service companies listed on Bursa Malaysia between 2015 to 2024. This study determind the relationships between leverage, firm size, firm age and tangibility on firm performance measured by Return on Assets (ROA) using 50 firm-year observations obtained from LSEG Workspace. Several diagnostic tests including descriptive statistics, panel unit root tests, Variance Inflation Factor (VIF), heteroscedasticity (Wald Test), Jarque-Bera normality test and Durbin-Watson autocorrelation test are applied to verify the validity and reliability of the regression analysis.

The study used three panel estimation methods like Pooled Ordinary Least Squares (POLS), Random Effects Model (REM) and Fixed Effects Model (FEM). The model results show that the Fixed Effects Model (FEM) is the most efficient models for this study. However, the Redundant Fixed Effects Test and Hausman Test reported P-values below 0.05. This proved FEM gives a higher adjusted R-squared value of 0.91145. The Fixed Effects Model (FEM) is chosen as the final model because it reflects firm-specific factors that can affect firm performance.

Based on the final FEM, leverage and firm size are statistically significantly and negatively related to ROA. The leverage coefficient is -0.31519 while the firm-size coefficient is -13.32098. However, firm age has a coefficient of 0.01191, and tangibility has a coefficient of 0.08349. This can be proven that none of these variables has a statistically significant relationship with ROA during period of studiesFirms must maintain debt levels and verify that

resources can be utilised effectively. The study provides knowledge on firm performance in Malaysia's telecommunications services sector.

Acknowledgements:	The authors would like to express their sincere gratitude to Universiti Teknologi MARA (UiTM) for providing the necessary resources and support throughout the course of this research. Special appreciation is extended to colleagues and peers who contributed valuable insights and constructive feedback, which greatly enhanced the quality of this paper.
Funding Statement:	No Funding
Conflict of Interest Statement:	The authors declare that there is no conflict of interest regarding the publication of this paper. All authors have contributed to this work and approved the final version of the manuscript for submission to the International Journal of Entrepreneurship and Management Practices (IJEMP)
Ethics Statement:	This study did not involve any human participants, animals, or sensitive data requiring ethical approval. The authors confirm that the research was conducted in accordance with accepted academic integrity and ethical publishing standards.
Author Contribution Statement:	All authors contributed significantly to the development of this manuscript. All authors was responsible for the conceptualization, methodology, and overall supervision of the study. All authors handled data collection, analysis, and interpretation of results. All authors contributed to the literature review, drafting, and critical revision of the manuscript. All authors read and approved the final version of the manuscript prior to submission.
Declaration on the Use of Artificial Intelligence (AI)	"The author(s) declare that generative AI or AI-assisted technologies were used during the preparation of this manuscript. The following tool(s) were used: [name of AI tool/software]. The tool(s) were used for [state the purpose, e.g., language editing, grammar improvement, translation, data analysis, or other purposes]. All AI-assisted content was reviewed and verified by the author(s), who take full responsibility for the accuracy, originality, integrity, and final content of the manuscript."

References

Agyei, J., Sun, S., & Abrokwah, E. (2020). Trade-off theory versus pecking order theory: Ghanaian evidence. Sage Open, 10(3). doi: 10.1177/2158244020940987.

Ahmad, A. U., Ph. D., Balakrishnan, U. V., & Jha, P. S. (2021). A Study of Multicollinearity Detection and Rectification under Missing Values. *Turkish Journal of Computer and Mathematics Education*, *12*(1S), 399–418.

Azimi, M. N., Rahman, M. M., & Maraseni, T. (2025). Advancing sustainable development goal 8 Targets: The role of institutional Quality, economic Complexity, and state fragility in G20 nations (2000–2023). *Research in Globalization*, *10*, 100278. https://doi.org/10.1016/j.resglo.2025.100278

Bittar, V., & Di, C. (2023). Do innovation policies support micro and small enterprises to overcome barriers? Innovation & Management Review, 21(2). https://doi.org/10.1108/inmr-12-2021-0234

Digital News Asia. (2026, July 28). AI Malaysia established to drive nation's AI ambitions towards 2030. Digital News Asia. https://www.digitalnewsasia.com/digital-economy/ai-malaysia-established-drive-nations-ai-ambitions-towards-2030

Fachriyyah, R. M., Rusmita, S., Yunita, K., Espa, V., & Kurniawan, R. (2025). The Influence of Return on Assets (ROA) and Firm Size on Company Value. International Journal of Finance and Business Management, 3(4), 375–392. https://doi.org/10.59890/ijfbm.v3i4.77

Fowler, C., Cai, X., Baker, J. T., Onnela, J., & Valeri, L. (2024). Testing unit root non-stationarity in the presence of missing data in univariate time series of mobile health studies. *Journal of the Royal Statistical Society Series C (Applied Statistics)*, *73*(3), 755–773. https://doi.org/10.1093/jrsssc/qlae010

Glinskiy, V., Ismayilova, Y., Khrushchev, S., Logachov, A., Logachova, O., Serga, L., Yambartsev, A., & Zaykov, K. (2024). Modifications to the Jarque–Bera test. *Mathematics*, *12*(16), 2523. https://doi.org/10.3390/math12162523

Huseynli, B. (2022). Examining the Relationship Between Brand Value, Energy Production and Economic Growth. International Journal of Energy Economics and Policy, 12(3), 298–304. https://doi.org/10.32479/ijeep.12987

Ji, A., Zhang, J., He, X., & Zhang, Y. (2022). Fixed effects panel interval-valued data models and applications. In Knowledge-Based Systems (Vol. 237, p. 107798). https://doi.org/10.1016/j.knosys.2021.107798

Kassa, B. Y., & Worku, E. K. (2025). The impact of artificial intelligence on organisational performance: The mediating role of employee productivity. *Journal of Open Innovation: Technology, Market, and Complexity*, *11*(1), 100474. https://doi.org/10.1016/j.joitmc.2025.100474

Kotronoulas, G., Miguel, S., Dowling, M., Fernández-Ortega, P., Colomer-Lahiguera, S., Bağçivan, G., Pape, E., Drury, A., Semple, C., Dieperink, K. B., & Papadopoulou, C. (2023). An overview of the fundamentals of data management, analysis, and interpretation in quantitative research. *Seminars in Oncology Nursing*, *39*(2), 151398. https://doi.org/10.1016/j.soncn.2023.151398

Kumar, N. K. (2023). Autocorrelation and Heteroscedasticity in Regression Analysis. *Journal of Business and Social Sciences*, *5*(1), 9–20. https://doi.org/10.3126/jbss.v5i1.72442

Kurniawan, D., Ardyan, E., Istiatin, I., & Luhgiatno, L. (2022). Impacts of Company Size, Company Age, and the Generation of the Leader on Firm Performance. Binus Business Review, 13(3), 273–283. https://doi.org/10.21512/bbr.v13i3.8213

Laurent S, Shi S. Unit Root Test with High-Frequency Data. *Econometric Theory*. 2022;38(1):113-171. doi:10.1017/S0266466621000098

Mansikkamäki, S. (2023). Firm growth and profitability: The role of age and size in shifts between the study growth–profitability configurations. Journal of Business Venturing Insights, 19, e00372. https://doi.org/10.1016/j.jbvi.2023.e00372

McKenzie, J. E., & Veroniki, A. A. (2024). A brief note on the random-effects meta-analysis model and its relationship to other models. Journal of Clinical Epidemiology, 174, 111492. https://doi.org/10.1016/j.jclinepi.2024.111492

Mwenda, B., Ngollo, M., & Mwasota, A. (2023). An Empirical Study on the Effects of Managerial Competence on Firm Profitability. Ilomata International Journal of Tax and Accounting, 4(3), 491–507. https://doi.org/10.52728/ijtc.v4i3.794

Nagara, N., & Arya, A. (2025). Pay inequality and firm performance. Journal of Contemporary Accounting & Economics, 21, 100510. https://doi.org/10.1016/j.jcae.2025.100510

Omay, T., & Ucar, N. (2023). Testing for Unit Roots in Nonlinear Dynamic Heterogeneous Panels with Logistic Smooth Breaks. Symmetry, 15(3), 747. https://doi.org/10.3390/sym15030747

Qu, Y., & Mardani, A. (2023). Market orientation, technological opportunity, and new product innovation performance. *Journal of Business Research*, *162*, 113841. https://doi.org/10.1016/j.jbusres.2023.113841

Ratnasari, V., Audha, S. H., & Dani, A. T. R. (2023). Statistical modeling to analyse factors affecting the middle-income trap in Indonesia using panel data regression. *MethodsX*, *11*, 102379. https://doi.org/10.1016/j.mex.2023.102379

Sarto, F., Saggese, S., Carbone, E., & Sarnacchiaro, P. (2024). Integrating SEM, Wald test and ANOM to disentangle the effect of TMT functional background on strategic plans. Socio-Economic Planning Sciences, 96, 102083. https://doi.org/10.1016/j.seps.2024.102083

Seraj, Z., & Mohamad Al As. (2026, January 26). ICT and e-commerce sectors contribute 23.4pc to GDP in 2024. NST Online; New Straits Times. https://www.nst.com.my/news/nation/2026/01/1364924/ict-and-e-commerce-sectors-contribute-234pc-gdp-2024

Sithamparam, A. G., & Kumar, S. (2025). Evaluating Performance Efficiency in the Malaysian Telecommunications Industry: A Data Envelopment Analysis Approach. Lecture Notes in Operations Research, 474–491. https://doi.org/10.1007/978-3-031-98177-7_32

Times, N. S. (2025, October 29). Malaysians spend 8 hours online daily, among region's heaviest internet users. NST Online; New Straits Times. https://www.nst.com.my/news/nation/2025/10/1304185/malaysians-spend-8-hours-online-daily-among-regions-heaviest-internet

Yadav Mani Upadhyaya, Rabindra Ghimire, & Shiva Raj Ghimire. (2023). Determinants of financial performance in Nepalese nonlife insurance companies: A panel data analysis. Insurance Markets and Companies, 14(1), 99–109. https://doi.org/10.21511/ins.14(1).2023.09

Yadav, I. S., Pahi, D., & Gangakhedkar, R. (2021). The nexus between firm size, growth and profitability: new panel data evidence from Asia–Pacific markets. European Journal of Management and Business Economics, 31(1), 115–140. https://doi.org/10.1108/ejmbe-03-2021-0077

Yousaf, M. (2025). Determinants of firm performance: How to choose the best model among panel data models? Central European Management Journal, 33(3), 504–521. https://doi.org/10.1108/cemj-05-2023-0229