IJAAR PUBLISHING®

Open Access Journal of Management Sciences Research | ISSN: 3027-1975
Vol. 3, Issue 1 (2025) | www.ijaar.org

Intellectual Capital Efficiency and Firm Financial Performance

By

Okonewa Onyinyechukwu, Oraka Azubike Onuorah, Ezenwafor Nonye Joy, Uchegbu Callista Ukamaka, Umenzekwe Peace Chioma

Department of Accountancy, Faculty of Management Sciences, Nnamdi Azikiwe University, Awka, Anambra State, Nigeria.
Corresponding author; Okonewa Onyinyechukwu
Email: o.okonewa@unizik.edu.ng

Abstract

This study examined the efficiency of intellectual capital and its performance on non-financial firms listed on the Nigerian Exchange Group (NGX). The results were based on the data taken from 16 companies in the non-financial sector for the year 2022 and 2023. It was found that all the independent variables had a positive significant effect on the dependent variable apart from Value-added intellectual capital which had a negative effect on performance (ROA, ROE & EBIT). The main conclusions from this particular study are that: intellectual capital is important regardless of industry type; the influence of capital employed and structural capital has a positive effect with business performance. It is recommended that; intellectual capital may be useful to companies' managers to make better decisions pertaining to the proper deployment of their strategic assets.

Keywords: Intellectual capital efficiency and firm financial performance

Okonewa, O., Oraka, A. O., Ezenwafor, N. J., Uchegbu, C. U., & Umenzekwe, P. C. (2025). Intellectual Capital Efficiency and Firm Financial Performance. *Open Access Journal of Management Sciences Research. 3*(1), 43-57. DOI: 10.5281/zenodo.15342609

1. Introduction

"People are our greatest asset and people are the most powerful factor in the value creation of every corporation". So, for any tangible asset to add value to any organization, it will need to be put to use by the human asset of such an organization. Hence, to develop a competitive advantage, it is important that firms truly leverage the workforce as a competitive weapon to actualize the firm's objective, (Kwarbai& Akinpelu, 2016). Human Capital is the most important asset that exists within a firm and represents the human factor in an organization wherebythe combination of intelligence, skills, knowledge, aptitudes, and expertise gives the organization its distinctive character thereby contributing to production and profitability, (Azlina, Ruhaya & Amrizah, 2017, Bontis, William & Richardson, 2000). According to Yusuf (2013), "the main goal for any business is simple; Invest Capital so that it maximizes shareholder value". Additionally, he argued that the ability of a corporate organization to successfully implement business strategies solely depends on efficient use of intangibles asset, particularly, human capital. According to Becker, Huselid & Ulrich (2002), "the degree to which employees contribute to effective implementation of the organization strategy is linked to human capital performance." Hence, they believed that human capital performance is indeed performance behaviors that affect customers buying experience and one can conclude that it is the basis of the company's financial performance, (Kwarbai& Akinpelu, 2016).

The aim of this study is to examine the effect of intellectual capital (IC) in Nigeria's non-financial companies. Specifically, the study will like to:

i. evaluate the effect of capital employed on the financial performance of listed non-financial companies in Nigeria.
ii. examine the effect of structural capital on the financial performance of listed non-financial companies in Nigeria.
iii. determine the effect of value-added intellectual capital on the financial performance of listed non-financial companies in Nigeria.

The remainder of the article is structured as follows: Firstly, we review the literature relevant to the topic, Secondly, we introduce the data and methodology. Thirdly, we present the results of the study. The concluding part summarizes the main outcomes of the study.

2. Literature Review

2.1. Concept of Intellectual Capital

Intellectual Capital comprises the stocks or funds of knowledge, intangible assets, and lastly intangible resources and capabilities, which enable the development of fundamental business processes of organizations, facilitating the achievement of competitive advantages (Gholamhossien, Hamid, Peyman & Mohammad, 2012). Intellectual Capital is defined as intangible assets which include technology, customer information, brand name, reputation, and corporate culture that are invaluable to a firm's competitive power, (Nik and Md Khairu, 2009; Low and Kalafut, 2002). Hence, intellectual capital consists of some key drivers of organizational performance and creation of future wealth; (1) tacit knowledge and innovativeness of the employees, (2) infrastructure of human capital (i.e., good working system, innovation) and improvement processes of structural capital and; (3) external relationships of the firm (i.e., customers' capital), Bontis et al., (2000); Riahi-Belkaoui (2003). Valued Added Intellectual Coefficient (VAIC™) developed by Ante Pulic is an analytical tool for measuring the efficiency of intellectual capital within a company by using its accounting-based figures.

VAIC™ is based on the relationship of three components: Human Capital Efficiency (HCE), Structural Capital Efficiency (SCE), and Capital Employed Efficiency (CEE). Even though there are several measurement methodologies, the most suitable method to measure intellectual capital efficiency and relate it to the organization as opined by (Azlina et al, 2017), is VAIC™.

The VAIC model is unique because it uses the data from the conventional financial report, as discussed by Andriessen (2004) to be a better tool for analyzing intellectual capital because the data is available online. In addition, it allows comparison and future predictability in respect of the companies' Intellectual Capital Performance, (Yu, Ng, Wong, Chu & Chan, 2010).

2.1.1. Human Capital

Human capital is the component that emerged from the concept of intellectual capital as postulated by Azlinaet al, 2017, Bontis et al, 2000. Human Capital emphasizes the skills, competency, and knowledge possessed by the employees rather than the physical assets of a company. Therefore, human capital is very crucial in determining the firm's performance. Different authors give different interpretationsofthe concept, while some find the term human capital a limiting one, others identified employees as investors in a business. Davenport (1999), suggests that identifying employees as human capital allows people to be highly valued. Human Capital is an investment in human capital. Human capital investment refers to various compensations that include payroll, commissions, bonuses, training, development, etc. meted out to workers. Kamal, Mat, Rahim, Husin & Ismail (2012), defined Human Capital "as employee's competence in creating both tangible and intangible assets by contributing in the continuous generation of knowledge and ideas".

Human Capital is the central and vital element of Intellectual Capital (Duho and Onumah, 2019). This reflects the value of company employees' knowledge, data, and resources. It also applies to an organization with human potential for addressing business issues and optimizing wealth. It incorporates the non-inherited workers' skills, information, expertise, and experience (Ahangar, 2011; Shahid, Ghulam, Martina, Junfeng, and Muhammad, 2022). Without high-quality workers, it is almost impossible to achieve success through financial assets, solid infrastructure, and new technologies (Tran et al., 2020). Human Capital plays a significant role in increasing efficiency and firm productivity (Anifowose, Rashid, Annuar, Ibrahim, 2018).Pulic (2000), explained that the knowledge held by employees is the primary source of value creation, so therefore employees' expenses should be seen as investment rather than cost.Firms have realized the importance of knowledge and the need to efficiently manage it, contributing to the development of the knowledge economy. The relevance of IC has grown rapidly because of the rising significance of the knowledge economy (Cabrita, 2009).Schmidt (2004), defines Human Capital as a form of intangible assets that creates future economic, value which includes the competencies of front-line employees and the organizational capabilities. From the definitions above, we can conclude that human capital is the output formed by the investment, the form intangible, and is expected to stay longer in an organization than some fixed assets. Human Capital Efficiency (HCE) measures the value added by the human resources of an organization (Kwarbai & Akinpelu, 2016). The value of human capital is the sum of all salaries, incentives, and allowances associated with the employees.

2.1.2. Structural Capital

Structural capital is the structure that supports human capital and includes organizational processes, procedures, technologies, information resources, and intellectual property rights (Malhotra,2003). Structural capital stems from human capital and is a combination of knowledge and intangible assets derived from the processes within the organization and encompasses elements of efficiency, procedural innovativeness, and access to information for codification into knowledge (Edvinsson and Malone, 2001). Bontis et al. (2000) asserts that structural capital includes all deposits of non-human knowledge in organizations including databases, organizational charts, process, strategies, and routines, and concludes that any company whose value on the market is greater than its financial value includes the structural capital. Thus, organizations that have a strong structural capital will have a supportive culture that permits their employees to try new things, to learn, and to practice them. Structural capital includes management relationship, organization structure, development, and relationship capitalrefer to the marketing relationship and it is very important for any organization.

This capital may enhance organizational effectiveness by transferring knowledge, (Luminita, Dan and Anca, 2015).

2.1.3. Capital Employed

Capital employed is the total amount of capital used for the acquisition of profits by a firm or project. Capital employed can also refer to the value of all the assets used by a company to generate earnings. By employing capital, companies invest in the long-term future of the company. Capital employed is helpful since it is used with other financial metrics to determine the return on a company's assets as well as how effective management is at employing capital (Adam, Margaret & Katrina 2021).

Definition of other Variables:

Return on Assets (ROA), is a profitability indicator used to measure how efficient a company's management is in generating earnings from their economic resources or assets on their balance sheet.

Return on Equity (ROE), effectively measures how much profit a company can generate on equity capital investors have deployed in the business (Adam, 2016). It signifies how good the company is at generating returns on the investment it received from its shareholders.

Earnings before Interest and Tax (EBIT), is an indicator of a company's profitability, used to analyze the performance of a company's core operations without the costs of capital structure and tax expenses impacting profit (Chris, 2021). EBIT can be calculated as revenue minus expenses excluding tax and interest.

2.2. Intellectual Capital (IC) and Firm Financial Performance

There are so many methods available to measure the success of physical capital and assess its impact on firm financial performance. For measuring the effectiveness or efficiency of the use of physical capital the well-known conventional tools like profit, return on investments (ROI), return on equity (ROE), and return on assets (ROA) can be used, but these are considered to be ineffective for measuring the performance of intellectual capital (Ekwe 2013). ROI and ROA and growth rate were adopted as the measure of financial performance (Andrzej and Marian, 2009). Tan et al (2007) have reported a positive association between the intellectual capital of firms and their financial performances. The study of Riahi-Belkaoui (2003) found a positive relationship between Intellectual Capital (IC) and financial performance, while Bontis et al (2000) concluded that, regardless of industry, the development of structural capital has a positive impact on business performance.

2.3. Prior studies in Intellectual Capital Efficiency and Firm Performance

Kwarbai and Akinpelu (2016) investigated "Human Capital Efficiency and Corporate Performance: The Nigerian Perspective". The study concluded that there is a positive significant relationship between Human Capital Efficiency (HCE) and Earnings per Share (EPS) and also between Human Capital Efficiency and Return on Assets (ROA) of industrial goods sector in Nigeria, but an insignificant negative relationship between Human Capital Efficiency and Number of Employee Growth.

Azlina, Ruhaya & Amrizah (2017) examined "Human Capital Efficiency and Firm Performance: An Empirical Study on Malaysian Technology Industry". The results from correlation analysis indicate that Human Capital Efficiency has a significant and positive relationship with a firm's performance.

Jamila, Syed, Krishna, Nawazish, and Bushra (2021) "Human capital efficiency, performance, market, and volatility timing of Asian equity funds during COVID-19 outbreak". They attempted to

explore this gap in the context of the outbreak of COVID-19 which provides a unique opportunity to assess human capital's importance during economic pressures. The results show that funds with better human capital efficiency outperform their counterparts that rank lower in human capital efficiency. The outperformance as measured by adjusted Sharpe and Sortino's ratios, Jensen's alpha, stochastic dominance, market, and volatility timing remained consistent for the pre-COVID period as well as through the outbreak during which the impact of human capital efficiency became even more significant.

Larisa, Nawazish, Jamila, and Amir (2021) investigated "the impact of human capital efficiency (HCE) on equity funds' performance during three stages of the COVID-19 pandemic". The results suggest that during the COVID-19 outbreak, the equity funds that were ranked higher in HCE outperformed their counterparts. We suggest that fund managers should invest in human capital to improve funds' coping ability and resilience during periods of extreme stress.

Shahid, Ghulam, Martina, Junfeng, and Muhammad (2022) this study aims to determine whether IC efficiency impacts the financial performance of listed Pakistani and Indian companies between 2010 and 2020. Return on Assets (ROA) and Return on Equity (ROE) are used to calculate financial performance, and IC is calculated using the modified Value-Added Intellectual Coefficient (MVAIC) model. Regression analysis is performed using the STATA software developed by the South Texas Art Therapy Association. Human Capital (HC), Structural Capital (SC), and Capital Employed (CE) have a significant impact on Pakistani and Indian firms' financial performance. Resource-based theory (RBT) supports these findings. The findings should provide management with a prompt to improve financial performance and emphasize the importance of IC.

Ahmed and Tamanna (2023) This study explored the efficiency of intellectual capital (ICE) and working capital management (WCME) in the GCC industrial sector and its potential impact on firm performance. The data were gathered from Standard & Poor's database from 2015 to 2019. This study uses data envelopment analysis (DEA), regression analysis, and robustness tests to accomplish its aims. The results indicate that most firms do not employ their intellectual and working capital investments well and need improvement actions to achieve the best practices. The regression model results reveal that ICE and WCME significantly and positively influence firms' performance. The results of this study support the resource-based, trade-of, and pecking-order theories. The study findings have important implications for many stakeholders; for example, they would be helpful for firm decision-makers in managing their investments in intellectual and working capital to achieve the best practices and improve a firm's performance. In addition, the findings would be helpful for financiers, because high-performance firms are likely to have more reasonable valuations that facilitate debt financing.

3. Research Methodology

3.1. Research Hypotheses

- H01: Capital Employed does not have an effect on the Financial Performance of listed non-financial companies in Nigeria.
- H02: Structural Capital does not have an effect on the Financial Performance of listed non-financial companies in Nigeria.
- H03: Value-added does not have an effect on the Financial Performance of listed non-financial companies in Nigeria.

3.2. Research Method

The Value-Added Intellectual Coefficient (VAIC™) introduced by Pulic (1998) was used to measure intellectual capital efficiency in the current study. Random-effect GLS regression analysis then was used to determine the effect of Intellectual Capital (measured by Structural Capital Efficiency, Capital Employed, and Value-Added Intellectual Capital) on a firm's financial performance. Thefirm's financial performance on the other hand was conceptualized by looking at the value of Return on

Assets, Return on Equity, and Earnings before Interest and tax. This paper utilizes data extracted from the annual reports of all non-financial companies listed on the Nigerian Stock Exchange (NSE) for the period of 2022 and 2023 from which 16 companies were randomly selected with representation from the following sector: industrial goods, consumer goods, and conglomerate.

3.3. Research Model

The research models below were formulated in line with our hypotheses in order to empirically examine the effect of intellectual capital efficiency and firm financial performance:

$ROA = \alpha_0 + \alpha_1 CEE + \alpha_2 SCE + \alpha_3 VAIC + FS + \varepsilon t$……Model 1

$ROE = ß_0 + ß_1 CEE + ß_2 SCE + ß_3 VAIC + FS + \varepsilon t$…… Model 2

$EBIT = f_0 + f_1 CEE + f_2 SCE + f_3 VAIC + FS + \varepsilon t$……Model 3

Where, ROA= Return on assets
ROE= Return on equity
EBIT= Earnings before interest and tax
CEE= Capital employed efficiency
SCE= Structural capital efficiency
VAIC= Value added intellectual capital
FS= Size of the firm

In addition, α_0, $ß_0$, f_0 are the intercepts; α_1,$ß_1$, f_1 are the explanatory variables coefficient; α_1 = (i = 1,2,3), $ß_1$ = (i = 1,2,3), f_1 = (i = 1,2,3), are the coefficient of the moderating variables, and εt = (i = 1,2,3), are the error term that absorbs the influence of omitted variables in the proxies used.

3.4. Variable Definition

3.4.1. **Independent Variables**: The independent variable used is,

- Structural Capital (SC): is the result of Human Capital's past performance (organization, licenses, patents, image, standards, and relationship with customers).

Therefore: Structural Capital Efficiency (SCE) is SC/VA

- Capital Employed (CE): all material and financial assets employed. Capital Employed Efficiency (CEE) is expressed as VA/CE
- Value Added Intellectual Coefficient (VAIC™), Indicates the value creation efficiency of all resources (sum of the previous indicators). It expresses the intellectual ability of a company, regional or national economy.
  VAIC™is ICE+CEE

Where ICE is Intellectual Capital Efficiency, an indicator that shows how efficiently Intellectual Capital has created value. It is also an indicator that shows how much Value Added is created on each monetary unit invested in Capital Employed.

Therefore: ICE = HCE+SCE

3.4.2. **Dependent Variables**include:

- Return on Assets (ROA) = $\frac{\text{Profit after tax}}{\text{Total asset}}$
- Return on Equity (ROE) = $\frac{\text{Profit after tax}}{\text{Total equity}}$

Earnings before interest and tax (EBIT) = Net income + Interest + Taxes

Alternatively, EBIT = Gross profit– Operating expenses.

3.4.3. Control Variable

- Firm Size (FS), which is believed to have a significant impact on the Human Capital as well as the performance of firms (Kwarbai & Akinpelu; 2016, Ismaila, 2013) was included in order to eliminate bias.

4. Data Analyses and Discussion of Result

In examining the effect of Intellectual capital efficiency proxied by capital employed, structural capital, and value-added intellectual capital on firm financial performance, we first carried out descriptive statistics. Regression analysis and correlation matrix technique were employed in this study and a 0.05 percent level of alpha is used as a yardstick for judgment accordingly. The descriptive statistics give insight into the nature of the sample of non-financial firms in this study shown below:

Table 4.1 Descriptive Statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
ceee	32	.3898656	1.01156	-.0501	5.8538
scee	32	.6827062	.5366401	-1.2395	2.3279
vaic	32	6.639591	13.96438	-.7471	80.2245
roet	32	-2.913291	76.03802	-372.3443	133.8432
reta	32	1.427869	11.38611	-43.3351	23.6242
ebtm	32	11.43825	10.64729	-9.0065	29.9173
fsma	30	7.461317	.9653006	5.1769	9.1421

Table 1: Summary of descriptive statistics of the Variables
Source: Author's Computation (2025)

From table 4.1, it is observed that on average, capital employed is 39% with a standard deviation of 1.012, also on average, the table shows that about 68% of the firms in our sample tend to engage in structural capital with a standard deviation of 0.537. On average, the value-added intellectual capital is 6.64 with a standard deviation of 13.97. the table reveals that on average, profitability (return on asset) is 1.43 with a standard deviation of 11.39. The return on equity average result is -2.91 with a standard deviation of 76. The earnings before interest and tax of our sample are 11.44 on average, with a standard deviation of 10.65. For the control variable, the table reveals that on average, the firm size is 7.46 with a standard deviation of 0.965.

4.2 Regression Analysis

Table 4.2.1 Random-Effects GLS Regression

Variables / **Models**	**Capital employed**	**Structural capital**	**Value-added intellectual capital**	**Firm size**
Return on assets	$ROA = \alpha_0 + \alpha_1 CEE + \alpha_2 SCE + \alpha_3 VAIC + FS + \varepsilon t$……Model 1			
Coefficient **z_ Statistics** **Probability_z**	1.064 0.99 0.322	2.194 2.46 0.014	-3.434 -2.75 0.006	8.975 2.52 0.012
No. of Obs. **Prob. F statistics** **R^2** **VIF** **Hettest.**	**28** **0.0144** **0.3425** **2.02** **0.000**			

Source: Author's Computation (2025)

The table above shows the results obtained from the least square regression model that is employed to examine the effect of intellectual capital efficiency on firm financial performance. First, the researcher employs Breusch-Pagan/Cook-Weisberg test for heteroscedasticity to diagnose heteroscedasticity in

the management model. The result obtained from the diagnostic reveals a probability value of (P-value: 0.0000) as seen in the table. This result indicates that the assumption of homoscedasticity has been violated due to very low P-values which are statistically significant at 1% level. Therefore, we rely on the within-fixed-effect regression estimator to control for this heterogeneity in the error term. Particularly, a careful examination of the results provided by the effects model shows that the models of interest suggest appropriateness as it relates to the dependent variable of return on assets for the period under investigation. Considering the p-value of the Hausman test (0.9881) implies acceptance of the random-effect results which tend to be more appealing statistically when compared to the fixed-effect results. The result from the fixed-effect regression reveals an R^2 value of 0.3434 (see appendix), which indicates that about 34% of the variation in the dependent variable is explained by the independent and control variable in the model. This also means that about 66% of the variation in the dependent variable is left unexplained but has been captured in the error term. It would also be observed that all the independent variables had a positive impact significant on the dependent variable apart from Value-added intellectual capital which had a negative effect of (-3.434) on performance (ROA). In trying to summarize the discrepancy between the observed values and the values expected under the model in question, we employed the Fisher statistics goodness of fit model which describes how well a model fits a set of observations. The probability value 0.0144 shows a 5% statistically significant level, indicatingthat the entire model is fit and can be employed for discussion and policy recommendation.

Table 4.2.2 Random-Effects GLS Regression

Variables **Models**	**Capital employed**	**Structural capital**	**Value-added intellectual capital**	**Firm size**
Return on equity	ROE = $ß_0$+ $ß_1$CEE+ $ß_2$SCE+ $ß_3$VAIC+ FS+ Ɛt……. Model 2			
Coefficient **z_ Statistics** **Probability_z**	0.445 1.01 0.315	0.898 2.44 0.015	-1.396 -2.71 0.007	3.682 2.51 0.012
No. of Obs. **Prob. F statistics** **R^2** **Rho**	**28** **0.0166** **0.3357** **0.000**			

Source: Author's Computation (2025)

It would be observed from the results provided in table 4.2.2 above that the dependent variable (return on equity) for the period under investigation, shows a p-value of the Hausman test (0.9810) which implies acceptance of the random-effect results which tends to be more appealing statistically when compared to the fixed-effect results. The result from the fixed-effect regression reveals an R^2 value of 0.3369 (see appendix), which indicates that about 34% of the variation in the dependent variable is explained by the independent and control variable in the model. This also means that about 66% of the variation in the dependent variable is left unexplained but has been captured in the error term. It would also be observed that all the independent variables had a positive significant effect on the dependent variable apart from Value-added intellectual capital which had a negative effect of (-1.396) on performance (ROE). In trying to summarize the discrepancy between the observed values and the values expected under the model in question, we employed the Fisher statistics goodness of fit model which describes how well a model fits a set of observation. The probability value 0.0166 shows a 5% statistically significant level, indicating that the entire model is fit and can be employed for discussion and policy recommendation.

Table 4.2.3 Random-Effects GLS Regression

Variables / Models	Capital employed	Structural capital	Value-added intellectual capital	Firm size
Earnings before interest and tax	EBIT = f_0+ f_1CEE+f_2SCE+f_3VAIC+ FS+ Ɛt……Model 3			
Coefficient z_ Statistics Probability_z	2.745 0.98 0.328	4.823 2.07 0.039	-1.548 -0.47 0.635	18.705 2.01 0.045
No. of Obs. Prob. F statistics R^2 Rho	**28** **0.0301** **0.3241** **0.000**			

Source: Author's Computation (2025)

It would be observed from the results provided in the table 4.2.3 above that the dependent variable (earnings before interest and tax) for the period under investigation, shows a p-value of the Hausman test (0.9935) which implies acceptance of the random-effect results which tend to be more appealing statistically when compared to the fixed-effect results. The result from the fixed-effect regression reveals an R^2 value of 0.3241 (see appendix), which indicates that about 32% of the variation in the dependent variable is being explained by the independent and control variable in the model. This also means that about 68% of the variation in the dependent variable is left unexplained but have been captured in the error term. It would also be observed that all the independent variables had a positive significant effect on the dependent variable apart from Value-added intellectual capital which had a negative effect of (-1.548) on performance (EBIT). In trying to summarize the discrepancy between the observed values and the values expected under the model in question, we employed the Fisher statistics goodness of fit model which describes how well a model fits a set of observation. The probability value 0.0301 shows a 5% statistically significant level, indicates that the entire model is fit and can be employed for discussion and policy recommendation.

5.0 Conclusion and Recommendation

The purpose of this empirical study is to investigate the efficiency of the three elements of intellectual capital in the non-financial sector, i.e., capital employed, structural capital, and value-added intellectual capital and its effectson company's performance. The study was conducted using the data from 16 companies' annual reports listed on the Nigerian Exchange Group (NGX). The method of analysis used was the random-effect GLS regression to investigate the effect of intellectual capital efficiency on firms' financial performance. The findings from this particular study are: that all the independent variables had a positive significant effect on the dependent variable apart from Value-added intellectual capital which had a negative effect on performance (ROA, ROE & EBIT). The main conclusions from this particular study are that: intellectual capital is important regardless of industry type; the influence of capital employed and structural capital has a positive relationship with business performance. It is recommended that; intellectual capital may be useful to companies' managers to make better decision pertaining to the proper deployment of their strategic asset and also, future research can also investigate other element of intellectual capital efficiency (human capital efficiency) with firm financial performance and make comparison for both financial and non-financial sector.

References

Adam, C. (2016), "Return on Equity: A Compelling Case for Investors". *Jensen Investment Management*. A Series of Reports on Quality Growth Investing.

Adam, H., Margaret, J. and Katrina, M. (2021), "Capital Employed". *Corporate Finance & Accounting Financial Analysis*. Investopedia.

Ahangar, R. G. (2011). The Relationship between Intellectual Capital and Financial Performance: An Empirical Investigation in an Iranian Company. *African Journal of Business & Management* 5, 88– 95.

Ahmed, M.H and Tamanna.D. (2023), Does the Efficiency of a FirmIntellectualCapital and Working Capital Management Affect its Performance? https://doi.org/10.1007/s13132-023-01138-7. *Journal of the Knowledge Economy*.

Anifowose, M., Rashid, H. M. A., Annuar, H. A., and Ibrahim, H. (2018). Intellectual Capital Efficiency and Corporate Book Value: Evidence from Nigerian Economy. *Journal of Intellectual Capital* 19, 644–668. doi: 10.1108/JIC-09-2016- 009.

Azlina, R., Ruhaya, A. and Amrizah, K. (2017), "Human Capital Efficiency and Firm Performance: An Empirical Study on Malaysian Technology Industry". DOI: 10.1051/shsconf/20173600026. *SHS Web of Conferences* 36.00026 (2017).

Bontis, N., William, C. and Richardson, S. (2000), "Intellectual Capital and Business Performance in Malaysian Industries", *Journal of Intellectual Capital*, Vol 1, No1, pp. 85-100.

Chris, B.M. (2021), "Earnings before Interest and Taxes". Corporate Finance & Accounting.

Duho, K.C.T, and Onumah, J. M. (2019). Bank Diversification Strategy and Intellectual Capital in Ghana: An Empirical Analysis. *Asian Journal Accounting & Resources*4, 246–259. doi: 10.1108/AJAR- 04-2019-0026.

Gholamhossein, M., Hamid, R.R., Peyman, A. and Mohammed, R.S., (2012), "The Impact of Intellectual Capital Efficiency on Market Value: An Empirical Study from Iranian Pharmaceutical Companies". *Iranian Journal of Pharmaceutical Research* (2012), 11 (1): 195-207.

Jamila, A.H, Syed, K.A. Rizvi, Kristine, R., Nawazish, M, and Bustra, N., (2021), "Human Capital Efficiency, Performance, Market and Volatility Timing of Asian Equity Funds during Covid-19 Outbreak". *Journal of Asset Management*, https://doi.org/10.1057/S41260-021-00228-y

Kamal, M.H.H, Mat, R.C, Rahim, N.A, Husin, N, and Ismail, I. (2012), "Intellectual Capital and Firm Performance of Commercial Banks in Malaysian.*Asian Economic and Financial Review* 2(4):577-590.

Kwarbai, J.D and Akinpelu, M.A. (2016), "Human Capital Efficiency and Corporate Performance: The Nigerian Perspective". *The International Journal of Business and Management* (ISSN 2321-8916).

Larisa, Y., Nawaziah, M., Jamila, A. and Amir, H. (2021), "Human Capital Efficiency and Equity Funds' Performance during the Covid-19 Pandemic". *International Review of Economic and Finance* 71 (2021) 584-591.

Low, J. and Kalafut, P.C. (2002), "Invisible Advantage - How Intangibles are Driving Business Performance". *Perseus Publishing, Cambridge.*

Luminita, M.G, Dan, C.D and Anca, D. (2015), "Structural Capital - A Proposed Measurement Model". 2nd Global Conference on Business, Economics, Management and Tourism, 30-31 Oct. 2014, Prague, Czech Republic. *Procedia Economic and Finance* 23(2015)1139-1146.

Nik, M.N.M and Md, Khairu A.I (2009), "Intellectual Capital Efficiency and Firm Performance: Study on Malaysian Financial Sectors". *International Journal of Economics and Finance*.

Riahi-Belkaoui A., (2003), "Intellectual Capital and Firm Performance of U.S Multinational Firms". *Journal of Intellectual Capital*, 4(2): 215-226.

Schmidt (2004), "Leveraging Human Capital by Kenneth Cline BAI Banking Strategies". Nov/Dec. 2004, Vol LXXX No. VI retrieved from http://www.bai.org/BANKINGSTRATEGIES/strategy/BAI- research/leveraging-human-capital on 24/09/2012.

Shahid, A., Ghulam, M., Martina, H., Junfeng, J., and Muhammad, N. (2022), Intellectual Capital and Financial Performance: A Comparative Study. DOI: 10.3389/fpsyg.2022,967820

Yusuf, I. (2013), "The Relationship between Human Capital Efficiency and Financial Performance: An Empirical Examination of Quoted Nigerian Banks". *Research Journal of Finance and Accounting*. Vol. 4, No4, pp. 148-154.

Yu, K.Y., Ng, H.T., Wong, W.K., Chu, S.K.W. and Chan, K.H. (2010), "An Empirical Study of the Impact of Intellectual Capital Performance on Business Performance". The 7th International Conference on Intellectual Capital Knowledge Management & Organizational Learning. *The Hong Kong Polytechnic University, Hong Kong Conference Paper.*

Appendix

```
. vif

    Variable |       VIF       1/VIF
-------------+----------------------
lvaic |      3.14    0.318109
lceee |      2.22    0.449482
lscee |      1.47    0.681478
srevg |      1.24    0.806535
-------------+----------------------
    Mean VIF |      2.02

. hettest

Breusch-Pagan / Cook-Weisberg test for heteroskedasticity
         Ho: Constant variance
         Variables: fitted values of retaa

         chi2(1)      =    38.22
         Prob > chi2  =   0.0000

. xtregretaalceeelsceelvaicsrevg

Random-effects GLS regression                   Number of obs     =         28
Group variable: fiscalyear                      Number of groups  =          2

R-sq:                                           Obs per group:
within  = 0.3425                                         min =         14
     between = 1.0000                                    avg =       14.0
     overall = 0.3508                                    max =         14

                                                Wald chi2(4)      =      12.43
corr(u_i, X)   = 0 (assumed)                    Prob > chi2       =     0.0144

------------------------------------------------------------------------------
retaa |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
lceee |   1.064193   1.074933     0.99   0.322    -1.042638    3.171024
lscee |   2.194016   .8922414     2.46   0.014     .4452552    3.942777
lvaic|  -3.433881   1.249203    -2.75   0.006    -5.882274    -.985488
srevg |   8.974956   3.564763     2.52   0.012     1.988149    15.96176
       _cons |   8.771348   3.474108     2.52   0.012     1.962222    15.58047
-------------+----------------------------------------------------------------
sigma_u |          0
sigma_e|  3.3619424
         rho |          0   (fraction of variance due to u_i)
------------------------------------------------------------------------------

. xtregretaalceeelsceelvaicsrevg, fe

Fixed-effects (within) regression               Number of obs     =         28
Group variable: fiscalyear                      Number of groups  =          2

R-sq:                                           Obs per group:
within  = 0.3434                                         min =         14
     between = 1.0000                                    avg =       14.0
     overall = 0.3498                                    max =         14

F(4,22)           =       2.88
corr(u_i, Xb)  = 0.0984                         Prob > F          =     0.0467

------------------------------------------------------------------------------
retaa |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
lceee |   .9556454   1.102175     0.87   0.395    -1.330126    3.241417
lscee |   2.052553   .9306191     2.21   0.038     .1225676    3.982539
lvaic|  -3.356877   1.271293    -2.64   0.015    -5.993376   -.7203772
srevg |    8.70013   3.636971     2.39   0.026     1.157514    16.24275
       _cons |   8.414491   3.563618     2.36   0.027        1.024    15.80498
-------------+----------------------------------------------------------------
sigma_u|  .60263918
sigma_e|  3.3619424
         rho |  .03113143   (fraction of variance due to u_i)
```

```
------------------------------------------------------------------------------
F test that all u_i=0: F(1, 22) = 0.41                      Prob > F = 0.5292

. hausmanfe re

                 ---- Coefficients ----
             |      (b)          (B)            (b-B)     sqrt(diag(V_b-V_B))
             |       fe           re         Difference          S.E.
-------------+----------------------------------------------------------------
lceee |    .9556454     1.064193       -.1085476        .2435331
lscee |    2.052553     2.194016       -.1414628        .2644942
lvaic |   -3.356877    -3.433881        .0770044        .2359586
srevg |     8.70013     8.974956       -.2748254        .7211288
------------------------------------------------------------------------------
                           b = consistent under Ho and Ha; obtained from xtreg
            B = inconsistent under Ha, efficient under Ho; obtained from xtreg

    Test:  Ho:  difference in coefficients not systematic

                  chi2(4) = (b-B)'[(V_b-V_B)^(-1)](b-B)
                          =        0.33
                Prob>chi2 =      0.9881

Random-effects GLS regression                   Number of obs     =         28
Group variable: fiscalyear                      Number of groups  =          2

R-sq:                                           Obs per group:
within  = 0.3357                                         min =         14
     between = 1.0000                                    avg =       14.0
     overall = 0.3449                                    max =         14

                                                Wald chi2(4)      =      12.11
corr(u_i, X)   = 0 (assumed)                    Prob > chi2       =     0.0166

------------------------------------------------------------------------------
roett |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
lceee |   .4452662   .4429674     1.01   0.315    -.4229339    1.313466
lscee |   .8975269   .3676821     2.44   0.015     .1768831    1.618171
lvaic|  -1.396803   .5147818    -2.71   0.007    -2.405757   -.3878491
srevg |    3.68213   1.468997     2.51   0.012     .8029494     6.56131
       _cons |   3.623265   1.431639     2.53   0.011     .8173053    6.429226
-------------+----------------------------------------------------------------
sigma_u |          0
sigma_e|  1.3823972
         rho |          0   (fraction of variance due to u_i)
------------------------------------------------------------------------------

Fixed-effects (within) regression               Number of obs     =         28
Group variable: fiscalyear                      Number of groups  =          2

R-sq:                                           Obs per group:
within  = 0.3369                                         min =         14
     between = 1.0000                                    avg =       14.0
     overall = 0.3436                                    max =         14

F(4,22)           =       2.79
corr(u_i, Xb)  = 0.1004                         Prob > F          =     0.0513

------------------------------------------------------------------------------
roett |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
lceee |   .3955696   .4532035     0.87   0.392    -.5443169    1.335456
lscee |   .8327606   .3826613     2.18   0.041     .0391697    1.626352
lvaic|  -1.361548   .5227428    -2.60   0.016    -2.44565   -.2774455
srevg |   3.556306   1.495486     2.38   0.027     .4548569    6.657754
       _cons |   3.459885   1.465324     2.36   0.027     .4209887    6.498781
-------------+----------------------------------------------------------------
sigma_u|  .27590764
sigma_e|  1.3823972
         rho |   .0383087   (fraction of variance due to u_i)
------------------------------------------------------------------------------
F test that all u_i=0: F(1, 22) = 0.51                      Prob > F = 0.4840
```

```
. hausmanfe re

                ---- Coefficients ----
             |      (b)          (B)            (b-B)     sqrt(diag(V_b-V_B))
             |       fe           re         Difference          S.E.
-------------+------------------------------------------------------------------
lceee |    .3955696     .4452662       -.0496966        .0957774
lscee |    .8327606     .8975269       -.0647662        .1060166
lvaic |   -1.361548    -1.396803        .0352551        .0908832
srevg |    3.556306      3.68213       -.1258239        .2802294
------------------------------------------------------------------------------
                           b = consistent under Ho and Ha; obtained from xtreg
            B = inconsistent under Ha, efficient under Ho; obtained from xtreg

    Test:  Ho:  difference in coefficients not systematic

                chi2(4) = (b-B)'[(V_b-V_B)^(-1)](b-B)
                        =        0.42
              Prob>chi2 =      0.9810

Fixed-effects (within) regression               Number of obs     =         28
Group variable: fiscalyear                      Number of groups  =          2

R-sq:                                           Obs per group:
within  = 0.3243                                         min =         14
     between = 1.0000                                    avg =       14.0
     overall = 0.3175                                    max =         14

F(4,22)           =       2.64
corr(u_i, Xb)  = -0.2800                        Prob > F          =     0.0612

------------------------------------------------------------------------------
ebtm |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
lceee |   2.992173   2.885877     1.04   0.311     -2.99277    8.977116
lscee |   5.144282   2.436684     2.11   0.046       .09091    10.19765
lvaic|  -1.722541   3.328685    -0.52   0.610    -8.625811    5.180729
srevg |   19.32959   9.522852     2.03   0.055    -.4195977    39.07878
       _cons |   23.36866   9.330788     2.50   0.020     4.017794    42.71953
-------------+----------------------------------------------------------------
sigma_u|  1.3697989
sigma_e|  8.8027314
         rho |  .02364219   (fraction of variance due to u_i)
------------------------------------------------------------------------------
F test that all u_i=0: F(1, 22) = 0.31                     Prob > F = 0.5845

Random-effects GLS regression                   Number of obs     =         28
Group variable: fiscalyear                      Number of groups  =          2

R-sq:                                           Obs per group:
within  = 0.3241                                         min =         14
     between = 1.0000                                    avg =       14.0
     overall = 0.3176                                    max =         14

                                                Wald chi2(4)      =      10.71
corr(u_i, X)   = 0 (assumed)                    Prob > chi2       =     0.0301

------------------------------------------------------------------------------
ebtm |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
lceee |   2.745445   2.808216     0.98   0.328    -2.758558    8.249447
lscee |   4.822738   2.330941     2.07   0.039     .2541768    9.391298
lvaic |   -1.54751   3.263488    -0.47   0.635    -7.943829    4.848808
srevg |   18.70491   9.312785     2.01   0.045     .4521879    36.95763
       _cons |   22.55753   9.075952     2.49   0.013      4.76899    40.34607
-------------+----------------------------------------------------------------
sigma_u |          0
sigma_e|  8.8027314
         rho |          0   (fraction of variance due to u_i)
------------------------------------------------------------------------------

. hausmanfe re

                ---- Coefficients ----
```

```
             |      (b)          (B)            (b-B)     sqrt(diag(V_b-V_B))
             |       fe           re         Difference          S.E.
-------------+----------------------------------------------------------------
lceee |    2.992173     2.745445        .2467288         .664988
lscee |    5.144282     4.822738        .3215449        .7100282
lvaic |   -1.722541     -1.54751        -.175031        .6555842
srevg |    19.32959     18.70491        .6246782        1.989159
------------------------------------------------------------------------------
                           b = consistent under Ho and Ha; obtained from xtreg
            B = inconsistent under Ha, efficient under Ho; obtained from xtreg

    Test:  Ho:  difference in coefficients not systematic

                  chi2(4) = (b-B)'[(V_b-V_B)^(-1)](b-B)
                          =        0.24
                Prob>chi2 =      0.9935
```