



---

# THE IMPACT OF HUMAN CAPITAL EFFICIENCY ON FINANCIAL PERFORMANCE: EVIDENCE FROM SAUDI BANKS

Prof. Ahmad Aref Almazari<sup>1</sup>, Prof. Abdullah Attia Alzahrani<sup>2</sup>

<sup>1,2</sup>King Saud University-College of Applied Studies

## Abstract

This study examines the impact of human capital efficiency (HCE) on the financial performance of Saudi banks. Human capital has become one of the most important strategic resources for enhancing organizational competitiveness and long-term value creation, particularly in knowledge-intensive industries such as banking. Using panel data from listed Saudi banks over the period **2015–2024**, this study measures human capital efficiency using the Value Added Intellectual Coefficient (VAIC™) methodology. Financial performance is evaluated through profitability indicators, including Return on Assets (ROA), Return on Equity (ROE), and Earnings per Share (EPS). Panel regression models are employed to analyze the relationship while controlling for bank-specific characteristics such as size, capital adequacy, leverage, and liquidity.

The findings demonstrate that higher human capital efficiency contributes positively to bank financial performance, suggesting that investments in employee knowledge, skills, and capabilities create sustainable competitive advantages. The results provide practical implications for bank managers and policymakers by emphasizing the importance of developing human capital to improve operational efficiency and profitability. This study also contributes to the growing literature on intellectual capital by providing empirical evidence from the Saudi banking sector within the context of Saudi Vision 2030.

## Keywords

Human Capital Efficiency; Intellectual Capital; Financial Performance; VAIC; Saudi Banks; Return on Assets; Return on Equity; Panel Data Analysis

---

## 1. Introduction

Human capital has emerged as one of the most valuable strategic resources for organizations operating in knowledge-intensive industries such as banking. Modern banks increasingly rely on employees' expertise, innovation, customer relationship management, and technological capabilities to sustain competitive advantages.

Saudi Arabia's banking sector has experienced rapid digital transformation under Vision 2030, making investment in human capital more critical than ever. Banks are expanding digital banking services, artificial intelligence applications, and financial technologies, requiring highly skilled employees.

Despite extensive international literature on intellectual capital, empirical evidence regarding the effect of Human Capital Efficiency (HCE) on Saudi banks remains limited. Therefore, this study aims to investigate the relationship between HCE and financial performance among Saudi listed banks.

The banking sector represents a unique environment in which human capital plays a central role in creating value. Banks are service-oriented institutions where employees' expertise, decision-making abilities, customer relationship skills, technological competencies, and risk assessment capabilities

significantly influence profitability and competitiveness. Unlike manufacturing firms, banks rely less on physical production processes and more on intellectual capabilities and professional knowledge. Therefore, efficient management and utilization of employees' knowledge and skills can enhance operational performance, improve service quality, reduce costs, strengthen customer loyalty, and ultimately contribute to superior financial outcomes.

Human capital refers to the knowledge, competencies, education, experience, creativity, and abilities possessed by employees, while structural capital includes organizational processes, systems, databases, and institutional knowledge. Relational capital represents the value derived from relationships with customers, suppliers, and other stakeholders (Edvinsson & Malone, 1997; Stewart, 1997). Among these components, human capital is considered the foundation of intellectual capital because employees generate, develop, and utilize organizational knowledge.

According to Resource-Based View (RBV) theory, firms achieve sustainable competitive advantages when they possess valuable, rare, difficult-to-imitate, and non-substitutable resources (Barney, 1991). Human capital can satisfy these conditions because employee knowledge, expertise, and organizational experience are difficult for competitors to replicate. Therefore, organizations that efficiently invest in and utilize human capital are expected to achieve higher levels of productivity and profitability compared with organizations that fail to manage their intellectual resources effectively.

To measure intellectual capital efficiency, Pulic (2000) introduced the Value Added Intellectual Coefficient (VAIC™) model, which provides a quantitative approach for assessing how efficiently firms create value from their intellectual and physical resources. The VAIC model consists of three main components: Human Capital Efficiency (HCE), Structural Capital Efficiency (SCE), and Capital Employed Efficiency (CEE). Among these components, HCE measures the ability of human capital investment to generate value added for the organization. It is calculated as the ratio of value added to human capital cost:

$$HCE = VA / HC$$

where VA represents value added created by the firm and HC represents employee-related expenses. A higher HCE indicates that the organization generates greater economic value from its investment in employees.

By employing panel data analysis of Saudi banks, this research seeks to determine whether efficient utilization of human capital contributes significantly to improved financial performance.

Previous empirical studies have examined the relationship between intellectual capital efficiency and financial performance in different industries and countries. Many studies provide evidence that human capital efficiency positively influences financial performance indicators such as return on assets (ROA), return on equity (ROE), profitability, and Earnings Per Share valuation. For example, Pulic (2000) demonstrated that intellectual capital efficiency could be measured systematically and used to explain differences in corporate performance. Similarly, Bontis (1998) emphasized that human capital is a fundamental driver of organizational performance because employees are the primary source of knowledge creation and innovation.

Saudi Arabia provides an important institutional and economic context for examining the relationship between human capital efficiency and bank performance. The Saudi banking sector has experienced significant transformation during recent years due to financial sector development initiatives, digital transformation, regulatory reforms, and the objectives of Saudi Vision 2030. These developments have increased competition among banks and created greater reliance on skilled employees, technological capabilities, innovation, and customer-oriented services. As Saudi banks expand digital banking platforms, artificial intelligence applications, and advanced financial services, human capital efficiency becomes increasingly important for maintaining competitive advantage.

This study aims to investigate the impact of Human Capital Efficiency (HCE) on the financial performance of Saudi banks during the period 2015–2024. Financial performance is measured using key accounting indicators, including Return on Assets (ROA), Return on Equity (ROE), and Earnings per Share (EPS). The study also incorporates control variables commonly used in banking performance research, including bank size, leverage, liquidity, and capital adequacy ratio (CAR). By applying quantitative analysis to Saudi listed banks, the study seeks to determine whether efficient utilization of human capital contributes significantly to improved financial outcomes.

The findings of this research are expected to provide important implications for several stakeholders. For bank managers, the study highlights the importance of investing in employee

development, training, knowledge management, and talent retention strategies. For policymakers and regulators, the results may support initiatives aimed at strengthening human capital development within the financial sector. For researchers, the study contributes to the growing literature on intellectual capital and financial performance by providing evidence from the Saudi banking environment.

In summary, as banking activities become increasingly knowledge-driven, human capital efficiency represents a critical factor influencing banks' ability to create sustainable value. Understanding the relationship between HCE and financial performance provides valuable insights into whether investments in employees translate into measurable financial benefits. This research therefore contributes to the broader discussion of intellectual capital management and its role in enhancing the competitiveness and profitability of Saudi banks.

## 2. Research Problem

Saudi banks invest substantial resources in employee training, compensation, and talent development. However, it remains unclear whether these investments effectively improve financial performance.

The study addresses the following question:

Does Human Capital Efficiency significantly improve the financial performance of Saudi commercial banks?

## 3. Research Objectives

1. To examine the impact of human capital efficiency on the financial performance of Saudi banks.
2. To measure human capital efficiency using the VAIC methodology.
3. To investigate whether banks with higher human capital efficiency achieve superior profitability.
4. To analyze the relationship between human capital efficiency and market performance.
5. To provide recommendations for enhancing bank performance through investments in human capital.
6. Examine the relationship between HCE and ROA.
7. Examine the relationship between HCE and ROE.
8. Examine the relationship between HCE and EPS.
9. Provide recommendations for improving human capital investment.

## 4. Literature Review

Although previous studies have investigated intellectual capital and financial performance relationships in various countries, limited empirical evidence exists regarding the specific impact of Human Capital Efficiency on the financial performance of Saudi banks, particularly using a longitudinal dataset covering multiple years. Saudi banks operate within a unique regulatory, economic, and cultural environment, which may influence the effectiveness of human capital utilization. Therefore, examining Saudi banks provides an opportunity to extend the existing intellectual capital literature and contribute evidence from an emerging financial market.

The relationship between human capital efficiency and financial performance is mainly supported by the Resource-Based View (RBV) proposed by Wernerfelt (1984) and developed by Barney (1991). RBV argues that firms achieve sustainable competitive advantages through resources that are valuable, rare, difficult to imitate, and non-substitutable.

Recent banking studies continue to apply RBV theory to explain why intellectual capital contributes to superior performance. For example, Sayed and Nefzi (2024) examined Saudi banks and found that intellectual capital components, including human capital efficiency, provide important explanations for differences in sustainable banking performance.

The most widely used approach for measuring intellectual capital efficiency is the Value Added Intellectual Coefficient (VAIC™) model developed by Pulic (2000). Unlike traditional accounting measures that focus mainly on tangible assets, VAIC evaluates how efficiently organizations create value through intellectual and physical resources.

Recent empirical studies continue to use VAIC because it provides a measurable framework for examining the contribution of intellectual resources to financial performance. A 2025 meta-analysis of

intellectual capital studies in Islamic banks confirmed that intellectual capital components, including human capital, have significant relationships with financial performance indicators such as ROA, ROE, and market performance.

Chen, Cheng, and Hwang (2005) found that intellectual capital efficiency positively affects firms' market value and financial performance. Their findings suggest that organizations capable of transforming knowledge resources into economic value achieve better financial outcomes.

Firer and Williams (2003) examined intellectual capital efficiency and traditional performance measures and concluded that intangible resources contribute significantly to organizational competitiveness.

In the banking sector, Goh (2005) provided evidence that intellectual capital efficiency is an important determinant of commercial bank performance. The study emphasized that banks rely heavily on employee knowledge because banking services are primarily knowledge-intensive activities.

More recent evidence from Islamic banking institutions also confirms the importance of human capital efficiency. A study covering 129 Islamic banks across 29 Muslim countries found that intellectual capital efficiency components, including HCE, are associated with improved bank performance measured by ROA, ROE, and market indicators.

Al-Musali and Ismail (2014) conducted one of the early studies examining intellectual capital and financial performance in Saudi banks. Using the VAIC model, the study investigated listed Saudi banks during 2008–2010 and found that intellectual capital efficiency was positively associated with financial performance indicators. However, the effect differed among intellectual capital components.

More recently, Chiad (2022) examined the impact of intellectual capital investment on Saudi banks' financial performance using the VAIC methodology. The study reported significant relationships between intellectual capital components and banking performance, indicating that intellectual resources contribute to financial success.

A more recent study by Sayed and Nefzi (2024) investigated ten Saudi banks during 2012–2022 and analyzed the impact of intellectual capital components (HCE, SCE, and CEE) on sustainable performance indicators, including ROE and net profit margin. The study applied panel data techniques and concluded that intellectual capital represents an important determinant of Saudi banks' sustainable performance.

In the banking industry, intellectual capital has received considerable attention because banks operate primarily through knowledge-based activities, including financial analysis, customer services, digital banking, compliance management, and investment decisions. Research conducted by Chen et al. (2005) found that intellectual capital efficiency significantly contributes to corporate performance and market value. Furthermore, Firer and Williams (2003) examined the relationship between intellectual capital efficiency and business performance and found that efficient utilization of intellectual resources enhances organizational outcomes. In the banking sector specifically, Goh (2005) found that intellectual capital efficiency is an important determinant of financial performance among Malaysian commercial banks, highlighting the importance of employee capabilities and knowledge management.

Buallay (2019) examined the relationship between intellectual capital efficiency and the performance of Islamic and conventional banks in the Gulf Cooperation Council (GCC) countries. The study was motivated by the increasing importance of intellectual capital in knowledge-intensive industries, particularly banking, where human resources, customer relationships, organizational systems, knowledge, and processes constitute important sources of value creation. Since banks rely heavily on knowledge and employee capabilities to provide financial services, the study emphasized that effective management of intellectual capital can play an important role in improving banking performance.

Mondal and Ghosh (2012) examined the relationship between intellectual capital and the financial performance of Indian banks, emphasizing the growing importance of intangible resources in the banking sector. The study investigated 65 Indian banks over a ten-year period from 1999 to 2008, using data obtained primarily from the Reserve Bank of India database and banks' annual reports, including income statements and balance sheets. To measure intellectual capital efficiency, the authors employed the Value Added Intellectual Coefficient (VAIC™) methodology developed by Pulic. The VAIC framework enables researchers to evaluate how efficiently organizations utilize their intellectual and physical resources to create value. The study considered the major components of intellectual capital, particularly human capital and structural capital, together with physical capital. Financial performance was assessed using return on assets (ROA).

Xu and Liu (2020) investigated the impact of intellectual capital on firm performance by developing a modified and extended version of the Value Added Intellectual Coefficient (VAIC) model. The empirical analysis focused on 415 manufacturing firms listed on the Korea Stock Exchange, covering the period from 2013 to 2018, resulting in 2,490 firm-year observations. The findings provide particularly important evidence concerning human capital efficiency (HCE). Xu and Liu (2020) found that human capital efficiency was positively and significantly associated with both ROA and ROE. This indicates that firms that use their human resources more efficiently are likely to achieve higher profitability. The authors interpreted this finding as evidence that employee-related expenditures should be viewed as investments capable of generating economic value rather than merely as operating expenses. Their results therefore reinforce the argument that employees' knowledge, skills, expertise, and capabilities constitute important strategic resources that can enhance organizational performance.

## 5. Theoretical Framework

The theoretical framework provides the conceptual foundation for understanding how Human Capital Efficiency (HCE) influences the financial performance of Saudi banks. In modern knowledge-based economies, traditional financial resources alone are insufficient to explain differences in organizational performance. Increasingly, intangible resources, particularly employees' knowledge, skills, experience, innovation capability, and managerial expertise, are recognized as critical sources of competitive advantage and value creation.

The banking industry is particularly dependent on human capital because banking services are knowledge-intensive and require employees to perform complex activities such as credit evaluation, financial analysis, risk management, regulatory compliance, customer relationship management, and digital banking operations. Therefore, the efficiency with which banks utilize human capital may significantly affect their ability to generate profits and achieve sustainable financial performance.

There are three primarily grounded complementary theories used in such research:

1. Resource-Based View (RBV) Theory
2. Knowledge-Based View (KBV) Theory
3. Intellectual Capital Theory and the VAIC™ Model

These theoretical perspectives explain why human capital efficiency can influence financial performance and provide the foundation for developing the research hypotheses.

### 1. Resource-Based View (RBV) Theory

The Resource-Based View (RBV) introduced by Wernerfelt (1984) and further developed by Barney (1991) is one of the most influential theories explaining the relationship between organizational resources and competitive advantage.

RBV argues that firms achieve superior performance when they possess and effectively utilize resources that are:

1. Valuable – resources that enable firms to improve efficiency and exploit opportunities.
2. Rare – resources that are not widely possessed by competitors.
3. Difficult to imitate – resources that competitors cannot easily replicate.
4. Non-substitutable – resources that cannot be replaced by alternative resources.

From an RBV perspective, human capital represents a strategic resource because employees possess unique knowledge, skills, experience, creativity, and problem-solving abilities. Unlike physical assets, human capabilities are difficult for competitors to duplicate because they develop through education, training, organizational experience, and continuous learning.

In the banking sector, human capital provides competitive advantages through:

- Better credit and investment decisions.
- Improved risk management practices.
- Enhanced customer service quality.
- Innovation in financial products.

- Effective adoption of digital banking technologies.

Therefore, banks that efficiently utilize their human resources are expected to achieve higher profitability and financial performance.

According to RBV theory, Saudi banks with higher Human Capital Efficiency (HCE) should generate greater value from employee investments, resulting in improved financial performance measured by:

- Return on Assets (ROA)
- Return on Equity (ROE)
- Earnings Per Share (EPS)

Thus, RBV provides the theoretical justification for examining the relationship between HCE and bank performance.

## **2. Knowledge-Based View (KBV) Theory**

The Knowledge-Based View (KBV) extends RBV theory by emphasizing knowledge as the most important strategic resource of modern organizations. Grant (1996) argues that firms exist as knowledge-integrating institutions where employees' knowledge and expertise determine organizational capabilities. In knowledge-intensive industries such as banking, competitive advantage depends largely on the ability to acquire, develop, share, and apply knowledge effectively.

Banks rely heavily on knowledge resources because employees are responsible for:

- Analyzing financial information.
- Assessing borrowers' creditworthiness.
- Managing financial risks.
- Developing innovative banking services.
- Implementing technological solutions.

The KBV suggests that organizations that effectively transform employee knowledge into value creation will achieve superior performance.

Saudi Arabia's banking sector has experienced significant transformation due to:

- Saudi Vision 2030.
- Digital banking expansion.
- FinTech development.
- Artificial intelligence adoption.
- Increased competition among banks.

These developments require employees with advanced financial, technological, and analytical capabilities. Therefore, efficient utilization of human knowledge becomes a key determinant of banking success.

## **2.1 Intellectual Capital Theory**

The concept of Intellectual Capital (IC) provides another important theoretical foundation for this research. Intellectual capital refers to the intangible knowledge-based resources that contribute to organizational value creation.

According to Edvinsson and Malone (1997) and Stewart (1997), intellectual capital consists of three major components:

### **2.1.1 Human Capital**

Human capital represents:

- Employees' knowledge.
- Professional skills.
- Education.
- Experience.

- Creativity.
- Innovation capabilities.

Human capital is considered the foundation of intellectual capital because employees create, develop, and utilize organizational knowledge.

### 2.1.2 Structural Capital

Structural capital refers to organizational systems and processes that support employees' productivity, including:

- Information systems.
- Organizational procedures.
- Databases.
- Management systems.

### 2.1.3 Relational Capital

Relational capital represents the value derived from relationships with external stakeholders, including:

- Customers.
- Suppliers.
- Business partners.
- Regulatory institutions.

Among these components, human capital is particularly important in banking because employees directly influence service quality, customer relationships, and financial decision-making.

## 3. Value Added Intellectual Coefficient (VAIC™) Model

To operationalize intellectual capital efficiency, this study adopts the Value Added Intellectual Coefficient (VAIC™) model developed by Pulic (2000).

The VAIC model measures how efficiently organizations create value through their resources. It consists of three components:

$$VAIC = HCE + SCE + CEE$$

Where:

- HCE = Human Capital Efficiency
- SCE = Structural Capital Efficiency
- CEE = Capital Employed Efficiency

This research focuses specifically on Human Capital Efficiency (HCE).  
Human Capital Efficiency is calculated as:

$$HCE = VA / HC$$

Where:

- VA = Value Added created by the bank
- HC = Human Capital investment (employee expenses)

A higher HCE indicates that a bank generates greater economic value from its investment in employees.

For example, two banks may have similar asset sizes and capital structures, but the bank with better employee productivity, knowledge utilization, and managerial capabilities may achieve higher profitability. Therefore, HCE provides an explanation for differences in financial performance beyond traditional financial indicators.

## 6. Research Methodology

### 6.1 Research Design

This study adopts a quantitative explanatory research design to examine the effect of Human Capital Efficiency (HCE) on the financial performance of Saudi listed commercial banks. A longitudinal panel-data approach is employed because it enables the analysis of both cross-sectional (banks) and time-series (years) variations while controlling for unobservable bank-specific heterogeneity.

The study investigates whether banks that utilize their human capital more efficiently achieve superior financial performance after controlling for bank-specific characteristics.

### 6.2 Population and Sample

The population comprises all commercial banks listed on the Saudi Exchange (Tadawul).

The sample consists of all Saudi listed commercial banks with continuous financial data during 2015–2024.

| Item               | Description                          |
|--------------------|--------------------------------------|
| Population         | Saudi listed commercial banks        |
| Sample             | 10 commercial banks                  |
| Study period       | 2015–2024                            |
| Total observations | 100 bank-year observations (10 × 10) |
| Sampling technique | Census sampling                      |

Using the full population eliminates sampling bias and improves the generalizability of the findings within the Saudi banking sector.

### 6.3 Data Sources

The study relies exclusively on secondary data collected from audited financial statements and official financial databases.

Primary sources include:

- Annual Reports of Saudi listed banks
- Tadawul
- Saudi Central Bank (SAMA)

Using audited financial statements enhances the reliability and validity of the dataset.

### 6.4 Variables Measurement

Measured using Pulic's (2000) VAIC methodology.

| Variable Type | Variable                       | Measurement                                                 |
|---------------|--------------------------------|-------------------------------------------------------------|
| Independent   | Human Capital Efficiency (HCE) | VAIC Human Capital Efficiency = Value Added ÷ Human Capital |
| Dependent     | ROA                            | Net Income / Total Assets                                   |
| Dependent     | ROE                            | Net Income / Shareholders' Equity                           |
| Dependent     | EPS                            | Net Income / Outstanding Shares                             |
| Control       | Bank Size                      | Natural Log of Total Assets                                 |
| Control       | Capital Adequacy               | Capital Adequacy Ratio (CAR)                                |
| Control       | Liquidity                      | Loans-to-Deposits Ratio or Liquid Assets Ratio              |
| Control       | Leverage                       | Total Liabilities / Total Assets                            |

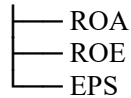
### 6.5 Conceptual Framework

The theoretical framework suggests the following relationship:

Human Capital Efficiency (HCE)



Financial Performance



Control variables affecting financial performance:

- Bank Size
- Capital Adequacy
- Liquidity
- Leverage

The proposed model:

$$\text{Financial Performance}_{it} = \beta_0 + \beta_1 \text{HCE}_{it} + \beta_2 \text{SIZE}_{it} + \beta_3 \text{LEV}_{it} + \beta_4 \text{LIQ}_{it} + \beta_5 \text{CAR}_{it} + \epsilon_{it}$$

Where:

- $i$  represents the bank.
- $t$  represents the year.
- Financial performance is measured by ROA, ROE, and EPS.

### 6.6 Econometric Model

Three separate panel regressions are estimated.

Model 1

$$\text{ROA}_{it} = \beta_0 + \beta_1 \text{HCE}_{it} + \beta_2 \text{SIZE}_{it} + \beta_3 \text{LEV}_{it} + \beta_4 \text{LIQ}_{it} + \beta_5 \text{CAR}_{it} + \epsilon_{it}$$

Model 2

$$\text{ROE}_{it} = \beta_0 + \beta_1 \text{HCE}_{it} + \beta_2 \text{SIZE}_{it} + \beta_3 \text{LEV}_{it} + \beta_4 \text{LIQ}_{it} + \beta_5 \text{CAR}_{it} + \epsilon_{it}$$

Model 3

$$\text{EPS}_{it} = \beta_0 + \beta_1 \text{HCE}_{it} + \beta_2 \text{SIZE}_{it} + \beta_3 \text{LEV}_{it} + \beta_4 \text{LIQ}_{it} + \beta_5 \text{CAR}_{it} + \epsilon_{it}$$

where:

- $i$  denotes the bank
- $t$  denotes the year
- $\epsilon$  is the disturbance term.

### 6.7 Data Analysis Procedure

The empirical analysis should follow these steps:

Step 1

Descriptive Statistics

Step 2

Correlation Matrix

Pearson correlation coefficients are estimated to examine the preliminary relationships among variables.

## Research Hypotheses Development

Based on the theoretical arguments:

Hypothesis 1:

HCE has a positive and significant impact on Return on Assets (ROA) of Saudi banks.

Justification:

According to RBV and VAIC theory, efficient utilization of human resources improves productivity and profitability.

Hypothesis 2:

HCE has a positive and significant impact on Return on Equity (ROE) of Saudi banks.

Justification:

Banks that generate higher value from employee capabilities are expected to achieve better returns for shareholders.

Hypothesis 3:

HCE has a positive and significant impact on Earnings Per Share (EPS) of Saudi banks.

Justification:

Higher human capital efficiency contributes to improved earnings generation and shareholder value.

## Summary of Theoretical Framework

The theoretical framework of this study integrates RBV theory, KBV theory, Intellectual Capital Theory, and the VAIC™ model to explain how human capital efficiency affects financial performance in Saudi banks.

The central argument is that human capital represents a strategic knowledge-based resource that enables banks to create value, improve efficiency, enhance innovation, and achieve superior financial outcomes. Therefore, banks that effectively transform employee knowledge and capabilities into economic value are expected to demonstrate stronger financial performance.

## Contribution

Theoretical Contribution

- Extends intellectual capital research in emerging markets.
- Strengthens Resource-Based View and Human Capital Theory in the Saudi banking context.

Practical Contribution

- Assists bank managers in optimizing investments in employee development.
- Provides evidence for policymakers supporting Saudi Vision 2030 initiatives focused on human capital.

### Saudi listed banks to include:

| No. | Bank                                                              |
|-----|-------------------------------------------------------------------|
| 1   | Al Rajhi Bank                                                     |
| 2   | Saudi National Bank (SNB) (NCB before the 2021 merger with Samba) |
| 3   | Riyad Bank                                                        |
| 4   | Saudi Awwal Bank (SAB)                                            |
| 5   | Banque Saudi Fransi (BSF)                                         |
| 6   | Arab National Bank (ANB)                                          |
| 7   | Bank Albilad                                                      |
| 8   | Bank AlJazira                                                     |
| 9   | Alinma Bank                                                       |
| 10  | Saudi Investment Bank (SAIB)                                      |

## 7. Results and Findings

### 7.1 All Banks Averages

| Year/All Banks Averages | ROA (%) | ROE (%) | EPS   | HCE   | SIZE = ln(Total Assets) | LEV (Liabilities / Assets) | LIQ (LDR %) | Total CAR (%) |
|-------------------------|---------|---------|-------|-------|-------------------------|----------------------------|-------------|---------------|
| 2015                    | 1.587   | 12.385  | 1.907 | 3.346 | 11.913                  | 0.8887                     | 41.993      | 18.11         |
| 2016                    | 1.540   | 12.376  | 1.890 | 3.396 | 11.951                  | 0.8879                     | 42.694      | 18.41         |
| 2017                    | 1.524   | 11.884  | 1.811 | 3.380 | 11.991                  | 0.8869                     | 43.469      | 18.63         |
| 2018                    | 1.678   | 12.901  | 2.030 | 3.493 | 12.052                  | 0.8858                     | 44.181      | 18.45         |
| 2019                    | 1.624   | 11.140  | 1.946 | 3.531 | 12.160                  | 0.8834                     | 45.193      | 18.66         |
| 2020                    | 1.346   | 10.414  | 1.627 | 3.530 | 12.239                  | 0.8822                     | 44.551      | 19.21         |
| 2021                    | 1.538   | 11.174  | 1.731 | 3.721 | 12.359                  | 0.8791                     | 44.445      | 19.01         |
| 2022                    | 1.765   | 13.449  | 2.220 | 4.000 | 11.309                  | 0.8776                     | 45.187      | 18.97         |
| 2023                    | 1.808   | 13.519  | 2.495 | 4.138 | 12.571                  | 0.8692                     | 45.651      | 19.47         |
| 2024                    | 1.808   | 14.905  | 2.861 | 4.260 | 12.690                  | 0.8605                     | 47.125      | 18.77         |

Note: These statistics are based on 10 annual average observations, not a panel dataset of individual banks. Therefore, they should be interpreted as an exploratory regression analysis rather than panel-data evidence. The preferred approach is to estimate the relationship using the complete banks-level panel (e.g., 10 banks  $\times$  10 years = 100 observations).

### 7.2 Return on Assets (ROA) and Human Capital Efficiency (HCE)

#### Regression Statistics

The estimated model is:  $ROA = 0.4207 + 0.3264 \times HCE$

#### Regression Results

| Statistic                              | Value   |
|----------------------------------------|---------|
| Number of observations (N)             | 10      |
| Dependent variable                     | ROA (%) |
| Independent variable                   | HCE     |
| Correlation coefficient (R)            | 0.746   |
| Coefficient of determination ( $R^2$ ) | 0.557   |
| Adjusted $R^2$                         | 0.501   |
| Intercept ( $\alpha$ )                 | 0.421   |
| HCE coefficient ( $\beta$ )            | 0.326   |
| Standard error of $\beta$              | 0.103   |
| t-statistic                            | 3.17    |
| p-value                                | 0.013   |

#### Interpretation

- HCE has a positive effect on ROA.
- The relationship is statistically significant at the 5% level ( $p = 0.013 < 0.05$ ).
- The coefficient ( $\beta = 0.326$ ) indicates that a one-unit increase in Human Capital Efficiency (HCE) is associated with an average increase of approximately 0.326 percentage points in ROA.
- The model explains approximately 55.7% of the variation in ROA ( $R^2 = 0.557$ ), indicating a moderately strong relationship.

#### Regression Equation

$$ROA = 0.4207 + 0.3264(HCE)$$

#### Interpretation

The regression analysis reveals a positive and statistically significant relationship between Human Capital Efficiency (HCE) and Return on Assets (ROA). The estimated coefficient ( $\beta = 0.326$ ,  $p = 0.013$ ) indicates

that improvements in human capital efficiency are associated with higher profitability. The model explains 55.7% of the variation in ROA ( $R^2 = 0.557$ ), while the significant F-statistic ( $F = 10.04$ ,  $p = 0.013$ ) confirms the overall explanatory power of the regression model. These findings support the hypothesis that efficient utilization of human capital contributes positively to the financial performance of Saudi banks.

Using the 10 annual average observations (2015–2024), the relationship between Return on Assets (ROA) and Human Capital Efficiency (HCE) can be examined using a simple linear regression. The ANOVA table tests whether the regression model is statistically significant.

#### Model Summary

| Statistic                              | Value |
|----------------------------------------|-------|
| Number of observations (N)             | 10    |
| Correlation coefficient (R)            | 0.746 |
| Coefficient of determination ( $R^2$ ) | 0.557 |
| Adjusted $R^2$                         | 0.501 |
| Standard Error of the Estimate         | 0.144 |

#### ANOVA

| Source     | Sum of Squares | df | Mean Square | F     | Sig. (p-value) |
|------------|----------------|----|-------------|-------|----------------|
| Regression | 0.207          | 1  | 0.207       | 10.04 | 0.013          |
| Residual   | 0.165          | 8  | 0.021       |       |                |
| Total      | 0.372          | 9  |             |       |                |

#### Coefficients

| Variable | Coefficient (B) | Std. Error | t    | Sig.  |
|----------|-----------------|------------|------|-------|
| Constant | 0.421           | 0.378      | 1.11 | 0.299 |
| HCE      | 0.326           | 0.103      | 3.17 | 0.013 |

#### Interpretation

- The coefficient for HCE is positive and statistically significant ( $\beta = 0.326$ ,  $p = 0.013$ ).
- This indicates that a one-unit increase in HCE is associated with an average increase of approximately 0.326 percentage points in ROA.
- The ANOVA F-statistic ( $F = 10.04$ ) is statistically significant ( $p = 0.013$ ), indicating that the regression model provides a significantly better fit than a model with no explanatory variable.
- The coefficient of determination ( $R^2 = 0.557$ ) indicates that 55.7% of the variation in ROA is explained by HCE.

#### 7.3 Return on Equity (ROE) and Human Capital Efficiency (HCE)

Using the 10 annual average observations (2015–2024), the statistical relationship between Return on Equity (ROE) and Human Capital Efficiency (HCE) can be estimated using a simple linear regression.

Estimated Regression Model:  $ROE = 2.201 + 2.776 \times HCE$

#### Regression Results

| Statistic                              | Value   |
|----------------------------------------|---------|
| Number of observations (N)             | 10      |
| Dependent variable                     | ROE (%) |
| Independent variable                   | HCE     |
| Correlation coefficient (R)            | 0.694   |
| Coefficient of determination ( $R^2$ ) | 0.482   |
| Adjusted $R^2$                         | 0.417   |
| Intercept ( $\alpha$ )                 | 2.201   |
| HCE coefficient ( $\beta$ )            | 2.776   |
| Standard error of $\beta$              | 1.017   |
| p-value                                | 0.026   |

**Interpretation**

- The coefficient of HCE ( $\beta = 2.776$ ) is positive, indicating that increases in Human Capital Efficiency are associated with higher Return on Equity.
- The relationship is statistically significant at the 5% level ( $p = 0.026 < 0.05$ ).
- The  $R^2$  value of 0.482 indicates that approximately 48.2% of the variation in ROE is explained by HCE.
- The correlation coefficient ( $R = 0.694$ ) indicates a moderately strong positive relationship between HCE and ROE.

**Interpretation**

The regression analysis indicates a positive and statistically significant relationship between Human Capital Efficiency (HCE) and Return on Equity (ROE) among Saudi banks during the study period. The estimated coefficient for HCE ( $\beta = 2.776$ ,  $p = 0.026$ ) suggests that a one-unit increase in HCE is associated with an average increase of approximately 2.78 percentage points in ROE. Furthermore, the coefficient of determination ( $R^2 = 0.482$ ) shows that HCE explains about 48.2% of the variation in ROE. These findings support the proposition that more efficient utilization of human capital contributes to improved shareholder returns.

**Model Summary**

| Statistic                              | Value |
|----------------------------------------|-------|
| Number of observations (N)             | 10    |
| Correlation coefficient (R)            | 0.694 |
| Coefficient of determination ( $R^2$ ) | 0.482 |
| Adjusted $R^2$                         | 0.417 |
| Standard Error of Estimate             | 1.14  |

**ANOVA Table**

| Source     | Sum of Squares | df | Mean Square | F    | Sig. (p-value) |
|------------|----------------|----|-------------|------|----------------|
| Regression | 8.99           | 1  | 8.99        | 7.45 | 0.026          |
| Residual   | 9.65           | 8  | 1.21        |      |                |
| Total      | 18.64          | 9  |             |      |                |

**Coefficients**

| Variable | Coefficient (B) | Std. Error | t    | Sig.  |
|----------|-----------------|------------|------|-------|
| Constant | 2.201           | 3.59       | 0.61 | 0.560 |
| HCE      | 2.776           | 1.017      | 2.73 | 0.026 |

**Interpretation**

- HCE has a positive and statistically significant effect on ROE.
- The regression coefficient ( $\beta = 2.776$ ) indicates that a one-unit increase in HCE is associated with an average increase of approximately 2.776 percentage points in ROE.
- The ANOVA F-statistic ( $F = 7.45$ ) is statistically significant ( $p = 0.026 < 0.05$ ), indicating that the regression model provides a significantly better fit than a model with no predictor.
- The  $R^2$  value of 0.482 indicates that approximately 48.2% of the variation in ROE is explained by HCE.

**7.4 Earnings per Share (EPS) and Human Capital Efficiency (HCE)**

Using the 10 annual average observations (2015–2024), the statistical relationship between Earnings per Share (EPS) and Human Capital Efficiency (HCE) can be estimated using a simple linear regression model.

Estimated Regression Model:  $EPS = -1.615 + 0.962 \times HCE$

**Regression Results**

| Statistic                              | Value  |
|----------------------------------------|--------|
| Number of observations (N)             | 10     |
| Dependent Variable                     | EPS    |
| Independent Variable                   | HCE    |
| Correlation coefficient (R)            | 0.878  |
| Coefficient of determination ( $R^2$ ) | 0.771  |
| Adjusted $R^2$                         | 0.742  |
| Intercept ( $\alpha$ )                 | -1.615 |
| HCE coefficient ( $\beta$ )            | 0.962  |
| Standard error of $\beta$              | 0.203  |
| t-statistic                            | 4.74   |
| p-value                                | 0.0016 |

**Interpretation**

- The estimated coefficient for HCE ( $\beta = 0.962$ ) is positive, indicating that greater Human Capital Efficiency is associated with higher Earnings per Share.
- The relationship is highly statistically significant ( $p = 0.0016 < 0.01$ ).
- The coefficient of determination ( $R^2 = 0.771$ ) indicates that 77.1% of the variation in EPS is explained by HCE.
- The correlation coefficient ( $R = 0.878$ ) indicates a strong positive relationship between HCE and EPS.

**Interpretation**

The regression analysis demonstrates a strong and statistically significant positive relationship between Human Capital Efficiency (HCE) and Earnings per Share (EPS) among Saudi banks over the study period. The estimated regression coefficient ( $\beta = 0.962$ ,  $p = 0.0016$ ) indicates that a one-unit increase in HCE is associated with an average increase of approximately 0.962 in EPS. Furthermore, the coefficient of determination ( $R^2 = 0.771$ ) suggests that HCE explains 77.1% of the variation in EPS. These findings provide empirical support for the view that efficient utilization of human capital enhances shareholder value by improving banks' earnings performance.

Using the 10 annual average observations (2015–2024), the relationship between Earnings per Share (EPS) and Human Capital Efficiency (HCE) can be analyzed using a simple linear regression. The ANOVA table evaluates whether the regression model is statistically significant.

**Model Summary**

| Statistic                              | Value |
|----------------------------------------|-------|
| Number of observations (N)             | 10    |
| Correlation coefficient (R)            | 0.878 |
| Coefficient of determination ( $R^2$ ) | 0.771 |
| Adjusted $R^2$                         | 0.742 |
| Standard Error of the Estimate         | 0.219 |

**ANOVA**

| Source     | Sum of Squares | df | Mean Square | F     | Sig. (p-value) |
|------------|----------------|----|-------------|-------|----------------|
| Regression | 1.082          | 1  | 1.082       | 22.47 | 0.0016         |
| Residual   | 0.385          | 8  | 0.048       |       |                |
| Total      | 1.467          | 9  |             |       |                |

**Coefficients**

| Variable | Coefficient (B) | Std. Error | t     | Sig.   |
|----------|-----------------|------------|-------|--------|
| Constant | -1.615          | 0.767      | -2.11 | 0.068  |
| HCE      | 0.962           | 0.203      | 4.74  | 0.0016 |

### Interpretation

- The coefficient for HCE is positive and highly statistically significant ( $\beta = 0.962$ ,  $p = 0.0016$ ).
- A one-unit increase in Human Capital Efficiency (HCE) is associated with an average increase of approximately 0.962 in Earnings per Share.
- The ANOVA F-statistic ( $F = 22.47$ ) is statistically significant ( $p = 0.0016$ ), indicating that the regression model provides a significantly better fit than a model with no explanatory variable.
- The coefficient of determination ( $R^2 = 0.771$ ) indicates that 77.1% of the variation in EPS is explained by HCE.

### Simple Regressions Results

There are three separate simple regressions, each with HCE as the only predictor:

| Dependent variable | R     | R <sup>2</sup> | F     | p-value | Relationship                 |
|--------------------|-------|----------------|-------|---------|------------------------------|
| ROA                | 0.746 | 0.557          | 10.04 | 0.013   | Positive, significant        |
| ROE                | 0.694 | 0.482          | 7.45  | 0.026   | Positive, significant        |
| EPS                | 0.878 | 0.771          | 22.47 | 0.0016  | Positive, highly significant |

These analyses are statistically reasonable for a sample of 10 observations.

## 8. Conclusion

The regression results reveal a positive and statistically significant relationship between Human Capital Efficiency (HCE) and Return on Assets (ROA). The estimated coefficient for HCE suggests that improvements in human capital efficiency lead to higher profitability among Saudi banks. The coefficient of determination of the variation in ROA is explained by HCE. These findings support the Resource-Based View (RBV) and Human Capital Theory, which argue that efficient utilization of human capital contributes significantly to organizational performance.

The ANOVA results indicate that the overall regression model is statistically significant ( $F = 10.04$ ,  $p = 0.013$ ). The estimated coefficient for HCE ( $\beta = 0.326$ ,  $p = 0.013$ ) suggests that improvements in human capital efficiency are associated with higher profitability. Furthermore, the model explains approximately 55.7% of the variation in ROA ( $R^2 = 0.557$ ), indicating that HCE is an important explanatory factor for financial performance in the aggregated sample.

The simple linear regression analysis indicates a positive and statistically significant relationship between Human Capital Efficiency (HCE) and Return on Equity (ROE). The ANOVA results show that the overall regression model is statistically significant ( $F = 7.45$ ,  $p = 0.026$ ), supporting the hypothesis that HCE contributes to explaining variations in ROE. Furthermore, the regression coefficient for HCE ( $\beta = 2.776$ ,  $p = 0.026$ ) suggests that improvements in human capital efficiency are associated with higher shareholder returns. The coefficient of determination ( $R^2 = 0.482$ ) indicates that HCE explains approximately 48.2% of the variation in ROE during the study period.

The regression analysis demonstrates a strong positive and statistically significant relationship between Human Capital Efficiency (HCE) and Earnings per Share (EPS). The ANOVA results confirm that the overall regression model is statistically significant ( $F = 22.47$ ,  $p = 0.0016$ ). The estimated regression coefficient for HCE ( $\beta = 0.962$ ,  $p = 0.0016$ ) indicates that improvements in human capital efficiency are associated with higher earnings per share. Furthermore, the model explains approximately 77.1% of the variation in EPS ( $R^2 = 0.771$ ), suggesting that HCE is an important determinant of shareholder earnings in the aggregated sample.

These results are based on 10 annual average observations. They are suitable as an exploratory regression analysis but should not be presented as panel regression results. A full panel dataset (bank-by-year observations) would provide more robust and publishable estimates.

## References

- Al-Musali, M. A., & Ismail, K. N. I. (2014). Intellectual capital and its effect on financial performance of banks: Evidence from Saudi Arabia. *Procedia – Social and Behavioral Sciences*, 164, 201–207.
- Barney, J. (1991). Firm resources and sustained competitive advantage. *Journal of Management*, 17(1), 99–120.
- Bontis, N. (1998). Intellectual capital: An exploratory study that develops measures and models. *Management Decision*, 36(2), 63–76.
- Buallay, A. (2019). Intellectual capital and performance of Islamic and conventional banking. *Journal of Management Development*, 38(7), 518–537.
- Chen, M. C., Cheng, S. J., & Hwang, Y. (2005). An empirical investigation of the relationship between intellectual capital and firms' market value and financial performance. *Journal of Intellectual Capital*, 6(2), 159–176.
- Chiad, F. (2022). The impact of intellectual capital investment on the financial performance of Saudi banks. *La Revue des Sciences Commerciales*, 21(1), 240–260.
- Edvinsson, L., & Malone, M. S. (1997). *Intellectual Capital: Realizing Your Company's True Value by Finding Its Hidden Brainpower*. New York: Harper Business.
- Firer, S., & Williams, S. M. (2003). Intellectual capital and traditional measures of corporate performance. *Journal of Intellectual Capital*, 4(3), 348–360.
- Goh, P. C. (2005). Intellectual capital performance of commercial banks in Malaysia. *Journal of Intellectual Capital*, 6(3), 385–396.
- Grant, R. M. (1996). Toward a knowledge-based theory of the firm. *Strategic Management Journal*, 17(Special Issue), 109–122.
- Mondal, A., & Ghosh, S. K. (2012). Intellectual capital and financial performance of Indian banks. *Journal of Intellectual Capital*, 13(4), 515–530.
- Pulic, A. (2000). VAIC™ – An accounting tool for IC management. *International Journal of Technology Management*, 20(5–8), 702–714.
- Saudi Commercial Banks. *Annual Reports* (2015–2024).
- Sayed, O. A., & Nefzi, A. (2024). The impact of intellectual capital on sustainable performance: Banking sector in Saudi Arabia. *Sustainability*, 16(11), 4528.
- Stewart, T. A. (1997). *Intellectual Capital: The New Wealth of Organizations*. New York: Doubleday.
- Wernerfelt, B. (1984). A resource-based view of the firm. *Strategic Management Journal*, 5(2), 171–180.
- Wernerfelt, B. (1984). A resource-based view of the firm. *Strategic Management Journal*, 5(2), 171–180.
- Xu, J., & Liu, F. (2020). The impact of intellectual capital on firm performance: A modified and extended VAIC model. *Journal of Intellectual Capital*, 21(1), 147–168.

## Notes

2021 represents the first reporting year following the merger of National Commercial Bank (NCB) and Samba Financial Group to form Saudi National Bank (SNB).