Iranian Journal of Finance

Print ISSN 2676-6337
Online ISSN 2676-6345

How Value Added of Intellectual Coefficient affect Iranian Banking Performance (A CAMEL Approach)

Mohammad Pourgholamali

Ph.D Candidate, Department of Economy and Accounting, South Tehran Branch, Islamic Azad University, Tehran, Iran. (Email: Pourgholamali.m@gmail.com)

Mohsen Hamidian*

*Corresponding Author, Assistant Prof., Department of Economy and Accounting, South Tehran Branch, Islamic Azad University, Tehran, Iran. (Email: Hamidian-2002@yahoo.com)

Roya Darabi

Associated Prof., Department of Economy and Accounting, South Tehran Branch, Islamic Azad University, Tehran, Iran. (Email: Royadarabi110@yahoo.com)

Iranian Journal of Finance, 2025, Vol. 9, No.2, pp. 107-125.
Publisher: Iran Finance Association
doi: https://doi.org/10.30699/ijf.2025.475398.1484
Article Type: Original Article

Received: August 26, 2024
Received in revised form: September 29, 2024
Accepted: January 06, 2025
Published online: March 01, 2025

Abstract

Today, numerous studies have investigated the role and effects of intangible assets on companies' performance. The existence of extensive literature regarding the use of intangible assets as a competitive advantage, in addition to

the importance of performance dimensions affected by these assets, is the focus of the attention of various researchers. Regarding examining the performance dimensions of banks, the CAMEL model can be a suitable basis for evaluating the effects of intellectual capital. Although there are many models for calculating intellectual capital, the added value of the intellectual coefficient is still one of the most common methods. Therefore, in the current research, the effects of intellectual capital (based on the calculation model of the coefficient of added value of intellectual capital) on the performance of banks (based on the CAMEL model) have been investigated. Also, the shape of the function (linear or nonlinear) has been investigated in this research. The results show that the value added of the intellectual capital coefficient in the ninth quantile has a significant relationship with the variable of capital adequacy. The form of the relationship is nonlinear and inverted U. This variable affects the quality of assets in the seventh to ninth quantiles, management in the eighth and ninth quantiles, income in the first and second and sixth to ninth quantiles, and liquidity in the first to fourth quantiles. The shape of the function is U, inverse U, and inverse U, respectively.

Keywords: Intellectual Capital, CAMEL, Banking, Intangible Assets, Banking, Performance Management.

Introduction

In the current economy, various actors are present in the financial markets, but the role of banks differs from other institutions. First, banks provide more services compared to other intermediaries (Bhattacharya & Thakor, 1993). Second, banks make deposits and provide direct loans to borrowers, while other financial institutions, such as insurance companies or pension funds, provide facilities by purchasing securities (Matthews & Thompson, 2003). The third and most important factor is that banks mediate funds and allocate resources, which other institutions are responsible for, and provide cash and payment systems. The development of payment gateways and mechanisms gives banks enormous advantages. Porter (1980) argues that industry structure strongly influences the measurement of competitive strategy. Therefore, the purpose of competitive strategy for a company in an industry depends on understanding in what situation the company can compete against five competitive forces (risk of entry of new competitors, risk of entry of potential competitors, bargaining power of buyers, bargaining power of suppliers. Many researchers have tried to define corporate resources. Barney (1991) divides the company's multiple resources into three categories: physical capital resources,

human capital resources, and structural capital resources. Fahy (2000) suggests that resources be divided into three categories: tangible assets, intangible assets, and capabilities. Kamath (2007) argues that banks with more appropriate use of their intangible assets, such as human capital, are more likely to survive. Therefore, he considers intellectual capital one factor that creates an organization's competitive advantage.

Marvridis and Kyrmizoglou (2005) and Reed Lubatkin and Srinivasan (2006, 2009) have suggested that the banking industry examines the effect of intangible assets on its performance. Marvridis and Kyrmizoglou (2005) showed that intangible assets (such as human capital and customers) can create a sustainable competitive advantage for organizations instead of tangible assets.

Some previous studies investigated the relationship between intellectual capital and its effect on risk management indicators such as market risk and specific industry risks (Nguyen et al., 2021). A recent study showed that intellectual capital has a negative effect on specific risks and financial turnover. In addition, another study examined the effect of intellectual capital components (human capital efficiency, structural capital efficiency) on risk management (Ghosh & Maji, 2014). This research showed that intellectual capital has the opposite effect on credit risk. Among the components of intellectual capital, the added value of human capital has a negative effect on credit risk. Nguyen et al. (2021) investigated the relationship between intellectual capital and banks' risk-taking. They used a nonlinear model to investigate the issue in Vietnamese banks. The results showed that the bank's liquidity risk has a positive relationship with the coefficient of added value of intellectual capital and the coefficient of added value of human capital in the upper quantiles.

In contrast, the credit risk (quality of assets) has the opposite condition. Asutay and Ubaidillah (2023) investigated the effect of intellectual capital and its components (human capital, structural capital, and physical capital) on the performance of Islamic banks. The results of the research showed that human capital and physical capital have a significant effect on the profitability of Islamic banks. In contrast, they did not significantly affect the banks' efficiency index. Also, no significant relationship was observed between structural capital and performance indicators (both profitability and efficiency). Barak and Sharma (2024) investigated the effect of intellectual capital on the performance of Indian state-owned banks. The results showed that human capital and structural capital significantly affect asset and equity returns. The

review of studies shows that there are few studies on the relationship between intellectual capital and the risk-oriented performance of banks, and even though the main task of banks is to manage all types of risks, the relationship between this issue and intellectual capital has not been the subject of much research. This indicates the need to examine the relationship between intellectual capital and the risk-oriented performance of banks (Nguyen, Le, and Ho, 2021).

As can be seen, various aspects of banks' performance have been examined in various research. One of the methods that can integrate the dimensions of the investigation of the effects of intellectual capital is the use of the CAMEL model. The CAMELS framework (Capital Adequacy, Asset quality, Management, Earnings, and Liquidity) is a common method for assessing the health of financial institutions. This system was created by the supervisory authorities of American banks (Baral, 2005).

As mentioned, intellectual capital is one factor that creates a competitive advantage in organizations, and it affects banking risks and their performance indicators. Therefore, this article analyzed the effect of the coefficient of added value of intellectual capital (as one of the methods of measuring intellectual capital) on Iranian banking performance (based on CAMEL structure). Also, one of the most important evaluation items is checking the shape of the function (linear or U-shaped) and the point of change in the direction of the function, which has been investigated.

According to previous studies, this article has tried to innovate in the following dimensions.

1. Since the previous research examined some of the banks' performance indicators, the current research examines a set of performance indicators.

2. Considering that the CAMEL model has a risk-oriented view of banks' activities, this method has been used to select the performance indicators of banks to evaluate the effect of intellectual capital on the risk-oriented performance of banks.

3. The shape of the relationship function between intellectual capital and performance is a critical issue investigated in this research.

4. Considering that if the shape of the function is nonlinear, there is the issue of changing the direction of the function; in this research, the point of changing the direction of the function has also been investigated.

Research Methodology

The present study is descriptive in terms of data collection and applied in terms of its purpose. The present study can be considered correlational by examining the relationships between variables. In terms of time, the present study is a post-event study that evaluates past data of independent and dependent variables. The necessary information for the present study was collected from the audited financial statements of banks, which are available to the public through bank websites or the Codal[1] site of the Securities and Exchange Organization of Iran.

This study used the systematic elimination method to select the sample. Initially, all banks whose financial statements are disclosed on the Codal site were identified. Then, their financial statements for the research period (2012 to 2022) were collected. Subsequently, the auditor's report on the financial statements was examined. The financial statement was used if the auditor's report contained an unqualified or qualified opinion. If the auditor's report contained an adverse opinion or disclaimer of opinion on even one financial statement, that bank was excluded from the sample. Data from 12 banks for the period 2012 to 2022 were used in this study.

Accordingly, and considering that bank performance is assessed based on CAMEL components (including capital adequacy, asset quality, management, income, and liquidity), the research questions are as follows:

- Does the value-added of intellectual coefficient significantly impact banks' capital adequacy?
- Does the value-added of intellectual coefficient significantly impact banks' asset quality?
- Does the value-added of intellectual coefficient significantly impact banks' management?
- Does the value-added of the intellectual coefficient significantly impact banks' income?
- Does the value-added of intellectual coefficient significantly impact banks' liquidity?

[1] www.codal.ir

Table 1. Description of Dependent Variables Based on the CAMEL Model

oo .	Vrr bbb mmm	Abbrvvooooo	Cuuuuooooo ee thod
1	Cpp dqq. ccy	C	Cpp dqquccy Roooo dss ooo sdd nn bnnk prr formanee rpporss
2	sss Qutttt y	A	oo n-prr forming Lonns oo To Lonns Roooo
3	aa nggement	M	Cosoooo Inoom Roooo
4	Err nnngs	E	Ruuurn on sss tt s Rtt oo
5	Lqquddty	L	Lonns ooppp ossss Rtt oo

The usage model in the research is taken from Nguyen et al. (2021) and is as follows.

ττ YYit|=====+VVVWWCtt++ττττAAIC2 tt++γγBBit++..... . ogAA+τττtt))))

The above model uses CAMEL components for the dependent variable (Yit). VAIC2 is used to investigate the U-shaped effect, and Bit is the effect of market power. In the above model, the Herfindahl-Hirschman index calculates the asset sector's market power. The Mt index is a macroeconomic indicator that includes the two variables of GDP growth and inflation rate. Another variable used is the logarithm of total assets, which was included as a component of the bank size.

The statistical model of this research is based on the concepts of quantile regression. In this way, the regression line for the dependent variable's quantile iii eeiii eeee aaaaaaiiieea ccccciiffffff ffxaaaaaaaaayvvaaaaaaaaaaaa.....

$$y_i = x_i'\beta_\theta + u_{\theta_i}, \qquad Quant_\theta\left(y_i \mid x_i\right) = x_i'\beta_\theta \tag{2}$$

In the above equation, the conditional quantile (CAMEL components) is determined by the condition (independent variables include value added of intellectual capital coefficient, GDP, inflation rate, Herfindahl-Hirschman index of assets, and the logarithm of assets). In this way, the mechanism of the effect of each of the independent variables on the quantiles of the distribution of the dependent variable in increasing (upper sequence of distribution) and decreasing (lower sequence of distribution) conditions was investigated based on quantile regression (QR).

Results

Table 2 shows the descriptive statistics of the research variables. Given that data from 12 banks over 11 years were used, 132 data points were utilized in the study, and their descriptive statistics are presented in Table 2.

Table 2. Descriptive Statistics of Research Variables

Vrr bbkee	. bbrvvttt oon	bb srr viii ons	nnn im mm	xxx mm mm	aaa n	kkewn sss	uu roo sss	nnnndrr vvv iiii nn
Vuuu ddddd of nrttttttt t ooff feeeen t	VAIC	222	-281.8	29.6	2.1	-0.9	93.5	27.1
Cpp dqqu.. y	C	222	-352.0	77.9	2.2	-7.5	58.5	42.7
sss uu tttt y	A	222	0.0	1.0	0.2	2.2	4.6	0.2
aa nggem nnt	M	222	0.1	13.8	1.2	5.8	37.0	1.7
Profbbbhii yy	E	222	-53.9	7.3	-1.1	-4.1	16.3	10.5
Lqquddty	L	222	0.2	2.3	0.7	2.1	14.8	0.2
Logrr tth m of To sss tt s	oog TA	222	6.7	10.1	8.7	-0.1	-0.1	0.6
Infttt oon Reee	IFF	222	9.0	46.5	27.9	-0.3	-1.5	13.2
rrr find rrr shhma n Indxx	III a	222	888	6666	555 2	3.1	-2.5	112.2
PPP rr owth	PPP g	222	0.0	4.8	0.4	2.9	6.4	1.4

In this section of the research, the relationship between independent and dependent variables was examined using quantile regression. First, the stationarity test was conducted, and after executing the model, the results were validated with necessary tests (slope equality test, quantile symmetry test).

The Levin, Lin, and Chu approach were used to examine stationarity in this research. The stationarity test results indicate that the variables are stationary at the 99% level. In other words, the null hypothesis of a unit root is rejected.

Table 3. Levin, Lin, and Chu Unit Root Test

Vrr bbbsss	sssssscc	Prob
III a	-6/86	0/0000
VAIC	-6/86	0/0000
LogTA	-6/54	0/0000
PPP g	-3/71	0/0000
IFF	-4/7	0/0000
C	-15/85	0/0000
A	-2/87	0/0000
M	-156/04	0/0000
E	-8/19	0/0000
L	-7	0/0000

The probability of the test statistic is less than 0.05 in Table 3, indicating that all research variables were stable.

Table 4 shows the effect of the value-added intellectual capital coefficient (VAIC) on capital adequacy. Table 4 shows a significant relationship between VAIC and capital adequacy in the ninth decile. Examination of the squared VAIC variable shows that this variable is also significant in the ninth decile, indicating a nonlinear relationship. The sign of the coefficients for these two variables suggests an inverted U-shaped relationship.

Table 4. Effect of Value Added of Intellectual Capital Coefficient on Capital Adequacy

Description	Deciles	First	Second	Third	Fourth	Fifth	Sixth	Seventh	Eighth	Ninth
VAIC	Coef	-0.044	0.011	0.005	-0.015	0.088	0.330	0.418	0.657	1.036
	Prob	0.725	0.919	0.942	0.838	0.679	0.373	0.251	0.193	0.033
VAIC^2	Coef	0.000	0.000	0.000	0.000	0.000	-0.001	-0.001	-0.002	-0.004
	Prob	0.549	0.969	0.922	0.796	0.685	0.371	0.241	0.184	0.030
HHIa	Coef	0.006	-0.001	-0.002	-0.004	-0.002	-0.003	-0.004	-0.003	-0.003

	Prob	0.317	0.815	0.455	0.037	0.182	0.119	0.017	0.011	0.007
INF	Coef	-0.350	-0.073	0.021	0.060	0.048	0.025	0.064	0.019	-0.071
	Prob	0.094	0.442	0.764	0.320	0.528	0.769	0.455	0.840	0.428
GDPg	Coef	0.019	0.950	0.984	1.480	0.911	1.414	1.704	1.722	1.899
	Prob	0.992	0.504	0.329	0.139	0.351	0.134	0.048	0.009	0.002
LogTA	Coef	-1.483	-2.641	-2.392	-1.639	-1.825	-2.270	-4.299	-4.475	-3.808
	Prob	0.610	0.254	0.166	0.367	0.319	0.211	0.005	0.001	0.005
intercept	Coef	13.664	27.222	25.252	21.549	23.101	27.537	46.284	48.396	44.058
	Prob	0.589	0.143	0.083	0.171	0.146	0.081	0.001	0.000	0.000
Observations		132	132	132	132	132	132	132	132	132

Research question 2 examines the relationship between the VAIC and asset quality. The results of the model execution are shown in Table 5. As observed, the VAIC has a significant relationship with asset quality in the seventh, eighth, and ninth deciles. Examination of the squared VAIC variable shows its significance in these deciles, indicating a nonlinear relationship. The sign of the coefficients for these variables suggests a U-shaped function.

Table 5. Effect of Value Added of Intellectual Capital Coefficient on Asset quality

Description	Deciles	First	Second	Third	Fourth	Fifth	Sixth	Seventh	Eighth	Ninth
VAIC	Coef	-0.001	-0.001	-0.001	-0.001	0.002	0.005	0.015	0.019	0.016
	Prob	0.469	0.617	0.582	0.668	0.706	0.492	0.006	0.000	0.001
VAIC^2	Coef	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Prob	0.218	0.368	0.387	0.524	0.801	0.537	0.008	0.000	0.001
HHIa	Coef	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Prob	0.05	0.059	0.03	0.020	0.01	0.01	0.002	0.000	0.20

		7		6		0	1			9
INF	Coef	0.000	0.000	0.000	-0.001	0.000	0.000	0.000	0.002	0.006
	Prob	0.903	0.866	0.795	0.628	0.814	0.932	0.996	0.312	0.061
GDPg	Coef	-0.001	0.000	0.001	0.007	0.018	0.026	0.041	0.053	0.010
	Prob	0.928	0.996	0.881	0.485	0.162	0.108	0.013	0.000	0.795
LogTA	Coef	0.020	0.021	0.014	0.011	-0.007	-0.016	-0.005	-0.014	-0.038
	Prob	0.101	0.150	0.360	0.512	0.686	0.459	0.851	0.730	0.808
intercept	Coef	-0.098	-0.093	-0.007	0.052	0.231	0.314	0.233	0.335	0.580
	Prob	0.347	0.458	0.960	0.729	0.127	0.082	0.348	0.339	0.665
Observations		132	132	132	132	132	132	132	132	132

Research question 3 examines the relationship between VAIC and management. As observed in **Error! Reference source not found.** 6, the VAIC has a significant relationship with management in the eighth and ninth deciles. Examination of the squared VAIC variable shows its significance in these deciles, indicating a nonlinear relationship. The sign of the coefficients for these variables suggests a U-shaped function.

Table 6. Effect of Value Added of Intellectual Capital Coefficient on Management

Description	Deciles	First	Second	Third	Fourth	Fifth	Sixth	Seventh	Eighth	Ninth
VAIC	Coef	-0.023	-0.011	-0.017	-0.012	-0.011	-0.010	-0.005	0.082	0.308
	Prob	0.234	0.211	0.052	0.182	0.091	0.121	0.561	0.000	0.000
VAIC^2	Coef	0.00	0.000	0.00	0.000	0.00	0.00	0.000	0.000	-0.00

		0		0		0	0			1
	Prob	0.208	0.189	0.048	0.178	0.095	0.130	0.579	0.000	0.000
HHIa	Coef	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	-0.001
	Prob	0.000	0.000	0.003	0.009	0.077	0.408	0.484	0.232	0.000
INF	Coef	-0.003	-0.012	-0.006	-0.007	-0.005	-0.003	-0.002	-0.002	0.011
	Prob	0.598	0.010	0.094	0.044	0.038	0.128	0.269	0.797	0.440
GDPg	Coef	-0.051	-0.040	-0.044	-0.035	-0.022	-0.014	-0.026	0.145	0.819
	Prob	0.024	0.113	0.052	0.209	0.379	0.567	0.436	0.074	0.002
LogTA	Coef	0.116	0.070	0.003	-0.035	-0.028	-0.015	-0.019	0.051	0.226
	Prob	0.083	0.234	0.961	0.496	0.466	0.710	0.702	0.701	0.531
intercept	Coef	-0.386	0.257	0.883	1.234	1.237	1.146	1.163	0.642	-0.525
	Prob	0.481	0.620	0.070	0.005	0.000	0.001	0.006	0.575	0.863
Observations		132	132	132	132	132	132	132	132	132

Research question 4 examines the relationship between the VAIC and earnings. As observed in **Error! Reference source not found.**, the VAIC has a significant relationship with bank earnings in the first, second, and sixth to ninth deciles. Examination of the squared VAIC variable shows its significance in these deciles, indicating a nonlinear relationship. The sign of the coefficients for these variables suggests an inverted U-shaped function. For other variables, HHIa and GDPg in the first and second deciles and log TA in the eighth and ninth deciles have a significant relationship with bank earnings.

Table 7. Effect of Value Added of Intellectual Capital Coefficient on Earnings

Description	Deciles	First	Second	Third	Fourth	Fifth	Sixth	Seventh	Eighth	Ninth
VAIC	Coef	-1.221	-0.928	-0.026	0.045	0.089	0.178	0.217	0.280	0.299
	Prob	0.000	0.000	0.806	0.498	0.200	0.028	0.001	0.008	0.001
VAIC^2	Coef	0.004	0.003	0.000	0.000	0.000	-0.001	-0.001	-0.001	-0.001
	Prob	0.000	0.000	0.798	0.502	0.197	0.026	0.001	0.007	0.001
HHIa	Coef	0.007	0.004	0.001	0.000	0.000	0.000	0.000	0.000	0.000
	Prob	0.001	0.017	0.179	0.488	0.779	0.983	0.989	0.799	0.992
INF	Coef	0.269	0.949	0.343	0.285	0.299	0.169	0.285	0.269	0.158
	Prob	0.073	0.469	0.344	0.243	0.384	0.233	0.387	0.624	0.592
GDPg	Coef	-1.847	-1.170	-0.076	0.078	0.125	0.184	0.194	0.240	0.155
	Prob	0.007	0.037	0.750	0.716	0.559	0.270	0.131	0.053	0.209
LogTA	Coef	-0.618	-1.368	-0.421	-0.153	-0.218	-0.518	-0.559	-0.755	-0.675
	Prob	0.676	0.211	0.289	0.637	0.539	0.120	0.080	0.038	0.021
intercept	Coef	3.333	10.745	2.972	0.974	1.791	4.389	4.842	6.560	5.861
	Prob	0.791	0.250	0.381	0.723	0.555	0.125	0.083	0.042	0.022
Observations		132	132	132	132	132	132	132	132	132

Research question 5 examines the relationship between VAIC and liquidity. As observed in Table 8, the VAIC has a significant relationship with bank liquidity in the first to fourth deciles. Examination of the squared VAIC variable shows its overlap with VAIC in these deciles, indicating a nonlinear relationship. The sign of the coefficients in these deciles suggests an inverted U-shaped function. The Herfindahl-Hirschman Index (HHI) has a significant relationship with liquidity in the first and second deciles. The logarithm of total assets also has a significant relationship in the eighth and ninth deciles.

Table 8. Effect of Value Added of Intellectual Capital Coefficient on Liquidity

Description	Deciles	First	Second	Third	Fourth	Fifth	Sixth	Seventh	Eighth	Ninth
VAIC	Coef	-0.005	-0.007	-0.007	-0.008	-0.003	-0.002	0.003	0.007	0.016
	Prob	0.030	0.000	0.000	0.000	0.613	0.761	0.730	0.504	0.158
VAIC^2	Coef	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Prob	0.023	0.001	0.001	0.001	0.720	0.904	0.602	0.424	0.122
HHIa	Coef	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Prob	0.000	0.038	0.214	0.061	0.080	0.558	0.587	0.345	0.074
INF	Coef	-0.005	-0.002	-0.002	-0.002	-0.002	-0.002	-0.002	-0.001	-0.001
	Prob	0.073	0.469	0.344	0.243	0.384	0.233	0.387	0.624	0.592
GDPg	Coef	-0.043	-0.022	-0.002	-0.009	-0.010	0.007	0.017	0.022	0.013
	Prob	0.051	0.487	0.921	0.670	0.679	0.735	0.388	0.224	0.379
LogTA	Coef	-0.034	-0.088	-0.033	-0.028	-0.018	0.047	0.066	0.091	0.125
	Prob	0.701	0.067	0.410	0.528	0.710	0.309	0.146	0.017	0.000
intercept	Coef	0.782	1.372	0.999	0.982	0.894	0.423	0.308	0.107	-0.170
	Prob	0.314	0.000	0.003	0.008	0.021	0.263	0.408	0.734	0.537
Observations		132	132	132	132	132	132	132	132	132

Another topic investigated in this research is identifying the point of change of function path in nonlinear functions. In order to check the function's change point, based on the study of Nguyan and others (2021), the function VAICt = -//// eee for estimating the turning point of the model. In this regard, if the division result is greater than 1, the whole number part is ignored. The results are shown in Table 9.

According to the significant VAIC and capital adequacy in the ninth decile, the change point in this decile equals 40. Also, the VAIC in the seventh, eighth, and ninth deciles has a significant relationship with asset quality; the turning point of the e function is the maximum value of these three decimals and is equal to 46.4. Considering the significant relationship between the VAIC and management in the eighth and ninth deciles, the turning point of the function is 40.9. Moreover, since the VAIC in the first, second, and sixth to ninth deciles has a significant relationship with the earnings variable, the highest numerical value of these deciles (41.3) is the turning point of the function. Also, considering the significant relationship between the VAIC and liquidity in the first to fourth deciles, the highest numerical value in these four deciles (equivalent to 60.3) is the turning point of the function.

Table 9. Function Turning Point

Description	Deciles	First	Second	Third	Fourth	Fifth	Sixth	Seventh	Eighth	Ninth
The function turning point for C		82.7	-70.7	-4.8	12.1	45.0	41.6	39.4	39.7	40.0
The function turning point for A		83.9	79.3	90.5	95.5	13.2	58.2	46.4	44.3	41.7
The function turning point for M		35.1	35.6	40.2	41.1	43.5	45.1	49.2	40.5	40.9
The function turning point for E		40.7	41.3	36.4	42.9	41.0	40.7	40.6	40.5	40.4
The function turning point for L		45.7	55.3	60.0	60.3	1.0	58.2	-5.4	19.0	30.3

Table 10 shows that the slope coefficients for the median differ from the estimated coefficients in the upper and lower quantiles, as the null hypothesis of coefficient equality is rejected. Additioaally tee χ Stttttt tttt aiisiic nn eee implemented models shows that all five models are significant at the usual test level. Therefore, the results indicate differences in coefficients across different quantiles, suggesting varying impacts of independent variables on the dependent variable across quantiles. The differences in coefficients across different quantiles also validate the methodology used in this research. Based on the symmetry test results, at the 5% significance level, the null hypothesis

of symmetric quantile regression coefficients is rejected, as the p-value is less than 5%.

Table 10. Slope Equality Test for Quantile Regression

rrrrr rr oonnooo dll	χ sssssssssiiiii iccc	ggg rees of eeeddom	p-Vuuue	TRRRRRRR
VAIC Coffeeennoon C	6511l	12	044730	uu hypothiii s rjj ccddd
VAIC Coffeeennoon A	98660	12	0/000	uu hypothiii s rjj ccd
VAIC Coffeeennoon M	62110	22	000561	uu hypothiii s rjj ccddd
VAIC Coffeeennoon E	14000	22	000300	uu hypothiii s rjj ccddd
VAIC Coffeeennoon L	16665	22	0001631	uu hypothiii s rjj ccddd

The results of the model execution are shown in **Error! Reference source not found.**

Table 11. Summary of Research Results

Row	Rrrrrr rr Quesoonn	gggnifaaanQQQaniisss	uunooonn hhppe
1	Roooooonshppbtt wee. VAIC and Cpp dqquccy	9hhuu aneeee	oo niinaar - Invrr ddd U-Shppdd
2	Roooooonshppbtt ween VAIC and sss Qutttt y	7hh-9th uu aniisss	oo niinaar - U-Shppdd
3	Roooooonshppbtt ween VAIC and aa nggement	8hhnnd 9hhQunntssss	oo niinaar - U-Shppdd
4	Roooooonshppbtt ween VAIC and Inoome	1saaand 2hh-6hh-9hh uu ansssss	ss niinaar - Invrr ddd U-Shppdd
5	Roooooonshppbtt ween . AIC and Lqqiddty	1st-4th uu aneeees	oo niinaar - Invrr ddd U-Shppdd

Discussion

Few studies have investigated the nonlinear relationship between intellectual capital and financial performance variables. Haris et al. (2016) observed an inverted U-shaped relationship between intellectual capital and financial variables.

Several previous studies, such as Ghosh and Maji (2014) and Zhang et al. (2021), found that there is a negative relationship between the efficiency of intellectual capital and risk management. However, various studies were also conducted with opposite results, which claim that intellectual capital has a positive relationship with credit risk and that intellectual capital seeks to

evaluate the organization's competitive advantages and provide a favorable image of management to others (Nawaz et al., 2019; Sun & Chang, 2011).

This research indicates that by planning the VAIC, changes in performance indicators in the Iranian banking industry can be planned. As the research results show, indicators such as earnings and liquidity are more affected by the value added of intellectual capital coefficient in more quantiles. A closer examination indicates that the income variable of banks in the first, second, and sixth-ninth decades is affected by the VAIC. In other words, acceptable changes in the variable can be observed by planning the VAIC variable. By the shape of the function and its turning point, the results indicate an increase in VAIC leads to an improvement in earnings, and from this point onwards, according to the inverted U-shape of the function, an increase in inputs leads to a decrease in outputs. For the asset quality and management variables, the shape of the function is U-shaped, indicating that instead of initial increases in the value-added intellectual capital coefficient, the resulting outputs will decrease until the function's turning point. After the turning point, as inputs increase, outputs also improve. In other words, concerning these two variables, the banking network must follow a self-controlled behavior to reach the optimal point.

Conclusion

Examining the results of the present study shows that the VAIC influences all functional components of the bank in different deciles. Although the amount of influence differs, the highest amount is on earning and liquidity variables.

Examining the shape of the function shows a nonlinear relationship between the VAIC and this research's dependent variables. Although, as mentioned above, in some of the relationships of the variables, the shape of the function was U-shaped, and in others, it was inverted U-shaped. Examining the change point of the function shows that the highest change point is related to the liquidity variable (60.3), and the lowest change point is 40 (for capital adequacy).

We want to compare the current research results with those of previous studies. In that case, the results obtained are like the study of Nguyen et al. (2021), who found that the coefficient of added value of intellectual capital influences default risk and bank credit risk. Although, in the mentioned study, the shape of the function related to the effect on credit risk and liquidity risk is inverted U. Also, the results of the present study are in line with the research of

Asuta Obaidullah (2023) and Chinnasamy et al., (2024), Barak and Sharma (2024) and Aidah and Lestari (2024)which showed that intellectual capital and its components influence the profitability of Islamic banks.

Acknowledgments

I want to express my appreciation and thanks to all those who have helped collect and analyze this article's data in all stages. Their worthy contributions are not only to the researchers of this research but also to their selfless role in the development of knowledge.

Declaration of Conflicting Interests

The authors declared no potential conflicts of interest concerning the research, authorship and, or publication of this article.

Funding

The authors received no financial support for the research, authorship and, or publication of this article.

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Bibliographic information of this paper for citing:

Pourgholamali, Mohammad; Hamidian, Mohsen & Darabi, Roya (2025). How Value Added of Intellectual Coefficient affect Iranian Banking Performance (A CAMEL Approach). *Iranian Journal of Finance*, 9(2), 107-125.