Intellectual capital and Tobin's Q as measures of bank performance

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CHRONICLE	ABSTRACT
	This paper aims at examining the effect of the Value Added by Intellectual Capital (VAIC) in terms of its three components: capital employed efficiency, human capital efficiency, and structure capital efficiency on the financial performance of commercial banks listed on the Amman Stock Exchange for the period 2010–2018.Value Added of Intellectual Capital (VAIC) model was used to measure the intellectual capital while Tobin's Q ratio was used as an indicator of bank financial performance. The study has used parametric techniques like multiple linear regression and correlation coefficient, and other statistical methods to investigate its hypothesis. It was found that only human capital efficiency and capital employed efficiency had impacts on the banks' financial performance. These results emphasize the importance of using the VAIC model to evaluate the financial performance of these banks, as well as encourage banks to make further investments in intellectual capital's components, and concentrate on human resources to build up their knowledge, skills and capabilities, because of their greatest role in value creation.

1. Introduction

The traditional methods used to measure the performance of organizations have many deficiencies and weaknesses due to their focus on the tangible assets that the enterprise possesses and their impact on profitability. Accordingly, this has arisen the need to study the components of Intellectual Capital and its effect on the performance of the firms and companies. In 1998, Ante Pulic developed a model – the Pulic Model – to measure the efficiency of Intellectual Capital in generating and creating value for the company i.e. Value Added Intellectual Coefficient of Value Venture Capital and to measure the efficiency of three types of intellectual inputs: Human Capital Efficiency (HCE), Structural Capital Efficiency (SCE), and Capital Employed Efficiency (CEE)**.** Therefore, this research has used the concept of Intellectual Capital and its various elements, like using the Pulic Model, to determine the effect of Intellectual Capital on the financial performance of banks listed on the Amman Stock Exchange. This study has resorted to three key performance indicators: the first one was a financial-based measure (ROE), the second one was an operational-based measure (ROA), and the third one was a market-based measure (Tobin's Q; Buallay et al., 2017). This research utilizes Tobin's Q as a market-based measure of performance which was affected by intellectual capital. The privilege of using Tobin's Q is its ability of showing the present value of predicted future economic benefits which means a high level of performance will be associated with a greater level of Tobin's Q (Copeland & Weston, 1988).

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2. Literature Review and Hypotheses Development

A study published in 2018 by Smriti and Das states that Invested Capital, which is considered one of the elements of Intellectual Capital, has a great effect on productivity, growth, and the value of the firm, while human capital is closely associated with profitability. The prefaced study by Smriti and Das was enhanced by a previous study in 2017 by Dzenopoljac (2017) which had an agreement with Smriti and Das's study and added that the degree of awareness shareholders and executives have about the importance of investing in Intellectual Capital has a huge positive influence on the future growth of the company and increases its competitiveness. Hejazi et al. (2016) asserted that human and intellectual capital is emphatically identified with performance, which emphasizes the importance of Intellectual Capital in enhancing the firm's value. In a nutshell, this study showcases that it is beneficial to use Tobin's Q as a technique for measuring performance.

A study by Ikapel (2016) has found that the efficiency of invested capital has the greatest effect on banks' financial performance in Kenya. Furthermore, Ozkan et al. (2016) s' study confirmed the same results when applied to the Turkish banking sector, except that the efficiency of organizational capital does not affect both return on assets and return on equity. While (Ozkan et al. 2016) study confirmed the same previous results when applied on the Turkish banking sector, but the efficiency of the regulatory capital did not affect both return on assets and return on equity. Another study by Al-Smadi (2016) has shed light on the impact of Intellectual Capital on increasing the profitability of banks in Jordan during 2012–2015.

By the same token, a study by Sirinuch (2015) has emphasized the importance of invested capital and human capital as vital components that improve the market value and financial performance of the firm, while the efficiency of the organizational and relational capital has a lesser impact. Additionally, Arslan and Zaman's 2014 study has shown that the value added by Intellectual Capital influences the profitability of the company which is evident by the return on equity. The study of Aminbeidokhti and Darvishkhadem (2012) found that there is an affirmative impact of Intellectual Capital and organizational performance. Further, Doong et al. (2011) has stated that human capital has a significant effect on enhancing the financial achievements of the firm. Based on the previously prefaced studies, the researchers have developed the following main hypothesis:

H_{01}: The impact of VAIC measured by HCE, SCE, and CEE on the financial performance of the commercial banks measured by Tobin's Q is not statistically significant. **The main hypothesis is divided into three sub-hypotheses as follows:**

1. The impact of VAIC measured by HCE on the financial performance of commercial banks measured by Tobin's Q is not statistically significant.
2. The impact of VAIC measured by SCE on the financial performance of commercial banks measured by Tobin's Q is not statistically significant.
3. The impact of VAIC measured by CEE on the financial performance of commercial banks measured by Tobin's Q is not statistically significant.

3. Research Methodology

3.1 Study population, sample and data resources:

3.1.1 The study population:

The population of this study consists of all the commercial banks listed in ASE.

3.1.2 The sample of the study and the variables

The sample of the study consists of all the commercial banks listed on the Amman Stock Exchange (ASE), which includes 13 banks and represents 100% of the population (Jordan Securities Depository Center).

Independent variable

The Value Added by Intellectual Capital (VA) = Output - Input (Pulic, 2000; Al-Musali & Ku Ismail, 2014). The Output refers to the total revenue generated from providing services during the specified financial period. The Input refers to the total costs paid during the same specified financial period, except the amounts paid as compensations and the costs of training programes for these workers.

Human capital efficiency = value added/total amounts spent on workers.

Structural capital efficiency = structural capital/total value added

Structural capital = total value added - human capital

Capital employed efficiency = total value added/difference between the book value of total assets and intangible assets

The Value Added by Intellectual Capital (VAIC) represents the total of the three factors (human capital, structural capital, employed capital), and it can be calculated through the following relationship:

Value added by intellectual capital = human capital + structural capital + employed capital

(VAIC = HCE + SCE + CEE)

Dependent variable

A reliable performance measure is Tobin's Q ratio (Rostami, 2015; Vafeas & Theodorou, 1998). which is calculated by the following equation:

The market value of total assets of the bank/the book value of total assets of the bank.

Independent variable	Dependent variable
VIAC	Bank Performance
HCE	Measured by Tobin's Q
CEE	
SCE	
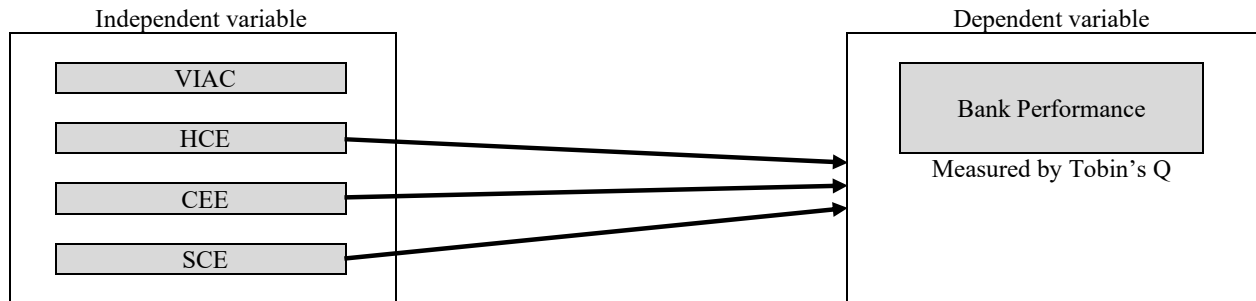
To achieve the objectives of this study, secondary data were collected over several annual reports for the selected sample during the period 2010-2018, a multi –linear regression is applied to define the effect of Intellectual Capital on the commercial banks' financial performance then Durbin –Watson tests were applied to ensure the absence of multi-collinearity problems . After that, the parametric tests (T and F Tests) were used to determine the effect of independent variables on the commercial banks' performance.

4. Statistical Tests and Empirical Results

4.1 Correlation tests

Table 1 shows that the allowable variance coefficient for the independent variables was less than 1 and greater than 0.01, and the values of the variance inflation factor (VIF) were less than 5. The previous indicators showcase that there are low correlations between the independent variables, so that the values are appropriate for performing multiple linear regression (Hair et al., 2011).

Table 1
VIF

Tolerance	VIF	Independent Variables	
0.427	2.344	HCE Human Capital	(VAIC)
0.423	2.366	Structural Capital SCE	
0.805	1.242	Capital Employed CEE	

To confirm the previous results, Pearson correlation was applied on the independent variables to ensure that there was no high linear correlation between these variables; this is shown in Table 2.

Table 2
Pearson correlation

CEE	SCE	HCE	
		1.00	HCE
	1.00	0.550**	SCE
1.00	0.417**	0.408**	CEE
	(SIG 0.01)**		

An autocorrelation test was also used to ensure that there was no problem of self-correlation of data in the regression model which would weaken the predictive power of the model. For this purpose, the Durbin–Watson test was applied; its value was limited between 0 and 4, and when this value approaches 2, this indicates that there is no problem of self-association. The Durban–Watson value which was calculated for the main study hypothesis is greater than its upper tabular values (du) and close to the value 2 at the level of significance of 5%, which indicates the validity of data used in the regression model (Gujarati, 2008).

4.2 Hypotheses Tests

4.2.1 Sub-hypotheses tests

H$_{01}$: The impact of the VAIC measured by HCE, on the value of Tobin's Q as a measure of banks' financial performance is not statistically significant.

This hypothesis was tested using one sample t-test, the results are given in Table 3 as follows:

Table 3
The results of testing the first hypothesis

Mean	t-calculated	t-tabulated	Result of null hypothesis	α	β	R^2	R
0.14063	2.708	1.91818	reject	0.2408	0.618	0.81	0.90

As shown in Table 1, the slope of the model is equal to 0.618 and the coefficient of determination is 0.81 which means that the independent variable (HCE) has interpreted 81% of the variations of financial banks performance . Also, the value of t-calculated is equal to 2.708 ,which is greater than t-tabulated, and it means that there is a statically positive   relationship between HCE and financial performance of commercial banks measured by Tobin's Q.

H$_{02}$: The impact of the VAIC measured by SCE, on the value of Tobin's Q as a measure of banks' financial performance is not statistically significant.

This hypothesis was tested using one sample t-test and the results are given in Table 4 as follows:

Table 4
The results of testing the second hypothesis

Mean	t-calculated	t-tabulated	Result of null hypothesis	α	β	R^2	R
0.432063	3.325	1.91818	reject	0.5498	0.542	0.64	0.8

As shown in Table 2, the slope of the model is equal to 0.542 and the coefficient of determination is equal to 64% which means that the independent variable (SCE) interprets 64% 0f the variation of the financial performance of commercial banks. Further, there is a significant relationship between the independent variable (SCE) and the dependent variable financial performance of commercial banks.

H$_{03}$: The impact of the VAIC measured by CEE, on the value of Tobin's Q as a measure of banks' financial performance is not statistically significant: This hypothesis was tested using one sample t-test, the results are given in Table 5 as follows:

Table 5
The results of testing the third hypothesis

Mean	t-calculated	t-tabulated	Result of null hypothesis	α	B	R^2	R
0.00133	1.325	1.91818	accept	0.01498	0.0.0242	0.22	0.469

Based on the prefaced table, the t-tabulated is greater than t-calculated and the coefficient of determination is equal to 22% which indicates a weak interpretation of CEE on the variation of the financial performance of the commercial banks, and this proves that there is no significant relationship between the Intellectual Capital measured by CEE and the financial performance of the commercial banks.

4.2.2 Testing the main hypothesis

H$_0$: The impact of the VAIC measured by HCE, SCE, and CEE, based on the value of Tobin's Q as an indicator of banks' financial performance, is not statistically significant.

Table 6 shows the results of testing the main hypotheses.

Table 6
The results of testing the main hypothesis using Coefficient

Model	coefficient	SIG. t	Calculated t-value
Constant	-0.073	0.772	-0.2900
(HCE)	0.532	0.00*	3.701
(SCE)	-0.017	0.906	-0.119
(CEE)	0.229	0.032*	2.189

F-value = 15.813 (0.000) R = 0.647 R^2 = 0.418

The conclusion from the tables above indicates that the Value Added of Intellectual Capital (VAIC) statistically affects at the level α≤0.05 the performance of listed banks measured by Tobin's Q ratio. The value of R^2 (0.418) indicates that the VAIC in all its dimensions explains the 41.8% variation in the performance of banks. The value of R is 64.7% and this reflects the strong association between the Value Added of Intellectual Capital (VAIC) and the bank's performance. In addition, HCE has the greatest effect on dependent variables (Tobin's Q ratio), while CEE has the second place in importance in terms of its effect on the dependent variables (Tobin's Q ratio), while SCE has no significant impact.

Based on the previously prefaced findings, the researchers of this study reject the null hypothesis, and accept the alternative hypothesis, which means that the statistical impact of the Value Added by Intellectual Capital(VAIC) on the performance of the commercial banks listed on the Amman Stock Exchange(ASE) measured by (Tobin's Q ratio) is present and evident.

The predicting equation is as follows:

*Tobin's Q ratio =- 0.073+   0.532 HCE- 0.017SCE + 0.229 CEE+*e

5. Conclusions and recommendations

It can be concluded that there is a statistically significant effect of the Value Added by Intellectual Capital (VAIC) on the financial performance of the commercial banks in Jordan. This result is consistent with previous studies on the effect of Intellectual Capital on performance such as the studies of Arslan and Zaman (2015), Al-Smadi (2016), Sirinuch (2015), Ikapel (2016) and Akbar (2012).

The study also concludes that only HCE and CEE have an effect on the financial performance of the commercial banks in Jordan; this result is consistent with Sirinuch's study (2015) on the most important dimensions of Intellectual Capital effect. On the one hand, a study by Smriti and Das (2018) and another one by Ikapel (2016) have stated that invested capital has the greatest impact on dependent variables ,productivity and performance, respectively, while Akbar(2012) found that the customer capital has the greatest impact on the bank's performance, whereas this study states that HCE has the greatest effect on financial performance. The researchers recommend adopting the VAIC model to evaluate the financial performance of commercial banks, as well as, the researchers encourage banks to increase investment in the components of Intellectual Capital, modern technology solutions, infrastructure to achieve greater added value to the company. The findings of this study have led to many implications: first, the managers can boost the profitability of their banks by applying this method as a tool of managing IC. Secondly and regarding the positive correlation between human capital and firms progress, the managers have to concentrate their attention on human resources and aim at developing their knowledge, skills and capabilities. Moreover, it is preferable that the IC has to be computed to support the banks in building and controlling strategies, enhancing the process of decision making and strengthening the relationships with shareholders. In a word, the researchers recommend that more studies should be carried out and further research should be undertaken in the Intellectual Capital in different sectors.

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