The Effect of Intellectual Capital on the Performance of Listed Companies in Iran Stock Exchange: A Panel Data Approach

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Abstract
According to the resource-based view, intellectual capital is strategic resources that enable companies to create competitive advantage and deliver superior financial performance. Relationship between resources and firm performance is an undeniable relationship. Therefore, this article aims to examine the impact of intellectual capital on the performance of listed companies in Tehran Stock Exchange. The period under study is in 2006-2010 and selection sample consists of 112 firms. Statistical method for testing hypotheses in this study is panel data of "combined data" using Eviews software. The results of hypothesis testing using both QTOBIN model and return on equity (ROE) suggests that regardless of company size and debt structure, there is a positive significant relationship between intellectual capital and financial performance.

Keywords: Intellectual Capital - Financial Performance - panel data – Iran Stock Exchange

1. Introduction

Communities with the transition from the industrial age to the information age, the importance of intellectual capital has increased. This can be caused by factors such as the importance of the information technology revolution, the growing importance of knowledge and knowledge-based economy and the impact of innovation and creativity as a defining element of competition [11]. In the industrial era, the price of property, machinery, equipment and raw materials of business unit were considered as efficient elements, while in the age of information, efficient use of intellectual capital often determines the success or failure of the business unit [19]. Based on the resource-based view, the firm's resource is considered as the most important driver of competitiveness and performance. These resources include tangible assets and intangible assets created within the company in a manner that is used in an efficient and effective manner in line with profitable and competitive strategies [17]. The first type of assets (such as property, machinery, equipment and physical technology) are commonly perceived and conventional and are easily imitated and alternative. These assets are strategic ones that can lead to sustainable competitive advantage and superior financial performance. So, during the industrial era, cost of finished properties were plant and equipment and raw materials that was necessary for the success of a business, but the information era is evident in the efficient use of assets that is usually effective in the success or failure of a firm. While Balou et.al concluded that in general, the ratio of book value to market value of companies has decreased since 1980. In 1980, the book value of the companies was 80% of market value. In1990, this ratio was 55%; in 2000, this ratio was almost 15% and in 2002, it was 25% despite market fall in 2001. This increasing difference indicates that accounting framework provides an imperfect picture of a company’s value. In spite of the fact that all these differences cannot be allocated to intellectual capital or intangible assets, certainly a large part of it could be assigned to such resources or assets. This implies the over-importance of intellectual capital [19]. Therefore, measuring performance with the approach of the organization's intellectual capital improve the quality of decision making by users, improve internal management, improve reporting to outside agencies, capital transactions within the company and outside the company and also improve accounting functions. The institutions and organizations in our country are not exempt from this issue and to align with other organizations and increase

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strength and global competitiveness in the domestic arena requires the use of the intellectual capital of their organization. Especially with the implementation of Article 44 of the constitution and the trend toward privatization of the economy, followed by increased competition in the domestic economy and the country's desire to join the WTO, the necessity of organizations’ approach to intellectual capital can be felt more than ever. Due to the increasing importance of capital in the strategic superiority of the companies, this study examines the relationship between intellectual capital and financial performance of listed companies in Tehran Stock Exchange. In this study, the definition of intellectual capital, its components and internal and external research is first considered. Then research hypotheses and hypotheses analyses resulted from are described. Finally, conclusions and recommendations will be presented.

Theories

The term "intellectual capital" was first used in 1996 by John Konzgalbris. In this sense, intellectual capital is not only a stationary intangible asset in itself, but an ideological process and a means to achieve the goal (7). Intellectual capital provides a new resource base through which organization can compete (5). Bentis (2000) divided components of intellectual capital into three categories: human, structural and relational (customer) capital.

Human Capital

Human capital represents the knowledge of each employee in an organization [9]. Human capital is the place for development, resource of innovation and onset of insights [18]. Human capital is also the basis of intellectual capital and is the basic element for the realization of intellectual capital [10].

Structural Capital

Structural capital consists of all non-human creatures in the organization including databases, organizational charts, strategies, procedures, processes, manuals and everything that it is worth for the organization much more than material value [9].

Customer Capital (Communicational)

The main purpose of customer capital is the knowledge used in organization’s marketing channels and customer relationships while doing business [9] and is the main factor in transferring intellectual capital into market value and as a result the performance of business organizations. Also, it includes external dependencies such as customer loyalty, reputation and relationships with suppliers of resources [15].

2. Review of Literature

External Research

In their study entitled "A new model for measuring intellectual capital based on Linguistics”, Shen Tai and Tongchen (2008) tested a new model for evaluating performance of intellectual capital by a combined approach of fuzzy 2-tuple with Multiple criteria decision making method (MCDM) provided to firms with advanced technology in Taiwan which the results show a significant relationship between intellectual capital components and functioning”. Bonties exploratory studies on the relationship between company investments of intellectual capital and about business performance represents an important and significant causal relationship between dimensions of intellectual capital and its business performance. Riahi examined the relationship between intellectual capital and business performance of America’s multi-national corporations and has endorsed the previous idea.

Internal Studies

Namazi and Ebrahimi (2009) conducted a study entitled investigating the effects of intellectual capital on the current and future financial performance in listed companies on the Stock Exchange and concluded that there is a significant positive relationship between intellectual capital and company’s current and future of financial performance.
3. Research Method

This research aims to examine the impact of intellectual capital on the financial performance of listed companies in Tehran Stock Exchange. Therefore, this is an applied study and its design is quasi-experimental and post-event approach was used (3).

Research Questions and Hypotheses

According to the theoretical background and literature review of the above research, and also in order to achieve the above objectives, the following hypotheses are presented:

Is there a relationship between intellectual capital and performance of listed companies in Tehran Stock Exchange?

To answer the question above, the following assumptions were written:

1 - There is a significant relationship between the value of intellectual capital and QTOBIN.

2 - There is a significant relationship between value added of intellectual capital and return on equity.

Research Period and Statistical Community

Due to data limitations, the study period from ranges in 2006 to 2010 and the examined population includes all firms listed in Tehran Stock Exchange. The following cases have been taken into account for sample selection:

1 - The company's financial year end is March 20.

2 - Complete information and notes to the financial statements is available.

3 - Equity during the period under review should not be negative.

Research Model

Because of the increased understanding of the role of managers in creating intangible assets for competitive advantage, several methods for measuring intellectual capital has emerged [13]. Paleek’s value-added factor model (2000) is used to measure intellectual capital in this study [16]:

A) They use information that is specific to some companies or nations, for example, data associated with the stock.

B) They use financial and non-financial indicators that cannot be easily combined in a single comprehensive measure.

C) They are in accordance with the characteristics of a particular company. Hence, the probability of their usage to perform comparative statistical analyses among a large and diverse sample of firms declines.

D) All data used in the value-added intellectual coefficient are extracted from the audited financial statements. Therefore, calculations are objective and verifiable. This method has been used in various studies (e.g., Fairer & Williams, Shiv, and Chang).

Paleek’s model (2000) has five steps as follows:

Step One, Determining the Added-Value

\[ VA=OUT-IN \]

VA: enterprise value-added, OUT: total revenue from sales of goods and services, IN: The total cost of materials, components and services purchased.

In this model, the cost of salary due to the active role of human resources in the process of creating value is not included in the input. Therefore, the cost for employees is not considered as a cost but as an investment. Value-added can be calculated using the information in the annual report as follows:

\[ VA= OP+EC+D+A \]
OP: Operating profit; EC: staff costs; D: Depreciation and A: Expiration date (amortization of intangible assets).

**Step Two: Determining the Efficiency of Capital Employed**

In these models, to provide a complete picture of the sources of efficiency, it is necessary that the performance of physical capital and financial assessment is taken into account. This performance is achieved by the following equation:

\[ CEE = \frac{VA}{CE} \]

CEE: Performance Capital Employed; CE: Capital Employed is equal to the book value of its total assets minus intangible assets.

**Step Three: Determining the Effectiveness of Human Capital**

According to this model, all costs are considered employees as human capital. Then we have:

\[ HCE = \frac{VA}{HC} \]

HCE: human capital performance; HC: human capital that is equal to the total cost of the company's payroll.

**Step Four: Determining the Efficiency of the Structural Funds**

Structural capital efficiency is calculated from the following equation:

\[ SC = VA - HC \]

SC: corporate’s Structural Capital;

\[ SCE = \frac{SC}{VA} \]

SCE: performance of structural capital. Intellectual capital efficiencies can now be calculated according to the following equation:

\[ IC = HCE + SCE \]

**Step Five: Determining the Value Added Intellectual Coefficient**

It is the value added intellectual capital coefficient, which is calculated according to the following relation:

\[ VAIC = ICE + CEE = HCE + SCE + CEE \]

VAIC: This index reflects the performance or value of the company's intellectual ability. The higher this ratio, the better potential will be used by management.

It has been indicated that Palteek model considers only capital employed, human capital, structural capital and customer capital and does not take into account customer capital formally.

**Research Variables**

**Independent Variable**

In this study, intellectual capital has been considered based on Paleek model as independent variable which its indicators include Capital Employed Efficiency (CEE), Human Capital Efficiency (HCE), structural capital efficiency (SCE) that are calculated based on the value added intellectual coefficient.

**Dependent Variable**

In this study, dependent variable is corporate financial performance that has been presented in terms of profitability ratios that Qtobin and ROE (return on equity ratio) have been used to measure profitability ratio which in the following, we describe how to calculate each.

\[ Q\text{-tobin} = \frac{MV}{BV - \text{Debt}} \]

Where MV, the company's market value, BV, book value of assets and Debt is corporate debts. The numerator of this fraction is multiplying the number of shares of the Company's stock price and its
denominator is corporates assets value after deducting its liabilities. The higher this ratio, the higher value of assets in the stock market. In other words, this ratio indicates how to use the assets of the company and its performance [6].

**Control Variable**

In order to analyze the impact of other variables that directly or indirectly affect the research problem, control variables were identified according to the literature review. The control variables in this study include:

1) The debt or financial leverage, which is measured by the ratio of total debt to book value of total assets. This aim of this issue is to control the impact of liability coverage on profitability and wealth management.

2) Firm size that is measured by the variable sales and assets, that we have used the natural logarithm of total assets in this study.

**Data Analysis Method**

In this section, considering the vast amount of data and processing required to estimate model parameters and investigating and analyzing the descriptive statistics and statistical inference Excel and Eviews software has been used.

For this reason, sorting and preparing variables (intellectual capital, performance, firm size, and financial leverage) for processing and to enter the software Eviews, Excel specialized software is used. Finally, Eviews software has been used to estimate research model. In this study, given the type of data and methods of statistical analysis, the panel data of "combined data" technique was used. For this reason, in order to examine the relationship between intellectual capital and corporate financial performance, the dependent and independent variables are evaluated from two different aspects. In one hand, these variables are tested among different companies for the period 2006-2010.

The following equation is used to determine regression:

In this study, the relationship between dependent and independent variables has been explained by the following equation. It is worth noting that the variables of firm size and financial leverage were entered the model as control variables.

\[
Q_{tobin} = \alpha_0 + \beta_1 IC_{it} + \beta_2 EVL_{it} + \beta_3 SIZE_{it} + \epsilon_1
\]

\[
ROE_{it} = \alpha_0 + \beta_1 IC_{it} + \beta_2 EVL_{it} + \beta_3 SIZE_{it} + \epsilon_2
\]

\[
Q_{tobin i t} = (total\ debt + market\ value\ of\ equity)\ divided\ by\ total\ assets\ of\ firm\ i\ at\ time\ t,
\]

\[
ROE_{it}: return\ on\ equity\ of\ firm\ i\ at\ time\ t,\ IC_{it}: intellectual\ capital\ of\ firm\ i\ at\ time\ t,
\]

\[
EVL_{it}: financial\ leverage\ of\ firm\ i\ at\ time\ t,\ SIZE_{it}: size\ of\ company\ i\ at\ time\ t;\ error.
\]

4. **Research Findings**

To investigate the hypothesis, each of the hypotheses based on the dependent variables, return on equity and Tobin Q, which are used to assess the financial performance, defined and estimated. Then, according to the results of the model, each hypothesis was examined separately and finally the results were expressed for each hypothesis.

**Model Diagnosis Test**

To select whether which of pool or panel models is more appropriate to test the research hypotheses and estimate the model, F Leemer test was used [4].

\[
F_0 = \frac{(RRSS - URSS) / (N - 1)}{URSS / (NT - N - K)} - F_{N-1, N(T-1)-K}
\]

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Choosing Fixed or Random Effects in Assessing Panel Model

Here, two important points about the fixed or random effects are mentioned. First, all people or sectors are equal in panels, so it does no need to worry about different intercepts for each person or section. In fact, the panel data approach could well show heterogeneity among individuals. This point is one of the advantages of panel models compared to cross-sectional or time series models. Second, intercepts are assumed as fixed sentence for any individual or sectional regression model. A random effects model assumes that intercept is a random sentence for each group. But in each time period, just one event is equally entered in each period in regression model out of this random distribution. In other words, we have only one intercept for the entire period for each individual [1]. To choose between fixed and random effects, the Hausman test is used which the results are presented in graphs.

Model Assessment

After doing F Leemer and Hausman tests and selecting random effects model to estimate the model, results of the model assessment are presented in Table 4.

As can be seen in Table 3, results of testing the significance of regression equation indicates that due to the magnitude and significance level of the F-statistic, H₀ hypothesis that is the meaningless of the whole model (all coefficients are zero), is rejected. It can be concluded that the whole model is significant. In this
model, the coefficient of determination ($R^2$) is 64.2776%. The coefficient of determination is a measure that explains the relationship between dependent and independent variables. The value of this coefficient actually determines that what percentage change in the dependent variable is explained by the independent variables. Hence we can say that 64.277% of the variability can be explained by the independent variables.

### Table 3: Results of Assessing the First Model (Dependent Variable of QTUBIN)

<table>
<thead>
<tr>
<th>Variable</th>
<th>Coefficient</th>
<th>t-statistics</th>
</tr>
</thead>
<tbody>
<tr>
<td>IC 0.0000</td>
<td>0.017620</td>
<td>24.63907</td>
</tr>
<tr>
<td>EVL 0.003</td>
<td>0.624631</td>
<td>2.977601</td>
</tr>
<tr>
<td>Size 0.0027</td>
<td>-0.126355</td>
<td>-3.013876</td>
</tr>
<tr>
<td>Constant 0.0000</td>
<td>2.98049</td>
<td>4.970650</td>
</tr>
<tr>
<td>Coefficient of determination</td>
<td>0.642776</td>
<td></td>
</tr>
<tr>
<td>Adjusted coefficient of determination</td>
<td>0.639936</td>
<td></td>
</tr>
<tr>
<td>F-statistics</td>
<td>226.2705</td>
<td>F significance</td>
</tr>
</tbody>
</table>

$$Qtobin_{it} = 2.980490 + 0.017620IC_{it} + 0.624631EVL_{it} - 0.136355SIZE_{it} + \varepsilon_{i}$$

As can be seen in Table 3, results of testing the significance of regression equation indicates that due to the magnitude and significance level of the F-statistic, $H_0$ hypothesis that is the meaningless of the whole model (all coefficients are zero), is rejected. It can be concluded that the whole model is significant. In this model, the coefficient of determination ($R^2$) is 78.9005%. The coefficient of determination is a measure that explains the relationship between dependent and independent variables. The value of this coefficient actually determines that what percentage change in the dependent variable is explained by the independent variables. Hence we can say that 78.9% of the variability can be explained by the independent variables.

### Table 4: Results from Assessing the Second Model (The Dependent Variable, Return on Equity)

<table>
<thead>
<tr>
<th>Variable</th>
<th>Coefficient</th>
<th>t-statistics</th>
</tr>
</thead>
<tbody>
<tr>
<td>IC 0.0000</td>
<td>0.026796</td>
<td>32.47539</td>
</tr>
<tr>
<td>EVL 0.001</td>
<td>-0.248630</td>
<td>3.947618</td>
</tr>
<tr>
<td>Size 0.0001</td>
<td>2.432271</td>
<td>2.926725</td>
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<tr>
<td>Constant 0.0035</td>
<td>0.787328</td>
<td>2.926725</td>
</tr>
<tr>
<td>Coefficient of determination</td>
<td>470.2268</td>
<td></td>
</tr>
<tr>
<td>Adjusted coefficient of determination</td>
<td>0.639936</td>
<td></td>
</tr>
<tr>
<td>F-statistics</td>
<td>226.2705</td>
<td>F significance</td>
</tr>
</tbody>
</table>

$$ROE_{it} = 2.433371 + 0.026796IC_{it} + 2.354157EVL_{it} - 0.248630SIZE_{it} + \varepsilon_{2}$$

In this case, intellectual capital (capital employed efficiency, performance, human capital and structural capital) were tested versus financial performance (QTUBIN, Return on Equity) with control variables (debt structure and size).

**Results of Testing Hypotheses**

Hypothesis one: there is a significant relationship between the values of intellectual capital with QTUBIN. As can be seen in Table 3, a positive coefficient indicates a positive relationship between intellectual capital variable and QTUBIN’s variable, which according to the probability (p-value<0.05) calculated, this relationship is statistically significant. So $H_0$ hypothesis there is no significant relationship between intellectual capital and QTUBIN is rejected.
Hypothesis 2: there is a significant relationship between value added of intellectual capital and return on equity. As can be seen in Table 3, a positive coefficient indicates a positive relationship between intellectual capital variable and return on equity, which according to the probability (p-value<0.05) calculated, this relationship is statistically significant. So H0 hypothesis there is no significant relationship between intellectual capital and return on equity is rejected.

Control Variables Test

Results of the effects of control variables on QTUBIN are presented in both Tables 3 and 4. The negative coefficient of variable size in both Tables 3 and 4 indicate a negative relationship between this variable and the dependent variable for both and return on equity and QTUBIN’s models, which given the probability (p-value<0.05) calculated, this relationship is statistically significant.

Positive coefficient of the variable of financial leverage suggests a positive relationship between these variables in both tables 3 and 4 with dependent variables for both QTUBIN and return on equity models, which given the probability (p-value<0.05) calculated, this relationship is statistically significant.

5. Conclusion and Recommendations

Present study was to examine the relationship between intellectual capital and performance evaluation criteria (QTUBIN, return on equity) of the firms listed in Tehran Stock Exchange. The results indicate that regardless of the size and structure of the debt, there is a significant positive relationship between intellectual capital and corporate financial performance. Also, in components of intellectual capital (capital employed efficiency, effectiveness and efficiency of human capital, structural capital) when their impact simultaneously investigated on the variables used to measure investment performance, only capital employed efficiency and human capital efficiency impacts on the firm performance. Therefore, it can be said that companies need to improve their performance in order to promote the act of intellectual capital. Taking carefully into account other research conducted inside and outside the country, we can largely observe the match of results achieved from this study and other conducted studies.

References

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