Investigating the Relationship Between Intellectual Capital and Earnings Quality in Tehran Stock Exchange (TSE)

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Abstract: Development of information technologies and communication networks has increased utilization of knowledge and information in the world. In this complex and changing business environment, survival of organizations depends on introducing new products, innovation and offering value-increasing processes based on modern knowledge. In knowledge-based economy, intellectual capital is used to create and increase organizational value and the position of any organization depends on managing these valuable and scarce resources. According to resource-based perspective of company, intellectual capitals are strategic resources that enable companies to create competitive advantage and better financial performance. So, the managers should measure intellectual capital as an important criterion for increasing business performance of organizations, determining the real value of intellectual capitals and even improving their control. In this paper we attempt to investigate the relationship between intellectual capital and earnings quality. Various classifications have been offered for measuring intellectual capital. One of these, named VAIC (value added of intellectual capital), was offered by PULIC. It consists of physical capital efficiency, human capital efficiency and structural capital efficiency. In this research, firstly intellectual capital value of companies accepted in Tehran stock exchange in a 10 years period between 2002-2011 was calculated using VAIC model. Then, the relationship between intellectual capital and the elements of earnings quality of companies was evaluated. To measure earnings quality, eight indices of financial performance in five group including receivable accounts, gross profit, cost of sales management, applied capital rate, liquidity realization, operational liquidity, inventory, profitable reinvested assets ratio were used. In this study, the statistical methods used for data analysis are multiple regression and correlation coefficients. The selected sample includes 73 companies for a period of 10 years and company size, type of industry and investment intensity ratio have been considered as control variables. The findings show significant and positive relationship between intellectual capital and earnings quality of companies and the positive effect of control variables on the relationship between intellectual capital and earnings quality. Regarding these results, we can absorb the attention of managers, stockholders, investors and other beneficiary groups to internal organizational resources and capabilities and suggest utilizing this model for gaining higher financial output and accessing real value of companies.

Key words: intellectual capital, earnings quality, company size, multiple regression

INTRODUCTION

Knowledge-based business environment requires an approach that embeds new intangible assets of organization such as knowledge and qualifications of human resources, innovation, relation with costumers, organization culture, systems, organizational structure. In this respect, intellectual capital theory absorbs the attention of scholars, and managers of organizations. On the other hand, one of the important capabilities of organizations that can help them to create advantage and facilitate knowledge and give them the capability of comparison with other organizations is social capital (Anvari Rostami, A., M. Rostami, 2003). On one hand, organizations need information and knowledge in any form and type to improve their earnings quality and participate in current markets. Thomas Stewart considers intellectual capital a useful knowledge package for organizations. According to Lif Edvinston and Michelle Malon, intellectual capital consists of human capital, structural capital and costumer capital. Human capital represents the knowledge of organization’s employees. Structural capital is supportive infrastructure that directs human capital to be operationalised. Costumer capital, emphasizes all communications and interactions that lead to strength and stability of relations with costumers. On the other hand, earnings quality is interested by persons who use financial reports for decision making. From their perspective, earnings of low quality are inappropriate because inappropriate and incomplete allocation of resources implies inefficiency. The previous researches have showed that there is a meaningful relationship between performance indices such as profitability and efficiency with intellectual capital. This research surveys
the relationship between intellectual capital and earning quality. In other words, when intellectual capital increases, earning quality of a company should increase too.

**Theoretical Framework:**

During past decade, businesses have understood the importance of intangible assets management and have considered trademark development, stockholders relationships, reputation, and organization culture as the most important resources of stable business advantage. In this economy, the ability to create and utilize the value of these intangible assets has created a major qualification for organizations (Kaplan, R.S. and D.P. Norton, 1996). Kendrick, a well-known American economist, says that in 1925 the ratio of intangible capital to tangible capital was 30 to 70. But in 1990 this ratio is 63 to 37. Also Leo suggests that intangible assets constitute 10% to 15% of overall market value of companies and no work has done to measure them. A series of studies carried out in 1999 about the composition of assets of thousands nonfinancial company in time period of 1978-1998 showed that the ratio of intangible assets to tangible assets has been 20 to 80 and in 1998 this ratio was 80 to 20. These significant changes lead to introduction of a series of methods for calculating the asset of companies whose assets are mainly intangible and in particular intellectual and knowledge (Pulic, A., 2002).

**Intellectual Capital:**

There are diverse definitions for intellectual capital in different resources. All of the scholars agree that intellectual capital is an aspect of knowledge that creates competitive advantage and represents intangible value of an organization. But there is no agreement for a specific definition. But there isn’t definite composition between theoretical aspect and application of intellectual capital. A key difference between different proposed definitions and models of intellectual capital measurement relates to priority that every one put one measuring internal and external human and social capital. Some of them tend to emphasize on customer capital, whereas others pay attention to internal human capital.

Others provide an holistic perspective about existing models of knowledge assets measurement coupled with their comparison. For instance, according to Bontis, intellectual capital is the sum of intangible assets of organization such as a part of human, structural, relational, organizational, internal and external capital. At first, he mentioned three kinds of human, structural and costumer capital and in 2000, he changed his classification as human capital, structural capital, relational capital and intellectual property (Bontis, N., 1998). Most scholars divide intellectual capital in customer, human and structural capital.

Human capital represents implicitly acquired knowledge in employers mind. Human capital is defined as a mixture of qualifications, line of thinking and creativity of employees. Employees’ qualification is the hardware of intellectual capital and includes knowledge, skills and talents of employees. Knowledge is technical and academic knowledge. Skill is the ability to carry out tasks and assignments that are obtained through exercise and some of them are acquired through education. Line of thinking is the hardware of intellectual capital that includes incentive for work and job satisfaction. Creativity enables employees to use their knowledge and have innovation (Chen Goh P., 2005).

Structural capital deals with systems and structures of organization. In fact, it is the procedures and routines of business. We can divide structural capital into culture, organizational structure, organizational learning, operational processes and information systems (Chen Goh P., 2005).

**Chart 1:** A summary of quantitative evaluation methods and components of intellectual capital (collected by Erik Sviely).

<table>
<thead>
<tr>
<th>year of development</th>
<th>Term</th>
<th>Main creator</th>
<th>Class</th>
<th>Measurement method description</th>
</tr>
</thead>
<tbody>
<tr>
<td>2004</td>
<td>Topplinjen/ Business IQ</td>
<td>Sandvik (2004)</td>
<td>SC</td>
<td>A combination of four indices: identity, human capital, knowledge capital and reputation. It has been developed by human capital group of Norway</td>
</tr>
<tr>
<td>2003</td>
<td>Danish Guidelines</td>
<td>Mouritzen, Bukh &amp; al. (2003)</td>
<td>SC</td>
<td>A suggestion from a government-sponsored research that investigates how Danish institutes report their intangible assets. Intellectual capital includes: 1) knowledge description, 2) management ability, 3) number of initiatives, related indices</td>
</tr>
<tr>
<td>2002</td>
<td>IC Rating</td>
<td>Edvinsson (2002)</td>
<td>SC</td>
<td>development of Scandia directing framework and combining it with idea of intangible assets monitoring</td>
</tr>
<tr>
<td>2002</td>
<td>Meritum guidelines</td>
<td>Meritum Guidelines (2002)</td>
<td>SC</td>
<td>A framework for management and disclosure of intangible assets that has been derived from an EU-sponsored research. 1) definition of strategic goals, 2) definition of intangible resources, 3) action for developing intangible resources. Three groups of intangible assets: human capital, structural capital and relational capital.</td>
</tr>
<tr>
<td>Year</td>
<td>Methodology</td>
<td>Authors</td>
<td>Type</td>
<td>Description</td>
</tr>
<tr>
<td>------</td>
<td>-------------</td>
<td>---------</td>
<td>------</td>
<td>-------------</td>
</tr>
<tr>
<td>2001</td>
<td>Knowledge Audit Cycle</td>
<td>Marr &amp; Schiuma (2001)</td>
<td>SC</td>
<td>A method for recognizing six scientific dimensions of capabilities of an organization in four steps: 1) define key properties of knowledge, 2) specify key processes of knowledge, 3) planning actions on knowledge process, 4) improvement of execution and monitoring tools and return to step 1.</td>
</tr>
<tr>
<td>2000</td>
<td>The value Explorer™</td>
<td>Andriessen &amp; Tiessen (2000)</td>
<td>DTC</td>
<td>The accounting method by KPMG method for calculation and value allocation for 5 types of intangible assets was proposed: 1) assets and devotions, 2) skills and implied knowledge, 3) collective values and norms, 4) technology and explicit knowledge, 5) management processes and main processes.</td>
</tr>
<tr>
<td>2000</td>
<td>Total Value Creation, TVCT™</td>
<td>Anderson &amp; Mcleen (2000)</td>
<td>DTC</td>
<td>It is a plan that has been founded by a Canadian institute. TVC utilizes descendingly planned liquidity to examine how events affect planned activities.</td>
</tr>
<tr>
<td>2000</td>
<td>Value Added Intellectual Coefficient (VAICTM)</td>
<td>Pulic (1997)</td>
<td>ROA</td>
<td>Quantity and quality of intellectual capital used in creating value is examined based on the following elements: 1) physical capital, 2) human capital, 3) structural capital.</td>
</tr>
<tr>
<td>1999</td>
<td>Knowledge Capital Earnings</td>
<td>Lev (1999)</td>
<td>ROA</td>
<td>Knowledge capital’s revenues have been estimated as part overall and usual revenues and more than book assets revenues that can be considered.</td>
</tr>
<tr>
<td>1998</td>
<td>Inclusive valuation Methodology (IVM)</td>
<td>McPherson (1998)</td>
<td>DTC</td>
<td>The hierarchy of combined of weight indices that preferably have focused on relative values than absolute ones. Combined added value=monetary added value+added value of intangible assets.</td>
</tr>
<tr>
<td>1998</td>
<td>Accounting for the future (AFTF)</td>
<td>ash H (1998)</td>
<td>DTC</td>
<td>It is a planned descending system. The difference between AFTF value at the end and at the beginning of period is added value of period.</td>
</tr>
<tr>
<td>1998</td>
<td>Investor assigned market value (IAMV™)</td>
<td>Standfield (1998)</td>
<td>MCM</td>
<td>Interpretation of net value of company to market value of its shares and its distribution as tangible capital+{realized IC+IC analysis+significant competitive advantage(SCA)}</td>
</tr>
<tr>
<td>1997</td>
<td>Economic Value Added (EVA™)</td>
<td>Stewart (1997)</td>
<td>ROA</td>
<td>It has been calculated by modification of announced profit of company by expenses related to intangible assets. The Variations in preparing economic value added is a sign of company’s intellectual capital, whether productive or nonproductive.</td>
</tr>
<tr>
<td>1997</td>
<td>Calculated Intangible Value</td>
<td>Stewart (1997), Luthy (1998)</td>
<td>ROA</td>
<td>It calculates additional output on fixed assets and applies this numerator as a proportion of output relating to intangible assets.</td>
</tr>
<tr>
<td>1997</td>
<td>Ic-Index™</td>
<td>Roos Dragonetti And Edvinsson (1997)</td>
<td>SC</td>
<td>It is unifying all of indices which offers intellectual characteristics and factors in one index. They are variations in index that lead to variation in market value of company.</td>
</tr>
<tr>
<td>1996</td>
<td>Skandia Navigator</td>
<td>Edvinsson And Malone (1997)</td>
<td>DIC</td>
<td>Intellectual capital is measured by analyzing more than 164 standard criteria ( 91 intellectual bases and 73 business standard) that covers the following components: 1) financial, 2) costumer, 3) process, 4) renewal and development, 5) human.</td>
</tr>
<tr>
<td>1994</td>
<td>Intangible Asset Monitor</td>
<td>Sveiby (1997)</td>
<td>SC</td>
<td>They choose index scale based on company’s strategic goals to measure four aspects of creativity value from three classes of intangible assets ( capability of people, internal structure, external structure). Aspects of value creation: 1) growth, 2) renewal, 3) profitability/efficiency, 4) risk reduction/ stability.</td>
</tr>
<tr>
<td>1992</td>
<td>Balanced Score Card</td>
<td>Kaplan and Norton(1992)</td>
<td>SC</td>
<td>The performance of a company is measured by indices that cover the following four main aspects: 1) financial aspect, 2) costumer aspect, 3) learning aspect. The indices are on the basis of strategic goals of company.</td>
</tr>
<tr>
<td>1989</td>
<td>The invisible Balance Sheet</td>
<td>Sveiby (1989)</td>
<td>MCM</td>
<td>The difference between marked value of a company’s shares and their book value is explained by three related families of capitals as follows: human capital, organizational capital and costumer capital. This classification was published for the first time in this book.</td>
</tr>
<tr>
<td>1950</td>
<td>Tobins q</td>
<td>Tobin J. (1956)</td>
<td>MCM</td>
<td>Q is market value of company’s shares divided by its assets replacement cost. Variations in q is a criterion to measure whether efficiency of intellectual capital of a company is effective or not. It was developed by two economists, Laureate N &amp; Tobin J in 1956.</td>
</tr>
</tbody>
</table>
Costumer (relational) capital: According to Bontis, costumer capital refers to knowledge that has been put in marketing channels of an organization that have been created by an institute through carrying out its business. In comparison to other three capitals, this capital has direct effect on realization of a company’s value and it has become an important factor in businesses (Bontis, N., 1998).

Analytical Model and Method of Variable Measurement:
A) Independent Variable: Intellectual Capital:
In 1998 and 2000, Pulic offered value added of intellectual capital (VAIC) to measure company’s’ intellectual capital. In pulic’s model, intellectual capital is divided into three component of human capital, structural (organizational) capital and physical capital. In this research, pulic model is used for measuring intellectual capital. The main reasons for using this method are its convenience in measuring intellectual capital, its independence and its realness that is used through financial statements and their attached notes and as we know, financial statements show what is in reality and is not illusion and considers anything that is in company through financial perspective.

\[ VAIC = HCE + SCE + CEE \]

VAIC = value added of intellectual capital
HCE = human capital efficiency
SCE = structural capital efficiency
CEE = physical capital efficiency

This model begins with company’s ability to create value added. Value added is the difference between input and output. So, VA can be calculated by the following equation:

\[ VA = OP + EC + D + A \]

OP = operating profit
A + D = Depreciation and Amortization
EC = total employee Expenses

In this research, total employee expenses EC has been extracted from financial statements and total cost (direct wage and production overheads), administrative costs and cost of sale. Also, the total depreciation and amortization costs of tangible and intangible assets have been extracted from comparative table of operating cash flow.

Physical capital efficiency (CEE): includes the ratio of value added to applied physical capital. This index is obtained through the following equation:

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

CE = total assets - intangible assets = tangible assets

Human capital efficiency (HCE): The coefficient of human capital efficiency shows that how much value added has been generated for every Rial spent for wage in company. The ratio of VA to HC, represents human capital ability (HC) to value creation in a company.

\[ HCE = \frac{value added}{employee expenses} \]

HC = total wages paid to human resources = total wages of company

Structural capital efficiency: the third relation is SCE that shows the ratio of structural capital in value added creation. Structural capital includes all nonhuman knowledge storage in an organization that includes databases, organizational charts, processes and procedures and it gives organization value higher than physical assets. In pulic model, structural capital equals to VA minus HC. The relationship between VA and SC is calculated as follows:

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

SC = VA - HU

B) Dependent Variable:
Index of Applied Capital Rate:
Applied capital rate = (profit before taxation + interest cost)/(asset - current debt)
Analyzing data of dependent variable Y_i (Applied capital rate)
Regression estimation of model:
Estimation mean model is presented as follows:

\[ \ln Y_{it} = \beta_0 + \beta_1 X_{1i} + \beta_2 Y_{1i} + \beta_3 Z_{3i} + \beta_4 Z_{2i} + \beta_5 Z_{1i} + \gamma_1 automobile + \gamma_2 medicine + \gamma_3 tire + \gamma_4 cement + \gamma_5 chemical + \gamma_6 food + \gamma_7 machinery + \gamma_8 electronic + \gamma_9 automobile \times X_{1i} + \gamma_{10} medicine \times X_{2i} + \gamma_{11} tire \times X_{3i} + \gamma_{12} cement \times X_{4i} + \gamma_{13} chemical \times X_{5i} + \gamma_{14} food \times X_{6i} + \gamma_{15} machinery \times X_{7i} + \gamma_{16} electronic \times X_{8i} + \epsilon_{it} \]

In this model, X_{1i} is the main independent variable and Z_{3i}, Z_{2i} and Z_{1i} are control variables. The effect of industry is dummy variable and is defined as follows:
If it is automobile industry=1
If it isn’t automobile industry=0
If it is medicine industry=1
If it isn’t medicine industry=0
If it is cement industry=1
If it isn’t cement industry=0
If it is tire industry=1
If it isn’t tire industry=0
If it is chemical industry=1
If it isn’t chemical industry=0
If it is food industry=1
If it isn’t food industry=0
If it is machinery industry=1
If it isn’t machinery industry=0
If it is electronic industry=1
If it isn’t electronic industry=0

In this model, the effect of industry shows itself with two parts:
The first part with parameter $\gamma_1, \gamma_2, \gamma_3, \gamma_4, \gamma_5, \gamma_6, \gamma_7, \gamma_8, \gamma_9, \gamma_{10}, \gamma_{11}, \gamma_{12}, \gamma_{13}, \gamma_{14}, \gamma_{15}, \gamma_{16}$ that mentioned parameters estimation show their effect in the width of origin of coordinates.
The second part with parameters $\gamma_9 \cdots \gamma_{10}, \gamma_{11} \cdots \gamma_{12}, \gamma_{13} \cdots \gamma_{14}, \gamma_{15} \cdots \gamma_{16}$ that mentioned parameters estimation show their effect in the slope of the line or in other words shows the effect of main variable in every industry.

To investigate the significance of regression model of $H_0$ and $H_1$ hypotheses are as follows:

$H_0: \beta_1 = \beta_2 = \ldots = \gamma_{16} = 0$

$H_1: \beta_1 \neq 0$ or $\beta_2 \neq 0$ … or $\gamma_{16} \neq 0$

$H_0$: there is no meaningful model

$H_1$: there is no meaningful model

Index of Liquidity Realization:

Index of liquidity realization = cash obtained from operation/net profit

Analyzing data of dependent variable $Y_2$ (index of liquidity realization)

In this mean model, $X_{it}$ is the main independent variable and $Z_{3it}$, $Z_{2it}$, and $Z_{1it}$ are control variables. The effect of industry is dummy variable and is defined as before.
Index of Gross Profit:
Index of gross profit=percent of variations of gross profit/percent of variation in sales revenue
Analyzing data of dependent variable \( Y_d \) (index of gross profit)
In this mean model, \( x_{1it} \) is the main independent variable and \( Z_{3it}, Z_{2it}, \) and \( Z_{4it} \) are control variables. The effect of industry is dummy variable and is defined as before.

Liquidity Index Obtained from Operations:
Liquidity index obtained from operative action=(net profit-cash obtained from operation)/average of assets
Analyzing data of dependent variable \( Y_d \) (index of liquidity obtained from operation)
In this mean model, \( x_{1it} \) is the main independent variable and \( Z_{3it}, Z_{2it}, \) and \( Z_{4it} \) are control variables. The effect of industry is dummy variable and is defined as before.

Receivable Accounts Index:
Receivable account index=percent of variation of sales revenue-percent of variation in receivable accounts
Analyzing data of dependent variable \( Y_d \) (index of receivable accounts)
In this mean model, \( x_{1it} \) is the main independent variable and \( Z_{3it}, Z_{2it}, \) and \( Z_{4it} \) are control variables. The effect of industry is dummy variable and is defined as before.

Index of Cost of Sales Management:
Index of cost of sale management=percent of revenue variation-percent of cost of sales management variation
Analyzing data of dependent variable \( Y_d \) (index of supply)
In this mean model, \( x_{1it} \) is the main independent variable and \( Z_{3it}, Z_{2it}, \) and \( Z_{4it} \) are control variables. The effect of industry is dummy variable and is defined as before.

Profitable Reinvested Assets Ratio Index:
Profitable reinvested assets ratio index=capital expenditures/depreciation
Analyzing data of dependent variable \( Y_d \) (index of supply)
In this mean model, \( x_{1it} \) is the main independent variable and \( Z_{3it}, Z_{2it}, \) and \( Z_{4it} \) are control variables. The effect of industry is dummy variable and is defined as before.

C) Control Variables:
Firm Size:
Firm size influences the relation between intellectual capital and output and financial performance of companies. In this research, the effect of Firm size on relations between variables has been controlled by its effect on regression equation. For measuring firm size, natural logarithm of market value of firm has been applied.
\[ \text{Log} = \text{M.V} \]
Firm’s market value = M.V

Type of Industry:
It is a group of companies whose products are proper alternative for each other. In other words, on the basis of similarities in terms of production process, type of equipment, type of required raw material, etc. that exists between different industrial groups. Different industrial groups can be classified from different aspects. There is a virtual variable with zero and one value. One is for industries with high technology and zero is for industries with low technology.

Investment Intensity Ratio:
It represents the amount company’s investment in fixed assets. So, when the amount of fixed assets to total asset of company shows high percentage, the investment ration of that company is high. This ratio is total fixed assets divided by total assets.

Methodology:
This study is applied in terms of purpose research and is correlation in terms of method. The statistical universe includes all accepted companies of Tehran Stock Exchange. By taking into account the 10 years period of research(from the beginning of 2001 to the end of 2010), companies have been selected that were member of
Tehran Stock Exchange from the beginning of 2001 and their financial period should be Esfand 29th. Sampling was step-by-step and with systematic elimination.

In this research, the companies have been selected that have the following qualifications:

2. Their financial year should end on Esfand 29th.
3. The stock of companies should be exchanged at the beginning and end of their financial year.
4. They should have delivered their financial statements to Exchange without study.
5. In the studied time period, they shouldn’t have operating loss in their audited income statements of end of financial year and also their residual shouldn’t be negative after taxation.

By taking those conditions into account, among all of the companies accepted to Tehran Stock Exchange, financial year of 282 companies ends on Esfand 29th. Among the companies that their financial year ends on Esfand 29th, 137 companies which had exchange interruption were eliminated and also 72 companies were eliminated because they couldn’t satisfy requirements 4 and 5. Finally, 73 companies were elected as statistical universe.

**Hypotheses:**

There are 4 major hypotheses and 8 minor hypotheses in this research.

**Major hypotheses:**

1. Assuming constancy of other factors, there is significant relation between intellectual capital and earnings quality.
2. Firm size affects the relation between intellectual capital and earnings quality.
3. Industry type affects the relation between intellectual capital and earnings quality.
4. Investment intensity ration affects the relation between intellectual capital and earnings quality.

**Minor hypotheses:**

1. Assuming constancy of other factors, there is significant relation between intellectual capital and applied capital index.
2. Assuming constancy of other factors, there is significant relation between intellectual capital and liquidity realization index.
3. Assuming constancy of other factors, there is significant relation between intellectual capital and gross profit index.
4. Assuming constancy of other factors, there is significant relation between intellectual capital and index of liquidity acquired from operation.
5. Assuming constancy of other factors, there is significant relation between intellectual capital and receivable accounts index.
6. Assuming constancy of other factors, there is significant relation between intellectual capital and inventory index.
7. Assuming constancy of other factors, there is significant relation between intellectual capital and cost of sales management index.
8. Assuming constancy of other factors, there is significant relation between intellectual capital and profitable reinvested assets ratio index.

**Data Analysis:**

For this goal, intellectual capital index independent variable and earnings quality index as dependent variable have been calculated through information extracted from financial statements and data in information banks for sample companies for 10 years time period. Pearson correlation coefficient has been used for yearly analysis of models and regression has been used for analysis of combined data. The basis of inference has been the level of significance and error. When the probability of significance level of test is less than .05, zero hypothesis is rejected in 95% level.

**Hypothesis Test and Analysis:**

Major hypothesis 1: there is significant relation between intellectual capital and earnings quality.

Minor hypotheses are examined by statistical symbols as follows:

\[
\begin{align*}
H_0 : \beta_1 = \beta_2 = \ldots = \beta_8 &= 0 \\
H_1 : \beta_i \neq 0 & \text{ at least } i = 1, 2, 3, \ldots, 8
\end{align*}
\]
Chart 2: Results of major hypothesis 1 examination.

<table>
<thead>
<tr>
<th>Accepted Hypothesis</th>
<th>Sig</th>
<th>T-Statistic</th>
<th>Durbin Watson (D.W.)</th>
<th>F-Statistic</th>
<th>R2</th>
<th>Standardized Coefficients</th>
<th>Relationship between intellectual capital and dependent variable</th>
<th>dependent variable</th>
<th>Testing for the major Hypothesis</th>
</tr>
</thead>
<tbody>
<tr>
<td>H₁</td>
<td>0.000</td>
<td>0.390</td>
<td>1.789</td>
<td>117072</td>
<td>0.0390</td>
<td>Pearson's Coefficient of Correlation</td>
<td>0.390 Pearson's Coefficient of Correlation</td>
<td>Index of applied capital rate</td>
<td>The first sub</td>
</tr>
<tr>
<td>y = 0 / 204 + 0 / 063 βᵢₑ</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>y = 0 / 204 + 0 / 063 βᵢₑ</td>
<td>Liner Regression Model with Research Variables</td>
<td></td>
</tr>
<tr>
<td>H₁</td>
<td>0.000</td>
<td>0.210</td>
<td>1.752</td>
<td>30.348</td>
<td>0.044</td>
<td>Pearson's Coefficient of Correlation</td>
<td>0.210 Pearson's Coefficient of Correlation</td>
<td>Index of liquidity realization</td>
<td>The second sub</td>
</tr>
<tr>
<td>y = 0 / 562 + 0 / 077 βᵢₑ</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>y = 0 / 562 + 0 / 077 βᵢₑ</td>
<td>Liner Regression Model with Research Variables</td>
<td></td>
</tr>
<tr>
<td>H₁</td>
<td>0.000</td>
<td>-0.087</td>
<td>1.884</td>
<td>60.332</td>
<td>0.084</td>
<td>Pearson's Coefficient of Correlation</td>
<td>-0.087 Pearson's Coefficient of Correlation</td>
<td>Index of gross profit</td>
<td>The third sub</td>
</tr>
<tr>
<td>y = 0 / 132 + 0 / 250 βᵢₑ</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>y = 0 / 132 + 0 / 250 βᵢₑ</td>
<td>Liner Regression Model with Research Variables</td>
<td></td>
</tr>
<tr>
<td>H₁</td>
<td>0.000</td>
<td>0.319</td>
<td>1.868</td>
<td>74.171</td>
<td>0.102</td>
<td>Pearson's Coefficient of Correlation</td>
<td>0.319 Pearson's Coefficient of Correlation</td>
<td>Liquidity index obtained from operations</td>
<td>The fourth sub</td>
</tr>
<tr>
<td>y = 0 / 083 + 0 / 021 βᵢₑ</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>y = 0 / 083 + 0 / 021 βᵢₑ</td>
<td>Liner Regression Model with Research Variables</td>
<td></td>
</tr>
<tr>
<td>H₁</td>
<td>0.000</td>
<td>0.314</td>
<td>1.775</td>
<td>71.424</td>
<td>0.098</td>
<td>Pearson's Coefficient of Correlation</td>
<td>0.314 Pearson's Coefficient of Correlation</td>
<td>Receivables accounts index</td>
<td>The fifth sub</td>
</tr>
<tr>
<td>y = 0 / 471 + 0 / 119 βᵢₑ</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>y = 0 / 471 + 0 / 119 βᵢₑ</td>
<td>Liner Regression Model with Research Variables</td>
<td></td>
</tr>
<tr>
<td>H₁</td>
<td>0.000</td>
<td>0.340</td>
<td>2.016</td>
<td>85.860</td>
<td>0.116</td>
<td>Pearson's Coefficient of Correlation</td>
<td>0.340 Pearson's Coefficient of Correlation</td>
<td>Inventory of goods index</td>
<td>The sixth sub</td>
</tr>
<tr>
<td>y = -0 / 199 + 0 / 078 βᵢₑ</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>y = -0 / 199 + 0 / 078 βᵢₑ</td>
<td>Liner Regression Model with Research Variables</td>
<td></td>
</tr>
<tr>
<td>H₁</td>
<td>0.000</td>
<td>0.352</td>
<td>1.891</td>
<td>92.929</td>
<td>0.124</td>
<td>Pearson's Coefficient of Correlation</td>
<td>0.352 Pearson's Coefficient of Correlation</td>
<td>Index of cost of sales management</td>
<td>The seventh sub</td>
</tr>
<tr>
<td>y = -0 / 267 + 0 / 080 βᵢₑ</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>y = -0 / 267 + 0 / 080 βᵢₑ</td>
<td>Liner Regression Model with Research Variables</td>
<td></td>
</tr>
<tr>
<td>H₁</td>
<td>0.000</td>
<td>0.384</td>
<td>2.133</td>
<td>57.443</td>
<td>0.181</td>
<td>Pearson's Coefficient of Correlation</td>
<td>0.384 Pearson's Coefficient of Correlation</td>
<td>Profitable reinvested assets ratio index</td>
<td>The eighth sub</td>
</tr>
<tr>
<td>y = 4 / 689 + 0 / 970 βᵢₑ</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>y = 4 / 689 + 0 / 970 βᵢₑ</td>
<td>Liner Regression Model with Research Variables</td>
<td></td>
</tr>
<tr>
<td>H₁</td>
<td>0.000</td>
<td>0.337</td>
<td>2.692</td>
<td>7.579</td>
<td>0.284</td>
<td>Pearson's Coefficient of Correlation</td>
<td>0.337 Pearson's Coefficient of Correlation</td>
<td>Adjusted R²</td>
<td>The first main hypothesis</td>
</tr>
</tbody>
</table>

As significance level of correlation coefficient is less than 5% for minor hypotheses 1-8, and regression model is significant too, we can conclude that intellectual capital has the ability to explain earnings quality variations in an acceptable level(33.7%). Also, according to the result of minor hypotheses 1 to 8 and
information obtained from chart 3, we can conclude that there is positive relation between intellectual capital and earnings quality. In the following part, multiple regression model has been examined using Enter method:

**Chart 3:** The summary of findings of multiple regression using Enter method.

<table>
<thead>
<tr>
<th>Collinearity Statistics</th>
<th>Index</th>
<th>Sig</th>
<th>T-Statistic</th>
<th>Standardized coefficients</th>
<th>Standardized coefficients are not</th>
<th>B</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tolerance</td>
<td>VIF</td>
<td>Status</td>
<td>Index</td>
<td>Std.Error</td>
<td>0.142</td>
<td>2.962</td>
</tr>
<tr>
<td>0.807</td>
<td>1.224</td>
<td>2.032</td>
<td>0.000</td>
<td>7.416</td>
<td>0.261</td>
<td>0.217</td>
</tr>
<tr>
<td>0.690</td>
<td>1.449</td>
<td>2.232</td>
<td>0.029</td>
<td>-2.186</td>
<td>-0.084</td>
<td>0.104</td>
</tr>
<tr>
<td>0.865</td>
<td>1.156</td>
<td>2.552</td>
<td>0.000</td>
<td>3.933</td>
<td>0.0134</td>
<td>0.040</td>
</tr>
<tr>
<td>0.715</td>
<td>1.399</td>
<td>2.733</td>
<td>0.000</td>
<td>5.344</td>
<td>0.201</td>
<td>0.568</td>
</tr>
<tr>
<td>0.763</td>
<td>1.311</td>
<td>3.237</td>
<td>0.042</td>
<td>2.041</td>
<td>0.074</td>
<td>0.096</td>
</tr>
<tr>
<td>0.751</td>
<td>1.332</td>
<td>4.865</td>
<td>0.000</td>
<td>4.686</td>
<td>0.172</td>
<td>0.160</td>
</tr>
<tr>
<td>0.739</td>
<td>1.353</td>
<td>6.376</td>
<td>0.000</td>
<td>3.711</td>
<td>0.137</td>
<td>0.163</td>
</tr>
<tr>
<td>0.831</td>
<td>1.204</td>
<td>2.310</td>
<td>0.005</td>
<td>2.842</td>
<td>0.099</td>
<td>0.010</td>
</tr>
</tbody>
</table>

According to chart 3 and significance level (sig=0) that is less than 5% error level, significance of estimated regression model is confirmed and about constant value and coefficient B of any variable in general model has been determined according to significance level. Whereas in this output the significance level of regression coefficient equivalence test relating to variables of study is less than 5%, the hypothesis of equivalence of regression coefficient with zero (hypothesis H0) is rejected and we shouldn’t put out them from regression equation. Collinearity is a position that shows that an independent variable is a linear function of other independent variable. If collinearity is in a high level, it means that there is high correlation between independent variables and it is possible that despite higher value of R², the model doesn’t have high reliability. Position indices with higher than 15 value shows the probability of collinearity between independent variables and higher than 30 shows serious problem in using regression and since the value of position index of model’s variables is less than 15, it show that there isn’t collinearity probability between independent variables and shouldn’t be eliminated from regression. The less tolerance (less than ./15), the less information of variables and this creates problems in using regression. But as we observe, the tolerance of model’s variables is in an acceptable level. Consequently, there will be no problem in using multiple regression and multiple regression model will be as follows:

\[ e_{i} = \beta_{0} + \beta_{1}x_{1i} + \beta_{2}x_{2i} + \ldots + \beta_{n}x_{ni} + \epsilon \]

We can say from the result of major hypothesis 1 that the results of this study are similar to the results of Chen et al. (2005), Wang (1996), Chan, Anvari (2005) and Madhushi (2009) and have similarities and differences with researches of other researchers.

Major hypothesis 2: firm size affects the relation between intellectual capital and earnings quality.

In this stage, we pay attention to testing hypotheses by dividing them according to their size as control variable.

According to obtained results of three variable regression with presence of modifier variable of firm size in chart 4 and comparison of results of two variable regression between intellectual capital and earnings quality, that has been discussed in detail and has been presented in chart 3, show that by adding firm size variable to regression model, modified determination coefficient and accepted hypothesis have undergone changes and this shows that modifier variable, firm size, affects the relations between variables and should be added to regression model.

According to the results, major hypothesis 2 is confirmed in 95% confidence level.

Analysis of major hypothesis 3:

Major hypothesis 3: industry type affects the relation between intellectual capital and earnings quality.

To investigate major hypothesis 3, we calculate variables industry type, intellectual capital and earnings quality as a three variable regression. Then, we compare it with regression model consisting intellectual capital and earnings quality without modifier variable industry type. If including modifier variable industry type in regression model lead to increase or decrease of correlation coefficient and modified determination coefficient, we can conclude that modifier variable industry type affects the relation between intellectual capital and earnings quality. The results of correlation coefficient, determination coefficient and modified determination coefficient in two mentioned case, has been illustrated in chart 5:
According to obtained results of three variable regression with presence of modifier variable of Industry type in chart 5 and comparison of results of two variable regression between intellectual capital and earnings quality, that has been discussed in detail and has been presented in chart 3, show that by adding industry type variable to regression model, modified determination coefficient and accepted hypothesis have undergone changes and this shows that modifier variable, industry type, affects the relations between variables and should be added to regression model. According to the results, major hypothesis 3 is confirmed in 95% confidence level.

Analysis of major hypothesis 4:
Major hypothesis 4: investment intensity ratio affects the relation between intellectual capital and earnings quality

To investigate major hypothesis 4, we calculate variables investment intensity ratio, intellectual capital and earnings quality as a three variable regression. Then, we compare it with previous regression model. If including modifier variable investment intensity ratio in regression model lead to increase or decrease of correlation coefficient and modified determination coefficient, we can conclude that modifier variable investment intensity ratio affects the relation between intellectual capital and earnings quality. The results of correlation coefficient, determination coefficient and modified determination coefficient in two mentioned case, has been illustrated in chart6:
Chart 6: The summary of finding resulted from investigating the effect of including variable investment intensity ratio on coefficients of regression model.

<table>
<thead>
<tr>
<th>Accepted Hypothesis</th>
<th>Sig.</th>
<th>Error level</th>
<th>Observations</th>
<th>T-Statistic</th>
<th>F-Statistic</th>
<th>Durbin Watson (D.W.)</th>
<th>Coefficient of determination</th>
<th>Adjusted R2</th>
<th>Coefficient of Correlation</th>
<th>Pearson's Coefficient of Correlation</th>
</tr>
</thead>
<tbody>
<tr>
<td>H1</td>
<td>0.00</td>
<td>0.05</td>
<td>657</td>
<td>23.53</td>
<td>54.22</td>
<td>1.617</td>
<td>0.144</td>
<td>0.145</td>
<td>0.381</td>
<td>Index of applied capital</td>
</tr>
<tr>
<td>H2</td>
<td>0.00</td>
<td>0.05</td>
<td>657</td>
<td>2.06</td>
<td>3.047</td>
<td>1.912</td>
<td>0.058</td>
<td>0.059</td>
<td>0.243</td>
<td>Index of liquidity realization</td>
</tr>
<tr>
<td>H3</td>
<td>0.00</td>
<td>0.05</td>
<td>657</td>
<td>2.257</td>
<td>4.277</td>
<td>1.801</td>
<td>0.097</td>
<td>0.098</td>
<td>0.314</td>
<td>Index of gross profit</td>
</tr>
<tr>
<td>H4</td>
<td>0.07</td>
<td>0.05</td>
<td>657</td>
<td>1.216</td>
<td>1.743</td>
<td>2.015</td>
<td>0.009</td>
<td>0.010</td>
<td>0.104</td>
<td>Liquidity index obtained from operations</td>
</tr>
<tr>
<td>H5</td>
<td>0.00</td>
<td>0.05</td>
<td>657</td>
<td>31.25</td>
<td>63.532</td>
<td>1.706</td>
<td>0.163</td>
<td>0.164</td>
<td>0.406</td>
<td>Receivable accounts index</td>
</tr>
<tr>
<td>H6</td>
<td>0.00</td>
<td>0.05</td>
<td>657</td>
<td>8.663</td>
<td>22.065</td>
<td>1.847</td>
<td>0.087</td>
<td>0.088</td>
<td>0.298</td>
<td>Inventory of goods index</td>
</tr>
<tr>
<td>H7</td>
<td>0.00</td>
<td>0.05</td>
<td>657</td>
<td>3.54</td>
<td>11.029</td>
<td>2.215</td>
<td>0.078</td>
<td>0.080</td>
<td>0.284</td>
<td>Index of cost of sales management</td>
</tr>
<tr>
<td>H8</td>
<td>0.00</td>
<td>0.05</td>
<td>657</td>
<td>8.567</td>
<td>14.93</td>
<td>1.799</td>
<td>0.095</td>
<td>0.098</td>
<td>0.314</td>
<td>Profitable reinvested assets ratio index</td>
</tr>
</tbody>
</table>

According to obtained results of three variable regression with presence of modifier variable of investment intensity ratio in chart 6 and comparison of results of two variable regression between intellectual capital and earnings quality, that has been discussed in detail and has been presented in chart 3, show that by adding investment intensity ratio variable to regression model, modified determination coefficient and accepted hypothesis have undergone changes and this shows that modifier variable, investment intensity ratio, affects the relations between variables and should be added to regression model. According to the results, major hypothesis 4 is confirmed in 95% confidence level.

Conclusion:
The researcher found out that in mentioned confidence level, there is significant and positive relation between variables of intellectual capital and indices of earnings quality. In this regard, intellectual capital has the highest correlation with indices applied capital, sales management cost and inventory. The effect off firm size on intellectual capital and earnings quality was direct and in the same direction. Including control variable industry type shows that it affects the relation between the variables of the research. Including control variable investment intensity ratio shows that it affects the relation between the variables of the research.

Suggestions Based on Findings of Research:
According to the results, we can offer the following suggestions:
1. By taking into account the prospective situation of industry and increasingly growth of technology and focus on customer and internal structure of companies and the results of hypothesis 1, we can use correlation between intellectual capital and earnings quality indices for ranking companies and use this ranking for evaluating real value of companies’ stock.
2. Because of relation between intellectual capital and earnings quality, we can offer this model to investors and financial managers that want to invest in stock exchange. They can obtain higher output by incorporating intellectual capital criterion in their decision making.
3. Because of relation between intellectual capital and earnings quality, the necessity of reflecting intellectual capital and intangible assets in financial statements has increased. Presenting full information in financial statements including physical assets and intellectual capital leads to determination of real value of companies.
4. By taking in to account the effect of control variables firm size, industry type and investment intensity ratio on relationship between intellectual capital and earnings quality, it is suggested that all users of financial information pay attention to these variables in their decision making and companies disclose intellectual capital information with more motivation.

Suggestions for Future Researches:
It is suggested that researchers add more variables to research and compare the results with the results of this research.
It is suggested that researchers rank the companies of Tehran Stock Exchange in terms of intellectual capital index so that investors use that criteria in their decision making model and allocate the resources optimally.
Investigation of the effect of intellectual capital on risk is suggested.
Evaluation of intellectual capital through combined financial and nonfinancial model is suggested.

Bibliography
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