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The Effect of Intellectual Capital on Market Value Added

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ABSTRACT

The aim of this article is to examine the relationship between intellectual capital (IC) and market value added (MVA) in Tehran Stock Exchange. In this research, the intellectual capital was measured from two aspects (efficiency and value). To measure IC efficiency the value added intellectual coefficient (VAIC) method and to evaluate IC value the calculated intangible value (CIV) method was used. The relationship between IC and MVA was investigated through panel data and by using static models, dynamic, estimation methods of fixed Effects and Random Effects.

While the effect of calculated intangible value (CIV) and VAIC and its components [Human capital Efficiency (HCE), structural capital Efficiency (SCE), capital Employed Efficiency (CEE)] on MVA was investigated individually and independently, the results of statistical tests indicated that separate from size of firm and financial leverage (LEV), VAIC and its components have a significant and positive relationship with MVA. In investigating the simultaneous effect of CIV and components of VAIC on MVA of firm, the result of statistical tests indicated that separate from size of firm and financial leverage, SCE only in firm fixed effect model and CEE only in fixed effects models had a significant and positive effect on MVA.

Key words: Intellectual capital, human capital, structural capital , capital employed, value added intellectual coefficient, calculated intangible value, market value added, panel Data.

1. INTRODUCTION

Intellectual capital is increasingly recognized as an important strategic asset for sustainable corporate competitive advantages (Chen et al. 2005, p. 174).

Johnson and Kaplan (1987) emphasize that IC plays very important role in overall performance of an enterprise.

In knowledge-based economy, the growing gap between firms' market and book value has been ascribed to the invisible value creation of intellectual capital which can't be accurately measured and reported under current financial accounting system (Edvinsson and Malone, 1997).

IC measurement is important from two aspects: first, inter organizational which its purpose is better to allocate resources in the line of efficiency and to minimize the costs of organization. Second, enter organizational which its purpose is to make access existing and potential investment information to forecast future growth as well as long-term planning's. (Enzo Dia and Fabrizio, 2009).

Today IC is a critical success factor, not only for knowledge-intensive organizations, but also for most of the other types of organizations. The intellectual capital of an organization may include knowledge and skills of employees, the culture and values as well as its immaterial properties in addition to the organizational infrastructure that supports the efforts of employees (Ghosh and Mondal, 2009. p.373).

One of the most popular models for classifying intellectual capital (IC) has been offered by Saint-Onge (1996). It divides intellectual capital into three parts: human capital, structural capital, and customer capital. A slight variant of this model developed by Bontis (1999) re-states customer capital as relational capital to include relationships with suppliers (Ghosh and Mondal, 2009. p.372).

In the researches of Sveiby (1997), Roos et al. (1997), Bontis (1999), O'Donnell et al. (2004, 2006), Sallebrant et al. (2007), Curado and Bontis (2007) among others, intellectual capital is defined as encompassing: Human capital; Structural capital; and relational capital.

Bontis et al.(2000.p.88) said that "Structural capital includes all the non-human storehouses of knowledge in organizations which include the databases, organizational charts, process manuals , strategies, routines and anything whose value to the company is higher than its material value".

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According to Bontis (1998), if an organization has poor systems and procedures by which to track its actions, the overall intellectual capital will not reach its fullest potential. Organizations with strong structural capital will have a supportive culture that allows individuals to try new things, to learn, and to fail.

According to Pulic (2000a), IC is a moving force for business success. Wiig (1997) said that knowledge and intellectual capital play a fundamental role in the modern enterprises. Firms, by means of managing their intellectual capital can outperform other companies.

In today knowledge oriented economic, it is necessary organizations to seek generate, manage, develop, and exploit from IC optimally in the line of organizational creation value and improving business and trade approach. Today despite of importance increase of intangible assets and IC in the firms, most accounting measurements would not be able to measure firms IC and reflect it in financial statements. By relying on these matters, it is appears necessary conducting broad and in-depth researches surrounding different aspects of IC including IC concept, examination of different methods of its reporting and measurement and how IC is related with other accounting, management and economic concepts.

In the same direction and with this regard to this that productivity improvement, creation value and wealth increase of share holders are among the main aims for managers in businesses, in this research the relationship between intellectual capital with market value added in Tehran Stock Exchange was investigated.

2. LITERATURE REVIEW

Teece (2000) stated that intangible assets of the firm and its IC are the keys to achieving sustainable competitive advantage and drive economic growth.

Pulic (2000b) tested the relationship between corporate efficiency of resources (VAIC) and the company's market value. He concluded that there is high degree of correlation between VAIC and MVA.

Firer and Stainbank (2003) investigated whether the performance of a company's intellectual capital can explain organizational performance. The empirical findings suggested that the performance of a company's intellectual capital can explain profitability and productivity, but not market valuation.

Chen et al. (2005) investigated empirically the relation between the value creation efficiency and firms' market valuation and financial performance in firms listed on the Taiwan Stock Exchange (TSE) during 1992-2002. The results have supported the hypothesis that firms' intellectual capital has a positive impact on market value and financial performance, and may be an indicator for future financial performance. In addition, the authors found investors may place different value on the three components of value creation efficiency (physical capital, human capital, and structural capital). Finally, evidence was presented that R&D expenditure may capture additional information on structural capital and has a positive effect on firm value and profitability.

Kamath (2008) studied the relationship, if any, between the intellectual capital (IC) components, namely human, structural, and physical capitals with the traditional measures of performance of the company, namely profitability, productivity and market valuation at the firms in the drug and pharmaceutical industry in India, for a ten-year period from 1996 to 2006. The domestic firms seem to be performing well and efficiently utilizing their IC as seen by the VAIC rankings. The empirical analysis found that the human capital was the one which was seen to have the major impact on the profitability and productivity of the firms over the period of study. Though there is a growing importance and efficiency in the utilization of the intellectual resources in the Indian pharmaceutical industry, the reflection of the same in creating an impact on the financial performance of the industry is seen to be missing in the empirical analysis.

Rechieri et al. (2008) in a conducted research about largest Brazilian companies in 2000-2005 period investigated the effect of firm intellectual capital on ratios of return on equity (ROE), return on assets (ROA) and return on sale (ROS). By using static panel data models, it was determined that the relationship between CIV, ICE with ROA, ROE, and ROS is positive.

Chan (2009) investigated the relationship between intellectual capital and financial performance criteria (productivity, return on equity, profitability and market valuation) in the companies of Hang Kong Stock Exchange in 2001-2005 periods. In analyses, the clear relationship between IC and financial performance criteria was not determined. In the best condition only, there was medium positive relationship between IC and profitability. Among VAIC components, the physical capital had the most effect on financial performance of studying companies.

Ghosh and Mondal (2009) studied the relationship between intellectual capital and corporate conventional financial performance measures of Indian software and pharmaceutical companies for a period of five years from 2002 to 2006. The analysis indicated that the relationships between the performance of a company's intellectual capital and conventional performance indicators, namely, profitability, productivity and market valuation, are varied. The findings suggested that the performance of a company's intellectual capital can explain profitability but not productivity and market valuation in India.

Cheng and Rui (2009) investigated the relationship between various resources and corporate value. The results showed that the physical capital has a significant positive impact on all listed companies' value, and the impact becomes stronger when the company's value goes up. Human capital had a stable positive effect on corporate value for most companies, but it could not significantly influence the companies with high value. Structural capital only positively affected those companies with median value. And the authors found that in all companies the influence of physical capital on corporate value is stronger than that of intellectual capital.

Kiong Ting and Lean (2009) examined the intellectual capital performance and its relationship with financial performance of financial institutions in Malaysia for the period 1999 to 2007. The empirical findings from this research clearly revealed that there is a significant positive relationship between VAIC and ROA. The study showed that HCE and CEE have significant positive effect on profitability while SCE has negative effect.

Kimura et al. (2009), Barros Junior et al. (2010) and Nogueira et al. (2010) also examined the relationship between intellectual capital with profitability and value creation in Brazil different industries. In these studies to evaluate intellectual capital the VAIC and CIV methods, and ROA as profitability index and value creation was used. Analyses indicated that in static models the relationship between IC with firm profitability is a significant and positive. But the dynamic models were not confirmed.

Zeghal and Maaloul (2010) reviewed intellectual capital impact on the firm's economic, financial and stock market performance. They divided 300 UK companies into three groups of industries: high-tech, traditional and services. The results showed that companies' IC has a positive impact on economic and financial performance. However, the association between IC and stock market performance was only significant for high-tech industries. The results also indicated that capital employed remains a major determinant of financial and stock market performance although it has a negative impact on economic performance.

Diez et al. (2010) tried to explore and to explain the influence of representative variables of human capital and structural capital on the creation of business value. Spanish firms with a staff of 25 employees or more was selected. The explanatory analysis of multiple lineal correlations and regressions allowed them to confirm the positive relation that exists between the use of human and structural capital indicators, and value creation measured by sales growth. Simultaneously, higher levels of the VAIC, in particular for the component that refers to the sum of the coefficient of human capital and structural capital, were also related to improvements in competitiveness reflected through an increase in sales figures. Despite having identified a relation between intellectual capital and value creation, the study found no evidence of a significant relationship between the use of human capital and structural capital indicators and dependent variables other than sales growth, such as return on assets (ROA) or productivity.

Laing et al. (2010) studied two companies operating in the Australian hotel industry over a four-year period (2004-2007). The results showed that the VAIC model provides a robust tool for assessing the efficient use of intellectual capital. The model can be used by management to assess their own organization's performance without having to rely upon industry standards.

Joshi et al. (2010) examined the intellectual capital (IC) performance of Australian banks for the period 2005-2007. It also aimed to examine the relationship amongst various constituents of IC performance. The paper revealed that VAIC has a significant relation with human costs and the value addition made by the Australian banks. All Australian owned banks had relatively higher human capital efficiency than capital employed efficiency and structural capital efficiency. The size of the bank in terms of total assets, total number of employees and total shareholders' equity had little or no impact on the IC performance of the Australian owned banks.

Gharoie (2011) indicated that human capital is very efficient than other two types of capital (structural and physical) in terms of value creation efficiency. The results showed that the relationships between the performance of a company's intellectual capital and profitability, Employee productivity, and Growth in sales are informative. Also,the empirical findings suggested that the performance of a company's intellectual capital can explain profitability and productivity.

3. Development of Hypotheses

MVA is considered as the amount of wealth a firm's management creates from the capital that investors have entrusted to management. It is also viewed as the market value assessed in the security market of the company's internal operating efficiency (Walbert, 1994).

From an investor's point of view, MVA is the best external measure of a company's performance (De Wet, 2005.p.3).

According to Riahi-Belkaoui (2003) and Firer and Williams (2003), in an efficient market investors are seen to place higher value for companies with greater IC. Therefore, it may be argued that the IC is expected to play an important role in enhancing corporate value (Ghosh and Mondal, 2009. p.375).

In this empirical study we expect that in listed companies in Tehran stock exchange there is a significant and positive relationship between firm market value added and intellectual capital. And so the following hypotheses are provided.

(Ha): There is a significant and positive relationship between VAIC and MVA.
(Hb): There is a significant and positive relationship between ICE and MVA.
(Hc): There is a significant and positive relationship between CEE and MVA.
(Hd): There is a significant and positive relationship between HCE and MVA.
(He): There is a significant and positive relationship between SCE and MVA.
(Hf): There is a significant and positive relationship between CIV and MVA.

4. RESEARCH METHODOLOGY

In this section first, it is dealt with to describe used indices for evaluating independent, dependent and control variables and then regression models for testing hypotheses are provided.

4.1. Measurement of Independent Variables

In this research, the intellectual capital is measured from two aspects (efficiency and Value). For this purpose to estimate IC value the CIV method and to measure IC efficiency the VAIC is used.

4.1.1. Measuring The Value of Intellectual Capital

In our research as Stewart (1997) CIV calculate as follow:

1. Calculate the company's average pre-tax earnings *(a)* for the latest three years.
2. Calculate average year-end tangible assets of the company *(b)* for the latest three years (i.e. all of the 'Assets' from the financial statement except 'Intangible Assets').
3. Divide the earnings by the tangible assets and you get the company's return on tangible assets (ROA) *(c)* (1):

$$C = a / b \qquad (1)$$

4. Calculate the average ROA *(d)* for industry (alike the ROA for the company) for the latest three years. *If and only if the return on tangible assets of the company is greater than the return on tangible assets of the industry (i.e. c>d) executing the method can be continued.*
5. Calculate the "excess return" by multiplying the industry ROA by the average year-end tangible assets of the company. Subtract the result from the pre-tax earnings of the company. Multiply this by the following clause: 1 less the three-year-average income tax rate of the company (2):

$$\text{Excess return} = (a – d * b) * (1 – \text{average income taxes}) \qquad (2)$$

6. Finally, divide the after-tax number by 12% percentage (financing rate in Iranian banks).

4.1.2. Measuring the Efficiency of IC

In order to manage value creation in a company we have to measure where value is created and how each of the resources, tangible and intangible, have participated in the created value. Due to the strategic importance of intellectual capital and its components – human and structural capital – for modern business it is vital to take these factors into analysis. First of all, we have to find out how competent a company creates Value Added (VA), which is calculated as the difference between output and input (Pulic, 2000b.p.3).
Value added is an objective indicator of business success and shows the ability of a company to create value (Pulic, 2004.p.64). We calculated value added as follow:
VA = OUT – IN
VA= value added
OUT = total revenue
IN = cost of bought – in materials, components and services.

Value added could be calculated by using available information in annual reports as follow:
VA = OP + EC + D + A
OP =Operating Profit
EC =Employee Costs
D =Depreciation
A =Amortization

Then we have to obtain information on how efficiently this value added has been created. VA grows as the efficiency of resources increases. In order to receive a company's value creation efficiency, the business result, VA, is related to the resources: capital employed , human and structural capital. The VACA (value creation efficiency of capital employed), VAHU (value creation efficiency of human capital) and STVA (value creation efficiency of structural capital) indicators can be considered precise and objective as they are derived

from the balance sheet. These coefficients enable management to visualize the value creation efficiency of resources in the company, which means they can see how much new value is created by each invested pound in each resource and how successfully each of the resources participates in the achieved VA (Pulic, 2000b.p.3).

4.1.2.1. Measuring Human Capital Efficiency (HCE)

HCE = VA / HC

HC = total salaries and wages

Most economic and financial models treat employees – the prime carriers of knowledge – as a cost and not as a resource. In order to take a step forward this is necessary to define a new status for employees. Employees and their intellectual Capital ought to receive the official status of key resource. This means that it should be put on the same level as financial and physical capital. The treatment of employees as investment is the beginning and the end of the knowledge based economy. In the same way, as in the industrial era, where investments were made in plants and machines as the base for value creation, today companies invest in employees, who are becoming the key factor of value creation (Pulic, 2004.p.62).

4.1.2.2. Measuring Structural Capital Efficiency (SCE)

SC = VA – HC

SC = Structural Capital

As the equation already indicates, this form of capital is not an independent indicator. It is dependent on the created VA and in reverse proportion to HC. This means that the bigger the share of human capital (HC) in the created VA, the smaller the share of structural capital (SC). In some cases, SC does not even have to occur (e.g. if VA is less than the investments in HC) (Pulic, 2004.p.64).

SCE = SC / VA

Because SC and HC must correspond to VA, the efficiencies of HC and SC are calculated in a different manner. If SCE were calculated in the same way as HCE (VA/SC), an illogical result would be obtained, meaning that the efficiency of SC would rise with the fall of HC efficiency, which is impossible. On the contrary, it is logical that the efficiency of both HC and SC raise, as this increases the total efficiency of IC (Gigante and Previati , 2009.p.19).

4.1.2.3. Measuring Intellectual capital efficiency (ICE)

ICE = HCE + SCE

CEE (Capital Employed Efficiency) = VA / CE

CE (Capital Employed) = physical capital + financial assets = Total assets - intangible assets

In order to receive a full insight into the efficiency of value creating resources, it is necessary to take financial and physical capital into account. Intellectual capital cannot create value on its own. Therefore we also need information on the efficiency of the capital employed (Pulic, 2004.p.65).

4.1.2.4. Measuring Value Added Intellectual Coefficient (VAIC)

VAIC = ICE +CEE

VAIC allows us to understand the overall efficiency of a company and indicates its intellectual ability. In simple words, VAIC measures how much new value has been created per invested monetary unit in each resource (Pulic, 2004.p.65).

The VAIC method enables a new way of benchmarking for companies, as it is based on value creation efficiency of the resources, in particular on IC as the decisive factor of modern business. The VAIC method measures and monitors the value creation efficiency in the company according to accounting based figures. As it is based on common financial documentation implementation inside the company is neither difficult nor expensive (Pulic, 2000b.p.40-41).

Recently, VAIC method has gained popularity among the researchers to measure intellectual ability of companies (Ghosh and Mondal, 2009.p.378). Schneider (1999) supports the adoption of this technique as an effective method of measuring intellectual capital efficiency.

4.2. Measurement of Market Value Added (MVA)

Firm performance create value for shareholders if total market value would exceed book value of capital employed.(Medeiros,2002)

MVA can be used as a single comprehensive measure for assessing the value of the management's performance. A positive MVA, for example, represents the amount of wealth the company has created, while a negative MVA shows the amount of capital which management has dissolved (Kim, 2004.p.940).

MVA= market value of stocks at the end of period- Capital offered by common shareholders

Capital offered by common shareholders includes equity value book and capital equivalents. In this research, due to broad volatilities of MVA Variable this criterion was standardized by using the following formula:

Standardized MVA = MVA (t)/Capital (t)

4.3. Control variables

4.3.1. Financial leverage (LEV)

Financial leverage as measured by total debt divided by book value of total assets is used to control for the impact of debt servicing on corporate performance and wealth creation.

4.3.2. Size of The Firm (SIZE)

In this study used natural Log total assets for controlling the impact of size on wealth creation through economies of scale, monopoly and bargaining power.

5. Regression Models of Research Hypotheses

The panel analysis was use to test the hypotheses. Regression equations employed for examining the relationship between intellectual capital and market value added would be as follows. As it is seen the effect of calculated intangible value and intellectual value added coefficient and its components (human capital efficiency, structural capital efficiency and capital employed efficiency) on MVA was investigated jointly and separately.

$$MVA_{it}=\beta_1+\beta_2 VAIC_{it}+\beta_3 SIZE_{it}+\beta_4 LEV_{it}+ e_{it}$$
$$MVA_{it}=\beta_1+\beta_2 ICE_{it}+\beta_3 SIZE_{it}+\beta_4 LEV_{it}+ e_{it}$$
$$MVA_{it}=\beta_1+\beta_2 CEE_{it}+\beta_3 SIZE_{it}+\beta_4 LEV_{it}+ e_{it}$$
$$MVA_{it}=\beta_1+\beta_2 HCE_{it}+\beta_3 SIZE_{it}+\beta_4 LEV_{it}+ e_{it}$$
$$MVA_{it}=\beta_1+\beta_2 SCE_{it}+\beta_3 SIZE_{it}+\beta_4 LEV_{it}+ e_{it}$$
$$MVA_{it}=\beta_1+\beta_2 LnCIV_{it}+\beta_3 SIZE_{it}+\beta_4 LEV_{it}+ e_{it}$$
$$MVA_{it}=\beta_1+\beta_2 HCE_{it}+\beta_3 SCE_{it}+\beta_4 CEE_{it}+\beta_5 Ln\ CIV_{it}+\beta_6 SIZE_{it}+\beta_7 LEV_{it}+ e_{it}$$

In dynamic models, past amount (value) of dependent variable (MVA_{it-1}) has been included in the model as explanatory variable. This is for showing the relationship between dependent variable and its past amount (value).

6. Sample Selection and Descriptive Statistics

All of listed companies in Tehran stock exchange other than industries such as banks, credit institutions, financial brokers and investment companies constituted the statistical society in this research. Due to broad volume of statistical society and existence of some inconsistencies between members of society, the following requirements have been established to select statistical sample and thus the statistical sample was selected by elimination systematically. Mentioned requirements to select companies of statistical sample are as follows:

1- Before 2004 financial year have been accepted in Tehran stock exchange.
2- In period of under investigation have not been eliminated from Tehran stock exchange.
3- In each one of investigated years their transactions have not been stopped for a long time (more than six months).
4- Information required by researcher would have been during the period 2004-2009.

With regard to above mentioned conditions finally 111 companies was selected as statistical sample for investigation. Because in dynamic models to avoid unbalanced it should be examined the companies which have information about total variables in during period of time for under investigation, among available companies in statistical sample 26 companies were qualified and were examined in dynamic models and fixed effects estimation and random effects methods. Table I, suggest the descriptive statistics about variables of research.

Table I. descriptive statistics about variables of research in dynamic models and fixed effects estimation and random effects methods.

		Ln CIV	HCE	SCE	ICE	CEE	VAIC	MVA	SIZE	LEV
N	Valid	130	130	130	130	130	130	130	130	130
	Missing	0	0	0	0	0	0	0	0	0
Mean		12.1637	3.3302	.6388	3.9690	.3370	4.3060	1.4349	13.0849	.5928
Mode		10.21[a]	3.06	.56[a]	2.15[a]	.17[a]	3.07	.74[a]	10.66[a]	.64
Std. Deviation		1.53951	1.60853	.14760	1.73735	.12207	1.76209	2.20525	1.35355	.13682
Minimum		7.74	1.18	.15	1.32	.11	1.67	-.76	10.66	.30
Maximum		16.97	9.27	.89	10.16	.68	10.44	14.75	17.55	.91

a. Multiple modes exist. The smallest value is shown

7. DISCUSSION OF RESULTS

First, it was tested the hypotheses research by using static models. In static models to obtain an economical optimal model which states variance maximum of dependent variable by using least independent variables the Backward Elimination method was used. In static models, it is assumed that observations are independent and there is no correlation between them, but Durbin - Watson in final model of all of research hypotheses indicated that there is a positive correlation between consecutive observations. So, it was concluded that results of static models are not reliable and it must be used from dynamic models to test hypotheses. In mean regression method also Durbin-Watson indicated that there is a positive correlation between consecutive observations, and it must be used from dynamic models to test hypotheses. By relied on these results in all of models relevant to hypotheses of research the past amount of dependent variable was included in the model as explanatory variable as for as possible to show the relationship between dependent variable with its past amount during time . Then, it was tested the hypotheses of research.

In dynamic models to estimate $B_1, B_2, \ldots$ parameters the Generalized least square (GLS) method was used. Because in these, model the first order Autoregressive was considered, the Parks method was used for estimation. In Parks method, variable dependent with itself is dependent by one delay and estimated parameter for dependent variable which has been included by one delay as explanatory variable is dependent to company.

Estimated parameters for MVA_{it-1} variable which have been included in dynamic models as explanatory variable have been provided in table II. It should be noted that in addition to Parks method the fixed effects estimation and random effects methods was used to test hypotheses. In fixed effects estimation method to examine lack of existence of fixed effect the Fisher test (F Test) and in random effects estimation method to examine the existence of random effect the Hausman test was used.

Result of analyses about the relationship between intellectual capital and firm MVA indicated that firm random effect models are not significant. Because in these models the probability value of Hausman statistics to examine statistical null hypothesis based on existence of firm random effect is less than 0.05. So, statistical null hypothesis is rejected with confidence of 95%.

on the other hand , sufficiency of these models is not accepted while in time and firm random effect models , the probability value of Hausman statistics to examine statistical null hypothesis based an existence of time and firm random effect is greater than 0.05. So, statistical null hypothesis is accepted with confidence of 95%. On the other hand sufficiency of time and firm random effect models is supported. In fixed effect models also probability value of Fisher statistics to examine statistical null hypothesis based on non-existence of fixed effect is less than 0.05. So, statistical null hypothesis is rejected with 95% confidence. On the other hand sufficiency of fixed effect models also is supported. Also, analyses show that Parks method have higher coefficient of determination than other methods.

As it is seen in table III, in examination at the relationship between VAIC and MVA the analyses indicated that VAIC in firm fixed effect model have $\beta = 0.457135$, sig =0.0027, in firm and time fixed effect model have $\beta = 0.455921$, sig =0.0031, in firm and time random effect model have $\beta = 0.544195$, sig =<0.0001 and in Parks method have $\beta = 0.528563$, sig =<0.0001.

So, hypothesis at research was supported in confidence 95% and results from statistical tests shown there is a significant and positive relationship between VAIC and MVA.

Result of this test would be consistent with research's result of Pulic(2000b)which examined the relationship between VAIC and MVA and also research conducted by Chen et al. (2005) examining the relationship between VAIC and market valuation. But it is contrary with researches' result at Ghosh and Mondal (2009), Chan (2009) and Fairer and Steinbeck (2003) which have examined the relationship between VAIC and market valuation.

In examination of the relationship between ICE and MVA the analyses indicated that ICE have $\beta =$ 0.457864 and sig =0.0041 in firm fixed effect model, in firm and time fixed effect model $\beta = 0.460697$, sig =0.0043. In firm and time random effect model $\beta = 0.534671$ and sig =0.0001 and in Parks method $\beta =$ 0.567217, sig = <0.0001. So, hypothesis of research was accepted in confidence 95% and results from statistical tests indicated that there is a significant and positive between ICE and MVA.

In examination of the relationship between CEE and MVA, the analyses indicated that CEE in firm fixed effect model have $\beta = 7.468383$, sig = 0.0004, in firm and time fixed effect model have β=7.604369, sig =0.0008, in firm and time random effect model $\beta = 10.02108$, sig =<0.0001 and in Parks method $\beta =$ 6.139108, sig =0.0112. So, research hypothesis was accepted in confidence 95% level and results from statistical tests indicated that there is a significantly positive relationship between CEE and MVA. Result of this test would

be consistent with result of researches performed by Chan (2009) and Chen et al. (2005) which examined the relationship between CEE and market valuation. While it is contrary with result of research performed by Kamath (2008) which he examined the relationship between CEE and market valuation.

In examination of the relationship between HCE and MVA the analyses indicated that HCE in firm fixed effect model have $\beta = 0.477486$, sig = 0.0060, in firm and time fixed effect model have $\beta = 0.482954$, sig = 0.0060, in firm and time random effect model $\beta = 0.567218$, sig=0.0002 and in Parks model $\beta = 0.600571$, sig = <0.0001.

So, hypothesis of research was accepted in confidence 95% and results from statistical tests indicated that there is a significant and positive between HCE and MVA. Result of this testing was consistent with result of research performed by Chen et al (2005), but it is not consistent with researches' result of Chan (2009) and kamath (2008). In these researches the effect of HCE on market valuation has been studied.

In examination of the relationship between SCE and MVA the analyses indicated that in firm fixed effect model SCE have $\beta = 5.305717$, sig=0.0006, in firm and time fixed effect model $\beta = 5.093543$, sig =0.0012, in firm and time random effect model $\beta = 5.71704$, sig=<0.0001 and in Parks model $\beta = 5.970008$, sig = <0.0001. So, the hypothesis of research was accepted in confidence 95% and results from statistical tests indicated that there is a significant and positive relationship between SCE and MVA. Result of this testing is consistent with result of research performed by Chen et al. (2005) and is not consistent with result of researches performed by Chan (2009) and kamath (2008).

In above researches, the relationship between SCE and market valuation has been studied.

Finally, in examination of the relationship between CIV and MVA, the analyses indicated that in firm fixed effect model Ln CIV have $\beta = 0.074024$, sig= 0.7162, in firm and time fixed effect model $\beta = 0.091734$, sig = 0.6507, in firm and time random effect model $\beta = 0.199768$, sig=0.3298 and in Parks model $\beta = 0.047098$, sig=0.1660. So, hypothesis of research was rejected in confidence 90% and results from statistical tests indicated that there is not a significant relationship between CIV and MVA.

In examination of simultaneous effect of CIV , CEE , SCE and HCE on MVA the results from statistical tests indicated that random effect models are not significant.

Analyses indicated that SCE in firm fixed effect model have $\beta = 4.394036$, sig=0.0775. So, in this model separate from firm size and leverage, the positive and significant relationship between SCE and MVA was accepted in confidence 90%. Also, in firm fixed effect model CEE have $\beta = 5.688517$, sig= 0.0300 and in firm and time fixed effect model have $\beta = 5.915944$, sig = 0.0476. So, in these models the positive and significant relationship between CEE and MVA was accepted in confidence 95%.

Table II. Estimated parameters for MVA_{it-1} variable in Parks method

Firm code	H(a)	H(b)	H(c)	H(d)	H(e)	H(f)	simultaneous effect of independent variables on MVA
141001	0.402240	0.394072	0.794337	0.396652	0.357288	0.403427	0.603818
152001	0.653204	0.638188	0.987388	0.635736	0.699888	0.999623	0.999289
152002	0.717215	0.732218	0.520124	0.724295	0.840940	0.619607	0.464657
155301	-.031550	-.006023	-.160987	0.011847	-.135053	-.089401	-.163930
241102	0.336748	0.307253	0.429609	0.303987	0.302407	0.533689	0.740008
242301	0.126303	0.125397	0.403673	0.136597	0.036810	0.325404	0.245205
242314	0.904682	0.911933	0.639531	0.908308	0.478314	0.525296	-.045419
242316	0.397479	0.446730	0.366488	0.472416	0.289073	0.616310	0.424981
251104	0.466828	0.492626	0.583533	0.481086	0.919022	0.994187	0.502942
251901	0.178868	0.216637	0.609071	0.221893	0.164697	0.370964	0.642917
269301	0.232049	0.183976	0.651635	0.060670	0.535077	0.773446	0.040975
269302	0.950715	0.953395	0.987388	0.962833	0.493157	0.999623	0.809400
269308	0.980671	0.995805	0.987388	0.983620	0.970603	0.999623	0.999289
269403	0.381639	0.381954	0.360118	0.383874	0.359109	0.370388	0.354896
269421	0.535189	0.539021	0.532290	0.541379	0.525380	0.535265	0.496936
289902	0.969367	0.995805	-.290026	0.982698	0.970603	0.960133	0.358224
289906	0.980671	0.981724	0.987388	0.983620	0.970603	0.999623	0.999289
291902	0.831055	0.870874	-.028596	0.868814	0.922501	0.937629	-.161793
292103	0.217433	0.238102	0.987388	0.230899	0.662409	0.792303	0.808683
292105	0.364025	0.363476	-.406675	0.332916	0.543657	0.244522	-.766869
293008	0.412531	0.576965	0.014840	0.641738	0.324048	0.999623	0.392250
312002	0.909551	0.948367	0.575351	0.946269	0.970603	0.999623	0.446089
331201	-.227008	-.152930	0.580101	-.007751	-.462280	0.447945	-.216279
341005	0.690482	0.648740	0.542711	0.647134	0.519000	0.658651	0.720628
341007	0.309322	0.303997	0.079963	0.283050	0.488156	0.463153	0.364945
343001	0.656822	0.653744	0.717789	0.665845	0.573625	0.798719	0.660012

Table III.

(Ha): There is a significant and positive relationship between VAIC and MVA.

	firm fixed effect		firm and time fixed effect		Random Effect of firm		Random Effect of firm and time		Parks model	
variable	B	Sig	β	Sig	β	Sig	B	Sig	β	Sig
Intercept	13.63913	0.0373*	9.235089	0.3705	3.223478	0.3304	2.184423	0.4810	6.733295	0.0035*
VAIC	0.457135	0.0027*	0.455921	0.0031*	0.558993	<.0001*	0.544195	<.0001*	0.528563	<.0001*
SIZE	-1.8151	0.0011*	-1.45803	0.1145	-0.79541	0.0013*	-0.66746	0.0047*	-0.83682	<.0001*
LEV	11.32865	<.0001*	12.13069	<.0001*	10.48021	<.0001*	9.516285	<.0001*	6.19189	<.0001*
	R^2 = 0.7429 F value = 8.17 Sig = <.0001*		R^2 = 0.7590 F value = 7.44 Sig = <.0001*		R^2 = 0.4281 m value = 46.19 Sig = <.0001		R^2 = 0.3404 m value = 7.01 Sig = 0.0715*		R^2 = 0.9517	

F Test for No Fixed Effects
Hausman Test for Random Effects
*Indicates Significant At α = 0.05 Level and **Indicates Significant At α = 0.1 Level

(Hb): There is a significant and positive relationship between ICE and MVA.

	firm fixed effect		firm and time fixed effect		Random Effect of firm		Random Effect of firm and time		Parks model	
variable	B	Sig	β	Sig	β	Sig	B	Sig	β	Sig
Intercept	14.25173	0.0302*	9.877163	0.3413	3.763281	0.2643	2.640127	0.4023	5.354895	<.0001*
ICE	0.457864	0.0041*	0.460697	0.0043*	0.550304	0.0001*	0.534671	0.0001*	0.567217	<.0001*
SIZE	-1.84734	0.0010*	-1.49286	0.1084	-0.81523	0.0013*	-0.6789	0.0049*	-0.73588	<.0001*
LEV	11.2326	<.0001*	12.03032	<.0001*	10.38301	<.0001*	9.373122	<.0001*	6.544813	<.0001*
	R^2 = 0.7410 F value = 8.36 Sig = <.0001 *		R^2 = 0.7574 F value = 7.62 Sig = <.0001*		R^2 = 0.4219 m value = 48.12 Sig = <.0001		R^2 = 0.3304 m value = 6.53 Sig = 0.0884*		R^2 = 0.9919	

F Test for No Fixed Effects
Hausman Test for Random Effects
*Indicates Significant At α = 0.05 Level and **Indicates Significant At α = 0.1 Level

(Hc): There is a significant and positive relationship between CEE and MVA.

	firm fixed effect		firm and time fixed effect		Random Effect of firm		Random Effect of firm and time		Parks model	
variable	B	Sig	β	Sig	β	Sig	B	Sig	β	Sig
Intercept	4.416326	0.5249	-4.15799	0.6924	-7.10598	0.0442*	-7.81647	0.0215*	1.457552	0.7517
CEE	7.468383	0.0004*	7.604369	0.0008*	9.998046	<.0001*	10.02108	<.0001*	6.139108	0.0112*
SIZE	-1.22299	0.0287*	-0.50945	0.5740	-0.17262	0.4479	-0.09133	0.6749	-0.59513	0.0431*
LEV	12.80739	<.0001*	13.21969	<.0001*	12.53512	<.0001*	11.92617	<.0001*	9.910608	<.0001*
	R^2 =0.7513 F value =7.37 Sig =<.0001*		R^2 = 0.7649 F value = 6.65 Sig = <.0001*		R^2 = 0.4624 m value = 31.71 Sig = <.0001		R^2 = 0.4001 m value = 5.52 Sig = 0.1374*		R^2 = 0.9704	

F Test for No Fixed Effects
Hausman Test for Random Effects
*Indicates Significant At α = 0.05 Level and **Indicates Significant At α = 0.1 Level

(Hd): There is a significant and positive relationship between HCE and MVA.

	firm fixed effect		firm and time fixed effect		Random Effect of firm		Random Effect of firm and time		Parks model	
variable	B	Sig	β	Sig	β	Sig	B	Sig	β	Sig
Intercept	14.27455	0.0305*	9.693394	0.3517	3.947352	0.2437	2.811537	0.3753	5.499083	<.0001*
HCE	0.477486	0.0060*	0.482954	0.0060*	0.584647	0.0001*	0.567218	0.0002*	0.600571	<.0001*
SIZE	-1.82964	0.0011*	-1.45705	0.1177	-0.80926	0.0014*	-0.67241	0.0055*	-0.73456	<.0001*
LEV	11.20743	<.0001*	11.98837	<.0001*	10.34071	<.0001*	9.33406	<.0001*	6.740961	<.0001*
	R^2 = 0.7391 F value = 8.36 Sig = <.0001*		R^2 = 0.7559 F value = 7.62 Sig = <.0001*		R^2 = 0.4188 m value = 46.70 Sig = <.0001		R^2 = 0.3259 m value = 6.52 Sig = 0.0888 *		R^2 = 0.9987	

F Test for No Fixed Effects
Hausman Test for Random Effects
*Indicates Significant At α = 0.05 Level and **Indicates Significant At α = 0.1 Level

(He): There is a significant and positive relationship between SCE and MVA.

	firm fixed effect		firm and time fixed effect		Random Effect of firm		Random Effect of firm and time		Parks model	
variable	B	Sig	β	Sig	β	Sig	B	Sig	β	Sig
Intercept	14.07848	0.0294*	9.815068	0.3374	1.483552	0.6608	0.436476	0.8884	5.13494	0.0527**
SCE	5.305717	0.0006*	5.093543	0.0012*	5.741962	<.0001*	5.71704	<.0001*	5.970008	<.0001*
SIZE	-1.99073	0.0004*	-1.62969	0.0779**	-0.77389	0.0021*	-0.64575	0.0057*	-0.83607	<.0001*
LEV	11.51395	<.0001*	12.18641	<.0001*	10.81362	<.0001*	9.778276	<.0001*	6.394036	<.0001*
	R^2 = 0.7498 F value =8.65 Sig =<.0001*		R^2 =0.7633 F value =7.76 Sig =<.0001*		R^2 =0.4266 m value =82.75 Sig =<.0001		R^2 =0.3524 m value =6.81 Sig =0.0781*		R^2 =0.9418	

F Test for No Fixed Effects
Hausman Test for Random Effects
*Indicates Significant At α = 0.05 Level and **Indicates Significant At α = 0.1 Level

(Hf): There is a significant and positive relationship between CIV and MVA

	firm fixed effect		firm and time fixed effect		Random Effect of firm		Random Effect of firm and time		Parks model	
variable	B	Sig	β	Sig	B	Sig	B	Sig	B	Sig
Intercept	14.13696	0.0398*	5.58289	0.6022	2.328162	0.5230	1.043263	0.7583	4.200827	<.0001*
Ln CIV	0.074024	0.7162	0.091734	0.6507	0.199707	0.3312	0.199768	0.3298	0.047098	0.1660
SIZE	-1.79355	0.0026*	-1.07106	0.2656	-0.74397	0.0210*	-0.59302	0.0575**	-0.52039	<.0001*
LEV	11.37805	<.0001*	11.63016	<.0001*	10.81767	<.0001*	9.652098	<.0001*	7.17838	<.0001*
	R^2 = 0.7192 F value = 9.27 Sig = <.0001*		R^2 = 0.7366 F value = 8.40 Sig = <.0001*		R^2 = 0.3622 m value =108.46 Sig = <.0001		R^2 = 0.2637 m value =2.42 Sig = 0.2984*		R^2 = 0.9769	

F Test for No Fixed Effects
Hausman Test for Random Effects
*Indicates Significant At α = 0.05 Level and **Indicates Significant At α = 0.1 Level

The results of simultaneous effect of CIV and components of value added intellectual coefficient (CEE, SCE and HCE) on MVA

	firm fixed effect		**firm and time fixed effect**		**Random Effect of firm**		**Random Effect of firm and time**		**Parks model**	
variable	B	Sig	β	Sig	β	Sig	B	Sig	B	Sig
Intercept	7.296613	0.3090	0.777325	0.9451	-5.57573	0.1399	-6.16303	0.0898**	16.6383	0.0450*
HCE	-0.13094	0.6345	-0.0941	0.7410	0.089312	0.7078	0.090975	0.6997	0.988761	0.1522
SCE	4.394036	0.0775**	3.831893	0.1252	2.514132	0.2727	2.525506	0.2689	-4.49487	0.3983
CEE	5.688517	0.0300*	5.915944	0.0476*	8.231459	0.0002*	8.362165	0.0001*	0.74037	0.7807
LnCIV	-0.20576	0.3086	-0.19649	0.3406	-0.12491	0.5301	-0.12391	0.5352	0.179599	0.4208
SIZE	-1.39234	0.0211*	-0.85316	0.3887	-0.25021	0.4245	-0.18934	0.5363	-1.82763	0.0148*
LEV	12.28161	<.0001*	12.88013	<.0001*	12.02295	<.0001*	11.55348	<.0001*	9.377607	<.0001*
	R^2 = 0.7626		R^2 = 0.7739		R^2 = 0.4783		R^2 =0.4402		R^2 =0.8383	
	F value =6.57		F value =5.87		m value = 31.17		m value = 50.37			
	Sig =<.0001*		Sig = <.0001*		Sig = <.0001		Sig = <.0001			

F Test for No Fixed Effects

Hausman Test for Random Effects

*Indicates Significant At α = 0.05 Level and **Indicates Significant At α = 0.1 Level

8. Conclusions

With regard to which that intellectual capital have been determined as an important strategic asset in permanent competitive advantages of the firm increasingly, optimal designing of internal arrangement of these resources and effective use from it could result in much more effective performance for organization and generate higher competitive advantage.

This research provide empirical evidence which IC could have impact firm productivity and also would be an effective factor in value creation and wealth increase of share holders, managers need to understand the importance of IC and its critical role in the firm and to survive in universal competition market they should better manage IC as soon as possible and consider even though generally accepted accounting standards deter to recognition of IC in financial statements, investors are aware of importance of IC in firms productivity.

In this research results show lack of a significant relationship between CIV and MVA.

So, this study indicates that CIV could not explain MVA. Moreover, significant relationship of VAIC and its components with MVA show that VAIC is treated as an effective criterion for describing MVA and it could be used as a tool to measure firm's performance in Tehran Stock Exchange. VAIC could be an important tool of decision making for many decision makers such as managers , analysts of capital market, lenders and investors, to add IC to their decision making approach by this.

Manager could benefit from VAIC to manage IC better and better and success in firm performance. Firms could prepare and represent complete and actual financial statements by using it in their accounting systems. Reporting about intangible assets such as IC to market analysts will help to actual stock valuing.

It is recommended to investors that they would use VAIC to measure IC in different firms to evaluate actual and future value of stock in different firms correctly and obtain higher financial yield in the future.

9. Research limitation

CIV and VAIC models cannot supply all of requirements related to measure IC. The VAIC model only considers human capital , structural capital, capital employed and doesn't consider relational capital formally. this model has been criticized by Andreissen (2004).

10. Practical Implication

The effect of VAIC on MVA shows that VAIC can be an important tool for many decision makers, including managers, analysts of capital, market lenders and investors. This means that some information of decision making is out of financial statements and do not reporting to investors. By consider of results of other researches, it is time for consideration to intangible asset and reporting of human resource in financial reporting.

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