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Value-Relevance of Intellectual Capital Productivity

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Abstract: One of the streams of research studying the level of accounting information usefulness is the research on value relevance. So, this study has proceeded to test the value relevance of intellectual capital, Structural capital and human capital with share price. Financial information in from financial information resources and annual reports of companies in as selective sample of 115 listed companies in Tehran-Iran Stock Exchange-during five-year period from 2009 to 2013. It has been analyzed by multi-variable regression and three models built from Kim and Taylor (2014) tests. The conclusions showed that the productivity of intellectual capital, structural capital and human capital has a positive significant relation with share price. Also it has value-relevance.

Keywords: Value-relevance, Intellectual capital, Structural capital, Human capital.

INTRODUCTION

In financial resources market, investors always are finding data reporting the real share price. While Collins et al(1997) moot the value-relevance change of earnings and book-value during 40 years period, that show the increase of earnings value-relevance and book-value. In contrast, Riahi-Belkaoui (2003) mentions the effect of intellectual capital on companies function in 5 years period, showing a significant relation between the function of American multi-nationality companies and their intellectual capital. In the third study, Kujansivu and Lannqvist (2007) tell of the value and efficiency of intellectual capital and market value in 3 years period showing a positive significant relation between value and efficiency of intellectual capital and market value. In the forth study, Kim and Taylor (2014) moot the value-relevance of intellectual capital during 5 year period, showing a positive significant relation between productivity of intellectual capital and share price. In another study, Samudhram et al. (2014) state tangible value-relevance of human capital in 7 years period, showing that the cost of employees voluntary disclosed, contains value-relevance.

Nowadays, by emerging information economy and introducing knowledge-based and networking economy, intellectual capital is regarded as a competitive and strategically element (Saleh et al., 2009). So, the purpose of this study is to explain the role of share price in determining the value-relevance of intellectual capital, structural capital and human capital by productivity criteria.

LITERATURE REVIEW

Intellectual capital

Intangible investments have no physical nature, in spite of having incoming economic advantages. The initial research concerning the economic applications of intangible investments had been focused on a specific type of cost (that is the cost of research and development) (Eberhart et al., 2004). Later, the relationship between intangible Assets and the performance of firms were studied through the specialized concepts like the human capital or the organizational capital. Finally, these concepts caused developing of intellectual capital (Lev, Pantzalis and park, 2009) .

Intellectual capital is the collection of knowledge, information, experience, competition and organizational instructions than can be used to create wealth. In fact, intellectual capital includes the whole employee's, organizational knowledge, human resources of groups with the same level, and their ability to make added-added, and it causes to make constant competitive profits (Stewart, 1997).

Edvinsson and Malone (1997) presented intellectual capital with two its main elements, that is, human capital and structural capital. In this framework, human capital has been defined as the combination of knowledge, skill, creativity, innovation and per employee's ability in duty entrusted to him. Structural capital includes hard ware, software, data bases, organized structural, registration right of invention, trademarks and anything else of organizational ability that supports employee's productivity (Kim and Taylor, 2014).

RESEARCH QUESTIONS

Kim and Taylor (2014) presented a framework for studying the valuable relationship of intellectual capital productivity. In this framework based on Edvinsson and Malon (1997) framework, intellectual capital, composing of two main elements of human and structural capital has been used. To calculate the human capital derived from pulic (1998), Kim and Taylor (2014) used the total salary and wage cost and calculated the structural capital based on Edvinsson and Malon (1997) framework and Ballester et al. (2002), so that the representative module for the structural capital the total intangible Assets identified in balance sheet and a given fraction of the human capital unknown in balance sheet including 16% of the total human capital and its three-year depreciation. Accordingly, in the present research, recognizing that how much distance there is between the book- value and market-value of the firms is due to the intellectual capital may be very important, forming the main direction of the present research. Hence, the research questions are given as the following:

RQ1. Does the productivity of Intellectual capital include the value relevance?

RQ2. Does the productivity of structural capital include the value relevance?

RQ3. Does the productivity of human capital include the value relevance?

METHODS

Sample selection and data construction

The sample selection includes approved companies in Tehran Stock Exchange during 5 years period from 2009-2013 that their financial year is the end of February. More exceptions are related to companies with loss during more than 3 year and business interruption for more than 5 months, financial institutions. These exceptions caused the providing of financial information of 115 companies during 5 year through 690 observations. One important item for this study is the cost of all human resources that is presented as representative of human assets in presented models of following parts. The information of human assets has been obtained from annual reports of financial statements of companies during 2009-2013 in a electronic noting manner. Other financial information has been obtained by Tadbirpardaz software and the site of research management, development and Islamic studies of Stock Exchange Organization.

The characteristics of models

In this study, suggested models Kim and Taylor (2014), that are, models (1) to (3) are used to test research theories, that are, the examination of the relation between the share price and the value-relevance of intellectual capital, (structural capital and human capital). Each of 3 suggested models includes 4 control variables that has been explained as follow. BVPS (the book value of per share), it is gained by the rights of share holders at the end of the year divided by balanced average of share numbers; ROE (return on owner's equity), it is obtained by the net profit divided by the mean of the rights of share holders; LFC (local financial crisis), the stock exchange indicator has been used in local financial crisis variable (LFC). If stock exchange indicator is positive, LFC will be 0, otherwise, it is 1. HLTECH, Herfindahl indicator will be used based on each industry in the technology of the companies. In the practical economy there are some indicators to measure the type of the market structural, such as the reverse indicators of agency numbers, the price discrimination, Lerner index, the profit rates, the concentration ratio, Herfindahl index, the edge of price-cost margin, Hannah Kay index, Anthropt index, Janei coefficient, variance change and the logarithm of agency size (Moddala and Miller, 1995; Clark, 1990; Adelman, 1969; Lerner, 1934; Hannah-Kay, 1977; Clowing, 1976; Freeman, 1983; Bhuyan and Lopez, 1997; Hay Donald and Morris, 1979). Herfindahl indicator depends on both the inequality of agency distribution and agency numbers in market. The existence of many institutions with the same portion in the market, bring close this indicator to zero, and number 1 shows the complete exclusivity of the market, that is HLTECH is 1. In the contrast, if there are few institutions, with the relative or equal quantities in the market, this indicator will be close to one, and zero shows the complete competition market, that is HLTECH is 0.

$$P_{it} = \gamma_0 + \gamma_1 BVPS_{it} + \gamma_2 ROE_{it} \times BVPS_{it} + \gamma_3 \left(\frac{VA}{IC} \right)_{it} \times BVPS_{it} + \gamma_4 LFC + \gamma_5 HLTECH \times \left(\frac{VA}{IC} \right)_{it} + \varepsilon_{it} \quad (1)$$

$$P_{it} = \gamma_0 + \gamma_1 BVPS_{it} + \gamma_2 ROE_{it} \times BVPS_{it} + \gamma_3 \left(\frac{VA}{SC} \right)_{it} \times BVPS_{it}$$

$$+\gamma_4LFC + \gamma_5HLTECH \times \left(\frac{VA}{SC}\right)_{it} + \varepsilon_{it} \quad (2)$$

$$P_{it} = \gamma_0 + \gamma_1BVPS_{it} + \gamma_2ROE_{it} \times BVPS_{it} + \gamma_3\left(\frac{VA}{HC}\right)_{it} \times BVPS_{it} \\ + \gamma_4LFC + \gamma_5HLTECH \times \left(\frac{VA}{HC}\right)_{it} + \varepsilon_{it} \quad (3)$$

Where P_{it} is the price of ordinary shares of firm (i) three month later after the end of financial year (t), regarding that the most financial statements of Iranian firms are enclosed 3 months after ending fiscal year, in these studies the shares price in 3 months after ending fiscal year has been used ; VA/IC, the productivity of Intellectual capital is obtained by gross value added divided by Intellectual capital at the end of the year; VA/SC, the productivity of structural capital is obtained by gross value added divided by structural capital at the end of the year; VA/HC, the productivity of human capital is obtained by gross value added divided by human capital at the end of the year.

To get gross value-added of the firm, Equation (4) compiled by Riahi-Belkaoui (1999) is used.

$$VA_{it} = W_{it} + I_{it} + DD_{it} + T_{it} + DP_{it} + R_{it} \quad (4)$$

Where VA_{it} is gross value-added of firm (i) at the end of fiscal year t; W_{it} is cost of salary of the firm (i) at the end of fiscal year t; I_{it} is financial cost of the firm (i) at the end of fiscal year t; DD_{it} is firm share profit of the firm (i) at the end of fiscal year t; T_{it} is income tax of the firm (i) at the end of fiscal year t; DP_{it} is amortization of the firm (i) at the end of fiscal year t; R_{it} is profit reserve of the firm (i) at the end of fiscal year t.

The Intellectual capital (IC) is estimated based on suggested Equation of Kim and Taylor (2014) as follows:

$$IC_{it} = HC_{it} + SC_{it} \quad (5)$$

Where IC_{it} is Intellectual capital of firm (i) at the end of fiscal year t; HC_{it} is total salary and wage cost of firm (i) at the end of fiscal year t (pulic, 1998); SC_{it} the structural capital is estimated based on suggested Equation of Kim and Taylor (2014) as follows:

$$SC_{it} = INTAN_{it+} (HC_{it} \times 16\%) + \frac{(HC_{t-1} \times 16\% \times 2/3)}{(1+k_{t-1})} + \frac{(HC_{t-2} \times 16\% \times 1/3)}{(1+k_{t-1})(1+k_{t-2})} \quad (6)$$

Where SC_{it} is structural capital of firm (i) at the end of fiscal year (t); $INTAN_{it}$ is intangible capital of per share of firm (i) at the end of fiscal year (t); HC_{it} is the cost of salaries and wages of per share of firm (i) at the end of fiscal year (t); K is the deposit rate.

RESULTS

Descriptive statistics

The table 1 shows the descriptive statistics for the various productivity measures that include information related to average, mean, maximum and minimum, standard deviation, distortion and extension. The fourth and fifth and sixth columns represent the productivity level of each IC components computed by the suggested metric in this study, VA/HC, VA/SC and VA/IC. While the means of HC productivity (VA/HC) is 0.316 and mean SC productivity is 1.766, IC productivity has a mean 2.093, because the IC amount is the combination of HC and SC.

Table 1
Descriptive statistics of major variable in productivity model

	<i>BVPS</i>	<i>ROE</i>	<i>VA/IC</i>	<i>VA/SC</i>	<i>VA/HC</i>
Mean	2258.686	0.315514	2.092518	1.765516	0.326528
Median	1911.221	0.333726	0.711292	0.442892	0.210581
Maximum	11242.96	5.692889	41.02339	38.37337	3.497429
Minimum	-3590.136	-8.941561	0.000000	0.000000	0.000000
Std. Dev.	1497.402	0.623647	4.461108	4.196855	0.431861
Skewness	1.506723	-5.199789	5.023313	5.229080	3.476457
Kurtosis	8.745155	99.99207	34.35503	36.34932	19.71538
n	690	690	690	690	690

Test results

The result of the first test, based on the productivity of Intellectual capital is effective on share price, has been presented by using the following regression model (6) in table 2.

With regard to the obtained probability amount of F-statistic that is equal to zero (probability amount ≥ 0.05), the H0 theory is rejected, showing that all of the regression coefficients aren't simultaneously zero. So, there is a simultaneous significant relation between all of the independent and dependent variables.

Table 2
Regression result of Intellectual capital productivity

<i>variable</i>	<i>Coefficient</i>	<i>Std. Error</i>	<i>t-Statistic</i>	<i>Prob.</i>
<i>C</i>	2.904	0.443	6.676	0.000
<i>BVPS</i>	1.193	0.336	3.549	0.000
<i>ROE*BVPS</i>	1.622	0.180	8.985	0.000
<i>(VA/IC)*BVPS</i>	0.035	0.015	2.306	0.022
<i>LFC</i>	6.716	4.965	1.353	0.177
<i>HLTECH*(VA/IC)*BVPS</i>	0.186	0.037	5.052	0.000
<i>N</i>	576	576	576	576
R-squared		0.818	Durbin-Watson stat	2.154
Adjusted R-squared		0.770	F-statistic	0.801
F-statistic		17.209	Probe(F-statistic)	0.331
Probe(F-statistic)		0.000		

Noticing the table II and the probability rate of T-statistic for the productivity variable of Intellectual capital (VA/IC) * BVPS that is equal to 0.02 and less than 0.05 error rate (probability rate ≥ 0.05), zero theory (the theory of not being any relation between the productivity of Intellectual capital and share price) is rejected, so that the productivity of Intellectual capital affects on the share price. So, the first theory is accepted. Also, with regard to the productivity variable coefficient of Intellectual capital that is positive and 0.04, it is concluded the productivity of Intellectual capital has a positive effect on the share price. The Adjusted R-squared amount of the model is 0.770, showing that 0.77 of the changes of the dependent variable are explained by the dependent variable, on other words, 0.77 of the changes of the dependent variable are related to independent variables.

The results of the second test, based on the effect of the productivity of structural capital on the share price, are represented by using the following regression model (7) in table 3.

With regard to the obtained probability amount of F-statistic that is equal to zero (probability amount ≥ 0.05), the H0 theory is rejected, showing that all of the regression coefficients aren't simultaneously zero. So, there is a simultaneous significant relation between all of the independent and dependent variables. Noticing the table 3 and the probability amount of T-statistic for the productivity variable of Structural capital (VA/SC)*BVPS that is equal to 0.04 and less than 0.05 error rate (probability rate ≥ 0.05), zero theory (the theory of not being any relation between the productivity of Structural capital and share price) is rejected, so that the productivity of Structural capital is effective. So, the second theory is accepted. Also, with regard to the productivity variable coefficient Structural capital that is positive and 0.03, it is concluded the productivity of Structural capital has a positive effect on share price.

The Adjusted R-squared amount of the model is 0.770, showing that 0.77 of the changes of the dependent variable are explained by the dependent variable, on other words, 0.77 of the changes of the dependent variable are related to independent variables.

Table 3
Regression result of Structural capital productivity

<i>variable</i>	<i>Coefficient</i>	<i>Std. Error</i>	<i>t-Statistic</i>	<i>Prob.</i>
<i>C</i>	2.884	0.442	6.617	0.000
<i>BVPS</i>	1.246	0.341	3.652	0.000
<i>ROE*BVPS</i>	1.632	0.186	8.785	0.000
<i>(VA/SC)*BVPS</i>	0.031	0.011	1.992	0.043
<i>LFC</i>	6.854	5.011	1.368	0.172
<i>HLTECH*(VA/SC)*BVPS</i>	0.187	0.039	4.837	0.000
<i>N</i>	576	576	576	576
R-squared		0.818	Durbin-Watson stat	2.152
Adjusted R-squared		0.770	F-statistic	0.811
F-statistic		17.179	Probe(F-statistic)	0.342
Probe(F-statistic)		0.000		

The result of the third test, based on the effect of the productivity human capital on the share price, ore represented by using the following regression model (8) in table 4.

With regard to the obtained probability amount of F-statistic that is equal to zero (probability amount ≥ 0.05), the H0 theory is rejected, showing that all of the regression coefficients aren't simultaneously zero. So, there is a simultaneous significant relation between all of the independent and dependent variables. Noticing the table IV and the probability amount of T-statistic for the productivity variable of human capital (VA/HC)*BVPS that is equal to 0.03 and less than 0.05 error level (productivity rate ≥ 0.05), zero theory (the theory of not being any relation between the productivity of human capital and the share price) is rejected, so that the productivity of human capital is effective. So, the third theory is accepted. Also, with regard to the productivity variable coefficient of human capital that is positive and 0.032, it is concluded the productivity of human capital has a positive effect on the share price. The Adjusted R-squared amount of the model is 0.783, showing that 0.78 of the changes of the dependent variable are explained by the dependent variable, in other words, 0.78 of the changes of the dependent variable are related to independent variables.

Table 4
Regression result of human capital productivity

<i>variable</i>	<i>Coefficient</i>	<i>Std. Error</i>	<i>t-Statistic</i>	<i>Prob.</i>
<i>C</i>	3.504	0.542	6.457	0.000
<i>BVPS</i>	0.492	0.287	1.714	0.087
<i>ROE*BVPS</i>	2.397	0.180	13.290	0.000
<i>(VA/HC)*BVPS</i>	0.325	0.149	2.179	0.030
<i>LFC</i>	3.382	4.673	0.724	0.470
<i>HLTECH*(VA/HC)*BVPS</i>	1.833	0.249	7.367	0.000
<i>N</i>	576	576	576	576
R-squared		0.828	Durbin-Watson stat	2.189
Adjusted R-squared		0.783	F-statistic	0.851
F-statistic		18.413	Probe(F-statistic)	0.300
Probe(F-statistic)		0.000		

CONCLUSIONS

The obtained estimations and the tests done by using the combination data in the table II showed the productivity of Intellectual capital affects positively on the share price, and it has the value-relevance, so that the first theory is a accepted. The results of the present study are similar to the findings of the research done by Riahi-Belkaoui (2003), Kujansivu and Lannqvist (2007), and Kim and Taylor (2014).

The obtained estimations and the tests done by using the combination data in the table III showed the productivity of Structural capital affects positive on the share price, and it has the value-relevance, so that the second theory is accepted. The results of the present study are similar to the findings of the research done by Riahi-Belkaoui (2003), Kujansivu and Lannqvist (2007), and Kim and Taylor (2014).

The obtained estimations and the tests done by using the combination data in the table IV showed the productivity of human capital affects positive on the share price, and it has the value-relevance, so that the

third theory is accepted. The results of the present study are similar to the findings of the research done by Riahi-Belkaoui (2003), Kujansivu and Lannqvist (2007), Kim and Taylor (2014) and Samudhram et al. (2014).

THE RESEARCH LIMITATIONS

This study has also limitations that make some suggestions for future. With regard to the sampling method used in this study, many of the companies included in the statistical society have been deleted from the statistical sample, because of not having some considered characteristics, so the necessary discretion should be taken to generalize the obtained results of the research to the whole accepted companies in Tehran-Iran Stock Exchange. The result of this study have been obtained by using the data of the accepted companies in Tehran Stock Exchange and without the separation of the companies based on the activity type and the related industry, and the different result may be obtained about each of individual industries.

THE SUGGESTIONS BASED ON THE RESEARCH FINDINGS

With regard to the findings of the study:

The importance of Intellectual capital shows the necessity of the using knowledge management in examined companies, as the managers, should try more for the investment in Intellectual capital and its report to be able to decrease the risk and the capital cost of the company. It is advised to the investors to invest in companies with higher productivity of Intellectual capital. Structural capital and human capital, it increases their investment return.

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APPENDIX

Table AI
The technology of the sample industries based on Herfindahl indicator

<i>The name of the industry</i>	<i>The technology type</i>
Medical, Optical and Measurement tools	Complete exclusivity (number 1)
The exploitation of other mines	Complete exclusivity (number 1)
The exploitation of metal mines	Complete exclusivity (number 1)
The exploitation of Oil, Gas and the lateral services except exploration	Complete exclusivity (number 1)
Automobile and making its parts	Competition (number 0)
Computer and the activities related to it	Complete exclusivity (number 1)
Agriculture and the services related to it	Complete exclusivity (number 1)
Making of metallic products	Complete exclusivity (number 1)
Other non- metallic	Complete exclusivity (number 1)
Cement, lime and plaster	Competition (number 0)
Oil products, coke and nuclear fuels	Complete exclusivity (number 1)
The basic metals	Competition (number 0)
Hard sugar and sugar	Complete exclusivity (number 1)
Tile and ceramics	Competition (number 0)

(contd... Table A1)

<i>The name of the industry</i>	<i>The technology type</i>
Rubber and plastic	Complete exclusivity (number 1)
Machinery and equipment	Complete exclusivity (number 1)
Electric machinery	Complete exclusivity (number 1)
Wood products	Complete exclusivity (number 1)
Chemical products	Competition (number 0)
Food and drink products except hard sugar and sugar	Competition (number 0)
Paper products	Complete exclusivity (number 1)
Non- metallic mineral products	Complete exclusivity (number 1)
Medicinal products	Competition (number 0)