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The Effect of Intellectual Capital Components on Effective Indicators and Investor Decisions

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ABSTRACT

This study examines the effects of intellectual capital components on the investment decision indicators. Decision-making process of investors is influenced by a combination of financial and non-financial information. The purpose of this study is to introduce variables that investors take into account in the decision model to achieve a better efficiency. Our sample consists of 120 publicly listed companies on the Tehran Stock Exchange operating in eight industries over a five-year period (2011-2015). We use the estimated generalized least squares method in the present study. The results show a significant and positive impact of the components of intellectual capital on stock liquidity, earnings per share, stock returns, and stock price volatility. However, there is no statistically significant relationship between the components of intellectual capital and price to earnings ratio as well as dividends per share. Overall, the present paper indicates the different components of intellectual and capital-based indicators of investment decisions in various industries.

Keywords: Intellectual capital, Human capital, Capital employed, Structural capital, Economic value added**.**

Introduction

The transformation of communities from an industrial-oriented era into an information-based one has accentuated the importance of intellectual

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capital. The importance could stem from factors such as information technology revolution, increasing the importance of knowledge, knowledge-based economy, and the effect of innovation and creativity as significant elements of competition. In the industrial era, the price of properties, machinery, equipment, and raw materials was considered as an effective element of a business entity; while in the information era, the efficient use of intellectual capital mainly determines the success or failure of a business entity (Kazem Nezhad and Setayesh, 2009).

The increase in competition level, development of new departments in companies, and technological improvements will lead to substantial deficiencies of the traditional form of financial statements. Companies' imprecision and limited ability to transfer their risk and other information to the future results in out-of-date information. By the absence of a suitable system, providing investors with related and reliable information is an excruciating task and public trust in the market will be lost, which in turn, causes the market inefficiency (Garcia-Mecaand Martinez, 2007).

In the present study, we argue that the intellectual capital is not reflected in the financial statements of the quoted Iranian firms, which is regarded as an important deficiency in the financial reporting. By employing different methodologies, a large body of domestic research, to date, has examined and measured intellectual capital and its relationship with other variables. Recognizing intellectual capital as an intangible asset in the financial statements remains a matter of necessity in the prior literature. However, to identify the necessity of disclosing information on intellectual capital for investment decisions is also a matter of consideration, particularly prior to questioning the necessity of reflecting intellectual capital in financial statements. Thereafter, we may recognize whether this information should be reflected in financial statements. Therefore, we contend that the present research raises opportunities for future studies on intellectual capital.

In this paper, we measure the effect of components of intellectual capital including "*human capital*, *capital employed*, and *structural capital*" on the indices affecting investment decisions, which mainly include "*liquidity, volatility of stock price, earnings per share, price-to-earnings ratio, stock return,* and *cash earnings per share*". Hence, we aim to introduce variables to the investors that should be considered in their decision models in order to achieve higher returns.

Literature Review

The term "intellectual capital" first introduced by Stewart and Kirsch (1991) as a synonym for invisibles. The reason for calling the term a *capital* goes back to its economic roots, because it was introduced as a value making process fallen into the category of assets (Galbraith, 1969). As Brooking (1997) suggests, "intellectual capital is a combination of intangible assets, human asset, and those underlying structures which empower a company to perform its duties."

There are two approaches proposed in the financial literature regarding the management of intellectual capital: In the first approach, organizational infrastructures, learning, communications, and employees' capabilities are strengthened, so that long-term performance of the company improves through expanding the organizational knowledge. This approach is known as "knowledge-based school of thought". Advocates of this approach such as Inkpen (1998) and Zack (1999) believed that a company with better intellectual capital will have a competitive advantage in the business environment.

In the second approach, intellectual capital is considered as a measurable economic asset. This approach emphasizes profit-making potential of intellectual capital, and is known as "economic capital school of thought." According to Barney (1991), intellectual capital makes companies capable of gaining a sustainable competitive advantage and superior financial performance. Experimental evidence shows that there is a positive and significant relationship between increases in investors' capital and intellectual capital of companies. Large corporations need more intellectual capital power in order to attract investors in the market and increase their stock capital (Appuhami, 2007). Moreover, companies with higher intellectual capital efficiency are highly valued by investors, because they have a better performance in the form of higher profitability and revenue growth (Chen, Zhu, and Yuan Xie, 2004; Chen, Cheng and Hwang, 2005)

Bontis, Chua Chong Keow and Richardson (2000) documented a mutual relationship between components of intellectual capital and Sofian, Tayles and Pike (2006) showed that structural and relational capital has significant effects on business performance. Moreover, the Spanish evidence of Garcia-Meca and Martinez (2007) indicated that financial analysts usually seek more information on companies' strategies, customer capital, and organizational capital. They considered the information on innovation and research and development as less important. Bharathi Kamath (2008)

examined the effect of intellectual capital components (efficiency of human capital, structural capital, and capital employed) on the company's performance. He showed that among intellectual capital components, the human capital has a significant effect on profitability, productivity, and value of pharmaceutical companies in India. Likewise, Kehelwalatenna and Premaratne (2012) showed that intellectual capital as a strategic asset has a positive and significant relationship with productivity, profitability, and response of investors in the banking industry. Saedi and Mokhtarian's (2009) research on the Tehran Stock Exchange revealed that most of the investors have little interest in speculation and high-risk transactions. As far as stock purchasing decisions are concerned, financial indices such as dividend per share and earnings per share are highly relevant. However, their importance is less than price volatilities and exchange prices of shares. Ghorbani et al. (2010) showed that efficient use of financial and intellectual resources by pharmaceutical companies in Iran affects their profitability index and also the efficiency of human capital has a negative impact on productivity. Furthermore, they indicated that the efficiency of structural capital has a positive effect on shareholders' equity. In another study, Mehrabi (2010) showed that there is a positive relationship between intellectual capital, financial performance and future performance of companies listed on the Tehran Stock Exchange. By examining the effects of 15 financial factors on investment decisions, he also indicated that indices such as stock liquidity, volatility of stock price, and stock market status are more important than the well-known ones such as earnings per share, and price-to-share ratio (Vadiee and Shokuhizadeh, 2012).

The present study also aims to find the effects of intellectual capital components (human capital, capital employed, and structural capital) on the indices influencing investors' decisions (liquidity, stock price volatility, earning per share, price-to-share ratio, return on stock, and dividend per share) in the Tehran Stock Exchange.

Research method

The statistical population of this study comprises all companies listed on the Tehran Stock Exchange during 2011 to 2015. We used the systematic elimination sampling method to choose the statistical sample. In this respect, the following restrictions were considered to choose our final research sample:

1. For homogeneity purposes, all sample companies should be enlisted on

the Tehran Stock Exchange prior to 2011;
2. To fulfill comparability, sample firms' fiscal year should be ended on March 20th and they should not change their fiscal year during the study period; and
3. The sample firms should operate uninterruptedly and trade their stock publicly on the TSE within our sample window.

Given the above-mentioned restrictions, 120 listed companies out of eight industries were selected as the final research sample.

Data analysis

We use heteroscedasticity analysis to choose between OLS and EGLS estimators and conduct the F test to choose between Pooled and Panel models.

Research hypotheses

H_1: There is a relationship between intellectual capital components and stock liquidity.

H_2: The effects of intellectual capital components on stock price volatility.

H_3: There is a relationship between intellectual capital components and stock profit.

H_4: There is a relationship between intellectual capital components and price to profit ratio.

H_5: There is a relationship between intellectual capital components and stock cash profit.

H_6: There is a relationship between intellectual capital components and stock return.

H_7: The effects of intellectual capital components on stock liquidity in various industries are different.

H_8: The effects of intellectual capital components on stock price volatility in various industries are different.

H_9: The effects of intellectual capital components on stock profit in various industries are different.

H_{10}: The effects of intellectual capital components on price to profit ratio in various industries are different.

H_{11}: The effects of intellectual capital components on stock cash profit in various industries are different.

H_{12}: The effects of intellectual capital components on stock return in various industries are different.

Variables

The variables in this study are categorized as follows: independent variables, dependent variables, and control variables. What follows is the description of research variables and their measures.

Independent variables

The independent variables in this study are components of intellectual capital. Various definitions have been proposed for intellectual capital. The most commonly agreed-upon definition divides intellectual capital into human capital (HC), structural capital (SC), and capital employed (CE). In this study, the economic value added method is used to measure the components of intellectual capital. Definitions of each component and their measurements are as follows:

Human Capital

Brooking (1997) argues that human capital of an organization includes expertise, problem-solving skills, and leadership styles. According to Bontis (1998), among the components of intellectual capital, human capital is more important because human capital is the source of innovation and strategic reconstruction of companies, which is achieved by using improved human skills.

Human capital (HC) =Total investment in staff (salary, wages, etc.)

Structural capital

According to Stewart and Stephanie (1994), structural capital includes knowledge of information technology, patent, and commercial exploitation of brands. Chen, Zhu, and Yuan Xie (2004) suggest that structural capital is the supportive part of intellectual capital in order to improve organizational performance. Thus, structural capital is a function of human capital, and these two interact with each other.

Structural capital (SC) = Economical Value Added (EVA) _ Human Capital (HC) (1)

Capital employed

Capital employed is defined as all resources linked to the entity's external relations, including relations of the firm with clients, suppliers and collaborators on the research and development plans. Indeed, capital employed is a factor in converting intellectual capital into value. Capital employed is also called relationship capital (RC) or customer capital (CC). (Ghayouri Moghadam, Mohammadi Zanjirani and Nematollahi, 2012).

Capital Employed (CE) = Total Asset - Intangible Asset (2)

To calculate the economic value added (EVA), the cost of capital is deducted from after-tax operating profit (Samimi Amoli, 2012).

$EVA_{i,t} = NOPAT_{i,t} - (WACC_{i,t} \times Capital_{t-1})$ (3)

In the above equation, NOPAT is net operating profit after tax, WACC is weighted average cost of capital, and capital is the employed capital. To measure EVA of the components of intellectual capital, we follow the steps below:

Economic value added of human capital: The relationship between economic value added and human capital employed, which shows how much economic value is created per unit of cash compensation (Shams and Khalili, 2011)

$$\text{Economic value added of human capital (EVAHC)} = \frac{\text{EVA}}{\text{HC structural capital EVA}} \quad (4)$$

Economic Value Added of structural capital: Shows structural capital contribution in creating new value (Shams and Khalili, 2011).

EVA of structural capital is obtained from the formula below:

$$\text{Economic Value Added structural capital (SCEVA)} = \frac{\text{SC}}{\text{EVA}} \quad (5)$$

Economic Value Added of the capital employed:

This indicates how much new value is created per unit of physical capital employed. When groups of companies are compared to each other, EVA of capital employed is considered as an indicator of the company's ability for a better control of physical capital (Shams and Khalili, 2011).

$$\text{Economic Value Added of the capital employed (EVACE)} = \frac{\text{EVA}}{\text{CE}} \quad (6)$$

Dependent variables

Following the literature, six out of fifteen financial indices, namely stock liquidity, volatility of stock price, earnings per share, the price to earnings ratio, dividend per share, and stock returns, which are regarded as having more influence on investors' investment decisions were chosen as dependent variables (Vadiee and Shokohizadeh, 2012).

Control variables

Firm size

This is a control variable measured by the natural log of market value of the equity at yearend. Larger firms use better methods of financial disclosure than smaller ones, thus investors have greater access to information related to intangible items of larger firms. In this study, we control for the effects of firm size on the relationships between the variables used in the regressions (Garcia-Meca and Martinez, 2007).

Growth opportunity

Firm opportunity to grow is calculated by dividing the company's market value to its book value, which is a good indication of firm performance as well as the value created for shareholders (Garcia-Meca and Martinez, 2007).

Industry

Porter (1979) defines industry as "a group of companies whose products are close substitutes".

Empirical results

Classification of industries and their frequency

In this study, the number of observations is equal to 600 firm-year. These observations are the result of combining data from 120 companies listed on the Tehran Stock Exchange operating in 8 industries during five years. Table (1) summarizes the frequency and percentage of sample observations per industry.

Table 1. Descriptive statistics of sample observations per industry

Industry	percentage	frequency
Automotive	19.2	23
Metals and Metal Products	15.8	19
Wood and loom	6.7	8
Machinery and Equipment	14.2	17
Cement and plaster	13.3	16
Food Products	5.8	7
Pharmaceutical and healthcare	11.7	14
Chemicals	13.3	16

Descriptive Statistics

The present study uses multivariate analysis and panel data technic to test the research hypotheses. In this respect, we conduct Heteroscedasticity test in order to choose between OLS and EGLS estimators and F test to choose between pooled and panel models.

Heteroscedasticity test

The results of Heteroscedasticity test conducted to choose between OLS or EGLS estimators are shown in Table 2.

Table 2. Results of Heteroscedasticity test

Hypothesis	t statistic	P value	Result
1	186.18	0.000	Heteroscedasticity approved
2	3979.55	0.000	Heteroscedasticity approved
3	907.96	0.000	Heteroscedasticity approved
4	3820.05	0.000	Heteroscedasticity approved
5	1206.02	0.000	Heteroscedasticity approved
6	3902.68	0.000	Heteroscedasticity approved

As it is evident, the results of heteroscedasticity test indicate that there exists a heteroscedasticity among the research variables for all hypotheses, because the probability values are less than the significant level of %5. Therefore, we use the EGLS estimator to solve this problem.

F test

We run this test to determine whether fixed effects or random effects estimator is appropriate in panel regression. It basically tests whether the unique errors are correlated with the regressors.

By running a fixed effects model and saving the estimates, and then running a random model and saving the estimates, we conduct the Hausman test. If the P-values are less than the significance level of 0.05, then we use the fixed effects estimator. Table (3) reports the results of four sets of estimations by comparing the estimators of fixed and random effects.

Table 3. Results of Hausman and F tests

Result	Hausman P-value	t	F - test	P-value	t statistic	Hypothesis
-	-	-	POOLED	0.273	1.0860	1
-	-	-	POOLED	0.8522	0.8533	2
RANDOM	0.0868	9.617	PANEL	0.000	2.419	3
FIXED	0.0218	13.169	PANEL	0.0003	3.593	4
FIXED	0.0423	18.610	PANEL	0.000	14.264	5
FIXED	0.0155	8.0195	PANEL	0.0008	1.541	6

Hypothesis testing

We test the research hypotheses by using Eviews and Stata Statistical Software. The results indicate that four out of six main hypotheses of the study are supported. Furthermore, the multivariate covariance analysis shows the significant effect of intellectual capital components on effective indices affecting the investors' investment decisions. Hypotheses testing

results are shown in Tables 4.

Table 4. Hypotheses testing results

Hypothesis	Variable	t statistic	P-value	Test result
H1	Human capital	1.789	0.044	Supported
	Capital employed	1.802	0.042	
	Structural capital	6.212	0.000	
H2	Human capital	2.828	0.004	Supported
	Capital employed	1.501	0.013	
	Structural capital	1.571	0.000	
H3	Human capital	0.476	0.006	Supported
	Capital employed	1.966	0.049	
	Structural capital	2.407	0.016	
H4	Human capital	1.36	0.17	Not supported
	Capital employed	9.16	0.10	
	Structural capital	0.96	0.99	
H5	Human capital	0.282	0.77	Not supported
	Capital employed	0.881	0.37	
	Structural capital	0.367	0.71	
H6	Human capital	5.699	0.000	Supported
	Capital employed	2.488	0.013	
	Structural capital	4.248	0.000	
H7	Industry	2.12	0.03	Supported
	Modified model	2.07	0.02	
H8	Industry	2.28	0.02	Supported
	Modified model	2.06	0.02	
H9	Industry	6.12	0.000	Supported
	Modified model	5.98	0.000	
H10	Industry	5.82	0.000	supported
	Modified model	5.76	0.000	
H11	Industry	2.12	0.03	supported
	Modified model	2.07	0.02	
H12	Industry	2.51	0.01	Supported
	Modified model	2.47	0.006	

Conclusions

This study examines the effects of human capital, structural capital, and capital employed on the investment decisions. Considering the prior literature on the investors' investment decisions in Iran and to the best of our knowledge, this is the first study that examines the effect of intellectual

capital components on the effective financial indices affecting investors' investment decisions. The results show that human capital has a significant effect on earnings per share and return on equity as indices influencing the investment decisions. These results are consistent with the results of many existing studies (e.g., Bontis, Chua Chong Keow, and Richardson 2000; Sofian, Tayles, and Pike 2005; PewTan, Plowman, and Hancock, 2007; Rehman et al. 2011; Anis, 2013). Human capital has also a significant effect on liquidity of stock and stock price volatility, but no significant relationship was observed between human capital and dividend per share as well as cost to earnings indices. In general, this study confirms the impact of human capital on some of the indices influencing the investment decisions. In other words, it emphasizes the central role of human capital in intellectual capital and consequently investors' investment decisions.

Moreover, the results show that the capital employed has a significant effect on earnings per share and return on equity as effective indices affecting investment decisions, which implies that capital employed (physical and financial) is of great importance to shareholders by its role in creating value. These results are consistent with the findings of Bontis, Chua, and Richardson (2000), Sofian, Tayles and Pike (2006), Garcia-Meca and Martinez (2007), Rehman et al (2011), and Anis (2013). The results are also in line with the findings of Nielsen, Rimmel, and Yosano (2015) for the Japanese market, in that the capital employed, as a key element to achieve corporate strategies, could help investors make sound decisions. In addition, the results show that capital employed has a significant effect on liquidity of shares and stock price volatility, but it does not affect the dividend per share and the ratio of price to earnings.

Managers are able to strengthen and develop structural funds by identifying some of the key processes, which have the highest value for their clients, such as team structures and project in different parts of the organization and devoting more funding and time to research and development. The positive impact of intellectual capital on stock returns, earnings per share, stock liquidity, and volatility of stock price reflects that intellectual capital is important for revenue growth, firm performance, efficiency, and profitability.

Furthermore, different impacts of intellectual capital on effective indices of decision making in various industries (according to results of hypotheses No, 7-12) are important findings of present study.

Although Generally Accepted Accounting Standards (GAAP) prohibit

the identification of intellectual capital in the financial statements, investors consider the value of intellectual capital in their decisions to achieve a better performance and increased returns on their investment.

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