Research Journal of Recent Sciences ISSN 2277-2502
Vol. **2(3),** 1-6, March **(2013)** *Res. J. Recent Sci.*

Intellectual Capital and its Effects on Firms' market value and Financial Performance in Iran: An Investigating Pulic Model

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Available online at: www.isca.in
Received 7th April 2012, revised 12th November 2012, accepted 2nd February 2013

Abstract

Traditional thinking in economics was based on measurement of material resources and tangible assets and it has replaced the value creation of intangible assets. This issue led to increasing the importance of Intellectual Capital (IC) as research and economic issues. This study uses annual time series data and unit root tests and analyze them using Smooth Transition Regression (STR) model by Liew and et. al., (2002). The results showed that there is a significant relationship among IC, market value and financial performance. Random sample includes 60 companies. To test the hypothesis, first we collected data and firms IC value is calculated based on Pulic (2000) model.

Key words: Intellectual capital, market value, financial performance, smooth transition regression (STR)

Introduction

In the mid-20th century, financial economists have tried to draw attention to the company's new approach to business. This approach was based on the idea that every organization has the capabilities, assets and other financial resources are unique and distinct from other organizations it is a source of self-cured creating value and wealth[1]. Therefore, it is necessary for all the resources and organizational capacity and balance sheet assets are identified and measured. Intellectual capital consists of all assets that are not shown the company's balance sheet and it includes those intangible assets such as trademarks, patents and human advantages, structure and the communication environment is not reflected method of accounting in financial statements. Intangible assets of a company guarantee to ensure competitiveness and sustainable development.

Research Focus: Generally, the market value of companies is greater than its book value. This is due lack of fully reflect the value of intellectual capital and intangible assets in the balance sheet, and thus causes the financial Statements lose utility value and effectiveness of their information. This leads to generate interest issues related to intellectual capital. Nowadays physical tangible assets alone is not the key to successful communities and organizations. But enjoyment of intellectual capital and management the capital is that key to success is considered in the field of today's turbulent and challenging environment. Because the growing importance of intellectual capital in Process companies strategic advantage, the research examines the relationship between intellectual capital and market value and financial performance listed companies in Tehran Stock Exchange bonds.

Previous studies: In 1969, John Galbraith[2] was the first to use the term intellectual capital. But In mid-1980s moving from the industrial age to the information age was started and widening divisions occurred between book value and market value companies. In the late 1980s, the first attempts was done for compilation of financial statements accounts that measurements do the intellectual capital and books on this subject was written such as knowledge asset management by Amiden[3]. In early 1990, the first time the role of intellectual capital management and allocation of an official position, and was the organization's legitimacy as director of intellectual capital Edinsson[4] company also introduced the concept of the balanced scorecard by Kaplan and Norton approach was introduced in the Journal of Fortune articles were published in this field and conferences in 1990, thank Askandya[5] first intellectual capital report released in 1196, and a conference was arranged by the SEC with intellectual capital. In the early 2000s, the first magazine focusing on intellectual capital and intellectual capital of the accounting standard was published by the Danish government. Nowadays various projects such as publishing books and seminars and prepare numerous articles in this field is ongoing. Bontis[6] components of intellectual capital are divided into three categories: Human capital, structural and social. From the perspective Broking intellectual Capital it is a combination of intangible assets, human assets and infrastructure that enables the company in doing his duties. He believes that an organization's human capital includes the skills, expertise, problem solving skills and leadership styles.

From the perspective Stewart intellectual capital included knowledge, information, intellectual property and experience that can be effective in creation of wealth. In his view capital structure, knowledge of information technology, is patent rights and exploitation of brand names. From the perspective Ross and colleague's employees, the intellectual capital to create through competencies, attitudes, intellectual skills and experience . From the perspective they capital structure all non-human resources

and the Knowledge Organization included databases and data sources, organizational charts, organization and methods, directives and regulations, the content and processes organizational strategies and operational programs. Chen and his colleagues believe that the capital structure to support the intellectual capital for improved organizational performance. Thus the capital structure is a function of human capital and the two interact with each other and their opinion relational capital (customer) is indicative of market power, increase market share and customer loyalty. The Bontis[6] relational social capital is indicated all relationships that company provides with Customers, competitors, suppliers and goods, trade associations or government. From the perspective Bontis[6] and his colleagues is more important among the components of intellectual capital, human capital; because human capital is source of innovation and strategic corporate restructuring, which is obtained by improving human skills. Smith is a collection of human capital, knowledge employees are a company's ability and experience the passing of the company's short term in office hours. But capital structure is abilities and knowledge of the company that has been controlled the company, and there remains, after the departure of the company's employees intellectual capital in the accounting of intangible assets say non-tradable. Kaplan and Norton intangible assets in the balance sheet are included Human capital, information capital and organizational capital. Intangible assets balance sheets are not traded in the market. Not possible supervision and inventory control these assets. These assets has not a limited life these assets hasn't a limited life and yet their depreciation is not calculated.

In the financial literature there are two approaches on the management of intellectual capital: In the first approach are strengthened organizational Infrastructures, learning communication and the ability of employees until Long-term performance of the company improved by increasing institutional knowledge. The approach is known as school of thought knowledge based. Advocates the school like Innkpn and Zack[7] believe that if a company is entitled of better intellectual capital in the business environment, will have a competitive advantage. In the second approach, intellectual Capital is considered kind of economic asset measurable. This approach emphasizes to earn profits through intellectual Capital and is known as the school of economic capital. The school advocates used of the models based on the capital market like intangible balance models by Svyby[8], direct models Intellectual Capital such as the valuation of intellectual property rights by Bontis[6] and models of asset returns such as economic value added models by Stewart and value added intellectual coefficient models by Pulic[9] for measuring Intellectual Capital. In this study, we use the Smooth Transition Regression (STR) approach by Liew and et. al[10] to test the sources of market value and financial performance using data over the period 1997–2010. The STR approach to test has some econometric advantages, which outlined briefly in the following section. Finally, we apply it taking as a benchmark previously utilized to other similar studies[6, 11-13] in order to sort out whether the results reported there reflect a spurious correlation or a genuine relationship between intellectual capital and the variables in question. This contributes to a new methodology in the intellectual capital literature. Next section starts with discussing the model and the methodology.

Material and Methods

The model: The model proposed here by Pulic[9] is based on the model adopted of VAIC that has been previously utilized to other similar studies[6, 11-13]. In a much-cited contribution to the literature, firms are divided to four sections (based on dividing traditional sector) including manufacturing and raw materials (15 firms), industrial and services (24 firms), food and beverages (12 firms) and Household goods and personal (28 firms). In the study of Dimitrios Maditinos[14], this model was explained as following:

Independent variables: The present study includes four independent variables[15]: i. VACA, indicator of value added efficiency of capital employed, ii. VAHU, indicator of value added efficiency of human capital, iii. STVA, indicator of value added efficiency of structural capital, iv. VAIC, the composite sum of the three separate indicators as value of intellectual capital.

The first step towards the calculation of the above variables is to calculate value added (VA). VA is calculated according to the methodology proposed by Maditinos[16]. Second, capital employed (CE); human capital (HU) and structural capital (SC) are being calculated:

CE = Total assets* - intangible assets
HU = Total investment on employees (salary, wages, etc)
SC = VA – HU

Finally, VAIC and its three components are being calculated: VACA = VA / CE, VAHU = VA / HU, STVA = SC / VA, VAIC = VACA + VAHU + STVA

The use of the above measurement methodology is argued to provide certain advantages[2, 11,17-20]: i. It is easy to calculate. ii. It is consistent. iii. It provides standardized measures, thus, allowing comparison between industries and countries. iv. Data are provided by financial statements that are more reliable than questionnaires, since, they are usually audited by professional public accountants.

Dependent variables: The present study includes two dependent variables: i. Market-to-book value ratios, ii. Financial performance.

The market-to-book value ratio is simply calculated by dividing the market value (MV) with the book value (BV) of common stocks:
MV = Number of shares * Stock price at the end of the year

BV* = Stockholders' equity - Paid in capital of preferred stocks
MBV=MV / BV (1)

Where, MBV is the market-to-book value ratio as first dependent variable. (*In all cases, that goodwill was included in the book value of a company of the sample, the required subtraction was conducted).

The financial performance is measured with the use of three indicators:

Return on equity (ROE): ROE = Net Income / Shareholder's Equity, ROE measures organizations profitability by revealing how much profit a company generates with the money shareholders have invested.

Return on assets (ROA): ROA = Net Income / Total Assets, ROA is an indicator of how profitable a company is in relation to its total assets. It gives an idea as to how efficient the management uses assets to generate earnings.

Growth revenues (GR): GR = [(Current year & apos; srevenues / Last year & apos; srevenues) -1] * 100%

GR is the most traditional measure that indicates the growth of an organization. Here, we use GR for financial performance as second dependent variable. Therefore, in this research, models are as following:
MBV = VACA + VAHU + STVA + VAIC (2)
GR = VACA + VAHU + STVA + VAIC (3)

Methodology: Generally a STAR model for a univariate time series y_t observed in t = 1 - p, 1 - (p-1), …, -1, 0, 1, …, T - 1, T is defined as follows:

$$y_t = \beta_0 + \sum_{j=1}^{p} \beta_j y_{t-j} + (\beta_0^* + \sum_{j=1}^{p} \beta_j^* y_{t-j} F(s_t)) + u_t, \qquad t = 1, 2, ..., T \tag{4}$$

Where: y_t = The variable of interest, b_i and b^*_i i = 0, 1... p = Autoregressive parameters, F (S_t) = A transition function allowing the model to switch smoothly between regimes which is bounded by zero, u_t = A random error component believed to satisfy the assumption $u_t \sim iid(0,s^2)$

The model in equation 4 can estimate if the null hypothesis of constancy in parameters rejected. This estimated model might provide information about where and how the parameters change. It is important to have the STR model in (4) as the alternative hypothesis to the null. Two forms of the transition functions given in Terasvirta are the logistic function:

$$F(0) = [\{1 + \exp(-\gamma(s_t - c))\}^{-1} - \frac{1}{2}] \tag{5}$$

And the exponential function:

$$F(0) = \{1 - \exp(-\gamma(s_t - c)^2)\} \tag{6}$$

A third re-parameterized version of (2) proposed by Liew and et. al[10] the Absolute Logistic transition function is:

$$F(0) = (1 + \exp\{-\gamma(|s_t| - c)\})^{-1} - 0.5 \qquad \gamma \succ 0 \tag{7}$$

Our model is:

$$F(0) = [\{1 + \exp(-\gamma(e_{t(AR_{(p)})} - c))\}^{-1} - \frac{1}{2}] \tag{8}$$

The LSTAR model describes an asymmetric realization, that is, this model can generate one type of dynamics for increasing growth rate of inflation and another for reductions of the rate of inflation. The objectives of this study are first, to evaluate the forecasting performances of LSTAR, ESTAR, ALSTAR models. Second, we shall evaluate our proposed ELSTR model using the AR, LSTAR and the ALSTAR models as benchmark. We shall accomplish this task by investigating the Mean Square Error (MSE) and the robustness of this criterion subjected to Meese and Rogoff [21] test.

Results and Discussion

Unit Root Test: We use the Augmented Dickey-Fuller[22] t-statistic when to difference time series data to make it stationary. Here are the various cases of the test equation. When the time series is flat (i.e. does not have a trend) and potentially slow turning around zero, we use the following test equation:

$$\Delta z_t = \theta z_{t-1} + \alpha_1 \Delta z_{t-1} + \alpha_2 \Delta z_{t-2} + \alpha_3 \Delta z_{t-3} + ... + \alpha_p \Delta z_{t-p} + a_t \tag{9}$$

Where the number of augmenting lags (p) determined by minimizing the Schwartz Bayesian information criterion or minimizing the Akaike information criterion or lags dropped until the last lag is statistically significant. Mifrofit allows all of these options to choose. This test equation does not have an intercept term or a time trend. Unfortunately, the Dickey-Fuller t-statistic does not follow a standard t-distribution as the sampling distribution of this test statistic skewed to the left with a long, left-hand-tail. Microfit will give us the correct critical values for the test, however. Notice that the test is left-tailed. The null hypothesis of the Augmented Dickey-Fuller[26] t-test is:
H_0: $\theta = 0$
(i.e. the data needs to be differenced to make it stationary)

Versus the alternative hypothesis of: H_1: $\theta < 0$
(i.e. the data is stationary and doesn't need to be differenced).

The results reported in table 1 show that null hypothesis of ADF unit root is accepted in case of *MBV*, *GR* and *VAHU* variables but rejected in first difference at 1% level of significance. This unit root test indicate that *MBV*, *GR* and *VAHU* variables considered in the present study are difference stationary I(1) while *VACA*, STVA and *VAIC* variables are level stationary I(0) as per ADF test. Based on this test, it has been inferred that *MBV*, *GR* and *VAHU* variables are integrated of order one I(1), while *VACA*, STVA and *VAIC* variables are integrated of order zero I(0).

Determine the optimal lag: The first step in estimating STR models is determining the optimal intervals for model variables. In this regard, according to the seasonal nature of the research

period, lag 8 considered for each of the variables. For this purpose, optimal intervals for MBV, GR, VACA, VAHU, STVA and VAIC variables is considered respectively 4, 3, 0, 1 and 2. The estimated STR displayed in table 2.

Table -1
Results of unit root by ADF test

Variables	Level	1st Differences	integrated of order
MBV	-1.21	-4.89*	I(1)
GR	-1.61	-4.56*	I(1)
VACA	-3.23	-7.55*	I(0)
VAHU	-1.18	-3.84*	I(1)
STVA	-4.88	-8.87*	I(0)
VAIC	-1.36	-4.79*	I(0)

Note: * denote statistical significance at 1%

The next step is choosing the proper transfer of variables between the variables proposed to model the nonlinear transfer. Quantity of final estimated for γ parameter is 4.16 and for growth of moving moment are 2.45. Therefore, transmission function is as following:

$$G(4.16, 2.45, LK_{T-1}) = \left(1 + \exp\left\{-4.16 \prod_{k=1}^{I} (LK_{t-1} - 2.45)\right\}\right)^{-1} \quad (10)$$

In the first regime G=0 and in the second regime G=1 therefore, for first regime we have:

LMBV (t-1) = 1.341 + 0.45 LMBV (t-1) + 0.21 LVACA (t-2) + 0.24 LVACA (t) - 0.26 LVAHU (t-2) + 0.29 LVAHU (t) + 0.32 LSTVA (t) – 0.38 LSTVA (t-1) – 0.41 LVAIC (t)

In addition, for second regime we have:

LGR (t-1) = 2.54 + 1.21 LGR (t-1) – 0.56 LVACA (t-2) + 0.21 LVACA (t) – 0.16 LVAHU (t-2) + 0.13 LVAHU (t) + 0.35 LSTVA (t) + 0.36 LSTVA (t-1) + 0.25 LVAIC (t)

The arguments in this paper, the effect of economic growth on environmental biology in consumption of energy in the new communities will provide. Comparing the situation in our country we reach points that are very important.

Table -2
Select the type and model variable transmission

proposed model	Value of F_2 statistic	Value of F_3 statistic	Value of F_4 statistic	Value of F statistic	Variable transmission
LSTR1	0.022	0.036	0.059	0.126	LMBV(t-1)
Linear	0.002	0.003	0.121	0.141	LMBV (t-2)
LSTR1	0.104	0.036	0.055	0.123	LMBV (t-3)
LSTR1	0.038	0.165	0.046	0.043	LMBV (t-4)
LSTR1	0.001	0.000	0.001	0.000	LGR(t)*
LSTR1	0.025	0.085	0.124	0.546	LGR(t-1)
Linear	0.033	0.222	0.174	0.219	LGR(t-2)
LSTR1	0.331	0.219	0.119	0.116	LGR(t-3)

Table -3
Results of final estimation by STR model in form of Nonlinear for MBV

Part of linear	Coefficient of Φ	Quantity of t statistic	Value of probably t statistic
Constant	1.341**	8.07	0.002
LMBV (t-1)	0.45*	3.41	0.005
LVACA (t-2)	0.21**	4.04	0.005
LVACA (t)	0.24***	3.22	0.036
LVAHU (t-2)	-0.26*	1.22	0.036
LVAHU (t)	0.29**	5.27	0.006
LSTVA (t)	0.32*	2.71	0.011
LSTVA (t-1)	-0.38***	3.42	0.003
LVAIC (t)	0.41*	3.74	0.002

*Significant of 1 percent, **Significant of 5 percent, ***Significant of 10 percent

Table -4
Results of final estimation by STR model in form of Nonlinear for GR

Part of Nonlinear	Coefficient of Ɵ	Quantity of t statistic	Value of probably t statistic
Constant	2.54**	3.25	0.007
LGR (t-1)	1.21*	3.07	0.007
LVACA (t-2)	-0.56*	4.35	0.004
LVACA (t)	0.21*	3.68	0.003
LVAHU (t-2)	-0.16*	4.14	0.005
LVAHU (t)	0.13*	1.38	0.036
LSTVA (t)	0.35*	2.38	0.023
LSTVA (t-1)	0.36*	3.89	0.006
LVAIC (t)	0.25*	2.51	0.018

*Significant of 1 percent, **Significant of 5 percent, ***Significant of 10 percent

Conclusion

The goal of this paper was to test the existence of long run relationship between intellectual capital and its effects on firms' market value and financial performance in Iran. After the measurement model of intellectual capital and its components using a value-added intellectual capital (VAIC) submitted by Pulic model, Their effects on five performance indicators defined in this study including return on equity, return on assets, interest rates, employee productivity, the ratio of market value to book value per share and earnings per share were analyzed using regression. It can be advised to pay attention and focus more on intellectual capital in organizations and understanding the importance and impact of this factor on the overall performance of the organization and positive effects on the process of value creation in organizations as a factor influencing the performance of financial organizations. Since in the research model, human capital is a key factor in determining the role of intellectual capital, providing a competitive environment in the order to determine the salary levels of employees, it increases the large amounts research model.

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