

THE RELATIONSHIP BETWEEN INTELLECTUAL CAPITAL AND MARKET VALUE OF COMPANIES LISTED IN TEHRAN STOCK EXCHANGE

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ABSTRACT

In today's knowledge-driven world, intellectual capital and knowledge assets are crucial for profitability and maintaining a competitive edge for the company. The rise of a knowledge-driven economy highlights the growing significance of intellectual capital as an intangible asset and a crucial source of competitive advantage for a business. Reality demonstrates the significance of intellectual capital and highlights the disparity between the book value and market value of firms, particularly since the 1980s, leading most financial analysts to advocate for greater business investment in intellectual capital. The primary aim of this paper is to examine the influence of intellectual capital on the market worth of firms listed on the Tehran Stock Exchange. In this research, the Pulic model and its modified version were employed to assess the intellectual capital. The study timeframe was from 2010 to 2014, with a sample size of 200 companies chosen. The findings from this study employing panel data regression (least squares method) indicate a notable connection between intellectual capital and market value. The findings indicated that the revised version of the previous Public model possesses enhanced explanatory capability. The findings indicated that, of the components of intellectual capital, human capital efficiency exerts the most significant influence on the company's market value.

INTRODUCTION

In the current world, the industrial economy and the emerging knowledge-based economy are emphasized. A system where the generation and utilization of knowledge significantly contribute to the wealth creation process (Chen Goh, 2005). The traits of the knowledge-based economy include substantial investments in human capital and information and communications technology, and the human ability to generate knowledge is boundless because, in the knowledge-based economy, it represents an infinite resource. The rise of a knowledge-driven economy highlights the growing value of intellectual capital as a non-physical asset and a crucial source of competitive edge for businesses (Rosorus, 1997).

Intellectual capital is regarded as a crucial element in sustaining competitive advantage, with many companies and researchers asserting that its role as the primary source of such advantage is growing (Edvinsson & Malone, 1997). Indeed, we are in an age where knowledge governs communities and organizations. The scientists of the twentieth century viewed the industrial economy as reliant on resources and physical assets, while the twenty-first century is recognized as the era of the knowledge economy centered on intellectual capital. Understanding solely your products or services in the economy is insufficient; you must create value and innovate to thrive in a competitive market. Numerous specialists argue that the key element in generating intellectual capital to enhance value and improve the performance of businesses is widely recognized. Reality highlights the significance of

intellectual capital and the disparity between book value and market value, particularly since 80 AD, after which most financial analysts suggest that increasing a company's investment in intellectual capital is essential. As a result of the above, the recognition, assessment, and management of intellectual capital became essential for businesses. Managers need to understand the company's intellectual capital to manage it effectively. Users of financial statements ought to consider the company's intellectual capital to anticipate future developments and make informed choices. Following the identification and valuation of appropriate intellectual capital for both managers and financial statement users, which are crucial for daily operations (Campbell & Abdul-Rahmani, 2010), this study explores the relationship between intellectual capital and the market value of firms listed on the Tehran Stock Exchange, considering the growing significance of intellectual capital. The results of this study are beneficial for managers, as research indicates they must recognize the significance of intellectual capital and understand that knowledge is essential for enhancing the company's capacity to stay competitive in today's market.

The necessity for investigation:

The growing disparity between the real value and the corporate headquarters has drawn researchers' focus toward elucidating the intangible value in financial statements, which has been overlooked. We named it because we believe in the worth of intellectual capital, and throughout the organization, there is a body of knowledge that exists but often remains overlooked. Research conducted on 500 Taiwanese firms indicates that the market value compared to the real book value of companies increased from 1 to over 5 times between the years 2010 and 2014, respectively. Research has shown that nearly 80 percent of the firm's market worth is not represented in financial statements. According to Madhoshi and Asgharnejad Amiri (2011), the significance and need for this research are growing due to the lesser-known capital (IC) in the true value of companies and their financial performance, as well as its influence on success and failure in today's intricate and competitive landscape.

Literature survey:

Anvari Rostami and Serajy (2006) examined the connection between intellectual capital and the market value of stocks listed on the Tehran Stock Exchange. This research utilized five quantitative variables to assess intellectual capital. This study's outcome highlights the significance of intellectual capital, emphasizing its value to investors and the strong correlation with the market value of shares in the Tehran Stock Exchange.

Qelichly, Khodadad Hosseini, and mosaics (2007) conducted a case study to investigate how intellectual capital contributes to establishing a competitive edge. This research case study involves two Iranian automakers. The findings indicated a significant positive relationship between the intellectual capital of both companies and their competitive advantage.

Sepehr Doust (2007) explores the connection between intellectual capital and pre-tax profit, operating cash flow, and added value as a measure of assessing the performance of companies listed on the Tehran Stock Exchange from 2005 to 2007. To examine the connection between intellectual capital, operating cash flows, and value-added companies, the Douglas production function was utilized. To assess the importance of the mutual cause-and-effect relationship between the independent and dependent variables, the Granger causality test was employed. The estimation model results for the chosen companies indicate that throughout the study period, there was a significant positive relationship between operating cash flows and value-added intellectual capital.

Shojaei and Baghbanian (2010) conducted a case study to explore the connection between intellectual capital and organizational performance in the banking sector of Kurdistan province, Iran. In this study, a valid psychometric questionnaire, which is based on the original version and was implemented for the first time in Canada, is utilized. The final estimated model indicates a positive effect on the performance of each intellectual capital component, with human capital, structural capital, and customer capital in the banking industry being the most impactful.

Hadavi (2012) investigated the impact of intellectual capital on companies' financial performance by employing Pulic to assess intellectual capital and examining performance evaluation criteria. The sample consisted of 100 companies that were listed on the Tehran Stock Exchange from the years 1380 to 1389. The findings of this research indicated a positive relationship between intellectual capital and financial performance in corporations.

Hemati and Mehrabi (2012) investigate the connection between intellectual capital and financial returns of publicly traded companies, utilizing Pulic's method to assess intellectual capital. The sample consisted of 146 firms traded on the Stock Exchange over a span of 5 years from 2006 to 2010. The findings of this research indicated that there is a positive correlation between intellectual capital and both financial performance and the company's future performance. Moreover, the proportion of intellectual capital in a company's future success varies across different sectors. The findings additionally indicated that there is no correlation between the growth rate of intellectual capital and the company's future performance.

Juma and Payne (2004) examine the link between intellectual capital and the performance of firms, particularly focusing on high-tech companies. However, it can be argued that this relationship is evidently unclear, and further experimental research should confirm its existence or, at the very least, more quantitative assessments need to be conducted.

Helena and Tanja (2007), in their research regarding the influence of IC elements on financial performance within the hospitality sector, commenced in Slovenia. The findings indicated a positive correlation between the elements of intellectual capital and financial performance in that industry. Secondly, capital, in relation to other elements of intellectual capital, exerts a greater influence on financial performance.

Huang and Wang (2008) examined the impact of economic value and intellectual capital on the market, concluding that EVA-based income and profit-based GAAP do not sufficiently explain the variations in a company's market value. Additionally, they found that intellectual capital offers supplementary information for stock evaluation.

No (2010) aims to analyze and clarify the connection between intellectual capital and the success of financial transactions in companies, examining 775 company-years from 1996 to 2006. The findings indicate that there is a noteworthy positive connection between human capital and structural capital, which also shows a significant positive relationship with the company's performance. Nonetheless, this study serves as compelling evidence to demonstrate the presence of a favorable connection between capital structure and corporate performance in that context. The findings of this study highlight the necessity for improved output variables of structural funds that still lack the presentation of financial statements. This research employs the Pulic method for calculating intellectual capital components, alongside performance measurement approaches such as ROA, ROE, and variations in the company's sales..

Maditinus and associates (2011) explored how intellectual capital influences the market value and financial performance of their firms. The strong link between the productivity of human capital and the financial performance of companies leads to the conclusion that in the Greek business environment, the enhancement of human resources is a key factor for economic success. Consequently, human capital is central to companies.

A study by Maditinus et al. (2011) examined the impact of intellectual capital on the market value of companies and their financial performance, utilizing empirical data from 96 Greek firms listed on the Athens Stock Exchange. These companies were categorized into four distinct economic sectors and analyzed over the three-year period from 2006 to 2008. This study aims to assess the intellectual capital of Pulic, based on the premise that firms with a greater intellectual capital ratio of market value to book value tend to have higher values. Ultimately, the experimental findings did not validate this hypothesis; thus, the hypothesis is dismissed.

Clark and colleagues (2011) investigated the link between intellectual capital and corporate performance pay in Australia, analyzing a sample of Australian firms from 2004 to 2008. Intellectual capital is evaluated using Pulic's method. The findings indicate that intellectual capital and financial performance in Australia are related. A positive association was noted between intellectual capital (human capital and structural) from the prior year and the financial performance of the current year. In this research, a metric for evaluating financial performance is the return on equity rate.

Definitions of intellectual assets:

Edvinsson & Malone (1997) describe intellectual capital as a knowledge-driven process encompassing assessments, functional capabilities, organizational technology, customer relationships, and professional expertise that enhance a company's competitiveness and profitability; it represents the future. They contend that intellectual capital consists of two components: human capital and structural capital. Stewart (1995) defines intellectual capital as knowledge that drives growth and development. His theoretical framework for intellectual capital was subsequently segmented. Stewart (1997) asserted that the structure of human and intellectual capital is comparable to customer capital and structural capital. The institutional asset associated with capital structure is regarded as a subset of capital structure. He thought that numerous Companies across all three subtypes of intellectual capital exist, yet the significance and strength of one aspect of intellectual capital vary based on type and location.

- 1) **Human capital:** Encompasses the qualifications, abilities, experience, and intellectual capabilities of employees (Stewart, 1997; Edvinsson & Sullivan, 1996; Bounfour, 2002; Brooking, 1996; Edvinsson & Malone, 1997; Roos et al., 1997).
- 2) **Capital structure:** Encompassing processes, systems, frameworks, intellectual property, and other intangible assets that are owned but not reflected in the balance sheet. (Bounfour, 2002; Brooking, 1996; Edvinsson & Malone, 1997; Roos et al., 1997; Stewart, 1997)
- 3) **Customer capital:** The leftover intellectual capital, customer capital that originates from both individual and organizational levels. Customer capital represents a component of intellectual capital, while a knowledge network comprises the collective knowledge that arises from a communication network (Edvinsson & Malvhn, 1997; Roos et al., 1997; Stewart, 1997). This connection extends beyond specific interactions, encompassing communication with clients, vendors, investors,

and other parties linked to the organizations involved (Bounfour, 2002; Edvinsson & Malone, 1997; Roos et al., 1997).

In every definition, a clear link between human capital, structural factors, and customers can be observed. Numerous investigations have examined the division's intellectual capital. The relationship between the subtitle and the organization's intellectual capital title is noted (Brooking, 1996; Roos et al., 1997).

Method of investigation:

Given the primary objective of this research, which is the introduction of intellectual capital, its components, and its correlation with the company's market value to book value ratio, this study is therefore descriptive. In this study, the intellectual capital of Pulic and a modified version of Pulic was utilized for measurement. This section covered the formulation of hypotheses, methods of data collection, statistical population, models, variables, and approaches to data analysis.

1. The relationship between the market value and book value ratio of the company's intellectual capital is significant.
2. The proportion of market value to book value of the intellectual capital in the company's subsidiaries showed a notable correlation.
3. The relationship between the market value to book value ratio of the company's subsidiaries' intellectual capital and the adjusted coefficient of value added is significant.

The necessary data was gathered from CD corporate financial information supplied by the Tehran Stock Exchange, which includes annual financial statements and their accompanying explanatory notes in PDF format, in addition to the Tehran Stock Exchange website.

Sampling of the categories of exclusion, in this research involving 448 firms listed on the Tehran Stock Exchange for which corporate financial information was available on CD-ROM, only 258 companies submitted reports to the stock exchange within each 5-year interval. To choose a sample of companies listed on the Tehran Stock Exchange, firms with these specific characteristics were chosen.:

- By the conclusion of 2005, acceptance into Tehran Stock Exchange occurred.
- Conclude their fiscal year in March.
- Throughout the financial year, transactions should not be interrupted for longer than 3 months.
- The financial institution, investment services, leasing, and banking it.
- Study period with a positive net profit and no operational losses either.
- The net book value of assets cannot be negative.
- Financial data from 2010 to 2014 will be completely accessible.
- Based on the above, of 258 active companies, 58 companies were eligible and were removed above. Thus, 200 companies were selected as the population.

Method

The value-added intellectual coefficient rises as information regarding the worth of both tangible and intangible assets generated by the company improves. In reality, this valuation

approach, rather than just focusing on intellectual capital efficiency, was assessed through three primary sources. These primarily represented the sources of financial and physical assets, human resources, and structural assets. His model was applied to the overall effectiveness of capital, human capital, and structural capital, as well as the firm's added value ratio. This research employed the modified Pulic model to assess intellectual capital. In the modified model, the effectiveness of intangible assets as an IC sub-Public was incorporated into the framework. The fundamental model (Pulic, 2000) determines the value added from utilizing company resources each year through the following equation:

$$1) \quad VA = OP + EC + D + A$$

P operating income, **EC** labor costs, **D** depreciation of fixed assets and intangible assets Depreciation is **A**.

Public assessments of intellectual capital in the company involve three criteria: the efficiency of human capital, the effectiveness of operations, and the efficiency of the relationship between capital and utilized capital. The effectiveness of human capital demonstrates the value added per rial spent, indicating the amount of value generated for the workforce.

Human capital encompasses direct labor expenses + indirect + operational sectors of sales, marketing, and administration.

$$2) \quad \text{Human Capital Efficiency} = \frac{\text{Efficiency of human capital}}{\text{human capital}}$$

Effectiveness of capital composition, Measured as a gauge of the performance of structural capital in the value creation process. Structural capital denotes the framework of share capital designed to generate value. Public model structural capital is determined in the following manner.

$$3) \quad \text{capital structure} = \text{value} - \text{Human capital}$$

The role of human capital in generating value is lower than that of structural capital, with structural capital efficiency described as follows.

$$4) \quad \text{Structural Capital Efficiency} = \frac{\text{capital structure}}{\text{value}}$$

The ratio of value added intellectual capital is derived from the previously mentioned elements and assesses the company's intellectual capital. This coefficient serves as a means to assess intellectual capital in the Public Model. It is accurate that the accounting information utilized in the index's calculation, but emphasize rather on the company's expenses as resources that generate value for the firm.

$$5) \quad VAIC = HCE + SCE + CEE$$

In the revised model, the intangible assets contribute to the performance of the model. Intangible assets indicate non-physical elements influencing the company's performance in comparison to its book value.

The efficiency of capital utilized, enhanced by each unit of physical capital, is illustrated as follows..

$$6) \quad \text{The efficiency of capital employed} = \frac{\text{Value Added}}{\text{Capital employed}}$$

Capital employed includes total assets minus the book value of intangible assets. Pulic (2000) posits that if a company utilizes each unit of capital more effectively than other firms, then the initial company employing that capital performs better.

Variables:

Dependent variables and independent variables are classified into two categories. The dependent variable is a variable that will be influenced by changes in the independent variable. This study examined intellectual capital and its components as independent variables, including human capital efficiency, structural capital efficiency, the efficiency of employed capital, the value-added intellectual coefficient, and intangible asset efficiency. The dependent variable represents the relationship between market value and book value. The company's market value to book value ratio: this ratio serves as a measure to assess the company's intellectual capital.

In reality, the distinction between the company's book value or the assets and liabilities of the company refers to the shareholders' equity.

The company's market worth is equal to the product of the total shares and the stock market price. The market value of the company is equal to the product of the total shares and the stock market price. The study aimed to determine the market value based on the latest stock price for each share, using transaction prices, and observed that the target price exceeds the traded volume for the shares.

7) The ratio of market value to book value = $\frac{\text{market value}}{\text{book value}}$

The company's market value to book value ratio serves as an indicator to assess its intellectual capital.

The distinction lies in the book value of the company or its assets and liabilities, which represents the shareholders' equity of the firm. A company's market value exceeds its book value; the balance sheet does not reflect intellectual property. While the entire variance linked to a company's intellectual capital isn't accounted for, most researchers attribute this discrepancy to intellectual capital.

The company's market value is equal to the number of shares multiplied by the stock market price. To determine the market value of the most recent stock price for each share of the company, the transaction prices were utilized, noting that the stock was traded at a price above the volume basis.

Data Analysis:

In this research, data examination and hypothesis verification employed regression analysis with panel data and a panel data regression model to explore the relationship between linear variables as outlined below.:

$$Y_{it} = \beta_0 + \beta_1 x_{it} + \beta_2 x_{it} + \dots + \mu_{it}$$

To evaluate hypotheses with the software Eviews, Hausman test is employed for the model utilized to ascertain who should be examined or the random effects model to assess the impact of consistent usage.

Subsequently, applying the least squares technique along with Eviews software to evaluate the hypothesis..

Test of hypothesis:

The first step is to examine the relationship between intellectual capital and the ratio of market value to book value of the company. The model was expressed as follows:

$$MV_{it} / BV_{it} = \beta_0 + \beta_1 VAIC_{it} + \mu_{it}$$

variable	F test		The coefficient of determination	t test		Coefficient was estimated
	Statistic test	Significant level		Statistic test	Significant level	
Constant				1.582	0.117	0.490
VAIC	58.20	00.00	0.075	8.46	0.000	0.501

Table1: Summary of Results of Regression of market value to book value and intellectual capital

Above table shows that the market value to book value ratio of corporate intellectual capital reveals a strong correlation. The initial hypothesis of Pulic's VAIC posits that the intellectual capital of the subsidiaries serves as the sole independent variable in the model. The subsequent phase involves examining the connection between intellectual capital and the ratio of market value to book value in the subsidiary companies that were addressed. The regression model was outlined as follows.

$$MV_{it} / BV_{it} = \beta_0 + \beta_1 HCE_{it} + \beta_2 SCE_{it} + \beta_3 CEE_{it} + \mu_{it}$$

The results of the regression analysis are summarized in Table 2.

variable	F test		The coefficient of determination	T test		Coefficient was estimated
	Statistic test	Significant level		Statistic test	Significant level	
Constant				1.334	0.153	0.800
HCE	3.840	00.000	0.470	2.900	0.00	0.340
SCE				- 0.430	0.590	-0.670
CEE				0.950	0.300	0.720

Table 2: Summary Results of regression ratio of market value to book value and sub intellectual capital

Table 2 illustrates that there was no meaningful correlation between the domain of intellectual capital and the market value to book value ratio of the companies.

The findings from evaluating the second hypothesis not only validate the first hypothesis's outcomes but also indicate that when individual subsets of intellectual capital are considered both separately and together, the explanatory power increases, and the connection between intellectual capital and the ratio of a company's market value to its book value is better represented (R^2 value rises from 7% in the initial model to 47% in the two-hits model). The correlation results indicate that subsets of intellectual capital, particularly the relationship between human capital and performance, reveal a significant positive market value to book value ratio for the two subsidiary companies, while other aspects of intellectual capital and the efficiency of capital employed show no statistically significant impact on the market value to book value ratio of the companies.

Ultimately, the connection between intellectual capital and the market-to-book value ratio of the company's subsidiaries was analyzed after adjusting for the value-added intellectual coefficient, and the regression model was formulated as follows.

$$MV_{it} / BV_{it} = \beta_0 + \beta_1 HCE_{it} + \beta_2 SCE_{it} + \beta_3 CEE_{it} + \beta_4 IAE_{it} + \mu_{it}$$

The results are summarized in Table 3 regression.

variable	F test		The coefficient of determination	T test		Coefficient was estimated
	Statistic test	Significant level		Statistic test	Significant level	
Constant	4.900	0.000	0.490	0.360	0.70	0.200
HCE				2.801	0.000	0.420
SCE				0.030	0.800	0.020
CEE				0.914	0.310	0.500
IAE				4.200	0.00	7.800

Table 3: Summary Results of regression ratio of market value to book value and intellectual capital sub-adjusted model

As shown in Table 3, within the subset of intellectual capital ratio of market value to book value post-adjustment model, a significant correlation now exists. The findings from testing the third hypothesis not only validated the outcomes of the first and second hypotheses but also indicated that incorporating the efficiency of intangible assets and intellectual capital, as part of Pulic, into the model resulted in greater explanatory power. This led to a communication improvement between the intellectual capital ratio, which accounted for 7% of the R² value regarding a company's market-to-book value, yielding a better performance (with 47% in the second model rising to 49% in the third model). The other two components of intellectual capital, the efficiency of employed capital and the capital itself, along with the adjusted ratio of market value to book value of the company, revealed a significant relationship in the Pulic Model.

DISCUSSION

Final Thoughts:

Given the traits of our era and the prevalence of knowledge-based societies and corporations, this study focused on the intangible assets and intellectual capital of the organization. This research presents intellectual capital by highlighting various definitions, concentrating on shared definitions, and reviewing both domestic and international studies. Most importantly, it investigates the connection between intellectual capital and the market value of companies listed on the Tehran Stock Exchange using the Pulic model and a modified version:

- 1) The results showed that when a subset of intellectual capital (including the efficiency of human capital, structural capital efficiency and the efficiency of capital employed) separately and simultaneously in a stepwise model, the model with the higher explanatory power, and the relationship between intellectual capital and value market to book value of the company to show better way.
- 2) The relationship between intellectual capital and market value, results showed that there was a significant relationship between intellectual capital and market value.

- 3) The results showed that the modified model Pulic, improved model and show a stronger relationship between intellectual capital and the market value of the company.
- 4) The results also showed that firms listed in the Tehran Stock Exchange, using skilled manpower and more investment in intangible assets and consequently, improve the market value of the company's intellectual capital can be enhanced.

Recommendations:

Proposals consisted of two parts based on the findings and further studies are recommended. Recommendations based on the study include the following:

- 1- According to the results of research showing the positive effect of intellectual capital on the market value of the company is proposed to investors when forecasting the company's overall situation, the components note intellectual capital and use of these components in their estimates.
- 2- Add other elements that affect intellectual capital, such as research and development costs.
- 3- The use of other methods of measuring intellectual capital and comparisons with model and modified model of Public Policy.
- 4- Methods to evaluate and measure intellectual capital in order to provide national or local model of heart adaptation to suit existing conditions.
- 5- Comparing the relationship between intellectual capital and market value and financial performance in the various industries using a modified version Pulic.

Restrictions of research:

Financial analysis faced with various challenges and constraints. A notable limitation is the inadequate quality of corporate financial reports, particularly prior to 2006, resulting in a phase of restricted research. However, since 2006, the company's financial report quality has improved, though in certain instances, even with statutory audits, standards and regulations have not been fully met. Another drawback of capital market inefficiency as a confounding element that may influence the study's outcomes, which a researcher cannot control, exists. Among other constraints that might influence the outcomes, the stock price relies on the political and economic climate.

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