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# Investigating the Role of Non-Financial Information Analysis and Risk- Return Analysis along with Financial Information in Increasing the Efficiency of the Stock Portfolio of Banks

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**Abstract**. The purpose of this study was to investigate the role of non-financial information analysis and risk-return analysis along with financial information in increasing the selected banks and financial institutions of Tehran Stock Exchange portfolio efficiency. To evaluate the efficiency of the portfolio, the Treynor's ratio was used and attempted to determine the Treynor's ratio of the selected optimal portfolio based on each accounting and financial information, non-financial information and risk-return analysis, and then the significant differences between the ratios were compared. also, intellectual capital, agency theory and management ability data were used as non-financial information. The 9 optimized Portfolio that were selected by any one or more of the data from

financial, non-financial, and risk-return analysis and calculated Treynor's ratio for each select were used. To achieve the goal of the research, 19 banks and financial institution of Tehran stock exchange were selected as sample and analyzed. The results showed that the use of non-financial and risk-return analysis information will increase the calculated efficiency of banks portfolio using the Treynor's ratio. All of hypotheses were approved, this means that there is significant difference between mean Treynor's ratio of stock combination based on risk-return information and accounting information, agency theory, management ability and accounting information and intellectual capital.

**Keywords**: Stock Portfolio, Stock Portfolio Performance, Agency Theory, Intellectual Capital, Risk-Return.

## 1. Introduction

The study of financial and accounting data is done in two wide categories: correlation and prediction studies. In the first method, based on market efficiency assumption, stock prices are considered as one of the main index for firm's value. Based on this approach, the existence of statistical correlations between accounting data and stock prices and or stock returns means that accounting information is an indicator for efficient events and stock prices information. So, it can contain a near-market value. (Piotroski, 2000). The second approach is based on the fundamental analysis of firms' data, and it assumes that stock prices do not reflect all information in a timely manner. Based on the efficient market theory, available financial information cannot used for predicting returns and systematically determine abnormal earnings. But Ou & Penman (1989) argue that there are significant abnormal earnings in some of the fundamental signals that arises from the market inability to completely and immediately process all the price signal information (Ou & Penman, 1989). Based on existing discussions, this paper focuses on fundamental analysis to processing a set of accounting and financial data of companies with a new approach and try to investigate the role of non-financial information and risk-return analysis in increasing the efficiency of stock portfolios. The purpose of this study at first is use the accounting information analysis (traditional and modern financial ratios)

and non-financial including intellectual capital, agency theory and managers' ability to optimizing use of this information for analysts, investors and the users of the financial statements to select the optimal portfolio. In other words, the importance of this research is to provide a new view on the fundamental analysis of accounting, financial and non-financial information in the formation of a portfolio and how the stock market is ranked in the capital market and investors of the country, so that, on the one hand, investors interesting choosing a portfolio have taken into account and, on the other hand, provide a comprehensive and optimal model for analyzing firms information. This issue has been analyzed and evaluated in banks and financial institutions accepted in Tehran Stock Exchange as well as at various industry levels.

## 2. Literature review

The efficient markets theory has been posed and emphasized as the main underpinning of financial economics. A market in which prices always accurately reflect the existing information is called efficient. The evaluation of market efficiency has always been important as a measure of capital market capability in achieving its goals and the process of evolution of its methods has had a profound effect on the development and deepening of financial economy. In the quantitative assessment of the capital market based on what information prices fully reflected, it is possible to categorize market efficiencies at weak, half-strong and strong performance levels, and the dominant sector of market efficiency literature is about the advancement and evolution of the performance test at the mentioned levels. In the following, some capital market analysis methods such as fundamental analysis and the modern stock portfolio theory will be described (Ou & Penman, 1989). Fundamental analysis is a method of evaluation of securities that involves attempting to measure the intrinsic value by examining economic and financial factors, accounting information and other qualitative and quantitative factors. Fundamental analysts study issues that could affect the value of securities. This method of analyzing securities is considered as the opposite of the technical analysis. Fundamental analysis uses real and historical data to evaluate the value of securities with the purpose of

forecasting financial items. Using fundamental analysis, one can assess the stock of a company and predict the trend and evolution of its potential price (Krantz, 2010). Fundamentalists are interested in the inherent value of securities. They believe that the value of each share can be scientifically determined, and they mainly rely on economics, financial statistics and information. They pay attention to income statement, balance sheets, dividend records, management policies, sales growth, management power, and competitive pressures (Anvari, et al, 2006). This is while technical analysis assumes that future prices of securities can be predicted using past information. Technical analysts believe that stock value is a function of its supply and demand and is weakly correlated with its inherent value (Nemazi, 2005). Technical analysts use three basic principles. According to the first principle, all features of a stock are reflected in its price. According to the second principle, prices move in trends that resist changes. And according to the third principle, market activity can be repeated (history tends to repeat itself) (Nemazi, 2005). Technical analysis indicators are classified into two main categories. According to, these two groups are: 1. follower patterns or delayed indicators; and 2. trend predictor indicators, oscillator or guide indicators (Nemazi, 2005). Harry Markowitz (1952, 1959) developed his portfolio-selection technique, which came to be called modern portfolio theory (MPT). Prior to Markowitz's work, security-selection models focused primarily on the returns generated by investment opportunities. Standard investment advice was to identify those securities that offered the best opportunities for gain with the least risk and then construct a portfolio from these. Following this advice, an investor might conclude that railroad stocks all offered good risk-reward characteristics and compile a portfolio entirely from these. The Markowitz theory retained the emphasis on return; but it elevated risk to a coequal level of importance, and the concept of portfolio risk was born. Whereas risk has been considered an important factor and variance an accepted way of measuring risk, Markowitz was the first to clearly and rigorously show how the variance of a portfolio can be reduced through the impact of diversification, he proposed that investors focus on selecting portfolios based on their overall risk-reward characteristics instead of merely compiling portfolios from securities that each

individually have attractive risk-reward characteristics (Markowitz, 1959). A Markowitz portfolio model is one where no added diversification can lower the portfolio's risk for a given return expectation (alternately, no additional expected return can be gained without increasing the risk of the portfolio). The Markowitz Efficient Frontier is the set of all portfolios of which expected returns reach the maximum given a certain level of risk (Rai and Pouyanfar, 2013). Following Markowitz, William Sharp introduced the single-index model. Sharp states that the risk-taking of stock portfolio only depends on a systematic risk factor. Except for the market factor, no other factor such as the effects of company industry and size will affect stock returns. In this model, any non-systematic risk has been eliminated (Rai and Pouyanfar, 2013). This model was not considered a desirable model for investors in the formation of stock portfolios because it considers the stock portfolio risk only in beta factor.

Efficient portfolios may contain any number of asset combinations. It examines efficient asset allocation by using two risky assets for example. Then it understands the properties of portfolios formed by mixing two risky assets, it will be easy to see how portfolio of many risky assets might best be constructed (Krantz, 2010). Because of envision forming a portfolio from two risky assets, it is needed to understand how the uncertainties of asset returns interact. It turns out that the key determinant of portfolio risk id the extent to which the returns on the two assets tend to vary rather in tandem or in opposition. The degree to which a two-risky-assets portfolio reduces variance of returns depends on the degree of correlation between the returns of the securities (Sinaei et al, 2012). According to two-fund separation, the efficient frontier of risky assets can be formed by any two risky portfolios one the frontier. All portfolios on the mean-variance efficient frontier can be formed as a weighted average of any two portfolios or funds on the efficient frontier, is called two-fund separation. So, if we have any two points of the portfolio combinations, we can draw an entire efficient frontier of the risky assets. Then, we can generate the entire efficient frontier by the separation property (Nemazi, 2005). We already have an efficient frontier, however, how we deicide the best allocation of portfolio? One of

the factors to consider when selecting the optimal portfolio for an investor is degree of risk aversion, investor's willingness to trade off risk against expected return. This level of aversion to risk can be characterized by defining the investor's indifference curve, consisting of the family of risk/return pairs defining the trade-off between the expected return and the risk. It establishes the increment in return that an investor will require in order to make an increment in risk worthwhile. The optimal portfolio along the efficient frontier is not unique with this model and depends upon the risk/return tradeoff utility function of each investor (Lopez et al, 2008). Most previous studies in this field have tried to present models with an emphasis on Markovitz and Sharp models and consider risk-return variables and use traditional financial ratios. Furthermore, most of these studies have tried to provide an optimal stock model using various decision-making methods, and most of them even used the same financial indicators and variables. Table 1 shows a summary of previous research.

**Table 1.** Creation of stock portfolios

| Author(s) | Year | Summary |
|---|---|---|
| Hosseini et al. | 1394 | companies with very high efficiency did not have much durability in repeating their performance in the next year |
| Patari et al. | 2012 | Data Envelopment Analysis Model can determine the most valuable portfolio in the market |
| Copta et al. | 2014 | they showed how to create an optimal portfolio that determines both the financial goals and the behavioral goals intended by shareholders. |
| Lim et al. | 2014 | application of DEA has led to higher returns than the same stock portfolios over a 9-year period |
| Liu et al. | 2015 | using Data Envelopment Analysis Technique is an effective and practical way to calculate the efficiency of stock portfolios |

According to research literature the research hypotheses are as follows:

There is a significant difference between the mean Treynor ratio of stock composition based on the risk-returns information with accounting information in analyzing the optimal portfolio.

There is a significant difference between the mean Treynor ratio of stock composition based on the risk-returns information with total amount of accounting information and agency theory in analyzing the optimal portfolio.

There is a significant difference between the mean Treynor ratio of stock composition based on the risk-returns information with total amount of accounting information and management ability in analyzing the optimal portfolio.

In analyzing the optimal portfolio, there is a significant difference between the mean Treynor ratio of stock composition based on the risk-returns information with total amount of accounting information and intellectual capital in analyzing the optimal portfolio.

The conceptual model of research is as follows:

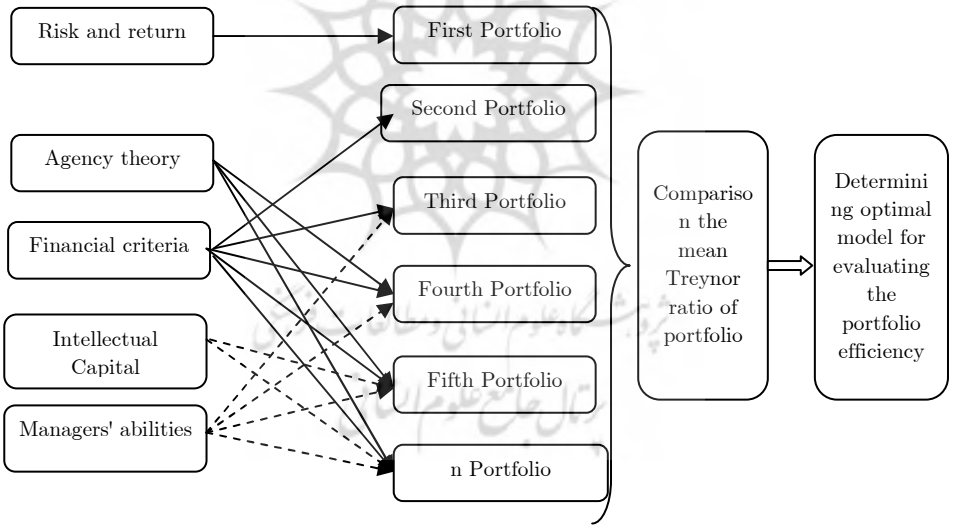


**Fig. 1.** The conceptual model

## 3. Method

The present research aimed to investigate roles of financial and non-financial information as well as risk-returns in increasing the efficiency of selected portfolios by banks as the members of Stock Exchange. Therefore, the research was applied and used the ex-post facto design

and modeling. This model can be the final product of a descriptive or an exploratory process and it can be also considered in the future forecast. A library method was used to collect data in the present research. The necessary data of theoretical principles was mainly collected from Latin specialized journals; and other data was mostly used through databases of the Tehran Stock Exchange, weekly reports and the monthly of Stock Exchange in addition to Tadbirpardaz and RahavardNovin software. The statistical population consisted of all banks and financial institutions listed on the Tehran Stock Exchange. Sampling was not done since the number of members was low and all of them were available; and the information of all members of statistical population was collected from 2011-2015.

## 4. Findings

According to the conceptual model of research, 9 portfolios were examined to test research hypotheses.

**Table 2.** Creation of stock portfolios

| Portfolio | Analyzed data in each portfolio | | | | |
|---|---|---|---|---|---|
| | Risk-return | Financial criteria | Agency theory | Intellectual capital | Management ability |
| Portfolio 1 | * | | | | |
| Portfolio 2 | | * | | | |
| Portfolio 3 | | * | | | * |
| Portfolio 4 | | * | * | | |
| Portfolio 5 | | * | | * | |
| Portfolio 6 | | * | * | * | |
| Portfolio 7 | | * | | * | * |
| Portfolio 8 | | * | * | | * |
| Portfolio 9 | | * | * | * | * |

The following indices were used to evaluate the financial data:
Current ratio: Current assets divided by current debt
Quick ratio: Current assets minus inventory divided by current debt
Net profit to sales: Net profit ratio divided by total sales
Return on equity: Net profit divided by company equity
Return on assets: Net profit divided by total assets

The following indices were used to evaluate non-financial data:

Agency costs: Agency costs were used to measure the multiplication of two criteria of Tobin's Q ratio in free cash flow.

Tobin's Q ratio is calculated as follows:

$$-Tobin'sQ = [MVOCE + PSLV + BVOLTD - (BVOSHTA - BVOSHTL)) / (NA)\, BVOTA$$

Where:
MVOCE: Market value of common stock at the end of year
PSLV: Preferred stock liquidity value at the end of the year
BVOLTD: Book values of the long debts at the end of the fiscal year
BVOSHTA: Book values of the current assets and FCF risks
BVOSHTL: Book values of the current debts at the end of the year
BVOTA: Book values of total assets at the end of the year

The following equation was used to calculate the free cash flow:

$$FCF_t = \frac{INC_t - tax_t - IExp_t - CDiv_t}{Asset_t}$$

Where,
FCF: Free Cash Flow
INC: Operating profit before deducting the depreciation cost
TAX: Income Tax
leXP: Interest expense
CDIV: Dividend paid to shareholders
ASSET: Total book value of assets

Intellectual capital: The value added of intellectual capital was used to measure the intellectual capital. Value-added of intellectual capital was calculated using the total human capital efficiency (HCE), structural capital efficiency (SCE) and capital employed efficiency (CEE) according to the following model:

$$VACI^{TM} = HCE + SCE + CEE$$

The human capital efficiency was calculated as follows:

$$HCE = \frac{VA}{HC}$$

Where, VA, HCE and HC are the coefficients of human capital efficiency, value added and total employee salary respectively.

Structural capital efficiency was determined as follows:

$$SCE = \frac{SC}{VA}$$

In the above model, SC is the structural capital and VA is the economic value added.

The capital employed efficiency was calculated as follows:

$$CEE = \frac{VA}{CE}$$

In the above model, VA is the value added and CE is the capital employed or the net book value of assets.

Management ability: In the present study, the following steps were taken to assess the management ability using the presented model by Demerjian et al. (2012):

**(1)** First, the firm performance was measured using the data envelopment analysis method by considering sales, cost of goods sold (CGS), selling, general and administrative cost (SGA), and Property, Plant and Equipment (PPE), Operating lease (Ops Lease), Research and development costs (RAD) and intangible assets (Intan). Therefore, the optimization equation was solved to measure the firm performance:

$$\max\theta = \frac{sales}{v_1 CGS + v_2 SG\&A + v_3 PPE + v_4 OPSLEASE + v_5 R\&D + v_6 INTAN}$$

**(2)** Management ability was calculated using the obtained efficiency at the first stage and the following regression equation:

$$\text{Firm Efficiency}_i = \alpha + \beta_1 In(TA)_i + \beta_2 MHM_i + \beta_3 FCF_i + \beta_4 In(Age)_i + \beta_5 BSC_i + \beta_6 FCI_i + Year_i + \varepsilon_i$$

Where:

LN (TA): Firm size: the natural logarithm of fixed assets

MSH: Company's market share: Company's sales divided by total sales of industry

FCF: Free cash flow

(Age) L: Company's age; the natural logarithm of company's age.

BSC: Company's operation complexity

FCI: Oversea Company Activity Index:

The remaining value of regression equation indicates the management ability in a company. Like studies by Andrew et al. (2013) and Demerjian et al (2012, the above model was used to assess the management ability index in the present study. The standard deviation of net profit was utilized to measure the risk-returns. In order to test the hypotheses, the research model was implemented using SmartPlS. The information obtained from the implementation of the model indicated the significance of the Treynor's ratio difference of all stock portfolios except for items 6 and 8. Considering the combination of portfolios 6 and 8 and comparing them to other stock portfolios, there is no case among these portfolios, and thus we can say that all four research hypotheses are confirmed.

## 5. Discussion and Conclusions

When facing choices to invest in various funds (whether mutual or hedge funds), it is quite common to compare their Sharpe ratio, or other performance ratios like Treynor or recovery ratio in order to rank funds. These ratios aim at measuring performance for a given risk. They achieve two important things: they measure performance considering risk. They allow constructing the optimal performance as the result of an optimization program. The usual performance metric is the eponymous Sharpe ratio established in Sharpe (1966). It is a simple number easy to derive and intuitive to understand as it computes the ratio of the excess return over the strategy standard deviation. It has various limitations that have been widely emphasized by various authors (Pilotte and Sterbenz (2006), Sharpe (1998), Nielsen and Vassalou (2004)) leading to other performance ratios like Treynor ratio (see Treynor and Black (1973)), but also Calmar (see Young (1991)), Sterling (see McCafferty (2003)) or Burke ratio (see Burke (2014)). In the present study, a new perspective on the fundamental analysis of a set of information was presented to form an effective portfolio of stock and its ranking in the capital market and investors of Iran. Since the associated information and analysis is costly for investors and decision makers, a combination of relevant information that can lead to an optimized stock portfolio should be extracted and presented to the capital market. This article proposed

to generalize the Treynor ratio in a multi-index setup through the recourse to geometric argument: since the original measure represents a proportion of distances in the returns and in the systematic risk referential, a multi-dimensional counterpart can be justified in an orthonormal risk referential. From that starting point, the proposed Generalized Treynor ratio represents the simplest measure that bears this interpretation and, at the same time, manages to conserve the key properties of its one-dimensional counterpart. For a given portfolio, its formula simplifies to a simple ratio of Jensen's alpha over an average of the betas. According to the afore-mentioned issues, the main topic of this research was to achieve an optimal information analysis model to form an efficient and effective portfolio of stock exchanges in Tehran Stock Exchange. In other words, this research seeks to properly answer the following fundamental question: "The analysis of which sets of models of development of financial institutions should be considered to create the efficiency and effectiveness of the stock market of listed companies in Tehran Stock Exchange?" Four hypotheses were presented according to the purpose of the study and a conceptual model was developed to test them. To implement the conceptual model, nine stock portfolios were examined using various financial and non-financial and risk-return indices. Hypothesis one was approved. This shows that the mean Treynor's ratio of stock combination based on risk information and returns is significantly different from accounting information and thus can be used to select the optimal stock portfolio. This result was in line with the findings of Lim et al., (2013), Hosseini et al., (2015), Khajawi and GhayouriMoghadam (2012), Dadkhah et al., (2010) and Khajavi et al., (2005). Hypothesis two was approved. This shows that Treynor's ratio poses modern topicscompared to the agency theory. This result was in line with the findings of Lim et al., (2013), Lourti and Griss (2012), Hosseini et al., (2015), Khajawi and GhayouriMoghadam (2012), Dadkhah et al., (2010) and Khajavi et al., (2005). Hypothesis three was confirmed too. The result of this hypothesis was in line with the findings of Karchen et al. (2015), Andrew et al. (2013), Panopaudis et al. (2013) and Damcchin et al. (2013). Hypothesis four was confirmed. The result of this hypothesis was in line with the findings of Andrew et al. (2013) and Patari et al. (2013). The results of the research model

implementation and data analysis showed that the difference in Treynor's ratio in all portfolios except for baskets 6 and 8 was significant. Considering the fact that portfolio 6 investigated the information of financial criteria, agency theory and intellectual capital, and also considering that portfolio 8 investigated the information of financial criteria, agency theory and management ability, it can be said that simultaneous application of these criteria can cause problems in analyzing stock returns and it is better not to use the combination of these criteria in financial analysis. However, the use of other combinations of mentioned indices is not a problem and results in the significant difference of the Treynor's ratio. Based on the obtained results, it can be said that using financial and non-financial criteria and risk-returns for stock analysis can provide more accurate information.

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