

THE USE OF TOPSIS MODEL IN RANKING AND DETACHING OF GROWTH AND VALUE STOCKS, AND COMPARING THEIR RETURNS IN TEHRAN SECURITIES EXCHANGE

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Abstract

Finding a proper method for selecting the best stock or portfolio among the mass of stock on the market is one of the major concerns to investors. Therefore, it is important for the investors what kind of stock to invest in, to obtain desirable Returns. In this study, which encompasses a time span from 2007 to 2011 (twenty three-months periods), 120 companies were selected as sample. Then, based on Hagen's six-factor model together with P/E criterion, and using Shannon's entropy and TOPSIS technique, the samples were weighted and ranked and finally, growth stocks were distinguished from value stocks. Consequently, every three months, a pair of growth and value portfolio was constructed and in the next three-month span, their returns were computed and their average returns were compared. The results regarding the weight of each one of the seven criteria indicated that in 2007 (4 initial periods), the price to book value index, and price to sales index had the utmost importance among all indexes. In other periods, price to sales index won the highest importance, which indicates the importance of this index among others. Finally, through the test of comparison of means (t-test), it was concluded that, during 20 periods of experiment, the average returns of growth portfolios was higher than that of value portfolios.

Keywords: value investment, growth investment, price to earnings ratio, price to book value ratio, price to sales ratio, return on assets ratio

Introduction

The method of selecting the right stock for investing in is of great importance. In this regard, two different selection strategies can be adopted, which are the "value investing" and "growth investing". Investing in value stocks, or value investing, is an investing strategy based on the views and ideas of Ben Graham and David Dodd regarding investing. According to the definition provided by the father of value investing, Benjamin Graham, value stocks are defined as stocks whose market price is lower compared to some measure of basic value. This difference in price (a lower price compared to the inherent value) is called

“margin of safety” according to Benjamin Graham. There are various basic measures for the selection of value stocks, among which are the revenue rate of the stock, the book value of the stock, and the rate of sales per share (Graham & Dodd, 1934). By contrast, growth stocks are defined as stocks, whose price is higher than the mean of the measures such as cash and revenue flows, dividend per share, or book value. The market expects the growth stocks to have a higher rate of growth compared to that of the mean. It is because of these expectations from growth stocks that the market acquiesces to pay a higher price for the revenues, the book value or the sale of such stocks. Therefore, the rate of the financial ratios of the growth stock market (such as ROA, ROE, P/BV, P/S, P/E. etc.) are higher than those of the value stock market. Various studies have indicated that the value stocks have higher returns compared to growth stocks and the market in general.

Nicholson believes stocks with a lower price to earnings ratio (P/E) to be value stocks, thus he concludes that a portfolio comprising stocks with the lowest price to earnings ratio, as opposed to stocks with higher price to earnings ratio will have better returns (Nicholson, 1968). Moreover, Fama and French (1992) concluded in their study that high-risk stocks are expensive growth stocks with the lowest book value to market value ratio, and that low-risk stocks are the cheap value stocks. They found that expensive stocks were high in risk and low in returns and cheap stocks were low in risk and high in returns and this finding posed a challenge to the modern financial assumptions (Fama & French, 1992). Capaul, Rowley, and Sharpe have considered stocks with lower P/B ratio as value stocks in their study and show that value stocks, i.e. stocks with a lower P/B ratio have a better performance compared to growth stocks with a higher P/B ratio (Capaul, Rowley, & Sharpe, 1993). Similarly, Javier has also compared stocks with a lower P/E ratio with stocks with a higher P/E ratio and has maintained that as the P/E ratio increases in the portfolios of the stocks, the returns of those portfolios decrease (Javier, 2003). Furthermore, Vruwink, Quirin & O'Bryan have considered P/S ratio as a powerful tool for the identification of value stocks and the prediction of stock returns (Vruwink, Quirin & O'Bryan, 2007).

The purpose of this study, following the classification and identification of growth stocks from value stocks using TOPSIS, is to compare the average returns of the value stocks with the average return of the growth stocks to see if there is a significant difference between the returns of these two groups of stocks.

Methodology

The Methodology for assessing the indicators of decision in the TOPSIS model

The ratios of asset growth, book value, price to earnings (P/E), price to book value (P/B), price to sales (P/S), return on asset (ROA) and return on book value, will be calculated based on the financial statements of the companies, predictions of the revenues of each share, and the price of the stock market.

Price to earnings ratio (P/E)

Price to earnings ratio indicates the cost (assessment of the relative costs) for every earning Rial (profit) that a company produces because of which it is also called stock ratio as well. The price to earnings ratio is calculated at any given time by dividing the market price of the stock at that time by the predicted earnings of the stock.

$$\frac{P}{E} = \frac{\text{The price of the stock at the end of each year of sampling}}{\text{The prediction of the earnings of each share in the time of portfolio construction}}$$

By constructing 6 portfolios and calculating the monthly returns and the beta coefficient, Javier showed the price to earnings ratio of each portfolio for the stock market in Spain between the years 1992 to 2000. This study indicated that in portfolios 1 to 5 the price to earnings ratio decreases and, accordingly, the returns of the portfolios of 1 to 5 increase (Javier, 2003).

Price to book value ratio (P/B)

Price to book value ratio is a criterion for assessing the value of a company based on the comparison of the book value and the market value of that company. The book value of a company is calculated based on the historical costs or the accounting value of that company and its market value is determined in the stock market.

$$\text{price to book value ratio} = \frac{\frac{\text{the market value of the company}}{\text{book value of the company}}}{\frac{\text{the price of each share}}{\text{the book value of the company for each share}}} =$$

Though, in their 1992 research, Fama and French found that price to book value ratio demonstrates the cross-sectional returns only a little better than the price to revenues ratio, there are still some conceptual complications regarding the utilization of book value as a criterion for value. This is partly because book value takes the fluctuations in the value of the stock market into granted and disregards the costs of research and development (R&D).

Further, Siegel & Palmer stated that, based on their research on the book value to dividend per share in the period of 1987 to 2006, earning per share or the cash flows had little success in explaining the returns (Siegel & Palmer, 2008). Also, in a study of the power of price to book value ratio in predicting returns, Pontiff & Schall (1998) concluded that this ratio has been useful in predicting the return of the market and the additional return of the small companies during the period of 1926 to 1994. They believe that the predicting power of price to book value ratio is due to the relationship between book value and future revenues (Pontiff & Schall, 1998).

Price to sales ratio (P/S)

The price to sales ratio is calculated through dividing the market value of the company by the amount of its sales in the previous fiscal year or the amount of its sales in the last four seasons. Similarly, one can also divide the price per share of the total stock of the company by the sales per share of that company to get the same results. This criterion can then be used to determine the stock value compared to the performance of the previous year.

$$\text{price to sales ratio} = \frac{\text{the market value of the company}}{\text{sales of the company}} = \frac{\text{price per share}}{\text{sales per share}}$$

Fisher & Kenneth maintain that the investors should only buy the stocks of the companies with lower P/S ratio because they will be buying more sales dollars with every dollar and thus there will be a better chance of having a higher return in the portfolio of their stocks. Fisher claims that identifying companies with a lower P/S will yield better results compared P/E ratio because the annual sales of companies are usually more stable than their revenue reports. The lower stability of the revenue rates of the companies can be justified based on the changes in economic and industrial conditions. Moreover, numerous studies have shown the prediction of the stability of the revenues of a company in future to be very difficult (Fisher & Kenneth, 1984).

Return on assets

The rate of return demonstrates the amount of revenue per one Rial of the total investment in the company by dividing the “earnings after income taxes” by “the total assets”.

$$\text{ROA} = \frac{\text{EBIT-TAX}}{\text{the average of the total assets of the company}}$$

Further, factors comprising the return rate of the assets can be calculated using the following formula:

$$\text{Return rate of the assets} = \frac{\text{earnings after income taxes}}{\text{net sales}} * \frac{\text{net sales}}{\text{total assets}}$$

Or:

$$\text{Return rate of the assets} = \text{earnings margin} * \text{sales ratio of total assets}$$

Return on equity

The return on equity, also called ROE, is also known as the rate of return on equity. Using this ratio, the earnings of the company per each Rial of equity can be calculated. This is done by dividing “earnings after income taxes” by “equity”:

$$\text{ROE} = \frac{\text{net income}}{\text{average equity}}$$

Asset growth

Assets are indicators of the amount of investments or the amount of capital consumption in companies. The most commonplace assets are cash and bank, documents and accounts receivable, inventories, and fixed assets. The assets of the financial institutions such as commercial banks, etc. are financial assets like stock and loans (Novo Raymond, 1385).

If we take the present year as “n” and the previous one as “n-1” then the asset growth of this year compared to that of the last year would be as follows (Cooper, Gulen, & Sheen, 2009):

$$\text{Asset growth} = \frac{\text{assets of the company in the year } n - \text{assets of the company in the year } (n-1)}{\text{assets of the company in the year } (n-1)}$$

Book value growth

What is meant by the book value growth in Hagen’s model is the equity growth which is calculated as follows:

$$\text{Equity growth} = \frac{\text{equity in year } (n) - \text{equity in year } (n-1)}{\text{equity in year } (n-1)}$$

Technique for Order –Preference by Similarity to ideal Solution (TOPSIS)

This technique is one of the methods of the Multiple Attribute Decision Making (MADM) (Asqarpour, 1385). The TOPSIS model has been proposed by Hwang and Yoon in 1981. In this method a number of “M” choices will be assessed by “N” number of criteria (Mo’emeni, 1387). An agreed principle in the TOPSIS method for a multiple attribute decision making is that the selected choice must be nearest to the ideal positive solution and the farthest to the ideal negative choice (Yang, Liu, & Wong, 1994). It is also assumed that the desirability of each criterion is steadily increasing or decreasing (Mo’emeni, 1387).

Assessing weights for criteria through Entropy

The majority of the MADM problems require the knowledge of the relative significance of the existing criteria in a way that their summation would equal the [normalized] unite and

that this relative significance would assess the degree of the priority of each criterion compared to others (Asqrpour, 1385). Entropy is a major concept in the physical science, social science, and information theory and it is an indication of the extent to which there is unreliability about the expected information carried by a message. In other words, Entropy in information theory is a criterion for the amount of unreliability as demonstrated by a discrete probability distribution in a way that the unreliability would be greater if the distribution is broad compared to when the frequency distribution is sharper (Asqarpoor, 2006). The “decision making matrix” contains information that entropy can be utilized as a criterion for assessment in it (Mo’emeni, 2008). When the data of a decision making matrix are fully specified, then entropy can be used for assessing the weights. The rationale behind the above-mentioned method is that the more dispersed the index values, the more important that index is (Mo’emeni, 2008).

The variables of the index for constructing the stock portfolios are the market ratios, i.e. the asset growth rate, book value growth rate, price to book value ratio (P/B), price to sales (P/S), price to earnings (P/E), return on assets (ROA), and return on equity (ROE). The variable of the study, with which the comparisons between the return of the portfolios is carried out, is the stock returns. Therefore, in the test of comparison of means for the independent samples, the variable of the test will be the stock returns.

The main financial ratios that were used to determine whether the stocks of the companies were value stocks or growth stocks, were the financial ratios of Hagen’s six-factor model (in addition to price to earnings ratio) which have been attended to in the present study as criteria for identification of growth stocks from value stocks. The time domain of the study was the period between the years 2007 to 2011 and the population comprises all the companies that were accepted in Tehran stock exchange. The sample population also includes the companies that were accepted in Tehran stock exchange except for the following:

1. Financial and investment companies
2. Companies whose fiscal year does not end on Esfand 29th
3. Companies whose information (financial statements) are not accessible during the project

The first condition eliminates the companies whose evaluation is based on Net Asset Value (NAV) and the second one makes the accounting information of all of the sample companies accessible in the similar periods thus making them homogenous.

The statistical test that is used in this study is the test of comparison of means (ANOVA) (Azar & Mo’emeni, 2006) and for the independent samples the “t” statistic was used. Moreover, to separate the growth stocks from value stocks, the researcher has employed the TOPSIS model in this study, which entails weighing the indices based on Hagen’s six-factor model (plus P/E index) and through Shannon Entropy; thus, once the weight (significance) of the indices is determined, the stocks will be ranked based on the same indices and the growth and value stocks will be identified and separated. Then, during the period of the research, i.e. the years 2007 to 2011, a pair of portfolios (a value portfolio and a growth portfolio) will be constructed every three months and each will be compared in returns against the previous

portfolio. This procedure will be repeated for all of the period under study which, in the end, will yield a large number of portfolios and their calculated returns.

Finally, the mean of the returns of the growth portfolios will be compared to those of the value portfolios using the statistical test of the comparison of means (ANOVA) which will show which portfolios (growths or values) had higher returns during the period of the study.

3- Hypothesis

To conduct a comparative study of the average returns of the growth and value strategies, based on the model presented in the companies that are accepted in Tehran stock exchange, the following hypotheses were formulated:

Primary hypothesis: the average returns of the value strategy in Tehran stock exchange are higher than the average returns of the growth strategy.

$$H_0: \mu_G \geq \mu_V$$

$$H_1: \mu_G < \mu_V$$

μ_G : The average returns of the stocks of the growth companies (during 20 periods)

μ_V : The average returns of the stocks of the value companies (during 20 periods)

Secondary Hypothesis: the average returns of the value strategy in Tehran stock market in the period "t" are more than the average returns of the growth strategy in the period "t".

$$H_0: \mu_{Gt} \geq \mu_{Vt}$$

$$H_1: \mu_{Gt} < \mu_{Vt}$$

μ_{Gt} : the average returns of the growth companies' stocks in the period "t".

μ_{Vt} : the average returns of the value companies' stocks in the period "t".

t: includes 20 periods under investigation in this study.

4. Results:

The companies that were studied in this research included 120 companies whose data were analyzed for the seven-factor indices (i.e. asset growth, book value growth, price to earnings

(P/E), price to book value (P/B), price to sales (P/S), return on assets (ROS), and return on equity (ROE) ratios) in 20 periods (from 2007 to 2011).

Table 1- The name and stock symbol of the surveyed companies

ROW	COMPANY	SYMBOL	ROW	COMPANY	SYMBOL	ROW	COMPANY	SYMBOL
1	ALBORZ DAROO	DALBER	41	DAROO OSVEH	DEOSVEH	81	FOOLAD AMIRKABIR KASHAN	FAJR
2	ELECTRIC KHODRO SHARGH	KHESHARGH	42	DAROO EXIR	DELOR	82	FOOLAD KAVYAN	FOOKA
3	IRAN TRANSFO	BETERANS	43	DAROO AMIN	DAMIN	83	GHAND NAGHSH JAHAN	GHENAGHSH
4	IRAN KHODRO	KHODRO	44	DAROO JABER EBN HAYAN	DEJABER	84	KARTON IRAN	CHEKAREN
5	IRAN KHODRO DIZEL	KHAVAR	45	DAROO DAMLORAN RAZAK	DEDAM	85	KARKHANEJAT DAROOPAKHSH	DAROO
6	IRAN DAROO	DIRAN	46	DAROO RAZAK	DERAZAK	86	KASHI ESFEHAN	KASFA
7	IRKA PART SANAT	KHEKAR	47	DAROO ZAHRAVI	DEZAHRAVI	87	KASHI ALVAND	KALVAND
8	ABSAL	LABSA	48	DAROO FARABI	DEFARA	88	KASHI HAFEZ	KEHAFEZ
9	ABGINEH	KABGEN	49	DAROO LOGHMAN	DELOGHMA	89	KASHI SINA	KESAVEH
10	AZARIT	SAZARI	50	DAROOSAZI KOSAR	DEKOSAR	90	KASHI NILOO	KENILOO
11	ALOMTAL	FALOM	51	DOODEH SANATI PARS	SHEDOOS	91	KAGHAZ SAZI KAVEH	CHEKAVEH
12	AHANGARI TERAKTOR	KHAHAN	52	ZOGHALSANG NEGIN TABAS	KETABAS	92	KARBON IRAN	SHEKARBON
13	BAMA	KAMA	53	RADIATOR IRAN	KHETOOR	93	KOMBAYN SAZI	TEKOMBA
14	BUTAN	LEBOOTAN	54	SAIPA AZIN	KHAZIN	94	KOMAK FANAR INDAMIN	KHEKOMAK
15	BEHNOOSH	GHEBEHNOOSH	55	SERAMIK ARDEKAN	KASRA	95	KONTORSAZI IRAN	AKONTOR
16	BISCUIT GORJI	GHEGORJI	56	SARMA AFARIN	LESARMA	96	KIMIDAROO	DEKIMI
17	PARS PAMCHAL	SHEPAMCHA	57	SIMAN OROOMIEH	SAROOM	97	GAZLOOLEH	PELOOLEH
18	PARS KHAZAR	LEKHAZAR	58	SIMAN ESFEHAN	SESFEHA	98	GOROOH BAHMAN	KHEBAHMAN
19	PARS KHODRO	KHEPARS	59	SIMAN TEHRAN	SETRAN	99	GOLGOHAR	KEGOL
20	PARS DAROO	DEPARS	60	SIMAN KHASH	SEKHASH	100	LASTIK SAHAND	PESAHAND
21	PARS SOEICH	BESOOEICH	61	SIMAN SEPAHAN	SEPAHA	101	LABANIAT PAK	GHEPAK
22	PETROSHIMI ESFEHAN	SHESEFEHA	62	SIMAN SHAHROOD	SEROOD	102	LOABIRAN	SHELOAB
23	PETROSHIMI ABADAN	SHEPETRO	63	SIMAN SHARGH	SESHARGH	103	LENT TORMOZ	KHELENT
24	PETROSHIMI SHAZAND	SHARAK	64	SIMAN SOOFIAN	SESOOFI	104	LOOLEH VA MASHIN SAZI	FELOOLEH

25	PEGAH ESFEHAN	GSHESHEFEHA	65	SIMAN FARS	SEFAR	105	MASHINSAZI NIROO MOHAREKE	TEMOHAREKE
26	PELASKOKAR SAIPA	PELASK	66	SIMAN GHAEN	SEGHAEN	106	MES BAHONAR	FABAHONAR
27	TAMIN MASEH	KEMASEH	67	SIMAN KERMAN	SEKERMA	107	MAADEN BAFGH	KEBAFGH
28	TERAKTORSAZI	TAYRA	68	SIMAN MAZANDARAN	SEMAZAN	108	MAADEN MANGENEZ IRAN	KEMANGENEZ
29	TECHNOTAR	TECHNO	69	SINA DAROO	DESINA	109	MADANI AMLAH IRAN	SHAMLA
30	TEKINCO	RETCO	70	SHAHD IRAN	GHESHAHD	110	MADANI DAMAVAND	KEDAMA
31	JAM DAROO	FAJAM	71	SHISHEH VA GAZ	KEGAZ	111	MAGSAL	ZEMAGSA
32	JOOSH O OXIGEN	FAJOOSH	72	SANAYE RIKHTEGARI IRAN	KHERIKHT	112	MALLI SORB VA ROOY	FESORB
33	CHADORMALOO	KECHAD	73	SANATI BAREZ	PEKERMAN	113	MAVAD DAROO PAKHSH	DETEMAD
34	CHARKHESHGAR	KHECHARKHESH	74	SANATI DARYAYI	KHESADRA	114	MEHRKAM PARS	KHEMEHR
35	CHINI IRAN	KECHINI	75	SANATI SEPAHAN	FASEPA	115	NAFT PARS	SHENAF
36	HAML O NAGHL TOOKA	HETOOKA	76	FARAVARDE TAZRIGHI	DEFRA	116	NAVARD ALOMINIOM	FENAVL
37	KHAK CHINI IRAN	KEKHAK	77	FARAVARDEHAYE NASOOZ AZAR	KAZAR	117	NOOSH MAZANDARAN	GHENOOSH
38	KHADAMAT KESHAVARZI	TEKSHA	78	FARAVARI MAVAD MADANI	FARAVAR	118	NIROO MOHAREKE	KHEMOHAREKE
39	DADE PARDAZI IRAN	MADARAN	79	FROSILIS IRAN	FEROS	119	NIROOKOLOR	SHEKOLOR
40	DAROO ABOOREYHAN	DABOOR	80	FANARSAZI KHAVAR	KHEFANAR	120	HEPKO	TEPKO

Ranking the companies in each period

After constructing the decision-making matrix for each period and weighing each of the indices through Shannon Entropy based on each decision matrix, in this stage the data of the 120 companies in 20 periods will be ranked by means of TOPSIS procedure.

In TOPSIS procedure a positive hypothetical ideal company and a negative hypothetical ideal company are assumed. This hypothetical company has the best rates in all of the indices. In ranking the companies, the smaller the Euclidean distance of a company with this option, the higher that company's level of social development. Moreover, this procedure assumes a negative hypothetical ideal company. This hypothetical company has earned the worst ranks in all indices. In ranking the companies, the greater the Euclidean distance of a company with this option, the nearer the company to the growth companies. Hence, the rank of the companies with respect to each other is determined based on their distance to these hypothetical companies and ranking of each company is done based on the descending order of "cli+". According to this type of ranking in each period:

- The first 30% of each period will be growth companies (the first 36 companies in ranking)

- The next 40% in each period will be neutral companies (48 companies in the middle of the ranking)
- The last 30% (36 companies at the end of the ranking) are called value companies.

The output of this stage will be the population of the value and growth companies in each period that will form the basis for the population of this study. Based on the ranking of the companies according to the index of relative proximity of the choice (A_i) to the ideal solution the type of their stock (i.e. growth, neutral, or value) in 20 periods was determined.

Based on the table 5.1 which presents the significance, or the weight of each of the 7 indices in this study, in the year 2007 (the first 4 periods) the highest weight had been that of price to book value and then price to sales, among other indices. However, based on the following charts, in the following years and periods the highest weight has been that of price to sales which demonstrates the importance of this index, among other indices, in selecting the growth and value strategies.

Table 2- the weight of indices during 2007-2011

year	period	p.s	p.b	P.E	roa	ROE	Assets growth	Book value growth
2007	1 st period	27.32	29.89	16.26	5.87	1.89	18.29	0.48 2.7 0.72 0.78
	2 nd period	32.94	40.1	6.3	4.84	1.99	11.13	
	3 rd period	28.15	33.45	4.25	10.85	2.65	19.92	
	4 th period	39.33	45.55	1.61	5.78	2.32	4.72	
2008	1 st period	41.09	36.6	1.69	10.75	1.01	1.74	7.65 5.58 0.8 7.97
	2 nd period	38.58	36.43	5.38	6.45	0.96	6.63	
	3 rd period	30.46	37.79	7.13	4.4	1.08	19.34	
	4 th period	58.91	11.47	2.68	6.18	4.24	8.55	
2009	1 st period	55.56	5.09	2.4	15.8	1.39	7.83	11.92 2.35 1.47 2.19
	2 nd period	55.64	1.95	5.74	11.04	6.75	16.53	
	3 rd period	36.29	1.70	19.88	5.07	2.21	33.47	
	4 th period	34.7	5.35	43.71	4.52	3.28	6.25	
2010	1 st period	37.46	3.53	21.86	2.36	1.68	19.2	13.91 0.94 1.22 1.79
	2 nd period	43.36	4.83	31.46	6.75	8.2	4.45	
	3 rd period	35.55	4.8	31.41	6.68	2.72	17.62	
	4 th period	63.9	1.76	10.29	8.55	3.01	10.7	
2011	1 st period	59.51	1.78	10.35	6.07	1.26	15.54	5.48
	2 nd period	38.42	1.16	37.79	6.17	7.45	6	
	3 rd period	40.77	1.41	40.21	4.84	3.76	7.92	
	4 th period	23.58	10.91	51.52	3.31	0.52	9.48	

Steps in testing each of the hypotheses

To carry out a test of equating the means of two populations we should first study the variances of the two populations to see if they are equal. In other words, the test of the equality of variances is prior to the test of the equality of the means. For the equality of variances (the “Levene” test) Fisher’s F is employed which is calculated as follows:

The statistical assumptions regarding the test of the equality of variances of two populations (Levene test) is as follows (Mo’emeni & Ghayoomi, 2007):

$$H_0: \sigma_G^2 = \sigma_V^2$$

$$H_1: \sigma_G^2 \neq \sigma_V^2$$

The “t” statistical procedure was also used as a test of the equality of two samples in two cases of equal and unequal variances of the two samples.

In this study, the function of the hypotheses was investigated. After ranking and separating the growth stocks from value stocks using TOPSIS model, the average returns of the value stocks were compared with the average returns of the growth stocks separately for each period to see if there is a significant difference between the returns of these two groups of stocks. Finally the average returns of the growth stocks and value stocks in each period were calculated and this question was answered for the all of the 20 periods. A discussion of the results of each of the 20 periods will be presented below.

The findings based on the statistical analyses for each of the 20 periods according to the primary research hypothesis are as follows:

Based on the information presented briefly in table 6.1, only in 5 periods among the total 20 periods the claim as to the equality of the growth stock average and value stock average has been rejected with 5% error. The reason for this conclusion has been that the significance of the test of the equality of means, with the assumption of equality or inequality of variances, has been less than 5%. On the other hand, the H_0 hypothesis was accepted as the upper and lower limits of the means of both stocks were positive. Therefore, it is safe to conclude that the average returns of the growth stocks were higher than the average returns of the value stocks. Moreover, in the other 15 periods the claim as to the equality of the growth stock average and the value stock average, with a 5% error, has been accepted as the significance of the test of equality of the means, with the assumption of equality or inequality of variances, has been more than 5%. Furthermore, the H_0 hypothesis was accepted, for, the upper and lower limits of the growth stock average and the value stock average were negative and positive respectively. Therefore, it is safe to conclude that the average returns of the growth stocks were more than that of the value stocks.

By testing the primary hypothesis in the end of 20 periods the claim as to the equality of the means of the growth and value portfolios, with a 5% error, was rejected and the reason for

this rejection has been that the significance of the test of equality of means, with the assumption of equality or inequality of variances has been less than 5%. However the H_0 hypothesis was accepted as both the upper and lower limits of the mean of both growth and value portfolios during 20 periods were positive. Hence, it is safe to conclude that the average returns of the growth portfolios were more than the average returns of the value portfolios during 20 periods under study.

The results of this study are in contrast with those of the foreign studies in many respects. It was revealed in this study that the returns of the growth stocks, based on the aforementioned 7 criteria and indices in a 5-year time (20 three-month periods) with a TOPSIS approach, were more than those of the value stocks which is in contrast with most of the foreign studies. Some of the similar studies administered in foreign countries have been summarized below.

One of the earliest studies on the P/E ratio was conducted by Sanjoy Basu who was a professor at McMaster University. In a paper entitled "Investment Performance of Common Stocks in Relation to Their Price-Earnings Ratios" he studied the list of stock in the New York stock market from 1957 to 1971. He categorized all the companies listed in his stock market in every year into five equal groups based on P/E and then studied their future performance. He found that the value stocks had a much better function compared to growth stocks and that a one-million-dollar investment in the value stocks would yield more than 2 times the returns of growth stocks (Basu, 1997). In another research in 1987 entitled "Other evidence of the overreaction of the investors and the stock market seasonality", DuPont and Taller divided the stock of the companies into five groups (groups of twenties). These two researchers found that the stocks sold at a lower price than book value earned 40% more of the market efficiency, which is in effect, 9% more returns in every year (De Bondt & Thaler, 1984). In yet another study, Lakonishok, Shleifer & Vishny categorized the shares traded on New York Stock Exchange based on "book value" to "market price" and then constructed some portfolios. Then, they placed 10% of the stocks with the highest book value to market price ratio in the portfolio number 1 and the next 10% in portfolio number two etc. The annual portfolios were then revised and their performance during the next five years was monitored. This process started in the period of 1968 to 1972 and continued until the last five-year period of 1985 to 1989. Through adjusting the returns by subtracting the monthly returns of each share from the monthly returns of a portfolio with a comparable size, these researchers found that in an overreacting market, "cheap value share" have a higher yield and "expensive growth shares" have a lower yield compared to other shares in their own category (Lakonishok, Shleifer & Vishny, 1994).

In a research paper published by Morgan Stanley, entitled "Benjamin Graham would be proud", Barton Biggs has studied the returns of value investing with the index of a low price to book value in different parts of the world in which more than 80% of the shares studied were from outside the United States. In this article it has also been concluded that the cheap shares always exceed more expensive shares in and the indices in different stock markets (Biggs, 1991). Goodman & Peavy, the professors of the Southern Methodist University also compared the P/E ratios in different industries separately in their study. They classified different companies in different industries into five groups and found that stocks with the lowest price to earnings ratio have a much better performance compared to those with a

higher price to earnings ratio. They found that every dollar that was invested in the cheapest groups, which were modified every year, had more than 12 times more returns than the groups with the highest price to earnings ratio. Moreover, the results showed that the second cheapest group had twice as much returns compared to one group before (Goodman & Peavy, 1985).

In yet another study, Ketabi *et al.* (2012) classified the stock exchange market of 40 countries, including 20 advanced countries and 0 developing countries, during 2004-2008, using the TOPSIS model. They used three indices of market depth, width, and sophistication in their study. The results of their study indicated that Iran had an average rank of 36, 25, and 15 in the aforementioned indices respectively and that its total rank was approximately 5 (Ketabi *et al.*, 2012)

The results of the present study, however, are similar to in many cases, and in contrast in some cases, with the findings of the similar domestic studies. The results of some of the domestic research studies in this regard have been summarized as follows.

In his MA thesis entitled “The Relationship between the Returns of the Common Stocks and $\frac{M}{B}$ Ratio (market value to book value of the stock) in the companies accepted in Tehran stock exchange” Eyvaani has based his enquiry on the assumption that portfolios with the lowest $\frac{M}{B}$ have higher returns. The time domain of this study had been the years 1369-1377 and its spatial domain included all the companies that were accepted in Tehran stock exchange, which were 64 out of 79 companies present in the stock exchange that had qualified in 1369, and were thus used as the desirable population for testing the hypotheses. The results of this study indicated that the portfolios with the lowest $\frac{M}{B}$ ratios (value portfolios) did not have higher returns than portfolios with the highest $\frac{M}{B}$ ratios (growth portfolios) and that $\frac{M}{B}$ ratio and the amount of returns did not have a linear relationship with each other (Eyvani, 1999).

In yet another thesis entitled “The Comparison of the Returns of Different Value-Stock and Growth-Stock Selection Methods Based on Hagen’s Six-Factor Model in Tehran Stock Exchange” which has been conducted on the time domain of 2004 to 2009, Sabzevari found that considering the index growth during the years 2004, 2005 and 2008, the market had been in recession and the value portfolios had had higher returns and that during the years 2006, 2007, and 2009 in which the rate of index growth had been above the 6-year average, the market had been booming and that growth portfolios had higher returns. Of course, considering the type of ratio used for the identification of the value and growth stocks, there are also some years in which the difference between the value and growth portfolios has not been significant. In this regard the P/E ratio seems to have demonstrated the highest level of ability in identifying value stocks from growth stocks. However, a comparison of the returns of the portfolios constructed by different ratios against each other does not reveal a significant difference. Moreover, the returns of the value portfolio (constructed in 2004 which had been preserved for six years) are higher than those of the growth portfolio based on these ratios (Sabzevari, 2011). In their study entitled “A Comparison between the Returns of the Growth Stocks with those of Value Stocks in Tehran Stock Exchange”, Ghalibaf, Babalavian & Jolan chose a sample of 50 companies that were accepted in Tehran stock exchange during the years 2004 to the first half of the year 1387 and categorized them into

ten groups (in which each portfolio consisted of 5 companies), based on their book value to price ratio at the beginning of each year, and from the highest ratios to the lowest ones (i.e. from the most expensive growth stocks to the cheapest values stocks). Following this categorization, the average returns of each of the categories during certain domains were studied and this study revealed that the average returns of the growth stocks were more than the average returns of the value stocks (Ghalibaf, Babalavian, & Jolan, 2008).

In another research, Daneshshakib and Fazli used the two techniques of AHP and TOPSIS to rank the companies active in cement industry which were admitted in Tehran stock exchange. To this end, they used the financial data of the years 1380-1386 and showed that Fars Cement Co. enjoyed the highest rank with regard to financial performance and the Ardabil Cement Co. and Ghaen Cement Co. fell in second and third ranks respectively (Daneshshakib & Fazli, 2009). In their study entitled "The Assessment of the Financial Performance of the Companies admitted in Tehran Stock Exchange" Mo'emeni and Najafi investigated the performance and the rank of 170 companies in 13 listed industries using the TOPSIS model and Shannon's Entropy with 9 indices. The results of their study, obtained through Entropy technique, revealed that 5 most significant indices that have high weights in almost all industries are "economic value added", "earnings per share", "working capital", "costs to sales ratio", and "price to earnings ratio" respectively. In other words, the assessment in this study has been carried out with the priority of these 5 indices and weighing the indices has been done without the use of the expert system (i.e. the opinions of experts and authorities) and merely through analyzing the model itself. It should be noted that the purpose of this study has been to arrive at such an assessment (i.e. without involving the authorities) (Mo'emeni & Najafi Moghadam, 2004).

5. Discussion and conclusion

Finding the right techniques and criteria for the assessment and selection of stocks and securities is one of the important issues in the area of investing and the stock exchange which has received considerable attention by the academicians and those engaged in investing. Therefore, the identification of these criteria, which would in turn help select portfolios with higher returns, is of great importance. One of the criteria in the selection of stocks is the selection of portfolios based on the comparison of their market price with some of items in the financial statements of the companies. To this end, one can employ the strategies of value stocks and growth stocks. Thus, if, in the selection of stocks, some cases are selected whose price is lower than some items that determine the value of the company, the value investing strategy has been followed and if, in the selection of stocks, cases are selected about which there is a consensus in the market that they will have a higher growth in the future, then one will have employed the growth investing strategy. As it was discussed earlier, paying attention to value investing is not equal to neglecting the real growth opportunities of the company in the future; rather, this strategy seeks to avoid overpricing such opportunities.

Suggestions for further research

Executive suggestions

1. The most important implication of this study for academics and investors is a more precise identification of the most important criteria and the selection of the winning strategy (i.e. growth or value). By the use of the results of this study, they can, in fact, obtain the most important criterion (among the 7 indices in this study) which leads to the selection of a value or growth strategy and also realize that which strategy's returns will be more during the intended domains.

Research suggestions

2. The value and growth ratios can be studied based on more indices, including cash flow statement and the dividends.
3. By extending the time domain of the research, the generalizability of the presented model about the relationship between the returns of the value and growth portfolios and the boom or the recession of the market can be investigated.
4. Future inquiries can make a detailed investigation of the indicators of behavioral finance and their influence on the value and growth investments.
5. Considering the proposed model with regard to the partial conformity of the superiority of the value and growth investments with the growth of the market index, it could be proposed that the value and growth ratios be used in future studies to predict bubble formation.
6. Other techniques, with more factors, could be used for ranking and identifying value and growth stocks.
7. The effect of investment horizon on the returns of the value and growth stocks.

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