



**Kaunas University of Technology**

School of Economics and Business

# **Research on Value-Based Investment Strategy to Outperform the Market**

Master's Final Degree Project

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**Kaunas, 2020**



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Accounting and auditing (6211LX037)

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**Kaunas, 2020**



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## **Research on Value-Based Investment Strategy to Outperform the Market**

### Declaration of Academic Integrity

I confirm that the final project of mine, Muhammed Ikbal Telli, on the topic „Research on Value-Based Investment Strategy to Outperform the Market” is written completely by myself; all the provided data and research results are correct and have been obtained honestly. None of the parts of this thesis have been plagiarised from any printed, Internet-based or otherwise recorded sources. All direct and indirect quotations from external resources are indicated in the list of references. No monetary funds (unless required by Law) have been paid to anyone for any contribution to this project.

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Telli, Muhammed Ikbal. Research on Value-Based Investment Strategy to Outperform the Market. Master's Final Degree Project / supervisor Assoc. Prof. Dr., Kristina Kundeliene; School of Economics and Business, Kaunas University of Technology.

Study field and area (study field group): Business and Public Management (Accounting).

Keywords: Benjamin Graham, Value Investing, Net Current Asset Value, Stock Market.

Kaunas, 2020. 79.

### **Summary**

The aim of this study to observe the applicability and the performance of Value Investing by testing Net Current Asset Value (NCAV) strategy developed by Graham. Companies in NASDAQ, whose current assets greater than 1.5 times of their market capitalizations are chosen to form different portfolios in terms of its holding periods. NASDAQ is used as the market. The study period tested is between beginning of 2004 and June of 2019. The results regarding the portfolios are taken from Portfolio123 whose raw data is supplied by Compustat, Standard & Poors, Capital IQ, and Reuters. Results showed that NCAV strategy outperforms the market with a huge margin. However, this strategy isn't applicable for most of the market participants due to illiquidity in these assets. When a volume condition is added to avoid illiquidity, the outperformance disappeared, even a loss of investment. The strategy is applicable for small-budget market participants, however, when the small-budget becomes bigger, illiquidity problem shows up once again.

In order to avoid the illiquidity problem in this strategy, a new methodology employed in NASDAQ 100. NASDAQ 100 is used as the benchmark which is the market. Companies whose current asset value greater than their total liabilities are observed with different level of excess current assets and different holding periods. A volume condition is also added to avoid illiquidity. Results showed that the companies whose current assets are greater than total liabilities outperformed the market without an illiquidity problem.

Telli, Muhammed Ikbal. Verte grįstos investavimo strategijos, siekiant aplenkti rinką, tyrimas. Magistro studijų baigiamasis projektas / vadovė doc. dr. Kristina Kundelienė; Kauno technologijos universitetas, Ekonomikos ir verslo fakultetas.

Studijų kryptis ir sritis (studijų krypčių grupė): Verslas ir viešoji vadyba (Apskaita).

Reikšminiai žodžiai: Benjamin Graham, Vertės Investicija, Grynoji Dabartinė Turto Vertė, Vertybinių Popierių Rinka.

Kaunas, 2020. 79 p.

### **Santrauka**

Šio tyrimo tikslas stebėti vertės investavimo taikymą ir efektyvumą testuojant gryniosios dabartinės turto vertės (NCAV) strategiją, sukurtą Graham. „NASDAQ“ įmonės, kurių dabartinis turtas didesnis nei 1,5 karto jų rinkos kapitalizacija, yra parenkamos formuoti skirtingiems portfeliais, atsižvelgiant į jo laikymo laikotarpį. „NASDAQ“ naudojama kaip rinka. Tiriamasis laikotarpis yra nuo 2004 m. pradžios iki 2019 m. birželio mėn. Rezultatai, susiję su portfeliais, yra paimti iš Portfolio123, kurio pirminius duomenis teikia „Compustat“, „Standard & Poors“, „Capital IQ“ ir „Reuters“. Rezultatai parodė, kad NCAV strategija pralenkia rinką dideliu skirtumu. Tačiau ši strategija netaikoma daugumai rinkos dalyvių dėl šio turto nelikvidumo. Kai pridedama apimties sąlyga, kad būtų išvengta nelikvidumo, prarandami pranašumai, netgi prarandama investicija. Ši strategija taikoma mažo biudžeto rinkos dalyviams, tačiau, padidėjus mažajam biudžetui, vėl išryškėja nelikvidumo problema.

Siekiant išvengti šios strategijos nelikvidumo problemos, „NASDAQ 100“ naudojama nauja metodika. „NASDAQ 100“ naudojama kaip rinkos etalonas. Įmonės, kurių dabartinė turto vertė didesnė nei jų visų įsipareigojimų yra stebimos su skirtingo lygio pertekliaus dabartiniu turtu ir skirtingu laikymo laikotarpiu. Taip pat pridedama apimties sąlyga, kad būtų išvengta nelikvidumo. Rezultatai parodė, kad įmonės, kurių dabartinis turtas yra didesnis už bendrus įsipareigojimus, aplenkė rinką be nelikvidumo problemos.

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## Introduction

Since the beginning of stock markets, companies started to gather funds in order to keep the business alive, generating more profits or finding related capital to start a business became easier than before. At the same time, stock exchanges allow all kinds of companies especially, mutual funds, asset management companies, private equity firms, investment banking, people or in other words for everyone to invest their money in stock market to have a better return on investment. Therefore, investing became important and easy not only for companies, also for everyone. However, as always there aren't many ways to make easy money in a short time period or long time period by investing in the stock market.

There have been numerous studies on creating a strategy to have higher returns on investment than the market's overall return. These strategies which leads to a field called Value Investing. Value Investing first defined by Graham and Dodd (1934), is a strategy to find companies which are traded with very cheap prices in the stock market according to their valuations. These kinds of companies are also called under-priced companies or undervalued companies. These companies are believed to be mispriced at the moment in accordance with their valuations, so that the prices will generally increase in the long run. Value Investing can be traced back to dates in 1930s in which Graham and Dodd (1934) wrote the book called 'Security Analysis'. Benjamin Graham presented strategies which are now called Value Investing. Later on, Graham (1949) wrote the book of 'The Intelligent Investor'. He revealed more strategies based on value investing, and he also showed the results of his strategies which how he was able to outperform the market. Thus, even nowadays he is known the godfather of value investing. According to Graham and Chatman (1996), Graham's strategies have posted 17% annualized returns in his company over the period between 1926 and 1956.

One of the strategies Graham and Dodd (1934) developed is Net Current Asset Value (NCAV) model. Basically, NCAV means that value left for the company after the value of total current assets pays its total liabilities and preferred stocks if there is, is divided by the outstanding number of the shares. Benjamin Graham found that buying companies whose market value is lower than its net current asset value can give excess return on investment to shareholders. He suggested that market price to net current asset value ratio should be lower than or equal to  $\frac{2}{3}$  of the net current asset value. Based on this strategy, in accordance with Graham and Chatman (1996), Graham reported 20% annualized capital gains over 30 years.

In this study, a value strategy will be observed for investment management since all the money managers, mutual funds' managers, hedge funds' managers or retail investors use Value Investing tools to choose the winners in the stock market.

The main aim of this study is to provide empirical evidence whether the outperformance of Value Investing strategies are still valid in nowadays' market.

The objectives of this study:

1. Analysing the problems of outperforming the market based on US Stock Market.
2. Analysing the literature review of outperformance of Value Investing.

3. Observing the outperformance of Net Current Asset Value strategy and developing a reliable and consistent strategy based on fundamentals that can outperform of its benchmark in US Stock Market.
4. Providing empirical evidence for the use of Value Investing via Net Current Asset Value strategy and a new methodology.

For the research method of this study, quantitative research methods are chosen to be used. Especially, based on publicly open secondary data are used for this study. These secondary data include company' stock prices, financial statements which have been audited by audit companies. Financial statements include only balance sheets, income statements, and cash flow statements.

## **1. Problem analysis of outperforming the market**

In the first part of thesis, different kinds of problems are analysed. Later on, main problems of outperforming the market are discussed by different authors.

If investors just kept investing since 1926 up to the end of 2018, if they just followed S and P 500 index, their annual return is approximately is 10 per cent.<sup>i</sup> Over the 92 years, if \$1000 was invested in S and P index, \$1000 would be equal to \$ 6,428,757.36 in the end of 2018. This is the return of S and P 500 index. However, human beings always want more. Therefore, there have been strategies to detect the winners to have better return on investment than the market itself.

Since choosing the winner of the market precisely is almost impossible and risky, creating a diversified portfolio have better chances to include winners. However, it is also not easy to form a portfolio which might include highest number of winners. One of the most famous strategy to outperform the market is to buy and hold cheap companies to sell it when the price moves higher enough, in other words value investing. Yet this doesn't mean all the strategies developed might work perfectly or be used correctly which leads to the reasons why outperforming the market is not for everyone.

- **The herd effect**

One of the most important reasons why investors can't outperform the market, they just follow what is being famous around them. A simple idea is that investing in the glamour companies without regarding the price of the company. These common crowd always follow glamour stocks which are the most favourite ones of the market. Glamour stocks can outperform the market surely if their prices are lower than their intrinsic values. However, this important issue is always disregarded by some investors. When the whole money is flowed to the favourite stocks, which leads for a company to become overpriced. In this case, if there is bad news such as economic crisis, or a market crash, these overpriced stocks might likely be the first ones which will collapse. A perfect example happened during the late 1990s. Whole money was flowing into internet dot com companies which caused big losses for investors. The market started to collapse in 2000. Until the end of 2003, S and P 500 index approximately lost 50 per cent during this time.<sup>ii</sup>

- **The analysts' effect**

Following the crowd without knowing what an investor should do can end badly. However, there are highly qualified financial analysts which can predict the earnings of the companies for investors to get an idea about the future of the stocks. This time, the crowd believes in analyst' predictions. Having said that analysts can be right sometimes, but that might be not enough for investors to solely believe in their predictions. One of the reasons is that companies might not be able to satisfy the earnings' expectations. When the earnings' expectation is missed, investors will lose some of their investments again because of selling off. Nevertheless, investors rely on analyst' expectations because companies try to accomplish these expectations. However, in 2008 credit rating companies and analysts was giving high rating scores for debt instruments or securities which debtors needed to pay back. Even though the debtor's ability to pay back was bad, still they were getting higher scores which led the banks to give more loans based on nothing. As a result, 2008 crisis was triggered. S and P 500 index lost 37 per

cent in just one year.<sup>iii</sup> This situation was a perfect example for not relying solely on analysts which leads investors to do their own job.

- **Desire to win in the short term**

It is an obvious fact that most of the rich people who come from nothing, they didn't get rich quickly. It is almost the same in investing. Every investor built their fortune by time. However, there is always a desire to get rich quickly. Due to the attractiveness of the day's winners or losers, the desire to get rich faster is strong. For instance, every day in the stock market, there are top gainers and top losers. These winners or losers can make a huge move in one day such as 20 per cent or 50 per cent etc. Every investor would like to take advantage of these huge moves. In these kinds of cases, day traders are more active. However, when the trade doesn't go to their favour, they sell the stock because they are afraid of losing more. That is not the only disadvantage, every time they trade, they pay commissions. In addition, short term tax rate for capital gains is much higher than the long-term. Speculation is way riskier. On the other hand, what a value investor does is after analysing the company and the stock's price, they buy and hold. If the price went lower, it is another opportunity for investors to buy more due to the cheapness of the company they bought. They would be buying more shares of the company because they believe that in the long-term based on their valuations the price would go up. That is why the charm of getting rich might cost hugely for investors who would like to speculate.

One of the studies which observed the returns of actively trading investors who try to speculate and investors who buy and hold the stocks for a long-term gain was conducted by Rotblut and Odean (2014). 78,000 investors' performances were tracked closely. The paper showed that the performance of investors who buy and hold the stocks outperform the returns of investors who speculate by about 5 per cent.

- **Behavioural effect**

It is unfortunately common to be led by emotions when it comes to investing. The emotion of fear while losing the hard-earned money is very essential in investing. Investors who can control their emotions perfectly are the ones who beat the market. However, when a stock loses its value of 10 per cent, investors started to fear because of losing more. Furthermore, especially for the small retail investors who lose 10 per cent of their investment which is almost about their monthly salary or even more. The fear can cause to make bad decisions for investors who aren't mentally prepared of losing money.

On the other hand, greed is also very essential for investors. Investors might be very greedy when it comes to sell the securities in order to realize more profit. For instance, value investors who value the company with precise price should generally sell when the stock price reached at the calculated value. However, when the price even moves higher than the intrinsic value, investors became greedy by not selling the stocks. As a result, after the price reached at desired value, it will become overvalued. Overvalued companies' price tends to fall more than the undervalued companies. Thus, investors lost the chance of selling profitably.

One of the most successful investors, Warren Buffett once said "Be fearful when others are greedy and greedy when others are fearful."<sup>iv</sup>

- **Financial statements' effect**

After 2008 market crash, investors have learned their lessons from solely relying on analysts. Value investors started to do their own job by analysing financial statements in order to value companies to determine whether they should invest or not. However, it is not easy to project future earnings for retail investors. This leads to high valuations of companies which are almost impossible for these companies to achieve. For instance, in the last 2 years, company A had 40 per cent earnings per share growth, while its cash flow per share dropped 20 per cent. A common investor mistake is that they do their calculations based on earnings per share, this leads an investor to have a higher valuation which eventually shows sign of weakness in the short term because of the decrease in the cash flow. This style is more directly choosing the winners, such as investing in biggest companies which some investors believe that they will eventually reach their valuations owing to earnings' stability. These kinds of investors stay with a few companies which they believe in companies' long-term stability.

On the other hand, investors who created diversified portfolios to make profits even though there might be some losers between these companies, chance of choosing the right winners is higher. In this case, creating a portfolio of highest number of winners is not easy for investors. Variety of fundamentals don't make it easier for retail investors. There are so many value indicators such as, price to earnings ratio, price to book ratio, price to cash flow ratio, debt to equity ratio etc. which makes it harder for investors to choose the right winners. Misinterpreting of fundamentals or misreading of financial statements can cause investors to lose their investment.

- **Previous studies based on complexity of value investing**

Value investing is beneficial not only for retail investors but also, money managing companies, asset management companies, private equity firms, fund managers etc. It is also useful to value a company for an acquisition and mergers. Thus, the attraction of value investing has charmed so many fellow researchers to go deeper in this field.

Value investing can also be described to buy stocks which are lower than their intrinsic values. Value investors believe that low market price to intrinsic value opportunities can outperform the market. In this case intrinsic value is an approximate value for the company's price which can be calculated based on free cash flows. However, intrinsic value can hugely vary among the investors due to micro factors such as higher/lower expectations for the value of the company or macro factors such as economic, political etc. Since intrinsic value calculations are complex enough, deciding investing based on fundamental ratios is not only easier to apply, but also more decisive to determine the stocks for creating a portfolio. These fundamental ratios might also vary between investors. Some of the ratios which have been studied before are usually called profitability ratios, market value ratios and liquidity ratios etc.

Since Benjamin Graham is known as godfather of Value Investing, Oppenheimer (1984) tested Graham's 10 criteria based on fundamentals for detecting the undervalued companies. Oppenheimer employed these criteria in New York Stock Exchange (NYSE) and Arca Major Market Index (AMEX) for the period between 1974 and 1981. He found that while market's annual return was 14 per cent, the portfolio's annual return created based on 10 criteria of fundamentals was 38 per cent.

Another research was done in Japan based on fundamentals by Chan, Hamao and Lakonishok (1991). They gave empirical evidences for using fundamentals to create a portfolio for testing. Japanese stocks were analyzed between the period of 1971 and 1988. The test included both manufacturing companies and non-manufacturing companies, delisted firms. The results showed that fundamentals such as earnings yield, size, book to market ratio, and cash flow yield played a main role in terms of returns. They also revealed that book to market ratio and cash flow yield has more impact for returns.

One of the studies followed a different style of value investing which focused on reactions to earnings' announcements in the short term. Jegadeesh and Titman (1993) analysed the past winners and past losers' performances to build a strategy. The strategy is to buy stocks that have done well before and sell stocks that have showed a bad performance. Based on the last six month's performance the portfolio was created and held for the next six months. The conclusion showed that this strategy produced 12 per cent excess return per year over the period between 1965 and 1989.

Since there are agreements value investing can outperform the market, the reasons why it can give excess returns than the market are always attracting issues. While value investing calls for buying stocks which has low prices regarding to earnings, dividends, book value and other fundamentals, Lakonishok, Shleifer, and Vishny (1994) studied a paper which mainly focused on the reasons why these low prices to fundamentals outperform the market. They didn't only provide evidence that value strategies can beat the market owing to the mistakes of other investors, they also provided that value strategies are less risky.

After the different studies which tested value investing fundamentals in Japan Stock Market, US Stock Market, Haugen and Baker (1996) focused on the major five countries to analyse the determinants of expected returns. The paper studied respectively stock markets of US, Japan, France, Germany and United Kingdom. The study found that even though from period to period or country to country expected return varied, however the determinants were the same. Determinants were associated with risk, liquidity, growth potential, price level and stock price history. The study also revealed that stocks which have higher expected returns are likely to have lesser risk than the stocks which have lower returns.

Choosing winners based on fundamentals can also vary hugely among the investors because of vast number of fundamentals. This can be a complicated issue for investors, thus using fundamentals are essential to make huge profits. In this case, Lamont (1998) presented the importance of dividends and earnings' power. However, the study showed that predictability of stock returns rather highly depended on dividends than the earnings' power. One interpretation of this study is that dividends have more predicting power for future returns. In addition, very high quarterly earnings and dividends showed higher returns in the short term.

Dividends might be an important indicator for some investors, since distributing cash is attractive, yet dividends are not only important option to choose winners for some investors. One of the famous indicators for choosing or valuing stocks is book to market ratio. Piotroski (2000) presented a strategy by combining fundamentals with high book to market ratio which produced abnormal returns. The study focused on the period between 1976 and 1996. The strategy was developed to buy companies

which have low prices with strong financial strength and go short for stocks which have higher values with weak balance sheets. The paper showed that the strategy can produce annualized return of 23 per cent over the period of 20 years.

Since there are a lot of fundamentals to analyse for investing purposes, this is another attracting issue for researchers to test. Beneish, Lee and Tarpley (2001) performed a two-stage strategy to detect winners and losers. Combining the fundamentals such as younger companies (age), smaller firms, high trading volume, great increase in sales growth, higher research and development expenses, and lower sales to price ratio, it allows investors to separate the winners from losers. For detecting losers, the study used fundamentals such as lower sales growth, sinking margins, lower research and development expenses, sudden decrease in earnings, decreasing market price, and highly increasing capital expenditures. The paper gave empirical evidence for the predicted winners to outperform the predicted losers over the next twelve months by 8.7 per cent to 17.8 per cent. In addition, the study revealed that accounting-based fundamentals are more powerful for predicting the future of stocks.

Although there are a lot of fundamentals to use, one of the most famous fundamentals is the ratio of price to earnings because price to earnings can give an idea for investors to decide whether the company is overvalued or undervalued. For instance, owner of a shop wants to sell his business with the management, employees, they are very qualified employees. Last 12 months the coffee shop made \$100 000 net profit. Thus, owner wants to sell the coffee shop because he is old, and he asks 5 million dollars to sell the whole coffee shop. In this case, price to earnings ratio is 50 times. An investor might likely think that this coffee shop is overvalued. In other words, price to earnings means, for the last 12 months' earnings how much the investors are willing to pay. Basu (1977) observed the performances of five portfolios created based on price to earnings ratios of companies listed in New York Stock Exchange for the period between 1957 and 1971. Each year these formations of five portfolios were repeated. Over the 14 years, the annual return of the lowest price to earnings ratio of portfolio generated 16.3 per cent. On the other hand, favorite glamour stocks' portfolio which had the highest price to earnings ratio generated 9.3 per cent. Low price to earnings' ratio of portfolio not only beat the market, but also beat the return of favourite stocks of the market.

These undervalued stocks are risky investment due to depressed earnings or bad news for the company which is why the prices of these securities go down. However, underlying risk can reward the investors with excess returns. Since the study of Basu is very old, a similar study above was repeated by Jordan (2015) in order to test the relevance between price to earnings' ratio and capital gains of stocks, therefore measuring the efficient market hypothesis which can be described as stocks' prices are reflected in the market correctly. It means that an investor can't produce higher returns than the market. Nevertheless, the portfolio which was formed in accordance with low price to earnings ratio was examined for the period between 1989 and 2014. Portfolio's rebalance frequency was one month, which means that every month the portfolio is renewed. Over the 25 years, each month's return was 3.54 per cent while the highest price to earnings portfolio generated 0.88 per cent monthly. The portfolio was able to earn higher returns than the market.



One of the studies based on price to earnings ratio was conducted in New Zealand. Truong (2009) observed New Zealand Stock Exchange for the period between 2000 and 2009. The study demonstrated that a portfolio of stocks which is consisted of low price to earnings ratio not only outperform the market, but also outperform the portfolio which includes highest price to earnings ratio. The portfolio which outperformed was created based on companies which their price to earnings ratios were lower than 8. The portfolio's annual return was 18.81 per cent for the period between 1997 and 2007.

Price to earnings ratio is generally used with price to book ratio to detect undervalued companies. Using these two ratios together makes more sense because of detecting values or more assets in a cheaper price. For example, Company A which its whole market price is 5 million dollars while its earnings is 1 million dollar which in this case price to earnings ratio is 5. In addition, its book value is also 5 million dollars, in this case price to book ratio is 1. On the other hand, company B has the same values, but only difference is that the book value of Company B is 2 million. Which means the price to book ratio is 2.5. In this metaphor, even though the market prices are the same for two companies, an investor can buy the Company A due to having more assets with the same price. Therefore, using these two ratios together can help to detect value companies. Chang (2011) combined these kinds of fundamentals to observe five portfolios' performances in Malaysian Stock Exchange for the period between 2000 and 2009.

Respectively:

- 1. Portfolio: Price to earnings ratio, lower or equal to 15.
- 2. Portfolio: Price to book ratios, lower or equal to 1.
- 3. Portfolio: Combining these two ratios and current assets ratio which is higher than 2.
- 4. Portfolio: Combining these two ratios and dividend yield as much as the risk-free rate.
- 5. Portfolio: Combining all the conditions stated above.

The study demonstrated that all these portfolios created based on fundamentals outperformed the market. The highest performance came from the 4<sup>th</sup> portfolio.

Current ratio is an important key not only for companies but also is for investors. Since Current Ratio is calculated as current assets divided by current liabilities, Current Ratio is very useful to understand whether the firms will have any problems in the short term or not. Generally, a Current Ratio which is higher than 1.5 is known as healthy company in the short term. Alavinasab and Davoudi (2013) observed 147 companies in Tehran Stock Exchange for the period between 2005 and 2009 in order to show the relevance of current ratio and return on equity. Under the current assets, increasing conversion cycle of cash, in other words decreasing the number of days of accounts receivables plays a key role in terms of shareholder's wealth.

Operating free cash flow is also very important fundamental to be used as selection criteria. Especially, investors like to see high operating free cash flow to market price of the company. In other words, the companies that have high operating cash flow to market price are believed to be cheaper in comparison to companies that have low operating free cash flow to its market capitalization. Patari, Leivo, Hulkkonen and Honkapuro (2018) tested the ratio of operating free cash flow to market price, by

ranking the companies from highest ratio to lowest. Later, sample is divided into decile portfolios. Top-decile portfolio generated a raw annual return of 17.94% for the period between 2000 and 2015 which outperformed the German Stock market during the observed period.

Another evidence for value investing came from Brazil. Vitor, Jose, Jose and Daniel (2018) employed price to book ratio as a selection criterion in Brazil Stock Market. The study showed that companies that has a price to book value lower than 1 generated higher return than Brazil Market itself. While low price to book value, companies has an annual return rate of 14.23% between 2005 and 2015, Brazil Market only generated 8.51%. However, it is important to note that exact number of shares traded for each company in the study isn't known. In other words, volume factor isn't known.

As it can be seen from the past studies, even though they are just the hypotheses, the ways for outperforming the market can hugely vary. No one knows accurately which company's price will jump hugely to make capital gains for investors. No one can exactly predict the winners in a stock market if they don't have insider information. Although there are proven strategies to make profits, it is not for everyone due to the differences between the types of investors. Since the time frame for value investing is long-term, some investors see long-term as 5, 10, and 20 years or forever, some investors see it as 1 or 2 years. In addition, there are also traders who focus on short term trading, such as day traders. Nevertheless, there are investors who constantly outperform the market.

## **2. Literature review of distinguished strategies that might outperform the market**

The second part of the thesis is about analysing investing strategies that might outperform the market. Many fellow researchers and authors studied financial markets to find a way to outperform the market itself. All the findings of other strategies are analysed in this section. In stock markets, there are market wizards who outperformed the market for so many years. Most of them revealed their strategies in their books. There are many different strategies to observe, such as technical part and fundamental part. The main focus in this study is fundamental part which also includes Value Investing.

### **2.1. Analysis of Value and Growth strategies.**

Value and Growth strategies that might outperform the market are presented below.

#### **— CAN SLIM strategy**

O'Neil (2009) created the CAN SLIM strategy based on strong fundamentals for selecting the winners in the stock market when the market is bullish. CAN SLIM stands for:

- C- Current Quarterly earnings. The most recent quarter's earnings should be at least 20% higher than the last year's same quarter's earnings.
- A- Annual earnings per share growth. Annual earnings per share growth rate should be at least 20% over the last 3 to 5 years.
- N- New Products, New Management. The company should have a new product or service or a new management or a great news for its stock price to soar further.
- S- Supply and Demand. The company's floating number of shares are important. It might not be easier to go higher for a stock which has 5 billion shares rather than 5 million outstanding number of shares. In addition, company should tend to buy back its shares which also causes the price to move upper.
- L-Choosing Leader companies over Laggard companies in their industry.
- Selecting stocks which have Institutional Sponsorship, it is really significant to get in before the big money fully invested.
- M- Market Indexes- Understanding the market direction while analysing market indexes.

Based on these fundamentals created by O'Neil, there have been numerous studies to test the effectiveness of these fundamentals in different stock markets. One of the studies was held by Sareewiwatthana and Janin (2017) on Thailand Stock Market showed that CAN SLIM strategy can produce higher return than the market itself. The strategy was tested from 2002 to 2016. Even though there is a high maximum drawdown in CAN SLIM strategy and the market which are respectively 56.14% and 47.14%, CAN SLIM strategy was able to produce 19.58% annual return over the 14 years, on the other hand Thailand Stock Market was able to generate an annual return of 14% in the same time period. CAN SLIM strategy in Thailand Stock Market focused on main growth companies which have high daily volume which makes it easier to buy and sell at the same if investors need cash or need shares immediately.

Another study was done based on a simplified version of CAN SLIM by Lutey, Crum, and Rayome (2013). The study gave an empirical evidence for outperforming the market by combining the first two rules of CAN SLIM strategy and one more condition which is market price of the company should be at least 10 dollars, a requirement to avoid the illiquid stocks. The simple version is created by combining current quarterly earnings growth of 20% and annual earnings per share growth 20% over the last 5 years. Rebalance frequency of the portfolio formed is monthly. The simplified version of CAN SLIM was tested in S and P 500 for the time period from 2001 to 2012. Simplified version generated a compounded return of 332% while S and P produced a compounded 123% return in this 11 years' time period. In this study, it can be seen that illiquid stocks have been avoided due to the fact that illiquid stocks don't represent accurate results and a proper back-testing.

#### — **Contrarian investing strategy**

Dreman and Lufkin (1997) created a value strategy based on fundamentals such as price to earnings ratio, price to book value, price to cash flow ratio. When the market is bearish the strategy gives a margin of safety, when the market is bullish the strategy outperforms the market itself. The strategy is formed as follows:

- Rank the stocks based on their price to earnings ratio. Lowest price to earnings ratio gets a score of 1 out of 1.
- Rank the stocks based on their price to book value ratio. Lowest price to book value gets a score of 1 out of 1.
- Rank the stocks based on their price to cash flow ratio. Lowest price to cash flow ratio gets a score of 1 out of 1.
- Summing up all the three scores above.
- Choosing 3 companies which have the lowest scores from each one of the 8 industries, in total 24 stocks. Investing equally to each stock. In other words, buying the cheapest 3 companies.

Based on the strategy above, Sareewiwatthana and Janin (2017) created a portfolio in Thailand Stock Exchange to compare the return of the portfolio and the market itself. The study showed that over the 14 years contrarian strategy produced higher returns than the market itself. While the market's annual return was 14%, on the other hand contrarian strategy generated 22.54% annual return. In this strategy, scale of the rules generally covers the small companies which are illiquid stocks. The companies which have low daily volume have significant effect to the results of a back-testing process.

#### — **Super Stock Strategy**

Fisher (1984) also analysed the fundamentals to generate higher returns than the market. Fisher formed a portfolio based on fundamentals such as price to sales ratio, debt to equity ratio and profit margin. The strategy is constructed as follows:

- Picking up stocks with price to sale ratio lower than 0.75.
- Choosing stocks with a net income to sales ratio higher than 5%.
- Selecting companies with a debt to equity ratio lower than 0.4.

- Investing equally in all the companies that passed all these three conditions.

Based on the conditions above, it can be seen that this strategy takes the obstacle of debt into account. When the debt is very high, company might not be able to grow if the debt isn't managed well.

Sareewiwatthana and Janin (2017) tested the effectiveness of this strategy in Thailand Stock exchange. The study showed that the companies that passed all of the criteria listed above were able to outperform the market. Although there is a high maximum drawdown for both the portfolio and stock market respectively 42.86% and 56.14%, the Market's annual return rate was 14% over the 14 years and Super Stock Portfolio was able to generate 25.09% annual return. This strategy is a combination of value and growth rules, in other words there is enough liquidity in the stocks that passed the rules and also some kind of value due to low prices to the sales.

### — Zulu Principle Portfolio

Slater (2010) also formed value components based on fundamentals to create a portfolio which can outperform the market. These components are consistency in net income, price to earnings ratio and price to earnings to growth ratio. The strategy is created as follows:

- Picking stocks with a Price to Earnings ratio lower than 20 times.
- Choosing stocks with Price to Earnings to Growth lower than 0.75. Growth refers to the earnings per share growth rate.
  - Selecting stocks which have positive earnings in the last 4 years, also last year's earnings should be the highest earnings in these years.
  - Choosing stocks which have an increasing earnings per share in the last 4 years, in addition, last year's earnings should be the highest in the last 4 years.
  - Investing equal amount of money in these stocks which passed all the above listed conditions.

Peters (1991) studied Price to Earnings to Growth ratio to find undervalued stocks in their industry. These stocks were able to produce higher returns than overvalued stocks in the long run. The effectiveness of Price to Earnings to Growth ratio was also tested within Euro-Zone by Chahine and Choudhry (2004). The study only focused on a simple version of Zulu strategy which is based on Price to Earnings to Growth ratio. The test rules are as follows:

- Short Selling Rules- Shorting companies which have a higher value than 1 of Price to Earnings to Growth ratio.
- Buying Rules- Buying the companies which have a lower value than 1 of Price to Earnings to Growth ratio.

The results of the study showed that following above listed rules can generate higher returns than the market.

Another empirical evidence came from Thailand Stock Market. A study which focused on a portfolio based on Zulu Principle was tested by Sareewiwatthana and Janin (2017). The portfolio was able to

generate 22.79% annual return with a maximum drawdown of 59.72%, while the market only generated a 14% annual return with a maximum drawdown of 56.14%.

### — **Tiny Titans Portfolio**

O'Shaughnessy (2006) formed a portfolio strategy focused on small cap and medium cap companies based on value components such as price to sales ratio, low market capitalization and price relative strength. The strategy rules are as follows:

- Companies which are traded over the counter excluded.
- Companies which are not based in USA excluded.
- Choosing companies which have the highest relative price strength ratio.
- Market capitalization is greater than or equal to 25 million USD and less than 250 million USD.
- The price to sales ratio is lower than 1.
- Calculating a 1-year return of a stock which is also called rate of change.
- Calculating a 1-year rate of change for the market which the company belongs to.
- Dividing 1-year rate of change for the stock to 1-year rate of change for the stock market in order to find a relative price strength.
- Finally, only 25 companies with the highest relative price strength in the last 1 year.

Based on the rules listed, O'Shaughnessy showed that Tiny Titans Portfolio can outperform the market.

Another study was done outside of USA to test if this distinguished strategy such as Tiny Titans Portfolio can outperform other markets. Brooks, Chow and Ward employed this strategy in UK Stock Market to whether it can outperform like it did in USA. The study confirmed that Tiny Titans Portfolio can outperform the UK Stock Market itself.

Tiny Titans Portfolio is also tested in Thailand Stock Exchange by Sareewiwatthana and Janin (2017). The Tiny Titans Portfolio generated a 20.93% annual return rate over the 14 years, even though maximum drawdown was 59.82%. On the other hand, Thailand Stock Market produced a 14% annual return although maximum drawdown was 56.14%.

This strategy also focuses on small cap companies, which is why the volume of stocks needed to be included to have an accurate result for the returns. The above mentioned two studies didn't include the volume in the back-testing process.

### — **Magic Formula Portfolio**

Greenblatt (2010) introduced a strategy based on fundamentals such as high earnings yields and high return on capital in order to determine which companies to invest. The rules of the magic formula are as follows:

- Selecting companies which have at least 50 million USD market capitalization.
- Excluding financial and utility companies.
- Excluding foreign companies.

- Calculating companies' earnings yields by dividing earnings before interest and tax to enterprise value of the companies.
- Determine companies' return on capital by dividing earnings before interest and tax to sum of tangible assets of the company and working capital.
- Ranking the companies after determining of highest earnings yields. Highest earnings yield is assigned a score of 1.
- Ranking the companies after determining of highest return on capital. Highest return on capital is assigned with a score of 1.
- Selecting the highest ranked 20-30 companies to invest with an equal amount of money.

Greenblatt tested the strategy for the time period between 1988 and 2009 with a rebalancing period of 1 year, the magic formula was able to generate 24% annual return over the 21 years.

Larkin (2009) also tested Magic Formula rules for the period from 1998 to 2006 in all USA Stock Markets. Even though the strategy outperformed the market, however the study showed that it might not be useful by big institutions since the formula focuses on small companies with low volume.

Sareewiwatthana and Janin (2017) also employed the strategy in Thailand Stock Exchange. While the study found that Magic Formula Portfolio generated a 25.32% annual return even though the maximum drawdown was 43.65%, the market's annual return and maximum drawdown were respectively 14% and 56.14%. The Magic Formula gave an empirical evidence for outperforming the market in Thailand.

#### — Acquirer's Multiple Portfolio

Carlisle (2014) created quantitative strategy based on earnings before interest and tax and enterprise value which allows to focus on undervalued companies. The strategy is formed as follows:

- Dividing enterprise value of a company to its earnings before interest and tax to find the company's multiple.
- Ranking the companies with a maximum score of 1, assign 1 for the highest multiple companies.
- Selecting 30 stocks which have the lowest score.
- Investing equal amount of money for the 30 stocks.
- Every 12 months the portfolio is rebalanced.

Montier (2006) tested the strategy in UK and Japan between 1993 and 2005 whether if it can outperform other markets. The study found that buying cheap companies make sense. The strategy not only beats the market approximately by 7% in both stock markets, but also it is less risky than the market itself.

Another evidence came from Thailand Stock Market. Sareewiwatthana and Janin (2017) created a portfolio by ranking the companies based on their multiples. The portfolio was able to generate an annual return of 27.72% while the maximum drawdown was 38.34%, on the other hand market itself produced 14% annual return and maximum drawdown was worse than the portfolio.

## — F-Score Portfolio

Piotroski, (2000) formed a ranking system based on fundamentals such as profitability, efficiency of operating activities, debt called F-score. The study introduced specific 9 rules which separates winners from losers among the low price to book value companies. So called strategy of F-score Portfolio rules are as follows:

- Choosing the companies which have positive net income in the current year, assign a maximum score of 1.
- Selecting the companies which have positive operating cash flow after extra ordinary items, assign a maximum score of 1.
- Determining the companies which have higher Return on Assets than previous year's Return on Assets. Assign a maximum score of 1
- Determining the companies which have higher operating cash flow than net income. Assign a score of 1.
- Determining the companies which have lower portion of long-term debt than previous year's long-term debt. Assign a score of 1.
- Determining the companies which have higher current ratio than the previous year's current ratio. Assign a maximum score of 1.
- Determining the companies which have lower or equal number of shares outstanding than the previous year's number of shares. Assign a maximum score of 1.
- Determining the companies which have higher gross profit margin than the previous year's gross profit margin. Assign a maximum score of 1.
- Determining the stocks which have higher asset turnover ratio than the previous year's asset turnover ratio. Assign a maximum score of 1.
- Add all the scores from the 9 signals to find the highest scored companies.
- Based on these signals, a hedge portfolio is formed which means buy and short portfolio. The companies which have at least or equal to a score of 5 should be bought with equal amount of money and the companies which have less than a score of 5 should be shorted with an equal amount of money.

Piotrski tested the performance of these 9 signals in US Stock Markets for the time period between 1976 and 1996. The strategy focused on small and medium sized firms which have low turnover in terms of volume. These fundamental 9 signals were able to generate a return of 23% annually.

Sareewiwatthana and Janin (2017) tested the same strategy with a slightly difference in the rules. The study tested the same rules in Thailand Stock Market for the time period between 2002 and 2016, but the rules only focused on companies which have at least a score of 8. While Focusing on fundamentally strong companies was able to produce an annual return of 24.87% with maximum drawdown of 36.97%, the Thailand Stock Market only generated 14% with a maximum drawdown of 56.14%. F-score strategy not only outperformed the Thailand Stock Market, but also provided a protection on invested capital. F-score portfolio gave an empirical evidence for not only outperforming the market in good times, but also in bad times.



In both cases, the rules generally cover the small cap companies. Since these two studies were tested hypothetically, by the time capital gains increase the strategy will lose its edge in the market due to illiquidity in the market.

### — **G-Score Portfolio**

Unlike Piotroski who focused on finding value stocks which have a low price to book value, in this case Mohanram (2005) presented a strategy which paid attention to growth stocks in other words high price to book value. Growth stocks can be described favorite stocks of the market (high price to book value). The companies which have higher price to book value than the average of their industry is chosen to be scored. For these companies, fundamentals were used to detect growth stocks and compare them with each other in order to determine which stocks investors should go long (buy) and go short (short selling). The study explained the strategy by creating signals based on scores. The rules of G-score portfolio are as follows:

- Determining the companies which their return on assets is higher than the other high price to book value companies' median, assign a score of 1, otherwise 0.
- Determining the companies which their cash from operations on assets is higher than the median the other high price to book value companies, assign a score of 1, otherwise 0.
- Determining the companies which their cash from operations is higher than net income, also higher than the other high price to book value companies' median. Assign a score of 1, otherwise 0.
- Determining the companies which their earnings' stability is more than the other high price to book value companies' median, assign a score of 1. Otherwise 0.
- Determining the companies which their sales growth's stability is more than the other high price to book value companies, assign a score of 1. For companies below than the other high price to book value companies, assign a score of 0.
- Determining the companies which their research and development, capital expenditure, advertising intensity respectively, are greater than the other high price to book value companies' median.

Based on these signals, higher scored stocks performed well while low scored stocks performed badly in terms of companies' profitability. Therefore, the strategy showed that it is better for investors to decide taking a position in the seller's side since return on investment was better than the companies performed well if taking a position as selling short. G-score strategy is more efficient to determine the companies who will perform badly in other words the losers.

## **2.2. Net current asset value portfolio**

Net Current Asset Value Model (NCAV) developed and employed by Graham and Dodd (1934) during 1930s, which was described as net current assets should be greater than total liabilities and preferred shares' dividends if there is any. After net current assets pays its debt, the amount left which is Net Current Assets also called liquidation value should be at least 1.5 times bigger than the company's market capitalization or equal to 1.5. The companies which have greater net current assets than their market capitalization should be paid attention for investment purposes. The formula looks like below:

$$(Total\ Current\ Assets - Total\ Liabilities) \geq Market\ Capitalization \times 1.5$$

Or it can be also formulated as follows:

$$Market\ Price\ Per\ Share \div Net\ Current\ Assets\ Per\ Share \leq 0.665$$

Based on this formula, it is easier to screen companies in order to determine which companies to invest. The main idea behind this strategy focuses on liquidation value. Basically, what Benjamin Graham was doing is finding the cheapest companies to make his investment decisions according to net current assets. In addition, there is a margin of safety due to the liquidation value. In other words, buying companies with a lower price than their liquidation value. These companies have some good reasons why they are being traded under their liquidation value. The reasons for these companies to be traded in very low prices can be listed below:

- The company might have sharp decreases in earnings in the recent years.
- The company might have a lawsuit because of their products which might affect the investor's trust which would lead to a sell off.
- Frequent changes in the management would cause problems in terms of trust issues of shareholders.
- An economic recession might affect the prices to decrease sharply.
- Market participants have an anticipation for these kinds of companies to keep wasting its assets and eventually go bankrupt.
- General decline in these types of companies' industry.

Attractiveness of investing in these kinds of companies comes from very low prices to buy a business. In addition, timing of buying these companies is generally a right time, in other words, buying from the bottom. After investing in these kinds of companies, several scenarios take a role for the future of the companies. These potential scenarios can be divided to 4 parts which are as follows:

- Management effect
- Merger or acquisition effect
- Effect of increasing earnings
- Liquidation effect

#### — **Management Effect**

Bad management would lead a company to waste their assets which is one of the reasons why these companies are traded lower than their liquidation value. When the company has enough cash, but not be able to generate profits due to bad management decisions or investments, this would cause shareholders to put pressure on the management to take the right initiatives to start generating profits. Shareholders also have the power of changing the management if the company's current management doesn't do well. When there is a new CEO or a new management team in the company, this would have an effect in the company's market prices. This kind of big changes in the management have generally an impact for the company's prices which would end up with an increase in the market price.

### — **Merger or acquisition effect**

These companies generally include newly established companies, very old companies, pharmaceutical companies, new tech companies etc. during an economic recession, these companies include a very wide range of companies from all the sectors, even biggest companies in the market. Every company has their reason to start a business or have been in business for a long time due to an idea or a strategy that will make profits for the company. These companies not only have current assets, but also tangible assets, intangible assets such as brands, or recipes, licenses, trademark, know-how rights, goodwill, patents. Therefore, when these kinds of companies are temporarily distressed by low earnings, losing money, or market participants which see these kind of companies as have no future, big companies jumped on to acquire their assets by merging or acquisition. The reason is big companies buy the whole company only based on liquidation value or with a very cheap price. In other words, they don't only buy the company's current assets with a liquidation value, they also buy all the intangible assets for free. Investing in companies which are being traded lower than their liquidation value, might have a big jump in the market price due to a merger or acquisition which will be rewarding the shareholders handsomely.

### — **Effect of increase in the earnings**

Some of these companies might go bankrupt, some of them might make a comeback. These companies have enough assets which can be convertible to cash in a short time period, which is an enough amount of money for the company to make new investments, new products, and new services to lift the earnings. Since the company have very less debt or no debt compared to their current assets value, they might have a better chance to make a comeback. In this case, the necessary movement might be a change in the management, getting rid of an old product to invest in new products, changing strategies which have been used before.

One of the crucially important factors is also dividends. When there is an increase in earnings, this would lead market participants to pay attention to this company. Moreover, company might decide to give dividends if they didn't give dividends before. Therefore, even dividend factor might be enough to play an important role for investor's attention. The reason can be explained by having high return on investment due to high dividend yields. In other words, dividend yield is high due to low prices. When the earnings are lifted by changes in the company, this company will start not to be neglected by market participants. In other words, an increase in earnings or rewarding shareholders via dividends is a sign for market participant to pour money to this company which will result in a soar in the market price.

### — **Liquidation effect**

Since these companies are being traded under their net current assets value for a reason, these companies might go bankrupt or might be liquidated in the future. If the companies have enough current asset value which wouldn't be wasted in a short time period, one of the most likely scenarios would be a liquidation of the assets or a partial liquidation. In this case, all the decision for liquidation relies on management and the votes of the shareholders. When the liquidation is decided by managers and also shareholders, the value of the company to liquidate is roughly equal to current asset value of a company.

It is not necessary to find experts to calculate a liquidation value for a company, the calculation of a company's liquidation value can also be measured roughly by retail investors as follows:

### Company C

Capitalization: Number of shares outstanding is 1,000,000

Price per Share: \$3. Total Market Value of the Company: \$3,000,000

#### BALANCE SHEET OF COMPANY C, DECEMBER 31, 2018 (000 OMITTED)

Item	Book value	Estimated liquidating value	
		% of book value	Amount
Cash	\$5,000	100	\$9,000
Govt. bonds	4,000		
Receivables (less reserves)	6,000	80	4,800
Inventory (lower of cost or market)	10,000	50	5,000
Total current assets	\$25,000		\$18,800
Less (current liabilities + non-current liabilities)	\$5000		5000
Net current assets	\$20,000		\$13800
Plant account	16,041		
Less depreciation	7,491		
Plant account, net	\$8,550	20	3,588
Investments in subsidiaries, etc.	4,000		
Deferred charges	390		
Good-will	5,000		
Total net assets for common stock	\$37,940		\$17,388
Estimated liquidating value per share		\$17.38	
Book value per share		\$37.94	
Current-asset value per share		\$20	
Cash-asset value per share		\$4	
Market price per share		\$3	

**Table 1.** Represents an example of Graham's Criteria to find undervalued companies.

In this example, estimated liquidating value calculated by adding 100% of the cash and cash equivalents, 80% of receivables, 50% of inventory, 20% of tangible and intangible assets and less total liabilities, total value left is divided by total number of shares outstanding. Book value per share is calculated by subtracting total liabilities and intangible assets divided by total number of shares outstanding. Current asset value per share is calculated by subtracting total liabilities from total current assets and then divided by total number of shares outstanding. From this example Company C is not only being traded lower than its book value, but also its estimated liquidating value, net current asset value, even its cash value. There is a good bargain opportunity to buy this company. This is one of the value investing strategies to look for bargain opportunities. In Company C, market price per share is 3 which is 85% less from the net current asset value of the company. The difference between net current asset value and market price in Company C is what Graham called margin of safety. In other words, a limited downside risk.

- **Studies based on net current asset value model**

Since B. Graham proved that Net Current Asset Value model can produce higher return than the market, many studies have been done about the same method. First study based on Net Current Asset value was done by Oppenheimer (1986). The empirical research focused on US stock market between 1970 and 1983. Based on the method, portfolios were created each year and sold in the end of each year. The results showed that annualized return of the portfolio was 28.3% which even after adjusting for risk, portfolio still outperformed the market. The results also revealed that companies of low capitalization had the largest returns. The reason why there was high annual return is because of small capitalization companies whose prices per share are between 1 and 5. In other words, the results are good on the paper, but applicability of the strategy in live investing environment would be very hard due to illiquidity.

Later on, another study has been conducted by Joseph (1988). The study examined the method for the period between 1970s and early 1980s. The results showed that the method produced higher returns than the market not only because of mergers but also non-merged companies which made higher capital gains. In case of a merge, illiquidity problem would be lifted because the news of the merge will bring high volume to illiquid companies. In between 1977 and 1984, a parallel study was done by Laugterbach and Vu (1993). In this parallel study, the results were also parallel too. The method produced higher returns, but when the size adjustment procedures were applied, the return was close to zero. The reason is most of the companies that fits the criteria of NCAV model are small cap companies which have very less volume.

Net Current Asset Value model was not only valid in US stock market, but also in Japan. According to Bildersee, Cheh and Zutshi (1993), they proved that the method was generating higher returns even after adjustment for risk. The study pays attention to the period between 1975 and 1988. In this study, in order to increase the number of companies in the portfolio, they changed the ratio as Net Current Asset Value over market capitalization is higher than 1 which was originally higher than 1.5 before. The results showed that portfolio's annualized return was 13% per year over the period of 13 years. It is important to note that Net Current Asset Value model is developed based on companies' liquidation

value so that investors will have a margin of safety. The companies bought with lower prices than their liquidation value has a margin of safety for investors if it is liquidated. In Japanese case, there is no any level of margin of safety.

Since NCAV model can be applied to any stock market, companies which pass the model can vary in terms of capitalization. One of the researches was done by Dudzinski and Kunkel (2014) showed that even though the portfolio based on NCAV model generated 24.7% annual return from 2003 to 2010, average capitalization of the companies in the portfolio was \$173 million which included average number of 96 companies. This study showed that strategy might not be used by mutual funds owing to small capitalization which leaves this strategy profitable for the rest of investors. This strategy is useful for the small investors. Small amount of money can be traded in these illiquid small companies. However, for big mutual funds, big amount of money will already move the price to the levels that most of the participants would take profits.

After Japan, NCAV model was also tested in London Stock Market by Xiao and Arnold (2008). The study observed the period between 1981 and 2005. The results were extreme. The annualized return was 19.7%. In this study, they also paid attention to the reasons why the method produces higher returns than the market. It is found out that the returns came from small companies. The extreme returns were assessed by the risk measurement of Capital Asset Pricing Model which pays attention to the relationship between systematic risk and expected returns. However, it didn't explain why there is a very high return. Therefore, the study concluded that high return on investment might be caused by irrational pricing. Net Current Asset Value model might work for some part of investors. Since the companies which passed the criteria are generally small companies, the method might not be useful for big mutual funds, asset management companies. Money management companies invest vast amount of money such as billions. By investing billions in small companies, they can literally buy the whole company owing to small market capitalization, which induces these small companies' prices to move up. Therefore, these small companies might not have enough place to make capital gains for mutual funds to make profits, which will affect the performance of the mutual funds and asset management companies in terms of return on investment.

Another research based on US Stock Market was conducted by Thorp (2010). He analyzed the companies which passed NCAV model. He found out that most of the companies that passed the criteria belongs to Over the Counter (OTC) Market. Since OTC Market or some of the stock markets in the world are not regulated strictly, investors should be concerned about the regulations of the stock market they invest by using NCAV model. In less regulated markets, the companies don't even need to file financial statements which can lead the price of the stocks to be mispriced or manipulated easily by big players. These less unregulated markets include high risks while it gives an opportunity for investors to make higher and faster capital gains.

One of the studies held outside of USA was in Indian Stock Market. The empirical study was done by Singh and Kaur (2013) in order to observe the relation of NCAV model with Indian Stock Market. They focused on for the period between 1996 and 2010. They provided evidence that the NCAV model can not only outperform the market if stocks' holding period are 12 month or 24 months, but also the

market's volatility and risk was higher than the portfolio created based on NCAV model. However, volume is not included in the back-testing process, which is a very important component for accuracy of the results. In addition, Singh and Kaur (2014) made another research by observing the companies based on NCAV model. The study provided evidence that if the companies which have higher Net Current Asset Value are blocked due to excessive value of inventory. Even though these companies are held for two years, they still couldn't provide higher returns than the market. These kinds of companies have lower chances for future potential growth. It is also significant to note that since the items of the current assets are the ones which can be converted to cash less than 12 months, converting receivables and inventory into cash might be essential in case there is a liquidation. Receivables might have bad debts which might cause a written off. Thus, shareholders which is at the bottom for sharing what is left for them will be left with very less. On the other hand, inventory is also another problem. All the inventory might not be able to be converted into cash which also decreases the value which is left for shareholders because of unexpected events or the decrease in the value of goods.

In 2015, a new study conducted based on NCAV which was different than the previous studies. This study paid attention not only to the returns, but also the downside and the risks of the NCAV model. According to An, Cheh, and Kim (2015), when the method was employed for the period between 1999 and 2012, they found out that in the long-term the method can significantly beat the market returns. However, when there is a regression or there is a bear market, the method's performance was riskier than the market. For instance, 2009 economic crisis induced US stock market to go down 18.05%, while the study showed that NCAV method's performance was worse than the market. Portfolio's downside was 25.99%.

The last study based on NCAV model was done in Thailand Stock Market by Sareewiwatthana and Janin (2017). This study focused on testing proven strategies by famous investors. The study was conducted in the stock market for the period between 2002 and 2015. In this study, it is found that NCAV model didn't only outperform the market, but also produced the highest raw return in comparison to other famous strategies. It is recorded once again, when the market is bearish, performance of NCAV might be risky. One of the interesting founding of this study was that the average number of the companies in portfolios was very different. While the NCAV model has an average 7 or 8 number of companies, other famous strategies has an average 25 number of companies. It was found out that when the number of companies for the portfolio of NCAV is very low, downside risk is the highest. In this study, volume is not included which again plays a key role on a back-testing process. The reason is if the companies that fits the criteria are very small companies, most probably daily volume of the company would be very less too. In other words, if there are no enough buyers and sellers, investors or traders who bought these shares before when there was liquidity might not be able to convert their shares into cash.

Up to now, strategies have been described and the past results of these distinguished strategies have been showed respectively. The studies described above cover the value investing strategies and growth strategies. However, these strategies have been backtested, the results aren't proved by live track records, and it is just a hypothesis. Hence, these strategies have its own applicability problems when it comes to live environment of the investing/trading.

### 2.3. Main issues of backtesting the distinguished strategies

There have been so many studies based on distinguished strategies to test the effectiveness of the strategies, even in different stock markets. These studies provided empirical evidence to back up the strategies. However, all these hypotheses were done as a back-testing process, not a live trading track record. One of the most important issues to be paid attention to while doing a back-testing is the volume.

The volume is the number of shares traded in a certain period of time, in other words, if someone sold his 1000 shares to someone else in one minute, the volume in one minute is 1000 shares, not 2000 just because of a buying at the same time. Therefore, the volume plays a key role in back-testing. The volume should be considered highly while doing a back-testing. For instance, back-testing of NCAV model, it generally focuses on small cap companies which generally have illiquidity problem. With NCAV criteria, the number of companies in the portfolio can be 10, 20, and 30 or even more. However, in a recession, this number can go up to 100, 200 companies and maybe even more. To give an idea about how the companies in these portfolios' price and volume look like, one company is chosen from the companies that fits the NCAV criteria to be observed. Figure 1 is a good illustrative example to this problem.



**Fig. 1.** US Global Investors' historical daily candle stick price chart and daily volume.<sup>v</sup>

Strategies that focus on small cap companies must deal with illiquidity. US Global Investors is a stock that fits the criteria of NCAV. However, an investor can buy this company on the date of June 3rd in 2019, with a price between 1.16 and 1.11.

Since the main problem of investing small companies is illiquidity, in other words volume, the number of shares traded in 3rd of June is 58,244 which caused prices to fluctuate between 1.16 and 1.11. The



market opened with a price of 1.16 and closed with a price of 1.13. Moreover, there were more sellers than buyers, so the price dropped from 1.16 to 1.13. From outsider point of view, let's suppose that sellers decided to sell the shares they have with the market price. Buyers decided to buy the shares with lower prices which would cause the price to come down because there are no buyers for the high price. Since an investor is willing to buy on this day, he would end up buying with a cheaper price. Which is why the price going down from 1.16 to 1.11. Thus, which if the price is also averaged between 1.16 and 1.11, the average price per share would be 1.13 for some specific number of shares, not all the shares traded in the day. In this example, hypothetically, our investor was able to buy 20,000 shares with a price per share of 1.13. Therefore, if the investor is the only buyer of these 20,000 shares, the amount of money required to buy this number of shares would be \$22,600.

Furthermore, almost 3 months later, on the date of September 5<sup>th</sup>, US Global Investors' price at least doubled, it even saw the price of 2.29. Thus, this investor would make 102% gain in only three months if all shares can be sold at 2.29. However, on September 5<sup>th</sup>, the volume is 157,527. There were again more sellers who would like to sell with the market price than buyers who would like to buy with cheaper prices, which induced prices to open with a price of 2.25 and close with a price of 2.09. The price also fluctuated between 2.29 and 2.05. Therefore, our investor who bought 20,000 shares would like to take profits on September 5<sup>th</sup>. This time price decreased more as percentage than the previous example of the buying process, so this time in comparison to beginning, there were more investors who would like to buy with cheaper prices rather than market price. Thus, our investor who would like to sell 20,000 shares would be selling his shares lower than 2.29. He will be limited to these buyers' low price offers. The average price per share would be approximately 2.17. Eventually, the investor who invested \$22,600 dollar would hypothetically be making 92% profit on his investment. This is a less or more accurate live investment example in a small cap company.

The volume is important because as it can be seen from the example illustrated above, the buyer or seller might not be able to sell or buy the number of shares he or she wanted to. So, the volume effect automatically prevents big funds such as mutual funds, private equity funds or big institutions to put their money into these companies which is also the reason why there is less liquidity. In the back-testing, point in time databases allows the back-tester to do a back-testing based on opening and closing prices in specific time period, such as weekly, 2 weeks, monthly, quarterly, yearly etc.

In the past studies, this detailed observation is skipped. So, these past studies hypothetically focused on the price to calculate the return. In other words, the price closed at 1.11 on June 3<sup>rd</sup>, so if the portfolio is rebalanced in every three months, the closed price is 2.09 after 3 months. The return calculated in the result of back-testing would be 88%. Here is the problem comes, it doesn't represent an accurate information due to volume. An investor who reads these articles which presented high returns every year thanks to strategies would realize while making live investment he can only buy 58,244 shares if he is willing to buy all of it and there is no specific price for that, because the price fluctuated between 1.16 and 1.11. Thus, this strategy can only be used by very small investors as it is explained in our example.

Another vitally important problem of back-testing is that after the rebalance in some certain period, returns are compounding. Hence, the amount of money invested in small cap companies will increase a lot more than the beginning of the back-testing process. As it is shown in the figure 1, not a lot of money can be invested in these kinds of small companies due to low volume in other words illiquidity. Investing high amount of money will be costly for the investors and institutions due to low volume and high spread.

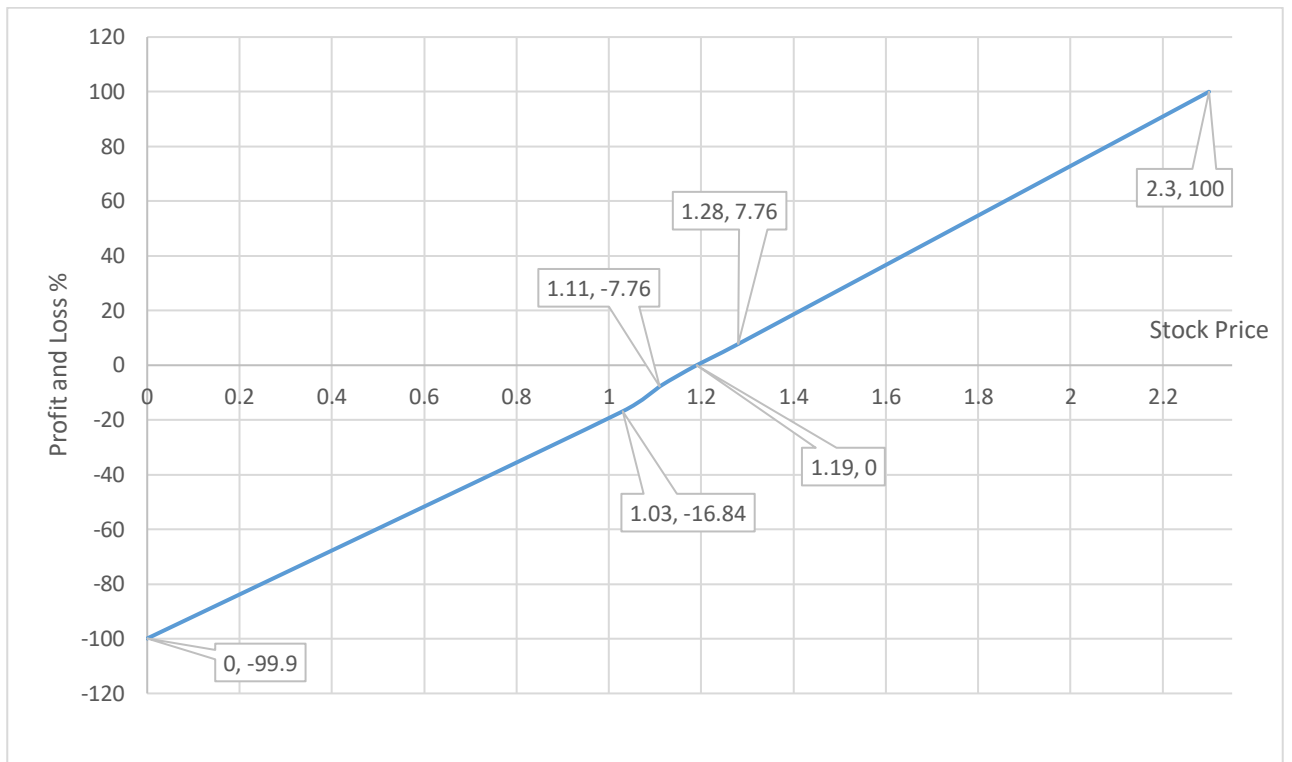
Investing in small cap companies have one more serious problem which is the spread. Spread is the difference between buy price and sell price, in other words the commission investors pay to the brokers. Nowadays, brokers don't charge their customers with an extra commission for each selling or buying transaction, they make money thanks to spreads. So, brokers make their money by adding spreads to the prices of the stocks.

From the example of US Global Investors, the prices investors see in the broker is not between 1.16 and 1.11 on the date of June 3<sup>rd</sup>. If the price of a stock is 1.11 at the moment, in the broker it is shown to investor as the buy price of 1.11 and sell price of 1.03. Thus, broker refers to that, if an investor would like to buy this stock, it is 1.11, if an investor would like to sell his stocks, it is 1.03, not 1.11. It also means that someone who would like to sell his shares will give up on his 7.76% profits because of the difference between 1.11 and 1.03, on the other hand someone else who would like to buy shares will be already in loss 7.76% due to the difference between 1.11 and 1.03. This huge difference is due to volume. If the volume is very low such as 58,244 which is very low compared to the big companies which have daily average of 30 million shares, the spread is big. If the volume is high, the spread would be very small such as 1.110 and 1.105. Table 3 and Table 4 are illustrative examples for this problem.

Market Price (Actual Price) of US Global Investors	1.11
Broker's buy offer to buyers at the moment	1.11
Broker's sell offers to sellers at the moment	1.03

**Table 2.** The prices of a stock under low liquidity/volume

While the current price of US Global Investors looks like the one in Table 3, an investor or traders' potential profit and loss chart, who would like to buy some shares of a small company which has low volume would look like exactly in Figure 2.



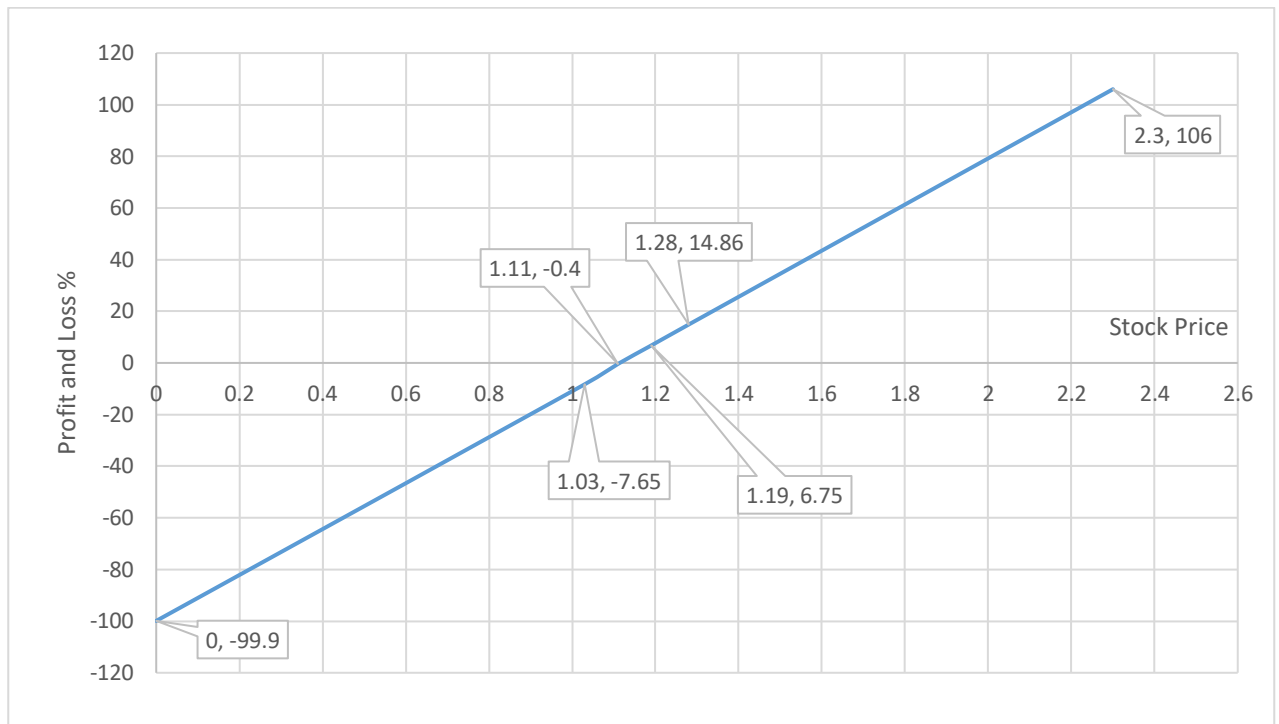
**Fig. 2.** The potential profit and loss chart of an investor/trader who would like to buy shares of small companies under low liquidity.<sup>vi</sup>

In another words, the broker's offer for the investors who are willing to sell their shares is 1.03 at the moment. On the other hand, the broker's offer for the investors who are willing to buy the shares is 1.11 at the same moment. If an investor buys a share with a price of 1.11, he or she must wait for the price to reach approximately 1.19 to realize break-even point. If the stock price goes higher than 1.19, the investor would start making profits. Even though the price has already gone upper than 1.11, but the spread is too big, so investor must wait for 1.19 to start making positive returns. In addition, if the company price went down to 1.03, broker's offer for investors to sell the shares they already have is 0.95, which is why when the price went down to 1.03, investors would lose approximately 17%, not 7.76%. On the contrary, when the volume is high enough, then the broker's offer to investors or traders would look like in Table 4.

Market Price (Actual Price) of US Global Investors	1.110
Broker's buy offer to buyers at the moment	1.110
Broker's sell offers to sellers at the moment	1.105

**Table 3.** The price of a stock under high liquidity/volume

While the current price of high-volume stock is exactly look like in Table 3, an investor or traders' potential profit and loss chart, who would like to buy shares from this high-volume stock would look like exactly in Figure 3.



**Fig. 3.** The potential profit and loss chart of an investor/trader who would like to buy shares of small companies under high liquidity.<sup>vii</sup>

Hence, an investor can buy a huge number of shares at one time owing to high volume, while under low volume case, the investor wouldn't be able to buy as much as the high-volume case. In addition, an investor can also buy without giving up the profits due to tight spread. In this case, when investor buy shares with a price of 1.11, he would be in 0.4% loss. In our low volume case, the investor would be in 7.76% loss. If the price went up to 1.19, the investor would be approximately in 6.75% profit, on the other hand, the low volume company would be approximately in break-even point.

These two main issues, volume and spread play a key role in terms of investing in small companies. Therefore, it enormously affects the results of back-testing strategies that focuses on small companies. While doing a back-testing 10 daily average volume should be added to back-testing process and bigger than at least 1 million shares so that investors or even institutions can use these strategies effectively to make investment decisions. There is value in small companies, but for some small investors, not for big players, or institutions.

On the other hand, a growth strategy focuses on big and glamour companies which have high liquidity. That is why hedge funds, asset management companies generally prefer to invest their money into these companies. In glamour companies, the daily volume is very high, and spreads are very tight. Millions of dollars can be converted into cash or can be invested into stocks within the same day. Facebook in Figure 2 is an example company from the strategy developed in this study for this illiquidity and high spread problem.



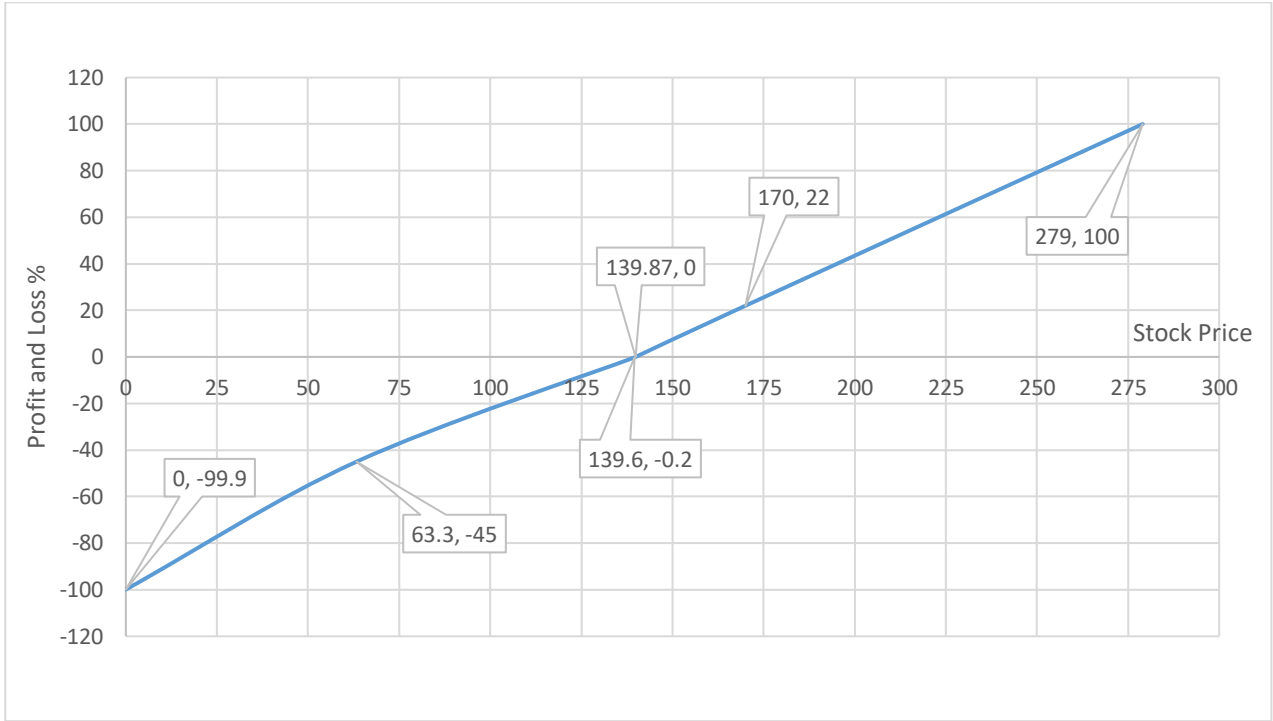
**Fig. 4.** Facebook's historical daily candle stick price chart and daily volume.<sup>viii</sup>

An investor or institution can buy this company on the date of December 10<sup>th</sup> in 2018 with a price between 143.05 and 139.01 for per share. The market opened with 139.60 and closed with a price of 141.85. The volume was approximately 21,195,000 shares in the end of the day, and prices fluctuate between 143.05 and 139.01. Thus, the volume is enough for big players to pour money to this company. If the average price of the day is the average of highest price and lowest price of the day, then average price of December 10<sup>th</sup> in 2018 was \$141.03. Since the volume was 21,195,000, this means that on average 21,195,000 number of shares have been sold to buyers from sellers with an approximately total amount of \$2,989,130,850. Even though the volume is huge, and since the amount of money that changed hands was almost 3 billion dollars, the percentage change in this day from open price to close price was only and approximately 1.61%. In other words, millions of dollars can be invested into this company in one day without moving the prices sharply. The prices at the open of the day would look exactly like in table 4. Due to high volume, the spread is very tight. An investor who buys a share of Facebook, would immediately realize a loss of %0.2. In comparison to Us Global Investors, while the immediate loss under high and low volume is respectively %7.76 and 0.4%, in Facebook, immediate loss is only %0.2 which is even lower than US Global Investors' immediate losses in both high and low volume.

Market Price (Actual Price) of Facebook	139.60
Broker's buy offer to buyers at the moment	139.60
Broker's sell offers to sellers at the moment	139.32

**Table 4.** Facebook's price of a share of under high liquidity/volume

Under such a low tight spread an investor/trader's potential profit and loss chart would look exactly like in Figure 5.



**Fig. 5.** The potential profit and loss chart of an investor/trader who would like to buy shares of Facebook under high liquidity.<sup>ix</sup>

26 weeks later, on the date of June 7<sup>th</sup> in 2019, the stock's price fluctuated between 173.87 and 168.84. The company's price opened with 170.17 and closed the day with a price of 173.35. The recorded volume was approximately 16,917,000 shares. Thus, the average price of the day for one share would be around 171.76. Hence, 16,917,000 shares have been sold from sellers to buyers in this day with an average total amount of \$2,905,663,920. Once again, the volume is big enough to convert big amount of money into cash. Total amount of money that changed hands was again around 3 billion dollars in one day. In other words, millions of dollars can be invested or sold within one day. On the contrary, small companies are very illiquid which is why not only impossible to invest 1 million dollars into US Global Investors in one day without moving the price effectively, but it is also impossible to convert the shares into cash. It would cause the price to increase sharply while Facebook wouldn't be affected if 1 million dollars invested in Facebook.

Since one of the main problems of these hypotheses is volume, Table 4 shows the results and the category of the strategies and its problem.

Strategy	Annual Return	Standard Deviation	Maximum Drawdown	Volume	Strategy Type
Net Current Asset Value	37.86%	44.92%	-53.08%	Needed	Value
Acquirer's multiple	27.72%	14.11%	-38.34%	Needed	Value
Magic formula	25.32%	15.14%	-43.65%	Needed	Value
Super stock	25.09%	16.83%	-42.86%	Needed	Value
F-score	24.87%	14.04%	-36.97%	Needed	Value
Zulu principle	22.79%	26.57%	-59.72%	Needed	Value
Contrarian	22.54%	17.27%	-41.62%	Needed	Value
Tiny titans	20.93%	22.40%	-59.82%	Needed	Value
CANSLIM	19.58%	17.32%	-47.24%	Not Needed	Growth
Thailand Stock Market	14.14%	20.36%	-56.14%		

**Table 5.** Comparison of the results of the back-testing the distinguished strategies in Thailand Stock Market.

In table 5, annual return, standard deviation and maximum drawdown are the results of a study that was done in Thailand (see Sareewiwatthana and Janin, 2017). In the next two columns, the type of the strategy and the problem of the strategy are added. In the study that was done in Thailand, the volume wasn't included. Thailand isn't the only case, there are many cases that the volume isn't included. In table 5, the Volume column represents which strategies need the volume to conduct an accurate back-testing in every stock market. Even though the volume was ignored on purpose in the studies, when the volume is added the results can change sharply and significantly.

While the value strategies focus on small and medium companies, growth strategies such as CANSLIM strategy, focuses on glamour companies. Glamour companies have the attention by the market participants, especially hedge funds, mutual funds, etc. That is why growth strategies doesn't need to deal with the volume factor. On the other hand, value stocks are forgotten stocks, the stocks that are having trouble to operate in their industry due to high amount of debt, competition in the industry, etc. Thus, big value companies are very rare to find. That is why value strategies generally focus on small companies. When back-testing the value strategies, volume is needed to conduct an accurate back-testing.

#### **2.4. New methodology: Impact of excess current assets.**

Since Graham used net current asset value to determine the value of a company, the same style is applied to the big companies without regarding the market price. The theory behind this strategy is very simple, but very effective. After subtracting all liabilities from current assets gives us an approximate

liquidation value, which is a value in terms of cash. Most of the companies that fits Graham's criteria reinvest these excess assets to make a comeback from bad days which will eventually increase the market price. Therefore, the big companies which sit on a lot of cash or current assets most likely to perform better in the next 6 months to 36 months. The difference in my strategy and Graham's is that buying the companies without paying attention to market price.

Graham's Formula:

$$(Total\ Current\ Assets - Total\ Liabilities) \geq Market\ Capitalization \times 1.5$$

New Methodology:

$$(Total\ Current\ Assets / Total\ Liabilities) > 3$$

According to New Methodology; Impact of excess current assets (IECA), the companies whose total current assets are 3 times higher than their total liabilities should be chosen to be analyzed to make a final decision before investing. In the formula developed, market capitalization of the companies that fits the criteria is disregarded. In other words, the aim of the formula to detect the companies which have enough assets which can be convertible to cash in the short term. The excess of this cash will play a key role in the future of the company. For instance, let's suppose that there are 2 different companies to be invested. The balance sheets of these companies are stated as below:

<b>Company X</b>			
Total Current Assets	5000	Total Liabilities	1500
Total Non-Current Assets	2000	Total Stockholder's Equity	5500

**Table 6.** Balance Sheet of Company X

<b>Company Y</b>			
Total Current Assets	2000	Total Liabilities	5000
Total Non-Current Assets	4000	Total Stockholder's Equity	1000

**Table 7.** Balance Sheet of Company Y

Company X's have more assets if it is liquidated today in comparison to Company Y's. If a company will keep making profits year by year, the probability of this company to be Company X is higher than the Company Y. Company X can make new investments to itself in order to grow its business thanks to its excess cash, while Company Y might be struggling in the future due to high amount of debt. An ordinary investor would like to buy a company which has a good amount of cash to grow the business and less debt to not deteriorate the earnings. In a perfect bull market, an investor would like to put his money into a more stable, more predictable company. If every factor that can affect the companies are ignored, all conditions are being equal, then it would be obvious for everyone to invest in Company X based on balance sheets. However, not everyone is willing to pay the market price. If the earnings of Company X are \$2 per share, market price per share is \$24, while the earnings of Company Y per share is \$0.30, and the market price per share is \$2.1. Market price might be decisive to choose which



companies to invest. In this case, an investor has two choices, paying 12 times higher than the earnings, but also it means buying \$3500 excess assets if the Company X is liquidated. On the other hand, paying 7 times higher than the earnings, also buying Company Y which might have a loss of \$3000 when it is liquidated. It would be smarter to buy more assets rather than buying debt.

Theory of the New Methodology focuses on companies which have this excess amount of assets. This excess amount of assets wouldn't only be returning to shareholders in terms of dividends or capital gains, it can also be reinvested to business in order to grow. However, there might be a lot of companies which can fit the criteria. There might be 10, 20, or 30 companies which can fit this criterion. In order to eliminate these companies to choose the winners which might have better prospective than the rest, a ranking system is needed to have a smaller portfolio. A portfolio can be constructed by having enough number of companies to invest, such as 5, 10, 15 or 20 at most. A ranking system is needed to have at least 5 companies that pass first criteria to have a diversified portfolio.

### **Ranking System: Quality.**

A ranking system is formed to rank the best companies that might perform better in the future. This system is based on fundamentals of companies. The companies which have better fundamentals than the rest in a chosen sample will be picked to be added in the main portfolio. The rules of the ranking system are as follow:

— **Margins (The effect rate is 25%)**

- Operating Margin (%) Trailing 12 months. (The effect rate is 50%)

This is a value which measures percent of revenues remaining after paying cost of goods sold and all operating expenses in the last 12 months. It is calculated as operating income divided by Total Revenue for the period as expressed for the percentage. The company which have the highest operating margin in its industry will increase the overall rank of the company. In margins' ratios, the most important one is operating margin trailing twelve months due to highest effect rate of 50%. Operating income is defined as:

$$(\text{Total Revenue} - \text{Cost of goods sold} - \text{All operating expenses}) = \text{Operating Income}$$



$$(\text{Operating income} / \text{Total Revenue}) \times 50\%$$

- Operating Margin (%) average of last 5 years. (The effect rate is 25%)

Finding Operating Margins of each of the last 5 fiscal years and then averaging the values. It is essential to focus on stable companies that can be predicted. Since theory of the main strategy focuses on stable companies which have enough amount of current assets, this rule will eliminate the less stable companies which help investors to make a final decision on investing in these companies.

$$(\text{Average of last 5 years' Operating Margin} \times 25\%)$$

- Excess Gross Margin Formula. (The effect rate is 25%)

This value measures the percent revenue left after paying all direct production expenses. This is a universe comparison. Universe comparison means that finding highest gross margin rate in comparison to all companies derived from the main sample or index. It is calculated as:

$$((\text{Total Revenue} - \text{Total Cost of Goods Sold}) / \text{Total Revenue}) \times 25\%$$

— **Turnover (The effect rate is 25%)**

- Asset Turnover Trailing 12 months. (The effect rate is 50%)

This value is calculated as the Total Revenues divided by the average Total Assets for the same period. This rule is an industry comparison, higher values are gathered to make the final decisions on choosing which companies to invest. Average Total assets is calculated by taking the average of beginning and ending of the last 12 months.

$$(\text{Total Revenue} / ((\text{Beginning Total assets} + \text{Ending Total Assets}) / 2)) \times 50\%$$

- Average Asset Turnover of last 5 years. (The effect rate is 50%)

Asset Turnover is calculated for each of the last 5 fiscal years, then taking the average of total 5 years' Asset Turnover. Another rule for determining the stable companies. The companies which have higher values are gathered to choose the most stable companies.

$$(\text{Total Asset Turnover of last 5 fiscal years} / 5) \times 50\%$$

— **Return on capital (The effect rate is 25%)**

- Return on investment (%) of last 12 months. (The effect rate is 30%)

This value is calculated as the trailing 12 months income after tax divided by the average long-term debt and shareholder's equity, expressed as percentage. Long-term debt and shareholder's equity are calculated as the average of their beginning period and ending period. The companies which have higher return on investment in their industries are gathered to be chosen.

$$(\text{Income after tax} / (\text{The average long-term debt} + \text{Average Shareholder's Equity})) \times 30\%$$

- Average return on investment (%) of the last 5 years. (The effect rate is 40%)

Each year's return on investment in the last 5 years (last 60 months) would be summed to find the average of return on investment in last 5 years, expressed as percentage. Another stability condition to choose the most stable companies in their industries. Higher values are gathered to make a final decision. In return on capital conditions, the weight of this ratio is the highest one in the return on capital ratios.

$$(\text{Sum of each year's return on investment in the last 5 years} / 5) \times 40\%$$

- Return on equity (%). (The effect rate is 10%)

The value is calculated as the income before extraordinary items for the period divided by the average common equity and is expressed as percentage. Average common equity is the average of the common equity at the beginning and the end of the period. This value is also an industry comparison. The companies which have higher return on equity are chosen to make a decision.

$(\text{Income before extraordinary items} / ((\text{beginning common equity} + \text{ending common equity}) / 2)) \times 10\%$

- Return on equity 5-year average. (The effect rate is 20%)

Each year's return on equity in the last 5 years would be summed to find the average of return on equity in the last 5 years, expressed as percentage. Another stability condition for the portfolio.

$(\text{Sum of the return on equity of each year in the last 5 years} / 5) \times 20\%$

— **Finances. (The effect rate is 25%)**

- Interest Coverage ratio of Trailing 12 months. (The effect rate is 50%)

Also known as Times Interest Earned, this is the ratio of Earnings before Interest and Taxes for the trailing twelve months divided by trailing twelve months' interest expense. This is a comparison in the industry. In order to detect who earns the most on the interest payments they make. This is a very essential ratio in finances rules which have %50 effect rate which will play a key role in the overall rank of a company.

$(\text{Earnings before interest and tax of trailing twelve months} / \text{Interest expense in the same period}) \times 50\%$

- Average Interest Coverage of last 60 months (5 years). (The effect rate is 30%)

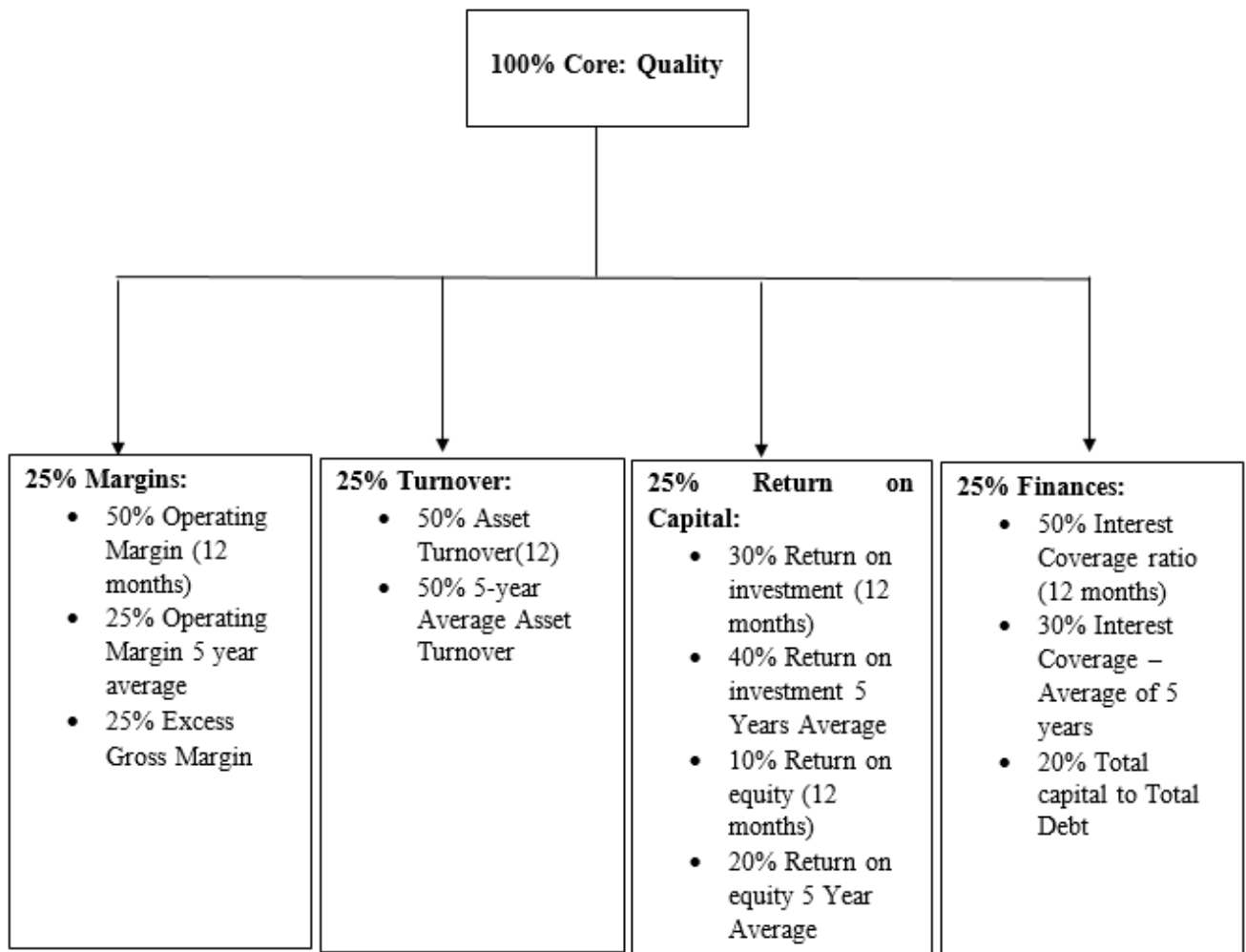
Each year's Interest Coverage ratio in the last 5 years would be summed to find average of Interest Coverage ratio in the last 5 years. This is a comparison in the industry. Another stability factor in the finance part of the ranking system.

$((\text{Sum of Interest Coverage ratio of each year in the last 5 years}) / 5) \times 30\%$

- Total capital to total debt of trailing 12 months. (The effect rate is 20%)

This ratio is Total Capital divided by total debt in the last 12 months. Total capital is the sum of short-term debt, current portion of long-term debt, long-term debt, capitalized lease obligations and total stockholder's equity.

$(\text{Total Capital} / \text{Total Debt}) \times 20\%$



**Fig. 6.** Ranking System: Quality

In Figure 6, represents whole ranking system of quality. All the scores from the parts respectively margins ratios, turnover ratios, return on capital ratios, and the ratios of finances are added to find the ultimate score of the companies that passed my main condition and rules. The companies which have highest scores are chosen to invest and create the ultimate portfolio. It depends on an investor to decide how many companies should be in a portfolio. In order to have a diversified portfolio, investors might choose 5, 10, 15, 20, 25, and 30 companies in their portfolios. With the strategy and the ranking system described focuses on very specific companies, which is why there aren't a lot of companies that can pass these criteria. Thus, new methodology focuses on excess current assets and ranking system to create a portfolio in order to outperform the market.

### 3. Data and research methodology

One of the main aims of this study is to give empirical evidence for the strategy of Net Current Asset Value (NCAV) that has been employed since the 1930s. NCAV is employed in this study as a criterion to select stocks to invest and observe their performances under different conditions. The performance of this strategy is compared to its benchmark NASDAQ. NASDAQ is a Stock Market that has more than 3000 companies. The following formula is applied to determine the companies that can pass our criteria.

$$(Total\ Current\ Assets - Total\ Liabilities) \geq Market\ Capitalization \times 1.5$$



Net Current Asset Value

Or it can also be formulated as:

$$(Market\ Price\ Per\ Share \div Net\ Current\ Assets\ Per\ Share) \leq 0.665$$

When a company's market price per share is lower than or equal to 66.5% of its net current asset value per share of the same company, this company is an undervalued company. In other words, a bargain opportunity for investors. It is believed by investors that this mispricing should be fixed in the near term or long-term by the market participants due to its good fundamentals. As the main sample, NASDAQ is used which has more than 3000 companies. All these companies' prices and fundamentals' data are observed in Portfolio123 which are supplied by Compustat, Standard & Poor's, S&P Capital IQ and Interactive Data<sup>x</sup>. The study period covers approximately 15 years since the beginning of 2004 to June of 2019.

To observe the performance of the criteria, all companies that passed the criteria are gathered in one portfolio. However, these companies are observed in other portfolios by adding different conditions such as volume and time period of holding the companies, in other words rebalancing period. In rebalancing dates or calculating the returns, opening prices are used to calculate the returns. If a company gives a dividend, dividend effect is also added to the prices in order to have an accurate performance of these companies in terms of returns. In order to avoid survivorship bias, delisted companies are also included in the portfolio during the testing period. In addition, adjustments are also made in accordance with splits. Companies are held until they don't fit the criteria or conditions anymore, that is when it is sold or renewed by other companies that fit the criteria. When rebalancing occurs, the companies' trailing 12 months' financial statements are used to select stocks. Moreover, in all of the portfolios tested in this study, investment is equally invested to each company that forms the portfolio. The list below represents all the back-testing and different conditions that have been tested in this study.

- NCAV-Portfolio 1-4-week (Monthly) rebalancing period is observed.
- NCAV-Portfolio 2-26-week (6 Months) rebalancing period is observed.
- NCAV-Portfolio 3-52-week (Annually) rebalancing period is observed.

- NCAV-Portfolio 4-4-week (Monthly) rebalancing period is observed with a volume condition. Before the rebalancing date, average number of shares traded in the last 10 days (Business days) should be higher than 100 000 shares.

- NCAV-Portfolio 5-4-week (Monthly) rebalancing period is observed with a volume condition. Before each rebalancing date, average number of shares traded in the last 10 days should be higher than 1 000 000 shares.

After the back-testing, the returns of the portfolios are compared to its benchmark, NASDAQ. The study observes that if the portfolios can beat its benchmark. In other words, whether the portfolios can outperform the market or not.

Later on, another strategy is developed to see if it can beat its benchmark's returns without worrying about spreads and illiquidity. New methodology focuses on companies whose current assets are higher than its total debt with a significant degree, this new methodology is decided to be called as Impact of Excess Current Assets (IECA). It is kind of similar to Net Current Asset Value strategy, **however IECA doesn't pay attention to market price of the chosen companies.** The formula of IECA can be described as:

$$(Total\ Current\ Assets/Total\ Liabilities) > 3$$

This strategy is employed in NASDAQ 100. NASDAQ 100 has the most liquid 100 companies which are heavily from healthcare and technology sectors. The time period for the back-testing of the new methodology is between the beginnings of January 2004 to June 2019. When this strategy is applied, the companies that pass the first criteria are chosen to be ranked in accordance with the ranking system of quality. In addition, after the first criteria, number of companies that are left on average is around 1 to 15 for almost every rebalancing period. A ranking system is applied in order to help investors to choose the stable companies from these companies. The reason is, not everyone would like to have a portfolio of 15 companies.

In this study, according to the strategy, the number of companies that passes the main criteria in average around 7.5 in accordance with every rebalancing period. Therefore, it is decided to have a portfolio of 5 companies. All portfolios are formed based on 5 companies. If the number of companies that fits the main criteria are very less, for example less than 5, then only these companies would be chosen to be invested. There wouldn't be a need for the ranking system. If the number of companies higher than 5, then ranking system is used to lower the numbers to 5. It is also important to note that, every rebalancing period for the first criteria, trailing 12 months of financial statements are used. According to the strategy, 7 different portfolios are tested to see the differences in the portfolios' returns.

- Portfolio 1- Only the ranking system of quality is tested. According to the ranking system, out of NASDAQ 100 companies, top 5 companies based on the ranking system are chosen to form a portfolio. The benchmark NASDAQ 100 is used to compare the returns of Portfolio 1. 26-week (6 months) of rebalancing period is used in portfolio 1.

- IECA - Portfolio 2- New methodology, IECA is used to determine companies whose total current assets higher than 3 times of the total liabilities. Main sample in this portfolio is NASDAQ 100.

Then, the ranking system is applied to choose highest scored 5 companies after the first criteria of IECA. 4 week (monthly) of rebalancing period is used in portfolio 2. The results are compared to its benchmark NASDAQ 100.

- IECA - Portfolio 3- IECA is used to choose the companies from NASDAQ 100. The companies whose total current assets higher than their total liabilities are chosen in the first step. After eliminating the companies that don't fit my first criteria, the ranking system of quality is used to rank the companies which passed the first criteria. Highest scored of 5 companies are chosen to form the portfolio 3. Rebalancing period is 26 weeks. The results are compared to the NASDAQ 100.

- IECA - Portfolio 4- IECA is used to determine the companies from NASDAQ 100. This time, the companies whose total current assets at least 2 times higher than their total liabilities are chosen for to be ranked in order to form the Portfolio 4. Rebalancing period is 26 weeks. Highest scored of 5 companies are chosen to form the Portfolio 4. The results will be compared to its benchmark NASDAQ 100.

- IECA - Portfolio 5- IECA is applied to NASDAQ 100 in order to find the companies whose total current assets 3 times higher than their total liabilities. After finding the companies that fit the first criteria, ranking system is used to form the Portfolio 5 by choosing the highest scored of 5 companies. 26 week rebalancing period is applied. The benchmark is NASDAQ 100.

- IECA - Portfolio 6- IECA is applied to NASDAQ 100. However, this time the companies whose total current assets are higher than 4 times of their total liabilities are chosen to be ranked. Later on, the ranking system is used to determine the highest scored 5 companies to form the Portfolio 6. Every 26 weeks, the portfolio is rebalanced. The benchmark NASDAQ 100 is used.

- IECA – Portfolio 7- IECA is applied to NASDAQ 100 to determine the companies whose current assets are 3 times higher than their total liabilities. Later on, ranking system is used to form the highest scored of 5 companies to form the Portfolio 6. However, this time rebalancing period is 52 weeks (Yearly).

The portfolios described until now are observed and tested in the next section in order to observe whether portfolios created can outperform the market.

#### 4. Research findings of backtesting the net current asset value strategy and the new methodology

After a detailed analysis and discussions of theories and hypotheses, the fourth part of the thesis not only questions the reliability of the returns of net current asset value strategy and also displays a new methodology to outperform the market. Net current asset value strategy and new methodology are tested in this section.

##### 4.1. Findings of backtesting net current asset value strategy

Net current asset value strategy is tested under different holding periods and different conditions. This strategy is tested with 5 different portfolios.

- **Portfolio 1-4-week rebalancing period.**

The companies in NASDAQ that fit the net current asset value criterion are gathered each month (20 business days) in this portfolio. Testing period is between 2004 and mid of 2019. The formula for the criteria is formulated as follows:

$$(Total\ Current\ Assets - Total\ Liabilities) \geq Market\ Capitalization \times 1.5$$

Due to monthly rebalancing, there might be new companies to add if they fit the criteria. On the other hand, new companies might be sold out from the portfolio if the companies don't fit the criteria in the end of each monthly rebalancing period. Portfolio 1 and its benchmark NASDAQ's returns are displayed in Figure 7.

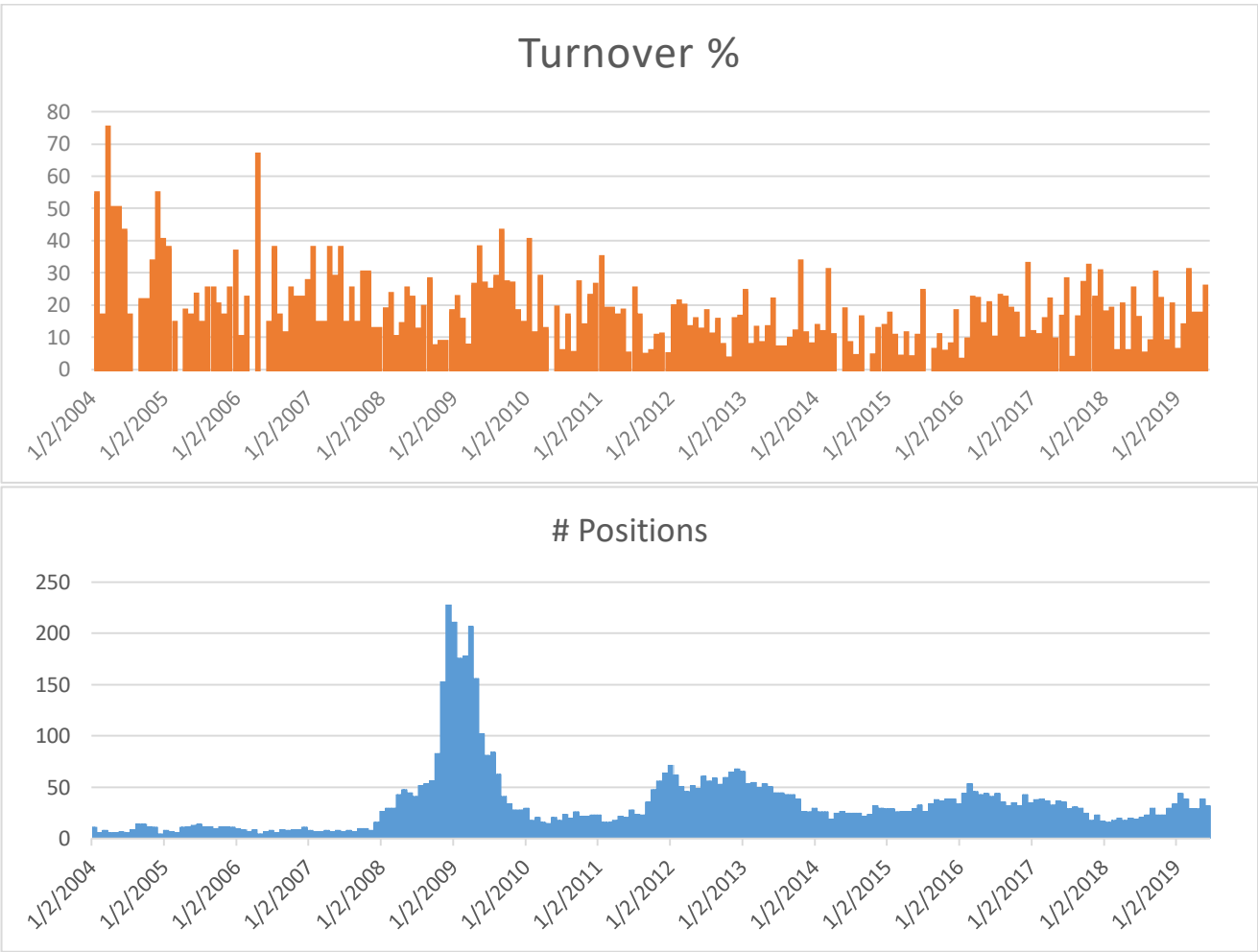


Fig. 7. Comparison of Portfolio 1's returns and NASDAQ's returns between 01/02/2004 and 06/21/2019. (4 week rebalancing period)



As it can be seen from Figure 7, net current asset value strategy outperformed the benchmark NASDAQ. While the strategy generated 16,396.88% return on investment during 15 years of period, the NASDAQ generated nearly 400% return on investment. In other words, whereas annual return of the strategy is 39.06% (without investment, only the return), NASDAQ generated annual return of approximately 9.36% (only the return).

If \$100,000 invested into this portfolio, portfolio's compounded value would be \$16,396,880. On the contrary, \$100,000 investment in NASDAQ would be worth around \$400,000 during the observed period between 2004 and mid of 2019. In this back-testing, while NASDAQ has a maximum drawdown of 54.75%, Portfolio 1 has a 76.03% maximum drawdown. This means that during any kind of recession in the market Portfolio 1 might be completely wiped out. In testing of Portfolio 1, results show that Portfolio 1 is riskier than NASDAQ even though it outperforms NASDAQ with a huge margin.



**Fig. 8.** Number of positions hold every rebalancing period and ratio of sold positions in the end of monthly rebalancing period.

In Figure 8, turnover ratio represents the number of companies sold divided by total number of companies in the portfolio before selling the companies. The decision to sell these companies are made in the end of the rebalancing period by regarding the formula. The companies that have a higher market

capitalization than the 66.5% of net current assets of the companies are sold in the end of each rebalancing period.

In the bottom chart, each column represents the number of companies held during each 4-week period. For instance, as it can be seen from the chart, during 2008-2009 financial crisis, number of companies that fit the criteria increased sharply. Until the ends of 2007 number of companies fit the formula in each month from lowest number to highest is respectively 5 and 16. In the last quarter in 2007, number of companies in the portfolio started to increase from 16 to 27, later in 2008 number of companies kept increasing from 50 to 228. In other words, in the last month of 2008, number of companies in the portfolio is exactly 228. Between 2004 and ends of 2007, the portfolio generated approximately a 300% return. During the financial crisis all these returns are lost. A retail investor holds positions in 228 different companies which might be a lot for individuals. Since 2008 to date of 06/21/2019, this kind of increase has never happened in the stock market. From number of positions held, abnormality in the stock market might be seen.

Net current asset value strategy mostly focuses on small and micro-cap companies if there is no recession. In recession, even big companies fall into this strategy which is a great discount opportunity for value investors. While small-cap companies can be described as whose market capitalization is between \$300 million and \$2 billion, on the other hand, micro-cap companies' market capitalization is less than \$300 million<sup>xi</sup>. By rebalancing each month, the strategy is able to catch most of the abnormal returns and bigger swings in the prices of these small and micro-cap companies. For instance, 4-week period between the date of 11/16/2015 and 12/14/2015 portfolio return was 173% in only one month. Another high example in the back-testing showed that 4-week period between 10/1/2007 and 10/29/2007 the return of the portfolio was 86% in one month. In Table 8, net current asset value strategy's results are summarized.

	Average number of companies held each month.	Return on investment	Maximum Drawdown	Average Turnover Ratio.	Std. Dev.
Portfolio 1	35	16396.88%	-76.03%	18%	67.20%
NASDAQ	-	399.22%	-54.75%	-	16.98%

**Table 8.** Summary of back-testing Portfolio 1 and NASDAQ.

During the study period, number of companies held in each month are calculated to find the average number of companies for 4 week holding period. Basically, an investor would be having approximately on average 35 companies in the portfolio each month.

It is important to note that maximum drawdown is the percentage sudden loss of the total value of the portfolio at the moment. Especially during 2008-2009 recession, while this number was 76.03% loss for the Portfolio 1, NASDAQ lost 54.75% of its value. This extreme downward movement can also be understood from Standard Deviation of the returns generated by Portfolio 1. Standard Deviation of Portfolio 1 is 67.20% which signals that, returns are extremely volatile not only for the upside, but also

downside. Net current asset value strategy rewards the investor with abnormal returns in good times, however in bad times, downside risk is also consistent with abnormality of returns.

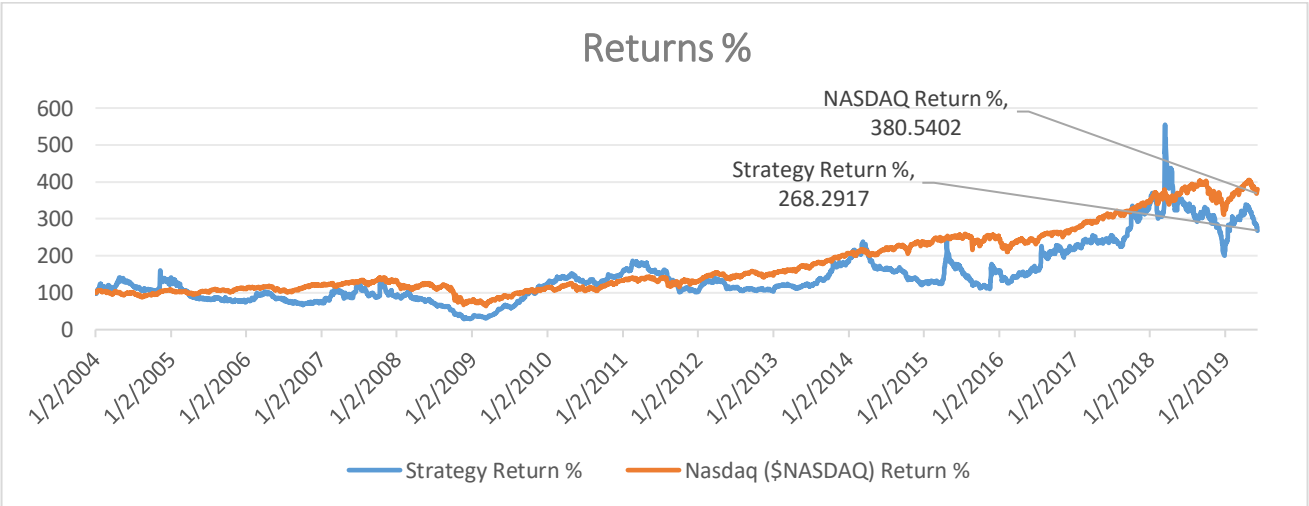
During this monthly rebalancing back-testing between 2004 to the date of 06/21/2019, number of observed 4-week period is 202. Out of 202 months, stock market (NASDAQ) has 137 up markets and 65 down markets. This means that NASDAQ generated negative returns for 65 months and positive returns for 137 months. While average returns of NASDAQ for these both up and down markets are respectively 3.52% and -4.85%, on the contrary Portfolio 1’s average returns for both up and down markets are respectively 7.01% and -3.72%. Portfolio 1’s average returns are calculated according to NASDAQ’s up and down markets.

In this monthly back-testing, volume is disregarded in order to show only the returns based on the price. This means that, with this strategy an investor might not be able to invest huge amount of money due to lack of information of volume. Volume is essential if someone would like to invest in companies with high amount of money.

Another situation to pay attention is that 4-week rebalancing period might be costly. Each month there are companies to be sold and to be bought. In Table 8, average turnover ratio is approximately 20%. This means that on average each month 20% of the companies in the portfolio are sold. This action might incur some commissions even though there are several no commission-based brokers. As a result, in order to reduce the cost some investors might want to hold the companies more than 4 week.

- **Portfolio 2-26-week rebalancing period.**

In Portfolio 2, only difference than portfolio 1 is that holding period is 26 weeks. 6 months are ideal to observe mid-term performance of the net current asset value strategy. Essentially, value investing focuses on buy and hold strategy for longer term investing. It is important to analyze performance of the strategy by increasing the holding period which will help investors to decide how to use net current asset value strategy.



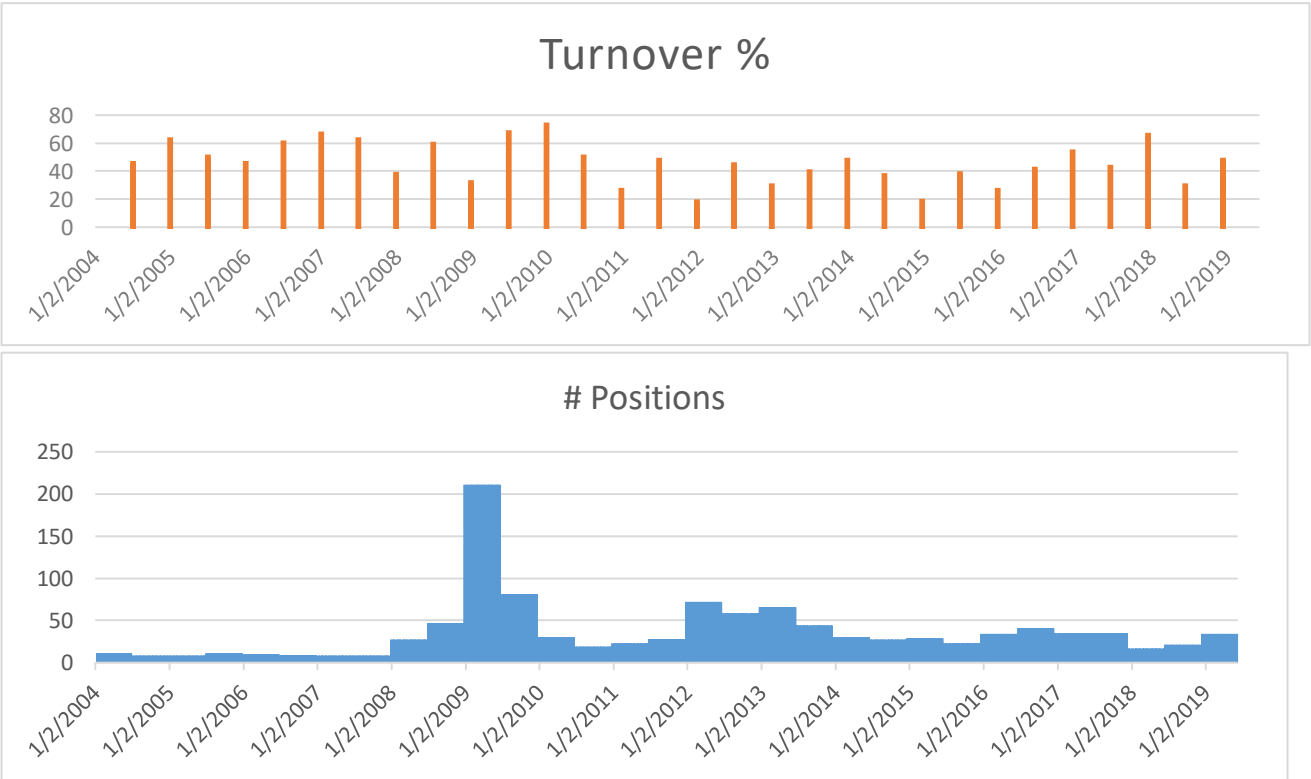
**Fig. 9.** Comparison of Portfolio 2’s returns and NASDAQ’s returns between 1/2/2004 and 6/7/2019. (26-week rebalancing period)

In Figure 9, strategy couldn't beat the market's returns. Holding companies for 26 weeks showed that returns are gone. Strategy underperformed NASDAQ's returns for most of the years during the 15-year period. While the strategy generated a 268.29% return over the 15 years, NASDAQ generated 380% return on investment. 26 weeks holding period's annualized rate of return is 6.61% (without investment only return). On the other hand, NASDAQ has a 9.05% annualized rate of return.

	Average number of companies held each 6 months.	Return on investment	Maximum Drawdown	Average Turnover Ratio.	Std. Dev.
Portfolio 2	35	268%	-82.00%	44%	42.37%
NASDAQ	-	381%	-54.75%	-	16.98%

**Table 9.** Summary of back-testing Portfolio 2 and NASDAQ.

26 week holding period also points out that maximum drawdown during 15 years is 82.06%. It is even riskier than 4 week holding period. During 2008-2009 financial crisis the portfolio was almost wiped out. Although underlying risk is high, strategy not only couldn't beat the market, but also underperformed the NASDAQ's returns. Table 9 also shows that by increasing the holding period, volatility of the returns for portfolio decreased. While standard deviation decreased from 67% to 42.37% for portfolio, NASDAQ's standard deviation is more reliable. There are smaller waves in the returns.



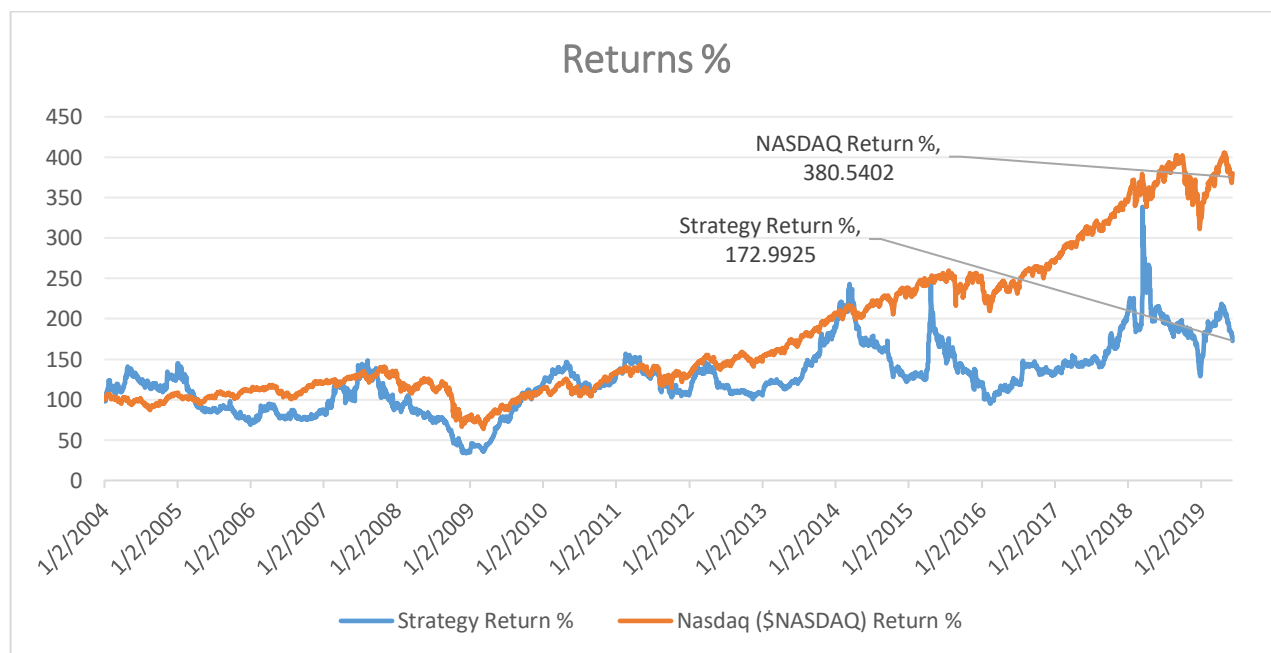
**Fig. 10.** Number of positions hold every rebalancing period and ratio of sold positions in the end of 26 week rebalancing period.

According to Figure 10, average turnover ratio during the study period is 44%. Each 6 months, almost half of the companies in the portfolio is sold. Average number of companies held in every 6-month rebalancing period is 35. By increasing the holding period turnover ratio increased from 18% to 44%.

Between 2004 and 06/07/2019, there are exactly 31 period of 6 months observed. NASDAQ has 22 up markets and 9 down markets. In the down markets, while NASDAQ's average return is -7.98%, Portfolio 2's average return was -17.89%. In the up markets, while NASDAQ can generate 10.37% on average, Portfolio 2 generated 19.40% return on average. It is important to note that, 26-week holding period outperformed the market if the market goes up. However, it can be seen that when the market goes down, 26 week holding period takes a big hit. Portfolio 2 underperforms the market during down markets. Once again, it is important to note that, volume factor is not included in this back-testing.

- **Portfolio 3-52-week rebalancing period.**

Only difference than other portfolios is that holding period is 52 weeks, a year. By holding companies for a year, the cost of buying and selling are decreased. Until the end of 2018, each portfolio created to hold for one year, only in 2019 which is the time of the back-testing done is 6 months. Yearly performance of the strategy is observed in Figure 11.



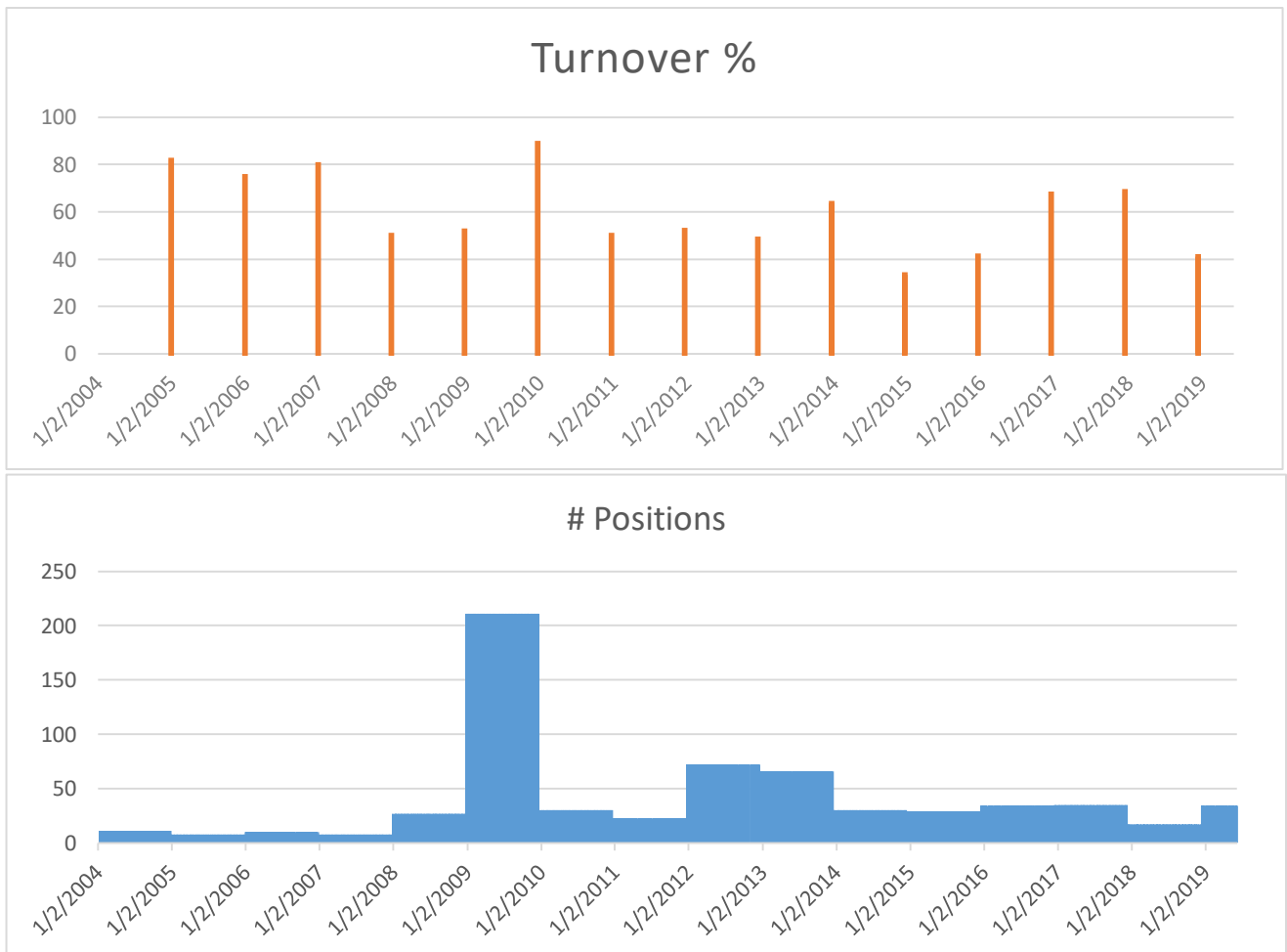
**Fig. 11.** Comparison of Portfolio 3's returns and NASDAQ's returns between 1/2/2004 and 6/7/2019. (52-week rebalancing period)

By increasing the holding period to a year, Portfolio's performance decreased even more. While Portfolio 3 generated 172.99% compounded return on investment, NASDAQ generated 380.54% compounded return on investment. As it can be seen in Figure 11, most of the years during the 15 years Portfolio 3 underperformed the market. Annualized return rate of Portfolio 3 is 3.62% (without investment, only the return), on the other hand NASDAQ has 9.05% (only the return, without investment) annualized rate of return.

	Average number of companies held each year.	Return on investment	Maximum Drawdown	Average Turnover Ratio.	Std. Dev.
Portfolio 3	40	172.99%	-76.99%	56%	36.19%
NASDAQ	-	380.54%	-54.75%	-	16.98%

**Table 10.** Summary of back-testing Portfolio 3 and NASDAQ.

Rebalancing period of 52 weeks showed that by holding companies selected according to net current asset value strategy, the strategy’s performance decreased sharply. Even though standard deviation of 36.19% showed that volatility of the returns decreased from 42.37% by holding a year, however, the strategy is not able to generate higher returns than the market according to Table 10. Strategy loses its power of taking advantage of sharp increases in the prices of these small companies if the companies are held for a long-term. Once again, strategy underperformed NASDAQ.



**Fig. 12.** Number of companies held in each year and ratio of sold companies to the overall portfolio before selling in the end of each year.

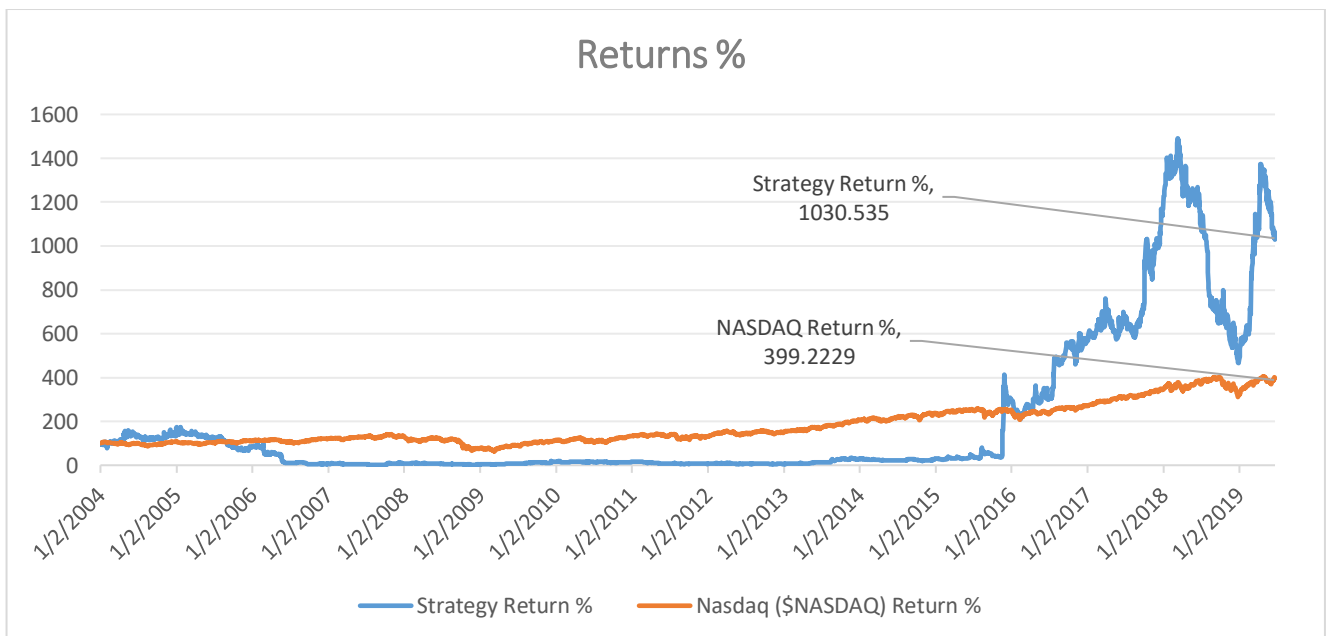
According to Figure 12, by increasing the holding period, turnover ratio increased from 44% to 56%. Each year, more than the half of companies in the portfolio is sold. Average number of companies held

each year increased from 35 to 40. During financial crisis of 2008-2009 number of companies held in 2009 reached at 211. Due to high spike of increase in number of companies held during 2009, average number of companies held each year increases from 28.5 to 40 for the overall back-testing of 15.5 years.

During yearly back-testing, there are 16 periods of markets observed between 2004 to the date of 6/7/2019. NASDAQ has 14 up markets and 2 down markets. During the 14 up markets, while NASDAQ generated on average 15.18% positive return for each year, Portfolio 3 generated a positive 23.87% average return for each year. In down markets, while NASDAQ generated an average return of negative 22.59% per year, Portfolio 3 generated an average 37.97% negative returns per year. It means that strategy beats the market during the bullish times of the market, however when the bear market starts, Portfolio 3's down potential is way higher than the NASDAQ. During the back-testing of yearly rebalancing period, volume isn't considered in the back-testing.

- **Portfolio 4 - 4-week rebalancing period, Volume condition added. (100,000 shares)**

Portfolio 1 is backtested with the volume factor. Volume is the number of shares sold to the buyers within specific time period. In Portfolio 4, last 10 trading days' average number of shares is added to decide which companies to invest because if there is no enough seller, the person who would like to invest high amount of money might not be able to get the number of shares without moving the price sharply. In other words, net current asset value strategy is employed with last 10 trading days' average number of shares together. Volume condition in back-testing Portfolio 4 is the average number of shares traded in the last 10 business days should be higher than 100,000 shares. By taking volume into account, the change in return is displayed in Figure 13.



**Fig. 13.** Comparison of Portfolio 4's returns and NASDAQ's returns between 1/2/2004 and 6/7/2019. (4-week rebalancing period, Volume condition added (100,000) shares).

By adding Volume condition, strategy lost most of its value over the years between 2005 and 2015. Strategy underperformed the market between 2005 and 2015. After 2015, strategy started to generate

higher returns than the market itself. In the end of testing period, accumulated return of the strategy is 1030.54% on investment. On the other hand, NASDAQ has a compounded return of 400% on investment. While the annualized return of strategy is 16.28% (only the return), NASDAQ has an annualized return of 9.36% (only the return). It can be seen that the strategy beats the market, however all these gains realized after 2015.

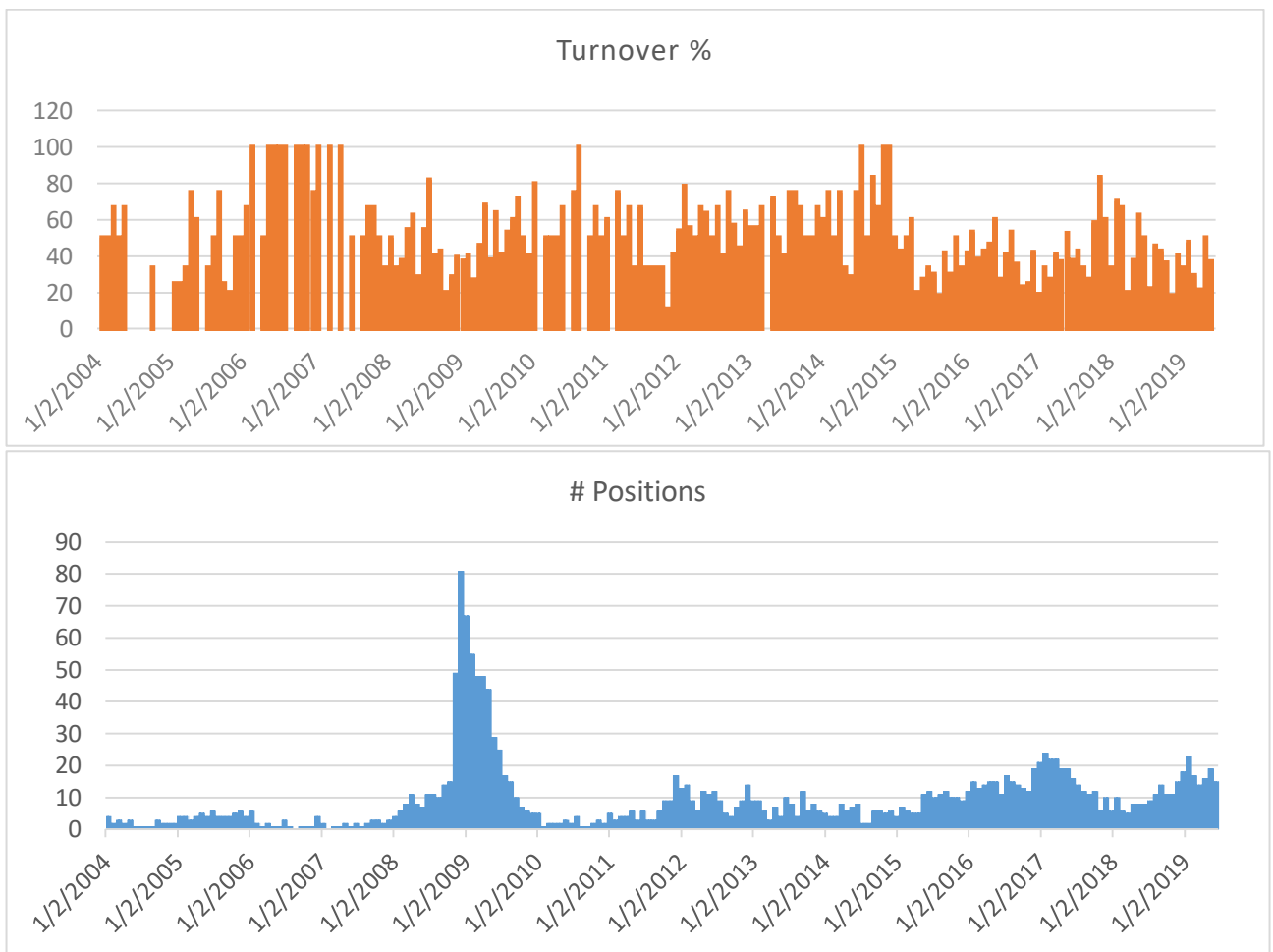
	Average number of companies held each month.	Return on investment	Maximum Drawdown	Average Turnover Ratio.	Std. Dev.
Portfolio 4	9.33	1030.53%	-98.97%	47%	228.93%
NASDAQ	-	399.22%	-54.75%	-	16.98%

**Table 11.** Summary of back-testing Portfolio 4 and NASDAQ.

In Table 11, average number of companies held in Portfolio 4 is 9.33 which is very low in comparison to 35 which is the average number of companies held in Portfolio 1. If strategy is tested by only looking at prices, Portfolio 1 has an outstanding annual return rate of 39.06%. However, if there is no volume, it means that there are no buyers and sellers. Illiquidity problem starts to show up. Investor who would like to sell, might not be able to sell because there are no buyers. Even though volume should be higher than only 100,000 shares which should be the average of the last 10 trading days, yet the strategy has a very low number of companies that fits the condition. In another words, high amount of money might not be able to be invested in these companies due to lack of liquidity. Otherwise, in Table 11, maximum drawdown of the portfolio is 98.97% which shows that an investor lost 98.97% of its portfolio value. Coming back from that loss would take years. As it can be seen from the Figure 13, from the date of 9/6/2005 to the date of 1/11/2016 strategy underperformed the market.

Standard deviation of the strategy also shows this abnormality in this Portfolio 4. **Price swings are very big and random, not consistent. This also confirms that lack of Volume changes the returns sharply. A back-testing without a volume loses its meaning if the money invested isn't small such as \$10,000. Because there aren't enough number of buyers or sellers for these small companies in the market. The person who invest in this company, might not be able to get out from the position at once. It might take time, which will be costly for the investors who invest in these small illiquid companies.**





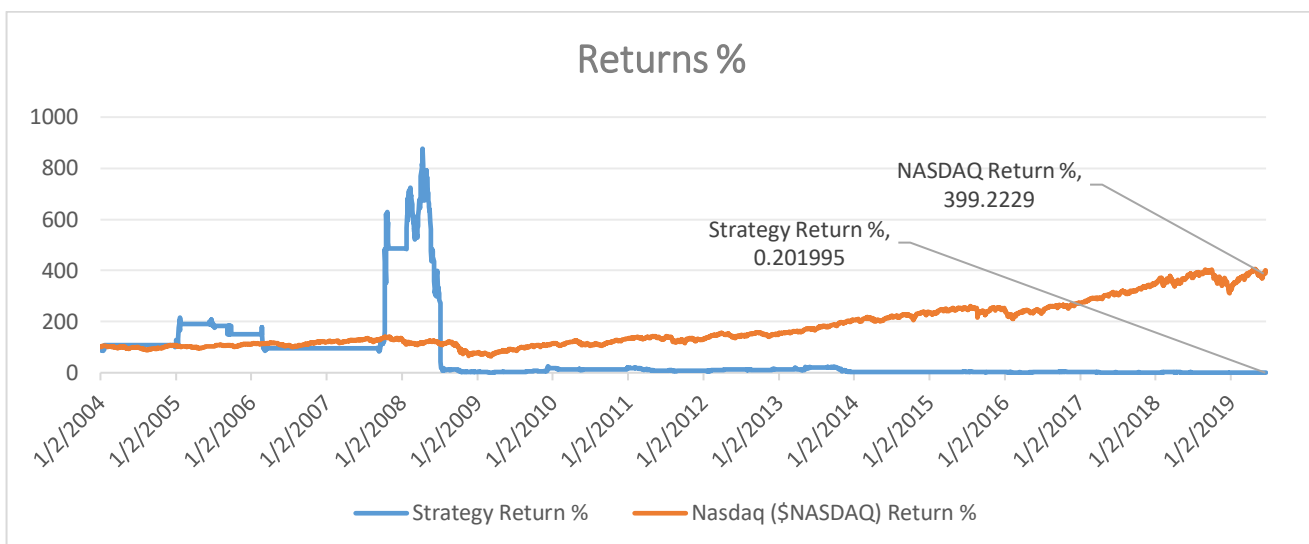
**Fig. 14.** Number of companies held in each month and ratio of sold companies to the overall portfolio before selling in the end of each month.

In Figure 14, it can be seen that the number of positions held in Portfolio 4 is very less comparison to other portfolios. This is due to volume condition. Volume condition applied in Portfolio 4, tries to eliminate companies that has very low liquidity. However, when volume condition is applied, the annual return of 39.06% of the Portfolio 1 dropped to an annual return of 16.28%. Not only the gains dropped, but also reliability of the returns also dropped because of inconsistency in returns. In addition, the strategy underperformed the NASDAQ between 2005 and 2016.

Volume condition is crucially essential in investing, even 100,000 shares traded in a day is not enough for big institutions to take a position of millions of dollars in one company.

- **Portfolio 5 - 4-week rebalancing period- Volume condition added. (1,000,000 shares)**

For investors or institutions who manages millions might not be able to invest if there is not enough liquidity in the stock market. For this purpose, last 10 trading days' average number of shares traded should be at least 1,000,000 for any company, so that millions can be invested in these companies without moving the price of the company. By combining volume and net current asset value strategy, it can be seen that the performance of the strategy lost its value which is displayed in Figure 15.



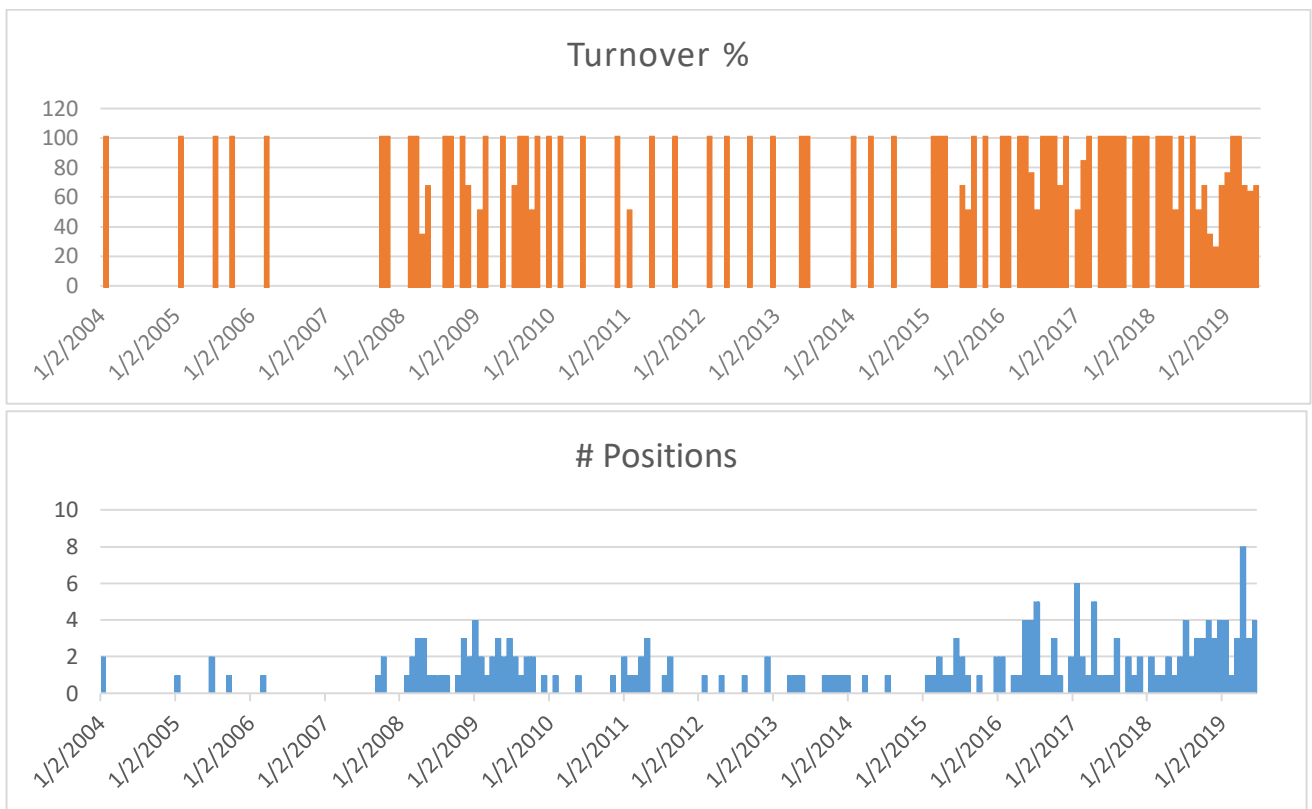
**Fig. 15.** Comparison of Portfolio 5’s returns and NASDAQ’s returns between 1/2/2004 and 6/7/2019. (4-week rebalancing period, Volume condition added (1,000,000) shares).

Strategy lost all the value it has. The return of the strategy is -99.99%. **Figure 15 shows that there is no company held in most of the months, because number of companies that passes the criteria and volume condition is very less.** That is why there are no proper companies for asset management companies, money managers to use this strategy to find companies to invest. The strategy works very well for very small budget investors as it can be seen from the performance of Portfolio 1.

	Average number of companies held each month.	Return on investment	Maximum Drawdown	Average Turnover Ratio.	Std. Dev.
Portfolio 5	1.01	-99.99%	-99.99%	37%	137.36%
NASDAQ	-	399%	-54.75%	-	16.98%

**Table 12.** Summary of back-testing portfolio 5 and NASDAQ.

However, Table 12 shows that average number of companies held for every rebalancing is around 1. This shows that there is no diversification. Due to risking all the investment in one company, results in loss of all the investment throughout the years. This strategy can be used during financial crisis to find long and hold companies, however it is only in bad times. In good times, it is very hard to find undervalued companies that have liquidity by using net current asset value strategy.



**Fig. 16.** Number of companies held in each month and ratio of sold companies to the overall portfolio before selling in the end of each month.

In Figure 16, it can be seen that there are many months that there is no available company that fits conditions applied such as volume and strategy. In Portfolio 5, average number of companies held each month decreased from 9.33 to 1.01 in comparison to Portfolio 4.

Returns are more reliable with volume, in other words liquidity. When there is enough liquidity in any specific stock, within one day the stock's number of shares traded can reach at least a few millions. These kinds of companies are more attractive to all kinds of investors, institutions. **Returns of net current asset value strategy based on only prices look very attractive, however the applicability of the strategy in live investing environment is very hard to employ due to lack of liquidity. When there is no liquidity, this will cause two problems. The spread of buy and sell prices are huge enough to make any investor automatically be in loss %10. Secondly, amount of money invested should be a small part of its daily volume, otherwise big amount of money will affect the price sharply. It means that, the price an investor wants to get will be way different than the one an investor will be able to get.** In other words, the price will increase if the investor buys a lot more than average number of shares in specific time period.

#### **4.2. Backtesting a new methodology: Impact of excess current assets in liquid stocks.**

Net current asset strategy shows that there are many opportunities in the small and micro-cap companies. However, adding the volume condition into strategy results in inconsistent returns and even loss of investment. Due to very low volume in the small and micro-cap companies, big parties such as

institutions and retail investors who manage millions might not be able to use the strategy to make investment decisions. However, this doesn't mean strategy isn't beneficial. Net current assets value strategy uses market price which should be lower than the net current asset value. However, if this condition is removed, this will allow investors to invest in all kind of companies, especially big-cap, medium cap. In this methodology, the main focus is only the excess current assets without considering the market price of the companies which will be essential to choose companies to invest. Since, net current asset value strategy struggles due to lack of liquidity in the small cap market, for choosing companies for the portfolios NASDAQ 100 will be used as a sample. NASDAQ 100 includes the biggest 100 non-financial companies in NASDAQ stock market. By focusing on NASDAQ 100 companies, the problem of low volume will be removed. As a result, big parties in the market will be able to use this strategy to make investment decisions.

- **Portfolio 1 - 26-week rebalancing period (Testing the ranking system).**

Core quality ranking system is tested only to show the effect of the ranking system in the study. The main focus is actually excess current assets, ranking system is only needed to create a diversified portfolio rather than choosing all the companies that fit the criteria of excess current assets. In Portfolio 1, only the performance of the ranking system is observed.<sup>1</sup> The main criteria of having higher current assets than total liabilities to select companies is excluded in Portfolio 1. Another condition used is that last 10 days' average number of shares traded is at least 1 million shares in order to avoid illiquid stocks. The performance of ranking system compared to NASDAQ 100 is displayed in Figure 17.



**Fig. 17.** Returns of Portfolio 1 and NASDAQ 100 for 26-week rebalancing period.

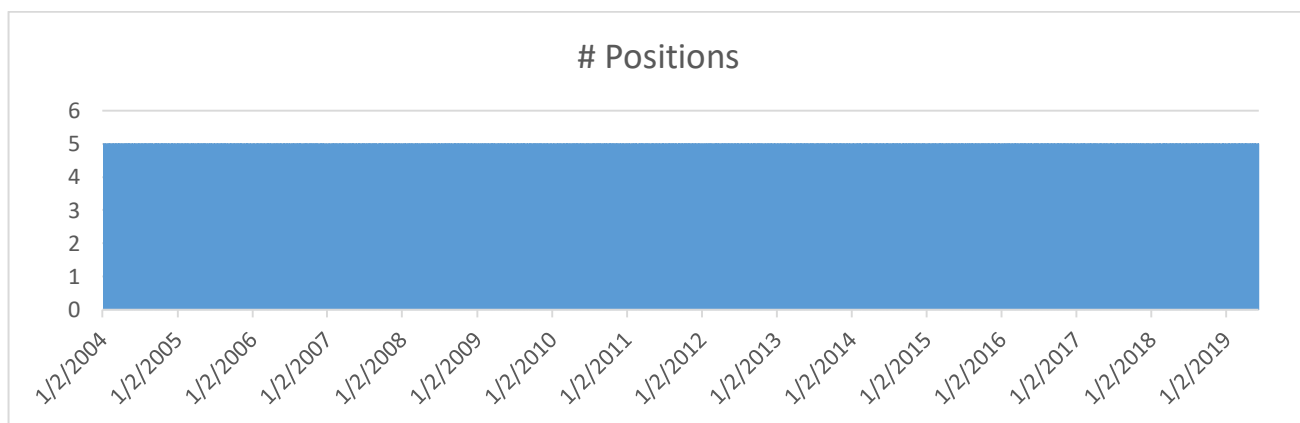
Figure 17 shows that by using only the ranking system investors would have generated an annual return of 12.54% (only the return, investment is not included) between the beginning of 2004 and June of 2019. On the other hand, NASDAQ 100 generated an annualized return of 11.03%. Backtesting the ranking system, only 5 companies which have the highest rank is chosen to be included in Portfolio 1.

<sup>1</sup> Ranking system's rules are described under the subsection 2.3.1 Ranking system: Quality. Ranking system is also taken from <http://www.portfolio123.com/>.

	Average number of companies held each 6 months.	Return on investment	Maximum Drawdown	Average Turnover Ratio.	Std. Dev.
Portfolio 1	5	619.19%	-51.52%	23%	20.03%
NASDAQ 100	-	502.58%	-53.13%	-	17.30%

**Table 13.** Summary of back-testing Portfolio 1 and NASDAQ 100.

Each 26-week period during the testing period, number of companies that fits the rules of ranking system is higher than 5. Highest ranked 5 companies are chosen to create Portfolio 1. Maximum drawdowns of both NASDAQ 100 and Portfolio 1 is very close. Volatility of the returns are very consistent with each other for NASDAQ 100 and Portfolio 1 because the standard deviations are very close to each other. It means that returns of Portfolio 1 is also consistent and reliable. It is also important to note that total number of periods observed between 2004 and June of 2019 is 31. Out of 31 period, there are 24 up markets and 7 down markets. While Portfolio 1 in up markets has on average 12.02% return, NASDAQ 100 has on average 10.92% return. In down markets, NASDAQ 100 has -10.37%, on the other hand Portfolio 1 has on average -9.84% return.



**Fig. 18.** Number of positions in each 26-week period.

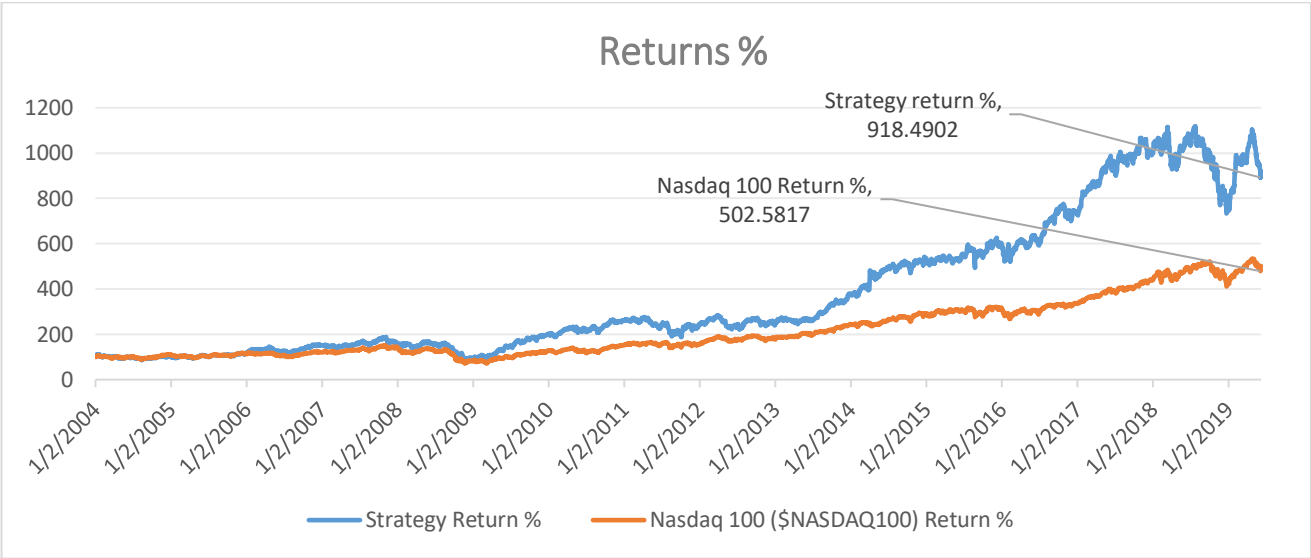
Average turnover ratio shows that each 26 weeks, almost one company out of 5 companies is sold and a new one added. It can be seen that Portfolio 1 closely follows the NASDAQ 100's performance, there isn't any kind of abnormal returns than the market. However, ranking system allows investors to rank the high number of companies to choose the superior ones.

- **Portfolio 2 - 4-week rebalancing period (IECA + Ranking system)**

In testing Portfolio 2, the first criteria to choose companies from NASDAQ 100 is that total current assets of a company should be higher than 3 times of total liabilities of the same company. In other words, out of 100 companies, the companies that have excess current assets are chosen to be ranked to create Portfolio 2. The formula used as first criteria is as follows:

$$(Total\ Current\ Assets/Total\ Liabilities) > 3$$

Last condition applied is that the last 10 trading days' average number of shares is at least 1,000,000 shares in order to avoid illiquid stocks. Conditions are applied between 2004 and the date of 06/07/2019. The performance of Portfolio 2 is displayed in Figure 19.



**Fig. 19.** Returns of Portfolio 2 and NASDAQ 100 for 4-week rebalancing period.

By combining the first criteria and ranking system allows investors to create a portfolio of 5 companies generated a total return of 918.49% on investment during the testing period. Portfolio 2 almost doubled the returns of NASDAQ 100. While the annual return of the strategy is 15.46% (only the returns, investment isn't included) over the 15 years of period, NASDAQ 100 has an annual return of 11.03%. Combining the criteria of excess current assets strategy with ranking system generated a higher return than Portfolio 1 and NASDAQ 100.

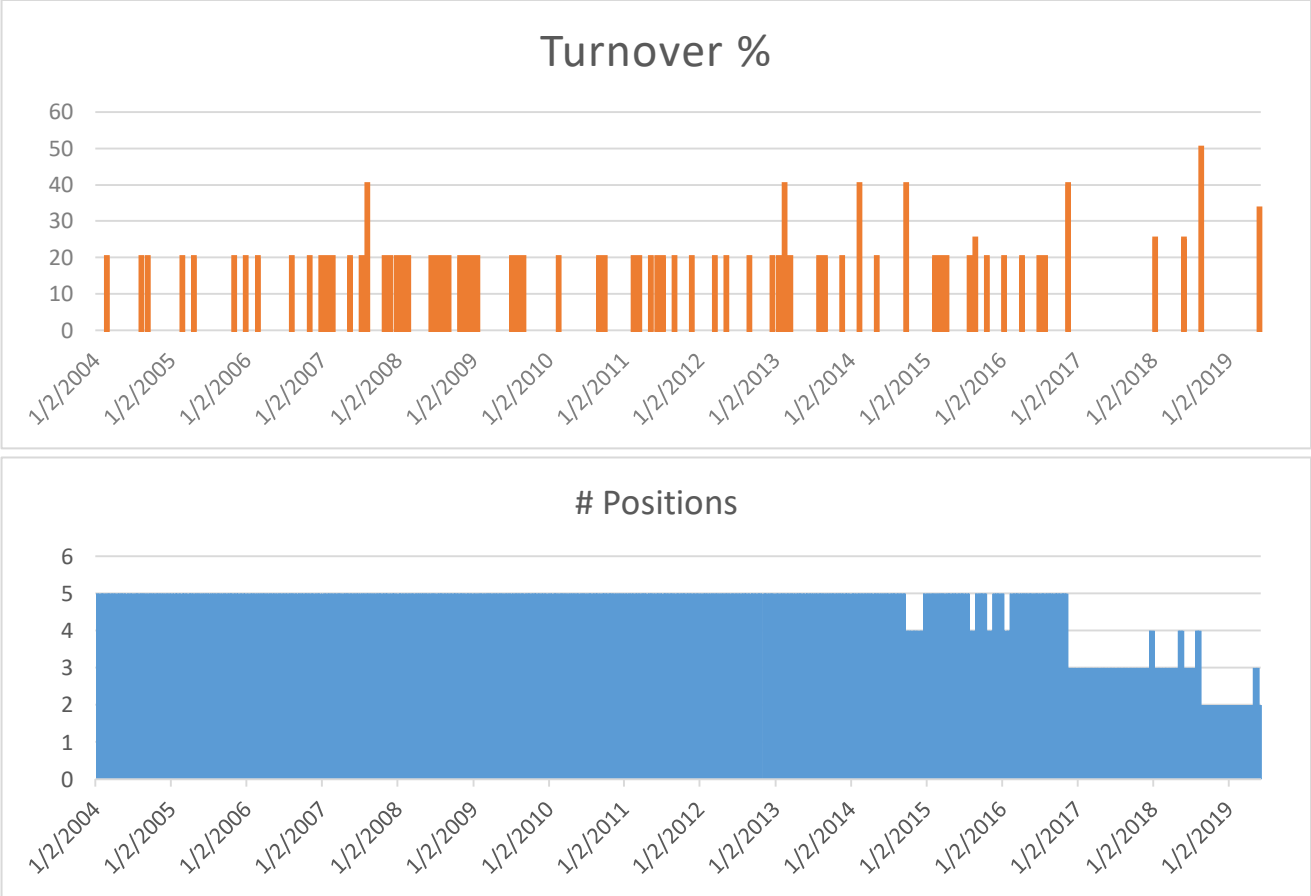
	Average number of companies held each 4-week period.	Return on investment	Maximum Drawdown	Average Turnover Ratio.	Std. Dev.
Portfolio 2	4.6	918.49%	-54.57%	8%	23.22%
NASDAQ 100	-	502.58%	-53.13%	-	17.30%

**Table 14.** Summary of back-testing Portfolio 2 and NASDAQ 100.

As it is displayed in Table 14, average number of companies that fits the criteria and the volume condition is 4.6. In forming Portfolio 2, if the number of companies that fit the criteria and conditions applied higher than 5, ranking system is employed to form a portfolio of 5 companies. If there are no more than 5 companies at the moment of rebalancing period, 5 companies are chosen to create the portfolio. Even if it is less than 5, all the money is invested equally to the companies available that fit the criteria.

Even though Portfolio 2 outperformed the NASDAQ 100, maximum drawdowns are approximately the same. From the standard deviations, volatility of returns of NASDAQ 100 and Portfolio 2 is close

to each other. It means that returns of Portfolio 2 are consistent and reliable. Out of 202 observed periods in back-testing Portfolio 2, there are 134 up markets and 68 down markets. While the average return of up markets for Portfolio 2 is 4.06%, NASDAQ 100 has average return of 3.66% for each month. In the down markets, while Portfolio 2 has an average return of -4.13%, NASDAQ 100 has an average return of -4.45%.

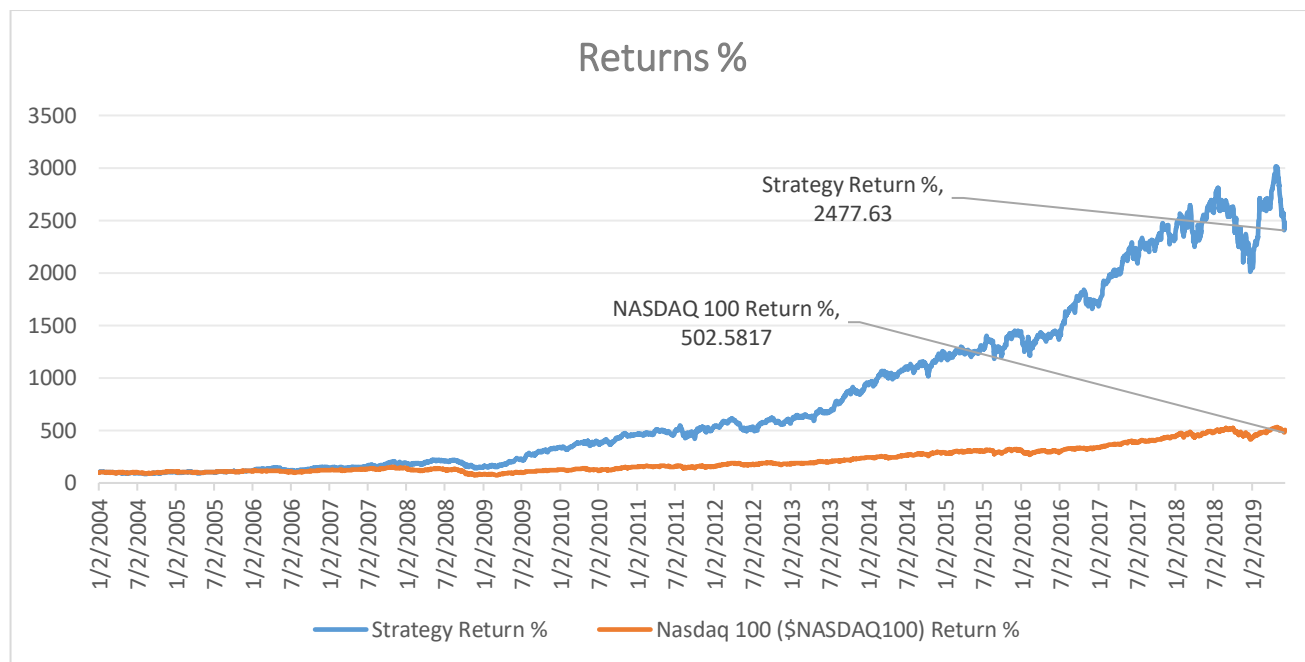


**Fig. 20.** Number of positions held for each month and the turnover ratio for each month over the testing period. In Figure 20, it can be seen that the number of companies that fit the conditions applied decreased. Especially, after 2015 number of companies in the portfolio changed between 5 and 2. Having only two company in the portfolio might increase the level of risk due to less diversification. Average turnover ratio is 8% during the back-testing period. Holding companies for a short term by rebalancing portfolio each month shows that Portfolio 2 can outperform the market, however it is also important to see the performance of the strategy in the mid-term and long term.

- **Portfolio 3 - 26-week rebalancing period (IECA + Ranking System)**

The difference of Portfolio 3 than Portfolio 2 is that holding (rebalancing) period is 26 weeks. Every 6 months, from NASDAQ 100, the companies that fit the conditions applied are added to Portfolio 3. If the number of companies that fit the conditions is more than 5, ranking system is applied to choose highest ranked 5 companies for the portfolio, otherwise companies that pass the conditions are directly

chosen to form the Portfolio 3. The performance of Portfolio 3 and NASDAQ 100 is displayed in Figure 21.



**Fig. 21.** Returns of NASDAQ 100 and Portfolio 3 for 26 week holding period.

By increasing holding period from 4 weeks to 26 weeks, total return on investment increased from 918.49% to 2477.63% during testing period. Portfolio 3 outperformed the Portfolio 2 and NASDAQ 100 as well, with a big difference on returns. Annualized return of Portfolio 3 is 23.13% (only the return, investment isn't included), on the other hand NASDAQ 100 has an annualized return of 11.03%.

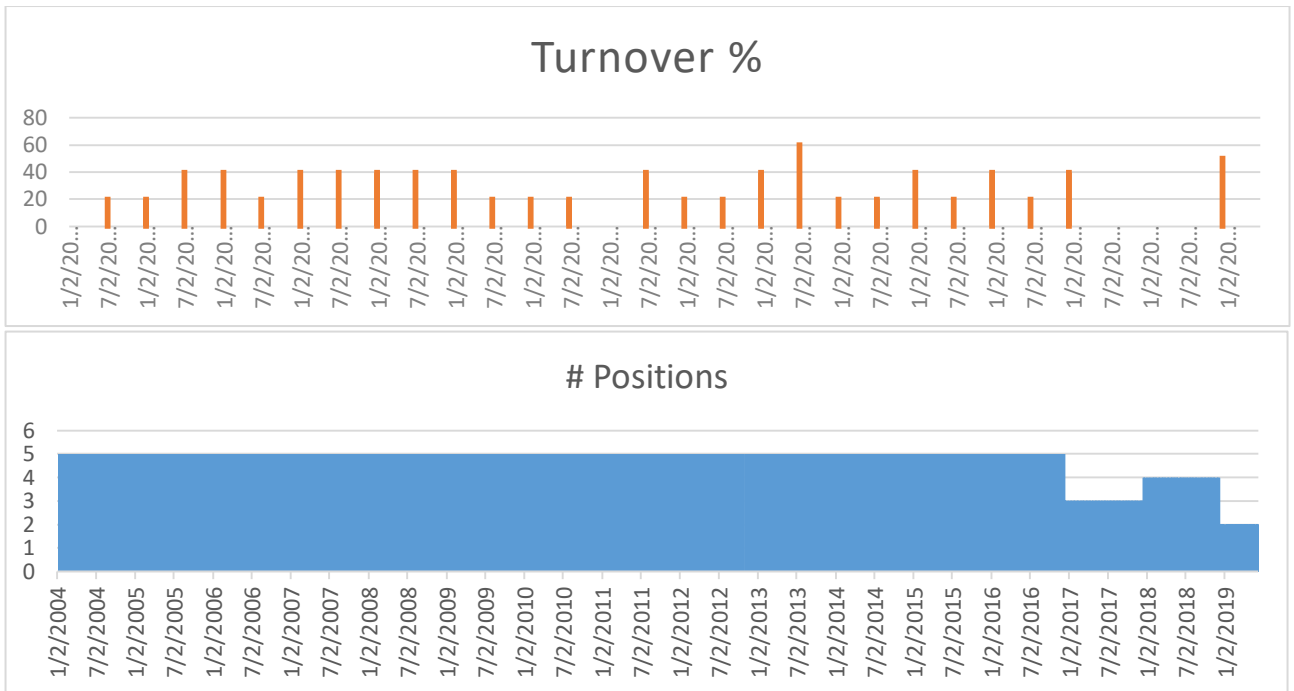
	Average number of companies held each 26-week period.	Return on investment	Maximum Drawdown	Average Turnover Ratio.	Std. Dev.
Portfolio 3	4.71	2477.63%	-35.97%	27%	22.10%
NASDAQ 100	-	502.58%	-53.13%	-	17.30%

**Table 15.** Summary of back-testing Portfolio 3 and NASDAQ 100.

Table 15 displays that average number of companies held each rebalancing period is 4.71. By holding the companies 26 weeks, shows that maximum drawdown is less than NASDAQ 100. The risk of portfolio is less than NASDAQ 100 itself, because some companies in the portfolio give dividends which lowered the sharp decrease during the 2008-2009 financial crisis. In every rebalancing period, there is at least one company that gives dividends. It is also important to note that average turnover ratio is 27% which shows that each 6 months on average only 1.27 companies are sold. 22.10% of standard deviation for the Portfolio 3 shows that returns are consistent and reliable. From Table 15, return on investment shows that IECA combined with ranking system is more reliable and profitable in the mid-term. Since the main idea of the strategy is to choose companies that have excess net current assets which if these assets are used wisely, these companies are most probably the winners in the long



run. From the back-testing Portfolio 2 and Portfolio 3, this difference can easily be seen from the returns of the strategy.

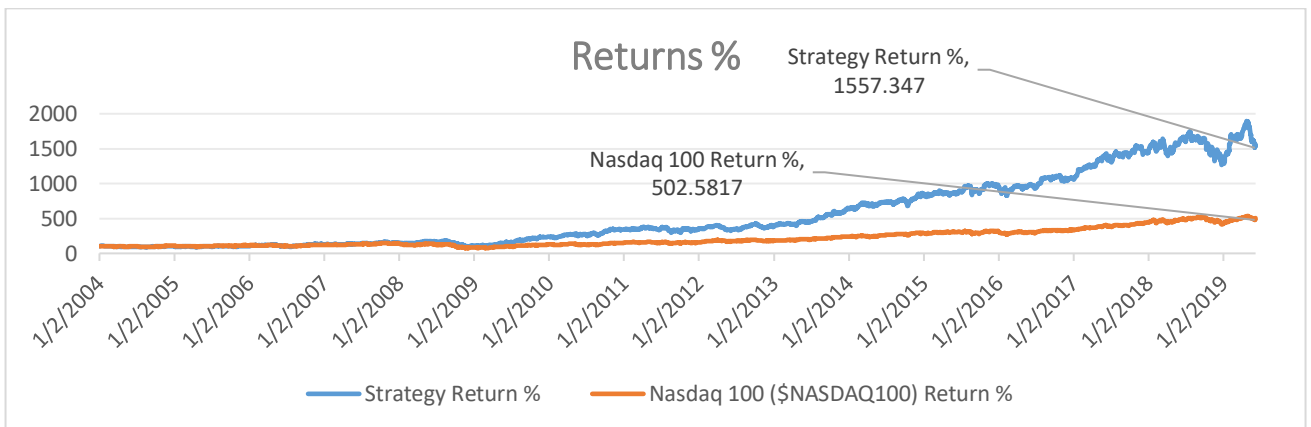


**Fig. 22.** Number of positions per 26 weeks and turnover ratio per 26 weeks.

It can be seen from Figure 22, even though number of companies dropped from 5, the strategy still outperformed the market. In the last 5 rebalancing period, number of companies is less than 5. In this last 5 rebalancing period, strategy couldn't outperform the market. This can be explained when number of companies are dropped, downside risk is higher than market. However, it is also important to see the performance of strategy if rebalancing period is one year.

- **Portfolio 4 - 52-week rebalancing period (IECA + Ranking System)**

The only difference between Portfolio 3 and Portfolio 4 is that holding period is a year. Portfolio 4 is rebalanced every year.



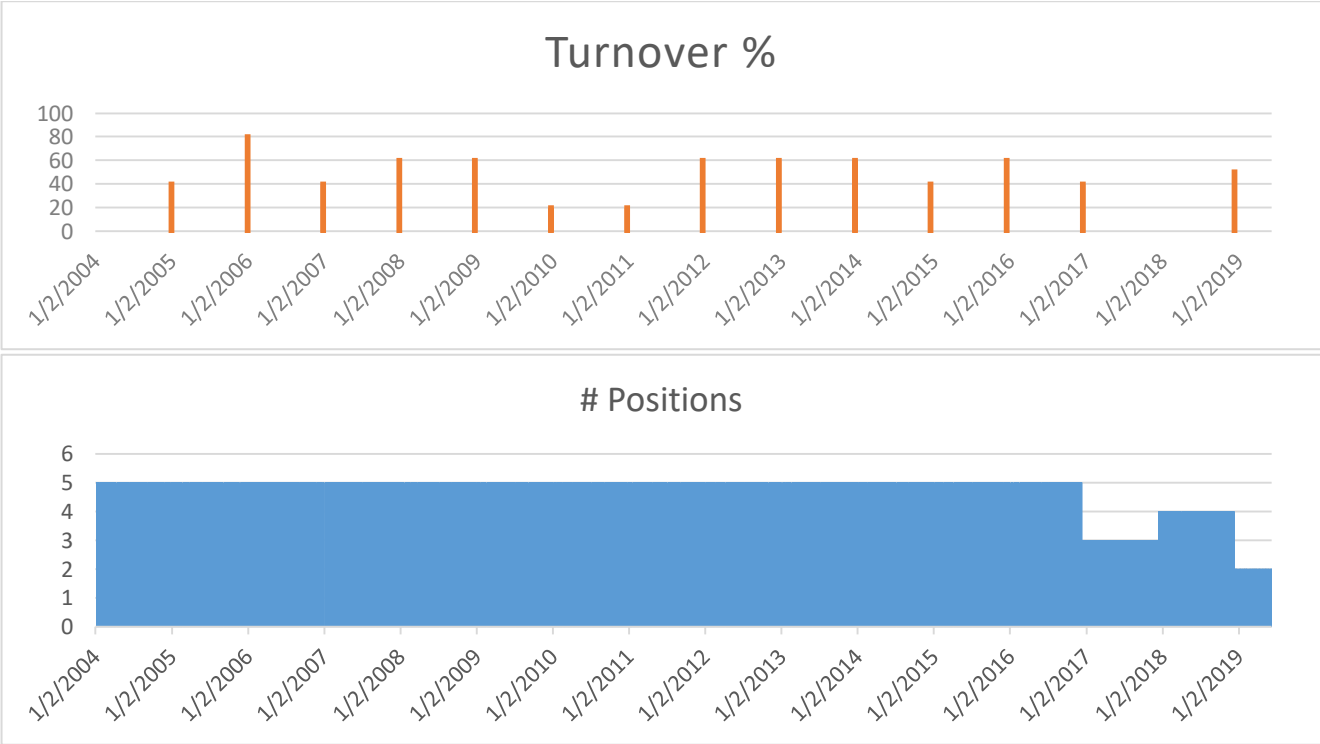
**Fig. 23.** Returns of Portfolio 4 and NASDAQ 100 for rebalancing period of 52 weeks.

By increasing the holding period to a year, Portfolio 4 can still outperform the market. However, in comparison to Portfolio 3, Portfolio 4 generated lesser returns than Portfolio 3. While annual return of Portfolio 4 is 19.48% (without investment itself, only the returns), NASDAQ 100 generated an 11.03%.

	Average number of companies held each 52-week period.	Return on investment	Maximum Drawdown	Average Turnover Ratio.	Std. Dev.
Portfolio 4	4.62	1557.34%	-49.17%	43%	22.57%
NASDAQ 100	-	502.58%	-53.13%	-	17.30%

**Table 16.** Summary of back-testing Portfolio 4 and NASDAQ 100 for 52 weeks rebalancing period.

Table 16 shows that Portfolio 4’s maximum drawdown increases from 35% to 49% during financial crisis in 2008-2009. Also, turnover ratio increased from 27% to 43%. From Figure 23, it can be seen that increasing holding period from 26 week to 1 year, almost half of the returns are gone. In other words, 26 weeks are enough to have superior returns with the excess current assets of these companies. Since the markets have many swings up and down in the short term, 26 weeks rebalancing period can take advantage of these swings better than 1 year. It is also important to note that, companies have extreme returns recorded in some quarters. In order to take advantage of these increases, 26-week rebalancing period is ideal for this strategy.



**Fig. 24.** Turnover ratio and number of positions held each year for Portfolio 4.

Turnover ratio and number of positions in Figure 24 is very similar to Figure 22. In Portfolio 2, 3 and 4, companies that have excess current assets can outperform the market. Especially, holding companies

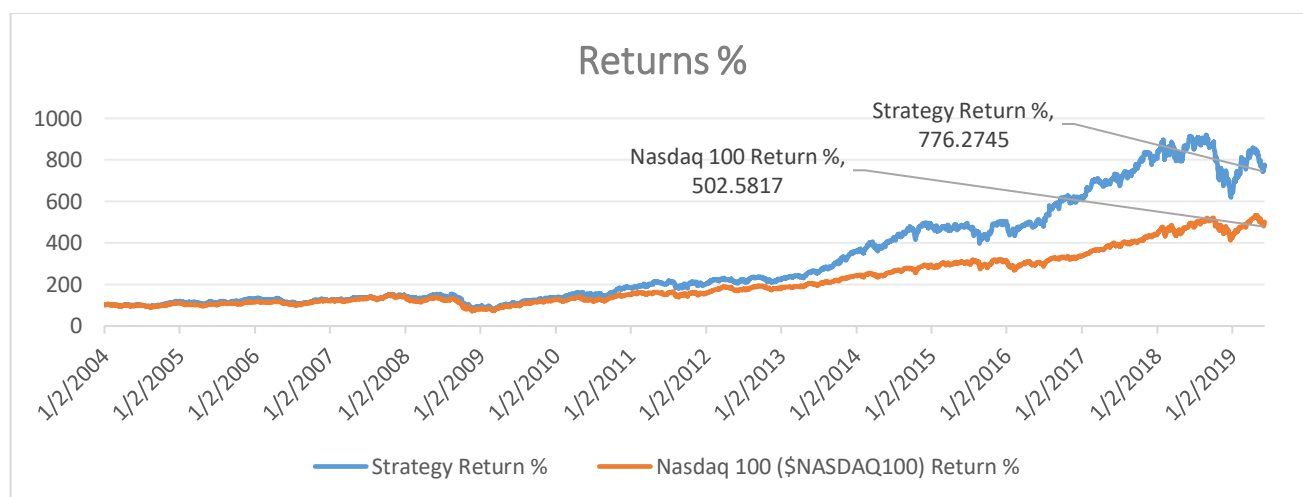
for 26 weeks, is better to take advantage of fast changes in the environment of companies and stock prices.

- **Portfolio 5 - IECA>1, 26 weeks rebalancing period.**

It can be seen that Portfolio 3 generated the highest return on investment in comparison to other portfolios. Portfolio 3 has the highest return when the rebalancing period is 26 weeks and total net current assets are at least 3 times higher than the total debt of the companies. However, it is also important to observe the condition that current assets are higher or lower than 3 times of the total debt. The only difference between Portfolio 5 and Portfolio 2, 3, 4 is that companies whose current assets are higher than total liabilities of the same companies are chosen to form the portfolio of top ranked 5 companies. Formula is as follows:

$$(Total\ Current\ Assets / Total\ Liabilities) > 1$$

Performance of Portfolio 5 and NASDAQ 100 is displayed in Figure 25.



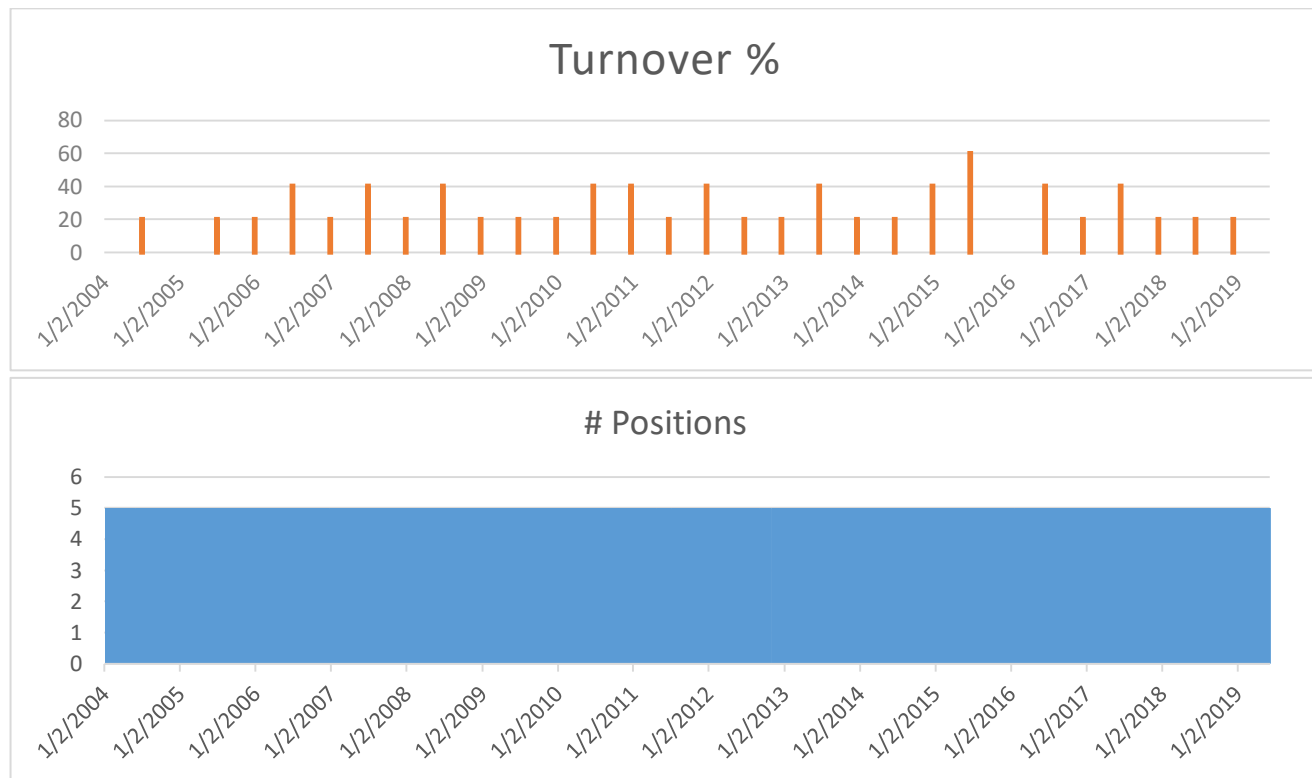
**Fig. 25.** The returns of Portfolio 5 and NASDAQ 100 for rebalancing period of 26 weeks.

While Portfolio 5 has an annual return rate of 14.21% (only the returns, without investment), NASDAQ 100 generated an annualized return of 11.03% over the period of 15 years. By focusing on companies that have excess current assets than their total liabilities, shows lower returns in comparison to the portfolios that focus on companies which have higher current assets than the 3 times of total liabilities. It means that the companies that don't have enough excess current assets by regarding the total liabilities, generate lower returns.

	Average number of companies held in each 26-week period.	Return on investment	Maximum Drawdown	Average Turnover Ratio.	Std. Dev.
Portfolio 5	5	776.27%	-50.40%	26%	20.11%
NASDAQ 100	-	502.58%	-53.13%	-	17.30%

**Table 17.** Summary of back-testing Portfolio 5 and NASDAQ 100 for 26 week holding period.

By lowering the number of 3 to 1 for the condition of excess current assets, the number of companies that fit the conditions applied is always more than 5, so average number of companies is 5. Maximum drawdown increased from -35.97% to -50.40% in comparison to Portfolio 3.



**Fig. 26.** Number of positions and turnover ratios for each 26-week rebalancing period.

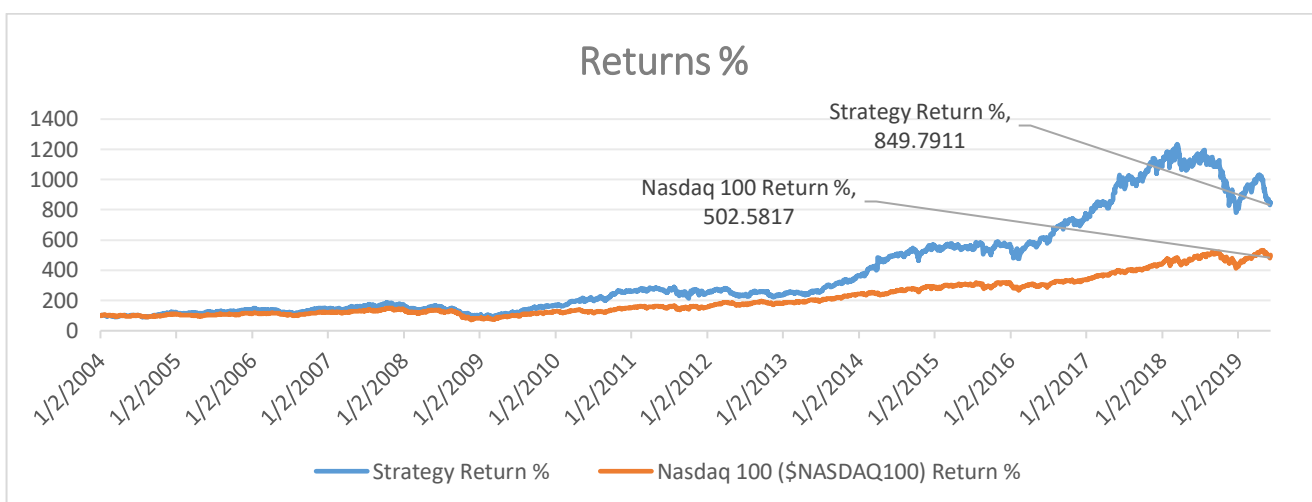
By investing in companies that only have higher current assets than their total liabilities, (not at least 2, 3 or 4) shows that Portfolio 5 generated lowest return rate in comparison to other Portfolios (2, 3, and 4). In other words, the number of companies that passes the conditions applied is highest in back-testing Portfolio 5. Average turnover ratio is 26%. Portfolio 5 generated the lowest return rate. If the condition of 1 in the formula increased to 2, there might be difference results.

- **Portfolio 6 - IECA>2, 26-week rebalancing period.**

Only difference between Portfolio 5 and Portfolio 6 is that number in the formula is increased from 1 to 2. In other words, Portfolio 6's aim is to observe companies whose total current assets is higher than at least 2 times of total liabilities of the same companies. Formula is as follows:

$$(Total\ Current\ Assets / Total\ Liabilities) > 2$$

Since the idea behind this strategy is that the companies which have excess current assets can use these assets to create their competitive advantage. Performance of Portfolio 6 and NASDAQ 100 is displayed in Figure 27.



**Fig. 27.** Returns of Portfolio 6 and NASDAQ 100 for 26-week rebalancing period.

By increasing the number from 1 to 2 in the formula shows that Portfolio 6 generated an annual return of 14.88% (only the returns). On the other hand, NASDAQ 100 has an annual return of 11.03%. By increasing the number from 1 to 2 displays that the performance of the strategy in comparison to Portfolio 5, increased from 776.27% to 849.79%.

	Average number of companies held in each 26-week period.	Return on investment	Maximum Drawdown	Average Turnover Ratio.	Std. Dev.
Portfolio 6	5	849.79%	-53.18%	30%	22.42%
NASDAQ 100	-	502.58%	-53.13%	-	17.30%

**Table 18.** Summary of back-testing Portfolio 6 and NASDAQ 100 for 26-week rebalancing period.

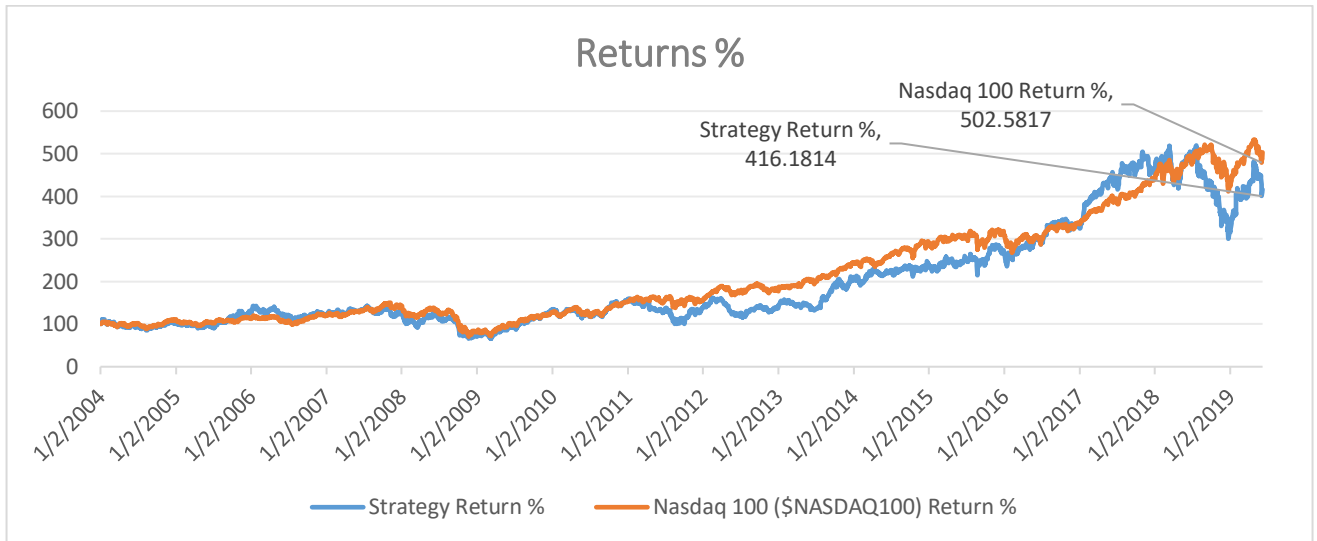
Table 18 shows that average number of companies is 5. The companies that have more current assets than 2 times of their total liabilities are always more than 5 in every rebalancing period. Maximum drawdown is almost the same with the NASDAQ 100. The performance of Portfolio 6 shows that by focusing on companies that have excess current assets generate higher returns. However, it is important to observe how much current assets are enough to generate higher returns.

- **Portfolio 7 - IECA>4, 26-week rebalancing period.**

The only difference between Portfolio 7 and Portfolio 6 is that number in the formula is increased from 2 to 4. From increasing 1 to 2 and 2 to 3, showed that the performance of the strategy sharply increased. In Portfolio 7, the formula used is as follows:

$$(Total\ Current\ Assets / Total\ Liabilities) > 4$$

The performance of Portfolio 7 and NASDAQ 100 is displayed in Figure 28.



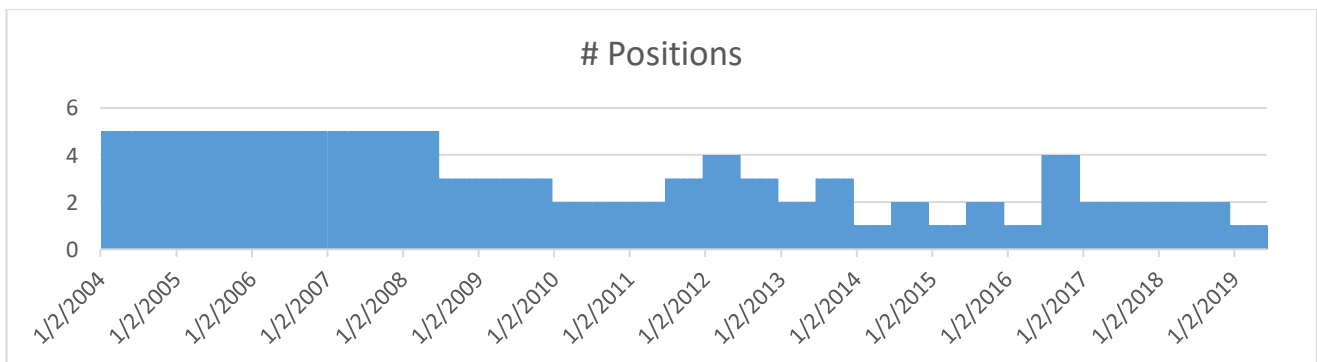
**Fig. 28.** The returns of Portfolio 7 and NASDAQ 100 for 26-week rebalancing period.

Portfolio 7 has an annual return of 9.68% (only the returns), on the other hand NASDAQ 100 has an annual return of 11.03%. Portfolio 7 underperformed the market itself. By increasing the number 2 to 4 in the formula, resulted in a decrease in the performance of the strategy.

	Average number of companies held in each 26-week period.	Return on investment	Maximum Drawdown	Average Turnover Ratio.	Std. Dev.
Portfolio 7	3.06	416.18%	-54.25%	25%	24.14%
NASDAQ 100	-	502.58%	-53.13%	-	17.30%

**Table 19.** Summary of back-testing Portfolio 7 and NASDAQ 100 for 26-week rebalancing period.

Table 19 shows that average number of companies held in each rebalancing period is 3.06. It is the lowest average number in the Portfolios tested before. Even maximum drawdown is lower than the market itself. Standard deviation is the highest in comparison to other portfolios tested. Reliability of returns is the lowest.



**Fig. 29.** Number of positions held in every rebalancing period.

The difference in number of companies held is displayed in Figure 29. By increasing the condition in the formula from 2 to 4 shows that there aren't many companies available for the strategy. Average number of companies held decreased from 5 to 3.06. This impacts the strategy's performance sharply. Diversification shows its importance in this strategy. By backtesting all 7 portfolios shows that when the number of companies started to drop from 5, the risk and volatility starts to increase. It can be easily seen that there aren't many companies whose current assets are more than at least 4 times of their total liabilities. By increasing this number to 5, might end up blowing up the investment itself due to lack diversification.

### 4.3. Results of back-testing Portfolios.

After backtesting the strategies with different conditions, comparison of the results are discussed under this subsection. Portfolios under each strategy is compared with other portfolios in the strategy.

- **Results of Net Current Assets Value Strategy.**

Results of the Portfolios are summarized in Table 20.

	Average number of companies held per rebalancing period	Return on investment	Maximum Drawdown	Average turnover ratio	Std. Dev.
Portfolio 1	35	16396.88%	-76.03%	18%	67.20%
Portfolio 2	35	268%	-82%	44%	42.37%
Portfolio 3	40	172.99%	-76.99%	56%	36.19%
Portfolio 4	9.33	1030%	-98.97%	47%	228.93%
Portfolio 5	1.01	-99.99%	-99.99%	37%	137%

**Table 20.** Comparison of Net Current Assets Strategy Portfolios.

In back-testing NCAV, based on only the price of the stocks, Portfolio 1 generated greatest returns. The results of Portfolio 1 backs up the findings of other authors (See Oppenheimer, 1986; Joseph, 1988; Laugterbach and Vu, 1993; Bildersee, Cheh and Zutshi, 1993; Dudzinski and Kunkel, 2014; Xiao and Arnold, 2008; Thorp, 2010; Singh and Kaur, 2013; An, Cheh, and Kim 2015; Sareewiwatthana and Janin, 2017). By increasing the holding period from 4-week rebalancing period (Portfolio 1) to 26 weeks (Portfolio 2) shows that there is a sharp decrease in the performance of the strategy. Holding the companies 1 year (Portfolio 3) resulted in even worse performance. Results by increasing holding period shows that the companies that fit the criteria become very speculative. It is observed that there are sharp swings up and down to be profited in the short-term.

When investing in a live environment, volume plays a key role. It helps any institution or retail investors to understand if there is enough liquidity to invest. If volume is very low, amount of money invested will be very limited and low, otherwise the price of the stock will increase or decrease sharply when investing occurs. In Portfolio 4 (monthly rebalancing), new condition along with the strategy, volume is applied. The condition is that in the last 10 trading days, average number of shares sold is at least

100,000. Portfolio 4 shows that there is a very sharp decrease in the performance and average number of companies held due to lack of volume. It can be seen that there aren't many companies available that fit the conditions applied. Average number of companies held each rebalancing period dropped from 35 to 9.33. Average number of companies held explains the sharp decrease. Investors prefer liquidity in the stocks such as companies which have average number of shares of 1,000,000 in the last 10 trading days.

Portfolio 5 is tested with volume condition of 1,000,000 shares. There are very less companies that fit the conditions applied. As a result, Portfolio 5 occurred a loss of investment. This can be seen easily due to the number of companies available. Average number of companies held decreased from 9.33 to 1.01, such decrease eliminates the effect of diversification. **The results of Portfolio 4 and Portfolio 5 shows that with volume condition, strategy loses its value.** Furthermore, the results of Portfolio 4 and Portfolio 5 supports the findings of the authors who paid attention to the illiquidity in value stocks (See Laugterbach and Vu, 1993; Vitor et al., 2018, Aron et al., 2017).

- **Results of Impact of Excess Current Assets (IECA) with Ranking System.**

Since volume is essential for every investor due to illiquidity, volume condition is applied in every portfolio tested under IECA. The condition is that last 10 trading days' average number of shares traded should be at least 1,000,000. Unlike the net current assets value strategy which can be used with a very small budget, this strategy is developed not only for small investors, but also big institutions such as hedge funds, mutual funds, and asset management companies etc. Results of the new methodology is summarized in table 21.

	Average number of companies held per rebalancing period	Return on investment	Maximum Drawdown	Average turnover ratio	Std. Dev.
Portfolio 1	5	619.19%	-51.52%	23%	20.03%
Portfolio 2	4.6	918.49%	-55%	8%	23.22%
Portfolio 3	4.71	2477.63%	-35.97%	27%	22.10%
Portfolio 4	4.62	1557.34%	-49.17%	43%	22.57%
Portfolio 5	5	776.27%	-50.40%	26%	20.11%
Portfolio 6	5	849.79%	-53.18%	30%	22.42%
Portfolio 7	3.06	416.18%	-54.25%	25%	24%

**Table 21.** Comparison of the Portfolios tested under the impact of excess current assets with ranking system.

First of all, ranking system has its own set of rules which need to be tested to see performance of the ranking system itself. Thus, Portfolio 1 is created for this purpose and generated a 619.19% return on investment. It is also important to note that NASDAQ 100, the market itself generated 502.5% return on investment. It can be seen that Portfolio 1 (26-week rebalancing period) outperformed the market very slightly. There isn't much superior performance over the market. However, when the strategy is combined with a formula that focuses on excess current assets over the total liabilities, in other words Portfolio 2 (4-week rebalancing period), generated higher returns than Portfolio 1. It is important to



note that average number of companies that fit the conditions applied started to drop from 5. It means that there aren't many companies whose current assets are greater than 3 times of their total liabilities. Since companies must report quarterly for the shareholders, 2 quarters might be enough to see big changes in the financial statements. Therefore, 26-week rebalancing period is applied in Portfolio 3. Portfolio 3 not only generated the highest return on investment in comparison to all other portfolios tested under IECA, but also has the lowest maximum drawdown of -35.97% thanks to dividends.

Some investors might believe that companies' yearly financial statements reflect the true performance of the companies. In order to test this hypothesis, 52-week rebalancing period is used in Portfolio 4. Portfolio 4 generated lower return than Portfolio 3. It can be easily seen that the price of the stocks can have many swings up and downs in a shorter time frame than 1 year. There are more opportunities to be profited in the lower time frame rather than 1 year. It can be said that this strategy has a better performance when the rebalancing period is 26 weeks. It is also important to note that under 26-week rebalancing period, there are companies which have extreme increases and decreases in current assets. The strategy takes advantage of these increases and decreases under the 26-week rebalancing period.

On the other hand, if excess current assets generate higher returns, it is important to decide how much excess current assets would be better for this strategy. Thus, in order to determine the level of excess current assets, companies whose current assets are higher than total liabilities tested in Portfolio 5. Returns dropped sharply from 2477.63% to 776.27%. The results show that focusing on companies whose current assets are only higher than total liabilities generated higher returns than the market, but superior return of Portfolio 3 is disappeared. By increasing the level of excess current assets, in other words, focusing on companies whose current assets are greater than 2 times of their total liabilities are chosen to be ranked to form the Portfolio 6. The results show that having more excess current assets generated higher returns than Portfolio 5. However, by increasing the current assets level is greater than 4 times of their total liabilities show that returns are disappearing. It is observed that while the excess current assets level increases, average number of companies held each rebalancing started to drop. In Portfolio 7, average number of companies dropped from 5 to 3.06.

**As a result, ideal level of excess current assets should be greater than 3 times of the companies' total liabilities. However, this study showed that when the number of companies held dropped from the base number of 5, the risk taken in the portfolio increases. In other words, diversification is consistent with returns. When the number of companies started to go lower than 4, the risk of downside increases consistently.** Performances of Portfolio 3, 4, 5, 6 and 7 display the discussed problem explicitly.

## Conclusions

1. The aim of this study is to test the validity of Value Investing strategies by testing Net Current Asset Value strategy. Based on results in this study, Net Current Asset Value (NCAV) strategy can be used as an investment strategy if the amount of money invested is very small. However, when the capital invested gets bigger, illiquidity problem shows up. This study's findings show that the companies that fit the strategy, are very small companies and illiquid stocks. Even though investors are compensated for the risk taken with a high outperformance, but that depends on only the price due to the nature of back-testing. Due to the low volume in these stocks, it isn't easy to be profited by institutions. Favourability of this strategy isn't for institution, but for small budget investors. Nevertheless, when the capital invested gets bigger, consistency of this strategy loses its value even for the small budget investors owing to illiquid stocks. Results also show that liquid companies that fit the strategy can be found especially in a recession in the stock market.
2. Previous studies show that NCAV can outperform the market. Findings of this study supports the results of others, if the attention paid to only the prices to calculate the returns. However, if there is no enough supply or demand in the stock market, investors might not be able to realize the profits they have or might not be able to get in the stock market with the price they want. If the volume is taken into account, the results show the otherwise. Outperformance of the strategy is disappeared. If the findings of previous studies supported by live track record of buying and selling securities by using this strategy to outperform the market, only then this strategy can prove its profitability and consistency. This strategy can be only proven by a live track record of at least 10 years of outperformance over the market by applying this strategy into markets. Backtesting this strategy without paying attention to supply and demand, in other words volume, might generally result in profitable. However, reliability of these results is questionable due to the fact that results are only calculated based on the prices.
3. Since this study gives an empirical evidence of the importance of a volume condition, a reliable back-testing requires volume. New methodology employed by focusing on companies in NASDAQ 100 that have excess current assets than their total liabilities with high volume in its stocks, outperformed the market without an illiquidity and inconsistency problem. In this new criterion, relationship between stock prices to net current asset value is disregarded. It is important to note that to avoid illiquid stocks, volume condition of last 10 trading days' average number of shares must be at least 1,000,000. By employing volume condition, returns become more reliable and the applicability of strategy become available not only for every retail investor, but also for institutions.
4. In this research, backtesting a value investing strategy shows that volume plays an essential role in terms of reliability of work. Regarding the previous studies based on Value Investing, the results of this research shows that without a volume condition, application of the strategy tested might not be able to realize the same returns in live investing environment due to the fact that disregarding the volume and hidden cost known as spread.

Further studies could attempt to specify how much amount of money can be invested and average number of shares traded (volume condition) in the companies invested while using these Value

Investing strategies; identifying what kind of market participants can use these strategies, determining what kind of institutions in terms of the amount managed under the institution; determining whether the strategy tested is consistent when the capital starts to increase or not; rather than doing a backtesting, but focusing on engaging in a live investing environment to provide track record by using these strategies in order to prove the Value investing strategies.

Lastly, while backtesting the new methodology in this study, the focus was on NASDAQ 100 which is heavily occupied by tech and health care companies. It can also be tested in different countries' stock market or different sectors to observe whether it can outperform the market or not. In addition, the testing period in this study was 15 years, further research could also attempt to observe more than 15 years by giving an empirical evidence for the strategy applied.

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## List of information sources

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### Notes

- <sup>i</sup> The data is retrieved from <https://www.investopedia.com/ask/answers/042415/what-average-annual-return-sp-500.asp>
- <sup>ii</sup> The data is retrieved from [https://ycharts.com/indicators/sandp\\_500\\_total\\_return\\_annual](https://ycharts.com/indicators/sandp_500_total_return_annual)
- <sup>iii</sup> The data is retrieved from [https://ycharts.com/indicators/sandp\\_500\\_total\\_return\\_annual](https://ycharts.com/indicators/sandp_500_total_return_annual)
- <sup>iv</sup> The data is retrieved from <https://www.businessinsider.com/13-brilliant-quotes-from-warren-buffett-2017-8#go-against-the-crowd-8>
- <sup>v</sup> Figure 1 is taken from <https://www.tradingview.com/>
- <sup>vi</sup> The data of Figure 2 is taken from <https://www.tradingview.com/>
- <sup>vii</sup> The data of Figure 3 is taken from <https://www.tradingview.com/>
- <sup>viii</sup> Figure 4 is taken from <https://www.tradingview.com/>
- <sup>ix</sup> The data of Figure 5 is taken from <https://www.tradingview.com/>
- <sup>x</sup> The following web-links can be visited for more details:  
<http://www.portfolio123.com/>  
<https://en.wikipedia.org/wiki/Compustat>  
<https://www.capitaliq.com/home.aspx>  
<http://www.interactivedata.com/>
- <sup>xi</sup> Definition is retrieved from <https://www.investopedia.com/terms/l/large-cap.asp>