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Graduate School of Management

Master in Corporate Finance

THE IMPACT OF FINANCIAL FLEXIBILITY ON THE COMPANY'S VALUE

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ЗАЯВЛЕНИЕ О САМОСТОЯТЕЛЬНОМ ХАРАКТЕРЕ ВЫПОЛНЕНИЯ ВЫПУСКНОЙ КВАЛИФИКАЦИОННОЙ РАБОТЫ

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01.06.2021

Аннотация

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Описание цели, задач и основных результатов	<p>Цель исследования заключается в определении взаимоотношения между финансовой гибкостью и стоимостью компании, основываясь на анализе данных публичных компаний, формирующих индекс S&P 500.</p> <p>В качестве гипотезы было сформировано предположение, что компании с большей финансовой гибкостью имеют дополнительную ценность, что делает их более привлекательными для потенциальных инвесторов. Для этого была построена модель, включающая в себя совокупность семи различных бинарных сигналов, каждый из которых оценивает финансовую гибкость компании в рамках определенного аспекта. В качестве сигналов были выбраны: волатильность свободных денежных потоков, волатильность роста продаж, отношение текущих активов к текущим обязательствам (current ratio), волатильность цикла конвертации наличных денег, волатильность дивидендов на акцию, интенсивность капитальных вложений, материальность активов.</p> <p>Исследование проведено на выборке из 404 компаний, формирующих индекс S&P 500 (были исключены финансовые компании и компании занимающиеся недвижимостью). Данные рассчитаны за период с 2014 по 2020 год с годичной периодичностью.</p> <p>Результаты исследования демонстрируют, что показатель финансовой гибкости, рассчитанный на основе модели бинарных сигналов, является статистически значимым и имеет прямую зависимость со стоимостью компании, в то время как отдельные компоненты модели не могут быть использованы самостоятельно для данных целей.</p> <p>Кроме того в исследовании показано, что используя расчетное значение финансовой гибкости можно сформировать инвестиционную стратегию, демонстрирующую доходность выше индекса S&P 500.</p> <p>Результаты исследования могут представлять практический и научный интерес финансовым менеджерам, акционерам и инвесторам.</p>

Ключевые слова

Стоимость компании, финансовая гибкость, финансовый анализ, инвестиционный анализ, финансовые показатели, принятие финансовых решений

Annotation

Master Student's Name	Aleksei Gerasimenko
Master Thesis Title	The impact of financial flexibility on the company's value
Faculty	Graduate School of Management, Saint Petersburg State University
Main field of study	Corporate finance
Year	2022
Academic Advisor's Name	Alexander Yurevich Andrianov, PhD
Description of the goal, tasks and main results	<p>The purpose of the study is to determine the relationship between financial flexibility and the value of the company, based on the analysis of data from public companies forming the S&P 500 index.</p> <p>As a hypothesis, the assumption was formed that companies with greater financial flexibility have additional value, which makes them more attractive to potential investors. To do this, a model was built that includes a set of seven different binary signals, each of which evaluates the financial flexibility of the company within a certain aspect. The following signals were selected: volatility of free cash flows, volatility of sales growth, the ratio of current assets to current liabilities (current ratio), volatility of the cash conversion cycle, volatility of dividends per share, intensity of capital investments (capex intensity), tangibility.</p> <p>The study was conducted on a sample of 404 companies forming the S&P 500 index (financial companies and real estate companies were excluded). The data are calculated for the period from 2014 to 2020 annually.</p> <p>The results of the study demonstrate that the indicator of financial flexibility calculated on the basis of the binary signals model is statistically significant and has a direct relationship with the value of the company, while individual components of the model cannot be used independently for these purposes.</p> <p>The results of the study may be of practical and scientific interest to financial managers, shareholders and investors.</p> <p>In addition, the study shows that using the calculated value of financial flexibility, it is possible to form an investment strategy that demonstrates profitability above the S&P 500 index.</p>
Keywords	Company value, financial flexibility, financial analysis, investment analysis, financial performance, financial decision-making

Glossary

<i>ROE</i>	Return on equity
<i>MDD</i>	Maximum drawdown
<i>GAR</i>	Geometric average return
<i>CFO</i>	Chief Financial Officer
<i>FF</i>	Financial flexibility
<i>S&P500</i>	A stock index, the basket of which includes shares of 500 selected companies with the maximum market capitalization traded on US stock exchanges. The list belongs to Standard & Poor's and is compiled by it.
<i>ETF</i>	Exchange-traded fund

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Introduction

Financial flexibility is a very complex term that in different papers and textbooks formulated from different point of views. Thus, Teng, Chang and Wu (2021) determined financial flexibility as the company's ability to respond effectively different kinds of unpredicted shocks which undermine cash flows stability. Gamba and Triantis (2008) formulated financial flexibility as an ability to restructure company capital structure at a low cost when it is necessary. Hence, firms become able to avoid the costs of financial distress and to fund investment when unpredicted projects with beneficial outcomes arise. In practice, there are a lot of examples when companies with a poor financial management must sell their value-creating business units due to the liquidity problems under the strict debt covenants, while in other cases such decisions would never have been accepted.

In a great accordance with Leautier (2007) company usually has two basic approaches how to deal with financial flexibility:

- Follow a conservative capital structure (mostly to use internal funds and do not aggressively attract debt)
- Reduce cash flow volatility

Allayannis and Weston (2003) find a positive relation between usage of foreign currency derivatives and the firm value, using Tobin's Q as a proxy parameter for firm value, while most theories suggest that hedging can reduce excessive cash flow variation, which directly leads to costly access to external financing. Thus, cash flow volatility is significantly associated with Tobin's Q utilizing the market-to-book ratio as a proxy. At the same time, Minton and Schrand (1999) provide evidence, that cash flow volatility permanently affects investments. In the research, authors found a strong negative correlation between level of company investments (R&D, advertising and capital expenditures) and cash flow volatility, while also a presence of positive correlation between cash flow volatility and costs of external capital rising was proved. Such results have been developed by Rountree, Weston and Allayannis (2009) to the concept that firms with smooth financials are valued at a premium relative to firms with volatile financials while controlling for other determinants of firm value, such as size, leverage, profitability, and growth, as well as alternative types of risk, such as systematic and idiosyncratic. Hereby, company may adopt a strategy of smoothing financial income pattern, as investors value smooth performance more than volatile, implementing different hedging techniques, with the great help of which in

case of company may reduce costs of financial distress and to easily fund investment when facing adverse cash flow shocks.

It should be noted that the concept of financial flexibility seems to be quite well-known both in academic and in the business environment. Thus, according to a study conducted by Graham and Harvey (2001), as part of a survey of 392 CFOs of American companies, the main factor in deciding on the capital structure of the firm was precisely financial flexibility. Subsequently, Brounen et al. (2004) conducted a similar study with the participation of 313 CFOs of European companies and came to similar results. In addition, Bancel and Mito (2004) also confirmed the results of the initial study of American colleagues by conducting a similar survey with the top management of European companies.

During the 2007-2008 global economy faced with the Great Financial Crisis (or as it is called a Great Recession) as an outcome of excessive risk-taking by global financial and insurance companies and institutions using mortgage-backed securities and credit-default swaps extremely. Companies and economies all around the world lost billions of dollars with subsequent bankruptcy of Lehman Brothers on September 15, 2008 and global banking crisis in most economies of the world (Williams, 2010). Too heavily financed and overwhelmingly leveraged companies, that were, indeed, financially inflexible, went bankrupt. But this was not the case for all companies. Those of them, who were financially healthier, surprisingly gained new investment opportunities and expanded their operations and market share. In addition, some of the companies were able to boost their R&D expenses and start increasing technological gap with their competitors, who was in a terrible situation and could not afford such expenses. Additionally, companies with a more stable financial position and, as a result, greater financial flexibility began to actively absorb companies with weaker financial flexibility, takeover of Merrill Lynch by Bank of America for instance, which led to increased consolidation in the markets within individual industries and allowed strong companies to take an even more dominant position.

It is obvious that despite the sufficient awareness of business representatives with the concept of financial flexibility, many of the representatives of the top management of companies did not consider this aspect seriously, which led to negative consequences for companies, while their more successful colleagues managed to generate company's value even in difficult times. Thus, the relevance of the topic for both academic and practical fields is undeniable. Thus, with the help of the conducted research, a following **research gap** can be filled in the concept of financial flexibility as a determinant of the company's value.

Despite the existence of a sufficient number of studies on the nature of financial flexibility, its impact on the capital structure, as well as attempts to evaluate this indicator as an abstract

absolute value, in essence, the relationship between financial flexibility and the company's value was not evaluated in detail with subsequent testing of the investment of the accounting-based fundamental analysis strategy model based on this approach.

The research goal of the paper is to determine the relationship between financial flexibility and company's value and to propose the model for the assessment of financial flexibility. The research will try to fulfill research gap, considering the empirical studies conducted earlier by many researchers. Finally developed model might be applicable by the value investors and top management of the non-financial companies.

The **following research questions** are stated:

- How to choose the model for the estimation of financial flexibility?
- How to apply proposed model as an investment strategy for value investors?

The **following research objectives** are stated:

- To study models suggested by the researches of company's value and financial flexibility;
- To build the model for financial flexibility estimation;
- To show how the model might be lucrative for a certain period of time.

The structure of this paper is as follows. In chapter 1 the relevant theoretical framework and background is given. In addition, we explore the relationship between financial flexibility and firm value according to economic theory more extensively. In chapter 2 we discuss the methodology we use to answer our main research question. First of all, we explain the research design of the study and we formulate our hypotheses. Then, we describe the data and the empirical techniques we used to test these hypotheses. In chapter 3 we present the findings and main results of the empirical study. Chapter 4 discusses the meaning and the implications of the obtained results. Finally, in chapter 5 we provide a summary and conclusion as well as major managerial implications for either future academic research or practical application.

Chapter 1. Literature review

In the introduction, we have already formulated the main question of this study, gave a brief introduction to the concept of financial flexibility. In this chapter, we will focus in more detail on the main ideas of financial flexibility, its relationship with the value of the company.

1.1 The relationship between financial flexibility and value of the firm

As mentioned above an idea of financial flexibility is concentrated in the following aspects:

- Help the company to avoid excessive costs of financial distress
- Provide the company with constant ability to have sufficient resources for investment projects

Rosslyn-Smith and others (2020) suppose that financially distressed firms have two basic options how to deal with: reorganization and going bankruptcy (firm liquidation). Liquidation procedures consist of the sale of all the company's assets to repay existing debts in accordance with order of repayment of claims on a monetary obligation (White, 1989). Opposite to the liquidation, reorganization is mostly oriented on saving the jobs of supposedly viable firm, which assets are higher than overall financial obligations. What is important, the firm management usually choose the option, which is best for the company equity, regardless of whether the company assets will be more valuable under the alternative decision.

Usually, company in distress tend to meet the financial obligations harder. Thus, company faces with the increasing cost of capital which undermine business profitability and, as a result company can not generate enough income to pay its financial obligations and default probability started increasing exponentially, with the parallel credit ratings falling. To reduce the debt covenant pressure and meet the obligations without attracting additional internal funds company must find internal recourse, that is liquid assets usually. Without enough liquidity company may incur too serious losses to cover current liabilities and ex-ante distress costs. As for the ex-post distress costs, that is, for example, hiring lawyers and accountants to work on bankruptcy proceedings, it will be covered by partial disposal of assets, which finally all will be disposed, and financial flexibility will not play an important role.

However, only the direct costs of financial distress are above mentioned, while indirect costs usually much higher than direct one. Indeed, sales reduction and loss of contracts, suppliers, employees with extensive background may significantly aggravate current company positions on the market. Altman (1984) estimated indirect costs of financial distress by measuring of decline in

sales of firms and from the deviation between their actual earnings and earnings forecasted over the three years prior to bankruptcy.

As for the company's ability to have sufficient resources for investment projects, it can be explored from the opportunity costs point of view. Indeed, firms may lose the ability to invest in promising projects only due to the impossibility of mobilizing every resource they have in short period of time. Essentially, company with the higher financial flexibility may avoid such opportunity costs and company successfully enter the project.

1.2 The relationship between value of the firm and distressed costs

In great accordance with Modigliani and Miller (1958) theory, firm's capital structure does not affect firm's weighted average cost of capital in terms of perfect capital market upon condition of the rationality of economic entities. However, this theory does not encompass the effect of taxation, transaction costs etc.

In practice, capital market is imperfect, thus some aspects, such as taxation, investors irrationality etc. must be included in models. Teplova (2013) separated all models that try to consider this imperfections into the following groups:

- testing the concepts of justification of the capital structure, such as trade-off theory
- identification of key factors of debt to equity ratio in capital structure from value based management point of view
- identification of key factors, which have the best correlation and explanation power of difference in financial ratios of companies

Modigliani and Miller theory evolved into the trade-off theory. Stewart Myers (1983) consider the total value of a firm using debt financing consists of the value of this firm without financial leverage and the present value of the interest-bearing tax shield, less the present value of the costs of financial distress, associated with leverage. The trade-off theory consider, that companies face with the duality of debt: the firm can have some advantages, such as tax benefits on debt, whereas debt increasing also leads to increasing of financial distress costs.

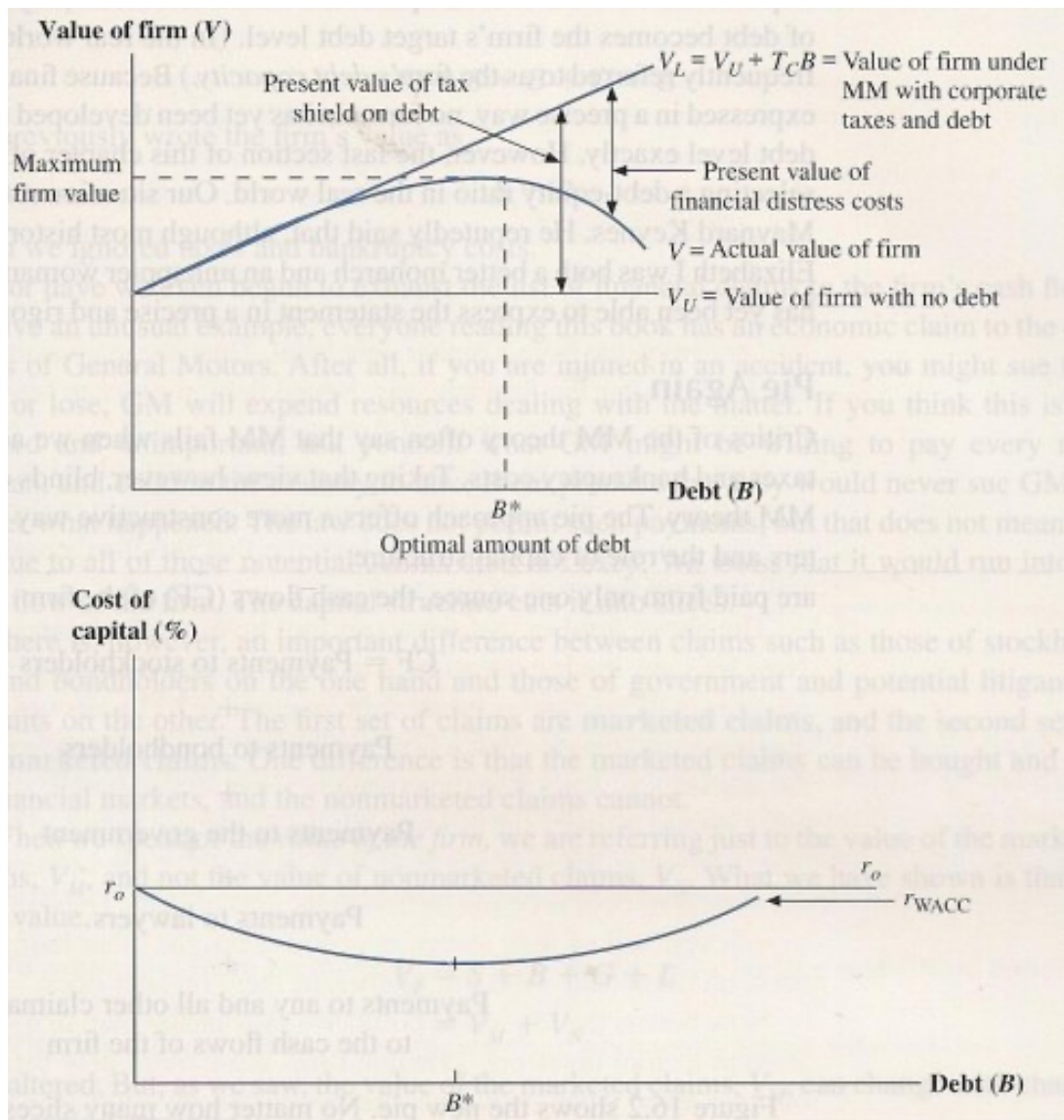


Figure 1.1: Firm value and cost of capital in an imperfect capital market
(Ross, Westerfield and Jaffe, 2015)

1.3 The model concept and main model variables

Financial flexibility is considered as a theoretical concept, while proper approaches to calculate this figure are not enough. The most valuable dynamic model developed by Gamba and Triantis (2008), which compromise dynamic financing, investment, cash retention/payout policies, level of corporate and personal tax rate, where examined the nature of dynamic debt and liquidity policies.

Correlation between dividend policy and financial flexibility examined in detail during last two decades. While Philip T. Fliers (2018) relies mostly on the conception, where financial flexibility is the firm's ability to adjust its capital structure either with debt financing or equity one at a low costs. It takes into consideration such firm characteristics as size, liquidity and investment.

Whereas Anil Kumar and Carles Vergara-Alert (2018) examine financial flexibility from the ability to access financing (not adjust current capital structure of the firm), using internal resources (such as real estate as the collateral), and mostly investigate the potential level of debt capacity, that is truly only the one side of the financial flexibility (two main strategies are mentioned at the beginning of the review). Opposite that Murali Jagannathan, Clifford P. Stephens, Michael S. Weisbach (2000) scrutinize financial flexibility through the cash flows, their nature and following distribution as a repurchase or dividends, taking debt financing out of scope (except debt ratio). Nonetheless this article clearly corresponds with the strategy to maintain the volatility level of the firms' cash flows and clarify the impact of the volatility on the dividend policy. Moreover, it corresponds to the (Gamba and Triantis, 2008) understanding of the link between volatility and financial flexibility in terms of potential earnings and cash flows.

Table 1.1 Comparison of different theoretical concepts

Article Parameter	Financial flexibility and the choice between dividends and stocks repurchase Murali Jagannathan, Clifford P. Stephens, Michael S. Weisbach (2000)	The Effect of Financial Flexibility on Payout Policy Anil Kumar and Carles Vergara-Alert (2018)	What is the relation between financial flexibility and dividend smoothing? Philip T. Fliers (2018)
Primary research problem	To examine firms' decisions to distribute cash flows and their choices between paying out cash flows in the form of dividends or stock repurchases.	To study the causal effect of financial flexibility on payout policy	To examine financial flexibility as a new determinant of dividend smoothing
Primary research goal	Primary goal is to assess the increasing importance of repurchases in payout	Using variation in real estate prices as exogenous shocks to firms' debt capacity to	To scrutinize how the firm's ability to adjust its capital structure relates to dividend

	decisions and to isolate factors that affect the choice between repurchases and dividends.	study the primary research problem	smoothing using Lintner's model.
Research questions/hypothesis	<p>1. Dividends represent an ongoing commitment and are used to distribute permanent cash flows, while repurchases are used to pay out cash flows that are potentially temporary.</p> <p>2. Repurchases are more pro-cyclical than dividends.</p>	<p>1. Cash dividends increase in the market value of firms' collateralizable assets.</p> <p>2. Share repurchases increase in the market value of firms' collateralizable assets.</p> <p>3. Payout flexibility increases in the market value of firms' collateralizable assets.</p> <p>4. Highly leveraged firms are more likely to decrease their payouts in response to a decrease in the value of their collateralizable assets.</p> <p>5. The magnitude of the payout increase that occurs when the value of collateralizable assets increases is greater for firms with few investment opportunities.</p>	<p>1. There is a positive relation between financial flexibility and dividend smoothing</p> <p>2. At higher levels of unused debt capacity, the positive relation between financial flexibility and dividend smoothing is stronger.</p> <p>3. There is a negative relation between capital structure adjustment costs and dividend smoothing</p>
Main results of the research	1. Repurchases are noticeably more volatile than dividends.	1. An increase in financial flexibility leads to an increase in cash dividends, share	1. The firm's capital structure is the shock absorber that enables dividend smoothing.

	<p>Repurchases are responsible for a disproportionately large fraction of the variation in total payouts.</p> <p>2. Firms with a higher standard deviation of cash flows are more likely to use repurchases.</p>	<p>repurchases, and payout flexibility.</p> <p>2. High-leverage firms decrease their dividends and share repurchases during periods of decreasing real estate prices</p> <p>3. The effects of financial flexibility on dividends and share repurchases are stronger for firms with few investment opportunities and for financially constrained firms.</p>	<p>2. Dividend smoothing is stronger at high levels of unused debt capacity and higher capital structure adjustment speeds.</p> <p>3. The nature of the shocks determines the degree of smoothing.</p>
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Chapter 2. Methodology

Earlier in the Introduction, we have already discussed the concept of financial flexibility. In the first chapter, we studied two main strategies for managing financial flexibility, presented different approaches to assessing financial flexibility and analyzed the relationship between the main parameters of the future model and the company's value. In this chapter, we will focus in more detail on the research methodology. First, we explain chosen research design to examine main research question, stated in the Introduction. Second, we formulate our main hypothesis, that we will test in the following chapters. Finally, we define empirical techniques used in the research to test our main hypothesis.

2.1 Research design

We are sure that we can measure the effect of financial flexibility on the firm value by analyzing stock returns of selected companies for the period between the publication of financial statements. According to Brealey, Myers and Allen (2010) it is hard to precisely estimate how much investors will be ready to pay for the stock and it is not always possible to determine value of the company based on its stock price. However, Koller, Goedhart and Wessels (2010) stated that the value of the company can be a measure of performance as long as it considers long-term interests of all stakeholders of certain company. Additionally, Lai and Wong (2015) explained close relationship between share price and valuation and introduced the model which uses this relationship.

2.2 Hypothesis

As it was mentioned before, the main goal is to study and develop the nature of the relationship between financial flexibility and the company value, relying on the number of variables, that might explain positive/negative correlation, or absence of any dependence between these variables. Thus, the core hypothesis of this master thesis would be stated in a following way: **companies with greater financial flexibility have an additional value, that makes them more attractive for potential investors.**

So, in the further I will thoroughly disclose main approach how this impact is expected to be measured and what potential conclusions might be done on the basis of that findings.

2.3 Data

All accounting data is obtained from S&P Capital IQ. The main reason for the choice of the companies that make up S&P500 index is because the most traded companies on a stock exchange during longer period are more likely to be mature companies (or growing companies that are in a transition phase) with the key characteristics in the subsequent generated model. The choice to limit the scope of companies for research only by companies forming the index is based on the fact that these companies represent the vast majority of market capitalization and they can give an adequate assessment of the profitability of the market and serve as the most frequently used benchmark for evaluating the effectiveness of active portfolio management and consecutive Jensen's alpha computation. The S&P 500 is a free capitalization weighted index.

In the data retrieved, all financial items are given in US dollars and no special conversion using average conversion rate during specific year are necessary.

2.4 Sample and excluded observations

The S&P 500 comprises the sample in this study, during the period 2020-2010. Data prior to 2010 were out of the study because with a significant increase in the sample, irrelevant results may be obtained, reflecting the presence of certain relationships taking into account the early period, but they are not representative in the current market conditions.

Financial institutions, real estate and insurance companies are excluded from the data because their financial policies, accounting systems and business models completely differ from the rest of the companies' ones. For firms in certain years that have some of the model items omitted we exclude them from the composition of the portfolio for the certain year.

We admit that in our data sample there may be an effect of outliers (for example extremely profitable companies in certain years due to the unregular activity). However, these deviations do not have significant impact on overall result and generally cumulative abnormal returns inherent in the data on the daily returns of companies and potential problems are usually leveled (Brown and Warner, 1984).

Statistics on the distribution of companies among the main sectors defined in the S&P500 index are presented in table 2.1.

Table 2.1 Distribution of the companies across sectors

Sector	Frequency
Industrials	72
Health Care	65
Information Technology	75
Communication Services	23
Materials	28
Utilities	29
Consumer Staples	32
Consumer Discretionary	59
Energy	21
Total	404

2.5 Model justification

Usually, concept of financial flexibility implies obtaining specified number for further calculations. Gamba and Triantis (2008) and Rapp, Schmid and Urban (2014) developed different models with the same idea, that initially was developed by Almeida, Campello, and Weisbach (2004) of defining unexpected changes in cash and consequently link it with the abnormal returns.

$$\begin{aligned}
 r_{i,t} - R_{i,t}^B = & \gamma_0 + \gamma_1 \frac{\Delta C_{i,t}}{M_{i,t-1}} + \gamma_2 SGR_{i,t} + \gamma_3 \frac{\Delta E_{i,t}}{M_{i,t-1}} + \gamma_4 T_{i,t} + \gamma_5 Spread_{i,t} + \gamma_6 Tang_{i,t} \\
 & + \gamma_7 SGR_{i,t} \times \frac{\Delta C_{i,t}}{M_{i,t-1}} + \gamma_8 \frac{\Delta E_{i,t}}{M_{i,t-1}} \times \frac{\Delta C_{i,t}}{M_{i,t-1}} + \gamma_9 T_{i,t} \times \frac{\Delta C_{i,t}}{M_{i,t-1}} + \gamma_{10} Spread_{i,t} \times \frac{\Delta C_{i,t}}{M_{i,t-1}} \\
 & + \gamma_{11} Tang_{i,t} \times \frac{\Delta C_{i,t}}{M_{i,t-1}} + \gamma_{12} \frac{C_{i,t-1}}{M_{i,t-1}} + \gamma_{13} \frac{\Delta NA_{i,t}}{M_{i,t-1}} + \gamma_{14} \frac{\Delta RD_{i,t}}{M_{i,t-1}} + \gamma_{15} \frac{\Delta I_{i,t}}{M_{i,t-1}} + \gamma_{16} \frac{\Delta D_{i,t}}{M_{i,t-1}} \\
 & + \gamma_{17} L_{i,t} + \gamma_{18} \frac{NF_{i,t}}{M_{i,t-1}} + \gamma_{19} Z_{i,t} + \epsilon_{i,t}.
 \end{aligned}$$

Figure 2.1: Unexpected changes in market firms' market value model
Almeida, Campello, and Weisbach (2004)

Opposing to the quantitative models described above, there are some qualitative models, that have the same idea of calculating the impact of certain parameters on the independent variable, but in relative terms. One of the most known models was developed by Joseph D. Piotroski in 2002. In his paper “Value Investing: The Use of Historical Financial Statement Information to Separate Winners from Losers” author introduced model as a sum of nine binary signals, where each binary signal equals one if the underlying realization is good about future firm performance, and zero, if the performance is expected to be poor.

$$F_SCORE = F_ROA + F_ΔROA + F_CFO + F_ACCRUAL + F_ΔMARGIN \\ + F_ΔTURN + F_ΔLEVER + F_ΔLIQUID + EQ_OFFER$$

Figure 2.2: Piotroski F-score calculation. Piotroski (2002)

Another model with the relative approach for the growing stocks is a Mohanram G-score (2005). Piotroski provides back testing of introduced model, that indicates outperforming of companies with strong signals in comparison with companies with poor signals in terms of one-year market returns for the buy-and-hold fundamental investment strategy for years between 1976-1996. For such relative model with binary signals relation between the variable (that is F-score) and the independent variable (that is one year return) is quite obvious in terms of interpretation, whereas for the Thriantis and Gamba model the calculated value of financial flexibility does not provide such insights (it is not a value without a physical meaning). For this reason, in my master thesis, I will continue developing relative model with binary variables for the determining companies with “good, strong and sustainable” financial flexibility and consequence correlation of that score with market values.

2.6 Basic variables

In a basic model there are seven depended variables, that are following: FCF volatility, Sales growth volatility, Current ratio, Cash Conversion Cycle volatility, Dividends per share volatility, Capex intensity, Tangibility (that is a tangible book value divided by book value, represent the share of tangible assets in overall firm’s assets). For a company’s fiscal year, I define return as a return on equity (to test the value of company for the shareholders). I choose these fundamental signs to measure company’s current FF. In the same way as Piotroski (2002), we estimate the value of each parameter (signal) both "positive" and "negative" depending on the interpretation of the

results obtained. If the result is evaluated as “positive”, then a value equal to one is assigned. Otherwise, the value of this signal is evaluated as “negative” and is equal to zero.

2.6.1 Free Cash Flow volatility

High volatility of free cash flows is a negative signal when assessing the value of the company. According to empirical studies (Behr, Osiichuk and Melcarr, 2018) evidence has been obtained that the high volatility of cash flows and the dynamism of the operating environment do not allow us to make a reliable forecast of the company's value on the example of public companies in Poland. In addition, since the DCF cost forecast is a methodology with a large number of assumptions, under the above conditions, forecasts can only be built in the short term, but the accuracy of the models leaves much to be desired. To do this, we use the cash flow volatility indicator in our model and claim that its high volatility negatively affects the value of the company and serves as the same signal for investors and professional appraisers.

2.6.2 Sales growth volatility

Low sales growth volatility implies higher earnings predictability and therefore less risk for potential investors. In fact, sales growth does not always mean an increase in the marginality of the business and, as a result, an increase in the net profit of the company. Sometimes it happens when a company, in pursuit of increasing revenue growth, sacrifices its net profit. However, this applies more to growing companies. In addition, as we indicated earlier, we adjust the resulting growth to the trend component so as not to overstate the real volatility of sales. In turn, this may slightly overestimate the growing companies, but the essence of the trend component is precisely the planned growth and any abnormal deviations will also be recorded. Nevertheless, when we talk about financial flexibility, we mean, among other things, the availability of resources from the company and the constancy of their source. That is why the volatility of sales is important when building our model.

2.6.3 Current ratio

In our model, the current ratio is implemented to assess the company's ability to meet future debt obligations. We assume that the availability of small opportunities for further debt servicing or its increase to cover unforeseen needs or finance a new project is a bad signal from the point of view of financial flexibility. In addition, the presence of high creditworthiness and low flexibility

of the capital structure may signal the presence of sufficiently strict restrictions on the part of equity and debt investors, which is also a negative signal.

2.6.4 Cash Conversion Cycle volatility

In fact, effective management of working capital increases the operational efficiency of the company, which in turn is one of the key drivers of the company's value growth. A decrease in the cash conversion cycle indicator signals an increase in the efficiency of the company's management and the possibility of greater productivity from the asset base. However, constant and steady fluctuations in this indicator may signal the absence of a corporate strategy in this area (constant changes in the policy of accounts receivable), or a great dependence on external factors (for example, when fluctuations are caused by constant changes in payable outstanding). In any case, these deviations indicate a weak position in the market and a reduced ability to generate constant profit without the use of manipulation.

2.6.5 Dividends per share volatility

Empirical studies of the impact of the dividend policy on the value of the company are mainly based on numerous theoretical explanations with the use of various assumptions (such as the tax rate or the presence/absence of convertible liabilities), which, however, are often too strict. Moreover, depending on the choice of country and time period, the results obtained also differ. Thus, this theoretical assumption has been proved by some researchers in different periods of time. However, the issue of the volatility of dividends per share is practically not studied at the moment. At the same time, for mature companies, the dividend policy is usually stable and the amount of dividends can be used as a proxy for assessing the profitability of the company. Thus, high volatility indicates the volatility of the company's profits, or the difficult predictability of income for shareholders, which in turn is a bad signal for them.

2.6.6 Capex intensity

The idea is that capital expenditures in theory maximize future sales and profits, which can affect stock returns. However, this signal may have a duality of interpretation: too low intensity may indicate a weak investment strategy of the company and a subsequent increase in technological gap. On the other hand, too high values may signal an excessive allocation of resources to capex and the current weak material base. It is worth noting that our sample considers only mature companies whose capex level is fairly predictable and constant. Therefore, we believe

that when compared within the industry, companies with an inflated value may currently have an increased need to restore their assets. This signals a decrease in the company's free cash and, as a result, a decrease in the company's financial flexibility in the future.

2.6.7 Tangibility

A tangible asset is an asset that usually has a physical and/or monetary form, and which can be converted to obtain a monetary value adjusted for its liquidity. It is worth noting that in the context of financial flexibility, we are talking about the availability of resources for the company to cover potential costs. For large businesses, in particular, the current ratio indicator is important, but it does not take into account the liquidity of the company's assets. At the same time, depending on the sector, the share of intangible assets can reach 90%. However, while some of the assets, for example, software, can be sold on the market, others even potentially have no value and their evaluation is difficult or impossible, and there is no effective market at all. Therefore, it is important for us to assess the company's ability to raise funds. In this connection, we study the tangibility of the company as one of the key parameters and use a conservative estimate when calculating, excluding all intangible assets (even those that in theory can be quite liquid). First of all, this approach is possible precisely due to the evaluation of companies within sectors, since a certain pattern is expected.

2.7 Volatility issues

For the computation of volatility for those variables, where it's necessary, I've used different approach in comparison with G-score. In the Mohanram model, the standard divagation is used for gains volatility. This is a bit of a mistake, because if gains grow veritably snappily, volatility increases also snappily and it's necessary to remove the trend element. That is, it turns out that the advanced the profit and revenue growth, the lower the F- score. To exclude this error, rather of the standard divagation, the standard error of literal returns relative to the exponential growth curve is used. This approach initially introduced by Ford Equity Research in their earnings variability model (EDV) (Ford Equity Research, a Mergent Company, 2022). It was completed using following formulas:

$$\text{Sales growth corrected}_{2020} = a * e^{b*y} + c, \text{ where}$$

$$a = e^A$$

$$SG = \ln (\text{Sales growth} - c)$$

$$SG = b + A * x$$

Here we use linear interpolation to get coefficients of the linear equation

C – minimum of sales growth among the dataset

After that we calculate 5 year volatility using standard equation:

$$\sigma_{sg} = \sqrt{\frac{\sum_{i=1}^5 \text{Sales growth corrected}_i}{4}}$$

2.8 Basic model

For the basic depended variables, presented in chapter 2.3 I have calculated flexibility Flex-score according to the following equation:

$$\text{Flex_score} = \text{Flex_FCF_vol} + \text{Flex_Sales_Growth_vol} + \text{Flex_CR} + \text{Flex_CCC_vol} + \text{Flex_DPS_vol} + \text{Flex_Capex} + \text{Flex_Tangibility}$$

Afterwards I compare all of the variables, with the mean value of variable for certain industry on the basis of S&P500 primary industry classification. I gain 1 if the value below median, otherwise gain 0 for all of the variables, except current ratio and tangibility. For these variables I gain 1 if the value above median, otherwise gain 0.

Table 2.2 Variable definitions

Variable	Variable description
Flex_FCF_vol	Previous 5-year volatility of Free Cash Flow of the company, reported at the end of each fiscal year.
Flex_Sales_Growth_vol	Previous 5-year volatility of Sales growth of the company.
Flex_CR	Current ratio of the company at the end of fiscal year. Current ratio is defined as a total current assets divided by total current liabilities, which are reported by the company.
Flex_CCC_vol	Previous 5-year volatility of Cash Conversion Cycle of the company. Cash Conversion Cycle is defined as a Days Inventory Outstanding (DIO) plus Days Sales Outstanding (DSO) minus Days Payable Outstanding.
Flex_DPS_vol	Previous 5-year volatility of Dividend per share (diluted) of the company, reported at the end of each fiscal year.

Flex_Capex	Capex intensity of the company at the end of fiscal year. Capex intensity is defined as a total Capex divided by total assets from the prior period
Flex_Tangibility	Tangibility of the company reported at the end of fiscal year. Tangibility is defined as a tangible book value divided by book value of the company. Book value of the company is defined as a total assets minus total liabilities. Tangible book value is defined as total assets excluding intangible assets and goodwill minus total liabilities.

Chapter 3. Results

In previous chapter we have discussed the research design and formulated main hypothesis of the paper. Moreover, additional information regardless data set and basic model is provided. In this chapter I present outcome of basic model and discuss robustness of following findings.

3.1 Description of the tests

The primary methodology that we use in our research is to form portfolios using the results of Flex_score calculation. In the first test we compare returns earned by the portfolio with high Flex_score against the portfolio consisting of low Flex_score companies with annual rebalancing. In the second test we compare returns earned by the portfolio with high Flex_score against the total index portfolio.

3.2 Description of the results

After calculation all the Flex_score values for companies I have separated them in the baskets according to the flexibility value from 0 to 7. After that I have calculated return on equity for each company in the each year and calculated average return for each score for each year.

Table 3.1. Number of companies scored certain Flex_score

Flex_score	2020	2019	2018	2017	2016	2015	2014
0	1	0	1	3	2	2	1
1	7	3	3	6	6	9	13
2	20	21	30	26	32	46	41
3	60	58	57	62	80	68	80
4	103	80	91	92	101	89	99
5	103	123	118	94	91	114	89
6	88	78	67	86	67	53	57
7	20	39	33	28	17	12	10

I define companies with values 0-3 as companies with low flexibility and companies with values 4-7 as companies with high flexibility. Afterwards I calculate geometric average return for holding period for each score across the years 2020-2014 (in returns calculation I have used less years as for volatility values I defined standard error of historical returns relative to the exponential

growth curve for previous consecutive 5 years). As a result, average of geometric average ROE for companies with low flexibility is 17,5%, whereas for companies with high flexibility average of geometric average ROE is 37,1%. Calculating ROE we define equally weighted investing, not a market cap weighting method. For all companies included in our data set, geometric average ROE is accounted for 31,67%. Using Same approach with ROI we get results from figure 3.1.1

Table 3. 2. Average one-year buy and hold return on equity and geometric average return for 2020-2014 period

Flex_score	2020	2019	2018	2017	2016	2015	2014	GAR (2020-2014)
0	6%	0%	27%	19%	15%	11%	6%	12%
1	20%	21%	24%	17%	14%	21%	19%	19%
2	9%	18%	18%	16%	19%	21%	18%	17%
3	8%	36%	24%	20%	17%	16%	40%	22%
4	13%	46%	35%	32%	38%	13%	22%	28%
5	32%	31%	42%	34%	30%	37%	23%	33%
6	76%	51%	71%	52%	28%	36%	21%	47%
7	73%	65%	36%	27%	-4%	38%	72%	41%

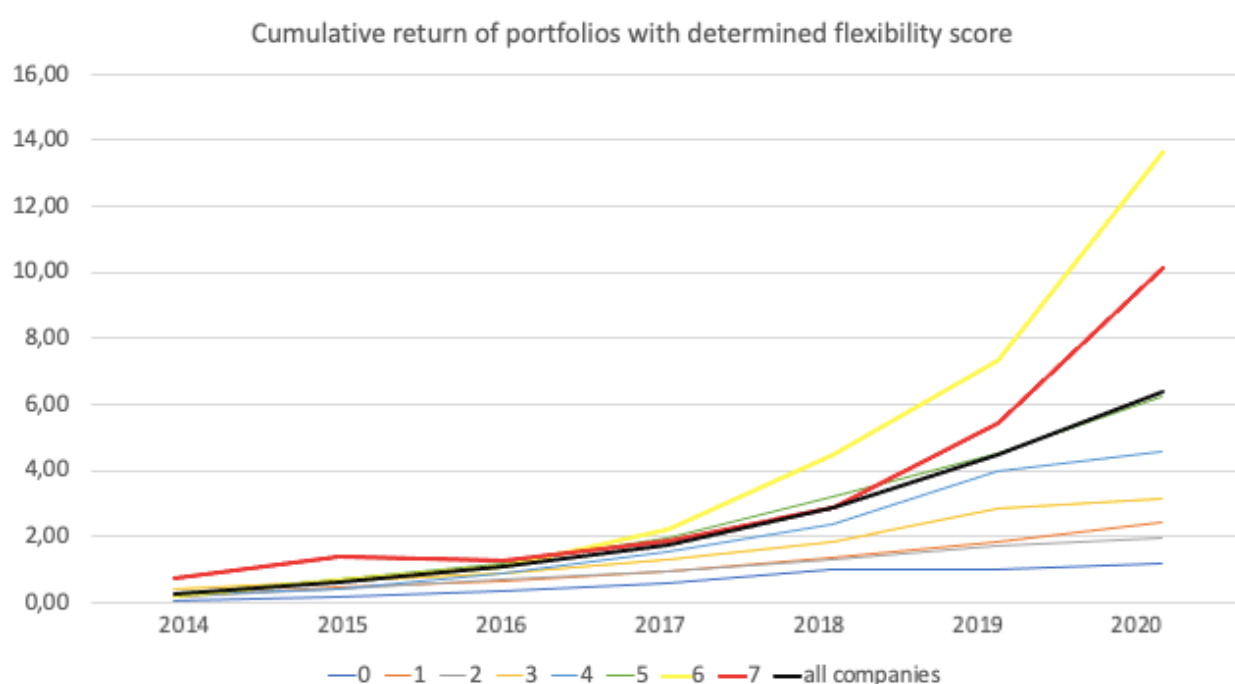


Figure 3.1: Comparison of cumulative returns of different portfolios within one flexible score

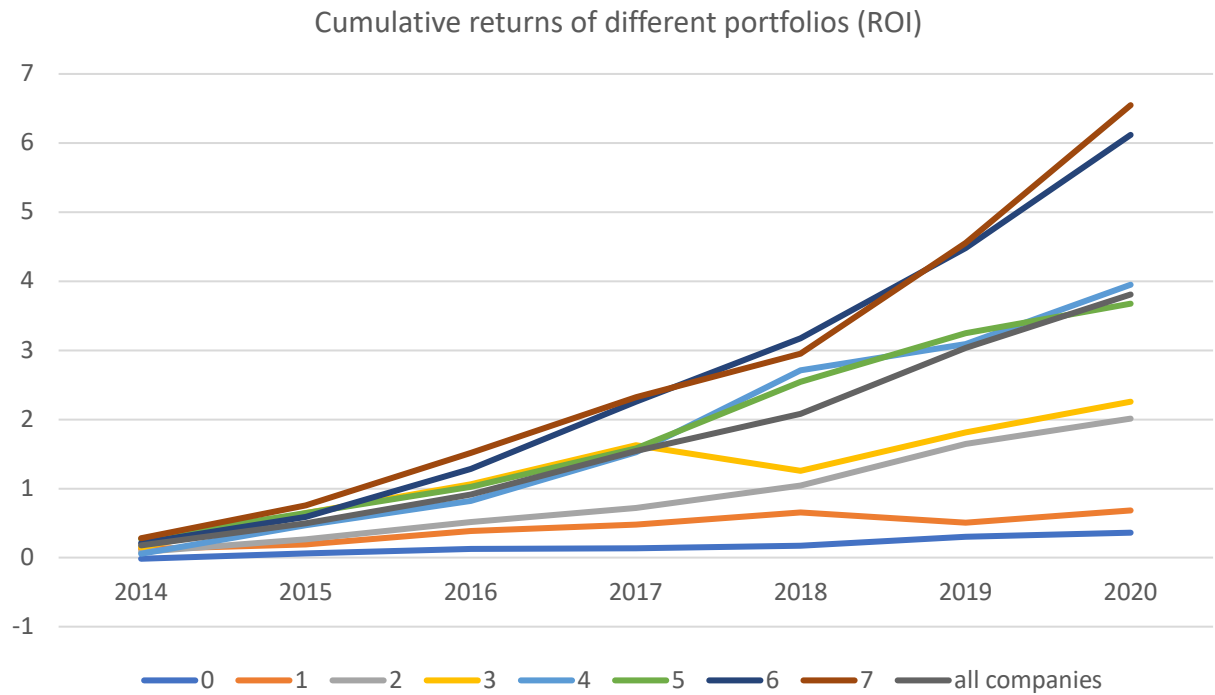


Figure 3.1.1: Comparison of cumulative returns of different portfolios within one flexible score (using ROI)

It is easily observed that companies with high flexibility have significantly outperformed companies with low flexibility. Company value is an estimation of future profits. In other words, we estimate company according to our expectations. It means, that companies with high flexibility have much better expectations about the generation of future profits. As for the ROI of portfolios, containing same companies, we could observe similar pattern on figure 3.1.1 to the pattern on figure 3.1.

Additionally, we evaluated the cumulative return under the buy and hold strategy for each individual indicator of flexibility score with annual rebalancing of the portfolio, subject to proportional allocation within the portfolio and full reinvestment of the income received for the year in the portfolio. In other words, the share of each asset in the portfolio is $1/n$, where n is the number of companies that have received this flexibility score value. The results of the profitability of these portfolios are shown in a figure 3.1.

3.3 Test 1 results

As previously stated, we calculate returns of low Flex-score portfolio and high Flex-score portfolio against each other year by year. Short selling in current test is restricted.

Table 3.3. One-year buy and hold ROE of different portfolios

Portfolio	2020	2019	2018	2017	2016	2015	2014
High flex	41%	44%	46%	38%	30%	29%	24%
Low flex	9%	31%	22%	19%	17%	18%	31%
Adjusted high flex	31%	13%	24%	19%	13%	11%	-7%

Portfolio of companies with high financial flexibility consistently outperformed the portfolio of companies with low flexibility, except 2014 year. Overall, the strategy shows a steady result and companies with high financial flexibility generate more value.

However, based on figure 3.1 and table 3.2 information, we can see that in reality only companies with indicators 6 and 7 can be attributed to companies with high financial flexibility. Therefore, we additionally checked the cumulative returns of portfolios, where companies were divided into the following 3 portfolios: companies with low FF (indicators from 0 to 2), companies with medium FF (indicators from 3 to 5) and companies with high FF (indicators 6 and 7).

The results of modeling the buy and hold strategy for combined portfolios with annual rebalancing are shown in figure 3.2.

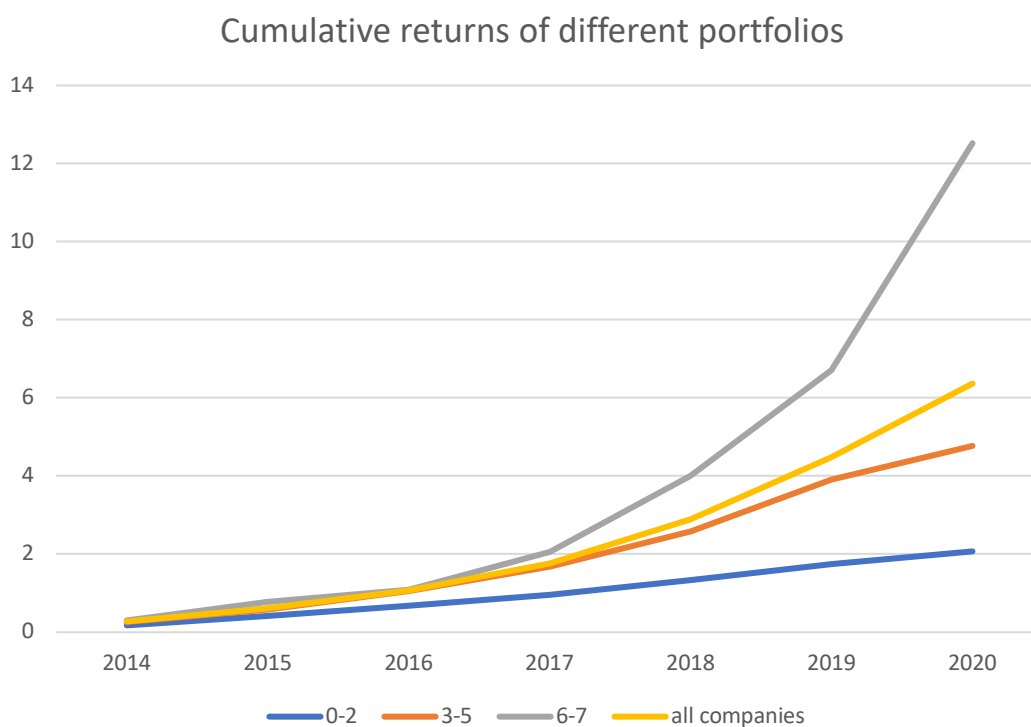


Figure 3.2: Comparison of cumulative returns of different portfolios with combined flexible score

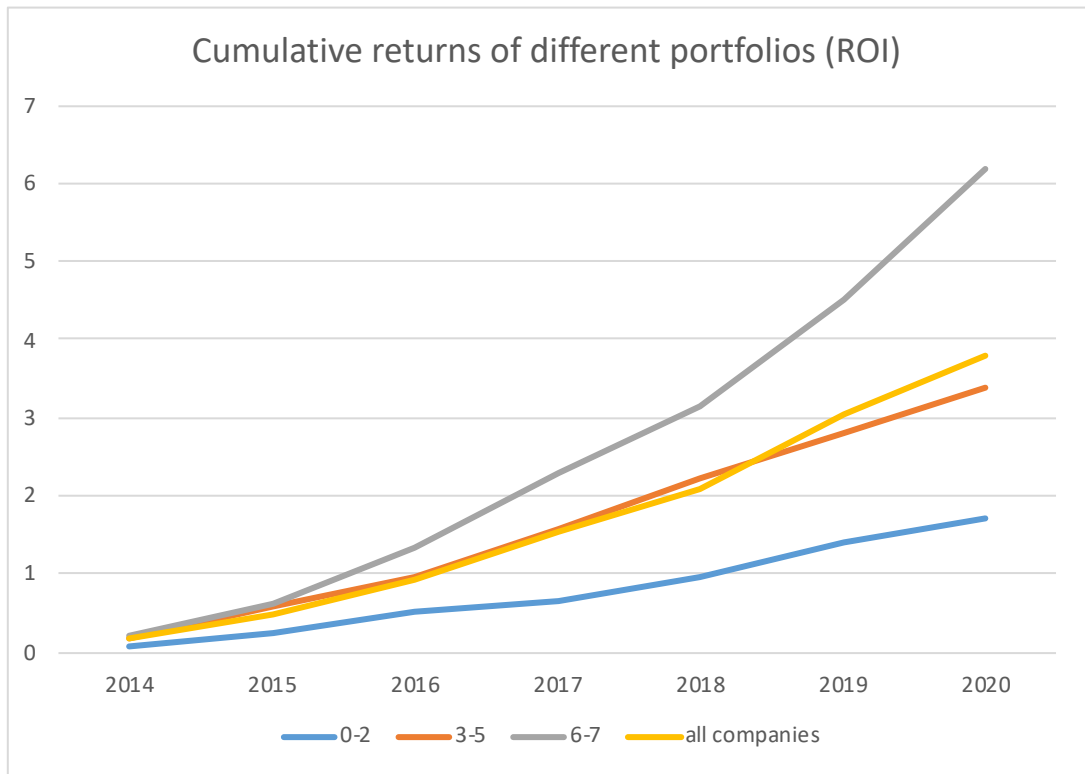


Figure 3.2.1: Comparison of cumulative returns of different portfolios with combined flexible score (ROI based)

3.4 Test 2 results

In the second test we compare results of one-year buy and hold strategy among different flexible scores against average return of all stocks in certain year (we call it as adjusted returns). All the results are provided in the table 3.4.

Table 3.4. Adjusted average one-year buy and hold return on equity

Flex_score	2020	2019	2018	2017	2016	2015	2014
0	-28%	-41%	-14%	-15%	-13%	-16%	-22%
1	-14%	-20%	-17%	-17%	-14%	-5%	-9%
2	-25%	-23%	-23%	-17%	-9%	-6%	-10%
3	-27%	-5%	-17%	-13%	-11%	-11%	12%
4	-22%	5%	-6%	-2%	10%	-14%	-6%
5	-2%	-10%	1%	1%	2%	10%	-5%
6	42%	10%	30%	19%	0%	10%	-7%
7	39%	24%	-5%	-7%	-32%	11%	44%

It should be noted that during the study period, only companies with a score of 3 and above managed to show a better-than-average return on equity (in our case it is positive adjusted return on equity). However, only companies with the highest financial flexibility, whose indicator is greater than or equal to 6, have shown a fairly stable positive result for several years.

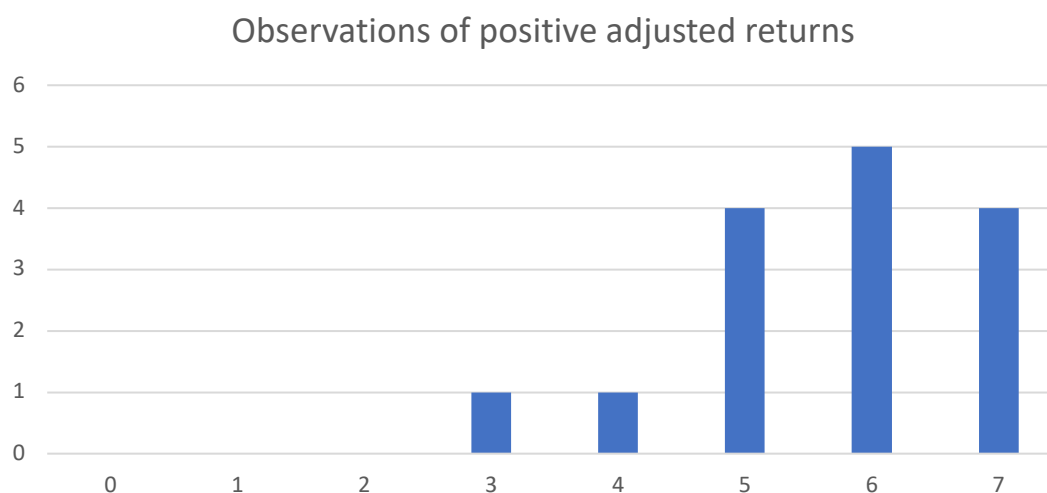


Figure 3.3: Comparison of number of positive market adjusted returns of different portfolios with determined flexible score

Figure 3.3 shows a graphical interpretation of the results obtained during Test 2 and presented in Table 3.4. As previously indicated, only companies with a high Flex_score index were able to consistently show ROE higher than the benchmark portfolio.

However, this graph does not show absolute values. So, it can be calculated that companies with an indicator of financial flexibility of 5 are no less successful than companies with an indicator of 7, but this assumption is refuted by the results obtained during the second test. Moreover, based on the data in Figure 3.1, it can be seen that companies with a financial flexibility value of 5 show results very close to the benchmark portfolio. This is explained by two facts: firstly, about 25% of the companies from the entire sample received exactly this value (the maximum concentration among all indicators of financial flexibility) and therefore it is logical to expect that the results of the benchmark portfolio should be quite close, and secondly, based on the results given in Table 3.4, companies with a financial flexibility value 5 demonstrated low deviations and positive market adjusted returns for 2015-2018 are offset by negative values for other years.

In 2002 Piotroski completed back testing of his strategy on the data for 1977-1997 years. Li and Mohanram (2018) have tested his investment strategy for the data for 1974-2020 years and concluded, that there is no any significant deviation between companies with high F-score and companies with low F-score in the last decade. Thus, strategy relying on the analysis of companies' financial position only is not effective currently and that model miss some crucial details, which I have incorporated in my model.

3.5 Additional test with short selling

As we indicated earlier, as one of the assumptions, we restricted short selling. This was done for several reasons. Firstly, value investors rarely resort to this approach and concentrate more on long positions. Secondly, short positions are associated with greater risks compared to long positions and are also not always optimal for investors, but are suitable only for investors with a high attitude to risk. However, during the second test, we found that companies with low ROE systematically show lower than the benchmark portfolio. Thus, in this additional test, it is proposed to consider the possibility of a short sale of assets with a low level of flexibility score and a simultaneous long position in the benchmark portfolio. The advantage of this position is the small amount of start-up capital required for the transaction, since it is the cash flow of a short position that will be used to open a long one. In practice, investing in the benchmark portfolio is possible by using ETFs that are widely represented on the S&P500 index, Vanguard S&P 500 ETF (VOO) for instance.

Table 3.5. Cumulative adjusted one-year short sell and hold return

Flex_score	2014	2015	2016	2017	2018	2019	2020
0	1,28	1,803	2,05	2,351	2,66	3,092	3,771
1	1,14	1,37	1,603	1,874	2,137	2,254	2,452
2	1,251	1,539	1,893	2,213	2,417	2,569	2,822
3	1,265	1,327	1,558	1,759	1,954	2,161	1,901
4	1,218	1,156	1,224	1,243	1,119	1,272	1,342
5	1,023	1,129	1,116	1,105	1,078	0,966	1,012
6	0,584	0,524	0,366	0,296	0,296	0,267	0,286
7	0,611	0,466	0,491	0,524	0,691	0,617	0,345

Based on the results presented in eable 5, it can be seen that only companies with indicators from 0 to 2 showed good growth with this strategy. Based on the results obtained, we will form a

portfolio of companies with a low level of financial flexibility and evaluate the cumulative returns in comparison with the index.

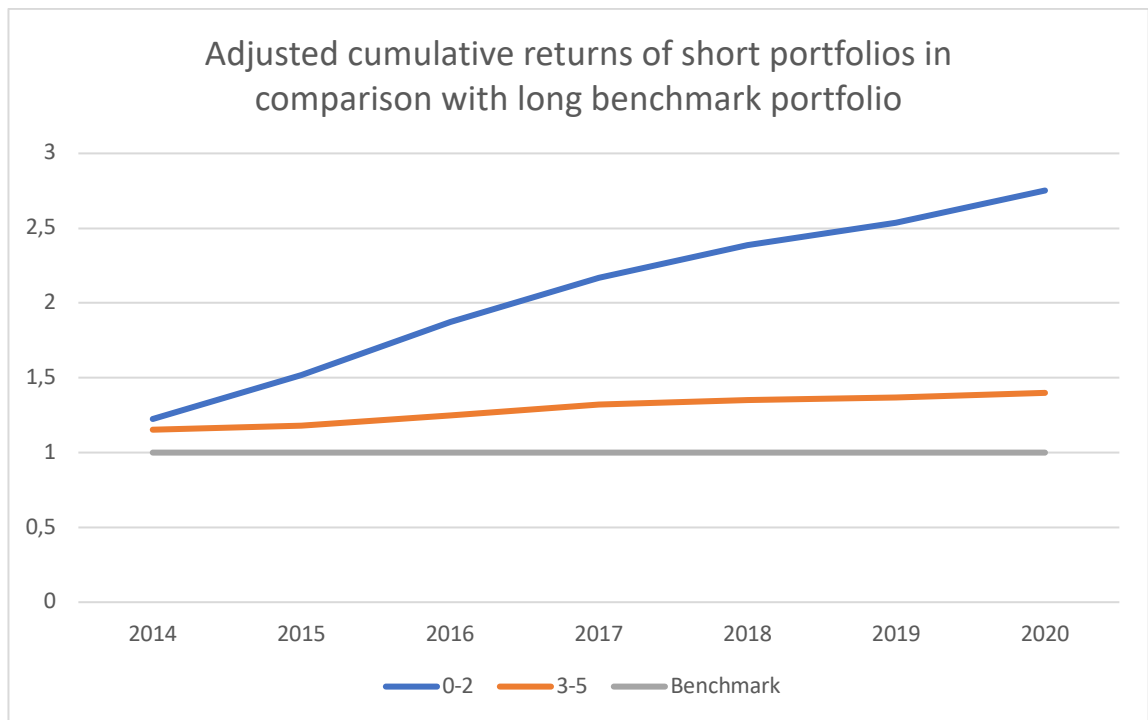


Figure 3.4: Adjusted cumulative returns of 1 year buy and hold short portfolios in comparison with long benchmark portfolio

3.6 Correlation analysis

To assess the predictive power of the model, we use spearman's rank correlation analysis, firstly introduced by Charles Spearman (Piotroski, 2000). Since our model uses binary signals and we distribute the selected companies into different baskets, in other words, we assign them a rank, this analysis will be the most objective.

$$\rho_s = 1 - \frac{6 \sum d^2}{n(n^2 - 1)}, \text{ where}$$

n - number of observations

$d = (x_i - y_i)^2$ - squares of differences between ranks

First, we will analyze all the individual variables and establish the presence/absence of predictive power of the variable.

Table 3.6. Spearman rank's correlation analysis of single variables for 2020

	Flex_FCF_vol	Flex_Sales_Growth_vol	Flex_CR	Flex_CCC_vol	Flex_DPS_vol	Flex_Capex	Flex_Tangibility	Flex_Score	ROE
Flex_FCF_vol	1,000	0,135	-0,096	0,036	0,102	0,125	-0,080	0,371	0,063
Flex_Sales_Growth_vol	-	1,000	0,042	0,185	-0,032	0,083	0,068	0,494	0,104
Flex_CR	-	-	1,000	0,065	-0,094	0,074	0,236	0,429	0,037
Flex_CCC_vol	-	-	-	1,000	-0,027	0,115	0,052	0,484	0,073
Flex_DPS_vol	-	-	-	-	1,000	-0,051	-0,017	0,283	0,045
Flex_Capex	-	-	-	-	-	1,000	0,044	0,478	0,003
Flex_Tangibility	-	-	-	-	-	-	1,000	0,444	0,140
ROE	-	-	-	-	-	-	-	-	1,000

As we can see from the results of table 3.6, none of the variables has sufficient correlation with ROE and cannot be used separately to predict ROE. Now we will conduct a similar analysis of Flex_score already throughout our data.

Table 3.7. Spearman rank's correlation analysis of Flexibility score and ROE

year	2020	2019	2018	2017	2016	2015	2014
Flex_score	0,810	0,952	0,762	0,667	0,190	0,762	0,762

Grading Standards	Correlation Degree
$\rho = 0$	no correlation
$0 < \rho \leq 0.19$	very week
$0.20 \leq \rho \leq 0.39$	weak
$0.40 \leq \rho \leq 0.59$	moderate
$0.60 \leq \rho \leq 0.79$	strong
$0.80 \leq \rho \leq 1.00$	very strong
1.00	monotonic correlation

Figure 3.5: Grading table of Spearman correlation coefficient

From the results of Table 3.7, as well as based on Figure 3.5, we can see that the correlation degree for all years, with the exception of 2016, is strong or very strong. We will also get similar values for ROI, since there is a close relationship between ROE and ROI and that explains why the statistical parameters found for ROE can also be used for analysis using another similar metric (Abdel M. and Majed Q., 2012).

Chapter 4. Discussion

Previously we determined research gap, formulated main research hypothesis, and constructed the model, explaining choice of the variables and data set. In chapter 3 we obtained results of different tests. In this chapter we discuss obtained results from the point of view of the formulated hypothesis and the implications of these results.

In previous chapters we have formulated the hypothesis that **companies with greater financial flexibility have an additional value, that makes them more attractive for potential investors**. As a basic model we have chosen a combination of binary signals to calculate flexibility score. Needless to say, that this estimation gives us understanding only the relative valuation of a company relative to other companies in the sample. This means that, in turn, the results are quite sensitive to the sample and when evaluating initially companies with low financial flexibility, we will only be able to choose the best from the worst. Nevertheless, it would be wrong to talk about the significant dependence of this approach purely on the sample, since when making investment decisions, quite often the task is only to select a good company from a predetermined pool of candidates for further investments. First of all, this is due to the diversification of the client's investment portfolio or the management company. As we remember, a number of binary signals of our model are based on characteristics that directly depend on the average indicators of the industry in which the company under study is represented. Thus, intuitively, there may be a feeling that some companies from the industry that are currently in a non-competitive state will receive inflated ratings, while even good companies from too competitive industries will receive the lowest rating due to the extremely high performance of the dominant companies in the industry. However, investors often look at different industries in order to diversify their nonsystematic risks. Then it will also be important for them to assess the behavior of the company within the sector, since when building the allocation of the portfolio, it was decided to invest in a certain industry. Therefore, despite certain limitations, the results obtained seem to be significant for managers and investors.

4.1 Managerial implication

From a practical point of view, this work contains a number of ideas that can be used by managers of large companies in the future. Firstly, we have demonstrated that companies with high financial flexibility are able to generate profits above the S&P 500 index at a sustainable level. Thus, these companies become the object of increased interest of potential investors in the medium and long term. In turn, this allows the company to have a sufficient amount of free resources to increase its position in the market. Moreover, in conditions of instability in the market,

such companies are much more likely to suffer the least value of losses and continue to increase their technological advantage (Bank of America case).

It is worth noting that the results of 2020 are especially important for managerial implication, namely when there was a coronavirus pandemic. As we can see from the analysis of Table 3.4, only companies with high financial flexibility were able to show ROE results above the market average, and their cumulative deviation is greater than in previous years. This confirms the judgment that investors value profitability higher in times of crisis and approach the company selection process more carefully. Thus, in order to overcome market crises, the company's management should pay attention to their financial flexibility at the moment and be able to build a corporate strategy consisting in constant monitoring and assessment of the situation in this aspect.

4.2 Investment implication

As previously stated, this study is primarily focused on value investments. Firstly, there is no evaluation of high-frequency strategies and the use of derivative instruments. Secondly, when forming an investment strategy based on the value of flexibility score, the product of the annual rebalancing of the portfolio is implied. Such a rare rebalancing can significantly reduce the transaction costs of portfolio management, although it increases the risks for the investor. However, during the time period under study, the MDD for the S&P500 index is 33.9% and is partly explained by the high volatility of financial sector companies that were excluded from our sample, as well as the general decline in the stock market due to the coronavirus pandemic in 2020. In addition, in this study we do not consider the use of leverage. Thus, with this strategy, the probability of a significant drawdown of the portfolio is quite small.

4.3 Possible limitations

The possible limitation of the research is the combination of two factors: application of the model only to the USA stock market (thus, introduced flexibility model may give different results and the investment strategy presented above will not be as effective as it showed in the study) and full complete exclusion of financial, real estate and insurance companies from the pool of companies under study, which leads to an increase in potential diversified risks, which in fact were not eliminated as effectively as possible in the process of forming an investment portfolio. This also provides an opportunity for potential follow-up studies: reproducing the approach we used on a larger sample, as well as considering small-cap and mid-cap companies.

4.4 Recommendation for further research

Based on the previously mentioned limitations of this study, it is primarily of scientific and practical interest to study the hypothesis put forward in emerging markets, since growth rates are sometimes more important in them, and investments are made from a lower base, which can give significantly different values regarding the profitability and risks of the proposed strategy. In addition, we considered only portfolios consisting of one or more of the most favorable flexibility score values, but did not study the possibility of using leverage and its impact on the characteristics of the new portfolio from the point of view of financial risk management. In addition, in Chapter 4, we discussed the limitations of the approach to assessing the flexibility score based on relative estimates within predefined sectors to which a particular company belongs. At the moment, there is no significant work on the use of the methodology we have adopted for evaluating companies within the framework of the cross-industrial approach. However, the problem of evaluating companies located in different sectors of the economy is currently quite acute and there is no single solution in this regard, the use of comparables and different ratios is significantly limited and rarely permissible between companies from different sectors

Chapter 5. Conclusion

The purpose of master thesis paper is to examine the idea of financial flexibility as a substantial factor of company's value creation. This might be especially interesting during the periods with high uncertainty in the business environment and either breakthrough possibilities of further swift growth or negative shocks to firms' cash flows. Using the model of binary signals, the degree of impact of company's financial flexibility on its' value was analyzed.

In the introductory part, two main research questions have been thoroughly studied and carried out within the framework of this paper and research objectives were formulated. Within the framework of the conducted research, the main literature on the studied problem was studied, as well as a detailed analysis of existing approaches and models of research on the issue was presented. Presented research results are consistent with the findings of Triantis and Gamba (2008). Despite this, the results obtained only partially converge with empirical studies Piotroski (2000) and the criteria obtained differ significantly from those originally proposed by the author, which, however, is confirmed by the results of Li and Mohanram (2018) which confirmed the operability of the proposed criterias in the current data sample.

This paper provides answers to the questions posed by testing the hypothesis formulated in the second chapter. The results of the study are presented in the third chapter of this work, while the main methodology, the process of selecting and constructing a model, as well as a description of the choice of variables and a detailed description of the hypothesis are given in the second chapter of this paper.

The fourth part provides a detailed explanation of the results obtained, assesses their stability and the presence of certain biases that can significantly affect the results in a negative way, as well as an explanation of how the bias data may be relevant depending on the subsequent use of the results.

The main research goal that was announced in the introduction has been achieved. The main application of the research results, limitations within the framework of this work and subsequent recommendations for further research are presented in the fourth part of this study.

All the necessary references to the literature used in the framework of this study are presented at the end of the article together with a complete list of the companies used for the study, as well as their affiliation to the main sectors of the economy in the appendix.

The main contribution of this research to this topic lies in the fact that this work pays special attention to the study of the issue of financial flexibility from the point of view of the formation of

the company's value. The results obtained make it possible to form not only an investment strategy for value investors, but also can be used by the company's management in the framework of investment and financial planning of both individual projects and the company as a whole.

The main limitations of this work are the use of data only from companies of the largest and most liquid companies of the American stock market, namely those included in the S&P500 index, which significantly reduces the data sample.

In the future, this study can be continued and expanded by increasing the sample, testing the proposed model on data from exchanges in other countries, as well as evaluating the possibility of using this approach for stocks of growing companies.

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Appendix

List of companies of portfolio

Company Name and an Exchange ticker	Market capitalisation, mln USD	Sector
3M Company (NYSE:MMM)	80502,26	Industrials
A. O. Smith Corporation (NYSE:AOS)	10319,53	Industrials
Abbott Laboratories (NYSE:ABT)	201072,25	Health Care
AbbVie Inc. (NYSE:ABBV)	263650,45	Health Care
Abiomed, Inc. (NasdaqGS:ABMD)	13053,59	Health Care
Accenture plc (NYSE:ACN)	196918,79	Information Technology
Activision Blizzard, Inc. (NasdaqGS:ATVI)	62580,35	Communication Services
Adobe Inc. (NasdaqGS:ADBE)	196406,45	Information Technology
Advance Auto Parts, Inc. (NYSE:AAP)	12358,59	Consumer Discretionary
Advanced Micro Devices, Inc. (NasdaqGS:AMD)	169717,89	Information Technology
Agilent Technologies, Inc. (NYSE:A)	39107,77	Health Care
Air Products and Chemicals, Inc. (NYSE:APD)	48640,36	Materials
Akamai Technologies, Inc. (NasdaqGS:AKAM)	17387,99	Information Technology
Alaska Air Group, Inc. (NYSE:ALK)	6147,04	Industrials
Albemarle Corporation (NYSE:ALB)	21623,68	Materials
Align Technology, Inc. (NasdaqGS:ALGN)	31570,99	Health Care
Allegion plc (NYSE:ALLE)	9820,93	Industrials
Alliant Energy Corporation (NasdaqGS:LNT)	15086,33	Utilities
Alphabet Inc. (NasdaqGS:GOOGL)	1720632,76	Communication Services
Altria Group, Inc. (NYSE:MO)	91735,15	Consumer Staples

Company Name and an Exchange ticker	Market capitalisation, mln USD	Sector
Amazon.com, Inc. (NasdaqGS:AMZN)	1480986,57	Consumer Discretionary
Amcor plc (ASX:AMC)	22573,68	Materials
Ameren Corporation (NYSE:AEE)	22548,34	Utilities
American Airlines Group Inc. (NasdaqGS:AAL)	9101,22	Industrials
American Electric Power Company, Inc. (NasdaqGS:AEP)	48174,94	Utilities
American Water Works Company, Inc. (NYSE:AWK)	27636,74	Utilities
AmerisourceBergen Corporation (NYSE:ABC)	30232,91	Health Care
AMETEK, Inc. (NYSE:AME)	29273,09	Industrials
Amgen Inc. (NasdaqGS:AMGN)	127476,17	Health Care
Amphenol Corporation (NYSE:APH)	44087,96	Information Technology
Analog Devices, Inc. (NasdaqGS:ADI)	77241,31	Information Technology
ANSYS, Inc. (NasdaqGS:ANSS)	25612,47	Information Technology
Anthem, Inc. (NYSE:ANTM)	112269,27	Health Care
APA Corporation (NasdaqGS:APA)	13541,62	Energy
Apple Inc. (NasdaqGS:AAPL)	2525107,11	Information Technology
Applied Materials, Inc. (NasdaqGS:AMAT)	109222,91	Information Technology
Aptiv PLC (NYSE:APTV)	28715,08	Consumer Discretionary
Archer-Daniels-Midland Company (NYSE:ADM)	46997,13	Consumer Staples
Arista Networks, Inc. (NYSE:ANET)	36894,03	Information Technology
AT&T Inc. (NYSE:T)	165643,68	Communication Services

Company Name and an Exchange ticker	Market capitalisation, mln USD	Sector
Atmos Energy Corporation (NYSE:ATO)	15404,07	Utilities
Autodesk, Inc. (NasdaqGS:ADSK)	42303,09	Information Technology
Automatic Data Processing, Inc. (NasdaqGS:ADP)	87062,78	Information Technology
AutoZone, Inc. (NYSE:AZO)	38474,69	Consumer Discretionary
Avery Dennison Corporation (NYSE:AVY)	13372,86	Materials
Baker Hughes Company (NasdaqGS:BKR)	35883,75	Energy
Ball Corporation (NYSE:BLL)	27507,18	Materials
Bath & Body Works, Inc. (NYSE:BBWI)	12064,01	Consumer Discretionary
Baxter International Inc. (NYSE:BAX)	38601,27	Health Care
Becton, Dickinson and Company (NYSE:BDX)	72477,09	Health Care
Best Buy Co., Inc. (NYSE:BBY)	22754,66	Consumer Discretionary
Bio-Rad Laboratories, Inc. (NYSE:BIO)	16011,83	Health Care
Bio-Techne Corporation (NasdaqGS:TECH)	15748,30	Health Care
Biogen Inc. (NasdaqGS:BIIB)	29050,14	Health Care
Booking Holdings Inc. (NasdaqGS:BKNG)	82486,85	Consumer Discretionary
BorgWarner Inc. (NYSE:BWA)	8715,76	Consumer Discretionary
Boston Scientific Corporation (NYSE:BSX)	59494,42	Health Care
Bristol-Myers Squibb Company (NYSE:BMJ)	150116,82	Health Care
Broadcom Inc. (NasdaqGS:AVGO)	235925,27	Information Technology
Broadridge Financial Solutions, Inc. (NYSE:BR)	16885,31	Information Technology

Company Name and an Exchange ticker	Market capitalisation, mln USD	Sector
Brown-Forman Corporation (NYSE:BF.B)	29205,10	Consumer Staples
C.H. Robinson Worldwide, Inc. (NasdaqGS:CHRW)	13168,36	Industrials
Cadence Design Systems, Inc. (NasdaqGS:CDNS)	40188,76	Information Technology
Caesars Entertainment, Inc. (NasdaqGS:CZR)	16018,58	Consumer Discretionary
Campbell Soup Company (NYSE:CPB)	12722,84	Consumer Staples
Cardinal Health, Inc. (NYSE:CAH)	14565,12	Health Care
CarMax, Inc. (NYSE:KMX)	16040,26	Consumer Discretionary
Carnival Corporation & plc (NYSE:CCL)	19357,73	Consumer Discretionary
Carrier Global Corporation (NYSE:CARR)	36866,94	Industrials
Catalent, Inc. (NYSE:CTLT)	17217,79	Health Care
Caterpillar Inc. (NYSE:CAT)	115124,83	Industrials
CDW Corporation (NasdaqGS:CDW)	22940,54	Information Technology
Celanese Corporation (NYSE:CE)	14909,12	Materials
Centene Corporation (NYSE:CNC)	48616,84	Health Care
CenterPoint Energy, Inc. (NYSE:CNP)	17893,23	Utilities
Ceridian HCM Holding Inc. (NYSE:CDAY)	9332,81	Information Technology
Cerner Corporation (NasdaqGS:CERN)	27361,77	Health Care
CF Industries Holdings, Inc. (NYSE:CF)	19911,63	Materials
Charles River Laboratories International, Inc. (NYSE:CRL)	13103,15	Health Care
Charter Communications, Inc. (NasdaqGS:CHTR)	96612,45	Communication Services
Chevron Corporation (NYSE:CVX)	332836,87	Energy

Company Name and an Exchange ticker	Market capitalisation, mln USD	Sector
Chipotle Mexican Grill, Inc. (NYSE:CMG)	41358,62	Consumer Discretionary
Church & Dwight Co., Inc. (NYSE:CHD)	23092,11	Consumer Staples
Cigna Corporation (NYSE:CI)	72811,45	Health Care
Cintas Corporation (NasdaqGS:CTAS)	38308,44	Industrials
Cisco Systems, Inc. (NasdaqGS:CSCO)	227191,45	Information Technology
Citrix Systems, Inc. (NasdaqGS:CTXS)	12682,95	Information Technology
CMS Energy Corporation (NYSE:CMS)	19112,59	Utilities
Cognizant Technology Solutions Corporation (NasdaqGS:CTSH)	46180,05	Information Technology
Colgate-Palmolive Company (NYSE:CL)	62002,74	Consumer Staples
Comcast Corporation (NasdaqGS:CMCS.A)	204086,03	Communication Services
Conagra Brands, Inc. (NYSE:CAG)	14438,90	Consumer Staples
ConocoPhillips (NYSE:COP)	127886,44	Energy
Consolidated Edison, Inc. (NYSE:ED)	31634,44	Utilities
Constellation Brands, Inc. (NYSE:STZ)	39937,93	Consumer Staples
Constellation Energy Corporation (NasdaqGS:CEG)	16111,07	Utilities
Copart, Inc. (NasdaqGS:CPRT)	27400,01	Industrials
Corning Incorporated (NYSE:GLW)	30822,76	Information Technology
Corteva, Inc. (NYSE:CTVA)	39004,68	Materials
Costco Wholesale Corporation (NasdaqGS:COST)	233765,36	Consumer Staples

Company Name and an Exchange ticker	Market capitalisation, mln USD	Sector
Coterra Energy Inc. (NYSE:CTRA)	20856,62	Energy
CSX Corporation (NasdaqGS:CSX)	76088,68	Industrials
Cummins Inc. (NYSE:CMI)	27814,52	Industrials
CVS Health Corporation (NYSE:CVS)	135805,45	Health Care
D.R. Horton, Inc. (NYSE:DHI)	28688,84	Consumer Discretionary
Danaher Corporation (NYSE:DHR)	187794,36	Health Care
Darden Restaurants, Inc. (NYSE:DRI)	16476,35	Consumer Discretionary
DaVita Inc. (NYSE:DVA)	10590,11	Health Care
Deere & Company (NYSE:DE)	119486,36	Industrials
Delta Air Lines, Inc. (NYSE:DAL)	20428,31	Industrials
DENTSPLY SIRONA Inc. (NasdaqGS:XRAY)	10610,12	Health Care
Devon Energy Corporation (NYSE:DVN)	38951,48	Energy
DexCom, Inc. (NasdaqGS:DXCM)	37880,83	Health Care
Diamondback Energy, Inc. (NasdaqGS:FANG)	23005,40	Energy
Discovery, Inc. (NasdaqGS:DISC.A)	15860,36	Communication Services
DISH Network Corporation (NasdaqGS:DISH)	15896,64	Communication Services
Dollar General Corporation (NYSE:DG)	47627,27	Consumer Discretionary
Dollar Tree, Inc. (NasdaqGS:DLTR)	33073,04	Consumer Discretionary
Dominion Energy, Inc. (NYSE:D)	66668,73	Utilities
Domino's Pizza, Inc. (NYSE:DPZ)	13923,30	Consumer Discretionary
Dover Corporation (NYSE:DOV)	21698,95	Industrials

Company Name and an Exchange ticker	Market capitalisation, mln USD	Sector
Dow Inc. (NYSE:DOW)	44774,08	Materials
DTE Energy Company (NYSE:DTE)	24599,92	Utilities
Duke Energy Corporation (NYSE:DUK)	81659,69	Utilities
DuPont de Nemours, Inc. (NYSE:DD)	37180,66	Materials
DXC Technology Company (NYSE:DXC)	7471,24	Information Technology
Eastman Chemical Company (NYSE:EMN)	13590,44	Materials
Eaton Corporation plc (NYSE:ETN)	58704,81	Industrials
eBay Inc. (NasdaqGS:EBAY)	29411,70	Consumer Discretionary
Ecolab Inc. (NYSE:ECL)	45550,48	Materials
Edison International (NYSE:EIX)	24665,36	Utilities
Edwards Lifesciences Corporation (NYSE:EW)	64470,81	Health Care
Electronic Arts Inc. (NasdaqGS:EA)	34401,92	Communication Services
Eli Lilly and Company (NYSE:LLY)	240295,04	Health Care
Emerson Electric Co. (NYSE:EMR)	55242,00	Industrials
Enphase Energy, Inc. (NasdaqGM:ENPH)	22912,36	Information Technology
Entergy Corporation (NYSE:ETR)	22079,26	Utilities
EOG Resources, Inc. (NYSE:EOG)	68303,24	Energy
EPAM Systems, Inc. (NYSE:EPAM)	11383,67	Information Technology
Equifax Inc. (NYSE:EFX)	27334,74	Industrials
Etsy, Inc. (NasdaqGS:ETSY)	15400,20	Consumer Discretionary
Evergy, Inc. (NYSE:EVRG)	14756,21	Utilities
Eversource Energy (NYSE:ES)	28867,51	Utilities

Company Name and an Exchange ticker	Market capitalisation, mln USD	Sector
Exelon Corporation (NasdaqGS:EXC)	42763,38	Utilities
Expedia Group, Inc. (NasdaqGS:EXPE)	27928,31	Consumer Discretionary
Expeditors International of Washington, Inc. (NasdaqGS:EXPD)	16647,43	Industrials
Exxon Mobil Corporation (NYSE:XOM)	359516,67	Energy
F5, Inc. (NasdaqGS:FFIV)	11809,32	Information Technology
Fastenal Company (NasdaqGS:FAST)	31062,63	Industrials
FedEx Corporation (NYSE:FDX)	56486,16	Industrials
Fidelity National Information Services, Inc. (NYSE:FIS)	54460,83	Information Technology
FirstEnergy Corp. (NYSE:FE)	25078,04	Utilities
Fiserv, Inc. (NasdaqGS:FISV)	61404,34	Information Technology
FLEETCOR Technologies, Inc. (NYSE:FLT)	17878,09	Information Technology
FMC Corporation (NYSE:FMC)	15494,97	Materials
Ford Motor Company (NYSE:F)	64228,13	Consumer Discretionary
Fortinet, Inc. (NasdaqGS:FTNT)	44888,42	Information Technology
Fortive Corporation (NYSE:FTV)	20193,89	Industrials
Fortune Brands Home & Security, Inc. (NYSE:FBHS)	11254,54	Industrials
Fox Corporation (NasdaqGS:FOXA)	21360,61	Communication Services
Freeport-McMoRan Inc. (NYSE:FCX)	68272,87	Materials
Garmin Ltd. (NYSE:GRMN)	21168,02	Consumer Discretionary
Gartner, Inc. (NYSE:IT)	23026,48	Information Technology
Generac Holdings Inc. (NYSE:GNRC)	17964,03	Industrials

Company Name and an Exchange ticker	Market capitalisation, mln USD	Sector
General Dynamics Corporation (NYSE:GD)	64435,51	Industrials
General Electric Company (NYSE:GE)	101445,42	Industrials
General Mills, Inc. (NYSE:GIS)	37561,68	Consumer Staples
General Motors Company (NYSE:GM)	60314,92	Consumer Discretionary
Genuine Parts Company (NYSE:GPC)	17273,48	Consumer Discretionary
Gilead Sciences, Inc. (NasdaqGS:GILD)	72725,43	Health Care
Global Payments Inc. (NYSE:GPN)	35807,12	Information Technology
Halliburton Company (NYSE:HAL)	33615,56	Energy
Hasbro, Inc. (NasdaqGS:HAS)	12015,85	Consumer Discretionary
HCA Healthcare, Inc. (NYSE:HCA)	81061,20	Health Care
Henry Schein, Inc. (NasdaqGS:HSIC)	11545,83	Health Care
Hess Corporation (NYSE:HES)	29152,13	Energy
Hewlett Packard Enterprise Company (NYSE:HPE)	21517,25	Information Technology
Hilton Worldwide Holdings Inc. (NYSE:HLT)	39573,55	Consumer Discretionary
Hologic, Inc. (NasdaqGS:HOLX)	17358,90	Health Care
Honeywell International Inc. (NasdaqGS:HON)	124983,61	Industrials
Hormel Foods Corporation (NYSE:HRL)	27511,48	Consumer Staples
Howmet Aerospace Inc. (NYSE:HWM)	14129,66	Industrials
HP Inc. (NYSE:HPQ)	38226,64	Information Technology
Humana Inc. (NYSE:HUM)	54007,85	Health Care

Company Name and an Exchange ticker	Market capitalisation, mln USD	Sector
Huntington Ingalls Industries, Inc. (NYSE:HII)	8240,54	Industrials
IDEX Corporation (NYSE:IEX)	14435,35	Industrials
IDEXX Laboratories, Inc. (NasdaqGS:IDXX)	41962,78	Health Care
Illinois Tool Works Inc. (NYSE:ITW)	63793,29	Industrials
Illumina, Inc. (NasdaqGS:ILMN)	47707,59	Health Care
Incyte Corporation (NasdaqGS:INCY)	16364,78	Health Care
Ingersoll Rand Inc. (NYSE:IR)	19415,19	Industrials
Intel Corporation (NasdaqGS:INTC)	186619,76	Information Technology
International Business Machines Corporation (NYSE:IBM)	111478,47	Information Technology
International Flavors & Fragrances Inc. (NYSE:IFF)	30088,45	Materials
International Paper Company (NYSE:IP)	15969,14	Materials
Intuit Inc. (NasdaqGS:INTU)	124245,18	Information Technology
Intuitive Surgical, Inc. (NasdaqGS:ISRG)	98308,03	Health Care
IPG Photonics Corporation (NasdaqGS:IPGP)	5865,68	Information Technology
IQVIA Holdings Inc. (NYSE:IQV)	40781,37	Health Care
J.B. Hunt Transport Services, Inc. (NasdaqGS:JBHT)	20797,00	Industrials
Jack Henry & Associates, Inc. (NasdaqGS:JKHY)	13357,57	Information Technology
Jacobs Engineering Group Inc. (NYSE:J)	16155,96	Industrials
Johnson & Johnson (NYSE:JNJ)	445266,56	Health Care
Johnson Controls International plc (NYSE:JCI)	42479,73	Industrials

Company Name and an Exchange ticker	Market capitalisation, mln USD	Sector
Juniper Networks, Inc. (NYSE:JNPR)	10696,22	Information Technology
Kellogg Company (NYSE:K)	20315,19	Consumer Staples
Keysight Technologies, Inc. (NYSE:KEYS)	26544,70	Information Technology
Kimberly-Clark Corporation (NYSE:KMB)	39599,19	Consumer Staples
Kinder Morgan, Inc. (NYSE:KMI)	41041,47	Energy
KLA Corporation (NasdaqGS:KLAC)	48721,75	Information Technology
L3Harris Technologies, Inc. (NYSE:LHX)	48264,95	Industrials
Laboratory Corporation of America Holdings (NYSE:LH)	24796,77	Health Care
Lam Research Corporation (NasdaqGS:LRCX)	67432,97	Information Technology
Lamb Weston Holdings, Inc. (NYSE:LW)	7276,15	Consumer Staples
Las Vegas Sands Corp. (NYSE:LVS)	27823,59	Consumer Discretionary
Leidos Holdings, Inc. (NYSE:LDOS)	14327,34	Industrials
Lennar Corporation (NYSE:LEN)	24942,27	Consumer Discretionary
Linde plc (NYSE:LIN)	142126,79	Materials
Live Nation Entertainment, Inc. (NYSE:LYV)	24295,05	Communication Services
LKQ Corporation (NasdaqGS:LKQ)	12554,87	Consumer Discretionary
Lockheed Martin Corporation (NYSE:LMT)	119562,41	Industrials
Lowe's Companies, Inc. (NYSE:LOW)	148880,70	Consumer Discretionary
Lumen Technologies, Inc. (NYSE:LUMN)	10929,62	Communication Services
LyondellBasell Industries N.V. (NYSE:LYB)	33926,03	Materials

Company Name and an Exchange ticker	Market capitalisation, mln USD	Sector
Marathon Oil Corporation (NYSE:MRO)	16931,83	Energy
Marathon Petroleum Corporation (NYSE:MPC)	44374,87	Energy
Marriott International, Inc. (NasdaqGS:MAR)	52744,93	Consumer Discretionary
Martin Marietta Materials, Inc. (NYSE:MLM)	23140,91	Materials
Masco Corporation (NYSE:MAS)	12891,24	Industrials
Mastercard Incorporated (NYSE:MA)	317474,57	Information Technology
Match Group, Inc. (NasdaqGS:MTCH)	25221,37	Communication Services
McCormick & Company, Incorporated (NYSE:MKC)	25856,19	Consumer Staples
McDonald's Corporation (NYSE:MCD)	168697,06	Consumer Discretionary
McKesson Corporation (NYSE:MCK)	42127,80	Health Care
Medtronic plc (NYSE:MDT)	139278,60	Health Care
Merck & Co., Inc. (NYSE:MRK)	197820,43	Health Care
Meta Platforms, Inc. (NasdaqGS:FB)	510663,53	Communication Services
Mettler-Toledo International Inc. (NYSE:MTD)	29903,18	Health Care
MGM Resorts International (NYSE:MGM)	17615,20	Consumer Discretionary
Microchip Technology Incorporated (NasdaqGS:MCHP)	38385,60	Information Technology
Micron Technology, Inc. (NasdaqGS:MU)	81542,17	Information Technology
Microsoft Corporation (NasdaqGS:MSFT)	2099647,38	Information Technology
Moderna, Inc. (NasdaqGS:MRNA)	55697,39	Health Care
Mohawk Industries, Inc. (NYSE:MHK)	8531,46	Consumer Discretionary

Company Name and an Exchange ticker	Market capitalisation, mln USD	Sector
Molina Healthcare, Inc. (NYSE:MOH)	18285,62	Health Care
Molson Coors Beverage Company (NYSE:TAP)	11059,33	Consumer Staples
Mondelez International, Inc. (NasdaqGS:MDLZ)	82077,95	Consumer Staples
Monolithic Power Systems, Inc. (NasdaqGS:MPWR)	18405,47	Information Technology
Monster Beverage Corporation (NasdaqGS:MNST)	38759,66	Consumer Staples
Motorola Solutions, Inc. (NYSE:MSI)	37303,73	Information Technology
NetApp, Inc. (NasdaqGS:NTAP)	18715,32	Information Technology
Netflix, Inc. (NasdaqGS:NFLX)	151089,52	Communication Services
Newell Brands Inc. (NasdaqGS:NWL)	9182,29	Consumer Discretionary
Newmont Corporation (NYSE:NEM)	60939,13	Materials
News Corporation (NasdaqGS:NWSA)	12234,89	Communication Services
NextEra Energy, Inc. (NYSE:NEE)	155645,68	Utilities
Nielsen Holdings plc (NYSE:NLSN)	6294,58	Industrials
NIKE, Inc. (NYSE:NKE)	193914,24	Consumer Discretionary
NiSource Inc. (NYSE:NI)	12076,42	Utilities
Nordson Corporation (NasdaqGS:NDSN)	12460,12	Industrials
Norfolk Southern Corporation (NYSE:NSC)	64102,10	Industrials
Northrop Grumman Corporation (NYSE:NOC)	68107,27	Industrials
NortonLifeLock Inc. (NasdaqGS:NLOK)	16082,13	Information Technology
Norwegian Cruise Line Holdings Ltd. (NYSE:NCLH)	7294,84	Consumer Discretionary

Company Name and an Exchange ticker	Market capitalisation, mln USD	Sector
NRG Energy, Inc. (NYSE:NRG)	9318,06	Utilities
Nucor Corporation (NYSE:NUE)	36399,14	Materials
NVIDIA Corporation (NasdaqGS:NVDA)	552500,00	Information Technology
NVR, Inc. (NYSE:NVR)	16057,53	Consumer Discretionary
NXP Semiconductors N.V. (NasdaqGS:NXPI)	46878,81	Information Technology
O'Reilly Automotive, Inc. (NasdaqGS:ORLY)	44962,95	Consumer Discretionary
Occidental Petroleum Corporation (NYSE:OXY)	54129,01	Energy
Old Dominion Freight Line, Inc. (NasdaqGS:ODFL)	35191,97	Industrials
Omnicom Group Inc. (NYSE:OMC)	15935,68	Communication Services
ONEOK, Inc. (NYSE:OKE)	29476,85	Energy
Oracle Corporation (NYSE:ORCL)	207635,98	Information Technology
Organon & Co. (NYSE:OGN)	9084,70	Health Care
Otis Worldwide Corporation (NYSE:OTIS)	30767,27	Industrials
PACCAR Inc (NasdaqGS:PCAR)	29738,26	Industrials
Packaging Corporation of America (NYSE:PKG)	13909,13	Materials
Paramount Global (NasdaqGS:PARA)	21278,55	Communication Services
Parker-Hannifin Corporation (NYSE:PH)	34814,87	Industrials
Paychex, Inc. (NasdaqGS:PAYX)	43508,87	Information Technology
Paycom Software, Inc. (NYSE:PAYC)	18257,94	Information Technology
PayPal Holdings, Inc. (NasdaqGS:PYPL)	112504,52	Information Technology
Penn National Gaming, Inc. (NasdaqGS:PENN)	7085,41	Consumer Discretionary

Company Name and an Exchange ticker	Market capitalisation, mln USD	Sector
Pentair plc (NYSE:PNR)	8882,32	Industrials
PepsiCo, Inc. (NasdaqGS:PEP)	212677,98	Consumer Staples
PerkinElmer, Inc. (NYSE:PKI)	20928,25	Health Care
Pfizer Inc. (NYSE:PFE)	282685,63	Health Care
Philip Morris International Inc. (NYSE:PM)	137733,20	Consumer Staples
Phillips 66 (NYSE:PSX)	35414,54	Energy
Pinnacle West Capital Corporation (NYSE:PNW)	8329,86	Utilities
Pioneer Natural Resources Company (NYSE:PXD)	56468,10	Energy
Pool Corporation (NasdaqGS:POOL)	17758,32	Consumer Discretionary
PPG Industries, Inc. (NYSE:PPG)	28392,09	Materials
PPL Corporation (NYSE:PPL)	19317,96	Utilities
PTC Inc. (NasdaqGS:PTC)	12156,01	Information Technology
Public Service Enterprise Group Incorporated (NYSE:PEG)	32996,56	Utilities
PulteGroup, Inc. (NYSE:PHM)	11534,92	Consumer Discretionary
PVH Corp. (NYSE:PVH)	5074,78	Consumer Discretionary
Qorvo, Inc. (NasdaqGS:QRVO)	13405,40	Information Technology
QUALCOMM Incorporated (NasdaqGS:QCOM)	171687,18	Information Technology
Quanta Services, Inc. (NYSE:PWR)	17596,57	Industrials
Quest Diagnostics Incorporated (NYSE:DGX)	16286,46	Health Care
Ralph Lauren Corporation (NYSE:RL)	7653,33	Consumer Discretionary
Raytheon Technologies Corporation (NYSE:RTX)	143938,90	Industrials
Regeneron Pharmaceuticals, Inc. (NasdaqGS:REGN)	68395,75	Health Care

Company Name and an Exchange ticker	Market capitalisation, mln USD	Sector
Republic Services, Inc. (NYSE:RSG)	40041,22	Industrials
ResMed Inc. (NYSE:RMD)	34817,88	Health Care
Robert Half International Inc. (NYSE:RHI)	11852,56	Industrials
Rockwell Automation, Inc. (NYSE:ROK)	29863,57	Industrials
Rollins, Inc. (NYSE:ROL)	15845,16	Industrials
Roper Technologies, Inc. (NYSE:ROP)	45653,16	Industrials
Ross Stores, Inc. (NasdaqGS:ROST)	31008,22	Consumer Discretionary
Royal Caribbean Cruises Ltd. (NYSE:RCL)	17449,84	Consumer Discretionary
salesforce.com, inc. (NYSE:CRM)	195921,00	Information Technology
Schlumberger Limited (NYSE:SLB)	60205,07	Energy
Seagate Technology Holdings plc (NasdaqGS:STX)	19116,39	Information Technology
Sealed Air Corporation (NYSE:SEE)	9596,20	Materials
Sempra (NYSE:SRE)	48676,99	Utilities
ServiceNow, Inc. (NYSE:NOW)	102430,00	Information Technology
Skyworks Solutions, Inc. (NasdaqGS:SWKS)	20917,30	Information Technology
Snap-on Incorporated (NYSE:SNA)	10992,33	Industrials
SolarEdge Technologies, Inc. (NasdaqGS:SEDG)	16792,63	Information Technology
Southwest Airlines Co. (NYSE:LUV)	23835,84	Industrials
Stanley Black & Decker, Inc. (NYSE:SWK)	22357,81	Industrials
Starbucks Corporation (NasdaqGS:SBUX)	95164,32	Consumer Discretionary
STERIS plc (NYSE:STE)	21903,83	Health Care

Company Name and an Exchange ticker	Market capitalisation, mln USD	Sector
Stryker Corporation (NYSE:SYK)	93544,25	Health Care
Synopsys, Inc. (NasdaqGS:SNPS)	44963,56	Information Technology
Sysco Corporation (NYSE:SYI)	39489,56	Consumer Staples
T-Mobile US, Inc. (NasdaqGS:TMUS)	155624,05	Communication Services
Take-Two Interactive Software, Inc. (NasdaqGS:TTWO)	16796,44	Communication Services
Tapestry, Inc. (NYSE:TPR)	9068,05	Consumer Discretionary
Target Corporation (NYSE:TGT)	95706,67	Consumer Discretionary
TE Connectivity Ltd. (NYSE:TEL)	41484,80	Information Technology
Teledyne Technologies Incorporated (NYSE:TDY)	19840,69	Information Technology
Teleflex Incorporated (NYSE:TFX)	15747,86	Health Care
Teradyne, Inc. (NasdaqGS:TER)	17359,13	Information Technology
Tesla, Inc. (NasdaqGS:TSLA)	822000,28	Consumer Discretionary
Texas Instruments Incorporated (NasdaqGS:TXN)	157335,48	Information Technology
Textron Inc. (NYSE:TXT)	14967,83	Industrials
The AES Corporation (NYSE:AES)	14816,17	Utilities
The Boeing Company (NYSE:BA)	102742,05	Industrials
The Clorox Company (NYSE:CLX)	16017,21	Consumer Staples
The Coca-Cola Company (NYSE:KO)	251110,61	Consumer Staples
The Cooper Companies, Inc. (NYSE:COO)	18732,62	Health Care
The Estée Lauder Companies Inc. (NYSE:EL)	94770,45	Consumer Staples

Company Name and an Exchange ticker	Market capitalisation, mln USD	Sector
The Hershey Company (NYSE:HSY)	42010,95	Consumer Staples
The Home Depot, Inc. (NYSE:HD)	330804,53	Consumer Discretionary
The Interpublic Group of Companies, Inc. (NYSE:IPG)	12996,74	Communication Services
The J. M. Smucker Company (NYSE:SJM)	13973,78	Consumer Staples
The Kraft Heinz Company (NasdaqGS:KHC)	45718,93	Consumer Staples
The Kroger Co. (NYSE:KR)	40576,14	Consumer Staples
The Mosaic Company (NYSE:MOS)	22805,71	Materials
The Procter & Gamble Company (NYSE:PG)	343307,75	Consumer Staples
The Sherwin-Williams Company (NYSE:SHW)	60528,02	Materials
The Southern Company (NYSE:SO)	72826,96	Utilities
The TJX Companies, Inc. (NYSE:TJX)	73278,52	Consumer Discretionary
The Walt Disney Company (NYSE:DIS)	239868,45	Communication Services
The Williams Companies, Inc. (NYSE:WMB)	38777,41	Energy
Thermo Fisher Scientific Inc. (NYSE:TMO)	207257,31	Health Care
Tractor Supply Company (NasdaqGS:TSCO)	25545,19	Consumer Discretionary
Trane Technologies plc (NYSE:TT)	34757,47	Industrials
TransDigm Group Incorporated (NYSE:TDG)	34607,78	Industrials
Trimble Inc. (NasdaqGS:TRMB)	16447,08	Information Technology
Twitter, Inc. (NYSE:TWTR)	26365,55	Communication Services
Tyler Technologies, Inc. (NYSE:TYL)	16469,69	Information Technology
Tyson Foods, Inc. (NYSE:TSN)	31766,50	Consumer Staples

Company Name and an Exchange ticker	Market capitalisation, mln USD	Sector
Ulta Beauty, Inc. (NasdaqGS:ULTA)	19243,66	Consumer Discretionary
Under Armour, Inc. (NYSE:UAA)	6974,38	Consumer Discretionary
Union Pacific Corporation (NYSE:UNP)	166561,82	Industrials
United Airlines Holdings, Inc. (NasdaqGS:UAL)	11319,72	Industrials
United Parcel Service, Inc. (NYSE:UPS)	177472,81	Industrials
United Rentals, Inc. (NYSE:URI)	23374,17	Industrials
UnitedHealth Group Incorporated (NYSE:UNH)	454331,97	Health Care
Universal Health Services, Inc. (NYSE:UHS)	11613,36	Health Care
V.F. Corporation (NYSE:VFC)	20806,24	Consumer Discretionary
Valero Energy Corporation (NYSE:VLO)	37520,86	Energy
VeriSign, Inc. (NasdaqGS:VRSN)	22491,78	Information Technology
Verisk Analytics, Inc. (NasdaqGS:VRSK)	29359,95	Industrials
Verizon Communications Inc. (NYSE:VZ)	222652,57	Communication Services
Vertex Pharmaceuticals Incorporated (NasdaqGS:VRTX)	60202,30	Health Care
Viatis Inc. (NasdaqGS:VTRS)	12119,95	Health Care
Visa Inc. (NYSE:V)	412691,82	Information Technology
Vulcan Materials Company (NYSE:VMC)	23281,14	Materials
W.W. Grainger, Inc. (NYSE:GWW)	24136,22	Industrials
Walgreens Boots Alliance, Inc. (NasdaqGS:WBA)	40953,62	Consumer Staples
Walmart Inc. (NYSE:WMT)	394084,91	Consumer Staples

Company Name and an Exchange ticker	Market capitalisation, mln USD	Sector
Waste Management, Inc. (NYSE:WM)	62797,45	Industrials
Waters Corporation (NYSE:WAT)	18939,57	Health Care
WEC Energy Group, Inc. (NYSE:WEC)	29606,69	Utilities
West Pharmaceutical Services, Inc. (NYSE:WST)	26979,82	Health Care
Western Digital Corporation (NasdaqGS:WDC)	14175,17	Information Technology
Westinghouse Air Brake Technologies Corporation (NYSE:WAB)	16498,23	Industrials
WestRock Company (NYSE:WRK)	12498,59	Materials
Whirlpool Corporation (NYSE:WHR)	10838,95	Consumer Discretionary
Wynn Resorts, Limited (NasdaqGS:WYNN)	8316,59	Consumer Discretionary
Xcel Energy Inc. (NasdaqGS:XEL)	38296,32	Utilities
Xylem Inc. (NYSE:XYL)	15043,33	Industrials
Yum! Brands, Inc. (NYSE:YUM)	33596,93	Consumer Discretionary
Zebra Technologies Corporation (NasdaqGS:ZBRA)	20492,50	Information Technology
Zimmer Biomet Holdings, Inc. (NYSE:ZBH)	24854,46	Health Care
Zoetis Inc. (NYSE:ZTS)	87451,43	Health Care