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Determining the Valuation of OMXH 25 Stocks by Utilizing the Gordon Growth Model

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Abstract

Investing is considered to be a great way to manage one's wealth. Investors seek to gain return with different strategies chosen and many of those strategies include defining intrinsic value of stock and comparing it to the market price. The current economic environment is putting pressure on investors and companies alike and thus, effective wealth management is vital. Based on value investing philosophy, this environment is creating higher dispersion in prices a d hence possible inefficiencies in market valuations.

Current research is implementing a form of fundamental analysis called Gordon Growth Model to determine intrinsic value for a stocks of OMXH 25 companies. This fundamental analysis was supported by technical analysis to gain a higher conviction on the recommendations. The study aims to, based on determined value and by comparing it to market price, determine whether inefficiently priced stocks can be found on the market. Furthermore, how an investor could benefit from these.

Results of the study implied that through fundamental analysis that it was possible to detect undervalued stocks. Furthermore, it revealed that the majority of benchmark stocks were undervalued and thus a possible opportunity for one to capitalize from this.

The findings of this research contribute to offer practical insights for investors to navigate on the markets, additionally to academic discourse of value investing. By determining the intrinsic value for a stock investor might be able to capitalize from market inefficiencies and gain valuable insight on how to make informed investing decisions.

Keywords/tags (subjects)

Stock Valuation, Gordon Growth Model, OMXH 25, CAPM, WACC

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OMXH 25 -osakkeiden arvon määrittäminen hyödyntämällä Gordonin kasvumallia.

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Tiivistelmä

Sijoittaminen katsotaan hyväksi tavaksi hallita varallisuuttaan. Sijoittajat pyrkivät saamaan tuottoa erilaisilla strategioilla, joista monet sisältävät osakkeiden sisäisen arvon määrittämisen ja sen vertaamisen markkinahintaan. Nykyinen taloudellinen ympäristö asettaa paineita sekä sijoittajille että yrityksille, ja siksi tehokas varallisuuden hallinta on elintärkeää. Arvo sijoittamisen filosofian perusteella tämä ympäristö luo korkeamman hajonnan hinnoissa ja siten mahdollisia epätehokkuuksia markkina-arvioissa.

Nykyinen tutkimus käyttää fundamentaali analyysin tyyliä nimeltä Gordonin kasvumalli määrittääkseen OMXH 25 -yhtiöiden osakkeiden sisäisen arvon. Tätä perusteellista analyysiä tuettiin teknisellä analyysillä saadakseen vahvistuksen suosituksille. Tutkimuksen tavoitteena on määrittää arvon perusteella ja sitä markkinahintaan verraten, voiko markkinoilta löytyä tehottomasti hinnoiteltuja osakkeita, ja kuinka sijoittaja voisi hyötyä niistä.

Tutkimuksen tulokset antoivat ymmärtää, että perusteellisen analyysin avulla oli mahdollista havaita alihinnoiteltuja osakkeita. Lisäksi paljastui, että suurin osa vertailuindeksin osakkeista oli alihinnoiteltuja, ja siten mahdollisuus hyötyä tästä.

Tämän tutkimuksen tulokset antavat käytännön näkökulmia sijoittajille markkinoiden navigointiin lisäksi arvopaperisijoittamisen akateemiseen keskusteluun. Määrittämällä osakkeen sisäisen arvon sijoittaja saattaa pystyä hyödyntämään markkinoiden tehottomuuksia ja saamaan arvokasta tietoa siitä, miten tehdä informoituja päätöksiä.

Avainsanat (asiasanat)

Osakkeen arvonmääritys, Gordonin kasvumalli, OMXH 25, Pääoman hintamalli, Painotettu keskimääräinen pääomakustannus

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1 Introduction

Investing is considered as a great way to manage one's wealth, and in this dissertation the author is introducing way to invest on particular asset class called stocks. A respected business newspaper The Economic times describes the stock as a certificate of an ownership of a company. Thus, acquiring a stock is buying a share of a company, and nowadays these certificates are generally electrical. Based on common investing philosophy, finding undervalued stock can be perceived as a theoretical buy signal. In this dissertation the author is applying a theoretical framework called Gordon Growth Model to determine an intrinsic price for a stock and by comparing it to the real market price determining if the stock is over- or undervalued. In the following subchapters respectively: background, motivation, research questions and structure of the thesis, the author will lay the theoretical foundation for this dissertation and familiarize the reader more precisely to this study. Following concepts used are universal financial theories and can be used by all investors, but the author decided to focus on perspective of individual investor due to relevance to author self and possible reader.

1.1 Background

As briefly discussed earlier, investing is considered to be great way to manage one's wealth and potentially grow it. There are multiple different kinds of asset classes to invest in such as bonds, funds and stocks. Stocks are often sold and bought in marketplaces called stock exchanges such as, Helsinki Stock Exchange, London Stock Exchange (LSE) and National Association of Securities Dealers Automated Quotations (Nasdaq). This dissertation is focused on investing in stocks specifically from an individual investors point of view due to relevance to author himself.

The basic idea of investing is to find the most efficient way for investors to allocate their capital to gain return. To do so, one must first decide the most suitable strategy based on one's goals and preferences such as their risk tolerance, time horizon and personal economic situation. Determining the intrinsic value through selected parameters and comparing it to market price can be seen a foundation of many strategies. Reason for investors to do so is that they hope to possibly detect undervalued assets, which can then be perceived as a theoretical buy signal. Benjamin Graham and David Dodd introduced the concept of value investing and laid a foundation for this concept in their book Security Analysis *originally published in 1934.* According to Graham & Dodd (2009), by

detecting undervalued assets through analysis and acquiring it, it lays strong foundation to gain return if and when the market corrects the temporarily incorrectly priced asset. This concept has been adapted by numerous notable investors, including Warren Buffet.

To be able to determine an intrinsic value for an asset, many different kinds of methods have been developed that takes into account the different kinds of relevant metrics. It is up to investor to decide which of these strategies is the most suitable for their preferences. Graham & Dodd's introduced theory includes taking account the fundamental data from company like Debt-to-equity (D/E), earning per share (EPS) and Price-to-earning (P/E) and not focusing so much on the historical stock price of a company. Determining the intrinsic value for a stock this way is called *Fundamental analysis* and it is the core of *Value investing.* On the other end, there has been developed a strategy called *technical analysis*. Its foundation is solely focused on the market data like historical stock price, and it ignores the company's fundamental data. As introduced in 'Dow Theory for the 21st century (Schannep, 2008) Charles Dow's Dow theory is considered universally as one of the fundamentals of this strategy. These strategies introduced are very well-known examples of strategies available for investors.

Since stocks are certificates of ownership of a company, the underlying company behind the security must be studied to make informed decisions. There are numerous factors effecting on investors and companies' decisions but in this section of the dissertation the author introduces one of the most important factors, Macro-economy. Macro-economy and its everchanging environment have its own effects on investors. Currently the macro-economy is very much different compared to early 2020s due to current world events such as the war in Ukraine and Israel/Hamas war, increased inflation and political stability over the world are forcing monetary and fiscal policy makers, central banks, and governments, to react and modify their polices. For instance central banks to carry out quantitative tightening, i.e. sell securities to open market and reducing the size of their balance sheet**,** increase rates and possible in tax modifications. These decisions have far reaching effects not only on companies and their operating environments but also the personal wealth of investors and their willingness to invest**.** These environmental changes can be seen, for instance, as increased financial costs and decreased demand for company's products or services consumed. As an example, the price of electricity, gas and household items have increased, which have put more pressure on one's personal wealth. These metrics, among others, are monitored by

investors and analysts who are evaluating the companies and their results. Based on principles of corporate finance, the function of companies is to create value and return for their investors (Brealey et al., 2023). If these principles do not materialize, investors simply are unwilling to invest and thus create a downward pressure on the companies' stocks.

As the very basic theory of economy, the concept of supply and demand, originally introduced by Adam Smith in his book Wealth of Nations originally published in 1776 and later further developed by other economists. Its basic principles can be seen also at the stock market. Generally, the supply of stock can be seen as a constant. The more investors are willing to pay for a stock, the more its price increases and vice versa. Over times market movements have been studied and based on these studies theories have been developed. Efficient market Hypothesis (EMH) introduced by Fama (1995), argues that markets are efficient, meaning that all available information is used and priced correctly on the market. Thus, it would make it impossible to gain above average returns consistently. On contrary to EMH, later studies on the field of economics, such as studies conducted by economist Richard J. Thaler's (2016) have shown that markets are in fact, not efficient. In his studies on the field of behavioral economics Thaler states that human decision making is not always rational, but rather irrational and exposed to psychological factors, such overconfidence, herd behavior and mental accounting. He argues that these factors can create inefficiencies on the market such as bubbles. If the assumption is that markets are not efficient all the time, but rather moved by sentiment on a short term, detecting inefficiencies could be way to above-average returns.

Based on the previously introduced information, the author has decided to choose to apply form of fundamental analysis methods to determine theoretical price for a stock. To support the analysis the author also used technical analysis methods. Rationale for using form of fundamental analysis is that based on EMH, technical analysis would be unable to produce additional returns, but even if weak form of EMH holds, fundamental analysis is able to do so by detecting undervalued assets. To do so the author has decided to apply this method to familiar Finnish companies from OMX Helsinki 25 index. OMX Helsinki 25 is a stock index which is tracking 25 most traded companies in Helsinki stock market and their price movements on the market. As mentioned earlier, the author decided to use a form of fundamental approach in the process to determine the intrinsic value of stocks and the data is collected through companies' financial reports as well as historical

stock prices. The author has decided to use time span of 3-years from 01.10.2020-30.09.2023, which marks as beginning of the fourth quarter of 2020 and end of third quarter of 2023. The value definition method chosen is called Gordon Growth Model (GGM) (Gordon, 1959) and the author offers more comprehensive explanation of model in chapter 2. Since the method takes account the dividend which companies pay to their investors, author has only used companies which have paid dividends in fiscal year 2022.

1.2 Motivation For Research

Since stock markets can be seen generally as a projection of environmental factors where the future has major role the current sentiment on the Finnish stock market is projecting the current economic situation in pessimistic manner so to say. Based on media reports and overall perceived sentiment on the market by viewing the graph of the OMXH 25 index (figure 1) one can spot the down forward trend from 1 year time span for instance. Since, like mentioned earlier, finding undervalued asset can be fundamentally efficient way to create profit this creates very interesting environment for one. The current environment creates, at least, theoretically a great chance to spot inefficiently priced assets which have been a major motivating factor for this research. Additionally, the author himself has been interested in investing for several years, thus making this dissertation relevant for him as well. This study also offers opportunity to learn financial concepts with real life applications to determine the valuation for stocks in order to make educated investment decisions.

Figure 1 OMXH 1 year (retrieved from Yahoo Finance)

1.3 Research Objectives

This dissertation's goal is to determine the intrinsic value, for the OMX Helsinki 25 companies' stocks and compare them to the real market price to determine if these selected stocks are under- or overvalued. To extract these, the following objectives have been deduced:

1. To define the intrinsic/fundamental price of the OMX Helsinki 25 stocks
2. To determining whether the stocks are over- or undervalued based on comparison between intrinsic value and market price of stocks

1.4 Thesis Structure

The author has structured the study in the following manner, in the first chapter the author introduces the study, in second chapter the author introduces the theoretical framework which introduces financial theories applied in this study. These theories have been gathered through multiple academic papers and studies such as Markowitz's in journal of finance. The third chapter will contain the methodology, where the author introduces research design, variables, data collection and methods used, supplemented with data collected from Yahoo Finance and financial reports. In the

fourth chapter, the author introduces the results. In the fifth and final chapter of the study, discussion of results, limitations, and conclusion respectively, the author discusses about the findings, limitations and concludes the study.

2 Literature Review

In the following chapter, the author introduces core financial concepts which have been utilized in this study. The concepts introduced in literature review have laid the foundation in finance and are studied widely by students in the field of finance, including the author. Theories and key terms explained in this chapter required author to review existing studies which were collected through online resources such as original research papers, textbooks and newspapers. The knowledge collected from these papers, articles and textbooks created the theoretical backbone to this study. This chapter lays the fundamental theoretical background to this study and familiarize the reader to these concepts to understand the later applied analysis of data and conclusions. The limitations of these theories have been discussed in the final chapter.

2.1 Value and Price

In this chapter the author familiarizes the reader to fundamental concepts of value and price. By defining these concepts, we are able to separate them from each other enabling us to view them as an individual concepts. This is a key part in this dissertation, since the author is defining the intrinsic price which can be perceived as a value and comparing it to real price.

In economic sense, the term value was first introduced in Wealth of Nations Smith (2000) as the labor theory of value. Smith introduces the idea of the labor theory of value, which suggests that amount of labor required is related to the value. Later on, the concept of value has been further developed by numerous economists. For instance, Von Mises & Greaves (2006) introduces in their book the concept of The Subjective theory of value. According to this theory the value is based on one's preferences and valuations, thus making it subjective. Based on a subjective theory of value, the factors investors to take account depends solely on one's subjective preferences which one perceive the most optimal for him or her. Key factors considered in value definition in this study are determined later. In the field of finance, the idea of a value is slightly less subjective and for instance, the value of a stock can be seen as according to universal valuation principle which states

that value equals the net present value of future cash flows, thus the value of stock can be described as net present value of all cash flows (possible capital gain and dividend) of security (Khoury et al., 2003). This idea can be seen in following applied research. Thus, to calculate the simple market value of a company, formula would be following:

$$MP_0^s = \sum_{i=0}^{n} \frac{D_i}{(1+K_e)} + \frac{MP_n^s}{(1+K_e)}$$

where:

$MP_0^s = Current\ market\ price\ of\ asset$

$MP_n^s = Market\ price\ at\ selling\ time\ n$

$K_e = investors\ required\ rate\ of\ return$

(Khoury et al., 2003).

To understand the concept of a price, we must first understand the basic concept of Supply and demand. This is very foundational theory that is widely introduced to economic students and it is a core concept of economy, since it is major factor for pricing. In his textbook Mankiw (1998) explains the concept of demand as a quantity of consumers desire to a product or a service and Supply as a quantity of services or products available to consumer. He defines the relationship of these concepts as a determiner of equilibrium. Based on fundamental economic theory, the price is determined by this equilibrium.

There are multiple different factors which can be seen effecting the price of an asset. To save readers time the author decided not to go through all numerous factors effecting the price for an asset, but rather introduce the general view of stock price dynamic. Definition of stock price is determined as perceived market value of a company's stock (Marcus et. al., (2017). Thus, we can determine the price to be the amount of medium of exchange which one is willing to pay for an object or service, stock in this particular study.

2.2 Risks

In the current chapter of the study and later subchapters, the author introduces the very relevant concepts related to investing. Since risk and return usually go hand in hand in the field of finance it is essential to understand these concepts. To do so, we must first study the concept of risk. Risk in the context of investment can be generally seen as a loss of principle, but in a deeper sense in the field of finance the risk is more precise factor. In the following subchapter, the author explains the fundamentals of risk, which lays the foundation to next subchapter and key concept, Risk and return Hypothesis. Since the concept of return is not complex or require more thorough explanation, author decided not to explain it more precisely. The concept of risk lays the foundation to later concepts, Capital Asset Pricing Model and Arbitrage pricing theory.

The concept of risk is very fundamental concept in the field of finance and economy and investors must take it into account while making investment decisions. In the field of finance there are numerous risks to take account, but in this dissertation, author is focused solely on quantitively measurable risks on the stock market. Modern Portfolio Theory (MPT now on) introduced originally by Markowitz in 1952. MPT revised by Francis & Kim (2013), explained that risk can be divided in to two different categories: Systematic risk also known as an undiversifiable risk or market risk and is measured with beta coefficient and unsystematic risk or specific risk.

2.2.1 Systematic Risk

Systematic risk, also referred to a market risk, is a risk inherited from overall market. Goetzmann et al., (2014) explained systematic risk as a risk which takes account economic factors like interest rate changes and overall sentiment on the market and thus it affects all the investments. According to MPT as the risk is economical and effecting all the investments it cannot be diversified away. Sharpe (1964) introduced in his paper the concept of systematic risk which can be quantified by the measurement called Beta (ß). This measurement quantifies the correlation of an asset to an overall market and thus, we can see the beta as a measurement of a volatility stock, or a portfolio has related to market. This measurement is in key role in theory called Capital Asset Pricing Model which Sharpe developed. This theory is further explained later in chapter 2. 4..

2.2.2 Unsystematic Risk

Unsystematic risk, or specific risk, is a specific risk related to certain stock or industry. Due to the specific nature of the risk, it can be reduced by diversification Goetzmann et al., (2014). Factors affecting to unsystematic risk can be for instance new regulations to industry, accident on a product line or financial risk. However, these risks only affect a specific company or industry and not the whole market. For instance, an accident on a factory only affects specific company, not the whole industry. As mentioned, this risk can be reduced with diversification as per Berk et al, (2013). They explained that as the number of stocks increase in portfolio the relational effect of specific stock will average out. So, in a portfolio the proportional effect of a single stock decreases when the number of stocks increase.

2.3 Risk and return Hypothesis

As previously discussed, investors will face risks while investing, but in order to compensate these risks they expect return. In this part of the study author introduces the concept of risk and return tradeoff and on later chapters how it can be used as a variable while determining intrinsic value of an asset.

Risk and return hypothesis, also referred as risk and return tradeoff is financial theory which is important to understand since this tradeoff is key factor in investors' decision-making Risk and return hypothesis describe the relationship between risk and return. The relationship was first examined by Markowitz in Modern portfolio theory in 1952. According to MPT theory (Francis & Kim, 2013), investor can expect higher profit only if the proportion of risk increase. The relationship between risk and return is linear and higher return can't be achieved unless the amount of risk is also increased. This concept has been used as a foundation to CAPM developed by Sharpe (1964), which is introduced in the following chapter.

2.4 Capital Asset Pricing Model

In this chapter author introduces earlier mentioned theory called the Capital Asset Pricing Model (CAPM hereafter). This fundamental theory is based on Markowitz's ideas and was further devel-

oped by Sharpe (1964) and Lintner (1965). CAPM can be perceived as a cornerstone of modern asset pricing. In this dissertation the CAPM Plays crucial role since, the variable of expected return is taken into account in further models.

CAPM is a single variable model, and it allows us to calculate expected return on asset by creating linear model of the relationship between risk and return. To calculate this for an asset the following formula must be applied:

$$ER_i = R_f + \beta_i(ER_m - R_f)$$

Where:

$ER_i = \text{Expected return on asset}$

R_f =Risk free rate of return

$\beta_i = \text{beta coefficient also referred as systematic risk}$

$(ER_m - R_f) = \text{Risk premium}$

As one can see, the model takes account the relationship between the risk (beta) and risk premium. (raw example) By doing this one is able to determine the amount of risk premium is needed related to risk received, and thus it determines the expected return for asset compared to its quantity of risk.

2.5 Arbitrage Pricing Theory

Arbitrage pricing theory (APT hereafter) was developed by economist Stephen Ross in 1976 as alternative to capital asset pricing model. Where CAPM is single factory model APT is creating the linear relation between the covariance of random variables and expected returns of asset. (Huberman & Wang, 2005). To compute the expected return, according to APT risk premium of each factor must be computed. Thus, the formula is following:

$$Er = R_f + \beta_1(R_1 - R_f) + \beta_2(R_2 - R_f) + \cdots \beta_n(R_n - R_f) + e$$

Where:

$\beta_n(R_n - R_f) = Proportional\ risk\ premium\ per\ factor\ n$

2.6 Weighted Average Cost of Capital (WACC)

Weighted average cost of capital or WACC now on, is a measurement tool used in finance to analyze company's cost of capital. Since companies use multiple different sources to finance their activities WACC takes account all of them Brealey et al., (2023). To calculate WACC of company the following formula must be used:

$$WACC = \frac{E}{D+E}\ (R_e) + \frac{D}{D+E}\ (R_d)\ (1 - Tc)$$

Where:

$E = Market\ value\ of\ the\ firm's\ equity$

$D = Market\ value\ of\ the\ firms\ debt$

$Re = Cost\ of\ equity$

$Rd = cost\ of\ debt$

$Tc = Corporate\ tax\ rate$ l.

2.7 Jensen's Alpha

Jensen's alpha or just alpha, was developed by economist Michael C. Jensen in 1968. Alpha is used to measure the performance of an asset compared to its expected return calculated by CAPM. The idea of alpha is that the return above security market line is quantified as an excess return asset has produced compared to its calculated risk-adjusted expected return Verma & Hirpara,

(2016). Thus, higher alpha can be seen as a great performance of an asset, or a portfolio has had. Alpha's formula is the following:

$$\alpha = R_i - [R_f + \beta\left(R_m - R_f\right)]$$

where:

$R_i = Realized\ return\ of\ investment$

$R_m = Realized\ return\ of\ market$

$R_f = risk\ free\ rate$

$\beta = beta$

2.8 Gordon Growth Model

An investor expects to gain return in two ways from their investments in stocks from the period they hold the stock, 1. through dividends and 2. appreciated stock price at the end of the period. The value of a company can be seen as net present value of its future cash flows and thus, by discounting the cash flow received in form of dividend in this case, and calculating its present value one is able to estimate the intrinsic value for a stock Mercer & Harms (2007). This strategy is perceived to be as one of the simplest ways to estimate the intrinsic value of an asset. Based on this idea the Dividend discount model was developed and thus, value per share can be computed with following formula:

$$Value\ per\ share\ of\ stock = \sum_{t=1}^{t=\infty} \frac{E(DPS_t)}{(1+k_e)^1}$$

where:

$DPS_t = Expected\ dividend\ per\ share$

$k_e = Cost\ of\ equity$

Gordon growth model is one of the specific variations of DDM. Gordon Growth model (GGM later on) also referred as Constant Growth Model, was introduced by Myron J. Gordon in 1959. As per

Carver (2011) Gordon Growth model calculates the present value of cash flows and is based on the assumption that the value of a company is present value of future cash flows, which enables us to determine the intrinsic value for an asset. The formula of GGM to calculate the theoretical price of a stock is following:

$$P_o = \frac{Div_1}{R_e - g}$$

Where:

$Div_1 = Expected\ Dividends\ 1\ year\ from\ now$

$R_e = Required\ rate\ of\ return\ or\ equity\ cost\ of\ capital$

$g = Growth\ rate\ of\ dividends$

2.9 Valuation

As previously stated, behind the stock there is a company. The stock is trading with everchanging price on the market, but from perspective of value investing, market price might differ from the actual intrinsic value of an underlying company. As per Baker et al., (2020) discussion of value investing, if the intrinsic value is substantially lower than market price the stock is a good buy. Baker et al., (2020) explained Graham & Dodd's (1996) idea, that the difference between real price and intrinsic price is called margin of safety and should be at least on third of a market price but preferably 50%. To determine the intrinsic value for a stock, one must determine the most suitable strategy. After the intrinsic value for an asset is determined, by comparing it to real market price we can conclude if the stock is either over-, under-, or fairly valued and based on that the investor can make informed investment decision.

2.10 Hypotheses

Based on the literature review, author has formed the following hypotheses:

Hypothesis 1: The discrepancy between intrinsic value and market value of stocks is found (both under- and overvalued), given that stock market is not efficient.

Hypothesis 1.1: If hypothesis 1 is correct then majority of stocks are undervalued.

Hypothesis 2: Majority of OMXH 25 stocks has not produced excess return as measured by Jensen's alpha.

3 Methodology

In this part of dissertation author will introduce the methodology of the study in following order research design, data collection, variables, and methods.

3.1 Research Design

One of the first and most important processes of conducting research is proper designing of study. There are different ways to conduct a research based on research criteria. Three commonly used types of research are Quantitative, Qualitative, and mixed methods research as per Creswell (2013). Taking account, the nature of the study, and since the goal of this dissertation Is to find intrinsic value for a stock and to compare it to real price, the author decided to adopt quantitative approach. This is due to study requirements of gathering and analyzing numerical data and thus, the chosen approach is the most suitable.

3.2 Data collection

To conduct this research the author used online resources and data analysis. Theoretical data collected though online resources was introduced in literature review and quantitative data will be introduced in current chapter. Data used in this dissertation is mostly primary data collected mostly via online.

This research required gathering data from 22 companies (appendix 1). The author decided to gather data from relevant companies to himself based on his experience and knowledge, and thus the Finnish stock market was chosen as the most suitable for this study. These publicly traded

companies chosen were companies included in OMX Helsinki 25 index, which tracks the movements of 25 most traded companies in Helsinki stock exchange and companies chosen are listed in chapter 3.5. Since the selected tool to determine intrinsic value for a stock was GGM, which takes account the dividend companies pay to its owners, only companies which had paid dividend from fiscal year 2022 were included in this study. Additionally, only Finnish based companies were included, since the study is focusing on domestic stocks. Based on these references, some companies from index were excluded.

Quantitative data collection process included gathering historical market data of chosen companies and benchmark index and it was gathered from yahoo finance. This data was utilized for instance while calculating expected return, quantifying risks, and finding theoretical price. Additionally, the author retrieved data from financial statements of case companies, i.e., dividend paid, liabilities and financial expenses.

Stock market data was collected from 3-year span beginning 1st of October 2020 until 30th of September 2023. The author chose to collect data from this time period, as it provides sufficient data to determine growth trends. As mentioned earlier, the economic environment has changed vastly during this time span. The author decided that the end date of time span, which data was collected, was most suitable for him, since it marks the end of 3rd quarter of the year and thus great time to have portfolio assessment for fiscal year 2023. Market value of stocks was gathered from date 04.10.2023 since author wanted to use most current market data available as possible and since data was gathered and analyzed by then, the date was chosen.

3.3 Description of Variables

In this chapter the researcher introduces the variables used in this dissertation (appendix 2). In the first part the author introduces the list of variables. In the following chapters more further explanations are offered.

3.3.1 Total Risk (Tr)

While computing the returns of asset (chapter 3.3.4), the variability of investments varies vastly and, for instance, for smaller stock's the return distribution is widely dispersed. This distribution is

called volatility and is measured by standard deviation. By calculating the standard deviation of the distribution of realized returns, the variability of return can be quantified (Berk & DeMarzo, 2013) Since, standard deviation is square root of the variance of the distribution of realized return, computing the variance is mandatory. Variance is measuring the variability in returns by squaring the difference of the returns from average return. Formula to calculate the variance is following:

$$Var(R) = \frac{1}{T-1}[(R_1 - \overline{R})^2 + [(R_2 - \overline{R})^2 \ldots + \ [(R_T - \overline{R})^2]$$

Where:

$\overline{R} = Estimated\ average$ return

$R_T = Actual\ return\ on\ time$ t

(Berk & DeMarzo, 2013)

As mentioned, total risk, or volatility is measured by standard deviation. Standard deviation is measuring the risk of a probability distribution and thus let us know how often and the historical returns are different from their average and how far they tend to be. (Berk & DeMarzo, 2013) Thus, computing the volatility of a stock indicates us how risky it has been, and it can be calculated by applying the following formula:

$$SD(R) = \sqrt{VAR(R)}$$

(Berk & DeMArzo, 2013)

3.3.2 Systematic Risk (Beta)

Systematic risk of a stock is measured with Beta coefficient. Beta measures the sensitivity security has compared to market (Arnold, 2013). By calculating the covariance between securities return and market return we can compute beta (Brealey et al., 2023). Essentially, the idea of beta coefficient can be illustrated as following:

When:

ß = 1 3% change in the index return generally leads to 3 % percent change in the security's return.

0 < ß < 1 3% change in the index return generally leads to less than 3% change in the security's return.

ß > 1 3% change in the index return generally leads to greater than 3% change in security's return.

(Arnold, 2013)

Concluding this the beta greater than 1 indicates that stock is more volatile compared to benchmark index and beta less than 1 indicates that the stock is less volatile compared to index.

Since Beta coefficient takes account returns of security and market, the author calculated the return of chosen stocks and their benchmark index OMXH 25. The formula to calculate the beta is following:

$$\beta = \frac{\sigma_{im}}{\sigma_m^2}$$

where:

$\sigma_{im} = Covariance\ between\ stock\ returns\ and\ market\ returns$

$\sigma_m^2 = Market\ return\ variance$

(Brealey et al., 2023)

3.3.3 Average Annual Return (AAR)

As stated earlier, investors expect return for their investments. Historical data can be useful while estimating future returns. Realized returns are measurement used to compute how much an investment has returned over certain period (Berk & DeMarzo 2023). If company pays dividend, which is the case in this study, the realized return compounds from two components: Capital gain yield and dividend yield. To compute the realized return of a security for a certain time, the following formula must be applied:

$$R_{t+1} = \frac{Div_{t+1}}{P_t} = \frac{P_{t+1} - P_t}{P_t}$$

where:

$Div_{t+1} = dividend$

$P_t = price\ of\ security\ on\ time\ t$

(Berk & DeMarzo, 2013)

Since the distributions of possible returns is vast, we want to know the most likely return and for this we have the average annual return which is illustrates arithmetic average of the realized returns per year Average annual return compounds the average of realized returns for each year. By assuming that the distribution of returns is same over the time, by calculating the average its providing estimation of returns in the future (Berk & DeMarzo, 2013). The formula to calculate average annualized return ($\overline{R}$) is presented below:

$$\overline{R} = \frac{1}{T}(R_1 + R_2 + \ldots . R_T$$

Where:

$R_T = Realized\ return\ on\ year\ t$

(Berk & DeMarzo, 2013)

3.3.4 Capital Asset Pricing Model (CAPM)

Since firm specific risk or unsystematic risk is diversifiable and thus not a guarantee for extra return, the systematic risk measured by beta is determinator of expected returns. (Berk & DeMarzo, 2013). Investors require higher rate of return for increased amount of risk, for instance expected return from market is greater than from treasury bills where the beta is 0 Brealey et al., (2023). The excess rate of market compared to risk free rate is called market risk premium and it illustrates the premium for increased risk. It is computed as follows:

$$\left(R_m - R_f\right)$$

As mentioned, the proportion of systematic risk is determinator of expected return and thus the proportion of systematic risk is related to expected return. The idea of CAPM is that risk premium of investment is related to proportional amount of systematic risk. Brealey et al., (2023) Thus, beta of 2 assumes twice the expected risk premium compared to market. This relationship can be written as:

$$r - r_f = \beta\left(r - r_f\right)$$

CAPM is a model which creates equilibrium between the risk and return of an asset which allows to compute the expected return of an asset based on its proportional amount of systematic risk. This model shows that expected returns equals risk premium proportional to assets beta added with risk free rate of return (Berk & DeMarzo 2013), the formula of Expected return is thus:

$$ER_i = R_f + \beta_i\left(ER_m - R_f\right)$$

Where:

- ER_i= Expected return on asset

-R_f= Risk free rate of return (10-year government bond interest rate)

-β_i= beta coefficient also referred as systematic risk

- $\left(ER_m - R_f\right)$= Risk premium

(Brealey et al., 2023)

Based on its risk-return relationship, CAPM is also used to compute required return for investments as well as equity cost of capital. (Berk & DeMarzo, 2013)

3.3.5 Weighted Average Cost Of Capital (WACC)

Companies are financed through different sources, common stocks most generally by equity and debt, to estimate their cost of capital both must be taking account proportionally. Weighted average cost of capital or WACC, is measure of company's cost of capital, where all categories are weighted by their relative proportion (Berk & DeMarzo, 2013).

In Valuation without any other factor taken account, the simple market value of the company (V) can be seen as the sum of its market value of debt (B) and equity (S):

$$V = B + S$$

(Bierman & Harold, 2009).

To calculate the WACC, the individual costs of Debt and equity must be computed. To calculate the cost of equity, the CAPM is commonly used. To calculate the cost of debt. The cost of equity is simply the interest rate company is paying to its debt holders. Because rate of interest is tax-deductible, the effective tax rate is the most relevant measure. Effective cost of the debt equals the net cost of interest after tax deductions and thus can be written as:

$$R_d(1 - T_c)$$

(Berk & DeMarzo, 2013)

Since, capital is not dividend equally, the relative proportions of the assets must be computed. WACC is thus the sum of weighted cost of equity capital plus weighted after tax cost of debt. The formula to compute the after-tax cost of capital is following:

$$WACC = \frac{E}{D+e}(R_e) + \frac{D}{D+E}(R_d)(1-Tc)$$

where:

$$\frac{E}{D+e}(R_e) = Proportional\ cost\ of\ equity$$

$$\frac{D}{D+E}(R_d)(1-Tc) = Proportional\ cost\ of\ after\ tax\ debt$$

(Berk & DeMarzo, 2013)

3.3.6 Jensens Alpha (Alpha)

Jensen's alpha or just alpha is measuring the risk-adjusted return of an asset compared to expected return (CAPM) Phuoc (2018). Alpha is measuring the performance of a stock compared to the expected return calculated by CAPM. Thus, if positive alpha is indicating better performance compared expected and negative alpha indicating underperformance. For this study, alpha was calculated to gain understanding how stock has been performing compared its expected return. To calculate the alpha following formula must be utilized:

$$\alpha = R_i - [R_f + \beta\ \times (R_m - R_f)]$$

where:

$R_i = Realized\ return\ of\ investment$

$R_m = Realized\ return\ of\ market$

$R_f = risk\ free\ rate$

$\beta = beta$

In this dissertation realized annua return of investments from chosen time span was used and by subtracting utilized CAPM, computed the alpha.

3.3.7 Valuation

As stated earlier in chapter 2, stocks are traded in stock exchanges where it has a price, which is its reflection of investors perception of price point which they are willing to pay to obtain it. Behind the security there is a company which has its own intrinsic value. Market price does not always reflect the actual value of the company. By determining the intrinsic value of a company and comparing it to market price it's possible to determine whether the company is under- or overvalued. Following illustration shows how mechanics of valuation work:

if

$$Iv > Mp\ company\ is\ undervalued$$
$$Iv < Mp\ company\ is\ overvalued$$

$Iv = Intrinsic\ value$

$Mp = market\ price$

Based on assumption that the stock price is equal to the net present value of the expected future dividends company will pay Berk & DeMarzo (2013), we can determine the intrinsic value of a company by discounting the present value of its dividends. To do so Dividend discount model must be applied. DDM values the stock of a company based on its present value of dividends it's paying. (Berk & DeMarzo, 2013). By assuming we do not have certain point in the future when the stock is going to be sold the formula to calculate the present value of dividends is following:

$$P_o = \frac{Div_1}{1 + R_e} + \frac{Div_2}{(1 + R_e)^2} + \frac{Div_3}{(1 + R_e)^3} \dots \dots$$

Where:

$Div_n = dividend\ of\ year\ n$

$R_e = rate\ of\ return\ or\ cost\ of\ equity$

(Berk & DeMarzo, 2013

Since estimating the future dividends is difficult, using the approximation that the dividends will grow at constant rate we can use the Gordon Growth Model, which utilizes the constant growth rate perpetuity. This model was applied in this study since it is simple model to determine intrinsic value for a stock. Since GGM assumes that dividend is growing in perpetuity The formula of GGM is following:

$$P_o = \frac{Div_1}{R_e - g}$$

Where:

$Div_1 = Expected\ Dividends\ 1\ year\ from\ now$

$R_e = Required\ rate\ of\ return\ or\ equity\ cost\ of\ capital$

$g = Growth\ rate\ of\ dividends$

(Berk & DeMarzo 2013)

3.4 List of sample companies

Author selected chosen stocks, since the data of domestic stocks was easily accessible, reliable and in familiar currency. Additionally, author has been investing and thus has gained previous knowledge of markets. Companies chosen were included in OMXH 25 index, since it tracks 25 most traded stocks, chosen stocks are relevant on the market. Since the chosen model, GGM, takes account the dividends companies pay the companies which have not paid dividend from year 2022 were excluded. Additionally, companies which were only listed in Helsinki Stock Exchange, but not Finnish based were excluded due to difficulties with currencies. The comprehensive list of companies used can be found from appendix 1.

3.5 Data Analysis

To analyze gathered quantitative data the author utilized Microsoft Excel. To answer research questions, the author implemented a form of fundamental analysis and to create comprehensive understanding of stock this was supported by parts of technical analysis. By gaining comprehensive understanding of stock, one is able to gain valuable insights of sample stocks.

By analyzing data and utilizing variables, the author was able to determine intrinsic value for stock. Intrinsic value was supported by technical analysis variables. The intrinsic value, computed from collected quantitative data from financial statements and stock market, was then compared to market price of stocks. The results are introduced in the following chapter.

4 Results

As per previously introduced methodology the author gathered and analyzed data to answer chosen research questions. Based on valuation variable, 22 of chosen stocks were divided in two categories: under- or overvalued. In this chapter author introduces descriptive statistics and results of analysis. Further discussion of results will be presented in chapter 5.

4.1.1 Undervalued stocks

In this chapter author introduces the results of the stocks where, based on valuation variable, the computed intrinsic value was greater than market price and thus undervalued. AAN column is illustrating company's average annual return computed from return and thus is not including the dividend. The following table 1 is illustrating these stocks with implemented descriptive statistics of variables.

Table 1 Undrvalued stocks

Company	**AAN**	**Tr**	**Beta**	**SysRisk**	**UnSysRisk**	**Alpha**	**WACC**
Elisa	-3,52 %	16,19 %	0,15	2,68 %	13,51 %	7,33 %	1,49 %
Fortum	-14,53 %	35,57 %	0,55	9,70 %	25,87 %	18,88 %	2,18 %
Kesko	-8,68 %	27,07 %	0,39	6,80 %	20,27 %	-12,80 %	1,92 %
Kojamo	-22,73 %	31,26 %	0,47	8,31 %	22,95 %	-26,97 %	2,39 %
Kone	-18,56 %	25,92 %	0,46	8,09 %	17,83 %	-22,79 %	1,82 %
Metsä Board	1,98 %	29,20 %	0,45	7,98 %	21,22 %	-2,23 %	2,92 %

Neste	-11,69 %	37,26 %	0,75	13,33 %	23,93 %	-16,32 %	2,91 %
Nokian Ren-kaat	-33,42 %	45,65 %	0,42	7,48 %	38,18 %	-37,60 %	13,68 %
Nordea	16,45 %	26,92 %	0,58	10,28 %	16,64 %	12,05 %	11,25 %
Orion b	-0,98 %	27,50 %	0,16	2,78 %	24,71 %	-4,80 %	2,39 %
Outokumpu	20,46 %	39,33 %	0,74	12,99 %	26,34 %	15,86 %	3,33 %
Sampo a	2,93 %	22,00 %	0,46	8,15 %	13,85 %	-1,30 %	1,19 %
Stora Enso	-4,71 %	31,94 %	0,68	11,92 %	20,02 %	-9,23 %	3,46 %
TietoEVRY	-3,44 %	24,59 %	0,44	7,76 %	16,83 %	-7,64 %	2,42 %
UPM-Kymmene	7,84 %	25,06 %	0,56	9,83 %	15,23 %	3,48 %	2,70 %
Valmet	0,80 %	30,32 %	0,62	11,03 %	19,29 %	-3,65 %	2,02 %

Average	-4,49 %	29,74 %	0,49	8,69 %	21,04 %	-5,48 %	3,63 %

In final row, Average, the calculated averages of variables of individual stocks are illustrated. Thus, the proportional weight of each stock is constant and is not illustrating the actual averages of benchmark index.

As the table illustrates, 16 of 22 or 73% of sample stocks had intrinsic value greater than market value, thus majority of chosen stocks were undervalued. Based on the author's calculations, on average stocks were 29,86% undervalued, meaning that the market price was nearly 30% less on average than intrinsic value.

Table 2 Average % price difference

	Undervalued	Overvalued
Average % difference between intrinsic price and market price	-29,86 %	38,76 %

As one can see from the table, on average the excess return, measured by Jensen's alpha, was negative with undervalued assets. Meaning that stocks has been underperforming based on their expected return.

The average annualized return of undervalued companies is negative, which is indicating that undervalued stocks have been yielding negative return over the chosen 3-year period.

4.1.2 Overvalued stocks

In this section the author introduces the stocks where the intrinsic value was less than market price, thus overvalued. The following table illustrates descriptive statistics of these stocks, implemented with computed variables.

Table 3 Overvalued stocks

Company	**AAR**	**Tr**	**Beta**	**SysRisk**	**UnSysRisk**	**ALPHA**	**WACC**
Cargotec	3,53 %	38,72 %	0,75	13,33 %	25,39 %	-1,10 %	1,91 %
Huhtamäki	-10,29 %	25,45 %	0,40	7,11 %	18,34 %	-14,44 %	2,73 %
Konecranes	1,28 %	36,80 %	0,73	12,88 %	23,93 %	-3,31 %	2,51 %
Metso	18,74 %	25,92 %	0,85	15,01 %	20,91 %	13,98 %	2,35 %
Nokia	2,77 %	33,79 %	0,66	11,70 %	22,09 %	-1,73 %	4,34 %
Wärtsilä	17,08 %	35,86 %	0,71	12,45 %	23,41 %	12,52 %	1,85 %

Average	5,52 %	32,76 %	0,68	12,08 %	22,35 %	0,99 %	2,62 %

As mentioned only 6 of 22 or 27% of companies were overvalued currently. As per figure 2, the stocks where the market price was greater than intrinsic value, the average difference was 38,76 %, which means the market price was on average nearly 39% more compared to intrinsic value.

Overvalued stocks also had positive returns on average measured by average annual return and Jensen's alpha of 5,52% and 0,99%, respectively. Meaning, companies with greater market price than intrinsic value have produced not only positive return over the years, but excess return on average.

4.1.3 Comparison of averages

In this section the author analyzes the notable differences of risk variables between under- and overvalued stocks additionally with

Table 4 Averages

	Overvalued	Undervalued
Total risk	32,76%	29,74%
Beta	0,68	0,49
total systematic risk	12,08%	8,69%

WACC	2,62%	3,64%

As seen in table 4, which illustrates the most notable differences between these stocks it can be seen that most notable differences between under- and overvalues stocks were on Beta, Total systematic risk and WACC.

As table 4 illustrates, overvalued stocks had greater beta on average, which indicates that stocks were more sensitive to market movements compared to undervalued stocks, since beta can be seen measurement of systematic risk, this can be also seen as a higher systematic risk.

WACC By comparing the data between under- and overvalued stocks, on average companies had WACC's of 3,63% and 2,63% respectively which indicates that on average undervalued stocks had higher costs of capital.

By viewing the averages, overvalued stocks have produced on average, Average Annual Return of 5,52% and excess return measured by alpha 0,99% compared to undervalues stocks which had Average Annual Return and alpha of -4,49 % and -5,48 % respectively.

5 Discussion, Limitations and Conclusion

In this final chapter of the dissertation, the author will have discussion related hypothesis and further data analysis. Later in the chapter the author discusses the limitations of this study and suggestions for further studies.

5.1 Discussion

As this dissertation's goal was to A) introduce common way to determine intrinsic value for a stock and B) based on computed intrinsic value and its comparison with market price, determine the valuation of stock. The author can conclude that hypothesis 1 and further 1.1 were correct. By applying form of fundamental analysis, the author computed the intrinsic value of a stock and as introduced 73% of sample stocks had higher intrinsic value compared to market price. And thus, we can

conclude that markets are not efficient and incorrectly priced assets can be found. Reasons for individual stock to be undervalued are numerous, but since majority of chosen stocks were undervalued, conclusion that market sentiment is forecasting weak future sights can be seen widely on the market, since the pressure from economy is forcing investors into act. Additionally, the geographical location of Finland has had its impacts not only for companies such as Nokian Renkaat, but for individual investors and their personal wealth. On the other end energy company Fortum and Nordea on the banking sector have been benefitting from increased costs of energy and increased interest rates. As per authors knowledge of markets and the sentiment. The Finnish market is very reserved, and the future sights are very insecure. This can be seen as an indicator that investors are more precocious while making investments, which can be detected on downward trend on the overall market.

As descriptive statistic illustrates, the companies which are overvalued have been gaining on average excess return compared to their expected return. This was not the case with undervalued stocks. Thus, hypotheses 2 that majority of stocks has not produced excess return was correct. As can be seen, overvalued stocks have been able to produce positive return over the period on average. Just by viewing data produced by technical analysis, these stocks have been performing more better, and if assumption that historical data can be used to forecast future trends, these stocks can be seen as more tempting option for future returns. However, when determining the intrinsic value with form of fundamental analysis, we can see these companies were overvalued and thus not offer the margin of safety required.

As the foundational goal of detecting undervalued asset, is to possibly obtain it and gain from market correction. Based on this idea, the companies which have been determined as undervalued would be considered taking into further examination by one. Additionally, the overvalued stocks can create opportunity to gain from price correction, and by short selling these stocks, one could be able to gain return.

5.2 Limitations

This study can provide valuable knowledge but still it has its limitations. When it comes to data, the author was able to gather primary source numerical data and some primary as well as secondary qualitative data gathered from literature. Still, the access to data, especially to literature was

somewhat limited. Since the price is not constant but everchanging, it will expire, thus companies which were undervalued on chosen date, might not be anymore. Also, the fundamentals of companies are constantly changing, thus the intrinsic value is determined from most recent data. These theories applied are universal, but they have their own limitations. This study was conducted in certain time frame, which can be seen as a limitation.

5.3 Conclusions

Purpose of this subchapter is to lay the conclusion of the study. As the determined goal of this study was to determine intrinsic value for a stock and by comparing it, possibly detect undervalued stocks. Reason for this was in basics of value investing, undervalued stock can be a buy signal due to possible future capital gain when markets correct the price. Based on collected data and further analysis, the author detected undervalued stocks from OMXH 25 index. As conclusion, the author's hypotheses were correct and a major part of stocks were undervalued and were not able to produce excess return measured by Alpha. Since the goal of this study was to help investors make more educated decisions, the portfolio formed by these stocks could possibly generate good rate of return on a long enough time horizon. This would require further fundamental analysis The author would recommend utilizing the margin of safety as a factor when deciding the proportion of a certain stock. On the other hand, one could also gain profit by selling short, overvalued stocks. For further suggestions, comparison of portfolio conducted based on these suggestions could be made. Also, further study of relevance of variables compared to valuation could be studied.

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Appendices

Appendix 1. List Of Sample Companies

Cargotec B (CGCBV)
Elisa OYJ (Elisa)
Fortum Oyj (Fortum)
Huhtamäki Oyj (HUH1V)
Kesko Oyj B (KESKOB)
Kojamo Oyj (KOJAMO)
Kone Oyj B (KNEBV)
Konecranes (KCR)
Metso Oyj (METSO)
Metsäboard Oyj B (METSB)
Neste Oyj (NESTE)
Nokia Oyj (NOKIA)
Nokian Renkaat Oyj (TYRES)

Nordea Bank ABP (NDA FI)
Orion Oyj B (ORNBV)
Outokumpu Oyj (OUT1V)
Sampo Oyj A (SAMPO)
Stora Enso Oyj R (STERV)
TietoEVRY Oyj (TIETO)
UPM-Kymmene Oyj (UPM)
Valmet Oyj (VALMT)
Wärtsilä Oyj Abp (WRT1V)

Appendix 2. List Of Variables

Variable	*Label*
Average Annual Return	*AAR*
Capital Asset Pricing Model	*CAPM*
Total Risk	Tr
Systematic Risk	Beta
Unsystematic Risk	UnSys Risk
Jensen's Alpha	Alpha
Weighted Average Cost of Capital	WACC