

# **INVESTING IN THE ORTHOPEDIC IMPLANT INDUSTRY**

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<p>Abstract:</p> <p>This thesis provides an analysis of investment into ordinary shares of the leading orthopedic implant manufacturers including Zimmer, Stryker, and Smith&amp;Nephew traded on the New York Stock Exchange. The aim of the study is to identify the leading company in terms of profitability for an investor. The author first constructs the theoretical framework based on investigation of the secondary literature and further conducts the primary research by applying the formulas in the particular context. Therefore, by applying two techniques, the Financial Ratio Analysis which provides an insight into the past performance of the companies and the Altman Z-score which assesses the probability of corporations going bankrupt within the next 20 months the companies are compared to each other. For the purpose of evaluating the particular investments, Return on Investment, and Internal Rate of Return formulas are applied. The timeframe for the analyses is 2006-2010.</p> <p>The results show that if the shares were bought in 2006 and sold in 2010 it would be a wealth-destroying affair because the price of the shares dropped significantly during, and after the financial crisis which affected the world in 2007. However, notwithstanding the negative effect of financial crisis and recession, investment into ordinary shares of orthopedic implant manufacturers is considered profitable in the long-run because the net sales are constantly increasing and are projected to be increasing due to increase in demand affected by the population ageing. The investor has to keep track of the share prices: buy at the downturn and sell at the peak.</p>	
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# 1 INTRODUCTION

When it comes to investing and choosing the right place to allocate the free funds, a proper, detailed analysis of investment options has to be performed using the right techniques, which in this case are ‘The Financial Ratio Analysis’ and ‘The Altman Z-score’- two of the various helpful tools in analyzing the company’s performance in order to make the right selection of stocks to be included in the investment portfolio. Therefore, by implementing the above-mentioned techniques in evaluating the performance of three major producers of orthopedic implants including Zimmer, Stryker, and Smith & Nephew, the author intends to identify the best performer in the group according to Profitability, Efficiency, Market Value, Liquidity and Leverage Ratios; and evaluate the probability of these companies going bankrupt within the next 20 months using Altman Z-score formula. The outcome of the research in a form of detailed, descriptive, analyzed calculation can be used by individual investors, as well as businesses, mutual funds and investment trusts intending to purchase stock from leading orthopedic implant manufacturers and deciding on the best alternative.

Orthopedic implants are the healthcare products manufactured for curing people, among other things, from a disease called “rheumatoid arthritis”. According to Smolen et al. (2007) and Aletaha et al. (2007), “Rheumatoid arthritis is characterized by synovial inflammation and a high propensity to destroy iuxtaarticular bone and cartilage” which leads to an inevitable, costly surgery. This illness is mostly common in the bodies of humans after 50 years of age. Population aging, the outcome of the post-World War II baby boom period which happened in 1946-1964, is a serious issue which affects the whole world. The Healthcare sector, where the orthopedic implant manufacturers belong, is one of the fastest growing sectors nowadays. According to OECD Health Data (2011), “health spending continues to rise faster than economic growth in most OECD countries” and is expected to keep increasing in the coming years.

Bringing the above-mentioned facts together, the author has identified an increasing, developing and expanding industry for a possibility of a profitable investment, and,

therefore, would like to expand the horizon and deepen the knowledge in the field of finance combining it with an insight from healthcare.

## **1.1 Motivation for choice of research topic**

This sub-section helps to identify the motives behind the selection of topic and its field by providing some historical, background information of the author's interests.

As the topic suggests "Investing in the orthopedic implant field", this is the thesis in the finance field with analysis of orthopedic implant segment of healthcare industry. The author, by using the Financial Ratio Analysis tool and the Altman Z-score model and applying them in the context of three leading manufacturers of orthopedic implants, intends to identify the best performer in the group and suggest the investment opportunity to an investor.

The reason for choosing a finance topic comes from the author's interest in the subject acquired by studying at Arcada University of Applied Sciences in Helsinki and Middlesex University in London. Moreover, the author has gained experience in performing Financial Ratio Analysis from several courses and feels experienced in doing it for this thesis. However, the author wants to deepen her knowledge of this and other tools by reading various articles, books and case studies on this topic.

The interest in orthopedic implants comes from the course "Entrepreneurship" taken at Arcada University of Applied Sciences during author's second year of studies. Together with two other students, the author came up with a business idea of producing orthopedic implants as the demand for these products is constantly increasing due, among other things, to the population ageing. However, by studying the major manufacturers of these products, the group realized that it might be too ambitious to set up this kind of business without the proper knowledge of the production process. Therefore, the group decided to focus on the current major problem associated with orthopedic implants which is hip wear. Hip implants tend to wear very fast and need replacement. The group worked whole summer 2010 at Arcada's laboratory to try to solve the problem. Through this practical training, several professional contacts were established. The group has visited the leading manufacturers' premises in Vantaa and scientists doing research in the field.

The author has gained a lot of information on orthopedic implants during the Entrepreneurship module and practical training and would like to expand her knowledge of the field and follow the current trend and changes. Moreover, the author would like to work for one of the major players in orthopedic implant field and feels this research can help gain a deeper knowledge of the products and industry and become a prosperous candidate for working in the area.

By combining these two fields together, the author intends to identify the strongest performer in the field to invest into. The interest for the investment evaluation also comes from the author's interest in investing into shares of this business. However, the problem arises from the lack of knowledge on financial performance of these companies. By applying the selected tools, the author's goal is to identify the best stock to buy based on the outcome of the calculation.

## **1.2 Research aim**

By looking at graphs of stock performance of Zimmer, Stryker and Smith&Nephew available at New York Stock Exchange's and London Stock Exchange's websites, it is clearly evident that the stock of orthopedic implant manufacturers keeps increasing in price which leads to an increase in capital gains for the investors. However, the author wants to identify the leading company in terms of profitability for an investor. Therefore, the aim of this research is to compare ratios performed for each company with its peers and rank the companies from the investor's point of view.

## **1.3 Research questions**

**“What is the best performer among Zimmer, Stryker and Smith&Nephew based on applied Financial Ratio Analysis?”**

Based on researching the theories on Financial Ratio Analysis and the annual reports and information available on orthopedic implant industry the author intends to perform the calculations for the three above-mentioned corporations and identify the strongest, fastest growing and most profitable player in the field.



**“What is the probability of Zimmer, Stryker or Smith&Nephew going bankrupt within the next 20 months based on Altman’s Z-score model?”**

By applying Altman Z-score model for the three above-mentioned companies the author intends to evaluate the probability of them going bankrupt within the next 20 months. Therefore, the answer to this question gives investor an insight into the future.

**“What is the best investment among Zimmer, Stryker and Smith&Nephew based on the author’s judgment?”**

Orthopedic implant industry represents a very profitable niche for the investor’s decision choice. By studying the produced results, the author intends to select the major criteria for judgment of the companies and identify the best performer based on the analysis.

## **1.4 Theoretical framework**

Gardiner et al. (1995) states that ratio analysis continues to represent one of the financial world’s most powerful and versatile tools. As an addition to that, Bodie, Kane and Marcus (2009) state that in order to evaluate the performance of a given firm, there needs to be a benchmark to which to compare its ratios and offer the comparison of the firm with those from the same industry as an example. Keown, Martin and Petty (2010) add that the examination of the historical performance for the purpose of comparison of a firm’s current and past performances gives the analyst a deeper and broader understanding of a particular company’s operations. On top of that, Frank et al. (1950) points out that ratios should not only be compared with the past figures and industry averages, but also are best understood when reviewed as a group rather than individually because the cause of bad outcome of one calculation might come from a performance of another ratio. Hitchings (1999) adds that the analyst should take into account the industry dynamics; political and economic situations happening in the world and the company-specific issues. Eakins (2002) argues that financial ratio analysis is not useful to all firms and further explains that corporations engaged in various businesses could be hard

to analyze because the annual figures for all divisions are usually brought in one financial statement and could be difficult to distinguish.

Hitchings (1999) and Mautz et al. (2006) propose a five-year timeframe as the optimal timeframe for computing the Financial Ratio Analysis. Moreover, Hitchings (1999) adds that Financial Ratio Analysis does not provide any wrong or right answers and it only points out the areas to be investigated. Mautz et al. (2006) agrees with that and adds that Financial Ratio Analysis can be a powerful tool to pinpoint the areas to be improved and is the first step towards implementing effective policy. Therefore, by applying Financial Ratio Analysis in the context of this thesis the author intends to identify the weak and strong sides of each company.

Altman (1968) questions the ability of the ratios to predict the corporate bankruptcy and, therefore, offers a tool that can be used in order to measure the probability of a corporate bankruptcy within 20 months called 'Altman Z-score'. Altman (1968) uses Multiple Discriminant Analysis defined as "a statistical technique used to classify an observation into one of several a priori groupings dependent upon the observation's individual characteristics" and applies it to construct the Z score. Out of 22 selected ratios, Altman (1968) further identifies five ratios that are doing the best job in predicting the corporate bankruptcy and assigns each a weight in the formula.

Even though, there has been done a lot of research on the Financial Ratio Analysis, it either has not been publicly available or applied in the context of comparing the performance of orthopedic industry major players. For the purpose of this study, the companies' performances are compared with the past, with the competitors from the same industry and, also, evaluated as one whole group for each firm. The figures used in the calculations are taken from annual reports available on the websites of the studied companies. Therefore, the author intends to deepen the knowledge of finance by analyzing companies' annual reports and performing ratio calculations from figures available in the reports 2006-2010<sup>1</sup>.

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<sup>1</sup> 2006-2010 is a five-year timeframe used by the author of this particular case

## **1.5 Demarcation**

First of all, using two techniques for evaluating companies and making an investment decision is very limiting in itself. Such theories as CAPM (Capital Asset Pricing Model), WACC (Weighted Average Cost of Capital), Portfolio diversification theory, Du Pont Ratio Analysis and various others are used by investors when evaluating the investment decision. Investors differ in their choices of tools and techniques applied in their research. Therefore, by being bounded by time and page limit it is not possible to perform and use all the theories in one thesis. Therefore, the author decided to focus on Financial Ratio Analysis and Altman Z-score in order to gain a deeper, thorough knowledge of the tools and their usability.

Moreover, the calculation is based on analyzing three major producers of orthopedic implants in UK and USA. However, there are other existing manufacturers in these countries, as well as in developing countries and the rest of the world. The selection of the companies is based on the size and global presence. All selected candidates are huge market cap stock listed companies leading their industry.

## **2 LITERATURE REVIEW**

### **2.1 Investment defined**

Bodie et.al. (2009) defines investment as "the current commitment of money or other resources in the expectation of reaping future benefits". Investment is the process of employing the money in order to earn a profit in the future. There are various types of investment and Millard (1998) provides the list of most popular forms of it including Building Society Deposits, Clearing Bank Deposits, National Savings Certificates, National Savings Index-linked, National Savings Investment Account, TESSAS ( Tax Exempt Special Savings Accounts), ISAS (Individual Savings Accounts), Collectors' Items and The Stock Market.

The focus of this study is on investment into the shares of blue chip companies traded on New York Stock Exchange and London Stock Exchange as an opportunity for a portfolio diversification. Stock Exchanges deal with two types of securities: fixed-interest stocks and ordinary shares. Fixed-interest stocks offer a fixed rate of interest to its holder and are issued as "gilts" by the government or "preference shares" by the companies. Meanwhile, ordinary shares are issued by the companies and provide the holder with return in two forms: capital gain and dividend payments. Dividend payments do vary with years depending on success and profitability of the business. It might happen so that dividends are retained for future expansion and not paid at all. Capital gain is the difference between the purchase price and selling price earned by an investor. Share price fluctuates every day depending on the economy, competition, innovations, business success and various other factors. Therefore, it is important for an investor to follow the price movement of particularly held shares in order to maximize the gain and decrease the probability of loss.

When investing into the Stock Market the investor has to thoroughly understand several factors which play an important role for the procedure. The first factor is Return on In-

vestment which is the income obtained from dividend payment plus capital appreciation of the shares. The formula for ROI is as follows:

$$\text{Return on Investment} = \frac{\text{Gain from Investment} - \text{Cost of Investment}}{\text{Cost of Investment}}$$

This formula is further applied for each studied company and compared.

The second factor is Risk involved. As one of the basic principles of finance states “Risk requires reward”. The higher the risk associated with the investment, the higher the return will be. People demand higher return for taking on additional risk in order to secure their money.

The third factor is the efficient market hypothesis which states that market prices are generally right. Keown et al. (2011) states that efficient market “is the one where the prices of the assets traded in that market fully reflect all available information at any instant of time”. The information is available on stock exchanges where the shares are traded, as well as in the companies’ annual reports easily downloadable from the official websites of the companies.

The fourth factor is that the main goal of publicly listed companies is to maximize the shareholder wealth. Shareholders are the legal owners of the company and the board of directors which is elected by shareholders’ voting exists to achieve this goal. Maximization of shareholder wealth means maximizing the market value of the existing stock.

The fifth factor is time. The investor needs to define the timeframe of the investment and search for the shares accordingly. Some investors tend to look for short-term gains, while others invest in the long run to be able to afford paying for the kid’s education or buying a house within couple of decades.

As Millard (1998) notes, the ideal investment would have a high return, high liquidity, low risk and take minimal time to manage. However, this is not possible to obtain by investing into one type of security, therefore the investor has to accept a degree of trade-off and therefore diversify the portfolio of securities. Investment into shares of orthopedic implant blue chip companies is offered by author as an alternative for a portfolio diversification.

## **2.2 Profitability of investment into ordinary shares.**

Ordinary share, or, common stock is defined by Bodie (2009) as “a certificate that indicates ownership in a corporation”. Shareholders are the true owners of the firm and the company exists in order to maximize their wealth. Common stock exists as long as the company operates and has no maturity date. Profit from holding shares comes from dividends and capital gains.

Dividend is a share of the company’s net income paid to the holders of the stock. The companies can either retain the earnings for keeping the business growth or pay certain share of earnings to its shareholders. High-growth companies rarely offer dividend payments and keep the earnings for future expansion (for example, Zimmer).

Capital gain is the difference between the purchase price and selling price of the share. Capital gain is also called as “investment income”. It is not always the case that investors gain income from their investment. It might be a capital loss when investors lose money on their investment.

In order for the investment into shares of orthopedic implant companies to be considered profitable, it needs to have higher dividend payments and higher capital gains. The

author evaluates profitability of investment into Zimmer, Stryker and Smith&Nephew for the period 2006-2010.

## **2.3 Financial Ratio Analysis**

When it comes to investing, financial ratio analysis can become one of the helpful tools in analyzing the company's performance in order to make the right selection of stocks to be included in the investment portfolio. Financial ratio analysis is based on analyzing and evaluating the company's financial statements including income statement, balance sheet and cash flow statement and producing a certain set of calculations based on the figures provided in the annual reports. This technique is widely used among various financial professionals worldwide. Investors, among others, use it when comparing different companies' performances and selecting the ones to purchase shares from.

Ratio analysis in itself is meaningless unless used within two contexts: vertical and horizontal analysis (Hitchings, 1999). The purpose of horizontal analysis is to compare the company's performance over a number of years. The outcome of the comparison is to identify trends which will give insight into the future performance. Ratio analysis does not give any forecasts or predictions for the analysts but allows to identify the areas which require further investigation. On the other hand, the purpose of vertical analysis is to compare firms in the same industry, determine the difference from the norm and investigate the outcome. Hitchings (1999) and Mautz et al. (2006) suggest a five-year timeframe as an optimal solution for both vertical and horizontal analyses. Moreover, when performing an analysis, it is important to pay attention to economic and political situations; industry dynamics and company-specific issues as insights from that areas will help understand and interpret the ratios.

Various institutions and professionals have different subdivision categories for the ratios, however, according to Bodie (2009); the ratios are broken down into five categories:

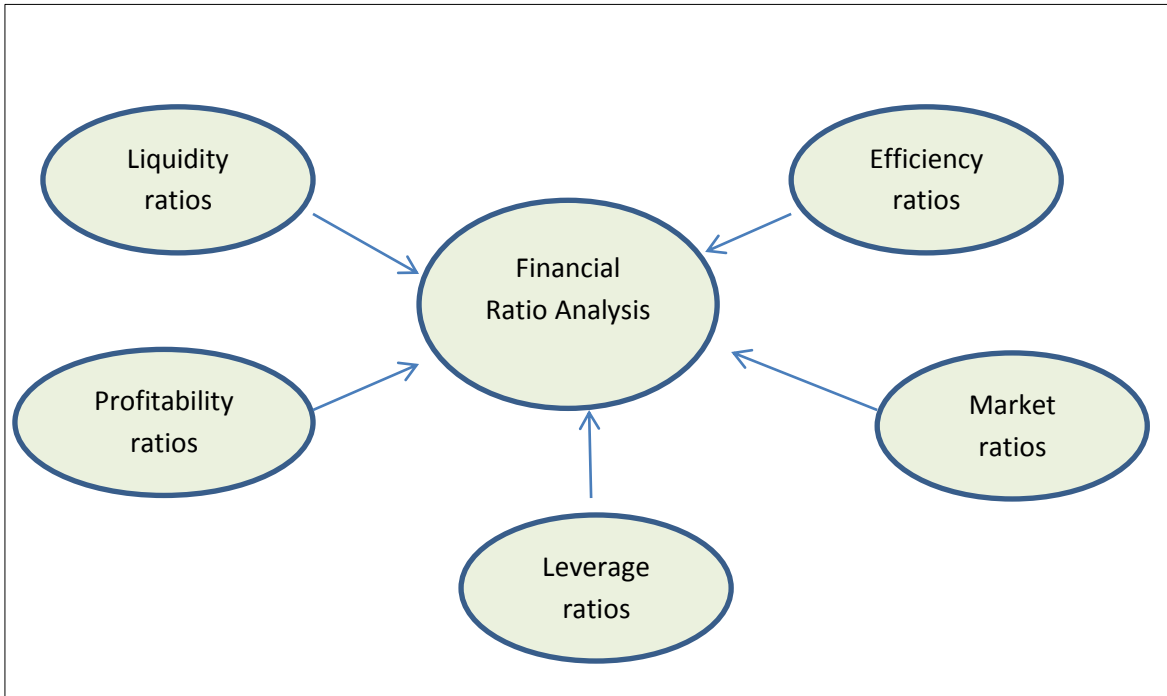


Figure 1. Financial Ratio Analysis

### 2.3.1 Liquidity

According to the definition, liquidity is the firm’s ability to meet its immediate and short-term obligations with cash when needed. The liquidity-riskiness relationship shows that the less liquid the firm is, the more risky its securities are considered; while the more liquid the company is, the more financially strong it is. Therefore, investors look for more liquid firms in case to avoid the possibilities of future bankruptcy.

According to Jenny Kähtävä (see Appendix), Quick ratio is one of the most important liquidity ratios.

Table 1. Liquidity

#	Ratio	Formula
1	Quick ratio	$\frac{\text{cash} + \text{marketable securities} + \text{accounts receivable}}{\text{current liabilities}}$



**Quick ratio** measures the ability of using company’s cash, marketable securities and accounts receivable to reduce its current liabilities.

### 2.3.2 Profitability

Profitability ratios include ROA (return on assets), ROE (return on equity), Gross Profit Margin and Profit Margin. These four ratios measure the ability of the company to generate earnings. In order to be financially attractive for investors, firms need to produce positive profits from their assets, equity and sales. The amount of dividend payment and its increase has direct dependence on profitability. According to Grullon et al. (2003), “one of the most important predictions of the dividend-signaling hypothesis is that dividend changes are positively correlated with future changes in profitability and earnings”. Companies with increasing earnings are of a great attractiveness to shareholders as dividend payments and capital gains are positively dependent on the increase in profits.

Table 2. Profitability

#	<u>Ratio</u>	<u>Formula</u>
1	<b>Return on assets</b>	$\frac{EBIT}{Total\ Assets}$
2	<b>Return on equity</b>	$\frac{Net\ income}{Shareholders'\ equity}$
3	<b>Gross Profit Margin</b>	$\frac{Sales - Cost\ of\ Goods\ Sold}{Sales}$
4	<b>Profit Margin</b>	$\frac{Net\ Income}{Sales}$

**Return on assets** ratio measures the rate of return that the firm's assets produce. The outcome of the calculation is affected by the industry the firm belongs to. The higher the ROA, the better.

**Return on equity** ratio is the measure of how well the shareholder's money is handled and which percentage of the total income they contribute to. ROE figure is higher when the company uses more debt financing assuming that the company produces higher return on assets than the interest rate is. However, the use of debt finance results in higher risk for investors.

**Gross Profit Margin**, also known as gross margin and gross margin rate, shows the difference between selling price and cost. The percentage represents how much of each dollar of sales the company retains for paying off its selling, general and administrative expenses.

**Profit Margin** shows the percentage of earnings from the total Sales figure. The higher the margin, the better control over costs the company has.

### **2.3.3 Leverage**

Keown.A (2008) states that "financial leverage means financing a portion of the firm's assets with securities bearing a fixed (limited) rate of return in hopes of increasing the ultimate return to the common stockholders". Firms use debt financing in order to increase its profitability and increase the stocks' value. Debt ratio is used for assessing the proportion of debt finance the firm uses for its operations. The use of leverage finance increases the financial risk of the company with an impact of an increased risk for investors.

Table 3. Leverage

#	Ratio	Formula
1	Debt ratio	$\frac{\text{Total liabilities}}{\text{Total Assets}}$

**Debt ratio** measures the percentage of debt financing used in a firm’s capital structure. Ratio greater than 0.5 indicates that the company uses more debt than equity for financing its operations which results in an increase of financial risk for the future of the business, as well as for the investors. Ratio less than 0.5 indicates that the company uses more equity financing for its operations and the risk of firm not being able to pay back its obligations is reduced. Debt ratio of one company is usually compared with the firms in the same industry or competitors and adds to the components affecting investor’s decision.

#### 2.3.4 Efficiency

Efficiency, according to the definition, is “an accomplishment of or ability to accomplish a job with a minimum expenditure of time and effort”; it is an ability of a company to utilize its resources with the minimum expenditure and maximum productivity in order to stay within the competition and win the market share of a certain territory. Efficiency ratios examine the internal management of company’s resources and liabilities. Improvement in the efficiency of the company leads to an improvement of profitability which further increases the market ratios measures. Therefore, there is an interconnection between all the ratios in the financial ratio analysis.

Total Asset Turnover, Fixed Asset Turnover, Inventory Turnover are the ratios used to measure the level of efficiency of a firm.

Table 4. Efficiency

#	<u>Ratio</u>	<u>Formula</u>
1	<b>Total Asset Turnover</b>	$\frac{\text{Net Sales}}{\text{Total Assets}}$
2	<b>Fixed Asset Turnover</b>	$\frac{\text{Net Sales}}{\text{Average Fixed Assets}}$
3	<b>Inventory Turnover</b>	$\frac{\text{Cost of goods sold}}{\text{Inventory}}$

**Total Asset Turnover ratio** measures the level of utilization of assets. This ratio measures how many dollars of sales are produced from one dollar of assets. The higher the outcome of the calculation, the better the company uses its assets for generating sales. Companies tend to outperform its competitors by efficiently utilizing their assets.

**Fixed Asset Turnover ratio** is similar to Total Asset Turnover ratio, however in this case average fixed assets are taken instead of total assets. Fixed assets are also known as Property, Plant and Equipment and are neither liquid nor easily convertible into cash. The higher the figure, the better the utilization of the fixed assets is.

**Inventory Turnover ratio** measures how many times the turnover is rolled over during the year and how fast the inventories are transformed into sales. High figure indicates that inventories kept in the warehouse are sold quickly and not kept for long times. Lower calculation outcome implies increase in stock holding costs and difficulties in selling stock.

### 2.3.5 Market Value

Market ratios are the most important indicators for this thesis as they are intended to measure whether the company is increasing shareholder value and creating a good return on invested capital. These measures are the ones that apply to investors' major interest when browsing through financial ratio figures. Market ratios reflect the current state of the share market price and the amounts of dividend payments. There is a direct relationship between market ratios and profitability, leverage, liquidity and efficiency ratios: if the company is increasing its sales, liquid, efficient and is able to pay its obligations, then it is seen as an attractive opportunity for investment. Market value analysis also helps to determine whether stock is underpriced or overpriced. The components of this work's market value ratios include Earnings per share; Price-to-earnings ratio; Earnings yield.

Table 5. Market value

#	<u>Ratio</u>	<u>Formula</u>
1	<b>EPS</b>	$\frac{\text{net earnings}}{\text{number of shares}}$
2	<b>P/E Ratio</b>	$\frac{\text{market price per share}}{\text{earnings per share}}$
3	<b>Earnings yield</b>	$\frac{\text{earnings per share}}{\text{price per share}}$

**EPS** which stands for Earnings per share is a percentage of company's earnings assigned to each outstanding share being issued. The formula is usually calculated twice: first time for basic and second time for diluted shares. In case there are diluted shares,

the outcome of the calculation is lower earnings per share figure as the net earnings are divided by the higher number of shares. Some companies also have adjusted earnings per share which is calculated using the adjusted net earnings.

**Price-to-earnings ratio** indicates the willingness of the market to pay for the company's earnings. Higher figure shows that the market believes in the future of the company's prospects and the price is, therefore, high for the shares. However, on the other hand, if the figure is low then investors do not have hopes for the prosperous future of the firm's operations and the price for the share is low. P/E ratio shows how much shareholders are ready to pay for one dollar of earnings.

**Earnings yield ratio** is the inverse of P/E ratio and measures the return on every dollar invested in the company.

### 2.3.6 Limitations of Financial Ratio Analysis

Financial ratio analysis is a useful tool for analyzing company's performance; however, it has certain pitfalls and drawbacks about which analysts need to be aware before performing the calculations in order to avoid false misinterpretations of results. The problems associated with the analysis include:

- According to Generally Accepted Accounting Principles (GAAP), there are various ways of representing items in financial statements. Therefore, it might have an impact on ratio calculations. As an example, Bodie (2009) points out differences in inventory valuation, depreciation, inflation and interest expense.

There are two ways of valuing inventories: LIFO (last-in first-out) and FIFO (first-in first-out). The LIFO principle estimates the inventory at the current cost of production, while the FIFO system estimates the inventory at original cost. The result of this is that the FIFO firm has a higher profit and a higher balance

sheet value than the LIFO firm. Therefore, this might create distortion in calculations and interpretations of results.

Depreciation is another confusion creating problem as firms use different depreciation methods including accelerated and straight-line methods. Moreover, firms differ in estimating the lifespan of depreciable assets.

Inflation has an impact on calculation of leverage ratios. What is considered as interest expense might be a part of principal repayment.

- Determination of the firm belonging to a certain industry might become a complicated task in case the company is engaged in various types of businesses.
- Financial Ratio analysis is a quantitative analytical tool providing the analyst with numbers only. Therefore, it does not measure the quality of the company's operations or customer service which plays an important role in financial performance.
- Financial Ratio Analysis is intended for measuring the past performance of the firm and does not provide future forecasts. However, financial analysts try to construct the future predictions based on the past performance.
- Ratios do not provide a good base for judgment unless compared with the industry norms, competitors and reviewed as interdependent variables.
- As with risk perception and net present value calculation, where there is no universal correct figure, same is applied to Financial Ratio Analysis. There is no right or wrong ratio. Analysts differ in their perceptions and judgment, therefore the interpretations of financial ratio analysis might differ among people.
- Ratio Analysis calculations are based on the numbers provided in the statements of operations assuming the data is correct. In case the information is wrong, the

result of analysis is misleading too. Therefore, there is a problem of window dressing when companies try to show the financial position in a better way.



## 2.4 Altman Z-score

Financial Ratio Analysis is used for evaluating the company's past performance and does not give an insight into the future. However, it is not enough for an investor to look at historical figures only. The future of the company needs to be analyzed also. Therefore, for this purpose Altman Z-score is calculated for each of three companies in order to evaluate the companies' probability of bankruptcy within the next 20 months (Altman, 1968). Z-score formula measures the corporate financial health.

Edward I. Altman is a Finance Professor at the University of New York. He is famous for establishing Z-score model for predicting corporate bankruptcy in 1968. The model helps investors to reduce risk and make investment safer. The variables used for calculating are derived from the company's Balance Sheet, Profit & Loss and Cash Flow Statements. The formula for Z-score is as follows:

$$Z = 1.2 * X1 + 1.4 * X2 + 3.3 * X3 + 0.6 * X4 + 1.0 * X5,$$

Where: X1= Working Capital/Total Assets

X2= Retained Earnings/Total Assets

X3= EBITDA/Total Assets

X4= Market Value of Equity/Total Liabilities

X5= Net Sales/Total Assets

X1, Working Capital/Total Assets

This ratio measures the liquidity of the firm by comparing its working capital to total assets. Altman (2000) states that among the liquidity ratios including current and quick ratios, this ratio has proved to be the most valuable.

#### X2, Retained Earnings/Total Assets

This ratio measures the leverage of the firm and what the percentage of retained earnings used for financing the total assets is. Altman (2000) calls this ratio ‘new ratio’. Moreover, he states that young companies tend to have lower retained earnings as they have not been able to build a cumulative retained earnings figure yet, which leads to a lower X2 figure and higher risk of bankruptcy, which actually reflects the real world situation. Dun&Brandstreet (2004) state that 50% of firms that failed in 1993 did it in the first five years of their existence.

#### X3, EBITDA/Total Assets

This ratio measures the firm’s efficiency in utilizing its assets. Altman (2000) states that “the firm’s ultimate existence is based on the earning power of its assets” and this ratio is intended to measure the earning power of the total assets. The higher the earning power of the company, the lower the risk of bankruptcy is.

#### X4, Market Value of Equity/Total Liabilities

This is the ratio for measuring the firm’s solvency. It assesses whether the company is able to pay for its liabilities in case the creditors suddenly reclaim the loans.

#### X5, Net Sales/Total Assets

The total asset turnover ratio measures the effect of utilization of the firm’s assets on generating sales. The higher this ratio, the better is the company in generating more sales by efficiently using its assets.

Charley Kyd (2008) classifies Z-score formula into 3 versions:

1. Z-score for private manufacturing companies,
2. Z-score for public manufacturing companies and,

### 3. Z-score for private non-manufacturing companies.

The difference between the formulas is in coefficients attributed to each variable. Moreover, Z-scores for private companies and for general use do not include X4 variable which includes the Market Value of equity, but instead have a different variable replacing the missing one. Z-score for private non-manufacturing companies does not include X5 variable as firms from different industries have different levels of asset turnover and the ratio result might be misleading.

Altman (2000) clarifies that variables should be included in the formula as absolute percentage values (0.2 instead of 20%).

#### **2.4.1 Interpretation**

The figure produced after plugging in the variables and multiplying them with the attributed variables needs to be analyzed by comparing it with the interpretations, which are as follows:

$Z < 1.8$  = “Distress zone”, the probability of bankruptcy is very high,

$1.8 < Z < 2.7$  = “Grey zone”, the probability of company going bankrupt within 20 months is possible,

$2.7 < Z < 2.99$  = “On Alert”, the investor should be very cautious when investing into these companies,

$Z > 2.99$  = “Safe zone”, the probability of company going bankrupt is low.

## 2.5 Population Projection

Population ageing trend has an impact on the increasing demand for healthcare products and pharmaceuticals around the globe. Older people tend to require more care and have higher rate of chronic illnesses development than the younger part of the population. According to a UN report (2009), people aged 55 or above represent 22% of the population in the developed and 9% in the developing countries. These figures will be constantly increasing in the future and will reach 33% and 20% respectively by 2050.

Research on the target population (Biomet, 2011) has shown that males and females in the age range 55-75 years represent the customers of orthopedic implants. Kotler et al. (2010) defines target market as a “set of buyers who share common needs or characteristics that the company decides to serve”. Therefore, the age group of 55-75 which belongs to an ageing population represents the main customers of orthopedic implant manufacturers.

It is a vital part of this research to look at the projections of US and UK population belonging to the identified age range as Zimmer and Stryker are American-based companies with biggest share of sales in the United States and Smith&Nephew is a UK-based company with the biggest share of sales represented by a British market.

Data derived from the U.S. Census Bureau Projections shows that the population will be ageing. Amount of People in the age group 55-74 will increase by 53% by 2051.

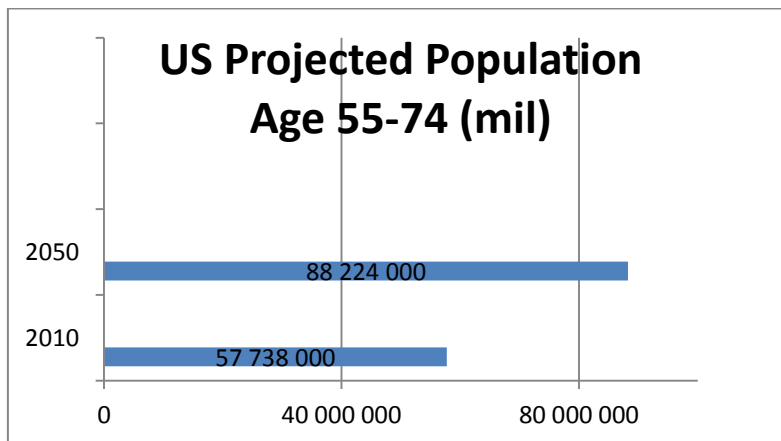


Figure 2. US projected population aged 55-74. 2010-2050

Table 6. Population change US (%) 2010-2050

(million)	2010	2050	% increase
<b>Total Population</b>	310233	439010	41,5%
<b>55-74 years old</b>	57738	88224	53 %

Data derived from Office for National Statistics of UK also shows that the population will be ageing. The increase in the age range 55-75 is expected to be 33% by 2051<sup>2</sup>.

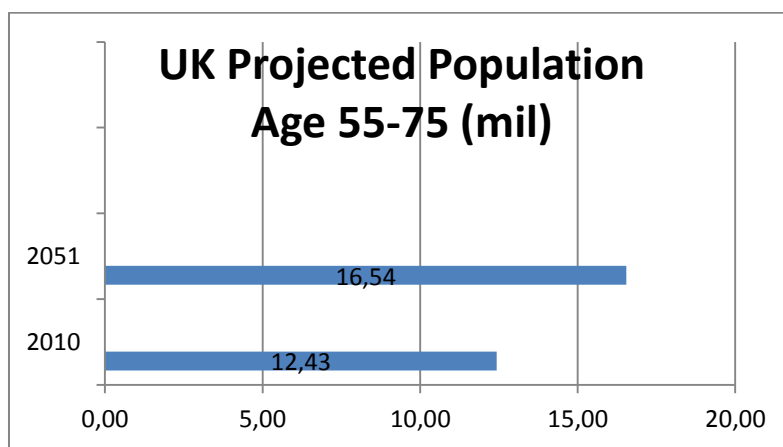


Figure 3. UK projected population aged 55-75. 2010-2051

Table 7. Population change UK (%) 2010-2051

(million)	2010	2051	% increase
<b>Total Population</b>	61,38	77,07	25,5%
<b>55-75 years old</b>	12,43	16,54	33%

Population projection is a good base for prediction of the demand for the products of the studied companies. With the ageing of population, there will be an increase in 55-75 age range category that represents the target market of orthopedic implant manufacturers. Therefore, the demand for the healthcare products including orthopedic implants, the field where Zimmer, Stryker, Smith&Nephew operate will increase. In order to meet the increased demand, the increased supply is expected to occur. Therefore, the companies will have to produce more

<sup>2</sup> The data from Office for National Statistics UK is available for years 2010 and 2051. Therefore, there is a 1 year difference between US statistics of 2050 and UK statistics of 2051

orthopedic implants in order to meet the demand. This leads to increase in Sales and Profits for the companies.

## **3 ORTHOPEDIC IMPLANT INDUSTRY ANALYSIS**

### **3.1 Introduction**

The orthopedic implant industry analysis section includes several topics: Industry Average; Descriptions of Stryker, Zimmer, and Smith&Nephew; Financial Ratio Analysis Results shown with the help of graphs; Altman Z-score results; Return on Investment and Internal Rate of Return calculations.

Industry Average is used as a benchmark for comparison in the financial ratio analysis section. The author performed financial ratio analysis for 10 top orthopedic implant manufacturers including Stryker, Zimmer, Smith&Nephew, Kensey Nash, Johnson&Johnson, Wright, Exactech, Synthes, Integra Lifesciences, and Medtronic and further calculated the mean for each ratio for each year.

Descriptions of the companies include the brief history, operations and business, net sales and growth, global presence and information about the listing on stock exchanges. The information is taken mainly from the companies' websites and also from various other sources including magazines and articles.

Financial Ratio Analysis includes 12 ratios shown separately. Each ratio description includes the graph with the three companies and the industry average and clarification of results.

Altman Z-score is calculated for each company separately and results are shown in the table. The results are further interpreted by comparing to the Altman's rule of interpretation.

Return on shares includes return on investment and internal rate of return calculations which measure the profitability and yield of particular investments.

The figures for the calculations are taken from the companies' annual reports available online. Balance sheet, Profit & Loss and Cash Flow Statements are the three key financial sheets used for this research.



### 3.2 Industry Average

As Bodie et al. (2009) states, financial ratio analysis needs to be compared to a benchmark being an industry average. Even though information on industry benchmark exists, it is not publicly available online. It can be purchased for a certain amount of money. However, the author decided to create an industry average herself. The author performed Financial Ratio Analysis for 10 top orthopedic implant industry companies including Stryker, Zimmer, Smith&Nephew, Kensey Nash, Johnson&Johnson, Wright, Exactech, Synthes, Integra Lifesciences, and Medtronic (“20 of the most profitable Orthopedic and Spine device Companies”, Miller, L., 2011) and further calculated the mean for each ratio. The industry benchmark is used further in the work to analyze the performance of the three studied companies. The industry benchmark can be found below.

*Table 8. Industry Average*

	2006	2007	2008	2009	2010
<b>Quick ratio</b>	1,94	2,93	2,24	2,80	2,89
<b>ROA</b>	14 %	12%	13%	13%	14%
<b>ROE</b>	17 %	14 %	15 %	14 %	15 %
<b>Gross Profit Margin</b>	72 %	72 %	71 %	71 %	72 %
<b>Debt Ratio</b>	32 %	36 %	39 %	36 %	37 %
<b>Gross Profit Margin</b>	16 %	13 %	13 %	14 %	15 %
<b>Profit Margin</b>	16 %	13 %	13 %	14 %	15 %
<b>Total Asset Turnover</b>	0,71	0,69	0,70	0,68	0,65
<b>Fixed Asset Turnover</b>	5,05	5,05	5,1	4,9	4,9
<b>Inventory turnover</b>	1,65	1,49	1,96	1,80	1,82
<b>EPS basic</b>	1,91	1,76	1,98	2,15	2,46
<b>P/E ratio</b>	28,41	33,13	19,99	16,54	14,87
<b>Earnings yield</b>	4,2 %	3 %	4,7 %	5 %	5,7 %

### **3.3 Stryker**

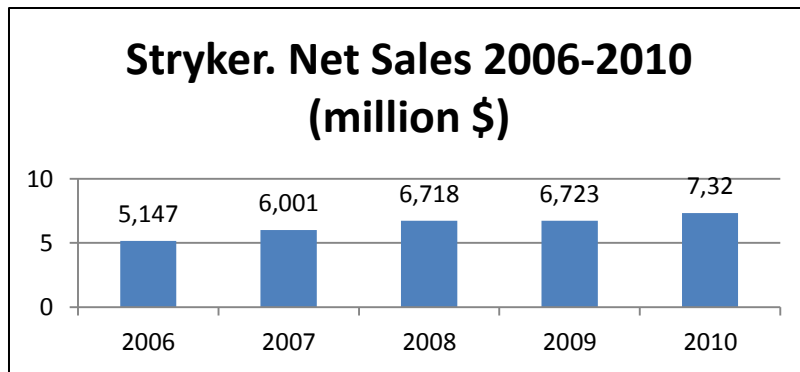
Stryker, among Zimmer and Smith&Nephew, is one of the leading orthopedic implant manufacturing companies in the world. The history of the corporation dates back to 1941 when Dr. Homer Stryker established an Orthopedic Frame Company being the only shareholder of 5,000 shares worth 20,000\$.

Stryker operates in 89 countries worldwide. America is the main market of the company, while the rest of the world represents 35% of the sales share. Stryker is headquartered in Michigan and most of its manufacturing facilities are located in the United States. However, Stryker operates plants in Germany, Switzerland, France, Ireland, China, Georgia, and Puerto Rico.

The two key business areas are orthopedic implants (59%) including hip implants, knee implants, craniomaxillofacial implant systems, spinal implants, trauma implants, bone cement, and, MedSurg equipment (41%) including surgical equipment and navigation systems, endoscopic and communication systems, medical device products and emergency room equipment.

Stryker was number 323 largest U.S. company in 2011 (Fortune 500, 2011); 95<sup>th</sup> world's most innovative company (Forbes "The world's most innovative companies", 2011); it ranked third in the world's most admired Companies in Medical&Other Precision Equipment (Fortune "World's Most admired companies", 2011); and was ranked 68<sup>th</sup> best company to work for (Fortune "100 Best companies to work for", 2011).

Stryker's sales have been constantly increasing for 31 years and reached 7.3 billion dollars in 2010. The annual compound growth rate in sales is equal to 20% for the 31-year period.



Annual Growth Rate	2006	2007	2008	2009	2010
Annual Growth Rate	12%	17%	12%	0,07%	9%

Figure 4. Stryker Net Sales 2006-2010 and Annual Growth rate

Stryker became public in May 1979 when it started listing its shares on NASDAQ stock exchange. Since 1997 Stryker is being listed on New York Stock Exchange. In the end of 2010 the share capital of the company was around 7 billion dollars with 396 million weighted average shares outstanding.

### 3.2 Zimmer

Zimmer is an American Public listed company included in the list of leading manufacturers of orthopedic implants. Zimmer is engaged in manufacturing, design, development and marketing of reconstructive implants, dental implants, trauma products, spinal implants and surgical equipment. Zimmer's share in a global market represents 27% of a \$6.4 billion knee market, 21% of a \$5.8 billion hip market, 13% of a \$1.0 billion extremities market, 6% of a \$3.3 billion dental market, 5% of a \$4.4 billion trauma market, and 3% of a \$8.7 billion spine market.

Zimmer has its offices in 25 countries and sells its products in more than 100 countries. American market represents 56 % of Zimmer sales, while Europe represents 26% and Asia 16%. Zimmer's current focus is to conquer markets in emerging countries. Therefore, it has just recently acquired Beijing Medical Company and expects to double the size of its sales in Chinese market by 2015.

The history of Zimmer dates back to 1927 when it was founded in Warsaw, Indiana. In 2001 Zimmer became an independent public company and is now listed on NYSE (New York Stock Exchange) and SIX (Swiss Exchange).

Zimmer currently employs approximately 9000 people and is constantly requiring more qualified specialists because of the expanding business.

The chart below provides the information on Zimmer’s net sales 2006-2010 and the annual growth rate table provides the information on net sales growth percentage by year.

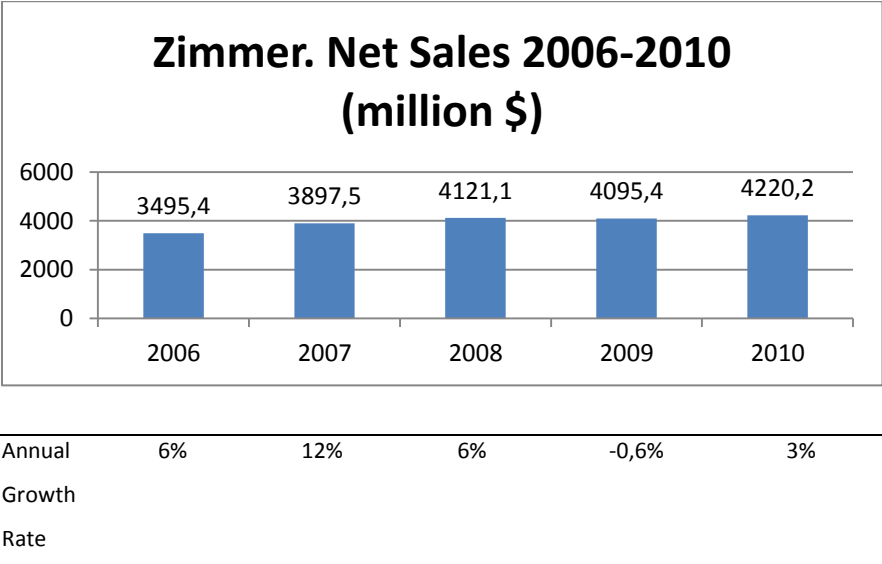


Figure 5. Zimmer Net Sales 2006-2010 and Annual Growth rate

Zimmer’s Sales are constantly increasing; however, there has been a decrease in 2009. Decrease in sales in 2009 is affected by several factors. First of all, by the decrease in global selling prices for orthopedic implants. The prices decreased by 1% in 2009. Moreover, the exchange rate in 2009 was not favorable for Zimmer as the dollar became strong compared to foreign currency which led to a 2% decrease in sales revenue. Moreover, Zimmer experienced customer losses due to implementation of several compliance initiatives. Notwithstanding the above-mentioned issues, the demand for Zimmer’s products is constantly increasing and is expected to follow the trend.

### 3.4 Smith&Nephew

Smith&Nephew is a UK-headquartered company. The four key areas of its operations include orthopedics, trauma, wound management, and endoscopy. The company started as a small pharmacy in Hull founded by Thomas James Smith in 1856.

The company operates in more than 90 countries worldwide and has manufacturing facilities in England, US, Germany, Switzerland, China, and Canada. United States represents 43% of group revenue, Europe represents 33% of group revenue and the rest represents 24%.

Smith&Nephew went public in 1936 when it started trading its shares on London Stock Exchange. Since 1999 the group’s shares are also traded on New York Stock Exchange in the form of American Depository Shares representing five ordinary shares each.

The Net Sales of the Company has been increasing throughout the whole period 2006-2010 with a slight decrease in 2009 the reason for which is mainly explained by fluctuations in the currency exchange rates when dollar became stronger compared to euro, sterling and Australian dollar.

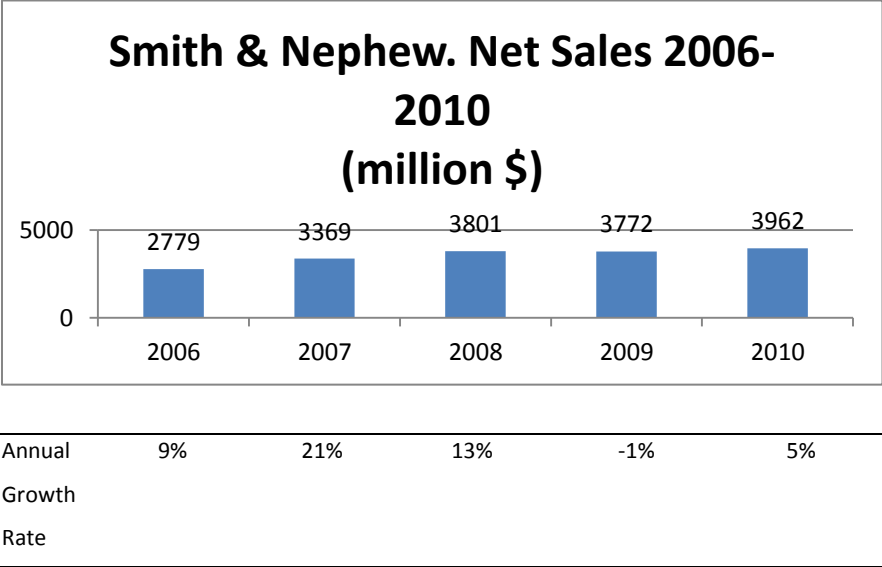


Figure 6. Smith&Nephew Net Sales 2006-2010 and Annual Growth rate

### 3.5 Financial Ratio Analysis Results

#### 3.5.1 Liquidity

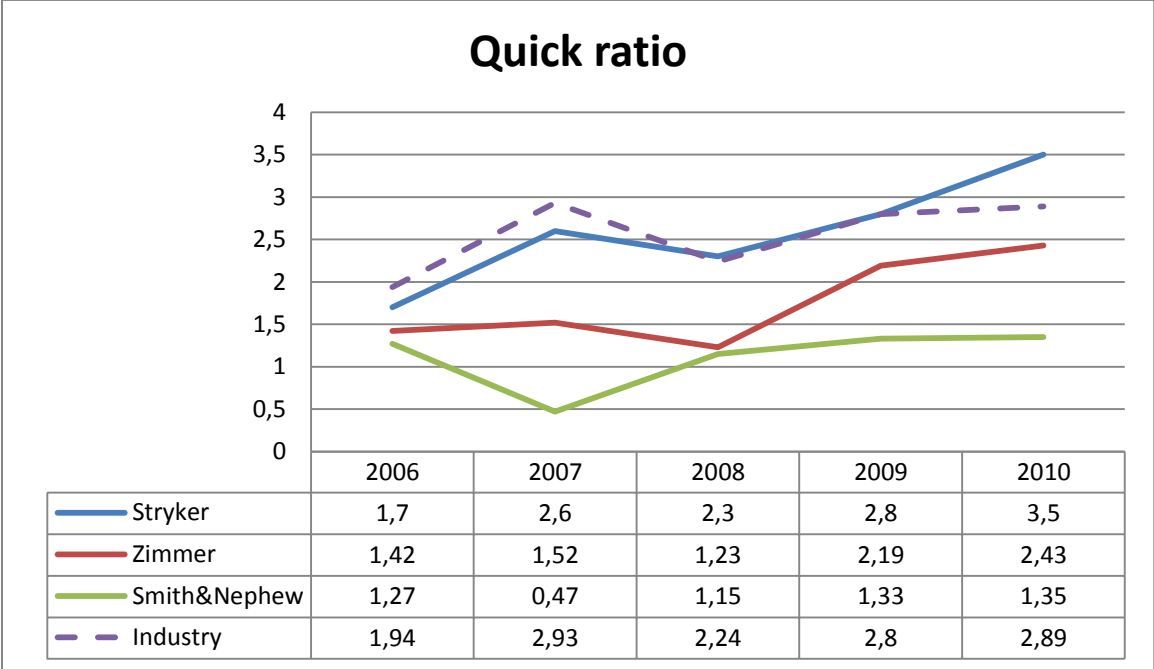


Figure 7. Quick Ratio. Stryker, Zimmer, Smith&Nephew. 2006-2010

As can be seen from the chart, Stryker outperforms Zimmer and Smith&Nephew and also the industry average since 2008. It has the highest level of liquidity among all. Even though Zimmer and Smith&Nephew have lower indicators of quick ratio and underperform the industry, they are still above the rule of thumb which suggests the company should have \$1 of cash, marketable securities and accounts receivable for every \$1 of current liabilities.

**3.5.2 Profitability**

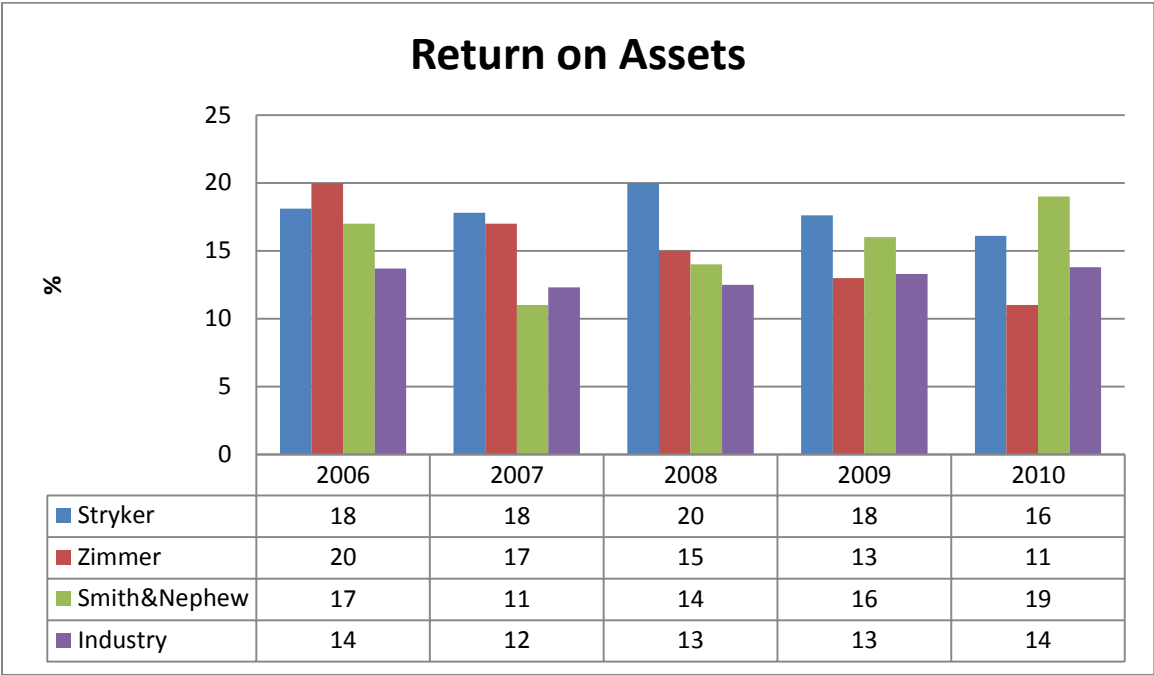


Figure 8. Return on Assets. Stryker, Zimmer, Smith&Nephew. 2006-2010

In terms of Return on Assets, Stryker has been able to outperform the industry and Zimmer with Smith&Nephew during 2007-2009, however underperformed Zimmer in 2006 and Smith&Nephew in 2010. Zimmer’s return on assets has been decreasing throughout the whole period and fell below the industry average in 2010. The possibility of increasing the ROA lies either in reducing the total assets or increasing the Earnings Before Interest and Taxes. The first is reached by selling off the assets, while the latter is reached by reducing the administrative, selling, general, R&D expenses. Smith&Nephew’s return on assets has been increasing since 2007 and reached its peak in 2010 with 19%. The rule of thumb suggests the company produces at least 5% return on its assets. Stryker, Zimmer and Smith&Nephew fulfill this requirement.

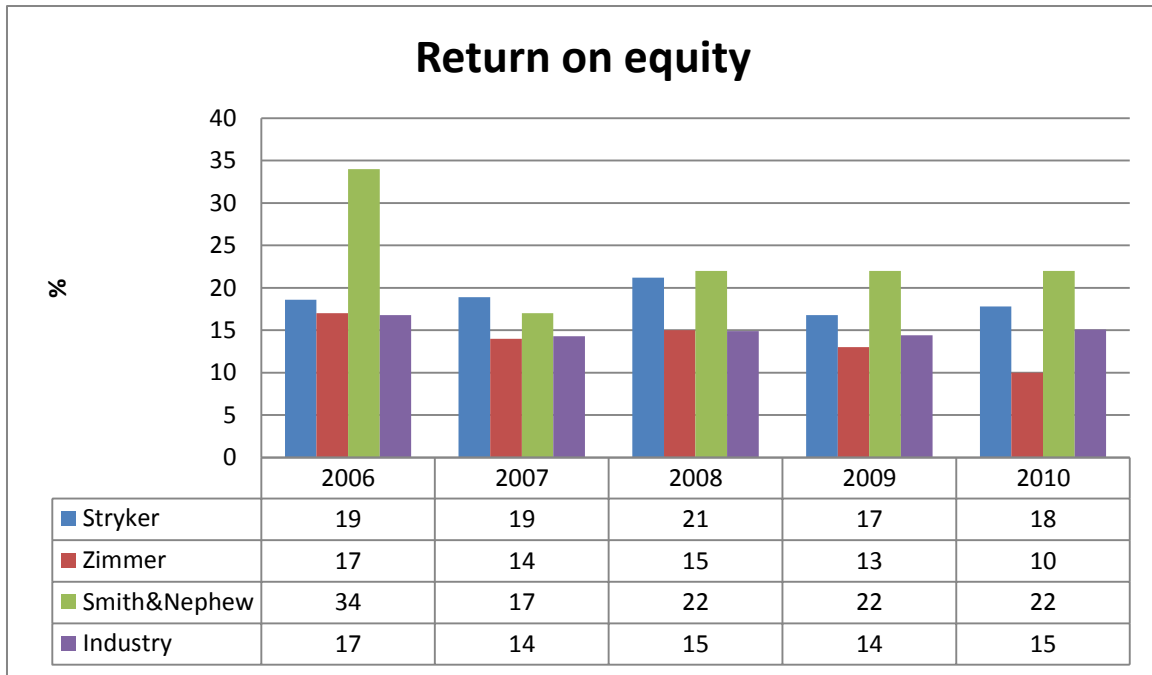


Figure 9. Return on equity. Stryker, Zimmer, Smith&Nephew. 2006-2010

Smith&Nephew undoubtedly outperforms Stryker, Zimmer and the Industry. It utilizes its equity most efficiently among all. This happens because Smith&Nephew is able to produce higher net income having lower shareholder's equity compared to Zimmer and Stryker. Zimmer's return on equity has been decreasing since 2008 and reached its lowest point in 2010 with 10% which underperforms the industry average. Stryker's return on equity has also been decreasing since 2008, however, it still outperformed the industry by 3% in 2010. The rule of thumb suggests the company should produce at least 10% return on equity. Even though the companies have been able to meet this requirement, Zimmer has been on the edge in 2010 with exactly 10% return on equity.



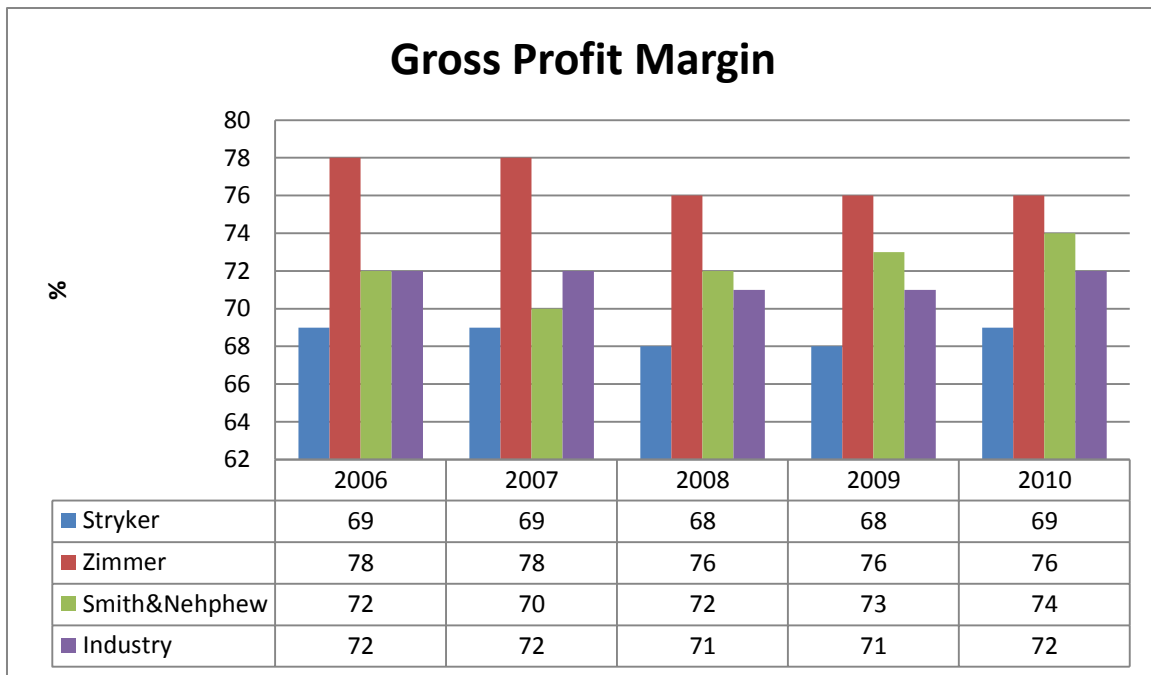


Figure 10. Gross profit margin. Stryker, Zimmer, Smith&Nephew. 2006-2010

The rule of thumb suggests the company should have at least 35% gross profit margin; however, orthopedic implant industry is characterized by very high gross profit margins and is currently the third highest in healthcare industry behind large pharmaceutical and biotech companies.

Zimmer has the highest gross profit margin which currently was 76% in 2010. Stryker's gross profit margin is lower than of its competitors and the industry. Meanwhile, Smith&Nephew's gross profit margin is higher than the industry average and Stryker but lower than Zimmer.

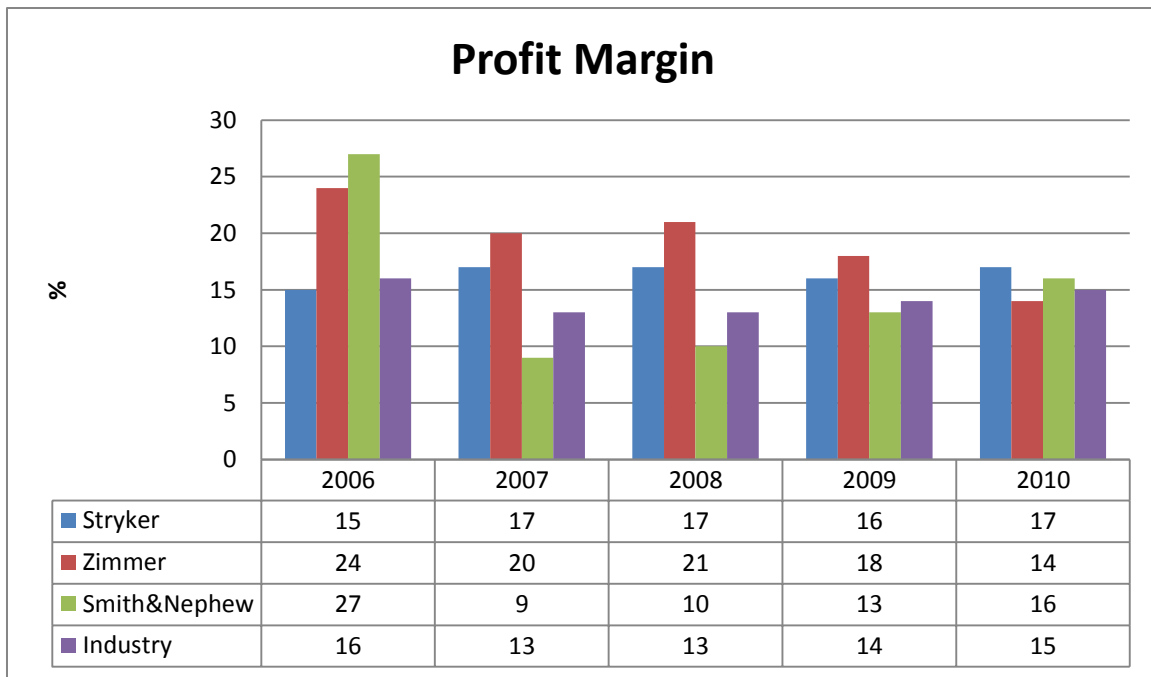


Figure 11 Net profit margin. Stryker, Zimmer, Smith&Nephew. 2006-2010

The profit margin graph helps to better understand the pricing of orthopedic implants. As can be seen from the gross profit margin, cost of implants represents a very slight proportion of the total price charged by the companies. The difference between the high gross profit margin and low profit margin shows that the biggest share of the implant's price is not represented by the cost of production but by other expenses associated with keeping up the business. Even though the gross profit margin is considered to be very high, net income tends to be quite low compared to the gross profit which is explained by Research&Development and Administrative, Selling and General Expenses consuming the biggest share of the cost of products. These expenses keep the price of orthopedic implants unreasonably high and leave no choice for the orthopedic surgeons because of oligopolistic nature of the market. The prices for the products need to be decreased as the demand is constantly increasing and can lead to government being unable to cover the costs incurred by the surgeries (Borzo, 2012). The cost issue is now in the core of the main challenges to be solved in the industry. The author believes that the companies able to reduce their expenses will win the share of orthopedic business in the future as the government might demand the decrease in prices because of the increasing demand for the surgeries covered by the government healthcare expenditure.

### 3.5.3 Leverage

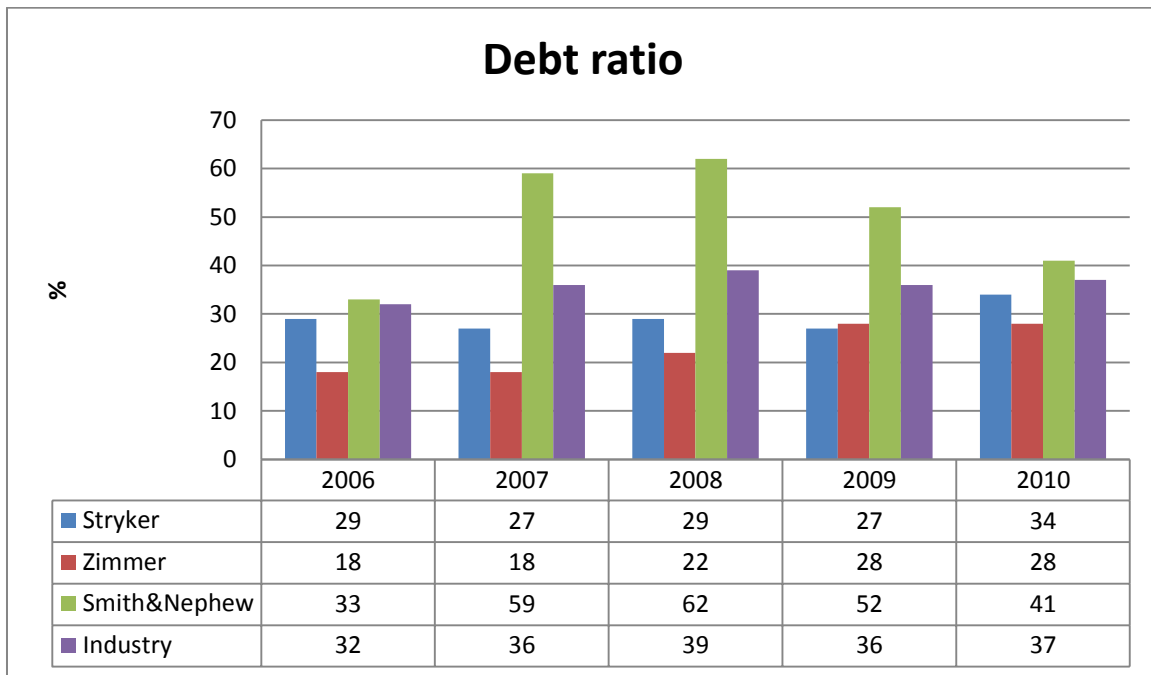


Figure 12. Debt ratio. Stryker, Zimmer, Smith&Nephew. 2006-2010

As can be seen from the chart, Smith&Nephew uses more debt finance than Stryker, Zimmer and the industry. This results in higher return on equity where Smith&Nephew undoubtedly wins the competition with the highest ratio indicators. Meanwhile, Zimmer and Stryker go for more equity finance and less debt finance than the industry which results in lower return on equity figures. Therefore, additional borrowing in this industry has a positive impact on return on equity. However, the rule of thumb suggests the companies should not go over 70% because more debt financing results in more financial risk (Bodie, 2009, p.98). This rule has not been broken by any studied company.

### 3.5.4 Efficiency

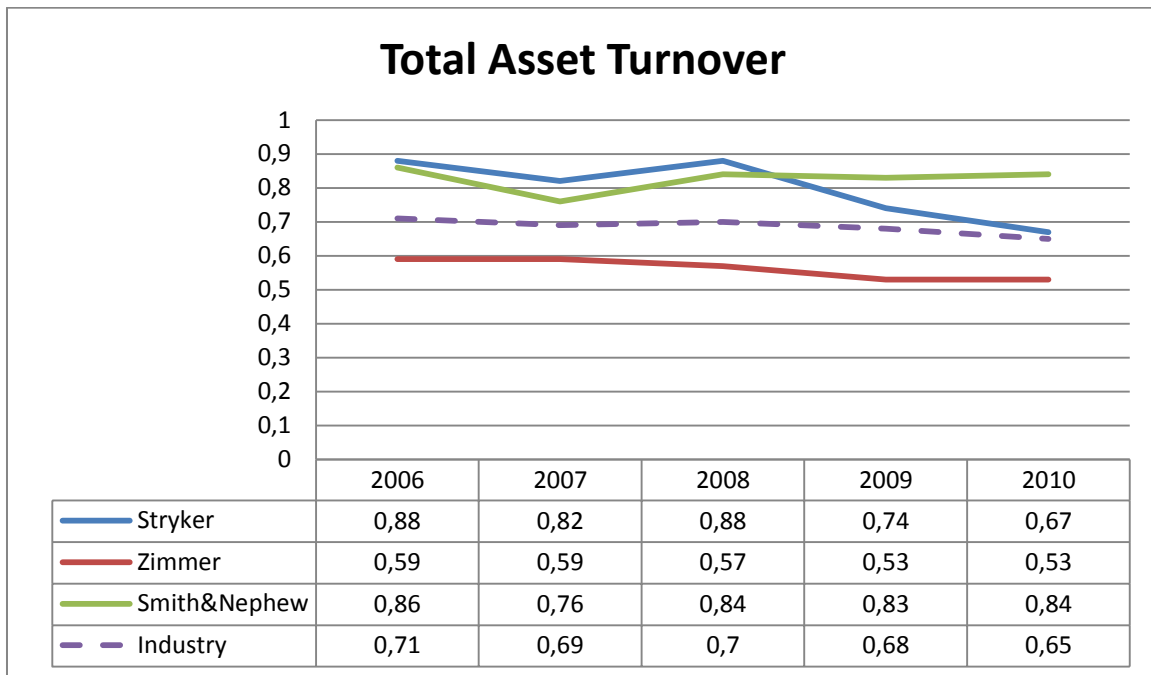


Figure 13. Total asset turnover. Stryker, Zimmer, Smith&Nephew. 2006-2010

Stryker and Smith&Nephew outperform the industry in terms of total asset utilization. Smith&Nephew reached the top with 84 cents in sales from every dollar of assets in 2010. Thus, Smith&Nephew has been utilizing its assets most efficiently during the period 2009-2010. Stryker has been the most efficient in utilizing total assets during 2006-2008. Meanwhile, Zimmer underperforms the industry and its competitors and produced 65 cents in sales for every dollar of total assets in 2010.

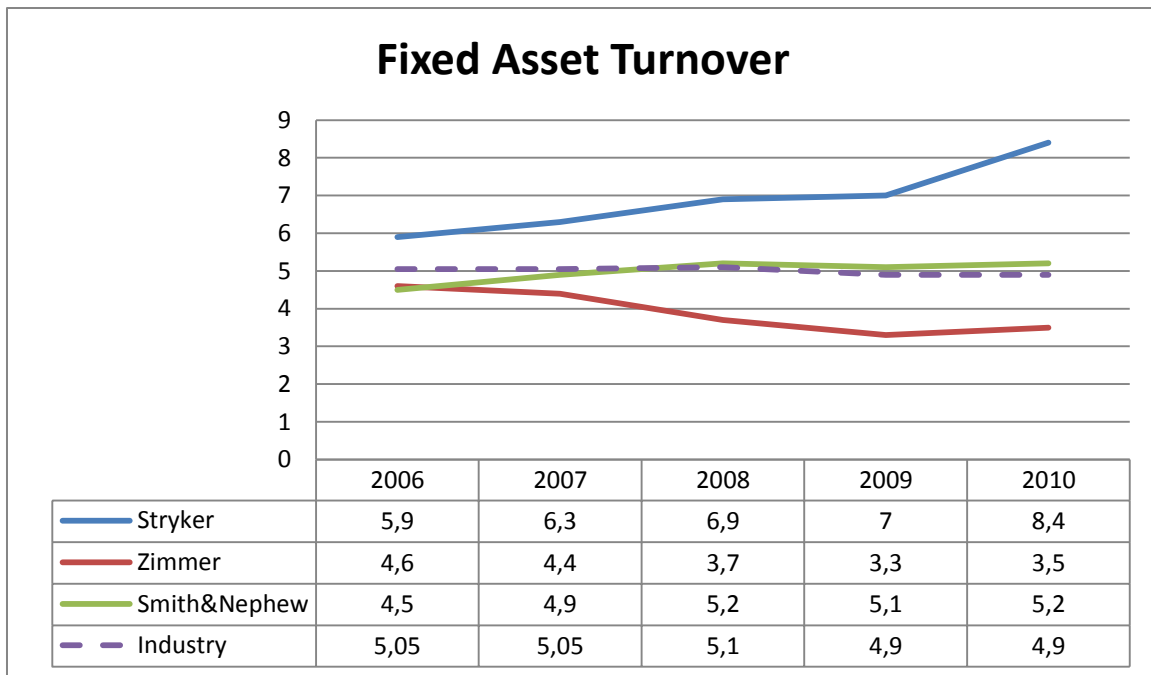


Figure 14. Fixed asset turnover. Stryker, Zimmer, Smith&Nephew. 2006-2010

Stryker invests into Property, Plant and Equipment most effectively than Zimmer, Smith&Nephew and the industry. Stryker's fixed asset turnover constantly increases throughout the examined period and reached its peak in 2010 with 8.4 dollars generated from each dollar of fixed assets. The rule of thumb suggests the company generates at least 5 dollars in sales per dollar of fixed assets. Stryker and Smith&Nephew have been able to meet this requirement and also outperform the industry. However, Zimmer underperformed the industry and its competitors and produced 3.5 dollars in sales per dollar of fixed assets in 2010 which leads to a conclusion that Zimmer needs to either increase the net sales figure with its current state of fixed assets or decrease the property, plant and equipment by selling them.

Table 9. Inventory turnover analysis. Stryker, Zimmer, Smith&Nephew. 2006-2010

Inventory Turnover*Gross Profit Margin					
Year	2006	2007	2008	2009	2010
<b>Stryker</b>	179 %	174 %	166 %	156 %	157 %
<b>Zimmer</b>	99 %	99 %	91 %	82 %	83 %
<b>Smith&amp;Nephew</b>	95 %	96 %	90 %	83 %	82 %
<b>Industry</b>	119 %	107 %	138 %	128 %	131 %

In order to examine the inventory turnover, the rule of thumb suggests that if inventory turnover multiplied by gross profit margin is higher than 100, then the average inventory is not too high. As can be seen from the table, Stryker is more efficient in utilizing its inventories and sells them faster than the industry and Zimmer and Smith&Nephew. Meanwhile, the level of Zimmer’s and Smith&Nephew’s inventories has been increasing throughout the period.

### 3.5.5 Market value

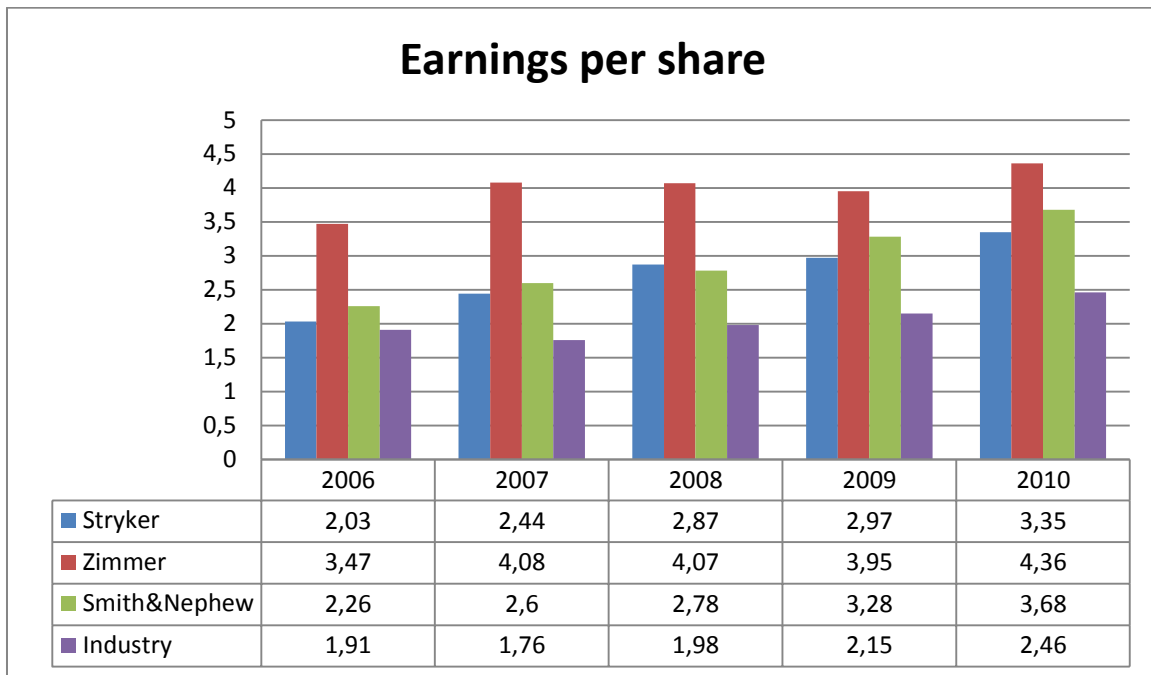


Figure 15. Earnings per share. Stryker, Zimmer, Smith&Nephew. 2006-2010

Zimmer does not pay any dividends to its shareholders. All profits are retained and reinvested for the expansion of the business. Therefore, the company is able to produce higher profit on its shares. Zimmer's earnings per share were almost double the industry norm in 2010 which means that Zimmer is highly efficient in utilizing the shareholder's money. Smith&Nephew follows Zimmer in earnings per share; however, it generates lower earnings per share than Zimmer. Stryker has the lowest EPS figure; however, it still outperforms the industry throughout the whole examined period.

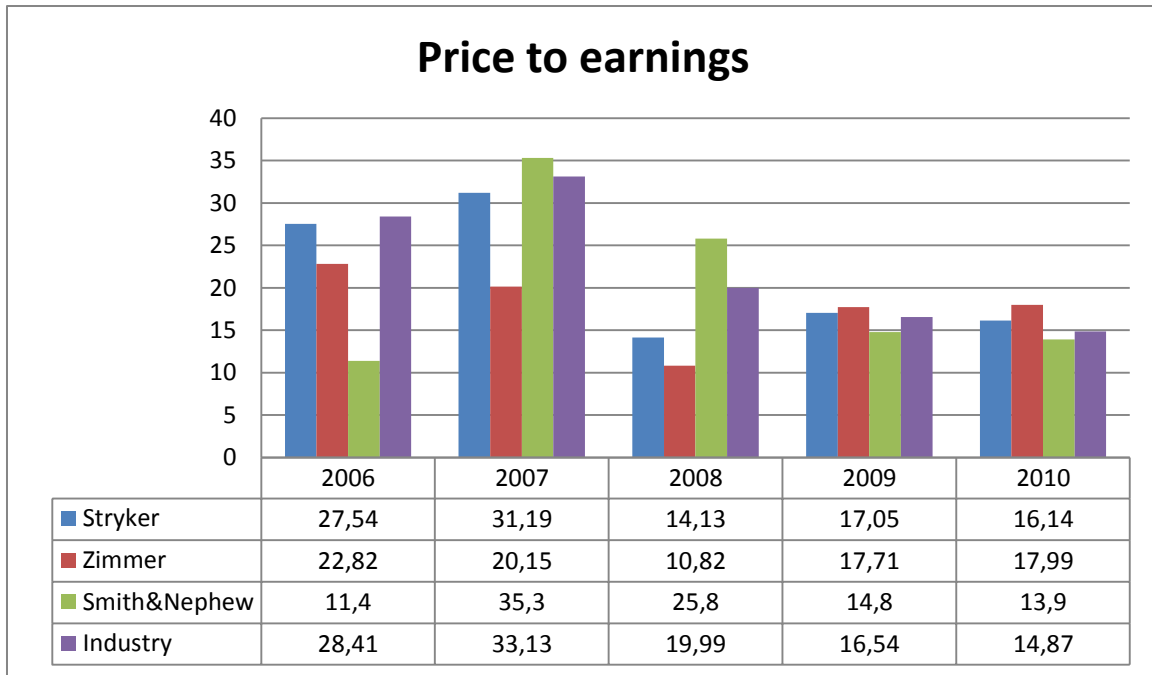


Figure 16. Price-to-earnings. Stryker, Zimmer, Smith&Nephew. 2006-2010

Price-to-earnings ratio helps the investor to check whether the stock is fairly priced, overpriced or underpriced. P/E ratio shows how much shareholders are ready to pay for one dollar of the company's earnings. The rule of thumb suggests that investors should avoid P/E ratio of more than 20 and look for lower priced shares. The 14-18 P/E ratio range is considered as fair.

The chart shows that the stock of Zimmer and Stryker has been overpriced during 2006-2007, however, since 2008 the shares of these two companies have been fairly priced.

Smith&Nephew's stock was overpriced during 2007-2008, however, prices fell after that and the stock became fairly priced during 2009-2010.

As can be seen from the chart, the stock of Stryker and Zimmer was priced higher than the industry's average stock during 2009-2010, while Smith&Nephew's stock was priced lower than the industry's average during the same period.



The maximum profitability from investing into shares is reached when the stock is bought during the “underpriced period” and sold during the “overpriced period”. Thus, for example, it would be most profitable to buy shares of Smith&Nephew in 2006 and sell them off in 2007. Meanwhile, lowest prices for Stryker’s and Zimmer’s stock were registered in 2008 which would be the recommended year to buy the shares.

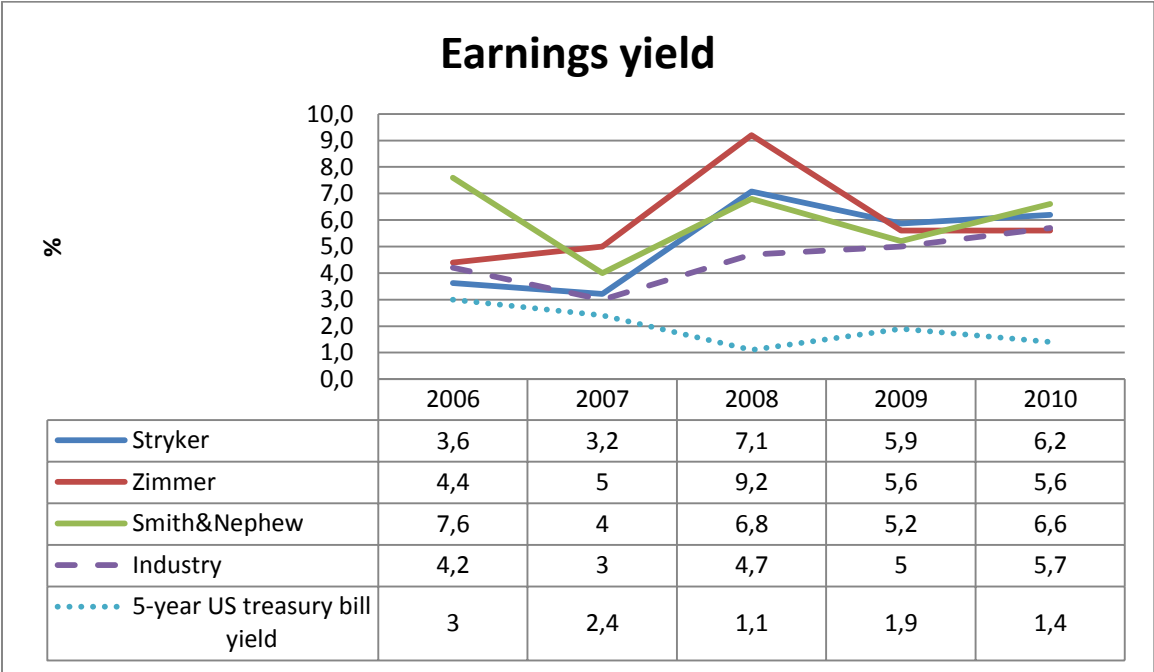


Figure 17. Earnings yield. Stryker, Zimmer, Smith&Nephew. 2006-2010

The rule of thumb suggests that earnings yield from the shares should be higher than a post-tax government bond yield (Kumar Gautam “When to sell your stocks: 5 thumb rules!” 2010). Investment into shares is riskier than investment into risk-free government bond; therefore, investor tends to look for higher yield on shares compared to the government bond.

As can be seen from the graph, shares of orthopedic implant industry produce higher earnings yield than a 5-year US Treasury Bill. Moreover, the companies produced higher earnings yield than the industry average throughout the whole examined period.

## 3.6 Altman Z-score Results

In order to evaluate the probability of the studied companies of going bankrupt within the next 20 months<sup>3</sup>, the Altman Z-score is applied. The results of the calculation are as follows:

*Table 10. Altman Z-score results. Stryker, Zimmer, Smith&Nephew*

Company Name	Z-score
Stryker	5,97
Smith&Nephew	5,06
Zimmer	4,84

As the interpretation suggests, if Z-score is greater than 2.99, the company is in the 'safe zone' and the probability of bankruptcy is very low. The results calculated for each company are higher than 2.99, therefore the probability of these companies going bankrupt within the next 20 months is very low. Investment into these companies is safe.

## 3.7 Return on shares

### 3.7.1 Return on Investment

In order to evaluate the profitability of investment into stock of Zimmer, Stryker and Smith & Nephew, Return on Investment formula is applied. The author assumes that investor purchased a single share of each company on December 29th 2005 and sold it after five years on 31st of December 2010.

*Table 11. Return on investment. Stryker, Zimmer, Smith&Nephew. 2006-2010*

	Zimmer	Stryker	Smith&Nephew
Purchase price (30.12.2005)	68.31	44.43	46.35
Selling price (31.12.2010)	53.68	53.7	52.55
Five-year dividend total	0.00	1.83	3.14
ROI	-21%	25%	20%

<sup>3</sup> 20 months from the calculated date at 31.12.2010. Therefore, 20 months from 31.12.2010 is 31.08.2012

As can be seen from the table, Stryker has the highest Return on Investment among the three companies; it is followed by Smith&Nephew with 20% ROI. Meanwhile, Zimmer has a negative ROI figure which means that the price of the share decreased, and, therefore, the investor would have lost 21% on the investment.

### **3.7.2 Internal rate of return**

Internal rate of return is defined by Bodie (2009) as “the discount rate that equates the present value of the project’s free cash flows with the project’s initial cash outlay”. In simple words, Internal Rate of Return is the discount rate which sets Net Present Value equal to zero. The IRR of an investment is also known as the ‘yield’ on the investment; it is the compound average annual rate of return over the period of the investment.

If the investor’s required rate of return is higher than IRR, NPV will be  $< 0$  and the investment will be value-destroying.

If the investor’s required rate of return is lower than IRR, NPV will be  $> 0$  and the investment will be value-creating.

In order to compare the internal rate of return we need to know the investor’s required rate of return. The investor’s required rate of return is defined by Bodie (2009) as “the minimum rate of return necessary to attract an investor to purchase or hold a security”. The required rate of return consists of two components being the risk-free rate of return and a risk premium. Risk-free rate of return is return required for risk-free investments, such as U.S. Treasury bill. Risk premium is the additional return required for taking on additional risk. As one of the main principles of finance states, risk requires reward; therefore, investors tend to require higher return for riskier investments. In our case the required rate of return is equal to 9.35 % which

includes 4.35% 5-year US Treasury Bill rate (U.S. Department of the treasury), and 5% risk premium.

*Table 12. Internal rate of return. Stryker, Zimmer, Smith&Nephew. 2006-2010*

	<b>Zimmer</b>	<b>Stryker</b>	<b>Smith&amp;Nephew</b>
<b>IRR 2006-2010</b>	-13%	-4%	-5%

Internal rate of return for these three companies is negative and lower than the required rate of return; therefore, the investment is value-destroying and not worthwhile. The reason for this negative figure is explained by the decrease in share prices during and after the financial crisis.

## 4 CONCLUSION

In order to answer the first research question and compare companies to each other in order to identify the strongest, fastest growing and most profitable player in the field, each part of financial ratio analysis is analyzed separately.

First of all, in terms of liquidity, Stryker has the highest indicator of quick ratio. The more liquid the company is, the more financially strong it is. Therefore, Stryker is considered as the most liquid and financially strong company among three studied companies.

In terms of profitability, both Stryker and Smith&Nephew have higher than the industry average return on assets and return on equity. Meanwhile, Zimmer is utilizing its assets and equity slightly less efficiently than the two peers and the industry; however, it has the highest gross profit and profit margins among all.

Regarding the debt finance, Zimmer and Stryker use slightly less debt than Smith&Nephew. The additional use of debt finance results in higher return on equity where Smith&Nephew undoubtedly leads the competition. All three companies do not exceed 70% debt rate so all of them are in a safe position.

In terms of efficiency, Stryker is considered as the most efficient among all as it has the highest total asset turnover, fixed asset turnover and inventory turnover figures. Therefore, Stryker has the maximum productivity and the minimum expenditure regarding the utilization of its assets and inventory.

As regarding the market ratios, it is important to note that Zimmer unlike Stryker and Smith&Nephew does not pay any dividends to its shareholders and reinvests all the net income for the generation of higher profits. This is considered by the author as the smart strategy because dividends are relatively low compared to the share's price, so it might not make a

difference for a shareholder to receive annual 20 cents as dividend, however, it makes a huge difference for a company's business when all the dividends are pooled together and further reinvested. When comparing P/E ratio for the three companies, it can be concluded that they are approximately equally priced during 2009-2010 with slight variations. As regarding the earnings yield, Zimmer was able to outperform the industry and competitors during 2007-2009; however, Stryker and Smith&Nephew outperformed Zimmer in 2010.

The future of all the studied companies looks quite safe and there is no possibility of future bankruptcy within the next 20 months according to Altman Z-score calculation. Therefore, investment into shares of these companies is quite safe.

In terms of return on investment, Stryker and Smith&Nephew have the highest indicators, while Zimmer produced -20% return on investment. Even though the internal rate of return figures of all three investments showed to be negative, this is explained by the financial crisis which affected the world in 2007. However, Stryker has been able to outperform S&P 500 Stock Index and S&P 500 Healthcare Equipment Index during all years 2006-2010 and produce a higher shareholder return. Meanwhile, Smith&Nephew has been able to outperform the Medical Devices (Median) Industry in the long-run and produce higher total shareholder return. However, Zimmer has been slightly less profitable than investment into S&P 500 Stock Index and S&P 500 Healthcare Equipment Index.

Stryker and Smith&Nephew outperformed the indexes in terms of shareholder return during 2006-2010 period, while Zimmer underperformed. Even though Zimmer's shares had slightly lower return than that of two other companies and the indexes, it is explained by the financial crisis which affected the world in 2007. While Stryker and Smith&Nephew have been able to recover after crisis rather fast, Zimmer failed to do so and therefore underperformed. There are many reasons why Zimmer's recovery from the crisis took longer. One of the main reasons is suspension of distribution of defective hip implant Durom Cup which led to huge expenditures on lawsuits, investigations and losses. However, based on Financial Ratio Analysis, Zimmer has higher profitability with higher operating profit and profit margins. Moreover, Zimmer's shares always produced higher earnings per share and in 2009 and 2010 Zim-

mer had the highest price-to-earnings ratio which means that investors believe in the future of the company and value it higher compared to competitors and the industry. Moreover, Zimmer had the highest earnings yield during 2007-2009 which means that the company produced higher return on every dollar invested in the company. By bringing all the above-mentioned facts together, it is reasonable to say that investing into Zimmer is more profitable than investing into Stryker or Smith&Nephew. The author believes that Zimmer has very perspective future prospects. However, Stryker and Smith&Nephew are also considered as profitable investments.

Moreover, the author wants to add that it seems like there is a need for decrease in operating expenses. Gross profit margins are very high in the industry: the third highest in healthcare industry behind large pharmaceutical and biotech companies. Meanwhile, the profit margins are relatively low. Therefore, the cost of the product represents a very slight proportion of the price but general, administrative, research and development expenses consume the biggest share of price keeping it unreasonably high. The companies able to decrease operating expenses will win the market share of the business. One way it can be achieved is decreasing the amount of sales representatives. The work done by sales representatives needs to be done by hospitals, especially maintaining the stock, assuring there are enough inventories kept in the warehouse and moving towards decreasing the appearance of sales representatives during surgeries.

If companies are not able to decrease expenses, it would be harder for the government to be able to afford paying for an increasing amount of costly orthopedic implant surgeries. There might be a trend of switching to something new, like 3D printed orthopedic implants which might become a future of orthopedic implant industry or even a better alternative of a recently offered by orthopedic surgeon Kevin Stone replacement of damaged parts with lab-grown tissue from animals and parts of human donors. If these alternatives gain popularity, investment into orthopedic implant shares of current manufacturers might become risky.

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## 7 APPENDIX

### Financial Ratio Analysis

#### Interview

Jenny Kähtävä

1. What are your current responsibilities at OP Pohjola?

Bank Analyst at OP Pohjola Headquarters.

2. What purposes is Financial Ratio Analysis used for in OP Pohjola? (Is it useful for investment evaluation?)

- Credit risk analysis

3. What ratios are included in the ratio analysis in OP Pohjola? Do you think there are some more important ratios (green) and less important ratios (red)?

- Enterprise value / EBITDA
- (Net) Total Debt / EBITDA
- (Net) Senior Debt / EBITDA
- Cash flow coverage
- Interest coverage
- Gearing
- Equity ratio
- Quick ratio
- Working capital based ratios (days outstanding)

4. Is there any software used for calculating the ratios? If so, how does it work?

- Excel based financial models
5. How long does it take to prepare FRA for a certain company?
- Few minutes, entire model takes half a day
6. How many people are involved in preparing FRA for one company?
- One
7. How are the ratios interpreted? (Are they compared with the peer companies, rule of thumb, industry norms?)
- All of the mentioned examples
8. Is FRA performed by OP Pohjola available online or is it strictly confidential?
- Strictly confidential
9. Do you find any drawbacks or pitfalls in using FRA? If so, how do you think it can be improved?
- Ratios do not give a good representation when there is significant business fluctuation, including economic downturns (the same goes for ratios calculated based on share price)
  - Do not give any insight into how good the business or industry is
  - Without forecasts, financial ratios as purely history based, static analysis do not necessarily give a good representation of the future
10. Would you like to give some useful tips for performing financial ratio analysis?
- High leverage (>3,5x EBITDA) needs much more cash flow analysis than just ratio based



- Equity ratio and gearing are fairly trivial in other than assessing buffers for bank debt in terms of enterprise value
- Emphasis should always be on understanding the company's cash flows and forecasts should always be based on understanding the business, cost structure, pricing and production, industry and competition