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USEFULNESS OF BOOK-TO-MARKET RATIO AND STRENGTH OF FUTURE RESIDUAL INCOMES TO PREDICT FUTURE STOCK RETURNS

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UNIVERISTY OF OULU ABSTRACT OF THE MASTER'S THESIS

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Abstract

In the past academic research have displayed strong evidence that stocks with the relatively low valuation earn higher future returns than stocks with relatively high valuation. This kind of value anomaly seems to exist for example between firms with high and low book-to-market ratio. In addition there is a lot of evidence that future stock returns can be predicted by analyzing past financial information. Especially the value relevant fundamentals which are usually the main components of equity valuation models seems to consist useful information about the future stock prices.

In this thesis it is investigated if the investment strategy based on book-to-market valuation ratio and the main fundamental components of residual income valuation model can generate abnormal future stock returns. Strategy focuses on high book-to-market firms which past financial information indicates strong future residual incomes for these firms. These pieces of information are recognized by analyzing the return on equity and expected return on equity which are the main components of residual income model.

The results shows that investment strategy based on book-to-market ratio and strength of future residual incomes generates higher mean returns than equally weighted market portfolio in the U.S markets during the years 1970-2010. Furthermore the strategy outperforms high book-to-market portfolio by mean return margin of 11.5%-points. Strategy seems to be quit robust across time as well when it is outperforming equally weighted market and high book-to-market portfolios almost 80% of the time. The returns appears to be highest among firms with the smallest market value and lowest among the large-sized firms. However the benefits of using fundamental based screening are stronger among medium-sized firms which indicates that superior return performance of the investment strategy is not driven by small firm effect.

It seems also that the superior returns are not at least fully compensation for extra risk. Actually the strategy prefers the stocks with the low earnings variability and leverage together with high liquidity which are argued to be appropriate proxies for risk. Also the explanation of Fama and French (1992) which argues that abnormal returns of high book-to-market firms are due high distress of these firms is not supported by results presented in this thesis. In fact the strategy prefers firms with low distress and still generates higher mean returns than high book-to-market firms on average. This indicates that there could be undervalued stocks in the market which are successfully identified by investment strategy based on valuation ratio and analyzing past financial information.

Keywords

Residual income, book-to-market, valuation, fundamental analysis, stock returns, value anomaly

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1 INTRODUCTION

The purpose of this thesis is to investigate if it is possible to earn abnormal future stock returns by using investment strategy based on book-to-market ratio and residual income valuation model. The book-to-market ratio measures the market expectations about the future profitability of the stocks and is calculated by dividing book value of equity with market value of equity. The higher is the ratio the lower are the market expectations about the future financial performance of the firm. The residual income valuation model on the other hand measures the value of the firm based on book value of equity and present value of the future residual incomes the company will generate. Residual incomes individually can be seen as a measure of market premium which is the difference of the market value and the book value of equity. Thus it is possible to challenge the market expectations of the future financial performance of the firms by analyzing the main components of the residual incomes which are the return on equity and the expected return on equity.

Prior research has evidenced that even by using valuation ratios like book-to-market ratio or fundamental analysis and valuation models individually it is possible to earn abnormal future returns in the stock market. For example Lakonishok et. al. (1994) and Fama and French (1992) have documented that high book-to-market firms earn positive market-adjusted returns and outperform low book-to-market firms. On the other hand for example Frankel and Lee (1998) evidenced that by using residual income valuation model it is possible to earn abnormal future returns as well. The investment strategy tested in this thesis however uses both the book-to-market ratio and the fundamental analysis based on residual income valuation model.

At first the stocks with relatively low valuation and low market expectations are identified by book-to-market ratio. Second the fundamental signals which measures the strength of the future residual incomes are identified and stocks with the high book-to-market ratio and relatively strong future residual incomes are picked to the final portfolio. Strength of the future residual incomes is measured by aggregated measure called SRI. It aggregates seven fundamental signals which consist information about the future profitability and risk of the company.

The same kind of research about the usefulness of fundamental analysis and valuation ratios in predicting future stock returns is documented by Piotroski (2000). He investigated if it is possible to separate financially strong and distressed firms from the group of high book-to-market firms by analyzing past financial information. It was evidenced like also argued in earlier researches that high book-to-market firms earned positive market-adjusted returns. In addition it was evidenced that financially strong high book-to-market firms earned even higher returns than all high book-to-market firms. The idea of this thesis is following the paper of Piotroski but the perspective is different. Piotroski wanted to separate financially distressed firms with fundamental analysis. In this thesis however the fundamental analysis is rather related to valuation of the companies than financial health. Thus the main purpose is to investigate if it's possible to identify at least part of the undervalued companies from the group of high book-to-market firms and test if this kind of screening will lead to positive market-adjusted future returns and superior return performance compared to high book-to-market firms.

The results shows first of all that like expected the high book-to-market firms earn positive market-adjusted future returns in this sample as well. Further the results show that investment strategy based on strength of future residual incomes outperforms high book-to-market firms by margin of 11.5%. In addition the high SRI companies earns 18.9% higher returns than low SRI companies. Especially the return difference of 11.5% between high SRI and all high book-to-market firms is remarkably high. The results indicates that fundamental screening strategy based on residual income valuation model is useful in predicting future stock returns. In addition because the strategy rather over-weights the companies with relatively low than high fundamental risk it may indicate that the abnormal returns are due undervaluation of these companies. On the other hand it can't be fully excluded either that abnormal returns wouldn't be compensation for extra risk carried by these companies. Anyhow this study offers complementary evidence about the existence of book-to-market value anomaly and the usefulness of fundamental analysis in predicting future stock returns.

In the next section of this thesis a prior literature concerning value anomalies and fundamental analysis is presented. Third section presents the theoretical framework

for investment strategy tested in this thesis. In this section the theory related to residual income valuation model is presented and the fundamental signals and screening criteria are determined. The forth section presents the research hypothesis, data and methodology used to test hypothesis. In fifth section the hypothesis are tested and the empirical results are discussed. In section six the final conclusions and suggestions for future research are presented.

2 LITERATURE REVIEW

2.1 Value anomalies

For decades investors and academic research have tried to find a way to earn abnormal returns in the stock markets. Prior research have found evidence of the various anomalies which have led to superior return performance. One well-known anomaly is called value anomaly (e.g. Fama & French 1992, Lakonishok et. al. 1994, Basu 1977.) It refers to the phenomenon where stocks with relatively low valuation (value stocks) earn superior returns compared to stocks with relatively high valuation (glamour stocks). Valuation of the stocks is usually measured by different ratios which are calculated by dividing some fundamental number by market value of the stock. These kinds of ratios are for example book-to-market (BM-ratio) and earnings-to-price (EP-ratio) ratios where book value of equity or net income of the firm is divided by the market value of equity. Then the firms with the highest BM or EP-ratio can be interpreted as firms with the lowest valuation and the lowest market expectations about the future financial performance. This kind of stocks can be categorized as value stocks. On the other hand firms with the lowest BM- and EP-ratios are usually classified as glamour stocks because of the high market expectations and high valuation related to current level of earnings or book value of equity (Bernard et. al. 1997.)

The value of the company can be measured also by using different equity valuation models. For example dividend discount model and residual income model are used in equity valuation. According to these valuation models the value of the equity of the company is the present value of the profits which company is expected to generate to the investors in the future. Dividend discount model uses dividends to measure these profits and thus value of the equity equals the summed present values of the dividends which company will generate in the future. Residual income model on the other hand uses residual incomes and book value of equity for measuring future profits. Hence according to residual income model equity value of the company equals the sum of the current book value of equity and present value of residual incomes which the company will earn in the future (Kallunki & Niemelä 2004: 103, 269, Penman 2010: 154–156.) The investors usually utilize valuation models to find

undervalued stocks from the market and by investing these stocks they are able to earn abnormal returns. Thus the purpose of using the valuation models and valuation ratios is very much the same but unlike valuation ratios the valuation models requires forecasting of future financial performance of the firm. Additionally forecasts are usually based on the fundamental analysis of the firms' financial performance in the past (Penman 2010: 14, 15, 17, 85.) Prior research have also founded evidence which indicates that use of valuation models and fundamental analysis can be useful when investors are trying to earn superior returns from the stock market. For example Frankel and Lee (1998) investigated if it's possible to earn abnormal returns by using residual income valuation model and analyst earnings forecasts. They evidenced that use of valuation model and analyst forecasts led to abnormal returns and especially two and three year buy and hold returns were superior compared to investment strategy based on BM-ratio.

The evidence concerning superior returns of value stocks compared to glamour stocks is undeniable. However there is two contrary explanations for this phenomenon. One argues that abnormal returns are compensation for extra risk related to value stocks. Another one in turn suggests that superior returns are due mispricing of the stocks. For example Fama and French (1992) and (1995) argued that high BM firms are under the relatively high financial distress and thus value stocks are riskier which explains the higher returns compared to glamour stocks. This indication is consistent with the efficient market hypothesis which means that stock prices reflects efficiently all available information (Basu 1977.) On the other hand for example Lakonishok et. al. (1994) argued that the investors are over pessimistic about the future performance of value stocks and over optimistic about the future performance of glamour stocks. This leads to mispricing of the stocks and abnormal returns of value stocks are the result of this kind of inefficiencies in the stock market. Also for example Piotroski (2000) have displayed contrarian evidence for the risk explanation. He separated financially strong firms from the group of high BM firms and found out that financially strong firms earned superior returns compared to all high BM firms and financially distressed high BM firms.

2.2 Prior research on market-to-book and earnings-to-price anomalies

Prior research have founded lot of evidence about the value stocks earning superior returns compared to glamour stocks. Fama and French (1992) and (1995), Lakonishok et. al. (1994) and Chan et. al. (1991) have displayed evidence about superior return performance of high BM firms in U.S. and Japanese stock markets. On the other hand for example Basu (1977) and Jaffe et. al. (1989) have found evidence that high EP firms outperforms low EP firms in U.S. stock markets.

Chan et. al. (1991) investigated BM and EP anomalies with stocks listed in Japan during years 1971-1988. According to their research the high BM and EP firms outperformed low BM and EP firms by a monthly return premium of 1.1% and 0.4% respectively. However their research didn't give an answer whether the superior returns were caused by market inefficiency or extra risk related to value stocks. On the other hand Fama and French (1992) investigated the same issue with stocks listed in U.S. stock markets during years 1962-1989. The results concerning value premium of BM-ratio and EP-ratio were constant with Chan et. al. (1991). The high BM and EP firms outperformed low but positive BM and EP firms by monthly return margins of 1.53% and 0.79% respectively. They suggested that the high BM and EP firms are fundamentally riskier because their past earnings tend to be poorer than low BM and EP firms. This indicates that abnormal returns of value stocks are compensation for extra risk which is consistent with the efficient market hypothesis.

Lakonishok et. al. (1994) however offered a contrarian explanation for the value premium. They investigated the existence of value anomaly and possible explanations for it with U.S. stock market data during years 1968-1990. First of all they found that high BM firms were outperforming low BM firms by annual return margin of 10.5%. After controlling the size of the firms the difference of the annual returns between these two portfolios was still 7.8%. Also high EP firms outperformed low EP firms by a margin of 7.6%. These results were highly expected and consistent with prior research in this area. However their research focused especially to finding an explanation for the value premium. They investigated future financial performance like earnings growth rates of the value and glamour stocks and compared it to the historical performance and to the performance which would have

been justified based on the valuation ratios. The main idea was that when the market value of equity is relatively high (low) compared for example to the current level of earnings the investors are expecting relatively strong (weak) earnings performance in the future. They found out that future financial performance of the glamour stocks were clearly poorer than markets were expecting according to valuation ratios. In addition the future performance of the glamour stocks were weak also when comparing it to the performance in the past. This may indicate that investors are overweighting the past information and expecting the poor or strong financial performance of the firm to continue in the future. Another explanation they suggested was that investors get too excited about the strong past performance of the value stocks and are investing in these stocks despite the high price of the stocks. In any case this indicates that investors are over pessimistic about the value stocks and over optimistic about the glamour stocks which leads to undervaluation of the value stocks and overvaluation of the glamour stocks. The consistent evidence with this explanation for value premium have presented also for example in Basu (1977). He researched existence of EP anomaly with U.S listed stocks during 1956-1971 and found out that high EP firms earned higher absolute and also higher risk-adjusted returns than low EP firms.

2.3 Prior research on usefulness of fundamental analysis

In this thesis it is investigated if it's possible to earn abnormal stock returns by utilizing book-to-market anomaly and fundamental analysis based on residual income valuation model. Like presented the evidence concerning superior return performance of high BM firms is strong. Prior research have displayed evidence about the functionality and usefulness of the valuation models and fundamental analysis as well.

Frankel and Lee (1998) investigated the usefulness of residual income model for explaining current stock prices and future stock returns with U.S. listed firms during years 1975-1993. They valuated companies based on analyst forecasts and residual income valuation model. Then they created the value-to-price (V/P) ratio by dividing valuation based price with the market price of the company. According to the results the equity values determined by their model were highly correlated with

contemporaneous stock prices. In addition they found out that the 12-month, 24-month and 36-month return differences between high and low V/P firms were 3.1%, 15.2% and 30.6% respectively. For comparison the same return differences between high and low BM firms were 4.9%, 8.2% and 15.1%. This supports the view that the use of valuation models offers incremental information about the future stock returns compared to only using simple valuation ratios at least with the longer horizon return period. The other important finding was that the analyst earnings growth forecasts seemed to be overoptimistic when the profitability of the firm had been relatively high in the past. They evidenced that after controlling this over optimism the future stock returns of the investment strategy based on V/P ratio were even higher. This supports the view that markets are over optimistic about the glamour stocks and that there may occur pricing errors in the stock markets.

Piotroski (2000) introduced another way of using financial analysis to predict future stock returns. Starting point of the Piotroski's research was the fact that in U.S markets during years 1976-1996 over 50% of the high BM firms earned negative market adjusted returns. It means that abnormal returns of high BM investment strategy is due superior returns of relatively small group of high BM firms. Piotroski investigated if it's possible to separate these so called winner stocks from losers by using fundamental analysis. He constructed aggregate measure called F-score which measures different aspects of the firms' financial condition. The model includes fundamentals like return on assets, changes in return on assets, current ratio, long-term debt and profit margin. These fundamentals are measuring for example the profitability and level of leverage of the firms. He set a limit value for each variable and when the value of the variable was over it the F-score of the firm increased by one. Then the firms with the highest (lowest) F-score were classified as a financially strong (distressed) firms. The results of the paper shows that the return differences between high and low F-score firms and between high F-score and all high BM firms were 23.5% and 7.4% respectively. First of all the results indicates that fundamental analysis is useful when predicting future stocks returns. Second it seems that the abnormal returns of high F-score strategy are not compensation for higher financial distress of the firms. This evidence doesn't support the suggestion of Fama and French (1992) which argues that BM anomaly is due higher financial distress and fundamental risk involved in value stocks.

The functionality of fundamental analysis to separate winners from losers has been investigated also among low BM firms in research of Mohanram (2005). He constructs the aggregate measure of different aspects of the firms' performance with the same kind of manner than Piotroski (2000) introduced. The aggregate measure called G-score measures among others the profitability, earnings variability and earnings conservatism of the firms. The results show that the high G-score firms outperformed low G-score firms by a margin of 18.9% during years 1978-2001 in U.S. stock markets. However because the absolute mean return of the high G-score portfolio is only 14% the strategy rather reveals the stocks which should be avoided than stocks which should be bought. In all cases these results offer further evidence for the usefulness of the fundamental analysis in predicting future stock market returns.

2.4 The F-score investment strategy introduced by Piotroski (2000)

Like mentioned in the section 2.3 Piotroski (2000) introduced the F-score method which he used to separate financially strong and distressed firms from the group of high BM firms. It was evidenced that the BM-anomaly could be enhanced by investing in financially strong firms instead of all high book-to-market firms. The investment strategy investigated in this thesis is also based on the idea of identifying firms with the superior future return performance from the group of high BM firms by using fundamental signals. Because of this the methodology used in investment strategy based on F-score will be introduced more precisely.

The starting point of F-score investment strategy is to yearly rank firms to 10 groups by BM-ratio. The second step is to separate high and low F-score firms from the group of firms with the highest BM-ratio. The F-score consist nine fundamental signals which measures the profitability, leverage, liquidity and operating efficiency of the firms. Each measure have a limit value which determines whether the signal is good or bad. If the signals is good the total F-score of the firm is increased by one and if it is bad there is no change in F-score of the firm. Thus the maximum value of the F-score is 9 and the minimum value is 0. When the F-score is 8 or 9 the firm is classified as a high F-score firm and when the F-score is 1 or 0 the firm is classified as a low F-score firm.

The profitability measures used in F-score are return on assets (ROA), cash flow from operations scaled by total assets (CFO), change in return on assets (DROA) and the size of accruals. The main idea of using these measures is to receive information about the firms' ability to generate funds internally. Piotroski (2000) suggests that if a firm can generate positive cash flows or profits it should be less financially distressed. Thus if the firm's ROA, CFO or DROA is positive the signal is interpreted to be good and it increases F-score of the firm. In addition the accrual signal is interpreted to be good if the CFO is greater than ROA.

Next three signals used in F-score consist information about the changes in the firms' capital structures. First two measures are the change in long-term debt to total assets and the change in current ratio. With these measures it is tried to capture the negative and positive signals concerning the changes in leverage and liquidity levels of the firm. If the firm's leverage decreases or liquidity increases it can be interpreted that the default risk of the company decreases as well. Thus when the long-term debt to total assets decreases or when the current ratio increases the F-score of the firm increases by one. The third signal concerning the capital structure of the firm is whether the firm has issued common equity in previous fiscal year. If there was an equity issue it can be interpreted that the firm has needed external funds to survive from its obligations. This indicates higher level of financial distress and can be seen as a negative signal. Thus if the firm haven't issued equity in the previous year the F-score increases by one and otherwise it stays unchanged.

The last two signals used to construct F-score are changes in profit margin and asset turnover. These fundamentals measures the operational efficiency of the firms and may consist information about the positive or negative changes in market conditions as well. The signals are interpreted to be positive when the profit margin or asset turnover have increased and negative otherwise. Thus positive changes leads to increase in F-score of the firm and negative changes keeps it unchanged.

3 THEORETICAL FRAMEWORK AND DEVELOPMENT OF THE SRI INVESTMENT STRATEGY

The investment strategy investigated in this thesis follows the F-score model introduced by Piotroski (2000). Similarly it tries to separate firms with the strong future return performance from the group of high BM firms. Also part of the fundamental signals used to proceed this separation measures the same aspects of the firm performance than measured with F-score. Thus part of the empirical results displayed in this research complements the evidence already presented in Piotroski (2000). However the main idea behind F-score model is to separate the financially distressed and healthy firms from the group of high BM firms. On the other hand SRI investment strategy is based on Residual income valuation model and its main components return on equity and expected return on equity. The main idea is to identify firms with relatively strong future residual incomes from the group of firms with relatively low valuation. Because of this the SRI measure have a different mix of fundamental signals than F-score although often financially healthy firms have relatively strong future residual incomes as well. In addition the strong link between the SRI and the valuation theory supports the explanation that superior future returns of the strategy are rather due undervaluation of the stocks than compensation for extra risk. Thus the SRI approaches the issue of identifying stocks with the superior future return performance from the different perspective than F-score.

Another major difference between these two strategies is that signals of F-score are simply interpreted as positive or negative. If the value of the fundamental measure is strong enough the signal is positive and otherwise negative. On the other hand most of the signals used in SRI are ranked which means that signals give more precise information about the relative strength of the signal compared to other firms. Thus the SRI is more focused to find the firms with the strongest financial performance than just separating the most distressed ones. This may lead to more optimized portfolios from the perspective of future return performance. And simultaneously it may be that less useful information is lost during the portfolio formation process. In this chapter we will have a deeper look to residual income valuation model and to its components. And especially based on these components we will first focus to identify the fundamental signals which can be used to identifying the firms with the

strong future residual incomes. And second the investment strategy will be developed by aggregating these signals to SRI measure.

3.1 Residual income equity valuation model

According to the Residual Income valuation model the value of equity is the sum of book value of equity (SE) and the discounted future residual incomes. Residual income can be expressed as a spread between the return on equity (ROE) and expected return on equity (r) multiplied by book value of equity. Thus the value of equity can be expressed as follows. (Penman 2010: 154–156, Peasnell 1982, Ohlson 1995.)

$$V_e = SE_{t-1} \sum \frac{(ROE_t - r) * SE_t}{(1+r)^t} \quad (1)$$

The equation 1 indicates that the value of equity increases (decreases) when ROE increases (decreases) and when r decreases (increases). In addition the size of the book value of equity affects to the equity value. However the influence can be either negative or positive depending on the spread of the return and expected return on equity. (Penman 2010: 156–157, Lundholm & Sloan 2007: 193, 206–209.)

Market value of equity is based on future expected profitability and risk levels. On the other hand book value of equity is determined by assets and liabilities on the balance sheet. Parts of these assets and liabilities are valued at fair values and parts at historical cost based values. In addition there are some items that are not recognized in the balance sheet but according to empirical evidence these items are considered as value generating assets on the market. For example Lev and Sougiannis (1996) presented evidence that market prices are related to the level of Research and Development expenditures which are usually not recognized in the balance sheet. Thus most of the time there is a difference between market value and book value of equity which can be also called the market premium and can be measured by book-to-market-ratio (BM-ratio). This ratio expresses the level of market expectations

related to capacity of assets to generate profits in the future. The lower (higher) the value of the ratio the higher (lower) are the market expectations for the future financial performance of the firm (Penman 2010: 42–45). When investors are trying to value the equity of the company the evaluation of the size of the market premium is the key item.

Residual Income valuation model captures the market premium with residual incomes. Investors can challenge the market expectations and market valuation of equity by analyzing and evaluating the components of residual incomes. Based on this evaluation investor can make a judgment of the value of the equity and compare it to the market valuation. This thesis researches if it is possible to identify stocks with abnormal subsequent returns based on components of residual Income valuation model. First it will be used the book-to-market-ratio for forming the group of potential undervalued stocks and after that it will be tried to pick mispriced stocks from this group. Next we will have a deeper look to the each of the components of the residual income model and we will identify appropriate financial measures which can be used as a signals when trying to form a portfolio of mispriced stocks.

3.2 Return on equity

One of the components of the Residual Income model is the return on equity which measures the profitability of the firm. It measures how much profits the company can generate on its equity. It is calculated by dividing the net income (NI) by average of book value of equity (SE) (Lundhol & Sloan 2007: 88–89.)

$$ROE_t = \frac{NI_t}{0{,}5 * (SE_t + SE_{t-1})} \quad (2)$$

However return on equity can be further disaggregated to smaller parts with Dupont-model. This disaggregation reveals more specific information about the contents of return on equity. The disaggregation is done as follows:

$$ROE_t = \frac{NI_t}{Sales_t} * \frac{Sales_t}{0{,}5 * (TA_t + TA_{t-1})} * \frac{0{,}5 * (TA_t + TA_{t-1})}{0{,}5 * (SE_t + SE_{t-1})}, \quad (3)$$

where TA is total assets.

The first term of the equation is the net profit margin and it reveals how efficiently the company is turning its sales to profits. The second term is called total asset turnover and it measures how effectively the company is using its assets to generate sales. Return on total assets ratio can be calculated by multiplying net profit margin and total asset turnover. However also the leverage of the company affects to the return on equity and the third term measures this aspect. (Lundholm & Sloan 2007: 92, Stickney, Weil, Schipper & Francis 2010: 262–263.)

The traditional Dupont-model can be developed so that it separates the operational and financial activities when analyzing return on equity (Lundholm & Sloan 2007: 94.) According to Miller and Modigliani (1958) and (1961) the capital structure of the firm don't affect the value of the company. When this proposition holds then for example distributing dividends to shareholders won't change the value of the company. This argument is based on an assumption which assumes that when the investor receives dividends the market value of the shares generating these dividends will decrease by the same amount. Thus using this kind of separation of operational and financial activities should be informative when applying Dupont-model and analyzing profitability from the valuation perspective. In addition assuming that Miller and Modigliani (1958) proposition 1 holds from now on it should be focused on operating components of the return on equity. In Dupont analysis it means focusing on return on net operating assets (RNOA) (Penman 2010: 246, Lundholm & Sloan 2007: 95–96.)

$$RNOA_t = \frac{Operating\ Income}{Average\ Net\ Operating\ Assets} \quad (4)$$

Return on net operating assets can be divided in to net operating profit margin (NOPM) and net operating asset turnover (NOAT) by using Dupont-model. This disaggregation reveals deeper information about operating profitability of the firm.

$$RNOA_t = NOPM_t * NOAT_t, \quad (5)$$

where

$$NOPM_t = \frac{Operating\ Income}{Sales_t}$$

$$NOAT_t = \frac{Sales_t}{Average\ Net\ Operating\ Assets},$$

where

$$Net\ operating\ assets = (AT - CHE - IVAO) - (AT - DLC - DLTT - CEQ - MIB)$$

Net operating profit margin and net operating asset turnover measures the same kind of efficiency aspects than profit margin and total asset turnover measures in traditional Dupont-model. The difference is that operating measures excludes non-operating activities. This kind of disaggregation of profitability measure like return on net operating assets makes it easier to identify factors which are affecting to company's profitability and valuation. For example the demand of the product of the company usually affects to the prices of the products and further to the profit margin of the company. On the other hand poor investment decisions made by management usually affects to the efficiency of the company's assets and further to the asset

turnover (Easton et. al. 2010: 3/12-13, Penman 2010: 16, Lund-holm & Sloan 2007: 100–106).

3.2.1 Identifying measures for future RNOA

According to the theoretical view presented previously the increases in profitability should increase the value of the equity. And in addition only the operating components of the profitability are value relevant. There have been also several researches made concerning usefulness of RNOA, NOAT and NOPM to forecast subsequent profitability. According to Fairfield and Yohn (2001), Soliman (2004) and Soliman (2008) only the changes in RNOA and in its components consist information about the future profitability. And In fact they found out that the current level of RNOA and its components don't consist information about the future level of profitability. However they displayed evidence that current change in RNOA is positively correlated to the change in RNOA in the subsequent period. And additionally they found that disaggregation of the change in RNOA to the change in NOAT and change in NOPM reveals incremental information about future profitability. Change in NOAT seems to be positively and significantly correlated to the change in future profitability. On the other hand the evidence concerning correlation between change in NOPM and change in future RNOA is weak. Soliman (2008) argued that the reason for different information content could be due of lower persistence of change in NOPM compared to change in NOAT. He suggested that high margins are more sensitive for the competition because they usually draw plenty of new competitors to the markets and ideas behind the margins are relatively easy to simulate. Thus high margins will mean revert faster than high turnovers. This suggestion is consistent with evidence concerning persistence of changes in NOAT and NOPM displayed by Nissim and Penman (2001). However Soliman (2004) found evidence that when industry variation is controlled also the change in NOPM and even the current levels of both of the components of RNOA consists information about future profitability. After all in this thesis industry variation has not been token account and because of this the current level of RNOA, NOAT, NOPM and the change in NOPM are not used as a signals for future profitability. Thus only the changes in RNOA and NOAT are used as a signals for changes in future profitability.

3.2.2 Two complementary measures of future profitability

There have been made several researches related to persistence of earnings and persistence of accrual and cash flow components of earnings as well. For example Dechow and Ge (2006) and Sloan (1996) found results which indicates that earnings are more (less) persistent among low (high) accrual firms. Furthermore Sloan documents that stock prices do not fully reflect the higher (lower) persistence of earnings because of the low (high) magnitude of accrual component of earnings. He ranked companies to ten portfolios by the magnitude of accrual component of earnings and found that the lowest accrual portfolio earned 4.9% size-adjusted abnormal returns in the following year of the portfolio formation. On the other hand the companies with highest accruals earned -5.5% size-adjusted returns. It seems that the magnitude of accrual component of earnings consist information about the future earnings and profitability and this information is not necessary fully incorporated in equity prices. Thus it will be used the size of the accrual component of earnings as a signal when forming portfolio of mispriced stocks.

Like mentioned earlier in this thesis the part of the market premium can be explained by assets not recognized in the balance sheet. For example under the generally accepted U.S accounting principles intangible assets such Research and Development expenditures are not reported in the balance sheet. However these kinds of assets can have a great influence to the equity value of the company (Chan et. al. 2001: 1.) According to results of Chan et. al. (2001) the companies with high past R&D expenditures related to market value earned about 6% excess returns over the following three years even after controlling the size and book-to-market effects. Also Lev and Sougiannis (1996) researched relation of stock prices and R&D expenditures. They adjusted earnings and book values of equity for the R&D expenditures and found that these adjustments are value relevant. In addition they found that this estimation of R&D capital led to the 4.57% market-adjusted subsequent stock returns. One explanation for this is that markets are mispricing shares of R&D intensive firms. Based on this evidence about value relevance of R&D expenditures it will be used a variable which measures this aspect as a signal when portfolio is constructed.

3.3 Expected return on equity

The second key component of the residual income model is the expected return on equity. It describes the return that investor demands to compensate the risk that is involved in the investment. When the risk increases the expected return should increase as well. (Easton et. al. 2010: 12/8, Lundholm & Sloan 2007: 193–194, Shapiro 1990: 59.) Risk of the investment is on the other hand related to uncertainty of future returns of the investment. The size of the risk can be evaluated by estimating the uncertainty of economic factors which affect to the profitability and financial strength of the company (Penman 2010: 667, Lundholm & Sloan 2007: 194.) On the other hand risk can be evaluated based on the past risk free interest rate adjusted stock market returns and volatility of the individual stock returns related to volatility of market returns. This market determined risk is usually measured by capital asset pricing-model (Shapiro 1990: 59, 121-122.) However in this thesis it will be tried to identify fundamentals that are related to uncertainty of profitability and financial strength. In addition it will be used these fundamentals as signals of risk when trying to form a portfolio of mispriced stocks.

Earnings are the key component of profitability of the company. Thus when the uncertainty in the future profitability can be seen as a risk measure should uncertainty related to earnings be an appropriate proxy for risk. According to Beaver et. al. (1970) standard deviation of earnings can be used measuring riskiness of the company. They ranked stocks to the portfolios based on market determined risk and accounting risk measures. They found high correlation with these two ranking methods and the correlation was the highest between the earnings variability and market risk. Based on this information earnings variability should be an appropriate measure for expected return on equity as well. Therefore it will be used the standard deviation of net income as a one signal of expected return on equity when portfolio is formed.

One risk factor concerning future returns which companies are generating to the shareholders is the risk of default and bankruptcy. For example Beaver (1966), Altman (1968) and Altman (2000) have investigated which financial ratios are related to default and bankruptcy risk. The empirical results of these studies indicate

that potential and the most significant indicators of predicting bankruptcy are profitability, liquidity and solvency ratios. In the paper of Altman (2000) he chose seven factors to construct a model for predicting bankruptcies. The measure of liquidity was the current ratio (current assets/current liabilities) because it was slightly more informative indicator of predicting bankruptcy than other liquidity indicators. Model included also common equity to total capital ratio which measures solvency. According to empirical results of the research the model consist information about the risk of the future bankruptcy. The evidence of these researches shows that there is a little variation concerning which single ratios are the best default risk measures. However there is also clear evidence that the levels of liquidity and solvency affects to the risk and to the expected return on equity. Thus it will be chosen current ratio and equity to total asset ratio as a measures of default and bankruptcy risk and signals for expected return on equity.

3.4 SRI investment strategy

The portfolio formation process starts by choosing a group of stocks which have a high potential to be undervalued. Like mentioned earlier I will use BM-ratio to proceed this step. The same kind of an approach introduced by Piotroski (2000) is used in this thesis as well. All shares are ranked yearly to ten groups based on the size of the BM-ratio. BM-ratio is calculated by dividing the book value of equity (Item #60) by the market value of the company (item#25 x item#199). Then the 10% of the stocks with the highest BM-ratio will be included to the portfolio. There is a lot of empirical evidence about subsequent abnormal stock returns of high BM firms but there are two competing explanation for this. Fama and French (1992) argued that the superior subsequent returns of high BM firms is compensation for higher risk which is consistent with the efficient market hypothesis. On the other hand Lakonishok et. al. (1994) suggested that the valuation of the high BM firms is too pessimistic because of the bad financial performance in the past. Also Piotroski (2000) presented that BM anomaly can be strengthened by choosing financially healthier and thus less risky firms from the group of high BM firms. This evidence supports the view that there can be found mispriced stocks and that the markets are not working efficiently all the time. The explanation for abnormal subsequent returns will be discussed more in this thesis later.

The second step of the portfolio formation process is to identify the stocks that are undervalued. At the beginning it is already known that the group from where the stocks are picked presents the stocks with a low market premium (i.e. high BM-ratio). Thus the stocks with the strongest future residual incomes should be chosen to the final portfolio. It will be used the fundamental signals related to the return on equity and to the expected return on equity identified earlier in this thesis to proceed the second step of the portfolio formation. The aggregate measure of the strength of the future residual incomes (SRI) will be constructed and the highest SRI companies will be chosen to the final portfolio.

3.4.1 Fundamental signals measuring profitability

First two fundamentals measuring profitability are the change in return on net operating assets (DRNOA) and the change in net operating asset turnover (DNOAT). These ratios are calculated as presented in section 3.2. The change is the percentage change in value during the prior year.

$$Change = (Xt - X_{t-1})/X_{t-1} \quad (6)$$

The stocks are ranked yearly to four groups by size of DRNOA and DNOAT. It will be created rank variables SRI_DRNOA and SRI_DNOAT to measure the strength of the signal. Rank variable gets value of 3 if the company is ranked to the extreme high and value of 0 if the company is ranked to the extreme low portfolio. For example if the value of the variable DRNOA is higher than 75% of the values of this variable the rank variable SRI_DRNOA gets the value of 3 and so on. Thus the higher the values of the DRNOA and DNOAT are the higher is the probability that the stock will be chosen to the final portfolio of undervalued stocks. Based on the theory and empirical evidence presented earlier in this thesis the DNOAT and DRNOA should have a positive correlation with the strength of future residual incomes.

The third measure of future profitability is the size of the accrual and cash flow components of earnings. Like presented earlier there is a negative relation between

the size of the accrual component of the earnings and persistence of earnings. In addition the subsequent stock returns are higher among low accrual firms than among high accrual firms. I will use the same measure for the size of accruals (ACCRUAL) than used in Sloan (1996). And I will calculate the cash flow from operations (CFO) by reducing accruals from the operating income (Item#178) and scaling this by average total assets (Item#6).

$$CFO = \frac{Operating\ income - Accrual}{Average\ of\ total\ assets}, \tag{7}$$

where

$$ACCRUAL = ((Change\ in\ current\ assets - Change\ in\ cash) - (change\ in\ current\ liabilities - change\ in\ debt\ in\ current\ liabilities - change\ in\ tax\ payable)) - Depreciation$$

The variable CFO is ranked yearly to the four groups like DRNOA and DNOAT. In the same manner than earlier if the company is ranked to the extreme high portfolio the rank variable SRI_CFO receives the value of 3 and if it is ranked to the extreme low portfolio the value of rank variable equals 0. Thus the higher the cash flow component of earnings the higher is the probability that the stock will be in the final portfolio.

The fourth and the last indicator of future profitability is the R&D expenditures. Like presented earlier in this thesis prior research like Chan et. al. (2001) and Lev and Sougiannis (1996) have displayed some evidence of value relevance of R&D expenditures. Additionally there has been documented positive relation of the size of R&D expenditures and subsequent stock returns. In this thesis it will be used variable SRI_RD to capture R&D effect. Also in this case firms will be ranked yearly to the

four groups by the size of the prior year R&D expenditures. SRI_RD variable equals 3 if the company did have extremely high R&D expenditures and 0 if R&D expenditures were extremely low. Thus the higher the R&D expenditures are higher is the probability that the company will be chosen to the final portfolio.

3.4.2 Fundamental signals measuring the expected return on equity

Expected return on equity measures the risk related to investment. Like mentioned earlier in this thesis variability of earnings can be used as a proxy for risk. It will be used the standard deviation of current and prior year's net incomes as a measure of earnings variability and risk. Standard deviation of two prior years' net income will be ranked yearly to four groups and the rank variable SRI_STDNI will get values from 0 to 3 in the same manner than rank measures mentioned earlier. However when the rank variables related to profitability will increase the aggregate measure of SRI the SRI_STDNI will decrease the SRI. Thus the higher is the variability in earnings the lower is the probability that the company will be included to the final portfolio. This should lead to the situation where companies with lower risk and lower expected return on equity relative to other companies will be chosen to the final portfolio.

Two last fundamental signals used to form portfolio of undervalued stocks are current ratio (CURRAT) and book value of equity to total assets ratio (LEVER). Unlike with the other variables used to construct the aggregate measure of SRI the variables CURRAT and LEVER are not ranked. Because these variables measures the bankruptcy and default risk it is more relevant to use the limit value that separates the companies with extremely high bankruptcy risk from the group of financially healthier companies. CURRAT is calculated by dividing current assets (item#4) by current liabilities (item#5). It will be used the dummy variable SRI_CURRAT for signaling the level of liquidity of the firm. If CURRAT is higher than 0.5 then SRI_CURRAT equals 1 and otherwise 0.In the same manner it will be used dummy variable SRI_LEVER for signaling the level of leverage. If the LEVER is higher than 0.25 the variable SRI_LEVER equals 1 and otherwise 0. Thus when the company's liquidity and solvency ratios are stronger than limit values the company have higher probability to be included in the final portfolio.

Finally the aggregated measure of strength of future residual incomes can be calculated based on SRI rank and dummy variables. SRI measure is calculated as follows:

$$SRI = SRI_{DRNOA} + SRI_{DNOAT} + SRI_{CFO} + SRI_{RD} - SRI_{STDNI} + SRI_{LEVER} + SRI_{CURRAT} \quad (8)$$

The final step of the portfolio formation is to choose the strongest SRI companies from the group of high BM firms. The companies will be ranked yearly to the 5 groups by value of the SRI and the companies included to the extreme high SRI group will be chosen to the final portfolio.

4 RESEARCH HYPOTHESIS, DATA AND METHODOLOGY

4.1 Research hypothesis

The purpose of this thesis is to investigate if it is possible to recognize undervalued stocks from U.S markets by developing a screening strategy based on valuation theory and residual income valuation model. The screening is done in two steps. First identifying stocks with a relatively low valuation with BM-ratio. And second using fundamental analysis to pick financially strong firms from this group of potentially mispriced stocks.

Based on prior research there is a strong evidence that companies with relatively high BM-ratio will earn positive market-adjusted returns in the future. For example Fama and French (1992), Lakonishok et. al. (1994) and Rosenberg et. al. (1985) have found evidence of superior performance of high BM firms. Thus the first hypothesis tested in this thesis is that stocks with the relatively high BM-ratios will earn positive market adjusted returns during sample period.

H1: The difference of one year subsequent mean returns of high BM portfolio and market portfolio is greater than zero.

The next two hypothesis will concentrate to testing the functionality of fundamental screening strategy based on the strength of future residual earnings (SRI) in the group of high BM firms. First it will be tested if the companies with the extreme high SRI will outperform the companies with the extreme low SRI. Second it will be tested if the high SRI companies will outperform the companies with high BM-ratio.

H2: The difference of one year subsequent mean returns of high SRI portfolio and mean return of high BM portfolio is greater than zero.

H3: The difference of one year subsequent mean returns of high SRI portfolio and mean return of low SRI portfolio is greater than zero.

Prior research has documented that there is relation between the total market value of the firm and stock returns. For example in Banz (1981) was founded that smaller firms earned higher risk-adjusted returns on average than large firms. On the other hand Wang (2000) argues that the size effect is at least partly caused by survival bias. The idea behind survival bias is that the future returns can be calculated only for the firms which are not delisted during the calculation period. When poorly performing firms are more likely to be delisted than strong performing firms the mean returns may become biased. He presents several reasons for delisting including bankruptcies, failure to meet the requirements set by the stock exchange, mergers and acquisitions. In addition he displays that smaller companies are more likely to delist because of two reasons. First low market value may reflect the poor financial performance of the firm which can lead to bankruptcy. And second when the market value is extremely low the stock exchange can stop trading of the stock or delist it. He also found out that the market value of delisted companies were clearly smaller than firms that stayed listed. Because of the relation of small market value of the company and abnormal returns and because of this returns can be compensation for extra risk it will be tested whether the results of high SRI portfolios are driven by size effect. The high BM firms will be ranked to three groups based on the market values of the companies and it will be tested if the high SRI companies will outperform the low SRI companies in these three groups.

H4: The difference of one year subsequent mean market-adjusted buy and hold returns of large-sized high SRI portfolio and mean return of large-sized low SRI portfolio is greater than zero.

H5: The difference of one year subsequent mean market-adjusted buy and hold returns of medium-sized high SRI portfolio and mean return of medium-sized low SRI portfolio is greater than zero.

H6: The difference of one year subsequent mean market-adjusted buy and hold returns of small-sized high SRI portfolio and mean return of small-sized low SRI portfolio is greater than zero.

4.2 Data and Methodology

The data used in this thesis is from the CRSP/COMPUSTAT merged database. Data contains CRSP monthly price and return information and Compustat yearly fundamental data from year 1970 to year 2010. The data contains stocks listed in United States in NYSE, Amex and NASDAQ exchanges. The final sample includes all the firm year observations with sufficient price, return and fundamental information. When calculating some of the ratios there is needed the prior or even two prior years' observations for the calculation. Because of this all of the firms' first and second years' observations are excluded from the final sample. Also if there is some of the fundamental variable values missing the observation is excluded from the final sample. One problem can also arise when the value of the fundamental which operates as a denominator of some of the ratios equals zero. In these situations the observation will be excluded from the final sample as well. The final sample of all firms with sufficient financial statement and price data consist of 58 026 firm year observations. And finally the sample of high BM firms consist 5790 firm year observation.

The portfolios are formed at the beginning of the fifth month after the fiscal year-end of the firms and rebalancing of the portfolios are executed yearly basis. The calculation of the book-to-market ratios, market values of the firms and fundamentals are done by using the fiscal year-end financial statement data. The returns are calculated one subsequent year annual buy and hold returns starting at the beginning of the fifth month after the fiscal year-end. The returns of the each firm have the same weight when portfolio returns are calculated. The calculations are done in the same way than for example in Piotroski (2000). By postponing the return calculation period for four months it is tried to avoid the look-ahead bias. Return period starting four months after the fiscal year-end ensures that most of the financial statement information is already publicly available when portfolios are formed.

The main purpose of this thesis is to investigate the performance of the portfolios formed based on the relatively low valuation and on the strength of the future residual incomes. First all of the stocks included in the final sample are ranked yearly to ten portfolios by size of the BM-ratio. Then the portfolio with the highest BM

ratios is ranked to the five portfolios by the size of the SRI. The hypothesis H1, H2 and H3 are tested based on these portfolios. First the differences between mean returns of the portfolios are calculated. Second the significance of these differences are tested with the one sample t-test. When interpreting the statistical significance of the results at least the confidence level of 0.05 is demanded for results to be statistically significant.

The hypothesis H4, H5 and H6 concentrates testing if the results given by prior hypothesis are driven by size effect. The methodology used to test these hypotheses follow the same practice that Piotroski (2000) used to test this same issue. The portfolio with the highest BM-ratio is first ranked to the three groups based on the size of the market value of the companies. After that each of these three portfolios are ranked to five portfolios based on the SRI. Then it will be calculated the difference in market-adjusted mean portfolio returns between high and low SRI portfolios differently among companies with large, medium and small market values. And finally the significances of the differences in mean returns are tested with one sample t-test using at least the confidence level of 0.05.

5 EMPIRICAL RESULTS

5.1 Descriptive statistics and correlations

Table 1 displays the financial characteristics of the firms including size, BM-ratio and variables used to form SRI portfolios. Panel A consist information about the whole sample firms and panel B about the high BM firms. In addition Panel C presents the financial characteristics of the companies included in the highest SRI portfolio. There are 58 026 observations in the whole sample, 5 790 observations in high BM firm sample and 1129 observations in high SRI firm sample. As shown in panel A, B and C the average market value of the whole sample firms is 1210.5 million dollars when it is 100.44 million dollars and 36.65 million dollars among the groups of the high BM firms and high SRI firms respectively. The average BM-ratio of the all observations is 0.73 and naturally lower than average BM-ratio of 2.44 among the high BM firms. The mean BM-ratio of high BM and high SRI firms is almost the same.

When comparing the means of financial ratios between the all firms and high BM firms the differences are relatively small. In addition for example average of DRNOA is noticeably higher in group of high BM firms than among all of the sample firms. This is inconsistent with for example the results of Stickel (2007) where he displayed evidence that low BM firms tend to have poorer financial performance than high BM firms. However the mean values of financial ratios can be misleading for example due lack of proportionality between the numerator and deflator. For example in paper of Sudarsanam and Taffler (1995) it have been suggested that the median value would be better measure of central tendency in ratio analysis. The median values of DRNOA of the whole sample and the high BM firms are -0.096 and -0.302 respectively. This result is consistent with the prior research and indicates poorer performance of operating profitability for the high BM firms. The median change in operating asset turnover is almost the same for both groups. This indicates that the change in profit margin is the reason for weaker median change in return on net operating assets in the high BM portfolio.

One interesting observation is that the mean standard deviation of net income is lower in high BM portfolio. The mean (median) value of all firms is 32.47 (2.96) and of the high BM firms 18.34 (2.06). Like mentioned earlier the variability in earnings is used as a proxy for risk. This supports the paper of Lakonishok et. al. (1994) where it was argued that BM anomaly is rather due of mispricing of the stocks than compensation for extra risk.

If we further compare financial characteristics of the high SRI companies with high BM companies and all of the sample companies we notice that the median DRNOA and DNOAT is clearly higher in high SRI group than it is in the groups of all firms or high BM firms. It can be also observed that mean CFO is higher in group of high SRI firms than in other groups. On the other hand earnings variability is even smaller in high SRI group than it is in high BM group. Interesting observation is that when the financial performance measures are stronger than in other groups the average BM-ratio is just slightly lower than in high BM firms and clearly higher than in group of all firms. This may indicate that high SRI companies have relatively strength future residual incomes with relatively low valuation.

Table 1: Descriptive statistics of all sample firms, high BM firms and high SRI firms during years 1970-2010.

Panel A: All sample firms (58 026 firm year observations)

Variable	Mean	Median	Std Dev
DRNOA	-0.099	-0.096	56.064
DNOAT	0.478	-0.008	88.680
CFO	0.048	0.100	0.263
RD	0.073	0.030	0.485
STDNI	32.475	2.961	459.232
CURRAT	3.502	2.409	9.978
LEVER	0.535	0.557	0.315
BM	0.730	0.546	5.924
MV	1201.50	71.889	9829.530

Panel B: High BM firms (5 790 firm year observations)

Variable	Mean	Median	Std Dev
DRNOA	0.225	-0.302	31.389
DNOAT	0.222	-0.009	11.563
CFO	0.044	0.062	0.135
RD	0.130	0.042	0.276
STDNI	18.342	2.065	87.146
CURRAT	3.852	2.360	16.822
LEVER	0.552	0.537	0.202
BM	2.436	1.906	4.378
MV	100.440	13.775	429.269

Panel C: High SRI firms (1 129 firm year observations)

Variable	Mean	Median	Std Dev
DRNOA	5.580	0.386	58.609
DNOAT	1.236	0.098	25.458
CFO	0.095	0.109	0.139
RD	0.188	0.116	0.267
STDNI	4.496	0.896	19.592
CURRAT	4.843	2.543	33.496
LEVER	0.590	0.586	0.187
BM	2.231	1.837	1.735
MV	36.651	8.519	148.411

Table 2 panel A presents the Spearman correlations for variables used to construct the aggregate measure of strength of future residual income, aggregate measure of SRI and one year subsequent buy and hold returns for high BM firms. The levels of significances of correlations are presented in the table as well. The correlation

between SRI and one year buy and hold return is 0.078 and significantly positive with the confidence level of 0.01. Based on theory presented earlier in this thesis these results are consistent with expectations. However the variable CFO has the strongest positive correlation with one year buy and hold return which is 0.082 and also statistically significant with confidence level of 0.01. Also the DRNOA have a positive statistically significant correlation with one year return which is 0.047. Interestingly the correlation between DNOAT and returns is 0.066 which is even higher than between DRNOA and returns. Nevertheless these results raises the concern that could fundamental screening strategy including only CFO or DNOAT lead to better returns than strategy based on SRI. This issue will be further investigated and discussed when the results of SRI strategy are gone through.

As expected the correlation between variability in earnings and returns among high BM firms is negative and statistically significant with confidence level of 0.01. If we consider STDNI as a proxy for risk this result indicates that when risk decreases the stock returns increases which is inconsistent with the efficient market hypothesis. On the other hand the same correlation among all the sample firms presented in panel B is almost equal to zero and statistically insignificant. When comparing other correlation values between panels A and B the other difference appears for current ratio and leverage. These ratios are statistically insignificant in the group of the high BM firms but significant with the confidence level of 0.01 among all sample firms. In the group of all sample firms the correlation between current ratio and future returns is negative which is consistent with the efficient market hypothesis if current ratio is considered as a bankruptcy risk measure like for example in research of Altman (2000).

Table 2: Spearman correlation analysis between 1 year subsequent buy and hold returns, fundamental variables and SRI during years 1970-2010.

Panel A: High BM firms (5790 firm year observations)

Variables	DRNOA	DNOAT	CFO	RD	STDNI	CURRAT	LEVER	SRI
Return	0.047	0.066	0.082	0.060	-0.052	0.006	-0.004	0.079
	0.0003	<.0001	<.0001	<.0001	<.0001	0.636	0.769	<.0001
DRNOA	1.000	0.210	0.072	-0.008	-0.047	-0.007	-0.025	0.530
		<.0001	<.0001	0.547	0.000	0.575	0.060	<.0001
DNOAT		1.000	0.166	-0.044	-0.015	-0.063	-0.082	0.491
			<.0001	0.000	0.258	<.0001	<.0001	<.0001
CFO			1.000	-0.174	-0.077	-0.156	-0.186	0.305
				<.0001	<.0001	<.0001	<.0001	<.0001
RD				1.000	0.084	0.231	0.191	0.378
					<.0001	<.0001	<.0001	<.0001
STDNI					1.000	-0.111	-0.127	-0.324
						<.0001	<.0001	<.0001
CURRAT						1.000	0.638	0.135
							<.0001	<.0001
LEVER							1.000	0.172
								<.0001
SRI								1.000

Panel B: All sample firms (58 026 firm year observations)

Variables	DRNOA	DNOAT	CFO	RD	STDNI	CURRAT	LEVER	SRI
Return	0.053	0.052	0.143	0.041	-0.000	-0.023	-0.021	0.099
	<.0001	<.0001	<.0001	<.0001	0.978	<.0001	<.0001	<.0001
DRNOA	1.000	0.371	0.191	-0.082	0.009	-0.015	-0.016	0.347
		<.0001	<.0001	<.0001	0.022	0.000	<.0001	<.0001
DNOAT		1.000	0.139	-0.010	0.011	-0.064	-0.076	0.697
			<.0001	0.014	0.004	<.0001	<.0001	<.0001
CFO			1.000	-0.276	0.069	-0.122	-0.008	0.709
				<.0001	<.0001	<.0001	0.065	<.0001
RD				1.000	0.035	0.156	0.051	-0.180
					<.0001	<.0001	<.0001	<.0001
STDNI					1.000	-0.132	-0.121	0.113
						<.0001	<.0001	<.0001
CURRAT						1.000	0.704	-0.115
							<.0001	<.0001
LEVER							1.000	-0.029
								<.0001
SRI								1.000

5.2 Returns of different portfolios

Table three presents the mean and median one year subsequent raw and market adjusted buy and hold returns for portfolios including all the sample firms and high BM firms. The sample period is from year 1970 to year 2010. The mean return of all sample firms during the sample period was 17.5%. The mean returns of the high BM firms was 29.26%. Like expected the firms with the highest BM-ratios outperforms the all sample firms generating 11.76% positive market adjusted returns on average. The t-value (p-value) of 8.75 (<0.0001) indicates that the difference between mean returns of high BM firms and mean return of all sample firms is statistically significant with the confidence level of 0.01. Based on this evidence the first hypothesis H1 holds and the results are consistent with prior research concerning

superior performance of high BM firms compared to performance of the market portfolio. (e.g. Fama & French 1992, Lakonishok et. al. 1994, Rosenberg et. al. 1985.)

Table 3: One year subsequent raw and market-adjusted mean buy and hold returns for all sample firms and high BM firms during years 1970-2010.

All sample firms			
Returns	Mean	Median	N
Raw	0.175	0.026	58026
High BM firms			
Returns	Mean	Median	N
Raw	0.293	0.067	5790
Market adjusted	0.118	-0.108	5790
High BM-All	0.118		
t-statistics	8.748		
p-Value	<0.0001		

In table 4 the panel A presents the average raw and market adjusted buy and hold returns for high BM firms and for portfolios with different strength of future residual income (SRI). The SRI-Group 0 presents the high BM firms with the lowest SRI and the group 4 presents the firms with the highest SRI. There is 1129-1226 firm year observation in each SRI-group and there is 5 790 firm year observations included in the whole high BM portfolio.

During the sample period the high BM firms earned raw mean return of 29.26% and market adjusted mean return of 11.76%. On the other hand the highest SRI-group earned mean raw (market-adjusted) buy and hold return of 40.8% (23.3%) during the sample period. The high SRI portfolio outperforms the all high BM firms by the margin of 11.54%-points. The t-statistics (t-value 3.54, p-value 0.0004) shows that the difference is statistically significant with confidence level of 0.01. The mean return difference between high and low SRI portfolios is 18.85% which is also statistically significant (t-value 5.78, p-value <0.0001) with confidence level of 0.01. Based on these results it can be interpreted that the hypothesis H2 and H3 holds.

One of the most impressive result is the difference of 11.54 %-points between mean returns of high BM portfolio and high SRI portfolio which is remarkably high even if it's compared to prior researches. For example Piotroski (2000) investigated if it's possible to earn higher returns by separating financially strong firms from the group of high BM firms with F_SCORE. It measures the profitability, leverage, liquidity and operating efficiency of the firms. The mean return difference between high BM portfolio and high F_SCORE portfolio was 7.5%-points. Piotroski mentioned that using binary measures to translate fundamentals to signals of financial strength can lead to situation where part of the useful information is lost. The results presented in table 4 supports the point of view that using ranked signals can improve the information content. However it should be highlighted that evidence presented in this thesis and Piotroski (2000) are not fully comparable because the financial performance measures used in these two researches are not identical although they measure the same aspects. In addition the time frame used in these researches is different and this can have an influence to the results as well.

If the stock markets are operating efficiently the positive market-adjusted return of high SRI portfolios should be compensation for extra risk included in high SRI stocks. However the high SRI firms have relatively high current and equity to total asset ratios and relatively low variability in earnings. According to Beaver et. al. (1970), Beaver (1966), Altman (1968) and Altman (2000) these measures can be seen as a proxy for risk. Thus at least measured by these three risk measures the high SRI firms should consist less risk than low SRI companies. Also like argued in Piotroski (2000) the positive signals in cash flows and profitability may decrease the level of risk of the company as well. This evidence and arguments supports the indication that positive mean market-adjusted returns of high SRI companies are rather due of mispricing than compensation for extra risk.

Earlier in this thesis the correlations between one year subsequent returns and individual financial measures were presented. These correlations raised a concern that screening strategy based on only the magnitude of cash flow or the change in net operating asset turnover may perform better than strategy based on SRI. In table 4 panel B and panel C presents the mean market-adjusted returns for two alternative screening strategies. In panel B the high BM companies are ranked to five groups

based on magnitude of the cash flow component of earnings (CFO). In panel C the firms are similarly ranked by size of the change in net operating asset turnover (DNOAT). The high CFO firms and high DNOAT firms have respectively 5.53%-points and 6.89%-points higher mean market-adjusted buy and hold returns than high BM portfolio. These differences are statistically significant with t-values (p-values) of 1.99 (0.0467) and 2.16 (0.0310). However it should be noticed that the results are significant only with the confidence level of 0.05. Furthermore it can be seen that the highest mean returns of the CFO-groups and DNOAT-groups are observed in group 0 and group 2 respectively. This indicates that firms with the highest CFO or DNOAT are not generating the highest returns. In addition the difference between the high and the low portfolios is positive only when firms are ranked by DNOAT and either one of these differences are not statistically significant. Based on this evidence it can be concluded that either of these screening strategies doesn't outperform the strategy based on the aggregated measure of fundamental signals.

Table 4: One year subsequent mean buy and hold returns from investment strategies based on SRI, CFO and DNOAT among high BM firms during years 1970-2010.

Panel A: Returns from SRI investment strategy

Raw returns			
	Mean	Median	N
All high BM firms	0.293	0.067	5790
SRI-Group			
0	0.218	3.600E-9	1128
1	0.251	0.051	1139
2	0.326	0.063	1226
3	0.257	0.062	1168
4	0.408	0.143	1129
High-All	0.115		
t-statistics	3.54		
p-Value	0.0004		
High SRI-Low SRI	0.189		
t-statistics	5.78		
p-Value	<0.0001		
Market-adjusted returns			
	Mean	Median	N
All high BM firms	0.118	-0.108	5790
SRI-Group			
0	0.045	-0.175	1128
1	0.076	-0.124	1139
2	0.151	-0.112	1226
3	0.082	-0.113	1168
4	0.233	-0.032	1129
High-All	0.115		
t-statistics	3.54		
p-Value	0.0004		
High SRI-Low SRI	0.189		
t-statistics	5.78		
p-Value	<0.0001		

Panel B: Returns from CFO investment strategy

Market-adjusted returns			
	Mean	Median	N
All high BM firms	0.118	-0.108	5790
CFO-Group			
0	0.223	-0.159	1114
1	0.025	-0.151	1149
2	0.160	-0.094	1350
3	0.016	-0.111	1202
4	0.173	-0.025	975
High-All	0.055		
t-statistics	1.99		
p-Value	0.047		
High CFO-Low CFO	-0.050		
t-statistics	-1.81		
p-Value	0.071		

Panel C: Returns from DNOAT investment strategy

Market-adjusted returns			
	Mean	Median	N
All high BM firms	0.118	-0.108	5790
DNOAT-Group			
0	0.139	-0.142	1227
1	0.014	-0.154	1371
2	0.308	0.116	510
3	0.074	-0.112	1470
4	0.187	-0.089	1212
High-All	0.069		
t-statistics	2.16		
p-Value	0.031		
High DNOAT-Low DNOAT	0.048		
t-statistics	1.5		
p-Value	0.133		

5.3 The size-effect in portfolio returns

Earlier in this thesis it has been brought up the concern that the abnormal returns of high SRI portfolio can be due of small firm effect. In table 5 the panels A, B and C presents the market adjusted buy and hold return for different SRI-groups in different size categories. High BM firms are divided to three groups based on the market value of the companies at the fiscal year-end. Panel A contains small-sized firms (1918 firm year observations), panel B medium-sized firms (1948 firm year observations) and panel C large-sized firms (1924 firm year observations).

Table 5 displays that the highest mean market-adjusted buy and hold returns are concentrated in the group of small high BM firms. On the other hand large high BM firms have earned clearly lower mean returns than medium or small-sized firms during the sample period. The mean returns of small, medium and large high BM firms during the sample period was 20.02%, 10.57% and 4.73% respectively. However if we have a deeper look to the panel A it can be noticed that high returns are not clearly concentrated to the group of high SRI stocks. The difference of mean returns between high SRI firms and all small high BM firms is 7.72%-points. Furthermore the difference between the high and low SRI companies is only 0.72%-points. In addition neither of these differences are statistically significant. Based on this evidence it can be concluded that H4 doesn't hold. In addition it seems that small high BM firms have relatively high mean returns but superior performance of high SRI companies is not driven by small firms.

Panel B displays the return performance of medium-sized SRI portfolios. The difference between mean buy and hold returns between high SRI companies and all medium-sized high BM firms is 8.72%-points which is higher than in group of small firms. However the t-value (p-value) of 1.8 (0.073) indicates that the difference is statistically significant only with the confidence level of 0.1. On the other hand the mean return difference between the high and low SRI portfolios is 18.3%-points which is statistically significant (t-value 3.77, p-value 0.0002) with the confidence level of 0.01. Based on this it can be concluded that H5 holds.

Panel C presents the results of the return performance for large companies. The difference of mean returns between high SRI firms and high BM firms among large-sized firms is 7.54%-points. However the t-value (p-value) of 1.43 (0.153) indicates that the difference is not statistically significant. On the other hand the mean return of high SRI portfolio is statistically significantly higher than mean return of low SRI portfolio with the confidence level of 0.05 (t-value 2.20, p-value 0.028). The return difference is 11.62%-points and thus it can be concluded that H6 holds.

When comparing the return performance of SRI portfolios between small, medium and large sized firms it can be seen that unexpectedly the benefits of the fundamental screening are the weakest in the group of small companies. For example in Piotroski (2000) the results indicates that fundamental screening is the most useful among small companies. Screening strategy based on level of SRI seems to be the most useful in the group of medium-sized firms. Results indicates also that SRI screening is useful among large-sized firms when identifying firms with relatively strong future return performance. Although differences of mean returns between high SRI companies and all high BM firms are not statistically significant among any of the individual size groups the results indicates that superior return performance of high SRI companies presented in table 4 is not driven by small firm effect.

Table 5: Market-adjusted returns from SRI investment strategy in groups of small-, medium- and large-sized high BM firms during years 1970-2010.

Panel A: Small firms

	Mean	Median	N
All Firms	0.200	-0.104	1918
SRI-Group			
0	0.270	-0.175	378
1	0.111	-0.171	347
2	0.099	-0.133	402
3	0.243	-0.093	451
4	0.277	0.031	340
High-All	0.077		
t-statistics	1.399		
p-Value	0.163		
High SRI-Low SRI	0.007		
t-statistics	0.131		
p-Value	0.896		

Panel B: Medium firms

	Mean	Median	N
All Firms	0.106	-0.118	1948
SRI-Group			
0	0.010	-0.210	364
1	0.082	-0.114	445
2	0.192	-0.120	365
3	0.057	-0.106	394
4	0.193	-0.048	380
High-All	0.087		
t-statistics	1.796		
p-Value	0.073		
High SRI-Low SRI	0.183		
t-statistics	3.768		
p-Value	0.0002		

Panel C: Large firms

	Mean	Median	N
All Firms	0.047	-0.105	1924
SRI-Group			
0	0.007	-0.171	357
1	-0.033	-0.139	382
2	0.058	-0.076	390
3	0.077	-0.075	413
4	0.123	-0.094	382
High-All	0.075		
t-statistics	1.432		
p-Value	0.153		
High SRI-Low SRI	0.116		
t-statistics	2.205		
p-Value	0.028		

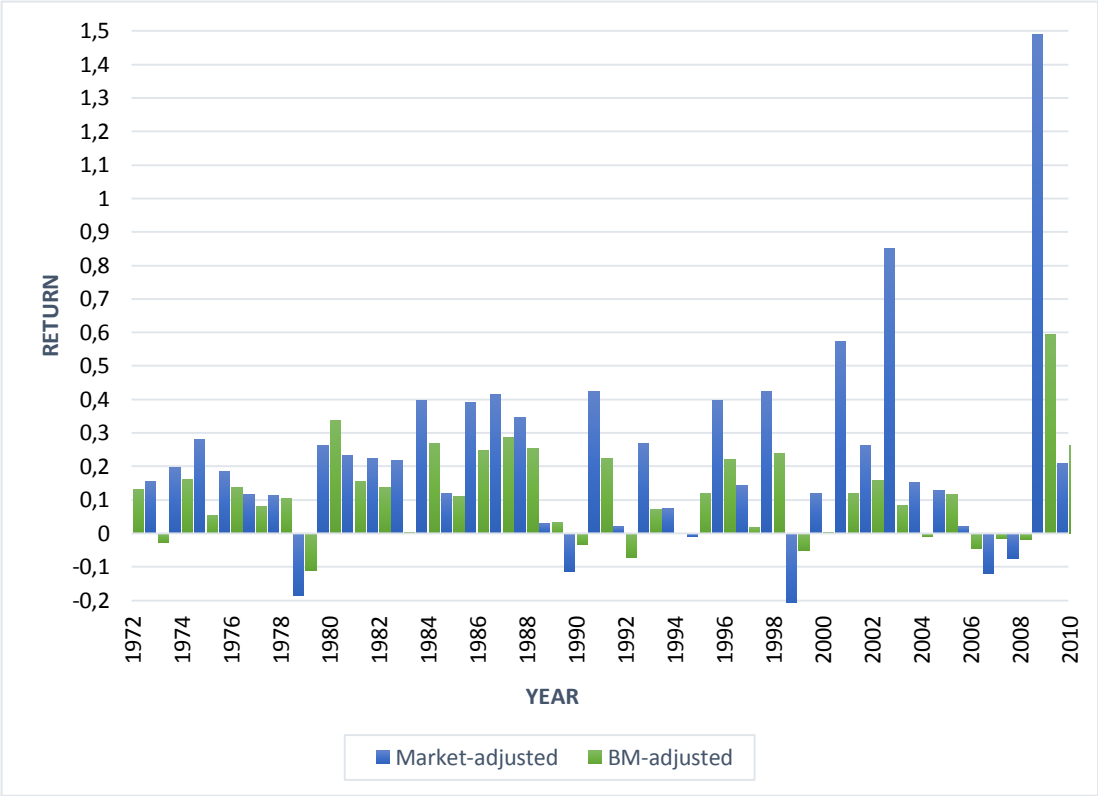
5.4 Robustness of the performance over time

Figure 1 presents the one year subsequent yearly mean market adjusted buy and hold returns for the high SRI portfolio over the sample period from year 1972 to year 2010. In addition figure presents yearly mean return differences between high SRI and high BM portfolios. During the whole sample period the high SRI portfolio outperforms the portfolios consisting all sample firms and high BM firms on average by a margin of 23.3%-points and 11.55%-points respectively. The figure shows that the SRI investment strategy is quite robust over time as well when it is outperforming other portfolios in most of the years during the sample period. The SRI portfolio earned negative market adjusted returns only in six years out of 39 years. In addition it outperformed high BM investment strategy in 31 years out of 39 years. The lowest market-market adjusted return was -23.3% in year 1999 and the smallest negative market adjusted return was only -1% in year 1995. On the other

hand the highest market-adjusted return was 149% and it occurred in year 2009. In addition most of the positive market-adjusted returns were clearly over 10%.

It can be noticed from the figure also that when SRI portfolio have earned negative market-adjusted returns the high BM portfolio's market-adjusted returns have been most of the time negative as well. However the negative market-adjusted returns of high SRI portfolio has been more extreme than negative returns of high BM portfolio. This result can be interpreted that there might be riskier stocks included in the high SRI portfolio than in in the high BM portfolio. On the other hand the high SRI strategy is outperforming high BM strategy almost 80 % of the time which challenges the risk explanation for superior returns of the SRI strategy. Furthermore it can be seen that the two largest positive market adjusted returns are observed in years 2003 and 2009 right after the two major stock market crashes (Dot Com bust and Sub-prime mortgage crash). Kim et. al. (2011) presented evidence that during the stock market crashes the returns of the stock markets are highly unpredictable. In addition for example Daniel et. al. (1998) argued that unpredictability is due investors' overreactions to news which is one reason for mispricing of the stocks. According to this information the large positive market-adjusted returns right after stock market crashes may indicate that high SRI strategy is benefitting of this kind of mispricing in stock markets. On the other hand two of the negative market-adjusted return years have occurred in years 1999 and 2007 during the Dot Com and US housing bubbles. One explanation for this could be that the SRI strategy is concentrating stocks with a relatively low valuation and low future expectations. In turn the investors are usually overoptimistic about the future growth expectations during the bubbles and are preferring the so called glamour stocks with the relatively high valuation and high future expectations.

Figure 1: Yearly returns of SRI investment strategy compared to returns of all sample firms and high BM firms during years 1972-2010.



6 CONCLUSION

In this thesis it has been investigated the existence of the value anomaly and the usefulness of fundamental analysis and residual income valuation model in predicting future stock returns. The results presented in this thesis shows that firms with the high book-to-market ratio earned 11.76% higher mean returns than other companies. The evidence about the superior return performance of the value stocks have been documented earlier also for example by Fama and French (1992), Lakonishok et. al. (1994) and Basu (1977). Furthermore the results shows that the investment strategy based on BM-ratio, residual income valuation model and historical financial information generates higher future returns than strategy just based on BM-ratio.

The high BM companies were divided to the five groups based on indicators which measures the strength of the future residual incomes of the companies. The companies with high SRI outperformed the low SRI and all high BM companies by a return margins of 18.9% and 11.5% respectively. It seems also that these abnormal returns are not at least fully compensation for extra risk. The profitability, leverage and liquidity aspects of the high SRI companies are on average stronger compared to the other high BM companies. This is inconsistent with the Fama and French (1992) where they argued that high BM firms earn abnormal future returns because these firms are financially distressed and thus fundamentally riskier. Additionally earnings variability which have been considered as a proxy for fundamental risk (e.g. Beaver et. al. 1970) is lower among high SRI firms than among all firms. In fact the stocks with the lower earnings variability had higher probability to be chosen to the high SRI portfolio.

Alternative explanation for abnormal returns could be that investment strategy based on level of SRI of the companies successfully identifies undervalued stocks from the group of high BM firms. This explanation is inconsistent with the efficient market hypothesis and if it holds two indications can be drawn based on it. First of all it seems that analyzing past financial information can be useful for investors with recognizing stocks with the superior earnings performance in the future. This indicates that all the past information is not fully incorporated in the stock prices.

Second the results indicates that the residual income valuation model successfully guides investors to analyzing fundamentals which consist value relevant information and are useful with recognizing undervalued stocks. Lakonishok et. al (1994) presented one possible reason for the undervaluation of the value stocks. They argued that because the stocks with high BM ratio have usually performed poorly in the past the investors are over pessimistic about these stocks and are expecting the poor performance to continue in the future as well. It's possible that part of the high BM firms in fact will perform poorly in the future as expected in the markets. Then on the other hand the other part is likely to perform better and should be valued higher by markets. In this case the superior returns of the high SRI firms compared to high BM firms indicates that SRI investment strategy successfully identifies at least part of these undervalued stocks from the group of high BM firms.

The empirical results showed also that the highest future returns are concentrated to the group of the smallest firms measured by market value. However the benefits of the SRI investment strategy were higher among the medium-sized and large-sized firms than in the group of small firms. This indicates that the results are not driven by small firm effect. The return performance was tested also for the portfolios which were constructed based on persistence of earnings and change in net asset turnover. Results revealed that the future returns of these two alternative portfolios were lower than returns of the high SRI portfolio. It also seems that superior return performance of the high SRI portfolios compared to equally weighted market portfolio and high BM portfolio is quit robust over time. During the sample period the high SRI portfolio was outperforming other portfolios almost 80% of the time.

This thesis offers complementary evidence about the existence of value anomaly and usefulness of fundamental analysis and valuation models in predicting future stock returns and challenging market valuation of the companies. The risk explanation of abnormal returns of the value stocks and the high SRI stocks however can't be fully excluded based on this thesis although results doesn't seem to be driven by risk measures like earnings variability, leverage and liquidity. One additional subject for future research definitely could be to investigate more precisely if the results presented in this thesis are robust for different kinds of risks like beta-risk. Another interesting object for future research is that could results be improved for example by

taking industry variation in to consideration when analyzing fundamental information. For example in Soliman (2004) it was evidenced that dividing return on net operating assets ratio to its components with the Du-pont analysis is more informative about the future profitability of the company if analysis is performed in industry level. Also when fundamental analysis is done only among high BM companies there is lot of potentially undervalued stocks let out of the analysis. Thus the strategy which could identify firms with relatively low valuation and relatively strong future financial performance among all firms would lead even stronger future return performance. However investigation of these kinds of more advanced strategies will be the matter of future researches.

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