Lappeenranta University of Technology

School of Business

Strategic Finance

Tuomas Kuparinen

The Effect of Risk-Based Factors on the Value Premium: The Finnish Evidence

Examiner: Professor Eero Pätäri

Examiner: Professor Mikael Collan

Abstract

Author:	Tuomas Kuparinen
Title:	The Effect of Risk-Based Factors on The Value Premium
Faculty:	LUT, School of Business
Major:	Strategic Finance
Year:	2014
Master Thesis:	Lappeenranta, University of Technology 66 pages, 15 tables, 4 figures, 1 appendix
Examiners:	Professor Eero Pätäri Professor Mikael Collan

Keywords: BE/ME, operating leverage, financial leverage

This thesis examines the effect of operating leverage and financial leverage on the value premium in the Finnish stock markets 2002-2012. The purpose of the thesis is to examine whether operating leverage and financial leverage affect firm`s BE/ME and stock returns.

The accounting data has been collected from Amadeus database and market-based data from the Datastream database. Sample used in this thesis covers years from 1998 to 2012. This thesis confirms the findings of previous research of tight connection between operating leverage and BE/ME and reinforces the findings of previous research that relation between financial leverage and BE/ME is not robust. In turn, relation between operating leverage, BE/ME and stock returns is not clearly perceived during the 2002-2012 period in the Finnish stock markets.

Tiivistelmä

Tekijä:	Tuomas Kuparinen
Tutkielman nimi	Riskiperusteisten tekijöiden vaikutus arvoanoma - liaan
Tiedekunta:	Kauppatieteellinen tiedekunta
Pääaine:	Strateginen rahoitus
Vuosi:	2014
Pro Gradu- tutkielma:	Lappeenrannan teknillinen yliopisto 66 sivua, 15 taulukkoa, 4 kuvaa, 1 liite
Tarkastajat :	Professori Eero Pätäri Professori Mikael Collan
Avainsanat:	BE/ME, operatiivinen velkaisuus, rahoituksellinen velkaisuus

Tutkielma käsittelee operatiivisen ja rahoituksellisen velkaantumisen vaikutusta arvopreemioon Suomen osakemarkkinoilla 2002-2012. Tutkielman tarkoituksena on selvittää, vaikuttaako operatiivinen ja rahoituksellinen velkaantuneisuus yritysten BE/ME-lukuihin ja sitä kautta osakkeiden tuottoihin.

Empiirisessä aineistossa käytetty tilinpäätösaineistoaineisto on peräisin Amadeus-tietokannasta ja markkinaperusteiset tunnusluvut ovat peräisin Datastream tietokannasta. Tutkimuksessa käytetty aineisto on vuosilta 1998-2012. Tutkielma vahvistaa aiempien tutkimusten tulokset operatiivisen velkaantumisen ja arvopreemion sidonnaisuudesta ja myös sen, ettei BE/ME-luvun ja rahoituksellisen velkaantumisen suhde ole kovin vankka. Sen sijaan operatiivisen velkaantumisen ja BE/ME-luvun suhteesta osaketuottoihin ei saada selvää näyttöä Suomen osakemarkkinoilla 2002-2012.

TABLE OF CONTENTS

1.Introduction

1.1 Backround

Value premium is widely investigated area in financial research. However, there are many things, which must be looked into much deeper. Basically, there is consistent evidence all over the world that stocks with high BE/ME ratio have earned higher returns than stocks with low BE/ME ratio after considering risk (Fama & French, 1998). However, researchers still disagree on the economic forces behind of this anomaly. Many studies argue that value premium is a compensation for higher systematic risk (Chan 1988, Ball & Kothari 1989, Fama & French, 1992, 1995). The studies from many stock markets all over the world have shown that value premium exist, but they notice that small value stocks earn better than big value stocks. They conclude that small value stocks are riskier and it guarantees better returns. According to them, beta[1] does not capture all risk included in small stocks.

Another theory states that value premium is caused by overreaction of the investors (Lakonishok &Schleifer & Vishny, 1994, Bauman, 1997, Bird & Casavecchia & 2007, Athanassakos, 2010). Some investors tend to get overly excited about the stocks that have done well in the past. Investors buy them up, so that such growth stocks become overpriced. Instead, value stocks become underpriced and it provides possibility to get excess returns for value investors. Despite the important aspect of investor behavior on the value premium, this study ignores this perspective and focuses mainly on risk-based explanations to explain differences in firms BE/ME ratios and returns.

In this thesis BE/ME ratio represents a measure of how stocks are valued. BE represents firm`s book value of equity and ME represents market value of equity. Generally, value stocks are stocks which have high book value of equity relative to market value of equity and growth stocks are stocks which have low book value

[1] Beta measures systematic risk based on how returns co-move with the overall market.

of equity to market value of equity. In principle, value premium can be a consequence of the facts that firms have high book equity relative to market value, because they operate in capital intensive industries or they have low market equity relative to book equity, because their business is unprofitable. Specifically, this study focuses on to provide risk based explanations for the differences in firms BE/ME ratios and thus seek explanations, why value stocks earn better than growth stocks.

Roughly, risk-based explanations are divided into two categories. Some studies argue that value premium is caused by increased financial distress (Fama & French 1996, Chen & Zhang, 1998). Other point of view explains that value premium is related to firm level investment activity (Berk & Green & Naik 1999, Carlson & Fisher & Giammarino 2004, Novy-Marx, 2007). Firm level investment activity means amount of investments that firm must do to preserve its competitiveness.

Firms with high investment activity are capital intensive firms, which have great amount of assets in place. According to new studies (Zhang 2005, Novy-Marx, 2007), assets in place are riskier than growth options especially in economic downturns. Thus, high BE/ME firms have more assets in place which explains excess returns for high BE/ME firms. Optimal investment strategy and amount of assets in place refers to operating leverage. Shortly, operating leverage means decision of management to choose between fixed costs and variable costs. Mainly, operating leverage is dictated by the nature of the industry. Managers do not have much choice over how much operating leverage their company will have. Generally, paper and metal sector are examples of industries, where large investments are necessary for firms to stay competitive. Instead, technology firms do not necessarily need much fixed assets to run their operations. Thus their operating leverage is lower in normal circumstances.

Basically, high investment activity causes large amounts of depreciations, which affects volatility of firms EBIT. Firms in the same industry sector usually make quite similar amount of investments compared to their sales. Therefore, their operating leverage is at the same level. This can be one reason why relation between BE/ME ratio and operating leverage can be seen as an intra-industry phenomenon.

Theoretically, correct method to estimate operating leverage is change in EBIT divided by change in sales. It takes account of two basic properties of operating leverage - contribution margin and flexibility. These properties are introduced properly in section 3. Secondly, large amount of investments are shown in balance sheet as high amount of fixed assets relation to total assets. Therefore, it is useful to measure operating leverage as a ratio of with fixed assets to total assets. Thirdly, investments are also tightly connected into the volatility of EBIT, because high amount of investments increases depreciations and thus weakens earnings before interest and taxes. Therefore, it makes sense to use gross investment rate as a proxy for operating leverage. Generally, several different methods must be used to provide proxies for operating leverage and give consistency for the results of connection of the value premium and operating leverage.

Financial leverage is the level which a firm is using borrowed funds. Firms with high amount of debt in their balance sheet must make interest payments regardless of the profits they make. Thereby, greater the amount of debt, the greater the financial leverage. High financial leverage may be beneficial in economic booms, but it may cause serious cash flow problems in economic downturns, because there is not enough sales to cover interest payments. Therefore financial leverage can operate as a gear to generate revenues like operating leverage, or be a heavy burden for a firm.

1.2 Objectives

The purpose of this thesis is to examine connection between BE/ME ratios and operating and financial leverage in the Finnish markets and thus, relation between stock returns and BE/ME. In addition, this thesis attempts to show that operating leverage has more effect on BE/ME ratios than financial leverage. Similarly, the purpose is to show that high BE/ME stocks have higher risk, which is mainly due to high operating leverage. The foundation of this study relies on recent findings between BE/ME and operating leverage from US and UK markets (Novy-Marx 2007, Gulen et al., 2008, Garcia-Feijoo & Jorgensen, 2010). Another underpin-

ning for this thesis is a research of Fama & French (1995), which considers financial distress as a reason for better returns for stocks of high BE/ME.

BE/ME anomaly is widely recognized, but there is no single – minded reason for that. Many prior studies have only stated that stocks with high BE/ME ratios are risky assets and therefore, they should earn better returns. These studies do not provide explanations for higher BE/ME ratios and thus do not explain and separate risk-factors for excess returns for value stocks. In particular, the impact of the operating leverage on BE/ME has not been pointed out clearly. This thesis extends prior studies of value premium by including operating leverage and financial leverage into closer inspection in the Finnish stock markets. The empirical methods used in this thesis follow principles and common methods used in recent studies of operating leverage.

There is no certain method to measure operating leverage precisely. Therefore it makes sense to use different methods to estimate proxies for operating leverage and thus provide more credence for the results. Three measures used in this study are fixed assets divided by total assets (book DOL), gross investments divided by sales (GI %) and change in EBIT % divided by change in sales % (DOL). The only difference between methods concerns chosen technique to estimate degree of operating leverage (DOL) and degree of financial leverage (DFL). Many studies use time-series regression to measure DOL and DFL, but this thesis focuses on point-to-point method because of short sample.

1.3 Structure of the thesis

This thesis consists of theoretical and empirical part. Theoretical part includes sections 2 and 3. Section two introduces salient studies concerning value premium, operating leverage and financial leverage. Section 3 discusses operating leverage and financial leverage from the theoretical viewpoint. In addition, it deals with relationship between BE/ME and operating leverage. Definitions of variables employed in this thesis, portfolio formation and the methodology are introduced in section 4. Section 5 includes results concerning descriptive analysis, correlation of variables and results connecting main variables BE/ME, operating leverage and

financial leverage measured by many several methods and examined from many perspectives. Portfolios are formed on the basis of different leverage measures and BE/ME separately to provide consistent evidence of connections between BE/ME, stock returns and operating and financial leverage. Moreover, linear regression is used to estimate role of operating and financial leverage on the systematic risk. Section 6 concludes with suggestions for further research.

1.4 Hypotheses

The main purpose of this thesis is to provide empirical evidence of connection between both operating and financial leverage and BE/ME. Secondly, this thesis tries to pinpoint their role in asset pricing. Operating leverage is estimated by many ways to provide consistency in results. Hypotheses to be tested by empirical methods in this thesis are as follows:

H1: Operating leverage is associated with BE/ME

H2: Financial leverage is associated with BE/ME

The additional hypotheses are following:

H3: Expected returns are associated with operating leverages of firms

H4: Expected returns are associated with BE/ME ratios

H5: Expected returns are associated with financial leverages of firms

H6: Operating leverage plays more important role on the systematic risk than financial leverage

2. Related literature

2.1 Studies on the determinants of systematic risk

There is common knowledge of components of the systematic risk. Kallunki (2007) defines systematic risk as entity of four components. Both theoretically and empirically, financial leverage, operating leverage, size of the firm and business risk provide best approximation of systematic risk. Business risk refers to variation of EBIT, when economic conditions changes. Operating leverage refers to firm`s cost structure. It means relation of fixed costs to total costs. Financial leverage measures firm`s relation of debt and equity.

Mandelker and Rhee (1984) analyzes that systematic risk can be separated into three parts. Degree of operating leverage (DOL), degree of financial leverage (DFL) and intrinsic business risk. Their study conclude that at portfolio level, 40 percent of the cross-sectional variation in systematic risks can be attributed to DFL and DOL. Chung (1989) enhances Mandelker and Rhee`s model by adding business risk into their framework. His empirical results reinforce that coefficients of DOL, business risk and DFL are positive. Only DFL is not statistically significant. Approximately 20 percent of systematic risk is explained by these three parts. There are also many other studies which try to explain joint effect of operating leverage and financial leverage. Many of these studies see operating leverage more significant factor to explain systematic risk (Huffman 1989, Li & Henderson 1991, Toms & Salama & Nguyen, 2005).

2.2 Studies of the connection between BE/ME and leverage

From accounting perspective Penman, Richardson and Tuna (2007) point out that book-to-market is intrinsically an accounting phenomenon. They decompose BE/ME ratio into two components: An enterprise book-to-price component and a leverage component. The former measure is calculated by book value of net operating assets[2] divided by market value of net operating assets. Therefore, they use this measure as a proxy for operating leverage. A leverage component is estimated

[2] Net operating assets are defined difference between operating assets and operating liabilities.

by book value of debt divided by market value of equity, which acts as estimate of financial leverage and thus reflects financial risk. Their empirical results confirm that operating leverage correlates with stock returns. Instead, their proxy for financial leverage is not positively correlated with stock returns.

Carlson, Fisher and Giammarino (2004) argue that when demand for a firm`s products decreases, market value falls relative to book value, leading to higher BE/ME ratio. Operating leverage can amplify this dynamic by adding to the demand volatilities. Demand usually decreases in economic downturns and thus market values decrease. Firms with high growth options have usually higher expectations than firms with assets in place which drops their market equity more in economic downturns causing higher BE/ME for firms with more assets in place. It explains why value stocks are recognized to earn better in economic recessions.

Zhang (2005) examines equilibrium in competitive product markets. Zhang argues that, contrary to conventional wisdom, assets in place are riskier than growth options. Explanation relies on two features of the Zhang model, costly reversibility and countercyclical price of risk. Costly reversibility and countercyclical price of risk cause assets in place to be harder to reduce, and hence are riskier than growth options especially in bad economic conditions.

Cooper (2006) argues that if capital investment is irreversible, the book value of assets of distressed firms remains, but market value falls increasing BE/ME ratio. High book-to-market firms are sensitive to aggregate shocks. Its excess installed capacity allows to benefit from positive aggregate shocks without increasing any costly investments. Instead, low book-to-market equity firms must make high cost investments to fully benefit from the positive aggregate shocks. Therefore, low book-to-market equity firms are not so sensitive to economic conditions and so their systematic risk is lower. Gourio (2007) provides indirect evidence for the importance of operating leverage. He presents that operating income (EBIT) is more sensitive to gross domestic product shocks for value firms than for growth stocks.

Gulen, Xing and Zhang (2008) see that value firms are less flexible than growth firms in adjusting to economic downturns. They find that value firms have larger

operating leverage and higher financial leverage than growth stocks and additionally, value firms disinvest more infrequently than growth firms. Inflexibility increases the cost of equity in the cross-section. Livdan et al., (2008) argue that leverage ratios increase risk and expected returns and this effect is more dramatic for the less profitable value firms than for the more profitable growth firms.

Novy-Marx argues (2007) that in operating leverage models value firms earn better returns because they consist mainly of assets in place, which are riskier than growth options. Novy-Marx explains that value premium is an intra-industry phenomenon. His model explains that relation between BE/ME and operating leverage is weak and non-monotonic. Instead, relation between BE/ME and stock returns is weak across industries, but strong within industries. His study recognizes relation between operating leverage and BE/ME. The results for the relationship BE/ME and operating leverage in his study are contrary to results given in several other studies (Carlson et al., 2004, Gulen et al., 2008, Garcia-Feijoo & Jorgensen, 2010). This is mainly due to different proxy for operating leverage. He uses annual operating costs divided by book assets as measure of operating leverage, which is rarely used method to estimate operating leverage. Overall, his research concludes that value firms in value industries earn better than growth firms in value industries and value firms in growth industries earn better than growth firms in growth industries.

Garcia-Feijoo & Jorgensen (2010) notice clear connection between DOL and BE/ME and between DOL and stock returns. They also find positive but weak connection between financial leverage and BE/ME. DOL increases monotonically for firms with higher BE/ME ratios. However, their research does conclude that value premium does not reflect compensation for financial risk. Their findings conclude that value premium is highly based on operating leverage and emphasizes that firm level investment activity is reason for value premium rather than financial distress.

Obreja(2013) emphasizes that BE/ME ratio explains cross-sectional differences in expected returns, because BE/ME ratio identifies firms which have low produc-

tivity and face high financial and/or operating leverage. Instead, book leverage[3] does not explain cross-sectional differences in stock returns properly, because both high book leverage and low book-leverage firms can have large equity risk premiums. Thereby, value premium is unnoticeable without operating leverage.

Aguerreve (2009) finds negative connection between operating leverage and BE/ME. In his model competition in industry defines firm`s systematic risk. In highly competitive markets firms are riskier, because demand is low and value of growth options decreases with more firms in the market and operating leverage makes assets in place riskier than growth options. Instead, when demand is high firms in more concentrated industries earn higher returns.

Most of recent studies of connection between operating leverage and BE/ME have been coherent and have shown explanatory power of operating leverage into BE/ME. Instead, effect of financial leverage into BE/ME is not so obvious.

Bhandari (1988), Fama & French (1995) see financial leverage as a main reason for higher BE/ME ratios. Griffin and Lemmon (2002) suggest that the BE/ME anomaly is due to priced financial distress risk. This gives credence to the conjecture that value effect is closely related to distress risk.

Vassalou & Xing (2004) also argue that high-default risk firms earn better than low default risk firms only if they are small and/or their BE/ME is high. Similarly value stocks earn better returns than growth stocks, only if their default risk is high. In other cases there are no significant differences in returns of high and low default firms.

Campbell & Hilscher & Szilagyi (2008) finds that high default probability firms tend to have lower future stock returns which cast doubt on the notion of market premium for distress risk. Garcia-Feijoo & Jorgensen (2010) finds little support for correlation between financial leverage and BE/ME ratio. In contrast, there does not seem to be a relation between degree of financial leverage and stock returns. In addition, there seem to be negative association between DFL and beta, which describes systematic risk.

[3] Book leverage is defined as total debt divided by total assets

Toms & Salama & Nguyen (2005) conclude that financial leverage affects stock returns and BE/ME ratio only if it exceeds critical level of financial leverage. In other cases financial leverage is insignificant. It means that investors do not basically regard financial leverage as a major problem. Additionally, it is very difficult to separate DOL and DFL from each other. Huffman (1983) points out that ex ante debt level have significant impact on fixed capacity investments. Capacity decision of firm is not exogenous but is highly related to financial leverage.

2.3 Features of the Finnish stock markets

Regarding relation between BE/ME and leverage measures there is not any recent studies in Finland concerning this area. However, this relation hardly differs very markedly in different countries. In contrast, there are some differences concerning behavior of stock markets. Firstly, Finnish markets suffer from "periphery syndrome ", which causes pricing errors (Pätäri & Leivo, 2009). The periodic periphery syndrome is said to be caused by the herding behavior of international investors cashing their equity positions first from the smallest stock markets during turbulent times. Thus, volatility is higher in the Finnish markets than in major stock markets for example, US or Germany. Moreover small size of Finnish markets reduces liquidity.

Value premium might be also uncertain in Finnish markets due to data shortages. With exceptions, the studies of Finnish markets are based on data sets which only extend over a few decades. Value premium may disappear for a long period of time like it happened in the late 1990s, when investors became excited about growth stocks (dotcom boom). Therefore, value premium does not necessarily exist in shorter periods, which this study represents. There are only few remarkable studies from recent years, which explain value premium in Finland with sufficient samples.

Pätäri & Leivo (2009) suggest that value premium is even stronger on smaller markets than on larger markets. They used different value strategies based on six ratios (P/E, P/B, EV/EBITDA, P/CF, P/D and P/S) and eight composition measures. There was clear difference between value portfolios versus growth port-

folios during the 1993-2008 period. They recognized that higher results could not be explained by small cap effect or by higher risk.

Leivo (2012) also provides evidence of the value premium in the Finnish markets over the years 1991-2010. Leivo uses several individual valuation ratios (P/B, P/D, EV/EBITDA, P/E and P/S) and various composite measures. According to his results, value strategies work best when different measures are composed. He also extends that value portfolios suffered much less than growth portfolios during the bearish markets.

3. Measurements of leverage

3.1 Definition of operating leverage

Basically, firms trade-off between fixed costs and variable costs. Operating leverage refers to amount of fixed assets versus variable costs. Firms with high fixed assets are called high operating leverage firms (Ross, Westerfeld, Jaffe, 2009). Instead, firms with low fixed assets versus variable costs are called low operating cost firms. Fixed costs are independent from the volume of production in the short period. Instead, variable costs burden the profits only in so far as they are required to get profits. High amount of fixed assets strongly affect to volume of sales and thus, such firms are riskier especially in economic downturns. Basically, operating leverage is industry-specific phenomena. Certain industries need more capital in order to manage their businesses. For example forest and energy sectors are highly capital intensive industries and thus, riskier and vulnerable in economic downturns. However, there are little differences in levels of operating leverage between firms in the same industry. Firm`s management can affect somewhat firm`s cost structure. Operating leverage can be explained better with easy numerical example.

Firm A (high operating leverage) and firm B (low operating leverage) produce same products, but they have different cost structures.

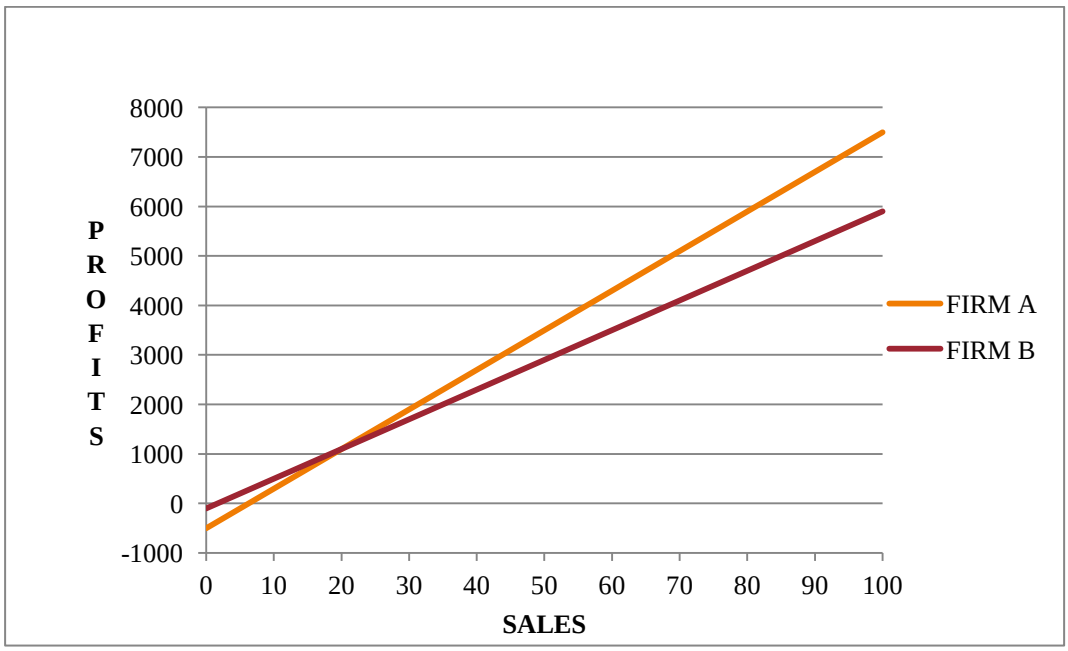
Cost and price	Firm A (High OL)	Firm B (Low OL)
Fixed costs	500	100
Unit Variable costs	20	30
Unit selling price	100	100

Assuming that sales volume remain same in each economic situation, profits change remarkably in different economic states due to cost structure of firms.

Economic state	Sales volume	Firm A profit	Firm B profit
Bad	10	300	500
Medium	50	3 500	2 900
Good	100	7 500	5 900

As shown clearly in the graph below, due to higher operating leverage, firm A experiences higher cyclicality of revenues than firm B. Firm A (high operating leverage) earns better in economic booms than Firm B, but loses in recessions. This is typical situation in the real world. High capital intensive firms are inflexible to change their capital structure at a short interval. Thus they are riskier than low capital firms in economic downturns and thereby, higher risk provides better returns for high operating firms.

Figure 1. The impact of operating leverage in different business cycles



3.2 Financial leverage

Similar to operating leverage, financial leverage is the trade-off between fixed and variable financial costs that firm faces. A firm that adopts large amount of debt in its capital structure must make fixed interest payments regardless of its profits. The use of financial leverage can impact positively or negatively on firm`s profits. The firms with more financial leverage are able to increase their profits, if return on assets exceeds cost of financial debt. At the same time higher financial leverage increases the firm`s risk of bankruptcy. Therefore, it is obvious that financial leverage is main component of systematic risk.

3.3 Measurement of operating leverage and financial leverage

The estimation of operating leverage has been technical problem that bothers the researchers in these kinds of studies. The main reason is that there is no commonly used and approved method to measure operating leverage. This is due to the fact that fixed and variable costs are concepts in management accounting rather than financial accounting. This leads to substantial difficulties in accurately separating variable costs from fixed costs. In other words, operating leverage is unobservable from the financial statements.

Basically, it means that researchers must compile proxies of operating leverage to investigate relationship between operating leverage and systematic risk. Lev (1974) demonstrated connection between operating leverage and systematic risk in his study. Lev defined operating leverage as a ratio of fixed costs to variable costs. Percival (1974) analyzed that contribution margin[4] is a component in the covariance between stock returns and the market return. This concludes that systematic risk is amplified by operating leverage through a form of contribution margin. Gahlon (1980) criticizes these studies by showing that these operating leverage measures do not consider level of fixed costs and thus are inadequate measures of operating leverage. Gahlon points out through single-product and

[4] Contribution margin is amount by which sales revenue exceeds variable costs. It is calculated by subtracting all variable costs from sales.

multi-product models that effect of operating leverage on a firm`s systematic risk is fully captured by concept of degree of operating leverage (DOL).

Degree of operating leverage is commonly used method to measure operating leverage in finance literature and theories. As a quantitative measure degree of operating leverage has two basic definitions (Khan & Jain, 2011).

$$Degree\ of\ operating\ \ leverage\ (DOL) = \frac{\%\Delta EBIT}{\%\Delta Q} \tag{1}$$

The first definition of DOL includes an elasticity concept: The ratio of percentage change in EBIT to percentage in units sold. This equation can be rewritten as following (Khan & Jain, 2011):

$$DOL = \frac{\%\Delta EBIT}{\%\Delta Q} = \frac{\Delta EBIT / EBIT}{\Delta Q / Q} = \frac{\Delta EBIT}{\Delta Q} \times \frac{Q}{EBIT}$$

IF P is denoted as price per unit, V as variable operating costs per unit and F as fixed operating costs, Q(P-V) is known as contribution margin (unit sold times the difference between unit price and unit variable cost). EBIT can be denoted

(P-V) Q-F(Sales less variable cost less fixed operating cost). When units sold changes by ΔQ, EBIT changes by (P-V) ΔQ. The equation above can be rewritten as follows (Khan & Jain, 2011).

$$DOL = \frac{\Delta EBIT}{\Delta Q} \times \frac{Q}{EBIT} = \frac{(P-V)\Delta Q}{\Delta Q} \times \frac{Q}{(P-V)Q-F} = \frac{Q(P-V)}{Q(P-V)-F} \tag{2}$$

This equation gives a second definition of DOL: the ratio of contribution margin to operating income.

Another main part of systematic risk is financial distress. Financial distress is commonly connected to financial leverage. Measurement of financial leverage can be estimated by same method than operating leverage. The quantitative measure of financial risk can be measured by relation between net income and EBIT as follows (Besley & Brigham, 2008).

$$Degree\ \ of\ \ financial\ \ leverage\,(DFL) = \frac{\%\Delta NI}{\%\Delta EBIT} \tag{3}$$

In the equation above, DFL is the ratio of percentage change in net income (NI) to percentage change in EBIT. Second definition of degree of financial leverage is as follows (Besley & Brigham, 2008):

$$Degree\ of\ \ financial\ \ leverage\,(DFL) = \frac{EBIT}{EBIT - INTEREST} \tag{4}$$

The result of the second definition is straightforward. The higher the fixed financial costs (interest costs), the higher the financial risk.

The firm`s total leverage is combination of degree of operating leverage and degree of financial leverage. According to previous equations of operating leverage and financial leverage, degree of total leverage can be defined in the following two ways (Besley &Brigham, 2008):

$$Degree\ \ of\ total\ leverage = DOL \times DFL = \frac{\%\Delta EBIT}{\%\Delta Q} \times \frac{\%\Delta NI}{\%\Delta EBIT} = \frac{\%\Delta NI}{\%\Delta Q} \tag{5}$$

$$DTL = \frac{Q(P-V)}{Q(P-V)-F} \times \frac{EBIT}{EBIT - INTEREST} = \frac{Q(P-V)}{EBIT - INTEREST} \tag{6}$$

The first equation of total leverage can be interpreted as the percentage of change in net income when units sold change by 1 percent. In the second equation, degree of total leverage equals to the proportion of contribution margin in earnings before tax.

There are several methods used to measure operating leverage. Other proxies for operating leverage are introduced next. Gross investment rate can be measured as following:

$$Operating\ leverage = \frac{Gross\ investments}{Sales} \quad (7)$$

Gross investments are the amount a company has invested in assets or business. In this proxy for operating leverage gross investments are divided by sales. Sales are most stable item in the income statement and thus it is rationale to use the sales as a denominator. Gross investments divided by sales describe quite well the risk, which includes into big investments. High gross investments mean high investment activity, which causes a high portion of depreciations in the future. Therefore, estimate of gross investments divided by sales differ somewhat from other measures of operating leverage used in this study. First measure of operating leverage DOL describes operating leverage as variation of EBIT and sales based on past information as well as does book DOL. In turn, gross investment rate is future-oriented estimate of operating leverage.

$$Book\ DOL = \frac{Fixed\ assets}{Total\ assets} \quad (8)$$

Third method of operating leverage book DOL is estimated as relation of fixed assets and total assets. This method also includes some drawbacks. Firstly, book assets do not necessarily reflect real value of fixed assets. Historical fixed assets are also susceptible for measurement errors because of variability in depreciation methods among firms. In addition, book DOL forgets the concept of elasticity, which is highly connected into nature of operating leverage.

3.4 Estimation of DOL and DFL

Basically, there are two methods to estimate operating leverage, time-series regression and point-to-point method. A broadly used method to estimate operating leverage is time-series regression, in which DOL coefficient is result of variation of EBIT and sales. Dugan & Shriver (1989) point out in their analysis that time-series regression is conceptually appropriate approach for calculating DOL. Ac-

cording to Lord (1998), both methods suffer from similar biases. DOL estimates should be higher than one if firm is operating above break-even point and could be negative if firm is operating below break-even. However, the large portions of DOL values in this study are below one.

Furthermore, time-series regression is not appropriate method to use in this thesis because of small sample in this study. Time-series regression analysis require lengthy estimation periods for the reliability and, at the same time the underlying assumption is nonetheless that DOL stays unchanged during the estimation period. The sample of this thesis covers years only from 1998 to 2012 of 91 firms. Thus it is useful to use point-to-point methods to estimate operating leverage in this thesis. Values of operating leverage are three-year averages of different variables. Therefore, this thesis follows procedures used by Gulen et al., (2008). Three methods used to estimate operating leverage are DOL, book DOL and gross investment %.

Financial leverage is used as a proxy for financial distress. There are two methods used to estimate financial leverage in this study. First method DFL is the ratio of percentage change in net income (NI) to percentage change in EBIT. The result of this is straightforward. The higher the interest costs, the higher financial risk firm has. DFL for the different firms is also estimated by using three year averages. Second proxy book DFL measures three-year average ratio of total debt divided by total assets.

4. Data and Methodology

4.1 Sample selection

The sample used in this thesis is based on Finnish stock markets. The data is collected from Datastream and Amadeus-databases and its time window is years from 1998 to 2012. BE/ME ratio and stock returns are from Datastream and rest of the parameters (sales, EBIT, net income, fixed assets, total assets, total debt and gross investments) used in this thesis are from Amadeus database. Stock returns are monthly returns and they are used as total return series, which adjusts appreciation of stocks and dividends paid. Statistical tests are used in comparing means between high and low portfolios with different variables. Statistical tests are done by SPSS software to provide robustness to the results.

The data includes information of 91 firms. Firms included in this empirical study must be in the Finnish stock market list from the start of 1998 to July 2012. Therefore, firms that have been delisted from the Finnish stock market list during 1998-2012 are excluded from the sample likewise firms, which have entered into stock market list after year 1998. This might consist "survivorship-bias"-problem[5], but it makes possible to investigate relation between BE/ME, leverage and stock returns in a consistent way. The data does not include financial firms (banks, insurance, real estate companies), because their financial statements are not comparable to companies operating in other sectors. Additionally, the data includes some small stocks which have liquidity risk[6]. Therefore liquidity risk is not considered to estimate riskiness of stocks.

4.2 Variable selection

The main variables of this study are DOL, DFL and BE/ME. DOL is measured by point-to-point method, which estimates DOL as ratio of change in EBIT to change in sales ($\frac{\Delta\%EBIT}{\Delta\%SALES}$). This method follows procedure used in study of Garcia- Feijoo

[5] Survivorship-bias problem refers to tendency to exclude delisted companies from the sample.
[6] Liquidity risk arises from the difficulty of buying or selling an asset at a desired time.

& Jorgensen 2010 which estimates relation between change in EBIT and change in sales as a proxy for operating leverage. The difference between studies is that Garcia- Feijoo &Jorgensen use time series regression in their estimation of DOL. Instead, this study uses point-to-point method, in which DOL is estimated for a single firm by following formula:

($\frac{E_t - E_{t-1}}{E_{t-1}} / \frac{S_t - S_{t-1}}{S_{t-1}}$). E_t describes earnings before interest and taxes in year t and S_t represents sales in year t. This formula provides proxy of DOL in year t but there are used preceding three year DOL values to estimate DOL in a year t in this thesis.

Alternative measure to estimate operating leverage is used in relation between fixed assets and total assets. Therefore, this estimate is based on accounting data. Value of fixed assets divided by total assets (book DOL) is based on the average of preceding three years. This measure follows principles of research of Gulen et al., 2008. Third method to provide proxy for operating leverage is gross investments % which is calculated by dividing gross investments by sales. In this proxy, value of gross investments % in year t is based on average value of gross investments to sales in preceding three years.

With respect to estimates of financial leverage, DFL is estimated as ratio of change in EBIT to change in net income ($\frac{\Delta\%NI}{\Delta\%EBIT}$). Method is following analysis of Garcia- Feijoo & Jorgensen, 2012.They estimate relation of EBIT and net income as proxy for financial leverage. As measuring DOL, DFL is also estimated by time-series regression in their study. However, this thesis uses point-to-point method as following formula ($\frac{NI_t - NI_{t-1}}{NI_{t-1}} / \frac{E_t - E_{t-1}}{E_{t-1}}$). NI is net income in year t and E_t is earnings before interest and taxes in year t. Alternative estimation of financial leverage is book DFL. Value of book DFL in year t is average value of total debt divided by total assets in three preceding years

Total leverage is estimated by degree of total leverage (DTL). DTL in year t is estimated by DOL times DFL in three preceding years. DOL is estimated by as ratio of change in EBIT to change in sales ($\frac{E_t - E_{t-1}}{E_{t-1}} / \frac{S_t - S_{t-1}}{S_{t-1}}$). DFL is estimated as

ratio of change in EBIT to change in net income ($\frac{\Delta\%NI}{\Delta\%EBIT}$).This measure combines operating leverage and financial leverage into single value of total leverage and describes loosely systematic risk for the firms. An estimation is done by point-to-point method.

BE/ME ratio is obtained directly from Datastream database. In all empirical analyses used in this study BE/ME is value of the previous year value (t-1). For instance, if portfolios are formed in July 2002 BE/ME ratios are based on the value of BE/ME in the end of the year 2001.

Average monthly returns in calendar year t are calculated as equally weighted average of monthly returns from July (year t) to the next June (year +1). Thus, this study contains of ten different one-year periods for a single firm since July 2002 to end of June 2012.At the portfolio level, returns are equally weighted average of monthly returns for a firms included in the portfolio. Average monthly returns are calculated for all portfolios from July (year t) to the next June (year +1) to avoid look ahead bias[7]. Table 1 provides a summary of variables used in this study.

Table 1 – Summary variables

Variable	Definition	Description
Average monthly return	∑(12 RETs/12)	Annually observed
DOL	% Δ EBIT/ % Δ Sales	3 - year average
Book(DOL)	Fixed assets/ Total Assets	3 - year average
DFL	% Δ NI/ % Δ EBIT	3 - year average
Book (DFL)	Total debt/ Total assets	3 - year average
DTL	DOL*DFL	3 - year average

[7] Look ahead bias refers to a situation in which investment decision is made based on information, which was not available at the time of the decision.

Variable	Definition	Description
Gross investment %	GI/ Sales	3 - year average
ME	Market equity	Yearly
BE/ME		Yearly

To conclude all information above, a brief numerical example is presented to clarify, how estimations of the main variables (DOL, DFL, DTL, book DOL, book DFL, GI %, BE/ME and stock returns) are calculated to estimate value of different variable for a single firm at the certain year. A company used in this numerical example is Nokian Renkaat and calculated values of different variables for the Nokian Renkaat are values in the end of 2010. Calculations of different variables follow estimation principles presented in Table 1.These average values are used to form portfolios.

Table2.Calculated values for the Nokian Renkaat in the end of the year 2010.

Table 2 introduces average DOL, DFL, DTL, book DOL, book DFL, GI%, BE/ME and market equity for the Nokian Renkaat from 2008 to 2010. There are used average values of the three preceding years to form portfolios in July 2011. BE/ME ratio and market equity are values at the end of previous fiscal year (2010).

Calculated variables for Nokian Renkaat in 2010								
	DOL	**DFL**	**DTL**	**book DOL**	**book DFL**	**GI %**	**BE/ME**	**ME**
2008	1,02	3,09	3,15	0,55	0,53	16,80		
2009	2,25	0,99	2,23	0,53	0,48	10,80		
2010	3,62	1,62	5,86	0,48	0,45	4,80	0,37	3 505
Average	**2,30**	**1,90**	**3,75**	**0,52**	**0,49**	**10,80**	**0,37**	**3 505**

As mentioned previously, portfolios are formed at the beginning of the July each year. Therefore, average values in the end of 2010 are used as proxies for different variables for the holding period from the beginning of July 2011 to the end of next June 2012.Similarly, average monthly returns for the single firm are calculated from the beginning of July 2011 to the end of June 2012.

4.3 Methodology

The main purpose of this study is to analyze relation between BE/ME, leverage and stock returns. In addition, we attempt to recognize whether operating leverage has more significant relationship with BE/ME than financial leverage. Regarding relation between leverage estimates and BE/ME, the main methods used in this thesis contain portfolio formation model, in which stocks are divided into three portfolio based on their BE/ME ratio. Instead, size-effect has not taken account to sort stocks into portfolios as has been done in many peer-group studies (Fama & French, 1993, Garcia-Feijoo & Jorgensen, 2010). This methodological choice is motivated by "disappearance" of the size- effect (Dimson & Marsh & Staunton 2002, Hirshleifer 2001, Schwert, 2003). Van Dijk (2011) argues that size-effect is basically attributed to the extraordinary performance of small caps firms in January. In addition, delisting bias and data mining problems concerning studies based on the size-effect has been recognized.

Secondly, the effect of leverage on BE/ME and stock returns is examined by forming portfolios based on different variables of operating leverage and financial leverage. Stocks are classified into three groups based on their value of a certain leverage variable. Groups are named by high, medium and low portfolios. The purpose of this method is to perceive differences in BE/ME ratios, stock returns and leverage ratios at portfolio level. This method includes statistical analysis, in which results obtained between high and low portfolios are compared.

4.3.1 Portfolio formation based on BE/ME

Stocks are divided into three portfolios based on their BE/ME ratio. Stocks are divided into portfolios year after year from 2002 to 2011(based on BE/ME ratio in year t -1). Portfolios are formed at the end of June each year again. For these three portfolios we calculate average monthly returns, value of operating and financial leverage by using different proxies and degree of total leverage. High and low BE/ME portfolios include 30 stocks and medium portfolio includes 31 stocks.

4.3.2 Portfolio formation with different variables of leverage.

In the second major empirical approach, stocks are divided into three portfolios based on their value of different variables of operating and financial leverage. The main proxy to estimate operating leverage is DOL. In addition, book DOL and gross investment percents are used in robustness checks to provide further evidence of relation of operating leverage and BE/ME and stock returns The main method of financial risk is degree of financial leverage (DFL) . Moreover, we use book DFL in robustness checks to estimate financial risk. In addition, stocks are divided into three groups based on their DTL. DTL describes degree of total leverage, where DOL and DFL are combined into one measure of systematic risk. DTL estimation is used in research of Garcia-Feijoo &Jorgensen, 2010.

4.3.3 Connection between leverage and systematic risk

The third major empirical approach is estimated role of operating and financial leverage separately from systematic risk. This effect is investigated both at firm level and portfolio level. In both estimates, beta is used for proxy of systematic risk. At portfolio level, beta is calculated for each firm separately and beta for portfolios based on DOL, DFL, book DOL and book DFL is average beta of firms included in certain portfolios. At firm level, linear regression is used to perceive if operating leverage plays more important role on the systematic risk than financial leverage. Beta is used as a dependent variable and DOL, DFL, book DOL, book DFL and ME are used independent variables. Methods are presented precisely in section 5.4. Beta is estimated by using 5-year rolling regression at monthly level for each firm following market model:

$$R_{it} = \alpha_{it} + \beta_{it} R_{mt} \tag{9}$$

R_{it} is the holding period return including dividends of a company in month i and R_{mt} is the return of market portfolio including dividends.

4.3.4 Economical development during the sample

In essence, market condition is an essential factor to explain stock returns for value and growth stocks. Mainly, success of value stocks are based on the factor that they do better in economic downturns than growth stocks (Zhang 2005, Cooper, 2006). In this thesis, sample period (2002-2012) contains varying economic situations in the Finnish markets. After the tech bubble, economy and stock markets experienced enormous rising era from 2003 to 2007, where market values of listed companies rose markedly. The rising era ended into subprime-crisis, which started from the US and caused financial credit crunch all over the world. Market values of firms suffered severe losses in years 2008 and 2009. After that, economy and especially stock markets have recovered slightly and movements of stock prices have been smoother than in years 2008 and 2009.

The impact of the subprime-crisis has been particularly harsh on average stock returns which have generally been quite low in this sample period. Therefore this sample does not necessarily give the best picture of the relation between BE/ME and stock returns.

5. Empirical results

This section is divided into four subsections. Subsection 5.1 introduces the descriptive analysis for the sample, correlation summary between variables and initial results, where stocks are divided into three portfolios based on BE/ME ratios. Subsection 5.2 presents results based on the main variables of operating leverage (DOL), financial leverage (DFL) and total leverage (DTL). This subsection discusses relationship between leverage and BE/ME. Third subsection 5.3 provides a closer look at the relationship between BE/ME and stock returns over the sample period. Last subsection 5.4 covers robustness checks of connection between leverage, BE/ME and stock returns.

5.1. Initial results

The summary statistics sample is presented in Table 3 and correlation summary in table 4. The results are analyzed deeper in section 5.1.1. Moreover, initial results based on BE/ME ratio between high, medium and low portfolios are presented in table 5 and analyzed accurately in subsection 5.1.2. The purpose of these preliminary results is to give initial picture of connection between leverage, BE/ME and stock returns. Any statistical tests to assess the robustness of the results are not used.

5.1.1 Descriptive analysis and correlation between variables

Table 3 – Summary description

Table 3 introduces summary description of the sample used in this thesis. BE/ME, market equity and stock returns are collected from Datastream. BE/MEs and market equities are fiscal years from 2001- 2010 and stock returns are average monthly returns from June 2002 to July 2012. Other variables used in this thesis are sales, EBIT, net income, book assets, total assets, total debt and gross investment %. These are collected from Amadeus database. The data of these variables covers years from 1998 to 2010 and they have been used to estimate different measures of leverage over the sample 2002-2012.

BE/ME ratio and Market equity (year t) are values at the end of previous fiscal year (year t-1). Average monthly return (year t) is calculated as the equally weighted average of monthly returns from July (year t) to June (year t+1).

Test variables of operating leverage, DOL, book DOL and GI% are defined as average of three preceding years. Similarly, test variables of financial leverage, DFL and book DFL are average of three preceding years. DTL is also average of three-year average. DTL is calculated by DOL times DFL.

	AVERAGE	STD	MEDIAN	MAX	MIN	COUNTS
RETURNS	0,82 %	0,03	0,71 %	20,05 %	-12,97 %	10 920
BE/ME	0,67	0,47	0,56	4,00	0,05	910
DOL	3,79	2,60	3,25	13,90	0,01	910
DFL	1,39	0,91	1,19	8,38	0,01	910
DTL	5,09	5,23	3,74	52,26	0,005	910
BOOK DOL	0,33	0,20	0,30	0,88	0,03	910
BOOK DFL	0,50	0,15	0,52	0,88	0,10	910
GI %	6,78 %	5,39	5,04 %	33,90 %	0,00 %	910
ME	1484	6793	139	101995	1.500	910

Table 4 – Correlation among main variables

	RETURNS	LN BE/ME	LN ME	LN DOL	LN DFL	LN DTL	LN BOOK DOL	LN BOOK DFL	LN GI
RETURNS	1								
LN BE/ME	0,03	1							
LN ME	-0,04	0,00	1						
LN DOL	0,00	0,14*	0,00	1					
LN DFL	0,06	-0,02	0,02	0,02	1				
LN DTL	0,03	0,09	0,03	0,74*	0,68*	1			
LN BOOK DOL	0,04	0,24*	0,12*	0,20*	0,00	0,14*	1		
LN BOOK DFL	-0,02	-0,01	0,11*	0,19*	0,05	0,16*	0,43*	1	
LN GI	0,05	0,07	0,12*	0,06	0,02	0,04	0,22*	0,12*	1

* Significant at the level 0,05

All estimates of operating leverage (DOL, book DOL, GI %) are positively correlated with BE/ME. Especially book DOL seem to correlate strongly with BE/ME (0,24) likewise DOL (0,14). BE/ME is positively correlated with stock returns, but not so strongly than reported in former studies. Instead, proxies of operating leverage show no consistent correlation with stock returns. Gross investments % and book DOL show small positive correlation with stock returns. Instead, DOL shows no correlation with stock returns. Gross investments % and book DOL seem to correlate with market equity. Book DOL, gross investments % and DOL are also correlated with each other, as they are expected.

The measures of financial leverage, DFL and book DFL show small negative correlation with BE/ME. Correlation between stock returns and measures of financial leverage is negative, consistently with previous studies. Estimates of financial leverage are correlated with each other.

DTL describes total leverage and it is calculated by multiplying DOL and DFL. Correlation summary shows clearly that DOL correlates better with DTL than DFL does. Degree of total leverage and BE/ME seem to correlate with each other (0,09), but this correlation is smaller than that between BE/ME and DOL. Similarly, book DFL (0,16) and book DOL(0,14) are correlated with total leverage. Instead relation with DTL and stock returns do not seem to correlate markedly with each other (0,03).

Considering the correlation summary, operating leverage seems to affect to BE/ME more strongly than financial leverage. This information is in line with recent studies (Carlson et al., 2004, Garcia- Feijoo & Jorgensen, 2010). In contrast, connection between stock returns and operating leverage is controversial regarding correlation summary.

5.1.2 Results based on BE/ME

This subsection introduces preliminary results on the cross-sectional association between BE/ME and different measures of operating- and financial leverage. Calculations for the three portfolios are presented in Table 5. Methods used in this section are based on study by Fama and French (1993).

Table 5: Average Monthly Returns and Characteristics for portfolios based on Book- to-Market Equity

Table 5 presents initial results for the different portfolios based on BE/ME. Portfolios are groups based on their BE/ME ratio (in year t-1). In total, three portfolios are formed in the end of June each year from 2002 to 2011. Low and high portfolio includes 30 stocks each year and medium portfolio includes 31 stocks. Calculations of different variables DOL, DFL, DTL, book DOL, book DFL and GI % are presented accurately in Table 1.

			BE/ME				
LOW	MEDIUM	HIGH	ALL	LOW	MEDIUM	HIGH	ALL
Average	**Monthly**	**Return**	**(Percent)**		**Average**	**DOL**	
0,82%	0,78%	0,83%	0,82%	3,21	3,59	4,54	3,79
			BE/ME				
LOW	MEDIUM	HIGH	ALL	LOW	MEDIUM	HIGH	ALL
	Average	**DFL**			**Average**	**DTL**	
1,41	1,38	1,40	1,40	4,66	5,00	6,57	5,09
			BE/ME				
LOW	MEDIUM	HIGH	ALL	LOW	MEDIUM	HIGH	ALL
	Average	**bookDOL**			**Average**	**bookDFL**	
0,28	0,33	0,42	0,33	0,50	0,48	0,52	0,50
			BE/ME				
LOW	MEDIUM	HIGH	ALL	LOW	MEDIUM	HIGH	ALL
	Gross	**Investments**	**%**		**Market**	**Equity**	
6,00 %	6,99 %	7,37 %	6,78 %	2100	1323	1028	1484

Regarding relation between BE/ME and stock returns, there seem to be no connection with them in the sample period. Average monthly returns are 0,83% for the high and 0,82% for the low BE/ME portfolio. In addition, average monthly returns for the medium BE/ME portfolio are 0,78%. The differences between high and low portfolio are minimal and thus connection between BE/ME and stock returns is non-monotonic in this sample.

There are a few possible reasons for observations mentioned above. Firstly, sample period is short (2002-2012). Thereby it is possible that value premium does not exist in this period. It is observed in former studies that value premium can be out of fashion for years (Chan et al. 2000). Secondly, financial crisis (2008-2009) interferes with results obtained over the sample period. Thirdly, Finnish stock markets are small and peripheral markets. The peripheral effect means that investors from abroad are cashing their equity positions first during the turbulent times. Thereby, financial crisis is harshly affected to Finnish stocks, especially stocks with small size and stocks with high leverage.

In contrast, connection between BE/ME and DOL seem to be very clear. Average yearly DOL for the high BE/ME portfolio is 4,54 over the sample, respectively 3,59 for the medium portfolio and 3,21 for the low portfolio. Thereby DOL increases monotonically from the lowest portfolio to the highest portfolio. Other proxies for the operating leverage, book DOL and gross investment % provide also further evidence about connection between BE/ME and operating leverage. Book DOL increases monotonically from the lowest portfolio to the highest portfolio. Average book DOL for the low portfolio is 0,28, respectively 0,33 for the medium portfolio and 0,42 for the high portfolio. The differences between high, medium and low portfolios are large and point out clearly the connection between BE/ME and operating leverage. The third measure of operating leverage, gross investments divided by sales (GI %) also describes very clearly relationship between BE/ME and operating leverage. Gross investments % increases also monotonically, when BE/ME increases. Average gross investment % is 6,00 for the low portfolio, 6,99 for the medium portfolio and 7,37 for the high BE/ME portfolio.

In summary, all estimates of operating leverage provide positive evidence for role of operating leverage to explain the level of BE/ME ratio. These results are con-

sistent with previous results obtained from recent studies (Carlson et al., 2004, Gulen et al., 2008, Garcia-Feijoo & Jorgensen, 2010).

The main measure of financial leverage used in this study is degree of financial leverage (DFL). As a sensitivity check, book DFL is estimated to provide further information about role of relationship between financial leverage and BE/ME. Regarding the financial leverage, DFL does not provide direct evidence of connection between financial leverage and BE/ME. Average DFL is 1,41 for the stocks with high BE/ME, 1,38 for the medium portfolio and respectively 1,40 for the low portfolio. Therefore, there seems to be no connection between DFL and BE/ME. Book DFL does neither provide exact evidence about context between financial leverage and BE/ME. Average book DFL is 0,50 for the low BE/ME portfolio, 0,48 for the medium portfolio and 0,52 for the high BE/ME portfolio. Therefore, the results are non-monotonic although the top portfolio has the highest book DFL and the bottom portfolio has the lowest book DFL.

To estimate total leverage, DOL and DFL are combined into one single measure. As a whole, DTL increase systematically from low BE/ME portfolio to high portfolio. DTL for the low portfolio is 4,66, whereas for the medium BE/ME portfolio it is 5,00, and 6,57 for the high BE/ME portfolio.

Totally, initial results are parallel to recent studies regarding role of operating leverage and financial leverage on the BE/ME. Instead, results in this study differ from recent studies concerning relation with stock returns and BE/ME. Unclear relation between BE/ME and stock returns may be due to financial crisis and/or the short interval in the sample period.

Next, we compare more specifically differences between high and low BE/ME portfolio. Both the highest BE/ME and the lowest portfolio includes 30 stocks. This method includes statistical analysis to compare means between the high and the low portfolio and their statistical significance. In addition, cross-sectional medians are calculated for the high and low portfolio. The results are presented in Table 6.

Table 6. Results for the high- and low portfolios based on the BE/ME

Table 6 introduces results for the high- and low portfolios based on the BE/ME from July 2002 to June 2012. Average means and medians are calculated for the high- and low BE/ME portfolios. In addition, the difference in returns between high- and low portfolio and T- statistics are reported.

Time series cross-sectional means				
	High	**Low**	**Dif**	**T- Stat**
EWRet%	0,83%	0,82%	0,01	0,07
DOL	4,54	3,21	1,33***	6,58
DFL	1,49	1,50	- 0,01	-0,11
DTL	6,57	4,66	1,91***	4,07
Book DOL	0,42	0,28	0,14***	7,73
Book DFL	0,52	0,50	0,02	1,22
GI%	7,37%	6,00%	1,37***	3,17
Time series cross- sectional medians				
	High	**Low**	**Dif**	
EWRet%	0,74%	0,76%	-0,02	
DOL	4,60	2,53	2,07	
DFL	1,12	1,29	-0,17	
DTL	4,81	3,28	1,53	
Book DOL	0,44	0,27	0,17	
Book DFL	0,54	0,50	0,04	
GI%	5,97%	4,82%	1,15	

*** Significant at the level 0,05

Table 6 presents clearly that value premium does not exist over the sample period. Average monthly return differences between high and low portfolios are minor and statistically insignificant. In contrast, differences between all operating leverage estimates are remarkable and also statistically significant at the level 0,05. Instead, main variable of financial leverage do not provide strong support for relationship between BE/ME and financial leverage. When measured by DFL, the difference between high and low portfolio is close to zero.

The second measure of financial leverage, book DFL does neither provide evidence of the relationship between BE/ME and financial leverage. A measure of total leverage (DTL) provides information that high BE/ME stocks are riskier than low BE/ME stocks. The difference between high and low portfolio is 1,90 and it is statistically significant at the 5 % level. Table 6 above supports the previous finding that operating leverage has more significant role to explain BE/ME ratio than financial leverage. These results are in the line with recent studies (Carlson et. al., 2004, Toms et al., 2005, Garcia-Feijoo & Jorgensen, 2010).

5.2 DOL, DFL, DTL and BE /ME

This section as a whole includes results of main leverage measures relation to BE/ME ratio and stock returns. Stocks are divided into three portfolios based on their main estimates of operating leverage and financial leverage. The main variables are degree of operating leverage (DOL), financial leverage (DFL) and degree of total leverage (DTL).

5.2.1 Operating leverage

In this subsection is investigated the association between DOL and cross-sectional returns and BE/ME. Stocks are divided into three portfolios based on their DOL. DOL in year t is the average DOL of the three preceding years. Theoretical models predict a positive association between operating leverage and BE/ME and thus association with operating leverage and stock returns. The main estimate of operating leverage (DOL) provides support for earlier studies of this area (Gulen et. al., 2008, Garcia-Feijoo & Jorgensen, 2010).

Table 7. Degree of operating leverage

Table 7 presents results for the different portfolios based on DOL. In total, three portfolios are formed in the end of June each year from 2002 to 2011. Low and high portfolio includes 30 stocks and medium portfolio includes 31 stocks. DOL in year t is the average DOL of the three preceding years. Calculation of DOL is presented accurately in Table 1.

	HIGH	MEDIUM	LOW	HIGH-LOW	(T-Stat)
EWRet %	1,03%	0,74%	0,65%	0,38	1,58
DOL	6,73	3,21	1,48		
BE/ME	0,83	0,62	0,56	0,27***	7,12
BookDOL	0,36	0,35	0,31	0,05***	3,00
GI %	6,02%	7,14%	7,16%	-1,14***	2,96
DTL	8,84	4,24	2,20	6,64	5,24
DFL	1,33	1,31	1,56	-0,23***	3,13
Book DFL	0,50	0,50	0,49	0,01	0,93
ME	1 058	1 082	1 300		

***Significant at the level 0,05

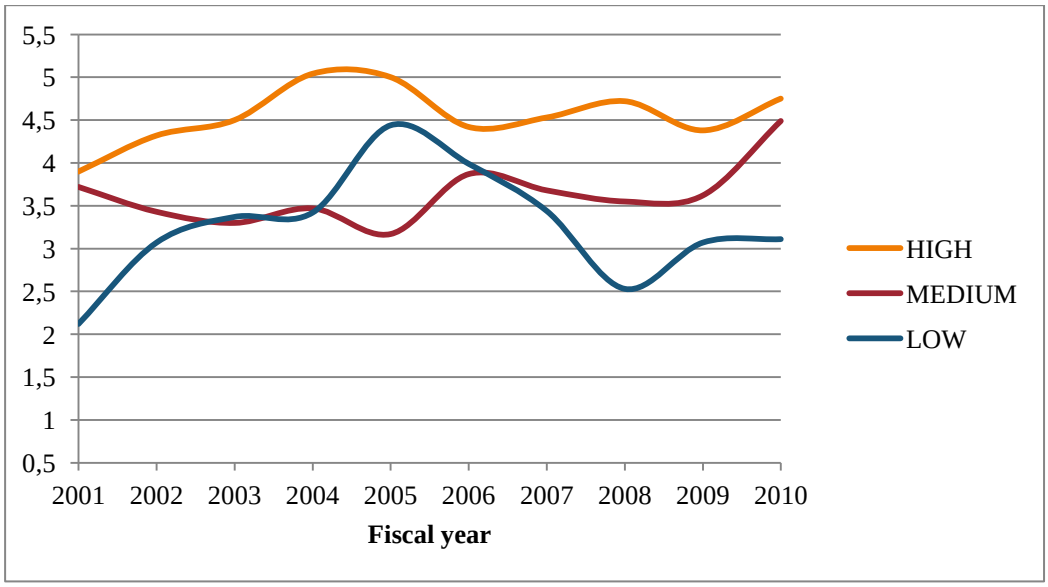
Table 7 above shows consistently connection between DOL and book-to-market ratio. BE/ME increases monotonically, when DOL increases. BE/ME is the highest for the high DOL portfolio (0,83), respectively BE/ME for the medium portfolio is 0,62 and 0,56 for the low DOL portfolio. The difference between high and low portfolio is remarkable and statistical significant at the 5 % level (T-statistics 7,12). Results are consistent with theoretical models and they follow results given from recent studies.

Average monthly returns are clearly better for the high DOL portfolio (1,03 %) than for the medium (0,74 %) and for the low portfolio(0,65 %). Stock returns move consistently by showing better returns for the high DOL portfolio than medium portfolio and respectively, higher average monthly returns for the medium DOL portfolio than low DOL portfolio. The spread between the high- and the low portfolio is large but not statistically significant (T-stat1,58). Even if the difference between high and low DOL portfolios is not statistically significant, there is some evidence that operating leverage seems to be related to into stock returns in this sample period.

Financial leverage does not have a role to explain differences in BE/ME ratios, when stocks are divided into portfolio based on DOL. The DFL is the highest for the small DOL portfolio (1,56) and the smallest for the high DOL portfolio(1,33). Therefore, it provides no information of relation between operating and financial leverage. Book DFL does neither show any marks of association between operating leverage and financial leverage. Practically, there are no differences in book DFL ratios between high, medium and low portfolios. Therefore, it seems that operating leverage is mainly related to BE/ME regardless of the level of financial leverage.

In Figure 3 is compared DOL for the high, medium and low portfolios based on BE/ME year after year through the sample period. Differences between DOL for the high, medium and low BE/ME portfolios seem to appear throughout the entire sample period 2001- 2010[8]. Therefore differences between DOL seem to be consistent in all economic conditions.

Figure 2. Average DOL based on BE/ME portfolios



[8] These years are years in which portfolios are formed. For example year 2010 is average of three preceding years for DOL at the end of 2010.

Figure 3 shows consistent connection between DOL and BE/ME ratio. DOL for the high BE/ME portfolio is consistently higher than DOL for the medium and for the low BE/ME portfolio during the sample. Sample period (2001-2010) is short, but it includes different economic conditions from rising stock markets from 2002 to 2007 till the financial crisis, and back to more stable economic environment after that. In all economic conditions DOL for high BE/ME portfolios are higher than for low portfolios. Comparing high and low portfolios, difference between them varies from 0,43 to 2,20. The narrowest range between the high- and the low BE/ME portfolios in terms of DOL difference was during economic boom 2005-2006. In other years the differences between high and low portfolios is quite stable within range of 1,50-2,20.

5.2.2 Financial leverage

In this subsection we analyze the relationship of financial leverage with BE/ME and stock returns. The main estimate of financial leverage is the degree of financial leverage (DFL), which is measured by dividing the average change in net income by the change in earnings before interest and taxes. Portfolios are formed in each June from 2002 to 2011. The results are presented in Table 8 below.

Table 8. Degree of financial leverage

Table 8 presents results for the different portfolios based on DFL. In total, three portfolios are formed in the end of June each year from 2002 to 2011. Low and high portfolio includes 30 stocks and medium portfolio includes 31 stocks.DFL in year t is the average DFL of the three preceding years. Calculation of DFL is presented accurately in Table 1.

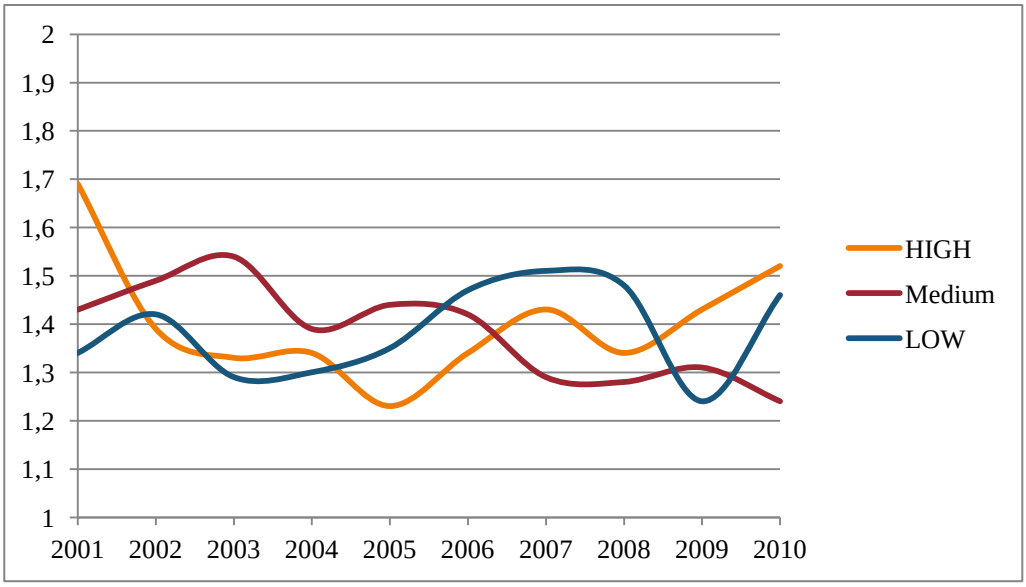
	HIGH	MEDIUM	LOW	HIGH-LOW	T-Stat
EWRet%	0,79%	1,00%	0,68%	0,11	0,60
DFL	2,34	1,21	0,62		
BE/ME	0,63	0,64	0,73	-0,10***	2,38
DOL	3,52	3,98	3,89	-0,37	1,77
DTL	7,99	4,76	2,52	5,49***	13,90
BookDFL	0,52	0,49	0,48	0,04***	3,57
BookDOL	0,43	0,42	0,41	0,02	1,33
GI%	7,14%	6,71%	6,51%	0,63	1,14
ME	787	2 845	781		

*** Significant at the level 0,05

Table 8 clearly indicates that there is no systematic association between DFL and BE/ME. BE/ME is the lowest for the high DFL firms (0,63), while DFL is the highest for the low DOL portfolio (0,73). However, the difference between the high and low DFL portfolio is quite small and statistically significant.

Figure 4 is introduces a closer relation between BE/ME and degree of financial leverage through sample period 2001-2010. Three portfolios are formed based on BE/ME and these portfolios are re-formed each year again. Values of DFL for the high, medium and low portfolios are three year average values of stocks included in portfolio.

Figure 3: Average DFL based on the BE/ME



As revealed by Figure 4, degree of financial leverage fluctuates strongly between different portfolios throughout the sample period. Basically, high BE/ME portfolio should include stocks with higher DFL ratios, but this seem to happen only in years 2001 and 2010. Thus, DFL does not seem to explain BE/ME ratio very strongly in any economical conditions. This information is opposite compared to

the relationship between DOL and BE/ME that share some consistency throughout the sample period.

According to Table 8, the association with DFL and average stock returns are neither very strong. Average monthly returns are 0,79 % for the high DFL portfolio, 1,00 % for the medium DFL portfolio and 0,68 % for the low DFL portfolio. The returns for the high DFL portfolio are slightly better than for the low DFL portfolio, but results are not statistically significant. In addition, medium DFL portfolio generates the best average monthly returns. Thereby, return generation process is non-monotonic and provide information that DFL does not affect stock returns in this sample.

All estimates of operating leverage vary randomly between three portfolios based on DFL and moreover, differences between high and low portfolios are statistically insignificant for all three proxies of operating leverage. It means that stocks with higher financial risk do not have markedly higher operating leverage.

5.2.3 Total leverage

In this subsection we analyze connection between total leverage, BE/ME and average stock returns. Value of DTL year t is DOL times DFL from the three preceding years. This method is rarely used in finance, but it includes two basic properties of systematic risk, operating leverage and financial leverage. Table 9 presents main results between degree of total leverage and BE/ME, stock returns and the main variables.

Table 9. Degree of total leverage

Table 9 presents results for the different portfolios based on DTL. In total, three portfolios are formed in the end of June each year from 2002 to 2011. Low and high portfolio includes 30 stocks and medium portfolio includes 31 stocks.DTL in year t is the average DTL of the three preceding years. Calculation of DTL is presented accurately in Table 1.

	HIGH	MEDIUM	LOW	HIGH-LOW	T-Stat
EWRet%	0,86%	0,85%	0,75%	0,11	0,49
BE/ME	0,74	0,68	0,58	0,16***	4,22
DTL	10,12	3,25	1,90	8,22	
DOL	6,01	3,58	1,78	4,13***	28,69
DFL	1,80	1,39	0,97	0,83***	13,00
Book DOL	0,42	0,33	0,29	0,13***	2,37
Book DFL	0,51	0,49	0,49	0,02	1,70
GI %	5,83%	7,52%	6,98%	-1,15***	2,93
ME	1 640	1 333	1 366		

*** Significant at the level 0,05

The connection between DTL and BE/ME is clear and monotonic. Average BE/ME for the high portfolio is 0,74, respectively 0,68 for the medium portfolio and 0,58 for the low portfolio. The difference between high and low BE/ME portfolio is 0,16 and it is statistically significant(T-statistic 4,22) at the level 0,05. Average stock returns increase also from the low portfolio(0,75%) to the medium portfolio (0,85 %) and furthermore, to the high portfolio(0,86 %), but the return difference between high and low portfolios is quite small and insignificant. Moreover, average monthly returns between high and medium portfolio is negligible (0,01%).

Other variables of operating leverage and financial leverage provide contradictory information. Book DOL seems to be the highest for the high portfolio and lowest for the low portfolio. The difference between high and low portfolio is 0,13 which is statistically significant (T- statistic 2,37). Instead, gross investment % provides opposite information. Table 9 shows that average gross investment % is smallest for the high DTL portfolio. Basically, it tells that gross investment percentages are not related to total leverage in this sample. Book DFL provides small and insignificant differences between high (0,51) and low(0,49) DTL portfolios.

5.3 Stock returns and BE/ME

This subsection describes more closely of the relation between BE/ME and stock returns. The purpose is to provide information of connection between BE/ME and stock returns based on yearly data. Secondly, impact on financial crisis is considered to analyze connection between BE/ME and stock returns for the high, medium and low portfolios. Stocks are divided into three groups. Portfolios are formed only according by BE/ME ratios and they are changed into new stocks every year. High book-to-market portfolio and low book-to-market portfolios include 30 stocks in every year and medium book-to-market portfolio includes 31 stocks.

Table 10 shows clearly that there is no remarkable difference in stock returns for different portfolios in years 2002-2012. The weakest portfolio is medium portfolio, for which average monthly return is 0,77 %. The corresponding return for the high book-to-market portfolio is 0,84 % and for the low book-to-market portfolio 0,83 %. Therefore, the BE/ME-based value premium did not exist in the Finnish markets during the 2002-2012 period. However, the finding could be partially explained by the shortness of the sample period. Secondly, by excluding the financial crisis period (from July 2008- to June 2009), average monthly return for the value portfolio is 1,62 % and it decreases monotonically to 1,46 % for the medium portfolio and furthermore, to 1,41 % for the low portfolio. Therefore, some evidence of value premium seems to exist, if extraordinary period within the full sample period is excluded from the calculations.

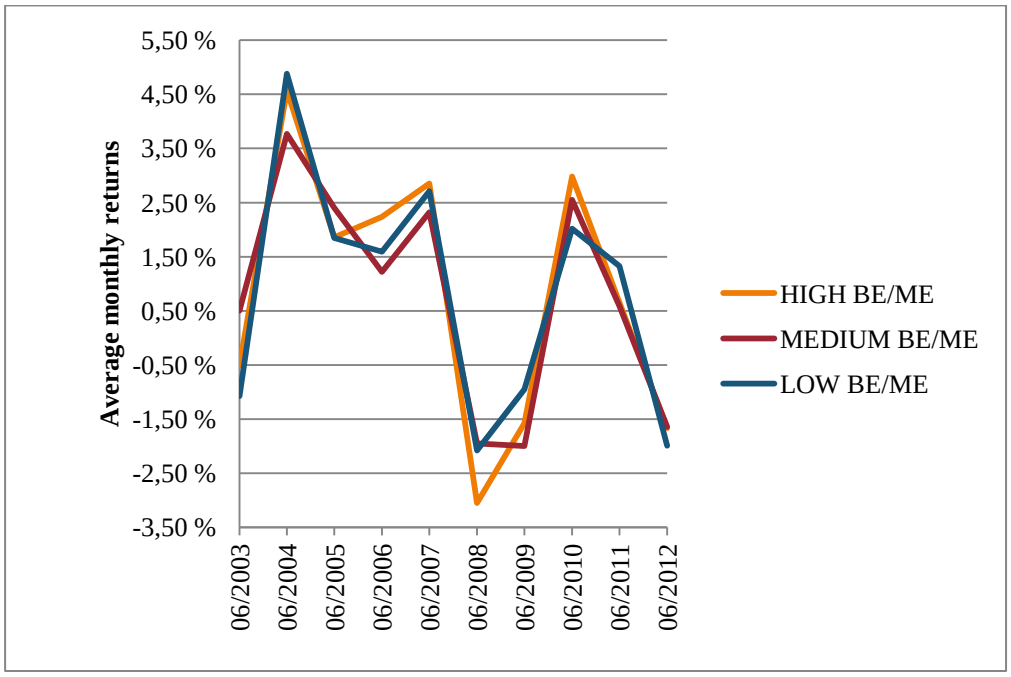
Table 10. Average monthly returns for high, medium and low portfolios based on BE/ME

Table 10 introduces average monthly returns for high, medium and low portfolios. Low and high portfolio includes 30 stocks and medium portfolio includes 31 stocks. Average monthly returns are calculated for the whole sample from 2002 to 2012 and for the sample without time of financial crisis (2008-2009).

	HIGH	MEDIUM	LOW
EWRet (2002-2012)	0,84 %	0,77 %	0,83 %
EWRet (2002- 2012 EXC. 2008-2009)	1,62 %	1,46 %	1,41 %

Figure 5 provides information of average monthly returns for high, medium and low portfolios on yearly basis. It shows even more clearly that value stocks (high BE/ME stocks) suffered most during the financial crisis (2008-2009).

Figure 4. Average monthly returns for the high, medium and low BE/ME portfolios during 2003 – 2012



Average monthly returns in years 2008 and 2009 for the high BE/ME portfolio are -3,05 % and -1,58% , whereas for the low BE/ME stocks, they are -2,08% and -0,95%. The return differences between high and low portfolios are quite large especially in 2008 and 2009, when corresponding differences are otherwise quite small during the sample period. Usually, high book- to-market stocks do better in economic downturns and this effect has been even stronger in the Finnish stock markets (Pätäri & Leivo, 2009). However, results from this sample provide evidence that, high book-to-market firms seem to suffer mostly in heavy economic crisis. This may indicate that investors have firstly abandoned the stocks with high BE/ME, which mainly include stocks with high operating leverage in this sample.

5.4. Robustness checks

This section reports additional results for the connections between operating and financial leverage with BE/ME and average stock returns. We use alternative proxies to estimate operating leverage and financial leverage. Operating leverage is estimated by book DOL and gross investments % and financial leverage is estimated by book DFL, where total debt is divided by total assets.

5.4.1 Additional measures of operating leverage

In Table 11, stocks are categorized on the basis of book DOLs. Again, three portfolios are formed. High and low portfolios include 30 stocks and medium portfolio includes 31 stocks each year. Portfolios are formed in the end of June each year again from 2002 to 2011. Results are presented in Table 11.

Table 11: Results based on book DOL

Table 11 presents results for the different portfolios based on book DOL. In total, three portfolios are formed in the end of June each year from 2002 to 2011. Low and high portfolio includes 30 stocks and medium portfolio includes 31 stocks. Book DOL in year t is the average book DOL of the three preceding years. Calculation of book DOL is presented accurately in Table 1.

	HIGH	MEDIUM	LOW	HIGH-LOW	T-Stat
EWRet%	0,86%	0,86%	0,69%	0,17	0,16
BookDOL	0,57	0,40	0,13	0,44	
BE/ME	0,85	0,60	0,55	0,30***	5,67
DOL	3,90	3,79	3,68	0,22	1,25
GI %	9,28%	5,69%	5,45%	3,73***	15,30
BookDFL	0,54	0,49	0,46	0,09***	8,49
DFL	1,51	1,35	1,32	0,19***	3,38
DTL	5,38	5,22	4,63	0,75***	2,78
ME	1 740	1 521	1 205		

***Significant at the level 0,05

Table 11 indicates quite clearly that there is connection between BE/ME and book DOL. BE/ME increases monotonically from the low portfolio (0,55) to the medium (0,60) and to the high portfolio (0,85). Additionally, the difference between

high and low portfolio is clear and statistically significant (t-stat 5,67). Thus, connection between operating leverage and BE/ME seem to be clear also with this proxy of operating leverage.

Comparing average stock returns for high, medium and low portfolios, there seem to be conflictive information. Average monthly returns are 0,86 % both for the high and for the medium portfolio. Instead, average stock returns are markedly lower for the low portfolio (0,69 %). The difference between high and low portfolio is clear but not statistically significant. Moreover, average stock returns of tercile portfolios are non-monotonic.

Degree of total leverage is higher for stocks with high book DOL. Similarly, market equity is higher for stocks with high book DOL than for stocks with low book DOL. Both estimates of financial leverage co-move with book DOL at portfolio level. Moreover, differences in financial leverage between high and low portfolio are statistically significant. The results provide some evidence that operating leverage and financial leverage are highly connected to each other.

Next, in Table 12, stocks are divided into three portfolio based on gross investments %. In this estimate, gross investments are divided by sales. Gross investments % in year t is average of three preceding years and portfolios are formed each year in the end of June from 2002 to 2011.

Table12. Results for the portfolios based on gross investments/sales

Table 12 presents results for the different portfolios based on gross investment %. In total, three portfolios are formed in the end of June each year from 2002 to 2011. Low and high portfolio includes 30 stocks and medium portfolio includes 31 stocks. Gross investment % in year t is the average value of the three preceding years. Calculation of gross investment % is presented accurately in Table 1.

	HIGH	MEDIUM	LOW	HIGH-LOW	T-Stat
EWRet%	0,89%	0,59%	0,97%	-0,08	-0,31
GI%	12,66	5,49	2,23	10,43	
BE/ME	0,72	0,64	0,64	0,08***	2,55
DOL	3,33	4,05	3,98	-0,65***	-2,93
BookDOL	0,53	0,41	0,32	0,21***	15,77
DTL	4,93	5,63	5,46	-0,53***	-7,81
DFL	1,60	1,44	1,37	0,23***	2,95

	HIGH	MEDIUM	LOW	HIGH-LOW	T-Stat
Book DFL	0,50	0,50	0,49	0,01	0,99
ME	1 602	1 223	1 630		
*** significant at the level 0,05					

Regarding relation between gross investment rate and BE/ME ratio, there seems to be some association between them. BE/ME is 0,72 for the high portfolio and 0,64 for the low portfolio. The difference between high and low portfolio is 0,08 and it is statistically significant(t-stat 2,55) at the 5% level. Results are not monotonic, because BE/ME for the medium portfolio is 0,64, which is equal to that of the low portfolio.

The relation between gross investments % and stock returns does not seem to exist. Average monthly returns for the high portfolio are 0,89 %, for the medium portfolio 0,59 % and for the low portfolio it is 0,97 %, which is the highest average return among these three portfolios. The difference between high and low portfolio is -0,08 %, which is negligible and statistically insignificant(T-stat 0,31).

Differences between degrees of financial leverage (DFL) for the portfolios seem to differ substantially. DFL is 1,51 for the high portfolio, respectively 1,39 for the medium portfolio and 1,29 for the low portfolio. The difference between high and low portfolio is obvious and statistically significant (T- stat 2,95).

5.4.2 Alternative measure of financial leverage

This subsection examines associations between alternative measure of financial leverage and BE/ME and stock returns. Each year, stocks are divided into three portfolios based on their value of book DFL. Portfolios are formed each year in the end of June from 2002 to 2011. Book DFL is estimated in year t as total debt divided by total assets in three preceding years. Table 13 below presents the main results for the three book DFL portfolios.

Table 13. Results for the portfolios based on book DFL

Table 13 presents results for the different portfolios based on book DFL. In total, three portfolios are formed in the end of June each year from 2002 to 2011. Low and high portfolio includes 30 stocks and medium portfolio includes 31 stocks .Book DFL in year t is the average DFL of the three preceding years. Calculation of book DFL is presented accurately in Table 1.

	HIGH	MEDIUM	LOW	HIGH-LOW	T-Stat
EWRet%	0,93%	0,96 %	0,58%	0,35	1,19
BE/ME	0,71	0,69	0,60	0,11***	3,25
BookDFL	0,65	0,52	0,33	0,32	
BookDOL	0,38	0,36	0,27	0,11***	6,65
DOL	3,80	3,81	3,78	0,02	0,20
GI%	6,96%	7,41%	5,97%	0,99***	2,10
DFL	1,49	1,40	1,27	0,22***	3,30
DTL	5,72	4,86	4,66	1,06***	5,52
ME	1 019	2 695	733		

*** Significant at the level 0,05

BE/ME for the high book DFL firms is 0,71, while for the low book DFL firms it is 0,60. The difference is statistically significant (t-stat 3,25). In addition, BE/ME increases monotonically from the lowest portfolio to the highest portfolio.

Also stock returns seem to be better for the high portfolio than for the low portfolio. Average monthly returns for the high portfolio are 0,93 %, 0,96 % for the medium portfolio and only 0,58 % for the low portfolio. The results are not consistent, but they provide some evidence of substantial difference between high and low portfolios. Therefore, large amount of debt in balance sheet might have affected stock returns in sample period 2002-2012, even if differences between average monthly returns for high and low portfolio are not statistically significant(1,19).

Book DFL seems to correlate strongly with book DOL and gross investment%. In both cases differences between high and low portfolio are statistically significant, when portfolios are formed by according book DFL. Connection with gross investments and book DFL is straightforward. The large amount of investments

usually increases debt in firm assets, because operations are mainly financed with debt. Similarly, book DFL and book DOL seem to correlate also with each other.

5.5 Leverage and Beta

In this subsection the purpose is to analyze role of operating leverage and financial leverage on the systematic risk. Firstly, this connection is analyzed at portfolio level. Stocks are divided into three portfolios based on DOL, DFL, book DOL and book DFL separately. For these portfolios, we calculate average betas, as average betas from 5-year rolling regressions. Secondly, linear regression is run to analyze the role of operating and financial leverage on the systematic risk at firm level. Main estimates used in this estimation are DOL, DFL, book DOL, book DFL and market equity. There have been run several regressions to estimate connection between beta (dependent variable) and different proxies of leverage estimates and market equity separately and together. In this thesis, beta is used only to extend further evidence of connection between leverage and systematic risk. Therefore, beta is not reported in earlier analyses of this study. Methods concerning relationship between systematic risk and leverage proxies are explained precisely in tables 14 and 15.

5.5.1 Connection between leverage and systematic risk at portfolio level

This section examines connections of DOL, DFL, book DOL and book DFL with beta at portfolio level from the Finnish stock markets between 2002-2012. Similarly, BE/ME, DTL and leverage values for portfolios are reported in Table 14.

Table14. Connection between DOL, DFL and systematic risk

Table 14 presents the results of the relationship of DOL, DFL, book DOL and book DFL within systematic risk. DOL, DFL, book DOL and book DFL are calculated as presented table 1. Beta is 5- year rolling regression against OMX Helsinki Cap index. Monthly observations are used to calculate beta for a single firm. Thus, 60 observations are considered to estimate betas for a single firm in a certain year. Average portfolio beta is average of betas of firms in each portfolio. Portfolios are formed each year from June 2002 to June 2011.

Panel A	Portfolios based on DOL					
	BETA	**DTL**	**BE/ME**	**DFL**	**HIGH - LOW**	**T - stat**
HIGH	0,71	8,84	0,83	1,33	0,05***	2,78
MEDIUM	0,67	4,24	0,62	1,31		
LOW	0,66	2,20	0,56	1,56		
Panel B	Portfolios based on DFL					
	BETA	**DTL**	**BE/ME**	**DOL**	**HIGH - LOW**	**T - stat**
HIGH	0,66	7,99	0,63	3,52	0,01	0,26
MEDIUM	0,72	4,76	0,64	3,98		
LOW	0,65	2,52	0,73	3,89		
Panel C	Portfolios based on book DOL					
	BETA	**DTL**	**BE/ME**	**bookDFL**	**HIGH - LOW**	**T - stat**
HIGH	0,75	5,39	0,85	0,54	0,09***	2,37
MEDIUM	0,64	5,22	0,60	0,49		
LOW	0,66	4,63	0,55	0,46		
Panel D	Portfolios based on book DFL					
	BETA	**DTL**	**BE/ME**	**bookDOL**	**HIGH - LOW**	**T - stat**
HIGH	0,75	5,72	0,71	0,38	0,15***	3,98
MEDIUM	0,66	4,86	0,69	0,36		
LOW	0,60	4,66	0,66	0,33		
	***Significant at the level 0,05					

Table 14 shows clearly that operating leverage is connected to systematic risk. Both measures of operating leverage indicate clearly that systematic risk is bigger for the stocks with high operating leverage and smaller for the stocks with low operating leverage. Moreover, the differences are clear and statistically significant. Estimates of financial leverage provide contradictory information about their relation to the systematic risk. Portfolios based on DFL do not indicate higher systematic risk for the stocks with higher financial leverage. The highest average beta is for the medium portfolio (0,72). In turn, book DFL provides very clearly and monotonically the highest beta for stocks with high financial leverage (0,75)

and lowest beta for stocks with low financial leverage (0,60). It is also noteworthy that operating and financial leverage seem to be tightly connected with each other, when accounting-based methods are used to estimate operating and financial leverage. Mainly, stocks with high operating leverage seem to include lot of debt and similarly portfolios based on high book DFL seem to have high operating leverage. Therefore, more important role of operating leverage on the systematic risk is very hard to identify at portfolio level.

Table 14 also concludes clearly connection between operating leverage, beta and BE/ME. Book-to-market ratios are markedly higher for stocks with high operating leverage. Similarly, stocks with high operating leverage have higher beta values. Therefore, it can be concluded that operating leverage is highly connected to book-to-market ratios. It means that firms with high BE/ME are more risky than firms with low BE/MEs. In turn, estimates of financial leverage, beta and BE/ME ratios are not connected so tightly to each other. The differences between book-to-market ratios for high, medium and low portfolios are quite small or non-monotonic. Considering both estimates of financial leverage (DFL, book DFL), they do not provide consistent evidence that financial risk is affected to BE/ME and beta.

5.5.2 Connection between leverage and systematic risk at firm level

In this subsection we describe the role of operating and financial leverage on the systematic risk at firm level. Former studies conclude clearly that operating leverage has more vital effect on systematic risk than financial leverage (Huffman 1983, Toms et al., 2005). This study concludes clearly that operating leverage has remarkable role on the BE/ME. In turn, former sections of this thesis do not consider if high operating leverage is affected to systematic risk. At portfolio level, we recognized that operating leverage is related with systematic risk. However, we also recognized that firms with high operating leverage might also include high financial leverage. Therefore, linear regression is used to estimate connection with operating leverage, financial leverage and systematic risk at firm level. Linear regression analysis is used to estimate role of operating and financial leverage

on the systematic risk separately and together. Dependent variable is beta. Independent variables used in linear regressions are DOL, DFL, book DOL, book DFL and market equity. Regressions are run each year from 2002-2012.

Table15. Regression results - Dependent variable Beta

Beta is 5–year rolling regression at monthly level against OMX Helsinki portfolio index. Thus, 60 monthly observations are considered to estimate beta for each firm. In panel A, beta is regressed against DOL and DFL separately. In addition, multiple regressions are done, where market equity is included in regressions. In panel B, beta is regressed against book DOL, book DFL and ME separately and together. Constants are included in all specifications of regressions but are not reported in this table. Estimation of the main variables DOL, DFL, book DOL, book DFL and ME is introduced precisely in Table 1.

Panel A	**Dependent variable: Ln BETA**					
	(A)	(B)	(C)	(D)	(E)	(F)
Ln DOL	0,16***		0,15***	0,16***		0,15***
Ln DFL		0,07***	0,04		0,04	0,04
Ln ME				0,04***	0,05***	0,04***
N	910	910	910	910	910	910
F	66,024	28,565	44,597	54,755	24,056	32,146
T	8,02	5,24				
Adj. R- S	0,17	0,06	0,16	0,17	0,07	0,18

*** Significant at the level 0,05

Panel B	**Dependent variable: Ln BETA**			
	(A)	(B)	(C)	(D)
BDOL	0,39***		0,39***	
BDFL		0,49***		0,48***
Ln ME			0,05***	0,05***
N	910	910	910	910
F	32,074	30,756	55,652	59,548
T	6,65	6,32		
Adj. R-S	0,07	0,06	0,15	0,18

*** Significant at the level 0,05

The results of linear regression analyses provide some conflict information of the role between operating and financial leverage on the systematic risk. Coefficients of DOL are higher than coefficients of DFL. DOL is statistical significant in all regressions. In turn, DFL is statistically insignificant in multiple regressions with DOL and ME. Similarly, goodness of model (F-score) and R- squareds are lower in regressions, where DFL is included. Based on these estimates, operating leverage affects systematic risk more than financial leverage. Another regression table (panel B) does not provide more detailed information of the problem. Both estimates (book DOL, book DFL) are connected with systematic risk. Similarly, coefficients with both estimates are statistically significant, but coefficients of book DFL are little bit higher than coefficients of book DOL. Similarly, goodness of model is equal for regressions of book DFL and beta than for regressions of book DOL and beta. Basically, results do not reinforce whether operating leverage has more important role on the systematic risk than financial leverage. This relation depends on the proxies used to estimate operating leverage and financial leverage.

6. Conclusions

6.1 Research summary

The main research objective was to examine the relationships of operating and financial leverage with the BE/ME. The main proxy used to estimate operating leverage is DOL, which is measured by dividing change in EBIT by change in sales for the each firm separately. Financial leverage is estimated by dividing change % in net income by change % in EBIT for the each firm separately. Because of uncertain estimates of operating risk and financial distress, there are used many proxies to estimate operating leverage and financial leverage. We use tercile portfolios to examine connections between BE/ME, leverage and stock returns in this study. Portfolios are formed on the basis of each proxy for leverage or BE/ME separately.

In addition, the following additional issues were addressed.

1) Stock returns are associated with BE/ME ratios
2) Stock returns are associated with operating leverage
3) Stock returns are associated with financial leverage
4) Operating leverage is more closely connected to BE/ME than is financial leverage.

The main proxy for operating leverage, DOL provides strong evidence of connection between BE/ME and operating leverage. When stocks are divided into portfolio based on their BE/MEs, stocks with high BE/MEs have higher DOLs than stocks with medium and low BE/MEs. The same impact is observed, when portfolios are grouped based on degree of operating leverage. BE/ME increases monotonically, when DOL increases. The difference between high and low DOL portfolios is statistically significant. These results are also supported with results obtained by using other proxies for operating leverage. Other measures of operating leverage (book DOL, gross investments %) provide clear evidence of nexus with operating leverage and BE/ME. Book DOL and gross investment rates are systematically higher for high BE/ME portfolio. Regarding the difference with high and low portfolios, both measures provide evidence of higher BE/ME for high

book DOL and gross investments portfolio. The difference is clear and statistical significant in both cases.

Generally, evidence of the association between operating leverage and BE/ME is robust. All proxies give similar results concerning this connection. Empirical results from Finnish stock markets are coherent with recent studies concerning relationship with operating leverage and BE/ME from bigger stock markets (e.g. Gulen et al., 2008, Garcia- Feijoo- Jorgensen, 2010). Therefore, findings from this study follow theoretical models (Carlson et al., 2004, Zhang, 2005, Cooper, 2006), which argue that value premium is related to firm-level investment activity.

The main proxy of financial risk, DFL and BE/ME does not seem correlate similarly than DOL and BE/ME. Dividing stocks by BE/ME ratio, there are no significant differences between high, medium and low portfolios or they are non-monotonic. When stocks are divided into groups based on their DFL, average BE/ME is highest for the low portfolio. Moreover, there are no differences between BE/MEs comparing high and medium portfolios. We also used book DFL as a robustness check to estimate financial leverage. In this method total debt is divided by total assets. This estimate provides contradictory information. Basically, there are no differences between amount of debt level for the high, medium and low portfolios, when stocks are divided into groups based on BE/ME. Instead, there seems to be strong connection between book DFL and BE/ME when stocks are divided into groups based on book DFL. In that case BE/ME increases monotonically from the low portfolio to the highest portfolio. In addition, difference between the high and the low portfolio is then statistically significant.

First sub-objective was to analyze connection between BE/ME and stock returns. In the whole sample period there are no signs that firms with high BE/ME earn better than growth stocks. The differences between average returns for portfolios are minor and non-monotonic. The results are contrary to major studies considering BE/ME and stock returns (Fama & French, 1998). However, there are few possible reasons for this conflict. First of all, our sample period is quite short to analyze this phenomenon. Secondly, the recent financial crisis mixes results given from this sample. By excluding the years of financial crisis (2008 and 2009) the

value premium existed (see table7, page 46). In contrast, the financial crisis seem to affect most heavily stocks with high BE/ME ratios. In this sample, high BE/ME stocks are stocks with high operating leverage. Therefore, it can be concluded that investors saw stocks with high BE/ME more risky in the time of financial crisis.

Third sub-objective was to investigate relation between operating leverage and stock returns. By dividing stocks based on their DOL proxies, some evidence that average returns are higher for the high DOL portfolio was found. The monthly difference in average stock returns between high and low portfolio is 0,38 %, but it is statistically insignificant. However, average returns increase monotonically from the lowest portfolio to the highest portfolio. Instead, other proxies for operating leverage (book DOL, GI%) do not provide systematic evidence of connection between operating leverage and stock returns. However, this effect should be analyzed with longer sample.

Connection between proxies of financial leverage and stock returns provide some evidence of differences with high and low financial leverage stocks. Average monthly returns are in both cases (DFL, book DFL) better for high financial leverage portfolio than low portfolio, but results are not significant and they do not increase monotonically, when medium portfolio is included into analysis. These findings are supported in analysis done by recent studies. Financial leverage has some role in asset pricing although financial leverage has not so significant impact on BE/ME ratios.

The final objective was to analyze whether operating leverage has bigger role on the systematic risk than financial leverage. The correlation summary provides some findings that both measures highly affect total leverage. At portfolio level, systematic risk is higher for the stocks with high operating leverage and it decreases monotonically, when operating leverage is estimated by DOL. In contrast, systematic risk is not connected to stocks with high financial leverage, when financial leverage is estimated by DFL. Book DOL also provides evidence that systematic risk is associated with operating leverage. Beta is higher for the stocks with high book DOL and it is markedly lower for the stocks with low book DOL. Similarly, firms with high debt rate on their balance sheet seem to have higher beta than firms with low debt. Therefore, at portfolio level connection between

operating leverage and beta is quite observable but connection between systematic risk and financial leverage is arguable. However, it is noticeable that firms with high operating leverage also seem to have high financial leverage, when this connection is estimated by accounting methods. At firm level, operating leverage seems to be connected with systematic risk better than financial leverage, when DOL and DFL are used as proxies for operating leverage and financial leverage. Respectively, if accounting-based book DOL and book DFL are used as proxies, both seem to have significant role on systematic risk.

6.2 Practical implications

This thesis provides some evidence of connection between BE/ME and operating leverage. In addition, this thesis links operating leverage on the higher risk. Basically, it means that from investors point of view, stocks with high operating leverage have higher BE/ME and similarly higher systematic risk in terms of beta and this risk explains excess returns of high BE/ME stocks possible for investors. Connection between BE/ME and stock returns is not observable in this thesis because of extraordinary period included in the full sample period, but it is verified in numerous studies with very large samples (Fama & French 1992, 1995, 1998, Athanassakos, 2010 etc.). The second implication of the results is that financial leverage is not consistently connected to BE/ME and risk at portfolio level. Therefore, these results follow the conclusions from the earlier studies that financial risk is not affected to BE/ME or it is affected to BE/ME only if it is at extraordinary level(Vassalou & Xing, 2004, Toms et al., 2005).

6.3 Limitations of the study

The sample includes small companies, which does not take account of illiquidity risk for the formed portfolios. For example, stocks that trade maybe once a month, have beta, which is artificially low and thus does not reflect real risk involved in holding that stock. To mitigate this problem, sizes of portfolios are kept as large as possible to hold the impact of insufficient diversification on the results as small as possible.

Secondly, because of the shortness of the sample period, DOL and DFL are not estimated similarly to recent peer-group studies in this thesis. In recent studies DOL and DFL are captured by linear regression, whereas point-to point method is used in this thesis. Therefore DOL and DFL values may differentiate results obtained from another studies. Moreover, point-to-point method used in this thesis takes into account only DOL and DFL values of preceding three years to calculate average DOL and DFL in certain year. It means that extremely high or low value may distort the average value obtained, which may shift the stock into another tercile portfolio. Moreover, the connection between BE/ME and stock returns is not necessarily strong, when stocks are changed each year into another stocks. According to recent studies, value premium exists strongly, when the holding period is three years or more (Bird & Casavecchia, 2007, Pätäri & Leivo, 2009).

6.4 Suggestions for further research

This study provides some evidence of connection between operating leverage and value premium. However, it is obvious that conclusions related to connection between BE/ME, stock returns and leverage measures based on short sample periods and low firm-level observations are not statistically robust. In best cases only small indications of this phenomenon can be observed. Therefore, there is a demand to analyze impact on leverage measures on the value premium with data of larger samples. For instance, by using firms from all Nordic countries would extend the sample size and therefore, provide more robust evidence for relation of BE/ME and leverage measures in small markets. Larger sample would also make possible to investigate if value premium is industry-specific phenomena as has been suggested earlier in some studies.

In addition, there is a certain need to discover and enhance general models to estimate operating leverage more precisely. All methods used in this thesis and earlier studies include many weaknesses, which may bias results. Moreover, to analyze role of operating leverage on the value premium and systematic risk more precisely, there is a need to discover methods that would better separates firms with high operating leverage from the firms with high financial leverage.

Bibliography

Aguerrevere F.L. 2009. Real Options, Product Market Competition, and Asset Returns. Journal of Finance 64, 957-983.

Athanassakos G. 2011. Do Value Investors Add Value. Journal of Investing 20, 86-100.

Ball R. & Kothari. S. 1989. Non-stationary Expected Returns: Implications for Tests of Market Efficiency and serial correlation of returns. Journal of Financial Economics 25, 51-74.

Bauman S.W. & Miller R. E. 1997. Investor Expectations and the Performance of Value Stocks versus Growth. Journal of Portfolio Management 23(3), 53-68.

Bird R. & Casavecchia L.2007. Sentiment and Financial Health Indicators for Value and Growth Stocks. The European Experience. European Journal of Finance, 13, 769 -793.

Besley S. & Brigham E.F.2008, 4th edition. Cengage Learning.

Berk J.B., Green R.C.,Naik V.1999. Optimal Investment, Growth Options and Security Returns. Journal of Finance 54, 1553-1607.

Carlson M., Fisher A.,Giammarino R. 2004.Corporate Investment and Asset Price Dynamics. Implications for the Cross Section of Returns.Journal of Finance 59, 2577-2603.

Chan L.K.C., Karceski J, Lakonishok J.2000. New Paradigm or Same Old Hype in Equity Investing? Financial Analyst's Journal, 56(4), 23-36.

Chen N. & Zhang F.1998. Risk and Return of Value Stocks. Journal of Business 71, 501-535.

Chung K.H.1989. Evidence on a Simplified Model of Systematic Risk. Financial Management, 11, 53-63.

Cooper I. 2006. Asset Pricing Implications of Non-Convex Adjustment Costs and Irreversibility of Investment. Journal of Finance 61, 139-170.

Dimson E., Marsh P., Staunton M. 2002. Triumph of the Optimists: 101 Years of Global Investment Returns. Princeton University Press.

Dugan, M.T. & Shriver.K.A.1989. The Effects of Estimation Period, Industry, and Proxy on the Calculation of the Degree of Operating Leverage. Financial Review 24, 109-122.

Dugan M.T. & Shriver. K.A. 1992. An Empirical Comparison of Alternative Methods for the Estimation of the Degree of Operating Leverage. The Financial Review 27(2), 309-321.

Fama E. F. & French K. R. 1992. The Cross Section of Expected Stock Returns, Journal of Finance 47,427 – 465.

Fama E. F. & French K. 1993. Common Risk Factors in the Returns on Stocks and Bonds, Journal of Financial Economics 33, 3-56.

Fama E.F. & French K.R (1995). Size and Book-to-Market Factors in Earnings and Returns. Journal of Finance 50,131-155

Fama E. F. & French K. R. 1996. Multifactor Explanations of Asset Pricing Anomalies, Journal of Finance 51, 55-84.

Ferri M.G. & Jones W.H 1979. Determinants of Financial Structure: Anew Methodological Approach. Journal of Finance 34, 631-644.

Gahlon J.M.1980.Operating Leverage as a Determinant of Systematic Risk. Journal of Business Research 9, 297-308.

Garcia-Feijoo L. & Jorgensen, R.D. 2010. Can Operating Leverage Be the Cause of the Value Premium? Financial Management, 1127 – 1153.

Gourio F. 2007. Labor Leverage, Firms Heterogeneous Sensitivities to the Business Cycle, and the Cross-Section of Returns. Working paper.

Gulen H., Xing Y. L. Zhang L. 2008. Value versus Growth: Time-Varying Expected Stock Returns. University of Michigan Working Paper.

Hamada R.S. 1972. The Effect of the Firms Capital Structure on the Systematic Risk of Common Stock. Journal of Finance 27, 435-452.

Hirshleifer D. 2001. Investor Psychology and Asset Pricing. Journal of Finance 56, 1533-1597.

Huffman L. 1983. Operating Leverage, Financial Leverage and Equity Risk. Journal of Banking & Finance 7 (2), 197-212.

Kallunki J.P & NiemeläJ. 2007. Uusi Yrityksen Arvonmääritys. Talentum

Khan M.Y. & Jain P.K. 2011. Financial Management 6th edition. Tata Mcgraw-Hill education.

Lakonishok J., Shleifer A., Vishny R. 1994. Contrarian Investment, Extrapolation and Risk. Journal of Finance 49 (5), 1541-1578.

Leivo T.H. 2012. Pricing Anomalies in the Finnish Stock Markets. Ph.D.Thesis, Lappeenranta University of Technology, School of Business, Finland.

Lev B.1974. On the Association between Operating Leverage and Risk. Journal of Financial and Quantitative Analysis 9,627-641.

Li R-J. & Henderson G.1991.Combined Leverage and Stock Risk. Quarterly Journal of Business and Economics,30,1,18-40.

Livdan D, Horacio S. Zhang Lu 2008. Financially Constrained Stock Returns. Journal of Finance, 4, 1827- 1862.

Lord R.1998. Properties of Time-Series Estimates of Degree of Leverage Measures. Financial Review 33, 69-84.

Mandelker G.N. & Rhee S.G. 1984. The Impact of the Degrees of Operating and Financial Leverage on Systematic Risk of Common Stock. Journal of Financial and Quantitative Analysis 19, 45-57.

Novy-Marx R. 2010. Operating Leverage. Review of Finance, 1–32.

Obreja Iulian.2013. Book-to-Market Equity, Financial leverage and the Cross-Section of Stock Returns. Review of Financial Studies, 26(5), 1146-1189.

Penman S., Richardson S., Tuna I.2007. The Book-to-Price Effect in Stock Returns: Accounting for Leverage. Journal of Accounting Research 45,427–467.

Percival J. R. 1974. Operating Leverage and Risk. Journal of Business Research 2, 223 – 227.

Pätäri E.J. & Leivo T.H. 2009.Performance of the Value Strategies in the Finnish Stock Markets. Journal of Money, Investment and Banking, Issue 8, 5 - 24.

Schwert G.W.2003. Anomalies and Market Efficiency. Handbook of the Economics of Finance, Vol. 1B, Amsterdam, Elsevier Science,1, 889-939.

Toms S., Salama, A., Nguyen, D.T. 2005. The Association between Accounting and Market-Based Risk Measures. Working Paper, Department of Management Studies, University of York, York.

Van Dijk M. A. 2011. Is Size Dead? A Review of the Size- Effect in Equity Returns. Journal of Banking & Finance, 35, 3263- 3274.

Vassalou M. & Xing, Y. 2004. Default Risk in Equity Returns. The Journal of Finance 59(2), 831-868.

Zhang L. 2005. The Value Premium. Journal of Finance 60, 67-103.

Appendixes

Appendix1. Firms used in this thesis

Amer	Huhtamäki	PKC Group
Apetit	Honkarakenne	P-karjalan kirjapaino
Aspo	Ilkka	Ponsse
Aspocomp	Incap	Pöyry
Atria	Ixonos	QPR
Basware	Kemira	Raisio
Biohit	Keskisuomalainen	Ramirent
Cencorp	Kesko B	Rapala
Componenta	Kesla	Rautaruukki
Comptel	Kone B	Revenio
Cramo	Konecranes	Ruukki Group
Digia	Lassila & Tikanoja	Sagafurs
Dovre	Lemminkäinen	Sanoma
Elecster	Marimekko	Sievi
Elektrobit	Martela	Solteq
Elisa	Metso	SSH
Etteplan	Metsäboard B	Stockmann B
Exel	Neo	Stonesoft
F-secure	Nokia	Stora enso R
Finnair	Nokian Renkaat	Suominen
Finnlines	Okmetic	Takoma
Fiskars	Olvi	Talentum
Fortum	Oral	Tecnotree

Glaston	Orion	Teleste
HK	Outokumpu	Tieto
Tiimari		
Trainers house		
Tulikivi		
Turvatiimi		
UPM		
Uponor		
Vaahto Group		
Vacon		
Vaisala		
Viking Line		
Wärtsilä		
Wulff		
YIT		
Yleiselektroniikka		