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JAMES FOYE

THE RELATIONSHIP BETWEEN FINANCIAL RATIOS AND STOCK MARKET RETURNS IN THE EAST EUROPEAN MEMBERS OF THE EU

DOCTORAL DISSERTATION

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AUTHORSHIP STATEMENT

The undersigned James Foye a student at the University of Ljubljana, Faculty of Economics, (hereafter: FELU), declare that I am the author of the doctoral dissertation entitled The Relationship between financial ratios and stock market returns in the East European members of the EU, written under supervision of Dr. Dušan Mramor and co-supervision of Dr. Marko Pahor.

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Supervisor: prof. dr. Dušan Mramor

Co-supervisor: prof. dr. Marko Pahor

Member: prof. dr. Neil Garrod

Ljubljana, June 18, 2013 Author's signature: _____

THE RELATIONSHIP BETWEEN FINANCIAL RATIOS AND STOCK MARKET RETURNS IN THE EAST EUROPEAN MEMBERS OF THE EU

SUMMARY

A considerable volume of research has been conducted into both determining whether capital markets are pricing efficient and identifying factors that have an explanatory ability on returns. Despite the substantial body of literature, the issue of pricing efficiency remains highly contentious and considerable debate remains as to whether determinants of equity returns are risk factors or attributable to mispricing. This poses a series of important questions. Firstly, as to whether there is any value added through active investment management. Secondly, an inefficient capital market may have substantial corporate finance ramifications as companies' costs of capital can be distorted. Thirdly, equity pricing inefficiency may have broader implications on a nation's economic development. The issue is of particular interest for the Eastern European (EE) countries that joined the European Union (EU) in 2004[1], firstly as they made the transition from planned to market economies and secondly as the stock market has a crucial role to play in the ongoing privatisation process. Thus this doctoral dissertation analyses numerous issues surrounding the pricing efficiency of the stock markets of the countries that joined the EU in 2004.

Firstly, a literature review is presented, the chapter begins with an overview of the early research into the predictability of stock market returns. This is followed by a review of research into asset pricing models for equities. The literature review then proceeds to a summary of research into the field of capital structure theory. Then the literature concerning the relationship between accounting information and stock market returns is reviewed. Finally, the literature review provides a short overview of the stock markets of each of the EE EU nations.

Secondly, an analysis of weak form efficiency for individual stocks listed on the stock markets of Eastern Europe is conducted by applying a wide range of tests to determine whether past equity returns can be used to predict future equity returns. Four different categories of tests are applied to assess weak form market efficiency in the region: serial independence, unit root tests, multiple variance ratio tests and also controls to examine whether the results have been distorted by illiquidity. The methodology of Worthington and

[1] Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Slovakia and Slovenia

Higgs (2004) is replicated for the tests of serial independence, unit root tests and multiple variance ratio tests because of the broad range of metrics employed by the authors and the recognition it received in the literature. The tests are applied to two subperiods: pre-EU accession (1999-2003) and post-EU accession (2004-2008) in order to determine whether EU accession has effected weak form market efficiency in the region. The tests are in broad agreement: the stock markets of the Eastern European EU nations are not weak form efficient, nor have they become more efficient since EU accession.

Thirdly, a respecified Fama French (1993) factor model is proposed that incorporates a term that acts as a proxy for accounting manipulation. In line with earlier research, the Fama French (1993) model's market value of equity component performs poorly when applied to stocks listed in the EE EU. An amendment to the standard three factor model is proposed by replacing the market value of equity factor with a term that proxies for accounting manipulation. The respecided three factor model is better able to explain returns in the EE EU nations than the Fama French (1993) three factor model, hereby offering an alternative model for use in the numerous markets in which previous studies have found little correlation between market value of equity and equity returns.

Finally, the Book-Price ratio is decomposed and this dissertation proposes that the ratio may have a different meaning in the EE EU countries than it does in other markets. In line with previous studies, we find a positive relationship between book-price and returns is found. However, when the book-price ratio is decomposed into its financing and operating components the results differ substantially to the findings of Penman, Richardson and Tuna (2007) and Skogsvik, Skogsvik and Thorsel (2011). This dissertation hypothesizes that the results differ from those reported by previous research as ratios that are considered to be measures of operating risk in more established capital markets are being used as proxies for inappropriate levels of leverage in the EE EU.

The appendices contain regressions examining the relationship between financial ratios and equity returns for stocks listed on the stock markets for the EE EU nations. The ratios used are base on the work of Lev and Thiagarajan (1993), Nissim and Penman (2001) and Ou and Penman (1989). The dissertation applies a range of linear and non-linear regressions. For the dependend variables, raw equity returns, CAPM-adjusted returns and Fama French (1993) three factor model-adjusted returns are used.

Key words: accounting manipulation, book-price effect, capital structure theory, Eastern European EU nations, factor models, stock market efficiency

POVEZAVA MED FINANČNIMI KAZALCI IN DONOSNOSTMI NA DELNIŠKIH TRGIH VZHODNOEVROPSKIH ČLANIC EU

POVZETEK

Kljub številnim raziskavam o učinkovitosti trgov kapitala in faktorjev, ki pojasnjujejo gibanje donosnosti delnic, ostaja vprašanje učinkovitosti trgov kapitala odprto. Prav tako se mnenja krešejo glede faktorjev s katerimi se skuša pojasniti gibanja donosnosti delnic, saj v literaturi ne najdemo enoznačnega odgovora ali so v ozadju razlike v tveganju ali je to posledica nesposobnosti trga kapitala za pravilno ovrednotenje delnic. To odpira številna vprašanja. Prvič, ali z aktivnim upravljanjem naložb sploh lahko ustvarimo dobiček? Drugič, ali neučinkoviti trgi kapitala lahko vplivajo na poslovne finance, saj so informacije trga kapitala o strošku kapitala izkrivljene? Tretjič, neučinkovito vrednotenje delnic ima lahko tudi širše posledice na gospodarski razvoj določene države. Slednje je posebej pomembno za Vzhodnoevropske (EE) države, ki so vstopile v Evropsko unijo (EU) v letu 2004[2], prvič zato, ker so se ta gospodarstva preoblikovala v tržne ekonomije iz planskih gospodarstev in drugič zato, ker je trg kapitala igral ključno vlogo v procesu privatizacije. Pričujoča doktorska disertacija tako analizira številna vprašanja povezana z učinkovitostjo trgov kapitala v državah, ki so v letu 2004 vstopile v EU.

Najprej predstavljam pregled literature. To poglavje začenjam s pregledom raziskav o napovedovanju donosnosti delnic. Nadaljujem s pregledom modelov vrednotenja delnic. Potem predstavim teorije strukture kapitala in raziskave o povezavah med računovodskimi informacijami in donosnostjo delnic. Zaključim pa s pregledom raziskav o trgih kapitala v EE državah EU.

Nato z izvedo številnih testov, s katerimi skušam ugotoviti ali s preteklimi donosnostmi delnic lahko napovedujemo njihove prihodnje donosnosti, analiziram šibko obliko učinkovitosti za posamezne delnice na trgih kapitala EE držav EU. Uporabim štiri različne kategorije testov: test neodvisnosti časovne vrste, test korena enote, multipla razmerja varianc in kontroliram vpliv nelikvidnosti delnic. Pri testih neodvisnosti časovne vrste, korena enote in multiplih razmerij varianc uporabljam metodologijo, ki sta jo predlagala Worthington and

[2] Češka, Estonija, Madžarska, Latvija, Litva, Poljska, Slovaška in Slovenija.

Higgs (2004), saj avtorja uporabljata širok nabor merskih testov, poleg tega je njuna metodologija vsesplošno prepoznana v literaturi. Teste izvedem na dveh podobdobjih: pred vstopom v EU (1999-2003) in po vstopu v EU (2004-2008), kar mi omogoča ugotoviti ali je vstop v EU vplival na šibko učinkovitost trgov kapitala v teh državah. Rezultati testov so enoznačni: trgi kapital EE držav EU niso šibko učinkoviti in niso postali bolj učinkoviti po vstopu teh držav v EU.

Zatem, razvijem dopolnjen Fama-Frenchov faktorski model (Fama in French, 1993), ki vključuje člen, ki aproksimira računovodsko manipuliranje. V skladu z ugotovitvami obstoječih raziskav ugotovim, da Fama-Frenchov faktorski model slabo pojasnjuje gibanje donosnosti delnic v EE državah EU. Zato predlagam spremembo 3-faktorskega modela z zamenjavo faktorja tržne vrednosti s členom, ki aproksimira računovodsko manipuliranje in pokažem, da le-ta veliko bolje pojasnjuje gibanje donosnosti delnic v EE državah EU kot Fama-Frenchov faktorski model. Tako predlagam alternativni model, ki ga lahko uporabimo na številnih trgih, kjer obstaja nizka korelacija med tržno vrednostjo delnic in donosnostjo delnic.

V naslednjem delu razgradim mnogokratnik knjigovodska vrednost/cena delnice saj domnevam, da ima le-ta lahko drugačen pomen na trgih kapitala EE držav EU kot ga ima na trgih kapitala drugih držav. V skladu z ugotovitvami predhodnih raziskav, ugotovim pozitivno povezanost mnogokratnika knjigovodska vrednost /cena delnice in donosnostjo delnic. Z razčlenitvijo mnogokratnika pa pridem do drugačnih rezultatov kot Penman, Richardson in Tuna (2007) in Skogsvik, Skogsvik in Thorsel (2011). Domnevam, da se moji rezultati razlikujejo predvsem ker približki, ki naj bi merili poslovno tveganje na razvitih trgih kapitala, v EE državah EU aproksimirajo neustrezno raven zadolženosti.

Ključne besede: računovodsko manipuliranje, učinek mnogokratnika knjigovodska vrednost-cena delnice, teorija strukture kapitala, Vzhodnoevropske države EU, faktorski modeli, učinkovitost trga kapitala

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INTRODUCTION

1.1. The Predictability of Equity Returns

1.1.1. Early research into the predictability of equity returns

Since the first stock markets were established there has been considerable debate as to whether equity returns are predictable and what factors are able to explain and predict returns. Brown (1828) examined grains of pollen in water under a microscope and observed that collisions with surrounding molecules caused the grains to move in a random fashion, a discovery which became known as Brownian motion. Bachelier's (1900) PhD thesis, *The Theory of Speculation*, extended Brown's (1828) work and applied it to model stock market returns. Bachelier's (1990) mathematical modelling of stock prices effectively founded the discipline of financial economics.

> "Bachelier laid the groundwork on which latter mathematicians constructed a full-fledged theory of probability. He derived a formula that anticipated Einstein's research into the behaviour of particles subject to random shocks in space. And he developed the now universally used concept of stochastic processes, the analysis of random movements among statistical variables. Moreover, he made the first theoretical attempt to value such financial instruments as options and futures, which had active markets even in 1900. And he did all this in an effort to explain why prices in capital markets are impossible to predict! Bachelier's opening paragraphs contain observations about "fluctuations on the Exchange" that could have been written today. He recognises that market movements are difficult to explain, even after the fact, and they often generate a self-reinforcing momentum"
>
> Bernstein (2005, p18)

After analysing the performance of a number of investment managers, Cowles (1933) concluded that the investment managers lacked forecasting ability.

> "Cowles analysed the track records of four sets of forecasters: sixteen leading financial services that furbished their subscribers with selected lists of common stocks; the purchases and sales of stocks made by twenty leading fire insurance companies; a test of the Dow Theory gleaned from Hamilton's editorials in The Wall Street Journal; and the twenty-four publications that had

> set Cowles off on his quest, including sixteen professional financial services, four financial weeklies, one bank letter, and one investment-house letter….Only six of the sixteen financial services had achieved any measure of success, and even the record of the best performer "could definitely not be attributed to skill" rather than to pure chance. Performance for the group as a whole was negative relative to the performance of the market as a whole."
>
> Bernstein (2005, p34)

Cowles (1944) developed his earlier research and found that investment managers were unable to outperform the market.

> "Cowles could not leave the matter alone. In 1944, he published a new study in *Econometrica* covering 6,904 forecasts over a period of fifteen and a half years. Once again the results failed "to disclose evidence of ability to predict successfully the future course of the stock market"".
>
> Bernstein (2005, p36)

Kendall (1953) found that equity returns were essentially random. Larson (1960) applied a new technique of time series analysis and found that 80% of equity returns were normally distributed, with "fat tails" accounting for the remaining 20%.

1.1.2. The efficient market hypothesis

Fama (1965) was the first to apply the term "efficient" for security prices that reflect all available information.

> "In an influential 1965 paper entitled 'Random walks in stock market prices', Fama gave Bachelier the ideology he had lacked back in 1900. The existence of 'smart people' using information to buy and sell stocks meant that stock prices resulting from this trading didn't contain any secrets. Fama's vision – called the Efficient Market Hypothesis – was of a market where traders and investors devoured information like army ants stripping the jungle bare. Stock prices were like bones picked clean of their information"
>
> Dunbar (2001, p18)

Fama (1970) extended this work and wrote the seminal Efficient Capital Markets: A Review of Theory and Empirical Work, a paper considered to be the definitive work on the efficient market hypothesis, which is concerned with how quickly (if at all) new information is discounted into stock prices. If, as the efficient markets hypothesis proposes, new information is immdiately discounted into prices, market participants can only earn returns in excess of those of the market by assuming more risk. Fama (1970) proposed three successively more restrictive forms of pricing efficiency: weak-form, semi-strong-form and strong-form.

In weak-form efficiency, past returns are deemed to have no predictive ability on future returns i.e. equity returns no do exhibit consistent patterns. Thus, technical analysis will not be able to consistently generate excess returns. Numerous studies have refuted weak form market efficiency and shown that stock markets have a tendency to trend over time and returns are not actually random. Fama and French (1998) reported that for holding periods greater than one year stock portfolios exhibit substantial negative autocorrelation. Lo and McKinley (1988) applied the variance ratio test and rejected the presence of weak-form market efficiency. Poterba and Summers (1988) reported that stock returns exhibit positive autocorrelation in the short term and negative autocorrelation in the long term. Chopra, Lakonishok and Ritter (1992) form portfolios for five year periods, and after making adjustments for time variations in beta and for the size effect, find that extreme prior losers outperformed extreme prior winners by 5% to 10% a year, the effect was stronger for small firms than large firms. DeBondt and Thaler (1985) found that "loser" portfolios outperformed the market by 20% for the 36 month period after forming portfolios, whilst "winner" portfolios earned about 5% less than the market. In contrast, Chan et al. (1997) find that equity markets are weak form efficient.

In semi-strong-form efficiency, share prices adjust immediately to all new publically available information. Thus, semi-strong-form efficiency implies that investors cannot earn excess returns from using either technical analysis or fundamental information. Event studies, which test the market's reaction to previously unknown news, are a standard technique for testing semi-strong efficiency. Ball (1978) found that stock prices actually took some time to adjust to earnings announcements. Grossman and Stiglitz (1976, 1980) argue that because of the costs associated with obtaining and analysing information, it is actually impossible for semi-strong form efficiency to

hold. In an efficient market investors can earn different gross rates of return because they pay different costs for information. However, net of costs their abnormal returns will be equal.

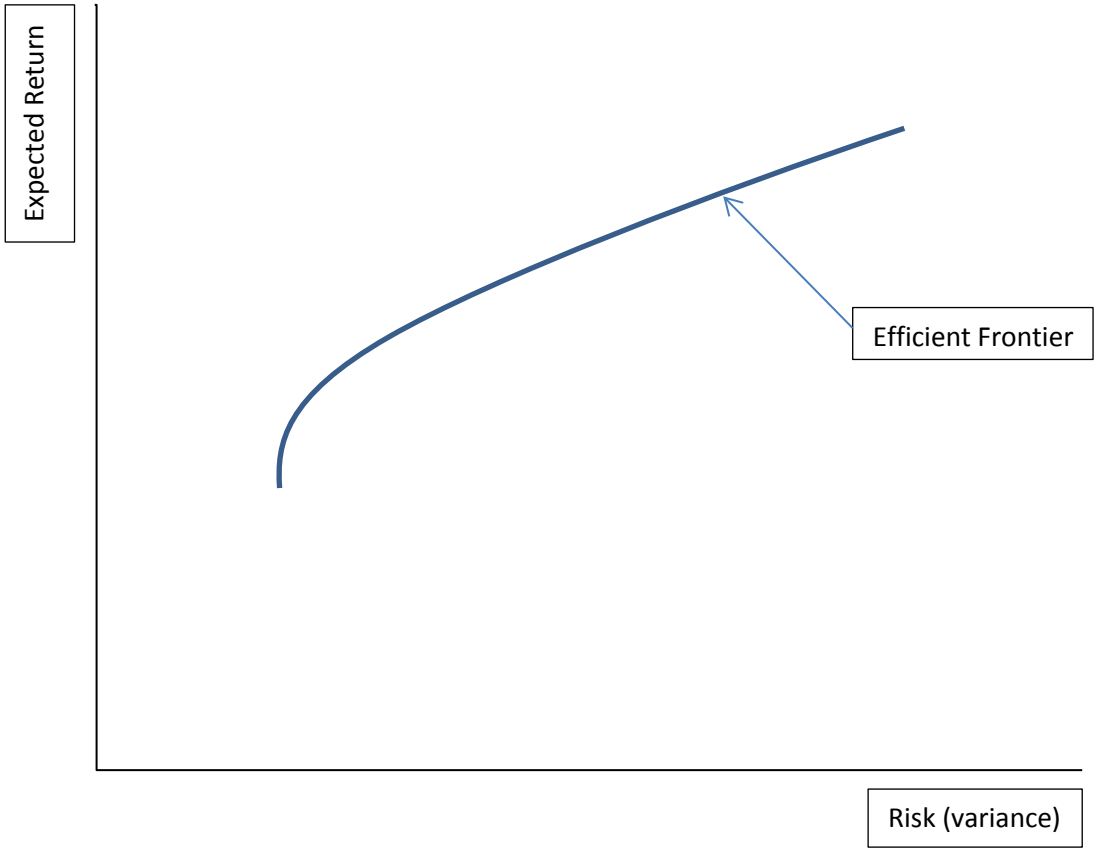
In strong-form efficiency, share prices reflect all available information, both public and private. Insider trading laws have created a legal obstacle to trading on private information.

1.2. Asset Pricing Models

1.2.1. Mean variance

By defining risk as variance in equity returns, Markowitz (1952, 1959) quantified the intuitive relationship between risk and return. Under Markowitz's framework, portfolio return and risk is determined by the expected return and variance on individual securities and the covariance of returns. This work founded modern portfolio theory (MPT) under which portfolio selection is determined by optimisation i.e. either minimising risk for a given return or maximising return for a given risk.

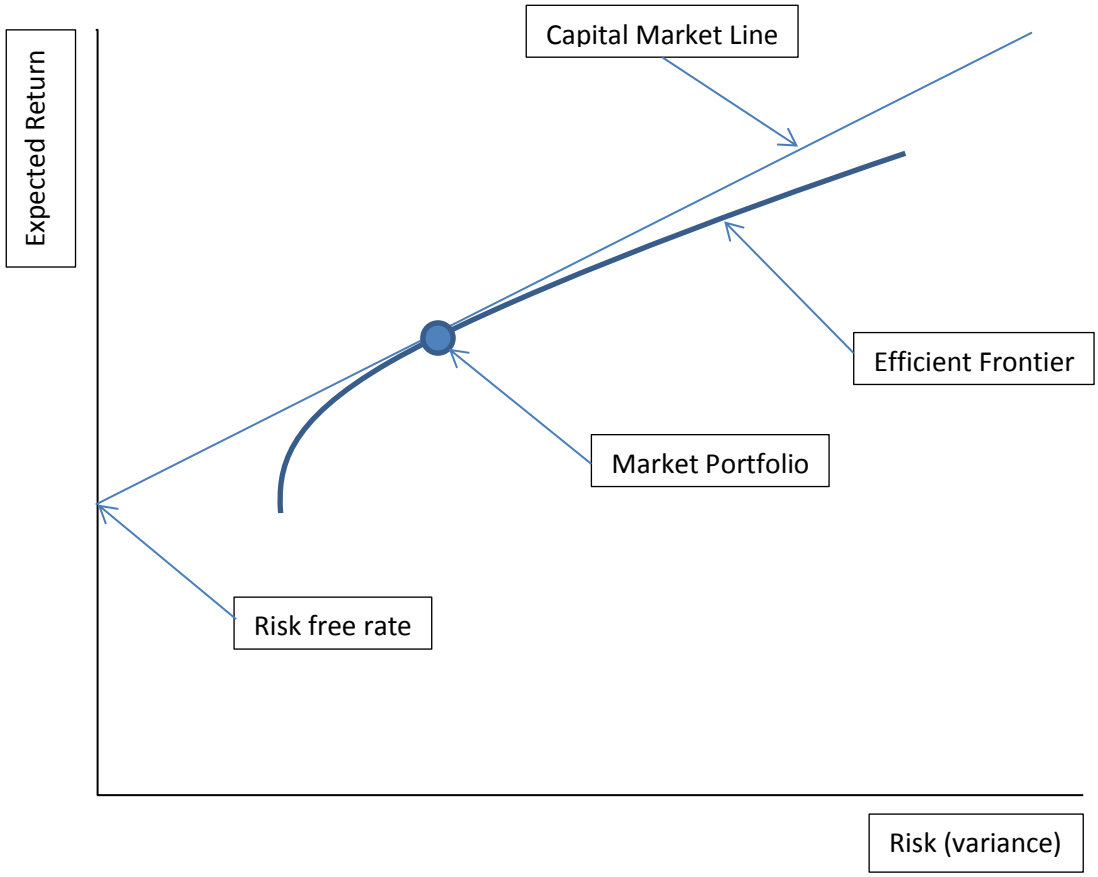
Figure 1: The Efficient Frontier



A portfolio is considered to be efficient if it has the highest possible expected return for its risk level, such portfolios lie on the efficient frontier. Given the estimates of expected return, variance and the covariance matrix for a portfolio of stocks Markowitz's mean-variance efficiency offers an exact portfolio allocation.

> "The most famous insight in the history of modern finance and investment appeared in a short paper titled 'Portfolio Selection'. It was published in the March 1952 issue of the Journal of Finance, the only journal then in existence for scholars in the field. Its author was an unknown 25-year-old graduate student from the University of Chicago named Harry Markowitz"
>
> Bernstein (2005, p41)

Figure 2: Separation Theorem



Tobin (1958) further developed the concept of portfolio selection by proposing the Separation Theorem. Tobin's insight was that every investor should hold the same portfolio of shares (the market portfolio) regardless of their level of risk tolerance. Different risk tolerances are accommodated for by varying the proportion invested in stocks and risk free assets.

Tobin showed that by incorporating the risk free rate and leverage into Markowitz's work, portfolio section is merely a question of investing in the market portfolio and lending at the risk free rate (for risk averse investors) and borrowing at the risk free rate (for risk seeking investors) and all investors holding a portfolio on the capital market line. The risk free is normally considered to be the return on government bonds. Although the assumption that investors can all borrow and lend at the risk free rate is obviously unrealistic, the idea of combining Markowitz's efficient portfolio with a risk free asset provided an important foundation for future advancements in the field.

1.2.2. The Capital Asset Pricing model

Treynor (1961, 1962), Sharpe (1964), Lintner (1965 a, b) and Mossin (1966) all independently developed the Capital Asset Pricing Model (CAPM). CAPM posits that excess return (defined as return over the risk free rate) is determined by the stock's sensitivity to the market:

$$\boldsymbol{E(R_i) = rf + \beta_i(E(R_m) - rf)} \qquad \textbf{(1)}$$

Where:

$$\boldsymbol{\beta_i = \frac{Cov(R_i, R_m)}{Var(R_m)}} \qquad \textbf{(2)}$$

Where:

$E(R_i)$=return on security i

$E(R_m)$=return on the market

rf=risk free rate

Var=variance

Cov=covariance

Thus, according to CAPM, the return on a security is a linear function of its covariance with the market.

> "One of Markowitz's students, William Sharpe, made the problem [of computing a mean variance efficient portfolio given the information technology available at the time] a lot easier by showing that one could focus on a stock's correlation with the index (such as the Dow Jones Industrial Average) rather than with each other individual stock in a portfolio. With this information, Sharpe could then ask if a particular stock was under- or over-valued. Sharpe's technique became known as the Capital Asset Pricing Model (CAPM)"
>
> Dunbar (2001, p17)

Roll (1977) questioned whether CAPM could truly be tested empirically because of difficulties in defining what the market portfolio should be.

1.2.3. Arbitrage Pricing Theory

Arbitrage pricing theory (APT) proposes that the expected return on an asset can be explained by a model incorporating a range of variales considered to have explanatory ability on returns. Ross (1976) APT to build on CAPM and offers a model with greater explanatory ability on equity returns than CAPM.

$$\boldsymbol{E(R_i)} = \propto_i + \sum_{k=1}^{k} \boldsymbol{\beta_{ik} f_k} + \boldsymbol{\varepsilon_i} \qquad \textbf{(3)}$$

Where:

f_k= the factors

β_{ik}= factor loadings of asset I to factor f_k

ε_i = residuals or unsystematic risk

The factors would be expected to have a pervasive influence on the market. However, an obvious limitation of APT is that it doesn't specify what the factors are or how many of them there should be.

1.2.4. Anomalies

Following the development of CAPM, a number of empirical results inconsistent with the model were documented, these became known as anomalies. A wide range of anomalies have been reported.

1.2.4.1. Calendar Anomalies

Keim (1983) and Reinganum (1983) both report that the majority of the outperformance of small capitalisation stocks over returns predicted by CAPM occurs during the first two weeks of the year. These findings prompted speculation that there may be a turn-of-the-year anomaly. Roll (1983) proposed that as small capitalisation stocks tend to be more volatile, the turn-of-the-year anomaly may be attributable to investors selling off in December to realise income tax losses and then repurchase the shares in January.

French (1980) reported that there may be a weekend anomaly as average returns for the Standard and Poor's Composite were consistently negative over weekends. Schwert (1990) and Keim and Stambaugh (1984) report similar findings.

1.2.4.2. Momentum Anomaly

DeBondt and Thaler (1985) report that previous losers (stocks with low returns in past years) have higher returns than previous winners (stocks with high returns in past years). In contrast, Jagedeesh and Titman (1993) found that previous winners (stocks with high returns in the past year) outperformed previous losers (stocks with low returns in the past year).

1.2.4.3. Size Anomaly

This refers to the differences in returns between a portfolio of small market capitalisation stocks and a portfolio of large market capitalisation stocks. Banz (1981) was the first to document the size anomaly, he found that stocks of small companies outperformed their larger peers even after using CAPM to adjust for risk. Banz (1981) found that smaller companies listed in the USA outperformed larger companies by 4% on a compound basis over 53 years. Reinganum (1981) used a broader sample and split the stocks into decile portfolios and reported similar results to Banz (1981). These findings apparently contradict the efficient market hypothesis because although small companies can have greater earnings prospects than large companies, there should be no difference in returns because that information should already be discounted into the share price. If it would be possible to earn superior returns by buying shares in companies with good earnings growth prospects, investors would push up share prices of these companies until their performance was fair relative to other companies.

Stoll and Whaley (1983) found that investors could not profitably exploit the size effect after considering transaction costs. Shares of small companies are often subject to higher direct transaction costs (commission) and higher indirect transaction costs (bid-ask spread). Investors trading in small stocks incur higher transaction costs and hence the difference between their net and gross returns is much higher than for investors in stocks of large companies. Amihud and

Mendelson (1986) argue that the size effect exists because of the illiquidity and higher transaction costs associated with smaller firms.

Merton (1987) proposed that if investors buy stocks of companies they know about and avoid stocks in companies which they have little information, the latter will tend to have higher returns.

1.2.4.4. Value Anomaly

Since the publication of Graham and Dodd's (1934) *Security Analysis*, a school of thought amongst academics and investors has developed based on the premise that value investments (stocks with low prices relative to some fundamental measure) outperform both the market and growth investments (stocks with high prices relative to some fundamental measure).

Basu (1977) found that stocks with high earnings-price ratios (value stocks) had higher returns than stocks with low earnings-price ratios (growth stocks) despite adjusting for risk using CAPM. While financial markets practitioners often view the earning-price ratio as a natural indicator of value, the book-price ratio has received more attention in the academic literature. This may be due to Fama French's (1992) finding that book-price absorbs the ability of earnings-price to explain returns (Rytchkov (2011)). Stattman (1980) and Rosenburg (1985) both documented the tendency of stocks with high book-price ratios (value stocks) to outperform stocks with low book-price (growth stocks).

1.2.5. Fama French Three Factor Model

Fama French (1993) incorporated the size and value anomalies into CAPM and proposed a three factor model:

$$\boldsymbol{E(R_i) = rf + \beta_i(E(R_m) - rf) + sSMB + hHML} \qquad \textbf{(4)}$$

Where:

SMB = Small Minus Big = excess returns of portfolios formed from small stocks over portfolios from large stocks

HML = High Minus Low = excess returns of portfolios formed from high book-price stocks over portfolios formed from low book-price stocks

Fama French (1993) report that their three factor model has substantially better explanatory ability on returns than CAPM. Black (1993) and MacKinlay (1995) questioned whether the size effect and book-price factors hold in general or if the significance is merely sample specific. In response, Fama and French (1998) applied their earlier work to a global dataset consisting of 13 developed markets and 16 emerging markets. In the emerging markets Fama and French found that, while the significance of the size effect diminishes, there is still a significant relationship between book-price and returns. Claessens, Dasgupta and Glen (1993, 1995, 1998) conducted a number of studies into stock market returns in emerging markets and also report that while book-price still has explanatory ability, the market value of equity component has less explanatory power in emerging markets than it has in developed capital markets.

1.2.6. Risk or Mispricing: The Joint Hypothesis Problem

The joint hypothesis problem refers to the fact that any test of market efficiency is also a test of the equilibrium model used (such as CAPM or Fama French (1993) three factor model). The findings can be viewed as being consistent with an efficient market – i.e. in the Fama French (1993) model market value and equity and book-price represent risk factors. Alternatively, the findings can be viewed as being consistent with an inefficient market – i.e. market value of equity and book-price effects represent the market's inefficient pricing of small, growth and value stocks. Hence, although subsequent research was in broad agreement that the Fama French (1993) model does have better explanatory ability than CAPM, there is considerable debate as whether to consider HML and SMB as risk factors or attributable to mispricing.

Fama French (1993) themselves believe HML and SMB to be risk factors omitted from CAPM. Fama and French (1995) find that higher book-price stocks tend to have persistently poor earnings, with the opposite being true for low book-price stocks; thus interpreting book-price as a risk factor associated with default risk. Vassalou and

Xing (2004) also report that companies with higher default risks earn higher returns only if they have high book-price ratios.

In contrast, Lakonishok, Shleifer and Vishney (1994) argue that market participants are overly optimistic about growth stocks and overly pessimistic about value stocks. The eventually corrections of these two mispricings leads to the underperformance of growth and outperformance of value stocks. Similarly, Daniel and Titman (1997) argue that firms with lower book-price ratios have lower expected returns after adjusting for risk.

1.3. Research into Capital structure

1.3.1. Modigliani and Miller

Modigliani and Milller (1958) proposed that a firm's operations and not its capital structure determined its value. Proposition I holds under a number of restrictions, one of which is the absence of corporation tax. Modigliani and Milller (1963) later incorporated corporation tax into their work in Proposal II. Modigliani and Milller argue that the tax deductibility of interest payments creates a tax shield and thus a company can add value by increasing leverage. Proposition II takes the following form:

$$\boldsymbol{E(R_i) = E(RU_i) + \big(E(RU_i) - E(RD_i)\big)D_i/E_i} \qquad \textbf{(5)}$$

Where:

$E(RU_i)$=Expected return on company i if it had no debt (unlevered return on equity)

$E(RD_i)$=Cost of debt

D_i/E_i=Ratio of debt to equity

Assuming that the unlevered cost of equity is greater than the cost of debt, a company's return on equity increases in proportion to its leverage, reflecting the greater risk associated with companies with more leverage.

1.3.2. Trade Off Theory

Under Modigliani and Milller (1963) the tax shield effect means that the optimal capital structure is 100% debt. To avoid this extreme, Kraus and Litzenberger (1963) proposed trade off theory, in which Proposal II's benefit of increasing leverage is balanced with the increasing probability of bankruptcy. This work was expanded in order to incorporate non-bankruptcy costs of debt. Jensen and Meckling (1976) consider agency costs and argue that directors are incentivised to maximise equity value rather than total firm value. Similarly, Myers (1977) proposed that directors of highly geared companies are incentivised to forgo potentially profitable projects if the profits accrue only to bondholders. Jensen (1986) furthered the agency costs argument by making the point that leverage exerts discipline on a company's management.

1.3.3. Pecking Order Theory

Pecking order theory is based on the concept of asymmetry of information between company insiders and outsiders and the associated adverse selection problems that arise because of this. Managers inevitably have superior information to firm outsiders and thus the form of financing chosen by managers can give outsiders insight into what the true value of the firm is and what growth prospects it has.

Myers (1984) proposes that if management chooses to finance the company by issuing new equity, this may send a signal that the company's insiders think that it is overvalued. The findings of Krasker's (1986) work support Myers's theory.

1.3.4. Market Timing Theory

Baker and Wurgler (2002) contend that neither pecking order theory not trade off theory take into consideration the effect of stock market conditions on firms' capital structure choices. They argue that firms issue equity when managers view stock market conditions as being favourable. Alti (2006), Kayhan and Titman (1997) and Leary and Roberts (2005) all argue that stock market conditions play an important role in mangers' capital structure decisions.

1.3.5. International Evidence on Capital Structure

Numerous studies have reported international differences in capital structure based on legal systems and the level of financial market development (e.g. Demirgüc-Kunt and Maksimovic (1999), Claessnes and Klapper (2005) and La Porta et al. (1997, 2000).

1.4. Research Into The Relationship Between Accounting Information and Stock Market Returns

1.4.1. Event Studies

Event studies are a technique employed to test the efficient market hypothesis by examining how a stock responds to new information, for example an earnings surprise. In an efficient market, the stock price should adjust immediately to the new information and few, if any, market participants are able to profit by trading on the announcement. Event study methodology has to take into consideration isolating the impact of one event so the results are not distorted by other factors affecting a stock's return. Returns also must be risk adjusted.

Early research in the field focussed on earnings, the works of Ball and Brown (1968) and Beaver (1968) are the totemic founders the research between capital market behaviour and financial statements. Both studies report that there is a significant positive relationship between changes in earnings and stock returns. When Ball and Brown extended their study to test whether reaction to good and bad news was immediate they found that the market actually takes a number of months to adjust, inferring that the market's reaction to earnings announcements is anomalous. Frankel and Lee (1998) conclude that "price convergence to value is a much slower process than prior evidence suggests". Kormendi and Lipe (1987) examine the magnitude of the relationship between earnings and returns known as earnings response coefficients. They tested whether estimated earnings response coefficients are related to the time-series properties of accounting earnings and that found earnings response coefficients rise with the persistence of the time-series property of earnings. Easton and Zmijewski (1989) and Collins and Kothari (1989) also conducted studies into earnings response coefficients and reported similar results.

There is also a body of research that examines how the relationship between accounting information and equity returns has evolved over time. For example, Francis and Schipper (1999), Lev and Zarowin (1999), Ely and Waymire (1999) and

Dechow and Schrand (2004) all conclude that earnings increasingly have less impact on stock market returns over time. Beaver, McNicholas and Rhie (2005) find that while there has been a small decline in the predictive ability of financial ratios this has been offset by an increase in the significance of market-based ratios.

1.4.2. Accruals and Cash Flows

A number of studies have found a negative relationship between accounting accruals (the non-cash part of earnings) and future equity returns. A company's income statement is prepared using accrual accounting, under which revenue is recognised when it is earned and expenses are recognised in the period when they were incurred. In contrast, in the cash flow statement companies record transactions only at the time they receive cash and record expenses only at the time they pay out cash. Research into the relationship between accruals and cash flows and the effect on equity returns has led to suggestions of an accrual anomaly.

Sloan (1996) first documented the accrual anomaly when he found that investors "fixate" on earnings. The research also reported that investors failed to fully distinguish the differences between the accrual and cash flow components of earnings. Bradshaw, Richardson and Sloan (2001) examined whether sell-side analysts and auditors use information in accruals. The research found that sell-side analysts' forecasts for firms with high accruals tended to be too optimistic. Despite the link between high accruals and overstated earnings, the research also found no evidence of a higher incidence of auditors issuing a qualified audit opinion for firms with high accruals. Lev and Nissim (2006) found that although some institutional investors trade on the accrual anomaly, the trades were rather small. Ali, Chen, Yao and Yu (2008) suggest that some mutual funds have profitably exploited the anomaly. Collins, Gong and Hribar (2003) found that stocks with high levels of institutional ownership are more likely to have stock prices that reflect the persistence of accruals. Leippold and Lohre (2010) and Pincus, Rajgopal and Venkatachalam (2007) find that the accrual anomaly exists internationally.

1.5. Capital Markets of the European Union Accession Countries

1.5.1. Czech Republic

The Prague Stock Exchange started trading in 1993. In 2010 the CEE Stock Exchange Group – comprised of the stock exchanges of Budapest, Ljubljana, Prague and Vienna – was formed which made the Prague Stock Exchange part of the largest trading platform in Central and Eastern Europe.

1.5.2. Estonia

The Tallinn stock exchange opened in 1996 and was bought out by the Helsinki Stock Exchange in 2001. The Tallinn stock exchange is now wholly owned by NASDAQ OMX. The Tallinn Stock Exchange has the same trading system, rules and market practices as the stock exchanges of Latvia and Lithuania (which are also part of NASDAQ OMX).

1.5.3. Hungary

The Budapest Stock Exchange was reopened in 1990. In 2010 the CEE Stock Exchange Group – comprised of the stock exchanges of Budapest, Ljubljana, Prague and Vienna – was formed which made the Budapest Stock Exchange part of the largest trading platform in Central and Eastern Europe.

1.1.1. Latvia

The NASDAQ OMX Riga (formerly the Riga Stock Exchange) is 92.8% owned by OMX. The NASDAQ OMX Riga has the same trading system, rules and market practices as the stock exchanges of Estonia and Lithuania (which are also part of NASDAQ OMX).

1.5.4. Lithuania

The NASDAQ OMX Vilnius (formerly the Vilnius Stock Exchange) was founded in 1993. As part of the NASDAQ OMX Baltic system, the NASDAQ OMX Riga has the same trading system, rules and market practices as the stock exchanges of Estonia and Lithuania (which are also part of NASDAQ OMX).

1.5.5. Poland

The Warsaw stared trading in 1991. The exchange has a substantially larger number of listings than any of the other Eastern European EU nations. Furthermore, the exchange has also attracted IPOs of large companies from other Eastern European nations, such as the ČEZ from the Czech Republic, Kernel from Ukraine and MOL from Hungary.

1.5.6. Slovakia

The Bratislava Stock Exchange began trading in 1991. The Bratislava Stock Exchange is predominantly focused on debt securities, with bond transactions accounting for the vast majority of trades made on the exchange; for example, in 2009 bond transactions generated 98.7% of the total value of trades made on the exchange.

1.5.7. Slovenia

The Ljubljana Stock Exchange was established in 1989 and electronic trading began in 1993. In 2008, the Vienna Stock Exchange became the majority owner of the Ljubljana Stock Exchange. In 2010 the CEE Stock Exchange Group – comprised of the stock exchanges of Budapest, Ljubljana, Prague and Vienna – was formed which made the Ljubljana Stock Exchange part of the largest trading platform in Central and Eastern Europe.

1.2. Purposes and Goals

Considering the ongoing debate into the pricing efficiency of stock markets and what factors explains equity returns along with the continuing EU enlargement process, the purpose of this dissertation is to investigate these issues in the capital markets of the EE EU nations. As formerly centrally planned economies, the EE EU nations began the transition process with the establishment (in some cases re-establishment) of stock markets and initiating privatisation programmes. The crucial role of the stock market in the transition process and the growing number of listed companies in the region means that there is a need to establish the extent to which the region's stock markets are pricing efficient and determine what factors affect stock returns. The first purpose of this dissertation is to examine weak-form market efficiency in the EE EU nations, failure to conform with the least stringent form of market efficiency would provide strong evidence that the region's stock markets are inefficient. Secondly, the dissertation examines whether the widely used Fama French (1993) model has explanatory ability on returns for equities listed on the region's stock markets. This dissertation then propose an alternative factor model which incorporates a term to proxy for accounting manipulation. Thirdly, the dissertation investigates the book-price ratio- one of the factors in the Fama French (1993) model – and decompose it into its financing and operating components in order to determine whether the ratio has the same meaning in the EE EU.

The issue of weak-form efficiency in the EE EU has been addressed in the literature (for example, Chun(2000), Dezelan (2000),Gilmore and McManus (2001), Gordon and Rittenberg (1995), Jagric et al (2005), Mihailov and Linowski (2002), Nivet (1997) and Worthington and Higgs (2004)). However, none of these studies incorporate liquidity controls. This dissertation incorporates liquidity controls as it is quite possible that illiquid shares exhibit properties consistent with weak form inefficiency; weak-form efficiency tests, especially those in emerging markets, need to incorporate liquidity controls in order to ensure that the results are not distorted by apparently predictable returns from infrequently traded securities. This is an omission in the studies listed above that reduces the robustness of their results. Testing whether the results have been distorted by illiquidity both extends previous work and also serves to verify this dissertation's results. A further contribution this part of the dissertation makes is testing whether EU accession has had any impact on weak-form market efficiency in the region. Thus this dissertation also provides an important test of whether weak form market efficiency has

evolved over time in the region. In addition to this, this dissertation provides an important verification of previous work into weak-from market efficiency, much of which examined weak-form market efficiency in the EE EU nations has been based on stock market indices rather than individual stocks: previously reported findings that the stock markets are inefficient may be due to only a small proportion of the indices' constituents or simply the manner in which the indices are constructed. By using individual stocks, our work provides an important validation of previous work. Furthermore, using individual stocks provides a broader view than using indices alone and may help to provide insight into the underlying causes of the inefficiency.

The aim of chapter three of the dissertation is to apply the Fama French (1993) model to stocks listed in the EE EU in order to determine what factors have explanatory ability on returns of stocks listed in the region. Fama and French (1998) applied their earlier work to a global dataset consisting of 13 developed markets and 16 emerging markets. In the emerging markets Fama and French (1998) found that, while the significance of the size effect diminishes, there is still a significant relationship between book-price and returns. Claessens, Dasgupta and Glen (1993, 1995, 1998) conducted a number of studies into stock market returns in emerging markets and also report that market value of equity has less explanatory power in emerging markets than it has in developed capital markets. Because of the findings of previous research, it is hypothesised that market value of equity will also perform poorly for stocks listed in the EE EU. Thus, this dissertation proposes an alternative to ME for use in markets where market value of equity has been shown to have a poor explanatory ability on returns. As Fama French (1992a) find that BE/ME is related to companies' relative levels of profitability, a measure of the quality of that profitability is a logical alternative to the market value of equity factor. A substantial body of literature exists regarding earnings quality and accruals with authors such as Healy (1985), DeAngelo (1986), Jones (1991) and Dechow, Sloan and Sweeney (1995) all concluding that accruals are more susceptible to earnings manipulation than cash from operations. Furthermore, there may be some region-specific aspects to the issue as Ahmed (2009), Capkun et al. (2008), Garrod, Kosi and Valentincic (2008), Kosi and Valentincic (2011), Vellam (2004) and Welc (2011) all report differences in earnings management practices between pre- and post-2004 EU members. Because of these findings, it is logical to propose an alternative model based on net income to cash flow from operations, a ratio commonly used as a rule of thumb test for accounting manipulation.

Having examined the market value of equity component of Fama French (1993) model, the logical next step is to look at the book-price part of the model. Penman, Richardson, and Tuna (2007) decompose the ratio into operating and financing risk components. Penman, Richardson, and Tuna (2007) report some puzzling results, while book-price's operating risk component is positively related to returns, the leverage risk component is negatively related to returns. This contradicts finance theory, particularly Modigliani and Miller (1958) Proposition 1, which states that there should be a positive relationship between cost of equity and leverage. Skogsvik, Skogsvik, and Tuna (2011) extend Penman, Richardson, and Tuna's (2007) work in order to further investigate this apparently anomalous finding. Skogsvik, Skogsvik, and Tuna (2011) proposed that financial leverage has a twofold effect on returns; firstly, a compounding operating risk effect which Skogsvik, Skogsvik, and Tuna (2011) capture by multiplying financial leverage by firms' operating leverage (positively related to returns); secondly, an interest cost effect of debt (negatively related to returns). Furthermore, there may also be a regional aspect to financial leverage as numerous studies have reported that the capital structure of firms listed in the EE EU nations does not conform with modern capital structure theory (e.g. Črnigoj and Mramor (2009), Haas and Peeters (2006), Mramor and Valentincic (2001) and Nivorozhkin (2004)). These regional differences in reasons for choosing a particular capital structure may well effect the relationship between financial leverage and equity returns. This dissertation hypothesises that the financing component of book-price is affected by regional differences for choosing a particular level of gearing. Furthermore, this dissertation proposes that while the book component of book-price may not be affected by the proportion of debt to equity, the price component of the ratio will reflect the market's perception of the level of leverage employed.

2. THE PERSISTENCE OF PRICING INEFFICIENCIES IN THE STOCK MARKETS OF THE EASTERN EUROPEAN EU NATIONS[3]

2.1. Abstract

The early years of stock markets in the Eastern European EU nations were predictably characterized by a lack of pricing efficiency, however most studies expected this to improve over time. We apply a range of metrics to test for the presence of weak form market efficiency in the Eastern European countries that joined the EU in May 2004, we test both the years prior to accession and years following accession. The results from our tests indicate that, despite the expectations of many previous studies, even after entering the EU, the stock markets of these countries still do not conform to even the loosest form of market efficiency despite the passage of almost a generation since their inception. Furthermore, we substantially improve and extend previous studies by incorporating liquidity controls, applying a wider range of methodology and by using individual stocks rather than indices.

2.2. Introduction

The debate over stock market efficiency is one of the central tenets of capital market theory. The issue is particularly pertinent for the Eastern European nations that joined the European Union in 2004[4] (hereafter the EE EU nations) because of the stock market's role in the ongoing privatization process and also as it serves as an important barometer with which to measure the progress made by these countries in the transition from planned to market economies. In this paper we examine weak form market efficiency (WFME) as defined by Fama (1970) which, as the loosest form of market efficiency, requires nothing more than current period returns "fully reflect" earlier period returns and thus successive price movements are independent of each other: failure to conform to WFME means that stronger forms of efficiency are not present and the stock market's pricing can be considered inefficient.

A significant body of research into WFME in the EE EU nations exists. Jagric et al (2005) test for WFME in the Central and Eastern European region, the authors found that the stock market indices of Czech Republic, Hungary, Russia and Slovenia all exhibited

[3] Co-authored with Dušan Mramor and Marko Pahor

[4] These are the transition nations that joined the EU on 1st May 2004, namely Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Slovakia and Slovenia

weak form inefficiencies in the form of long memory in stock returns. Worthington and Higgs (2004) examined WFME in both developed and emerging stock markets in Europe, of the emerging markets covered (Czech Republic, Hungary, Poland and Russia) only the Hungarian stock market could be considered weak form efficient. Gilmoore and McManus (2001) applied a range of WFME tests to the larger EE EU economies (Czech Republic, Hungary and Poland) over the period 1990 to 2000 and found that significant weak form inefficiencies exist in the stock exchanges of all three countries. Chun (2000) reported that while the Hungarian market may be weak-form efficient, the stock markets of the Czech Republic and Poland were inefficient. Nivet (1997) and Gordon and Rittenberg (1995) also found that the Polish stock market could not be considered weak form efficient. Ahmed, Rosser and Uppal (2010) found strong evidence of nonlinear speculative bubbles in Czech Republic, Hungary and Poland. Mihailov and Linowski (2002) and Dezelan (2000) find evidence of weak-form inefficiency in the Latvian and Slovenian stock markets respectively.

We further the above studies in a number of ways. Firstly, we incorporate liquidity controls into our work. It is quite possible that illiquid shares exhibit properties consistent with weak form inefficiency; WFME tests, especially those in emerging markets, need to incorporate liquidity controls in order to ensure that the results are not distorted by apparently predictable returns from infrequently traded securities. In our view this is an omission in the studies listed above that reduces the robustness of results. Indeed, Benic and Franic (2008) found a substantial level of illiquidity in the stock markets for Central and Eastern Europe. Secondly, we include all eight transition countries that acceded to the EU in 2004, while the studies listed above include between one and five of the countries: by considering the region in its entirety, we are able to ascertain a broader and more complete perspective of WFME in the EE EU nations. Thirdly, Jagric, Podobnik and Kolanovics's (2005) dataset ends in 2004, the datasets in the other papers cited end before this year. In contrast, our dataset starts in 1999 and runs to the end of 2008. Fourthly, much of the previous work examining WFME in the EE EU nations has been based on stock market indices rather than individual stocks: previously reported findings that the stock markets are inefficient may be due to only a small proportion of the indices' constituents or simply the manner in which the indices are constructed. By using individual stocks, our work provides an important validation of previous work. Furthermore, using individual stocks provides a broader view than using indices alone

and may help to provide insight into the underlying causes of the inefficiency. Finally, we use the same metrics as Worthington and Higgs (2004), this is a much broader range than the other cited papers use: our wider range of tests allows us to cross check and validate our results. Therefore, the results from our work further the existing literature by providing a post-EU accession comparison.

While the majority of early studies found that returns on the newly-created stock exchanges of the EE EU nations did not conform to WFME, many expected these inefficiencies to disappear over time. Wheeler et al (2002) studied the Warsaw Stock Exchange during its first five years of operation; the authors expected the exchange to become more efficient over time, citing increasing experience of market participants, more sessions per week, more brokers offering better research, and better investor relations departments. Rockinger and Urga (2001) surmised that their finding that the Hungarian market had a lower level of predictability than the markets of Czech Republic, Poland and Russia was partly due to the fact that the Budapest Stock Exchange had operated for a longer period of time. Again, suggesting that the stock markets of the EE EU nations should become more efficient simply due to the passage of time. Moor and Wang (2007) examined the volatility levels on the stock markets of the Czech Republic, Hungary, Poland, Slovenia and Slovakia and concluded that volatility declined as the nations moved into the EU. Worthington and Higgs (2004) hypothesised that there may be a link between the absence of WFME and the small size of some stock markets in the EE EU; this implies pricing efficiency will improve with the growth of these markets. Jagric et al (2005) also proposed a tentative link between a stock market's size and its pricing efficiency. From a macroeconomic perspective, Claessens et al (2000) suggested that EU integration will drive the development process in the EU transition countries. Rapacki and Prochniak (2009) and Vojinovic, Oplotnik and Prochiniak (2010) examined real beta and sigma convergence in the EE EU nations during the process of EU accession, an important extension of this work is to question whether nations' stock markets are also converging as authors such as Csaba (2011, p11) report that "financial institutions play a pre-eminent role in all phases of transformation".

We test WFME in the EE EU nations over periods 1.1.1999 to 31.12.2003 and 1.1.2004 to 31.12.2008 to determine whether the increasing experience of market participants over time, EU accession and the increasing number of stocks listed, larger market capitalisations and increased turnover in the region has caused markets to become more

efficient. Contrary to the expectations of the majority of studies listed above, our tests are all in broad agreement that the equity markets of the EE EU nations do not conform with WFME and this situation has not been substantially affected by accession to the EU. Therefore, none of the factors that previous researchers expected to become catalyst to drive the markets towards higher efficiency have materialized. Despite the passage of almost a generation since the creation of the EE EU stock markets, a significantly larger number of listed securities and 5 years since EU accession, these markets still cannot be considered to conform to WFME: these results pose the question of what changes are needed to improve efficiency of financial markets in these countries or whether these stock exchanges will ever attain pricing efficiency.

2.3. Dataset

Our dataset consists of stocks included in the Dow Jones Stoxx EU Enlarged Total Market index, using data obtained from Bloomberg. This is a free-float capitalization-weighted index covering the countries have joined the EU since 2004. We excluded stocks from Bulgaria and Romania as the paper is concerned with the countries that joined the EU in 2004. We excluded stocks from Cyprus and Malta as we are only investigating transition countries. Our dataset covers the period from the 1st January 1999 to 31st December 2008, split into subperiods 1st January 1999 to 31st December 3003 (pre-accession) and 1st January 2004 to 31st December 2008 (post-accession). The reason for the use of subperiods lies in the broader range of methodology employed, such as liquidity controls and the use of individual stocks rather than indices, that does not allow direct comparison of our post accession results with previous studies. Although 1st May was the actual accession date, the effects of accession were earlier – this is the reason why we include the entirety of 2004 in our dataset. We did not extend our dataset past 2008 because of the collapse in financial markets. Indeed, Šonje, Alajbeg and Bubas (2011) found that the financial crisis substantially affected their tests of market efficiency on the Zagreb Stock Exchange.

We use daily Bloomberg last prices and log returns calculated as:

$$\Delta \boldsymbol{y_{it}} = \mathbf{log}(\boldsymbol{y_{it}}) - \mathbf{log}(\boldsymbol{y_{it-1}}) \qquad \textbf{(6)}$$

Where:

y_{it} = price of stock i at time t

The descriptive statistics for the two datasets are shown in Table 1.

Table 1: Descriptive Statistics

	Number of Stocks		Mean		Standard Deviation		Skewness		Kurtosis		Jarque -Bera		Jarque -Bera P Value	
	1999-2003	2004-2008	1999-2003	2004-2008	1999-2003	2004-2008	1999-2003	2004-2008	1999-2003	2004-2008	1999-2003	2004-2008	1999-2003	2004-2008
Entire Region	97	151	0,05%	-0,03%	3,31%	2,64%	-0,01	0,01	34,07	13,27	401.433	14.812	0,00	0,00
Czech Republic	5	7	0,05%	0,00%	2,33%	2,25%	-0,36	-0,61	10,28	15,45	3.443	7.750	0,00	0,00
Estonia	5	8	0,08%	-0,16%	5,05%	2,73%	-4,17	-0,51	141,87	10,67	2.620.152	4.281	0,00	0,00
Hungary	8	8	0,00%	0,02%	2,43%	2,41%	0,06	-0,02	9,58	8,93	7.757	2.077	0,05	0,00
Lithuania	10	10	0,17%	0,01%	6,60%	2,42%	1,94	-0,46	89,32	12,81	992.034	5.575	0,00	0,00
Latvia	1	1	0,04%	-0,05%	2,77%	2,24%	0,17	0,36	8,43	15,21	1.500	7.636	0,00	0,00
Poland	55	102	0,03%	-0,02%	3,14%	2,79%	0,03	0,10	20,43	13,21	252.419	16.014	0,00	0,00
Slovakia	1	1	0,08%	0,06%	3,90%	1,81%	-2,38	-0,44	25,08	13,92	14.601	5.511	0,00	0,00
Slovenia	12	14	0,08%	-0,05%	1,60%	2,09%	0,19	0,37	34,74	16,69	161.628	30.662	0,00	0,00

Our dataset is based on stocks in the Dow Jones Stoxx EU Enlarged Total Market index, we only use the transition countries that joined the EU on 1st May 2004.

All calculations are based on daily stock returns calculated on natural logarithms of Bloomberg last prices in local currencies.

Mean is calculated as an arithmetic mean calculated for stocks on an individual basis and then equally weighted for the entire region/individual exchanges

Standard deviation, skewness and kurtosis are calculated on daily returns equally weighted for the entire region/individual exchanges

The skewness and kurtosis inputs for the Jarque-Berra are the same as those reported in this table

The increasing number of IPOs caused the number of stocks in our post accession dataset to increase to 151 from 97 in our pre accession dataset. As Poland is by far the region's largest economy, it is logical that the country's stock exchange has the largest weight in our dataset; what is interesting is that the number of stocks quoted on the Warsaw Stock Exchange has almost doubled from 55 to 102 between 1999 and 2004, while few new stocks appeared on the other exchanges.

Average returns over the pre-accession period are positive, the financial crisis that began in 2007 resulted in negative returns over the post-accession period. Despite the volatility ensuing from the stock market downturn that began in 2007, the standard deviation of our dataset for 2004-2008 is lower than for 1999-2003, with only Slovenia recording higher volatility. The skewness of our datasets moves from positive to negative, indicating that while over period 1999-2003 there was a greater probability of a large decrease rather than a large increase in stock prices, the opposite was true for period 2004-2008. However, as the skewness readings for 1999-2003 and 2004-2008 are both close to zero, it is hard to draw any firm conclusions. The kurtosis of our dataset decreased significantly between 1999-2003 and 2004-2008, with only the single Latvian stock recording an increase. The Jacque-Bera statistic is used to test the null hypothesis that stock returns are normally distributed. From the associated p-values, it is clear that only stocks listed on the Budapest Stock Exchange over period 1999-2003 could have returns considered to be normally distributed at any conventional level of significance. The results from the Jacque-Bera test are in broad agreement: returns on the stock markets of the EE EU nations are not normally distributed. However, it is clear the Jacque-Bera test is significant due to high kurtosis, rather than skewness, therefore the parametric models we apply still return robust results.

2.4. Methodology

The tests we employ fall into four categories: tests of serial independence, unit root tests, multiple variance ratio tests and liquidity. We chose to replicate the methodology of Worthington and Higgs (2004) for the serial independence, unit root tests and multiple variance ratio tests because of the broad range of WFME tests applied by the authors and the recognition it received in the literature. While our dataset covers a large geographic area, the majority of stocks are quoted on the Warsaw Stock Exchange. To control for any

Polish bias, we perform the tests for both the region as a whole and the individual countries[5].

2.4.1. Tests of serial independence

A time series is said to be serially correlated if a regression of a time series of returns with its own lags yields statistically significant results:

$$\boldsymbol{E(\Delta y_{it}|\Delta y_{it-1}) = \beta_1 + \beta_2 \Delta y_{it-1}} \qquad \textbf{(7)}$$

Where:

$E(\Delta y_{it}|\Delta y_{it-1})$ = the expected value of Δy_{it} given Δy_{it-1}

β_1 = the regression intercept

β_2 = the regression slope

Unlike serial correlation, the runs test is non-parametric and therefore does not require the returns to be normally distributed. Runs tests determine whether a time series follows a random walk by counting the number of consecutive positive or negative observations and comparing it to an expected value *(E(R))***:**

$$\boldsymbol{E(R) = \frac{N+2N_U N_D}{N}} \qquad \textbf{(8)}$$

Where:

N = Number of observations

N_U *= Number of positive observations*

N_D *= Number of negative observations*

R = Number of runs

[5] Despite the Polish bias, the tests can still be considered to be of the EE EU as a whole as approximately one-half and one-third of the pre- and post-accession datasets respectively consist of non-Polish stocks.

All tests were performed on an individual stock basis and the results from these were summed to calculate the individual country and EE EU portfolios. Therefore, the results from our tests would not change if they were calculated on an EE EU ex-Poland basis as results from different countries can be combined through weighted addition.

We use the expected value and variance values (V(R)) to calculate a test statistic, Z:

$$\boldsymbol{V(R) = \frac{2N_u N_D (2N_D N_D - N)}{(N)^2 (N-1)}} \qquad \textbf{(9)}$$

$$\boldsymbol{Z = \frac{R - E(R)}{\sqrt{V(R)}}} \qquad \textbf{(10)}$$

The null hypothesis is that the returns can be considered to follow a random walk process. Rejection of the null hypothesis indicates that the stock's returns are non-random and contravene WFME. In order to test whether EU accession resulted in an increase in WFME, we use a z-test to determine if the percentage of stocks considered statistically significant at a particular significance level is statistically different between the pre- and post-accession datasets.

2.4.2. Unit root tests

Unit root tests are used to examine how a time series evolves over time. We use the tests to examine to what extent stock returns can be predicted using past returns. Unit root tests are used to determine whether the log returns of stocks in our dataset is stationary, i.e. whether it has constant statistical properties; if stocks follow a random walk process, stock returns should be non-stationary. We use three variants, Augmented Dickey Fuller (ADF), Phillips-Perron (PP) and Kwaitkowki, Phillips, Schmidt and Shin (KPSS).

ADF is the most well known unit root test, the null hypothesis is that the data is nonstationary. The measure is calculated by running the following regression:

$$\boldsymbol{\Delta y_{it} = \beta_0 + \beta_1 tr + \alpha_0 yi_{t-1} + \alpha_p \sum_{p=1}^{q} \Delta y_{it-p} + \varepsilon_{pt}} \qquad \textbf{(11)}$$

Where:

α = the coefficients to be estimated

q = number of lagged terms

β_0= intercept

β_1 = trend coefficient

tr= trend

MacKinnon's critical values are then applied to determine the significance of α.

The PP test, developed by Phillips and Perron (1988), extends ADF to deal with serial correlation and heteroskedasticity in the errors by modifying the test statistic with a non-parametric correction. The non-parametric nature of the PP test offers an advantage over ADF as it does not have to specify the level of serial correlation. While the ADF and PP tests have null hypothesis of nonstationarity, the KPSS test has a null hypothesis of stationarity. Reversing the null hypothesis provides a useful validation check for the results from the ADF and PP tests. In the KPSS test, the time series is represented as the sum of a deterministic trend, a random walk and a stationary error term. The KPSS test statistic is the Lagrange multiplier test and the null hypothesis is that the random walk has a variance equal to zero. As with the tests of serial independence, we apply a z-test to determine whether the results from the pre- and post-accession datasets can be considered statistically different.

2.4.3. Multiple Variance Ratio Tests

The third set of statistics employed are multiple variance ratio (MVR) tests. This approach was developed by Lo and MacKinlay (1988, 1989) and Chow and Denning (1993) who constructed the MVR tests in order to detect both autocorrelation and heteroscedasticity in returns. This is important because if stocks follow a random walk, the variance of returns should rise as a linear function to the number of observations. That is, the variance ratio of the returns over q period must be equal to $q\sigma^2$. The variance ratio (VR) is calculated as:

$$\boldsymbol{VR(q) = \frac{\sigma^2(q)}{\sigma^2(1)}} \qquad \textbf{(12)}$$

Where:

$\sigma^2(1)$ = variance of daily log returns

q = number of periods used for the sampling interval

$\sigma^2(q) = \left(1/q\right)$ multiplied by the variance of q-daily returns

If stocks conform to the random walk process, VR should not be statistically different to one. In line with the methodology of Worthington and Higgs (2004), the sampling intervals used for q were 2, 5, 10 and 20 days. For a more in depth overview of MVR methodology or a complete derivation, the reader should consult Worthington and Higgs (2004) or Chow and Denning (1993) respectively. We also apply a z-test to determine whether the pre- and post-accession results are statistically different.

2.4.4. Liquidity Controls

Studies frequently conclude that liquidity is related to future returns. Examples of such work include Amihud and Mendelson (1986, 1989), Chordia et al (2001), Jones (2002), Amihud (2002), and Brennan et al (1998). Datar et al (1998) demonstrate a negative correlation between liquidity, as measured by turnover, and returns. Haugen and Baker (1996) found that liquidity is one of several generic factors that explain returns across global stock markets. Brzeszczynski et al (2011) found that trading intensity affected beta calculations for stocks listed on the Warsaw Stock Exchange and thus had serious ramifications for corporate finance decisions.

The relatively small size of the stock markets of the EE EU countries raises the concern that our results could be distorted by liquidity issues. Liquidity is an elusive concept, consequently in Table 5 we employ three widely used measures to control for it: i) Market capitalization ii) Average volume divided by shares outstanding iii) Bid-ask spread divided by share price. We create liquidity portfolios by assigning a rank (1 (low) to 5 (high)) to every stock for each of the three liquidity measures. Then we separate the combined results from Tables 2, 3, and 4 into five liquidity ranked portfolios in order to examine the effects of liquidity on the tests employed; we repeat this for each of market capitalization (Panel A) average volume divided by shares outstanding (Panel B) and Bid-ask spread (Panel C).

2.5. Results

The results from the tests of serial independence, unit root tests and multiple variance ratio tests are shown in Tables 2, 3 and 4 respectively. As we cover a large geographic

region, each table also provides a geographic breakdown of the results. While around one-third of our dataset is listed outside Poland, the shares are listed on a lot of different exchanges; no exchange other that the Warsaw Stock Exchange has more than 14 shares in the dataset. This makes inferences for individual countries difficult.

2.5.1. Tests of serial independence

Table 2 shows the results from the tests of serial independence, the serial correlation coefficient and the runs test.

Table 2: Tests Of Serial Independence

Percentages

		Serial Correlation T Statistic			Runs Test		
		1999-2003	2004-2008	Z Test	1999-2003	2004-2008	Z Test
Entire Region							
% of Observations Significant at	1%	31%	28%	0,41	22%	19%	0,47
	5%	39%	54%	-2,23	38%	38%	- 0,04
	10%	43%	66%	-3,45	46%	49%	- 0,40
% of Negative Observations		15%	42%		64%	69%	
Czech Republic							
% of Observations Significant at	1%	40%	29%		20%	0%	
	5%	60%	43%		40%	29%	
	10%	60%	71%		60%	43%	
% of Negative Observations		0%	29%		80%	57%	
Estonia							
% of Observations Significant at	1%	60%	50%		40%	38%	
	5%	60%	63%		60%	50%	
	10%	60%	63%		60%	63%	
% of Negative Observations		60%	75%		20%	63%	
Hungary							
% of Observations Significant at	1%	13%	38%		13%	38%	
	5%	38%	50%		13%	63%	
	10%	50%	63%		13%	75%	
% of Negative Observations		38%	50%		13%	38%	
Latvia							
% of Observations Significant at	1%	0%	100%		0%	0%	
	5%	0%	100%		0%	0%	
	10%	0%	100%		0%	0%	
% of Negative Observations		0%	0%		100%	0%	
Lithuania							
% of Observations Significant at	1%	40%	70%		70%	30%	
	5%	70%	90%		90%	50%	
	10%	70%	90%		90%	70%	
% of Negative Observations		30%	20%		90%	90%	
Poland							
% of Observations Significant at	1%	13%	16%		11%	18%	
	5%	16%	48%		27%	35%	
	10%	22%	63%		40%	44%	
% of Negative Observations		11%	48%		71%	74%	
Slovakia							
% of Observations Significant at	1%	100%	0%		100%	100%	
	5%	100%	0%		100%	100%	
	10%	100%	0%		100%	100%	
% of Negative Observations		0%	0%		0%	100%	
Slovenia							
% of Observations Significant at	1%	100%	71%		25%	7%	
	5%	100%	71%		50%	36%	
	10%	100%	71%		50%	50%	
% of Negative Observations		0%	0%		58%	50%	

All calculations are based on stock returns calculated on natural logarithms of Bloomberg last prices in local currencies.

Serial correlation is calculated using one day lags

Runs tests calculations are based on the sign of returns

Absolute Numbers

		Serial Correlation T Statistic			Runs Test		
		1999-2003	2004-2008	Z Test	1999-2003	2004-2008	Z Test
Entire Region							
	1%	30	42	0,41	21	29	0,47
Observations Significant at	5%	38	82	-2,23	37	57	- 0,04
	10%	42	100	-3,45	45	74	- 0,40
Negative Observations		15	63		62	104	
Czech Republic							
	1%	2	2		1	0	
Observations Significant at	5%	3	3		2	2	
	10%	3	5		2	3	
Negative Observations		0	2		4	4	
Estonia							
	1%	3	4		2	3	
Observations Significant at	5%	3	5		3	4	
	10%	3	5		3	5	
Negative Observations		3	6		1	5	
Hungary							
	1%	1	3		1	3	
Observations Significant at	5%	3	4		1	5	
	10%	4	5		1	6	
Negative Observations		3	4		1	3	
Latvia							
	1%	0	1		0	0	
Observations Significant at	5%	0	1		0	0	
	10%	0	1		0	0	
Negative Observations		0	0		1	0	
Lithuania							
	1%	4	7		7	3	
Observations Significant at	5%	7	9		9	5	
	10%	7	9		9	7	
Negative Observations		3	2		9	9	
Poland							
	1%	7	16		6	18	
Observations Significant at	5%	9	49		15	36	
	10%	12	64		22	45	
Negative Observations		6	49		39	75	
Slovakia							
	1%	1	0		1	1	
Observations Significant at	5%	1	0		1	1	
	10%	1	0		1	1	
Negative Observations		0	0		0	1	
Slovenia							
	1%	12	10		3	1	
Observations Significant at	5%	12	10		6	5	
	10%	12	10		6	7	
Negative Observations		0	0		7	7	

All calculations are based on stock returns calculated on natural logarithms of Bloomberg last prices in local currencies.

Serial correlation is calculated using one day lags

Runs tests calculations are based on the sign of returns

Looking at all the stock exchanges in the dataset, even at the 0.01 level of significance, almost one third of the stocks in our dataset return significant t-statistics from the serial correlation regressions for both the pre- and post-EU accession periods. Whilst there has been a marginal decrease in the number of stocks statistically significant at the 0.01 level between the pre- and post-accession datasets, the z-test reveals that the difference is not statistically significant. 43% of stocks in our dataset can be considered serially correlated at the 0.1 significance level for the pre-accession period; this rises to 66% for the post-accession period. The z-test reveals that the increase in the number of stocks exhibiting serial correlation at the 0.05 and 0.1 levels is statistically significant at 0.01, indicating that prices of stocks listed in the EE EU nations may have actually become less efficient. Looking at the individual stock exchanges, it can be seen that the results from the stock exchanges of other countries are largely consistent with those from the Warsaw Stock Exchange. Across the majority of stock exchanges most stocks exhibit properties consistent with serial correlation, at least at the 0.1 level. The z-test reveals no statistically significant difference between the pre- and post-accession datasets. Thus we can comfortably reject the null hypothesis that returns in the stock markets of the EE EU are not serially correlated.

When the runs test was applied to our dataset, about one fifth of stocks yielded statistically significant results even at the most stringent 0.01 level for both the 1999-2004 and 2004-2008 datasets. Around half of both the pre- and post-accession datasets can be considered significant at the 0.1 level. Stocks listed on the Riga Stock Exchange perform poorly in the runs tests, but the dataset only contains one stock from this country; excluding Latvia, the non-Polish stock markets have similar results to the entire dataset.

2.5.2. Unit root tests

Table 3 shows the results from the three sets of statistics that form the unit root tests. The null hypothesis of the ADF and PP tests is that the time series has a unit root. The KPSS test reverses the null hypothesis and assumes that the time series has no unit root.

Table 3: Unit Root Tests

		ADF		Phillips-Perron Test		KPSS Test		
		1999-2003	2004-2008	1999-2003	2004-2008	1999-2003	2004-2008	Z Test
Entire Region								
% of Observations Significant at	1%	100%	100%	100%	100%	5%	46%	- 6,81
	5%	100%	100%	100%	100%	13%	64%	- 7,86
	10%	100%	100%	100%	100%	25%	72%	- 7,31
	Average	-29,27	-28,88	-33,76	-31,09	0,26	0,79	
	Absolute Average	29,27	28,88	33,76	31,09	0,26	0,79	
Czech Republic								
% of Observations Significant at	1%	100%	100%	100%	100%	0%	0%	
	5%	100%	100%	100%	100%	0%	14%	
	10%	100%	100%	100%	100%	20%	29%	
	Average	-31,61	-28,49	-33,00	-32,15	0,16	0,34	
	Absolute Average	31,61	28,49	33,00	32,15	0,16	0,34	
Estonia								
% of Observations Significant at	1%	100%	100%	100%	100%	0%	63%	
	5%	100%	100%	100%	100%	0%	75%	
	10%	100%	100%	100%	100%	20%	75%	
	Average	-31,57	-28,50	-34,43	-30,91	0,24	0,88	
	Absolute Average	31,57	28,50	34,43	30,91	0,24	0,88	
Hungary								
% of Observations Significant at	1%	100%	100%	100%	100%	0%	50%	
	5%	100%	100%	100%	100%	0%	75%	
	10%	100%	100%	100%	100%	0%	75%	
	Average	-31,32	-31,86	-31,37	-35,00	0,13	0,65	
	Absolute Average	31,32	31,86	31,37	35,00	0,13	0,65	
Latvia								
% of Observations Significant at	1%	100%	100%	100%	100%	0%	100%	
	5%	100%	100%	100%	100%	0%	100%	
	10%	100%	100%	100%	100%	0%	100%	
	Average	-36,60	-35,06	-36,58	-35,10	0,27	1,04	
	Absolute Average	36,60	35,06	36,58	35,10	0,27	1,04	
Lithuania								
% of Observations Significant at	1%	100%	100%	100%	100%	30%	90%	
	5%	100%	100%	100%	100%	60%	100%	
	10%	100%	100%	100%	100%	60%	100%	
	Average	-18,52	-25,24	-30,20	-32,16	0,56	1,73	
	Absolute Average	18,52	25,24	30,20	32,16	0,56	1,73	
Poland								
% of Observations Significant at	1%	100%	100%	100%	100%	4%	39%	
	5%	100%	100%	100%	100%	9%	60%	
	10%	100%	100%	100%	100%	22%	69%	
	Average	-30,73	-28,75	-33,88	-30,30	0,23	0,71	
	Absolute Average	30,73	28,75	33,88	30,30	0,23	0,71	
Slovakia								
% of Observations Significant at	1%	100%	100%	100%	100%	0%	100%	
	5%	100%	100%	100%	100%	0%	100%	
	10%	100%	100%	100%	100%	0%	100%	
	Average	-22,35	-34,85	-22,24	-34,81	0,11	0,96	
	Absolute Average	22,35	34,85	22,24	34,81	0,11	0,96	
Slovenia								
% of Observations Significant at	1%	100%	100%	100%	100%	0%	64%	
	5%	100%	100%	100%	100%	17%	79%	
	10%	100%	100%	100%	100%	33%	93%	
	Average	-28,19	-30,21	-38,55	-32,87	0,27	0,93	
	Absolute Average	28,19	30,21	38,55	32,87	0,27	0,93	

All calculations were made on natural logarithms of Bloomberg last prices in local currency

Augmented Dickey Fuller (ADF) test, H0: unit root, H1: no unit root (stationary)

Phillips Peron (PP), H0: unit root, H1: no unit root (stationary)

Kwiatkowski, Phillips, Schmidt and Shin (KPSS), H0: no unit root (stationary), H1: unit root

Both the ADF and PP tests reject the null hypothesis, even at 0.01, for all stocks in both the pre- and post-accession datasets. We can comfortably reject the null hypothesis of nonstationarity for all stocks. Needless to say, there is no country variation here. Both tests clearly indicate that the returns of all stocks in the dataset are stationary, that is follow a deterministic rather than stochastic trend; inconsistent with a random walk.

Out of all the metrics we employ, only the KPSS test indicates that stationarity may have declined between the pre- and post-accession periods. The KPSS statistic is insignificant for less than half of all stocks at the 0.01 level of significance for the post-accession dataset, indicating that we cannot reject the null hypothesis of no unit root; yet for our pre-accession dataset, only 5% of stocks have KPSS statistics that can be considered statistically significant at the 0.01 level. Whilst almost three quarters of post-accession stocks have KPSS statistics that can be considered statistically significant at 0.1, the corresponding figure for the pre-accession nations is only around one quarter. The z-test reveals that there is a statistically significant increase in the KPSS statistic between the pre- and post-accession datasets. The results from Poland are almost identical to those for the region as a whole, indicating little regional variation.

The results from the ADF/PP and KPSS tests return marked different results, making the unit root tests the hardest part of the paper to interpret. The most logical null hypothesis is that stocks follow a random walk in a manner consistent with the efficient market hypothesis – this is consistent with the null hypothesis in the ADF/PP null hypothesis of non-stationarity. Both KPSS and ADF are known to be sensitive to sample size, this may explain why the KPSS statistic increases so much between the pre- and post-accession datasets. Alternatively, Ahamada (2004) demonstrates via a simulation exercise that the KPSS test fails to detect a form of non-stationarity due to a shift in the unconditional variance. This may also explain the difference in the results from the pre- and post-accession datasets. The unit root tests return ambiguous results and we can only speculate as to why this might be. As we cannot draw any firm conclusions from these tests, the next step is to move on to MVR tests which detect both autocorrelation and heteroscedasticity in returns.

2.5.3.Multiple Variance Ratio Tests

Table 4 shows the results from the MVR tests using sampling intervals of two days, 5 five days, 10 days and 20 days; corresponding to one day, one week, one fortnight and one month.

Table 4: Multiple Variance Ratio Tests

		T Statistic q=2			T Statistic q=5			T Statistic q=10			T Statistic q=20			Stocks significant at at least one of the above time intervals		
		1999-2003	2004-2008	Z Test	1999-2003	2004-2008	Z Test	1999-2003	2004-2008	Z Test	1999-2003	2004-2008	Z Test	1999-2003	2004-2008	Z Test
Entire Region																
% of	1%	14%	19%	-0,97	12%	21%	-1,66	7%	19%	-2,62	9%	20%	-2,24	22%	31%	-1,63
Observations	5%	31%	32%	-0,25	26%	32%	-1,12	20%	28%	-1,47	16%	29%	-2,27	41%	44%	-0,38
Significant at	10%	38%	38%	-0,04	35%	38%	-0,43	25%	33%	-1,41	25%	37%	-2,03	55%	54%	0,05
Czech Republic																
% of	1%	0%	14%		0%	0%		0%	0%		0%	0%		0%	14%	
Observations	5%	40%	14%		20%	14%		20%	0%		0%	0%		40%	14%	
Significant at	10%	40%	14%		20%	14%		20%	0%		0%	0%		40%	14%	
Estonia																
% of	1%	40%	25%		40%	0%		20%	0%		20%	13%		60%	38%	
Observations	5%	60%	50%		80%	38%		80%	0%		60%	13%		100%	75%	
Significant at	10%	80%	50%		80%	38%		80%	13%		80%	25%		100%	88%	
Hungary																
% of	1%	13%	13%		13%	13%		0%	0%		13%	0%		25%	13%	
Observations	5%	13%	25%		13%	13%		13%	13%		13%	0%		25%	25%	
Significant at	10%	13%	38%		25%	13%		25%	13%		50%	13%		63%	38%	
Latvia																
% of	1%	0%	0%		0%	0%		0%	0%		0%	0%		0%	0%	
Observations	5%	0%	0%		0%	0%		0%	0%		0%	0%		0%	0%	
Significant at	10%	0%	0%		0%	0%		0%	0%		0%	0%		0%	0%	
Lithuania																
% of	1%	10%	10%		20%	30%		20%	30%		30%	60%		40%	60%	
Observations	5%	30%	40%		30%	40%		50%	50%		40%	70%		60%	70%	
Significant at	10%	30%	40%		50%	40%		50%	50%		40%	80%		70%	80%	
Poland																
% of	1%	15%	22%		11%	25%		5%	25%	-2,98	5%	22%		18%	31%	
Observations	5%	27%	34%		24%	37%		13%	33%	-2,80	13%	33%		35%	45%	
Significant at	10%	38%	41%		35%	44%		16%	39%	-2,95	18%	41%		49%	56%	
Slovakia																
% of	1%	0%	0%		0%	0%		0%	0%		0%	0%		0%	0%	
Observations	5%	0%	0%		0%	0%		0%	0%		0%	0%		0%	0%	
Significant at	10%	0%	0%		0%	0%		0%	0%		0%	0%		0%	0%	
Slovenia																
% of	1%	17%	14%		8%	14%		8%	7%		8%	7%		17%	29%	
Observations	5%	50%	21%		25%	14%		8%	14%		8%	14%		50%	29%	
Significant at	10%	50%	29%		25%	21%		25%	21%		17%	21%		58%	43%	

All calculations were made on natural logarithms of Bloomberg last prices in local currency

Sampling intervals (q) are in days

Even at the 0.01 level of significance, the MVR tests generally suggest that many stocks in our dataset do not follow a random walk process. While the percentage of stocks significant for at least one of the q levels is substantially higher for the post-accession dataset than the pre-accession dataset, the z-tests reveal that this is not statistically significant. At the 0.1 level of significance, more than half of all stocks do not conform to a random walk process for at least one of the sampling intervals applied, and the results are very similar for the pre- and post-accession nations. Excluding Czech Republic, Latvia and Slovakia, there is not a large variation amongst the different countries in our dataset, with the results for Poland and the entire region being almost identical.

2.5.4.Liquidity Controls

Table 5 shows the results from the liquidity controls employed:

Table 5: Liquidity Controls

Panel A: Market Cap

		Tests of Serial Independence						**Unit Root Tests**		**Multiple variance ratio tests**	
		Serial Correlation T Statistic		Number of Runs		Runs Test		KPSS Test		Stocks significant for at least one of the q sampling intervals	
		2000-2004	2004-2008	2000-2004	2004-2008	2000-2004	2004-2008	2000-2004	2004-2008	2000-2004	2004-2008
Quintile 1											
Observations											
	1%	50%	11%			30%	26%	10%	51%	30%	34%
% of Observations	5%	60%	86%			45%	46%	20%	69%	55%	60%
Significant at	10%	65%	89%			50%	63%	20%	80%	75%	69%
	Average			422,70	515,03						
Quintile 2											
Observations											
	1%	33%	15%			19%	15%	3%	35%	19%	27%
% of Observations	5%	33%	31%			39%	31%	11%	50%	36%	42%
Significant at	10%	42%	77%			42%	38%	19%	54%	53%	54%
	Average			540,03	496,62						
Quintile 3											
Observations											
	1%	50%	73%			0%	27%	0%	53%	50%	37%
% of Observations	5%	50%	80%			50%	50%	0%	63%	50%	43%
Significant at	10%	50%	90%			50%	53%	0%	70%	50%	57%
	Average			319,00	512,00						
Quintile 4											
Observations											
	1%	23%	33%			9%	10%	5%	33%	14%	17%
% of Observations	5%	41%	50%			27%	27%	5%	60%	32%	20%
Significant at	10%	41%	50%			45%	50%	23%	77%	36%	37%
	Average			478,77	438,63						
Quintile 5											
Observations											
	1%	12%	10%			35%	17%	6%	53%	24%	40%
% of Observations	5%	24%	13%			41%	37%	24%	77%	47%	50%
Significant at	10%	24%	20%			53%	37%	47%	77%	59%	53%
	Average			524,47	552,57						

Market capitalization is an average of daily market capitalization taken from Bloomberg in Euros over the period for which the weak form tests for the individual security were calculated.

Stocks are ranked according to their market capitalization in Euros and assigned to quintiles 1 (low) to 5 (high). The results from Tables 2, 3 and 4 are shown for each market capitalization quintile.

Panel B: Average Volume Divided By Shares Outstanding

		Tests of Serial Independence						**Unit Root Tests**		**Multiple variance ratio tests**	
		Serial Correlation T Statistic		Number of Runs		Runs Test		KPSS Test		Stocks significant for at least one of the q sampling intervals	
		2000-2004	2004-2008	2000-2004	2004-2008	2000-2004	2004-2008	2000-2004	2004-2008	2000-2004	2004-2008
Quintile 1											
Observations											
	1%	35%	16%			45%	26%	15%	48%	45%	35%
% of Observations	5%	50%	29%			65%	42%	30%	55%	65%	52%
Significant at	10%	50%	71%			70%	58%	40%	55%	80%	65%
	Average			395,35	527,39						
Quintile 2											
Observations											
	1%	5%	0%			11%	20%	5%	53%	16%	37%
% of Observations	5%	16%	7%			26%	30%	16%	73%	32%	53%
Significant at	10%	16%	10%			47%	40%	47%	73%	37%	53%
	Average			530,21	477,07						
Quintile 3											
Observations											
	1%	84%	37%			21%	7%	0%	37%	11%	20%
% of Observations	5%	95%	57%			37%	30%	11%	60%	37%	23%
Significant at	10%	95%	60%			47%	47%	21%	80%	42%	40%
	Average			527,89	497,43						
Quintile 4											
Observations											
	1%	32%	7%			11%	23%	0%	43%	11%	27%
% of Observations	5%	32%	87%			32%	43%	5%	67%	47%	53%
Significant at	10%	42%	87%			37%	53%	5%	80%	58%	63%
	Average			595,89	513,03						
Quintile 5											
Observations											
	1%	0%	83%			20%	20%	5%	47%	25%	37%
% of Observations	5%	5%	90%			30%	47%	5%	67%	25%	37%
Significant at	10%	15%	100%			30%	47%	10%	73%	55%	50%
	Average			432,45	501,97						

Both average volume and shares outstanding were calculated as average of daily observations taken from Bloomberg over the period for which the weak form tests for the individual security were calculated.

Stocks are ranked according to average volume divided by shares outstanding and assigned to quintiles 1 (low) to 5 (high). The results from Tables 2, 3 and 4 are shown for each average volume divided by shares outstanding quintile.

Panel C: Bid-Ask Spread

		Tests of Serial Independence						**Unit Root Tests**		**Multiple variance ratio tests** Stocks significant for at least one of the q sampling intervals	
		Serial Correlation T Statistic		Number of Runs		Runs Test		KPSS Test			
		2000-2004	2004-2008	2000-2004	2004-2008	2000-2004	2004-2008	2000-2004	2004-2008	2000-2004	2004-2008
Quintile 1											
Observations											
	1%	0%	58%			13%	10%	0%	45%	21%	26%
% of Observations	5%	4%	74%			33%	26%	4%	65%	33%	29%
Significant at	10%	17%	74%			38%	35%	8%	77%	50%	42%
	Average			530,96	521,19						
Quintile 2											
Observations											
	1%	60%	60%			27%	20%	7%	43%	27%	30%
% of Observations	5%	60%	73%			40%	47%	7%	67%	47%	37%
Significant at	10%	60%	80%			40%	53%	13%	80%	53%	57%
	Average			358,67	452,07						
Quintile 3											
Observations											
	1%	84%	0%			32%	20%	5%	42%	26%	28%
% of Observations	5%	89%	50%			47%	40%	21%	54%	53%	48%
Significant at	10%	89%	76%			58%	56%	26%	62%	63%	58%
	Average			542,16	502,82						
Quintile 4											
Observations											
	1%	22%	50%			22%	30%	9%	50%	17%	30%
% of Observations	5%	39%	70%			39%	60%	17%	60%	39%	60%
Significant at	10%	43%	80%			48%	80%	30%	60%	52%	70%
	Average			501,30	543,50						
Quintile 5											
Observations											
	1%	0%	7%			19%	23%	6%	53%	19%	43%
% of Observations	5%	13%	13%			31%	33%	19%	80%	38%	53%
Significant at	10%	13%	20%			50%	37%	50%	80%	56%	53%
	Average			501,75	524,63						

Bid-ask spread and last price is an average of daily market capitalization taken from Bloomberg in Euros over the period for which the weak form tests for the individual security were calculated. The bid-ask spread was divided by the last price in order to obtain a percentage measure.

Stocks are ranked according to their Bid-ask spread and assigned to quintiles 1 (low) to 5 (high). The results from Tables 2, 3 and 4 are shown for each Bid-ask spread quintile.

The results from using market capitalization as a proxy for liquidity are shown in Table 5 Panel A. For both the pre- and post-accession datasets, smaller capitalized stocks exhibit higher levels of serial correlation. Runs tests are also substantially affected by their market capitalization quintile, with the smaller market capitalization quintile stocks returning a higher proportion of significant results. The ADF and PP tests are both excluded from the table as every stock in our dataset can be considered statistically significant at the 0.01 level and thus there is no variation across any of the liquidity quintiles. For the KPSS tests, the results for the large market capitalization quintile are very similar to those from the small market capitalization quintile, therefore there is nothing to suggest that the KPSS tests is affected by liquidity (as measured by market capitalization). For the MVR tests, portfolio 5 actually has a higher percentage of stocks returning statistically significant results than any of the other four quintiles: lack of liquidity is clearly not distorting results from the MVR tests. Whilst lack of liquidity associated with smaller market capitalization may have distorted some of the tests of serial independence, a substantial number of stocks in the largest market capitalization portfolio still return significant results. Market capitalization does not have any meaning affect on any of the three unit root tests of the MVR tests.

The results from using average volume divided by shares outstanding as a liquidity control are shown in Table 5 Panel B. For serial correlation, the number of stocks significant at each of the three significance levels we use is actually higher in the most liquid portfolio 5 than in the least liquid portfolio 1. Therefore, there is no indication that lack of liquidity, as measured by average volume divided by shares outstanding, is distorting the serial correlation tests. Whilst the runs tests return the highest percentage of significant results for the lowest-liquidity portfolio 1, but there is not a huge amount of variation across the quintiles. In a similar manner to the serial correlation statistic, the percentage of stocks returning significant results for the KPSS tests actually increases as liquidity increases. The MVR tests return very similar results across the five quintiles. It is clear that average volume divided by shares outstanding is not distorting any of the results from these tests.

The results from using the bid-ask spread as a liquidity measure are shown in Table 5 Panel C. Note that, unlike the market capitalization and average volume divided by shares outstanding liquidity controls, higher bid-ask spreads are associated with lack

of liquidity. Thus portfolio 1 contains stocks with the lowest bid-ask spreads and highest liquidity. For the serial correlation tests, quintile 1 returns a greater percentage of stocks with statistically significant results than quintile 5; therefore, lack of liquidity is not distorting these results. For the runs tests, the extreme bid-ask portfolios 1 and 5 return the lowest percentage of statistically significant results for the runs test; the median quintile 3 returns the highest percentage of statistically significant results: runs test results are not affected by liquidity as measured by bid-ask spread. The KPSS tests return a marginally higher percentage of statistically significant results for quintile 5, but the results are largely consistent across quintiles. The numbers of stocks returning statistically significant results from the MVR tests increases for the wider bid-ask quintiles, but the lower bid-ask quintiles still return a substantial number of statistically significant results. We can thus conclude that bid-ask spread is not distorting the results of our WFME tests.

Hence from the liquidity tests employed it is clear that the apparent weak-form inefficiencies highlighted by the WFME tests cannot be entirely explained away by liquidity issues. While liquidity may have some explanatory power for some of the tests, it is clear that lack of liquidity is not creating a spurious sense of weak form inefficiency.

2.5.5.A note on the liquidity measures employed

We employ liquidity measures that are commonly applied in large liquid markets. This raises the question of to what extent are the liquidity measures we apply appropriate for our dataset. We are unaware of any research into liquidity for the whole of the EE EU region, however, a recent study by Lischewski and Voronkova (2012) examined liquidity on the Warsaw Stock Exchange. The liquidity measures employed by Lischewski and Voronkova (2012) are the same as those used in large liquid capital markets. So we can be confident that the measures we employ are appropriate for our dataset. Furthermore, Lischewski and Voronkova (2012) find that liquidity is not a priced risk factor for stocks listed on the Warsaw Stock Exchange and thus has minimal impact on returns.

2.5.6. The relationship between stock markets and the broader economy in the EE EU nations

Table 6 shows market capitalisation as a percentage of GDP for each nation in our dataset along with the average for the EU and the Eurozone. While the average for the EU/Eurozone is substantially higher than for any of the EE EU nations, with the possible exception of the Baltic states, the broader econonmic importance of listed companies can still be considered substantial.

Furthermore, whilst market capitalisation to GDP has declined substantially in the EU and the Eurozone, in five out of the eight countries in our dataset the measure increased, and only Estonia declined by more than the EU/Eurozone average. This indicates that the importance of stock markets to the region's broader economy is increasing.

Thus, we can conclude that the weak-form inefficiencies in the stock markets of the EE EU nations can have an impact on the functioning of national economies.

Table 6: Stock Market Capitalisation as a Percentage of GDP

	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	10 Year % Change
Eurozone	86.88%	68.15%	50.89%	58.29%	60.93%	62.68%	80.42%	84.68%	38.06%	49.86%	52.21%	-39.91%
European Union	100.26%	79.97%	60.89%	69.42%	71.70%	74.00%	92.19%	92.01%	41.51%	60.37%	65.10%	-35.07%
Czech Republic	18.71%	14.49%	20.26%	18.54%	27.08%	29.48%	32.76%	40.67%	21.67%	26.72%	21.64%	15.69%
Estonia	32.53%	23.77%	33.20%	38.52%	51.58%	25.13%	35.50%	27.45%	8.20%	13.88%	11.99%	-63.13%
Hungary	25.91%	19.66%	19.75%	20.03%	28.17%	29.53%	37.26%	35.01%	12.05%	22.34%	21.54%	-16.88%
Latvia	7.19%	8.38%	7.67%	10.20%	12.03%	15.75%	13.57%	10.82%	4.78%	7.05%	5.21%	-27.52%
Lithuania	13.89%	9.86%	10.33%	18.86%	28.66%	31.52%	33.87%	25.92%	7.67%	12.15%	15.59%	12.29%
Poland	18.26%	13.66%	14.51%	17.14%	28.13%	30.89%	43.63%	48.74%	17.04%	31.40%	40.49%	121.73%
Slovak Republic	4.24%	5.14%	5.50%	6.06%	7.87%	7.16%	8.08%	8.29%	5.19%	5.36%	4.77%	12.48%
Slovenia	12.75%	13.85%	19.91%	24.47%	28.60%	22.11%	38.98%	61.22%	21.56%	23.99%	20.10%	57.65%

Source: The World Bank

2.6. Concluding Remarks

The tests employed are in broad agreement: the stock markets of the EE EU nations are not WFME, nor have they become more efficient since EU accession. This contravenes the expectations of many academics who expected these markets to become more efficient and leads us to hypothesize that the inefficiencies will remain for years to come. Many researchers suggested that the passage of time would allow market participants to gain experience and make markets more efficient, however as this has not happened after nearly 20 years of operating, there is no reason to presume that it ever will. Some previous studies argued that the process of EU integration will improve market efficiency, however our dataset covers the 5 years following EU accession and these markets are still inefficient. Finally, some suggested that the small size of the stock markets of the EE EU made them inefficient, however the number of stocks listed on the Warsaw Stock Exchange has increased to make the number of listed shares comparable to the exchanges of the pre-enlargement EU nations, yet our results show that the Polish stock market is no more efficient than the rest of the EE EU region. The reasons researchers gave for expecting the stock markets of the EE EU nations to become WFME have clearly not materialized: given this it is hard to see what catalyst can drive these markets to become efficient. Therefore we expect the stock markets of the EE EU countries to remain weak form inefficient for the foreseeable future.

Given our tests incorporate two sub periods and indicate no improvement in the level of WFME in the EE EU nations, our view is that these stock markets will take a significant amount of time to show any meaningful improvement in WFME. This has substantial ramifications. While the issue is most obviously of interest to researchers and market participants engaged in technical analysis and trading models, lack of WFME also has much more important implications for corporate financial decisions and the development of the broader economy. There is a well-established link between pricing efficiency and the efficient allocation of capital; consequently, the absence of WFME in the EE EU nations may impair corporate finance decisions and prevent companies from attaining an optimal capital structure. Even more importantly, the link between the pricing efficiency of a country's stock market and its overall economic development and that the possibility that the availability of stock market financing can enhance economic growth means that it is clear that WFME has significant ramifications not just for a country's capital market but also its overall economic development. Furthermore, WFME is of particular

importance in the EE EU countries: an efficient capital market can facilitate the ongoing privatization process; as these nations are aiming for economic convergence with the pre-enlargement EU nations, the stock market clearly has a large role to play here; finally, as Worthington and Higgs (2004) suggest, the absence or presence of WFME in Europe's developing markets is an important consideration in the debate about what technological and regulatory reform is necessary or even whether the region's exchanges should merge.

3. A RESPECIFIED FAMA FRENCH THREE FACTOR MODEL FOR THE EASTERN EUROPEAN TRANSITION NATIONS[6]

3.1. Abstract

This paper uses factor models to explain stock market returns in the Eastern European (EE) countries that joined the European Union (EU) in 2004. In line with other studies, we find that the market value of equity component in the Fama French (1993) three factor model performs poorly when applied to our emerging markets dataset. We propose a significant amendment to the standard three factor model by replacing the market value of equity factor with a term that proxies for accounting manipulation. We show that our three factor model is able to explain returns in the EE EU nations significantly better than the Fama French (1993) three factor model, hereby offering an alternative model for use in the numerous markets in which previous studies have found little correlation between market value of equity and equity returns.

3.2. Introduction

The debate over what determinants explain equity returns is one of the central tenets of capital market theory. Since the publication of Sharpe's (1964) capital asset pricing model (CAPM), a number of anomalies have been documented identifying investment strategies based on firm characteristics that consistently generated returns in excess of those explainable by CAPM. Banz (1981) found that smaller capitalization stocks outperformed larger capitalization stocks; while Stattman (1980) and Rosenberg, Reid and Lanstein (1985) report that returns are related to a firm's book-to-market (BE/ME) ratio. Following the publication of Fama and French's (1993) influential paper – which augmented CAPM to incorporate the aforementioned anomalies into a three factor model comprised of beta and factors proxying market value of equity (ME) and book-to-price (BE/ME) – the debate over whether the findings are risk factors, attributable to investor irrationality, or merely a product of data mining has become one of the most contentious issues in the financial literature. The issue is particularly pertinent for the Eastern

[6] Co-authored with Dušan Mramor and Marko Pahor. Due to appear as a paper in the Journal of International Financial Management & Accounting

European (EE) nations that joined the European Union (EU) in 2004[7] (hereafter the EE EU nations) because of the stock market's crucial role in the ongoing privatization process and also as it serves as an important barometer with which to measure the progress made by these countries in the transition from planned to market economies.

This paper applies the Fama French (1993) model to the stock markets of the EE EU nations and extends previous literature by offering a respecification of the three factor model – using net income/cash flow from operating activities (NI/CFO) as a proxy for earnings management – that works significantly better for stocks listed on the stock markets of the EE EU nations. We find that NI/CFO has substantially greater explanatory ability than ME when incorporated into factor models.

3.3. Literature Review

3.3.1. Debate over the findings of Fama French (1993)

Fama and French (1993) consider CAPM to be misspecified and believe that their three factor model incorporates additional risk factors that are absent from CAPM; thus they consider their results to be consistent with the efficient market hypothesis. However, other researchers consider Fama and French's (1993) results to be indicative of investor irrationality and inefficient markets, particularly with respect to the BE/ME component of the model. Researchers such as Debondt and Thaler (1987), Lakonishok, Shleifer and Vishny (1994) and Haugen (1995) adopt a behavioralist stance and hypothesize that BE/ME's explanatory ability on returns is a product of investor overreaction to both good and bad news. Investors extrapolate past performance and become overly pessimistic for high BE/ME (value) stocks and overly optimistic for low BE/ME (growth) stocks. When the overreaction is eventually corrected, high BE/ME stocks outperform and low BE/ME stocks underperform. Others question the methodology employed by Fama and French (1993), the main such argument is by authors such as Berk (1995) who argue that portfolios formed on the basis of factors previously documented to have explanatory ability on returns will inevitably outperform regardless of whether the factors represent risk, are a product of investor irrationality, or merely a result of data mining. Black (1993) and MacKinlay (1995) also question whether the size effect and BE/ME

[7] These are the Eastern European nations that joined the EU on 1st May 2004, namely Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Slovakia, and Slovenia

factors hold in general or if the significance is merely sample specific. In response, Fama and French (1998) applied their earlier work to a global dataset consisting of 13 developed markets and 16 emerging markets. In the emerging markets Fama and French found that, while the significance of the size effect diminishes, there is still a significant relationship between BE/ME and returns. Claessens, Dasgupta and Glen (1993, 1995, 1998) conducted a number of studies into stock market returns in emerging markets and also report that ME has less explanatory power in emerging markets than it has in developed capital markets.

In this paper we propose for an alternative to ME for use in markets where ME has been shown to have a poor explanatory ability on returns. As Fama French (1992) find that BE/ME is related to companies' relative levels of profitability, a measure of the quality of that profitability is a logical alternative to the ME factor. A substantial body of literature exists regarding earnings quality and accruals with authors such as Healy (1985), DeAngelo (1986), Jones (1991) and Dechow, Sloan and Sweeney (1995) all concluding that accruals are more susceptible to earnings manipulation than cash from operations, whilst Khanchel El Mehdi (2011) and Li, Niu, Zhang, and Largay (2011) find evidence of accruals mispricing in the emerging markets of China and Tunisia respectively, indicating that NI/CFO can be used as a proxy for earnings quality. Furthermore, there may also be country level determinants of earnings quality, for example Hope (2003) reports that legal origin and national culture are both important in explaining firm disclosure.

3.3.2. Institutional Characteristics of the EE EU Nations

The combination of transition from planned to market economies and EU accession has led to changing institutional characteristics of the EE EU nations. Bushman and Piotroski (2006) link firms' reported accounting numbers with the institutional characteristics of the nations in which they are domiciled. Jindrichovska and McLeay (2005) and Joos and Lang (1994) also found a relationship between earnings quality and the transition process in the EE EU nations.

Ahmed (2009) argues that there are substantial differences in earnings management practices between pre- and post-2004 EU members. Vellam (2004) explains how the

accounting profession in Poland has struggled to make the transition from the old legalistic and rule-based procedures to the new investor-oriented International Financial Reporting Standards (IFRS). Welc (2011, P83) studied stocks listed on the Warsaw Stock Exchange over the period 2000-2009 and found evidence of aggressive accounting practices, in particular "there is an unusually low number of observations with the net margin between -1,5% and 0% and unusually high number of observations with the net margin between 0% and 2%, which suggests that companies with unmanaged earnings just below zero boost those earnings to the levels just above zero'. Capkun et al. (2008) examined the presence of earnings management during the transition to IFRS in nine EU countries and found that Poland (the only EE EU country in the study) was one of the nations which exhibited particularly high levels of earnings management. Garrod, Kosi and Valentincic (2008) examined private companies in Slovenia and found a positive relationship between profitability and both the likelihood and magnitude of write-offs; the paper also reported that whilst larger companies have a greater propensity to write-off, the magnitude of write-offs decreases with firm size, possibility due to the companies' higher visibility. Kosi and Valentincic (2011) find that private firms in Slovenia are less likely to use financial reports to communicate performance and may instead use it for other objectives, particularly reducing tax costs.

3.4. Methodology

We replicate the portfolio ranking methodology of Fama and French (1993), i.e. ranking ME and BE/ME into quintiles and then forming 25 portfolios at the intersections of the quintiles[8]. For the BE/ME computations, both BE and ME are measured using Bloomberg data from the end of December t-1. The high minus low (HML) portfolio is created to proxy returns related to BE/ME. The stocks are sorted by BE/ME and then split into two sets representing: bottom 50% (low) and top 50% (high). The portfolio HML is the weekly difference between average returns on the high (H) and low (L) portfolios over the period between the first trading day of July year t to the last trading day of June year t+1 for each year in our dataset. Note that using weekly returns represents a departure

[8] The relatively small size of our dataset means that each of our quintiles is rather small, however, we wanted to replicate the methodology of Fama French (1993) as closely as possible in order to facilitate comparability

from the methodology of Fama and French (1993) who use monthly returns. However, Fama French's (1993) dataset covers a substantially longer time horizon, the relatively recent development of stock markets in the EE EU nations means that our dataset does not have a sufficiently long time series to obtain statistically robust results using monthly data, hence the decision to use weekly data[9].

The portfolio small minus big (SMB) is also calculated in line with the methodology of Fama and French (1993). ME is calculated on the last trading day of June in year t. Stocks are then sorted and placed into small (S) and big (B) portfolios. ME is measured on 30th June year t, we specify ME in Euros to ensure comparability across stocks listed in different countries. We extend Fama and French's (1993) work and create a portfolios based on NI/CFO, in order to test whether this proxy for earnings management has explanatory ability on equity returns for stocks listed on the stock markets of the EE EU nations. In line with the calculation of BE/ME, both NI and CFO are measured as of December of year t-1. The stocks are sorted by NI/CFO and then split into two sets representing top 50% (large) and bottom 50% (small). The portfolio large minus small (LMS) is the weekly difference between average returns on the large and small portfolios over the period between the first trading day of July year t to the last trading day of June year t+1.

For the excess returns (market portfolio [RM] – risk free rate [RF]), RF is the weekly yield on the one month eurozone generic government bond, calculated as:

$$RF=(1+Rfm)^{(1/n)}-1 \qquad (13)$$

Where:

RF = Weekly risk free rate

Rfm = Monthly risk free rate quoted on an annualized basis

n = Number of weeks in the year

RM is calculated as the weekly return on all stocks in the Stoxx EU Enlarged Total Market Index.

[9] Although the use of weekly data may exasperate illiquidity issues, the last chapter of the thesis found that the results were robust to liquidity controls. Furthermore, the dataset used in this chapter was subject to a more stringent trimming process. Finally, the stocks in the dataset are taken from the Stoxx EU Enlarged Total Market Index which is screened to exclude highly illquid stocks.

The stocks are then split into 25 portfolios. For each year of our dataset, BE/ME is used to allocate stocks into one of five BE/ME quintiles with portfolio 1 containing the highest BE/ME stocks and portfolio 5 containing the lowest BE/ME stocks. We repeat the ranking process to allocate each stock to a quintile for both ME and NI/CFO (hereafter collectively referred to as the third factor) for each year t. We then form two sets of 25 portfolios (one set based on BE/ME and ME, the other based on BE/ME and NI/CFO) at the intersections of the five BE/ME and two sets of five third factor portfolios.

Following the portfolio ranking process, we build two sets of three univariate factor models in order to determine exactly what each variable contributes to the model, with both sets containing the regressions:

$$E(r_p) = RF + \beta[RM(t) - RF(t)] + e(t) \quad (14)$$

$$E(r_p) = RF + hHML(t) + e(t) \quad (15)$$

Where:

$E(r_p)$ = *expected portfolio return*

And the third regression being one of:

$$E(r_p) = RF + sSMB(t) + e(t) \quad (16)$$

$$E(r_p) = RF + lLMS(t) + e(t) \quad (17)$$

Then we apply the following three factor models:

$$E(r_p) = RF + \beta[RM(t) - RF(t)] + sSMB(t) + hHML(t) + e(t) \quad (18)$$

And:

$$E(r_p) = RF + \beta[RM(t) - RF(t)] + lLMS(t) + hHML(t) + e(t) \quad (19)$$

3.5. Dataset

The empirical results are based upon data from the EE EU nations that were named in the introduction. We use stocks included in the Stoxx EU Enlarged Total Market Index, which captures 95% of the free float capitalization of stocks traded in the nations that have joined the EU since 2004. Equity returns used for the dependent variables in our dataset run from July 2005 to June 2012. For the independent variables, accounting data used for portfolio ranking runs from December 2004 to December 2010.

Some constituents of the Stoxx EU Enlarged Total Market Index were excluded from the dataset as part of the trimming process, we removed stocks with thse following characteristic:

- Lack of pricing data. Stocks must have Bloomberg prices for at least 24 months prior to June of year t, where year t is the year in which the portfolios are formed.
- All stocks must still have a listing on 31st July 2012.
- Missing one of the two items of fundamental data (BE, CFO, NI or ME) for the end of year t-1, if required for building the factor model under consideration.
- We excluded stocks from Bulgaria, Cyprus, Malta, and Romania as our research is only concerned with the transition nations that joined the EU on 1st May 2004.

All data was obtained from Bloomberg and specified in Euros.

The descriptive statistics associated with our dataset are shown in Table 7

Table 7: Descriptive Statistics

Stocks are taken from the Stoxx EU Enlarged Total Market Index, we exclude stocks from Bulgaria, Cyprus, Malta, and Romania. We also exclude stocks without a time series of 24 months of prices prior to the start of July year t, where year t is the year that the portfolios are formed.

Average weekly returns are based on natural logarithms of Bloomberg last prices and are calculated over the first Friday of July year t to last Friday of June year t+1. These returns are used to calculate average weekly standard deviation, average weekly skewness and average weekly kurtosis. For example, the average return for Czech Republic is 0.003 per week or approximately 16% per year.

Number of stocks

	June 2005-July 2006	June 2006-July 2007	June 2007-July 2008	June 2008-July 2009	June 2009-July 2010	June 2010-July 2011	June 2011-July 2012
Czech Republic	5	5	6	6	6	6	6
Estonia	1	6	8	8	9	9	9
Hungary	7	7	7	7	7	7	7
Lithuania	1	9	9	9	9	9	9
Latvia	1	2	2	2	2	2	2
Poland	77	93	101	114	119	121	122
Slovakia	1	1	1	1	1	1	1
Slovenia	3	5	8	10	12	12	12
Total	96	128	142	157	165	167	168

Average Weekly Return

	June 2005-July 2006	June 2006-July 2007	June 2007-July 2008	June 2008-July 2009	June 2009-July 2010	June 2010-July 2011	June 2011-July 2012
Czech Republic	0.003	0.003	-0.003	-0.007	0.005	0.001	-0.002
Estonia	-0.007	0.006	-0.010	-0.019	0.011	0.002	-0.004
Hungary	0.007	0.002	-0.004	-0.008	0.006	-0.001	-0.006
Lithuania	0.001	0.006	-0.003	-0.023	0.011	0.007	-0.001
Latvia	-0.002	0.005	-0.005	-0.018	0.012	0.002	-0.006
Poland	0.011	0.012	-0.009	-0.010	0.006	0.001	-0.008
Slovakia	- 0.002	0.001	-0.001	-0.008	-0.002	0.003	-0.005
Slovenia	0.000	0.013	-0.003	-0.016	-0.005	-0.006	-0.011
Average	0.001	0.006	-0.005	-0.014	0.006	0.001	-0.005

Average Weekly Standard Deviation

	June 2005-July 2006	June 2006-July 2007	June 2007-July 2008	June 2008-July 2009	June 2009-July 2010	June 2010-July 2011	June 2011-July 2012
Czech Republic	0.037	0.040	0.033	0.078	0.037	0.026	0.028
Estonia	0.019	0.040	0.038	0.088	0.067	0.039	0.042
Hungary	0.050	0.049	0.036	0.081	0.048	0.031	0.043
Lithuania	0.027	0.036	0.040	0.086	0.069	0.042	0.031
Latvia	0.026	0.037	0.044	0.072	0.088	0.046	0.040
Poland	0.053	0.058	0.061	0.081	0.053	0.035	0.055
Slovakia	0.018	0.023	0.012	0.060	0.078	0.047	0.035
Slovenia	0.019	0.033	0.040	0.064	0.039	0.039	0.066
Average	0.031	0.039	0.038	0.076	0.060	0.038	0.043

Average Weekly Skewness

	June 2005-July 2006	June 2006-July 2007	June 2007-July 2008	June 2008-July 2009	June 2009-July 2010	June 2010-July 2011	June 2011-July 2012
Czech Republic	-0.148	-0.599	-0.347	-0.797	-0.142	-0.609	-0.071
Estonia	-3.524	-0.447	-0.264	-0.337	0.853	-0.264	-0.194
Hungary	-0.281	-0.453	-0.081	-0.309	-0.205	-0.304	-0.804
Lithuania	0.673	-0.012	0.255	-0.908	1.573	1.226	-0.866
Latvia	-1.403	1.020	-1.607	-1.040	-1.136	0.696	0.040
Poland	0.374	0.345	-0.161	-0.256	0.345	0.383	-0.141
Slovakia	-0.475	-1.599	-0.306	-1.224	-1.791	-0.510	-0.139
Slovenia	0.360	1.414	-0.212	-0.493	0.318	0.011	0.143
Average	-0.553	-0.041	-0.340	-0.671	-0.023	0.079	-0.254

Average Weekly Kurtosis

	June 2005-July 2006	June 2006-July 2007	June 2007-July 2008	June 2008-July 2009	June 2009-July 2010	June 2010-July 2011	June 2011-July 2012
Czech Republic	1.904	2.338	0.837	4.079	3.274	2.889	1.589
Estonia	5.009	3.621	1.303	1.356	2.591	5.037	1.836
Hungary	0.603	3.203	0.467	3.214	1.182	1.057	4.703
Lithuania	2.047	3.070	3.431	4.977	6.775	9.745	4.154
Latvia	6.500	2.545	6.997	2.227	5.203	3.552	0.907
Poland	2.628	1.449	1.691	2.190	1.393	2.246	2.434
Slovakia	2.058	10.907	0.754	7.557	4.802	3.840	1.015
Slovenia	3.711	2.654	1.388	2.163	2.184	1.061	2.578
Average	3.057	3.723	2.108	3.470	3.425	3.603	2.402

The number of stocks in our dataset increases substantially with each year. Poland has by far the largest economy of the EE EU nations and therefore it is of no surprise to see that the majority of stocks in our dataset are listed on the Warsaw Stock Exchange. Furthermore, the number of stocks in our dataset that are listed on the Warsaw Stock Exchange increases substantially over the years under consideration: from 77 to 122. Whilst it is logical that the Warsaw Stock Exchange has more stocks listed on it than any of the other EE EU exchanges, we find it interesting that it is the only exchange in our dataset that has seen a substantial increase in the number of stocks listed on it. It is possible that the Warsaw Stock Exchange is the only exchange in the region to have reached the critical mass required to attract initial public offerings in volume. An alternative explanation for the substantially largely number of stocks listed in Poland may be that the Law on Public Trade in Securities and Trust Funds, which regulates trade on the Warsaw Stock Exchange, was passed on 22nd March 1991, before the exchange was founded on 12th April 1991. Unlike Poland, not all stock exchanges of the EE EU nations had securities laws in place before their stock exchanges were created. Poland's early implementation of securities laws may have helped the exchange attract new listings. Although other stock markets also experienced a substantial percentage increase in the number of shares incorporated in the dataset, these increases were all from a very low base. The stock markets of Estonia (1 share in June 2005-July 2006 to 9 shares in June 2011-July 2012), Lithuania (1 share in June 2005-July 2006 to 9 shares in June 2011-July 2012) and Slovenia (3 shares in June 2005-July 2006 to 12 shares in June 2011-July 2012). Some stock markets have a largely constant number of shares in the dataset over the years coved: Czech Republic (5 shares in June 2005-July 2006 and 6 shares in June 2011-July 2012), Hungary (7 shares in each year of the dataset), Latvia (1 share in June 2005-July 2006 and 2 shares in June 2011-July 2012) and Slovakia (1 share in each year of the dataset).

Average returns were positive over the time horizons June 2005-July 2006 and June 2006-July2007, and turned negative in June 2007-July 2008 and June 2008-July 2009. The EE EU nations were certainly not immune from the economic crisis that gripped the world in 2008 and the ensuing savage bear market had a highly negative effect on returns. Stocks recovered somewhat in the periods June 2009-July 2010 and June

2010-July 2011, before the Euro Zone's troubles dragged the markets down in period June 2011-July 2012.

The EE EU region's stock markets all experienced a volatility spike in June 2008-July 2009, with average weekly standard deviation reaching 0.076. Total average weekly standard deviation for the other six years in our dataset is between a low of 0.031 in June 2005-July 2006 and a high of 0.076 for June 2008-July 2009.

The returns of stocks listed in many of the nations covered by our dataset exhibit negative skewness, with only June 2010-July 2011's average skewness of 0.079 being positive. Average weekly skewness reaches an low of -0.671 in June 2008-July 2009, before reverting to an high of -0.023 in June 2009-July 2010.

While returns do become more leptokurtic during the crisis period (an increase from 2.108 in June 2007-July 2008 to 3.47 in June 2008-July 2009) the highest average kurtosis was 3.723 in June 2006-July 2007, which was the period immediately before the crisis hit.

Our dataset covers an entire stock market cycle and therefore our results hold throughout both rising and falling markets. Furthermore, as accounting standards change substantially year-to-year, the relatively short time period covered by our dataset has the advantage of being less affected by changes in accounting standards. Also, survivorship bias is a standard criticism of the Fama French (1993) model, the EE EU dataset suffers from this problem to a lesser extent as we cover a shorter time horizon and only a few companies were delisted during this period.

3.6. Results

The results of the univariate regressions using the Fama French (1993) variables (regressions 14, 15, and 16) are shown in Table 8

Table 8: Univariate Regressions Using Beta, Book Value Of Equity To Market Value Of Equity (BE/ME), And Market Capitalization (ME)

The 25 size-book-to-market (ME-BE/ME)portfolios are formed in the following way. Each year t from 2005 to 2012 BE/ME (measured at the end of December year t-1)is used to assign stocks to one of five BE/ME quintiles, 1 being the highest BE/ME portfolios and 5 being the lowest. The same procedure is followed for ME, which is measured in Euros at the end of June in year t, and stocks are assigned to one of five ME quintiles.
RM is the weekly return on the Stoxx EU Enlarged Total Market Index
RF is the weekly yield on the 1 month eurozone generic government bond
HML is the difference between returns on high BE/ME (H) and low BE/ME portfolios (L). SMB is the difference between the returns on small ME (S)and large ME (B)portfolios.
Average R^2 is the arithmetic mean of the R^2s from the 25 ME-BE/ME portfolios calculated on an equally weighted basis.
Weighted R^2 is the arithmetic mean of the R^2s from the 25 ME-BE/ME portfolios calculated weighted by the number of observations from each portfolio.
For *β*, *s*, and *h* the number not in parenthesis is the regression's slope coefficient, the number in parenthesis is the regression t-statistic.

Average Number of Observations

	Low	4	3	2	HIgh
Low	1.000	8.000	7.000	4.000	8.000
4	4.000	4.000	4.000	7.000	8.000
3	11.000	6.000	3.000	6.000	3.000
2	8.000	3.000	7.000	7.000	3.000
High	4.000	7.000	7.000	4.000	4.000

R(t) - RF(t) = α + β[RM(t) - RF(t)] + e(t)

β

ME (€)					
(BE/ME)	Low	4	3	2	HIgh
Low	0.2 (4.35)	0.21 (4.81)	0.29 (6.72)	0.29 (5.13)	0.29 (5.82)
4	0.17 (3.72)	0.28 (6.13)	0.34 (7.15)	0.24 (5)	0.27 (5.78)
3	0.29 (6.25)	0.33 (6.96)	0.25 (5.66)	0.23 (4.63)	0.31 (6.42)
2	0.34 (6.25)	0.34 (7.19)	0.29 (5.45)	0.31 (6.51)	0.37 (6.2)
High	0.21 (4.91)	0.32 (7.27)	0.35 (7.65)	0.31 (6.13)	0.51 (5.9)

R^2

ME (€)					
(BE/ME)	Low	4	3	2	HIgh
Low	0.05	0.06	0.12	0.07	0.09
4	0.04	0.10	0.13	0.07	0.09
3	0.11	0.13	0.09	0.06	0.11
2	0.11	0.14	0.08	0.11	0.10
High	0.07	0.14	0.15	0.10	0.09

Average R^2 0.10

Weighted Average R^2 0.10

R(t) - RF(t) = α + hHML(t) + e(t)
HML = (BE/ME)

h

ME (€)					
(BE/ME)	Low	4	3	2	HIgh
Low	-0.51 (-3.2)	0.03 (0.22)	-0.11 (-0.74)	0.38 (1.93)	0.39 (2.16)
4	-0.16 (-0.99)	-0.24 (-1.42)	-0.32 (-1.86)	0.19 (1.08)	-0.01 (-0.05)
3	-0.51 (-3.06)	-0.63 (-3.77)	-0.5 (-3.26)	-0.47 (-2.67)	-0.79 (-4.61)
2	-1.01 (-5.44)	-1.03 (-6.26)	-0.76 (-4.15)	-1.22 (-7.55)	-0.93 (-4.46)
High	-0.84 (-5.86)	-0.81 (-5.17)	-1.08 (-6.77)	-1.2 (-6.92)	-1.22 (-4.07)

R^2

ME (€)					
(BE/ME)	Low	4	3	2	HIgh
Low	0.03	-0.00	-0.00	0.01	0.01
4	-0.00	0.00	0.01	0.00	-0.00
3	0.03	0.04	0.03	0.02	0.06
2	0.08	0.11	0.05	0.15	0.05
High	0.09	0.07	0.12	0.13	0.05

Average R^2 0.05

Weighted Average R^2 0.06

R(t) - RF(t) = α + SMB(t) + e(t)
SMB = ME (€) (June)

s

ME (€)					
(BE/ME)	Low	4	3	2	HIgh
Low	-0.51 (-3.76)	-0.04 (-0.27)	0.24 (1.83)	0.55 (3.27)	1.15 (8.18)
4	-0.56 (-4.24)	-0.31 (-2.22)	0.29 (1.97)	0.29 (2.01)	0.72 (5.19)
3	-0.57 (-4.09)	-0.24 (-1.65)	0.11 (0.84)	0.48 (3.26)	0.8 (5.6)
2	-0.81 (-5.13)	-0.01 (-0.04)	0.25 (1.59)	0.76 (5.34)	0.92 (5.28)
High	-0.6 (-4.86)	0.01 (0.03)	0.22 (1.55)	0.33 (2.1)	0.87 (3.4)

R^2

ME (€)					
(BE/ME)	Low	4	3	2	HIgh
Low	0.04	-0.00	0.01	0.03	0.17
4	0.05	0.01	0.01	0.01	0.07
3	0.05	0.01	-0.00	0.03	0.09
2	0.07	-0.00	0.00	0.08	0.08
High	0.07	-0.00	0.00	0.01	0.03

Average R^2 0.03

Weighted Average R^2 0.03

Of the three univariate regressions 14, 15 and 16, beta has the greatest explanatory ability, although the R2 value of 0.1 indicates that there is substantial scope within the model for the inclusion of additional factors. Predictably, beta's relationship with returns is positive for all portfolios, ranging from a low of 0.17 to a high of 0.51.

For BE/ME, our results corroborate the findings of Fama French's (1993) two factor regression – which excludes beta – in that the BE/ME regression slope coefficient is negative for the majority of the 25 of the portfolios, ranging from a low of -1.22 to a high of 0.39. While we find that BE/ME t-stats become more significant for high BE/ME portfolios, in contrast Fama French (1993) report that low BE/ME portfolios return the highest t-stats.

For ME, we find that the slope coefficients are actually negative for low ME portfolios (ranging from -051 to -0.81 for the five low ME portfolios and between 0.72 and 1.15 for the five high ME portfolios), and t-stats are the highest for extreme low and high portfolios. The average R^2 of the 25 ME portfolios is only 0.03, indicating that the ME factor lacks the explanatory ability of beta and BE/ME. Our findings corroborate the findings of previous studies which found BE/ME, but not ME, to be effective at explaining stock market returns for stocks listed on the stock markets of developing nations.

In an extension of Fama and French's work, we now propose an alternative to the poorly-performing ME factor by forming portfolios based on NI/CFO. NI/CFO tells investors little about a company's performance, however, it is widely used by investors to test for 'earnings quality' and possible accounting manipulation[10]. The results from this model are shown in Table 9.

[10] Among practitioners, Schilit and Perler (2010) writes that divergence between net income and cash flow from operations is frequently viewed by investors as an indicator of accounting manipulation. This is supported in academic research by Sloan (1996), Healy and Wahlen (1999) and Cohen, Day, and Lys (2005)

Table 9: Univariate Regressions Using Beta, Book Value Of Equity To Market Value Of Equity (BE/ME), And Net Income To Cash From Operations (NI/CFO)

The 25 net-income-to-cashflow-from-operations-book-to-market (NI/CFO-BE/ME)portfolios are formed in the following way. Each year t from 2005 to 2012 BE/ME (measured at the end of December year t-1)is used to assign stocks to one of five BE/ME quintiles, 1 being the highest BE/ME portfolios and 5 being the lowest. The same procedure is followed for NI/CFO, which is also measured at the end of December in year t-1, and stocks are assigned to one of five NI/CFO quintiles.
RM is the weekly return on the Stoxx EU Enlarged Total Market Index
RF is the weekly yield on the 1 month eurozone generic government bond
HML is the difference between the returns on high BE/ME (H)and low BE/ME (L)portfolios. LMS is the difference between returns on high NI/CFO (L)and low NI/CFO portfolios (S).
Average R^2 is the arithmetic mean of the R^2s from the 25 NI/CFO-BE/ME portfolios calculated on an equally weighted basis.
Weighted R^2 is the arithmetic mean of the R^2s from the 25 NI/CFO-BE/ME portfolios calculated weighted by the number of observations from each portfolio.
For *β*, *s*, and *h* the number not in parenthesis is the regression's slope coefficient, the number in parenthesis is the regression t-statistic.

Average Number of Observations

	Low	4	3	2	HIgh
Low	3,800	4,000	6,800	6,000	6,000
4	6,400	5,600	5,400	3,600	5,200
3	5,200	5,400	4,200	6,200	5,200
2	6,600	4,400	4,600	4,800	5,800
High	4,600	6,800	5,200	5,600	4,200

R(t)- RF(t)= α + β[RM(t)- RF(t)] + e(t)

β

(BE/ME) \ NI/CFO	Low	4	3	2	HIgh
Low	0.25 (4.76)	0.25 (4.76)	0.28 (5.54)	0.24 (4.5)	0.34 (6.46)
4	0.26 (6.13)	0.26 (6.13)	0.2 (4.75)	0.33 (6.84)	0.35 (5.74)
3	0.37 (5.88)	0.37 (5.88)	0.31 (6.56)	0.3 (6.69)	0.18 (4.26)
2	0.35 (7.46)	0.35 (7.46)	0.28 (6.05)	0.25 (4.65)	0.33 (5.78)
High	0.32 (4.55)	0.32 (4.55)	0.28 (6.06)	0.31 (6.36)	0.37 (7.15)

R^2

(BE/ME) \ NI/CFO	Low	4	3	2	HIgh
Low	0.06	0.08	0.06	0.11	0.08
4	0.10	0.06	0.12	0.09	0.09
3	0.09	0.12	0.12	0.05	0.10
2	0.15	0.10	0.06	0.09	0.14
High	0.06	0.10	0.11	0.13	0.12

Average R^2 0.10

Weighted Average R^2 0.10

R(t)- RF(t)= α + hHML (t)+ e(t)
HML = (BE/ME)

h

(BE/ME) \ NI/CFO	Low	4	3	2	HIgh
Low	0.01 (0.03)	0.6 (3.41)	0.23 (1.22)	0.44 (2.39)	0.53 (2.73)
4	0.08 (0.51)	0.2 (1.41)	-0.03 (-0.17)	0.07 (0.32)	-0.1 (-0.51)
3	-0.43 (-1.97)	-0.37 (-2.21)	-0.52 (-3.32)	-0.24 (-1.71)	-0.54 (-3.3)
2	-0.84 (-5.04)	-0.8 (-4.93)	-0.81 (-4.46)	-0.92 (-4.62)	-0.85 (-4.8)
High	-0.71 (-2.91)	-0.97 (-6.13)	-0.72 (-4.32)	-1.1 (-6.12)	-1.06 (-5.34)

R^2

(BE/ME) \ NI/CFO	Low	4	3	2	HIgh
Low	-0.00	0.03	0.00	0.01	0.02
4	-0.00	0.00	-0.00	-0.00	-0.00
3	0.01	0.01	0.03	0.01	0.03
2	0.07	0.07	0.05	0.06	0.06
High	0.02	0.10	0.05	0.10	0.08

Average R^2 0.04

Weighted Average R^2 0.05

R(t)- RF(t)= α + sLMS(t)+ e(t)
LMS = NI/CFO

s

(BE/ME) \ NI/CFO	Low	4	3	2	HIgh
Low	0.32 (1.57)	0.21 (1.07)	0.89 (4.43)	1.31 (6.76)	1,89 (9,45)
4	0.4 (2.4)	0.38 (2.36)	1.01 (5.44)	1.86 (8.53)	1,71 (7,41)
3	0.58 (2.39)	0.24 (1.33)	0.48 (2.72)	0.98 (6.49)	1,9 (8,85)
2	0.46 (2.45)	0.38 (2.07)	1.14 (5.77)	1.15 (5.26)	1,64 (7,35)
High	0.55 (2.02)	0.77 (4.29)	0.55 (2.94)	1.64 (8.69)	2,19 (8,62)

R^2

(BE/ME) \ NI/CFO	Low	4	3	2	HIgh
Low	0.01	0.02	0.12	0.20	0.28
4	0.04	0.03	0.14	0.18	0.19
3	0.05	0.06	0.04	0.20	0.26
2	0.10	0.03	0.11	0.12	0.19
High	0.03	0.10	0.09	0.26	0.25

Average R^2 0.12

Weighted Average R^2 0.13

The univariate beta and BE/ME regressions return similar results to those in Table 8 (with weighted average R^2s of 0.1 and 0.05 respectively), whilst NI/CFO performs substantially better than ME. As expected, NI/CFO has strong explanatory ability for the higher NI/CFO portfolios: investors perceive big differences between net income and cash flow from operations as being associated with accounting manipulation. Therefore, we believe that NI/CFO represents a risk factor.

Following the univariate regressions, we now form two three factor models. One model is based upon Fama French (1993), the other replaces the ME term with NI/CFO. The results are shown in Table 10.

Table 10: Factor Model Multiple Regressions

Panel A shows the multivariate regressions of the computations in table 4.
Panel B shows the multivariate regressions of the computations in table 5.

Panel A
BEME
ME

R(t)- RF(t)= α + β[RM(t)- RF(t)] + hHML (t)+ s*SMB* (t)+ e(t)
BMS =
S/FA

β

	ME				
(BE/ME)	Low	4	3	2	HIgh
Low	0.2 (4.36)	0.22 (4.91)	0.28 (6.54)	0.3 (5.29)	0.28 (6.1)
4	0.18 (4.05)	0.29 (6.21)	0.33 (6.82)	0.25 (5.08)	0.26 (5.61)
3	0.29 (6.4)	0.31 (6.73)	0.23 (5.23)	0.21 (4.13)	0.27 (5.82)
2	0.32 (6.36)	0.3 (6.66)	0.25 (4.9)	0.25 (5.84)	0.31 (5.59)
High	0.19 (4.84)	0.3 (6.78)	0.31 (7.04)	0.26 (5.42)	0.44 (5.3)

h BE/ME

	ME				
(BE/ME)	Low	4	3	2	HIgh
Low	-0.49 (-3.72)	-0.09 (-0.7)	0.2 (1.59)	0.44 (2.7)	1.06 (7.81)
4	-0.59 (-4.5)	-0.35 (-2.59)	0.27 (1.93)	0.22 (1.53)	0.68 (5.04)
3	-0.58 (-4.34)	-0.23 (-1.66)	0.13 (1.04)	0.51 (3.55)	0.88 (6.57)
2	-0.76 (-5.15)	0.07 (0.53)	0.31 (2.03)	0.9 (7.17)	1.01 (6.15)
High	-0.54 (-4.61)	0.05 (0.41)	0.31 (2.43)	0.44 (3.14)	0.97 (3.97)

s ME

	ME				
(BE/ME)	Low	4	3	2	HIgh
Low	-0.33 (-2.11)	0.15 (0.94)	-0.03 (-0.22)	0.43 (2.2)	0.31 (1.9)
4	0.03 (0.21)	-0.05 (-0.29)	-0.23 (-1.4)	0.25 (1.47)	-0.03 (-0.17)
3	-0.27 (-1.72)	-0.45 (-2.81)	-0.43 (-2.83)	-0.48 (-2.78)	-0.84 (-5.32)
2	-0.73 (-4.13)	-0.91 (-5.74)	-0.71 (-3.93)	-1.29 (-8.68)	-0.98 (-5.07)
High	-0.65 (-4.69)	-0.69 (-4.58)	-1.01 (-6.64)	-1.17 (-6.97)	-1.21 (-4.2)

R^2

	ME				
(BE/ME)	Low	4	3	2	HIgh
Low	0.11	0.06	0.12	0.11	0.26
4	0.09	0.12	0.14	0.08	0.15
3	0.17	0.16	0.11	0.10	0.25
2	0.23	0.21	0.12	0.34	0.23
High	0.19	0.19	0.26	0.23	0.16

Average R^2 0.16
Weighted Average R^2 0.17

Panel B
BEME
NICFO
R(t)- RF(t)= α + β[RM(t)- RF(t)] + hHML (t)+ *lLMS* (t)+ e(t)
BMS =
NI/CFO

β

	NI/CFO				
(BE/ME)	Low	4	3	2	HIgh
Low	0.25 (4.61)	0.3 (6.02)	0.22 (4.19)	0.31 (6.31)	0.27 (5.16)
4	0.26 (5.96)	0.2 (4.69)	0.3 (6.32)	0.3 (5.12)	0.25 (4.98)
3	0.34 (5.41)	0.29 (6.21)	0.27 (6.06)	0.14 (3.39)	0.23 (5.23)
2	0.32 (6.79)	0.25 (5.39)	0.19 (3.6)	0.27 (4.82)	0.31 (6.47)
High	0.29 (4.02)	0.23 (5.11)	0.27 (5.64)	0.28 (6.1)	0.29 (5.52)

h BE/ME

	NI/CFO				
(BE/ME)	Low	4	3	2	HIgh
Low	0.19 (0.96)	0.06 (0.35)	0.78 (3.93)	1.15 (6.27)	1.21 (6.21)
4	0.27 (1.66)	0.28 (1.78)	0.85 (4.78)	1.71 (8.01)	1.4 (7.51)
3	0.39 (1.67)	0.08 (0.48)	0.32 (1.95)	0.9 (6.03)	1.31 (8.07)
2	0.28 (1.62)	0.23 (1.35)	1.03 (5.38)	0.99 (4.76)	1.07 (6.07)
High	0.38 (1.45)	0.63 (3.79)	0.4 (2.24)	1.47 (8.57)	1.51 (7.74)

l NI/CFO

	NI/CFO				
(BE/ME)	Low	4	3	2	HIgh
Low	0.11 (0.6)	0.72 (4.28)	0.33 (1.84)	0.58 (3.52)	0.65 (9.7)
4	0.50 (2.27)	0.29 (2.04)	0.11 (0.66)	0.22 (2.12)	0.03 (6.16)
3	0.29 (1.37)	0.25 (2.56)	0.41 (4.72)	0.18 (2.3)	0.43 (4.95)
2	0.71 (4.5)	0.69 (4.44)	0.72 (4.17)	0.8 (4.24)	0.71 (4.44)
High	0.59 (2.45)	0.87 (5.77)	0.61 (3.8)	0.96 (6.17)	0.91 (5.21)

R^2

	NI/CFO				
(BE/ME)	Low	4	3	2	HIgh
Low	0.07	0.15	0.18	0.30	0.38
4	0.17	0.11	0.26	0.23	0.27
3	0.14	0.17	0.20	0.25	0.37
2	0.28	0.16	0.25	0.25	0.35
High	0.17	0.33	0.24	0.49	0.44

Average R^2 0.25

Weighted Average R^2 0.25

For both of the three factor models, the individual components perform similarly in a multivariate setting to how they did in the univariate regressions. The models' components retain the statistical significance of the univariate regressions in Tables 7 and 8 (NI/CFO has a weighted R^2 of 0.13, compared to ME's weighted R^2 of 0.03) and the direction of the regression slope coefficients does not change substantially. As with the univariate regressions, NI/CFO performs substantially better than ME in terms of R^2, with regression 6 portfolios returning a weighted average R^2 of 0.17 and the regression 19 portfolios returning a substantially higher weighted average R^2 of 0.25. As the model which includes the NI/CFO factor returns substantially higher R^2 values than the model including the ME factor: it is clear that NI/CFO has substantially greater explanatory ability than ME.

In order to ensure that our results are not distorted by mutlicollinearity, we examine correlations between variables and also calculate variance inflation factors. The results are shown in Table 11.

Table 11: Multicolinearity Tests

RM is the weekly return on the Stoxx EU Enlarged Total Market Index

RF is the weekly yield on the 1 month eurozone generic government bond

HML is the difference between returns on high BE/ME (H) and low BE/ME portfolios (L).

BMS is the difference between the returns on large ME (B)and small ME portfolios (S).

LMS is the difference between returns on high NI/CFO (L)and low NI/CFO portfolios (S).

Variance Inflation Factor is calculated as: $1/(1-R^2)$, where R^2 is the coefficient of determination for the regression of the dependent and independent variables

Panel A
Correlations

ME				**NI/CFO**			
	SMB	HML	RM-RF		LMS	HML	RM-RF
SMB	-			LMS	-		
HML	-0.28	-		HML	-0.12	-	
Market Excess Returns	0.01	-0.18	-	Market Excess Returns	0.14	-0.18	-

Panel B
Variance Inflation Factors

ME			**NI/CFO**		
Dependent Variable	Independent Variable(s)	VIF	Dependent Variable	Independent Variable(s)	VIF
HML	SMB	1.08	HML	LMS	1.01
HML	RM-RF	1.04	HML	RM-RF	1.03
HML	SMB and RM-RF	1.11	HML	LMS and RM-RF	1.03
RM-RF	SMB and HML	1.04	Market Excess Returns	LMS and HML	1.05
SMB	HML and RM-RF	1.08	LMS	HML and RM-RF	1.04

The correlation between SMB and HML is actually greater than it is between LMS and HML. LMS is more correlated with market excess returns that SMB, but this may be due to LMS's greater explanatory ability on returns.

In Panel B, the variance inflation factors (VIF) are low for the variables in both the factor models.

Table 11 Panel A shows that the factors RM-RF, SMB, HML, and LMS are largely uncorrelated with one another; the VIF tests in Table 11 Panel B also return low values, indicating lack of multicolinearity. Thus we are confident that the regressions in Table 10, which utilize three factor models, provide three independent factors with which to explain equity returns.

3.7. Discussion of Results

As a minimum, our results show that NI/CFO is better than ME at explaining equity returns for stocks listed on the stock markets of the EE EU nations. Section 3.2 documents previous research examining the effect of changing institutional characteristics associated with EU accession and thetransition from planned to market economies on reported accounting numbers. It is possible that the instituitional characteristics of the EE EU nations and the associated effect on reported accounting numbers has compelled investors to pay close attention to NI/CFO in the EE EU. Thus, in our opinion NI/CFO represents a risk factor.

Beyond this, we believe that our findings raise questions about the pricing efficiency of the stock markets of the EE EU nations. There are many reasons unrelated to earnings management why NI can diverge from CFO: NI/CFO can only be considered a crude proxy for accounting manipulation. As Fama (1970) defines an efficient market as one which "fully reflects' all available information, it could be argued that investors' suspicions of reported NI prevents all available information from being discounted into share prices.

3.8. Conclusions

Our application of the Fama French (1993) model to the EE EU nations shows that while beta and BE/ME do have significant explanatory ability on returns, ME performs poorly for stocks listed on the stock markets of the EE EU. These results corroborate the results from previous studies that have applied the Fama French (1993) to emerging markets. We show that replacing the ME factor with NI/CFO yields results that can be considered substantially more statistically significant. Our results can be employed in any function that requires expected equity returns in the EE EU nations, and potentially applied to the numerous markets in which ME has proved to have a poor explanatory ability on returns. Furthermore, while NI/CFO is rarely used in academia, it is standard in literature aimed at

financial market practitioners and is regarded as an indicator of accounting manipulation. We hypothesize that stock prices do not incorporate all available information because investors are not able to determine which companies' net income figures are reliable and have to resort to crude approximations such as NI/CFO.

The poor performance of the Fama French (1993) model in the EE EU nations and the success of our respecified models has significant ramifications and opens up many interesting research questions. We identify two of them. Firstly, an important extension of our work would be to apply the respecified models to another emerging markets dataset, for which ME has previously shown to have poor explanatory ability. Secondly, as we have found intriguing results using financial ratios in the EE EU, it would be interesting to examine how financial ratios perform in the region in a non-factor model-based scenario.

We believe that our findings also have practical implications. Whether our findings are a product of pricing inefficiencies or risk factors, the work is of obvious interest to those who invest in the EE EU region and possibility also of interest to those who invest in other regions. Our findings also have important implications for accounting standards setters as one of the main reasons for the existence of accounting standards is to ensure comparability across companies that use the same accounting standards regardless of where a company is domiciled, yet our findings indicate that there may be some region-specific idiosyncrasies in the reporting and interpretation of accounting numbers.

4. THE IMPACT OF INTERNATIONAL DIFFERENCES IN CAPITAL STRUCTURE CHOICES ON THE BOOK-TO-PRICE EFFECT: EVIDENCE FROM THE TRANSITION NATIONS OF THE EUROPEAN UNION

4.1. Abstract

We propose a theory that international differences in the reasons companies choose a particular capital structure translate into different meanings of the book-to-price (B/P) ratio across countries. Whilst previous research has shown that capital structure choices are motivated by different factors in the in the Eastern European nations that joined the European Union in 2004 (hereafter referred to as the EE EU nations), no research we are aware of considers the impact of this on the B/P ratio. We show that, whilst the B/P effect still holds for stocks listed in the EE EU, the decomposed elements of the ratio return very different results to the ones reported by research into more established capital markets. We hypothesize that our results differ from those reported by previous research as ratios that are considered to be measures of operating risk in more established capital markets are being used as proxies for inappropriate levels of leverage in the EE EU.

4.2. Introduction

Since the publication of Fama and French's (1993) seminal work, the debate over whether the B/P effect represents a risk factor, or is attributable to mispricing has become one of the most contentious issues in the finance literature. Fama and French (1993) interpret B/P as being a proxy for financial distress omitted from CAPM, and hence consider their results to be consistent with a risk based explanation. In contrast, Lakonistock, Shleifer and Vishny (1994) and Daniel and Titman (1997) consider Fama French's (1993) results as being attributable to the market's mispricing of high B/P (value) stocks and low B/P (growth) stocks, leading to the eventual outperformance of value and underperformance of growth.

In an attempt to identify the underlying reasons for the existence of the B/P effect, Penman, Richardson, and Tuna (2007) (PRT) decompose the ratio into operating and financing risk components. PRT report some puzzling results, while B/P's operating risk component is positively related to returns, the leverage risk component is negatively

related to returns. This contradicts finance theory, particularly Modigliani and Miller (1958) Proposition 1, which states that there should be a positive relationship between cost of equity and leverage. Skogsvik, Skogsvik, and Tuna (2011) (SST) extend PRT's work in order to further investigate this apparently anomalous finding. SST proposed that financial leverage has a twofold effect on returns; firstly, a compounding operating risk effect which SST capture by multiplying financial leverage by firms' operating leverage (positively related to returns); secondly, an interest cost effect of debt (negatively related to returns).

There may also be a regional aspect to financial leverage as numerous studies have reported that the capital structure of firms listed in the EE EU nations does not conform with modern capital structure theory. For example, Haas and Peeters (2006) found that companies listed in the EE EU used too little leverage due to the underdeveloped banking system in the years immediately following the move towards becoming market economies. Although companies listed in the EE EU were getting closer to their target leverage, asymmetry of information between firms and banks was still substantial. As a consequence of this, firms prefer internal finance and only gradually adjust leverage, indicating that substantial market frictions still remain. Nivorozhkin (2004) also noted that changes in debt financing for firms listed in the EE EU nations had only been gradual. Mramor and Valentinčič (2001) questioned the issue at a more fundamental level and proposed that the underlying assumptions of modern capital structure theory did not apply to Slovenia. Whilst the study only considered firms from one of the smaller nations in our dataset, the conclusion that privatized firms do not have either the objective of maximizing shareholders' wealth or striving for long term survival, but rather exhibit evidence of employee-governed behavior may well hold for other transition nations. Črnigoj and Mramor (2009, p.11), examined capital structure in Slovenian firms and concluded "[we] show that theories based on the assumption that firms follow the goal of maximizing shareholders' wealth cannot offer a satisfactory explanation of the capital structure choice in emerging European economies". These regional differences in reasons for choosing a particular capital structure may well effect the relationship between financial leverage and equity returns.

This paper is motivated by the above observations of differences in capital structure choices between firms listed on established capital markets and those listed on the capital markets of transition nations and how this effects the relationship between financial

leverage (and consequently B/P) and equity returns in transition nations. When we apply the methodology of PRT and SST to stocks listed in the EE EU nations we find that whilst the B/P effect still exists in the EE EU nations, the decomposed elements of B/P perform substantially differently. Our results combined with the findings of previous research leads us to hypothesize that the B/P effect has a different meaning for stocks listed in the EE EU nations than it does for stocks listed in more established capital markets, with the operating risk component acting as a proxy for inappropriate levels of leverage determined by factors other than modern capital structure theory.

4.3. Methodology

The first part of our methodology is based upon the work of PRT. For the operating risk component of B/P, PRT used enterprise book-to-price (NOA/P^{NOA}), calculated as:

$$\boldsymbol{NOA = B + ND} \qquad (20)$$

$$\boldsymbol{P^{NOA} = P + ND} \qquad (21)$$

Where:

NOA= Book value of net operating assets

B = Book value of equity

ND= Book value of net debt[11]

P^{NOA} = Price of operations (enterprise value)

P = Market value of equity

PRT use financial leverage (ND/P) is for the financing risk component of B/P.

We calculate both NOA/P^{NOA} and ND/P at the end of each fiscal year t in our dataset, where t runs from 2004 to 2009.

We rerun PRT's cross-sectional regressions of raw equity returns on B/P, B/P components and other characteristics. The following regressions have been estimated:

$$\boldsymbol{R_{t+1} = \propto + \lambda \cdot \frac{B}{P}} \qquad (22)$$

[11] Owing to the difficulties associated with measuring the market value of debt, PRT assume that book value is a reasonable approximation.

$$\boldsymbol{R_{t+1}} = \propto + \boldsymbol{\lambda} \cdot \frac{\boldsymbol{NOA}}{\boldsymbol{P^{NOA}}} \qquad (23)$$

$$\boldsymbol{R_{t+1}} = \propto + \boldsymbol{\lambda} \cdot \frac{\boldsymbol{ND}}{\boldsymbol{P}} \qquad (24)$$

$$\boldsymbol{R_{t+1}} = \propto + \boldsymbol{\lambda} \cdot \left(\boldsymbol{BP} - \frac{\boldsymbol{NOA}}{\boldsymbol{P^{NOA}}}\right) \qquad (25)$$

$$\boldsymbol{R_{t+1}} = \propto + \boldsymbol{\lambda_1} \cdot \frac{\boldsymbol{NOA}}{\boldsymbol{P^{NOA}}} + \boldsymbol{\lambda_2} \cdot \frac{\boldsymbol{ND}}{\boldsymbol{P}} \qquad (26)$$

$$\boldsymbol{R_{t+1}} = \propto + \boldsymbol{\lambda_1} \cdot \frac{\boldsymbol{NOA}}{\boldsymbol{P^{NOA}}} + \boldsymbol{\lambda_2} \cdot \left(\boldsymbol{BP} - \frac{\boldsymbol{NOA}}{\boldsymbol{P^{NOA}}}\right) \qquad (27)$$

$$\boldsymbol{R_{t+1}} = \propto + \boldsymbol{\lambda_1} \cdot \frac{\boldsymbol{NOA}}{\boldsymbol{P^{NOA}}} + \boldsymbol{\lambda_2} \cdot \frac{\boldsymbol{FL}}{\boldsymbol{P}} + \boldsymbol{\lambda_3} \cdot \frac{\boldsymbol{FA}}{\boldsymbol{P}} \qquad (28)$$

$$\boldsymbol{R_{t+1}} = \propto + \boldsymbol{\lambda_1} \cdot \frac{\boldsymbol{NOA}}{\boldsymbol{P^{NOA}}} + \boldsymbol{\lambda_2} \cdot \frac{\boldsymbol{ND}}{\boldsymbol{P}} + \boldsymbol{\lambda_3} \cdot \mathbf{ln}(\boldsymbol{P_t}) + \boldsymbol{\lambda_4} \cdot \boldsymbol{\beta}(\boldsymbol{e})_{\boldsymbol{t}} \qquad (29)$$

Where:

R_{t+1} = natural logarithmic equity returns covering the 12 month period starting 4 months after the end of fiscal year end t. Calculated as:

$$\boldsymbol{R_{t+1}} = \prod_{\boldsymbol{m=1}}^{\boldsymbol{12}} \left(\mathbf{1} + \boldsymbol{R_{t+1(m)}}\right) - \mathbf{1} \qquad (30)$$

$R_{t+1(m)}$=natural logarithmic return for month m in year t+1

$\beta(e)$ = levered equity beta, estimated on an annual basis from the regression of firm returns on market returns using weekly natural logarithmic returns for the same year as the B/P calculation. The Stoxx EU Enlarged Total Market Index is used for market returns.

The results are shown in Table 13.

Following these regressions, we apply the methodology of SST to examine the performance of two different measures of operating risk for stocks listed in the EE EU. Firstly, we apply an operating covariance risk premium, Oprm(Cov), calculated as:

$$\boldsymbol{Oprm(Cov)} = \boldsymbol{\beta}(\boldsymbol{u}) \cdot (\boldsymbol{rm} - \boldsymbol{rf}) \qquad (31)$$

Where:

rm = Return on the market. Calculated using 12 month returns on the Stoxx EU Enlarged Total Market Index

rf = Risk free rate. Calculated using the 1 year Euro generic government bond

$\beta(u)$ = unlevered beta, calculated as:

$$\boldsymbol{\beta(u) = \frac{\beta(e)}{1+\left(\frac{ND}{P}\right)}} \qquad (32)$$

We then run the following regression:

$$\boldsymbol{R_{t+1} = \propto + \lambda \cdot Oprm(Cov)} \qquad (33)$$

$$\boldsymbol{R_{t+1} = \propto + \lambda_1 \cdot Oprm(Cov) + \lambda_2 \cdot \left(\frac{ND}{P}\right)} \qquad (34)$$

$$\boldsymbol{R_{t+1} = \propto + \lambda_1 \cdot Oprm(Cov) + \lambda_2 \cdot Oprm(Cov) \cdot \left(\frac{ND}{P}\right)} \qquad (35)$$

$$\boldsymbol{R_{t+1} = \propto + \lambda_1 \cdot Oprm(Cov) + \lambda_2 \cdot Oprm(Cov) \cdot \left(\frac{ND}{P}\right) + \lambda_3 \cdot \left(\frac{ND}{P}\right)} \qquad (36)$$

$$\boldsymbol{R_{t+1} = \propto + \lambda_1 \cdot Oprm(Cov) + \lambda_2 \cdot Oprm(Cov) \cdot \left(\frac{ND}{P}\right) + \lambda_3 \cdot \left(\frac{ND}{P}\right)} \qquad (37)$$

$$\boldsymbol{R_{t+1} = \propto + \lambda_1 \cdot Oprm(Cov) + \lambda_2 \cdot Oprm(Cov) \cdot \left(\frac{ND}{P}\right) + \lambda_3 \cdot \left(\frac{ND}{P}\right) + \lambda_4 \cdot \ln(P_t)} \qquad (38)$$

The results are shown in Table 14.

For the second measure of operating risk, we replace Oprm(Cov) with NOA/P^{NOA} and estimate the following regressions:

$$\boldsymbol{R_{t+1} = \propto + \lambda_1 \cdot \left(\frac{NOA}{P^{NOA}}\right) + \lambda_2 \cdot \left(\frac{NOA}{P^{NOA}}\right) \cdot \left(\frac{ND}{P}\right) + \lambda_3 \cdot \left(\frac{ND}{P}\right)} \qquad (39)$$

$$\boldsymbol{R_{t+1} = \propto + \lambda_1 \cdot \left(\frac{NOA}{P^{NOA}}\right) + \lambda_2 \cdot \left(\frac{NOA}{P^{NOA}}\right) \cdot \left(\frac{ND}{P}\right) + \lambda_3 \cdot \left(\frac{ND}{P}\right) + \lambda_4 \cdot \ln(P_t) + \lambda_5 \cdot \beta(e)} \qquad (40)$$

The results are shown in Table 15.

In line with the methodology of SST, we then combine Oprm(Cov) and NOA/P^{NOA} in the following regression:

$$\boldsymbol{R_{t+1} = \propto + \lambda_1 \cdot Oprm(Cov) + \lambda_2 \cdot Oprm(Cov) \cdot \left(\frac{ND}{P}\right) + \lambda_3 \cdot \left(\frac{ND}{P}\right) + \lambda_4 \cdot Size + \lambda_5 \cdot \left(\frac{NOA}{P^{NOA}}\right)} \qquad (41)$$

Where:

$Size$ = P at the end of the fiscal year t.

The results are shown in Table 16.

4.4. Dataset

Our dataset covers stocks listed in the EE EU countries that joined the Union in May 2004 namely Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Slovakia and Slovenia. We use stocks included in the Stoxx EU Enlarged Total Market Index, which captures 95% of the free float capitalization of stocks traded in the nations that have joined the EU since 2004. Some constituents of the Stoxx EU Enlarged Total Market Index were excluded as part of the trimming process, we removed stocks that:

- Lack pricing data. Stocks must have Bloomberg prices for at least 12 months prior to the end of year t.
- All stocks must still have a listing on 30th April 2011.
- Lack fundamental data. We also excluded stocks missing Bloomberg B or P for the end of year t.
- We excluded stocks from Bulgaria, Cyprus, Malta, and Romania as our research is only concerned with the transition nations that joined the EU on 1st May 2004.
- In line with the methodology of PRT, we also exclude financial services companies.

Table 12 provides a geographic and yearly breakdown of the number of stocks included in the dataset.

Table 12: Number Of Stocks Included In The Dataset

	2004	2005	2006	2007	2008	2009
Czech Republic	1	3	3	3	3	3
Estonia	0	2	3	2	1	1
Hungary	4	4	4	4	4	4
Latvia	0	0	0	1	1	1
Lithuania	0	4	4	2	3	4
Poland	26	47	62	73	76	96
Slovakia	0	0	1	1	1	1
Slovenia	1	4	6	8	9	8
Total	31	64	82	92	96	116

Stocks are taken from the Stoxx EU Enlarged Total Market Index. The dataset does not include stocks that:

- Lack pricing data. Stocks must have Bloomberg prices for at least 12 months prior to the end of year t.
- All stocks must still have a listing on 30th April 2011.
- Lack fundamental data. We also excluded stocks missing Bloomberg B or P for the end of year t.
- We excluded stocks from Bulgaria, Cyprus, Malta, and Romania as our research is only concerned with the transition nations that joined the EU on 1st May 2004.
- In line with the methodology of PRT, we also exclude financial services companies.

The number of stocks included in the dataset increased considerably over the period under consideration. From the start of our dataset onwards there is a strong Polish bias, this is hardly surprising considering that the Polish economy is substantially larger than the economy of any other nation in our dataset. Furthermore, whilst there has been a substantial increase in the number of stocks listed in Poland, the other nations in the dataset have only experienced minor changes in the number of listed companies.

4.5. Results

The results from the regressions of B/P and B/P's decomposed components on returns are shown in Table 13.

Table 13: Means And T-Statistics From Cross-Sectional Regressions Of Raw Stock Returns On B/P And B/P Components

	i	ii	iii	iv	v	vi	vii	viii
Intercept	0.078	0.003	0.193	0.232	0.008	0.024	0.013	0.281
	(1.565)	(0.049)	(5.063)	(6.644)	(0.129	(0.372)	(0.204)	(1.915)
B/P	0.196							
	(4.730)							
NOA/P^{NOA}		0.308			0.263	0.272	0.259	0.225
		(4.710)			(3.750)	(3.861)	(1.098)	(3.066)
ND/P			0.133		0.075			0.058
			(3.309)		(1.756)			(1.337)
$BP - NOA/P^{NOA}$				0.219		0.108		
				(2.993)		(1.399)		
Size								-0.040
								(-2.391)
$\beta(e)$								0.036
								(0.443)
FL/P							0.063	
							(1.098)	
FA/P							0.031	
							(0.294)	
Adjusted R^2	0.054	0.053	0.026	0.021	0.058	0.056	0.056	0.068

B/P – book value of equity divided by market value of equity, calculated at the end of the fiscal year.
NOA/P^{NOA} – enterprise book-to-price. Calculated as book value of net operating assets divided by the market value of net operating assets at the end of the fiscal year.
ND/P – book value of net debt divided by market value of equity at the end of the fiscal year.
Size – the natural logarithm of the market value of equity at the end of the fiscal year.
$\beta(e)$ – beta, estimated from a 48 month regression of equity returns on EU Enlarged Total Market Index.
FL – financial liabilities at the end of fiscal year t
FA – financial assets at the end of fiscal year t
Returns are 12 month size-adjusted natural log returns beginning 4 months after the end of the fiscal year.

Examining the univariate regressions, the results for regressions i, ii and iv in Table 13 are very similar for stocks in both our dataset and PRT's dataset, with B/P, NOA/P^{NOA}, and $BP\text{-}NOA/P^{NOA}$ all being positively and statistically significantly related to returns for both datasets. In regression iii, PRT report that ND/P is positively related to returns, but not statistically significant at any conventional level. In contrast we find that ND/P is not only positive, but also statistically significant at 1%.

Turning to the multivariate regressions, in line with PRT we find that NOA/P^{NOA} is positive and statistically significant in regression v. A notable difference between our findings and those of PRT is that whilst PRT report that the ND/P regression coefficient turns negative and becomes statistically significant, we find that the ND/P slope remains positive and statistically significant. This marks a substantial departure between our results and those reported by PRT. Indeed, PRT's paper is based upon the negative relationship they find between ND/P and returns, which they believe contradicts finance theory. In regression vi, both the EE EU and PRT datasets have positive and statistically significant slope coefficients for NOA/P^{NOA}; $BP\text{-}NOA/P^{NOA}$ is also positive for both regions, but cannot be considered to be statistically significant for the EE EU dataset. In regression vii, the slope coefficients of NOA/P^{NOA} and FA/P are positive for both EE EU and PRT, however the results are only statistically significant for PRT's dataset. In line with ND/P in regression v, in regression vii FL/P is positive for the EE EU dataset and negative for PRT's dataset, although the slope coefficient for the EE EU dataset cannot be considered to be statistically significant. In regression viii, NOA/P^{NOA} is positive and statistically significant for both the EE EU and PRT datasets. Again, ND/P is negative for PRT's dataset, but positive for the EE EU dataset. Size is negative and statistically significant for both the EE EU and PRT datasets.

From the regressions in Table 13, it is clear that PRT's finding that ND/P is negatively related to returns does not hold for stocks listed on the stock markets of the EE EU. PRT believe that their finding of a negative relationship between ND/P and returns is an anomaly, we think that it would be strange if the relatively recently established capital markets of the EE EU nations conform with finance theory but the highly liquid and well-established US markets do not. In order to investigate why financial leverage has a different effect on returns for stocks listed in the EE EU compared to those quoted in the USA, we apply the methodology of SST to our dataset. The results are shown in Table 14.

Table 14: Regressions Of Raw Returns On Operating Covariance Risk (Oprm(Cov)), The Compounding Operating Covariance Risk Effect Of Leverage (Oprm(Cov).ND/P), Leverage (ND/P) And Size

	i	ii	iii	iv	v
Intercept	0.257	0.193	0.229	0.211	0.517
	(1.565)	(5.063)	(6.728)	(5.710)	(4.415)
Oprm(Cov)	0.929	0.860	0.719	0.721	0.688
	(5.350)	(4.942)	(3.963)	(3.976)	(3.817)
Oprm(Cov)*ND/P			1.270	1.042	1.051
			(3.461)	(2.546)	(2.591)
ND/P		0.104		0.055	0.028
		(2.642)		(1.251)	(0.624)
Size					-0.043
					(-2.750)
Adjusted R^2	0.068	0.083	0.095	0.096	0.112

Oprm(Cov) is calculated as:

$$Oprm(Cov) = \beta(u) \cdot (rm - rf)$$

Where:

rm = Return on the market. Calculated using 12 month returns on the Stoxx EU Enlarged Total Market Index starting 4 months after the end of the fiscal year

rf = Risk free rate. Calculated using the 1 year Euro generic government bond

$\beta(u)$ = unlevered beta, calculated as:

$$\beta(u) = \frac{\beta(e)}{1 + \left(\frac{ND}{P}\right)}$$

Where:

β(e) = levered equity beta, estimated on an annual basis from the regression of firm returns on market returns using weekly natural logarithmic returns for the same year as the B/P calculation. The Stoxx EU Enlarged Total Market Index is used to calculate market returns.

From regression i it is clear that, in line with the findings of SST, there is a positive and statistically significant relationship between Oprm(Cov) and returns. Again corroborating the findings of SST, in regression ii Oprm(Cov) is positive and statistically significant for stocks listed in the EE EU. As with the results in Table 13, we find a positive relationship between ND/P and returns, whilst SST report a negative relationship. In regression iii, in both the EE EU and SST datasets, ND/P loads positively on Oprm(Cov) through Oprm(Cov)*ND/P; a relationship that SST attribute to the *compounding operating risk effect* of financial leverage on returns. For regression iv, in both the EE EU and SST datasets Oprm(Cov) and Oprm(Cov)*ND/P are positive. Whilst SST report that ND/P is negative and statistically significant in this regression, we find that the variable's regression slope coefficient is positive and not significant, although the EE EU regression has a higher coefficient of determination than SST's regression. In regression v, the addition of a control for size does not change the direction of the slope coefficient for the variables used in iv for either the EE EU or SST datasets. Although the size effect is significant for both datasets, SST report a positive size effect, whilst we find a negative size effect. SST explain the coexistence of a positive Oprm(Cov)*ND/P slope and a negative ND/P slope as being due to the *positive compounding risk effect of financial leverage* and the negative interest cost of debt. This leaves us with the puzzling question of why there is no negative interest cost of debt for stocks quoted on the stock markets of the EE EU.

Table 15: Results From The Regressions Of Raw Stock Returns On NOA/P^{NOA}, NOA/P^{NOA}*ND/P, ND/P, Size And β(E)

	i	ii
Intercept	0.013	0.284
	(0.204)	(1.926)
NOA/P^{NOA}	0.259	0.221
	(3.645)	(2.972)
NOA/P^{NOA} * ND/P	0.259	0.221
	(0.294)	(0.261)
ND/P	0.033	0.020
	(0.218)	(0.136)
Size		-0.040
		(-2.383)
β(e)		0.038
		(0.460)
Adjusted R^2	0.056	0.065

In Table 15 regression i, NOA/P^{NOA} retains the positive and statistically significant relationship from earlier regressions for both the EE EU and SST datasets. Interestingly, whilst SST find that ND/P loads significantly on NOA/P^{NOA}, the variable NOA/P^{NOA}*ND/P is not statistically significant at any conventional level for the EE EU dataset. In line with previous regressions, ND/P is positive for the EE EU dataset, but negative for SST's dataset. In regression ii, the addition of size and beta does not change the direction of the regression slope for any of the variables used in regression i. As with regression v in Table 14, we find a negative size effect. SST report that ND/P loads positively and significantly on both measures of operating risk. We find that ND/P only loads significantly on Oprm(Cov). This leads us to question whether NOA/P^{NOA} has a different meaning for stocks quoted in the EE EU.

Table 16: Results From The Regressions Of Raw Returns On Oprm(Cov), Oprm(Cov) * ND/P, ND/P, Size, And NOA/P^{NOA}

Intercept	0.384
	(2.800)
Oprm(Cov)	0.572
	(3.008)
Oprm(Cov)* ND/P	1.056
	(2.611)
ND/P	0.004
	(0.092)
Size	- 0.039
	- (2.413)
NOA/P^{NOA}	0.136
	(1.852)
R^2	0.117

In line with the findings of SST, Oprm(Cov) and Oprm(Cov)*ND/P both remain positive and statistically significant in Table 16. Consistent with earlier regressions, ND/P remains positive but not statistically significant for the EE EU dataset, whilst SST report a negative and statistically significant relationship between ND/P and returns. Whilst SST report that size is positive and not statistically significant, we find the variable to be negative and statistically significant. Interestingly, NOA/P^{NOA} turns negative for SST, but remains positive for our dataset.

4.6. Discussion of Results

Our results concur with those of SST insofar that Oprm(Cov) seems to be a good proxy for operating risk and that leverage positively and statistically significantly loads on it in a similar manner for both the EE EU and SST datasets. However, whilst NOA/P^{NOA} is considered by both PRT and SST to be a measure of operating risk and performs similarly to Oprm(Cov) when SST load ND/P on it, in the EE EU dataset NOA/P^{NOA} returns results are substantially different, leading us to hypothesize that the ratio has a different meaning for stocks listed in the EE EU nations.

Previous research persistently reports that capital structure choice for stocks listed in the EE EU is determined by different factors than in developed capital markets: we believe that the capital structure idiosyncrasies of stocks listed in the EE EU offers an explanation to the differing performance of both ND/P and NOA/P^{NOA} in our dataset.

Referring to the calculation of NOA and P^{NOA}, a change in ND will cause an exactly equal change in NOA. However, this is not necessarily the case for P^{NOA}. The change in P^{NOA} with respect to a change in ND depends on the market's perception of the change in leverage. It is possible that for firms with high (low) NOA/P^{NOA} the market has a negative (positive) perception of the appropriateness of the level of financial leverage employed by the company. Thus, it may be that whilst NOA/P^{NOA} acts as a proxy for operating risk in more established capital markets, in the capital markets of the EE EU, the ratio proxies for levels of leverage that would be considered inappropriate according to modern capital structure theory.

We believe that it is merely a coincidence that we find similar results for our "inappropriate leverage" NOA/P^{NOA} to SST's "operating risk" NOA/P^{NOA} in Table 13. This explains why ND/P fails to load significantly on NOA/P^{NOA} in Table 15 i.e. there is

no compounding operating risk of leverage because NOA/P^{NOA} does not represent operating risk. Unlike the results reported by SST, NOA/P^{NOA} remains positive and statistically significant when combined with Oprm(Cov) in Table 16 – we find this logical as whilst Oprm(cov) and NOA/P^{NOA} both proxy for operating risk in SST's dataset, for stocks listed in the EE EU the measures proxy for two different risks. We hypothesize that whilst Oprm(Cov) proxies for operating risk in both the capital markets of the EE EU and USA, NOA/P^{NOA} is a measure of the market's perception of the appropriateness of the level of operating leverage employed by firms listed in the EE EU.

4.7. Conclusion

This paper shows that, whilst the B/P effect is present for stocks listed in the EE EU, when B/P is broken down into its financing and operating components, these decomposed elements behave substantially differently to the results reported by PRT and SST. We find that whilst NOA/P^{NOA} is considered to be a measure of operating risk in previous research into more established capital markets, in the capital markets of the EE EU NOA/P^{NOA} may well proxy for the market's perception of the appropriateness of the level of leverage employed. This leads us to conclude that differences in the market's perception of capital structure choices is reflected in different NOA/P^{NOA} ratios and a different relationship between leverage, NOA/P^{NOA} and returns.

We further the existing literature in the following ways. Given the importance of capital structure on a company's financial performance and on the broader development of a nation's economy, further research into the role of financial leverage is of particular importance in the EE EU nations because of the stock market's role in the ongoing privatization process and also as it serves as an important barometer with which to measure the progress made by these nations in the transition from planned to market economies. Furthermore, as explanations for the B/P effect are contentious, by examining the previously overlooked EE EU region, our work serves both to provide useful further insight into the debate and also to validate the findings of previous research. Finally, by unifying research into both the B/P effect and capital structure in the EE EU, our work offers new insights for both strands of research.

The results raise some interesting issues for future research. We show that the B/P effect has substantial regional characteristics. Whilst previous research, e.g. Fama French

(1998), has shown that the B/P effect exists internationally, the decomposition, (and hence consideration that the meaning of B/P may differ between countries) was not taken into account. We offer an important new dimension for considering the B/P effect on an international basis. The international evidence concerning the B/P effect needs to be reexamined in order to determine whether previous research is distorted by international differences in the behavior of B/P's decomposed elements. Furthermore, the Fama French (1993) factor model, which incorporates B/P, is in widespread use; research is needed to examine how regional differences in the B/P ratio effect the model's performance. Other accounting identities that incorporate financial leverage, such the Dupont formula, should also be examined to determine what effect regional differences in corporate finance policy has on them.

CONCLUSION

Demirguc-Kunt, Feyen and Levine (2011) emphasize the importance of securities markets during the process of economic development. It is of particular importance for the EE EU nations; firstly as they made the transition from planned to market economies and the successful establishment of a stock market is an important measure of the progress made by these nations and secondly because of the stock market's role in the ongoing privatisation process. A well-functioning stock market should be pricing efficient, this has created a need to investigate the pricing efficiency of the EE EU's stock markets and also to investigate what determines equity returns in the region.

This doctoral dissertation investigated the extent to which returns on shares listed on the stock markets of Eastern Europe are predictable and attempted to determine what factors have explanatory ability. Firstly, the dissertation reviewed the extant literature with a particular focus on the efficient market hypothesis, factor models, capital structure theory and the relationship between accounting information and stock market returns. Secondly, the dissertation investigated weak-form market efficiency for individual stocks listed on the stock exchanges of Eastern Europe. While the tests applied are conventional, this dissertation is distinctive because it also tests whether EU accession and illiquidity have affected market efficiency. Thirdly, in response to previous studies that have found the market value of equity component of the Fama French (1993) model to have poor explanatory ability, we propose an alternative three factor model that replaces market value of equity with NI/CFO to proxy for accounting manipulation. The research fills a gap in the extant literature by respecifying a popular model in a manner that works better for stocks listed in the EE EU nations, and possibility other emerging markets. Fourthly, we investigate the book-price effect for stocks listed in the Eastern European accession nations. Previous research has established that capital structure choices are determined by different factors in the EE EU, this dissertation is distinctive because it develops this work and examines the effect of these different leverage choices on the book-price ratio.

Chapter two addressed weak-form market efficiency in the EE EU. The tests employed are in broad agreement that returns on stocks listed in the region are not weak-form efficient. Furthermore, the process of EU accession has not affected these weak-form inefficiencies. Previous research had indicated that although the stock markets of the EE EU did not

conform with weak-form market efficiency, they would become more pricing efficient over time. Given that after twenty years of operating and completing the process of EU accession, returns on stocks listed in the EE EU still do not conform with weak-form market efficiency, we find it hard to see what catalyst can propel these markets to become more efficient. These findings have substantial ramifications. Most obviously, market participants may be able to earn abnormal returns by employing technical analysis. As the dissertation did not take transaction costs into consideration, it is not clear whether investors are able to profit from technical analysis as a stand-alone strategy, however it appears that as a minimum technical analysis can be used as a profitable supplement to another trading strategy. Furthermore, the persistence of weak-form market efficiency in the stock markets of the EE EU has substantial implications for corporate finance decisions as an inefficient stock market may prevent companies from obtaining an optimal capital structure; this may also hinder to ongoing privatisation process.

Chapter three applied the Fama French (1993) model to stocks listed in the EE EU and proposed a respecified model that has greater explanatory ability on returns of stocks listed in the region. These results show that while portfolios formed on book-price do have explanatory ability on returns, portfolios formed on market value of equity do not have substantial explanatory ability. The results corroborate the findings of others and also the hypothesis that portfolios based on the market value of equity factor would have little explanatory ability on returns. Also in line with the hypothesis, portfolios based on NI/CFO substantially outperform those based on market value of equity. We believe that our findings raise questions about the pricing efficiency of the stock markets of the EE EU nations. There are many reasons unrelated to earnings management why NI can diverge from CFO: NI/CFO can only be considered a crude proxy for accounting manipulation. As Fama (1970) defines an efficient market as one which "fully reflects' all available information, it could be argued that investors' suspicions of reported NI prevents all available information from being discounted into share prices. As discussed earlier, a lack of pricing efficiency in the EE EU has important ramifications not just for investors, but also on firms' corporate finance decisions and the broader economy.

Chapter four examines the relationship between equity returns and the book-price ratio and its decomposed elements. When the methodology of Penman, Richardson and Tuna (2007) and Skogsvik, Skogsvik and Tuna (2011) is applied to stocks listed in the EE EU nations the

dissertation find that whilst the book-price effect still exists in the EE EU nations, the decomposed elements of B/P perform substantially differently. This corroborates the hypothesis that the book-price effect has a different meaning for stocks listed in the EE EU nations than it does for stocks listed in more established capital markets, with the operating risk component acting as a proxy for inappropriate levels of leverage determined by factors other than modern capital structure theory. Given the importance of capital structure on a company's financial performance and on the development of a nation's economy, further research into the role of financial leverage is of particular importance in the EE EU nations because of the stock market's role in the ongoing privatization process and also as it serves as an important barometer with which to measure the progress made by these nations in the transition from planned to market economies. Furthermore, as explanations for the B/P effect are contentious, by examining the previously overlooked EE EU region, the work serves both to provide useful further insight into the debate and also to validate the findings of previous research. Finally, by unifying research into both the B/P affect and capital structure in the EE EU, the work offers new insights for both strands of research.

For the reasons detailed above, I believe that this dissertation makes a substantial contribution to the existing work on the subject. However, the findings of the thesis are not without limitations. An important limitation of the dissertation is the relatively short time horizon covered in the empirical sections. In the early years of stock markets in the EE EU nations, there were insufficient stocks to be able to perform the tests employed in the thesis, e.g. forming portfolios for factor models. However, despite covering a relatively short period of time, it does incorporate a complete economic cycle. Furthermore, having a short time horizon can also be an advantage as the results are not distorted by structural changes occurring over a long period of time, e.g. long term changes in the relevance of financial statements or the effect of the internet on the availability of information. In addition to this, a dataset covering a short time horizon is less susceptible to distortions arising from survivorship bias.

While the alternative three factor model proposed in this dissertation has significant explanatory ability in the EE EU, there is no way of knowing whether the model will work in other markets without performing further tests; future research needs to examine whether the proposed three factor model works as effectively for stocks listed on other markets. Similarly, decomposing the book-price ratio returns results that differ from the findings of studies

conducted in other stock markets, further research should be undertaken into whether there are international differences in the meaning of the book-price ratio across countries. The region-specific nature of the findings of this dissertation are both a limitation of the thesis and a suggestion for future research to address interesting questions about how market participants may view supposedly similar fundamental information depending on where a stock is domiciled.

A further limitation of the findings of this dissertation is that it does not answer the question of why the Fama French (1993) three factor model has been shown to work well in numerous markets without incorporating a term for accounting manipulation. This raises questions for future research, particularly whether accounting manipulation is particularly prevalent in the EE EU nations or whether small firms are more likely to engage in accounting manipulation and thus NI/CFO is absorbed by ME in other markets. Similarly, this thesis assumes that the findings from decomposing the B/P ratio are due to leverage having a different meaning in the region, this hypothesis is supported by previous research, but the dissertation does not conclusively prove that market participants view the B/P ratio differently in the EE EU than they do in other markets. This produces an interesting avenue for future research: surveys of stock market participants in the EE EU nations could be conducted which question their interpretation of NI/CFO and B/P would help determine whether the ratios are being used as proxies for accounting manipulation and inappropriate levels of leverage respectively.

Fama French (1992b) found the B/P effect "consumed" the price-earnings effect which had been reported by Basu (1977). Because of Fama French's (1992b) finding the price-earnings effect may have received less attention in the academic literature (Rytchkov, 2011). As this dissertation proposes that B/P has a different meaning in the EE EU nations (and possibility elsewhere) research needs to be undertaken to re-examine the price-earnings effect internationally.

I believe that the key research questions in this doctoral thesis – of whether the stock markets of the Eastern European EU nations are pricing efficient and what factors explain equity returns in the region – have been clearly answered. The research indicates that the region's stock markets do not conform with the least stringent of the three forms of market efficiency. Furthermore, this dissertation contributes to the field by incorporating liquidity controls and examining whether EU accession has affected pricing efficiency. The respecified Fama French (1993) model proposed in this dissertation makes a substantial contribution to the

existing research by offering an alternative model for use in the numerous markets where market value of equity has been shown to have poor explanatory ability. In addition to this, the dissertation contributes to the existing literature in showing that whilst the well-documented book-price effect still holds in the EE EU, the decomposed elements of the ratio have a very different relationship with equity returns than reported by previous studies. This leads to the hypothesis that the book-price ratio has a different meaning in the EE EU nations as it is actually a proxy for levels of leverage that the market perceives as being inappropriate.

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APPENDICES

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Appendix A: Using financial ratios to predict stock market returns

The regressions included in the appendices were an attempt to predict stock market returns using financial ratios. Weekly natural logarithmic returns are used for a one year period. Annual equity returns starting six months after the end of the fiscal year are used to ensure that the financial ratios were publically available at the time the returns series began.

For the linear regressions, ratios proposed in previous research by Lev and Thiagarajan, Nissim and Penman (1989) and Ou and Penman (1989) are used. We also replicate the methodology of Mramor and Pahor (2001) to test both linear and non-linear relationships between financial ratios and returns.

The empirical results are based upon data from the EE EU nations that were named in the introduction. We use stocks included in the Stoxx EU Enlarged Total Market Index, which captures 95% of the free float capitalization of stocks traded in the nations that have joined the EU since 2004. Equity returns used for the dependent variables in our dataset run from July 2004 to June 2008. For the independent variables, the accounting ratios used for portfolio ranking runs from December 2003 to December 2006.

Some constituents of the Stoxx EU Enlarged Total Market Index were excluded from the dataset as part of the trimming process, we removed stocks with thse following characteristic:

- Lack of pricing data. Stocks must have Bloomberg prices for at least 24 months prior to the end of the fiscal year.
- All stocks must still have a listing on 30th June 2008.
- We excluded stocks from Bulgaria, Cyprus, Malta, and Romania as our research is only concerned with the transition nations that joined the EU on 1st May 2004.

All data was obtained from Bloomberg and specified in Euros.

Appendix B: Regressions to predict raw equity returns using financial ratios

These regressions use unadjusted equity returns for the depenent variable running from 1st July 2004 to 31st June 2008.

Lev and Thiagarajann (1993)

	Inventory	Accounts Receivable	Capital Expenditure	Gross Margin	Sales and Administrative Expenses	Labor Force	LIFO Earnings
Observations	183	175	151	133	175	87	247
R^2	0,00	0,00	0,00	0,02	0,00	0,00	0,00
Intercept	0,32	0,31	0,30	0,25	0,32	0,16	0,35
Intercept T-stat	9,80	9,40	8,52	6,76	9,52	5,61	7,31
Slope	0,02	0,02	0,00	- 0,04	0,02	0,00	-0,01
Slope T-stat	1,15	1,11	0,76	-1,24	0,63	0,67	-0,31

Nissim and Penman (2001)

	Sales Profit Margin	Operating Assets	Operating Liabilities	Book Value	Asset Turnover	Financial Leverage	Net Borrowing Cost	Operating Liability Leverage
Observations	185	241	225	225	171	171	87	171
R^2	0,01	-0,00	-0,00	-0,00	0,02	0,01	0,00	0,04
Intercept	0,28	0,33	0,32	0,32	0,24	0,26	0,19	0,17
Slope	0,67	0,00	0,00	0,00	0,10	0,15	3,45	0,37
Intercept T-stat	7,21	10,67	10,28	10,24	5,29	6,05	4,97	3,92
Slope T-stat	2,04	0,15	0,24	0,13	1,16	1,93	1,05	1,73

Ou and Penman (1989) Ratios

	Observations	R^2	Intercept	Slope	Intercept T-stat	Slope T-stat
Current Ratio	178	0,25%	0,279	0,030	5,548	1,236
Change in Current Ratio	158	1,86%	0,310	0,267	9,057	2,195
Quick Ratio	178	0,13%	0,289	0,032	6,159	1,129
Change in Quick Ratio	158	2,93%	0,310	0,262	9,146	2,657
Days Sales in Accounts Receivable	168	0,10%	0,299	0,000	8,610	1,097
Change in Days Sales in Accounts Receivable	148	0,48%	0,295	0,001	8,582	0,271
Inventory Turnover	132	0,55%	0,175	0,252	4,162	4,035
Change in Inventory Turnover	118	0,30%	0,264	0,022	6,990	0,676
Inventory/Total Assets	178	0,84%	0,270	0,469	5,740	1,669
Change in Inventory/Total Assets	158	0,28%	0,320	-0,034	9,191	-0,669
Change in Inventory	176	0,91%	0,303	0,040	8,915	1,712
Change in Sales	176	0,83%	0,312	0,034	9,281	1,660
Change in Depreciation	174	2,18%	0,300	0,090	8,889	2,377
Change in Dividend per Share	5	3,35%	0,015	-0,152	1,749	-2,264
Depreciation /Fixed Assets	176	0,64%	0,287	0,111	6,829	1,534
Change in Depreciation /Fixed Assets	152	2,69%	0,000	-0,415	0,002	-2,457
Return on Opening Equity	176	0,73%	0,307	0,072	9,110	1,595
Change in Return on Opening Equity	176	0,37%	0,319	0,000	9,479	-0,465
Debt-Equity Ratio	168	1,20%	0,292	0,100	7,325	1,873
Change in Debt-Equity Ratio	132	0,53%	0,299	-0,002	8,664	-0,176
LT Debt to Equity	141	1,38%	0,238	0,159	6,579	1,921
Change in LT Debt to Equity	112	0,47%	0,230	0,002	7,424	0,434
Equity to Fixed Assets	178	0,47%	0,325	0,000	9,337	-0,083
Change in Equity to Fixed Assets	158	0,50%	0,316	0,000	9,147	0,007
Times Interest Earned	104	0,11%	0,230	0,000	6,638	0,899
Change in Times Interest Earned	64	4,94%	0,151	0,026	4,738	3,015
Sales/Total Assets	178	0,66%	0,272	0,138	5,640	1,551
Change in Sales/Total Assets	158	0,48%	0,316	0,006	9,166	0,184
Return on Total Assets	178	0,36%	0,316	0,113	9,047	1,326
Return on Closing Equity	178	0,37%	0,323	0,072	9,333	0,481
Gross Margin Ratio	132	0,33%	0,263	0,051	6,899	0,615
Change in Gross Margin Ratio	118	0,67%	0,267	-0,031	7,262	-1,488
Operating Profit (Before Depreciation) to Sales	178	0,46%	0,325	0,003	9,425	0,153
Change in Operating Profit (Before Depreciation) to Sales	158	0,62%	0,312	0,002	9,058	1,504
Pretax Income to Sales	178	0,47%	0,325	0,000	9,410	0,079
Change in Pretax Income to Sales	158	0,43%	0,315	0,000	9,115	0,364
Net Profit Margin	178	0,47%	0,319	0,000	9,343	0,101
Change in Net Profit Margin	160	0,24%	0,319	0,001	9,267	0,716
Sales to Total Cash	178	0,15%	0,329	0,000	9,444	-0,824
Sales to Accounts Receivable	168	2,37%	0,234	0,026	5,230	2,451
Sales to Inventory	176	0,30%	0,311	0,001	8,658	1,277
Change in Sales to Inventory	156	0,05%	0,314	0,020	9,048	0,950
Sales to Working Capital	178	0,30%	0,320	0,004	9,267	1,279
Change in Sales to Working Capital	158	0,27%	0,315	0,001	9,125	0,670
Sales to Fixed Assets	178	0,30%	0,296	0,017	7,194	1,282
Change in Production	132	1,24%	0,260	0,023	7,110	1,827
Change in R&D	4	0,63%	0,004	-0,025	0,855	-0,626
Change in R&D/Sales	4	2,41%	0,005	-0,172	1,035	-1,844
Change in Advertising Expense	74	2,42%	0,179	0,063	5,565	2,214
Change in Advertising/Sales	66	1,96%	0,167	0,007	5,277	2,015
Change in Total Assets	176	2,80%	0,280	0,207	8,455	3,332
Cash Flow to Total Debt	150	2,27%	0,294	0,001	9,115	2,358

Working Capital/Total Assets	178	0,42%	0,286	0,291	6,493	1,372
Working Capital/Total Assets	158	0,38%	0,317	0,000	9,198	0,489
Operating Income/Total Assets	178	4,57%	0,251	3,028	6,271	3,332
Change in Operating Income/Total Assets	158	2,82%	0,319	0,019	9,413	2,616
Repayment of LT Debt as % of total LT Debt	107	0,78%	0,244	-0,001	7,462	-1,534
Issuance of LT Debt as % of total LT Debt	108	0,55%	0,251	-0,001	7,697	-1,400
Purchase of Treasury Stock as % of Stock	14	0,65%	0,047	0,247	3,008	0,459
% Change in LT Debt	124	0,26%	0,240	0,003	7,834	0,728
Cash Dividend as % of Cash Flows	75	0,61%	0,195	0,418	5,874	0,225
Change in Working Capital	176	0,33%	0,316	0,000	9,436	0,556
Net Income Over Cash Flows	170	0,48%	0,316	0,000	9,055	0,110

Mramor and Pahor (2001)

Linear **a+bx**

	Return on Assets	Profit Margin	Sales/Fixed Assets	Sales/ Assets	Current Ratio	Quick Ratio	Quick Quick Ratio	Days Payable	Days Inventory	Times Interest Earned	Debt/ Assets	Equity/ Assets
Observations	219	211	211	218	211	211	211	185	190	167	205	211
R2	0,03	0,03	0,00	0,02	0,00	0,00	0,02	0,00	0,01	0,03	0,03	0,01
Intercept	0,26	0,27	0,31	0,26	0,28	0,29	0,27	0,27	0,26	0,17	0,22	0,29
Slope	1,70	0,77	0,00	0,13	0,02	0,02	0,14	0,00	0,00	0,00	0,60	0,02
Intercept T-stat	7,11	7,03	8,55	5,83	5,98	6,26	7,19	7,68	6,67	5,08	4,94	6,92
Slope T-stat	1,82	1,50	0,21	1,04	0,87	0,88	1,09	0,56	1,18	1,13	1,63	1,13

Quadratic **a+bx+cx2**

	Return on Assets	Profit Margin	Sales/Fixed Assets	Sales/ Assets	Current Ratio	Quick Ratio	Quick Quick Ratio	Days Payable	Days Inventory	Times Interest Earned	Debt/ Assets	Equity/ Assets
Observations	219	211	211	218	211	211	211	185	190	167	205	211
R2	0,04	0,03	0,04	0,04	0,03	0,04	0,02	0,01	0,06	0,05	0,05	0,04
a	0,24	0,27	0,26	0,14	0,16	0,16	0,28	0,27	0,27	0,17	0,17	0,19
b	3,49	0,79	0,04	0,62	0,16	0,23	0,06	-0,00	0,00	0,00	1,82	0,11
aT-stat	6,43	6,89	6,41	2,69	2,62	2,70	6,62	7,69	3,48	4,99	3,46	3,69
b T-stat	2,32	2,34	2,69	3,30	2,29	2,22	0,41	-0,31	1,83	2,47	1,03	1,97
c	-3,92	-0,14	-0,00	-0,24	-0,02	-0,04	0,03	0,00	0,00	-0,00	-3,02	-0,01
c T-stat	-2,07	-0,13	-2,95	-2,80	-1,23	-2,12	0,50	1,00	2,12	-1,81	-1,20	-1,74

Logarithmc **a+b*lnx**

	Return on Assets	Profit Margin	Sales/Fixed Assets	Sales/Assets	Current Ratio	Quick Ratio	Quick Quick Ratio	Days Payable	Days Inventory	Times Interest Earned	Debt/Assets	Equity/Assets
Observations	192	191	211	211	211	211	211	184	189	161	198	210
R2	0,01	0,03	0,01	0,00	0,00	0,00	0,03	0,05	0,02	0,02	0,04	0,01
Intercept	0,08	0,09	0,31	0,29	0,31	0,32	0,23	0,00	0,03	0,04	0,16	0,29
Slope	0,09	0,11	0,04	-0,03	0,02	-0,03	0,05	0,08	0,07	0,13	0,08	0,07
Intercept T-stat	1,44	1,71	9,36	6,56	7,85	9,52	4,83	0,01	0,53	1,14	3,67	7,70
Slope T-stat	1,47	1,49	1,39	-0,88	0,28	-0,60	2,48	4,35	5,19	4,37	3,57	1,36

Exponential **a.bx**

	Return on Assets	Profit Margin	Sales/Fixed Assets	Sales/Assets	Current Ratio	Quick Ratio	Quick Quick Ratio	Days Payable	Days Inventory	Times Interest Earned	Debt/Assets	Equity/Assets
Observations	192	191	211	211	211	211	211	184	189	161	198	210
R2	0,02	0,05	0,05	0,01	0,01	0,01	0,00	0,04	0,03	0,02	0,02	0,00
Intercept	-0,13	-0,31	-0,72	-0,41	-0,62	-0,69	-0,64	-0,06	-0,11	-0,19	-0,51	-0,70
Slope	0,18	0,14	0,19	0,39	-0,22	-0,14	0,04	-0,14	-0,13	-0,17	0,09	-0,01
Intercept T-stat	-1,16	- 2,77	-10,64	-4,65	-7,62	-9,92	-6,30	-0,61	-1,04	-2,63	-5,33	-8,88
Slope T-stat	2,11	1,08	2,34	2,09	-1,74	-1,20	0,91	- 2,42	- 1,58	- 2,30	1,18	-0,09

Square Root

$$a + b\sqrt{X}$$

	Return on Assets	Profit Margin	Sales/Fixed Assets	Sales/Assets	Current Ratio	Quick Ratio	Quick Quick Ratio	Days Payable	Days Inventory	Times Interest Earned	Debt/Assets	Equity/Assets
Observations	198	191	211	218	211	211	211	184	189	161	205	210
R2	0,05	0,06	0,03	0,04	0,03	0,03	0,03	0,06	0,07	0,07	0,06	0,04
Intercept	0,13	0,12	0,22	0,14	0,16	0,18	0,22	0,14	0,09	0,10	0,16	0,16
Slope	1,18	0,87	0,09	0,31	0,14	0,15	0,23	0,01	0,02	0,04	0,50	0,13
Intercept T-stat	2,72	2,37	4,54	2,37	2,51	2,81	4,58	3,31	1,80	2,79	3,11	2,78
Slope T-stat	2,56	1,60	2,93	2,48	1,69	1,69	2,84	1,63	3,52	2,47	3,47	2,12

Quadratic
Logarithmic **a+b*lnx+c*ln2x**

	Return on Assets	Profit Margin	Sales/Fixed Assets	Sales/Assets	Current Ratio	Quick Ratio	Quick Quick Ratio	Days Payable	Days Inventory	Times Interest Earned	Debt/Assets	Equity/Assets
Observations	192,00	191,00	211,00	211,00	211,00	211,00	211,00	184,00	189,00	161,00	198,00	210,00
R2	0,08	0,07	0,01	0,00	0,00	0,00	0,03	0,08	0,07	0,09	0,07	0,03
a	0,03	0,03	0,03	0,28	0,31	0,31	0,24	- 0,00	0,29	0,23	0,12	0,29
b	-0,18	-0,20	0,04	-0,06	0,08	-0,04	-0,02	0,10	0,12	0,19	-0,14	0,21
aT-stat	0,58	0,58	-0,30	2,19	3,86	2,29	1,79	-0,06	1,47	1,67	2,15	2,88
b T-stat	-2,62	-2,63	1,38	-0,91	0,85	-0,65	-0,41	2,09	1,16	1,96	-3,49	1,34
c	-0,02	-0,02	0,01	-0,01	-0,05	0,01	0,01	- 0,00	- 0,01	- 0,01	-0,01	-0,10
c T-stat	-2,01	-1,90	0,63	-0,47	-0,87	0,24	0,78	- 0,32	- 0,89	- 1,36	-1,61	-1,90

Rational Logarithmic **a/x+blnx/x**

	Return on Assets	Profit Margin	Sales/Fixed Assets	Sales/Assets	Current Ratio	Quick Ratio	Quick Quick Ratio	Days Payable	Days Inventory	Times Interest Earned	Debt/Assets	Equity/Assets
Observations												
R2	0,02	0,02	0,00	0,00	0,00	0,00	0,01	0,02	0,03	0,00	0,02	0,01
Intercept	0,02	0,03	0,71	0,18	0,50	0,43	0,13	126,92	51,53	10,95	0,05	0,58
Slope	0,00	0,00	0,00	0,00	0,33	0,11	0,00	-110,85	-18,04	0,37	0,00	0,46
Intercept T-stat	4,58	5,93	4,25	6,26	5,29	5,47	3,26	2,22	5,03	1,70	7,02	6,16
Slope T-stat	0,82	0,89	0,40	0,54	1,70	1,56	0,41	- 0,91	- 1,38	0,05	0,55	2,51

Appendix C: Regressions to predict CAPM-adjusted returns using financial ratios

These regressions use CAPM-adjusted returns. CAPM returns are calculated using the same methodolgy as in Table 8 and formulas 13 and 14. Excess returns run from 1st July 2004 to 31st June 2008 and are calculated by substracting the CAPM returns from the raw returns.

Lev and Thiagarajann (1993)

	Inventory	Accounts Receivable	Capital Expenditure	Gross Margin	Sales and Administrative Expenses	Labor Force	LIFO Earnings
Observations	183	175	151	133	175	87	247
R^2	0,00	0,00	0,00	0,00	0,00	0,00	0,04
Intercept	-0,00	0,02	0,01	-0,01	-0,01	-0,01	0,21
Intercept T-stat	-0,07	0,47	0,36	-0,23	-0,14	-0,43	3,78
Slope	0,02	0,02	0,00	-0,02	0,04	0,00	-0,15
Slope T-stat	0,79	0,71	0,95	-1,05	1,29	0,60	-4,13

Nissim and Penman (2001)

	ROCE							
	Sales Profit Margin	Operating Assets	Operating Liabilities	Book Value	Asset Turnover	Financial Leverage	Net Borrowing Cost	Operating Liability Leverage
Observations	185	241	225	225	171	171	87	171
R^2	0,01	0,00	0,00	0,00	0,00	0,00	0,00	0,00
Intercept	0,02	0,03	0,02	0,02	-0,02	0,05	-0,01	-0,02
Slope	0,01	0,00	0,00	0,00	0,05	-0,11	-1,99	0,09
Intercept T-stat	0,34	0,70	0,52	0,50	-0,37	1,05	-0,22	-0,36
Slope T-stat	0,04	0,44	0,44	0,47	0,93	-1,23	-0,56	0,90

Ou and Penman (1989) Ratios

	Observations	R^2	Intercept	Slope	Intercept Tstat	Slope Tstat
Current Ratio	178	0,00%	0,060	0,026	1,110	0,999
Change in Current Ratio	158	0,50%	0,001	0,012	0,016	0,086
Quick Ratio	178	0,13%	0,050	0,026	0,988	0,853
Change in Quick Ratio	158	0,07%	0,002	0,102	0,053	0,932
Days Sales in Accounts Receivable	168	0,15%	0,024	0,000	0,653	0,835
Change in Days Sales in Accounts Receivable	148	0,45%	0,002	0,001	0,044	0,350
Inventory Turnover	132	0,29%	0,034	0,087	0,717	1,245
Change in Inventory Turnover	118	0,72%	0,009	0,053	0,234	1,518
Inventory/Total Assets	178	0,34%	0,040	0,165	0,775	0,541
Change in Inventory/Total Assets	158	2,12%	0,013	0,127	0,341	2,315
Change in Inventory	176	0,37%	0,003	0,034	0,082	1,335
Change in Sales	176	0,47%	0,007	0,002	0,191	0,088
Change in Depreciation	174	0,26%	0,007	0,028	0,192	0,670
Change in Dividend per Share	5	47,59%	0,001	0,142	0,447	9,861
Depreciation /Fixed Assets	176	0,98%	0,062	0,136	1,393	1,758
Change in Depreciation /Fixed Assets	152	0,50%	0,002	0,010	0,021	0,110
Return on Opening Equity	176	0,46%	0,006	0,011	0,164	0,215
Change in Return on Opening Equity	176	0,47%	0,008	0,000	0,226	0,159
Change in Capital Expenditure/Total Assets)	130	0,18%	0,038	0,185	0,838	0,820
Change in Capital Expenditure/Total Assets), oneyear lag	122	7,43%	0,086	0,682	2,370	3,960
DebtEquity Ratio	168	0,22%	0,039	0,043	0,892	0,739
Change in DebtEquity Ratio	132	0,09%	0,006	0,010	0,150	0,916
LT Debt to Equity	141	0,28%	0,011	0,063	0,267	0,687
Change in LT Debt to Equity	112	0,45%	0,012	0,006	0,332	1,340
Equity to Fixed Assets	178	0,47%	0,021	0,000	0,565	0,109
Change in Equity to Fixed Assets	158	0,49%	0,000	0,001	0,001	0,110
Times Interest Earned	104	0,53%	0,047	0,000	1,328	0,291
Change in Times Interest Earned	64	2,99%	0,027	0,015	0,856	2,397
Sales/Total Assets	178	0,37%	0,003	0,046	0,056	0,480
Change in Sales/Total Assets	158	0,50%	0,000	0,000	0,008	0,009
Return on Total Assets	178	0,44%	0,019	0,025	0,494	0,271
Return on Closing Equity	178	0,17%	0,017	0,129	0,470	0,803
Gross Margin Ratio	132	0,48%	0,003	0,029	0,076	0,323
Change in Gross Margin Ratio	118	0,52%	0,020	0,031	0,506	1,393
Operating Profit (Before Depreciation) to Sales	178	0,45%	0,021	0,005	0,565	0,248
Change in Operating Profit (Before Depreciation) to Sales	158	0,08%	0,003	0,001	0,091	0,917
Pretax Income to Sales	178	0,46%	0,021	0,001	0,567	0,193
Change in Pretax Income to Sales	158	0,42%	0,002	0,000	0,044	0,410
Net Profit Margin	178	0,46%	0,024	0,001	0,642	0,174
Change in Net Profit Margin	160	0,45%	0,001	0,000	0,022	0,318
Sales to Total Cash	178	0,37%	0,018	0,000	0,468	0,463
Sales to Accounts Receivable	168	0,43%	0,029	0,004	0,606	0,336
Sales to Inventory	176	0,32%	0,026	0,000	0,668	0,566
Change in Sales to Inventory	156	0,49%	0,001	0,004	0,027	0,175
Sales to Working Capital	178	0,14%	0,017	0,003	0,461	0,837
Change in Sales to Working Capital	158	0,49%	0,001	0,000	0,015	0,104
Sales to Fixed Assets	178	0,05%	0,005	0,015	0,113	1,048
Change in Production	132	0,51%	0,026	0,003	0,653	0,240
Change in R&D	4	0,63%	0,002	0,010	0,912	0,629
Change in R&D/Sales	4	13,03%	0,001	0,132	0,529	3,940

Change in Advertising Expense	74	0,39%	0,007	0,020	0,186	0,619
Change in Advertising/Sales	66	3,68%	0,002	0,011	0,048	2,618
Change in Total Assets	176	0,43%	0,010	0,017	0,272	0,320
Cash Flow to Total Debt	150	0,51%	0,019	0,000	0,492	0,061
Working Capital/Total Assets	178	0,34%	0,037	0,124	0,771	0,539
Working Capital/Total Assets	158	0,47%	0,000	0,000	0,007	0,223
Operating Income/Total Assets	178	0,36%	0,009	0,489	0,198	0,487
Change in Operating Income/Total Assets	158	0,49%	0,000	0,001	0,004	0,137
Change in Total Uses of Funds	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!
Change in Total Sources of Funds	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!
Repayment of LT Debt as % of total LT Debt	107	0,58%	0,021	0,000	0,536	0,052
Issuance of LT Debt as % of total LT Debt	108	0,57%	0,005	0,000	0,120	0,038
Purchase of Treasury Stock as % of Stock	14	0,82%	0,028	0,027	2,458	0,068
% Change in Funds	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!
% Change in LT Debt	124	0,05%	0,020	0,005	0,549	1,042
Cash Dividend as % of Cash Flows	75	0,41%	0,010	1,126	0,308	0,594
Change in Working Capital	176	0,45%	0,008	0,000	0,213	0,222
Net Income Over Cash Flows	170	0,83%	0,014	0,001	0,369	1,651

Mramor and Pahor (2001)

Linear	**a+bx**												
	Return on Assets	**Profit Margin**		**Sales/Fixed Assets**	**Sales/Assets**	**Current Ratio**	**Quick Ratio**	**Quick Quick Ratio**	**Days Payable**	**Days Inventory**	**Times Interest Earned**	**Debt/Assets**	**Equity/Assets**
Observations	219		211	211	218	211	211	211	185	190	167	205	211
R^2	0,00		0,00	0,00	0,00	0,01	0,01	0,00	0,01	0,01	0,00	0,00	0,00
Intercept	0,01		0,00	-0,01	0,00	0,06	0,07	0,03	-0,03	-0,03	-0,01	0,04	0,00
Slope	-0,03		0,05	0,01	0,01	-0,04	-0,05	-0,09	0,00	0,00	0,00	-0,26	0,00
Intercept T-stat	0,21		0,08	-0,13	0,02	1,20	1,28	0,75	-1,01	-0,73	-0,30	0,69	0,04
Slope T-stat	-0,04		0,13	0,69	0,16	-1,50	-1,67	-1,18	0,89	1,43	0,39	-0,95	0,17

Quadratic	**$a+bx+cx^2$**											
	Return on Assets	**Profit Margin**	**Sales/Fixed Assets**	**Sales/Assets**	**Current Ratio**	**Quick Ratio**	**Quick Quick Ratio**	**Days Payable**	**Days Inventory**	**Times Interest Earned**	**Debt/Assets**	**Equity/Assets**
Observations	219	211	211	218	211	211	211	185	190	167	205	211
R^2	0,00	0,01	0,00	0,00	0,01	0,01	0,01	0,02	0,02	0,00	0,01	0,00
a	0,02	-0,01	-0,01	-0,04	0,05	0,02	0,03	0,02	0,00	-0,01	0,05	-0,04
b	-0,55	-0,12	0,01	-0,06	-0,02	-0,04	-0,03	0,00	0,00	0,00	-0,70	0,00
aT-stat	0,33	-0,15	-0,28	-1,15	0,68	0,36	0,51	0,28	-0,02	-0,29	0,91	-1,03
b T-stat	-0,43	-0,30	0,65	-0,35	-0,32	-0,43	-0,17	2,02	0,26	0,02	-0,96	-0,06
c	2,84	1,38	0,00	0,04	0,00	0,00	-0,03	0,00	0,00	0,00	1,08	0,00
c T-stat	0,50	1,08	-0,37	0,47	-0,37	-0,22	-0,35	-1,96	-1,48	0,13	0,65	0,14

Logarithmic	**a+b*lnx**											
	Return on Assets	**Profit Margin**	**Sales/Fixed Assets**	**Sales/Assets**	**Current Ratio**	**Quick Ratio**	**Quick Quick Ratio**	**Days Payable**	**Days Inventory**	**Times Interest Earned**	**Debt/Assets**	**Equity/Assets**
Observations	192	191	211	211	211	211	211	184	189	161	198	210
R^2	0,01	0,00	0,00	0,00	0,01	0,02	0,00	0,00	0,00	0,00	0,00	0,00
Intercept	0,02	0,01	0,01	0,01	0,05	0,02	-0,02	-0,01	-0,01	-0,03	-0,04	0,01
Slope	0,01	0,01	0,00	0,00	-0,11	-0,12	-0,02	0,00	0,01	0,01	-0,02	0,00
Intercept T-stat	0,29	0,21	0,16	0,10	1,05	0,41	-0,41	-0,15	-0,20	-0,73	-0,76	0,13
Slope T-stat	0,30	0,25	0,12	-0,04	-1,66	-2,00	-0,72	-0,28	0,33	0,54	-0,96	0,04

Exponential **a.bx**

	Return on Assets	Profit Margin		Sales/Fixed Assets	Sales/Assets	Current Ratio	Quick Ratio	Quick Quick Ratio	Days Payable	Days Inventory	Times Interest Earned	Debt/Assets	Equity/Assets
Observations	192		191	211	211	211	211	211	184	189	161	198	210
R^2	0,07		0,05	0,02	0,03	0,01	0,00	0,02	0,04	0,03	0,02	0,05	0,00
Intercept	-0,27		-0,39	-1,28	-0,92	-1,16	-1,25	-1,02	-0,10	-0,25	-0,37	-0,64	-1,16
Slope	0,31		0,32	0,10	0,46	-0,30	-0,15	0,15	-0,27	-0,23	-0,25	0,28	-0,27
Intercept T-stat	-1,77		-2,75	-12,43	-6,96	-9,56	-12,17	-6,93	-0,62	-1,48	-3,46	-4,47	-10,06
Slope T-stat	6,45		5,58	1,17	3,95	-1,62	-0,86	2,27	-1,61	-2,32	-1,33	4,84	-1,77

$$a + b\sqrt{X}$$

Square Root

	Return on Assets	Profit Margin	Sales/Fixed Assets	Sales/Assets	Current Ratio	Quick Ratio	Quick Quick Ratio	Days Payable	Days Inventory	Times Interest Earned	Debt/Assets	Equity/Assets
Observations	198	191	211	218	211	211	211	184	189	161	205	210
R^2	0,00	0,00	0,00	0,00	0,01	0,01	0,00	0,00	0,00	0,00	0,00	0,00
Intercept	-0,02	-0,03	-0,02	0,01	0,08	0,09	0,04	-0,02	0,00	-0,03	0,04	0,00
Slope	0,16	0,14	0,02	-0,01	-0,06	-0,09	-0,09	0,00	0,00	0,01	-0,14	0,00
Intercept T-stat	-0,29	-0,48	-0,27	0,16	0,99	1,16	0,78	-0,35	-0,07	-0,72	0,66	0,05
Slope T-stat	0,70	0,96	0,70	-0,08	-0,68	-0,77	-0,62	-0,17	0,20	0,81	-0,57	0,05

Quadratic Logarithmic	a+b*lnx+c*ln2x											
	Return on Assets	**Profit Margin**	**Sales/Fixed Assets**	**Sales/Assets**	**Current Ratio**	**Quick Ratio**	**Quick Quick Ratio**	**Days Payable**	**Days Inventory**	**Times Interest Earned**	**Debt/Assets**	**Equity/Assets**
Observations	192	191	211	211	211	211	211	184	189	161	198	210
R^2	0,05	0,00	0,03	0,00	0,01	0,02	0,00	0,0	0,00	0,00	0,00	0,00
a	0,02	0,04	-0,01	0,01	0,05	0,02	-0,03	0,00	-0,01	-0,02	-0,04	0,01
b	0,01	0,05	0,00	0,00	-0,09	-0,12	-0,05	-0,02	0,01	-0,03	-0,03	0,03
aT-stat	0,29	0,53	-0,22	0,12	1,05	0,38	-0,57	-0,06	-0,20	-0,53	-0,70	0,16
b T-stat	0,15	0,83	0,12	0,03	-0,79	-1,83	-0,80	-0,41	0,10	-0,46	-0,54	0,32
c	0,00	0,01	0,01	0,00	-0,02	0,00	-0,01	0,00	0,00	0,01	0,00	-0,02
c T-stat	0,05	0,80	0,79	0,07	-0,34	-0,03	-0,54	0,35	-0,02	0,77	-0,13	-0,36

Rational Logarithmic **a/x+blnx/x**

	Return on Assets	Profit Margin	Sales/Fixed Assets	Sales/Assets	Current Ratio	Quick Ratio	Quick Quick Ratio	Days Payable	Days Inventory	Times Interest Earned	Debt/Assets	Equity/Assets
Observations	192	191	211	211	211	211	211	184	189	161	198	210
R^2	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
Intercept	-0,01	-0,01	-0,35	-0,09	-0,25	-0,22	-0,05	-24,51	-25,61	-2,23	-0,03	-0,27
Slope	0,00	0,00	0,00	0,00	-0,23	-0,07	0,00	23,09	87,56	-0,26	0,00	-0,20
Slope T-stat	-0,77	-0,65	-0,39	-0,45	-2,24	-2,03	-0,47	0,17	0,96	-0,31	-0,37	-2,06

Appendix D: Regressions to predict Fama French (1993)-adjusted returns using financial ratios

These regressions use Fama French (1993)-adjusted returns. Returns are calculated using the same methodology as in Table 8 and formulas 13 and 18. Excess returns run from 1st July 2004 to 31st June 2008 and are calculated by substracting the Fama French (1993) returns from the raw returns.

Lev and Thiagarajann (1993)

	Inventory	Accounts Receivable	Capital Expenditure	Gross Margin	Sales and Administrative Expenses	Labor Force	LIFO Earnings
Observations	183	175	151	133	175	87	247
R^2	0,00	0,00	0,00	0,00	0,01	0,00	0,08
Intercept	0,01	0,03	0,03	0,02	0,01	-0,02	0,22
Intercept T-stat	0,27	0,77	0,76	0,41	0,16	-0,60	4,16
Slope	0,02	0,02	0,00	-0,03	0,05	0,00	- 0,17
Slope T-stat	0,96	0,93	1,14	-1,32	1,53	0,06	- 4,65

Nissim and Penman (2001)

	ROCE							
	Sales Profit Margin	Operating Assets	Operating Liabilities	Book Value	Asset Turnover	Financial Leverage	Net Borrowing Cost	Operating Liability Leverage
Observations	185	241	225	225	171	171	87	171
R^2	0,00	0,00	0,00	0,00	0,01	0,00	0,01	0,00
Intercept	0,02	0,03	0,02	0,02	-0,04	0,04	-0,02	-0,03
Slope	0,04	-0,00	-0,00	-0,00	0,10	-0,07	0,19	0,12
Intercept T-stat	0,55	0,78	0,45	0,45	-0,82	0,862	-0,38	-0,47
Slope T-stat	0,10	-0,07	-0,02	-0,03	1,76	-0,74	0,05	1,25

Ou and Penman (1989) Ratios

	Observations	R^2	Intercept	Slope	Intercept Tstat	Slope Tstat
Current Ratio	178	0,24%	0,056	0,018	1,044	0,701
Change in Current Ratio	158	0,50%	0,013	0,012	0,345	0,087
Quick Ratio	178	0,26%	0,051	0,020	1,027	0,669
Change in Quick Ratio	158	0,20%	0,010	0,128	0,277	1,184
Days Sales in Accounts Receivable	168	0,15%	0,029	0,000	0,812	0,837
Change in Days Sales in Accounts Receivable	148	0,39%	0,012	0,001	0,325	0,498
Inventory Turnover	132	0,10%	0,058	0,076	1,231	1,090
Change in Inventory Turnover	118	0,11%	0,019	0,038	0,469	1,092
Inventory/Total Assets	178	0,45%	0,020	0,070	0,405	0,233
Change in Inventory/Total Assets	158	1,59%	0,024	0,112	0,651	2,059
Change in Inventory	176	0,16%	0,012	0,029	0,333	1,154
Change in Sales	176	0,48%	0,004	0,000	0,114	0,017
Change in Depreciation	174	0,36%	0,002	0,021	0,067	0,502
Change in Dividend per Share	5	38,35%	0,000	0,151	0,067	8,181
Depreciation /Fixed Assets	176	0,13%	0,054	0,086	1,205	1,124
Change in Depreciation /Fixed Assets	152	0,50%	0,001	0,007	0,017	0,077
Return on Opening Equity	176	0,42%	0,005	0,017	0,149	0,359
Change in Return on Opening Equity	176	0,43%	0,004	0,000	0,098	0,315
Change in Capital Expenditure/Total Assets)	130	0,43%	0,033	0,303	0,727	1,346
Change in Capital Expenditure/Total Assets), oneyear lag	122	4,70%	0,089	0,559	2,388	3,167
DebtEquity Ratio	168	0,26%	0,043	0,039	0,989	0,680
Change in DebtEquity Ratio	132	0,08%	0,000	0,011	0,000	1,075
LT Debt to Equity	141	0,30%	0,009	0,059	0,225	0,650
Change in LT Debt to Equity	112	0,15%	0,013	0,005	0,363	1,125
Equity to Fixed Assets	178	0,45%	0,030	0,000	0,806	0,244
Change in Equity to Fixed Assets	158	0,50%	0,013	0,001	0,359	0,064
Times Interest Earned	104	0,52%	0,040	0,000	1,154	0,309
Change in Times Interest Earned	64	1,24%	0,020	0,011	0,607	1,715
Sales/Total Assets	178	0,45%	0,022	0,133	0,428	1,396
Change in Sales/Total Assets	158	0,47%	0,014	0,009	0,364	0,243
Return on Total Assets	178	0,11%	0,022	0,079	0,602	0,871
Return on Closing Equity	178	0,19%	0,024	0,188	0,655	1,185
Gross Margin Ratio	132	0,46%	0,024	0,034	0,595	0,382
Change in Gross Margin Ratio	118	0,38%	0,012	0,028	0,298	1,301
Operating Profit (Before Depreciation) to Sales	178	0,39%	0,029	0,009	0,797	0,423
Change in Operating Profit (Before Depreciation) to Sales	158	0,15%	0,016	0,001	0,430	0,840
Pretax Income to Sales	178	0,40%	0,030	0,002	0,804	0,388
Change in Pretax Income to Sales	158	0,37%	0,015	0,000	0,399	0,518
Net Profit Margin	178	0,41%	0,033	0,002	0,895	0,373
Change in Net Profit Margin	160	0,49%	0,013	0,000	0,348	0,089
Sales to Total Cash	178	0,28%	0,024	0,000	0,657	0,648
Sales to Accounts Receivable	168	0,48%	0,027	0,001	0,577	0,106
Sales to Inventory	176	0,32%	0,035	0,000	0,911	0,581
Change in Sales to Inventory	156	0,50%	0,013	0,001	0,355	0,024
Sales to Working Capital	178	0,35%	0,027	0,002	0,718	0,518
Change in Sales to Working Capital	158	0,45%	0,014	0,001	0,375	0,319
Sales to Fixed Assets	178	1,27%	0,018	0,028	0,406	1,929
Change in Production	132	0,49%	0,004	0,004	0,100	0,311
Change in R&D	4	4,45%	0,003	0,055	0,936	2,349
Change in R&D/Sales	4	0,34%	0,001	0,047	0,473	0,820

Change in Advertising Expense	74	0,58%	0,027	0,011	0,704	0,315
Change in Advertising/Sales	66	4,95%	0,019	0,013	0,525	2,994
Change in Total Assets	176	0,30%	0,002	0,033	0,060	0,615
Cash Flow to Total Debt	150	0,46%	0,032	0,000	0,853	0,310
Working Capital/Total Assets	178	0,44%	0,021	0,061	0,437	0,267
Working Capital/Total Assets	158	0,42%	0,012	0,000	0,327	0,393
Operating Income/Total Assets	178	0,22%	0,000	1,203	0,010	1,213
Change in Operating Income/Total Assets	158	0,47%	0,014	0,002	0,362	0,244
Change in Total Uses of Funds	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!
Change in Total Sources of Funds	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!
Repayment of LT Debt as % of total LT Debt	107	0,58%	0,012	0,000	0,318	0,041
Issuance of LT Debt as % of total LT Debt	108	0,57%	0,002	0,000	0,043	0,024
Purchase of Treasury Stock as % of Stock	14	0,37%	0,019	0,239	2,013	0,745
% Change in Funds	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!
% Change in LT Debt	124	0,19%	0,022	0,004	0,591	0,815
Cash Dividend as % of Cash Flows	75	0,26%	0,015	1,472	0,444	0,766
Change in Working Capital	176	0,40%	0,003	0,000	0,070	0,392
Net Income Over Cash Flows	170	0,97%	0,025	0,001	0,677	1,743

Mramor and Pahor (2001)

Linear a+bx

	Return on Assets	Profit Margin	Sales/ Fixed Assets	Sales/ Assets	Current Ratio	Quick Ratio	Quick Quick Ratio	Days Payable	Days Inventory	Times Interest Earned	Debt/ Assets	Equity /Assets
Observations	219	211	211	218	211	211	211	185	190	167	205	211
R2	0,00	0,00	0,01	0,01	0,01	0,01	0,01	0,00	0,01	0,00	0,00	0,00
Intercept	0,00	0,01	-0,01	-0,03	0,07	0,08	0,05	-0,01	-0,01	-0,01	0,03	0,00
Slope	0,46	0,09	0,01	0,09	-0,04	-0,05	-0,10	0,00	0,00	0,00	-0,15	0,01
Intercept T-stat	0,02	0,24	-0,19	-0,52	1,33	1,50	1,03	-0,33	-0,15	-0,15	0,49	-0,06
Slope T-stat	0,65	0,24	1,38	1,15	-1,44	-1,72	-1,30	0,78	1,63	0,83	-0,56	0,66

Quadratic	a+bx+x2											
	Return on Assets	**Profit Margin**	**Sales/ Fixed Assets**	**Sales/ Assets**	**Current Ratio**	**Quick Ratio**	**Quick Quick Ratio**	**Days Payable**	**Days Inventory**	**Times Interest Earned**	**Debt/ Assets**	**Equity/ Assets**
Observations	219	211	211	218	211	211	211	185	190	167	205	211
R2	0,00	0,00	0,01	0,01	0,01	0,01	0,01	0,03	0,03	0,00	0,00	0,00
a	0,01	0,00	-0,03	-0,03	0,04	0,06	0,04	-0,01	0,02	-0,01	0,04	0,00
b	-0,01	-0,03	0,03	0,09	0,00	-0,02	-0,10	0,00	0,00	0,00	-0,45	0,01
aT-stat	0,13	0,08	-0,61	-0,43	0,60	0,86	0,91	-0,34	0,51	-0,17	0,63	-0,08
b T-stat	-0,01	-0,07	1,51	0,53	-0,04	-0,29	-0,52	2,13	0,41	0,66	-0,62	0,30
c	2,60	0,93	0,00	0,00	-0,01	-0,01	0,00	0,00	0,00	0,00	0,73	0,00
c T-stat	0,46	0,73	-0,97	-0,01	-0,66	-0,40	-0,01	-2,22	-1,50	-0,38	0,45	-0,05

Logarithmic a+b*lnx

	Return on Assets	Profit Margin	Sales/ Fixed Assets	Sales/ Assets	Current Ratio	Quick Ratio	Quick Quick Ratio	Days Payable	Days Inventory	Times Interest Earned	Debt/ Assets	Equity/ Assets
Observations	192	191	211	211	211	211	211	184	189	161	198	210
R2	0,00	0,00	0,01	0,00	0,01	0,02	0,01	0,00	0,00	0,00	0,00	0,00
Intercept	0,04	0,01	0,01	0,05	0,05	0,03	-0,03	0,00	-0,01	-0,03	-0,02	0,00
Slope	0,01	0,00	0,04	0,05	-0,10	-0,13	-0,03	0,00	0,01	0,02	-0,01	0,03
Intercept T-stat	0,57	0,19	0,29	1,00	1,16	0,68	-0,61	-0,06	-0,10	-0,77	-0,43	0,11
Slope T-stat	0,42	-0,03	1,34	1,03	-1,48	-2,13	-1,24	0,12	0,71	0,89	-0,64	0,59

Exponential a.bx

	Return on Assets	Profit Margin	Sales/ Fixed Assets	Sales/ Assets	Current Ratio	Quick Ratio	Quick Quick Ratio	Days Payable	Days Inventory	Times Interest Earned	Debt/ Assets	Equity/ Assets
Observations	192	191	211	211	211	211	211	184	189	161	198	210
R2	0,02	0,03	0,01	0,03	0,01	0,00	0,04	0,03	0,03	0,6	0,07	0,00
Intercept	-0,26	-0,38	-1,17	-0,87	-1,10	-1,16	-0,91	-0,07	-0,22	-0,33	-0,71	-1,11
Slope	0,27	0,28	0,10	0,39	-0,17	-0,07	0,16	-0,24	-0,21	-0,28	0,19	-0,12
Intercept T-stat	-2,11	-3,11	-13,80	-7,92	-10,96	-13,53	-7,52	-0,54	-1,67	-3,29	-5,89	-11,59
Slope T-stat	2,75	2,65	1,33	2,12	-1,07	-0,53	1,82	-1,97	-1,12	-2,03	1,78	-0,92

Square Root $a + b\sqrt{X}$

	Return on Assets	Profit Margin	Sales/ Fixed Assets	Sales/ Assets	Current Ratio	Quick Ratio	Quick Quick Ratio	Days Payable	Days Inventory	Times Interest Earned	Debt/ Assets	Equity/ Assets
Observations	198	191	211	218	211	211	211	184	189	161	205	210
R2	0,01	0,00	0,01	0,00	0,00	0,01	0,01	0,00	0,00	0,01	0,00	0,00
Intercept	-0,03	-0,01	-0,05	-0,04	0,08	0,09	0,06	0,01	0,01	-0,03	0,02	-0,01
Slope	0,33	0,14	0,06	0,09	-0,06	-0,08	-0,12	0,00	0,00	0,01	-0,07	0,03
Intercept T-stat	-0,54	-0,25	-0,80	-0,54	1,00	1,29	1,12	0,12	0,19	-0,76	0,40	-0,19
Slope T-stat	1,39	0,90	2,50	1,56	-0,62	-0,77	-0,72	-0,12	0,60	2,20	-0,34	0,68

Quadratic	a+b*lnx											
Logarithmic	+c*ln2x											
	Return on Assets	**Profit Margin**	**Sales/ Fixed Assets**	**Sales/ Assets**	**Current Ratio**	**Quick Ratio**	**Quick Quick Ratio**	**Days Payable**	**Days Inventory**	**Times Interest Earned**	**Debt/ Assets**	**Equity/ Assets**
Observations	192	191	211	211	211	211	211	184	189	161	198	210
R2	0,00	0,00	0,01	0,01	0,01	0,02	0,01	0,00	0,00	0,01	0,00	0,00
a	0,03	-0,01	0,01	-0,01	0,05	-0,01	-1,77	-0,01	-0,01	-0,01	-0,02	-0,01
b	-0,01	0,04	0,04	0,06	-0,05	-0,13	-0,04	0,01	0,03	-0,04	-0,03	0,06
aT-stat	0,40	-0,32	0,22	-0,78	1,16	-0,62	2,18	-0,25	-0,09	-0,29	-0,32	-0,44
b T-stat	-0,16	0,62	1,33	0,79	-0,46	-1,98	-0,80	0,10	0,45	-0,73	-0,59	0,62
c	0,00	0,01	0,01	0,00	-0,04	0,00	0,00	0,00	0,00	0,02	0,00	-0,02
c T-stat	-0,33	0,68	0,79	0,20	-0,62	0,06	-0,27	-0,07	-0,28	1,23	-0,34	-0,34

Rational	a/x+bln
Logarithmic	x/x

	Return on Assets	Profit Margin	Sales/ Fixed Assets	Sales/ Assets	Current Ratio	Quick Ratio	Quick Quick Ratio	Days Payable	Days Inventory	Times Interest Earned	Debt/ Assets	Equity/ Assets
Observations	192	191	211	211	211	211	211	184	189	161	198	210
R2	0,01	0,02	0,00	0,00	0,00	0,01	0,00	0,00	0,00	0,00	0,00	0,01
Intercept	-0,01	-0,01	-0,31	-0,08	-0,25	-0,21	-0,05	-22,28	-23,00	-1,77	-0,03	-0,26
Slope	0,00	0,00	0,00	0,00	-0,22	-0,07	0,00	19,84	76,64	-0,25	0,00	-0,17
Intercept T-stat	-6,43	-5,01	-4,16	-5,19	-5,22	-5,99	-4,12	-3,93	-3,52	-3,43	-4,67	-5,63
Slope T-stat	-0,76	-0,69	-0,39	-0,45	-2,20	-2,10	-0,52	0,16	0,91	-0,41	-0,37	-1,97

APPENDIX E: Daljsi Povzetek (Extended Summary in Slovene)

Kljub številnim raziskavam o učinkovitosti trgov kapitala in faktorjev, ki pojasnjujejo gibanje donosnosti delnic, ostaja vprašanje učinkovitosti trgov kapitala odprto. Prav tako se mnenja krešejo glede faktorjev s katerimi se skuša pojasniti gibanja donosnosti delnic, saj v literaturi ne najdemo enoznačnega odgovora ali so v ozadju razlike v tveganju ali je to posledica nesposobnosti trga kapitala za pravilno ovrednotenje delnic. To odpira številna vprašanja. Prvič, ali z aktivnim upravljanjem naložb sploh lahko ustvarimo dobiček? Drugič, ali neučinkoviti trgi kapitala lahko vplivajo na poslovne finance, saj so informacije trga kapitala o strošku kapitala izkrivljene? Tretjič, neučinkovito vrednotenje delnic ima lahko tudi širše posledice na gospodarski razvoj določene države. Slednje je posebej pomembno za Vzhodnoevropske (EE) države, ki so vstopile v Evropsko uniji (EU) v letu 2004[12], prvič zato, ker so se ta gospodarstva preoblikovala v tržne ekonomije iz planskih gospodarstev in drugič zato, ker je trg kapitala igral ključno vlogo v procesu privatizacije. Pričujoča doktorska disertacija tako analizira številna vprašanja povezana z učinkovitostjo trgov kapitala v državah, ki so v letu 2004 vstopile v EU.

Pričujoča doktorska disertacija raziskuje v kolikšni meri je mogoče pojasniti donosnosti delnic, ki kotirajo na trgih kapitala EE držav EU, in skuša določiti faktorje s katerimi bi bilo mogoče te donosnosti kar najbolje pojasniti. V ta namen disertacija najprej podaja pregled obstoječe literature, s posebnim poudarkom na hipotezi učinkovitosti trga kapitala, faktorskih modelih, teoriji strukture kapitala in povezavi med računovodskimi informacijami in donosnostmi delnic. Nato, doktorska disertacija testira šibko obliko učinkovitosti trga kapitala za delnice, ki kotirajo na borzah EE držav EU. Kljub temu, da so uporabljeni običajni testi, se pričujoča disertacija razlikuje od predhodnih raziskav, saj testira vpliv vstopa v EU in nelikvidnosti na učinkovitost trga kapitala.

Kot odgovor na ugotovitve obstoječih raziskav, ki ugotavljajo, da ima faktor tržna vrednost kapitala v Fama-Frenchovem 3-faktorskem modelu nizko pojasnjevalno moč, nato predlagam dopolnjen 3-faktorski model v katerem faktor tržna vrednost kapitala zamenjam s kazalcem dobiček/denarni tok (NI/CFO) s katerim aproksimiram računovodsko manipuliranje. Z dopolnitvijo modela se bistveno poveča sposobnost pojasnjevanja dejavnikov donosnosti delnic na trgih kapitala EE držav EU (verjetno tudi drugih razvijajočih se držav). Tako ta moj

[12] Češka, Estonija, Madžarska, Latvija, Litva, Poljska, Slovaška in Slovenija.

prispevek zapolnjuje vrzel v obstoječi literaturi. Poleg tega, v disertaciji raziskujem učinek mnogokratnika knjigovodska vrednost/cena delnice na donosnost delnic, ki kotirajo na borzah EE držav EU. Pretekle raziskave so namreč pokazale, da je izbor strukture kapitala odvisen od različnih faktorjev v teh državah, kot v državah z najrazvitejšimi trgi kapitala. Izvirnost disertacije je v dopolnitvi teh ugotovitev in preučitvi učinkov strukture kapitala na mnogokratnik knjigovodska vrednost/cena delnice.

Razprave, ali je mogoče donosnosti delnic napovedovati in kateri faktorji lahko pojasnijo in napovedujejo donosnosti delnic, so se pojavile kmalu za tem ko so začeli delovati prvi trgi kapitala. Brown (1828) je z mikroskopom opazoval zrna cvetnega prahu v vodi in ugotovil, da trki z molekulami v okolju povzročijo, da se zrna premikajo čisto naključno ter prišel do odkritja, ki ga poznamo kot Brownovo gibanje. Bachelierjeva (1990) doktorska disertacija, *Teorija špekulacij*, razširi Brownovo delo in uporabi njegov model za modeliranje donosnosti trga kapitala. Bachelierjevo (1990) matematično modeliranje cen delnic tako predstavlja začetek finančne ekonomije. Na podlagi analize uspešnosti upravljavcev premoženja, Cowles (1933) zaključi, da upravljavcem premoženja manjka sposobnosti za napovedovanje. Cowles (1944) po nadaljevanju svojih raziskav ugotovi tudi, da upravljavci premoženja z aktivnim upravljanjem ne uspejo doseči višje donosnosti od donosnosti trga. Kendall (1953) celo ugotavlja, da so donosnosti delnic naključne. Larson (1960) pa z aplikacijo nove tehnike analize časovnih vrst, da se 80% donosnosti delnic porazdeljuje normalno, z »debelimi repi«, ki predstavljajo ostalih 20%.

Prvi, termin »učinkovit(e)« za cene delnic, ki naj bi pomenil, da le-te vsebujejo vse razpoložljive informacije, uporabi Fama (1965). Fama (1970) razširi svoje delo in napiše prvi članek na tem področju: *Efficient Capital Markets: A Review of Theory and Empirical Work*, članek, ki se smatra za ključen prispevek na področju učinkovitosti trga kapitala. Fama (1970) predlaga tri zaporedne restriktivne oblike cenovne učinkovitosti: šibka oblika, srednje močna oblika in močna oblika. V šibki obliki pretekle donosnosti nimajo napovedovalne moči za napovedovanje prihodnjih donosnosti, kar pomeni, da donosnosti ne izkazujejo konsistentnih vzorcev. To pa pomeni, da s tehnično analizo ne moremo ustvarjati presežnih donosov. Številne študije sicer zavračajo šibko obliko učinkovitosti, saj pokažejo, da imajo trgi kapitala tendenco gibanja v skladu s trendi in da se donosnosti ne gibljejo naključno. Fama in French (1998) ugotovita, da za obdobja držanja delnic, ki so daljša od enega leta, donosnosti premoženje kažejo znatno negativno avtokorelacijo. Lo in McKinley (1988)

uporabita test razmerja varianc in zavrneta obstoj šibke učinkovitosti trga kapitala. Poterba in Summers (1988) poročata, da donosnosti delnic kažejo pozitivno avtokorelacijo na kratek rok in negativno avtokorelacijo na dolgi rok. Chopra, Lakonishok in Ritter (1992) oblikujejo premoženja za 5-letna obdobja in s prilagoditvami za variabilnost beta koeficienta in učinka velikosti ugotovijo, da ekstremni predhodni poraženci premagajo ekstremne predhodne zmagovalce za 5 do 10 % na leto, pri čemer naj bi bil učinek močnejši pri majhnih podjetjih kot pri velikih podjetjih. DeBondt in Thaler (1985) ugotovita, da premoženja, ki jih lahko označimo kot poražence, prekosijo trg kapitala za 20% v 36 mesecih po oblikovanju premoženj, medtem ko zmagovalci prinesejo približno 5% manj kot trg v povprečju. Nasprotno, Chan et al. (1997) ugotovi, da so trgi kapitala šibko učinkoviti. V srednje močni učinkovitosti se cene delnic prilagajajo nemudoma vsem novim razpoložljivim informacijam. To pomeni, da vlagatelji ne morejo ustvarjati presežnih donosnosti ne s tehnično analizo, ne s temeljno analizo. Najpogosteje uporabljana tehnika za testiranje srednje močne učinkovitosti so študije dogodkov, s katerimi testiramo reakcije trga kapitala na nove informacije. Ball (1978) npr. ugotavlja, da cene delnic potrebujejo nekaj časa, da se prilagodijo objavam dobičkov. Grossman in Stiglitz (1976, 1980) trdita, da je zaradi stroškov povezanih s pridobivanjem in analiziranjem informacij nemogoče govoriti o srednje močni učinkovitosti. Na učinkovitem trgu kapitala bodo vlagatelji zaslužili različne bruto donosnosti ker imajo različne stroške pridobivanja informacij. Ne glede na to, pa imajo vsi enake neto donosnosti. Močna oblika učinkovitosti predpostavlja, da cene delnic odražajo vse razpoložljive informacije, tako javne kot notranje. Zakoni, ki prepovedujejo trgovanje na podlagi notranjih informacij otežujejo trgovanje na podlagi notranjih informacij.

Z definicijo tveganja v smislu varinace donosnosti delnic , Markowitz (1952, 1959) kvantificira intuitivno razmerje med tveganjem in donosnostjo. V okviru Markowitzovega instrumentarija je donosnost in tveganje premoženja določeno s pričakovano donosnostjo in varianco donosnosti posamezne delnice ter kovarianco donosnost delnic. Ta prispevek predstavlja temelj sodobne premoženjske teorije (MPT), v skladu s katero je izbira naložb v premoženju določena z optimizacijo in sicer bodisi z minimiranjem tveganja na enoto donosnosti, ali maksimiranjem donosnosti na enoto tveganja. Tobin (1958) nadalje razvije koncept izbire premoženja, tako da predlaga teorem ločitve. Tobinova ugotovitev je, da mora vsak vlagatelj držati enako premoženje (tržno premoženje), ne glede na njegov odnos do tveganja. Različen odnos do tveganja se odraža v različnih deležih premoženja, ki so naloženi v netvegano naložbo. Tobin je pokazal, da se z vključitvijo naložbe brez tveganja in

zadolženosti v Markowitzovo delo izbira premoženja poenostavi na vprašanje, kolikšen del investirati v tržno premoženje in kolikšen del posoditi po netvegani stopnji donosa (za običajne tveganju nenaklonjene vlagatelje), oziroma kolikšen delež si izposoditi po netvegani stopnji donosa (za tveganju zelo naklonjene vlagatelje), pri čemer vsi vlagatelji držijo premoženje na premici trga kapitala. Čeprav je predpostavka, da si vlagatelji izposojo in posojajo po netvegani stopnji donosa nerealna, predstavlja povezava Markowitzovega učinkovitega premoženja in netvegane naložbe pomemben temelj za prihodnji razvoj teorije na tem področju.

Treynor (1961, 1962), Sharpe (1964), Lintner (1965a, b) in Mossin (1966) neodvisno razvijejo model vrednotenja dolgoročnih naložb (CAPM). CAPM predpostavlja, da je presežna tržna donosnost naložbe (opredeljena kot donosnost nad netvegano stopnjo donosa) določena s povezanostjo donosnosti naložbe z donosnostjo trga kapitala. Po CAPM je donosnost naložbe linearna funkcija njene kovariance z donosnostjo trga. Roll (1977) podvomi, da je CAPM resnično mogoče empirično testirati zaradi težav z opredelitvijo tržnega premoženja.

Po razvoju CAPM so bili dokumentirani številni empirični rezultati, ki so pokazali na neskladnost z modelom, ki so se smatrali kot anomalije. DeBondt in Thaler (1985) pokažejo, da imajo predhodni poraženci (delnice z nizkimi donosnostmi v zadnjih letih) višje donosnosti kot predhodni zmagovalci (delnice z visokimi donosnostmi v zadnjih letih). V nasprotju s tem, Jagedeesh in Titman (1993) pokažeta, da predhodni zmagovalci (delnice z visokimi donosnostmi v zadnjem letu) prekosijo predhodne poražence (delnice z nizkimi donosnostmi v zadnjem letu). Prvi na anomalijo velikosti opozori Banz (1981), ki ugotavlja, da donosnosti delnic majhnih podjetij presegajo donosnosti večjih podjetij, tudi po uporabi CAPM za prilagoditev za tveganje. Banz (1981) ugotavlja, da je donosnost delnic majhnih podjetij iz ZDA prekosila donosnost večjih podjetij za 4 odstotne točke v 53-letnem obdobju. Reinganum (1981) uporabi širši vzorec in razdeli delnice v decile premoženj in pride do podobnih rezultatov kot Banz (1981). Te ugotovitve so očitno v nasprotju s hipotezo učinkovitega trga, saj kljub temu da imajo majhna podjetja v primerjavi z velikimi večje priložnosti, ne bi smelo prihajati do razlik v donosnostih, ker naj bi te informacije že bile vključene v cenah delnic. Če bi bilo mogoče, zaslužiti višje donosnosti z vlaganjem v delnice podjetij z večjimi priložnostmi, bi vlagatelji z nakupi dvigovali cene delnic teh podjetij,

dokler njihova donosnost ne bi bila primerljiva, seveda z upoštevanjem različne tveganosti, glede na druga podjetja.

Po objavi knjige Grahama in Dodda, Security Analysis (1934) se je med teoretiki in vlagatelji uveljavila doktrina, ki temelji na predpostavki, da naložbe v delnice vrednost (delnice z nizkimi cenami, glede na nekatere temeljne kazalce) prekašajo tako donosnosti naložbe v celoten trg vrednostnih papirjev kot tudi v delnice rasti (delnice z visokimi cenami glede na nekatere temeljne kazalce). Basu (1977) ugotovi, da imajo delnice z visokimi mnogokratniki donos/cena (delnice vrednosti), višje donosnosti kot delnice z nizkimi mnogokratniki donos/cena (delnice rasti), kljub prilagoditvi za tveganje z uporabo CAPM. Medtem ko vlagatelji na finančnih trgih pogosto smatrajo mnogokratnik donos/cena kot naravni pokazatelj vrednosti, je prejel več pozornosti v strokovni literaturi mnogokratnik knjigovodska vrednost/cena. To je verjetno posledica Fama in Frenchove (1992) ugotovitve, da mnogokratnik knjigovodska vrednost/cena absorbira tudi sposobnost mnogokratnika donos/cena za pojasnjevanje donosnosti (Rytchkov (2011)). Stattman (1980) in Rosenburg (1985) pokažeta, da delnice z visokimi vrednostmi mnogokratnikov knjigovodska vrednost/cena (delnice vrednosti), prekašajo delnice z visokimi vrednostmi mnogokratnikov knjigovodska vrednost/cena (delnice rasti).

Z vključitvijo anomalij velikosti in vrednosti v CAPM Fama in French (1993) predlagata 3-faktorski model. Fama French (1993) pokažeta, da ima njun 3-faktorski model bistveno boljšo pojasnjevalno sposobnost kot CAPM. Black (1993) in MacKinlay (1995) pa se sprašujeta, ali sta vpliva velikosti in mnogokratnika knjigovodska vrednost/cena splošna, ali sta to specifična vpliva, ki ju je mogoče zaznati le v vzorcu, ki se ga je preučevalo. Kot odgovor Fama in French (1998) vplive testirata na podatkih iz 13 razvitih trgov kapitala in 16 razvijajočih se trgov. Na razvijajočih se trgih Fama in French ugotovita, da čeprav se pomen učinka velikosti zmanjša, je še vedno značilna povezava med mnogokratnikom knjigovodska vrednost/cena in donosnostjo delnice. Claessens, Dasgupta in Glen (1993, 1995, 1998) so naredili več študij borznih donosnosti na razvijajočih se trgih in so prav tako ugotovili, da medtem ko ima mnogokratnik knjigovodska vrednost/cena pojasnjevalno moč, ima komponenta s tržno vrednostjo kapitala (velikost) manjšo pojasnjevalno moč na razvijajočih se trgih kot jo ima na razvitih kapitalskih trgih.

Problem povezanih hipotez se nanaša na dejstvo, da vsak preizkus učinkovitosti trga kapitala predstavlja tudi preizkus predpostavljenega ravnotežja na trgu kapitala znotraj modela (CAPM ali Fama-Frenchov (1993) 3-faktorski model). Ugotovitve lahko tako štejemo kot potrditev hipoteze učinkovitosti trga kapitala (v Fama-Frenchovem (1993) modelu tržna vrednost -SMB- in mnogokratnik knjigovodska vrednost/cena -HML- naj bi predstavljala dejavnike tveganja). Lahko pa se ugotovitve smatra kot potrditev neučinkovitosti trga kapitala (tržna vrednost lastniškega kapitala in mnogokratnik knjigovodska vrednost/cena predstavljata neučinkovito vrednotenje delnic malih podjetij, delnic vrednosti in delnic rasti. Zato, čeprav se v kasnejših raziskavah nekako doseže soglasje, da ima Fama-Frenchov (1993) model boljšo pojasnjevalno moč kot CAPM, se razprava nadaljuje v smeri ali obravnavati HML in SMB kot dejavnike tveganja, ali pa jih pripisati neučinkovitemu vrednotenju. Fama in French (1993) verjameta, da so HML in SMB dejavniki tveganja, ki manjkajo v CAPM. Fama in French (1995) ugotovita, da imajo delnice z visokimi vrednostmi mnogokratnika knjigovodska vrednost/cena značilno nižje dobičke, ravno nasprotno pa velja za delnice z visokimi vrednostmi mnogokratnika knjigovodska vrednost/cena. Zato smatrata mnogokratnik knjigovodska vrednost/cena kot dejavnik tveganja povezan s tveganjem neplačila. Vassalou in Xing (2004) pokažeta tudi, da imajo podjetja z večjim tveganjem neplačila višje dobičke le, če imajo visoke vrednosti mnogokratnika knjigovodska vrednot/cena. V nasprotju s tem pa Lakonishok, Shleifer in Vishney (1994) trdijo, da so udeleženci trga kapitala preveč optimistični glede delnic rasti in preveč pesimistični glede delnic vrednosti. Korekcije teh neučinkovitih vrednotenj pa vodita do slabših rezultatov delnic vrednosti. Podobno, Daniel in Titman (1997) trdita, da imajo podjetja z nižjimi vrednostmi mnogokratnika knjigovodska vrednost/cena nižje donosnosti tudi po prilagoditvi za tveganje.

Glede na razmerje med zadolženostjo in donosnostjo, Modigliani in Millller (1958) predlagata, da je vrednost podjetja odvisna od njegove dejavnosti in ne njegove strukture kapitala. Ta podmena I pa velja ob številnih omejitvah, med njimi tudi ob neobstoju podjetniških davkov. Podjetniške davke Modigliani in Millller (1963) vključita kasneje, v podmeni II. Modigliani in Millller trdita, da obravnava obresti kot davčno priznanih odhodkov ustvarja davčni ščit in tako podjetje s povečevanjem zadolženosti lahko poveča svojo vrednost. Ob predpostavki, da je strošek lastniškega kapitala nezadolženega podjetja večji od stroškov dolga, se strošek lastniškega kapitala povečuje s povečevanjem zadolženosti, saj so podjetja, ki so bolj zadolžena bolj tvegana. Iz Modigliani in Milllerjevega (1963) sklepa sledi,

da izkoriščanje davčnega ščita pomeni, da je optimalna struktura kapitala tista, pri kateri je podjetje financirano s 100% dolga. Da bi se izognili tej skrajnosti, Kraus in Litzenberger (1963) predlagata teorijo tehtanja, v kateri so prednosti dolga v podmeni II uravnotežene s slabostmi zaradi povečevanja verjetnostjo stečaja. Prispevek je bil kasneje razširjen z vključitvijo tudi drugih stroškov dolga. Jensen in Meckling (1976) obravnavata stroške agentov in trdita, da so direktorji nagnjeni k maksimiranju vrednosti lastniškega kapitala, ne pa vrednosti celotnega kapitala podjetja. Podobno Myers (1977) predlaga, da so direktorji močno zadolženih podjetij nagnjeni k opuščanju investicij v potencialno donosne projekte, če dobiček realizirajo le imetniki obveznic. Jensen (1986) nadaljuje z analizo pomena stroškov agentov in pripiše dolgu pomembno vlogo pri discipliniranju managementa podjetja. Teorija vrstnega reda temelji na konceptu asimetrije informacij med insiderji in outsiderji v podjetju in posledično problemom nepravilne izbire, ki nastane zaradi tega. Management ima v primerjavi z delničarji boljše informacije, zato lahko izbor načina financiranja s strani managementa delničarjem vpogled v pravo vrednosti podjetja in priložnosti za rast. Baker in Wurgler (2002) pa ugotavljata, da ne teorija vrstnega reda, ne teorija tehtanja ne upoštevata vpliva razmer na trgu kapitala pri izbiri strukture kapitala. Trdita, da podjetja izdajo lastniški kapital ko managerji menijo, da so razmere na trgu kapitala ugodne. Glede vpliva razmer na trgu kapitala se strinjajo tudi Alti (2006), Kayhan in Titman (1997) in Leary in Roberts (2005). Myers (1984) predlaga, da če se management odloči za financiranje družbe z izdajo novega lastniškega kapitala, to lahko signalizira, da insiderji menijo, da je vrednost podjetja precenjena. Ugotovitve Kraskerja (1986) potrdijo Myersovo teorijo.

Nadaljujmo s študijami dogodkov. Začetne raziskave na tem področju so se osredotočile na dobičke. Prelomne raziskave na področju povezave med obnašanjem trga kapitala in računovodskimi izkazi predstavljajo dela Balla in Browna (1968) in Beaverja (1968). Obe omenjeni študiji pokažeta, da obstaja značilna pozitivna povezava med spremembami dobičkov in donosnostmi delnic. Ko Ball in Brown razširita svojo študijo in skušata preveriti, ali je bil odziv na dobre in slabe novice takojšen, ugotovita, da trg kapitala dejansko potrebuje več mesecev, da se prilagodi in zato zaključita, da ima trg kapitala pri reakcijah na objave dobičkov določene anomalije. Frankel in Lee (1998) ugotovita, da je konvergiranje cene k vrednosti veliko počasnejši proces kot se je sklepalo na podlagi predhodnih dokazov. Kormendi in Lipe (1987) preučita moč povezave med dobički in donosnostmi, znani kot koeficienti odgovora na dobičke. Preizkusita, ali so ocenjeni koeficienti odgovora na dobičke povezani z lastnostmi časovne vrste računovodskih dobičkov in ugotovita, da se koeficienti

odgovora na dobičke povečujejo z vztrajnostjo dobičkov v časovni vrsti. Easton in Zmijewski (1989) in Collins in Kothari (1989) prav tako raziskujejo koeficiente odgovora na dobičke in pridejo do podobnih rezultatov. Obstaja tudi več raziskav, ki proučujejo, kako se povezava med računovodskih informacij in donosnostmi delnic spreminja skozi čas. Na primer, Francis in Schipper (1999), Lev in Zarowin (1999), Ely in Waymire (1999) in Dechow in Schrand (2004) zaključujejo, da imajo dobički vse manj vpliva na donosnost delnic. Beaver, McNicholas in Rhie (2005) ugotovijo, da medtem ko obstaja manjši upad napovedne zmožnosti finančnih kazalcev, je to na drugi strani kompenzirano s povečanjem pomena vplivov tržno-orientiranih kazalcev. Sloan (1996) prvi dokumentira anomalijo povezano z razmejitvami, ko ugotovi, da se vlagatelji osredotočajo na dobičke. Raziskava pokaže, da vlagatelji niso v celoti prepoznali razlike med komponento razmejitev in komponento denarnih tokov v dobičku. Bradshaw, Richardson in Sloan (2001) preučijo, ali analitiki na prodajni strani in revizorji uporabljajo informacije povezane z razmejitvami. Raziskava pokaže, da so napovedi analitikov prodajne strani za podjetja z visokimi razmejitvami večinoma preveč optimistične. Kljub povezavi med visokimi razmejitvami in preotimističnimi napovedmi, v raziskavi ni dokazov o večji pojavnosti revizorjev, ki izdajajo mnenje s pridržkom podjetjem z visokimi razmejitvami. Lev in Nissim (2006) pokažeta, da čeprav nekateri institucionalni vlagatelji izkoriščajo anomalijo povezano z razmejitvami, je obseg teh poslov precej majhen. Ali, Chen, Yao in Yu (2008) pokažejo tudi, da so anomalijo uspešno izkoriščali nekateri vzajemni skladi. Collins, Gong in Hribar (2003) ugotovijo, da so delnice z visokim deležem institucionalnih lastnikov bolj verjetno odsevajo vztrajnost časovnih razmejitev. Leippold in Lohre (2010) in Pincus, Rajgopal in Venkatachalan (2007) ugotovijo tudi, da omenjena anomalija obstaja na mednarodni ravni.

Glede na predstavljeno razpravo o učinkovitosti trga kapitala in dejavnikih, ki pojasnjujejo donosnosti delnic, ter nadaljevanju procesa širitve EU, je namen pričujoče disertacije raziskati ta vprašanja na kapitalskih trgih EE držav EU. Kot države z nekdanjimi planskimi gospodarstvi, so EE države EU začele proces tranzicije z ustanovitvijo (v nekaterih primerih ponovno vzpostavitvijo) trgov kapitala in programi privatizacije. Ključna vloga trgov kapitala v procesu tranzicije in naraščajoče število družb, ki kotirajo v regiji, narekuje potrebo po določitvi sposobnosti trgov kapitala za učinkovito vrednotenje delnic in razpoznavo dejavnikov, ki vplivajo na donosnosti delnic. Prvi cilj disertacije je analizirati šibko obliko učinkovitost v EE državah EU. Neskladnost z najmanj učinkovito obliko učinkovitosti bi namreč zagotovila trdne dokaze, da so v regiji trgi kapitala neučinkoviti. Drugič, disertacija

preverja, ali ima pogosto uporabljani Fama-Frenchov (1993) model pojasnjevalno sposobnost za pojasnjevanje donosnosti delnic na trgih kapitala v regiji. Po analizi predlaga dopolnjen model z vključitvijo člena, ki aproksimira računovodsko manipuliranje. Tretjič, disertacija raziskuje mnogokratnik knjigovodska vrednost/cena, enega od dejavnikov v Fama-Frenchovem (1993) modelu – in ga razgradi v na komponento povezano s financiranjem in komponento povezano z dejavnostjo z namenom ugotoviti, ali ima mnogokratnik enak pomen tudi v EE državah EU.

V EE državah EU obstaja veliko raziskav šibke oblike učinkovitosti trga kapitala (WFME). Jagrič et al. (2005) preizkušajo WFME v regiji Srednje in Vzhodno Evrope (CEE) in ugotavljajo, da borzni indeksi na Češkem, na Madžarskem, v Rusiji in v Sloveniji ne izkazujejo šibke oblike učinkovitosti zaradi dolgoročnega spomina v donosnostih delnic. Worthington in Higgs (2004) preučujeta WFME na razvitih in razvijajočih se trgih v Evropi. Od razvijajočih se trgov (Češka, Madžarska, Poljska in Rusija) pa lahko le madžarskemu pripišejo šibko obliko učinkovitosti. Gilmoore in McManus (2001) uporabita vrsto WFME testov za večja gospodarstva EE držav EU (Češka, Madžarska in Poljska) v obdobju 1990 do 2000 in pokažeta, da trgi nimajo šibke oblike učinkovitosti v vseh teh državah. Chun (2000) pokaže, da medtem ko madžarski trg izkazuje šibko obliko učinkovitosti, so delniški trgi Češke in Poljske neučinkoviti. Nivet (1997) in Gordon in Rittenberg (1995) ugotovijo, da tudi Poljska borza ne more šteti za trg s šibko obliko učinkovitosti. Ahmed, Rosser in Uppal (2010) ugotovijo, trdne dokaze o nelinearnih špekulativnih balonih na Češkem, Madžarskem in Poljskem. Tudi Mihailov in Linowski (2002) in Deželan (2000) ugotovijo neobstoj šibke oblike učinkovitosti latvijske in slovenske borze.

Nobena od omenjenih raziskav pa ne kontrolira za vpliv likvidnosti. Predvsem na novih trgih namreč morajo preizkusi WFME vključevati kontrolne spremenljivke za likvidnost, da rezultati ne bi bili pristranski zaradi na videz predvidljivih donosnosti redko trgovanih delnic. Menim, da omenjena pomanjkljivost zmanjšuje robustnost rezultatov obstoječih raziskav. V disertaciji so zato kot kontrolne spremenljivke vključeni kazalci likvidnosti delnic, saj je povsem mogoče, da imajo nelikvidne delnice lastnosti neskladne s šibko obliko učinkovitosti. Testiranje, ali so rezultati izkrivljeni zaradi nelikvidnosti dopolnjuje prejšnje raziskave in služi kot dodatna preveritev njihove veljavnosti. Naslednji prispevek disertacije je preizkus, ali je pristop k EU vplival na šibko obliko učinkovitosti trgov kapital v regiji. Torej disertacija zagotavlja tudi pomemben preizkus, ali se učinkovitost trgov kapitala v

regiji spreminja. Poleg tega disertacija preverja omenjene raziskave šibke oblike učinkovitosti. Šibkim oblika učinkovitosti trga v EE EU se je namreč navadno preučevala na podatkih gibanja donosnosti borznih indeksov namesto posameznih delnic: obstoječe ugotovitve, da so trgi kapitala neučinkoviti so lahko posledica manjšega deleža sestavnih elementov indeksa ali preprosto načina sestave indeksov. Z uporabo o podatkov o delnicah posameznih kotirajočih podjetij tako pričujoča disertacija predstavlja pomembno potrditev dosedanjih ugotovitev. Poleg tega uporaba podatkov o delnicah zagotavlja širši pogled kot uporaba indeksov in tako omogoča vpogled v vzroke za neučinkovitost.

Obstoječe raziskave soglasno ugotavljajo, da trgi kapitala EE držav EU niso šibko učinkoviti, niti niso le-ti postali bolj učinkoviti z vključitvijo v EU. To je v nasprotju s pričakovanji mnogih teoretikov, ki so pričakovali, da bodo trgi postali bolj učinkoviti in vodi do pričakovanj, da bodo le-ti ostali neučinkovitosti tudi v prihodnje. Številni raziskovalci so namreč pričakovali, da bodo udeleženci na trgu kapitala sčasoma pridobili izkušnje in da bodo tako trgi postali bolj učinkoviti, pa se to ni zgodilo. Ker se to ni zgodilo niti po skoraj 20 letih delovanja, ni nobenega razloga, da se pričakuje, da se bo to zgodilo v bližnji prihodnosti. Čeprav se v nekaterih obstoječih študijah napoveduje, da bo proces vključevanja v EU izboljšal učinkovitost trga, ugotovitve disertacije, ki temeljijo na analizi podatkov obdobja 5 let po vstopu v EU, še vedno kažejo, da so trgi neučinkoviti. Nenazadnje, nekateri menijo, da je vzrok neučinkovitosti trgov EE držav EU njihova majhnost. Vendar se je na primer število delnic, ki kotirajo na Varšavski borzi, povečalo za toliko, da se število delnic na tej borzi lahko primerja s trgi kapitala drugih držav EU, rezultati pa kažejo, da Poljski trg kapitala ni bolj učinkovit kot drugi trgi EE EU. Omenjani razlogi, zaradi katerih naj bi trgi kapitala v EE EU postali bolj učinkoviti, očitno niso pravi. Glede na to je težko reči, kaj bi lahko bil katalizator teh sprememb.

Ker moji testi vključujejo dve podobdobji in ne pokažejo izboljšanja ravni učinkovitosti trga kapitala v EE državah EU, menim, da bodo ti trgi kapitala potrebovali veliko časa, da bo moč zaznati izboljšanje šibke oblike učinkovitosti. To ima pomembne posledice. Čeprav je izboljšanje WFME predvsem v interesu raziskovalcev in udeležencev na trgu kapitala, ki uporabljajo različne trgovalne modele, ima pomanjkanje WFME veliko pomembnejši vpliv na finančne odločitve podjetij in razvoj gospodarstva. Obstaja namreč jasna povezava med cenovno učinkovitostjo in učinkovitostjo alokacije kapitala; posledično lahko odsotnost WFME v EE državah EU otežuje sprejemanje finančnih odločitev podjetij in doseganje

optimalne strukture kapitala. Še bolj pomembno, povezava med cenovno učinkovitostjo trga kapitala neke države in gospodarskim razvojem ter možnost, da lahko razpoložljivost financiranja na trgu kapitala poveča gospodarsko rast, pomeni, da ima WFME pomembne posledice ne samo za razvoj trga kapitala neke države, temveč tudi njen splošni gospodarski razvoj. Poleg tega je WFME še posebej pomemben v EE državah EU: učinkovit trg kapitala namreč lahko pospeši sedanji proces privatizacije, saj se te države prizadevajo za gospodarsko približevanje drugim državam EU. Nenazadnje, kot pokažeta Worthington in Higgs (2004), je odsotnost ali prisotnost WFME na razvijajočih se trgih v Evropi pomemben dejavnik v razpravi o potrebnih tehnoloških in regulativnih reformah in razmišljanjih o potencialnih združitvah borz v regiji.

Fama in French (1998) ugotovita, da čeprav se pomen vpliva velikosti zmanjšuje, obstaja značilna povezava med mnogokratnikom knjigovodska vrednost /cena (BE/ME) in donosnostjo. Claessens, Dasgupta in Glen (1993, 1995, 1998) izdelajo več študij borznih donosov na razvijajočih se trgih in pokažejo, da ima tržna vrednost lastniškega kapitala (ME) manjšo pojasnjevalno moč na razvijajočih se trgih, kot jo ima na razvitih kapitalskih trgih. Zaradi ugotovitve obstoječih raziskav postavljam hipotezo, da ima tržna vrednost lastniškega kapitala skromno pojasnjevalno moč pri pojasnjevanju donosnosti v EE državah EU. Zato predlagam alternativo ME, ki naj bi se uporabljala na trgih, kjer ima tržna vrednost lastniškega kapitala slabo pojasnjevalno moč. Kot ugotavljata Fama in French (1992a), da je BE/ME povezan z relativno dobičkonosnostjo podjetja, je mera kakovosti te dobičkonosnosti logična alternativa za tržno vrednost kapitala. Obstaja vrsta prispevkov na temo kakovosti in razmejitev, kot so Healy (1985), DeAngelo (1986), Jones (1991) in Dechow, Sloan in Sweeney (1995), ki ugotavljajo, da so vse razmejitve večkrat predmet manipulacij v primerjavi z denarnim tokom iz poslovanja. Poleg tega lahko obstajajo nekatere za regije specifični dejavniki. Ahmed (2009), Capkun et al. (2008), Garrod, Kosi in Valentinčič (2008), Kosi in Valentinčič (2011), Vellam (2004) in welc (2011) ugotavljajo razlike v prirejanju dobičkov med pred in po-2004 EU članicah. Zaradi teh ugotovitev menim, da je logično predlagati alternativni model, ki temelji na čistem dobičku na denarni tok iz poslovanja (NI/CFO), razmerju, ki se pogosto uporablja kot test za oceno računovodskih manipulacij čez palec.

Aplikacija Fama-Frenchovega (1993) modela v EE državah EU je pokazala, da čeprav imata beta in BE/ME značilno pojasnjevalno moč pri pojasnjevanju donosnosti, se ME slabo izkaže

pri delnicah, ki kotirajo na trgih kapitala teh držav. Ti rezultati potrjujejo rezultate iz obstoječih študij, ki so uporabile Fama-Frenchov (1993) model na razvijajočih se trgih. Pokazal sem, da z nadomestitvijo faktorja ME z NI/CFO pridemo do statistično bolj značilnih rezultatov. Moji rezultati se lahko uporabijo v kateri koli funkciji, v kateri se uporablja pričakovana donosnost lastniškega kapitala v EE državah EU, potencialno pa tudi na številnih trgih, na katerih se je ME izkazal kot faktor z nizko pojasnjevalno močjo. Poleg tega, čeprav se NI/CFO redko uporablja med teoretiki, je le-ta standard v strokovni literaturi namenjeni finančnikom in se šteje kot kazalnik računovodskih manipulacij. Predpostavljam, da tečaji delnic ne vključujejo vseh razpoložljivih informacij, ker vlagatelji ne morejo ugotoviti v kolikšni meri so podatki o čistih dobičkih podjetij zanesljivi in se zato zatekajo k uporabi približkov kot je NI/CFO.

Moji rezultati kažejo, da je NI/CFO boljši pri pojasnjevanju donosnosti delnic na trgih kapitala v EE državah EU od ME. Poleg tega sem menim, da moje ugotovitve sprožajo številna vprašanja o učinkovitosti trgov kapitala v EE državah EU. Obstaja veliko razlogov zakaj NI odstopa od CFO, ki niso povezani manipuliranjem dobičkov: NI/CFO je mogoče šteti le kot približek za računovodske manipulacije. Ker Fama (1970) opredeljuje kot učinkovit trg tisti trg, ki "v celoti odseva" vse razpoložljive informacije, je mogoče trditi, da vlagateljev sum glede resničnosti poročanega NI preprečuje, da bi bile vse razpoložljive informacije odražene v ceni delnice.

Nizka pojasnjevalna moč Fama-Frenchovega (1993) modela v EE državah EU in uspeh predlaganih dopolnjenih modelov ima pomembne posledice in odpira mnogo zanimivih raziskovalnih vprašanj. Če omenim samo dva izmed njih. Prvič, pomembna razširitev mojega prispevka je uporabiti dopolnjene modele za druge razvijajoče se trge, za katere se je pokazalo, da ima ME nizko pojasnjevalno moč. Drugič, ker sem prišel do zanimivih rezultatov z uporabo finančnih kazalcev v EE državah EU, bi bilo zanimivo preučiti, kako se finančni kazalci izkažejo v regiji v modelskem scenariju brez faktorjev.

Po preučitvi tržne vrednosti kapitala v zvezi s Fama-Frenchovim (1993) modelom, je logičen naslednji korak, da se analizira del modela z mnogokratnikom knjigovodska vrednost/cena (BE/ME). Penman, Richardson in Tuna (2007) -PRT- razgradijo mnogokratnik na komponento povezano s poslovnim tveganjem in komponento povezano s finančnim tveganjem. PRT pa pridejo do nelogičnih rezultatov; medtem ko je poslovno tveganje

pozitivno povezano z donosnostjo, je tveganje povezano z zadolženostjo negativno povezano z donosnostjo. To je pa v nasprotju s finančno teorijo, zlasti Modigliani in Millerjevo (1958) podmeno 1, iz katere izhaja pozitivna povezava med stroški lastniškega kapitala in zadolženostjo. Skogsvik, Skogsvik in Tune (2011) -SST- razširijo delo PRT, da bi dodatno raziskali te očitno nelogične ugotovitve. SST menijo, da ima zadolženost dvojni učinek na donosnost: prvič, sestavljen učinek poslovnega tveganja, ki ga SST zajemajo z množenjem finančnega vzvoda s poslovnim vzvodom (pozitivno povezan z donosnostjo), in drugič, učinek preko stroškov obresti (negativno povezan z donosnostjo).

Poleg tega se je potrebno zavedati, da obstajajo regionalne posebnosti pri zadolženosti podjetij, saj se v številnih študijah ugotavlja, da struktura kapitala podjetij v EE državah EU ni v skladu s sodobno teorijo strukture kapitala (na primer Črnigoj in Mramor (2009), Haas in Peeters (2006), Mramor in Valentinčič (2001) in Nivorozhkin (2004)). Te regionalne razlike v razlogih za izbiro specifične strukture kapitala pa lahko vplivajo na odnos med zadolženostjo in donosnostjo delnic. Tako na primer, Haas in Peeters (2006) ugotavljata, da podjetja, ki kotirajo na borzah v EE državah EU uporabljajo premalo dolga zaradi nerazvitega bančnega sistema v letih takoj po transformaciji teh gospodarstev v tržna gospodarstva. Čeprav je v podjetjih, ki kotirajo v EE državah EU, moč zaznati premik proti ciljni zadolženosti, je asimetrija informacij med podjetji in bankami še vedno precejšnja. Kot posledica, podjetja raje uporabljajo notranje vire financiranja in le postopoma prilagajajo strukturo kapitala, kar kaže na obstoj trenj na finančnem trgu. Nivorozhkin (2004) prav tako navaja, da so spremembe v uporabi dolžniškega financiranja v podjetjih iz EE držav EU postopne. Mramor in Valentinčič (2001) podvomita celo na bolj osnovni ravni, in sugerirata, da temeljne predpostavke sodobne teorije strukture kapitala ne veljajo za Slovenijo. Čeprav študija upošteva samo podjetja iz ene od držav v mojem naboru podatkov, sklep, da privatizirana podjetja nimajo niti cilja maksimiranja premoženja delničarjev, niti si ne prizadevajo za dolgoročno preživetje, temveč kažejo znake, da so ta podjetja upravljana s strani delavcev, lahko velja tudi za druge tranzicijske države. Črnigoj in Mramor (2009, str.11) preučita kapitalsko strukturo v slovenskih podjetjih in pravita, "teorije, ki temeljijo na predpostavki, da podjetja, ki sledijo cilj maksimiziranja premoženja delničarjev ne morejo zadovoljivo pojasniti izbire strukture kapitala v razvijajočih se evropskih gospodarstvih" Te regionalne posebnosti v razlogih za izbiro specifične strukture kapitala pa lahko vplivajo na odnos med zadolženostjo in donosnostjo delnic.

Tako postavljam hipotezo, da na komponento mnogokratnika knjigovodska vrednost/cena, ki je povezana s finančnim tveganjem, vplivajo regionalne razlike glede izbire določene ravni zadolženosti. Poleg tega menim, da medtem ko razmerje med dolgom in lastniškim kapitalom ne vpliva knjigovodska vrednost, cena odraža dojemanje trga o ravni zadolženosti podjetja.

V tem delu disertacije tako pokažem, da medtem ko je BE/ME učinek prisoten pri delnicah v EE državah EU, se razgrajeni elementi učinka BE/ME na poslovno in finančno komponento, obnašajo bistveno drugače kot izhaja iz rezultatov PRT in SST. Ugotavljam, da čeprav se knjigovodska/tržna vrednost podjetja (NOA/PNOA) uporablja kot mera poslovnega tveganja v predhodnih raziskavah na razvitih trgih kapitala, bi na trgih kapitala EE držav EU NOA/PNOA odražal percepcijo trga glede primernosti zadolženosti podjetja. To vodi do sklepa, da se razlike v zaznavanju izbire struktura kapitala odražajo v različnih razmerjih NOA/PNOA in različnih povezavah med zadolženostjo, NOA/PNOA in donosnostmi delnic.

Pričujoča disertacija nadaljuje delo na omenjenem področju na več načinov. Glede na pomen strukture kapitala za finančno uspešnost podjetja in širše razvoj gospodarstva, je raziskovanje pomena zadolženosti še posebej pomembno v EE državah EU zaradi vloge trga kapitala v procesu privatizacije in tudi ker le-ta služi kot pomembno merilo, s katerim se meri napredek teh držav pri prehodu iz planskega v tržno gospodarstvo. Poleg tega, ker so razlage učinka BE/ME sporne, omogoča analiza prej spregledanih EE držav EU v mojem delu koristen poglobljeni vpogled v razprave in potrditev ugotovitev predhodnih raziskav. Nenazadnje, s poenotenjem raziskave tako v smislu učinka BE/ME in strukture kapitala v EE EU, disertacija ponuja nov pogled na obeh področjih raziskav.

Rezultati odpirajo nekaj zanimivih vprašanj za nadaljnje raziskave. Raziskave kažejo, da ima učinek BE/ME precejšnje regionalne značilnosti. Medtem ko predhodne raziskave, npr. Fama French (1998), pokažejo, da BE/ME učinek obstaja na mednarodni ravni, razgradnja (in s tem tudi zavedanje, da se lahko pomen BE/ME po državah razlikuje) ni bila upoštevana. Moja raziskava tako ponuja pomembno novo dimenzijo za razmislek o BE/ME učinku na mednarodni ravni. Mednarodne dokaze o učinku BE/ME je treba namreč ponovno preučiti, da bi ugotovili ali so ugotovitve predhodnih raziskav pristranske zaradi mednarodnih razlik v vedenju razgrajenih elementov BE/ME. Ker je Fama-Frenchov (1993) faktorski model, ki vključuje BE/ME pogosto uporabljen splošno veljavni model, so potrebne tudi raziskave s katerimi bi preučili kako regionalne razlike v učinku BE/ME vplivajo na uspešnost modela.

Prav tako je potrebno ugotoviti vpliv na druge računovodske identitete, ki vsebujejo zadolženost, na primer Dupontovo shemo.

Menim, da v pričujoči doktorski disertaciji jasno odgovarjam na ključna raziskovalna vprašanja – o tem, ali so trgi kapitala v EE državah EU učinkoviti in kateri dejavniki pojasnjujejo donosnosti delnic v regiji. Raziskava pokaže, da v regiji trgi kapitala ne izkazujejo niti najmanj stroge oblike učinkovitosti. Poleg tega je prispevek te disertacije vključevanje kontrole za likvidnosti in preveritev, ali je pristop k EU vplival na učinkovitost. Dopolnjen Fama-Frenchov (1993) model, predlagan v disertaciji, predstavlja velik prispevek k obstoječim raziskavam, saj ponuja alternativni model za uporabo na številnih trgih, kjer se je tržna vrednost lastniškega kapitala pokazala kot faktor z nizko pojasnjevalno močjo. Poleg tega disertacija prispeva k obstoječi literaturi z dokazom, da medtem ko dokumentiran učinek mnogokratnika knjigovodska vrednost/cena še vedno velja v EE državah EU, kažejo razgrajeni elementi mnogokratnika bistveno drugačno povezavo z donosnostjo delnic kot jo pokažejo obstoječe raziskave . To vodi k domnevi, da ima mnogokratnik drugačen pomen v EE državah EU, saj dejansko odraža koliko trg kapitala ocenjuje stopnjo zadolženosti podjetja kot neprimerno.