Aalto University
School of Economics

Style Migration: Evidence from the European Equity Markets

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Jussi Mikkonen

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Aalto University
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ABSTRACT
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PURPOSE OF THE STUDY

This paper examines how migration contributes to value and size premiums in stock returns. Migration is defined as stocks moving from one valuation or size category to another. Specifically, this thesis is the first to replicate the methodology of Fama and French (2007a) using European data. Fama and French (2007a) find that migrating stocks form most of the size and value premiums in the US. Therefore, European data gives the opportunity to provide an out-of-sample test for the Fama and French (2007a) study. The secondary objective of this study is to predict migration using the contextual fundamental analysis method of Piotroski (2000). As Piotroski (2000) is able to show that investors can enhance value investing strategies, it is interesting to test whether the same phenomenon drives migration.

DATA

The sample used in this study consists of companies from over 23 countries in Europe between 1980 and 2011. The total amount of firm-year observations is 52,154. Accounting data is acquired from the Worldscope database using Thomson One Banker and market data from Datastream. To be able to fully replicate the Fama and French (2007) method supplemental data for buyouts (35,255 observations during 1980-2011) from SDC Platinum is acquired.

RESULTS

The results of this thesis indicate a significant value effect in Europe during 1980-2011. Further, migration has a significant contribution to the value effect. Additionally, size effect is positive in 1980-1988 but seems to disappear after 1988, which is in line with previous research (van Dijk 2011). In accordance to Chen and Zhao (2009), the size effect appears to be positive if small growth stocks are omitted from the portfolios. Migration also has a major role in the formation of the size effect.

The fundamental analysis method of Piotroski (2000) is able to enhance portfolio returns, although the benefits are mainly concentrated on small firms. However, the results concerning the method's ability to predict migrating stocks are mixed. Firms in a very good financial condition have a higher probability to migrate favourably than firms in a poor financial condition.

KEYWORDS

Value premium, size premium, F_SCORE, value investing, migration

Aalto-yliopiston kauppakorkeakoulu
Rahoituksen laitos
Pro gradu -tutkielma
Jussi Mikkonen

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STYLE MIGRATION: EVIDENCE FROM THE EUROPEAN EQUITY MARKETS

TUTKIELMAN TAVOITTEET

Tutkimuksen tavoitteena on selvittää osakkeiden siirtymisten eli migraation vaikutusta osakkeiden arvo- ja kokopreemioiden muodostumiseen Euroopassa. Aikaisemmissa tutkimuksissa, jotka keskittyvät lähinnä Yhdysvaltoihin, on havaittu, että suurin osa osakkeiden arvo- ja kokopreemioista syntyy osakkeiden siirtyessä kategoriasta toiseen. Tutkimus pyrkii selvittämään, päteekö sama myös Euroopassa. Lisäksi tutkielmassa pyritään selvittämään, voiko arvosijoitusstrategioiden tuottoa parantaa tilinpäätösanalyysin avulla ja voiko migraatiota ennustaa tilinpäätösanalyysilla.

LÄHDEAINEISTO

Lähdeaineisto koostuu aktiivisten ja ei-aktiivisten eurooppalaisten julkisesti noteerattujen yritysten tilinpäätöstiedoista ja osaketuotoista. Aineisto kattaa yli 23 maata Euroopassa ja ulottuu vuodesta 1980 vuoteen 2011. Aineisto käsittää 52,154 vuosittaista havaintoa. Kaikki aineisto on kerätty Thomson ONE Banker-, Datastream- ja SDC Platinum-tietopankeista.

TULOKSET

Tulokset osoittavat, että siirtymien rooli arvo- ja kokopreemioissa on merkittävä. Arvopreemio, joka on ollut Euroopassa merkittävä vuosien 1980 ja 2011 välillä, muodostuu osakkeiden siirtyessä valuaatioluokkien välillä. Sen sijaan kokopreemio ei ole tilastollisesti merkittävä vuoden 1988 jälkeen. Tilinpäätösanalyysin avulla on mahdollista parantaa arvo-osakkeista koostuvan salkun tuottoa, mutta tilinpäätösanalyysi suurten yritysten osakkeissa ei ole yhtä hyödyllistä kuin pienien yhtiöiden osakkeissa. Arvo-osakkeiden siirtymiseen liittyvät tulokset ovat osittain ristiriitaisia. Yhtiöt, joilla on vahva operatiivinen tilanne, ovat todennäköisempiä siirtymään ylöspäin valuaatiossa tai markkina-arvoluokituksessa kuin heikot yhtiöt. Tulokset eivät kuitenkaan kykene osoittamaan kausaliteettia operatiivisen tilanteen ja migraation välillä.

AVAINSANAT

Arvopreemio, kokopreemio, F_SCORE, arvosijoittaminen, migraatio

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1. INTRODUCTION

1.1. BACKGROUND

Investment professionals and academics have long been divided over whether a value or a growth approach to equity investing pays off more. Investors and fund managers have based their investment strategies on the different characteristics that stocks depict. Labelling stocks and indexes into value and growth styles is a typical practice among the investment professionals and much time is spent on debating the merits of these two categories. Likewise, academics have joined the discussion by studying how these strategies perform in the long run and what characteristics do they have.

The origins of the value versus growth debate can be traced back to the work of Benjamin Graham and David Dodd (1934) who asserted that investors can achieve superior returns by selecting undervalued stocks using fundamental analysis. Their work became known as value investing and caught attention among investment professionals. In the academic world however, the tenets of Graham and Dodd received little interest until the first anomalies in the Efficient Market Hypothesis (EMH) started to emerge. According to the EMH investors should not be able to find mispriced securities as they are correctly valued at all times.

Among the first academics to document inconsistencies in the EMH were Basu (1977) with the size effect and Dreman (1977) with the low P/E effect. As similar anomalies were found over the subsequent decades (for instance, see Fama and French 1992, 1998; 2007b and Zhang 2005) the academic world gradually reached a consensus over the superior performance of value investing. In plain terms, value strategies base on the finding that cheap stocks have outperformed expensive stocks on average. This is also known as the *value effect* (or the *value premium*). Although academics generally agree on the outperformance of value strategies, the underlying reasons for the superior performance are not fully known.

The reasons for the outperformance of value strategies have divided academics into two contrasting schools of thought. The first group argues that value strategies are simply more risky and the better performance is compensation for bearing the extra risk (see for instance Fama & French 1992; Doukas et al. 2002; Vassalou & Xing 2004). The second group of researchers however disagree with the risk explanation and argue that the outperformance is due to mispricing of equities. A number of studies (such as Lakonishok et al. 1994; La Porta et al. 1997; Griffin & Lemmon 2002) interpret that value stocks are mispriced due to behavioural reasons such as errors in investor expectations. The debate between the two schools of thought seems highly controversial and reaching a consensus appears unlikely. Chapter 2 will present the conflicting theories in more detail.

Even though there is no clear and concise definition of a growth or a value stock, most practitioners and academics (for instance, Fama and French 1992, 2006a; Chen and Zhang 1998) typically label stocks with low valuation multiples (e.g. price-to-earnings, price-to-book value) as value stocks. Moreover, value stocks may also have a higher dividend yield. Conversely, growth stocks are typically characterized by higher multiples. This paper will define value stocks as those stocks with a low price-to-book multiple (P/BV), whereas growth stocks have high P/BV. An overwhelming amount of research has been made on the performance of these two categories and the general consensus appears to be in favour of value stocks (for instance, see Chan and Lakonishok 2004 for an excellent summary).

Another distinctive feature relating to the value effect is the convergence of price-to-book value. Over time, stocks with low price-to-book value see an increase in P/BV and the converse is true for high P/BV stocks. In other words, valuation is mean reverting. Researchers have coined the term *migration* (also *style migration*) to describe stocks shifting from one category to another over time (e.g. Fama and French 2007a; Jiang and Koller 2007; Pirjetä and Puttonen 2008). The results of the previous migration studies have been rather interesting for academics and practitioners alike. For instance, Pirjetä and Puttonen (2008) find that stocks migrating from value to growth provide higher returns and Sharpe ratios than the index and other value stocks.

In addition to the value premium, company size can often be used as a proxy for risk. As Fama and French (1992) argue, size premium is also one of the risk factors alongside the value premium in the cross-section of average stock returns. In plain terms, smaller companies are deemed as riskier and thus have higher expected returns. It is also here where migration can be applied. The preliminary research on this area (Fama and French 2007a; Gharghori et al. 2010) shows that stocks migrate both in size and value spectrums. Fama and French (2007a) highlight small value stocks as an especially intriguing category as they provide very substantial outperformance when they migrate in the size spectrum.

Migration is especially useful in the value versus growth debate due to its ability to provide a different, bottom-up view on where the size and value risk factors come from and how they behave over time. By forming portfolios of individual companies it is possible to examine more closely how the risk factors are actually formed. Furthermore, using this method enables one to follow individual companies over time and look at which accounting variables have a key role in driving migration. In addition to providing academics a more close-up view on the two risk factors, migration can give valuable ideas for financial professionals in how to approach equity investing.

As migration seems to be able to provide insights into why the value and size premiums arise, it gives an interesting opportunity to apply this method to European stocks. There are only two previous studies utilizing European data (Pirjetä and Puttonen 2008; Pätäri and Leivo 2010) and this thesis will continue on their work. The preceding papers on migration have used data from the U.S. (Fama and French 2007a; Chen and Zhao 2009) and from Australia (Gharghori et al. 2010). This paper will examine whether the same results apply to stocks in the Euro area as well. As the Euro zone is fragmented into diverse countries with little similarity the analysis will provide more detail into how the value and size premiums behave over time in very divergent countries. Moreover, the data in this paper spans from 1980 to 2011 which includes several periods (such as the formation of the European Union and the deregulation of capital flows) that affect the dynamics of the equity markets. The data used in this paper is explained in more detail in Chapter 4.

In addition to examining the size and value premiums, this study will also look further in to the determinants of migration. Because some of the migrating stocks provide substantial outperformance the interesting question naturally relates to whether these stocks could be predicted somehow. This question is also addressed in this thesis. The importance for separating winning stocks from losers is paramount for portfolio managers. This stems from the finding of Piotroski (2000) who was one of the first to apply fundamental analysis to select *ex-ante* superior performers out of a sample of value stocks. Piotroski's (2000) results seem to indicate that investors can take advantage of a possible mispricing of equities. Whether the same fundamental analysis tools provided by Piotroski (2000) can be applied to predicting migrating stocks is not known yet. Combining migration analysis with the portfolio selection tools of Piotroski (2000) can thus provide insights whether investors can achieve better risk-adjusted returns.

1.2. RESEARCH PROBLEM AND PURPOSE

The research problem of this thesis is:

How does migration contribute to the size and value premiums of equity returns?

The central objective of this paper is to provide an out-of-sample test of the Fama and French (2007a) results using European data. As of to date, the study by Fama and French (2007a) has only been replicated as such in the US by Chen and Zhao (2009) and in Australia by Gharghori et al (2010). To examine the role of migration, this thesis will follow the portfolio construction approach outlined in Fama and French (2007a). This approach is examined more closely in Chapter 4.

In addition to examining the contribution of migration to excess returns, this paper will also look at the drivers of migration and whether migration can be predicted. The secondary research question in this thesis is:

Can portfolio returns be enhanced by predicting migration?

To answer this question this thesis applies the methodology of Piotroski (2000), namely the F_SCORE. The F_SCORE is one of the possible tools that investors can use to separate winning stocks from losers in a value strategy. This separation is needed because a large proportion of lowly valuated companies are rightfully cheap due to their weak financial condition. Piotroski (2000) shows that less than 44% of low P/BV stocks achieve positive returns after portfolio formation. The F_SCORE separates stocks using nine different metrics related to a company's (1) profitability, (2) financial strength and (3) efficiency. Piotroski's (2000) method was able to increase the mean returns of a low P/BV strategy by 7.5% annually. The paper by Piotroski (2000) received an enthusiastic welcome from the academic community and started a trend that emphasizes fundamental analysis in value and growth strategies (see Mohanram 2005; Bird & Casavecchia 2007 for more). More details about the landmark paper by Piotroski (2000) and the F_SCORE are presented in Chapter 4.

1.3. CONTRIBUTION

Although the value and size effects have been widely studied, there are only few papers on the relationship between migration and the value and size effects. This thesis will contribute to the literature by (1) using a larger European database to provide more scope into migration, (2) examining in more detail the accounting variables that drive migration and (3) looking more closely on whether migrating stocks could be separated to enhance investment returns.

As of to date, European data has only been very scarcely used in previous research. The paper by Pirjetä and Puttonen (2008) is one of the two using European data and their time span is from 2001 to 2006. Also, Pirjetä and Puttonen (2008) do not consider the size premium in their paper as Fama and French (2007a) do. The second study on migration is by Pätäri and Leivo (2010) who examine how stocks change valuation categories using Finnish data. This thesis will provide a larger dataset spanning from 1980 to 2011 and extend the analysis to cover migration also in the size spectrum. The dataset in this thesis covers over 23 countries in Europe with 52,154 firm-year observations.

To gain a better understanding of migration, this thesis will look more closely at the economic fundamentals that lead a stock to migrate from one category to another. For instance, the role of financial strength has not been discussed in previous research. This paper will provide a more detailed breakdown of the accounting variables that might have a role in style migration. Previous papers (such as Pirjetä and Puttonen 2008) have examined only a few variables. This paper will extend the analysis to cover company fundamentals more widely to provide more scope on why some stocks migrate. Finally, although there are several papers on enhancing portfolio returns (notably Piotroski 2000 and Mohanram 2005) the methods have not been applied in migration analysis.

1.4. LIMITATIONS OF THE STUDY

One of the central limitations of this thesis is the availability of data. The Thomson ONE Banker database lacks accounting data for European companies dating back to pre-1980 years. Hence, the timeframe of the study covers only 1980-2011. Companies that are included in the sample are required to have a financial year ending in December, available data for market capitalization, stock returns and book equity. To be able to utilize the Piotroski (2000) fundamental analysis method, further accounting data (see Chapter 4.2.3) is required from the companies.

This study is also limited by the quality of the data. The data obtained from the Worldscope database reports whether or not a company is delisted but does not explain the reason. Because companies need to be classified by their reasons for delisting the results are not fully accurate. However, this critique only applies to a minute fraction of the total results.

1.5. THE MOST RELEVANT FINDINGS

The main contribution of this thesis is that it is able to replicate the results of Fama and French (2007a) in a European setting and provide an up-to-date view on both the size and value premiums. The key finding is that migration has a major role in driving both the value and size effects. The value effect is found to be 9.58% on average and caused by value stocks migrating to a growth category and vice versa. Stocks that do not migrate contribute very little to the value premium. The size effect is positive only in years 1980-1988 after which it disappears. The disappearance of the size effect is documented on several occasions (see van Dijk 2011 for a summary) although up-to-date European data is very scarce. The magnitude of the size effect is found to be -0.23% annually in the aggregate sample.

The second contribution of this study is to add to the existing literature on enhancing value investing strategies. The Piotroski (2000) F_SCORE is able to increase the returns of value portfolios although the results are mainly concentrated in small stocks. The results concerning the F_SCORE's ability to predict migrating stocks are however mixed. Stocks in very good financial condition tend to migrate favourably than stocks in very poor condition but causality between the F_SCORE and migration probability cannot be ascertained. Still, the results provide insight into what may cause some stocks to be upgraded in valuation.

1.6. KEY CONCEPTS AND DEFINITIONS

Throughout this thesis, the definition for *value* and *growth* stocks is based only on their *price-to-book ratio (P/BV)*. Value stocks have low P/BV whereas growth stocks have high P/BV. Growth stocks are often referred to as *glamour* stocks in the academic literature and this thesis also uses these terms interchangeably. Therefore, the definition of value investing differs from the original Graham and Dodd (1934) of buying stocks below their intrinsic value.

Since the intrinsic value of a stock cannot be directly observed, academics have to rely on proxies for probable undervaluation, i.e. valuation multiples.

For the sake of brevity, portfolios are referred to by their valuation and size categories. Following the method of Fama and French (2007a), six portfolios (SV, SN, SG, LV, LN and LG) are formed. *SV, SN* and *SG* refer to small-cap value, small-cap neutral and small-cap growth, respectively. Moreover, *LV, LN* and *LG* are abbreviations for large-value, large-neutral and large-growth, respectively. The *neutral* category includes stocks that fall between the value and growth categories (see Chapter 4.2.1).

The *value effect* is defined as the return difference between value and growth stocks. Value effect and *value premium* are used interchangeably. The same holds for the *size effect* and *size premium*. Further, this thesis refers to the value premium as the *HML* factor to be in line with existing literature. HML refers to high-minus-low book-to-market stocks, or in layman's terms, how much cheap stocks outperform expensive stocks. In addition, the size premium is referred to as the *SMB* factor, or simply, small-minus-big (the return difference between small capitalization and large capitalization stocks).

A stock *migrates* when it moves from one of the six portfolios to another during the year. *Favourable migration* is defined as a situation, where a stock is upgraded in valuation (a stock moves from value to neutral or growth) or market capitalization (a stock moves from small to large).

Another key concept is *behaviourists*, which refers to a school of thought that tries to explain asset pricing anomalies with theories of behavioural finance. Behaviourists reject the risk-based explanation for the value effect and offer a mispricing theory instead.

1.7. STRUCTURE OF THE THESIS

This thesis is divided into six chapters. The first chapter introduces the reader to the topic and provides background information why the subject is relevant. The second chapter contains the review of the literature on value and growth investing and the surrounding debate on the reasons behind the success of value strategies. Chapter 3 presents the hypotheses and Chapter 4 explains the data and methods used in more detail. The results of the analysis are provided in Chapter 5. Finally, Chapter 6 concludes with a discussion of the results and provides suggestions for further research.

2. LITERATURE REVIEW

Value and growth investment strategies have become an enormously popular topic in finance literature as a vast amount of anomalies regarding the efficient market hypothesis (EMH) have been found. As more anomalies such as the abnormal returns produced by a low P/E strategy (Basu 1977) have accumulated, the academic community has started to speak about the value effect. Although academics widely agree that, on average, value strategies beat growth strategies, no consensus has been reached on the underlying reasons of the effect.

The first section introduces the reader to the value effect and the alternative ways to explain why the effect exists. The second section provides an overview of the literature on the size effect and the surrounding debate. The third section reviews the advancements in applying value investing strategies in practice and introduces the reader to novel approaches in combining fundamental analysis on value investing. The fourth section concludes with an overview on migration, the key topic of this thesis.

2.1 .THE VALUE EFFECT

There is a wealth of information on the value effect as it has been studied for decades and several schools of thought have formed to explain why the value effect exists. This section provides a brief review of the literature on the value effect. Those interested in the topic should refer to Chan and Lakonishok (2004) for a more thorough summary and discussion on both value and growth investing. In this thesis the terms value effect and value premium are used interchangeably.

The literature on the value effect has been built on several anomalies related to the efficient market hypothesis that academics have found over the past decades. The origins of the value strategy can be traced back to Graham and Dodd (1934), who argued that value strategies outperform the market. However, academics seemed to become interested in the subject quite a while later. One of the early papers was by Basu (1977), who found that stocks with low P/E-ratios outperformed stocks with higher P/Es. Dreman (1977) was also a proponent of the low P/E strategy and argued that not only do stocks with low valuation outperform, but the explanation can be found from stock market psychology. Although Dreman named his approach as contrarian investing, the concept of taking advantage of the value effect can be seen in his writing.

The low P/E anomaly was also found by Jaffe et al. (1989) and Chan et al. (1991). Chan et al. (1991) further notice that in addition to low P/E, outsized returns are also produced by high book to market ratio and cash flow yield (or conversely low P/BV and P/CF). Related to the value effect are two papers by De Bondt and Thaler (1985, 1987), who assert that severely underperforming stocks tend to produce market-beating returns in subsequent years. Hong and Stein (1999) offer a simple explanation for this phenomenon: the price of an asset overshoots its intrinsic value when series of good news are announced an eventually the price undergoes a correction. Rosenberg, Reid and Lanstein (1985) also find the low price-to-book-value effect and show that the strategy is able to beat the market.

The most notable papers on value and growth investment strategies have been by Fama and French (1992) and Lakonishok et al. (1994) as these papers extend on the previous build-up of anomalies in the EMH and offer more refined explanations for the effects. These papers also caused quite a debate and started to shift academics' attention away from the capital asset pricing model (CAPM) and the efficient market hypothesis. The Fama and French (1992) paper found rather disturbing evidence against the explanatory power of the CAPM for the cross-sectional stock returns. The authors argue that price-to-book and company size are better associated with risk and expected return. Fama and French (1992) further continue on the tradition of the efficient market hypothesis and argue that the success of the value strategy is explained by increased risk. Lakonishok et al. (1994) however provide behavioural and institutional explanations on why the value strategy achieves higher returns. These two alternative theories attempting to explain the value effect are presented in more detail in the following chapters.

2.1.1 Risk Explanation

As the academic community has over time reached a consensus that the value effect exists, the reasons behind the effect are still debated. One way of explaining the outperformance of value strategies is that the strategies are fundamentally riskier. The most notable proponents of this explanation are Fama and French (1992), who argue that investors who follow a value strategy take on more risk and the outsized returns are simply a compensation for the extra risk. The 1992 article by Fama and French — also dubbed the "beta is dead" paper — reasons that companies with low P/BV ratios are judged by the market to have inferior prospects and the higher expected returns are logical as investors demand a higher cost of capital.

The riskiness of value stocks is usually interpreted as financial distress (Piotroski 2000). This view is supported by the finding (for instance Fama and French 2005; Penman 1991) that low P/BV companies have a consistently lower return on equity than high P/BV companies. Furthermore, Chen and Zhang (1998) and Fama and French (1992) find a clear relation between low P/BV, high amounts of debt and other financial measures of risk but also substantial earnings uncertainty in the future.

The risk-based argument is also made by Chan (1988), who criticizes the investor overreaction model by De Bondt and Thaler (1985, 1987). Chan (1988) argues that the estimation of abnormal returns to a contrarian strategy of buying past losers depends heavily on the model used and the estimation methods. Asgharian and Hansson (2009) examine contrarian anomalies in the US during January 1931-2005 and find that the returns to a long-term contrarian strategy are compensation for risk. Interestingly, the authors also find that a short-run contrarian strategy generates excess profits of 0.50% per month which cannot be explained by a risk-based component.

Griffin and Lemmon (2002) examine the relationship between the value premium and default risk using accounting-based measures. They find that low P/BV firms earn superior returns and the outperformance cannot be explained by the Fama-French three-factor model or by alternative accounting variables. Griffin and Lemmon (2002) note that the return difference between low and high P/BV companies that are in financial distress is more than twice as large as the return in other groups. The authors also provide an alternative explanation for the phenomena and assert that companies with high distress risk might be the most likely to be mispriced. The reasoning is that these companies tend to display the largest return reversals around earnings announcements and the abnormal returns are largest with stocks having the least amount of analyst coverage.

Taking the opposite view are Vassalou and Xing (2004) who argue that the Griffin and Lemmon (2002) methodology of accounting variables is inadequate and a market price-based method should be used instead. The reasoning is that market-based measures are forward-looking and tend to reflect a company’s financial condition better. Vassalou and Xing (2004) apply an option pricing model to assess a company’s probability of default using US data during 1971-1999. The authors find that default risk is strongly related to a company’s size and P/BV characteristics. A notable finding in their study was that high default risk firms do earn superior returns but only when they have a low market capitalization and low P/BV.

When controlled for these two characteristics, companies with high default risk do not earn higher returns.

Not all academics however agree that value strategies are inherently riskier. As a generalization, those who do not accept the risk story simply say that value stocks are underpriced relative to their risk and return characteristics. The next chapter provides an overview of the alternative explanations.

2.1.2 Behavioural Explanation

The behavioural school of thought offers an alternative point of view on why the value effect exists. This thesis uses the term behavioural school (or behaviourists) when referring to the researchers who reject the risk explanation of the value effect. The aim is to simplify the discussion as the arguments made by this school often are based on investor behaviour in some way or the other. One of the most influential studies on the value effect and the reasons behind it is by Lakonishok et al. (1994). They argue that the risk-based explanation for the outperformance of value strategies lacks support and offer alternative explanations.

The first finding of Lakonishok et al. (1994) is that a strategy that buys out-of-favour (value) stocks is able to outperform a glamour (growth) stock strategy. Further, the authors observe that a likely explanation for this outperformance is behavioural: investors extrapolate past growth rates into the future and misprice stocks as the growth rates are not realized. In other words, investors make consistent mistakes in estimating stock prospects as high growth rates of earnings, cash flows etc. are expected to continue. As these rosy projections turn out to be too optimistic, the past glamour (growth) stocks will subsequently underperform. Finally, Lakonishok et al. (1994) examine whether the argument made by the risk-school is plausible, e.g. value is riskier than growth.

Lakonishok et al. (1994) argue that if value was riskier, the strategy should underperform when investors do not want to be exposed to risk. For instance, during a recession the marginal utility of wealth is high and thus, risk-averse investors should not like value stocks. During such occasions, growth (or glamour) should outperform a value approach. Lakonishok et al. (1994) however observe that this is not the case at all. They find that between 1968 and 1989, value has consistently outperformed growth using a 1-year horizon; in 17 out of 22 years using P/CF, 19 out of 22 years with P/CF and growth in sales and finally in 17 out of 22 years using P/BV. When the horizon is widened to 3 and 5-year periods, the outperformance of value gets even stronger. Evidence for underperformance during recessions and downturns is not found as value does worse only during one period out of four.

Continuing with assessing the risk of value vs. growth, Lakonishok et al. (1994) study whether value underperforms during the worst months. During the 25 worst months for the stock market as a whole, value performs better than growth (-8.6% and -10.3% using P/CF and growth in sales). In the next worst 88 months when the index declined, the value portfolio outperformed the growth portfolio on average (-1.5% versus -2.9% for the two strategies whereas the index declined by 2.3%). The authors conclude that no support is found for the claim that a high-return strategy should be riskier at least in extreme market conditions.

When explaining the clear outperformance of the value approach, Lakonishok et al. (1994) turn on to behavioural reasons. They suggest that investors systematically suffer from expectational errors when they are assessing the growth rates (earnings, cash flows etc.) of stocks. The authors show that investor expectations are tied to past growth rates even though these rates tend to mean revert and thus past winners become losers and vice versa. Lakonishok et al. (1994) assert that the outperformance of a value approach can be explained by investors (both retail and institutional) who prefer to buy glamour stocks. As mentioned previously, the systematic errors in estimating growth rates is one reason for preferring glamour stocks. A second explanation is that brokers tend to recommend companies with favourable characteristics such as high growth rates. Institutional investors on the other hand might want to buy glamour stocks because these stocks are easier to justify to clients. Lakonishok et al. (1992 and 1994) maintain that owning glamour stocks appears “prudent” and may decrease the career risk of institutional money managers even though these stocks are not less risky.

Analyst behaviour might also play a role in the avoidance of value stocks. Stickel (2007) finds that analysts do not recommend low P/BV companies. Instead, they prefer high P/BV glamour (growth) firms which have performed strongly in the short term, i.e. momentum stocks. These stocks also tend to have high forecasted earnings growth. Stickel (2007) argues that analysts are simply incentivized to recommending these stocks but also notes that analysts might confuse stocks with high earnings growth with stocks with price appreciation.

Further, another factor to consider in the value effect debate is time horizons. As proposed by De Long et al. (1990) and Shleifer and Vishny (1990) and further continued by Lakonishok et al. (1994), investors simply might have too short time horizons to wait for value strategies to pay off more. Institutional money managers for instance cannot follow a value strategy as it might underperform the benchmark index for some periods. This short-term underperformance might result in career risk for institutional investors.

Doukas et al. (2002) criticize the errors-in-expectations interpretation of the value effect of Lakonishok et al. (1994) using I/B/E/S analyst forecast data during 1976 and 1997. The results by Doukas et al. (2002) show that low P/BV portfolios exhibit higher forecast errors and larger forecast revisions downwards than high P/BV portfolios. Their interpretation is that investors are more optimistic towards value stocks than growth stocks, which is in direct contradiction with the Lakonishok et al. (1994) model.

The study by Petkova and Zhang (2005) questions the behavioural stance of Lakonishok et al. (1994) that value cannot be riskier than growth. The paper examines the relationship between expected market risk premium and betas of value and growth stocks. They find that value (growth) betas tend to covary positively (negatively) with the expected market risk premium. The underlying economic reasoning is that expanding capital is less expensive than reducing capital and therefore value betas tend to be countercyclical. Even though Petkova and Zhang (2005) are able to shed doubt on the Lakonishok et al. (1994) theory, the value premium remains positive after controlling for time-varying risk indicating that their model cannot explain all drivers of the value effect.

An additional insight into the risk versus mispricing debate is brought by Bartov and Kim (2004) who form a strategy by combining the book-to-market and accrual anomalies (see Sloan 1996). They document negative raw returns for firms that are recognized as overvalued by the mispricing model and argue that the rational pricing story needs to be rejected because few investors would want to hold risky stocks with predictable negative returns. Further, Bartov and Kim (2004) find supporting evidence for the Lakonishok et al. (1994) theory of excessive optimism towards the earnings of growth stocks and pessimism towards the earnings of value stocks. An interesting finding is that mispricing is strongest in firms with less institutional following and which are held mostly by unsophisticated investors when a stock price of $10 is used as a proxy. Bartov and Kim (2004) conclude that the mispricing story is supported especially because portfolio performance can be enhanced without adding risk by combining the accrual anomaly and book-to-market strategy.

2.2. THE SIZE EFFECT

Since the size effect (or size premium) was first documented by Banz (1981) there has been substantial and controversial debate on whether the premium is compensation for systematic risk. In essence, the proponents of the risk story argue that the systemic risk is caused by numerous factors and company size is simply an appropriate proxy for that risk. According to van Dijk (2011), other explanations for the size effect are liquidity, investor behaviour and data mining. Making the size effect even more controversial is the finding that the effect seems to disappear, although the empirical evidence supporting this argument is mainly concentrated in the US.

Banz (1981) was the first to discover that stocks with lower market value tend to have higher average returns than stocks with higher market value. The size premium, or the difference in returns between small and large stocks, was 0.40% per month in his study that consisted of all NYSE stocks during 1936-1975. Banz (1981) asserts that investors tend to avoid owning stocks of small companies due to insufficient information. The size premium has also been documented in the US by Reinganum (1981), Brown et al. (1983), Keim (1983), with two datasets by Lamoureux and Sanger (1989) and Fama and French (1992) with the magnitude of the monthly size premium being 1.77%, 1.85%, 2.52%, 2.00%, 1.70% and 0.63% respectively.

The international evidence on the size effect tends to be consistent. Providing an excellent review, van Dijk (2011) analyses studies using international data and finds that the size effect ranges from 0.13% in the Netherlands to 5.06% in Australia. Moreover, small companies tend to outperform large companies in 18 out of 19 countries investigated. The author concludes that data mining cannot be seen as the reason for the size effect since international evidence is remarkably robust.

An important aspect that needs to be considered when examining the size effect is liquidity. McQuarrie (2010) argues that investors should separate the *academic* size effect from the real-world size effect. The author asserts that the size effect is empirically valid but investors cannot utilize the same bid-ask spread. McQuarrie (2010) further illustrates this problem with the commonly used CRSP database that includes records from 1930s. Months with very large abnormal returns for small stocks were also months with outsized bid-ask spreads. In addition, fewer than 25% of the smallest stocks were traded on the exchange in 1932. Even though McQuarrie's (2010) criticism is targeted at the manipulation and interpretation of US studies, the same argument applies also into international studies. McQuarrie (2010) concludes that even though the size effect can be replicated over and over again using past data, realizing abnormal returns using a small-cap strategy is however extremely difficult to do.

As van Dijk (2011) argues, investor behaviour is often used to explain the value effect but the same theories are rarely applied to the size effect. Van Dijk (2011) asserts that the Lakonishok et al. (1994) hypothesis of investor overreaction could be applied to the size effect as well. To support his argument, van Dijk (2011) cites Chan and Chen (1991), who find that small firms tend to be companies that have done poorly in the past. The outperformance of small stocks would therefore be driven by the correction of the investors' original overreaction.

The second argument of van Dijk (2011) is that investors might simply prefer large-cap stocks over small-cap stocks. Gompers and Metrick (2001) propose that the increased presence of large institutional investors increase the demand for large-cap stocks due to liquidity drives the relative performance of small-cap stocks downwards. Gompers and Metrick (2001) find that institutional investors have almost doubled their share of the US stock market during 1980-1996. The authors argue further that this compositional shift can explain nearly half of large-cap equity prices relative to small-cap stocks and can partly explain the disappearance of the size premium.

The debate surrounding the size premium is particularly controversial at least in part because there are numerous studies showing that the premium disappears. In the US, the size premium tends to disappear after the early 1980's as suggested by Dichev (1998), Chan et al. (2000), Horowitz et al. (2000a, 2000b), Amihud (2002) and Chen and Zhao (2009). Using European data, Annaert et al. (2002) find a significant size premium of 1.45% per month but the effect disappears if firms are classified by their size relative to their native country. In other words, the definition of small and large capitalization stocks plays a significant role in whether the effect exists.

2.3. FUNDAMENTAL ANALYSIS IN VALUE AND GROWTH STRATEGIES

A very intriguing strand of literature regarding value investing strategies spun from the paper by Piotroski (2000). Piotroski (2000) applied a simple, accounting-based fundamental analysis tool onto value stocks and was able to improve the returns earned by an investor. Between 1976 and 1996 with US stocks the enhanced value strategy increased the average returns by 7.5% annually when compared to a simple low P/BV strategy. The long-short strategy proposed by the author achieved an annual 23% return. The findings of the paper indicated that historical accounting information has predictive value and outperforming stocks can be separated *ex-ante*.

Although the idea of buying winning value stocks based on accounting fundamentals is not new, Piotroski's paper was the first to aggregate financial information to form portfolios based on an overall signal. Previous papers such as Lev and Thiagarajan (1993) and Abarbanell and Bushee (1997) find that certain financial indicators are able to predict future changes in earnings. Piotroski (2000) takes a step further and combines these signals into a simple tool to create portfolios. The method, namely the F_SCORE is explained in more detail in Chapter 4.

The findings of Piotroski (2000) indicate that the market reacts slowly to financial information and thus seemingly contradicts the Efficient Market Hypothesis. The author concludes that the benefits of fundamental analysis are concentrated in small to medium-sized firms due to their lower share turnover and lesser analyst following. In plain terms, the strategy relies on finding "diamonds in the rough". However, the method does not work equally well to growth stocks. Piotroski (2000) states that this is because the valuation of growth stocks depends less on current accounting fundamentals and more on future expectations.

Mohanram (2005) applied Piotroski's (2000) idea onto growth stocks by adding variables more conducive to growing companies. Although Mohanram (2005) is able to extend the success of contextual fundamental analysis on growth stocks, most of the returns come from shorting future losers. Mohanram's (2005) paper drew criticism over this aspect as the costs of shorting and the ability to borrow stocks were not considered in the study. Piotroski (2005) commented that the Mohanram's (2005) method faces constraints due to 1) high frictions and costs associated with shorting and 2) high search costs of industry-adjusted data that the method requires.

The findings of Piotroski (2000) have been replicated in a global setting by Mikkonen[1] (2008) who focuses on the information dissemination setting of the value and growth stocks. Even though Mikkonen (2008) is able to show that portfolio returns can be enhanced with the F_SCORE, the author has mixed results on whether the abnormal returns are due to the companies being neglected by the markets. As proposed in the original paper by Piotroski (2000), the abnormal returns seem to concentrate on companies with less analyst following and smaller volume. Mikkonen (2008) however finds contradictory evidence by showing that the winning value stocks have higher analyst following. Hence, the reasons for the success of the F_SCORE remain still somewhat unknown as the evidence regarding original hypothesis of Piotroski (2000) was mixed.

Fama and French (2006b) utilize fundamental analysis tools including the Piotroski (2000) F_SCORE in an effort to examine the relationship between P/BV, expected profitability and expected investment to future profitability. Even though they confirm that the F_SCORE does predict future profitability, the authors disagree with the mispricing argument. Fama and French (2006b) conclude that tests based on valuation equations cannot reveal how the relation between average returns and P/BV can separate rational risk and irrational beliefs.

Taking one step further, Bird and Casavecchia (2007) combine fundamental analysis signals with momentum into value and growth strategies. The authors are able to extract higher returns with the addition of the momentum factor. Using 15 years of data from Europe, Bird and Casavecchia (2007) show that a strategy buying “good momentum” value stocks and shorting “bad momentum” growth stocks delivers approximately 27% during the first year and another 15% and 8% in the next two years. The authors conclude that the momentum (or sentiment) factor provides a useful tool to identify the proper timing of the trades. In essence, momentum seems to delay entry to stocks that are not subject to a turnaround. Interestingly, the authors also note that only 45% of value stocks outperform at the 12 month holding period level. Bird and Casavecchia (2007) convey a message that investors should be careful when selecting a valuation metric because the method used may not tell when a value stock will pick up in performance or if will happen in the first place. Also, their results seem to indicate

[1] Not related to the author of this thesis.

the necessity of adding a stock screening method into a value approach to realize the value premium with a higher probability.

The study by Bird and Casavecchia (2007) is consistent with Rousseau and van Rensburg (2004) who find that the rewards to value investing are heavily affected by the holding period. Using data from Johannesburg Stock Exhange (JSE) over January 1982 through August 1998, the authors find that the probability of low P/E stocks outperforming the benchmark and high P/E stocks increases significantly only after the holding period is lengthened from 12 months. To illustrate, low P/E portfolios (lowest 10% cut-off level) have a probability of 48.2% to beat the benchmark if a 6 month holding period is used. However, the probability increases to 52% at 12 months, 56.8% at 18 months and finally up to 61.5% (24 months) and 67.6 % (30 months). Rousseau and van Rensburg (2004) conclude that value portfolios have more extreme upside but the strategy requires diversification and a long holding period.

2.4. MIGRATION

In previous research, the convergence of P/BVs is seen as the key determinant of the value effect (e.g. Fama and French 2007a, 2007b). When stocks move in size or valuation spectrum, academics call this migration (or style migration). Although the value effect and the mean reversing nature of valuation are well-known, the role of style migration in the value effect is a more scarcely researched topic. The problem with studying the different risk factors (value and size premiums) is that their exact composition is not well known. It is here where migration becomes useful. Migration provides an elegant solution to study the value and size premiums and their breakdown.

The most influential and widely cited paper on migration is by Fama and French (2007a), who document the following findings in the US markets during 1927-2006. First, the value premium is due to value stocks migrating to neutral or growth portfolio because they earn high returns or because they are acquired by other companies. Second, growth stocks that earn low returns and migrate to neutral or value portfolio also contribute to the value premium. The final determinant of the value premium is that value stocks that do not migrate earn higher returns than growth stocks that do not migrate. Fama and French (2007a) also find that the size premium is almost completely driven by small stocks migrating to a large-cap portfolio.

Pirjetä and Puttonen (2008) continue on the footsteps of Fama and French (2007a) by examining style migration in the European markets. They reach similar conclusions as Fama and French (2007a), notably the convergence of P/BVs and their contribution to the value premium. Pirjetä and Puttonen (2008) however provide more scope to the factors determining what makes stocks migrate. They find that value stocks with high return on invested capital (ROIC) and return on equity (ROE) are more likely to migrate to a growth portfolio. The authors also note that investors might avoid value stocks due to their weak operating margins and less consistency in ROIC levels. This finding gives some support to the claims of the behaviouralist school, namely that investors prefer to buy growth stocks due to their "prudent" and favourable characteristics.

Gharghori et al. (2010) provide more insights on the role of style migration by examining its role in the Australian markets. They report that the value premium has three sources in order of magnitude: (1) small-cap value stocks have higher annual returns than small-cap growth stocks, (2) large proportion of value stocks that improve in type and have higher annual returns than growth stocks, and (3) large-cap value stocks staying in the same portfolio, small-cap value stocks which grow to become large-caps and finally large-cap value stocks that experience a decline and migrate to small-cap. Although the Gharghori et al. (2010) paper is mostly consistent with Fama and French (2007a), the authors also find contradicting evidence. For instance, they find that small-cap stocks that become large-cap companies contribute only slightly to the size premium. Perhaps the most striking finding is that small-cap value stocks that do not migrate contribute most to the size and value premiums. The Gharghori et al. (2010) finding is not found at all in the US data. Although the Australian authors also incorporate momentum into their studies, the results seem mixed and the authors conclude that momentum contributes very little to the value and size effects.

Another intriguing paper on migration is by Chen and Zhao (2009) who study US stocks over 1951-2006. Their major finding is that migration is driven by earnings announcement shocks. Simply put, value (growth) stocks are upgraded (downgraded) in valuation because they have returns above (below) what the market expects. The authors highlight that the three-day announcement returns form more than 50% of the total return of migrating stocks. To illustrate, Chen and Zhao (2009) find that small value stocks that do not migrate have three-day announcement returns of 0.10%; if they however are upgraded to large growth firms their return is 2.35%.

Pätäri and Leivo (2010) examine migration patterns in Finland during 1993-2008 using different valuation criteria. The authors track how stocks migrate for 5 years after portfolio formation and use five different valuation measures to classify stocks into value and growth categories. They find that the sustainability of valuation differences depend heavily on the metric used. To illustrate, the valuation difference between value and growth stocks using P/S and P/BV remain significant even after a five year period. However, when using the P/E ratio the valuation difference between stocks diminishes more rapidly: the valuation difference is significant only 38.5% of cases after two years compared to 100% (P/S) and 92.86% (P/BV). Pätäri and Leivo (2010) suggest that this may be due to the popularity of the P/E measure. Investors are more aware of a stock's P/E ratio and thus possible mispricings are corrected more quickly.

3. HYPOTHESES

The focus of this thesis is on the role of migration in the size and value premiums in average equity returns. As the convergence of P/BV is the key component of the value premium, migration of stocks across groups is essential in explaining the cross-section of average equity returns. Further, migration across the size spectrum is able to shed light on how the size effect behaves. Specifically, this thesis will try to answer the following question:

How does migration contribute to the size and value premiums of equity returns?

Because there are many possible ways how the size and value premiums can form, the hypotheses and sub-hypotheses below will be used to find out the exact composition of the size and value premiums.

H1. *Stocks migrating across the valuation spectrum have a significant contribution on the value premium:*

H1.1. *Value stocks that improve in type contribute positively to the value premium*

H1.2. *Growth stocks that deteriorate in type contribute negatively to the value premium*

H1.3. *Value stocks that do not migrate have higher returns than growth stocks that do not migrate*

The first set of hypotheses relate to the value premium and its components and the second set to the size premium. As the aim of this thesis is to provide an out-of-sample test for the study by Fama and French (2007a), the hypotheses are formed in such a way that replicates their work.

H2. *Stocks migrating across the size spectrum have a significant contribution on the size premium:*

H2.1. *Migration from small to large contributes positively to the size premium*

H2.2. *Migration from large to small contributes negatively to the size premium*

H2.3. *Small-cap stocks that do not migrate have higher returns than large-cap stocks that do not migrate*

H2.4. *Growth stocks are more likely to migrate from small to large than value stocks*

H2.5. *Value stocks are more likely to migrate from large to small than growth stocks*

The secondary research question in this thesis is:

Can portfolio returns be enhanced by predicting migration?

Because previous research (Pirjetä and Puttonen 2008; Fama and French 2007a, Gharghori et al. 2010) finds that certain migrating stocks — mainly small-cap value that improve in size or type — tend to be extremely profitable, the interesting question naturally is whether these stocks could be separated from other stocks. Furthermore, because Piotroski (2000) is able to show that outperforming value stocks can be predicted ex-ante the same methodology is applied to a migration setting. The final hypotheses relate to predicting the migrating stocks to enhance portfolio returns:

H3. *Value stocks with higher F_SCORE outperform value stocks with a lower F_SCORE*

H4. *Positive transitions are more likely for small value stocks with higher F_SCORE than value stocks with a lower F_SCORE*

4. DATA AND METHODS

This chapter presents the data and methodology employed in this thesis. The first section provides a description on the sample selection and return calculations. The first section also presents descriptive statistics of the aggregate sample and briefly discusses its characteristics. The second section continues by describing the portfolio forming methodology and how the F_SCORE is utilized.

4.1. DATA DESCRIPTION

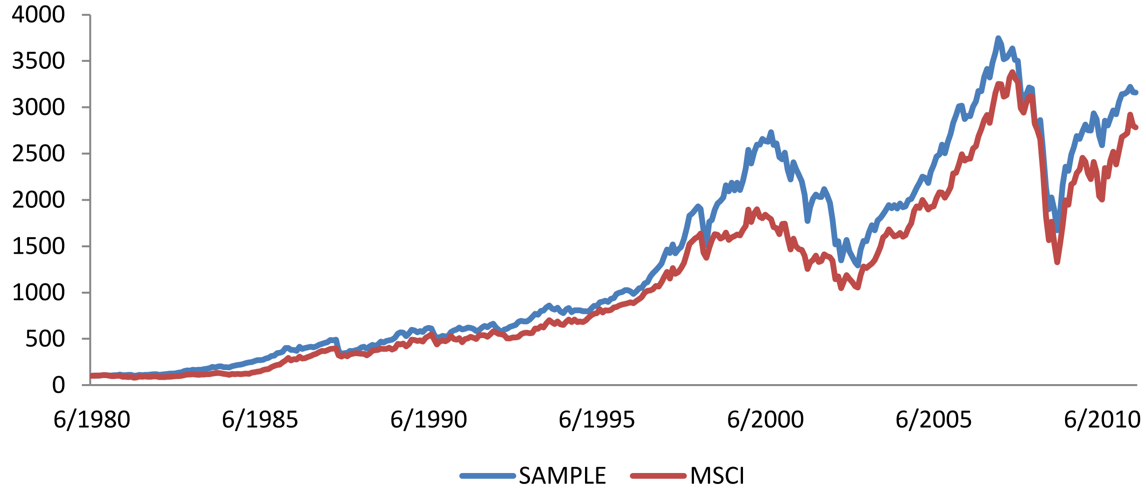
4.1.1 Sample Selection

The first step in the sample selection process screens for publicly listed active and non-active companies located in Europe during 1980-2011. To be accepted in the sample a company is required to have sufficient data on price-to-book, market capitalization and stock returns. A further requirement is that a company's fiscal year must end at December. Accounting data is acquired from the Worldscope database using Thomson One Banker whereas the data for market capitalization and returns from Datastream. The number of firm-year observations included in the sample during 1980-2011 is 52,154. Figure 1 shows the development of the sample of companies during the whole 1980-2011 period. The aggregate sample tends to follow the index rather closely over the sample period.

To identify which companies are bought out by other companies, data from SDC Platinum is acquired. This step is required to form the Good Delist portfolios (described in more detail in Chapter 4.2.). The merger and acquisition data includes 35,255 observations during 1980-2011 which forms a reference list to match the acquired companies. The buyout target companies are matched by their Datastream codes, Worldscope tickers or SEDOL codes.

Figure 1. Development of the Reference Portfolio and the MSCI Europe Benchmark

This figure represents the cumulative wealth of an investment in the reference portfolio (Sample) and the MSCI Europe index (MSCI). The reference portfolio is calculated by forming a single value-weighted portfolio from the aggregate sample of 52,154 observations. The portfolio is balanced annually at every June starting from 1980. During the time period 1980-2011 the reference portfolio returns 12.57% annually on average whereas the MSCI Europe delivers a 12.44% return.



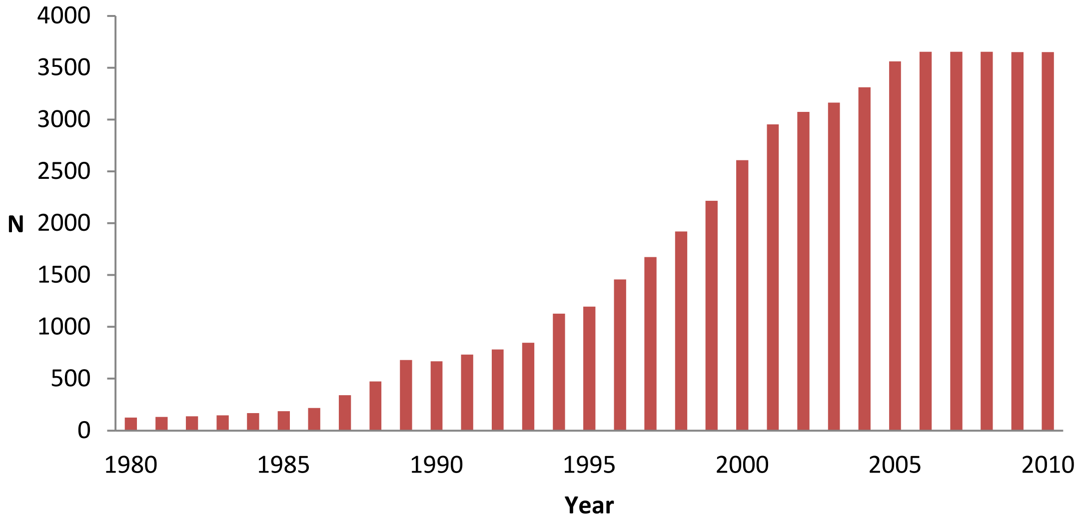
4.1.2. Calculation of Returns

Following Fama and French (2007a), portfolio returns are measured from the end of June each year. The annual buy-and-hold returns are calculated as the sum of monthly returns. The return data is the Total Return Index obtained from Datastream and includes dividends. All portfolios are value-weighted and rebalanced at the end of each June. The benchmark index for the aggregate sample is MSCI Europe. Excess returns are calculated as a portfolio's return less the return of the benchmark index during the respective month.

4.1.3. Descriptive Statistics

Figure 2. Firm-Year Observations by Calendar Year

This figure reports the annual number of firm-year observations that form the six value weight size-P/BV portfolios across the period 1980-2011. Companies are included in the sample if adequate data for price-to-book, market capitalization and stock returns is available in the Thomson Financial and Datastream databases. The total amount of firm-year observations in the sample is 52,154.



The scarcity of available data in the 1980’s is clearly seen in Figure 2. The selection of 1980 as the starting year was mainly due to the limitations in Thomson ONE Banker — earlier data was simply not available. Although this does not cause problems in the aggregate sample of 52,154, analysis by country and region are somewhat limited because the Fama and French (2007a) method requires six portfolios per year. As can be seen in Table 1, the number of observations naturally varies between countries. Expectedly, the United Kingdom, France and Germany are the countries with most observations. Interestingly, the price-to-book ratios are mostly gathered at the total sample median of 1.63, Eastern European countries have clearly lower valuations. This is most likely due to less developed capital markets as stock exchanges in Eastern Europe have a shorter history than their Western European counterparts. Variations in the companies’ market capitalizations can also be seen. Central and Western European companies tend to dominate the sample by both average and median market capitalization.

Table 1. Firm-Year Observation Breakdown Per Country.

This table illustrates the market capitalizations and price-to-book ratios by the nation of each company. The country codes and book equity are obtained from Worldscope. Market capitalizations for each observation at June t are obtained from Datastream. P/BV is the market capitalization at June t divided by the book equity at December t-1. Forming portfolios in the end of June is due to allowing enough time for the publishing of the financial reports to mitigate look-ahead bias.

		Market Cap		P/BV	
Region / Country	n	Mean	Median	Mean	Median
North Europe / Scandinavia					
Denmark	1572	362	58	2.09	1.13
Finland	825	690	107	3.69	1.71
Norway	1694	683	74	2.42	1.48
Sweden	1554	499	34	3.76	2.22
Central / Western Europe					
Austria	1021	548	81	2.35	1.37
Belgium	1033	630	116	2.66	1.38
France	8612	1323	74	3.24	1.62
Germany	6938	1446	60	3.38	1.80
Ireland	763	1072	118	2.52	1.75
Luxembourg	321	1963	238	2.67	1.30
Netherlands	2061	2622	221	3.54	1.71
Switzerland	1311	1289	175	3.82	1.44
United Kingdom	13237	1363	67	4.39	1.80
Central / Western Europe (misc.)	232	617	79	3.57	1.52
Southern Europe					
Greece	2523	352	57	2.47	1.43
Italy	2261	1553	168	3.51	1.58
Spain	1898	2958	414	2.61	1.70
Portugal	597	731	86	2.03	1.18
Southern Europe (misc.)	413	654	190	2.82	1.60
Eastern Europe					
Bulgaria	303	29	2	2.35	0.76
Czech Republic	212	1209	50	1.08	0.71
Hungary	350	467	50	1.39	1.06
Poland	1598	423	60	2.58	1.47
Slovakia	51	83	4	0.64	0.43
Slovenia	111	204	27	0.99	0.83
Eastern Europe (misc.)	663	78	28	1.54	1.06
TOTAL SAMPLE	52,154	1257	79	3.32	1.63

4.2. PORTFOLIO CONSTRUCTION

4.2.1. Migration Portfolios

The core part of this thesis follows the methodology and notation presented in Fama and French (2007a). In the Fama and French (2007a) approach, stocks are sorted into three valuation categories by their price-to-book ratios. The lowest 30% by P/BV forms the value (V) group, the highest 30% the growth (G) group and the middle 40% are neutral (N) stocks. The second step is to divide stocks into two size categories, small-caps (S) and large-caps (L) by their market capitalization. The cut-off point for S and L in year t is the median market capitalization for the benchmark index at t. This results in six different size-P/BV portfolios:

1. SV — Small-cap Value
2. SN — Small-cap Neutral
3. SG — Small-cap Growth
4. LV — Large-cap Value
5. LN — Large-cap Neutral
6. LG — Large-cap Growth

The portfolios are formed at the end of June each year and rebalanced annually. The first portfolio starts from June 1980 and the last from June 2010. Thus the last data point for the final portfolio is from June 2011. The selection of June as the starting year follows Fama and French (2007a) to prevent look-ahead bias. Since companies with negative book value cannot be ranked, they are excluded from the portfolio formation.

In general, there are two types of migration: 1) migration between the six size-P/BV portfolios and 2) migration out of the six portfolios. In the latter case, a stock will end up in one of the following portfolios:

1. “Good Delist”
2. “Bad Delist”
3. “Neg”
4. “NA”

A stock migrates to the “Good Delist” portfolio if it is bought out during year t. To identify these stocks, data from SDC Platinum is employed. A stock’s SEDOL, CUSIP or Datastream code must match the merger’s or acquisition’s target company’s code. The SEDOL, CUSIP and Datastream codes are a reliable way to identify stocks in different databases since each company has an individual code. The “Bad Delist” portfolio consists of stocks that disappear for substandard reasons such as bankruptcy or not meeting listing requirements. The stocks must have been identified as delisted in the Worldscope database. The “Neg” portfolio consists of companies with negative book equity and the “NA” includes stocks with missing data for book equity or the delisting reason is not known.

4.2.2. Summarized Migration Portfolios

To follow the methodology of Fama and French (2007a) the migration portfolios are combined into 24 summarised migration portfolios. This enables to examine the average annual contributions to the size and value premiums and simplify the analysis. Each size-P/BV portfolio is split into four broad movement categories:

1. Same: stocks that stay in the same portfolio when portfolios are rebalanced. This category also includes stocks in the “NA” portfolio.
2. dSize: small-cap stocks that move into large-cap portfolios and vice versa.
3. Plus: stocks that move towards growth portfolios (from value or neutral) or are acquired by another company (“Good delist”).
4. Minus: stocks that move towards value portfolios or are delisted due to a negative event (“Bad delist”) or their book value goes negative (“Neg”).

Subsequently, the average annual contributions to the size-P/BV portfolios by each migration type can be examined. Migration in the size spectrum contributes to the size premium. Also, migrating stocks with different P/BV characteristics contribute to the value premium. Contribution comes from two factors, namely the frequency and the magnitude of returns for migrating stocks. The returns of each migration type are calculated relative to the market return.

4.2.3. Fundamental Signals

Because the migrating stocks can be traced at an individual level this opens up several ways to examine the stocks’ characteristics and what makes them migrate. In order to study whether migration can be predicted the method outlined in Piotroski (2000), namely the F_SCORE, is applied. Because the literature on the F_SCORE (see Chapter 2) posits that value stocks that perform well can be separated ex-ante from a group of value stocks, the same method is applied to a migration setting. The F_SCORE analysis has two objectives: 1) to enhance portfolio returns and 2) predict migration.

To be able to calculate the F_SCORE accounting data from the Worldscope database is acquired. After the fundamental accounting data is collected, the number of observations for small value stocks is 13,610 and 2,006 for large value stocks. Therefore the data in this section is smaller than the original dataset from Chapter 4.1.1 due to the increased requirements for data.

The F-score is defined as the sum of the following binary signals:

$$F_{SCORE} = F_{ROA} + F_{\Delta ROA} + F_{CFO} + F_{ACCRUAL} + F_{\Delta MARGIN} + F_{\Delta TURN} + F_{\Delta LEVER} + F_{\Delta LIQUID} + EQ_{OFFER}$$

The components of the F_SCORE are described below. The variable is equal to one if the condition is filled, zero otherwise.

1) $\boldsymbol{F_{ROA}}$**:** the company's return on assets is positive in year t

2) $\boldsymbol{F_{\Delta ROA}}$: ROA in year t is larger than ROA in year t-1

3) $\boldsymbol{F_{CFO}}$: cash flow from operations is positive in year t

4) $\boldsymbol{F_{ACCRUAL}}$: cash flow from operations in year t is higher than net income before extraordinary items in year t (scaled by beginning-of –the-year total assets)

5) $\boldsymbol{F_{\Delta MARGIN}}$: gross margin ratio in year t is higher than the gross margin ratio in year t-1

6) $\boldsymbol{F_{\Delta TURN}}$: asset turnover ratio in year t is higher than the asset turnover ratio in year t-1

7) $\boldsymbol{F_{\Delta LEVER}}$: leverage ratio (long-term debt to average total assets) in year t is lower than the leverage ratio in year t-1

8) $\boldsymbol{F_{\Delta LIQUID}}$: current ratio in year t is higher than the current ratio in year t-1

9) $\boldsymbol{EQ_{OFFER}}$: the company did not issue equity during year t

The first four variables are associated with profitability. As value firms typically have a poor historical performance in generating earnings or cash flows (Fama and French 1995; Piotroski 2000; Pirjetä and Puttonen 2008), these four variables are able to separate companies that can generate profits. ROA and CFO are defined as net income before extraordinary items and cash flow from operations scaled by total assets at the beginning of the year. Therefore, if a company's ROA (CFO) is positive, the indicator variable F_{ROA} (F_{CFO}) is equal to one, zero otherwise. In addition to current financial performance, recent trend is also considered. $F_{\Delta ROA}$ is equal to one if a firm's current ROA is higher than in previous year, zero otherwise. Finally, $F_{ACCRUAL}$ measures the relationship between earnings and cash flow levels to indicate possible earnings management by the company. Sloan (1996) shows that positive accrual adjustments (if profits are greater than cash flows from operations) are a bad signal for future firm performance. Piotroski (2000) adds that the incentives for earnings management are greater for value firms to avoid possible covenant violations. The $F_{ACCRUAL}$ variable is defined as current year's net income before extraordinary items less cash flow from operations, scaled by total assets at the beginning of the year. The variable is equal to one if CFO is larger than ROA, zero otherwise.

The two next signals, $F_{\Delta MARGIN}$ and $F_{\Delta TURN}$ are designed to measure the operating efficiency of the company. $F_{\Delta MARGIN}$ is defined as current year's gross margin ratio less the gross margin ratio in the previous year. This variable indicates a possible improvement in pricing power (or a reduction in costs). The variable is equal to one if the company was able to increase its gross margin ratio, zero otherwise. $F_{\Delta TURN}$ is defined as current year's asset turnover ratio (total sales scaled by total assets at the beginning of the year) less the asset turnover ratio in the previous year. The variable is equal to one if the company has managed to increase its asset turnover ratio, zero otherwise. The asset turnover ratio is a measure of how efficiently a firm manages its assets. A firm can increase its asset turnover ratio by generating more sales with the same amount of assets or employ fewer assets to generate the same amount of sales.

The last three signals, $F_{\Delta LEVER}$, $F_{\Delta LIQUID}$, EQ_{OFFER}, relate to leverage, liquidity and source of funds, respectively. $F_{\Delta LEVER}$ measures the changes in the company's long-term debt levels. If the company is able to reduce its long-term debt compared to previous year, the variable is equal to one, zero otherwise. $F_{\Delta LIQUID}$ measures the change in the firm's current ratio (current assets divided by current liabilities) from the previous year. A company can serve its short term liabilities better when the ratio is high. The variable is equal to one if the current ratio has increased from the previous year, zero otherwise. The last variable, EQ_{OFFER}, indicates whether a company has issued equity in the year before portfolio formation. The variable is equal to one if a company did not have the need to issue shares, zero otherwise. According to Piotroski (2000), financially distressed firms that cannot generate adequate cash flows have a need for external financing and especially the variables $F_{\Delta LEVER}$ and EQ_{OFFER} are able to single out the companies in distress.

5. ANALYSIS AND RESULTS

This chapter presents the empirical findings and addresses the central hypotheses of this thesis. The first section begins by presenting the returns of the six size-P/BV portfolios and the magnitudes of the size and value effects. The second section continues by providing a geographic breakdown of the size and value premiums. The next two sections investigate the role of migration and provide an analysis on the migration portfolios. The final section provides the results of applying fundamental analysis in a migration setting and examines whether migration can be predicted.

5.1. SIZE AND VALUE PREMIUMS

Table 2 depicts the average monthly returns for each of the six size-P/BV portfolios and the size and value premiums. The data indicates the presence of a significant value premium (HML) with European stocks during the 1980-2011 timeframe. The time-series average for the value premium is 0.80% per month, which translates to a 9.58% for the average annual premium. The conventional *t*-statistic for the value premium is 5.24 (with the critical value for a two-tailed test being at 1.96) indicating statistical significance. In other words, the value premium differs significantly from zero. On average, smaller firms do not outperform their large capitalization counterparts. The size premium (SMB) is slightly negative -0.02% per month for the aggregate European sample. For the whole time period 1980-2011, the size effect is not statistically significant with a *t*-statistic of -0.14. For the portfolios SV, SN, SG, LV, LN and LG, the return difference to the MSCI Europe index is tested. Small value stocks (SV) show significant outperformance compared to the index.

Table 2. Descriptive Statistics of Average Monthly Returns.

This table presents the average monthly returns (%) of all six size-P/BV portfolios and the size (SMB) and value (HML) premiums during 1980-2011. Six value-weighted portfolios are formed at the end of each June t: SV, SN, SG, LV, LN and LG. Small-caps (S) are below the median market capitalization of MSCI Europe and large-caps (L) are above it at each June t. Stocks are further divided into three groups based on their P/BV: Value (V) stocks are the bottom 30%, Neutral (N) middle 40% and Growth (G) the top 30%. SMB is defined as the return difference between small-cap (SV, SN and SG) and large-cap stocks (LV, LN and LG) using monthly returns. HML is defined as the return difference between value stocks (SV and LV and growth stocks (SG and LG). P/BV is calculated by dividing market cap at the end of June t by book equity at the end of December t-1. Portfolios are rebalanced at the end of each June. Mean return differences are tested using the *t*-Statistic. For a two-tailed test, the critical value at the 95% significance level is 1.96.

	SV	**SN**	**SG**	**LV**	**LN**	**LG**	**SMB**	**HML**
Mean	1.68	1.15	0.58	1.44	1.08	0.94	-0.02	0.80
Standard Error	0.24	0.23	0.27	0.31	0.27	0.25	0.13	0.15
t-Statistic	2.951	0.542	-2.044	1.824	0.272	-0.533	-0.14	5.24
Median	1.72	1.68	1.20	1.73	1.74	1.37	0.20	0.62
Maximum	21.87	17.25	17.82	29.90	17.39	19.10	10.70	12.95
Minimum	-19.17	-21.03	-25.34	-24.19	-26.28	-24.25	-10.60	-7.95
Skewness	-0.452	-0.952	-1.024	-0.098	-0.808	-0.631	-0.231	0.737
Kurtosis	2.916	3.160	3.104	4.159	2.880	3.310	2.200	2.231

Figure 3. Cumulative Returns for the Six Size-P/BV Portfolios During 1980-2011.

This figure presents the cumulative wealth of an investment in the six size-P/BV portfolios during the total sample period of 1980-2011.

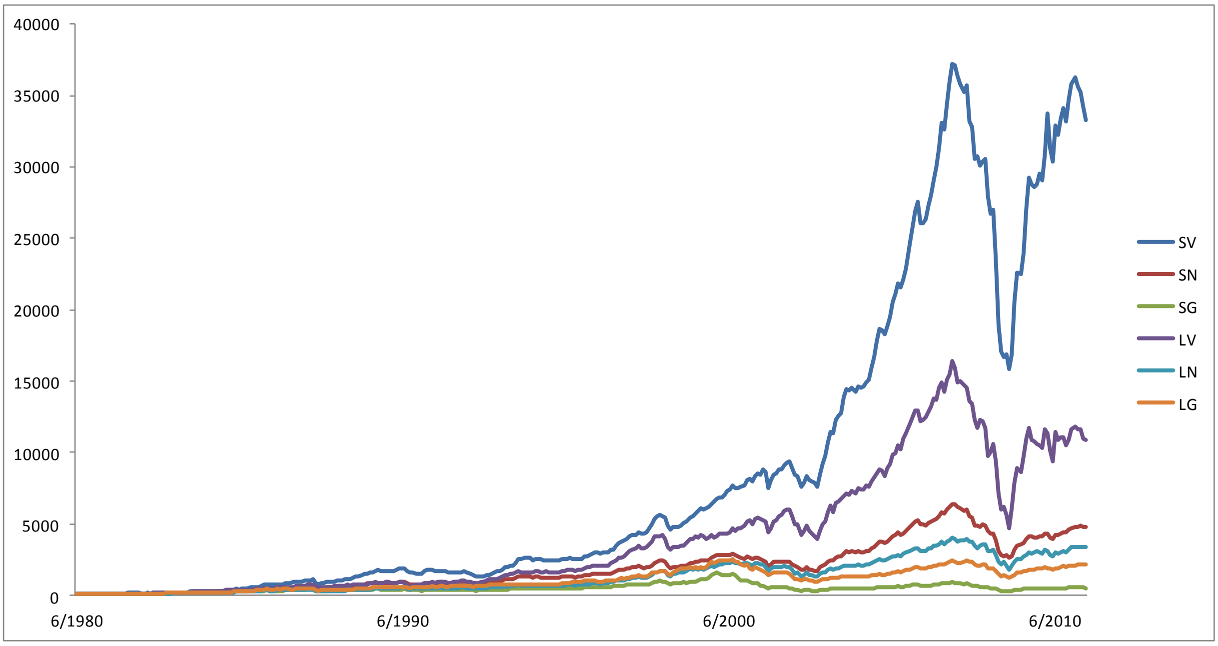


Figure 3 shows how the six portfolios behave over time. The average annual returns for the SV, SN, SG, LV, LN and LG portfolios are 20.2%, 13.7%, 7.0%, 17.3%, 13.0% and 11.3%, respectively. The corresponding benchmark index return is 12.4% for the same period. The figure illustrates the remarkable outperformance of the small-cap value strategy as the returns are compounded over three decades. Compared to the results by Fama and French (2007a), the returns are mostly similar. The main difference in the results is that small-cap growth companies tend to perform better in the US data. The reason for this is most likely the devastating effect of the IT bubble on growth stocks. Because the Fama and French (2007a) study covers 1926-2005, the crash of IT stocks forms a smaller portion of the total time frame. See Chapter 5.4 for a more detailed comparison of the results.

The financial crisis of 2007-2008 tends to result in a very poor performance for all portfolios as can be seen from Figure 3. The worst performer is the small-cap growth (SG) portfolio with returns of -48.6% and -18.8% for the two portfolio formation years starting from June 2007. The corresponding returns for the index are -12.9% and -26.6%, respectively. Double-digit negative returns are common for all six portfolios although interestingly, the large-cap value portfolio manages a positive 4.0% return in the latter year. A list of annual returns for all portfolios is presented in Appendix 1.

The value premium and its development over time can be seen from Figure 4, Panel A. Even though the average annual value premium is 9.58% (0.80% monthly) over the whole 1980-2011 time period, the behaviour of the HML factor is somewhat erratic. The performance of a simple low P/B strategy has been steady from 1980 to 1998 (7.59% annually) but the technology boom of the late 1990's changes the picture drastically; the value premium becomes negative in 1998 and 1999 (-8.58% and -14.87%). Figure 4 shows how quickly the situation reverses as the IT bubble bursts. From June 2000 to June 2011 the value premium is 16.71% on average with the peak year being 2000 (64.16%). The magnitude of the value effect during the whole sample is 9.58% which is larger than the 6.1% proposed by Chen et al. (2008). Whether the 9.58% found in this study is abnormally large is open to interpretation as the data set used in Chen et al. (2008) covers US stocks from 1945 to 2005. Also, compared to the 0.40% per month found by Fama and French (2006a) in the US during 1926-2004 the value premium found in the European data in this thesis appears somewhat high. However, since the data covers only 1980-2011, the effect of the IT bubble plays a major role. The annual value premiums are also depicted in Appendix 2 by each portfolio formation year.

The value effect has been studied in Europe on two occasions by Fama and French (1998, 2011). In their earlier paper, Fama and French (1998) provide a country-level breakdown of the value effect in 8 European nations. The authors document an annual value premium ranging from -5.99% in Italy to 8.02% in Sweden. They also find a positive value premium for example in United Kingdom, France and Germany, with annual HML factors of 4.62%, 7.64% and 2.75% respectively. A surprising phenomenon was the opposite finding in Italy, which was the only country where growth stocks outperformed value stocks. The data in the Fama and French (1998) study consisted of 686 firms on average during 1975-1995.

In a more recent paper Fama and French (2011) continue to study the size and value effects in an international setting. They find a value premium in Europe with a magnitude of 0.55% per month. The difference to the 0.80% monthly value premium found in this thesis can be at least partly explained by the smaller dataset. Fama and French (2011) cover fewer countries (16 in total) with a shorter time span (1990 to 2011). They also report a larger value premium for small stocks (0.69%) than large stocks (0.42%).

Interestingly, when compared to the European dataset provided by Kenneth French on his website[2], the behaviour of the value premium tends to differ during the financial crisis and its aftermath in 2007-2009. French’s data show a negative value premium which is in stark contrast with the positive premium found in this thesis. However, little can be said about the different behaviour of the value effect since 1) French utilizes the Bloomberg database, which can differ markedly from the Thomson Reuters database used in this thesis, and 2) French covers a group of 16 European countries, whereas this thesis utilizes over 23 countries.

Also using data from Europe, Bird and Casavecchia (2007) find the value premium to have a magnitude of 3.1% when portfolios are formed by price-to-sales for 12 months. When the holding period is extended to 24 and 36 months, the excess returns earned by the value portfolios are 14.6% and 23.8%, respectively. In their study the holding period tends to have a major role in how large the value premium is and how the outperformance of value stocks can be realized by investors. Bird and Casavecchia (2007) use a sample of approximately 1650 firms each year from 15 European countries during 1989-2004.

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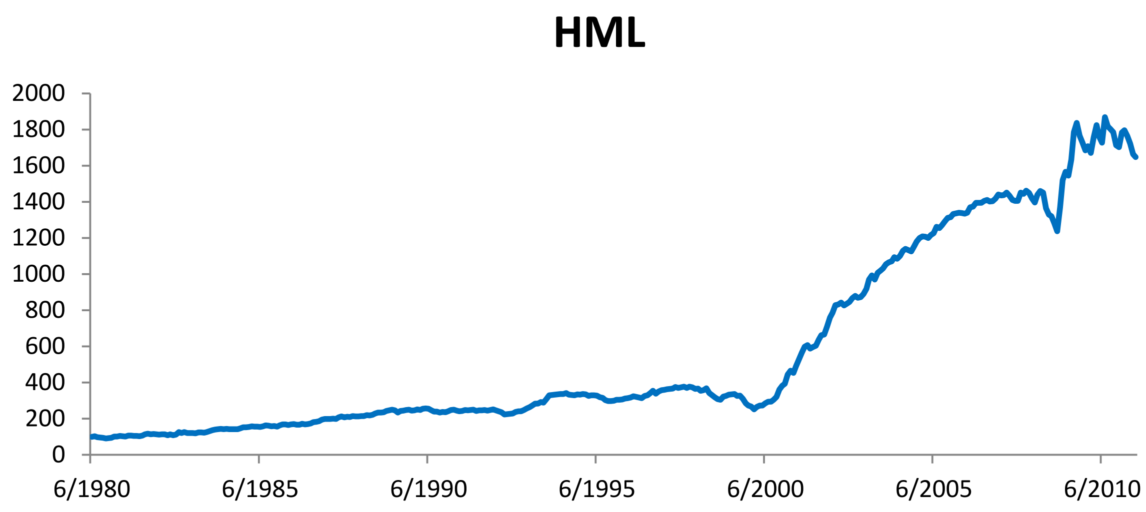
[2] http://mba.tuck.dartmouth.edu/pages/faculty/ken.french/data_library.html

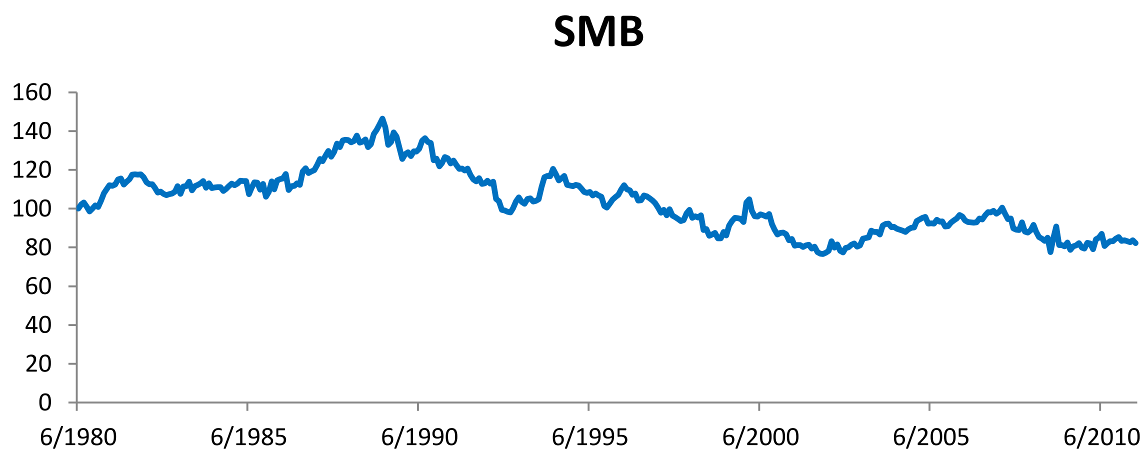
Figure 4. Cumulative Return of the Value and Size Premiums.

This figure represents the cumulative wealth of an investment in the HML (Panel A) and SMB (Panel B) factors. HML is defined as the difference between the average monthly returns of value stocks less the average monthly returns of growth stocks. Value stocks are the SV and LV and growth stocks are the SG and LG portfolios denoted in Chapter 4.2.1. SMB is defined as the difference between the average monthly returns of small-cap stocks and large-cap stocks.

Panel A:



Panel B:

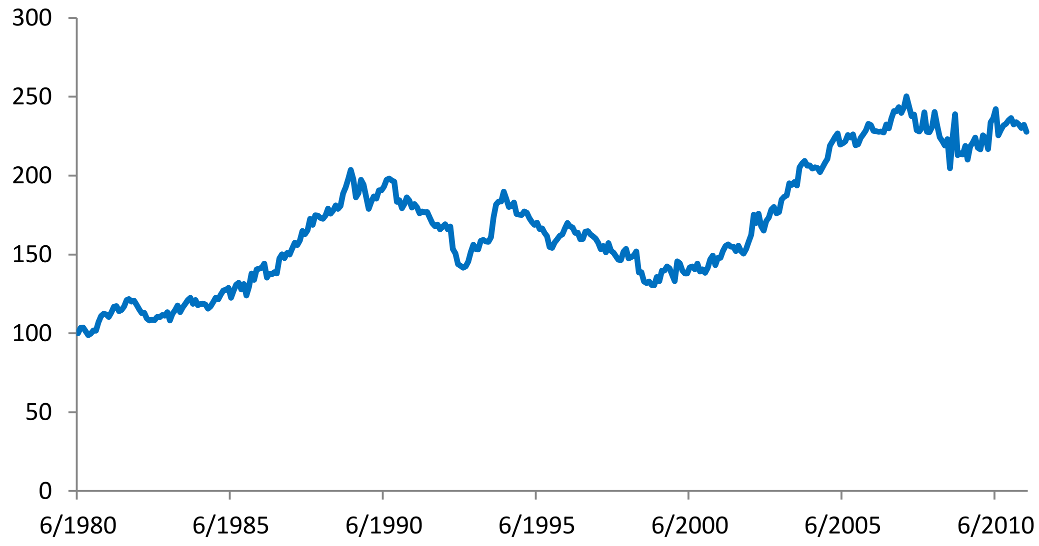


The behaviour of the size premium during 1980-2011 is somewhat striking even though in line with previous literature such as Chen and Zhao (2009). Panel B of Figure 4 shows the development of the size premium. Interestingly, the size premium is positive during 1980-1988 with average returns of 4.20% but starts to decline after that. From 1989 to 2011 the average annual size premium is -2.04%. For the total sample, the average size premium is -0.23% annually. Therefore, by using this definition of the size premium the clear conclusion is that the size premium has disappeared from Europe after 1988. The annual size premium is also presented in Appendix 2 by portfolio formation year.

Chen and Zhao (2009) argue that if an alternative definition for the size premium is used, the premium is as robust as ever. The authors find the total size premium to be 0.24% per month during 1926-2006, 0.30% during 1926-1980 and 0.11% during 1981-2006 with US data. If however small growth firms are excluded from the sample, the size premium is 0.31%, 0.31% and 0.30% for periods 1926-2006, 1926-1980 and 1981-2006, respectively. Therefore, the disappearance of the size premium is solely due to the disappointing performance of small growth firms. This thesis also considers Chen and Zhao's (2009) argument and the results are depicted in Figure 5. If small growth stocks are excluded from the sample, the annual size premium for 1980-2011 is 3.10%. However, the *t*-statistic is only 1.84 which represents a statistical significance at a 95% only when using a one-tailed test.

Figure 5. Cumulative Returns of the Size Premium Excluding Small Growth Stocks.

This figure represents the cumulative wealth of an investment in the SMB factor that excludes small growth stocks. The definition for the SMB factor is the average monthly returns of small value and neutral stocks less the average monthly returns of all large stocks.



5.2. BREAKDOWN OF SIZE AND VALUE PREMIUMS BY REGION

This chapter presents how the size and value premiums have behaved in different European countries. The aim of this section is to provide an updated view of the size and value effects since European data is scarce on this subject. Because European countries are diverse in cultural terms, it is interesting to examine the magnitude of the size and value effects by geography and over time. Further, as Fama and French (1998) find that Italy had a negative value premium during 1975-1995, it is important to provide an updated view of the same phenomenon. Since the number of observations is low for especially smaller nations, countries are grouped into fairly similar regions. Countries with more observations are reported independently.

Table 3. Size and Value Premiums by Region: 1980-2011.

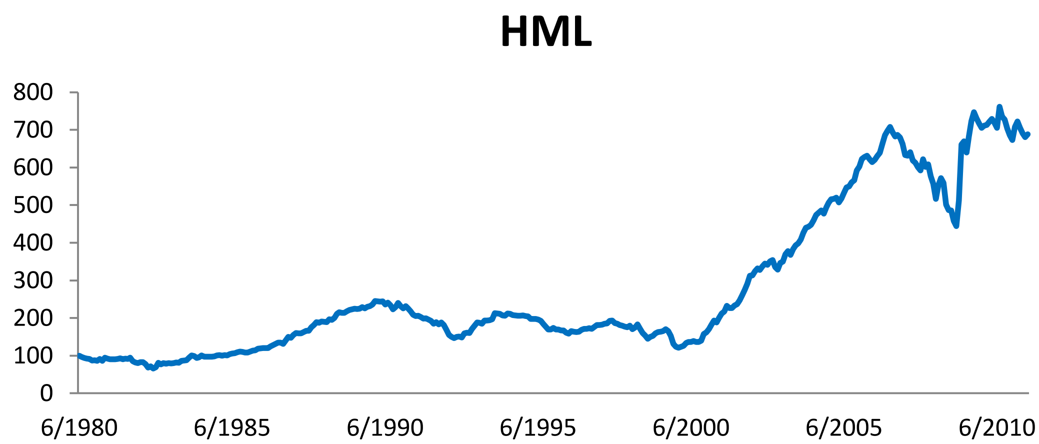
This table presents the average annual returns (%) of the six size-P/BV portfolios and the size and value premiums by geographical region. Six value weight portfolios (SV, SN, SG, LV, LN and LG) are formed at the end of June t of each year. The portfolios are formed at the intersection of two size groups: small-cap (S) and large-cap (L). The cut-off value for small-caps and large-caps is the median market capitalization of the MSCI Europe. Companies are divided into three P/BV groups: value (V, bottom 30%), neutral (N, middle 40%) and growth (G, top 30%). Market capitalization at the end of June t is used to form the size groups and is obtained from Datastream. To form the P/BV groups, book equity at December t-1 is obtained from Worldscope and combined with the market capitalization data at June t. The HML factor is the return difference between value stocks (SV and LV) and growth stocks (SG and LG). The SMB factor is the return difference between small stocks (SV, SN and SG) and large stocks (LV, LN and LG). The Benelux category includes Belgium, Netherlands and Luxembourg. Central Europe consists of Austria, Czech Republic, Hungary, Poland, Slovakia, Slovenia and Switzerland. Southern Europe is comprised of companies from Greece, Spain and Portugal. Scandinavia includes Denmark, Finland, Norway and Sweden. Tests for statistical significance are performed for the HML and SMB factors by utilizing the two-tailed *t*-test. Symbols *, ** and *** illustrate statistical significance at confidence levels of 90%, 95% and 99%, respectively.

Country / Region	n	SV	SN	SG	LV	LN	LG	HML	SMB
United Kingdom	13237	19.4	17.2	10.9	18.7	13.5	13.0	7.1***	0.8
France	8612	27.8	17.2	12.3	20.7	15.5	10.3	12.9***	3.6
Germany	6938	16.6	8.6	1.7	17.1	10.5	10.9	10.5***	-3.9*
Italy	2261	18.8	5.1	10.6	5.3	16.6	8.7	4.9*	1.1
Benelux	3415	19.7	16.9	17.2	22.5	15.8	11.9	0.7	7.5***
Central Europe	4654	22.0	15.3	2.5	23.7	12.0	8.6	12.2***	-0.7
Southern Europe	5018	15.5	11.7	1.9	14.8	14.3	9.8	9.3**	-2.4
Scandinavia	5645	18.6	14.6	13.0	15.7	13.7	7.1	5.9*	1.1

Interestingly, the value premium in Italy has been positive (4.9% on average) during 1980-2011, although it only started to pick up during the aftermath of the IT bubble. The value premium fluctuated around zero which adds weight to the Fama and French (1998) finding of a negative value premium in Italy. Table 3 shows remarkable differences in the HML and SMB factors that illustrate how divergent the national stock markets have been in Europe. The most interesting finding almost certainly is that the value premium has been positive in each region on average, although not statistically significant in Benelux countries. Moreover, the size effect has both positive and negative magnitudes during the entire period, which highlights the controversial nature of the size effect. Interestingly, Benelux is the only region where the size effect is significant at a 99% confidence level.

Figure 6. Value and Size Premium in the United Kingdom: 1980-2011

This table presents the value (HML) and size premiums (SMB) in the UK during June 1980 and June 2011. The HML factor is defined as the return differential between value and growth stocks. The SMB factor is the difference between small and large capitalization stocks. The number of firm-year observations is 13,237 and is a sub-set of the aggregate sample (52,154) of stocks with their country code listed as United Kingdom in the Worldscope database.



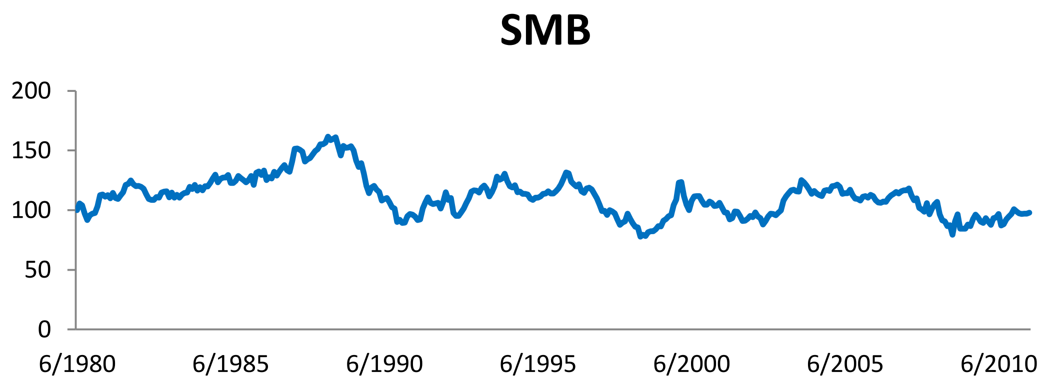


Figure 6 illustrates how the size and value premiums have behaved over time in the United Kingdom. For instance, the value premium was 9.39% per annum during 1980-1989 but turned negative (-4.77%) during 1989-1999. The years after the IT bubble (2000-2006) the value premium increased up to a remarkable 22.63% only to collapse when the financial crisis hit. The portfolio formed during June 2007 and June 2008 showed a negative return of -19.63%. However, the premium turned positive after the crisis dissipated and the average value premium for 2007 and 2011 is 4.06%. This exemplifies the erratic behaviour of value and growth stocks and demonstrates that a simple value strategy does not work in every market condition but performs well over longer periods. The behaviour of the size premium is puzzling as it is positive during the 1980-1987 but turns negative in June 1988 and seems to disappear after that. The size premium is a negligible 0.78% for the whole 1980-2011 period.

5.3. MIGRATION PORTFOLIOS

Table 4 displays the time-series average of the value-weight portions of the migration portfolios. Stocks allocated to each size-P/BV portfolios are most likely to stay at the same portfolio when the portfolios are rebalanced at the end of June t+1. Small-cap stocks are less likely to stay at the same portfolio (67.8%, 59.8% and 59.9%) than large-cap stocks (75.4%, 80.8% and 84.0% for value, neutral and growth, respectively). The second largest migration type tends to be within the same size classification. All stocks are more likely to improve or deteriorate in type rather than migrate across the size spectrum. For small-cap neutral stocks, deterioration in type is more likely (13.8%) than improvement in type (9.8%). However, with large-cap neutral stocks the situation is opposite (9.7% improves while 7.4% deteriorates in type).

Table 4. Average Transition Frequencies for Stocks Migrating Within or Exiting from the Six P/BV Portfolios: Years 1980-2011

This table presents the average annual value-weighted transition proportions for migrating stocks within the six P/BV portfolios and the four leaving portfolios during the 1980-2011 period. Six value weight portfolios (SV, SN, SG, LV, LN and LG) are formed at the end of June t of each year. The portfolios are formed at the intersection of two size groups: small-cap (S) and large-cap (L). The cut-off value for small-caps and large-caps is the median market capitalization of the MSCI Europe. Companies are divided into three P/BV groups: value (V, bottom 30%), neutral (N, middle 40%) and growth (G, top 30%). “Good Delist” companies are acquired by another company during the year. “Bad Delist” portfolio consists of companies delisting due to sub-par reasons such as bankruptcy or not meeting listing requirements. “Neg” category includes companies with negative book value after a year of portfolio formation. Stocks that cannot be classified in any of the other categories due to unavailable data belong into the “NA” portfolio. Market capitalization at the end of June t is used to form the size groups and is obtained from Datastream. To form the P/BV groups book equity at December t-1 is obtained from Worldscope and combined with the market capitalization data at June t. To identify the “Good Delist” companies, data from SDC Platinum is obtained.

AVERAGE TRANSITION FREQUENCIES

	SV	SN	SG	LV	LN	LG	GOOD DELIST	BAD DELIST	NEG	NA
SV	67.8	14.9	0.9	8.0	5.4	0.4	0.5	0.1	0.6	1.4
SN	13.8	59.8	9.8	0.5	10.2	3.8	0.6	0.2	0.2	1.0
SG	2.1	21.6	59.9	0.0	0.8	12.8	1.0	0.4	0.5	0.9
LV	1.7	0.2	0.0	75.4	20.5	0.3	0.5	0.1	0.1	1.3
LN	0.3	0.5	0.0	7.4	80.8	9.7	0.7	0.0	0.1	0.5
LG	0.2	0.3	0.8	0.3	13.3	84.0	0.2	0.1	0.5	0.4

Interestingly, migration into large-cap territory is almost equally likely for small value stocks (8.0%, 5.4% and 0.4%, or 13.8% in total) and small growth stocks (0.0%, 0.8% and 12.8% or 13.6% in total) when all three valuation categories are taken into account. This finding is somewhat different to Fama and French (2007a) who find that small growth stocks are more likely (11.7%) to migrate into the large-cap category than small value stocks (8.5%). Migration from large to small on the other hand is somewhat more likely for large cap value stocks (1.9%) than large growth stocks (1.3%), which is to be expected.

Stocks that change size tend to stay in the same valuation category. For instance, small cap value stocks are most likely to migrate to large cap value portfolio (8.0%) rather than neutral (5.4%) or growth portfolio (0.4%). This phenomenon holds for all six categories.

Table 5. Average Annual Excess Returns and *t*-Statistics for Migrating Stocks.

Panel A of this table presents the average annual returns for the migrating stocks above the benchmark index MSCI Europe during 1980-2011. The total column depicts contains all the stocks of that particular style. The leftmost column reports the starting portfolio whereas the rest of the columns depict the portfolio where the stock migrates. For instance, small value stocks (SV) that migrate to large-cap value category (LV) return 16.9% more than the benchmark index on average. The average annual return of the benchmark index was 12.4% during the 1980-2011 period. Panel B represents the corresponding *t*-statistics for the excess returns (compared to MSCI Europe) of the migration portfolios. Symbols *, ** and *** illustrate statistical significance at confidence levels of 90%, 95% and 99%, respectively.

Panel A.

AVERAGE ANNUAL EXCESS RETURNS

	TOTAL	SV	SN	SG	LV	LN	LG	GOOD DELIST	BAD DELIST	NEG	NA
SV	7.8	-2.6	37.1	74.0	16.9	46.8	164.1	36.2	-46.9	-39.3	17.7
SN	1.3	-33.8	0.1	32.7	-9.6	29.7	60.7	41.3	-57.1	-27.4	-16.9
SG	-5.4	-87.9	-32.9	0.8	5.0	4.9	35.1	11.8	-56.7	-37.5	-37.8
LV	4.9	-19.8	38.7	N/A	0.9	26.4	42.1	4.3	-60.0	-24.1	-10.7
LN	0.6	-53.2	-23.4	-12.1	-18.3	-0.1	27.6	20.0	-38.6	-19.4	4.2
LG	-1.1	-87.2	-49.1	-19.3	-63.5	-18.2	2.4	7.1	-80.7	-50.2	-3.1

Panel B.

***t*-Statistics**

	TOTAL	SV	SN	SG	LV	LN	LG
SV	2.95***	-0.96	11.00***	5.57***	4.03***	7.33***	5.01***
SN	0.54	-10.34***	0.04	8.54***	-0.74	4.99***	9.69***
SG	-2.04**	-11.32***	-9.74***	0.29	-2.16**	0.58	8.17***
LV	1.82*	-3.16***	1.57	N/A	0.3	7.60***	2.12**
LN	0.27	-9.44***	-5.32***	-1.01	-4.80***	-0.05	8.59***
LG	-0.53	-4.49***	-8.39***	-2.54**	-3.34***	-6.01***	1.11

Table 5 illustrates the excess returns of the six size-P/BV portfolios and the excess returns by migration type. Both small-cap and large-cap value stocks (7.8% and 4.9%) beat their growth counterparts (-5.4% and -1.1%). Table 5 exemplifies the role of migration in the returns of each portfolio. For instance, small cap value tends to outperform the benchmark (7.8% average annual excess return) but small cap value stocks that stay in the same category underperform the benchmark (-2.6%). The outperformance of small-cap value therefore derives from the stocks that migrate favourably in type or in the size spectrum. To illustrate, small-cap value stocks migrating to small-cap neutral and growth outperform by 37.1% and 74.0%, respectively.

Expectedly, stocks tend to outperform by a substantial margin when they improve in type or size. Contrarily, deterioration in type or size always leads to negative returns. The only exception to this is the SN category which migrates to the large value (LV) portfolio. The results can be explained by the low amount of observations. Further, negative returns are possible due to the fact that the cut-off level between large and small caps changes every year. Sharpe ratios tend to increase (see Table 6) when a stock migrates upwards in either size or value spectrums, which is to be expected. For instance, small-cap value stocks as a whole have a Sharpe ratio of 1.30 on aggregate, but their ratio improves considerably as they migrate favourably. Interestingly, not all favourable migration types warrant a higher Sharpe ratio. To illustrate, stocks migrating from small value to small growth have a ratio of 1.56 than stocks migrating to small neutral category. This is most likely due to higher volatility as the portfolios are highly concentrated. Migration from small value to small growth is very rare and hence, the portfolios are naturally more concentrated.

Table 6. Median Sharpe Ratios for the Six Size-P/BV Portfolios.

This table presents the median annual Sharpe ratios for the portfolios during 1980-2011. The risk-free rate is the average 6 month LIBOR rate for the corresponding period and is obtained from Datastream. The leftmost column reports the starting portfolio whereas the rest of the columns depict the portfolio where the stock migrates during the year.

MEDIAN SHARPE RATIOS

	TOTAL	SV	SN	SG	LV	LN	LG
SV	1.30	0.90	2.74	1.56	1.61	1.62	3.09
SN	0.93	-1.82	0.69	2.03	-0.15	1.59	2.65
SG	0.53	-1.99	-1.21	0.63	-2.03	0.24	1.71
LV	0.93	-0.61	0.69	N/A	0.34	1.75	0.59
LN	0.58	-1.79	-0.81	-0.08	-0.69	0.40	1.79
LG	0.45	-1.47	-1.80	-0.96	-1.02	-0.55	0.47

5.4. SUMMARIZED MIGRATION PORTFOLIOS

The summarized migration portfolios are illustrated in Table 7. The following sub-sections will provide further analysis on the role of each migration type on the average excess returns of the portfolios. In addition, as the returns are broken down into four segments, it enables one to examine the causes of the value and size effects more easily. Since stocks have 10 portfolios where they can end up, aggregating the 10 portfolios into four broad migration categories simplifies the analysis. This technique follows Fama and French (2007a). The Fama and French (2007a) results are illustrated in Table 8 for comparison purposes as the key objective of this thesis is to replicate the Fama and French (2007a) study.

Table 7. Average Annual Excess Returns, Average Transition Vectors and Average Contributions to Average Excess Returns: Period 1980-2011.

This table presents the average excess returns, average transition vectors and average contributions to the excess return for each size-P/BV portfolios. Average excess return is defined as the average of the annual value-weight returns in excess of the market return for the year after portfolio formation for all stocks in a size-P/BV portfolio (Total), or for the Minus, Same, Plus or dSize groups of the portfolio. The Minus group consists of stocks that are downgraded in valuation or delisted due to sub-par reasons. The Same group includes stocks that do not migrate or data is not available for the next year. Stocks that are upgraded in valuation or acquired by another company are included in the Plus portfolio. Small (large) stocks that move into large-cap (small-cap) category are included in the dSize group. The year t transition vector for a portfolio is the fraction of the aggregate market cap of the portfolio when formed at the end of June of year t that is in the Minus, Same, Plus or dSize group at the end of June t+1. The average transition vector is the average of the annual vectors. The Minus, Same, Plus or dSize group's contribution to a portfolio's average return for year t is the fraction of the year t market cap that migrates to the group in t+1 times the value-weight average excess return for the group from t to t+1. The average contribution to excess return is the average of the annual contributions. The average annual value-weight market return is 12.4% for June 1980 to June 2011.

	AVERAGE EXCESS RETURN					AVERAGE TRANSITION VECTOR				AVERAGE CONTRIBUTION TO EXCESS RETURN			
	TOTAL	**MINUS**	**SAME**	**PLUS**	**dSIZE**	**MINUS**	**SAME**	**PLUS**	**dSIZE**	**MINUS**	**SAME**	**PLUS**	**dSIZE**
SV	8.1	-51.7	-2.4	36.8	34.3	0.7	69.2	16.3	13.7	-0.5	-1.6	5.8	4.4
SN	1.8	-33.6	-0.7	28.8	37.1	14.2	60.8	10.4	14.5	-5.0	-0.4	3.3	3.9
SG	-5.3	-35.5	0.6	3.8	31.8	24.6	60.8	1.0	13.6	-9.5	1.3	-0.7	3.6
LV	5.4	-31.7	1.1	25.8	-14.4	0.2	76.7	21.3	1.8	-0.3	0.8	5.3	-0.5
LN	1.0	-18.2	0.0	27.1	-36.8	7.5	81.3	10.3	0.8	-1.3	0.1	2.4	-0.2
LG	-0.6	-19.1	2.4	13.3	-37.3	14.1	84.4	0.2	1.3	-2.5	2.0	0.0	-0.1

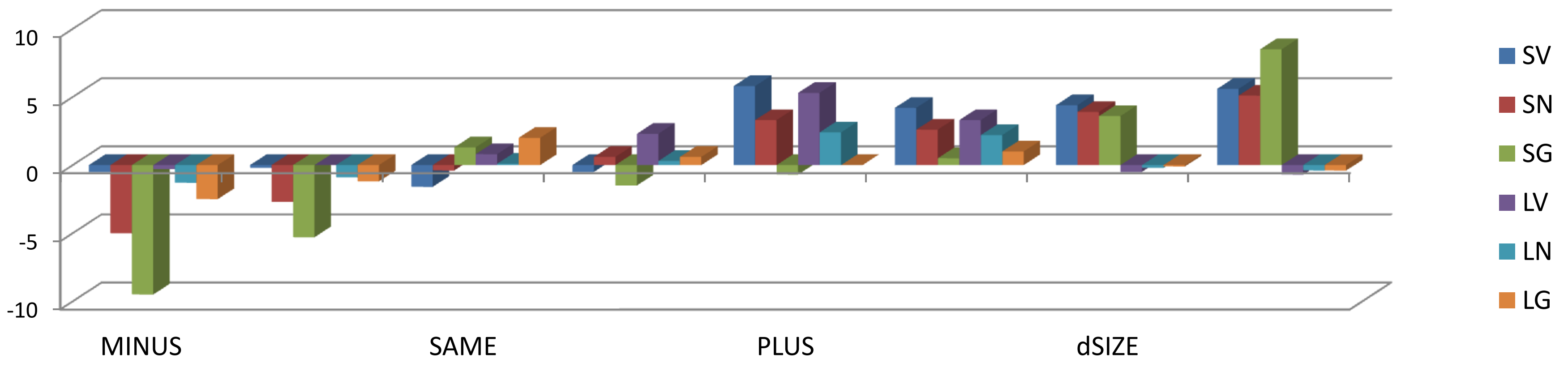
Table 8. Average Annual Excess Returns, Average Transition Vectors and Average Contributions to Average Excess Returns: Fama and French. Period 1926-2005.

Panel A presents the findings of Fama and French (2007a). The return for the benchmark index was 13.3% during the corresponding period. The table is represented here for comparison purposes as the key objective of this thesis is to replicate the Fama and French (2007a) results. Panel B provides a graphical comparison of the "Average Contribution to Excess Return" data of this thesis (the first set of columns) and the Fama and French (2007a) results (the second set of columns).

Panel A:

	AVERAGE EXCESS RETURN					AVERAGE TRANSITION VECTOR				AVERAGE CONTRIBUTION TO EXCESS RETURN			
	TOTAL	**MINUS**	**SAME**	**PLUS**	**dSIZE**	**MINUS**	**SAME**	**PLUS**	**dSIZE**	**MINUS**	**SAME**	**PLUS**	**dSIZE**
SV	9.2	-17.1	-0.3	21.5	61.5	1.0	70.9	19.6	8.5	-0.2	-0.5	4.2	5.6
SN	5.6	-15.3	0.5	21.9	50.1	16.7	61.1	11.9	10.2	-2.7	0.6	2.6	5.1
SG	2.2	-19.3	-3.0	18.8	61.6	25.6	60.0	2.4	11.8	-5.3	-1.5	0.5	8.5
LV	4.8	-36.3	3.2	16.9	-31.7	0.1	75.2	22.5	2.2	0.0	2.3	3.3	-0.7
LN	1.2	-11.5	0.4	16.6	-31.1	8.6	75.1	15.0	1.2	-0.9	0.3	2.2	-0.4
LG	-0.9	-12.0	0.8	15.6	-37.4	10.9	87.5	0.7	0.9	-1.2	0.6	1.0	-0.4

Panel B:



5.4.1. Non-Migrating Stocks

Although stocks tend to stay in the same group year over year (from 60.8% with SN and SG to 84.4% with LG), their returns tend to be negligible. Interestingly, small-cap value stocks that stay in the same category contribute negatively (-1.6%) to the total (8.1%) portfolio, whereas small growth stocks have positive contributions (1.3 % out of total -5.3%). Further, LV stocks in the “Same” group contribute only 0.8% to the total (5.4%) portfolio. Another interesting finding is that the only positive contribution to the LG portfolio is solely dependent on the “Same” group. This implies that acquisitions of large companies are very rare.

Contrary to what was expected was the underperformance of the value stocks (SV and LV) to the growth stocks (SG and LG) that stay put. This indicates the significant role of migration due to the fact that majority of all stocks tend to stay in the starting category. For instance, small value stocks as a whole perform best (8.1%) but the typical small value stock does not migrate (with a probability of 69.2%) and this leads to an average underperformance of -2.4% compared to the benchmark index.

5.4.2. Migration Between Value and Growth

Improvements and deteriorations by type tend to be relatively frequent for all stocks. Value stocks tend to improve in type (SV: 16.3%, LV: 21.3%) almost in equal proportions to growth stocks that deteriorate (SG: 24.6%, LG: 14.1%). Similarly to Fama and French (2007a), large value stocks are more likely to be upgraded (21.3%) than small value stocks (16.3%). Moreover, deterioration in type is more likely for small growth stocks (24.6%) than their large-cap counterparts (14.1%).

Small-cap neutral stocks are more likely to deteriorate (14.2%) than be upgraded (10.4%). Interestingly, the opposite is found for large-cap neutral stocks with 7.5% migrating towards lower valuation and 10.3% upwards. This finding is similar to Fama and French (2007a). Another finding of interest is the difference in returns for neutral stocks in the “Minus” group. Small neutral stocks tend to suffer more heavily (-33.6%) than large-cap neutral stocks (-18.2%).

The role of “Minus” and “Plus” transitions in regard to the value effect is very significant. Most of the outperformance of small value stocks comes from those stocks that migrate upwards to neutral or value (5.8% out of 8.1% total portfolio). The same holds for large-caps (5.3% from a total portfolio of 5.4%). Contrarily, growth stocks that are in the “Minus” category form a significant portion of the value effect. Small growth stocks contribute -9.5% to the total -5.3% SG portfolio. The same holds for large cap growth stocks as well. The underperformance of growth stocks comes mostly from the heavy losses from the “Minus” group for both SG and LG.

5.4.3 Migration Between Size Groups

As expected, migration across the size boundary contributes extensively to the excess returns of the small-cap portfolios (4.4%, 3.9% and 3.6% for SV, SN and SG, respectively). Interestingly, the same does not apply for the large-cap stocks. For large-caps, the negative contribution ranges from -0.1% to -0.5%, which are significantly smaller figures compared to small-caps. The reason for this is straightforward and due to the value-weighting of portfolios. Simply put, migration from small to large is most likely for firms close to the market cap boundary and these companies have the largest weights in the portfolios. The opposite holds for large-caps. The likelihood of crossing the size boundary is almost equal for small value and growth stocks (13.7% versus 13.6%), as noted also in Chapter 5.3.

5.5. FUNDAMENTAL ANALYSIS IN A MIGRATION SETTING

This section presents the findings of applying Piotroski’s (2000) F_SCORE method into a migration setting. The data used in this section is a sub-set of the original 52,154 firm-year observations and is explained in more detail in Chapter 4.2.3. This section has two objectives: 1) to find out whether portfolio returns can be enhanced with the F_SCORE and 2) to find out whether the F_SCORE predicts migration.

5.5.1. Enhancing Portfolio Returns

Table 9. Descriptive Statistics for Small-Cap and Large-Cap Value Stocks Based on Fundamental Signals.

This table presents the average annual returns, number of observations, Sharpe ratios and tests of statistical significance for small value stocks and large value stocks. Low Score portfolio consists of stocks with a F_SCORE of 0 or 1 and High Score portfolio of stocks with a F_SCORE of 8 or 9. All portfolios are value-weighted. The Sharpe column indicates the median annual Sharpe ratios for the portfolios from 1981-2011. Mean return differences are tested with the *t*-statistic. Symbols * and ** denote a statistical significance of 95% and 99%, respectively, using a two-tailed *t*-test. The median F_SCORE value for both small and large value stocks is 5.

Small Value	Return	n	Sharpe	Large Value	Return	n	Sharpe
All Firms	20.2 %	13610	1.32	All Firms	17.3 %	2006	0.98
0	7.9 %	672	0.64	0	44.6 %	13	0.36
1	9.1 %	695	0.06	1	14.4 %	38	0.56
2	7.4 %	1018	0.06	2	7.9 %	129	0.05
3	14.4 %	1745	0.71	3	16.6 %	330	0.59
4	15.7 %	2227	0.84	4	15.5 %	438	0.49
5	18.9 %	2492	0.69	5	18.9 %	460	0.58
6	25.2 %	2248	1.40	6	20.8 %	325	0.60
7	29.2 %	1530	1.80	7	25.8 %	176	0.98
8	34.6 %	784	1.29	8	23.6 %	76	0.96
9	30.8 %	199	1.26	9	32.0 %	21	0.88
Low Score	10.8 %	1367	0.02	Low Score	20.6 %	51	0.51
High Score	34.9 %	983	1.40	High Score	23.3 %	97	0.54
High - Low	24.1 %			High - Low	2.8 %		
t-Statistic	4.04**			*t*-Statistic	0.29		
High - All	14.7 %			High - All	6.00 %		
t-Statistic	4.11**			*t*-Statistic	1.79*		

The results (Table 9) indicate that the F_SCORE is able to increase the returns of a value strategy, although the benefits of fundamental analysis are concentrated mainly on small-cap stocks. The results are in accordance with previous research (Piotroski 2000, Bird and Casavecchia 2007, Mikkonen 2008), i.e. financial health indicators have a significant role in predicting future returns. The findings in Table 9 illustrate some of the specifics of where the benefits of the F_SCORE are concentrated. For instance, the F_SCORE can very easily separate financially weak firms (Low Score) from strong firms (High Score) when applied to small stocks. The return difference is 24.1% and the difference is statistically significant at the 99% level. Moreover, the return difference between financially strong firms and the total sample of small stocks is 14.7%, which is also significant at the 99% level. However, in large-capitalization stocks, only the return difference of 6% between financially strong companies and the total large-cap sample is significant (95% significance level). The return difference between financially strong and weak large companies (2.8%) is not statistically significant. Large-cap value stocks tend to suffer from a lack of observations, making the results somewhat unreliable. The main surprising finding is that large-cap value stocks with a low F_SCORE (0 or 1) outperform all large value stocks but this is very likely due to very low amount of 51 firm-year observations. The results are mostly in line with Piotroski (2000), Bird and Casavecchia (2007) and Mikkonen (2008). Piotroski (2000) posits that improvement in returns is isolated to firms in the bottom 2/3 of market capitalization.

5.5.2. Predicting Migration

This sub-chapter brings together two previous findings of this thesis. Firstly, the returns to a small-cap value portfolio are driven by stocks migrating to other categories, i.e. stocks are rewarded with a higher P/BV ratio or they move in the size spectrum. Secondly, stocks that perform well can be separated from other stocks in the small-cap universe. The natural question therefore is whether or not these findings are linked.

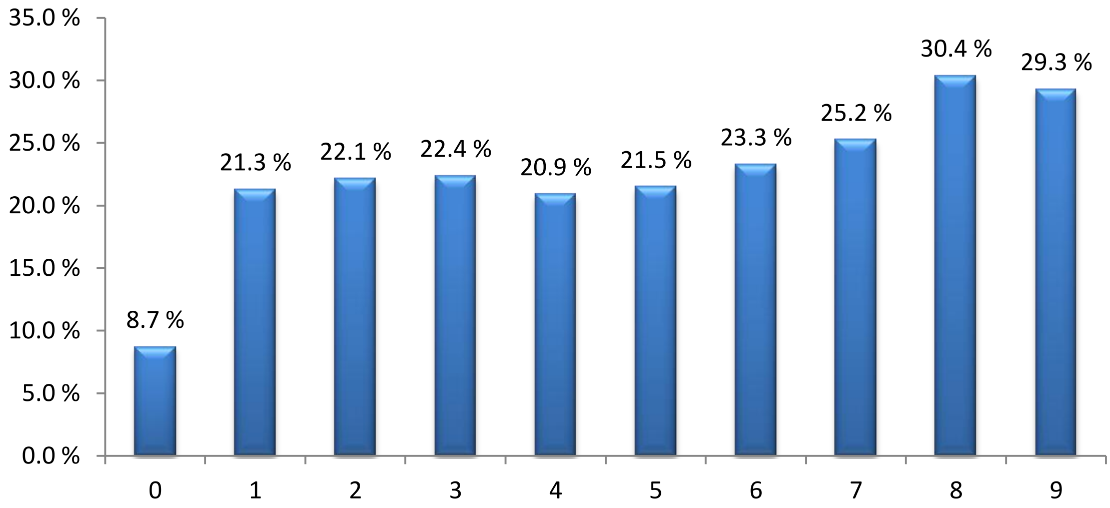
The data for this section are the small-cap value stocks (the SV portfolio) from the original sample of 52,154 stocks. The stocks are divided into two groups, those that migrate favourably ("Good Migration") and the rest ("Other"). "Good Migration" consists of SV stocks moving upwards in value spectrum (into SN or SG) or the size spectrum (in any of the three LV, LN and LG groups) or are acquired by another company. Therefore the "Other" category consists of small-cap value stocks that do not migrate or stocks that are delisted for sub-par reasons such as bankruptcy.

Further, a logistic regression (logit) model is applied on the data to examine the association between F_SCORE values and the probability to migrate. Since the outcome is binomial, i.e. a stock migrates favourably or not, the logistic regression is the preferred tool.

Figure 7. Statistics of Migrating and Non-Migrating Small-Cap Value Stocks.

Panel A of this figure represents the proportions of small-cap value stocks that belong in the "Good Migration" category by their F_SCORE. The "Good Migration" category consists of stocks that move from small-cap value (SV) category to either small-cap neutral (SN), small-cap growth (SG), large-cap value (LV), large-cap neutral (LN), large-cap growth (LG) or stocks that are acquired by another company during the year. The rest of the stocks ("Other") are stocks that stay put in the SV category or are either delisted due to sub-par reasons or have negative book equity the next year. Panel B represents the corresponding number of observations.

Panel A.



Panel B.

Number of Observations

F_SCORE	"Good Migration"	"Other"
0	49	514
1	126	466
2	205	721
3	372	1292
4	438	1659
5	501	1833
6	493	1625
7	361	1070
8	215	493
9	53	128
TOTAL	2813	9801

As noted in Chapter 5.3 (see Table 4) the bulk of outperformance of small-cap value stocks are driven by stocks that migrate in either the value or size spectrum. Figure 7 illustrates how the probability of migration changes depending on the firm's F_SCORE at the portfolio formation period. The results are somewhat mixed but provide a useful insight in the relationship between a company's financial strength and the probability to migrate favourably. For instance, companies with very weak financial strength (F_SCORE of zero to one) tend not to migrate or are more likely to be delisted. The proportion of these stocks in the "Good Migration" category is 15.2%. The situation is the opposite with the very strong companies (F_SCORE of 8 or 9). Their proportion in the "Good Migration" category is 30.1% indicating that financial strength as measured by the F_SCORE might play a significant role in whether a stock migrates. However, the situation is not very clear in the middle range of the F_SCORE values, where the proportion of stocks migrating favourably hover around 21%-25%.

Table 10. Logistic Regression Results for Migrating and Non-Migrating Small-Cap Value Stocks.

This table presents the results of the logistic regression applied to the probability of migration for small-cap value (SV) stocks. Y represents whether a stock belongs to the "Good Migration" category in the end of June t+1 and X is the F_SCORE value at the end of June t. A value of Y = 1 indicates that a stock has migrated to the "Good Migration" category and a value of Y = 0 indicates that the stock belongs in the "Other" category. "Good Migration" is defined as the combination of small-cap neutral (SN), small-cap growth (SG), large-cap value (LV), large-cap neutral (LN), large-cap growth (LG) or a stock which has been acquired by another company. The "Other" category includes the remaining destinations a small-cap value (SV) stock can have: it can belong in the same small-cap value (SV) category, its book value can go negative or the company can be delisted for sub-par reasons. The sample size is 12,614 firm-year observations during 1981-2011 and is a subset of the original 52,154 firm-year observations.

Logistic Regression Results

Sample Size	12614		
Cases With Y = 0	9801 (77.70%)		
Cases With Y = 1	2813 (22.30%)		
Overall Model Fit			
Null model -2 Log Likelihood	13388.16		
Full model -2 Log Likelihood	13326.353		
Chi-Square	61.807		
Degrees of Freedom	1		
Significance Level	P < 0.0001		
Coefficients and Standard Errors			
Variable	Coefficient	Std. Error	P
X	0.081277	0.010419	<0.0001
Constant	-1.6268		
Odds Ratios and 95% Confidence Intervals			
Variable	Odds ratio	95% CI	
X	1.0847	1.0627 - 1.1070	

Table 10 shows the results of the logistic regression for the probability of favourable migration. The odds ratio stands at 1.0847, which can be interpreted that a one-point increase in the F_SCORE increases the stock's probability to migrate by 8.47%. Even though the model is significant, the results should be interpreted cautiously. As the objective of the regression is only to examine whether a relationship exists between the F_SCORE and migration probability, the model is a crude measure to accomplish this and is not meant to be a definitive answer to the causes of migration.

The evidence presented here is not enough to draw considerable conclusions about the reasons why stocks migrate. However, the results are intriguing especially in relation to Chen and Zhao (2009) who study the reasons for migration. One of their main findings is that positive earnings shocks drive favourable migration. Stocks that beat analyst expectations are upgraded in valuation and this explains roughly a third of migration. Further clues for the underlying reasons for migration are provided by Pirjetä and Puttonen (2008) who find that an improvement in a firm's return on equity and return on invested capital increase the propensity of an upgrade in valuation, i.e. value stocks migrating towards a growth category. Jiang and Koller (2007) also find that growth stocks tend to have higher returns on equity and invested capital. The aforementioned findings are interesting because a significant portion of the F_SCORE's variables consider a company's profitability and its improvements.

Perhaps the underlying reason for migration therefore is a simple "turnaround" story — a company's stock price increases because it is able to deliver better than expected results due to improving operational efficiency and thus profitability (as measured by the F_SCORE). Investors might shun value stocks and remain pessimistic about the companies' probability to become more profitable but the firms manage to surprise positively. Contrarily, without an improvement in a company's financials the stock is not rewarded with an upgrade in valuation. According to the data from Europe (see Figure 7), stocks that have a poor financial condition tend to stay put and their stock price languishes. Although this is a very enticing explanation for migration, more research is needed to confirm or reject this theory.

6. SUMMARY AND CONCLUSIONS

This thesis examines the role of migration in the value and size premiums by complementing the existing literature with a European dataset. The motivation for this study stems from Fama and French's (2007a) novel approach — migration — to assessing the two main anomalies in asset pricing literature, namely the value and size effects. Migration enables to see how the size and value premiums form and to examine the dynamics of equity valuation. As prior studies in this area are scarce, the opportunity arises to extend the research to cover Europe as well.

As the main contribution of this thesis is to provide an out-of-sample test of the Fama and French (2007a) results, the key empiric tests follow the exact methodology of Fama and French (2007a). A European sample containing 52,154 firm-year observations from over 23 countries is utilized. The overall results suggest that migration has a significant role in forming the value and size effects. Taking a step further, this thesis attempts to bridge the connection between the value effect literature and applying fundamental analysis into value investing to see whether migration can be traced to company level. The main empirical method is the aggregate measure of a firm's financial condition (F_SCORE) which is applied in a migration setting. Although the results in this area are somewhat mixed, this thesis provides some evidence to understanding what makes a stock migrate. The rest of this chapter summarizes the key results of this study in relation to the hypotheses. Finally, suggestions for further research are provided.

6.1. THESIS SUMMARY

6.1.1. Discussion of Central Findings

The main objective of this thesis was to answer the following question:

How does migration contribute to the size and value premiums of equity returns?

The answers to this research question are summarized in tables 11 and 12 below. The analysis of both the value and size premiums revealed several findings which are summarized here. Firstly, the data shows a significant value premium in Europe with a magnitude of 9.58% per annum. Secondly, size premium disappears in the late 1980's and is insignificant in the sample during 1980-2011. The third observation is that the size premium appears to be positive if small growth stocks are omitted from the definition, following Chen and Zhao (2009). Even though the size effect is insignificant, migration still helps to understand from which components the premium comes from.

Concerning migration, the main findings from the pooled sample of European firms is that migration has a significant role in the formation of both size and value effects. The value effect in Europe is mainly caused by 1) value firms that migrate to a neutral or growth portfolio due to high returns or firms that are acquired by other companies and 2) growth stocks that deliver negative returns and migrate to neutral or value portfolios (hypotheses 1.1 and 1.2). These findings are consistent with Fama and French (2007a), Pirjetä and Puttonen (2008) and Chen and Zhao (2009). The main difference between the findings of this thesis and the study by Fama and French (2007) is that in the US data value stocks that do not migrate earn higher returns than growth stocks that do not migrate (hypothesis 1.3) . The European data set in this thesis did not support this.

Table 11. Summary of the First Set of Hypotheses.

Hypothesis	Findings
H1.1. Value stocks that improve in type contribute positively to the value premium	The outperformance of both small and large value stocks is mainly attributed to stocks that are upgraded in valuation.
H1.2. Growth stocks that deteriorate in type contribute negatively to the value premium	The bulk of the underperformance of growth stocks comes from stocks that deteriorate in valuation.
H1.3. Value stocks that do not migrate have higher returns than growth stocks that do not migrate	The data shows contradicting evidence. Both small and large growth stocks that do not migrate outperform small and large value stocks.

Table 12. Summary of the Second Set of Hypotheses

Hypothesis	**Findings**
H2.1. Migration from small to large contributes positively to the size premium	Significant contribution. This type of migration forms most of the excess returns of small neutral and growth stocks.
H2.2. Migration from large to small contributes negatively to the size premium	The contribution is small which is due to the fact that the portfolios are value-weighted.
H2.3. Small-cap stocks that do not migrate have higher returns than large-cap stocks that do not migrate	Data supports contrary view. The average excess returns of non-migrating large stocks are larger than their small-cap counterparts.
H2.4. Growth stocks are more likely to migrate from small to large than value stocks	Mixed results. Both are almost equally likely (13.7 % and 13.6 %) to migrate to large-cap category.
H2.5. Value stocks are more likely to migrate from large to small than growth stocks	Somewhat mixed results. Large value stocks migrate to small-cap category with a probability of 1.8 % on average, whereas for growth stocks the same probability is 1.3%.

The second part of this thesis was to take a step further in understanding migration. Here, two features of the value effect literature were brought together. The first characteristic is that value stocks that migrate in a favourable way earn substantial returns compared to the index, which was first discovered by Fama and French (2007a) and later by Pirjetä and Puttonen (2008) and Chen and Zhao (2009). The second key feature in value investing literature is that value stocks that outperform other stocks and the index can be selected *ex-ante* (for instance Piotroski 2000; Bird and Casavecchia 2007). By combining these features the natural secondary objective of this thesis was to answer the question:

Can portfolio returns be enhanced by predicting migration?

The key empirical method to enhance portfolio returns and predict migration applied in this thesis is the F_SCORE, a system that aggregates financial information signals into a simple score. First, the F_SCORE was applied on both small and large capitalization value stocks in order to enhance portfolio returns. Secondly, the same method was applied onto small value stocks to examine the connection between the F_SCORE values and favourable migration. The reason for choosing only small-cap value stocks was simple because the benefits of the F_SCORE were mainly concentrated on small stocks, which is in line with Piotroski (2000) and Mikkonen (2008).

The answers to the secondary research question are summarized in table 13. In essence, portfolio returns can be enhanced with the F_SCORE, but only the results for small stocks are highly statistically significant. For large value stocks, the results are more mixed. In large stocks, only stocks with a high F_SCORE tend to outperform other large value stocks (with a significance level of 95% utilising the *t*-test). The results related to hypothesis 3 are intriguing when considering the efficient markets hypothesis (EMH). The returns for value stocks tend to increase as F_SCORE increases, i.e. a company's financial condition improves. In other words, higher returns can be achieved with lower risk. Although this evidence cannot disprove the EMH, the results cast significant doubt on the market's rational pricing of equities.

Even though the F_SCORE seems to be able to enhance portfolio returns, its ability to predict migration (hypothesis 4) is ambiguous. Small-cap stocks with a very high score are more likely to migrate favourably (30.1% proportion is upgraded in valuation or size spectrum) than stocks with a very low score (15.2% proportion). Further, a logistic regression model is able to pick up a relationship between the F_SCORE of a stock and its probability to migrate: an increase of one in the F_SCORE value for a stock increases the probability of favourable migration by 8.47%. However, the regression results need to be approached with caution as the model does not control for other variables and thus, sheds little light on the underlying causes for migration.

Table 13. Summary of the Third and Fourth Hypotheses.

Hypothesis	Findings
H3. Value stocks with higher F_SCORE outperform value stocks with a lower F_SCORE	The average annual returns for value portfolios increases as F_SCORE increases. This applies for both small-cap and large-cap value stocks although results are more significant in small stocks. Stocks with low F_SCORE similarly underperform on average.
H4. Positive transitions are more likely for small value stocks with higher F_SCORE than small value stocks with a lower F_SCORE	Evidence is mixed. Stocks with a very high F_SCORE are more likely to migrate favourably than stocks with a very low F_SCORE. However the causality between financial strength (F_SCORE) and migration likelihood cannot be proved.

6.1.2. Discussion of Limitations of the Thesis

There are several issues that affect the interpretation of the results that can be identified by far. Perhaps the most important weakness is that the subject of size and value premiums lacks a robust theoretical framework. Therefore the empirical findings of this thesis cannot be linked to an existing theory — the size and value premiums are deemed only as anomalies in asset pricing literature and used as risk factors due to their empirical robustness.

One of the most interesting aspects of the value vs. growth discussion has been whether value stocks are inherently riskier than growth stocks or whether they are mispriced. The evidence provided in this thesis cannot offer a solution to the debate even though the results related to the second part of the thesis match the mispricing story better. The risk explanation is difficult to accept when stocks in strong financial condition (low risk) outperform stocks in weak financial condition (high risk), as seen in Chapter 5.5.1. However, the explanations for this phenomenon provided by the behavioural school are lacking as well. There are no concrete theories to sufficiently explain why a subset of value stocks is able to outperform other value stocks.

When comparing the magnitude of the size and value effects found in this thesis, a problem could be caused by the selection of the metrics and the cut-off points used. Results might not be comparable with other studies for instance, when the value effect is assessed with P/E rather than P/BV. Also, different results might arise depending on the definition of value and growth stocks. To illustrate, there is no correct definition for a value stock and it could just as well be defined as belonging to the bottom 10% or 30% of any valuation metric. Also, the value effect tends to be sensitive to the portfolio holding period, as Rousseau and van Rensburg (2004) and Bird and Casavecchia (2007) find.

Additionally, there are some data issues that limit the interpretation of the results. The first is that there is a possibility that firm delisting events or delisting returns are not correctly reported in the Worldscope and Datastream databases, which could cause an upwards bias especially in the returns of small-cap portfolios. However, the delisting returns (see the “Bad Delist” portfolio in Table 5) seem to be at least in the right direction and of reasonable magnitude. Further, even though the aggregate sample of 52,154 firm-year observations is large enough, statistical significance is not achieved at all times. For instance, some migration types are exceedingly rare to be able to gather enough observations. Another limitation is found in the numbers of observations for large value stocks making some of the F_SCORE calculations statistically insignificant.

Further, liquidity or trading volume is not taken into account when portfolio returns are calculated and interpreted. There is a realistic possibility that especially small-cap portfolio returns are biased due to illiquidity and therefore are not achievable in the real world markets. Also, this might have an impact on the F_SCORE trading strategy with small-cap stocks.

6.1.3. Concluding Remarks and Suggestions for Future Research

This thesis contributed to the existing literature by providing further empirical evidence on the seemingly anomalous equity pricing effects, the value and size premiums. Although this study is able to replicate the previous core paper, namely Fama and French (2007a), to a large extent, the underlying mechanism behind the effects are still more or less unknown. Furthermore, even though behavioural finance has taken major steps in contributing to the field of asset pricing, the behaviourists lack a unifying theory which could explain how a possible mispricing arises. For instance, Piotroski (2000) and Bird and Casavecchia (2007) are able to show that outperforming stocks can be selected ex-ante but whether this is due to mispricing is not known. Applying the concepts of behavioural finance into asset pricing will be a valuable area for further research. However, the task of explaining asset pricing anomalies with investor behaviour is rather formidable.

In practice, a particularly interesting area for further research could be the role of information dissemination environment and equity pricing. The key objective should be to understand what sort of behavioural mechanisms make stocks mispriced. Also, the strategy of combining fundamental analysis with momentum (such as Bird and Casavecchia 2007) could be a fertile field of research. Furthermore, research on migration could benefit from a more complete modelling of the underlying economic logic behind migration. For instance, the turnaround explanation proposed in this thesis should be put to the test. Are the well-performing value stocks simply companies that manage to improve their operations? Answering this question could help to understand why a certain portion of value stocks are responsible for the value effect.

Interestingly, the field of finance seems to have come full circle from the early philosophy of Graham and Dodd (1934), who wrote about such things as the importance of fundamental analysis and investor behaviour. After a dominant spell of the Efficient Market Hypothesis, the sentiment in the academic world seems to be turning back towards the possibility that assets are not priced right all the time and fundamental analysis might have some merit in equity investing. No doubt, this trend will persist in the future when the behavioural school of thought can develop better tools to assess investor behaviour.

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APPENDICES

Appendix 1. Annual Raw Returns for the Six Size-P/BV Portfolios During 1980-2011.

This table presents the annual raw returns (%) for the six value-weighted portfolios and the benchmark index (the INDEX column) MSCI Europe. The six portfolios are formed at the end of every June starting from 1980. The final portfolio thus covers June 2010 to June 2011. The portfolios contain the aggregate sample of 52,154 firm-year observations. The small-cap portfolios are formed from companies below benchmark median by their market capitalization at the end of each June. Portfolios are then ranked by their price-to-book value. Bottom 30% of companies represent value stocks, middle 40% neutral stocks and top 30% growth stocks. Price-to-book value is calculated from the book equity at the end of December of the preceding year while the market capitalization is from June. This method follows Fama and French (2007a) with the objective being to avoid look-ahead bias. Portfolios are balanced at the end of each June. Return data is obtained from Datastream and the portfolio returns are calculated as the sum of monthly returns. A stock's weight in the portfolio is its market capitalization divided by the sum of the portfolio's market capitalization at June of each year.

Annual Raw Returns

Start of Period	INDEX	SV	SN	SG	LV	LN	LG
6/1980	-10.48	21.23	21.48	24.91	16.84	5.76	10.98
6/1981	-2.85	18.86	1.67	1.76	12.66	-2.13	6.28
6/1982	31.86	38.36	36.47	40.08	52.90	42.85	34.97
6/1983	3.31	30.37	24.28	8.10	26.74	13.12	13.15
6/1984	22.79	42.65	33.86	18.66	27.91	38.36	37.60
6/1985	66.69	63.45	39.76	30.09	33.79	28.63	46.97
6/1986	32.02	29.20	31.29	22.60	35.30	18.28	10.44
6/1987	-8.77	5.12	2.42	-3.74	-2.48	-11.78	-9.93
6/1988	17.59	41.94	31.79	13.03	22.10	24.64	22.21
6/1989	30.19	21.51	14.54	0.96	10.95	24.85	23.75
6/1990	-10.08	-8.95	-4.47	-3.22	-1.59	-4.38	2.52
6/1991	21.80	-6.78	4.25	-5.67	10.00	1.40	6.13
6/1992	-1.54	6.92	6.59	5.71	24.66	11.27	11.56
6/1993	16.24	39.83	27.58	15.34	26.44	15.97	0.64
6/1994	18.26	2.60	1.74	3.38	9.18	8.44	13.50
6/1995	14.46	17.77	18.19	27.78	20.07	17.42	16.17
6/1996	27.12	31.00	23.20	17.70	40.30	36.47	27.26
6/1997	33.41	31.82	24.60	31.21	34.03	38.36	30.58
6/1998	1.17	4.23	-1.35	2.44	-0.25	14.79	18.70
6/1999	15.50	25.04	19.61	39.30	6.15	17.69	21.64
6/2000	-21.01	14.92	-10.83	-64.79	21.13	-1.19	-27.48
6/2001	-7.59	6.48	-12.70	-41.98	6.59	-17.62	-27.23
6/2002	-2.58	10.89	3.13	-8.68	-1.31	-4.38	-13.86
6/2003	27.10	42.09	34.80	25.75	38.41	27.60	18.04
6/2004	16.73	29.59	25.97	13.92	22.11	22.21	15.74
6/2005	24.30	30.18	23.21	21.14	29.79	18.47	20.98
6/2006	29.16	35.99	25.91	26.06	26.79	24.06	22.82
6/2007	-12.90	-27.33	-33.56	-48.61	-46.59	-22.99	-20.00
6/2008	-26.59	-15.02	-17.32	-18.82	4.03	-14.47	-15.42
6/2009	4.94	32.40	11.82	7.26	12.33	8.67	13.10
6/2010	35.42	9.83	18.04	15.63	17.17	22.82	19.27
AVG.	12.44	20.20	13.74	7.01	17.30	13.01	11.33

Appendix 2. Annual Size and Value Premiums During 1980-2011.

This table presents the annual raw returns (%) for the size (SMB) and value (HML) factors during 1980-2011. The portfolios are formed at the end of every June from 1980 and the final portfolios cover June 2010 to June 2011. SMB is defined as the return differential between portfolios of small (SV, SN and SG) and large (LV, LN and LG) stocks. HML is the return differential between value stocks (SV and LV) and growth stocks (SG and LG). The returns represent the average annual returns while the annual returns are calculated as the sum of monthly returns.

Annual Raw Returns

Start of Period	SMB	HML
6/1980	11.35	1.09
6/1981	1.83	11.74
6/1982	-5.27	8.10
6/1983	3.24	17.93
6/1984	-2.90	7.15
6/1985	7.97	10.09
6/1986	6.36	15.73
6/1987	9.33	8.15
6/1988	5.94	14.40
6/1989	-7.52	3.88
6/1990	-4.40	-4.92
6/1991	-8.58	1.38
6/1992	-9.42	7.16
6/1993	13.24	25.14
6/1994	-7.80	-2.54
6/1995	3.36	-3.05
6/1996	-10.71	13.17
6/1997	-5.11	2.03
6/1998	-9.30	-8.58
6/1999	12.83	-14.87
6/2000	-17.72	64.16
6/2001	-3.31	41.14
6/2002	8.29	16.06
6/2003	6.20	18.35
6/2004	3.15	11.02
6/2005	1.76	8.92
6/2006	4.76	6.95
6/2007	-6.64	-2.65
6/2008	-8.43	11.63
6/2009	5.79	12.18
6/2010	-5.25	-3.95
AVG.	-0.23	9.58